Intalco Spill Kit Contents:

Clean up equipment: Nitrile gloves, Goggles, shovel, garbage bags, and barrel.

Drain Cover: Use to keep material out of drains. Clear debris from around drain, place cover over drain so it overlaps all edges uniformly, press down edges to seal.



DRAIN SPILL GUARD:
- Qty: 1
- WH Part#: 500520956

Oil Absorbent Materials: good for petroleum-based fluids, paints and non-water soluble chemicals while repelling water





ENV ABSORBENT BOOM:
- Qty: 1
- WH Part#: 500511231

ENV Small ABSORBENT BOOM:
- Qty: 6
- WH Part#: 500511232





Oil Pads:
- Qty: 25
- WH Part#: 500511236
- 500511234, 500511237

Universal Absorbent Materials:

Will universally absorb liquids. Low cost, good for cleaning variety of spills. Poor when raining or when chemical in water as will absorb water.

UNIVERSAL ABSORBENT SOCK:
- Qty: 4
- WH Part#: 500511233



UNIVERSAL ABSORBENT PAD:
- Qty: 25
- WH Part#: 500511235



FLOOR DRY / DIATOMACEOUS EARTH:
- Qty: 1-25lb bag
- WH Part#: GS9136101001

Using Intalco Spill Kits:

Clean up spills only if safe to do so! Call x7911 if the spill is life threatening.

Identify and stop the source of the spill. Shut off a valve, move leaky equipment onto impervious surface to keep materials out of the storm water system.

Contain the spill. Apply absorbents to minimize the spreading of material. Booms can be deployed quickly and floor dry can be poured out to create berms. Cover nearby storm drains.

Contact the main gate EHS specialists at x7301 If you can't contain the spill, don't have enough materials or the spill has gotten into the storm water system. (360-384-7301 from cell phones).

Clean up the spill. Deployed materials are oily waste and need to be disposed of properly. An oily waste dumpster is in the southwest corner of the MHD. Bag materials or place into containers for transport to the MHD building so you don't spread the spill. The blue barrel can be used to hold the garbage bags and used absorbents. If you don't have transportation contact your supervisor or the main gate for assistance.

Restock the spill kit. Contact your supervisor, area owner or Environmental Department to restock the kit. Please provide the part number of the spill kit items you used which are listed on the opposite side of this sheet.

Spill kit inventory on reverse side.

APPENDIX D
SPILL PREVENTION TRAINING AND SPILL BRIEFINGS

Record of Spill Prevention Training and Briefings

Annual SPCC training and Spill briefings are conducted annually and provided to all employees. These briefings include all required SPCC training information and spill events including, at a minimum description of known spill events, documentation of malfunctioning equipment, and a review of recently developed precautionary measures. Personnel will also be instructed in the operation and maintenance of SPCC equipment and spill notification procedures. Site personnel are encouraged to share recommendations concerning SPCC procedures and health and safety and environmental issues at all times.

Records are stored electronically using the facility's training records database, currently "Workbrain."

APPENDIX E
INSPECTION FORM

Maintenance Monthly SPCC Tank/Storage Area Inspection Form

Fill in, sign, and submit a hardcopy of this form to Environmental by the last day of the inspection month.

Inspector's Name:			**Signature:**							
Inspector's Dept.:			**Date:**							
Tank ID:		**CT - T6**	**CH-T13**	**E - T1**	**F1**	**F2**	**SS-T2**	**P-T3**	**C-T1**	
Description:		Oil/Water	Hydraulic Oil	Oil/Water	Diesel	Gasoline	Elect Insul Oil	Portable Diesel	Diesel	
Location:		CT Oil Skimmer	Warehouse #4	Outfall Pond	Vehicle Fuel Stn	Vehicle Fuel Stn	Sub-station	Skid Mounted Tank	Auto Maintenance Shop	
Date										
Time:										
Tanks, Piping, and Systems										
1. Drip marks or discoloration of tank wall?										
2. Distortion of tank wall?										
3. Puddles of material from tank?										
4. Corrosion?										
5. Localized dead vegetation?										
6. Tank foundation cracks or discoloration?										
7. Foundation settling or gaps between tank and foundation?										
8. Foundation damage caused by vegetation/roots?										
9. Evidence of product seepage at valves, fittings, joints, or piping?										
10. Failure/Corrosion on pipes, pipe supports, ladders, platforms? Attachment points not secure?										
11. Drain valves unlocked or line caps missing?										
12. Any malfunction of overfill alarms or leak detectors when tested?										
13. Product leakage from internal heating coils condensate line?										
14. Damage to insulation or paint?										
15. Obstructed or inoperable vents?										
16. Lighting inadequate?										
17. Liquid in interstitial space of double wall tank?										
18. Liquid level gauge not readable or not functioning?										
19. Other problems?										
Secondary Containment:										
20. Excessive rain water in containment?										
21. Open or damaged containment drainage valves?										
22. Discoloration or presence of free product?										
23. Presence of debris inside containment?										
24. Evidence of stressed vegetation surrounding containment?										
25. Did drainage of secondary containment occur? Y / N										
26. Was drainage log filled out? if no need to add to log										
Overall Tank Score: lowest score from individual questions, above.										

Pass (P) - Tank or containment system shows no signs of leakage or compromised structural integrity. No attention required.

Issue (I) - Tank or containment system shows minor signs of leakage or compromised structural integrity. Continue to monitor or schedule corrective action.

Fail (F) - Tank or containment system has major leakage or compromised structural integrity. Needs immediate maintenance or repair.

For any finding below a Pass, describe the necessary action plan. (Exp. Continue to monitor condition of surface rust)

Tank ID	Description of Necessary Action

Maintenance Monthly SPCC Tank/Storage Area Inspection Form

Fill in, sign, and submit a hardcopy of this form to Environmental by the last day of the inspection month.

Inspector's Name:			**Signature:**								
Inspector's Dept.:			**Date:**								
Tank ID:		**SA-1**	**SA-3**	**SA-6**							
Description:		Lubricants, used oil	Lubricants	Used Oil							
Location:		Auto Maintenance Shop	Warehouse #4	90-day Drum/Tote Yard							
Date											
Time:											
Tanks, Piping, and Systems											
1. Drip marks or discoloration of tank wall?											
2. Distortion of tank wall?											
3. Puddles of material from tank?											
4. Corrosion?											
5. Localized dead vegetation?											
6. Tank foundation cracks or discoloration?											
7. Foundation settling or gaps between tank and foundation?											
8. Foundation damage caused by vegetation/roots?											
9. Evidence of product seepage at valves, fittings, joints, or piping?											
10. Failure/Corrosion on pipes, pipe supports, ladders, platforms? Attachment points not secure?											
11. Drain valves unlocked or line caps missing?											
12. Any malfunction of overfill alarms or leak detectors when tested?											
13. Product leakage from internal heating coils condensate line?											
14. Damage to insulation or paint?											
15. Obstructed or inoperable vents?											
16. Lighting inadequate?											
17. Liquid in interstitial space of double wall tank?											
18. Liquid level gauge not readable or not functioning?											
19. Other problems?											
Secondary Containment:											
20. Excessive rain water in containment?											
21. Open or damaged containment drainage valves?											
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Tank ID	**Description of Necessary Action**

Maintenance Monthly SPCC Tank/Storage Area Inspection Form

Fill in, sign, and submit a hardcopy of this form to Environmental by the last day of the inspection month.

Inspector's Name:			**Signature:**							
Inspector's Dept.:			**Date:**							
Tank ID:		**G-1**	**G-2**	**G-3**	**G-4**	**G-5**	**G-6**	**G-7**	**G-8**	**G-9**
Description:		Diesel	Diesel	Diesel	Diesel	Diesel	Diesel	Diesel	Diesel	Diesel
Location:		Admin Building	Admin Building	Main Gate	Warehouse #3	SWTP	Anode Building	Monitoring Point 101	PWT	Water Tower
Date										
Time:										
Tanks, Piping, and Systems										
1. Drip marks or discoloration of tank wall?										
2. Distortion of tank wall?										
3. Puddles of material from tank?										
4. Corrosion?										
5. Localized dead vegetation?										
6. Tank foundation cracks or discoloration?										
7. Foundation settling or gaps between tank and foundation?										
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23. Presence of debris inside containment?										
24. Evidence of stressed vegetation surrounding containment?										
25. Did drainage of secondary containment occur? Y / N										
26. Was drainage log filled out? if no need to add to log										
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Tank ID	**Description of Necessary Action**

Maintenance Monthly SPCC Tank/Storage Area Inspection Form

Fill in, sign, and submit a hardcopy of this form to Environmental by the last day of the inspection month.

Inspector's Name:		**Signature:**							
Inspector's Dept.:		**Date:**							
Tank ID:	**FC-1**	**FC-2**	**FC-3**	**FC-4**	**FC-5**	**FC-6**	**FC-7**	**FC-8**	**FC-9**
Description:	Diesel	Diesel	Diesel	Diesel	Diesel	Diesel	Diesel	Diesel	Diesel
Location:	Admin Building	Main Gate	MHD Casting Facility	Warehouse #3	Anode Building	Outfall Pond	Monitoring Point 101	Alumina Storage Area	Water Tower
Date									
Time:									
Tanks, Piping, and Systems									
1. Drip marks or discoloration of tank wall?									
2. Distortion of tank wall?									
3. Puddles of material from tank?									
4. Corrosion?									
5. Localized dead vegetation?									
6. Tank foundation cracks or discoloration?									
7. Foundation settling or gaps between tank and foundation?									
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24. Evidence of stressed vegetation surrounding containment?									
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For any finding below a Pass, describe the necessary action plan. (Exp. Continue to monitor condition of surface rust)

Tank ID	**Description of Necessary Action**

Maintenance Monthly SPCC Tank/Storage Area Inspection Form

Fill in, sign, and submit a hardcopy of this form to Environmental by the last day of the inspection month.

Inspector's Name:		**Signature:**				
Inspector's Dept.:		**Date:**				
Tank ID:		**MT-1**	**MT-2**	**MT-3**	**MT-4**	**MT-5**
Description:		Diesel	Diesel	Diesel	Diesel	Gasoline
Location:		Mobile refueler	Mobile refueler	Mobile refueler	Mobile refueler	Mobile refueler
Date						
Time:						
Tanks, Piping, and Systems						
1. Drip marks or discoloration of tank wall?						
2. Distortion of tank wall?						
3. Puddles of material from tank?						
4. Corrosion?						
5. Localized dead vegetation?						
6. Tank foundation cracks or discoloration?						
7. Foundation settling or gaps between tank and foundation?						
8. Foundation damage caused by vegetation/roots?						
9. Evidence of product seepage at valves, fittings, joints, or piping?						
10. Failure/Corrosion on pipes, pipe supports, ladders, platforms?						
11. Drain valves unlocked or line caps missing?						
12. Any malfunction of overfill alarms or leak detectors when tested?						
13. Product leakage from internal heating coils condensate line?						
14. Damage to insulation or paint?						
15. Obstructed or inoperable vents?						
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17. Liquid in interstitial space of double wall tank?						
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Secondary Containment:						
20. Excessive rain water in containment?						
21. Open or damaged containment drainage valves?						
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23. Presence of debris inside containment?						
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25. Did drainage of secondary containment occur? Y / N						
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For any finding below a Pass, describe the necessary action plan. (Exp. Continue to monitor condition of surface rust)

Tank ID	**Description of Necessary Action**

Appendix D
Sampling and Quality Assurance Project Plan

DRAFT



February 2026
Former Intalco Smelter Site

ANCHOR QEA

Sampling and Quality Assurance Project Plan

Prepared for Intalco Aluminum, LLC

DRAFT

February 2026
Former Intalco Smelter Site

Sampling and Quality Assurance Project Plan

Prepared for
Intalco Aluminum, LLC
4050 Mountain View Road
Ferndale, Washington 98248

Prepared by
Anchor QEA
20 Bellwether Way, Suite 101
Bellingham, Washington 98225

Project Number: 230002-05.09
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DRAFT

SIGNATURE PAGE

Washington State Department of Ecology

Madison Lyon, Quality Assurance/Quality Control Coordinator

Signature: _____ Date: _____

Anchor QEA

Heather Gadwa, Project Manager

Signature: _____ Date: _____

DRAFT

TABLE OF CONTENTS

1 Introduction and Purpose 1

1.1 Project Organization and Responsibilities 3

1.2 Special Training/Certification 4

1.3 Overview of Interim Action Implementation Framework 4

2 Inspections and Quality Assurance 6

2.1 Pre- and Post-Demolition Inspections 6

2.2 Remedial Excavation Quality Assurance 6

2.2.1 Soil Handling, Stockpiling, and Disposal 7

3 Compliance Monitoring Framework 9

3.1 Protection Monitoring 9

3.1.1 Health and Safety 9

3.1.2 Environmental Monitoring and Permit Compliance 10

3.2 Performance Monitoring 10

4 Sample Collection and Processing 12

4.1 Soil Screening 12

4.2 Station and Sample Identification 14

4.3 Sample Access and Positioning 14

4.4 Soil Sampling 15

4.4.1 Surface Soil Sampling 15

4.4.2 Excavator Soil Sampling 16

4.4.3 Geoprobe Soil Sampling 16

4.4.4 Soil Logging and Classification 17

4.4.5 Soil Processing Methods 17

4.5 Field Quality Assurance/Quality Control 18

4.5.1 Field Quality Control Samples 18

4.5.2 Field and Rinse Blanks 18

5 Sample Management 19

5.1 Sample Custody and Transfer 19

5.2 Sample Handling Requirements 19

5.3 Investigation-Derived Waste 20

5.4 Decontamination Procedures 20

5.5 Laboratory Analytical Methods 20

6 Quality Assurance/Quality Control 21
6.1 Data Quality Objectives and Criteria 21
6.1.1 Precision 21
6.1.2 Accuracy 22
6.1.3 Representativeness 23
6.1.4 Comparability 23
6.1.5 Completeness 23
6.1.6 Sensitivity 24
6.2 Laboratory Quality Control 24
6.2.1 Laboratory Instrument Calibration and Frequency 24
6.2.2 Laboratory Duplicates and Replicates 25
6.2.3 Matrix Spikes and Matrix Spike Duplicates 25
6.2.4 Method Blanks 25
6.2.5 Laboratory Control Samples 25
6.3 Instrument and Equipment Testing, Inspection, and Maintenance Requirements 26
6.3.1 Field Instruments and Equipment 26
6.3.2 Laboratory Instruments and Equipment 26

7 Assessments and Oversight 28
7.1 Compliance Assessments 28
7.2 Response and Corrective Actions 28
7.2.1 Field Activities 28
7.2.2 Laboratory 28
7.3 Reports to Management 29

8 Sampling Documentation and Records 30
8.1 Field Records 30
8.2 Analytical Records 30
8.3 Data Reduction 32

9 Data Validation and Usability 34
9.1 Data Review, Validation, and Verification 34
9.2 Validation and Verification Methods 34
9.3 Use of Non-Detect Results 35
9.4 Reconciliation with User Requirements 35

10 Interim Action Report 37

11 References 38

TABLES

Table 1 Soil Parameters Analytical Parameters and Target Quantitation Limits
Table 2 Guidelines for Soil Sample Handling and Storage
Table 3 Field and Laboratory Quality Assurance/Quality Control Analysis Summary
Table 4 Data Quality Objectives

FIGURE

Figure 1 Site Vicinity Map 2

CHART

Chart 1 Interim Action Implementation Framework 5

ATTACHMENTS

Attachment 1 Health and Safety Plan
Attachment 2 Field Forms
Attachment 3 Standard Operating Procedures

ABBREVIATIONS

ASTM	ASTM International
bgs	below ground surface
BMP	best management practice
CCV	continuing calibration verification
COC	contaminant of concern
CP	Competent Person
Demolition SWPPP	*Stormwater Pollution Prevention Plan Demolition Addendum*
DIAWP	*Demolition Interim Action Work Plan*
DQO	data quality objective
Ecology	Washington State Department of Ecology
EIM	Environmental Information Management
EPA	U.S. Environmental Protection Agency
EQuIS	Environmental Quality Information System
FC	field coordinator
FS	feasibility study
GC	gas chromatography
HASP	*Health and Safety Plan*
HAZWOPER	Hazardous Waste Operations and Emergency Response
HDPE	high-density polyethylene
HVOC	halogenated volatile organic compound
Intalco	Intalco Aluminum, LLC
LCS	laboratory control sample
MDL	method detection limit
MRL	method reporting limit
MS	matrix spike
MSD	matrix spike duplicate
MTCA	Model Toxics Control Act
NAD83	North American Datum 1983
NFG	National Functional Guidelines
NPDES	National Pollutant Discharge Elimination System
OSHA	Occupational Safety and Health Administration
PAH	polycyclic aromatic hydrocarbon
PCB	polychlorinated biphenyl
PID	photoionization detector
Plant	former Intalco smelter
PM	project manager

QA	quality assurance
QC	quality control
RCRA	Resource Conservation and Recovery Act
RI	remedial investigation
RL	reporting limit
RPD	relative percent difference
sf	square foot
SOP	standard operating procedures
SQAPP	*Sampling and Quality Assurance Project Plan*
SVOC	semivolatile organic compound
SWPPP	stormwater pollution prevention plan
VOC	volatile organic compound
WAC	Washington Administrative Code
XRF	X-ray fluorescence

1 Introduction and Purpose

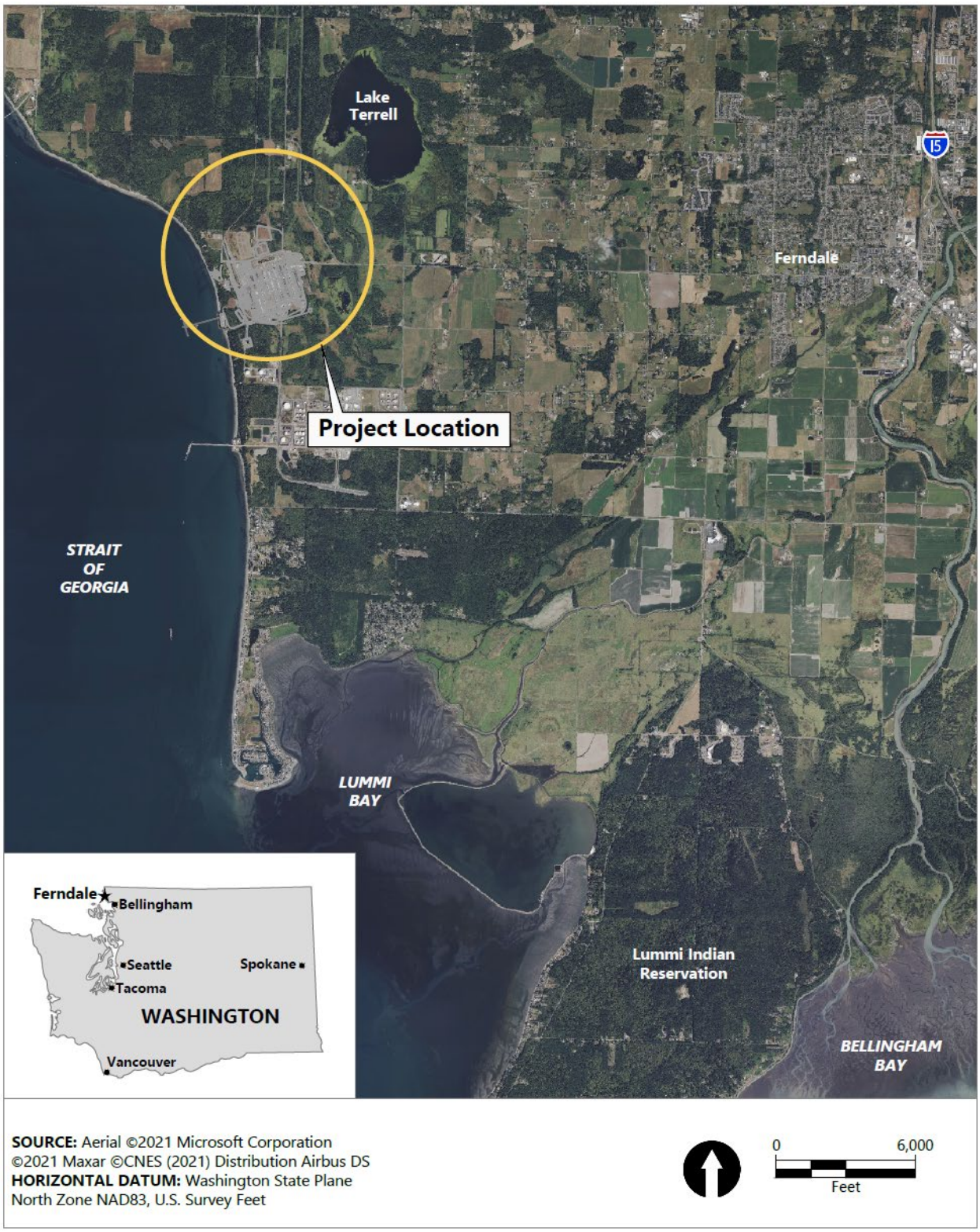
This *Sampling and Quality Assurance Project Plan* (SQAPP) has been prepared by Anchor QEA on behalf of Intalco Aluminum, LLC (Intalco), for the former Intalco smelter (Plant) located at 4050 Mountain View Road, Ferndale, Washington (Figure 1). It documents planned sample collection and analysis methods, as well as quality assurance (QA)/quality control (QC) procedures to be followed during the implementation of the *Demolition Interim Action Work Plan* (DIAWP).

The DIAWP provides a framework for assessing field conditions and performing soil sampling and potential cleanup activities concurrently with planned demolition activities. The DIAWP identifies the tentative sampling areas, depths, analytical plan, and rationale. As demolition progresses, sample locations will be refined following the framework approach as specified in the DIAWP. Additional sampling may be conducted at the discretion of Intalco to assess site conditions in areas where demolition has occurred.

The objective of this SQAPP is to ensure data are sufficient to support the project data quality objectives (DQOs). All materials necessary to complete sampling for soil are included in this SQAPP. This includes sample collection and analysis procedures, forms to record field information, and sample collection and analysis details regarding sample quality (i.e., sample containers, hold times, and QA/QC requirements). Inspections and QA activities that will be performed in parallel during interim action construction are discussed in Section 2. The project schedule, selected contaminants for sampling, and screening criteria for interim action implementation are specified in the DIAWP.

As part of this SQAPP, an interim action compliance monitoring framework has additionally been prepared to support any remedial excavation activities. The compliance monitoring framework identifies procedures for verifying the performance and effectiveness of interim action activities (Section 3). This SQAPP is intended to include sampling procedures and analytical methods to support both initial sampling and performance monitoring during interim action activities. The analytical methods and QA procedures described in this SQAPP will be followed by Intalco and its contractors during sample collection and documentation activities. Sections 4 through 10 describe these procedures and methods in detail.

Figure 1
Site Vicinity Map



1.1 Project Organization and Responsibilities

Anchor QEA will lead the field investigation activities and be responsible for project and data management. The primary responsibilities of the team members for any investigation activities are described in the following paragraphs.

Intalco Project Director: Kristin Gaines will serve as the Intalco project director to ensure implementation of this SQAPP. The project director will provide overall project compliance and direction, including monetary resources, commitment to project execution, and corporate responsibility for reporting to Washington State Department of Ecology (Ecology).

Anchor QEA Project Manager: Heather Gadwa, is the project manager (PM) for the implementation of activities described in this SQAPP. As such, she will coordinate all activities with the Ecology site manager and is responsible for overall project coordination and planning to ensure the timely and successful completion of the project.

Anchor QEA Field Coordinator: Niki Seyster will serve as the field coordinator (FC) for the implementation of field activities at the Plant. The FC is responsible for overall management of the field sampling activities and general field and QA/QC oversight, and she will ensure that appropriate protocols for sample collection, preservation, and holding times are observed.

Anchor QEA Quality Assurance/Quality Control Manager: Lydia Greaves or her designee will provide QA oversight for laboratory programs to ensure data quality, oversee data validation, and supervise project QA coordination. Third-party data review and validation of analytical chemistry data may be completed by Anchor QEA or will be provided by subcontractors Laboratory Data Consultants, Inc., or EcoChem, Inc.

Laboratory Project Manager: National Environmental Laboratory Accreditation Program and Washington-accredited analytical laboratories will be used for this project. Darwin Thomas is the laboratory PM for Apex Laboratories, LLC, and Jennifer Christmann is the laboratory PM for Enthalpy Analytical, LLC.[1] The laboratory PM will oversee all laboratory operations associated with the receipt of the environmental samples, all chemical and physical analyses, and preparation of laboratory reports. The laboratory PM will review all laboratory reports and prepare case narratives describing any anomalies and exceptions that occur during sample handling and analysis.

Anchor QEA Data Manager: Laurel Menoche will oversee data management to ensure that analytical data are incorporated into the project database with appropriate qualifiers following

[1] Alternative laboratories with this accreditation may be substituted for or added in addition to Apex Laboratories and/or Enthalpy Analytical due to availability.

acceptance of the data validation. QA/QC of the database entries will be overseen by the Anchor QEA data manager to ensure accuracy for use in project reporting.

Contractor: The Contractor selected by Intalco to implement the interim action will be responsible for conducting the remediation activities, including remedial excavations, surveying, and waste management. The Contractor is responsible for ensuring that the work complies with the requirements set forth in the required permits and DIAWP and providing all necessary QC information to Anchor QEA for review.

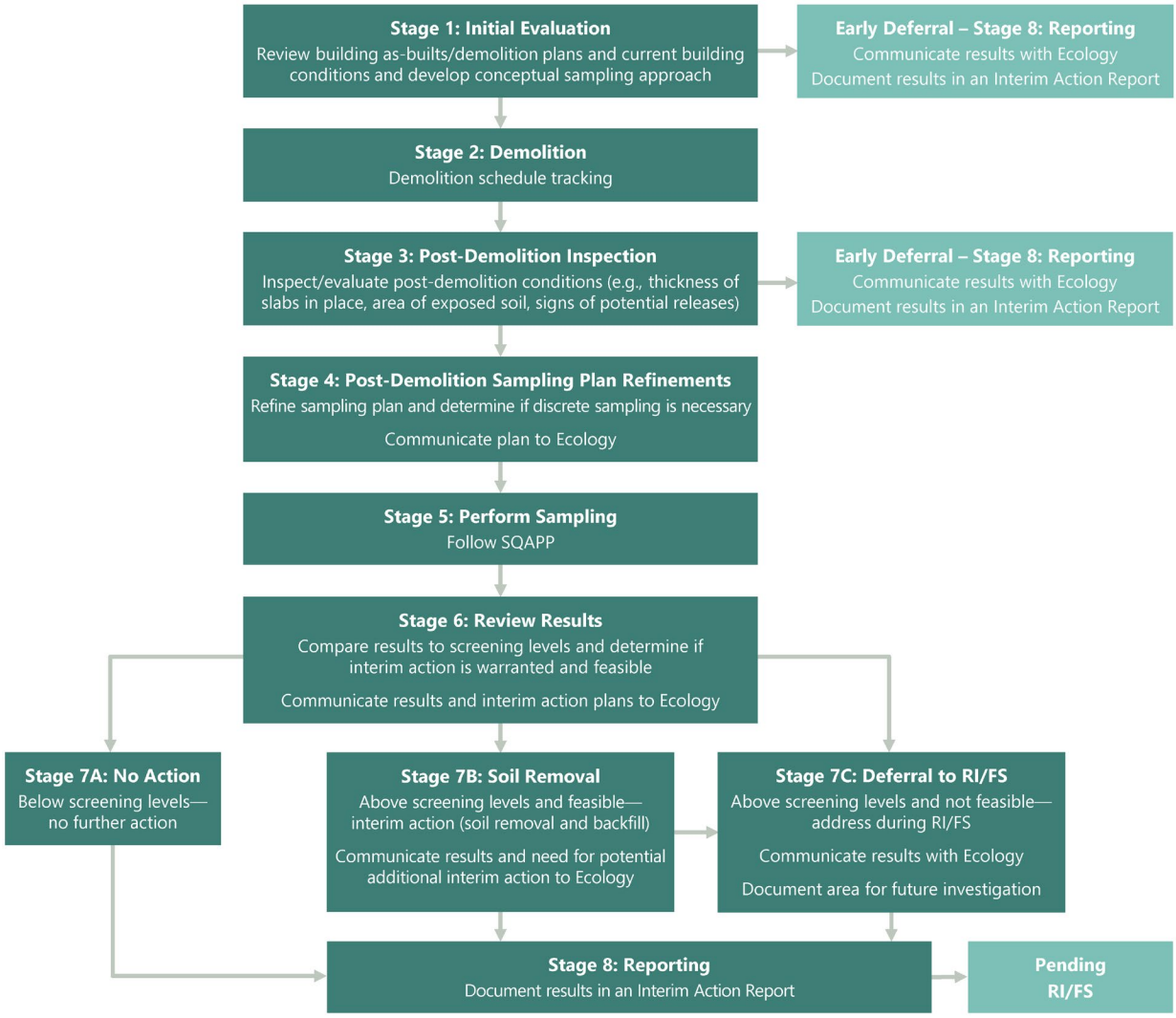
1.2 Special Training/Certification

The federal regulation 29 *Code of Federal Regulations* 1910.120 requires training to provide employees with the knowledge and skills enabling them to perform their jobs safely and with minimum risk to their personal health. All sampling personnel will have completed the 40-hour Hazardous Waste Operations and Emergency Response (HAZWOPER) training course and 8-hour refresher courses, as necessary, to meet the Occupational Safety and Health Administration (OSHA) regulations.

1.3 Overview of Interim Action Implementation Framework

The process for determining where interim actions may be performed during the demolition phase of the project will follow the framework outlined in the DIAWP. The framework is designed to be adaptive, meaning that pending post-demolition field conditions, certain areas may not complete all the assessment stages. Accordingly, the scope and locations of field inspections, screenings, and sampling will also adapt to post-demolition conditions. The framework is shown in Chart 1 and discussed in further detail in the DIAWP.

Chart 1
Interim Action Implementation Framework



Note: At any stage, Intalco may inform Ecology of work areas where additional investigation and/or interim action during the demolition process will be deferred to the future RI/FS process.

The following sections within this SQAPP provide procedures and methodology for implementing the field-related tasks of the framework, including pre-and post-demolition inspection, soil screening and sampling, and interim action compliance monitoring.

2 Inspections and Quality Assurance

Inspections and QA tasks will be performed throughout the stages of the interim action framework to assess progress, record activities, and ensure quality throughout the interim action process. The documentation and reporting of activities will support determination of whether construction activities were carried out in general accordance with the DIAWP. These data include, but are not limited to, the following: data sheets, photograph logs, soil sampling logs, laboratory analytical reports, health and safety reports, contractor progress reports, and documentation identifying corrective actions to resolve deviations. Management of QA documentation will be the responsibility of Anchor QEA and the selected Contractor.

During multiple stages of the interim action framework, inspection of buildings pre- and post-demolition are necessary to evaluate pertinent site features to inform the selection of final sampling locations. Further, remedial excavations performed in response to performed sampling will require ongoing inspection and record-keeping to ensure proper documentation of the activities. Anticipated inspections and forms of QA documentation implemented as part of the DIAWP framework and to support final reporting are further discussed in the following subsections.

2.1 Pre- and Post-Demolition Inspections

During Stage 3, after the foundations are removed to their target depth and when soil becomes accessible, soil field screening will be completed following the methods outlined in this SQAPP. Exposed soil will be field-screened for physical properties that may indicate potential contamination following procedures outlined in Section 4.1. The areas will also be photographed.

The location of pertinent features and/or locations of potentially adversely affected soil identified during field screening will be measured with a handheld GPS device and documented for future identification either during subsequent stages of the DIAWP or the RI. Location information will be supplemented as needed by handheld measuring devices (e.g., measuring wheel or tape measure) when GPS devices are ineffective if satellite interference is encountered.

Inspections will be documented on daily field logs including field sketches to provide additional detail that will be considered during sampling plan refinements made in Stage 4. Required elements of daily field records are described in Section 8.1.

2.2 Remedial Excavation Quality Assurance

For each interim action area, an engineering drawing will be prepared that will define the extents of the soil excavation (as defined by the analytical results of the vertical core samples collected during Stage 5), and a brief memorandum will be prepared that will describe any location-specific construction considerations, the required disposition of the material, and the approximate excavation

volume. During Stage 7B interim actions, Anchor QEA will perform QA inspections of the excavation areas, implement compliance monitoring (refer to Section 3), collate documentation that will be used to verify that the work has been performed to plans, and prepare the Interim Action Report.

Anchor QEA will perform QA inspections as soil excavation progresses. Each individual remedial excavation area and associated sampling will be documented on daily field logs including photographs and sketches, as necessary, to provide additional detail. Depending on the observations made at the time of excavation, field screening described in Section 2.1 may also be performed if staining or olfactory indicators are observed. The digital web map will also be used to track photographs during excavation advancement and subsequent soil sampling. The Contractor is responsible for its own protection monitoring, ensuring that requirements are met in the Fill and Grade permit, associated *Stormwater Pollution Prevention Plan Demolition Addendum* (Demolition SWPPP; Anchor QEA 2025), and National Pollutant Discharge Elimination System (NPDES) permit, which are further discussed in Section 3.1.2.

The Contractor will be required to perform post-excavation surveys so that final excavation volumes and extents can be documented. Project surveys will be performed using North American Datum 1983 (NAD83) projected on Washington State Plane Coordinate System (North Zone), United States.

2.2.1 Soil Handling, Stockpiling, and Disposal

Contaminated soil and materials generated during excavation activities will be segregated into stockpiles and transferred into trucks, roll off bins, and/or railcars for off-site transport and disposal. Stockpiles will be managed by the Contractor to prevent erosion, runoff, and contamination by covering them with plastic sheeting, placing them on impervious surfaces, and/or using perimeter sediment barriers (i.e., silt fences). Stockpiles will be located away from drainage areas, wetland, and/or waterbodies.

Prior to transport, material will be profiled using the discrete sample analysis produced as part of Stage 4 sampling. Waste with similar contaminants determined by discrete sampling discussed in Section 4.4 may be combined and profiled together. Intalco will manage soil profiling with an appropriate facility. Soil analysis requirements will be provided by the selected disposal facility and completed by Intalco.

Once material is profiled, soil will be loaded by the Contractor to facilitate off-site transportation. The Contractor is responsible for implementing best management practices (BMPs) while conducting material handling, stockpiling, loading into trucks, and transporting of contaminated soils in accordance with the Demolition SWPPP (Anchor QEA 2025). The Contractor will be responsible for the scheduling and coordination of off-site transportation and disposal of all soil materials and recyclable materials (if any).

Intalco will prepare and maintain an off-site transportation/disposal log that summarizes waste transported each day for final disposal. Disposal of impacted material will be documented by the Contractor with the following information and provided to Intalco and Anchor QEA for review:

- Date of waste shipment via truck
- Waste manifest
- Waste hauler
- Waste destination (name of permitted Subtitle D and C landfill facilities)
- Estimated volume of waste in each shipment.

Intalco anticipates using imported materials to backfill interim action excavations. Imported material will require analytical testing prior to placement. Imported materials will be analyzed for the following contaminants to confirm compliance with Model Toxics Control Act (MTCA) Methods A and B unrestricted land use values:

- Resource Conservation and Recovery Act (RCRA) eight metals
- Petroleum hydrocarbons (gasoline, diesel, and oil)
- Semivolatile organic compounds (SVOCs)
- Polychlorinated biphenyls (PCBs)
- Polycyclic aromatic hydrocarbons (PAHs)

Data and information regarding off-site disposal of contaminated soil and import material documentation will be provided in the Interim Action Report, as discussed in Section 10.

3 Compliance Monitoring Framework

Washington Administrative Code (WAC) 173-340-410 requires compliance monitoring, which includes each of the following:

- Protection monitoring to confirm that human health and the environment are protected during the construction
- Performance monitoring to confirm that the cleanup action has attained cleanup screening levels and other performance requirements, as defined in the DIAWP
- Confirmation monitoring to confirm the long-term effectiveness of the cleanup action once performance standards have been attained

For the proposed interim actions during demolition, this section describes the implementation approach for both protection and performance monitoring. Confirmation monitoring will be evaluated and addressed during the remedial investigation (RI)/feasibility study (FS) processes.

3.1 Protection Monitoring

Protection monitoring focuses on activities to protect human health and the environment during construction. This includes the implementation of applicable health and safety monitoring and monitoring of stormwater discharged to the sanitary sewer in compliance with applicable Fill and Grade permit requirements.

Protection monitoring will be achieved by following the procedures outlined in the *Health and Safety Plan* (HASP), following Intalco's internal safety protocols, and through Contractor inspections for environmental monitoring to promote a safe working environment. Protection monitoring will confirm that human health and the environment are adequately protected during construction and the operation and maintenance period of interim action. Protection monitoring measures are discussed in Sections 3.1.1 and 3.1.2.

3.1.1 Health and Safety

The Project will be executed following a site-specific HASP. The purpose of the HASP is to identify and mitigate risks, ensure worker protection through procedures and training, and outline emergency response. A HASP was developed by Anchor QEA for the related tasks outlined in the DIAWP and potential contaminants that could be encountered as outlined in the SQAPP. The HASP is provided as Attachment 1.

The Contractor will provide a Competent Person (CP) to oversee excavation procedures including protective systems (sloping, benching, shoring, and shielding). The CP will assume responsibility to complete inspections and other necessary monitoring of excavations to ensure safe access and egress, including monitoring of atmospheric conditions, soil stability, and groundwater/surface water

infiltration. Intalco and its Contractor and CP are responsible for determining all safety measures that, depending on the complexity, may result in the deferral of remedial excavation activities to the RI.

3.1.2 Environmental Monitoring and Permit Compliance

The Contractor is responsible for ensuring that requirements are met in the Fill and Grade permit, associated Demolition SWPPP (Anchor QEA 2025), and NPDES permit. This includes, but is not limited to, erosion control, stormwater/groundwater management, noise control, and pollution prevention. According to the Demolition SWPPP, BMPs will be implemented and inspected routinely to prevent inadvertent discharge of untreated stormwater into the existing stormwater system. In accordance with the Demolition SWPPP inspections, BMPs will be performed by a Certified Erosion Sediment Control Lead contracted by Intalco.

3.2 Performance Monitoring

Performance monitoring will be completed to confirm that the interim action was effective in removing contaminated soil above project screening levels. Screening levels presented in the DIAWP will be used to determine if the interim action cleanup objectives have been met or if deferral to the RI will be necessary.

Where feasible, the results of pre-excavation characterization samples will be used to vertically delineate and document that the base of remedial excavations meets cleanup objectives. Post-excavation performance monitoring, soil samples will be collected from the excavation area bases or sidewalls, as required, to confirm that remaining post-excavation surface soils meet the cleanup objectives. The following frequencies will be used to determine the number of performance monitoring samples for an area:

- Excavation areas up to 2,000 square feet (sf): A minimum of one base sample will be obtained per 500 sf. Sidewall samples will be collected at a frequency of one sample per 50 linear feet of excavation, with a minimum of one sample per sidewall.
- Excavation areas greater than 2,000 sf: A minimum of one base sample will be obtained per 2,000 sf. Sidewall samples will be collected at a frequency of one sample per 100 linear feet of excavation, with a minimum of one sample per sidewall.

Soil verification samples will be analyzed only for those contaminants known to exceed interim soil cleanup or screening levels at each remedial excavation area based on existing analytical data. The samples may be analyzed on a short turnaround basis to allow timely decision-making regarding the need for further excavation to achieve cleanup levels, as needed.

If sidewall verification sample results for target contaminants do not exceed soil cleanup or remediation levels, no further excavation will be performed. If sidewall sample results exceed cleanup levels, additional excavation may be performed or documented and deferred to the RI. Following

each additional excavation, one or more samples will be obtained from the limits of the extended excavation to verify attainment of cleanup levels. The same approach will be used to determine final vertical excavation limits. If the analytical results of post-excavation compliance soil samples exceed screening levels, additional excavation may be necessary to remove additional soil (i.e., contingent soil excavation) until screening levels are met. Additional soil excavation will be completed in 1-foot increments in those excavation area(s). However, Intalco may also determine that additional excavation is not feasible during the demolition phase, and the area would be demarcated for protection and documented until further investigation can be completed during the RI. Depending on the stability of the area post-excavation, a temporary backfill layer may be placed until a final remedial action approach can be developed.

4 Sample Collection and Processing

This SQAPP describes the procedures that will be used to screen soils and collect soil samples as appropriate post demolition and, if necessary, during remedial excavation activities, as described in the DIAWP. It is anticipated that soil samples will be collected via several methods including hand auger, hand tools, geoprobe, and/or excavator. The DIAWP details the preliminary sample areas, depths, analytical plan, and rationale. The following subsections describe general soil screening, field sampling methods, and procedures. Procedural field forms are provided in Attachment 2, and standard operating procedures (SOPs) are provided in Attachment 3.

4.1 Soil Screening

Shallow soil screening will be completed in the areas of concern as identified in the DIAWP and based on visual inspection of buildings as described in Stage 3 of the DIAWP framework. After demolition of the building and foundations are removed, the condition of the underlying soil will be assessed via field screening for the potential for adversely affected soil that may warrant collection of samples to further assess the area. To determine final sample locations within the defined sampling areas of the DIAWP, exposed soil will be field-screened for visual and olfactory properties that may indicate potential contamination. Pending visual inspection of buildings and field screening results, additional analysis may be considered. Both refinement of soil sampling locations and adjustments analysis will be discussed with Ecology per the framework. Soil screening frequency will be completed as follows:

- Underlying soil will be visually inspected and screened in a systematic fashion across the exposed areas of soil within the areas of demolition. For the eight initial early action areas, visually inspect the post-demolition conditions and collect a surface sample (approximately 0 to 6 inches) for field screening at a rate of one sample per 500 square feet, or at minimum five samples per area.
- For other areas identified as requiring review in Stage 1 of the DIAWP framework, visually inspect each area with attention on locations of sumps, floor drains, and/or areas where compromised concrete was identified during Stage 1. For larger operational areas (e.g., potrooms), visual inspections should be made along two to three longitudinal transects in addition to focus areas. Designate areas for potential field screening based on the visual inspections.

To determine the presence of petroleum hydrocarbons and volatile organic compounds (VOCs), a photoionization detector (PID) will be used. Screening soil using a PID will be completed by placing a small amount of soil (2 to 4 ounces) in a sealed plastic bag. The bag will be punctured, and PID will be inserted into the headspace of the bag.

To detect the presence of petroleum hydrocarbons, sheen tests will also be performed by placing a small amount of soil in a stainless-steel bowl filled with water to observe if sheen is present on the water surface.

To assist in the identification of metals in the field, soil will be screened using a Nitro XL3t GOLDD+X-Ray Fluorescence (XRF) Analyzer (or similar device). The XRF is generally used by placing a small amount of soil in a silicon XRF sampling cup and covering it with plastic film. The device is placed over the sample for analysis. Specific processes for operating an XRF will be specified in the user manual for the actual equipment used on site. The device reading will be documented in the field screening log and used for potential sample location selection where metals are identified as a potential contaminant of concern (COC).

The following table summarizes potential field indicators of contamination per contaminant and how they will be screened for in the field. Potential COCs per Plant operational area that may be encountered during demolition are specified in the DIAWP (Section 4).

Table of Soil Screening Methods

Contaminant	Visual Indicator	Additional Screening Methods		
		PID/Odor	Sheen Test	XRF
Fluoride	Grayish white			
Metals	None			✓
cPAHs	Dark black staining/discoloration		✓	
PCBs	Potential staining		✓	
Petroleum hydrocarbons (gasoline, diesel, oil)	Brown, dark gray, black staining/discoloration	✓	✓	
VOCs/SVOCs	Varies	✓	✓	
HVOCs	Gray staining/discoloration	✓		

Visual indicators, odors, PID readings (measured in parts per million), and sheen tests results (positive or negative) will be recorded on daily logs and maps. Where a potential release is identified, as necessary, the area will undergo additional field screening to determine the potential extent of the area and location documented using a GPS device. In the absence of field indication of impacts within the specific sampling areas outlined in the DIAWP, sample locations will be evenly distributed to the extent practical within the sampling area or selected based on the inferred location of previous equipment, tanks, and/or former sample locations.

4.2 Station and Sample Identification

After selection of sample locations, unique station identifiers will be assigned to each. Samples will then be assigned a unique alphanumeric identifier using the following format:

- The first three characters identify the site (i.e., INT).
- The following characters identify the sample type:
  - SO: soil
  - GW: groundwater
  - SW: surface water
  - EB: equipment blank
  - FB: field blank
  - RB: rinse blank
  - TB: trip blank
- The next three characters identify the location (e.g., 001, 002, or 003).
- The next two to four characters identify the sampling interval in feet below ground surface (bgs).
- The remaining characters identify the sampling date (YYMMDD) with examples of full IDs as follows:
  - INT-SO-01-0-2-260501 represents the 0- to 2-foot depth interval soil sample collected at core location 001 on May 1, 2026.
  - INT-RB-260501 represents a rinse blank collected on May 1, 2026.
  - Field duplicates will be identified by adding D to the sampling date; INT-SO-001-0-2-260501D is the field duplicate of sample INT-SO-001-0-2-260501.

4.3 Sample Access and Positioning

Prior to mobilization to the site, Intalco will assist in obtaining access to the proposed stations. The sampling areas will be cordoned off, and a traffic plan will be implemented to direct traffic, as necessary, during sampling activities. The Plant is a closed site, and demolition areas will be restricted to only permitted personnel. Traffic around the Plant will be managed by Intalco's demolition subcontractor.

Once access is established, the selected excavation contractor will be responsible for clearing locations for utility obstructions. Access will be coordinated with the Contractor to ensure work areas have proper ingress and egress. Access to particular areas may be limited based on potential safety issues, weather conditions, or demolition activities.

On site, a differential GPS will be used to navigate to the desired sampling location. Collection at the sampling location will be guided by the navigation system with an accuracy of ±3 feet. The actual sampling coordinates will be recorded after completion of each sampling location. Coordinates will be recorded in Washington State Plane Coordinates, North Zone, NAD83.

As necessary, a licensed professional land surveyor will be contracted to provide vertical and horizontal coordinates for boring locations.

4.4 Soil Sampling

Soil samples will be collected using either hand auger, hand tools, or excavator methods based on if the sample is for screening or performance/compliance sampling. Pending access constraints, a geoprobe direct-push drill rig may also be used. The locations, depths, drilling method, analytical plan, and rationale are provided in the DIAWP and may be adjusted after demolition as discussed in Stage 4 of the implementation framework.

Discrete samples will be collected as feasible in 1-foot depth intervals from the exposed surface post foundation removal to approximately 4 feet bgs. The coordinates of the final sample locations will be surveyed. The 0- to 1-foot and 1- to 2-foot intervals will be collected and analyzed for the parameters noted in Section 5.3 of the DIAWP. The deeper intervals will be archived, unless field screening indicates impacts are possibly deeper than 2 feet bgs, in which case the subsequent interval(s) will be analyzed at Intalco's discretion and not archived. Field screening methods are discussed in Section 4.1. Table 1 includes all analytes that may be triggered pending field conditions and knowledge of Plant processes as described in the DIAWP. General sample container requirements, holding times, and preservation requirements are shown in Table 2.

General soil sample collection methods and procedures, including decontamination processes, are presented in the following subsections, and further detail is included in the SOPs (Attachment 3).

4.4.1 Surface Soil Sampling

Samples will be collected from surface soils (0- to 4-feet bgs) using a hand auger or similar hand tool (e.g., shovel or hand trowel). Samples will be extruded directly into soil mixing bowls from the hand auger core barrel or similar tool and logged and sampled for analytical testing.

Soil sampling via hand auger or similar tool will be conducted according to the following general procedures:

- The tool head (i.e., shovel or trowel blade) or core barrel will be decontaminated prior to each sample location to ensure no cross-contamination is occurring. For hand auger, the core barrel will be attached to a rod of appropriate length and a T-shaped handle.
- The tool head will be dug into the soil, or the core barrel will be twisted into the soil by turning the T-shaped handle until the tool head or core barrel has filled with soil.
- Once filled with soil, the tool head or core barrel will be carefully retracted from the borehole to prevent loose soils from falling into the borehole. The tool head or core barrel will be emptied into a plastic bag or soil mixing bowl and then returned to the borehole and advanced further until full or maximum borehole depth is reached.

- Once the borehole is complete, any residual soil will be removed from the tool head or sides of the core barrel, and the tool head or core barrel will be decontaminated in preparation for the next borehole.
- Temporary boreholes will be decommissioned in accordance with state regulations (WAC 173-160). Each borehole will be abandoned by filling it with bentonite chips and hydrating it or by filling it with bentonite grout, concrete, cement grout, or neat cement.

Samples will be submitted for laboratory analyses; general laboratory methods and reporting limits (RLs) are provided in this SQAPP. Sample parameters are outlined in the DIAWP, pending post-demolition evaluation.

4.4.2 Excavator Soil Sampling

Temporary excavations for soil may be conducted with an excavator. Soil samples are collected directly from the excavator bucket and logged and sampled for analytical testing. Soil sampling for excavations shallower than 4 feet bgs will be collected directly from the base and/or sidewalls using hand tools following the procedures outlined in Section 4.4.1.

Soil sampling via excavator for excavations greater than 4 feet bgs will be conducted according to the following general procedures:

- The excavator bucket will be decontaminated prior to each sample location to ensure no cross-contamination is occurring.
- The bucket will be dug into the soil until the tool head has reached the target depth and has filled with soil.
- Once filled with soil, the bucket will be carefully retracted from the excavated area to prevent loose soil from falling into the hole. The excavator will be turned off to allow staff to safely remove soil from the bucket and place the material into a decontaminated mixing bowl. Soil in contact with the excavator bucket will not be collected to prevent cross-contamination.
- Following sample collection, any excess material will be placed to the side, and the process will be repeated for subsequent intervals until the target depth is reached.
- Once sample material is complete, any residual soil will be placed in a designated stockpile, and the bucket will be decontaminated in preparation for the next location.

Samples will be submitted for laboratory analyses; general laboratory methods and RLs are provided in this SQAPP. Sample parameters are outlined in the DIAWP, pending post-demolition evaluation.

4.4.3 Geoprobe Soil Sampling

Temporary borings for soil may be advanced by a direct-push (geoprobe) drill rig. Core samples are collected directly from the core barrel in a plastic liner and logged and sampled for analytical testing.

Soil sampling via direct-push will be conducted according to the following general procedures:

- A core sampler with a retractable screen will be loaded in the drill rig. The piston tip will be loosened, and the sampler will be advanced into the ground, coring the soil into the sampler's disposable, single-use plastic liner.
- For each direct-push drill rig sample, a new liner will be placed inside the core sampler. The core sampler, with the piston tip locked, will be advanced to the top of the next sample interval. The piston tip will then be released, and the core sampler will be advanced to obtain the next sample. This process will be repeated until refusal is met or the target investigation depth is encountered.
- The sampler will be withdrawn to retrieve the liner and soil sample. The liner will be cut in half lengthwise to remove the soil sample.
- Temporary boreholes will be decommissioned in accordance with state regulations (WAC 173-160). Each borehole will be abandoned by filling it with bentonite chips and hydrating it or by filling it with bentonite grout, concrete, cement grout, or neat cement.

Samples will be submitted for laboratory analyses; general laboratory methods and RLs are provided in this SQAPP.

4.4.4 Soil Logging and Classification

Surface and subsurface core samples and excavated soil will be continuously examined to develop a lithologic boring log/profile. The cores will be described in the field as to their color, structure, texture, mineral composition, moisture, and percent recovery, according to ASTM International (ASTM) D-2488 and Unified Soil Classification System. Each sample will also undergo examination of possible contamination via field screening, including presence of anthropogenic material, chemical odor, VOCs, sheen, or staining, as described in Section 4.1. Field staff will note all observations on field forms (Attachment 2). These procedures will be applied to all soil collection.

4.4.5 Soil Processing Methods

Soil samples will be collected via hand auger (or similar hand tool), geoprobe, or excavator, as described in Sections 4.4.1, 4.4.2, and 4.4.3. Samples will be collected and submitted to the laboratory for chemical analysis as discrete samples per the DIAWP.

Soil processing will be conducted according to the following general procedures:

- Samples will be photographed, with respective boring identification, and sample location markers will be visible in the photographs.
- Physical attributes will be logged by the field sampler.
- Discrete soil samples will be taken directly from a selected depth interval. After soil sampling is complete for VOCs (if specified), soil will be spooned into a clean stainless-steel bowl for

homogenization. The soil will be mixed until homogenous in color and texture and spooned into laboratory-supplied jars for testing.

- Samples will be immediately placed and held on ice between sample collection and transport/shipment to the laboratory.

Composite sampling is not currently specified in the DIAWP; however, pending evaluation of the underlying soil after foundation removal, additional sampling may be conducted at the discretion of Intalco and through consultation with Ecology

4.5 Field Quality Assurance/Quality Control

4.5.1 Field Quality Control Samples

Field duplicate samples will be collected to evaluate the variability attributable to the nature of the sample matrix, homogenization procedures (if applicable), and subsequent sample handling. Field duplicate samples will be collected from the same homogenized material as the original sample, if sufficient sample volume or mass is available, and analyzed as a separate sample. Field duplicate collection frequencies are listed in Table 3. Field duplicates will be screened against a relative percent difference (RPD) value of 50% when parent and duplicate sample results are detected and greater than five times the RLs. Results are less than five times the RL will be evaluated by the difference between them and screened against a control limit of plus or minus two times the RL for solid matrices and plus or minus the RL for aqueous matrices.

4.5.2 Field and Rinse Blanks

Field and rinse blank samples will be collected at the start of each sampling program to evaluate the efficiency of field decontamination procedures and the cleanliness of the water sample bottles. One rinse blank will be collected for each type of sampling technique and used where nondedicated equipment is used. The rinse blank will consist of rinsing the soil processing equipment with distilled water after sample collection and decontamination and collecting the rinsate. The rinse blank will be analyzed for organics and metals parameters. If target analytes are detected in the rinse blank at levels above the RLs, concentrations will be compared to sample concentrations, and sample data may be disqualified if results are within five times the concentration in the blank. The field blank will be collected by pouring deionized water directly into the sampling containers. The field blank sample will be submitted to the laboratory for analysis.

5 Sample Management

5.1 Sample Custody and Transfer

Chain-of-custody procedures will be followed for all samples throughout the collection, handling, and analysis process as follows:

- Sample IDs, sampling date and time, and requested analyses will be recorded on a chain-of-custody form upon sample collection.
- Sample containers and chain-of-custody forms will remain under the direct supervision of staff or in an appropriately secure area (i.e., a locked vehicle or office) between sample collection and delivery/shipment to the laboratory. If samples are being shipped, shipping containers will be sealed with tape and an appropriate chain-of-custody seal signed and dated by the staff delivering samples for shipment.

A chain-of-custody form will accompany all samples to the analytical laboratory. Copies of all chain-of-custody forms will be retained in the project files.

All samples will be delivered to the analytical laboratory when sufficient samples have been collected to send a full shipment, provided that this delay does not jeopardize any holding time requirements.

Specific sample packing procedures are as follows:

- Ice will be sealed in separate plastic bags and placed in the shipping containers.
- Sample containers will be placed in a sealable plastic bag, packed to prevent breakage, and transported in a sealed ice chest or other suitable container.
- Chain-of-custody forms will be completed prior to transfer to laboratory. Photocopies or photographs of original signed copies will be documented after laboratory receipt.
- Upon transfer of sample possession to the analytical laboratory, the person transferring custody of the sample container will sign the chain-of-custody form.

5.2 Sample Handling Requirements

General sample container requirements, holding times, and preservation requirements are shown in Table 2. Sample containers, instruments, working surfaces, technician protective gear, and other items that may come into contact with sample material must meet high standards of cleanliness. All equipment and instruments that will be used and are in direct contact with various media collected for chemical analyses must be made of glass, stainless steel, or high-density polyethylene (HDPE) and be single-use or cleaned prior to each day's use and between sampling or compositing events.

5.3 Investigation-Derived Waste

All soil cuttings obtained from drilling activities will be disposed of in 55-gallon drums and consolidated or placed in stockpiles for off-site disposal. Any decontamination water waste generated during the purging process and sample collection will be collected in 5-gallon buckets or similar, drummed, and stored on site until analytical data are received, at which time disposal will be coordinated with Intalco. After completion of field sampling activities, the drums will be transported for appropriate disposal.

All disposable sampling materials and personal protective equipment used in sample collection and processing (e.g., disposable gloves and paper towels) will be placed in heavy-duty garbage bags for disposal as nonhazardous solid waste. No hazardous materials requiring disposal are anticipated.

5.4 Decontamination Procedures

The following decontamination steps will be used to decontaminate sampling equipment that comes into contact with sample media. Decontamination of all items will follow the *Field Branches Quality Management Plan* (EPA 2020a) and *Test Methods for Evaluating Solid Waste, Physical/Chemical Methods* (SW-846 protocols; EPA 1986). The decontamination procedure is as follows:

- Rinse and scrub off residual sample media from equipment.
- Prewash rinse with tap water.
- Wash with solution of tap water and nonphosphatic soap (use scrub brush).
- Rinse with tap water.
- Triple rinse with distilled water.
- Use immediately or cover all decontaminated items with aluminum foil.

All used decontamination fluids will be collected and placed in labeled, designated containers suitable for disposal.

5.5 Laboratory Analytical Methods

Chemical analyses will be conducted at an environmental laboratory accredited by Ecology and the National Environmental Laboratory Accreditation Program.

Proposed analytes, analytical methods, target detection, and RLs for the evaluation of soil and groundwater, as well as screening and cleanup criteria, will be developed on a site-by-site basis. All sample analyses will be conducted in accordance with methods approved by Ecology, as applicable. Prior to analyses, all samples will be maintained according to appropriate holding times and required temperatures for each matrix and analysis (Table 2).

6 Quality Assurance/Quality Control

Requirements for QA/QC will include the collection of field QC samples and laboratory QC analyses. Laboratory QC analyses are described in detail in Section 6.2. The overall DQO for field sampling and laboratory analyses is to produce data of known and acceptable quality to support the project objectives. Field and laboratory QA/QC analytical frequencies are provided in Table 3, and laboratory DQOs for precision, accuracy, and completeness are provided in Table 4.

6.1 Data Quality Objectives and Criteria

Results of the QC samples from each sample group will be reviewed by the analyst immediately after a sample group has been analyzed. The QC sample results will then be evaluated to determine if control limits have been exceeded. If control limits are exceeded in the sample group, Anchor QEA will determine whether corrective action is needed and determine the impact on the overall project requirements and schedule.

The DQOs for this program are to provide results of known quality to inform the site assessment activities. The parameters used to assess data quality are precision, accuracy, representativeness, comparability, completeness, bias, and sensitivity. These parameters are discussed in more detail in the following subsections. QA/QC results will be reviewed by the laboratory analysts, project QA/QC manager, and data validator. Re-extraction and/or reanalysis may be warranted in some instances for results outside of control limits, as required by the analytical methods and laboratory standard operating procedures. Data will be qualified accordingly by the validator if DQOs described herein and provided in Table 4 are not met for final data.

6.1.1 Precision

Precision is the ability of an analytical method or instrument to reproduce its own measurement. It is a measure of the variability or random error in sample collection, sample handling, and laboratory analyses. ASTM recognizes two levels of precision (ASTM 2020):

1. **Repeatability** is the random error associated with measurements made by a single test operator on identical aliquots of test material in a laboratory with the same apparatus under constant operating conditions.
2. **Reproducibility** is the random error associated with measurements made by different test operators in different laboratories using the same method but different equipment to analyze identical samples of test material.

In a laboratory, "within-batch" precision is measured using duplicate sample or QC analyses and is expressed as the RPD between measurements. The "batch-to-batch" precision is determined from variance observed in the analyses of standard solutions or laboratory control samples (LCSs) from multiple analytical batches.

Precision measurements can be affected by the nearness of a chemical concentration to the method detection limit (MDL), where the percent error (expressed as RPD) increases. Results less than five times the RL will be evaluated by the difference between them and screened against a control limit of plus or minus two times the RL for solid matrices and plus or minus the RL for aqueous matrices. Equation 1 is used to express precision.

Equation 1

$$RPD = \frac{(C_1 - C_2)\, x\, 100\%}{(C_1 + C_2)/2}$$

where:

RPD	=	relative percent difference
C_1	=	larger of the two observed values
C_2	=	smaller of the two observed values

6.1.2 Accuracy

Accuracy is a measure of the closeness of an individual measurement (or an average of multiple measurements) to the true or expected value. Accuracy is determined by calculating the value of results from analyses of LCSs, standard reference materials, and standard solutions. In addition, matrix spike (MS) samples, which indicate the accuracy or bias in the actual sample matrix, are also measured. Accuracy is expressed as percent recovery of the measured value relative to the true or expected value. If a measurement process produces results that are not the true or expected values, the process is said to be biased. Bias is the systematic error either inherent in a method of analysis (e.g., extraction efficiencies) or caused by an artifact of the measurement system (e.g., contamination). Analytical laboratories use several QC measures to eliminate analytical bias, including systematic analysis of method blanks, LCSs, and independent calibration verification standards. Because bias can be positive or negative and because several types of bias can occur simultaneously, only the net (or total) bias can be evaluated in a measurement.

Laboratory accuracy will be evaluated using quantitative LCS, MS, and surrogate spike standard recoveries, compared with method- or laboratory-specified performance criteria or criteria listed in Table 4. Accuracy can be expressed as a concentration compared to the true or reference value or as a percent recovery in analyses where spiked samples are analyzed. Equation 2 is used to express accuracy.

Equation 2

$$\%R = 100\%\ x\ (S - U)/Csa$$

where:

$\%R$	=	percent recovery
S	=	measured concentration in the spiked aliquot
U	=	measured concentration in the unspiked aliquot
Csa	=	actual concentration of spike added

6.1.3 Representativeness

Representativeness expresses the degree to which data accurately and precisely represent an environmental condition. For the site, the sample locations were selected based on previous site investigations, and the list of analytes are the COCs.

6.1.4 Comparability

Comparability expresses the confidence with which one dataset can be evaluated in relation to another dataset. For this program, comparability of data will be established through the use of standard collection, processing, and logging procedures; standard analytical methodologies and reporting formats; and common traceable calibration standards and reference materials.

6.1.5 Completeness

Completeness is a measure of the amount of data determined to be valid in proportion to the amount of data collected. Completeness will be calculated as shown in Equation 3.

Equation 3

$$C = \frac{(Number\ of\ acceptable\ data\ points)\ x\ 100}{Total\ number\ of\ data\ points}$$

where:

C	=	completeness

The DQO for completeness for all components of this project is 95%. Data qualified as estimated because the QC criteria were not met will be considered valid for the purpose of assessing

completeness. Data that have been rejected will not be considered valid for the purpose of assessing completeness.

6.1.6 Sensitivity

Sensitivity is a measure of MDLs and method reporting limits (MRLs). In general, the lowest technologically achievable MDLs and MRLs will be targeted for this project.

The MDL is defined as the minimum concentration at which a given target analyte can be measured and reported with 99% confidence that the analyte concentration is greater than zero. The laboratory MRL is defined as the lowest level that can be reliably achieved within specified limits of precision and accuracy during routine laboratory operating conditions. Laboratory MDLs and MRLs will be used to evaluate the sensitivity or applicability of a method prior to its acceptance for this program.

Sample-specific MDLs and MRLs will be reported by the laboratory and will consider any factors relating to the sample analysis that might decrease or increase these limits (e.g., dilution factor, percent moisture, and analytical mass or volume). If MDLs and MRLs are elevated due to matrix interferences and subsequent dilutions or reductions in sample aliquots, the data will be evaluated by Anchor QEA and the laboratory to determine whether an alternative course of action is required or possible. The sample-specific MDLs and MRLs will be the values stored in the project database.

6.2 Laboratory Quality Control

Laboratory QC procedures, where applicable, include initial and continuing instrument calibrations, standard reference materials, LCSs, matrix replicates, MSs, surrogate spikes (for organic analyses), and method blanks. A summary of the DQOs is provided in Table 4. QA/QC sample analytical frequencies are provided in Table 3.

The analyst will review the results of the QC samples from each sample group immediately after a sample group has been analyzed. The QC sample results will then be evaluated to determine whether control limits have been exceeded. If control limits are exceeded in the sample group, the QA/QC manager will be contacted immediately, and corrective action (e.g., method modifications followed by reprocessing the affected samples) will be initiated prior to processing a subsequent group of samples.

6.2.1 Laboratory Instrument Calibration and Frequency

An initial calibration will be performed on each laboratory instrument to be used prior to the start of the project, after each major interruption to the analytical instrument, and when any ongoing calibration does not meet method control criteria. Calibration verification will be analyzed following each initial calibration and will meet method criteria prior to analyses of samples. Continuing calibration verifications (CCVs) will be analyzed at method-required frequencies to track instrument

performance. The frequency of CCVs varies with method. For gas chromatography (GC)/mass spectrometer methods (i.e., PAHs, SVOCs, and VOCs), one CCV will be analyzed every 12 hours. For GC and inorganic methods that use instrumentation, one will be analyzed for every 10 project samples analyzed and at the end of each run. If the continuing calibration is out of control, the analysis will be terminated until the source of the control failure is eliminated or reduced to meet control specifications, which may include analyzing a new initial calibration. Any project samples analyzed while the instrument calibration was out of control will be reanalyzed.

Instrument blanks or continuing calibration blanks provide information on the stability of the baseline established. Continuing calibration blanks will be analyzed immediately prior to or immediately following a CCV at the instrument for each type of applicable analysis.

6.2.2 Laboratory Duplicates and Replicates

Analytical duplicates provide information on the precision of the analysis and are useful in assessing potential sample heterogeneity and matrix effects. Analytical duplicates and replicates are subsamples of the original sample that are prepared and analyzed as separate samples.

6.2.3 Matrix Spikes and Matrix Spike Duplicates

Analyses of MS samples provide information on the extraction efficiency of the method on the sample matrix, as well as any interferences introduced by the sample matrix. By analyzing MS samples in duplicate, information on the precision of the method is also provided. Matrix spike duplicates (MSDs) may be analyzed in place of laboratory duplicates.

6.2.4 Method Blanks

Method blanks are prepared and analyzed in the same manner as project samples to assess possible laboratory contamination at all stages of sample preparation and analysis. The method blank for all analyses must be less than the MRL of any single target analyte. If a laboratory method blank exceeds this criterion for any analyte, and the concentration of the analyte in any of the samples is above detection and less than five times the concentration found in the blank (10 times for common contaminants), analyses must stop, and the source of contamination must be eliminated or reduced. Affected samples should be reprepared and reanalyzed, if possible.

6.2.5 Laboratory Control Samples

LCSs are analyzed to assess possible laboratory bias at all stages of sample preparation and analyses. The LCS is a matrix-dependent spiked sample prepared at the time of sample extraction when the sample to be analyzed, the MS, and the method blank are prepared. The LCS will provide information on the precision of the analytical process and, when analyzed in duplicate, will provide accuracy information, as well.

6.3 Instrument and Equipment Testing, Inspection, and Maintenance Requirements

This section describes procedures for the testing, inspection, and maintenance of field and laboratory equipment.

6.3.1 Field Instruments and Equipment

In accordance with the QA program, Anchor QEA will maintain an inventory of field instruments and equipment. The frequency and types of maintenance performed on this equipment will be based on the manufacturer's recommendations or Anchor QEA's experience with the equipment.

The Anchor QEA FC will be responsible for the preparation, documentation, and implementation of the preventive maintenance program. The equipment maintenance information will be documented in the instrument's calibration log. The frequency of maintenance depends on the type and stability of the equipment, methods used, intended use of the equipment, and manufacturer's recommendations. Detailed information about the calibration process and the frequency of equipment calibration is provided in each manufacturer's instruction manuals.

All maintenance records will be verified prior to each sampling event. The FC will be responsible for verifying that required maintenance has been performed before the equipment is used in the field. Any problems will be noted in the field log book and corrected prior to continuing sampling, observation, and installation operations.

6.3.2 Laboratory Instruments and Equipment

In accordance with the QA program, the laboratory will maintain an inventory of instruments and equipment, and the frequency of maintenance will be based on the manufacturer's recommendations or the laboratory's experience with the equipment.

The laboratory preventative maintenance program, as detailed in the laboratory QA plan, is organized to maintain proper instrument and equipment performance and to prevent instrument and equipment failure during use. The program considers instrumentation, equipment, and parts that are subject to wear, deterioration, or other changes in operational characteristics; the availability of spare parts; and the frequency at which maintenance is required. Any equipment that has been overloaded, has been mishandled, gives suspect results, or has been determined to be defective will be taken out of service, tagged with the discrepancy noted, and stored in a designated area until the equipment has been repaired. After repair, the equipment will be tested to verify it is in proper operational condition. The client will be promptly notified in writing if defective equipment casts doubt on the validity of analytical data. The client will also be notified immediately regarding any delays due to instrument malfunctions that could affect holding times.

Laboratories will be responsible for the preparation, documentation, and implementation of the preventative maintenance program. Maintenance records will be checked according to the laboratory's internal schedule and recorded by laboratory personnel. The laboratory PM or designee will be responsible for verifying compliance.

6.3.2.1 Laboratory Instrument and Equipment Calibration

As part of their QC programs, laboratories perform two types of calibrations. Periodic calibration of equipment (e.g., scales, drying ovens, refrigerators, and thermometers) is performed at prescribed intervals. Operational calibrations are performed daily at a specified frequency or prior to analysis (i.e., initial calibrations) according to method requirements. Calibration procedures and frequency are discussed in the laboratory QA plan. Calibrations are discussed in the laboratory standard operating procedures for analyses.

The laboratory PM will be responsible for ensuring the laboratory instrumentation is calibrated in accordance with specifications. Implementation of the calibration program will be the responsibility of the respective laboratory group supervisors. Recognized procedures (e.g., U.S. Environmental Protection Agency [EPA], ASTM, or manufacturer's instructions) will be used when available.

Physical standards (i.e., weights or certified thermometers) will be traceable to nationally recognized standards, such as those by the National Institute of Standards and Technology. Chemical reference standards will be National Institute of Standards and Technology reference materials or vendor-certified materials traceable to these standards.

The calibration requirements for each method and respective corrective actions will be accessible, either in the laboratory standard operating procedures or in the laboratory QA plan for each instrument or analytical method in use. All calibrations will be preserved on electronic media.

7 Assessments and Oversight

Once data are received from the laboratory, several QC procedures will be followed to provide an accurate evaluation of the data quality. Specific procedures will be followed to assess data precision, accuracy, and completeness.

7.1 Compliance Assessments

Laboratory and field performance audits consist of on-site reviews of QA systems and equipment for sampling, calibration, and measurement. Audits will not be conducted as part of this study. However, laboratory audit reports will be made available to the project QA/QC manager upon request.

The laboratory is required to have written procedures addressing internal QA/QC. When these procedures have been submitted, the project QA/QC manager will review them to ensure compliance with this SQAPP. The laboratory must ensure that personnel engaged in sampling and analysis tasks have appropriate training.

7.2 Response and Corrective Actions

The PM, QA/QC manager, and FC will work together to determine actions to be taken in the event of an error, problem, or nonconformance to protocols identified in this SQAPP.

7.2.1 Field Activities

The FC will be responsible for correcting equipment malfunctions during the field sampling effort. The QA/QC manager will be responsible for resolving situations identified by the FC that may result in noncompliance with this SQAPP. All corrective measures will be immediately documented in the field log book.

7.2.2 Laboratory

The laboratory is required to comply with its standard operating procedures. The laboratory PMs will be responsible for ensuring appropriate corrective actions are initiated as required for conformance with this SQAPP. All laboratory personnel will be responsible for reporting problems that may compromise quality data.

The laboratory PMs will be notified if any QC sample grossly exceeds the laboratory in-house control limits. The analyst will identify and correct the anomaly before continuing with the sample analysis. If the anomaly cannot be corrected, the laboratory PM will notify the QA/QC manager. A narrative describing the anomaly, steps taken to identify and correct the anomaly, and the treatment of the relevant sample batch (i.e., recalculation, reanalysis, and re-extraction) will be submitted with the data package.

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7.3 Reports to Management

QA reports to the PM will include verbal status reports, written reports on field sampling activities and laboratory processes, data validation reports, and final project reports. These reports will be the responsibility of the PM.

8 Sampling Documentation and Records

Records will be maintained documenting all activities and data related to field surveys, sample collection, and laboratory analyses. Results of data verification and validation activities will also be documented. Procedures for documentation of these activities are described in this section.

8.1 Field Records

Field surveys and sample collection activities will be documented using a custom field application or field collection logs. Additionally, the FC or designee will keep a daily record of significant events, observations, and measurements on a daily log. Entries for each day will begin on a new page. The person recording information must enter the date and time and initial each entry.

In general, sufficient information will be recorded during sampling and surveys to reconstruct the event without relying on the memory of the field personnel.

The daily log will contain the following information, as applicable to the task:

- Project name
- Field personnel on site and time(s) present on site
- Site visitors
- Weather conditions
- Field observations
- Maps and/or drawings
- Sample collection date and time
- Sample collection method and description of activities
- Deviations from the site-specific scope of work and documentation describing corrective actions taken for field problems
- Conferences associated with field activities
- Description of the general work being performed by the Contractor and related interim action observations
- Description of any health and safety issues encountered
- Results of soil screening performed

A daily field report will be generated at the end of each workday.

8.2 Analytical Records

The laboratory will retain analytical data records. Additionally, Anchor QEA will retain them in its central project files. For all analyses, the data reporting requirements will include those items necessary to complete data validation, including copies of all raw data. The analytical laboratory will be required, where applicable, to report the following:

Project Narrative: This summary, in the form of a cover letter, will discuss problems, if any, encountered during any aspect of analysis. This summary will discuss, but not be limited to, QC, sample shipment, sample storage, and analytical difficulties. Any problems encountered, actual or perceived, and their resolutions will be documented in as much detail as appropriate.

Chain-of-Custody Records: Legible copies of the chain-of-custody forms will be provided as part of the data package. This documentation will include the time of receipt and condition of each sample received by the laboratory. Additional internal tracking of sample custody by the laboratory will also be documented on a sample receipt form. The form must include all sample shipping container temperatures measured at the time of sample receipt.

Sample Results: The data package will summarize the results for each sample analyzed. The summary will include the following information when applicable:

- Field sample identification code and the corresponding laboratory identification code
- Sample matrix
- Date of sample extraction
- Date and time of analysis
- Weight and/or volume used for analysis
- Final dilution volumes or concentration factor for the sample
- Identification of the instrument used for analysis
- MDLs
- MRLs accounting for sample-specific factors (e.g., dilution)
- Analytical results with reporting units identified
- Data qualifiers and their definitions

QA/QC Summaries: This section will contain the results of the laboratory QA/QC procedures. Each QA/QC sample analysis will be documented with the same information required for the sample results. No recovery or blank corrections will be made by the laboratory. The following are required summaries; additional information may be requested:

- **Calibration Sata Summary:** This summary will report the concentrations of the initial calibration and daily calibration standards and the date and time of analysis. The response factor, percent relative standard deviation, percent difference, and retention time for each analyte will be listed, as appropriate. Results for standards to indicate instrument sensitivity will be documented.
- **Internal Standard Area Summary:** The stability of internal standard areas will be reported.
- **Method Blank Analysis:** The method blank analyses associated with each sample and the concentration of all compounds of interest identified in these blanks will be reported.

- **Surrogate Spike Recovery:** This will include all surrogate spike recovery data for associated organic analyses. The names and concentrations of all compounds added, percent recoveries, and acceptable range of recoveries will be listed.
- **MS Recovery:** This will report all MS recovery data for all analytes. The names and concentrations of all analytes added, percent recoveries, and range of recoveries will be listed. The percent recoveries and RPD values for all MSD analyses will be included.
- **MSD:** RPD values for all MSD analyses will be reported.
- **LCS:** All LCS recovery data for organic and metal analytes will be reported. The name and concentration of all analytes added, percent recoveries, and acceptable range of recoveries will be listed. The percent recoveries and RPD values for all LCS duplicate analyses will be reported.
- **Relative Retention Time:** This will include a report of the relative retention time of each analyte detected in the samples for both primary and confirmational analyses.

Original Data: Legible copies of the original data generated by the laboratory will include the following:

- Sample extraction, preparation, identification of extraction method used, and cleanup logs
- Instrument specifications and analysis logs for all instruments used on days of calibration and analysis
- Calculation worksheets for inorganic analyses
- Full scan chromatograms and quantitation reports for all GC and/or GC/mass spectrometry samples, standards, blanks, calibrations, spikes, replicates, and reference materials
- Enhanced spectra of detected compounds with associated best-match spectra for each sample

All instrument data will be fully restorable at the laboratory from electronic backup. The laboratory will be required to maintain all records relevant to project analyses for a minimum of 5 years. Data validation reports will be maintained in the central project files with the analytical data reports.

8.3 Data Reduction

Data reduction is the conversion of raw data to final results. Methods or procedures for data reduction will be documented. The following procedures will be implemented to verify the accuracy of data reduction:

- Technical staff will document, review, and QC their own work to ensure accuracy.
- Major calculations will be subject to an independent senior technical review to ensure that both the methods and the calculations are correct.

- The PM will be responsible for ensuring data reduction is conducted in a manner that produces high-quality data via review and approval of concepts, methods, assumptions, and calculations.

9 Data Validation and Usability

Data generated in the field and at the laboratories will be verified and validated according to methods and procedures described in this section.

9.1 Data Review, Validation, and Verification

During the validation process, analytical data will be electronically and/or manually evaluated for method and laboratory QC compliance, and validity and applicability for program purposes will be determined.

Based on findings of the validation process, data validation qualifiers may be assigned. Validated project data, including qualifiers, will be entered into the project database, thus enabling this information to be retained or retrieved as needed.

9.2 Validation and Verification Methods

Laboratory data will be provided in both PDF and Environmental Quality Information System (EQuIS) electronic format and uploaded to Anchor QEA's project database. Once data are received from the laboratory, several QC procedures will be followed to provide an accurate evaluation of data quality and accuracy.

Stage 2B validations (EPA 2009) will be performed for all testing parameters. Data quality review will be completed by Anchor QEA (or a subconsultant) in accordance with the EPA National Functional Guidelines (NFG) for data review (EPA 2020b, 2020c, 2020d) by considering the following:

- Data completeness
- Holding times
- Method blanks
- Surrogates
- Detection and RLs
- LCSs
- Replicates
- MS/MSD samples
- Initial and continuing calibrations
- Internal standard area counts
- Standard reference materials

Data will be validated in accordance with the project-specific DQOs (Table 4), analytical method criteria, and the laboratory's internal performance standards based on its standard operating procedures. The results of the data quality review, including assigning qualifiers in accordance with

the EPA NFG (EPA 2020b, 2020c, 2020d) and a tabular summary of qualifiers, will be generated by the validator and submitted to the QA/QC manager for final review and confirmation of data validity.

Laboratory data, which will be electronically provided and loaded into Anchor QEA's project database, will undergo a check against the laboratory hard copy data. Data will be validated or reviewed manually, and qualifiers, if assigned, will be entered manually. The accuracy of all manually entered data will be verified by a second party. Data tables and reports will be exported from the EQuIS to Excel tables. Validated data will be submitted to Ecology consistent with Ecology's Environmental Information Management (EIM) system at the time of Interim Action Report submittal.

Field datasheets or data entries will be checked for completeness and accuracy prior to database entry. Data generated in the field will be documented electronically or on hard copies and provided to the data manager, who is responsible for data entry into the database. Manually entered data will be checked by a second party. Field documentation will be filed in the main project file after data entry and checking are complete.

9.3 Use of Non-Detect Results

Sample results will be reported to the MDL. In cases where a sample result is below the MDL, the result will be noted as non-detect and reported to the RL. Totals will be calculated as the sum of all detected results (U = 0). If all results are not detected, the maximum non-detected value will be reported as the total.

9.4 Reconciliation with User Requirements

The QA/QC manager will review data at the completion of the task to determine if DQOs have been met.

If data do not meet the project's specifications, the QA/QC manager will review the errors and determine if the problem is due to calibration/maintenance, sampling techniques, or other factors and will suggest corrective action, as appropriate. The problem will be corrected by retraining, revising techniques, or replacing supplies/equipment; if not, the DQOs will be reviewed for feasibility. If specific DQOs are not achievable, the QA/QC manager will recommend appropriate modifications. If matrix interference is suspected to have attributed to the exceedance, adequate laboratory documentation must be presented to demonstrate that instrument performance and/or laboratory techniques did not bias results. In cases where the DQOs have been exceeded and corrective actions did not resolve the outlier, data will be qualified per the EPA NFG (EPA 2020b, 2020c, 2020d). In these instances, the usability of data will be determined by the extent of the exceedance.

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Rejected data will be assigned an "R" qualifier and will not be used for any purpose. Data qualified with a "J" flag will be used, but the basis for the J flag will be documented in the data validation report, and data uncertainties will be considered during use of the data for project reporting.

10 Interim Action Report

At the conclusion of the interim action activities, an Interim Action Report will be prepared. The report will include the following:

- A summary of field activities, including description of sampling and interim action activities
- A figure showing actual sampling locations
- A summary of analytical results as compared to screening levels, including summary data tables
- A summary of any deviations from this SQAPP
- Copies of laboratory data packages included as appendices or attachments, including chain-of-custody forms and data qualifiers and their definitions applied by the laboratory
- A summary of field, laboratory, and validator QA/QC findings
- Copies of validation reports as appendices or attachments, including additional data qualifiers as a result of data validation
- Contractor-provided copies of waste disposal documentation included as appendices or attachments, including waste manifests/bills of lading, trucking logs, and truck tickets
- Contractor-provided survey information for final remedial excavation extents
- Copies of field logs and sample photographs as appendices or attachments
- Documentation of areas requiring further investigation as part of the RI/FS process.

Following the completion of the report, electronic data will be submitted to Ecology consistent with EIM data transmittal requirements.

11 References

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Tables

Table 1

Soil Parameters for Analysis, Analytical Methods, and Target Quantitation Limits

Parameter	Analytical Method	Method Detection Limit[1]	Reporting Limit[1]	Laboratory
Conventional Parameters (pct)				
Total solids	SM2540G/PSEP	--	0.1	Apex
Total organic carbon	Plumb, 1981/EPA 9060 Mod	--	0.1	
Total sulfides	PSEP/SM 4500-S2	--	1.0	
Total Fluoride	SM 4500-F-B or EPA 1312 (SPLP) SM 4500- F-C	--	1.0 mg/kg	
Metals (mg/kg)				
Arsenic	EPA 6020B	0.25	0.50	Apex
Barium	EPA 6020B	0.25	0.50	
Cadmium	EPA 6020B	0.05	0.10	
Chromium	EPA 6020B	0.25	0.50	
Lead	EPA 6020B	0.05	0.10	
Mercury	EPA 1613E	0.0015	0.003	
Selenium	EPA 6020B	0.25	0.50	
Silver	EPA 6020B	0.05	0.10	
Polycyclic Aromatic Hydrocarbons (µg/kg)				
2-Methylnaphthalene	EPA 8270E	2.67	5.33	Apex
Acenaphthene	EPA 8270E	1.33	2.67	
Acenaphthylene	EPA 8270E	1.33	2.67	
Anthracene	EPA 8270E	1.33	2.67	
Benzo(a)anthracene	EPA 8270E	1.33	2.67	
Benzo(a)pyrene	EPA 8270E	2.00	4.00	
Benzo(g,h,i)perylene	EPA 8270E	1.33	2.67	
Chrysene	EPA 8270E	1.33	2.67	
Dibenzo(a,h)anthracene	EPA 8270E	1.33	2.67	
Fluoranthene	EPA 8270E	1.33	2.67	
Fluorene	EPA 8270E	1.33	2.67	
Indeno(1,2,3-cd)pyrene	EPA 8270E	1.33	2.67	
Naphthalene	EPA 8270E	2.67	5.33	
Phenanthrene	EPA 8270E	1.33	2.67	
Pyrene	EPA 8270E	1.33	2.67	
Total benzo(b,j,k)fluoranthenes	EPA 8270E	2.00	4.00	
Polychlorinated Biphenyls (µg/kg)				
Aroclor 1016	EPA 8082A	5.0	10	Apex
Aroclor 1221	EPA 8082A	5.0	10	
Aroclor 1232	EPA 8082A	5.0	10	
Aroclor 1242	EPA 8082A	5.0	10	
Aroclor 1248	EPA 8082A	5.0	10	
Aroclor 1254	EPA 8082A	5.0	10	
Aroclor 1260	EPA 8082A	5.0	10	
Total PCB Aroclors (U = 0)	EPA 8082A	--	--	
Volatile Organic Compounds (µg/kg)				
1,1,1,2-Tetrachloroethane	EPA 8260D	12.5	25	Apex
1,1,1-Trichloroethane	EPA 8260D	12.5	25	
1,1,2,2-Tetrachloroethane	EPA 8260D	25	50	
1,1,2-Trichloroethane	EPA 8260D	12.5	25	
1,1-Dichloroethane	EPA 8260D	12.5	25	
1,1-Dichloroethene	EPA 8260D	12.5	25	
1,1-Dichloropropene	EPA 8260D	25	50	
1,2,3-Trichlorobenzene	EPA 8260D	125	250	
1,2,3-Trichloropropane	EPA 8260D	25.0	50	
1,2,4-Trichlorobenzene	EPA 8260D	125.0	250	
1,2,4-Trimethylbenzene	EPA 8260D	25.0	50	
1,2-Dibromo-3-chloropropane	EPA 8260D	125	250	
1,2-Dibromoethane (EDB)	EPA 8260D	25.0	50	
1,2-Dichlorobenzene	EPA 8260D	12.5	25	
1,2-Dichloroethane (EDC)	EPA 8260D	12.5	25	
1,2-Dichloropropane	EPA 8260D	12.5	25	
1,3,5-Trimethylbenzene	EPA 8260D	25.0	50	
1,3-Dichlorobenzene	EPA 8260D	12.5	25	
1,3-Dichloropropane	EPA 8260D	25.0	50	
1,4-Dichlorobenzene	EPA 8260D	12.5	25	
2,2-Dichloropropane	EPA 8260D	25.0	50	
2-Butanone (MEK)	EPA 8260D	250	500	
2-Chlorotoluene	EPA 8260D	25.0	50	
2-Hexanone	EPA 8260D	250	500	
4-Chlorotoluene	EPA 8260D	25.0	50	
4-Methyl-2-pentanone (MiBK)	EPA 8260D	250	500	
Acetone	EPA 8260D	500	1000	
Benzene	EPA 8260D	5.0	10	
Bromobenzene	EPA 8260D	12.5	25	
Bromodichloromethane	EPA 8260D	25	50	
Bromoform	EPA 8260D	50	100	
Bromomethane	EPA 8260D	500	500	
Carbon tetrachloride	EPA 8260D	25	50	

Table 1
Soil Parameters for Analysis, Analytical Methods, and Target Quantitation Limits

Parameter	Analytical Method	Method Detection Limit[1]	Reporting Limit[1]	Laboratory
Chlorobenzene	EPA 8260D	12.5	25	Apex
Chloroethane	EPA 8260D	250	500	
Chloroform	EPA 8260D	25.0	50	
Chloromethane	EPA 8260D	125	250	
cis-1,2-Dichloroethene	EPA 8260D	12.5	25	
cis-1,3-Dichloropropene	EPA 8260D	25	50	
Dibromochloromethane	EPA 8260D	50	100	
Dibromomethane	EPA 8260D	25	50	
Dichlorodifluoromethane	EPA 8260D	50	100	
Ethylbenzene	EPA 8260D	12.5	25	
Hexachlorobutadiene	EPA 8260D	50	100	
Hexane	EPA 8260D	25.0	50	
Isopropylbenzene	EPA 8260D	25.0	50	
m,p-Xylene	EPA 8260D	25.0	50	
Methyl t-butyl ether (MTBE)	EPA 8260D	25.0	50	
Methylene chloride	EPA 8260D	250	500	
Naphthalene	EPA 8260D	50.0	100	
n-Propylbenzene	EPA 8260D	12.5	25	
o-Xylene	EPA 8260D	12.5	25	
p-Isopropyltoluene	EPA 8260D	25.0	50	
sec-Butylbenzene	EPA 8260D	25.0	50	
Styrene	EPA 8260D	25.0	50	
tert-Butylbenzene	EPA 8260D	25.0	50	
Tetrachloroethene (PCE)	EPA 8260D	12.5	25	
Toluene	EPA 8260D	25.0	50	
trans-1,2-Dichloroethene	EPA 8260D	12.5	25	
trans-1,3-Dichloropropene	EPA 8260D	25	50	
Trichloroethene (TCE)	EPA 8260D	12.5	25	
Trichlorofluoromethane	EPA 8260D	125	250	
Vinyl chloride	EPA 8260D	12.5	25	
Total Petroleum Hydrocarbons (mg/kg)				
Gasoline range organics	NWTPHGx	2.50	5.0	Apex
Diesel range organics	NWTPHDx	10.0	20.0	
Oil range organics	NWTPHDx	20.0	40	

Notes:
1. Method detection limits, reporting limits, and dry weight screening levels are reported in the units specified in the chemical group header.
µg/kg: microgram per kilogram
Apex: Apex Laboratories, LLC
EPA: U.S. Environmental Protection Agency
mg/kg: milligram per kilogram
NWTPH-Dx: Northwest Total Petroleum Hydrocarbons – Diesel- and Oil-Range
NWTPH-Gx: Northwest Total Petroleum Hydrocarbons – Gasoline-Range
PCB: polychlorinated biphenyl
pct: percent
PSEP: Puget Sound Estuary Program
SPLP: synthetic precipitation leaching procedure

Table 2
Guidelines for Soil Sample Handling and Storage

Parameter	Sample Size	Container Size and Type[1]	Holding Time	Preservative
Total solids	50 g	16-oz glass	6 months	Cool/4°C
Total metals	10 g		6 months (30 days for chromium VI)[2] (28 days for mercury)	Cool/4°C
			2 years (1 year for mercury)	Freeze -18°C
PAHs/PCBs/DRO/ MRO	150 g		14 days to extraction	Cool/4°C
			1 year to extraction	Freeze -18°C
			40 days to analysis	Cool/4°C
GRO	5 g	2 x 40-mL VOA vials	14 days	MeOH; Cool/4°C
VOCs	5 g	3 x 40-mL VOA vials	14 days	MeOH; Cool/4°C
Total Fluoride	50 g	8-oz glass	28 days	Cool/4°C
SPLP Fluoride	50 g	8-oz glass	28 days to extraction	Cool/4°C
			48 hours until analysis	Cool/4°C
Total sulfides	50 g	4-oz glass	7 days	5 mL 2N Zn acetate/dark/cool/4°C

Notes:
1. Container requirements may vary based on container availability and laboratory requirements.
2. Hexavalent chromium is a contingent analysis and will only be collected/analyzed if total chromium is present above screening levels.
2N: two normal
chromium VI: hexavalent chromium
DRO: diesel-range organic
g: gram
GRO: gasoline-range organic
MeOH: methanol
mL: milliliter
MRO: motor oil-range organic
oz: ounce
PAH: polycyclic aromatic hydrocarbon
PCB: polychlorinated biphenyl
SPLP: synthetic precipitation leaching procedure
VOA: volatile organic analysis
VOC: volatile organic compound
Zn: zinc

Table 3
Field and Laboratory Quality Assurance/Quality Control Analysis Summary

Analysis Type	Field Duplicates	Equipment Blanks	Field Blanks	Trip Blanks	Initial Calibration	Ongoing Calibration	Laboratory Duplicates[2]	LCS/OPR	Matrix Spikes	Matrix Spike Duplicates	Method Blanks	Surrogate Spikes/ Labeled Compounds
Fluoride	1 per 20 samples	1 per sampling method	NA	NA	Daily or each batch[1]	1 per 10 samples	1 per 20 samples	1 per 20 samples	NA	1 per 20 samples	1 per 20 samples	NA
Total sulfides	1 per 20 samples	1 per sampling method	NA	NA	Daily or each batch[2]	1 per 10 samples	1 per 20 samples	1 per 20 samples	NA	NA	1 per 20 samples	NA
TOC	1 per 20 samples	NA	NA	NA	Daily or each batch[1]	1 per 10 samples	1 per 20 samples	1 per 20 samples	NA	NA	1 per 20 samples	NA
Metals	1 per 20 samples	1 per sampling method	NA	NA	Daily or each batch[1]	1 per 10 samples	NA	1 per 20 samples	1 per 20 samples	1 per 20 samples	1 per 20 samples	NA
PCB Aroclors	1 per 20 samples	1 per sampling method	NA	NA	As needed[3]	1 per 10 samples	NA	1 per 20 samples	1 per 20 samples	1 per 20 samples	1 per 20 samples	Each sample
GRO, DRO, MRO	1 per 20 samples	1 per sampling method	NA	NA	As needed[3]	1 per 10 samples	NA	1 per 20 samples	1 per 20 samples	1 per 20 samples	1 per 20 samples	Each sample
VOCs	1 per 20 samples	1 per sampling method	NA	1 per cooler	As needed[3]	Every 12 hours	NA	1 per 20 samples	1 per 20 samples	1 per 20 samples	1 per 20 samples	Each sample
PAHs	1 per 20 samples	1 per sampling method	NA	NA	As needed[3]	Every 12 hours	NA	1 per 20 samples	1 per 20 samples	1 per 20 samples	1 per 20 samples	Each sample

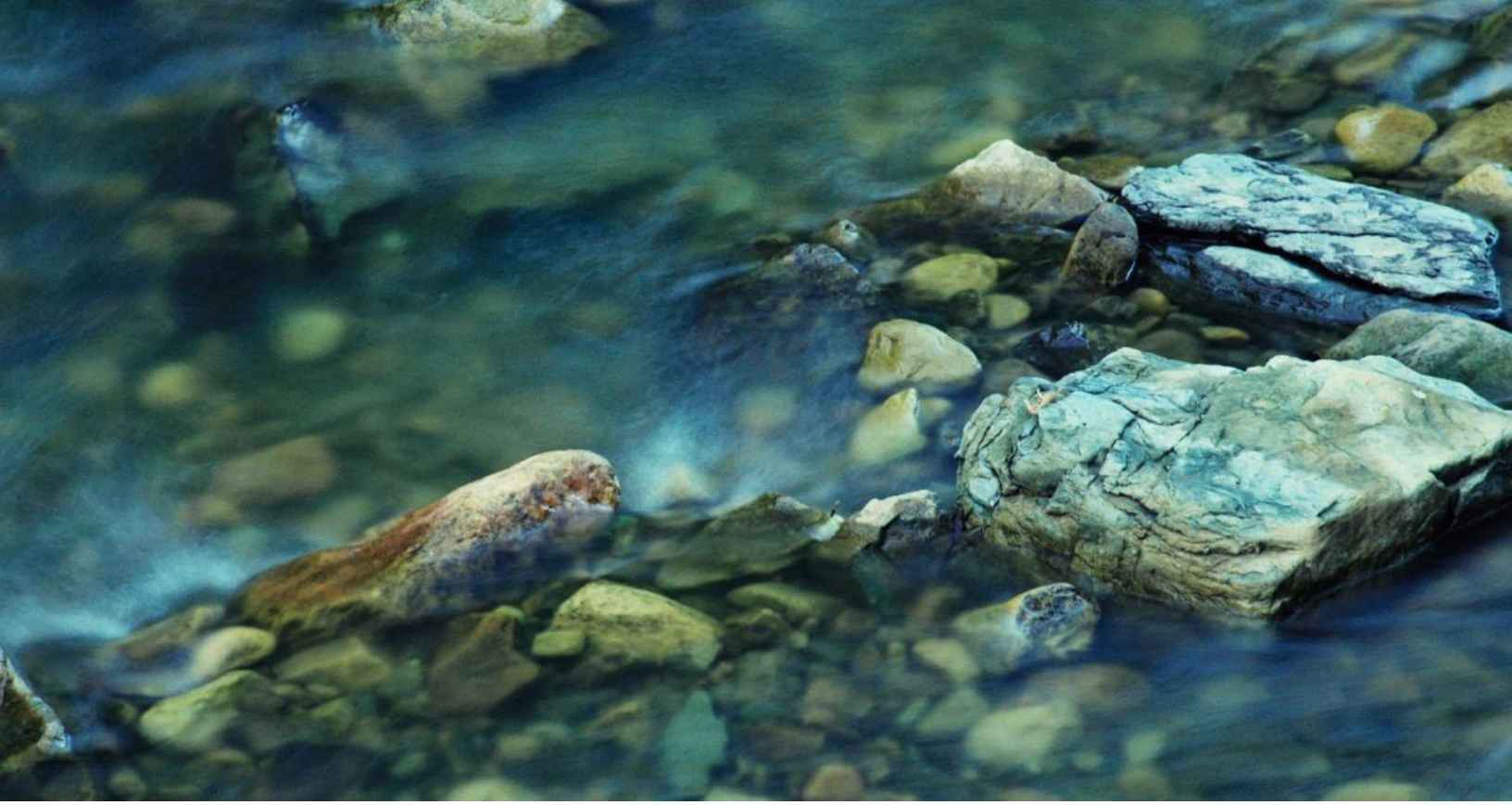
Notes:
1. Calibration and certification of drying ovens and weighing scales are conducted biannually.
2. A matrix spike duplicate may be analyzed in lieu of a sample replicate.
3. Initial calibrations are considered valid until the ongoing continuing calibration no longer meets method specifications. At that point, a new initial calibration is performed.
4. Isotope dilution method; labeled compounds added to each sample.
DRO: diesel-range organic
GRO: gasoline-range organic
LCS: laboratory control sample
MRO: motor oil-range organic
NA: not applicable
OPR: ongoing precision and recovery
PAH: polycyclic aromatic hydrocarbon
PCB: polychlorinated biphenyl
TOC: total organic carbon
VOC: volatile organic compound

Table 4
Data Quality Objectives

Parameter	Precision	Accuracy[1]	Completeness
Soils			
Total solids	±20 RPD	NA	95%
Fluoride	±25 RPD	75%–125% R	95%
Metals	±30 RPD	75%–125% R	95%
GRO	±35 RPD	50%–150% R	95%
DRO/MRO	±35 RPD	50%–150% R	95%
VOCs	±35 RPD	50%–150% R	95%
PCB Aroclors	±35 RPD	50%–150% R	95%
PAHs	±35 RPD	50%–150% R	95%

Notes:
1. LCS/OPR and MS/MSD percent recovery.
DRO: diesel-range organic
GRO: gasoline-range organic
LCS: laboratory control sample
MRO: motor oil-range organic
MS: matrix spike
MSD: matrix spike duplicate
NA: not applicable
OPR: ongoing precision and recovery
PAH: polycyclic aromatic hydrocarbon
PCB: polychlorinated biphenyl
R: recovery
RPD: relative percent difference
VOC: volatile organic compound

Attachment 1
Health and Safety Plan



February 2026
Former Intalco Smelter Site

ANCHOR QEA

Health and Safety Plan

Prepared for Intalco Aluminum, LLC

PLAYING IT SAFE

Stop Play Record Rewind

Template Version 2024.01

February 2026
Former Intalco Smelter Site

Health and Safety Plan

Prepared for
Intalco Aluminum, LLC
4050 Mountain View Road
Ferndale, Washington 98248

Prepared by
Anchor QEA
20 Bellwether Way, Suite 101
Bellingham, Washington 98225

Certification Page

The below individuals are certifying that they have reviewed the contents of this Health and Safety Plan and that it is complete and accurate to the best of their knowledge. Should any of the below individual roles change, this Health and Safety Plan should be modified.

