# REMEDIAL INVESTIGATION WORK PLAN

**JMA Campus Plan**
623 Oneida Street
Syracuse, New York 13202

**Project Site #734144A**
CHA Project Number: 059294.002

**May 2024**


**Prepared for:**
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# CERTIFICATION

I, Samantha J. Miller, P.E., certify that I am currently a New York State registered professional engineer and that this Remedial Investigation Work Plan was prepared in accordance with all applicable statutes and regulations and in substantial conformance with DER Technical Guidance for Site Investigation and Remediation (DER-10).

I certify that all information and statements in this certification form are true. I understand that a false statement made herein is punishable as a Class “A” misdemeanor, pursuant to Section 210.45 of the Penal Law. I, the undersigned, of CHA Consulting, Inc. have been designated by the Site owner to sign this certification for the Site.

**For CHA Consulting, Inc.:**

(Professional Seal)


Samantha J Miller, P.E.
Printed Name of Certifying Engineer

Signature of Certifying Engineer

Senior Engineer V
Title

May 10, 2024
Date of Certification

103303
NYS Professional Engineer Registration Number

New York
Registration State

August 31, 2025
Registration Expiration Date

CHA Consulting, Inc.
Company

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| | |
|---|---|
| AST | Aboveground Storage Tank |
| AWQS | Ambient Water Quality Standard |
| BCA | Brownfield Cleanup Agreement |
| BCP | Brownfield Cleanup Program |
| BGS | Below Ground Surface |
| CAMP | Community Air Monitoring Program |
| CHA | CHA Consulting, Inc. |
| CPP | Citizen Participation Plan |
| CVOC | Chlorinated Volatile Organic Compound |
| DER-10 | Division of Environmental Remediation Technical Guidance for Site Investigation and Remediation |
| EPA | Environmental Protection Agency |
| ESA | Environmental Site Assessment |
| FSP | Field Sampling Plan |
| GZA | GZA GeoEnvironmental, Inc. |
| HASP | Health and Safety Plan |
| HDPE | High-Density Polyethylene |
| IRM | Interim Remedial Measure |
| JMA | JMA Tech Properties, LLC |
| NYCRR | New York Codes, Rules and Regulations |
| NYSDEC | New York State Department of Environmental Conservation |
| NYSDOH | New York State Department of Health |
| PBS | Petroleum Bulk Storage |
| PCB | Polychlorinated Biphenyl |
| PFAS | Per and Polyfluoroalkyl Substances |
| PID | Photoionization Detector |
| QAPP | Quality Assurance Project Plan |
| QA/QC | Quality Assurance/Quality Control |
| RCRA | Resource Conservation and Recovery Act |
| RIWP | Remedial Investigation Work Plan |
| SCO | Soil Cleanup Objective |
| SVOC | Semivolatile Organic Compounds |
| TAL | Target Analyte List |
| TCL | Target Compound List |
| TMW | Temporary Monitoring Well |
| TO-15 | Toxic Organics Method 15 |
| TOD | Total Oxidant Demand |
| TOGS | Technical and Operational Guidance Series |
| UST | Underground Storage Tank |
| VOC | Volatile Organic Compounds |

# 1.0 INTRODUCTION

This Remedial Investigation Work Plan (RIWP) was prepared on behalf of JMA Tech Properties, LLC (JMA) for proposed redevelopment of 623 Oneida Street, in the City of Syracuse, Onondaga County, New York. JMA will implement the RIWP upon acceptance into the New York State Brownfield Cleanup Program (BCP), pursuant to the requirements of the Brownfield Cleanup Agreement (BCA). CHA Consulting, Inc. (CHA) has prepared this RIWP to be consistent with the guidance provided in the New York State Department of Environmental Conservation (NYSDEC) Division of Environmental Remediation program policy 10 (DER-10) Technical Guidance for Site Investigation and Remediation, dated May 2010.

The objective of the Remedial Investigation (RI) is to characterize the nature and extent of environmental impacts, provide sufficient information to evaluate remedial alternatives, as required, and identify potential source areas. Previous investigation conducted by CHA and GZA GeoEnvironmental (GZA) have been reviewed and incorporated into this RIWP to evaluate the areas of known contamination, as discussed in Section 2.5, and close data gaps that remain after the completion of those investigations, to meet the requirements of an RI.

To facilitate field investigation RI activities in a manner consistent with NYSDEC protocols, CHA has prepared the following site-specific documents:

- Citizen Participation Plan (CPP) (submitted under separate cover)
- Field Sampling Plan (FSP) (Appendix A)
- Quality Assurance Project Plan (QAPP) (Appendix B)
- Health and Safety Plan (HASP) (Appendix C)
- Community Air Monitoring Plan (CAMP) (Appendix D)

These documents are integral to this RIWP and are referenced throughout this report.

# 2.0 SITE BACKGROUND

## 2.1 Site Description

The JMA Campus Plan is located at 623 Oneida Street, City of Syracuse, Onondaga County, New York and is identified as Lot 1000 on Section Map 94 of the City of Syracuse Tax Map. Hereinafter, the location may be referred to as the JMA Campus Plan or the Site. A Site location map is provided as Figure 1. The Site is 6.96 acres in area and encompasses the block bounded by Oneida Street to the west, West Taylor Street to the north, the private access road formerly known as South Clinton Street to the east, and Tallman Street to the south.

## 2.2 Site Physical Condition

### 2.2.1 Site Features

The Site was historically comprised of many tax map parcels with various owners. In 2023, JMA merged the parcels into Lot 1000. Most recently, the Site was occupied by the following uses and is described in this RIWP as follows, and presented on Figure 2:

- Former Horizon Transport – A slab-on-grade, steel frame and concrete block building with high ceilings and multiple overhead doors to allow for vehicle and equipment access inside the building. The Former Horizon Building and the asphalt parking lots to the east and west of the building are located on the northern portion of the Site. The property is vacant at the time of this report.
- Former Tompkins Manufacturing – A single-story concrete and brick building formerly occupied by a warehouse and office area for Tompkins USA Manufacturing, a manufacturer of circular knitting equipment. The parking lot to the south of the building is unpaved gravel and the location of what is believed to be an underground storage tank (UST). The property is vacant at the time of this report.
- Former Syracuse Stamp – Formerly a two-story industrial use building located in the central and eastern portion of the Site. This facility was formerly a manufacturer of garage door hardware, gate faucets, and inked ribbon spools. In 2020/2021, the building was demolished and four USTs were removed as part of the redevelopment of the JMA Wireless facility employee parking area. At the time of this report, the area known as the Former Syracuse Stamp is occupied by a vegetated area with a geotextile demarcation barrier and one foot of imported fill material and an employee parking lot constructed with at least six inches of crushed stone covered by asphalt pavement or concrete sidewalks. A small berm of soil was placed in the vegetated area to reduce visibility of the derelict Former Tompkins Manufacturing building.
- Former Catholic Charities Men's Shelter – A single-story brick building formerly housing the men's shelter and offices for Catholic Charities of Onondaga County and located on the southeastern portion of the Site. The property is vacant at the time of this report.

### 2.2.2 Topography

Based on a review of the 1973 United States Geologic Survey Map 7.5-minute Quadrangle for Syracuse West, New York, the Site has an approximate elevation of 390 feet above mean sea level and is relatively flat. The surrounding areas to the east and west have a relatively shallow topographic gradient which slopes toward Onondaga Creek. Onondaga Creek is located approximately 550 feet west of the Site.

### 2.2.3 Surficial and Bedrock Geology

According to the United States Department of Agriculture Web Soil Survey, Site soils consist of Urban Land. The term “Urban Land” indicates that a significant portion of the Site is covered with impervious surfaces such as buildings, asphalt, and concrete, or that the surface features have been significantly altered by development activities.

Review of the Surficial Geologic Map of New York, Finger Lakes Sheet (Cadwell, D.H.,1986) indicates the surficial geology at the Site consists of lacustrine silts and clays with variable thickness up to approximately 50 meters.

Previous investigations confirm the presence of urban fill material to a depth of 2 to 10 feet below ground surface (bgs). Generally, this fill material is characterized as a mixture of silts, sands, and gravels, with various amounts of brick, concrete, asphalt, cinders, etc. Beneath the fill material was typically a silty clay layer that was approximately 10-18 feet thick followed by a sand and gravel layer that was encountered to a depth of 18-25 feet bgs. A second silty clay layer is present below the sands and gravels; however, the sand and gravel layer was found to be thinner or not present in the soil boring locations on the northernmost portion of the Site. Rather, silty clays were identified to the final depth of each boring. The second silty clay layer was generally identified at a depth of approximately 18 to 24 feet bgs, particularly on the southern and central portion of the Site. During the previous investigations, the intent was to limit potential downward migration of contamination, so this silty clay layer was not investigated to find its thickness.

Review of the Geologic Map of New York, Finger Lakes Sheet (Rickard and Fisher, 1970) indicates the bedrock geology of the Site consists of Paleozoic era dolostone, shale, gypsum, and salts of the Syracuse Formation.

Saturated soil was identified in the borings between 13 and 15 feet bgs across the Site. Depth to groundwater in the temporary wells was typically recorded between 12 to 16 feet bgs.

### 2.2.4 Hydrogeology

Onondaga Creek is located approximately 550 feet west of the Site and flows in a northerly direction towards Onondaga Lake. Based on review of historical investigations at the Site, the estimated depth to groundwater is 10 feet bgs. Groundwater at the Site is assumed to flow to the west toward Onondaga Creek, which flows northward to discharge to Onondaga Lake. However, localized flow directions in the area of the Site may vary as a result of underground utilities or other heterogeneous subsurface conditions.

The Site is located in flood hazard zone AE indicating a high-risk area with at least a one percent annual chance of flooding.

## 2.3 Surrounding Property Land Use

The Site is located in a mixed-use area primarily consisting of commercial and industrial properties with a few residential properties located to the west. The following is a summary of the surrounding property uses.

**Table 1. Surrounding Property Land Use**

| Direction | Tax Map Parcel | Land Use Code and Classification | General Description |
|---|---|---|---|
| North | 096.-08-03.0 | 882 – Electrical Transmission Improvements | Electrical substation operated by Niagara Mohawk Power Corporation, now known as National Grid |
| East | 094.-05-02.1<br>094.-05-09.0 | 642 – Health Facility | Syracuse Community Health Center for outpatient medical services |
| | 094.-05-05.2<br>094.-05-08.3<br>094.-05-08.1<br>094.-05-07.0<br>094.-05-06.0<br>094.-20-02.0<br>094.-20-01.0<br>094.-05-12.0 | 710 – Manufacturing | JMA Wireless manufacturing facility, parking lots, and private access roads |
| South | 094.-22-01.1 | 651 – Highway Garage | Central New York Regional Transit Authority bus garage and offices |
| West | 094.-02-13.0 | 340 – Vacant Industrial Land | Vacant |
| | 094.-02-12.0<br>094.-02-11.0<br>094.-02-08.0 | 330 – Vacant Commercial Land | Vacant |
| | 094.-02-10.0 | 220 – Two Family Residence | Residential property |
| | 094.-02-09.0 | 220 – Two Family Residence | Residential property |
| | 094.-02-04.2 | 449 – Distribution Facility | Byrne Dairy truck garage |
| | 094.-03-06.2 | 220 – Two Family Residence | Residential property |
| | 094.-03-03.0 | 220 – Two Family Residence | Residential property |
| | 094.-03-02.0 | 340 – Vacant Industrial Land | Vacant |
| | 094.-03-01.0 | 484 – One Occupant Small Structure | Unknown |
| | 094.-03-09.1 | 220 – Two Family Residence | Residential property |
| | 094.-02-02.2 | 710 – Manufacturing | Unknown |

## 2.4 Site History

According to a Phase I Environmental Site Assessment (ESA) conducted for Coyne Textile Services by GZA, which included 207 West Taylor Street (Former Horizon Transport), the Site was vacant land with no discernable features in the 1898 historical aerial photographs. By 1938, the Site and general vicinity were highly developed. The Former Horizon Transport facility was occupied by a variety of commercial/industrial users since the mid-1930's including a freight line facility, metal products factory, maintenance garage, and dry-cleaning facility. Multiple permits from the City of Syracuse were available that document the installation or removal of petroleum tanks associated with this property from 1940 through 1993. The Sanborn Fire Insurance Maps indicate historical buildings adjacent to the current structure and at least one gasoline tank located on the Former Horizon Transport property in 1961, 1968, and 1971. Coyne Textile Services utilized the property from 1989 until 2015 for maintenance of the fleet vehicles and to refuel and park delivery trucks overnight. During the site reconnaissance for the Phase I ESA, one 275-gallon aboveground storage tank (AST) labelled diesel fuel, one 275-gallon AST labelled 15W-40 Motor Oil, multiple 55-gallon drums and buckets storing lubricants, degreasers, and paints were identified throughout the building. One AST containing gasoline and staining on the surrounding asphalt pavement was noted in the parking lot of the property. In 2016, the property was purchased by Horizon Transport LLC for use as a junk yard, personal storage facility, and paint/body shop by the owner and various tenants.

Limited historical information pertaining to other areas of the Site was available in the documents provided in the Phase I ESA. The Sanborn Fire Insurance Maps indicate the Site was mostly undeveloped apart from multiple residential dwellings along Tallman Street in 1892 and 1911. A small building identified as the Syracuse Stamping Company is located on the Site as early as 1911. Between, 1911 and 1951, significant development of the Site occurred with residential dwellings, multifamily apartments, and garages constructed along Oneida Street, expansion of the Syracuse Stamping Company, and construction of Tompkins Brothers manufacturing building located at 619 Oneida Street (Former Tompkins Manufacturing) with construction date recorded as 1919. Between 1961 and 1968, several residential buildings were razed and the building that most recently housed the Catholic Charities Men's Shelter and offices (Former Catholic Charities Men's Shelter) was constructed on the southeastern portion of the Site. Between 1968 and present day, all residential dwellings have been razed and all current buildings are owned by JMA and vacant.

## 2.5 Previous Investigations and Remediation

This section describes, in chronological order, the investigations and remediation conducted on the Site, to date.

### 2.5.1 Phase I Environmental Site Assessment, GZA 2014

GZA performed a Phase I ESA, dated October 14, 2014, for the Coyne Textile Services facility which included the property at 207 West Taylor Street (Former Horizon Transport). Recognized environmental conditions associated with the Former Horizon Transport property included:

**Historical Underground Storage Tanks (USTs):** Petroleum USTs historically used at the property. The tanks were removed in 1986, but no closure documentation was provided.

The Sanborn Fire Insurance Maps indicate at least one gasoline tank located on the Former Horizon Transport property in 1961, 1968, and 1971. The Syracuse City Clerk's Office provided building permits for the property including:

- 6/21/1940 – 207 West Taylor Street – permit for the installation of one 2,000-gallon and one 1,000-gallon gas tanks.
- 5/26/1943 – 207 West Taylor Street – permit for the installation of one 2,000-gallon gasoline tank.

- 1/4/1974 – 207 West Taylor Street – permit for the installation of one 2,000-gallon gasoline tank.
- 5/1/1986 – 501-517 Oneida Street – storage facilities closure document for Coyne Textile Services for the removal of one 1,000-gallon, one 2,000-gallon, and one 4,000-gallon tanks. The document indicated that no leakers were identified, and that one unknown tank was left on the property.
- 5/2/1986 – 501-517 Oneida Street – storage facilities closure document for Coyne Textile Services for the removal of one 1,000-gallon tank. Leaks were not identified. The building was noted to have burned in November 1988.
- 11/11/1988 – 207-209 West Taylor Street – storage facilities closure document for one 10,000-gallon #6 fuel oil tank. The document indicated the closed tank did not leak.
- 12/29/1988 – 207-209 West Taylor Street – storage facilities closure document for two 1,000-gallon gasoline tanks associated with an old service station. The soil was noted to be "ok" during removals.
- 1/1/1993 – 207 West Taylor Street – note pertaining to one 2,000-gallon diesel fuel AST present on the property.

**Staining around the AST Fuel Dispenser:** During the site reconnaissance, noticeable staining was observed on the asphalt around a 2,000-gallon diesel fuel AST and dispenser pump.

**Historical Dry Cleaning and Automotive Repair:** The Former Horizon Transport property was occupied by a variety of commercial/industrial users since the mid-1930s. Uses of the property included a metal products factory, maintenance garage, dry cleaning plant, and freight line facility.

### 2.5.2 Phase II Environmental Site Assessment, GZA 2014

GZA conducted a limited subsurface investigation of the Former Horizon Transport building and parking lot in 2014 with a focus on subsurface soil. Subsurface soil samples were collected between 6 and 12 feet bgs and analyzed for target compound list (TCL) volatile organic compounds (VOCs), TCL semivolatile organic compounds (SVOCs), and Resource Conservation and Recovery Act (RCRA) 8 Metals. The sample locations and historical data are presented on Figure 3. SVOC contamination in exceedance of the Title 6 New York Codes, Rules and Regulations (6 NYCRR), Part 375 Commercial Use Soil Cleanup Objectives (SCOs) was identified in the area around the AST. This hot spot area was recommended for further investigation.

### 2.5.3 Phase III Environmental Site Assessment, GZA 2015

Additional investigation was performed in 2015 with soil sampling and one temporary monitoring well installed in the vicinity of the contamination identified during the Phase II ESA. The soil and groundwater samples were analyzed for TCL VOCs and TCL SVOCs. Analytical results identified elevated SVOC contamination typical of petroleum hydrocarbons exceeding the Part 375 Commercial Use SCOs including benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, and indeno(1,2,3-cd)pyrene, and elevated lead in one sample. Additionally, analytical results in groundwater indicated VOC and SVOC contamination exceeding the Division of Water Technical and Operational Guidance Series (TOGS) 1.1.1 Ambient Water Quality Standards (AWQS). The soil sampling locations and historical results are presented on Figure 3 and the temporary monitoring well location and results are presented on Figure 5.

### 2.5.4 Syracuse Stamp Subsurface Investigation, CHA 2019

Further investigation of the Site with a focus on the Former Syracuse Stamp and exterior locations on the Former Catholic Charities Men's Shelter was conducted by CHA in October 2019. Both facilities were occupied at the time of the investigation. A portion of the investigation was also located on small tax map parcels located across the Former South Clinton Street roadway and are not discussed in this section since the results are not associated with the Site.

The investigation included the advancement of 22 borings, locations identified on Figure 4, to a maximum depth of 25 feet bgs and collection of a soil sample from each boring location for analysis of:

- TCL VOCs
- TCL SVOCs
- RCRA 8 Metals
- Total Polychlorinated Biphenyls (PCBs)

The soil analytical results indicated low level SVOC and metals contamination site-wide that typically did not exceed the Part 375 Commercial Use SCOs. Field evidence of contamination was identified at two soil boring locations, SB-11 and SB-13, from depths 10 to 15 feet bgs. Upon discovery, the presence of contamination was reported to the NYSDEC and a spill number was registered for the Site (Spill #1908028). The NYSDEC issued a No Further Action letter until such time as the Site owner begins redevelopment of that area and the location of the spill is accessible. The contamination was addressed in 2021, as discussed in Section 2.5.6.

Additionally, six of the soil boring locations were converted to temporary monitoring wells for collection of groundwater samples analyzed for the same parameters as listed above. Locations are identified on Figure 5. The results indicated site-wide chlorinated VOC (CVOC) contamination, notably detections of cis-1,2-dichloroethene and vinyl chloride, the breakdown products of tetrachloroethene. The CVOCs observed in the groundwater are compounds typically associated with dry cleaning operations. The Former Coyne Textile Facility across South Clinton Street (presumed upgradient direction) is currently listed in the BCP program with known off-site groundwater impacts. The CVOCs detected during this investigation are likely the result of off-Site impacts from the Former Coyne Textile Facility. Site-wide SVOC contamination was also identified in groundwater.

Concurrent sub-slab vapor and indoor air samples were collected at five locations within buildings that existed at the time of investigation, identified on Figure 6. The samples were collected using SUMMA canisters and analyzed for toxic organics via Environmental Protection Agency (EPA) Method TO-15. The results indicated no further action was needed based on the New York State Department of Health (NYSDOH) Decision Matrices for soil vapor intrusion.

### 2.5.5 Clinton/Cortland Subsurface Investigation, CHA 2020

The focus of this investigation was the roadways encompassing Cortland Avenue and South Clinton Street with additional investigation in the area of contamination identified during the 2019 Syracuse Stamp Subsurface Investigation. Field work commenced in December 2020 with the intent of incorporating the roadways into the Former Coyne Textile Facility (BCP 734144). This section summarizes the investigation and results conducted on the property now incorporated into the JMA Campus Plan.

This investigation included advancement of nine soil borings and installation of two temporary monitoring wells on the Site for sample collection and analysis of:

- TCL VOCs
- TCL SVOCs
- Total PCBs
- RCRA 8 Metals

Select samples were also analyzed for emerging contaminants including:

- Per- and Polyfluoroalkyl Substances (PFAS)
- 1,4-Dioxane

The sample locations and results are presented on Figures 4 and 5.

Strong petroleum odors, elevated photoionization detector (PID) evidence of contamination, sheen, and free product were identified at boring SB-115. Elevated PID readings were also identified at soil borings SB-112, SB-113, and SB-114. These soil boring locations are in the general vicinity of petroleum contamination documented in the 2019 subsurface investigation discussed in Section 2.5.4 and previously reported to the NYSDEC and registered under Spill No. 1908028. Analytical results identified SVOCs in exceedance of the Commercial Use SCOs in one location. Emerging contaminants were not detected in soil samples collected.

Soil borings SB-112 and SB-133 were converted to temporary monitoring wells (TMW-112 and TMW-133) on the Former Syracuse Stamp property. During purging and sampling, both wells exhibited mild odors. No sheen, effervescence, or free product were observed in the groundwater in the temporary monitoring wells. CVOCs were identified in exceedance of TOGS 1.1.1. AWQS, consistent with previous investigations of the area.

### 2.5.6 Spill Closure and Underground Storage Tank Closure

As noted in Section 2.4.4, a spill was reported to the NYSDEC and recorded as Spill #1908028 during the subsurface investigation in October 2019. Subsequently, a release of petroleum from four steel tanks located in a basement vault was reported to the NYSDEC in January 2021 and recorded as Spill #2008908.

On February 2, 2021, a contractor mobilized to remove and dispose of four 560-gallon tanks from the basement vault. As part of the redevelopment, three sides of the concrete basement vault were to be removed, however the concrete wall on the east side and the concrete floor were to remain. However, during excavation of petroleum impacted debris from the basement, the Contractor broke through the concrete basement floor. Significant petroleum-like odors, stained water, fuel oil saturated fine gravel, and sheen were identified beneath the concrete basement floor. At that time, work was halted to re-assess the tank removal and spill cleanup activities. The NYSDEC was informed of all activities. The close proximity of the two spill locations were determined to be managed concurrently via soil excavation and off-site disposal.

On March 15, 2021, the contractor re-mobilized to the Site to begin excavation of the spill areas. Based on photoionic evidence of contamination, the impacted media was found to be approximately 7 to 14 feet bgs. Overburden material was segregated for use as backfill in the excavation. Contaminated material was either live-loaded into dump trucks for off-site disposal or stockpiled within the excavation until trucks were available. Limits of the excavation were determined based on visual, olfactory, and photoionic methods using a PID.

During excavation of impacted soil, the contractor uncovered a 10,000-gallon fuel oil UST that was not previously documented on any plan, drawing or historical map. The UST was found to be filled with flowable fill material. The UST was removed and placed on polyethylene sheeting. The bottom of the UST was corroded, likely resulting in the release of fuel oil to the soil. The grossly contaminated soil beneath and adjacent to the UST was excavated, stockpiled, and disposed off-site. Flowable fill was removed from the UST, the steel was cut, rendered useless, and disposed of off-site.

Between March 16 and March 25, 2021, non-hazardous contaminated soil from the excavation work was transported for disposal at Seneca Meadows Landfill in Seneca Falls, New York. A total of 1,884.8 tons of soil was excavated and disposed of from the spill area. Additionally, a total of 49.9 tons of stained concrete from the excavation was transported to Seneca Meadows Landfill. The steel tank carcasses, a total of 3,400 pounds, was recycled as scrap steel.

Excavation sidewall and bottom samples were submitted for analysis of VOCs via EPA Method 8260 and SVOCs via EPA Method 8270. The results indicated the remaining contamination did not exceed the NYSDEC CP-51 Soil Cleanup Guidance Values. A report of this spill cleanup and UST closure was provided to the NYSDEC and the spills were closed with a no further action letter dated July 1, 2021.

#### 2.5.7 Additional Parcels Subsurface Investigation, CHA 2023

Additional investigation conducted by CHA in June 2023 included surface and subsurface soil, groundwater, and sub-slab vapor/indoor air sampling at the Former Tompkins Manufacturing property and the Former Horizon Transport property. The locations and results are identified on Figures 3, 5, 6 and 7.

Five surface soil samples were collected from the vegetated areas around the Former Tompkins Manufacturing facility and analyzed for:

- TCL SVOCs
- Total PCBs
- RCRA 8 Metals

The results indicate SVOC and metals contamination with some exceedances of the Commercial Use SCOs in all five surface soil samples collected.

The subsurface investigation included advancement of 23 soil borings and collection of samples for the same parameters as surface soil with the addition of TCL VOCs. The subsurface soil was typically not in exceedance of the Unrestricted Use SCOs with the exception of SVOC parameters detected in the area of soil contamination previously identified near the former AST reported to be located on the Former Horizon Transport property.

Seven soil borings were converted to temporary groundwater monitoring wells and sampled for the same parameters as soil. The results indicate site-wide VOC, SVOC, and metals contamination exceeding TOGS 1.1.1. AWQS, although the metals detections are likely associated with urban fill material and high turbidity in the groundwater samples. CVOCs were detected in the two temporary monitoring wells directly downgradient of the contaminant source at the adjacent Former Coyne Textile facility, but also detected in the furthest northwest location, TMW-111.

Concurrent sub-slab vapor and indoor air samples were collected using 2.7 Liter SUMMA canisters and analyzed for toxic organics via EPA Method TO-15. The results were used to evaluate potential soil vapor intrusion using the NYSDOH Decision Matrices. The results indicate the sub-slab vapor and indoor air located at Former Horizon Transport building is impacted by CVOCs, specifically tetrachloroethene and trichloroethene, at concentrations that require mitigation. The Former Tompkins Manufacturing building was found to not require mitigation.

## 2.6 Proposed Site Redevelopment

Proposed redevelopment of the Site includes demolition of all current structures to construct a warehouse and office area expected to be approximately 115,000 square feet. The employee parking lot, currently located on the Former Syracuse Stamp area of the Site, will be moved to the southern portion of the Site. A truck entrance will be constructed on the northern portion of the Site with access from the JMA-owned private access drive located to the east of the Site.

# 3.0 PROPOSED REMEDIAL INVESTIGATION

## 3.1 Potential Underground Storage Tank

Based on field observations and Petroleum Bulk Storage (PBS) registration (7-033944) of a 9,000-gallon #2 fuel oil tank at the Former Tompkins Manufacturing property, CHA suspects the UST is in the location identified on Figure 2. If the location of the tank is confirmed, the fill port and access covers will be opened and a fuel tank measuring stick with water finding paste will be used to confirm the size of the tank and evaluate for potential water infiltration.

One test pit on the east (presumed upgradient) and west (presumed downgradient) ends of the tank will be installed to evaluate the subsurface for potential impacts from the presence of a tank. Soils will be screened by a qualified environmental professional in accordance with the FSP and one soil sample from the bottom of each test pit will be submitted to an NYSDOH Environmental Laboratory Approval Program (ELAP)-certified laboratory for analysis of the CP-51 list for VOCs via EPA Method 8260/5035 and SVOCs via EPA Method 8270.

Prior to redevelopment, JMA intends to remove the UST, collect documentation samples, and close the PBS registration as part of the remedial design or as an Interim Remedial Measure (IRM).

## 3.2 Sampling of Environmental Media

### 3.2.1 Surface Soil

Based on the surface soil sample results from previous investigations, all surface soils at the Site are anticipated to be impacted with SVOC and metals contamination. One additional surface soil sample is proposed in the location identified on Figure 8 and described in Table 2. No other surface soil sampling is proposed because the surface soil samples collected in the June 2023 investigation evaluated the vegetated areas on the south and west portions of the Site. The area identified in red on Figure 8 was capped with imported fill material in 2021. Therefore, vegetated areas and surface soils are not representative of surface soils potentially impacted by Site contaminants.

One surface soil sample will be collected and submitted under proper chain of custody to an ELAP-certified laboratory for the analyses listed in Table 2 and below:

- TCL SVOCs via EPA Method 8270, including 1,4-Dioxane
- TAL Metals via EPA Method 6010/7471
- Total PCBs via EPA Method 8082
- TCL Pesticides via EPA Method 8081
- TCL Herbicides via EPA Method 8082
- Per- and Polyfluoroalkyl Substances (PFAS) via EPA Method 1633

### 3.2.2 Subsurface Soil

The Site is very well characterized regarding subsurface soils, as discussed in Section 2.4 and referenced on Figures 3 and 4. No additional subsurface soil sampling, apart from that described in Section 3.1 and in this part, is proposed.

