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Date: September 9, 2022
Our Ref: 30144520
Subject: **Remedial Design Work Plan Modifications**
NYSEG Shulman's Salvage Yard
Elmira, Chemung County
Site No. 808013

Dear Mr. Gregory,

On behalf of NYSEG, please find enclosed the final Remedial Design Work Plan (RDWP) for the Shulman's Salvage Yard site located in Elmira, New York.

The RDWP was submitted to the New York State Department of Environmental Conservation (NYSDEC) on June 15, 2022. The NYSDEC submitted a September 6, 2022 RDWP comment letter requesting a revised RDWP submittal before approval. The RDWP has been updated to address the NYSDEC's comments, as appropriate. For ease of presentation, each NYSDEC modification request is presented below in italics, followed by NYSEG's response.

## Modification Requests and Responses

*Modification 1: We don't review draft documents from responsible parties and will expect only final document submissions in the future. Remove all draft markings from document and include the required signature and seal on the Certification Statement.*

Response 1: The intent of the Draft markings was to indicate that the version is under NYSDEC review and requires NYSDEC approval before it can be considered "Final". The version you received was the "Final Draft" for NYSDEC review and approval. Draft markings have been removed from this submittal and future submittals will not include draft markings.

*Modification 2: Section 1.2.1: This section mentions site features including a weigh station and it refers the reader to Figure 2. The weigh station is not visible in Figure 2. Revise Figure 2 so that the weigh station is visible.*

Response 2: The site figures have been updated to indicate the location of the weigh station and scale house trailer.

*Modification 3: Section 1.6: Include the specific contents of green remediation found in the AROD, Section 9, Number 1.*

Response 3: The requested text from Section 9, Number 1 of the Amended Record of Decision has been added to Section 1.6 of the RDWP.

*Modification 4: Section 2.1, Last Sentence: Refers to "... a Utility Checklist included in the HASP (Appendix C)." Include a Utility Checklist in the HASP, Appendix C.*

Response 4: The Utility Checklist is included in Attachment 4 (Field Forms) of Appendix C. The RDWP text has been updated.

*Modification 5: Section 2.5: Show the five catch basins on a dedicated figure in this work plan and reference the figure in this section.*

Response 5: Figure 6 has been prepared to show the location of the five catch basins and it is referenced in Section 2.5.

*Modification 6: Section 2.8: Add the following: Analytical data will be submitted to DEC in an Electronic Data Deliverable (EDD) format in accordance with the NYSDEC Electronic Data Deliverable Manual, NYSDEC EDD Format v.4, November 2018.*

Response 6: The requested text has been added.

*Modification 7: Section 2.8: In the bulleted items, include a figure depicting sampling locations.*

Response 7: The fourth bullet in Section 2.8 has been updated. Updated site plans will include sample locations.

*Modification 8: Section 5.2: Remove draft from the title of this section and the entire document. Provide a final stamped design that you believe is ready to be bid, and DEC will review it.*

Response 8: Draft was removed from Section 5.2, and Section 5.3 Final Remedial Design Report was removed.

*Modification 9: Table 5.1, Title: Change the title to remedial design and construction schedule.*

Response 9: The requested change has been made.

*Modification 10: Table 5.1, Ninth Row: Bid documents should be complete and included in the final RD report. Procurement can be in the 2nd half of 2023.*

Response 10: The RD submitted to the NYSDEC will be of biddable quality.

*Modification 11: Table 5.1, Tenth Row: Add an end date for construction.*

Response 11: The requested change has been made.

*Modification 12: Table 5.1 Subsequent (additional) Rows: Add dates for submission of the SMP, FER, PCB and cleanup report for EPA, and easement documents.*

Response 12: Submission dates for the SMP, FER, EPA PCB Cleanup Report, and easement documentation have been added to table 5.1.

*Modification 13: Note Below Table 5.1: Remove all these contingencies. After this work plan is approved, any proposed schedule revision would need to be submitted for DEC approval along with the reasons for the change.*

Response 13: The requested text has been removed.

*Modification 14: Section 6: Add an additional sub-section with Final Engineering Report (FER) as per DER-10 and list what will be in it.*

Response 14: A Final Engineering Report in accordance with DER-10, with details on what it will include, has been added as Section 6.2.

*Modification 15: Section 6.1: Add an O&M plan as per DER-10 if needed.*

Response 15: Clarifying text that a general O&M plan will be developed during preparation of the Remedial Design in accordance with DER-10 has been added to Section 6.1. The O&M program will be more specifically defined in the site SMP.

*Modification 16: Section 6.2: Add Institutional Controls to the schedule with a specific timetable for submitting easement documents to the DEC.*

Response 16: Requested modification has been addressed with Response 12.

*Modification 17: Figure 5: Some of the background soil boring locations are within the site boundary. Review the background soil boring locations and either: a) verify that they are outside of the contaminated area, or if any of the background borings are in a contaminated area, modify those locations.*

Response 17: The “Approximate Limit of Site Areas” and “Site Boundary” presented on all figures has been updated. The Remedial Investigation Report prepared by CDM Smith identifies that the site is comprised of four areas:

- Recycling Area;
- Processing Area;
- Rail Transit Area; and
- Outlying Parcel.

Initial figures in the RDWP and previous figures by other consultancies included the New York State Department of Transportation right-of-way (ROW) property along Clemens Center Parkway (State Route 14) as an unnamed “Site Area” and within the “Site Boundary” but did not define it as being part of the Site. Furthermore, the Remedial Investigation Report identifies the “Site” as being bounded to the east by a chain-link fence and Clemens Center Park Way. The background soil boring locations are proposed to be installed in the ROW between the chain link fence and Clemens Center Parkway.

Please contact John Ruspantini at 607.725.3801 or JJRuspantini@nyseg.com with any questions or comments.

Sincerely,
Arcadis of New York, Inc.

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Doreen Simmons, Esq.
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Joe Simone, GEI

Enclosure: Remedial Design Work Plan

Andrew Park, Chief
United States Environmental Protection Agency, Region 2
Corrective Action Section
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Date: September 9, 2022
Our Ref: 30144520
Subject: **Remedial Design Work Plan Modifications**
NYSEG Shulman's Salvage Yard
Elmira, Chemung County
Site No. 808013

Dear Mr. Park,

On behalf of NYSEG, please find enclosed the final Remedial Design Work Plan (RDWP) for the Shulman's Salvage Yard site located in Elmira, New York.

The RDWP was submitted to the United States Environmental Protection Agency (USEAP) on June 16, 2022. The USEPA provided comments on the June RDWP via a September 2, 2022 email requesting modifications to the RDWP before approval. The RDWP has been updated to address each USEPA modification request from the September 2, 2022 email correspondence, as appropriate. For ease of presentation, each USEPA modification request is presented below in italics, followed by NYSEG's response.

## Modification Requests and Responses

*Modification 1: Section 1.4.3.3 It says "PCBs do not have a surface water standard or guidance value; however, PCBs were detected at concentrations above the Class GA standards." Please refer to the Regional Screening Levels, as in https://www.epa.gov/risk/regional-screening-levels-rsls-generic-tables and 40 CFR 791.79(b)(1)(iii)*

Response 1: The text has been corrected to reflect that PCBs were detected in surface water at concentrations greater than the decontamination standard listed in CFR 761-79(b)(1)(iii).

*Modification 2: Concerning PCBs in the catch basin sediment, in general, the soil cleanup standards may apply. Other requirements may apply depending on site conditions. It is suggest that EPA be consulted concerning relevant standards.*

Response 2: Surface water and sediment samples will be collected from each of the five onsite catch basins as part of planned pre-Design Investigation activities. The results will be provided to the USEPA for consultation on relevant standards.

*Modification 3: Section 1.6, Page 7, 1st paragraph: It says, "… or a soil cover in areas where the upper 1 foot of exposed surface soil will exceed applicable SCOs but cannot contain more than 1 ppm of PCBs." It appears confusing what it means. It needs to be clarified.*

Response 3: The site cover description mirrors the language provided in the NYSDEC Amended Record of Decision. The intent of the remedy is to excavate any soil that exceeds 1 ppm PCBs to a depth of at least 1 foot. Onsite soil within the 0- to 1-foot depth interval that exceeds applicable SCOs for other constituents of concern (and does not contain 1ppm or greater PCBs) will have a soil cover system constructed over it.

Please contact John Ruspantini at 607.725.3801 or JJRuspantini@nyseg.com with any questions or comments.

Sincerely,
Arcadis of New York, Inc.

Nicholas (Klaus) Beyrle

Nicholas (Klaus) Beyrle, PG
Senior Geologist

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Jason Brien, PE, Arcadis
Joe Simone, GEI

Enclosure: Remedial Design Work Plan

NYSEG

# Remedial Design Work Plan

**Shulman's Salvage Yard**
**Elmira, New York**
**Site No. 808013**

September 2022

# Remedial Design Work Plan

**Shulman's Salvage Yard**
**Elmira, New York**
**Site No. 808013**

September 2022

**Prepared By:**
Arcadis of New York, Inc.
One Lincoln Center, 110 West Fayette Street, Suite 300
Syracuse
New York 13202
Phone: 315 446 9120
Fax: 315 449 0017

**Prepared For:**
New York State Electric & Gas Corporation
18 Link Drive
Binghamton, New York 13904

**Our Ref:**
30119464

# Certification Statement

I, Jason D. Brien, certify that I am currently a New York State registered Professional Engineer and that this design was prepared in accordance with all applicable statutes and regulations and in substantial conformance with the Division of Environmental Remediation's DER-10 / Technical Guidance for Site Investigation and Remediation.


| | | |
|---|---|---|
| | 9/8/2022 | 084067 |
| Jason D. Brien, P.E.<br>Principal Engineer | Date | NYS Professional Engineer # |

# Contents

# Tables (in-text)



# Tables



# Figures

# Appendices

# Acronyms and Abbreviations

| | |
|---|---|
| AFI | AFI Environmental |
| Arcadis | Arcadis of New York, Inc. |
| AROD | Amended Record of Decision |
| bgs | below ground surface |
| CDM Smith | Camp, Dresser, McKee & Smith |
| COC | constituent of concern |
| COC-metals | constituent of concern metals listed in ROD |
| CP-51 | CP-51 Soil Cleanup Guidance |
| DER-10 | Division of Environmental Remediation's DER-10 / Technical Guidance for Site Investigation and Remediation |
| FER | Final Engineering Report |
| HASP | Health and Safety Plan |
| IDW | investigation-derived waste |
| NS | Norfolk Southern Railway |
| NYCRR | New York Codes, Rules, and Regulations |
| 6 NYCRR Part 375-6 | Title 6 of New York Codes, Rules, and Regulations Part 375-6 |
| NYSDEC | New York State Department of Environmental Conservation |
| NYSDOH | New York State Department of Health |
| NYSEG | New York State Electric & Gas Corporation |
| PCB | polychlorinated biphenyl |
| PDI | pre-design investigation |
| ppm | parts per million |
| QA/QC | quality assurance/quality control |
| RAO | remedial action objective |
| RDWP | Remedial Design Work Plan |
| RI | remedial investigation |
| RI Report | Final Remedial Investigation Report |
| RP | Responsible Party |
| SCG | standards, criteria, and guidance |
| SCO | soil cleanup objective |
| SMP | Site Management Plan |
| USEPA | United States Environmental Protection Agency |

# 1 Introduction

This Remedial Design Work Plan (RDWP) presents anticipated remedial design preparation activities for the New York State Department of Environmental Conservation (NYSDEC)-selected remedy for the Shulman's Salvage Yard Site (the site) located in Elmira, New York (Site No. 8-08-013). The selected remedy to address environmental impacts identified at the site is presented in the March 2022 Amended Record of Decision (AROD) (NYSDEC 2022).

Arcadis of New York, Inc. (Arcadis) has prepared this RDWP, on behalf of New York State Electric & Gas Corporation (NYSEG), in accordance with the Order on Consent (Index #CO-8-20150721-93; NYSDEC 2017) between NYSEG and NYSDEC and NYSDEC's Division of Environmental Remediation's DER-10 / Technical Guidance for Site Investigation and Remediation (DER-10) (NYSDEC 2010b). This RDWP also includes proposed pre-design investigation (PDI) activities to support remedial design preparation, as well as the anticipated remedial design components.

## 1.1 Remedial Design Work Plan Organization

This RDWP has been organized as described in the table below.

*Table 1.1 – Remedial Design Work Plan Organization*

| Section | Description |
|---|---|
| Section 1 – Introduction | Presents site background information; potentially applicable standards, criteria, and guidance (SCGs); a remedial investigation (RI) summary; remedial objectives; and a summary of the NYSDEC-selected remedy. |
| Section 2 – Pre-Design Investigation Activities | Presents the scope and rationale for the PDI activities to be completed in support of the remedial design. |
| Section 3 – Remedial Design Activities | Describes anticipated remedial design tasks, components, and activities. |
| Section 4 – Permits and Approvals | Presents anticipated permits and approvals necessary to conduct the PDI and implement the remedial action. |
| Section 5 – Remedial Design Documents and Schedule | Identifies remedial design submittals and the anticipated schedule for implementing the PDI and preparing the remedial design. |
| Section 6 – Post-Construction Activities | Describes activities to be conducted following remedial construction. |
| Section 7 – References | Lists documents used to support the preparation of this RDWP. |

## 1.2 Background

This section summarizes site background information, including a description of the site location and physical setting, followed by a brief description of the site history and operation.

### 1.2.1 Location and Physical Setting

The site is in a mixed residential, commercial, and industrial area located in the City of Elmira, Chemung County, New York (Figure 1). The 7.34-acre property is located at One Shulman Plaza, 197 East Washington Avenue, Elmira, New York, at the intersection of Eastern Washington Avenue and Clemens Center Parkway (Tax Lot ID

89.11-1-5). The site includes two permanent buildings, along with a weigh station and a scale house trailer (Figure 2). Surface cover consists of asphalt pavement along the southern portion of the site, south of the office building, with the remainder of the site unpaved (i.e., gravel, dirt) and used for storage and handling of various metal and non-metal salvage materials.

The site is bounded to the north by a Chemung County Transit Systems office, to the south by East Washington Avenue, to the east by a chain link fence and Clemens Center Parkway, and to the west by mix residential/commercial properties. A Norfolk Southern Railway (NS) property is adjacent to the northwestern portion of the site. Ground surface elevation rises abruptly southwest of the site to the former Triple Cities Metal Finishing property, which is listed in the NYSDEC State Superfund Program as a Class 2 Inactive Hazardous Waste Site (Site ID #808045). Fencing surrounds most of the property, and the gated main entrance at the south end of the property is locked after business hours.

### 1.2.2 Site History and Operation

The property has operated as Shulman's Salvage Yard for various metal salvaging operations since the 1970s. Prior to its current usage, the southern portion of the site was a coal yard operated by C. A. Petrie Company Inc., and the central and northern portions of the site were dissected by several rail lines that were likely used to transport the coal. Two large crushers (used to crush automobiles) were previously operated at the site but have since been removed. In 1982, a shipment of drained transformers was processed on site and sold as scrap. It is believed that some of the polychlorinated biphenyl (PCB) contamination at the site can be linked to the shipment of drained transformers.

The site is currently used to sort processed scrap metals and paper goods to be transported off site via tractor trailers, or by rail using a single spur line located northwest of the site.

## 1.3 Standards, Criteria, and Guidance

Chemical-, action-, and location-specific SCGs that are potentially applicable to the design and implementation of the NYSDEC-selected remedy are presented in the *Final Feasibility Study Report* (Camp, Dresser, McKee & Smith [CDM Smith] 2015). Primary SCGs that were considered during the development of this RDWP include the following:

- NYSDEC's DER-10 (NYSDEC 2010b);
- Soil cleanup objectives (SCOs) based on Title 6 of the New York Codes, Rules, and Regulations (NYCRR) Part 375-6 (6 NYCRR Part 375-6) (NYSDEC 2006); and
- Resource Conservation and Recovery Act and New York State regulations regarding the identification, transportation, and disposal of hazardous wastes as outlined in Code of Federal Regulations, Title 40, Part 261 (United States Environmental Protection Agency [USEPA] 1990) and 6 NYCRR Part 371, respectively (NYSDEC 2006).

## 1.4 Site Characterization Summary

This section presents an overall site characterization and summary of the nature and extent of impacted media based on results obtained from site investigation activities completed to date, which include the following:

- 1984 – Initial Investigation (Malcolm Pirnie). The initial investigation included sampling surface soils and soils from catch basins and sampling from a pool of oil on the northern portion of the site. The samples were analyzed for PCBs and metals; additionally, catch basin samples were analyzed for priority pollutants.
- 1987 – Follow-Up Investigation (Malcolm Pirnie). Sampling activities for the follow-up investigation included collecting additional soil, catch basin, and oil samples to confirm the previous results and to further define the extent of impacted soils.
- 1987 – Supplemental Field Investigation (Malcolm Pirnie). Supplemental field investigation activities included reviewing the City of Elmira sewer network and determining sewer discharge locations, installing monitoring wells, and collecting and analyzing groundwater, soil, and oil samples. The supplemental field investigation objectives were to:
  - Establish existing groundwater quality and the potential for vertical migration of PCBs through subsurface soils to groundwater;
  - Evaluate off-site migration of PCBs via impacted sediments in the City of Elmira sewer; and
  - Establish a long-term monitoring program.
- 1989 – Remedial Investigation/Feasibility Study (RI/FS) (Malcolm Pirnie). RI/FS activities, performed in accordance with the *Work Plan Remedial Investigation/Feasibility Study* (Malcolm Pirnie 1989), included advancing soil borings to collect data for mapping the water table configuration and to determine the effect of the sewer on groundwater flow. Additionally, nine monitoring wells were installed to provide downgradient sampling points to assess groundwater quality and determine if downward migration of impacts has occurred.

In 1990, a *Modified Work Plan Remedial Investigation/Feasibility Study* (AFI Environmental [AFI] 1990) was prepared under the direction of the NYSDEC; however, the Responsible Party (RP) (I. Shulman and Son, Inc.) challenged their requirement to conduct the activities specified by the work plan. The RP's challenge was upheld, and the RI/FS was postponed.

The remedial program was resumed under the State Superfund Program in 2012. In 2013, CDM Smith completed an RI (CDM Smith 2014), which consisted of a surface, subsurface, and catch basin soil evaluation; a stormwater and groundwater screening; and a risk evaluation. The overall RI objectives were to:

- Characterize the site by establishing the nature and extent of impacted soils.
- Evaluate the risk posed to human health and the environment from impacted soils.
- Provide information needed for evaluating the remedial actions to address impacted soils.

The results of these investigations were collectively used to develop the current site characterization that, as presented in the sections below, consists of a summary of site geology and hydrogeology and the nature and extent of impacts. A detailed site characterization is presented in the *Final Remedial Investigation Report* (RI Report) (CDM Smith 2014).

### 1.4.1 Geology

The overburden strata at the site are summarized below in descending order from the ground surface. Additional site topography, geology, and hydrogeology details are presented in the RI Report (CDM Smith 2014).

- Surface Soils – Surface soils appear to be reworked, imported, and/or locally derived fill material comprised of silt, sand, and gravel with varying amounts of clay, cobbles, metal fragments, and trash. Regional native surface soils are classified as gravelly loam, being derived from loamy glaciofluvial deposits over sandy and gravelly glaciofluvial deposits, containing significant amounts of limestone (CDM Smith 2014). Fill thickness varies between 0 and 12 feet below ground surface (bgs).
- Subsurface Soils – Native soils below the fill are primarily poorly to moderately sorted silty sands, intermittent gravels, and well sorted sand deposits. Fairly continuous glaciolacustrine peat and clay deposits are observed over the northern half of the site at depths of 6.5 to 13.5 feet bgs. In the field, the peat deposit was classified into two units, upper and lower, based on color and composition. At many locations, the upper peat is very dark brown to light brown with varying amounts of clay and silt and intervals containing yellow wood particles (up to cobble sized). Some samples also contained green leaf fragments. The apparent thickness of this unit is up to 5.5 feet. The lower unit is up to 3.4 feet thick and is a light gray or light brown peat/marl with fibrous inclusions and varying percentages of gastropod shells. It is generally higher in clay content than the upper peat. Where the peat is observed, it is underlain by a massive unit of gray clay up to 7 feet thick.
- Unconsolidated Sedimentary Deposits –Till deposits overlie bedrock throughout much of Chemung County. In the Horseheads-Elmira Valley, till deposits are glaciofluvial and glaciolacustrine (glacial outwash) sand and gravels deposits with observed thicknesses varying from 30 to more than 400 feet. Refusal at the site was encountered at approximately 26 to 30 feet bgs at a few locations. The very tightly packed deposits at the bottom of these borings suggest the presence of lodgement till (CDM Smith 2014).
- Bedrock – Although bedrock was not encountered during previous investigations, bedrock beneath the site is comprised of the Beers Hill Shale, a member of the West Falls Group. The Beers Hill Shale contains primarily thinly bedded fissile black shale layers that lie approximately horizontal. The estimated depth to bedrock in this area of the valley is approximately 100 feet bgs (CDM Smith 2014).

### 1.4.2 Hydrogeology

The primary aquifer in the site vicinity is comprised of outwash sands and gravels (CDM Smith 2014). Clay and peat units encountered in soil borings may act as semi-confining units and divide this aquifer into upper and lower zones over much of the site, especially the processing area (Malcolm Pirnie 1989; AFI 1990; CDM Smith 2014). The depth to water during the RI activities was approximately 12 feet bgs over much of the site. Previous investigations identified the depth to water at 2 to 8 feet bgs and estimated the groundwater flow direction to be approximately northwest, generally following site topography (Malcom Pirnie 1989; AFI 1990).

### 1.4.3 Nature and Extent of Impacts

This section describes the nature and extent of environmental impacts identified at the site. As presented in the AROD, constituents of concern (COCs) for the site include:

- PCBs – primarily Aroclors 1016, 1242, 1248, 1254, and 1260; and
- Metals – arsenic, cadmium, copper, lead, and mercury (COC-metals).

Based on information presented in the RI Report (CDM Smith 2014), on-site soil, groundwater, and surface water have been impacted by these COCs. A summary of environmental impacts, by media type, is presented below.

#### 1.4.3.1 Soils

PCB concentrations in soil exceeding the CP-51 Soil Cleanup Guidance (CP-51) (NYSDEC 2010a) limit of 1 part per million (ppm) in the top 1 foot of soil and 25 ppm below 1 foot exist in on-site soil. One off-site location exceeded 1 ppm in the 0- to 1-foot interval. The highest PCB concentrations were in the scrap processing and rail transit areas. PCB impacts were generally observed to depths of 2 and 4 feet bgs; however, PCBs were detected above SCOs at isolated boring locations in the scrap processing and rail transit areas at depths up to 12 feet bgs. Additionally, low level PCB concentrations were also observed at the adjacent NS property, northwest of the site, to depths up to 4 feet bgs with one shallow location (0 to 1 foot bgs) exceeding the applicable SCO.

Metal concentrations exceeding 6 NYCRR Part 375-6.8(b) residential use SCOs in the top 1 foot of soil and metal concentrations exceeding industrial use SCOs below 1 foot exist in on- and off-site soil. The highest metal concentrations are in the processing and rail transit areas. Metal concentrations exceeding SCOs were generally observed to depths of 2 and 4 feet bgs. Additionally, metal concentrations above SCOs were also found at the adjacent NS property and generally observed to depths of 2 and 4 feet bgs.

#### 1.4.3.2 Groundwater

COC-metals were detected in site groundwater at concentrations exceeding the NYSDEC Division of Water Technical and Operational Guidance Series (NYSDEC 1998) Ambient Water Quality Standards and Guidance Values and Groundwater Effluent Limitations for Class GA groundwater. However, elevated concentrations of metals appear to be sporadic and are likely elevated due to surficial soil contamination and do not indicate groundwater contamination migrating off site (CDM Smith 2014). PCBs were not detected in site groundwater.

Chlorinated volatile organic compounds (primarily trichloroethene) were also detected in groundwater samples above the groundwater quality standards. However, this contamination is believed to originate from off-site sources and is not addressed in this RDWP.

#### 1.4.3.3 Surface Water and Sediment

Surface water samples collected from two on-site catch basins indicated the presence of both PCBs and metals. PCBs were detected at concentrations greater than decontamination standard listed in the Code of Federal Regulations 761.79(b)(1)(III). Metal COCs (lead and arsenic) were detected at concentrations above the surface water criteria and were also detected in groundwater samples (discussed above). Metals concentrations in catch basin water samples (i.e., surface water) were comparable to those found in site groundwater.

A catch basin sediment sample was collected from one catch basin and indicated the presence of both PCBs and metals greater than 6 NYCRR Part 375-6.8(a) unrestricted use SCOs but less than 6 NYCRR Part 375-6.8(b) protection of groundwater SCOs. PCB and metal concentrations in sediments were several orders of magnitude lower than concentrations found in site soils.

Polycyclic aromatic hydrocarbons were detected greater than the protection of groundwater SCOs in catch basin sediments and greater than site-specific surface water criteria (presented in the RI Report [CDM Smith 2014]) in catch basin water samples. Polycyclic aromatic hydrocarbons were not elevated in site groundwater.

## 1.5 Remedial Action Objectives

As presented in the AROD, the selected remedy will eliminate or mitigate, to the extent practicable, all significant threats to public health and/or the environment. To achieve this goal, remedial action objectives (RAOs) have been established for the site and are presented in Table 1.2 below.

*Table 1.2 – Remedial Action Objectives*

| Media | Remedial Action Objective |
|---|---|
| Groundwater | RAOs for Public Health Protection<br>• Prevent ingestion of groundwater with contaminant levels exceeding drinking water standards.<br>RAOs for Environmental Protection<br>• Remove the source of groundwater or surface water contamination. |
| Soil | RAOs for Public Health Protection<br>• Prevent ingestion/direct contact with contaminated soil.<br>RAOs for Environmental Protection<br>• Prevent migration of contaminants that would result in groundwater or surface water contamination. |
| Surface Water | RAOs for Environmental Protection<br>• Restore the surface water to ambient water quality criteria for the contaminant of concern. |

## 1.6 Description of Selected Remedy

The NYSDEC-selected remedy for the site, as presented in the AROD, generally includes the following components:

- Implementing a remedial design program to provide details necessary for the construction, operation, optimization, maintenance, and monitoring of the remedial program. Green remediation principles and techniques will be implemented, to the extent feasible, in the design, implementation, and site management of the remedy as per Division of Environmental Remediation's DER-31 / Green Remediation (NYSDEC 2011). The major green remediation components are as follows:
  - Considering the environmental impacts of treatment technologies and remedy stewardship over the long term
  - Reducing direct and indirect greenhouse gases and other emissions
  - Increasing energy efficiency and minimizing use of non-renewable energy
  - Conserving and efficiently managing resources and materials
  - Reducing waste, increasing recycling and increasing reuse of material which would otherwise be considered a waste
  - Maximizing habitat value and creating habitat when possible
  - Fostering green and healthy communities and working landscapes with balance ecological, economic, and social goals
  - Integrating the remedy with the end use where possible and encouraging green and sustainable redevelopment

- Excavating on-site soil that exceeds 1 ppm PCBs in the top 1 foot of soil and 25 ppm in the subsurface (i.e., deeper than 1 foot bgs), as defined by CP-51, for transportation and off-site disposal at an appropriately permitted facility. All off-site areas where soil exceeds residential standards for PCBs, as defined by 6 NYCRR Part 375-6.8(b), will also be excavated and transported off site for disposal. Approximately 1,800 cubic yards of PCB-contaminated soil is estimated to be removed from the on-site and off-site areas. On-site excavation areas will be backfilled with material meeting the requirements of 6 NYCRR Part 375-6.7(d) for industrial use, and off-site areas will be backfilled with material meeting the requirements of 6 NYCRR Part 375-6.7(d) for residential use. These areas will be regraded to accommodate installation of a cover system. Soil derived from regrading and meeting industrial standards may be used to backfill on-site excavations. Removal of contaminated surface soil will eliminate sources of surface water runoff contamination.
- Excavating on-site and off-site areas where soil exceeds industrial use SCOs for metals, as defined by 6 NYCRR Part 375-6.8(b), for transportation and off-site disposal at an appropriately permitted facility. In addition, all off-site areas where surface soil (i.e., 0 to 1 foot bgs) exceeds residential standards for metals, as defined by 6 NYCRR Part 375-6.8(b), will also be excavated and transported off site for disposal. Approximately 1,935 cubic yards of metals-contaminated soil is estimated to be removed from the on-site and off-site areas. On-site excavation areas will be backfilled with material meeting the requirements of 6 NYCRR Part 375-6.7(d) for industrial use, and off-site areas will be backfilled with material meeting the requirements of 6 NYCRR Part 375-6.7(d) for residential use. These areas will be regraded to accommodate installation of a cover system. Soil derived from regrading and meeting industrial standards may be used to backfill the on-site excavation. Removal of contaminated surface soil will eliminate sources of surface water runoff contamination.
- Constructing a site cover consisting of either structures, such as buildings, pavement, sidewalks comprising the site development, or a soil cover in areas where the upper 1 foot of exposed surface soil will exceed applicable SCOs but cannot contain more than 1 ppm of PCBs. Where soil cover is required, it will be a minimum of 1 foot of soil, meeting the SCOs for cover material as set forth in 6 NYCRR Part 375-6.7(d) for industrial use. The soil cover will be placed over a demarcation layer, with the upper 6 inches of sufficient quality to maintain a vegetation layer. Any fill material brought to the site will meet the requirements for the identified site use as set forth in 6 NYCRR Part 375-6.7(d).
- Imposition of an institutional control in the form of an environmental easement for the controlled property that:
  - Requires a remedial party or site owner to complete a periodic certification of institutional and engineering controls, in accordance with Part 375-1.8 (h)(3), and submit it to the NYSDEC;
  - Allows the use and development of the controlled property for industrial uses, as defined by Part 375-1.8 (g), although land use is subject to local zoning laws;
  - Restricts the use of groundwater as a source of potable or process water, without necessary water quality treatment, as determined by the New York State Department of Health (NYSDOH) or County Department of Health; and
  - Requires compliance with a NYSDEC-approved Site Management Plan (SMP).
- Developing an SMP, which includes the following:
  - An Institutional and Engineering Control Plan that identifies all use restrictions and engineering controls for the site, and any off-site impacts, and details the steps and media-specific requirements necessary to ensure the following institutional and/or engineering controls remain in place and effective:
    - Institutional Controls (the environmental easement as described above); and
    - Engineering Controls (the soil cover described above).

This plan includes, but may not be limited to:

- An Excavation Plan that details the provisions for the management of future excavations in areas of remaining impacted material;
- Descriptions of the provisions in the environmental easement, including land use and groundwater use restrictions;
- Site access controls maintenance and NYSDEC notification; and
- The steps necessary for periodic reviews and certification of the institutional controls.

– A Monitoring Plan to assess the performance and effectiveness of the remedy, which includes, but may not be limited to:

- Expansion of the groundwater monitoring network, as necessary, and monitoring groundwater to assess the performance and effectiveness of the remedy;
- Monitoring the soil cover to assure it remains in place and effective; and
- A schedule for monitoring the frequency of submittals to the NYSDEC.

# 2 Pre-Design Investigation Activities

A PDI will be completed during the remedial design phase of the project to support design of the NYSDEC-selected remedy. The following PDI data needs have been identified:

- Utility evaluation to identify the extent of utilities in the vicinity of the remedial area;
- Surface soil sampling to further delineate surface soil removal areas;
- Subsurface soil sampling to further delineate soil removal areas;
- In-situ waste characterization sampling to evaluate waste handling, treatment, and/or disposal requirements;
- Hydraulic data collection to support excavation dewatering evaluation/design; and
- Site survey to document PDI locations and develop a topographic site plan.

Detailed descriptions of the work activities and descriptions of specific activities necessary to facilitate development of the remedial design are presented in this section.

Initial PDI activities will focus on delineating excavation limits and completing a background study. Data from the initial PDI will be used to define the scopes of work for supplemental PDI activities that will focus on data needs for excavation dewatering/support design and in-situ waste characterization and waste handling. General activities for the supplemental PDI are discussed in Section 2.9.

Initial PDI activities will include:

- PDI Task 1 – Utility Identification;
- PDI Task 2 – Surface Soil Sampling;
- PDI Task 3 – Subsurface Soil Sampling;
- PDI Task 4 – Background Soil Boring Investigation;
- PDI Task 5 – Sediment and Surface Water Investigation; and
- PDI Task 6 – Site Survey.

Methodologies and protocols to be followed while conducting PDI activities are presented in the Field Sampling Plan (Appendix A). The analytical procedures and requirements for laboratory analysis of samples collected during the PDI are presented in the Quality Assurance Project Plan (Appendix B). Health and safety protocols to be followed by field personnel during investigation activities are presented in the Health and Safety Plan (HASP) (Appendix C). Worker health and safety air monitoring requirements and action levels can be found in the HASP.

Community air monitoring activities will be performed consistent with the general requirements provided in Appendix 1A of DER-10 (NYSDOH Generic Community Air Monitoring Plan), included as Appendix D. Given the limited soil disturbance activities anticipated for the PDI, real-time air monitoring for volatile organic compounds and particulates will be completed during all intrusive activities at two air monitoring stations located at the upwind and downwind perimeter of the exclusion zone (i.e., designated work area).

In general, soil/sediment samples collected as part of PDI Tasks 2, 3, 4, and 5 (described below) will be collected and handled in accordance with the following practices, where appropriate:

- Soil samples will be collected from each surface soil sampling or soil boring location at the intervals identified in Table 1. Samples will be retrieved continuously to the completion depth of each soil boring using manual methods or a Macro Core® sampler, as required.
- Collected samples will be logged and described by the field geologist. The length of representative sample recovered from each interval will be measured and recorded, as appropriate. Soil descriptions will include color, soil components and gradation, moisture condition, particle shape (e.g., angular), plasticity, and structure (e.g., layered).
- Soil cuttings that do not exhibit visual evidence of impacts or an obvious odor will be reused on site to fill the boreholes. Soil cuttings that contain visual impacts/discoloration will be placed into an appropriate container (e.g., drum, roll-off) for waste characterization sampling and disposal.
- Soil/sediment samples will be analyzed for:
  - PCBs using USEPA SW 846 Method 8082; and
  - COC-metals using USEPA SW 846 Methods 6010/7471.
- Quality assurance/quality control (QA/QC) samples will be submitted to facilitate validation of the analytical testing results. Analytical test methods, detection and reporting limits, and required QA/QC samples are described in the Quality Assurance Project Plan (Appendix B). A summary of soil sampling analytical and QA/QC requirements are included in Table 2.

## 2.1 Pre-Design Investigation Task 1 – Utility Identification

PDI Task 1 consists of coordinating with NYSEG and other parties (as appropriate) to determine the presence and location of utilities that may impact construction of the selected remedy.

Potential utilities at the site include storm and sanitary sewers. Utilities in and around the proposed work areas will be investigated and cleared, to the extent feasible, by locating, marking, and where appropriate, visually verifying prior to initiating any intrusive activities. Utility location will require a minimum of three lines of evidence.

Underground utility identification/location tasks will be accomplished in the following sequence:

- NYSEG, or others, will provide as-built and/or other available drawings showing utility locations for review prior to selecting soil boring locations in the field.
- Arcadis, or Arcadis' survey subcontractor, will flag and mark all proposed soil boring locations with white paint, pins, and/or stakes.
- Arcadis' drilling subcontractor will contact UDig NY (formerly Dig Safely New York, Inc.), at 811 or (800) 272-4480, at least 2 working days, and not more than 10 working days, before subsurface work is initiated to identify and mark the locations of all underground utilities at, and in the immediate vicinity of, the proposed work areas.
- Companies with subsurface utilities will locate and mark utility lines.
- Arcadis' private utility survey contractor will complete a geophysical survey, consisting of ground-penetrating radar and radio detection, in the areas of the proposed soil borings.

Soil boring/sampling locations will be adjusted to maintain safe setback distances from the identified utilities.

Prior to initiating soil disturbance work, Arcadis will complete, and retain in the project files, a Utility Checklist included in the HASP (Appendix C, Attachment 4).

## 2.2 Pre-Design Investigation Task 2 – Surface Soil Sampling

As presented in the AROD and summarized in the *Final Feasibility Study Report* (CDM Smith 2015), soil impacts at the site were sufficiently delineated by previous investigations to facilitate the soil remedy selection. Additional soil investigation is proposed to further evaluate the extent of surface soil removal (i.e., 0 to 1 foot bgs) to support remedial design preparation.

Additional surface soil sampling is required to finalize the horizontal extent of PCBs in each surface soil removal area. Proposed PDI activities to be completed under this task include collecting a total of 46 surface soil samples at the locations shown on Figure 3.

Soil samples will be collected, handled, and analyzed as detailed in Section 2, above.

## 2.3 Pre-Design Investigation Task 3 – Subsurface Soil Sampling

To develop the remedial design, additional subsurface soil sampling is required to further evaluate the extent of PCB- and COC-metal-impacted subsurface soils on site and off site.

PDI Task 3 consists of advancing 250 soil borings to further delineate PCB- and COC-metal-impacted soils on site and off site, as detailed below:

- On site:
  - 8 locations to delineate PCBs only;
  - 146 locations to delineate COC-metals only; and
  - 45 locations to delineate co-located PCBs and COC-metals.
- Off site:
  - 50 locations to delineate COC-metals only; and
  - 1 location to delineate co-located PCBs and COC-metals.

Final soil boring locations may be modified in the field based on accessibility, obstructions, utility locations, and/or subsurface conditions encountered.

Where utility locations cannot be confirmed by three lines of evidence (see PDI Task 1), select soil boring locations will be cleared using manual methods (e.g., via hand digging, air knife/vacuum truck, etc.) to verify the absence of utilities in the top 5 feet. Soil borings will be advanced using direct-push technology methods, as described in the Field Sampling Plan included as Appendix A. Proposed soil boring locations are shown on Figure 4.

Soil samples will be collected, handled, and analyzed as detailed in Section 2, above.

## 2.4 Pre-Design Investigation Task 4 – Background Soil Boring Investigation

PDI Task 4 consists of advancing soil borings at 15 locations to collect background metals data for COC-metals. Soil borings will be advanced either manually or using a direct-push technology drill rig. Background soil investigation locations are shown on Figure 5.

Soil samples will be collected and handled as detailed in Section 2, above. However, background metals samples will only be analyzed for COC-metals using USEPA SW 846 Methods 6010/7471.

## 2.5 Pre-Design Investigation Task 5 – Sediment and Surface Water Investigation

PDI Task 5 consists of collecting water and sediment samples from the five catch basins located on site (as identified in the RI Report [CDM Smith 2014] and shown on Figure 6). One water sample and one sediment sample will be collected from each catch basin and submitted for analysis of PCBs using USEPA SW 846 Method 8082 and COC-metals using USEPA SW 846 Methods 6010/7471.

Sediment and surface water samples will be collected, handled, and analyzed as detailed in Section 2, above.

## 2.6 Pre-Design Investigation Task 6 – Site Survey

A land survey will be conducted to document PDI soil boring locations, subsurface utilities, and site features; generate 1-foot topographic contours to facilitate preparation of the remedial design; and complete a boundary survey complying with American Land Title Association standards. The survey will be completed by a New York State Licensed Surveyor and will be collected using the New York State Plane Coordinate System, Central Zone (Federal Information Processing Standard 3102), North American Datum of 1983, and relative to the North American Vertical Datum of 1988. Information obtained from the additional survey efforts will be used to update the site base map and other drawings for use during the remedial design.

## 2.7 Investigation-Derived Waste Management

Investigation-derived waste (IDW) generated during the PDI will be containerized on site. Soil cuttings not returned to the borehole, personal protective equipment, spent disposable sampling materials, and water generated during sampling and decontamination activities will be segregated by waste type and placed in roll-off waste containers or New York State Department of Transportation-approved, 55-gallon, steel drums. Each drum/container will be appropriately labeled (i.e., with the contents, generator, location, and date).

Drums/containers are anticipated to be staged in a secure on-site location that does not interfere with site operations. One water sample and one soil sample will be collected and analyzed, as necessary. Analytical results will be used to prepare waste profiles for the IDW. At the end of the PDI activities, NYSEG's waste disposal vendor will transport the IDW for off-site treatment/disposal in accordance with state and federal regulations.

## 2.8 Pre-Design Investigation Documentation

Results of the PDI will be documented in a summary letter report that will be included as an attachment to the Preliminary Remedial Design Report (described in Section 5). Those results, along with existing site information, will support the development of a basis of design. The PDI Summary Letter Report will include the following:

- A summary of PDI activities, including community air monitoring, field observations, sampling results, changes made in response to field conditions, problems encountered and resolutions, and other pertinent information to document that the site activities were performed pursuant to this RDWP;
- Soil boring logs;
- Summary tables presenting analytical results;
- An updated site plan(s) showing soil boring locations, sample locations, subsurface utilities, and pertinent identified subsurface features; and
- Laboratory analytical data reports and data validation reports that will be attached electronically.
- Analytical data will be submitted to the NYSDEC in an Electronic Data Deliverable (EDD) format in accordance with the NYSDEC Electronic Data Deliverable Manual, NYSDEC EDD Format v.4, November 2018.

## 2.9 Supplemental PDI Activities

Additional PDI activities will be required to develop the remedial design. These activities include:

- Evaluating handling requirements for soil to be removed as part of the remedy;
- Evaluating geotechnical properties of soil within the excavation areas;
- Collecting/evaluating hydraulic data to support excavation dewatering evaluation/design; and
- Further evaluating (as necessary) the extent of PCB-impacted soils on site and metals-impacted soils both on site and off site.

Conducting these PDI activities during the initial PDI mobilization is premature, based on the available site characterization data and current unknown excavation limits. Data from these activities will be required to develop the remedial design and it is proposed that these activities be conducted under a supplemental PDI following initial PDI completion and data review. The sections below provide descriptions of the anticipated work activities to facilitate remedial design component development.

### 2.9.1 Geotechnical Soil Sampling

Geotechnical data needs for the evaluation and design of excavation support systems (e.g., slide rail, steel sheet pile, etc.) will be evaluated following completion of the initial PDI. If required, geotechnical testing details, including the number and location of borings, types of sampling, and geotechnical testing requirements, will be provided in a supplemental PDI Work Plan.

### 2.9.2 In-Situ Waste Characterization

Materials excavated during remedial construction activities are anticipated to be transported off site for disposal. In-situ waste characterization sampling is anticipated to be conducted during the supplemental PDI. This data will be collected to support profiling for off-site disposal and to facilitate direct loading of the excavated materials during remedial construction. If required, details on the type(s) of samples required and number of locations will be provided in a supplemental PDI Work Plan.

### 2.9.3 Groundwater Investigation

A temporary water treatment system may be required to support soil excavation during remedial construction (to be determined as part of the remedial design). The need for groundwater samples will be evaluated, and if required, details on the number of samples and parameters to be analyzed will be provided in the supplemental PDI Work Plan.

# 3 Remedial Design Activities

This section presents a description of the remedial design activities to be completed in support of the design of the selected site remedy. Work activities associated with preparing the remedial design will be conducted under the following principal design tasks:

- Remedial Design Task 1 – Utility Relocation/Protection;
- Remedial Design Task 2 – Soil Excavation and Handling;
- Remedial Design Task 3 – Liquid Waste Management;
- Remedial Design Task 4 – Solid Waste Management; and
- Remedial Design Task 5 – Backfilling and Site Restoration.

The design tasks listed above represent major tasks associated with preparation of the remedial design. Other related tasks (including, but not limited to, site preparation, site security/control/access, erosion and sedimentation control, noise/vapor/dust suppression, air monitoring, characterization/verification sampling, equipment decontamination, site restoration, etc.) will be detailed in the remedial design. A description of the activities to be performed under each of the above-listed principal design tasks is presented below.

## 3.1 Remedial Design Task 1 – Utility Relocation/Protection

Subsurface utilities may be encountered within the proposed excavation areas. Certain utilities may need to be left in place and protected or re-located to facilitate excavation. The design will provide a means to either temporarily or permanently relocate, bypass, or protect these utilities to facilitate remedial construction. The proposed handling of utilities will be further evaluated during the remedial design based on the PDI results.

## 3.2 Remedial Design Task 2 – Soil Excavation and Handling

As indicated in Section 2, PDI activities will be completed to refine the horizontal and vertical extent of soils requiring excavation. The remedial design will include the extent and approximate volume of soil to be excavated to meet the appropriate site cleanup levels presented in the AROD. Excavation activities are anticipated to include:

- Removal of on-site PCB-impacted soils exceeding 1 ppm in the top 1 foot of soil and 25 ppm in soils deeper than 1 foot bgs, as defined by CP-51, which includes removal of contaminated sediments from affected catch basins;
- Removal of off-site PCB-impacted soil exceeding residential standards for PCBs, as defined by 6 NYCRR Part 375-6.8(b);
- Removal of on-site and off-site metal-COC-impacted soil exceeding industrial standards, as defined by 6 NYCRR Part 375-6.8(b); and
- Removal of off-site metal-COC-impacted soil exceeding residential standards, from 0 to 1 foot bgs, as defined by 6 NYCRR Part 375-6.8(b).

Soil excavation activities are anticipated to be conducted via open cut excavations with sloped and/or benched excavation sidewalls, as necessary, to allow excavation to proceed to the target depths, prevent cave-ins, and comply with the Occupational Safety and Health Administration requirements outlined in Title 29 of the Code of Federal Regulations Part 1926 Subpart P. The remedial design will consider additional excavation support requirements, as appropriate. The remedial design will describe excavated soil handling and transportation requirements for off-site treatment/disposal. Soil derived from site grading and meeting 6 NYCRR Part 375-6.7 (d) standards for industrial use may be used to backfill on-site excavations.

## 3.3 Remedial Design Task 3 – Liquid Waste Management

Groundwater is generally encountered at depths from 2 to 8 feet bgs and water management may be required during excavation activities. Site hydrology will be evaluated during the remedial design using data collected from the supplemental PDI (if needed) to determine water management requirements (e.g., onsite water treatment or transportation for offsite treatment and disposal).

The final treatment/disposal method will be selected during the remedial design based on the feasibility and cost of implementing each applicable option.

## 3.4 Remedial Design Task 4 – Solid Waste Management

The remedial design will present solid waste management requirements for the waste streams anticipated to be generated during implementation of the remedial action. The waste management plan will include the following components:

- Applicable codes, standards, and specifications;
- Description of anticipated waste streams; and
- Materials handling activities required for each waste stream.

Excavated materials that are not suitable for reuse as subsurface fill are anticipated to be transported off site for disposal as a non-hazardous solid waste (e.g., at Casella Waste Systems in Lowman, New York), transported to US Ecology’s Bellville, Michigan facility for Toxic Substance Control Act PCB waste, or incinerated at a permitted facility if the material is Resource Conservation and Recovery Act hazardous and has PCBs as underlying hazardous constituents.

The remedial design will present requirements associated with soil amendment (to pass paint filter testing and other disposal/treatment facility moisture content requirements), additional waste characterization sampling (if necessary), and loading/hauling of excavated materials. The remedial design will also present anticipated waste stream quantities, including treatment/disposal requirements for soil removed from various depth intervals at each excavation area, based on the PDI waste characterization sampling results.

## 3.5 Remedial Design Task 5 – Backfilling and Site Restoration

Following soil removal activities, disturbed portions of the processing area, recycling area, and outlying parcel will be restored to match pre-construction conditions. Anticipated backfill materials include, but are not limited to, excavated soil suitable for re-use and imported clean soil fill. The remedial design will include specifications (i.e., gradations, material types, and analytical criteria) for re-use and imported fill materials. Review of geotechnical data collected during the PDI/supplemental PDI activities will be used to identify fill material(s) to be used during remedial construction. Backfilling and grading protocols (e.g., lift thickness, compaction requirements, etc.) will also be specified in the remedial design. In accordance with the AROD, on-site excavation areas will be backfilled with material meeting the requirements of 6 NYCRR Part 375-6.7 (d) for industrial use, and off-site areas will be backfilled with materials meeting the requirements of 6 NYCRR Part 375-6.7 (d) for residential use.

# 4 Permits and Approvals

The remedial design will be developed to meet applicable SCGs, permits, and approvals. In addition to NYSDEC approval of the remedial design, permits and approvals will be necessary to conduct the PDI field activities and to implement the NYSDEC-selected remedy.

## 4.1 PDI Permits and Approvals

Permits and approvals required for PDI activities are primarily associated with performing subsurface investigations within properties not owned by NYSEG and within the roadway right-of-way. NYSEG will coordinate PDI activities with the property owner and neighboring property owners. The Remediation Engineer and/or their subcontractor will obtain all necessary permits and approvals required by the City, County, and/or State to complete PDI activities. NYSEG will notify and coordinate PDI activities with the City of Elmira, as necessary.

## 4.2 Remedial Construction Permits and Approvals

Permits and approvals necessary to complete remedial construction activities are associated with performing subsurface excavations within properties not owned by NYSEG and within the roadway right-of-way. NYSEG will coordinate remedial activities with the property owner and neighboring property owners. The Design Engineer will obtain all necessary permits and approvals required by the City, County, and State to complete remedial construction activities. Additionally, the Remediation Engineer and/or Remediation Contractor will coordinate with the City of Elmira, if needed, during remedial construction activities.

Any additional regulatory and permitting requirements associated with implementing the remedial activities will be identified during the remedial design.

# 5 Remedial Design Documents and Schedule

Consistent with the requirements set forth in DER-10, the following remedial design documents will be prepared:

- Preliminary Remedial Design Report; and
- Final Remedial Design Report.

A description of the remedial design documents is presented below, followed by a preliminary schedule for implementing the PDI and preparing the remedial design.

## 5.1 Preliminary Remedial Design Report

The purpose of the Preliminary Remedial Design Report is to present the general remedial approach and preliminary design for implementing the NYSDEC-selected remedy. The Preliminary Remedial Design Report is anticipated to include the following:

- An introductory section that will provide a brief overview of the remedial design, site background information, design report objectives, and report organization.
- A summary of the PDI activities and results.
- A summary of the remedy with a basis of design that describes the proposed remedial design and presents information used to develop the design and construction components of the project. Design calculations and other supporting data, where appropriate, will be included to support the basis of design.
- A description of site controls for protecting the public health, safety, welfare, and environment and to maintain the effectiveness of the remedial action.
- The regulatory and permitting requirements associated with implementing the remedial construction activities.
- A summary of the organizational structure and responsibilities of NYSEG, the Design Engineer, the Remediation Engineer, and the Remediation Contractor.
- A description of the pre-remediation activities to be completed, including but not limited to citizen participation, access agreements (if any), permitting, and pre-mobilization submittals.
- A general description of the various components associated with completing the remediation tasks, including but not limited to:
  - Mobilization;
  - Site Preparation;
  - Site Controls and Monitoring;
  - Utility Relocation/Protection;
  - Excavation;
  - Backfilling;
  - Waste Management;
  - Surface Restoration/Cover Installation; and
  - Project Close-Out.
- A summary of the anticipated post-remediation reporting requirements and monitoring activities, including a description of operation, maintenance, and monitoring activities to be undertaken after the NYSDEC has approved construction of the remedial design.

- A description of the certification report to be prepared after the remedy has been implemented.
- An anticipated schedule for completing the Final Remedial Design Report, contractor procurement, and implementation of the remedial construction activities.
- A set of engineering design drawings that represent an accurate identification of existing site conditions and an illustration of the proposed work. Each engineering design drawing will include a north arrow (where applicable), a scale, a legend, definitions of all symbols and abbreviations, and a sheet number. It is anticipated that the engineering design drawings will include, at a minimum, the following:
  - Title Sheet – to include, at minimum, the title of the project, key map, date prepared, sheet index, and NYSDEC project identification.
  - Existing Site Plan(s) – to include pertinent property data, including:
    - Owners of record for all properties adjacent to the site (as necessary);
    - A site survey that includes the distance and bearing of all property lines that identify and define the site;
    - All easements, rights-of-way, and reservations (as necessary);
    - Existing buildings and structures, wells, facilities, and equipment;
    - A topographic survey of existing contours and spot elevations within the anticipated limits of disturbance, based on United States Geological Survey datum;
    - All known existing underground and aboveground utilities; and
    - The location and identification of significant natural features, including, among other things, wooded areas, water courses, wetlands, and flood hazard areas.
  - General Site Layout Plan(s) – to include general locations indicating site facilities (parking areas, decontamination area, equipment/material lay down area), limits of the excavation, and relocation of utilities (if any).
  - Restoration Plan(s) – to include the final topographic survey (proposed contours and spot elevations) of the site, limits of the final surface covers, location of new structures and/or wells, final surface restoration for disturbed adjacent properties, and other final restoration features.
- A draft list of technical specifications.

## 5.2 Final Remedial Design Report

The purpose of the Final Remedial Design Report is to provide a remedial design for implementing the NYSDEC-selected remedy that will be of biddable quality . The Final Remedial Design Report will be stamped and signed by a Professional Engineer licensed in the State of New York and will be used as the basis for procurement of a Remediation Contractor. In addition to the items identified for the Preliminary Remedial Design Report, the Final Remedial Design Report is anticipated to include the following:

- Incorporated NYSDEC comments on the Preliminary Remedial Design Report, as appropriate.
- Final Engineering Design Drawings, including but not limited to the following, in addition to the design drawings prepared for the Preliminary Remedial Design Report:
  - Site Preparation Plan(s) – to include minimum requirements for temporary erosion and sedimentation controls, relocation/protection of utilities, identification of other site features to be protected during remedial construction activities, and site facilities (parking areas, decontamination area, equipment/laydown areas).

   - Excavation Plans and Cross-Sections – to include limits of soil excavation. Geologic cross-sections will also be prepared to present the vertical extent of remedial activities, as necessary, to complete the remedial action.
   - Miscellaneous Details – to include details related to the surface cover profiles, temporary erosion and sedimentation controls, and decontamination area.
- Technical Specifications for site preparation, erosion and sedimentation control, noise control, odor suppression, excavation, impacted soil and debris transportation, backfill, and support facilities.
- Supporting plans consisting of the following:
   - Community and Environmental Response Plan – describes the site monitoring and work practices that will be completed to address potential short-term impacts to the surrounding community and/or environmental resources;
   - Erosion Control Plan – describes the erosion and sedimentation control measures to be implemented during the remedial action;
   - Sampling and Analysis Plan – describes the samples to be collected and laboratory analyses to be performed associated with the remedial action;
   - Community Air Monitoring Plan – describes the monitoring activities that will be conducted to detect potential airborne releases of COCs and odor, vapor, and dust control measures during implementation of the remedial activities; and
   - Contingency Plan (CP) – describes the procedures to be implemented at the site in the event of an emergency.
- Final Design, which will also include a Schedule of Submittals.

## 5.3 Remedial Design Schedule

The anticipated schedule for completing the PDI activities identified in this RDWP and a preliminary schedule for completion of the remedial design and construction of the selected remedy for the site is presented in Table 5.1 below.

*Table 5.1 – Remedial Design and Construction Schedule*

| Schedule Component | Date |
|---|---|
| NYSDEC RDWP Approval | September 2022 |
| Conduct Initial and Supplemental PDI Activities | September – November 2022 |
| Submit PDI and Background Study Summary Report | February 2023 |
| Submit Final Remedial Design Report | April 2023 |
| Receive NYSDEC Comments on Final Remedial Design Report | May 2023 |
| Remedial Contractor Procurement | June 2023 – December 2023 |
| Remedial Construction | August 2024 – October 2024 |
| Submit Site Management Plan | April 2025 |
| Submit Environmental Easement supporting documentation | July 2025 |
| Submit PCB Cleanup Report to EPA | December 2025 |
| Submit Final Engineering Report | March 2026 |

# 6 Post-Construction Activities

Post-construction activities are anticipated to include preparation of a SMP, Final Engineering Report (FER) and establishing institutional controls for the site. The anticipated components of the SMP, FER, and institutional controls are presented below.

## 6.1 Site Management Plan

As indicated in the AROD, the primary components of the SMP will consist of an Institutional and Engineering Control Plan and a Monitoring Plan. These plans will consist of the following:

- Institutional and Engineering Control Plan – describes the use restrictions and engineering controls that will be established. The primary institutional control will consist of an environmental easement (as described in Section 6.2), and the main engineering control will consist of the existing/new site cover.
- Monitoring Plan – used to assess the performance and effectiveness of the remedial activities. Potential monitoring plan components are described in Section 1.6 and will be further developed and presented as part of the Remedial Design Report.

The SMP will include requirements for post-remedial action groundwater monitoring, as well as site inspection schedules and NYSDEC submittal requirements. The SMP will also include soil vapor intrusion monitoring requirements for any new buildings constructed at the site.

## 6.2 Final Engineering Report

A FER will be prepared and submitted to the NYSDEC to document the implementation and completion of remedial activities. In accordance with DER-10, the FER will present, at minimum, the following information:

- Description of the remediation activities completed in accordance with the approved Final Remedial Design, including problems encountered and variations (if any) from the NYSDEC-approved Final Remedial Design Report.
- Record (“as-built”) drawings, tables, and figures detailing the remedial activities completed and indicating that acceptance criteria were met.
- Information and documentation regarding the final quantities and disposition of materials disposed/treated off-site during implementation of the remedial activities, including executed manifests and bills of lading.
- Summaries of field observations, test performed, laboratory samples collected, and monitoring results obtained during construction (e.g., CAMP monitoring).
- Summaries of problems and deficiencies encountered during construction, including recurring problems and/or deficiencies discovered.
- Representative photographs taken during implementation of the remedial activities.
- Copies of the regulatory permit(s) and other key regulatory agency correspondence related to the permits and permit compliance.
- Certification statement.

The FER will be prepared in a format based on available templates on the NYSDEC website. A professional engineer licensed in New York State will sign and seal the FER, including the record drawings and certification statement.

## 6.3 Institutional Controls

As indicated above, institutional controls in the form of an environmental easement will be established to:

- Require NYSEG or the designated RP to provide a periodic certification of institutional and engineering controls to the NYSDEC in accordance with 6NYCRR Part 375-1.8(h)(3).
- Allow the use and development of the controlled property for industrial uses, as defined by Part 375-1.8(g), although land use is subject to local zoning laws.
- Restrict the use of groundwater as a source of potable or process water, without necessary water quality treatment, as determined by the NYSDOH or County Department of Health.
- Require compliance with an NYSDEC-approved SMP.

Institutional controls will be established by NYSEG following completion of the remedial construction activities.

# 7 References

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CDM Smith. 2014. Final Remedial Investigation Report, Shulman's Salvage Yard (Site No: 808013), Elmira, New York, September.

CDM Smith. 2015, Final Feasibility Study Report, Shulman's Salvage Yard, Elmira, New York, January.

Malcolm Pirnie/AFI. 1989. Work Plan Remedial Investigation/Feasibility Study, prepared for I. Shulman & Son Inc., Elmira, New York. February, revised July 1989.

NYSDEC. 1998. Technical and Operational Guidance Series, Division of Water. June.

NYSDEC. 2006. Title 6 of the New York Codes, Rules, and Regulations, Environmental Remediation Programs. December 14.

NYSDEC. 2010a. CP-51 / Soil Cleanup Guidance, Division of Environmental Remediation. October 21.

NYSDEC. 2010b. DER-10 / Technical Guidance for Site Investigation and Remediation, Division of Environmental Remediation. May 3.

NYSDEC. 2011. DER-31 / Green Remediation, Division of Environmental Remediation. January 20.

NYSDEC. 2017. Order on Consent Index No. CO-8-20150721-93, dated February 16, 2017.

NYSDEC. 2022. Amended Record of Decision, NYSEG – Shulman's Salvage Yard, Elmira, Chemung County, New York, Site No. 808013. March.

USEPA. 1990. Code of Federal Regulations: Protection of Environment, Title 40. Various dates, revised July 1, 2008.

# Tables

**Table 1**
**Proposed PDI Sampling Summary**

**Remedial Design Work Plan**
**Shulman's Salvage Yard, Elmira New York**

| Parent Location ID | Proposed Sample Location for Delineation | Location Depth (ft bgs) | Delineation | | | | | Background Evaluation | Catch Basin Investigation |
|---|---|---|---|---|---|---|---|---|---|
| | | | PCB Surface Soil[2] (0-1 ft bgs) | PCBs Subsurface Soil[2] Below 1 ft bgs | | COC-Metals Subsurface Soil[2] | | COC-Metals Subsurface Soil[2] | PCBs and COC-Metals Soil and Water[2] |
| | | | Sample Depth Interval (ft bgs) | Sample Depth Interval (ft bgs) | Additional Sample Depth Interval (ft bgs) (Placed on Hold) | Sample Depth Interval (ft bgs) | Additional Sample Depth Interval (ft bgs) (Placed on Hold) | Sample Depth Interval (ft bgs) | Sample Depth Interval (ft bgs) |
| **Onsite** | | | | | | | | | |
| GWS-02/SB-06 | GWS-02 | 10 | -- | -- | -- | 8 - 10 | -- | -- | -- |
| | GWS-02E | 10 | -- | -- | -- | 0 - 1, 1 - 2, 2 - 4, 4 - 6 | 6 - 8, 8 - 10 | -- | -- |
| | GWS-02N | 10 | -- | -- | -- | 0 - 1, 1 - 2, 2 - 4, 4 - 6 | 6 - 8, 8 - 10 | -- | -- |
| | GWS-02S | 10 | -- | -- | -- | 0 - 1, 1 - 2, 2 - 4, 4 - 6 | 6 - 8, 8 - 10 | -- | -- |
| | GWS-02W | 10 | -- | -- | -- | 0 - 1, 1 - 2, 2 - 4, 4 - 6 | 6 - 8, 8 - 10 | -- | -- |
| GWS-03 | GWS-03E | 8 | -- | -- | -- | 0 - 1, 1 - 2, 2 - 4, 4 - 6 | 6 - 8 | -- | -- |
| | GWS-03N | 8 | -- | -- | -- | 0 - 1, 1 - 2, 2 - 4, 4 - 6 | 6 - 8 | -- | -- |
| | GWS-03S | 8 | -- | -- | -- | 0 - 1, 1 - 2, 2 - 4, 4 - 6 | 6 - 8 | -- | -- |
| | GWS-03W | 8 | -- | -- | -- | 0 - 1, 1 - 2, 2 - 4, 4 - 6 | 6 - 8 | -- | -- |
| GWS-08 | GWS-08 | 8 | -- | 4 - 6 | 6 - 8 | -- | -- | -- | -- |
| | GWS-08E | 8 | -- | 0 - 1, 1 - 2, 2 - 4, 4 - 6 | 6 - 8 | -- | -- | -- | -- |
| | GWS-08N | 8 | -- | 0 - 1, 1 - 2, 2 - 4, 4 - 6 | 6 - 8 | -- | -- | -- | -- |
| | GWS-08S | 8 | -- | 0 - 1, 1 - 2, 2 - 4, 4 - 6 | 6 - 8 | -- | -- | -- | -- |
| | GWS-08W | 8 | -- | 0 - 1, 1 - 2, 2 - 4, 4 - 6 | 6 - 8 | -- | -- | -- | -- |
| GWS-09/SB-09 | GWS-09 | 8 | -- | -- | -- | 4 - 6 | 6 - 8 | -- | -- |
| | GWS-09E | 8 | -- | 0 - 1, 1 - 2 | 2 - 4 | 0 - 1, 1 - 2, 2 - 4 | 4 - 6, 6 - 8 | -- | -- |
| | GWS-09N | 8 | -- | 0 - 1, 1 - 2 | 2 - 4 | 0 - 1, 1 - 2, 2 - 4 | 4 - 6, 6 - 8 | -- | -- |
| | GWS-09S | 8 | -- | 0 - 1, 1 - 2 | 2 - 4 | 0 - 1, 1 - 2, 2 - 4 | 4 - 6, 6 - 8 | -- | -- |
| | GWS-09W | 8 | -- | 0 - 1, 1 - 2 | 2 - 4 | 0 - 1, 1 - 2, 2 - 4 | 4 - 6, 6 - 8 | -- | -- |
| SB-01 | SB-01W | 1 | 0 - 1 | -- | -- | -- | -- | -- | -- |
| SB-02 | SB-02E | 1 | 0 - 1 | -- | -- | -- | -- | -- | -- |
| | SB-02S | 1 | 0 - 1 | -- | -- | -- | -- | -- | -- |
| | SB-02W | 1 | 0 - 1 | -- | -- | -- | -- | -- | -- |
| | SB-02WW | 1 | 0 - 1 | -- | -- | -- | -- | -- | -- |
| | SB-02SW | 1 | 0 - 1 | -- | -- | -- | -- | -- | -- |
| SB-03 | SB-03S | 1 | 0 - 1 | -- | -- | -- | -- | -- | -- |
| | SB-03W | 1 | 0 - 1 | -- | -- | -- | -- | -- | -- |
| SB-05 | SB-05E | 1 | 0 - 1 | -- | -- | -- | -- | -- | -- |
| | SB-05W | 1 | 0 - 1 | -- | -- | -- | -- | -- | -- |
| SB-06 | SB-06SW | 1 | 0 - 1 | -- | -- | -- | -- | -- | -- |
| SB-10 | SB-10E | 8 | -- | 0 - 1, 1 - 2 | 2 - 4 | 0 - 1, 1 - 2, 2 - 4 | 4 - 6, 6 - 8 | -- | -- |
| | SB-10N | 8 | -- | 0 - 1, 1 - 2 | 2 - 4 | 0 - 1, 1 - 2, 2 - 4 | 4 - 6, 6 - 8 | -- | -- |
| | SB-10S | 8 | 0 - 1 | 1 - 2 | 2 - 4 | 0 - 1, 1 - 2, 2 - 4 | 4 - 6, 6 - 8 | -- | -- |
| | SB-10W | 8 | 0 - 1 | 1 - 2 | 2 - 4 | 0 - 1, 1 - 2, 2 - 4 | 4 - 6, 6 - 8 | -- | -- |
| SB-15 | SB-15SW | 1 | 0 - 1 | -- | -- | -- | -- | -- | -- |

See Notes on Page 9.

Table 1
Proposed PDI Sampling Summary

Remedial Design Work Plan
Shulman's Salvage Yard, Elmira New York

| Parent Location ID | Proposed Sample Location for Delineation | Location Depth (ft bgs) | Delineation | | | | | Background Evaluation | Catch Basin Investigation |
|---|---|---|---|---|---|---|---|---|---|
| | | | PCB Surface Soil[2] (0-1 ft bgs) | PCBs Subsurface Soil[2] Below 1 ft bgs | | COC-Metals Subsurface Soil[2] | | COC-Metals Subsurface Soil[2] | PCBs and COC-Metals Soil and Water[2] |
| | | | Sample Depth Interval (ft bgs) | Sample Depth Interval (ft bgs) | Additional Sample Depth Interval (ft bgs) (Placed on Hold) | Sample Depth Interval (ft bgs) | Additional Sample Depth Interval (ft bgs) (Placed on Hold) | Sample Depth Interval (ft bgs) | Sample Depth Interval (ft bgs) |
| **Onsite (cont.)** | | | | | | | | | |
| SB-17 | SB-17E | 8 | -- | -- | -- | 0 - 1, 1 - 2, 2 - 4 | 4 - 6, 6 - 8 | -- | -- |
| | SB-17N | 8 | -- | -- | -- | 0 - 1, 1 - 2, 2 - 4 | 4 - 6, 6 - 8 | -- | -- |
| | SB-17S | 8 | -- | -- | -- | 0 - 1, 1 - 2, 2 - 4 | 4 - 6, 6 - 8 | -- | -- |
| | SB-17W | 8 | -- | -- | -- | 0 - 1, 1 - 2, 2 - 4 | 4 - 6, 6 - 8 | -- | -- |
| SB-19 | SB-19E | 12 | -- | -- | -- | 0 - 1, 1 - 2, 2 - 4, 4 - 6 | 6 - 8, 10 - 12 | -- | -- |
| | SB-19N | 12 | -- | -- | -- | 0 - 1, 1 - 2, 2 - 4, 4 - 6 | 6 - 8, 10 - 12 | -- | -- |
| | SB-19S | 12 | -- | -- | -- | 0 - 1, 1 - 2, 2 - 4, 4 - 6 | 6 - 8, 10 - 12 | -- | -- |
| | SB-19W | 12 | -- | -- | -- | 0 - 1, 1 - 2, 2 - 4, 4 - 6 | 6 - 8, 10 - 12 | -- | -- |
| SB-20 | SB-20E | 8 | -- | 0 - 1, 1 - 2 | 2 - 4 | 0 - 1, 1 - 2, 2 - 4 | 4 - 6, 6 - 8 | -- | -- |
| | SB-20N | 8 | -- | 0 - 1, 1 - 2 | 2 - 4 | 0 - 1, 1 - 2, 2 - 4 | 4 - 6, 6 - 8 | -- | -- |
| | SB-20S | 8 | 0 - 1 | 1 - 2 | 2 - 4 | 0 - 1, 1 - 2, 2 - 4 | 4 - 6, 6 - 8 | -- | -- |
| | SB-20W | 8 | 0 - 1 | 1 - 2 | 2 - 4 | 0 - 1, 1 - 2, 2 - 4 | 4 - 6, 6 - 8 | -- | -- |
| SB-22 | SB-22 | 8 | -- | -- | -- | 2 - 4 | 4 - 6, 6 - 8 | -- | -- |
| | SB-22E | 8 | -- | -- | -- | 0 - 1, 1 - 2, 2 - 4 | 4 - 6, 6 - 8 | -- | -- |
| | SB-22N | 8 | -- | -- | -- | 0 - 1, 1 - 2, 2 - 4 | 4 - 6, 6 - 8 | -- | -- |
| | SB-22S | 8 | -- | -- | -- | 0 - 1, 1 - 2, 2 - 4 | 4 - 6, 6 - 8 | -- | -- |
| | SB-22W | 8 | -- | -- | -- | 0 - 1, 1 - 2, 2 - 4 | 4 - 6, 6 - 8 | -- | -- |
| SB-24 | SB-24E | 8 | -- | -- | -- | 0 - 1, 1 - 2, 2 - 4 | 4 - 6, 6 - 8 | -- | -- |
| | SB-24N | 8 | -- | -- | -- | 0 - 1, 1 - 2, 2 - 4 | 4 - 6, 6 - 8 | -- | -- |
| | SB-24S | 8 | -- | -- | -- | 0 - 1, 1 - 2, 2 - 4 | 4 - 6, 6 - 8 | -- | -- |
| | SB-24W | 8 | -- | -- | -- | 0 - 1, 1 - 2, 2 - 4 | 4 - 6, 6 - 8 | -- | -- |
| SB-25 | SB-25E | 8 | -- | 0 - 1, 1 - 2 | 2 - 4 | 0 - 1, 1 - 2 | 2 - 4, 4 - 6, 6 - 8 | -- | -- |
| | SB-25N | 8 | -- | 0 - 1, 1 - 2 | 2 - 4 | 0 - 1, 1 - 2 | 2 - 4, 4 - 6, 6 - 8 | -- | -- |
| | SB-25W | 8 | -- | 0 - 1, 1 - 2 | 2 - 4 | 0 - 1, 1 - 2 | 2 - 4, 4 - 6, 6 - 8 | -- | -- |
| | SB-25S | 8 | -- | 0 - 1, 1 - 2 | 2 - 4 | 0 - 1, 1 - 2 | 2 - 4, 4 - 6, 6 - 8 | -- | -- |
| SB-26 | SB-26 | 8 | -- | -- | -- | 2 - 4 | 4 - 6, 6 - 8 | -- | -- |
| | SB-26E | 8 | -- | -- | -- | 0 - 1, 1 - 2 | 2 - 4, 4 - 6, 6 - 8 | -- | -- |
| | SB-26N | 8 | -- | -- | -- | 0 - 1, 1 - 2 | 2 - 4, 4 - 6, 6 - 8 | -- | -- |
| | SB-26S | 8 | -- | -- | -- | 0 - 1, 1 - 2 | 2 - 4, 4 - 6, 6 - 8 | -- | -- |
| | SB-26W | 8 | -- | -- | -- | 0 - 1, 1 - 2 | 2 - 4, 4 - 6, 6 - 8 | -- | -- |
| SB-30 | SB-30E | 8 | -- | -- | -- | 0 - 1, 1 - 2, 2 - 4 | 4 - 6, 6 - 8 | -- | -- |
| | SB-30N | 8 | -- | -- | -- | 0 - 1, 1 - 2, 2 - 4 | 4 - 6, 6 - 8 | -- | -- |
| | SB-30S | 8 | -- | -- | -- | 0 - 1, 1 - 2, 2 - 4 | 4 - 6, 6 - 8 | -- | -- |
| | SB-30W | 8 | -- | -- | -- | 0 - 1, 1 - 2, 2 - 4 | 4 - 6, 6 - 8 | -- | -- |

See Notes on Page 9.

**Table 1**
**Proposed PDI Sampling Summary**

**Remedial Design Work Plan**
**Shulman's Salvage Yard, Elmira New York**

| Parent Location ID | Proposed Sample Location for Delineation | Location Depth (ft bgs) | Delineation | | | | | Background Evaluation | Catch Basin Investigation |
|---|---|---|---|---|---|---|---|---|---|
| | | | PCB Surface Soil[2] (0-1 ft bgs) | PCBs Subsurface Soil[2] Below 1 ft bgs | | COC-Metals Subsurface Soil[2] | | COC-Metals Subsurface Soil[2] | PCBs and COC-Metals Soil and Water[2] |
| | | | Sample Depth Interval (ft bgs) | Sample Depth Interval (ft bgs) | Additional Sample Depth Interval (ft bgs) (Placed on Hold) | Sample Depth Interval (ft bgs) | Additional Sample Depth Interval (ft bgs) (Placed on Hold) | Sample Depth Interval (ft bgs) | Sample Depth Interval (ft bgs) |
| **Onsite (cont.)** | | | | | | | | | |
| SB-31 | SB-31 | 8 | -- | -- | -- | 2 - 4 | 4 - 6, 6 - 8 | -- | -- |
| | SB-31E | 8 | -- | -- | -- | 0 - 1, 1 - 2 | 2 - 4, 6 - 6, 6 - 8 | -- | -- |
| | SB-31N | 8 | -- | -- | -- | 0 - 1, 1 - 2 | 2 - 4, 4 - 6, 6 - 8 | -- | -- |
| | SB-31S | 8 | 0 - 1 | -- | -- | 0 - 1, 1 - 2 | 2 - 4, 4 - 6, 6 - 8 | -- | -- |
| | SB-31W | 8 | 0 - 1 | -- | -- | 0 - 1, 1 - 2 | 2 - 4, 4 - 6, 6 - 8 | -- | -- |
| SB-32 | SB-32 | 8 | -- | -- | -- | 2 - 4 | 4 - 6, 6 - 8 | -- | -- |
| | SB-32E | 8 | -- | -- | -- | 0 - 1, 1 - 2 | 2 - 4, 4 - 6, 6 - 8 | -- | -- |
| | SB-32N | 8 | -- | -- | -- | 0 - 1, 1 - 2 | 2 - 4, 4 - 6, 6 - 8 | -- | -- |
| | SB-32S | 8 | -- | -- | -- | 0 - 1, 1 - 2 | 2 - 4, 4 - 6, 6 - 8 | -- | -- |
| | SB-32W | 8 | -- | -- | -- | 0 - 1, 1 - 2 | 2 - 4, 4 - 6, 6 - 8 | -- | -- |
| SB-33 | SB-33 | 8 | -- | -- | -- | 2 - 4 | 4 - 6, 6 - 8 | -- | -- |
| | SB-33E | 8 | -- | -- | -- | 0 - 1, 1 - 2 | 2 - 4, 4 - 6, 6 - 8 | -- | -- |
| | SB-33N | 8 | -- | -- | -- | 0 - 1, 1 - 2 | 2 - 4, 4 - 6, 6 - 8 | -- | -- |
| | SB-33S | 8 | -- | -- | -- | 0 - 1, 1 - 2 | 2 - 4, 4 - 6, 6 - 8 | -- | -- |
| | SB-33W | 8 | -- | -- | -- | 0 - 1, 1 - 2 | 2 - 4, 4 - 6, 6 - 8 | -- | -- |
| SB-34 | SB-34E | 8 | -- | -- | -- | 0 - 1, 1 - 2 | 2 - 4, 4 - 6, 6 - 8 | -- | -- |
| | SB-34N | 8 | -- | -- | -- | 0 - 1, 1 - 2 | 2 - 4, 4 - 6, 6 - 8 | -- | -- |
| | SB-34S | 8 | -- | -- | -- | 0 - 1, 1 - 2 | 2 - 4, 4 - 6, 6 - 8 | -- | -- |
| | SB-34W | 8 | -- | -- | -- | 0 - 1, 1 - 2 | 2 - 4, 4 - 6, 6 - 8 | -- | -- |
| SB-37 | SB-37 | 8 | -- | 4 - 6 | 6 - 8 | -- | -- | -- | -- |
| | SB-37E | 8 | -- | 0 - 1, 1 - 2, 2 - 4, 4 - 6 | 6 - 8 | 0 - 1, 1 - 2, 2 - 4 | 4 - 6, 6 - 8 | -- | -- |
| | SB-37S | 8 | -- | 0 - 1, 1 - 2, 2 - 4, 4 - 6 | 6 - 8 | 0 - 1, 1 - 2, 2 - 4 | 4 - 6, 6 - 8 | -- | -- |
| | SB-37N | 8 | -- | 0 - 1, 1 - 2, 2 - 4, 4 - 6 | 6 - 8 | 0 - 1, 1 - 2, 2 - 4 | 4 - 6, 6 - 8 | -- | -- |
| | SB-37W | 8 | 0 - 1 | 1 - 2, 2 - 4, 4 - 6 | 6 - 8 | 0 - 1, 1 - 2, 2 - 4 | 4 - 6, 6 - 8 | -- | -- |
| SB-39 | SB-39E | 8 | -- | -- | -- | 0 - 1, 1 - 2, 2 - 4 | 4 - 6, 6 - 8 | -- | -- |
| | SB-39N | 8 | -- | -- | -- | 0 - 1, 1 - 2, 2 - 4 | 4 - 6, 6 - 8 | -- | -- |
| | SB-39S | 8 | -- | -- | -- | 0 - 1, 1 - 2, 2 - 4 | 4 - 6, 6 - 8 | -- | -- |
| | SB-39W | 8 | -- | -- | -- | 0 - 1, 1 - 2, 2 - 4 | 4 - 6, 6 - 8 | -- | -- |
| SB-40 | SB-40E | 12 | -- | -- | -- | 0 - 1, 1 - 2, 2 - 4 | 4 - 6, 6 - 8, 10 - 12 | -- | -- |
| | SB-40N | 12 | -- | -- | -- | 0 - 1, 1 - 2, 2 - 4 | 4 - 6, 6 - 8, 10 - 12 | -- | -- |
| | SB-40S | 12 | -- | -- | -- | 0 - 1, 1 - 2, 2 - 4 | 4 - 6, 6 - 8, 10 - 12 | -- | -- |
| | SB-40W | 12 | -- | -- | -- | 0 - 1, 1 - 2, 2 - 4 | 4 - 6, 6 - 8, 10 - 12 | -- | -- |
| SB-41 | SB-41 | 8 | -- | -- | -- | 2 - 4 | 4 - 6, 6 - 8 | -- | -- |
| | SB-41E | 8 | -- | -- | -- | 0 - 1, 1 - 2 | 2 - 4, 4 - 6, 6 - 8 | -- | -- |
| | SB-41N | 8 | -- | -- | -- | 0 - 1, 1 - 2 | 2 - 4, 4 - 6, 6 - 8 | -- | -- |

See Notes on Page 9.