Heather Gadwa

Project Manager

Anchor QEA

Date: February 6, 2026

Mikayla Bowers

Field Lead

Anchor QEA

Date: February 6, 2026

The information in this Health and Safety Plan has been designed for the Scope of Work presently contemplated by Anchor QEA. Therefore, this document may not be appropriate if the work is not performed by or using the methods presently contemplated by Anchor QEA. In addition, as the work is performed, conditions different from those anticipated may be encountered and this document may have to be modified. Therefore, Anchor QEA only intends this Health and Safety Plan to address currently anticipated activities and conditions and makes no representations or warranties as to the adequacy of the Health and Safety Plan for all conditions encountered.

Health and Safety Plan Acknowledgement Form

Project Number: 230002-05.09

Project Name: Former Intalco Smelter Site

My signature below certifies that I have read and understand the policies and procedures specified in this Health and Safety Plan (HASP). For non-Anchor QEA employees, this HASP is to be used for informational purposes only to ensure their own HASP meets or exceeds these requirements. Non-affiliated personnel may be required to sign a separate Liability Waiver.

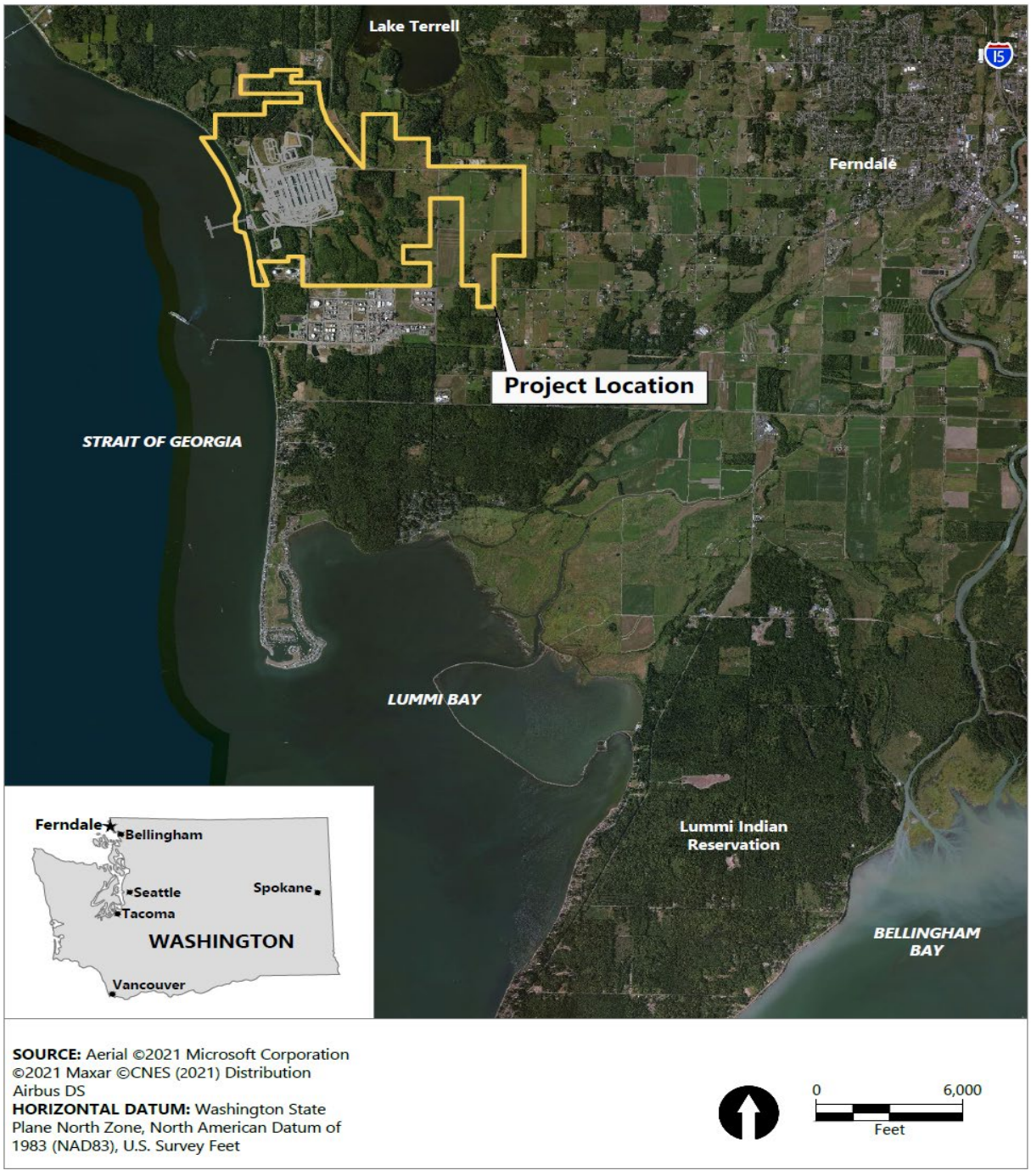
Date	Name (print)	Signature	Company

Date	Name (print)	Signature	Company

Site Emergency Procedures

Site Map

Figure A
General Site Location Overview



Emergency Contact Information

Table A
Site Emergency Form and Emergency Phone Numbers*

Category	Information	
Possible Chemicals of Concern	TCLP metals, PCBs, PAHs, TPH-Dx, TPH-Gx, aluminum, chloride, cyanide, calcium, fluoride, potassium, and sodium	
Minimum Level of Protection	Modified Level D	
Site(s) Location Address	4050 Mountain View Road, Ferndale, Washington 98248	
Emergency Phone Numbers		
Ambulance	911	
Fire	911	
Police	911	
Poison Control	(800) 222-1222	
Client Contact	Kristin Gaines	Mobile:(360) 798-2509
Project Manager (PM)	Heather Gadwa	Office: (206) 709-6867 Mobile: (253) 720-2958
Field Lead (FL)	Mikayla Bowers	Office: (360) 715-2710 Mobile: (360) 724-8488
Corporate Health and Safety Manager (CHSM)	Matt Gruber	Office: (828) 771-0327 Mobile: (828) 490-6877
Director of Health and Safety (DOHS)	Tim Shaner	Office: (251) 375-5282 Mobile: (251) 281-3386
State Emergency Response System	911	
EPA Emergency Response Team,[1] Region 10	(800) 424-4372	

Notes:

* In the event of any emergency, contact the PM and FL.

1. For local resources, please visit: http://www.epa.gov/emergency-response/emergency-response-my-community. The National Response Center hotline is (800) 424-8802.

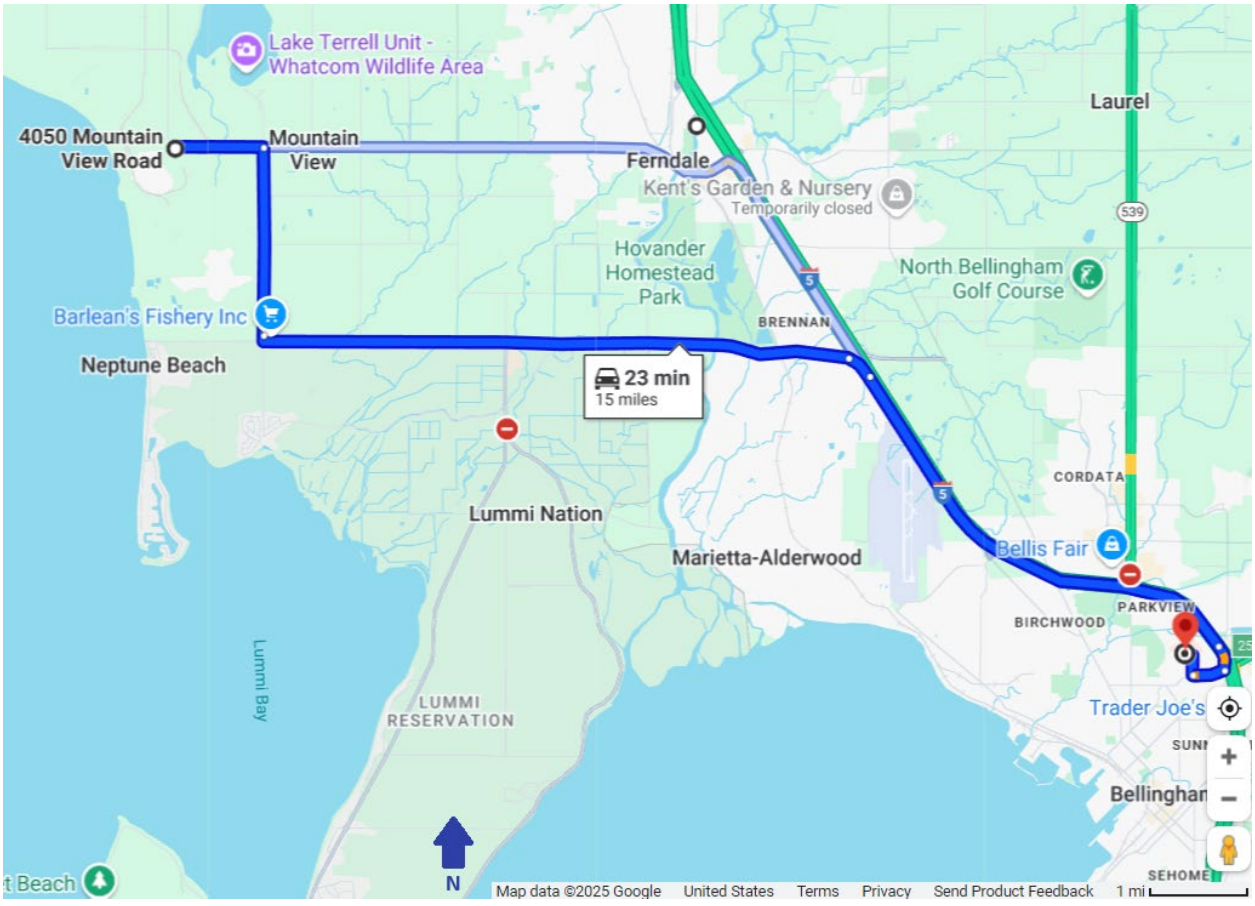
Table B
Hospital Information

Category	Information
Hospital Name	PeaceHealth St. Joseph Medical Center
Address	2901 Squalicum Parkway
City, State	Bellingham, Washington
Phone	(360) 734-5400
Emergency Phone	911

Hospital Route Map and Driving Directions

1. Depart the Intalco site and head east on Mountain View Road toward Rainbow Road for 0.9 mile (about 2 minutes).
2. Turn right onto Lake Terrell Road and continue for 1.9 miles.
3. Turn left onto Slater Road and drive straight for 6.1 miles.
4. At the traffic circle, take the first exit onto the I-5 South ramp. Merge onto I-5 South and drive for 4.8 miles.
5. Take Exit 255 for Sunset Drive toward WA-542 East/Mt. Baker. At the end of the exit ramp, turn right onto East Sunset Drive and continue for 0.3 mile.
6. Turn right onto Ellis Street and drive for 0.3 mile.
7. Arrive at PeaceHealth St. Joseph Medical Center.

Figure B
Hospital Route Map



Care Management—WorkCare Incident Intervention

Anchor QEA maintains access to WorkCare Incident Intervention, a 24/7 telehealth triage program for the management of work-related injuries, illnesses, and physical discomfort. WorkCare nurses and physicians are available by calling **(888) 449-7787** and are ready to intervene immediately whenever a workplace injury or illness happens.

Every Anchor QEA employee is encouraged to use this service, but most likely the manager, a coworker, or the injured worker themselves will call WorkCare with details about the type of incident, the probable cause, and the scope of the situation. With that information, WorkCare will evaluate the incident, explain the appropriate course of action, and consult with the employee's treating physician on a quality treatment plan that meets the needs of the employee and Anchor QEA.

Key Safety Personnel

The following people share responsibility for health and safety at the site. See Section 4 of this Health and Safety Plan (HASP) for a description of each person's role and responsibilities.

Client Contact: Kristin Gaines	Mobile: (360) 798-2509
Project Manager (PM): Heather Gadwa	Office: (206) 709-6867 Mobile: (253) 720-2958
Field Lead (FL): Mikayla Bowers	Office: (360) 715-2710 Mobile: (360) 724-8488
Corporate Health and Safety Manager (CHSM): Matt Gruber	Office: (828) 771-0327 Mobile: (828) 490-6877
Director of Health and Safety (DOHS): Tim Shaner	Office: (251) 375-5282 Mobile: (251) 281-3386

Personal Incident Response Procedures

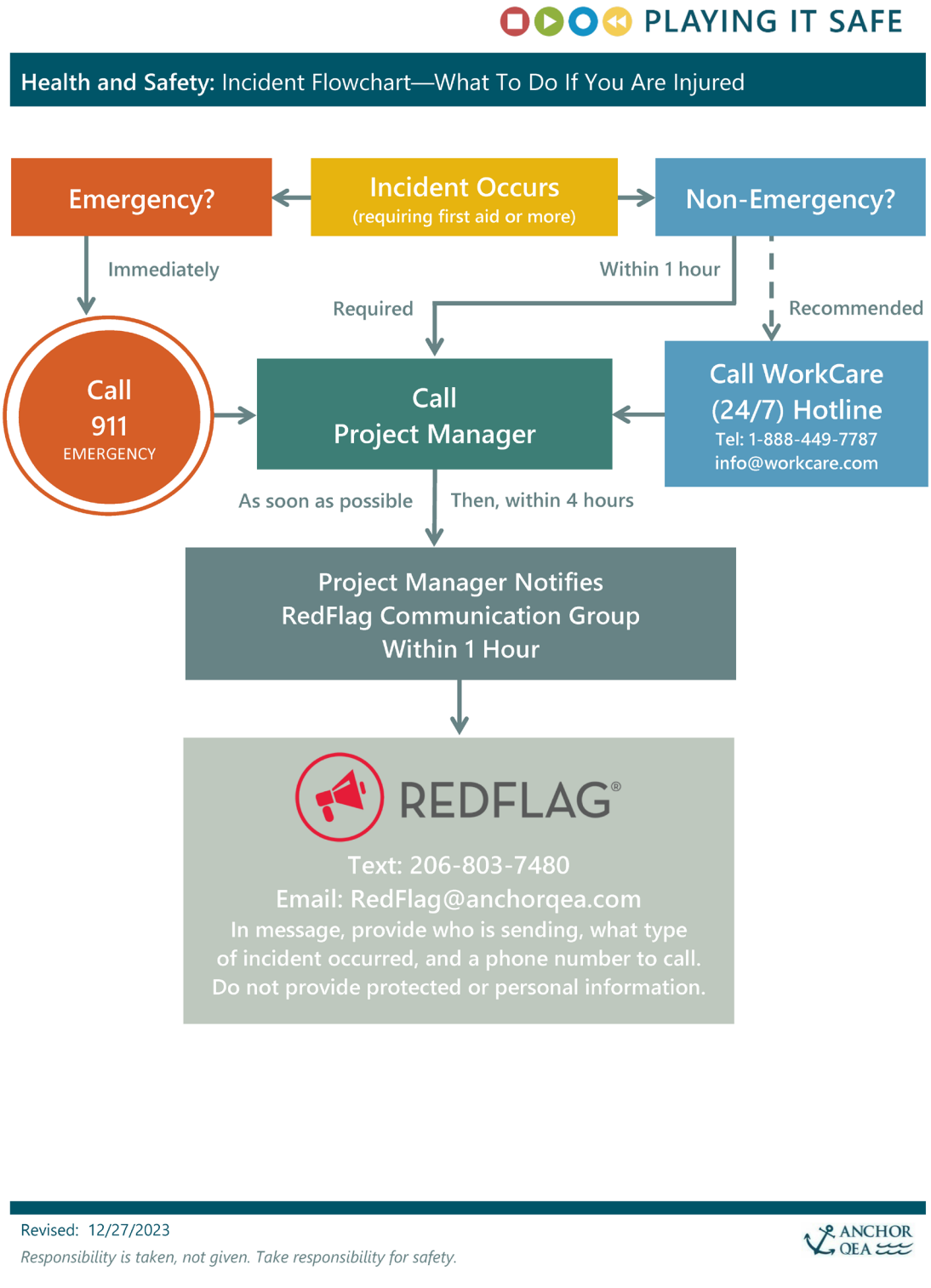
The first person to recognize an emergency must take immediate action using the following steps and the flowchart in Figure C:

1. Survey the situation to verify it is safe for you and the victim. **Do not endanger your own life.**
    - Never enter an area to rescue someone who has been overcome unless you are properly equipped and trained.
    - Make sure all protocols are followed.
    - Review Safety Data Sheets (SDSs) to evaluate response actions for chemical exposures.
2. Immediately call 911 or the appropriate emergency number listed in Table A, or have someone else to do it.
    - Report the physical injury, incident location, and any chemical exposure, fire, or release.

3. Have someone retrieve the nearest first aid kit containing the necessary items and, if needed, an Automated External Defibrillator (AED).
    - Use an AED only if you are properly trained and are currently certified.
4. Decontaminate the victim without delaying lifesaving procedures (see Section 8).
5. Administer first aid and cardiopulmonary resuscitation (CPR), if you are properly trained, until emergency responders arrive.[1]
6. Notify the Field Lead (FL) and Project Manager (PM); the PM will notify the client contact. The PM will also contact the Corporate Health and Safety Manager (CHSM), who will facilitate the incident investigation. All client requirements pertinent to personal incident reporting will also be adhered to.
7. If evacuation is required, the FL must conduct a head count to verify that all Anchor QEA personnel are accounted for.
8. Complete the appropriate incident investigation reports.

[1] Personnel qualified and currently certified in basic first aid or CPR are protected under Good Samaritan policies as long as they perform only the basic tasks that they were taught. Do not provide first aid or perform CPR unless you have been properly trained.

Figure C
Incident Flowchart



Non-Personal Incident Response Procedures

All incidents—including, but not limited to, fire, explosion, property damage, or environmental releases—must be responded to according to the site-specific HASP. In general, this means securing the site of the incident and turning control over to the emergency responders, or securing the site and summoning appropriate remedial personnel or equipment. Anchor QEA will immediately notify the client of any major incident, fire, equipment or property damage, or environmental incident in a preliminary report, followed by a full report within 72 hours.

Spills and Releases of Hazardous Materials

When required, notify the National Response Center [**(800) 424-8802**] and state and local agencies. Give the following information to the National Response Center:

- Name and telephone number
- Name and address of incident location
- Time and type of incident
- Name and quantity of materials involved, if known
- Extent of injuries
- Possible hazards to human health or the environment outside the facility

If hazardous waste is released or produced through control of the incident, verify the following:

- Waste has been collected and contained.
- Containers of waste have been removed or isolated from the immediate site of the emergency.
- Recovered waste, contaminated soil or surface water, and any other material that results from the incident or its control has been treated or stored.
- No waste incompatible with the released material is treated or stored in the facility until the cleanup is complete.

Before operations resume, make sure all emergency equipment that was used has been decontaminated, recharged, and is fit for its intended use.

Recording Playing It Safe Events

All events that could have reasonably led to an injury, environmental release, or other incident must be immediately reported to the FL and PM so the conditions that led to the event can be readily corrected to prevent future occurrences. Any events where there are opportunities for others to learn should be recorded as a Playing It Safe event.

TABLE OF CONTENTS

Certification Page i

Health and Safety Plan Acknowledgement Form ii

Site Emergency Procedures iv

Site Map iv

Emergency Contact Information v

Hospital Route Map and Driving Directions vi

Care Management—WorkCare Incident Intervention vii

Key Safety Personnel vii

Personal Incident Response Procedures vii

Non-Personal Incident Response Procedures x

Spills and Releases of Hazardous Materials x

Recording Playing It Safe Events x

1 Introduction 1

1.1 Health and Safety Plan Requirements 1

1.2 Health and Safety Plan Modifications 2

2 Site Description and Background Information 3

2.1 Site Description and Background 3

3 Scope of Work 4

3.1 Project Scope of Work 4

4 Authority and Responsibilities of Key Personnel 5

4.1 Project Manager 5

4.2 Field Lead 5

4.3 Corporate Health and Safety Manager 7

4.4 Project Field Team 7

5 Project-Specific Requirements 9

5.1 Activity-Specific Level-of-Protection Requirements 9

5.2 Project Air Monitoring Requirements 9

6 Risk Analysis and Control 18

6.1 Job Safety Analysis 18

6.1.1 Augmented Job Safety Analysis Process 19

6.2 Exposure Routes 19
6.2.1 Inhalation 19
6.2.2 Dermal Contact 19
6.2.3 Ingestion 19
6.3 Chemicals of Concern Profile 19
7 Site Control and Communications 25
7.1 General Site Control Safety Procedures 25
7.2 Work Area Access Control 25
7.3 Hazardous Waste Site Work Control Procedures 26
7.4 Site-Specific Work Zone Requirements 26
7.4.1 Working in a Roadway 27
7.4.2 Working at Excavation or Trenching Sites 27
7.5 Field Communications 28
8 Decontamination Procedures and Practices 30
8.1 Minimizing Contamination 30
8.2 Decontaminating Equipment 30
8.3 Personnel Decontamination 31
8.4 Sampling and Processing Equipment Decontamination 31
8.5 Handling of Investigation-Derived Waste 31
8.5.1 Disposable Personal Protective Equipment 31
8.5.2 Non-Disposable Personal Protective Equipment 32
8.6 Sanitizing Personal Protective Equipment 32
8.7 Emergency Personnel Decontamination 32
8.8 Containment of Decontamination Fluids 32
9 Health and Safety Training and Informational Programs 33
9.1 Initial Project Site Orientation 33
9.2 Daily Safety Meetings 33
9.3 End-of-Day Wellness Checks 33
9.4 Hazardous Waste Operations Training 34
9.5 Hazard Communication Program 34
9.6 Respiratory Protection Training 35
10 General PPE Requirements 36
10.1 Minimum Requirements: Level D Protection 36
10.1.1 Modified Level D Protection Requirements 36

10.2 Respiratory Protection Requirements 37
10.2.1 Level C Protection Requirements 37
10.2.2 Cartridge Change-Out Schedule 37
10.2.3 Level B and A Protection Requirements 38
10.2.4 Respirator Fit Testing 38
10.2.5 Respirator Cleaning, Maintenance, and Inspection 39
10.3 Evaluation of PPE 39
11 General Air Monitoring Requirements 40
11.1 General Requirements 40
11.2 Real-Time Air Monitoring Equipment 40
11.3 Equipment Calibration and Maintenance 40
11.4 Air Monitoring Action Levels 41
11.5 Air Monitoring Frequency Guidelines 41
12 Health and Safety Procedures and Practices 42
12.1 Physical Hazards and Controls 42
12.1.1 General Site Activities 42
12.1.2 Slips, Trips, and Falls 43
12.1.3 Ergonomic Considerations 43
12.1.4 Corrosive Material Handling Procedures 44
12.1.5 Underground or Overhead Utility Line Contact Prevention 44
12.1.6 Electric Safety 45
12.1.7 Use of Hand-Held X-Ray Fluorescence Spectrometers 47
12.1.8 General Falls 48
12.1.9 Heavy Equipment Operations 48
12.1.10 Drilling with Direct Push Technology 49
12.1.11 Hand and Power Tools 50
12.1.12 Motor Vehicle Operation 50
12.1.13 Vehicular Traffic 51
12.1.14 Working Near Railways 52
12.1.15 Noise 54
12.1.16 Lifting and Material Handling 55
12.1.17 Fire Control 56
12.1.18 Cleaning Equipment 56
12.2 Environmental Hazards and Controls 56
12.2.1 Fatigue Management 56

12.2.2 Heat Stress 58
12.2.3 Cold Stress 62
12.2.4 Sunlight and Ultraviolet Exposure 63
12.2.5 Inclement Weather 64
12.2.6 Insects and Spiders 65
12.2.7 Bees and Wasps 65
12.2.8 Ticks 66
12.2.9 Mosquitoes 67
12.2.10 Parasitic Hazards 67
12.2.11 Bird Droppings 68
12.2.12 Feral Dogs 68
12.2.13 Bears 69
12.2.14 Mountain Lions (Cougars), Wolves, and Coyotes 70
12.2.15 Rodent-Borne Diseases 71
12.2.16 Poisonous Plants 72
12.2.17 The Public at Large 74
12.2.18 Personal Health and Safety 75

13 Medical Monitoring Program 77

13.1 General Requirements 77
13.2 Team Self-Monitoring 79

TABLES

Table A Site Emergency Form and Emergency Phone Numbers* v
Table B Hospital Information v
Table 5-1 Project Job Tasks and Required Personal Protective Equipment 10
Table 5-2 Project Air Monitoring Requirements 17
Table 6-1 Chemicals of Concern Profile 20
Table 7-1 Field Communication Methods 29
Table 10-1 Respirator Cartridge Change-Out Schedule 38
Table 12-1 Overhead Utility Clearance Requirements 45
Table 12-2 Noise Exposure Action Levels 55
Table 12-3 Permissible Heat Exposure Threshold Limit Values 61
Table 12-4 Wet Bulb Globe Temperature Correction Factors 61
Table 12-5 Tick Identification Guide 67

Table 12-6 North American Bear Identification Guide 69
Table 12-7 North American Canid Identification Guide 71
Table 12-8 North American Hazardous Plant Identification Guide 73

FIGURES

Figure A General Site Location Overview iv
Figure B Hospital Route Map vi
Figure C Incident Flowchart ix

APPENDICES

Appendix A Health and Safety Logs and Forms
Appendix B Job Safety Analysis Documents
Appendix C Safety Data Sheets
Appendix D Certifications
Appendix E Heat and Cold Exposure Program

ABBREVIATIONS

ACGIH	American Conference of Governmental Industrial Hygienists
AED	Automated External Defibrillator
ANSI	American National Standards Institute
APR	Air-Purifying Respirator
ASTM	ASTM International
CAS	Chemical Abstracts Service (number)
CDC	Centers for Disease Control and Prevention
CFR	*Code of Federal Regulations*
CHSM	Corporate Health and Safety Manager
COC	chemical of concern
cPAH	carcinogenic polycyclic aromatic hydrocarbon
CPR	cardiopulmonary resuscitation
CRZ	Contamination Reduction Zone
dBA	A-weighted decibel
dB	decibel
DOHS	Director of Health and Safety
DPT	direct-push technology
EPA	U.S. Environmental Protection Agency
eV	electron volts
EZ	Exclusion Zone/Hot Zone
FID	flame ionization detector
FL	Field Lead
GFCI	ground-fault circuit interrupter
HASP	Health and Safety Plan
HAZMAT	Hazardous Materials
HAZWOPER	Hazardous Waste Operations and Emergency Response
HEPA	high-efficiency particulate air
HII	heavy impact industrial
JSA	Job Safety Analysis
kV	kilovolt
LEL	lower-explosive limit
LO/TO	lockout/tagout
mg/m^3	milligram per cubic meter
MHR	maximum heart rate
N/A	not applicable
NIOSH	National Institute for Occupational Safety and Health

NPL	National Priority List
NRR	Noise Reduction Rating
O_2	oxygen
OSHA	Occupational Safety and Health Administration
OV	organic vapor
OVM	organic vapor monitor
PAH	polycyclic aromatic hydrocarbon
PCB	polychlorinated biphenyl
PEL	Permissible Exposure Limit
PFD	personal flotation device
PID	photoionization detector
PM	Project Manager
PPE	personal protective equipment
ppm	parts per million
PRCS	Permit-Required Confined Spaces
REL	Recommended Exposure Limit
RCRA	Resource Conservation and Recovery Act
RPP	Respiratory Protection Program
SDS	Safety Data Sheet
STEL	Short-Term Exposure Limit
SVOC	semivolatile organic compound
SZ	Support Zone/Clean Zone
TCLP	toxicity characteristic leaching procedure
TLV	Threshold Limit Value
TPH	total petroleum hydrocarbons
TWA	time-weighted average
USCG	U.S. Coast Guard
UV	ultraviolet
VOC	volatile organic compound
WBGT	wet bulb globe temperature
XRF	X-ray fluorescence

1 Introduction

This Health and Safety Plan (HASP) was prepared on behalf of Alcoa Corp and presents health and safety requirements and procedures that will be followed by Anchor QEA personnel and, at a minimum, by Anchor QEA subcontractors during work activities at Alcoa Intalco (the site). This HASP was developed in accordance with Title 29 of the *Code of Federal Regulations* (CFR), Part 1910.120(b), and is to be used in conjunction with Anchor QEA's Corporate Health and Safety Program. See Section 1.2 for information on how to modify this HASP in response to changing conditions in the field or new project tasks.

This HASP identifies potential physical, chemical, and biological hazards associated with field activities; establishes safe working conditions and protective measures to control those hazards; defines emergency procedures; and describes the responsibilities of site personnel as well as their training and medical monitoring requirements.

Issuance of this approved HASP documents that a hazard assessment was performed for the work site and specific site activities, and the adequacy of the personal protective equipment (PPE) selected was evaluated as required by 29 CFR 1910.132(d)—Personal Protective Equipment, General Requirements (General Industry); 29 CFR 1910.134—Respiratory Protection; 29 CFR 1926.28—Personal Protective Equipment (Construction Industry); and 29 CFR 1926.55—Gases, Vapors, Fumes, Dusts and Mist, and is duly noted by the signature(s) and date appearing on the certification page of this document.

1.1 Health and Safety Plan Requirements

The provisions of this HASP are mandatory for all Anchor QEA personnel assigned to the project and must be followed when working at the site. Personnel assigned to work at the project site will be required to read this HASP and must sign the Health and Safety Plan Acknowledgement Form to confirm that they understand and agree to abide by the provisions of this HASP. A copy of this HASP must be maintained on site and available for employees and visitors to review at any time.

Subcontractors are ultimately responsible for the health and safety of their employees and shall have their own HASP that covers their specific activities related to this project. Any subcontractor HASPs must include, at a minimum, the requirements set forth in this HASP. Subcontractors may mandate health and safety protection measures for their employees beyond the minimum requirements specified in this HASP.

All visitors to the work site must also abide by the requirements of this HASP and must attend a pre-work briefing where the contents of this HASP will be presented and discussed. Visitors may also be required to sign the Liability Waiver.

1.2 Health and Safety Plan Modifications

This HASP will be amended, if necessary, to address changing field conditions or additional work tasks not already described in this document. Modifications will be proposed by the Field Lead (FL) using the Modification to Health and Safety Plan form included in Appendix A. Modifications will be reviewed by a Corporate Health and Safety Manager (CHSM) or the Director of Health and Safety (DOHS) and approved by the Project Manager (PM). Significant operational changes that could affect the health and safety of personnel, the community, or the environment will not be made without the prior approval of the PM and a CHSM.

2 Site Description and Background Information

2.1 Site Description and Background

The Plant encompasses approximately 383 acres located at 4050 Mountain View Road west of Ferndale, Washington. The Plant property includes Whatcom County Tax Property ID Nos. 186684, 186663, 186709, 186714, and 186715.

The Plant is located west of the city of Ferndale, in Whatcom County, approximately 13 miles south of the United States-Canada border (Figure 1). Ferndale has a population of approximately 16,000. The primary land uses in the area are residential, agricultural, and industrial. The Plant property is bordered to the north and south by heavy industrial operations, to the east by rural residential and agricultural lands, and to the west by the Strait of Georgia. The Plant and surrounding area are zoned for heavy impact industrial (HII).

Plant construction began in 1965, with the first aluminum metal produced in 1966. Construction continued through 1968 with the completion of the third potline. Alumax, Inc., was the majority owner of the Intalco facility until July 1998 when Alcoa Corp. acquired Alumax. At the height of production, the Plant employed 1,350 full-time hourly and salaried staff and was capable of producing 307,000 tons of aluminum per year. Normal three-line operating capacity was less than 300,000 tons of aluminum per year. Operations were curtailed in 2020 and officially closed in March 2023.

The production process employed at Intalco involved the electrolytic reduction of aluminum oxide (alumina) to aluminum metal (Hall-Héroult process). This process entailed passing an electrical current through a carbon anode in contact with molten alumina dissolved in an electrolyte bath all contained within a cathodic “pot.” Each pot was constructed with an outer steel casing, called a pot shell, and connected with others in an electrical circuit line called a potline. The Plant operated three potlines, each with approximately 240 pots, housed within 6 potrooms. Other operations include a casting house, a carbon plant for anode production, a series of water treatment facility structures, and several material storage, maintenance, and administrative facilities.

3 Scope of Work

3.1 Project Scope of Work

This HASP addresses health and safety issues associated with the following field tasks:

- Soil sample collection using a hand auger, direct push technology (geoprobe), and excavator
- Soil screening including use of X-ray fluorescence (XRF)
- Soil logging and classification
- Groundwater sample collection using a peristaltic pump, bladder pump, impeller pump, and/or disposable bailers
- Building material sampling through destructive and wipe techniques
  - Monitoring well decommissioning oversight
- Environmental document handling, including compilation, review, and inventory of site-related records
  - Hantavirus sampling
  - Disinfection of files and boxes through appropriate bleach solution and UV treatment

4 Authority and Responsibilities of Key Personnel

This section describes the authority and responsibilities of the key Anchor QEA project personnel. Their names and contact information are listed in the Site Emergency Procedures section at the beginning of this HASP. If key site personnel change during the project, a new contact list will be posted immediately at the site. The site's medical, fire, and police emergency phone number is **911**.

4.1 Project Manager

The PM provides overall direction for the project and is responsible for ensuring that the project meets the client's objectives in a safe and timely manner. The PM is responsible for providing qualified staff for the project and adequate resources and budget so the Health and Safety staff can carry out their responsibilities during the field work. In addition, the PM is in regular contact with the FL and CHSM to verify that appropriate health and safety procedures are followed during the performance of each project task.

The PM has authority to direct response operations; the PM assumes total control over project activities but may assign responsibility for aspects of the project to others. In addition, the PM has the following responsibilities:

- Oversee the preparation and organization of background review of the project, the Scope of Work, and the field team.
- Verify that the team obtains permission for site access and coordinates activities with appropriate officials.
- Brief the FL and field personnel on specific assignments.
- Together with the FL, see that health and safety requirements are met.
- Consult with a CHSM regarding unsafe conditions, incidents, or changes in site conditions or the Scope of Work.

4.2 Field Lead

The FL reports to the PM, also has authority to direct response operations, and assumes control over on-site activities. The FL directs field activities, coordinates the technical and health and safety components of the field program, and is responsible in general for implementing, enforcing, and administering this site-specific HASP and Corporate Health and Safety Program requirements. The FL will be the primary point of contact for all field personnel and visitors. FLs on contaminated sites must have completed a minimum of an additional 8-hour HAZWOPER Supervisor course as approved by Health and Safety. The FL must be present on site when work is being performed.

The FL and any other member of the field team have **STOP WORK AUTHORITY**—the authority to stop or suspend work in the event of an emergency, if conditions arise that pose an unacceptable health and safety risk to the field team or environment, or if conditions arise that warrant

modifications to this HASP. It is critical that both the FL and PM communicate regularly to proactively identify and address any safety-related concerns that may arise.

The FL can designate an alternate to act in their absence; however, the FL alternate must meet any FL requirements to include training. The FL's responsibilities related to this HASP include, but are not necessarily limited to, the following:

- Provide (via implementation of this HASP) emergency procedures, evacuation routes, and telephone numbers for the local hospital, poison control center, fire department, and police department.
- Conduct and document daily safety meetings.
- Execute the Scope of Work and schedule.
- Conduct periodic field health and safety inspections to verify compliance with this HASP.
- Oversee implementation of safety procedures.
- Implement site personnel protection levels.
- Enforce site control measures designed to limit access to authorized personnel only.
- Periodically inspect protective clothing and equipment for adequacy and safety compliance.
- Verify that protective clothing and equipment are properly stored and maintained.
- Perform or oversee air monitoring (if required) in accordance with this HASP.
- Maintain and oversee operation of monitoring equipment and interpretation of data from the monitoring equipment.
- Monitor site personnel for signs of stress, including heat stress, overexertion, cold exposure, and fatigue.
- Require participants to use the "buddy" system when performing tasks.
- Maintain communication with a CHSM regarding on-site activities.
- If applicable, verify that decontamination and disposal procedures are followed.
- Maintain the availability of required safety equipment.
- Notify, when necessary, local public emergency officials (**all personnel on site may conduct this task as needed**).
- Notify emergency response personnel in the event of an emergency and coordinate emergency medical care.
- Communicate incidents promptly to the PM.
- Follow up on incident reports to the PM.
- Advise appropriate health services and medical personnel of potential exposures.

The FL records in the field logbook health and safety-related details of the project. At a minimum, each day's entries must include the following information:

- Project name or location
- Names of all on-site personnel

- Level of PPE worn and any other specifics regarding PPE
- Weather conditions
- Type of field work being performed

The FL will have completed the required Occupational Safety and Health Administration (OSHA) 40-hour Hazardous Waste Operations and Emergency Response (HAZWOPER) training and annual updates, the 8-hour Supervisor training, medical monitoring clearance, and current first aid and cardiopulmonary resuscitation (CPR) training. Other certifications or training may be stipulated based on client or site requirements.

4.3 Corporate Health and Safety Manager

A CHSM (or designee) is responsible for managing on-site health and safety activities and for supporting the PM and FL on health and safety-related issues. A CHSM or designee has the following responsibilities:

- Provide technical input into the design and implementation of this HASP.
- Advise on the potential for occupational exposure to project hazards, along with appropriate methods and/or controls to eliminate site hazards.
- Verify that a hazard assessment has been performed and that the adequacy of the PPE selected was evaluated as required by 29 CFR 1910.132(d), 29 CFR 1910.134, 29 CFR 1926.25, and 29 CFR 1926.55, and is duly noted by the signatures and date appearing on the Certification Page of this document.
- Consult with the FL on matters relating to suspending site activities in the event of an emergency.
- Verify that all on-site Anchor QEA and subcontractor personnel have read and signed the Health and Safety Plan Acknowledgement Form.
- Verify that corrective actions resulting from deficiencies identified by audit and observations are implemented and effective.

A CHSM or designee will have completed the required OSHA 40-hour HAZWOPER training and annual updates as well as the 8-hour Supervisor training (or a minimum of 5 years of supervisory experience).

4.4 Project Field Team

In addition to the key personnel noted previously, the project field team members also have specific responsibilities related to this HASP. All field team members, including subcontractors, must be familiar with and comply with this HASP. Before beginning work on the site, all project field team members must attend a meeting led by the FL concerning safety issues and a review of the project work tasks.

Field team members must immediately report to the FL any potentially unsafe or hazardous conditions, and all members of the field team have **STOP WORK AUTHORITY**—the authority to stop or suspend work if conditions arise that pose an unacceptable health and safety risk to the field team or environment, or if conditions arise that warrant modifications to this HASP. It is critical that all field team members proactively communicate with the FL to identify potential unsafe conditions.

Field team members report to the FL for on-site activities and also have the following responsibilities:

- Review, maintain a working knowledge of, and comply with this HASP.
- Attend and participate in daily safety meetings.
- Safely complete on-site tasks required to fulfill the Scope of Work.
- Notify the FL of existing or potential safety issues at the site.
- Report all incidents to the FL.
- Demonstrate safety- and health-conscious conduct.

In accordance with OSHA standards at 29 CFR 1910.120(e)(3)(i),[2] newly assigned HAZWOPER 40-hour trained field team members must have at least 3 days of field work supervised by an experienced FL (with HAZWOPER Supervisor training). The PM is responsible for identifying such "short service" personnel and verifying that their supervised field experience occurs (or has occurred) and is documented in the project field notes and on the Daily Safety Briefing form (Appendix A).

[2] "General site workers (such as equipment operators, general laborers and supervisory personnel) engaged in hazardous substance removal or other activities which expose or potentially expose workers to hazardous substances and health hazards shall receive a minimum of 40 hours of instruction off the site, and a minimum of three days actual field experience under the direct supervision of a trained experienced supervisor."

5 Project-Specific Requirements

This section provides activity-specific levels of protection and air monitoring requirements to be used on this site based on the Scope of Work and the chemicals of concern (COCs).

5.1 Activity-Specific Level-of-Protection Requirements

See Section 10 for general PPE requirements. Level D is the minimum level of PPE acceptable for most sites. An upgrade to Modified Level D occurs when there is a possibility that contaminated media can come in contact with the skin or work uniform. An upgrade to Level C occurs when there is a potential for exposure to airborne COCs (i.e., if the results of air monitoring reveal that action levels have been exceeded). Hearing protection must be worn when there are high noise levels. Site personnel must maintain proficiency in the use and care of PPE that is to be worn.

Table 5-1 describes the specific means of protection needed for each identified work activity.

5.2 Project Air Monitoring Requirements

See Section 11 for general requirements for air monitoring at the project site, including information on air monitoring equipment. Upgrade from Level D and/or Modified Level D to Level C when the results of air monitoring reveals that action levels have been exceeded. Use of Level C by Anchor QEA staff requires participation in Anchor QEA's Respiratory Protection Program (RPP).

Table 5-2 describes the specific air monitoring required for each identified work activity.

Table 5-1
Project Job Tasks and Required Personal Protective Equipment

Job Tasks		PPE Requirements
• Destructive material sampling	☒	Standard work uniform/coveralls
	☒	Work boots with safety toe conforming to ASTM F2412-05/ASTM F2413-05
	☒	High-visibility traffic safety vest
	☐	Chemical-resistant clothing <u>check appropriate garments</u>: ☐ One-piece coverall ☐ Hooded one- or two-piece chemical splash suit ☐ Disposable chemical coveralls ☐ Chemical-resistant hood and apron ☐ Bib-style overalls and jacket with hood **Fabric Type**: Tyvek NOTE: Thick rain pants and coveralls may be substituted for coated Tyvek if sediments are not obviously contaminated with PAHs or related petroleum products. Rain slickers cannot be effectively decontaminated of tar/petroleum contamination.
	☐	Disposable inner gloves (latex or equivalent "surgical")
	☒	Disposable chemical-resistant outer gloves **Material Type**: Nitrile
	☐	Chemical-resistant boots with safety toe conforming to ASTM F2412-05/ASTM F2413-05 or disposable boot covers for safety toe/work boots **Material Type**: Rubber or leather
	☐	Puncture-resistant shanks in safety shoes conforming to ASTM F2412-05/ASTM F2413-05
	☐	Metatarsal guards conforming to ASTM F2412-05/ASTM F2413-05
	☐	Sleeves to be duct-taped over gloves and pants to be duct-taped over boots
	☐	Splash-proof safety goggles
	☒	Safety glasses
	☒	Hard hat
	☐	Hard hat with face shield
	☒	Hearing protectors (**REQUIRED** if site noise levels are greater than 85 decibels [dB] based on an 8-hour TWA). **Type**: Earplugs
	☐	Two-way radio communication (intrinsically safe, if explosive atmosphere is a potential)
	☐	Long cotton underwear

Job Tasks		PPE Requirements
• Destructive material sampling	☐	High-visibility, USCG-approved PFD (if working on any water vessel or without fall protection within 10 feet of water)
	☐	USCG-approved float coat and bib-overalls (e.g., full two-piece "Mustang" survival suit or similar) or one-piece survival suit if combined air and water temperature is below 90°F
	☐	Half-face APR (OSHA/NIOSH-approved)
	☒	Full-face APR (OSHA/NIOSH-approved)
	☐	**Type of Cartridges to Be Used**: ☐ **OV or** ☒ **OV/HEPA (if samples are dry)**
• Sampling and characterizing soil • Soil and groundwater sample collection and processing • Wipe sampling building material	☒	Standard work uniform/coveralls
	☒	Work boots with safety toe conforming to ASTM F2412-05/ASTM F2413-05
	☒	High-visibility traffic safety vest
	☐	Chemical-resistant clothing <u>check appropriate garments</u>: ☐ One-piece coverall ☐ Hooded one- or two-piece chemical splash suit ☐ Disposable chemical coveralls ☐ Chemical-resistant hood and apron ☐ Bib-style overalls and jacket with hood **Fabric Type**: Tyvek NOTE: Thick rain pants and coveralls may be substituted for coated Tyvek if sediments are not obviously contaminated with PAHs or related petroleum products. Rain slickers cannot be effectively decontaminated of tar/petroleum contamination.
	☒	Disposable inner gloves (latex or equivalent "surgical")
	☒	Disposable chemical-resistant outer gloves **Material Type**: Nitrile
	☐	Chemical-resistant boots with safety toe and steel shank conforming to ASTM F2412-05/ASTM F2413-05 or disposable boot covers for safety toe/work boots **Material Type**: Rubber or leather
	☐	Puncture-resistant shanks in safety shoes conforming to ASTM F2412-05/ASTM F2413-05
	☐	Metatarsal guards conforming to ASTM F2412-05/ASTM F2413-05
	☐	Sleeves to be duct-taped over gloves and pants to be duct-taped over boots
	☐	Splash-proof safety goggles

Job Tasks		PPE Requirements
• Sampling and characterizing soil • Soil and groundwater sample collection and processing • Wipe sampling building material	☒	Safety glasses
	☒	Hard hat
	☐	Hard hat with face shield
	☒	Hearing protectors (**REQUIRED** if site noise levels are greater than 85 dB based on an 8-hour TWA). **Type:** Earplugs
	☐	Two-way radio communication (intrinsically safe, if explosive atmosphere is a potential)
	☐	Long cotton underwear
	☐	High-visibility, USCG-approved PFD (if working on any water vessel or without fall protection within 10 feet of water)
	☐	USCG-approved float coat and bib-overalls (e.g., full two-piece "Mustang" survival suit or similar) or one-piece survival suit if combined air and water temperature is below 90°F
	☐	Half-face APR (OSHA/NIOSH-approved)
	☐	Full-face APR (OSHA/NIOSH-approved)
	☐	**Type of Cartridges to Be Used:** ☐ **OV or** ☐ **OV/HEPA (if samples are dry)**
• Overseeing Bollard installation • Overseeing Ground Monument and PVC pipe installation • Well decommissioning	☒	Standard work uniform/coveralls
	☒	Work boots with safety toe conforming to ASTM F2412-05/ASTM F2413-05
	☒	High-visibility traffic safety vest
	☐	Chemical-resistant clothing <u>check appropriate garments</u>: ☐ One-piece coverall ☐ Hooded one- or two-piece chemical splash suit ☐ Disposable chemical coveralls ☐ Chemical-resistant hood and apron ☐ Bib-style overalls and jacket with hood **Fabric Type**: Tyvek NOTE: Thick rain pants and coveralls may be substituted for coated Tyvek if sediments are not obviously contaminated with PAHs or related petroleum products. Rain slickers cannot be effectively decontaminated of tar/petroleum contamination.
	☐	Disposable inner gloves (latex or equivalent "surgical")

Job Tasks		PPE Requirements
• Overseeing Bollard installation • Overseeing Ground Monument and PVC pipe installation • Well decommissioning	☒	Disposable chemical-resistant outer gloves **Material Type**: Nitrile
	☐	Chemical-resistant boots with safety toe and steel shank conforming to ASTM F2412-05/ASTM F2413-05 or disposable boot covers for safety toe/work boots **Material Type**: Rubber or leather
	☐	Puncture-resistant shanks in safety shoes conforming to ASTM F2412-05/ASTM F2413-05
	☐	Metatarsal guards conforming to ASTM F2412-05/ASTM F2413-05
	☐	Sleeves to be duct-taped over gloves and pants to be duct-taped over boots
	☐	Splash-proof safety goggles
	☒	Safety glasses
	☒	Hard hat
	☐	Hard hat with face shield
	☒	Hearing protectors (**REQUIRED** if site noise levels are greater than 85 dB based on an 8-hour TWA). **Type:** Earplugs
	☐	Two-way radio communication (intrinsically safe, if explosive atmosphere is a potential)
	☐	Long cotton underwear
	☐	High-visibility, USCG-approved PFD (if working on any water vessel or without fall protection within 10 feet of water)
	☐	USCG-approved float coat and bib-overalls (e.g., full two-piece "Mustang" survival suit or similar) or one-piece survival suit if combined air and water temperature is below 90°F
	☐	Half-face APR (OSHA/NIOSH-approved)
	☐	Full-face APR (OSHA/NIOSH-approved)
	☐	**Type of Cartridges to Be Used:** ☐ **OV or** ☐ **OV/HEPA (if samples are dry)**
	☒	Standard work uniform/coveralls
	☒	Work boots with safety toe conforming to ASTM F2412-05/ASTM F2413-05

Job Tasks		PPE Requirements
• Environmental document handling • Compilation, review, and inventory of site-related records • Box handling and heavy lifting (mice nests have been identified)	☒	High-visibility traffic safety vest
	☒	Chemical-resistant clothing <u>check appropriate garments</u>:
		☐ One-piece coverall
		☐ Disposable chemical coveralls
		☐ Bib-style overalls and jacket with hood
		☒ **Fabric Type**: Tyvek NOTE: Thick rain pants and coveralls may be substituted for coated Tyvek if sediments are not obviously contaminated with PAHs or related petroleum products. Rain slickers cannot be effectively decontaminated of tar/petroleum contamination.
	☐	Disposable inner gloves (latex or equivalent "surgical")
	☒	Disposable chemical-resistant outer gloves **Material Type**: Nitrile
	☐	Chemical-resistant boots with safety toe and steel shank conforming to ASTM F2412-05/ASTM F2413-05 or disposable boot covers for safety toe/work boots **Material Type**: Rubber or leather
	☐	Puncture-resistant shanks in safety shoes conforming to ASTM F2412-05/ASTM F2413-05
	☐	Metatarsal guards conforming to ASTM F2412-05/ASTM F2413-05
	☐	Sleeves to be duct-taped over gloves and pants to be duct-taped over boots
	☒	Splash-proof safety goggles
	☐	Safety glasses
	☒	Hard hat
	☐	Hard hat with face shield
	☒	Hearing protectors (**REQUIRED** if site noise levels are greater than 85 dB based on an 8-hour TWA). **Type:** Earplugs
	☐	Two-way radio communication (intrinsically safe, if explosive atmosphere is a potential)
	☐	Long cotton underwear

Job Tasks		PPE Requirements
• Environmental document handling • Compilation, review, and inventory of site-related records • Box handling and heavy lifting (mice nests have been identified)	☐	High-visibility, USCG-approved PFD (if working on any water vessel or without fall protection within 10 feet of water)
	☐	USCG-approved float coat and bib-overalls (e.g., full two-piece "Mustang" survival suit or similar) or one-piece survival suit if combined air and water temperature is below 90°F
	☒	Half-face APR (OSHA/NIOSH-approved)
	☐	Full-face APR (OSHA/NIOSH-approved)
	☐	**Type of Cartridges to Be Used:** ☐ **OV or** ☒ **OV/HEPA (if samples are dry)**
• Soil Screening with XRF	☒	Standard work uniform/coveralls
	☒	Work boots with safety toe conforming to ASTM F2412-05/ASTM F2413-05
	☒	High-visibility traffic safety vest
	☐	Chemical-resistant clothing check appropriate garments:
		☐ One-piece coverall
		☐ Disposable chemical coveralls
		☐ Bib-style overalls and jacket with hood
		☐ Fabric Type: Tyvek NOTE: Thick rain pants and coveralls may be substituted for coated Tyvek if sediments are not obviously contaminated with PAHs or related petroleum products. Rain slickers cannot be effectively decontaminated of tar/petroleum contamination.
	☐	Disposable inner gloves (latex or equivalent "surgical")
	☒	Disposable chemical-resistant outer gloves Material Type: Nitrile
	☐	Chemical-resistant boots with safety toe and steel shank conforming to ASTM F2412-05/ASTM F2413-05 or disposable boot covers for safety toe/work boots Material Type: Rubber or leather

Job Tasks		PPE Requirements
• Soil Screening with XRF	☐	Puncture-resistant shanks in safety shoes conforming to ASTM F2412-05/ASTM F2413-05
	☐	Metatarsal guards conforming to ASTM F2412-05/ASTM F2413-05
	☐	Sleeves to be duct-taped over gloves and pants to be duct-taped over boots
	☐	Splash-proof safety goggles
	☐	Safety glasses
	☒	Hard hat
	☐	Hard hat with face shield
	☒	Hearing protectors (REQUIRED if site noise levels are greater than 85 dB based on an 8-hour TWA). Type: Earplugs
	☐	Two-way radio communication (intrinsically safe, if explosive atmosphere is a potential)
	☐	Long cotton underwear
	☐	High-visibility, USCG-approved PFD (if working on any water vessel or without fall protection within 10 feet of water)
	☐	USCG-approved float coat and bib-overalls (e.g., full two-piece "Mustang" survival suit or similar) or one-piece survival suit if combined air and water temperature is below 90°F
	☐	Half-face APR (OSHA/NIOSH-approved)
	☐	Full-face APR (OSHA/NIOSH-approved)
	☐	**Type of Cartridges to Be Used:** ☐ **OV or** ☐ **OV/HEPA (if samples are dry)**

Table 5-2
Project Air Monitoring Requirements

Instrument*	Job Tasks/Functions	Measurement	Monitoring Schedule[3]	Actions[1]
FID and/or PID (11.7*eV Lamp; Measures Total Organic Vapors)	Conduct air monitoring for VOCs during activities where contaminated media are present. Make sure that a background reading is taken before the start of activities and periodically thereafter.	0 to 0.5 ppm above background in breathing zone	Periodically (every 15 to 30 minutes)	Acceptable, continue work.
		>0.5 to 1 ppm above background	Periodically (every 15 minutes)	Upgrade to Level C[4] protection. Monitor for any low exposure limit COCs that could be present based on site history and/or previous sampling data (i.e., vinyl chloride, hydrogen cyanide, and benzene) using colorimetric detector tubes as described below.
		>1 ppm above background in breathing zone		Stop work required.[2] Leave work area and contact PM and CHSM for guidance.
Dust Monitor (Soil)	Conduct monitoring when dusty conditions are encountered in areas that contain potentially contaminated soils. Monitor in employee breathing zones and general areas. Determine if potentially contaminated materials are migrating off site. Dust concentration action levels are based on downwind minus upwind measurements.	<0.001 mg/m^3	Initially and every 15 minutes while conditions persist	Continue work.
		0.001 to 0.002 mg/m^3 above background	Continuously	Move support zone to upwind location. Initiate dust suppression activities (water or local exhaust ventilation)
		>0.002 mg/m^3 above background		Upgrade to Level C protection (HEPA filters);[4] If dust levels cannot be maintained <0.01 mg/m^3.

Notes:
*Note: Instruments must be calibrated according to manufacturer's recommendations.

1. For VOCs, a sustained reading for greater than 2 minutes in excess of the action level will trigger a protective measure.
2. Contact a CHSM and PM before continuing work. A hazard review must be conducted before proceeding with work. Corrective actions may include temporary work stoppage to allow vapors to dissipate, and then returning to work if air monitoring data permits.
3. Monitoring frequency is from the beginning of each task and at specified intervals thereafter, or when detectable soil contamination is encountered (as indicated by strong, sustained odor, visual evidence of product, or petroleum-discolored soils).
4. Work must be conducted in accordance with Anchor QEA's RPP. Contact a CHSM for respiratory protection fit testing and air-purifying cartridge change-out requirements.

6 Risk Analysis and Control

The following sections discuss the potential health and safety hazards associated with the field tasks described in the Scope of Work. These hazards can be addressed through mechanical and physical control measures, the use of PPE, monitoring, training, decontamination, emergency response, and safety procedures.

Significant changes in the Scope of Work covered by this HASP must be reported to the PM and CHSM, and the HASP must be modified, if necessary (see Section 1.2). Any task not specified in the Scope of Work and this HASP must be evaluated using the Job Safety Analysis (JSA) process before conducting the work.

6.1 Job Safety Analysis

Anchor QEA work tasks have been evaluated for their hazards, and JSA documents have been developed that detail the chemical, physical, and biological hazards associated with these tasks along with the control measures (e.g., engineering controls, administrative controls, and/or PPE) that will be used to conduct them safely.

The PM and FL are responsible for identifying work tasks and project site conditions that are beyond the previously developed JSA documents and for informing a CHSM about them. A CHSM, in turn, will provide any support needed by the PM and the FL, who will be primarily responsible for developing project-specific JSAs to address those tasks and conditions.

Project personnel will be informed about the contents of the JSA documents during the site orientation meeting and during daily safety meetings when conducting work where the specific JSAs are applicable.

JSA documents applicable to this project are provided in Appendix B and include the following field tasks:

- Field Activities
- Decontamination Activities
- Motor Vehicle Operation
- Sample and Laboratory Glassware Handling
- Groundwater Sampling
- Soil and Building Material Sampling
- Investigation-Derived Waste Management
- Hantavirus Sampling and Disinfectant
- Drilling Oversight
- Soil Excavation and Earthworks
- X-Ray Fluorescence Field Use

6.1.1 Augmented Job Safety Analysis Process

If significant work tasks are identified during the course of the project that were not previously addressed in the JSA documentation (provided in Appendix B), then the PM and FL shall develop a task-specific JSA document with input from a CHSM, as needed, before conducting the work. This HASP will be modified to include the new task-specific JSA document (see Section 1.2 for HASP modification procedures). Project personnel shall be trained on the contents of the new task-specific JSA before it can be implemented.

6.2 Exposure Routes

Possible routes of exposure to the chemicals that may be encountered on this project include inhalation, dermal contact, and ingestion of dust, mist, gas, vapor, or liquid. Exposure can be minimized by following safe work practices and by wearing the appropriate PPE. See Section 10 for information about PPE requirements.

6.2.1 Inhalation

Inhalation of particulates, dust, mist, gas, or vapor during field activities is possible. Whenever possible, work activities will be oriented so that personnel are upwind of the work area. An organic vapor monitor (OVM) may be used to monitor ambient air and the breathing zone within the work area for organic compounds. Section 5.2 describes potential OVM action levels and response procedures.

6.2.2 Dermal Contact

Dermal (skin) contact with potentially contaminated soil, sediment, or groundwater during field activities is possible. Direct contact will be minimized by using appropriate PPE and decontamination procedures.

6.2.3 Ingestion

Direct ingestion of contaminants can occur by inhaling airborne dust, mist, or vapors, or by swallowing contaminants trapped in the upper respiratory tract. Indirect ingestion can occur by introducing the contaminants into the mouth by way of food, tobacco, fingers, or other carriers. Proper hygiene, decontamination, and contamination reduction procedures should reduce the chances of ingesting contaminants.

6.3 Chemicals of Concern Profile

Table 6-1 provides a summary profile of project COCs. This profile is based on recent site history and site characterization information, when available. For more detailed and specific information, always refer to the Safety Data Sheet (SDS) or equivalent information for the COC (see Appendix C).

Table 6-1
Chemicals of Concern Profile

Chemical Name and Chemical Abstracts Service (CAS) Number (#)	Exposure Routes	Symptoms	Target Organs	Occupational Exposure Limit	LEL (%)	Ionization Potential (eV)
Arsenic CAS No. 7440-38-2 (soil/building material)	Oral ingestion, acute inhalation (as dust), skin/eye contact	Vomiting, abdominal pain, diarrhea followed by numbness and tingling in the extremities	Skin, bladder, lungs	ACGIH TLV 0.01 mg/m^3	N/A	N/A
Barium CAS No. 7440-39-3(soil/building material)	Inhalation (as dust), skin/eye contact, oral ingestion	Vomiting, nausea, vomiting, diarrhea, irregular heartbeat, muscle weakness, tremors, paralysis	Kidneys, mucous membranes	ACGIH TLV TWA 0.5 mg/m^3	N/A	N/A
Cadmium CAS No. 7440-43-9 (soil/building material)	Inhalation (as dust), skin/eye contact, oral ingestion	Flu-like symptoms (chills, fever, muscle pain)	Kidneys, bone, lungs	ACGIH TLV TWA 0.002 mg/m^3 Respirable Particulate	N/A	N/A
Chromium CAS No. 7440-47-3 (soil/building material)	Inhalation (as dust), skin/eye contact, oral ingestion	Respiratory tract irritation (inhalation), intense GI irritation or ulceration, nausea, vomiting, diarrhea, vertigo, fever, muscle cramps (ingestion)	Kidneys, liver, skin, eyes	ACGIH TLV TWA 0.5 mg/m^3	N/A	N/A
Lead CAS No. 7439-92-1 (soil/building material)	Inhalation (as dust), skin/eye contact, oral ingestion	Abdominal pain, neurological changes, irritability, anemia, abdominal pain	Kidneys, central nervous system, blood	OSHA PEL TWA 0.05 mg/m^3	N/A	N/A
Mercury CAS No. 7439-97-6 (soil/building material)	Inhalation (as vapor) Skin/eye contact, oral ingestion	Numbness or pain on skin, shaking/tremor, seizures, blindness/double vision, inability to walk well	Kidneys, liver, brain, central nervous system	ACGIH TLV TWA 0.1 mg/m^3	N/A	N/A

Chemical Name and Chemical Abstracts Service (CAS) Number (#)	Exposure Routes	Symptoms	Target Organs	Occupational Exposure Limit	LEL (%)	Ionization Potential (eV)
Selenium CAS No. 7782-49-2 (soil/building material)	Inhalation (as dust), skin/eye contact, oral ingestion	Garlicky odor of breath, fatigue, GI symptoms, alopecia, peripheral neuropathy	Respiratory tract (if inhaled), central nervous systems, GI tract, skin	OSHA PEL TWA 0.2 mg/m^3	N/A	N/A
Silver CAS No. 7440-22-4 (soil/building material)	Inhalation (as dust), skin/eye contact, oral ingestion	Breathing problems, lung & throat irritation (if inhaled) and stomach pain (if ingested)	Skin, eyes, brain, liver, kidney, spleen, bone	OSHA PEL TWA 0.01 mg/m^3	N/A	N/A
PAH (as Naphthalene) CAS No. 91-20-3 (soil/building material)	Inhalation, skin absorption, ingestion, skin and/or eye contact	Irritation eyes; headache, confusion, excitement, malaise (vague feeling of discomfort); nausea, vomiting, abdominal pain; irritation bladder; profuse sweating; jaundice; hematuria (blood in the urine), renal shutdown; dermatitis, optical neuritis, corneal damage	Eyes, skin, blood, liver, kidneys, central nervous system	ACGIH TLV TWA 10 ppm (52 mg/m^3)	0.9	8.12
PCB (Chlorodiphenyl 42%) CAS No. 53469-21-9 (soil/building material)	Inhalation, skin absorption, ingestion, skin and/or eye contact	Irritation of eyes; chloracne; liver damage; reproductive effects (potential occupational carcinogen)	Skin, eyes, liver, reproductive system	ACGIH TLV TWA 1 mg/m3	NA	Unknown
PCB (Aroclor 1242 Chlorodiphenyl 54%) CAS No. 11097-69-1 (soil/building material)	Inhalation, skin absorption, ingestion, skin and/or eye contact	Irritation of eyes; chloracne; liver damage; reproductive effects (potential occupational carcinogen)	Skin, eyes, liver, reproductive system	ACGIH TLV TWA 0.5 mg/m3	NA	Unknown
cPAHs – Coal tar pitch volatiles (soil) CAS No. 65996- 93-2 (soil/building material)	Inhalation, skin and/or eye contact	Dermatitis, bronchitis (potential occupational carcinogen)	Respiratory system, skin, bladder, kidneys	OSHA PEL TWA 0.2 mg/m^3	Varies	Varies

Chemical Name and Chemical Abstracts Service (CAS) Number (#)	Exposure Routes	Symptoms	Target Organs	Occupational Exposure Limit	LEL (%)	Ionization Potential (eV)
Diesel (TPH-d) (soil) CAS No. 68334-30-5 (soil/building material)	Inhalation (as vapor), skin absorption, ingestion, skin and/or eye contact	Dizziness, drowsiness, loss of coordination, blood pressure elevation, headache, nausea, asphyxiation, lung damage	Kidney (chronic), lungs, brain	N/A	0.7	N/A
Gasoline (TPH-g) CAS No. 86290-81-5 (soil/building material)	Inhalation (as vapor), skin absorption, ingestion, skin and/or eye contact	Confusion, giddiness, nausea, headache, blurred vision, dizziness, and weakness	Blood, liver, kidneys	N/A	1.4	N/A
VOCs (as vinyl chloride) CAS No. 75-01-4 (Soil/building material)	Inhalation (as vapor), skin absorption, ingestion, skin and/or eye contact	Lassitude, abdominal pain, gastrointestinal bleeding, enlarged liver, pallor or cyanosis of extremities	Liver, central nervous system, blook, respiratory system, lymphatic system	OSHA PEL 1 ppm C 5 ppm TWA	3.6	9.99
SVOCs (as phenol) CAS No. 108–95–2 (Soil/building material)	Inhalation (as vapor), skin absorption, ingestion, skin and/or eye contact	Irritation eyes, nose, throat; anorexia, weight loss; lassitude, muscle aches, pain; dark urine, cyanosis; liver, kidney damage; skin burns; dermatitis; ochronosis; tremor, convulsions, twitching	Eyes, skin, respiratory system, liver, kidneys	NIOSH REL 5 ppm (19 mg/m^3) TWA	1.8	8.50
Halogenated VOCs (as methylchloride) CAS No. 74-87-3 (Soil/building material)	Inhalation (as vapor), skin absorption, ingestion, skin and/or eye contact	Dizziness, nausea, vomiting; visual disturbance, stagger, slurred speech, convulsions, coma; liver, kidney damage; liquid: frostbite; reproductive, teratogenic effects	Central nervous system, liver, kidneys, reproductive system	OSHA PEL 100 ppm TWA	8.1	11.28
Aluminum CAS No. 7429-90-5 (groundwater)	Irritation eyes, skin, respiratory system	Irritation eyes, skin, respiratory system	Eyes, skin, respiratory system	ACGIH TLV TWA 1 mg/m^3 Respirable Particulate Matter	N/A	N/A

Chemical Name and Chemical Abstracts Service (CAS) Number (#)	Exposure Routes	Symptoms	Target Organs	Occupational Exposure Limit	LEL (%)	Ionization Potential (eV)
Chloride (as hydrogen chloride) CAS No. 7647-01-0 (groundwater)	Inhalation, ingestion (solution), skin and/or eye contact	Irritation nose, throat, larynx; cough, choking; dermatitis; solution: eye, skin burns; liquid: frostbite; In Animals: laryngeal spasm; pulmonary edema	Eyes, skin, respiratory system	OSHA PEL C 5 ppm (7 mg/m^3)	N/A	12.74
Cyanide (as hydrogen cyanide) CAS No. 74-90-8 (groundwater)	Inhalation, ingestion, skin and/or eye contact	Irritation to eyes and skin, asphyxia, lassitude (weakness, exhaustion), headache, confusion, nausea, vomiting, increased respiratory rate, slow gasping respiration	Eyes, skin, mucous membrane, respiratory system	NIOSH REL 4.7 ppm (5 mg/m^3) STEL (skin)	N/A	N/A
Calcium (as calcium carbonate) CAS No 471-34-1 (groundwater)	Inhalation, skin and/or eye contact	Irritation eyes, skin, respiratory system; cough	Eyes, skin, respiratory system	NIOSH REL TWA 10 mg/m^3 (total) TWA 5 mg/m^3 (resp)	N/A	N/A
Fluoride (as Hydrogen fluoride) CAS No. 7664-39-3 (groundwater)	Inhalation, ingestion, skin and/or eye contact	Skin and eye irritant. May cause respiratory and digestive tract irritation. Toxic gases may be generated by combustion Incompatible with acids. Nausea, abdominal pain, diarrhea; salivation, thirst, sweating; stiff spine; dermatitis; calcification of ligaments of ribs, pelvis	Eyes, skin, respiratory system, central nervous system, skeleton, kidneys	NIOSH REL TWA 3 ppm	N/A	15.98
Potassium CAS No. 7440-09-7 (groundwater)	Inhalation, ingestion, skin and/or eye contact	Skin corrosion or irritation, eye corrosion or irritation	N/A	NOISH REL TWA 5 mg/m3	N/A	N/A

Chemical Name and Chemical Abstracts Service (CAS) Number (#)	Exposure Routes	Symptoms	Target Organs	Occupational Exposure Limit	LEL (%)	Ionization Potential (eV)
Sodium CAS No. 7440-23-5 (groundwater)	Inhalation, ingestion, skin and/or eye contact	Skin, eye, and respiratory track irritation	Eyes, skin, respiratory system	N/A	N/A	N/A

Note:

1. The Standard List of PAHs includes the following: 1-Methylnaphthalene, 2-Methylnaphthalene, acenaphthene, acenaphthylene, anthracene, benzo(a)pyrene, benzo(b)fluoranthene, benzo(g,h,i)perylene, benzo(j,k)fluoranthene, benz[a]anthracene, chrysene, dibenzo(a,h)anthracene, fluoranthene, fluorene, indeno(1,2,3-cd)pyrene, naphthalene, phenanthrene, and pyrene.

7 Site Control and Communications

The primary purposes of site controls are to establish the hazardous area perimeter, reduce the migration of contaminants into clean areas, and prevent unauthorized access or exposure to hazardous materials by site personnel and the public. Site control is especially important in emergencies.

7.1 General Site Control Safety Procedures

All Anchor QEA site personnel and subcontractors must comply with the following standard safe work practices, which must be discussed in the safety briefing before initiating work on the site:

- Eating, drinking, chewing gum or tobacco, and smoking are prohibited on site except in designated areas.
- Hands and faces must be washed upon leaving the work area and before eating, drinking, chewing gum or tobacco, and smoking.
- A buddy system will be used. Radio, mobile phone, or hand signals will be established to maintain communication.
- During site operations, all workers will be a safety backup to their partner.
- Buddies will maintain visual contact on site when performing potentially hazardous duties.
- No one will be admitted to the site without the proper safety equipment, training, and (if required) medical monitoring certification.
- Proper decontamination procedures must be followed before leaving a contaminated work area.

Any staff member who does not comply with the safety policy established in this HASP may be subject to corrective action, potentially including but not limited to being reprimanded or immediately dismissed.

7.2 Work Area Access Control

When work is performed in public areas, precautions must be taken to protect site personnel and the public. Access to the work area will be controlled using a combination of the following:

- Fences and/or barricades
- Traffic control devices and/or use of flaggers
- Caution tape

Other methods can also be used to keep the site secure and provide a visual barrier to prevent unauthorized personnel from entering the site and active work areas.

7.3 Hazardous Waste Site Work Control Procedures

To prevent the spread of contamination from personnel and equipment, work areas will be clearly specified as an Exclusion Zone/Hot Zone (EZ), Contamination Reduction Zone (CRZ), or Support Zone/Clean Zone (SZ) before beginning operations. Each work area will be clearly identified using signs or physical barriers. At the end of each work day, the site should be secured and/or guarded to prevent unauthorized entry.

The site work zones are defined as follows:

- **Exclusion Zone/Hot Zone (EZ).** The EZ, also known as the "hot zone," is the contaminated area inside the site perimeter (or sample collection area of a boat). The EZ is where potential respiratory or other health hazards exist. All personnel entering the EZ must use the required PPE, as specified in this HASP, and meet the appropriate training and medical clearance requirements. Entry to and exit from this zone will be made through a designated point. Appropriate warning signs to identify the EZ should be posted (e.g., Danger, Authorized Personnel Only, Protective Equipment Required Beyond This Point). Personnel and equipment must be decontaminated upon exiting the EZ.
- **Contamination Reduction Zone (CRZ).** The CRZ, also known as the "warm zone," is a transitional area between the EZ and the SZ. The CRZ provides a location to remove and decontaminate PPE and tools leaving the EZ. A separate decontamination area will be established for heavy equipment. All personnel and equipment must exit the EZ through the CRZ. If the CRZ is compromised at any time, a new CRZ must be established.
- **Support Zone/Clean Zone (SZ).** The SZ, also known as the "cold zone" or "clean zone," is the uncontaminated area outside the EZ and CRZ and within the geographic perimeters of the site (including boat and processing areas). The SZ is used for support personnel; staging materials; parking vehicles; office, laboratory, and sanitation facilities; and receiving deliveries. Personnel entering this zone may include delivery personnel, visitors, security guards, and others not necessarily permitted in the EZ or CRZ.

The FL shall maintain a log of all personnel visiting, entering, or working on the site. No visitor will be allowed in the EZ without showing proof of training and medical certification, in accordance with 29 CFR 1910.120(e),(f) (and 29 CFR 1926.1101(k)(9),(m), if appropriate). Visitors must attend a site orientation given by the FL and review and sign the HASP.

7.4 Site-Specific Work Zone Requirements

This section provides guidelines for maintaining safe conditions when working in a roadway, or at an excavation site.

7.4.1 Working in a Roadway

Working in public streets may require coordination with local governments and the development and submittal of a traffic control plan in accordance with the U.S. Department of Transportation (DOT) *Manual on Uniform Traffic Control Devices* (MUTCD). Qualified flaggers may also be required to provide temporary traffic control.

Follow these site control practices and procedures when working in roadways:

- Plan and conduct work in a manner that traffic can be continuously observed. This may require having a spotter equipped with a noise-making device such as an air horn or a whistle, as appropriate.
- Wear a high-visibility traffic vest and hardhat when vehicle hazards are present.[3] Include lighted elements like flashing signs whenever possible in high hazard environments.
- Use traffic cones, flag-mounted cones, caution tape, and/or barricades.
- Protect the work area with a vehicle or other piece of heavy equipment, unless doing so would pose an additional hazard. If possible, the equipment should have a strobe light and operating headlights or running lights.
- Develop a traffic flow plan for high-traffic situations that includes, as appropriate, the following:
  - Use of a qualified flagger
  - Use of a flashing arrow sign
  - Liberal use of "WORKER AHEAD" signs
  - Lane-closing permits
  - Police details

See Sections 12.1.12 and 12.1.13 for additional information about motor vehicle operation and vehicular traffic.

7.4.2 Working at Excavation or Trenching Sites

Observe the following site control practices and procedures when working around excavation and trenching sites:

- A "Competent Person" is required per OSHA standards at 29 CFR 1926 Subpart P.
  - OSHA defines a "Competent Person" in 29 CFR 1926.32(f) as "one who is capable of identifying existing and predictable hazards in the surroundings or working conditions which are unsanitary, hazardous, or dangerous to employees, and who has authorization to take prompt corrective measures to eliminate them."

[3] The 2023 MUTCD 11th Edition (ANSI 107-2015) federal standard stipulates specific requirements for, among other characteristics, reflectivity of work vests and headwear. This standard must be reviewed, and provisions included if work covered by this HASP includes work in controlled roadways.

- Safeguard open excavations by restricting unauthorized access.
- Mark the work area with prominent warning signs (e.g., cones, sawhorses or other barricades, and signage) placed at least 10 feet back from the excavation opening.
- Maintain zone definition along the perimeter with a continuous length of high-visibility caution tape.

7.4.2.1 Excavations Left Unattended or Overnight

Secure excavations that must be left unattended or overnight in one of the following ways:

- Surround the entire perimeter with plastic or cloth construction net fencing at least 4 feet high and capable of withstanding 200 pounds of pressure.
  - Attach the fencing to steel posts driven into the ground no more than 8 feet apart.
  - Erect the fencing at least 10 feet back from the excavation opening.
- Place 8-foot-long barricades outfitted end to end with flashing lights and a 4-foot-high construction net fence attached to the barricades.
- Install temporary curbing or concrete "jersey" barriers outfitted with flashing signal lights or other effective warning signs.

7.5 Field Communications

Communication between all Anchor QEA employees and subcontractors at the work site can be verbal or non-verbal, although verbal communication can be affected by background noise or the use of various PPE. All project personnel must be initially briefed on the communication methods before starting work, and communication methods should be reviewed in daily safety meetings. Communication equipment must be checked daily to verify proper operation. Table 7-1 lists the types of communication methods and equipment to use, depending on site conditions.

Table 7-1
Field Communication Methods

Type of Communication	Communication Device	Signal
Emergency notification	On-site telephone or mobile telephone	Initiate phone call using applicable emergency numbers
Emergency notification among site personnel	Two-way radio	Initiate radio communication with Code Red message
Hailing site personnel for non-emergency	Compressed air horn	One long blast, one short blast
Hailing site personnel for emergency evacuation	Compressed air horn	Three long, continuous blasts
Hailing site personnel for distress, need help	Visual	Arms waved in circle over head
Hailing site personnel for emergency evacuation	Visual	Arms waved in crisscross over head
Contaminated air or strong odor	Visual	Hands clutching throat
Break, lunch, end of day	Visual	Two hands together, break apart

8 Decontamination Procedures and Practices

8.1 Minimizing Contamination

Take the following measures to prevent or minimize exposure to potentially contaminated materials:

Personnel

- Do not walk through spilled materials.
- Do not handle, touch, or smell sample media directly.
- Make sure PPE is not cut or torn before using it.
- Protect and cover any skin injuries.
- Stay upwind of airborne dust and vapors.
- Do not eat, drink, chew tobacco, or smoke in the work zones.

Sampling Equipment and Vehicles

- Avoid getting sampled media on the outside of sample containers.
- Bag sample containers before filling with sampled media, if necessary.
- Place clean equipment on a plastic sheet to avoid direct contact with contaminated media.
- Keep contaminated equipment and tools separate from clean equipment and tools.
- Fill sample containers over a plastic tub to contain spillage.
- Clean up spilled material immediately to avoid tracking it around the vehicle.

8.2 Decontaminating Equipment

All vehicles, vessels, and equipment that have entered a potentially contaminated area will be visually inspected and, if necessary, decontaminated before leaving the area. If the vehicle's contamination level is low, decontamination may be limited to rinsing its tires and wheel wells with an appropriate detergent and water. If a vehicle is significantly contaminated, steam cleaning or pressure washing may be required. Tools are to be cleaned in the same manner. Rinsate from all decontamination activities will be collected for proper disposal. Decontamination of equipment and tools will take place within the CRZ. Appropriate PPE should be donned before beginning decontamination activities.

The following supplies will be available to use in decontaminating equipment:

- Wash and rinse buckets
- Tap water and phosphate-free detergent
- Distilled or deionized water
- Scrub brushes
- Paper towels and plastic garbage bags
- Deck pump with pressurized freshwater hose (aboard the vessel)
- Pressure washer/steam cleaner, if appropriate
- Appropriate PPE for the type of contaminant

8.3 Personnel Decontamination

The FL will verify that all site personnel are familiar with the personnel decontamination procedures as listed here. All personnel wearing PPE in an EZ work area must undergo the following decontamination procedures before entering the SZ:

1. Wash and rinse outer gloves and boots in portable buckets to remove gross contamination.
2. Rinse off protective suit if it is heavily soiled.
3. Remove and inspect outer gloves. Discard if damaged. Leave inner gloves on.
4. Remove outer garment and gloves and dispose of them in a properly labeled container or drum.
5. Decontaminate hard hats and boots with an aqueous solution of detergent or other appropriate cleaning solution. Carry these items by hand to the next station.
6. Remove inner gloves.
7. Thoroughly wash hands and face before leaving the CRZ.
8. Sanitize respirators and place them in a clean plastic bag.

8.4 Sampling and Processing Equipment Decontamination

To prevent sample cross-contamination, sampling and processing equipment that comes into contact with soil, sediment, or water samples will undergo the following decontamination procedures when work in the CRZ is completed and before the equipment is used again:

1. Rinse with potable water and wash with scrub brush.
2. Wash with phosphate-free detergent (i.e., Alconox®).
3. Visually inspect the sampler and, if necessary, repeat the scrub and rinse step. If scrubbing and rinsing with Alconox® or similar substance is not enough to remove visually observable tar-related contamination, scrub and rinse the equipment with hexane (or a similar type of solution) until all visible signs of contamination are gone.
4. Before using sampling equipment again, rinse the exterior of the equipment with potable water three times. Rinse homogenizing equipment once with potable water and three times with distilled water before and between sample processing.
5. Wear PPE that is appropriate for the contaminant.

8.5 Handling of Investigation-Derived Waste

Any remaining soil or sediment, fluids used to decontaminate sampling equipment, and disposable sample collection wastes (e.g., gloves, paper towels, or foil) will be placed into appropriate containers and staged on site for disposal.

8.5.1 Disposable Personal Protective Equipment

Disposable PPE, which may include Tyvek suits, inner latex gloves, and respirator cartridges, must be disposed of according to the requirements of the client and state and federal agencies.

8.5.2 Non-Disposable Personal Protective Equipment

Non-disposable PPE may include respirators, boots, and gloves. Respirators should be decontaminated using the following practices and procedures:

- Wipe out the respirator with a disinfecting pad before donning.
- At the end of each work day, decontaminate the respirator on site with an approved sanitizing solution.

Boots and gloves should be decontaminated using the following practices and procedures:

- Decontaminate boots and gloves outside with a solution of detergent and water; rinse with water before leaving the site.
- Protect boots and gloves from exposure by covering them with a plastic or similar disposable cover to minimize the decontamination that will be required after use.

8.6 Sanitizing Personal Protective Equipment

Exhalation, body oils, and perspiration will soil the insides of masks and clothing. Before reusing respirators, reusable protective clothing, and other personal articles, they must be decontaminated and also sanitized. Follow the manufacturer's instructions to sanitize respirator masks. If practical, machine wash reusable protective clothing after a thorough decontamination; otherwise, clean by hand. Following proper sanitization, bag or tag equipment to show that it has been sanitized and is ready for use.

8.7 Emergency Personnel Decontamination

Personnel who experience medical problems or injuries may also require decontamination. However, if the decontamination may aggravate or cause more serious health effects, or if prompt lifesaving, first aid, and medical treatment are required, decontamination procedures will be omitted. Either way, a member of the site management team will accompany contaminated personnel to the medical facility to advise on matters involving decontamination. Consideration should still be given to the potential for contaminating other areas such as vehicles and treatment facilities. PPE appropriate for the contaminant should be worn.

8.8 Containment of Decontamination Fluids

Spill control measures will be used, as necessary, to contain contaminated runoff that may enter into clean areas. Use plastic sheeting or hay bales, or install a spill control system to prevent spills and contain contaminated water.

9 Health and Safety Training and Informational Programs

This section describes the health and safety training and informational programs with which Anchor QEA project site personnel must comply. All certifications required in this section are provided in Appendix D and will be kept on internal file.

9.1 Initial Project Site Orientation

Everyone working at an Anchor QEA project site must participate in an initial health and safety orientation presented by the PM or FL that, at a minimum, will cover the following topics:

- A review of the contents of this HASP, including the Scope of Work and associated site hazards and control methods and procedures.
- Provisions of this HASP are mandatory for all Anchor QEA personnel assigned to the project.
- Anchor QEA subcontractors are also expected to follow the provisions of this HASP unless they have their own HASP that covers their specific activities related to this project and includes the minimum requirements of this HASP.
- All visitors to the work site will also be required to abide by the requirements of this HASP.
- Personnel assigned to perform work at the project site, working under the provisions of this HASP, will be required to read the HASP and must sign the Health and Safety Plan Acknowledgement Form to confirm that they understand and agree to abide by the provisions of this HASP. Personnel not directly affiliated with the project (i.e., visitors) may also be required to sign the Liability Waiver.

9.2 Daily Safety Meetings

Daily safety "tailgate" meetings make accident prevention a top priority for everyone working at a site and reinforce awareness of important accident-prevention techniques. The following daily safety meeting procedures and practices are required:

- Daily safety meetings will be held each morning before conducting site activities.
- The Daily Safety Briefing form in Appendix A will be used to document each meeting.
- Copies of the completed Daily Safety Briefing forms will be maintained on site during the course of the project.

9.3 End-of-Day Wellness Checks

Similar to the daily safety meetings, field staff will gather at the end of the day to verify group health and wellness and discuss any near misses that occurred that day. These wellness checks will be recorded on that day's Daily Safety Briefing form.

9.4 Hazardous Waste Operations Training

Personnel working on project sites where they may be potentially exposed to hazardous wastes or other hazardous substances must be trained in accordance with the requirements of the 29 CFR 1910.120 (HAZWOPER) regulation, as follows:

- Field personnel must complete a minimum of 40 hours of hazardous waste activity instruction.
- Field personnel must complete a minimum of 3 days of supervised field instruction.
- Field personnel assigned to the site must also have received 8 hours of refresher training annually. If the time lapse since their previous training has exceeded 1 year, they may not work on the site until training is current.
- On-site managers and supervisors directly responsible for workers engaged in hazardous waste operations must have an additional 8 hours of supervisory training.
- Field personnel must be current in first aid and CPR training offered by the American Red Cross or similar organization.
- Other training may be required depending on the task to be performed (e.g., confined space entry, excavation or trenching, underground storage tank removal, fall protection, respiratory protection, and hazard communication).

9.5 Hazard Communication Program

The purpose of hazard communication (Employee Right-to-Know) is to verify that the hazards of all chemicals located at the field project site are communicated to all Anchor QEA personnel and subcontractors in accordance with 29 CFR 1910.1200. See the Anchor QEA Hazard Communication Program document for additional information. These chemicals may be brought on site to support site investigation/remediation activities or site maintenance (e.g., fuel for lawn mowers), and/or may be containerized investigation-derived waste following field activities.

Every container of hazardous materials must be labeled by the manufacturer, who must also provide the SDS upon initial order of the product and upon request thereafter. The actual format may differ from company to company (e.g., National Fire Protection Association, Hazardous Material Information System, or other), but the labels must contain similar types of information, and manufacturer labels should be kept, if possible. The label may use words or symbols to communicate the following information:

- Introduction
- Hazard(s) identification
- Composition or information about ingredients
- First aid measures
- Fire-fighting measures
- Accidental release response measures

- Handling and storage
- Exposure controls or personal protection
- Physical and chemical properties
- Stability and reactivity properties
- Toxicological properties
- Ecological properties
- Disposal considerations
- Transport considerations
- Regulatory information
- Other information, including at a minimum, label preparation or last revision date

SDSs for all chemicals brought onto the site or anticipated to be used on site are provided in Appendix C of this HASP. These SDSs shall be readily available for reference by site personnel and emergency response personnel.

Hazardous materials received without proper labels shall be set aside and may not be distributed for use until properly labeled.

If a hazardous chemical is transferred into a portable container (e.g., an approved safety can), even if for immediate use only, the contents of the portable container (e.g., acetone or gasoline) must be identified.

9.6 Respiratory Protection Training

Anchor QEA employees who use respiratory protection are required to have a medical evaluation first. They must also be trained in the following topics in accordance with Anchor QEA's RPP, as required by 29 CFR 1910.134:

- Fit testing procedures for tight-fitting respirators
- Procedures for proper use of respirators in routine and reasonably foreseeable emergency situations
- Procedures and schedules for cleaning, disinfecting, storing, inspecting, repairing, discarding, and otherwise maintaining respirators
- Respiratory hazards that employees may potentially be exposed to during routine and emergency situations
- Proper use of respirators, including putting on and removing them, any limitations on their use, and their maintenance

See Section 10.2 for additional information.

10 General PPE Requirements

The minimum level of PPE (usually Level D or C) should be selected according to the hazards that may be encountered during site activities in accordance with established U.S. Environmental Protection Agency (EPA) levels of protection. Only PPE that meets American National Standards Institute (ANSI) standards shall be worn. Site workers must be proficient in the use and care of PPE. Damaged or defective PPE must be replaced and may not be used. Anchor QEA will provide all necessary PPE for its employees, as described in this HASP.

Refer to Section 5 for site-specific job task and level-of-protection requirements.

10.1 Minimum Requirements: Level D Protection

Level D PPE provides the minimum level of protection on project sites and includes the following equipment:

- Standard work uniform or coveralls
- Work boots with safety toe conforming to ASTM International (ASTM) F2412-05/ASTM F2413-05
- Approved safety glasses or goggles that meet ANSI Z87.1—2010 requirements for eye protection
- Hard hat that meets ANSI Z89.1—1986 requirements for head protection
- High-visibility traffic safety vest
- Hearing protection when there are high noise levels

Level D protection will be used only under the following conditions:

- The atmosphere contains no known hazards.
- Work functions preclude splashes, immersions, or the potential for unexpected inhalation of, or contact with, hazardous concentrations of chemicals.
- Atmospheric concentrations of contaminants are less than the Permissible Exposure Limit (PEL) and/or Threshold Limit Value (TLV).

10.1.1 Modified Level D Protection Requirements

Level D protection should be upgraded to Modified Level D when there is a possibility that contaminated media can contact the skin or work uniform, or if unique, site-specific hazards exist. Modified Level D protection includes additional protective equipment such as U.S. Coast Guard (USCG)-approved PFDs, face shields or goggles, chemical-resistant clothing, and disposable gloves of various materials depending on the type of chemicals involved.

10.2 Respiratory Protection Requirements

Respiratory protection devices may potentially be used for protection against particulates and organic vapors during the course of an Anchor QEA field project, including building material sampling and documentation handling that has been impacted by mice. In accordance with Anchor QEA's RPP, the need for respiratory protection will be determined by air monitoring results and site conditions (contact a CHSM with questions). However, engineering and administrative controls must first be evaluated for use as the primary means for protecting workers from site respiratory hazards. If engineering and administrative controls are deemed not feasible, respiratory protection will be required.

The remainder of this section summarizes relevant points from Anchor QEA's RPP. For projects requiring respiratory protection, this section will be amended as appropriate based on project-specific respiratory hazard analysis, and all respiratory protection actions will take place in accordance with Anchor QEA's RPP.

10.2.1 Level C Protection Requirements

Protection requirements should be upgraded to Level C when the results of air monitoring reveal that action levels have been exceeded.

Level C PPE, in addition to Level D PPE, involves the use of full-face and/or half-face Air-Purifying Respirators (APRs) that are equipped with cartridges of appropriate type for the airborne hazards and are National Institute for Occupational Safety and Health (NIOSH) approved.

Level C protection shall be used in the following situations:

- When there is a recognized need for protection against particulates, organic vapors, or other airborne contaminants during the course of the project
- During activities where product odors or exposure symptoms are noted

If, during the use of respiratory protection, any unusual odors or other evidence of elevated concentrations of chemicals in the workers' breathing zone is noted, work must be stopped, the workers must leave the work area, and the PM and CHSM must be contacted for instructions.

10.2.2 Cartridge Change-Out Schedule

The schedule for changing respirator cartridges can be updated by manufacturers at any time. Schedule information provided in this section must be verified before the project HASP is finalized.

Field personnel must understand the limitations of APRs and the End-of-Service Life cartridge change-out schedule for the particular type of respirator that will be used. Manufacturer's data have been evaluated for three types of respirators: Scott, MSA, and Survivair.

See Table 10-1 for an organic vapor (OV) cartridge change-out schedule for total hydrocarbons and benzene.

Table 10-1
Respirator Cartridge Change-Out Schedule

Total Hydrocarbons (Toluene, Ethylbenzene, Xylenes) Air Concentration (ppm)	Change-Out Schedule			
	SCOTT642 OV/Acid Gas642 OV642 MPC Cartridges	**MSA Ultra Twin GME Cartridge**	**Survivair OV Cartridge 100100**	**Survivair OV/Acid Gas Cartridge 100300/1053 (includes P-100)**
<150	8 hours	8 hours	8 hours	8 hours
>150 to 200	8 hours	8 hours	8 hours	8 hours
>200 to 250	8 hours	8 hours	8 hours	8 hours
>250	Stop Work	Stop Work	Stop Work	Stop Work
Benzene Air Concentration (ppm)	**SCOTT642 OV/Acid Gas642 OV642 MPC Cartridges**	**MSA Ultra Twin GME Cartridge**	**Survivair OV Cartridge 100100**	**Survivair OV/Acid Gas Cartridge 100300/1053 (includes P-100)**
<10	8 hours	8 hours	8 hours	8 hours
>10 to 100	8 hours	8 hours	8 hours	7 hours
>100 to 125	7 hours	7 hours	7 hours	6 hours
>125	Stop Work	Stop Work	Stop Work	Stop Work

10.2.3 Level B and A Protection Requirements

Protection requirements would be upgraded to Level B or Level A when the results of air monitoring reveal that action levels have been exceeded. **Anchor QEA employees are not permitted to work in atmospheres requiring Level B or Level A respiratory protection**.

10.2.4 Respirator Fit Testing

All Anchor QEA personnel who may be required to wear a negative-pressure APR when working must be fit-tested annually. Employees who wear a respirator for more than 30 days per year must be enrolled in a medical monitoring program, as detailed in Section 13 of this HASP.

Before their annual fit test, employees shall have the opportunity to handle the respirators and wear them in normal air for a familiarity period. Every time employees don a respirator for work, they shall perform positive and negative pressure tests to check the piece-to-face seal, as follows:

- **Positive Pressure Test:** With the exhaust port(s) blocked, the positive pressure of slight exhalation should remain consistent for several seconds.

- **Negative Pressure Test:** With the intake ports blocked, the negative pressure of slight inhalation should remain constant for several seconds.

An APR shall not be worn if conditions prevent it from sealing to the wearer's face, for example because of a beard or sideburns, a skull cap that projects under the face piece, or temple pieces on glasses. No employee may wear a beard if it interferes with the fit of the respirator. Also, the absence of one or both dentures can seriously affect the fit of a face piece, so dentures should be worn whenever the respirator is being used.

10.2.5 Respirator Cleaning, Maintenance, and Inspection

All respirators used on site must be cleaned and maintained in the following manner:

- Remove filters and cartridges.
- Visually inspect face piece and parts, and discard faulty items.
- Remove all elastic headbands.
- Remove the exhalation cover and inhalation valves.
- Wash, sanitize, and rinse the face piece. Wash any parts that were removed separately.
- Dry the mask. Wipe the face pieces and valves.
- Disassemble and clean the exhalation valve.
- Visually inspect the face piece and all parts for deterioration, distortion, or other faults that might affect the respirator's performance.
- Replace any questionable or faulty parts.
- Reassemble the mask and visually inspect completed assembly.
- Seal the mask in a plastic bag.

10.3 Evaluation of PPE

If modifications need to be made to the PPE that has been initially selected, the individuals who determine a change is needed shall vet the change with the FL, PM, and Health and Safety. Any changes shall be documented in a Modification to Health and Safety Plan form. See Section 1.2 for HASP modification procedures.

11 General Air Monitoring Requirements

11.1 General Requirements

Air monitoring shall be conducted when there is a possibility of hazardous atmospheres, chemical volatilization, or contaminated airborne dust (e.g., from intrusive activities involving contaminated soils or groundwater, developing new monitoring wells, working with wells known to contain COCs, entering confined spaces, or other activities).

Air movers or other engineering controls shall be used to exhaust or dilute solvent vapors coming from monitoring wells or hazardous atmospheres in confined spaces using respiratory protection devices.

Site-specific air monitoring action levels are provided in Section 5.2.

11.2 Real-Time Air Monitoring Equipment

OV concentrations shall be monitored in the field, as applicable, with either a photoionization detector (PID) or flame ionization detector (FID). Flammable vapors and gases are monitored with an oxygen/lower-explosive limit (O_2/LEL) real-time instrument. OV measurements are usually taken in the worker's breathing zone while O_2/LEL measurements are taken at the point of operation (e.g., monitoring well head or auger point).

Airborne dust or particulate concentrations shall be measured, as applicable, using a real-time aerosol monitor (using a scattered light photometric sensing cell) when potentially contaminated airborne dust is visible. Both area and personal air monitoring readings should be taken to characterize site activities.

Colorimetric detector tubes shall be used, as applicable, to monitor specific COCs such as benzene or vinyl chloride if they could potentially be present in elevated concentrations based upon the background of the project site, the Scope of Work, and conditions discovered at the site.

Other real-time air monitoring equipment, such as hydrogen cyanide meters, may be used depending upon the Scope of Work and COCs.

Air monitoring results shall be documented on the Daily Air Monitoring Record form (see Appendix A) or in the field logbook.

11.3 Equipment Calibration and Maintenance

Follow the manufacturer's specifications and document the calibration and maintenance of air monitoring equipment. Complete the recalibration and adjustment of air monitoring equipment as site conditions and equipment operation warrant. Record all air monitoring equipment calibration

and adjustment information on the Daily Air Monitoring Record form (see Appendix A) and in the field logbook.