To comply with the April 2023 Sampling, Analysis, and Assessment of PFAS Under NYSDEC's Part 375 Remedial Programs, six shallow subsurface soil samples will be collected using a direct push technology drilling rig (e.g. Geoprobe®) or a slide hammer hand sampler to evaluate PFAS Site-wide. Proposed sample locations are presented on Figure 8 and a description of the sampling effort is in Table 2. 1,4-Dioxane was previously included in the SVOC parameter list for soil sampling and no detections were noted in the previous investigation therefore no additional sampling for this parameter is proposed. Non-disposable equipment will be decontaminated between locations and field personnel will wear PFAS sampling compliant clothing and personal protective equipment in accordance with the FSP. The sample will be placed in a decontaminated stainless-steel bowl, homogenized, and placed in laboratory-provided PFAS-free containers. Quality assurance samples will be collected in accordance with the frequency described in DER-10, as presented in the QAPP and FSP. The samples will be submitted under proper chain-of-custody to an ELAP-certified laboratory for analysis of PFAS via EPA Method 1633.

Additionally, up to two subsurface soil samples will be collected and analyzed for total oxidant demand (TOD) to evaluate potential oxidants that may be used as part of chemical oxidation remediation design alternatives. More specifically, the TOD of the oxidant in the presence of a representative contaminated soil sample can be used to determine the oxidant loading for potential remedial design. Soil will be collected from the shallow groundwater bearing zone identified from approximately 12 to 25 feet bgs and above the suspected confining layer. Samples will be biased toward the area exhibiting evidence of contamination or, if none are observed, the five feet of soil above the suspected confining layer. Samples will be collected in laboratory provided containers and shipped, under proper chain of custody, to Lourerio Engineering for analysis.

### 3.2.3 Groundwater

The CVOCs cis-1,2-dichloroethene (DCE) and vinyl chloride were detected at concentrations exceeding TOGS 1.1.1 in monitoring wells located on the southern half of the Site with the highest concentration identified on the southwest corner with a DCE concentration of 3,500 µg/L. A source of tetrachloroethene (PCE) contamination on the southwestern portion of the Site has not been identified. The elevated concentrations of DCE may be associated with advection and natural attenuation of contaminated groundwater from the Former Coyne Textile facility, particularly if a preferential pathway is present. Further investigation of the area is warranted to evaluate whether there is a source of contamination or if the contamination is the result of a preferential pathway.

DCE and vinyl chloride were detected at concentrations exceeding TOGS 1.1.1. AWQS hydraulically downgradient of the Former Horizon Transport building, at the northwest end of the Site as well. Further investigation of groundwater in that area is warranted to potentially identify a source of CVOC contamination.

Up to eight permanent, stick-up steel casing groundwater monitoring wells will be installed in the locations identified on Figure 9. Six of the eight monitoring wells will be installed to an approximate depth of 25 feet below ground surface to evaluate the shallow water bearing zone and will screen the interval from the bottom of the well to the top of the water table, previously identified at approximately 10 feet bgs. This design is to evaluate the potential for both petroleum, and CVOC contamination. Two of the locations, as identified on Figure 9, will be clusters of two monitoring wells to evaluate the deeper water bearing zone beneath a clay confining layer previously identified in the subsurface investigations. The screened interval will be set in the suspected silty sand layer present below 30 feet bgs. This will aid in determining if the clay confining layer was successful at retarding the downward migration of CVOC contamination. The proposed locations were selected to evaluate the areas where the most elevated levels of contamination were observed on the Site.

Wells will be constructed with two-inch diameter polyvinyl chloride (PVC) riser pipe and well screen which will have a slot opening size of 0.010-inches. The screen will be installed within the groundwater zone of interest, as described above. A sand pack will be placed within the annulus between the borehole and the well screen. A two-foot bentonite seal will then be placed above the screen and the remaining borehole between the bentonite seal and the ground surface will be backfilled with bentonite-cement grout. Stick-up steel protective casings will be installed at each well location to protect the PVC riser. The monitoring wells will be surveyed after installation to obtain the top of casing and riser elevations. Soil cuttings from drilling operations will not be used as backfill in any of the monitoring wells and will be containerized for characterization and off-site disposal at a later date.

Once the wells are installed, each well will be developed using a combination of pumping and surging until the turbidity of the groundwater is less than 50 nephelometric turbidity unit (NTUs), or for a maximum of two hours each, whichever is achieved first . .

From the six monitoring well locations, eight samples will be collected for the following parameters, as described in Table 2:

- TCL VOCs via EPA Method 8260
- TCL SVOCs via EPA Method 8270
- 1,4-Dioxane via EPA Method 8270-SIM
- TAL Metals via EPA Method 6010/7471
- Total PCBs via EPA Method 8082
- PFAS via EPA Method 1633

All purging and sampling of the permanent wells will be conducted in accordance with the FSP. Tentatively identified compounds (TICs) will be included in the VOC and SVOC analysis. Quality assurance samples will be collected in accordance with the frequency described in DER-10, as presented in the QAPP and FSP.

Additionally, parameters to aid in the design of potential remedial alternatives will be collected during this investigation. Three of the eight monitoring wells (1 deep and 2 shallow) will be analyzed for:

- Anions - Chloride and Sulfate via EPA Method 300.0
- Microbiological presence of CVOC reducing microorganisms (Dehalococcoides, Dehalobacter, Desulfitobacterium, etc.) using a polymerase chain reaction method, or equivalent analytical laboratory method

Cation and anion groundwater samples are collected concurrently with the standard parameters. The method of sampling for microbiological presence of CVOC reducing microorganisms is further described in the FSP.

Dedicated/disposable high-density polyethylene (HDPE) tubing will be installed at each well and a low-flow pump will be used to collect the sample. All non-disposable equipment will be decontaminated in accordance with FSP to minimize the potential for cross-contamination. Bottle requirements and handling procedures are presented in the QAPP. Sampling protocols are presented in the FSP.

Soil cuttings from the monitoring well installation and purged groundwater from monitoring well development and sampling will be containerized and sampled (one sample for soil and one sample for groundwater) for off-site disposal as investigation derived waste (IDW). Further information on sampling and management of IDW is provided in the FSP.

### 3.2.4 Sub-Slab Vapor/Ambient Air/Soil Vapor

As previously discussed in Sections 2.5.4 and 2.5.7, sub-slab vapor and ambient air sampling within the remaining buildings on-site has been conducted previously and the data is presented on Figure 6.

The Site structures will be demolished upon redevelopment of the property. Newly constructed buildings will be equipped with an active sub-slab pressurization system (SSDS) due to the presence of CVOC contamination in groundwater and soil at the Site. Therefore, no additional concurrent sub-slab vapor and indoor air samples are proposed.

Based on the soil vapor intrusion results, and historical reports, CHA anticipates a potential source of CVOC contamination in the Former Horizon Building located on the northern part of the Site. Therefore, CHA proposes collecting two soil vapor samples in the locations identified on Figure 10, for methods described in Table 2. CHA will oversee the installation of two soil vapor points by drilling and installing semi-permanent sampling screens approximately three to five feet bgs, backfilled with inert material, fitted with inert tubing, and sealed with bentonite slurry, in accordance with NYSDOH guidance. A tracer gas (e.g. Helium) will be used at each soil vapor sampling location to confirm outdoor air infiltration is not occurring.

At least 24 hours after the installation of the probes, one to three implant (screen and tubing) volumes will be purged. Samples will then be collected in 2.7-liter SUMMA canisters that are individually certified clean by the laboratory and will run for approximately two hours at a flow rate less than 0.2 liters per minute. Samples will be analyzed for toxic organics via EPA Method TO-15. Sample container requirements, preservation measures, and handling procedures are presented in the QAPP.

Additionally, as a screening tool for VOC contamination in the subsurface, CHA proposes installing passive gas samplers in the approximate locations identified on Figure 10 to evaluate potential unidentified source areas, potential preferential pathways for contaminant migration, and as a proxy for groundwater contamination. Applied Geochemical Imaging, LLC (AGI) produces and analyzes the passive gas samplers as an appropriate screening tool for VOC contaminated sites. The passive gas samplers will be installed approximately 36 inches below ground surface and corked to prevent surface contamination. The samplers will remain in place for two weeks prior to extraction and shipping to AGI for analysis. An isoconcentration map of the results, as well as the analytical data in mass of contaminant (micrograms – µg) will be provided in a final report from AGI.

**Table 2. Sampling Rationale**

| Sample ID | Matrix | Sample Depth(s) | Sample Location | Analytical Parameters | Rationale |
|---|---|---|---|---|---|
| SURF-201 | Surface Soil | Between 6 and 12 inches below the vegetated surface | Location identified on Figure 8. | TCL SVOCs EPA Method 8270<br>TAL Metals EPA Methods 6010/7471<br>Total PCBs EPA Method 8082<br>PFAS EPA Method 1633<br>TCL Pesticides EPA Method 8081<br>TCL Herbicides EPA Method 8151 | To obtain surface soil results in the remaining area that was not previously investigated and was not recently redeveloped with clean fill material. |
| SOIL-201 to SOIL-206 | Shallow Subsurface Soil | Within 3 feet of the surface | Site-wide evaluation at the locations identified on Figure 8. | PFAS EPA Method 1633 | To characterize the shallow subsurface soil for PFAS contamination in accordance with the April 2023 Sampling, Analysis, and Assessment of PFAS Under NYSDEC's Part 375 Remedial Programs |
| TP-201 to TP-202 | Subsurface Soil | Dependent on field conditions. | Two locations adjacent to the suspect underground storage tank. | CP-51 List VOCs EPA Method 8260<br>CP-51 List SVOCs EPA Method 8270 | If the location of the UST is confirmed, test pits at two locations adjacent to the UST will be performed to investigate the potential release from the UST. Soil sampling will only occur if the presence of a UST is verified. |

**Table 2. Sampling Rationale**

| Sample ID | Matrix | Sample Depth(s) | Sample Location | Analytical Parameters | Rationale |
|---|---|---|---|---|---|
| MW-201S | Groundwater | Shallow water bearing zone based on field determination. | Northwest portion of the Site in the approximate location of temporary monitoring well TMW-111 installed during a previous investigation. See Figure 9. | TCL VOCs EPA Method 8260<br>TCL SVOCs EPA Method 8270<br>TAL Metals EPA Methods 6010/7471<br>Total PCBs EPA Method 8082<br>PFAS EPA Method 1633 | Permanent monitoring wells will be installed in accordance with the RIWP and FSP. This cluster will screen shallow and deep groundwater bearing zones for the potential of CVOC impacts downgradient of a potential source of CVOC contamination from the Former Horizon Transport Building. This location is approximately in the same location as TMW-111 installed during a previous investigation because DCE and vinyl chloride contamination was identified in the shallow water bearing zone. |
| MW-201D | | Deeper water bearing zone based on field determination. | | | |
| MW-202S | Groundwater | Shallow water bearing zone based on field determination. | Southwest portion of the Site in the approximate location of temporary monitoring well TMW-101 installed during a previous investigation. See Figure 9. | TCL VOCs EPA Method 8260<br>TCL SVOCs EPA Method 8270<br>TAL Metals EPA Methods 6010/7471<br>Total PCBs EPA Method 8082<br>PFAS EPA Method 1633<br>Anions and Cations EPA Method 300.0 at MW-202D, only | Permanent monitoring wells will be installed in accordance with the RIWP and FSP. This cluster will screen shallow and deep groundwater bearing zones for the potential of CVOC impacts. This location is approximately in the same location as TMW-101 installed during a previous investigation because DCE and vinyl chloride contamination was identified in the shallow water bearing zone. |
| MW-202D | | Deeper water bearing zone based on field determination. | | | |

**Table 2. Sampling Rationale**

| Sample ID | Matrix | Sample Depth(s) | Sample Location | Analytical Parameters | Rationale |
|---|---|---|---|---|---|
| MW-203 to MW-206 | Groundwater | Shallow water bearing zone based on field determination. | Locations identified on Figure 9. | TCL VOCs EPA Method 8260 plus TICs<br>TCL SVOCs EPA Method 8270 plus TICs<br>TAL Metals EPA Methods 6010/7471<br>Total PCBs EPA Method 8082<br>PFAS EPA Method 1633<br>Anions EPA Method 300.0 at locations MW-201S and MW-204, only | Permanent monitoring wells will be installed in accordance with the RIWP and FSP. These locations are selected to investigate Site-wide groundwater focusing on areas around the Former Horizon Transport building, which is a suspected area of concern, and where a data gap exists from the temporary monitoring wells installed and sampled during previous investigations. |
| SV-201 to SV-202 | Soil Vapor | 3 to 5 feet below ground surface | West and east of the Former Horizon Transport Building at the locations identified on Figure 10. | VOCs EPA Method TO-15 | To investigate the potential for impacted soil vapor near the Former Horizon Transport building because sub-slab and indoor air sampling conducted inside the Former Horizon Transport building in June 2023 identified soil vapor intrusion impacts requiring mitigation. |
| PGS-201 to PGS-285 | Passive Gas Sampler | 3 feet below ground surface | Site-wide with an emphasis on the area around the Former Horizon Transport Building due to subsurface soil, groundwater, and sub-slab/indoor air sampling results. | AGI Screening Method | Passive gas samplers are a screening tool to evaluate the total mass of VOC contaminants in the subsurface unsaturated zone and will air in identifying other source areas. The focus of this sampling effort is around the Former Horizon Transport building to potentially find a source of CVOC contamination along the southern portion of the |

**Table 2. Sampling Rationale**

| Sample ID | Matrix | Sample Depth(s) | Sample Location | Analytical Parameters | Rationale |
|---|---|---|---|---|---|
| | | | | | Site to see if a preferential pathway or source of CVOCs is present. |
| SOIL-WC-1 | Soil | N/A | Investigation derived waste stored in 55-gallon drums for off-site disposal. | TCLP VOCs EPA Method 8260/1311<br>TCLP SVOCs EPA Method 8270/1311<br>TAL Metals EPA Methods 6010/7471/1311<br>Total PCBs EPA Method 8082<br>TCLP Herbicides EPA Method 8081/1311<br>TCLP Pesticides EPA Method 8151/1311<br>Reactivity, Ignitability, Corrosivity | One waste characterization soil sample will be collected to adequately characterize the soil for off-site disposal at a permitted facility. |
| WATER-WC-1 | Groundwater | N/A | Investigation derived waste stored in 55-gallon drums for off-site disposal. | TCL VOCs EPA Method 8260<br>TCL SVOCs EPA Method 8270<br>TAL Metals EPA Methods 6010/7471<br>Total PCBs EPA Method 8082 | One waste characterization groundwater sample will be collected to adequately characterize the purged groundwater for off-site disposal at a permitted facility. |

**Table 2. Sampling Rationale**

| Sample ID | Matrix | Sample Depth(s) | Sample Location | Analytical Parameters | Rationale |
|---|---|---|---|---|---|
| SOIL-TOD-201 and SOIL-TOD-205 | Subsurface Soil | Suspected treatment design depth within the shallow water bearing zone. | SOIL-201<br>SOIL-205 | Total Oxidant Demand analysis conducted by Loureiro Engineering. | TOD is used to determine the oxidant loading for potential remedial design |
| MW-MICRO-201 TO MW-MICRO-203 | Groundwater | One sample from a monitoring well installed in the deeper zone and two samples from monitoring wells installed in the shallow water bearing zone. | MW-201S<br>MW-202D<br>MW-204 | Microorganisms including Dehalococcoides, Dehalobactor, Desulfitobacterium | Microbiology of the groundwater is important for understanding the biological mechanisms of chemical reduction capable naturally. Presence or absence of specific microorganisms may lead to choosing one remedial alternative over another. |

## 3.3 Project Plans

### 3.3.1 Community Participation Plan

A CPP, prepared in accordance with DER-23 Citizen Participation Handbook for Remedial Programs, was submitted under separate cover concurrently with the BCP Application.

### 3.3.2 Field Sampling Plan

The proposed work described in this RIWP will be performed in accordance with the FSP, included as Appendix A. The FSP details the specific sampling objectives, procedures, and protocols associated with the scope of work, described in Section 3.1. Additionally, the FSP details decontamination procedures and management of IDW.

### 3.3.3 Quality Assurance Project Plan

A QAPP has been prepared for the RIWP. The QAPP presents the policies, organization, objectives, and specific activities designed to achieve the specific data quality goals associated with the RI. Additionally, the QAPP specifies data reporting, data validation, and electronic data deliverable requirements for this scope of work. A project specific QAPP is provided in Appendix B.

Quality Assurance (QA) is defined as the program for assuring the reliability of monitoring and measurement data which includes a system for integrating the planning, assessment, and improvement efforts to meet the data quality requirements.

Quality Control (QC) is defined as the routine application of procedures for attaining the prescribed standard of performance in the monitoring and measurement process.

### 3.3.4 Health and Safety Plan

A site-specific HASP was prepared for CHA personnel using the information from previous investigations into known physical and chemical hazards present at the Site and an evaluation of the risks associated with the investigations. Available Site information was examined and adequate warnings and safeguards for field personnel were selected. CHA field personnel are required to review and sign the HASP before entering the field. The site-specific HASP is provided in Appendix C. Subcontractors to CHA are required to develop and implement their own HASP.

### 3.3.5 Community Air Monitoring Plan

The purpose of a CAMP 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 the proposed remedial investigation activities. A copy of the site-specific CAMP is provided in Appendix D.

CAMP is generally not required for investigation or delineation of site conditions which are not considered intrusive.

## 3.4 Data Usability

A data usability review will be completed for the analytical data generated as part of this investigation to assess for accurateness and defensibility. The review of analytical data provided by an ELAP-certified laboratory will include an Analytical Services Protocol (ASP) Category B deliverable consistent with the NYSDEC Data Usability Summary Report Guidance.

## 3.5 Qualitative Exposure Assessment

A Qualitative Exposure Assessment for human health is required to be completed during the RI to identify, evaluate, and document potential exposure to contaminants. The assessment includes the following items and will be developed in accordance with Appendix 3B of DER-10:

- Description of the nature and size of the population currently exposed or which may be reasonably expected to be exposed to the contaminants that are present or migrating from the Site;
- An explanation of the contaminant release and transport mechanisms;
- A determination of the reasonably anticipated future land use of the Site, if applicable;
- Identification of the reasonably anticipated future groundwater use; and,
- Characterization of the exposure setting, identifying current and reasonably foreseeable exposure pathways.

Note that JMA is applying as a Volunteer in the BCP and is not required to evaluate off-site impacts.

## 4.0 REPORTING

A RI Report will be prepared to summarize the information generated during implementation of this RIWP. The report will be prepared in accordance with the New York State Department of Environmental Conservation's "DER-10 Technical Guidance for Site Investigation and Remediation" (May 2010).

The report will also include the following information and data pertaining to the Site:

1. A narrative that summarizes the results of the investigation including a discussion of the physical and analytical results.
2. A characterization of the soil, soil vapor, and groundwater of the site to allow for the confirmation of the source(s) of the contamination, movement of the contamination, and nature and extent of contamination.
3. Figures showing the locations of the surface and shallow subsurface samples, soil vapor points, and groundwater monitoring wells at the Site.
4. Tables and figures summarizing the analytical data for soil, soil vapor, and groundwater samples collected including comparisons to appropriate standards, criteria, and guidance (e.g., 6 NYCRR Part 375 Soil Cleanup Objectives for Commercial Use and NYSDEC TOGS 1.1.1. AWQS)
5. Groundwater contour maps, assuming groundwater is encountered, to show the direction of the local groundwater flow.
6. A qualitative exposure assessment for contamination, if any, emanating from the Site.
7. Conclusions and recommendations regarding the environmental status of the site.

## 5.0 SCHEDULE

The following table provides an estimated schedule for completion of the JMA Campus Plan BCP Project. The overall progress of the project will be dependent upon a number of factors including, but not limited to, NYSDEC review and approval timeframes, time of year at which the final design documents are complete, weather conditions at the time of remedial construction, etc.

**Table 3. Proposed Schedule**

| Task | Estimated Month Complete |
|---|---|
| Submit BCP Application Concurrently with this RIWP | March 2024 |
| NYSDEC 60-Day Comment Period | May 2024 |
| Public 45-Day Comment Period | |
| NYSDEC Execution of BCA and Approval of RIWP | May 2024 |
| Conduct the RIWP Field Work Described Herein | June 2024 |
| Submit Remedial Investigation Report | August 2024 |
| Submit Draft Remedial Design Work Plan with Alternatives Analysis | September 2024 |
| NYSDEC Selects Proposed Remedy | October 2024 |
| NYSDEC 45-Day Comment Period | December 2024 |
| Public Meeting (optional) | December 2024 |
| Finalize the Remedial Design Work Plan and Issue Construction Notice | January 2025 |
| Construction Complete | December 2025 |
| Submit Draft Final Engineering Report and Draft Site Management Plan | March 2026 |
| NYSDEC Issues Certificate of Completion | June 2026 |
| Begin Operations & Monitoring per requirements of Site Management Plan and Institutional and Engineering Controls | |

# 6.0 REFERENCES


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

*Closure of Spill #190828 and 2008908 and Closure of Underground Storage Tanks* letter report, prepared by CHA Consulting, Inc., dated June 28, 2021.

*Geologic Map of New York: Finger Lakes Sheet.* USGS. Rickard and Fisher, 1970.

*Limited Subsurface Investigation Report*, prepared by CHA Consulting, Inc., dated January 8, 2021.

*Subsurface Investigation Report*, prepared by CHA Consulting, Inc., dated March, 2024.

*NYSDEC DER-10* – "Technical Guidance for Site Investigation and Remediation", issued May 3, 2010.

*Phase I Environmental Site Assessment*, prepared for Coyne Textile Services, prepared by GZA GeoEnvironmental, Inc., dated October 16, 2014.

*Phase II Environmental Site Assessment*, prepared for Coyne Textile Services, prepared by GZA GeoEnvironmental, Inc., dated January 5, 2015.

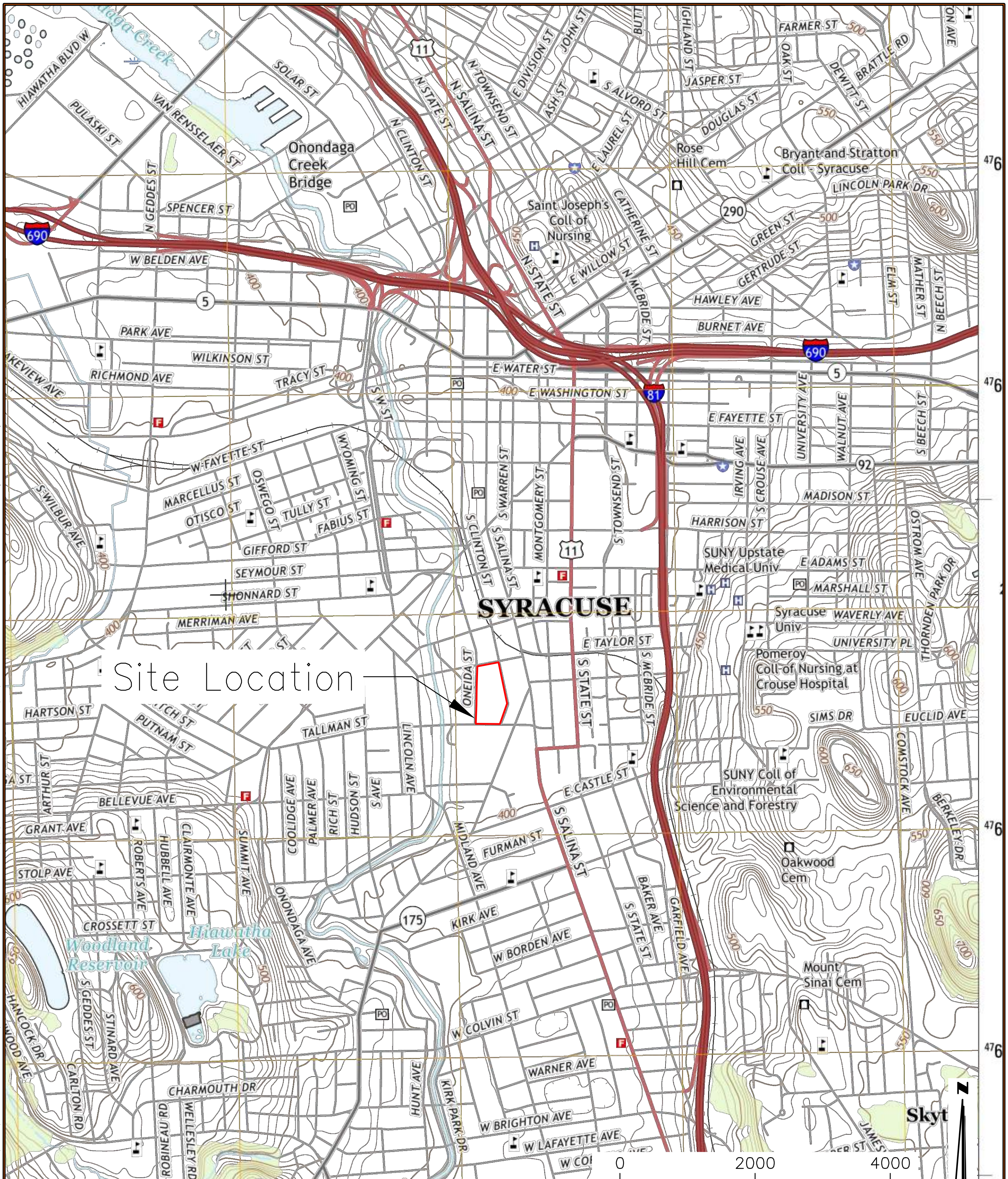
*Phase III Environmental Site Assessment*, prepared for Coyne Textile Services, prepared by GZA GeoEnvironmental, Inc., dated April 2015

*Subsurface Investigation Report*, prepared by CHA Consulting, Inc., dated November 15, 2019.

*Surficial Geologic Map of New York: Finger Lakes Sheet*. Cadwell 1986.

*USDA Soil Survey for Onondaga County*: accessed online 2/13/24.