**Table 1**
**Proposed PDI Sampling Summary**

**Remedial Design Work Plan**
**Shulman's Salvage Yard, Elmira New York**

| Parent Location ID | Proposed Sample Location for Delineation | Location Depth (ft bgs) | Delineation | | | | | Background Evaluation | Catch Basin Investigation |
|---|---|---|---|---|---|---|---|---|---|
| | | | PCB Surface Soil[2] (0-1 ft bgs) | PCBs Subsurface Soil[2] Below 1 ft bgs | | COC-Metals Subsurface Soil[2] | | COC-Metals Subsurface Soil[2] | PCBs and COC-Metals Soil and Water[2] |
| | | | Sample Depth Interval (ft bgs) | Sample Depth Interval (ft bgs) | Additional Sample Depth Interval (ft bgs) (Placed on Hold) | Sample Depth Interval (ft bgs) | Additional Sample Depth Interval (ft bgs) (Placed on Hold) | Sample Depth Interval (ft bgs) | Sample Depth Interval (ft bgs) |
| **Onsite (cont.)** | | | | | | | | | |
| SB-41 (cont.) | SB-41S | 8 | -- | -- | -- | 0 - 1, 1 - 2 | 2 - 4, 4 - 6, 6 - 8 | -- | -- |
| | SB-41W | 8 | -- | -- | -- | 0 - 1, 1 - 2 | 2 - 4, 4 - 6, 6 - 8 | -- | -- |
| SB-42 | SB-42E | 8 | -- | 0 - 1, 1 - 2 | 2 - 4 | 0 - 1, 1 - 2, 2 - 4 | 4 - 6, 6 - 8 | -- | -- |
| | SB-42N | 8 | -- | 0 - 1, 1 - 2 | 2 - 4 | 0 - 1, 1 - 2, 2 - 4 | 4 - 6, 6 - 8 | -- | -- |
| | SB-42S | 8 | -- | 0 - 1, 1 - 2 | 2 - 4 | 0 - 1, 1 - 2, 2 - 4 | 4 - 6, 6 - 8 | -- | -- |
| | SB-42W | 8 | -- | 0 - 1, 1 - 2 | 2 - 4 | 0 - 1, 1 - 2, 2 - 4 | 4 - 6, 6 - 8 | -- | -- |
| SB-43 | SB-43E | 8 | 0 - 1 | -- | -- | 0 - 1, 1 - 2, 2 - 4 | 4 - 6, 6 - 8 | -- | -- |
| | SB-43EE | 1 | 0 - 1 | -- | -- | -- | -- | -- | -- |
| | SB-43N | 8 | -- | -- | -- | 0 - 1, 1 - 2, 2 - 4 | 4 - 6, 6 - 8 | -- | -- |
| | SB-43S | 8 | -- | -- | -- | 0 - 1, 1 - 2, 2 - 4 | 4 - 6, 6 - 8 | -- | -- |
| | SB-43W | 8 | -- | -- | -- | 0 - 1, 1 - 2, 2 - 4 | 4 - 6, 6 - 8 | -- | -- |
| SB-45 | SB-45E | 8 | 0 - 1 | -- | -- | 0 - 1, 1 - 2, 2 - 4 | 4 - 6, 6 - 8 | -- | -- |
| | SB-45EE | 1 | 0 - 1 | -- | -- | -- | -- | -- | -- |
| | SB-45N | 8 | -- | -- | -- | 0 - 1, 1 - 2, 2 - 4 | 4 - 6, 6 - 8 | -- | -- |
| | SB-45S | 8 | -- | -- | -- | 0 - 1, 1 - 2, 2 - 4 | 4 - 6, 6 - 8 | -- | -- |
| | SB-45W | 8 | -- | -- | -- | 0 - 1, 1 - 2, 2 - 4 | 4 - 6, 6 - 8 | -- | -- |
| SB-46 | SB-46E | 8 | -- | -- | -- | 0 - 1, 1 - 2, 2 - 4 | 4 - 6, 6 - 8 | -- | -- |
| | SB-46S | 8 | -- | -- | -- | 0 - 1, 1 - 2, 2 - 4 | 4 - 6, 6 - 8 | -- | -- |
| SB-47 | SB-47 | 8 | -- | -- | -- | 2 - 4 | 4 - 6, 6 - 8 | -- | -- |
| | SB-47E | 8 | 0 - 1 | -- | -- | 0 - 1, 1 - 2 | 2 - 4, 4 - 6, 6 - 8 | -- | -- |
| | SB-47EE | 1 | 0 - 1 | -- | -- | -- | -- | -- | -- |
| | SB-47N | 8 | -- | -- | -- | 0 - 1, 1 - 2 | 2 - 4, 4 - 6, 6 - 8 | -- | -- |
| | SB-47S | 8 | -- | -- | -- | 0 - 1, 1 - 2 | 2 - 4, 4 - 6, 6 - 8 | -- | -- |
| | SB-47W | 8 | -- | -- | -- | 0 - 1, 1 - 2 | 2 - 4, 4 - 6, 6 - 8 | -- | -- |
| SB-49 | SB-49E | 8 | 0 - 1 | -- | -- | 0 - 1, 1 - 2, 2 - 4 | 4 - 6, 6 - 8 | -- | -- |
| | SB-49EE | 1 | 0 - 1 | -- | -- | -- | -- | -- | -- |
| | SB-49N | 8 | -- | -- | -- | 0 - 1, 1 - 2, 2 - 4 | 4 - 6, 6 - 8 | -- | -- |
| | SB-49S | 8 | -- | -- | -- | 0 - 1, 1 - 2, 2 - 4 | 4 - 6, 6 - 8 | -- | -- |
| | SB-49W | 8 | -- | -- | -- | 0 - 1, 1 - 2, 2 - 4 | 4 - 6, 6 - 8 | -- | -- |
| SB-50 | SB-50 | 8 | -- | -- | -- | 2 - 4 | 4 - 6, 6 - 8 | -- | -- |
| | SB-50E | 8 | 0 - 1 | -- | -- | 0 - 1, 1 - 2 | 2 - 4, 4 - 6, 6 - 8 | -- | -- |
| | SB-50N | 2 | -- | -- | -- | 0 - 1, 1 - 2 | 2 - 4, 4 - 6, 6 - 8 | -- | -- |
| | SB-50S | 2 | 0 - 1 | -- | -- | 0 - 1, 1 - 2 | -- | -- | -- |
| | SB-50W | 8 | 0 - 1 | -- | -- | 0 - 1, 1 - 2 | 2 - 4, 4 - 6, 6 - 8 | -- | -- |

See Notes on Page 9.

**Table 1**
**Proposed PDI Sampling Summary**

**Remedial Design Work Plan**
**Shulman's Salvage Yard, Elmira New York**

| | | | Delineation | | | | | Background Evaluation | Catch Basin Investigation |
|---|---|---|---|---|---|---|---|---|---|
| | | | PCB Surface Soil[2] (0-1 ft bgs) | PCBs Subsurface Soil[2] Below 1 ft bgs | | COC-Metals Subsurface Soil[2] | | COC-Metals Subsurface Soil[2] | PCBs and COC-Metals Soil and Water[2] |
| Parent Location ID | Proposed Sample Location for Delineation | Location Depth (ft bgs) | Sample Depth Interval (ft bgs) | Sample Depth Interval (ft bgs) | Additional Sample Depth Interval (ft bgs) (Placed on Hold) | Sample Depth Interval (ft bgs) | Additional Sample Depth Interval (ft bgs) (Placed on Hold) | Sample Depth Interval (ft bgs) | Sample Depth Interval (ft bgs) |
| **Onsite (cont.)** | | | | | | | | | |
| SB-52 | SB-52E | 1 | 0 - 1 | -- | -- | -- | -- | -- | -- |
| | SB-52W | 1 | 0 - 1 | -- | -- | -- | -- | -- | -- |
| SB-53 | SB-53 | 8 | -- | -- | -- | 2 - 4 | 4 - 6, 6 - 8 | -- | -- |
| | SB-53E | 8 | -- | -- | -- | 0 - 1, 1 - 2 | 2 - 4, 4 - 6, 6 - 8 | -- | -- |
| | SB-53N | 8 | -- | -- | -- | 0 - 1, 1 - 2 | 2 - 4, 4 - 6, 6 - 8 | -- | -- |
| | SB-53S | 8 | -- | -- | -- | 0 - 1, 1 - 2 | 2 - 4, 4 - 6, 6 - 8 | -- | -- |
| | SB-53W | 8 | -- | -- | -- | 0 - 1, 1 - 2 | 2 - 4, 4 - 6, 6 - 8 | -- | -- |
| SB-54 | SB-54N | 1 | 0 - 1 | -- | -- | -- | -- | -- | -- |
| | SB-54W | 1 | 0 - 1 | -- | -- | -- | -- | -- | -- |
| | SN-54NE | 1 | 0 - 1 | -- | -- | -- | -- | -- | -- |
| | SB-54S | 1 | 0 - 1 | -- | -- | -- | -- | -- | -- |
| SB-55 | SB-55 | 8 | -- | -- | -- | 2 - 4 | 4 - 6, 6 - 8 | -- | -- |
| | SB-55N | 8 | 0 - 1 | 1 - 2 | 2 - 4 | 0 - 1, 1 - 2 | 2 - 4, 4 - 6, 6 - 8 | -- | -- |
| | SB-55S | 8 | | 0 - 1, 1 - 2 | 2 - 4 | 0 - 1, 1 - 2 | 2 - 4, 4 - 6, 6 - 8 | -- | -- |
| | SB-55E | 8 | 0 - 1 | 1 - 2 | 2 - 4 | 0 - 1, 1 - 2 | 2 - 4, 4 - 6, 6 - 8 | -- | -- |
| | SB-55W | 8 | | 0 - 1, 1 - 2 | 2 - 4 | 0 - 1, 1 - 2 | 2 - 4, 4 - 6, 6 - 8 | -- | -- |
| SB-70 | SB-70W | 1 | 0 - 1 | -- | -- | -- | -- | -- | -- |
| SB-71 | SB-71 | 8 | -- | 4 - 6 | 6 - 8 | -- | -- | -- | -- |
| | SB-71E | 8 | -- | 0 - 1, 1 - 2, 2 - 4, 4 - 6 | 6 - 8 | 0 - 1, 1 - 2, 2 - 4 | 4 - 6, 6 - 8 | -- | -- |
| | SB-71N | 8 | -- | 0 - 1, 1 - 2, 2 - 4, 4 - 6 | 6 - 8 | 0 - 1, 1 - 2, 2 - 4 | 4 - 6, 6 - 8 | -- | -- |
| | SB-71S | 8 | -- | 0 - 1, 1 - 2, 2 - 4, 4 - 6 | 6 - 8 | 0 - 1, 1 - 2, 2 - 4 | 4 - 6, 6 - 8 | -- | -- |
| | SB-71W | 8 | -- | 0 - 1, 1 - 2, 2 - 4, 4 - 6 | 6 - 8 | 0 - 1, 1 - 2, 2 - 4 | 4 - 6, 6 - 8 | -- | -- |
| SB-72 | SB-72E | 8 | -- | -- | -- | 0 - 1, 1 - 2 | 2 - 4, 4 - 6, 6 - 8 | -- | -- |
| | SB-72N | 8 | -- | -- | -- | 0 - 1, 1 - 2 | 2 - 4, 4 - 6, 6 - 8 | -- | -- |
| | SB-72S | 8 | -- | -- | -- | 0 - 1, 1 - 2 | 2 - 4, 4 - 6, 6 - 8 | -- | -- |
| | SB-72W | 8 | -- | -- | -- | 0 - 1, 1 - 2 | 2 - 4, 4 - 6, 6 - 8 | -- | -- |
| SB-73 | SB-73E | 8 | -- | -- | -- | 0 - 1, 1 - 2, 2 - 4 | 4 - 6, 6 - 8 | -- | -- |
| | SB-73N | 8 | -- | -- | -- | 0 - 1, 1 - 2, 2 - 4 | 4 - 6, 6 - 8 | -- | -- |
| | SB-73S | 8 | -- | -- | -- | 0 - 1, 1 - 2, 2 - 4 | 4 - 6, 6 - 8 | -- | -- |
| | SB-73W | 8 | -- | -- | -- | 0 - 1, 1 - 2, 2 - 4 | 4 - 6, 6 - 8 | -- | -- |
| SB-74 | SB-74 | 8 | -- | 4 - 6 | 6 - 8 | -- | -- | -- | -- |
| | SB-74E | 8 | -- | 0 - 1, 1 - 2, 2 - 4, 4 - 6 | 6 - 8 | 0 - 1, 1 - 2, 2 - 4 | 4 - 6, 6 - 8 | -- | -- |
| | SB-74N | 8 | -- | 0 - 1, 1 - 2, 2 - 4, 4 - 6 | 6 - 8 | 0 - 1, 1 - 2, 2 - 4 | 4 - 6, 6 - 8 | -- | -- |
| | SB-74S | 8 | -- | 0 - 1, 1 - 2, 2 - 4, 4 - 6 | 6 - 8 | 0 - 1, 1 - 2, 2 - 4 | 4 - 6, 6 - 8 | -- | -- |

See Notes on Page 9.

Table 1
Proposed PDI Sampling Summary

Remedial Design Work Plan
Shulman's Salvage Yard, Elmira New York

| Parent Location ID | Proposed Sample Location for Delineation | Location Depth (ft bgs) | Delineation | | | | | Background Evaluation | Catch Basin Investigation |
|---|---|---|---|---|---|---|---|---|---|
| | | | PCB Surface Soil[2] (0-1 ft bgs) | PCBs Subsurface Soil[2] Below 1 ft bgs | | COC-Metals Subsurface Soil[2] | | COC-Metals Subsurface Soil[2] | PCBs and COC-Metals Soil and Water[2] |
| | | | Sample Depth Interval (ft bgs) | Sample Depth Interval (ft bgs) | Additional Sample Depth Interval (ft bgs) (Placed on Hold) | Sample Depth Interval (ft bgs) | Additional Sample Depth Interval (ft bgs) (Placed on Hold) | Sample Depth Interval (ft bgs) | Sample Depth Interval (ft bgs) |
| **Onsite (cont.)** | | | | | | | | | |
| SB-75 | SB-75E | 8 | -- | -- | -- | 0 - 1, 1 - 2, 2 - 4 | 4 - 6, 6 - 8 | -- | -- |
| | SB-75N | 8 | -- | -- | -- | 0 - 1, 1 - 2, 2 - 4 | 4 - 6, 6 - 8 | -- | -- |
| | SB-75S | 8 | -- | -- | -- | 0 - 1, 1 - 2, 2 - 4 | 4 - 6, 6 - 8 | -- | -- |
| | SB-75W | 8 | -- | -- | -- | 0 - 1, 1 - 2, 2 - 4 | 4 - 6, 6 - 8 | -- | -- |
| SB-76 | SB-76E | 8 | -- | -- | -- | 0 - 1, 1 - 2, 2 - 4 | 4 - 6, 6 - 8 | -- | -- |
| SB-77 | SB-77 | 8 | 0 - 1 | 1 - 2, 2 - 4 | 4 - 6 | 0 - 1, 1 - 2, 2 - 4 | 4 - 6, 6 - 8 | -- | -- |
| | SB-77E | 8 | 0 - 1 | 1 - 2, 2 - 4 | 4 - 6 | 0 - 1, 1 - 2, 2 - 4 | 4 - 6, 6 - 8 | -- | -- |
| | SB-77N | 8 | -- | 0 - 1, 1 - 2, 2 - 4 | 4 - 6 | 0 - 1, 1 - 2, 2 - 4 | 4 - 6, 6 - 8 | -- | -- |
| | SB-77W | 8 | -- | 0 - 1, 1 - 2, 2 - 4 | 4 - 6 | 0 - 1, 1 - 2, 2 - 4 | 4 - 6, 6 - 8 | -- | -- |
| | SB-77S | 8 | -- | 0 - 1, 1 - 2, 2 - 4 | 4 - 6 | 0 - 1, 1 - 2, 2 - 4 | 4 - 6, 6 - 8 | -- | -- |
| SB-78 | SB-78 | 16 | -- | -- | -- | 12 - 14 | 14 - 16 | -- | -- |
| | SB-78E | 16 | 0 - 1 | -- | -- | 1 - 2, 4 - 6, 8 - 10 | 10 - 12, 12 - 14, 14 - 16 | -- | -- |
| | SB-78N | 16 | -- | -- | -- | 1 - 2, 4 - 6, 8 - 10 | 10 - 12, 12 - 14, 14 - 16 | -- | -- |
| | SB-78W | 16 | 0 - 1 | -- | -- | 1 - 2, 4 - 6, 8 - 10 | 10 - 12, 12 - 14, 14 - 16 | -- | -- |
| | SB-78S | 16 | -- | -- | -- | 1 - 2, 4 - 6, 8 - 10 | 10 - 12, 12 - 14, 14 - 16 | -- | -- |
| SB-79 | SB-79E | 8 | -- | -- | -- | 0 - 1, 1 - 2, 2 - 4 | 4 - 6, 6 - 8 | -- | -- |
| | SB-79N | 8 | -- | -- | -- | 0 - 1, 1 - 2, 2 - 4 | 4 - 6, 6 - 8 | -- | -- |
| | SB-79W | 8 | -- | -- | -- | 0 - 1, 1 - 2, 2 - 4 | 4 - 6, 6 - 8 | -- | -- |
| | SB-79S | 8 | -- | -- | -- | 0 - 1, 1 - 2, 2 - 4 | 4 - 6, 6 - 8 | -- | -- |
| SB-80 | SB-80E | 8 | -- | -- | -- | 0 - 1, 1 - 2, 2 - 4 | 4 - 6, 6 - 8 | -- | -- |
| | SB-80N | 8 | -- | -- | -- | 0 - 1, 1 - 2, 2 - 4 | 4 - 6, 6 - 8 | -- | -- |
| | SB-80W | 8 | -- | -- | -- | 0 - 1, 1 - 2, 2 - 4 | 4 - 6, 6 - 8 | -- | -- |
| | SB-80S | 8 | -- | -- | -- | 0 - 1, 1 - 2, 2 - 4 | 4 - 6, 6 - 8 | -- | -- |
| SB-82 | SB-82E | 8 | -- | -- | -- | 0 - 1, 1 - 2 | 2 - 4, 4 - 6, 6 - 8 | -- | -- |
| | SB-82N | 8 | -- | -- | -- | 0 - 1, 1 - 2 | 2 - 4, 4 - 6, 6 - 8 | -- | -- |
| | SB-82W | 8 | -- | -- | -- | 0 - 1, 1 - 2 | 2 - 4, 4 - 6, 6 - 8 | -- | -- |
| | SB-82S | 8 | -- | -- | -- | 0 - 1, 1 - 2 | 2 - 4, 4 - 6, 6 - 8 | -- | -- |
| SB-84 | SB-84 | 8 | -- | -- | -- | 4 - 6 | 6 - 8 | -- | -- |
| | SB-84E | 8 | -- | -- | -- | 0 - 1, 1 - 2, 2 - 4 | 4 - 6, 6 - 8 | -- | -- |
| | SB-84N | 8 | -- | -- | -- | 0 - 1, 1 - 2, 2 - 4 | 4 - 6, 6 - 8 | -- | -- |
| | SB-84S | 8 | -- | -- | -- | 0 - 1, 1 - 2, 2 - 4 | 4 - 6, 6 - 8 | -- | -- |
| | SB-84W | 8 | -- | -- | -- | 0 - 1, 1 - 2, 2 - 4 | 4 - 6, 6 - 8 | -- | -- |
| SB-85 | SB-85 | 8 | -- | 2 - 4 | 4 - 6 | 2 - 4 | 4 - 6, 6 - 8 | -- | -- |
| | SB-85E | 8 | -- | 0 - 1, 1 - 2, 2 - 4 | 4 - 6 | 0 - 1, 1 - 2 | 2 - 4, 4 - 6, 6 - 8 | -- | -- |
| | SB-85N | 8 | -- | 0 - 1, 1 - 2, 2 - 4 | 4 - 6 | 0 - 1, 1 - 2 | 2 - 4, 4 - 6, 6 - 8 | -- | -- |
| | SB-85S | 8 | -- | 0 - 1, 1 - 2, 2 - 4 | 4 - 6 | 0 - 1, 1 - 2 | 2 - 4, 4 - 6, 6 - 8 | -- | -- |

See Notes on Page 9.

**Table 1**
**Proposed PDI Sampling Summary**

**Remedial Design Work Plan**
**Shulman's Salvage Yard, Elmira New York**

| | | | Delineation | | | | | Background Evaluation | Catch Basin Investigation |
|---|---|---|---|---|---|---|---|---|---|
| | | | PCB Surface Soil[2] (0-1 ft bgs) | PCBs Subsurface Soil[2] Below 1 ft bgs | | COC-Metals Subsurface Soil[2] | | COC-Metals Subsurface Soil[2] | PCBs and COC-Metals Soil and Water[2] |
| Parent Location ID | Proposed Sample Location for Delineation | Location Depth (ft bgs) | Sample Depth Interval (ft bgs) | Sample Depth Interval (ft bgs) | Additional Sample Depth Interval (ft bgs) (Placed on Hold) | Sample Depth Interval (ft bgs) | Additional Sample Depth Interval (ft bgs) (Placed on Hold) | Sample Depth Interval (ft bgs) | Sample Depth Interval (ft bgs) |
| **Onsite (cont.)** | | | | | | | | | |
| SB-86 | SB-86 | 8 | -- | -- | -- | 4 - 6 | 6 - 8 | -- | -- |
| | SB-86E | 8 | -- | -- | -- | 0 - 1, 1 - 2, 2 - 4 | 4 - 6, 6 - 8 | -- | -- |
| | SB-86N | 8 | -- | -- | -- | 0 - 1, 1 - 2, 2 - 4 | 4 - 6, 6 - 8 | -- | -- |
| | SB-86S | 8 | -- | -- | -- | 0 - 1, 1 - 2, 2 - 4 | 4 - 6, 6 - 8 | -- | -- |
| | SB-86W | 8 | -- | -- | -- | 0 - 1, 1 - 2, 2 - 4 | 4 - 6, 6 - 8 | -- | -- |
| SB-87 | SB-87 | 8 | -- | -- | -- | 2 - 4 | 4 - 6, 6 - 8 | -- | -- |
| | SB-87E | 8 | 0 - 1 | -- | -- | 0 - 1, 1 - 2 | 2 - 4, 4 - 6, 6 - 8 | -- | -- |
| | SB-87EE | 1 | 0 - 1 | -- | -- | -- | -- | -- | -- |
| | SB-87N | 8 | -- | -- | -- | 0 - 1, 1 - 2 | 2 - 4, 4 - 6, 6 - 8 | -- | -- |
| | SB-87S | 8 | -- | -- | -- | 0 - 1, 1 - 2 | 2 - 4, 4 - 6, 6 - 8 | | |
| | SB-87W | 8 | -- | -- | -- | 0 - 1, 1 - 2 | 2 - 4, 4 - 6, 6 - 8 | -- | -- |
| **Offsite** | | | | | | | | | |
| SB-202 | SB-202E | 8 | -- | -- | -- | 0 - 1, 1 - 2 | 2 - 4, 4 - 6, 6 - 8 | -- | -- |
| | SB-202N | 8 | -- | -- | -- | 0 - 1, 1 - 2 | 2 - 4, 4 - 6, 6 - 8 | -- | -- |
| | SB-202W | 8 | -- | -- | -- | 0 - 1, 1 - 2 | 2 - 4, 4 - 6, 6 - 8 | -- | -- |
| | SB-202S | 8 | -- | -- | -- | 0 - 1, 1 - 2 | 2 - 4, 4 - 6, 6 - 8 | -- | -- |
| SB-203 | SB-203E | 8 | -- | -- | -- | 0 - 1, 1 - 2 | 2 - 4, 4 - 6, 6 - 8 | -- | -- |
| | SB-203N | 8 | -- | -- | -- | 0 - 1, 1 - 2 | 2 - 4, 4 - 6, 6 - 8 | -- | -- |
| | SB-203W | 8 | -- | -- | -- | 0 - 1, 1 - 2 | 2 - 4, 4 - 6, 6 - 8 | -- | -- |
| SB-205 | SB-205E | 8 | -- | -- | -- | 2 - 4 | 4 - 6, 6 - 8 | -- | -- |
| | SB-205N | 8 | -- | -- | -- | 0 - 1, 1 - 2 | 2 - 4, 4 - 6, 6 - 8 | -- | -- |
| | SB-205W | 8 | -- | -- | -- | 0 - 1, 1 - 2 | 2 - 4, 4 - 6, 6 - 8 | -- | -- |
| | SB-205S | 8 | -- | -- | -- | 0 - 1, 1 - 2 | 2 - 4, 4 - 6, 6 - 8 | -- | -- |
| SB-209 | SB-209E | 6 | -- | -- | -- | 0 - 1 | 1 - 2, 2 - 4, 4 - 6 | -- | -- |
| | SB-209N | 6 | -- | -- | -- | 0 - 1 | 1 - 2, 2 - 4, 4 - 6 | -- | -- |
| | SB-209W | 6 | -- | -- | -- | 0 - 1 | 1 - 2, 2 - 4, 4 - 6 | -- | -- |
| SB-211 | SB-211W | 8 | -- | -- | -- | 0 - 1, 1 - 2 | 2 - 4, 4 - 6, 6 - 8 | -- | -- |
| SB-213 | SB-213N | 8 | -- | -- | -- | 0 - 1, 1 - 2 | 2 - 4, 4 - 6, 6 - 8 | -- | -- |
| | SB-213W | 8 | -- | -- | -- | 0 - 1, 1 - 2 | 2 - 4, 4 - 6, 6 - 8 | -- | -- |
| | SB-213S | 8 | -- | -- | -- | 0 - 1, 1 - 2 | 2 - 4, 4 - 6, 6 - 8 | -- | -- |
| SB-215 | SB-215E | 6 | -- | -- | -- | 0 - 1 | 1 - 2, 2 - 4, 4 - 6 | -- | -- |
| | SB-215N | 6 | -- | -- | -- | 0 - 1 | 1 - 2, 2 - 4, 4 - 6 | -- | -- |
| | SB-215W | 6 | -- | -- | -- | 0 - 1 | 1 - 2, 2 - 4, 4 - 6 | -- | -- |
| | SB-215S | 6 | -- | -- | -- | 0 - 1 | 1 - 2, 2 - 4, 4 - 6 | -- | -- |

See Notes on Page 9.

**Table 1**
**Proposed PDI Sampling Summary**

**Remedial Design Work Plan**
**Shulman's Salvage Yard, Elmira New York**

| Parent Location ID | Proposed Sample Location for Delineation | Location Depth (ft bgs) | Delineation | | | | | Background Evaluation | Catch Basin Investigation |
|---|---|---|---|---|---|---|---|---|---|
| | | | PCB Surface Soil[2] (0-1 ft bgs) | PCBs Subsurface Soil[2] Below 1 ft bgs | | COC-Metals Subsurface Soil[2] | | COC-Metals Subsurface Soil[2] | PCBs and COC-Metals Soil and Water[2] |
| | | | Sample Depth Interval (ft bgs) | Sample Depth Interval (ft bgs) | Additional Sample Depth Interval (ft bgs) (Placed on Hold) | Sample Depth Interval (ft bgs) | Additional Sample Depth Interval (ft bgs) (Placed on Hold) | Sample Depth Interval (ft bgs) | Sample Depth Interval (ft bgs) |
| **Offsite (cont.)** | | | | | | | | | |
| SB-216 | SB-216W | 6 | 0 - 1 | -- | -- | 0 - 1 | 1 - 2, 2 - 4, 4 - 6 | -- | -- |
| | SB-216S | 6 | -- | -- | -- | 0 - 1 | 1 - 2, 2 - 4, 4 - 6 | -- | -- |
| SB-219 | SB-219E | 6 | -- | -- | -- | 0 - 1 | 1 - 2, 2 - 4, 4 - 6 | -- | -- |
| | SB-219N | 6 | -- | -- | -- | 0 - 1 | 1 - 2, 2 - 4, 4 - 6 | -- | -- |
| | SB-219W | 6 | -- | -- | -- | 0 - 1 | 1 - 2, 2 - 4, 4 - 6 | -- | -- |
| | SB-219S | 6 | -- | -- | -- | 0 - 1 | 1 - 2, 2 - 4, 4 - 6 | -- | -- |
| SB-220 | SB-220 | 8 | -- | -- | -- | 4 - 6 | 6 - 8 | -- | -- |
| | SB-220E | 8 | -- | -- | -- | 0 - 1, 1 - 2, 2 - 4 | 4 - 6, 6 - 8 | -- | -- |
| | SB-220N | 8 | -- | -- | -- | 0 - 1, 1 - 2, 2 - 4 | 4 - 6, 6 - 8 | -- | -- |
| | SB-220W | 8 | -- | -- | -- | 0 - 1, 1 - 2, 2 - 4 | 4 - 6, 6 - 8 | -- | -- |
| | SB-220S | 8 | -- | -- | -- | 0 - 1, 1 - 2, 2 - 4 | 4 - 6, 6 - 8 | -- | -- |
| SB-224 | SB-224E | 6 | -- | -- | -- | 0 - 1 | 1 - 2, 2 - 4, 4 - 6 | -- | -- |
| | SB-224N | 6 | -- | -- | -- | 0 - 1 | 1 - 2, 2 - 4, 4 - 6 | -- | -- |
| | SB-224W | 6 | -- | -- | -- | 0 - 1 | 1 - 2, 2 - 4, 4 - 6 | -- | -- |
| | SB-224S | 6 | -- | -- | -- | 0 - 1 | 1 - 2, 2 - 4, 4 - 6 | -- | -- |
| SB-226 | SB-226E | 6 | -- | -- | -- | 0 - 1 | 1 - 2, 2 - 4, 4 - 6 | -- | -- |
| | SB-226N | 6 | -- | -- | -- | 0 - 1 | 1 - 2, 2 - 4, 4 - 6 | -- | -- |
| | SB-226W | 6 | -- | -- | -- | 0 - 1 | 1 - 2, 2 - 4, 4 - 6 | -- | -- |
| SB-228 | SB-228E | 8 | -- | -- | -- | 0 - 1, 1 - 2 | 2 - 4, 4 - 6, 6 - 8 | -- | -- |
| | SB-228N | 8 | -- | -- | -- | 0 - 1, 1 - 2 | 2 - 4, 4 - 6, 6 - 8 | -- | -- |
| | SB-228W | 8 | -- | -- | -- | 0 - 1, 1 - 2 | 2 - 4, 4 - 6, 6 - 8 | -- | -- |
| | SB-228S | 8 | -- | -- | -- | 0 - 1, 1 - 2 | 2 - 4, 4 - 6, 6 - 8 | -- | -- |
| NA | SB-01BE | 4 | -- | -- | -- | -- | -- | 0 - 1, 1 - 2, 2 - 4 | -- |
| NA | SB-02BE | 4 | -- | -- | -- | -- | -- | 0 - 1, 1 - 2, 2 - 4 | -- |
| NA | SB-03BE | 4 | -- | -- | -- | -- | -- | 0 - 1, 1 - 2, 2 - 4 | -- |
| NA | SB-04BE | 4 | -- | -- | -- | -- | -- | 0 - 1, 1 - 2, 2 - 4 | -- |
| NA | SB-05BE | 4 | -- | -- | -- | -- | -- | 0 - 1, 1 - 2, 2 - 4 | -- |
| NA | SB-06BE | 4 | -- | -- | -- | -- | -- | 0 - 1, 1 - 2, 2 - 4 | -- |
| NA | SB-07BE | 4 | -- | -- | -- | -- | -- | 0 - 1, 1 - 2, 2 - 4 | -- |
| NA | SB-08BE | 4 | -- | -- | -- | -- | -- | 0 - 1, 1 - 2, 2 - 4 | -- |
| NA | SB-09BE | 4 | -- | -- | -- | -- | -- | 0 - 1, 1 - 2, 2 - 4 | -- |
| NA | SB-10BE | 4 | -- | -- | -- | -- | -- | 0 - 1, 1 - 2, 2 - 4 | -- |
| NA | SB-11BE | 4 | -- | -- | -- | -- | -- | 0 - 1, 1 - 2, 2 - 4 | -- |
| NA | SB-12BE | 4 | -- | -- | -- | -- | -- | 0 - 1, 1 - 2, 2 - 4 | -- |

See Notes on Page 9.

## Table 1
## Proposed PDI Sampling Summary

## Remedial Design Work Plan
## Shulman's Salvage Yard, Elmira New York

| Parent Location ID | Proposed Sample Location for Delineation | Location Depth (ft bgs) | Delineation | | | | | Background Evaluation | Catch Basin Investigation |
|---|---|---|---|---|---|---|---|---|---|
| | | | PCB Surface Soil[2] (0-1 ft bgs) | PCBs Subsurface Soil[2] Below 1 ft bgs | | COC-Metals Subsurface Soil[2] | | COC-Metals Subsurface Soil[2] | PCBs and COC-Metals Soil and Water[2] |
| | | | Sample Depth Interval (ft bgs) | Sample Depth Interval (ft bgs) | Additional Sample Depth Interval (ft bgs) (Placed on Hold) | Sample Depth Interval (ft bgs) | Additional Sample Depth Interval (ft bgs) (Placed on Hold) | Sample Depth Interval (ft bgs) | Sample Depth Interval (ft bgs) |
| **Offsite (cont.)** | | | | | | | | | |
| NA | SB-13BE | 4 | -- | -- | -- | -- | -- | 0 - 1, 1 - 2, 2 - 4 | -- |
| NA | SB-14BE | 4 | -- | -- | -- | -- | -- | 0 - 1, 1 - 2, 2 - 4 | -- |
| NA | SB-15BE | 4 | -- | -- | -- | -- | -- | 0 - 1, 1 - 2, 2 - 4 | -- |
| Catch Basin 1 | Catch Basin 1 | Depth of Basin | -- | -- | -- | -- | -- | -- | Depth of Basin |
| Catch Basin 2 | Catch Basin 2 | Depth of Basin | -- | -- | -- | -- | -- | -- | Depth of Basin |
| Catch Basin 3 | Catch Basin 3 | Depth of Basin | -- | -- | -- | -- | -- | -- | Depth of Basin |
| Catch Basin 4 | Catch Basin 4 | Depth of Basin | -- | -- | -- | -- | -- | -- | Depth of Basin |
| Catch Basin 5 | Catch Basin 5 | Depth of Basin | -- | -- | -- | -- | -- | -- | Depth of Basin |

**Notes:**
1. ft bgs = feet below ground surface.
2. See Table 2 for analytical requirements.
3. COC-Metals = COC Metals listed in the ROD (arsenic, cadmium, copper, lead, and mercury).
4. -- Indicates sample not required.
5. NA = not applicable.

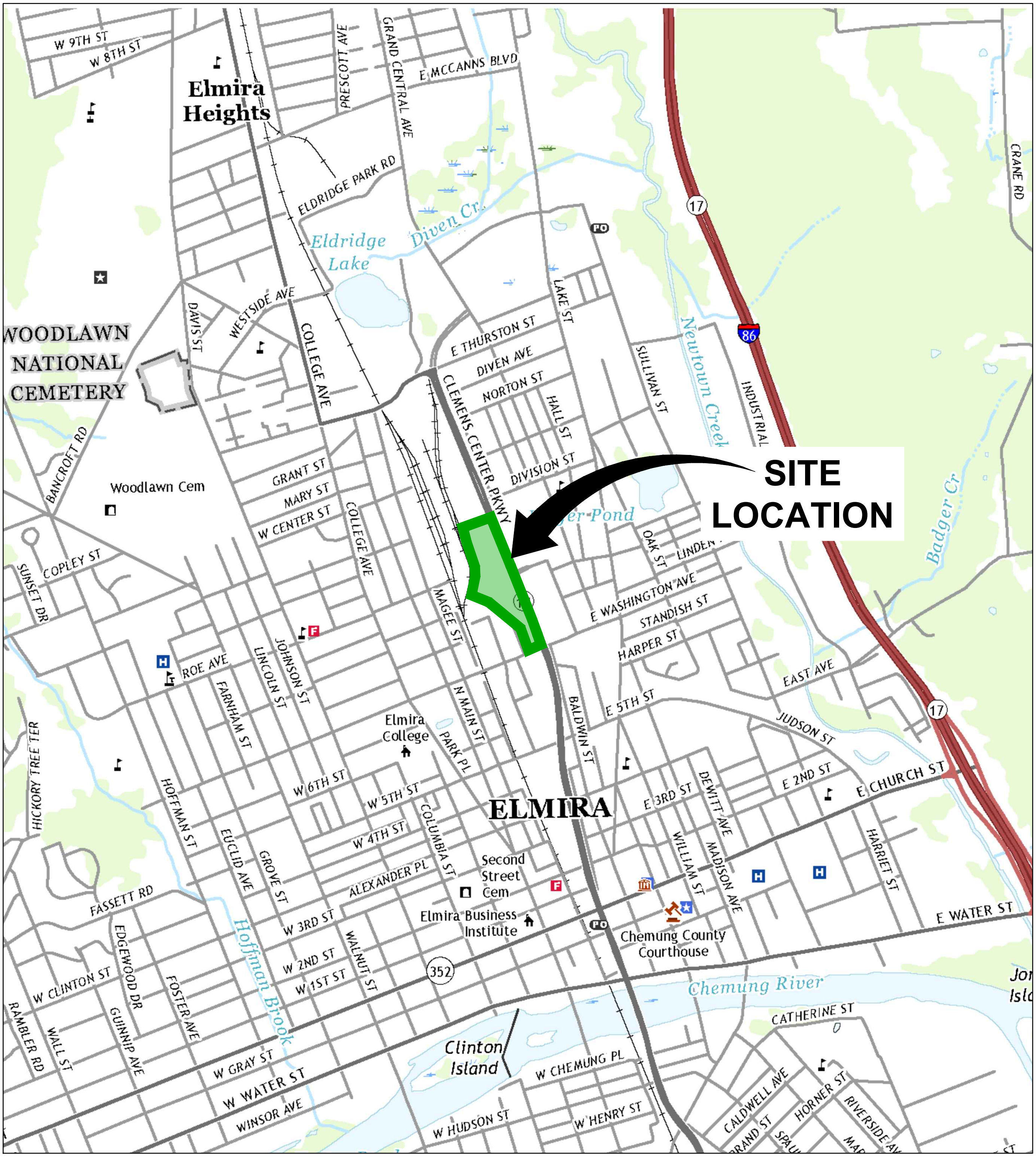
**Table 2**
**PDI Field Sample Laboratory Analysis Summary**

**Remedial Design Work Plan**
**Shulman's Salvage Yard, Elmira New York**

| Laboratory Analysis | Quantity | Field Duplicate | MS / MSD |
|---|---|---|---|
| **Surface Soil** | | | |
| PCBs using USEPA Method 8082 | 46 | 2 | 2 |
| **Subsurface Soil** | | | |
| PCBs using USEPA Method 8082 | 128 | 7 | 7 |
| COC-Metals using USEPA Method 6010/7471 | 550 | 28 | 28 |
| **Subsurface Soil (on Hold)** | | | |
| PCBs using USEPA Method 8082 | 52 | 3 | 3 |
| COC-Metals using USEPA Method 6010/7471 | 553 | 28 | 28 |
| **Background Evaluation (Soil)** | | | |
| COC-Metals using USEPA Method 6010/7471 | 45 | 3 | 3 |
| **Catch Basin Evaluation (Sediment)** | | | |
| PCBs using USEPA Method 8082 | 5 | 1 | 1 |
| COC-Metals using USEPA Method 6010/7471 | 5 | 1 | 1 |
| **Catch Basin Evaluation (Water)** | | | |
| PCBs using USEPA Method 8082 | 5 | 1 | 1 |
| COC-Metals using USEPA Method 6010/7471 | 5 | 1 | 1 |

**Notes:**
1. COC-Metals = constituent of concern metals listed in the Amended Record of Decision (arsenic, cadmium, copper, lead, mercury).
2. MS / MSD = matrix spike / matrix spike duplicate.
3. PCBs = polychlorinated biphenyls.
4. USEPA = United States Environmental Protection Agency.

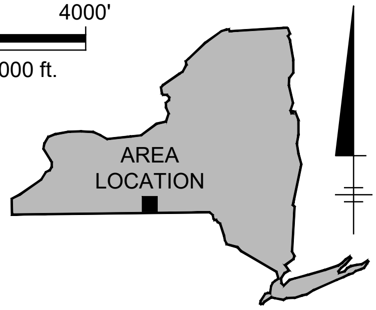
# Figures




REFERENCE: BASE MAP USGS 7.5. MIN. TOPO. QUAD., ELMIRA, NY, 2019.

0 2000' 4000'

Approximate Scale: 1 in. = 2000 ft.




NEW YORK

NYSEG
SHULMAN'S SALVAGE YARD
ELMIRA, NEW YORK
**REMEDIAL DESIGN WORK PLAN**

**SITE LOCATION MAP**

ARCADIS

FIGURE
**1**

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XREFS: X-Base Map Title Block-LB IMAGES: Chemung Co Parcels.PNG Property ownership.tif Shulmans Parcels S.PNG PROJECTNAME: ----


LEGEND:

APPROXIMATE LIMIT OF SITE AREAS

SITE BOUNDARY

NORFOLK SOUTHERN PROPERTY

SOIL BORING LOCATION

OFFSITE SOIL BORING LOCATION

0 150' 300'

GRAPHIC SCALE

NOTES:

1. ALL LOCATIONS ARE APPROXIMATE.

2. BASE MAP SOURCES:
   2.1. BOUNDARIES AND SAMPLE LOCATIONS:GEI CONSULTANTS; SEPTEMBER 2018.
   2.2. AERIAL PHOTO: MICROSOFT CORPORATION, COPYRIGHT 2022.

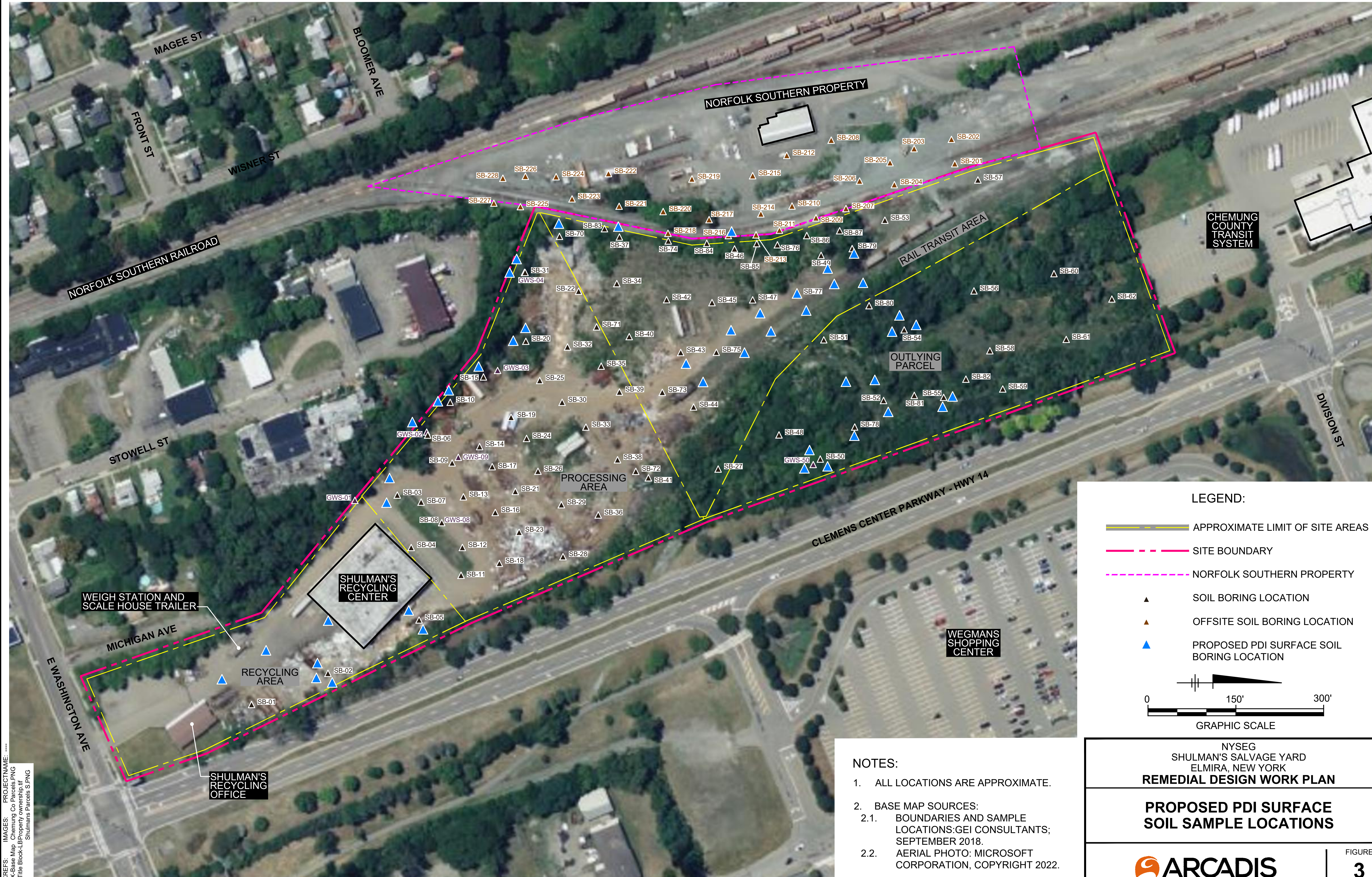
NYSEG
SHULMAN'S SALVAGE YARD
ELMIRA, NEW YORK

**REMEDIAL DESIGN WORK PLAN**

**SITE PLAN**

ARCADIS

FIGURE
**2**




LEGEND:

- APPROXIMATE LIMIT OF SITE AREAS
- SITE BOUNDARY
- NORFOLK SOUTHERN PROPERTY
- SOIL BORING LOCATION
- OFFSITE SOIL BORING LOCATION
- PROPOSED PDI SURFACE SOIL BORING LOCATION

0 150' 300'

GRAPHIC SCALE

NOTES:

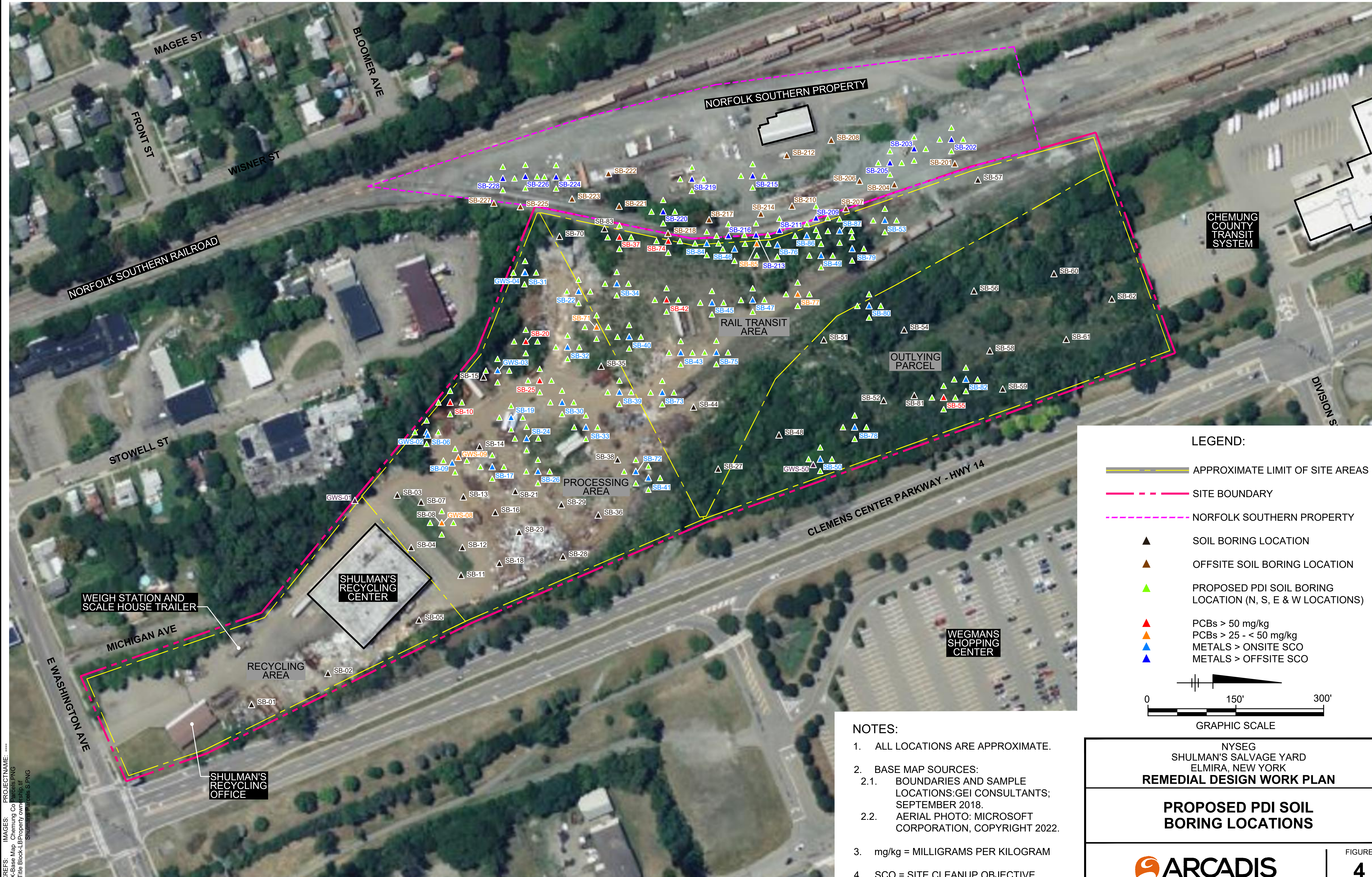
1. ALL LOCATIONS ARE APPROXIMATE.
2. BASE MAP SOURCES:
   2.1. BOUNDARIES AND SAMPLE LOCATIONS:GEI CONSULTANTS; SEPTEMBER 2018.
   2.2. AERIAL PHOTO: MICROSOFT CORPORATION, COPYRIGHT 2022.

NYSEG
SHULMAN'S SALVAGE YARD
ELMIRA, NEW YORK
**REMEDIAL DESIGN WORK PLAN**

**PROPOSED PDI SURFACE SOIL SAMPLE LOCATIONS**

ARCADIS

FIGURE
3




LEGEND:

- APPROXIMATE LIMIT OF SITE AREAS
- SITE BOUNDARY
- NORFOLK SOUTHERN PROPERTY
- ▲ SOIL BORING LOCATION
- ▲ OFFSITE SOIL BORING LOCATION
- ▲ PROPOSED PDI SOIL BORING LOCATION (N, S, E & W LOCATIONS)
- ▲ PCBs > 50 mg/kg
- ▲ PCBs > 25 - < 50 mg/kg
- ▲ METALS > ONSITE SCO
- ▲ METALS > OFFSITE SCO

0 150' 300'

GRAPHIC SCALE

NOTES:

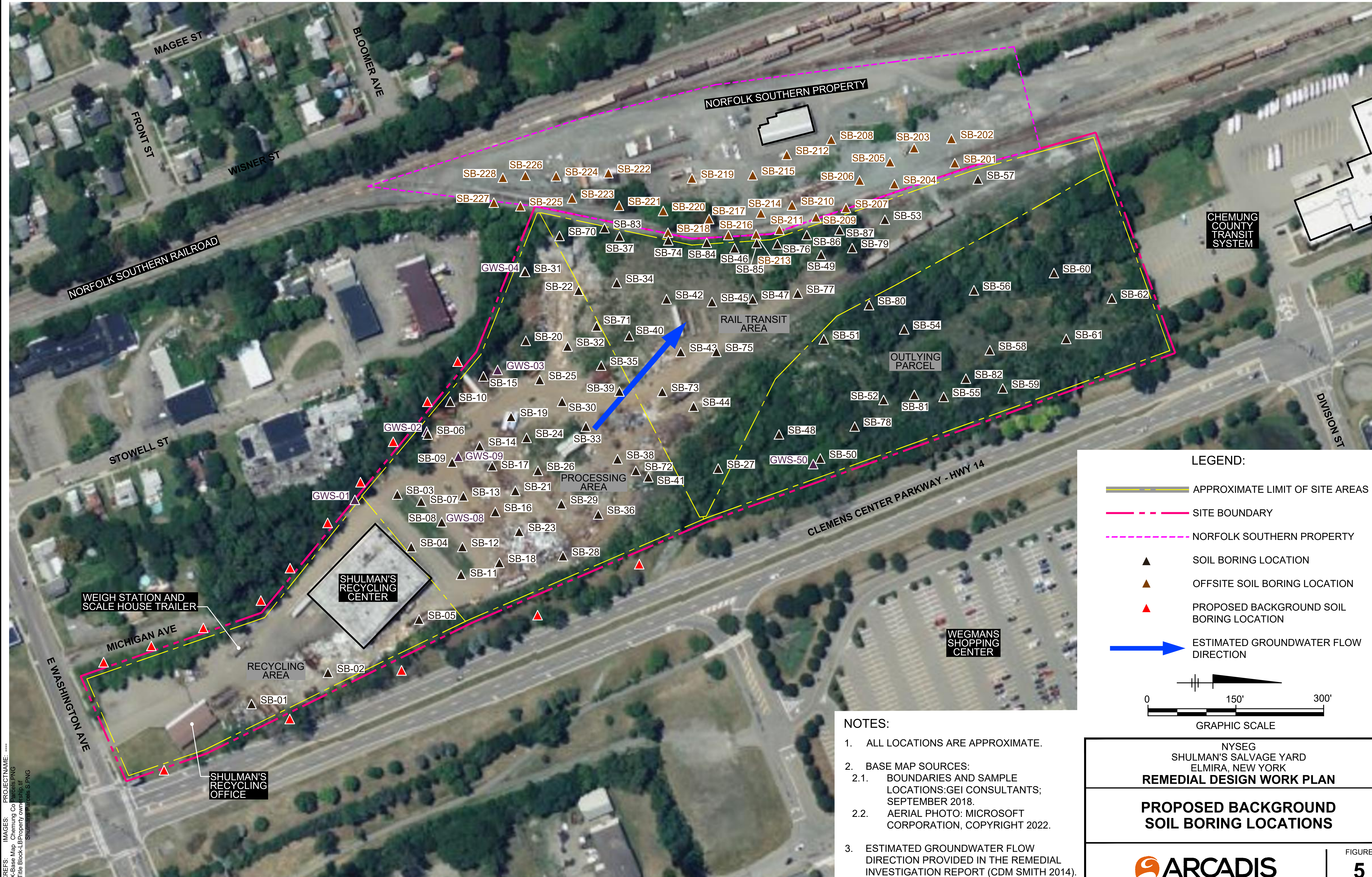
1. ALL LOCATIONS ARE APPROXIMATE.
2. BASE MAP SOURCES:
   2.1. BOUNDARIES AND SAMPLE LOCATIONS:GEI CONSULTANTS; SEPTEMBER 2018.
   2.2. AERIAL PHOTO: MICROSOFT CORPORATION, COPYRIGHT 2022.
3. mg/kg = MILLIGRAMS PER KILOGRAM
4. SCO = SITE CLEANUP OBJECTIVE

NYSEG
SHULMAN'S SALVAGE YARD
ELMIRA, NEW YORK
**REMEDIAL DESIGN WORK PLAN**

**PROPOSED PDI SOIL BORING LOCATIONS**

ARCADIS

FIGURE
4




LEGEND:

- APPROXIMATE LIMIT OF SITE AREAS
- SITE BOUNDARY
- NORFOLK SOUTHERN PROPERTY
- SOIL BORING LOCATION
- OFFSITE SOIL BORING LOCATION
- PROPOSED BACKGROUND SOIL BORING LOCATION
- ESTIMATED GROUNDWATER FLOW DIRECTION

0 150' 300'

GRAPHIC SCALE

NOTES:

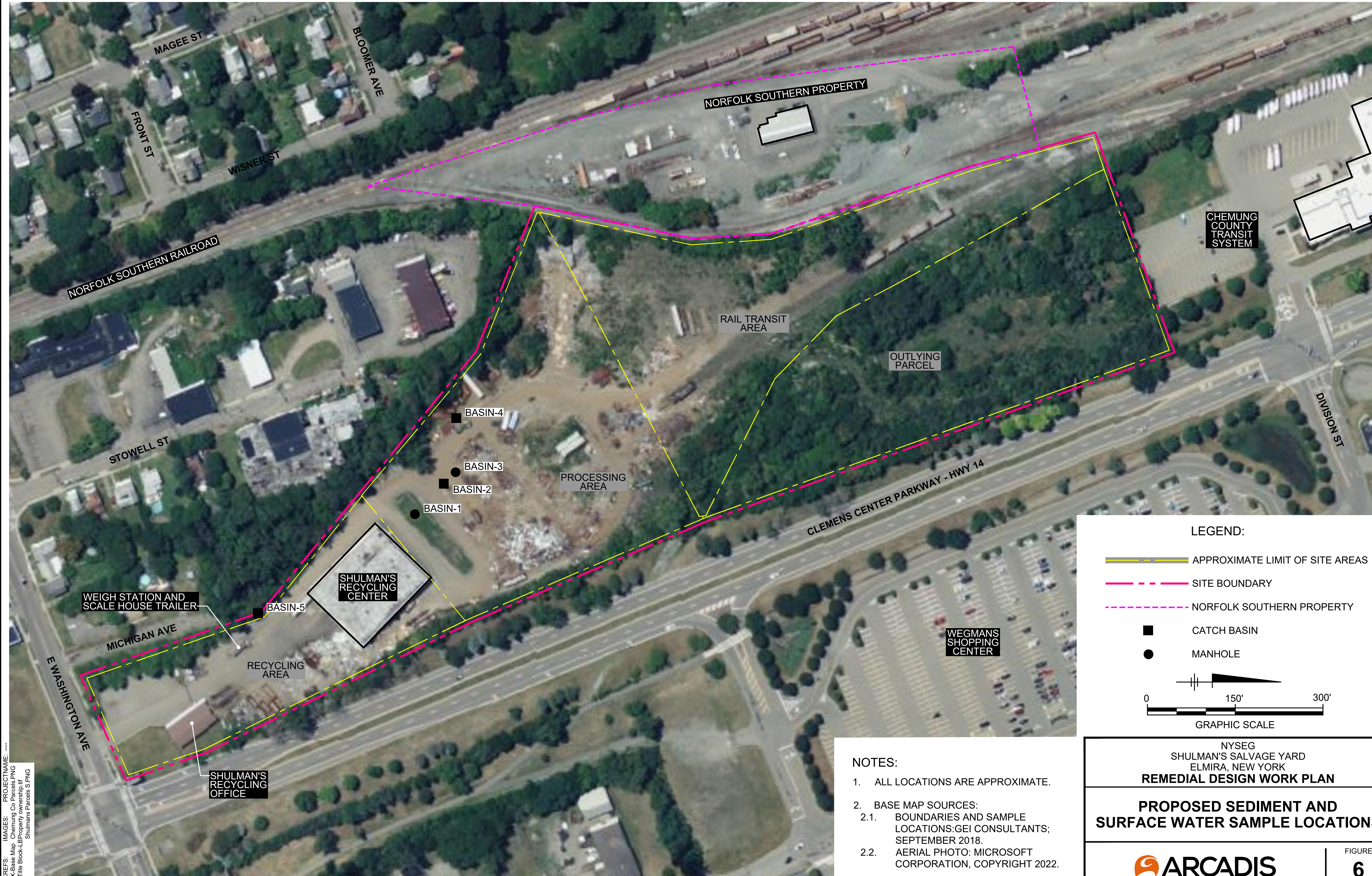
1. ALL LOCATIONS ARE APPROXIMATE.
2. BASE MAP SOURCES:
   - 2.1. BOUNDARIES AND SAMPLE LOCATIONS:GEI CONSULTANTS; SEPTEMBER 2018.
   - 2.2. AERIAL PHOTO: MICROSOFT CORPORATION, COPYRIGHT 2022.
3. ESTIMATED GROUNDWATER FLOW DIRECTION PROVIDED IN THE REMEDIAL INVESTIGATION REPORT (CDM SMITH 2014).

NYSEG
SHULMAN'S SALVAGE YARD
ELMIRA, NEW YORK
**REMEDIAL DESIGN WORK PLAN**

**PROPOSED BACKGROUND SOIL BORING LOCATIONS**

ARCADIS

FIGURE
5




LEGEND:

- APPROXIMATE LIMIT OF SITE AREAS
- SITE BOUNDARY
- NORFOLK SOUTHERN PROPERTY
- CATCH BASIN
- MANHOLE

0 150' 300'

GRAPHIC SCALE

NOTES:

1. ALL LOCATIONS ARE APPROXIMATE.
2. BASE MAP SOURCES:
   2.1. BOUNDARIES AND SAMPLE LOCATIONS:GEI CONSULTANTS; SEPTEMBER 2018.
   2.2. AERIAL PHOTO: MICROSOFT CORPORATION, COPYRIGHT 2022.

NYSEG
SHULMAN'S SALVAGE YARD
ELMIRA, NEW YORK
**REMEDIAL DESIGN WORK PLAN**

**PROPOSED SEDIMENT AND SURFACE WATER SAMPLE LOCATIONS**

ARCADIS

FIGURE
6

C:\Users\ekrahmer\ACCDocs\Arcadis\AUS-NYSEG-SHULMANS SALVAGE YARD-ELMIRA New York\Project Files\2022\01-In Progress\01-DWG\RDWP_Shulmans_Sediment Water Sample.dwg LAYOUT: 6 SAVED: 9/8/2022 11:03 AM ACADVER: 24.0S (LMS TECH) PAGESETUP: ---- PLOTSTYLETABLE: ----
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XREFS: IMAGES: PROJECTNAME: ----
X-Base Map Chemung Co Parcels.PNG
Title Block-LB Property ownership.tif
Shulmans Parcels S.PNG

# Appendix A

## Field Sampling Plan

NYSEG

# Field Sampling Plan

**Shulman's Salvage Yard**
**Elmira, New York**
**NYSDEC Site No. 808013**

September 2022

# Field Sampling Plan

**Shulman's Salvage Yard**
**Elmira, New York**
**Site No. 808013**

September 2022

**Prepared By:**
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**Prepared For:**
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Binghamton, New York 13904

**Our Ref:**
30119464

# Contents

# Attachments

# Acronyms and Abbreviations

| | |
|---|---|
| % | percent |
| CFR | Code of Federal Regulations |
| COC | chain-of-custody |
| DO | Dissolved Oxygen |
| FSP | Field Sampling Plan |
| HASP | Health and Safety Plan |
| HazMat | Hazardous Materials |
| IDW | investigation-derived waste |
| NAPL | non-aqueous phase liquid |
| NYSEG | New York State Electric & Gas Corporation |
| ORP | oxidation reduction |
| PID | photoionization detector |
| PPE | personal protective equipment |
| QA | quality assurance |
| QAPP | Quality Assurance Project Plan |
| QC | quality control |
| RCRA | Resource Conservation and Recovery Act |
| RDWP | Remedial Design Work Plan |
| TGI | Technical Guidance Instruction |
| USDOT | United States Department of Transportation |
| USEPA | United States Environmental Protection Agency |
| VOC | volatile organic compound |

# 1 Introduction

## 1.1 General

This Field Sampling Plan (FSP) supports the Remedial Design Work Plan (RDWP) for the Shulman's Salvage Yard Site located in Elmira, New York (the site).

This FSP provides field procedures and sample collection methods to be used during implementation of RDWP field activities. This FSP should be used in conjunction with the RDWP, the Quality Assurance Project Plan (QAPP), and an approved Health and Safety Plan (HASP). The QAPP (included as Appendix B of the RDWP) presents quality assurance (QA)/quality control (QC) procedures to be used during field activities described in the RDWP, as well as a description of the general field and laboratory procedures.

## 1.2 Overview of Investigation Field Activities

The following activities may be conducted at the site:

- Sampling shallow surface soil;
- Advancing soil borings;
- Collecting subsurface soil samples;
- Measuring water table elevations; and
- Collecting surface water and groundwater samples.

Sampling locations and the rationale for each field sampling activity are described in the RDWP.

# 2 Field Activities

This section describes field procedures and methods potentially used for site investigation work.

## 2.1 General Field Guidelines

### 2.1.1 Utilities

Underground utilities will be identified prior to any drilling or subsurface sampling. Public and privately owned utilities will be located by contacting responsible agencies by telephone so that their underground utilities can be marked at the site. Other potential on-site hazards, such as traffic, overhead power lines, building hazards, and railroad hazards, will be identified during a site reconnaissance visit.

### 2.1.2 Equipment

The following is a general list of equipment necessary for sample collection:

- Stainless-steel spoons and bowls or single-use, disposable, zip-top bags for compositing soil samples;
- Appropriate sample containers provided by the laboratory (kept closed and in laboratory-supplied coolers until the samples are collected);
- Pre-preserved sample containers (as required) for aqueous samples;
- Chain-of-custody (COC) record forms;
- Logbooks, field sampling records, and indelible ink pens and markers;
- Laboratory-grade soap (such as Alconox®), reagent-grade solvents, and distilled water to be used for decontaminating equipment between sampling stations;
- Buckets, plastic wash bins, and scrub brushes for decontaminating equipment;
- A digital camera and extra batteries;
- Stakes, pin flags, and/or spray paint to identify sampling locations;
- Shipping labels and forms;
- A safety auto-retract knife;
- Packing/shipping material for sample bottles;
- Strapping tape;
- Clear plastic tape;
- Duct tape;
- Aluminum foil; and
- Portable field instruments, including a photoionization detector (PID) and a water-level indicator.

### 2.1.3 Field Logbooks

Field logbooks will be maintained by the field team leader and other team members to provide a daily record of significant events, observations, and measurements during the field investigation.

Information pertinent to the field investigation and/or sampling activities will also be recorded in the logbooks. The logbooks will be bound with consecutively numbered pages. Entries in the logbooks will include, at a minimum, the following information:

- Author's name, date of entry, and physical/environmental conditions during field activity;
- Purpose of sampling activity;
- Location of sampling activity;
- Field crew members' names;
- Site visitors' names;
- Sample media (e.g., soil, groundwater);
- Sample collection method;
- Number and volume of sample(s) taken;
- Description of sampling point(s);
- Volume of groundwater removed before sampling (where appropriate);
- Preservatives used;
- Date and time of collection;
- Sample identification number(s);
- Field observations; and
- Any field measurements made, such as, but not limited to, pH, temperature, conductivity, and water level.

All original data recorded in field logbooks and COC records will be written with indelible ink. If an error is made on an original document assigned to one individual, that individual will make all corrections by simply crossing a single line through the error and entering the correct information. The erroneous information will not be erased. Any subsequent error discovered on an original document will be corrected by the person who made the entry. All subsequent corrections will be initialed and dated.

## 2.2 Surface Soil Sample Collection

The following procedures will be used to collect surface soil samples. Surface soil sample locations will be collected from below the vegetative sod layer or subbase material (if these materials are present at the selected locations) to a depth of 1 foot below ground surface. Each sample will be visually characterized for color, texture, and moisture content. Each sample may be placed into a container for headspace screening using a PID to measure the relative concentration of volatile organic compounds (VOCs), if any. Equipment, materials, and procedures for collecting surface soil grab samples are presented below.

The following equipment and materials will be available, as required, during the surface soil sampling:

- Appropriate health and safety equipment, as specified in the HASP;
- Digital camera;
- Decontamination equipment;
- Tape measure;
- Appropriate sample containers and forms;

- Appropriate tools to collect the samples;
- Coolers with ice; and
- Field notebooks.

The procedures for collecting surface soil samples are presented below.

1. Don personal protective equipment (PPE), as required by the HASP.
2. Identify the sample locations from the sample location plan and note the locations in the field notebook. The locations should not be selected in areas covered with crushed stone or hard-packed gravel.
3. Collect the sample by carefully cutting into and removing the surface material (sod, subbase, etc.) with a pre-cleaned, stainless-steel scoop or decontaminated shovel and place the sample into a plastic zip-top bag.
4. Gently mix the soil in the bag and screen the headspace with a PID (if required). Record the PID reading in the field logbook.
5. Visually characterize and describe each soil sample, including:
    - Soil type;
    - Color;
    - Moisture condition;
    - Density;
    - Grain-size;
    - Consistency; and
    - Other observations, particularly relating to the presence of potential impacts.
6. Obtain one discrete sample and place it into the appropriate sample container provided by the analytical laboratory.
7. Fill out the sample labels, in accordance with the procedures in Section 2.6, and affix the labels on the containers.
8. Place the sample containers on ice in a cooler.
9. Discard gloves and any other PPE.
10. Handle, pack, and ship the samples using appropriate COC procedures, in accordance with Section 2.6.
11. Record all other appropriate information in the field logbook.

## 2.3 Soil Boring Advancement and Sample Collection

Where required, soil borings will be advanced to the depths and at the locations defined in the RDWP. The following procedures will be used to advance borings.

### 2.3.1 Drilling and Geological Logging Methods

The drilling and geological logging methods to be completed for each soil boring are as follows:

- Boreholes in the overburden will be drilled using rotosonic technology, hollow-stem augers, direct-push technology, or other methods identified in the New York State Department of Environmental Conservation-approved RDWP.
- Continuous soil sampling will be conducted during the advancement of soil borings. The drilling contractor, or Arcadis' drill rig operator, is responsible for obtaining accurate and representative samples, informing the

supervising geologist of changes in drilling pressure, and keeping a separate general log of soils encountered.

- Split-spoon sampling and/or Shelby tube sampling will be conducted during the advancement of soil borings for geotechnical data collection. Sampling will be performed in accordance with American Society for Testing and Materials Specifications D1586 and D1587 for standard penetration test and split-spoon sampling and Shelby tube sampling, respectively, unless otherwise authorized by the field geologist.
- The designated field geologist will log borehole geology in the field logbook and/or field forms. Records will also be kept of occurrences of premature refusal due to boulders or construction materials that may have been used as fill. When a boring cannot be advanced to the desired depth, the boring will be abandoned, and an additional boring will be advanced at an adjacent location to obtain the required sample. Where it is desirable to avoid leaving vertical connections between depth intervals, the borehole will be sealed using cement and/or bentonite. Multiple refusals may lead to a decision by the supervising geologist to abandon that sampling location.
- To contain soil cuttings, a plywood sheet or tub may be placed around the drill stem when drilling.
- Soil cuttings will be placed in a drum or roll-off supplied by New York State Electric & Gas Corporation (NYSEG) or the drilling subcontractor. Decontamination water will be placed in plastic tanks/drums supplied by NYSEG or the drilling subcontractor. Soil cuttings and decontamination water will be containerized at the end of each workday. Roll-offs or open-top drums used to contain solids will be covered when not in use.

### 2.3.2 Subsurface Soil Sampling Method

Continuous soil sampling will be conducted during soil boring advancement in the overburden. At locations designated for geotechnical data collection, the Standard Penetration Test (American Society for Testing and Materials D1586) and hollow-stem augers or flush-join casings will be used during drilling to collect split-spoon samples from the unconsolidated fill and soil beneath the site.

The supervising geologist or scientist will be responsible for documenting drilling events using a bound field notebook to record all relevant information in a clear and concise format. The record of drilling events will include:

- Start and finish dates of drilling;
- Project name, project number, client name, and site location;
- Sample number and depths;
- Blow counts and recovery;
- Depth to water;
- Type of drilling method;
- Drilling equipment specifications, including diameter of drilling tools;
- Documentation of any elevated organic vapor readings;
- Names of drillers, inspectors, or other people on site; and
- Weather conditions.

Soil samples are typically screened with a flame ionization detector or PID at sites where VOCs are present in the subsurface. VOCs are not a constituent of concern at the site and, therefore, recovered samples will not be screened for VOCs. However, if VOCs were to become a constituent of concern, field screening would be performed using the following methods:

- Upon opening the sampler, the soil is split open, and the PID or flame ionization detector probe is placed in the opening and covered with a gloved hand. Such readings should be obtained at several locations along the length of the sample.
- A portion of the collected sample is placed in a re-sealable plastic bag or jar, sealed, and allowed to warm to room temperature. After warming, the cover is removed, and a reading is obtained.

Samples selected for laboratory analysis will be handled, packed, and shipped in accordance with the procedures outlined in this FSP. A geologist will be on site during drilling and sampling operations to describe each soil sample on the soil boring log, including:

- Percent recovery;
- Soil type;
- Color;
- Moisture condition;
- Density;
- Grain-size;
- Consistency; and
- Other observations, particularly relating to the presence of potential impacts.

Samples selected for laboratory analysis will be placed into appropriate containers provided by the laboratory. Sample containers for VOC analyses will be filled first (if required). Next, a sufficient amount of the remaining soil will be homogenized by mixing the sample in a re-closable plastic bag. Laboratory-supplied sample containers for other analytes will then be filled. Duplicate samples will be collected, at the frequency detailed in the QAPP, by alternately filling two sets of sample containers.

Representative portions of each soil sample will be placed in a 1-pint jar or re-closable plastic bag, labeled, and stored on site. This container will be labeled with:

- Site name;
- Boring number;
- Interval sampled;
- Date; and
- Initials of sampling personnel.

Soil samples will be described using the methods provided in the Technical Guidance Instruction (TGI) – Soil Description, which is included in Attachment 1.

If required, the samples selected for laboratory analysis will be based on:

- Their position in relation to potential source areas;
- The visual presence of source materials; and
- The discretion of the on-site geologist.

For samples that may be submitted for chemical analysis, split-spoons, or any portion of the drilling rig that may contact the sample, will be decontaminated (as specified in Section 2.7) after each sample is collected. Sample descriptions and boring locations will be recorded in the field logbook or on the soil boring log form presented as

Attachment 2. The procedures to be followed will be dependent on the PID acquired for this project, as described in the equipment manual.

## 2.4 Measurement of Fluid levels

The following procedure will be used to measure fluid-level depths at monitoring wells if present on site:

- Decontaminate the water-level probe or oil/water interface probe (for wells expected to contain non-aqueous phase liquid [NAPL]).
- Measure the static fluid level, fluid interfaces (i.e., NAPL/water interface), and the bottom of the well (if applicable) with reference to the surveyed elevation mark on the top of the well casing or surface-water gauge. Record all measurements, to the nearest hundredth of a foot, in the field logbook.

Measurements will be made in as short a timeframe as practical to minimize temporal fluctuations in hydraulic conditions.

Fluid levels will be measured using an electronic fluid-level indicator (sounder), steel tape, pressure transducer, or stream gauge at established reference points (e.g., top of casing, stream gauge).

The following materials will be available, as required:

- Appropriate health and safety equipment, as specified in the HASP;
- Laboratory-type soap (Alconox® or equivalent);
- Electronic water-level indicator (sounder) or pressure transducer;
- PID;
- Analyte-free water;
- Indelible ink pen; and
- Six-foot engineer’s rule.

The following procedures will be used to obtain fluid levels.

1. Measure the lengths between markers on the cable with a 6-foot engineer’s rule or a fiberglass engineer’s tape. The tape or cable associated with the electronic water-level probe should be checked for the length corresponding to the deepest total well depth to be monitored during the data collection event.

   Note: If the length designations on the tape or cable associated with the electronic water-level probe are found to be incorrect, the probe will not be used until it is repaired by the manufacturer.
2. Record the verification of this calibration process in the field logbook.
3. Obtain fluid level depth measurements.

   Note: Field notes on logs will be treated as secured documentation, and indelible ink will be used. As a general rule, the order of measuring should proceed from the least to most contaminated monitoring wells, based on available data.
4. Identify the site and well number in the field logbook using indelible ink, along with the date, time, personnel names, and weather conditions.
5. Avoid activities that may introduce contamination into monitoring wells. Activities such as dispensing gasoline into vehicles or generators should be accomplished well in advance of obtaining field measurements.
6. Use PPE, as required by the HASP.

7. Clean the water-level probe and cable in accordance with appropriate cleaning procedures. Down-hole instrumentation should be cleaned prior to obtaining readings at the first monitoring well and upon completion of readings at each well.
8. Clean the water-level probe and cable with a soapy (Alconox®) water rinse, followed by a solvent rinse (if appropriate, based on site-specific constituents of concern) and an analyte-free water rinse. Contain the rinse water in a portable container that will be transferred to an on-site container.
9. Put clean plastic sheeting on the ground next to the well.
10. Unlock and open the well cover while standing upwind from the well. Place the well cap on the plastic sheeting.
11. Locate a measuring reference point on the well casing. If one is not found, initiate a reference point at the highest discernable point on the inner casing (or outer casing if an inner casing is not present) by notching with a hacksaw or using an indelible marker. All down-hole measurements will be taken from the reference point established at each well on the inner casing (or on the outer casing, only if an inner casing is not present).
12. Measure to the nearest hundredth of a foot and record the height of the inner and outer casings (from the reference point, as appropriate) to ground level.
13. Record the inside diameter of the well casing in the field logbook.
14. Lower the probe until it emits a signal (tone and/or light) indicating the top of the water surface. Gently raise and lower the instrument through this interface to confirm its depth. Measure and record the depth of the water surface and the total well depth, to the nearest hundredth of a foot, from the reference point at the top of the well. Lower the probe to the bottom of the well to obtain a total depth measurement.
15. Clean the water-level probe and cable in accordance with appropriate cleaning procedures.
16. Compare the depth of the well to previous records and note if there is a discrepancy.
17. Lock the well when all activities are completed.

Fluid level measurement data will be recorded legibly in the field logbook in indelible pen. Field situations, such as apparent well damage or suspected tampering, or other observations of conditions that may result in compromised data collection, will be photographically documented where practicable.

## 2.5 Surface Water and Groundwater Sampling Procedures

The following procedures will be used to collect surface water/catch basin samples and groundwater samples from monitoring wells.

### 2.5.1 Catch Basin/Surface Water Sampling Procedures for Grab Samples

This protocol describes procedures to be used to collect water samples from surface drainageways or catch basins. During precipitation events, water sampling will not be conducted until the precipitation ceases.

The following materials, as required, shall be available during groundwater sampling:

- Disposable bailer;
- PID (if needed);

- Appropriate health and safety equipment, as specified in the HASP;
- Plastic sheeting (for each sampling location);
- New disposable polypropylene rope;
- Buckets to measure/contain purge water;
- Water-level probe;
- Six-foot rule with gradation in hundredths of a foot;
- Appropriate water sample containers;
- Appropriate blanks (trip blank supplied by the laboratory);
- Appropriate transport containers (coolers) with ice and appropriate labeling, packing, and shipping materials;
- COC forms;
- Indelible ink pens;
- Site map with well locations and groundwater contour maps; and
- Keys to wells.

The following 11 steps detail catch basin/surface water sampling procedures:

1. Identify the site and location to be sampled in the field logbook, including the date, arrival time, and weather conditions. Also identify the personnel and equipment used in the logbook.
2. Label all sample containers using an appropriate label.
3. Use safety equipment, as required in the HASP.
4. Place plastic sheeting adjacent to the sample location to use as a clean work area.
5. Establish a background reading with the PID (if required) and record the reading on the field log.
6. Remove the cover to the catch basin while standing upwind of the well. Insert the PID probe into the breathing zone above the catch basin following instructions in the HASP.
7. Set out dedicated or disposable sampling devices and meters on plastic sheeting.
8. Obtain the water sample needed for analysis directly from the bailer in the appropriate container and tightly screw on the container cap.
9. Secure the sample containers with packing material and store at 4 degrees Celsius on wet ice in an insulated transport container provided by the laboratory.
10. Record the time the sampling procedures were completed in the field logbook.
11. Place all disposable sampling materials (plastic sheeting, disposable bailers, and health and safety equipment) in appropriately labeled containers. Go to the next location and repeat Step 1 through Step 10 until all locations are sampled.

### 2.5.2 Low-Flow Groundwater Purging and Sampling

Groundwater samples are not anticipated to be collected at the site. However, if groundwater samples were to be collected, this protocol describes procedures that would be used to collect the samples. This protocol has been developed in accordance with the United States Environmental Protection Agency (USEPA) Region I Low Stress (Low Flow) Purging and Sampling Procedures for the Collection of Groundwater Samples from Monitoring Wells (USEPA Standard Operating Procedure No. GW0001; July 30, 1996). No wells will be sampled until well development has been performed. During heavy precipitation events, groundwater sampling will be discontinued until the precipitation ceases. Groundwater samples will not be collected within 1 week following well development. When one round of water levels is taken to generate water-elevation data, the water levels will be taken consecutively, at one time, prior to sampling or other activities.

The following equipment and materials will be available, as required, during groundwater sampling:

- Appropriate PPE, as required in the site HASP;
- Site map, well construction records, and prior groundwater sampling records (if available);
- Sample pump, which may consist of one or more of the following:
  - Submersible pump (e.g., Grundfos Redi-Flo 2),
  - Peristaltic pump (e.g., ISCO Model 150), and
  - Bladder pump (e.g., Marschalk System 1, QED Well Wizard, Geotech, etc.);
- Low-density polyethylene tubing of an appropriate size for the pump being used (high-density polyethylene tubing if sampling for 1,4-dioxane or Per- and Polyfluoralkyl Substances);
- Power source (i.e., generator, battery);
- PID;
- Water-level probe;
- Water-quality (temperature/pH/specific conductivity/oxidation reduction [ORP]/turbidity/dissolved oxygen [DO]) meter and flow-through measurement cell; several brands may be used, including:
  - YSI 6-series multi-parameter instrument,
  - Hydrolab Series 3 or Series 4a multiprobe and display, and
  - Horiba U-10 or U-22 water quality monitoring system;
- Supplemental turbidity meter (e.g., Horiba U-10, Hach 2100P, LaMotte 2020);
- Appropriate water sample containers;
- Appropriate blanks (trip blank supplied by the laboratory);
- Appropriate transport containers (coolers) with ice and appropriate labeling, packing, and shipping materials;
- Groundwater sampling logs;
- COC forms;
- Indelible ink pens;
- Decontamination equipment;
- Plastic sheeting (for each sampling location);
- Dedicated or disposable bailers;
- New disposable polypropylene rope;
- Buckets to measure purge water; and
- Keys to wells.

To mitigate potential cross-contamination, groundwater samples will be collected in a pre-determined order, from least impacted to most impacted, based on previous analytical data. If no analytical data are available, samples will be collected in order from the furthest upgradient to the furthest downgradient to the source area locations.

The following steps detail monitoring well sampling procedures:

1. Review the materials checklist to ensure that the appropriate equipment has been acquired.
2. Identify the site and the well to be sampled on the sampling log sheets, along with the date, arrival time, and weather conditions. Also identify the personnel, the equipment used, and other pertinent data requested on the Low-Flow Groundwater Sampling Form (Attachment 3).
3. Label all sample containers using an appropriate label.
4. Use safety equipment, as required in the HASP.
5. Calibrate the field instruments according to the manufacturer's procedures for calibration.
6. Place plastic sheeting adjacent to the well to use as a clean work area.
7. Establish the background reading with the PID and record the reading on the field log.
8. Remove the lock from the well. If the lock is rusted or broken, replace it with a new brass keyed-alike lock.
9. Unlock and open the well cover while standing upwind of the well. Remove the well cap and place it on the plastic sheeting. Insert the PID probe into the breathing zone above the well casing following instructions in the HASP.
10. Set out dedicated or disposable sampling devices and meters on plastic sheeting.
11. Prior to sampling, measure groundwater elevations at each monitoring well. Determine whether light NAPL or dense NAPL is present. Obtain a water-level depth and bottom of well depth using an electric well probe and record the depths on the sampling log sheet. Clean the well probe after each use with a soapy (Alconox®) water wash and a tap water rinse. (Note: Water levels will be measured at all wells prior to initiating a sampling event.)
12. After the groundwater elevations are measured and NAPLs are determined to be not present, groundwater will be purged from the wells. If NAPLs are determined to be present, a groundwater sample will not be collected; rather, a representative NAPL sample may be collected (if required) using a peristaltic pump or other method determined by the Field Manager/Site Supervisor.
13. Prepare and install a pump in the well:
    a. For submersible and non-dedicated bladder pumps, decontaminate the pump according to site decontamination procedures. Attach the air line tubing to the air port on the top of the bladder pump. Attach the sample discharge tubing to the water port on the top of the bladder pump. Care should be taken not to reverse the air and discharge tubing lines during bladder pump set-up as this could result in bladder failure or rupture. Attach and secure a safety cable to the eyebolt on the top of bladder pump (if present, depending on the pump model used). Slowly lower the pump, safety cable, tubing, and electrical lines into the well to a depth corresponding to the approximate center of the saturated screen section of the well. Take care to avoid twisting and tangling of the safety cable, tubing, and electrical lines while lowering the pump into the well; twisted and tangled lines could result in the pump becoming stuck in the well casing. Also, make sure to keep the tubing and lines from touching the ground or other surfaces while introducing them into the well as this could lead to well contamination.
    b. If using a bladder pump, connect the air line to the pump controller output port. The pump controller should then be connected to a supply line from an air compressor or compressed gas cylinder using an appropriate regulator and air hose. Take care to tighten the regulator connector onto the gas cylinder (if used) to prevent leaks. Once the air compressor or gas cylinder is connected to the pump controller, turn on the compressor or open the valve on the cylinder to begin the gas flow. Turn on the pump controller if

an on/off switch is present and verify that all batteries are charged and fully operating before beginning to pump.

c. If using a peristaltic pump, slowly lower the sampling tubing into the well to a depth corresponding to the approximate center of the saturated screen section of the well. The pump intake or sampling tube must be kept at least 2 feet above the bottom of the well to prevent mobilization of any sediment present in the bottom of the well.