11.4 Air Monitoring Action Levels

Air monitoring action levels stipulate the chemical concentrations in the breathing zone that require an upgrade in level of PPE. Air monitoring action levels are typically set at one-half of the OSHA PEL, NIOSH Recommended Exposure Limit (REL), or the American Conference of Governmental Industrial Hygienists (ACGIH) TLVs. The rationale for establishing action levels is based on the available data that characterize COCs in site media.

Air monitoring measurements shall generally be taken in the breathing zone of the worker most likely to have the highest exposure. Transient peaks will not automatically trigger action. Action will be taken when levels are consistently exceeded in a 2-minute period. Similarly, if chemical odors are bothersome or irritating, respiratory protection can be upgraded to provide an extra level of comfort or protection when conducting site activities.

11.5 Air Monitoring Frequency Guidelines

In general, conduct periodic air monitoring in the following situations:

- It is possible that an immediately dangerous to life or health condition or a flammable atmosphere has developed (e.g., confined space entry or intrusive activities).
  - Note that continuous air monitoring will be performed while personnel are in confined spaces.
- There is an indication that exposures may have risen over established action levels, PELs, or published exposure levels since the last monitoring. Look for a possible rise in exposures associated with the following situations:
  - Change in site area (e.g., work begins on a different section of the site)
  - Change in on-site activity (e.g., one operation ends and another begins)
  - Change in contaminants (e.g., handling contaminants other than those first identified)
  - Visible signs of particulate exposure from intrusive activities such as drilling, boring, or excavation
  - Perceptible chemical odors or symptoms of exposure
  - Handling leaking drums or containers
  - Working with obvious liquid contamination (e.g., a spill or lagoon)
  - When the possibility of volatilization exists (such as with a new monitoring well or a well containing known COCs)

12 Health and Safety Procedures and Practices

In addition to the task-specific JSAs listed in Section 6.1 and presented in Appendix B, this section lists the health and safety procedures and practices applicable to this project. For additional information, consult with the PM.

12.1 Physical Hazards and Controls

12.1.1 General Site Activities

Observe the following general procedures and practices to prevent physical hazards:

- Legible and understandable precautionary labels shall be affixed prominently to containers of potentially contaminated soil, sediment, water, and clothing.
- No food or beverages shall be present or consumed in areas that have the potential to contain COCs and/or contaminated materials or equipment.
- No tobacco products or cosmetics shall be present or used in areas that have the potential to contain COCs and/or contaminated materials or equipment.
- No horseplay shall occur on the site.
- When lifting, personnel should first assess the load to make sure that it is not too heavy to lift. If it is too heavy, get help or use a lifting tool or equipment. When lifting, keep the load as close as possible to the body, bend at the knees, and lift with the legs and not the back.
- When using a knife or other sharp tool, cut away from the body and use appropriate cut-resistant gloves. Use a safety box cutter to open boxes.
- An emergency eyewash unit shall be located immediately adjacent to employees who handle hazardous or corrosive materials, including decontamination fluids. All operations with the potential for eye injury or splash must have approved eyewash units locally available that are capable of delivering at least 0.4 gallon per minute for at least 15 minutes.
- Personnel working within 10 feet of bodies of water shall wear USCG-approved PFDs.
- Certain project sites may have newly finished work (e.g., concrete, paving, framing, habitat reconstruction, or sediment caps) that may be damaged by unnecessary contact, or that could cause dangerous conditions for personnel (e.g., slipping, sinking, or tripping). Personnel working in or around these areas shall communicate with the PM, FL, and client contact as needed to prevent damaging new work or entering dangerous conditions.
- Generally, all on-site activities will be conducted during daylight hours. If work after dusk is planned or becomes necessary due to an emergency, adequate lighting must be provided.
- Hazardous work, such as handling hazardous materials and heavy loads and operating equipment, should not be conducted during severe storms.
- All temporary electrical power must have a ground-fault circuit interrupter (GFCI) as part of its circuit if the circuit is not part of permanent wiring. Temporary GFCIs shall be placed on the

plug end of cords and plugged directly into the outlet. All equipment must be suitable and approved for the class of hazard present.

- Generators must be used in dry, well-ventilated areas. Hearing protection must be used in accordance with Section 12.1.15.
- Gasoline and diesel equipment must be shut down and allowed to cool before refueling.

12.1.2 Slips, Trips, and Falls

Observe the following procedures and practices to prevent slips, trips, and falls:

- Inspect each work area for potential slip, trip, and fall hazards before each work task.
- Communicate any identified slip, trip, and fall hazards to all personnel. Identified hazards shall be corrected or labeled with warning signs or barricades so they can be avoided.
- All personnel must be aware of their surroundings and maintain constant communication with each other at all times.

12.1.3 Ergonomic Considerations

Workers performing certain field tasks may need to remain in fixed positions (e.g., observing subcontractor work) or repeat the same motions over a period of time (e.g., sediment sample processing). It is important that workers self-monitor for ergonomic fatigue (e.g., soreness, tightness, stiffness, or pain in muscles) and adjust work tasks, body positions, or work areas to minimize ergonomic stressors.

Observe the following suggestions for minimizing ergonomic stress:

- Limit fixed positions. Periodically vary standing and sitting positions, take frequent short walks, and modify observation locations when possible.
- Minimize extreme postures. Conduct work tasks using comfortable postures (particularly if the tasks are repetitive), and use tools or structures to minimize the need to hold or work with materials or access the work area.
- Limit contact stress. Be aware of soft tissue resting on hard surfaces, and limit these occurrences (e.g., use comfortable footwear, and use tools to hold materials).
- Contact the Field Services Group in advance for prolonged field efforts that involve a field trailer. This group can set up field staff with a monitor, mouse, and keyboard so they are not working solely on laptops.
- Take breaks from work tasks, particularly repetitive ones.
- Consider performing stretching exercises before and during work activities if those tasks are anticipated to be long or strenuous.

12.1.4 Corrosive Material Handling Procedures

Corrosive materials include acids and bases, which are extremely corrosive and have a variety of uses. Acids include hydrochloric, nitric, and sulfuric acids. Bases include sodium hydroxide.

Observe the following procedures when working with corrosive materials:

- Wear gloves rated for the corrosive material and eye-splash protection while using acid dispensed from a small dropper bottle during water sampling.
- Wear a full-face APR equipped with combination cartridges (organic vapor/acid gas) as well as Tyvek coveralls and nitrile gloves for large volume applications.
- Have an eyewash bottle and/or portable eyewash station on site.
- Do not add anything into a virgin chemical drum, including unused product.
- Avoid mixing strong acids and bases. Consult a CHSM for task-specific evaluation. If mixing is absolutely necessary, do it slowly. Avoid vapors or fumes that are generated.
- When diluting acids and bases, add the acid or base to water in small quantities and mix cautiously.

12.1.5 Underground or Overhead Utility Line Contact Prevention

Observe the following underground/overhead utility line contact prevention procedures and practices:

- Before conducting work, the PM or FL shall verify that all existing underground or overhead utilities in the work area are located per the state or local mark-out methods and subcontract. Document the utility mark-out using the Utility Contact Prevention Checklist form (see Appendix A). No excavation work is to be performed until all utility mark-outs are verified.
- The PM or FL shall conduct a site survey to search for signs of other buried or overhead utilities. Document the site survey results on the Utility Contact Prevention Checklist form.
- The property owner or facility operator shall be consulted on the issue of underground utilities. As-built drawings shall be reviewed, when available, to verify that underground utility locations are consistent with the utility location mark-outs. All knowledge of past and present utilities must be evaluated before conducting work.
- If on-site subsurface utility locations are in question, a private locating service shall be contacted to verify locations. If the investigation calls for boreholes in an area not covered by the municipal One-Call system, then a private utility locate firm shall be contacted to determine the location of other underground utilities.
- The PM shall have documented verbal contact and an agreement with the fiber optic company for all work within 50 feet of any fiber optic cables.
- **Only non-destructive excavation, such as hand digging or hydro excavation, is permitted within 3 feet of underground high voltage, product, or gas lines.** Once the line is exposed, heavy equipment can be used but must remain at least 3 feet from the exposed line.

- Elevated superstructures (e.g., drill rig, backhoe, scaffolding, ladders, and cranes) shall remain a distance of 10 feet away from utility lines and 20 feet away from power lines. The FL may adjust the distance from utility lines depending on the actual voltage of the lines.
- Overhead utility locations shall be marked with warning tape or flags where equipment has the potential for contacting overhead utilities.

Table 12-1 shows the minimum clearances required for energized overhead electrical lines.

Table 12-1
Overhead Utility Clearance Requirements

Nominal System Voltage	Minimum Required Clearance from Energized Overhead Electric Lines
0 to 50 kV	10 feet
51 to 200 kV	15 feet
201 to 350 kV	20 feet
351 to 500 kV	25 feet
501 to 750 kV	35 feet
751 to 1,000 kV	45 feet
More than 1,000 kV	As established by the utility owner/operator or registered Professional Engineer who is a qualified person with respect to electrical power transmission and distribution

Notes:
Whenever equipment operations must be performed closer than 20 feet from overhead power lines, the FL must be notified. When clearance to proceed is received from the FL, the electric utility company must be contacted to turn the power off or physically insulate (protect) the lines if the operation must be performed closer to the power line than is allowed in this table. This information is in accordance with 29 CFR 1926.1408 Table A.

12.1.6 Electric Safety

Observe the following procedures and practices to prevent electric shock:

- General
  - Only appropriately trained and certified electricians will perform tasks related to electrical equipment. A good rule of thumb is to defer any task that would not normally and reasonably be completed by the average public consumer.
  - Each circuit encountered will be considered live until proven otherwise.
  - Only proper tools will be used to test circuits.
  - No wire will be touched until the circuit is determined to be de-energized.
- Extension Cords
  - All extension cords used on any project will be three-pronged.
  - All extension cords will be in good working order.

  - Each extension cord ground will be tested for continuity on at least a quarterly basis and marked to indicate when the inspection occurred.
  - Each extension cord will be visually inspected before each use.
  - If any extension cord is found in disrepair or fails the continuity test, it will be taken out of service.
  - Any extension cord that does not have the grounding pin will be taken out of service and not used.
  - Extension cords will not be used in place of fixed wiring.
  - Extension cords will not be run through holes in walls, ceilings, or floors.
  - Extension cords will not be attached to the surface of any building.
  - No extension cord will be of the "flat wire" type. Every extension cord will have each individual wire insulated and further protected by an outside cover.
  - Extension cords will be located out of traffic areas or, if this is unavoidable, use barricades and tape the cords down to protect workers from tripping over them.
  - Extension cords or powered equipment will not be staged in wet areas, to the degree possible. Elevate cords, connections, and equipment out of puddles.
- Power Tools/Plug and Cord Sets
  - Any cord that is cut in a way that exposes insulation will be removed from service.
  - All tools and plug and cord sets will be tested for continuity.
  - If grounding pins are missing, the plug and cord will be removed from service.
  - Any tool or plug and cord set failing the continuity test will be removed from service.
  - All power tools will have three-pronged plugs unless double insulated.
- Ground-Fault Circuit Interrupters
  - Each 120-volt electrical wall receptacle providing power to the job site will be protected by a portable GFCI.
  - Each GFCI will be tested quarterly and marked to indicate when the inspection occurred.
  - Each 120-volt, single-phase, 15- and 20-ampere receptacle outlet, including those on generators, will have an approved GFCI.
  - GFCIs will be located in line as close to the plug as possible (opposite end from the piece of equipment).
- Specific
  - If unsure if a task requires specific electrical training, err on the side of caution and contact the PM and FL before proceeding.
  - If subsurface work is to be performed, follow the guidelines in Section 12.1.5 and conduct utility locating before beginning work and in accordance with local ordinances.
  - If lock out/tag out (LO/TO) procedures are required (i.e., de-energizing machinery or equipment so work may be performed), the equipment owner must provide LO/TO procedures and training. By default, the equipment owner should perform any LO/TO. If

it becomes necessary for Anchor QEA personnel to perform LO/TO tasks, contact the PM and FL who will coordinate with a CHSM before doing so.
- Maintain appropriate distance from overhead utilities (see Table 12-1).
- If unexpected electrical equipment is encountered (i.e., buried wire), assume it is live, stop work, and contact the PM and FL immediately.
- If working in enclosed or restricted areas where electrical hazards may be present, contact a licensed electrician or other suitably trained party to provide barriers, shields, or insulating materials to prevent electric shock.
- If working in areas where electrical hazards are present, verify that conductive clothing and jewelry is replaced with non-conductive clothing, or removed.

12.1.7 Use of Hand-Held X-Ray Fluorescence Spectrometers

Some field tasks, such as testing site materials like soils, may require the use of hand-held XRF spectrometers. Portable XRF units—which emit X-rays (ionizing radiation) during usage—use either a sealed radioactive source or a battery-powered X-ray generator and are available for rent or purchase from a variety of retail vendors.

Ionizing radiation is a health and safety concern due to its potential to alter the chemical structure of living cells. These changes can alter or impair the normal functions of a cell, and exposure to sufficient amounts of ionizing radiation can cause hair loss, blood changes, and varying degrees of illness. The level of ionizing radiation required to cause these changes is orders of magnitude higher than PELs. Nevertheless, the following specific training and safety procedures are required before employees use a hand-held XRF unit.

Training: Before using any portable XRF unit, personnel must complete the appropriate radiation safety training for the instrument being used and be approved by Health and Safety.

Registration:

- Contact the state where the unit will be used for proper registration.
- Follow state-specific requirements for the use of the device and personal monitoring.
- Coordinate registration with the Corporate Radiation Safety Officer.

Proper Usage:

- Never point the XRF unit at another person or body part, regardless of whether the unit is energized or de-energized.
- Never point the XRF unit into the air to perform a test. Never analyze any material that is being held in a person's hand.
- Hold instruments only by the handle. Never attempt to service the XRF unit or open or remove any covers on the instrument.

Establishing Controlled Areas:

- Restrict access to XRF unit storage and use locations where potential exposure to ionizing radiation is limited.
- In use, the target should not be hand-held, and the area at least three paces beyond the target should be unoccupied.

Specific Controls:

- XRF units should be stored in a locked case, locked cabinet, or otherwise restricted access area when not in use.
- When in use, XRF units must remain in direct control of a trained and certified operator.

Time, Distance, and Shielding Policies:

- Operators should minimize time around the energized XRF unit, maximize the distance from the instrument window, and shoot into high-density materials whenever possible.
- Under no circumstances should the operator point the XRF unit at themselves or others.

Preventing Exposure to Ionizing Radiation:

- All reasonable measures including labeling; operator training and certification; and the concepts of time, distance, and shielding should be implemented to limit radiation exposure to as low as reasonably achievable.

12.1.8 General Falls

Observe the following general falls procedures and practices:

- Assess work areas for fall hazards. A fall protection system that meets OSHA and ANSI Z3591 standards must be used if work is conducted 4 feet or more above the surface.
- Do not carry any object or load that could cause a loss of balance or a fall.

12.1.9 Heavy Equipment Operations

Observe the following heavy equipment operations procedures and practices:

- Wear leather gloves while attaching support members to protect against pinching injuries.
- While working from elevated levels greater than 6 feet, verify that all employees have fall protection that meets OSHA and ANSI Z3591 standards, the equipment has an annual inspection by a Competent Person, and the employees have received annual training.
- Do not stand under loads that are being raised or lowered with cranes or aerial lifts.
- The subcontractor or Anchor QEA equipment operator must conduct pre-operational inspections of all equipment. In addition, daily inspections will be conducted on the equipment before site activities.

- Maintain the appropriate distance from overhead utilities (see Table 12-1).
- Always stay out of the swing radius of all heavy equipment. Always use a spotter during movement of equipment. The spotter and others, as appropriate, shall maintain constant communication with the operator.
- All operators must have adequate training and be qualified to operate the particular heavy equipment unit.
- Conduct a site evaluation to determine proper positioning for the unit. Make sure the surface is level. Cordon off holes, drop-offs, bumps, or weak ground surfaces.
- When using a crane, do not use hands when the load is being lifted or lowered. Use non-conductive tag line to help direct and position the load.
- Never climb a raised platform or stand on the mid-rail or top-rail.
- Tools should always be hung or put into a belt whenever possible.

12.1.10 Drilling with Direct Push Technology

General rules associated with direct-push technology (DPT) intrusive activities are as follows:

- Maintain all equipment in a safe condition.
- Keep all guards in place during use.
- Before DPT sampling is started, verify that everyone who operates the rig has had adequate training and is thoroughly familiar with the DPT rig and its controls, capabilities, and operating manual.
- Set up equipment on stable and level terrain.
- Outriggers must be extended per the manufacturer's specifications.
- Do not place outriggers on underground structures such as vaults, manholes, stormwater inlets, catch basins, or well boxes.
- Use proper dunnage, cribbage, plates, or wooden blocks between outriggers and supporting surfaces.
- The driller and helper must be present during all active operations and **test the two kill switches during each startup**.
- The DPT rig helper and other site personnel must know the location of the two emergency shutoff switches.
- Cordon off or barricade the area around the drilling operation.
- When hazardous conditions are deemed present, shut down the operation.
- Do not wear loose clothing, free long hair, jewelry, or equipment that might become caught in moving machinery. Secure PPE close to the body to avoid getting caught in moving parts.
- Keep unauthorized personnel clear of the DPT rig.
- Shut down, lock, and tag out the DPT rig to make repairs or adjustments or to lubricate fittings. Release all pressure on the hydraulic systems, the drilling fluid system, and the air pressure systems of the drill rig before performing maintenance.

- Identify and understand parts of the equipment that may cause crushing, pinching, rotating, or similar injuries.
- Neatly stack pipe, rods, or similar on racks or sills to prevent spreading, rolling, or sliding.
- Wear proper work gloves when moving or handling large or heavy objects to prevent pinching or other injuries.
- Establish a system of responsibility for the operator and helpers to follow during the series of various activities, such as connecting and disconnecting sections and inserting and removing the sections.
- Never reach behind or around rotating equipment for any reason.
- Clean equipment only when the DPT rig is in neutral and the equipment has stopped.
- Do not place hands, feet, and/or limbs into or through openings of equipment frames or structures that were not intended to be used in such a fashion.

12.1.11 Hand and Power Tools

Observe the following procedures and practices when working with hand and power tools:

- Keep hand tools sharp, clean, oiled, dressed, and not abused.
- Worn tools are dangerous. For example, the "teeth" in a pipe wrench can slip if worn smooth, an adjustable wrench will slip if the jaws are sprung, and hammerheads can fly off loose handles.
- Tools subject to impact (e.g., chisels, star drills, and caulking irons) tend to "mushroom." Keep them dressed to avoid flying spalls, and use tool holders.
- Do not force tools beyond their capacity.
- Flying objects can result from operating almost any power tool, so always warn people in the vicinity and use proper eye protection.
- Each power tool should be examined before use for damaged parts, loose fittings, and frayed or cut electric cords. Tag and return defective tools for repairs. Verify that there is adequate lighting, inspect tools for proper lubrication, and relocate tools or material that could "vibrate into trouble."
- Compressed air must be shut off or the electric cord unplugged before making tool adjustments. Air must be "bled down" before replacement or disconnection.
- Proper guards or shields must be installed on all power tools before issue. Do not use improper tools or tools without guards in place.
- Replace all guards before startup. Remove cranks, keys, or wrenches used in service work.

12.1.12 Motor Vehicle Operation

All drivers are required to have a valid driver's license, and all vehicles must have appropriate state vehicle registration and inspection stickers. **Anchor QEA prohibits the use of hand-held wireless devices while driving any vehicle for business use at any time, for personal use during business**

hours, and as defined by law. Additionally, site-specific motor vehicle requirements must be followed, if any.

When driving to, from, and within the job site, be aware of potential hazards including:

- Vehicle accidents
- Distractions
- Fatigue
- Weather and road conditions

To mitigate these hazards, observe the following procedures and practices regarding motor vehicle operation:

- Before leaving, inspect fuel and fluid levels and air pressure in tires, and adjust mirrors and seat positions appropriately.
- Wear a seat belt at all times and make sure that clothing will not interfere with driving.
- Plan your travel route and check maps for directions or discuss with colleagues.
- Clean windows and mirrors as needed throughout the trip.
- Wear sunglasses as needed.
- Fill up when the fuel level is low (not near empty).
- Follow a vehicle maintenance schedule to reduce the possibility of a breakdown while driving.
- Stop driving the vehicle, regardless of the speed (e.g., even 5 miles per hour) or location (e.g., a private road), when the potential of being distracted by conversation exists.
- Using hand-held communication devices (e.g., mobile phones) while operating any motor vehicle is prohibited.
- Get adequate rest before driving.
- Periodically change your seat position, stretch, open the window, or turn on the radio to stay alert.
- Pull over and rest if you are experiencing drowsiness.
- Check road and weather conditions before driving.
- Be prepared to adjust your driving plans if conditions change.
- Travel in daylight hours, if possible.
- Give yourself plenty of time to allow for slowdowns due to construction, accidents, or other unforeseen circumstances.
- Use lights at night and lights and wipers during inclement weather.

12.1.13 Vehicular Traffic

Observe the following procedures and practices regarding vehicular traffic:

- Wear a high-visibility traffic safety vest when vehicle hazards exist.
- Use cones, flags, barricades, and caution tape to define the work area.

- Use a vehicle to block the work area (if conditions allow).
- Engage a police detail for high-traffic situations.
- Always use a spotter in tight or congested areas for material deliveries.
- As necessary, develop traffic control plans and train personnel as flaggers in accordance with the U.S. Department of Transportation Manual of Uniform Traffic Control Devices and/or local requirements.

12.1.14 Working Near Railways

When working near railways or in rail yards, observe the following procedures and practices:

- Plan work activities well ahead of time, including coordination with the railway owner(s) and operator(s).
- Always assume work near railways requires a permit from the railway owner/operator.
- Maintain emergency rail yard and railway owner/operator contact information at the field location.
- Become cognizant of train signals such as horns and lights, in order to understand potential train activity.
- Follow all railway owner/operator required procedures.
- Plan work activities to minimize time spent adjacent to tracks.
- Expect movement from on-track equipment at any time.
- Before approaching a track, look in both directions. Make sure it's safe to get on or cross the track.
- Never cross a track in front of oncoming traffic.
- When on-track equipment is approaching, stay at least 30 feet from the track while the equipment is passing.
- Watch for protruding structures on passing equipment as well as other hazards.
- Do not stage or store equipment unattended within 30 feet of tracks.
- When rail traffic is approaching, move away from the track, and warn your coworkers of approaching rail traffic.
- Never sit, walk, step, stand, or lie down on rails, including other track components such as switch points, frogs, guard rails, derails, and wheel stops.
- Do not lean on, climb on, or go under any on-track equipment unless your job requires it, in which case do so only after all required safety procedures have been put in place.
- Do not walk between on-track equipment unless they are separated by at least 50 feet.
- Keep at least 30 feet from the end of standing trains, cars, or locomotives. This will allow you time to react safely to any movement of the equipment.
- Avoid being trapped between on-track equipment passing on adjacent tracks.

12.1.14.1 Rescue and Emergency Services

The company recommends the use of non-company rescue services whenever possible. In certain instances, such as unavailability of a qualified outside provider, company employees can participate in rescues if they have been provided the required equipment and training.

12.1.14.1.1 Outside Rescue Services

Before designating a non-company rescue service, an evaluation of their capabilities must be conducted. This documented evaluation can be conducted by an entry supervisor or a Health and Safety representative. The rescue service must be certified by the evaluator as capable of performing rescues before being identified as the rescue service provider.

Each selected rescue service will be informed of the hazards they may encounter at the location. They will also be provided access to all PRCSs from which a rescue may be necessary.

12.1.14.1.2 Company Rescue Services

Company personnel assigned to provide emergency entry and rescue services will be trained annually in the proper use of PPE and rescue equipment. Such training will include a simulated rescue exercise.

Company rescue services will be evaluated and certified by the evaluator as capable of performing rescues before being identified as the rescue service provider.

12.1.14.2 Employee Access to Documentation

Each employee participating in a PRCS entry, or that employee's authorized representative, will be provided an opportunity to observe all testing and be provided a copy of the testing results. Each employee, or that employee's authorized representative, may also request the company to re-evaluate the PRCS because the employee or representative has reason to believe that the evaluation of the space may not have been adequate.

12.1.14.3 Retention of Inspection and Test Logs

A copy of all entry permits and other documents related directly to the PRCS entry (e.g., hot work permits, air monitoring records) will be maintained in project files. If requested, these documents will also be made available to all employees participating in a PRCS entry, or to their authorized representatives. Any air monitoring records must be maintained for the length of employment plus 30 years for all employees participating in the entry.

12.1.14.4 Program Review

The Health and Safety representative responsible for each location performing PRCS operations will review all entry permits for incidents or problems occurring during entry annually. Incidents or

problems may include injuries, accidents, unauthorized entries, or any other event that indicates that improvements can be made in the PRCS program.

12.1.15 Noise

Excessive noise is hazardous not only because of its potential to damage hearing, but also because of its potential to disrupt communications and instructions. The following procedures and practices shall be followed to prevent noise-related hazards:

- All employees will have access to hearing protection with a Noise Reduction Rating of not less than 30.
- Hearing protection must be worn in any environment where site personnel must raise their voices to be heard while standing at a distance of 3 feet or less. However, the preferred method is a calibrated sound level meter for determining the sound level.
- Hearing protection must be worn by any personnel observing or operating concrete cutting or sawing equipment, pile driving, or other loud noise-generating activities.

Hearing protection is required for site personnel operating or working near noisy equipment or operations, where the noise level is greater than 85 A-weighted decibels (dBA) (time-weighted average [TWA]), as well as personnel working around heavy equipment. The FL will determine the need and appropriate testing procedures, (i.e., sound level meter and/or dosimeter) for noise measurement.

When needed, a calibrated sound level meter will be used to measure noise levels at selected locations in the work area and on the site perimeter. When used, noise monitoring equipment must be calibrated before and after each shift.

If continuous noise levels are found to exceed 85 dBA at any location within the work area, warning signs will be posted. Site personnel and visitors will be notified that hearing protection is required. Appropriate hearing protection (i.e., ear plugs or ear muffs) will be worn whenever personnel or visitors are working in that location. A supply of ear plugs will be maintained on site.

Action levels in Table 12-2 will trigger the use of appropriate hearing protection (plugs or muffs). Hearing protection must be able to attenuate noise below 90 dBA (8-hour TWA). Each hearing protection device has a Noise Reduction Rating (NRR) assigned by EPA. The calculation for a hearing protection device’s effectiveness is as follows:

Equation 1

Noise reading $dBA - (NNR - 7dB) < 90dBA$

where:

dB	=	decibel
dBA	=	A-weighted decibel
NRR	=	Noise Reduction Rating

Table 12-2
Noise Exposure Action Levels

Instrument	Measurement	Action
Type I or Type II Sound Level Meter or Dosimeter	>80 dBA to 85 dBA	Hearing protection recommended. Limit work duration to 8-hour shifts.
	>85 dBA to 90 dBA	Hearing protection required. Limit work duration to 8-hour shifts.
	>90 dBA to 115 dBA	Hearing protection required. Investigate use of engineering controls. Limit work duration to 8-hour shifts.
	>115 dBA	Stop work. Consult a CHSM.

12.1.16 Lifting and Material Handling

Observe the following procedures and practices for lifting and material handling:

- Use leather gloves when handling metal, wire rope, sharp debris, or transporting materials (e.g., wood, piping, or drums).
- The size, shape, and weight of the object to be lifted must first be considered. No individual employee is permitted to lift any object that weighs more than 60 pounds. Multiple employees or mechanical lifting devices are required for objects heavier than the 60-pound limit.
- Plan a lift before doing it. Bend at the knees and lift with the legs; maintain the natural curves of the back; do not use back muscles.
- Check the planned route for clearance.
- Use the buddy system when lifting heavy or awkward objects.
- Do not twist your body while lifting.
- Know the capacity of any handling device (e.g., crane, forklift, chain fall, or come-along) that you intend to use.
- Use tag lines to control loads.
- Verify that your body, material, tools, and equipment are safe from such unexpected movement as falling, slipping, rolling, tripping, bowing, or any other uncontrolled motion.

- Trucks (i.e., flat beds) hauling equipment or materials must not be moved once rigging has been released.
- Chock all material and equipment (such as pipe, drums, tanks, reels, trailers, and wagons) as necessary to prevent rolling.
- Tie down all light, large-surface-area material that might be moved by the wind.
- When working at heights, secure tools, equipment, and wrenches against falling.
- Do not store materials or tools on ducts, lighting fixtures, beam flanges, hung ceilings, or similar elevated locations.
- Fuel-powered tools used inside buildings or enclosures shall be vented and checked for excessive noise.

12.1.17 Fire Control

Observe the following fire control procedures and practices:

- Smoke only in designated areas.
- Keep flammable liquids in closed containers.
- Keep the work site clean; avoid accumulating combustible debris such as paper.
- Obtain and follow property owner hot work safety procedures when welding or performing other activities requiring an open flame.
- Isolate flammable and combustible materials from ignition sources.
- Verify fire safety integrity of equipment installations according to National Electrical Code specifications.

12.1.18 Cleaning Equipment

Observe the following procedures and practices when cleaning equipment:

- Wear appropriate PPE to avoid skin and eye contact with isopropyl alcohol, Alconox®, or other cleaning materials.
- Stand upwind to minimize any potential inhalation exposure.
- Dispose of spent cleaning solutions and rinses accordingly.

12.2 Environmental Hazards and Controls

12.2.1 Fatigue Management

Because Anchor QEA personnel may be working during both daytime and nighttime hours several days per week, depending on the activity, it is important that all personnel are aware of the hazards related to fatigue. Fatigue can be defined as an increasing difficulty in performing physical or mental activities. Signs of fatigue may include tiredness, changes in behavior, loss of energy, and reduced ability to concentrate. Fatigued site personnel may have a reduced ability to recognize or avoid risks

on the work site, which may lead to an increase in the number and severity of injuries and other incidents. Fatigue can occur at any time when working and may cause safety concerns due to decreased manual dexterity, reaction time, and alertness.

Fatigue results from insufficient rest and sleep between activities. Contributing factors to fatigue may include the following:

- The time of day that work takes place
- The length of time spent at work and in work-related duties
- The type and duration of a work task and the environment (e.g., weather conditions and ambient noise) in which it is performed
- The quantity and quality of rest obtained before, during, and after a work period
- Non-work activities
- Individual factors such as sleeping disorders, medications, or emotional state

Personnel suffering from fatigue may exhibit both physical and mental effects, such as the following:

- Slower movements
- Poor coordination
- Slower response time to interaction
- Bloodshot eyes
- Slumped or weary appearance
- Nodding off
- Distractedness or poor concentration
- Inability to complete tasks
- Fixed gaze
- Appearing depressed, irritable, frustrated, or disinterested

Employees are strongly encouraged to get sufficient pre-work rest, maintain sufficient nutritional intake during work (i.e., eat and drink at regular intervals), and communicate with team members and leaders if their level of fatigue elevates.

Use the following procedures to help detect and address fatigue-related issues:

- Periodically observe and query coworkers for signs or symptoms of fatigue.
- Site personnel that express concern over their level of fatigue, or that are observed to be fatigued such that elevated worker risk is evident, will be relieved or have their work tasks adjusted so that they may rest sufficiently.
- Work schedules will consider fatigue factors and optimize continuous periods available for uninterrupted sleep. The employee is responsible for reporting to work properly rested and fit for duty. In case of an emergency or operational difficulties (e.g., limited access due to water levels or boat repairs), work hours may require adjustment.

- Maintain a routine exercise program and regular sleep schedule as much as possible over the course of the work.
- Avoid heavy meals or caffeine and minimize or eliminate the consumption of alcohol and nicotine before sleeping.

12.2.2 Heat Stress

Heat-related illnesses can happen if workplace activities in a hot environment overwhelm the body's ability to cool itself. Observe the following general procedures and practices regarding heat stress:

- Increase the number of rest breaks and/or rotate site personnel in shorter work shifts.
- Watch for signs and symptoms of heat stress and fatigue (see Section 12.2.2.1).
- During hot months, plan work for early morning or evening.
- Use ice vests when necessary.
- Rest in cool, dry areas.
- Verify that employees have access to potable drinking water and shade.
- During conditions exceeding 95°F, verify that the following additional procedures are adhered to:
  - Establish effective communication by voice, observation, or electronic means.
  - Observe employees for alertness and signs or symptoms of heat illness.
  - Designate one or more employees on each work site as authorized to call for Emergency Medical Services.
  - Remind employees to drink water throughout the shift.
  - Conduct pre-shift meetings before beginning work to review the high heat procedures, encourage drinking water, and remind employees of their right to take a cool-down rest when necessary.

12.2.2.1 Signs, Symptoms, and Treatment

The FL will be trained in heat stress prevention, including the following, before supervising employees:

- Procedures to prevent heat illness.
- Procedures to follow when an employee exhibits symptoms consistent with possible heat illness, including emergency response procedures.

In addition, employees should be regularly trained on heat exposure, as outlined in the Heat and Cold Exposure Program (Appendix E). The information provided below addresses these training requirements.

Adverse climatic conditions are important considerations in planning and conducting site operations. High ambient temperature can result in health effects ranging from transient heat fatigue, physical discomfort, reduced efficiency, personal illness, and increased accident probability to serious illness or death. Heat stress is of particular concern when chemical protective garments are worn because

they prevent evaporative body cooling. Wearing PPE places employees at considerable risk of developing heat stress.

Heat stress is caused by a number of interacting factors, including environmental conditions, clothing, workload, and the individual characteristics of the worker. Because heat stress is probably one of the most common (and potentially serious) illnesses, regular monitoring and other preventive precautions are vital.

Heat Rash. Heat rash can be caused by continuous exposure to hot and humid air and skin abrasion from sweat-soaked clothing, rubber boots, or impermeable waders. The condition is characterized by a localized red skin rash and reduced sweating. Heat rash reduces the ability to tolerate heat. To treat, keep skin hygienically clean and allow it to dry thoroughly after using chemical protective clothing. Take measures to prevent heat rash by changing clothes often to maximize use of dry garments, or taking frequent breaks to allow doffing of equipment and drying of skin.

Heat Cramps. Heat cramps are caused by profuse perspiration with inadequate electrolytic fluid replacement. This often robs the larger muscle groups (stomach and quadriceps) of blood, which can cause painful muscle spasms and pain in the extremities and abdomen. To treat, move the employee to a cool place and give sips of water or an electrolytic drink. Watch for signs of heat exhaustion or heat stroke.

Heat Exhaustion. Heat exhaustion is a mild form of shock caused by increased stress on various organs to meet increased demand to cool the body. Onset is gradual and symptoms should subside within 1 hour. Symptoms include a weak pulse; shallow breathing; pale, cool, moist skin; profuse sweating; dizziness; and fatigue. To treat, move the employee to a cool place and remove as much clothing as possible. Give sips of water or electrolytic solution and fan the person continuously to remove heat by convection. Do not allow the affected person to become chilled. Treat for shock if necessary.

Heat Stroke. Heat stroke is the most severe form of heat stress; the body must be cooled immediately to prevent severe injury and/or death. ***This is a medical emergency!*** Symptoms include red, hot, dry skin; a body temperature of 105°F or higher; no perspiration; nausea; dizziness and confusion; and a strong, rapid pulse. Because heat stroke is a true medical emergency, the individual should be transported to a medical facility immediately. Call for Emergency Medical Services. Before transport, remove as much clothing as possible and wrap the individual in a sheet soaked with water. Fan the individual vigorously while transporting to help reduce body temperature. If available, apply cold packs under the arms, around the neck, or any other place where they can cool large surface blood vessels. If transportation to a medical facility is delayed, reduce body temperature by immersing the individual in a cool-water bath (however, be careful not to over-chill the individual

once body temperature is reduced below 102°F). If this is not possible, keep the individual wrapped in a sheet and continuously douse with water and fan.

12.2.2.2 Prevention

The implementation of preventive measures is the most effective way to limit the effects of heat-related illnesses. During periods of high heat, adequate liquids must be provided to replace lost body fluids. Replacement fluids can be a commercial mix such as Gatorade or fresh water. The replacement fluid should be kept cool, 50°F to 60°F, and it should be placed close to the work area. Employees must be encouraged to drink more than the amount required to satisfy thirst.

Cooling devices such as vortex tubes or cooling vests can be worn beneath impermeable clothing. If cooling devices are worn, only physiological monitoring will be used to determine work activity.

All site personnel are to rest when any symptoms of heat stress are noticed. Rest breaks are to be taken in a cool, shaded rest area. Employees shall remove chemical protective garments during rest periods and will not be assigned other tasks.

All employees shall be informed of the importance of adequate rest and proper diet, including the harmful effects of excessive alcohol and caffeine consumption.

12.2.2.3 Monitoring

Heat stress monitoring should be performed when employees are working in environments exceeding 90°F ambient air temperature. If employees are wearing impermeable clothing, this monitoring should begin at 77°F. There are two general types of monitoring that the Health and Safety representative can designate to be used: wet bulb globe temperature (WBGT), and physiological. The Heat Stress Monitoring Record form (see Appendix A) will be used to record the results of heat stress monitoring.

Note that some states such as Washington and California have specific regulatory standards for protection of employees from heat stress-related injuries.

Wet Bulb Globe Temperature (WBGT). The WBGT index is the simplest and most suitable technique to measure the environmental factors that most nearly correlate with core body temperature and other physiological responses to heat. When WBGT exceeds 25°C (77°F), the work regimen in Table 12-3 should be followed.

Table 12-3
Permissible Heat Exposure Threshold Limit Values

Work/Rest Regimen	Workload		
	Light	Moderate	Heavy
Continuous work	86°F (30.0°C)	80°F (26.7°C)	77°F (25.0°C)
75% work and 25% rest each hour	87°F (30.6°C)	82°F (28.0°C)	78°F (25.9°C)
50% work and 50% rest each hour	89°F (31.4°C)	85°F (29.4°C)	82°F (27.9°C)
25% work and 75% rest each hour	90°F (32.2°C)	88°F (31.1°C)	86°F (30.0°C)
These TLVs assume that nearly all acclimated, fully-clothed site personnel with adequate water and salt intake should be able to function effectively under the given working conditions without exceeding a deep body temperature of 100.4°F (38°C).			

(From OSHA Technical Manual, Section III: Chapter 4 - Heat Stress)

The TLVs denoted in Table 12-3 apply to physically fit and acclimatized individuals wearing light, summer clothing. If heavier clothing that impedes sweat or has a higher insulation value is required, the permissible heat exposure TLVs should be adjusted based on the WBGT Correction Factors in Table 12-4.

Table 12-4
Wet Bulb Globe Temperature Correction Factors

Clothing Type	WBGT Correction
Summer lightweight working clothing	0°F (0°C)
Cotton coveralls	-3.6°F (-2°C)
Winter work clothing	-7.2°F (-4°C)
Water barrier, permeable	-10.8°F (-6°C)
Fully encapsulating	-14.4°F (-10°C)

Physiological. Physiological monitoring can be used in lieu of, or in addition to, WBGT. This monitoring can be self-performed once the Health and Safety representative demonstrates appropriate techniques to affected employees. Because individuals vary in their susceptibility to heat, this type of monitoring has its advantages. The following two parameters are to be monitored at the beginning of each rest period:

- **Heart Rate:** The maximum heart rate (MHR) is the amount of work (beats) per minute a healthy person's heart can be expected to safely deliver. Each individual will count their radial (wrist) pulse for 1 minute as early as possible during each rest period. If the heart rate of any individual exceeds 75% of their calculated MHR (MHR = 200 - age) at the beginning of the rest period, then the work cycle will be decreased by one-third. The rest period will remain the

same. An individual is not permitted to return to work until their sustained heart rate is below 75% of their calculated MHR.

- **Temperature:** Each individual will measure their temperature with a thermometer for 1 minute as early as possible in the first rest period. If the temperature exceeds 99.6°F at the beginning of the rest period, then the work cycle will be decreased by one-third. The rest period will remain the same. An individual is not permitted to return to work if their temperature exceeds 100.4°F.

12.2.2.4 Training

Employees potentially exposed to heat stress conditions will be instructed on the contents of this procedure. This training can be conducted during daily safety tailgate meetings.

12.2.3 Cold Stress

Employees should be regularly trained on cold exposure, as outlined in the Heat and Cold Exposure Program (Appendix E). Observe the following procedures and practices regarding cold stress:

- Take breaks in heated shelters when working in extremely cold temperatures.
- Upon entering the shelter, remove the outer layer of clothing and loosen other layers to promote evaporation of perspiration.
- Drink warm liquids to reduce the susceptibility to cold stress.
- Be aware of cold stress symptoms, including shivering, numbness in the extremities, and sluggishness.
- Provide adequate insulating dry clothing to maintain warmth if work is performed in air temperature below 40°F. Wind chill cooling rates and the cooling power of air are critical factors. The higher the wind speed and the lower the temperature in the work area, the greater the insulation value of the protective clothing required.
- If the air temperature is 32°F or less, hands should be protected.
- If only light work is involved and if the clothing on the worker may become wet on the job site, the outer layer of the clothing in use should be impermeable to water. With more severe work under such conditions, the outer layer should be water repellent, and the outer wear should be changed as it becomes wetted. The outer garments should include provisions for easy ventilation in order to prevent wetting of the inner layer by sweat.
- If available clothing does not give adequate protection to prevent cold injury, work should be modified or suspended until adequate clothing is made available, or until weather conditions improve.
- Implement a buddy system in which site personnel are responsible for observing fellow workers for early signs and symptoms of cold stress.

12.2.3.1 Signs, Symptoms, and Treatment

Cold stress can range from frostbite to hypothermia. The signs and symptoms of cold stress are listed below. The appropriate guidelines should be followed if any personnel exhibit these symptoms:

Frostbite. Frostbite is characterized by pain in the extremities and loss of manual dexterity. "Frostnip," or reddening of the tissue, is accompanied by a tingling or loss of sensation in the extremities and continuous shivering.

Hypothermia. Hypothermia is characterized by pain in the extremities and loss of manual dexterity, with severe, uncontrollable shivering, and an inability to maintain the level of activity. Symptoms include excessive fatigue, drowsiness, irritability, or euphoria. Severe hypothermia includes clouded consciousness, low blood pressure, pupil dilation, cessation of shivering, unconsciousness, and possible death.

Move the individual to a warm, dry place. If the individual's clothing is wet, remove it and replace it with dry clothing. Keep the individual warm. Re-warming of the individual should be gradual to avoid stroke symptoms. Dehydration, or the loss of body fluids, may result in a cold injury due to a significant change in blood flow to the extremities. If the individual is conscious and alert, warm sweet liquids should be provided. Coffee and other caffeinated liquids should be avoided because of diuretic and circulatory effects. Extremities affected by frostbite should be gradually warmed up and returned to normal temperature. Moist compresses should be applied; begin with lukewarm compresses and slowly increase the temperature as changes in skin temperature are detected. Call for Emergency Medical Services. Keep the individual warm and calm and move them to a medical facility as soon as possible.

12.2.4 Sunlight and Ultraviolet Exposure

Observe the following procedures and practices regarding ultraviolet (UV) exposure:

- Protect against extended exposure to sunlight with shade, long clothing, sunscreen, and high-SPF, broad-spectrum sunscreen applied frequently.
- Plan work to avoid unnecessary UV exposure (see Section 12.2.4.2).
- During peak daylight months, plan work for early morning or evening.
- Many factors affect the hazards associated with UV exposure, including the following:
  - **Time of day:** UV rays are strongest between 10:00 a.m. and 4:00 p.m.
  - **Season of the year:** UV rays are stronger during spring and summer months. This is less of a factor near the equator.
  - **Distance from the equator (latitude):** UV exposure goes down as you get farther from the equator.
  - **Altitude:** More UV rays reach the ground at higher elevations.

  - **Cloud cover:** The effect of clouds can vary. Sometimes cloud cover blocks some UV from the sun and lowers UV exposure, while some types of clouds can reflect UV and increase UV exposure. What is important to know is that UV rays can get through, even on a cloudy day. Consider monitoring the UV index for your work area: https://www.epa.gov/sunsafety/uv-index-1.
  - **Reflection off surfaces:** UV rays can bounce off surfaces like water, sand, snow, pavement, or grass, leading to an increase in UV exposure.
- Evaluate site-specific factors affecting UV exposure and address work practices as appropriate.

12.2.4.1 Signs, Symptoms, and Treatment

The best way to treat sunburn is to prevent it by using the guidelines listed in the preceding bullets and in Section 12.2.4.2. Signs of sunburn include the following:

- Pinkness or redness
- Skin that feels warm or hot to the touch
- Pain, tenderness, or itching
- Swelling
- Small, fluid-filled blisters, which may break
- Headache, fever, chills, and fatigue if the sunburn is severe

If signs of sunburn are noticed, avoid further exposure and immediately implement treatment. If the sunburn is blistering *and* covers 15% or more of the body, seek medical attention.

12.2.4.2 Prevention

UV exposure hazards and their impacts on each work site should be evaluated to determine the best practices for risk mitigation. The most effective way to prevent skin damage from UV exposure is to protect bare skin from the exposure. This can be accomplished with shade, clothing (e.g., pants, long sleeves, or hats), sunscreen, and sunglasses. Plan work to either create shade or take advantage of natural shade, and avoid peak UV times during the day when possible.

12.2.5 Inclement Weather

Observe the following procedures and practices regarding inclement weather:

- Evaluate the work site for hazards that may be amplified during inclement weather, such as traction issues, ingress and egress, slope stability, or wind-driven hazards (e.g., dust, debris, or falling trees).
- Stop outdoor work during electrical storms (lightning strikes), hailstorms, high winds, and other extreme weather conditions such as extreme heat or cold.

- Stop outdoor work when lightning is within 10 miles and remain stopped until 30 minutes following the last strike within 10 miles. Note that if you hear thunder, you can be struck by lightning.
- Take cover indoors or in a vehicle that will provide adequate protection. In some cases, this may require exiting the work site, such as during windstorms in areas with overhead hazards (e.g., trees or power lines).
- Listen to local forecasts for warnings about specific weather hazards such as tornadoes, hurricanes, and flash floods.
- Verify that on-site equipment and resources are adequately protected from inclement weather.
- If working in an unfamiliar geographic location, consult with local resources for unique weather hazards.

12.2.6 Insects and Spiders

Observe the following general procedures and practices regarding insects/spiders:

- Tuck pants into socks.
- Wear long sleeves.
- Use insect repellent.
- Avoid contact by always looking ahead to where you will be walking, standing, sitting, leaning, grabbing, lifting, or reaching.
- Check for signs of insect/spider bites, such as redness, swelling, and flu-like symptoms.

The most dangerous spiders to humans in North America are black widows and brown spiders (also known as brown recluse or fiddleback spiders).

12.2.7 Bees and Wasps

Many encounters with bees and wasps occur when nests built in well casings or excavation areas are disturbed. Before opening a well casing, take a few moments to observe whether or not insects are entering or exiting. If they are flying to and from the casing, avoid it if possible. If you must be in an area where disturbing a nest is likely, be sure to wear long pants and a long-sleeved shirt. Stinging insects fly around the top of their target, so if you get into trouble, pull a portion of your shirt over your head and run away.

If you get stung, look for a stinger and, if one is present, remove it as soon as possible. Several over-the-counter products or a simple cold compress can be used to alleviate the pain of the sting. If the sting is followed by severe symptoms, or if it occurs in the neck or the mouth, seek medical attention immediately because swelling could cause suffocation.

If you need to destroy a nest, consult with the PM and project FL first. Commercially available aerosols to control stinging insects are very effective but could potentially contaminate the well.

Once the nest is destroyed, fine mesh may be applied over the exit and entry points of a well casing to prevent re-infestation.

Employees who know they are allergic to insect stings or bites and carry an EpiPen are encouraged to notify the FL to ensure that proper support is provided to the employee when exposed to these hazards.

12.2.8 Ticks

Ticks in North America can be carriers of several diseases, including Lyme disease, Rocky Mountain spotted fever, and ehrlichiosis. A guide to identifying ticks is presented in Table 12-5.

Limiting exposure to ticks reduces the likelihood of infection when exposed to tick-infested habitats. Measures to prevent tick exposure include the following:

- Remove leaf litter and brush in areas where you will be working before tick season.
- Wear light-colored clothing so that ticks are visible.
- Tuck your pant legs into your socks.
- Apply repellents to discourage tick attachment.
- Promptly inspect your body and remove crawling or attached ticks when you leave a tick-infested area.
- Conduct tick checks on buddies upon exiting any suspect area (may be needed multiple times per work day).
- Be aware of seasonal activity; ticks are often most active in the spring.

Observe the following procedures and practices if you are bitten by a tick:

- Use fine-tipped tweezers or shield your fingers with tissue, paper towel, or rubber gloves.
- Grasp the tick as close to the skin surface as possible and pull upward with steady, even pressure. Do not twist or jerk the tick; this may cause mouthparts to break off and remain in the skin.
- Do not squeeze, crush, or puncture the body of the tick because its fluids may contain infectious organisms.
- Do not handle the tick with bare hands because infectious agents may enter through mucous membranes or breaks in the skin.
- After removing the tick, thoroughly disinfect the bite site and wash your hands with soap and water.
- You may wish to save the tick for identification in case you become ill within 2 to 3 weeks. Place the tick in a sealed plastic bag in the freezer and mark the bag with the date of the bite.

Table 12-5
Tick Identification Guide

Tick Identification Guide	
American Dog Tick • Found mainly east of the Rocky Mountains and in parts of the West Coast. • Bite from an American dog tick can spread Rocky Mountain spotted fever and tularemia. • Scientific name is *Dermacentor variabilis*. Some populations made up of a related tick, *D. similis*. • Female is approximately 3 mm in size (abdomen).	
Brown Dog Tick • Found throughout the United States. • Bite from a brown dog tick can spread Rocky Mountain spotted fever in the southwestern United States and along the border with Mexico. • Scientific name is *Rhipicephalus sanguineus*. • Female is approximately 2 mm in size (abdomen).	

Source:
Mayo Clinic, 2024. "Guide to different tick species and the diseases they carry." Accessed September 13, 2024. Available at: https://www.mayoclinic.org/diseases-conditions/alpha-gal-syndrome/in-depth/tick-species/art-20546861.

Photography credits:

1. "American dog tick in hand" by U.S. Fish and Wildlife Service - Midwest Region, marked with Public Domain Mark 1.0.
2. "brown dog tick" by Klaus Wehrlin, marked with CC0 1.0.

12.2.9 Mosquitoes

Mosquitoes in the United States have been known to carry West Nile virus, Zika virus, St. Louis encephalitis, and dengue fever. Avoid mosquito bites by doing the following:

- Apply insect repellent containing DEET (N,N-diethyl-meta-toluamide) when outdoors. DEET is very effective but could potentially contaminate samples.
- Read and follow the product directions whenever you use insect repellent.
- Wear long-sleeved clothes and long pants treated with repellent to further reduce your risk, or stay indoors during peak mosquito feeding hours (dusk until dawn).
- Limit the number of places available for mosquitoes to lay their eggs by eliminating standing water sources from around the work area.
- If you need to destroy a nest, consult with the PM and project FL first.
- Check to see if there is an organized mosquito control program near the project site. If no program exists, work with the local government officials to establish a program.

12.2.10 Parasitic Hazards

Potential parasitic hazards may be present in surface waters, sediment, and soil. These include (but are not limited to) roundworm, whipworm, and hookworm. People can become infected with

intestinal worms through contact with soil that has been contaminated with human or animal feces. Parasites can enter the body through ingestion, as well as dermal contact. Hookworm larvae, which may be present in animal feces (including nutria feces), can burrow through skin. Intestinal parasites can cause symptoms such as the following:

- Diarrhea
- Abdominal cramps
- Loss of appetite
- Distended abdomen
- Coughing, fever, and vomiting

Anyone experiencing these or any abnormal symptoms should seek medical attention. To reduce the potential for exposure to parasites, avoid skin contact with water and sediment or soil through the use of rubber gloves or any other appropriate PPE.

12.2.11 Bird Droppings

Large populations of roosting birds may present a disease risk. The most serious health risks arise from disease organisms that grow in the accumulations of bird droppings, feathers, and debris under a roost—especially if roosts have been active for years. Among the fungal diseases associated with bird droppings, the two most common are Histoplasmosis and Cryptococcosis.

If you are working in an area where large quantities of droppings are present, follow certain precautions to minimize the risk from disease organisms in the droppings:

- Wear a respirator that can filter particles as small as 0.3 micron, such as a HEPA filter.
- Wear disposable protective gloves, hat, coveralls, and boots if you will be in close contact.
- Wash or shower at the work site after cleanup, if possible.
- If allowable, modify the structure or use methods to prevent birds from re-establishing the roost.

12.2.12 Feral Dogs

Feral (i.e., "wild" or "stray") dogs have been observed at several Anchor QEA job sites. Packs of feral dogs can be dangerous, so if you observe them on the site, call animal control immediately. If a dog approaches you, take the following steps to reduce your chances of being attacked:

- Do not run away or run past the dog.
- Remain calm. If you say anything, speak calmly and firmly. Avoid eye contact. Try to stay still until the dog leaves, or back away slowly until the dog is out of sight. Do not turn and run.
- If you fall to the ground or are knocked down, curl into a ball, placing your hands over your head and neck. Protect your face.

If a dog bites someone, take the following steps:

- Restrain the dog immediately, if it is safe to do so. The dog will have to be quarantined or tested for rabies.
- Check on the victim's condition. Call 911 if paramedic response is required.

12.2.13 Bears

Though bear attacks in the wild are extremely rare, both grizzly and black bears have the potential to occur within project sites in North America. A guide to identifying these bears is presented in Table 12-6. Observe the following general procedures and practices regarding bears:[4]

- Don't surprise bears. If you're walking, make your presence known. Make noise by talking loudly.
- Always travel with a group. Groups are noisier and easier for bears to detect.
- Keep in mind that bears tend to be more active at dawn and dusk, so plan field work accordingly.
- Keep an eye out for tracks, scat, digs, and trees that bears have rubbed.

Table 12-6
North American Bear Identification Guide

Bear Identification Guide	
Black Bear (*Ursus americanus*) • Color: Includes black, brown, cinnamon, blonde, blue/gray, and even white.[1] Brown bears are most common in western North America.[2] • Weight: From 100 to 600 pounds depending on age, sex, season.[1] • Height: About 3 feet at the shoulder and 5 to 7 feet standing upright.[1] • Head: Small, supported by a strong neck. Ears small and rounded.[2] • Claws: Curved and nonretractile.[2] Able to climb trees.[1] • Prints: Walk on the soles of their feet (plantigrade locomotion).[2] • Range: Forests of North America and parts of northern Mexico.[2] • Diet: Omnivorous. Opportunistic feeders.[2]	

Sources:

1. National Park Service, 2024. "Black Bears." Accessed September 13, 2024. Available at: https://www.nps.gov/subjects/bears/black-bears.htm.
2. Brittanica, 2024. "Black Bear." Accessed September 13, 2024. Available at: https://www.britannica.com/animal/black-bear.
3. National Park Service, 2022. "Brown Bears." Accessed September 13, 2024. Available at: https://www.nps.gov/subjects/bears/brown-bears.htm.

Photography credits:
"Black bear, Northeast Entrance" by Neal Herbert, marked with Public Domain Mark 1.0.

[4] For more information, visit: https://www.fws.gov/story/2016-07/wildlife-safety-tips-enjoying-great-outdoors

12.2.14 Mountain Lions (Cougars), Wolves, and Coyotes

Mountain lions (cougars), gray wolves, and coyotes also have the potential to occur within project sites in North America. Gray wolves are very rare and attacks in the wild are extremely rare. Coyotes are more common but are rarely seen during the daytime. It is difficult to distinguish between wolves, coyotes, and feral dogs, especially if the light is bad, the sighting is brief, or the animal is far away. Table 12-7 lists the differences in physical appearance between canids. The following practices and procedures should be followed when working in areas that cougars or wolves may inhabit:[5]

- Hike in groups and make enough noise to avoid surprising a cougar or wolf.
- Do not approach dead animals, especially deer or elk; they could have been cougar or wolf prey left for a later meal.

If you see or encounter a cougar or a wolf:

- Stop immediately and do not run. Running and rapid movements may trigger an attack. At close range, a cougar's instinct is to chase.
- Face the animal. Talk to it firmly while slowly backing away. Always leave the animal an escape route. Do not take your eyes off the animal or turn your back. Do not crouch down or try to hide.
- Try to appear larger than the animal. Get above it (e.g., step up onto a rock or stump). If wearing a jacket, hold it open to further increase your apparent size. If you are in a group, stand shoulder-to-shoulder to appear intimidating.
- In the rare instance that the animal does not flee, be more assertive. If it shows signs of aggression, shout, wave your arms or a stick, and throw anything you have available (water bottle, book, backpack). The idea is to convince the animal that you are not prey, but a potential danger.
- If an animal attacks, fight back. Be aggressive and try to stay on your feet. Cougars and wolves have been driven away by people who have fought back using anything within reach, including sticks, rocks, shovels, backpacks, and clothing—even bare hands. If you are aggressive enough, an animal will flee, realizing it has made a mistake.
- In the case of an aggressive wolf, climb a tree if necessary; wolves cannot climb trees. **Do not use this method for cougars.**

[5] For more information, visit: https://www.fws.gov/story/2016-07/wildlife-safety-tips-enjoying-great-outdoors and https://conservationnw.org/tips-for-hiking-in-wolf-country

Table 12-7
North American Canid Identification Guide

Differences in Physical Appearance Between Canids	
Gray Wolf (*Canus lupus*) • Color: White to black, most are light brown or gray.[1] Light-colored wolves common in Arctic regions.[2] • Weight: Males 65 to 175 pounds; females 50 to 120 pounds.[1] • Size: 30 inches tall at the shoulder[2] and 4.25 to 6.75 feet long. Largest wild member of the dog family (Canidae). Largest wolves found in west-central Canada and Alaska.[1] • Tail: Bushy, about 20 inches long.[2] • Diet: Mainly large herbivores such as deer, elk, moose, bison, bighorn sheep, caribou, and musk oxen. Beavers and hares when available. Wolves in western Canada will fish for Pacific salmon.[2]	
Coyote (*Canis latrans*) • Color: Variable, but usually grizzled gray with cream or white underside. Some individuals have blonde, reddish, and charcoal coat colors. Most have dark hairs over back and at tip of tail.[3] • Weight: 20 to 50 pounds. Largest are in northeast U.S. and Canada.[4] • Size: About 24 inches at the shoulder, 3.3 to 4.3 feet long (with tail).[4] • Tail: Bushy, straight, and carried low to the ground.[3] About 12 to 15 inches long.[4] • Diet: Omnivorous, opportunistic predator; will hunt rabbits, rodents, fish, frogs, deer. Will eat insects, fruit, grass, carrion. Sometimes kills livestock and pets.[5]	

Sources:

1. Smithsonian's National Zoo & Conservation Biology Institute, 2024. "Gray Wolf." Accessed September 13, 2024. Available at: https://nationalzoo.si.edu/animals/gray-wolf.
2. Britannica, 2024. "Gray Wolf." Accessed September 13, 2024. Available at: https://www.britannica.com/animal/gray-wolf.
3. Connecticut Department of Energy & Environmental Protection, 2023. "Coyote." Accessed September 13, 2024. Available at: https://portal.ct.gov/deep/wildlife/fact-sheets/coyote.
4. Britannica, 2024. "Coyote." Accessed September 13, 2024. Available at: https://www.britannica.com/animal/coyote-mammal.
5. National Geographic, 2024. "Coyote." Accessed September 13, 2024. Available at: https://www.nationalgeographic.com/animals/mammals/facts/coyote.

Photography credits:
Top: "Gray Wolf" by PacificLegalFoundation, marked with Public Domain Mark 1.0.
Bottom: "Coyote" by YellowstoneNPS, marked with Public Domain Mark 1.0.

12.2.15 Rodent-Borne Diseases

Rodent infestation on a site has the potential to cause serious communicable diseases including hantavirus pulmonary syndrome and bubonic plague. The most common rodent-borne disease is hantavirus, which may infect workers who inhale tiny droplets containing the virus when fresh rodent urine, droppings, or nesting materials are stirred up.

The following working conditions may put workers at risk of hantavirus:

- Contact with rodent feces or dried urine, which may mobilize particles of these wastes into the air where they may be inhaled
- Entry into rooms or warehouses that have been closed up and infested for extended periods
- Activities that stir up dust that may mobilize hantavirus

If working in areas of obvious rodent infestation, the Centers for Disease Control and Prevention (CDC) recommends the following precautions:

- Do not enter rooms or warehouses that have been closed up unless absolutely necessary.
- If work in closed-up areas or areas with rodent infestation is necessary, contact professional exterminators to eliminate the infestation and clean up the location.
- If an exterminator is not available or possible, employees should clean up the infested area using the following steps:
  - When going into outbuildings or rooms that have been closed for an extended period, open them up and air them out before cleaning.
  - Don an APR equipped with HEPA P-100 cartridges and nitrile gloves before cleaning.
  - Do not stir up dust by sweeping or vacuuming droppings, urine, or nesting materials.
  - Thoroughly wet contaminated areas with detergent or liquid to deactivate the virus. Most general-purpose disinfectants and household detergents are effective. However, a hypochlorite solution prepared by mixing 1-1/2 cups of household bleach in 1 gallon of water may be used in place of a commercial disinfectant.
  - Once everything is wet, pick up contaminated materials with a damp towel, then mop or sponge the area with disinfectant.
  - Spray dead rodents with disinfectant and flea repellent (to avoid bubonic plague), then double-bag and dispose of in an appropriate waste disposal system. Contact the local or state health department for other disposal methods.
  - Finally, remove respirator and disinfect gloves before taking them off with disinfectant or soap and water. After taking off the clean gloves, thoroughly wash hands with soap and warm water.

If you experience hantavirus symptoms (fatigue, fever, and muscle aches) within 1 to 5 weeks of exposure to potentially affected rodents and their droppings, contact your supervisor immediately.

12.2.16 Poisonous Plants

Poisonous plants include poison ivy, poison oak, and poison sumac as shown in Table 12-8. Observe the following procedures and practices regarding poisonous plants:

- Avoid entering areas infested with poisonous plants.
- Immediately wash any areas that come into contact with poisonous plants.

- Use PPE when there is a possibility of contact with poisonous plants.

Table 12-8
North American Hazardous Plant Identification Guide

Hazardous Plant Identification Guide		
Poison Ivy • Found in all parts of the United States except the extreme southwest and throughout Canada. • Grows as a woody vine, trailing shrub mostly on the ground, or an erect wood shrub without supports. • Leaves grow in groups of three leaflets: green through spring and summer and scarlet, orange, or russet in fall. • Small white flowers above a leaf • White or creamy berries with distinctive lines		
Poison Sumac • Found in damp areas of every state, generally prevalent east of the Mississippi River • A coarse woody shrub or small tree—never a vine • Seven to 13 smooth-edged leaflets in pairs along a central midrib with a single leaf at the end. Bright orange in spring, dark glossy green with scarlet midribs in summer, red-orange and russet in early fall • Ivory white or green fruit in loose clusters 1 foot long		

Source:
National Safety Council, 2016. "Poison ivy, poison oak and poison sumac." Accessed September 16, 2024. Available at: https://www.nsc.org/getmedia/e91abfaa-16f1-42a1-b678-c1c14c67f6cc/poison-ivy,-poison-oak,-poison-sumac.pdf.aspx.

Photography credits:
Top left: "Poison Ivy Vine" by Alabama Extension, marked with CC0 1.0.
Top right: "Poison ivy" by U.S. Fish and Wildlife Service - Midwest Region, marked with Public Domain Mark 1.0.
Bottom left: "poison sumac" by Nick Spigler, marked with CC0 1.0.
Bottom right: "poison sumac" by Adam Kranz, marked with CC0 1.0.

If you have been exposed to poison ivy, oak, or sumac, act quickly because the toxin in the plants penetrates the skin within minutes. If possible, stay outdoors until you complete the first two steps:

1. Cleanse the exposed skin with generous amounts of isopropyl alcohol.
2. Wash the skin with water.
3. Take a regular shower with soap and warm water. Do not use soap until this point because it will pick up the toxin from the surface and move it around.
4. Wash clothes, tools, and anything else that may have been in contact with the toxin with alcohol and water. Be sure to wear hand protection during that process.

Signs and symptoms of exposure include redness and swelling that appears 12 to 48 hours after exposure. Blistering and itching will follow. If you have had a severe reaction in the past, you should

see a physician right away. Over-the-counter products that are available to alleviate symptoms include Cortaid, Lanacort, baking soda, Aveeno oatmeal baths, and calamine lotion.

12.2.17 The Public at Large

The community residents around work sites may pose their own specific hazards. These conditions may include the following:

- Unintentional disruption of work
- Benign or malicious trespass
- Criminal intent

Scenarios may include the following:

- Pedestrians, cyclists, or motorists disregarding site boundaries due to distraction or willful disobedience.
- Public use of private site facilities for shelter, relief, and other reasons with no ill-intention.
- Public use of private site facilities for mischievous or criminal activity, such as loitering, vandalism, or theft.
- Encounters with community members who are disgruntled with the project activity.
- Encounters with criminal activities on or near a project site.
- Encounters with hunters who may intentionally or unintentionally disregard site boundaries.

If any of the previously mentioned scenarios are anticipated to be likely, take the following precautions as appropriate:

- Verify that the site is adequately marked and barricaded to limit unintentional disruptions of the work by the public.
- Review the site for attractive nuisances (e.g., hazards or conditions that are likely to attract children), and mitigate those.
- Secure all equipment and site facilities to prevent unauthorized access or use.
- Remove valuable items from the site or adequately secure them on site to limit the temptation for potential criminals.
- Have contact information for the client's or owner's public relations office while on site, and direct disgruntled community members to that office. If necessary, vacate the site to relieve the situation and notify the PM or FL.
- Work in pairs when uncertain of the public safety situation at a site. In questionable situations, postpone work as necessary until a plan of action can be developed to verify a safe working environment.

12.2.18 Personal Health and Safety

In addition to hazards associated with COCs, equipment, operations, or site conditions discussed above, there may be additional personal safety issues to consider at a site, including those related to one or multiple protected classes, such as race, gender, religion, ability, sexual orientation, or gender identity. These conditions may involve the following, perpetrated by the public or those associated with the work:

- Malicious disruption of work
- Harassment, including unwanted comments, gestures, or actions
- Threats of violence, either implied (using derogatory language) or explicit
- Assault

It is critical that the work environment be discussed within the project team to evaluate risks, ways to avoid those risks, and communication protocols. Anchor QEA requires that work be performed in teams.

Specifically, if any of the above are anticipated, take the following precautions as appropriate:

- Alert the PM, FL, CHSM, and Human Resources Department of potential issue(s).
- Formulate a plan of action to verify and maintain a safe working environment before field work, which may include the following:
  - Working in pairs and/or within a certain physical distance of other work groups.
  - Coordinated check-ins (calls to or from the office or visual check-ins with other field members).
- Whenever possible, schedule work only within daylight hours (which fluctuate seasonally) or on weekends when questionable scenarios may be less likely.
  - If night work is required, maintain a minimum of two field personnel at all times, and potentially increase the total number of personnel.
  - If working in high-risk areas, discuss the possibility of hiring security if work needs to be performed at night, in low light, or near potentially dangerous areas (e.g., abandoned buildings, public displays of hostility, discrimination, or gang-related activity).
- Maintain a field phone with active GPS and non-locking 911 capability at all times while out in the field.
- If a need arises for a change in field work (e.g., additional sampling or moving to an area that was not planned) or travel plans (e.g., dead battery or flat tire), immediately alert the FL and PM as to the event.

In addition, practice active awareness of your environment. Discuss personal health and safety concerns at the daily safety tailgate meeting. If you feel unsafe based on the potential behavior of others, immediately bring it up to field team coworkers. If the issue is not resolved to your

satisfaction, alert the PM, FL, CHSM, and Human Resources Department to assist in resolving any potential issue(s).

13 Medical Monitoring Program

This section describes the medical monitoring program that Anchor QEA field personnel must comply with when working on sites where there is a potential for exposure to hazardous wastes or other hazardous substances.

13.1 General Requirements

Anchor QEA employees shall be enrolled in a medical monitoring program in compliance with OSHA standards (29 CFR 1910.120(f)) under the following circumstances:

- If they are involved with any of the following operations:
  - **Cleanup operations** required by a governmental body, whether federal, state, local, or other, involving hazardous substances that are conducted at uncontrolled hazardous waste sites (including, but not limited to, the EPA's National Priority List [NPL] sites, state priority list sites, sites recommended for the EPA NPL, and initial investigation of government-identified sites that are conducted before the presence or absence of hazardous substances has been ascertained)
  - **Corrective actions** involving cleanup operations at sites covered by the Resource Conservation and Recovery Act of 1976 (RCRA) as amended (42 *United States Code* 6901 et seq.)
  - **Voluntary cleanup operations** at sites recognized by federal, state, local, or other governmental bodies as uncontrolled hazardous waste sites
  - **Operations involving hazardous wastes** that are conducted at treatment, storage, and disposal facilities regulated by 40 CFR 264 and 40 CFR 265 pursuant to RCRA or by agencies under agreement with the EPA to implement RCRA regulations
  - **Emergency response operations** for releases of, or substantial threats of releases of, hazardous substances without regard to the location of the hazard
- And, if they meet the following criteria:
  - Are or may be exposed to hazardous substances or health hazards at or above the established PEL, above the published exposure levels for these substances, without regard to the use of respirators, for 30 days or more per year
- In addition, employees are required to be enrolled in the medical monitoring program if they meet any of the following conditions:
  - Wear a respirator for 30 days or more per year
  - Are injured, become ill, or develop signs or symptoms due to possible overexposure involving hazardous substances or health hazards from an emergency response or hazardous waste operations
  - Are members of a Hazardous Materials (HAZMAT) team

Anchor QEA employees required to be enrolled in a medical monitoring program under 29 CFR 1910.120(f) shall have medical examinations and consultations made available to them by Anchor QEA on the following schedule:

- Before assignment
- At least once every 12 months unless the attending physician believes a longer interval (not greater than biennially) is appropriate
- At termination of employment or reassignment to an area where the employee would not be covered if the employee has not had an examination within the last 6 months
- As soon as possible upon notification that the employee has developed signs or symptoms indicating possible overexposure to hazardous substances or health hazards, or that the employee has been injured or exposed above the PEL or published exposure levels in an emergency situation
- At more frequent times, if the examining physician determines that an increased frequency of examination is medically necessary

The content of medical examinations or consultations made available to employees shall be determined by the attending physician but shall include, at a minimum, a medical and work history with special emphasis on symptoms related to the handling of hazardous substances and health hazards, and to fitness for duty including the ability to wear any required PPE under conditions (i.e., temperature extremes) that may be expected at the work site.

The attending physician shall provide Anchor QEA with a written opinion for each examined employee that contains the following information:

- Whether the employee has any detected medical conditions that would place the employee at an increased risk of impairment of the employee's health from hazardous waste operations work, emergency response, or respirator use
- Any recommended limitations on the employee's assigned work
- A statement that the employee has been informed of the results of the medical examination and any medical conditions that require further examination or treatment

The written opinion obtained by Anchor QEA shall not reveal specific findings or diagnoses unrelated to occupational exposures. Medical monitoring and other employee-related medical records shall be retained for at least the duration of employment plus 30 years.

13.2 Team Self-Monitoring

All personnel will be instructed to look for and inform each other of any deleterious changes in their physical or mental condition during the performance of all field activities. Examples of such changes are as follows:

- Headaches
- Dizziness
- Nausea
- Blurred vision
- Cramps
- Irritation of eyes, skin, or respiratory system
- Skin chafing from damp or wet clothing
- Changes in complexion or skin color
- Changes in apparent motor coordination
- Increased frequency of minor mistakes
- Excessive salivation or changes in papillary response
- Changes in speech ability or speech pattern
- Symptoms of heat stress or heat exhaustion
- Symptoms of hypothermia

If any of these conditions develop, the affected person will be moved from the immediate work location and evaluated. If further assistance is needed, personnel at the local hospital will be notified, and an ambulance will be summoned if the condition is thought to be serious. If the condition is the result of sample collection or processing activities, procedures and/or PPE will be modified to address the problem.

Appendix A
Health and Safety Logs and Forms

Daily Air Monitoring Record

Project Name: _____ **Date:** _____

Project Number: _____ **Location:** _____

Temperature: _____

Conditions: _____

COC	Instrument	S/N	Calibration Date	Calibration Gas/Method	Calibration by
Organic vapors					
Particulates					
O_2					
Other:					
Other:					
Other:					

Time	Location/Description	Organic Vapor (ppm)	O2%	CG %LEL	Other	Other

Notes:

Completed by:

Printed Name _____ Signature _____ Date _____

Daily Safety Briefing Form

ANCHOR QEA

Date: _____

Project No: _____

Project Name: _____

Submit a Playing It Safe Event

Person Conducting Meeting: _____ **Health & Safety Officer:** _____ **Project Manager:** _____

TOPICS COVERED: *Highlighted topics are required*

- ☐ Emergency Procedures and Evacuation Route
- ☐ Directions to Hospital
- ☐ HASP Review and Location
- ☐ Safety Equipment Location
- ☐ Proper Safety Equipment Use
- ☐ Employee Right-to-Know/ SDS Location
- ☐ Fire Extinguisher Location
- ☐ Eye Wash Station Location
- ☐ Buddy System
- ☐ Self and Coworker Monitoring
- ☐ Lines of Authority
- ☐ Communication
- ☐ Site Security
- ☐ Vessel Safety Protocols
- ☐ Work Zones
- ☐ Vehicle Safety and Driving/ Road Conditions
- ☐ Equipment Safety and Operation
- ☐ Proper Use of PPE
- ☐ Decontamination Procedures
- ☐ Near Miss Reporting Procedures
- ☐ Lifting Techniques
- ☐ Slips, Trips, and Falls
- ☐ Hazard Exposure Routes
- ☐ Heat and Cold Stress
- ☐ Overhead and Underfoot Hazards
- ☐ Chemical Hazards
- ☐ Flammable Hazards
- ☐ Biological Hazards
- ☐ Eating/Drinking/Smoking
- ☐ Reviewed Prior Lessons Learned
- ☐ Field Team Medical Conditions for Emergency Purposes (Confidential): _____
- ☐ Other: _____

Weather Conditions: _____

Daily Work Scope: _____

Site-specific Hazards: _____

Safety Comments: _____

Attendees

Printed Name	Signature

End of Day Wellness Check

Field Safety Equipment Checklist

The following is a list of safety-related gear that may be appropriate depending on the type of work being conducted. The purpose of this checklist is twofold: 1) ensure that all field crew members think about appropriate safety gear needs before heading to the worksite; and 2) provide an extensive list of gear to consider in order to serve as a reminder of potential safety gear needs during a field effort.

☐ **Safety Briefing Log or Notebook**

Personal Protective Gear

- ☐ Rain pants and jacket
- ☐ Hard hats
- ☐ Boots (steel-toed, if appropriate)
- ☐ Safety glasses
- ☐ Ear protection
- ☐ Nitrile gloves (inner and outer pair)
- ☐ Tyvek overalls
- ☐ H_2S sensor
- ☐ Flashlight
- ☐ EpiPen (inquire if any field staff use one)
- ☐ Other:

Warm Weather Safety Gear

- ☐ Sunscreen
- ☐ Water
- ☐ Hat
- ☐ Light clothes

Cold Weather Safety Gear

- ☐ Warm clothes (preferably synthetics)
- ☐ Hat
- ☐ Gloves
- ☐ Boot warmers
- ☐ Thermos of warm drink/soup

Communications

- ☐ Notify office staff of day's field plan
- ☐ Walkie Talkies
- ☐ Cell phones
- ☐ Satellite phone (if appropriate)
- ☐ Contact numbers (e.g., for other field crew members, the PM, or others to notify that you are accessing site)

General Gear for Work Near Water

- ☐ Life jacket
- ☐ Boots or waders (hip or chest)
- ☐ Throwline

Boat Safety Gear

U.S. Coast Guard Required Gear:

- ☐ 1. Personal flotation device (PFD), preferably life jacket, for each occupant
- ☐ 2. Fire extinguisher (filled to operable range)
- ☐ 3. Flares (unexpired)
- ☐ 4. Horn
- ☐ 5. Navigation lights

- ☐ First aid kit
- ☐ Bowline and stern line
- ☐ Anchor and anchor line
- ☐ Paddle
- ☐ Spare propeller and linchpin
- ☐ Appropriate personal protective gear (boots or waders) to step onto shore if necessary
- ☐ Drain plug (and spare)
- ☐ Boat fuel and oil
- ☐ Weather radio (if appropriate)
- ☐ Weather, tides, and currents forecasts
- ☐ Warm clothes/blanket in dry bag

Modification to Health and Safety Plan

Date: _____

Project No: _____

Project Name: _____

Modification: _____

_____

_____

_____

_____

Reason for Modification: _____

_____

_____

_____

_____

_____

Site Personnel Briefed

Name: _____ **Date:** _____

Name: _____ **Date:** _____

Name: _____ **Date:** _____

Name: _____ **Date:** _____

Name: _____ **Date:** _____

Name: _____ **Date:** _____

Name: _____ **Date:** _____

Name: _____ **Date:** _____

Name: _____ **Date:** _____

Name: _____ **Date:** _____

Approvals

Field Lead: _____ _____ _____
Printed Name | Signature | Date

Project Manager: _____ _____ _____
Printed Name | Signature | Date

Heat Stress Monitoring Record

Date: _____

Project No: _____

Project Name: _____

Location: _____

Employee Name	Monitoring Results												
	Initial Reading Time:	First Work Period Time:		Second Work Period Time:		Third Work Period Time:		Fourth Work Period Time:		Fifth Work Period Time:		Sixth Work Period Time:	
	WBGT (°F):	WBGT (°F):		WBGT (°F):		WBGT (°F):		WBGT (°F):		WBGT (°F):		WBGT (°F):	
	Air Temp (°F):	Air Temp (°F):		Air Temp (°F):		Air Temp (°F):		Air Temp (°F):		Air Temp (°F):		Air Temp (°F):	
	Initial Temp:	Initial Temp:	Final Temp:	Initial Temp:	Final Temp:	Initial Temp:	Final Temp:	Initial Temp:	Final Temp:	Initial Temp:	Final Temp:	Initial Temp:	Final Temp:
	Initial H.R.:	Initial H.R.:	Final H.R.:	Initial H.R.:	Final H.R.:	Initial H.R.:	Final H.R.:	Initial H.R.:	Final H.R.:	Initial H.R.:	Final H.R.:	Initial H.R.:	Final H.R.:
	Initial Temp:	Initial Temp:	Final Temp:	Initial Temp:	Final Temp:	Initial Temp:	Final Temp:	Initial Temp:	Final Temp:	Initial Temp:	Final Temp:	Initial Temp:	Final Temp:
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	Initial Temp:	Initial Temp:	Final Temp:	Initial Temp:	Final Temp:	Initial Temp:	Final Temp:	Initial Temp:	Final Temp:	Initial Temp:	Final Temp:	Initial Temp:	Final Temp:
	Initial H.R.:	Initial H.R.:	Final H.R.:	Initial H.R.:	Final H.R.:	Initial H.R.:	Final H.R.:	Initial H.R.:	Final H.R.:	Initial H.R.:	Final H.R.:	Initial H.R.:	Final H.R.:
	Initial Temp:	Initial Temp:	Final Temp:	Initial Temp:	Final Temp:	Initial Temp:	Final Temp:	Initial Temp:	Final Temp:	Initial Temp:	Final Temp:	Initial Temp:	Final Temp:
	Initial H.R.:	Initial H.R.:	Final H.R.:	Initial H.R.:	Final H.R.:	Initial H.R.:	Final H.R.:	Initial H.R.:	Final H.R.:	Initial H.R.:	Final H.R.:	Initial H.R.:	Final H.R.:
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	Initial H.R.:	Initial H.R.:	Final H.R.:	Initial H.R.:	Final H.R.:	Initial H.R.:	Final H.R.:	Initial H.R.:	Final H.R.:	Initial H.R.:	Final H.R.:	Initial H.R.:	Final H.R.:

Notes:

Completed by:

Printed Name _____ Signature _____ Date _____

Utility Contact Prevention Checklist

NOTE: Utility mark-out requirements vary from state to state; consult state authorities before beginning work.

Purpose: This form is intended to help the Field Lead confirm that underground or overhead utilities are identified to the extent practicable and consistent with applicable regulations **PRIOR** to site work.

INVESTIGATIONS MUST NOT OCCUR UNTIL MULTIPLE LINES OF EVIDENCE INDICATE THAT SUBSURFACE OR OVERHEAD UTILITIES ARE NOT PRESENT IN THE WORK AREA

Project Name/No: _____ **Date:** _____

Field Lead: _____ **Project Address:** _____

Project Manager: _____ **Health & Safety Officer:** _____

Emergency Contact Information for One Call: _____

Duration/Summary of Work to be Performed: _____

_____

_____

Consideration	Check		Explanation	Initial
Has the state One Call been contacted?	☐ Yes	☐ No		
Has the property owner or client been contacted for local knowledge of utilities, as applicable?	☐ Yes	☐ No		
Does the property owner or client have specific utility contact prevention procedures and, if so, have they been completed?	☐ Yes	☐ No		
Are any as-built drawings available? If so, do they show any utilities?	☐ Yes	☐ No		
Has a visual inspection of the work area(s) been completed?	☐ Yes	☐ No		
Has the potential presence of in-water utilities been assessed (shore markers, streets dead-ending at water's edge, etc.)	☐ Yes	☐ No		
Is evidence of electrical utilities present? (electric meters on structures, conduits, overhead lines, light poles, etc.)	☐ Yes	☐ No		
Is evidence of water/sewer utilities present? (water meter, hydrants, restrooms, grates in ground, etc.)	☐ Yes	☐ No		
Is evidence of telecommunications utilities present? (fiber optic warning signs, conduits from utility poles, wall-mounted boxes, etc.)	☐ Yes	☐ No		
Is other evidence of utilities present? (unknown ground markings, manholes or valve covers, "Call Before You Dig" signs, linear asphalt or concrete repair characteristics, liner subsidence of ground surface, pin flags or stakes, etc.)	☐ Yes	☐ No		

Utility Contact Prevention Checklist

NOTE: Utility mark-out requirements vary from state to state; consult state authorities before beginning work.

Consideration	Check		Explanation	Initial
Has a private locating service been contacted?	☐ Yes	☐ No		
Were any utilities identified and marked out through a private locating service? If so, duplicate mark-outs on site drawings.	☐ Yes	☐ No		
Are there any fiber optic cables, fuel lines, or high-pressure lines within 50 feet of work locations?	☐ Yes	☐ No		
If fiber optic cables, fuel lines, or high-pressure lines are within 50 feet, has an agreement with the utility owner been established?	☐ Yes	☐ No		
Can a test borehole be advanced by hand digging, probing, post-hole digging, and/or air knifing to 5 feet below ground surface (bgs)?	☐ Yes	☐ No		
If hand digging, probing, post-hole digging, and/or air knifing to 5 feet bgs is not possible, can a non-invasive geophysical investigation be conducted? If not, why?	☐ Yes	☐ No		
Other considerations:				

NOTE: Please fill in second page and attach additional reports, drawings, or other information, as necessary.

Confirmation Number: _____

Contact Name: _____ **Organization:** _____

Contact Date: _____ **Contact Time:** _____

Response: _____

_____

_____

_____

Completed by:

_____ _____ _____

Printed Name Signature Date

Contractor:

_____ _____ _____

Printed Name Signature Date

Incident Report Form

Please immediately contact your manager when a work-related incident has occurred. It is your responsibility (or your manager's if you are not able) to contact Human Resources (HR) and Health and Safety (H&S) ASAP when an incident happens.

This Incident Report is the first form you must complete when a work-related incident has occurred. Once completed, forward this form to HR and H&S.

Incident Type: ☐ Injury ☐ Illness ☐ Near Miss ☐ Spill ☐ Fire ☐ Other _____

Employees Involved in Incident

_____

_____

Was anyone injured? ◯ Yes ◯ No

(If **Yes**, complete **a** and **b** below)

a. Information Regarding Injured or Ill Employee

Full name: _____

Street: _____

City: _____ **State:** _____ **Zip:** _____

Date of birth: _____ **Sex:** _____

Date hired: _____ **Job title:** _____

b. Information about the Physician or Health Care Professional

Was medical treatment required? ◯ Yes ◯ No

First aid only: ◯ Yes ◯ No

Name of physician/health care professional: _____

If treatment was given away from the worksite, where was it given?

Facility: _____

Street: _____

City: _____ **State:** _____ **Zip:** _____

Was employee treated in emergency room? ◯ Yes ◯ No

Was employee hospitalized overnight as an in-patient? ◯ Yes ◯ No

Did the employee miss a full day of work following the incident? ◯ Yes ◯ No

Date of last day worked: _____

Date of return to work: _____

Number of restricted days of work: _____

Incident Report Form

Information about the Incident:

Date of incident: _____

Time of incident: _____

Location of incident: _____

Were there any witnesses? ○ Yes ○ No

Name and phone number of witness: _____

_____

What was employee doing just before the incident occurred? Describe the activity, as well as the tools, equipment, or material the employee was using. Be specific (e.g., climbing a ladder while carrying roofing materials, spraying chlorine from hand sprayer, daily computer key-entry).

What happened? Tell us how the injury occurred (e.g., when ladder slipped on wet floor, worker fell 20 feet; worker was sprayed with chlorine when gasket broke during replacement; worker developed soreness in wrist over time).

If an injury or illness, what was it? Tell us the part of the body that was affected and how it was affected.

Employer Use Only:

Date Recorded in Incident Log: _____ **By:** _____

Investigation:

Date Investigation Started: _____ **Date Investigation Concluded:** _____

Investigation Team Leader and Title: _____

Investigation Team Member Names and Titles:

Name	Title

Root Cause Determination (attach other sheets as necessary)

Any statements, photographs, sketches, or other documents should be attached to this document.

Incident Report Form

Corrective Actions: *Documentation supporting completion of corrective actions should be attached to this report.

Corrective Action	Person Responsible	Due Date	Completion Date	Completion Notes	Completed By

Appendix B
Job Safety Analysis Documents

Job Safety Analysis

Field Activities – General

Project Name: Former Intalco Smelter Site	**Project Number:** 230002-05.09	**JSA Number:** 001	**Issue Date:** 02/06/2026
Location: 4050 Mountain View Road, Ferndale, Washington 98248	**Contractor:** Anchor QEA	**Analysis by:** Joey Lane	**Analysis Date:** 02/04/2026
Work Operation: Field activities	**Superintendent/Competent Person:**	**Revised by:** Mikayla Bowers	**Revised Date:** 04/15/2025
Required Personal Protective Equipment (PPE): • Modified Level D—Long pants, long sleeves, and/or Tyvek coveralls if handling potentially contaminated media, and steel-toed footwear conforming to ASTM International (ASTM) F2412-05/ASTM F2413-05 • Depending on activity, the following PPE may also be required: safety glasses/splash goggles, hard hat, nitrile outer gloves and latex inner gloves, half-face or full-face APR (OSHA/NIOSH-approved)		**Reviewed by:** Matt Gruber	**Reviewed Date:** 02/04/2026
		Approved by: Heather Gadwa	**Approved Date:** 02/04/2026

Work Activity	Potential Hazards	Preventive or Corrective Measures	Inspection Requirements
Outdoor, physical activity	Slips, trips, and falls	• Avoid walking while writing or texting—maintain a heads-up posture. • Be aware of potentially slippery surfaces and tripping hazards. Use handrails where available. Wear footwear that has sufficient traction. • Maintain good housekeeping practices. Clean up all spills immediately. • Be aware of weather effects on the work area, including wet and/or frozen ground. • Jumping, running, and horseplay are prohibited. • Keep all areas clean and free of debris to prevent any trips and falls. • Be aware of and limit loose clothing or untied shoelaces that may contribute to slips, trip, and falls. • Notify the field team members of any unsafe conditions.	• Routinely inspect work area for unsafe conditions.

Job Safety Analysis

Field Activities – General

Work Activity	Potential Hazards	Preventive or Corrective Measures	Inspection Requirements
Outdoor, physical activity (continued)	Heat stress	• Adjust work schedules, as necessary, to avoid the hottest part of the day. • Take rest breaks as warranted. • Provide shelter (air-conditioned, if possible) or shaded areas to protect personnel during rest periods. • Maintain body fluids at normal levels. • Train workers to recognize the symptoms of heat-related illness.	• Review weather forecast prior to field work. • Monitor workers' physical conditions. • Monitor outside temperature versus worker activity.
	Cold stress	• Provide shelter (enclosed, heated environment) to protect personnel during rest periods. • Educate workers to recognize the symptoms of frostbite and hypothermia. • Use appropriate cold-weather gear, up to and including Mustang-type bib coveralls or jacket/bib combinations. • Consider additional precautions if working near water in cold weather. • Have a dry change of clothing available. • Train workers to recognize the symptoms of cold-related illness.	• Review weather forecast prior to field work. • Monitor workers' physical conditions and PPE. • Monitor outside and water temperature versus worker activity and PPE.
	Rain or snow	• Wear appropriate PPE (rain gear). • Be aware of slip hazards, puddles, and electrical hazards when working in wet conditions. • If extremely cold conditions are forecast, consider additional precautions or postponing work activity.	• Review weather forecast prior to field work. • Inspect PPE daily prior to use. • Routinely inspect work area for deteriorating conditions.
	Sunshine	• Have sunscreen available for ultraviolet protection. • Have abundant water available to prevent dehydration. • Consider wearing wide-brimmed headwear and light-colored, lightweight, sun-blocking clothing.	• Ensure that sunscreen and water are available.
	Lightning	• Do not begin or continue work until lightning subsides for at least 30 minutes. Disconnect and do not use or touch electronic equipment. • Immediately head for shore if on the water and lightning is observed. If not able to get to shore, disconnect and do not use or touch the major electronic equipment, including the radio, throughout the duration of the storm.	• Obtain weather forecast and updates as needed.

Job Safety Analysis

Field Activities – General

Work Activity	Potential Hazards	Preventive or Corrective Measures	Inspection Requirements
Outdoor, physical activity (continued)	High winds	• Wear goggles or safety glasses if dust or debris are visible.	• Review weather forecast prior to field work. • Ensure that goggles or safety glasses are available.
	Biological hazards (flora [e.g., poison ivy and poison sumac] and fauna [e.g., ticks, bees, spiders, and mosquitoes])	• Be aware of likely biological hazards in the work area. • Wear appropriate clothing (i.e., hat, long-sleeve shirt, long pants, leather gloves, boots, and Tyvek coveralls, as appropriate), and apply insect repellant. • Wear hand and arm protection when clearing plants or debris from the work area. • Be aware of potential wildlife and defensive behavior (e.g., nesting birds, or animals with young). • Be aware of the potential for exposure to rodent remains and mouse nests, which may pose a risk of hantavirus. Wear appropriate PPE, including gloves, goggles, and a half- or full-face APR with OSHA/NIOSH-approved organic vapor/HEPA (OV/HEPA) filters.	• Ensure that insect repellent is available. • Inspect clothing and skin for insects (e.g., ticks) after working in insect-prone areas. • Ventilate areas before cleanup to disperse any airborne particles. Open known mice-infested boxes outside. • Use disinfectants to wet down mouse nest-infected areas before cleaning to prevent dust from becoming airborne.
	Noise exposure	• Wear hearing protection in high noise environments or when working around heavy machinery or equipment (action level of 85 decibels averaged over an 8-hour day).	• Ensure that hearing protection is available.

Training Requirements:

- All personnel working on hazardous waste sites must receive appropriate training as required by 29 Code of Federal Regulations (CFR) 1910.120(e), including but not limited to initial 40-hour, 8-hour supervisor, and annual 8-hour refresher trainings.
- Medical clearance must be received on an annual basis as required by 29 CFR 1910.120(f).
- All assigned employees are required to familiarize themselves with the contents of this JSA before starting a work activity and review it with their supervisor during their daily safety meeting.

Job Safety Analysis

Decontamination Activities

Project Name: Former Intalco Smelter Site	**Project Number:** 230002-05.09	**JSA Number:** 002	**Issue Date:** 02/06/2026
Location: 4050 Mountain View Road, Ferndale, Washington 98248	**Contractor:** Anchor QEA	**Analysis by:** Joey Lane	**Analysis Date:** 02/04/2026
Work Operation: Decontamination activities	**Superintendent/Competent Person:** Mikayla Bowers	**Revised by:** Joey Lane	**Revised Date:** 02/04/2026
Required Personal Protective Equipment (PPE): • High-visibility safety vest • Hard hat where overhead hazards and/or heavy equipment are present • U.S. Coast Guard-approved personal flotation device (PFD), if boating (see cold stress section for cold-weather PFD information)		**Reviewed by:** Matt Gruber	**Reviewed Date:** 02/04/2026
		Approved by: Heather Gadwa	**Approved Date:** 02/04/2026

Work Activity	Potential Hazards	Preventive or Corrective Measures	Inspection Requirements
Decontamination area set up	Vehicle or heavy equipment traffic in work area	• Wear high-visibility safety vest and hard hat PPE. • Be alert when working around heavy equipment , especially if wearing hearing protection.	• Ensure that safety vests are available for staff and visitors.
	Muscle strain or injuries from improper lifting	• Use proper lifting techniques or ask for assistance with heavy objects.	• Evaluate weight and center of gravity of heavier items prior to lifting or moving.
	Biological hazards (flora [e.g., poison ivy, and poison sumac] and fauna [e.g., ticks, bees, spiders, mosquitoes, and snakes])	• Be aware of likely biological hazards in the work area. • Wear appropriate clothing (i.e., hat, long-sleeve shirt, long pants, leather gloves, boots, and Tyvek coveralls, as appropriate), and apply insect repellent. • Wear hand and arm protection when clearing plants or debris from the work area.	• Ensure that insect repellent is available. • Inspect clothing and skin for insects (e.g., ticks) after working in insect-prone areas.

Job Safety Analysis

Decontamination Activities

Work Activity	Potential Hazards	Preventive or Corrective Measures	Inspection Requirements
Decontamination activities	Injury from hand and power tool operation (e.g., spatula or drill)	• Be aware of sharp edges on hand tools (e.g., spatulas, knives, drill bits, and saw blades). • Be aware of electrical connections and water hazards when working with electric- or battery-operated tools. • Ensure that all tools are working properly; repair or replace defective tools. Repair when unplugged and off. • Keep guards on power tools when not in use.	• Inspect tools to ensure that they are in good working order. • Inspect electrical connections (if applicable). • Inspect tools periodically to ensure dry and clean operation.
	Noise exposure	• Wear hearing protection in high noise environments or when working around heavy machinery or equipment (action level of 85 decibels averaged over an 8-hour day).	• Ensure that hearing protection is available.
	Slips, trips, and falls	• Avoid walking while writing or texting—maintain a heads-up posture. • Be aware of potentially slippery surfaces and tripping hazards. Use handrails where available. Wear footwear that has sufficient traction. • Maintain good housekeeping practices. Clean up all spills immediately. • Be aware of weather effects on the work area, including wet and/or frozen ground. • Jumping, running, and horseplay are prohibited. • Keep all areas clean and free of debris to prevent any trips and falls. • Notify the field team members of any unsafe conditions.	• Routinely inspect work area for unsafe conditions.
	Ingestion of contaminants or decontamination fluids, or skin or eye contact with contaminants or decontamination fluids	• Wear appropriate PPE to prevent/reduce exposure. • Contact 911, as necessary; perform CPR if breathing stops. • Move exposed person away from source of contamination, and rinse mouth. If exposure to skin occurs, promptly wash contaminated skin using soap or mild detergent and water. Rinse eyes with large amounts of water. • Follow decontamination procedures as outlined in the Health and Safety Plan (HASP).	• Ensure that decontamination procedures are on hand and are reviewed. • Ensure that PPE and rinsing water are available.

Job Safety Analysis

Decontamination Activities

Work Activity	Potential Hazards	Preventive or Corrective Measures	Inspection Requirements
Working outdoors	Heat stress	• Adjust work schedules, as necessary, to avoid the hottest part of the day. • Take rest breaks as warranted. • Provide shelter (air-conditioned, if possible) or shaded areas to protect personnel during rest periods. • Maintain body fluids at normal levels. • Train workers to recognize the symptoms of heat-related illness.	• Review weather forecast prior to field work. • Monitor workers' physical conditions. • Monitor outside temperature versus worker activity.
	Cold stress	• Provide shelter (enclosed, heated environment) to protect personnel during rest periods. • Educate workers to recognize the symptoms of frostbite and hypothermia. • Use appropriate cold-weather gear, up to and including Mustang-type bib coveralls or jacket/bib combinations. • Consider additional precautions if working near water in cold weather. • Have a dry change of clothing available. • Train workers to recognize the symptoms of cold-related illness.	• Review weather forecast prior to field work. • Monitor workers' physical conditions and PPE. • Monitor outside and water temperature versus worker activity and PPE.
	Rain or snow	• Wear appropriate PPE (rain gear). • Be aware of slip hazards, puddles, and electrical hazards when working in wet conditions. • If extremely cold conditions are forecast, consider additional precautions or postponing work activity.	• Review weather forecast prior to field work. • Inspect PPE daily prior to use. • Routinely inspect work area for deteriorating conditions.
	Sunshine	• Have sunscreen available for ultraviolet protection. • Have abundant water available to prevent dehydration. • Consider wearing wide-brimmed headwear and light-colored, lightweight, sun-blocking clothing.	• Ensure that sunscreen and water are available.
	Lightning	• Do not begin or continue work until lightning subsides for at least 30 minutes. Disconnect and do not use or touch electronic equipment.	• Obtain weather forecast and updates as needed.