# FIGURES




SOURCE: U.S.G.S. 7.5' Topographic
QUADRANGLE: SYRACUSE WEST, NEW YORK



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# SITE LOCATION MAP

JMA CAMPUS PLAN
REMEDIAL INVESTIGATION WORK PLAN

PROJECT NO. 059294

DATE: 03/2024

FIGURE 1

File: V:\PROJECTS\ANY\K5\059294.001\CADD_ACAD\ENVP\JMA BCP APPLICATION\FIGURES FOR BCA AND RIWP.DWG Saved: 2/28/2024 3:06:32 PM Plotted: 2/28/2024 3:06:58 PM Current User: Ehmann, Karyn LastSavedBy: 5768


N

0 100 200
Scale in feet

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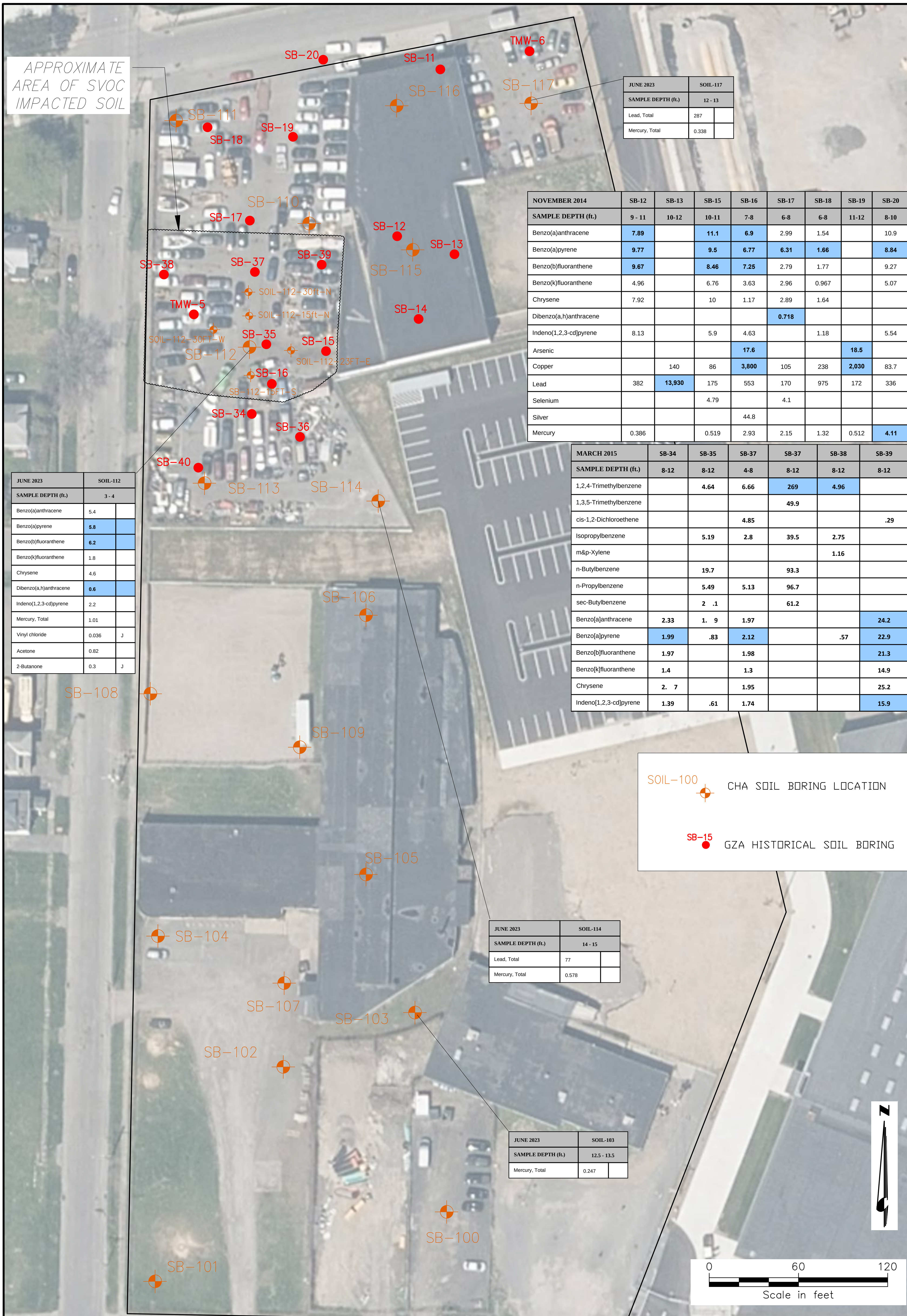
SITE LAYOUT MAP

JMA CAMPUS PLAN
REMEDIAL INVESTIGATION WORK PLAN

PROJECT NO. 059294

DATE: 03/2024

FIGURE 2




| JUNE 2023 | SOIL-117 | |
|---|---|---|
| SAMPLE DEPTH (ft.) | 12 - 13 | |
| Lead, Total | 287 | |
| Mercury, Total | 0.338 | |

| NOVEMBER 2014 | SB-12 | SB-13 | SB-15 | SB-16 | SB-17 | SB-18 | SB-19 | SB-20 |
|---|---|---|---|---|---|---|---|---|
| SAMPLE DEPTH (ft.) | 9 - 11 | 10-12 | 10-11 | 7-8 | 6-8 | 6-8 | 11-12 | 8-10 |
| Benzo(a)anthracene | **7.89** | | **11.1** | **6.9** | 2.99 | 1.54 | | 10.9 |
| Benzo(a)pyrene | **9.77** | | **9.5** | **6.77** | **6.31** | **1.66** | | **8.84** |
| Benzo(b)fluoranthene | **9.67** | | **8.46** | **7.25** | 2.79 | 1.77 | | 9.27 |
| Benzo(k)fluoranthene | 4.96 | | 6.76 | 3.63 | 2.96 | 0.967 | | 5.07 |
| Chrysene | 7.92 | | 10 | 1.17 | 2.89 | 1.64 | | |
| Dibenzo(a,h)anthracene | | | | | **0.718** | | | |
| Indeno(1,2,3-cd]pyrene | 8.13 | | 5.9 | 4.63 | | 1.18 | | 5.54 |
| Arsenic | | | | **17.6** | | | **18.5** | |
| Copper | | 140 | 86 | **3,800** | 105 | 238 | **2,030** | 83.7 |
| Lead | 382 | **13,930** | 175 | 553 | 170 | 975 | 172 | 336 |
| Selenium | | | 4.79 | | 4.1 | | | |
| Silver | | | | 44.8 | | | | |
| Mercury | 0.386 | | 0.519 | 2.93 | 2.15 | 1.32 | 0.512 | **4.11** |

| MARCH 2015 | SB-34 | SB-35 | SB-37 | SB-37 | SB-38 | SB-39 |
|---|---|---|---|---|---|---|
| SAMPLE DEPTH (ft.) | 8-12 | 8-12 | 4-8 | 8-12 | 8-12 | 8-12 |
| 1,2,4-Trimethylbenzene | | 4.64 | 6.66 | **269** | **4.96** | |
| 1,3,5-Trimethylbenzene | | | | 49.9 | | |
| cis-1,2-Dichloroethene | | | 4.85 | | | .29 |
| Isopropylbenzene | | 5.19 | 2.8 | 39.5 | 2.75 | |
| m&p-Xylene | | | | | 1.16 | |
| n-Butylbenzene | | 19.7 | | 93.3 | | |
| n-Propylbenzene | | 5.49 | 5.13 | 96.7 | | |
| sec-Butylbenzene | | 2 .1 | | 61.2 | | |
| Benzo[a]anthracene | 2.33 | 1. 9 | 1.97 | | | **24.2** |
| Benzo[a]pyrene | **1.99** | .83 | **2.12** | | .57 | **22.9** |
| Benzo[b]fluoranthene | 1.97 | | 1.98 | | | **21.3** |
| Benzo[k]fluoranthene | 1.4 | | 1.3 | | | 14.9 |
| Chrysene | 2. 7 | | 1.95 | | | 25.2 |
| Indeno[1,2,3-cd]pyrene | 1.39 | .61 | 1.74 | | | **15.9** |

| JUNE 2023 | SOIL-112 | |
|---|---|---|
| SAMPLE DEPTH (ft.) | 3 - 4 | |
| Benzo(a)anthracene | 5.4 | |
| Benzo(a)pyrene | **5.8** | |
| Benzo(b)fluoranthene | **6.2** | |
| Benzo(k)fluoranthene | 1.8 | |
| Chrysene | 4.6 | |
| Dibenzo(a,h)anthracene | **0.6** | |
| Indeno(1,2,3-cd)pyrene | 2.2 | |
| Mercury, Total | 1.01 | |
| Vinyl chloride | 0.036 | J |
| Acetone | 0.82 | |
| 2-Butanone | 0.3 | J |

| JUNE 2023 | SOIL-114 | |
|---|---|---|
| SAMPLE DEPTH (ft.) | 14 - 15 | |
| Lead, Total | 77 | |
| Mercury, Total | 0.578 | |

| JUNE 2023 | SOIL-103 | |
|---|---|---|
| SAMPLE DEPTH (ft.) | 12.5 - 13.5 | |
| Mercury, Total | 0.247 | |

SUBSURFACE SOIL SAMPLE RESULTS PRESENTED IN MG/KG (PPM).
PARAMETERS SHOWN EXCEED 6 NYCRR PART 375 UNRESTRICTED USE SCOs OR COMMERCIAL USE SCOs (HIGHLIGHTED IN BLUE). A BLANK CELL INDICATES NON-DETECT OR THE DETECTION WAS BELOW THE UNRESTRICTED USE SCO.
NOVEMBER 2014 AND MARCH 2015 DATA ARE FROM PREVIOUS INVESTIGATIONS CONDUCTED BY GZA GEOENVIRONMENTAL.
NOTE EXCEEDANCES OF ACETONE ARE OMITTED BECAUSE ACETONE IS CONSIDERED TO BE A LABORATORY CONTAMINANT RATHER THAN A SITE CONTAMINANT OF CONCERN.



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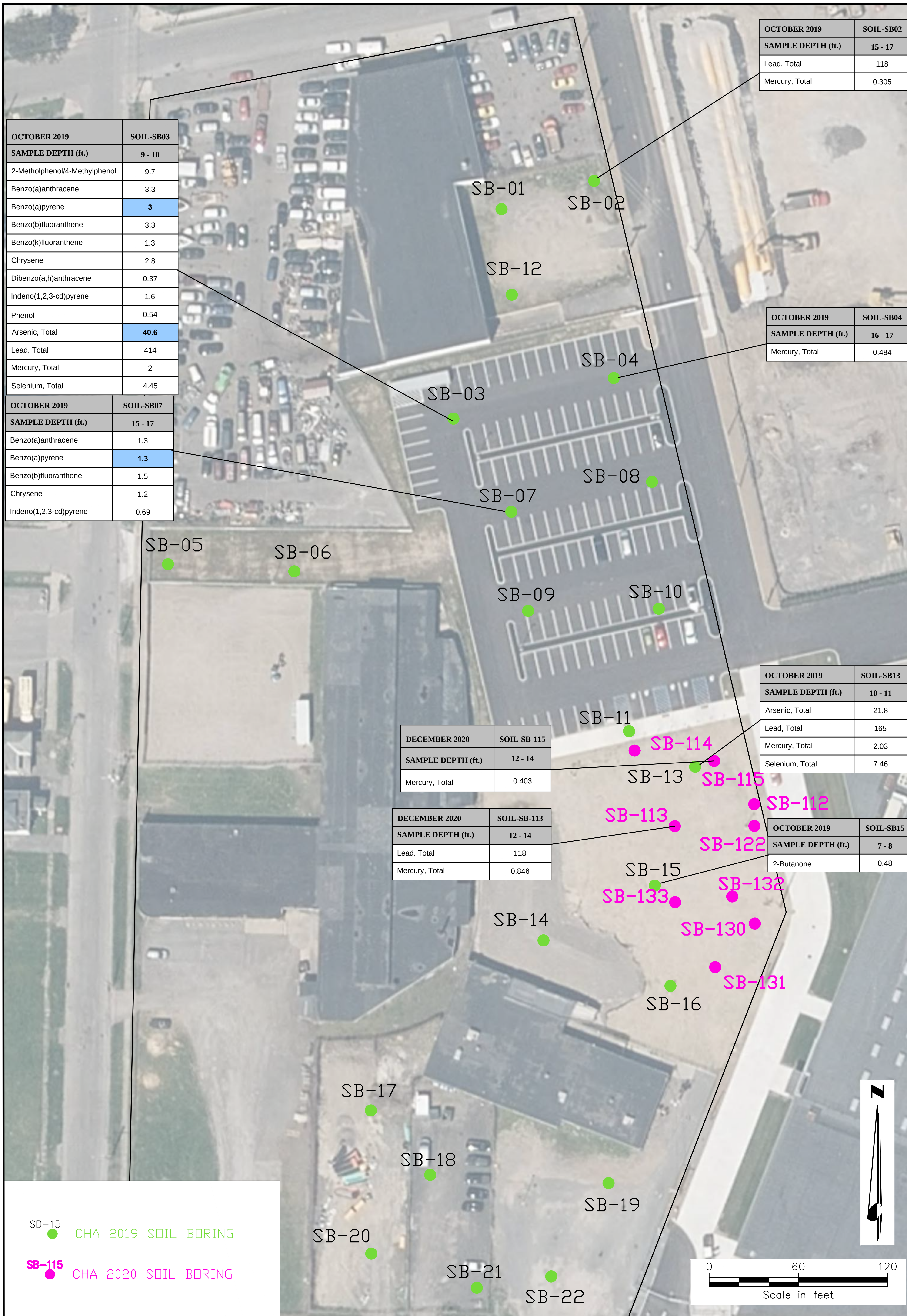
# SOIL ANALYTICAL RESULTS –GZA HISTORICAL RESULTS AND CHA JUNE 2023 RESULTS – EXCEEDANCES ONLY

JMA CAMPUS PLAN
REMEDIAL INVESTIGATION WORK PLAN

PROJECT NO. 059294

DATE: 03/2024

FIGURE 3




| OCTOBER 2019 | SOIL-SB02 |
|---|---|
| SAMPLE DEPTH (ft.) | 15 - 17 |
| Lead, Total | 118 |
| Mercury, Total | 0.305 |

| OCTOBER 2019 | SOIL-SB03 |
|---|---|
| SAMPLE DEPTH (ft.) | 9 - 10 |
| 2-Metholphenol/4-Methylphenol | 9.7 |
| Benzo(a)anthracene | 3.3 |
| Benzo(a)pyrene | 3 |
| Benzo(b)fluoranthene | 3.3 |
| Benzo(k)fluoranthene | 1.3 |
| Chrysene | 2.8 |
| Dibenzo(a,h)anthracene | 0.37 |
| Indeno(1,2,3-cd)pyrene | 1.6 |
| Phenol | 0.54 |
| Arsenic, Total | 40.6 |
| Lead, Total | 414 |
| Mercury, Total | 2 |
| Selenium, Total | 4.45 |

| OCTOBER 2019 | SOIL-SB04 |
|---|---|
| SAMPLE DEPTH (ft.) | 16 - 17 |
| Mercury, Total | 0.484 |

| OCTOBER 2019 | SOIL-SB07 |
|---|---|
| SAMPLE DEPTH (ft.) | 15 - 17 |
| Benzo(a)anthracene | 1.3 |
| Benzo(a)pyrene | 1.3 |
| Benzo(b)fluoranthene | 1.5 |
| Chrysene | 1.2 |
| Indeno(1,2,3-cd)pyrene | 0.69 |

| OCTOBER 2019 | SOIL-SB13 |
|---|---|
| SAMPLE DEPTH (ft.) | 10 - 11 |
| Arsenic, Total | 21.8 |
| Lead, Total | 165 |
| Mercury, Total | 2.03 |
| Selenium, Total | 7.46 |

| DECEMBER 2020 | SOIL-SB-115 |
|---|---|
| SAMPLE DEPTH (ft.) | 12 - 14 |
| Mercury, Total | 0.403 |

| DECEMBER 2020 | SOIL-SB-113 |
|---|---|
| SAMPLE DEPTH (ft.) | 12 - 14 |
| Lead, Total | 118 |
| Mercury, Total | 0.846 |

| OCTOBER 2019 | SOIL-SB15 |
|---|---|
| SAMPLE DEPTH (ft.) | 7 - 8 |
| 2-Butanone | 0.48 |

SOIL SAMPLES FROM INVESTIGATIONS IN OCTOBER 2019 AND DECEMBER 2020 CONDUCTED BY CHA.
SUBSURFACE SOIL SAMPLE RESULTS PRESENTED IN MG/KG (PPM).
PARAMETERS SHOWN EXCEED 6 NYCRR PART 375 UNRESTRICTED USE SCOs OR COMMERCIAL USE SCOs (HIGHLIGHTED IN BLUE). A BLANK CELL INDICATES NON-DETECT OR THE DETECTION WAS BELOW THE UNRESTRICTED USE SCO.
NOTE EXCEEDANCES OF ACETONE ARE OMITTED BECAUSE ACETONE IS CONSIDERED TO BE A LABORATORY CONTAMINANT RATHER THAN A SITE CONTAMINANT OF CONCERN.



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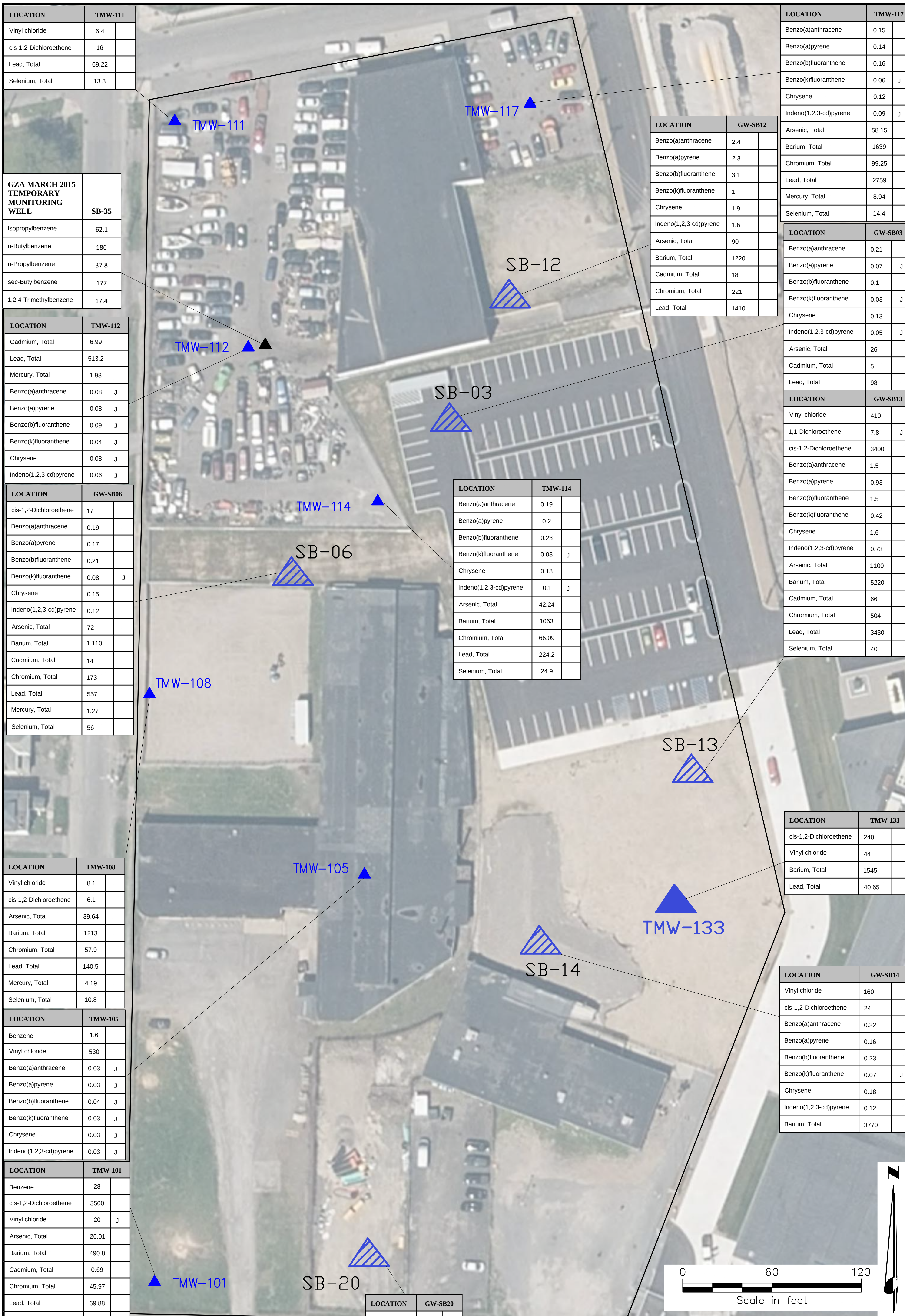
# SOIL ANALYTICAL RESULTS – 2019 AND 2020 – EXCEEDANCES ONLY

JMA CAMPUS PLAN
REMEDIAL INVESTIGATION WORK PLAN

PROJECT NO. 0592941

DATE: 03/2024

FIGURE 4




| LOCATION | TMW-111 | |
|---|---|---|
| Vinyl chloride | 6.4 | |
| cis-1,2-Dichloroethene | 16 | |
| Lead, Total | 69.22 | |
| Selenium, Total | 13.3 | |

| GZA MARCH 2015 TEMPORARY MONITORING WELL | SB-35 |
|---|---|
| Isopropylbenzene | 62.1 |
| n-Butylbenzene | 186 |
| n-Propylbenzene | 37.8 |
| sec-Butylbenzene | 177 |
| 1,2,4-Trimethylbenzene | 17.4 |

| LOCATION | TMW-112 | |
|---|---|---|
| Cadmium, Total | 6.99 | |
| Lead, Total | 513.2 | |
| Mercury, Total | 1.98 | |
| Benzo(a)anthracene | 0.08 | J |
| Benzo(a)pyrene | 0.08 | J |
| Benzo(b)fluoranthene | 0.09 | J |
| Benzo(k)fluoranthene | 0.04 | J |
| Chrysene | 0.08 | J |
| Indeno(1,2,3-cd)pyrene | 0.06 | J |

| LOCATION | GW-SB06 | |
|---|---|---|
| cis-1,2-Dichloroethene | 17 | |
| Benzo(a)anthracene | 0.19 | |
| Benzo(a)pyrene | 0.17 | |
| Benzo(b)fluoranthene | 0.21 | |
| Benzo(k)fluoranthene | 0.08 | J |
| Chrysene | 0.15 | |
| Indeno(1,2,3-cd)pyrene | 0.12 | |
| Arsenic, Total | 72 | |
| Barium, Total | 1,110 | |
| Cadmium, Total | 14 | |
| Chromium, Total | 173 | |
| Lead, Total | 557 | |
| Mercury, Total | 1.27 | |
| Selenium, Total | 56 | |

| LOCATION | TMW-108 | |
|---|---|---|
| Vinyl chloride | 8.1 | |
| cis-1,2-Dichloroethene | 6.1 | |
| Arsenic, Total | 39.64 | |
| Barium, Total | 1213 | |
| Chromium, Total | 57.9 | |
| Lead, Total | 140.5 | |
| Mercury, Total | 4.19 | |
| Selenium, Total | 10.8 | |

| LOCATION | TMW-105 | |
|---|---|---|
| Benzene | 1.6 | |
| Vinyl chloride | 530 | |
| Benzo(a)anthracene | 0.03 | J |
| Benzo(a)pyrene | 0.03 | J |
| Benzo(b)fluoranthene | 0.04 | J |
| Benzo(k)fluoranthene | 0.03 | J |
| Chrysene | 0.03 | J |
| Indeno(1,2,3-cd)pyrene | 0.03 | J |

| LOCATION | TMW-101 | |
|---|---|---|
| Benzene | 28 | |
| cis-1,2-Dichloroethene | 3500 | |
| Vinyl chloride | 20 | J |
| Arsenic, Total | 26.01 | |
| Barium, Total | 490.8 | |
| Cadmium, Total | 0.69 | |
| Chromium, Total | 45.97 | |
| Lead, Total | 69.88 | |
| Selenium, Total | 15.7 | |

| LOCATION | GW-SB20 | |
|---|---|---|
| Barium, Total | 2670 | |

| LOCATION | TMW-114 | |
|---|---|---|
| Benzo(a)anthracene | 0.19 | |
| Benzo(a)pyrene | 0.2 | |
| Benzo(b)fluoranthene | 0.23 | |
| Benzo(k)fluoranthene | 0.08 | J |
| Chrysene | 0.18 | |
| Indeno(1,2,3-cd)pyrene | 0.1 | J |
| Arsenic, Total | 42.24 | |
| Barium, Total | 1063 | |
| Chromium, Total | 66.09 | |
| Lead, Total | 224.2 | |
| Selenium, Total | 24.9 | |

| LOCATION | GW-SB12 | |
|---|---|---|
| Benzo(a)anthracene | 2.4 | |
| Benzo(a)pyrene | 2.3 | |
| Benzo(b)fluoranthene | 3.1 | |
| Benzo(k)fluoranthene | 1 | |
| Chrysene | 1.9 | |
| Indeno(1,2,3-cd)pyrene | 1.6 | |
| Arsenic, Total | 90 | |
| Barium, Total | 1220 | |
| Cadmium, Total | 18 | |
| Chromium, Total | 221 | |
| Lead, Total | 1410 | |

| LOCATION | TMW-117 | |
|---|---|---|
| Benzo(a)anthracene | 0.15 | |
| Benzo(a)pyrene | 0.14 | |
| Benzo(b)fluoranthene | 0.16 | |
| Benzo(k)fluoranthene | 0.06 | J |
| Chrysene | 0.12 | |
| Indeno(1,2,3-cd)pyrene | 0.09 | J |
| Arsenic, Total | 58.15 | |
| Barium, Total | 1639 | |
| Chromium, Total | 99.25 | |
| Lead, Total | 2759 | |
| Mercury, Total | 8.94 | |
| Selenium, Total | 14.4 | |

| LOCATION | GW-SB03 | |
|---|---|---|
| Benzo(a)anthracene | 0.21 | |
| Benzo(a)pyrene | 0.07 | J |
| Benzo(b)fluoranthene | 0.1 | |
| Benzo(k)fluoranthene | 0.03 | J |
| Chrysene | 0.13 | |
| Indeno(1,2,3-cd)pyrene | 0.05 | J |
| Arsenic, Total | 26 | |
| Cadmium, Total | 5 | |
| Lead, Total | 98 | |

| LOCATION | GW-SB13 | |
|---|---|---|
| Vinyl chloride | 410 | |
| 1,1-Dichloroethene | 7.8 | J |
| cis-1,2-Dichloroethene | 3400 | |
| Benzo(a)anthracene | 1.5 | |
| Benzo(a)pyrene | 0.93 | |
| Benzo(b)fluoranthene | 1.5 | |
| Benzo(k)fluoranthene | 0.42 | |
| Chrysene | 1.6 | |
| Indeno(1,2,3-cd)pyrene | 0.73 | |
| Arsenic, Total | 1100 | |
| Barium, Total | 5220 | |
| Cadmium, Total | 66 | |
| Chromium, Total | 504 | |
| Lead, Total | 3430 | |
| Selenium, Total | 40 | |

| LOCATION | TMW-133 | |
|---|---|---|
| cis-1,2-Dichloroethene | 240 | |
| Vinyl chloride | 44 | |
| Barium, Total | 1545 | |
| Lead, Total | 40.65 | |

| LOCATION | GW-SB14 | |
|---|---|---|
| Vinyl chloride | 160 | |
| cis-1,2-Dichloroethene | 24 | |
| Benzo(a)anthracene | 0.22 | |
| Benzo(a)pyrene | 0.16 | |
| Benzo(b)fluoranthene | 0.23 | |
| Benzo(k)fluoranthene | 0.07 | J |
| Chrysene | 0.18 | |
| Indeno(1,2,3-cd)pyrene | 0.12 | |
| Barium, Total | 3770 | |

CHA TEMPORARY MONITORING WELLS (TMWs), ANALYZED FOR VOCs, SVOCs, AND METALS. GROUNDWATER RESULTS DISPLAYED IN UG/L (PPB).
PARAMETERS DISPLAYED EXCEED TOGS 1.1.1 AMBIENT GROUNDWATER QUALITY STANDARDS OR GUIDANCE VALUES FOR CLASS GA WATERS.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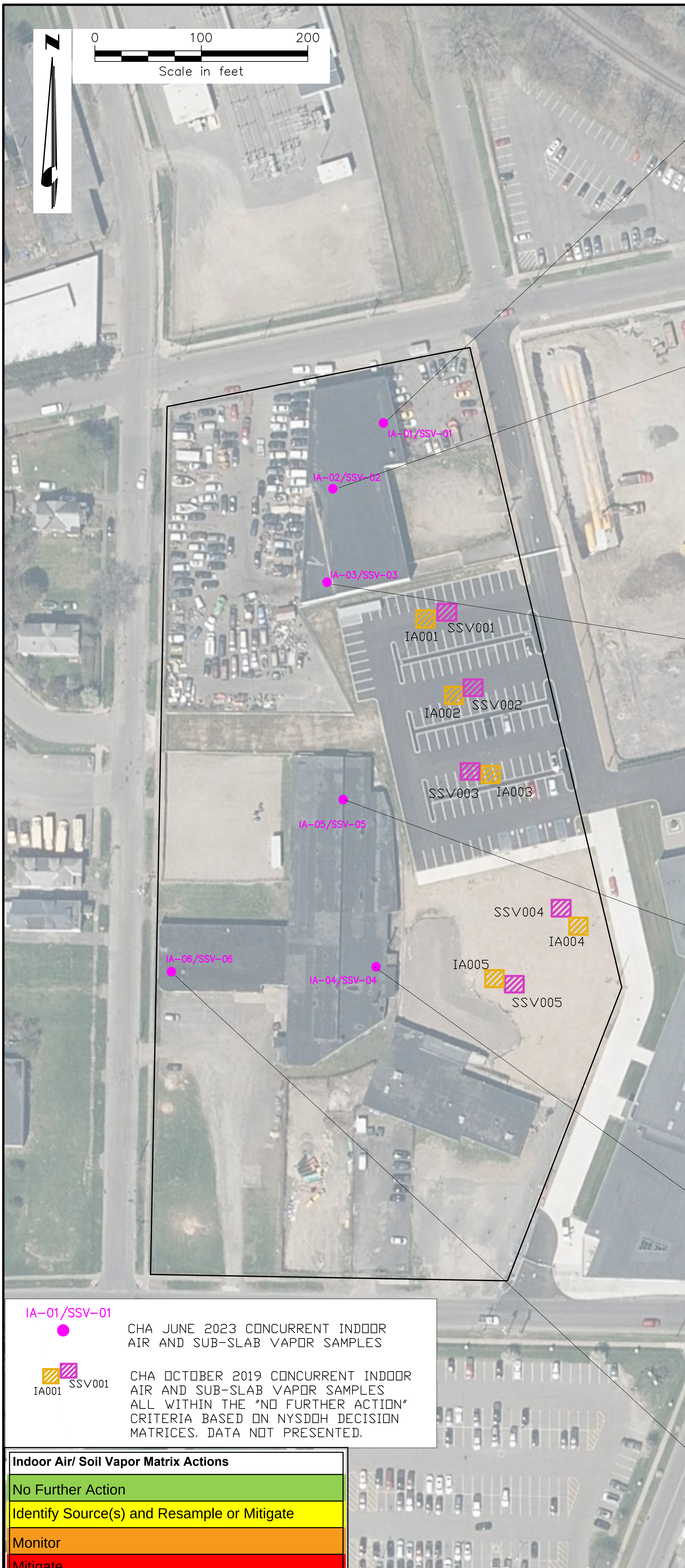
# GROUNDWATER MONITORING RESULTS EXCEEDANCES ONLY FROM ALL PREVIOUS INVESTIGATIONS