14. Connect the pump discharge water line to the bottom inlet port on the flowthrough cell connected to the water quality meter.
15. If the well diameter is 2 inches in diameter or larger, measure the water level again, with the pump in the well, before starting the pump. Start pumping the well at 200 to 500 milliliters per minute. Ideally, the pump rate should cause little water-level drawdown in the well (less than 0.3 feet), and the water level should be stabilized. The water level should be monitored every 3 to 5 minutes (or as appropriate) during pumping. Care should be taken to avoid breaking the pump suction or entrainment of air in the sample. Record any pumping rate adjustments and the depths to water. Pumping rates should, if needed, be reduced to the minimum capabilities of the pump to avoid pumping the well dry and/or to ensure stabilization of the indicator parameters. If the recharge rate of the well is very low, purging should be interrupted to prevent drawdown within the well advancing below the pump. However, a steady flow rate should be maintained to the extent practicable. Sampling should commence as soon as the volume in the well has recovered sufficiently to permit sample collection.
16. During well purging, monitor the field indicator parameters (turbidity, temperature, specific conductance, pH, DO, and ORP) every 3 to 5 minutes (or as appropriate). The well is considered stabilized and ready for sample collection when the indicator parameters have stabilized for three consecutive readings as follows:
    - ±0.1 for pH;
    - ±3 percent (%) for specific conductance (conductivity);
    - ±10 millivolts for ORP; and
    - ±10% for turbidity and DO.

    Note: Turbidity and DO usually require the longest time to achieve stabilization. If the field indicator parameters do not stabilize within 1 hour of the start of purging, but the groundwater turbidity is below the goal of 50 nephelometric turbidity units and the values for all other parameters are within 10%, the well can be sampled. If the parameters have stabilized but the turbidity is not in the 50 NTU range, the pump flow rate should be decreased to a minimum rate of 100 milliliters per minute to reduce turbidity levels as much as possible.
17. Fill in the sample label and cover the label with clear packing tape to secure it to the container.
18. After the indicator parameters have stabilized, collect groundwater samples by diverting flow out of the unfiltered discharge tubing into the appropriately labeled sample container. If a flow-through cell is being used to measure field parameters, the flow-through cell should be disconnected after stabilization of the field indicator parameters and prior to groundwater sample collection. Under no circumstances should analytical samples be collected from the discharge of the flow-through cell. When the container is full, tightly screw on the cap.
19. Secure the sample containers with packing material and store at 4 degrees Celsius on wet ice in an insulated transport container provided by the laboratory.
20. Record the time the sampling procedures were completed on the field logs.

21. Place all disposable sampling materials (plastic sheeting, disposable bailers, and health and safety equipment) in appropriately labeled containers. Go to the next well and repeat Step 1 through Step 21 until all wells are sampled.
22. Complete the procedures for packaging, shipping, and handling samples with associated COC forms.

### 2.5.3 Waste Management

Materials generated during groundwater sampling activities, including disposable equipment and excess purge water, will be stored on site in appropriately labeled containers and disposed of properly. Waste will be managed in accordance with the TGI – Investigation-Derived Waste Handling and Storage (Attachment 1); the procedures identified in the RDWP or QAPP; and all state-, federal-, or client-specific requirements. Waste containers will be properly labeled and documented in the field logbook.

### 2.5.4 Data Recording and Management

The original documents from the field will be managed in accordance with the site-specific QAPP. In general, forms (e.g., Low-Flow Sampling Field Forms), logs/notes (including daily field and calibration logs), digital records, and COC records will be maintained by the field team lead.

Field logs and COC records will be transmitted to the Arcadis Project Manager and/or Task Manager, as appropriate, at the end of each day unless otherwise directed. Electronic data files will be sent to the project team and uploaded to the electronic project folder daily.

Records generated as a result of this FSP will be controlled and maintained in the project record files in accordance with project requirements.

### 2.5.5 Quality Assurance

QA procedures will be conducted in accordance with the Arcadis Quality Management System or the site-specific QAPP.

Unless described otherwise in the project-specific work plan or QAPP, QA/QC samples will be collected as follows:

- One duplicate for every 10 samples; and
- One laboratory matrix/matrix spike sample for every 20 samples.

In addition to the QC samples to be collected in accordance with this FSP, the following QC procedures will be observed in the field:

- Collect samples from the monitoring wells, in order of increasing concentration, to the extent known based on review of historical site information, if available.
- Collect equipment blanks after wells with higher concentrations (if known) have been sampled. Equipment blanks will include the pump and tubing (if using disposable tubing) or the pump only (if using tubing dedicated to each well).
- Operate all monitoring instrumentation in accordance with manufacturers' instructions and calibration procedures—calibrate the instruments at the beginning of each day, verify the calibration at the end of each day, and record all calibration activities in the field logbook.
- Following the procedures for equipment decontamination, clean all groundwater sampling equipment prior to use in the first well and after each subsequent well.

## 2.6 Sample Labeling, Packing, and Shipping

Each sample will be given a unique identification. With this type of identification, no two samples will have the same label.

Upon collection, samples will be promptly labeled with the following information:

- Project number and site location;
- Unique sample identification;
- Analysis required;
- Date and time sampled;
- Sample type (composite or grab); and
- Preservative, if applicable.

Clear tape will be secured over the sample label and the COC will be initiated. A sample COC form is included as Attachment 4.

Appropriate sample containers, preservation methods, and laboratory holding times for each sample type will be applied as identified in the QAPP.

If samples are to be shipped by a commercial carrier (e.g., Federal Express), the sample bottles/jars will be packed in coolers containing the following:

- A drain plug (if present) that has been sealed with duct tape;
- Bubble wrap on the bottom of the cooler (1 to 2 inches);
- Water ice packaged in re-sealable plastic bags;
- Sufficient bubble wrap to fill in the remaining area; and
- The completed COC form in a re-sealable plastic bag, taped in place on the inside cover of the cooler.

The cooler will then be sealed with tape. Appropriate shipping labels, such as "this-end-up" and "fragile" stickers, will be affixed to the cooler. Samples will be hand delivered or delivered by an express carrier within 48 hours of sample collection. The express carrier will not be required to sign the COC form; however, the shipping receipt should be retained by the sampler and forwarded to the project files.

All samples, whether solids, liquids, or gases, being shipped by air or ground transport will be evaluated using a shipping determination process to determine if the material or equipment being shipped is hazardous for transport. All materials identified as Hazardous Materials (HazMat) will be shipped according to applicable United States Department of Transportation (USDOT) and International Air Transport Association regulations and requirements. All employees collecting samples, preparing HazMat packages, or offering HazMat to a third-party carrier, such as FedEx, will have current HazMat training.

## 2.7 Equipment Decontamination

### 2.7.1 Drill Rig Decontamination

A decontamination pad will be lined with plastic sheeting on a surface sloped to a sump. The sump must also be lined and of sufficient volume to contain approximately 20 gallons of decontamination water. All drilling equipment, including the rear-end of the drilling rig, augers, bits, rods, tools, split-spoon samplers, tremie pipe, etc., will be cleaned on the decontamination pad with a high-pressure, hot water, “steam cleaner” unit and scrubbed with a wire brush, as needed, to remove dirt, grease, and oil before beginning work in the project area. If heavy accumulations of tars or oils are present on the downhole tools, a citrus-based cleaner (e.g., Citra-Solv) may be used to aid in equipment cleaning. Tools, drill rods, and augers will be placed on sawhorses, decontaminated pallets, or polyethylene plastic sheets following steam cleaning. Direct contact with the ground will be avoided. The back of the drill rig and augers, rods, and tools will be decontaminated between each drilling location according to these procedures. Decontamination water will be contained in a dedicated plastic tank or 55-gallon open-top drums located on site. All open-top drums will remain closed when not in use.

The decontamination pad will be decommissioned following decontamination of all heavy site equipment. The decommissioning will be completed by:

- Transferring the bulk of the remaining liquids and solids into drums, tanks, and/or roll-offs to be provided by NYSEG or the drilling subcontractor for these materials.
- Rolling the sheeting used in the decontamination pad onto itself to prevent discharge of remaining materials to the ground surface. Once rolled up, the polyethylene sheeting will be placed in the roll-offs or drums used for disposal of PPE and disposable equipment.

### 2.7.2 Sampling Equipment Decontamination

The following equipment will be required for use during sampling equipment cleaning procedures:

- Appropriate PPE, as required in the site HASP;
- Distilled water;
- Non-phosphate detergent, such as Alconox® (or equivalent);
- Tap water;
- Rinsate collection plastic containers;
- USDOT-approved waste shipping container(s);
- Brushes;
- Large, heavy-duty, garbage bags;
- Spray bottles;
- “Pesticide grade” methanol (optional);
- “Ultra-pure grade” nitric acid (optional);
- Hexane (optional);
- Re-sealable plastic bags; and
- Plastic sheeting.

Prior to collecting samples to be submitted for chemical analysis, if any, all non-dedicated bowls, spoons, hand augers, bailers, and filtering equipment will be washed with potable water and a detergent (such as Alconox®). Decontamination may take place at the sampling location, as long as all liquids are contained in pails and buckets. Sampling equipment will then be rinsed with potable water, followed by a 10% “pesticide-grade” methanol rinse and then a distilled water rinse. When sampling for inorganic constituents in an aqueous phase, an additional rinse step will be added prior to the rinse with methanol. The rinse step will entail a rinse with a 10%

"ultra-pure-grade" nitric acid followed by a distilled water rinse. Between rinses, equipment will be placed on polyethylene sheets or aluminum foil, if necessary. At no time will washed equipment be placed directly on the ground. Equipment will either be used immediately or wrapped in plastic or aluminum foil for storage or transportation from the designated decontamination area to the sampling location.

## 2.8 Air Monitoring

Air monitoring will be conducted during all intrusive activities and may require a PID and dust meter or only a PID. Specific air monitoring requirements that need to be conducted during intrusive activities are provided in the RDWP. The PID will be used to monitor organic vapors in the breathing zone and borehole and to screen samples for analysis.

PID readings will be recorded in the field logbook during trenching and drilling activities. The instrument will be calibrated at least once each day or more frequently, if needed. A detailed procedure for the PID calibration is included in Section 3.1.

## 2.9 Investigation-Derived Waste and Storage

Investigation-derived waste (IDW) will be generated during site activities, which include, but are not limited to, groundwater sampling and decontamination. IDW may include decontamination liquids, PPE, sorbent materials, purge water, recovered NAPLs, and disposable sampling materials that may have come in contact with potentially impacted materials. IDW will be collected and staged at the point of generation. Waste materials will be analyzed for constituents of concern to evaluate proper disposal methods. Anticipated IDW will be labeled and stored in 55-gallon drums with bolt-sealed lids. Disposable equipment (PPE and disposable sampling equipment) typically does not require laboratory analysis.

Minimization of IDW will be considered and may include techniques such as replacing solvent-based cleaners with aqueous-based cleaners for decontamination of equipment, reuse of equipment (where it can be decontaminated), and sampling techniques that generate little waste.

The procedures for handling IDW are based on the USEPA's 1992 Guide to Management of Investigation Derived Wastes. IDW is assumed to be contaminated with site residuals until analytical evidence indicates otherwise. IDW will be managed to ensure the protection of human health and the environment and will comply with all applicable or relevant and appropriate requirements, including, but not limited to, the following laws and regulations for hazardous waste management.

- 6 New York Codes, Rules, and Regulations Part 364 "Waste Transporter Permits," Part 371 "Identification and Listing of Hazardous Wastes," and Part 372 "Hazardous Waste Manifest System and Related Standards for Generators, Transporters and Facilities;"
- Resource Conservation and Recovery Act (RCRA) 42 United States Code Part 6901-6987;
- Comprehensive Environmental Response, Compensation, and Liability Act 42 United States Code Part 9601-9675;
- Superfund Amendments and Reauthorization Act; and
- USDOT Hazardous Materials Transportation.

Waste characterization will be conducted in accordance with waste hauler, waste handling facility, and state/federal requirements and following the laboratory requirements and methodologies outlined in the QAPP.

IDW will be analyzed by methods appropriate for the known constituents that have been historically detected in the monitoring wells.

In the unexpected event that IDW is characterized as a hazardous waste (as defined in 6 New York Codes, Rules, and Regulations Part 371), RCRA and USDOT requirements must be followed for packaging, labeling, transporting, storing, and recordkeeping, as described in Title 40 of the Code of Federal Regulations (CFR) (40 CFR) Part 262 and Title 49 of the CFR Part 171-178. Waste material classified as RCRA non-hazardous may be handled and disposed of as an industrial waste.

These procedures may be varied or changed as required, dependent upon site conditions, equipment limitations, or limitations imposed by the procedure. The ultimate procedure employed will be documented in the project work plans or reports.

The following materials, as required, shall be available for IDW handling and storage:

- Appropriate PPE, as specified by the HASP;
- USDOT 1A2 or equivalent 55-gallon steel drums;
- Socket wrench (15/16-inch);
- Hammer;
- Leather gloves;
- Drum dolly;
- Appropriate drum labels (outdoor waterproof self-adhesive);
- Polyethylene storage tank;
- Appropriate labeling, packing, COC forms, and shipping materials;
- Indelible ink and/or permanent marking pens;
- Plastic sheeting;
- Digital camera; and
- Field logbook.

### 2.9.1 Drum Storage

All 55-gallon drums will be stored at a secure, centralized, on-site location that is readily accessible for vehicular pick-up. Drums confirmed as containing, or believed to contain, hazardous waste will be stored over an impervious surface provided with secondary containment. For drums containing liquid, the storage location will have a containment system that can contain at least the larger of 10% of the aggregate volume of staged materials or 100% of the volume of the largest container. Drums will be closed during storage and in good condition in accordance with the USEPA's 1992 Guide to Management of Investigation-Derived Wastes.

### 2.9.2 Drum Container Labelling

Drums will be labeled on both the side and lid of the drum using a permanent marking pen. Old drum labels must be removed to the extent possible, descriptions crossed out should any information remain, and new labels affixed on top of the old labels. Other containers used to store various types of waste (polyethylene tanks, roll-off boxes, end-dump trailers, etc.) will be labeled with an appropriate "Waste Container" or “Testing in Progress” label pending characterization. Drums and containers will be labeled as follows:

- Appropriate waste characterization label (Testing in Progress, Hazardous, or Non-Hazardous);
- Waste generator's name (e.g., client name);
- Project name;
- Name and telephone number of Arcadis Project Manager;
- Composition of contents (e.g., used oil, acetone 40%, toluene 60%);
- Media (e.g., solid, liquid);
- Accumulation date (i.e., date the waste is first placed in the container); and
- Drum number of total drums as reconciled with the drum inventory maintained in the field logbook.

Immediately upon placing waste into the drum/container, an appropriate waste label will be filled out to include the information specified above and affixed to the container. Containers with waste determined to be non-hazardous will be labeled with a green and white "Non-Hazardous Waste" label over the "Waste Container" label. Containers with waste determined to be hazardous will be stored in an on-site storage area and will be labeled with the "Hazardous Waste" label and affixed over the "Waste Container" label. USDOT hazardous class labels must be applied to all hazardous waste containers for shipment off site to an approved disposal or recycling facility. In addition, a proper USDOT shipping name shall be included on the hazardous waste label. The transporter should be equipped with the appropriate USDOT placards. However, placarding or offering placards to the initial transporter is the responsibility of the generator per 40 CFR Part 262.33.

### 2.9.3 Inspection and Documentation

All IDW will be documented as generated on a Drum Inventory Log maintained in the field logbook. The Drum Inventory Log will record the generation date, type, quantity, matrix, and origin (e.g. RW-1 through RW-10, MW-97-7) of materials in every drum, as well as a unique identification number for each drum. The drum inventory will be used during drum pickup to assist with the labeling of drums. Digital photographs will be taken upon the initial generation and drumming/staging of waste and upon final labeling after characterization to document compliance with labeling and storage protocols and the condition of the containers. Two photographs of each drum, including one of the entire drum and a close-up photograph of the label, will be provided as part of the drum inventory log. An additional photograph of the drum storage location (including all drums) will also be included. Evidence of damage, tampering, or other discrepancies should be documented photographically.

### 2.9.4 Preparing Waste Shipment Documentation (Hazardous and Non-Hazardous)

Waste profiles will be prepared by Arcadis and forwarded, along with laboratory analytical data, to NYSEG for approval/signature. NYSEG will then return the profiles to Arcadis, who will then forward them to the waste removal contractor for preparation of a manifest. The manifest will be reviewed by Arcadis prior to forwarding to NYSEG for approval. Upon approval of the manifest, NYSEG will return the original signed manifest directly to the waste contractor.

Different profile numbers will be generated for different matrices or materials in the drums. For example, the profile number for disposable equipment will be different than the profile number for soil cuttings. When there are multiple profiles, it is critical that the proper label, with the profile number appropriate to a specific material, be affixed to the proper drums. A copy of the Arcadis drum inventory will be provided to the waste transporter during drum pickup and to the facility receiving the waste.

## 2.10 Emergency Response and Notifications

Specific procedures for responding to site emergencies will be detailed in the HASP. In the event of a fire, explosion, or other release that could threaten human health outside of the site, or when NYSEG or Arcadis has knowledge of a spill that has reached surface water, NYSEG or Arcadis must immediately notify the National Response Center (800-424-8802) in accordance with 40 CFR Part 262.34. Other notifications to state agencies may also be necessary.

# 3 Field Instruments

All field-screening equipment will be calibrated immediately prior to each day's use or more frequently, if required. Additional calibration may be required if measurements appear erroneous. Calibration procedures will conform to the manufacturer's standard instructions. Records of all instrument calibration will be maintained by the field personnel.

## 3.1 Portable Photoionization Analyzer

If required, the PID will be a MiniRAE 3000 (or equivalent), equipped with a 10.6 electron volt lamp. The MiniRAE is capable of ionizing and detecting compounds with an ionization potential of less than 10.6 electron volts. This accounts for up to 73% of the VOCs on the Target Compound List. Calibration will be performed according to the following procedures:

1. Turn on the MiniRAE 3000 and monitor the ambient air. If there is any doubt of the air quality, then zero grade gas will be obtained.
2. Connect the regulator to the span gas cylinder. Hand-tighten the fittings.
3. Open the valve on the gas bag by turning the valve stem fully counterclockwise.
4. Attach the gas bag to the regulator. Hand-tighten the fittings.
5. Turn the regulator knob counterclockwise half a turn to start the gas flow.
6. Fill the gas bag half full and then close the regulator fully clockwise to turn off the flow of gas.
7. Fill the gas bag and then turn the valve clockwise.
8. Press “MODE” and “N” at the same time to enter the set-up screens. Press “MODE” to cycle through the screens. Press “Y” for span cal and “Y” again for zero point. Press “Y” to set the zero point.
9. When the screen displays “CAL GAS,” press “Y” and calibrate the unit with isobutylene calibration gas.
10. Press and hold “MODE” for a few seconds, and the display will return to normal screening mode.
11. After 7 hours of use, recharge the battery pack. Record the time the battery pack was charged.

The date, time, user’s initials, calibration gas, and concentration will be recorded on the PID Calibration Log (Attachment 5).

## 3.2 Water-Level Meter

The water-level cable will be checked once to a standard to assess if the meter has been correctly calibrated by the manufacturer or vendor. If the markers are incorrect, the meter will be sent back to the manufacturer or vendor.

# Attachment 1

**Technical Guidance Instruction**

# TGI – GROUNDWATER AND SOIL SAMPLING EQUIPMENT DECONTAMINATION

Rev: 1

Rev Date: May 8, 2020

# VERSION CONTROL

| Revision No | Revision Date | Page No(s) | Description | Reviewed by |
|---|---|---|---|---|
| 0 | February 23, 2017 | ALL | Conversion from SOP to TGI | Cassandra McCloud / Pete Frederick |
| 1 | May 8, 2020 | 4-5 | Added note regarding use of Liquinox and 1,4-Dioxane | Marc Killingstad |
| | | | | |
| | | | | |

# APPROVAL SIGNATURES

| | | | |
|---|---|---|---|
| Prepared by: | Derrick Maurer | Date: | 02/23/2017 |
| Technical Expert Reviewed by: | Marc Killingstad (Technical Expert) | Date: | May 8, 2020 |

# 1 INTRODUCTION

This document describes general and/or specific procedures, methods, actions, steps, and considerations to be used and observed by Arcadis staff when performing work, tasks, or actions under the scope and relevancy of this document. This document may describe expectations, requirements, guidance, recommendations, and/or instructions pertinent to the service, work task, or activity it covers.

It is the responsibility of the Arcadis Certified Project Manager (CPM) to provide this document to the persons conducting services that fall under the scope and purpose of this procedure, instruction, and/or guidance. The Arcadis CPM will also ensure that the persons conducting the work falling under this document are appropriately trained and familiar with its content. The persons conducting the work under this document are required to meet the minimum competency requirements outlined herein, and inquire to the CPM regarding any questions, misunderstanding, or discrepancy related to the work under this document.

This document is not considered to be all inclusive nor does it apply to any and all projects. It is the CPM's responsibility to determine the proper scope and personnel required for each project. There may be project- and/or client- and/or state-specific requirements that may be more or less stringent than what is described herein. The CPM is responsible for informing Arcadis and/or Subcontractor personnel of omissions and/or deviations from this document that may be required for the project. In turn, project staff are required to inform the CPM if or when there is a deviation or omission from work performed as compared to what is described herein.

In following this document to execute the scope of work for a project, it may be necessary for staff to make professional judgment decisions to meet the project's scope of work based upon site conditions, staffing expertise, state-specific requirements, health and safety concerns, etc. Staff are required to consult with the CPM when or if a deviation or omission from this document is required that has not already been previously approved by the CPM. Upon approval by the CPM, the staff can perform the deviation or omission as confirmed by the CPM.

# 2 SCOPE AND APPLICATION

Decontamination is performed on sampling equipment prior to sample collection to ensure that the sampling equipment that contacts a sample, or monitoring equipment that is brought into contact with environmental media to be sampled, is free from analytes of interest and/or constituents that could interfere with laboratory analysis for analytes of interest. Sampling equipment must be appropriately cleaned prior to use for sampling or coming into contact with environmental media to be sampled, and following completion of the sampling event prior to shipment or storage. The effectiveness of the decontamination procedure should be verified by collecting and analyzing equipment blank samples.

The sampling equipment cleaning procedures described herein includes pre-field, in the field, and post-field cleaning of sampling equipment which may be conducted at an established equipment decontamination area (EDA) on site, as appropriate and necessary. Sampling equipment that may require decontamination at a given site includes: soil sampling tools; groundwater, sediment, and surface-water sampling devices; water testing instruments; down-hole instruments; and other activity-specific sampling equipment. Non-disposable equipment will be cleaned before collecting each sample, between each sample collected, and prior to placing sampling equipment in protective cases, or containers for transport. Cleaning procedures for sampling equipment should be monitored by collecting equipment blank samples as required in project work plans, field sampling plans, quality assurance project plans (QAPP), or other pertinent project documents. Dedicated and/or single-use (i.e., not to be re-used) sampling equipment will not require decontamination.

# 3 PERSONNEL QUALIFICATIONS

Arcadis field sampling personnel will have completed or are in the process of completing site-specific training as well as having current health and safety training as required by Arcadis, client, or regulations, such as 40-hour HAZWOPER training and/or OSHA HAZWOPER site supervisor training. Arcadis personnel will also have current training as specified in the Health and Safety Plan (HASP) which may include first aid, cardiopulmonary resuscitation (CPR), Blood Borne Pathogens (BBP) as needed. In addition, Arcadis field sampling personnel will be knowledgeable in the relevant processes, procedures, and Technical Guidance Instructions (TGIs) and possess the demonstrated required skills and experience necessary to successfully complete the desired field work. The project health and safety plan (HASP) and other documents will identify other training requirements or access control requirements.

# 4 EQUIPMENT LIST

The equipment required for equipment decontamination is presented below:

- Health and safety equipment, including appropriate PPE, as required in the site Health and Safety Plan (HASP)
- Deionized water that meets that analytical criteria for deionized water with no detectable constituents above the reporting limits for the methods to be used and analytes being analyzed for. Deionized water is used for inorganics, and organic-free water for VOCs, SVOCs, pesticides, etc.
- Non-phosphate detergent such as Alconox or, if sampling for phosphorus or phosphorus-containing compounds, Liquinox (or equivalent). NOTE: *Liquinox has shown to provide false positives for 1,4-Dioxane and should not be used at sites where that may be a constituent of concern (COC).*
- Tap water
- Rinsate collection plastic containers
- DOT-approved waste shipping container(s), as specified in the work plan, field sampling plan, or regulatory requirements if decontamination waste is to be shipped for disposal
- Brushes
- Large heavy-duty garbage bags
- Spray bottles

- (Optional) – Isopropyl alcohol (free of ketones) or methanol. These can be wipes or diluted with water (usually 1part isopropyl/methanol to 10 parts water) if a spray is needed.
- Airtight, sealable plastic baggies, such as Ziploc-type
- Plastic sheeting

# 5 CAUTIONS

Rinse equipment thoroughly and allow the equipment to dry before re-use or storage to prevent introducing solvent into sample medium. If manual drying of equipment is required, use clean lint-free material to wipe the equipment dry. Ensure all rinsate materials do not adversely affect sample collection efficiency or analytical results.

Store decontaminated equipment in a clean, dry environment. Do not store near combustion engine exhausts. Properly containerize equipment to ensure cross-contamination doesn't happen from other uncontaminated surfaces or equipment.

If equipment is damaged to the extent that decontamination is uncertain due to cracks, gouges, crevices, or dents, the equipment should not be used and should be discarded or submitted for repair prior to use for sample collection.

A proper shipping determination regarding hazardous materials will be performed by a DOT-trained individual for cleaning materials shipped by Arcadis.

Caution should be exercised to avoid contact with the pump casing and water in the container while the pump is running (do not use metal drums or garbage cans) to avoid electric shock.

# 6 HEALTH AND SAFETY CONSIDERATIONS

Review the safety data sheets (SDS) for the cleaning agents and materials used in decontamination. If solvent is used during decontamination, use appropriate PPE and work in a well-ventilated area and stand upwind while applying solvent to equipment. Apply solvent in a manner that minimizes potential for exposure to workers and bystanders. Follow health and safety procedures outlined in the HASP.

# 7 PROCEDURE

A designated area will be established to clean sampling equipment in the field prior to and following sample collection. Equipment cleaning areas will be set up within or adjacent to the specific work area, but not at a location that expose equipment to contamination (i.e. exposed to combustion engine exhaust). Detergent solutions will be prepared in clean containers for use in equipment decontamination. Decontaminated equipment should be handled by workers wearing clean gloves, properly changed to prevent cross-contamination.

**Cleaning Sampling Equipment**

1. Wash the equipment/pump with potable water.

2. Wash with detergent solution (Alconox, Liquinox or equivalent) to remove all visible particulate matter and any residual oils or grease. NOTE: *Liquinox has shown to provide false positives for 1,4-Dioxane and should not be used at sites where that may be a constituent of concern (COC).*
3. If equipment is very dirty, precleaning gross debris with a brush and tap water may be necessary.
4. If non-aqueous phase liquids are present, the use of isopropyl alcohol (free of ketones) or methanol is recommended. Cloth wipes or diluted solution can be used to remove the non-aqueous phase liquids that are hard to remove with detergent solution in step 2. Consult with project manager if non-aqueous phase liquids are present onsite and design an appropriate decontamination procedure that includes step 4.
5. Rinse with deionized water.

**Decontaminating Submersible Pumps**

Submersible pumps may be used during well development, groundwater sampling, or other investigative activities. The pumps must be cleaned and flushed before and between uses. This cleaning process will consist of an external detergent solution wash and tap water rinse, a flush of detergent solution through the pump, followed by a flush of potable water through the pump. Flushing will be accomplished by using an appropriate container filled with detergent solution and another container filled with potable water. The pump should be flushed with deionized water as the last step prior to use. The pump will run long enough to effectively flush the pump housing and hose (unless new, disposable hose is used). Disconnect the pump from the power source before handling. The pump and hose should be placed on or in clean polyethylene sheeting to avoid contact with the ground surface.

# 8 WASTE MANAGEMENT

Equipment decontamination rinsate will be managed in conjunction with all other waste produced during the field sampling effort. Waste management procedures are outlined in the work plan or Waste Management Plan (WMP).

# 9 DATA RECORDING AND MANAGEMENT

Equipment cleaning and decontamination will be noted in the field notebook for project documentation. Information will include the type of equipment cleaned, the decontamination location, specific procedures utilized, solvents and/or cleaning agents used, source of water, and deviations or omissions from this TGI.

Unusual field conditions should be noted if there is potential to impact the efficacy of the decontamination or subsequent sample collection.

An inventory of the solvents brought on site and used and removed from the site will be maintained in the project documentation. Records will be maintained for solvents used in decontamination, including lot number and expiration date.

Containers with decontamination fluids will be labeled.

# 10 QUALITY ASSURANCE

Equipment blanks should be collected to verify that the decontamination procedures are effective in minimizing potential for cross contamination. The equipment blank is prepared by pouring deionized water (or organic-free water, for organic analyses) over the clean and dry tools and collecting the water into appropriate sample containers. Equipment blanks should be analyzed for the same set of parameters that are performed on the field samples collected with the equipment that was cleaned as specified in the sampling and analysis plan. Equipment blanks are collected per equipment set, which represents all of the tools needed to collect a specific sample.

# 11 REFERENCES

USEPA Region 9 - Field Sampling Guidance #1230, Sampling Equipment Decontamination.

USEPA Region 1 - Low Stress (low flow) Purging and Sampling Procedure for the Collection of Groundwater Samples from Monitoring Wells.

# TGI - INVESTIGATION-DERIVED WASTE HANDLING AND STORAGE

Rev #: 1

Rev Date: May 15, 2020

# VERSION CONTROL

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| | Derrick Maurer | Date: |
| Technical Expert Reviewed by: | | 05/15/2020 |
| | Ryan Mattson (Technical Expert) | Date: |

# 1 INTRODUCTION

This document describes general and/or specific procedures, methods, actions, steps, and considerations to be used and observed by Arcadis staff when performing work, tasks, or actions under the scope and relevancy of this document. This document may describe expectations, requirements, guidance, recommendations, and/or instructions pertinent to the service, work task, or activity it covers.

It is the responsibility of the Arcadis Certified Project Manager (CPM) to provide this document to the persons conducting services that fall under the scope and purpose of this procedure, instruction, and/or guidance. The Arcadis CPM will also ensure that the persons conducting the work falling under this document are appropriately trained and familiar with its content. The persons conducting the work under this document are required to meet the minimum competency requirements outlined herein, and inquire to the CPM regarding any questions, misunderstanding, or discrepancy related to the work under this document.

This document is not considered to be all inclusive nor does it apply to any and all projects. It is the CPM's responsibility to determine the proper scope and personnel required for each project. There may be project- and/or client- and/or state-specific requirements that may be more or less stringent than what is described herein. The CPM is responsible for informing Arcadis and/or Subcontractor personnel of omissions and/or deviations from this document that may be required for the project. In turn, project staff are required to inform the CPM if or when there is a deviation or omission from work performed as compared to what is described herein.

In following this document to execute the scope of work for a project, it may be necessary for staff to make professional judgment decisions to meet the project's scope of work based upon site conditions, staffing expertise, state-specific requirements, health and safety concerns, etc. Staff are required to consult with the CPM when or if a deviation or omission from this document is required that has not already been previously approved by the CPM. Upon approval by the CPM, the staff can perform the deviation or omission as confirmed by the CPM.

# 2 SCOPE AND APPLICATION

The objective of this Technical Guidance Instruction (TGI) is to describe the procedures to manage investigation-derived wastes (IDW), both hazardous and nonhazardous, generated during site activities, which may include, but are not limited to: drilling, trenching/excavation, construction, demolition, monitoring well sampling, soil sampling, decontamination and remediation. For the purposes of this TGI, IDW is considered to be discarded materials which are defined as solid waste by United States Environmental Protection Agency (EPA) standard 40 CFR § 261.2 (which may include liquids, solids, or sludges). IDW may include soil, groundwater, drilling fluids, decontamination liquids, as well as contaminated personal protective equipment (PPE), sorbent materials, construction and demolition debris, and disposable sampling materials. Hazardous or uncharacterized IDW will be collected and staged at the point of generation. Quantities small enough to be containerized in 55-gallon drums will be taken to a designated temporary onsite storage area (discussed in further detail under Drum Storage) pending characterization and disposal. IDW materials will be characterized using process knowledge and appropriate laboratory analyses to determine the waste classification and evaluate proper safe handling and disposal methods.

This TGI describes the necessary equipment, field procedures, materials, regulatory references, and documentation procedures necessary for proper handling and storage of IDW up to the time it is properly transported from the project site and disposed. The procedures included in this TGI for handling and temporary storage of IDW are based on the EPA's guidance document *Guide to Management of Investigation Derived Wastes* (USEPA, 1992). IDW is assumed to be contaminated with the site constituents of concern (COCs) until analytical evidence indicates otherwise. IDW will be managed to ensure the protection of human health and the environment and will comply with all applicable or relevant and appropriate requirements (ARAR). Although not comprehensive, the following laws and regulations on Hazardous Waste Management should be considered as potential ARAR. It is the Arcadis Certified Project Manager (CPM) and/or designated Technical Expert to determine which laws and regulations, at all levels of government, are applicable to each project site and activity falling under this TGI.

Federal Laws and Regulations

- Resource Conservation and Recovery Act (RCRA) 42 USC § 6901-6987.
- Federal Hazardous Waste Regulations 40 CFR § 260-265

Department of Transportation (DOT) Hazardous Materials Transportation 49 CFR

Occupational Safety and Health Administration (OSHA) Regulations 29 CFR

State Laws and Regulations

- To be determined based on location of site and location of treatment, storage, and/or disposal facility (TSDF) to be utilized.

Regional, County, Municipal, and Local Regulations

- To be determined based on location of site and location of treatment, storage, and/or disposal facility (TSDF) to be utilized.

**Initial Storage**

Pending characterization, IDW will be temporarily stored appropriately within each area of contamination (AOC). Under RCRA, "storage" is defined as the "holding of hazardous waste for a temporary period, at the end of which the hazardous waste is treated, disposed of, or stored elsewhere" (40 CFR § 260.10). The onsite waste staging area will be in a secure and controlled area. Uncharacterized wastes are considered potentially hazardous wastes and must be stored in DOT approved packaging. Liquid wastes must be stored in DOT approved closed head drums or other approved containers (e.g., portable tank containers) that are compatible with the type of material stored therein. Solid materials must be stored in DOT approved open head drums where practicable. Larger quantities of solid IDW can be containerized in bulk containers (such as in a roll-off box). Soil from large excavation projects may be managed in stockpiles with within the AOC and does not need to be containerized until exiting the AOC.

**Characterization**

Waste characterization can either be based on generator knowledge, such as using historical process knowledge and safety data sheets (SDS), or can be based upon characterization sampling analytical results. IDW typically is not characterized using SDS as it is a mixture of aged chemicals and environmental media. Historical process knowledge should be used to determine if the IDW is a listed hazardous waste (40 CFR § 261.31-33). If the IDW is not a listed hazardous waste, waste characterization can be completed by laboratory analysis of representative samples of the IDW. The laboratory used for waste characterization analysis must have the appropriate state and federal accreditations and may be required to be pre-approved by the Client. IDW will be classified as RCRA hazardous or non-regulated under RCRA based on the waste characterization determination.

If IDW is characterized as RCRA hazardous waste, RCRA and DOT requirements must be followed for packaging, labeling, transporting, storing, and record keeping as described in 40 CFR § 262 and 49 CFR § 171-178. Waste material classified as RCRA nonhazardous may be handled and disposed of as nonhazardous waste in accordance with applicable federal, state, and local regulations.

**Storage Time Limitations**

Containerized hazardous wastes can be temporarily stored for a maximum of 90 calendar days from the accumulation start date for a large quantity generator or a maximum of 180 calendar days from the accumulation start date for a small quantity generator. Wastes classified as nonhazardous may be handled and disposed of as nonhazardous waste and are not subject to storage time limitations.

This is TGI may be modified by the CPM and/or Technical Expert for a specific project or client program, as required, dependent upon client requirements, site conditions, equipment limitations, or limitations imposed by the procedure. The resulting procedure employed to execute the work will be documented in the project work plans or reports. If changes to the sampling procedures are required due to unanticipated field conditions, the changes will be discussed with the CPM and/or Technical Expert as soon as practicable, and if approved to be performed, be documented.

# 3 PERSONNEL QUALIFICATIONS

Arcadis field sampling personnel will have current regulatory- and Arcadis-required health and safety training including 40-hour HAZWOPER training, site supervisor training, site-specific training, first aid, and cardiopulmonary resuscitation (CPR), as needed. Personnel handling and packaging hazardous waste and performing hazardous waste characterizations must have RCRA hazardous waste management training per 40 CFR § 264.16. Additional state-specific hazardous waste management training is required in certain states (i.e., California).

Although not common practice, in certain situations Arcadis personnel may sign waste profiles and/or waste manifests on a case by case basis for clients, provided the appropriate agreement is in place between Arcadis and the client documenting that Arcadis is not the generator, but is acting as an authorized representative of the generator. Arcadis personnel who sign waste profiles and/or waste manifests will have both current RCRA hazardous waste management training per 40 CFR § 264.16 and current DOT hazardous materials transportation training per 49 CFR § 172.704. Arcadis field personnel will also comply with client-specific training. In addition, Arcadis field sampling personnel will be knowledgeable in the relevant processes, procedures, and Technical Guidance Instructions (TGIs) and possess the demonstrated required skills and experience necessary to successfully complete the desired field work. The project health and safety plan (HASP) and other documents will identify other training requirements or access control requirements.

# 4 EQUIPMENT LIST

The Following Materials, as required, will be available for IDW handling and Storage:

- Appropriate personal protective equipment as specified in the Site Health and Safety Plan (HASP)
- DOT approved containers
- Hammer
- Leather gloves
- Drum dolly
- Appropriate drum labels (outdoor waterproof self-adhesive)
- Portable tank container
- Appropriate labeling, packing, chain-of-custody forms, and shipping materials as determined by the CPM and/or Technical Expert.
- Indelible ink and/or permanent marking pens
- Plastic sheeting
- Appropriate sample containers, labels, and forms
- Stainless-steel bucket auger
- Stainless steel spatula or knife
- Stainless steel hand spade
- Stainless steel scoop
- Digital camera
- Field logbook

# 5 CAUTIONS

Filled drums can be very heavy, become unbalanced, or spill its contents.  Therefore, use appropriate moving techniques and equipment for safe handling. Similar media (e.g. soils with other soils; or liquids with other liquids) will be stored in the same drums to aid in sample analysis and disposal. Drum lids must be secured to prevent rainwater from entering the drums and leakage during movement. Drums containing solid material may not contain any free liquids. Waste containers stored for extended periods of time may be subject to deterioration. Drum Over Packs may be used as secondary containment. All drums must be visually inspected for condition to ensure that they are in good condition without visible evidence of rusting, holes, breakage, etc., to prevent potential leakage and facilitate subsequent disposal. All drum lids must be verified as having a properly functioning secured lid prior to use.

# 6 HEALTH AND SAFETY CONSIDERATIONS

As determined by the site's known and suspected hazards, appropriate PPE must be worn by all field personnel within the designated work area. Exposure air monitoring may be required during certain field activities as required in the Site Health and Safety Plan. If soil excavation in areas with potentially hazardous contaminants is possible, contingency plans will be developed to address the potential for encountering gross contamination or non-aqueous phase liquids. All excavation activities shall be in compliance with OSHA standard 29 CFR 1926.651 Excavations, and any other applicable regulations.

Arcadis field personnel and subcontractors will be trained in and perform their work in compliance with all applicable federal, state, and local health and safety regulations as well as Arcadis' HASP and applicable Client health and safety requirements.

# 7 PROCEDURE

Specific waste temporary storage and handling procedures to be used are dependent upon the type of generated waste, including type of media (e.g. soils or free liquids) and constituents of concern. For this reason, IDW can be stored in a secure location onsite in separate 55-gallon storage drums, where solids can be stockpiled onsite (if nonhazardous) and purge water may be stored in portable tank containers. Waste materials such as broken sample bottles or equipment containers and wrappings will be stored in 55-gallon drums unless they were not in contact with sample media.

**Management of IDW**

Minimization of IDW should be considered by the project team during all phases of the project. Site managers may want to consider techniques such as replacing solvent based cleaners with aqueous-based cleaners for decontamination of equipment, reuse of equipment (where it can be properly decontaminated), limitation of traffic between exclusion and support zones, and drilling methods and sampling techniques that minimize the generation of waste. Alternative drilling and subsurface sampling methods may include the use of small diameter boreholes, as well as borehole testing methods such as a core penetrometer or direct push technique instead of coring.

**Drum Storage**

Drums containing hazardous waste will be stored in accordance with the requirements of 40 CFR 265 Subpart I (for containers) and 265 Subpart DD (for containment buildings). All 55-gallon drums will be stored at a secure, centralized onsite location that is readily accessible for vehicular pick-up. Drums confirmed as, or assumed to contain hazardous waste will be stored over an impervious surface provided with secondary spill containment. The storage location will, for drums containing liquid, have a containment system that can contain at least the larger of 10% of the aggregate volume of staged materials or 100% of the volume of the largest container. Drums will be closed during storage and be in good condition in accordance with the Guide to Management of Investigation-Derived Wastes (USEPA, 1992).

**Hazardous Waste Determination**

Waste material must be characterized to determine if it meets any of the federal definitions of hazardous waste as required by 40 CFR § 262.11. If the waste does not meet any of the federal definitions, it must then be established if any state-specific or local-specific hazardous waste criteria exist/apply.

**Generator Status**

Once hazardous waste determination has been made, the generator status will be determined. Large quantity generators (LQG) are generators who generate more than 1,000 kilograms of hazardous waste in a calendar month. Small quantity generators (SQG) of hazardous waste are generators who generate greater than 100 kilograms but less than 1,000 kilograms of hazardous waste in a calendar month. Very small quantity generators (VSQG) are generators who generate less than 100 kilograms of hazardous waste per month. Please note that a generator status may change from month to month and that a notice of this change is usually required by the generator’s state agency.

**Accumulation Time for Hazardous Waste**

A LQG may accumulate hazardous waste on site for 90 calendar days or less without a permit and without having interim status, provided that such accumulation is in compliance with requirements in 40 CFR § 262.17. A SQG may accumulate hazardous waste on site for 180 calendar days or less without a permit or without having interim status, subject to the requirements of 40 CFR § 262.16. VSQG requirements are found in 40 CFR § 262.14. NOTE: The federal VSQG and SQG provisions may not be recognized by some states (e.g., California and Rhode Island). State-specific and local-specific regulations must be reviewed and understood prior to the generation of hazardous waste.

Satellite Accumulation of Hazardous Waste Satellite accumulation (SAA) will mean the accumulation of as much as fifty-five (55) gallons of hazardous waste, or the accumulation of as much as one quart of acutely hazardous waste, in containers at or near any point of generation where the waste initially accumulates, which is under the control of the operator of the process generating the waste, without a permit or interim status and without complying with the requirements of 40 CFR § 262.15 and without any storage time limit, provided that the generator complies with 40 CFR § 262.15.

Once more than 55 gallons of hazardous waste accumulates in SAA, the generator has three days to move this waste into storage.

Storage recommendations for hazardous waste include:

- Ignitable or reactive hazardous wastes must be >50 feet from the property line per 40 CFR § 265.176 (LQG generators only).
- Hazardous waste should be stored on a concrete slab (asphalt is acceptable if there are no free liquids in the waste).
- Drainage must be directed away from the accumulation area.
- Area must be properly vented.
- Area must be secure.

**Drum/Container Labeling**

Drums will be labeled on both the side and lid of the drum using a permanent marking pen. Old drum labels must be removed to the extent possible, descriptions crossed out should any information remain, and new labels affixed on top of the old labels. Other containers used to store various types of waste (e.g., polyethylene tanks, roll-off boxes, end-dump trailers, etc.) will be labeled with an appropriate "Waste Container" or “Testing in Progress” label pending characterization. Drums and containers will be labeled as follows:

- Appropriate waste characterization label (Pending Analysis, Hazardous, or Nonhazardous)
- Waste generator's name (e.g., client name)
- Project Name
- Name and telephone number of Arcadis project manager
- Composition of contents (e.g., used oil, acetone 40%, toluene 60%)
- Media (e.g., solid, liquid)
- Accumulation start date

- Drum number of total drums as reconciled with the Drum Inventory maintained in the field log book.

IDW containers will remain closed except when adding or removing waste. Immediately upon beginning to place waste into the drum/container, a “Waste Container” or “Pending Analysis” label will be filled out to include the information specified above, and affixed to the container. Once the contents of the container are identified as either non-hazardous or hazardous, the following additional labels will be applied.

- Containers with waste determined to be non-hazardous will be labeled with a green and white "Nonhazardous Waste" label over the "Waste Container" label.
- Containers with waste determined to be hazardous will be stored in an onsite storage area and will be labeled with the "Hazardous Waste" label and affixed over the "Waste Container" label.

The ACCUMULATION DATE for the hazardous waste is the date the waste is first placed in the container and is the same date as the date on the "Waste Container" label. DOT hazardous class labels must be applied to all hazardous waste containers for shipment offsite to an approved disposal or recycling facility. In addition, a DOT proper shipping name will be included on the hazardous waste label. The transporter should be equipped with the appropriate DOT placards. However, placarding or offering placards to the initial transporter is the responsibility of the generator per 40 CFR § 262.33.

**Inspections and Documentation**

All IDW will be documented as generated on a Drum Inventory Log maintained in the field log book. The Drum Inventory will record the generation date, type, quantity, matrix and origin (e.g., Boring-1, Test Pit 3, etc.) of materials in every drum, as well as a unique identification number for each drum. The drum inventory will be used during drum pickup to assist with labeling of drums. The drum storage area and any other areas of temporarily staged waste, such as soil/debris piles, will be inspected weekly. The weekly inspections will be recorded in the field notebook or on a Weekly Inspection Log. Digital photographs will be taken upon the initial generation and drumming/staging of waste, and final labeling after characterization to document compliance with labeling and storage protocols, and condition of the container. Evidence of damage, tampering or other discrepancy should be documented photographically.

**Emergency Response and Notifications**

Specific procedures for responding to site emergencies will be detailed in the HASP. If the generator is designated as a LQG, a Contingency Plan will need to be prepared to include emergency response and notification procedures per 40 CFR § 265 Subpart D. In the event of a fire, explosion, or other release which could threaten human health outside of the site or when Client or Arcadis has knowledge of a spill that has reached surface water, Client or Arcadis must immediately notify the National Response Center (800-424-8802) in accordance with 40 CFR § 262.265. Other notifications to state and/or other local regulatory agencies may also be necessary.

**Drilling Soil Cuttings and Muds**

Soil cuttings are solid to semi-solid soils generated during trenching activities, subsurface soil sampling, or installation of monitoring wells. Depending on the drilling method, drilling fluids known as "muds" may be used to remove soil cuttings. Drilling fluids flushed from the borehole must be directed into a settling section of a mud pit. This allows reuse of the decanted fluids after removal of the settled sediments. Soil cuttings will be labeled and stored in 55-gallon drums with bolt-sealed lids.

**Excavated Solids**

Excavated solids may include, but are not limited to: soil, fill, and construction and demolition debris. Prior to permitted treatment or offsite disposal, potentially hazardous excavated solids may be temporarily stockpiled onsite as long as the stockpile remains in the same AOC from where it was excavated. Potentially hazardous excavated solids removed from the AOC must be immediately containerized in labeled drums or closable top roll-offs lined with 9-mil polyvinyl chloride (PVC) sheeting and are subject to LQG storage time limits. Nonhazardous excavated solids can be stockpiled either inside or outside of the AOC, do not have to be containerized and are not subject to hazardous waste regulations. Potentially hazardous excavated solids must not be mixed with nonhazardous excavated solids. All classes of excavated solid stockpiles should be maintained in a secure area onsite. At a minimum, the floor of the stockpile area will be covered with a 20-mil high density polyethylene liner that is supported by a foundation or at least a 60-mil high density polyethylene liner that is not supported by a foundation. The excavated material will not contain free liquids. The owner/operator will provide controls for windblown dispersion, run-on control, and precipitation runoff. The run-on control system will prevent flow onto the active portion of the pile during peak discharge from at least a 25-year storm and the run-off management system will collect and control at least the water volume resulting from a 24-hour, 25-year storm (USEPA, 1992). Additionally, the stockpile area will be inspected on a weekly basis and after storm events. Individual states may require that the stockpile be inspected/certified by a licensed professional engineer. Stockpiled material will be covered with a 6-mil polyvinyl chloride (PVC) liner or sprayed dust control product. The stockpile cover will be secured in place with appropriate material (concrete blocks, weights, etc.) to prevent the movement of the cover.

**Decontamination Solutions**

Decontamination solutions are generated during the decontamination of personal protective equipment and sampling equipment. Decontamination solutions may range from detergents, organic solvents and acids used to decontaminate small field sampling equipment to steam cleaning rinsate used to wash heavy field equipment. These solutions are to be labeled and stored in closed head drums compatible with the decontamination solution. Decontamination procedures, including personnel and field sampling equipment, must comply with applicable Arcadis procedural documents.

**Disposable Equipment**

Disposable equipment includes personal protective equipment (e.g., tyvek coveralls, gloves, booties and APR cartridges) and disposable sampling equipment such as trowels or disposable bailers. If the media sampled exhibits hazardous characteristics per results of waste characterization sampling, contaminated disposable equipment will also be disposed of as a hazardous waste. If compatible with the original IDW waste stream (i.e., the IDW is a solid and the disposal equipment is a solid), the disposable equipment can be combined with the IDW. If these materials are not compatible (i.e., the IDW is a liquid and the disposal equipment is a solid), the disposable equipment will be stored onsite in separate labeled 55-gallon drums. Uncontaminated or decontaminated disposable equipment can be considered nonhazardous waste.

**Purge Water**

Purge water includes groundwater generated during well development, groundwater sampling, or aquifer testing. The volume of groundwater generated will dictate the appropriate storage procedure. Monitoring well development and groundwater sampling may generate three well volumes of groundwater or more. This volume will be stored in labeled 55-gallon drums. Aquifer tests may generate significantly greater volumes of groundwater depending on the well yield and the duration of the test. Therefore, large-volume portable polyethylene tanks will be considered for temporary storage pending groundwater-waste characterization.

**Purged Water Storage Tank Decontamination and Removal**

The following procedures will be used for inspection, cleaning, and offsite removal of storage tanks used for temporary storage of purge water. These procedures are intended to be used for rented portable tanks such as Baker Tanks or Rain for Rent containers. Storage tanks will be made of inert plastic materials. The major steps for preparing a rented tank for return to a vendor include characterizing the purge water, disposing of the purge water, decontaminating the tank, final tank inspection, and mobilization. Decontamination and inspection procedures are described in further detail below.

- <u>Tank Cleaning</u>: Most vendors require that tanks be free of any visible sediment and water before returning, a professional cleaning service may be required. Each specific vendor should be consulted concerning specific requirements for returning tanks.
- <u>Tank Inspection</u>: After emptying the tank, purged water storage tanks should be inspected for debris, chemical staining, and physical damage. The vendors require that tanks be returned in the original condition (i.e., free of sediment, staining and no physical damage).

# 8 WASTE MANAGEMENT

**Soil/Solids Characterization**

Waste characterization will be conducted in accordance with waste hauler, waste handling facility, and local/state/federal requirements. In general, RCRA hazardous wastes are those solid wastes determined by a Toxicity Characteristic Leaching Procedure (TCLP) test or to contain levels of certain toxic metals, pesticides, or other organic chemicals above specific applicable regulatory agency thresholds. If the one or more of 40 toxic compounds listed in Table I of 40 CFR § 261.24 are detected in the sample at levels above the maximum unregulated concentrations, the waste must be characterized as a toxic hazardous waste. Wastes can also be considered “listed” hazardous waste depending on site-specific processes.

Composite soil samples will be collected at a frequency of one sample per 250 cubic yard basis for stockpiled soil or one per 55-gallon drum per different waste stream for containerized. A four-point composite sample will be collected per 250 cubic yards of stockpiled material and for each drum waste stream. Sample and composite frequencies may be adjusted in accordance with the waste handling facility’s requirements and may be reduced for large volumes of waste with consistent properties. Waste characterization samples will be considered valid for consistent waste streams for a period of 1 year. Waste characterization samples may be analyzed for the TCLP volatile organic compounds (VOCs), TCLP semi-volatile organic compounds (SVOCs), TCLP RCRA metals, and polychlorinated biphenyls (PCBs), as well as reactivity and flammability (flashpoint). Additional samples may be collected and analyzed by the laboratory on a contingency basis. Site-specific constituents of concern including pesticides may require additional sampling. Please note that state- or local-specific regulations may require a different or additional sampling approaches.

**Wastewater Characterization**

Waste characterization will be conducted in accordance with the requirements of the waste hauler, waste handling facility, and local/state/federal governments. In general, purge water should be analyzed by methods appropriate for the known contaminants, if any, that have been historically detected in the monitoring wells. Samples will be collected and analyzed in accordance with the requirements of the waste disposal facility. Wastewater characterization samples may be analyzed for TCLP volatile organic compounds (VOCs), TCLP semi-volatile organic compounds (SVOCs), TCLP RCRA metals, and polychlorinated biphenyls, as well as corrosivity (pH), reactivity and flammability (flashpoint). Additional samples may be collected and analyzed by the laboratory on a contingency basis. Site-specific constituents of concern including pesticides may require additional sampling. Please note that state- and/or local-specific regulations may require different or additional sampling approaches.

**Sample Handling and Shipping**

All samples will be appropriately labeled, packed, and shipped, and the chain-of-custody will be filled out in accordance with current Arcadis sample chain of custody, handling, packing, and shipping procedures and guidance instructions.

It should be noted that additional training is required for packaging and shipping of hazardous and/or dangerous materials. Please refer to the current Arcadis training requirements related to handling and shipping of samples, shipping determinations, and hazardous materials.

**Preparing Waste Shipment Documentation (Hazardous and Nonhazardous)**

Waste profiles will be prepared by the Arcadis CPM and forwarded, along with laboratory analytical data to the Client for approval/signature. The Client will then return the profile to Arcadis who will then forward to the waste removal contractor for preparation of a manifest. The manifest will be reviewed by Arcadis prior to forwarding to the Client for approval. Upon approval of the manifest, the Client will return the original signed manifest directly to the waste contractor or to the Arcadis CPM for forwarding to the waste contractor. Arcadis personnel may sign waste profiles and/or waste manifests on a case by case basis for clients, provided the appropriate agreement is in place between Arcadis and the client documenting that Arcadis is not the generator, but is acting as an authorized representative of the generator.

Final drum labeling and pickup will be supervised by an Arcadis representative who is trained and experienced with applicable waste labeling procedures. The Arcadis representative will have a copy of the drum inventory maintained in the field book and will reconcile the drum inventory with the profile numbers on the labels and on the manifest. Different profile numbers will be generated for different matrices or materials in the drums. For example, the profile number for drill cuttings will be different than the profile number for purge water. When there are multiple profiles it is critical that the proper label, with the profile number appropriate to a specific material be affixed to the proper drums. A copy of the Arcadis drum inventory will be provided to the waste transporter during drum pickup and to the facility receiving the waste.

# 9 DATA RECORDING AND MANAGEMENT

Waste characterization sample handling, packing, and shipping procedures will be documented in accordance with relevant Arcadis procedures and guidance instructions as well as applicable client and/or project requirements, such as a Quality Assurance Project Plan or Sampling and Analysis Plan. Copies of the chain-of-custody forms will be maintained in the project file. Arcadis should photograph or maintain a copy of any hazardous waste manifest signed on behalf of Client in the corresponding office DOT record file.

# 10 QUALITY ASSURANCE

The CPM or APM will review all field documentation once per week for errors or omissions as compared to applicable project requirements including but not limited to: the proposal/scope of work, QAPP, SAP, HASP, etc. Deficiencies will be noted, tracked, and resolved. Upon correction, they will be noted for project documentation.

# 11 REFERENCES

United States Environmental Protection Agency (USEPA). 1992. Guide to Management of Investigation-Derived Wastes. Office of Remedial and Emergency Response. Hazardous Site Control Division. January 1992.

# TGI – Soil Description

Rev: 3.0

Rev Date: April 15, 2022

# Version Control

| Issue | Revision No. | Date Issued | Page No. | Description | Reviewed By |
|---|---|---|---|---|---|
| | 0 | May 20, 2008 | 17 | Original SOP | Joe Quinnan<br>Joel Hunt |
| | 1 | September 2016 | 15 | Updated to TGI | Nick Welty<br>Patrick Curry |
| | 2 | February 16, 2018 | 15 | Updated descriptions, attachments and references in text | Nick Welty<br>Patrick Curry |
| | 3 | April 15, 2022 | | Minor description edits, intro of grain-size K analysis, revised boring log template | Matt McCaughey<br>Patrick Curry |
| | | | | | |

# Approval Signatures

| | | |
|---|---|---|
| Prepared by: | | 4/15/2022 |
| | Matthew C. McCaughey, PG (Preparer) | Date |
| Reviewed by: | | 4/15/2022 |
| | Patrick Curry, PG (Subject Matter Expert) | Date |

# 1 Introduction

This Arcadis Technical Guidance Instruction (TGI) describes proper soil description procedures based on visual inspection and testing of soil cores and samples. This document has been developed to emphasize field observation and documentation of details required to:

- Make hydrostratigraphic interpretations guided by depositional environment/geologic settings
- Provide information needed to understand the distribution of constituents of concern; properly design wells, piezometers, and/or additional field investigations; and develop appropriate remedial strategies.

# 2 Intended Use and Responsibilities

This document describes general and/or specific procedures, methods, actions, steps, and considerations to be used and observed by Arcadis staff when performing work, tasks, or actions under the scope and relevancy of this document. This document may describe expectations, requirements, guidance, recommendations, and/or instructions pertinent to the service, work task, or activity it covers.

It is the responsibility of the Arcadis Certified Project Manager (CPM) to provide this document to the persons conducting services that fall under the scope and purpose of this procedure, instruction, and/or guidance. The Arcadis CPM will also ensure that the persons conducting the work falling under this document are appropriately trained and familiar with its content. The persons conducting the work under this document are required to meet the minimum competency requirements outlined herein, and inquire to the CPM regarding any questions, misunderstanding, or discrepancy related to the work under this document.

This document is not considered to be all inclusive nor does it apply to all projects. It is the CPM's responsibility to determine the proper scope and personnel required for each project. There may be project- and/or client- and/or state-specific requirements that may be more or less stringent than what is described herein. The CPM is responsible for informing Arcadis and/or Subcontractor personnel of omissions and/or deviations from this document that may be required for the project. In turn, project staff are required to inform the CPM if or when there is a deviation or omission from work performed as compared to what is described herein.

In following this document to execute the scope of work for a project, it may be necessary for staff to make professional judgment decisions to meet the project's scope of work based upon site conditions, staffing expertise, regulation-specific requirements, health and safety concerns, etc. Staff are required to consult with the CPM when or if a deviation or omission from this document is required that has not already been previously approved by the CPM. Upon approval by the CPM, the staff can perform the deviation or omission as confirmed by the CPM.

# 3 Scope and Application

This TGI should be followed for unconsolidated material unless there is an established client-required specific procedure or regulatory-required specific procedure. In cases where there is a required specific procedure, it should be followed and should be referenced and/or provided as an appendix to reports that include soil classifications and/or boring logs. When following a required non-Arcadis procedure, additional information required by this TGI should be included in field notes with client approval.

This TGI incorporates elements from various standard systems such as ASTM D2488-06, Unified Soil Classification System, Burmister and Udden Wentworth. However, none of these standard systems focus specifically on contaminant hydrogeology and remedial design. Therefore, although each of these systems contain valuable guidance and information related to correct descriptions, strict application of these systems can omit information critical to our clients and the projects that we perform.

This TGI includes the following attachments:

- **Attachment A –** Field Soil Description Guide
- **Attachment B –** Particle Size System Comparison
- **Attachment C –** Description of Logging Terms
- **Attachment D –** Blank Boring Log
- **Attachment E –** Completed Boring Log

This TGI does not address details of health and safety; drilling method selection; boring log preparation; sample collection; or laboratory analysis. Refer to other Arcadis procedure, guidance, and instructional documents, the project work plans including the quality assurance project plan, sampling plan, and health and safety plan (HASP), as appropriate.

# 4 Personnel Qualifications

Soil descriptions should only be performed by Arcadis personnel or authorized sub-contractors with a degree in geology or a geology-related discipline. Field personnel will complete training on the Arcadis soil description TGI in the office and/or in the field under the guidance of an experienced field geologist with at least 2 years of prior experience applying the Arcadis soil description method.

# 5 Equipment List

The following equipment should be taken to the field to facilitate soil descriptions:

- Field book, field forms or digital devices to record soil descriptions
- Field book for supplemental notes
- This TGI for Soil Descriptions and any project-specific procedure, guidance, and/or instructional documents (if required)
- Field card showing Wentworth scale
- Munsell® soil color chart
- Tape measure divided into tenths of a foot
- Stainless steel knife or spatula
- Hand lens
- Water squirt bottle
- 4-ounce glass jars with lids (for collecting soil core samples)
- Personal protective equipment (PPE), as required by the HASP
- Digital camera

- Folding table

# 6 Cautions

Drilling and drilling-related hazards including subsurface utilities are discussed in other procedure documents and site-specific HASPs and are not discussed herein.

Soil samples may contain hazardous substances that can result in exposure to persons describing soils. Routes for exposure may include dermal contact, inhalation and ingestion. Refer to the project specific HASP for guidance in these situations.

# 7 Health and Safety Considerations

Field activities associated with soil sampling and description will be performed in accordance with a site-specific HASP, a copy of which will be present on site during such activities. Know what hazardous substances may be present in the soil and understand their hazards. Always avoid the temptation to touch soils with bare hands, detect odors by placing soils close to your nose, or tasting soils.

# 8 Procedure

## 8.1 General Procedures

- Select the appropriate sampling method to obtain representative samples in accordance with the selected sub-surface exploration method, e.g., split-spoon or Shelby sample for hollow-stem drilling, acetate sleeves for direct push, bagged core for sonic drilling, etc.
- Proceed with field activities in required sequence. Although completion of soil descriptions is often not the first activity after opening sampler, identification of stratigraphic changes is often necessary to select appropriate intervals for field screening and/or selection of laboratory samples.
- Set up boring log field sheet.
    - Determine the proper units of measure. Drillers in both the US and Canada generally work in feet due to equipment specifications. Field geologists typically record drilling depths, core recovery, and sample intervals in feet and grain size in millimeters
    - Use the Arcadis standard boring log form (**Attachment D**). *Note that as of April 2022, several digital logging applications are available through the FieldNow™ program and the Fulcrum app. A future revision of this TGI, likely in early 2023, will emphasize digital logging methods and field boring log forms will no longer be acceptable. FieldNow is discussed further in Section 10.*
    - The boring log template includes a graphic log of the primary soil texture to support quick visual evaluation of grain size. The purpose of the graphic log is to quickly assess relative soil permeability. Note, for poorly sorted soils (e.g., glacial till), the principal component may not correlate to permeability of the sample. In this case, the geologist should use best judgement to graph overall soil type consistent with relative soil permeability. For example, for a dense sand/silt/clay till, the graphic log would reflect the silt/clay, rather than sand.

- Record depths along the left-hand side at a standard scale to aid in the use of this tool.

- Examine each soil core (this is different than examining each sample selected for laboratory analysis) and record the soil conditions in accordance with guidelines provided in Section 8.2.
- At the end of the boring, record the amount of drilling fluid used (if applicable) and the total depth logged.
- At a minimum, a written or digital boring log should be prepared with the following information:
  - Describe type of surface material (asphalt, grass, topsoil, gravel, etc.)
  - Describe the type of fill or non-native soils and estimated depth to native soils
  - Record sample intervals (soil cores, environmental and/or geotechnical samples)
  - Describe soil conditions in accordance with this TGI
  - Record moisture content and estimated depth to water table or saturated zone
  - Record the total depth and document why drilling was stopped (refusal, target depth achieved, etc.)

## 8.2 Soil Description Procedures

The standard soil description order is presented below.

- Depth
- PRIMARY TEXTURE
- Principal and Minor Components with Descriptors
  - % Modifiers and grain size fraction
  - Angularity for very coarse sand and larger particles
  - Consistency or Density
  - Plasticity for silt and clay
  - Dilatancy for silt and silt-sand mixtures
- Sorting
- Moisture Content
- Color
- Notes

**Depth.** To measure and record the depth below ground surface (bgs) of top and bottom of each stratum, the following information should be recorded.

- Measured depth to the top and bottom of sampled interval. Use starting depth of sample based upon measured tool length information and the length of sample interval.
- Length of sample recovered, not including slough (material that has fallen into hole from previous interval), expressed as fraction with length of recovered sample as numerator over length of sampled interval as denominator (e.g., 36/60 for 36 inches recovered from 5-ft [60-inch] sampling interval).
- Thickness of each stratum measured sequentially from the top of recovery to the bottom of recovery.
- Any observations of sample condition or drilling activity that would help identify whether there was loss from the top of the sampling interval, loss from the bottom of the sampling interval, or compression of the sampling interval. Examples: 14/24, gravel in nose of spoon; or 36/60 bottom 12 inches of core empty.

**Determination of Components.** Obtain a representative sample of soil from a single stratum. If multiple strata are present in a single sample interval, each stratum should be described separately. More specifically, if the sample is from a 2-foot-long split-spoon where strata of coarse sand, fine sand and clay are present, then the resultant description should be of the three individual strata unless a combined description can clearly describe the interbedded nature of the three strata. Example: SAND, fine; with interbedded lenses of Silt and Clay, ranging between 1 and 3 inches thick.

Identify principal component and express volume estimates for minor components on logs using the following standard modifiers.

| Modifier | Percent of Total Sample (by volume) |
|---|---|
| and | 36 – 50 |
| some | 21 - 35 |
| little | 10 - 20 |
| trace | <10 |

Determination of components is based on using the Udden-Wentworth particle size classification (see below) and measurement of the average grain size diameter. Each size class differs from the next larger class by a constant ratio of ½. Due to visual limitations, the finer classifications of Wentworth's scale cannot be distinguished in the field and the subgroups are not included. Visual determinations in the field should be made carefully by comparing the sample to the Soil Description Field Guide (**Attachment A**) that shows Udden-Wentworth scale or by measuring with a ruler.

The following table summarized the modified Udden-Wentworth Scale for grain size classification.  Note that gravel is a size category encompassing the granule, pebble, cobble, and boulder size classes.

| Udden-Wentworth Scale (Modified by Arcadis, 2008) | | | | |
|---|---|---|---|---|
| **Size Category** | **Size Class** | **Millimeters** | **Inches** | **Standard Sieve #** |
| Gravel (Cobble) | Boulder | 256 – 4096 | 10.08+ | |
| | Large cobble | 128 - 256 | 5.04 -10.08 | |
| | Small cobble | 64 - 128 | 2.52 – 5.04 | |
| Gravel (Pebble) | Very large pebble | 32 – 64 | 0.16 - 2.52 | |
| | Large pebble | 16 – 32 | 0.63 – 1.26 | |
| | Medium pebble | 8 – 16 | 0.31 – 0.63 | |
| | Small pebble | 4 – 8 | 0.16 – 0.31 | No. 5 + |
| | Granule | 2 – 4 | 0.08 – 0.16 | No.5 – No.10 |

| | | | | |
|---|---|---|---|---|
| Sand | Very coarse sand | 1 -2 | 0.04 – 0.08 | No.10 – No.18 |
| | Coarse sand | ½ - 1 | 0.02 – 0.04 | No.18 - No.35 |
| | Medium sand | ¼ - ½ | 0.01 – 0.02 | No.35 - No.60 |
| | Fine sand | 1/8 -¼ | 0.005 – 0.1 | No.60 - No.120 |
| | Very fine sand | 1/16 – 1/8 | 0.002 – 0.005 | No. 120 – No. 230 |
| Fines | Silt (subgroups not included) | 1/256 – 1/16 | 0.0002 – 0.002 | Not applicable (analyze by pipette or hydrometer) |
| | Clay (subgroups not included | 1/2048 – 1/256 | 0.00002 – 0.0002 | |

Identify components as follows. Remove particles greater than very large pebbles (64-mm diameter) from the soil sample. Record the volume estimate of the greater than very large pebbles. Examine the sample fraction of very large pebbles and smaller particles and estimate the volume percentage of the pebbles, granules, sand, silt and clay. Use the jar method, visual method, and/or wash method (Appendix X4 of ASTM D2488) to estimate the volume percentages of each category.

Sieve and hydrometer grain-size analysis can be used to vet the visual description, as well as used to estimate hydraulic conductivity. Lab or field sieve analysis is advisable to characterize the variability and facies trends within each hydrostratigraphic unit. It is recommended that sieve-hydrometer analysis be performed on representative samples from each soil type to estimate the fraction of each grain size category using ASTM D422 Standard Test Method for Particle-Size Analysis of Soils. If desired sieve sizes can be specified to follow the Udden-Wentworth classification (U.S. Standard sieve sizes 6; 12; 20; 40; 70; 140; and 270) to retain pebbles; granules; very coarse sand; coarse sand; medium sand; fine sand; and very fine sand, respectively.

Several empirical formulas provide a reliable means of estimating hydraulic conductivity (K) from grain-size distribution data, provided that the formation does not contain abundant fines that result in cohesive or plastic behavior or include cobble-sized grains (Payne et al. 2008). Grain-size analysis can help bracket the permeability of hydrostratigraphic units (HSUs) and identify order-of-magnitude spatial variations in K. Arcadis has completed modifications to the Excel-based program HydroGeoSieveXL (Devlin 2015) to process sieve data quickly and estimate K. The tool calculates estimated K values from grain-size data using 15 different empirical formulas. A decision matrix then selects which of the formulas is relevant for the soil type and calculates an average K.

**Principal Component.** The principal component is the size fraction or range of size fractions containing the majority of the volume. Examples: the principal component in a sample that contained 55% small to medium pebbles would be “PEBBLES, small to medium”; or the principal component in a sample that was 20% fine sand, 30% medium sand and 25% coarse sand would be “SAND, fine to coarse” or for a sample that was 40% silt and 45% clay the principal component would be “CLAY and SILT”.

The boring log form (**Appendix D**) includes a graphic log to visually illustrate a relative estimate of soil permeability. To use the graphic log, place an ‘X’ or shade the appropriate column for the primary soil texture. If the soils have a high percentage of a secondary soil texture (i.e., when the ‘and’ modifier’ is used), it’s acceptable to mark off the appropriate column for the secondary soil texture in this instance. However, care should be used to avoid marking off the columns for other minor soil textures because doing so will make it difficult to determine the relative soil permeability of the poorly sorted soils.

As noted above, for poorly sorted soils such as glacial till, the principal component may not correlate to permeability of the sample. In this case, the geologist should use best judgement to graph overall soil type consistent with relative soil permeability.

**Minor Component(s).** The minor component(s) are the size fraction(s) containing less than 50% volume. Example: the identified components are estimated to be 60% medium sand to granules, 25% silt and clay; 15% pebbles – there are two identified minor components: silt and clay; and pebbles.

Include a standard modifier to indicate percentage of minor components (see particle size table) and the same descriptors that would be used for a principal component. An example of minor constituents with modifiers include: some silt and clay, low plasticity; little medium to large pebbles, sub-round.

### 8.2.1 Secondary Descriptors

The following are the descriptors used outside of the principal and minor components. Note that plasticity should be provided as a descriptor for clay and clay mixtures. Dilatancy should be provided for silt and silt mixtures. Angularity should be provided as a descriptor for pebbles and coarse sand.

**Angularity**. Describe the angularity for very coarse sand and larger particles in accordance with the table below (ASTM D-2488-06). Figures showing examples of angularity are available in ASTM D-2488-06 and the Arcadis Soil Description Field Guide (**Appendix B**).

| Description | Criteria |
|---|---|
| Angular | Particles have sharp edges and relatively plane sides with unpolished surfaces |
| Sub-Angular | Particles are like angular description but have rounded edges |
| Sub-Rounded | Particles have nearly plane sides but have well-rounded corners and edges |
| Rounded | Particles have smoothly curved sides and no edges. |

**Plasticity**. Describe the plasticity for silt and clay based on observations made during the following test method (ASTM D-2488-06).

- As in the dilatancy test (described below), select enough material to mold into a ball about ½ inch (12 mm) in diameter. Mold the material, adding water, if necessary, until it has a soft, but not sticky, consistency.
- Shape the test specimen into an elongated pat and roll by hand on a smooth surface or between the palms into a thread about 1/8 inch (3 mm) in diameter. If the sample is too wet to roll easily, it should be spread into a thin layer and allowed to lose some water by evaporation. Fold the sample threads and reroll repeatedly until the thread crumbles at a diameter of about 1/8 inch. The thread will crumble when the soil is near the plastic limit.

| Description | Criteria |
|---|---|
| Non-plastic | A 1/8-inch (3 mm) thread cannot be rolled at any water content. |
| Low | The thread can barely be rolled, and the lump cannot be formed when drier than the plastic limit. |
| Medium | The thread is easy to roll and not much time is required to reach the plastic limit. The thread cannot be rerolled after reaching the plastic limit. The lump crumbles when drier than the plastic limit. |
| High | It takes considerable time rolling and kneading to reach the plastic limit. The thread can be rolled several times after reaching the plastic limit. The lump can be formed without crumbling when drier than the plastic limit. |

**Dilatancy**. Describe the dilatancy for silt and silt-sand mixtures using the following field test method (ASTM D-2488-06).

- From the specimen, select enough material to mold into a ball about ½ inch (12 mm) in diameter. Mold the material adding water, if necessary, until it has a soft, but not sticky, consistency.
- Smooth the ball in the palm of one hand with a small spatula.
- Shake horizontally, striking the side of the hand vigorously with the other hand several times.
- Note the reaction of water appearing on the surface of the soil.
- Squeeze the sample by closing the hand or pinching the soil between the fingers, and not the reaction as none, slow, or rapid in accordance with the table below. The reaction is the speed with which water appears while shaking and disappears while squeezing.

| Description | Criteria |
|---|---|
| None | No visible change in the specimen |
| Slow | Water appears slowly on the surface of the specimen during shaking and does not disappear or disappears slowly upon squeezing |
| Rapid | Water appears quickly on the surface of the specimen during shaking and disappears quickly upon squeezing |

Note that silt and silt-sand mixtures will be non-plastic and display dilatancy.  Clay mixtures will have some degree of plasticity but do not typically react to dilatancy testing.  Therefore, the tests outlined above can be used to differentiate between silt-dominated and clay-dominated soils.

**Sorting.** Sorting is the opposite of grading, which is a commonly used term in the USCS or ASTM methods to describe the uniformity of the particle size distribution in a sample. Well-sorted samples are poorly graded and poorly sorted samples are well graded. Arcadis prefers the use of sorting for particle size distributions and grading to describe particle size distribution trends in the vertical profile of a sample or hydrostratigraphic unit because of the relationship between sorting and the energy of the depositional process. For soils with sand-sized or larger particles, sorting should be determined as follows:

| Description | Criteria |
|---|---|
| Well Sorted | the range of particle sizes is limited (e.g., the sample is comprised of predominantly one or two grain sizes) |
| Poorly Sorted | A wide range of particle sizes are present |

You can also use sieve analysis to estimate sorting from a sedimentological perspective; sorting is the statistical equivalent of standard deviation. Smaller standard deviations correspond to higher degree of sorting (see Remediation Hydraulics, 2008).

**Consistency or Density.** This can be determined by standard penetration test (SPT) blow counts (ASTM D-1586) obtained when using hollow-stem auger drilling methods and a split spoon sampling device. Otherwise, some field tests are available as outlined below. When drilling with hollow-stem augers and split-spoon sampling, the SPT blow counts and N-value is used to estimate density. The N-value is the blows per foot for the 6" to 18" interval. For example, for a 24-inch split spoon soil core, the recorded blows per 6-inch interval are: 4/6/9/22. Since the second interval is 6" to 12", the third interval is 12" to 18", the N value is 6+9, or 15. Fifty blow counts for less than 6 inches is considered refusal. In recent years, more common drilling methods include rotary-sonic or direct push. When blow counts are not available, density is determined using a thumb test. Note however, the thumb test only applies to fine-grained soils.

**Fine-grained soil – Consistency**

| Description | Criteria | Blow Counts (6-12 to 12-18-inch split spoon interval) |
|---|---|---|
| Very soft | Easily penetrated several inches by thumb | N-value < 2 |
| Soft | Easily penetrated one inch by thumb | N-value 2-4 |
| Medium Stiff | Indented about ½ inch with much effort | N-value 5-8 |
| Stiff | Indented with ¼ inch with great effort | N-value 9-15 |
| Very Stiff | Readily indented by thumbnail | N-value 16-30 |
| Hard | Indented by thumbnail with difficulty | N-value > than 30 |

**Coarse-grained soil – Density**

| Description | Criteria | Blow Counts (6-12 to 12-18-inch split spoon interval) |
|---|---|---|
| Very loose<br>Loose<br>Medium dense<br>Dense<br>Very dense | Density classification of coarse-grained soils is only required when blow counts from standard penetration tests are performed during hollow-stem auger drilling | N-value 1- 4<br>N-value 5-10<br>N-value 11-30<br>N-value 31- 50<br>N-value >50 |

**Moisture Content.** Moisture content should be described for each soil sample in accordance with the table below (percentages should not be used unless determined in the laboratory). *Note that some drilling methods (e.g., sonic) can compress and dry out the sample during drilling. Therefore, it can be difficult to determine if a sample is saturated, or merely moist. In this case, care should be taken to try and determine a static water level within the borehole by measuring depth to water through the drill casing, if possible.*

| Description | Criteria |
|---|---|
| Dry | Absence of moisture, dry to touch, dusty |
| Moist | Damp but no visible water |
| Wet | Visibly free water |

**Color.** Color should be described using simple basic terminology and modifiers based on the Munsell system. Munsell alpha-numeric codes are required for all samples. If the sample contains layers or patches of varying colors this should be noted, and all representative colors should be described. The colors should be described for moist samples. If the sample is dry, it should be wetted prior to comparing the sample to the Munsell chart.

**Notes.** Additional comments should be made where observed and should be presented as notes with reference to a specific depth interval(s) to which they apply. Some of the significant information that may be observed includes the following.

- Odor - You should not make an effort to smell samples by placing near your nose since this can result in unnecessary exposure to hazardous materials. However, odors should be noted if they are detected during the normal sampling procedures. Odors should be based upon descriptors such as those used in NIOSH "Pocket Guide to Chemical Hazards", e.g., "pungent" or "sweet" and should not indicate specific chemicals such as "phenol-like" odor or "BTEX" odor.
- Structure
- Bedding planes (laminated, banded, geologic contacts).
- Presence of roots, root holes, organic material, man-made materials, minerals, etc.
- Mineralogy

- Cementation
- NAPL presence/characteristics, including sheen (based on client-specific guidance).
- Reaction with HCl - typically only used for special soil conditions, such as caliche environments.
- Origin, if known (Lacustrine; Fill; etc.).

## 8.3 Example of Soil Descriptions

The standard generic description order is presented below.

- Depth
- PRIMARY TEXTURE
- Principal and Minor Components with Descriptors
  - % Modifiers and grain size fraction
  - Angularity for very coarse sand and larger particles
  - Consistency or Density
  - Plasticity for silt and clay
  - Dilatancy for silt and silt-sand mixtures
- Sorting
- Moisture Content
- Color
- Notes

**10-15 feet CLAY, trace silt, trace small to very large pebbles, subround to subangular up to 2" diameter; medium to high plasticity, stiff, moist, dark grayish brown (10YR 4/2). NOTE: Lacustrine; laminated 0.1 to 0.2" thick, laminations brownish yellow (10YR 4/3).**

**10 -15 feet SAND, medium to very coarse, little granules to medium pebbles, subround to subangular, trace silt; poorly sorted, wet, grayish brown (10YR5/2).**

Unlike the first example where a density of cohesive soils could be estimated, this rotary-sonic sand and pebble sample was disturbed during drilling (due to vibrations in a loose sand and pebble matrix) so no density description could be provided. Neither sample had noticeable odor so odor comments were not included.

# 9 Waste Management

Project-specific requirements should be identified and followed. The following procedures, or similar waste management procedures are generally required.

Water generated during cleaning procedures will be collected and contained onsite in appropriate containers for future analysis and appropriate disposal. PPE (such as gloves, disposable clothing, and other disposable equipment) resulting from personnel cleaning procedures and soil sampling/handling activities will be placed in plastic bags. These bags will be transferred into appropriately labeled 55-gallon drums or a covered roll-off box for appropriate disposal.

Soil materials will be placed in sealed 55-gallon steel drums or covered roll-off boxes and stored in a secured area. Once full, the material will be analyzed to determine the appropriate disposal method.

# 10 Data Recording and Management

## 10.1 Digital Data Collection Process Overview

Digital data collection is the Arcadis standard using available FieldNow® applications that enable real-time, paperless data collection, entry, and automated reporting. Paper forms should only be used as backup to FieldNow® digital data collection and/or as necessary to collect data not captured by available FieldNow® applications. The Field Now® digital form applications follow a standardized approach, correlate to most TGIs and are available to all projects accessible with a PC or capable mobile device. Once the digital forms are saved within FieldNow®, the data is instantly available for review on a web interface. This facilitates review by project management team members and SMEs enabling error or anomalous data detection for correction while the staff are still in the field. Continual improvements of FieldNow® applications are ongoing, and revisions are made as necessary in response to feedback from users and subject matter experts.

## 10.2 Digital Data Collection Tools for Soil Descriptions

Arcadis is transitioning from the use of paper forms to a digital soil description logging process using web-based FieldNow applications accessible on field tablets and smart phones. Company-wide roll out of a FieldNow application for soil descriptions is targeted by the end of 2022.

Paper forms are included in Revision 3 (April 2022) of this Soil Description TGI. Specifically, a blank boring log and completed boring log are provided in **Attachment D** and **Attachment E**. Additional guidance and examples of the digital data collection tools for soil descriptions will be provided in the next revision to this TGI.