Job Safety Analysis

Decontamination Activities

Work Activity	Potential Hazards	Preventive or Corrective Measures	Inspection Requirements
Working outdoors (continued)	High winds	• Wear goggles or safety glasses if dust or debris are visible.	• Review weather forecast prior to field work. • Ensure that goggles or safety glasses are available.

Training Requirements:

- All personnel working on hazardous waste sites must receive appropriate training as required by 29 Code of Federal Regulations (CFR) 1910.120(e), including but not limited to initial 40-hour, 8-hour supervisor, and annual 8-hour refresher trainings.
- Medical clearance must be received on an annual basis as required by 29 CFR 1910.120(f).
- All assigned employees are required to familiarize themselves with the contents of this JSA before starting a work activity and review it with their supervisor during their daily safety meeting.

Job Safety Analysis

Anchor QEA Motor Vehicle Operation

Project Name: Former Intalco Smelter Site	**Project Number:** 230002-05.09	**JSA Number:** 003	**Issue Date:** 02/06/2026
Location: 4050 Mountain View Road, Ferndale, Washington 98248	**Contractor:** Anchor QEA	**Analysis by:** Joey Lane	**Analysis Date:** 02/04/2026
Work Operation: Anchor QEA motor vehicle operation	**Superintendent/Competent Person:** Vehicle Driver	**Revised by:** Joey Lane	**Revised Date:** 02/04/2026
Required Personal Protective Equipment (PPE): • Wear seat belt at all times • Make sure that clothing will not interfere with driving		**Reviewed by:** Matt Gruber	**Reviewed Date:** 02/04/2026
		Approved by: Heather Gadwa	**Approved Date:** 02/04/2026

Work Activity	Potential Hazards	Preventive or Corrective Measures	Inspection Requirements
Anchor QEA motor vehicle operation	Unfamiliar with the vehicle	• Allow yourself some time to get familiar with an Anchor QEA vehicle, a rental vehicle, or one not used often. • Test the lights, windshield wipers, hazard lights, horn, parking brake, and other important functions. • Review the dashboard controls, steering radius, and overhead and side clearances. • Allow extra side, front, and back space around the vehicle while driving or parking an unfamiliar vehicle. • Adjust mirrors and the seat while the vehicle is in park. • Drive slowly in confined locations, as in a parking garage, parking lots, or industrial settings. Confirm adequate clearances by sight before turning or backing up in tight or unfamiliar locations. • Use a second person to be a spotter outside the vehicle if needed in tight spaces.	• Inspect fluid levels and air pressure in tires, adjust mirrors and seat positions appropriately, monitor the fuel level, and fill up when the fuel level is low

Job Safety Analysis

Anchor QEA Motor Vehicle Operation

Work Activity	Potential Hazards	Preventive or Corrective Measures	Inspection Requirements
Anchor QEA motor vehicle operation (continued)	Speed and braking	• Fasten and properly adjust the seat belt. • Obey all posted and designated speed limits. • Radar detectors are prohibited in all company-owned, leased, or rented vehicles. • Reduce travel speed during hazardous conditions (e.g., rain, fog, or snow). • Identify whether your vehicle has the Anti-Lock Braking System (ABS). If it does, DO NOT pump the brakes to stop when the vehicle has begun to skid. Apply steady pressure to the brakes. If the vehicle does not have ABS, pump the brakes to stop during slippery conditions.	• Seatbelt • Identify designated speed limits • Determine if vehicle has ABS
	Distance spacing	• Continually check your rear and side view mirrors. • Use the 3-second rule to keep a safe distance between vehicles. • Increase the 3-second rule as necessary during hazardous travel conditions. • Regularly scan the area you will be entering in the next 10 to 12 seconds. • Always leave yourself an “out” during travel. • When stopping, make sure that you leave enough distance between you and the car in front of you. You should be able to see the rear tires of the vehicle in front when stopped. • Obey the speed limit and traffic regulations. • When at a red light and it turns green, use the “delayed start” technique, by counting to three before you take your foot off the brake. • DO NOT TAILGATE. • Keep headlights (and running lights, if available) on for maximum visibility.	• Seatbelt
	Skids	• If the vehicle has begun to skid out of control, turn the steering wheel in the direction of the skid and re-adjust the wheel, as necessary. • Reduce speed during hazardous travel conditions. • Use 4-wheel drive, if available, when driving vehicles off-road, on steep inclines, or in muddy conditions. • Do not take vehicles off-road if they cannot be operated safely in such conditions.	• Seatbelt

Job Safety Analysis

Anchor QEA Motor Vehicle Operation

Work Activity	Potential Hazards	Preventive or Corrective Measures	Inspection Requirements
Anchor QEA motor vehicle operation (continued)	Blind spots	• Become familiar with any blind spots associated with your vehicle. • Adjust mirrors to give the maximum viewing area. • Use your directional devices to signal all turns and when changing lanes; check rear and side view mirror and glance over your shoulder to check that the lane is clear. • Avoid other driver's blind spots; slow down and let the other vehicle pass. • If parked for an extended period and staying in the vehicle, be sure to inspect the area for changed conditions (e.g., a car that moved in behind you) before leaving.	• Seatbelt • Mirrors
	Backing	• Back into parking spaces upon arrival whenever possible. • Perform a 360-degree walk around the vehicle before backing to identify any new conditions or obstructions. • Use a spotter when backing whenever possible. • Understand hand signals. • Sound the horn prior to backing. • Check the rear and side view mirrors prior to backing. • Back slowly in areas of obstructed vision. • Anticipate others who may be backing out into your pathway and adjust accordingly.	• Seatbelt • Mirrors
	Distractions (e.g., cell phones, reading maps or directions, eating)	• Do not engage in distracted driving—focus on operating the vehicle, and on your surroundings (e.g., road conditions and other drivers). • Obey state or local laws regarding cell phone use, at a minimum. • Certain clients prohibit cell phone use regardless of the state you are operating in—know your client's policy. • Use hands-free devices (not hand-held cellular phones) while driving. • Pull over to the side of the road when making a call or checking directions.	• Seatbelt • Hands-free devices connected and ready for use
	Accidents	• In the event of an accident, use the following procedures: – Stop, call for medical assistance, notify police, and complete an accident report and submit it to your supervisor. – Notify the Project Manager (PM) and Field Lead (FL). – Complete the appropriate incident investigation reports. – Contact Sara Weiskotten, Operations Liaison, at (857) 445-4987. – Contact Diana Reynolds, Insurance Liaison, at (302) 236-8403.	• Seatbelt

Job Safety Analysis

Anchor QEA Motor Vehicle Operation

Work Activity	Potential Hazards	Preventive or Corrective Measures	Inspection Requirements
Anchor QEA motor vehicle operation (continued)	Influenced by drugs or alcohol	• NEVER DRIVE UNDER THE INFLUENCE OF DRUGS OR ALCOHOL. • Keep in mind that the person in another vehicle may be under the influence of controlled substances, and be prepared for erratic or sudden driving changes on their part.	• Seatbelt
	Driver attitude	• Do not operate any vehicle when abnormally tired, temporarily disabled (i.e., injured), or under the influence of drugs or alcohol. • Keep an even temper when driving. Do not let the actions of others affect your attitude. • Do not allow yourself to become frustrated, rushed, distracted, or drowsy.	• Seatbelt
	Fatigue	• Stop and rest if fatigued. Exit the road and enter a safe area. Rest until fully refreshed. • Be aware that certain medications (such as cold or allergy medicines) may make you drowsy when driving a vehicle.	• Seatbelt
	Vehicle loading	• DO NOT OVERLOAD the vehicle. • Secure all equipment and supplies within the body of the vehicle using proper tie-downs. • Do not block side view mirrors with the load. • Do not transport U.S. Department of Transportation (DOT)-manifested hazardous materials. • Dispatch all equipment and personnel with proper forms and identification.	• Seatbelt
	Equipment failure	• Perform daily inspections of your vehicle. • Maintain vehicle safety equipment (e.g., mirrors, alarms, horns, wipers, lights, and brakes). • Maintain the vehicle (e.g., tire pressure and fluid levels). • Any vehicle with mechanical defects that may endanger the safety of the driver, passengers, or the public shall not be used. • Ensure that appropriate safety equipment is in the vehicle. Safety equipment should include a spare tire, jack, first-aid kit, fire extinguisher, and flashlight. Flares and/or reflective triangles should be available in larger trucks. • Ensure that the proper documentation is in the vehicle. Documentation should include an operations manual for the vehicle, insurance card, vehicle registration, and accident forms.	• Inspect and maintain the vehicle

Job Safety Analysis

Anchor QEA Motor Vehicle Operation

Training Requirements:

- All drivers are required to have a valid driver's license, and all vehicles must have appropriate state vehicle registration and inspection stickers. The use of hand-held wireless devices is prohibited while driving any vehicle for business use at any time, for personal use during business hours, and as defined by law.
- All assigned employees are required to read, familiarize themselves with the contents of this Job Safety Analysis, and sign the signature page before the operation of an Anchor QEA vehicle, and review it with their supervisor during their daily safety meeting.
- All assigned employees are required to complete required annual driver training.

Job Safety Analysis

Anchor QEA Motor Vehicle Operation

Vehicle Operation Job Safety Analysis Acknowledgement Form

The Anchor QEA Motor Vehicle Operation Job Safety Analysis must be read, understood, and signed before the operation of any Anchor QEA vehicle. My signature below certifies that I have read and understand the procedures presented in the Anchor QEA Motor Vehicle Operation Job Safety Analysis and have completed annual driver training.

Date	Name (print)	Signature

Job Safety Analysis

Anchor QEA Motor Vehicle Operation

Date	Name (print)	Signature

Job Safety Analysis

Sample and Laboratory Glassware Handling

Project Name: Former Intalco Smelter Site	**Project Number:** 230002-05.09	**JSA Number:** 004	**Issue Date:** 02/06/2026
Location: 4050 Mountain View Road, Ferndale, Washington 98248	**Contractor:** Anchor QEA	**Analysis by:** Joey Lane	**Analysis Date:** 02/04/2026
Work Operation: Sample and laboratory glassware handling	**Superintendent/Competent Person:** Mikayla Bowers	**Revised by:** Joey Lane	**Revised Date:** 02/04/2026
Required Personal Protective Equipment (PPE): • Modified Level D—Long pants, long sleeves, and/or Tyvek coveralls if handling potentially contaminated media, and steel-toed footwear conforming to ASTM International (ASTM) F2412-05/ASTM F2413-05 • Depending on activity, the following PPE may also be required: safety glasses/splash goggles, hard hat, and nitrile outer gloves.		**Reviewed by:** Matt Gruber	**Reviewed Date:** 02/04/2026
		Approved by: Heather Gadwa	**Approved Date:** 02/06/2026

Work Activity	Potential Hazards	Preventive or Corrective Measures	Inspection Requirements
Transporting and using glassware	Breakage of containers during field activities	• Use appropriately sized tubs or bottle carriers with dividers to prevent bottle-to-bottle contact during transport. • Consider using coated glassware, if practicable. • Carry oversize bottles in tubs or bottle carriers using both hands.	• Ensure dividers are sufficient and will remain in place during transport.
	Faulty glassware	• Replace any glassware that is chipped, nicked, or cracked.	• Inspect glassware before use.
	Impact with equipment and other objects	• Use care when loading and unloading sampling equipment. • Minimize the handling of individual containers to the extent possible.	
Filling sample containers	Over-tightening of bottle lids causing breakage	• Avoid use of excessive force to tighten bottle caps (i.e., finger tight). • Secure lids with clear tape to prevent opening during transport.	
	Breakage during sample collection	• Place containers in plastic tubs between aliquots to limit contact with hard surfaces. • Place containers on a stable and non-slip surface during collection. • Use the buddy system as needed to hold bottles during filling.	

Job Safety Analysis

Sample and Laboratory Glassware Handling

Work Activity	Potential Hazards	Preventive or Corrective Measures	Inspection Requirements
Filling sample containers (continued)	Contact with sample preservatives (generally HCL or H_2SO_4 to lower pH to less than 2)	• Wear nitrile gloves and protective eyewear to prevent skin and eye contact if a container is damaged. • Do not open preserved bottles until necessary.	
Packing samples for shipment	Breakage during packing and shipment	• Use bottle wraps, foam sleeves, or bubble wrap to prevent bottle contact in the cooler. • Pack coolers snugly, but do not over pack.	• Ensure glass bottles do not touch to minimize potential breakage during transport.
Unpacking glassware returned from a laboratory	Breakage during packing and shipment	• Carefully inspect cooler contents prior to reaching in with hands. • If glassware is broken, utilize cut-resistant gloves or no-touch tool to remove from cooler.	• Ensure glassware did not break during packing or shipment.
	Contact with sample preservatives (generally HCL or H_2SO_4 to lower pH to less than 2)	• Wear nitrile gloves and protective eyewear to prevent skin and eye contact in the event that glassware preservatives have leaked into the cooler.	• Look for unexpected moister in cooler.

Training Requirements:

- All personnel working on hazardous waste sites must receive appropriate training as required by 29 Code of Federal Regulations (CFR) 1910.120(e), including, but not limited to initial 40-hour, 8-hour supervisor, and annual 8-hour refresher trainings.
- Medical clearance must be received on an annual basis as required by 29 CFR 1910.120(f).
- All assigned employees are required to familiarize themselves with the contents of this JSA before starting a work activity and review it with their supervisor during their daily safety meeting.

Job Safety Analysis

Groundwater Sampling

Project Name: Former Intalco Smelter Site	**Project Number:** 230002-05.09	**JSA Number:** 005	**Issue Date:** 02/06/2026
Location: 4050 Mountain View Road, Ferndale, Washington 98248	**Contractor:** Anchor QEA	**Analysis by:** Joey Lane	**Analysis Date:** 2/04/2026
Work Operation: Groundwater sampling	**Superintendent/Competent Person:** Mikayla Bowers	**Revised by:** Joey Lane	**Revised Date:** 2/04/2026
Required Personal Protective Equipment (PPE): • Modified Level D—See Table 5-1 of the Health and Safety Plan (HASP)		**Reviewed by:** Matt Gruber	**Reviewed Date:** 02/04/2026
		Approved by: Heather Gadwa	**Approved Date:** 02/04/2026

Work Activity	Potential Hazards	Preventive or Corrective Measures	Inspection Requirements
If using glassware		• Follow the Job Safety Analysis (JSA) for handling glassware.	
Groundwater sample retrieval	Slips, trips, and falls	• Avoid walking while writing or texting—maintain a heads-up posture. • Be aware of potentially slippery surfaces, thick mud, and tripping hazards. Use handrails where available. Wear footwear that has sufficient traction. • Maintain good housekeeping practices. Clean up all spills immediately. • Be aware of weather effects on the work area, including wet and/or frozen ground. • Jumping, running, and horseplay are prohibited. • Keep all areas clean and free of debris to prevent any trips and falls. • Notify the field team members of any unsafe conditions.	• Routinely inspect work area for unsafe conditions.
	Ingestion of contaminants, or skin or eye contact with contaminants	• Wear appropriate PPE to prevent or reduce exposure. • Contact 911 if necessary, and perform cardiopulmonary resuscitation (CPR) if breathing stops. • Move the exposed person away from the source of contamination and rinse their mouth. If skin exposure occurs, promptly wash the contaminated skin using soap or mild detergent and water. If eye exposure occurs, rinse the eyes with large amounts of water. • Follow decontamination procedures as outlined in the HASP.	• Ensure that decontamination procedures are on hand and are reviewed. • Ensure that PPE and rinsing water are available.

Job Safety Analysis

Groundwater Sampling

Work Activity	Potential Hazards	Preventive or Corrective Measures	Inspection Requirements
Groundwater sample retrieval (continued)	Pinch points	• Maintain a safe distance from closing mechanisms and moving parts on sampling gear.	• Routinely inspect work area for unsafe conditions.
	Biological hazards (flora [e.g., poison ivy and poison sumac] and fauna [e.g., ticks, bees, spiders, and mosquitoes])	• Be aware of likely biological hazards in the work area. • Wear appropriate clothing (i.e., hat, long-sleeve shirt, long pants, leather gloves, and boots as appropriate). • Wear hand and arm protection when clearing plants or debris from the work area. • Be aware of potential wildlife and defensive behavior (e.g., nesting birds, or animals with young).	• Inspect clothing and skin for insects (e.g., ticks) after working in insect-prone areas.
	Muscle strain or injuries from improper lifting	• Use proper lifting techniques or ask for assistance with heavy objects, buckets, or other unwieldy equipment.	• Evaluate weight and center of gravity of heavier items prior to lifting or moving.
	Noise exposure	• Wear hearing protection in high-noise environments or when working around heavy machinery or equipment (action level of 85 decibels averaged over an 8-hour day).	• Ensure that hearing protection is available.
Outdoor, physical activity	Heat stress	• Adjust work schedules, as necessary, to avoid the hottest part of the day. • Take rest breaks as warranted. • Provide shelter (air conditioned, if possible) or shaded areas to protect personnel during rest periods. • Maintain body fluids at normal levels. • Train workers to recognize the symptoms of heat-related illness.	• Review weather forecast prior to field work. • Monitor workers' physical conditions. • Monitor outside temperature versus worker activity.
	Cold stress	• Provide shelter (enclosed, heated environment) to protect personnel during rest periods. • Educate workers to recognize the symptoms of frostbite and hypothermia. • Use appropriate cold-weather gear, up to and including Mustang-type bib coveralls or jacket/bib combinations. • Consider additional precautions if working near water in cold weather. • Have a dry change of clothing available. • Train workers to recognize the symptoms of cold-related illness.	• Review weather forecast prior to field work. • Monitor workers' physical conditions and PPE. • Monitor outside and water temperature versus worker activity and PPE.

Job Safety Analysis

Groundwater Sampling

Work Activity	Potential Hazards	Preventive or Corrective Measures	Inspection Requirements
Outdoor, physical activity (continued)	Rain or snow	• Wear appropriate PPE (rain gear). • Be aware of slip hazards, puddles, and electrical hazards when working in wet conditions. • If extremely cold conditions are forecast, consider additional precautions or postponing work activity.	• Review weather forecast prior to field work. • Inspect PPE daily prior to use. • Routinely inspect work area for deteriorating conditions.
	Sunshine	• Have sunscreen available for ultraviolet protection. • Have abundant water available to prevent dehydration. • Consider wearing wide-brimmed headwear and light-colored, lightweight, sun-blocking clothing.	• Ensure sunscreen and water are available.
	Lightning	• Do not begin or continue work until lightning subsides for at least 30 minutes. Disconnect and do not use or touch electronic equipment. • Immediately head for shore if on the water and lightning is observed. If not able to get to shore, disconnect and do not use or touch the major electronic equipment, including the radio, throughout the duration of the storm.	• Obtain weather forecast and updates as needed.
	High winds	• Wear goggles or safety glasses if dust or debris are visible.	• Review weather forecast prior to field work. • Ensure that goggles or safety glasses are available.

Job Safety Analysis

Groundwater Sampling

Training Requirements:

- All personnel working on hazardous waste sites must receive appropriate training as required by 29 Code of Federal Regulations (CFR) 1910.120(e), including but not limited to initial 40-hour, 8-hour supervisor, and annual 8-hour refresher trainings.
- Medical clearance must be received on an annual basis as required by 29 CFR 1910.120(f).
- All assigned employees are required to familiarize themselves with the contents of this JSA before starting a work activity and review it with their supervisor during their daily safety meeting.

Job Safety Analysis

Soil and Building Material Sampling

Project Name: Former Intalco Smelter Site	**Project Number:** 230002-05.09	**JSA Number:** 006	**Issue Date:** 02/06/2026
Location: 4050 Mountain View Road, Ferndale, Washington 98248	**Contractor:** Anchor QEA	**Analysis by:** Joey Lane	**Analysis Date:** 02/04/2026
Work Operation: Soil sampling and well installation	**Superintendent/Competent Person:** Mikayla Bowers	**Revised by:** Joey Lane	**Revised Date:** 02/04/2026
Required Personal Protective Equipment (PPE): • Modified Level D—See Table 5-1 of the Health and Safety Plan (HASP) • Level C if dusty conditions persist		**Reviewed by:** Matt Gruber	**Reviewed Date:** 02/04/2026
		Approved by: Heather Gadwa	**Approved Date:** 02/04/2026

Work Activity	Potential Hazards	Preventive or Corrective Measures	Inspection Requirements
Health and safety tailgate meeting	General	• Park the vehicle in a safe area where everyone can participate. • Review the HASP, especially chemical and site hazards, Job Safety Analyses (JSAs), work activities, access and egress, facility rules (if applicable), and site-specific hospital/emergency care. • Determine operation of other on-site workers. • Discuss any new or unknown hazards.	• Follow the JSA for Motor Vehicle Operation. • Complete daily tailgate form.
Review site conditions	Slips, trips, and falls	• Ensure drilling areas are free of trip hazards. Be aware of wet and muddy conditions. • Remove hazards if possible.	• Conduct site walk and inspect work area prior to equipment setup.
	Biological hazards	• Identify any poisonous plants common to the area. • Be aware of snakes, bees, ants, and other stinging insects.	• Wear appropriate clothing and bug repellent as necessary.
	Utility damage	• Prior to ground disturbance, verify the location of known and suspected utilities. • Be observant of pavement repairs indicative of utilities. • Require the property owner or client to verify the absence of utilities for all drilling locations. • If it appears a utility has not been marked, contact the site Project Manager (PM).	• Document completion of Utility Clearance.

Job Safety Analysis

Soil and Building Material Sampling

Work Activity	Potential Hazards	Preventive or Corrective Measures	Inspection Requirements
Set up work area	Traffic hazards	• If working in a trafficked area, secure the work area with reflective cones and park in a safe area. • Use a spotter while moving vehicles and equipment.	• Routinely inspect work area for unsafe conditions.
	Slips, trips, and falls	• Set up work area with clear walking paths, devoid of tripping hazards. • Be aware of potentially slippery surfaces, thick mud, and tripping hazards. Wear footwear that has sufficient traction. • Maintain good housekeeping practices. Clean up all spills immediately. • Be aware of weather effects on the work area, including wet and/or frozen ground. • Keep all areas clean and free of debris to prevent any trips and falls. • Notify the field team members of any unsafe conditions.	• Routinely inspect work area for unsafe conditions.
	Ergonomic hazards	• Use proper lifting techniques when unloading equipment; lift with legs, avoiding twisting or over-reaching while lifting. • Use two or more people to lift when necessary. • Wear work gloves to avoid hand injuries.	• Routinely inspect work area for unsafe conditions.
Soil and building material sample collection	Personal injury	• Test kill switches before each workday. • Beware of the pinch points on tools in case of emergency. • Maintain a spill kit , fire extinguisher, and first-aid kit in case of emergencies. • Conduct air monitoring as specified in HASP. • Be sure all heavy equipment is secured and powered off before retrieving sample if sampling from an excavator. • Stand clear of swing/operation radius while excavators are in operation. • Communicate with excavator operator and staff to ensure that all personnel are clear of the work area prior to resuming excavation.	• Routinely inspect work area for unsafe conditions.
	Utility damage	• If additional utilities are discovered, stop work immediately and contact the PM.	• Routinely inspect work area for unsafe conditions.
	Slips, trips, and falls	• Ensure tools (e.g., hand drill or auger) are stored neatly. • Ensure all drill and support equipment staging areas are roped or barricaded clearly to prevent public access	• Routinely inspect work area for unsafe conditions.
	Chemical hazards	• Wear PPE, including safety glasses and nitrile gloves. • Decontaminate equipment between drilling locations.	• Monitor workers' PPE. • Routinely inspect work area for unsafe conditions.

Job Safety Analysis

Soil and Building Material Sampling

Work Activity	Potential Hazards	Preventive or Corrective Measures	Inspection Requirements
	Noise exposure	• Wear ear plugs or earmuffs the sound level is above 85 decibels (dB).	• Monitor workers' PPE.
Soil and building material sample collection (continued)	Inhalation hazards	• Wet the material, if necessary, to prevent airborne dust.	• Review air monitoring action levels. • Monitor workers' PPE.
Advance geoprobe borings	Personal injury	• Only drillers and helpers may approach the rig while it is in use. • Test kill switches before each workday. • Beware of getting hands or body parts caught in the drill rig. • Request for the operator to point out all of the pinch points on the drill rig in case of emergency. • Maintain a spill kit (for the drill rig), fire extinguisher, and first-aid kit in case of emergencies. • Conduct air monitoring as specified in HASP. Set alarms or stand away from the rig.	• Routinely inspect work area for unsafe conditions.
	Utility damage	• If additional utilities are discovered, stop work immediately and contact the PM.	• Routinely inspect work area for unsafe conditions.
	Slips, trips, and falls	• Ensure tools and drill rods are stored neatly. • Ensure all drill and support equipment staging areas are roped or barricaded clearly to prevent public access	• Routinely inspect work area for unsafe conditions.
	Chemical hazards	• Wear PPE, including safety glasses and nitrile gloves. • Decontaminate equipment between drilling locations.	• Monitor workers' PPE. • Routinely inspect work area for unsafe conditions.
	Noise exposure	• Wear ear plugs or earmuffs when in the vicinity of the drill rig or anywhere where the sound level is above 85 decibels (dB).	• Monitor workers' PPE.
	Inhalation hazards	• Wet the ground, if necessary, to prevent airborne dust. • Wear a dust mask while mixing Portland cement.	• Review air monitoring action levels. • Monitor workers' PPE.

Job Safety Analysis

Soil and Building Material Sampling

Work Activity	Potential Hazards	Preventive or Corrective Measures	Inspection Requirements
Material sample retrieval	Slips, trips, and falls	• Be aware of potentially slippery surfaces, thick mud, and tripping hazards. Wear footwear that has sufficient traction. • Maintain good housekeeping practices. Clean up all spills immediately. • Be aware of weather effects on the work area, including wet and/or frozen ground. • Keep all areas clean and free of debris to prevent any trips and falls. • Notify the field team members of any unsafe conditions.	• Routinely inspect work area for unsafe conditions.
	Chemical hazards	• Wear PPE, including safety glasses and appropriate gloves for the chemical hazard anticipated, when in contact with soil. • Decontaminate equipment between drilling locations and soil sample intervals.	• Monitor workers' PPE. • Routinely inspect work area for unsafe conditions.
	Noise exposure	• Wear ear plugs or earmuffs when the sound level is above 85 dB.	• Monitor workers' PPE.
	Inhalation hazards	• Wet material, if necessary, to prevent airborne dust.	• Review air monitoring action levels. • Monitor workers' PPE.
	Ingestion of contaminants, or skin or eye contact with contaminants	• Wear appropriate PPE to prevent or reduce exposure. • Contact 911 if necessary, and perform cardiopulmonary resuscitation (CPR) if breathing stops. • Move the exposed person away from the source of contamination and rinse their mouth. If skin exposure occurs, promptly wash the contaminated skin using soap or mild detergent and water. If eye exposure occurs, rinse the eyes with large amounts of water. • Follow decontamination procedures as outlined in the Health and Safety Plan (HASP).	• Ensure that decontamination procedures are on hand and are reviewed. • Ensure that PPE and rinsing water are available.

Job Safety Analysis

Soil and Building Material Sampling

Training Requirements:

- All personnel working on hazardous waste sites must receive appropriate training as required by 29 Code of Federal Regulations (CFR) 1910.120(e), including, but not limited to, initial 40-hour, 8-hour supervisor, and annual 8-hour refresher trainings.
- Medical clearance must be received on an annual basis as required by 29 CFR 1910.120(f).
- All assigned employees are required to familiarize themselves with the contents of this JSA before starting a work activity and review it with their supervisor during their daily safety meeting.

Job Safety Analysis

Investigation-Derived Waste Management

Project Name: Former Intalco Smelter Site	**Project Number:** 230002-05.09	**JSA Number:** 007	**Issue Date:** 02/06/2026
Location: 4050 Mountain View Road, Ferndale, Washington 98248	**Contractor:** Anchor QEA	**Analysis by:** Joey Lane	**Analysis Date:** 02/04/2026
Work Operation: Investigation-derived waste management	**Superintendent/Competent Person:** Mikayla Bowers	**Revised by:** Joey Lane	**Revised Date:** 02/04/2026
Required Personal Protective Equipment (PPE): • Modified Level D—Long pants, long sleeves, and/or Tyvek coveralls if handling potentially contaminated media, and steel-toed footwear conforming to ASTM International (ASTM) F2412-05/ASTM F2413-05 • Depending on activity, the following PPE may also be required: safety glasses/splash goggles, hard hat, and nitrile outer gloves.		**Reviewed by:** Matt Gruber	**Reviewed Date:** 02/04/2026
		Approved by: Heather Gadwa	**Approved Date:** 02/04/2026

Work Activity	Potential Hazards	Preventive or Corrective Measures	Inspection Requirements
Containerizing investigation-derived waste (IDW) at the source	Lifting	• Use care when lifting to redistribute IDW from one container (e.g., drums and buckets) to another at the source. • Seek assistance if loads are too heavy, or if you are experiencing fatigue. • Fill containers only to the degree that will be manageable in the future (e.g., half full) and to limit weight.	• Inspect containers for competency (i.e., no cracks, and handles in good repair).
	Pinch points	• Wear hand protection when closing containers. • Use the buddy system when affixing drum rings.	• Inspect drums for rust or sharp edges prior to opening or closing.
Relocating or staging IDW containers	Lifting	• Use task-specific tools whenever possible to move full containers (i.e., hoists, drum caddies or dollies, and vehicles). • When task-specific tools are not available, use the buddy system to move containers that are reasonable to lift. • Never roll drums or containers holding IDW. • Stage containers in areas protected from heavy traffic and weather, if possible.	• Ensure tools are in good repair. • Assess IDW container weight prior to moving.

Job Safety Analysis

Investigation-Derived Waste Management

Work Activity	Potential Hazards	Preventive or Corrective Measures	Inspection Requirements
Relocating or staging IDW containers (continued)	Pinch points or crushing	• Use tools to achieve the final arrangement when staging containers—do not place hands on the edges of containers while moving them into place. • Stand well clear of containers being moved in case they become dislodged from their handling tool during transport. • Do not stack IDW containers, as this poses a risk for container toppling and damage. • Place containers on a pallet for easy transfer using a pallet jack, if possible. • If transporting containers on a pallet, strap or band the containers together to prevent them from falling off.	• Inspect drums for evidence of cracks or rust.
IDW management – general	Splash	• Wear the required PPE at all times. • Use care to minimize splashing or smearing of IDW during handling and containerization.	• Inspect PPE upon donning and periodically during tasks.

Training Requirements:

- All personnel working on hazardous waste sites must receive appropriate training as required by 29 Code of Federal Regulations (CFR) 1910.120(e), including but not limited to initial 40-hour, 8-hour supervisor, and annual 8-hour refresher trainings.
- Medical clearance must be received on an annual basis as required by 29 CFR 1910.120(f).
- All assigned employees are required to familiarize themselves with the contents of this JSA before starting a work activity and review it with their supervisor during their daily safety meeting.

Job Safety Analysis

Hantavirus Contamination

Project Name: Former Intalco Smelter Site	**Project Number:** 230002-05.09	**JSA Number:** 008	**Issue Date:** 5/22/2025
Location: 4050 Mountain View Road, Ferndale, Washington 98248	**Contractor:** Anchor QEA	**Analysis by:** Matt Gruber	**Analysis Date:** 5/22/2025
Work Operation: Hantavirus Contamination	**Superintendent/Competent Person:** Mikayla Bowers	**Revised by:** Mikayla Bowers	**Revised Date:** 5/22/2025
Required Personal Protective Equipment (PPE): • Half-face HEPA-filter respirator (per OSHA respiratory program) • Disposable coveralls • Rubber or nitrile gloves • Eye protection (goggles or face shield) • Disposable shoe covers		**Reviewed by:** Matt Gruber	**Reviewed Date:** 5/22/2025
		Approved by: Heather Gadwa	**Approved Date:** 05/23/2025

Work Activity	Potential Hazards	Preventive or Corrective Measures	Inspection Requirements
Entering potentially contaminated area	Inhalation of airborne virus particles	• Ventilate area for 30+ minutes before entry. • Use fans (avoid standing downwind). • Wear HEPA respirator, goggles, gloves, disposable coveralls, and shoe covers. • Limit access to qualified employees.	• Ensure affected employees are trained. • Inspect area for potential contamination. • Ensure that controls (engineering, administrative, and PPE) are implemented.
Cleaning rodent droppings or nests	Inhalation of airborne virus particles	• Spray area with bleach solution (1:10 bleach to water) before disturbing. • Avoid sweeping or vacuuming dry debris. • Use wet mopping or damp cloths.	• Ensure that required PPE is used.

Job Safety Analysis

Hantavirus Contamination

Work Activity	Potential Hazards	Preventive or Corrective Measures	Inspection Requirements
Handing documents (books, paper and other non-washable items	Inhalation of airborne virus particles	• Leave items in the sunlight for several hours, or leave items in a contaminant-free indoor area for a minimum of three weeks, six weeks suggested. • Utilize required PPE.	• Inspect workplace for potential contamination.
Demobilization and waste disposal	Inhalation of airborne virus particles	• Decontaminate PPE before removal, specifically coveralls, gloves and boots. • Remove PPE carefully follow this order: shoe covers → coveralls → goggles → respirator → gloves. • Double-bag contaminated PPE: Place used PPE in a plastic bag, seal it, then place that bag into a second bag and seal again. • Label the bag as “Biohazard.” • Dispose according to local regulations; contact your local health department or environmental services for guidance. • Hand hygiene: Wash hands for 20 seconds with soap and water.	• Inspect workplace for demobilization and waste.

Job Safety Analysis

Hantavirus Contamination

Training Requirements:

- Train workers on Hantavirus symptoms and transmission.
- Post warning signs in contaminated areas.
- Ensure medical evaluation and fit testing for respirator use.
- Maintain hygiene and decontamination protocols.

Reference

CDC (Centers for Disease Control and Prevention), 2024. “How to Clean Up After Rodents.” https://www.cdc.gov/healthy-pets/rodent-control/clean-up.html.

Job Safety Analysis

Drilling Oversight

Project Name: Former Intalco Smelter Site	**Project Number:** 230002-05.09	**JSA Number:** 009	**Issue Date:** 2026/02/06
Location: 4050 Mountain View Road, Ferndale, Washington 98248	**Contractor:** Anchor QEA	**Analysis by:** Mikayla Bowers	**Analysis Date:** 7/16/2025
Work Operation: Drilling	**Superintendent/Competent Person:** Mikayla Bowers	**Revised by:** Mikayla Bowers	**Revised Date:** 7/16/2025
Required Personal Protective Equipment (PPE): • Modified Level D—Standard work uniform/coveralls, work boots conforming to ASTM F2412-05, traffic safety vest conforming to ANSI 107, safety glasses conforming to ANSI Z87.1 with permanently installed side shields, hard hat conforming to ANSI Z89, hearing protection conforming to ANSI S12.42		**Reviewed by:** Tim Shaner	**Reviewed Date:** 7/18/2025
		Approved by: Heather Gadwa	**Approved Date:** 02/04/2026

Work Activity	Potential Hazards	Preventive or Corrective Measures	Inspection Requirements
Health and safety tailgate meeting	General	• Park the vehicle in a safe area where everyone can participate. • Review the HASP, especially chemical and site hazards, Job Safety Analyses (JSAs), work activities, access and egress, facility rules (if applicable), and site-specific hospital/emergency care. • Determine operation of other on-site workers. • Discuss any new or unknown hazards.	• Follow the JSA for Motor Vehicle Operation. • Complete daily tailgate form.
Drilling activities	Muscle strain or injuries from improper lifting	• Use proper lifting techniques or ask for assistance with heavy objects.	• Evaluate weight and center of gravity of heavier items prior to lifting/moving.
	Noise exposure	• Wear hearing protection in high noise environments or when working around heavy machinery or equipment (action level of 85 decibels averaged over an 8-hour day).	• Ensure that hearing protection is available.

Job Safety Analysis

Drilling Oversight

Work Activity	Potential Hazards	Preventive or Corrective Measures	Inspection Requirements
Drilling activities (continued)	Rotating and moving equipment	• Set up borehole logging station in area well clear of drill rig and drilling activities. • Set up borehole logging station in an upwind location, if possible. • Stay clear of drill rig while drill rig is in operation.	• Get visual contact with driller and ensure driller has shut down rig before approaching drilling work area. • Confirm with driller that borehole logging station will not be in a potentially hazardous location.
	Utility damage	• Prior to ground disturbance, verify the location of known and suspected utilities. • Be observant of pavement repairs indicative of utilities. • Require the property owner or client to verify the absence of utilities for all drilling locations. • If it appears a utility has not been marked, contact the site Project Manager (PM).	• Document completion of Utility Clearance.
	Traffic	• Use methods such as cones, signs, lights, and caution tape to divert and slow traffic near work site.	• Evaluate work site for traffic hazards before commencing work.
	Moving support vehicles or forklifts	• Set up borehole logging station in area well clear of moving vehicles and work zones.	• Confirm with driller that borehole logging station will not be in a potentially hazardous location.
	Slips, trips, and falls	• Stay clear of drilling contractor work zones, if possible. • Ensure drilling areas are free of trip hazards. Be aware of wet and muddy conditions. • Remove hazards if possible.	• Inspect ground surface for uneven surfaces or equipment before entering a work area.
	Overhead hazards	• Keep adequate distance between yourself and heavy overhead hazards, such as drill tooling and samplers. • Stay clear of drill rig while drill rig is in operation. • Wear appropriate PPE.	• Evaluate cables and connectors for overhead objects.

Job Safety Analysis

Drilling Oversight

Work Activity	Potential Hazards	Preventive or Corrective Measures	Inspection Requirements
Drilling activities (continued)	Personal injury	• Only drillers and helpers may approach the rig while it is in use. • Test kill switches before each workday. • Beware of getting hands or body parts caught in the drill rig. • Request for the operator to point out all of the pinch points on the drill rig in case of emergency. • Maintain a spill kit (for the drill rig), fire extinguisher, and first-aid kit in case of emergencies. • Conduct air monitoring as specified in HASP. Set alarms or stand away from the rig.	• Routinely inspect work area for unsafe conditions.
	Chemical hazards	• Wear PPE, including safety glasses and nitrile gloves. • Decontaminate equipment between drilling locations.	• Monitor workers' PPE. • Routinely inspect work area for unsafe conditions.
	Inhalation hazards	• Wet the ground, if necessary, to prevent airborne dust.	• Review air monitoring action levels. • Monitor workers' PPE.

Job Safety Analysis

Drilling Oversight

Training Requirements:

- All personnel working on hazardous waste sites must receive appropriate training as required by 29 Code of Federal Regulations (CFR) 1910.120(e), including, but not limited to initial 40-hour and annual 8-hour refresher training.
- Medical clearance must be received on an annual basis as required by 29 CFR 1910.120 (f).
- All assigned employees are required to familiarize themselves with the contents of this JSA before starting a work activity.

Job Safety Analysis

Soil Excavations and Earthworks

Project Name: Former Intalco Smelter Site	**Project Number:** 230002-05.09	**JSA Number:** 010	**Issue Date:** 02/06/2026
Location: 4050 Mountain View Road, Ferndale, Washington 98248	**Contractor:** Anchor QEA	**Analysis by:** Joey Lane	**Analysis Date:** 02/04/2026
Work Operation: Soil excavations and earthworks	**Superintendent/Competent Person:** Mikayla Bowers	**Revised by:** Joey Lane	**Revised Date:** 02/04/2026
Required Personal Protective Equipment (PPE): • Modified Level D—Long pants, long sleeves, and/or Tyvek coveralls if handling potentially contaminated media, and steel-toed footwear conforming to ASTM International (ASTM) F2412-05/ASTM F2413-05 • Depending on activity, the following PPE may also be required: safety glasses/splash goggles, hard hat, nitrile outer gloves and latex inner gloves, and, if boating, U.S. Coast Guard-approved personal flotation device (PFD; see cold stress section for cold-weather PFD information)		**Reviewed by:** Tim Shaner	**Reviewed Date:** 7/18/2025
		Approved by: Heather Gadwa	**Approved Date:** 02/04/2026

Work Activity	Potential Hazards	Preventive or Corrective Measures	Observation/Inspection Requirements
Health and Safety tailgate meeting	General	• Park the vehicle in a safe area where everyone can participate. Review the HASP, especially chemical and site hazards, Job Safety Analyses (JSAs), work activities, access and egress, facility rules if applicable, and site-specific hospital/emergency care. Determine operation of other workers on site. Discuss any new or unknown hazard. • Follow all safety procedures required by the excavating contractor.	
Inspecting equipment	Mechanical hazards	• Confirm that equipment is in proper working order. • Always use appropriate PPE (see PPE requirements above).	• Inspect equipment before every use. Specific inspection checklist may apply.

Job Safety Analysis

Soil Excavations and Earthworks

Work Activity	Potential Hazards	Preventive or Corrective Measures	Observation/Inspection Requirements
Reviewing site conditions	Slips, trips, and falls	• Ensure excavation areas are free of trip hazards. • Be aware of wet and muddy conditions. • Remove hazards if possible. Plan foot paths and routes.	
	Unexploded Ordinance (UXO) clearance	• Prior to work commencing, a UXO inspection must be performed by a trained Anchor QEA staff member.	
	Biological hazards	• Identify any poisonous plants common to the area. • Be aware of snakes, bees, ants, and other stinging insects.	
	Utility/cap damage	• Prior to ground disturbance, verify the location of known and suspected utilities. (When applicable, One-Call should already have been called and public utilities should be fully marked.) • Be observant of pavement repairs indicative of utilities. • If possible, request that the client verify the absence of utilities for all excavation locations. If it appears that a utility has not been marked, contact the site project manager (PM). • Be conscious of the depth of the landfill cap and keep excavation at a maximum depth of 6 inches. Stop work if it is suspected that the cap has been penetrated.	
Setting up work area	Traffic hazards	• If in a trafficked area, secure the work area with reflective cones and park in a safe area.	• Routinely inspect work area for unsafe conditions.
	Slips, trips, and falls	• Set up working area with clear walking paths, devoid of tripping hazards.	
Setting up work area (continued)	Ergonomic hazards	• Use proper lifting technique when unloading equipment: Lift with legs, and avoiding twisting or over-reaching while lifting. • Use two or more people to lift when necessary. • Wear work gloves to avoid hand injuries.	• Routinely inspect work area for unsafe conditions.

Job Safety Analysis

Soil Excavations and Earthworks

Work Activity	Potential Hazards	Preventive or Corrective Measures	Observation/Inspection Requirements
Excavating/ moving soils	Personal injury, struck-by	• Beware of proximity to operating equipment. Establish exclusion zones and discuss ways of communication between personnel in the field and equipment operators. If available, use two-way radios. • Beware of proximity to open excavations and trenches. • Request that the operator point out all of the pinch points on the excavator. • Maintain spill kit (for the excavator), fire extinguisher, and first aid kit in case of emergencies. • Always ensure equipment is secured and powered off prior to retrieving sample if sampling from an excavator.	• Routinely inspect work area for unsafe conditions.
	Utility damage	• If additional utilities are discovered, stop work immediately and contact the PM.	• Routinely inspect work area for unsafe conditions.
	Trenching	• The depth of the trench shall be kept at 36 inches or less unless the slopes are laid back at a maximum 2:1 slope. A Competent Person in excavation shall evaluate the weather, soil, and work in progress to determine if a hazard related to trench collapse is possible. • Spoil pile will be at least 4 feet from the edge of the excavation. If soil is not suitable to be used for backfill, it will be immediately removed from the site and hauled to a designated area.	• Keep heavy equipment away from trench edges. • Inspect trenches daily and following rainfall. • Provide safe egress. • Use approved shoring methods when required. • Follow all Occupational Safety and Health Administration (OSHA) requirements related to trenching and excavation safety.
	Driving	• When driving vehicles or heavy equipment on site, care should be taken to avoid getting stuck in soft soils. • Stay on designated roads whenever possible. If not possible, take paths to avoid wet or soft soils. Work may need to be postponed until conditions are dry.	
	Slips, trips, and falls	• Ensure tools and equipment are stored neatly, and that the excavation is properly cordoned off and flagged.	• Routinely inspect work area for unsafe conditions.

Soil Excavations and Earthworks

Work Activity	Potential Hazards	Preventive or Corrective Measures	Observation/Inspection Requirements
Excavating/ moving soils (continued)	Heavy machinery	• Establish non-audible communication methods when working around heavy machinery. • Use caution when approaching heavy machinery or personnel near heavy machinery. • Ensure that parked heavy equipment and field vehicles have emergency brake engaged and chocked if parked on slopes. • Workers shall not be within the swing radius of heavy equipment unless absolutely necessary. If necessary, the operator shall be informed prior to entering the swing radius. • Care should be taken to avoid damage to hydraulic lines. If hydraulic lines are damaged, equipment shall be turned off and repairs shall be made.	• Establish an "exclusion zone" where personnel are out of reach of heavy machinery. • Inspect hydraulic lines daily.
	Chemical hazards	• Wear PPE including safety glasses and nitrile gloves. • Decontaminate equipment between excavation locations if waste is encountered.	
	Hearing damage	• Wear ear plugs or earmuffs when in the vicinity of heavy equipment.	
	Inhalation hazards	• Wet the ground if necessary, to prevent airborne dust.	
Outdoor, physical activity	Rain or snow	• Wear appropriate PPE (rain gear). • Be aware of slip hazards, puddles, and electrical hazards when working in wet conditions. • If extremely cold conditions are forecast, consider additional precautions or postponing work activity.	• Review weather forecast prior to field work. • Inspect PPE daily prior to use. • Routinely inspect work area for deteriorating conditions.
	Sunshine	• Have sunscreen available for ultraviolet protection. • Have abundant water available to prevent dehydration. • Consider wearing wide-brimmed headwear and light-colored, lightweight, sun-blocking clothing.	• Ensure that sunscreen and water are available.
Outdoor, physical activity (continued)	Lightning	• Do not begin or continue work until lightning subsides for at least 30 minutes. Disconnect and do not use or touch electronic equipment. • Immediately head for shore if on the water and lightning is observed. If not able to get to shore, disconnect and do not use or touch the major electronic equipment, including the radio, throughout the duration of the storm.	• Obtain weather forecast and updates as needed.

Soil Excavations and Earthworks

Work Activity	Potential Hazards	Preventive or Corrective Measures	Observation/Inspection Requirements
	High winds	• Wear goggles or safety glasses if dust or debris are visible.	• Review weather forecast prior to field work. • Ensure that goggles or safety glasses are available.
	Biological hazards (flora [e.g., poison ivy and poison oak] and fauna [e.g., ticks, bees, spiders, mosquitoes, and snakes])	• Be aware of likely biological hazards in the work area. • Wear appropriate clothing (i.e., hat, long-sleeve shirt, long pants, leather gloves, boots, and Tyvek coveralls, as appropriate), and apply insect repellant. • Wear hand and arm protection when clearing plants or debris from the work area. • Be aware of potential wildlife and defensive behavior (e.g., nesting birds, or animals with young).	• Ensure that insect repellent is available.
	Noise exposure	• Wear hearing protection in high noise environments or when working around heavy machinery or equipment (action level of 85 decibels averaged over an 8-hour day).	• Ensure that hearing protection is available. • Inspect clothing and skin for insects (e.g., ticks) after working in insect-prone areas.

Soil Excavations and Earthworks

Training Requirements:

- Per 29 Code of Federal Regulations (CFR) 1910.120(e), workers on site only occasionally for a specific limited task (such as, but not limited to, groundwater monitoring, land surveying, or geophysical surveying) and who are unlikely to be exposed over permissible exposure limits and published exposure limits shall receive a minimum of 24 hours of instruction off the site, and the minimum of 1 day actual field experience under the direct supervision of a trained, experienced supervisor. All personnel working regularly on hazardous waste sites must receive appropriate training as required by 29 CFR 1910.120(e), including but not limited to initial 40-hour, 8-hour supervisor, and annual 8-hour refresher trainings. All 24-hour HAZWOPER trained staff will be supervised by a 40-hour or supervisor trained HAZWOPER staff member. Documentation of this training must be available on site.
- All site workers must review and sign the site-specific HASP administered by Anchor QEA.
- All Anchor QEA employees must receive medical clearance on an annual basis as required by 29 CFR 1910.120(f) and detailed in the Anchor QEA Medical Monitoring Program.
- A competent operator is required to operate heavy equipment; they must have partner/senior staff approval. The competent operator must be familiar with the owner's manual prior to use.
- All assigned employees will familiarize themselves with the contents of this JSA before starting a work activity and review it with their supervisor during the kickoff meeting and during the daily safety meeting.

Job Safety Analysis

Soil Excavations and Earthworks

Employee Signatures

All employees overseeing or performing excavations or earthworks at the site must sign off on this JSA at a minimum of 1-week intervals for the duration of the work being done. The signature indicates that the employee has reviewed the JSA and understands its contents.

Printed Name	Signature	Date

Job Safety Analysis

X-Ray Fluorescence Field Use

Project Name: Former Intalco Smelter Site	**Project Number:** 230002-05.09	**JSA Number:** 011	**Issue Date:** 02/06/2026
Location: 4050 Mountain View Road, Ferndale, Washington 98248	**Contractor:** Anchor QEA	**Analysis by:** Joey Lane	**Analysis Date:** 02/04/2026
Work Operation: Soil screening using handheld X-ray fluorescence	**Superintendent/Competent Person:** Mikayla Bowers	**Revised by:** Joey Lane	**Revised Date:** 02/04/2026
Required Personal Protective Equipment (PPE): • Modified Level D – Standard work uniform/coveralls, steel-toed footwear conforming to ASTM International (ASTM) F2412-05/ASTM F2413-05, traffic safety vest conforming to ANSI 107, safety glasses conforming to ANSI Z87.1 with permanent side shields, hard hat conforming to ANSI Z89, hearing protection conforming to ANSI S12.42.		**Reviewed by:** Matt Gruber	**Reviewed Date:** 02/04/2026
		Approved by: Heather Gadwa	**Approved Date:** 02/04/2026

Work Activity	Potential Hazards	Preventive or Corrective Measures	Inspection Requirements
Work staging	Damage to XRF by dropping	• Use XRF on stable table. • Place work table out of pedestrian area.	
Analysis of sample using XRF	Muscle strain or injuries from improper lifting	• Use proper lifting techniques or ask for assistance when lifting the XRF case.	
	Muscle strain from repeated use of XRF	• Do not continually use XRF involving the trigger. • Take frequent breaks to rest.	
	Slips, trips and falls	• Be aware of potentially slippery surfaces and tripping hazards. • Maintain good housekeeping practices. • Keep all areas clean and free of debris to prevent any trips and falls.	• Maintain awareness of surroundings.

Job Safety Analysis

X-Ray Fluorescence Field Use

Work Activity	Potential Hazards	Preventive or Corrective Measures	Inspection Requirements
Analysis of sample using XRF	Worker exposure to X-ray radiation	• Always keep XRF pointed at the ground away from people. • Never point the XRF unit at a person or body part, regardless of whether the unit is energized or deenergized. • Never point the XRF unit in the air to perform a test. Never analyze any material that is being held in a person's hand. • Hold instrument only by the handle. Never attempt to service the XRF unit or open or remove any covers on the instrument.	• Continually monitor site personnel
Public and security concerns including storage and transportation	Public or affected persons	• Post signage that states "X-Ray Device in Use" to alert others of XRF operation.	• Continually monitor site personnel
	XRF storage and security	• XRF units should be stored in a locked case, locked cabinet, or otherwise restricted access area when not in use. • When in use, XRF units must remain in direct control of a trained and certified operator.	
	Transportation	• During transport, remove lithium-ion battery from the XRF device to disarm the radiation capabilities. • Only transport the XRF in its original case, which conforms to the 1.2-meter drop test criteria.	
	Fires from lithium-ion batteries	• During transport, place batteries in inner packaging such as a plastic bag to avoid contact with conductive materials. • During transport, label the packaging with a DOT-approved lithium-ion battery label.	

Training Requirements:

- All personnel working on hazardous waste sites must receive appropriate training as required by 29 Code of Federal Regulations (CFR) 1910.120(e), including but not limited to initial 40-hour, 8-hour supervisor, and annual 8-hour refresher trainings.
- Medical clearance must be received on an annual basis as required by 29 CFR 1910.120(f).
- All those tasked to operate an XRF shall be trained on its proper use as approved by Health and Safety.
- There must be a license for the state where the unit will be used.

Appendix C
Safety Data Sheets

Safety Data Sheet

Effective date: 11 May 2020 **Revision**: 11 May 2020
Trade Name: Alconox®

1 Identification of the substance/mixture and of the supplier

1.1 GHS Product identifier

Trade Name: Alconox®

Product number: 1101, 1103, 1104, 1104-1, 1112, 1112-1, 1125, 1150

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

1.2.1 Recommended dilution ratio: 1 – 2% in water

1.3 Details of the supplier of the Safety Data Sheet

Manufacturer:
Alconox Inc.
30 Glenn St
White Plains, NY 10603
(914) 948-4040

Supplier:

Emergency telephone number:
ChemTel Inc
North America: 1-888-255-3924
International: +1 813-248-0573

2 Hazards identification

2.1 Classification of the substance or mixture:

In compliance with EC regulation No. 1272, 29CFR1910/1200 and GHS requirements.

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

2.2 Label elements:

Eye damage, category 1.

Skin irritation, category 2.

Product at recommended dilution:
Eye irritation, category 2B

Hazard pictograms:



Signal word: Danger

Hazard statements:
H315 Causes skin irritation.
H318 Causes serious eye damage.

Precautionary statements:
P264 Wash skin thoroughly after handling.

Effective date: 11 May 2020 **Revision**: 11 May 2020
Trade Name: Alconox®

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

Hazardous Elements at Use Dilution:

Hazard Pictograms:



Signal Word: Warning
Hazard Statements:
H320 Causes eye irritation

Precautionary statements:
P302+P352 If on skin: Wash with soap and water.
P305+P351+P338 If in eyes: Rinse cautiously with water for several minutes. Remove contact lenses if present and easy to do. Continue rinsing.
P501 Dispose of contents and container as instructed in Section 13

Additional information: None.

Hazard description
Hazards Not Otherwise Classified (HNOC): May cause surfaces to become slippery if wet. Use caution in areas of foot traffic if on floors.

Information concerning particular hazards for humans and environment:
The product has to be labelled due to the calculation procedure of the "General Classification guideline for preparations of the EU" in the latest valid version.

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

3 Composition/information on ingredients

3.1 Chemical characterization: Not determined or not available.

3.2 Description: None

3.3 Hazardous components (percentages by weight)

Identification	Chemical Name	Classification	Wt. %
CAS number: 7758-29-4	Sodium tripolyphosphate	Skin Irrit. 2; H315 Eye Irrit. 2; H319	12-28
CAS number: 68081-81-2 or 68411-30-3	Sodium Alkylbenzene Sulfonate	Acute Tox. 4; H303 Skin Irrit. 2; H315 Eye Dam. 1; H318	8-22
CAS number: 7722-88-5	Tetrasodium Pyrophosphate	Skin Irrit. 2; H315 Eye Irrit. 2; H319	2-16

Effective date: 11 May 2020 **Revision**: 11 May 2020
Trade Name: Alconox®

Hazardous components at use dilution (percentages by weight):

Identification	Chemical Name	Classification	Wt. %
CAS number: 7758-29-4	Sodium tripolyphosphate	Eye Irrit. 2; H319	0.12 - 0.28
CAS number: 68081-81-2 or 68411-30-3	Sodium Alkylbenzene Sulfonate	Eye Irrit. 2; H319	0.08 – 0.22
CAS number: 7722-88-5	Tetrasodium Pyrophosphate	Eye Irrit. 2; H319	0.02 – 0.16

3.4 Additional Information: None.

4 First aid measures

4.1 Description of first aid measures

General information: None.

After inhalation:
Maintain an unobstructed airway.
Loosen clothing as necessary and position individual in a comfortable position.

After skin contact:
Wash affected area with soap and water.
Seek medical attention if symptoms develop or persist.

After eye contact:
Rinse/flush exposed eye(s) gently using water for 15-20 minutes.
Remove contact lens(es) if able to do so during rinsing.
Seek medical attention if irritation persists or if concerned.

After swallowing:
Rinse mouth thoroughly.
Seek medical attention if irritation, discomfort, or vomiting persists.

4.2 Most important symptoms and effects, both acute and delayed

None

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

No additional information.

First aid measure at recommended dilution:

General information: None.

After inhalation:
Maintain an unobstructed airway.
Loosen clothing as necessary and position individual in a comfortable position.

After skin contact:
Wash affected area with soap and water.

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

After swallowing:
Rinse mouth thoroughly. Seek medical attention if irritation, discomfort, or vomiting develops.

5 Firefighting measures

Effective date: 11 May 2020 **Revision**: 11 May 2020
Trade Name: Alconox®

5.1 Extinguishing media

Suitable extinguishing agents:

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

For safety reasons unsuitable extinguishing agents: None

5.2 Special hazards arising from the substance or mixture:

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

5.3 Advice for firefighters

Protective equipment:

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

5.4 Additional information:

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

6 Accidental release measures

6.1 Personal precautions, protective equipment and emergency procedures:

Ensure adequate ventilation.
Ensure air handling systems are operational.

6.2 Environmental precautions:

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

6.3 Methods and material for containment and cleaning up:

Wear protective eye wear, gloves and clothing.

6.4 Reference to other sections: None

7 Handling and storage

7.1 Precautions for safe handling:

No expected hazards under normal use condition.

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

7.2 Conditions for safe storage, including any incompatibilities:

Store in a cool, well-ventilated area.

7.3 Specific end use(s):

No additional information.

Effective date: 11 May 2020 **Revision**: 11 May 2020
Trade Name: Alconox®

8 Exposure controls/personal protection





8.1 Control parameters:

a) 7722-88-5, Tetrasodium Pyrophosphate, ACGIH TWA 10 mg/m3
b) 7758-29-4, Sodium Tripolyphosphate, ACGIH TWA 10 mg/m3
c) Dusts, non-specific OEL, Irish Code of Practice
   (i) Total inhalable 10 mg/m3 (8hr)
   (ii) Respirable 4 mg/m3 (8hr)
   (iii) Tetrasodium Pyrophosphate, OSHA TWA 5 mg/m3, (8hr)

8.2 Exposure controls

Appropriate engineering controls:

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

Respiratory protection:

Not needed under normal use conditions.

Protection of skin:

Select glove material impermeable and resistant to the substance.

Eye protection:

Safety goggles or glasses, or appropriate eye protection. Recommended to comply with ANSI Z87.1 and/or EN 166.

General hygienic measures:

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

Exposure Control and Personal Protective Equipment at recommended dilution:

Under normal use and operational conditions, no special personal protective equipment or engineering controls will be necessary. Handle with care.

9 Physical and chemical properties

Appearance (physical state, color):	White and cream colored flakes - powder	**Explosion limit lower:** **Explosion limit upper:**	Not determined or notavailable. Not determined or notavailable.
Odor:	Not determined or not available.	**Vapor pressure at 20°C:**	Not determined or notavailable.
Odor threshold:	Not determined or not available.	**Vapor density:**	Not determined or notavailable.
pH-value:	9.5 (1% aqueous solution)	**Relative density:**	Not determined or notavailable.

Safety Data Sheet

Effective date: 11 May 2020 **Revision**: 11 May 2020
Trade Name: Alconox®

Melting/Freezing point:	Not determined or not available.	**Solubilities**:	Not determined or notavailable.
Boiling point/Boiling range:	Not determined or not available.	**Partition coefficient (n-octanol/water)**:	Not determined or notavailable.
Flash point (closed cup):	Not determined or not available.	**Auto/Self-ignition temperature**:	Not determined or notavailable.
Evaporation rate:	Not determined or not available.	**Decomposition temperature**:	Not determined or notavailable.

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

10 Stability and reactivity

10.1 Reactivity: Not determined or not available.
10.2 Chemical stability: Not determined or not available.
10.3 Possibility hazardous reactions: Not determined or not available.
10.4 Conditions to avoid: Not determined or not available.
10.5 Incompatible materials: Not determined or not available.
10.6 Hazardous decomposition products: Not determined or not available.

11 Toxicological information

11.1 Information on toxicological effects:

Acute Toxicity:

Oral:

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

Chronic Toxicity: No additional information.

Skin corrosion/irritation:

Sodium Alkylbenzene Sulfonate: Causes skin irritation.

Serious eye damage/irritation:

Sodium Alkylbenzene Sulfonate: Causes serious eye damage.

Tetrasodium Pyrophosphate: Risk of serious damage to eyes.

Product information at recommended dilution:

Eye irritation may occur upon direct contact with eyes. No specific hazards for skin contact, inhalation, or chronic exposure are expected within normal use parameters.

Respiratory or skin sensitization: No additional information.

Carcinogenicity: No additional information.

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

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

Germ cell mutagenicity: No additional information.

Reproductive toxicity: No additional information.

STOT-single and repeated exposure: No additional information.

Additional toxicological information: No additional information.

12 Ecological information

12.1 Toxicity:

Sodium Alkylbenzene Sulfonate: Fish, LC50 1.67 mg/l, 96 hours.
Sodium Alkylbenzene Sulfonate: Aquatic invertebrates, EC50 Daphnia 2.9 mg/l, 48 hours.
Sodium Alkylbenzene Sulfonate: Aquatic Plants, EC50 Algae 29 mg/l, 96 hours.
Tetrasodium Pyrophosphate: Fish, LC50 - other fish - 1,380 mg/l - 96 h.
Tetrasodium Pyrophosphate: Aquatic invertebrates, EC50 - Daphnia magna (Water flea) - 391 mg/l - 48 h.

12.2 Persistence and degradability: No additional information.

12.3 Bioaccumulative potential: No additional information.

12.4 Mobility in soil: No additional information.

General notes: No additional information.

12.5 Results of PBT and vPvB assessment:

PBT: No additional information.

vPvB: No additional information.

12.6 Other adverse effects: No additional information.

13 Disposal considerations

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

Relevant Information:

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

14 Transport information

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

US DOT
Limited Quantity Exception: None

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

Comments: None	**Comments:** None
14.4 Packing group: ADR, ADN, DOT, IMDG, IATA	None
14.5 Environmental hazards:	None
14.6 Special precautions for user:	None
Danger code (Kemler):	None
EMS number:	None
Segregation groups:	None

14.7 Transport in bulk according to Annex II of MARPOL73/78 and the IBC Code: Not applicable.

14.8 Transport/Additional information:

Transport category:	None
Tunnel restriction code:	None
UN "Model Regulation":	None

15 Regulatory information

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

North American

SARA

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

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

Spill Quantity: None of the ingredients are listed.

TSCA (Toxic Substances Control Act):

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

Proposition 65 (California):

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

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

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

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

Canadian

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

EU

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

Germany MAK: Not classified.
EC 648/2004 – This is an industrial detergent. Contains >30% phosphate, 15-30% anionic surfactant, <5% EDTA salts
EC 551/2009 – This is not a laundry or dishwasher detergent
EC 907/2006 – Contains no enzymes, optical brighteners, perfumes, allergenic fragrances, or preservative agents

Asia Pacific

Australia

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

China

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

Japan

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

Korea

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

New Zealand

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

Philippines

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

Taiwan

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

16 Other information

Abbreviations and Acronyms: None

Summary of Phrases

Hazard statements:
H315 Causes skin irritation.
H318 Causes serious eye damage.

NFPA: 1-0-0
HMIS: 1-0-0

At recommended dilution:
NFPA: 1-0-0
HMIS: 1-0-0

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

Manufacturer Statement:

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

SAFETY DATA SHEET

Aluminium

SECTION 1: Identification of the substance/mixture and of the company/ undertaking

1.1 Product identifier

Product name	:	Aluminium
EC number	:	231-072-3
CAS number	:	7429-90-5
Product code	:	AL000
Product description	:	Not available.
Product type	:	Solid.
Other means of identification	:	Aluminum; CI 77000; Aluminum, (as Al) Metal; Aluminum Metal; Elemental aluminum; Aluminum powder; ALUMINUM, ELEMENTAL; Aluminium Metal; Aluminum - Metal
Chemical formula	:	Al

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

Identified uses

No intended uses recorded.

Uses advised against

None identified.

1.3 Details of the supplier of the safety data sheet

Goodfellow Cambridge Ltd.
Ermine Business Park, Huntingdon, England PE29 6WR
Email: info@goodfellow.com
Telephone: 0800 731 4653 (UK) or +44 1480 424 800
Fax: 0800 328 7689 (UK) or +44 1480 424 900

e-mail address of person responsible for this SDS : sds@goodfellow.com

1.4 Emergency telephone number (Chemtrec)

Emergency phone:

Telephone number : +01-813-248-0585

SECTION 2: Hazards identification

2.1 Classification of the substance or mixture

Product definition : Mono-constituent substance

Classification according to UK CLP/GHS

Not classified.

The product is not classified as hazardous according to UK CLP Regulation SI 2019/720 as amended.

See Section 11 for more detailed information on health effects and symptoms.

2.2 Label elements

Signal word : No signal word.

SECTION 2: Hazards identification

Hazard statements : No known significant effects or critical hazards.

Precautionary statements

Prevention : Not applicable.

Response : Not applicable.

Storage : Not applicable.

Disposal : Not applicable.

Supplemental label elements : Not applicable.

Annex XVII - Restrictions on the manufacture, placing on the market and use of certain dangerous substances, mixtures and articles : Not applicable.

Special packaging requirements

Containers to be fitted with child-resistant fastenings : Not applicable.

Tactile warning of danger : Not applicable.

2.3 Other hazards

Product meets the criteria for PBT or vPvB according to Regulation (EC) No. 1907/2006, Annex XIII :

PBT	P	B	T	vPvB	vP	vB
Not applicable (Inorganic)	N/A	N/A	N/A	Not applicable (Inorganic)	N/A	N/A

Other hazards which do not result in classification : None known.

SECTION 3: Composition/information on ingredients

3.1 Substances : Mono-constituent substance

Product/ingredient name	Identifiers	%	Classification	Type
aluminium, non flammable solid	EC: 231-072-3 CAS: 7429-90-5	100	Not classified. **See Section 16 for the full text of the H statements declared above.**	[1]

There are no additional ingredients present which, within the current knowledge of the supplier, are classified and contribute to the classification of the substance and hence require reporting in this section.

Type

[1] Constituent

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

SECTION 4: First aid measures

4.1 Description of first aid measures

Eye contact : Immediately flush eyes with plenty of water, occasionally lifting the upper and lower eyelids. Check for and remove any contact lenses. Get medical attention if irritation occurs.

Inhalation : Remove victim to fresh air and keep at rest in a position comfortable for breathing. Get medical attention if symptoms occur.

Skin contact : Flush contaminated skin with plenty of water. Remove contaminated clothing and shoes. Get medical attention if symptoms occur.

SECTION 4: First aid measures

Ingestion : Wash out mouth with water. If material has been swallowed and the exposed person is conscious, give small quantities of water to drink. Do not induce vomiting unless directed to do so by medical personnel. Get medical attention if symptoms occur.

Protection of first-aiders : No action shall be taken involving any personal risk or without suitable training.

4.2 Most important symptoms and effects, both acute and delayed

Over-exposure signs/symptoms

Eye contact : No specific data.

Inhalation : No specific data.

Skin contact : No specific data.

Ingestion : No specific data.

4.3 Indication of any immediate medical attention and special treatment needed

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

Specific treatments : No specific treatment.

SECTION 5: Firefighting measures

5.1 Extinguishing media

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

Unsuitable extinguishing media : None known.

5.2 Special hazards arising from the substance or mixture

Hazards from the substance or mixture : No specific fire or explosion hazard.

Hazardous combustion products : Decomposition products may include the following materials:
metal oxide/oxides

5.3 Advice for firefighters

Special protective actions for fire-fighters : Promptly isolate the scene by removing all persons from the vicinity of the incident if there is a fire. No action shall be taken involving any personal risk or without suitable training.

Special protective equipment for fire-fighters : Fire-fighters should wear appropriate protective equipment and self-contained breathing apparatus (SCBA) with a full face-piece operated in positive pressure mode. Clothing for fire-fighters (including helmets, protective boots and gloves) conforming to British standard BS EN 469 will provide a basic level of protection for chemical incidents.

SECTION 6: Accidental release measures

6.1 Personal precautions, protective equipment and emergency procedures

For non-emergency personnel : No action shall be taken involving any personal risk or without suitable training. Evacuate surrounding areas. Keep unnecessary and unprotected personnel from entering. Do not touch or walk through spilt material. Put on appropriate personal protective equipment.

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

6.2 Environmental precautions : Avoid dispersal of spilt material and runoff and contact with soil, waterways, drains and sewers. Inform the relevant authorities if the product has caused environmental pollution (sewers, waterways, soil or air).

SECTION 6: Accidental release measures

6.3 Methods and material for containment and cleaning up

Small spill : Move containers from spill area. Vacuum or sweep up material and place in a designated, labelled waste container. Dispose of via a licensed waste disposal contractor.

Large spill : Move containers from spill area. Prevent entry into sewers, water courses, basements or confined areas. Vacuum or sweep up material and place in a designated, labelled waste container. Dispose of via a licensed waste disposal contractor.

6.4 Reference to other sections : See Section 1 for emergency contact information.
See Section 8 for information on appropriate personal protective equipment.
See Section 13 for additional waste treatment information.

SECTION 7: Handling and storage

The information in this section contains generic advice and guidance. The list of Identified Uses in Section 1 should be consulted for any available use-specific information provided in the Exposure Scenario(s).

7.1 Precautions for safe handling

Protective measures : Put on appropriate personal protective equipment (see Section 8).

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

7.2 Conditions for safe storage, including any incompatibilities

Store in accordance with local regulations. Store in original container protected from direct sunlight in a dry, cool and well-ventilated area, away from incompatible materials (see Section 10) and food and drink. Keep container tightly closed and sealed until ready for use. Containers that have been opened must be carefully resealed and kept upright to prevent leakage. Do not store in unlabelled containers. Use appropriate containment to avoid environmental contamination. See Section 10 for incompatible materials before handling or use.

7.3 Specific end use(s)

Recommendations : Not available.

Industrial sector specific solutions : Not available.

SECTION 8: Exposure controls/personal protection

8.1 Control parameters

Occupational exposure limits

No exposure limit value known.

Biological exposure indices

No exposure indices known.

Recommended monitoring procedures : Reference should be made to monitoring standards, such as the following: British Standard BS EN 689 (Workplace atmospheres - Guidance for the assessment of exposure by inhalation to chemical agents for comparison with limit values and measurement strategy) British Standard BS EN 14042 (Workplace atmospheres - Guide for the application and use of procedures for the assessment of exposure to chemical and biological agents) British Standard BS EN 482 (Workplace atmospheres - General requirements for the performance of procedures for the measurement of chemical agents) Reference to national guidance documents for methods for the determination of hazardous substances will also be required.

DNELs/DMELs

SECTION 8: Exposure controls/personal protection

Product/ingredient name	Type	Exposure	Value	Population	Effects
aluminium, non flammable solid	DNEL	Long term Inhalation	3.72 mg/m³	Workers	Local
	DNEL	Long term Inhalation	3.72 mg/m³	Workers	Systemic
	DNEL	Long term Oral	3.95 mg/kg bw/day	General population	Systemic

PNECs

No PNECs available

8.2 Exposure controls

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

Individual protection measures

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

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

Skin protection

Hand protection : Chemical-resistant, impervious gloves complying with an approved standard should be worn at all times when handling chemical products if a risk assessment indicates this is necessary.

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

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

Respiratory protection : Based on the hazard and potential for exposure, select a respirator that meets the appropriate standard or certification. Respirators must be used according to a respiratory protection program to ensure proper fitting, training, and other important aspects of use.

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

SECTION 9: Physical and chemical properties

The conditions of measurement of all properties are at standard temperature and pressure unless otherwise indicated.

9.1 Information on basic physical and chemical properties

Appearance

Physical state : Solid. [Metal.]

Colour : Silver-white.

Odour : Odourless.

Odour threshold : Not available.

Melting point/freezing point : 660°C

Initial boiling point and boiling range : 2450°C

SECTION 9: Physical and chemical properties

Flammability (solid, gas)	:	Not available.
Upper/lower flammability or explosive limits	:	Not applicable.
Flash point	:	Not applicable.
Auto-ignition temperature	:	Not applicable.
Decomposition temperature	:	Not available.
pH	:	Not available.
Viscosity	:	Dynamic (room temperature): Not available. Kinematic (room temperature): Not available. Kinematic (40°C): Not available.
Solubility in water	:	Not available.
Partition coefficient: n-octanol/ water	:	Not available.
Vapour pressure	:	Not available.
Relative density	:	2.7
Density	:	2.702 g/cm³
Vapour density	:	Not applicable.
Explosive properties	:	Not available.
Oxidising properties	:	Not available.

Particle characteristics

Median particle size : Not available.

9.2 Other information

Solubility in water	:	Not available.
Molecular weight	:	26.98 g/mole

SECTION 10: Stability and reactivity

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

10.2 Chemical stability : The product is stable.

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

10.4 Conditions to avoid : No specific data.

10.5 Incompatible materials : No specific data.

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

SECTION 11: Toxicological information

11.1 Information on toxicological effects

Acute toxicity

Conclusion/Summary : Not available.

Acute toxicity estimates

N/A

Irritation/Corrosion

Conclusion/Summary : Not available.

Sensitisation

Conclusion/Summary : Not available.

SECTION 11: Toxicological information

Mutagenicity

Conclusion/Summary : Not available.

Carcinogenicity

Conclusion/Summary : Not available.

Reproductive toxicity

Conclusion/Summary : Not available.

Teratogenicity

Conclusion/Summary : Not available.

Specific target organ toxicity (single exposure)

Not available.

Specific target organ toxicity (repeated exposure)

Not available.

Aspiration hazard

Not available.

Information on likely routes of exposure : Not available.

Potential acute health effects

Eye contact : No known significant effects or critical hazards.

Inhalation : No known significant effects or critical hazards.

Skin contact : No known significant effects or critical hazards.

Ingestion : No known significant effects or critical hazards.

Symptoms related to the physical, chemical and toxicological characteristics

Eye contact : No specific data.

Inhalation : No specific data.

Skin contact : No specific data.

Ingestion : No specific data.

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

Short term exposure

Potential immediate effects : Not available.

Potential delayed effects : Not available.

Long term exposure

Potential immediate effects : Not available.

Potential delayed effects : Not available.

Potential chronic health effects

Not available.

Conclusion/Summary : Not available.

General : No known significant effects or critical hazards.

Carcinogenicity : No known significant effects or critical hazards.

Mutagenicity : No known significant effects or critical hazards.

Reproductive toxicity : No known significant effects or critical hazards.

Other information : Not available.

SECTION 12: Ecological information

12.1 Toxicity

Conclusion/Summary : Not available.

12.2 Persistence and degradability

Conclusion/Summary : Not available.

12.3 Bioaccumulative potential

Not available.

12.4 Mobility in soil

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

Mobility : Not available.

12.5 Results of PBT and vPvB assessment

Product/ingredient name	PBT	P	B	T	vPvB	vP	vB
aluminium, non flammable solid	Not applicable (Inorganic)	N/A	N/A	N/A	Not applicable (Inorganic)	N/A	N/A

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

SECTION 13: Disposal considerations

The information in this section contains generic advice and guidance. The list of Identified Uses in Section 1 should be consulted for any available use-specific information provided in the Exposure Scenario(s).

13.1 Waste treatment methods

Product

Methods of disposal : The generation of waste should be avoided or minimised wherever possible. Disposal of this product, solutions and any by-products should at all times comply with the requirements of environmental protection and waste disposal legislation and any regional local authority requirements. Dispose of surplus and non-recyclable products via a licensed waste disposal contractor. Waste should not be disposed of untreated to the sewer unless fully compliant with the requirements of all authorities with jurisdiction.

Hazardous waste : Within the present knowledge of the supplier, this product is not regarded as hazardous waste, as defined by EU Directive 2008/98/EC.

Packaging

Methods of disposal : The generation of waste should be avoided or minimised wherever possible. Waste packaging should be recycled. Incineration or landfill should only be considered when recycling is not feasible.

Special precautions : This material and its container must be disposed of in a safe way. Empty containers or liners may retain some product residues. Avoid dispersal of spilt material and runoff and contact with soil, waterways, drains and sewers.

SECTION 14: Transport information

SECTION 14: Transport information

	ADR/RID	ADN	IMDG	IATA
14.1 UN number	Not regulated.	Not regulated.	Not regulated.	Not regulated.
14.2 UN proper shipping name	-	-	-	-
14.3 Transport hazard class(es)	-	-	-	-
14.4 Packing group	-	-	-	-
14.5 Environmental hazards	No.	No.	No.	No.

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

14.7 Transport in bulk according to IMO instruments : Not available.

SECTION 15: Regulatory information

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

UK (GB)/REACH

Annex XIV - List of substances subject to authorisation

Annex XIV

None of the components are listed.

Substances of very high concern

None of the components are listed.

Ozone depleting substances

Not listed.

Prior Informed Consent (PIC)

Not listed.

Persistent Organic Pollutants

Not listed.

Annex XVII - Restrictions on the manufacture, placing on the market and use of certain dangerous substances, mixtures and articles

No listed substance

Seveso Directive

This product is not controlled under the Seveso Directive.

EU regulations

Industrial emissions (integrated pollution prevention and control) - Air : Listed

SECTION 15: Regulatory information

Industrial emissions (integrated pollution prevention and control) - Water : Listed

International regulations

Chemical Weapon Convention List Schedules I, II & III Chemicals

Not listed.

Montreal Protocol

Not listed.

Stockholm Convention on Persistent Organic Pollutants

Not listed.

Rotterdam Convention on Prior Informed Consent (PIC)

Not listed.

UNECE Aarhus Protocol on POPs and Heavy Metals

Not listed.

Inventory list

Australia	:	This material is listed or exempted.
Canada	:	This material is listed or exempted.
China	:	This material is listed or exempted.
Eurasian Economic Union	:	**Russian Federation inventory**: Not determined.
Japan	:	**Japan inventory (CSCL)**: Not determined. **Japan inventory (ISHL)**: Not determined.
New Zealand	:	This material is listed or exempted.
Philippines	:	This material is listed or exempted.
Republic of Korea	:	This material is listed or exempted.
Taiwan	:	This material is listed or exempted.
Thailand	:	Not determined.
Turkey	:	This material is listed or exempted.
United States	:	This material is active or exempted.
Viet Nam	:	This material is listed or exempted.
15.2 Chemical safety assessment	:	Not available.

SECTION 16: Other information

Indicates information that has changed from previously issued version.

Abbreviations and acronyms : ATE = Acute Toxicity Estimate
GB CLP = UK CLP (EC No 1272/2008) on the Classification, Labelling and Packaging of Substances and Mixtures as amended by (EU Exit) Regulations 2019 No. 720 and amendments
DMEL = Derived Minimal Effect Level
DNEL = Derived No Effect Level
EUH statement = GB CLP-specific Hazard statement
N/A = Not available
PBT = Persistent, Bioaccumulative and Toxic
PNEC = Predicted No Effect Concentration
RRN = REACH Registration Number
SGG = Segregation Group
vPvB = Very Persistent and Very Bioaccumulative

Procedure used to derive the classification

Not classified.

Full text of abbreviated H statements

SECTION 16: Other information

Not applicable.

Full text of classifications

Not applicable.

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Date of previous issue	:	No previous validation
Version	:	0.01

Notice to reader

Further information.

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SAFETY DATA SHEET

Version 6.1
Revision Date 01/15/2020
Print Date 05/29/2020

SECTION 1: Identification of the substance/mixture and of the company/undertaking

1.1 Product identifiers

Product name : Arsenic

Product Number : 202657
Brand : Aldrich
Index-No. : 033-001-00-X
CAS-No. : 7440-38-2

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

Identified uses : Laboratory chemicals, Synthesis of substances

1.3 Details of the supplier of the safety data sheet

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

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

1.4 Emergency telephone number

Emergency Phone # : +1-703-527-3887

SECTION 2: Hazards identification

2.1 Classification of the substance or mixture

GHS Classification in accordance with 29 CFR 1910 (OSHA HCS)

Acute toxicity, Oral (Category 4), H302
Acute toxicity, Inhalation (Category 3), H331
Carcinogenicity (Category 1B), H350
Short-term (acute) aquatic hazard (Category 1), H400
Long-term (chronic) aquatic hazard (Category 1), H410

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

2.2 GHS Label elements, including precautionary statements

Pictogram



Signal word Danger

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Hazard statement(s)

H302	Harmful if swallowed.
H331	Toxic if inhaled.
H350	May cause cancer.
H410	Very toxic to aquatic life with long lasting effects.

Precautionary statement(s)

P201	Obtain special instructions before use.
P202	Do not handle until all safety precautions have been read and understood.
P261	Avoid breathing dust/ fume/ gas/ mist/ vapours/ spray.
P264	Wash skin thoroughly after handling.
P270	Do not eat, drink or smoke when using this product.
P271	Use only outdoors or in a well-ventilated area.
P273	Avoid release to the environment.
P280	Wear protective gloves/ protective clothing/ eye protection/ face protection.
P301 + P312 + P330	IF SWALLOWED: Call a POISON CENTER/doctor if you feel unwell. Rinse mouth.
P304 + P340 + P311	IF INHALED: Remove person to fresh air and keep comfortable for breathing. Call a POISON CENTER/doctor.
P308 + P313	IF exposed or concerned: Get medical advice/ attention.
P391	Collect spillage.
P403 + P233	Store in a well-ventilated place. Keep container tightly closed.
P405	Store locked up.
P501	Dispose of contents/ container to an approved waste disposal plant.

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

SECTION 3: Composition/information on ingredients

3.1 Substances

Formula	:	As
Molecular weight	:	74.92 g/mol
CAS-No.	:	7440-38-2
EC-No.	:	231-148-6
Index-No.	:	033-001-00-X

Component	Classification	Concentration
Arsenic		
	Acute Tox. 4; Acute Tox. 3; Carc. 1B; Aquatic Acute 1; Aquatic Chronic 1; H302, H331, H350, H400, H410 M-Factor - Aquatic Acute: 10	<= 100 %

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

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SECTION 4: First aid measures

4.1 Description of first aid measures

General advice
Consult a physician. Show this safety data sheet to the doctor in attendance.Move out of dangerous area.

If inhaled
If breathed in, move person into fresh air. If not breathing, give artificial respiration. Consult a physician.

In case of skin contact
Wash off with soap and plenty of water. Take victim immediately to hospital. Consult a physician.

In case of eye contact
Flush eyes with water as a precaution.

If swallowed
Never give anything by mouth to an unconscious person. Rinse mouth with water. Consult a physician.

4.2 Most important symptoms and effects, both acute and delayed
The most important known symptoms and effects are described in the labelling (see section 2.2) and/or in section 11

4.3 Indication of any immediate medical attention and special treatment needed
No data available

SECTION 5: Firefighting measures

5.1 Extinguishing media

Suitable extinguishing media
Use water spray, alcohol-resistant foam, dry chemical or carbon dioxide.

5.2 Special hazards arising from the substance or mixture
Arsenic oxides

5.3 Advice for firefighters
Wear self-contained breathing apparatus for firefighting if necessary.

5.4 Further information
No data available

SECTION 6: Accidental release measures

6.1 Personal precautions, protective equipment and emergency procedures
Wear respiratory protection. Avoid dust formation. Avoid breathing vapours, mist or gas. Ensure adequate ventilation. Evacuate personnel to safe areas. Avoid breathing dust. For personal protection see section 8.

6.2 Environmental precautions
Prevent further leakage or spillage if safe to do so. Do not let product enter drains. Discharge into the environment must be avoided.

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6.3 Methods and materials for containment and cleaning up

Pick up and arrange disposal without creating dust. Sweep up and shovel. Keep in suitable, closed containers for disposal.

6.4 Reference to other sections

For disposal see section 13.

SECTION 7: Handling and storage

7.1 Precautions for safe handling

Avoid contact with skin and eyes. Avoid formation of dust and aerosols.Further processing of solid materials may result in the formation of combustible dusts. The potential for combustible dust formation should be taken into consideration before additional processing occurs.
Provide appropriate exhaust ventilation at places where dust is formed.
For precautions see section 2.2.

7.2 Conditions for safe storage, including any incompatibilities

Keep container tightly closed in a dry and well-ventilated place.

Keep in a dry place.
Storage class (TRGS 510): 6.1B: Non-combustible, acute toxic Cat. 1 and 2 / very toxic 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

Components with workplace control parameters

Component	CAS-No.	Value	Control parameters	Basis
Arsenic	7440-38-2	TWA	0.01 mg/m3	USA. ACGIH Threshold Limit Values (TLV)
	Remarks	Lung cancer Substances for which there is a Biological Exposure Index or Indices (see BEI® section) Confirmed human carcinogen		
		C	0.0020 mg/m3	USA. NIOSH Recommended Exposure Limits
		Potential Occupational Carcinogen See Appendix A 15 minute ceiling value		

Biological occupational exposure limits

Component	CAS-No.	Parameters	Value	Biological specimen	Basis
Arsenic	7440-38-2	inorganic arsenic plus methylated metabolites	35µg As/l	Urine	ACGIH - Biological Exposure Indices (BEI)
	Remarks	End of the workweek (After four or five consecutive working			

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		days with exposure)

8.2 Exposure controls

Appropriate engineering controls
Avoid contact with skin, eyes and clothing. Wash hands before breaks and immediately after handling the product.

Personal protective equipment

Eye/face protection
Face shield and safety glasses Use equipment for eye protection tested and approved under appropriate government standards such as NIOSH (US) or EN 166(EU).

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

Full contact
Material: Nitrile rubber
Minimum layer thickness: 0.11 mm
Break through time: 480 min
Material tested:Dermatril® (KCL 740 / Aldrich Z677272, Size M)

Splash contact
Material: Nitrile rubber
Minimum layer thickness: 0.11 mm
Break through time: 480 min
Material tested:Dermatril® (KCL 740 / Aldrich Z677272, Size M)

data source: KCL GmbH, D-36124 Eichenzell, phone +49 (0)6659 87300, e-mail sales@kcl.de, test method: EN374
If used in solution, or mixed with other substances, and under conditions which differ from EN 374, contact the supplier of the CE approved gloves. This recommendation is advisory only and must be evaluated by an industrial hygienist and safety officer familiar with the specific situation of anticipated use by our customers. It should not be construed as offering an approval for any specific use scenario.

Body Protection
Complete suit protecting against chemicals, The type of protective equipment must be selected according to the concentration and amount of the dangerous substance at the specific workplace.

Respiratory protection
Where risk assessment shows air-purifying respirators are appropriate use a full-face particle respirator type N100 (US) or type P3 (EN 143) respirator cartridges as a backup to engineering controls. If the respirator is the sole means of protection, use a full-face supplied air respirator. Use respirators and components tested and approved under appropriate government standards such as NIOSH (US) or CEN (EU).

Control of environmental exposure
Prevent further leakage or spillage if safe to do so. Do not let product enter drains. Discharge into the environment must be avoided.

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SECTION 9: Physical and chemical properties

9.1 Information on basic physical and chemical properties

a)	Appearance	Form: powder Colour: light grey, black
b)	Odour	No data available
c)	Odour Threshold	No data available
d)	pH	No data available
e)	Melting point/freezing point	Melting point/range: 817 °C (1503 °F) - lit.
f)	Initial boiling point and boiling range	613 °C 1135 °F - lit.
g)	Flash point	()Not applicable
h)	Evaporation rate	No data available
i)	Flammability (solid, gas)	No data available
j)	Upper/lower flammability or explosive limits	No data available
k)	Vapour pressure	No data available
l)	Vapour density	No data available
m)	Relative density	5.727 g/mL at 25 °C (77 °F)
n)	Water solubility	No data available
o)	Partition coefficient: n-octanol/water	No data available
p)	Auto-ignition temperature	No data available
q)	Decomposition temperature	No data available
r)	Viscosity	No data available
s)	Explosive properties	No data available
t)	Oxidizing properties	No data available

9.2 Other safety information

No data available

SECTION 10: Stability and reactivity

10.1 Reactivity

No data available

10.2 Chemical stability

Stable under recommended storage conditions.

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10.3 Possibility of hazardous reactions
No data available

10.4 Conditions to avoid
Heat Exposure to air may affect product quality.

10.5 Incompatible materials
Strong oxidizing agents

10.6 Hazardous decomposition products
Hazardous decomposition products formed under fire conditions. - Arsenic oxides
Other decomposition products - No data available
In the event of fire: see section 5

SECTION 11: Toxicological information

11.1 Information on toxicological effects

Acute toxicity
LD50 Oral - Rat - 763 mg/kg
Remarks: Behavioral:Ataxia. Diarrhoea
LD50 Oral - Mouse - 145 mg/kg
Remarks: Behavioral:Ataxia. Diarrhoea
Inhalation: No data available
Dermal: No data available
No data available

Skin corrosion/irritation
No data available

Serious eye damage/eye irritation
No data available

Respiratory or skin sensitisation
No data available

Germ cell mutagenicity

Carcinogenicity
No data available

IARC: 1 - Group 1: Carcinogenic to humans (Arsenic)

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

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

Reproductive toxicity

Specific target organ toxicity - single exposure
No data available

Specific target organ toxicity - repeated exposure
No data available

Aspiration hazard
No data available

Additional Information
RTECS: CG0525000

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

Stomach - Irregularities - Based on Human Evidence
Stomach - Irregularities - Based on Human Evidence

SECTION 12: Ecological information

12.1 Toxicity

Toxicity to fish	LC50 - Pimephales promelas (fathead minnow) - 9.9 mg/l - 96.0 h
Toxicity to daphnia and other aquatic invertebrates	EC50 - Daphnia magna (Water flea) - 3.8 mg/l - 48 h

12.2 Persistence and degradability
No data available

12.3 Bioaccumulative potential
No data available

12.4 Mobility in soil
No data available

12.5 Results of PBT and vPvB assessment
PBT/vPvB assessment not available as chemical safety assessment not required/not conducted

12.6 Other adverse effects
An environmental hazard cannot be excluded in the event of unprofessional handling or disposal.
Very toxic to aquatic life with long lasting effects.

SECTION 13: Disposal considerations

13.1 Waste treatment methods

Product
Offer surplus and non-recyclable solutions to a licensed disposal company. Contact a licensed professional waste disposal service to dispose of this material. Dissolve or mix the material with a combustible solvent and burn in a chemical incinerator equipped with an afterburner and scrubber.

Contaminated packaging
Dispose of as unused product.

SECTION 14: Transport information

DOT (US)
UN number: 1558 Class: 6.1 Packing group: II
Proper shipping name: Arsenic
Reportable Quantity (RQ): 1 lbs
Reportable Quantity (RQ): 1 lbs

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Poison Inhalation Hazard: No

IMDG
UN number: 1558 Class: 6.1 Packing group: II EMS-No: F-A, S-A
Proper shipping name: ARSENIC
Marine pollutant : yes

IATA
UN number: 1558 Class: 6.1 Packing group: II
Proper shipping name: Arsenic

SECTION 15: Regulatory information

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

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

	CAS-No.	Revision Date
Arsenic	7440-38-2	2015-11-23

SARA 311/312 Hazards
Acute Health Hazard, Chronic Health Hazard

Reportable Quantity : D004 lbs

Massachusetts Right To Know Components
No components are subject to the Massachusetts Right to Know Act.

Pennsylvania Right To Know Components

	CAS-No.	Revision Date
Arsenic	7440-38-2	2015-11-23

SECTION 16: Other information

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

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Version: 6.1 Revision Date: 01/15/2020 Print Date: 05/29/2020

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SAFETY DATA SHEET

Version 6.3
Revision Date 01/15/2020
Print Date 02/20/2020

SECTION 1: Identification of the substance/mixture and of the company/undertaking

1.1 Product identifiers

Product name : Barium

Product Number : 237094
Brand : Aldrich
CAS-No. : 7440-39-3

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

Identified uses : Laboratory chemicals, Synthesis of substances

1.3 Details of the supplier of the safety data sheet

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

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

1.4 Emergency telephone number

Emergency Phone # : +1-703-527-3887

SECTION 2: Hazards identification

2.1 Classification of the substance or mixture

GHS Classification in accordance with 29 CFR 1910 (OSHA HCS)

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

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

2.2 GHS Label elements, including precautionary statements

Pictogram



Signal word Danger

Hazard statement(s)
H261 In contact with water releases flammable gases.

Precautionary statement(s)
P223 Do not allow contact with water.
P231 + P232 Handle under inert gas. Protect from moisture.

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P280	Wear protective gloves/ eye protection/ face protection.
P335 + P334	Brush off loose particles from skin. Immerse in cool water/ wrap in wet bandages.
P370 + P378	In case of fire: Use dry sand, dry chemical or alcohol-resistant foam to extinguish.
P402 + P404	Store in a dry place. Store in a closed container.
P501	Dispose of contents/ container to an approved waste disposal plant.

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

SECTION 3: Composition/information on ingredients

3.1 Substances

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

Component	Classification	Concentration
Barium		
	Water-react. 2; H261	<= 100 %

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
Consult a physician. Show this safety data sheet to the doctor in attendance.Move out of dangerous area.

If inhaled
If breathed in, move person into fresh air. If not breathing, give artificial respiration. Consult a physician.

In case of skin contact
Wash off with soap and plenty of water. Consult a physician.

In case of eye contact
Flush eyes with water as a precaution.

If swallowed
Never give anything by mouth to an unconscious person. Rinse mouth with water. Consult a physician.

4.2 Most important symptoms and effects, both acute and delayed
The most important known symptoms and effects are described in the labelling (see section 2.2) and/or in section 11

4.3 Indication of any immediate medical attention and special treatment needed
No data available

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SECTION 5: Firefighting measures

5.1 Extinguishing media

Suitable extinguishing media
Dry powder

5.2 Special hazards arising from the substance or mixture
Barium oxide

5.3 Advice for firefighters
Wear self-contained breathing apparatus for firefighting if necessary.

5.4 Further information
No data available

SECTION 6: Accidental release measures

6.1 Personal precautions, protective equipment and emergency procedures
Avoid dust formation. Avoid breathing vapours, mist or gas. Ensure adequate ventilation.
Evacuate personnel to safe areas.
For personal protection see section 8.

6.2 Environmental precautions
Prevent further leakage or spillage if safe to do so. Do not let product enter drains.

6.3 Methods and materials for containment and cleaning up
Sweep up and shovel. Contain spillage, and then collect with an electrically protected vacuum cleaner or by wet-brushing and place in container for disposal according to local regulations (see section 13). Do not flush with water. Keep in suitable, closed containers for disposal.

6.4 Reference to other sections
For disposal see section 13.

SECTION 7: Handling and storage

7.1 Precautions for safe handling
Further processing of solid materials may result in the formation of combustible dusts. The potential for combustible dust formation should be taken into consideration before additional processing occurs.
Provide appropriate exhaust ventilation at places where dust is formed.Keep away from sources of ignition - No smoking.
For precautions see section 2.2.

7.2 Conditions for safe storage, including any incompatibilities
Keep container tightly closed in a dry and well-ventilated place.
Never allow product to get in contact with water during storage.

Store under inert gas.
Storage class (TRGS 510): 4.3: Hazardous materials, which set free flammable gases upon contact with water

7.3 Specific end use(s)
Apart from the uses mentioned in section 1.2 no other specific uses are stipulated

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SECTION 8: Exposure controls/personal protection

8.1 Control parameters

Components with workplace control parameters

Component	CAS-No.	Value	Control parameters	Basis
Barium	7440-39-3	TWA	0.5 mg/m3	USA. ACGIH Threshold Limit Values (TLV)
	Remarks	Eye irritation Muscular stimulation Skin irritation Gastrointestinal irritation Not classifiable as a human carcinogen		

8.2 Exposure controls

Appropriate engineering controls
Handle in accordance with good industrial hygiene and safety practice. Wash hands before breaks and at the end of workday.

Personal protective equipment

Eye/face protection
Safety glasses with side-shields conforming to EN166 Use equipment for eye protection tested and approved under appropriate government standards such as NIOSH (US) or EN 166(EU).

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

Full contact
Material: Nitrile rubber
Minimum layer thickness: 0.11 mm
Break through time: 480 min
Material tested:Dermatril® (KCL 740 / Aldrich Z677272, Size M)

Splash contact
Material: Nitrile rubber
Minimum layer thickness: 0.11 mm
Break through time: 480 min
Material tested:Dermatril® (KCL 740 / Aldrich Z677272, Size M)

data source: KCL GmbH, D-36124 Eichenzell, phone +49 (0)6659 87300, e-mail sales@kcl.de, test method: EN374
If used in solution, or mixed with other substances, and under conditions which differ from EN 374, contact the supplier of the CE approved gloves. This recommendation is advisory only and must be evaluated by an industrial hygienist and safety officer familiar with the specific situation of anticipated use by our customers. It should not be construed as offering an approval for any specific use scenario.

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Body Protection
Flame retardant protective clothing, The type of protective equipment must be selected according to the concentration and amount of the dangerous substance at the specific workplace.

Respiratory protection
Where risk assessment shows air-purifying respirators are appropriate use a full-face particle respirator type N100 (US) or type P3 (EN 143) respirator cartridges as a backup to engineering controls. If the respirator is the sole means of protection, use a full-face supplied air respirator. Use respirators and components tested and approved under appropriate government standards such as NIOSH (US) or CEN (EU).

Control of environmental exposure
Prevent further leakage or spillage if safe to do so. Do not let product enter drains.