JMA CAMPUS PLAN
REMEDIAL INVESTIGATION WORK PLAN

PROJECT NO. 059294
DATE: 03/2024
FIGURE 5

File: V:\PROJECTS\ANY\K5\059294.001\CADD_ACAD\ENVP\JMA BCP APPLICATION\FIGURES FOR BCA AND RIWP.DWG Saved: 2/26/2024 1:53:50 PM Plotted: 2/26/2024 1:55:39 PM Current User: Ehmann, Karyn LastSavedBy: 5768




| LOCATION | IA-01 | | SSV-01 | |
|---|---|---|---|---|
| SAMPLE TYPE | INDOOR AIR | | SOIL VAPOR | |
| | Results | Qual | Results | Qual |
| Vinyl chloride | 0.051 | U | 0.511 | U |
| 1,1-Dichloroethene | 0.079 | U | 0.793 | U |
| Methylene chloride | 1.74 | U | 63.9 | |
| cis-1,2-Dichloroethene | 0.143 | | 0.793 | U |
| 1,1,1-Trichloroethane | 0.109 | U | 38.2 | |
| Carbon tetrachloride | 0.359 | | 1.26 | U |
| Trichloroethene | 0.769 | | 1.07 | U |
| Tetrachloroethene | 14.6 | | 137 | |

| LOCATION | IA-02 | | SSV-02 | |
|---|---|---|---|---|
| SAMPLE TYPE | INDOOR AIR | | SOIL VAPOR | |
| | Results | Qual | Results | Qual |
| Vinyl chloride | 0.051 | U | 22.8 | U |
| 1,1-Dichloroethene | 0.079 | U | 35.3 | U |
| Methylene chloride | 1.74 | U | 77.5 | U |
| cis-1,2-Dichloroethene | 0.159 | | 46.4 | |
| 1,1,1-Trichloroethane | 0.109 | U | 48.6 | U |
| Carbon tetrachloride | 0.327 | | 56 | U |
| Trichloroethene | 0.812 | | 2120 | |
| Tetrachloroethene | 11.9 | | 42000 | |

| LOCATION | IA-03 | | SSV-03 | |
|---|---|---|---|---|
| SAMPLE TYPE | INDOOR AIR | | SOIL VAPOR | |
| | Results | Qual | Results | Qual |
| Vinyl chloride | 0.051 | U | 0.511 | U |
| 1,1-Dichloroethene | 0.079 | U | 0.793 | U |
| Methylene chloride | 1.74 | U | 7.09 | |
| cis-1,2-Dichloroethene | 0.139 | | 0.793 | U |
| 1,1,1-Trichloroethane | 0.109 | U | 3.24 | |
| Carbon tetrachloride | 0.34 | | 4.62 | |
| Trichloroethene | 0.672 | | 1.07 | U |
| Tetrachloroethene | 9.29 | | 186 | |

| LOCATION | IA-05 | | SSV-05 | |
|---|---|---|---|---|
| SAMPLE TYPE | INDOOR AIR | | SOIL VAPOR | |
| | Results | Qual | Results | Qual |
| Vinyl chloride | 0.051 | U | 0.511 | U |
| 1,1-Dichloroethene | 0.079 | U | 0.793 | U |
| Methylene chloride | 1.74 | U | 1.74 | U |
| cis-1,2-Dichloroethene | 0.079 | U | 0.793 | U |
| 1,1,1-Trichloroethane | 0.109 | U | 1.09 | U |
| Carbon tetrachloride | 0.321 | | 1.26 | U |
| Trichloroethene | 0.107 | U | 1.07 | U |
| Tetrachloroethene | 0.19 | | 1.39 | |

| LOCATION | IA-04 | | SSV-04 | |
|---|---|---|---|---|
| SAMPLE TYPE | INDOOR AIR | | SOIL VAPOR | |
| | Results | Qual | Results | Qual |
| Vinyl chloride | 0.051 | U | 0.511 | U |
| 1,1-Dichloroethene | 0.079 | U | 0.793 | U |
| Methylene chloride | 1.74 | U | 1.74 | U |
| cis-1,2-Dichloroethene | 0.079 | U | 0.793 | U |
| 1,1,1-Trichloroethane | 0.109 | U | 1.09 | U |
| Carbon tetrachloride | 0.283 | | 1.26 | U |
| Trichloroethene | 0.107 | U | 1.07 | U |
| Tetrachloroethene | 0.17 | | 71.2 | |

| LOCATION | IA-06 | | SSV-06 | |
|---|---|---|---|---|
| SAMPLE TYPE | INDOOR AIR | | SOIL VAPOR | |
| | Results | Qual | Results | Qual |
| Vinyl chloride | 0.051 | U | 0.511 | U |
| 1,1-Dichloroethene | 0.079 | U | 0.793 | U |
| Methylene chloride | 1.74 | U | 1.74 | U |
| cis-1,2-Dichloroethene | 0.079 | U | 0.793 | U |
| 1,1,1-Trichloroethane | 0.109 | U | 1.09 | U |
| Carbon tetrachloride | 0.283 | | 1.26 | U |
| Trichloroethene | 0.107 | U | 1.07 | U |
| Tetrachloroethene | 0.176 | | 3.01 | |

AIR SAMPLE RESULTS PRESENTED IN UG/M3. PARAMETERS LISTED ARE EVALUATED USING THE DECISION MATRICES PROVIDED IN THE NYSDOH GUIDANCE FOR EVALUATING SOIL VAPOR INTRUSION IN THE STATE OF NEW YORK, OCTOBER 2006 AND SUBSEQUENT UPDATES THROUGH 2017.
U = NON-DETECT



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# INDOOR AIR/SUBSLAB VAPOR ANALYTICAL RESULTS NYSDOH MATRIX EVALUATION

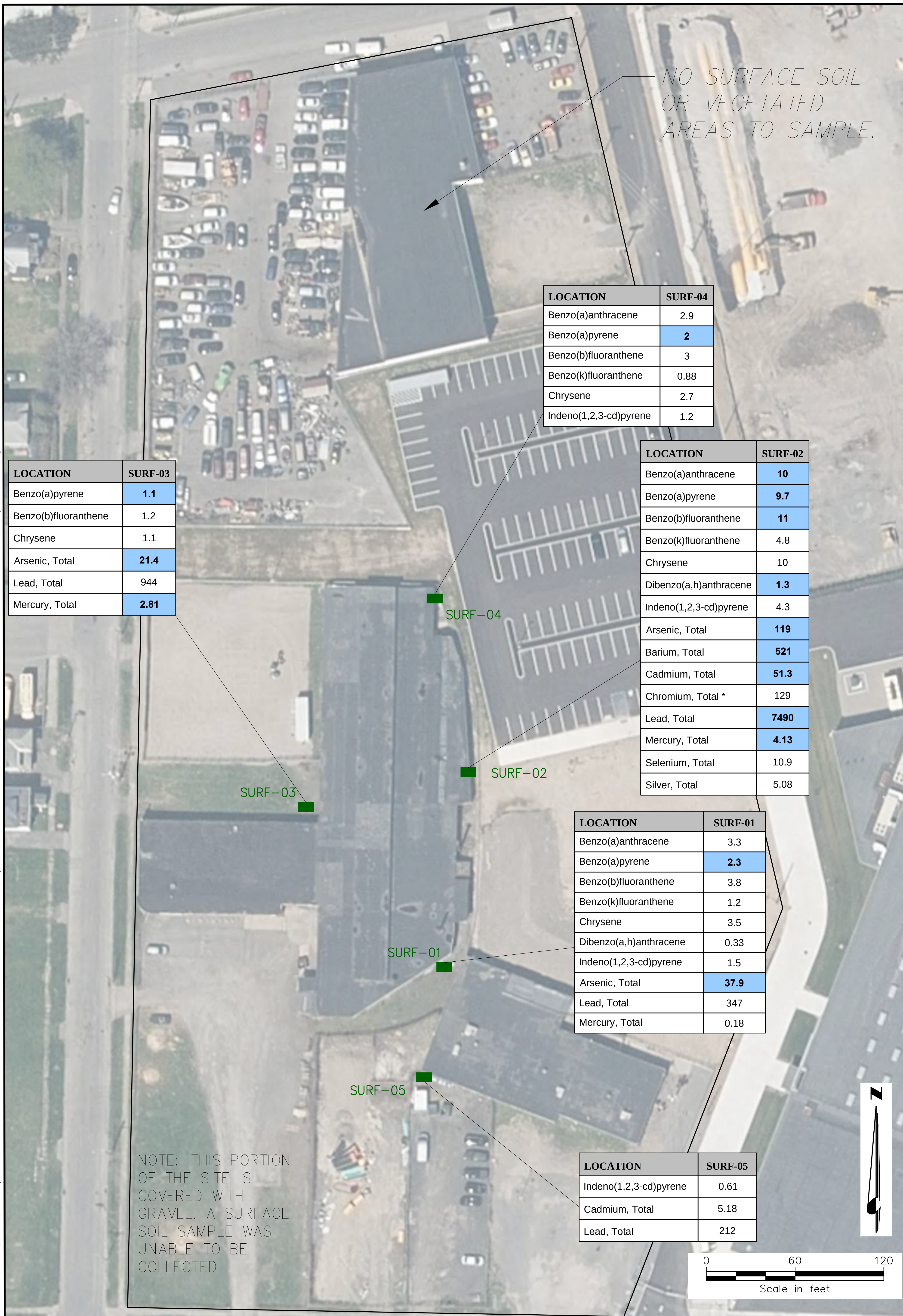
JMA CAMPUS PLAN
REMEDIAL INVESTIGATION WORK PLAN

PROJECT NO. 059294

DATE: 03/2024

FIGURE 6

File: V:\PROJECTS\ANY\K5\059294.001\CADD_ACAD\ENVP\JMA BCP APPLICATION\FIGURES FOR BCA AND RIWP.DWG Saved: 2/26/2024 1:53:50 PM Plotted: 2/26/2024 1:56:19 PM Current User: Ehrmann, Karyn LastSavedBy: 5768




| LOCATION | SURF-04 |
|---|---|
| Benzo(a)anthracene | 2.9 |
| Benzo(a)pyrene | **2** |
| Benzo(b)fluoranthene | 3 |
| Benzo(k)fluoranthene | 0.88 |
| Chrysene | 2.7 |
| Indeno(1,2,3-cd)pyrene | 1.2 |

| LOCATION | SURF-03 |
|---|---|
| Benzo(a)pyrene | **1.1** |
| Benzo(b)fluoranthene | 1.2 |
| Chrysene | 1.1 |
| Arsenic, Total | **21.4** |
| Lead, Total | 944 |
| Mercury, Total | **2.81** |

| LOCATION | SURF-02 |
|---|---|
| Benzo(a)anthracene | **10** |
| Benzo(a)pyrene | **9.7** |
| Benzo(b)fluoranthene | **11** |
| Benzo(k)fluoranthene | 4.8 |
| Chrysene | 10 |
| Dibenzo(a,h)anthracene | **1.3** |
| Indeno(1,2,3-cd)pyrene | 4.3 |
| Arsenic, Total | **119** |
| Barium, Total | **521** |
| Cadmium, Total | **51.3** |
| Chromium, Total * | 129 |
| Lead, Total | **7490** |
| Mercury, Total | **4.13** |
| Selenium, Total | 10.9 |
| Silver, Total | 5.08 |

| LOCATION | SURF-01 |
|---|---|
| Benzo(a)anthracene | 3.3 |
| Benzo(a)pyrene | **2.3** |
| Benzo(b)fluoranthene | 3.8 |
| Benzo(k)fluoranthene | 1.2 |
| Chrysene | 3.5 |
| Dibenzo(a,h)anthracene | 0.33 |
| Indeno(1,2,3-cd)pyrene | 1.5 |
| Arsenic, Total | **37.9** |
| Lead, Total | 347 |
| Mercury, Total | 0.18 |

| LOCATION | SURF-05 |
|---|---|
| Indeno(1,2,3-cd)pyrene | 0.61 |
| Cadmium, Total | 5.18 |
| Lead, Total | 212 |

SURFACE SOIL SAMPLES COLLECTED JUNE 2023.
RESULTS PRESENTED IN MG/KG (PPM).
PARAMETERS ANALYZED INCLUDE SVOCs, AND RCRA-8 METALS.
PARAMETERS SHOWN EXCEED 6 NYCRR PART 375 UNRESTRICTED USE SCOs OR COMMERCIAL USE SCOs (HIGHLIGHTED IN BLUE)



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# SURFACE SOIL ANALYTICAL RESULTS EXCEEDANCES ONLY

JMA CAMPUS PLAN
REMEDIAL INVESTIGATION WORK PLAN

PROJECT NO. 059294

DATE: 03/2024

FIGURE 7

File: V:\PROJECTS\ANY\K5\059294.001\CADD_ACAD\ENVP\JMA BCP APPLICATION\FIGURES FOR BCA AND RIWP.DWG Saved: 2/26/2024 1:53:50 PM Plotted: 2/26/2024 1:56:00 PM Current User: Ehmmann, Karyn LastSavedBy: 5768


SUBSURFACE SOIL SAMPLE
TOD = TOTAL OXIDANT DEMAND

SURFACE SOIL SAMPLE

AREA REDEVELOPED IN 2021



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**PROPOSED SURFACE SOIL AND SUBSURFACE SOIL SAMPLING LOCATIONS**

JMA CAMPUS PLAN
REMEDIAL INVESTIGATION WORK PLAN

PROJECT NO. 059294

DATE: 03/2024

**FIGURE 8**

File: V:\PROJECTS\ANY\K6\059294.002\09_DESIGN\DRAWINGS\ENV\JMA CAMPUS PLAN RIWP\PROPOSED_SAMPLE_LOCATIONS.DWG Saved: 2/23/2024 11:24:23 AM Plotted: 2/26/2024 12:15:30 PM Current User: Ehmann, Karyn LastSavedBy: 5768


PERMANENT STICK-UP GROUNDWATER MONITORING WELL
S: SHALLOW
D: DEEP



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# PROPOSED PERMANENT GROUNDWATER MONITORING WELLS

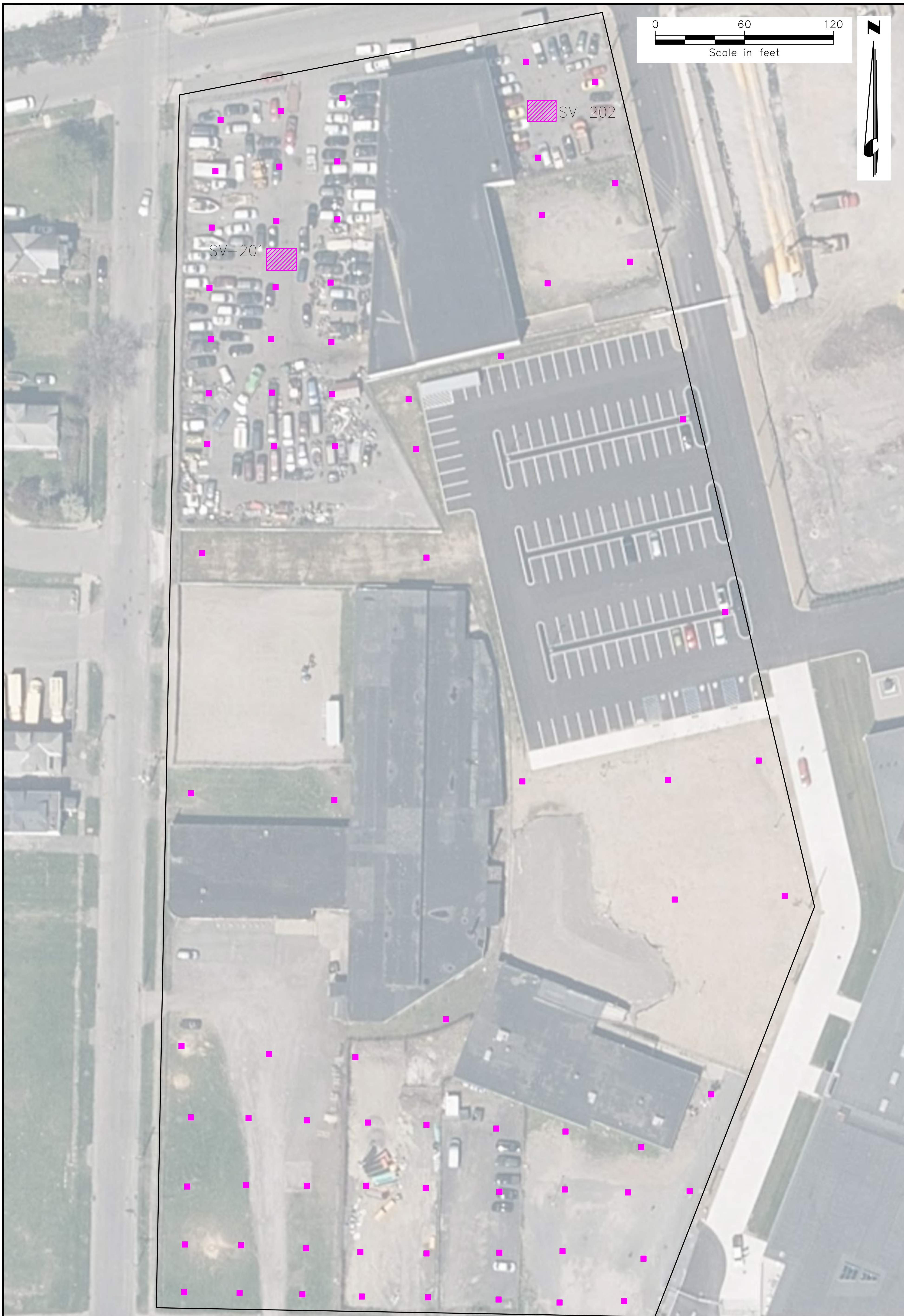
JMA CAMPUS PLAN
REMEDIAL INVESTIGATION WORK PLAN

PROJECT NO.
059294

DATE: 03/2024

FIGURE 9

File: V:\PROJECTS\ANY\K6\059294.002\09_DESIGN\DRAWINGS\ENV\JMA CAMPUS PLAN RIWP\PROPOSED_SAMPLE_LOCATIONS.DWG Saved: 2/28/2024 4:13:19 PM Plotted: 2/28/2024 4:13:33 PM Current User: Ehmann, Karyn LastSavedBy: 5768




SOIL VAPOR SAMPLING POINT

PASSIVE GAS SAMPLING POINT

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**PROPOSED PASSIVE GAS SAMPLING AND SOIL VAPOR SAMPLING LOCATIONS**

JMA CAMPUS PLAN
REMEDIAL INVESTIGATION WORK PLAN

PROJECT NO. 059294

DATE: 03/2024

**FIGURE 10**

File: V:\PROJECTS\ANY\K6\059294.002\09_DESIGN\DRAWINGS\ENV\JMA CAMPUS PLAN RIWP\PROPOSED_SAMPLE_LOCATIONS.DWG Saved: 2/23/2024 8:48:34 AM Plotted: 2/23/2024 8:48:54 AM Current User: Ehmann, Karyn LastSavedBy: 5768

# APPENDIX A
Field Sampling Plan

# FIELD SAMPLING PLAN

**JMA Campus Plan**
1074 South Clinton Street
Syracuse, New York 13202

**Project Site #**
CHA Project Number: 059294.002

**March 2023**

**Prepared for:**
**JMA Tech Properties, LLC**
**dba GEC Consulting**
168 Brampton Road
Syracuse, New York 13205

**Prepared by:**
**CHA Consulting, Inc.**
300 South State Street, Suite 600
Syracuse, New York 13202
Phone: (315) 471-3920

# TABLE OF CONTENTS



# LIST OF APPENDICES

# LIST OF ACRONYMS & ABBREVIATIONS

| | |
|---|---|
| AGI | Amplified Geochemical Imaging, LLC |
| BCP | Brownfield Cleanup Program |
| CHA | CHA Consulting, Inc. |
| CVOC | Chlorinated Volatile Organic Compound |
| ELAP | Environmental Laboratory Approval Program |
| EPA | Environmental Protection Agency |
| FSP | Field Sampling Plan |
| HASP | Health and Safety Plan |
| HDPE | High-Density Polyethylene |
| IDW | Investigation Derived Waste |
| NTU | Nephelometric Turbidity Units |
| NYSDEC | New York State Department of Environmental Conservation |
| NYSDOH | New York State Department of Health |
| PFAS | Per- and Polyfluoroalkyl Substances |
| PGS | Passive Gas Sampler |
| PPE | Personal Protective Equipment |
| QAPP | Quality Assurance Project Plan |
| RIWP | Remedial Investigation Work Plan |
| SOP | Standard Operating Procedures |
| TIC | Tentatively Identified Compounds |

# 1.0 INTRODUCTION

This Field Sampling Plan (FSP) has been prepared for the JMA Campus Plan (Site), located at 1074 South Clinton Street in the City of Syracuse, Onondaga County, New York, and is to be utilized during implementation of the Remedial Investigation Work Plan (RIWP). The Site is an applicant into the New York State Department of Environmental Conservation (NYSDEC) Brownfield Cleanup Program (BCP).

This FSP outlines the protocols which will be followed during the remedial investigation activities and has been prepared as an appendix to the RIWP for the project. In general, all activities will be performed in accordance with the CHA Consulting, Inc. (CHA) Standard Operating Procedures (SOPs) that are included in Appendix A.

The following activities will be conducted as part of the site investigation activities:

- Installation of soil borings, monitoring wells, soil vapor monitoring points, and passive gas sampler monitoring points;
- Collection of surface and subsurface soil samples;
- Collection of groundwater samples;
- Survey of monitoring well locations and elevations;
- Waste characterization sampling;
- Equipment decontamination; and
- Waste handling.

# 2.0 GENERAL SAMPLING PROTOCOLS

The sampling approach and rationale for sample collection is described in the RIWP. The Data Quality Objectives for the project and the quality assurance and quality control (QA/QC) procedures for the project are described in the Quality Assurance Project Plan (QAPP), found in Appendix B of the RIWP. Sampling activities will be conducted in a manner to protect both workers in accordance with the Health and Safety Plan (HASP), found in Appendix C of the RIWP.

## 2.1 Sample Designation

Each sample will be uniquely defined by including the media type and sequential number. To avoid confusion with samples collected prior to this RIWP, CHA will start at number 201 on all media types (e.g. SOIL-201).

The following abbreviations will be used to identify media types:

| Sample Type | Abbreviation | Example Sample ID |
|---|---|---|
| Surface Soil | SURF | SURF-201 |
| Subsurface Soil | SOIL | SOIL-201 |
| Soil – Test Pits | TP | TP-201 |
| Passive Gas Samples | PGS | PGS-201 |
| Groundwater | MW | MW-201 |

## 2.2 Sample Handling

A new pair of disposable nitrile gloves will be used at each location sampled for chemical analyses. Additional glove changes will be undertaken as conditions warrant.

Sample containers will be new and delivered from the laboratory prior to the sampling event. Sample containers will come with the proper volume of chemical preservative appropriate for the type of analysis as detailed in CHA SOP#603.

After sample collection, the sample containers will be logged onto a chain of custody record described in the QAPP. The sample containers will be placed on ice and/or ice packs in laboratory supplied rigid coolers after collection and labeling. Remaining space will be filled with packing material to cushion the containers during transportation or shipment.

For this project CHA staff will hand deliver the sample coolers to the Pace Analytical Services' facility located in Syracuse, New York, or coordinate with their courier service. Other samples for remedial design purposes will be transmitted to their appropriate subcontracted vendor or laboratory, as described in Section 3.0, under proper chain of custody protocols.

Samples will remain under the control of CHA's field representative until relinquished to the laboratory under chain-of-custody (see QAPP).

## 2.3 Field Documentation

Pertinent field and sampling information shall be recorded in a logbook or on field logs during each day of the field effort per CHA SOP#101 Field Logbook and Photographs.

At a minimum, entries in a logbook shall include:

- Date and time of starting work
- Names of all personnel at site
- Weather conditions
- Purpose of proposed work effort
- Sampling equipment to be used and calibration of equipment
- Description of work area
- Location of work area, including map reference
- Details of work effort, particularly any deviation from the field operations plan or standard operating procedures
- Field observations
- Field measurements (e.g., photoionization detector (PID) readings)
- Field laboratory analytical results
- Daily health and safety entries, including levels of protection
- Type, number, and location of samples
- Sampling method, particularly deviations from the standard operating procedures
- Sample location and number
- Sample handling, packaging, labeling, and shipping information (including destination)

In addition to keeping logs, photographs will be taken to provide a physical record to augment the fieldworker's written observations. For each photograph taken, several items shall be recorded in the field logbooks:

- Date and time
- Name of photographer
- General direction faced and description of the subject photographed

Additional protocols specific to each sampling method are presented in the following sections.

# 3.0 PROPOSED REMEDIAL INVESTIGATION ACTIVITIES

## 3.1 Surface Soil

The surface soil sample will be collected from the interval below the vegetated surface, typically 6 to 12 inches below the surface. The sample volume will be homogenized by the following process:

1. Remove rocks, twigs, leaves and other debris from the sampling device.
2. Place the sample into a stainless-steel bowl and thoroughly mix using a stainless-steel spoon.
3. Scrape the sample from the sides, corners, and bottom of bowl, roll to the middle of the bowl and mix.
4. Quarter the sample and move to the four corners of the bowl. Each quarter will be individually mixed and rolled to the center of the bowl and then the entire sample will be mixed again.
5. Place the sample into the appropriate glassware require for each parameter in the following order: per- and polyfluoroalkyl substances (PFAS), semi-volatile organic compounds (SVOCs), total polychlorinated biphenyls (PCBs) and target analyte list (TAL) Metals.

## 3.2 Subsurface Soil

Shallow subsurface soil samples will be collected from surface to final depth using either a Macrocore® sampling device or slide hammer hand sampler. The soil samples will then be screened in the field for visual, olfactory, and photoionic evidence of contamination. Soils will be logged in the field using a modified soil classification method on Soil Probe Logs in accordance with CHA SOP#303.

Immediately upon opening the soil sampler, a photoionization detector (PID) or equivalent meter will be used to obtain readings along the length of the soil sample. One soil sample from each soil boring location will be submitted to an off-site New York State Department of Health (NYSDOH) Environmental Laboratory Approval Program (ELAP)-certified laboratory for a select set of parameters as described in Table 2 of the RIWP.

Each sample will be homogenized by the following process for all analyses except VOCs which will be collected as grab samples:

1. Remove rocks, twigs, leaves and other debris from the sampling device.
2. Place the sample into a stainless-steel bowl and thoroughly mix using a stainless-steel spoon.
3. Scrape the sample from the sides, corners and bottom of bowl, roll to the middle of the bowl and mix.
4. Quarter the sample and move to the four corners of the bowl. Each quarter will be individually mixed and rolled to the center of the bowl and then the entire sample will be mixed again.

Additionally, two locations will be selected for total oxidant demand (TOD) sampling. Sufficient soil will be collected from an approximately five-foot interval of the Macrocore® sampling device for TOD analysis. This sample will be collected using the same homogenizing process described above, but transported to the Loureiro Engineering laboratory in Portsmouth, New Hampshire.

Before drilling at each boring location and after drilling at the last location, the drilling equipment and all non-disposable sampling equipment will be decontaminated in accordance with the protocols established in Section 4. Drill cuttings will be managed as described in Section 5. Soil borings will be backfilled with bentonite.

## 3.3 Groundwater

### 3.3.1 Monitoring Well Installation

A maximum of eight permanent, stick-up groundwater monitoring wells will be installed in accordance with CHA SOP#309. Six of the eight monitoring wells will be installed to an approximate depth of 25 feet below ground surface to evaluate the shallow water bearing zone with screen intervals from the bottom of the well to the top of the water table, previously identified at approximately 12 feet bgs. This design is to evaluate both the potential for petroleum contaminants which are less dense than water, and CVOC contaminants which are denser than water. Two of the locations, as identified on Figure 10 of the RIWP, will be clusters of two monitoring wells to evaluate the deeper water bearing zone beneath a clay confining layer identified during the previous subsurface investigations.

Wells will be constructed with two-inch diameter PVC riser pipe and well screen and will have a slot opening size of 0.010-inches. The screen for the well will be installed to straddle the desired water table. A sand pack, consisting of a minimum thickness of one inch, will be placed within the annulus between the borehole and the well screen. A two-foot bentonite seal will then be placed above the screen. The remaining borehole between the bentonite seal and the ground surface will be backfilled with bentonite-cement grout. Flush-mounted steel protective casings will be installed at each well location to protect the riser pipes. Soil cuttings from drilling operations will not be used as backfill in any of the monitoring wells.