## 10.3 Additional Guidance

The general logging scheme for soil descriptions is described in this document. Depending on project data quality objectives, specific soil description parameters that are not applicable to project goals may be omitted at the project manager’s discretion. In any case, use of consistent procedures is required.

Completed logs and/or logbook will be maintained in the task/project field records file. Digital photographs of typical soil types observed at the site and any unusual features should be obtained whenever possible. Photographs should include a ruler or common object for scale. Photo location, depth and orientation must be recorded in the daily log or logbook and a label showing this information in the photo is useful.

For projects involving soil logging and soil sampling, the soil sample should be recorded on the Arcadis boring log form and the field logbook based on Data Quality Objectives for the task/project.

# 11 Quality Assurance

Soil descriptions should be completed only by appropriately trained personnel. Descriptions should be reviewed by an experienced field geologist for content, format and consistency. Edited boring logs should be reviewed by the original author to assure that content has not changed.

# 12 References

ASTM D-1586, Test Method for Penetration Test and Split-Barrel Sampling of Soils.

ASTM D-2488-00, Standard Practice for Description and Identification of Soils (Visual-Manual Procedure)

ASTM D422, 63rd Edition, 1972 - Standard Test Method for Particle-Size Analysis of Soils.

Devlin, J.F. 2015. HydroGeoSieve XL: an Excel-based tool to estimate hydraulic conductivity from grain-size analysis. Hydrogeology Journal, DOI 10.1007/s10040-015-1255-0.

Folk, Robert L. 1980. Petrology of Sedimentary Rocks, p. 1-48.

Payne, F. C., Quinnan, J. A., & Potter, S. T. 2008. Remediation Hydraulics. Boca Raton: FL: CRC Press.

United States Bureau of Reclamation. Engineering Geology Field Manual. United States Department of Interior, Bureau of Reclamation. http://www.usbr.gov/pmts/geology/fieldmap.htm.

Munsell® Color Chart – available from Forestry Suppliers, Inc.- Item 77341 “Munsell® Color Soil Color Charts.

Field Gauge Card that Shows Udden-Wentworth scale – available from Forestry Suppliers, Inc. – Item 77332 “Sand Grain Sizing Folder.”

NIOSH Pocket Guide to Chemical Hazards.

# Attachment A

## Soil Field Reference Guide

*The purpose of this attachment is to present a field reference guide for use during soil logging. Field staff are encouraged to bring a laminated copy of this reference guide into the job site.*

ON THE ORIGINAL DRAWING.
USE TO VERIFY FIGURE
REPRODUCTION SCALE

# SOIL DESCRIPTION FIELD GUIDE (APRIL, 2022; REV. 3.0)



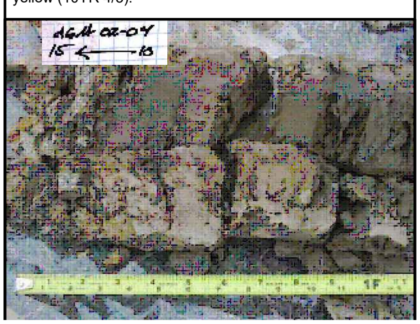
ARCADIS Design & Consultancy for natural and built assets

## FINE-GRAINED SOILS

| Description | Criteria |
|---|---|
| | **Descriptor - Plasticity** |
| Nonplastic | A 1/8-inch (3 mm) thread cannot be rolled at any water content. |
| Low | The thread can barely be rolled, and the lump cannot be formed when drier than the plastic limit. |
| Medium | The thread is easy to roll and not much time is required to reach the plastic limit. The thread cannot be rerolled after reaching the plastic limit. The lump crumbles when drier than the plastic limit. |
| High | It takes considerable time rolling and kneading to reach the plastic limit. The thread can be rolled several times after reaching the plastic limit. The lump can be formed without crumbling when drier than the plastic limit. |
| | **Descriptor - Dilatancy** |
| No Dilatancy | No visible change when shaken or squeezed. |
| Slow | Water appears slowly on the surface of soil during shaking and does not disappear or disappears slowly when squeezed. |
| Rapid | Water appears quickly on surface of soil during shaking and disappears quickly when squeezed. |
| **Minor Components with Descriptors** | |
| | **Moisture** |
| Dry | Absence of moisture, dry to touch, dusty. |
| Moist | Damp but no visible water. |
| Wet | Visible free water; soil is usually below the water table. (Saturated) |
| | **Consistency** |
| Very soft | N-value < 2 or easily penetrated several inches by thumb. |
| Soft | N-value 2-4 or easily penetrated 1 inch by thumb. |
| Medium stiff | N-value 5-8 or indented about 1/2 inch by thumb with great effort. |
| Stiff | N-value 9-15 or indented about 1/4 inch by thumb with great effort. |
| Very stiff | N-value 16-30 or readily indented by thumb nail. |
| Hard | N-value > than 30 or indented by thumbnail with difficulty. |
| **Color using Munsell** | |
| **Geologic Origin (if known)** | |
| **Other** | |

### EXAMPLE OF SOIL DESCRIPTION AND PHOTO

10-15 feet CLAY, trace silt, trace small to very large pebbles, subround to subangular up to 2" diameter; medium to high plasticity, stiff, moist, dark grayish brown (10YR 4/2). NOTE: Lacustrine; laminated 0.1 to 0.2" thick, laminations brownish yellow (10YR 4/3).



## DESCRIPTION ORDER

Depth Interval
PRIMARY TEXTURE (e.g., SAND)
Principal and Minor Components with Descriptors:
- % Modifiers and grain size fraction
- Angularity coarse sand and larger
- Consistency or Density
- Plasticity for silt and clay
- Dilatancy for silt and silt-sand

Sorting for granular sediments
Moisture Content
Color
Other NOTES

## MINOR COMPONENTS % MODIFIERS

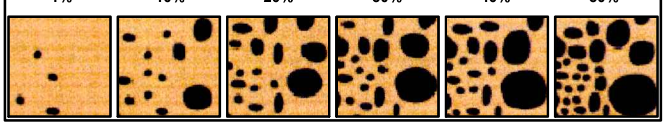
| Modifier | Percent of Total Sample (by volume) |
|---|---|
| and | 36 - 50 |
| some | 21 - 35 |
| little | 10 - 20 |
| trace | <10 |

## UDDEN-WENTWORTH SCALE

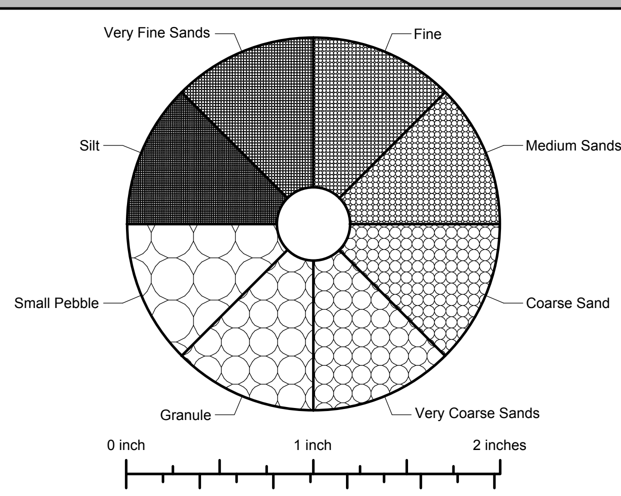
| Fraction | Sieve Size | Grain Size | Approximate Scale |
|---|---|---|---|
| Boulder | | 256 - 4096 mm | Larger than volleyball |
| Large Cobble | | 128 - 256 mm | Softball to volleyball |
| Small Cobble | | 64 - 128 mm | Pool ball to softball |
| Very Large Pebble | | 32 - 64 mm | Pinball to pool ball |
| Large Pebble | | 16 - 32 mm | Dime size to pinball |
| Medium Pebble | | 8 - 16 mm | Pencil eraser to dime size |
| Small Pebble | No. 5+ | 4 - 8 mm | Pea size to pencil eraser |
| Granule | No. 10 - 5 | 2 - 4 mm | Rock salt to pea size |
| Very Coarse Sand | No. 18 - 10 | 1 - 2 mm | See field gauge card |
| Coarse Sand | No. 35 -18 | 0.5 - 1 mm | See field gauge card |
| Medium Sand | No. 60 - 35 | 0.25 - 0.5 mm | See field gauge card |
| Fine Sand | No. 120 - 60 | 0.125 - 0.25 mm | See field gauge card |
| Very Fine Sand | No. 230 - 120 | 0.0625 - 0.125 mm | See field gauge card |
| Silt and Clay. See SOP for description of fines | Not Applicable | <0.0625 mm | Analyze by pipette or hydrometer |

## PARTICLE PERCENT COMPOSITION ESTIMATION

| 1% | 10% | 20% | 30% | 40% | 50% |
|---|---|---|---|---|---|



## GRAPH FOR DETERMINING SIZE OF PARTICLES

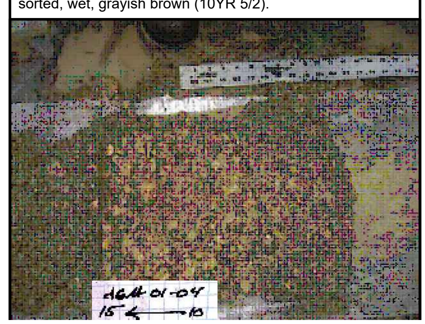



## FOR COARSE-GRAINED SOILS

| Description | Criteria |
|---|---|
| | **Descriptor - Angularity** |
| Angular | Particles have sharp edges and relatively planar sides withunpolished surfaces. |
| Subangular | Particles are similar to angular but have rounded edges. |
| Subround | Particles have nearly planar sides but have well-roundedcorners and edges. |
| Round | Particles have smoothly curved sides and no edges. |
| **Minor Components with Descriptors** | |
| | **Sorting Cu= d60/d10** |
| Well Sorted | Near uniform grain-size distribution Cu= 1 to 3. |
| Poorly Sorted | Wide range of grain size Cu= 4 to 6. |
| | **Moisture** |
| Dry | Absence of moisture, dry to touch, dusty. |
| Moist | Damp but no visible water. |
| Wet | Visible free water; soil is usually below the water table. (Saturated) |
| | **Density** |
| Very loose | N-value 1 - 4 |
| Loose | N-value 5 - 10 |
| Medium Dense | N-value 11 - 30 |
| Dense | N-value 31 - 50 |
| Very dense | N-value >50 |
| **Color using Munsell** | |
| **Geologic Origin (if known)** | |
| **Other** | |
| | **Cementation** |
| Weak Cementation | Crumbles or breaks with handling or little finger pressure. |
| Moderate Cementation | Crumbles or breaks with considerable finger pressure. |
| Strong Cementation | Will not crumble with finger pressure. |
| | **Reaction with Dilute HCl Solution (10%)** |
| No Reaction | No visible reaction. |
| Weak Reaction | Some reaction, with bubbles forming slowly. |
| Strong Reaction | Violent reaction, with bubbles forming immediately. |

### EXAMPLE OF SOIL DESCRIPTION AND PHOTO

10 -15 feet SAND, medium to very coarse, little granules to medium pebbles, subround to subangular, trace silt; poorly sorted, wet, grayish brown (10YR 5/2).

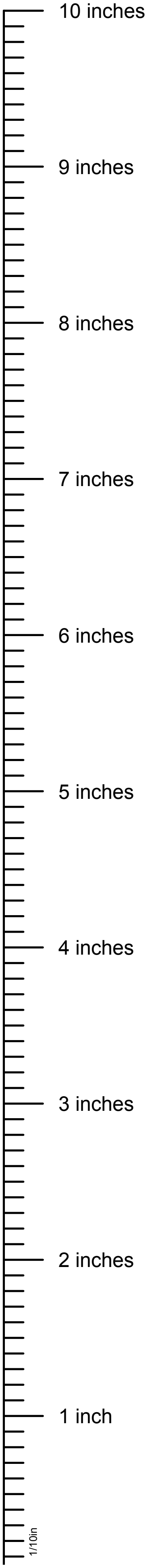


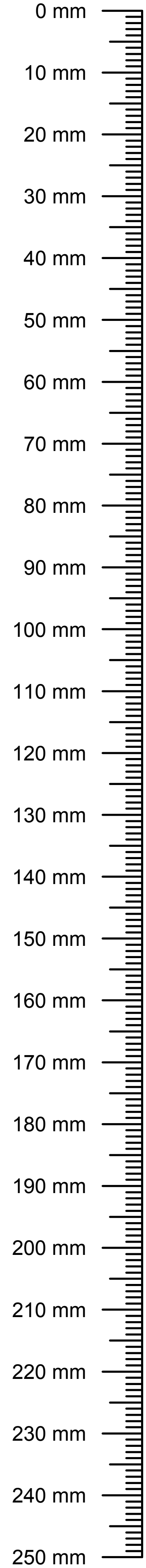
ON THE ORIGINAL DRAWING.
USE TO VERIFY FIGURE
REPRODUCTION SCALE

# SOIL DESCRIPTION FIELD GUIDE (APRIL, 2022; REV. 3.0)



ARCADIS Design & Consultancy for natural and built assets



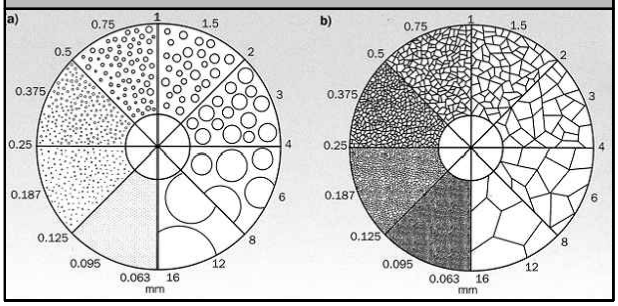

## VARIATIONS IN SOIL STRATIGRAPHY

| Term | Thickness of Configuration |
|---|---|
| Parting | 0 - to 1/16-inch thickness. |
| Seam | 1/16 - to 1/2-inch thickness. |
| Layer | 1/2 - to 12-inch thickness. |
| Stratum | > 12-inch thickness. |
| Pocket | Small erratic deposit, usually less than 1 foot in size. |
| Varved Clay | Alternating seams or layers of sand, silt, and clay (laminated). |
| Occasional | $\leq$ 1 foot thick. |
| Frequent | > 1 foot thick. |

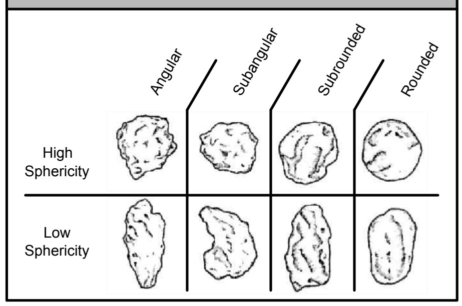
## SOIL STRUCTURE DESCRIPTIONS

| Term | Description |
|---|---|
| Homogeneous | Same color and appearance throughout. |
| Laminated | Alternating layers < 1/4 inch thick. |
| Stratified | Alternating layers $\geq$ 1/4 inch thick. |
| Lensed | Inclusions of small pockets of different materials, such as lenses of sand scattered through a mass of clay; note thickness. |
| Blocky | Cohesive soil can be broken down into small angular lumps, which resist further breakdown. |
| Fissured | Breaks along definite planes of fracture with little resistance to fracturing. |
| Slickensided | Fracture planes appear to be polished or glossy, sometimes striated. |

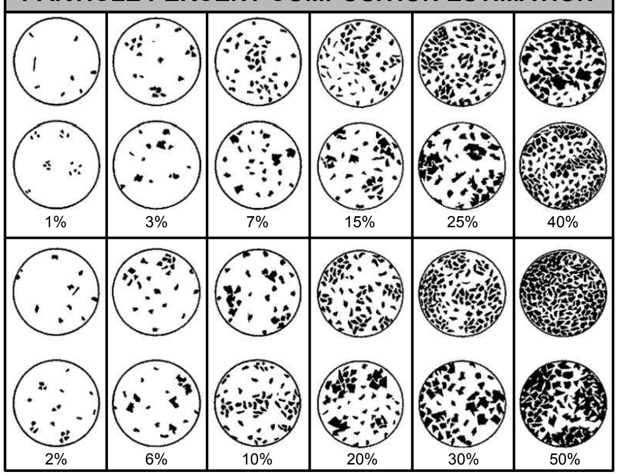
## GRAPH FOR DETERMINING SIZE OF PARTICLES



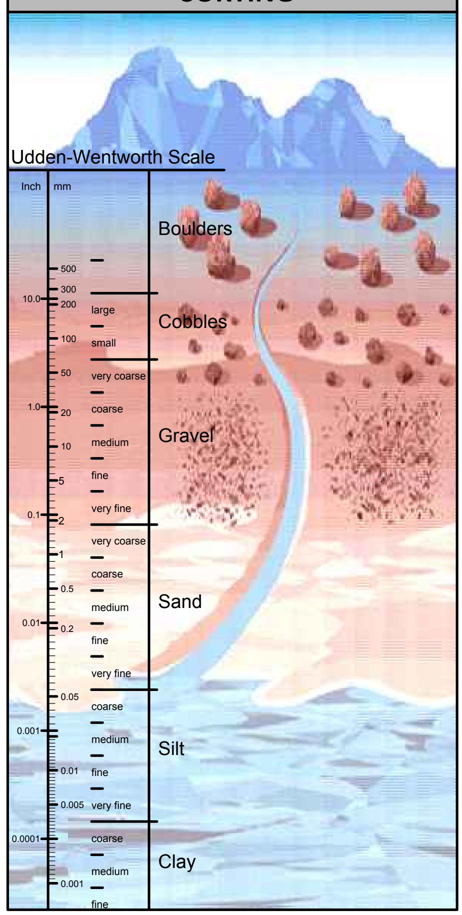

## ANGULARITY CHART




## PARTICLE PERCENT COMPOSITION ESTIMATION




## SORTING




## SETTLING TABLE (SILT/CLAY)

| Diameter of Particle (mm) | <0.625 | <0.031 | <0.016 | <0.008 | <0.004 | <0.002 | <0.0005 |
|---|---|---|---|---|---|---|---|
| | | | | | | | |
| Depth of Withdrawal (cm) | 10 | 10 | 10 | 10 | 5 | 5 | 3 |
| | | | | | | | |
| Time of Withdrawal | hr:min:sec | hr:min:sec | hr:min:sec | hr:min:sec | hr:min:sec | hr:min:sec | hr:min:sec |
| Temperature (Celsius) | | | | | | | |
| 20 | 00:00:29 | 00:01:55 | 00:07:40 | 00:30:40 | 00:61:19 | 04:05:00 | 37:21:00 |
| 21 | 00:00:28 | 00:01:52 | 00:07:29 | 00:29:58 | 00:59:50 | 04:00:00 | |
| 22 | 00:00:27 | 00:01:50 | 00:07:18 | 00:29:13 | 00:58:22 | 03:54:00 | |
| 23 | 00:00:27 | 00:01:47 | 00:07:08 | 00:28:34 | 00:57:05 | 03:48:00 | |
| 24 | 00:00:26 | 00:01:45 | 00:06:58 | 00:27:52 | 00:55:41 | 03:43:00 | 33:56:00 |
| 25 | 00:00:25 | 00:01:42 | 00:06:48 | 00:27:14 | 00:54:25 | 03:38:00 | |
| 26 | 00:00:25 | 00:01:40 | 00:06:39 | 00:26:38 | 00:53:12 | 03:33:00 | |
| 27 | 00:00:24 | 00:01:38 | 00:06:31 | 00:26:02 | 00:52:02 | 03:28:00 | |
| 28 | 00:00:24 | 00:01:35 | 00:06:22 | 00:25:28 | 00:50:52 | 03:24:00 | 31:00:00 |
| 29 | 00:00:23 | 00:01:33 | 00:06:13 | 00:24:53 | 00:49:42 | 03:10:00 | |
| 30 | 00:00:23 | 00:01:31 | 00:06:06 | 00:24:22 | 00:48:42 | 03:05:00 | |

# Attachment B

## Particle Size System Comparison

*The purpose of this attachment is to illustrate how the Udden-Wentworth particle sizes and descriptive terms compares to other particle size systems.*

*When in the field, it is a customary practice to compare current soil descriptions to historical soil boring logs for reference purposes. When reviewing boring logs prepared by others, field staff should first note the particle size system used and recognize these particle size systems may differ. This will avoid confusion when cross referencing between historical and new boring logs and when reviewing existing geologic cross-sections.*

*For example, a well-sorted sand with grain sizes ranging from 1 to 2 mm should be classified as a very coarse sand by the Udden-Wentworth system. As shown in this attachment, the same particle size would be classified as a medium sand by the United Soil Classification System. The later system has fewer particle size grades and in general, is less descriptive than the Udden-Wentworth system.*

# PARTICLE SIZE SYSTEM COMPARISON

**System Name** | **Used By** | **Grain size distribution in millimeters (mm)**

**Udden-Wentworth** — Remediation Geologists and Engineers

| | | | | | | | | Pebbles | | | | Cobbles | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | V. Fine | Fine | Medium | Coarse | V. Coarse | Granule | Small | Medium | Large | V. Large | Small | Large |
| CLAY | SILT | SAND | | | | | GRAVEL | | | | | | |

0.039 0.065 0.125 0.25 0.5 1 2 4 8 16 32 64 128 256

1/16 1/8 1/4 1/2

**United Soil Classification System** — Geotechnical Engineers

| | | | | | | |
|---|---|---|---|---|---|---|
| | | Fine | Medium | Coarse | Fine | Coarse | |
| CLAY | SILT | SAND | | | GRAVEL | | COBBLE |

0.074 0.42 2 4.75 19 75 300

**U.S. Dept. of Agriculture** — Soil Scientists

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| | | V. Fine | Fine | Medium | Coarse | V. Coarse | |
| CLAY | SILT | SAND | | | | | GRAVEL |

0.002 0.05 0.10 0.25 0.5 1 2 75

***Remediation Hydraulics 2008, page 195): The Udden-Wentworth scale is preferred "...because the geometric progression of grain-size diameter also reflects relationships that are important when considering the erosion and deposition of sediments during the depositional process. The correlation between increasing grain size and degree of sorting and permeability is the most important, as permeability structure is responsible for the mobile and immobile porosity within aquifer systems. "***

# Attachment C

## Description of Soil Logging Terms

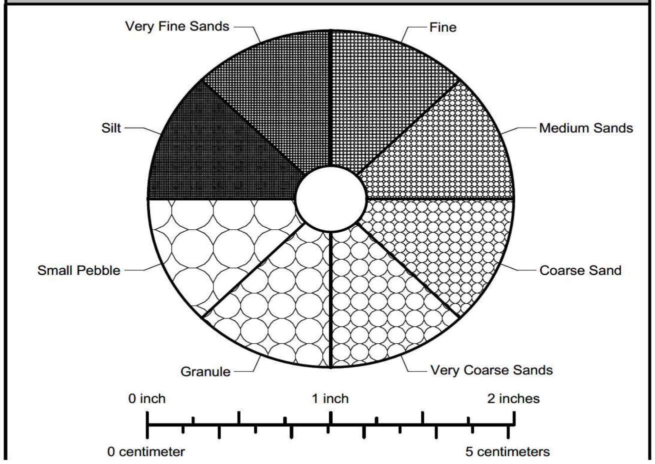
*The purpose of this attachment is to concisely define the soil logging terms used when filling out boring logs. During report preparation, project staff could use this sheet as an index placed in front of the completed boring logs. Also, it can serve as a supplemental reference sheet during field activities.*

# Description of Logging Terms

ARCADIS

Note: Soil descriptions based on Arcadis Technical Guidance and Instructions (TGI) procedures. Key terms defined below.

**GRAPH FOR DETERMINING SIZE OF PARTICLES**




**<u>Udden Wentworth Soil Sizes</u>**

| | |
|---|---|
| Boulder | > 256 mm |
| Large Cobble | 128 to 256 mm |
| Small Cobble | 64 to 128 mm |
| Very Large Pebble | 32 to 64 mm |
| Large Pebble | 16 to 32 mm |
| Medium Pebble | 8 to 16 mm |
| Small Pebble | 4 to 8 mm |
| Granule | 2 to 4 mm |
| Very Coarse Sand | 1 to 2 mm |
| Coarse Sand | 0.5 to 1 mm |
| Medium Sand | 0.25 to 0.5 mm |
| Fine Sand | 0.125 to 0.25 mm |
| Very Fine Sand | 0.062 to 0.12 mm |
| Silt/Clay | <0.065 mm |

**<u>Primary Texture</u>** *(e.g. CLAY, SILT, SAND, GRANULE, PEAT, MUCK, FILL, etc.)*
List particle size with the highest percentage per sample interval (e.g. SAND)
Always CAPITALIZE the primary texture
Follow primary texture with a comma followed by grain-size descriptors, etc.

**<u>Minor Texture</u>**

| | |
|---|---|
| And | (36 to 50%) |
| Some | (21 to 35%) |
| Little | (10 to 20%) |
| Trace | (>10%) |

**<u>Angularity</u>**

| | |
|---|---|
| Angular | Sharp edges |
| Sub-Angular | Rounded edges |
| Sub-Rounded | Well-rounded |
| Rounded | Smooth curved edges |

**<u>Sand Density (Blow Counts/ft)</u>**

| | |
|---|---|
| Very Loose | 0-4 |
| Loose | 5-10 |
| Medium Dense | 11-30 |
| Dense | 31-50 |
| Very Dense | <50 |

**<u>Silt/Clay Consistency (Blow Counts/ft)</u>**

| | | |
|---|---|---|
| Very Soft | 0-2, | thumb easily penetrates several inches |
| Soft | 3-4, | thumb easily penetrates one inch |
| Medium Stiff | 5-8, | thumb indents 0.5 in. with much effort |
| Stiff | 9-15, | thumb indents 0.25 in. with great effort |
| Very Stiff | 16-30, | thumbnail is readily intended |

**<u>Sorting</u>**

| | |
|---|---|
| Well Sorted | 1 to 3 Particle Sizes |
| Poorly Sorted | 4+ Particle Sizes |

**<u>Moisture Content</u>**

| | |
|---|---|
| Dry | Dry to touch |
| Moist | No visible water |
| Wet | Visible free water |

**<u>Plasticity (for silts and clays)</u>**

| | |
|---|---|
| Non-Plastic | 3 mm thread can not be rolled |
| Low Plasticity | 3 mm thread can barely be rolled |
| Medium Plasticity | 3 mm thread can easily and quickly rolled, but not rerolled |
| High Plasticity | 3 mm thread can be rolled slowly, but can be rerolled |

**<u>Dilatancy (for silts and silt-sand mixtures)</u>**

| | |
|---|---|
| None | No visible change in the specimen |
| Slow | Water appears slowly during shaking / disappears slowly or not at all upon squeezing |
| Rapid | Water appears quickly during shaking / disappears quickly upon squeezing |

**<u>Example Description</u>**

**10 -15 feet SAND, medium to very coarse, little granules to medium pebbles, subround to subangular, trace silt; poorly sorted, wet, grayish brown (10YR5/2).**

# Attachment D

## Blank Boring Log

*The purpose of this attachment is to present a blank field form for use during soil logging.  A digital version (Microsoft Excel) of this field form is available from the authors (upon request).  If project specific modifications to this boring log template are warranted, please contact the Site Investigation Community of Practice leader for further assistance.*

# BORING LOG

ARCADIS

| | | | | | |
|---|---|---|---|---|---|
| **Boring ID:** | | **Project Name:** | | **Page:** | / |
| **Permit ID:** | | **Date Started:** | | **Ground Elevation:** | |
| **Site Address:** | | **Date Completed:** | | **Vertical Datum:** | |
| **City, State:** | | **Total Depth:** | | **Northing:** | |
| **Drilling Co:** | | **Depth to Water:** | | **Easting:** | |
| **Driller:** | | **Hole Diameter:** | | **Horizontal Datum:** | |
| **Drilling Method:** | | **Core Device:** | | **Prepared by:** | |
| **Boring Status:** | | **Drilling Fluid:** | | **Reviewed by:** | |

| Drilling Information | | | | Graphical Log for Primary Texture | | | | | | | | | | | Soil Description (Udden-Wentworth System) | Field Notes |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Fines | | Sand | | | | | Gravel | | | | | |
| Drilling Depth (ft bgs) | Core Interval (ft) | Core Recovery (inches) | Vapor Reading (ppm) | clay | silt | very fine | fine | medium | coarse | very coarse | granule | pebble | cobble | boulder | Depth Interval (ft), PRIMARY TEXTURE, Principal and Minor Components with Descriptors (% modifiers and grain size fraction, angularity for coarse sand and larger, consistency/density, plasticity for silt and clay, dilatancy for silt/silt-sand); Sorting, Moisture Content, Color. NOTES: *Texture Modifiers: Trace (<10%), Little (10 to 20%), Some (21 to 35%), And (36 to 50%)* | Driller's Observations, Geologic Formation, Field Screening Results, Sample Interval etc. |

# BORING LOG

ARCADIS

**Boring ID:** ____________________ **Project Name:** ______________________________ **Page:** _____ / _____

| Drilling Information | | | | Graphical Log for Primary Texture | | | | | | | | | | | Soil Description (Udden-Wentworth System) | Field Notes |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Fines | | Sand | | | | | Gravel | | | | | |
| Drilling Depth (ft bgs) | Core Interval (ft) | Core Recovery (inches) | Vapor Reading (ppm) | clay | silt | very fine | fine | medium | coarse | very coarse | granule | pebble | cobble | boulder | Depth Interval (ft), PRIMARY TEXTURE, Principal and Minor Components with Descriptors (% modifiers and grain size fraction, angularity for coarse sand and larger, consistency/density, plasticity for silt and clay, dilatancy for silt/silt-sand); Sorting, Moisture Content, Color. NOTES: *Texture Modifiers: Trace (<10%), Little (10 to 20%), Some (21 to 35%), And (36 to 50%)* | Driller's Observations, Geologic Formation, Field Screening Results, Sample Interval etc. |

# Attachment E

## Completed Boring Log

*The purpose of this attachment is to provide an example of a completed boring log for reference purposes to field staff. The example provided is for a soil boring completed outside the waste mass of a closed municipal landfill near Baltimore, Maryland. The objective of the drilling program was to determine the depth to groundwater to determine the appropriate depth interval to install a soil gas monitoring well and groundwater monitoring well across the first water-bearing zone. The site geology consists of unconsolidated sediments of the Mid-Atlantic Coastal Plain, specifically the Upper Patapsco formation. These sediments were deposited in a moderate gradient fluvial environment during the Cretaceous period. The landfill was constructed into a regional clay confining unit.*

# BORING LOG

ARCADIS

| | | | | | |
|---|---|---|---|---|---|
| **Boring ID:** | MW-08 | **Project Name:** | Acme Landfill | **Page:** | 1 / 1 |
| **Permit ID:** | MD-PG-100 | **Date Started:** | 7/18/2018 | **Ground Elevation:** | 50.5 ft |
| **Site Address:** | 100 Landfill Road | **Date Completed:** | 7/18/2018 | **Vertical Datum:** | NAVD 88, feet |
| **City, State:** | Baltimore, Maryland | **Total Depth:** | 35 ft below ground | **Northing:** | 123456.79 |
| **Drilling Co:** | Earth Matters | **Depth to Water:** | 19 ft below ground | **Easting:** | 123456.79 |
| **Driller:** | Rod E. Piper | **Hole Diameter:** | 2-inch | **Horizontal Datum:** | NAD 83 feet, MD State |
| **Drilling Method:** | Direct-push/hollow-stem | **Core Device:** | 5-foot macrocore sampler | **Prepared by:** | Sandy Pebbles |
| **Boring Status:** | completed as well | **Drilling Fluid:** | none | **Reviewed by:** | Clay Brown |

| Drilling Information | | | | Graphical Log for Primary Texture | | | | | | | | | | | Soil Description (Udden-Wentworth System) | Field Notes |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Fines | | Sand | | | | | Gravel | | | | | |
| Drilling Depth (ft bgs) | Core Interval (ft) | Core Recovery (inches) | VOC Vapor Reading (ppm) | clay | silt | very fine | fine | medium | coarse | very coarse | granule | pebble | cobble | boulder | Depth Interval (ft), PRIMARY TEXTURE, Principal and Minor Components with Descriptors (% modifiers and grain size fraction, angularity for coarse sand and larger, consistency/density, plasticity for silt and clay, dilatancy for silt/silt-sand); Sorting, Moisture Content, Color. NOTES: *Texture Modifiers: Trace (<10%), Little (10 to 20%), Some (21 to 35%), And (36 to 50%)* | Driller's Observations, Geologic Formation, Field Screening Results, Sample Interval etc. |
| 0 to 1 | | | < 1 | | | | | | | | | | | | 0-0.5 ft, topsoil with organics | Grass covered area |
| 1 to 2 | | | < 1 | | | | X | | | | | | | | 0.5-5 ft, SAND, fine, trace silt, trace pebble, round; poorly sorted, moist, yellowish brown (7.5 YR 5/8). NOTE: some cementation, does not react with HCl | |
| 2 to 3 | 0-5 | 43.2/60 | < 1 | | | | X | | | | | | | | | continuous macro-core logging |
| 3 to 4 | | | < 1 | | | | X | | | | | | | | | cemented sand @3.6-4 ft |
| 4 to 5 | | | < 1 | | | | X | | | | | | | | | |
| 5 to 6 | | | < 1 | | | | X | X | X | | | | | | 5-10 ft, SAND, fine to coarse, round to subround; well sorted, moist, light to strong brown (7.5 YR 6/4 to 7.5 YR 5/6). | |
| 6 to 7 | | | < 1 | | | | X | X | X | | | | | | | |
| 7 to 8 | 5-10 | 40.8/60 | < 1 | | | | X | X | X | | | | | | | |
| 8 to 9 | | | < 1 | | | | X | X | X | | | | | | | |
| 9 to 10 | | | < 1 | | | | X | X | X | | | | | | | |
| 10 to 11 | | | < 1 | | | | X | X | X | | | | | | 10-12.5 ft, same as above with trace silt | |
| 11 to 12 | | | < 1 | | | | X | X | X | | | | | | | |
| 12 to 13 | 10-15 | 36/60 | < 1 | | | | X | X | X | | | | | | | |
| 13 to 14 | | | < 1 | | | | X | X | X | | | | | | 12.5 to 15 ft, same as above, color change to pink (7.5 YR 7/3) and reddish yellow (7.5YR 6/8) | |
| 14 to 15 | | | < 1 | | | | X | X | X | | | | | | | |
| 15 to 16 | | | < 1 | | | | | | X | X | | | | | 15-18.9 ft, SAND, coarse to very coarse, round to subround; well sorted, moist, strong brown (7.5YR 5/6) to reddish yellow (7.5YR 6/6) | |
| 16 to 17 | | | < 1 | | | | | | X | X | | | | | | |
| 17 to 18 | 15-20 | 55.2/60 | < 1 | | | | | | X | X | | | | | | |
| 18 to 19 | | | < 1 | | X | X | X | | | | | | | | 18.9-22.7 ft, SAND, very fine to fine, and SILT, coarse to very coarse, poorly sorted, wet, light gray (7.5YR 7/1) | water table encountered @ 18.9 ft |
| 19 to 20 | | | < 1 | | X | X | X | | | | | | | | | |
| 20 to 21 | | | < 1 | | X | X | X | | | | | | | | | |
| 21 to 22 | | | < 1 | | X | X | X | | | | | | | | | |
| 21 to 23 | 20-25 | 36/60 | < 1 | | X | X | X | | | | | | | | | |
| 23 to 24 | | | < 1 | X | X | | | | | | | | | | 22.7-25 ft, CLAY and SILT, high plasticity, soft to stiff at 25 ft, dry to moist, light gray (2/5YR 7/1) w/ red mottling (2.5YR 4/6) | Middle Patapsco Confining Unit |
| 24 to 25 | | | < 1 | X | X | | | | | | | | | | | |
| 25 to 26 | | | < 1 | X | X | | | | | | | | | | 25-31.1 ft, CLAY and SILT, high plasticity, stiff; dry to moist, light gray (2/5YR 7/1) with red mottling (2.5YR 4/6) | |
| 26 to 27 | | | < 1 | X | X | | | | | | | | | | | |
| 27 to 28 | 25-30 | 30/60 | < 1 | X | X | | | | | | | | | | | |
| 28 to 29 | | | < 1 | X | X | | | | | | | | | | | |
| 29 to 30 | | | < 1 | X | X | | | | | | | | | | | |
| 30 to 31 | | | < 1 | X | X | | | | | | | | | | | |
| 31 to 32 | | | < 1 | | X | | | | | | | | | | | |
| 32 to 33 | 30-35 ft | 60/60 | < 1 | | X | | | | | | | | | | | |
| 33 to 34 | | | < 1 | | X | | | | | | | | | | 31.1-35 ft, SILT, low plasticity, high dilatancy; wet, gray (7.5YR 7/1) | End of direct-push boring @ 35 ft |
| 34 to 35 | | | < 1 | | X | | | | | | | | | | | |

# Attachment 2

## Soil Boring Log

# BORING LOG

ARCADIS

| | | | | | |
|---|---|---|---|---|---|
| **Boring ID:** | | **Project Name:** | | **Page:** | |
| **Permit ID:** | | **Date Started:** | | **Ground Elevation:** | |
| **Site Address:** | | **Date Completed:** | | **Vertical Datum:** | |
| **City, State:** | | **Total Depth:** | | **Northing:** | |
| **Drilling Co:** | | **Depth to Water:** | | **Easting:** | |
| **Driller:** | | **Hole Diameter:** | | **Horizontal Datum:** | |
| **Drilling Method:** | | **Core Device:** | | **Prepared by:** | |
| **Boring Status:** | | **Drilling Fluid:** | | **Reviewed by:** | |

| Drilling Information | | | | Primary Texture | | | | | | | | | | | Soil Description (Udden-Wentworth System) | Field Notes |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Fines | | Sand | | | | | Gravel | | | | | |
| Drilling Depth (ft bgs) | Core Interval (ft) | Core Recovery (inches) | PID Reading (ppm) | clay | silt | very fine | fine | medium | coarse | very coarse | granule | pebble | cobble | boulder | Depth interval (ft), Moisture, PRIMARY TEXTURE, Modifier/Minor Texture, Sorting, Angularity, Consistency, Plasticity, Color - Only Record Sand Density with Standard Penetration Tests Minor Texture Modifiers: Trace (<10%), Little (10 to 20%), Some (21 to 35%), And (36 to 50%) | Driller's Observations, Particle Size Percentages, Geologic Formation, Field Screening Results, Sample Interval etc. |
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# Attachment 3

## Low-Flow Groundwater Sampling Form

ARCADIS

# LOW-FLOW GROUNDWATER SAMPLING FORM



Project No. ____________________ Well ID ____________________ Date ____________

Project Name/Location ________________________________________ Weather ____________

Measuring Pt. Description ____________ Screen Setting (ft-bmp) ____________ Casing Diameter (in.) ____________ Well Material ____ PVC ____ SS

Static Water Level (ft-bmp) ____________ Total Depth (ft-bmp) ____________ Water Column (ft) ____________ Gallons in Well ____________

MP Elevation ____________ Pump Intake (ft-bmp) ____________ Purge Method: ____________ Centrifugal ____________ Submersible ____________ Other ____________ Sample Method ____________

Pump On/Off ____________ Volumes Purged ____________

Sample Time: Label ____________ Gallons Purged ____________

Purge Start ____________ Replicate/ Code No. ____________ Sampled by ____________

Purge End ____________

| Time | Minutes Elapsed | Rate (gpm)/(mL/min) 200mL/min + | Depth to Water (ft) -0.3 | Gallons Purged | pH ± 0.1 | Cond. (μMhos)/(mS/cm) ± 3% | Turbidity (NTU) ± 10% | DO (mg/L) ± 10% | Temp. (°C)/(°F) ± 3% | Redox (mV) ± 10mV | Appearance Color | Appearance Odor |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
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| Stabilization Calculations (±) | | | | | | | | | | | | |
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| | | | | | | | | | | | | |
| Stabilization Criteria | | | | | ± 0.1 s.u. | ±3% | ± 10% or within 1 NTU (1) | ± 10% | ±3% | ±10 mV | | |

(1) **Turbidity** < 50 NTU and ±10% or within 1 NTU of a previous reading when <10 NTU

| Constituents Sampled | Container | Number | Preservative |
|---|---|---|---|
| | | | |
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**Comments** ________________________________________

**Well Casing Volumes**

| *Gallons/Foot* | *1" = 0.04* | *1.5" = 0.09* | *2.5" = 0.26* | *3.5" = 0.50* | *6" = 1.47* |
|---|---|---|---|---|---|
| | *1.25" = 0.06* | *2" = 0.16* | *3" = 0.37* | *4" = 0.65* | |

**Well Information**

| | | | |
|---|---|---|---|
| Well Location: | | Well Locked at Arrival: | Yes / No |
| Condition of Well: | | Well Locked at Departure: | Yes / No |
| Well Completion: | Flush Mount / Stick Up | Key Number To Well: | |

# Attachment 4

**Chain-of-Custody Form**

ARCADIS

ID#:

# CHAIN OF CUSTODY & LABORATORY ANALYSIS REQUEST FORM

Page ___ of ___

Lab Work Order #

**Send Results to:**

| Contact & Company Name: | Telephone: |
|---|---|
| Address: | Fax: |
| City / State / Zip | E-mail Address: |
| Project Name/Location (City, State): | Project #: |
| Sampler's Printed Name: | Sampler's Signature: |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Preservative | | | | | | | | |
| Filtered (✓) | | | | | | | | |
| # of Containers | | | | | | | | |
| Container Information | | | | | | | | |

**PARAMETER ANALYSIS & METHOD**

**Keys**

**Preservation Key:**
A. $H_2SO_4$
B. HCL
C. $HNO_3$
D. NaOH
E. None
F. Other: ________
G. Other: ________
H. Other: ________

**Container Information Key:**
1. 40 ml Vial
2. 1 L Amber
3. 250 ml Plastic
4. 500 ml Plastic
5. Encore
6. 2 oz. Glass
7. 4 oz. Glass
8. 8 oz. Glass
9. Other: ________
10. Other: ________

**Matrix Key:**
SO - Soil, SE - Sediment, NL - NAPL/Oil
W - Water, SL - Sludge, SW - Sample Wipe
T - Tissue, A - Air, Other: _______

| Sample ID | Collection Date | Collection Time | Type (✓) Comp | Type (✓) Grab | Matrix | | | | | | | | REMARKS |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | | | | |
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**Special Instructions/Comments:**

☐ **Special QA/QC Instructions(✓):**

| Laboratory Information and Receipt | | Relinquished By | Received By | Relinquished By | Laboratory Received By |
|---|---|---|---|---|---|
| Lab Name: | Cooler Custody Seal (✓) | Printed Name: | Printed Name: | Printed Name: | Printed Name: |
| ☐ Cooler packed with ice (✓) | ☐ Intact ☐ Not Intact | Signature: | Signature: | Signature: | Signature: |
| Specify Turnaround Requirements: | Sample Receipt: | Firm: | Firm/Courier: | Firm/Courier: | Firm: |
| Shipping Tracking #: | Condition/Cooler Temp: _________ | Date/Time: | Date/Time: | Date/Time: | Date/Time: |

20730826 CofC AR Form 08.27.2015

**Distribution:** **WHITE – Laboratory returns with results** **YELLOW – Lab copy** **PINK – Retained by Arcadis**

# Attachment 5

**PID Calibration Log**

# PID Calibration Log

ARCADIS Design & Consultancy for natural and built assets

Zero Gas Source: ______________ Instrument Type: ______________ PAGE ____ of ____

Lot Number/Expiration Date: ______________ Serial Number: ______________

Calibration Gas Source: ______________ Instrument Type: ______________

Lot Number/Expiration Date: ______________ Serial Number: ______________

Concentration: ______________ ______________

| Instrument Number | Date | Time | Zero Cal. OK (Y/N) | Calibration Gas Reading | Comments | Calibration w/in 2% (Y/N)? | Alarms Set (Yes/No)? | User Initials |
|---|---|---|---|---|---|---|---|---|
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# Appendix B

## Quality Assurance Project Plan

NYSEG

# Quality Assurance Project Plan

**Shulman's Salvage Yard**
**Elmira, New York**
**NYSDEC Site No. 808013**

September 2022

# Quality Assurance Project Plan

**Shulman's Salvage Yard**
**Elmira, New York**
**Site No. 808013**

September 2022

**Prepared By:**
Arcadis of New York, Inc.
One Lincoln Center, 110 West Fayette Street, Suite 300
Syracuse
New York 13202
Phone: 315 446 9120
Fax: 315 449 0017

**Prepared For:**
NYSEG
18 Link Drive
Binghamton, New York 13904

**Our Ref:**
30119464

# Contents

# Tables



# Attachments

# Acronyms and Abbreviations

| | |
|---|---|
| % | percent |
| ASP | Analytical Services Protocol |
| Arcadis | Arcadis of New York, Inc. |
| COC | chain-of-custody |
| DQO | data quality objective |
| EDD | electronic data deliverable |
| FSP | Field Sampling Plan |
| GC/MS | gas chromatography/mass spectrometry |
| IDW | investigation-derived waste |
| LCS | laboratory control sample |
| MB | method blank |
| MDL | method detection limit |
| MS | matrix spike |
| MSD | matrix spike duplicate |
| NYSDEC | New York State Department of Environmental Conservation |
| NYSEG | New York State Electric & Gas Corporation |
| OSHA | Occupational Safety and Health Administration |
| OSWER | Office of Solid Waste and Emergency Response |
| PDF | portable document format |
| PPE | personal protective equipment |
| QA | quality assurance |
| QAC | Quality Assurance Coordinator |
| QAM | Quality Assurance Manager |
| QAPP | Quality Assurance Project Plan |
| QC | quality control |
| RDWP | Remedial Design Work Plan |
| RL | reporting limit |
| SDG | sample delivery group |
| SOP | standard operating procedure |
| USEPA | United States Environmental Protection Agency |

# 1 Introduction

This Quality Assurance Project Plan (QAPP) supports the Remedial Design Work Plan (RDWP) and provides guidance for data collection associated with the New York State Electric & Gas Corporation (NYSEG) Shulman's Salvage Yard Site ("the site") located in Elmira, New York.

## 1.1 Purpose

This QAPP and the Field Sampling Plan (FSP) (RDWP Appendix A) are intended to guide all sampling, measurement, and other field and laboratory activities conducted as part of the RDWP. This QAPP contains laboratory analysis procedures and quality control (QC) methods to be used to characterize environmental media, as needed, for future site monitoring. Laboratory analysis includes polychlorinated biphenyls and select metal constituents of concern (arsenic, cadmium, copper, lead, and mercury).

This QAPP is applicable to the RDWP. To the extent that other work plans are written and approved relevant to this QAPP, those activities will be incorporated by reference to the scope of the QAPP herein.

This QAPP was prepared in a manner consistent with the following documents, where applicable:

- United States Environmental Protection Agency (USEPA) guidance document entitled *EPA Requirements for Quality Assurance Project Plans*, EPA-QA/R-5 (USEPA 2001) (https://www.epa.gov/quality/agency-wide-quality-system-documents);
- USEPA *Guidance for Quality Assurance Project Plans,* EPA-QA/G-5 (USEPA 2002b) (https://www.epa.gov/quality/agency-wide-quality-system-documents); and
- The National Enforcement Investigations Center Policies and Procedures Manual (USEPA 1991) (https://www.epa.gov/quality/agency-wide-quality-system-documents).

## 1.2 Report Organization

The information contained in this QAPP has been organized as presented in the following table.

| Section | Content |
|---|---|
| **Project Management** | |
| 1 | Introduction |
| 2 | Project Organization |
| 3 | Quality Objectives and Criteria for Measurement Data |
| 4 | Special Training Requirements/Certification |
| 5 | Documentation and Records |
| **Measurement/Data Acquisition** | |
| 6 | Sampling Process Design |
| 7 | Sampling Method Requirements |
| 8 | Sample Handling and Custody Requirements |
| 9 | Analytical Method Requirements |
| 10 | Quality Control Requirements |

| Section | Content |
| --- | --- |
| 11 | Instrument/Equipment Testing, Inspection, and Maintenance Requirements |
| 12 | Instrument Calibration and Frequency |
| 13 | Inspection/Acceptance Requirements for Supplies and Consumables |
| 14 | Data Management |
| **Assessment/Oversight** | |
| 15 | Assessment and Response Actions |
| 16 | Reports to Management |
| **Data Validation and Usability** | |
| 17 | Data Reduction and Review |
| 18 | Data Verification and Validation |
| 19 | Reconciliation with User Requirements |
| 20 | References |

Details on each of the subjects listed above are provided in the subsequent sections.

# 2 Project Organization

The activities to be completed under this QAPP may require integration of personnel from the organizations identified below, collectively referred to as the “project team.” A description of the responsibilities of each member of the project team is presented below.

## 2.1 Overall Project Management

The QAPP will be executed by a project team assigned per the specific work plan. The project team will perform sampling activities and will evaluate data and prepare the deliverables as specified in the RDWP. Project direction will be provided with lead regulatory oversight by the New York State Department of Environmental Conservation (NYSDEC).

## 2.2 Team Member Responsibilities

The responsibilities and duties of the various team members are summarized below by organization.

### 2.2.1 NYSEG

**Project Manager**

The NYSEG Project Manager responsibilities and duties include:

- Provide overall direction of site actions.
- Direct consultant(s) and contractors/subcontractors.
- Review work products, including data, memoranda, letters, reports, and all other documents transmitted to the NYSDEC.

### 2.2.2 Arcadis of New York, Inc.

**Project Manager/Assistant Project Manager**

The Arcadis Project Manager/Assistant Project Manager responsibilities and duties include:

- Manage and coordinate the project as defined in the RDWP, and any other related work plans, with an emphasis on adhering to the objectives of the site activities.
- Review documents prepared by subcontractors.
- Verify that corrective actions are taken for deficiencies cited during any audits of site activities.

**Task Managers**

The sampling components will be managed by various Arcadis Task Managers. The duties of each Task Manager include, as appropriate:

- Manage relevant day-to-day activities.
- Develop, establish, and maintain files on relevant site activities.

- Review data reductions from the relevant site activities.
- Perform a final data review of field data reductions and reports on relevant site activities.
- Verify that corrective actions are taken for deficiencies cited during audits of relevant site activities.
- Perform overall quality assurance (QA)/QC of the relevant portions of the site activities.
- Review relevant field records and logs.
- Instruct personnel working on relevant site activities.
- Coordinate field and laboratory schedules pertaining to relevant site activities.
- Request sample bottles from the laboratory.
- Review field instrument maintenance and calibration to meet quality objectives.
- Prepare reports pertaining to relevant site activities.
- Maintain field and laboratory files of notebooks/logs, data reductions, and calculations. Transmit the original files to the Project Manager.

**Field Personnel**

The Arcadis field personnel responsibilities and duties include:

- Perform field procedures associated with the investigations as set forth in the specific work plan.
- Perform field analyses and collect QA samples.
- Calibrate, operate, and maintain field equipment.
- Reduce field data.
- Maintain sample custody.
- Prepare field records and logs.

**Quality Assurance Coordinator**

The Quality Assurance Coordinator (QAC) Responsibilities and duties include:

- Review laboratory data packages.
- Oversee and interface with the analytical laboratory.
- Coordinate field QA/QC procedures with the Task Managers, concentrating on field analytical measurements and practices to meet the data quality objectives (DQOs).
- Perform and review audit reports.
- Prepare interim QA/QC compliance reports.
- Prepare a QA/QC report in accordance with USEPA guidelines, including an evaluation of laboratory data and data usability reports.

### 2.2.3 Analytical Laboratories

The general responsibilities and duties of the analytical laboratories include:

- Perform sample analyses and associated laboratory QA/QC procedures.
- Supply sample bottles and coolers.

- Maintain laboratory custody of sample.
- Strictly adhere to all protocols in the QAPP.

**Laboratory Project Manager**

The laboratory Project Manager responsibilities and duties include:

- Serve as the primary communication link between the environmental consultant and the laboratory technical staff.
- Monitor the workload and maintain an availability of resources.
- Oversee the preparation of analytical reports.
- Supervise the in-house chain-of-custody (COC).

**Quality Assurance Manager**

The laboratory Quality Assurance Manager (QAM) responsibilities and duties include:

- Supervise the personnel who are reviewing and inspecting all project-related laboratory activities.
- Conduct audits of all laboratory activities.

### 2.2.4 Regulatory Agencies

**Project Manager**

The regulatory agency Project Manager responsibilities and duties include:

- Provide review and approval of the QAPP, work plans, supporting documents, and future deliverables.
- Monitor the progress of site activities.

# 3 Quality Objectives and Criteria for Measurement Data

The DQO process, as described in *Guidance for Quality Assurance Project Plans* (USEPA 2002b), is intended to provide a "logical framework" for planning field investigations. This section addresses, in turn, each of the seven sequential steps in the USEPA's QAPP DQO process, listed below.

**Step 1: Problem Statement**

The site is impacted by residuals related to historical operations conducted at the property. The site-specific constituent list will be evaluated during the time of sampling. Existing sampling data from past investigations will be incorporated and utilized to determine the site-specific constituent list. Past investigations are summarized in the RDWP.

**Step 2: Goal Identification**

The goal of the sampling program will depend on the specific sampling needs for the site. In general, the goal will be to protect human health and the environment and manage the remaining site impacts in accordance with applicable rules and regulations. Analytical results of constituents will be compared to applicable NYSDEC standards/guidance values and any other applicable regulations. The analyzed environmental media will then be managed and handled accordingly. Based on analytical results, additional characterization or remedial measures may be required.

**Step 3: Identifying Decision Inputs**

Decision inputs incorporate both the concentration and distribution of constituents in site media. A fundamental basis for decision making is that a sufficient number of data points of acceptable quality must be available to support decisions. Thus, the necessary inputs for the decision are: 1) the proportion of non-rejected (usable) data points; and 2) the quantity of data needed to evaluate whether there is unacceptable risk to human health and the environment at and surrounding the site.

The data will be evaluated for completeness, general conformance with the requirements of this QAPP, and consistency among data sets and with historical data, as appropriate.

**Step 4: Defining the Study Boundaries**

The site is in a mixed residential, commercial, and industrial area located in the City of Elmira, Chemung County, New York (RDWP Figure 1). The 7.34-acre property is located at One Shulman Plaza, 197 East Washington Avenue, Elmira, New York, at the intersection of Eastern Washington Avenue and Clemens Center Parkway. The site is bounded to the north by a Chemung County Transit Systems office, to the east by a chain link fence and Clemens Center Parkway, to the south by East Washington Avenue, and to the west by mix residential/commercial properties. A Norfolk Southern Railway property is adjacent to the northwestern portion of the site. Southwest of the site, the elevation rises abruptly to the former Triple Cities Metal Finishing property. A map showing the site location and boundaries is included as Figure 2 in the RDWP.

**Step 5: Developing a Decision Rule**

The decision on whether data can be used will be based on the validation results. Following validation, the data will be flagged, as appropriate, and any use restrictions will be noted. Media-specific sampling plans have been devised so that the loss of any single data point will not hinder the description of the distribution of constituents or the development of a remediation plan. Given this, a reasonable decision rule would be that 90 percent (%) of the data points are not rejected or deemed unusable.

The usable data will be evaluated versus the applicable NYSDEC standards and guidance values. The required reporting limits (RLs) are documented in Tables 1a through 1e. The lowest achievable reporting and method detection limits (MDLs) will be reported by the laboratory and, where possible, at or below the screening criteria. Applicable actions would be evaluated, if needed, based on the results of the exposure evaluation.

**Step 6: Limits on Decision Errors**

Specifications for this step call for: 1) giving forethought to corrective actions to improve data usability; and 2) understanding the representative nature of the sampling design. This QAPP has been designed to meet both specifications for this step. The sampling and analysis programs have been developed based on a review of previous site data and knowledge of present site conditions. The representative nature of the sampling design has been facilitated by discussions among professionals familiar with the site and the appropriate government agencies.

**Step 7: Design Optimization**

The overall QA objective is to develop and implement procedures for field sampling and develop COC, laboratory analysis, and reporting that will provide results to support the evaluation of the site data consistent with the RDWP requirements. Specific procedures for sampling, COC, laboratory instrument calibration, laboratory analysis, data reporting, internal QC, audits, preventive maintenance of field equipment, and corrective action are described in other sections of this QAPP.

A DQO summary for the anticipated sampling efforts is presented in the following subsections. The summary consists of stated DQOs relative to data uses, data types, data quantity, sampling and analytical methods, and data measurement performance criteria. Field sampling procedures are detailed in the FSP, which is included as Appendix A to the RDWP.

## 3.1 Data Categories

Three data categories have been defined to address various analytical data uses and the associated QA/QC effort and methods required to achieve the desired levels of quality. These categories are:

**Screening Data**

Screening data affords a rapid preliminary assessment of site characteristics or conditions. The collection activities for screening data involve rapid, non-rigorous methods of analysis and QA. Screening DQOs are generally applied to the physical and/or chemical properties of samples, preliminary ecological and/or human health and safety indicators, and visual or other qualitative observations used to make rapid assessment decisions for deployment or additional assessment.

**Screening Data with Definitive Confirmation**

Screening data provide rapid identification and quantitation; however, because screening generally involves the use of less precise methods of analysis with less rigorous sample preparation, the quantitation may be relatively imprecise. Generally, at least 10% of the data are confirmed using analytical methods and QA/QC procedures and criteria associated with definitive data. Screening data with definitive confirmation can also be used to verify less rigorous laboratory-based methods and is available for data collection activities that require qualitative and/or quantitative verification of a select portion of sample findings.

**Definitive Data**

Definitive data are generated using rigorous analytical methods, such as approved USEPA reference methods. Data are analyte-specific, with confirmation of analyte identity and concentration. These methods produce tangible raw data (e.g., chromatograms, spectra, digital values). Definitive data may be generated at the site or at an off-site location, as long as the QA/QC requirements are satisfied. For data to be definitive, either the analytical or total measurement error must be determined. Definitive data are used for formal site characterization, environmental monitoring, the confirmation of field data, decision-making, and risk assessments.

It is anticipated that definitive data will be collected during this investigation. All soil and water samples will be analyzed at an off-site laboratory using definitive techniques.

For the purposes of this investigation, two levels of data reporting have been defined in the NYSDEC *Analytical Services Protocol* (ASP) (NYSDEC 2005). They are as follows:

**NYSDEC ASP Category A**

NYSDEC ASP Category A reporting is used for analyses that do not generate or require extensive supporting documentation. For this investigation, Category A reporting will be required for liquid and solid waste characterization samples.

NYSDEC ASP Category A laboratory data reports include the following items:

- A sample delivery group (SDG) narrative;
- Sample information sheets;
- NYSDEC data package summary forms;
- COC forms; and
- Test analysis results.

**NYSDEC ASP Category B**

NYSDEC ASP Category B reporting is used for analyses that are performed following standard USEPA-approved methods and QA/QC protocols. For this investigation, Category B reporting is anticipated to be used for final "documentation" sampling events. Based on the intended data use, full documentation is required.

NYSDEC ASP Category B laboratory data reports include the following items:

- An SDG narrative;
- Sample information sheets;
- NYSDEC data package summary forms;
- COC forms;
- Test analysis results;
- Calibration standards;
- Surrogate recoveries;
- Blank results (method blank [MB], instrument blanks);

- Spike recoveries (matrix spike [MS]/matrix spike duplicate [MSD], laboratory control sample [LCS]);
- Laboratory duplicate results;
- Confirmation samples;
- An internal standard area and retention time summary;
- Chromatograms;
- Raw data files; and
- Other method-specific information.

Analytical results will be reported by the laboratory in the electronic data deliverable (EDD) format, which will be in either an ASCII comma-separated value format or a format outlined in the EQuIS™ Laboratory Standard Operating Procedure (SOP) (Attachment 1). The Form Is (results sheets) will be in either a portable document format (PDF) or an electronic spreadsheet format. The analytical results will be provided within 15 working days from the date of sample receipt.

## 3.2 Field Investigations

To obtain the information necessary to meet the objectives stated above, additional field sampling will be conducted to support the DQOs and is detailed in the RDWP.

Surface soil, subsurface soil, and water collected from on-site catch basins will be analyzed for the following:

- Polychlorinated biphenyls using USEPA SW-846 Method 8082A; and
- Metals using USEPA SW-846 Methods 6010C/7471B.

**Data Uses**

Data generated as part of the field sampling will be used to provide supplemental site characterization/delineation data.

**Data Quantity**

Field activities will involve collecting environmental samples and associated QC samples. The anticipated number of samples to be collected, the number of QC samples, and the constituents to be analyzed are presented in Table 2 of this QAPP.

**Sampling and Analytical Methods**

Sampling procedures are provided in the FSP (RDWP Appendix A). The laboratory analytical methods for the chemical constituents are listed above. NYSDEC ASP Category B will be used for data reporting (as defined previously).

**Measurement Performance Criteria**

Table 3 presents precision and accuracy QC limits for chemical constituents used during data review to assess analytical performance. Data representativeness is addressed by the sample quantities and locations identified in the sampling plans. Data comparability will be achieved by using standard USEPA-approved methods. Data completeness will be assessed at the conclusion of the analytical activities.

# 4 Special Training Requirements/Certification

In compliance with the Occupational Safety and Health Administration's (OSHA's) final rule, "Hazardous Waste: Operations and Emergency Response," 29 Code of Federal Regulations 1910.120(e)", all personnel performing sampling activities at the site, except as noted below, will have completed the requirements for OSHA 40-Hour Hazardous Waste Operations and Emergency Response initial training and have current 8-hour refresher training. Persons in field supervisory positions will have also completed the additional OSHA 8-Hour Supervisory Training.

Field personnel involved with the shipping of samples to the subcontracted laboratory will have completed United States Department of Transportation Hazardous Materials #1 – United States Department of Transportation/International Air Transportation Association Hazardous Materials Shipping and Transportation training.

# 5 Documentation and Records

Samples will be collected as described in the FSP (RDWP Appendix A). Detailed descriptions of the documentation and reporting requirements are presented below.

## 5.1 Sample Designation System

Samples will be identified with a unique designation system that will facilitate sample tracking. The sample designation system to be employed during the sampling activities will be consistent, yet flexible enough to accommodate unforeseen sampling events and conditions. An alpha-numeric system is considered appropriate and will be used by field personnel to assign each sample with a unique sample identification number.

The sample identification number will begin with a two- or three-letter prefix indicating the sample type and two digits indicating the sequential sample number collected from the location.

The sample types (if applicable) will be designated using the following codes:

- Surface Soil Sample – “SS;”
- Subsurface Soil Sample – “SB;”
- Groundwater Sample – “GW” or “MW;”
- Trip Blank Sample – “TB;”
- Field Duplicate Sample – “DUP;”
- Equipment Blank Sample – “EB;”
- Matrix Spike and Matrix Spike Duplicate – “MS” and MSD;” and
- Waste Characterization – “WC.”

The location code will follow the sample type code. The sample code will also be a six-digit number indicating the month, day, and year the sample was obtained. For example, a groundwater sample collected from MW-10 on March 11, 2022, will be designated MW-10(220311).

QA/QC samples will be designated using the sample type code followed by the six-digit sample collection date. For example, a field blank collected on March 11, 2022, during groundwater samples collection would be designated GW-FB1-220311. The locations of field duplicates must be recorded in the field logbook.

## 5.2 Field Documentation

Field personnel will provide comprehensive documentation covering various aspects of field sampling, field analysis, and sample COC. This documentation consists of a record that allows reconstruction of field events to aid in the data review and interpretation process. Documents, records, and information relating to the performance of the field work will be retained in the project file.

The various forms of documentation to be maintained throughout the investigation include:

- Sampling Information – Detailed notes will be made as to the exact sampling location, physical observations, and weather conditions (as appropriate).
- Field Logbooks/Forms – All pertinent information regarding the site and sampling procedures will be documented. A field notebook consists of a waterproof, bound notebook that will contain a record of all activities performed at the site. Detailed notes will be made as to the exact sampling location, physical observations, and weather conditions (as appropriate). To ensure that data collected in the field is consistent, accurate, and complete, forms may be used during repetitive data collection (e.g., depth to groundwater in monitoring wells during groundwater sampling).
- Sample Labels – Sample labels reduce the possibility of confusing sample containers and provide information necessary to complete COC forms. To the extent practical, sample containers will be pre-labeled before sample collection (with all the required information, except the date and time of the sample collection). The labels will be protected with a clear tape covering.
- Sample COC – COC forms will provide the record of responsibility for sample collection, transport, and submittal to the laboratory. COC forms will be filled out at each sampling site, at a group of sampling sites, or at the end of each day of sampling by field personnel responsible for sample custody. In the event that samples are relinquished by the designated sampling person to other sampling or field personnel, the COC form will be signed and dated by the appropriate personnel to document the sample transfer. The original COC form will accompany the samples to the laboratory, and copies will be forwarded to the project files.

  Persons will have custody of samples when the samples are in their physical possession, in their view after being in their possession, or in their physical possession and secured so they cannot be tampered with. In addition, when samples are secured in a restricted area accessible only to authorized personnel, they will be deemed to be in the custody of such authorized personnel.
- Field Equipment, Calibration, and Maintenance Logs – To document the calibration and maintenance of field instrumentation, calibration and maintenance logs will be maintained for each piece of field equipment that is not factory calibrated.

## 5.3 Laboratory Documentation Files

Analytical laboratory documentation requirements are presented in the following subsections.

### 5.3.1 Laboratory Project Files

The laboratory will establish a file for pertinent data. The file will include correspondence, faxed information, telephone logs, and COC forms. The laboratory will retain project files and data packages for a period not less than 5 years.

### 5.3.2 Laboratory Logbooks

Workbooks, bench sheets, instrument logbooks, and instrument printouts will be used to trace the history of samples through the analytical process and to document important aspects of the work, including the associated QC checks. As such, logbooks, bench sheets, instrument logs, and instrument printouts will be part of the permanent record of the laboratory.

Each page or entry will be dated and initialed by the analyst at the time of entry. Errors in entry will be crossed out in indelible ink with a single stroke, corrected without the use of white-out or by obliterating or writing directly over the erroneous entry, and initialed and dated by the individual making the correction. Pages of logbooks that are not used will be completed by lining out unused portions.

Information regarding the sample, analytical procedures performed, and the results of the testing will be recorded on laboratory forms or personal notebook pages by the analyst. These notes will be dated and will also identify the analyst, the instrument used, and the instrument conditions.

Laboratory notebooks will be periodically reviewed by the laboratory group leaders for accuracy, completeness, and compliance with this QAPP. All entries and calculations will be verified by the laboratory group leader. If all entries on the pages are correct, the laboratory group leader will initial and date the pages. Corrective action will be taken for incorrect entries before the laboratory group leader signs.

### 5.3.3 Computer and Hard Copy Storage

All electronic files and deliverables will be retained by the laboratory for not less than 5 years. Hard copy data packages (or electronic copies) will also be retained for not less than 5 years.

## 5.4 Data Reporting Requirements

Data will be reported both in the field and by the analytical laboratory, as described below.

### 5.4.1 Field Data Reporting

Information collected in the field through visual observation, manual measurement, and/or field instrumentation will be recorded in field logbooks or data sheets and/or on forms. Such data will be reviewed by the appropriate Task Manager for adherence to the work plans and for consistency. Concerns identified as a result of this review will be discussed with the field personnel, corrected if possible, and (as necessary) incorporated into the data evaluation process.

If applicable, field data forms and calculations will be processed and included as appendices to the appropriate reports (when generated). The original field logs, documents, and data reductions will be kept in the project file.

### 5.4.2 Laboratory Data Reporting

Analytical results will be provided by the laboratory in a digital format. The data packages will be examined to ensure that the correct analyses were performed for each sample submitted and that all of the analyses requested on the COC form were performed. If discrepancies are noted, the QAC will be notified and will promptly follow up with the laboratory to resolve any issues.

If validation is required, each data package will be validated in accordance with the procedures presented in this QAPP. Data that do not meet the specified standards will be flagged pending resolution of the issue. The flag will not be removed from the data until the issue associated with the sample results is resolved. Although flags may remain for certain data, the use of that data may not necessarily be restricted.

Following completion of the data validation, the data review will be used to populate the appropriate database tables. This format specifies one data record for each constituent and each sample analyzed. Specific fields include:

- Sample identification number;
- Date sampled;
- Date analyzed;
- Parameter name;
- Analytical result;
- Units;
- Detection limit; and
- Qualifier(s).

The individual EDDs supplied by the laboratory, which will be in either an ASCII comma-separated value format or a format outlined in the EQuIS™ Laboratory SOP (Attachment 1), will be loaded into the appropriate database table. Analytical data that cannot be provided by the laboratory in electronic format will be entered manually. Hand-keyed data will be reviewed for accuracy. After entry into the database, the EDD data will be compared to the field information previously entered into the database to confirm that all requested analytical data were received.

The analytical laboratory is responsible for preparing NYSDEC ASP Category B data packages for all samples, except solid and liquid waste characterization samples. Data reports for all parameters will include, at a minimum, the following items:

**Narrative**

The narrative will contain a summary of activities that took place during the course of sample analysis, including the following information:

- Laboratory name and address;
- Date of sample receipt;
- Cross-reference of the laboratory identification number to the sample identification;
- Analytical methods used;
- Deviations from specified protocol; and
- Corrective actions taken.

Included with the narrative will be any sample handling documents, including field and internal COC forms, air bills, and shipping tags.

**Analytical Results**

Analytical results will be reported according to the analysis type and will include the following information, as applicable:

- Sample identification;
- Laboratory identification;
- Date of collection;

- Date of receipt;
- Date of extraction;
- Date of analysis;
- Dilution factor; and
- Detection limits.

Sample results on the report forms will be corrected for dilutions. Unless otherwise specified, all results will be reported uncorrected for blank contamination.

## 5.5 Project File

Project documentation will be placed in project files according to Arcadis of New York's (Arcadis') protocol for document management. Project files typically consist of the following components:

1. Agreements/Proposals (filed chronologically).
2. Change Orders/Purchase Orders (filed chronologically).
3. Invoices (filed chronologically).
4. Project Management (filed by topic).
5. Correspondence (filed chronologically).
6. Notes and Data (filed by topic).
7. Public Relations Information (filed by topic).
8. Regulatory Documents (filed chronologically).
9. Marketing Documents (filed chronologically).
10. Final Reports/Presentations (filed chronologically).
11. Draft Reports/Presentations (filed chronologically).
12. Documents Prepared by Others (filed chronologically).

Final reports (including QA reports) are filed in a designated folder within the project file. Analytical laboratory documentation (when received) and field data will also be filed in a designated folder within the project file. Filed materials may be removed and signed out by authorized personnel on a temporary basis only.

# 6 Sampling Process Design

Information regarding the sampling design and rationale and associated sampling locations are presented in the RDWP. Field investigation activities will be conducted according to the appropriate FSP (RDWP Appendix A) procedures and applicable NYSDEC regulations.

# 7 Sampling Method Requirements

Sampling of site media will be collected as described in the FSP (RDWP Appendix A). The approximate sample quantities and field QC samples are shown in Table 2. The FSP also contains the procedures that will be followed to perform field measurements; handle investigation-derived waste (IDW); and handle, package, and ship collected samples.

# 8 Sample Handling and Custody Requirements

Sampling handling requirements for various project personnel are presented in the following subsections.

## 8.1 Sample Containers and Preservation

Appropriate sample containers, preservation methods, and laboratory holding times for the samples are shown in Table 4.

The analytical laboratory will supply appropriate sample containers and preservatives, as necessary. The bottles will be purchased pre-cleaned to USEPA Office of Solid Waste and Emergency Response (OSWER) Directive 9240.05A requirements. The field personnel will be responsible for properly labeling containers and appropriately preserving samples. Sample labeling procedures are discussed in Section 8.2.2.

## 8.2 Field Custody Procedures

The objective of field sample custody is to ensure that samples are not tampered with or modified from the time of collection through transport and transfer to the analytical laboratory. Persons will have “custody of samples” when the samples are in their physical possession, in their view after being in their possession, or in their physical possession and secured so they cannot be tampered with. In addition, when samples are secured in a restricted area accessible only to authorized personnel, they will be deemed to be in the custody of such authorized personnel.

Field custody documentation consists of both field logbooks and field COC forms.

### 8.2.1 Field Logbooks

Field logbooks will provide the means of recording the data collecting activities that are performed. As such, entries will be described in as much detail as possible so that persons going to the site could reconstruct a particular situation without reliance on memory.

Field logbooks will be bound field survey books or notebooks. Logbooks will be assigned to field personnel but will be stored in a secure location when not in use. Each logbook will be identified by the project-specific document number. The title page of each logbook will contain the following:

- Person to whom the logbook is assigned;
- Logbook number;
- Project name;
- Project start date; and
- End date.

Entries will be made in indelible ink with no erasures. If an incorrect entry is made, the information will be crossed out with a single strike mark and initialed by the person making the correction.

Recorded information in field logbooks typically includes, but may not be limited to, the following:

- Name and location of the site;
- Date and time of arrival and departure;
- Name and signature of person keeping the logbook;
- Names of all persons on site;
- Purpose of the site visit;
- Level of personal protective equipment (PPE) used;
- Field instrument identification and calibration information;
- Location of sampling points;
- Results of field measurements made;
- Number and volume of samples taken;
- Preservation;
- Method of sample collection and any factors that may affect its quality;
- Name of sample collector;
- All sample identification numbers (assigned prior to sample collection);
- Description of samples, including, as applicable, the depth at which the sample was collected;
- Weather conditions on the day of sampling and any field observations; and
- Number and description of photographs taken, if any.

### 8.2.2 Sample Labeling

The following information is required on each sample label:

- Project name;
- Date collected;
- Time collected;
- Location;
- Sampler;
- Analysis to be performed;
- Preservative; and
- Sample identification number.

### 8.2.3 Field Chain-of-Custody Forms

Completed COC forms will be required for all samples to be analyzed. COC forms will be initiated by the sampling crew in the field. The COC forms will contain the unique sample identification number, sample date and time, sample description, sample type, preservation (if any), and analyses required. The original COC form will accompany the samples to the laboratory. Copies of the COC form will be made prior to shipment (or multiple-copy forms will be used) for field documentation. The COC forms will remain with the samples at all times. The samples and signed COC forms will remain in the possession of the sampling crew until the samples are delivered to the express carrier (e.g., Federal Express), hand delivered to a mobile or permanent laboratory, or placed in secure storage.

Sample labels will be completed for each sample using waterproof ink. The labels will include the information listed in Section 8.2.2. The completed sample labels will be affixed to each sample bottle and covered with clear tape.

Whenever samples are split with a government agency or other party, a separate COC form will be prepared for those samples and marked to identify the party with whom the samples are being split. The person relinquishing the samples to the facility or agency should request the representative’s signature acknowledging sample receipt. If the representative is unavailable or refuses, this is noted in the “Received By” space.

### 8.2.4 Sample Custody Seals

Custody seals are narrow strips of adhesive paper or glass fiber used to demonstrate that no tampering of the shipping container has occurred. The custody seals will be signed and dated by the sampling crew and placed across the opening of the lid and body of the shipping containers and at least on one side and the front of the container. The custody seals will be covered with clear, wide tape. These custody seals shall be plainly visible.

## 8.3 Management of Investigation-Derived Materials and Wastes

IDW will be generated during site activities and may include decontamination liquids, PPE, sorbent materials, purge water, and disposable sampling materials that may have come into contact with potentially impacted materials. The intent of managing IDW is to insure that impacted materials and media are not allowed to contaminate non-impacted materials and media. An example of an impacting event would be the purging of impacted groundwater and discharging that water onto non-impacted soil and shallow groundwater. Those kinds of activities will not be allowed.

Where necessary to promote the safe, efficient, and environmentally protective performance of work, management of investigation-derived materials and wastes will be performed consistent with the USEPA guidance, *Guide to Management of Investigation-Derived Wastes*, 9345.3-03FS (USEPA 1992). Disposable equipment (including PPE) will be containerized, appropriately labeled during the sampling events, and disposed of appropriately. All purged groundwater and water generated during equipment decontamination will be containerized, temporarily staged on site in 55-gallon drums or portable tanks, and disposed of appropriately based on analytical results. Equipment will be decontaminated, as appropriate.

## 8.4 Packing, Handling, and Shipping Requirements

Sample packaging and shipment procedures are designed so that the samples will arrive at the laboratory, with the COC, intact.

Samples will be packaged for shipment as outlined below:

- Securely affix the sample label to the container with clear packing tape.
- Check the cap on the sample container to confirm that it is properly sealed.
- Wrap the sample container cap with clear packing tape to prevent the cap from becoming loose.

- Complete the COC form with the required sampling information and confirm that the recorded information matches the sample labels.

  NOTE: If the designated sampler relinquishes the samples to other sampling or field personnel for packing or other purposes, the sampler will complete the COC form prior to this transfer. The appropriate personnel will sign and date the COC form to document the sample custody transfer.
- Wrap the glass sample containers in bubble wrap or other cushioning material.
- Place 1 to 2 inches of cushioning material at the bottom of the cooler.
- Place the sealed sample containers into the cooler.
- Place ice in plastic bags, seal the bags, and place the bags loosely in the cooler.
- Fill the remaining space in the cooler with cushioning material.
- Place the COC forms in a plastic bag and seal the bag. Tape the COC forms to the inside of the cooler lid.
- Close the lid of the cooler and secure the lid with duct tape.
- Wrap strapping tape (or equivalent) around both ends of the cooler at least twice.
- Mark the cooler on the outside with the shipping address and the return address, affix “Fragile” labels to the cooler, and draw (or affix) arrows indicating “this side up” on the cooler. Cover the shipping labels with clear plastic tape. If the samples are being delivered directly to the laboratory or will be picked up by the laboratory’s courier service, this step is eliminated.
- Place a signed custody seal over the sample cooler lid.

Samples will be packaged by the field personnel and transported as low-concentration environmental samples. The samples will be hand-delivered or delivered by an express carrier within 48 hours of the time of collection. In some cases, the analytical method may require analysis within a shorter holding time, and arrangements will need to be made to accommodate the laboratory requirements. Shipments will be accompanied by the COC form identifying the contents. The original COC form will accompany the shipment; copies will be retained by the sampler for the sampling office records. If the samples are sent by common carrier, a bill of lading will be used. Receipts or bills of lading will be retained as part of the permanent project documentation. Commercial carriers are not required to sign off on the COC form, as long as the forms are sealed inside the sample cooler and the custody seals remain intact.

Sample custody seals and packing materials for filled sample containers will be provided by the analytical laboratory. As described above, the filled, labeled, and sealed containers will be placed in a cooler on ice and carefully packed to eliminate the possibility of container breakage.

## 8.5 Laboratory Custody Procedures

Upon sample receipt, laboratory personnel will be responsible for sample custody. The original field COC form will accompany all samples requiring laboratory analysis. The laboratory will use COC guidelines described in the USEPA guidance documents. Samples will be kept secured in the laboratory until all stages of analysis are complete. All laboratory personnel having samples in their custody will be responsible for documenting and maintaining sample integrity.

### 8.5.1 Sample Receipt and Storage

Immediately upon sample receipt, the laboratory sample custodian will verify the integrity of the cooler seal, open the cooler, and compare the contents against the field COC form. If a sample container is missing, a sample container is received broken, the sample is in an inappropriate container, or the sample has not been preserved by appropriate means, the Arcadis Project Manager and/or QAC will be notified. The laboratory sample custodian will be responsible for logging the samples in, assigning a unique laboratory identification number to each sample, labeling the sample bottle with the laboratory identification number, and moving the sample to an appropriate storage location to await analysis. The project name, field sample code, date sampled, date received, analysis required, storage location and date, and action for final disposition will be recorded in the laboratory tracking system. Relevant custody documentation will be placed in the project file.

### 8.5.2 Sample Analysis

Analysis of an acceptable sample will be initiated by a work sheet that will contain pertinent information for analysis. The routing sheet will be forwarded to the analyst, and the sample will be moved into an appropriate storage location to await analysis. The document control officer will file the COC forms in the project file.

Samples will be organized into SDGs by the laboratory. An SDG may contain up to 20 field samples (field duplicates and trip blanks are considered field samples for the purposes of SDG assignment). All field samples assigned to a single SDG will be received by the laboratory over a maximum of 7 calendar days and must be processed through the laboratory (preparation, analysis, and reporting) as a group. If reanalysis of a sample is required, it may be re-run separately from the original SDG; however, the resulting data will be reported with the original SDG.

Every SDG must include a minimum of one MB and one MS/MSD pair; each SDG will, therefore, be self-contained for all of the required QC samples. Project samples to be used for MS/MSDs will be noted on the COC form.

Information regarding the sample, analytical procedures performed, and the results of the testing will be recorded in a laboratory notebook by the analyst. These notes will be dated and identify the analyst, the instrument used, and the instrument conditions.

### 8.5.3 Sample Storage Following Analysis

Samples will be maintained by the laboratory for at least 1 month after the final report is delivered. The laboratory will be responsible for the eventual and appropriate disposal of the samples. The analytical laboratory will inform the environmental consultant before any samples are disposed. Unused portions of the samples, sample extracts, and associated wastes will be disposed of by the laboratory in accordance with applicable rules and regulations.

# 9 Analytical Method Requirements

Analytical method requirements are presented in the following subsections.

## 9.1 Field Analytical Procedures

Specific field measurement protocols are provided in the FSP (RDWP Appendix A).

## 9.2 Laboratory Parameters and Methods

The laboratory analytical requirements presented in the subsections below include a general summary of the requirements, the specifics related to each sample medium to be analyzed, and details of the methods to be used for this project. Current USEPA-approved methods will be used for all applicable parameters and sample media.

### 9.2.1 General

The following tables (attached at the end of this QAPP) summarize the general analytical requirements:

- Table 1a: Parameters, Methods, and Target Quantitation Limits (Surface Soil);
- Table 1b: Parameters, Methods, and Target Quantitation Limits (Subsurface Soil);
- Table 1c: Parameters, Methods, and Target Quantitation Limits (Water);
- Table 1d: Parameters, Methods, and Target Quantitation Limits (Solid Waste Characterization);
- Table 1d: Parameters, Methods, and Target Quantitation Limits (Liquid Waste Characterization);
- Table 2: Sample Quantities and Quality Control Frequencies;
- Table 3: Laboratory Quality Control Limits; and
- Table 4: Sample Containers, Preservation, and Holding Times.