SECTION 9: Physical and chemical properties

9.1 Information on basic physical and chemical properties

a)	Appearance	Form: Rods Colour: grey
b)	Odour	No data available
c)	Odour Threshold	No data available
d)	pH	No data available
e)	Melting point/freezing point	Melting point/range: 725 °C (1337 °F) - lit.
f)	Initial boiling point and boiling range	1,640 °C 2,984 °F - lit.
g)	Flash point	()Not applicable
h)	Evaporation rate	No data available
i)	Flammability (solid, gas)	No data available
j)	Upper/lower flammability or explosive limits	No data available
k)	Vapour pressure	No data available
l)	Vapour density	No data available
m)	Relative density	3.6 g/mL at 25 °C (77 °F)
n)	Water solubility	No data available
o)	Partition coefficient: n-octanol/water	No data available
p)	Auto-ignition temperature	No data available
q)	Decomposition temperature	No data available
r)	Viscosity	No data available
s)	Explosive properties	No data available

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t) Oxidizing properties No data available

9.2 Other safety information
No data available

SECTION 10: Stability and reactivity

10.1 Reactivity
No data available

10.2 Chemical stability
Stable under recommended storage conditions.

10.3 Possibility of hazardous reactions
Reacts violently with water.

10.4 Conditions to avoid
Exposure to moisture

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

10.6 Hazardous decomposition products
Hazardous decomposition products formed under fire conditions. - Barium oxide
Other decomposition products - No data available
In the event of fire: see section 5

SECTION 11: Toxicological information

11.1 Information on toxicological effects

Acute toxicity
No data available
Inhalation: No data available
Dermal: No data available
No data available

Skin corrosion/irritation
No data available

Serious eye damage/eye irritation
No data available

Respiratory or skin sensitisation
No data available

Germ cell mutagenicity
No data available

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

IARC: No component of this product present at levels greater than or equal to 0.1% is identified as probable, possible or confirmed human carcinogen by IARC.

NTP: No component of this product present at levels greater than or equal to 0.1% is

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identified as a known or anticipated carcinogen by NTP.

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

Reproductive toxicity
No data available
No data available

Specific target organ toxicity - single exposure
No data available

Specific target organ toxicity - repeated exposure
No data available

Aspiration hazard
No data available

Additional Information
RTECS: CQ8370000

Stomach/intestinal disorders, Nausea, Vomiting, Drowsiness, Dizziness, Gastrointestinal disturbance, Weakness, Tremors, Seizures.
To the best of our knowledge, the chemical, physical, and toxicological properties have not been thoroughly investigated.

SECTION 12: Ecological information

12.1 Toxicity

Toxicity to fish	mortality NOEC - Cyprinodon variegatus (sheepshead minnow) - 500 mg/l - 96 h
	LC50 - Cyprinodon variegatus (sheepshead minnow) - > 500 mg/l - 96 h

12.2 Persistence and degradability
No data available

12.3 Bioaccumulative potential
No data available

12.4 Mobility in soil
No data available

12.5 Results of PBT and vPvB assessment
PBT/vPvB assessment not available as chemical safety assessment not required/not conducted

12.6 Other adverse effects
No data available

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SECTION 13: Disposal considerations

13.1 Waste treatment methods

Product
Burn in a chemical incinerator equipped with an afterburner and scrubber but exert extra care in igniting as this material is highly flammable. Offer surplus and non-recyclable solutions to a licensed disposal company. Contact a licensed professional waste disposal service to dispose of this material.

Contaminated packaging
Dispose of as unused product.

SECTION 14: Transport information

DOT (US)
UN number: 1400 Class: 4.3 Packing group: II
Proper shipping name: Barium
Reportable Quantity (RQ): 1000 lbs
Poison Inhalation Hazard: No

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

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

SECTION 15: Regulatory information

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

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

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

SARA 311/312 Hazards
Reactivity Hazard

Reportable Quantity : D005 lbs

Massachusetts Right To Know Components

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

Pennsylvania Right To Know Components

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California Prop. 65 Components
This product does not contain any chemicals known to State of California to cause cancer, birth defects, or any other reproductive harm.

SECTION 16: Other information

Further information
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Version: 6.3 Revision Date: 01/15/2020 Print Date: 02/20/2020

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SAFETY DATA SHEET

Revision Date 24-Dec-2021 **Revision Number** 4

1. Identification

Product Name **Cadmium**

Cat No. : **C3-500**

CAS No 7440-43-9
Synonyms No information available

Recommended Use Laboratory chemicals.
Uses advised against 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

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

2. Hazard(s) identification

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

Flammable solids	Category 2
Acute oral toxicity	Category 4
Acute dermal toxicity	Category 4
Acute Inhalation Toxicity - Dusts and Mists	Category 2
Germ Cell Mutagenicity	Category 2
Carcinogenicity	Category 1A
Reproductive Toxicity	Category 2
Specific target organ toxicity (single exposure)	Category 3
Target Organs - Respiratory system.	
Specific target organ toxicity - (repeated exposure)	Category 1
Target Organs - Kidney, Blood.	
Combustible dust	Yes

Label Elements

Signal Word

Danger

Hazard Statements
Flammable solid
May form combustible dust concentrations in air
Fatal if inhaled
Harmful if swallowed
Harmful in contact with skin
May cause respiratory irritation
Suspected of causing genetic defects
May cause cancer
Suspected of damaging fertility. Suspected of damaging the unborn child
Causes damage to organs through prolonged or repeated exposure



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

3. Composition/Information on Ingredients

Component	CAS No	Weight %
Cadmium	7440-43-9	100

4. First-aid measures

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

Eye Contact Rinse immediately with plenty of water, also under the eyelids, for at least 15 minutes. In the case of contact with eyes, rinse immediately with plenty of water and seek medical advice.

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

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

Ingestion Do NOT induce vomiting. Call a physician or poison control center immediately.

Most important symptoms and effects None reasonably foreseeable. . Kidney disorders: May cause harm to the unborn child: Blood disorders

Notes to Physician Treat symptomatically

5. Fire-fighting measures

Unsuitable Extinguishing Media No information available

Flash Point No information available
Method - No information available

Autoignition Temperature No information available

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

Specific Hazards Arising from the Chemical
Thermal decomposition can lead to release of irritating gases and vapors. Fine dust dispersed in air may ignite. Dust can form an explosive mixture with air. Pyrophoric properties of solids and liquids. Do not allow run-off from fire-fighting to enter drains or water courses.

Hazardous Combustion Products
Toxic fumes.
Protective Equipment and Precautions for Firefighters
As in any fire, wear self-contained breathing apparatus pressure-demand, MSHA/NIOSH (approved or equivalent) and full protective gear. Thermal decomposition can lead to release of irritating gases and vapors.

NFPA

Health	Flammability	Instability	Physical hazards
4	1	0	N/A

6. Accidental release measures

Personal Precautions Ensure adequate ventilation. Use personal protective equipment as required. Avoid dust

formation. Keep people away from and upwind of spill/leak. Evacuate personnel to safe areas.

Environmental Precautions Do not flush into surface water or sanitary sewer system. Do not allow material to contaminate ground water system. Prevent product from entering drains. Local authorities should be advised if significant spillages cannot be contained.

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

7. Handling and storage

Handling Wear personal protective equipment/face protection. Do not get in eyes, on skin, or on clothing. Avoid dust formation. Use only under a chemical fume hood. Do not breathe (dust, vapor, mist, gas). Do not ingest. If swallowed then seek immediate medical assistance.

Storage. Keep containers tightly closed in a dry, cool and well-ventilated place. Store under an inert atmosphere. Incompatible Materials. Strong oxidizing agents. Strong acids. Sulfur oxides.

8. Exposure controls / personal protection

Exposure Guidelines

Component	ACGIH TLV	OSHA PEL	NIOSH IDLH	Mexico OEL (TWA)
Cadmium	TWA: 0.01 mg/m³ TWA: 0.002 mg/m³	Ceiling: 0.3 mg/m³ Ceiling: 0.6 mg/m³ (Vacated) STEL: 0.3 ppm TWA: 0.1 mg/m³ TWA: 0.2 mg/m³ TWA: 5 µg/m³	IDLH: 9 mg/m³	TWA: 0.01 mg/m³ TWA: 0.002 mg/m³

Legend

ACGIH *- American Conference of Governmental Industrial Hygienists*
OSHA *- Occupational Safety and Health Administration*
NIOSH IDLH: *NIOSH - National Institute for Occupational Safety and Health*

Engineering Measures Use only under a chemical fume hood. Ensure that eyewash stations and safety showers are close to the workstation location.

Personal Protective Equipment

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

Skin and body protection 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 When using do not eat, drink or smoke. Provide regular cleaning of equipment, work area and clothing. Avoid contact with skin, eyes or clothing. Wash hands before breaks and immediately after handling the product. Keep away from food, drink and animal feeding stuffs.

9. Physical and chemical properties

Physical State Solid

Appearance	Silver
Odor	Odorless
Odor Threshold	No information available
pH	No information available
Melting Point/Range	321 °C / 609.8 °F
Boiling Point/Range	765 °C / 1409 °F @ 760 mmHg
Flash Point	No information available
Evaporation Rate	Not applicable
Flammability (solid,gas)	No information available
Flammability or explosive limits	
Upper	No data available
Lower	No data available
Vapor Pressure	No information available
Vapor Density	Not applicable
Specific Gravity	8.64 @ 25°C
Solubility	Insoluble in water
Partition coefficient; n-octanol/water	No data available
Autoignition Temperature	No information available
Decomposition Temperature	No information available
Viscosity	Not applicable
Molecular Formula	Cd
Molecular Weight	112.40

10. Stability and reactivity

Reactive Hazard None known, based on information available

Stability Stable under recommended storage conditions. Moisture sensitive. Air sensitive.

Conditions to Avoid Incompatible products. Excess heat. Avoid dust formation. Exposure to air or moisture over prolonged periods.

Incompatible Materials Strong oxidizing agents, Strong acids, Sulfur oxides

Hazardous Decomposition Products Toxic fumes

Hazardous Polymerization Hazardous polymerization does not occur.

Hazardous Reactions None under normal processing.

11. Toxicological information

Acute Toxicity

Product Information

Component Information

Component	LD50 Oral	LD50 Dermal	LC50 Inhalation
Cadmium	LD50 = 2330 mg/kg (Rat)	Not listed	LC50 = 25 mg/m³ (Rat) 30 min

Toxicologically Synergistic Products No information available

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

Irritation No information available

Sensitization No information available

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

Component	CAS No	IARC	NTP	ACGIH	OSHA	Mexico
Cadmium	7440-43-9	Group 1	Known	A2	X	A2

IARC (International Agency for Research on Cancer)	*IARC (International Agency for Research on Cancer)* *Group 1 - Carcinogenic to Humans* *Group 2A - Probably Carcinogenic to Humans* *Group 2B - Possibly Carcinogenic to Humans*
NTP: (National Toxicity Program)	*NTP: (National Toxicity Program)* *Known - Known Carcinogen* *Reasonably Anticipated - Reasonably Anticipated to be a Human Carcinogen*
ACGIH: (American Conference of Governmental Industrial Hygienists)	*A1 - Known Human Carcinogen* *A2 - Suspected Human Carcinogen* *A3 - Animal Carcinogen* *ACGIH: (American Conference of Governmental Industrial Hygienists)*

Mutagenic Effects Possible risk of irreversible effects

Reproductive Effects Possible risk of impaired fertility. May cause harm to the unborn child.

Developmental Effects No information available.

Teratogenicity No information available.

STOT - single exposure Respiratory system
STOT - repeated exposure Kidney Blood

Aspiration hazard No information available

Symptoms / effects,both acute and delayed Kidney disorders: May cause harm to the unborn child: Blood disorders

Endocrine Disruptor Information No information available

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

12. Ecological information



Ecotoxicity

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

Component	Freshwater Algae	Freshwater Fish	Microtox	Water Flea
Cadmium	Not listed	LC50: 0.0004 - 0.003 mg/L, 96h (Pimephales promelas) LC50: = 0.016 mg/L, 96h (Oryzias latipes) LC50: = 21.1 mg/L, 96h flow-through (Lepomis macrochirus) LC50: = 0.24 mg/L, 96h static (Cyprinus carpio) LC50: = 4.26 mg/L, 96h semi-static (Cyprinus carpio) LC50: = 0.002 mg/L, 96h	Not listed	EC50: = 0.0244 mg/L, 48h Static (Daphnia magna)

		(Cyprinus carpio) LC50: = 0.006 mg/L, 96h static (Oncorhynchus mykiss) LC50: = 0.003 mg/L, 96h flow-through (Oncorhynchus mykiss)		

Persistence and Degradability No information available

Bioaccumulation/ Accumulation No information available.

Mobility No information available.

13. Disposal considerations

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

14. Transport information

DOT

UN-No	UN2930
Proper Shipping Name	Toxic solid, flammable, organic, n.o.s.
Technical Name	Cadmium
Hazard Class	6.1
Subsidiary Hazard Class	4.1
Packing Group	I

TDG

UN-No	UN2930
Proper Shipping Name	Toxic solid, flammable, organic, n.o.s.
Hazard Class	6.1
Subsidiary Hazard Class	4.1
Packing Group	I

IATA

UN-No	UN2930
Proper Shipping Name	Toxic solid, flammable, organic, n.o.s.
Hazard Class	6.1
Subsidiary Hazard Class	4.1
Packing Group	I

IMDG/IMO

UN-No	UN2930
Proper Shipping Name	Toxic solid, flammable, organic, n.o.s.
Hazard Class	6.1
Subsidiary Hazard Class	4.1
Packing Group	I

15. Regulatory information

United States of America Inventory

Component	CAS No	TSCA	TSCA Inventory notification - Active-Inactive	TSCA - EPA Regulatory Flags
Cadmium	7440-43-9	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
Cadmium	7440-43-9	X	-	231-152-8	X	X		X	X	KE-04397

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

U.S. Federal Regulations

SARA 313

Component	CAS No	Weight %	SARA 313 - Threshold Values %
Cadmium	7440-43-9	100	0.1

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

CWA (Clean Water Act)

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

Clean Air Act

OSHA - Occupational Safety and Health Administration: Not applicable

Component	Specifically Regulated Chemicals	Highly Hazardous Chemicals
Cadmium	5 µg/m³ TWA 2.5 µg/m³ Action Level	-

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

Component	Hazardous Substances RQs	CERCLA EHS RQs
Cadmium	10 lb	-

California Proposition 65 This product contains the following Proposition 65 chemicals.

Component	CAS No	California Prop. 65	Prop 65 NSRL	Category
Cadmium	7440-43-9	Carcinogen Developmental Male Reproductive	0.05 µg/day	Developmental Carcinogen

U.S. State Right-to-Know Regulations

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

U.S. Department of Transportation

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

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

Other International Regulations

Mexico - Grade No information available

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)
Cadmium	-	Use restricted. See item 72. (see link for restriction details) Use restricted. See item 23. (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)	SVHC Candidate list - 231-152-8 - Carcinogenic, Article 57a;Specific target organ toxicity after repeated exposure, Article 57(f) - human health

After the sunset date the use of this substance requires either an authorization or can only be used for exempted uses, e.g. use in scientific research and development which includes routine analytics or use as intermediate.

https://echa.europa.eu/authorisation-list
https://echa.europa.eu/substances-restricted-under-reach
https://echa.europa.eu/candidate-list-table

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)
Cadmium	7440-43-9	Listed	Not applicable	Not applicable	0.01% (Max. Conc.)

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)
Cadmium	7440-43-9	Not applicable	Not applicable	Not applicable	Annex I - Y26

16. Other information

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

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

SAFETY DATA SHEET

Version 6.12
Revision Date 11/25/2024
Print Date 11/26/2024

SECTION 1: Identification of the substance/mixture and of the company/undertaking

1.1 Product identifiers

Product name : Calcium carbonate

Product Number : 239216
Brand : SIGALD
CAS-No. : 471-34-1

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)

Short-term (acute) aquatic hazard (Category 3), H402

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

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2.2 GHS Label elements, including precautionary statements

Pictogram	none
Signal Word	none
Hazard Statements	
H402	Harmful to aquatic life.
Precautionary Statements	
P273	Avoid release to the environment.
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

3.1 Substances

Formula	:	$CCaO_3$
Molecular weight	:	100.09 g/mol
CAS-No.	:	471-34-1
EC-No.	:	207-439-9

Component	Classification	Concentration
calcium carbonate		
	Aquatic Acute 3; H402	<= 100 %

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

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. Remove contact lenses.

If swallowed
After swallowing: make victim drink water (two glasses at most). Consult doctor if feeling unwell.

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

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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 water spray, alcohol-resistant foam, dry chemical or carbon dioxide.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.For this substance/mixture no limitations of extinguishing agents are given.

5.2 Special hazards arising from the substance or mixture
Calcium oxide
Not combustible.
Ambient fire may liberate hazardous vapours.

5.3 Advice for firefighters
In the event of fire, wear self-contained breathing apparatus.

5.4 Further information
none

SECTION 6: Accidental release measures

6.1 Personal precautions, protective equipment and emergency procedures
Advice for non-emergency personnel: Avoid inhalation of dusts. Evacuate the danger area, observe emergency procedures, consult an expert.
For personal protection see section 8.

6.2 Environmental precautions
No special precautionary measures necessary.

6.3 Methods and materials for containment and cleaning up
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.

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Keep in a dry place. hygroscopic

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
calcium carbonate	471-34-1	PEL	10 mg/m3	California permissible exposure limits for chemical contaminants (Title 8, Article 107)
		PEL	5 mg/m3	California permissible exposure limits for chemical contaminants (Title 8, Article 107)
		TWA	5 mg/m3	USA. NIOSH Recommended Exposure Limits
		TWA	10 mg/m3	USA. NIOSH Recommended Exposure Limits

8.2 Exposure controls

Appropriate engineering controls
Change contaminated clothing. Wash hands 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). Safety glasses

Skin protection
This recommendation applies only to the product stated in the safety data sheet, supplied by us and for the designated use. When dissolving in or mixing with other substances and under conditions deviating from those stated in EN 16523-1 please contact the supplier of CE-approved gloves (e.g. KCL GmbH, D-36124 Eichenzell, Internet: www.kcl.de).
Full contact
Material: Nitrile rubber
Minimum layer thickness: 0.11 mm
Break through time: 480 min
Material tested:KCL 741 Dermatril® L

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This recommendation applies only to the product stated in the safety data sheet, supplied by us and for the designated use. When dissolving in or mixing with other substances and under conditions deviating from those stated in EN 16523-1 please contact the supplier of CE-approved gloves (e.g. KCL GmbH, D-36124 Eichenzell, Internet: www.kcl.de).
Splash contact
Material: Nitrile rubber
Minimum layer thickness: 0.11 mm
Break through time: 480 min
Material tested:KCL 741 Dermatril® L

Respiratory protection
Recommended Filter type: Filter type P1
The entrepeneur 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
No special precautionary measures necessary.

SECTION 9: Physical and chemical properties

9.1 Information on basic physical and chemical properties

a)	Appearance	Form: powder Color: white
b)	Odor	No data available
c)	Odor Threshold	No data available
d)	pH	8.0
e)	Melting point/freezing point	Melting point/freezing point: 800 °C (1472 °F) - Decomposes on heating.
f)	Initial boiling point and boiling range	800 °C 1472 °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	No data available

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l)	Vapor density	No data available
m)	Density	2.93 g/cm3 at 25 °C (77 °F) - lit.
	Relative density	No data available
n)	Water solubility	0.017 g/l at 20 °C (68 °F) - OECD Test Guideline 105 - slightly soluble
o)	Partition coefficient: n-octanol/water	Not applicable for inorganic substances
p)	Autoignition temperature	not auto-flammable
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
Generates dangerous gases or fumes in contact with:
acids
carbon dioxide
ammonium compounds
acids
Exothermic reaction with:
Fluorine
Aluminum
magnesium

10.4 Conditions to avoid
Exposure to moisture may affect product quality.
no information available

10.5 Incompatible materials
No data available

10.6 Hazardous decomposition products
In the event of fire: see section 5

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SECTION 11: Toxicological information

11.1 Information on toxicological effects

Acute toxicity
LD50 Oral - Rat - female - > 2,000 mg/kg
(OECD Test Guideline 420)
LC50 Inhalation - Rat - male and female - 4 h - > 3 mg/l - aerosol

(OECD Test Guideline 403)
LD50 Dermal - Rat - male and female - > 2,000 mg/kg
(OECD Test Guideline 402)

Skin corrosion/irritation
Skin - reconstructed human epidermis (RhE)
Result: No skin irritation - 15 min
(OECD Test Guideline 439)

Serious eye damage/eye irritation
Eyes - Bovine cornea
Result: No eye irritation - 4 h
(OECD Test Guideline 437)

Respiratory or skin sensitization
Local lymph node assay (LLNA) - Mouse
Result: negative
(OECD Test Guideline 429)

Germ cell mutagenicity
Test Type: Ames test
Test system: Escherichia coli/Salmonella typhimurium
Metabolic activation: with and without metabolic activation
Method: OECD Test Guideline 471
Result: negative
Test Type: Mutagenicity (mammal cell test): chromosome aberration.
Test system: Human lymphocytes
Metabolic activation: with and without metabolic activation
Method: OECD Test Guideline 473
Result: negative
Test Type: In vitro mammalian cell gene mutation test
Test system: mouse lymphoma cells
Metabolic activation: with and without metabolic activation
Method: OECD Test Guideline 476
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.

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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

Repeated dose toxicity - Rat - male and female - Oral - 48 Days - NOAEL (No observed adverse effect level) - 1,000 mg/kg

RTECS: FF9335000
To the best of our knowledge, the chemical, physical, and toxicological properties have not been thoroughly investigated.

Hazardous properties cannot be excluded but are unlikely when the product is handled appropriately.

Handle in accordance with good industrial hygiene and safety practice.

SECTION 12: Ecological information

12.1 Toxicity

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 (OECD Test Guideline 202)
Toxicity to algae	static test ErC50 - Desmodesmus subspicatus (green algae) - 14 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)

12.2 Persistence and degradability

Biodegradability	aerobic - Exposure time 28 d Result: 90 % - Readily biodegradable. (OECD Test Guideline 301B)

12.3 Bioaccumulative potential

Bioaccumulation is unlikely.

12.4 Mobility in soil

No data available

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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 ecological problems are to be expected when the product is handled and used with due care and attention.

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.

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SARA 311/312 Hazards	:	No SARA Hazards
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.

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).
This product does not contain any hazardous air pollutants (HAP), as defined by the U.S. Clean Air Act Section 112 (40 CFR 61).
This product does not contain any chemicals listed under the U.S. Clean Air Act Section 112(r) for Accidental Release Prevention (40 CFR 68.130, Subpart F).
This product does not contain any chemicals listed under the U.S. Clean Air Act Section 111 SOCMI Intermediate or Final VOC's (40 CFR 60.489).

Clean Water Act

This product does not contain any Hazardous Substances listed under the U.S. CleanWater Act, Section 311, Table 116.4A.
This product does not contain any Hazardous Chemicals listed under the U.S. CleanWater Act, Section 311, Table 117.3.
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

No components are subject to the Massachusetts Right to Know Act.

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	:	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.

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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: 6.12 Revision Date: 11/25/2024 Print Date: 11/26/2024

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SAFETY DATA SHEET

1. Identification

Product identifier Chromium

Other means of identification

SDS number	1FX
Materion Code	1FX
CAS number	7440-47-3
Synonyms	CHROMIUM - METAL

Manufacturer/Importer/Supplier/Distributor information

Manufacturer

Company name	Materion Electronic Materials
Address	6070 Parkland Blvd Mayfield Heights, Ohio 44124 United States
Telephone	1.216.383.4019
E-mail	Materion-PS@materion.com
Contact person	Product Stewardship Director

Emergency phone number See Section 16

2. Hazard(s) identification

Physical hazards	Flammable solids	Category 2
Health hazards	Acute toxicity, oral	Category 2
Environmental hazards	Not classified.	
OSHA defined hazards	Not classified.	

Label elements



Signal word Danger

Hazard statement Flammable solid. Fatal if swallowed.

Precautionary statement

Prevention	Keep away from heat/sparks/open flames/hot surfaces. - No smoking. Ground and bond container and receiving equipment. Wear protective gloves/protective clothing/eye protection/face protection.
Response	If swallowed: Immediately call a poison center/doctor. Rinse mouth. If exposed or concerned: Call a poison center/doctor. In case of fire: Use appropriate media to extinguish.
Storage	Store in a well-ventilated place. Keep container tightly closed. Store locked up.
Disposal	Dispose of contents/container in accordance with local/regional/national/international regulations.

Hazard(s) not otherwise classified (HNOC) None known.

Supplemental information For further information, please contact the Product Stewardship Department at +1.800.862.4118.

3. Composition/information on ingredients

Substances

Chemical name	Common name and synonyms	CAS number	%
Chromium	CHROMIUM - METAL	7440-47-3	100

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

4. First-aid measures

Inhalation
Remove victim to fresh air and keep at rest in a position comfortable for breathing. Oxygen or artificial respiration if needed. Do not use mouth-to-mouth method if victim inhaled the substance. Induce artificial respiration with the aid of a pocket mask equipped with a one-way valve or other proper respiratory medical device. If experiencing respiratory symptoms: Call a POISON CENTER or doctor/physician.

Skin contact
Wash off with soap and water. Get medical attention if irritation develops and persists. For minor skin contact, avoid spreading material on unaffected skin.

Eye contact
Do not rub eyes. Immediately flush eyes with plenty of water for at least 15 minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Get medical attention if irritation develops and persists.

Ingestion
Call a physician or poison control center immediately. Rinse mouth. Do not induce vomiting without advice from poison control center. If vomiting occurs, keep head low so that stomach content doesn't get into the lungs. Do not use mouth-to-mouth method if victim ingested the substance. Induce artificial respiration with the aid of a pocket mask equipped with a one-way valve or other proper respiratory medical device.

Most important symptoms/effects, acute and delayed
May cause allergic skin reaction. May cause allergic respiratory reaction. Irritation of eyes and mucous membranes.

Indication of immediate medical attention and special treatment needed
Provide general supportive measures and treat symptomatically. Thermal burns: Flush with water immediately. While flushing, remove clothes which do not adhere to affected area. Call an ambulance. Continue flushing during transport to hospital. Keep victim warm. Keep victim under observation. Symptoms may be delayed.

General information
IF exposed or concerned: Get medical advice/attention. Ensure that medical personnel are aware of the material(s) involved, and take precautions to protect themselves. Show this safety data sheet to the doctor in attendance. Wash contaminated clothing before reuse.

5. Fire-fighting measures

Suitable extinguishing media
Water fog. Foam. Dry chemical powder. Carbon dioxide (CO2).

Unsuitable extinguishing media
Do not use water jet as an extinguisher, as this will spread the fire.

Specific hazards arising from the chemical
During fire, gases hazardous to health may be formed.

Special protective equipment and precautions for firefighters
Self-contained breathing apparatus and full protective clothing must be worn in case of fire. Wear suitable protective equipment.

Fire fighting equipment/instructions
In case of fire and/or explosion do not breathe fumes. Move containers from fire area if you can do so without risk. Water runoff can cause environmental damage.

Specific methods
Use standard firefighting procedures and consider the hazards of other involved materials.

General fire hazards
Flammable solid. No unusual fire or explosion hazards noted.

6. Accidental release measures

Personal precautions, protective equipment and emergency procedures
Keep unnecessary personnel away. Keep people away from and upwind of spill/leak. Wear appropriate protective equipment and clothing during clean-up. Ensure adequate ventilation. Local authorities should be advised if significant spillages cannot be contained. For personal protection, see section 8 of the SDS.

Methods and materials for containment and cleaning up

Eliminate all ignition sources (no smoking, flares, sparks, or flames in immediate area). Take precautionary measures against static discharge. Use only non-sparking tools. Collect spillage. The product is immiscible with water and will spread on the water surface. Prevent entry into waterways, sewer, basements or confined areas. Stop the flow of material, if this is without risk.

Large Spills: Wet down with water and dike for later disposal. Shovel the material into waste container. Following product recovery, flush area with water.

Small Spills: Sweep up or vacuum up spillage and collect in suitable container for disposal. Clean surface thoroughly to remove residual contamination.

Never return spills to original containers for re-use. For waste disposal, see section 13 of the SDS. The product is insoluble in water.

Environmental precautions

Avoid release to the environment. Refer to special instructions/safety data sheets. Do not contaminate water. Avoid discharge into drains, water courses or onto the ground.

7. Handling and storage

Precautions for safe handling

Obtain special instructions before use. Do not handle until all safety precautions have been read and understood. Provide adequate precautions, such as electrical grounding and bonding, or inert atmospheres. Do not handle, store or open near an open flame, sources of heat or sources of ignition. Protect material from direct sunlight. Explosion-proof general and local exhaust ventilation. Do not taste or swallow. Avoid prolonged exposure. When using, do not eat, drink or smoke. Wear appropriate personal protective equipment. Wash hands thoroughly after handling. Avoid release to the environment. Do not empty into drains. Use appropriate container to avoid environmental contamination. Observe good industrial hygiene practices.

Conditions for safe storage, including any incompatibilities

Store locked up. Keep away from heat, sparks and open flame. Store in a cool, dry place out of direct sunlight. Use appropriate container to avoid environmental contamination. Store in tightly closed container. Store in a well-ventilated place. Keep in an area equipped with sprinklers. Store away from incompatible materials (see Section 10 of the SDS).

8. Exposure controls/personal protection

Occupational exposure limits

The following constituents are the only constituents of the product which have a PEL, TLV or other recommended exposure limit. At this time, the other constituents have no known exposure limits.

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

Material	Type	Value
Chromium (CAS 7440-47-3)	PEL	1 mg/m3

US. ACGIH Threshold Limit Values (TLV)

Material	Type	Value	Form
Chromium (CAS 7440-47-3)	TWA	0.5 mg/m3	Inhalable fraction.

NIOSH. Immediately Dangerous to Life or Health (IDLH) Values, as amended

Material	Type	Value
Chromium (CAS 7440-47-3)	IDLH	250 mg/m3

US. NIOSH: Pocket Guide to Chemical Hazards Recommended Exposure Limits (REL)

Material	Type	Value
Chromium (CAS 7440-47-3)	TWA	0.5 mg/m3

US. California Code of Regulations, Title 8, Section 5155. Airborne Contaminants

Material	Type	Value
Chromium (CAS 7440-47-3)	PEL	0.5 mg/m3

Biological limit values

ACGIH Biological Exposure Indices (BEI)

Material	Value	Determinant	Specimen	Sampling Time
Chromium (CAS 7440-47-3)	0.7 µg/l	Total chromium	Urine	*

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

Appropriate engineering controls Explosion-proof general and local exhaust ventilation. Good general ventilation should be used. Ventilation rates should be matched to conditions. If applicable, use process enclosures, local exhaust ventilation, or other engineering controls to maintain airborne levels below recommended exposure limits. If exposure limits have not been established, maintain airborne levels to an acceptable level. Provide eyewash station.

Individual protection measures, such as personal protective equipment

Eye/face protection Wear safety glasses with side shields (or goggles). Face shield is recommended.

Skin protection

Hand protection Wear appropriate chemical resistant gloves.

Other Wear suitable protective clothing.

Respiratory protection Wear positive pressure self-contained breathing apparatus (SCBA).

Thermal hazards Wear appropriate thermal protective clothing, when necessary.

General hygiene considerations Do not get in eyes. When using do not smoke. Keep away from food and drink. Always observe good personal hygiene measures, such as washing after handling the material and before eating, drinking, and/or smoking. Routinely wash work clothing and protective equipment to remove contaminants. Contaminated work clothing should not be allowed out of the workplace.

9. Physical and chemical properties

Appearance Powder.

Physical state Solid.

Form Solid.

Color Not available.

Odor Not available.

Odor threshold Not available.

pH >7

Melting point/freezing point 3452 °F (1900 °C)

Initial boiling point and boiling range 4787.6 °F (2642 °C)

Flash point Not available.

Evaporation rate Not available.

Flammability (solid, gas) Flammable solid.

Upper/lower flammability or explosive limits

Explosive limit - lower (%) Not available.

Explosive limit - upper (%) Not available.

Vapor pressure <0.0000001 kPa (77 °F (25 °C))

Vapor density Not available.

Relative density Not available.

Solubility(ies)

Solubility (water) Insoluble

Partition coefficient (n-octanol/water) Not available.

Auto-ignition temperature Not available.

Decomposition temperature Not available.

Viscosity	Not available.

Other information

Density	7.14 g/cm3 estimated at 20 °C
Explosive properties	Not explosive.
Molecular formula	Cr
Molecular weight	52 g/mol
Oxidizing properties	Not oxidizing.
Specific gravity	7.14 at 20 °C

10. Stability and reactivity

Reactivity	The product is stable and non-reactive under normal conditions of use, storage and transport.
Chemical stability	Material is stable under normal conditions.
Possibility of hazardous reactions	No dangerous reaction known under conditions of normal use. Hazardous polymerization does not occur.
Conditions to avoid	Keep away from heat, hot surfaces, sparks, open flames and other ignition sources. Contact with incompatible materials.
Incompatible materials	Strong oxidizing agents.
Hazardous decomposition products	No hazardous decomposition products are known.

11. Toxicological information

Information on likely routes of exposure

Inhalation	May cause irritation to the respiratory system. May cause allergy or asthma symptoms or breathing difficulties if inhaled. Prolonged inhalation may be harmful.
Skin contact	May cause an allergic skin reaction.
Eye contact	Direct contact with eyes may cause temporary irritation.
Ingestion	Fatal if swallowed.
Symptoms related to the physical, chemical and toxicological characteristics	Direct contact with eyes may cause temporary irritation.

Information on toxicological effects

Acute toxicity	Fatal if swallowed. May cause allergy or asthma symptoms or breathing difficulties if inhaled. May cause respiratory irritation. May cause allergic skin reaction.

Product	Species	Test Results
Chromium (CAS 7440-47-3)		
Acute		
Oral		
LD50	Rat	46 - 113 mg/kg

Skin corrosion/irritation	Due to lack of data the classification is not possible.
Serious eye damage/eye irritation	Causes eye irritation.

Respiratory or skin sensitization

Respiratory sensitization	May cause allergy or asthma symptoms or breathing difficulties if inhaled.
Skin sensitization	May cause an allergic skin reaction.
Germ cell mutagenicity	Suspected of causing genetic defects.
Carcinogenicity	This product is not considered to be a carcinogen by IARC, ACGIH, NTP, or OSHA.

IARC Monographs. Overall Evaluation of Carcinogenicity

Chromium (CAS 7440-47-3)	3 Not classifiable as to carcinogenicity to humans.

OSHA Specifically Regulated Substances (29 CFR 1910.1001-1053)

Not listed.

US. National Toxicology Program (NTP) Report on Carcinogens

Not listed.

Reproductive toxicity Due to lack of data the classification is not possible.

Specific target organ toxicity - single exposure May cause damage to organs (). Respiratory tract irritation.

Specific target organ toxicity - repeated exposure Due to lack of data the classification is not possible.

Aspiration hazard Due to lack of data the classification is not possible.

Chronic effects Prolonged inhalation may be harmful.

12. Ecological information

Ecotoxicity Very toxic to aquatic life with long lasting effects. Accumulation in aquatic organisms is expected.

Product		Species	Test Results
Chromium (CAS 7440-47-3)			
Aquatic			
Acute			
Crustacea	EC50	Water flea (Daphnia magna)	0.01 - 0.7 mg/l, 48 hours
Fish	LC50	American eel (Anguilla rostrata)	13.9 mg/l, 96 hours

Persistence and degradability No data is available on the degradability of this product.

Bioaccumulative potential No data available.

Mobility in soil No data available.

Other adverse effects No other adverse environmental effects (e.g. ozone depletion, photochemical ozone creation potential, endocrine disruption, global warming potential) are expected from this component.

13. Disposal considerations

Disposal instructions This material and its container must be disposed of as hazardous waste. Dispose of this material and its container to hazardous or special waste collection point. Incinerate the material under controlled conditions in an approved incinerator. Do not discharge into drains, water courses or onto the ground. Do not allow this material to drain into sewers/water supplies. Do not contaminate ponds, waterways or ditches with chemical or used container. After recovery of solvent dispose of residue as hazardous waste. Dispose of contents/container in accordance with local/regional/national/international regulations.

Local disposal regulations Dispose in accordance with all applicable regulations.

Hazardous waste code D007: Waste Chromium
The waste code should be assigned in discussion between the user, the producer and the waste disposal company.

Waste from residues / unused products Dispose of in accordance with local regulations. Empty containers or liners may retain some product residues. This material and its container must be disposed of in a safe manner (see: Disposal instructions). Avoid discharge into water courses or onto the ground.

Contaminated packaging Since emptied containers may retain product residue, follow label warnings even after container is emptied. Empty containers should be taken to an approved waste handling site for recycling or disposal.

14. Transport information

DOT

UN number UN3089

UN proper shipping name Metal powder, flammable. n.o.s. (Chromium)

Transport hazard class(es)

Class 4.1

Subsidiary risk -

Label(s)	9
Packing group	III
Environmental hazards	
Marine pollutant	No.
Special precautions for user	Read safety instructions, SDS and emergency procedures before handling.
Special provisions	8, 146, 335, A112, B54, IB8, IP3, N20, T1, TP33
Packaging non bulk	213
Packaging bulk	240

IATA

UN number	UN3089
UN proper shipping name	Metal powder, flammable, n.o.s. (Chromium)
Transport hazard class(es)	
Class	4.1
Subsidiary risk	-
Packing group	III
Environmental hazards	No.
Special precautions for user	Read safety instructions, SDS and emergency procedures before handling.
Other information	
Passenger and cargo aircraft	Allowed with restrictions.
Cargo aircraft only	Allowed with restrictions.

IMDG

UN number	UN3089
UN proper shipping name	Metal powder, flammable, n.o.s. (Chromium)
Transport hazard class(es)	
Class	4.1
Subsidiary risk	-
Packing group	III
Environmental hazards	
Marine pollutant	No.
EmS	Not assigned.
Special precautions for user	Read safety instructions, SDS and emergency procedures before handling.

DOT



IATA; IMDG



15. Regulatory information

US federal regulations

All components are on the U.S. EPA TSCA Inventory List.
This product is a "Hazardous Chemical" as defined by the OSHA Hazard Communication Standard, 29 CFR 1910.1200.

Toxic Substances Control Act (TSCA)

TSCA Section 12(b) Export Notification (40 CFR 707, Subpt. D)

Not regulated.

CERCLA Hazardous Substance List (40 CFR 302.4)

Chromium (CAS 7440-47-3) Listed.

SARA 304 Emergency release notification

Not regulated.

OSHA Specifically Regulated Substances (29 CFR 1910.1001-1053)

Not listed.

Superfund Amendments and Reauthorization Act of 1986 (SARA)

SARA 302 Extremely hazardous substance

Not listed.

SARA 311/312 Hazardous chemical Yes

Classified hazard categories Flammable (gases, aerosols, liquids, or solids)
Acute toxicity (any route of exposure)

SARA 313 (TRI reporting)

Chemical name	CAS number	% by wt.
Chromium	7440-47-3	100

Other federal regulations

Clean Air Act (CAA) Section 112 Hazardous Air Pollutants (HAPs) List

Chromium (CAS 7440-47-3)

Clean Air Act (CAA) Section 112(r) Accidental Release Prevention (40 CFR 68.130)

Not regulated.

Clean Water Act (CWA) Section 112(r) (40 CFR 68.130) Priority pollutant
Toxic pollutant

Safe Drinking Water Act (SDWA) Listed.

US state regulations

California Safe Drinking Water and Toxic Enforcement Act of 1986 (Proposition 65): This material is not known to contain any chemicals currently listed as carcinogens or reproductive toxins.

US. California. Candidate Chemicals List. Safer Consumer Products Regulations (Cal. Code Regs, tit. 22, 69502.3, subd. (a))

Chromium (CAS 7440-47-3)

California Proposition 65

California Safe Drinking Water and Toxic Enforcement Act of 1986 (Proposition 65): This material is not known to contain any chemicals currently listed as carcinogens or reproductive toxins. For more information go to www.P65Warnings.ca.gov.

16. Other information, including date of preparation or last revision

Issue date 07-14-2015

Revision date 04-03-2024

Version # 05

Further information	Transportation Emergency Call Chemtrec at: US: 800.424.9300 International: 703.741.5970 Spain: 900.868.538 Switzerland: 0800.564.402 Chemtrec's toll free, mobile-enabled number in Germany – 0800 1817059 South Korea Toll-free Number – 080-880-0468
References	ACGIH EPA: AQUIRE database NLM: Hazardous Substances Data Base US. IARC Monographs on Occupational Exposures to Chemical Agents
Disclaimer	This document has been prepared using data from sources considered to be technically reliable and the information is believed to be correct. Materion makes no warranties, expressed or implied, as to the accuracy of the information contained herein. Materion cannot anticipate all conditions under which this information and its products may be used and the actual conditions of use are beyond its control. The user is responsible to evaluate all available information when using this product for any particular use and to comply with all Federal, State, Provincial and Local laws, statutes and regulations.
Revision information	This document has undergone significant changes and should be reviewed in its entirety.

Safety Data Sheet

According to OSHA HCS 2012 (29 CFR 1910.1200), Health Canada HPR (SOR/2015-17), and Mexico NOM-018-STPS-2015

SECTION 1: Identification

Product Identifier:	**No. 1 Diesel Fuel**
Other means of identification:	Diesel Fuel No. 1;No. 1 Diesel, Ultra Low Sulfur, Dyed and Undyed;No. 1 High Sulfur Diesel – Dyed;No. 1 High Sulfur Distillate;No. 1 Low Sulfur Diesel – Dyed; No. 1 Low Sulfur Distillate;#1 DSL ULS 15 NRLM;#1 DSL ULS 15 NRLM D; PCR - HOD – Heating Oil Distillate
Code:	**001929**
Issue date:	12-Jun-2024
MARPOL Annex I Category :	Kerosenes
Relevant identified uses:	Fuel
Uses advised against:	All others
24 Hour Emergency Phone Number:	CHEMTREC Global +1 703 527 3887 CHEMTREC United States 1-800-424-9300 CHEMTREC Mexico 01-800-681-9531
Manufacturer/Supplier:	Phillips 66 Company P.O. Box 421959 Houston, Texas 77242-1959
SDS Information:	URL: www.phillips66.com/SDS Phone: 800-762-0942 Email: SDS@P66.com

SECTION 2: Hazard identification

Classified Hazards

H226 -- Flammable liquids -- Category 3
H304 -- Aspiration Hazard -- Category 1
H315 -- Skin corrosion/irritation -- Category 2
H336 -- Specific target organ toxicity (single exposure) -- Category 3 (Central Nervous System (CNS))
H411 -- Hazardous to the aquatic environment, chronic toxicity -- Category 2

Label Elements



DANGER
H226 - Flammable liquid and vapor
H304 - May be fatal if swallowed and enters airways
H315 - Causes skin irritation
H336 - May cause drowsiness or dizziness
H411 - Toxic to aquatic life with long lasting effects

Precautionary Statements
P210 - Keep away from heat/sparks/open flames/hot surfaces. - No smoking; P233 - Keep container tightly closed; P240 - Ground/bond container and receiving equipment; P241 - Use explosion-proof electrical (ventilation and lighting) equipment; P242 - Use only non-sparking tools; P243 - Take precautionary measures against static discharge; P261 - Avoid breathing dust/fume/gas/mist/vapors/spray; P264 - Wash skin thoroughly after handling; P271 - Use only outdoors or in a well-ventilated area; P273 - Avoid release to the environment; P280 - Wear protective gloves/protective clothing and eye/face protection; P301 + P310 - IF SWALLOWED: Immediately call a POISON CENTER or doctor/physician; P331 - Do NOT induce vomiting; P303 + P361 + P353 - IF ON SKIN (or hair): Remove/Take off immediately all contaminated clothing. Rinse skin with water/shower; P332 + P313 - If skin irritation occurs: Get medical advice/attention; P304 + P340 - IF INHALED: Remove victim to fresh air and keep at rest in a position comfortable for breathing; P312 - Call a POISON CENTER or doctor/physician if you feel unwell; P362 - Take off contaminated clothing and wash before reuse; P370 + P378 - In case of fire: Use CO2, dry chemical, or foam to extinguish; P391 - Collect spillage; P403 + P235 - Store in a well-ventilated place. Keep cool; P501 - Dispose of contents/

container to an approved waste disposal plant

Hazards Not Otherwise Classified (HNOC)

PHNOC: Electrostatic charge may be generated during pumping and other operations

HHNOC: None known

SECTION 3: Composition/information on ingredients

Substance	CASRN	Concentration[1]
Petroleum distillates, hydrotreated light	64742-47-8	0-100
Kerosine, petroleum, hydrodesulfurized	64742-81-0	0-100
Kerosine, petroleum	8008-20-6	0-100

Hazardous Constituent(s) Contained Within Above Complex Substance(s)

Substance	CASRN	Concentration[1]
Naphthalene	91-20-3	<3
Benzene, 1,2,4-trimethyl-	95-63-6	<2
Ethylbenzene	100-41-4	<1

[1] All concentrations are percent by weight unless ingredient is a gas. Gas concentrations are in percent by volume.

SECTION 4: First aid measures

Eye Contact: If irritation or redness develops from exposure, flush eyes with clean water. If symptoms persist, seek medical attention.

Skin Contact: Remove contaminated shoes and clothing, and flush affected area(s) with large amounts of water. If skin surface is damaged, apply a clean dressing and seek medical attention. If skin surface is not damaged, cleanse affected area(s) thoroughly by washing with mild soap and water or a waterless hand cleaner. If irritation or redness develops, seek medical attention. Wash contaminated clothing before reuse. If product is injected into or under the skin, or into any part of the body, regardless of the appearance of the wound or its size, the individual should be evaluated immediately by a physician. (see Note to Physician)

Inhalation: First aid is not normally required. If breathing difficulties develop, move victim away from source of exposure and into fresh air in a position comfortable for breathing. Seek immediate medical attention.

Ingestion: Aspiration hazard: Do not induce vomiting or give anything by mouth because this material can enter the lungs and cause severe lung damage. If victim is drowsy or unconscious and vomiting, place on the left side with the head down. If possible, do not leave victim unattended and observe closely for adequacy of breathing. Seek medical attention.

Most important symptoms and effects, both acute and delayed: While significant vapor concentrations are not likely, high concentrations can cause minor respiratory irritation, headache, drowsiness, dizziness, loss of coordination, disorientation and fatigue. Ingestion can cause irritation of the digestive tract, nausea, diarrhea, and vomiting. Prolonged or repeated contact may dry skin and cause irritation.

Notes to Physician: When using high-pressure equipment, injection of product under the skin can occur. In this case, the casualty should be sent immediately to the hospital. Do not wait for symptoms to develop. High-pressure hydrocarbon injection injuries may produce substantial necrosis of underlying tissue despite an innocuous appearing external wound. These injuries often require extensive emergency surgical debridement and all injuries should be evaluated by a specialist in order to assess the extent of injury. Early surgical treatment within the first few hours may significantly reduce the ultimate extent of injury.

SECTION 5: Firefighting measures

NFPA 704: National Fire Protection Association

Health: 1 **Flammability:** 2 **Instability:** 0



0 = minimal hazard
1 = slight hazard
2 = moderate hazard
3 = severe hazard
4 = extreme hazard

Extinguishing Media: Dry chemical, carbon dioxide, or foam is recommended. Water spray is recommended to cool or protect exposed materials or structures. Carbon dioxide can displace oxygen. Use caution when applying carbon dioxide in confined spaces. Simultaneous use of foam and water on the same surface is to be avoided as water destroys the foam. Water may be ineffective for extinguishment, unless used under favorable conditions by experienced fire fighters.

Specific hazards arising from the chemical

Unusual Fire & Explosion Hazards: Flammable. This material can be ignited by heat, sparks, flames, or other sources of ignition (e.g., static electricity, pilot lights, mechanical/electrical equipment, and electronic devices such as cell phones, computers, calculators, and pagers which have not been certified as intrinsically safe). Vapors may travel considerable distances to a source of ignition where they can ignite, flash back, or explode. May create vapor/air explosion hazard indoors, in confined spaces, outdoors, or in sewers. This product will float and can be reignited on surface water. Vapors are heavier than air and can accumulate in low areas. If container is not properly cooled, it can rupture in the heat of a fire.

Hazardous Combustion Products: Combustion may yield smoke, carbon monoxide, and other products of incomplete combustion. Oxides of nitrogen and sulfur may also be formed.

Special protective actions for fire-fighters: For fires beyond the initial stage, emergency responders in the immediate hazard area should wear protective clothing. When the potential chemical hazard is unknown, in enclosed or confined spaces, a self contained breathing apparatus should be worn. In addition, wear other appropriate protective equipment as conditions warrant (see Section 8). Isolate the hazard area and deny entry to unnecessary and unprotected personnel. Stop spill/release if it can be done safely. Move undamaged containers from immediate hazard area if it can be done safely. Water spray may be useful in minimizing or dispersing vapors and to protect personnel. Cool equipment exposed to fire with water, if it can be done safely. Avoid spreading burning liquid with water used for cooling purposes.

See Section 9 for Flammable Properties including Flash Point and Flammable (Explosive) Limits

SECTION 6: Accidental release measures

Personal precautions, protective equipment and emergency procedures: Flammable. Spillages of liquid product will create a fire hazard and may form an explosive atmosphere. Keep all sources of ignition and hot metal surfaces away from spill/release if safe to do so. The use of explosion-proof electrical equipment is recommended. Stay upwind and away from spill/release. Avoid direct contact with material. For large spillages, notify persons down wind of the spill/release, isolate immediate hazard area and keep unauthorized personnel out. Wear appropriate protective equipment, including respiratory protection, as conditions warrant (see Section 8). See Sections 2 and 7 for additional information on hazards and precautionary measures.

Environmental Precautions: Stop and contain spill/release if it can be done safely. Prevent spilled material from entering sewers, storm drains, other unauthorized drainage systems, and natural waterways. Use foam on spills to minimize vapors. Use water sparingly to minimize environmental contamination and reduce disposal requirements. If spill occurs on water notify appropriate authorities and advise shipping of any hazard. Spills into or upon navigable waters, the contiguous zone, or adjoining shorelines that cause a sheen or discoloration on the surface of the water, may require notification of the National Response Center (phone number 800-424-8802).

Methods and material for containment and cleaning up: Notify relevant authorities in accordance with all applicable regulations. Immediate cleanup of any spill is recommended. Dike far ahead of spill for later recovery or disposal. Absorb spill with inert material such as sand or vermiculite, and place in suitable container for disposal. If spilled on water remove with appropriate methods (e.g. skimming, booms or absorbents). In case of soil contamination, remove contaminated soil for remediation or disposal, in accordance with local regulations.

Recommended measures are based on the most likely spillage scenarios for this material; however local conditions and regulations may influence or limit the choice of appropriate actions to be taken. See Section 13 for information on appropriate disposal.

SECTION 7: Handling and storage

Precautions for safe handling: Keep away from heat, hot surfaces, sparks, open flames and other ignition sources. No smoking. Take precautionary measures against static discharge. Use non-sparking tools. Wear protective gloves/protective clothing/eye protection/face protection. Wash thoroughly after handling. Use good personal hygiene practices and wear appropriate personal protective equipment (see section 8). Flammable. May vaporize easily at ambient temperatures. The vapor is heavier than air and may create an explosive mixture of vapor and air. Beware of accumulation in confined spaces and low lying areas. Open container slowly to relieve any pressure. The use of explosion-proof electrical equipment is recommended and may be required (see appropriate fire codes). Refer to NFPA-70 and/or API RP 2003 for specific bonding/grounding requirements. Do not enter confined spaces such as tanks or pits without following proper entry procedures such as ASTM D-4276 and 29CFR 1910.146. Do not wear contaminated clothing or shoes. Keep contaminated clothing away from sources of ignition such as sparks or open flames.

High pressure injection of hydrocarbon fuels, hydraulic oils or greases under the skin may have serious consequences even though no symptoms or injury may be apparent. This can happen accidentally when using high pressure equipment such as high pressure grease guns, fuel injection apparatus or from pinhole leaks in tubing of high pressure hydraulic oil equipment.

For use as a motor fuel only. Do not use as a solvent due to its flammable and potentially toxic properties. Siphoning by mouth can result in lung aspiration which can be harmful or fatal.

The use of hydrocarbon fuel in an area without adequate ventilation may result in hazardous levels of incomplete combustion products (e.g. carbon monoxide, oxides of sulfur and nitrogen, benzene and other hydrocarbons) and/or dangerously low oxygen levels.

Diesel engine exhaust contains hazardous combustion products and has been identified as a cancer hazard. Exposure should be minimized to reduce potential risk.

Static Accumulation Hazard: Electrostatic charge may accumulate and create a hazardous condition when handling this material. To minimize this hazard, bonding and grounding of tanks, transfer piping, and storage tank level floats are necessary but may not, by themselves, be sufficient. Review all operations which have the potential of generating and accumulating an electrostatic charge and/or a flammable atmosphere (including tank and container filling, splash filling, tank cleaning, sampling, gauging, switch loading, filtering, mixing, agitation, and vacuum truck operations) and use appropriate mitigating procedures. Special care should be given to ensure that special slow load procedures for "switch loading" are followed to avoid the static ignition hazard that can exist when higher flash point material (such as fuel oil or diesel) is loaded into tanks previously containing low flash point products (such as gasoline or naphtha). For more information, refer to OSHA Standard 29 CFR 1910.106, 'Flammable and Combustible Liquids', National Fire Protection Association (NFPA 77, 'Recommended Practice on Static Electricity', and/or the American Petroleum Institute (API) Recommended Practice 2003, 'Protection Against Ignitions Arising Out of Static, Lightning, and Stray Currents'.

Conditions for safe storage: Keep container(s) tightly closed and properly labeled. Use and store this material in cool, dry, well-ventilated areas away from heat, direct sunlight, hot metal surfaces, and all sources of ignition. Store only in approved containers. Post area "No Smoking or Open Flame." Keep away from any incompatible material (see Section 10). Protect container(s) against physical damage. Outdoor or detached storage is preferred. Indoor storage should meet OSHA standards and appropriate fire codes.

"Empty" containers retain residue and may be dangerous. Do not pressurize, cut, weld, braze, solder, drill, grind, or expose such containers to heat, flame, sparks, or other sources of ignition. They may explode and cause injury or death. "Empty" drums should be completely drained, properly bunged, and promptly shipped to the supplier or a drum reconditioner. All containers should be disposed of in an environmentally safe manner and in accordance with governmental regulations. Before working on or in tanks which contain or have contained this material, refer to OSHA regulations, ANSI Z49.1, and other references pertaining to cleaning, repairing, welding, or other contemplated operations.

SECTION 8: Exposure controls/personal protection

Occupational exposure limits

Substance	ACGIH	OSHA	Mexico	Phillips 66
Petroleum distillates, hydrotreated light	TWA-8hr: 200 mg/m^3 total hydrocarbon vapor Skin	---	---	TWA-8hr: 200 mg/m^3 total hydrocarbon vapor Skin
Kerosine, petroleum,	TWA-8hr: 200 mg/m^3 total	---	TWA-8hr: 200 mg/m^3	---

hydrodesulfurized	Hydrocarbon vapor Kerosene/Jet fuels Skin A3		(VLE-PPT)	
Kerosine, petroleum	TWA-8hr: 200 mg/m^3 total Hydrocarbon vapor Kerosene/Jet fuels Skin A3	---	TWA-8hr: 200 mg/m^3 (VLE-PPT) Skin	TWA-8hr: 200 mg/m^3 TWA-8hr: 28 ppm Skin
Naphthalene	TWA-8hr: 10 ppm Skin A3	TWA-8hr: 10 ppm TWA-8hr: 50 mg/m^3 Carcinogen	TWA-8hr: 10 ppm (VLE-PPT) STEL: 15 ppm (VLE-CT)	TWA-8hr: 10 ppm Skin
Benzene, 1,2,4-trimethyl-	TWA-8hr: 10 ppm Trimethylbenzene, isomers A4	---	---	---
Ethylbenzene	TWA-8hr: 20 ppm OTO A3	TWA-8hr: 100 ppm TWA-8hr: 435 mg/m^3 Carcinogen	TWA-8hr: 20 ppm (VLE-PPT)	TWA-8hr: 20 ppm Skin

State, local or other agencies or advisory groups may have established more stringent limits. Consult an industrial hygienist or similar professional, or your local agencies, for further information. --- = None.

Biological occupational exposure limits

Substance	ACGIH	Mexican NOM-047-SSA1-2011
Naphthalene	1-Naphthol with hydrolysis plus 2-Naphthol with hydrolysis in : (end of shift)	---
Ethylbenzene	Sum of mandelic acid and phenylglyoxylic acid in urine: 150 mg/g creatinine (end of shift)	Sum of mandelic acid and phenylglyoxylic acid in urine: 0.7 g/g creatinine (end of shift at end of work week) Ethylbenzene in exhaled air: (not critical)

State, local or other agencies or advisory groups may have established more stringent limits. Consult an industrial hygienist or similar professional, or your local agencies, for further information. --- = None.

Engineering controls: If current ventilation practices are not adequate to maintain airborne concentrations below the established exposure limits, additional engineering controls may be required.

Eye/Face Protection: The use of eye protection that meets or exceeds ANSI Z.87.1 is recommended to protect against potential eye contact, irritation, or injury. Depending on conditions of use, a face shield may be necessary.

Skin/Hand Protection: The use of gloves impervious to the specific material handled is advised to prevent skin contact. Users should check with manufacturers to confirm the breakthrough performance of their products. Depending on exposure and use conditions, additional protection may be necessary to prevent skin contact including use of items such as chemical resistant boots, aprons, arm covers, hoods, coveralls, or encapsulated suits. Suggested protective materials: Nitrile rubber.

Respiratory Protection: Where there is potential for airborne exposure above the exposure limit a NIOSH certified air purifying respirator equipped with organic vapor cartridges/canisters may be used.

A respiratory protection program that meets or is equivalent to OSHA 29 CFR 1910.134 and ANSI Z88.2 should be followed whenever workplace conditions warrant a respirator's use. Air purifying respirators provide limited protection and cannot be used in atmospheres that exceed the maximum use concentration (as directed by regulation or the manufacturer's instructions), in oxygen deficient (less than 19.5 percent oxygen) situations, or under conditions that are immediately dangerous to life and health (IDLH).

Other Protective Equipment: Eye wash and quick-drench shower facilities should be available in the work area. Thoroughly clean shoes and wash contaminated clothing before reuse.

Suggestions provided in this section for exposure control and specific types of protective equipment are based on readily available information. Users should consult with the specific manufacturer to confirm the performance of their protective equipment. Specific situations may require consultation with industrial hygiene, safety, or engineering professionals.

SECTION 9: Physical and chemical properties

Note: Unless otherwise stated, values are determined at 20°C (68°F) and 760 mm Hg (1 atm). Data represent typical values and are not intended to be specifications.

Color:	Clear, light yellow or light green (may be dyed red)
Physical State:	Liquid
Odor:	Kerosene
Odor threshold:	No data
pH:	Not applicable
Melting / freezing point:	< -40 °F / < -40 °C
Initial boiling point and boiling range:	300 - 572 °F / 149 - 300 °C
Flash point:	100-150 °F / 38-66 °C
Method:	Tag Closed Cup (TCC), ASTM D56
Evaporation Rate (nBuAc=1):	<1
Flammability (solid, gas):	Not applicable
Upper Explosive Limits (vol % in air):	7.0
Lower Explosive Limits (vol % in air):	0.7
Vapor pressure:	0.40 mmHg
Vapor density:	> 4.5 (air = 1) >1
Relative density:	0.775-0.840 @ 68ºF (20ºC) (water = 1)
Solubility:	<0.1%
Partition coefficient n-octanol /water (log Kow):	No data
Autoignition temperature:	410 °F / 210 °C
Decomposition temperature:	No data
Viscosity:	1-2.4 cSt @ 40°C
Molecular weight:	No data

Other information

Particle characteristics	No data
Pour point:	No data
Percent volatile:	98-100% @ 545ºF (285ºC)
Bulk density:	6.73 lbs/gal
VOC content (%):	0.16 lb/1000 gal

SECTION 10: Stability and reactivity

Reactivity: Not chemically reactive.

Chemical stability: Stable under normal ambient and anticipated conditions of use.

Possibility of Hazardous Reactions: Hazardous reactions not anticipated.

Conditions to Avoid: Avoid high temperatures and all sources of ignition. Prevent vapor accumulation.

Incompatible Materials: Avoid contact with strong oxidizing agents and strong reducing agents.

Hazardous Decomposition Products: Not anticipated under normal conditions of use.

SECTION 11: Toxicological information

Information on Toxicological Effects

Substance / Mixture

Acute Toxicity	Hazard	Additional Information	LC50/LD50 Data
Inhalation	Unlikely to be harmful		>5.2 mg/L (mist)
Dermal	Unlikely to be harmful		>2 g/kg
Oral	Unlikely to be harmful		>5 g/kg

Likely Routes of Exposure: Inhalation, eye contact, skin contact

Aspiration Hazard: May be fatal if swallowed and enters airways.

Skin Corrosion/Irritation: Causes skin irritation. Repeated exposure may cause skin dryness or cracking.

Serious Eye Damage/Irritation: Causes mild eye irritation.

Skin Sensitization: Not expected to be a skin sensitizer.

Respiratory Sensitization: No information available.

Specific target organ toxicity - Single exposure: May cause drowsiness and dizziness.

Specific target organ toxicity - Repeated exposure: Not expected to cause organ effects from repeated exposure.

Carcinogenicity: Not expected to cause cancer. Petroleum middle distillates have been shown to cause skin tumors in mice following repeated and prolonged skin contact. Follow-up studies have shown that these tumors are produced through a non-genotoxic mechanism associated with frequent cell damage and repair, and that they are not likely to cause tumors in the absence of prolonged skin irritation.

Germ Cell Mutagenicity: Not expected to cause heritable genetic effects.

Reproductive Toxicity: Not expected to cause reproductive toxicity. Hydrodesulfurized kerosene applied to the skin of female rats at 494, 330, or 165 mg/kg daily for 7 consecutive weeks (premating, mating, and gestation), or for 8 consecutive weeks in males did not result in systemic, reproductive, or developmental toxicity.

Other Comments: Naphthalene has been shown to cause cataracts in humans upon eye contact with vapors or dusts, and upon ingestion or inhalation in laboratory animals.

Diesel engine exhaust has been classified by the International Agency for Research on Cancer (IARC) and National Toxicology Program (NTP) as a carcinogen.

Information on Toxicological Effects of Components

Naphthalene

Additional Information (Carcinogenicity): Naphthalene has been evaluated in two year inhalation studies in both rats and mice. The US National Toxicology Program (NTP) concluded that there is clear evidence of carcinogenicity in male and female rats based on increased incidences of respiratory epithelial adenomas and olfactory epithelial neuroblastomas of the nose. NTP found some evidence of carcinogenicity in female mice (alveolar adenomas) and no evidence of carcinogenicity in male mice. Naphthalene has been identified as a carcinogen by IARC and NTP.

Ethylbenzene

Additional Information (Carcinogenicity): Rats and mice exposed to 0, 75, 250, or 750 ppm ethyl benzene in a two year inhalation study demonstrated limited evidence of kidney, liver, and lung cancer. Ethyl benzene has been listed as a possible human carcinogen by IARC.

Additional Information (STOT RE): In rats and mice exposed to 0, 75, 250, or 750 ppm ethyl benzene in a two year inhalation study there was mild damage to the kidney (tubular hyperplasia), liver (eosinophilio foci, hypertrophy, necrosis), lung (alveolar epithelium metaplasia), thyroid (hyperplasia), thyroid (hyperplasia) and pituitary (hyperplasia). In animal models (particularly rats), ethyl benzene affects the auditory function mainly in the cochlear mid-frequency range and ototoxicity was observed after combined exposure to noise and ethyl benzene. There is no evidence of either ethyl benzene-induced hearing losses or ototoxicity with combined exposure to ethyl benzene and noise in workers.

SECTION 12: Ecological information



GHS Classification:
H411 -- Hazardous to the aquatic environment, chronic toxicity -- Category 2
Toxic to aquatic life with long lasting effects.

Toxicity: Acute aquatic toxicity studies on samples of jet fuel and kerosine streams show acute toxicity values greater than 1 mg/L and mostly in the range 1-100 mg/L. These tests were carried out on water accommodated fractions, in closed systems to prevent evaporative loss. Results are consistent with the predicted aquatic toxicity of these substances based on their hydrocarbon composition. Kerosines should be regarded as toxic to aquatic organisms, with the potential to cause long term adverse effects in the aquatic environment.

Persistence and Degradability: The hydrocarbons in this material are not readily biodegradable but are regarded as inherently

biodegradable since their hydrocarbon components can be degraded by microorganisms.

Persistence per IOPC Fund definition: Non-Persistent

Bioaccumulative Potential: Hydrocarbon constituents of kerosine show measured or predicted Log Kow values ranging from 3 to 6 and above and therefore would be regarded as having the potential to bioaccumulate. In practice, metabolic processes may reduce bioconcentration.

Mobility in Soil: On release to water, hydrocarbons will float on the surface and since they are sparingly soluble, the only significant loss is volatilization to air. It is possible that some of the higher molecular weight hydrocarbons will be adsorbed on sediment. Biodegradation in water is a minor loss process. In air, these hydrocarbons are photodegraded by reaction with hydroxyl radicals with half lives varying from 0.1 to 0.7 days.

Other adverse effects: None anticipated.

SECTION 13: Disposal considerations

The generator of a waste is always responsible for making proper hazardous waste determinations and needs to consider state and local requirements in addition to federal regulations. This material, if discarded as produced, would not be a federally regulated RCRA "listed" hazardous waste. However, it would likely be identified as a federally regulated RCRA hazardous waste for the following characteristic(s) shown below. See Sections 7 and 8 for information on handling, storage and personal protection and Section 9 for physical/chemical properties. It is possible that the material as produced contains constituents which are not required to be listed in the SDS but could affect the hazardous waste determination. Additionally, use which results in chemical or physical change of this material could subject it to regulation as a hazardous waste.Container contents should be completely used and containers should be emptied prior to discard. Container residues and rinseates could be considered to be hazardous wastes.

EPA Waste Number(s)
• D001 - Ignitability characteristic

SECTION 14: Transport information

UN Number: UN1202
UN proper shipping name: Diesel fuel
Transport hazard class(es): 3 ***or*** Combustible liquid
Packing Group: III
Environmental Hazard(s): Marine pollutant - Environmentally Hazardous
Special precautions for user: ***Combustible liquid classification is dependent on a flash point of >60° C (140° F) and <93° C (200° F).***
If transported in bulk by marine vessel in international waters, product is being carried under the scope of MARPOL Annex I.
Container(s) greater than 5 liters (liquids) or 5 kilograms (solids), shipped by water mode and ALL bulk shipments may require the shipping description to contain the "Marine Pollutant" notation [49 CFR 172.203(l)] and the container(s) to display the [Marine Pollutant Mark] [49 CFR 172.322].
Transport in bulk according to Annex II of MARPOL 73/78 and the IBC Code: Not applicable

SECTION 15: Regulatory information

CERCLA/SARA - Section 302 Extremely Hazardous Substances and TPQs (in pounds)
This material does not contain any chemicals subject to the reporting requirements of SARA 302 and 40 CFR 372.

CERCLA/SARA - Section 311/312 (Title III Hazard Categories)
Should this product meet EPCRA 311/312 Tier reporting criteria at 40 CFR 370, refer to Section 2 of this SDS for appropriate classifications.

CERCLA/SARA - Section 313 and 40 CFR 372
This material contains the following chemicals subject to the reporting requirements of Section 313 of SARA Title III and 40 CFR 372:

Substance	Concentration[1]	de minimis
Naphthalene	<3	0.1%
Benzene, 1,2,4-trimethyl-	<2	1.0%
Ethylbenzene	<1	0.1%

[1] All concentrations are percent by weight unless ingredient is a gas. Gas concentrations are in percent by volume.

EPA (CERCLA) Reportable Quantity (in pounds)
EPA's Petroleum Exclusion applies to this material - (CERCLA 101(14)).

California Proposition 65

WARNING: This product can expose you to chemicals including Benzene (CASRN 71-43-2), Naphthalene (CASRN 91-20-3), and Ethylbenzene (CASRN 100-41-4) which are known to the State of California to cause cancer, and Benzene (CASRN 71-43-2) and Toluene (CASRN 108-88-3) which are known to the State of California to cause birth defects or other reproductive harm. For more information go to www.P65Warnings.ca.gov.

International Inventories
TSCA (United States): All ingredients are on the inventory or exempt from listing.
All components are either on the DSL, or are exempt from DSL listing requirements.

SECTION 16: Other information

Issue date	Previous Issue Date:	SDS Number	Status:
12-Jun-2024	20-Oct-2021	001929	FINAL

Reason for Revision:
Periodic review and update
Format change
Composition/information on ingredients
Occupational Exposure Limits
Toxicological Information

Mexican NOM-018-STPS-2015:
The information within is considered correct but is not exhaustive and will be used for guidance only, which is based on the current knowledge of the substance or mixture and is applicable to the appropriate safety precautions for the product.

Precautionary Statements
P210 - Keep away from heat/sparks/open flames/hot surfaces. - No smoking
P233 - Keep container tightly closed
P240 - Ground/bond container and receiving equipment
P241 - Use explosion-proof electrical (ventilation and lighting) equipment
P242 - Use only non-sparking tools
P243 - Take precautionary measures against static discharge
P261 - Avoid breathing dust/fume/gas/mist/vapors/spray
P264 - Wash skin thoroughly after handling
P271 - Use only outdoors or in a well-ventilated area
P273 - Avoid release to the environment
P280 - Wear protective gloves/protective clothing and eye/face protection
P301 + P310 - IF SWALLOWED: Immediately call a POISON CENTER or doctor/physician
P331 - Do NOT induce vomiting
P303 + P361 + P353 - IF ON SKIN (or hair): Remove/Take off immediately all contaminated clothing. Rinse skin with water/shower
P332 + P313 - If skin irritation occurs: Get medical advice/attention
P304 + P340 - IF INHALED: Remove victim to fresh air and keep at rest in a position comfortable for breathing
P312 - Call a POISON CENTER or doctor/physician if you feel unwell
P362 - Take off contaminated clothing and wash before reuse
P370 + P378 - In case of fire: Use CO2, dry chemical, or foam to extinguish
P391 - Collect spillage
P403 + P235 - Store in a well-ventilated place. Keep cool

P501 - Dispose of contents/ container to an approved waste disposal plant

Guide to Abbreviations:
ACGIH = American Conference of Governmental Industrial Hygienists; CASRN = Chemical Abstracts Service Registry Number; CEILING = Ceiling Limit (15 minutes); CERCLA = The Comprehensive Environmental Response, Compensation, and Liability Act; EPA = Environmental Protection Agency; GHS = Globally Harmonized System; HPR = Hazardous Products Regulations; IARC = International Agency for Research on Cancer; INSHT = National Institute for Health and Safety at Work; IOPC = International Oil Pollution Compensation; LEL = Lower Explosive Limit; NE = Not Established; NFPA = National Fire Protection Association; NTP = National Toxicology Program; OSHA = Occupational Safety and Health Administration; PEL = Permissible Exposure Limit (OSHA); SARA = Superfund Amendments and Reauthorization Act; STEL = Short Term Exposure Limit (15 minutes); TLV = Threshold Limit Value (ACGIH); TWA = Time Weighted Average (8 hours); UEL = Upper Explosive Limit; WHMIS = Worker Hazardous Materials Information System (Canada); A1 - Known Human Carcinogen; A2 - Suspected Human Carcinogen; A3 - Animal Carcinogen; A4 - Not Classifiable as a Human Carcinogen

Disclaimer of Expressed and implied Warranties:
The information presented in this Safety Data Sheet is based on data believed to be accurate as of the date this Safety Data Sheet was prepared. HOWEVER, NO WARRANTY OF MERCHANTABILITY, FITNESS FOR ANY PARTICULAR PURPOSE, OR ANY OTHER WARRANTY IS EXPRESSED OR IS TO BE IMPLIED REGARDING THE ACCURACY OR COMPLETENESS OF THE INFORMATION PROVIDED ABOVE, THE RESULTS TO BE OBTAINED FROM THE USE OF THIS INFORMATION OR THE PRODUCT, THE SAFETY OF THIS PRODUCT, OR THE HAZARDS RELATED TO ITS USE. No responsibility is assumed for any damage or injury resulting from abnormal use or from any failure to adhere to recommended practices. The information provided above, and the product, are furnished on the condition that the person receiving them shall make their own determination as to the suitability of the product for their particular purpose and on the condition that they assume the risk of their use. In addition, no authorization is given nor implied to practice any patented invention without a license.

Date of issue: 5/13/15
Date of revision: None previous
Version 1

Safety Data Sheet
Hydrogen fluoride

SECTION 1: Identification

GHS product identifier : Hydrogen fluoride

Other means of identification : Hydrofluoric acid
Hydrogen fluoride, anhydrous
HF (Hydrogen fluoride, Hydrofluoric acid, formula or chemical symbol)
AHF (Anhydrous hydrofluoric acid or Anhydrous Hydrogen fluoride)
CAS-No. 7664-39-3
Galaxy Chemicals Product number GCR0038

Product use : Laboratory chemicals, Manufacture of substance, Synthetic/Analytical chemistry

Supplier's details
Company name and address : Galaxy Chemicals, LLC
6472 Tower Lane
Riverview Business Park
Claremore, OK 74019
USA

Telephone 1-918-379-0821
1-918-379-0820

Fax 1-918-379-0826

Emergency telephone : 1-918-381-9183 (Monday - Friday, 10:00 a.m. - 5:00 p.m.)

SECTION 2: Hazards identification

Classification of the substance or mixture : GHS Classification in accordance with 29 CFR 1910. 1200 (OSHA HCS)
Gases under pressure - Liquefied gas
Acute toxicity, Inhalation - Category 3

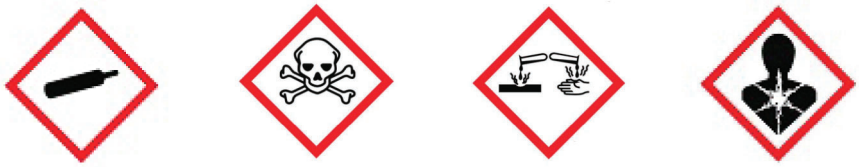
SECTION 2: Hazards identification

Classification of the substance or mixture
Continued

: Acute toxicity, Dermal - Category 1
Acute toxicity, Oral - Category 2
Serious eye damage/Irritation - Category 1
Respiratory sensitization - Category 1
Skin corrosion/Irritation - Category 1
Skin sensitizer - Category 1
Germ cell mutagenicity - Category 2
Hazardous to the aquatic environment, Acute Category 3
Target Organ Systemic Toxicity: Single Exposure & Repeated Exposure - Category 1

GHS Label elements, including precautionary statements
Pictogram

:



Signal word

: Danger

Hazard statements

: Contains gas under pressure; may explode if heated.
Fatal if swallowed, in contact with skin or if inhaled.
Toxic if inhaled.
Corrosive to respiratory tract.
Causes severe skin burns and eye damage.
Causes serious eye damage.
Causes damage to organs.
Causes damage to organs through prolonged or repeated exposure.
May cause frostbite.
May cause allergy or asthma symptoms or breathing difficulties if inhaled.
Harmful to aquatic life.

SECTION 2: Hazards identification

Precautionary statements

General : Read and follow all Safety Data Sheets before use. Read all labeling before use. Keep out of reach of children. If medical advice is needed, have product label or container at hand as well as SDS. Close valve after each use and when emptied. Only use equipment rated for the cylinders pressure. Do not open valve until connected to equipment prepared for use. Always use a back flow preventative device in the piping. Use only equipment of compatible materials. Always keep container in a upright position.

Prevention : Obtain special instructions before use. Do not handle until all safety precautions have been thoroughly read and understood. Always use personal protective equipment or as required. Wear protective gloves, respiratory protection, eye and face protection and protective clothing. Use only in a designated area that is well ventilated, that uses a scrubber. Avoid release to the environment. Do not get in eyes, on skin, or on clothes. Avoid breathing gas. Do not eat, drink or smoke when using this product. Always wash hands thoroughly after handling. Contaminated work clothing should not be mix with other clothes or leave the workplace. Use and store in a well ventilated place that uses a scrubber.

Response : If exposed or concerned get medical attention. *IF INHALED*: Remove victim to fresh air and keep at rest in a position comfortable for breathing. Immediately call a *POISON CENTER* or physician. If experiencing respiratory symptoms call a *POISON CENTER* or physician. *IF SWALLOWED*: Immediately call a *POISON CENTER* or physician. Rinse mouth. *DO NOT INDUCE VOMITING. IF ON SKIN(or hair)*: Take off all contaminated clothing. Wash all contaminated clothing before reuse. Rinse skin with plenty of soap and water. Immediately call a *POISON CENTER* or physician.

SECTION 2: Hazards identification

Response Continued : If skin irritation or rash occurs get medical attention. *IF IN EYES*: Carefully remove contact lenses, if present and easy to do so. Rinse cautiously with water for several minutes. Immediately call a *POISON CENTER* or physician. For more detailed and advanced directions please see *SECTION 4: First aid measures.*

Storage : Store locked up. Protect from sunlight. Protect from sunlight when ambient temperatures exceeds 125°F/52°C. Store in a well ventilated place that uses a scrubber. Keep container tightly closed.

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

Other Hazards which do not result in classification : May displace oxygen and cause rapid suffocation. May cause dental or skeletal fluorosis from chronic exposure.

SECTION 3: Composition/information on ingredients

Substance or mixture : Substance

Chemical name : Hydrofluoric acid

Other means of identification : Hydrogen fluoride
Hydrogen fluoride, anhydrous
HF
AHF

SECTION 3: Composition/information on ingredients

CAS number/other identifiers

CAS number 7664-39-3

Galaxy Chemicals Product number GCR0038

Ingredient name	Percent	CAS-No.
Hydrogen fluoride	>99.95	7664-39-3

There are no additional ingredients present which, with the current knowledge of the supplier and in the concentrations applicable, are classifiable as hazardous to health or the environment. Occupational exposure limits, if available, are listed in SECTION 8: Exposure controls/personal protection.

SECTION 4: First aid measures

Description of necessary first aid measures : **Consult a physician as soon as possible. Show this safety data sheet to the doctor in attendance. Hydrofluoric (HF) acid burns require immediate and specialized medical treatment and first aid. Symptoms can be delayed up to 24 hours depending on the concentration of the HF. After decontamination with water, further damage is able to occur due to penetration/absorption of the fluoride ion. Treatment should be directed toward binding the fluoride ion as well as the effects from the exposure. Skin exposures can be treated with a 2.5% calcium gluconate gel, repeat application until burning ceases. Wear gloves while applying. More serious skin exposures may depend upon subcutaneous calcium gluconate treatment except for digital areas unless the physician is experienced in this technique, due to the potential for tissue injury from the increased pressure. Absorption can easily occur through the subungual areas and should be considered when undergoing decontamination.**

General advice

(continued on page 6)

SECTION 4: First aid measures

Description of necessary first aid measures

General advice Continued

: Prevention of absorption of the fluoride ion in cases of ingestion can be obtained by giving milk, chewable calcium carbonate tablets or Milk of Magnesia to conscious victims. Conditions such as hypocalcemia, hypomagnesemia and cardiac arrhythmias should be monitored for, since they can occur after exposure. Move out of dangerous area.

Inhalation

: Get medical attention immediately. Call a poison center or physician. Remove victim to fresh air and keep at rest in a position comfortable for breathing. If it is suspected that fumes are still present, the rescuer should wear an appropriate mask or self-contained breathing apparatus. If not breathing, if breathing is irregular or if respiratory arrest occurs, provide artificial respiration or oxygen by trained personnel. It may be dangerous to the person providing aid to give mouth-to-mouth resuscitation. If unconscious, place in recovery position and get medical attention immediately. Maintain an open airway. Loosen tight clothing such as a collar, tie, belt or waistband. In the event of any complaints or symptoms, avoid further exposure.

Skin contact

: Get medical attention immediately. Call a poison center or physician. Gently wash with plenty of soap and water. Remove contaminated clothing and shoes. Wash contaminated clothing thoroughly with water before removing it, wear gloves. Continue to rinse for at least 10 minutes. Chemical burns must be treated promptly by a physician. Wash clothing before reuse. Clean shoes thoroughly before reuse. Please see General advice pages 5 - 6 for more information.

Eye contact

: Get medical attention immediately. Call a poison center or physician. Immediately flush eyes with plenty of water, occasionally lifting the upper and lower eyelids. Check for and remove any contact lenses. Continue to rinse for at least 10 minutes. Chemical burns must be treated promptly by a physician.

SECTION 4: First aid measures

Ingestion

: Get medical attention immediately. Call a poison center or physician. Do not induce vomiting. Never give anything by mouth to an unconscious person. Rinse mouth with water. Please see General advice page 6 for more information.

Most important symptoms/effects, acute and delayed

: Inhalation

Toxic if inhaled. May give off gas, vapor or dust that is very irritating or corrosive to the respiratory system. May cause allergy or asthma symptoms or breathing difficulties if inhaled.

Skin contact

Causes severe burns.

Eye contact

Causes serious eye damage.

Ingestion

May cause burns to mouth, throat and stomach.

Frostbite

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

Over exposure signs/symptoms

Inhalation

: Adverse symptoms may include the following:
respiratory tract irritation
wheezing and breathing difficulties
coughing
asthma

Skin contact

: Adverse symptoms may include the following:
pain or irritation
redness
blistering may occur

Eye contact

: Adverse symptoms may include the following:
pain
watering
redness

SECTION 4: First aid measures

Over exposure signs/symptoms Continued

: Adverse symptoms may include the following: stomach pains

Ingestion

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

: For inhalation, consider oxygen. For skin contact, consider ice water bath, iced alcohol, iced magnesium sulfate, magnesium oxide/glycerin gels, calcium gluconate gel or benzalkonium chloride solution. Avoid gastric lavage or emesis.

Note to physician

SECTION 5: Fire-fighting measures

Suitable extinguishing media

: Use an extinguishing agent suitable for the surrounding fire such as regular dry chemical, carbon dioxide, water or regular foam.

Unsuitable extinguishing media

: None Known.

Specific hazards arising from the chemical

: Contains gas under pressure. In a fire or if heated, a pressure increase will occur and the container may burst or explode. This material is harmful to aquatic life. Fire water contaminated with this material must be contained and prevented from being discharged to any waterway, sewer or drain.

Hazardous combustion products

: Decomposition products may include the following materials, halogenated compounds.

Special protective actions for fire-fighters

: Remove all personal from vicinity of the incident. No actions shall be taken involving any personal risk or without suitable training. (continued of Page 9)

SECTION 5: Fire-fighting measures

Special protective actions for fire-fighters
continued

: Contact supplier immediately for specialist advice. Move containers from fire area if this can be done without risk. Use copious amounts of water to keep fire exposed containers cool.

Special protective equipment for fire-fighters

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

SECTION 6: Accidental release measures

Personal precautions, protective equipment and emergency procedures

For non-emergency personnel

and

For emergency responders

: No action shall be taken involving any personal risk or without suitable training. Evacuate surrounding areas. Keep unnecessary and unprotected personnel from entering. Do not breathe gas. Provide adequate ventilation. Wear appropriate respirator when ventilation is inadequate. Put on appropriate personal protective equipment. Take note of any information in Section 8 on suitable and unsuitable materials.

Environmental precautions

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

Methods and materials for containment and cleaning up

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

SDS for Hydrogen fluoride

SECTION 6: Accidental release measures

Methods and materials for containment and cleaning up continued : to container for disposal. neutralize. Collect spilled material in appropriate *Large spills*: Dike for later disposal. Keep unnecessary people away, isolate hazard area and deny entry.

Reference to other sections : For disposal see section 13.

SECTION 7: Handling and storage

Precautions for safe handling : Put on appropriate personal protective equipment (see Section 8). Persons with a history of skin sensitization problems or asthma, allergies or chronic or recurrent respiratory disease should not be employed in any process in which this product is used. Avoid exposure, obtain special instructions before use. Contains gas under pressure. Do not get in eyes or on skin or clothing. Do not breathe gas. When using, do not eat, drink or smoke. Use only with adequate ventilation. Wear appropriate respirator when ventilation is inadequate. Empty containers retain product residue and can be hazardous. Do not puncture or incinerate container. Use equipment rated for cylinder pressure. Close valve after each use and when empty. Protect cylinders from physical damage; do not drag, roll, slide, or drop. Use a suitable hand truck for cylinder movement.

Conditions for safe storage, including any incompatibilities : Store locked up. Protect from sunlight. Protect from sunlight when ambient temperatures exceeds 125°F/52°C. Store in a well ventilated place that uses a scrubber. Keep away from incompatible materials (see section 10). Keep container tightly closed. Cylinder should be stored upright, with valve protection cap in place and firmly secured to prevent falling or being knocked over.

SECTION 8: Exposure controls/personal protection

Control parameters

: Component Exposure Limits
HYDROGEN FLUORIDE (7664-39-3)
ACGIH: 0.5 ppm TWA (as F)
2 ppm Ceiling (as F)
Skin - potential significant contribution to overall exposure by the cutaneous route
Europe: 1.8 ppm TWA; 1.5 mg/m3 TWA
3 ppm STEL; 2.5 mg/m3 STEL
OSHA (Final): 3 ppm TWA (as F)
OSHA (Vacated): 3 ppm TWA (as F)
6 ppm STEL (as F)
NIOSH: 3 ppm TWA; 2.5 mg/m3 TWA
6 ppm Ceiling (15 min); 5 mg/m3 Ceiling (15 min)
Component Biological Limit Values
HYDROGEN FLUORIDE (7664-39-3)
ACGIH: 3 mg/g creatinine Medium: urine Time: prior to shift Parameter: Fluoride (background, nonspecific); 10 mg/g creatinine Medium: urine Time: end of shift Parameter: Fluorid (background, nonspecific)
IDLH: 30 ppm

Appropriate engineering controls

: Provide local exhaust or process enclosure ventilation system. Ensure compliance with applicable exposure limits.

Individual protective measures, such as personal protective equipment (PPE)

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

SECTION 8: Exposure controls/personal protection

Eye/face protection : Safety eyewear complying with an approved standard should be used when a risk assessment indicates this is necessary to avoid exposure to liquid splashes, mists, gases or dusts. If contact is possible, the following protection should be worn, unless the assessment indicates a higher degree of protection: chemical splash goggles and or face shield. If inhalation hazards exist, a full-face respirator may be required instead.

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

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

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

Respiratory protection : Use a properly fitted, air-purifying or air-fed respirator complying with an approved standard if a risk assessment indicates this is necessary. Respirator selection must be based on known or anticipated exposure levels, the hazards of the product and the safe working limits of the selected respirator.

SECTION 9: Physical and chemical properties

Physical State: Liquid

Color: colorless

Odor: irritating odor, pungent odor

pH: acidic in solution

Boiling Point: 20 °C

Decomposition: Not available

Vapor Pressure: 760 mmHg @ 20 °C

Vapor Density (air = 1): 0.7

Water Solubility: miscible, reacts violently, heat released

Auto Ignition: Not applicable

Volatility: 100 %

Molecular Formula: H-F

Solvent Solubility Soluble: alcohol, organic solvents

Appearance: Fuming colorless liquid

Physical Form: gas

Odor Threshold: 0.03 - 0.11 mg/m3

Melting/Freezing Point: -83 °C

Flash Point: Not flammable

LEL : Not applicable

Evaporation Rate: Not available

UEL: Not applicable

Henry's Law Constant: 9.61

Specific Gravity (water=1): 0.987 - 0.991

Log KOW: Not available

Viscosity: 0.256 cP @0 °C (liquid)

Molecular Weight: 20.01

Slightly Soluble: ether, benzene, toluene, m-xylene, tetrahydronaphthalene

SECTION 10: Stability and reactivity

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

Chemical stability : Stable under recommended storage conditions.

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

Conditions to avoid : Exposure to heat and moisture

Incompatible materials : Glass and silicate containing materials are corroded by Hydrogen fluoride. HF in contact with glass, concrete and other silicon bearing materials will yield silicon tetrafluoride gas. Pressure buildup from this process has been known to rupture glass containers. HF contact with carbonates, sulfides and cyanides yield toxic gases such as carbon dioxide, hydrogen sulfide and hydrogen cyanide. Contact with alkalies and some oxides cause strong violent exothermic reactions. Contact with metals will yield hydrogen gas, a fire and explosive reactive hazard. On dilution or dissolving in water, considerable heating always occurs. When diluting, add acids to water, never the other way around.

Hazardous decomposition products : Hazardous decomposition products formed under fire conditions. - Hydrogen fluoride
Other decomposition products - Hydrogen gas
In the event of fire: see section 5

SECTION 11: Toxicological information

Information on toxicological effects

Acute toxicity

Product	Result	Species	Dose	Exposure
Hydrogen fluoride	LC50 Inhalation Gas.	Rat	1276 ppm	1 hours

IDLH : 30 ppm

Skin corrosion/irritation

Product	Result	Species	Score	Exposure	Observation
Hydrogen fluoride	Eyes - Severe irritant Skin - Severe irritant	Human Rat	- -	50 milligrams 3 minutes 50 Percent	- -

Sensitization

Not available.

Mutagenicity

Genotoxicity in vitro	Test substance: Sodium fluoride In vitro tests did not show mutagenic effects

Carcinogenicity

Rat Cytogenetic analysis	
Rat Oral NOAEL: 175ppm Drinking water	IARC: No component of this product present at levels greater than or equal to 0.1% is identified as probable, possible or confirmed human carcinogen by IARC. NTP: No component of this product present at levels greater than or equal to 0.1% is identified as a known or anticipated carcinogen by NTP. OSHA: No component of this product present at levels greater than or equal to 0.1% is identified as a carcinogen or potential carcinogen by OSHA. ACGIH: No component of this product present at levels greater than or equal to 0.1% is identified as a carcinogen or potential carcinogen by ACGIH.

SECTION 11: Toxicological information

Reproductive toxicity

Toxicity to reproduction/Fertility	Rat NOAEL parent: 10 - 14 mg/kg
Developmental Toxicity / Teratogenicity	Rat - Inhalation Effects on Embryo or Fetus: Fetal death.
STOT(Specific target organ toxicity)- single exposure	Exposure routes: Inhalation no observed effect
STOT(Specific target organ toxicity) - repeated exposure	Inhalation Prolonged exposure - Rat Test substance: gas Target Organs: Respiratory system, Kidney, Liver, Testes observed effect Inhalation Prolonged exposure - Rat Test substance: gas Target Organs: Cardio-vascular system, Nervous system observed effect Oral - Mouse LOAEL: 50 ppm Test substance: Sodium fluoride Target Organs: Skeleton Inhalation - Rat NOAEC: 720 mg/l Test substance: Hydrogen fluoride Target Organs: Respiratory Tract, Bone, Teeth, Kidney

Aspiration toxicity

Not available.

Further information

RTECS: Not available

Fluoride ions can reduce serum calcium levels possibly causing fatal hypocalcemia. Hydrogen fluoride can cause severe burns and blistering which may not be immediately painful or visible. The full extent of tissue damage may not present itself for 12-24 hours after exposure. Hydrogen fluoride is extremely destructive to tissue of the mucous membranes and upper respiratory tract, eyes, and skin. Necrosis of the skin is highly possible. It is likely for inflammation and edema of the larynx, spasm, inflammation and edema of the bronchi, pneumonitis, pulmonary edema to develop. Symptoms of exposure may include burning sensation, coughing, wheezing, laryngitis, shortness of breath, headache, nausea, and vomiting.

Corrosive effects
Stomach - Irregularities - Based on Human Evidence
Liver and kidney injuries may occur.

SECTION 12: Ecological information

Toxicity

Aquatic Compartment

Acute toxicity to fish	LC50 - 96 h : 51 mg/l - Fishes, Salmo gairdneri static test Test substance: Sodium fluoride Fresh water
Acute toxicity to daphnia and other aquatic invertebrates	EC50 - 96 h : 10.5 mg/l - Daphnia magna (Water flea) Test substance: Sodium fluoride salt water EC50 - 48 h : 26 mg/l - Daphnia magna (Water flea) Test substance: Sodium fluoride Fresh water
Toxicity to aquatic plants	EC50 - 96 h : 43 mg/l - Algae Test substance: Sodium fluoride Fresh water EC50 : 81 mg/l - Algae Test substance: Sodium fluoride Marine water NOEC - 7 Days : 50 mg/l - Algae static test Test substance: Sodium fluoride Fresh water NOEC - 7 Days : 50 mg/l - Algae static test Test substance: Sodium fluoride Marine water
Chronic toxicity to fish	NOEC: 4 mg/l - 21 Days - Oncorhynchus mykiss (rainbow trout) static test Test substance: Sodium fluoride Fresh water
Chronic toxicity to daphnia and other aquatic invertebrates.	NOEC: 8.9 mg/l - 21 Days - Daphnia magna (Water flea) static test Fresh water Sodium fluoride

Persistence and degradability

Abiotic degradation Photodegradation	Air neutralization by natural alkalinity
Biodegradation Biodegradability	The methods for determining the biological degradability are not applicable to inorganic substances.

SECTION 12: Ecological information

Mobility in soil

Adsorption potential (Koc)	Air mobility as solid aerosols Water Solubility(ies) Mobility Soil/sediments potential adsorption pH Test substance fluoride

Results of PBT and vPvB assessment

Not available.

Bioaccumulative potential

Not available.

Other adverse effects

Not available.

Ecotoxicity assessment

Acute aquatic toxicity	Harmful to aquatic organisms.
Chronic aquatic toxicity	Low chronic toxicity.

SECTION 13: Disposal considerations

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

Waste Code
- Environmental Protection Agency
- Hazardous Waste - YES
- RCRA Hazardous Waste (40 CFR 302)
- Corrosive waste - (C)

United States - RCRA Toxic hazardous waste "U" List

Ingredient	CAS #	Status	Reference number
Hydrogen fluoride (C,T); Hydrofluoric acid (C,T)	7664-39-3	Listed	U134

SECTION 14: Transport information

DOT (US) (US Department of Transportation)	
Proper shipping name	UN1052, Hydrogen fluoride, anhydrous, 8 (6.1), PG I, Poison Inhalation Hazard, Zone C
Hazard Zone/Class/PG	C / 8 (6.1) / I
Identification Number	UN1052
Shipping Label	Corrosive 8, Inhalation Hazard 6
Placard (required)	Any quanity of a Inhalation Hazard material. 454 kg (1001 lbs) or more gross weight of a Corrosive material.
Special Shipping Information	Reportable quantity 100 lbs, do not mix with food, ERG 125.

SECTION 14: Transport information

IATA (International Air Transport Association)	
Proper shipping name	IATA Passenger: Forbidden IATA Cargo: Forbidden UN1052, Hydrogen fluoride, anhydrous, 8 (6.1), PG I, Poison Inhalation Hazard, Zone C
Hazard Zone/Class/PG	C / 8 (6.1) / I
Identification Number	UN1052
Shipping Label	Corrosive 8, Inhalation Hazard 6

IMDG (International Maritime Dangerous Goods)	
Proper shipping name	UN1052, Hydrogen fluoride, anhydrous, 8 (6.1), PG I, Poison Inhalation Hazard, Zone C
Hazard Zone/Class/PG	C / 8 (6.1) / I
Identification Number	UN1052
Shipping Label	Corrosive 8, Inhalation Hazard 6
EMS-No	F-C, S-U

TDG (Transportation of Dangerous Goods - Transport Canada)	
Proper shipping name	UN1052, Hydrogen fluoride, anhydrous, 8 (6.1), PG I, Poison Inhalation Hazard, Zone C
Hazard Zone/Class/PG	C / 8 (6.1) / I
Identification Number	UN1052
Shipping Label	Corrosive 8, Inhalation Hazard 6
ERG Number	125
Special Shipping Information	Special Provisions 23

SECTION 14: Transport information

SCT (The Mexican Secretariat for Communications and Transport)	
Proper shipping name	UN1052, Hydrogen fluoride, anhydrous, 8 (6.1), PG I, Poison Inhalation Hazard, Zone C
Hazard Zone/Class/PG	C / 8 (6.1) / I
Identification Number	UN1052
Shipping Label	Corrosive 8, Inhalation Hazard 6

Special precautions for user:

Always transport in closed containers that are upright and secure. Ensure that persons transporting the product know what to do in the event of an accident or spillage.

SECTION 15: Regulatory information

International Inventories

US. Toxic Substances Control Act	On TSCA Inventory
Australia. Industrial Chemical (Notification and Assessment) Act	On the inventory, or in compliance with the inventory
Canadian Environmental Protection Act (CEPA). Domestic Substances List (DSL) See WHMIS on page 23	All components of this product are on the Canadian DSL.
China. Inventory of Existing Chemical Substances	On the inventory, or in compliance with the inventory
European Chemicals Agency and REACH	This material is listed or exempted.
Japan. Kashin-Hou LawList	On the inventory, or in compliance with the inventory
Korea. Toxic ChemicalControl Law (TCCL) List	On the inventory, or in compliance with the inventory
Malaysia (EHSNR)	This material is listed or exempted.

SECTION 15: Regulatory information

International Inventories
continued

New Zealand. Inventory of Chemicals (NZIoC), as published by ERMA New Zealand	On the inventory, or in compliance with the inventory
Philippines. The Toxic Substances and Hazardous and Nuclear Waste Control Act	On the inventory, or in compliance with the inventory
Taiwan(TCSCA and TCSI)	This material is listed or exempted.
WHMIS Classification (Canada)	D1A: Very Toxic Material Causing Immediate and Serious Toxic Effects D2A: Very Toxic Material Causing Other Toxic Effects E: Corrosive Material This product has been classified according to the hazard criteria of the CPR and the MSDS contains all of the information required by the CPR.