### 3.3.2 Monitoring Well Development

Once the wells are installed, each well will be developed using a combination of pumping and surging in accordance with CHA SOP#311. The newly installed wells will be developed until the turbidity of the groundwater is less than 50 nephelometric turbidity units (NTUs), or for a maximum of two hours each, whichever comes first. The locations of both, the proposed wells, and those previously installed are shown on Figure 5.

Groundwater samples will be collected from proposed wells for a select set of parameters, further described in Table 2 of the RIWP. Dedicated high-density polyethylene (HDPE) tubing will be installed at each well and a low-flow pump will be used to collect the sample. All non-disposable equipment will be cleaned in accordance with Section 5.0 to minimize the potential for cross-contamination. Bottle requirements and handling procedures are presented in the QAPP. Sampling protocols are presented in the following sub-sections.

### 3.3.3 Water Level Gauging

Groundwater levels will be collected from available wells at the site and will be used with monitoring well elevation data to determine direction of groundwater flow. Groundwater level measurements will be collected on at least two separate occasions following installation and development: once immediately following development, and once immediately prior to groundwater sampling.

The water level in all monitoring wells will be measured to the nearest 0.01-foot using a Solinst electronic water level meter and recorded prior to the collection of any samples in accordance with CHA SOP#313. Using the well riser elevations and depth to groundwater measurements, CHA will record the water level elevations and construct a groundwater potentiometric surface map. The well depth and depth to water data will be used to calculate the volume of water in the well casing. Water level measuring equipment that comes in contact with well water will be decontaminated in accordance with Section 5.0 to minimize the potential for cross-contamination.

### 3.3.4 Groundwater Sampling

Monitoring well sampling will be carried out in accordance with CHA SOP#317 for Low-Flow Groundwater Purging and Sampling and CHA SOP#341 for sampling of per- and polyfluoroalkyl substances (PFAS).

All groundwater samples will be analyzed for the parameters listed in Table 2 of the RIWP. Additionally, three of the eight monitoring wells (1 deep and 2 shallow) will be analyzed for:

- Anions - Chloride and Sulfate via Environmental Protection Agency (EPA) Method 300.0
- Microbiological presence of CVOC reducing bacteria using a polymerase chain reaction method, or equivalent analytical laboratory method.

In summary, the sampling procedure includes:

1. Personnel involved in well purging will wear a new pair of disposable nitrile gloves for each well.
2. Flow rate used during purging must be low enough to avoid increasing the water turbidity.
3. Water quality measurements for dissolved oxygen, oxidation-reduction potential, specific conductance, pH, turbidity, and temperature will be taken every 3 to 5 minutes.
4. The well will have reached stability and purging will be considered complete when they are within the following ranges for three consecutive readings:

| | |
|---|---|
| Dissolved Oxygen | ±10% |
| Oxidation-Reduction Potential (redox) | ±10% |
| Specific Conductance | ±3% of reading |
| pH | ±0.1 units |
| Turbidity | ±10% |

5. Water will be pumped using a submersible Monsoon pump, or equivalent.
6. Groundwater pumping equipment will be decontaminated in accordance with the protocols presented in Section 4.0.

7. New HDPE tubing will be used at each well.
8. Groundwater samples will be analyzed for a select set of parameters as described in Table 2 of the RIWP.
9. Sample preservation details are presented in the QAPP. Sample containers will be prepared by the laboratory and will be pre-labeled and pre-preserved.
10. Calibration of all field instruments will be conducted in accordance with the manufacturer's instructions.
11. QA/QC samples will be collected in accordance with the QAPP.
12. Non-disposable sampling equipment will be decontaminated in accordance with the protocols established in Section 4. Purge water will be managed as described in Section 5.
13. All field personnel shall remove personal protective equipment (PPE) after decontamination of equipment has been completed. Removal of PPE and decontamination of personnel will be in accordance with CHA SOP#505.

Additionally, sampling procedures for microbiological sampling are provided in Appendix B and generally include:

1. Scheduling of the biological sampling toward the second half of the day due to short hold times (48 hours).
2. After the monitoring well is purged and stabilized, a clamp will be installed on the dedicated tubing to create a leak-proof connection.
3. Attaching the inlet of the filter to the tubing using the clamp to secure.
4. Placing the filter within a receiving container to measure the amount of water filtered through (recommend 1 to 2 liters).
5. Once the recommended volume of water is filtered, stop the pump, remove the filter from the tubing, cap the filter at both ends with the provided rubber or clear luer plugs, place the filter in the containment tube provided by the laboratory, and label appropriately.
6. Placing the samples on double bagged ice or blue ice.
7. Shipping the samples overnight to the contract laboratory under proper chain of custody procedures.

## 3.4 Soil Vapor

### 3.4.1 Soil Vapor Point Installation

Soil vapor points will be installed in one location east and one location west of the Former Horizon Transport building to evaluate for the potential impacts of soil vapor contamination outside of the building footprint since the soil vapor intrusion sampling results within the building indicated the need to mitigate. CHA will oversee the installation of two soil vapor points by drilling and installing semi-permanent sampling screens approximately three to five feet bgs, backfilled with inert material, fitted with inert tubing, and sealed with bentonite slurry, in accordance with NYSDOH guidance. A tracer gas (e.g. Helium) will be used at each soil vapor sampling location to confirm outdoor air infiltration is not occurring.

### 3.4.2 Soil Vapor Point Sampling

At least 24 hours after the installation of the probes, one to three implant (screen and tubing) volumes will be purged. Samples will then be collected in 2.7-liter SUMMA canisters that are individually certified clean by the laboratory and will run for approximately two hours at a flow rate less than 0.2 liters per minute. Samples will be analyzed for toxic organics via EPA Method TO-15. Sample container requirements, preservation measures, and handling procedures are presented in the QAPP.

### 3.4.3 Passive Gas Samplers

A network of passive gas samplers (PGSs) will be installed in the approximate locations identified on Figure 10 of the RIWP. The PGSs will be installed approximately 36 inches below the ground surface to absorb soil vapor over a two week sampling interval. Once retrieved, the PGSs will be shipped to Applied Geochemical Imaging, LLC (AGI) for mass analysis of volatile organic compounds via their screening method. The following is standard protocol for PGS installation, retrieval, and handling with additional information provided in Appendix B:

1. Use a rotary hammer drill with a 0.5 inch drill bit to advance to the appropriate depth for PGS installation.
2. Loop a 72 inch length of string through the eyelet of the cork used to cap the PGS.
3. Remove the PGS from the vial and compare the serial number on the vial to that on the sampler.
4. Record the location and serial number in field logs and Site map. Record the installation date and time in field logs.
5. Loop the string through the looped end of the sampler.
6. Place the insertion rod into the pocket of the sampler.
7. Insert the rod and sampler into the hole and push to the maximum depth of the hole.
8. Twist the insertion rod to detach the sampler.
9. Insert the cork to seal the hole using a rubber mallet to secure, as necessary.
10. Return to the Site two weeks later to retrieve the PGSs.
11. Remove the cord and pull the string to remove the sampler.
12. Compare the sampler serial number to records.
13. Cut and discard string and cork.
14. Return the sampler to the vial. Clean the vial and threads as necessary to secure the cap.
15. Attach a custody seal to the vial.
16. Records the retrieval time and date and place in the AGI provided box.
17. Appropriately fill out the chain of custody.
18. Ship the samples to AGI for analysis.

### 3.5 Survey

After installation, the elevation of the top of the stick-up casings and top of riser at each new well location will be surveyed and tied into the existing Site survey data. The survey data is necessary to determine the overall direction of groundwater flow.

## 4.0 EQUIPMENT DECONTAMINATION

Prior to mobilization, the drill rig shall be thoroughly cleaned to remove oil, grease, mud, and other foreign matter. Subsequently, before initiating drilling at each boring location, samplers, drill steel, and associated equipment will be cleaned to prevent cross-contamination. All cleaning will be conducted at a predetermined on-site location. Cleaning will be accomplished using the procedures outlined in the following sections and in accordance with CHA SOP's.

### 4.1 Small Equipment

For all activities, dedicated sampling equipment is preferred. However, if non-dedicated equipment is used (i.e. Macrocore barrel), the required decontamination procedure for all manual sampling equipment used to collect samples for chemical analysis is provided in CHA SOP#501 and summarized below:

1. Disassemble equipment, as required.
2. Remove gross contamination from the equipment by brushing and then rinsing with tap water.
3. Wash with Alconox and tap water.
4. Rinse with tap water.
5. Rinse with distilled water.
6. Air dry equipment.

Decontaminated equipment will be placed on polyethylene sheeting in order to avoid contacting a contaminated surface prior to use.

Field personnel will use a new pair of outer gloves before handling sample equipment after it is cleaned.

### 4.2 Large Equipment

The permanent components of the drill rig (body, tracks, etc.) are not expected to come into contact with contaminated soils since the work will be performed primarily in an area covered by asphalt and, therefore, will not require decontamination.

Decontamination of the excavator bucket after test pit investigation around the suspected UST will be required. The temporary decontamination pad will be constructed with a minimum of two-layers of 10-mil polyethylene sheeting with raised berms and overspray guards around the perimeter to maintain wash fluids on the pad. Wash waters will be containerized with the investigation derived waste discussed in the following section.

## 5.0 INVESTIGATION DERIVED WASTE

Gloves, personal protection equipment, sampling materials, etc. will be collected daily and disposed of as solid waste. All work will be performed in accordance with CHA SOP#507. Soil cuttings from the monitoring well installation will be containerized for off-site disposal as investigation derived waste (IDW).

All soil removed from intrusive activities and all purged water from groundwater sampling and decontamination, will be containerized in 55-gallon drums to be characterized and disposed of at the applicable permitted disposal facilities.

Samples for waste characterization purposes will be collected from both soil and groundwater. One composite soil sample from the drummed soil and one groundwater sample from the drummed water will be collected for a select set of parameters, further described in Table 2 of the RIWP.

# APPENDIX A

CHA Standard Operating Procedures

Author: Chris Burns
Reviewer: Seth Fowler, Sandy Warner

# PRE-FIELD ACTIVITY PLANNING AND POST-FIELD ACTIVITY FOLLOW-UP

A. PURPOSE/SCOPE:

To adequately prepare for conduct field activities and to follow-up after the field work is complete. This SOP generally applies to all field activities and provides a summary of activities to complete both prior to going into and after returning from the field.

B. EQUIPMENT/MATERIALS:

As required for each field task. See individual SOPs.

C. PROCEDURE:

Pre-Field Activity Planning:

1. Contact property owner/client and obtain authorization to access site, if not already completed by PM.
2. Inquire about field conditions at the Site (access, terrain, overhead clearance, facilities/utilities available, etc.).
3. Consider weather conditions for proper dress and equipment.
4. Consider potential chemical, biological or physical hazards and either prepare, or review the Health and Safety Plan.
5. Review the Project Work Plan (or Pre-sampling Worksheet). Confirm project budget and schedule with PM.
6. If drilling or excavating, verify that CHA and/or our subcontracts have contacted dig-safe (or similar) for marking out public utilities and the property owner for location of private utilities.
7. Complete appropriate checklist for field tasks to ensure all necessary equipment and supplies are available.
8. Schedule the pickup of rental equipment and sample containers from laboratories as necessary.
9. Develop sample naming conventions in advance if samples will be collected. Coordinate with laboratory to get samples containers pre-labeled whenever possible.
10. Review bottle kits sent by laboratory for accuracy and to ensure nothing was broken in shipment (if applicable).
11. Calibrate all equipment per manufacturer's specifications and document calibration is complete.

Post-Field Activity Follow-Up:

1. Review all forms/paperwork to make sure they are properly filled out. If electronic data tablets were used, download data and review.
2. Decontaminate all equipment that is reusable.
3. Restore site to original condition unless other arrangements have been made.
4. Secure site.

**PRE-FIELD ACTIVITY PLANNING AND POST-FIELD ACTIVITY FOLLOW-UP**

5. Deliver samples (if applicable) to laboratory or courier following chain-of-custody protocols.
6. Return any field equipment utilized for field work.
7. Arrange for disposal of sampling residuals (e.g., PPE, purge water, soil cuttings, etc.).
8. Contact the PM with any unusual information about field activity.
9. Upon returning to the office, scanned forms and electronic data shall be stored in the "Data" folder under the appropriate project number.

D. QA/QC REQUIREMENTS:

Not Applicable

E. SPECIAL CONDITIONS:

Not Applicable

F. REFERENCES:

None

G. APPENDICES/FORMS:

Not Applicable

**END OF SOP**
Final Check by C. Burns 10/2/15

Author: Chris Burns
Reviewer: Seth Fowler
Sandy Warner

# FIELD LOGBOOK AND PHOTOGRAPHS

A. PURPOSE/SCOPE:

To produce an accurate and reliable record of all field activities, including field observations, sample collection activities, etc.

All pertinent field survey and sampling information shall be recorded in a logbook or on field logs during each day of the field effort.

In addition to keeping logs, photographs will be taken to provide a physical record to augment the field worker's written observations. They can be valuable to the field team during future inspections, informal meetings, and hearings. Photographs should be taken with a camera-lens system having a perspective similar to that afforded by the naked eye. A photograph must be documented if it is to be a valid representation of an existing situation.

B. EQUIPMENT/MATERIALS:

- Bound Field Book (with waterproof paper) or Field Logs
- Chain-of-Custody, Other Appropriate Forms
- Indelible Ink Pens
- Digital Camera with 50 mm lens or similar.

C. PROCEDURE:

1. At a minimum, entries in a logbook shall include:
   a. Date and time of starting work
   b. Names of all personnel at site
   c. Summary of key conversations with contractors, agency representatives, etc.
   d. Purpose of proposed work effort
   e. Sampling equipment to be used
   f. Field calibration of equipment or documentation of calibration of rented equipment
   g. Description of work area
   h. Location of work area, including map reference. Document sample locations with references to fixed landmarks (e.g., 10 feet from southwest corner of building).
   i. Details of work effort, particularly any deviation from the field operations plan or standard operating procedures
   j. Field observations and field measurements (e.g., pH)
   k. Field laboratory analytical results
   l. Personnel and equipment decontamination procedures
   m. Daily health and safety entries, including levels of protection
   n. Type and number of samples

**FIELD LOGBOOK AND PHOTOGRAPHS**

o. Sampling method, particularly deviations from the standard operating procedures

p. Sample location and number

q. Sample handling, packaging, labeling, and shipping information (including destination)

r. Time of leaving site.

For each photograph taken, several items shall be recorded in the field logbooks:

a. Date and time – Camera set to record on photo

b. Name of photographer

c. General direction faced and description of the subject

d. Sequential number of the photograph

e. Always attempt to include an object in the photograph that helps show scale

f. Always try to shoot at approximately 50mm focal length (what human eye sees).

2. Each day's entries will be initialed and dated at the end by the author, and a line will be drawn through the remainder of the page.

D. QA/QC REQUIREMENTS:

All entries in the logbook shall be made in indelible ink. All corrections shall consist of single line-out deletions that are initialed.

The field task leader shall be responsible for ensuring that sufficient detail is recorded in the logbooks, and shall review the site logbooks daily.

E. SPECIAL CONDITIONS:

Photographs should be downloaded from the camera to the project folder and notes regarding the photographs should accompany the photos. Photographs should be no larger than 2 MB each unless they are being utilized for presentation purposes. CHA has software available to decrease file sizes if necessary.

As noted above, if a bound logbook is not used, then a field observation form must be used and information above should be captured on the form.

F. REFERENCES:

None

G. APPENDICES/FORMS:

Not Applicable

**END OF SOP**

Final Check by C. Burns 10/2/15

**Author: Sarah Benson**
**Reviewer(s): Keith Cowan**
**Sandy Warner**

# SAMPLE NAMING AND NUMBERING

A. PURPOSE/SCOPE:

The success of large environmental programs is greatly affected by the efficiency of data management and analysis. When performing environmental sampling, one of the most critical steps is appropriately naming or numbering samples so that they are uniquely identified and can be distinguished from all other samples by all future users.

Some of the potential benefits that can be obtained by adopting a naming convention include the following:

a. To ensure that every sample collected at a site has a unique identifier

b. To enhance clarity in cases of potential ambiguity

c. To help avoid "naming collisions" that might occur when the data is imported into our Equis or other databases; and

d. To provide meaningful data to be used in project handovers.

Note that many of our sampling programs are performed at sites with previously established sample locations and in these cases, we would not change sample names. Additionally, this process shall be applied at larger, more complex sites, and/or sites that are required to follow a site- specific QAAP. Simpler naming conventions may be implemented for small, simple sites.

B. EQUIPMENT/MATERIALS:

- Field Logbook
- Field Sample Login Sheet
- Site Map/ Work Plan
- Sampling Forms
- Chain-of-Custody
- Sample Containers with Labels

C. PROCEDURE:

1. Each sample shall be uniquely defined by a multi-field name. In general, three fields are required: [Project # or Name] – [Media Type] – [Location Name/Sequential Number].

2. If using a site name, abbreviate to 2-3 letters. (e.g., Congress St site would be “CS”).

3. Use the following abbreviations for media types:

Subsurface Soil ...................................... SOIL
Surface Soil............................................ SURF
Sediment ................................................ SED
Groundwater .......................................... GW
Surface Water ........................................ SW
Waste Water........................................... WW
Soil Vapor .............................................. SV
Storm Water........................................... STORM

## SAMPLE NAMING AND NUMBERING

4. All samples collected at a site shall be numbered sequentially for each media type, regardless of the field event or project phase. The use of hyphens to separate segments of a sample name is beneficial for sample name readability. It is also beneficial to use enough leading zeros to accommodate the Sequential Number (or sys_loc_code) portion of the sample name, which will assist in sorting sample IDs in the data management program or database (see EQUIS discussion below).
5. Do not include information such as time, sample depths, etc. in the name. This information should be recorded as defined in Section F (below).
6. In no cases shall the multi-field name be longer than 30 characters, including dashes. Ensure that each name is clearly written on both the sample label as well as the Chain of Custody.
7. Do not use special characters (e.g. #, ‘, “, @, !) when naming samples. Including such characters in the Serial Number (sys_loc_codes) or Sample Number (sys_sample_codes) can be incompatible with the database.
8. For QA/QC blank samples use the following abbreviations in place of the media type:

   Trip Blank............................................TB
   Equipment Rinse (Field Blank) .............FB
   Duplicate..............................................DUP
   Matrix Spike .........................................MS
   Matrix Spike Duplicate..........................SD

   For Duplicate and MS/MSD samples we need to make sure we include the parent sample name. Add the DUP, MS or MSD indicator after the Sequential Number.

   For Blind Duplicate samples, use the CHA indicator in place of the Sequential Number. The location should be recorded in the field logs for our evaluation purposes. For example, a blind duplicate sample number for soil collected at the 005 location would be “CS-SOIL-CHA-1.”

   You would record in the field log that the blind soil duplicate CHA-1 has SOIL-12345-005 as its parent sample.

9. <u>Option to Include the Sample Collection Date</u> - As an option, the date may be included in the sample name. NYS Electronic Data Deliverable guidance suggests using dates in the YYYYDDMM format. Placing the year first provides for ease of sorting data in the database:

   However, adding the date adds 9 characters to the sample name thus increasing the complexity of sample numbering. The date is captured on the Chain-of-Custody and in field records.

D. <u>QA/QC REQUIREMENTS:</u>

All data must be documented on field data sheets or within site logbooks.

Field personnel should verify that all sample data and supporting information in log books is correct prior to leaving the site.

Author: Sarah Benson
Reviewer(s): Keith Cowan
Sandy Warner

# SAMPLE NAMING AND NUMBERING

## E. SPECIAL CONDITIONS:

NYSDEC EQUIS Considerations:

NYSDEC uses EQuIS for data management and generally requires data to be submitted in EQuIS format. EQuIS has three different sample name related fields, a sample_name, a sys_sample_code and a location_name. Location_name will almost always be simplified to something like SW-1, GW-2 etc. and is usually the last field of the sample name.

In terms of the other two, sample_name is what we record in the field. That is limited to 30 characters of text.

The laboratory generates the sys_sample_code by taking the sample_name field and adding another qualifier, such as the sample delivery group or work order number. EQuIS requires that the sys_sample_code field be unique within a database. This is limited to 40 characters of text so it typically will be the sample name plus up to 10 characters.

It is recommended to keep the CHA sample name as short as possible to work with the EQuIS format. The basic sample names identified above are 14 to 17 characters long. If the optional date format is used, sample names will be 23 to 26 characters which is near the limit for what EQuIS can accommodate (and you may have issues physically fitting the sample names legibly into the COC form).

## F. REFERENCES:

NYSDEC, DER-10, Technical Guidance for Site Investigation and Remediation, May 2010, http://www.dec.ny.gov/docs/remediation_hudson_pdf/der10.pdf

NYSDEC, Electronic Data Delivery Manual, January 2013, http://www.dec.ny.gov/docs/remediation_hudson_pdf/eddmanual.pdf

New Jersey Department of Environmental Protection, August 2005, Field Sampling Procedures Manual, Chap. 6, http://www.nj.gov/dep/srp/guidance/fspm/

## G. APPENDICES/FORMS:

Not Applicable

**END OF SOP**

Final Check by C. Burns 12/2/15

**Author: Sarah Newell, Mark Corey**
**Reviewer: Keith Cowan, Sandy Warner**

# COMPLETING A CHAIN-OF-CUSTODY RECORD

A. PURPOSE/SCOPE:

This protocol provides a standard operating procedure (SOP) for initiating and maintaining a Chain of Custody (COC) document. A COC is a legal document designed to track persons who are responsible for the preparation of the sample container, sample collection, sample delivery, sample storage, and sample analysis. A COC is an appropriate format to record important data associated with each individual sample. In general, a sample requiring a COC will follow a path as follows:

Sample Collector → Sample Courier/Operator → Sample Custodian

Verification of who has possessed the samples and data and where the samples have been is completed when staff follow chain-of-custody procedures.

B. EQUIPMENT/MATERIALS:

- Chain of Custody form
- Ball-point, permanent pens
- Gallon-Sized Ziploc Bag (to keep COC dry)
- Field Logbook
- Custody seals
- Padlock(s) (optional)

C. PROCEDURE:

1. Once a sample has been determined to require a COC, the Sample Collector must initiate the COC. The Sample Collector must fill in the fields provided on the COC. The words "Chain of Custody" must be located in a conspicuous location at the top of the document.
2. The form is generally a three-page carbon copy document, including a white, yellow and pink sheet. While CHA generally uses COCs provided by the applicable laboratory, it is important to ensure that the COC from each lab contains places for all necessary information.
3. The COC at that time should include the fourteen-digit CHA project number and phase, the project name and location.
4. The Client Information Section must be completed. In most cases the "client" will be CHA Consulting, Inc.
5. The first field of information is the Sample Identification or Sample Identification Number. This identification/number must match the identification/number located on the sample container.
6. An information line for the date, time, phone number, printed name of Sample Collector, signature of Sample Collector, organization name (no acronyms), organization's full mailing address, and sample description must also be included.
7. Sampling personnel should enter the sample number(s) (which should correspond with a unique number on a sample container [SOP #103] if applicable, and parameters to be analyzed. The "Sample ID" must be included and must match the number on the sample.

# COMPLETING A CHAIN-OF-CUSTODY RECORD

8. Subsequent fields must be provided to allow for documentation of information about any subsequent Sample Couriers/Operators or Sample Custodians. These fields must contain the date, time, phone number, printed name of person taking custody of sample, signature of person taking custody of sample and organization name (no acronyms).
9. Field Information - The COC must contain places to enter the following field information: sample number, sampling date, and type of sample. Other field information may be recorded as specified in the field sampling plan or proposal for the project. It is imperative that there be only one sample with a particular sample number per project/study so as to prevent duplicates in Excel files and EQuIS databases.
10. Laboratory Information - Once the sample is delivered to the lab, the laboratory personnel will sign and date the "received by" line located at the bottom of the COC. Other laboratory information may be recorded as specified in the project/study work plan/proposal.
11. Signatures - The COC must contain places for all people who handle the sample to sign his/her name. This is a record of persons who had custody of the sample during all steps of the process from container preparation, sample collection, sample storage and transport, and sample analysis. There should be signature lines to relinquish custody of the sample and to receive custody of the sample.

## D. QA/QC REQUIREMENTS:

The Field Team Leader or senior person on the sampling team will review the completed COC form to verify that all fields are properly completed. For purposes of this SOP, signing the form under Collected/Delivered by is considered evidence that the COC form has been checked for accuracy and completeness.

## E. SPECIAL CONDITIONS:

Whenever samples are split with a source or government agency, a separate chain of custody form should be completed for the samples and the relinquisher (sampler) and recipient should sign. If a representative is unavailable or refuses to sign for the samples, this can be noted in the "remarks" area of the form. When appropriate, as in the case where the representative is unavailable, the custody record should contain a statement that the samples were delivered to the designated location at the designated time. A copy of the chain of custody form for split samples must be kept with the project file.

Samples may require short term storage in field locations prior to delivery to the laboratory for analyses. The storage may be in vehicles or lodging locations. The samples must be secured to limit access to them. A locked vehicle is considered controlled access. However, simply a locked lodging room is not secure due to potential custodial access. If an unattended lodging room is used for sample storage, the samples must be further secured. This may entail a padlock on the ice chest, samples in an ice chest secured in an inner bag with a custody seal on it, and/or ice chest taped shut with custody seal on the outside of it.

## F. REFERENCES:

Sampling Guidelines and Protocols, NYSDEC, http://www.dec.ny.gov/regulations/2636.html
Chain of Custody Protocol is in Appendix 5X.2.

Author: Sarah Newell, Mark Corey
Reviewer: Keith Cowan, Sandy Warner

# COMPLETING A CHAIN-OF-CUSTODY RECORD

Chain of Custody Procedures for Samples and Data, EPA 50 minute Self Instructional Course:
http://www.epa.gov/apti/coc/

SOP for Chain of Custody, EPA Region 1:
http://www.epa.gov/region6/qa/qadevtools/mod5_sops/misc_docs/r1_chain-of-custody.pdf

G. APPENDICES/FORMS:

CHA COC Form

**END OF SOP**

Final Check by C. Burns 10/7/15

Author: Sarah Newell
Reviewer: Charlie Symmes

# FIELD DESCRIPTION OF SOILS

## A. PURPOSE/SCOPE:

This objective of this SOP is to establish a consistent method for field staff to follow when completing the description of soil samples and entry onto borehole logs. Consistency with description is important because many employees are involved in logging soils, frequently within the same project. Uniformity is critical to allowing meaningful subsurface interpretations using data generated from multiple sources.

This procedure will be used during all field activities when borehole subsurface drilling or surface soil sampling is occurring. These activities should be documented as described herein.

## B. EQUIPMENT/MATERIALS:

Some or all of the following equipment is may be required for completing the procedures outlined in this SOP:

- Hand lens
- Field notebook and borehole log forms
- Pencils
- Stiff scraper
- Standard grain size examples
- Squirt bottle with water
- Small clear containers with lids

## C. PROCEDURE:

1. CHA utilizes a combination of the USCS and Modified Burmister methods of soil descriptions.
2. The Unified Soil Classification System (USCS) is the most widely used engineering/geotechnical soil classification method. The USCS is based on engineering properties of soil which are effected by grain size, water content, grain size distribution, and compaction. This system is often used for classifying soils encountered in boreholes, test pits, and at the surface. The following properties form the basis of USCS soil classification:
   - Percentage of gravel, sand, and fines;
   - Shape of the grain size distribution curve; and
   - Plasticity and compressibility characteristics.
3. The Modified Burmister Method is used for the verbal description of soil samples. The Modified Burmister classification system is based on grain size and plasticity, but differs from the Unified Soil Classification System in that it includes nomenclature to describe the soil's texture, color, mineralogy, and geological origin.
4. The following step by step procedure will be used for the field classification of soils encountered during subsurface activities (i.e. borehole drilling, trenching, etc.). References to aid in the development of a soil description are included in Appendix A and Appendix B.

A complete soil description should contain the following information in the order indicated.

## FIELD DESCRIPTION OF SOILS

- Major grain size component
- Minor grain size component(s) with modifier
- Gradation or Plasticity
- Color
- Soil Moisture
- Density/Consistency
- Soil Structure or Mineralogy (if necessary)
- Evidence of Contamination (odor, staining, etc.)
- USCS symbol

a. Grain Size: There are five major grain sizes: Boulders, Cobbles, Gravel, Sand, and Silt/Clay.