### 9.2.2 Laboratory Analyses

The primary sources of the analytical methods to be used during the investigation are provided in USEPA SW-846. Quantitation limits for the analyses are shown in Tables 1a through 1e. The laboratory will make every effort to achieve quantitation limits as low as practicable, unless dilution or interference effects make it necessary to report at higher levels. Results quantitated below the RLs will be reported as estimated concentrations and flagged with a "J".

# 10 Quality Control Requirements

The following subsections present a summary of the project QC requirements.

## 10.1 Data Quality Indicators

The overall DQO for this assessment is to develop and implement procedures for sampling, COC, laboratory analysis, instrument calibration, data reduction and reporting, internal QC, audits, preventive maintenance, and corrective action, such that valid data will be generated for site assessment purposes. These DQ procedures are presented or referenced in subsequent sections of the QAPP.

DQOs are generally defined in terms of the following parameters:

- Representativeness;
- Comparability;
- Completeness;
- Precision;
- Accuracy; and
- Sensitivity.

Each parameter is defined below. Specific objectives for this assessment are set forth in other sections of this QAPP as referenced below.

### 10.1.1 Representativeness

Representativeness is the extent to which measurements represent the site conditions. It is dependent on sampling and analytical variability and the variability (or homogeneity) of the site itself. The sampling activities have been designed to assess the presence of the constituents at the time of sampling. This QAPP presents field sampling methodologies and laboratory analytical methodologies. The use of the prescribed field and laboratory analytical methods, with associated holding times and preservation requirements, are intended to provide representative data.

### 10.1.2 Comparability

Comparability is defined as the extent to which data from one data set can be compared directly to similar or related data sets and/or decision-making standards. Comparability between this investigation and, to the extent possible, with existing data will be maintained through consistent use of the sampling and analytical methodologies set forth in this QAPP, applicable analytical methods, stringent application of established QA/QC procedures, and utilization of appropriately trained personnel.

### 10.1.3 Completeness

Completeness is defined as a measure of the amount of usable data collected compared to the total amount of data that was expected to be obtained. This will be determined upon final assessment of the analytical results.

### 10.1.4 Precision

Precision is a measure of the reproducibility of sample results. The goal is to maintain a level of analytical precision consistent with the objectives of the site assessment. To maximize precision, sampling and analytical procedures will be strictly followed and work will adhere to established protocols presented in the QAPP and sampling plans. Checks for analytical precision will include the analysis of MS/MSD pairs, laboratory duplicates, and field duplicates. Field measurement precision will be monitored by obtaining duplicate field measurements.

### 10.1.5 Accuracy

Accuracy is a measure of how close a measured result is to the true value. Recovery of reference standards, MSs, laboratory control standards, and surrogate standards will be used to assess the accuracy of the analytical data.

### 10.1.6 Sensitivity

Sensitivity is defined as the ability of the method or instrument to detect the contaminant of concern and other target compounds at the level of interest. The MDL is defined as the minimum concentration of a substance that can be identified, measured, and reported with 99% confidence that the analyte concentration is greater than zero and is determined from repeated analysis of a sample in a given matrix containing the analyte. MDLs have been determined as required in Title 40 Code of Federal Regulations Part 136B. The RL is greater than or equal to the lowest standard used to establish the calibration curve. The RLs for this investigation are generally at least 3 times greater than the MDL. Results greater than the MDL and less than the RL will be qualified estimated (“J”) by the laboratory. Non-detected results will be reported at the RL.

## 10.2 Field Quality Control Checks

Field QC requirements are presented in the following subsections.

### 10.2.1 Field Measurements

To verify the quality of data using field instrumentation, duplicate measurements will be obtained and reported for all field measurements. A duplicate measurement will involve obtaining measurements a second time at the same sampling location.

### 10.2.2 Sample Containers

Certified, clean sample containers (Eagle Picher pre-cleaned containers or equivalent), in accordance with Exhibit I of the NYSDEC ASP (NYSDEC 2005), will be supplied by the laboratory.

### 10.2.3 Field Duplicates

Field duplicates will be collected to verify the reproducibility of the sampling methods. In general, field duplicates will be analyzed at a 5% frequency (every 20 samples) for the chemical constituents.

# 10.3 Analytical Laboratory Quality Control Checks

Internal laboratory QC checks will be used to monitor data integrity. These checks will include MBs, LCSs, MS/MSDs, laboratory duplicates, internal standards, surrogate samples, and calibration standards. Project QC limits are identified in Table 3. Laboratory control charts will be used to determine long-term instrument trends.

## 10.3.1 Method Blanks

Sources of contamination in the analytical process, whether from specific analyses or interferences, must be identified, isolated, and corrected. The MB is useful in identifying possible sources of contamination within the analytical process. For this reason, it is necessary that the MB be initiated at the beginning of the analytical process and encompass all aspects of the analytical work. As such, the MB would assist in accounting for any potential contamination attributable to glassware, reagents, instrumentation, or other sources that could affect sample analysis. One MB will be analyzed with each analytical series associated with no more than 20 samples.

## 10.3.2 Matrix Spike/Matrix Spike Duplicates

MS/MSDs will be used to measure the accuracy of analyte recovery from the sample matrices and will be site-specific. MS/MSD pairs will be analyzed at a 5% frequency (every 20 samples).

When MS recoveries are outside QC limits, associated control sample and surrogate spike recoveries will be evaluated, as applicable, to attempt to verify the reason for the deviation and determine the effect on the reported sample results. Table 2 presents an estimated number of MS and MSD analyses for each applicable parameter.

## 10.3.3 Laboratory Control Samples

LCSs are standards of known concentrations and are independent in origin from the calibration standards. The intent of LCS analysis is to provide insight into the analytical proficiency within an analytical series. This includes preparation of calibration standards, validity of calibration, sample preparation, instrument setup, and the premises inherent in quantitation. Reference standards will be analyzed at the frequencies specified within the analytical methods.

## 10.3.4 Surrogate Spikes

Surrogates are compounds that are unlikely to occur under natural conditions but have properties similar to the analytes of interest. This type of control is primarily used for organic samples analyzed by gas chromatography/mass spectrometry (GC/MS) and is added to the samples prior to purging or extraction. The surrogate spike is utilized to provide broader insight into the proficiency and efficiency of an analytical method on a sample-specific basis. This control reflects analytical conditions that may not be attributable to the sample matrix.

If surrogate spike recoveries exceed specified QC limits, the analytical results must be evaluated thoroughly in conjunction with other control measures. In the absence of other control measures, the integrity of the data may not be verifiable, and reanalysis of the samples with additional control may be necessary.

Surrogate spike compounds will be selected utilizing the guidance provided in the analytical methods.

### 10.3.5 Calibration Standards

The initial calibration of instruments will be performed as required in the analytical methods and when any ongoing calibration does not meet control criteria. The number of points used in the initial calibration is defined in each analytical method.

Calibration check standards analyzed within a particular analytical series provide insight regarding instrument stability. Ongoing calibration verification will be performed as specified in the analytical methods to monitor instrument performance. In general, the calibration check standard will be analyzed at the beginning and end of an analytical series, or periodically throughout a series containing a large number of samples.

In the event that an ongoing calibration does not meet control limits, the analysis of samples will be suspended until the source of the control failure is either eliminated or reduced to within control specifications. Any samples analyzed while the instrument was out of control specifications will be reanalyzed.

### 10.3.6 Internal Standards

Internal standard areas and retention times will be monitored for organic analyses performed by GC/MS methods. Method-specified internal standard compounds will be spiked into all field samples, calibration standards, and QC samples after preparation and prior to analysis. If internal standard areas in one or more samples exceed the specified tolerances, the cause will be investigated, the instrument will be recalibrated if necessary, and all affected samples may be re-analyzed.

The acceptability of internal standard performance will be determined using the guidance provided within the analytical methods.

## 10.4 Data Precision Assessment Procedures

Field precision is difficult to measure because of temporal variations in field parameters. However, precision will be controlled through the use of experienced field personnel, properly calibrated meters, and duplicate field measurements. Field duplicates will be used to assess precision for the entire measurement system, including sampling, handling, shipping, storage, preparation, and analysis.

Laboratory data precision for analyses will be monitored through the use of MSDs, laboratory duplicates, and field duplicates, as identified in Table 3.

The precision of data will be measured by calculation of the relative percent difference by the following equation:

$$RPD = \frac{abs(D1 - D2)}{\frac{(D1 + D2)}{2}} \times 100$$

Where:

abs = absolute value
RPD = relative percent difference
D1 = sample value
D2 = duplicate sample value

The precision objectives for MSDs and laboratory duplicate analyses are identified in the NYSDEC ASP (NYSDEC 2005) and in Table 3.

## 10.5 Data Accuracy Assessment Procedures

The accuracy of field measurements will be controlled by experienced field personnel, properly calibrated field meters and adherence to established protocols. The accuracy of field meters will be assessed by review of calibration and maintenance logs.

Laboratory accuracy will be assessed by using MSs, surrogate spikes, internal standards and reference standards. Where available and appropriate, QA performance standards will be analyzed periodically to assess laboratory accuracy. Accuracy will be calculated in terms of percent recovery as follows:

$$\%\ \text{Recovery} = \frac{A - X}{B} \times 100$$

Where:

A = value measured in spiked sample or standard
X = value measured in original sample
B = amount added to sample or true value of the standard

This formula is derived under the assumption of constant accuracy between the original and spiked measurements. If any accuracy calculated by this formula is outside of the acceptable levels, data will be evaluated to determine whether the deviation represents unacceptable accuracy, or variable, but acceptable accuracy. Accuracy objectives for MS recoveries and surrogate recovery objectives are identified in the NYSDEC ASP (NYSDEC 2005) and in Table 3.

## 10.6 Data Representative Assessment Procedures

Representativeness will be assessed by examining sample preservation, results of the precision and accuracy evaluation, and adherence to method holding times. Failure of the field or laboratory personnel to properly handle samples may result in qualification of the data as estimated or unusable. The use of laboratory data from a sample with a failed holding time could render the data unusable. In particular, for volatile organic compound analysis, there is a potential for the loss of compounds, and the concentration may be biased low. The representativeness review will qualitatively consider whether precision and/or accuracy are sufficient to characterize the representativeness of the samples.

## 10.7 Blank Sample Assessment Procedures

Blank samples will be used to determine the existence and magnitude of contamination resulting from laboratory or field activities. The MB is used as a check on laboratory procedures, as well as possible contamination from laboratory equipment (i.e., reagents, glassware, etc.). Trip blanks determine the integrity of the sample container for loss or addition of analytes due to handling and transport. Detections in any blank samples will be used to qualify similar detections in associated field samples.

## 10.8 Data Completeness Assessment Procedures

Completeness of a field or laboratory data set will be calculated by comparing the number of valid sample results generated to the total number of results generated.

$$Completeness = \frac{usable\ data\ points\ obtained}{total\ data\ points\ planned} \times 100$$

As a general guideline, overall project completeness is expected to be at least 90%. The assessment of completeness will require professional judgment to determine data usability for the intended purposes.

# 11 Instrument/Equipment Testing, Inspection, and Maintenance Requirements

Testing and maintenance schedules have been developed for both field and laboratory instruments. This section summarizes the testing and maintenance activities to be performed.

## 11.1 Field Instruments and Equipment

Prior to field sampling, each piece of field equipment will be calibrated (if necessary) and inspected to confirm that it is operational. If the equipment is not operational, it will be serviced prior to use. All meters that require charging or batteries will be fully charged or have fresh batteries. If instrument servicing is required, the appropriate field activities Task Manager or field personnel will be responsible for following the maintenance schedule and arranging for timely service. Field instruments will be maintained according to the manufacturers' instructions.

Field instrumentation to be used in this study includes meters to measure pH, oxidation reduction potential, turbidity, temperature, conductivity, dissolved oxygen, and groundwater levels. Field equipment also includes sampling devices for groundwater. A logbook will be kept for each field instrument. Each logbook contains records of operation, maintenance, calibration, and any problems and repairs. The Task Manager will review the calibration and maintenance logs.

All measuring and test equipment to be used in support of the field sampling activities that directly affect the quality of the analytical data will be subject to preventive maintenance measures that minimize equipment downtime. Equipment will be examined to certify that it is in operating condition. This includes checking the manufacturer's operating manual to confirm that all maintenance requirements are being observed. Field notes from previous sampling events will be reviewed to verify that any prior equipment problems are not overlooked and that any necessary repairs to the equipment have been carried out. However, in most cases, the environmental consultant will use field meters maintained and calibrated by national, reputable environmental rental equipment companies; calibration and maintenance records are provided with these pieces of rental equipment and will be maintained as part of the project file.

Field equipment returned from the site will be inspected to confirm that it is in working order. The inspection will be recorded in the logbook or field notebooks, as appropriate. It will also be the obligation of the last user to record any equipment problems in the logbook. Non-operational field equipment will either be repaired or replaced. Appropriate spare parts for field equipment/meters will be available from the rental companies or manufacturers. Consultant-/subcontractor-owned or leased equipment will be maintained in accordance with the manufacturers' instructions.

## 11.2 Laboratory Instruments and Equipment

Laboratory instrument and equipment documentation procedures include the details of any observed problems, corrective measure(s), routine maintenance, and instrument repair (including information regarding the repair and the individual who performed the repair).

Preventive maintenance of laboratory equipment generally will follow the guidelines recommended by the manufacturer. A malfunctioning instrument will be repaired immediately by in-house staff or through a service call to the manufacturer.

Maintenance schedules for laboratory equipment adhere to each manufacturer's recommendations. Equipment service records will reflect the complete history of each instrument and specify the timeframe for future maintenance. Major repairs or maintenance procedures are performed through service contracts with the manufacturer or qualified contractors. Paperwork associated with service calls and preventive maintenance calls will be kept on file by the laboratory.

Laboratory Systems Managers are responsible for the routine maintenance of instruments used in the laboratory. Any routine preventive maintenance carried out is logged into the appropriate logbooks. The frequency of routine maintenance is dictated by the nature of samples being analyzed, the requirements of the analytical method used, and/or the judgment of the Laboratory Systems Manager.

All major instruments are backed up by comparable (if not equivalent) instrument systems for use in the event of unscheduled downtime. An inventory of spare parts is also available to minimize equipment/instrument downtime.

The operation of balances, incubators, ovens, refrigerators, and water purification systems will be checked and documented on a daily basis. Any discrepancies will be immediately reported to the appropriate laboratory personnel for resolution.

# 12 Instrument Calibration Frequency

Instrument calibration requirements are presented in the following subsections.

## 12.1 Field Equipment Calibration Procedures and Frequency

Calibration checks will be performed daily, or as often as required, to ensure the accuracy of field equipment. Field calibration solutions, standards, and gases will be used within specified expiration dates and will be obtained from manufacturers or authorized suppliers. Calibration solutions, standards, and gases will be discarded or returned to the supplier if expiration dates have been exceeded.

Field personnel are responsible for confirming that a master calibration/maintenance log is maintained following the procedures specified for each measuring device. A calibration log for each specific field instrument (as identified by serial/instrument number) will be used to link daily calibrations to that specific field instrument. Where applicable, each log will include, at a minimum, the following information in order to link daily calibrations to specific field instruments:

- Name of the device and/or instrument calibrated;
- Device/instrument serial/identification numbers;
- Calibration method;
- Tolerance;
- Calibration standard used;
- Frequency of calibration;
- Date(s) of calibration(s); and
- Name of the person(s) performing the calibration(s).

The instruments and equipment used to gather, generate, or measure environmental data will be calibrated at the intervals specified by the manufacturer, or more frequently, and in such a manner that accuracy and reproducibility of results are consistent with the manufacturer's specifications. If an internally calibrated field instrument fails to meet calibration/checkout procedures, it will be returned to the manufacturer for service. Equipment found to be out of tolerance during the period of use will be removed from the field, and measuring and testing activities performed using the equipment will be addressed via the corrective action system described in Section 15.3 of this QAPP.

## 12.2 Laboratory Equipment Calibration Procedures and Frequency

Instrument calibration will follow the specifications provided by the instrument manufacturer or specific analytical method used. The analytical methods for chemical constituents are identified in Tables 1a though 1e.

When analyses are conducted according to USEPA methods, the calibration procedures and frequencies specified in the applicable method will be followed. In general, equipment calibration procedures will follow guidelines presented in the NYSDEC ASP, Exhibit E, Part III (NYSDEC 2005). Records of calibrations will be filed and maintained by the laboratory. These records will be subject to a QA audit. For all instruments, the laboratory will maintain trained repair staff with in-house spare parts or will maintain service contracts with vendors.

All standards used to calibrate equipment are traceable, directly or indirectly, to the National Institute of Standards and Technology. All standards received will be logged into standard receipt logs maintained by the individual analytical groups. Each group will maintain a standards log that tracks the preparation of standards used for calibration and QC purposes.

# 13 Inspection/Acceptance Requirements for Supplies and Consumables

All supplies to be used in the field and laboratory will be available when needed. They will be free of target chemicals and interferences.

All laboratory reagents will be tested for acceptability prior to use in the analyses of site samples. All standards will be verified against a second source standard. The laboratory will follow a “first in/first out” procedure for the storage and use of all consumables to minimize the risk of contamination and degradation.

# 14 Data Management

The purpose of data management is to provide for the accuracy and ready accessibility of all of the necessary data to meet the analytical and reporting objectives of the project.

The data management program established for the project includes field documentation and sample QA/QC procedures, methods for tracking and managing the data, and a system for filing all site-related information. More specifically, data management procedures will be employed to efficiently process the information collected such that the data are readily accessible and accurate. These procedures are described in detail in the following section.

The data management plan has five elements:

1. Sample designation system.
2. Field activities.
3. Sample tracking and management.
4. Data management system.
5. Document control and inventory.

Each of these elements is discussed in the following subsections.

## 14.1 Sample Designation System

A concise and easily understandable sample designation system is an important part of the project sampling activities. It provides a unique sample number that will facilitate both sample tracking and easy re-sampling of select locations to evaluate data gaps, if necessary. The sample designation system to be employed during the sampling activities will be consistent, yet flexible enough to accommodate unforeseen sampling events or conditions. A combination of letters and numbers will be used to yield a unique sample number for each field sampled collected, as outlined in Section 5.1.

## 14.2 Field Activities

Field activities designed to gather the information necessary to make decisions require consistent documentation and accurate record keeping. During site activities, standardized procedures will be used for documenting field activities, data security, and QA. These procedures are described in further detail in the following subsections.

### 14.2.1 Field Documentation

Complete and accurate record keeping is a critical component of the field activities. When interpreting analytical results and identifying data trends, field notes are an important part of the review and validation process. To confirm that all aspects of the field investigation are thoroughly documented, several different information records, each with its own specific reporting requirements, will be maintained, including field logs, instrument calibration records, and COC forms. A description of each of these types of field documentation is provided in previous sections of this QAPP.

### 14.2.2 Data Security

Measures will be taken during the field investigation to prevent samples and records from being lost, damaged, or altered. When not in use, all field notebooks and logbooks will be stored at the field office or locked in the field vehicle. An electronic copy (e.g., scan to PDF) of all field data and laboratory data are available to all project team members.

## 14.3 Sample Tracking and Management

A record of all field documentation will be maintained to provide verification of the validity of data used in the site analysis. To effectively execute such documentation, specific sample tracking and data management procedures will be used throughout the sampling program.

Sample tracking will begin with the completion of COC forms, as summarized in Section 8.2.3. The completed COC forms associated with samples collected will be faxed and/or scanned and emailed to the Task Manager. Copies of all completed COC forms will be maintained in the field office. The laboratory will verify receipt of the samples electronically (via email) on the following day.

When analytical data are received from the laboratory, the QAC or designee will review the incoming analytical data packages against the information on the COC forms to confirm that the correct analyses were performed for each sample and that results for all samples submitted for analysis were received. Any discrepancies noted will be promptly followed up by the QAC.

## 14.4 Data Management System

In addition to the sample tracking system, a data management system will be implemented. The central focus of the data management system will be the development of a computer-based project database. Additionally, the data management system will allow submission of data to the NYSDEC's EQuIS™ database. The project database, to be maintained by the database administrator, will combine pertinent geographical, field, and analytical data. Information that will be used to populate the database will be derived from three primary sources: surveying of sampling locations, field observations, and analytical results. Each of these sources is discussed in the following sections.

### 14.4.1 Computer Hardware

The database will be constructed on personal computer workstations connected through a network server. The network will provide access to various hardware peripherals, such as laser printers, backup storage devices, image scanners, and modems. Computer hardware will be upgraded to industrial and corporate standards, as necessary, in the future.

### 14.4.2 Computer Software

The data will be warehoused in a database using CORE or EQuIS™ software. Geographic information system applications will be developed using ESRI ArcGIS software, with additional customization performed with Visual Basic. Tables and other database reports will be generated through Microsoft® Access in conjunction with Microsoft® Excel and/or Microsoft® Word. These software products will be upgraded to current industrial standards, as necessary.

### 14.4.3 Survey Information

In general, each location sampled will be surveyed or located using a global positioning system, with sub-meter accuracy, to confirm the accurate documentation of sample locations for mapping and geographic information system purposes (if appropriate) and to facilitate the re-sampling of select sample locations during future monitoring programs, if needed, and for any potential remediation activities. The surveying activities that will occur in the field will consist of the collection of information that will be used to compute a northing and easting in state plane coordinates for each sample location and the collection of information to compute elevations relative to the North American Vertical Datum of 1988 for select sample locations, as appropriate. All field logbooks associated with surveying activities will be stored as a record of the project activities.

### 14.4.4 Field Observations

An important part of the information that will ultimately reside in the data management system for use during the project will originate in the observations that are recorded in the field.

During each sampling event, appropriate field documentation will be prepared by the field personnel who performed the sampling activities. The purpose of the documentation is to create a summary and a record of the sampling event. Items included may be the locations sampled, the sampling methodologies used, blind duplicate and sample identification numbers, equipment decontamination procedures, personnel involved in the activity, and any noteworthy events that occurred.

### 14.4.5 Analytical Results

Analytical results will be provided by the laboratory in digital format. The data packages will be examined to confirm that the correct analyses were performed for each sample submitted and that all of the analyses requested on the COC form were performed. If discrepancies are noted, the QAC will be notified and will promptly follow up with the laboratory to resolve any issues.

Each data package will be validated in accordance with the procedures presented in Section 18. Any data that do not meet the specified standards will be flagged pending resolution of the issue. The flag will not be removed from the data until the issue associated with the sample results is resolved. Although flags may remain for certain data, the use of those data may not necessarily be restricted.

Following completion of the data validation, the digital files will be used to populate the appropriate database tables. An example of the EDD format is included in the EQuIS™ Laboratory SOP in Attachment 1. This format specifies one data record for each constituent for each sample analyzed. Specific fields include:

- Sample identification number;
- Date sampled;
- Date analyzed;
- Parameter name;
- Analytical result;
- Units;
- Detection limit; and
- Qualifier(s).

The individual EDDs, supplied by the laboratory in EQuIS™ file format, will be loaded into the appropriate database. Any analytical data that cannot be provided by the laboratory in electronic format will be entered manually. After entry into the database, the EDD data will be compared to the field information previously entered into the database to confirm that all requested analytical data have been received.

### 14.4.6 Data Analysis and Reporting

The database management system will have several functions to facilitate the review and analysis of the data. Data entry screens will be developed to assist in the keypunching of field observations. Routines have been developed to permit the user to scan analytical data from a given site for a given media. Several output functions are also available that can be modified, as necessary, for use in the data management system.

A valuable function of the data management system will be the generation of tables of analytical results from the project databases. The capability of the data management system to directly produce tables reduces the redundant manual entry of analytical results during report preparation and precludes transcription errors that may occur otherwise. This data management system function creates a digital file of analytical results and qualifiers for a given media. The file can then be processed into a table of rows and columns that can be transferred to word processing software (e.g., Microsoft® Excel) for final formatting and addition of titles and notes. Tables of analytical data will be produced as part of data interpretation tasks and the reporting of data to the USEPA.

The data management system also has the capability of producing a digital file of select parameters that exist in one or more of the databases. This type of custom function is accomplished on an interactive basis and is best used for transferring select information into a number of analysis tools, such as statistical or graphing programs.

## 14.5 Document Control and Inventory

Arcadis will maintain project files as discussed in Section 5.5.

# 15 Assessment and Response Actions

Performance and systems audits will be completed in the field and in the laboratory during sampling, as described below.

## 15.1 Field Audits

Field performance audit summaries will contain an evaluation of field activities to verify that the activities are performed according to established protocols. Field performance audits may be performed by the NYSDEC and the Arcadis Project Manager (or designee). The auditor(s) will review field reports and communicate concerns to the Arcadis Project Manager and/or Task Managers, and/or NYSDEC Project Manager, as appropriate. The observations made during field performance audits and any recommended changes/deviations to the field procedures will be recorded and documented.

In addition, systems audits comparing scheduled QA/QC activities from this QAPP with actual QA/QC activities completed will be performed. The appropriate Task Manager and QAC will periodically confirm that work is being performed consistent with this QAPP.

## 15.2 Laboratory Audits

Internal laboratory audits are conducted by the Laboratory QAM. As part of the audit, the overall performance of the laboratory staff is evaluated and compared to the performance criteria outlined in the laboratory QA manual and SOPs. The results of the audits are summarized and issued to each department supervisor, the Laboratory Manager, and the Laboratory Director. A systems audit of each laboratory may be performed by the QAM to determine whether the procedures implemented by each laboratory are in compliance with the QA manual and SOPs.

As a participant in state and federal certification programs, the laboratory is audited by representatives of the regulatory agency issuing certification in addition to the laboratory’s internal audits. Audits are usually conducted on an annual basis and focus on laboratory conformance to the specific program protocols for which the laboratory is seeking certification. The auditor reviews sample handling and tracking documentation, analytical methodologies, analytical supportive documentation, and final reports. The audit findings are formally documented and submitted to the laboratory for corrective action, if necessary.

## 15.3 Corrective Action

Corrective actions are required when field or analytical data are not within the objectives specified in this QAPP or the FSP (RDWP Appendix A). Corrective actions include procedures to promptly investigate, document, evaluate, and correct data collection and/or analytical procedures. Field and laboratory corrective action procedures for the assessment are described below.

### 15.3.1 Field Procedures

When conducting field work, if a condition is noted by the field crew that would have an adverse effect on data quality, corrective action will be taken so as not to repeat this condition. Any condition identification, cause, and corrective action implemented by the Field Manager or designee will be documented on a Corrective Action Form and reported to the appropriate Task Manager, QAC, and Project Manager. The QAC or designee will be responsible for follow-up and acceptance of corrective actions.

Examples of situations that would require corrective actions are provided below:

- Protocols, as defined by the QAPP, SOPs, and/or work plans, have not been followed.
- The equipment is not in proper working order or properly calibrated.
- QC requirements have not been met.
- There are issues resulting from performance or systems audits.

Project personnel will continuously monitor ongoing work performance in the normal course of daily responsibilities.

### 15.3.2 Laboratory Procedures

In the laboratory, when a condition is noted to have an adverse effect on data quality, corrective action will be taken so as not to repeat this condition. Any condition identification, cause, and corrective action to be taken will be documented and reported to the appropriate Project Manager and QAC.

Corrective action may be initiated, at a minimum, under the following conditions:

- Protocols, as defined by this QAPP, have not been followed.
- Predetermined data acceptance standards are not obtained.
- The equipment is not in proper working order or calibrated.
- The sample and test results are not completely traceable.
- QC requirements have not been met.
- There are issues resulting from performance or systems audits.

Laboratory personnel will continuously monitor ongoing work performance in the normal course of daily responsibilities. Corrective action will be initiated upon identification of a problem. At whatever level this occurs (analyst, supervisor, data review or QC), it will be brought to the attention of the Laboratory QAM and, ultimately, the Laboratory Director. Final approval of any action deemed necessary is subject to the approval of the Laboratory Director. If previously reported data are affected by a situation requiring correction or if the corrective action impacts a project budget or schedule, the action will directly involve the Arcadis Project Manager and QAC.

A corrective action deemed necessary based on system or performance audits, the analytical results of split samples, or the results of data review will be implemented. The corrective action may include sample re-extraction, sample re-preparation, sample re-analysis, cleanup, dilution, matrix modification, or other activities deemed necessary to assure usable analytical data.

# 16 Reports to Management

The QAC will audit the implementation of the QAPP. Each project component will result in some type of QA report or, by its absence, will indicate that no significant QA or QC deviations occurred. Items that may result in a QA report include:

- Changes or updates to the QAPP;
- Deviations from the QAPP or work plan specifications;
- Results of system and performance audits;
- Significant QA/QC problems, recommended solutions, and results of corrective actions; and
- Limitations on the use of measurement data.

## 16.1 Field Reports

Reporting of the quality of field sample collection and field measurements will be the responsibility of the Field Supervisor or designee. Information from the field logbooks will be compiled, and a summary report on field activity QA will be prepared for the project file.

## 16.2 Laboratory Reports

The laboratory will maintain QA records related to analyses, QC, and corrective action. This information will be made available to the Project Manager upon request. Routine reporting will include documenting all internal QC checks performed for this project.

# 17 Data Reduction and Review

After field and laboratory data are obtained, the data will be subject to the following:

- Data reduction or manipulation, mathematically or otherwise, into meaningful and useful forms;
- Data validation;
- Review; and
- Organization, interpretation, and reporting.

## 17.1 Field Data Reduction and Review

Requirements for field data reduction and review are presented in the following subsections.

### 17.1.1 Field Data Reduction

Information collected in the field through visual observation, manual measurement, and/or field instrumentation will be recorded in field notebooks, data sheets, and/or on forms. Such data will be reviewed by the appropriate Task Manager for adherence to the RDWP and this QAPP and for consistency. Concerns identified as a result of this review will be discussed with the field personnel, corrected if possible, and (as necessary) incorporated into the data evaluation process.

### 17.1.2 Field Data Review

Field data calculations, transfers, and interpretations will be conducted by the field personnel and reviewed for accuracy by the appropriate Task Manager and QAC. Field documentation and data reduction prepared by field personnel will be reviewed by the appropriate Task Manager and the QAC. Logs and documents will be checked for:

- General completeness;
- Readability;
- Usage of appropriate procedures;
- Appropriate instrument calibration and maintenance;
- Reasonableness in comparison to present and past data collected;
- Correct sample locations; and
- Correct calculations and interpretations.

## 17.2 Laboratory Data Reduction and Review

Requirements for laboratory data reduction and review are presented in the following subsections.

### 17.2.1 Laboratory Data Reduction

The calculations used for data reduction will be in accordance with the analytical methods. Whenever possible, analytical data will be transferred directly from the instrument to a computerized data system. Raw data will be entered into permanently bound laboratory notebooks. The data entered must be sufficient to document all factors used to arrive at the reported value.

Concentration calculations for chromatographic analyses will be based on response factors. Quantitation will be performed using internal standards for GC/MS methodology.

Unless otherwise specified, all values will be reported as uncorrected for blank contamination.

### 17.2.2 Laboratory Data Review

Data will be subject to multi-level review by the laboratory. The group leader will review all data reports prior to release for final data report generation. The QAM will review the final data reports, and the Laboratory Director will review a cross-section of the final data reports prior to release.

If discrepancies or deficiencies are present in the analytical results, corrective action will be taken, as discussed in Section 15. Deficiencies discovered as a result of internal data review, as well as the corrective actions to be used to rectify the situation, will be documented on a Corrective Action Form. This form will be submitted to the Project Manager and QAC.

# 18 Data Verification and Validation

For samples where a NYSDEC ASP Category B report is requested, data validation will be conducted as outlined in the USEPA's *Guidance on Environmental Data Verification and Data Validation*, EPA QA/G-8 (USEPA 2002a).

Data validation is a standardized review process for judging the analytical quality and usefulness of a discrete set of chemical data and is necessary to ensure that data of known and documented quality are used in making environmental decisions that meet the DQOs of the site. Data validation is a systematic process that compares a body of data to the requirements in a set of documented acceptance criteria to ascertain its completeness, correctness, and consistency. The data validation personnel will work independently from all other project teams. Data validators will not be involved in sampling or data analysis/reporting for the end user.

## 18.1 Data Validation Process

All data generated will be validated using the most recent versions of:

- The *National Functional Guidelines for Organic Superfund Methods Data Review*, EPA 540-R-2017-002 (USEPA 2017a) (with reference to the historical *Contract Laboratory Program National Functional Guidelines for Organic Data Review*, OSWER 9240.1-05A-P [USEPA 1999], as appropriate);
- The *National Functional Guidelines for Inorganic Superfund Methods Data Review*, EPA 540-R-2017-001 (USEPA 2017b) (with reference to the historical *Contract Laboratory Program National Functional Guidelines for Inorganic Data Review*, OSWER 9240.1-45 [USEPA 2004], as appropriate);
- USEPA SW-846 methodology;
- NYSDEC ASP (NYSDEC 2005); and
- QA/QC and reporting deliverables requirements for data validation available at the time of project initiation, where appropriate.

These procedures and criteria may be modified, as necessary, to address project-specific and method-specific criteria, control limits, and procedures. Data validation will consist of data screening, checking, reviewing, and editing to document analytical data quality and to determine whether the quality is sufficient to meet the DQOs.

The data validator will verify that reduction of laboratory measurements and laboratory reporting of analytical parameters is in accordance with the procedures specified for each analytical method and/or as specified in this QAPP. Any deviations from the analytical method or any special reporting requirements, apart from those specified in this QAPP, will be detailed on the COC forms.

Upon receipt of laboratory data, the following procedures will be executed by the data validator:

- Evaluate the completeness of the data package.
- Verify that the field COC forms were completed and that samples were handled properly.
- Verify that holding times were met for each parameter. Document holding time exceedances, if any occur. Flag data for all samples exceeding holding time requirements as either estimated or rejected. The decision as to which qualifier is more appropriate will be made on a case-by-case basis.
- Verify that parameters were analyzed according to the analytical methods specified.

- Review QA/QC data (i.e., confirm that duplicates, blanks, and LCSs were analyzed for the required number of samples, as specified in the analytical method, and verify that duplicate relative percent differences are acceptable).
- Investigate any anomalies identified during review. When anomalies are identified, they will be discussed with the Project Manager and/or Laboratory Manager, as appropriate.

Deficiencies discovered as a result of the data review, as well as the corrective actions implemented in response to the deficiencies, will be documented and submitted in the form of a written report addressing the following topics, as applicable to each analytical method:

- Assessment of the data package;
- Description of any protocol deviations;
- Failures to reconcile reported and/or raw data;
- Assessment of any compromised data;
- Laboratory case narrative;
- Overall appraisal of the analytical data; and
- Table of site name, sample quantities, data submitted to the laboratory, year of protocol used, matrix, and fractions analyzed.

## 18.2 Data Verification

It should be noted that qualified results do not necessarily invalidate data. The goal to produce the best possible data does not necessarily mean that data must be produced without QC qualifiers. Qualified data can provide useful information.

During the review process, laboratory qualified and unqualified data are verified against the supporting documentation. Based on this evaluation, qualifier codes may be added, deleted, or modified by the data reviewer. Results will be qualified with the following codes in accordance with the National Functional Guidelines.

| Qualifier | Definition |
|---|---|
| **Concentration Qualifiers (Laboratory Assigned)** | |
| U | The analyte/compound was analyzed for but not detected. The associated value is the compound RL. |
| B | The analyte/compound has been found in the sample as well as its associated blank; its presence in the sample may be suspect. (Note: Laboratory assigned B qualifiers will be removed during data validation in the event that the concentration detected in the sample is greater than 5 times the concentration detected in the associated blank.) |
| J | The analyte/compound was positively identified; however, the associated numerical value is an estimated concentration only. |
| **Quantitation Qualifiers (Laboratory Assigned)** | |
| E | The compound was quantitated above the calibration range. |
| D | The concentration is based on a diluted sample analysis. |
| P | The lower of the two values is reported when the percent difference between the results of two GC columns is greater than 40%. |

| Qualifier | Definition |
|---|---|
| **Validation Qualifiers** | |
| UJ | The analyte/compound was not detected above the reported sample quantitation limit; however, the reported limit is approximate and may or may not represent the actual RL. |
| UB | The analyte/compound is considered non-detect at the listed value due to associated blank contamination (i.e., concentration in the sample is less than 5 times the concentration detected in the associated blank). |
| J | The analyte/compound was positively identified; however, the associated numerical value is an estimated concentration. |
| R | The sample results are rejected. |

Two notes to all data users:

- The “R” qualifier means that the associated value is unusable. In other words, due to significant QC problems, the analysis is invalid and provides no information as to whether the compound is present or not. “R” values should not appear on data tables because they cannot be relied upon, even as a last resort.
- No compound concentration, even if it has passed all QC tests, is guaranteed to be accurate. Strict QC serves to increase confidence in the data, but any value potentially contains an error.

Resolution of any issues regarding laboratory performance or deliverables will be handled between the laboratory and the data validator. Suggestions for reanalysis may be made by the QAC at this point.

Data validation reports will be kept in electronic format (e.g., PDF) at the environmental consultant’s office.

# 19 Reconciliation with User Requirements

The data results will be examined to determine the performance that was achieved for each data usability criterion. The performance will then be compared with the project objectives and DQOs. Deviations from the objectives will be noted. Additional action may be warranted when the performance does not meet the performance objectives for critical data. Options for corrective action relating to incomplete information, questionable results, or inconsistent data may include any or all of the following:

- Retrieval of missing information;
- Request for additional explanation or clarification;
- Reanalysis of a sample from extract (when appropriate); and
- Recalculation or reinterpretation of the results by the laboratory.

These actions may improve the data quality, reduce uncertainty, and eliminate the need to qualify or reject data.

If these actions do not improve the data quality to an acceptable level, the following additional actions may be taken:

- Extrapolation of missing data from existing data points;
- Use of historical data; and
- Evaluation of the critical/non-critical nature of the sample.

If the data gap cannot be resolved by these actions, an evaluation of the data bias and potential for false negatives and positives can be performed. If the resultant uncertainty level is unacceptable, additional sample collection and analysis may be required.

# 20 References

NYSDEC. 2005. Analytical Services Protocol. July.

USEPA. 1991. National Enforcement Investigations Center Policies and Procedures Manual. August.

USEPA. 1992. Guide to Management of Investigation-Derived Wastes. 9345.3-03FS. Office of Solid Waste and Emergency Response. April.

USEPA. 1999. Contract Laboratory Program National Functional Guidelines for Organic Data Review. EPA-540/R-99-008. October.

USEPA. 2001. EPA Requirements for QA Project Plans for Environmental Operations. EPA-QA/R-5. Office of Environmental Information. March.

USEPA. 2002a. Guidance on Environmental Data Verification and Data Validation. EPA QA/G-8. Office of Environmental Information. November.

USEPA. 2002b. Guidance for Quality Assurance Project Plans. EPA-QA/G-5. Office of Environmental Information. December.

USEPA. 2004. Contract Laboratory Program National Functional Guidelines for Inorganic Data Review. OSWER 9240.1-45. October.

USEPA. 2017a. National Functional Guidelines for Organic Superfund Methods Data Review, EPA 540-R-2017-002, January.

USEPA. 2017b. National Functional Guidelines for Inorganic Superfund Methods Data Review, EPA-540-R-2017-001, January.

# Tables

**Table 1a**
**Parameters, Methods, and Target Quantitation Limits**
**(Surface Soil)**

**Quality Assurance Project Plan**
**Shulman's Salvage Yard, Elmira New York**

| Analyte | CAS Number | Action Limit (mg/kg)[1] | Laboratory MDL (mg/kg)[2,3,4] | Laboratory RL (mg/kg)[2,3,4] |
|---|---|---|---|---|
| **PCBs (SW-846 8082A)** | | | | |
| Aroclor-1016 | 12674-11-2 | -- | 0.0489 | 0.25 |
| Aroclor-1221 | 11104-28-2 | -- | 0.0489 | 0.25 |
| Aroclor-1232 | 11141-16-5 | -- | 0.0489 | 0.25 |
| Aroclor-1242 | 53469-21-9 | -- | 0.0489 | 0.25 |
| Aroclor-1248 | 12672-29-6 | -- | 0.0489 | 0.25 |
| Aroclor-1254 | 11097-69-1 | -- | 0.117 | 0.25 |
| Aroclor-1260 | 11096-82-5 | -- | 0.117 | 0.25 |
| Total PCBs | 1336-36-3 | 1.0 | -- | -- |
| **Metals (SW-846 6010C/7471B)** | | | | |
| Arsenic | 7440-38-2 | 16 | 400 | 2,000 |
| Cadmium | 7440-43-9 | 2.5 | 30 | 200 |
| Copper | 7440-50-8 | 270 | 210 | 1,000 |
| Lead | 7439-92-1 | 400 | 240 | 1,000 |
| Mercury | 7439-97-6 | 0.81 | 0.0081 | 0.02 |

**Notes:**

1 6 NYCRR Part 375 Restricted Use Soil Cleanup Objectives for Protection of Public Health - Residential Use, NYSDEC, December 2006. "NS" indicates that there is no criteria listed for the analyte. Criteria is applicable to Imported Backfill samples only.

2 Concentrations detected less than the reporting limit but greater than the method detection limit must be reported with the appropriate qualifier.

3 The laboratory limits were provided by Eurofins TestAmerica are current as of the writing of the QAPP. The samples will be reported using the current limits at the time of the analysis.

4 The target reporting limits are based on wet weight. The actual reporting limits will vary based on sample weight and moisture content.

**Abbreviations and Acronyms:**

-- = not applicable
MDL = method detection limit
mg/kg = micrograms per kilogram
PCBs = polychlorinated biphenyls
RL = reporting limit

**Table 1b**
**Parameters, Methods, and Target Quantitation Limits**
**(Subsurface Soil)**

**Quality Assurance Project Plan**
**Shulman's Salvage Yard, Elmira New York**

| Analyte | CAS Number | Action Limit (mg/Kg)[1] | Laboratory MDL (mg/kg)[2,3,4] | Laboratory RL (mg/kg)[2,3,4] |
|---|---|---|---|---|
| **PCBs (SW-846 8082A)** | | | | |
| Aroclor-1016 | 12674-11-2 | -- | 0.0489 | 0.25 |
| Aroclor-1221 | 11104-28-2 | -- | 0.0489 | 0.25 |
| Aroclor-1232 | 11141-16-5 | -- | 0.0489 | 0.25 |
| Aroclor-1242 | 53469-21-9 | -- | 0.0489 | 0.25 |
| Aroclor-1248 | 12672-29-6 | -- | 0.0489 | 0.25 |
| Aroclor-1254 | 11097-69-1 | -- | 0.117 | 0.25 |
| Aroclor-1260 | 11096-82-5 | -- | 0.117 | 0.25 |
| Total PCBs | 1336-36-3 | 25 | -- | -- |
| **Metals (SW-846 6010C/7471B)** | | | | |
| Arsenic | 7440-38-2 | 16 | 400 | 2,000 |
| Cadmium | 7440-43-9 | 60 | 30 | 200 |
| Copper | 7440-50-8 | 10,000 | 210 | 1,000 |
| Lead | 7439-92-1 | 3,900 | 240 | 1,000 |
| M e | 7439-97-6 | 6 | 0.0081 | 0.02 |

**Notes:**

1 6 NYCRR Part 375 Restricted Use Soil Cleanup Objectives for Protection of Public Health - Industrial Use, NYSDEC, December 2006. "NS" indicates that there is no criteria listed for the analyte. Criteria is applicable to Imported Backfill samples only.

2 Concentrations detected less than the reporting limit but greater than the method detection limit must be reported with the appropriate qualifier.

3 The laboratory limits were provided by Eurofins TestAmerica are current as of the writing of the QAPP. The samples will be reported using the current limits at the time of the analysis.

4 The target reporting limits are based on wet weight. The actual reporting limits will vary based on sample weight and moisture content.

**Abbreviations and Acronyms:**

-- = not applicable
MDL = method detection limit
mg/kg = micrograms per kilogram
PCBs = polychlorinated biphenyls
RL = reporting limit

**Table 1c**
**Parameters, Methods, and Target Quantitation Limits (Water)**

**Quality Assurance Project Plan**
**Shulman's Salvage Yard, Elmira New York**

| Analyte | CAS Number | Action Limit (ug/L)[1,2] | Laboratory MDL (ug/L)[3,4] | Laboratory RL (ug/L)[3,4] |
|---|---|---|---|---|
| **PCBs (SW-846 8082A)** | | | | |
| Aroclor-1016 | 12674-11-2 | -- | 0.5 | 1.0 |
| Aroclor-1221 | 11104-28-2 | -- | 1.0 | 2.0 |
| Aroclor-1232 | 11141-16-5 | -- | 0.5 | 1.0 |
| Aroclor-1242 | 53469-21-9 | -- | 0.5 | 1.0 |
| Aroclor-1248 | 12672-29-6 | -- | 0.5 | 1.0 |
| Aroclor-1254 | 11097-69-1 | -- | 0.5 | 1.0 |
| Aroclor-1260 | 11096-82-5 | -- | 0.5 | 1.0 |
| Total PCBs | 1336-36-3 | 5 | -- | -- |
| **Metals (SW-846 6010C/7470A)** | | | | |
| Arsenic | 7440-38-2 | 5.0 | 3.9 | 10 |
| Cadmium | 7440-43-9 | 1.0 | 0.59 | 5 |
| Copper | 7440-50-8 | 200.0 | 1.6 | 10 |
| Lead | 7439-92-1 | 5.0 | 2.5 | 50 |
| Mercury | 7439-97-6 | 0.2 | 0.077 | 0.2 |

**Notes:**
1 BTEX and PAH analyses will be performed in association with Documentation/Reuse Samples. The project action limits are <500 ug/L for Benzene.
2 Groundwater screening criteria correspond to the NYSDEC's Division of Water, Technical and Operational Guidance Series (TOGS) 1.1.1, Class GA Standards.
3 Concentrations detected less than the reporting limit but greater than the method detection limit must be reported with the appropriate qualifier.
4 The laboratory limits were provided by Eurofins TestAmerica and are current as of the writing of the QAPP. The samples will be reported using the current limits at the time of the analysis.

**Abbreviations and Acronyms:**
-- = not applicable
BTEX = benzene, toluene, ethylbenzene, and xylenes
MDL = method detection limit
PAHs = polynuclear aromatic hydrocarbon compounds
PCBs = polychlorinated biphenyls
RL = reporting limit
ug/L = micrograms per liter

**Table 1d**
**Parameters, Methods, and Target Quantitation Limits**
**(Solid Waste Characterization)**

**Quality Assurance Project Plan**
**Shulman's Salvage Yard, Elmira New York**

ARCADIS

| Analyte | CAS Number | Action Limit (mg/L)[1] | Laboratory MDL (mg/L)[2,3] | Laboratory RL (mg/L)[2,3] |
|---|---|---|---|---|
| **TCLP VOCs (SW-846 1311/8260C)** | | | | |
| Benzene | 71-43-2 | 0.5 | 0.00029 | 0.001 |
| 2-Butanone | 78-93-3 | 200 | 0.00132 | 0.005 |
| Carbon tetrachloride | 56-23-5 | 0.5 | 0.00027 | 0.001 |
| Chlorobenzene | 108-90-7 | 100 | 0.00075 | 0.001 |
| Chloroform | 67-66-3 | 6.0 | 0.00034 | 0.001 |
| 1,2-Dichloroethane | 107-06-2 | 0.5 | 0.00021 | 0.001 |
| 1,1-Dichloroethene | 75-35-4 | 0.7 | 0.00029 | 0.001 |
| Tetrachloroethene | 127-18-4 | 0.7 | 0.00036 | 0.001 |
| Trichloroethene | 79-01-6 | 0.5 | 0.00046 | 0.001 |
| Vinyl chloride | 75-01-4 | 0.2 | 0.00090 | 0.001 |
| **TCLP SVOCs (SW-846 1311/8270D)** | | | | |
| 1,4-Dichlorobenzene | 106-46-7 | 7.5 | 0.0018 | 0.040 |
| 2,4-Dinitrotoluene | 121-14-2 | 0.13 | 0.0017 | 0.020 |
| Hexachlorobenzene | 118-74-1 | 0.13 | 0.0023 | 0.020 |
| Hexachlorobutadiene | 87-68-3 | 0.5 | 0.0027 | 0.020 |
| Hexachloroethane | 67-72-1 | 3 | 0.0023 | 0.020 |
| 2-Methylphenol | 95-48-7 | 200 | 0.0016 | 0.020 |
| 3&4-Methylphenol | 108-39-4 / 106-44-5 | 200 | 0.0016 | 0.040 |
| Nitrobenzene | 98-95-3 | 2 | 0.0011 | 0.020 |
| Pentachlorophenol | 87-86-5 | 100 | 0.0088 | 0.040 |
| Pyridine | 110-86-1 | 5 | 0.0016 | 0.100 |
| 2,4,5-Trichlorophenol | 95-95-4 | 400 | 0.0019 | 0.020 |
| 2,4,6-Trichlorophenol | 88-06-2 | 2 | 0.0024 | 0.020 |
| **TCLP Metals (SW-846 1311/6010C/7470A)** | | | | |
| Arsenic | 7440-38-2 | 5.0 | 0.0056 | 0.015 |
| Barium | 7440-39-3 | 100 | 0.1000 | 1.00 |
| Cadmium | 7440-43-9 | 1.0 | 0.0005 | 0.002 |
| Chromium | 7440-47-3 | 5.0 | 0.0100 | 0.02 |
| Lead | 7439-92-1 | 5.0 | 0.0030 | 0.02 |
| Mercury | 7439-97-6 | 0.2 | 0.00012 | 0.0002 |
| Selenium | 7782-49-2 | 1.0 | 0.0087 | 0.025 |
| Silver | 7440-22-4 | 5.0 | 0.0017 | 0.006 |
| **General Chemistry** | | | | |
| Cyanide (SW-846 9012B) | 57-12-5 | -- | 0.483 | 1.0 |
| Reactive Cyanide (SW-846 9014) | 57-12-5 | 10 mg/L | 10 | 10 |
| Reactive Sulfide (SW-846 9034) | NA | 10 mg/L | 10 | 10 |
| Flashpoint (SW-846 1030) | NA | > 140 deg F | -- | -- |
| pH (SW-846 9045D) | NA | < 2 or > 12.5 | -- | -- |
| **PCBs (SW-846 8082A)** | | | | |
| Aroclor-1016 | 12674-11-2 | -- | 0.049 | 0.25 |
| Aroclor-1221 | 11104-28-2 | -- | 0.049 | 0.25 |
| Aroclor-1232 | 11141-16-5 | -- | 0.049 | 0.25 |
| Aroclor-1242 | 53469-21-9 | -- | 0.049 | 0.25 |
| Aroclor-1248 | 12672-29-6 | -- | 0.049 | 0.25 |
| Aroclor-1254 | 11097-69-1 | -- | 0.117 | 0.25 |
| Aroclor-1260 | 11096-82-5 | -- | 0.117 | 0.25 |
| Total PCBs | 1336-36-3 | 50 | -- | -- |
| **TPH (SW-846 8015B)** | | | | |
| TPH-GRO (C6-C10) | NA | -- | 0.330 | 1.25 |
| TPH-DRO (C10-C28) | NA | -- | 5.0 | 16.7 |

See Notes on Page 2.

## Table 1d
## Parameters, Methods, and Target Quantitation Limits
## (Solid Waste Characterization)

## Quality Assurance Project Plan
## Shulman's Salvage Yard, Elmira New York

**Notes:**

[1] Waste characterization screening criteria reflect 40 CFR 261, Appendix II, 1993 ed., as amended by 58 FR 46040, August 31, 1993.

[2] Concentrations detected less than the reporting limit but greater than the method detection limit must be reported with the appropriate qualifier.

[3] The laboratory limits were provided by Eurofins TestAmerica are current as of the writing of the QAPP. Samples will be reported using the current limits at the time of the analysis.

**Abbreviations and Acronyms:**

-- = not applicable
DRO = Diesel Range Organics
GRO = Gasoline Range Organics
MDL = method detection limit
mg/L = milligrams per liter
PCBs = polychlorinated biphenyls
RL = reporting limit
SVOCs = semivolatile organic compounds
TCLP = toxicity characteristic leaching procedure
TPH = total petroleum hydrocarbons
VOCs = volatile organic compounds

**Table 1e**
**Parameters, Methods, and Target Quantitation Limits**
**(Liquid Waste Characterization)**

**Quality Assurance Project Plan**
**Shulman's Salvage Yard, Elmira New York**

| Analyte | CAS Number | Action Limit (mg/L)[1] | Laboratory MDL (ug/L)[2,3] | Laboratory RL (ug/L)[2,3] |
|---|---|---|---|---|
| **VOCs (SW-846 8260C)** | | | | |
| 1,1,1-Trichloroethane | 71-55-6 | -- | 0.36 | 1 |
| 1,1,2,2-Tetrachloroethane | 79-34-5 | -- | 0.20 | 1 |
| 1,1,2-Trichloro-1,2,2-trifluoroethane | 76-13-1 | -- | 0.31 | 1 |
| 1,1,2-Trichloroethane | 79-00-5 | -- | 0.23 | 1 |
| 1,1-Dichloroethane | 75-34-3 | -- | 0.20 | 1 |
| 1,1-Dichloroethene | 75-35-4 | 0.7 | 0.28 | 1 |
| 1,2,4-Trichlorobenzene | 120-82-1 | -- | 0.57 | 1 |
| 1,2-Dibromo-3-chloropropane | 96-12-8 | -- | 0.74 | 2 |
| 1,2-Dibromoethane | 106-93-4 | 0.5 | 0.24 | 1 |
| 1,2-Dichlorobenzene | 95-50-1 | -- | 0.20 | 1 |
| 1,2-Dichloroethane | 107-06-2 | -- | 0.20 | 1 |
| 1,2-Dichloroethylene (Total) | 540-59-0 | -- | 0.40 | 2 |
| 1,2-Dichloropropane | 78-87-5 | -- | 0.20 | 1 |
| 1,3-Dichlorobenzene | 541-73-1 | -- | 0.20 | 1 |
| 1,4-Dichlorobenzene | 106-46-7 | 7.5 | 0.25 | 1 |
| 4-Methyl-2-pentanone | 108-10-1 | -- | 0.20 | 5 |
| Acetone | 67-64-1 | -- | 1.6 | 5 |
| Benzene | 71-43-2 | 0.5 | 0.20 | 1 |
| Bromodichloromethane | 75-27-4 | -- | 0.32 | 1 |
| Bromoform | 75-25-2 | -- | 0.21 | 1 |
| Bromomethane | 74-83-9 | -- | 0.70 | 1 |
| Carbon disulfide | 75-15-0 | -- | 0.28 | 1 |
| Carbon tetrachloride | 56-23-5 | 0.5 | 0.45 | 1 |
| Chlorobenzene | 108-90-7 | 100 | 0.20 | 1 |
| Chloroethane | 75-00-3 | -- | 0.22 | 1 |
| Chloroform | 67-66-3 | 6.0 | 0.20 | 1 |
| Chloromethane | 74-87-3 | -- | 0.21 | 1 |
| cis-1,2-Dichloroethene | 156-59-2 | -- | 0.20 | 1 |
| cis-1,3-Dichloropropene | 10061-01-5 | -- | 0.20 | 1 |
| Cyclohexane | 110-82-7 | -- | 0.25 | 1 |
| Dibromochloromethane | 124-48-1 | -- | 0.20 | 1 |
| Dichlorodifluoromethane | 75-71-8 | -- | 0.21 | 1 |
| Ethylbenzene | 100-41-4 | -- | 0.20 | 1 |
| Isopropylbenzene | 98-82-8 | -- | 0.20 | 1 |
| Methyl acetate | 79-20-9 | -- | 0.25 | 2 |
| Methyl tert-butyl ether | 1634-04-4 | -- | 0.20 | 1 |
| Methylcyclohexane | 108-87-2 | -- | 0.27 | 1 |
| Methylene chloride | 75-09-2 | -- | 0.36 | 1 |
| Styrene | 100-42-5 | -- | 0.20 | 1 |
| Tetrachloroethene | 127-18-4 | 0.7 | 0.20 | 1 |
| Toluene | 108-88-3 | -- | 0.20 | 1 |
| trans-1,2-Dichloroethene | 156-60-5 | -- | 0.20 | 1 |
| trans-1,3-Dichloropropene | 10061-02-6 | -- | 0.20 | 1 |
| Trichloroethene | 79-01-6 | 0.5 | 0.20 | 1 |
| Trichlorofluoromethane | 75-69-4 | -- | 0.20 | 1 |
| Vinyl chloride | 75-01-4 | 0.2 | 0.22 | 1 |
| Xylenes, Total | 1330-20-7 | -- | 0.20 | 2 |
| **SVOCs (SW-846 8270D)** | | | | |
| 1,1'-Biphenyl | 92-52-4 | -- | 1.9 | 10 |
| 2,2-Oxybis(1-chloropropane) | 108-60-1 | -- | 1.4 | 10 |
| 2,4,5-Trichlorophenol | 95-95-4 | 400 | 1.1 | 10 |
| 2,4,6-Trichlorophenol | 88-06-2 | 2 | 1.0 | 10 |
| 2,4-Dichlorophenol | 120-83-2 | -- | 1.0 | 10 |

See Notes on Page 3.

**Table 1e**
**Parameters, Methods, and Target Quantitation Limits**
**(Liquid Waste Characterization)**

**Quality Assurance Project Plan**
**Shulman's Salvage Yard, Elmira New York**

| Analyte | CAS Number | Action Limit (mg/L)[1] | Laboratory MDL (ug/L)[2,3] | Laboratory RL (ug/L)[2,3] |
|---|---|---|---|---|
| **SVOCs (SW-846 8270D) (cont.)** | | | | |
| 2,4-Dimethylphenol | 105-67-9 | -- | 1.0 | 10 |
| 2,4-Dinitrophenol | 51-28-5 | -- | 2.9 | 50 |
| 2,4-Dinitrotoluene | 121-14-2 | 0.13 | 2.7 | 10 |
| 2,6-Dinitrotoluene | 606-20-2 | -- | 1.5 | 10 |
| 2-Chloronaphthalene | 91-58-7 | -- | 1.1 | 10 |
| 2-Chlorophenol | 95-57-8 | -- | 1.0 | 10 |
| 2-Methylnaphthalene | 91-57-6 | -- | 1.0 | 10 |
| 2-Methylphenol | 95-48-7 | 200 | 1.0 | 10 |
| 2-Nitroaniline | 88-74-4 | -- | 2.4 | 50 |
| 2-Nitrophenol | 88-75-5 | -- | 1.5 | 10 |
| 3,3'-Dichlorobenzidine | 91-94-1 | -- | 1.0 | 10 |
| 3-Nitroaniline | 99-09-2 | -- | 1.8 | 50 |
| 4,6-Dinitro-2-methylphenol | 534-52-1 | -- | 3.7 | 50 |
| 4-Bromophenyl-phenylether | 101-55-3 | -- | 1.4 | 10 |
| 4-Chloro-3-methylphenol | 59-50-7 | -- | 1.1 | 10 |
| 4-Chloroaniline | 106-47-8 | -- | 1.0 | 10 |
| 4-Chlorophenyl-phenylether | 7005-72-3 | -- | 1.2 | 10 |
| 3&4-Methylphenol | 108-39-4 / 106-44-5 | 200 | 1.0 | 10 |
| 4-Nitroaniline | 100-01-6 | -- | 1.9 | 50 |
| 4-Nitrophenol | 100-02-7 | -- | 3.0 | 50 |
| Acenaphthene | 83-32-9 | -- | 1.6 | 10 |
| Acenaphthylene | 208-96-8 | -- | 1.3 | 10 |
| Acetophenone | 98-86-2 | -- | 1.3 | 10 |
| Anthracene | 120-12-7 | -- | 1.4 | 10 |
| Atrazine | 1912-24-9 | -- | 1.3 | 10 |
| Benzaldehyde | 100-52-7 | -- | 1.4 | 50 |
| Benzo(a)anthracene | 56-55-3 | -- | 1.1 | 10 |
| Benzo(a)pyrene | 50-32-8 | -- | 1.3 | 10 |
| Benzo(b)fluoranthene | 205-99-2 | -- | 1.3 | 10 |
| Benzo(g,h,i)perylene | 191-24-2 | -- | 1.5 | 10 |
| Benzo(k)fluoranthene | 207-08-9 | -- | 1.5 | 10 |
| bis(2-Chloroethoxy)methane | 111-91-1 | -- | 1.0 | 10 |
| bis(2-Chloroethyl)ether | 111-44-4 | -- | 1.0 | 10 |
| bis(2-Ethylhexyl)phthalate | 117-81-7 | -- | 9.7 | 10 |
| Butylbenzylphthalate | 85-68-7 | -- | 1.0 | 10 |
| Caprolactam | 105-60-2 | -- | 1.0 | 10 |
| Carbazole | 86-74-8 | -- | 1.3 | 10 |
| Chrysene | 218-01-9 | -- | 1.5 | 10 |
| Dibenzo(a,h)anthracene | 53-70-3 | -- | 1.4 | 10 |
| Dibenzofuran | 132-64-9 | -- | 1.3 | 10 |
| Diethylphthalate | 84-66-2 | -- | 1.2 | 10 |
| Dimethylphthalate | 131-11-3 | -- | 1.5 | 10 |
| Di-n-butylphthalate | 84-74-2 | -- | 1.1 | 10 |
| Di-n-octylphthalate | 117-84-0 | -- | 1.8 | 10 |
| Fluoranthene | 206-44-0 | -- | 1.4 | 10 |
| Fluorene | 86-73-7 | -- | 1.6 | 10 |
| Hexachlorobenzene | 118-74-1 | 0.13 | 1.4 | 10 |
| Hexachlorobutadiene | 87-68-3 | 0.5 | 1.1 | 10 |
| Hexachlorocyclopentadiene | 77-47-4 | -- | 1.5 | 10 |
| Hexachloroethane | 67-72-1 | 3 | 1.2 | 10 |
| Indeno(1,2,3-cd)pyrene | 193-39-5 | -- | 1.4 | 10 |
| Isophorone | 78-59-1 | -- | 1.2 | 10 |
| Naphthalene | 91-20-3 | -- | 1.1 | 10 |

See Notes on Page 3.

**Table 1e**
**Parameters, Methods, and Target Quantitation Limits**
**(Liquid Waste Characterization)**

**Quality Assurance Project Plan**
**Shulman's Salvage Yard, Elmira New York**

| Analyte | CAS Number | Action Limit (mg/L)[1] | Laboratory MDL (ug/L)[2,3] | Laboratory RL (ug/L)[2,3] |
|---|---|---|---|---|
| **SVOCs (SW-846 8270D) (cont.)** | | | | |
| Nitrobenzene | 98-95-3 | 2 | 1.0 | 10 |
| N-Nitrosodiphenylamine | 86-30-6 | -- | 4.7 | 10 |
| N-Nitroso-di-n-propylamine | 621-64-7 | -- | 2.0 | 10 |
| Pentachlorophenol | 87-86-5 | 100 | 6.0 | 50 |
| Phenanthrene | 85-01-8 | -- | 1.6 | 10 |
| Phenol | 108-95-2 | -- | 1.0 | 10 |
| Pyrene | 129-00-0 | -- | 1.8 | 10 |
| **PCBs (SW-846 8082A)** | | | | |
| Aroclor-1016 | 12674-11-2 | -- | 0.5 | 1.0 |
| Aroclor-1221 | 11104-28-2 | -- | 1.0 | 2.0 |
| Aroclor-1232 | 11141-16-5 | -- | 0.5 | 1.0 |
| Aroclor-1242 | 53469-21-9 | -- | 0.5 | 1.0 |
| Aroclor-1248 | 12672-29-6 | -- | 0.5 | 1.0 |
| Aroclor-1254 | 11097-69-1 | -- | 0.5 | 1.0 |
| Aroclor-1260 | 11096-82-5 | -- | 0.5 | 1.0 |
| Total PCBs | 1336-36-3 | 5 | -- | -- |
| **Metals (SW-846 6010C/7470A)** | | | | |
| Arsenic | 7440-38-2 | 5.0 | 3.9 | 10 |
| Barium | 7440-39-3 | 100 | 6.9 | 20 |
| Cadmium | 7440-43-9 | 1.0 | 0.59 | 5 |
| Chromium | 7440-47-3 | 5.0 | 1.4 | 10 |
| Lead | 7439-92-1 | 5.0 | 2.5 | 50 |
| Mercury | 7439-97-6 | 0.2 | 0.077 | 0.2 |
| Selenium | 7782-49-2 | 1.0 | 4.6 | 10 |
| Silver | 7440-22-4 | 5.0 | 0.57 | 10 |
| **General Chemistry** | | | | |
| Total Cyanide (SW-846 9012B) | 57-12-5 | | 4 | 10 |
| Oil and Grease (SW-846 1664A) | NA | -- | 1400 | 5000 |
| pH (SW-846 9045C) | NA | | -- | -- |

**Notes:**
1 Waste characterization screening criteria reflect 40 CFR 261, Appendix II, 1993 ed., as amended by 58 FR 46040, August 31, 1993.
2 Concentrations detected less than the reporting limit but greater than the method detection limit must be reported with the appropriate qualifier.
3 The laboratory limits were provided by Eurofins TestAmerica are current as of the writing of the QAPP. Samples will be reported using the current limits at the time of the analysis.

**Abbreviations and Acronyms:**
-- = not applicable
MDL = method detection limit
mg/L = milligrams per liter
PCBs = polychlorinated biphenyls
RL = reporting limit
SVOCs = semivolatile organic compounds
ug/L = micrograms per Liter
VOCs = volatile organic compounds

**Table 2**
**Sample Quantities and Quality Control Frequencies**

**Quality Assurance Project Plan**
**Shulman's Salvage Yard, Elmira New York**

| Parameter | Field QC Analyses | | | | | | Laboratory QC Sample | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Trip Blank | | Rinse Blank | | Field Duplicate | | MS | | MSD | | Laboratory Duplicate | |
| | Freq. | No. | Freq. | No. | Freq. | No. | Freq. | No. | Freq. | No. | Freq. | No. |
| **Soil** | | | | | | | | | | | | |
| PCBs (SW-846 8082A) | -- | -- | -- | -- | 1/20 | TBD | 1/20 | TBD | 1/20 | TBD | -- | -- |
| Metals (SW-846 6010C) | -- | -- | -- | -- | 1/20 | TBD | 1/20 | TBD | 1/20 | TBD | 1/20 | TBD |
| Mercury (SW-846 7471B) | -- | -- | -- | -- | 1/20 | TBD | 1/20 | TBD | 1/20 | TBD | 1/20 | TBD |
| **Water** | | | | | | | | | | | | |
| PCBs (SW-846 8082A) | -- | -- | -- | -- | 1/20 | TBD | 1/20 | TBD | 1/20 | TBD | -- | -- |
| Metals (SW-846 6010C) | -- | -- | -- | -- | 1/20 | TBD | 1/20 | TBD | 1/20 | TBD | 1/20 | TBD |
| Mercury (SW-846 7471B) | -- | -- | -- | -- | 1/20 | TBD | 1/20 | TBD | 1/20 | TBD | 1/20 | TBD |
| **Solid Waste Characterization** | | | | | | | | | | | | |
| TCLP VOCs (SW-846 1311/8260C) | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| TCLP SVOCs (SW-846 1311/8270D) | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| TCLP Metals (SW-846 1311/6010C) | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| TCLP Mercury (SW-846 1311/7470A) | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| PCBs (SW-846 8082A) | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| TPH-GRO and TPH-DRO (SW-846 8015) | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Cyanide (SW-846 9012B) | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Reactivity (Cyanide) (SW-846 9014) | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Reactivity (Sulfide) (SW-846 9034) | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Flashpoint (SW-846 1030) | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| pH (SW-846 9045D) | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| **Liquid Waste Characterization** | | | | | | | | | | | | |
| VOCs (SW-846 8260C) | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| SVOCs (SW-846 8270D) | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| PCBs (SW-846 8082A) | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Metals (SW-846 6010C) | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Mercury (SW-846 7471B) | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Cyanide (SW-846 9012) | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Oil and Grease (SW-846 1664A) | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| pH (SW-846 9045C) | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |

**Abbreviations and Acronyms:**

-- = not applicable
DRO = diesel range organics
Freq. = frequency
GRO = gasoline range organics
MS = matrix spike
MSD = matrix spike duplicate
No. = number
PCBs = polychlorinated biphenyls
QC = quality control
SVOCs = semivolatile organic compounds
TBD = to be determined
TCLP = toxicity characteristic leaching procedure
TPH = total petroleum hydrocarbons
VOCs = volatile organic compounds

## Table 3
## Laboratory Quality Control Limits

**Quality Assurance Project Plan**
**Shulman's Salvage Yard, Elmira New York**

| Parameter | Accuracy - Percent Recovery | | | Precision - Relative Percent Difference | | |
|---|---|---|---|---|---|---|
| | Surrogate | MS/MSD | LCS | MS/MSD | Laboratory Duplicate | Field Duplicate |
| **Soil** | | | | | | |
| VOCs (SW-846 8260C) | 60-144 | 37-146 | 37-146 | 30 | -- | 50 |
| SVOCs (SW-846 8270D) | 52-130 | 10-150 | 10-150 | 30 | -- | 50 |
| PCBs (SW-846 8082A) | 60-174 | 33-200 | 51-184 | 30 | -- | 50 |
| Metals (SW-846 6010C) | -- | 75-125 | 27-174 | -- | 20 | 50 |
| Mercury (SW-846 7471B) | -- | 75-125 | 51-149 | -- | 20 | 50 |
| Cyanide (SW-846 9012B) | -- | 85-115 | 29-122 | -- | 20 | 50 |
| TPH-GRO (SW-846 8015) | 46-156 | 41-142 | 46-129 | 30 | -- | -- |
| TPH-DRO (SW-846 8015) | 48-125 | 43-150 | 63-127 | 30 | -- | -- |
| TCLP VOCs (SW-846 1311/8260C) | 73-123 | 57-140 | 57-140 | 30 | -- | -- |
| TCLP SVOCs (SW-846 1311/8270D) | 22-148 | 16-150 | 10-136 | 30 | -- | -- |
| TCLP Metals (SW-846 6010C) | -- | 75-125 | 80-120 | 30 | -- | -- |
| TCLP Mercury (SW-846 7470A) | -- | 80-120 | 80-120 | 30 | -- | -- |
| Reactivity (Cyanide) (SW-846 9014) | -- | 10-100 | 10-100 | 30 | -- | -- |
| Reactivity (Sulfide) (SW-846 9034) | -- | 10-100 | 10-100 | 30 | -- | -- |
| Flashpoint (SW-846 1030) | -- | -- | 97-103 °F | -- | -- | -- |
| pH (SW-846 9045D) | -- | -- | -- | -- | ±0.10 | -- |
| **Water** | | | | | | |
| VOCs (SW-846 8260C) | 73-123 | 55-150 | 55-150 | 37 | -- | 30 |
| SVOCs (SW-846 8270D) | 22-148 | 10-150 | 10-150 | 49 | -- | 30 |
| PCBs (SW-846 8082A) | 19-121 | 15-150 | 56-130 | 50 | -- | 30 |
| Metals (SW-846 6010C) | -- | 75-125 | 80-120 | 20 | 20 | 30 |
| Mercury (SW-846 7471B) | -- | 80-120 | 80-120 | 20 | 20 | 30 |
| Cyanide (SW-846 9012) | -- | 90-110 | 90-110 | 15 | 15 | 30 |
| Oil and Grease (SW-846 1664A) | -- | 78-114 | 78-114 | 18 | 18 | 30 |
| pH (SW-846 9045C) | -- | -- | -- | -- | ±0.10 | 30 |

**Note:**
1. The listed QC limits are based on the laboratory-provided limits at the time of this document. The limits are updated periodically by the laboratory, and the current limits at the time of analysis will be reported.

**Abbreviations and Acronyms:**
-- = not applicable
DRO = diesel range organics
GRO = gasoline range organics
LCS = laboratory control sample
MS = matrix spike
MSD = matrix spike duplicate
PCBs = polychlorinated biphenyls
SVOCs = semivolatile organic compounds
TCLP = toxicity characteristic leaching procedure
TPH = total petroleum hydrocarbons
VOCs = volatile organic compounds

**Table 4**
**Sample Containers, Preservation, and Holding Times**

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**Quality Assurance Project Plan**
**Shulman's Salvage Yard, Elmira New York**

| Parameter | Method | Bottle Type[1] | Preservation | Holding Time[2] |
|---|---|---|---|---|
| **Soil** | | | | |
| PCBs | SW-846 8082A | 1-8oz glass jar with Teflon®-lined lid | Cool to <6°C | 14 days to extraction |
| | | | | 40 days to analysis |
| Metals | SW-846 6010C | 1-4oz wide mouth glass jar | Cool to <6°C | 180 days to analysis |
| Mercury | SW-846 7471B | | | 28 days to analysis |
| **Water** | | | | |
| PCBs | SW-846 8082A | 2-1 L amber glass bottle with Teflon®-lined lid | Cool to <6°C | 7 days to extraction |
| | | | | 40 days to analysis |
| Metals | SW-846 6010C | 1 L plastic bottle | $HNO_3$ to pH<2 | 180 days to analysis |
| Mercury | SW-846 7470A | | Cool to <6°C | 28 days to analysis |
| **Solid Waste Characterization** | | | | |
| TCLP VOCs | SW-846 1311/8260C | 1-4oz glass jar with Teflon®-lined lid | Cool to <6°C | 14 days to TCLP extraction |
| | | | | 14 days to analysis |
| TCLP SVOCs | SW-846 1311/8270D | 1-8oz glass jar with Teflon®-lined lid | Cool to <6°C | 14 days to TCLP extraction |
| | | | | 7 days to extract prep |
| | | | | 40 days to analysis |
| TCLP Metals | SW-846 1311/6010C | 1-4oz wide mouth glass jar | Cool to <6°C | 180 days to TCLP extraction |
| | | | | 180 days to analysis |
| TCLP Mercury | SW-846 1311/7470A | | | 28 days to TCLP extraction |
| | | | | 28 days to analysis |
| PCBs | SW-846 8082A | 1-8oz glass jar with Teflon®-lined lid | Cool to <6°C | 14 days to extraction |
| | | | | 40 days to analysis |
| TPH-GRO | SW-846 8015 | 3-EnCore™ samplers and 2 oz vial for moisture | Cool to <6°C | 48 hours to preservation |
| | | | DI Water; Methanol | 14 days to analysis |
| TPH-DRO | SW-846 8015 | 1-8oz glass jar with Teflon®-lined lid | Cool to <6°C | 14 days to extraction |
| | | | | 40 days to analysis |
| Cyanide | SW-846 9012B | 1-4oz wide mouth glass jar | Cool to <6°C | 14 days to analysis |
| Reactivity (Cyanide) | SW-846 9014 | 1-4oz wide mouth glass jar | Cool to <6°C | 14 days to analysis |
| Reactivity (Sulfide) | SW-846 9034 | 1-4oz wide mouth glass jar | Cool to <6°C | 7 days to analysis |
| Flashpoint | SW-846 1030 | 1-4oz wide mouth glass jar | Cool to <6°C | 14 days to analysis |
| pH | SW-846 9045D | 1-4oz wide mouth glass jar | Cool to <6°C | 24 hours to analysis |
| **Liquid Waste Characterization** | | | | |
| VOCs | SW-846 8260C | 2-40ml glass vials with Teflon®-lined lid | HCl to pH<2 | 14 days to analysis |
| | | | Cool to <6°C | |
| SVOCs | SW-846 8270D | 2-1 L amber glass bottle with Teflon®-lined lid | Cool to <6°C | 7 days to extraction |
| | | | | 40 days to analysis |
| PCBs | SW-846 8082A | 2-1 L amber glass bottle with Teflon®-lined lid | Cool to <6°C | 7 days to extraction |
| | | | | 40 days to analysis |

See Notes on Page 2.

**Table 4**
**Sample Containers, Preservation, and Holding Times**

**Quality Assurance Project Plan**
**Shulman's Salvage Yard, Elmira New York**

| Parameter | Method | Bottle Type[1] | Preservation | Holding Time[2] |
|---|---|---|---|---|
| **Liquid Waste Characterization (cont.)** | | | | |
| Metals | SW-846 6010C | 1 L plastic bottle | $HNO_3$ to pH<2 | 180 days to analysis |
| Mercury | SW-846 7470A | | Cool to <6°C | 28 days to analysis |
| Cyanide | SW-846 9012B | 500 ml plastic bottle | Cool to <6°C<br>Zinc acetate; NaOH pH >12 | 14 days to analysis |
| pH | SW-846 9045C | 250 ml plastic bottle | Cool to <6°C | 24 hours to analysis |
| Oil and Grease | USEPA 1664A | 2-1 L amber glass bottle with Teflon®-lined lid | HCl to pH<2<br>Cool to <6°C | 28 days to analysis |

**Notes:**

1 The laboratory should be consulted prior to sample collection, as it may be possible to combine sample volume for multiple analyses in one sample container.

2 All holding times are measured from date of collection. It is imperative that all samples are submitted to the laboratory with ample time for the analysis to be completed within the holding time. Missing a holding time is unacceptable and may result in unusable data if the holding time is missed.

**Abbreviations and Acronyms:**

< = less than
°C = degrees Celsius
DI = deionized
DRO = diesel range organics
GRO = gasoline range organics
HCl = hydrochloric acid
$HNO_3$ = nitric acid
L = liter
ml = milliliter
NaOH = sodium hydroxide
oz = ounce
PCBs = polychlorinated biphenyls
SVOCs = semivolatile organic compounds
TCLP = toxicity characteristic leaching procedure
TPH = total petroleum hydrocarbons
VOCs = volatile organic compounds

# Attachment 1

**EQuIS™ Laboratory Standard Operating Procedure**

## INTRODUCTION

ARCADIS manages and verifies/validates analytical data generated by commercial analytical laboratories in the EQuIS database (product of Earthsoft, Inc.). All laboratories contracted by ARCADIS or their clients, on a site-by-site basis, may be required to submit electronic data deliverables (EDDs) in addition to the hard copy report. This Standard Operating Procedure (SOP) describes the structure, format, and submission requirements for electronic data deliverables (EDDs) in the EQuIS EFWEDD (Sample, Test, Result, Batch) format.

This document is a general guidance for preparation of the required electronic data and associated quality control information. The structure of the EDD as defined in this document will remain constant unless Earthsoft modifies the database structure. Reference values and requirements for population of additional fields with specific information will not change from project to project.

Modification to reference value lists may NOT be made by the laboratory without authorization from ARCADIS.

Section I provides ARCADIS contact information and the procedure to submit electronic deliverables directly via e-mail. However, all EDDs will be required to be submitted in a final CD compilation for each specific sampling event or as directed by the ARCADIS Project Manager (PM).

Section II outlines the table structures and general requirements of the EDDs. The EDD structure is based on EarthSoft's EFWEDD EDD format. EarthSoft's EDD format has not been changed; however, some 'optional' fields identified in the EarthSoft EDD have been modified to be 'required' in this EDD format. Additional information regarding the EarthSoft products can be found at http://www.earthsoft.com/.

Section III presents some additional explanation and requirements for populating the table structure and population set forth in Section II.

Section IV summarizes the use of the EDP. Each laboratory **MUST** use EDP to check each EDD file set prior to submission to ARCADIS. The EDP Error Report must be submitted with the EDD. ***All errors identified by the EDP routine must be corrected prior to forwarding the files for entry into the EQuIS database. Or approval for submittal with errors must be authorized by ARCADIS.***

## I. CONTACT INFORMATION

Laboratories should contact the ARCADIS National Program Lab Managers with questions regarding this document. The contact info is as follows:

Richard J. Murphy, Ph.D.
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Direct: 315.671.9299
Fax: 315.449.0025
Cell: 315.751.1672
Dennis.capria@arcadis-us.com

## ELECTRONIC LABORATORY DATA CHECKER EDP

Prior to submitting an EDD to ARCADIS, the EarthSoft EDP must be run to check and verify the EDD structure, format and reference value compliance. The EDP report must be submitted for each file with each EDD set. The Data Checker error report, which demonstrates that the EDD files were successfully checked, must be electronically submitted with the four EDD files to ARCADIS.

## REFERENCE VALUES

**A specific set of values is required to be utilized in populating certain key fields of the EDD.** The Reference Value Lists for the EDP will be provided for each ARCADIS subcontracted laboratory. The Reference Value Lists must be utilized as provided. Alterations or additions to the Reference Values are **NOT** allowed **without prior** written authorization by the ARCADIS Data Manager. Electronic mail may be considered written authorization.

## ELECTRONIC DATA DELIVERABLE (EDD) SUBMISSION

Prior to submission to ARCADIS, each data file must also be reviewed by the laboratory to ensure that the sample IDs, dates, times and other inter-related information is consistent between all four (4) files and the EDD is complete. All parameters that are subcontracted to other laboratories must be included in the EDD for a specific SDG or Laboratory Project Number. It is not acceptable to submit separate EDDs for subcontract parameters. Manual review of the files may be necessary to complete this review.

It is **IMPERATIVE** that the EDD results match the hard copy results. If the results do not match the lab will correct the error ASAP at no additional charge. This includes issues involving various rounding routines for different electronic data management programs within the laboratory (i.e. LIMS vs. EPA CLP). Significant figures must also match hard copy and be consistent from one sampling event to the next. Reporting limits must be consistent between events as well and must be in compliance with the Laboratory Task Order or Project Statement of Work. There may be instances where diluted surrogates and unrecovered spike compounds will require population of the EDD with numeric values in lieu of data flags in the hard copy report. The ARCADIS Data Manager will provide project specific guidance for these conditions. Adherence to the SOP requirements for population of spike/surrogate recovery and RPD fields is required to allow electronic validation of the data.

The EDP Reports for each file must be submitted with the 4 files of the actual EDD.

Laboratories must submit EDDs via e-mail for verification of compatibility and completeness to the assigned ARCADIS Data Manager for the project.

**The subject line of this e-mail must include the following text:**

***[Facility-Code] [Laboratory Project/Log/SDG Number] - EDD Submission***

The e-mail should also include the laboratory contact name and phone number.

EDDs must be submitted via e-mail prior to or at the same time the final hard copy document is delivered. ARCADIS may review the EDDs prior to requesting final submittal on CD. EDDs will be returned to the laboratory for modifications until the files can be successfully imported into the EQuIS Project Database and Electronic Data Validation can be performed without field population errors. Any revisions to the EDD will be required within 24 hours of notification to the laboratory regarding observed problems with the EDD. When the EDD is acceptable to the ARCADIS Data Manager and Project Manager, a CD containing all final versions of the EDD should be submitted to ARCADIS for archiving.

Invoices for analytical work will not be approved for payment until the final EDD revisions are acceptable.