National regulatory information

US. EPA CERCLA Hazardous Substances (40 CFR 302)	The following component(s) of this product is/are subject to release reporting under 40 CFR 302 when release exceeds the Reportable Quantity (RQ): Reportable quantity: 100 lbs Hydrogen fluoride 7664-39-3
SARA 302 Components	The following components are subject to reporting levels established by SARA Title III, Section 302: Hydrogen fluoride 7664-39-3
SARA 313 Components	The following components are subject to reporting levels established by SARA Title III, Section 313: Hydrogen fluoride 7664-39-3
SARA 311/312 Hazards	Acute Health Hazard Chronic Health Hazard Reactivity Hazard
CERCLA Reportable Quantity	100 lbs
California Prop. 65	This product does not contain any chemicals known to State of California to cause cancer, birth defects, or any other reproductive harm.
Massachusetts RTK	Hydrogen fluoride 7664-39-3

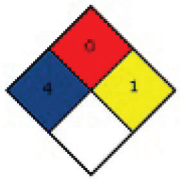
SECTION 15: Regulatory information

National regulatory information
continued

New Jersey RTK	Hydrogen fluoride 7664-39-3
Pennsylvania RTK	Hydrogen fluoride 7664-39-3

SECTION 16: Other information

NFPA (National Fire Protection Association) - Classification
Health 4 severe
Flammability 0 minimal
Instability or Reactivity 1 slight
Special Notices None



HMIS (Hazardous Materials Identification System (Paint & Coating)) - Classification
Health 4 severe
Flammability 0 minimal
Reactivity 1 slight
PPE Determined by User; dependent on local conditions

Key to abbreviations :
ATE = Acute Toxicity Estimate
GHS = Globally Harmonized System of Classification and Labelling of Chemicals
IATA = International Air Transport Association
LogKow = logarithm of the octanol/water partition coefficient
UN = United Nations
TWA = 8-hour, time-weighted average
ACGIH = American Conference of Governmental Industrial Hygienists
OSHA = Occupational Safety and Health Administration
NTP = National Toxicology Program
IARC = International Agency for Research on Cancer

Further information
- Environmental Protection Agency (EPA) requirements for a Risk Management Plan must be followed anytime at least 1000 lbs. of Hydrogen fluoride/Hydrofluoric acid (conc 50% or greater) are used or stored. Refer to 40 CFR 68.150 for specific details.
- Occupational Safety and Health Administration (OSHA) requirements for process safety management must be followed anytime at least 1000 lbs. of Hydrogen Fluoride are used or stored. Refer to 29 CFR 1910.119 for specific details.
- Product classified under the US GHS format.

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

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SAFETY DATA SHEET

GASOLINE, UNLEADED AUTOMOTIVE

ExxonMobil

Section 1. Identification

Product name : GASOLINE, UNLEADED AUTOMOTIVE

See Section 16 for synonyms.

Product description : Hydrocarbons and Additives

Other means of identification : ESSO EXTRA MIDGRADE UNLEADED; ESSO MIDGRADE UNLEADED; ESSO PREMIUM UNLEADED; ESSO REGULAR UNLEADED; ESSO SUPER PREMIUM UNLEADED; EXXON MIDGRADE UNLEADED; EXXON PREMIUM UNLEADED; EXXON REGULAR UNLEADED; EXXON SYNERGY EXTRA GASOLINE; EXXON SYNERGY REGULAR GASOLINE; EXXON SYNERGY SUPREME+™ PREMIUM GASOLINE; GASOLINE; INDOLENE GASOLINE; MIDGRADE UNLEADED; MOBIL EXTRA UNLEADED; MOBIL REGULAR UNLEADED; MOBIL SPECIAL UNLEADED; MOBIL SUPER UNLEADED; MOBIL SYNERGY EXTRA GASOLINE; MOBIL SYNERGY REGULAR GASOLINE; MOBIL SYNERGY SUPREME+™ PREMIUM GASOLINE; PREMIUM UNLEADED; REGULAR UNLEADED; SYNERGY EXTRA GASOLINE; SYNERGY REGULAR GASOLINE; SYNERGY SUPREME+™ PREMIUM GASOLINE; UNLEADED GASOLINE

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

Identified uses : GASOLINE

Uses advised against : This product is not recommended for any industrial, professional or consumer use other than the identified uses above.

Supplier : EXXON MOBIL CORPORATION

22777 Springwoods Village Parkway
Spring, TX 77389 USA

24-Hour emergency telephone number : 1-800-424-9300 / +1 703-741-5970 / +1-703-527-3887 (CHEMTREC)

Product Technical Information : 800-662-4525

SDS Internet Address : www.sds.exxonmobil.com

Section 2. Hazards identification

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

Classification of the substance or mixture : FLAMMABLE LIQUIDS - Category 1
SKIN IRRITATION - Category 2
GERM CELL MUTAGENICITY - Category 1B
CARCINOGENICITY - Category 1B
SPECIFIC TARGET ORGAN TOXICITY (SINGLE EXPOSURE) (Narcotic effects) - Category 3
ASPIRATION HAZARD - Category 1

GHS label elements

Hazard pictograms :



Signal word : Danger

Section 2. Hazards identification

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

Precautionary statements

P101 - If medical advice is needed, have product container or label at hand.
P102 - Keep out of reach of children.
P103 - Read label before use.

Prevention : P201 - Obtain special instructions before use.
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.
P240 - Ground and bond container and receiving equipment.
P241 - Use explosion-proof electrical, ventilating or lighting equipment.
P242 - Use non-sparking tools.
P243 - Take action to prevent static discharges.
P261 - Avoid breathing vapor.
P264 - Wash thoroughly after handling.
P271 - Use only outdoors or in a well-ventilated area.
P280 - Wear protective gloves, protective clothing and eye or face protection.

Response : P301 + P310, P331 - IF SWALLOWED: Immediately call a POISON CENTER or doctor. Do NOT induce vomiting.
P302 + P352 - IF ON SKIN: Wash with plenty of water.
P303 + P361 + P353 - IF ON SKIN (or hair): Take off immediately all contaminated clothing. Rinse skin with water or shower.
P304 + P312, P340 - IF INHALED: Call a POISON CENTER or doctor if you feel unwell. Remove person to fresh air and keep comfortable for breathing.
P308 + P313 - IF exposed or concerned: Get medical advice or attention.
P332 + P313 - If skin irritation occurs: Get medical advice/attention.
P362 + P364 - Take off contaminated clothing and wash it before reuse.
P370 + P378 - In case of fire: Use water fog, foam, dry chemical or carbon dioxide (CO2) to extinguish.

Storage : P403 + P233 - Store in a well-ventilated place. Keep container tightly closed.
P403 + P235 - Keep cool.
P405 - Store locked up.

Disposal : P501 - Dispose of contents and container in accordance with all local, regional, national and international regulations.

Contains : gasoline and benzene

Hazards not otherwise classified : None known.

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

Section 3. Composition/information on ingredients

Substance/mixture : Mixture

Section 3. Composition/information on ingredients

Ingredient name	% by weight	CAS number
gasoline	≥89	86290-81-5
cumene	≤15	98-82-8
butane	≤14	106-97-8
ethyl alcohol	<11	64-17-5
xylenes	≥5 - ≤10	1330-20-7
toluene	≥5 - ≤15	108-88-3
trimethyl benzene	≥1 - ≤5	25551-13-7
pseudocumene (1,2,4-trimethylbenzene)	≥1 - ≤5	95-63-6
n-hexane	≥1 - ≤5	110-54-3
ethyl benzene	≥1 - ≤15	100-41-4
benzene	≤1.65	71-43-2
naphthalene	<1	91-20-3

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

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

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

Section 4. First aid measures

Description of necessary first aid measures

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

Inhalation : Remove victim to fresh air and keep at rest in a position comfortable for breathing. If it is suspected that fumes are still present, the rescuer should wear an appropriate mask or self-contained breathing apparatus. If not breathing, if breathing is irregular or if respiratory arrest occurs, provide artificial respiration or oxygen by trained personnel. It may be dangerous to the person providing aid to give mouth-to-mouth resuscitation. Get medical attention. If necessary, call a poison center or physician. If unconscious, place in recovery position and get medical attention immediately. Maintain an open airway. Loosen tight clothing such as a collar, tie, belt or waistband.

Skin contact : Flush contaminated skin with plenty of water. Remove contaminated clothing and shoes. Wash clothing before reuse. Clean shoes thoroughly before reuse. Continue to rinse for at least 10 minutes. Wash contaminated clothing thoroughly with water before removing it, or wear gloves. Get medical attention.

Ingestion : Get medical attention immediately. Call a poison center or physician. Wash out mouth with water. Remove dentures if any. If material has been swallowed and the exposed person is conscious, give small quantities of water to drink. Stop if the exposed person feels sick as vomiting may be dangerous. Aspiration hazard if swallowed. Can enter lungs and cause damage. Do not induce vomiting. If vomiting occurs, the head should be kept low so that vomit does not enter the lungs. Never give anything by mouth to an unconscious person. If unconscious, place in recovery position and get medical attention immediately. Maintain an open airway. Loosen tight clothing such as a collar, tie, belt or waistband.

Most important symptoms/effects, acute and delayed

Potential acute health effects

Eye contact : No known significant effects or critical hazards.

Section 4. First aid measures

Inhalation : Can cause central nervous system (CNS) depression. May cause drowsiness or dizziness.

Skin contact : Causes skin irritation.

Ingestion : Can cause central nervous system (CNS) depression. May be fatal if swallowed and enters airways.

Over-exposure signs/symptoms

Eye contact : Adverse symptoms may include the following:
pain or irritation
watering
redness

Inhalation : Adverse symptoms may include the following:
nausea or vomiting
headache
drowsiness/fatigue
dizziness/vertigo
unconsciousness
Numbness, muscle cramps, weakness and paralysis that may be delayed.

Skin contact : Adverse symptoms may include the following:
irritation
redness

Ingestion : Adverse symptoms may include the following:
nausea or vomiting

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

Notes to physician : If ingested, material may be aspirated into the lungs and cause chemical pneumonitis. Treat appropriately. This material, or a component, may be associated with cardiac sensitization following very high exposures (well above occupational exposure limits) or with concurrent exposure to high stress levels or heart-stimulating substances like epinephrine. Administration of such substances should be avoided.

Specific treatments : No specific treatment.

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

See toxicological information (Section 11)

Section 5. Fire-fighting measures

Extinguishing media

Suitable extinguishing media : Use dry chemical, CO_2, water spray (fog) or foam.

Unsuitable extinguishing media : Do not use water jet.

Specific hazards arising from the chemical : Extremely flammable liquid and vapor. Runoff to sewer may create fire or explosion hazard. In a fire or if heated, a pressure increase will occur and the container may burst, with the risk of a subsequent explosion. The vapor/gas is heavier than air and will spread along the ground. Vapors may accumulate in low or confined areas or travel a considerable distance to a source of ignition and flash back. This material is toxic to aquatic life with long lasting effects. Fire water contaminated with this material must be contained and prevented from being discharged to any waterway, sewer or drain.

Hazardous combustion products : Aldehydes, Incomplete combustion products, Oxides of carbon, Smoke, Fume, sulfur oxides

Section 5. Fire-fighting measures

Special protective actions for fire-fighters : Use standard firefighting procedures and consider the hazards of other involved materials. Promptly isolate the scene by removing all persons from the vicinity of the incident if there is a fire. Move containers from fire area if this can be done without risk. Use water spray to keep fire-exposed containers cool. Assure an extended cooling down period to prevent re-ignition. Prevent runoff from fire control or dilution from entering streams, sewers, or drinking water supply. No action shall be taken involving any personal risk or without suitable training.

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

Section 6. Accidental release measures

NOTIFICATION PROCEDURES

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

Personal precautions, protective equipment and emergency procedures

For non-emergency personnel : No action shall be taken involving any personal risk or without suitable training. Evacuate surrounding areas. Keep unnecessary and unprotected personnel from entering. Do not touch or walk through spilled material. Shut off all ignition sources. No flares, smoking or flames in hazard area. Put on appropriate personal protective equipment. Avoid breathing vapor or mist. Provide adequate ventilation. Wear appropriate respirator when ventilation is inadequate.

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

Environmental precautions : Avoid dispersal of spilled material and runoff and contact with soil, waterways, drains and sewers. Inform the relevant authorities if the product has caused environmental pollution (sewers, waterways, soil or air). Water polluting material. May be harmful to the environment if released in large quantities. Collect spillage.

Methods and materials for containment and cleaning up

Small spill : Stop leak if without risk. Move containers from spill area. Use spark-proof tools and explosion-proof equipment. Dilute with water and mop up if water-soluble. Alternatively, or if water-insoluble, absorb with an inert dry material and place in an appropriate waste disposal container. Dispose of via a licensed waste disposal contractor.

Large spill : Stop leak if without risk. Eliminate all ignition sources. Move containers from spill area. Use spark-proof tools and explosion-proof equipment. Approach release from upwind. Prevent entry into sewers, water courses, basements or confined areas. Wash spillages into an effluent treatment plant or proceed as follows. Contain and collect spillage with non-combustible, absorbent material e.g. sand, earth, vermiculite or diatomaceous earth and place in container for disposal according to local regulations (see Section 13). Dispose of via a licensed waste disposal contractor. Contaminated absorbent material may pose the same hazard as the spilled product. Do not confine in area of spill. Allow liquid to evaporate from the surface. Seek the advice of a specialist before using dispersants. Advise occupants and shipping in downwind areas of fire and explosion hazard and warn them to stay clear. Note: see Section 1 for emergency contact information and Section 13 for waste disposal.

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

Section 7. Handling and storage

Precautions for safe handling

Protective measures : Put on appropriate personal protective equipment (see Section 8). Avoid exposure - obtain special instructions before use. Do not handle until all safety precautions have been read and understood. Do not get in eyes or on skin or clothing. Do not swallow. Avoid breathing vapor or mist. Avoid release to the environment. Use only with adequate ventilation. Wear appropriate respirator when ventilation is inadequate. Do not enter storage areas and confined spaces unless adequately ventilated. Keep in the original container or an approved alternative made from a compatible material, kept tightly closed when not in use. Store and use away from heat, sparks, open flame or any other ignition source. Use explosion-proof electrical (ventilating, lighting and material handling) equipment. Use only non-sparking tools. Take precautionary measures against electrostatic discharges. To avoid fire or explosion, dissipate static electricity during transfer by grounding and bonding containers and equipment before transferring material. Empty containers retain product residue and can be hazardous. Do not reuse container.

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

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

Conditions for safe storage, including any incompatibilities : Store in accordance with local regulations. Store in a segregated and approved area. Store in original container protected from direct sunlight in a dry, cool and well-ventilated area, away from incompatible materials (see Section 10) and food and drink. Store locked up. Eliminate all ignition sources. Separate from oxidizing materials. Keep container tightly closed and sealed until ready for use. Containers that have been opened must be carefully resealed and kept upright to prevent leakage. Do not store in unlabeled containers. Use appropriate containment to avoid environmental contamination. See Section 10 for incompatible materials before handling or use.

Section 8. Exposure controls/personal protection

Control parameters

Occupational exposure limits

Ingredient name	Exposure limits
GASOLINE, UNLEADED AUTOMOTIVE	**ExxonMobil (Company).** TWA: 100 ppm 8 hours. Form: Vapor. TWA: 300 mg/m³ 8 hours. Form: Vapor.
gasoline	**ACGIH TLV (United States, 1/2023).** TWA: 300 ppm 8 hours. TWA: 890 mg/m³ 8 hours. STEL: 500 ppm 15 minutes. STEL: 1480 mg/m³ 15 minutes. **ExxonMobil (Company).** STEL: 200 ppm 15 minutes. TWA: 100 ppm 8 hours.
cumene	**NIOSH REL (United States, 10/2020). Absorbed through skin.** TWA: 50 ppm 10 hours. TWA: 245 mg/m³ 10 hours. **CAL OSHA PEL (United States, 5/2018). Absorbed through skin.** TWA: 245 mg/m³ 8 hours. TWA: 50 ppm 8 hours.

Section 8. Exposure controls/personal protection

	OSHA PEL (United States, 5/2018). Absorbed through skin. TWA: 50 ppm 8 hours. TWA: 245 mg/m³ 8 hours. **OSHA PEL 1989 (United States, 3/1989). Absorbed through skin.** TWA: 50 ppm 8 hours. TWA: 245 mg/m³ 8 hours. **ACGIH TLV (United States, 1/2023).** TWA: 5 ppm 8 hours. **ExxonMobil (Company). Absorbed through skin.** TWA: 5 ppm 8 hours.
butane	**NIOSH REL (United States, 10/2020).** TWA: 800 ppm 10 hours. TWA: 1900 mg/m³ 10 hours. **CAL OSHA PEL (United States, 5/2018).** TWA: 1900 mg/m³ 8 hours. TWA: 800 ppm 8 hours. **OSHA PEL 1989 (United States, 3/1989).** TWA: 800 ppm 8 hours. TWA: 1900 mg/m³ 8 hours. **ACGIH TLV (United States, 1/2023). [Butane isomers] Explosive potential.** STEL: 1000 ppm 15 minutes.
ethyl alcohol	**NIOSH REL (United States, 10/2020).** TWA: 1000 ppm 10 hours. TWA: 1900 mg/m³ 10 hours. **CAL OSHA PEL (United States, 5/2018).** TWA: 1900 mg/m³ 8 hours. TWA: 1000 ppm 8 hours. **OSHA PEL (United States, 5/2018).** TWA: 1000 ppm 8 hours. TWA: 1900 mg/m³ 8 hours. **OSHA PEL 1989 (United States, 3/1989).** TWA: 1000 ppm 8 hours. TWA: 1900 mg/m³ 8 hours. **ACGIH TLV (United States, 1/2023).** STEL: 1000 ppm 15 minutes.
xylenes	**CAL OSHA PEL (United States, 5/2018). [xylene]** STEL: 655 mg/m³ 15 minutes. STEL: 150 ppm 15 minutes. C: 300 ppm TWA: 435 mg/m³ 8 hours. TWA: 100 ppm 8 hours. **OSHA PEL (United States, 5/2018). [Xylenes]** TWA: 100 ppm 8 hours. TWA: 435 mg/m³ 8 hours. **OSHA PEL 1989 (United States, 3/1989). [Xylenes (o-, m-, p-isomers)]** TWA: 100 ppm 8 hours. TWA: 435 mg/m³ 8 hours. STEL: 150 ppm 15 minutes. STEL: 655 mg/m³ 15 minutes. **ACGIH TLV (United States, 1/2023). [p-xylene and mixtures containing p-xylene] Ototoxicant.** TWA: 20 ppm 8 hours.
toluene	**NIOSH REL (United States, 10/2020).** TWA: 100 ppm 10 hours. TWA: 375 mg/m³ 10 hours. STEL: 150 ppm 15 minutes. STEL: 560 mg/m³ 15 minutes. **OSHA PEL Z2 (United States, 2/2013).** TWA: 200 ppm 8 hours.

Section 8. Exposure controls/personal protection

	CEIL: 300 ppm AMP: 500 ppm 10 minutes. **CAL OSHA PEL (United States, 5/2018). Absorbed through skin.** STEL: 560 mg/m³ 15 minutes. STEL: 150 ppm 15 minutes. C: 500 ppm TWA: 37 mg/m³ 8 hours. TWA: 10 ppm 8 hours. **OSHA PEL 1989 (United States, 3/1989).** TWA: 100 ppm 8 hours. TWA: 375 mg/m³ 8 hours. STEL: 150 ppm 15 minutes. STEL: 560 mg/m³ 15 minutes. **ACGIH TLV (United States, 1/2023). Ototoxicant.** TWA: 20 ppm 8 hours.
trimethyl benzene	**CAL OSHA PEL (United States, 5/2018). [trimethylbenzene, all isomers]** TWA: 125 mg/m³ 8 hours. TWA: 25 ppm 8 hours. **OSHA PEL 1989 (United States, 3/1989). [Trimethyl benzene]** TWA: 25 ppm 8 hours. TWA: 125 mg/m³ 8 hours. **ACGIH TLV (United States, 1/2023). [trimethyl benzene, isomers]** TWA: 10 ppm 8 hours.
pseudocumene (1,2,4-trimethylbenzene)	**NIOSH REL (United States, 10/2020).** TWA: 25 ppm 10 hours. TWA: 125 mg/m³ 10 hours. **CAL OSHA PEL (United States, 5/2018). [trimethylbenzene, all isomers]** TWA: 125 mg/m³ 8 hours. TWA: 25 ppm 8 hours. **OSHA PEL 1989 (United States, 3/1989). [Trimethyl benzene]** TWA: 25 ppm 8 hours. TWA: 125 mg/m³ 8 hours. **ACGIH TLV (United States, 1/2023).** TWA: 10 ppm 8 hours.
n-hexane	**NIOSH REL (United States, 10/2020).** TWA: 50 ppm 10 hours. TWA: 180 mg/m³ 10 hours. **CAL OSHA PEL (United States, 5/2018). Absorbed through skin.** TWA: 180 mg/m³ 8 hours. TWA: 50 ppm 8 hours. **OSHA PEL (United States, 5/2018).** TWA: 500 ppm 8 hours. TWA: 1800 mg/m³ 8 hours. **OSHA PEL 1989 (United States, 3/1989).** TWA: 50 ppm 8 hours. TWA: 180 mg/m³ 8 hours. **ACGIH TLV (United States, 1/2023). Absorbed through skin.** TWA: 50 ppm 8 hours.
ethyl benzene	**NIOSH REL (United States, 10/2020).** TWA: 100 ppm 10 hours. TWA: 435 mg/m³ 10 hours. STEL: 125 ppm 15 minutes. STEL: 545 mg/m³ 15 minutes. **CAL OSHA PEL (United States, 5/2018).** STEL: 130 mg/m³ 15 minutes. STEL: 30 ppm 15 minutes. TWA: 22 mg/m³ 8 hours. TWA: 5 ppm 8 hours. **OSHA PEL (United States, 5/2018).**

Section 8. Exposure controls/personal protection

	TWA: 100 ppm 8 hours. TWA: 435 mg/m³ 8 hours. **OSHA PEL 1989 (United States, 3/1989).** TWA: 100 ppm 8 hours. TWA: 435 mg/m³ 8 hours. STEL: 125 ppm 15 minutes. STEL: 545 mg/m³ 15 minutes. **ACGIH TLV (United States, 1/2023). Ototoxicant.** TWA: 20 ppm 8 hours.
benzene	**NIOSH REL (United States, 10/2020).** TWA: 0.1 ppm 10 hours. STEL: 1 ppm 15 minutes. **OSHA PEL Z2 (United States, 2/2013).** TWA: 10 ppm 8 hours. CEIL: 25 ppm AMP: 50 ppm 10 minutes. **CAL OSHA PEL (United States, 5/2018). Absorbed through skin.** STEL: 5 ppm 15 minutes. TWA: 1 ppm 8 hours. **OSHA PEL (United States, 5/2018).** TWA: 1 ppm 8 hours. STEL: 5 ppm 15 minutes. **OSHA PEL 1989 (United States, 3/1989).** TWA: 1 ppm 8 hours. STEL: 5 ppm 15 minutes. **ACGIH TLV (United States, 1/2023). Absorbed through skin.** TWA: 0.5 ppm 8 hours. TWA: 1.6 mg/m³ 8 hours. STEL: 2.5 ppm 15 minutes. STEL: 8 mg/m³ 15 minutes. **ExxonMobil (Company). Absorbed through skin.** STEL: 1 ppm 15 minutes. TWA: 0.5 ppm 8 hours.
naphthalene	**NIOSH REL (United States, 10/2020).** TWA: 10 ppm 10 hours. TWA: 50 mg/m³ 10 hours. STEL: 15 ppm 15 minutes. STEL: 75 mg/m³ 15 minutes. **CAL OSHA PEL (United States, 5/2018). Absorbed through skin.** TWA: 0.5 mg/m³ 8 hours. TWA: 0.1 ppm 8 hours. **OSHA PEL (United States, 5/2018).** TWA: 10 ppm 8 hours. TWA: 50 mg/m³ 8 hours. **OSHA PEL 1989 (United States, 3/1989).** TWA: 10 ppm 8 hours. TWA: 50 mg/m³ 8 hours. STEL: 15 ppm 15 minutes. STEL: 75 mg/m³ 15 minutes. **ACGIH TLV (United States, 1/2023). Absorbed through skin.** TWA: 10 ppm 8 hours. TWA: 52 mg/m³ 8 hours.

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

Biological exposure indices

Section 8. Exposure controls/personal protection

Ingredient name	Exposure indices
xylenes	**ACGIH BEI (United States, 1/2023) [xylenes (technical or commercial grade)]** BEI: 1.5 g/g creatinine, methylhippuric acids [in urine]. Sampling time: end of shift.
toluene	**ACGIH BEI (United States, 1/2023)** BEI: 0.03 mg/l, toluene [in urine]. Sampling time: end of shift. BEI: 0.3 mg/g creatinine, o-cresol [in urine]. Sampling time: end of shift. BEI: 0.02 mg/l, toluene [in blood]. Sampling time: prior to last shift of workweek.
n-hexane	**ACGIH BEI (United States, 1/2023)** BEI: 0.5 mg/l, 2,5-hexanedion [in urine]. Sampling time: end of shift.
ethyl benzene	**ACGIH BEI (United States, 1/2023)** BEI: 0.15 g/g creatinine, sum of mandelic acid and phenylglyoxylic acid [in urine]. Sampling time: end of shift.
benzene	**ACGIH BEI (United States, 1/2023)** BEI: 25 µg/g creatinine, S-phenylmercapturic acid [in urine]. Sampling time: end of shift. BEI: 500 µg/g creatinine, t,t-muconic acid [in urine]. Sampling time: end of shift.
naphthalene	**ACGIH BEI (United States, 1/2023)** BEI: Nonquantitative: Biological monitoring should be considered for this compound based on the review; however, a specific BEI® could not be determined due to insufficient data., 1-naphthol + 2-naphthol [(sample not specified)]. Sampling time: end of shift.

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

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

Individual protection measures

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

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

Skin protection

Section 8. Exposure controls/personal protection

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

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

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

Respiratory protection : Based on the hazard and potential for exposure, select a respirator that meets the appropriate standard or certification. Respirators must be used according to a respiratory protection program to ensure proper fitting, training, and other important aspects of use.

Section 9. Physical and chemical properties and safety characteristics

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

The conditions of measurement of all properties are at standard temperature and pressure unless otherwise indicated.

Appearance

Physical state : Liquid.

Color : Clear (May Be Dyed)

Odor : Petroleum/Solvent

Odor threshold : Not available.

pH : Not applicable.

Melting point/freezing point : Not available.

Boiling point, initial boiling point, and boiling range : >20°C (>68°F)

Flash point : Closed cup: <-40°C (<-40°F) [ASTM D-56]

Evaporation rate : >10 (butyl acetate = 1)

Flammability : Flammable liquids - Category 1

Lower and upper explosion limit/flammability limit : Lower: 1.4%
Upper: 7.6%

Vapor pressure : >200 mm Hg [20 °C]

Relative vapor density : 3 [Air = 1]

Relative density : 0.74

Density : 0.72 to 0.758 g/cm³ [15°C (59°F)]

Solubility in water : Negligible

Partition coefficient: n-octanol/water : >3

Auto-ignition temperature : >250°C (>482°F)

Decomposition temperature : Not available.

Viscosity : <1 cSt [40 °C]

Particle characteristics

Median particle size : Not applicable.

Section 10. Stability and reactivity

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

Chemical stability : The product is stable.

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

Conditions to avoid : Avoid all possible sources of ignition (spark or flame). Do not pressurize, cut, weld, braze, solder, drill, grind or expose containers to heat or sources of ignition. Do not allow vapor to accumulate in low or confined areas. Heat, sparks, flame, and build up of static electricity.

Incompatible materials : Reactive or incompatible with the following materials:,oxidizing materials,Halogens, strong acids, Alkalies, Strong oxidizers

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

Section 11. Toxicological information

Information on toxicological effects

Acute toxicity

Product/ingredient name	Test	Species	Result	Duration
GASOLINE, UNLEADED AUTOMOTIVE	LC50 Inhalation Vapor	Rat	>5000 mg/m³	4 hours
	LD50 Dermal	Rabbit	>2000 mg/kg	-
	LD50 Oral	Rat	>5000 mg/kg	-
ethyl benzene	LC50 Inhalation Vapor	Rat	17.8 mg/l	4 hours
	LD50 Oral	Rat	3.5 g/kg	-
naphthalene	LC50 Inhalation Vapor	Rat	>0.4 mg/l	4 hours
	LD50 Oral	Mouse	533 mg/kg	-

Conclusion/Summary

Inhalation : Minimally Toxic. Data available. Based on test data for structurally similar materials. Test (s) equivalent or similar to OECD Guideline 403

Dermal : Minimally Toxic. Data available. Based on test data for structurally similar materials. Test (s) equivalent or similar to OECD Guideline 402

Oral : Minimally Toxic. Data available. Based on test data for structurally similar materials. Test (s) equivalent or similar to OECD Guideline 401

Irritation/Corrosion

Conclusion/Summary

Skin : Irritating to the skin. Data available. Based on test data for structurally similar materials. Test(s) equivalent or similar to OECD Guideline 404

Eyes : May cause mild, short-lasting discomfort to eyes. Data available. Based on test data for structurally similar materials. Test(s) equivalent or similar to OECD Guideline 405

Respiratory : Negligible hazard at ambient/normal handling temperatures. No end point data for material. Elevated temperatures or mechanical action may form vapors, mist, or fumes which may be irritating to the eyes, nose, throat, or lungs.

Sensitization

Conclusion/Summary

Skin : Not expected to be a skin sensitizer. Data available. Based on test data for structurally similar materials. Test(s) equivalent or similar to OECD Guideline 406

Respiratory : Not expected to be a respiratory sensitizer. No end point data for material.

Mutagenicity

Conclusion/Summary : May cause genetic defects. Data available. Based on test data for structurally similar materials. Test(s) equivalent or similar to OECD Guideline 471 475 476

Section 11. Toxicological information

Carcinogenicity

Conclusion/Summary : May cause cancer. Data available. Based on test data for structurally similar materials. Test(s) equivalent or similar to OECD Guideline 451

Classification

Product/ingredient name	OSHA	IARC	NTP
gasoline	-	2B	-
cumene	-	2B	Reasonably anticipated to be a human carcinogen.
ethyl alcohol	-	1	-
xylenes	-	3	-
toluene	-	3	-
ethyl benzene	-	2B	-
benzene	+	1	Known to be a human carcinogen.
naphthalene	-	2B	Reasonably anticipated to be a human carcinogen.

Reproductive toxicity

Conclusion/Summary : Not expected to be a reproductive toxicant. Data available. Based on test data for structurally similar materials. Test(s) equivalent or similar to OECD Guideline 416 421

Specific target organ toxicity (single exposure)

Conclusion/Summary : May cause drowsiness or dizziness. No end point data for material.

Specific target organ toxicity (repeated exposure)

Conclusion/Summary : Not expected to cause organ damage from prolonged or repeated exposure. Data available. Based on test data for structurally similar materials. Test(s) equivalent or similar to OECD Guideline 410 412 453

Aspiration hazard

Conclusion/Summary : May be fatal if swallowed and enters airways. Based on physico-chemical properties of the material. Data available.

Other information

Contains : TRIMETHYLBENZENE: Long-term inhalation exposure of trimethylbenzene caused effects to the blood in laboratory animals. NAPHTHALENE: Exposure to high concentrations of naphthalene may cause destruction of red blood cells, anemia, and cataracts. Naphthalene caused cancer in laboratory animal studies, but the relevance of these findings to humans is uncertain. ETHYLBENZENE: Caused cancer in laboratory animal studies. The relevance of these findings to humans is uncertain. ETHANOL: Prolonged or repeated exposure to high concentrations of ethanol vapor or overexposure by ingestion may produce adverse effects to brain, kidney, liver, and reproductive organs, birth defects in offspring, and developmental toxicity in offspring. BENZENE: Caused cancer (acute myeloid leukemia and myelodysplastic syndrome), damage to the blood-producing system, and serious blood disorders in human studies. Caused genetic effects and effects on the immune system in laboratory animal and some human studies. Caused toxicity to the fetus and cancer in laboratory animal studies. CUMENE: Repeated inhalation exposure of cumene vapor produced damage in the kidney of male rats only. These effects are believed to be species specific and are not relevant to humans. N-HEXANE: Prolonged and/or repeated exposures to n-Hexane can cause progressive and potentially irreversible damage to the peripheral nervous system (e.g. fingers, feet, arms, legs, etc.). Simultaneous exposure to Methyl Ethyl Ketone (MEK) or Methyl Isobutyl Ketone (MIBK) and n-Hexane can potentiate the risk of adverse effects from n-Hexane on the peripheral nervous system. n-Hexane has been shown to cause testicular damage at high doses in male rats. The relevance of this effect for humans is unknown. TOLUENE : Concentrated, prolonged or deliberate inhalation may cause brain and nervous system damage. Prolonged and repeated exposure of pregnant animals (> 1500 ppm) have been reported to cause adverse fetal developmental effects.

Section 11. Toxicological information

Product : Gasoline unleaded: Caused cancer in animal tests. Chronic inhalation studies resulted in liver tumors in female mice and kidney tumors in male rats. Neither result considered significant for human health risk assessment by the United States EPA and others. Did not cause mutations In Vitro or In Vivo. Negative in inhalation developmental studies and reproductive tox studies.Inhalation of high concentrations in animals resulted in reversible central nervous system depression, but no persistent toxic effect on the nervous system. Non-sensitizing in test animals. Caused nerve damage in humans from abusive use (sniffing). Laboratory animal studies have shown that prolonged and repeated inhalation exposure to light hydrocarbon vapors in the same boiling range as this product can produce adverse kidney effects in male rats. However, these effects were not observed in similar studies with female rats, male and female mice, or in limited studies with other animal species. Additionally, in a number of human studies, there was no clinical evidence of such effects at normal occupational levels. In 1991, The U.S. EPA determined that the male rat kidney is not useful for assessing human risk. Vapor concentrations above recommended exposure levels are irritating to the eyes and the respiratory tract, may cause headaches and dizziness, are anesthetic and may have other central nervous system effects. Exposure to this material, or one of its components, in situations where there is the potential for high levels, such as in confined spaces or with abuse, may result in abnormal heart rhythm (arrhythmia). High-level exposure to hydrocarbons (above occupational exposure limits) may initiate arrhythmia in a worker that is undergoing stress or is taking a heart-stimulating substance such as epinephrine, a nasal decongestant, or an asthma or cardiovascular drug. Small amounts of liquid aspirated into the lungs during ingestion or from vomiting may cause chemical pneumonitis or pulmonary edema.

Section 12. Ecological information

The information given is based on data for the material, components of the material, or for similar materials, through the application of bridging principals.

Toxicity

Conclusion/Summary

Acute toxicity : Toxic to aquatic life.

Chronic toxicity : Toxic to aquatic life with long lasting effects.

Persistence and degradability

Biodegradability : Majority of components -- Expected to be inherently biodegradable

Atmospheric Oxidation : More volatile component -- Expected to degrade rapidly in air

Bioaccumulative potential

Conclusion/Summary : Majority of components -- Has the potential to bioaccumulate, however metabolism or physical properties may reduce the bioconcentration or limit bioavailability.

Mobility in soil

Mobility : Less volatile component -- Expected to partition to sediment and wastewater solids. Low solubility and floats and is expected to migrate from water to the land. More volatile component -- Highly volatile, will partition rapidly to air. Not expected to partition to sediment and wastewater solids.

Other ecological information

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

Section 13. Disposal considerations

Disposal methods : The generation of waste should be avoided or minimized wherever possible. Disposal of this product, solutions and any by-products should at all times comply with the requirements of environmental protection and waste disposal legislation and any regional local authority requirements. Dispose of surplus and non-recyclable products via a licensed waste disposal contractor. Waste should not be disposed of untreated to the sewer unless fully compliant with the requirements of all authorities with jurisdiction. Waste packaging should be recycled. Incineration or landfill should only be considered when recycling is not feasible. Avoid dispersal of spilled material and runoff and contact with soil, waterways, drains and sewers.

Section 13. Disposal considerations

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

United States - RCRA Toxic hazardous waste "U" List

Ingredient	CAS #	Status	Reference number
Cumene (I)	98-82-8	Listed	U055
Xylene	1330-20-7	Listed	U239
Toluene	108-88-3	Listed	U220
Benzene (I,T)	71-43-2	Listed	U019

Section 14. Transport information

	DOT Classification	TDG Classification	IMDG	IATA
UN number	UN1203	UN1203	UN1203	UN1203
UN proper shipping name	Gasoline	GASOLINE	GASOLINE	Gasoline
Transport hazard class(es)	3	3	3	3
Label(s) / Marks				
Packing group	II	II	II	II
Environmental hazards	Yes.	Yes.	Yes.	Yes. The environmentally hazardous substance mark is not required.

Additional information

DOT Classification : This product is not regulated as a marine pollutant when transported on inland waterways in sizes of ≤5 L or ≤5 kg or by road, rail, or inland air in non-bulk sizes, provided the packagings meet the general provisions of §§ 173.24 and 173.24a.
Reportable quantity 606.06 lbs / 275.15 kg [98.359 gal / 372.33 L]. Package sizes shipped in quantities less than the product reportable quantity are not subject to the RQ (reportable quantity) transportation requirements.
Limited quantity Yes.
Packaging instruction Exceptions: 150. Non-bulk: 202. Bulk: 242.
Quantity limitation Passenger aircraft/rail: 5 L. Cargo aircraft: 60 L.
Special provisions 144, 177, B1, B33, IB2, T4

TDG Classification : Product classified as per the following sections of the Transportation of Dangerous Goods Regulations: 2.18-2.19 (Class 3), 2.7 (Marine pollutant mark).
The marine pollutant mark is not required when transported by road or rail.
Explosive Limit and Limited Quantity Index 30
Passenger Carrying Vessel Index 100
Passenger Carrying Road or Rail Index 5
Special provisions 17, 88, 98, 150

IMDG : The marine pollutant mark is not required when transported in sizes of ≤5 L or ≤5 kg.
Emergency schedules F-E, S-E
Special provisions 243

Section 14. Transport information

Flash point <-40 °C C.C.

IATA : The environmentally hazardous substance mark may appear if required by other transportation regulations.
Quantity limitation Passenger and Cargo Aircraft: 5 L. Packaging instructions: 353. Cargo Aircraft Only: 60 L. Packaging instructions: 364. Limited Quantities - Passenger Aircraft: 1 L. Packaging instructions: Y341.
Special provisions A100

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

Transport in bulk according to IMO instruments : Not applicable.

Section 15. Regulatory information

U.S. Federal regulations : **TSCA 8(a) PAIR**: naphthalene
TSCA 8(a) CDR Exempt/Partial exemption: Not determined
Clean Water Act (CWA) 307: toluene; ethyl benzene; benzene; naphthalene
Clean Water Act (CWA) 311: xylenes; toluene; ethyl benzene; benzene; naphthalene
Clean Air Act (CAA) 112 regulated flammable substances: butane

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

Clean Air Act Section 602 Class I Substances : Not listed

Clean Air Act Section 602 Class II Substances : Not listed

DEA List I Chemicals (Precursor Chemicals) : Not listed

DEA List II Chemicals (Essential Chemicals) : Not listed

SARA 302/304

Composition/information on ingredients

No products were found.

SARA 304 RQ : Not applicable.

SARA 311/312

Classification : FLAMMABLE LIQUIDS - Category 1
SKIN IRRITATION - Category 2
GERM CELL MUTAGENICITY - Category 1B
CARCINOGENICITY - Category 1B
SPECIFIC TARGET ORGAN TOXICITY (SINGLE EXPOSURE) (Narcotic effects) - Category 3
ASPIRATION HAZARD - Category 1

SARA 313

Section 15. Regulatory information

	Product name	CAS number	%
Form R - Reporting requirements	cumene xylenes toluene pseudocumene (1,2,4-trimethylbenzene) n-hexane ethyl benzene benzene naphthalene	98-82-8 1330-20-7 108-88-3 95-63-6 110-54-3 100-41-4 71-43-2 91-20-3	≤15 ≥5 - ≤10 ≥5 - ≤15 ≥1 - ≤5 ≥1 - ≤5 ≥1 - ≤15 ≤1.65 <1
Supplier notification	cumene xylenes toluene pseudocumene (1,2,4-trimethylbenzene) n-hexane ethyl benzene benzene naphthalene	98-82-8 1330-20-7 108-88-3 95-63-6 110-54-3 100-41-4 71-43-2 91-20-3	≤15 ≥5 - ≤10 ≥5 - ≤15 ≥1 - ≤5 ≥1 - ≤5 ≥1 - ≤15 ≤1.65 <1

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

State regulations

Massachusetts : The following components are listed: CUMENE; BUTANE; ETHYL ALCOHOL; XYLENE; TOLUENE; TRIMETHYL BENZENE; PSEUDOCUMENE; HEXANE; ETHYL BENZENE; BENZENE

New York : The following components are listed: Cumene; Xylene mixed; Toluene; Hexane; Ethylbenzene; Benzene

New Jersey : The following components are listed: CUMENE; BUTANE; ETHYL ALCOHOL; XYLENES; TOLUENE; TRIMETHYL BENZENE (mixed isomers); PSEUDOCUMENE; n-HEXANE; ETHYL BENZENE; BENZENE; NAPHTHALENE

Pennsylvania : The following components are listed: GASOLINE; BENZENE, (1-METHYLETHYL)-; BUTANE; ETHANOL; BENZENE, DIMETHYL-; BENZENE, METHYL-; BENZENE, TRIMETHYL-; PSEUDOCUMENE; HEXANE; BENZENE, ETHYL-; BENZENE

Illinois : None of the components are listed.

California Prop. 65

⚠ **WARNING**: Cancer and Reproductive Harm - www.P65Warnings.ca.gov.

Inventory list

Australia inventory (AIIC) : All components are listed or exempted.

Canada inventory (DSL-NDSL) : All components are listed or exempted.

China inventory (IECSC) : Not determined.

Japan inventory (CSCL) : All components are listed or exempted.

Japan inventory (Industrial Safety and Health Act) : Not determined.

New Zealand Inventory of Chemicals (NZIoC) : All components are listed or exempted.

Philippines inventory (PICCS) : All components are listed or exempted.

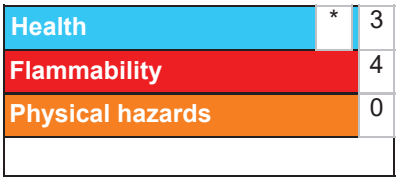
Korea inventory (KECI) : All components are listed or exempted.

Taiwan Chemical Substances Inventory (TCSI) : All components are listed or exempted.

United States inventory (TSCA 8b) : All components are active or exempted.

Section 16. Other information

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



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

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

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



Procedure used to derive the classification

Classification	Justification
FLAMMABLE LIQUIDS - Category 1	Expert judgment
SKIN IRRITATION - Category 2	Expert judgment
GERM CELL MUTAGENICITY - Category 1B	Expert judgment
CARCINOGENICITY - Category 1B	Expert judgment
SPECIFIC TARGET ORGAN TOXICITY (SINGLE EXPOSURE) (Narcotic effects) - Category 3	Expert judgment
ASPIRATION HAZARD - Category 1	Expert judgment

New Jersey Right to Know Disclosure

Name	CAS #
cumene	98-82-8
butane	106-97-8
ethyl alcohol	64-17-5
xylenes	1330-20-7
toluene	108-88-3
trimethyl benzene	25551-13-7
pseudocumene (1,2,4-trimethylbenzene)	95-63-6
n-hexane	110-54-3
ethyl benzene	100-41-4
benzene	71-43-2
naphthalene	91-20-3
gasoline	86290-81-5

History

Date of issue/Date of revision : 15 May 2024

Date of previous issue : 15 March 2024

Version : 2.01

Key to abbreviations : ATE = Acute Toxicity Estimate
BCF = Bioconcentration Factor
GHS = Globally Harmonized System of Classification and Labelling of Chemicals
IATA = International Air Transport Association
IBC = Intermediate Bulk Container
IMDG = International Maritime Dangerous Goods
LogPow = logarithm of the octanol/water partition coefficient
MARPOL = International Convention for the Prevention of Pollution From Ships, 1973

Section 16. Other information

as modified by the Protocol of 1978. ("Marpol" = marine pollution)
N/A = Not available
SGG = Segregation Group
UN = United Nations

References : Not available.

Indicates information that has changed from previously issued version.

THIS SDS COVERS THE FOLLOWING MATERIALS :

GASOLINE

Product code : 1152181

Notice to reader

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Hydrogen Cyanide (0.0001%-0.0025%) in Nitrogen

Issue date March 1, 2015

Reviewed date November 1, 2023

Safety Data Sheet

SDS ID# 4096

Section 1. IDENTIFICATION

1.1. Product identifier

Product form : Mixture

Product name : Hydrogen Cyanide (0.0001%-0.0025%) in Nitrogen

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

Product use : Calibration gas/Bumptest gas/Function test gas

1.3. Details of the supplier of the safety data sheet

Intermountain Specialty Gases
21913 Cobalt Ave.
Caldwell, Idaho 83605
Telephone 1-208-585-5829 or Toll free 1-800-552-5003
www.isgases.com

1.4. Emergency telephone number

Emergency number : CHEMTREC: 1-800-424-9300

Section 2. HAZARDS INDENTIFICATION

2.1. Classification of the substance or mixture

Classification : GASES UNDER PRESSURE - Compressed gas
Simple asphyxiant - Yes
Acute toxicity, 5 Inhalation

2.2. Label elements

Hazard pictograms



Signal word : WARNING

Hazard statements : H280 - CONTAINS GAS UNDER PRESSURE; MAY EXPLODE IF HEATED
: OSHA-H01 - MAY DISPLACE OXYGEN AND CAUSE RAPID SUFFOCATION.
: H333 - MAY BE HARMFUL IF INHALED
: OSHA - PG01 - DO NOT REMOVE THIS PRODUCT LABEL

Precautionary statements

[General] : Read and follow all Safety Data Sheets (SDS's) before use. Read label before use. Keep out of reach of children. If medical advice is needed, have a product container or label at

hand. Use equipment rated for cylinder pressure.

[Prevention] : P202 - Do not handle until all safety precautions have been read and understood
: P308+P313 - If exposed or concerned: Get medical advice/attention.
: P271+P403- Use only outdoors or in a well-ventilated area

[Response] : P304+P340 - If inhaled: Remove person to fresh air and keep comfortable for breathing.
: P313 - Get medical advice/attention.

[Storage] : CGA-PG02 - Protect from sunlight when ambient temperature exceeds 52°C (125°F)

[Disposal] : Dispose of content and/or container in accordance with local, regional, national, and/or international regulations.

2.3. Other hazards

No additional information available

2.4. Unknown acute toxicity

No data available

Section 3. COMPOSITION/INFORMATION ON INGREDIENTS

3.1. Substance

Not applicable

3.2. Mixture

Name	Product Identifier	%
Nitrogen	(CAS No) 7727-37-9	99.75 - 99.9999
Hydrogen Cyanide	(CAS No) 74-90-8	0.0001 - 0.0025

Section 4. FIRST AID MEASURES

4.1. Description of first aid measures

General : IF exposed or concerned: Get medical advice/attention.

Inhalation : Remove to fresh air and keep at rest in a position comfortable for breathing. If breathing has stopped, give artificial respiration or oxygen by trained personnel. If victim feels unwell, seek medical advice.

Skin contact : Immediately flush with copious amount of water for at least 15 minutes.

Eye contact : Immediately flush with copious amount of water for at least 15 minutes.

Ingestion : Ingestion is not considered a potential route of exposure, refer to the inhalation section.

4.2. Most important symptoms/effects, acute and delayed

Acute

Inhalation PROMPT REMOVAL FROM THE CONTAMINATED AREA AND IMMEDIATE MEDICAL ATTENTION IS MANDATORY IN ALL CASES OF OVEREXPOSURE. RESCUE PERSONNEL SHOULD BE EQUIPED WITH SELF-CONTAINED BREATHING APPARATUS AND BE AWARE OF THE HEALTH HAZARDS ASSOCIATED WITH HYDROGEN CYANIDE.

: A complete Cyanide Antidote Kit should be available near all areas of use. Personnel should e trained in the use of the kit to administer first aid in advance of medical assistance. Pertinent medical records shall be maintained for 5 years following the last exposure to hydrogen cyanide.

	: May displace oxygen and cause rapid suffocation.
Skin contact	: Contact with rapidly expanding gas may cause burns or frostbite.
Eye contact	: Contact with rapidly expanding gas may cause burns or frostbite.
Ingestion	: Ingestion is not considered a potential route of exposure, refer to the inhalation section.
Frostbite	: Thaw frosted parts with lukewarm water. Do not rub affected areas. Get immediate medical advice/attention.
Symptoms/injuries upon intravenous administration	: Not known
Chronic symptoms	: Adverse effects not expected from this product.
Delayed	: Adverse effects not expected from this product.

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

If victim feels unwell, seek medical advice. If breathing is difficult, give artificial respiration or oxygen by trained personnel.

Section 5. FIREFIGHTING MEASURES

5.1. Extinguishing media

Suitable extinguishing media	: Use extinguishing media appropriate for surrounding fire.
Unsuitable extinguishing media	: None known

5.2. Special hazards arising from the substance or mixture

Fire hazard	: The product is not flammable
Explosion hazard	: Heat may build pressure, rupturing closed containers, spreading fire and increasing risk of burns and injuries.
Reactivity	: None known.

5.3. Advice for fire-fighters

Firefighting instructions	: In case of fire: Evacuate all personnel from the danger area. Stop the leak and flow of gas before extinguishing fire, if safe to do so. If this is not possible, withdraw from area and allow fire to burn. Fight fire remotely due to the risk of explosion. Use water spray or fog for cooling exposed containers. Let the fire burn. Avoid inhalation of material or combustion by-products. Stay upwind and keep out of low areas. Exercise caution when fighting any chemical fire.
Protection during firefighting	: Standard protective clothing and equipment (e.g., Self Contained Breathing Apparatus, SCBA) for fire fighters. Do not enter fire area without proper protective equipment, including respiratory protection.

Section 6. ACCIDENTAL RELEASE MEASURES

6.1. Personal precautions, protective equipment and emergency procedures

General measures	: Ensure adequate ventilation.
6.1.1. For non -emergency personnel	
Protective equipment	: Wear protective equipment consistent with the site emergency plan.
Emergency procedures	: Escape the danger area by the closest safe route. Close doors and windows of adjacent premises. Keep containers closed. Mark the danger area. Seal off low-lying areas. Keep upwind.
6.1.12. For emergency responders	
Protective equipment	: Standard protective clothing and equipment (e.g., Self Contained Breathing Apparatus) for fire fighters. Equip cleanup crew with proper protection.
Emergency procedures	: Evacuate and limit access. Ventilate area. See information above "For non-emergency personnel".

6.2. Methods and material for containment and cleaning up

For containment	: Immediately contact emergency personnel. Try to stop gas leak if safe to do so.
Methods for cleaning up	:Dispose of content and/or container in accordance with local, regional, national, and/or international regulations.

Section 7. HANDLING AND STORAGE

7.1. Precautions for safe handling

Precautions for safety handling	: Pressurized container: Do not pierce or burn, even after use. Use equipment rated for cylinder pressure. Do not handle until all safety precautions have been read and understood. Use only outdoors or in a well-ventilated area. Avoid contact with eyes, skin and clothing. Avoid breathing gas. Protect cylinders from physical damage; do not drag, roll, slide, or drop.
Hygiene measures	: Do not eat, drink or smoke when using this product.

7.2. Conditions for safe storage, including any incompatibilities

Technical measures	: None known.
Storage conditions	: Do not expose to temperatures exceeding 52°C (125°F). Store locked up. Keep containers closed when not in use. Protect cylinder from physical damage. Store and use away from heat, sparks, open flame or any other ignition source. Store in well ventilated area.
Incompatible products	: None known.
Incompatible materials	: None known.

Section 8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Nitrogen (7727-37-9)

OSHA PEL		Cal/OSHA PEL	NIOSH REL	ACGIH 2015 TLV
		(as of 4/26/13)	(as of 4/26/13)	
ppm	mg/m^3	8-hour TWA (ST) STEL (C) Ceiling	up to 10-hour TWA (ST) STEL (C) Ceiling	8-hour TWA (ST) STEL (C) Ceiling
Not established	*Not established*	*Not established*	*Not established*	Simple asphyxiant

Hydrogen cyanide (74-90-8)

OSHA PEL		Cal/OSHA PEL	NIOSH REL	ACGIH 2015 TLV
		(as of 4/26/13)	(as of 4/26/13)	
ppm	mg/m^3	8-hour TWA (ST) STEL (C) Ceiling	up to 10-hour TWA (ST) STEL (C) Ceiling IDLH	8-hour TWA (ST) STEL (C) Ceiling
4.7 ppm	11 mg/m^3	10 ppm		
			(ST) 4.7 ppm	(ST) 4.7 ppm

8.2. Appropriate engineering controls

Engineering measures/controls	: Provide adequate general and local exhaust ventilation. Systems under pressure should be regularly check for leakages. Ensure exposure is below occupational exposure limits. Oxygen detectors should be used when asphyxiating gases may me released. Consider work permit system e.g. for maintenance activities.

8.3. Individual protection measures

Hand protection	: Wear working gloves when handling gas containers. 29CFR 1910.138: Hand Protection.
Eye protection	: Wear safety glasses with side shields. 29 CFR 1910.133: Eye and Face Protection.
Skin and body protection	: Wear suitable protective clothing, e.g.-Lab coats, coveralls or flame resistant clothing.
Respiratory protection	: Use a properly fitted, air-purifying or air-fed respirator complying with an approved standard if a risk assessment indicates this is necessary.
Thermal hazard protection	: None necessary during normal and routine operations.
Environmental exposure controls	: Refer to local regulations for restriction of emissions to the atmosphere. See section 13 for specific methods for waste gas treatment.
Other information	: Wear safety shoes while handling containers. 29 CFR 1910.136: Foot Protection

Section 9. PHYSICAL AND CHEMICAL PROPERTIES

9.1. Exposure controls

Appearance	: Clear, colorless gas.
Physical state	: Gas
Color	: Colorless
Odor	: Bitter-sweet almond (HCN)
Odor threshold	: 2 - 5 ppm (HCN)
pH	: No data available
Freezing point	: -209.9 °C
Flash point	: No data available
Evaporation rate	: No data available
Flammability (solid, gas)	: Not Flammable - not combustible
Upper flammability	: Not Flammable - not combustible
Lower flammability	: Not Flammable - not combustible
Relative density	: No data available
Solubility	: Very slight
Partition coefficient	: No data available
Auto-ignition temperature	: No data available
Decomposition temperature	: No data available
Viscosity	: Not applicable

	Hydrogen Cyanide	Nitrogen		
Molecular weight (grams)	27.03	28.013		
Boiling point	-195.8 °C	-196 °C		
Vapor pressure	630 mmHg @ 20°C	Above critical temperature		
Vapor density at 20°C	n/a	0.97		
Relative gas density	n/a	1.153		
Critical Temperature	n/a	-146.9 °C		

Section 10. STABILITY AND REACTIVITY

10.1. Reactivity

No reactivity hazard other than the effects described below.

10.2. Chemical stability

Stable under normal conditions.

10.3. Possibility of hazardous reactions

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

10.4. Conditions to avoid

Strong oxidizing agents, strong acids, strong bases, amines and combustible materials.

10.5. Incompatible materials

None known

10.6. Hazardous decomposition products

Carbon Oxides and Nitrogen Oxides (NOx)

Section 11. TOXICOLOGICAL INFORMATION

Acute toxicity

Nitrogen (7727-37-9)	
LC50 inhalation rat (ppm)	410,000 ppm/4h

Hydrogen cyanide (74-90-8)	
LD50 oral rat (mg/l)	4.21 mg/kg
LD50 dermal rabbit (ppm)	2.34 mg/kg
LC50 inhalation rat (mg/l)	120 mg/m^3 / 1 hour
LC50 inhalation rat (ppm)	140 ppm/1 hour

11.1. Information on routes of exposure

Inhalation	: May displace oxygen and cause rapid suffocation.
Skin contact	: Adverse effects not expected from this product
Eye contact	: Adverse effects not expected from this product
Ingestion	: Ingestion is not considered a potential route of exposure

11.2. Symptoms related to physical, chemical and toxicological characteristics

Symptoms	Simple asphyxiant. May cause suffocation by displacing the oxygen in the air. Exposure to oxygen-deficient atmosphere (<=18%) may cause dizziness, drowsiness, nausea, vomiting, excess salivation, diminished mental alertness, loss of consciousness and death. Exposure to atmospheres containing 8-10% or less oxygen will bring about unconsciousness without warning and so quickly that the individuals cannot help or protect themselves. Lack of sufficient oxygen may cause serious injury

11.3. Delayed and immediate effects

Skin corrosion/irritation	: Contact with rapidly expanding gas may cause burns or frostbite. Hydrogen cyanide is acutely toxic when absorbed through the skin.
Serious eye damage/irritation	: Contact with rapidly expanding gas may cause burns or frostbite. Causes eye irritatio
Respiratory or skin sensitization	: Not classified
Germ cell mutagenicity	: Not classified
Carcinogenicity	: Not classified
Reproductive toxicity	: Oxygen deficiency during pregnancy has produced developmental abnormalities in humans and experimental animals.
Developmental Toxicity	: Not classified
Specific target organ toxicity (single exposure)	: Hydrogen cyanide blocks respiration at the cellular level. Acute poisoning results in weakness, headache, confusion, nausea, and vomiting.
Specific target organ toxicity (repeated exposure)	: Chronic exposure to hydrogen cyanide may cause fatigue and weakness. Long term effects include neurasthenia with autonomic nervous system involvement, psychic alterations, precordal pains, breathlessness on exercise, bradycardia, arterial hypotomia, polycythemia, dyspepsia, hepatic impairment, and thyroidal hypo function. May cause liver, kidney, cardiovascular, or central nervous system
Aspiration hazard	: Not classified

Not applicable for gases and gas-mixtures

11.4. Carcinogenic effects

The components of this material are not found on the following lists: FEDERAL OSHA Z LIST, NTP AND IARC; therefore, they are not considered to be, nor suspected to be, cancer-causing agents by these agencies.

Section 12. ECOLOGICAL INFORMATION

12.1. Aquatic Toxicity

Hydrogen cyanide (74-90-8)

LC50 Fish 1	0.082 - 0.137 mg/l (Exposure time: 96 hours - Species: Pimephales promelas (fathead minnow))
LC50 Fish 2	0.024 - 0.035 mg/l (Exposure time: 96 hours - Species: Oncorhynchus mykiss (rainbow trout))
LC50 Fish 3	0.232 - 0.365 mg/l (Exposure time: 96 hours - Species: Leponmis marcrochirus (Bluegill Sunfish))
EC50 Fish	1.8 mg/l (Exposure time: 48 hours - Species: Daphnia magna (Water Flea))

12.2. Persistence and degradability

No information available for the product

12.3. Bioaccumulative potential

No information available for the product

12.4. Mobility in soil

No information available for the product

12.5. Other

No information available for the product

Section 13. DISPOSAL CONSIDERATIONS

13.1. Disposal methods

Dispose of content and/or container in accordance with local, regional, national, and/or international regulations.

Section 14. TRANSPORATION INFORMATION

	US DOT	TDG	IMDG	IATA
UN #	UN 1956	UN 1956	UN 1956	UN 1956
Proper shipping name	Compressed gas, n.o.s. (Nitrogen, Hydrogen Cyanide)	Compressed gas, n.o.s. (Nitrogen, Hydrogen Cyanide)	Compressed gas, n.o.s. (Nitrogen, Hydrogen Cyanide)	Compressed gas, n.o.s. (Nitrogen, Hydrogen Cyanide)
Transport hazard class(es)	2.2 	2.2 	2.2 	2.2 
Packing group	-	-	-	-
Environment	No.	No.	No.	No.

Section 15. REGULATORY INFORMATION

15.1. US Federal regulations

SARA 311/312 hazard categories

Acute Health	: No
Chronic Health	: No
Fire	: No

Pressure	: Yes
Reactive	: No

Hydrogen cyanide is listed under the accident prevention provisions of section 112R of the Clean Air Act (CAA) with a threshold quantity (TQ) of 2,500 pounds

Hydrogen cyanide is listed as a RCRA hazardous waste P063 (40 CFR 261.33) and D003 (40 CFR 261.23)

The presence of hydrogen cyanide in quantities in excess of the threshold planning quantity (TQP) of 100 pounds requires certain emergency planning activities to be conducted.

Releases of hydrogen cyanide in quantities equal to or greater than the reportable quantity (RQ) of 10 pounds are subject to reporting to the National Response Center under CERCLA, Section 304 SARA Title III.

15.2. US State regulations

Nitrogen (007727-37-9)
U.S. - Massachusetts - Right To Know List
U.S. - Minnesota - Right To Know Hazardous Substance List
U.S. - New Jersey - Right To Know Hazardous Substance List
U.S. - Pennsylvania - RTK (Right To Know) List
Hydrogen Cyanide (74-90-8)
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

Section 16. OTHER INFORMATION

Date of issue/Date of revision	11/1/2023
Revision Note	

Hazardous Material Information System (USA)

Hazard Scale	: 0 = Minimal/ 1 = Slight/ 2 = Moderate/ 3 = Serious/ 4 = Severe
Health	: 1
Fire	: 0
Physical hazards	: 3

Key/Legend

SARA	Superfund Amendments and Reauthorization Act
OSHA	Occupational Safety and Health Administration
DOT	Department of Transportation
TSCA	Toxic Substance Control Act
NTP	National Toxicology Program
ACGIH	American Conference of Governmental Industrial Hygienists
PEL	Permissible Exposure Limit
STEL	Short Term Exposure Limit
TLV	Threshold Limit Value
TDG	Transportation of Dangerous Goods
CAS	Chemical Abstracts Service
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
IATA	International Air Transport Association
IMDG	International Maritime Dangerous Goods
TWA	Time Weighted Average
Prop	Proposition

ATE	Acute Toxicity Estimate
Repr. 2	Reproductive toxicity Category 2

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Although reasonable care has been taken in the preparation of this document, we extend no warranties and make no representations as to the accuracy or completeness of the information contained herein, and assume no responsibility regarding the suitability of this information for the user's intended purposes or for the consequences of its use. Each individual should make a determination as to the suitability of the information for their particular purpose (s).

LEAD METAL
SAFETY DATA SHEET

SECTION 1. IDENTIFICATION

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

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

Supplier:
Teck Metals Ltd.
#600-100 Wellington Street West
Toronto, Ontario
M5H 1H1

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

Date of Last Revision: 13 December 2022
Date of Last Edit: 18 January 2024

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

This product has been classified in accordance with the hazard criteria of the Hazardous Products Regulation SOR/2015-17 and this SDS contains all the information required by both the HPR and the OSHA Hazard Communication Standard of 2012 (29 CFR 1910.1200(g) and Appendix D.

SECTION 2. HAZARDS IDENTIFICATION

CLASSIFICATION:

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

LABEL:

Symbols:



Signal Word:

DANGER

Hazard Statements

DANGER!
Causes damage to kidneys, blood-forming systems, central nervous system through prolonged or repeated exposure.
May damage the unborn child. May cause harm to breast-fed children. Suspected of damaging fertility.
Suspected of causing cancer.
Harmful to aquatic life.

Precautionary Statements:

Obtain special instructions before use. Do not handle until all safety precautions have been read and understood.
Wear protective gloves/protective clothing/eye protection.
Do not breathe dust or fumes.
Wash hands thoroughly after handling.
Do not eat, drink or smoke when using this product.
If exposed or concerned or you feel unwell: Get medical advice/attention.
Avoid release to the environment.

Emergency Overview: A bluish white to silvery-grey, heavy, soft metal that does not burn in bulk but will melt readily at temperature above 300°C to form a molten metal pool. Finely divided lead dust clouds may be a moderate fire and explosion hazard, however. When heated strongly in air, highly toxic lead oxide fumes will be generated. Inhalation or ingestion of lead fumes may produce both acute and chronic health effects. Possible cancer and reproductive hazard. SCBA and full protective clothing are required for fire emergency response personnel.

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

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

SECTION 3. COMPOSITION / INFORMATION ON INGREDIENTS

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

Note: see Section 8 for Occupational Exposure Guidelines.

SECTION 4. FIRST AID MEASURES

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

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

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

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

SECTION 5. FIRE FIGHTING MEASURES

Fire and Explosion Hazards: Massive metal is not flammable or combustible but will melt readily at temperatures above 328°C to form a molten metal pool. Finely divided lead dust or powder may be a moderate fire hazard and moderate explosion hazard when dispersed in the air at high concentrations and exposed to heat, flame, or other ignition sources. Explosions may also occur under certain circumstances upon contact with some incompatible materials (see Stability and Reactivity, Section 10).

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

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

SECTION 6. ACCIDENTAL RELEASE MEASURES

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

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

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

SECTION 7. HANDLING AND STORAGE

Precautions for Safe Handling

Solid metal suspected of containing moisture should be THOROUGHLY DRIED before being added to a molten bath. Otherwise, entrained moisture could expand explosively and spatter molten metal out of the bath. Use with adequate ventilation, particularly in circumstances where high heat may be applied to the product. Lead metal, in contact with wood or other surfaces, may leave traces of lead particulate that can accumulate over time. Cleaning or disposal of such surfaces requires review to ensure that any effluent or solid waste disposal meets the requirements of regulations in the applicable jurisdiction.

Conditions for Safe Storage

Store in a DRY, covered area, separate from strong acids, other incompatible materials, active metals and food or feedstuffs. No special packaging materials are required.

SECTION 8. EXPOSURE CONTROLS / PERSONAL PROTECTION

Occupational Exposure Guidelines: *(Time-Weighted Average (TWA) concentration over 8 hr unless otherwise indicated)*

Component	ACGIH TLV	OSHA PEL	NIOSH REL
Lead	0.05 mg/m^3	0.05 mg/m^3	0.05 mg/m^3

NOTE: OEGs for individual jurisdictions may differ from those given above. Check with local authorities for the applicable OEGs in your jurisdiction. ACGIH - American Conference of Governmental Industrial Hygienists; OSHA - Occupational Safety and Health Administration; NIOSH - National Institute for Occupational Safety and Health. TLV – Threshold Limit Value, PEL – Permissible Exposure Limit, REL – Recommended Exposure Limit.

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

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

Protective Clothing: Although metallic lead is not considered to be absorbable through the intact skin, basic lead carbonate that forms as a protective layer on the surface of lead metal can rub off on the skin and then be transferred by hand to mouth contact. Gloves and coveralls or other work clothing are therefore recommended to prevent prolonged or repeated direct skin contact when lead is processed Where hot or molten metal is handled, heat resistant gloves, goggles or face shield, and clothing to protect from radiant heat and hot metal splash should be worn. Safety type boots are recommended.

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

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

SECTION 9. PHYSICAL AND CHEMICAL PROPERTIES

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

NOTE: Flash point and viscosity are not relevant physical properties of this product and therefore have not been included above.

SECTION 10. STABILITY AND REACTIVITY

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

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

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

SECTION 11. TOXICOLOGICAL INFORMATION

General: It should be noted that simple handling and non-thermal processing of lead billets does not present any significant health hazards to workers. The primary routes of exposure to lead are inhalation or ingestion of dust and fumes generated from processing the lead. Lead accumulates in bone and body organs once it enters the body. Elimination from the body is slow. Initial and periodic medical examinations are advised for persons repeatedly exposed to levels at or above the exposure limits of lead dust or fumes. Once lead enters the body, it can affect a variety of organ systems, including the nervous system, kidneys, reproductive system, blood formation system.

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

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

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

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

(Probably Carcinogenic to Humans) while lead metal is listed as *Group 2B (Possibly Carcinogenic to Humans)*. The NTP lists lead and lead compounds as *Reasonably Anticipated to be a Human Carcinogen*. OSHA and the EU do not currently list lead as a human carcinogen.

Animal Toxicity:

Hazardous Ingredient:	Acute Oral Toxicity:	Acute Dermal Toxicity:	Acute Inhalation Toxicity:
Lead	No Data	No Data	No Data

SECTION 12. ECOLOGICAL INFORMATION

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

SECTION 13. DISPOSAL CONSIDERATIONS

If material cannot be returned to process or salvage, dispose of in accordance with applicable regulations. Any waste materials would meet the definition of a hazardous material in most jurisdictions. It is the responsibility of the waste generator to determine the toxicity and physical properties of the material generated in order to determine the proper waste classification and disposal methods.

SECTION 14. TRANSPORT INFORMATION

PROPER SHIPPING NAME ..... Not a regulated product in ingot form.
TRANSPORT CANADA AND U.S. DOT CLASSIFICATION ..... Not Applicable
TRANSPORT CANADA AND U.S. DOT PIN ..... Not Applicable
MARINE POLLUTANT ..... No
IMO CLASSIFICATION ..... Not Regulated

SECTION 15. REGULATORY INFORMATION

U.S.
Ingredient Listed on TSCA Inventory ..... Yes

Hazardous Under Hazard Communication Standard ..... Yes

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

EPCRA Section 302 Extremely Hazardous Substance ..... No

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

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

SECTION 16. OTHER INFORMATION

Date of Original Issue:
Date of Latest Revision: 13 December 2022

Version: 01 *(first edition)*
Version: 15

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

- American Conference of Governmental Industrial Hygienists, 2004, Documentation of the Threshold Limit Values and Biological Exposure Indices, Seventh Edition plus updates.
- American Conference of Governmental Industrial Hygienists, 2022, Threshold Limit Values for Chemical Substances and Physical Agents and Biological Exposure Indices.
- American Conference of Governmental Industrial Hygienists, Guide to Occupational Exposure Values – 2021.
- Bretherick's Handbook of Reactive Chemical Hazards, 20th Anniversary Edition. (P. G. Urben, Ed), 1995.
- Canadian Centre for Occupational Health and Safety, Hamilton, ON, CHEMINFO Record No. 608 - Lead (Rev. 2009-05).
- European Regulation (EC) No 1272/2008 on classification, labelling and packaging of substances and mixtures, amending and repealing directives 67/548/EEC and 1999/45/EC, and amending Regulation (EC) No 1907/2006 (REACH).
- Health Canada, SOR/2015-17, Hazardous Products Regulations11 February 2015.
- International Agency for Research on Cancer (IARC), Monographs on the Evaluation of the Carcinogenic Risk of Chemicals to Man, 1972 – present, (multi-volume work), World Health Organization, Geneva.
- International Chemical Safety Cards (WHO/IPCS/ILO), ICSC:0052 - Lead.
- Merck & Co., Inc., 2001, The Merck Index, An Encyclopedia of Chemicals, Drugs, and Biologicals, Thirteenth Edition.
- National Library of Medicine, National Toxicology Information Program, Hazardous Substance Data Bank (online version).
- Patty's Toxicology, Fifth Edition, 2001: E. Bingham, B. Cohrssen & C.H. Powell, Ed.
- U.S. Dept. of Health and Human Services, National Institute of Environmental Health Sciences, National Toxicology Program (NTP), 15th Report on Carcinogens, December 2021.
- U.S. Dept. of Health and Human Services, National Institute for Occupational Safety and Health, NIOSH Pocket Guide to Chemical Hazards, on-line edition.
- U.S. Dept. of Health and Human Services, Public Health Service, Agency for Toxic Substances and Disease Registry, Toxicological Profile for Lead, September 2005.
- U.S. Occupational Safety and Health Administration, 1989, Code of Federal Regulations, Title 29, Part 1910.100 & 1910.1200

Acronyms not spelled out elsewhere in the SDS:
CAS: Chemical Abstracts Service
CERCLA: Comprehensive Environmental Response, Compensation, and Liability Act
DOT: Department of Transportation
EPCRA: Emergency Planning and Community Right- to-Know Act
IMO: International Maritime Organization
LD50, LC50: Lethal Dose 50%, Lethal Concentration 50%
OEGs: Occupational Exposure Guidelines
TSCA: Toxic Substances Control Act
Wt: Weight

Notice to Reader

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

SAFETY DATA SHEET

Creation Date 20-Aug-2014 **Revision Date** 28-Mar-2024 **Revision Number** 5

1. Identification

Product Name **Mercury**

Cat No. : **00522**

CAS No 7439-97-6
Synonyms Quicksilver

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

Details of the supplier of the safety data sheet

Company
Thermo Fisher Scientific Chemicals, Inc.
30 Bond Street
Ward Hill, MA 01835-8099
Tel: 800-343-0660
Fax: 800-322-4757

Emergency Telephone Number
For information **US** call: 001-800-227-6701 / **Europe** call: +32 14 57 52 11
Emergency Number **US:**001-201-796-7100 / **Europe:** +32 14 57 52 99
CHEMTREC Tel. No. **US:**001-800-424-9300 / **Europe:**001-703-527-3887

2. Hazard(s) identification

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

Acute Inhalation Toxicity - Vapors	Category 2
Reproductive Toxicity	Category 1B
Specific target organ toxicity - (repeated exposure)	Category 1
Target Organs - Central nervous system (CNS), Kidney, Liver.	

Label Elements

Signal Word
Danger

Hazard Statements
Fatal if inhaled
May damage the unborn child

Causes damage to organs through prolonged or repeated exposure



Precautionary Statements
Prevention
Obtain special instructions before use
Do not handle until all safety precautions have been read and understood
Use personal protective equipment as required
Do not breathe dust/fume/gas/mist/vapors/spray
Use only outdoors or in a well-ventilated area
Wear respiratory protection
Wash face, hands and any exposed skin thoroughly after handling
Do not eat, drink or smoke when using this product
Response
IF exposed or concerned: Get medical attention/advice
Inhalation
IF INHALED: Remove victim to fresh air and keep at rest in a position comfortable for breathing
Immediately call a POISON CENTER or doctor/physician
Storage
Store locked up
Store in a well-ventilated place. Keep container tightly closed
Disposal
Dispose of contents/container to an approved waste disposal plant
Hazards not otherwise classified (HNOC)
Very toxic to aquatic life with long lasting effects
WARNING. Reproductive Harm - https://www.p65warnings.ca.gov/.

3. Composition/Information on Ingredients

Component	CAS No	Weight %
Mercury	7439-97-6	100

4. First-aid measures

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

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

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

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

Ingestion Do NOT induce vomiting. Call a physician or poison control center immediately.

Most important symptoms and Neurological disorders. May cause central nervous system depression: May cause adverse

effects	kidney effects: May cause adverse liver effects: Symptoms may be delayed: Chronic exposure damages the brain and the central nervous system
Notes to Physician	Treat symptomatically

5. Fire-fighting measures

Suitable Extinguishing Media	Water spray, carbon dioxide (CO2), dry chemical, alcohol-resistant foam.
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
Very toxic. Non-combustible, substance itself does not burn but may decompose upon heating to produce corrosive and/or toxic fumes. Keep product and empty container away from heat and sources of ignition. Do not allow run-off from fire-fighting to enter drains or water courses.

Hazardous Combustion Products
Mercury oxide. Toxic fumes.
Protective Equipment and Precautions for Firefighters
As in any fire, wear self-contained breathing apparatus pressure-demand, MSHA/NIOSH (approved or equivalent) and full protective gear. Thermal decomposition can lead to release of irritating gases and vapors.

NFPA

Health	Flammability	Instability	Physical hazards
4	0	0	N/A

6. Accidental release measures

Personal Precautions	Ensure adequate ventilation. Use personal protective equipment as required. Keep people away from and upwind of spill/leak. Evacuate personnel to safe areas.
Environmental Precautions	Do not flush into surface water or sanitary sewer system. Do not allow material to contaminate ground water system. Prevent product from entering drains. Local authorities should be advised if significant spillages cannot be contained. Should not be released into the environment.
Methods for Containment and Clean Up	Soak up with inert absorbent material. Keep in suitable, closed containers for disposal.

7. Handling and storage

Handling	Wear personal protective equipment/face protection. Do not get in eyes, on skin, or on clothing. Use only under a chemical fume hood. Do not breathe mist/vapors/spray. Do not ingest. If swallowed then seek immediate medical assistance.
Storage.	Keep containers tightly closed in a dry, cool and well-ventilated place. Do not store in metal containers. Incompatible Materials. Strong oxidizing agents. Ammonia. Metals. Halogens.

8. Exposure controls / personal protection

Exposure Guidelines

Component	ACGIH TLV	OSHA PEL	NIOSH	Mexico OEL (TWA)
Mercury	TWA: 0.025 mg/m³ Skin	(Vacated) TWA: 0.05 mg/m³ Ceiling: 0.1 mg/m³ (Vacated) STEL: 0.03 mg/m³ Skin (Vacated) Ceiling: 0.1 mg/m³	IDLH: 10 mg/m³ TWA: 0.05 mg/m³ Ceiling: 0.1 mg/m³	TWA: 0.025 mg/m³

Legend

ACGIH *- American Conference of Governmental Industrial Hygienists*
OSHA *- Occupational Safety and Health Administration*
NIOSH: *NIOSH - National Institute for Occupational Safety and Health*

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

Personal Protective Equipment

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

Skin and body protection 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.

Recommended Filter type: Particulates filter conforming to EN 143. or. Inorganic gases and vapours filter. Type B. Grey. conforming to EN14387.

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

9. Physical and chemical properties

Physical State	Liquid
Appearance	Silver
Odor	Odorless
Odor Threshold	No information available
pH	Not applicable
Melting Point/Range	-38.9 °C / -38 °F
Boiling Point/Range	356.5 °C / 673.7 °F
Flash Point	No information available
Evaporation Rate	No information available
Flammability (solid,gas)	Not applicable
Flammability or explosive limits	
Upper	No data available
Lower	No data available
Vapor Pressure	0.01 hPa @ 20 °C
Vapor Density	7.0
Specific Gravity	13.540
Solubility	insoluble
Partition coefficient; n-octanol/water	No data available
Autoignition Temperature	No information available
Decomposition Temperature	No information available
Viscosity	1.554 cP at 20 °C
Molecular Formula	Hg
Molecular Weight	200.59

10. Stability and reactivity

Reactive Hazard None known, based on information available

Stability Stable under normal conditions.

Conditions to Avoid Incompatible products. Excess heat.

Incompatible Materials Strong oxidizing agents, Ammonia, Metals, Halogens

Hazardous Decomposition Products Mercury oxide, Toxic fumes

Hazardous Polymerization Hazardous polymerization does not occur.

Hazardous Reactions None under normal processing.

11. Toxicological information

Acute Toxicity

Product Information

Component Information

Component	LD50 Oral	LD50 Dermal	LC50 Inhalation
Mercury	Not listed	Not listed	LC50 < 27 mg/m³ (Rat) 2 h

Toxicologically Synergistic Products No information available

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

Irritation No information available

Sensitization No information available

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

Component	CAS No	IARC	NTP	ACGIH	OSHA	Mexico
Mercury	7439-97-6	Not listed	Not listed	Not listed	Not listed	Not listed

Mutagenic Effects No information available

Reproductive Effects No information available.

Developmental Effects May cause harm to the unborn child.

Teratogenicity No information available.

STOT - single exposure None known

STOT - repeated exposure Central nervous system (CNS) Kidney Liver

Aspiration hazard No information available

Symptoms / effects,both acute and delayed May cause central nervous system depression: May cause adverse kidney effects: May cause adverse liver effects: Symptoms may be delayed: Chronic exposure damages the brain and the central nervous system

Endocrine Disruptor Information No information available

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

12. Ecological information

Ecotoxicity

Very toxic to aquatic organisms, may cause long-term adverse effects in the aquatic environment. The product contains following substances which are hazardous for the environment. Do not allow material to contaminate ground water system.

Component	Freshwater Algae	Freshwater Fish	Microtox	Water Flea
Mercury	Not listed	0.9 mg/L LC50 96h 0.18 mg/L LC50 96h 0.16 mg/L LC50 96h 0.5 mg/L LC50 96h	Not listed	Not listed

Persistence and Degradability Insoluble in water May persist

Bioaccumulation/ Accumulation No information available.

Mobility Is not likely mobile in the environment due its low water solubility.

13. Disposal considerations

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

Component	RCRA - U Series Wastes	RCRA - P Series Wastes
Mercury - 7439-97-6	U151	-

14. Transport information

DOT

UN-No	UN2809
Proper Shipping Name	Mercury
Hazard Class	8
Subsidiary Hazard Class	6.1
Packing Group	III

TDG

UN-No	UN2809
Proper Shipping Name	Mercury
Hazard Class	8
Subsidiary Hazard Class	6.1
Packing Group	III

IATA

UN-No	UN2809
Proper Shipping Name	Mercury
Hazard Class	8
Subsidiary Hazard Class	6.1
Packing Group	III

IMDG/IMO

UN-No	UN2809
Proper Shipping Name	Mercury
Hazard Class	8
Subsidiary Hazard Class	6.1
Packing Group	III

15. Regulatory information

United States of America Inventory

Component	CAS No	TSCA	TSCA Inventory notification - Active-Inactive	TSCA - EPA Regulatory Flags
Mercury	7439-97-6	X	ACTIVE	S;12C

Legend:
TSCA US EPA (TSCA) - Toxic Substances Control Act, (40 CFR Part 710)
X - Listed
'-' - Not Listed
S - Indicates a substance that is identified in a proposed or final Significant New Use Rule.

TSCA - Per 40 CFR 751, Regulation of Certain Chemical Substances & Mixtures, Under TSCA Section 6(h) (PBT) Not applicable

TSCA 12(b) - Notices of Export

Component	CAS No	**TSCA 12(b)** - Notices of Export
Mercury	7439-97-6	Section 5

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
Mercury	7439-97-6	X	-	231-106-7	X	X		X	X	KE-23117

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

U.S. Federal Regulations

SARA 313

Section 313 of Title III of the Superfund Amendments and Reauthorization Act of 1986 (SARA). This product contains a chemical or chemicals which are subject to the reporting requirements of the Act and Title 40 of the Code of Federal Regulations, Part 372. Note that PBT chemicals are not eligible for the de minimis exemption. For these chemicals, supplier notification limits are provided.

> 0 % = no low concentration cut-off set, supplier notification limit applies.

Component	CAS No	Weight %	SARA 313 - Threshold Values %	SARA 313 - Reporting threasholds
Mercury	7439-97-6	100	> 0 %	RT = 10 lb

SARA 311/312 Hazard Categories

Should this product meet EPCRA 311/312 Tier reporting criteria at 40 CFR 370, refer to Section 2 of this SDS for appropriate classifications.

CWA (Clean Water Act)

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

Clean Air Act

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) or the Superfund Amendments and Reauthorization Act (SARA) (40 CFR 355).

Component	Hazardous Substances RQs	CERCLA Extremely Hazardous Substances RQs	SARA Reportable Quantity (RQ)
Mercury	1 lb	-	1 lb 0.454 kg

California Proposition 65 This product contains the following Proposition 65 chemicals.

Component	CAS No	California Prop. 65	Prop 65 NSRL	Category
Mercury	7439-97-6	Developmental	-	Developmental

U.S. State Right-to-Know Regulations

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

U.S. Department of Transportation
Reportable Quantity (RQ): Y
DOT Marine Pollutant N
DOT Severe Marine Pollutant N

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

Other International Regulations

Mexico - Grade No information available

Authorisation/Restrictions according to EU REACH

Component	CAS No	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)
Mercury	7439-97-6	-	Use restricted. See item 18[a]. (see link for restriction details) Use restricted. See item 30. (see link for restriction details) Use restricted. See item 75. (see link for restriction details)	-

REACH links
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)
Mercury	7439-97-6	Listed	Not applicable	Not applicable	0.1% (Max. Conc.)

Contains component(s) that meet a 'definition' of per & poly fluoroalkyl substance (PFAS)?
Not applicable

Other International Regulations

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)
Mercury	7439-97-6	Not applicable	Not applicable	X	Annex I - Y29

16. Other information

Prepared By	Health, Safety and Environmental Department Email: chem.techinfo@thermofisher.com www.thermofisher.com
Creation Date	20-Aug-2014
Revision Date	28-Mar-2024
Print Date	28-Mar-2024
Revision Summary	New emergency telephone response service provider.

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

Coal Tar Solution

This SDS is valid for all grades and catalog #s

1. IDENTIFICATION OF SUBSTANCE / MIXTURE AND OF SUPPLIER

Product Identifier: Ethanol

Synonyms:

Other means of identification: CAS No. 65996-93-2
EINECS No. 200-578-6

Recommended use of the chemical and restrictions on use:

Supplier Details:

Pharmco Products, Inc.
58 Vale Road, Brookfield,
CT 06804, USA.
Tel: 203.740.3471
Fax: 203.740.3481
CCN17213

Pharmco Products, Inc.
1101 Isaac Shelby Drive, Shelbyville,
KY 40065, USA.
Tel: 502.232.7600
Fax: 502.633.6100
CCN17213

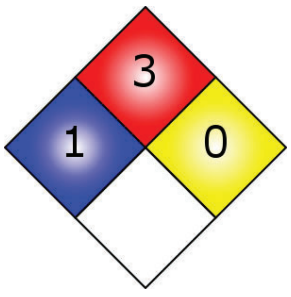
Emergency Contact: **CHEMTREC: 1.800.424.9300 (USA) / +1.703.527.3887 (International)**

2. HAZARDS IDENTIFICATION

OSHA Hazards:
Flammable liquid, Target Organ Effect, Irritant

Target Organs:
Central nervous system, Heart, Liver

NFPA



GHS label elements, including precautionary statements



Signal Word:
DANGER!

Hazard statement(s)

H225	Highly flammable liquid and vapor.
H319	Causes serious eye irritation.

Precautionary statement(s)

P210	Keep away from heat, sparks, open flames, and hot surfaces. No smoking.
P305 + P351 + P338	IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Seek medical attention.
P280	Wear protective gloves and eye and face protection.
P264	Wash hands thoroughly after handling.
P501	Dispose of contents and container to an approved waste disposal plant.
P337 + P313	If eye irritation persists: Get medical attention.
P370 + P378	In case of fire: Use dry sand, dry chemical or alcohol-resistant foam for extinction.
P403 + P235	Store in a well-ventilated place. Keep cool.
P233	Keep container tightly closed.
P303 + P361 + P353	IF ON SKIN (or hair): Remove immediately all contaminated clothing. Rinse skin with water.
P240	Ground/bond container and receiving equipment.
P241	Use explosion-proof electrical, ventilating, and lighting equipment.
P242	Use only non-sparking tools.
P243	Take precautionary measures against static discharge.

GHS Classification(s)
Flammable Liquids (Category 2)
Skin irritation (Category 2)
Eye irritation (Category 2B)
Specific target organ toxicity - single exposure (Category 3)

Other hazards which do not result in classification:

Potential Health Effects:
ETHANOL

Organ	Description
Eyes	Causes eye irritation. May cause painful sensitization to light. May cause chemical conjunctivitis and corneal damage.
Ingestion	May cause gastrointestinal irritation with nausea, vomiting and diarrhea. May cause systemic toxicity with acidosis. May cause central nervous system depression, characterized by excitement, followed by headache, dizziness, drowsiness, and nausea. Advanced stages may cause collapse, unconsciousness, coma and possible death due to respiratory failure.
Inhalation	High concentrations may cause central nervous system effects characterized by nausea, headache, dizziness, unconsciousness and coma. Causes respiratory tract irritation. May cause narcotic effects in high concentration. Vapors may cause dizziness or suffocation.
Skin	Causes moderate skin irritation. May cause dermatitis by de-fatting the skin from prolonged or repeated contact.

3. COMPOSITION AND INFORMATION ON INGREDIENTS

Chemical identity: Coal tar solution
CAS number: 64-17-5
EINECS number: 200-578-6
ICSC number: 0044
RTECS #: KQ6300000
UN #: UN1993
EC #: 603-002-00-5

% Weight	Material	CAS
14-19	Coal Tar Distillates	65996-92-1
81-86	Ethyl Alcohol	64-17-5

4. FIRST AID MEASURES

General advice

Take proper precautions to ensure your own health and safety before attempting rescue and providing first aid. Consult a physician. Show this safety data sheet to the doctor in attendance. Move out of dangerous area.

Skin

Immediately flush affected area with plenty of water while removing contaminated clothing. Wash contaminated clothing before reuse. Contact a doctor. If irritation persists, get medical attention.

Inhalation

Remove person to fresh air. If signs/symptoms continue, get medical attention. Give oxygen or artificial respiration as needed.

Eyes

Thoroughly flush the eyes with large amounts of clean low-pressure water for at least 15 minutes, occasionally lifting the upper and lower eyelids. If irritation persists, seek medical attention.

Ingestion

DO NOT induce vomiting. If vomiting does occur, have victim lean forward to prevent aspiration. Rinse mouth with water. Seek medical attention. Never give anything by mouth to an unconscious individual.

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5. FIRE FIGHTING MEASURES

Suitable (and unsuitable) extinguishing media:

SMALL FIRE: Use dry chemicals, CO2, water spray or alcohol-resistant foam. LARGE FIRE: Use water spray, water fog or alcohol-resistant foam. Cool all affected containers with flooding quantities of water.

Specific hazards arising from the chemical (e.g., nature of any hazardous combustion products):

Carbon monoxide is expected to be the primary hazardous combustion product.

Special protective equipment and precautions for firefighters:

Wear self-contained breathing apparatus and protective clothing to prevent contact with skin and eyes. Keep unopened containers cool by spraying with water.

Unusual Fire and Explosion Hazards:

- May produce a floating fire hazard.
- Static ignition hazard can result from handling and use.
- Vapors may travel to source of ignition and flash back.
- Vapors may settle in low or confined spaces.

Alcohols burn with a pale blue flame which may be extremely hard to see under normal lighting conditions. Personnel may only be able to feel the heat of the fire without seeing flames. Extreme caution must be exercised in fighting alcohol fires. Fight fire from maximum distance or use unmanned hose holders or monitor nozzles. Cool containers with flooding quantities of water until well after fire is out. Withdraw immediately in case of rising sound from venting safety devices or discoloration of tank. Always stay away from tanks engulfed in fire.

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6. ACCIDENTAL RELEASE MEASURES

Personal precautions, protective equipment and emergency procedures:

Do not inhale vapors, mist or gas. Ensure adequate ventilation. Remove all sources of ignition. Evacuate personnel to safe areas. Beware of vapors accumulating to form explosive concentrations. Vapors can accumulate in low areas.

Environmental precautions:

Stop leak. Contain spill if possible and safe to do so. Prevent product from entering drains.

Methods and materials for containment and cleaning up:

Highly flammable liquid. Eliminate all sources of ignition. All equipment used when handling this product must be grounded. A vapor suppressing foam may be used to reduce vapors. Do not touch or walk through spilled material. Contain spillage, and then collect with non-combustible absorbent material, (e.g. sand, earth, diatomaceous earth, vermiculite) and place in container for disposal according to local / national regulations. Use clean non-sparking tools to collect absorbed material.

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7. HANDLING AND STORAGE

Precautions for safe handling:

Do not get on skin or in eyes. Do not inhale vapor or mist. Keep away from sources of ignition - No smoking. Take measures to prevent the buildup of electrostatic charge. Open and handle container with care. Metal containers involved in the transfer of this material should be grounded and bonded.

Conditions for safe storage, including any incompatibilites:

Keep container tightly closed in a cool, dry and well-ventilated place. Containers which are opened must be carefully resealed and kept upright to prevent leakage. Consult local fire codes for additional storage information.

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8. EXPOSURE CONTROLS / PERSONAL PROTECTION

Control parameters, e.g., occupational exposure limit values or biological limit values:

Occupational Exposure Limits

Component	Source	Type	Value	Note
Coal Tar	US (OSHA)	TWA	0.2 mg/m3	29 CFR 1910,1000 Table Z-1 Limits for Air Contaminants
Coal Tar	US (ACGIH)	TWA	0.2 mg/m3	ACGIH Threshold Limit Value
Ethyl alcohol	US (ACGIH)	STEL	1000 ppm	Upper Respiratory Tract irritation Confirmed animal carcinogen with unknown relevance to humans
Ethyl alcohol	US (OSHA)	IDHL	3300 ppm	None
Ethyl alcohol	US (OSHA)	TWA	1000 ppm / 1,900 mg/m3	29 CFR 1910.1000 Table Z-1 Limits for Air Contaminants.

Appropriate engineering controls:

General room or local exhaust ventilation is usually required to meet exposure limit(s). Electrical equipment should be grounded and conform to applicable electrical code.

Individual protection measures, such as personal protective equipment:

Respiratory protection:

Where risk assessment shows air-purifying respirators are appropriate use a full-face respirator with multi-purpose combination (US) or type ABEK (EN 14387) respirator cartridges as a backup to engineering controls. If the respirator is the sole means of protection, use a full-face supplied air respirator. Use respirators and components tested and approved under appropriate government standards such as NIOSH (US) or CEN (EU).

Hand 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.

Eye protection:
Use chemical safety goggles and/or a full face shield where splashing is possible. Use equipment approved by appropriate government standards, such as NIOSH (US) or EN166 (EU) Maintain eye wash fountain and quick-drench facilities in work area.

Skin and body protection:
Choose body protection according to the amount and concentration of the dangerous substance at the work place.

Hygiene measures:
Handle in accordance with good industrial hygiene and safety practice. Wash hands before breaks and at the end of workday.

9. PHYSICAL AND CHEMICAL PROPERTIES

Appearance *(physical state, color, etc.)*	Liquid. Greenish-brown.
Freezing point	-118 °C (-180.4°F)
Initial boiling point and boiling range	78 °C (172.4 °F)
Evaporation rate	Specific data not available - expected to be rapid.
Flammability (solid, gas)	Flammable
Upper / Lower flammability or explosive limits	3.3%(V) / 19%(V) (for 100% ethanol)
Vapor pressure	55.2 hPa (41.4 mmHg) at 20 °C (68 °F) (for 100% ethanol)
Vapor Density	1.6
Relative Density	0.796 g/mL at 25 °C (77 °F)
Formula (ETHANOL)	C2H6O
Molecular Weight (ETHANOL)	46.07 g/mol

10. STABILITY AND REACTIVITY

Chemical Stability	Stable under recommended storage conditions.
Possibility of hazardous reactions	Vapors may form explosive mixture with air.
Conditions to avoid (e.g., static discharge, shock or vibration)	Heat, flames, and sparks. Extreme temperatures and direct sunlight.
Incompatible materials	Alkali metals, Ammonia, Oxidizing agents, Peroxides, Strong Inorganic Acids
Hazardous decomposition products	Hazardous decomposition products formed under fire conditions. - Carbon oxides

11. TOXICOLOGICAL INFORMATION

- Ethyl Alcohol 64-17-5

Signs and Symptoms of Exposure
Central nervous system depression, narcosis, damage to the heart. To the best of our knowledge, the chemical, physical, and toxicological properties have not been thoroughly investigated.

Product Summary:
Ethanol is not toxic by OSHA standards. Coingestion of sedative hypnotics or tranquilizers can increase the toxic affects of ethanol.

Acute Toxicity:

LC50 (inhl)	Rat	20000ppm	10 hrs.
LC50 (Oral)	Rat	7060mg/Kg BWT	
LDLo (Oral)	Human	1400 mg/Kg BWT	

Irritation:

Eyes (ETHANOL)
Eye exposure to Ethanol generally causes transient pain, irritation, and reflex lid closure. A foreign-body sensation may persist for one to two days. Vapors produce transient stinging and tearing, but no apparent adverse effects. Transiently impaired preception of color may occur with acute ingestion or chronic alcoholism. Standard Draize eye test (rabbit) - Dose: 500 mg Reaction: Severe Dose: 500 mg/24 hrs Reaction: Mild

Skin
Standard Draize skin test (rabbit) - Dose: 20 mg/24 hrs Reaction: Moderate Repeated exposure may cause skin dryness or cracking.

Carcinogenicity
IARC: Not classifiable as a human carcinogen.
ACGIH: Not classifiable as a human carcinogen.
NTP: Not classifiable as a human carcinogen.
OSHA: Not classifiable as a human carcinogen.

Other Hazards

Organ	Description
Eyes	Irritating to the eyes. May cause painful sensitization to light. May cause chemical conjunctivitis and corneal damage.
Ingestion	May cause gastrointestinal irritation with nausea, vomiting and diarrhea. May cause systemic toxicity with acidosis. May cause central nervous system depression, characterized by excitement, followed by headache, dizziness, drowsiness, and nausea. Advanced stages may cause collapse, unconsciousness, coma and possible death due to respiratory failure.

Inhalation	Inhalation of high concentrations may cause central nervous system effects characterized by nausea, headache, dizziness, unconsciousness and coma. Causes respiratory tract irritation. May cause narcotic effects in high concentration. Vapors may cause dizziness or suffocation.
Skin	Mildly irritating to the skin. May cause dermatitis by de-fatting the skin from prolonged or repeated contact.
Chronic	May cause reproductive and fetal effects. Laboratory experiments have resulted in mutagenic effects. Animal studies have reported the development of tumors. Prolonged exposure may cause liver, kidney, and heart damage. Long term exposure can cause loss of appetite, weight loss, nervousness, memory loss, mental retardation.

- Coal Tar 8007-45-2

Product Summary:
Laboratory tests have shown mutagenic effects in bacteria. No data available for the teratogenic or reproductive effects of the product.

Acute Toxicity:

No data available			

Irritation:

No data available

/

Carcinogenicity
IARC: Group 1: Carcinogenic to humans
NTP: Known to be a human carcinogen.

Other Hazards

Organ	Description
Eyes	May be irritating to the eyes.
Ingestion	May be harmful if ingested.
Inhalation	May be harmful if inhaled. May be irritating to the respiratory tract.
Skin	May be harmful if absorbed through skin. May be irritating to the skin.

12. ECOLOGICAL INFORMATION

- Ethyl Alcohol 64-17-5

Ecotoxicity (aquatic and terrestrial, where available):
Acute Fish toxicity (ETHANOL)

LC50 / 96 HOUR Oncorhynchus mykiss (rainbow trout) > 10,000 mg/l
LC50 / 96 HOUR Pimephales promelas (fathead minnow) > 13,400 mg/l

Toxicity to aquatic plants (ETHANOL)
Growth inhibition / 96 HOURS Chlorella vulgaris (Fresh water algae) 1,000 mg/l

Toxicity to microorganisms (ETHANOL)
Toxicity Threshold / Pseudomonas putida 6,500 mg/l
Summary: Inhibition of cell multiplication begins.