- Boulders are > 8"
- Cobbles are 3" to 8"
- Gravels range in size from 0.2" to 3.0" in diameter and are subdivided into Fine gravel (>0.2" to 0.75") in diameter and Coarse gravel (>0.75" to 3.0")
- Sands range in size from 0.002" to 0.2" and are subdivided into coarse, medium and fine. Standard comparison cards are available for field use.
- Silt and clay are difficult to distinguish in the field. An attempt is made, however, to describe the soil as one of the six following classifications: silt, clayey silt, silt and clay, clay and silt, silty clay, or clay. The field description may be later verified in a lab hydrometer test if required by the project. For field descriptions of silts and clays, the following guidelines should be used:

SILT: --------------------gritty, no threads can be rolled
Clayey SILT:-----------rough to smooth, difficult to roll threads
SILT and CLAY:------rough to smooth, difficult to roll threads
CLAY and SILT:------smooth and dull, threads can be rolled readily
Silty CLAY:------------smooth and shiny, threads can be rolled very readily
CLAY: ------------------very shiny and waxy, threads can be rolled very easily

Grain size descriptions are written with the major grain size component listed first. In order to be considered a major grain size component, the component must constitute greater than 50% of the sample. Major grain size components are written in all capital letters and are underlined. If no grain size component constitutes greater than 50% of the sample, the sample is classified by describing the distribution of the sand component of the sample first (ex. f.m. Sand). Then, the other grain size components are described and the appropriate percentage modifier (see below) is assigned. The reader can then determine the percentage of sand in the sample by subtracting the sum of the modifier percentages from 100%. An example is shown below.

Other grain size components, if present, are listed in order of decreasing percentage.

**FIELD DESCRIPTION OF SOILS**

The following modifiers are used to indicate the relative proportion of a minor grain size component in the soil:

Estimated amount: Modifier

- < 10 percent: ...................... Trace
- 10 percent to 20 percent: .... Little
- 20 percent to 35 percent: .... Some
- 35 percent to 50 percent: .... And

Minor grain size components assigned a trace or little modifier are written in lower case letters.

Minor grain size components assigned a “some” or “and” modifier are written with the first letter of the grain size capitalized (ex. f. Sand). When multiple minor grain size components are described with the same modifier, finer grain sizes precede coarser grain sizes.

b. Gradation or Plasticity. Granular soils (i.e., sands or gravels) should be described as well-graded, poorly-graded, uniform, or gap-graded, depending on the gradation of the minus 3-inch fraction. Cohesive soils (i.e., silts and clays) should be described as nonplastic, slightly plastic, moderately plastic, or highly plastic, depending on results of the manual evaluation for plasticity.

c. Color: Common colors and their abbreviations are listed below.

- Orange: ----Or
- Tan: --------Tan
- Black: ------Blk
- Brown: -----Br
- Grey: -------Gr
- Red: --------Red

d. Moisture Content: The moisture content is determined in the field and is described using the following terms:

- Dry: -------------(dab finger in soil, no moisture on finger)
- Moist: -----------(dab finger in soil, moisture on finger)
- Wet:--------------(water visible)
- Saturated: ------(all pore spaces filled)

## FIELD DESCRIPTION OF SOILS

e. Density/Consistency: The density or consistency of the soils is classified according to the "N" value of the soil. The "N" value is the sum of the middle two blow counts determined during a standard penetration test (SOP #303). The following classifications are used:

**Table 1**
**Standard Penetration Test for Soil Density**

| N-Blows/Feet | Relative Density |
|---|---|
| **Cohesionless Soils** | |
| 0 - 4 | Very loose |
| 5 - 10 | Loose |
| 11 - 30 | Medium |
| 31 - 50 | Dense |
| >50 | Very dense |
| **Cohesive Soils** | |
| 0 - 2 | Very soft |
| 3 - 4 | Soft |
| 5 - 8 | Medium |
| 9 - 15 | Stiff |
| 16 - 30 | Very stiff |
| >30 | Hard |

f. Odor (if present): Odor is described from a warm, moist sample. The odor should only be described it is organic or unusual. An organic odor will have distinctive decaying vegetation smell. Unusual odors such as petroleum product, chemical, etc. should be described appropriately.

g. Soil Texture and Structure (if present): Description of particle size distribution, arrangement of particles into aggregates, and their structure. This description includes joints, fissures, slicked sides, mottling, bedding, veins, root holes, debris, organic content, and residual or relict structure (laminations, etc.), as well as other characteristics that may influence the movement or retention of water or contaminants.

h. USCS symbol: A USCS symbol is assigned to each symbol. The USCS recognizes 15 soil groups and uses names and letter symbols to distinguish between these groups.

The coarse grained soils are subdivided into gravels (G) and sands (S). Both the gravel and sand groups are divided into four secondary groups. Fine grained soils are subdivided into silts (M) and clays (C).

**FIELD DESCRIPTION OF SOILS**

Soils are also classified according to their plasticity and grading. Plastic soils are able to change shape under the influence of applied stress and to retain the shape once the stress is removed. Soils are referred to either low (L) or high (H) plasticity. The grading of a soil sample refers to the particle size distribution of the sample. A well graded (W) sand or gravel has a wide range of particle sizes and substantial amounts of particles sized between the coarsest and finest grains. A poorly graded (P) sand or gravel consists predominately of one size or has a wide range of sizes with some intermediate sizes missing.

Soils which have characteristics of two groups are given boundary classifications using the names that most nearly describe the soil. The two groups are separated by a slash. The same is true when a soil could be well or poorly graded. Again the two groups are separated by a slash.

| **First and/or second letters** | |
|---|---|
| **Symbol** | **Definition** |
| G | gravel |
| S | sand |
| M | silt |
| C | clay |
| O | organic |

| **Second letter** | |
|---|---|
| **Letter** | **Definition** |
| P | poorly graded (uniform particle sizes) |
| W | well graded (diversified particle sizes) |
| H | high plasticity |
| L | low plasticity |

<u>Example</u>:

A. Sample with Major Component:

**<u>f. SAND</u>**, Some Silt, little m.c. sand and f. gravel, trace c. gravel, brown, wet, m. compact, petroleum odor (SM)

B. Sample with No Major Component:
f.m.c. Sand, Some Silt and f. Gravel, brown, moist, v. compact, no evidence of contamination (SM)
*(In this sample, the describer classified the sample as containing 30% silt and 30% f. gravel. The percentage of sand would then be determined as: 100%-30%-30%=40%).*

D. <u>QA/QC REQUIREMENTS:</u>

Not Applicable

E. <u>SPECIAL CONDITIONS:</u>

Not Applicable

**FIELD DESCRIPTION OF SOILS**

F. REFERENCES:

Burmister, D.M., Suggested Methods of Test for Identification of Soils.

The Unified Soil Classification System (USCS).

Classification of Soils for Engineering Purposes: Annual Book of ASTM Standards, D 2487-83, 04.08, American Society for Testing and Materials, 1985.

G. APPENDICES/FORMS:

ASTM Criteria for Describing Soils
CHA Legend to Subsurface Logs
CHA Test Boring Log

**END OF SOP**
Final Check by C. Burns 10/07/15

## ASTM CRITERIA FOR DESCRIBING SOIL

### Criteria for Describing Angularity of Coarse-Grained Particles

| Description | Criteria |
|---|---|
| Angular | Particles have sharp edges and relatively plane side with unpolished surfaces |
| Subangular | Particles are similar to angular description but have rounded edges |
| Subrounded | Particles have nearly plane sides but have well-rounded corners and edges |
| Rounded | Particles have smoothly curved side and no edges |

### Criteria for Describing Dilatancy

| 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. |

### Criteria for Describing Toughness

| Description | Criteria |
|---|---|
| Low | Only slight pressure is required to roll the thread near the plastic limit . The thread and the lump are weak and soft. |
| Medium | Medium pressure is required to roll the thread to near plastic limit. The thread and the lump have medium stiffness. |
| High | Considerable pressure is required to roll the thread to near the plastic limit. The thread and the lump have very high stiffness. |

### Criteria for Describing Dry Strength

| Description | Criteria |
|---|---|
| None | The dry specimen crumbles into powder with mere pressure of handling |
| Low | The dry specimen crumbles into powder with some finger pressure |
| Medium | The dry specimen breaks into pieces or crumbles with considerable finger pressure |
| High | The dry specimen cannot be broken with finger pressure. Specimen will break into pieces between thumb and a hard surface. |
| Very High | The dry specimen cannot be broken between the thumb and shard surface |

### Criteria for Describing Structure

| Description | Criteria |
|---|---|
| Stratified | Alternating layers of varing material or color with layers at least 6 mm thick; note thickness. |
| Laminated | Alternating layers of varying materials or color with the layers less than 6 mm thick; note thickness. |
| Fissured | Breaks along definite planes of fracture with little resistance to fracturing. |
| Slickensided | Fracture planes appear polished or glossy, sometimes striated. |
| Blocky | Cohesive soil that can be broken down into small angular lumps which resist further breakdown. |
| Lensed | Inclusion of small pockets of different soils, such as small lenses of sand scattered through a mass of clay; note thickness. |
| Homogeneous | Same color and appearance throughout. |

## CRITERIA FOR DESCRIBING SOIL (Cont.)

### Criteria for Describing the Reaction with HCl

| Description | Criteria |
|---|---|
| None | No visible reaction |
| Weak | Some reaction, with bubbles forming slowly |
| Strong | Violent reaction, with bubbles forming immediately |

### Criteria for Describing Consistency

| Description | Criteria |
|---|---|
| Very Soft | Thumb will penetrate soil more than 1 inch (25 mm) |
| Soft | Thumb will penetrate soil about 1 inch (25 mm) |
| Firm | Thumb will indent soil about 1/4 inch (6 mm) |
| Hard | Thumb will not indent soil but readily indented with thumbnail |
| Very Hard | Thumbnail will not indent soil |

### Criteria for Describing Cementation

| Description | Criteria |
|---|---|
| Weak | Crumbles or breaks with handling or little finger pressure |
| Moderate | Crumbles or breaks with considerable finger pressure |
| Strong | Will not crumble or break with finger pressure |

### Criteria for Describing Particle Shape

The particle shape shall be described as follows where length, width, and thickness refer to greatest, intermediate, and least dimensions of a particle, respectively (see page 104 ).

| | |
|---|---|
| Flat | Particles with width/thickness ratio > 3 |
| Elongated | Particles with length/width ratio > 3 |
| Flat and Elongated | Particles meet criteria for both flat and elongated |

### Criteria for Describing Plasticity

| Description | Criteria |
|---|---|
| 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 rolled 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 rerolled several times after reaching the plastic limit. The lump can be formed without crumbling when drier than the plastic limit. |

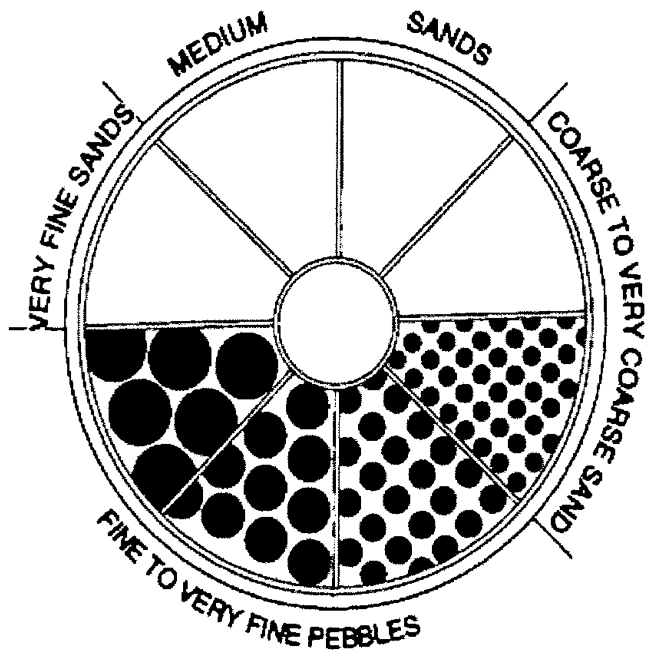
### Identification of Inorganic Fine-Grained Soils from Manual Tests

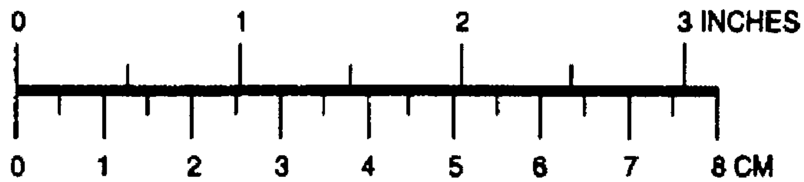
| Soil Symbol | Dry Strength | Dilatancy | Toughness |
|---|---|---|---|
| ML | None to low | Slow to rapid | Low or thread cannot be formed |
| CL | Medium to high | None to slow | Medium |
| MH | Low to medium | None to slow | Low to medium |
| CH | High to very high | None | High |

### Criteria for Describing Moisture Condition

| Description | Criteria |
|---|---|
| Dry | Absence of moisture, dusty, dry to the touch |
| Moist | Damp but no visible water |
| Wet | Visible free water, usually soil is below water table |

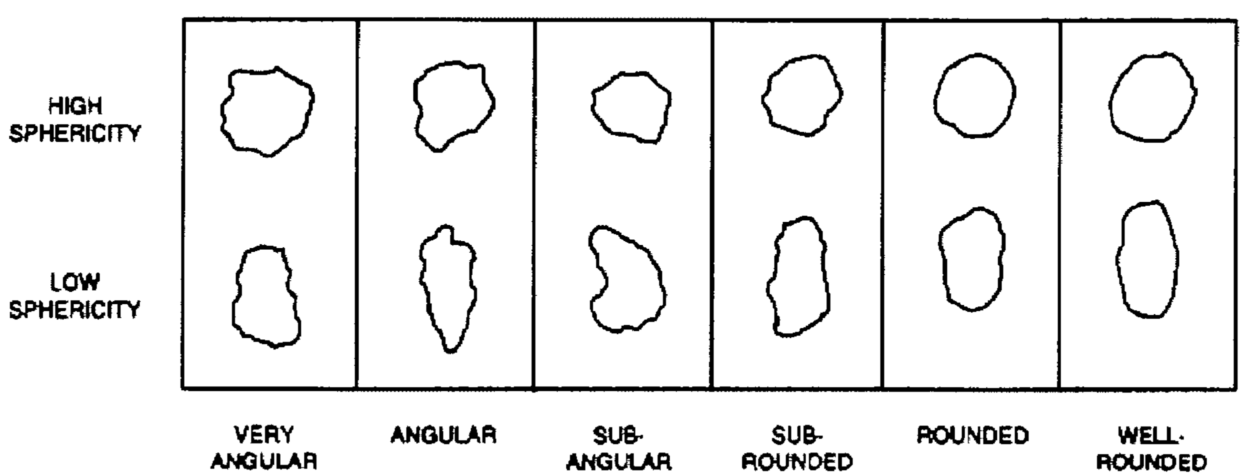
## GRAPH FOR DETERMINING SIZE OF SEDIMENTARY PARTICLES




COBBLES RANGE FROM 6.4 TO 25.6 cm (~2.5 TO 10.1 INCHES)
BOULDERS ARE LARGER THAN 25.6 cm (>10.1 INCHES)

## SEDIMENT PARTICLE SHAPES



# LEGEND TO SUBSURFACE LOGS



| SAMP./CORE NUMBER | SAMP. ADV(ft) LEN CORE(ft) | RECOVERY (ft) | Blows per 6" on Split Spoon Sampler | "N" VALUE or RQD% | SAMPLE | DEPTH (Feet) | GRAPHICS | DESCRIPTION AND CLASSIFICATION | ELEVATION (Feet) | Remarks on Character of Drilling, water return, etc | WATER LEVELS AND/OR WELL DATA |
|---|---|---|---|---|---|---|---|---|---|---|---|
| S1 | 2.0 | 1.8 | 2-3-4-5 | 7 | | | | f. SAND, Some Silt, trace f. gravel, brown, loose, moist (SM) | 100 | | |
| R1 | 2.0 | 2.0 | N/A | 88% | | | | Mica SCHIST, gray, soft, slightly weathered, closely fractured, good RQD | | | |
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 10 | 11 | 12 | 13 |

Subsurface Logs present material classifications, test data, and observations from subsurface investigations at the subject site as reported by the inspecting geologist or engineer. In some cases, the classifications may be made based on laboratory test data when available. It should be noted that the investigation procedures only recover a small portion of the subsurface materials at the site. Therefore, actual conditions between borings and sampled intervals may differ from those presented on the Subsurface Logs. The information presented on the logs provide a basis for an evaluation of the subsurface conditions and may indicate the need for additional exploration. Any evaluation of the conditions reported on the logs must be performed by Professional Engineers or Geologists.

1. SAMP./CORE NUMBER – Samples are numbered for identification on containers, laboratory reports or in text reports.

2. SAMP.ADV/LEN.CORE – Length of sampler advance or length of coring run measured in feet.

3. RECOVERY – Amount of sample actually recovered after withdrawing sampler or core barrel from bore hole measured in feet.

4. SAMPLE BLOWS/6" – Unless otherwise noted, blow counts represent values obtained by driving a 2.0" (O.D.), 1-3/8" (I.D.) split spoon sampler into the subsurface strata with a 140 pound weight falling 30" as per ASTM International D1586. After an initial penetration of 6" to seat the sampler into undisturbed material, the sampler is then driven an additional 2 or 3 six inch increments. Refusal is defined as a resistance greater than 50 blows per 6" of penetration.

5. "N" Value or RQD % – "N" VALUE – The sum of the second and third sample blow increments is generally termed the Standard Penetration Test (SPT) "N" value. Refusal (R) is defined as a resistance greater than 50 blows for 6 inches of penetration. CORE RQD – Core Rock Quality Designation, RQD, is defined as the summed length of all pieces of core equal to or longer than 4 inches divided by the total length of the coring run. Fresh, irregular breaks distinguishable as being caused by drilling or recovery operations are ignored and the pieces are counted as intact lengths. RQD values are valid only for cores obtained with NX size core barrels.

6. SAMPLE – Graphical presentation of sample type and advance or core run length. See Table 1.

7. DEPTH – Depth as measured from the ground surface in feet.

8. GRAPHICS – Graphical presentation of subsurface materials. See Table 4. Dual soil classification and rock graphics may vary and are not shown on Table 4.

9. DESCRIPTION AND CLASSIFICATION – SOIL – Recovered samples are visually classified in the field by the supervising geologist or engineer unless otherwise noted. Particle size and plasticity classification is based on field observations, and using the Unified Soil Classification System (USCS). See Table 4. USCS symbols are presented in parentheses following the soil description. Where necessary, dual symbols may be used for combinations of soil types. Relative proportions, by weight and/or plasticity, are described in general accordance with "Suggested Methods of Test for Identification of Soils" by D.M. Burmister, ASTM Special Publication 479, 6-1970. See Table 2. Soil density or consistency description is based on the penetration resistance. See Table 3. Soil moisture description is based on the observed wetness of the soil recovered being dry, moist, wet, or saturated. Water introduced into the boring during drilling may affect the moisture content of the materials. Other geologic terms may also be used to further describe the subsurface materials. ROCK – Rock core descriptions are based on the inspector's observations and may be examined and described in greater detail by the project engineer or geologist. Terms used in the description of rock core are presented in Table 5.

10. DIVISION LINES – Division lines between deposits are based on field observations and changes in recovered material. Solid lines depict contacts between two deposits of different geologic depositional environment of known elevation. Dashed lines represent estimated elevation of contacts between two deposits of different geologic depositional environment. Dotted lines depict transitions of deposits within the same depositional environment, such as grain size or density.

11. ELEVATION – Elevation of strata changes in feet.

12. REMARKS – Miscellaneous observations.

13. WATER LEVELS & WELL DATA – Hollow water level symbol, if present, represents level at which first saturated sample or water level was encountered. Solid water level symbol, if present, depicts the most probable static water elevation at the time of drilling or as measured in an installed observation well at a later date. Subsurface water conditions are influenced by factors such as precipitation, stratigraphic composition, and drilling/coring methods. Conditions at other times may differ from those described on the logs. For graphical presentation of observation/monitoring well construction, see Table 6. Elevations of changes in construction are noted at the bottom of each section.

# LEGEND TO SUBSURFACE LOGS



## TABLE 1
## TYPICAL SAMPLE TYPES

- SPLIT SPOON (1 3/8" I.D.)
- NX SIZE ROCK CORE
- SHELBY TUBE "UNDISTURBED"
- AUGER SAMPLE

## TABLE 2
## SAMPLE MATERIAL PROPORTIONS

| ADJECTIVE | PERCENTAGE OF SAMPLE |
|---|---|
| "and" | 35% – 50% |
| "some" | 20% – 35% |
| "little" | 10% – 20% |
| "trace" | < 10% |

Standard split spoon samples may not recover particles with any dimension larger than 1 3/8". Therefore, reported gravel percentages may not reflect actual conditions.

## TABLE 3
## DENSITY/CONSISTENCY

| GRANULAR SOILS | | COHESIVE SOILS | |
|---|---|---|---|
| Blows/ft. | Density | Blows/ft. | Consistency |
| < 5 | Very Loose | < 2 | Very Soft |
| 5–10 | Loose | 2–4 | Soft |
| 11–30 | Med. Compact | 5–8 | Med. Stiff |
| 31–50 | Compact | 9–15 | Stiff |
| > 50 | Very Compact | 16–30 | Very Stiff |
| | | > 30 | Hard |

## TABLE 4
## USCS CLASSIFICATION, PARTICLE SIZE, & GRAPHICS

| | MAJOR PARTICLE SIZE DIVISION | USCS SYMBOL | GRAPHIC SYMBOL | GENERAL DESCRIPTION |
|---|---|---|---|---|
| COARSE GRAINED SOILS | GRAVEL<br>Coarse: 3"–3/4"<br>Fine: 3/4"–#4<br>Classification based on > 50% being gravel | GW | | Well graded gravels, gravel & sand mix. |
| | | GP | | Poorly graded gravels, gravel & sand mix. |
| | | GM | | Gravel, sand and silt mix. |
| | | GC | | Gravel, sand and clay mix. |
| | SAND<br>Coarse: #4–#10<br>Med.: #10–#40<br>Fine: #40–#200<br>Classification based on > 50% being sand | SW | | Well graded sand, sand & gravel mix. |
| | | SP | | Poorly graded sand, sand & gravel mix. |
| | | SM | | Sand and silt mix. |
| | | SC | | Sand and clay mix. |
| FINE GRAINED SOILS | SILT & CLAY<br>Classification based on > 50% passing #200 sieve. | ML | | Inorganic silt, low plasticity. |
| | | CL | | Inorganic clay, low plasticity. |
| | | OL | | Organic silt/clay, low plasticity. |
| | | MH | | Inorganic silt, high plasticity. |
| | | CH | | Inorganic clay, high plasticity. |
| | | OH | | Organic silt/clay, high plasticity. |
| | ORGANIC SOILS | Pt | | Peat and other highly organic soils. |
| | FILL | Fill | | Miscellaneous fill materials. |

## TABLE 5
## ROCK CLASSIFICATION TERMS

HARDNESS:

| | |
|---|---|
| Very Soft | Carves |
| Soft | Grooves with knife |
| Med. Hard | Scratched easily with knife |
| Hard | Scatched with difficulty |
| Very Hard | Cannot be scratched with knife |

WEATHERING:

| | |
|---|---|
| Fresh | Slight or no staining of fractures, little or no discoloration, few fractures. |
| Slightly | Fractures stained, discoloration may extend into rock 1", some soil in fractures. |
| Moderately | Significant portions of rock stained and discolored, soil in fractures, loss of strength. |
| Highly | Entire rock discolored and dull except quartz grains, severe loss of strength. |
| Complete | Weathered to a residual soil. |

| BEDDING: | | FRACTURE SPACING: | | RQD: | |
|---|---|---|---|---|---|
| Massive | > 40" | Massive/V. Wide | > 6' | Excellent | > 90% |
| Thick | 12' – 40" | Thick/Wide | 2' – 6' | Good | 76% – 90% |
| Medium | 4" – 12" | Med./Med. | 8" – 24" | Fair | 51% – 75% |
| Thin | < 4" | Thin/Close | 2 1/2" – 8" | Poor | 25% – 50% |
| | | V. Thin/V. Close | < 2 1/2" | V. Poor | < 25% |

## TABLE 6
## WELL CONSTRUCTION

- SOLID PVC PIPE
- SCREENED PVC PIPE
- STAINLESS STEEL SCREENED PIPE
- FINE GRAINED WASHED SAND
- WASHED SAND
- BENTONITE PLUG
- AIR ENTRAINED CEMENT
- NATURAL SOIL/ ROCK FILL
- BENTONITE/ CEMENT GROUT

**Authors: Sarah Newell and Mark Corey**
**Reviewer: Keith Cowan**

# BOREHOLE INSTALLATION AND SAMPLING

A. PURPOSE/SCOPE:

The following SOP presents a description of the methods generally employed for the installation of boreholes and the collection of subsurface soil samples. Boreholes are typically advanced to define geologic conditions; allow the installation of monitoring wells and piezometers; and allow the collection of subsurface soil samples (generally above the water table) for chemical analysis. Although several manual methods are available for the collection of subsurface soils samples (e.g. hand augers, post-hole augers [see SOP #305 and SOP #307]), the most common method used by CHA to advance boreholes is a drill rig equipped with hollow-stem augers (HSA) or direct-push technology (DPT). Representative samples are most often collected utilizing split-spoon samplers or Macrocore technology.

The purpose of drilling test borings is typically to characterize the lateral and vertical extent of contamination in the unsaturated zone. The test borings may also be used to allow the installation of ground water monitoring wells. Test borings may also be used to determine the subsurface characteristics for the purpose of geotechnical investigations.

B. EQUIPMENT/MATERIALS:

Drilling will be performed by a licensed drilling firm under the direction of CHA staff. The drilling field crew will consist of a driller, a driller's assistant, and a CHA field geologist/engineer. The field geologist/engineer will supervise drilling operations and conduct the geologic logging of the boreholes. A list of typical equipment needed for installation of monitoring wells at the site is summarized in the table included in SOP #309.

C. PROCEDURE:

1. Subcontractor Responsible for Utility Clearance - Subcontractor shall take all reasonable precautions, including contacting the appropriate utility organizations (USPFO, Dig Safe, etc.), in order to verify there are no buried utilities at the test boring and test pit locations.
2. The drilling rig and sampling equipment may be required to be decontaminated by steam-cleaning (high pressure, hot water) prior to drilling and in between borings, depending on the job requirements
3. The borings will be drilled with direct push technology (DPT), hollow-stem augers, flush joint casing, open hole or any combination depending on the type of information needed, geologic conditions, and other limitations that may be imposed due to contamination or state or federal guidelines. The boring shall be advanced to match the sampling interval (continuous or standard sampling).
4. Drilling progress and information about the formations encountered shall be recorded by the geologist on the field boring log. The information should include total depth drilled, depths and thickness of strata, problems with borehole advancement, fill materials encountered, and water levels.

## BOREHOLE INSTALLATION AND SAMPLING

Hollow Stem Auger/Flush Joint Driven Casing

a. At the chosen depth interval, drive a clean, standard, 24-inch long, 2-inch O.D. split-spoon sampler into the soil a distance of 24 inches using a 140 lb hammer, free falling 30 inches. Record the number of blows required to drive the sampler every 6 inches on the field boring log. Discontinue driving the sampler if 100 blows have been applied and the sampler has not been driven 6 inches. If 6 inches of penetration has been achieved, discontinue driving the sampler after 50 blows has failed to penetrate fully any of the remaining 6 inch intervals. The first six inches seats the spoon, the next 12 inches represents the Standard Penetration Resistance, and the last six inches is driven to insure sample recovery.

b. Retrieve the sampler from the borehole and place it on a clean, flat surface. Open the sampler and immediately scan the sample with an air monitoring instrument (e.g., HNu or OVA) if appropriate to the purpose of the investigation. Record instrument readings on the field boring log.

Direct Push Technology

a. The DPT is hydraulically powered and mounted in a customized four-wheel drive vehicle. Position the base of the sampling device on the ground over the sampling location and hydraulically raise the vehicle on the base. As the weight of the vehicle is transferred to the probe, the probe is pushed into the ground.

b. Soil samples will be collected with a Macrocore (or equivalent). The sample tube is pushed and/or vibrated to a specified depth. The interior plug of the sample tube is then removed by inserting small-diameter threaded rods. Drive the sample tube an additional foot to collect the soil sample. Withdraw the probe sections and sample tube.

Shelby Tube Sampling

a. Further, describe and record the following properties of the sample: Sample length recovered, presence of any slough in sampler, basic soil type (e.g., sand, gravel, clay), structure, texture, sorting, grain size, grain shape, degree of saturation, competency, color, odor, staining, and presence of foreign material(s). Refer to SOP#301, Field Description of Soils.

b. After the soil within the sampler has been described, it will be placed in sealed sample jars directly from the sampling device.

c. If appropriate to the investigation, the air space surrounding the borehole shall be scanned with a FID or PID and Explosimeter during all drilling activities to determine the presence or absence of volatile organic compounds. Results of this air monitoring shall be recorded on the Geologic Field Log. Activities shall proceed according to the site HSP if the presence of volatile organic compounds is indicated.

5. Upon completion of the test boring, all drill cuttings shall either be placed back in the borehole or will be drummed based on potential contaminants encountered.

6. Note the locations of the borings on a site map and/or mark the locations of the boreholes with a labeled wooden stake.

# BOREHOLE INSTALLATION AND SAMPLING

D. QA/QC REQUIREMENTS:

Follow QA/QC requirements for field documentation.