## II. ELECTRONIC DELIVERABLE DATA FORMAT

This section identifies the structure and format requirements for EQuIS EFWEDD EDDs submitted by all laboratories to ARCADIS. Specific field definitions are presented for each of the four files. Laboratories should review the unique requirements for these fields. The format population and adherence to the criteria are mandatory. Data are electronically validated and errors are quickly identifiable if the EDD is incorrect.

### GENERAL FORMAT REQUIREMENTS

All laboratory data must be saved as an ASCII file format using the following standard format. Each subcontracting laboratory's data must be incorporated into the primary laboratory's EDD.

Each data field must be either separated by tabs or enclosed in double quotes (") and separated by commas. Data fields that do not contain information may be represented by two commas. Maximum length of text fields is indicated in the parentheses. If the input information is less than the maximum field length, **DO NOT ADD** spaces to account for the difference.

Each record must be terminated with a carriage return/line feed (i.e., standard DOS text file). The file can be produced using any software with the capability to create ASCII files.

**THE LABORATORY SHALL LEAVE THE HEADERS IN EACH ASCII FILE TO ASSIST IN REVIEW AND RESOLUTION OF ERRORS.**

Four files are required for each SDG or Laboratory Project Number: one each for samples, tests, results, and batches. Each file must be saved as a Tab Delimited or Comma Separated file.

Enterprise EDD File Naming Conventions
EDD packages must be named using a specific naming convention. An EDD Package consists of a .zip file containing the text (.txt) EDDs and a User Certificate. The zip file and text file names must contain the specific elements listed below under file naming conventions, separated by a period. A User Certificate file will be supplied to the lab by Arcadis for inclusion in the zip file. Please include in the subject line of emailed EDD submissions the facility code and Sample Delivery Group (SDG) number.

File Naming Conventions:
ZIP File Name = Unique ID.Facility Code.Format Name.zip
Text File EDDs Name = Unique ID.EDD Section Name.txt

Unique ID = SDG number.
Facility Code = The facility code (i.e., Site Name from ENFOS)
Format Name = The EQuIS EDD format name (e.g., ESBasic, EFWEDD, etc.).
EDD Section Name = The name of the section within the EDD (e.g. EFW2FSample, EFW2LabTST, etc.).

For example, ZIP File Name = "2009001.BP-99999.EFWEDD.zip" will contain the following files: "2009001.EFW2FSample.txt", "2009001.EFW2LabTST.txt", “2009001.EFW2LabRES.txt", '2009001.EFW2LabBCH.txt' and "pfoos.usr".

Package re-submittal
In order to re-submit corrected EDDs, the .zip file and text (.txt) EDDs must each be renamed. If the example EDD package above were to be re-submitted it would have ZIP File Name = "2009001B.BP-99999.EFWEDD.zip" containing "2009001B.EFW2FSample.txt", "2009001B.EFW2LabTST.txt", “2009001B.EFW2LabRES.txt", '2009001B.EFW2LabBCH.txt' and "pfoos.usr". Note that a “B” has been appended to the SDG name in both the zip file name and each of the text file names. A subsequent re-submittal of the same SDG would require that a C be appended and so on.

Referential integrity is enforced between tables (e.g. sys_sample_code present in the result, batch, and test tables must also be present in the sample table). For example, a data record with a specific sys_sample_code found in the result table, but not in the sample table, will cause and error in the Data Import Module and the file will not be allowed to be entered into the database. Dates and times associated with each test must match in the “Test” and “Result” files or the database will not allow entry of the entire file.

Reference values must be adhered to for a variety of fields as identified in the Reference Value list and described in the following table format requirements.

**FORMAT DETAILS**

The following four sections provide a detailed summary and the specific layout for each field required in each of the four (4) tables of the EDD. The ARCADIS EDD has been derived from the EarthSoft EFWEDD EDD.

Date is reported as MM/DD/YY (month/day/year) and time as HH:MM (hour:minute). Time must be reported in 24-hour (military) format (3:30 p.m. = 15:30 and 8:30 AM = 08:30 not 8:30). **NOTE:** Make certain that the LIMS systems format the date and time the same way for all files.

**The columns in the following 4 tables relate to:**

**“Number”** Column in Tables = Column of EDD table

**“Attribute Name”** = Column Name
PK after attribute indicates this is a primary key within Access for the table.

**"Column Data"** Type = Text or Numeric values required. Parenthetical number indicates total allowable number of characters in the field.

**"Required"** Column:

The column titled 'Required' will contain the text 'Yes' if the field is required to be populated by the laboratory. In addition, a "condition" is added to indicate additional information applying to population of the associated field. The first number of the condition relates to the table in which the condition applies, i.e. 1 is the Sample File, 2 is the Test File, 3 is the Result File, and 4 is the Batch File. Conditions apply as follows:

| Condition | Table | Description |
|---|---|---|
| 0 | ALL | Field always required |
| 1-1 | SAMPLE | Field required for field samples only not required for laboratory samples |
| 1-2 | SAMPLE | Field required (parent_sample_code) for **laboratory** QC samples that have 'parents' |
| 1-3 | SAMPLE | Field not required for field samples |
| 2-1 | TEST | Field required if applicable for specific test |
| 3-1 | RESULT | Field required (result_value) for detected analytes only (TRG or TICs). Must be NULL if non-detect or surrogates, internal standards or spiked compounds |
| 3-2 | RESULT | Field required if available or appropriate for result |
| 3-3 | RESULT | Field required for matrix spikes or matrix spike duplicates (NOT required for surrogate compounds or LCS samples where the original concentration is assumed to be zero). |
| 3-4 | RESULT | Field required for surrogate compounds, LCS, Blank Spikes, Matrix Spikes, and Internal Standards. |
| 3-5 | RESULT | Field required for LCS duplicates, Blank Spike Duplicates, Matrix Spike Duplicates, Lab Replicates |
| 3-6 | RESULT | Field required for LCSD, BSD, MSD, and Lab duplicate samples |
| 3-7 | RESULT | Field required for surrogates and spike compounds |
| 4-1 | BATCH | Field required if available or appropriate for result |

**"REQUIRED":**

**"YES" = Required data if applicable**

**"NO" = Optional information unless otherwise directed by ARCADIS Data Manager or preferred for insertion by lab except where lab is specifically directed to leave the field Null.**

**Parent Sample Definition**

Parent Samples are base samples for duplicates or spikes. i.e. original field samples used for matrix spikes or field sample used for Lab Duplicate/Replicate. A Matrix Spike is not the Parent Sample of the Matrix Spike Duplicate.

**POPULATING SPIKE FIELDS**

**SURROGATES**: surrogate recoveries are to be populated in qc_spike_added, qc_spike_measure, and qc_spike_recovery fields. Surrogates are analyte type = SUR. Control limits for surrogate recoveries must also be populated.

**INTERNAL STANDARDS**: internal standard values are to be populated in qc_spike_added, qc_spike_measure, and qc_spike_recovery fields. Internal Standards are analyte type = IS.

**LCS, BS, and MS COMPOUNDS**: recoveries are to be populated in qc_spike_added, qc_spike_measured, and qc_spike_recovery fields. Compounds spiked to evaluate method accuracy are analyte type = SC. Control limits for spike recoveries must also be populated.

**LCSD, BD, AND MSD COMPOUNDS**: recoveries are to be populated in qc_dup_spike_added, qc_dup_spike_measured, and qc_dup_spike_recovery fields. The Compounds spiked to evaluate method accuracy are analyte type = SC. Control limits for spike recoveries must also be populated. Additionally, the qc_rpd and qc_rpd_cl fields must be populated for these samples.

**LAB REPLICATE SAMPLE DATA**: values for lab duplicates/replicates are to be populated in qc_dup_spike_measured field. The qc_rpd and qc_rpd_cl fields must be populated for these samples.

## III. ADDITIONAL REQUIREMENTS

| SAMPLE TABLE | | | | |
|---|---|---|---|---|
| **Num** | **Attribute Name** | **Column Data Type** | **Required** | **Attribute Definition** |
| 1 | sys_sample_code | Text(40) | Yes (0) | Unique sample identifier (COC Sample ID). Each sample must have a unique value, including spikes and duplicates. Unique sample identifiers **throughout** the database are an **ABSOLUTE** restriction enforced by EQuIS Chemistry. This unique identifier also carries through to each subsequent sampling event where the samples IDs must be unique for EVERY event of the project (continuing years). Laboratory QC samples must also have unique identifiers between sampling event and from 1 year to the next and between laboratories in the event subcontractors are used. For Matrix Spike, Matrix Spike Duplicate, and Laboratory Duplicates of Field Samples, add the suffix **MS, MSD, and LR**, respectively to create unique identifiers for these types of Lab QC samples. |
| 2 | sample_name | Text(30) | No | Additional sample identification information as necessary. Is not required to be unique (i.e., duplicates are OK). |

| SAMPLE TABLE | | | | |
|---|---|---|---|---|
| **Num** | **Attribute Name** | **Column Data Type** | **Required** | **Attribute Definition** |
| 3 | sample_matrix_code | Text(10) | Yes (0) | Code, which distinguishes between different types of sample matrix. **Examples**: Soil samples ="SO" , groundwater samples = "WG". Field Blanks, Trip Blanks, and Rinsate Blanks = "WQ". Water Method Blanks and liquid matrix spikes = "WQ" Soil Method Blanks and soil/sludge/sediment matrix spikes = "SQ' This field refers to the sample matrix not the matrix after preparation or extraction. See rt_matrix for the list of valid values. |
| 4 | sample_type_code | Text(10) | Yes (0) | Code that distinguishes between different types of samples. **For example**, normal field samples = "N" and laboratory method blank ="LB". Field QC sample types are Field Duplicates = "FD", Field Blanks = "FB", Trip Blanks = "TB". Lab QC sample types are LCS or Blank Spikes = "BS", LCSD or BS Duplicates = "BD" and Matrix Spikes = "MS" and Matrix Spike Duplicates = "SD". See rt_sample_type in Reference Values list of valid values. |
| 5 | sample_source | Text(10) | Yes (0) | Must be either "Field" for field samples **or** "Lab" for laboratory QC samples. No other values are allowed. Matrix spikes and lab duplicate/replicate are "Lab" samples, even though the parent is a "Field" and the base sample came from the field. The spiking or splitting for duplication is done in the lab. Field duplicates as submitted to the lab by field sampling teams are "Field" |
| 6 | parent_sample_code | Text(40) | Yes (1-2) | The value in the "sys_sample_code" that identifies the sample that was the source of this sample. *For example*, the Matrix Spike and the Matrix Spike Duplicate or Lab Replicates parent_sample_code is the sys_sample_code for the originating field sample that is spiked to generate the MS/MSD or split by the lab for use as the laboratory duplicate. This field is only required in the EDD for laboratory "clone" samples (e.g., matrix spikes and duplicates). Field duplicates are submitted blind to the laboratory, so this field cannot be completed by the laboratory. This field must be blank for samples that have no parent (e.g., normal field samples, method blanks, etc.). |
| 7 | sample_delivery_group | Text(10) | Yes (0) | Sample delivery group or laboratory Project/Log Number. All deliverables must reference the SDG or Lab Log-in Number. **This field MUST BE POPULATED** |
| 8 | sample_date | Date | Yes (1-1) | Date of sample collection in **MM/DD/YY** format including trip blanks. Must be blank for laboratory samples. |
| 9 | sample_time | Time | Yes (1-1) | Time of sample collection in 24-hour (military) **HH:MM** format. 8:45 AM = 08:45 and 3:30 PM = 15:30. Must be blank for laboratory samples. |

| SAMPLE TABLE | | | | |
|---|---|---|---|---|
| **Num** | **Attribute Name** | **Column Data Type** | **Required** | **Attribute Definition** |
| 10 | sys_loc_code | Text(20) | No | Sample collection location. To be populated by ARCADIS unless otherwise directed at project initiation. |
| 11 | start_depth | Double | No | Beginning depth (top) of soil sample. To be populated by ARCADIS unless otherwise directed at project initiation. |
| 12 | end_depth | Double | No | Ending depth (bottom) of soil sample. To be populated by ARCADIS unless otherwise directed at project initiation. |
| 13 | depth_unit | Text(15) | No | Unit of measurement for the sample begin and end depths. IRPIMS-style unit of measurement codes (see table X03) are recognized by Chem; other codes may be allowed by the Chem project manager. To be populated by ARCADIS unless otherwise directed at project initiation. |
| 14 | chain_of_custody | Text(15) | Yes (1-1) | Chain of custody identifier or number. A single sample may be assigned to only one chain of custody. The COC identifier will be provided by the field sampling team based on conventions established for a specific project. |
| 15 | sent_to_lab_date | Date | No | Date sample was sent to lab (in MM/DD/YY format for EDD). |
| 16 | sample_receipt_date | Date | Yes (1-1) | Date that sample was received at laboratory in **MM/DD/YY** format. Must be blank for laboratory samples. |
| 17 | sampler | Text(30) | No | Name or initials of sampler. |
| 18 | sampling_company_code | Text(10) | Yes (1-1) | Name or initials of sampling company (no controlled vocabulary). “ARCADIS” should be entered into this field unless otherwise directed at project initiation. |
| 19 | sampling_reason | Text(30) | No | Optional reason for sampling. No controlled vocabulary is enforced. |
| 20 | sampling_technique | Text(40) | No (1-1) | To be populated by ARCADIS unless otherwise directed at project initiation. Sampling technique. **For example**, low flow, bailing, MIP, etc… Must be blank for laboratory samples. |
| 21 | task_code | Text(10) | No | Code used to identify the task under which the field sample was retrieved. |
| 22 | collection_quarter | Text(5) | No | Quarter of the year sample was collected (e.g., "1Q96") |
| 23 | composite_yn | Text(1) | No | Boolean field used to indicate whether a sample is a composite sample. |
| 24 | composite_desc | Text(255) | No | Description of composite sample (if composite_yn is YES). |

| SAMPLE TABLE | | | | |
|---|---|---|---|---|
| **Num** | **Attribute Name** | **Column Data Type** | **Required** | **Attribute Definition** |
| 25 | sample_class | Text(10) | No | Navy sample class code. |
| 26 | custom_field_1 | Text(255) | No | Custom sample field |
| 27 | custom_field_2 | Text(255) | No | Custom sample field |
| 28 | custom_field_3 | Text(255) | No | Custom sample field |
| 29 | comment | Text(255) | Yes (0) | Field required to contain the full sample ID code. |
| 30 | sample_receipt_time | Text(5) | Yes (1-1) | Time of sample receipt by laboratory in 24-hour (military) **HH:MM** format. 8:45 AM = 08:45 and 3:30 PM = 15:30 |

| TEST TABLE | | | | |
|---|---|---|---|---|
| **Num** | **Attribute Name** | **Column Data Type** | **Required** | **Attribute Definition** |
| 1 | sys_sample_code (PK) | Text (40) | Yes (0) | SAME AS #1 IN SAMPLE TABLE. This value is used in enforcing referential integrity between tables. Must match sys_sample_code in Sample Table. |
| 2 | lab_anl_method_name (PK) | Text (35) | Yes (0) | Laboratory analytic method name or description. See rt_analytic_method in reference value tables for list of valid values. |
| 3 | analysis_date (PK) | Date/ Time | Yes (0) | Date of sample analysis in MM/DD/YY format. Refers to initiation of the analysis not prep method date. |
| 4 | analysis_time (PK) | Text (5) | Yes (0) | Time of sample analysis in 24-hour (military) HH:MM format. Note that this field, combined with the "analysis_date" field is used to distinguish between reextractions, reanalyses, and dilutions. Please ensure that retests have "analysis_date" and/or analysis_time" different from the original test event (and complete test_type field as appropriate). |
| 5 | total_or_dissolved (PK) | Text (1) | Yes (0) | "T" for total metal organic carbon concentration, "D" for dissolved or filtered metal or organic carbon concentration ONLY. USE "N" for organic (or other) constituents for which neither "total" nor "dissolved" is applicable including TDS. |
| 6 | column_number (PK) | Text (2) | Yes (2-1) | Applicable for GC or HPLC methods. "1C" for first column analyses, "2C" for second column analyses, or "NA" for analyses where not applicable. If any "2C" tests are listed, then there must be corresponding "1C" tests present also. Laboratories must indicate which of the two columns is to be considered "primary" by entering "Y" in the "reportable_result" field of the result table for the result presented in hard copy reports. It is NOT acceptable to identify both "1C" and "2C" reportable_result as "Y:; one must be "N" if" "1C" and "2C" are provided in the EDD. |

| TEST TABLE | | | | |
|---|---|---|---|---|
| **Num** | **Attribute Name** | **Column Data Type** | **Required** | **Attribute Definition** |
| 7 | test_type (PK) | Text (10) | Yes (0) | Type of test. Valid values include "initial", "reextract", and "reanalysis", "dilution" are acceptable. See rt_test_type for al valid values. |
| 8 | lab_matrix_code | Text (10) | Yes (0) | Code that distinguishes between different types of matrix analyzed. Soil = "SO"; groundwater = "GW" and TCLP = TCLP as a lab matrix. See rt_matrix for valid values |
| 9 | analysis_location | Text (2) | Yes (0) | "LB" for fixed-based laboratory analysis, "FI" for field instrument, "FL" for mobile field laboratory analysis, or. |
| 10 | basis | Text (10) | Yes (0) | "Wet" for wet-weight basis; or "Dry" for dry-weight basis. For tests for which this distinction is not applicable use Wet |
| 11 | container_id | Text (30) | No | Sample container identifier. |
| 12 | dilution_factor | Single | Yes (0) | Test or analytical run dilution factor. **Must** be "1'" if no dilution. |
| 13 | Prep_method | Text (35) | Yes (2-1) | Laboratory sample preparation method name. See rt_std_prep_method for valid values. |
| 14 | prep_date | Date/ Time | Yes (2-1) | Date of sample preparation in MM/DD/YY format. |
| 15 | prep_time | Text (5) | Yes (2-1) | Time of sample preparation in 24-hour (military) HH:MM format |
| 16 | leachate_method | Text (15) | Yes (2-1) | Method name, e.g., SW1311 or SW1312. See rt_analytic_method for valid values. |
| 17 | leachate_date | Date/ Time | Yes (2-1) | Date of leachate preparation in MM/DD/YY format. |
| 18 | leachate_time | Text (5) | Yes (2-1) | Time of leachate preparation in 24-hour (military) HH:MM format. |
| 19 | lab_name_code | Text (10) | Yes (0) | Unique identifier of the laboratory reporting results. See rt_subcontractor for valid values. |
| 20 | qc_level | Text (10) | NO | Not populated by Lab. |
| 21 | lab_sample_ id | Text (20) | Yes (0) | Laboratory sample identifier. A field sample may have more than one laboratory lab_sample_id; however it is limited to only ONE lab_sample_id per method). |
| 22 | percent_moisture | Text (5) | Yes (2-1) | Percent moisture of the sample portion used in the specific lab_anl_methd_name test; this value may vary from test to test for any sample. The value must be NUMERIC as "NN.MM", e.g., 70.1% could be reported as "70.1" but not as 70.1%". The database assumes that the number is a "%" and units of measure are not necessary**. NOTE: This field MUST be populated for all soil, sludge, and sediment samples whether or not the value is reported in the hard copy. Use "0" for lab soil QC samples.** |
| 23 | subsample_amount | Text (14) | Yes 0) | Amount of sample used for the test. THIS FIELD MUST BE POPULATED |
| 24 | subsample_amount_u nit | Text (15) | Yes (0) | Unit of measurement for subsample amount. See rt_unit for valid values. |

| TEST TABLE | | | | |
|---|---|---|---|---|
| **Num** | **Attribute Name** | **Column Data Type** | **Required** | **Attribute Definition** |
| 25 | analyst_name | Text (30) | Yes (0) | Name or initials of laboratory analyst. |
| 26 | instrument_lab | Text (50) | Yes (0) | Instrument identifier. |
| 27 | comment | Text (255) | NO | Comments about the test as necessary (Optional). |
| 28 | preservative | Text (50) | Yes (2-1) | Indicate preservative or leave blank, if none. **THIS FIELD MUST BE POPULATED IF A PRESERVATIVE WAS IN THE SAMPLE AS RECEIVED FROM THE FIELD OR IF THE SAMPLE WAS PRESERVED BY THE LABORATORY BEFORE PREPARATION AND ANALYSIS.** |
| 29 | final_volume | Text (15) | Yes (2-1) | Final amount of extract or digestate. |
| 30 | final_volume_unit | Text (15) | Yes (2-1) | Unit of measure for final_volume. See rt_unit for valid values. |

| RESULT TABLE | | | | |
|---|---|---|---|---|
| **Num** | **Attribute Name** | **Column Data Type** | **Required** | **Attribute Definition** |
| 1 | sys_sample_code (PK) | Text (40) | Yes (0) | SAME AS #1 IN SAMPLE & TEST TABLES. This value is used in enforcing referential integrity between tables. |
| 2 | lab_anl_method_name (PK) | Text (35) | Yes (0) | Laboratory analytic method name. Must be same as lab_anl_method_name in Test File. See rt _analytic_method for valid values. |
| 3 | analysis_date (PK) | Date/Time | Yes (0) | Must be the SAME AS #3 IN THE TEST TABLE. This value is used in enforcing referential integrity between tables. Date of sample analysis in MM/DD/YY format. |
| 4 | analysis_time (PK) | Text (5) | Yes (0) | Must be the SAME AS #4 IN THE TEST TABLE. This value is used in enforcing referential integrity between tables. |
| 5 | total_or_dissolved_ (PK) | Text (1) | Yes (0) | Must be the SAME AS #5 IN THE TEST FILE. |
| 6 | column_number (PK) | Text (2) | Yes (3-2) | Must be the SAME AS #6 IN THE TEST FILE |
| 7 | test_type (PK) | Text (10) | Yes (0) | Must be the SAME AS #7 IN THE TEST FILE |
| 8 | cas_rn (PK) | Text (15) | Yes (0) | Chemical Abstracts Number for the parameter if available. This must be the true CAS # and "not made up". Where CAS #s are not available, i.e. wet chem. Parameters, identifiers will be provided by ARCADIS project requirements. See notes at end of section for TIC management. See rt_analyte for valid values. The lab is not authorized to add internally developed "CAS #s" for general chemistry parameters, surrogates, internal standards, TICs. CAS#s used for TICs must be available through an outside source such as "Chemfinder". |
| 9 | chemical_name | Text (60) | Yes (0) | Chemical name associated with CAS # in #8. The cas_rn field is the only chemical identifier information actually imported in EQuIS Chemistry. |

| RESULT TABLE | | | | |
|---|---|---|---|---|
| **Num** | **Attribute Name** | **Column Data Type** | **Required** | **Attribute Definition** |
| | | | | |
| 10 | result_value | Text (20) | Yes (3-1) | Analytical result reported for **"TRG" or "TIC"** result_type **ONLY**. Appropriate and consistent number of significant digits must be entered. **MUST BE BLANK FOR NON-DETECTS.** "SUR", "IS", and "SC" results do **NOT** populate this field (populate the QC fields). |
| 11 | result_error_delta | Text (20) | Yes (3-2) [Radiochem) | Error range applicable to the result value for radiochemistry results. |
| 12 | result_type_code | Text (10) | Yes (0) | Must be either "TRG" for a target or regular results, "TIC" for tentatively identified compounds, "SUR" for surrogates, "IS" for internal standards, or "SC" for spiked compounds.**[LCS, LCSD, MS, MSD, BS, BSD]** |
| 13 | reportable_result | Text (10) | Yes (0) | Must be either "**Yes**" for results, which are considered to be reportable, **or** "**No**" for other results. Used to distinguish between multiple results where a sample is retested after dilution or to indicate which of the first or second column result should be considered primary. For re-analyses and dilutions all results must be entered into the database if hard copy data is provided **BUT ONLY ONE RESULT FOR EACH COMPOUND/ANALYTE MAY BE FLAGGED AS REPORTABLE**. |
| 14 | detect_flag | Text (2) | Yes (0) | Either "Y" for detected analytes or "N" for non-detects**.** **MUST be "N" for NON-DETECTS**. |
| 15 | lab_qualifiers | Text (7) | Yes (3-2) | Qualifier flags assigned by the laboratory. See rt_qualifier for valid qualifiers that may be used. |
| 16 | Organic_ yn | Yes/No | Yes (0) | Must be either "Y" for organic constituents or "N" for inorganic constituents. |
| 17 | method_detection_ limit | Text (20) | Yes (0) | Laboratory determined MDL per 40 CFR Part 136, adjusted for dilutions and percent moisture (if it applies). |
| 18 | reporting_detection_ limit | Text (20) | Yes (0) | Detection limit that reflects sample analysis conditions including analysis volumes and dilution factors. This should be the laboratory PQL or standard reporting limits |
| 19 | quantitation_limit | Text (20) | No | NOT Currently used unless specifically defined for the project. |
| 20 | Result_unit | Text (15) | Yes (0) | Units of measure relates to **ALL** results including result_value, qc_original_concentration, qc_spike added, qc_spike_measured, qc_dup_orginal_conc, qc_dup_spike_added, qc_dup_spike_measured. See rt_unit for valid values. |
| 21 | detection_limit_unit | Text (15) | Yes (0) | Units of measure for detection limit(s). See rt_unit for valid values. |
| 22 | tic_retention_time | Text (8) | Yes (3-2) | Retention time in minutes for tentatively identified compounds (TICs). Populated only for TIC result_type |
| 23 | result_comment | Text (255) | NO | MUST BE LEFT BLANK BY THE LAB |

| RESULT TABLE | | | | |
|---|---|---|---|---|
| **Num** | **Attribute Name** | **Column Data Type** | **Required** | **Attribute Definition** |
| 24 | qc_original_conc | Text (14) | Yes (3-3) | The concentration of the analyte in the original (unspiked) sample. Populated for matrix spike samples. Not populated where original concentration is assumed to be zero, i.e. LCS or BS samples. |
| 25 | qc_spike_added | Text (14) | Yes (3-4) | The concentration of the analyte added to the original sample. Populated for **ALL** Surrogates, and LCS, BS, and MS samples |
| 26 | qc_spike_measured | Text (14) | Yes (3-4) | The measured concentration of the analyte. Use zero for spiked compounds that were not detected in the sample. **MUST BE NUMBERIC** even if diluted out or not recovered (use "0" if diluted, matrix interference, elevated concentrations of target compounds, etc.) Populated for **ALL** Surrogates, and LCS, BS, and MS samples |
| 27 | qc_spike_recovery | Text (14) | Yes (3-4) | The percent recovery for "SUR" and "SC" results. **MUST BE NUMERIC** even if diluted out or not recovered (use "0" if diluted, matrix interference, elevated concentrations of target compounds, etc.) Report as percentage (e.g., report "120%" as "120"); DO NOT include "%" sign in field. Populated for **ALL** Surrogates, and LCS, BS, and MS samples |
| 28 | qc_dup_original conc | Text (14) | Yes (3-5) | The concentration of the analyte in the original (unspiked) sample. Populated for matrix spike duplicate samples. Not populated where original concentration is assumed to be zero, i.e. LCSD or BSD samples. |
| 29 | qc_dup_spike_added | Text (14) | Yes (3-5) | The concentration of the analyte added to the original sample. Populated for **ALL** LCSD, BSD, and MSD samples. |
| 30 | qc_dup_spike_measured | Text (14) | Yes (3-5) | The measured concentration of the analyte in the duplicate. Populated for **ALL** LCSD, BSD, and MSD samples. MUST be NUMERIC. Use zero for spiked compounds that were not recovered due to dilution, matrix interference, elevated concentrations of target compounds, etc.. |
| 31 | qc_dup_spike_recovery | Text (14) | Yes (3-5) | The duplicate percent recovery. Populated for **ALL** LCSD, BSD, and MSD samples. **MUST be NUMERIC.** Use zero for spiked compounds that were not recovered due to dilution, matrix interference, elevated concentrations of target compounds, etc Report as percentage (e.g., report "120%" as "120"). |
| 32 | qc_rpd | Text (8) | Yes (3-6) | The relative percent difference between MS and MSD, LCS and LCSD, BS and BSD, & primary field sample result and Lab Replicate. Populated for **ALL** LCSD, BSD, MSD, and LR samples. **MUST be NUMERIC**. Use zero for RPDs that were not calculated due to elevated concentrations of target compounds, dilution, matrix interference, etc Report as percentage (e.g., report "120%" as 120"). |
| 33 | qc_spike_lcl | Text (8) | Yes (3-7) | Lower control limit for spike recovery. Required for spikes, spike duplicates, surrogate compounds, LCS and any spiked sample. Report as |

| RESULT TABLE | | | | |
|---|---|---|---|---|
| **Num** | **Attribute Name** | **Column Data Type** | **Required** | **Attribute Definition** |
| | | | | percentage (e.g., report "120%" as "120"). |
| 34 | qc_spike_ucl | Text (8) | Yes (3-7) | Upper control limit for spike recovery. Required for spikes, spike duplicates, surrogate compounds, LCS and any spiked sample. Report as percentage (e.g., report "120%" as "120"). |
| 35 | qc_rpd_cl | Text (8) | Yes (3-6) | Relative percent difference control limit. Required for any duplicated sample. Report as percentage (e.g., report "120%" as "120"). |
| 36 | qc_spike_status | Text (10) | Yes (3-4) | Used to indicate whether the spike recovery was within control limits. Use the "+" character to indicate failure, otherwise leave blank. |
| 37 | qc_dup_spike_status | Text (10) | Yes (3-5) | Used to indicate whether the duplicate spike recovery was within control limits. Use the "+" character to indicate failure, otherwise leave blank. |
| 38 | qc_rpd_status | Text (10) | Yes (3-6) | Used to indicate whether the relative percent difference was within control limits. Use the "+" character to indicate failure, otherwise leave blank. Required for any duplicated sample. |

| BATCH TABLE | | | | |
|---|---|---|---|---|
| **Num** | **Attribute Name** | **Column Datatype** | **Required** | **Attribute Definition** |
| 1 | sys_sample_code (PK) | Text (40) | Yes (0) | SAME AS #1 IN SAMPLE , TEST TABLE. This value is used in enforcing referential integrity between tables. |
| 2 | lab_anl_method_name (PK) | Text (35) | Yes (0) | SAME AS #2 IN TEST TABLE. See rt _analytic_method for valid values. |
| 3 | analysis_date (PK) | Date | Yes (0) | SAME AS #3 IN TEST TABLE. This value is used in enforcing referential integrity between tables. Date of sample analysis in MM/DD/YY format. May refer to either beginning or end of the analysis as required by EQuIS Chemistry project manager. |
| 4 | analysis_time (PK) | Text (5) | Yes (0) | SAME AS #4 IN TEST, AND RESULT TABLES. This value is used in enforcing referential integrity between tables. |
| 5 | total_or_dissolved (PK) | Text (1) | Yes (0) | SAME AS #5 IN TEST TABLE. This value is used in enforcing referential integrity between tables. |
| 6 | column_number (PK) | Text (2) | Yes (4-1) | SAME AS #6 IN TEST TABLE. This value is used in enforcing referential integrity between tables. |
| 7 | test_type (PK) | Text (10) | Yes (0) | SAME AS #7 IN TEST TABLE. This value is used in enforcing referential integrity between tables. |
| 8 | test_batch_type (PK) | Text (10) | Yes (0) | Lab batch type. Valid values include "Prep", "Analysis", and "Leach". Additional valid values may optionally be provided by the EQuIS Chemistry project manager. This is a required field for all batches. |
| 9 | test_batch_id | Text (20) | Yes (0) | Unique identifier for all and each lab batches. Must be unique within EQuIS Chemistry database. For example, the same identifier cannot be used for a prep batch and an analysis batch and the values must be different from one sampling event to another. THIS IDENTIFIER CANNOT BE USED FROM ONE YEAR TO THE NEXT. |

**ADDITIONAL INFORMATION FOR PREPARING THE 4-FILE EDD**

## SAMPLE FILE AND SYS_SAMPLE_CODE

1. The sys_sample_code is the unique sample ID as supplied on the Chain of Custody form with the same spacing as identified on the COC or on a supplemental Sample ID list submitted to the laboratory with the Laboratory Task Order or prior to submission of samples.

2. In order to uniquely identify MS/MSD, laboratory duplicates, TCLP, and SPLP samples, the laboratory shall add a suffix to the original sample ID listed on the chain of custody:

    Matrix Spike Sample = xxxxx MS
    Matrix Spike Duplicate Sample = xxxxx MSD
    Lab Duplicate/Replicate = xxxxx LR
    TCLP Extract Sample = xxxxx TCLP
    SPLP Extract Sample = xxxxx SPLP

    These are the only characters that are allowed to be amended to ANY sample ID as listed on the COC or the sample ID list referred to above.
    The parent_sample_code shall be entered into the parent_sample_code field of the Sample File.

3. If the sample_name field is provided it must contain the full sample ID from the chain of custody.

4. Sample_Type_Code must be appropriately applied as follows:
    "N" = normal field samples
    "FD" = field duplicates samples submitted blind to the laboratory
    "TB" = trip blanks
    "FB" = field blanks
    "EB" = rinsate or equipment blanks
    "BS" = laboratory control samples or blank spikes
    "BD" = laboratory control sample duplicates or blank spike duplicates
    "MS" = matrix spikes
    "SD" = matrix spike duplicates
    "LR" = laboratory duplicates or laboratory replicates

5. The following "**matrix_type**" codes must be used ("**SQ**" = soil QC sample and "**WQ"** = water QC sample):
    Method Blank = "SQ" or "WQ"
    MS/MSDs = "SQ" or "WQ"
    LCS/LCSDs = "SQ" or "WQ"
    BS/BSDs = "SQ" or "WQ"

6. SDG Numbers or laboratory Log Numbers (per ARCADIS PM direction) **MUST** be populated in "**sample_delivery_group**" field of the **Sample File.**

## QUALITY CONTROL SAMPLES AND DATA

7. The source of Lab Duplicates, Lab Replicates, Matrix Spikes, and Matrix Spike Duplicates is the Lab not the Field even if the MS/MSD are identified on the COC by the field sampling team. The samples are spiked in the laboratory not in the field.

8. Laboratory QC data, which span more than one SDG may be submitted with each appropriate SDG.

9. Laboratory LCS and LCSD should be reported as two separate samples.

10. **Matrix Spike and Matrix Spike Duplicate recoveries must be reported as "0" if the value is not calculated due to concentrations of the spiked analyte in the sample at concentrations above the 4X factor.**

11. **All laboratory method performance site-specific and batch Quality Control sample results (i.e. Method Blanks, LCS/LCSDs, Blank Spikes, Leachate Blanks as method appropriate) must be included in the EDD.** For most projects, this does **NOT** include **non-site-specific** matrix spikes and laboratory duplicates/replicates.

12. Laboratory batch sample duplicate/replicate and MS/MSD results from **non-project specific** samples (i.e. batch QC samples) shall **NOT** be included in the EDD.

13. Surrogates populate the qc_spike fields not qc_dup_spike fields or the result_value field even if the surrogates are reported for MSD, BSD, or LCSD samples.

14. QC_Spike_Added values for Spike, IS and Surrogate compounds are REQUIRED.

15. QC_Spike_Measured values for Spike, IS and Surrogate compounds are REQUIRED.

16. RPDs for LCSDs, BSDs, MSDs, and Laboratory Duplicates must be populated in the "**qc_rpd"** field. A value of "0" or "100" must be reported, as appropriate, if the RPD is not calculated due to excessive concentrations or interference present in the sample. The "**qc_rpd**" must be a numeric entry.

17. The RPD control limit must be listed in the "**rpd_cl"** field for all parameters where an RPD is reported. This includes lab duplicate/replicate samples.

**<u>SAMPLE FILE</u>**

18. The following "**matrix_type**" codes must be used for QC samples ("**SQ**" = soil QC sample and "**WQ"** = water QC sample):

    Method Blank = "SQ" of "WQ"
    MS/MSDs = "SQ" or "WQ"
    LCS/LCSDs = "SQ" or "WQ"
    BS/BSDs = "SQ" or "WQ"

19. SDG or Laboratory Project numbers must be populated in "sample_delivery_group" field.

**<u>TEST FILE</u>**

20. Percent moisture must be reported in the "**percent_moisture**" field in the **Test File** for all solid samples (i.e., soil, sediment, and sludge).

21. Subsample weights and final volumes must be listed for all parameters as appropriate.

**<u>RESULTS FILE</u>**

22. Result_value is only populated with data for "TRG" and "TIC" detections. All other data is entered in the "qc_" fields. The field must be "NULL" for non-detects and other analyte_types. The Reporting Limit must not be entered in this field.

23. Non-detected data shall have a lab_qualifier of "U" in addition to other qualifiers deemed applicable. The Detect_Flag shall be "N" and the Result_value field shall be blank.

24. The Reporting Limit must be provided for all parameters. The RL MUST be adjusted for dilutions made during analysis.

25. Surrogate recoveries MUST BE REPORTED in the qc_spike_measured and qc_spike_recovery fields, even if the surrogate had been diluted out. List “0” as the measured and recovered amount. Control Limits must also be entered for surrogates. Surrogates are “SUR” analyte_type not “TRG”.

26. Surrogate, LCS, LCSD, BS, BSD, MS, and MSD detected concentrations, and percent recoveries must be populated with a numeric value. A value of “0” **must** be entered if the Spiked Compound is diluted out or not recovered. An “+” is unacceptable as this is a numeric field.

27. “**QC_original_concentration**” must be populated for matrix spikes and matrix spike duplicates

28. Valid entries for the reportable_result field are "Yes" or "No” only.

29. ONLY report compounds of interest for any method blank, sample, and sample duplicate, trip blank.

30. Laboratory Qualifier designation must be consistent. For an estimated concentration with blank contamination “BJ” must be used. Note that “JB”, “B J” or “J B” cannot be used.

31. Explanation of Duplicate Qualifiers:

| | | |
|---|---|---|
| B | Analyte found in associated blank | Organic Analysis |
| B | <CRDL but >= Instrument Detection Limit | Inorganic Analysis |
| N | Presumptive evidence of a compound | Organic Analysis |
| N | Sample recovery not within control limits | Inorganic Analysis |

It is preferred by ARCADIS that the laboratory not qualifiers with multiple explanations. **Any qualifiers utilized in the hard copy report or the electronic report must be defined in the hard copy report. There is no exception to this requirement for explanation of qualifiers applied to electronic data.**

32. Nomenclature for tentatively identified compounds (TIC):

Use the CAS # if it is available and **REAL (outside verifiable source)** for TICs and enter the chemical name in the chemical_name field.

For UNKNOWN TICs follow the following protocol:

cas_rn for unkown VOA TIC = VTIC 1 through VTIC 10
cas_rn for unkown SVOA TIC = SVTIC 1 through SVTIC 20

Enter “UNKNOWN”, “UNKNOWN Hydrocarbon”, “UNKNOWN Aliphatic”, or other identifier as appropriate or applicable in “chemical_name” field.

TICs will produce errors in the ELDC/EDDP that cannot be corrected by the laboratory. These are the only acceptable errors in the data checker report unless otherwise authorized by ARCADIS.

33. TCLP or SPLP results must be submitted in units of mg/L or appropriate liquid units. **(Make sure that moisture correction is not automatically enforced).**

**BATCH FILE**

34. **The laboratory must use unique Batch File Names for each analytical department/method and for continuing years. Electronic validation utilizes Batch IDs to link field samples with quality control data. Overlapping Batch IDs are not acceptable.**

**GENERAL ISSUES**

35. Incomplete chain-of-custody (C-O-C) forms must be immediately communicated to the project manager. Some of the C-O-C information is used for completion of the Sample_Matrix_Code and Sample_Delivery_Group. These discrepancies must be rectified upon receipt of samples at the laboratory prior to log in.

36. **Duplicate sample IDs are not acceptable within the EQuIS database. It is imperative that samples including field blanks, trip blanks, equipment blanks, field duplicates have unique sample IDs for projects including ongoing sampling events such as quarterly groundwater monitoring.**

**SUBCONTRACTED PARAMETERS**

37. The EDD must be populated with **ALL** appropriate and applicable fields, including **ALL** QC data for any subcontracted parameters.

**PLEASE CONTACT THE ARCADIS PROJECT CHEMIST, DATA MANAGER or PROJECT MANAGER IF THERE ARE ANY QUESTIONS REGARDING PREPARATION OR GENERATION OF THE EDD.**

**EXAMPLE EDD REPORTS**

The following subsections provide examples of how the EQuIS EDD should be populated for QC data.

**RESULT FILE FIELDS FOR A NORMAL FIELD SAMPLE, TRG AND TIC RESULTS**

**The table below shows some of the fields in the Result File for a normal field sample (i.e., Sample_type_code = N, TB, FD, etc.) and "TRG" or "TIC" analyte_type_code. NOTE: all QC fields are blank.**

| cas_rn | result value | qc original conc | qc spike added | qc spike measured | qc spike recovery | qc dup. original conc | qc dupl. spike added | qc dup. spike measured | qc dup. spike recovery |
|---|---|---|---|---|---|---|---|---|---|
| 93-76-5 | 3.17 | | | | | | | | |
| 94-75-7 | 1.56 | | | | | | | | |
| 94-82-6 | 2.31 | | | | | | | | |

**RESULT FILE FIELDS FOR A NORMAL FIELD SAMPLE WITH SURROGATES**

The following table shows some of the fields in the result file for a normal field sample (i.e., Sample_type_code = N, TB, etc.). Note that QC fields are blank except on surrogate Rows.

| cas_rn | result value | result unit | result type code | qc original conc | qc spike added | qc spike measured | qc spike recovery |
|---|---|---|---|---|---|---|---|
| 93-76-5 | 1.56 | mg/L | TRG | | | | |
| 94-75-7 | 3.17 | mg/L | TRG | | | | |
| PHEN2F | | mg/L | SUR | | 12.5 | 12.9 | 103 |

## RESULT FILE FIELDS FOR A MATRIX SPIKE

The following table shows some of the fields in the result file for a matrix spike sample (i.e., Sample_type_code = MS). Note that all "dup" QC fields are blank, and that the result_value field is NULL. Also, the qc_rpd field would be blank for these rows. The parent_sample_code must contain the contents of the sys_sample_code of the original (parent) sample.

| cas_rn | result value | qc original conc | qc spike added | qc spike measured | qc spike recovery | qc dup. original conc | qc dupl. Spike added | qc dup. spike measured | qc dup. spike recovery |
|---|---|---|---|---|---|---|---|---|---|
| 93-76-5 | | 1.56 | 4.18 | 5.36 | 90.9 | | | | |
| 94-75-7 | | 3.17 | 4.18 | 7.15 | 95.2 | | | | |
| 94-82-6 | | 2.31 | 4.22 | 5.66 | 79.3 | | | | |

## RESULT FILE FIELDS FOR A MATRIX SPIKE DUPLICATE

The following table shows some of the fields in the result file for a matrix spike/matrix spike duplicate considered as a single sample (i.e., Sample_type_code = MSD). Note that all QC fields are completed, and that the result_value field is not needed. Also, the qc_rpd field would be completed for these rows. The parent_sample_code must contain the contents of the sys_sample_code of the original (parent) sample.

| cas_rn | result value | qc original conc | qc spike added | qc spike measured | qc spike recovery | qc dup original conc | qc dup. spike added | qc dup spike measured | qc dup spike recovery |
|---|---|---|---|---|---|---|---|---|---|
| 93-76-5 | | | | | | 1.56 | 4.23 | 5.70 | 97.8 |
| 94-75-7 | | | | | | 3.17 | 4.23 | 7.62 | 105 |
| 94-82-6 | | | | | | 2.31 | 4.13 | 5.33 | 73.1 |

## RESULT FILE FIELDS FOR A LCS or BS \

The following table shows some of the fields in the result file for an LCS sample (i.e., laboratory control sample, blank spike, Sample_type_code = BS). The qc_rpd field is left blank for these rows.

| cas_rn | result value | qc original conc | qc spike added | qc spike measured | qc spike recovery | qc dup original conc | qc dup spike added | qc dup spike measured | qc dup spike recovery |
|---|---|---|---|---|---|---|---|---|---|
| 93-76-5 | | 1.5 | 5.00 | 5.26 | 105 | | | | |
| 94-75-7 | | 10.2 | 1.00 | 1.02 | 102 | | | | |
| 94-82-6 | | 3.4 | 12.5 | 12.9 | 103 | | | | |

## RESULT FILE FIELDS FOR A LCS DUPLICATE OR BS DUPLICATE

The following table shows some of the fields in the result file for a laboratory control sample duplicate (i.e., Sample_type_code = BD). Note that the result_value field is not required. Also, the qc_rpd field must be completed for these rows.

| cas_rn | result value | qc original conc | qc spike added | qc spike measured | qc spike recovery | qc dup original conc | qc dup spike added | qc dup spike measured | qc dup spike recovery | qc_rpd |
|---|---|---|---|---|---|---|---|---|---|---|
| 93-76-5 | | | | | | | 5.00 | 4.92 | 98 | 2.0 |
| 94-75-7 | | | | | | | 1.00 | 0.95 | 95 | 6.6 |
| 94-82-6 | | | | | | | 12.5 | 11.8 | 94 | 12.3 |

## REANALYSES, REEXTRACTIONS, DILUTIONS

The following table shows how to report retests for three different circumstances. The first example, the sample was retested (for 75-25-2) because the initial result required reanalysis due to QC failure. For the second example, the initial sample result (for 95-95-4) required dilution. The third example (for 67-66-3) required both reanalysis and dilution (reanalysis supercedes dilution). The fourth example (87-86-5) shows an initial result that require re-extraction due to QC failure or elevated concentrations that could not be diluted based on the original extraction. The other results are "turned off" by setting the reportable_result field to "No".

| test_type | cas_rn | result_value | reportable_result |
|---|---|---|---|
| initial | 75-25-2 | 1.2 | No |
| reanalysis | 75-25-2 | 1.1 | Yes |
| initial | 95-95-4 | 250E | No |
| dilution | 95-95-4 | 328 | Yes |
| initial | 67-66-3 | 3.4 | No |
| reanalysis | 67-66-3 | 3.3 | Yes |
| initial | 87-86-5 | 980E | No |
| reextraction | 87-86-5 | 1500 | Yes |

## ANALYSES REQUIRING SECOND COLUMN CONFIRMATION

Analyte identification requiring confirmation by a second analytical technique is required by certain gas chromatography (GC) methods. A common technique used to confirm the identity of an analyte is to analyze the sample using a second GC column that is dissimilar from the GC column used for the first analysis. This confirmation technique is used routinely when analyzing samples for pesticides, herbicides, and certain volatile organic compounds (e.g., BTEX), and the two analyses often are performed simultaneously using an instrument equipped with dual GC columns connected to common injection port.

The method for reporting data from dual column GC analyses is not standard throughout the environmental laboratory industry. ARCADIS recommends that laboratories use the method described in SW-846 Method 8000B, unless project-specific requirements or the method used for analysis dictate otherwise. The following table illustrates the proper format to be used to report first and second column results. The results for the first and third constituents (75-25-2 and 95-95-4) are being reported from column 1, and the result for the second constituent (67-66-3) is being reported from column 2. The other results are "turned off" by setting the reportable_result field to "No".

| column_number | cas_rn | result_value | reportable_result |
|---|---|---|---|
| 1C | 75-25-2 | 6.2 | Yes |
| 1C | 67-66-3 | 3.4 | No |
| 1C | 95-95-4 | 5.6 | Yes |
| 2C | 75-25-2 | 1.3 | No |
| 2C | 67-66-3 | 33.7 | Yes |
| 2C | 95-95-4 | 5.4 | No |

## REFERENCE TABLES

A number of fields in each of the EDD files must be entered to correspond exactly with reference values standardized by ARCADIS. These reference values will be updated from time to time. Each laboratory will be supplied a copy of the updated document. It is the laboratory’s responsibility to submit EDDs using the most current reference tables as defined by a specific project.

The following table summarizes the EDD fields where standard reference values must be used:

| EDD File | EDD Field | Reference Table |
|---|---|---|
| Sample | sample_type_code | rt_sample_type |
| | sample_matrix_code | rt_matrix |
| Test | lab_anl_method_name | rt_anl_mthd |
| | lab_matrix_code | rt_matrix |
| | prep_method | rt_std_prep_mthd |
| | subsample_amount_unit | rt_unit |
| | final_volume_unit | rt_unit |
| Result | lab_anl_method_name | rt_anl_mthd |
| | cas_rn | rt_analyte |
| | chemical_name | rt_analyte |
| | result_type_code | rt_result_type |
| | lab_qualifier | rt_qualifier |
| | result_unit | rt_unit |
| | detection_limit_unit | rt_unit |
| Batch | lab_anl_method_name | rt_anl_mthd |

## IV. EDP

The EDP data checker assists the **LABORATORY** in checking EDD files to ensure that they are error-free prior to submission to ARCADIS. All laboratories providing data to ARCADIS **must use** the EDP program to verify that EDDs are without error. The EDP error reports for each file **must be** submitted with each EDD.

The use of the EDDP helps to solve common data population problems including duplicate data, incorrectly populated fields, and incorrect methods, CAS #s, and other acceptable reference values. If an EDD is received by ARCADIS containing errors it will be rejected until the EDD report is acceptable for import into the EQuIS database. Invoice payment will not be made until the EDD is acceptable.

ARCADIS will provide laboratories with the most recent version of the EDP.

# Appendix C

## Health and Safety Plan

# Site Specific Health and Safety Plan

Revision 19 a

| | |
|---|---|
| Project Name: | Shluman's Salvage Yard<br>Elmira, NY |
| Project Number: | 30119464 |
| Client Name: | NYSEG |
| Date: | 4/20/2022 |
| HASP Expires | 4/20/2023 |
| Revision: | 0 |

Approvals:

HASP Developer: Makenna Guarnieri

Project Manager: Joe Bistrovich

HASP Reviewer: Liz, Hover (Baker)

HASP Reviewer Name Typed

Elizabeth Hover

HASP Reviewer Signature (handwritten or digital signature)

**Arcadis Culture of Caring**

Arcadis is committed to a Culture of Caring that ensures each Arcadis employee, part time as needed employee (PTAN), temporary agency employee under Arcadis day to day control, Inexperienced Workers and contractor (cumulatively referred to here as "field staff") goes home at the end of the day free from injury or illness. I certify that the following has been performed with all Arcadis field staff on this project either in person or virtually through Teams:

- [X] Reviewed the HASP including a discussion of hazard identification and controls.
  - [ ] If conducting activities deemed by Arcadis to be "High Risk", frontline management has reviewed applicable H&S standards (Job Safety Analysis [JSA] when authorized by H&S) for these activities with field staff.
  - [ ] If permit to work is required, frontline management has reviewed the permit(s) with field staff.
- [X] Reviewed proactive H&S engagement expectations/injury prevention actions.
- [X] Reviewed Stop Work Authority.
- [X] Reviewed the incident reporting process and expectations including when WorkCare should be contacted by staff (WorkCare incident intervention for all minor, non-emergency injuries) and that the WorkCare phone number is programmed into field team cell phone.
- [ ] For Inexperienced Workers, a mentor has been assigned for the new task being performed.

For short service employees (SSEs), PTANS* and temporary agency employees* :

- [ ] Provided coaching and mentoring on Arcadis H&S expectations during project work. Reviewed in detail specific hazards and controls and provided a resource who can be contacted if individual has questions regarding planned or unplanned work tasks.

Mentor/Resource # ______________________ ______________________

Name Phone Number

Signed:

______________________ Select

* Upon hiring/contracting for the first time.

# Emergency Information

**Site Address:** Shulman's Company Inc.
197 E Washington Ave
Elmira, NY 14901

**Emergency Phone Numbers:**

| | | |
|---|---|---|
| Emergency (fire, police, ambulance) | | 911 |
| Emergency (facility specific, if applicable): | | |
| | | |
| | | |
| Emergency Other (specify): | | |
| Primary Client Contact: | John Ruspantini | 585-484-6787 |
| WorkCare (non-life-threatening injury/illness): | | 1-888-449-7787 |
| Project H&S: | Dan Zuck | 315-671-9152 |
| Task Manager: | Nicholas Beyrle | 585-662-4044 |
| Project Manager: | Joe Bistrovich | 315-671-9697 |
| H&S Specialist: | Alec MacAdam | 720-454-0948 |
| Area H&S Director: | Andrew McDonald | 410-200-3752 |

**Hospital Name and Address:** Emergency Department, Arnot Ogden Medical Center
600 Roe Ave
Elmira, New York 14905

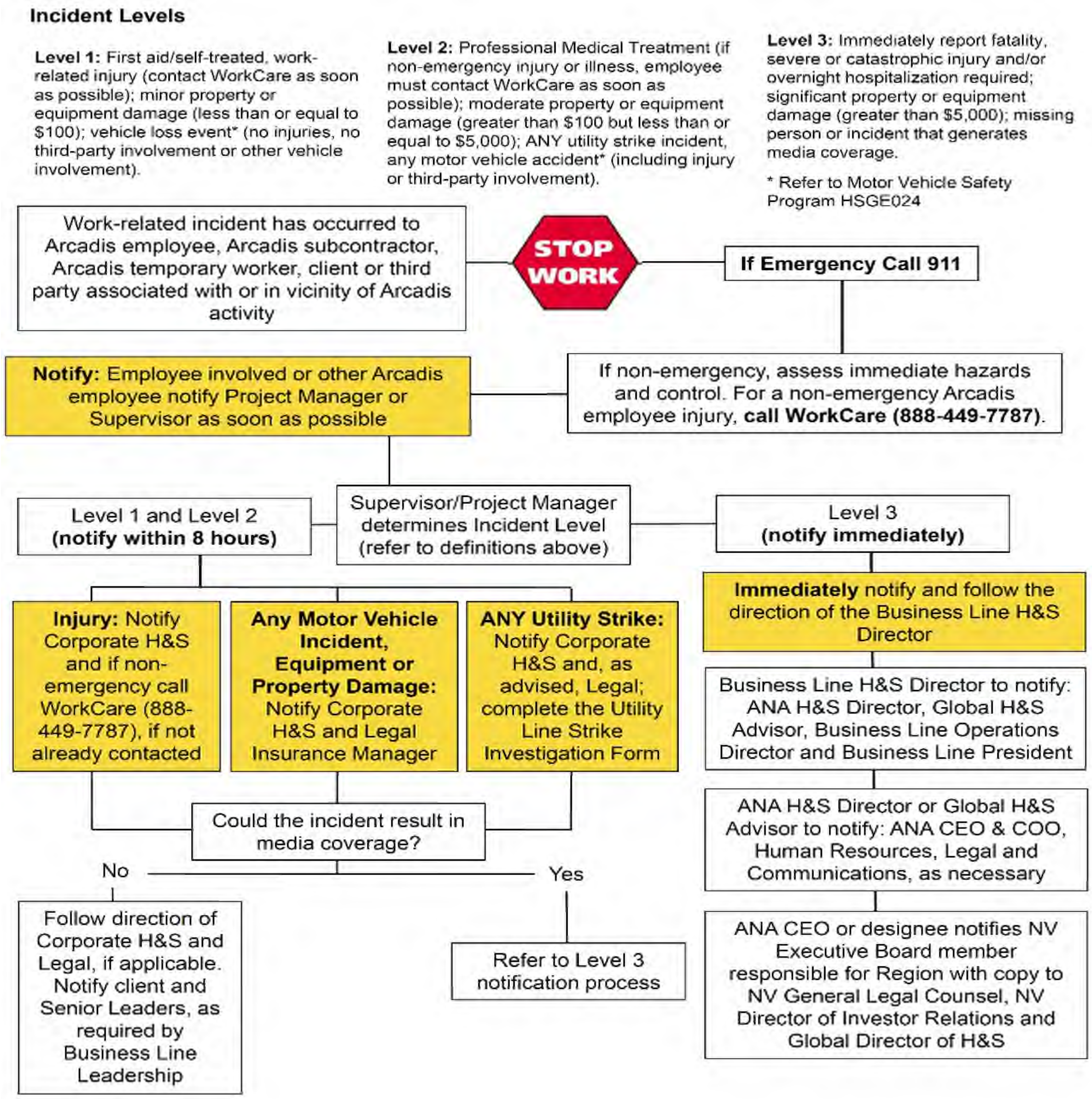
Hospital Phone Number: 607-737-4194

**Supplemental Client Contact Information:**

**Other Important Phone Numbers:**

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

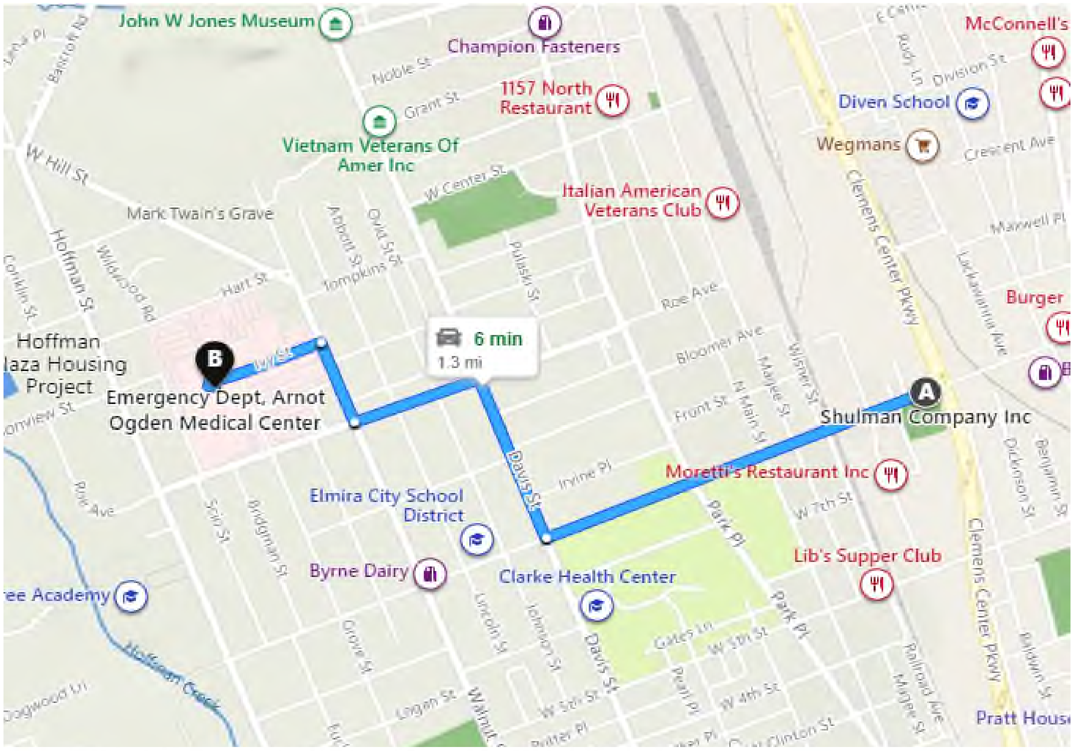
## Incident Reporting Protocol Within Arcadis




## Client Incident Reporting Protocol

Dial 911/ Facility Emergency Number/ WorkCare as applicable. Contact PM/Supervisor Joe Bistrovich.

**Route to the Hospital**




| | | |
|---|---|---|
| **A** | Shulman Company Inc, 197 E Washington Ave, Elmira, NY 14901 | 6 min , 1.3 miles |
| **B** | Emergency Dept, Arnot Ogden Medical Center, 600 Roe Ave, Elmira, NY 14905 | Light traffic (Leave at 8:41 AM)<br>Via W Washington Ave, Davis St<br>· Local roads |

**A** Shulman Company Inc

| | | | |
|---|---|---|---|
| ↑ | 1. | Head **west** on **E Washington Ave** toward Michigan Ave | 0.1 mi |
| ↑ | 2. | Road name changes to **W Washington Ave** | 0.4 mi |
| ↱ | 3. | Turn **right** onto **Davis St** | 0.3 mi |
| ↰ | 4. | Turn **left** onto **Roe Ave** | 0.2 mi |
| ↱ | 5. | Turn **right** onto **Walnut St** | 0.1 mi |
| ↰ | 6. | Turn **left** onto **Ivy St** | 0.1 mi |
| ↑ | 7. | Keep **straight** to get onto **road** | 331 ft |
| | 8. | Arrive at destination<br>The last intersection before your destination is Ivy St | |

**B** Emergency Dept, Arnot Ogden Medical Center

**Site Map Showing Assembly Areas**

**Site Type**

The project site is an active facility with the following attributes:

| | |
|---|---|
| Commercial | |
| Industrial | |
| Parking Lot/Private Drive (NON ROW) | |
| | |
| | |

Work in parking lots will require preparation of a Non-ROW Traffic Safety Plan.

**Surrounding Land Use and Topography**

The Shulman's Salvage Yard Site is is an active yard located at One Shulman Plaza in a mixed residential and commercial area The property is located the intersection of Eastern Washington Avenue and Clemens Center Parkway. The Site is bounded to the south by East Washington Avenue and to the east by a chain link fence and Clemens Center Parkway. North of the Site is a Chemung County Transit Systems office. A Norfolk Southern Property is adjacent to the northwestern portion of the Site. To the southwest of the Site, the elevation rises abruptly to the former Triple Cities.

**Simultaneous Operations (SimOps)**

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

**Site Background**

Currently, processed scrap metal and paper goods are sorted onsite and taken offsite via tractor trailer, or by rail using a single spur line located in the northwest section of the Site. Two large crushers (used to crush automobiles) previously operated on the Site, north of the main building, but these have since been removed. In 1982, a shipment of drained transformers was processed onsite and sold as scrap. It is believed that some of the polychlorinated biphenyl (PCB) contamination at the Site is derived from crushing the transformers.

**Project Tasks**

The following tasks are identified for this project:

| | |
|---|---|
| 1 | Utilities - Clearance |
| 2 | Sampling - Soil sampling using direct push technology |
| 3 | Survey - Land surveying |
| 4 | Drilling - Contractor oversight |
| 5 | Waste - Containment of IDW in small containment devices greater than 10 gallons but less than or equal to 119 gallons capacity |
| 6 | Select |
| 7 | Select |
| 8 | Select |
| 9 | Select |
| 10 | Select |
| 11 | Select |
| 12 | Select |
| 13 | Select |
| 14 | Select |
| 15 | Select |
| 16 | Select |
| 17 | Select |
| 18 | Select |
| 19 | Select |
| 20 | Select |

The following documents and/or plans associated with the above task(s) are required and attached:
- The Arcadis Utilities and Structures Checklist must be used for utility clearance activities.
- Current Arcadis COVID-19 Prevention Recommendations and Guidance

| X | Required Checklists/Work Forms |
|---|---|
| | *Tailgate Safety Briefing Form* |
| | *Vehicle Inspection Checklist* |
| | *Utility and Structures Checklist* |
| | *Tailgate Safety Briefing Form* |
| | |
| | |
| | |

| ☐ | Required Permits |
|---|---|
| | *Not Applicable* |
| | |

| ☐ | Required H&S Standards |
|---|---|
| | *Heat Stress Prevention_ARC HSIH013* |
| | *Stop Work Authority_ARC HSGE009* |
| | *Utility Location Procedures_ARC HSFS019* |

**Short Service Employees (SSEs)**

SSEs (employees who are employed with Arcadis for less than 1 year or are Inexperienced Workers) are not anticipated to be working on this project. If staffing changes occur during this project and SSEs are utilized, the project team working in conjunction with the SSE's administrative supervisor will ensure requirements of ARC HSGE019 "Short Service Employees" are completed. SSE's will be identified in the project Tailgate Safety Meeting Form.

**Roles and Responsibilities**

| | Name | Role | Short Service Employee |
|---|---|---|---|
| 1 | Nicholas Beyrle | Project Manager (PM) | No |
| 2 | | Associate Project Manager (APM) | |
| 3 | Joe Bistrovich | Task Manager | No |
| 4 | Ryan Clare | Field Technical Lead | No |
| 5 | Ryan Clare | Site Safety Officer (SSO) (HAZWOPER) | No |
| 6 | | | |
| 7 | | | |
| 8 | | | |
| 9 | | | |
| 10 | | | |

**Training**

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

| |
|---|
| Defensive Driving - Smith On-Line |
| Hazwoper 40-Hour |
| Hazwoper 8-Hour Annual Refresher |
| PPE (non-certificate) |
| HAZCOM GHS/EAP (non-certificate) |
| None |
| None |
| None |
| None |
| None |
| None |
| None |
| None |
| Client specific: |
| |
| Other: |
| |

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

| | Names or Numbers from above |
|---|---|
| DOT HazMat #1 | |
| First Aid/CPR | |
| None | |
| None | |
| None | |
| None | |
| None | |
| None | |
| None | |
| None | |
| None | |
| None | |
| None | |
| None | |
| None | |
| Other: | |
| | |

**The Arcadis Fundamental H&S Principles**

Staff working on any of the task(s) listed above must utilize the six Arcadis Fundamental H&S Principles to ensure work is conducted safely. These principles include: 1) Use of TRACK, 2) H&S Planning, 3) Stop Work Authority, 4) "If Not Me Then Who", 5) Stewardship, and 6) Incident Reporting. Every project team member plays an important role in project health and safety. This is more than just having a HASP, training, or PPE. Proactive staff engagement with these principles is critical to a safe work environment.

**General Task Hazard Assessment and Risk Control (HARC)**

| General: | Site-Wide |
|---|---|

The 12 hazard category HARC ratings are not available in this General THA. The mitigated and unmitigated ratings for the hazards presented are based on the Risk Assessment Matrix below. Modify hazards and ratings as necessary to meet project needs.

| Risk Assessment Matrix | | Likelihood Ratings | | | |
|---|---|---|---|---|---|
| Consequences Ratings | | A | B | C | D |
| People | Property | 0 Almost Impossible | 1 Possible but Unlikely | 2 Likely to Happen | 3 Almost Certain to Happen |
| 1-Slight or No Health Effect | Slight or No Damage | 0-Low | 1-Low | 2-Low | 3-Low |
| 2-Minor Health Effect | Minor Damage | 0-Low | 2-Low | 4-Medium | 6-Medium |
| 3-Major Health Effect | Local Damage | 0-Low | 3-Low | 6-Medium | 9-High |
| 4-Fatalities | Major Damage | 0-Low | 4-Medium | 8-High | 12-High |

***Hazard #1***

Driving - On road - Injury or vehicle damage from motor vehicle accident or incident

| | | |
|---|---|---|
| Suggested FHSHB Ref: | 3.4 | To mitigate this hazard, use TRACK and the following: |
| Overall Unmitigated Risk: | HIGH | Smith System (on line) |
| Mitigated Risk: | MEDIUM | JSAs |

Comments: Use Smith System "5-Keys" when driving. See Driving JSA for details.

***Hazard #2***

Driving - Driver - Injury, death or property damage due to driver distraction, fatigue, etc.

| | | |
|---|---|---|
| Suggested FHSHB Ref: | 3.4, 3.21 | To mitigate this hazard, use TRACK and the following: |
| Overall Unmitigated Risk: | HIGH | Smith System (on line) |
| Mitigated Risk: | LOW | Driver awareness and use of stop work authority |

Comments: Use route planning. Keep eyes moving while driving. See Driving JSA.

***Hazard #3***

Biological - skin/eye irritation or damage from poisonous plants

| | | |
|---|---|---|
| Suggested FHSHB Ref: | 3.17.11 | To mitigate this hazard, use TRACK and the following: |
| Overall Unmitigated Risk: | LOW | See HASP Tick/Poisonous Plant Section |
| Mitigated Risk: | LOW | Job Briefing/Site Awareness |

Comments: Use skin pre-treatment lotions when available.

***Hazard #4***

Biological - bites or stings from exposure to insects or arachnids

| | | |
|---|---|---|
| Suggested FHSHB Ref: | 3.17: 2,3,7,8,9,10 | To mitigate this hazard, use TRACK and the following: |
| Overall Unmitigated Risk: | MEDIUM | PPE (see HASP "PPE" section) |
| Mitigated Risk: | LOW | Job Briefing/Site Awareness |

Comments: Do body check daily. For ticks see also HASP Tick/Poisonous Plant section

***Hazard #5***

Biological - cuts, scrapes, skin/eye puncture from exposure to physically damaging plants

| | | |
|---|---|---|
| Suggested FHSHB Ref: | 3.17.11 | To mitigate this hazard, use TRACK and the following: |
| Overall Unmitigated Risk: | MEDIUM | Job Briefing/Site Awareness |
| Mitigated Risk: | LOW | PPE (see HASP "PPE" section) |

Comments:

**General Task HARC (continued)**

| | | |
|---|---|---|
| ***Hazard #6*** | | |
| Environmental - Thermal stress - Injury or illness from heat or cold | | |
| Suggested FHSHB Ref: | 3.16 | To mitigate this hazard, use TRACK and the following: |
| Overall Unmitigated Risk: | MEDIUM | Field H&S Handbook (see ref. above) |
| Mitigated Risk: | LOW | JSAs |
| Comments: | Use job rotation or rest breaks. Stay hydrated and eat regularly. | |
| ***Hazard #7*** | | |
| Environmental - Inclement weather -Injury or equipment damage from inclement weather | | |
| Suggested FHSHB Ref: | 3.12 | To mitigate this hazard, use TRACK and the following: |
| Overall Unmitigated Risk: | MEDIUM | Weather Monitoring |
| Mitigated Risk: | LOW | Cont./Emerg. Planning |
| Comments: | Use 30/30 rule for lightning. See FHSHB for details. | |
| ***Hazard #8*** | | |
| Motion - Musculoskeletal - Injury from lifting, twisting , stooping, or awkward body positions | | |
| Suggested FHSHB Ref: | 3.29.1 | To mitigate this hazard, use TRACK and the following: |
| Overall Unmitigated Risk: | MEDIUM | Engineering Controls (specify in comments) |
| Mitigated Risk: | LOW | Admin. Controls (specify in comments) |
| Comments: | Use proper lifting techniques. Use job rotation when applicable. See FHSHB for details. | |
| ***Hazard #9*** | | |
| Motion - Musculoskeletal - Injury from repeated work activity or body motion | | |
| Suggested FHSHB Ref: | 3.29.2 | To mitigate this hazard, use TRACK and the following: |
| Overall Unmitigated Risk: | MEDIUM | Engineering Controls (specify in comments) |
| Mitigated Risk: | LOW | Admin. Controls (specify in comments) |
| Comments: | Use proper lifting techniques. Use job rotation when applicable. See FHSHB for details. | |
| ***Hazard #10*** | | |
| Gravity - Falls - Injury due to slips and trips | | |
| Suggested FHSHB Ref: | 3.26.4, 4.11 | To mitigate this hazard, use TRACK and the following: |
| Overall Unmitigated Risk: | MEDIUM | Site Awareness |
| Mitigated Risk: | LOW | Housekeeping |
| Comments: | Use footwear appropriate for site conditions, plan routes and do not hurry while walking. | |

**Task Specific HARC**

| Task 1: | Utilities - Clearance | | | | | | |
|---|---|---|---|---|---|---|---|
| HARC Unmitigated Hazard Types (H-High, M-Medium, L-Low): | | | | FHSHB Ref: | 3.36 | | |
| Biological* | L | Chemical | L | Driving* | - | Electrical | M |
| Environmental* | L | Gravity* | L | Mechanical | M | Motion* | M |
| Personal Safety | L | Pressure | L | Radiation | - | Sound | L |

* *Hazard rating, if present, excludes General THA hazards in this category.*

***Hazard #1***

Environmental - Utilities - Injury or property damage from utility strike/damage

| | | |
|---|---|---|
| Suggested FHSHB Ref: | 3.36 | To mitigate this hazard, use TRACK and the following: |
| Overall Unmitigated Risk: | HIGH | Specialized Checklist/Forms |
| Mitigated Risk: | MEDIUM | Field H&S Handbook (see ref. above) |
| Comments: | | |

***Hazard #2***

Biological - bites or stings from exposure to insects or arachnids

| | | |
|---|---|---|
| Suggested FHSHB Ref: | 3.17: 2,3,7,8,9,10 | To mitigate this hazard, use TRACK and the following: |
| Overall Unmitigated Risk: | MEDIUM | See HASP "Tick/Poisonous Plant Hazards" Section |
| Mitigated Risk: | LOW | PPE (see HASP "PPE" section) |
| Comments: | | |

**Task Specific HARC (continued)**

| Task 2: | Sampling - Soil sampling using direct push technology | | | | | | |
|---|---|---|---|---|---|---|---|
| HARC Unmitigated Hazard Types (H-High, M-Medium, L-Low): | | | | | | FHSHB Ref: | 3.9 |
| Biological* | L | Chemical | L | Driving* | - | Electrical | M |
| Environmental* | L | Gravity* | M | Mechanical | M | Motion* | M |
| Personal Safety | L | Pressure | L | Radiation | - | Sound | H |

***Hazard #1***

Chemical - solids/particulates, skin or eye irritation/damage/allergy

| | | |
|---|---|---|
| Suggested FHSHB Ref: | 3.9, 3.22, 3.30, 3.33 | To mitigate this hazard, use TRACK and the following: |
| Overall Unmitigated Risk: | MEDIUM | HASP |
| Mitigated Risk: | LOW | PPE (see HASP "PPE" section) |
| Comments: | | |

***Hazard #2***

Environmental - Sun or wind -Skin injury from sun or wind exposure

| | | |
|---|---|---|
| Suggested FHSHB Ref: | 3.12 | To mitigate this hazard, use TRACK and the following: |
| Overall Unmitigated Risk: | MEDIUM | PPE (see HASP "PPE" section) |
| Mitigated Risk: | LOW | Field H&S Handbook (see ref. above) |
| Comments: | | |

***Hazard #3***

Mechanical - Pinch point - Injury by pinching of body part in mechanical process

| | | |
|---|---|---|
| Suggested FHSHB Ref: | 3.27.4 | To mitigate this hazard, use TRACK and the following: |
| Overall Unmitigated Risk: | MEDIUM | Machine Guarding |
| Mitigated Risk: | LOW | Inspections |
| Comments: | Maintain equipment to manufacturer's recommendations. | |

***Hazard #4***

Motion - Cuts and scrapes - Injury from moving object impacting skin or eye

| | | |
|---|---|---|
| Suggested FHSHB Ref: | 2.5, 3.22 | To mitigate this hazard, use TRACK and the following: |
| Overall Unmitigated Risk: | MEDIUM | JSAs |
| Mitigated Risk: | LOW | PPE (see HASP "PPE" section) |
| Comments: | | |

***Hazard #5***

Environmental - Utilities - Injury or property damage from utility strike/damage

| | | |
|---|---|---|
| Suggested FHSHB Ref: | 3.36 | To mitigate this hazard, use TRACK and the following: |
| Overall Unmitigated Risk: | HIGH | Specialized Checklist/Forms |
| Mitigated Risk: | MEDIUM | Inspections |
| Comments: | | |

***Hazard #6***

Chemical - liquids, skin or eye irritation/damage/allergy

| | | |
|---|---|---|
| Suggested FHSHB Ref: | 3.9, 3.22, 3.30, 3.33 | To mitigate this hazard, use TRACK and the following: |
| Overall Unmitigated Risk: | MEDIUM | PPE (see HASP "PPE" section) |
| Mitigated Risk: | LOW | HASP |
| Comments: | | |

**Task Specific HARC (continued)**

| Task 3: | Survey - Land surveying |
|---|---|

HARC Unmitigated Hazard Types (H-High, M-Medium, L-Low): FHSHB Ref: 3.9

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Biological* | M | Chemical | - | Driving* | - | Electrical | - |
| Environmental* | M | Gravity* | M | Mechanical | - | Motion* | M |
| Personal Safety | L | Pressure | - | Radiation | - | Sound | L |

***Hazard #1***

Personal safety - Fatigue - Injury or illness caused while working when fatigued

| | | |
|---|---|---|
| Suggested FHSHB Ref: | 3.21 | To mitigate this hazard, use TRACK and the following: |
| Overall Unmitigated Risk: | MEDIUM | Job Rotation |
| Mitigated Risk: | LOW | Job Briefing/Site Awareness |
| Comments: | | |

***Hazard #2***

Motion - Struck by - Bodily injury from impact with moving object

| | | |
|---|---|---|
| Suggested FHSHB Ref: | 2.5, 3.22 | To mitigate this hazard, use TRACK and the following: |
| Overall Unmitigated Risk: | MEDIUM | Site Awareness |
| Mitigated Risk: | LOW | Job Briefing/Site Awareness |
| Comments: | | |

***Hazard #3***

Environmental - Sun or wind -Skin injury from sun or wind exposure

| | | |
|---|---|---|
| Suggested FHSHB Ref: | 3.12 | To mitigate this hazard, use TRACK and the following: |
| Overall Unmitigated Risk: | MEDIUM | PPE (see HASP "PPE" section) |
| Mitigated Risk: | LOW | Field H&S Handbook (see ref. above) |
| Comments: | | |

**Task Specific HARC (continued)**

| **Task 4:** | **Drilling - Contractor oversight** | | | | | | |
|---|---|---|---|---|---|---|---|
| HARC Unmitigated Hazard Types (H-High, M-Medium, L-Low): | | | | | | FHSHB Ref: | 4.5 |
| Biological* | L | Chemical | L | Driving* | - | Electrical | L |
| Environmental* | L | Gravity* | M | Mechanical | M | Motion* | M |
| Personal Safety | - | Pressure | L | Radiation | - | Sound | H |

| | | |
|---|---|---|
| ***Hazard #1*** | | |
| Gravity - Struck by - Injury from falling object | | |
| Suggested FHSHB Ref: | 3.26.2 | To mitigate this hazard, use TRACK and the following: |
| Overall Unmitigated Risk: | MEDIUM | H&S Standards |
| Mitigated Risk: | LOW | Job Briefing/Site Awareness |
| Comments: | | |
| ***Hazard #2*** | | |
| Sound - Noise - Injury or illness due to noise exposure | | |
| Suggested FHSHB Ref: | 3.15 | To mitigate this hazard, use TRACK and the following: |
| Overall Unmitigated Risk: | MEDIUM | Engineering Controls (specify in comments) |
| Mitigated Risk: | LOW | H&S Standards |
| Comments: | Hearing protection | |
| ***Hazard #3*** | | |
| Pressure - Hydraulic - Injury from hydraulic process or device failure | | |
| Suggested FHSHB Ref: | 2.5, 4.5, 4.6 | To mitigate this hazard, use TRACK and the following: |
| Overall Unmitigated Risk: | MEDIUM | Engineering Controls (specify in comments) |
| Mitigated Risk: | LOW | PPE (see HASP "PPE" section) |
| Comments: | ensure gaurds are in place and functioning, use of PPE | |

**Task Specific HARC (continued)**

| Task 5: | Waste - Containment of IDW in small containment devices greater than 10 gallons but less than or equal to 119 gallons capacity |
| --- | --- |

HARC Unmitigated Hazard Types (H-High, M-Medium, L-Low): FHSHB Ref: 3.3

| | | | | | | | |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Biological* | L | Chemical | M | Driving* | - | Electrical | - |
| Environmental* | M | Gravity* | M | Mechanical | L | Motion* | M |
| Personal Safety | L | Pressure | L | Radiation | - | Sound | L |

***Hazard #1***

Chemical - liquids, skin or eye irritation/damage/allergy

| | | |
| --- | --- | --- |
| Suggested FHSHB Ref: | 3.9, 3.22, 3.30, 3.33 | To mitigate this hazard, use TRACK and the following: |
| Overall Unmitigated Risk: | MEDIUM | PPE (see HASP "PPE" section) |
| Mitigated Risk: | LOW | Job Briefing/Site Awareness |
| Comments: | | |

***Hazard #2***

Gravity - Struck by - Injury from falling object

| | | |
| --- | --- | --- |
| Suggested FHSHB Ref: | 3.26.2 | To mitigate this hazard, use TRACK and the following: |
| Overall Unmitigated Risk: | MEDIUM | H&S Standards |
| Mitigated Risk: | LOW | Job Briefing/Site Awareness |
| Comments: | | |

***Hazard #3***

Personal safety - Fatigue - Injury or illness caused while working when fatigued

| | | |
| --- | --- | --- |
| Suggested FHSHB Ref: | 3.21 | To mitigate this hazard, use TRACK and the following: |
| Overall Unmitigated Risk: | MEDIUM | Job Rotation |
| Mitigated Risk: | LOW | Field H&S Handbook (see ref. above) |
| Comments: | | |

**Hazard Communication (HAZCOM)/Global Harmonization System (GHS)**

☐ HAZCOM/GHS for this project is managed by the client or general contractor

*List the chemicals anticipated to be used by Arcadis on this project per HAZCOM/GHS requirements.*
(Modify quantities as needed)

| | **Preservatives** | Qty |
|---|---|---|
| | Not applicable | |
| X | Hydrochloric acid | <500 ml |
| | Nitric acid | <500 ml |
| | Sulfuric acid | <500 ml |
| | Sodium hydroxide | <500 ml |
| | Zinc acetate | <500 ml |
| | Ascorbic acid | <500 ml |
| | Acetic acid | <500 ml |
| | Isopropyl alcohol | < 4 gal. |
| | Formalin (<10%) | < 4 gal. |
| | Methanol | <500 ml |
| | Sodium bisulfate | <500 ml |

| | **Decontamination** | Qty |
|---|---|---|
| | Not applicable | |
| X | Alconox | ≤ 5 lbs |
| | Liquinox | ≤ 1 gal |
| | Acetone | ≤ 1 gal |
| | Methanol | ≤ 1 gal |
| | Hexane | ≤ 1 gal |
| | Isopropyl alcohol | ≤ 4 gal |
| | Nitric acid | ≤ 1 L |
| | Other: | |
| | ______ | |
| | ______ | |
| | ______ | |

| | **Calibration** | Qty. |
|---|---|---|
| | Not applicable | |
| X | Isobutylene/air | 1 cyl |
| | Methane/air | 1 cyl |
| | Pentane/air | 1 cyl |
| | Hydrogen/air | 1 cyl |
| | Propane/air | 1 cyl |
| | Hydrogen sulfide/air | 1 cyl |
| | Carbon monoxide/air | 1 cyl |
| | pH standards (4,7,10) | ≤ 1 gal |
| | Conductivity standards | ≤ 1 gal |
| | Other: | |
| | ______ | |

| | **Fuels** | Qty. |
|---|---|---|
| X | Not applicable | |
| | Gasoline | ≤ 5 gal |
| | Diesel | ≤ 5 gal |
| | Kerosene | ≤ 5 gal |
| | Propane | 1 cyl |
| | Other: | |
| | ______ | |

| | **Kits** | | Qty. |
|---|---|---|---|
| | Not applicable | | |
| | Hach (specify): | ______ | 1 kit |
| | DTECH (specify): | ______ | 1 kit |
| | Other: | ______ | 1 kit |
| | ______ | | |
| | ______ | ______ | |
| | ______ | ______ | |

| | **Remediation** | Qty. |
|---|---|---|
| | Not applicable | |
| | ______ | |
| | ______ | |
| | ______ | |
| | ______ | |
| | ______ | |

| | **Other:** | Qty. |
|---|---|---|
| | Not applicable | |
| X | Spray paint | ≤ 6 cans |
| | WD-40 | ≤ 1 can |
| | Pipe cement | ≤ 1 can |
| | Pipe primer | ≤ 1 can |
| | Mineral spirits | ≤ 1 gal |
| | ______ | |

| | **DOT(1):** | Qty. |
|---|---|---|
| | MOT eligible soils | |
| | MOT eligible water | |
| | MOT eligible solids | |
| | MOT eligible liquids | |
| | ______ | |
| | ______ | |
| | ______ | |

(1) Attach applicable Materials of Trade (MOT) generic shipping determination. SDS not generally applicable to this category.