Persistence and degradability:
Biodegradation is expected.

Bioaccumulative potential:
Biaccumulation is unlikely

- Coal Tar 8007-45-2

Ecotoxicity (aquatic and terrestrial, where available):
Ecotoxicity
Not Applicable

Persistence and degradability:
No data available

Bioaccumulative potential:
No data available

13. DISPOSAL CONSIDERATIONS

Description of waste residues and information on their safe handling and methods of disposal, including the disposal of any contaminated packaging:

Burn in a chemical incinerator equipped with an afterburner and scrubber but exert extra care in igniting as this material is highly flammable. Observe all federal, state, and local environmental regulations. Contact a licensed professional waste disposal service to dispose of this material.

14. TRANSPORT INFORMATION

Description of waste residues and information on their safe handling and methods of disposal:

UN number	UN1993
UN proper shipping name	Flammable liquids, n.o.s. (Ethanol; coal tar, solution)
Transport hazard class(es)	3
Packing group *(if applicable)*	II

Reportable Quantity
1 lb (for Coke Oven Emissions)
IMDG
UN-Number: UN1993 Class: 3 Packing Group: II
EMS-No: F-E, S-D
Proper shipping name: FLAMMABLE LIQUIDS, N.O.S. (ETHANOL; COAL TAR, SOLUTION)
Marine pollutant: Yes
IATA
UN-Number: UN1993 Class: 3 Packing Group: II
Proper shipping name: Flammable liquids, n.o.s. (Ethanol; coal tar, solution)

15. REGULATORY INFORMATION

Safety, health and environmental regulations specific for the product in question:

OSHA Hazards
Flammable liquid, Target Organ Effect, Irritant

All ingredients are on the following inventories or are exempted from listing

Country	Notification
Australia	AICS
Canada	DSL
China	IECS
European Union	EINECS
Japan	ENCS/ISHL
Korea	ECL
New Zealand	NZIoC
Philippines	PICCS
United States of America	TSCA

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

SARA 313 Components
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.

SARA 311/312 Hazards
Acute Health Hazard

Chronic Health Hazard
Fire Hazard

CERCLA
Coke Oven Emissions CAS-No. 8007-45-2

Massachusetts Right To Know Components
Ethanol CAS-No.64-17-5 Revision Date 2007-03-01

Pennsylvania Right To Know Components
Coal Tar Pitch CAS-No. 8007-45-2

Ethanol CAS-No.64-17-5 Revision Date 2007-03-01

New Jersey Right To Know Components
Coal Tar Pitch CAS-No. 8007-45-2

Ethanol CAS-No.64-17-5 Revision Date 2007-03-01

California Prop 65 Components
WARNING! This product contains a chemical known to the State of California to cause cancer. COKE OVEN EMISSIONS CAS-No. 8007-45-2

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16. OTHER INFORMATION: INCLUDING INFORMATION ON PREPARATION AND REVISION OF THE SDS

Disclaimer
PHARMCO-AAPER believes that the information on this SDS was obtained from reliable sources. However, the information is provided without any warranty, expressed or implied, regarding its correctness. Some information presented and conclusions drawn herein are from sources other than direct test data on the substance itself. The conditions or methods of handling, storage, use and disposal of the product are beyond our control and may be beyond our knowledge. For this and other reasons, PHARMCO-AAPER does not assume responsibility and expressly disclaims liability for loss, damage, or expense arising out of or in any way connected with handling, storage, use, or disposal of this product. If the product is used as a component in another product, this SDS information may not be applicable. Information is correct to the best of our knowledge at the date of the SDS publication.

SAFETY DATA SHEET

Creation Date 27-Sep-2010 **Revision Date** 13-Oct-2023 **Revision Number** 7

1. Identification

Product Name **Naphthalene**

Cat No. : **N7-500; N134-500**

CAS No 91-20-3
Synonyms Tar Camphor; Naphthalin; Naphthene (Crystalline/Certified/Laboratory)

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

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

2. Hazard(s) identification

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

Flammable solids	Category 2
Acute oral toxicity	Category 4
Carcinogenicity	Category 1B

Label Elements

Signal Word
Danger

Hazard Statements
Flammable solid
Harmful if swallowed
May cause cancer



Precautionary Statements
Prevention
Obtain special instructions before use
Do not handle until all safety precautions have been read and understood
Use personal protective equipment as required
Wash face, hands and any exposed skin thoroughly after handling
Do not eat, drink or smoke when using this product
Do not breathe dust/fume/gas/mist/vapors/spray
Use only outdoors or in a well-ventilated area
Keep away from heat/sparks/open flames/hot surfaces. - No smoking
Ground/bond container and receiving equipment
Use explosion-proof electrical/ventilating/lighting equipment
Response
IF exposed or concerned: Get medical attention/advice
Inhalation
IF INHALED: Remove victim to fresh air and keep at rest in a position comfortable for breathing
Ingestion
IF SWALLOWED: Call a POISON CENTER or doctor/physician if you feel unwell
Rinse mouth
Fire
In case of fire: Use CO2, dry chemical, or foam for extinction
Storage
Store locked up
Store in a well-ventilated place. Keep container tightly closed
Disposal
Dispose of contents/container to an approved waste disposal plant
Hazards not otherwise classified (HNOC)
Very toxic to aquatic life with long lasting effects
WARNING. Cancer - https://www.p65warnings.ca.gov/.

3. Composition/Information on Ingredients

Component	CAS No	Weight %
Naphthalene	91-20-3	>95

4. First-aid measures

General Advice If symptoms persist, call a physician.

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

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

Inhalation Remove to fresh air. If breathing is difficult, give oxygen. Get medical attention.

Ingestion Clean mouth with water and drink afterwards plenty of water. Get medical attention if symptoms occur.

Most important symptoms and . Symptoms of overexposure may be headache, dizziness, tiredness, nausea and vomiting

effects

Notes to Physician Treat symptomatically

5. Fire-fighting measures

Suitable Extinguishing Media Water spray, carbon dioxide (CO2), dry chemical, alcohol-resistant foam. Water mist may be used to cool closed containers.

Unsuitable Extinguishing Media No information available

Flash Point 78 °C / 172.4 °F

Method - No information available

Autoignition Temperature 526 °C / 978.8 °F

Explosion Limits

Upper	5.9 vol %
Lower	0.9 vol %
Sensitivity to Mechanical Impact	No information available
Sensitivity to Static Discharge	No information available

Specific Hazards Arising from the Chemical

Combustible material. Containers may explode when heated. Do not allow run-off from fire-fighting to enter drains or water courses.

Hazardous Combustion Products

Carbon monoxide (CO). Carbon dioxide (CO_2).

Protective Equipment and Precautions for Firefighters

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

NFPA

Health	Flammability	Instability	Physical hazards
2	2	0	N/A

6. Accidental release measures

Personal Precautions Use personal protective equipment as required. Ensure adequate ventilation. Avoid dust formation. Remove all sources of ignition. Take precautionary measures against static discharges.

Environmental Precautions Do not flush into surface water or sanitary sewer system. Do not allow material to contaminate ground water system. Prevent product from entering drains. Local authorities should be advised if significant spillages cannot be contained.

Methods for Containment and Clean Up Sweep up and shovel into suitable containers for disposal. Keep in suitable, closed containers for disposal. Remove all sources of ignition.

7. Handling and storage

Handling Wear personal protective equipment/face protection. Ensure adequate ventilation. Avoid ingestion and inhalation. Do not get in eyes, on skin, or on clothing. Avoid dust formation. Keep away from open flames, hot surfaces and sources of ignition.

Storage. Keep containers tightly closed in a dry, cool and well-ventilated place. Keep away from heat, sparks and flame. Incompatible Materials. Strong oxidizing agents.

8. Exposure controls / personal protection

Exposure Guidelines

Component	ACGIH TLV	OSHA PEL	NIOSH	Mexico OEL (TWA)
Naphthalene	TWA: 10 ppm Skin	(Vacated) TWA: 10 ppm (Vacated) TWA: 50 mg/m^3 (Vacated) STEL: 15 ppm (Vacated) STEL: 75 mg/m^3 TWA: 10 ppm TWA: 50 mg/m^3	IDLH: 250 ppm TWA: 10 ppm TWA: 50 mg/m^3 STEL: 15 ppm STEL: 75 mg/m^3	TWA: 10 ppm STEL: 15 ppm

Legend

ACGIH *- American Conference of Governmental Industrial Hygienists*
OSHA *- Occupational Safety and Health Administration*
NIOSH: *NIOSH - National Institute for Occupational Safety and Health*

Engineering Measures Use only under a chemical fume hood. Ensure that eyewash stations and safety showers are close to the workstation location. Use explosion-proof electrical/ventilating/lighting equipment. Ensure adequate ventilation, especially in confined areas.

Personal Protective Equipment

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

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.

Recommended Filter type: Particulates filter conforming to EN 143.

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

9. Physical and chemical properties

Physical State	Solid
Appearance	White
Odor	Characteristic
Odor Threshold	No information available
pH	No information available
Melting Point/Range	79 - 82 °C / 174.2 - 179.6 °F
Boiling Point/Range	218 °C / 424.4 °F
Flash Point	78 °C / 172.4 °F
Evaporation Rate	Not applicable
Flammability (solid,gas)	No information available
Flammability or explosive limits	
Upper	5.9 vol %
Lower	0.9 vol %
Vapor Pressure	0.08 mbar @ 20 °C
Vapor Density	Not applicable
Specific Gravity	0.990
Solubility	slightly soluble
Partition coefficient; n-octanol/water	No data available
Autoignition Temperature	526 °C / 978.8 °F
Decomposition Temperature	540 °C
Viscosity	Not applicable
Molecular Formula	C10 H8
Molecular Weight	128.17

10. Stability and reactivity

Reactive Hazard Yes

Stability Stable under normal conditions.

Conditions to Avoid Incompatible products. Excess heat. Avoid dust formation. Keep away from open flames, hot surfaces and sources of ignition.

Incompatible Materials Strong oxidizing agents

Hazardous Decomposition Products Carbon monoxide (CO), Carbon dioxide (CO_2)

Hazardous Polymerization Hazardous polymerization does not occur.

Hazardous Reactions None under normal processing.

11. Toxicological information

Acute Toxicity

Product Information

Component Information

Component	LD50 Oral	LD50 Dermal	LC50 Inhalation
Naphthalene	LD50 = 1110 mg/kg (Rat)	LD50 = 1120 mg/kg (Rabbit)	LC50 > 0.4 mg/L (Rat) 4 h

Toxicologically Synergistic Products No information available

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

Irritation 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
Naphthalene	91-20-3	Group 2B	Reasonably Anticipated	A3	X	Not listed

IARC (International Agency for Research on Cancer)

NTP: (National Toxicity Program)

ACGIH: (American Conference of Governmental Industrial Hygienists)

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

Mutagenic Effects Not mutagenic in AMES Test

Reproductive Effects Experiments have shown reproductive toxicity effects on laboratory animals.

Developmental Effects Developmental effects have occurred in experimental animals.

Teratogenicity Teratogenic effects have occurred in experimental animals.

STOT - single exposure None known

STOT - repeated exposure None known

Aspiration hazard No information available

Symptoms / effects,both acute and delayed Symptoms of overexposure may be headache, dizziness, tiredness, nausea and vomiting

Endocrine Disruptor Information No information available

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

12. Ecological information

Ecotoxicity

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

Component	Freshwater Algae	Freshwater Fish	Microtox	Water Flea
Naphthalene	Not listed	LC50 96 h 1-6.5 mg/L (Pimephales promelas)	EC50 = 0.93 mg/L 30 min EC50 > 20 mg/L 18 h	EC50: 1.09 - 3.4 mg/L, 48h Static (Daphnia magna) EC50: = 1.96 mg/L, 48h Flow through (Daphnia magna) LC50: = 2.16 mg/L, 48h (Daphnia magna)

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
Naphthalene	3.4

13. Disposal considerations

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

Component	RCRA - U Series Wastes	RCRA - P Series Wastes
Naphthalene - 91-20-3	U165	-

14. Transport information

DOT

UN-No UN1334
Proper Shipping Name NAPHTHALENE, CRUDE
Hazard Class 4.1
Packing Group III

TDG

UN-No UN1334
Proper Shipping Name NAPHTHALENE, CRUDE
Hazard Class 4.1
Packing Group III

IATA

UN-No UN1334
Proper Shipping Name NAPHTHALENE, CRUDE
Hazard Class 4.1
Packing Group III

IMDG/IMO

UN-No UN1334
Proper Shipping Name NAPHTHALENE, CRUDE

Hazard Class	4.1
Packing Group	III

15. Regulatory information

United States of America Inventory

Component	CAS No	TSCA	TSCA Inventory notification - Active-Inactive	TSCA - EPA Regulatory Flags
Naphthalene	91-20-3	X	ACTIVE	-

Legend:
TSCA US EPA (TSCA) - Toxic Substances Control Act, (40 CFR Part 710)
X - Listed
'-' - Not Listed

TSCA - Per 40 CFR 751, Regulation of Certain Chemical Substances & Mixtures, Under TSCA Section 6(h) (PBT) Not applicable

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
Naphthalene	91-20-3	X	-	202-049-5	X	X	X	X	X	KE-25545

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

U.S. Federal Regulations

SARA 313

Component	CAS No	Weight %	SARA 313 - Threshold Values %
Naphthalene	91-20-3	>95	0.1

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

CWA (Clean Water Act)

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

Clean Air Act

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

OSHA - Occupational Safety and Health Administration Not applicable

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

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

California Proposition 65 This product contains the following Proposition 65 chemicals.

Component	CAS No	California Prop. 65	Prop 65 NSRL	Category
Naphthalene	91-20-3	Carcinogen	5.8 µg/day	Carcinogen

U.S. State Right-to-Know Regulations

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

U.S. Department of Transportation

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

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

Other International Regulations

Mexico - Grade Moderate risk, Grade 2

Authorisation/Restrictions according to EU REACH

Component	CAS No	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)
Naphthalene	91-20-3	-	Use restricted. See item 75. (see link for restriction details)	-

REACH links
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)
Naphthalene	91-20-3	Listed	Not applicable	Not applicable	Not applicable

Contains component(s) that meet a 'definition' of per & poly fluoroalkyl substance (PFAS)?
Not applicable

Other International Regulations

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)
Naphthalene	91-20-3	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	27-Sep-2010
Revision Date	13-Oct-2023
Print Date	13-Oct-2023
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

Monsanto*

Material Safety Data

Emergency Phone No.
CHEMTREC
800-424-9300

POLYCHLORINATED BIPHENYLS (PCBs)

1. CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

PRODUCT NAME: POLYCHLORINATED BIPHENYLS (PCBs)
Aroclor® Series 1016, 1221, 1232, 1242, 1248, 1254, 1260, 1262, 1268
Therminol® FR Series

Date : 9/2004

Chemical Family:	Chlorinated Hydrocarbons
Chemical Name:	Polychlorinated biphenyls
Synonyms:	PCBs, Chlorodiphenyls, Chlorinated biphenyls

Trade Names/Common Names:

PYRANOL® and INERTEEN® are trade names for commonly used dielectric fluids that may have contained varying amounts of PCBs as well as other components including chlorinated benzenes.

ASKAREL is the generic name for a broad class of fire resistant synthetic chlorinated hydrocarbons and mixtures used as dielectric fluids that commonly contained about 30 - 70% PCBs. Some ASKAREL fluids contained 99% or greater PCBs and some contained no PCBs.

PYDRAUL® was the trade name for hydraulic fluids that, prior to 1972, may have contained varying amounts of PCBs and other components including phosphate esters.

THERMINOL® FR-0, -1, -2, and -3 were the trade names for heat transfer fluids that, prior to 1972, contained PCBs. THERMINOL® fluids without the FR designation, including current THERMINOL® products, did not and do not contain PCBs.

The product names/trade names are representative of several commonly used Monsanto products (or products formulated with Monsanto products). Other trademarked PCB products were marketed by Monsanto and other manufacturers. PCBs were also manufactured and sold by several European and Asian companies. Contact the manufacturer of the trademarked product, if not in this listing, to determine if the formulation contained PCBs.

In 1972, Monsanto restricted sales of PCBs to applications involving only closed electrical systems, (transformers and capacitors). In 1977, all manufacturing and sales were voluntarily terminated. In 1979, EPA restricted the manufacture, processing, use, and distribution of PCBs to specifically exempted and authorized activities.

FOR CHEMICAL EMERGENCY, SPILL, LEAK, FIRE, EXPOSURE, OR ACCIDENT
Call CHEMTREC - Day or Night - 800-424-9300 Toll free in the continental U.S., Hawaii, Puerto Rico, Canada, Alaska, or Virgin Islands. For calls originating elsewhere, call 202-483-7616 (collect calls accepted).

For additional nonemergency information, call 314-480-1677.

2. COMPOSITION/INFORMATION ON INGREDIENTS

Chemically, commercial PCBs are defined as a series of technical mixtures, consisting of many congeners, that vary from mobile, oily liquids to white crystalline solids and hard noncrystalline resins. Technical products vary in composition, in the degree of chlorination, and possibly according to batch.

The mixtures generally used contain an average of 3 atoms of chlorine per molecule (42% chlorine) to 5 atoms of chlorine per module (54% chlorine). They were used as components of dielectric fluids in transformers and capacitors. Prior to 1972, PCB applications included heat transfer media, hydraulic and other industrial fluids, plasticizers, carbonless copy paper, paints, inks, and adhesives.

Component	CAS No.
chlorinated biphenyl	1336-36-3
Aroclor 1016	12674-11-2
Aroclor 1221	11104-28-2
Aroclor 1232	11141-16-5
Aroclor 1242	53469-21-9
Aroclor 1248	12672-29-6
Aroclor 1254	11097-69-1
Aroclor 1260	11096-82-5
Aroclor 1262	37324-23-5
Aroclor 1268	11100-14-4

There are also CAS Numbers for individual PCB congeners and for mixtures of Aroclor® products.

PCBs are identified as hazardous chemicals under criteria of the OSHA Hazard Communication Standard (29 CFR Part 1910.1200). PCBs have been listed in the International Agency for Research on Cancer (IARC) Monographs (1987)-Group 2A and in the National Toxicology Program (NTP) Annual Report on Carcinogens (Tenth).

3. HAZARDS IDENTIFICATION

EMERGENCY OVERVIEW

Appearance and Odor: PCB mixtures range in form and color from clear to amber liquids to white crystalline solids. They have a mild, distinctive odor and are not volatile at room temperature. Refer to Section 9 for details.

WARNING!
CAUSES EYE IRRITATION
MAY CAUSE SKIN IRRITATION

PROCESSING AT ELEVATED TEMPERATURES MAY RELEASE VAPORS OR FUMES WHICH MAY CAUSE RESPIRATORY TRACT IRRITATION

POTENTIAL HEALTH EFFECTS

Likely Routes of Exposure: Skin contact and inhalation of heated vapors

Eye Contact: Causes moderate irritation based on worker experience.

Skin Contact: Prolonged or repeated contact may result in redness, dry skin and defatting based on human experience. A potential exists for developing chloracne. PCBs can be absorbed through intact skin.

Inhalation: Due to the low volatility of PCBs, exposure to this material in ambient conditions is not expected to produce adverse health effects. However, at elevated processing temperatures, PCBs may produce a vapor that may cause respiratory tract irritation if inhaled based on human experience.

Ingestion: No more than slightly toxic based on acute animal toxicity studies. Coughing, choking and shortness of breath may occur if liquid material is accidentally drawn into the lungs during swallowing or vomiting.

Other:

Numerous epidemiological studies of humans, both occupationally exposed and nonworker environmentally exposed populations, have not demonstrated any causal relationship between PCB exposure and chronic human illnesses such as cancer or neurological or cardiovascular effects. PCBs at high dosage can cause skin symptoms; however, these subside upon removal of the exposure source.

Refer to Section 11 for toxicological information.

4. FIRST AID MEASURES

IF IN EYES, immediately flush with plenty of water for at least 15 minutes. If easy to do, remove any contact lenses. Get medical attention. Remove material from skin and clothing.

IF ON SKIN, immediately flush the area with plenty of water. Wash skin gently with soap as soon as it is available. Get medical attention if irritation persists.

IF INHALED, remove person to fresh air. If breathing is difficult, get medical attention.

IF SWALLOWED, do NOT induce vomiting. Rinse mouth with water. Get medical attention. Contact a Poison Control Center. NEVER GIVE ANYTHING BY MOUTH TO AN UNCONSCIOUS PERSON

NOTE TO PHYSICIANS: Hot PCBs may cause thermal burn. If electrical equipment arcs between conductors, PCBs or other chlorinated hydrocarbon dielectric fluids may decompose to produce hydrochloric acid (HCl), a respiratory irritant. If large amounts are swallowed, gastric lavage may be considered.

5. FIRE FIGHTING MEASURES

Flash Point: 284 degrees F (140 degrees C) or higher depending on the chlorination level of the Aroclor product

Fire Point. 349 degrees F (176 degrees C) or higher depending on the chlorination level of the Aroclor product

NOTE: Refer to Section 9 for individual flash points and fire points.

Extinguishing Media: Extinguish fire using agent suitable for surrounding fire. Use dry chemical, foam, carbon dioxide or water spray. Water may be ineffective. Use water spray to keep fire-exposed containers or transformers cool.

PCBs are fire-resistant compounds. They may decompose to form CO, C02, HCl, phenolics, aldehydes, and other toxic combustion products under severe conditions such as exposure to flame or hot surfaces.

Dielectric fluids having PCBs and chlorinated benzenes as components have been reported to produce polychlorinated dibenzo-p-dioxins (PCDDs) and furans (PCDFs) during fire situations involving electrical equipment. At temperatures in the range of 600-650 degrees C in the presence of excess oxygen, PCBs may form polychlorinated dibenzofurans (PCDFs). Laboratory studies under similar conditions have demonstrated that PCBs do not produce polychlorinated dibenzo-p-dioxins (PCDDs).

Federal regulations require all PCB transformers to be registered the U.S. Environmental Protection Agency.

If a PCB transformer is involved in a fire-related incident, the owner of the transformer may be required to report the incident. Consult and follow appropriate federal, state and local regulations.

Fire Fighting Equipment: Fire fighters and others exposed to products of combustion should wear self-contained breathing apparatus. Equipment should be thoroughly decontaminated after use.

6. ACCIDENTAL RELEASE MEASURES

Cleanup and disposal of liquid PCBs and other PCB items are strictly regulated by the federal government. The regulations are found at 40 CFR Part 761. Consult these regulations as well as applicable state and local regulations prior to any cleanup or disposal of PCBs, PCB items, or PCB contaminated items.

If PCBs leak or are spilled, the following steps should be taken immediately:

All nonessential personnel should leave the leak or spill area.

The area should be adequately ventilated to prevent the accumulation of vapors.

The spill/leak should be contained. Loss to sewer systems, navigable waterways, and streams should be prevented. Spills/leaks should be removed promptly by means of absorptive material, such as sawdust, vermiculite, dry sand, clay, dirt or other similar materials, or trapped and removed by pumping or other suitable means (traps, drip-pans, trays, etc.).

Personnel entering the spill or leak area should be furnished with appropriate personal protective equipment and clothing as needed. Refer to Section 8 for personal protection equipment and clothing.

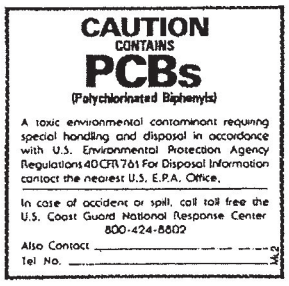
Personnel trained in emergency procedures and protected against attendant hazards should shut off sources of PCBs, clean up spills, control and repair leaks, and fight fires in PCB areas.

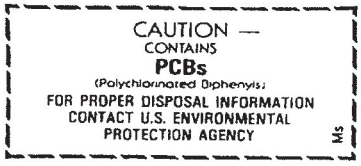
Refer to Section 13 for disposal information and Sections 14 and 15 for information regarding reportable quantity, and Section 7 for marking information.

7. HANDLING AND STORAGE

Care should be taken to prevent entry into the environment through spills, leakage, use vaporization, or disposal of liquid or containers. Avoid prolonged breathing of vapors or mists. Avoid contact with eyes or prolonged contact with skin. If skin contact occurs, remove by washing with soap and water. Following eye contact, flush with water. In case of spillage onto clothing, the clothing should be removed as soon as practical, skin washed, and clothing laundered. Comply with all federal, state, and local regulations.

Federal regulations under the Toxic Substances Control Act require PCBs, PCB items, storage areas, transformer vaults, and transport vehicles to be marked (check regulations, 40 CFR 761, for details).





Storage: The storage of PCB items or equipment (those containing 50 ppm or greater PCBS) and PCB waste is strictly regulated by 40 CFR Part 761. The storage time is limited, the storage area must meet physical requirements, and the area must be labeled.

Avoid contact with eyes.
Wash thoroughly after handling.
Avoid breathing processing fumes or vapors.
Process using adequate ventilation.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Eye Protection: Wear chemical splash goggles and have eye baths available where there is significant potential for eye contact.

Skin Protection: Wear appropriate protective clothing and chemical resistant gloves to prevent skin contact. Consult glove manufacturer to determine the appropriate type glove for a given application. Wear chemical goggles, face shield, and chemical resistant clothing such as a rubber apron when splashing is likely. Wash immediately if skin is contacted. Remove contaminated clothing promptly and launder before reuse. Clean protective equipment before reuse. Provide a safety shower at any location where skin contact can occur. Wash thoroughly after handling.

ATTENTION! Repeated or prolonged skin contact may cause chloracne in some people.

Respiratory Protection: Avoid breathing vapor, mist, or dust. Use NIOSH/MSHA approved equipment when airborne exposure limits are exceeded. Full facepiece equipment is recommended when airborne exposure limits are exceeded and, if used, replaces the need for face shield and/or chemical splash goggles. Consult respirator manufacturer to determine the type of equipment for a given application. The respirator use limitations specified by NIOSH/MSHA or the manufacturer must be observed. High airborne concentrations may require use of self-contained breathing apparatus or supplied air respirator. Respiratory protection programs must be in compliance with 29 CFR Part 1910.134.

ATTENTION! Repeated or prolonged inhalation may cause chloracne in some people.

Ventilation: Provide natural or mechanical ventilation to control exposure levels below airborne exposure limits (see below). If practical, use local mechanical exhaust ventilation at sources of vapor or mist, such as open process equipment.

Airborne Exposure Limits:

Product: Chlorodiphenyl (42% chlorine)

OSHA PEL: 1 mg/m^3 8-hour time-weighted average - Skin*
ACGIH TLV: 1 mg/m^3 8-hour time-weighted average - Skin*

Product: Chlorodiphenyl (54% chlorine)

OSHA PEL: 0.5 mg/m^3 8-hour time-weighted average - Skin*
ACGIH TLV: 0.5 mg/m^3 8-hour time-weighted average - Skin*

*For Skin notation see Threshold Limit Values for Chemical Substances and Physical Agents & Biological Exposure Indices, American Conference of Governmental Industrial Hygienists, 2003.

9. PHYSICAL AND CHEMICAL PROPERTIES

PROPERTIES OF SELECTED AROCLORS®

PROPERTY	1016	1221	1232	1242	1248	1254	1260
Color (APHA)	40	100	100	100	100	100	150
Physical state	mobile oil	mobile oil	mobile oil	mobile oil	mobile oil	viscous liquid	sticky resin
Stability	inert	inert	inert	inert	inert	inert	inert
Density (lb/gal 25 °C)	11.40	9.85	10.55	11.50	12.04	12.82	13.50
Specific gravity x/15.5°C	1.36-1.37 x-25°	1.18-1.19 x-25°	1.27-1.28 x-25°	1.30-1.39 x-25°	1.40-1.41 x-65°	1.49-1.50 x-65°	1.55-1.56 x-90°
Distillation range (°C)	323-356	275-320	290-325	325-366	340-375	365-390	385-420
Acidity mg KOH/g, maximum	.010	.014	.014	.015	.010	.010	.014
Fire point (°C)	none to boiling point	176	238	none to boiling point	none to boiling point	none to boiling point	none to boiling point
Flash point (°C)	170	141-150	152-154	176-180	193-196	none	none
Vapor pressure (mm Hg @ 100°F)	NA	NA	0.005	0.001	0.00037	0.00006	NA
Viscosity (Saybolt Univ. Sec. @ 100°F) (centistokes)	71-81 13-16	38-41 3.6-4.6	44-51 5.5-7.7	82-92 16-19	185-240 42-52	1800-2500 390-540	— —

NA-Not Available

NOTE: These physical data are typical values based on material tested but may vary from sample to sample. Typical values should not be construed as a guaranteed analysis of any specific lot or as specifications for the product.

10. STABILITY AND REACTIVITY

Stability: PCBs are very stable, fire-resistant compounds.
Materials to Avoid: None
Hazardous Decomposition
Products: PCBs may decompose to form CO, CO_2 HCl, phenolics, aldehydes, and other toxic combustion products under severe conditions such as exposure to flame or hot surface.
Hazardous Polymerization: Does not occur.

11. TOXICOLOGICAL INFORMATION

Data from laboratory studies conducted by Monsanto and from the available scientific literature are summarized below.
Single exposure (acute) studies indicate:
Oral - Slightly Toxic (Rat LD50 - 8.65 g/kg for 42% chlorinated; 11.9 g/kg for 54% chlorinated)

The liquid products and their vapors are moderately irritating to eye tissues. Animal experiments of varying duration and at different air concentrations show that for similar exposure conditions, the 54% chlorinated material produces more liver injury than the 42% chlorinated material.

There are literature reports that PCBs can impair reproductive functions in laboratory monkeys. Literature reports of earlier chronic feeding studies of laboratory rodents provided sufficient evidence that Aroclor 1260 could cause liver cancer when fed at high doses. Similar experiments with less chlorinated PCB products produced negative or equivocal results. A recent literature report of a chronic feeding study of Aroclor 1260, Aroclor 1254, Aroclor 1242, and Aroclor 1016 provided evidence that all four mixtures caused cancer in rodent livers.

The consistent finding in animal studies is that PCBs produce liver injury following prolonged and repeated exposure by any route, if the exposure is of sufficient degree and duration. Liver injury is produced first, and by exposures that are less than those reported to cause cancer in rodents. Therefore, exposure by all routes should be kept sufficiently low to prevent liver injury.

Numerous epidemiological studies of humans, both occupationally exposed and nonworker environmentally exposed populations, have not demonstrated any causal relationship between PCB exposure and chronic human illnesses such as cancer or neurological or cardiovascular effects. PCBs at high dosage can cause skin symptoms; however, these subside upon removal of the exposure source.

PCBs have been listed in the International Agency for Research on Cancer (IARC) Monographs (1987)-Group 2A and in the National Toxicology Program (NTP) Tenth Annual Report on Carcinogens.

12. ECOLOGICAL INFORMATION

Care should be taken to prevent entry of PCBs into the environment through spills, leakage, use, vaporization or disposal of liquid or solids. PCBs can accumulate in the environment and can adversely affect some animals and aquatic life. In general, PCBs have low solubility in water, are strongly bound to soils and sediments, and are slowly degraded by natural processes in the environment.

13. DISPOSAL CONSIDERATIONS

The disposal of PCB items or equipment (those containing 50 ppm or greater PCBs) and PCB wastes is strictly regulated by 40 CFR Part 761. For example, all wastes and residues containing PCBs (wiping cloths, absorbent material, used disposable protective gloves and clothing, etc.) should be collected, placed in proper containers, marked and disposed of in the manner prescribed by EPA regulations (40 CFR Part 761) and applicable state and local regulations.

14. TRANSPORT INFORMATION

The data provided in this section are for information only. Please apply the appropriate regulations to properly classify a shipment for transportation.

DOT Classification:	IF WEIGHT OF PCBs TO BE SHIPPED IS OVER ONE POUND, THE FOLLOWING CLASSIFICATION AND LABEL APPLY.
DOT Label:	LIQUID: Environmentally Hazardous Substance, liquid, n.o.s. (Contains PCB), 9, UN 3082, III
	SOLID: Environmentally Hazardous Substance, solid, n.o.s. (Contains PCB), 9, UN 3077, III
DOT Label:	Class 9
DOT Reportable Quantity:	One pound
IMO Classification:	Polychlorinated Biphenyls, IMO Class 9, UN 2315, II IMO Page 9034, EMS 6.1-02
IATA/ICAO Classification:	Polychlorinated Biphenyls, 9, UN2315,II

15. REGULATORY INFORMATION

For regulatory purposes, under the Toxic Substances Control Act, the term "PCBs" refers to a chemical substance limited to the biphenyl molecule that has been chlorinated to varying degrees or any combination of substances which contain such a substance (40 CFR Part 761).

TSCA Inventory: not listed.

Hazard Categories Under Criteria of SARA Title III Rules (40 CFR Part 370): Immediate, Delayed.
SARA Section 313 Toxic Chemical(s): Listed-1993 (De Minimis concentration 0.1%.)

Reportable Quantity (RQ) under DOT (49 CFR), CERCLA Regulations and TSCA (40 CFR Part 761): 1 lb. (polychlorinated biphenyls) PCBs.

Release of more than 1 (one) pound of PCBs to the environment requires notification to the National Response Center (800-424-8802 or 202-426-2675).

Various state and local regulations may require immediate reporting of PCB spills and may also define spill cleanup levels. Consult your attorney or appropriate regulatory officials for information relating to spill reporting and spill cleanup.

16. OTHER INFORMATION

Reason for revision: Contact information change. Supersedes MSDS dated 7/99.

Therminol® is a registered trademark of Solutia Inc.
Aroclor® and Pydraul® were registered trademarks of Monsanto Company
Pyranol®is a registered trademark of General Electric Company
Inerteen® is a registered trademark of Westinghouse Electric Corporation

FOR ADDITIONAL NONEMERGENCY INFORMATION, CONTACT:

Robert G. Kaley, II, Ph.D.
200 S. Hanley Road
Suite 300
St. Louis, MO 63105
314-480-1677

* The former Monsanto Company, now known as Pharmacia Corporation, ceased manufacturing PCBs in 1977. This MSDS is provided as a convenience to former customers and users.

Although the information and recommendations set forth herein (hereinafter "Information") are presented in good faith and believed to be correct as of the date hereof, Pharmacia makes no representations as to the completeness or accuracy thereof. Information is supplied upon the condition that the persons receiving same will make their own determination as to its suitability for their purposes prior to use. In no event will Pharmacia be responsible for damages of any nature whatsoever resulting from the use of or reliance upon Information. NO REPRESENTATIONS OR WARRANTIES, EITHER EXPRESS OR IMPLIED, OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE OR OF ANY OTHER NATURE ARE MADE HEREUNDER WITH RESPECT TO INFORMATION OR THE PRODUCT TO WHICH INFORMATION REFERS.

Safety Data Sheet

2-Chlorodiphenyl-2',3',4',5',6'-d_5

Section 1. Chemical product and company identifications

Product code: D-3011
Chemical formula: $C_{12}H_4D_5Cl$
CAS: 51624-35-2
CAS (unlabelled): 2051-60-7
Synonyms: *o*-Chlorodiphenyl, PCB # 1

Supplier / Manufacturer:

C/D/N Isotopes Inc.
88 Leacock Street
Pointe-Claire (Québec) H9R 1H1
Phone: 514-697-6254
Toll-Free (Canada & USA): 1-800-565-4696
Fax: 514-697-6148
Website: www.cdnisotopes.com

In case of emergency:

TOXYSCAN HOTLINE: 1-855-780-0599

Section 2. Hazards identifications

Physical state: Solid
Warning: May cause damage to organs through prolonged or repeated exposure.
Routes of entry: Inhalation, ingestion, skin and eyes

GHS (Globally Harmonized System of Classification and Labelling of Chemicals):

GHS Classification: - Specific target organ toxicity - repeated exposure (Category 2)

GHS Label elements: - Pictograms: 

- Signal word: Warning

Hazards statement: - H373 May cause damage to organs through prolonged or repeated exposure.

Precautionary statement: - P281 Use personal protective equipment as required.
- P308 + P313 IF exposed or concerned: Get medical advice/ attention.

Section 3. Composition and information on ingredients

Name	CAS	Concentration %
2-Chlorodiphenyl-2',3',4',5',6'-d_5	51624-35-2	> 98

Section 4. First aid measures

Eye contact: Flush eyes with water as a precaution.
Skin contact: Wash off with soap and plenty of water. Consult a physician.
Inhalation: If breathed in, move person into fresh air. If not breathing, give artificial respiration. Consult a physician.
Ingestion: Never give anything by mouth to an unconscious person. Rinse mouth with water. Consult a physician.
General advice: Consult a physician. Show this safety data sheet to the doctor in attendance. Move out of dangerous area.

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Section 5. Firefighting measures

Flammability of the product: Not flammable or combustible.
Lower explosion limit: No data available.
Upper explosion limit: No data available.
Auto-ignition temperature: No data available.
Flash point: No data available.
Products of combustion: Hazardous decomposition products formed under fire conditions: Carbon oxides, hydrogen chloride gas
Firefighting media and instructions: Use water spray, alcohol-resistant foam, dry chemical or carbon dioxide.
Special protective equipment for firefighters: Wear self-contained breathing apparatus for firefighting if necessary.

Section 6. Accidental release measures

Personal precautions: Use personal protective equipment. Avoid dust formation. Ensure adequate ventilation. Avoid breathing dust.
Environmental precautions: Do not let product enter drains. Discharge into the environment must be avoided.
Methods for cleaning up: Pick up and arrange disposal without creating dust. Keep in suitable, closed containers for disposal.

Section 7. Handling and storage

Handling: Avoid contact with skin and eyes. Avoid formation of dust and aerosols. Provide appropriate exhaust ventilation at places where dust is formed.
Storage: Store at room temperature. Adequate ventilation.

Section 8. Exposure Controls, Personal Protections

Engineering controls: Use mechanical exhaust or laboratory fumehood to avoid exposure.
Eyes: Safety glasses with side-shields conforming to NIOSH (US) or EN 166 (EU).
Respiratory: Where risk assessment shows air-purifying respirators are appropriate use a full-face respirator with multi-purpose combination (US) or type ABEK (EN 14387) respirator cartridges as a backup to engineering controls. If the respirator is the sole means of protection, use a full-face supplied air respirator. Use respirators and components tested and approved under appropriate government standards such as NIOSH (US).
Hands: Handle with gloves. Dispose of contaminated gloves after use in accordance with applicable laws and good laboratory practices. Wash and dry hands.
Skin/body: Impervious clothing. The type of protective equipment must be selected according to the concentration and amount of the dangerous substance at the specific workplace.

Section 9. Physical and chemical properties (unlabelled)

Molecular weight: 188.65 g/mol
Physical status: Solid
Color: White to pale yellow
Odour: No data available
Density: No data available
Melting point: 34 °C (93 °F)
Boiling point: 274 °C (525 °F)
Vapour pressure: No data available
Vapour density: No data available
Partition coefficient (octanol/water): log Pow: 4.53
Water solubility: 4.8 mg/L

Section 10. Stability and reactivity

Stability and reactivity: Stable under recommended storage conditions.
Incompatibility: Strong oxidizing agents.
Products of combustion: Hazardous decomposition products formed under fire conditions: Carbon oxides, hydrogen chloride gas.
Reactivity conditions: No data available.

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Section 11. Toxicological information (unlabelled)

Toxicological data: 2-Chlorobiphenyl

Information on ingredients:

Name	CAS	LD_{50}	LC_{50}
2-Chlorobiphenyl	2051-60-7	No data available	No data available

Potential acute effects

- **Eyes:** May cause eye irritation.
- **Skin:** May be harmful if absorbed through skin. May cause skin irritation.
- **Inhalation:** May be harmful if inhaled. May cause respiratory tract irritation.
- **Ingestion:** May be harmful if swallowed.

Potential chronic effects

- **Carcinogenic effects:** This product is or contains a component that has been reported to be probably carcinogenic based on its IARC, OSHA, ACGIH, NTP, or EPA classification. IARC: No component of this product present at levels greater than or equal to 0.1% is identified as probable, possible or confirmed human carcinogen by IARC. ACGIH: No component of this product present at levels greater than or equal to 0.1% is identified as a carcinogen or potential carcinogen by ACGIH.
- **Mutagenic effects:** No data available.
- **Teratogenic effects:** No data available.
- **Medical conditions aggravated by overexposure:** No data available.

Section 12. Ecological information

Ecological data:

Name	Results	Species	Period
2-Chlorobiphenyl	0.54 mg/l LC50	Oncorhynchus mykiss	96 h
	0.71 mg/l LC50	Daphnia magna	48 h

Effects on environment: An environmental hazard cannot be excluded in the event of unprofessional handling or disposal.
Mobility: No data available.
Environmental precautions: No data available.
Persistence and degradability: No data available.
Bioaccumulative potential: No data available.

Section 13. Disposal considerations

Waste disposal: Offer surplus and non-recyclable solutions to a licensed disposal company. Contact a licensed professional waste disposal service to dispose of this material.

Section 14. Transportation information

Classification DOT/IMDG/IATA label:

Shipping name: Polychlorinated biphenyls, solid
UN number: UN3432
Class: 9
Packaging group: II

Additional information: None

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Section 15. Regulatory information

UNITED STATES:
NFPA classification



Health: 0
Flammable: 0
Reactivity: 0
Special conditions: None

Legend: 4: Severe, 3: High, 2: Moderate, 1: Slightly, 0: Not hazardous

U.S. Federal regulations:

TSCA 8(b) inventory: 2-Chlorobiphenyl
SARA 302/304/311/312 extremely hazardous substances: Not Listed
SARA 302/304 emergency planning and notification: Not Listed
SARA 302/304/311/312 hazardous chemicals: Not Listed
SARA 311/312 MSDS distribution - chemical inventory - hazard identification: Fire hazard, Immediate (acute) health hazard, Delayed (chronic) health hazard: Not Listed
CWA (Clean Water Act) 307: Not Listed
CWA (Clean Water Act) 311: Not Listed
CAA (Clean Air Act) 112 accidental release prevention: Not Listed
CAA (Clean Air Act) 112 regulated flammable substances: Not Listed
CAA (Clean Air Act) 112 regulated toxic substances: Not Listed

State regulations:

DEA List I Chemicals (Precursor Chemicals): Not Listed
DEA List II Chemicals (Essential Chemicals): Not Listed
Substances in Massachusetts: Not Listed
Dangerous substances in New Jersey: Not Listed
New York – Dangerous substances with acute effects: Not Listed
Dangerous substances in Pennsylvania – right to know: Not Listed

WHMIS (Canada):



D2A - Very toxic material causing other toxic effects

Section 16. Additional information

References:

- ANSI Z400.1, MSDS Standard, 2001.
- Manufacturer's Material Safety Data Sheet.
- 29CFR Part1910.1200 OSHA MSDS Requirements.
- 49CFR Table List of Hazardous Materials, UN#, Proper Shipping Names, PG. -Canada
- Gazette Part II, Vol. 122, No. 2 Registration SOR/88-64 31 December, 1987 Hazardous Products Act "Ingredient Disclosure List".
- Federal act on the controlled products
- Canadian Transport of Dangerous Goods, Regulations and Schedules, Clear Language version 2002.
- Toxicological repertory, HSC.
- Material safety data sheet from the components.

Date of issue: **May 16th, 2018**
Version: 1
Elaborated by: **Toxyscan Inc., 1-866-780-0599**
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SAFETY DATA SHEET

Version 3.16
Revision Date 04/13/2018
Print Date 04/22/2018

1. PRODUCT AND COMPANY IDENTIFICATION

1.1 Product identifiers

Product name : Potassium

Product Number : 679909
Brand : Aldrich

CAS-No. : 7440-09-7

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

Identified uses : Laboratory chemicals, Synthesis of substances

1.3 Details of the supplier of the safety data sheet

Company : Sigma-Aldrich
3050 Spruce Street
SAINT LOUIS MO 63103
USA

Telephone : +1 800-325-5832
Fax : +1 800-325-5052

1.4 Emergency telephone number

Emergency Phone # : +1-703-527-3887 (CHEMTREC)

2. HAZARDS IDENTIFICATION

2.1 Classification of the substance or mixture

GHS Classification in accordance with 29 CFR 1910 (OSHA HCS)
Substances and mixtures, which in contact with water, emit flammable gases (Category 1), H260
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 statement(s)

H260	In contact with water releases flammable gases which may ignite spontaneously.
H314	Causes severe skin burns and eye damage.

Precautionary statement(s)

P223	Keep away from any possible contact with water, because of violent reaction and possible flash fire.
P231 + P232	Handle under inert gas. Protect from moisture.
P260	Do not breathe dust or mist.
P264	Wash skin thoroughly after handling.
P280	Wear protective gloves/ protective clothing/ eye protection/ face protection.
P301 + P330 + P331	IF SWALLOWED: Rinse mouth. Do NOT induce vomiting.

P303 + P361 + P353	IF ON SKIN (or hair): Remove/ Take off immediately all contaminated clothing. Rinse skin with water/ shower.
P304 + P340	IF INHALED: Remove victim to fresh air and keep at rest in a position comfortable for breathing.
P305 + P351 + P338	IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.
P310	Immediately call a POISON CENTER/doctor.
P321	Specific treatment (see supplemental first aid instructions on this label).
P335 + P334	Brush off loose particles from skin. Immerse in cool water/ wrap in wet bandages.
P363	Wash contaminated clothing before reuse.
P370 + P378	In case of fire: Use dry sand, dry chemical or alcohol-resistant foam for extinction.
P402 + P404	Store in a dry place. Store in a closed container.
P405	Store locked up.
P501	Dispose of contents/ container to an approved waste disposal plant.

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

Reacts violently with water.
May form explosive peroxides.

3. COMPOSITION/INFORMATION ON INGREDIENTS

3.2 Mixtures

Formula : K
Molecular weight : 39.10 g/mol

Hazardous components

Component		Classification	Concentration
Potassium			
CAS-No. EC-No. Index-No.	7440-09-7 231-119-8 019-001-00-2	Water-react. 1; Skin Corr. 1A; Eye Dam. 1; H260, H314, H318	90 - 100 %
Paraffin oils			
CAS-No. EC-No.	8012-95-1 232-384-2	Asp. Tox. 1; H304	1 - 5 %

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

4. FIRST AID MEASURES

4.1 Description of first aid measures

General advice
Consult a physician. Show this safety data sheet to the doctor in attendance.Move out of dangerous area.

If inhaled
If breathed in, move person into fresh air. If not breathing, give artificial respiration. Consult a physician.

In case of skin contact
Take off contaminated clothing and shoes immediately. Wash off with soap and plenty of water. Consult a physician.

In case of eye contact
Rinse thoroughly with plenty of water for at least 15 minutes and consult a physician.Continue rinsing eyes during transport to hospital.

If swallowed
Do NOT induce vomiting. Never give anything by mouth to an unconscious person. Rinse mouth with water. Consult a physician.

4.2 Most important symptoms and effects, both acute and delayed
The most important known symptoms and effects are described in the labelling (see section 2.2) and/or in section 11

4.3 Indication of any immediate medical attention and special treatment needed
No data available

5. FIREFIGHTING MEASURES

5.1 Extinguishing media

Suitable extinguishing media
Dry powder

5.2 Special hazards arising from the substance or mixture
No data available

5.3 Advice for firefighters
Wear self-contained breathing apparatus for firefighting if necessary.

5.4 Further information
No data available

6. ACCIDENTAL RELEASE MEASURES

6.1 Personal precautions, protective equipment and emergency procedures
Use personal protective equipment. Avoid dust formation. Avoid breathing vapours, mist or gas. Ensure adequate ventilation. Evacuate personnel to safe areas. Avoid breathing dust.
For personal protection see section 8.

6.2 Environmental precautions
Prevent further leakage or spillage if safe to do so. Do not let product enter drains.

6.3 Methods and materials for containment and cleaning up
Sweep up and shovel. Contain spillage, and then collect with an electrically protected vacuum cleaner or by wet-brushing and place in container for disposal according to local regulations (see section 13). Do not flush with water. Keep in suitable, closed containers for disposal.

6.4 Reference to other sections
For disposal see section 13.

7. HANDLING AND STORAGE

7.1 Precautions for safe handling
Avoid formation of dust and aerosols.
Provide appropriate exhaust ventilation at places where dust is formed.Keep away from sources of ignition - No smoking.
For precautions see section 2.2.

7.2 Conditions for safe storage, including any incompatibilities
Keep container tightly closed in a dry and well-ventilated place.
Never allow product to get in contact with water during storage.

Handle and store under inert gas.
Storage class (TRGS 510): 4.3: Hazardous materials, which set free flammable gases upon contact with water

7.3 Specific end use(s)
Apart from the uses mentioned in section 1.2 no other specific uses are stipulated

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

8.1 Control parameters

Components with workplace control parameters

Component	CAS-No.	Value	Control parameters	Basis
Paraffin oils	8012-95-1	TWA	5 mg/m3	USA. Occupational Exposure Limits (OSHA) - Table Z-1 Limits for Air Contaminants
		TWA	5 mg/m3	USA. ACGIH Threshold Limit Values (TLV)
	Remarks	Upper Respiratory Tract irritation Not classifiable as a human carcinogen		
		TWA	5 mg/m3	USA. NIOSH Recommended Exposure Limits
		ST	10 mg/m3	USA. NIOSH Recommended Exposure Limits
		PEL	5 mg/m3	California permissible exposure limits for chemical contaminants (Title 8, Article 107)
		As sampled by method that does not collect vapor.		

Hazardous components without workplace control parameters

8.2 Exposure controls

Appropriate engineering controls
Handle in accordance with good industrial hygiene and safety practice. Wash hands before breaks and at the end of workday.

Personal protective equipment

Eye/face protection
Face shield and safety glasses Use equipment for eye protection tested and approved under appropriate government standards such as NIOSH (US) or EN 166(EU).

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

Full contact
Material: Nitrile rubber
Minimum layer thickness: 0.11 mm
Break through time: 480 min
Material tested:Dermatril® (KCL 740 / Aldrich Z677272, Size M)

Splash contact
Material: Nitrile rubber
Minimum layer thickness: 0.11 mm
Break through time: 480 min
Material tested:Dermatril® (KCL 740 / Aldrich Z677272, Size M)

data source: KCL GmbH, D-36124 Eichenzell, phone +49 (0)6659 87300, e-mail sales@kcl.de, test method: EN374
If used in solution, or mixed with other substances, and under conditions which differ from EN 374, contact the supplier of the CE approved gloves. This recommendation is advisory only and must be evaluated by an industrial hygienist and safety officer familiar with the specific situation of anticipated use by our customers. It should not be construed as offering an approval for any specific use scenario.

Body Protection
Complete suit protecting against chemicals, Flame retardant protective clothing, The type of protective equipment must be selected according to the concentration and amount of the dangerous substance at the specific workplace.

Respiratory protection
Where risk assessment shows air-purifying respirators are appropriate use a full-face particle respirator type N100 (US) or type P3 (EN 143) respirator cartridges as a backup to engineering controls. If the respirator is the sole means of protection, use a full-face supplied air respirator. Use respirators and components tested and approved under appropriate government standards such as NIOSH (US) or CEN (EU).

Control of environmental exposure
Prevent further leakage or spillage if safe to do so. Do not let product enter drains.

9. PHYSICAL AND CHEMICAL PROPERTIES

9.1 Information on basic physical and chemical properties

a)	Appearance	Form: Fragments Colour: grey
b)	Odour	No data available
c)	Odour Threshold	No data available
d)	pH	No data available
e)	Melting point/freezing point	No data available
f)	Initial boiling point and boiling range	No data available
g)	Flash point	No data available
h)	Evaporation rate	No data available
i)	Flammability (solid, gas)	No data available
j)	Upper/lower flammability or explosive limits	No data available
k)	Vapour pressure	0.12 hPa (0.09 mmHg) at 260 °C (500 °F)
l)	Vapour density	No data available
m)	Relative density	No data available
n)	Water solubility	No data available
o)	Partition coefficient: n-octanol/water	No data available
p)	Auto-ignition temperature	No data available
q)	Decomposition temperature	No data available
r)	Viscosity	No data available
s)	Explosive properties	No data available
t)	Oxidizing properties	No data available

9.2 Other safety information
No data available

10. STABILITY AND REACTIVITY

10.1 Reactivity
No data available

10.2 Chemical stability
Stable under recommended storage conditions.

10.3 Possibility of hazardous reactions
Reacts violently with water.

10.4 Conditions to avoid
Exposure to moisture

10.5 Incompatible materials
Oxidizing agents, Strong oxidizing agents, Carbon oxides, Reacts violently with water., Reacts with water to generate Hydrogen gas.

10.6 Hazardous decomposition products

Hazardous decomposition products formed under fire conditions. - Carbon oxides, Potassium oxides
Other decomposition products - No data available
In the event of fire: see section 5

11. TOXICOLOGICAL INFORMATION

11.1 Information on toxicological effects

Acute toxicity
No data available

Inhalation: No data available

Dermal: No data available

No data available

Skin corrosion/irritation
No data available

Serious eye damage/eye irritation
No data available

Respiratory or skin sensitisation
No data available

Germ cell mutagenicity
No data available

Carcinogenicity

IARC: No component of this product present at levels greater than or equal to 0.1% is identified as probable, possible or confirmed human carcinogen by IARC.

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

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

Reproductive toxicity
No data available
No data available

Specific target organ toxicity - single exposure
No data available

Specific target organ toxicity - repeated exposure
No data available

Aspiration hazard
No data available

Additional Information
RTECS: Not available

Material is extremely destructive to tissue of the mucous membranes and upper respiratory tract, eyes, and skin., spasm, inflammation and edema of the larynx, spasm, inflammation and edema of the bronchi, pneumonitis, pulmonary edema, burning sensation, Cough, wheezing, laryngitis, Shortness of breath, Headache, Nausea

12. ECOLOGICAL INFORMATION

12.1 Toxicity

No data available

12.2 Persistence and degradability

No data available

12.3 Bioaccumulative potential
No data available

12.4 Mobility in soil
No data available

12.5 Results of PBT and vPvB assessment
PBT/vPvB assessment not available as chemical safety assessment not required/not conducted

12.6 Other adverse effects
No data available

13. DISPOSAL CONSIDERATIONS

13.1 Waste treatment methods

Product
Burn in a chemical incinerator equipped with an afterburner and scrubber but exert extra care in igniting as this material is highly flammable. Offer surplus and non-recyclable solutions to a licensed disposal company. Contact a licensed professional waste disposal service to dispose of this material. Dissolve or mix the material with a combustible solvent and burn in a chemical incinerator equipped with an afterburner and scrubber.

Contaminated packaging
Dispose of as unused product.

14. TRANSPORT INFORMATION

DOT (US)
UN number: 2257 Class: 4.3 Packing group: I
Proper shipping name: Potassium
Reportable Quantity (RQ):
Poison Inhalation Hazard: No

IMDG
UN number: 2257 Class: 4.3 Packing group: I EMS-No: F-G, S-N
Proper shipping name: POTASSIUM

IATA
UN number: 2257 Class: 4.3 Packing group: I
Proper shipping name: Potassium
IATA Passenger: Not permitted for transport

15. REGULATORY INFORMATION

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

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

SARA 311/312 Hazards
Reactivity Hazard, Acute Health Hazard, Chronic Health Hazard

Massachusetts Right To Know Components

	CAS-No.	Revision Date
Potassium	7440-09-7	1993-02-16
Paraffin oils	8012-95-1	2007-03-01

Pennsylvania Right To Know Components

	CAS-No.	Revision Date
Potassium	7440-09-7	1993-02-16
Paraffin oils	8012-95-1	2007-03-01

New Jersey Right To Know Components

	CAS-No.	Revision Date
Potassium	7440-09-7	1993-02-16

Paraffin oils	8012-95-1	2007-03-01

California Prop. 65 Components
This product does not contain any chemicals known to State of California to cause cancer, birth defects, or any other reproductive harm.

16. OTHER INFORMATION

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

Asp. Tox.	Aspiration hazard
Eye Dam.	Serious eye damage
H260	In contact with water releases flammable gases which may ignite spontaneously.
H304	May be fatal if swallowed and enters airways.
H314	Causes severe skin burns and eye damage.
H318	Causes serious eye damage.
Skin Corr.	Skin corrosion
Water-react.	Substances and mixtures, which in contact with water, emit flammable gases

HMIS Rating

Health hazard:	3
Chronic Health Hazard:	*
Flammability:	4
Physical Hazard	2

NFPA Rating

Health hazard:	3
Fire Hazard:	4
Reactivity Hazard:	2
Special hazard.I:	W

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

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

Version: 3.16 Revision Date: 04/13/2018 Print Date: 04/22/2018

SAFETY DATA SHEET

Selenium

Section 1. Identification

Product identifier : Selenium

Product code : Not available.

Chemical name : selenium

Other means of identification : C.I. 77805; Selenium (crystalline); Selenium (amorphous); Selenium, elemental; Elemental selenium

Product type : Powder.

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

Identified uses
Industrial uses: Uses of substances as such or in preparations* at industrial sites Manufacture of basic metals, including alloys Metal articles Use in rigid foams, coatings, adhesives and sealants Intermediate Use in rubber production and processing

Uses advised against

Not applicable.

Supplier's details : 5N Plus Inc.
4385 Garand Street
Montreal, H4R 2B4 - Canada
MSDS@5nplus.com
T 514-856-0644

Emergency telephone number : ChemTel Contract Number MIS5311335 - USA and Canada: +1-800-255-3924 (toll free), Australia: +1-300-954-583, Brazil: +0-800-591-6042, China: +400-120-0751, India: +000-800-100-4086, Mexico: 800-099-0731, International phone number : +1-813-248-0585 (collect calls accepted)

Section 2. Hazard identification

Classification of the substance or mixture : ACUTE TOXICITY (oral) - Category 3
ACUTE TOXICITY (inhalation) - Category 3
SPECIFIC TARGET ORGAN TOXICITY (REPEATED EXPOSURE) - Category 2
AQUATIC HAZARD (LONG-TERM) - Category 4

GHS label elements

Hazard pictograms :



Signal word : Danger

Hazard statements : H301 + H331 - Toxic if swallowed or if inhaled.
H373 - May cause damage to organs through prolonged or repeated exposure.
H413 - May cause long lasting harmful effects to aquatic life.

Precautionary statements

Prevention : P271 - Use only outdoors or in a well-ventilated area.
P273 - Avoid release to the environment.
P260 - Do not breathe dust or mist.
P270 - Do not eat, drink or smoke when using this product.
P264 - Wash thoroughly after handling.

Section 2. Hazard identification

Response : P304 + P340, P311 - IF INHALED: Remove person to fresh air and keep comfortable for breathing. Call a POISON CENTER or doctor.
P301 + P310, P330 - IF SWALLOWED: Immediately call a POISON CENTER or doctor. Rinse mouth.

Storage : P405 - Store locked up.

Disposal : P501 - Dispose of contents and container in accordance with all local, regional, national and international regulations.

Section 3. Composition/information on ingredients

Substance/mixture : Substance

Chemical name : selenium

Other means of identification : C.I. 77805; Selenium (crystalline); Selenium (amorphous); Selenium, elemental; Elemental selenium

CAS number/other identifiers

CAS number : 7782-49-2

Ingredient name	Synonyms	% (w/w)	CAS number
selenium	C.I. 77805; Selenium (crystalline); Selenium (amorphous); Selenium, elemental; Elemental selenium	>99.9	7782-49-2

Ranges if listed above for hazardous ingredient(s) are prescribed ranges. The actual concentration(s) or actual concentration range(s) are being withheld as a trade secret.

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

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

Section 4. First-aid measures

Description of necessary first aid measures

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

Inhalation : Remove victim to fresh air and keep at rest in a position comfortable for breathing. If it is suspected that fumes are still present, the rescuer should wear an appropriate mask or self-contained breathing apparatus. If not breathing, if breathing is irregular or if respiratory arrest occurs, provide artificial respiration or oxygen by trained personnel. It may be dangerous to the person providing aid to give mouth-to-mouth resuscitation. Get medical attention. If necessary, call a poison center or physician. If unconscious, place in recovery position and get medical attention immediately. Maintain an open airway. Loosen tight clothing such as a collar, tie, belt or waistband.

Skin contact : Wash contaminated skin with soap and water. Remove contaminated clothing and shoes. Continue to rinse for at least 10 minutes. Get medical attention following exposure or if feeling unwell. Wash clothing before reuse. Clean shoes thoroughly before reuse.

Ingestion : Get medical attention immediately. Call a poison center or physician. Wash out mouth with water. Remove dentures if any. If material has been swallowed and the exposed person is conscious, give small quantities of water to drink. Stop if the exposed person feels sick as vomiting may be dangerous. Do not induce vomiting unless directed to do so by medical personnel. If vomiting occurs, the head should be kept low so that vomit does not enter the lungs. Never give anything by mouth to an unconscious person. If unconscious, place in recovery position and get medical attention immediately. Maintain an open airway. Loosen tight clothing such as a collar, tie, belt or waistband.

Most important symptoms/effects, acute and delayed

Section 4. First-aid measures

Potential acute health effects

Eye contact : Exposure to airborne concentrations above statutory or recommended exposure limits may cause irritation of the eyes.

Inhalation : Toxic if inhaled. Exposure to airborne concentrations above statutory or recommended exposure limits may cause irritation of the nose, throat and lungs.

Skin contact : No known significant effects or critical hazards.

Ingestion : Toxic if swallowed.

Over-exposure signs/symptoms

Eye contact : Adverse symptoms may include the following:
irritation
redness

Inhalation : Adverse symptoms may include the following:
respiratory tract irritation
coughing

Skin contact : No specific data.

Ingestion : No specific data.

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

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

Specific treatments : No specific treatment.

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

See toxicological information (Section 11)

Section 5. Fire-fighting measures

Extinguishing media

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

Unsuitable extinguishing media : None known.

Specific hazards arising from the chemical : This material may cause long lasting harmful effects to aquatic life. Fire water contaminated with this material must be contained and prevented from being discharged to any waterway, sewer or drain.

Hazardous thermal decomposition products : No specific data.

Special protective actions for fire-fighters : Promptly isolate the scene by removing all persons from the vicinity of the incident if there is a fire. No action shall be taken involving any personal risk or without suitable training.

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

Section 6. Accidental release measures

Personal precautions, protective equipment and emergency procedures

For non-emergency personnel : No action shall be taken involving any personal risk or without suitable training. Evacuate surrounding areas. Keep unnecessary and unprotected personnel from entering. Do not touch or walk through spilled material. Do not breathe dust. Provide adequate ventilation. Wear appropriate respirator when ventilation is inadequate. Put on appropriate personal protective equipment.

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

Environmental precautions : Avoid dispersal of spilled material and runoff and contact with soil, waterways, drains and sewers. Inform the relevant authorities if the product has caused environmental pollution (sewers, waterways, soil or air). Water polluting material. May be harmful to the environment if released in large quantities.

Methods and materials for containment and cleaning up

Small spill : Move containers from spill area. Avoid dust generation. Do not dry sweep. Vacuum dust with equipment fitted with a HEPA filter and place in a closed, labeled waste container. Dispose of via a licensed waste disposal contractor.

Large spill : Move containers from spill area. Approach release from upwind. Prevent entry into sewers, water courses, basements or confined areas. Avoid dust generation. Do not dry sweep. Vacuum dust with equipment fitted with a HEPA filter and place in a closed, labeled waste container. Avoid creating dusty conditions and prevent wind dispersal. Dispose of via a licensed waste disposal contractor. Note: see Section 1 for emergency contact information and Section 13 for waste disposal.

Section 7. Handling and storage

Precautions for safe handling

Protective measures : Put on appropriate personal protective equipment (see Section 8). Do not get in eyes or on skin or clothing. Do not breathe dust. Do not ingest. Avoid release to the environment. Use only with adequate ventilation. Wear appropriate respirator when ventilation is inadequate. Keep in the original container or an approved alternative made from a compatible material, kept tightly closed when not in use. Empty containers retain product residue and can be hazardous. Do not reuse container.

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

Conditions for safe storage, including any incompatibilities : Store in accordance with local regulations. Store in original container protected from direct sunlight in a dry, cool and well-ventilated area, away from incompatible materials (see Section 10) and food and drink. Store locked up. Keep container tightly closed and sealed until ready for use. Containers that have been opened must be carefully resealed and kept upright to prevent leakage. Do not store in unlabeled containers. Use appropriate containment to avoid environmental contamination. See Section 10 for incompatible materials before handling or use.

Section 8. Exposure controls/personal protection

Control parameters

Occupational exposure limits

Section 8. Exposure controls/personal protection

Ingredient name	Exposure limits
selenium	**CA Alberta Provincial (Canada, 6/2018). [Selenium and compounds as Se]** OEL: 0.2 mg/m³, (as Se) 8 hours. **CA British Columbia Provincial (Canada, 6/2022). [Selenium and compounds as Se]** TWA: 0.1 mg/m³, (as Se) 8 hours. **CA Quebec Provincial (Canada, 6/2022). [Selenium and compounds]** TWAEV: 0.2 mg/m³, (as Se) 8 hours. **CA Ontario Provincial (Canada, 6/2019). [Selenium and compounds as Se]** TWA: 0.2 mg/m³, (as Se) 8 hours. **CA Saskatchewan Provincial (Canada, 7/2013). [Selenium and compounds as Se]** STEL: 0.6 mg/m³, (measured as Se) 15 minutes. TWA: 0.2 mg/m³, (measured as Se) 8 hours.

Biological exposure indices

No exposure indices known.

Appropriate engineering controls : Use only with adequate ventilation. Use process enclosures, local exhaust ventilation or other engineering controls to keep worker exposure to airborne contaminants below any recommended or statutory limits.

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

Individual protection measures

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

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

Skin protection

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

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

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

Section 8. Exposure controls/personal protection

Respiratory protection : Based on the hazard and potential for exposure, select a respirator that meets the appropriate standard or certification. Respirators must be used according to a respiratory protection program to ensure proper fitting, training, and other important aspects of use.

Section 9. Physical and chemical properties and safety characteristics

The conditions of measurement of all properties are at standard temperature and pressure unless otherwise indicated.

Appearance

Physical state : Solid. [Crystals.]

Color : Silver.

Odor : Odorless.

Odor threshold : Not available.

pH : Not available.

Melting point/freezing point : 220.8°C (429.4°F)

Boiling point, initial boiling point, and boiling range : 685°C (1265°F)

Flash point : Not applicable.

Flammability : Not available.

Lower and upper explosion limit/flammability limit : Not applicable.

Vapor pressure : 0 kPa (0 mm Hg)

Relative vapor density : Not applicable.

Relative density : 4.8

Density : 4.81 g/cm³

Solubility(ies) :

Media	Result
cold water	Not soluble
hot water	Not soluble

Solubility in water : 0.000003774 g/l

Miscible with water : No.

Partition coefficient: n-octanol/water : Not available.

Auto-ignition temperature : Not applicable.

Decomposition temperature : Not available.

Viscosity : Not applicable.

Molecular weight : 78.96 g/mole

Particle characteristics

Median particle size : Not available.

Section 10. Stability and reactivity

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

Chemical stability : The product is stable.

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

Section 10. Stability and reactivity

Conditions to avoid : High temperature

Incompatible materials : Reducing material. strong acids

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

Section 11. Toxicological information

Information on toxicological effects

Acute toxicity

Product/ingredient name	Result	Species	Dose	Exposure
selenium	LC50 Inhalation Dusts and mists LD50 Oral	Rat Rat	>5.67 mg/l >5000 mg/kg	4 hours -

Irritation/Corrosion

Not available.

Sensitization

Not available.

Mutagenicity

Not available.

Carcinogenicity

Not available.

Classification

Product/ingredient name	IARC	NTP	ACGIH
selenium	3	-	-

Reproductive toxicity

Not available.

Teratogenicity

Not available.

Specific target organ toxicity (single exposure)

Not available.

Specific target organ toxicity (repeated exposure)

Product/ingredient name	Category	Route of exposure	Target organs
selenium	Category 2	-	-

Aspiration hazard

Not available.

Information on the likely routes of exposure : Not available.

Potential acute health effects

Eye contact : Exposure to airborne concentrations above statutory or recommended exposure limits may cause irritation of the eyes.

Inhalation : Toxic if inhaled. Exposure to airborne concentrations above statutory or recommended exposure limits may cause irritation of the nose, throat and lungs.

Skin contact : No known significant effects or critical hazards.

Section 11. Toxicological information

Ingestion : Toxic if swallowed.

Symptoms related to the physical, chemical and toxicological characteristics

Eye contact : Adverse symptoms may include the following:
irritation
redness

Inhalation : Adverse symptoms may include the following:
respiratory tract irritation
coughing

Skin contact : No specific data.

Ingestion : No specific data.

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

Short term exposure

Potential immediate effects : Not available.

Potential delayed effects : Not available.

Long term exposure

Potential immediate effects : Not available.

Potential delayed effects : Not available.

Potential chronic health effects

Product/ingredient name	Result	Species	Dose	Exposure
selenium	Sub-chronic NOAEL Oral	Rat	0.4 mg/kg	90 days

General : May cause damage to organs through prolonged or repeated exposure. Repeated or prolonged inhalation of dust may lead to chronic respiratory irritation.

Carcinogenicity : No known significant effects or critical hazards.

Mutagenicity : No known significant effects or critical hazards.

Reproductive toxicity : No known significant effects or critical hazards.

Numerical measures of toxicity

Acute toxicity estimates

Product/ingredient name	Oral (mg/kg)	Dermal (mg/kg)	Inhalation (gases) (ppm)	Inhalation (vapors) (mg/l)	Inhalation (dusts and mists) (mg/l)
selenium	100	N/A	N/A	N/A	0.5

Section 12. Ecological information

Toxicity

Product/ingredient name	Result	Species	Exposure
selenium	Acute EC50 0.00173 mg/l Fresh water Acute EC50 0.1603 mg/l Fresh water Acute LC50 0.0262 mg/l Fresh water Chronic NOEC 0.000547 mg/l Fresh water Chronic NOEC 0.00342 mg/l Fresh water Chronic NOEC 0.00157 mg/l Fresh	Algae Daphnia Fish Algae Daphnia Fish	72 hours 48 hours 96 hours 72 hours 21 days 60 days

Section 12. Ecological information

	water		

Persistence and degradability

Not available.

Bioaccumulative potential

Not available.

Mobility in soil

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

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

Section 13. Disposal considerations

Disposal methods : The generation of waste should be avoided or minimized wherever possible. Disposal of this product, solutions and any by-products should at all times comply with the requirements of environmental protection and waste disposal legislation and any regional local authority requirements. Dispose of surplus and non-recyclable products via a licensed waste disposal contractor. Waste should not be disposed of untreated to the sewer unless fully compliant with the requirements of all authorities with jurisdiction. Waste packaging should be recycled. Incineration or landfill should only be considered when recycling is not feasible. This material and its container must be disposed of in a safe way. Care should be taken when handling emptied containers that have not been cleaned or rinsed out. Empty containers or liners may retain some product residues. Avoid dispersal of spilled material and runoff and contact with soil, waterways, drains and sewers.

Section 14. Transport information

	TDG Classification	DOT Classification	IMDG	IATA
UN number	Not regulated.	Not regulated.	Not regulated.	Not regulated.
UN proper shipping name	-	-	-	-
Transport hazard class(es)	-	-	-	-
Packing group	-	-	-	-
Environmental hazards	No.	No.	No.	No.

Additional information

DOT Classification : **Reportable quantity** 100 lbs / 45.4 kg. Package sizes shipped in quantities less than the product reportable quantity are not subject to the RQ (reportable quantity) transportation requirements.

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

Transport in bulk according to IMO instruments : Not available.

Section 15. Regulatory information

Canadian lists

Canadian NPRI : This material is listed.

CEPA Toxic substances : This material is listed.

International regulations

Chemical Weapon Convention List Schedules I, II & III Chemicals

Not listed.

Montreal Protocol

Not listed.

Stockholm Convention on Persistent Organic Pollutants

Not listed.

Rotterdam Convention on Prior Informed Consent (PIC)

Not listed.

UNECE Aarhus Protocol on POPs and Heavy Metals

Not listed.

Inventory list

Australia : This material is listed or exempted.

Canada : This material is listed or exempted.

China : This material is listed or exempted.

Eurasian Economic Union : **Russian Federation inventory**: This material is listed or exempted.

Japan : **Japan inventory (CSCL)**: Not determined.
Japan inventory (ISHL): Not determined.

New Zealand : This material is listed or exempted.

Philippines : This material is listed or exempted.

Republic of Korea : This material is listed or exempted.

Taiwan : This material is listed or exempted.

Thailand : This material is listed or exempted.

Turkey : This material is listed or exempted.

United States : This material is active or exempted.

Viet Nam : This material is listed or exempted.

Section 16. Other information

History

Date of printing : 11/15/2023

Date of issue/Date of revision : 11/15/2023

Date of previous issue : 10/13/2022

Version : 1.01

Key to abbreviations : ATE = Acute Toxicity Estimate
BCF = Bioconcentration Factor
GHS = Globally Harmonized System of Classification and Labelling of Chemicals
HPR = Hazardous Products Regulations
IATA = International Air Transport Association
IBC = Intermediate Bulk Container
IMDG = International Maritime Dangerous Goods
LogPow = logarithm of the octanol/water partition coefficient
MARPOL = International Convention for the Prevention of Pollution From Ships, 1973 as modified by the Protocol of 1978. ("Marpol" = marine pollution)
N/A = Not available
SGG = Segregation Group
UN = United Nations

Section 16. Other information

Procedure used to derive the classification

Classification	Justification
ACUTE TOXICITY (oral) - Category 3	Expert judgment
ACUTE TOXICITY (inhalation) - Category 3	Expert judgment
SPECIFIC TARGET ORGAN TOXICITY (REPEATED EXPOSURE) - Category 2	Expert judgment
AQUATIC HAZARD (LONG-TERM) - Category 4	Expert judgment

References : Not available.

Indicates information that has changed from previously issued version.

Notice to reader

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

MATERION

SAFETY DATA SHEET

1. Identification

Product identifier Silver

Other means of identification

SDS number G09

CAS number 7440-22-4

Synonyms Silver Target, Silver Product, Silver Pieces, Silver Ribbon

Manufacturer/Importer/Supplier/Distributor information

Manufacturer

Company name Materion Electronic Materials

Address 6070 Parkland Boulevard
Mayfield Heights, Ohio 44124
United States

Telephone 1.216.383.4019

Website www.materion.com

E-mail ehs@materion.com

Contact person Theodore Knudson

Emergency phone number See Section 16.

2. Hazard(s) identification

Physical hazards Not classified.

Health hazards Not classified.

Environmental hazards Not classified.

OSHA defined hazards Not classified.

Label elements

Hazard symbol None.

Signal word None.

Hazard statement The material as sold in solid form is generally not considered hazardous. However, if the process involves grinding, melting, cutting or any other process that causes a release of dust or fumes, hazardous levels of airborne particulate could be generated.

Precautionary statement

Prevention Observe good industrial hygiene practices.

Response Wash hands after handling.

Storage Store away from incompatible materials.

Disposal Dispose of waste and residues in accordance with local authority requirements.

Hazard(s) not otherwise classified (HNOC) None known.

Supplemental information For further information, please contact the Product Stewardship Department at +1.216.383.4019.

3. Composition/information on ingredients

Substances

Chemical name	Common name and synonyms	CAS number	%
Silver	Silver Target, Silver Product, Silver Pieces, Silver Ribbon	7440-22-4	100

4. First-aid measures

Inhalation	Move to fresh air. Call a physician if symptoms develop or persist.
Skin contact	Wash off with soap and water. Get medical attention if irritation develops and persists.
Eye contact	Rinse with water. Get medical attention if irritation develops and persists.
Ingestion	Rinse mouth. Get medical attention if symptoms occur.
Most important symptoms/effects, acute and delayed	Direct contact with eyes may cause temporary irritation.
Indication of immediate medical attention and special treatment needed	Treat symptomatically.
General information	Ensure that medical personnel are aware of the material(s) involved, and take precautions to protect themselves.

5. Fire-fighting measures

Suitable extinguishing media	Water fog. Foam. Dry chemical powder. Carbon dioxide (CO2).
Unsuitable extinguishing media	Do not use water as an extinguisher.
Specific hazards arising from the chemical	This product is not flammable.
Special protective equipment and precautions for firefighters	Self-contained breathing apparatus and full protective clothing must be worn in case of fire.
Fire fighting equipment/instructions	Move containers from fire area if you can do so without risk.
Specific methods	Use standard firefighting procedures and consider the hazards of other involved materials.
General fire hazards	No unusual fire or explosion hazards noted.

6. Accidental release measures

Personal precautions, protective equipment and emergency procedures	Keep unnecessary personnel away. For personal protection, see section 8 of the SDS.
Methods and materials for containment and cleaning up	The product is immiscible with water and will spread on the water surface. Stop the flow of material, if this is without risk. Following product recovery, flush area with water. For waste disposal, see section 13 of the SDS. The product is insoluble in water.
Environmental precautions	Avoid discharge into drains, water courses or onto the ground.

7. Handling and storage

Precautions for safe handling	Avoid prolonged exposure. Observe good industrial hygiene practices.
Conditions for safe storage, including any incompatibilities	Store in tightly closed container. Store away from incompatible materials (see Section 10 of the SDS).

8. Exposure controls/personal protection

Occupational exposure limits

The following constituents are the only constituents of the product which have a PEL, TLV or other recommended exposure limit. At this time, the other constituents have no known exposure limits.

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

Material	Type	Value
Silver (CAS 7440-22-4)	PEL	0.01 mg/m3

US. ACGIH Threshold Limit Values (TLV)

Material	Type	Value	Form
Silver (CAS 7440-22-4)	TWA	0.1 mg/m3	Dust and fume.

NIOSH. Immediately Dangerous to Life or Health (IDLH) Values, as amended

Material	Type	Value
Silver (CAS 7440-22-4)	IDLH	10 mg/m3

US. NIOSH: Pocket Guide to Chemical Hazards Recommended Exposure Limits (REL)

Material	Type	Value	Form
Silver (CAS 7440-22-4)	TWA	0.01 mg/m3	Dust.

US. California Code of Regulations, Title 8, Section 5155. Airborne Contaminants

Material	Type	Value
Silver (CAS 7440-22-4)	PEL	0.01 mg/m3

Biological limit values No biological exposure limits noted for the ingredient(s).

Appropriate engineering controls Good general ventilation should be used. Ventilation rates should be matched to conditions. If applicable, use process enclosures, local exhaust ventilation, or other engineering controls to maintain airborne levels below recommended exposure limits. If exposure limits have not been established, maintain airborne levels to an acceptable level.

Individual protection measures, such as personal protective equipment

Eye/face protection Wear safety glasses with side shields (or goggles).

Skin protection

Hand protection Wear gloves to prevent metal cuts and skin abrasions during handling.

Other Wear suitable protective clothing.

Respiratory protection In case of insufficient ventilation, wear suitable respiratory equipment.

Thermal hazards Wear appropriate thermal protective clothing, when necessary.

General hygiene considerations Always observe good personal hygiene measures, such as washing after handling the material and before eating, drinking, and/or smoking. Routinely wash work clothing and protective equipment to remove contaminants.

9. Physical and chemical properties

Appearance

Physical state Solid.

Form Solid. Various shapes.

Color Silver.

Odor None.

Odor threshold Not applicable.

pH Not applicable.

Melting point/freezing point 1760.9 °F (960.5 °C) / Not applicable.

Initial boiling point and boiling range Not applicable.

Flash point Not applicable.

Evaporation rate Not applicable.

Flammability (solid, gas) None known.

Upper/lower flammability or explosive limits

Explosive limit - lower (%) Not applicable.

Explosive limit - lower (%) temperature Not applicable.

Explosive limit - upper (%) Not applicable.

Explosive limit - upper (%) temperature Not applicable.

Vapor pressure Not applicable.

Vapor pressure temp. 77 °F (25 °C)

Vapor density	Not applicable.
Relative density	Not applicable.
Solubility(ies)	
Solubility (water)	Insoluble
Partition coefficient (n-octanol/water)	Not applicable. Not applicable.
Auto-ignition temperature	Not applicable.
Decomposition temperature	Not applicable.
Viscosity	Not applicable.
Other information	
Density	10.49 g/cm3 estimated at 15 °C 10.49 g/cm3 estimated at 15 °C estimated Not applicable.
Explosive limit	Not applicable.
Explosive properties	Not explosive. Not applicable.
Explosivity	Not applicable.
Molecular formula	Ag
Molecular weight	107.86 g/mol
Oxidizing properties	Not oxidizing.

10. Stability and reactivity

Reactivity	The product is stable and non-reactive under normal conditions of use, storage and transport.
Chemical stability	Material is stable under normal conditions.
Possibility of hazardous reactions	No dangerous reaction known under conditions of normal use.
Conditions to avoid	Contact with incompatible materials.
Incompatible materials	Strong acids. Ammonia. Chlorine. May react with strong bases or oxidizing agents.
Hazardous decomposition products	No hazardous decomposition products are known.

11. Toxicological information

Information on likely routes of exposure

Inhalation	Not likely, due to the form of the product.
Skin contact	Not likely, due to the form of the product.
Eye contact	Not likely, due to the form of the product.
Ingestion	Not likely, due to the form of the product.
Symptoms related to the physical, chemical and toxicological characteristics	None known.

Information on toxicological effects

Acute toxicity	None known.
Skin corrosion/irritation	Not likely, due to the form of the product.
Serious eye damage/eye irritation	Not likely, due to the form of the product.
Respiratory or skin sensitization	
Respiratory sensitization	Not a respiratory sensitizer.
Skin sensitization	Not a skin sensitizer.
Germ cell mutagenicity	Not classified.
Carcinogenicity	This product is not considered to be a carcinogen by IARC, ACGIH, NTP, or OSHA.

IARC Monographs. Overall Evaluation of Carcinogenicity

Not listed.

OSHA Specifically Regulated Substances (29 CFR 1910.1001-1053)

Not listed.

US. National Toxicology Program (NTP) Report on Carcinogens

Not listed.

Reproductive toxicity	Not classified.
Specific target organ toxicity - single exposure	Not classified.
Specific target organ toxicity - repeated exposure	Not classified.
Aspiration hazard	Not likely, due to the form of the product.
Chronic effects	None known.
Further information	None known.

12. Ecological information

Ecotoxicity The product is not classified as environmentally hazardous. However, this does not exclude the possibility that large or frequent spills can have a harmful or damaging effect on the environment.

Product		Species	Test Results
Silver (CAS 7440-22-4)			
Aquatic			
Acute			
Fish	LC50	Fathead minnow (Pimephales promelas)	0.0019 - 0.003 mg/l, 96 hours

* Estimates for product may be based on additional component data not shown.

Persistence and degradability	No data is available on the degradability of this product.
Bioaccumulative potential	No data available.
Mobility in soil	No data available.
Other adverse effects	No other adverse environmental effects (e.g. ozone depletion, photochemical ozone creation potential, endocrine disruption, global warming potential) are expected from this component.

13. Disposal considerations

Disposal instructions	Dispose of this material and its container to hazardous or special waste collection point. Incinerate the material under controlled conditions in an approved incinerator.
Local disposal regulations	Dispose in accordance with all applicable regulations.
Hazardous waste code	D011: Waste Silver The waste code should be assigned in discussion between the user, the producer and the waste disposal company.
Waste from residues / unused products	Dispose of in accordance with local regulations. Empty containers or liners may retain some product residues. This material and its container must be disposed of in a safe manner (see: Disposal instructions).
Contaminated packaging	Since emptied containers may retain product residue, follow label warnings even after container is emptied. Empty containers should be taken to an approved waste handling site for recycling or disposal.

14. Transport information

DOT

Not regulated as dangerous goods.

IATA

Not regulated as dangerous goods.

IMDG

Not regulated as dangerous goods.

15. Regulatory information

US federal regulations This product is not known to be a "Hazardous Chemical" as defined by the OSHA Hazard Communication Standard, 29 CFR 1910.1200.

Toxic Substances Control Act (TSCA)

TSCA Section 12(b) Export Notification (40 CFR 707, Subpt. D)

Not regulated.

CERCLA Hazardous Substance List (40 CFR 302.4)

Silver (CAS 7440-22-4) Listed.

SARA 304 Emergency release notification

Not regulated.

OSHA Specifically Regulated Substances (29 CFR 1910.1001-1053)

Not listed.

Superfund Amendments and Reauthorization Act of 1986 (SARA)

SARA 302 Extremely hazardous substance

Not listed.

SARA 311/312 Hazardous chemical Yes

SARA 313 (TRI reporting)

Chemical name	CAS number	% by wt.
Silver	7440-22-4	100

Other federal regulations

Clean Air Act (CAA) Section 112 Hazardous Air Pollutants (HAPs) List

Not regulated.

Clean Air Act (CAA) Section 112(r) Accidental Release Prevention (40 CFR 68.130)

Not regulated.

Clean Water Act (CWA) Section 112(r) (40 CFR 68.130) Priority pollutant
Toxic pollutant

Safe Drinking Water Act (SDWA) Not regulated.

US state regulations

US. California. Candidate Chemicals List. Safer Consumer Products Regulations (Cal. Code Regs, tit. 22, 69502.3, subd. (a))

Silver (CAS 7440-22-4)

California Proposition 65

California Safe Drinking Water and Toxic Enforcement Act of 1986 (Proposition 65): This material is not known to contain any chemicals currently listed as carcinogens or reproductive toxins. For more information go to www.P65Warnings.ca.gov.

16. Other information, including date of preparation or last revision

Issue date 03-19-2024

Version # 01

Further information	Transportation Emergency Call Chemtrec at: US: 800.424.9300 International: 703.741.5970 Spain: 900.868.538 Switzerland: 0800.564.402 Chemtrec's toll free, mobile-enabled number in Germany – 0800 1817059 South Korea Toll-free Number – 080-880-0468
Disclaimer	This document has been prepared using data from sources considered to be technically reliable and the information is believed to be correct. Materion makes no warranties, expressed or implied, as to the accuracy of the information contained herein. Materion cannot anticipate all conditions under which this information and its products may be used and the actual conditions of use are beyond its control. The user is responsible to evaluate all available information when using this product for any particular use and to comply with all Federal, State, Provincial and Local laws, statutes and regulations.
Revision information	This document has undergone significant changes and should be reviewed in its entirety.

Safety Data Sheet

Sodium

1. PRODUCT AND COMPANY IDENTIFICATION

Product Name: Sodium

Synonyms/Generic Names: None

SDS Number: 782.00

Product Use: For Educational Use Only

Manufacturer: Columbus Chemical Industries, Inc.
N4335 Temkin Rd.
Columbus, WI. 53925

For More Information Contact: Ward's Science
5100 West Henrietta Rd.
PO Box 92912-9012
Rochester, NY 14692
(800) 962-2660 (Monday-Friday 7:30-7:00 Eastern Time)

In Case of Emergency Call: CHEMTREC - 800-424-9300 or 703-527-3887 (24 Hours/Day, 7 Days/Week)

2. HAZARDS IDENTIFICATION

OSHA Hazards: Water reactive, Corrosive, Carcinogen

Target Organs: None

Signal Word: Danger

Pictograms:



GHS Classification:

Substances, which in contact with water, emit flammable gases	Category 1
Skin corrosion	Category 1B
Serious eye damage	Category 1

GHS Label Elements, including precautionary statements:

Hazard Statements:

H260	In contact with water releases flammable gases which may ignite spontaneously.
H314	Causes severe skin burns and eye damage.

Precautionary Statements:

P223	Keep away from any possible contact with water, because of violent reaction and possible flash fire.
P231+P232	Handle under inert gas. Protect from moisture.
P280	Wear protective gloves/ protective clothing/ eye protection/ face protection.
P305+P351+P338	IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.
P310	Immediately call a POISON CENTER or doctor/ physician.
P370+P378	In case of fire: Use dry sand, dry chemical or alcohol-resistant foam for extinction.
P422	Store contents under inert gas.

Potential Health Effects

Eyes	Causes eye irritation.
Inhalation	May be harmful if inhaled. Causes respiratory tract irritation.
Skin	May be harmful if absorbed through skin. Causes skin irritation.
Ingestion	May be harmful if swallowed.

NFPA Ratings

Health	3
Flammability	3
Reactivity	2
Specific hazard	Not Available

HMIS Ratings

Health	3
Fire	3
Reactivity	2
Personal	E

3. COMPOSITION/INFORMATION ON INGREDIENTS

Component	Weight %	CAS #	EINECS# / ELINCS#	Formula	Molecular Weight
Sodium	100	7440-23-5	231-132-9	Na	22.99 g/mol
Mineral Oil	N/A	8012-95-1	232-384-2	N/A	N/A

4. FIRST-AID MEASURES

Eyes	Rinse with plenty of water for at least 15 minutes and seek medical attention immediately.
Inhalation	Move casualty to fresh air and keep at rest. If breathing is difficult, give oxygen. If not breathing, give artificial respiration. Get medical attention immediately.
Skin	Immediately flush with plenty of water for at least 15 minutes while removing contaminated clothing and wash using soap. Get medical attention immediately.
Ingestion	**Do Not Induce Vomiting!** Never give anything by mouth to an unconscious person. If conscious, wash out mouth with water. Get medical attention immediately.

5. FIRE-FIGHTING MEASURES

Suitable (and unsuitable) extinguishing media	May burn in presence of air, or emit a flammable gas in the presence of water or water vapor. Keep away from heat/sparks/open flame/hot surface/air/water. No smoking. Use dry powder to extinguish fire.
Special protective equipment and precautions for firefighters	Wear self-contained, approved breathing apparatus and full protective clothing, including eye protection and boots.
Specific hazards arising from the chemical	May emit toxic fumes under fire conditions. Nature of decomposition products not known. (See also Stability and Reactivity section).

6. ACCIDENTAL RELEASE MEASURES

Personal precautions, protective equipment and emergency procedures	See section 8 for recommendations on the use of personal protective equipment.
Environmental precautions	Prevent spillage from entering drains. Any release to the environment may be subject to federal/national or local reporting requirements.
Methods and materials for containment and cleaning up	Sweep up and shovel. Contain spillage, and then collect with an electrically protected vacuum cleaner or by wet brushing and place in container for disposal according to local regulations (see section 13). Do not flush with water. Keep in suitable, closed containers for disposal. Dispose of all waste and cleanup materials in accordance with regulations.

7. HANDLING AND STORAGE

Precautions for safe handling
See section 8 for recommendations on the use of personal protective equipment. Use with adequate ventilation. Wash thoroughly after using. Keep container closed when not in use. Keep away from sources of ignition - No smoking.

Conditions for safe storage, including any incompatibilities
Store in cool, dry well ventilated area. Handle and store under inert gas. Air sensitive. Keep away from incompatible materials (see section 10 for incompatibilities).

8. EXPOSURE CONTROLS / PERSONAL PROTECTION

Occupational exposure controls: Contains no substances with occupational exposure limit values.

Personal Protection

Eyes	Wear chemical safety glasses or goggles and face shield.
Inhalation	Provide local exhaust, preferably mechanical. If exposure levels are excessive, use an approved respirator.
Skin	Wear nitrile or rubber gloves, apron or lab coat.
Other	Not Available

Other Recommendations
Provide eyewash stations, quick-drench showers and washing facilities accessible to areas of use and handling.

9. PHYSICAL AND CHEMICAL PROPERTIES

Appearance (physical state, color, etc.)	Silvery metal solid.
Odor	Not Available
Odor threshold	Not Available
pH	Not Available
Melting point/freezing point	97.8°C (208°F)
Initial boiling point and boiling range	881.4°C (1618.5°F)
Flash point	Not Flammable
Evaporation rate	Not Available
Flammability (solid, gas)	Not Flammable
Upper/lower flammability or explosive limit	Not Explosive

Vapor pressure	Not Available
Vapor density	Not Available
Density	0.97 (Water = 1)
Solubility (ies)	Insoluble in cold water, hot water.
Partition coefficient: n-octanol/water	Not Available
Auto-ignition temperature	Not Available
Decomposition temperature	Not Available

10. STABILITY AND REACTIVITY

Chemical Stability	Stable
Possibility of Hazardous Reactions	Reacts violently with water.
Conditions to Avoid	Air. Exposure to moisture.
Incompatible Materials	Oxidizing agents.
Hazardous Decomposition Products	Nature of decomposition products not known.

11. TOXICOLOGICAL INFORMATION

Acute Toxicity

Skin	Not Available
Eyes	Not Available
Respiratory	Not Available
Ingestion	Not Available

Carcinogenicity

IARC	No components of this product present at levels greater than or equal to 0.1% is identified as probable, possible or confirmed human carcinogen by IARC.
ACGIH	No components of this product present at levels greater than or equal to 0.1% is identified as a carcinogen or potential carcinogen by ACGIH.
NTP	No components 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 components of this product present at levels greater than or equal to 0.1% is identified as a carcinogen or potential carcinogen by OSHA.

Signs & Symptoms of Exposure

Skin	Irritation, redness, itchiness.
Eyes	Irritation, redness, watering eyes, itchiness.
Respiratory	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.
Ingestion	Irritation, nausea, vomiting, laxative effect, Gastrointestinal disturbance.

Chronic Toxicity	Not Available
Teratogenicity	Not Available
Mutagenicity	Not Available
Embryotoxicity	Not Available
Specific Target Organ Toxicity	Not Available
Reproductive Toxicity	Not Available
Respiratory/Skin Sensitization	Not Available

12. ECOLOGICAL INFORMATION

Ecotoxicity

Aquatic Vertebrate	Not Available
Aquatic Invertebrate	Not Available
Terrestrial	Not Available

Persistence and Degradability	Not Available
Bioaccumulative Potential	Not Available
Mobility in Soil	Not Available
PBT and vPvB Assessment	Not Available
Other Adverse Effects	Not Available

13. DISPOSAL CONSIDERATIONS

Waste Residues	Users should review their operations in terms of the applicable federal/national or local regulations and consult with appropriate regulatory agencies if necessary before disposing of waste product or residues.
Product Containers	Users should review their operations in terms of the applicable federal/national or local regulations and consult with appropriate regulatory agencies if necessary before disposing of waste product container.

The information offered in section 13 is for the product as shipped. Use and/or alterations to the product may significantly change the characteristics of the material and alter the waste classification and proper disposal methods.

14. TRANSPORTATION INFORMATION

US DOT	UN1429, Sodium, 4.3, pg I
TDG	UN1429, Sodium, 4.3, pg I
IMDG	UN1429, Sodium, 4.3, pg I
Marine Pollutant	No
IATA/ICAO	UN1429, Sodium, 4.3, pg I

15. REGULATORY INFORMATION

TSCA Inventory Status	All ingredients are listed on the TSCA inventory.
DSCL (EEC)	All ingredients are listed on the DSCL inventory.
California Proposition 65	Listed: Mineral Oil
SARA 302	Not Listed
SARA 304	Not Listed
SARA 311	Sodium, Mineral Oil
SARA 312	Sodium, Mineral Oil
SARA 313	Not Listed
WHMIS Canada	CLASS D-2B: Material causing other toxic effects (TOXIC).

16. OTHER INFORMATION

Revision	Date
Revision 1	01/31/2013

Disclaimer: Columbus Chemical Industries, Inc. (“Columbus”) believes that the information herein is factual but is not intended to be all inclusive. The information relates only to the specific material designated and does not relate to its use in combination with other materials or its use as to any particular process. Because safety standards and regulations are subject to change and because Columbus has no continuing control over the material, those handling, storing or using the material should satisfy themselves that they have current information regarding the particular way the material is handled, stored or used and that the same is done in accordance with federal, state and local law. COLUMBUS MAKES NO WARRANTY, EXPRESS OR IMPLIED, INCLUDING (WITHOUT LIMITATION) WARRANTIES WITH RESPECT TO THE COMPLETENESS OR CONTINUING ACCURACY OF THE INFORMATION CONTAINED HEREIN OR WITH RESPECT TO FITNESS FOR ANY PARTICULAR USE.