E. SPECIAL CONDITIONS:

1. Drilling Subcontract - The Field Team Leader must be familiar with the scope, fee, schedule, and all the terms and conditions of the drilling subcontract. When contractual issues or questions arise during the fieldwork, the Field Team Leader should communicate with the Project Manager and with the owner/client as appropriate.
2. Abandoned Borehole - If the contractor is not able to finish the drilling or has to abandon the borehole due to loss of tools, accidents or any unforeseeable circumstances, the contractor should remove the casings or drive pipes already in the hole and refill it with native soil cuttings, sand, grout, or as approved by the Engineer. All materials extracted from the hole, after refilling it will be managed as investigation derived material and will be disposed of accordingly. Typically, another borehole will be attempted in the area of the initial borehole attempt.
3. Subcontractor/Driller Standby Time - Document any conditions that may result in driller/subcontractor standby time. Such conditions may include adverse weather conditions, lack of access to the property, utilities not marked out, etc. Standby time may result in additional costs from our subcontractor that may not be planned for or approved. Communicate any conditions that may result in standby time to the CHA Project Manager as soon as possible.

F. REFERENCES:

ASTM Standard D 1586

Drilling Subcontract Scope, Schedule, Fee, Terms, and Conditions

NYSDEC DER-10, May 2010 (or current version)

CHA's Legend to Subsurface Logs

G. APPENDICES/FORMS:

Boring Log Form

**END OF SOP**

Final Check by C. Burns 10/07/15

**Author: Sarah Johnston**
**Reviewer: Keith Cowan**

# SOIL SAMPLING WITH A HAND AUGER

## A. PURPOSE/SCOPE

Hand auger borings are used to collect near surface soil and sediment samples in situations where use of a drill rig is not necessary or not feasible. Typical use includes the collection of samples from zero (0) inches to approximately 36 inches but is ultimately limited by the combined length of the handle and extension (approximately 8 ft). This SOP outlines the methods for using a hand auger to collect samples for field screening and laboratory analysis and should be reviewed in conjunction with SOP #405, *Surface Soil Sampling*, for general soil sampling techniques.

## B. EQUIPMENT/MATERIALS

- Hand (bucket) auger and handle extension
- Shovel
- Plastic sheeting
- Disposable or stainless steel scoops and spatula
- Sample bottles and coolers
- Field screening equipment (PID)
- Disposable gloves
- Tape measure, survey stakes and tape
- Field data sheets
- Decontamination supplies

## C. PROCEDURE:

1. Clear sample site of any vegetation or debris with a shovel. A large enough area should be cleared (approximately one (1) foot square) to prevent surrounding debris and soils from spilling into the auger hole.
2. Plastic sheeting should be laid out for placing removed soils. This step facilitates the sampling process, aids in the return of soils to the hole, and prevents contamination of the surrounding area.
3. Slowly rotate the auger until the bucket has filled or the desired sampling increment has been reached.
4. Carefully remove the auger and turn it upside down on plastic sheeting to remove soil from the bucket.
5. As with a standard boring log, classify major and minor soil components, soil color, moisture content, and any evidence of contamination including PID readings according to the Work Plan. See SOP 301, *Field Description of Soils*.
6. If the Work Plan indicates samples are to be taken for volatile organic compounds (VOCs), collect those samples as soon as possible from the least disturbed soil possible. Note that according to New Jersey Guidance VOC sample collection with a hand auger is not acceptable due to matrix disturbance.
7. Record soil observations on a boring log. For each boring the boring # and location, total depth, and depth at which water is encountered should also be recorded.

## SOIL SAMPLING WITH A HAND AUGER

8. Finish collecting any analytical samples. Parameters such as SVOCs, pesticides, PCBs, metals, or cyanide must be homogenized to create a representative sample. Prior to homogenization, twigs, roots, leaves, rocks, and miscellaneous debris should be removed from the sample using the decontaminated stainless steel spoon or spatula. The soil should be mixed, quartered (divided into 4), and mixed again until a consistent physical appearance over the homogenized soil has been obtained. The soil should be transferred into the appropriate sample container using the decontaminated stainless steel spoon or spatula.
9. When boring is completed, soils can be generally be returned to the hole depending on level of contamination and project specifications.
10. Decontaminate the auger between each boring using an Alconox® wash followed by a tap water rinse.

D. QA/QC REQUIREMENTS:

All data must be documented on field data sheets or within site logbooks.

E. SPECIAL CONDITIONS:

Site soils should be considered prior to developing a work plan that includes extensive auguring by hand. Note that rocky or coarse grained soils are often difficult to sample with a hand auger due to refusal. In contrast, sandy soils may be quite easy to advance the auger through; but sample loss may occur during extraction of the bucket. Different types of bucket designs are available for different soil types such as clay or sand to reduce this problem.

F. REFERENCES:

New Jersey Department of Environmental Protection (2005): *Field Sampling Procedures Manual*: http://www.nj.gov/dep/srp/guidance/fspm/

United States Environmental Protection Agency Environmental Response Team (2000): *Standard Operating Procedures; Soil Sampling, # 2012*: http://www.dem.ri.gov/pubs/sops/wmsr2012.pdf

G. APPENDICES/FORMS:

Boring Log Form

**END OF SOP**

Final Check by C. Burns 10/07/15

**Author: Danielle Benati**
**Reviewer: Scott Smith**

# EXCAVATION OF TEST PITS

A. PURPOSE/SCOPE:

To evaluate subsurface soils and/or to search for buried objects within 12 to 20 feet of surface grade. Even though these are CHA's standard procedures, each person working in the field is responsible for ensuring that they are following state standards/guidelines where applicable.

B. EQUIPMENT/MATERIALS:

- Backhoe and operator (subcontractor)
- Wooden stakes
- Indelible ink pens
- Hammer
- Combustible gas meter
- Photoionization detector
- Appropriate sample jars
- Latex gloves
- Test pit field logs
- Clipboard
- Camera
- Tape measure
- Shovel
- Handheld GPS.

C. PROCEDURE:

1. Personnel should stand at the opposite end of the pit from the backhoe. From this position, it is possible to see in the pit, yet be out of the backhoe operators way.
2. Screening with a photoionization or flame ionization detector and a combustible gas meter should be performed on a continual basis if specified in the Health and Safety Plan. Refer to SOP 205 for instructions on use of the Mini-Rae PID or PGM-7600 photo-ionization detectors and SOP 207 for instructions on use of the V-Rae Landfill Gas or PGM 7800 four gas meters.
3. Record test pit information and field notes as described below.
4. The excavated material should be placed on one side of the pit, at least 4 feet from the edge of the pit.
5. Should buried drums (or other material that presents an immediate threat be encountered in a test pit, work will stop and the Project Manager will be notified.
6. Samples will be collected directly from the backhoe bucket. Volatile organic sample jars will be filled first if testing of volatile organic compounds is specified in the site investigation plan. Then pack all other sample fractions. Refer to SOP #607 for sample field handling procedures. Always wear latex gloves when sampling, and use a new pair for every sample. Latex gloves should also be changed if samples are collected from different depths in one test pit.
7. Photographs of the test pit and material excavated may be taken as necessary. Refer to SOP #101 for photograph instructions. If numerous test pits are installed, print out test pit number identification sheets to photograph in the field to identify each test pit.

## EXCAVATION OF TEST PITS

8. Record location of test pit with handheld GPS.
9. Promptly backfill and compact test pits. When backfilling, soil materials should be placed back in the excavation from the same general strata from which it was removed.

D. QA/QC REQUIREMENTS:

1. All data must be documented on field data sheets or within site logbooks.
2. All instrumentation must be operated in accordance with operating instructions as supplied by the manufacturer, unless otherwise specified in the work plan.
3. Equipment checkout and calibration activities must occur prior to sampling/operation, and they must be documented. If equipment was rented, save calibration sheet in project folder.

E. SPECIAL CONDITIONS:

Landfill Applications: If the scope of work involves delineating the limit of waste by installing test pits, pay attention to topography in the field. It may be helpful to acquire a topographic map of the area before working onsite. The Test Pit Log for Landfill applications should also be used. Contaminated soil from each test pit should be segregated from clean soils and placed on plastic if possible to avoid contamination to the surface of the site. When backfilling, waste materials should be placed back in the excavation in the same strata as they were removed. In accordance with DER-10 Technical Guidance for Site Investigation and Remediation, any drums or other containers encountered, as well as NAPL or other free product, will be over packed or otherwise containerized for appropriate off-site disposal. Refer to SOP #607 for information on Drum/Soil Excavation and Stockpiling.

Utility Investigations: Depending on scope of work and site conditions, it may be necessary to install test pits near overhead or underground utilities. A representative from the utility company should be notified in advance of project work, and arrangements for oversight by the utility company may also be required. Check with the utility company to see if any additional equipment is required for use by the subcontractor like grounding rods for work near overhead utilities, or pressure distribution mats for heavy equipment working or crossing over underground utilities.

F. REFERENCES:

Dig Safely New York Website for UFPO information: http://www.digsafelynewyork.com/

NYSDEC DER 10 Technical Guidance for Site Investigation and Remediation:
http://www.dec.ny.gov/docs/remediation_hudson_pdf/der10.pdf

G. APPENDICES/FORMS:

Test Pit Field Logs

**END OF SOP**

Final Check by C. Burns 10/07/15

# MONITORING WELL INSTALLATION

## A. PURPOSE/SCOPE:

The following standard operating procedure (SOP) presents a description of the methods generally employed for the installation of monitoring wells. Monitoring well installation creates access for collection of groundwater samples which are used to define the lateral and vertical extent of groundwater contamination, to determine the elevation and fluctuations in the water table, as an observation point during pump tests, to aid in determining the hydraulic conductivity of screened soil layers, and to establish a background level for the local groundwater chemistry. Wells are also installed for the purpose of environmental remediation projects and include air-sparging wells, soil vapor extraction wells, and groundwater recovery wells.

The most commonly used drilling methods are hollow-stem auger, mud rotary, and air rotary. The procedures described below are intended to provide access to groundwater with minimum disturbance to the aquifer. Additionally, the procedures are intended to prevent cross-contamination between aquifers.

## B. EQUIPMENT/MATERIALS:

Drilling will be performed by a licensed drilling firm under the direction of CHA. The drilling field crew will consist of, at a minimum, a driller, a driller's assistant, and a CHA field geologist/engineer. The field geologist/engineer will supervise drilling operations and conduct the geologic logging of the boreholes. A list of typical equipment needed for installation of monitoring wells is included below.

a. Heavy Equipment

- Drill rig
- Water truck (if needed)
- Grout mixer
- Steam cleaner
- Generator for steam cleaner

b. Sampling Tools

- 2-Inch I.D split-barrel samplers or 3-Inch I.D. thin-walled sampling tubes

c. Well Casing Materials

- Varies with job requirements

d. Other Well Construction Materials

- Type I Portland cement
- Bentonite pellets
- Washed sand of various grain sizes depending on screen or geologic conditions

e. Miscellaneous Equipment/Materials

- Bore brush
- 55-Gallon drums
- Stainless steel tape (100 feet)
- Tremie pipe
- Shovels

## MONITORING WELL INSTALLATION

C. METHODS:

1. Hollow Stem Auger

Wells can be installed in unconsolidated formations using hollow-stem augers. The augers are advanced by rotation and the drill cuttings are brought to the surface by travelling up the outside of the auger flights in a screw-like manner. Upon reaching the planned well depth, the casing and screen are placed inside the hollow-stem augers and the flights are individually removed while the annual space around the well is filled with filter pack and grout.

Outside diameters of hollow-stem augers generally range from 6 ¼ inches to 22-inches with corresponding inner diameters ranging from 2 ¼ inches to 13 inches. Auger lengths are usually 5 feet which allows easy handling. Soil samples can be collected using split spoons or Shelby tubes, which can be used inside the augers.

Advantages of hollow-stem auger drilling include:

- allowing the well to be installed inside the hollow stem of the auger, which prevents the borehole from collapsing and representative soil samples can be easily obtained using split-spoon samples
- relatively fast and inexpensive
- well development is usually less difficult than with wells drilled by the mud rotary method

Disadvantages of hollow-stem auger drilling include:

- very slow or impossible to use in coarse materials such as cobble or boulders
- cannot be used in consolidated formations
- generally limited to depths of approximately 100 feet in order to be efficient

2. Air Rotary

The air rotary method uses air as the drilling fluid. Air is forced down the drill rods by an air compressor, escapes out of the bit and returns to the surface in the annual space between the borehole wall and the drill string. Cuttings are moved out of the hole by the ascending air and collect around the rig. The bit is pneumatically driven rapidly against the rock in short strokes while the drilling string slowly rotates. The air supply must be filtered to prevent introduction of contamination into the borehole.

The advantages of air rotary drilling include:

- fast, more than 100 feet of borehole advancement a day is possible
- preliminary estimates of well yields and water levels are often possible
- no drilling fluid to plug the borehole

The disadvantages of air rotary drilling include:

- generally cannot be used in unconsolidated formations
- in contaminated zones, the use of high-pressure air may pose a significant hazard to the drill crew because of transport of contaminated material up the hole
- introduction of air to the groundwater could reduce concentration of volatile organic compounds.

# MONITORING WELL INSTALLATION

D. PROCEDURE:

Wells Installed in Unconfined Aquifers

Refer to SOP #303 for drilling procedures used to advance boreholes.

The following procedure describes construction of a monitoring well using 2-inch diameter water-tight flush threaded PVC well casing and screen. The slot size of the screen will be determined depending on the data required and the type of soil screened. Filter pack sand size used will be dependent on the screen slot size and various state and federal regulations.

It should be noted however, that the diameter and type of well casing material may differ according to different specific applications.

1. Well casing and screens should be new and brought to the site enclosed in plastic. Contact of casing or screen with the ground prior to installation shall be avoided. Plastic sheeting (e.g., visqueen) shall be placed on the ground and used as a cover to protect stockpiled materials from contamination.
2. If monitoring for contaminants less dense than water, drilling will proceed to a depth of several feet below the water table. The well will be screened across the water table, using approximately ten feet of screen.
3. If monitoring for contaminants more dense than water, drilling will proceed until the first confining surface (e.g., clay layer, top of bedrock, etc.) is encountered. In these situations, ten feet of screen will be placed immediately above the confining surface.
4. A sand pack composed of washed sand will be tremmied in the annular space of each monitoring well. The filter pack will be placed at 6 inches below the bottom of the well screen to two feet or 20 percent of the screen length, whichever is greater, above the well screen.
5. A bentonite seal at least 3 feet thick will be placed on top of the filter pack. The preferred method of placing bentonite is by the tremie method, however the bentonite may be poured in boreholes less than 50 feet in depth.
6. The remaining annulus to the ground surface will be filled with a cement-bentonite grout using a tremie pipe. Depending on local requirements, a certain amount of setting time for the bentonite seal may be required before the bentonite/cement grout is placed.
7. The wells shall extend three feet above grade. A four to six inch diameter protective steel surface casing shall be installed over the completed well and will be surrounding by a three-foot square concrete pad extending below the frost line. The pad should be shaped to shed rainwater and the protective casing should be fitted with a lockable water-tight cap. Weep holes should be drilled at the base of the protective steel casing and a vent hole must be drilled at the top of the PVC casing to allow water levels to respond to barometric changes and prevent explosive gas buildup. The annular space of the protective casing should be filled with gravel or coarse sand.
8. In cases where wells must be installed in high traffic areas, the protective steel casing may be replaced with a manhole which is mounted flush with surface grade. The protective casing will be grouted in place and fitted with bolts and rubber gaskets. The well top will be fitted with a locking cap.

**MONITORING WELL INSTALLATION**

9. The drilling rig and sampling equipment may be required to be decontaminated by steam-cleaning (high pressure, hot water) prior to drilling and in between borings depending on the job requirements.
10. Drilling progress and information about the formations encountered shall be recorded by the geologist on the field boring log. The information should include:
    - Borehole Depth
    - Well Screen Depth
    - Filter Pack Interval
    - Seal Interval
    - Grout Interval
    - Surface Cap Detail
    - Well Material
    - Well Riser and Screen Length
    - Well Diameter
    - Filter Pack Material
    - Date Installed

Wells Installed in Confined Aquifers

Wells installed in confined aquifers must penetrate a confining layer. That confining layer may be a clay lens in more porous unconsolidated materials or unfractured bedrock in consolidated materials.

1. Drill to the top of the confining surface. Grout the steel casing in place. After the grout has set, proceed drilling until the desired depth is reached.
2. If drilling proceeds through more than one confining layer, repeat the process described above, except the first aquifer will be cased off with a wider casing and the second aquifer will be cased off with narrower diameter casing, etc.
3. A well will then be constructed and installed in this borehole in the same manner as described in the steps for an unconfined aquifer.
4. When install a well in fractured bedrock, it may be possible to leave the open borehole as is, depending upon the competency of the rock.

E. QA/QC REQUIREMENTS:

Instruments used during groundwater sampling should be calibrated at the beginning of each day. If a measurement falls outside the calibration range, the instrument should be recalibrated so the measurements fall within the calibration range. The calibration should be checked at the end of each day to verify the instruments remained in calibration.

**MONITORING WELL INSTALLATION**

F. SPECIAL CONDITIONS:

We have seen cases where settlement causes the PVC riser to extend above the steel casing over time. Drillers often "rest" the cap of the outer protective casing on the PVC riser (or on an attached gripper plug) when pouring the concrete surface pad. This provides no room for settlement since the PVC is at, or near the top of the steel casing cap. When completing the well installation, recommend that the driller use a block or spacer on top of the riser to provide separation from the cap of the steel casing. Once the concrete for the pad and casing has set, the spacer can be removed.

G. REFERENCES:

New Jersey Department of Environmental Protection (August 2005), *Field Sampling Procedures Manual*, Chap. 6, retrieved January 5, 2009 from http://www.nj.gov/dep/srp/guidance/fspm/.

United States Environmental Protection Agency (March 13, 1996), *Monitor Well Installation*, retrieved March 18, 2009, from http://www.dem.ri.gov/pubs/sops/wmsr2048.pdf

H. APPENDICES/FORMS:

Monitoring Well Construction Log

**END OF SOP**

Final Check by C. Burns 10/07/15 (Revised Title 5-30-17)

Author: Sarah Burke
Reviewer: Keith Cowan

# WELL DEVELOPMENT

## A. PURPOSE/SCOPE:

Prior to the collection of hydraulic or groundwater quality data, a monitoring well must be developed. Well development is necessary to remove drilling fluid and construction residues remaining in the borehole or surrounding aquifer, restore the hydraulic properties of the formation immediately surrounding the screened interval, and sort the filter pack material to allow groundwater to freely flow into the monitoring well.

Well development can be accomplished using bailing, overpumping, mechanical surging, and air-lift methods. The best methods involve surging water flow back and forth through the well screen to sort the filter pack materials. These methods include bailing, pumping/overpumping/backwashing, and surging with a surge block, or a combination of these methods. Pumping alone will tend to cause particles moving toward the well to form blockages that restrict subsequent particle movement.

Mechanical surging forces water to flow into and out of a screen by operating a plunger up and down in the casing, similar to a piston in a cylinder. The tool normally used is called a surge block, surge plunger, or swab. Silt and sediment loosened by the surging is removed by either a bailer or pump. The combination of mechanical surging and pumping are generally used in 2 to 4-inch diameter monitoring wells.

Compressed air can also be used to develop wells in consolidated and unconsolidated formations. Most air rotary drilling rigs have sufficient air capacity to develop 6-inch to 12-inch diameter wells. Airlift methods may introduce air into the aquifer surrounding the monitoring well, potentially altering groundwater quality, particularly for volatile organics.

Overpumping/backwashing creates an increase in the flow velocity of the water to the well, creating a rapid and effective migration of particulates toward the well. Where there is no backflow-prevention valve installed, the pump can be alternately started and stopped, allowing the column of groundwater that is initially picked up by the pump to be alternately dropped and raised up in a surging action (backwashing).

Bailing is an effective development technique in relatively clean, permeable formations where water flows freely into the well. The bailer is dropped until it strikes the surface of the water, producing an outward surge of water. As the bailer fills and is rapidly withdrawn, the particulate matter outside the well flows into the well. Subsequent bailing removes the particulate matter.

## B. EQUIPMENT/MATERIALS:

- Surge block
- Inertial or submersible pump
- Bailer
- Air compressor and air line
- Well development log

**WELL DEVELOPMENT**

C. PROCEDURE:

1. Mechanical Surging and Pumping

   a. Before starting to surge, the well should be evacuated to ensure water will flow into it.

   b. Lower the surge block into the well until it is 10 to 15 feet beneath the static water level, but above the well screen. The water column will effectively transmit the action of the surge block to the screen section. The initial surging motion should be relatively gentle, allowing any material blocking the screen to break up, go into suspension, and move into the well.

   c. As water begins to move easily both into and out of the screen, the surging tool is usually lowered progressively downward through the entire length of the screen. As the block is lowered, the force of the surging movement is increased.

   d. Continue surging for approximately 20 minutes, then pull the block from the well. A pump or bailer may be used to remove the sediment out of the well. Pumping should continue for approximately 20 minutes.

   e. Continue alternating the surging and pumping action until little or no sand or fines can be pulled into the well. The turbidity of the final discharge water should be below 50 NTU.

2. Airlift Development

   a. Place the airline into the water at a shallow depth. Initially, the airlift should be operated to pump fluids at a reduced rate from the well. Once a constant flow rate from the well has been established, the airline is lowered to within five feet of the bottom of the screen, assuming that sufficient pressure is available to overcome the static head. Development can also start near the top of the screen, depending on the preference of the driller.

   b. A surging action is created by injecting air into the well to lift the water to the surface. As the water reaches the top of the casing, the air supply is shut off, allowing the aerated water column to fall (this procedure is called "rawhiding"). This tends to drive the water outward through the well screen openings.

   c. After surging the well for a period of 20 to 30 minutes, the air should be applied in a continuous manner so that the water is expelled from the casing. The airline should be lowered to the bottom of the well so that accumulated sediment will be expelled. Surging and lifting cycles are repeated until the water is relatively free of sand and fine particles. The turbidity of the final discharge water should be below 50 NTU.

3. Overpumping / Backwashing

   a. Place the pump in the well and lower until it is 10 to 15 feet beneath the static water level.

   b. Pump the groundwater from the well at a rate that substantially exceeds the rate that the formation can deliver the water.

   c. Alternately start and stop the pump to allow the column of water that is initially picked up by the pump to be alternately dropped and raised up in a surging action.

   d. After surging the well for a period of 20-30 minutes, the pump should be lowered to the bottom of the well and operated in a continuous matter so that accumulated sediment will be expelled.

Author: Sarah Burke
Reviewer: Keith Cowan

**WELL DEVELOPMENT**

e. Surging and lifting cycles are repeated until the water is relatively free of sand and fine particles. The turbidity of the final discharge water should be below 50 NTU.

4. Bailing

a. Drop the bailer so it is allowed to fall freely through the monitoring well until it strikes the surface of the water.

b. After the bailer fills with groundwater, rapidly withdraw it from the monitoring well.

c. Subsequent bailing will remove the sand and other particulate matter from the well.

d. Bailing should be continued until the turbidity of the final discharge water is below 50 NTU.

e. QA/QC REQUIREMENTS:

If an air compressor is used to develop the wells, make sure a filter is present on the compressor. Otherwise, oil from the compressor will be present in the airstream that enters the well.

D. SPECIAL CONDITIONS:

The surge block should be operated with care in cases where excessive sand will be introduced through the well screen to prevent the tool from becoming sand locked.

Air development procedures should begin by determining that groundwater can flow freely into the screen. Application of too much air volume in the borehole when the formation is clogged can result in a collapsed screen.

E. REFERENCES:

New Jersey Department of Environmental Protection (August 2005), *Field Sampling Procedures Manual*, Chap. 6, retrieved January 5, 2009 from http://www.nj.gov/dep/srp/guidance/fspm/.

F. APPENDICES/FORMS:

Well Development Log

**END OF SOP**
Final Check by C. Burns 10/07/15

Author: Sarah Johnston
Reviewer: Keith Cowan

# MEASUREMENT OF WATER LEVEL/ FREE PRODUCT THICKNESS

## A. PURPOSE/SCOPE:

Measurements of static groundwater levels are used to determine the general elevation of groundwater, to evaluate horizontal and vertical hydraulic gradients, and to calculate the volume of water to be purged from a well prior to sampling. Seasonal fluctuations of the water table can also be assessed when water levels are monitored over the long term. Individual measurements of free product thickness are used to evaluate the presence of free product and also to determine the lateral extent of free product contamination in an unconfined aquifer.

## B. EQUIPMENT/MATERIALS:

- Electronic water level meter
- Clear polyethylene or Teflon bailer (for free product measurement only)
- Oil/water interface meter (for free product measurement only)
- Field data sheets
- Well keys if necessary
- Decontamination supplies

## C. PROCEDURE:

1. Identify and inspect the well. Determine if the well cap and lock are present and in good working order. Note any defects in the well casing or surface seal in field notes.
2. If it is known that free product is not present in the well, the electronic water level indicator may be used to measure the depth to water according to the meter instructions.
   a. Every well should have an established measuring point on the inner well casing that is clearly marked and used during each monitoring event. Measure the depth to the water from the established reference point to the nearest 0.01 foot. For any site, all measurements should be made during the same day, prior to any purging activities that will affect water levels (see Section J, Special Conditions).
   b. If it is unknown whether free product is present in a well, collect a water level measurement as per Step A above. Then lower a dedicated clear bailer into the well until liquid is encountered, being careful not to fully submerge the bailer. Remove the bailer from the well and measure the thickness of the free product, if present, using a tape measure or ruler. Record the measurement to the nearest 0.01 foot.
   c. If free product is known to exist in a well, the use of an oil/water interface meter is recommended. The meter incorporates both optical and conductivity sensors to determine if the probe is in product or water, respectively. The probe typically emits two different types of signals; one for free product and one for water. Slowly lower the probe until the first signal indicates the interface between air and free product has been reached. Then continue to lower the probe until the second signal indicates the interface between free product and water. The water/product interface measurement is actually best taken while moving the probe back up from the water toward the floating product interface, as this minimizes the effects of product coating the conductivity probe.

## MEASUREMENT OF WATER LEVEL/ FREE PRODUCT THICKNESS

Repeat the measurements and record all measurements to the nearest 0.01 foot. In the event that an oil/water interface probe is not available, free product measurements may be collected using a clear bailer as described in Step B above.

3. Record all data on the field data sheet or log book. This includes all measured depths and notation of the measuring point on the well casing (i.e., top of inner PVC casing, top of steel protective casing, etc.). Water level measurements are eventually used to calculate water elevations above mean sea level using the surveyed elevations of each well.
4. Decontaminate the probe after each use according to the complete procedures in SOP #501, Small Equipment Decontamination. Field decontamination procedures generally include removal of gross contamination by scraping/brushing and rinsing, followed by a wash with Alconox® to remove all visible contamination, and a re-rinse with potable water to remove the detergent. The water level meter probe and the entire length of tape subject to contamination should be decontaminated. The meter should be decontaminated between each well. Field staff should also consult the site specific work plan for any specialized decontamination requirements.

D. QA/QC REQUIREMENTS:

Not Applicable

E. SPECIAL CONDITIONS:

When measuring water levels in multiple wells on a site, all measurements should be collected in as short of time as possible to minimize the effects of daily fluctuations in water levels. This is particularly important in areas where groundwater levels may be tidally-influenced. Other possible causes of fluctuations include precipitation events, changes in barometric pressure, pumping of nearby wells, and changes in river stage or flow in unlined ditches. If any of these conditions are observed they should be recorded in field notes.

For newly installed wells or piezometers, a period of 24 hours should be allowed prior to measurement so water levels stabilize following development. Additionally, any well with a cap capable of producing an air tight seal on the casing may contain a vacuum or pressurized zone that can measurably affect water levels. In this instance, water level measurements should be repeated until the level has stabilized following cap removal.

F. REFERENCES:

U.S. EPA Environmental Response Team, 2000: Standard Operating Procedures, SOP #2043, Manual Water Level Measurements

G. APPENDICES/FORMS:

Field Data Sheets

**END OF SOP**

Final Check by C. Burns 10/07/15

**Author: Sarah Newell**
**Reviewer: Keith Cowan**

# LOW-FLOW GROUNDWATER PURGING/SAMPLING

## A. PURPOSE/SCOPE:

Low-flow purging is purging using a pumping mechanism that produces low-flow rates [less than 1 liter per minute (lpm) or less than 0.26 gallon per minute (gpm)] that cause minimal drawdown of the static water table and usually employs a flow cell in which geochemical parameters are continuously monitored. These parameters may include dissolved oxygen content, oxidation-reduction potential (redox), conductivity, turbidity, and pH.