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

**Air Monitoring**

☐ There are no atmospheric chemical, radiological, or particulate hazards on this project requiring air monitoring.

☐ Air monitoring is the responsibility of the client or subcontractor.

***Constituents of Interest:***

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

| PCBs | | Anticipated Breathing Zone Concentration <= | 0 | mg/m3 |
|---|---|---|---|---|
| TWA | 0.5 mg/m3, skin | LEL/UEL (%): | NA/NA | |
| STEL | NA | VD (Air = 1): | NA | |
| IDLH | 5 mg/m3, NIOSH | VP (mmHg): | 0.001 | |

| Lead | | Anticipated Breathing Zone Concentration <= | 0 | mg/m3 |
|---|---|---|---|---|
| TWA | 0.05 mg/m3, OSHA Reg. See Notes | LEL/UEL (%): | NA/NA | |
| STEL | NA | VD (Air = 1): | NA | |
| IDLH | 100 mg/m3 | VP (mmHg): | NA | |

| Cadmium | | Anticipated Breathing Zone Concentration <= | 0 | mg/m3 |
|---|---|---|---|---|
| TWA | 0.005 mg/m3, OSHA, OSHA Reg. See Notes | LEL/UEL (%): | NA/NA | |
| STEL | NA | VD (Air = 1): | NA | |
| IDLH | 9 mg/m3, NIOSH | VP (mmHg): | NA | |

| Copper dusts and mists | | Anticipated Breathing Zone Concentration <= | 0 | mg/m3 |
|---|---|---|---|---|
| TWA | 1 mg/m3 | LEL/UEL (%): | NA/NA | |
| STEL | NA | VD (Air = 1): | NA | |
| IDLH | 100 mg/m3, NIOSH | VP (mmHg): | NA | |

| Mercury (elemental and inorg.) | | Anticipated Breathing Zone Concentration <= | 0 | mg/m3 |
|---|---|---|---|---|
| TWA | 0.025 mg/m3, skin | LEL/UEL (%): | NA/NA | |
| STEL | 0.1 mg/m3, NIOSH | VD (Air = 1): | NA | |
| IDLH | 10 mg/m3, NIOSH | VP (mmHg): | 0.0012 | |

| Arsenic | | Anticipated Breathing Zone Concentration <= | 0 | mg/m3 |
|---|---|---|---|---|
| TWA | 0.01 mg/m3, OSHA Reg. See Notes | LEL/UEL (%): | NA/NA | |
| STEL | NA | RGD (Air = 1): | NA | |
| IDLH | 5 mg/m3 | VP (mmHg): | NA | |

TWA - Time Weighted Average (ACGIH TLV unless noted) | LEL/UEL - Lower /Upper Explosive Limit
STEL - Short Term Exposure Limit | RGD - Relative Gas Density
IDLH - Immediately Dangerous to Life and Health | VP - Vapor Pressure

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

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

***Required Monitoring Instruments, Action Levels and Monitoring Frequency***

*<u>Gray fields below are not automated.</u> Make necessary selections from drop down menus.*

Photoionization Detector | Select Lamp: 10.6 eV

| Computed action levels (PID units) (1): | | | Computed action levels have been manually adjusted. |
|---|---|---|---|
| < | #DIV/0! | Continue working | |
| | #### - #DIV/0! | Levels sustained > 5 minutes, monitor continuously and review engineering controls and PPE. Proceed with caution. | |
| > | #DIV/0! | Stop work and contact SSO | |

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

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

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

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

Hourly

If manually logging air monitoring results, all results must be documented, including non-detects.

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

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

Additional Gas/Vapor Monitoring is Not Required

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

* Ceiling or STEL value

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

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

| | | |
|---|---|---|
| Indicator: | ≤TWA | Continue work |
| ☐ Tube ☐ Chip | >TWA | Stop work, review engineering controls and PPE, contact SSO |
| Compound(s): | | |

Indicator tube/chip monitoring frequency:

**Air Monitoring Acronyms and Definitions**

| *Arcadis Acronym* | *Meaning* | *Definition* |
|---|---|---|
| Action Levels | | |
| A | Arcadis Specific TWA | An Arcadis administrative TWA. |
| c | Ceiling (TLV-C) | The concentration that shall not be exceeded during any part of the working exposure. |
| i | Inhalable | Particles that enter the respiratory system via the nose or mouth. |
| IDLH | Immediately Dangerous to Life and Health | The exposure concentration which is likely to cause significant injury/illness or death. |
| PEL | Permissible Exposure Limit (OSHA) | OSHA exposure limit and is legally enforceable in the United States. |
| r | Respirable | The portion of inhalable particles that enter the deepest part of the lung, the nonciliated alveoli. |
| REL | Recommended Exposure Limit (NIOSH) | The NIOSH TWA for an exposure up to a 10-hour workday during a 40-hour work week. |
| s | Skin | Potential for dermal absorption |
| se | Sensitizer | Potential for  dermal or respirable sensitization resulting from the interaction of an absorbed agent. |
| STEL | Short Term Exposure Limit (TLV-STEL) | Usually a 15-minute TWA exposure that should not be exceeded at any time during the workday, even if the  8-hour TWA is within the TLV,PEL, or REL TWAs. |
| TLV | Threshold Limit Value (ACGIH) | The ACGIH TWA for an exposure up to a 8-hour workday during a 40-hour work week. |
| TWA | Time Weighted Average  (TLV-TWA) | Time-weighted average exposure concentration for a conventional 8-hour (TLV,PEL) or up to 10-hour (REL) workday and a 40-hour week. |
| Chemical and Physical Properties | | |
| IP | Ionization Potential | Ionization potential, eV (electron volts) [Ionization potentials are given as a guideline for the selection of photoionization detector lamps used in some direct-reading instruments.] |
| LEL | Lower Explosive Limit | The minimum concentration of a vapor in air below which propagation of a flame will not occur in the presence of an ignition source. |
| UEL | Upper Explosive Limit | The maximum concentration of a vapor in air below which propagation of a flame will not occur in the presence of an ignition source. |
| RGD | Relative Gas Density | Weight of a vapor or gas compared to an equal volume of air (air = 1 ). If greater than 1.0, the vapor or gas is heavier than air and will concentrate in the low places. If less than 1.0, the vapor or gas will rise. |

| Units | | |
|---|---|---|
| eV | Electron volt | A unit of energy equal to the energy acquired by an electron falling through a potential difference of one volt. |
| m | mg/m3 | Milligrams per cubic meter |
| p | ppm | Parts per million |
| Organizations/Agencies | | |
| ACGIH | American Conference of Governmental Industrial Hygienists | |
| NIOSH | National Institute for Occupational Safety and Health | |
| OSHA | Occupational Safety and Health Administration | |

**Tick and Poisonous Plant Hazards**

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

**Controlling Tick Hazards**

*Risk Guide for Ticks:*

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

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

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

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

*Select required controls below:*

*Engineering Controls*

- [ ] Mowing of work area
- [X] Clearing overgrown vegetation
- [X] Pesticide application
- [ ] Other: ______

*Administrative Controls*

- [X] Complete tick check morning/evening
- [ ] Scheduled tick check: ______
- [ ] Inspect backpacks, equipment cases, etc. daily
- [ ] Vehicle cab - maintain good housekeeping
- [ ] Other: ______

*Personal Protective Equipment*

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

Heat stress signs/symptoms and controls to also be addressed in tailgate safety meeting if temperatures >80°F

*Repellents*

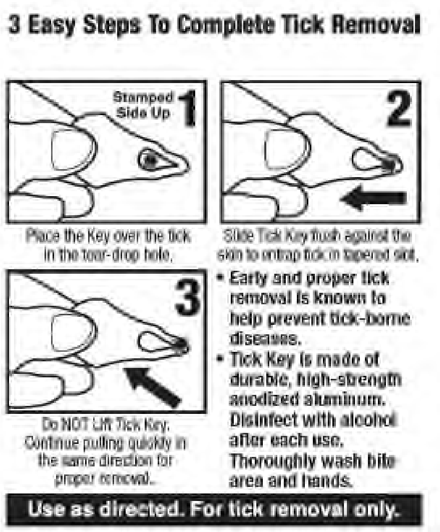
- [ ] Repellents will not be used
- [X] Permethrin impregnated clothing (purchased)
- [X] Permethrin (0.5% self applied/treated to clothing)
- [X] Deet 20-40% applied to skin
- [ ] Other: ______

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

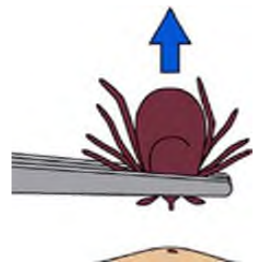
*Tick Removal and First Aid*

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

*Using a Tick Removal Tool*




*Using Tweezers*



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

Do not crush tick with fingers

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

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

All work outdoors, regardless of time of year, must address poisonous plant hazards and controls in the tailgate safety meeting. For low risk projects, the discussion should consider potential vegetation exposure near fences, buildings, work near trees, etc.

**Controlling Exposure to Poisonous Plants**

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

*Select required controls below:*

*Engineering Controls*

- [X] Not applicable
- [ ] Mowing of work area
- [ ] Clearing overgrown vegetation
- [ ] Herbicide application
- [ ] Other: ____________________

*Administrative Controls*

- [X] Identify and avoid (see ID Quick Guide below)
- [X] Watch for signs or symptoms of exposure
- [ ] Vehicle cab - maintain good housekeeping
- [ ] Other: ____________________

*Personal Protective Equipment*

- [X] Gloves
- [X] Hat/hardhat/head covering
- [ ] Pants tucked in boots
- [ ] Shirt tucked into pants
- [X] Long sleeved shirt and long pants
- [ ] White coveralls/Tyvek
- [ ] Taped cuffs/pant legs
- [ ] Dust mask (during burning activities, etc.)
- [ ] Other: ____________________

Heat stress signs/symptoms and controls to also be addressed in tailgate safety meeting if temperatures >80°F

*Repellents*

- [ ] Repellents will not be used
- [ ] Barrier creams
- [ ] Other: ____________________

*Skin Decontamination*

- [X] Wash with post-exposure soap and water
- [ ] Wash with soap and water (use hot water if available)
- [X] Hot shower at end of day
- [ ] Other: ______________________________________

*Equipment Decontamination*

Due to the low risk associated with poisonous plants on this project, portable equipment and tools may still have a potential to be contaminated with urushiol (the oil that causes allergic reactions and dermatitis in poisonous plants covered by this plan). It is recommend to decontaminate handles, grips, and hand holds of tools and equipment with post-exposure soap and water or alcohol spray (if safe to do so for the equipment/tool being decontaminated) as a best practice.

*Clothing Decontamination*

Wash work clothing in hot water separate from other clothing. Even though there is a low risk for poisonous plants on this project, work boots should be considered potentially contaminated with urushiol. Decontaminate with post-exposure soap and water or hot soap and water. If safe for the boot, consider spraying with alcohol spray of post exposure soap is not available.

*First Aid*

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

*Identification Quick Guide*

Ticks:

American Dog Tick


Blacklegged (Deer) Tick


Brown Dog Tick


Groundhog Tick


Gulf Coast Tick


Lone Star Tick


Rocky Mountain Wood Tick


Soft Tick


Poison Ivy:



Poison Oak:



Poison Sumac:

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

**Personal Protective Equipment (PPE)**

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

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

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

Task specific PPE: See Task Specific JSAs

Comments:

See Tick and Poisonous Plant Hazards section for addtional PPE information.

**Medical Surveillance**

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

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

**Hazardous Materials Shipping and Transportation**

A shipping determination package has been prepared, reviewed and provided to Arcadis field staff for this project.

**Traffic Safety and Traffic Safety Plans (TSPs)**

All or portions of the project work will be conducted in a parking lot and/or private roadway. A Non-ROW TSP addressing this work is attached to this HASP.

**Arcadis Commercial Motor Vehicles (CMVs)**

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

**Site Control**

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

**Decontamination**

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

**Sanitation**

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

**Safety Briefings**

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

The safety briefing will also address COVID-19 prevention protocols to be used on site as described in current Arcadis recommendations and guidance.

**Employee Health and Safety Engagement**

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

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

1 per task

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

1 NM per event

Other (specify):

**Safety Equipment and Supplies**

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

| | | | |
|---|---|---|---|
| X | First aid kit | X | Insect repellent: Permethrin |
| | Bloodborne pathogens kit | X | Sunscreen |
| X | Fire extinguisher | | Air horn |
| | Eyewash (ANSI compliant) | X | Traffic cones |
| X | Eyewash (bottle) | | 2-way radios |
| X | Drinking water | | Heat stress monitor |
| | Other: | X | See Tick and Poisonous Plant Hazards section for addtional equipment/supply information. |

**International Travel**

International travel is not required for this project.

**Spill Control and Containment**

Spill control and containment planning and implementation is not required for this project.

**Use of Electronic Devices in Areas of Increased Safety Risk**

The intent of this section is to ensure use of standard computer tablets, laptops, or cell phones (collectively referred to in this HASP as a digital device) is performed in a manner that is effective in preventing or mitigating injury to the user of the digital device.

Use of electronic devices in an active parking lot must be addressed in the Non-ROW TSP. Use of Non-ROW short-term traffic controls in situations where digital data collection or documentation is conducted should be avoided unless spotter options are utilized. When practical, use project vehicle as shield in parking lots.

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

**Signatures**

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

| Printed Name | Signature | Date |
|---|---|---|
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Add additional sheets if necessary

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

ARCADIS

June 7, 2022

To whom it may concern:

Arcadis and its affiliates ("Arcadis") is a firm with experienced professionals and staff who support projects, activities, infrastructure and businesses essential to maintaining the public's health, safety and welfare.

Arcadis has been authorized by NYSEG to complete the following activities:
Utility Clearance, collect soil boring samples, and survey the location of the samples on site.

Arcadis personnel will be identifiable by:

| | |
|---|---|
| X | Branded hard hat and/or safety vest |
| | Branded vehicle |
| | Buisness card or ID badge |
| | Other: ______________________ |

If you have any questions related to the work being completed or Arcadis' presence at this location, please contact the following:

| | | | |
|---|---|---|---|
| Joe Bistrovich | Arcadis Project Manager | at | 315-671-9697 |
| John Ruspantini | NYSEG | at | 585-484-6787 |

**Attachment 1**
JSAs

# Job Safety Analysis

## General

| | | | |
|---|---|---|---|
| **JSA ID** | HASP 1 | **Status** | Complete |
| **Job Name** | General Industry-Driving - passenger vehicles | **Created Date** | 4/20/2022 |
| **Task Description** | Driving a car, van, or truck on public roadways. | **Completed Date** | 04/20/2022 |

## Client / Project

| | |
|---|---|
| **Client** | NYSEG |
| **Project Number** | 30119464 |
| **Project Name** | Shluman's Salvage Yard |
| **Project Manager** | Joe Bistrovich |

## User Roles

| Role | Employee | Due Date | Completed Date |
|---|---|---|---|
| Developer | Makenna Guarnieri | 4/20/2022 | 4/20/2022 |
| HASP Reviewer | Hover (Baker), Liz | 4/20/2022 | 4/20/2022 |
| Quality Reviewer | | | |

## Job Steps

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

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

## PPE Personal Protective Equipment

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

## Supplies

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

# Job Safety Analysis

## General

| | | | |
|---|---|---|---|
| **JSA ID** | 18858 | **Status** | (2) Review |
| **Job Name** | Environment-Drilling, soil sampling, well installation | **Created Date** | 4/26/2022 |
| **Task Description** | Drilling and soil sampling | **Completed Date** | |
| **Template** | False | **Auto Closed** | False |

## Client / Project

| | |
|---|---|
| **Client** | New York State Electric & Gas |
| **Project Number** | 30119464 |
| **Project Name** | NYSEG Shulman's Salvage Yard |
| **PIC** | White, Keith |
| **Project Manager** | Beyrle, Nicholas |

## User Roles

| Role | Employee | Due Date | Completed Date | Supervisor | Active |
|---|---|---|---|---|---|
| Developer | Guarnieri, Makenna | 5/17/2022 | 4/26/2022 | Brien, Jason | ☑ |
| HASP Reviewer | Hover, Elizabeth | 5/10/2022 | | Hill, Sarah | ☑ |

## Job Steps

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

| | | | | | |
|---|---|---|---|---|---|
| 4 | Direct push drilling | 1 | The drill rods will be handled by workers most of the time rather than the rig doing it, therefore pinch points can cause lacerations and crushing of fingers/body parts. | Keep a minimum of 5 feet away from drill rig operation and moving parts. | |
| | | 2 | The direct push rigs are usually meant to fit in spaces where larger rig can't. Tight spaces can pin workers. | Do not put yourself between the rig and a fixed object. Use Spotters or a tape measure to ensure clearances in tight areas. Pre-plan equipment movement from one location to the next. | |
| | | 3 | Some direct push equipment is controlled by wireless devices. These controls can fail and equipment can strike workers or cause damage to property. | The drill rig should be used in a large open area to test wireless controls prior to moving to boring locations. The operator of the rig will test the kill switch with wireless remote prior to use. Operator will stay in range of rig while moving so that wireless signal will not be too weak and cause errors to the controls. | |
| | | 4 | Sampling sleeves must be cut to obtain access to soil. Cutting can cause lacerations. | It's preferable to let the driller cut the sleeves open. Many drillers have holders for the sleeve to allow for stability when cutting. If you cut the sleeves, use a hook blade, change blade regularly, and cut away from the body. | |
| | | 5 | Soil cores may contain contaminated media. | Wear nitrile gloves and saftey glasses for protection from contaminated media when logging soil borings. | |
| 5 | Sample collection and processing | 1 | Injuries can result from pinch points on sampling equipment, and from breakage of sample containers. | Care should be taken when opening sampling equipment. Look at empty containers before picking them up, and do not over-tighten container caps. Use dividers to store containers in the cooler so they do not break. | Sample Cooler Handling JSA |
| | | 2 | Lifting heavy coolers can cause back injuries. | Use two people to move heavy coolers. Use proper lifting techniques. | |
| 6 | Soil cutting and purge water management | 1 | Moving full drums can cause back injury, or pinching/crushing injury. | Preferably have the drilling contractor move full drums with their equipment. If this is not practicable, use lift assist devices such as drum dollies, lift gates, etc. Employ proper lifting techniques, and perfrom TRACK to identify pinch/crush points. Wear leather work gloves, and clear all walking and work areas of debris prior to moving a drum. | Drum Handling JSA |

## PPE — Personal Protective Equipment

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

## Supplies

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

# Job Safety Analysis

## General

| | | | |
|---|---|---|---|
| **JSA ID** | 18859 | **Status** | (2) Review |
| **Job Name** | Environment-Drum sampling/handling | **Created Date** | 4/26/2022 |
| **Task Description** | Drum Handling | **Completed Date** | |
| **Template** | False | **Auto Closed** | False |

## Client / Project

| | |
|---|---|
| **Client** | New York State Electric & Gas |
| **Project Number** | 30119464 |
| **Project Name** | NYSEG Shulman's Salvage Yard |
| **PIC** | White, Keith |
| **Project Manager** | Beyrle, Nicholas |

## User Roles

| Role | Employee | Due Date | Completed Date | Supervisor | Active |
|---|---|---|---|---|---|
| Developer | Guarnieri, Makenna | 5/17/2022 | 4/26/2022 | Brien, Jason | ☑ |
| HASP Reviewer | Hover, Elizabeth | 5/10/2022 | | Hill, Sarah | ☑ |

## Job Steps

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

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

## PPE — Personal Protective Equipment

| Type | Personal Protective Equipment | Description | Required |
|---|---|---|---|
| **Dermal Protection** | chemical protective suit (specify type) | Tyvek | Required |
| | long sleeve shirt/pants | | Required |
| **Eye Protection** | faceshield | | Required |
| | safety goggles | | Required |
| **Hand Protection** | chemical resistant gloves (specify type) | Nitrile | Required |
| | work gloves (specify type) | Leather | Required |
| **Head Protection** | hard hat | | Required |
| **Hearing Protection** | ear plugs | | Required |
| **Miscellaneous PPE** | traffic vest--Class II or III | Class II | Required |

## Supplies

| Type | Supply | Description | Required |
|---|---|---|---|
| **Communication Devices** | mobile phone | | Required |
| **Miscellaneous** | Other | Dolly | Required |
| **Traffic Control** | traffic cones | | Required |

# Job Safety Analysis

## General

| | | | |
|---|---|---|---|
| **JSA ID** | 18860 | **Status** | (2) Review |
| **Job Name** | Environment-Sample cooler handling | **Created Date** | 4/26/2022 |
| **Task Description** | Sample Cooler Handling | **Completed Date** | |
| **Template** | False | **Auto Closed** | False |

## Client / Project

| | |
|---|---|
| **Client** | New York State Electric & Gas |
| **Project Number** | 30119464 |
| **Project Name** | NYSEG Shulman's Salvage Yard |
| **PIC** | White, Keith |
| **Project Manager** | Beyrle, Nicholas |

## User Roles

| Role | Employee | Due Date | Completed Date | Supervisor | Active |
|---|---|---|---|---|---|
| Developer | Guarnieri, Makenna | 5/17/2022 | 4/26/2022 | Brien, Jason | ☑ |
| HASP Reviewer | Hover, Elizabeth | 5/10/2022 | | Hill, Sarah | ☑ |

## Job Steps

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

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

## PPE — Personal Protective Equipment

| Type | Personal Protective Equipment | Description | Required |
|---|---|---|---|
| **Eye Protection** | safety glasses | | Required |
| **Hand Protection** | chemical resistant gloves (specify type) | Nitrile | Required |
| | work gloves (specify type) | ANSI Level II Cut Resistant Gloves | Required |

## Supplies

| Type | Supply | Description | Required |
|---|---|---|---|
| **Communication Devices** | mobile phone | | Required |
| **Miscellaneous** | first aid kit | | Required |
| | Other | Scissors | Required |

# Job Safety Analysis

## General

| | | | |
|---|---|---|---|
| **JSA ID** | 18861 | **Status** | (2) Review |
| **Job Name** | Environment-Other | **Created Date** | 4/26/2022 |
| **Task Description** | Utility Clearance | **Completed Date** | |
| **Template** | False | **Auto Closed** | False |

## Client / Project

| | |
|---|---|
| **Client** | New York State Electric & Gas |
| **Project Number** | 30119464 |
| **Project Name** | NYSEG Shulman's Salvage Yard |
| **PIC** | White, Keith |
| **Project Manager** | Beyrle, Nicholas |

## User Roles

| Role | Employee | Due Date | Completed Date | Supervisor | Active |
|---|---|---|---|---|---|
| Developer | Guarnieri, Makenna | 5/17/2022 | 4/26/2022 | Brien, Jason | ☑ |
| HASP Reviewer | Hover, Elizabeth | 5/10/2022 | | Hill, Sarah | ☑ |

## Job Steps

| Job Step No. | Job Step Description | | Potential Hazard | Critical Action | H&S Reference |
|---|---|---|---|---|---|
| 1 | Coordinate Subsurface Utility Survey Activities | 1 | Traffic Hazards, subsurface/ overhead utilities, property damage | Complete utility clearance checklist. Review site locations and survey specifications. | |
| 2 | Mobilization of Equipment to Survey Area | 1 | Lifting Hazards | Use buddy system or mechanical aids as much as possible. Use TRACK to plan lifts and use proper lifting techniques. | |
| | | 2 | Awkward body positions and twisting | Plan activity to avoid twisting and awkward positions, Use the buddy system. | |
| | | 3 | Slips/Trips/Falls When Carrying Equipment | Break loads down to manageable size that does not obstruct your view. Plan route and use TRACK, wear footwear with good tread and ankle support. | |
| 3 | Demobilization | 1 | Muscle Strain | Use devices that maintain neutral body positions to remove pins or stakes when practical. | |
| | | 2 | Lifting hazard from demobilizing equipment from work area | Use buddy system to lift heavy equipment and use proper lifting techniques. | |
| | | 3 | Slips/Trips/Falls | Be aware of your surroundings. Select the less dangerous and authorized routes to walk. | |
| 4 | Driving to/from the work site | 1 | Motion Hazards | Practice defensive driving and follow the Smith 5 keys, No cell phone use while driving. Allow for extra time for adverse weather. | |
| 5 | Performing Survey | 1 | Slips/Trips/Falls | Identify or minimize slip hazards prior to starting the survey. Check for wet/slippery surfaces, equipment, or excavation areas. Select less dangerous and authorized access routes. | |
| | | 2 | Scrapes/ Cuts | Wear leather or suitable gloves when performing the survey. Wear long pants and a long sleeve shirt. | |

## PPE — Personal Protective Equipment

| Type | Personal Protective Equipment | Description | Required |
|---|---|---|---|
| **Dermal Protection** | long sleeve shirt/pants | | Required |
| **Foot Protection** | boots | | Required |
| | steel-toe boots | | Recommended |
| **Hand Protection** | work gloves (specify type) | Leather or cut resistant material | Required |
| **Head Protection** | hard hat | | Required |
| **Miscellaneous PPE** | traffic vest--Class II or III | Class II | Required |

## Supplies

| Type | Supply | Description | Required |
| --- | --- | --- | --- |
| **Communication Devices** | mobile phone | | Required |
| **Miscellaneous** | fire extinguisher | | Required |
| | first aid kit | | Required |
| **Personal** | eye wash (specify type) | Bottle | Required |
| **Traffic Control** | traffic cones | | Required |

**Attachment 2**
Safety Data Sheets (SDS)

# SAFETY DATA SHEET

Version 8.4
Revision Date 06/07/2021
Print Date 04/09/2022

## SECTION 1: Identification of the substance/mixture and of the company/undertaking

### 1.1 Product identifiers

| | | |
|---|---|---|
| Product name | : | Alconox® detergent |
| Product Number | : | 242985 |
| Brand | : | Aldrich |

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

| | | |
|---|---|---|
| Identified uses | : | Laboratory chemicals, Synthesis of substances |
| Uses advised against | : | This product is not intended for consumer use. |

### 1.3 Details of the supplier of the safety data sheet

| | | |
|---|---|---|
| Company | : | Sigma-Aldrich Inc.<br>3050 SPRUCE ST<br>ST. LOUIS MO 63103<br>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)**

Acute toxicity, Oral (Category 4), H302
Skin irritation (Category 2), H315
Serious eye damage (Category 1), H318
Short-term (acute) aquatic hazard (Category 2), H401

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) | |
| H302 | Harmful if swallowed. |
| H315 | Causes skin irritation. |
| H318 | Causes serious eye damage. |
| H401 | Toxic to aquatic life. |

| | |
|---|---|
| Precautionary statement(s) | |
| P264 | Wash skin thoroughly after handling. |
| P270 | Do not eat, drink or smoke when using this product. |
| P273 | Avoid release to the environment. |
| P280 | Wear protective gloves/ eye protection/ face protection. |
| P301 + P312 + P330 | IF SWALLOWED: Call a POISON CENTER/ doctor if you feel unwell. Rinse mouth. |
| P302 + P352 | IF ON SKIN: Wash with plenty of soap and water. |
| P305 + P351 + P338 + P310 | IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Immediately call a POISON CENTER/ doctor. |
| P332 + P313 | If skin irritation occurs: Get medical advice/ attention. |
| P362 | Take off contaminated clothing and wash before reuse. |
| P501 | Dispose of contents/ container to an approved waste disposal plant. |

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

## SECTION 3: Composition/information on ingredients

### 3.2 Mixtures

| Component | | Classification | Concentration |
|---|---|---|---|
| **sodium dodecyl benzenesulfonate** | | | |
| CAS-No.<br>EC-No. | 25155-30-0<br>246-680-4 | Acute Tox. 4; Skin Irrit. 2; Eye Irrit. 2A; Aquatic Acute 2; H302, H315, H319, H401 | >= 30 - < 50 % |
| **tetrasodium diphosphate** | | | |
| CAS-No.<br>EC-No.<br>Registration number | 7722-88-5<br>231-767-1<br>01-2119489794-17-XXXX | Eye Dam. 1; H318 | >= 30 - < 50 % |
| **sodium carbonate** | | | |
| CAS-No.<br>EC-No.<br>Index-No.<br>Registration number | 497-19-8<br>207-838-8<br>011-005-00-2<br>01-2119485498-19-XXXX | Eye Irrit. 2A; H319 | >= 10 - < 20 % |

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

## SECTION 4: First aid measures

### 4.1 Description of first-aid measures

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

**If inhaled**
After inhalation: fresh air.

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

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

**If swallowed**
After swallowing: immediately make victim drink water (two glasses at most). Consult a physician.

### 4.2 Most important symptoms and effects, both acute and delayed
The most important known symptoms and effects are described in the labelling (see section 2.2) and/or in section 11

### 4.3 Indication of any immediate medical attention and special treatment needed
No data available

## SECTION 5: Firefighting measures

### 5.1 Extinguishing media

**Suitable extinguishing media**
Water Foam Carbon dioxide ($CO_2$) Dry powder

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

### 5.2 Special hazards arising from the substance or mixture
Carbon oxides
Oxides of phosphorus
Sodium oxides
Combustible.
Development of hazardous combustion gases or vapours possible in the event of fire.

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

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

## SECTION 6: Accidental release measures

**6.1 Personal precautions, protective equipment and emergency procedures**

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

For personal protection see section 8.

**6.2 Environmental precautions**

Do not let product enter drains.

**6.3 Methods and materials for containment and cleaning up**

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

**6.4 Reference to other sections**

For disposal see section 13.

## SECTION 7: Handling and storage

**7.1 Precautions for safe handling**

For precautions see section 2.2.

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

**Storage conditions**

Tightly closed. Dry.

Storage class (TRGS 510): 11: Combustible Solids

**7.3 Specific end use(s)**

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

## SECTION 8: Exposure controls/personal protection

**8.1 Control parameters**

**Ingredients with workplace control parameters**

| Component | CAS-No. | Value | Control parameters | Basis |
|---|---|---|---|---|
| tetrasodium diphosphate | 7722-88-5 | TWA | 5 mg/m3 | USA. NIOSH Recommended Exposure Limits |
| | | TWA | 5 mg/m3 | USA. OSHA - TABLE Z-1 Limits for Air Contaminants - 1910.1000 |
| | | PEL | 5 mg/m3 | California permissible exposure limits for chemical contaminants (Title 8, Article 107) |

**8.2 Exposure controls**

**Appropriate engineering controls**

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

**Personal protective equipment**

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

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

Full contact
Material: Nitrile rubber
Minimum layer thickness: 0.11 mm
Break through time: 480 min
Material tested: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 EC approved gloves. This recommendation is advisory only and must be evaluated by an industrial hygienist and safety officer familiar with the specific situation of anticipated use by our customers. It should not be construed as offering an approval for any specific use scenario.

**Body Protection**
protective clothing

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

**Control of environmental exposure**
Do not let product enter drains.

## SECTION 9: Physical and chemical properties

### 9.1 Information on basic physical and chemical properties

| | | |
|---|---|---|
| a) | Appearance | Form: granular, powder<br>Color: white |
| b) | Odor | odorless |
| c) | Odor Threshold | No data available |
| d) | pH | 9.5 at 10 g/l |
| e) | Melting | No data available |

| | | |
|---|---|---|
| | point/freezing point | |
| f) | Initial boiling point and boiling range | No data available |
| g) | Flash point | ()No data available |
| h) | Evaporation rate | No data available |
| i) | Flammability (solid, gas) | No data available |
| j) | Upper/lower flammability or explosive limits | No data available |
| k) | Vapor pressure | No data available |
| l) | Vapor density | No data available |
| m) | Relative density | No data available |
| n) | Water solubility | soluble |
| o) | Partition coefficient: n-octanol/water | No data available |
| p) | Autoignition temperature | No data available |
| q) | Decomposition temperature | No data available |
| r) | Viscosity | No data available |
| s) | Explosive properties | No data available |
| t) | Oxidizing properties | No data available |

**9.2 Other safety information**
No data available

## SECTION 10: Stability and reactivity

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

**10.2 Chemical stability**
The product is chemically stable under standard ambient conditions (room temperature) .

**10.3 Possibility of hazardous reactions**
No data available

**10.4 Conditions to avoid**
no information available

**10.5 Incompatible materials**
No data available

**10.6 Hazardous decomposition products**
In the event of fire: see section 5

## SECTION 11: Toxicological information

### 11.1 Information on toxicological effects

**Mixture**

**Acute toxicity**
Oral: No data available
Acute toxicity estimate Oral - 1,305 mg/kg
(Calculation method)
Symptoms: Irritations of mucous membranes in the mouth, pharynx, oesophagus and gastrointestinal tract.
Symptoms: Possible symptoms:, mucosal irritations
Dermal: No data available

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

**Skin corrosion/irritation**
Mixture causes skin irritation.

**Serious eye damage/eye irritation**
Mixture causes serious eye damage.

**Respiratory or skin sensitization**
No data available

**Germ cell mutagenicity**
No data available

**Carcinogenicity**

IARC: No ingredient of this product present at levels greater than or equal to 0.1% is identified as probable, possible or confirmed human carcinogen by IARC.

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

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

**Reproductive toxicity**
No data available

**Specific target organ toxicity - single exposure**
No data available

**Specific target organ toxicity - repeated exposure**
No data available

**Aspiration hazard**
No data available

### 11.2 Additional Information

To the best of our knowledge, the chemical, physical, and toxicological properties have not been thoroughly investigated.
Other dangerous properties can not be excluded.

Handle in accordance with good industrial hygiene and safety practice.

**Components**

**sodium dodecyl benzenesulfonate**

**Acute toxicity**
LD50 Oral - Rat - male and female - 500 - 2,000 mg/kg
(OECD Test Guideline 401)
LC50 Inhalation - Rat - male and female - 4 h - 0.26 - 31 mg/l
Remarks: (ECHA)
Dermal: No data available
No data available

**Skin corrosion/irritation**
Skin - Rabbit
Result: Skin irritation - 24 h

**Serious eye damage/eye irritation**
Eyes - Rabbit
Result: Eye irritation
Remarks: (External MSDS)

**Respiratory or skin sensitization**
No data available

**Germ cell mutagenicity**
Test Type: Ames test
Test system: Salmonella typhimurium
Result: negative
Remarks: (National Toxicology Program)

**Carcinogenicity**
No data available

**Reproductive toxicity**
No data available

**Specific target organ toxicity - single exposure**
No data available

**Specific target organ toxicity - repeated exposure**
No data available

**Aspiration hazard**
No data available

**tetrasodium diphosphate**

**Acute toxicity**
LD50 Oral - Rat - female - > 300 - < 2,000 mg/kg
(OECD Test Guideline 420)
LC50 Inhalation - Rat - male and female - 4 h - > 0.58 mg/l
(OECD Test Guideline 403)
Remarks: (highest concentration to be prepared)
The value is given in analogy to the following substances: Disodium pyrophosphate
LD50 Dermal - Rabbit - male and female - > 2,000 mg/kg
(US-EPA)
No data available

**Skin corrosion/irritation**
Skin - Rabbit
Result: No skin irritation - 4 h
(OECD Test Guideline 404)

**Serious eye damage/eye irritation**
Eyes - Rabbit
Result: Irreversible effects on the eye - 4 h
(OECD Test Guideline 405)

**Respiratory or skin sensitization**
Sensitisation test: - Mouse
Result: Does not cause skin sensitization.
(OECD Test Guideline 429)
Remarks: The value is given in analogy to the following substances: Disodium pyrophosphate

**Germ cell mutagenicity**
Test Type: Micronucleus test
Test system: lymphocyte
Result: negative
Test Type: gene mutation test
Test system: Mouse lymphoma test
Result: negative

**Carcinogenicity**
No data available

**Reproductive toxicity**
No data available

**Specific target organ toxicity - single exposure**
No data available

**Specific target organ toxicity - repeated exposure**
No data available

**Aspiration hazard**
No data available

**sodium carbonate**

**Acute toxicity**
LD50 Oral - Rat - male and female - 2,800 mg/kg
Remarks: (ECHA)
LC50 Inhalation - Rat - male - 2 h - 2,300 mg/l
Remarks: (ECHA)
LD50 Dermal - Rabbit - > 2,000 mg/kg
(US-EPA)
No data available

**Skin corrosion/irritation**
Skin - Rabbit
Result: No skin irritation - 4 h
(OECD Test Guideline 404)

**Serious eye damage/eye irritation**
Eyes - Rabbit
Result: Eye irritation

(US-EPA)

**Respiratory or skin sensitization**
No data available

**Germ cell mutagenicity**
No data available

**Carcinogenicity**
No data available

**Reproductive toxicity**
No data available

**Specific target organ toxicity - single exposure**
No data available

**Specific target organ toxicity - repeated exposure**
No data available

**Aspiration hazard**
No data available

## SECTION 12: Ecological information

### 12.1 Toxicity

**Mixture**
No data available

### 12.2 Persistence and degradability
No data available

### 12.3 Bioaccumulative potential
No data available

### 12.4 Mobility in soil
No data available

### 12.5 Results of PBT and vPvB assessment
PBT/vPvB assessment not available as chemical safety assessment not required/not conducted

### 12.6 Other adverse effects
No data available

**Components**

**sodium dodecyl benzenesulfonate**

| | |
|---|---|
| Toxicity to fish | static test LC50 - Oncorhynchus mykiss (rainbow trout) - 3.2 - 5.6 mg/l - 96 h<br>(OECD Test Guideline 203) |
| Toxicity to daphnia and other aquatic invertebrates | static test EC50 - Daphnia magna (Water flea) - 6.3 - 9.5 mg/l - 48 h<br>(OECD Test Guideline 202) |

**tetrasodium diphosphate**

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

| | |
|---|---|
| | (OECD Test Guideline 203) |
| Toxicity to daphnia and other aquatic invertebrates | static test EC50 - Daphnia magna (Water flea) - > 100 mg/l - 48 h<br>(US-EPA) |
| Toxicity to algae | static test ErC50 - Desmodesmus subspicatus (green algae) - > 100 mg/l - 72 h<br>(OECD Test Guideline 201) |
| Toxicity to bacteria | static test EC50 - activated sludge - > 1,000 mg/l - 3 h<br>(OECD Test Guideline 209)<br>Remarks: The value is given in analogy to the following substances: dipotassium hydrogen phosphate |

**sodium carbonate**

| | |
|---|---|
| Toxicity to fish | static test LC50 - Lepomis macrochirus (Bluegill sunfish) - 300 mg/l - 96 h<br>Remarks: (ECHA) |
| Toxicity to daphnia and other aquatic invertebrates | semi-static test EC50 - Ceriodaphnia (water flea) - 220 - 227 mg/l - 48 h<br>Remarks: (ECHA) |

## 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. See www.retrologistik.com for processes regarding the return of chemicals and containers, or contact us there if you have further questions.

## 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

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

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

**SARA 311/312 Hazards**
Acute Health Hazard

**Massachusetts Right To Know Components**
No components are subject to the Massachusetts Right to Know Act.

## SECTION 16: Other information

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


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Version: 8.4 Revision Date: 06/07/2021 Print Date: 04/09/2022

# SAFETY DATA SHEET

Version 6.15
Revision Date 09/24/2021
Print Date 11/27/2021

## SECTION 1: Identification of the substance/mixture and of the company/undertaking

### 1.1 Product identifiers

| | | |
|---|---|---|
| Product name | : | Hydrochloric acid |
| Product Number | : | 258148 |
| Brand | : | SIGALD |
| Index-No. | : | 017-002-01-X |

### 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.<br>3050 SPRUCE ST<br>ST. LOUIS MO 63103<br>UNITED STATES |
| Telephone | : | +1 314 771-5765 |
| Fax | : | +1 800 325-5052 |


### 1.4 Emergency telephone

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

## SECTION 2: Hazards identification

### 2.1 Classification of the substance or mixture

**GHS Classification in accordance with 29 CFR 1910 (OSHA HCS)**

Corrosive to Metals (Category 1), H290
Skin corrosion (Category 1B), H314
Serious eye damage (Category 1), H318
Specific target organ toxicity - single exposure (Category 3), Respiratory system, H335

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

### 2.2 GHS Label elements, including precautionary statements

Pictogram

Signal word Danger

Hazard statement(s)

| | |
|---|---|
| H290 | May be corrosive to metals. |
| H314 | Causes severe skin burns and eye damage. |
| H335 | May cause respiratory irritation. |

Precautionary statement(s)

| | |
|---|---|
| P234 | Keep only in original container. |
| 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. |
| P280 | Wear protective gloves/ protective clothing/ eye protection/ face protection. |
| P301 + P330 + P331 | IF SWALLOWED: Rinse mouth. Do NOT induce vomiting. |
| P303 + P361 + P353 | IF ON SKIN (or hair): Take off immediately all contaminated clothing. Rinse skin with water/ shower. |
| P304 + P340 + P310 | IF INHALED: Remove person to fresh air and keep comfortable for breathing. Immediately call a POISON CENTER/ doctor. |
| P305 + P351 + P338 + P310 | IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Immediately call a POISON CENTER/ doctor. |
| P363 | Wash contaminated clothing before reuse. |
| P390 | Absorb spillage to prevent material damage. |
| P403 + P233 | Store in a well-ventilated place. Keep container tightly closed. |
| P405 | Store locked up. |
| P406 | Store in corrosive resistant container with a resistant inner liner. |
| P501 | Dispose of contents/ container to an approved waste disposal plant. |

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

## SECTION 3: Composition/information on ingredients

### 3.2 Mixtures

Formula : HCl
Molecular weight : 36.46 g/mol

| Component | | Classification | Concentration |
|---|---|---|---|
| **hydrochloric acid** | | | |
| CAS-No.<br>EC-No.<br>Index-No.<br>Registration number | 7647-01-0<br>231-595-7<br>017-002-01-X<br>01-2119484862-27-XXXX | Met. Corr. 1; Skin Corr. 1B; Eye Dam. 1; STOT SE 3; H290, H314, H318, H335<br>Concentration limits:<br>>= 0.1 %: Met. Corr. 1, H290; >= 25 %: Skin Corr. 1B, H314; 10 - < 25 %: Skin Irrit. 2, H315; 10 - < 25 %: Eye Irrit. 2, H319; >= 10 %: STOT SE 3, H335; | >= 30 - < 50 % |

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

## SECTION 4: First aid measures

### 4.1 Description of first-aid measures

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

**If inhaled**
After inhalation: fresh air. Call in physician.

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

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

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

### 4.2 Most important symptoms and effects, both acute and delayed
The most important known symptoms and effects are described in the labelling (see section 2.2) and/or in section 11

### 4.3 Indication of any immediate medical attention and special treatment needed
No data available

## SECTION 5: Firefighting measures

### 5.1 Extinguishing media

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

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

### 5.2 Special hazards arising from the substance or mixture
Hydrogen chloride gas
Not combustible.
Ambient fire may liberate hazardous vapours.

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

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

## SECTION 6: Accidental release measures

**6.1 Personal precautions, protective equipment and emergency procedures**

Advice for non-emergency personnel: Do not breathe vapors, aerosols. Avoid substance contact. Ensure adequate ventilation. Evacuate the danger area, observe emergency procedures, consult an expert.
For personal protection see section 8.

**6.2 Environmental precautions**

Do not let product enter drains.

**6.3 Methods and materials for containment and cleaning up**

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

**6.4 Reference to other sections**

For disposal see section 13.

## SECTION 7: Handling and storage

**7.1 Precautions for safe handling**

For precautions see section 2.2.

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

**Storage conditions**

No metal containers.
Tightly closed.

Metal containers must be lined. Corrodes metal

**Storage class**

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

**7.3 Specific end use(s)**

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

## SECTION 8: Exposure controls/personal protection

**8.1 Control parameters**

**Ingredients with workplace control parameters**

| Component | CAS-No. | Value | Control parameters | Basis |
|---|---|---|---|---|
| hydrochloric acid | 7647-01-0 | C | 2 ppm | USA. ACGIH Threshold Limit Values (TLV) |
| | Remarks | Not classifiable as a human carcinogen | | |

| | | | | |
|---|---|---|---|---|
| | | C | 5 ppm<br>7 mg/m3 | USA. NIOSH Recommended Exposure Limits |
| | | C | 5 ppm<br>7 mg/m3 | USA. Occupational Exposure Limits (OSHA) - Table Z-1 Limits for Air Contaminants |
| | | C | 5 ppm<br>7 mg/m3 | USA. OSHA - TABLE Z-1 Limits for Air Contaminants - 1910.1000 |
| | | PEL | 0.3 ppm<br>0.45 mg/m3 | California permissible exposure limits for chemical contaminants (Title 8, Article 107) |
| | | C | 2 ppm | California permissible exposure limits for chemical contaminants (Title 8, Article 107) |

## 8.2 Exposure controls

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

**Personal protective equipment**

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

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

Full contact
Material: Nitrile rubber
Minimum layer thickness: 0.4 mm
Break through time: 480 min
Material tested:Camatril® (KCL 730 / Aldrich Z677442, Size M)

Splash contact
Material: Nitrile rubber
Minimum layer thickness: 0.11 mm
Break through time: 69 min
Material tested:Dermatril® (KCL 740 / Aldrich Z677272, Size M)

data source: KCL GmbH, D-36124 Eichenzell, phone +49 (0)6659 87300, e-mail sales@kcl.de, test method: EN374
If used in solution, or mixed with other substances, and under conditions which differ from EN 374, contact the supplier of the EC approved gloves. This recommendation is advisory only and must be evaluated by an industrial hygienist and safety officer familiar with the specific situation of anticipated use by our customers. It should not be construed as offering an approval for any specific use scenario.

**Body Protection**
protective clothing

**Respiratory protection**
required when vapours/aerosols are generated.
Our recommendations on filtering respiratory protection are based on the following standards: DIN EN 143, DIN 14387 and other accompanying standards relating to the used respiratory protection system.

**Control of environmental exposure**
Do not let product enter drains.

## SECTION 9: Physical and chemical properties

### 9.1 Information on basic physical and chemical properties

| | | |
|---|---|---|
| a) | Appearance | Form: liquid<br>Color: light yellow |
| b) | Odor | pungent |
| c) | Odor Threshold | No data available |
| d) | pH | < 1 |
| e) | Melting point/freezing point | Solidification / Setting point: -30 °C (-22 °F) |
| f) | Initial boiling point and boiling range | > 100 °C > 212 °F - lit. |
| g) | Flash point | ()Not applicable |
| h) | Evaporation rate | No data available |
| i) | Flammability (solid, gas) | No data available |
| j) | Upper/lower flammability or explosive limits | No data available |
| k) | Vapor pressure | 227 hPa at 21.1 °C (70.0 °F)<br>547 hPa at 37.7 °C(99.9 °F)<br>190 hPa at 20 °C(68 °F) |
| l) | Vapor density | No data available |
| m) | Density | 1.2 g/cm3 at 25 °C (77 °F) - lit. |
| | Relative density | No data available |
| n) | Water solubility | completely misciblesoluble |
| o) | Partition coefficient: n-octanol/water | No data available |
| p) | Autoignition temperature | Not applicable |
| q) | Decomposition temperature | No data available |
| r) | Viscosity | No data available |
| s) | Explosive properties | Not explosive |
| t) | Oxidizing properties | The substance or mixture is not classified as oxidizing. |

## 9.2 Other safety information
No data available

## SECTION 10: Stability and reactivity

### 10.1 Reactivity
Corrosive in contact with metals

### 10.2 Chemical stability
The product is chemically stable under standard ambient conditions (room temperature) .

### 10.3 Possibility of hazardous reactions
Exothermic reaction with:
Amines
Aldehydes
permanganates, for example potassium permanganate
Risk of ignition or formation of inflammable gases or vapours with:
Aluminum
Carbides
Fluorine
Metals
Bases
Sulfides
Risk of explosion with:
Alkali metals
Sulphuric acid
Gives off hydrogen by reaction with metals.

### 10.4 Conditions to avoid
no information available

### 10.5 Incompatible materials
MetalsMetals

### 10.6 Hazardous decomposition products
In the event of fire: see section 5

## SECTION 11: Toxicological information

### 11.1 Information on toxicological effects

**Mixture**

**Acute toxicity**
Symptoms: If ingested, severe burns of the mouth and throat, as well as a danger of perforation of the esophagus and the stomach.
Symptoms: mucosal irritations, Cough, Shortness of breath, Possible damages:, damage of respiratory tract
Dermal: No data available

**Skin corrosion/irritation**
Mixture causes burns.

**Serious eye damage/eye irritation**
Mixture causes serious eye damage. Risk of blindness!

**Respiratory or skin sensitization**
No data available

**Germ cell mutagenicity**
No data available

**Carcinogenicity**

| | |
|---|---|
| IARC: | No ingredient of this product present at levels greater than or equal to 0.1% is identified as probable, possible or confirmed human carcinogen by IARC. |
| NTP: | No ingredient of this product present at levels greater than or equal to 0.1% is identified as a known or anticipated carcinogen by NTP. |
| OSHA: | No component of this product present at levels greater than or equal to 0.1% is on OSHA's list of regulated carcinogens. |

**Reproductive toxicity**
No data available

**Specific target organ toxicity - single exposure**
Mixture may cause respiratory irritation.

**Specific target organ toxicity - repeated exposure**
No data available

**Aspiration hazard**
No data available

**11.2 Additional Information**

RTECS: MW4025000
Other dangerous properties can not be excluded.

Handle in accordance with good industrial hygiene and safety practice.

**Components**

**hydrochloric acid**

**Acute toxicity**
Oral: No data available
Inhalation: Cough Difficulty in breathing
Inhalation: absorption
Inhalation: Corrosive to respiratory system.
Symptoms: mucosal irritations, Cough, Shortness of breath, Inhalation may lead to the formation of oedemas in the respiratory tract., Possible damages:, damage of respiratory tract, tissue damage
Dermal: No data available

**Skin corrosion/irritation**
Skin - reconstructed human epidermis (RhE)
Result: Corrosive
(OECD Test Guideline 431)

**Serious eye damage/eye irritation**
Eyes - Bovine cornea
Result: Corrosive
(OECD Test Guideline 437)

**Respiratory or skin sensitization**
Maximization Test - Guinea pig

Result: negative
(OECD Test Guideline 406)

**Germ cell mutagenicity**
Test Type: Chromosome aberration test in vitro
Test system: Chinese hamster ovary cells
Result: Conflicting results have been seen in different studies.

**Carcinogenicity**
Carcinogenicity - Did not show carcinogenic effects in animal experiments. (IUCLID)

**Reproductive toxicity**
No data available

**Specific target organ toxicity - single exposure**
May cause respiratory irritation.
The substance or mixture is classified as specific target organ toxicant, single exposure, category 3 with respiratory tract irritation.
Acute inhalation toxicity - mucosal irritations, Cough, Shortness of breath, Inhalation may lead to the formation of oedemas in the respiratory tract., Possible damages:, damage of respiratory tract, tissue damage

**Specific target organ toxicity - repeated exposure**
The substance or mixture is not classified as specific target organ toxicant, repeated exposure.**Aspiration hazard**
No aspiration toxicity classification

## SECTION 12: Ecological information

### 12.1 Toxicity

**Mixture**
No data available

### 12.2 Persistence and degradability
No data available

### 12.3 Bioaccumulative potential
No data available

### 12.4 Mobility in soil
No data available

### 12.5 Results of PBT and vPvB assessment
PBT/vPvB assessment not available as chemical safety assessment not required/not conducted

### 12.6 Other adverse effects
No data available

**Components**

**hydrochloric acid**
No data available

| | |
|---|---|
| Toxicity to fish | LC50 - Gambusia affinis (Mosquito fish) - 282 mg/l - 96 h<br>Remarks: (IUCLID) |

## SECTION 13: Disposal considerations

### 13.1 Waste treatment methods

**Product**
Waste material must be disposed of in accordance with the national and local regulations. Leave chemicals in original containers. No mixing with other waste. Handle uncleaned containers like the product itself. See www.retrologistik.com for processes regarding the return of chemicals and containers, or contact us there if you have further questions.

## SECTION 14: Transport information

**DOT (US)**
UN number: 1789 Class: 8 Packing group: II
Proper shipping name: Hydrochloric acid
Reportable Quantity (RQ):
Poison Inhalation Hazard: No

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

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

## SECTION 15: Regulatory information

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

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

| | CAS-No. | Revision Date |
|---|---|---|
| Hydrochloric Acid | 7647-01-0 | 2013-02-08 |

**SARA 311/312 Hazards**
Acute Health Hazard

**Massachusetts Right To Know Components**
No components are subject to the Massachusetts Right to Know Act.

## SECTION 16: Other information

**Further information**
The above information is believed to be correct but does not purport to be all inclusive and shall be used only as a guide. The information in this document is based on the present state of our knowledge and is applicable to the product with regard to appropriate safety precautions. It does not represent any guarantee of the properties of

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Version: 6.15 Revision Date: 09/24/2021 Print Date: 11/27/2021

# SAFETY DATA SHEET

Version 6.2
Revision Date 01/15/2020
Print Date 11/27/2021

## SECTION 1: Identification of the substance/mixture and of the company/undertaking

### 1.1 Product identifiers

| | | |
|---|---|---|
| Product name | : | 2-Methylpropene |
| Product Number | : | 295469 |
| Brand | : | Aldrich |
| Index-No. | : | 601-012-00-4 |
| CAS-No. | : | 115-11-7 |

### 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 Inc.<br>3050 SPRUCE ST<br>ST. LOUIS MO 63103<br>UNITED STATES |
| Telephone | : | +1 314 771-5765 |
| Fax | : | +1 800 325-5052 |


### 1.4 Emergency telephone number

| | | |
|---|---|---|
| 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)**

Flammable gases (Category 1), H220
Gases under pressure (Liquefied gas), H280
Simple Asphyxiant,

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

**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

---

## 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**
Carbon oxides

**5.3 Advice for firefighters**
Wear self-contained breathing apparatus for firefighting if necessary.

**5.4 Further information**
Use water spray to cool unopened containers.

---

## SECTION 6: Accidental release measures

**6.1 Personal precautions, protective equipment and emergency procedures**
Avoid breathing vapours, mist or gas. Ensure adequate ventilation. Remove all sources of ignition. Evacuate personnel to safe areas. Beware of vapours accumulating to form explosive concentrations. Vapours can accumulate in low areas.
For personal protection see section 8.

**6.2 Environmental precautions**
Prevent further leakage or spillage if safe to do so. Do not let product enter drains.

**6.3 Methods and materials for containment and cleaning up**
Clean up promptly by sweeping or vacuum.

**6.4 Reference to other sections**
For disposal see section 13.

---

## SECTION 7: Handling and storage

**7.1 Precautions for safe handling**
Avoid inhalation of vapour or mist.
Use explosion-proof equipment.Keep away from sources of ignition - No smoking.Take measures to prevent the build up of electrostatic charge.
For precautions see section 2.2.

**7.2 Conditions for safe storage, including any incompatibilities**
Keep container tightly closed in a dry and well-ventilated place.
Storage class (TRGS 510): 2A: Gases

### 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 |
|---|---|---|---|---|
| 2-Methylpropene | 115-11-7 | TWA | 250 ppm | USA. ACGIH Threshold Limit Values (TLV) |
| | Remarks | Upper Respiratory Tract irritation<br>body weight effects<br>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**

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

**Skin protection**

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

Full contact
Material: Fluorinated rubber
Minimum layer thickness: 0.7 mm
Break through time: 480 min
Material tested:Vitoject® (KCL 890 / Aldrich Z677698, Size M)

Splash contact
Material: Nitrile rubber
Minimum layer thickness: 0.4 mm
Break through time: 60 min
Material tested:Camatril® (KCL 730 / Aldrich Z677442, 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**
Impervious clothing, Flame retardant antistatic protective clothing., The type of protective equipment must be selected according to the concentration and amount of the dangerous substance at the specific workplace.

**Respiratory protection**
Where risk assessment shows air-purifying respirators are appropriate use a full-face respirator with multi-purpose combination (US) or type AXBEK (EN 14387) respirator cartridges as a backup to engineering controls. If the respirator is the sole means of protection, use a full-face supplied air respirator. Use respirators and components tested and approved under appropriate government standards such as NIOSH (US) or CEN (EU).

**Control of environmental exposure**
Prevent further leakage or spillage if safe to do so. Do not let product enter drains.

## SECTION 9: Physical and chemical properties

### 9.1 Information on basic physical and chemical properties

| | | |
|---|---|---|
| a) | Appearance | Form: Liquefied gas |
| b) | Odour | unpleasant |
| c) | Odour Threshold | No data available |
| d) | pH | No data available |
| e) | Melting point/freezing point | Melting point/range: -140 °C (-220 °F) |
| f) | Initial boiling point and boiling range | -6.9 °C 19.6 °F - lit. |
| g) | Flash point | -80 °C (-112 °F) - closed cup |
| h) | Evaporation rate | No data available |
| i) | Flammability (solid, gas) | No data available |
| j) | Upper/lower flammability or explosive limits | Upper explosion limit: 9.6 %(V)<br>Lower explosion limit: 1.8 %(V) |
| k) | Vapour pressure | 4,370 hPa at 37.7 °C (99.9 °F) |
| l) | Vapour density | 2.25 |
| m) | Relative density | No data available |
| n) | Water solubility | No data available |
| o) | Partition coefficient: n-octanol/water | log Pow: 2.34 |
| 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**

Relative vapour density 2.25

---

## 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**
No data available

**10.4 Conditions to avoid**
Heat, flames and sparks.

**10.5 Incompatible materials**
Strong oxidizing agents, Strong acids, Halogens

**10.6 Hazardous decomposition products**
Hazardous decomposition products formed under fire conditions. - Carbon oxides
Other decomposition products - No data available
In the event of fire: see section 5

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## SECTION 11: Toxicological information

**11.1 Information on toxicological effects**

**Acute toxicity**
LC50 Inhalation - Rat - 4 h - 620,000 mg/m3
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: UD0890000

Acts as a simple asphyxiant by displacing air., Dizziness, Disorientation, Headache, excitement, Central nervous system depression, To the best of our knowledge, the chemical, physical, and toxicological properties have not been thoroughly investigated.

## SECTION 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

## SECTION 13: Disposal considerations

**13.1 Waste treatment methods**

**Product**
Offer surplus and non-recyclable solutions to a licensed disposal company. Burn in a chemical incinerator equipped with an afterburner and scrubber but exert extra care in igniting as this material is highly flammable. 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: 1055    Class: 2.1
Proper shipping name: Isobutylene
Reportable Quantity (RQ):
Poison Inhalation Hazard: No

**IMDG**
UN number: 1055    Class: 2.1    EMS-No: F-D, S-U
Proper shipping name: ISOBUTYLENE

**IATA**
UN number: 1055    Class: 2.1
Proper shipping name: Isobutylene
IATA Passenger: Not permitted for transport

## 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**
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**
Fire Hazard, Sudden Release of Pressure Hazard

**Massachusetts Right To Know Components**

| | CAS-No. | Revision Date |
|---|---|---|
| 2-Methylpropene | 115-11-7 | 1993-04-24 |

No components are subject to the Massachusetts Right to Know Act.

**Pennsylvania Right To Know Components**

| | CAS-No. | Revision Date |
|---|---|---|
| 2-Methylpropene | 115-11-7 | 1993-04-24 |

| | CAS-No. | Revision Date |
|---|---|---|
| 2-Methylpropene | 115-11-7 | 1993-04-24 |

**New Jersey Right To Know Components**

| | CAS-No. | Revision Date |
|---|---|---|
| 2-Methylpropene | 115-11-7 | 1993-04-24 |

## SECTION 16: Other information

**Further information**



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

The branding on the header and/or footer of this document may temporarily not visually match the product purchased as we transition our branding. However, all of the information in the document regarding the product remains unchanged and matches the product ordered. For further information please contact mlsbranding@sial.com.

Version: 6.2 Revision Date: 01/15/2020 Print Date: 11/27/2021

# Safety Data Sheet (SDS)

Date Prepared/Revised: 7/1/21  Version no.: 08  Supersedes: (7/8/19)

## 1.) Identification of the Mixture and of the Company

Product identifier**: Aervoe Survey Marking Paint - Aerosol**

Product name: **Survey Marking Paint**

| Non-Fluorescent Colors | Fluorescent Colors | High Delivery | Metallic |
|---|---|---|---|
| 201 Red | 220 Red | 281 Red | 210 Silver |
| 202 Yellow | 222 Orange | 288 Fluorescent Orange | |
| 203 Blue | 224 Green | | |
| 204 Green | 226 Yellow | | |
| 205 Orange | 227 Blue | | |
| 206 Black | 229 Pink | | |
| 207 White | 230 Red/Orange | | |
| 208 Hi Visibility Yellow | | | |
| 209 Light Blue | | | |
| 212 Purple | | | |
| 280 Concrete Grey | | | |

Relevant identified uses of the substance: Designed to adhere to most surfaces, includ¬ing pavement, gravel, and soil.
Uses advised against: This aerosol product is designed to spray at an angle not greater than 30° from vertical. Do not use on turf surfaces.

| | |
|---|---|
| CAS No: | **Not Applicable (mixture)** |
| EC No: | **Not Applicable (mixture)** |
| Index No: | **Not Applicable (mixture)** |
| Manufacturer/Supplier: | **Aervoe Industries Incorporated** |
| Street address/P.O. Box: | **1100 Mark Circle** |
| Country ID/Postcode/Place | **Gardnerville, Nevada 89410** |
| Telephone number: | **1-775-782-0100** |
| e-mail: | **mailbox@aervoe.com** |
| National contact: | **Aervoe industries Incorporated** |
| For Product Information: | **1-800-227-0196** |
| Emergency telephone number: | **1-800-424-9300 (CHEMTREC – 24 hrs)** |

## 2. Hazards identification

**Classifications**

Physical Hazards:
Aerosol - Category 1
Flam. Gas. 1
Liquefied Gas
Flam. Liq. 2
Flam. Liq. 3 * 210 Silver

Health Hazards:
Car 1B
Muta 1B
Asp Tox. 1
Eye Irrit. - 2
Rep. 2

| | |
|---|---|
| | Skin Irr. 2<br>STOT SE3<br>STOT RE 2<br>Acute Tox. 4 * 280 Concrete Grey |
| Environmental Hazards: | Aquatic Chronic 2 |

**Labeling**

| | |
|---|---|
| Signal Word: | Danger |
| Hazard Statements: | H220 – Extremely flammable gas<br>H222 – Extremely flammable aerosol<br>H225 – Highly flammable liquid and vapour.<br>H226 – Flammable liquid and vapour.<br>H229 - Pressurized container: may burst if heated<br>H304 – May be fatal if swallowed and enters airways.<br>H312 – Harmful in contact with skin. *280 Concrete Gray<br>H315 – Causes skin irritation.<br>H319 – Causes serious eye irritation.<br>H332 – Harmful if inhaled. * 280 Concrete Gray<br>H336 – May cause drowsiness or dizziness.<br>H340 – May cause genetic defects<br>H350 – May cause cancer<br>H361 – Suspected of damaging fertility or the unborn child .<br>H373 – May cause damage to nervous system through prolonged or repeated exposure(Inhalation)<br>H411 – Toxic to aquatic life with long lasting effects. |
| Precautionary Statements: | P101 - If medical advice is needed, have product container or label at hand<br>P102 - Keep out of reach of children<br>P103 - Read label before use<br>P210 - Keep away from heat/sparks/open flames/hot surfaces - no smoking<br>P211 - Do not spray on an open flame or other ignition source<br>P251 - Pressurized container: Do not pierce or burn, even after use<br>P261 - Avoid breathing dust/fume/gas/mist/vapours/spray<br>P262 - Do not get in eyes, on skin, or on clothing<br>P264 - Wash … thoroughly after handling<br>P280 - Wear protective gloves/eye protection/face protection<br><br>P303+P361+P353 - If on skin or hair, remove/takeoff immediately all contaminated clothing. Rinse skin with water/shower.<br>P410+P412 - Protect from sunlight. Do not expose to temperatures exceeding 50ºC/122ºF<br>P501 - Dispose of contents/container in accordance with local/regional/national/international regulation |

Symbols/Pictograms: 

## 3. Composition / Information on Ingredients

### Composition

| Chemical | Synonyms | CAS Number | EINECS Number | Weight Percent | Hazard Category | H-Code |
|---|---|---|---|---|---|---|
| Hydrocarbon Propellant | LPG | 68476-86-8 | 270-705-8 | 10-30% | Flam. Gas 1<br>Liquefied Gas | H220<br>H229<br>H222 |
| Hexane | n-Hexane | 110-54-3 | 203-777-6 | 5-10% | Flam. Liq. 2<br>Repr. 2<br>Asp. Tox. 1<br>STOT RE 2 *<br>Skin Irrit. 2<br>STOT SE 3<br>Aquatic Chronic 2 | H225<br>H361f *<br>H304<br>H373 **<br>(nervous system)<br>(inhalation)<br>H315<br>H336<br>H411 |
| Aliphatic Petroleum Distillates | Solvent Naphtha | 64742-89-8 | 265-192-2 | 5-10% | Flam Liq. 2<br>Skin Irr. 2<br>Asp. Tox. 1<br>STOT SE 3<br>Aquatic Tox. 2 | H224<br>H304<br>H315<br>H336<br>H411 |
| Aliphatic Petroleum Distillates | Solvent Naphtha | 64742-88-7 | 265-191-7 | 1-5% | Asp. Tox. 1 | H304 |
| **Non-fluorescent colors also contain:** | | | | | | |
| Acetone | Propanone | 67-64-1 | 200-662-2 | 1-5% | Flam. Liq. 2<br>Eye Irrit. 2<br>STOT SE 3 | H225<br>H319<br>H336 |
| Aliphatic Petroleum Distillates | Solvent Naphtha | 8052-41-3 | 232-489-3 | 1-5% | Carc. 1B<br>Muta. 1B<br>Asp. Tox. 1<br>STOT RE 1 | H304<br>H340<br>H350<br>H372<br>(Nervous) |
| **210 silver contains:** | | | | | | |
| Hydrocarbon Propellant | LPG | 68476-86-8 | 270-705-8 | 10-30% | Flam. Gas 1<br>Liquefied Gas | H220<br>H229<br>H222 |
| Acetone | Propanone | 67-64-1 | 200-662-2 | 30-60% | Flam. Liq. 2<br>Eye Irrit. 2<br>STOT SE 3 | H225<br>H319<br>H336 |
| Aliphatic Petroleum Distillates | Solvent Naphtha | 8052-41-3 | 232-489-3 | 1-5% | Carc. 1B<br>Muta. 1B<br>Asp. Tox. 1<br>STOT RE 1 | H304<br>H340<br>H350<br>H372<br>(Nervous) |
| n-Butyl Acetate | n-Butyl Ester | 123-86-4 | 204-658-1 | 1-5% | Flam. Liq. 3<br>STOT SE 3 | H226<br>H336 |

| | | | | | | |
|---|---|---|---|---|---|---|
| Aliphatic Petroleum Distillates | Solvent Naphtha | 64742-89-8 | 265-192-2 | 10-30% | Flam Liq. 2<br>Skin Irr. 2<br>Asp. Tox. 1<br>STOT SE 3<br>Aquatic Tox. 2 | H224<br>H304<br>H315<br>H336<br>H411 |
| Aliphatic Petroleum Distillates | Solvent Naphtha | 64742-88-7 | 265-191-7 | 7-13% | Asp. Tox. 1 | H304 |
| **280 Concrete Gray contains:** | | | | | | |
| Hydrocarbon Propellant | LPG | 68476-86-8 | 270-705-8 | 10-30% | Flam. Gas 1<br>Liquefied Gas | H220<br>H229<br>H222 |
| Hexane | n-Hexane | 110-54-3 | 203-777-6 | 5-10% | Flam. Liq. 2<br>Repr. 2<br>Asp. Tox. 1<br>STOT RE 2 *<br>Skin Irrit. 2<br>STOT SE 3<br>Aquatic Chronic 2 | H225<br>H361f *<br>H304<br>H373 **<br>(nervous system)<br>(inhalation)<br>H315<br>H336<br>H411 |
| Aliphatic Petroleum Distillates | Solvent Naphtha | 64742-89-8 | 265-192-2 | 5-10% | Flam Liq. 2<br>Skin Irr. 2<br>Asp. Tox. 1<br>STOT SE 3<br>Aquatic Tox. 2 | H224<br>H304<br>H315<br>H336<br>H411 |
| Acetone | Propanone | 67-64-1 | 200-662-2 | 1-5% | Flam. Liq. 2<br>Eye Irrit. 2<br>STOT SE 3 | H225<br>H319<br>H336 |
| n-Butyl Acetate | n-Butyl Ester | 123-86-4 | 204-658-1 | 1-5% | Flam. Liq. 3<br>STOT SE 3 | H226<br>H336 |
| Ethyl Acetate | Ethanoate | 141-78-6 | 205-500-4 | 1-5% | Flam. Liq. 2<br>Eye Irrit. 2<br>STOT SE 3 | H225<br>H319<br>H336 |
| 2-Butoxyethyl Acetate | Butyl Glycol Acetate | 112-07-2 | 203-933-3 | 1-5% | Acute Tox. 4 *<br>Acute Tox. 4 * | H332<br>H312 |
| 2-(2-butoxyethoxy)ethanol; diethylene glycol monobutyl ether | 0 | 112-34-5 | 203-961-6 | 1-5% | Eye Irrit. 2 | H319 |

### Other Product Information

Chemical Identity: Mixture

## 4.) First Aid Measures

**General Advice:** If symptoms persist, always call a doctor.

**Inhalation First Aid:** Remove victim to fresh air and provide oxygen if breathing is difficult. If not breathing, give artificial respiration, preferably mouth to mouth. Get medical attention immediately.

**Skin Contact First Aid:** Wash with soap and water. Remove contaminated clothing and shoes. Get medical attention immediately. Wash clothing before reuse.

**Eye Contact First Aid:** If contact with eyes, immediately flush eyes with plenty of water for at least 15 minutes, while holding eyelids open. Get medical attention immediately.

**Ingestion First Aid:** If swallowed, wash out mouth with water provided the person is conscious. Do not induce vomiting. Never give anything by mouth to an unconscious person. Get medical attention immediately.

**Most Important Symptoms/Effects:** Exposure may cause slight irritation to the skin, eyes, and respiratory tract. Excessive exposure may cause central nervous system effects.

## 5. Fire Fighting Measures

| | |
|---|---|
| Flammable Properties: | Aerosol |
| Auto Ignition Temperature: | Not Available |
| Suitable extinguishing media: | Carbon dioxide, dry chemical, water spray. |
| Unsuitable extinguishing media: | None known |
| Special hazards arising from the substance or mixture: | None known |
| Hazardous combustion products: | Carbon dioxide, Carbon monoxide |
| Fire & Explosion Hazards: | Closed Containers may rupture due to the buildup of pressure from extreme temperatures. |
| Precautions for fire-fighters: | Use water spray to cool containers exposed to heat or fire to prevent pressure build up. In the event of a fire, wear full protective clothing and NIOSH- approved self-contained breathing apparatus with full face piece operated in the pressure demand or other positive pressure mode. |

## 6. Accidental Release Measures

**PERSONAL PRECAUTIONARY MEASURES:**

1) Follow personal protective equipment recommendations found in section 8.
2) Maintain adequate ventilation.

**SPILL CLEAN-UP PROCEDURES:**

1.) Evacuate unprotected personnel from the area.
2.) Remove sources of ignition if safe to do so.
3.) Pickup spilled materials using non-sparking tools and place in an appropriate container for disposal.
4.) Contain spill to prevent material from entering sewage or ground water systems.
5.) Always dispose of waste materials in accordance with all EU, National and Local Regulations.

## 7. Handling and Storage

**Handling**:

Flammable Aerosol, use in a well ventilated area.
Do not use near sources of ignition.

Do not to eat, drink and smoke while working with this material.
Wash hands after use.

**Conditions for safe storage, including any incompatibilities:**
Store out of direct sunlight.
Storage Temperature: 32° to 120°F (0° to 49°C).
No known incompatibilities.

## 8. Exposure Controls / Personal Protection

**Appropriate engineering controls:**
Ensure adequate ventilation. A system of local and/or general exhaust is recommended to keep employee exposures below the Airborne Exposure Limits.
Keep away from sources of ignition.
Take precautionary measures against static discharge.

**Personal Protection:**
Eye & face protection devices such as safety glasses, safety goggles or face shield are recommended.

**Skin protection**
Wear the appropriate protective clothing, including boots, gloves, lab coat, apron or coveralls, as appropriate, to prevent skin contact.

**Respiratory protection:**
Use only in an adequately ventilated area. For unknown vapor concentrations use a positive-pressure, pressure-demand, self-contained breathing apparatus (SCBA).

| Hazardous Ingredient | CAS Number | ACGIH TLV (TWA) | ACGIH TLV (STEL) | OSHA PEL (TWA) | OSHA PEL (STEL) |
|---|---|---|---|---|---|
| Aliphatic Petroleum Distillates | 64742-88-7 | N/A | N/A | N/A | N/A |
| Aliphatic Petroleum Distillates | 64742-89-8 | N/A | N/A | N/A | N/A |
| Hydrocarbon Propellant | 68476-86-8 | N/A | N/A | N/A | N/A |
| Hexane | 110-54-3 | 50PPM | N/A | 500PPM | N/A |
| Acetone | 67-64-1 | 250PPM | 500PPM | 1000PPM | N/A |
| Aliphatic Hydrocarbon | 8052-41-3 | 100PPM | N/A | 500PPM | N/A |
| n-Butyl Acetate | 123-86-4 | 50PPM | 150PPM | 150 ppm | N/A |
| Aliphatic Petroleum Distillates | 64742-47-8 | N/A | N/A | N/A | N/A |
| Ethyl Acetate | 141-78-6 | 400PPM | N/A | 400PPM | N/A |
| 2-Butoxyethyl Acetate | 112-07-2 | 20PPM | N/A | N/A | N/A |
| diethylene glycol monobutyl ether | 112-34-5 | 10PPM (IFV) | N/A | N/A | N/A |

***Values are based on the 2019 Guide to Occupational Exposure Values by ACGIH**

## 9. Information on Basic Physical and Chemical Properties

| | |
|---|---|
| Appearance: Color varies by product. | Odor: Hydrocarbon Odor |
| Odor Threshold: N/AV | pH: Not Applicable (solvent Base) |
| Melting Point: N/AV | Freezing Point: N/AV |

Date Prepared/Revised: 7/1/21 Version no.: 08 Supersedes: (7/8/19)

| | |
|---|---|
| Initial Boiling Point: N/AV | Boiling Point Range: N/AV |
| Flash Point: <0° F (-18° C) | Evaporation Rate: Faster than n-Butyl Acetate |
| Flammability Solid/Gas: Flammable gas | Upper LEL: 1% Lower LEL: 13% |
| Vapor Pressure: N/AV | Vapor Density: Heavier Than Air |
| Relative Density: N/AV | Solubility: Negligible |
| Partition Coefficient: n-octanol/ water: N/AV | Auto-ignition Temperature: N/AV |
| Decomposition Temperature: N/AV | Viscosity: N/AV |
| Explosive Properties: N/AV | Oxidizing Properties: N/AV |

## 10. Stability & Reactivity

Possibility of hazardous reactions: Hazardous polymerization will not occur under normal conditions
Chemical stability: Stable under normal conditions
Conditions to avoid: Heat and ignition sources
Incompatible materials: Strong Oxidizing Agents
Hazardous decomposition products: Will not occur

## 11. Toxicological Information

Reports have associated repeated and prolonged overexposure to solvents with permanent brain and nervous system damage. Repeated overexposure can also damage kidneys, lungs, liver, heart and blood

Routes of exposure: Eyes, skin, ingestion, and/or inhalation

| | |
|---|---|
| Acute toxicological data: | (Acetone) Acute oral LD50: 5800mg/kg(rat)<br>(Acetone) LC50: 21000 ppm / 8 hr (rat)<br>(Hexane) LD50: 2870 mg/kg (Rat-Oral)<br>(2-Butoxyethyl Acetate)CD50: 2400mg/kg (Rat-Oral) |
| Eye irritation data: | Eye Irrit. 2 |
| Skin irritation/sensitization/absorption data: | Skin Irrit. 2 |
| Reproductive toxicity data: | Reproductive 2 (Fertility) |
| Mutagenicity data: | Muta 1B |
| Symptoms associated with physical contact: | N/AV |
| Acute/chronic effects from short/long term exposure: | STOT SE 3 (Nervous system, Inhalation)<br>STOT RE 1/2 (Nervous system, Inhalation)<br>Irritating to skin. Prolonged/repeated contact may cause defatting of the skin which can lead to dermatitis. Not expected to be a skin sensitizer. |

Known reportable carcinogens via the following agencies:

| | |
|---|---|
| NTP: | N/AV |
| IARC: | IARC3:Classification not possible from current data |
| OSHA: | TLV-A4 |

## 12. Ecological Information

Ecotoxicity: **No Data Available**
Persistence and degradability: **No Data Available**
Bioaccumulative potential: **No Data Available**
Mobility in soil: **No Data Available**
Results of PBT and vPvB assessment: **No Data Available**
Other adverse effects: **No Data Available**

## 13. Disposal Considerations

**Waste Disposal:** Dispose of material in accordance with EU, national and local requirements. For proper disposal of used material, an assessment must be completed to determine the proper and permissible waste management options permitted under applicable rules, regulations and/or laws governing your location.
**Product / Packaging disposal:** Dispose of packaging in accordance with federal, state and local requirements, regulations and/or laws governing your location.

## 14. Transportation Information

### US DOT

| UN Number | Proper Shipping Name | Hazard Class | Packing Group | Marine Pollutant | Special Provisions |
|---|---|---|---|---|---|
| UN1950 | Aerosols | 2.1 | Not Applicable | Not Applicable | Reference 49 CFR 172.101 |

### IMDG

| UN Number | Proper Shipping Name | Hazard Class | Packing Group | Marine Pollutant | Special Provisions |
|---|---|---|---|---|---|
| UN1950 | Aerosols | 2.1 | Not Applicable | Not Applicable | Reference IMDG code part 3 |

### IATA:

| UN Number | Proper Shipping Name | Hazard Class | Packing Group | Marine Pollutant | Special Provisions |
|---|---|---|---|---|---|
| UN1950 | Aerosols, Flammable | 2.1 | Not Applicable | Not Applicable | Reference IATA Dangerous Goods Regulation |

## 15. Regulatory Information

**Workplace classification:**
This product is considered hazardous under the OSHA Hazard Communication Standard (29 CFR 1910.1200). The Occupational Safety and Health Administration's interpretation of the product's hazard to workers.
**SARA Title 3:**
Section 311/312 Categorizations (40 CFR 372): This product is a hazardous chemical under 29 CFR 1910.1200, and is categorized as an immediate and delayed health, and flammability physical hazard. Superfund Amendment and Reauthorization Act (SARA) category. SARA requires reporting any spill of any hazardous substance.
**TSCA status:** All chemicals in this product are listed, or are exempt from listing, on the TSCA Inventory.
**WHMIS:** This product has been classified in accordance with the hazard criteria of the Controlled Products Regulations (CPR) and the (M)SDS contains all of the information required by the CPR.
**PROP 65 (CA):** WARNING: Cancer and Reproductive Harm – www.P65Warnings.ca.gov.

## 16. Other Information

This SDS has been completed in accordance with GHS Rev04 (2011): U.S OSHA, CMA, ANSI, Canadian WHMIS standards, and European Directives.

Date of Preparation/Revision: 7/1/21
Supersedes: (7/8/19)

To the best of our knowledge, the information contained herein is believed to be accurate. However, the above data does not imply any guarantee or warranty of any kind, expressed or implied. The final determination of the suitability of any material is the sole responsibility of the user. All materials made present un-known hazards and should be used with caution. Although certain hazards are described herein, we cannot guarantee these are the only hazards existing.

**Attachment 3**
HS Standards

# Table of Contents

**QUICK SHEET**

## Applicability

This HSS assigns responsibilities and expectations for proper utility location and clearance by both Arcadis employees and Arcadis subcontractors at project sites

## Need to Know

PMs are responsible for ensuring the requirements of this HSS are followed. Project personnel are responsible for understanding the HSS and Supplemental document, having the minimum 1 year of required training in order to clear sites, understand and apply the requirement for a minimum three reliable lines of evidence for each point of work, know and understand the Arcadis 30-in tolerance Zone requirements.

**If and when any line of evidence reveals planned subsurface work will occur within the Arcadis 30-inch Tolerance Zone of known/marked/located/observed utilities or structures, the project team must Stop Work and contact Corporate H&S for a review of steps the team has taken to prevent injury or incident involving the conflict.**

Additional details addressing hazards, risk factors, and safe work practices are discussed in the HSS Supplemental document Sections:

1. Best Practices for Project Managers (or Their Delegates) Concerning Utility Clearance.
2. Best Practices for Field Personnel Concerning Utility Clearance.
3. Use and Limitations of Common Underground Locating Technologies and Clearance Methods.
4. Best Practices for State One Call Notification Process and Mark Outs.
5. Emergency Action Plan Guidelines for Utility Strikes.
6. Utility Location Procedures for Aquatic Work Activities.

Arcadis field personnel involved with any strike incidents including contact with a structural feature, subsurface, submerged, and/or aboveground utilities must immediately STOP WORK and contact the Project Manager to discuss the incident. If there are life threatening injuries, or the incident presents a risk to public safety (e.g. natural gas leak, downed live electrical line, flooding, or an unstable building) first call 911 or the available emergency services number for the client site or area and then call the Project Manager. The incident must be reported to Corporate Health and Safety immediately and no later than 24 hours after gaining knowledge of the incident. Compliant notification within 24 hrs. requires an acknowledgement of the notification by Corporate H&S.