Appendix D
Certifications

Individual User Report

Training Summary

Catherine Banks

Report Date : July 28,2025

Name: Catherine Banks

Completion History

Title	Completed	Expiry
Adult First Aid/CPR/AED [American Red Cross]	02/04/2025	02/04/2027
HAZWOPER 40 Hour Training [Safety Unlimited, Inc.]	16/01/2022	-
Inorganic Arsenic Hazard Awareness [Anchor QEA]	19/10/2022	-
Medical Surveillance Exam [Occupational Health Monitoring]	21/04/2025	21/04/2026
Mercury & Heavy Metals Testing [Occupational Health Monitoring]	17/10/2022	-
Washington L&I WAC 296-800-140 Accident Prevention Program [Anchor QEA, LLC]	22/08/2022	-
Emergency Response Plan Annual Review - Bellingham	29/08/2024	29/08/2025
Emergency Response Plan Annual Review - Bellingham	29/08/2024	29/08/2025
Corporate Health and Safety Program Acknowledgment	02/04/2025	02/04/2026
2025 Bloodborne Pathogens In-Person [Anchor QEA]	02-04-2025	02-04-2026
2025 Confined Space Awareness In-Person [Anchor QEA]	02-04-2025	02-04-2026
2025 Fire Extinguisher In-Person [Anchor QEA]	02-04-2025	02-04-2026
2025 HAZWOPER 8-Hour Refresher In-Person [Anchor QEA]	02-04-2025	02-04-2026
2025 Respiratory Protection In-Person [Anchor QEA]	02-04-2025	02-04-2026
Driving Safety: The Basics [MARCOM_BIZ Library]	11-06-2025	11-06-2026

SciAps XRF Training [SciAps]	27-10-2024	27-10-2026

Individual User Report

Training Summary

Heather Gadwa

Report Date : January 20,2025

Name: Heather Gadwa

Completion History

Title	Completed	Expiry
Adult First Aid/CPR/AED [ProTrainings]	16/12/2024	16/12/2026
Bloodborne Pathogens Course [ProTrainings]	16/12/2024	16/12/2025
Emergency Response Plan Annual Review - Seattle	22/11/2024	22/11/2025
Corporate Health and Safety Program Acknowledgment	25/11/2024	25/11/2025
Acknowledgement of Employee Guidebook	22/11/2024	22/11/2025
AI Use Policy Acknowledgment	22/11/2024	22/11/2025
Driving Safety: The Basics [MARCOM_BIZ Library]	22-11-2024	22-11-2025
Fire Extinguisher Training [Anchor QEA]	22-11-2024	22-11-2025
Inorganic Arsenic Hazard Awareness [Anchor QEA]	25-11-2024	-

Individual User Report

Training Summary

Joey Lane

Report Date : January 31,2025

Name: Joey Lane

Completion History

Title	Completed	Expiry
Adult First Aid/CPR/AED [ProTrainings]	10/06/2024	10/06/2026
Bloodborne Pathogens Course [ProTrainings]	10/06/2024	10/06/2025
HAZWOPER 3-Day Supervised Field Training [Anchor QEA, LLC]	20/06/2024	-
HAZWOPER 40 Hour Training [Safety Unlimited, Inc.]	20/06/2024	-
HAZWOPER New to HAZWOPER (date is completion of 40 Hour Training) [Anchor QEA, LLC]	20/06/2024	20/06/2025
Medical Surveillance Exam [Occupational Health Monitoring]	11/11/2024	11/11/2025
Mercury & Heavy Metals Testing [Occupational Health Monitoring]	12/11/2024	-
Washington L&I WAC 296-800-140 Accident Prevention Program [Anchor QEA, LLC]	07/06/2024	-
Playing It Safe Event	17/01/2025	-
Emergency Response Plan Annual Review - Bellingham	13/08/2024	13/08/2025

Acknowledgement of Employee Guidebook	29/08/2024	29/08/2025
AI Use Policy Acknowledgment	13/11/2024	13/11/2025
AI Use Policy Acknowledgment	13/11/2024	13/11/2025
AI Use Policy Acknowledgment	13/11/2024	13/11/2025
Driving Safety: The Basics [MARCOM_BIZ Library]	10-06-2024	10-06-2025
Fire Extinguisher Training [Anchor QEA]	10-06-2024	10-06-2025

Individual User Report

Training Summary

Mikayla Bowers

Report Date : April 15,2025

Name: Mikayla Bowers

Completion History

Title	Completed	Expiry
Adult First Aid/CPR/AED [ProTrainings]	22/06/2023	22/06/2025
Annual Respirator Clearance and Fit Test Exam [Occupational Health Monitoring]	10/09/2024	10/09/2025
Bloodborne Pathogens Course [ProTrainings]	10/05/2024	10/05/2025
HAZWOPER 3-Day Supervised Field Training [Anchor QEA, LLC]	12/06/2023	-
HAZWOPER 40 Hour Training [Safety Unlimited, Inc.]	12/06/2023	-
HAZWOPER Supervisor 8 Hour Initial [Safety Unlimited, Inc.]	29/07/2024	-
Medical Surveillance Exam [Occupational Health Monitoring]	10/09/2024	10/09/2025
Mercury & Heavy Metals Testing [Occupational Health Monitoring]	28/06/2023	-
Silica Awareness [BIZ Library]	04/01/2024	-
Washington L&I WAC 296-800-140 Accident Prevention Program [Anchor QEA, LLC]	04/01/2024	-

Emergency Response Plan Annual Review - Bellingham	29/08/2024	29/08/2025
Emergency Response Plan Annual Review - Bellingham	29/08/2024	29/08/2025
AI Use Policy Acknowledgment	17/10/2024	17/10/2025
Acknowledgement of Employee Guidebook	29/08/2024	29/08/2025
Corporate Health and Safety Program Acknowledgment	02/04/2025	02/04/2026
2025_01 Confined Space Awareness In-Person [Anchor QEA]	02-04-2025	02-04-2026
2025_02 Fire Extinguisher In-Person [Anchor QEA]	02-04-2025	02-04-2026
2025_03 Bloodborne Pathogens In-Person [Anchor QEA]	02-04-2025	02-04-2026
2025_04 Respiratory Protection In-Person [Anchor QEA]	02-04-2025	02-04-2026
2025_05 HAZWOPER 8-Hour Refresher In-Person [Anchor QEA]	02-04-2025	02-04-2026
All About Non-Permit Confined Spaces [BIZ Library]	05-01-2024	-
Asbestos [BIZ Library]	05-01-2024	-
Driving Safety: The Basics [MARCOM_BIZ Library]	10-04-2025	-
Driving Safety: The Basics [MARCOM_BIZ Library]	10-04-2025	10-04-2026
Fire Extinguisher Training [Anchor QEA]	27-03-2025	27-03-2026
Lead Exposure [BIZ Library]	05-01-2024	-
Lead Exposure [BIZ Library]	05-01-2024	-
Lead Exposure [BIZ Library]	05-01-2024	-
Respiratory Protection (OSHA)	15-09-2024	15-09-2026

Individual User Report

Training Summary

Tanner Kamila-Lindell

Report Date : July 28,2025

Name: Tanner Kamila-Lindell

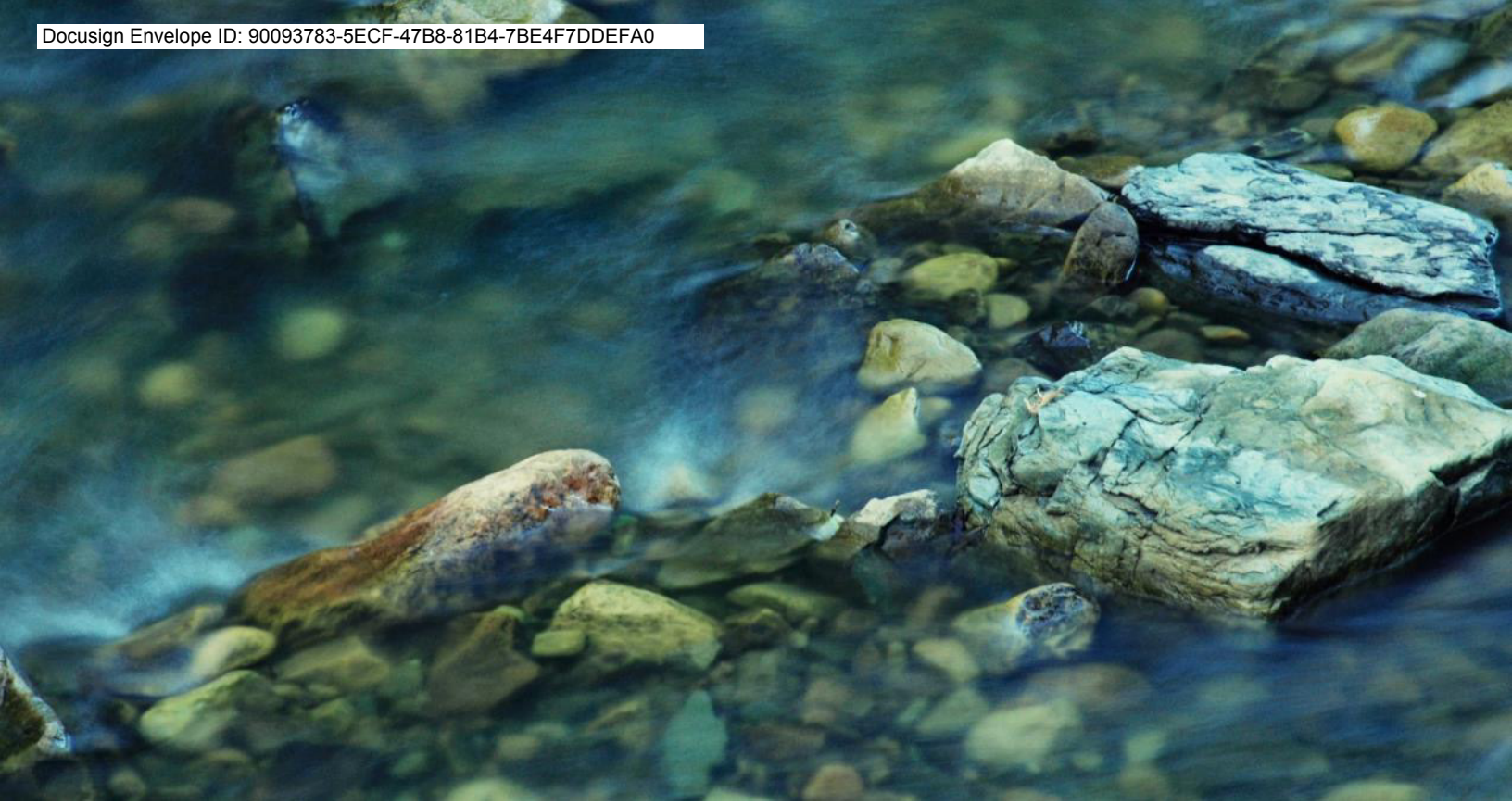
Completion History

Title	Completed	Expiry
2-HR Confined Space Entry Refresher [eTraining, Inc.]	23/05/2025	23/05/2026
Adult First Aid/CPR/AED [American Red Cross]	02/04/2025	02/04/2027
Annual Respirator Clearance and Fit Test Exam [Occupational Health Monitoring]	30/05/2025	30/05/2026
Asbestos [BIZ Library]	14/08/2023	-
CalOSHA Workplace Injury and Illness Prevention Program [Anchor QEA, LLC]	13/09/2021	-
Energy Control Authorized Person Practical Training [Anchor QEA, LLC]	28/04/2021	-
Fall Protection Awareness (User) Training [Honeywell]	23/05/2025	23/05/2026
HAZWOPER 40 Hour Training [Safety Unlimited, Inc.]	01/07/2018	-
HAZWOPER Supervisor 8 Hour Initial [Safety Unlimited, Inc.]	25/09/2020	-
Inorganic Arsenic Hazard Awareness [Anchor QEA]	19/12/2023	-
Lead Exposure [BIZ Library]	19/12/2023	-
Medical Surveillance Exam [Occupational Health Monitoring]	30/05/2025	30/05/2026
Mercury & Heavy Metals Testing [Occupational Health Monitoring]	14/06/2023	-
Mercury Safety [Anchor QEA]	19/12/2023	-
NGA Task 70 [GTI]	12/09/2023	-

Vaccination HEP A (1st) [Occupational Health Monitoring]	21/02/2001	-
Vaccination HEP A (2nd) [Occupational Health Monitoring]	28/08/2006	-
Vaccination HEP B (1st) [Occupational Health Monitoring]	26/03/1996	-
Vaccination HEP B (2nd) [Occupational Health Monitoring]	22/05/1996	-
Vaccination HEP B (3rd) [Occupational Health Monitoring]	24/09/1996	-
Washington L&I WAC 296-800-140 Accident Prevention Program [Anchor QEA, LLC]	19/05/2021	-
Acknowledgement of Employee Guidebook	02/08/2024	02/08/2025
Emergency Response Plan Annual Review - Bellingham	27/08/2024	27/08/2025
AI Use Policy Acknowledgment	17/12/2024	17/12/2025
Corporate Health and Safety Program Acknowledgment	02/04/2025	02/04/2026
2025 Bloodborne Pathogens In-Person [Anchor QEA]	02-04-2025	02-04-2026
2025 Confined Space Awareness In-Person [Anchor QEA]	02-04-2025	02-04-2026
2025 Fire Extinguisher In-Person [Anchor QEA]	02-04-2025	02-04-2026
2025 HAZWOPER 8-Hour Refresher In-Person [Anchor QEA]	02-04-2025	02-04-2026
2025 Respiratory Protection In-Person [Anchor QEA]	02-04-2025	02-04-2026
Driving Safety: The Basics [MARCOM_BIZ Library]	10-04-2025	10-04-2026
Energy Control Initial and Refresher [Anchor QEA]	22-12-2024	22-12-2025
Respiratory Protection (OSHA)	09-04-2024	09-04-2026

Appendix E
Heat and Cold Exposure Program

Docusign Envelope ID: 90093783-5ECF-47B8-81B4-7BE4F7DDEFA0



Document No.: TBD
Revision No.: 01
Issue Date: July 12, 2024
Corporate Health and Safety

Heat and Cold Exposure Program

PLAYING IT SAFE

Stop Play Record Rewind

Docusign Envelope ID: 90093783-5ECF-47B8-81B4-7BE4F7DDEFA0

July 12, 2024
Corporate Health and Safety

Heat and Cold Exposure Program

Prepared by
Anchor QEA
1201 3rd Avenue, Suite 2600
Seattle, Washington 98101

Project Number: 059999-71.03

Docusign Envelope ID: 90093783-5ECF-47B8-81B4-7BE4F7DDEFA0

TABLE OF CONTENTS

Purpose and Scope 1

Program Responsibilities 1

Heat Exposure Management 2

- Prevention Measures 2
  - Set Up the Work Site for Shade 2
  - Schedule Work to Reduce Heat Exposure 3
  - Stay Hydrated 3
  - Allow Time to Adjust to Heat (Acclimatization) 4
  - Training 4
- High Heat Practices 5
- Responding to Heat-Related Illness 5
- Risk Factors 6
- Heat-Related Illnesses 6
  - Heat Rash 6
  - Heat Exhaustion 7
  - Heat Stroke 7
- Responsibilities 8
- Sources 9

Cold Weather and Cold Stress Management 9

- Signs, Symptoms, and Treatment 10
- Cold Water Work 11

Employee Training 11

Periodic Program Review 11

Docusign Envelope ID: 90093783-5ECF-47B8-81B4-7BE4F7DDEFA0

Purpose and Scope

Anchor QEA is committed to providing a safe and healthy work environment for all employees. In pursuit of this goal, the purpose of the following program is to apply general principles and sound decision-making to reduce risk. It is Anchor QEA's intent to help employees make safety-related decisions at any time—including the decision to Stop Work if conditions appear, or may become, unsafe. This program has been developed to provide guidance to staff regarding heat and cold exposure.

Program Responsibilities

All employees are required to follow the minimum procedures outlined in this program.

Management. Along with providing financial and leadership support, Anchor QEA management will assist Health and Safety, managers, field leads, and employees with complying with this program.

Health and Safety. Health and Safety is responsible for the following:

- Ensuring safety hazards are corrected as soon as possible
- Providing guidance and support regarding heat and cold exposure
- Reviewing this program annually and revising if necessary
- Ensuring necessary training is provided to employees

Managers and Field Leads. Managers and field leads are responsible for the following:

- Identifying conditions where exposure to heat and cold is possible and implementing proper controls
- Ensuring employees understand this program
- Ensuring employees comply with all aspects of this program
- Ensuring the necessary elements are part of the site-specific plan(s)
- Taking personal factors into consideration before assigning a task where there is a possibility of a heat- or cold-related illness occurring
- When indoor work conditions at company or client facilities exceeds 82°F, implementing additional controls in coordination with Health and Safety
- Understanding what conditions and practices are considered outdoor environments, including inside vehicles, sheds, tents, manholes, tunnels, or outside vaults without sufficient cooling, heating, or airflow
- Allowing for adequate rest breaks in shady or climate-controlled areas at appropriate frequencies depending upon temperatures and heat or cold index
- Documenting outdoor temperatures and heat/cold index at least every 2 hours on the Heat Stress Monitoring Record Form

Docusign Envelope ID: 90093783-5ECF-47B8-81B4-7BE4F7DDEFA0

- Field leads, or their designee, will serve as the heat and cold exposure safety coordinator for the particular work site.

Employees. Employees are responsible for the following:

- Reporting safety hazards to their manager, field lead, or Health and Safety
- Following the safe work practices outlined in this program
- Immediately notifying a manager or field lead if they experience signs or symptoms of a heat- or cold -related illness
- Understanding that those who work outdoors in cold weather could be exposed to cold stress

Heat Exposure Management

This program is intended to be used primarily from May to September of each year; however, depending on temperatures it may also be needed during other months. Heat-related illnesses can happen if workplace activities in a hot environment overwhelm the body's ability to cool itself. This becomes more likely if any risk factors are present. Examples include working in a hot environment without adequate access to water for rehydration, working in protective gear that does not allow air circulation across the skin, and working where the humidity is too high for sweat to evaporate.

This program should be used for anyone working outdoors more than 15 minutes in any 60-minute period in heat index temperatures, as follows:

- As low as 52°F when wearing clothing that is non-breathable or that provides a vapor barrier, such as rain gear, chemical-resistant suits, or Level A suits
- At least 77°F when wearing double -layer woven clothing such as sweatshirts, coveralls, and jackets on top of other clothes
- At least 80°F when wearing any other type of clothing such as typical shirts and pants

Some individuals—for example, individuals who are not acclimatized or who come to work dehydrated—are more susceptible to heat stress than others.

Prevention Measures

The field team shares responsibility for safety at the work site. This includes watching out for oneself and others because heat illness can become life threatening quickly if unnoticed or ignored. Any worker should speak up if they notice anything that could be unsafe or result in someone getting hurt or sick.

Set Up the Work Site for Shade

Before work begins, the field lead will assess shade options for the work site. Shade from trees, walls, or structures like a portable canopy can be used. Fans can help if the air temperature does not go

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above 95°F, but if air-conditioned spaces, such as cabs, are available, they can be used to cool individuals. The field lead is responsible for ensuring that equipment is available, functional, transported, and set up properly. More than one shaded area may be needed for rest breaks depending upon the size of the site and whether employees are working in a hot zone and choose to take a break in a suitable hot zone area. Such areas will not be used for consumption of food. The shade area must either be open to the air or provide mechanical ventilation for cooling. Shade must be provided with outdoor temperatures greater than 80°F. If an employee asks for a cool-down rest period, this request shall not be denied.

The area of shade present must be at least large enough to allow the staff on recovery or rest periods to sit in a normal position fully in the shade. The shade must be as close as practical to the areas where staff are working. Shade present during meal periods must be large enough to accommodate the number of staff that remain on site during the meal period. If shade cannot be provided because of safety or feasibility concerns, alternative cooling measures must be implemented.

Schedule Work to Reduce Heat Exposure

The field lead, in coordination with the project manager, will consider changes in shift timing to avoid working during the hottest period of the day. This could include starting earlier, working in the evening, or splitting the day with a break during the hottest part of the day.

Stay Hydrated

Staff should not wait to be thirsty to drink water, and they should not drink it all at once. In fact, it is best to start drinking water before work and to drink small amounts often throughout the day to stay hydrated. Additional water breaks are allowed during hot days. Potable water should be cool (66°F to 77°F) or cold (35°F to 65°F). During moderate activity in moderately hot conditions, staff should drink about 8 ounces of liquid every 15 to 20 minutes. The opportunity to drink at least one quart of water per hour should be provided and the water should be potable and of sufficient coolness. Water sources used for drinking water at work sites should be either bottled water or from sources having backflow preventers. Multi-use cups and/or use of hoses to deliver water are not acceptable.

Sports drinks low in sugar are all right but should not completely replace water. Drinks with caffeine and high sugar content, like sodas, should be avoided because they will not provide sufficient hydration.

The field lead will ensure enough water is available to allow each staff member to drink at least a quart of water each hour (at least 1 cup every 15 minutes) and that it is consumed on a regular basis.

Staff should be encouraged to eat regular meals and snacks because they provide enough salt and electrolytes to replace those lost through sweating—if enough water is consumed.

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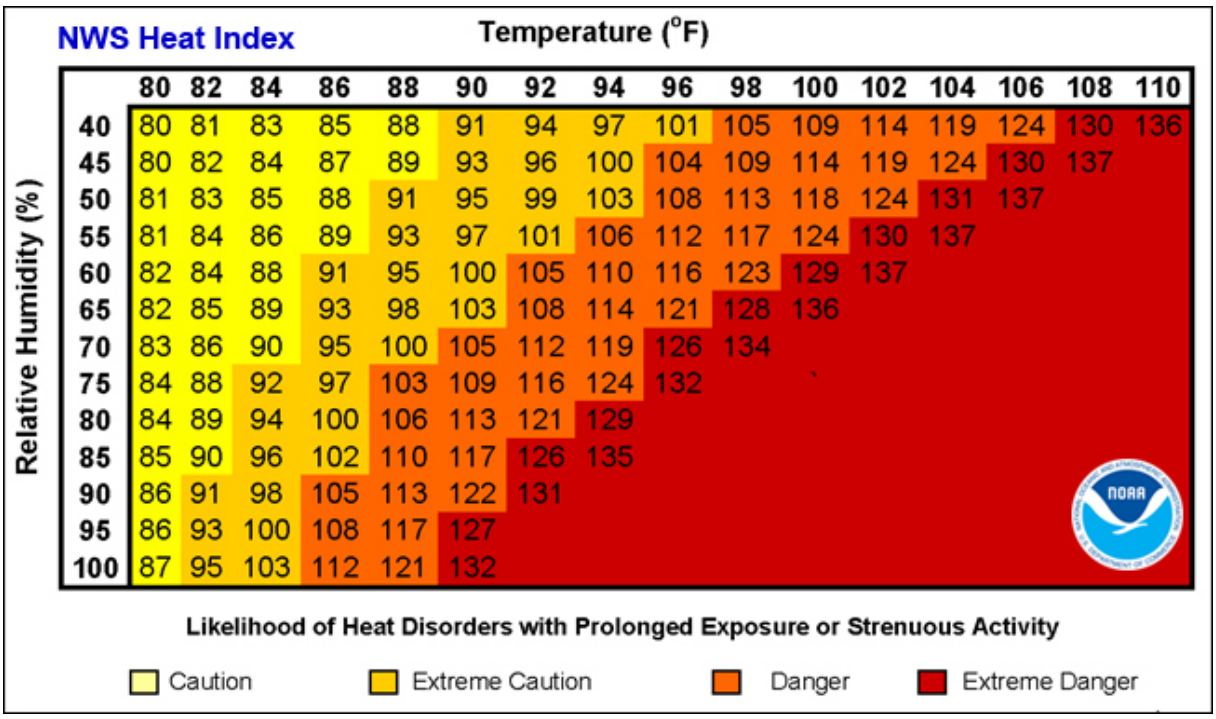
Allow Time to Adjust to Heat (Acclimatization)

It takes about 2 weeks to fully adjust to hot working conditions. This adjustment is lost if a worker is away from the hot conditions for a week or more. Acclimatization is especially critical for heavy work in hot temperatures.

To acclimatize, start with light physical work for short durations of work time and slowly increase each day. Increase by 20% (of the total shift) each day for non-acclimatized staff. Those that are in the process of acclimatization shall be observed more closely through the buddy system and/or by the field lead for signs and symptoms related to extreme heat or extreme cold. The observation methods for such individuals should be documented. Closer observation should be performed during heat waves when the predicted high temperature is at least 10 degrees higher than the average high temperature in the preceding 5 days.

Training

Each year, staff who may encounter the working conditions just discussed will be provided with safety training on the dangers of outdoor heat exposure, the steps Anchor QEA takes to protect them, and actions they must follow to prevent heat-related illness. This information will also be covered during tailgate meetings at the project site.



Source: https://www.weather.gov/images/safety/heatindexchart-650.jpg

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High Heat Practices

The following additional high-heat practices must be implemented when the ambient heat index exceeds 90°F:

- Ensure that effective communication by voice, observation, or electronic means is maintained so that staff at the work site can contact a supervisor when necessary. An electronic device, such as a mobile phone or text messaging device, may be used for this purpose only if reception in the area is reliable.
- Ensure that staff are observed for alertness and signs and symptoms of heat illness and are monitored to determine whether medical attention is necessary by implementing one or more of the following:
  - Establish regular communication with staff working alone, such as by radio, mobile phone, or other alternative means.
  - Create a mandatory buddy system.
  - Implement other equally effective means of observation or communication.
- The field lead must designate and equip one or more staff on the work site as authorized to call for emergency medical services and must allow other staff to call for emergency services when designated staff are not immediately available. (Such a practice supplements existing requirements to ensure that emergency medical care is immediately available in all workplaces.)
- The field lead must ensure that each staff member takes a minimum 10-minute preventative cool-down rest period in the shade at least every 2 hours, regardless of the overall length of the shift.

Responding to Heat-Related Illness

Let a supervisor or someone nearby know if you or a coworker are experiencing any signs or symptoms of heat-related illness and take immediate action to ensure things do not get dangerously worse.

- Time is critical. Get the individual away from the hot area into a cool, shaded area. Quick action increases the chances for a full recovery. Means to either lead or transport such individuals to shaded areas should be addressed in the project-specific safety plan.
- Let the individual rest and drink cool water.
- Remove any personal protective equipment (PPE) as appropriate.
- Use ice packs or cooling towels as appropriate and available.
- Never leave an individual who is experiencing heat-related problems alone; things could get worse.
- If the individual is a lone worker, an Anchor QEA representative will stay on the line with the individual and emergency services will be called to the individual's location unless a representative of Anchor QEA or another company can quickly arrive at the location.

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- If the individual does not respond quickly, call emergency medical services.
- Follow the steps in the main HASP for notifying emergency services to include directions to the site.
- If the individual is in a remote or non-developed area with unidentified roads, someone may be designated to meet emergency services at the closest point and guide them to the victim's location.
- Notify Health and Safety.

If an individual receives medical attention, a written authorization must be obtained from the provider indicating that the individual can get back to work and specifying any restrictions or limitations.

Risk Factors

The following are environmental risk factors for heat illness:

- Air temperature above 90°F
- Relative humidity above 40%
- Radiant heat from the sun and other sources
- Conductive heat sources such as dark-colored work surfaces
- Lack of air movement
- Physical effort needed for the work
- Use of non-breathable protective clothing and other PPE

The following are personal risk factors for heat illness:

- Lack of acclimation to warmer temperatures
- Poor general health
- Dehydration
- Alcohol consumption
- Caffeine consumption
- Previous heat-related illness
- Use of prescription medications that affect the body's water retention or other physiological responses to heat, such as beta blockers, diuretics, antihistamines, tranquilizers, and antipsychotics

Heat-Related Illnesses

Heat Rash

Heat rash is the most common health problem in hot work environments. It is caused by sweating and looks like a red cluster of pimples or small blisters. Heat rash usually appears on parts of the

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body that overlap or rub other parts of the body, such as in the groin, under arms or breasts, and in knee or elbow creases. If an individual has symptoms of heat rash, provide a cooler, less humid work environment, if possible. Advise the individual to keep the area dry and not to use ointments and creams that make the skin warm or moist because they can make the rash worse.

Heat Exhaustion

Heat exhaustion can best be prevented by being aware of one's physical limits in a hazardous environment on hot, humid days. It is especially important to drink enough clear fluids (especially water, not alcohol or caffeine) to replace fluids lost to perspiration. Signs and symptoms of heat exhaustion typically include the following:

- Profuse sweating
- Weakness and fatigue
- Nausea and vomiting
- Muscle cramps (associated with dehydration)
- Headache
- Light-headedness or fainting (fainting or loss of consciousness is potentially serious and should be treated as a medical emergency)

When you recognize heat exhaustion symptoms in an individual, you must intervene; stop the activity, and move the individual to a cooler environment. Cooling off and rehydrating with water (or electrolyte-replacing sports drinks) is the cornerstone of treatment for heat exhaustion. If the individual resumes work before their core temperature returns to normal, symptoms may quickly return.

If there is no intervention and the body's temperature regulation fails, heat exhaustion can rapidly progress to heat stroke, a life-threatening condition!

Heat Stroke

Heat stroke requires an immediate emergency medical response. The individual may stop sweating, become confused or lethargic, and may even have a seizure! Their internal body temperature may exceed 106°F. Signs and symptoms of heat stroke typically include the following:

- Absence of sweating
- Dry skin
- Agitation or strange behavior
- Dizziness, disorientation, or lethargy
- Seizures or signs that mimic those of a heart attack

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Ensure that emergency responders are summoned immediately if heat stroke is suspected. While waiting for emergency responders to arrive, move the individual to an air-conditioned environment or a cool, shady area and help them remove any unnecessary clothing. Do not leave the individual unattended. Heat stroke requires immediate medical attention to prevent permanent damage to the brain and other vital organs that can result in death.

Responsibilities

Staff need to be aware of the following:

- How heat can make them sick and how to recognize the common signs and symptoms of heat-related illness in themselves and coworkers. The four most common signs and symptoms are heat rash, heat cramps, heat exhaustion, and heat stroke.
- The environmental factors that increase risk for heat-related illness, such as higher temperatures, humidity, sunlight (working in direct sunlight makes it feel about 15°F hotter), additional sources of heat such as powered equipment and asphalt, the lack of wind, their level of physical activity, and wearing PPE or layers of clothing
- Personal factors that may increase susceptibility to heat-related illness—including age, not being acclimatized, medical conditions such as hormonal and heart issues and diabetes, dehydration, and the use of substances that can affect the body's response to heat such as drugs, alcohol, caffeine, nicotine, and medications
- The importance of removing heat-retaining PPE such as non-breathable chemical-resistant clothing during all breaks to allow the body to cool down
- How to stay well hydrated by drinking small quantities of water or other acceptable beverages frequently throughout the day
- The importance of acclimatization (to get used to the hot working conditions). It takes about 5 days to start and 2 weeks to be fully acclimated.
- How to immediately report signs or symptoms of heat-related illness they experience or observe in coworkers and how to immediately respond to prevent the situation from becoming a medical emergency
- The importance of closely observing new workers and newly assigned workers working in hot areas during a 14-day acclimatization period, as well as all workers during a heat wave. Utilize the buddy system.
- How to identify and what to do during a heat-related medical emergency (e.g., potential heat stroke)

In addition, supervisors also need to know the following:

- How to implement the heat-related illness prevention plan, including the acclimatization schedule; how to keep track of environmental conditions throughout the day including how to check weather reports; when to increase the number of breaks or stop work early; checking

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that staff are accessing shade and water (especially for mobile operations); encouraging staff to stay hydrated; and communicating with lone workers to ensure they are safe. The free OSHA-NIOSH Heat Safety Tool app could be helpful: https://www.cdc.gov/niosh/topics/heatstress/heatapp.html.

- When to provide PPE such as cooling vests and gel-filled bandanas
- What the supervisor needs to do if an individual shows signs and symptoms of possible heat-related illness, including appropriate emergency response procedures and how to transport any affected staff to a medical service provider

Sources

https://osha.oregon.gov/OSHAPubs/pubform/heat-sample-program.pdf

https://www.lni.wa.gov/safety-health/_docs/HRIAPPAddendum.doc

Cold Weather and Cold Stress Management

Observe the following procedures and practices regarding cold stress:

- Conduct an assessment to determine the types of work that could expose staff to cold stress on work sites.
- Walkways and travel ways should be sanded, salted, or cleared of snow and ice as soon as practicable.
- Take breaks in heated shelters when working in extremely cold temperatures.
- Upon entering the shelter, remove the outer layer of clothing and loosen other layers to promote evaporation of perspiration.
- Drink warm liquids to reduce susceptibility to cold stress.
- Be aware of cold stress symptoms, including shivering, numbness in the extremities, and sluggishness.
- Provide adequate insulating dry clothing to maintain warmth if work is performed in air temperatures below 40°F. Wind chill cooling rates and the cooling power of air are critical factors. The higher the wind speed and the lower the temperature in the work area, the greater the insulation value of the protective clothing required.
- If the air temperature is 32°F or less, hands should be protected.
- If only light work is involved and if the clothing on a worker may become wet on the job site, the outer layer of the clothing in use should be impermeable to water. With more severe work under such conditions, the outer layer should be water repellent, and the outer wear should be changed as it becomes wet. The outer garments should include provisions for easy ventilation to prevent wetting of the inner layer by sweat.

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- If available clothing does not give adequate protection to prevent cold injury, work should be modified or suspended until adequate clothing becomes available or weather conditions improve.
- Cold weather supplies will be regularly inspected and restocked when necessary.
- Implement a buddy system in which site personnel are responsible for observing fellow workers for early signs and symptoms of cold stress.
- Take proper precautions around snow and ice buildups to include barricading the areas and keeping people out. Snow and ice buildup can create hazards of engulfment or the snow or ice collapsing on individuals.

Signs, Symptoms, and Treatment

Cold stress can range from frostbite to hypothermia. The signs and symptoms of cold stress are listed here. The appropriate guidelines should be followed if any personnel exhibit these symptoms:

Frostbite. Frostbite is characterized by pain in the extremities and loss of manual dexterity. "Frostnip," or reddening of the tissue, is accompanied by continuous shivering and tingling or loss of sensation in the extremities.

Hypothermia. Hypothermia is characterized by pain in the extremities and loss of manual dexterity, with severe, uncontrollable shivering, and an inability to maintain the level of activity. Symptoms include excessive fatigue, drowsiness, irritability, or euphoria. Severe hypothermia includes clouded consciousness, low blood pressure, pupil dilation, cessation of shivering, unconsciousness, and possible death.

Trench foot. According to the Centers for Disease Control and Prevention, 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. Blisters may form, followed by skin and tissue dying and falling off. In severe cases, untreated trench foot can involve the toes, heel, or entire foot.

Move the individual to a warm, dry place. If the individual's clothing is wet, remove it and replace it with dry clothing. Keep the individual warm. Re-warming of the individual should be gradual to avoid stroke symptoms. Dehydration, or the loss of body fluids, may result in a cold injury due to a significant change in blood flow to the extremities. If the individual is conscious and alert, warm sweet liquids should be provided. Coffee and other caffeinated liquids should be avoided because of their diuretic and circulatory effects. Extremities affected by frostbite should be gradually warmed and returned to normal temperature. Moist compresses should be applied; begin with lukewarm compresses and slowly increase the temperature as changes in skin temperature are detected. Keep the individual warm and calm and move them to a medical facility as soon as possible.

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Cold Water Work

When the combined air and water temperature is below 90°F, field personnel working on or near water shall wear either a float coat and bib overalls (e.g., a full two-piece "Mustang" survival suit or similar) or a one-piece survival suit. Suits or float coats shall be U.S. Coast Guard-approved. If extremely cold or severe weather conditions are forecast, work activities should be postponed. Work activities will be continually reviewed, and adjustments will be made if wearing a survival suit during work activities potentially poses a hazard due to warm air temperatures or to limited mobility or agility. In addition, proximity of water work to shore and the scope, duration, and timing of work activities will be considered when stipulating the above requirement. Overall, if watercraft will be used during work, or work will be conducted near water, it is imperative that site-specific conditions are considered and evaluated so that proper safeguards and procedures are in place prior to beginning work.

Employee Training

Employees should be regularly trained on heat and cold exposure. They should be trained initially and annually regarding the health effects of heat and cold exposure. Employees responsible for supervising staff, where heat and/or cold exposure are a risk, will be trained in preventing heat- and cold-related illnesses prior to supervising employees. This includes training on Anchor QEA's heat and cold illness emergency response procedures. Additionally, all field staff should be current on first aid training to include heat and cold exposure.

Periodic Program Review

At least annually, Health and Safety will conduct a review to assess the progress and success of the program.

John Colvin	Health and Safety Manager/Industrial Hygienist
Author's Name	Title

DocuSigned by:
Timothy Shaner
7378A499700B4BB...
Approver's Digital Signature

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Revision History

Revision No.	Issue Date of Revision	Revision Changes
01	07/12/2024	Minor updates due to the Proposed Heat Injury and Illness Prevention Plan (HIIPP) Federal Standard

Attachment 2
Field Forms

Daily Log

ANCHOR QEA

PROJECT NAME: _____ **DATE:** _____

SITE ADDRESS: _____ **PERSONNEL:** _____

WEATHER: **WIND FROM:**

N	NE	E	SE	S	SW	W	NW
SUNNY		CLOUDY		RAIN		?	

LIGHT	MEDIUM	HEAVY

TEMPERATURE: ° F . ° C

[Circle appropriate units]

TIME	COMMENTS

Signature: _____

Utility Contact Prevention Checklist

NOTE: Utility mark-out requirements vary from state to state; consult state authorities before beginning work.

Purpose: This form is intended to help the Field Lead confirm that underground or overhead utilities are identified to the extent practicable and consistent with applicable regulations **PRIOR** to site work.

INVESTIGATIONS MUST NOT OCCUR UNTIL MULTIPLE LINES OF EVIDENCE INDICATE THAT SUBSURFACE OR OVERHEAD UTILITIES ARE NOT PRESENT IN THE WORK AREA

Project Name/No: _____ **Date:** _____

Field Lead: _____ **Project Address:** _____

Project Manager: _____ **Health & Safety Officer:** _____

Emergency Contact Information for One Call: _____

Duration/Summary of Work to Be Performed: _____

_____

_____

Consideration	Check		Explanation	Initial
Has the state One Call been contacted?	☐ Yes	☐ No		
Has the property owner or client been contacted for local knowledge of utilities, as applicable?	☐ Yes	☐ No		
Does the property owner or client have specific utility contact prevention procedures and, if so, have they been completed?	☐ Yes	☐ No		
Are any as-built drawings available? If so, do they show any utilities?	☐ Yes	☐ No		
Has a visual inspection of the work area(s) been completed?	☐ Yes	☐ No		
Has the potential presence of in-water utilities been assessed? (Shore markers, streets dead-ending at water's edge, etc.)	☐ Yes	☐ No		
Is evidence of electrical utilities present? (Electric meters on structures, conduits, overhead lines, light poles, etc.)	☐ Yes	☐ No		
Is evidence of water/sewer utilities present? (Water meter, hydrants, restrooms, grates in ground, etc.)	☐ Yes	☐ No		
Is evidence of telecommunications utilities present? (Fiber-optic warning signs, conduits from utility poles, wall-mounted boxes, etc.)	☐ Yes	☐ No		

Utility Contact Prevention Checklist

NOTE: Utility mark-out requirements vary from state to state; consult state authorities before beginning work.

Consideration	Check		Explanation	Initial
Is other evidence of utilities present? (Unknown ground markings, manholes or valve covers, "Call Before You Dig" signs, linear asphalt or concrete repair characteristics, liner subsidence of ground surface, pin flags or stakes, etc.)	☐ Yes	☐ No		
Has a private locating service been contacted?	☐ Yes	☐ No		
Were any utilities identified and marked out through a private locating service? If so, duplicate mark-outs on site drawings.	☐ Yes	☐ No		
Are there any fiber-optic cables, fuel lines, or high-pressure lines within 50 feet of work locations?	☐ Yes	☐ No		
If fiber-optic cables, fuel lines, or high-pressure lines are within 50 feet, has an agreement with the utility owner been established?	☐ Yes	☐ No		
Can a test borehole be advanced by hand digging, probing, post-hole digging, and/or air knifing to 5 feet below ground surface (bgs)?	☐ Yes	☐ No		
If hand digging, probing, post-hole digging, and/or air knifing to 5 feet bgs is not possible, can a non-invasive geophysical investigation be conducted? If not, why?	☐ Yes	☐ No		
Other considerations:				

NOTE: Please fill in second page and attach additional reports, drawings, or other information, as necessary.

Confirmation Number: _____

Contact Name: _____ **Organization:** _____

Contact Date: _____ **Contact Time:** _____

Response: _____

_____

_____

_____

Completed by:

_____ _____ _____

Printed Name Signature Date

Utility Contact Prevention Checklist

NOTE: Utility mark-out requirements vary from state to state; consult state authorities before beginning work.

Contractor:

Printed Name	Signature	Date

ANCHOR QEA

LOG OF EXPLORATORY BORING

CLIENT/PROJECT NAME:	BORING #
PROJECT NUMBER:	DATE BEGAN:
GEOLOGIST/ENGINEER:	DATE COMPLETED:
DRILLING CONTRACTOR:	TOTAL DEPTH:
DRILLING METHOD:	SHEET OF
HOLE DIAMETER:	

OTHER*	WELL OR PIEZOMETER DETAILS	SAMPLING DATA						DEPTH IN FEET	SOIL GROUP SYMBOL (USCS)	Field location of boring / LITHOLOGIC DESCRIPTION
		SAMPLING METHOD	SAMPLE NUMBER	FID / PID (ppm)	RECOVERY (feet)	BLOWS / 6 INCHES	DEPTH SAMPLED			

Remarks:

ANCHOR QEA

Investigation-derived Waste Drum Log

Drum Number:	Investigation-derived Waste (IDW) Medium:
Accumulation Start Date:	Manifest Number:
Accumulation End Date:	Manifest Date:
Transport Contractor:	Lab ID Number:
Transport Pick-up Date:	Haz Characterization Date:
Manifest Copy Received from Waste Facility: _____	Date:

Samples placed in Drum	Date of Placement	Comment	Initials

IDW Medium:

Soil

Soiled PPE

MONITORING WELL DECOMMISSIONING RECORD

WELL/BORING NO:

PROJECT NUMBER: _____ **START DATE:** _____

PROJECT NAME: _____ **FINISH DATE:** _____

LOCATION: _____

DRILLING CONTRACTOR: _____

CLIENT: _____ **INSPECTOR:** _____

WELL SCHEMATIC & CONSTRUCTION MATERIALS

SKETCH

WELL TYPE

☐ Stickup
☐ Flushmount

OUTER CASING

☐ PVC ☐ Stainless ☐ Carbon
☐ Other _____

BOREHOLE DIMENSION

Diameter (in): _____

Total Depth (ft): _____

SURFACE SEAL

☐ Concrete ☐ Cement Grout ☐ Soil
☐ Other _____

Total Depth (ft): _____

FILTER PACK SEAL

☐ Bentonite Pellets ☐ Bentonite Grout
☐ Cement Grout
☐ Other _____

Total Depth (ft): _____

FILTER PACK

☐ Sand ☐ Gravel ☐ Soil
☐ Other _____

Total Depth (ft): _____

WELL CASING

☐ PVC ☐ Stainless ☐ Carbon
☐ Other _____

Diameter (in): _____

Total Depth (ft): _____

WELL SCREEN

☐ PVC ☐ Stainless ☐ Carbon
☐ Other _____

Diameter (in): _____

Total Depth (ft): _____

WELL SUMP

Total Depth (ft):

Volume of Well/Borehole (in gallons) = π X well/borehole radius (in feet) squared X length of well/borehole (in feet) X 7.481 (gallons per cubic foot)

DECOMMISSIONING INFORMATION

CASING REMOVAL METHOD:

_____

_____

GROUTING

Calculated Borehole Volume: _____

Cement Type: _____

Cement Quantity (lbs): _____

Bentonite Quantity (lbs): _____

Water Quantity (gal): _____

Actual Grout Volume: _____

SURFACE FINISH

_____

_____

_____

_____

_____

COMMENTS

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

ANCHOR QEA

TEST PIT LOG
MATERIAL DESCRIPTION

Test Pit No.	
Sheet No.	1 of 3
Project No.	
Date Began	
Date Finished	
Surface Elev.	

Project Name:	
Client:	
Location:	

METHOD OF INVESTIGATION

Operator:
Inspector:
Equipment:
Type:
Bucket Size:

GROUNDWATER OBSERVATIONS

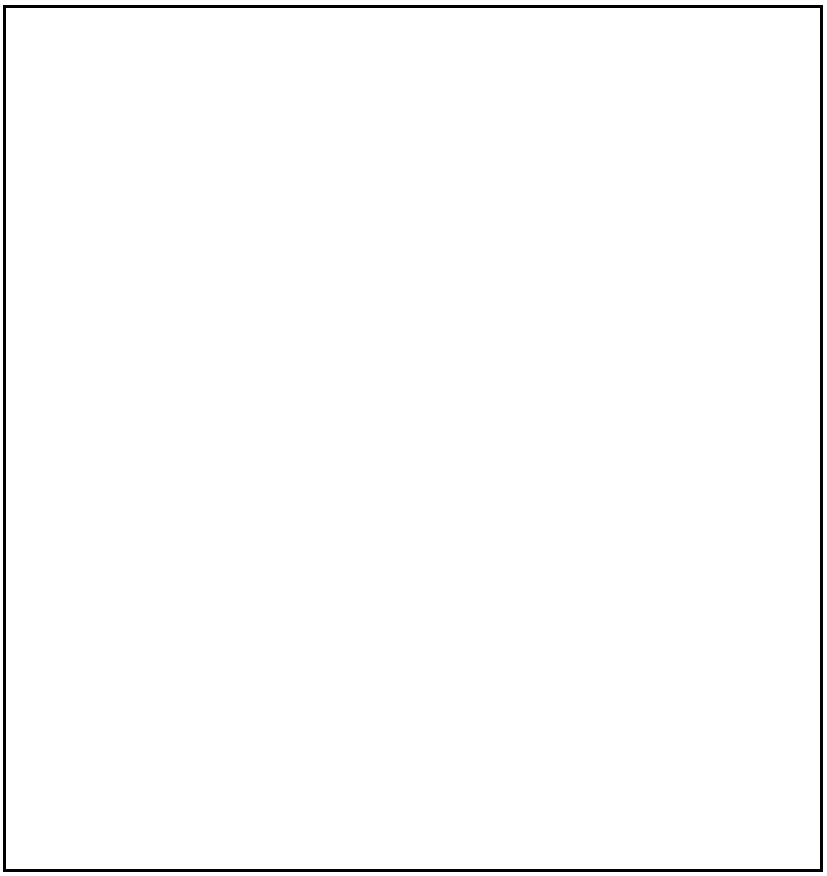
Date	Time	Depth (Ft.)	Comment

VISUAL CLASSIFICATION OF MATERIAL

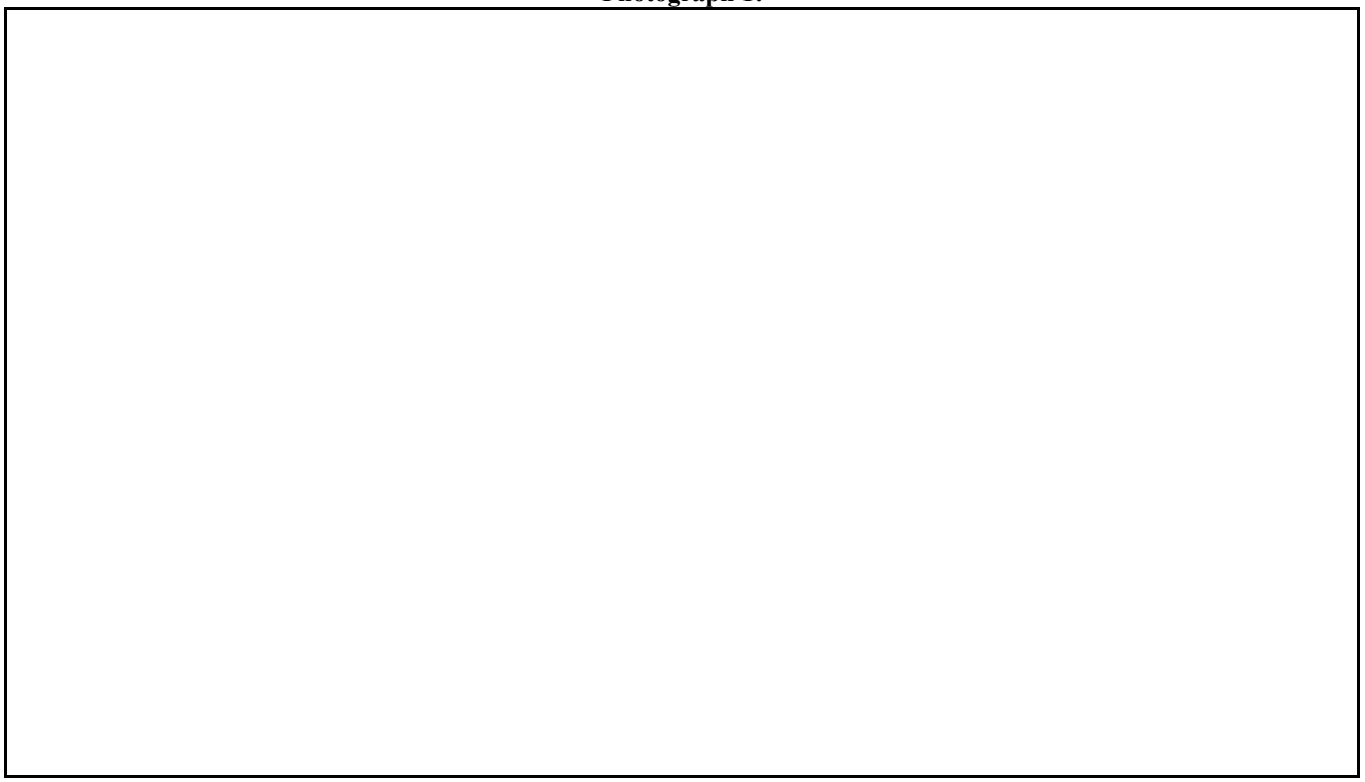
Depth Scale (Feet)	Sample No.	Sample Depth (Ft.) From	Sample Depth (Ft.) To	PID/FID (ppm)	c - coarse m - medium f - fine	and - 35 to 50% / some - 20 to 35% little - 10 to 20% / trace - 0 to 10%	
0							
1							
2							
3							
4							
5							
6							
7							
8							
9							
10							
11							
12							
13							
14							
15							
16							
17							
18							
19							
20							

Remarks:

ANCHOR QEA	TEST PIT LOG PHOTOGRAPHS	Test Pit No.	
		Sheet No.	2 of 3
		Project No.	



Photograph 1:



Photograph 2:

Remarks:

ANCHOR QEA	TEST PIT LOG SKETCHES/	Test Pit No.
		Sheet No. 3 of 3
		Project No.

Remarks:

Chain of Custody Record and Laboratory Analysis Request

Laboratory Number:
Date:
Project Name:
Project Number:
Project Manager:
Phone Number:
Shipment Method:

Line	Field Sample ID	Collection Date/Time	Matrix	No. of Containers	Test Parameters: Dissolved Metals	Total Metals	Hexavalent Chromium	PAHs	TPH-Gx/BTEX	TPH-Dx															Comments/Preservation
1																									
2																									
3																									
4																									
5																									
6																									
7																									
8																									
9																									
10																									
11																									
12																									
13																									
14																									
15																									

Notes:

Relinquished By:	Company: Anchor QEA
Signature/Printed Name	Date/Time

Received By:	Company:
Signature/Printed Name	Date/Time

Relinquished By:	Company:
Signature/Printed Name	Date/Time

Received By:	Company:
Signature/Printed Name	Date/Time

Distribution: A copy will be made for the laboratory and client. The Project file will retain the original.

Field Deviation Form

Project Name:
Form No.:
Deviation Subject:
Standard Procedure for Field Activity:
Reason for Deviation:
Description of Deviation:
Special Equipment, Materials, or Personnel Required:

Initiator's Name:	**Date:**
Project Manager:	**Date**

Daily Safety Briefing Form

ANCHOR QEA

Date: _____

Project No: _____

Project Name: _____

Submit a Playing It Safe Event

Person Conducting Meeting: _____ **Health & Safety Officer:** _____ **Project Manager:** _____

TOPICS COVERED: *Highlighted topics are required*

- ☐ Emergency Procedures and Evacuation Route
- ☐ Directions to Hospital
- ☐ HASP Review and Location
- ☐ Safety Equipment Location
- ☐ Proper Safety Equipment Use
- ☐ Employee Right-to-Know/ SDS Location
- ☐ Fire Extinguisher Location
- ☐ Eye Wash Station Location
- ☐ Buddy System
- ☐ Self and Coworker Monitoring
- ☐ Lines of Authority
- ☐ Communication
- ☐ Site Security
- ☐ Vessel Safety Protocols
- ☐ Work Zones
- ☐ Vehicle Safety and Driving/ Road Conditions
- ☐ Equipment Safety and Operation
- ☐ Proper Use of PPE
- ☐ Decontamination Procedures
- ☐ Near Miss Reporting Procedures
- ☐ Lifting Techniques
- ☐ Slips, Trips, and Falls
- ☐ Hazard Exposure Routes
- ☐ Heat and Cold Stress
- ☐ Overhead and Underfoot Hazards
- ☐ Chemical Hazards
- ☐ Flammable Hazards
- ☐ Biological Hazards
- ☐ Eating/Drinking/Smoking
- ☐ Reviewed Prior Lessons Learned
- ☐ Field Team Medical Conditions for Emergency Purposes (Confidential): _____
- ☐ Other: _____

Weather Conditions: _____

Daily Work Scope: _____

Site-specific Hazards: _____

Safety Comments: _____

Attendees

Printed Name	Signature

End of Day Wellness Check

ANCHOR QEA

Surface Soil Field Sample Record

Project Name: **Project No:**

Sampling Crew: _____

Sample Date: _____ Sampling Method: _____

Station Coordinates: N / Lat. _____ Weather: _____

E / Long. _____

Datum: NAD 83 / WGS 84

Sample Number: _____

Analysis: Metals / TBTs / SVOCs / VOCs / PCBs / Pest Other: _____

TS / TVS / Grain Size / TOC / Ammonia / Sulfides Other: _____

(Circle Appropriate Analyses)

Sample Depth: _____ Time:_____

Soil Type:	Soil Color:	Density:	Soil Odor:	
cobble	D.O.	Very soft/Loose	none	H2S
gravel	gray	soft/loose	slight	Petroleum
sand C M F	black	mod dense/stiff	moderate	other:
silt clay	brown	dense/stiff	strong	
organic matter	brown surface	very dense/stiff	overwhelming	

Comments:

Sample Location Sketch:

Sample Location Description:

Recorded by:_____

Attachment 3
Standard Operating Procedures

Standard Operating Procedure 1.06 – Hand-Held Bucket Auger Sampling

DRAFT

Standard Operating Procedure 1.06 – Hand-Held Bucket Auger Sampling

Standard Operating Procedure Acknowledgment Form

Project Number: 230002-05.09 Project Name: Former Intalco Smelter Site

My signature below certifies that I have read and understand the procedures specified in this standard operating procedure.

Date	Name (print)	Signature	Company

Purpose

The purpose of this standard operating procedure (SOP) is to establish uniform procedures for the collection of soil samples using a hand-held bucket auger, otherwise known as a hand auger.

This SOP describes the equipment, field procedures, materials, and documentation procedures necessary to perform the activities described in the previous paragraph. The details within this SOP should be used in conjunction with the associated project planning documents, such as the *Sampling and Quality Assurance Project Pla*n (SQAPP) and other project-specific SOPs.

Scope and Application

This SOP is applicable to the collection of soil samples using a hand-held bucket auger, otherwise known as a hand auger. Substantive deviations from the procedures detailed in this SOP will be recorded in the field log book or Daily Log and in a Field Deviation Form.

Health and Safety Warnings

Health and safety issues for the work associated with this SOP, including physical, chemical, and biological hazards, are addressed in the project *Health and Safety Plan* (HASP). The HASP will be followed during all activities conducted by Anchor QEA staff.

For all subsurface sampling activities, underground utility clearance will be conducted in accordance with project-specific planning documents.

Staff Qualifications

Field staff executing these procedures will have read, must be familiar with, and must comply with the requirements of this SOP and all associated project planning documents, such as the SQAPP and other project-specific SOPs. Field staff will be under the direct supervision of qualified professionals who are experienced in performing the tasks described in this SOP, as approved by the project manager.

Field Records

The field records associated with the activities described in this SOP are critical project documents that will be used in data interpretation. Field logs may be included in the subsequent reports presenting the results of the field program.

Field team members will keep a daily record of significant events, observations, and measurements in the field logs. The required field logs and records are included in Attachment 1 of the SQAPP and are described as follows:

- Daily Log (or field log book, as dictated by project planning documents)

- Boring Log
- Utility Clearance Checklist
- SOP Deviation Log

Equipment and Supplies

The following is a list of equipment that may be necessary to carry out the activities in this SOP. Additional equipment may be required, depending on field conditions.

- Approved project-specific planning documents, including the *Demolition Interim Action Work Plan*, HASP, SQAPP, and other project SOPs
- Appropriate personal protective equipment (PPE) and clothing as defined in the HASP
- Decontamination equipment
- Large stainless-steel mixing bowl and spoon
- Laboratory-supplied sample containers, insulated coolers, and ice
- Chain-of-custody forms, custody seals, sample labels
- Ziplock bags
- Indelible ink pen
- Tape measure (ideally with engineer scale)
- Putty knife or other tools for inspection of recovered soil samples
- Camera
- Whiteboard with erasable markers
- Air monitoring equipment, as defined by the HASP
- Soil description aids (e.g., Munsell color chart and Unified Soil Classification System [USCS] grain or size charts)
- Field log book; field records included in Attachment 1 of the SQAPP
- Safety knife or scissors
- Field table (recommended)

Procedures

Introduction

Soils can be sampled in a variety of ways. One way is with the use of a hand-held steel auger that can be used for digging or for sample collection. Most bucket augers consist of an auger bucket, shafts of various lengths, and a T-grip handle. Auger buckets come in various sizes but are typically 3 inches in diameter and collect soil samples in a 6-inch interval. All parts are either threaded and screwed together or held together with pins. The nose of the bucket is shaped so that it threads into the soil and soil is forcefully driven into the bucket as the handle is twisted in a corkscrew action. The following procedures define the steps to be taken when sampling dry or moist solids with a stainless-steel bucket auger.

Sample Collection

The following list provides a summary for sample collection:

1. Locate the sample station as directed in the project-specific planning documents. Label containers with sample labels prior to filling.
2. Don a new pair of nitrile or latex gloves at each sample location.
3. Expose the soil surface by clearing an approximately 1-square-foot area at the sampling site of any rocks or organic material greater than approximately 3 inches in size. Note any material removed from the sampling site in the field log book.
4. Excavate the soil to the depth specified in the project-specific planning documents with a decontaminated stainless-steel sampling tool (i.e., shovel, scoop, trowel, or spoon).
5. Using a long-handled, stainless-steel hand auger, several layers of soil can be removed at a time, minimizing cross-contamination between layers. This method is ideal for moist soils where small soil clumps do not fall to the top of lower sections. The core can be replaced by a newly decontaminated core by unscrewing the core from the long handlebar.
6. Mark the handle of the auger to confirm proper sampling depths are achieved.
7. Advance a thoroughly cleaned and decontaminated bucket auger into the soil incrementally by twisting the handle in a clockwise motion.
8. Exercise proper back care when pulling a stuck auger out of a hole or when turning an auger for long periods. Wear work gloves to prevent blisters.

Sample Processing

The following list provides a summary for sample processing:

1. If required for analysis, first collect volatile organic compound samples with a minimum of disturbance (prior to any homogenization) from a discrete location, placing the samples in the appropriate containers with no headspace and sealing the container tightly. Label containers prior to filling.
2. Once the corer is full or has attained the penetration depth specified in the SQAPP, use a decontaminated stainless-steel spoon to transfer the soil into a decontaminated stainless-steel bowl, and cover the bowl with foil until an adequate sample volume (as stipulated in the SQAPP) has been collected for that station.
3. If the soil is difficult to remove from the hand corer, then the contents can be loosened by carefully tapping on the outside of the corer with a separate implement from the one used to collect and composite the sample (i.e., the decontaminated spoon). Care should always be taken to ensure that any substance on the outside of the corer does not enter the sample collection bowl.
4. Describe the soil in accordance with the USCS.

5. Thoroughly mix and homogenize the sample using disposable equipment or a decontaminated stainless-steel spoon until uniform in color and texture.
6. If required for analysis, first collect samples for grain-size tests before removing any large rocks from the homogenized soil.
7. Remove samples of the homogenized soil from the mixing bowl with the decontaminated stainless-steel spoon and place in the appropriate size sample container. Avoid touching the material with gloves. Label sample containers before filling.

Quality Assurance/Quality Control

It is the responsibility of the field team leader to periodically check and ensure that procedures are in conformance with those stated in this SOP.

Standard Operating Procedure 1.10 – Soil Sample Collection

DRAFT

Standard Operating Procedure 1.10 – Soil Sample Collection

Standard Operating Procedure Acknowledgment Form

Project Number: 230002-05.09 Project Name: Former Intalco Smelter Site

My signature below certifies that I have read and understand the procedures specified in this standard operating procedure.

Date	Name (print)	Signature	Company

Purpose

The purpose of this standard operating procedure (SOP) is to establish uniform procedures for the collection of soil samples.

This SOP describes the equipment, field procedures, materials, and documentation procedures necessary to perform the activities described in the previous paragraph. The details within this SOP should be used in conjunction with the associated project planning documents, such as the *Sampling and Quality Assurance Project Pla*n (SQAPP) and other project-specific SOPs.

Scope and Application

This SOP is applicable to the collection of soil samples, including surface grabs, vertical profiles, and lead isotope analysis splits. This SOP is based on the procedures specified in the *Sampling Quality Assurance Project Plan* (SQAPP).

Health and Safety Warnings

Health and safety issues for the work associated with this SOP, including physical, chemical, and biological hazards, are addressed in the project *Health and Safety Plan* (HASP). The HASP will be followed during all activities conducted by Anchor QEA staff.

Staff Qualifications

Field staff executing these procedures will have read, must be familiar with, and must comply with the requirements of this SOP and all associated project planning documents, such as the SQAPP and other project-specific SOPs. Field staff will be under the direct supervision of qualified professionals who are experienced in performing the tasks described in this SOP, as approved by the project manager.

Field Records

Surface soil sample collection field activities will be recorded in the Collector Tablet and on printed field forms. The Collector Tablet will save the date and time of sample collection, sample identification number, geographic coordinates, and depth intervals. Field forms should be kept on water-resistant paper, and field documentation will be made in indelible ink. Entries for each day will begin on a new form.

The required field logs and records are included in Attachment 1 of the SQAPP and are described as follows:

- Daily Log
- Health and Safety Briefing
- Surface Soil Field Sample Record

- SOP Deviation Form
- Chain-of-custody (COC) forms

General requirements include the following:

- Appropriate header information should be documented on each page, including project name, date, field team, and author.
- Information fields that are not applicable should be noted "NA" or with other appropriate notations.
- A single line should be drawn through incorrect entries, and the corrected entry should be written next to the original strikeout. Strikeouts are to be initialed and dated by the originator.
- Applicable units of measurement will be recorded with entry values.
- Field records will be maintained in project files unless otherwise specified by a client or stipulated by a contract.

Documents generated during the field effort are controlled documents that become part of the project file.

Documentation Entries

The Daily Log is intended to provide sufficient data and observations to enable participants to reconstruct events that occurred during the sampling period and provide certification that all necessary requirements were met. The Deviation Form will record any modifications to the procedures and plans identified in the SQAPP and HASP.

A chronology of field events will be recorded. General entry requirements include the following:

- Visitors to the sampling or processing areas
- Summary of pertinent project communications with the client, regulators, or other visitors
- Other contractors working in the sampling area
- A description of the day's field activities, in chronological sequence using military time notation (e.g., "9:00 a.m." as "0900" and "5:00 p.m." as "1700")
- Field equipment used
- General weather conditions, including temperature, description of wind (e.g., light wind from the north), and general conditions during sampling (e.g., sunny, overcast, light rain)
- If applicable, reference to specific forms used for collection of data
- If applicable, subcontractor progress and/or problems encountered
- Changes in the scope of work
- Other unusual events

Sample Collection Data

Sample collection data will be documented on a Surface Soil Field Sample Record form. Entries may include the following:

- Sample identification number, sample collection time and date, geographic coordinates, and depth interval
- Field team collecting the sample
- Sample collection method
- Physical description of the sample, per Unified Soil Classification System (USCS) requirements
- Quality control (QC)-related samples collected (e.g., field duplicates)
- Container description and sample volume
- Pertinent technical comments and field observations

Equipment and Supplies

The following is a list of equipment that may be necessary to carry out the procedures contained in this SOP. Additional equipment may be required, pending field conditions:

- Approved documents, including the SQAPP and HASP
- PPE and clothing as defined in the HASP
- Collector Tablet with differential global positioning system (DGPS)
- Digital camera
- Field forms
- COC forms
- Dry-erase board and markers
- Ballpoint black ink pens or Sharpie permanent markers (or equivalent)
- USCS Field Reference Guide
- Stainless-steel hand auger
- Stainless-steel hand shovels
- XRF analyzer, if available
- Disposable plastic samplers
- Flagging
- Bowls and spoons
- Measuring tape
- Plastic sheeting
- Duct tape
- Loppers
- Tools
- Work gloves
- Laboratory sample containers, labels, cooler

- Quality assurance (QA)/QC sample containers and deionized water
- Plastic resealable bags
- Bubble wrap
- Packing tape
- 5-gallon buckets with lids
- Alconox, spray bottle, distilled water
- Scrub brushes
- Aluminum foil
- Paper towels
- Heavyweight garbage bags

Field Procedures

At each sampling location, a vertical profile will be collected using a decontaminated stainless-steel soil sampling hand auger or stainless-steel spoons or scoops.

The following procedures for sample collection and processing will be followed:

- Navigate to the target sampling location using a DGPS.
- Record the actual sample location in the Collector Tablet.
- Photograph the sample location (mark the location with flagging, include white board with Sample ID, Date/Time, and capture enough background for frame of reference).
- If grass or other plants are present, cut the plants to ground level and remove before the sample is collected.
- Exclude gravel and rocks greater than 2.5 centimeters (cm) from the sample.
- Collect a soil sample from the prescribed interval until sufficient volume for all chemical testing has been obtained.
- Photograph each sample interval (include white board with Sample ID, Date/Time).
- Qualitatively describe the soil samples according to USCS guidelines.
- Using a decontaminated stainless-steel spoon, fill pre-labeled, sample containers for all proposed analyses. *(Note: for the vertical profiles, each sample interval will be placed in its own sample container.)*
- Immediately place filled and sealed sample containers in a cooler, while following the handling and COC procedures. The required sample volumes, preservation, and maximum holding times for the categories of analytes are presented in the SQAPP.
- After completing the sampling at a given location, sampling equipment will be decontaminated using the procedures outlined in SOP 7.02.

Quality Assurance/Quality Control

It is the responsibility of the field team leader to periodically check and ensure that procedures are in conformance with those stated in this SOP.

Standard Operating Procedure 7.01 – Field Records

DRAFT

Standard Operating Procedure 7.01 – Field Records

Standard Operating Procedure Acknowledgment Form

Project Number: 230002-05.09 Project Name: Former Intalco Smelter Site

My signature below certifies that I have read and understand the procedures specified in this standard operating procedure.

Date	Name (print)	Signature	Company

Purpose

The purpose of this standard operating procedure (SOP) is to establish uniform procedures for the documentation of field activities during implementation of field tasks.

This SOP describes the equipment, field procedures, materials, and documentation procedures necessary to perform the activities described in the previous paragraph. The details within this SOP should be used in conjunction with the associated project planning documents, such as the *Sampling and Quality Assurance Project Pla*n (SQAPP) and other project-specific SOPs.

Scope and Application

This SOP is applicable to maintaining sample collection forms, electronic forms, photographs, and electronically recorded field measurements. Substantive deviations from the procedures detailed in this SOP will be recorded in the field log book or Daily Log and in a Field Deviation Form.

Health and Safety Warnings

Health and safety issues for the work associated with this SOP, including physical, chemical, and biological hazards, are addressed in the project *Health and Safety Plan* (HASP). The HASP will be followed during all activities conducted by Anchor QEA staff.

Staff Qualifications

Field staff executing these procedures will have read, must be familiar with, and must comply with the requirements of this SOP and all associated project planning documents, such as the SQAPP and other project-specific SOPs. Field staff will be under the direct supervision of qualified professionals who are experienced in performing the tasks described in this SOP, as approved by the project manager.

Field Records

The field records associated with the activities described in this SOP are critical project documents that will be used in data interpretation. Field logs may be included in the subsequent reports presenting the results of the field program.

Field team members will keep a daily record of significant events, observations, and measurements in the field logs. The required field logs and records are included in Attachment 1 of the SQAPP and are described as follows:

- Daily log (or field log book, as dictated by project planning documents)
- Field forms
- SOP Deviation Log

Equipment and Supplies

The following is a list of equipment that may be necessary to carry out the activities in this SOP. Additional equipment may be required, depending on field conditions.

- Approved project-specific planning documents, including the *Demolition Interim Action Work Plan*, HASP, SQAPP, and other project SOPs
- Daily logs
- Field forms and records
- Waterproof pen
- Camera
- Electronic field application (if applicable)
- Whiteboard with erasable markers

Field Documentation Procedures

Field team members will keep a daily record of significant events, observations, and measurements in log books, paper field forms or electronically. If field forms are used, all field activities will be recorded on forms specific to the collection activity and will be maintained by the field team leader. Field notes should be maintained for all field activities (e.g., the collection of samples or the gathering of environmental data). The on-site field representative will record on the daily log forms information pertinent to the field task, including, at a minimum, the following information:

- Project name
- Field staff on site
- Health and safety discussions
- Location and sample IDs
- Observations made during sample collection, including weather conditions, complications, and other details
- Sampling method and description of activities
- Name, telephone number, and category of site visitors (e.g., client, regulatory, municipal, or general public)
- Meetings in the field associated with sampling or installation activities

Field notes shall be written in water-resistant paper log books or on preprinted forms, and all field documentation will be made using an indelible, waterproof-ink pen. Corrections will be made by drawing a single line through the error, writing in the correct information, and then dating and initialing the change. Blank pages or lines in the field log book will be lined out, dated, and initialed at the end of each sampling day. The field forms will be scanned into the project file directory as convenient during the sampling event or upon completion of each sampling event.

If an electronic field application is used, the above information will be entered into a field laptop, tablet, or smartphone. Field logs may be printed if hard copies are required. Data will be uploaded to a data management system.

Quality Assurance/Quality Control

It is the responsibility of the field team leader to periodically check and ensure that procedures are in conformance with those stated in this SOP.

Standard Operating Procedure 7.02 – Equipment Decontamination

DRAFT

Standard Operating Procedure 7.02 – Equipment Decontamination

Standard Operating Procedure Acknowledgment Form

Project Number: 230002-05.09 Project Name: Former Intalco Smelter Site

My signature below certifies that I have read and understand the procedures specified in this standard operating procedure.

Date	Name (print)	Signature	Company

Purpose

The purpose of this standard operating procedure (SOP) is to establish uniform procedures for the decontamination of non-dedicated sampling equipment, instruments, and other materials used during implementation of field tasks at the project site that come in contact with contaminated site media. Decontamination is the process of neutralizing, washing, and rinsing field sampling equipment to clean field equipment and minimize the potential for sample cross-contamination.

This SOP describes the equipment, field procedures, materials, and documentation procedures necessary to perform the activities described in the previous paragraph. The details within this SOP should be used in conjunction with the associated project planning documents, such as the *Sampling and Quality Assurance Project Pla*n (SQAPP) and other project-specific SOPs.

Scope and Application

This SOP is applicable to decontamination of all equipment and instruments that are in direct contact with the sample medium. Substantive deviations from the procedures detailed in this SOP will be recorded in the field log book or Daily Log and in a Field Deviation Form.

Health and Safety Warnings

Health and safety issues for the work associated with this SOP, including physical, chemical, and biological hazards, are addressed in the project *Health and Safety Plan* (HASP). The HASP will be followed during all activities conducted by Anchor QEA staff.

Staff Qualifications

Field staff executing these procedures will have read, must be familiar with, and must comply with the requirements of this SOP and all associated project planning documents, such as the SQAPP and other project-specific SOPs. Field staff will be under the direct supervision of qualified professionals who are experienced in performing the tasks described in this SOP, as approved by the project manager.

Field Records

The field records associated with the activities described in this SOP are critical project documents that will be used in data interpretation. Field logs may be included in the subsequent reports presenting the results of the field program.

Field team members will keep a daily record of significant events, observations, and measurements in the field logs. The required field logs and records are included in Attachment 1 of the SQAPP and are described as follows:

- Daily Log (or field log book, as dictated by project planning documents)

- SOP Deviation Log

Equipment and Supplies

The following is a list of equipment that may be necessary to carry out the activities in this SOP. Additional equipment may be required, depending on field conditions.

- Approved project-specific planning documents, including the *Demolition Interim Action Work Plan*, HASP, SQAPP, and other project SOPs
- Personal protective equipment (PPE), as required by the HASP
- Scrub brushes
- Plastic wash and rinse buckets or tubs
- Phosphate-free biodegradable detergent (e.g., Liquinox or Alconox)
- Deionized water (or distilled water)
- Spray bottles
- Aluminum foil
- Tap water source (any treated municipal water supply)
- Investigation-derived waste (IDW) storage containers

Equipment Decontamination Procedures

Generally, dedicated sampling equipment will be used during investigations (i.e., stainless-steel trowels and shovels, plastic scoops, groundwater sample bailers). However, equipment that is not dedicated (i.e., non-dedicated drilling equipment) will be decontaminated prior to each use to mitigate the potential for cross-contamination of the samples collected for laboratory analysis.

The following steps will be used to decontaminate supporting equipment that is not in direct contact with samples or contaminated media:

1. Equipment will be rinsed with tap or site water and wiped down as appropriate.
2. Rinse water will be contained, and any wipes used to clean will be containerized as IDW.

The following decontamination steps will be used to decontaminate sampling equipment that comes into contact with sample media in areas of suspected impacts. Decontamination of all items will follow the *Field Branches Quality Management Plan* (EPA 2009) and *Test Methods for Evaluating Solid Waste, Physical/Chemical Methods* (SW-846 protocols; EPA 2013). The decontamination procedure for sampling equipment is as follows:

1. Rinse with tap or site water.
2. Wash with phosphate-free detergent and sufficiently scrub to remove any remaining sample material.
3. Rinse with tap water.
4. Rinse with distilled water.

5. If significant contamination is anticipated, the following steps may be added:
    a. Rinse with 10% nitric acid (when sampling for metals).
    b. Rinse with methanol (when sampling for volatiles).
6. Rinse with hexane (when sampling for polychlorinated biphenyls [PCBs]).
7. Rinse with distilled water.
8. Air dry sampling equipment.
9. Use immediately or cover all decontaminated items with aluminum foil once dry.

Waste Management

Waste generated during decontamination procedures must be placed in appropriate containers and labeled. Be sure to separate liquids from PPE and solids. Waste materials will be stored securely in a client-approved location. Handling and disposal of waste procedures will be managed in accordance with project-specific planning documents.

Quality Assurance/Quality Control

It is the responsibility of the field team leader to periodically check and ensure that procedures are in conformance with those stated in this SOP.

References

EPA (U.S. Environmental Protection Agency), 2009. *Field Branches Quality Management Plan*. May 8, 2009.

EPA, 2013. *Test Methods for Evaluating Solid Waste, Physical/Chemical Methods*. SW-846. Available at: http://www.epa.gov/osw/hazard/testmethods/sw846/online/index.htm.

Standard Operating Procedure 7.07 – Sample Custody

DRAFT

Standard Operating Procedure 7.07 – Sample Custody

Standard Operating Procedure Acknowledgement Form

Project Number: 230002-05.09 Project Name: Former Intalco Smelter Site

My signature below certifies that I have read and understand the procedures specified in this standard operating procedure.

Date	Name (print)	Signature	Company

Purpose

The purpose of this standard operating procedure (SOP) is to establish uniform procedures to ensure the integrity of sample custody throughout the sample collection and shipping process.

This SOP describes the equipment, field procedures, materials, and documentation procedures necessary to perform the activities described in the previous paragraph. The details within this SOP should be used in conjunction with the associated project planning documents, such as the *Sampling and Quality Assurance Project Pla*n (SQAPP) and other project-specific SOPs.

Scope and Application

This SOP is applicable to the storage requirements, chain-of-custody (COC) procedures, and delivery of samples to analytical laboratories for chemical and physical analyses. Substantive deviations from the procedures detailed in this SOP will be recorded in the field log book or Daily Log and in a Field Deviation Form.

Health and Safety Warnings

Health and safety issues for the work associated with this SOP, including physical, chemical, and biological hazards, are addressed in the project *Health and Safety Plan* (HASP). The HASP will be followed during all activities conducted by Anchor QEA staff.

Staff Qualifications

Field staff executing these procedures will have read, must be familiar with, and must comply with the requirements of this SOP and all associated project planning documents, such as the SQAPP and other project-specific SOPs. Field staff will be under the direct supervision of qualified professionals who are experienced in performing the tasks described in this SOP, as approved by the project manager.

Field Records

The field records associated with the activities described in this SOP are critical project documents that will be used in data interpretation. Field logs may be included in the subsequent reports presenting the results of the field program.

Field team members will keep a daily record of significant events, observations, and measurements in the field logs. The required field logs and records are included in Attachment 1 of the SQAPP and are described as follows:

- COC Form
- SOP Deviation Log

Equipment and Supplies

The following is a list of equipment that may be necessary to carry out the activities in this SOP. Additional equipment may be required, depending on field conditions.

- Approved project-specific planning documents, including the *Demolition Interim Action Work Plan*, HASP, SQAPP, and other project SOPs
- Bound, waterproof field logbooks
- Black-ink ballpoint pens or permanent markers (or equivalent)
- Custody tape or seals
- Sample labels
- COC forms (use waterproof paper if available)
- Waterproof bags for COCs
- Clear-plastic sealing tape
- Coolers
- Temperature blanks
- Trash bags for cooler liners

Sample Chain-of-Custody Procedures

As few people as possible should handle the samples. Each sample generated in the field will be assigned a unique identification number. A label will be attached to each bottle used for sampling. Labels will be applied to the container, not the lid, whenever possible. The lid will also be labeled with the sample identification written in waterproof, indelible black ink as a backup for the container label.

When practical, the project identification, sample matrix, laboratory designation/analyses requested, field sample identification code, and preservation will be typed or printed onto the label before sampling. Completion of the sample labels (including the field team staff's initials and the date and time of sample collection) will occur prior to filling the sample bottles, if possible, to avoid placing labels on wet surfaces. Labels will be completed in waterproof, indelible black ink. Individual sample bottles will be properly labeled and securely sealed before being placed in the container for shipment to the laboratory.

Samples are considered to be in one's custody if they are as follows: 1) in the custodian's possession or view; 2) in a secured location (under lock) with restricted access; or 3) in a container that is secured with an official seal(s) such that the sample cannot be reached without breaking the seal(s).

Field COC procedures shall be followed from the time a sample is collected until it is relinquished to the analytical laboratory (either in person or to a shipper). The principal document used to track possession and transfer of samples is the COC form. A COC form shall be filled out in duplicate and

initiated when the first sample is collected and updated continuously through the sampling event. A new COC form shall be prepared for each day of field sampling. Information to be entered on the COC form includes the following:

- Project identification (project and task number)
- Sample identification
- Time and date of sampling
- Sample matrix (e.g., sediment, water, and air)
- Number of containers for each sample
- Analyses requested
- Preservative, if applicable
- Grab or composite sample designation, if applicable
- Signatures of field team staff/sample custodian
- Field team staff's remarks
- Destination (e.g., laboratory name and location)
- Page number (e.g., 1 of 2, 2 of 2)
- Air bill or other shipping number, if applicable
- Any special instructions

All data entries will be made using a waterproof, indelible ink pen. Corrections will be made by drawing a single line through the error, writing in the correct information, and then dating and initialing the change. Blank lines and spaces on the COC form will be lined-out, dated, and initialed by the individual maintaining custody. A COC form will accompany each cooler of samples to the analytical laboratories. Each person who has custody of the samples will sign the COC form and ensure that the samples are not left unattended unless properly secured. One copy of the COC form should be placed in a waterproof bag and attached to the inside of each sample cooler. In the event that sediment subsamples are being sent to different laboratories, separate COC forms should be prepared for each laboratory and each sample cooler. A custody seal should be placed on the sample cooler when it is not in the custody of a member of the sampling team.

When samples are relinquished, either to the laboratory or for shipment, the COC form must be completed by the sample deliverer (except in the case of a commercial carrier such as FedEx). It should include the printed and signed name of the deliverer, the organization that person represents, date and time of sample relinquishment, and method of shipment, if appropriate. A completed copy of the laboratory-verified COC form will be distributed via email or fax to the project chemist within 24 hours of sample receipt at the laboratory. The original will be retained by the laboratory.

Quality Assurance/Quality Control

It is the responsibility of the field team leader to periodically check and ensure that procedures are in conformance with those stated in this SOP.

Standard Operating Procedure 7.08 – Sample Shipping and Handling

DRAFT

Standard Operating Procedure 7.08 – Sample Shipping and Handling

Standard Operating Procedure Acknowledgment Form

Project Number: 230002-05.09 Project Name: Former Intalco Smelter Site

My signature below certifies that I have read and understand the procedures specified in this standard operating procedure.

Date	Name (print)	Signature	Company

Purpose

The purpose of this standard operating procedure (SOP) is to establish uniform procedures for the packaging and shipping of samples.

This SOP describes the equipment, field procedures, materials, and documentation procedures necessary to perform the activities described in the previous paragraph. The details within this SOP should be used in conjunction with the associated project planning documents, such as the *Sampling and Quality Assurance Project Pla*n (SQAPP) and other project-specific SOPs.

Scope and Application

This SOP is applicable to the transport of samples to prevent breakage and maintain temperature. Substantive deviations from the procedures detailed in this SOP will be recorded in the field log book or Daily Log and in a Field Deviation Form.

Health and Safety Warnings

Health and safety issues for the work associated with this SOP, including physical, chemical, and biological hazards, are addressed in the project *Health and Safety Plan* (HASP). The HASP will be followed during all activities conducted by Anchor QEA staff.

Staff Qualifications

Field staff executing these procedures will have read, must be familiar with, and must comply with the requirements of this SOP and all associated project planning documents, such as the SQAPP and other project-specific SOPs. Field staff will be under the direct supervision of qualified professionals who are experienced in performing the tasks described in this SOP, as approved by the project manager.

Field Records

The field records associated with the activities described in this SOP are critical project documents that will be used in data interpretation. Field logs may be included in the subsequent reports presenting the results of the field program.

Field team members will keep a daily record of significant events, observations, and measurements in the field logs. The required field logs and records are included in Attachment 1 of the SQAPP and are described as follows:

- Daily Log (or field log book, as dictated by project planning documents)
- Chain-of-Custody (COC) Form
- SOP Deviation Log

Equipment and Supplies

The following is a list of equipment that may be necessary to carry out the activities in this SOP. Additional equipment may be required, depending on field conditions.

- Approved project-specific planning documents, including the *Demolition Interim Action Work Plan*, HASP, SQAPP, and other project SOPs
- Appropriate personal protective equipment (PPE) and clothing as defined in the HASP
- Decontamination equipment
- Bound, waterproof field log books
- Black, ballpoint pen or Sharpies (or equivalent)
- Inert packing material (e.g., cardboard, bubble wrap, etc.)
- Pre-preserved sample containers as specified in the SQAPP
- Contractor-grade trash bags or similar for cooler liners
- Sample labels
- Insulated coolers
- Custody seals
- Shipping tape
- Sealable Ziploc bags
- Temperature blanks (if not provided by the laboratory)
- Ice
- Overnight courier waybills or shipping forms
- Clear plastic sealing tape

Sample Storage, Handling, and Shipping Procedures

Sample Holding and Storage

Observance of proper holding times and conditions during sample storage and shipment prior to laboratory analysis is critical to obtaining quality data from a sampling event. Immediately after collection, samples (sediment, biota, and water) should be stored in refrigerators (if available) or ice-filled, insulated coolers with sufficient ice to maintain an ambient temperature of approximately 4°C until receipt by the analytical laboratory. Specific sample holding times and conditions for specific matrices and analyses are listed in the SQAPP.

It is most practical to use wet ice to store samples in the field. Ice can be purchased on the way to the project site or obtained from an on-site freezer. Ice should be double bagged, and a liner should be placed in the sample coolers to prevent leakage as the day goes on. Individual sample containers (or groups of sample containers) should be placed in Ziploc bags to prevent labels from smearing and falling off during cooler storage. Ice should be placed around the samples and the temperature blank inside of the coolers.

Chain of Custody

Most projects will require COC procedures. Field COC procedures should be followed from the time a sample is collected until it is relinquished to the analytical laboratory (either in person or to a shipper). A COC form should be initiated when the first sample is collected, filled out in triplicate, and updated continuously throughout the sampling event. A new COC form should be prepared for each day of field sampling. Information to be entered on the COC form should include the following:

- Sample identification
- Time and date of sampling
- Sample matrix
- Number of containers for each sample
- Analytical parameters for each sample
- Any special instructions

One copy of the COC form should be placed in a waterproof bag and attached to the inside of each sample cooler. In the event that sediment subsamples are being sent to different laboratories, separate COC forms should be prepared for each laboratory and each sample cooler.

A sample is considered to be in one's custody if they are as follows: 1) in the custodian's possession or view; 2) in a secured location (under lock) with restricted access; or 3) in a container that is secured with an official seal(s) such that the sample cannot be reached without breaking the seal(s). A custody seal should be placed on the sample cooler when it is not in the custody of a member of the sampling team.

When samples are relinquished, either to the laboratory or for shipment, the COC form must be completed by the sample deliverer. It should include the printed and signed name of the deliverer, the organization that person represents, date and time of sample relinquishment, and method of shipment, if appropriate.

Sample Shipping

All samples should be shipped or hand delivered to the analytical laboratory immediately after completion of sampling to minimize the number of people handling samples and to protect sample quality and security. The following guidelines apply to water and sediment samples that will be shipped by courier to the laboratory.

- Shipping containers should be free of defects to withstand rough treatment during shipping.
- Samples should be packed tightly with dividers or bubble wrap separating all glass containers and filling any empty space within shipping boxes so the jars are held securely.
- Sample coolers should be packed with ice to maintain an ambient sample temperature of approximately 4°C until delivery to the analytical laboratory. Wet or synthetic ice can be used,

but either type should be packed in a manner that will preclude leaking inside the sample cooler. A temperature blank (supplied by the laboratory) can be placed in the sample cooler along with analytical samples.

- All coolers must be leakproof or lined with a leakproof plastic liner. Leaking coolers will not be delivered by some couriers.
- A COC record for each shipping container should be filled out completely.
- The original COC should be protected from damage by placing it into a re-sealable plastic bag and attaching to the inside of the cooler lid.
- A custody seal should be attached so the shipping container cannot be opened without breaking the seal.
- Shipping containers should be sent by a carrier that will provide a delivery receipt (such as FedEx) to confirm that the contract laboratory received the samples and serve as a backup to the COC record.
- Sample shipments by common carrier or air freight must be packaged and labeled according to U.S. Department of Transportation regulations or the international Air Transportation Association requirements. Packaging must account for suspected types and levels of contaminants in the samples as well as chemicals used to preserve the samples.

Quality Assurance/Quality Control

It is the responsibility of the field team leader to periodically check and ensure that procedures are in conformance with those stated in this SOP.

Standard Operating Procedure 7.10 – Photoionization Detector Calibration and Operation

DRAFT

Standard Operating Procedure 7.10 – Photoionization Detector Calibration and Operation

Standard Operating Procedure Acknowledgment Form

Project Number: 230002-05.09 Project Name: Former Intalco Smelter Site

My signature below certifies that I have read and understand the procedures specified in this standard operating procedure.

Date	Name (print)	Signature	Company

Purpose

The purpose of this standard operating procedure (SOP) is to establish uniform procedures for the calibration and use of a photoionization detector (PID) in the field.

This SOP describes the equipment, field procedures, materials, and documentation procedures necessary to perform the activities described in the previous paragraph. The details within this SOP should be used in conjunction with the associated project planning documents, such as the *Sampling and Quality Assurance Project Pla*n (SQAPP) and other project-specific SOPs.

Scope and Application

This SOP is applicable to the detection of organic and inorganic chemical compounds in air. Substantive deviations from the procedures detailed in this SOP will be recorded in the field log book or Daily Log and in a Field Deviation Form.

Health and Safety Warnings

Health and safety issues for the work associated with this SOP, including physical, chemical, and biological hazards, are addressed in the project *Health and Safety Plan* (HASP). The HASP will be followed during all activities conducted by Anchor QEA staff.

Staff Qualifications

Field staff executing these procedures will have read, must be familiar with, and must comply with the requirements of this SOP and all associated project planning documents, such as the SQAPP and other project-specific SOPs. Field staff will be under the direct supervision of qualified professionals who are experienced in performing the tasks described in this SOP, as approved by the project manager.

Field Records

The field records associated with the activities described in this SOP are critical project documents that will be used in data interpretation. Field logs may be included in the subsequent reports presenting the results of the field program.

Field team members will keep a daily record of significant events, observations, and measurements in the field logs. The required field logs and records are included in Attachment 1 of the SQAPP and are described as follows:

- Daily Log (or field log book, as dictated by project planning documents)
- SOP Deviation Log

Equipment and Supplies

The following is a list of equipment that may be necessary to carry out the activities in this SOP. Additional equipment may be required, depending on field conditions.

- Approved project-specific planning documents, including the *Demolition Interim Action Work Plan*, HASP, SQAPP, and other project SOPs
- Appropriate personal protective equipment and clothing as defined in the HASP
- Decontamination equipment
- PID
- Calibration gas cylinder
- Model-specific operations manual
- 11.7 electron volt (eV) probe
- Battery charger for PID

PID Calibration and Operation Procedures

Calibration

Check out and ensure the proper operation of the PID as appropriate, using the following equipment checklist:

1. Allow the unit to calibrate to the surrounding temperature (approximately 5 minutes).
2. Follow the start-up procedure detailed in the operation manual.
3. Set the PID to calibration mode.
4. Attach a regulator to a disposable cylinder of calibration gas.
5. Follow the procedure detailed in the operation manual to calibrate the detector; if the meter reading is greater than plus or minus 15% of the responses value of the calibration gas used, the instrument should be red tagged and not used until fixed.

Operation

All readings are to be recorded on the matrix-specific field forms. The following procedures pertain to all aspects of the field sampling program.

1. Position the probe assembly close to the area to be monitored because the low sampling rate allows for only very localized readings. Under no circumstances should the probe tip come in contact with the sample.
2. Monitor the breathing zone of the work area as specified in the HASP.
3. When designated, take readings of the sample when first collected and record any readings on the appropriate field form.
4. When the activity is completed, carefully clean the outside of the PID with a damp disposable towel to remove any visible dirt.

5. Turn the unit off as directed by the operation manual and recharge the battery.

Quality Assurance/Quality Control

It is the responsibility of the field team leader to periodically check and ensure that procedures are in conformance with those stated in this SOP.

Appendix E
Monitoring and Inadvertent Discovery Plan

Intalco Aluminum LLC
Ferndale, Washington

Archaeological Inadvertent Discovery Plan
Intalco Aluminum LLC
Intalco Site Wide Decommission and Demolition Project

May 22, 2024

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Prepared for:

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4050 Mountain View Road
Ferndale, WA 98248

Contents

1 Introduction 2
1.1 Project Summary 2
1.2 Location 3
1.3 Regulatory Context 6
2 What Are Archaeological Resources? 7
Precontact Resources 7
Post-contact/Historic-era Resources 7
3 Existing Conditions 10
3.1 Previous Investigations 10
3.2 Exceptions for Alcoa Intalco Works Aluminum Smelter Debris 11
4 Protocol for Inadvertent Discovery of Archaeological Resources 12
5 Protocol for Inadvertent Discovery of Human Remains 13
6 Contact Information 14
7 References 15

List of Figures

Figure 1. Vicinity and Parcel Map 4
Figure 2. Demolition Plan 5
Figure 3. Examples of precontact-era cultural resources. 8
Figure 4. Examples of historic-era cultural resources. 9

List of Tables

Table 1. Contacts for Inadvertent Discovery of Archaeological Resources or Human Remains 14

1 Introduction

Intalco Aluminum LLC (Intalco) is proposing to decommission and demolish their aluminum smelter situated at 4050 Mountain View Road, Ferndale, Whatcom County, Washington, 98248. The Project will prepare the site for new economic development opportunities.

This Archaeological Inadvertent Discovery Plan (IDP) describes the procedures to be used during ground-disturbing activities associated with the demolition and decommission in the event human skeletal remains or archaeological materials are unexpectedly encountered. Alcoa contracted with AECOM Technical Services, Inc. (AECOM) to provide this document as a best management practice so that Project personnel are aware of the steps they must take in the event a discovery is made, in compliance with state laws.

This document addresses the following topics:

- What Are Cultural Resources?
- Existing Conditions
- Steps to Take for Inadvertent Discovery of Archaeological Materials
- Steps to Take for Inadvertent Discovery of Human Remains
- Contact Information

1.1 Project Summary

Intalco is proposing to decommission and demolish its Intalco aluminum smelter in the Ferndale, Washington vicinity.

The Site Wide Demolition Project (the Project) will be completed in two phases in two discrete Work Areas (Figure 1). Work Area 1 encompasses the main plant and is approximately 145 acres in size. This area includes the six potrooms, rectifiers and ancillary structures, anode production facilities, ingot casting facilities, support warehouses and repair shops (Figure 2). Work Area 2 encompasses an additional 60 acres outside of the main plant, including the alumina storage area located along the shoreline, sanitary treatment facility, administration buildings, parking areas and miscellaneous support buildings. The existing wharf and other in and over water facilities are under separate ownership and are not part of the Project.

Activities to be completed during each phase of the Project will be similar and involve demolishing all facility equipment, buildings and structures within each of the two Work Areas (except those identified to remain on the attached Demolition Plan (Figure 2); removal of all at or above grade concrete and asphalt paving; and removal of most below grade concrete structures, foundations and footers to a depth of 3 feet below the surface. All areas disturbed during the demolition process will be restored by grading the site equal to the surrounding elevation.

AltaGas and Intalco have entered into an agreement for AltaGas to acquire the rights to own and develop approximately 1,600 acres at the Intalco site, including transportation and utility infrastructure. AltaGas is currently exploring potential development opportunities, but no future plans have been announced. Future use of the property and any planned improvements would be subject to separate permit review.

1.2 Location

The Project is located at 4050 Mountain View Road, Ferndale vicinity; within Sections 28 and 29, Township 39 North, Range 1 East, Willamette Meridian. Work Area 1 is in Parcel 186715; Latitude: 46.84608, Longitude: -122.70309. Work Area 2B is in Parcel 186709; Latitude 48.84371, Longitude: -122.71247. Figure 1 and Figure 2 identify the Project area and Project activities.

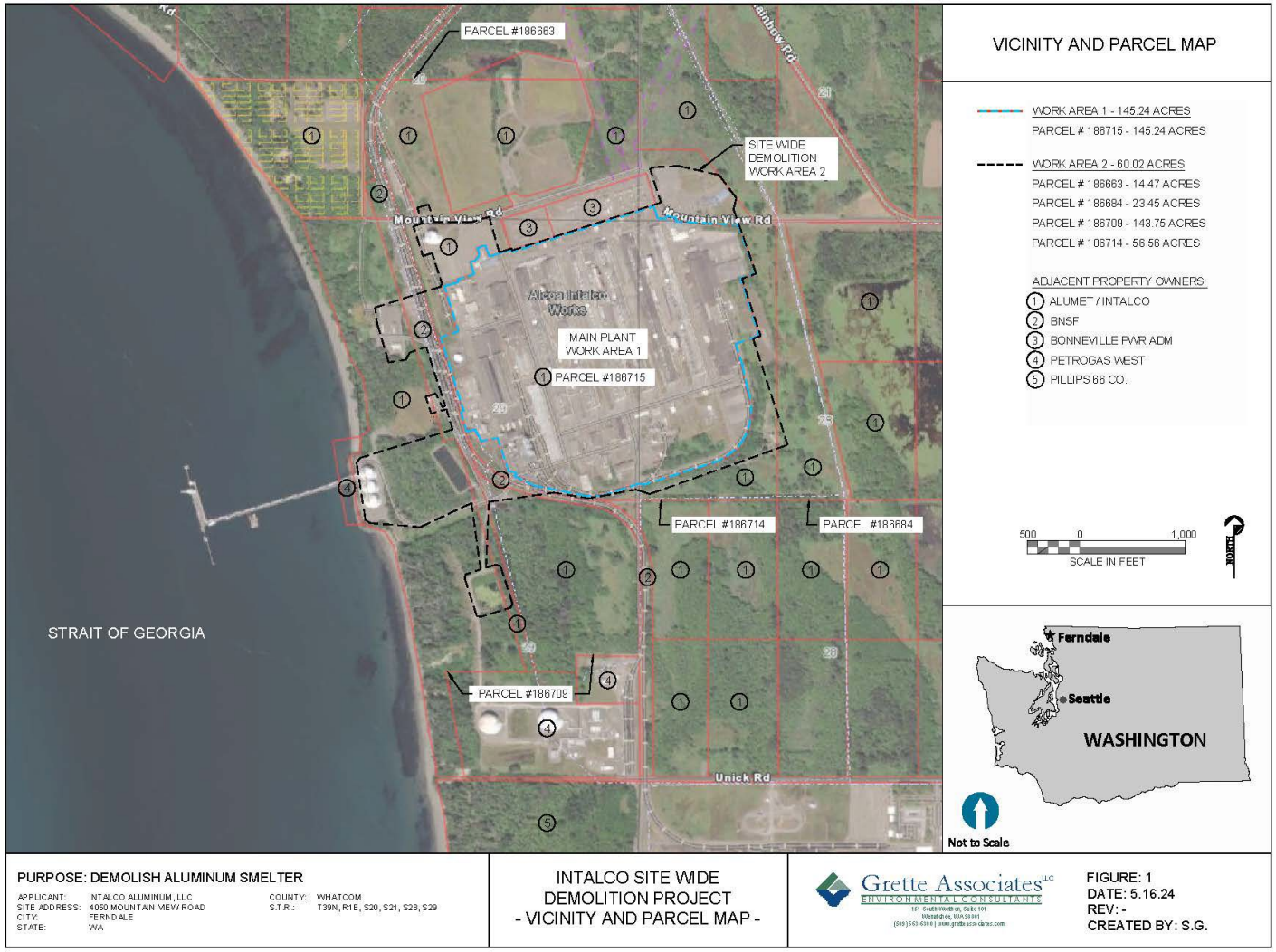


Figure 1. Vicinity and Parcel Map