The Arcadis standard client and subcontractor contracts contain required terms and conditions defining responsibility for utility clearance and the allocation of risk associated with an impacted utility.

## Training

Field staff must complete a minimum of one year of utility clearance-related experience before accepting responsibility for any utility clearance tasks. This experience requires mentorship by a currently trained and experienced Arcadis employee for the processes of; completing DigSafe 811 notifications, developing a working understanding of the types of utilities present at project sites, developing a working understanding of the various reliable lines of evidence, and participating in on-site training led by another Arcadis employee with detailed knowledge and experience in identifying utilities and structures.

### Permits or Forms Required

The Utility Location HSS and associated supplements will be reviewed, and the Utility and Structures Checklist will be prepared during project planning to document and record the location and clearance process for the Site.

## 1. POLICY

It is the practice of Arcadis and its affiliated companies to implement appropriate, reasonable, and practical standards within acceptable and customary industry practices to promote the health and safety of its employees and avoid and mitigate exposure of risk in the performance of their work. In furtherance of this policy, Arcadis promotes and encourages compliance by all employees with this policy and standards relating to work in the vicinity of subsurface, submerged, or aboveground utilities.

## 2. PURPOSE AND SCOPE

### 2.1 Purpose

Arcadis is committed to providing a healthy and safe work environment for our employees, subcontractors, clients, and visitors. To this end, this health and safety standard (HSS) establishes general safety standards and best practices associated with the identification, management and avoidance of subsurface, submerged, and aboveground structures and utilities on project sites.

### 2.2 Scope

This HSS assigns responsibilities and expectations for proper utility location and clearance by both Arcadis employees and Arcadis subcontractors at project sites.

## 3. DEFINITIONS

Definitions related to Utility Location and Clearance can be found in Exhibit 1. Acronyms and Abbreviations are found in Exhibit 2.

## 4. RESPONSIBILITIES

Project staff involved in subsurface and aboveground work activities are expected to read, understanding and comply with this HSS and the ARC HSFS-019 Supplements, specifically ARC HSFS-019 Supplement Sections 2 and 3, make the required DigSafe notification(s), and complete the appropriate checklists during the on-site utility and structures locate and clearance process.

### 4.1 Project Managers

For every project site having the potential to come into contact with utilities, Project Managers (PMs) are responsible for the requirements of this HSS in that:

- The requirements of this HSS are followed.
- Local regulations governing utility clearance are followed. This includes ensuring local and/or state laws defining activities or depth of intrusive work/excavation requiring utility clearance are reviewed as they vary by location. For further information, refer to the

Common Ground Alliance One Call State Law Directory (https://commongroundalliance.com/map).

- Efforts are made to work with the client, project site representatives, public utility companies, and subcontractors to identify the nature of any utilities and to determine control processes that need to be implemented by Arcadis and the subcontractors to prevent damage to these utilities and to properly manage the effects in the event there is utility damage.

- In jurisdictions where the actual contractor performing the subsurface intrusive work is required to perform utility clearance notifications (811, State One Call, etc.) ***and*** Arcadis is also self-performing the work, Arcadis will complete the clearance notifications and include the ticket number on the Utility Clearance Checklist. Refer to ARC HSFS-019 Supplement Section 4 for Best Practices for State One Call procedures.

- Utility clearance activities are only delegated to a Task Manager or other individual meeting the requirements of Section 4.2 below, as appropriate. However, even if the Project Manager delegates certain responsibilities, the Project Manager maintains primary responsibility for the completion of utility clearance. For additional information on Project Manager responsibilities and best practices, refer to ARC HSFS-019 Supplement 1.

- Prior to beginning subsurface work, Project Managers or designee must review the Utility and Structures Checklist with staff and Arcadis subcontractors (including subs of subs). The Project Manager or designee review must be documented on the Utility and Structures Checklist prior to starting subsurface intrusive work

### 4.2 Field Personnel Responsibilities

Arcadis field personnel conducting work on a project site having the potential to come into contact with utilities have the responsibility to:

- Read, understand, and follow this HSS and ARC HSFS-019 Supplement document.

- Complete a minimum of one year of utility clearance-related experience before accepting responsibility for any utility clearance tasks. This experience requires mentorship for notifying DigSafe 811, developing a working understanding of the types of utilities present at project sites, developing a working understanding of the various reliable lines of evidence, and participating in on-site training led by another Arcadis employee with detailed knowledge and experience in identifying utilities and structures.

- Request and review the 811 DigSafe notification(s) in place for the appropriate work area(s).

- Prior to beginning any subsurface intrusive work (i.e., any work or activity that breaks the plane of the ground surface), excavation work involving heavy and mechanized equipment, or operating high clearance equipment at the Site, the Utility and Structures Checklist must be completed and signed by the staff member completing or overseeing the clearance. Confirm that the Utility and Structures Checklist was reviewed by the Project Manager or designee as discussed in Section 4.1 above. Review the Utility and Structures Checklist daily prior to starting subsurface intrusive activities to ensure all utilities are identified and markings are present. A copy of the completed Utility and Structures Checklist will remain on-site during all subsurface intrusive work.

- Use their STOP WORK Authority to eliminate any reasonable concern if utilities cannot be reasonably located and contact the Project Manager to review the STOP WORK situation and confirm the direction of action before proceeding with the work.

- Check that Arcadis subcontractors conduct their own reasonable independent utility clearance efforts as required by state and local laws and the Arcadis subcontractor agreement.

- Be on-site and provide oversight during utility location and clearance activities and any active subsurface intrusive work or activities involving subcontractor under contract to Arcadis.

- If a utility is damaged and repaired during the course of the field event, Arcadis field staff must provide oversight and document that the repair was tested to ensure the repaired utility is competent and complete to prevent further damage to the site when the damaged utility is re-activated.

### 4.3 Corporate Health & Safety

Corporate H&S is responsible for keeping this HSS up to date with regulatory requirements and best work practices.

Corporate H&S will, as requested, provide guidance to employees and their supervisors engaged in work involving utility location and clearance on the risks and measures prevention utility strikes, including how to recognize the presence of utilities whether overhead, underground, or submerged and how to mark and protect them from damage.

### 4.4 Arcadis Subcontractor Responsibilities

According to the Arcadis standard subcontract terms and conditions, subcontractors agree to take responsibility for any damages resulting from a utility impact caused by their work. Therefore, Arcadis subcontractors are expected to take reasonable time and diligence to conduct their own independent utility clearance using reasonable standards and processes. Subcontractors have the responsibility to stop their work if utility concerns are identified and will report those concerns to the Arcadis employee overseeing their work activities. Arcadis staff should reinforce these responsibilities with subcontractors during job safety briefings.

In jurisdictions where the actual contractor performing the subsurface intrusive work is required to perform utility clearance notifications (811, State One Call, etc.), the contractor will perform the clearance notification and will provide evidence of the notification to Arcadis (ticket or ticket number, etc.). Refer to ARC HSFS-019 Supplement Section 4 for Best Practices for State One Call procedures.

- If overhead utilities are present in areas where heavy equipment will be operated, ensure adequate clearance is provided. For heavy equipment with extendable or telescoping (e.g., excavators, dump trucks, extendable lift trucks) equipment, evaluate whether the use of a spotter is necessary prior to operating heavy equipment when in proximity to the overhead utility.

- Consider signage and/or other forms of identification to ensure aboveground and overhead utilities that need to be protected during Arcadis work are effectively addressed.

- If a utility is struck and requires repair, the repair must be tested prior to restoring the utility to full service.

## 5. PROCEDURE

### 5.1 General Safe Work Practices

Arcadis staff will follow these general safe work practices when working around utilities. Procedures to be followed during utility and structures location and clearance activities are outlined in the following sections of the Utility Location and Clearance Supplemental document:

7. Best Practices for Project Managers (or Their Delegates) Concerning Utility Clearance.
8. Best Practices for Field Personnel Concerning Utility Clearance.
9. Use and Limitations of Common Underground Locating Technologies and Clearance Methods.
10. Best Practices for State One Call Notification Process and Mark Outs.
11. Emergency Action Plan Guidelines for Utility Strikes.
12. Utility Location Procedures for Aquatic Work Activities.

### 5.2 Lines of Evidence

When locating utilities and structures three (3) reliable "lines of evidence" must be established to help determine where a subsurface utility may be located. A line of evidence may be a scaled site drawing showing where a utility is located, it could be information obtained verbally from owners or employees who meet the definition of a "knowledgeable person" regarding utility and structural features, it could be established using any number of non-intrusive geophysical methods including but not limited to; ground penetrating radar (GPR), electromagnetic survey (EM), radio-frequency methods (RF), or it could involve probing for or exposing the utility by soft dig technologies (AKA "daylighting" or "potholing") using air knife, Hydroknife and/or soil vacuum. Some lines of evidence will identify utility locations with a high degree of certainty (e.g., direct connect radio-frequency technique, daylighting, or potholing, sonde tracing, etc.). Other lines of evidence will identify utilities will less certainty (e.g., GPR, historical reports, old design drawings, etc.).

Effective utility locate practices must use multiple lines of evidence until there is a high degree of certainty that the various underground utility services have been adequately located. A minimum of three (3) reliable lines of evidence are required for an appropriate utility clearance as defined in this HSS. All reliable lines of evidence used during the utility clearance procedure will be recorded on the Utility and Structures Checklist or equivalent client-provided checklist or ground disturbance permit. If three (3) reliable lines of evidence have not established certainty regarding the location of a utility, STOP WORK and do not proceed until the certainty has improved, the work has been modified to resolve the lack of certainty. Additional reliable lines of evidence must be utilized until the presence or absence of the underground utility can be established. During work activities, if a line of evidence is lost or not apparent (e.g., paint markings have faded), STOP WORK, and re-establish the line of evidence prior to resuming subsurface intrusive work.

Generally, the following example reliable lines of evidence may be used to meet the minimum three lines utility clearance requirement:

1. Contacting the State One Call or equivalent service (Nationwide "811") in advance of intrusive work is **REQUIRED BY LAW**.. Contacting the State One Call or equivalent service (Nationwide "811") is an acceptable reliable line of evidence when working within or adjacent to the public right of way or easement. Note that the State One Call can provide valuable information regarding locations and types of utilities entering a privately owned property.

   **Note**: When conducting work on private property or in areas not served by State One Call or equivalent service, teams are to evaluate using a reputable private utility locating company to locate and mark the utilities. **Use of a reputable private utility locator is encouraged for all projects with subsurface or submerged utilities.** When working with a private utility location subcontractor, it is best practice to pre-plan clearance areas, review the necessary clearance equipment needed based on the types of utilities anticipated to be present, and the re-clearing/confirmation of any public utility location markings (State One Call or equivalent service Nationwide "811").

2. Use detailed, scaled site utility plans, preferably in the form of an "as-built" or "record" drawing, to identify and/or confirm utility locations. Document request and/or receipt of utility drawings from the property owner/client on the Utilities and Structures Checklist.

3. Interview(s) with knowledgeable site or client personnel. The following questions should be asked during the interview and answers documented on the Utility and Structures Checklist:

   - Employees(s) Name and Affiliation(s) with the site.
   - Types of utilities, including utility composition and location of utilities on-site.
   - Depths of known utilities; and
   - Any other pertinent information regarding utilities on the site.

4. Conduct a detailed visual site inspection of areas around all planned subsurface intrusive work points or areas to identify and/or confirm utility locations. The area needed to conduct a thorough site inspection can vary significantly depending on the number and type of utilities present, notably gravity-fed utilities such as sewers. Sewer network manhole spacing can often include 100-foot distances or greater between manholes. For underground utilities, conduct an inspection for structures that tend to indicate the presence and general location of such utilities, including, but not limited to manholes, vaults, valve covers, valve markers, telephone pedestals, transformer housings, fire hydrants, fire suppression post indicator valves (PIVs), spigots, sprinkler heads, air relief valves, backflow preventers, meters, vent lines, downspouts going into the subsurface, power poles with wiring going into the subsurface and line markers, stakes, and monuments. Saw cut lines and concrete/asphalt repairs often yield valuable information regarding utility locations.

Always discuss the presence of utilities with the site owner, operator, facility representative and/or occupant to identify any potential utilities that might not be readily identified by non-intrusive geophysical clearing methods. Situations where non-intrusive clearance methods may not be effective include:

- Depths > 5 ft. below ground surface (BGS).
- Small diameter or certain utility construction materials (e.g. plastics).
- Multiple layers of surface cover e.g. reinforced concrete, multiple layers of historical roadbed.
- Soil conditions such as dense soils or shallow groundwater table.

A discussion of use and limitations associated with common utility location and clearance geophysical methods is provided in ARC HSFS-019 Supplement Section 3.

Standard operating procedures for utility location in submerged settings are presented in ARC HSFS-019 Supplement Section 6.

The lines of evidence will be recorded on the Utility and Structures Checklist or equivalent client-provided checklist or permit.

**Note**: If a line of evidence is lost, not apparent, no longer applicable or utility location markings are removed/worn/unclear, or area of previous clearance is not confirmed, STOP WORK and re-establish the line(s) of evidence prior to resuming subsurface intrusive work. **Each location of subsurface intrusive work must have a minimum of 3 reliable lines of evidence.** All lines of evidence used during the utility clearance procedure will be recorded on the Utility and Structures Checklist or equivalent client-provided checklist or permit. The Utility Structures and Checklist is valid for 15 business days from the date of completion. Prior to the end of the 15 day period the checklist detailing the utilities which have been located and marked must be reviewed to verify no new utilities have been identified but are unmarked and, utilities which have been located and marked continue to be clearly marked. Update the checklist with the date of the review and reviewer name to “re-set” the 15-day period. A copy of the completed Utility and Structures Checklist will remain onsite while work involving or in the vicinity of utilities is conducted.

**Caution: If and when any line of evidence reveals planned subsurface work will occur within the Arcadis 30-inch Tolerance Zone of known/marked/located/observed utilities, the project team must Stop Work and contact Corporate H&S for a review of the steps the team has taken to prevent injury or incident involving the utility conflict.**

### 5.3 Color Codes Used for Utility Markings

The following colors are used for marking utilities. Some government agencies or large industrial facilities may use additional colors not provided below. Arcadis policy is to assume any paint marking or pin flag color not provided below is a subsurface utility marking until proven otherwise.

If utilities or subsurface anomalies are identified but the utility type or anomalies are not classified, it is recommended the color pink (Temporary Survey Marking) be used to mark the location pending confirmation. Once the type of utility is established, the pink marks will be repainted/remarked to represent the correct type of utility.

| COLOR | Utility Line |
|---|---|
| WHITE | Proposed Excavation |
| PINK | Temporary Survey Markings |
| RED | Electrical Power Lines, Cables, Conduit and Lighting Cables |
| YELLOW | Gas, Oil, Steam, Petroleum or Gaseous Materials |
| ORANGE | Communication, Alarm or Signal Lines, Cables or Conduit |
| BLUE | Potable Water |
| PURPLE | Reclaimed Water, Irrigation and Slurry Lines |
| GREEN | Sewer and Drain Lines |

*APWA and ANSI standard Z-53.1*

### 5.4 Locating Technologies

There are several types of locating technologies that can be used to identify and locate utilities in the subsurface. Project teams need to work closely with private utility locators (PUL) in order to best match locating technology with site conditions. To provide the best results, all possible locating technologies should be available for use and implementation at the project location. Any potential interferences should also be discussed up front and then at the project site during utility location activities. Potential interferences could be soil moisture, soil type, standing water on concrete/asphalt, rebar, fencing, and metal structures that are in the subsurface. Employees overseeing locating technology activities should have an understanding of device operation and limitations. For further information, refer to ARC HSFS-019 Supplement Section 3, Use and Limitations of Common Utility Location Technologies and Clearance Methods.

### 5.5 Clearance Methods

In some cases, proposed subsurface intrusive locations may be pre-cleared using other intrusive methods. Determine the clearance or soft dig method based on-site conditions and utilize the least invasive method possible. The number of subsurface intrusive locations and soil type should be taken into consideration. The following clearance methods are listed from least invasive to most invasive:

1. Vacuum Extraction/Potholing (air or water-based)
2. Air knifing
3. Hydro knifing
4. Probing
5. Hand augering
6. Hand digging
7. Posthole digging

"Single-Point" clearance involves clearing the intrusive location to 110% of the proposed subsurface intrusive area or the diameter plus 2 inches of the largest piece of tooling used in the subsurface (e.g. clear the borehole to 10-in. when setting wells using 8-in. hollow stem auger tooling), or whichever is greater.

"Three-Point" clearance involves clearing the utility using a triangular pattern placed around the proposed borehole location and in a configuration such as to not allow utilities to pass undetected between the clearance boreholes. In some cases, it is more practical to advance three individual slot trenches which connect at each end making a "clearance triangle" instead of advancing multiple boreholes side-by-side. Using the Three-Point clearance triangle trenching method allows for teams to inspect larger areas for potential utilities. The teams can advance trenches along each side of the proposed work area extending down to a target depth based on suspected depth of utilities at the Site. Each method of clearance will be documented on the Utility and Structures Checklist.

Manual clearing methods, such as shoveling, using pickaxes, digging bars (AKA "Spud bars" and other hand tools, should be avoided completely or only used when absolutely necessary and used with caution. Excessive downward force, prying or use in poor/obstructed visibility conditions is prohibited as these tools are known to be capable of damaging utilities.

Surface cover (e.g., asphalt) removal methods that pose excessive downward force, such as jackhammering, must be used with extreme caution. Methods that only cut the surface cover (coring or saw cutting) present less risk due to the absence of the blunt downward force, which could cause collateral damage to shallow subsurface utilities by unintentionally pushing buried debris into the utility. Note that certain utilities are often present at the concrete or pavement/soil interface or encased within the concrete or pavement and are easily damaged during concrete coring or pavement removal. Always work slowly, methodically, and frequently STOP WORK to evaluate conditions during these work activities.

For borings and excavations, if the utility is known to be at depths where hand clearing is not feasible or creates additional safety concerns, no work will be performed within the Arcadis 30-inch Tolerance Zone vertically or horizontally of the utility unless manual clearing of the utility is performed under the oversight of an Excavation Competent Person as defined in ARC HSCS005 HSS Arcadis Excavation and Trenching.

#### 5.5.1 Temporary Backfilling of Pre-Cleared Boreholes

In some cases, it may be necessary to temporarily backfill a pre-cleared / daylighted location until the remaining subsurface activities are performed. At these locations where subsurface intrusive work does not immediately follow pre-clearance, it is important to properly backfill and mark the pre-cleared location in order to protect the utility integrity and maintain the location. In general, wooden stakes, survey flags, whisker markers, paint marking, or other surface markings alone are inadequate because these markings can be easily removed, damaged, or otherwise lost creating uncertainty for the pre-cleared location. Although the specific steps for backfilling a pre-cleared location will depend on site-specific conditions, use the following steps to prevent loss of the pre-cleared location:

- Backfill a pre-cleared location with clean sand or other granular material that is recognizably different from the surrounding subsurface native material. Native soil should not be used to backfill a pre-cleared location that may require further subsurface work.

- Backfill the top 2 feet of a pre-cleared location with dyed sand or gravel to facilitate re-location.

- Place wooden stakes or delineators to mark locations as an additional measure, if practical.

- In the event that the pre-cleared borehole is located on asphalt or concrete and an asphalt cold patch is required, use white paint to mark the intrusive location over the asphalt cold patch.

- In some instances, such as projects potentially affected by unexploded ordinance (UXO), the pre-cleared borehole may require that a PVC pipe of matching diameter be inserted into the pre-cleared borehole, filled with clean sand and affixed with a matching cap. Project teams are to discuss client specific utility location and marking requirements with the project manager prior to conducting work.

- Always use a physical subsurface marker such as described above to identify the pre-cleared borehole location. Don't rely solely on field measurements or GPS coordinates as the only means for locating pre-cleared locations.

- If a utility or anomaly/obstruction is encountered during the pre-clearing process, backfill the hole with the native soil and mark the location with a pink-painted X and/or NO.

In the event that a previously pre-cleared location cannot be located, the location must be re-cleared prior to performing subsurface intrusive work

### 5.6 Clearance for Working in Vicinity of Subsurface Utilities – The Arcadis Utility Tolerance Zone

Prior to the start of subsurface intrusive activities (i.e., excavating / test pitting, drilling, installing grounding rods, manual soil sampling etc.), all utilities must be located, and steps taken to avoid unintentionally contacting or damaging subsurface utilities. See exemptions for subsurface intrusive work in Exhibit 1 (Definitions). Field Teams are not to procced with subsurface work involving utilities located within 30 inches of a line marking as measured radially (e.g. 360 degrees) from the outermost point of the marked utility. If only the centerline of the utility or utility bank is marked, but the utility width or diameter is known or suspected, the diameter of the utility or utility bank (Exhibit 1) must be incorporated into the Arcadis 30-inch Tolerance Zone, see Figure 1 located in Exhibit 2 for further instructions and an illustration of the Arcadis 30-in. Tolerance Zone.

If and when any line of evidence reveals planned subsurface work will occur within the Arcadis 30-inch Tolerance Zone of known/marked/located/observed utilities or structures, the project team must Stop Work and contact Corporate H&S for a review of steps the team has taken to prevent injury or incident involving the conflict.

If subsurface work using heavy or mechanized equipment must take place within the Arcadis 30-inch Tolerance Zone of the marked utility, the utility must be exposed (daylighted) using soft dig clearance methods prior to starting subsurface intrusive activities as described in Section 5.5 of this HSS.

**Note: No heavy or mechanized equipment is permitted to be used within the Arcadis 30-inch Tolerance Zone for the purpose of daylighting the utility.**

Once the utility in conflict has been daylighted, and heavy or mechanized equipment use is planned within the Arcadis 30-inch Tolerance Zone of the utility, such work must receive pre-approval by Corporate H&S to review steps the team has taken to assess and mitigate the risk associated with the planned work. Additional excavation safety procedures may have to be developed as part of the Corporate H&S approval to proceed. It should be noted that any disturbance within 30 inches of the marked utility, or disruption of the surrounding bedding materials could affect the integrity of the utility.

For horizontal borings, to avoid striking a utility, damage from vibration, damage by pressure of the advancing boring, do not drill within 30 inches in all directions (3-Dimensional cylinder) of a line marking. Make sure to factor the diameter of the line or utility bank when calculating the extent of the 30-inch Tolerance Zone. When crossing a utility during horizontal drilling, it is recommended that the utility be exposed 30 inches in a 360°-direction. When exposing utilities for horizontal borings, the utility must be exposed (potholed) by soft dig/clearance methods. This recommendation applies even if the operating contractor has technology that places the location to within a few inches. Make sure to factor the diameter of the utility when determining the 30-inch Tolerance Zone. If subsurface work must take place within the 30-inch Tolerance Zone of the line marking, the utility must be exposed (potholed) by soft dig/clearance methods prior to starting subsurface intrusive work (see Section 5.5 for options); no mechanized equipment is permitted for the exposing of the utility. Once the utility has been exposed, if mechanized equipment is planned for use within the 30-inch Tolerance Zone of the utility, such activity must receive pre-approval by Corporate H&S, as necessary, to mitigate or accept the risk associated with the planned work. Additional excavation safety procedures may have to be developed as part of the approval to proceed. It should be noted that any disturbance within the 30 inches or disruption of the bedding materials could affect the integrity of the utility.

Additional cautions for horizontal borings include gravity-fed utilities, such as sewers and storm drains. The depth of these utilities will change (sometimes significantly) as they run across the project site. Project teams need to obtain sewer utility depths in the work area(s) and determine the depth of the sewer at the location where the boring will actually intersect with the sewer line by collecting sewer pipe invert elevations from identified manholes and interpolating those depths to the area of the subsurface intrusive work.

During well installations and well abandonment via mechanical equipment, the Arcadis 30-inch Tolerance Zone rule applies in an outward direction extending from the outermost edge of the largest diameter auger or greatest width tool used for installation and abandonment (e.g. "over drilling"). In cases where wells have been previously installed and the 30-inch rule has not been followed, work proposed using heavy or mechanized equipment falling within the Arcadis 30-inch Tolerance Zone requires approval from Corporate H&S. For more information, see Figure 1 in Exhibit 2 for further instructions.

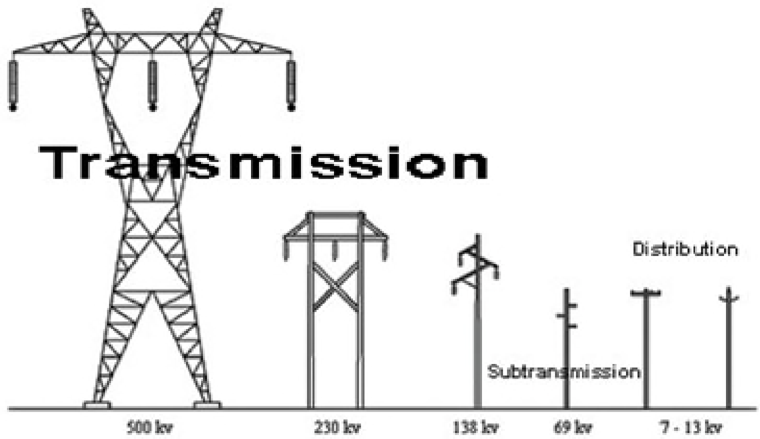
### 5.6.1 Aboveground Activities causing Subsurface Disturbance in the Vicinity of Underground Utilities

Aboveground work-related activities can cause damage to shallow underground utilities or structures. Asses the intended travel paths, mobilization, staging, and operation of heavy equipment and take steps to ensure shallow utilities are not damaged. If heavy equipment must cross over shallow utilities, the team is responsible for confirming the utilities will be protected.

Other subsurface disturbances may lead to damage such as removing trees/tree stumps, shrubs, or dense vegetation as roots may be entangled with underground piping or structures. For more information, see ARC HSFS-019 Supplement Section 2 Best Practices for Field Personnel Concerning Utility Clearance.

### 5.7 Acceptable Clearance for Working in Vicinity of Overhead Power Lines and Other Overhead Lines and Structures

No work will be performed by Arcadis or our subcontractor near overhead power lines where any Unqualified Person or equipment is within the limits specified below, unless the power line has been properly covered or de-energized by the owner or operator of the power line, or a qualified electrical subcontractor. Qualified Person approach distances are defined in Exhibit 5A and 5B of **ARC HSFS0006 Electrical Safety Standard**. Illustrations of general types of overhead utility conveyances are provided in **Exhibit 3** - Overhead Power Utility Illustrations




*OSHA Electric Power etool illustration*

| Power Line Voltage Phase to phase (kV) | Minimum Safe Clearance (feet) |
|---|---|
| 50 or below | 10 |
| Above 50 to 200 | 15 |
| Above 200 to 350 | 20 |
| Above 350 to 500 | 25 |
| Above 500 to 750 | 35 |
| Above 750 to 1,000 | 45 |

*ANSI standard B30.5-1994, 5-3.4.5*

5.7.1 Reducing Vehicle and Mechanical Equipment Clearance Requirements

Any vehicle or mechanical equipment capable of having parts of its structure elevated near energized overhead lines shall be operated so that a minimum clearance of 10 feet (305 centimeters [cm]) is maintained. If the voltage is greater than 50 kilovolts (kV), the clearance shall be increased 4 inches (10 cm) for every 10 kV over that voltage. However, under any of the following conditions, the clearance may be reduced:

- If the vehicle is in transit with its structure lowered, the clearance may be reduced to 4 feet (122 cm).
- If insulating barriers or "power line shields" rated for the voltage of the line being guarded are installed to prevent contact with the lines, and the barriers are not a part of, or an attachment to, the vehicle or its raised structure, the clearance may be reduced to a distance within the designed working dimensions of the insulating barrier.
- If the equipment is an aerial lift that is insulated for the voltage involved and if the work is performed by a qualified person, the clearance (between the uninsulated portion of the aerial lift and the power line) may be reduced to the distance given in OSHA 1910.333(c)(3)(ii)(C) Table S-5. Reference information from OSHA 1910.333 Table S-5 and NFPA 70E Table 130.4(C)(a) for alternating-current systems and 130.4(C)(b) for the distances associated with direct-current voltage systems is included as Exhibit 5 of ARC HSFS0006 Electrical Safety Standard.

Employees standing on the ground may not contact the vehicle or mechanical equipment or any of its attachments unless:

- The employee is using protective equipment rated for the voltage; or
- The equipment is located so that no uninsulated part of its structure (that portion of the structure that provides a conductive path to employees on the ground) can come closer to the line than permitted in this section of this HSS.

If any vehicle or mechanical equipment capable of having parts of its structure elevated near energized overhead lines is intentionally grounded, employees working on the ground near the point of grounding may not stand at the grounding location whenever there is a possibility of overhead line contact. Additional precautions, such as the use of barricades or insulation, shall be taken to protect employees from hazardous ground potentials, depending on earth resistivity and fault currents, which can develop within the first few feet or more outward from the grounding point.

When a machine is in contact with an overhead power line, do not allow anyone to come near or touch the machine. Stay away from the machine and summon outside assistance.

5.7.2 Acceptable Clearance for Working in Vicinity of Non-Electrical Overhead Utilities and Structures

Arcadis field personnel will identify non-electrical overhead utilities and structures and where possible, work is not be conducted within the 30-inch Tolerance Zone of these overhead utilities and structures. It is recommended that if work will be completed in the vicinity of non-electric overhead utilities, the overhead utilities should be labeled with warning signs, protective barricades, and/or flags. Non-electrical overhead utilities and structures may include, but is not limited to, pipe chases, water lines, ceilings in buildings, etc. Arcadis field personnel will notify its site workers (employees, subcontractors, vendors, etc.) of known overhead utilities and structures during the tailgate safety meeting. See Exhibit 2 for additional details.

### 5.8 Reporting Utility Incidents

Arcadis field personnel involved with any strike incidents including contact with a structural feature, subsurface, submerged, and/or aboveground utilities must immediately STOP WORK and contact the Project Manager to discuss the incident. If there are life threatening injuries, or the incident presents a risk to public safety (e.g. natural gas leak, downed live electrical line, flooding, or an unstable building) first call 911 or the available emergency services number for the client site or area and then call the Project Manager. The incident must be reported to Corporate Health and Safety immediately and no later than 24 hours after gaining knowledge of the incident. Compliant notification within 24 hrs. requires an acknowledgement of the notification by Corporate H&S. Team must provide critical details of the incident when notifying Corporate H&S such as; 3rd party involvement, any injuries, known extent of damage and estimate of potential repair cost, service interruption, and client reporting requirements. The project team and field staff will use the Arcadis Utility Line Strike Investigation Form to record initial details of the incident as part of the notification process.

Selected utility strike incidents may also utilize a conference call with operations management to review findings and lessons learned. The Business Line H&S Director will make the determination concerning the need to have the incident investigation review call and will arrange the call, if deemed necessary.

### 5.9 Relationship of this HSS to the Project Specific HASP

With the exception of the Utility and Structures Checklist, this HSS and the supplement documents, are not required to be printed and attached to project HASPs. Project teams have discretion to include such supplements as a BMP or reference guide when developing a project HASP. During project health and safety planning, this HSS will be reviewed and applicable clearance technologies and methods will be documented on the Utility and Structures Checklist.

Additionally, emergency response procedures specific to utility strikes should be addressed. See ARC HSFS-019 Supplement Section 5 which provides general guidelines for emergency response to utility strikes. Applicable information may be attached to the HASP or the Utility and Structures Checklist to facilitate communication of response expectations.

### 5.10 Required Contract Terms and Conditions

The Arcadis standard client and subcontractor contracts contain required terms and conditions defining responsibility for utility clearance and the allocation of risk associated with an impacted utility. These terms and conditions have prescribed language concerning subsurface work that is presented in Arcadis client contracts and the Arcadis subcontractor contracts, which can be found on the ANA Intranet Legal webpage. If such provisions cannot be agreed upon, the reasons are documented and other risk-management actions should be identified, such as limits of liability, add additional physical investigations, additional lines of evidence or utility location, assignment of risk to subcontractors, etc. In addition, any changes to these terms and conditions require approval by Legal Services.

## 6. TRAINING

Employees responsible for coordinating or conducting utility clearance activities will be familiar with the requirements of this HSS and the supplemental documents. Arcadis in-house 8-hour Hazardous Waste Operations and Emergency Response (HAZWOPER) refresher may provide awareness-level training regarding this utility location and clearance HSS.

Field staff must complete a minimum of one year of utility clearance-related experience before accepting responsibility for any utility clearance tasks. This experience requires mentorship by a currently trained and experienced Arcadis employee for the processes of; completing DigSafe 811 notifications, developing a working understanding of the types of utilities present at project sites, developing a working understanding of the various reliable lines of evidence, and participating in on-site training led by another Arcadis employee with detailed knowledge and experience in identifying utilities and structures.

## 7. REFERENCES

- Occupational Safety and Health Administration (OSHA) 29 CFR Subpart P, Excavations, 1926.651, Specific Excavation Requirements.
  - Common Ground Alliance State Law Directory - https://commongroundalliance.com/map
  - Arcadis Utilities and Structures Checklist:
    - Excel Version - Utility and Structures Checklist
    - PDF Version - Utility and Structures Checklist
  - Arcadis Utility Line Strike Investigation Form
  - The Arcadis ARC HSFS-019 Supplement Documents include the following Sections:
    - Section 1 - Best Practices for Project Managers (or Their Delegates) Concerning Utility Clearance
    - Section 2 - Best Practices for Field Personnel Concerning Utility Clearance
    - Section 3 - Use and Limitations Associated with Location Technologies and Common Utility Clearance Methods
    - Section 4 - Best Practices for State One Call Procedures and Notifications
    - Section 5 - Emergency Action Plan guidelines for Utility Strikes
    - Section 6 - Utility Location SOP for Aquatic Work Activities
  - Figure 1 – 30-Inch Tolerance Zone
  - Arcadis H&S Standard ARC HSCS005 Excavation and Trenching

- Arcadis H&S Standard ARC HSFS0006 Electrical Safety Standard

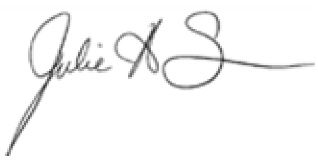
## 8. RECORDS

### 8.1 Utility Clearance Records

All records (maps, checklists, and documentation of communications) used to determine the location of utilities should be retained and kept in the project file.

## 9. APPROVALS AND HISTORY OF CHANGE

Approved by Julie Santaniello, CSP – Corporate H&S Manager of Technical Programs



**History of Change**

| Revision Date | Revision Number | Standard Developed/Reviewed by or Revised By | Reason for change |
|---|---|---|---|
| 13 December 2006 | 01 | Mike Thomas/Pat Vollertsen | Original document |
| 26 March 2007 | 02 | Mike Thomas/Pat Vollertsen | Put in new company format |
| 15 May 2007 | 03 | Mike Thomas/Pat Vollertsen | Added nation-wide 811 number |
| 6 September 2007 | 04 | Mike Thomas/Pat Vollertsen | Changing over to new template format |
| 22 February 2008 | 05 | Mija Coppola | Changing over to new template format |
| 13 January 2009 | 06 | Mija Coppola | Define lines of evidence |
| 4 October 2010 | 07 | Sam Moyers/Mija Coppola | Reformatting and addition of utility clearance information |
| 13 February 2012 | 08 | Sam Moyers/Mija Coppola | Modified link information for utility strike reporting, clarified local/state requirements in section 4.1 and 4.3 |

| Revision Date | Revision Number | Standard Developed/Reviewed by or Revised By | Reason for change |
|---|---|---|---|
| 28 January 2013 | 09 | Tony Tremblay | Utility and Structures Checklist revised; hyperlink updated |
| 12 February 2013 | 10 | Amanda Tine/Tony Tremblay | Clarified clearance boundaries for Unqualified staff in Section 5.7 and added information about vehicles and equipment being used near power lines in Section 5.7.1 |
| 15 March 2013 | 11 | Kurt Merkle, Rebecca Lindeman / Tony Tremblay | Added additional text to HSS for recent lessons learned, added section 5.4 (Locating Technologies) and 5.5 (Clearance Methodologies), added additional details to section 5.6 when working in close proximity to subsurface utilities, and added Supplement 6 - Utility Location SOP for Aquatic Work Activities. |
| 07 July 2013 | 12 | Andrew McDonald/ Tony Tremblay | Removed HSFS-019 Supplement 1, Utility Definitions. Added hyperlink for One Call and State Law Directory. Segregated evidence of sewer or storm drains in USC list. Removed Sam Moyers and added Andrew McDonald as author. |
| 26 September 2014 | 13 | Andrew McDonald/Tony Tremblay | Added Exhibit 1. Definitions and 30-inch tolerance zone. Clarified use of 811 or state one call as a reliable line of evidence. Added best practice to cover backfilling of pre-cleared boreholes. Updated USC list to cover soft dig termination depths and PM review. |
| 23 February 2015 | 14 | Tony Tremblay | Page number correction |

| Revision Date | Revision Number | Standard Developed/Reviewed by or Revised By | Reason for change |
|---|---|---|---|
| 10 May 2016 | 15 | Denis Balcer/Sharon Lingle/Alec MacAdam/Andrew McDonald/Tony Tremblay/Julie Santaniello | ES and Section 4.2 - define subsurface intrusive work; clarify employees providing oversight of utility contractors, Arcadis requirements of operating and interpreting results of utility clearance equipment, and utility clearance before all subsurface intrusive work. Sections 1 and 5.8- changed submarine to submerged. Section 4.1 – added contacting public utility companies to help clear utilities. Section 4.2 – Clarified requirement to complete one year of utility clearance-related experience. Section 4.2 and 4.3 - Added discussion on aboveground activities causing subsurface disturbances. Added responsibility to clear overhead utilities when heavy equipment will be used and to evaluate use of a spotter. Added that repairs to damaged utilities need to be verified as competent and complete. Section 5.2 – Clarified reliable lines of evidence for each subsurface intrusive work point and degrees of certainty. Added all work within 30-inch Tolerance Zone needs Corp H&S preapproval. Section 5.6 and Exhibit 1- Clarify subsurface intrusive work and activity and exemptions for subsurface intrusive work. Section 5.6.1 – Add requirement to evaluate aboveground activities that may lead to subsurface disturbances that may cause damage to shallow underground utilities or structures. |

| Revision Date | Revision Number | Standard Developed/Reviewed by or Revised By | Reason for change |
|---|---|---|---|
| 10 May 2016 | 15 | Denis Balcer/Sharon Lingle/Alec MacAdam/Andrew McDonald/Tony Tremblay/Julie Santaniello | Section 5.7.2 – added non-electric overhead utilities and structures other than power lines need to be identified and marked if working in that area. Section 9 – Changed reviewer from Tony Tremblay to Julie Santaniello. Exhibit 1 – added definitions of Utility Strike, Daylighting, Potholing, Subsurface Intrusive Work, Subsurface Intrusive Activities, and Utility Bank.<br><br>HSS and Supplements placed on new Arcadis headers. Updated Supplement revision numbers to be consistent with HSS. Supplement 2 revised. Utility Clearance and Structures Checklist and Utility Strike Investigation Form revised. |
| 17 March 2017 | 16 | Alec MacAdam/Julie Santaniello | Hyperlink updates; minor formatting; Utility Clearance and Structures Checklist revised. |
| 13 May 2020 | 17 | Alec MacAdam/Denis Balcer/Greg Mason/Julie Santaniello | Updated HSS format. Combined HSS Supplements, revised HSS sections, revised the Utility & Structures Checklist, added Exhibit 2 - Acronyms and Abbreviations. |

## EXHIBIT 1 - DEFINITIONS

**Aboveground Utilities -** For the purpose of this procedure, aboveground utilities include, but are not limited to: any aboveground line, pipe, conduit, system, or facility used for producing, storing, conveying, transmitting or distributing communication or telecommunications signals, electricity, gas, liquid, petroleum and petroleum products, coal slurry, hazardous liquids or gases, water under pressure, steam, sanitary sewage, storm water, or other materials, liquids, or gases.

**Daylighting –** exposing underground utilities or structures through soft dig technology/clearance prior to completing subsurface intrusive activities.

**e.g.** - Exempli gratia. Latin for "for the sake of example." Use it to introduce one or more examples.

**Excavation** - Any man-made cut, cavity, trench, or depression, in an earth surface formed by earth removal into which a person can bodily enter.

**I.e. -** I.e. is the abbreviation for "id est" and means "in other words" or "in essence".

**Kilovolt (kV) -** One kilovolt is equal to 1,000 volts (v), which are the potential difference that would move one ampere of current against one ohm of resistance. The kilovolt is a multiple of the volt, which is the SI derived unit for voltage.

**Overhead Utilities and Structures** – Overhead water lines, overhead pipe chases, ceilings in buildings.

**Potholing** – exposing underground utilities or structures through soft dig technology/clearance prior to completing subsurface intrusive activities.

**Subsurface Intrusive Activities** – For the purposes of this procedure, subsurface intrusive activities include, but are not limited to excavations, vertical drilling, installing grounding rod, soil sampling, etc.,

**Subsurface Intrusive Work** – Is any work or activity that breaks the plane of the ground surface. Exemptions include soil sampling using a non-conductive sampling tool to a depth of 6 inches below ground surface (bgs), placement of survey flagging to a depth of 6 inches bgs, and placement of non-conductive survey stake(s) to a depth of 6 inches bgs).

**Subsurface Utilities -** For the purposes of this procedure, subsurface utilities include, but are not limited to: any underground line, pipe, conduit, system, or facility used for producing, storing, conveying, transmitting or distributing communication or telecommunications signals, electricity, gas, liquid, petroleum and petroleum products, coal slurry, hazardous liquids or gases, water under pressure, steam, storm water, or sanitary sewage; underground storage tanks; tunnels and cisterns; and septic tanks and lines.

**Utility Bank** – a structure containing two or more conduits. A conduit is a single enclosure containing one or more facilities.

**Utility Strike –** An unplanned contact of a utility (i.e., overhead utilities, buildings, structures, aboveground utilities, underground utilities. or submerged utilities) during the course of work that results in; damage requiring repairs, making a report to the utility owner, or requiring further assessment to evaluate the potential for damage.

**Utility Tolerance Zone** – The area within 30 inches measured radially (e.g. extending in all directions) from the outside diameter of a located/marked utility in which special care is to be taken. If the centerline of the utility is marked, the diameter of the utility or utility bank/trench must be incorporated into the 30 inches. This area must be hand cleared with non-mechanized equipment. Once the utility has been exposed, if mechanized equipment is planned for use within the Arcadis 30-inch Tolerance Zone of the utility, such activity must receive pre-approval by Corporate H&S, to mitigate or accept the risk associated with the planned work. See Figure 1 – 30-inch Tolerance Zone.

**Exhibit 2 – Acronyms and Abbreviations**

| | |
|---|---|
| ANA | Arcadis North America |
| Arcadis | Arcadis U.S. Inc. |
| ARC | Arcadis |
| APM | Associate Project Manager |
| APL | Acoustic Pipe Location |
| AKA | Also Known As |
| BGS | Below Ground Surface |
| cm | Centimeter |
| EM | Electromagnetic |
| ft. | Feet |
| GPR | Ground Penetrating Radar |
| HS | Health and Safety |
| H&S | Health and Safety |
| HSS | Health and Safety Standard |
| HAZWOPER | Hazardous Waste Operations and Emergency Response |
| HSFS | Health and Safety Field Safety |
| HSCS | Health and Safety Construction Safety |
| https | Hypertext transfer protocol secure |
| in. | Inch |
| kV | Kilovolt |
| m | Meter |
| NFPA | National Fire Protection Association |
| OSHA | Occupational Safety and Health Administration |
| PIV | Post Indicator Valve |
| PUL | Private Utility Locator |
| PM | Project Manager |
| RF | Radio Frequency |

| | |
| --- | --- |
| RFD | Radio Frequency Detection |
| SOP | Standard Operating Procedure |
| TM | Task Manager |
| TZ | Tolerance Zone |
| UXO | Unexploded Ordinance |

**Exhibit 2 Figure 1 – Arcadis Tolerance Zone Illustration**

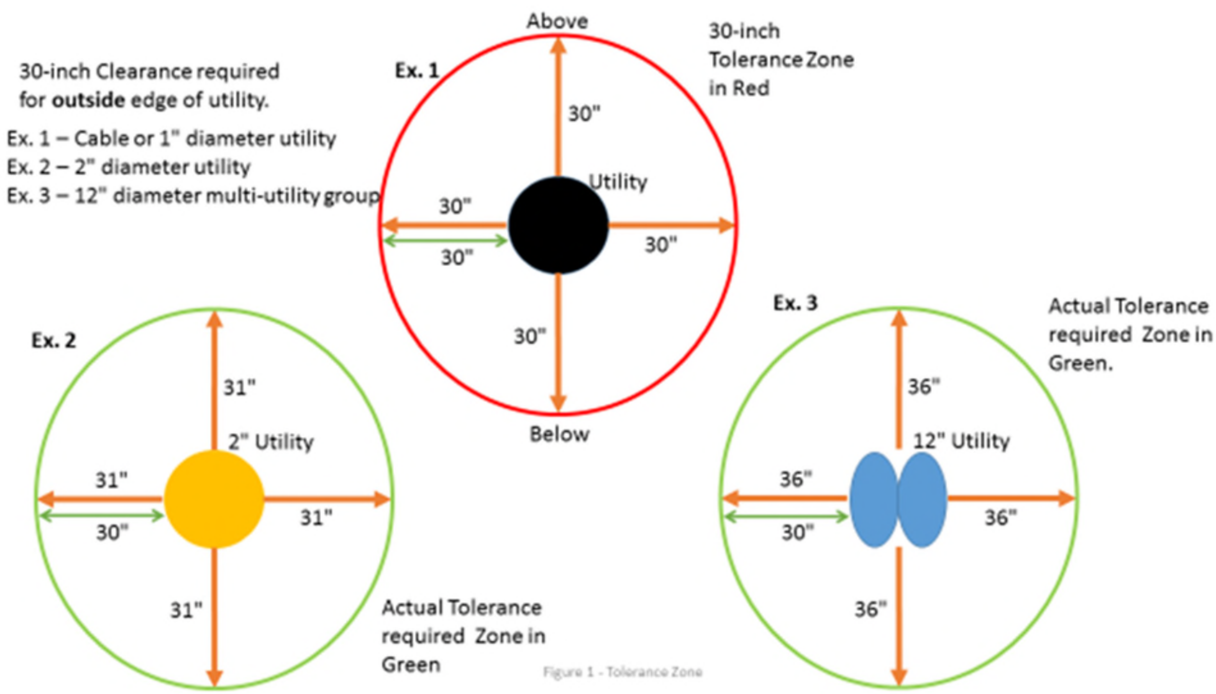
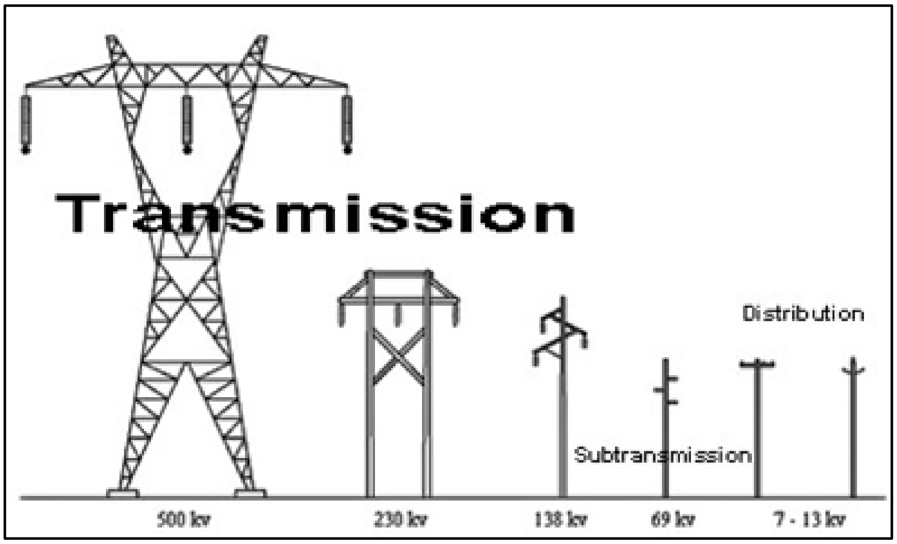
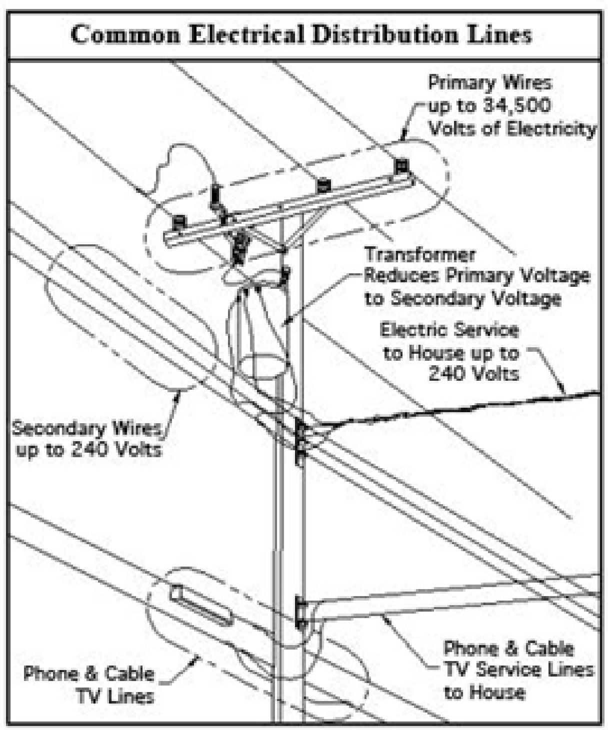


**Exhibit 3 – Overhead Power Utility Illustrations**



**Attachment 4**
Field Forms

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

Project Name: Shluman's Salvage Yard    Start Date: ____________

Project #: 30119464    End Date: ____________

*Utility markings valid for 15 days. Initiate clearance renewal 5 days prior to expiration for ongoing work*

**PRE-FIELD WORK REQUIREMENTS**

DigSafe 811 notified 48-72 hrs. in advance of work? ☐    DigSafe Ticket #: ____________

Ticket Expiration Date: ____________    State Utility Laws: www.commongroundalliance.com/map

Ticket(s) Attached(Y/N)? ☐    List utility owners notified via DigSafe 811 & response status:

List addt'l. utilities requiring notification not included in DigSafe811 Notice:

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

Private Utility Locator Name, if used:    AUS onsite meeting (Y/N)? ☐

**FIELD WORK REQUIREMENTS**

*This portion of the checklist must be completed on site. AUS staff must have a minimum of one year of field experience in identifying utilities to complete the checklist. Field staff will review the completed checklist with PM or designee prior to beginning intrusive work.*

*Heavy equipment/mechanized intrusive work w/in the Arcadis Tolerance Zone (utility or structure present within 30-in. of point of work) REQUIRES pre-approval by Corporate H&S prior to working at all such locations. STOP WORK if the Arcadis Tolerance Zone work has not been approved.*

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

*3 Reliable Lines of Evidence are REQUIRED for EACH INTRUSIVE LOCATION prior to starting any subsurface intrusive work. Check corresponding boxes below to document utility clearance efforts.*

☐ OneCall/DigSafe 811 Public Utility Locate (required by State law for subsurface work)

*811 is only reliable as a Line of Evidence when working in/adjacent to a public ROW or easement.*

Marking type: ☐ Paint ☐ Pin Flags/Stakes ☐ Other: ____________ ☐ None

☐ Client provided maps/drawings (Y/N)?    ☐ Maps/drawings not provided (Y/N)?

☐ Client Clearance (Y/N)?    Name(s)/Affiliation(s): ____________

☐ Interviews (Y/N)?    Name(s)/Affiliation(s): ____________

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

Details provided: ____________

☐ Site Inspected (Y/N)? (document on Pg. 2.) Photo Document Marked Utilities & Structures

☐ Public records/Client Dwgs/As-Builts (Y/N)? Type:

List private locator tools used: ☐ Radio Freq. Detection ☐ Electromagnetic ☐ GPR

☐ Metal Detector ☐ Acoustic Pipe Locator ☐ Downhole sonde    Other:

☐ Soft Dig Methods used (Y/N)? ☐ Hand auger ☐ Probing ☐ Hand tools (shovel/rake)

☐ Air knife ☐ Hydro Knife ☐ Potholing/Vacuum extraction

☐ Other soft dig tools used (Y/N)?    If Yes, list here:

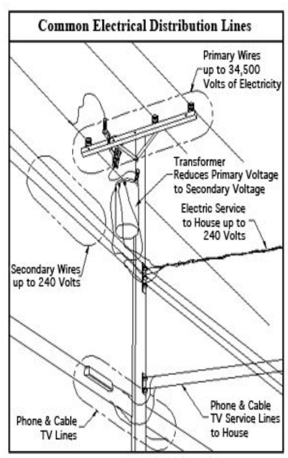
**ALL BOXES BELOW MUST BE COMPLETED BEFORE PROCEEDING**

*Site inspection also requires investigating vicinity outside of the work area for structures and utilities.*
*Noting "YES" requires addt'l. investigation. Utilities must be field marked prior to intrusive work.*

| Is the utility present (Y/N)? | | Utility Color Code |
|---|---|---|
| | Utilities entering/exiting structures? | **No Color** |
| | Intrusive work area marked out? | **White** |
| | Structural features above or below? | **White** |
| | Public natural gas line or meter? | **Yellow** |
| | Private natural gas laterals/feeders? | **Yellow** |
| | Public electrical service? | **Red** |
| | Conduit from meter or on wall? | **Red** |
| | Conduit from poles into ground? | **Red** |
| | Poles/devices w/ no visible lines? | **Red** |
| | Overhead electrical lines? | **Red** |
| | Solar arrays or wind turbines? | **Red** |
| | Public water line(s)? | **Blue** |
| | Private water line(s) or lateral(s)? | **Blue** |
| | Water meter onsite? | **Blue** |
| | Fire hydrants/post indicator valves? | **Blue** |
| | Irrigation system control box/valve? | **Blue** |
| | Sprinkler heads, drip lines, vaults? | **Blue** |
| | Water dispensers, fill stations? | **Blue** |
| | Telecomm. overhead or buried? | **Orange** |
| | Telecomm. ground box or relays? | **Orange** |
| | Telecomm./security CCTV devices? | **Orange** |
| | Public sanitary sewer pipes? | **Green** |
| | Combined sanitary/storm pipes? | **Green** |
| | Private sanitary laterals/clean outs? | **Green** |
| | Restrooms, kitchens, wash bays? | **Green** |

| Is the utility present (Y/N)? | | Utility Color Code |
|---|---|---|
| | Evidence of stormwater network? | **Green** |
| | Curb drains/catch basins/manholes? | **Green** |
| | Stormwater culverts, outfalls? | **Green** |
| ABOVEGROUND Features Present? | | |
| | Transportation tunnels/structures/markers present? | |
| | Overhead electrical lines? | **Red** |
| | < 50 kV w/in 10 ft of work area? | **Red** |
| | >50-200 kV w/in 15 ft of work area? | **Red** |
| | >200-350 kV w/in 20 ft of work area? | **Red** |
| | >350-500 kV w/in 25 ft of work area? | **Red** |
| | >500-750 kV w/in 35 ft of work area? | **Red** |
| | >750-1000 kV w/in 45 ft of work area? | **Red** |
| | Aboveground fire suppression? | **Blue** |
| | Aboveground communications? | **Orange** |
| | Aboveground chases/racks/trays? | **Orange** |
| | Private/Remediation system lines? | **Various** |
| | Unclassed utilities/anomalies? | **Pink** |
| | Warning signs/stakes/markers present? | |
| | Heavy Equipment: Mark travel route for overhead, next to route, and/or under route (e.g. crush risk) utilities. | |
| Signs of other utilities/ground disturbance | | |
| | Signs of asphalt or concrete disturbance/repair? | |
| | Any ground subsidence or change in vegetation? | |
| | Unknown manholes or valve covers in work area? | |

Tips for Thorough Utility Location (HSS Section 5.6):
1. Don't forget to look up for utilities
2. Be on-site with Private Utility Locators.
3. Ask Private Locators to "confirm" other's markings.
4. Also clear alternate/backup locations
5. Mark all known utilities.
6. No hammering, no pickaxes, no digging bars, no shortcutting.
7. No excessive turning or downward force of hand tools, especially hand augers.
8. Utilities may run in or directly under asphalt/concrete
9. Heavy equipment may damage shallow utilities. Especially during clearing and grubbing.
10. Use spotter for heavy equipment near aboveground utilities?




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

PM or Designee Name: ______________________________

Name and Signature of person completing the checklist: ______________________________

Date of checklist review / update: ______________________________

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

# Task Improvement Process

## General

| | |
|---|---|
| Observed Company: | |
| Observation Type: | |
| TIP Form: | H&S Field Multi-Task (General) |
| Task Observed: | |
| Observee Name: | |
| Observer Name: | |
| Observation Date: | |
| Project Number: | 30119464 |
| Project Name: | Shluman's Salvage Yard |
| Supervisor: | |
| Equipment On Site: | |
| Pertinent Information: | |

## Observation

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

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

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

Discussion following the TIP led by: ______________________________

Date of follow-up discussion: ______________________________

Positive Comments:

| |
|---|
| |

Discussion Summary Completed:

- [ ] Supervisor Led
- [ ] Peer to Peer
- [ ] Arcadis Employee to Subcontractor

Summary of Questionable Items

| |
|---|
| |

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

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

## Standard Review

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

## Quality Review

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

## Field Validation and Verification

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

Control Number: TSM- 30119464

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

ARCADIS

# TAILGATE HEALTH & SAFETY MEETING FORM

| | | | |
|---|---|---|---|
| **Project Name:** | **Shluman's Salvage Yard** | | **Project Location:** |
| **Date:** | **Time:** | **Conducted by:** | **Signature/Title:** |

**Issues or concerns from previous day's activities:**

**Task anticipated to be performed today:**

**The following was used to communicate H&S information in this briefing (check all that apply):**

- ☐ HASP (*including THA*)
- ☐ JSAs (*specify JSA #s*): ____________
- ☐ Permits (*specify type or #*): ____________
- ☐ Traffic Safety Plan
- ☐ FHSHB (*specify sections*): ____________
- ☐ H&S Standard (*specify number*): ____________
- ☐ H&S checklist (*specify type*): ____________
- ☐ Activity specific hazard analysis:

Activity: ____________

Hazard Types (unmitigated ranking H-High, M-Medium, L-Low):

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Biological | | Chemical | | Driving | | Electrical | |
| Environmental | | Gravity | | Mechanical | | Motion | |
| Personal Safety | | Pressure | | Radiation | | Sound | |

Controls required to be used:

**PPE Required (If not using JSA or Permit with PPE requirements):**

- ☐ Hard hat
- ☐ Safety glasses
- ☐ Face shield
- ☐ Safety goggles
- ☐ Steel/composite toe boots
- ☐ Traffic vest *(specify II or III)*: ____
- ☐ Life Vest (*specify type*): ____
- ☐ Protective Suit (*specify type*):
- ☐ Protective gloves (*specify type*):
- ☐ Other (*specify*):

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

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

| SSE Employee* | Printed Name/Signature/Company | Sign In Time | Sign Out Time |
|---|---|---|---|
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
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**I will STOP** the job any time anyone is concerned or uncertain about health & safety or if anyone identifies a hazard or additional mitigation not recorded in the site, project, job or task hazard assessment.

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

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

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

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

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

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

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

**What You Need to Know**

| | | | |
|---|---|---|---|
| *Emergency Phone:* | 911 | *WorkCare Phone:* | 1-888-449-7787 |
| *Your nearest hospital:* | Emergency Department, Arnot Ogden Medical Center, 600 Roe Ave, Elmira, New Y | | |
| *H&S Specialist for this project:* | Alec MacAdam | *Cell Phone:* | 720-454-0948 |
| *Project Site Safety Officer:* | 0 | | |
| *Nearest assembly area(s):* | 0 | | |
| *Nearest storm shelter(s):* | 0 | | |

#DIV/0!

Control Number: TSM- 30119464

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

ARCADIS

# TAILGATE HEALTH & SAFETY MEETING FORM

| | | | |
|---|---|---|---|
| **Project Name:** | | | **Project Location:** |
| **Date:** | **Time:** | **Conducted by:** | **Signature/Title:** |

**Issues or concerns from previous day's activities:**

**Task anticipated to be performed today:**

☐ Additional permits/checklists attached

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

☐ Gravity (i.e., ladder, trips) (L M H)
h:
c:

☐ Motion (i.e., traffic, machinery) (L M H)
h:
c:

☐ Mechanical (i.e., augers, motors) (L M H)
h:
c:

☐ Electrical (i.e., utilities) (L M H)
h:
c:

☐ Pressure (i.e., gas cyl., wells) (L M H)
h:
c:

☐ Environment (i.e., heat, cold) (L M H)
h:
c:

☐ Chemical (i.e., fuel, acid, paint) (L M H)
h:
c:

☐ Biological (i.e., ticks, poison ivy) (L M H)
h:
c:

☐ Radiation (i.e., alpha, sun, laser) (L M H)
h:
c:

☐ Sound (i.e., machinery) (L M H)
h:
c:

☐ Personal (i.e. alone, night) (L M H)
h:
c:

☐ Driving (i.e. car, ATV, boat) (L M H)
h:
c:

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

**Comments:**

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

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

| SSE Employee* | Printed Name/Signature/Company | Sign In Time | Sign Out Time |
|---|---|---|---|
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***Short Service Employee (SSE) working for Arcadis <1 year.**

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

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

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

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

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

In the event of an injury, employees will call **WorkCare at 1.888.449.7787** and then notify the field supervisor.

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

# PID Calibration Log

ARCADIS

Zero Gas Source: ____________ Instrument Type: ____________ PAGE ____ of ____

Lot Number/Expiration Date: ____________ Serial Number: ____________

Calibration Gas Source: ____________ Instrument Type: ____________

Lot Number/Expiration Date: ____________ Serial Number: ____________

Concentration: ____________ ____________

| Instrument Number | Date | Time | Zero Cal. OK (Y/N) | Calibration Gas Reading | Comments | Calibration w/in 2% (Y/N)? | Alarms Set (Yes/No)? | User Initials |
|---|---|---|---|---|---|---|---|---|
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# AUS Personal Protective Equipment List by Business Area

This matrix outlines **basic** PPE requirements for each Business Area. **Specific client, task, or regulatory requirements may dictate the type of PPE beyond what is listed in this matrix.** Additionally, task specific PPE requirements may also be included in the HASP or JSA. Hazard/task specific PPE or emergency supply recommendations are outlined by hazard/task in the Field H&S Handbook. PPE and equipment should be charged to the project. For any supplies that the PM determines cannot be billed, the equipment should be charged to the employee's overhead charge number. PPE associated with specialized training such as NFPA 70E Arc Flash is not included in this matrix. Refer to the specific training program for a description of the necessary PPE for tasks involving such requirements.

| ***Listed "General PPE" is required for field staff, the last column specifies PPE for Arcadis staff visiting project sites. Revised 7/9/2021*** | **Environment/ Resilience [1]** | **Infrastructure / Mobility [1]** | **Water/ Places [1]** | **Staff Visiting Project Sites** |
|---|---|---|---|---|
| **Minimum PPE Required to Be Worn** | | | | |
| Hard Hat | R | R | R | R |
| Reflective Traffic Vest (Minimum Class 2) | R | R | R | R |
| Safety Glasses - Clear and Tinted | R | R | R | R |
| ANSI Compliant Safety - Toe Boots | R | R | R | R |
| **Minimum PPE Required to Have On Hand** | | | | |
| Hearing Protection - Ear plugs (Need for ear muffs TBD) | R | R | R | R |
| Leather gloves and glove clip | R | R | R | R |
| **First Aid Supplies [2]** | | | | |
| Small first aid kit | R | R | R | O |
| 16 oz. bottle of Eye Wash | R | R | R | O |
| Tick Remover (fine tip tweezers) (See HASP Tick/Poisonous Plant Section) | O | O | O | O |
| **PPE Supplies Required As Appropriate** | | | | |
| PPE duffel bag with logo, or equivalent | O | O | O | O |
| Half Face or Full-Face Respirator [3] (See THA) | O [3] | O [3] | O [3] | O [3] |
| Insect Repellent ( See THA.) (Recommended 20-30% DEET) | O | O | O | O |
| Sunscreen | O | O | O | O |
| Hand sanitizer | O | O | O | O |
| Cut Resistant or Chemical Resistant Gloves [4] | O | O | O | O |
| Poison Ivy pre-exposure wipes or post exposure cleanser (i.e., Tecnu or Zanfel) (see THA for high risk locations) | O | O | O | O |
| Other specialized protective equipment (See THA for Work Tasks) | O | O | O | O |
| Outdoor wilderness survival kit [5] | O | O | O | O |

**Notes:**

R - Required

O - Optional. Based on HASP Task Hazard Analysis (THA) or geographic location of work.

THA - Task Hazard Analysis.
Review the HASP Task Hazard Analysis (THA) in making this determination. Certain specific factors can influence the determination for requiring this PPE for the site or task. For example, certain geographic regions may have a higher incidence of the hazard or associated risk, the proximity of the site relative to emergency services may require such, previous observations of the hazard at the site, or where unknown hazard conditions apply. Modifications to the minimum required PPE are required to be communicated via the HASP and/or JSA.

1. The Business Area Director, Operations Manager, Project Manager, or Employee Supervisor is responsible for making the decision to provide Arcadis branded shirts to employees. Billing of such shirts is related to the authority level of the decision maker.

2. For project sites with an office/trailer, first aid/emergency response supplies can be kept in a central location, and may not be required to be carried by each Arcadis employee.

3. Staff must comply with the Arcadis Respiratory Protection H&S Standard before a respirator can be worn. The H&S Standard is available on the H&S Team webpage via the H&S Standards Library link.

Arcadis Standards

4. Determination for use of cut resistant, chemical resistant gloves or other specialized hand protection are to be based on THA in the project HASP.

5. Outdoor survival kits are generally required when working in remote wilderness locations. See the HASP THA and the Field H&S Handbook for requirements and supply list.

# Arcadis Weekly Vehicle Inspection Form

**Vehicle # / License Plate #** ______ **Lease Plan # / Last 6 of Vin #** ______

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

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

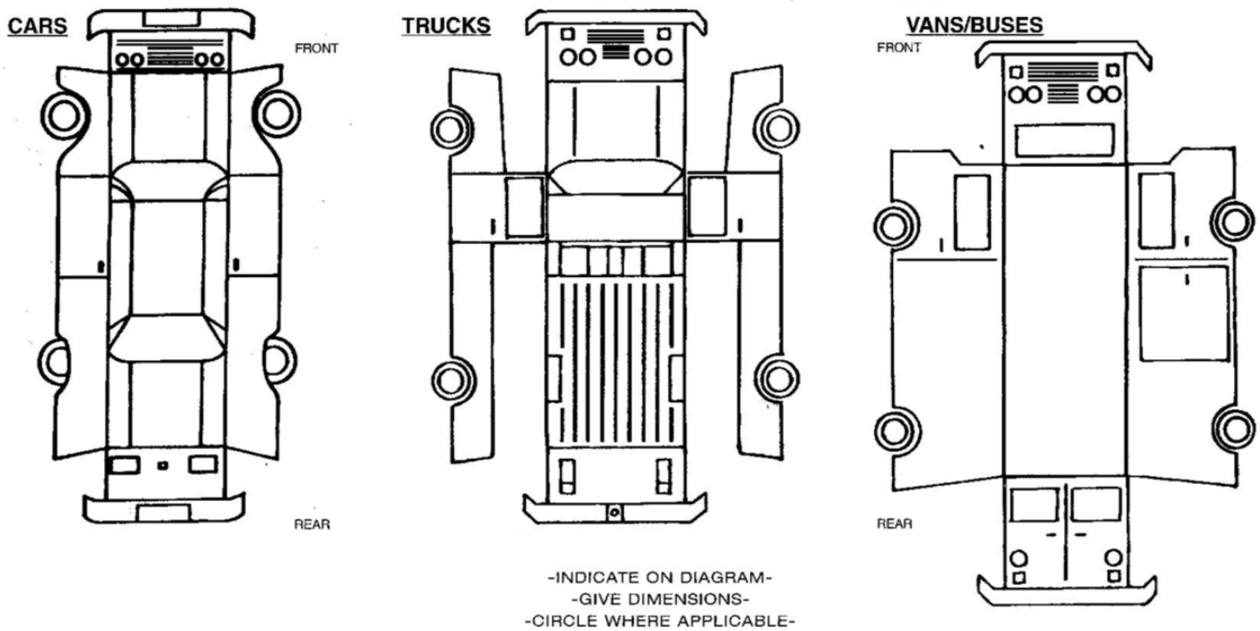
[2] **Emergency Equipment required per Motor Vehicle Standard ARC HSGE024**

## Note All Vehicle Damage Below

**All Vehicle Damage must be reported to Sue Berndt (Corporate Legal), Andrew McDonald (Corporate H&S), and Roger Elliot (Corporate Fleet Manger)**

**CODES:**

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




Notes:

________________________________________

________________________________________

________________________________________

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

2/32" remaining 4/32" remaining 6/32" remaining

**Reference JSA 10907 For Weekly Vehicle Inspection**

**Attachment 5**
Traffic Safety Plan

Traffic Safety Plan (TSP)

## 1.0 General

| | |
|---|---|
| Plan type | Non-Right of Way (Non-ROW) |
| Project Name: | Shulman's Salvage Yard |
| Project Number: | 30119464 |
| Developer Name: | Makenna Guarnieri |
| Duration of Project (in hours or days): | |
| Time Restrictions (Y/N, if Y describe below): | |
| Not Applicable | |
| Not Applicable | |
| Not Applicable | NA |
| Not Applicable | |
| Not Applicable | NA |

☐ Working on multiple roads?

Comments:

## 2.0 Work Description

Provide a brief description of scope of work:

A land survey will be conducted to map out soil boring locations. Following the survey, soil borings will be sampled. Some of the work will take place in a non-ROW stone parking lot at the active site.

## 3.0 Type and Duration

Work locations on this project will be: Intermediate work (1-8 hours per location)

Non-ROW work will be performed in: Active parking lot

Special traffic conditions may include (select most prevalent): Not applicable

## 4.0 Traffic Control Layout, Number of Devices Required, and Phasing

The following Non-ROW requirements in the Traffic Safety Handbook applies:

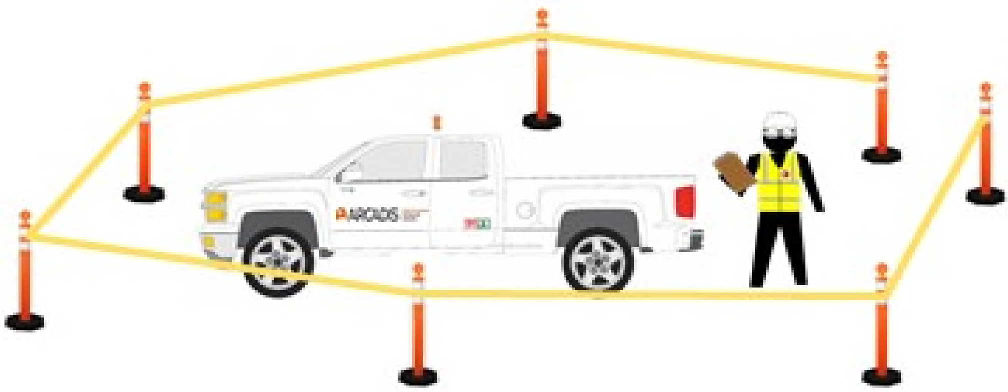
Section 7.3 Intermediate Duration Work in Parking Areas (1 to 8 Hours) (DOT Facts-302b)

The menu below will be blank and is not applicable.

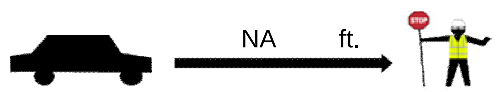
The menu below will be blank and is not applicable.

Non-ROW configuration:

An example non-ROW traffic control configuration for this project is illustrated below. The actual type and number of devices required are specified below. Don't leave vehicle doors open. Don't establish controls within 25 ft of the front or rear of parked large vehicles/rolling equipment without coordinating with the vehicle/equipment operator.

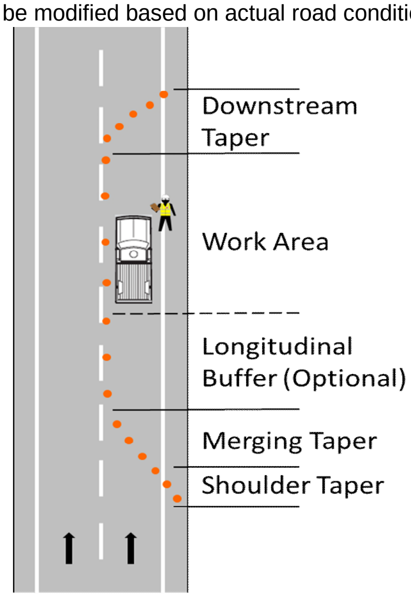


Intermediate Term (1-8 Hours)
Channelizing Cones with Caution Tape

| ROW minimum sign spacing distances for "A", "B" and "C" (as applicable) in referenced DOT Facts. | ROW oncoming traffic minimum site distance required to see Flagger and properly decelerate and stop. |
|---|---|
| A NA ft.<br>B NA ft.<br>C NA ft. |  |

ROW Cone Calculation (Values are default. Light grey fields may be modified based on actual road conditions)

| | |
|---|---|
| Active work area length (feet) | |
| ☐ Apply Optional Longitudinal Buffer (ft)? | |
| Lane width of offset (feet) | |
| Shoulder width of offset (feet) | |
| Posted speed limit | NA |




☐ **Shoulder Taper**

| | |
|---|---|
| Taper Length (feet) | NA |
| Cones Required | NA |
| Cones Spacing (max., ft) | NA |

☐ **Merging Taper**

| | |
|---|---|
| Taper Length (feet) | NA |
| Cones Required | NA |
| Cones Spacing (max., ft) | NA |

☐ **Work Area**

| | |
|---|---|
| Cone Spacing (max., ft) | NA |
| Cones Required | NA |

Note: Review taper configuration and cone spacing after ROW implementation to ensure traffic is moving efficiently without motorist confusion in the RWZ.

☐ **Downstream Taper**

| | |
|---|---|
| Taper Length (feet) | NA |
| Cones Required | NA |
| Cone Spacing (max., ft) | NA |

**Cones Required (minimum)** NA

Select the traffic control devices to be used and enter number each required:

| *Check all that apply:* | | *Wording or Pictogram* | *Number:* |
|---|---|---|---|
| | Warning signs | | |
| | Warning signs | | |
| | Warning signs | | |
| | Stop/Slow paddle | | |
| | Red flag | | |
| | Drums | | |
| X | Channelizer cone (42 inch height, 10 lb base) | | 7 |
| | Channelizer cone (42 inch height, 30 lb base) | | |
| | Traffic cones (≥ 18 inches tall) | | NA |
| | Barricade: | | |
| | Flags for cones | | |
| | Lights (for night work) | | |
| | Plastic fencing (rolls) | | |
| X | Caution tape (rolls) | | 1 |
| | Other (specify): | | |

**Non-ROW Phasing:**

1) Position truck as shield, if practical
2) Deploy traffic control devices
3) Affix flags, caution tape or fencing
4) Unload project equipment
5) Commence work
6) SSO to maintain controls
7) Remove controls in reverse order

Electronic Device Use Safety

Electronic devices (tablets, laptops and cell phones) used to collect data or document activities in active parking lots must be used in a manner that does not interfere with the user's ability to see and react to vehicle movements in the work area. If this requirement cannot maintained, a spotter must be used. When possible position vehicle to act as a shield. Short-term traffic control scenarios provided by this TSP are not authorized if a spotter is not used.

Reviewed By:

HASP Reviewer: ______________________

______________________

**Attachment 6**
Shipping Determination

**SHIPPING/TRANSPORTATION DETERMINATION FORM** Revision 14
Regulated Material Shipping Determination for Non-Bulk and Bulk Consignments

| | |
|---|---|
| Date: | 8/1/2022 |
| Project Name: | NYSEG Elmira Shulman's Salvage Yard |
| Project Number: | TBD |
| Supplemental Information: | None |

**1) Description of the Material to be Transported or Shipped**

1a Select a description category ===> Samples

1b *Polychlorinated biphenyls impacted soils or solids*

1c

☑ This material is mixed with water, soil or other inert material
☑ This material will be shipped on wet or blue ice
☐ Consignment contains dry ice
☐ Consignment contains containers with acid/base preservatives prepared by an analytical laboratory.
☐ Leave this box unchecked

☐ AIR shipping is required

**2) Classification and Identification**

2a This material is: Not Restricted/Not Regulated
Do not complete sections 2b or 2c below

*Complete for Hazardous Materials ONLY:*

2b UN/NA/ID# : NA 2c PG: NA Primary Hazard Class: NA
Subsidiary Hazard Class: NA NA

PSN: NA

Mixture
Add the word "mixture" or "solution" in cell G33 above if not already included in the PSN.

☐ See Section 7a

2d This material is a: No additional criteria applies to this material

**3) Packaging, Exceptions and Shipping Information**

3a Packaging Type: Combination Package - Non-Bulk
3b Inner Container Category: Glass receptacles
3c Number and Quantity:

| | Number | Container type | | **Net Qty. Each Container** | |
|---|---|---|---|---|---|
| Largest Container Type => | 15 | 8 oz | Glass | 8 | oz |
| Container type #2 | 0 | None | None | | None |
| Container type #3 | 0 | None | None | | None |
| Container type #4 | 0 | None | None | | None |
| Container type #5 | 0 | None | None | | None |
| Container type #6 | 0 | None | None | | None |

<= Select units here
TIP: Do not place units in the white column. Place the largest container in bottle set in row #1.

3d Intermediate Packaging: Plastic bag/liner
3e Outer Packaging: SAMPLE COOLER (Non-specification box- plastic )
3f Other: None Type: None

☐ AIR shipping is required

Your suggested shipping configuration (**excluding MOT**): None

This material will be shipped (mode of transport and type of shipment):

3g Road as a non-regulated/restricted consignment

If using an exception/exemption, list the exception/exemption below

3h None

Carrier/Transporter information:

3i Arcadis or Lab Courier Transport (NON BULK)

3j Auth. Air Limits for EQ, LQ and Fully Reg. Shipments and Selected Ground LQ and SQE:
Inner Container Limit (NA- Not Applicable; F- Forbidden; mg, g, or kg for solids; ml or L for liquids):

| | | |
|---|---|---|
| Glass | NA | NA |
| Metal | NA | NA |
| Plastic | NA | NA |

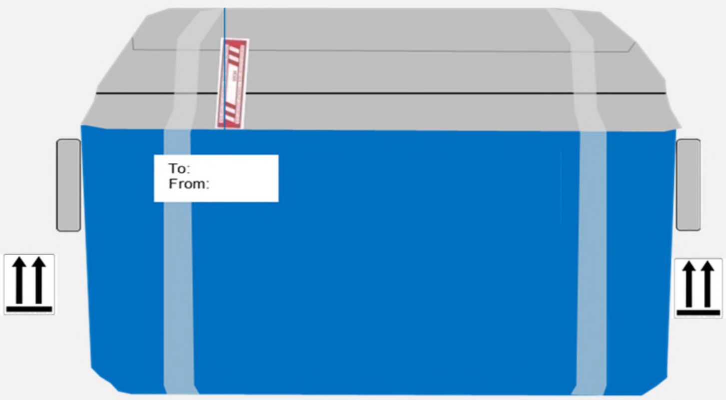
| | | |
|---|---|---|
| Plastic Bag | NA | NA |
| Paper Bag | NA | NA |
| Fibre | NA | NA |

| Outer Package Limit | |
|---|---|
| NA | NA |
| Total net volume/mass: 3.5484 | L/Kg |

☑ Arcadis Shipping Guide US-001 attached
☐ Specific package closure instructions are attached
☐ Arcadis Shipping Guide or HSSP is available for this shipment: NA

**4) Marks, Labels and/or Placards Required**

Orientation arrows, if shown, may be red or black in color.




Place all marks and labels checked in this section on same side of package (excludes orientation arrows, if shown).

**5) Documentation**

☑ No special documentation required
☐ Requires a Shipper's Declaration (air) prepared using : None
☐ Requires HazMat ground shipping papers prepared using: None
☐ Requires a Bill of Lading or Manifest (>MOT, Freight,Trucking Co., Waste Hauler, etc.)
☐ Requires Special Permit DOT-Special Permit #:
☐ Other:

**6) Emergency Response**

☐ Use VelocityEHS (formerly known as ChemTel) 24/7 Emergency Phone and Contract Number or approved equivalent (authorized client or vendor) for this shipment:

1-800-255-3924 (VelocityEHS #MIS0007883) Register this shipment with VelocityEHS:
Have carrier tracking number available. http://Arcadis.chemtel.net/

☐ Ensure current edition of Emergency Response Guidebook in vehicle (this applies to Arcadis Transport requiring a shipping paper)

**7) Special Instructions** (Specify any "See Section 7" details in 7a)

**8) References and Rationale for the Determination** (add additional sheets, if required).

NA

DOT Special Provisions: NA

8a Soil samples containing a soil mixture that includes PCBs and Metals will be collected from the site by Arcadis personnel to Laboratory. Samples will be packaged in 8 oz. glass recepticles and packaged in a non-specification plastic box (sample cooler) for trasnportation to laboratory.

# Appendix D

## Generic Community Air Monitoring Plan

**Appendix 1A**
**New York State Department of Health**
**Generic Community Air Monitoring Plan**

Overview

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

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

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

Community Air Monitoring Plan

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

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

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

VOC Monitoring, Response Levels, and Actions

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

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

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

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

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

Particulate Monitoring, Response Levels, and Actions

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

1. If the downwind PM-10 particulate level is 100 micrograms per cubic meter ($mcg/m^3$) greater than background (upwind perimeter) for the 15-minute period or if airborne dust is observed leaving the work area, then dust suppression techniques must be employed. Work may continue with dust suppression techniques provided that downwind PM-10 particulate levels do not exceed 150 $mcg/m^3$ above the upwind level and provided that no visible dust is migrating from the work area.

2. If, after implementation of dust suppression techniques, downwind PM-10 particulate levels are greater than 150 $mcg/m^3$ above the upwind level, work must be stopped and a re-evaluation of activities initiated. Work can resume provided that dust suppression measures and other controls are successful in reducing the downwind PM-10 particulate concentration to within 150 $mcg/m^3$ of the upwind level and in preventing visible dust migration.

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

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