The intent of this sampling protocol is to collect a representative sample from the monitored groundwater zone. A representative sample may be obtained when all the monitored chemical parameters have stabilized, thus qualitatively demonstrating that the groundwater being purged is in equilibrium (refer to Table 3). Samples are collected directly from the pumping mechanism with minimum disturbance to the aquifer groundwater. The low-flow/low volume purging method (purging to parameter stability) tends to isolate the interval being sampled, which provides more accurate water quality measurements and reduces the volume of purge water generated. This method has an advantage in that it can limit vertical mixing and volatilization of volatile organic compounds in solution within the well casing or borehole as compared to high-flow purging and sampling.

An overview of this methodology is presented in Puls and Barcelona, 1996. Low-flow purging and sampling is appropriate for collection of groundwater samples for all groundwater contaminants, including inorganic compounds, metals, pesticides, PCBs, volatile and semi-volatile organic compounds (VOCs and SVOCs), other organic compounds, radiochemical and microbiological constituents. This method is not applicable to the collection LNAPL or DNAPL.

## B. EQUIPMENT/MATERIALS:

- Inertial pump
- Submersible pump
- Disposable bailers
- Generator
- Sample bottles
- Bailing twine and rope
- Field analyses meters
- Sampling gloves
- Water level meters
- Filtration system
- 2-Inch grundfos rediflow pump and controller
- Well sampling forms

Depending on the purging method to be used, there are specific equipment limitations. Table 1 provides a description of the various methodologies and their applicability. The proper selection of sampling devices or pumps is critical to the quality and representation of the sampling results. The following table provides a summary of the acceptable sampling methods for the various compounds of concern.

## LOW-FLOW GROUNDWATER PURGING/SAMPLING

**Table 1**
**Acceptable Sampling Methods for Compounds of Concern**

| Method | VOCs | Semi-VOCs | Metals and Inorganics | Petroleum Hydrocarbons | | General Chemistry |
|---|---|---|---|---|---|---|
| | | | | C3-C16 | C16+ | |
| Peristaltic Pump | X | 1 | 3 | X | 1 | 2 |
| Centrifugal Pump | 2 | 3 | 3 | 2 | 2 | 3 |
| Submersible Impeller Pump (w/ controller) | 2 | 3 | 3 | 2 | 3 | 3 |
| Bailer | 2 | 2 | 2 | 2 | 2 | 2 |
| **Bladder Pump** | **3** | **3** | **3** | **3** | **3** | **3** |
| DPIS | 3 | 3 | 2 | 2 | 2 | 2 |
| Diffusion Sampler | 2 | 2 | X | 2 | 2 | X |

**1** - Not recommended, better methods exist
**2** - Useful with limitations
**3** - Recommended method
**X** – Unacceptable
**Note**: Centrifugal pump - assumed at a low-flow rate (no greater than 1 Lpm)

C. PROCEDURE:

1. The wells will be sampled in order from the least contaminated well to the most contaminated well.
2. Using a decontaminated measurement probe, determine the water level in the well; then calculate the fluid volume in the casing.
3. Setting up the Pump:
   a. Dedicated Systems

      Installation of any device into a well disturbs the stratification typically exhibited in a well due to laminar flow of groundwater in the well. Insertion also potentially mobilizes suspended solids in the water column due to disturbance of settled and solids in the casing and agitation of water in the filter pack. Dedicated systems result in lower initial turbidity values and lower purge volumes to achieve stabilized indicator parameter readings, and should be considered when a well will be sampled multiple times.

   b. Portable Systems

      If portable systems are used, they must be placed carefully into the well and lowered into the screen zone as slowly as possible to avoid disturbance of the groundwater resulting in non-equilibrium conditions. As a result, longer purge times and greater purge volumes may be necessary to achieve indicator parameter stabilization. In general, this may require that after installation, the portable pump should remain in place for a minimum of 1-2 hours to allow settling of solids and re-establishment of horizontal flow through the screen zone. If initial turbidity readings are excessive (>50 NTU), pumping should cease and the well should rest for another 1-2 hours before initiating pumping again. In wells set in very fine-grained formations, longer waiting periods may be required.

**LOW-FLOW GROUNDWATER PURGING/SAMPLING**

4. The flow rate used during purging must be low enough to avoid increasing the water turbidity. The following measures should be taken to determine the appropriate flow rate:
    a. The flow rate shall be determined for each well, based on the hydraulic performance of the well.
    b. The flow must be adjusted to obtain stabilization of the water level in the well as quickly as possible.
    c. The maximum flow rate used should not exceed 1 liter per minute (0.26 gpm).
    d. Once established, this rate should be reproduced with each subsequent sampling event.
    e. If a significant change in initial water level occurs between events, it may be necessary to re-establish the optimum flow rate at each sampling event.
5. Water Level Monitoring:
    a. Should not fluctuate more than 0.1 meters (~4 inches).
6. Measurement of indicator parameters (Dissolved oxygen content, redox potential, specific conductance, temperature and pH) is required. Continuous monitoring of water quality indicator parameters is used to determine when purging is competed and sampling should begin. Stabilized values, based on selected criteria listed in Table 2 should be met prior to sampling. The use of an in-line flow cell (closed) system is recommended for measuring indicator parameters, except for turbidity.

    For turbidity measurement, a separate field nephalometer should be used. Indicator parameter collection is more important when low-flow purging is used compared to the high-flow purging method. Generally, measurements are taken every 3 to 5 minutes and water chemistry parameters are considered to be stable when they are within the following ranges for three (3) consecutive readings:

**Table 2**
**Stability Criteria for Low-Flow Purging**

| Constituent | Criteria |
|---|---|
| Dissolved Oxygen Content (DO) | ± 10% |
| Oxidation-Reduction Potential (redox) | ± 10 mv |
| Specific Conductance | ± 03% of reading |
| pH | ± 0.1 units |
| Turbidity | ± 10% |
| Temperature | NA |

Turbidity should be below 50 NTU, if possible. If sample turbidity can not be reduced below 50 NTU, a field filtered sample shall be collected for metals analysis in addition to an unfiltered sample. Record these readings on the well sampling log.

7. The order in which samples are to be collected is as follows:
    - Volatile Organic Compounds (VOCs)
    - Semi-Volatile Organic Compounds (SVOCs)

**LOW-FLOW GROUNDWATER PURGING/SAMPLING**

- Purgeable organic carbon (POC)
- Purgeable organic halogens (POX)
- Total organic carbon (TOC)
- Total organic halogens (TOX)
- Extractable organics
- Total metals
- Dissolved metals
- Phenols
- Cyanide
- Sulfate and chloride
- Turbidity
- Nitrate and ammonia
- Radionuclides

8. When collecting aliquots for analysis of volatile organic compounds, make absolutely certain that there are no bubbles adhering to the walls or the top of the VOA container.
9. Add appropriate preservatives to samples as described in SOP #605.
10. Label the sample containers with all necessary information and complete all chain-of-custody documents and seals.
11. Place the properly labeled and sealed sample bottles in a cooler with ice and maintain at 4oC for the duration of the sampling and transportation period. Do not allow samples to freeze.

D. QA/QC REQUIREMENTS:

To the extent possible, all samples should be collected using the same type of equipment and in the same manner to ensure comparability of data.

E. SPECIAL CONDITIONS:

Because the methodology requires that disturbance to the water column in the well be minimized, the same pumping device used for purging should be used for sampling.

Sample collection will be performed utilizing either an inertial pump system or disposable bailer. If the inertial pump system is used, samples will be obtained through the dedicated polyethylene tubing while maintaining a low-flow. Should disposable bailers be utilized, the sampling will be performed as follows:

Attach a new bailer line to the disposable bailer equipped with a single check valve. Check the operation of the check valve assembly to confirm free operation. Lower the single check valve bailer slowly into the well until it contacts the water surface. Then lower the bailer just below the water surface with a minimum of disturbance. When filled with groundwater, slowly raise the bailer to the surface. Discharge the first bailer to the ground. Tip the bailer to allow the water to slowly discharge from the top and to flow gently down the inside of the sample bottle with minimum entry turbulence and aeration.

**LOW-FLOW GROUNDWATER PURGING/SAMPLING**

Step 4 (*samples collected*) can be replaced if purging and sampling is being performed with a Grundfos Rediflow pump. In this case, after well purging was completed, the discharge rate for the pump would be reduced to approximately 40 ml/minute. Sampling can then proceed as described above.

F. REFERENCES:

Low-Flow (Minimal Drawdown) Ground-Water Samp*ling Procedures"* by Robert Puls and Michael J. Barcelona dated April 1996.

G. APPENDICES/FORMS:

Well Sampling Forms

**END OF SOP**

Final Check by C. Burns 11/4/15

**Original Author: Joseph Saulsbery**
**Latest Revisions by: Julia Craner/Karyn Ehmann**
**Reviewer: Scott Smith**

# SAMPLING PERFLUOROALKYL SUBSTANCES (PFAS) and PERFLUORINATED COMPOUNDS (PFCS)

## A. PURPOSE/SCOPE:

The objective of this SOP is to ensure proper and uncontaminated collection of Perfluoroalkyl Substances (PFAS) and other Perfluorinated Compounds (PFCs). PFAS and PFCs are large groups of manufactured compounds used as surfactants in industrial applications, applied to many household products for grease, water, and stain resistance, and heavily used in Aqueous Film Forming Foams (AFFF) which are often used in firefighting. Although there are no federal regulations currently requiring remedial action for these chemicals, many states are adopting rules and regulation regarding these compounds. As rules continue to develop for these contaminants permitted and non-permitted equipment, materials, and procedure are subject to change. The user of this SOP should consult with applicable regulatory agencies to determine a final list of compounds that need to be analyzed.

Note: This SOP has been developed assuming that there are no elevated concentrations of more toxic chemicals present at the site warranting additional personal protective equipment. However, prior to commencing sampling activities, the sampler should consider all potential contaminants at the site and determine if additional protocols are necessary.

Due to the prevalence of these chemicals in common goods, it is imperative that field personnel are conscious of potential cross contamination. This contamination can be from field equipment, field clothing and PPE, sample containers, decontamination, and food.

## B. EQUIPMENT/MATERIALS:

**Equipment/Materials that are NOT PERMITTED:** Field equipment, field clothing, PPE, sample containers, and any other items that may be used or present on site made of or containing the following materials **ARE NOT PERMITTED** in the work area where PFAS and/or PFCs are being sampled:

- Low Density Polyethylene (LDPE)
- Aluminum foil
- Glass
- Polytetrafluoroethylene (PTFE) / Teflon™
- Waterproofed clothing or boots
- Clothing containing PTFE material (i.e. GORE-TEX®)
- New clothing (clothing not washed a minimum of 6 times) or clothing washed with fabric softeners
- Polypropylene coated coveralls and PVC boot covers completely covering personnel’s street clothes is an acceptable alternative.
- Tyvek® material
- Waterproof/treated paper or field books
- Plastic clipboards, binders, or spiral hard cover notebooks
- Post-it notes or other adhesives
- Sharpies or other permanent markers
- Paint pens, marking paint, etc.

**SAMPLING PERFLUOROALKYL SUBSTANCES (PFAS) and PERFLUORINATED COMPOUNDS (PFCS)**

- Most insect repellents, sunscreens, moisturizers, cosmetics, or other related products
- Decon 90
- Ice packs (blue ice)

A complete list of what is and is not permitted can be found in the Appendix A. This list should be given to personnel well in advance of sampling to ensure compliance.

Materials such as Teflon™ or PTFE may be found in common sampling equipment. It is important that field personnel examine and assess existing equipment to avoid accidental contamination.

**Equipment/Materials that are PERMITTED:** The following materials are **ALWAYS PERMITTED** in sampling equipment and in the work area:

- Stainless steel
- High density polyethylene (HDPE)
- PVC
- Nitrile
- Silicone
- Acetate
- Polypropylene
- Loose paper on aluminum clipboards
- Ballpoint pens
- Regular ice

There are changes necessary in several CHA SOPs when sampling for PFAS and PFCs. The changes relate to the sampling equipment and supplies used and are as follows for each SOP as referenced:

**Surface Soil Sampling (SOP #405**)

- A stainless steel spoon should be used for surficial soil sampling (0-6") Turf should be removed prior to soil sampling with a steel trowel or shovel without any coatings.
- A stainless steel spoon and bowl should be used to mix the soil sample prior to filling sample jar since PFAS are SVOCs. Cover the bowl with a stainless steel lid where possible between the addition of each aliquot. Do NOT cover the bowl with aluminum foil.

**Soil Sampling with a Hand Auger (SOP #305)**

- A stainless steel hand auger without any coatings must be used when sampling. Auger to the appropriate depth and then use a pre-cleaned hand auger or spoon to collect the sample.
- Scoops and spatula used must be stainless steel.

**SAMPLING PERFLUOROALKYL SUBSTANCES (PFAS) and PERFLUORINATED COMPOUNDS (PFCS)**

- A stainless steel spoon and bowl should be used to mix the soil sample prior to filling sample jar since PFAS are SVOCs. Cover the bowl with a stainless steel lid where possible between the addition of each aliquot. Do NOT cover the bowl with aluminum foil.

**Borehole Installation and Sampling (SOP #303/309)**

- If using hollow stem augers/split spoons or similar, they must be carbon steel and not coated.
- If collecting a soil or sediment core sample (e.g. Geoprobe®), it must be collected directly from single-use PVC liners that must not be decontaminated or reused at different locations.

**Well Development (SOP #311)**

- Do not use bailers, unless entirely made of PVC or stainless steel. Teflon in any part of the bailer is not acceptable.
- Do not use bladder pumps, most bladders are made of Teflon. Only bladder pumps with a bladder made of natural rubber are acceptable.
- Other pump types are typically okay but should still be examined for Teflon or other prohibited materials.

**Conventional Groundwater Sampling (SOP #315) / Low-Flow Groundwater Purging/ Sampling (SOP #317) / Residential Well Sampling (SOP #319)**

- Bailers should not be used unless entirely made of PVC or stainless steel. Teflon is not acceptable. Single use disposable polyethylene or silicone materials are also acceptable.
- Tubing can only be made of HDPE or silicone.
- Do not use bladder pumps, most bladders are made of Teflon. Only bladder pumps with a bladder made of natural rubber are acceptable.
- The following pump types are acceptable by NYSDEC:
    - Stainless steel inertia pump with HDPE tubing
    - Peristaltic pump equipped with HDPE tubing and silicone tubing
    - PFAS-free bladder pump with HDPE tubing
- Other pump types are typically okay, but should still be examined for Teflon or other prohibited materials.

**Small Equipment Decontamination (SOP #501)**

- Use a standard two-step decontamination process using detergent (Alconox and Liquinox are acceptable) and clean PFAS-free water. The PFAS-free water should be verified as PFAS free through lab analysis or certification.

**SAMPLING PERFLUOROALKYL SUBSTANCES (PFAS) and PERFLUORINATED COMPOUNDS (PFCS)**

**Field Handling, Packaging, and Shipping (SOP #607)**

- Plastic bags must be polyethylene.
- Only ice from water should be used, not chemical (blue) ice and not ice pack.

These equipment changes can be applied to other SOPs if PFAS and/or PFCs are being sampled. If equipment is not specifically mentioned, refer to the list of materials that are always permitted. If the materials are not mentioned DO NOT use that sampling equipment.

C. PROCEDURE:

Standard operating procedures for sampling as outlined in a number of CHA's SOPs should be followed, but with the specific changes listed below for the specific SOPs referenced, if being used:

**Borehole Installation and Sampling (SOP #303/309)**

- When drilling the well use PFAS-free drilling fluids.
- Don't use detergent to decon drilling equipment with the exception of Alconox and Liquinox. Scrub with equipment a plastic brush to remove heavy soiling and rinse thoroughly in tap water. Use a steam cleaner or a triple-rinse of PFAS-free water as the final step. If large quantities of PFAS-free water are not available from the lab, additional QA/QC sampling may be required to verify the source as a potential source of cross-contamination.
- Collect a representative water sample used during drilling activities.
- If using an auger, it must be carbon steel and un-coated.

**Conventional Groundwater Sampling (SOP #315) / Low-Flow Groundwater Purging/ Sampling (SOP #317) / Residential Well Sampling (SOP #319)**

- Collect samples from the pump discharge tubing only. Never collect a water sample that has passed through a flow through cell or similar.
- When sampling prioritize drinking water, followed by surface water, followed by groundwater.
- When sampling groundwater; start with the upgradient well(s), then the furthest downgradient of the interpreted or known source, then wells downgradient to the source, and lastly the wells closest to the interpreted or known source.
- When sampling residential wells, any plumber's sealing tape should be noted, as these typically contain PFCs.
- Prior to sample collection, field personnel must wash their hands and wear a new set of nitrile gloves.
- PFAS/PFC samples should be taken first, prior to collecting samples for any other parameters into any other containers. Field personnel should avoid contact with any other type of sample container or package materials.
- When samples are collected and capped, place the sample bottle(s) in an individual sealed plastic bag (i.e. Ziploc®) separate from all other sample parameter bottles, and place in a

shipping container packed only with ice made from frozen water. PFAS samples should be placed in a separate cooler from sample containers for other parameters (e.g. VOCs).
- After collecting PFOA samples conduct the "Shaker Test:" A small portion of the sample (~10-25 ml) should be shaken by the sample collector on site. If foaming is noted within the sample, this should be documented when samples are submitted for analysis.

**<u>Surface Water Sampling (SOP #401)</u>**

- Surface water must be collected by inserting a capped sampling container with the opening pointing down to avoid the collection of surface films.
- Where conditions permit, sampling devices should be rinsed with site medium to be sampled prior to collection of the sample.

**<u>Surface Soil Sampling (SOP #405)</u>**

- PFAS/PFC samples should be taken first, prior to collecting samples for any other parameters into any other containers. Field personnel should avoid contact with any other type of sample container or package materials.
- A stainless steel spoon and bowl should be used to mix the soil sample prior to filling sample jar since PFAS are SVOCs. Cover the bowl with a stainless steel lid where possible between the addition of each aliquot. Do NOT cover the bowl with aluminum foil.

**SAMPLING PERFLUOROALKYL SUBSTANCES (PFAS) and PERFLUORINATED COMPOUNDS (PFCS)**

**Large Equipment Decontamination (SOP #503)**

- Don't use detergent to decon drilling equipment, scrub with a plastic brush and rinse thoroughly in tap water, then triple-rinse in distilled or deionized water.

**Field Handling, Packaging, and Shipping (SOP #607)**

- Ice should be double bagged and secured to avoid meltwater from contacting sample containers, and/or samples should be in an individual sealed plastic bag.
- PFAS samples should be put in a cooler separate from other samples bottles for other parameters (e.g., VOCs).

D. LABORATORY REQUIREMENTS

A laboratory certified under the Environmental Laboratory Approval Program (ELAP) shall be contracted when analyzing for PFAS. The sample will be analyzed under EPA Method 1633 with the reporting limits less than or equal to:

- Aqueous Sample – 2 ng/L (ppt)
- Solid Sample – 0.5 µg/kg (ppb)

E. QA/QC REQUIREMENTS:

A variety of blanks should be collected to trace the sources of any artificially introduced contamination. Rinsate or equipment blanks, field blanks, and trip or travel blanks should all be collected during the sampling event. Rinsate or equipment blanks and field blanks should be collected once per day per matrix or once per 20 samples per matrix, whichever comes first. One trip blank is required per cooler.

Samples should be immediately placed in a cooler maintained at 4±2º Celsius.

**SAMPLING PERFLUOROALKYL SUBSTANCES (PFAS) and PERFLUORINATED COMPOUNDS (PFCS)**

| Sampling Media | NYSDEC Requirements for Field Duplicate | NYSDEC Requirements for Equipment Blank | NYSDEC Requirements for MS/MSD | NYSDEC Requirements for Field Reagent Blank (FRB) | NYSDEC Requirements for Deliverable |
|---|---|---|---|---|---|
| Groundwater | 1 per sample batch; minimum 1 per 20 samples. | One per day per site; minimum 1 per 20 samples. | One set per sample batch; minimum 1 set per 20 samples. | n/a | Category B Report and EDDs. |
| Surface Water | 1 per sample batch; minimum 1 per 20 samples. | One per day per site; minimum 1 per 20 samples. | One set per sample batch; minimum 1 set per 20 samples. | n/a | Category B Report and EDDs. |
| Soils/Sediment/ Solids | 1 per sample batch; minimum 1 per 20 samples. | n/a | One set per sample batch; minimum 1 set per 20 samples. | n/a | Category B Report and EDDs. |
| Private Potable Water | 1 per sample batch; minimum 1 per 20 samples.* | One per day per site; minimum 1 per 20 samples.* | One set per sample batch; minimum 1 set per 20 samples.* | One per 20 samples.* | Category B Report and EDDs. |

* For sampling events where multiple private wells (homes or sites) are to be sampled per day, it is acceptable to collect QC samples at a rate of one per 20 across multiple sites or days.
n/a = not applicable.

F. SPECIAL CONDITIONS:

In the event of wet weather field personnel must avoid using personal waterproof or water-resistant rain gear. Instead a gazebo tent that is only touched or moved prior to or after sampling activities should be used.

No food or drink is permitted in the sampling area, except for bottled water and hydration drinks, such as Gatorade. These drinks should only be consumed in the staging area. When field personnel require a break to eat or drink, they should remove their gloves and coveralls and move away from the sampling location, preferably downwind. When finished eating, field personnel should clean up and put their coveralls back on and don a new pair of gloves prior to returning to the work area.

Visitors to the site are asked to remain at least 30 feet from sampling areas.

G. REFERENCES:

Chiang, D., Ph.D., P.E., Davis, K., Ph.D., Bogdan, D., Ph.D., Aucoin, M., & Woodward, D. (n.d.). PFAS Sampling. AECOM.

National Groundwater Association Press 2017, Groundwater and PFAS: State of Knowledge and Practice, Section 5, Field Sampling and Analysis.

NYSDEC Sampling, Analysis, and Assessment of Per- and Polyfluoroalkyl Substances (PFAS) under NYSDEC's Part 375 Remedial Programs. April 2023.

United States Environmental Protection Agency Office of Water. Method 1633 Analysis of Per- and Polyfluoroalkyl Substances (PFAS) in Aqueous, Solid, Biosolids, and Tissue Samples by LC-MS/MS. January 2024.

H. APPENDICES/FORMS:

Appendix A - PFAS/PFC Sampling – Acceptable and Prohibited Items

**END OF SOP**
**Final Check – C. Burns**

**APPENDIX A – SOP 341**
**PFAS/PFC SAMPLING – ACCEPTABLE AND PROHIBITED ITEMS**

| PROHIBITED | ACCEPTABLE |
|---|---|
| **Field Equipment** | |
| Teflon containing materials | High-Density Polyethylene (HDPE) Materials |
| Low density polyethylene (LDPE) materials | Acetate Liners |
| Fluoropolymer tubing, valves and other parts in pumps | Silicon Tubing |
| Sharpies (acceptable by EPA) and other markers | Ball point pens |
| Waterproof field books, Post-it Notes, and any adhesive paper produces | Loose paper (non-waterproof) |
| Plastic clipboards, binders, or spiral hard cover notebooks | Aluminum field clipboards or with Masonite |
| Chemical (blue) ice packs | Regular Ice |
| **Field Clothing and PPE** | |
| New cotton clothing or synthetic water resistant, waterproof, or stain-treated clothing, clothing containing GORE-TEX | Well-laundered clothing made of natural fibers (preferably cotton) |
| Clothing laundered using fabric softener | No fabric softener |
| Boots containing GORE-TEX or treated for water resistance | Boots made with polyurethane and PVC |
| Tyvek | Cotton clothing or Polypropylene coated coveralls |
| No cosmetics, moisturizers, hand cream, or other related products as part of personal cleaning/showering routine on the morning of sampling | **Sunscreens** – Alba Organics Natural Sunscree, Yes to Cucumbers, Aubrey Organics, Jason Natural Sun Block, Kiss my Face, Baby sunscreens that are "free" or "natural"<br><br>**Insect Repellents** – Jason Natural Quit Bugging Me, Repel Lemon Eucalyptus Insect Repellant, Herabl Armor, California Baby Natural Bug Spray, BabyGanics<br><br>**Sunscreen and Insect Repellant** – Avon Skin So Soft Bug Guard Plus – SPF 30 Lotion |
| **Sample Containers** | |
| LDPE or glass containers | HDPE or polypropylene |
| PTFE or Teflon-lines caps | Unlined polypropylene caps |
| **Equipment Decontamination** | |
| Decon 90 | Alconox and/or Liquinox |
| Water from an on-site well | Laboratory certified "PFAS-free" water |
| **Food Considerations** | |
| All food and drink, with exceptions noted | Bottled water and hydration fluids to be brought and consumed only in the staging areas.<br><br>Eating should take place away from the sampling location, wash hands well after handling, wear powderless nitrile gloves |

**Author: Katie Flood**
**Reviewer: Scott Smith**

# SURFACE SOIL SAMPLING

## A. PURPOSE/SCOPE:

The following SOP presents a description of the methods generally employed for the collection of surface soil samples. Surface soils are generally collected to determine risk associated with exposure to potentially contaminated surface soils or to determine whether contaminants are present above applicable standards.

Surficial soil sampling is generally conducted in potentially contaminated areas of concern, whether relating to former or current uses of the site, to determine whether contaminants are present above applicable standards. Locations should be biased to suspected areas of greatest contamination including stressed vegetation, soil discoloration, odor, etc. Sample locations are also chosen based on area specific requirements. This includes sampling in locations that includes past or present usage or hazardous substances or wastes, discharge points of past or present processes, and former and current containers that may contain or previously contained hazardous substances or waste.

## B. EQUIPMENT/MATERIALS:

The equipment needed for this task will vary depending on the exact nature of the project but needed supplies may include:

- Stainless steel trowel or scoop
- Stainless steel spatula
- Shovel
- Stainless steel bowls
- Wooden stakes and flagging, or wire flags
- Hammer or mallet
- Indelible ink pens (sharpies)
- Measuring tape (length appropriate for the project)
- Appropriate sample jars
- Field logs
- GPS unit for referencing sample locations
- Latex or nitrile gloves
- Non-phosphate detergent, distilled water, and paper towels.

## C. PROCEDURE:

1. Use the shovel to clear any surface debris from the sampling location, including grasses or other vegetation.
2. If appropriate to the investigation, screen the soil with a PID or FID and record the results on the Field Log.
3. Sampling Procedure:

   *Discrete Sample Collection:*

   a. Collect the sample from 0-6 inches depth (or as specified by the project). In instances where a soil is collected for VOC analysis as well as other non-VOC parameters, the soil for VOC analysis must be collected first to minimize volatilization and biodegradation.

**SURFACE SOIL SAMPLING**

b. When analyzing for VOCs, the soil sample must be collected directly from the soil sample location into the sample container without disturbing the matrix structure.

c. Once VOC soil sampling is complete, the remaining soil to be analyzed for non-VOC parameters such as SVOCs, pesticides, PCBs, metals, or cyanide must be homogenized to create a representative sample. Prior to homogenization, twigs, roots, leaves, rocks, and miscellaneous debris should be removed from the sample using the decontaminated stainless steel spoon or spatula. The soil should be mixed, quartered (divided into 4), and mixed again until a consistent physical appearance over the homogenized soil has been obtained. The soil should be transferred into the appropriate sample container using the decontaminated stainless steel spoon or spatula.

*Composite Sampling:*

a. For Composite Sampling (applicable to non-VOC's only) where several discrete samples (of equal volume) are mixed together, collect the sample from 0-6 inches depth (or as specified by the project) from the first composite point. Cover the stainless steel bowl with aluminum foil and proceed to the next sampling point. Repeat between locations. If VOC samples are also being collected at each discrete point, the stainless steel spoon/trowel should be decontaminated between locations (Refer to Step 8). Once equal volumes of soil have been collected from each point which will make up the composite sample, the soil must be homogenized to create a representative sample. Prior to homogenization, twigs, roots, leaves, rocks, and miscellaneous debris should be removed from the sample using the stainless steel spoon or spatula. The soil should be mixed, quartered (divided into 4), and mixed again until a consistent physical appearance over the homogenized soil has been obtained. The soil should be transferred into the appropriate sample container using the stainless steel spoon or spatula.

4. Label the sample bottles (if the bottles are not pre-printed) with the sample location name, collection time, project name, analysis to be performed, and any other field required on the label.

5. Place the properly labeled sample bottles in a cooler with ice and maintain at 4ºC for the duration of the sampling and transportation period. Do not allow samples to freeze.

   *Describe and record the following properties of the sample: basic soil type (e.g., sand, gravel, and clay), structure, texture, sorting, grain size, and grain shape, degree of saturation, color, odor, staining, and presence of foreign material. Refer to SOP#301, Field Description of Soils.*

6. After sampling is completed, the sampling location should be marked by a wooden stake and flagging and/or wire flag. The station number and date of sampling should be written on the stake using a permanent marker or other waterproof ink. A properly calibrated GPS unit should be used to mark the sample location (Refer to SOP#107).

7. Decontaminate the sampling equipment as specified in SOP #501 and move to the next sampling location. Repeat steps 1 through 7 for subsequent sampling locations.

8. Soil samples should be packed and shipped/prepared for courier pick up according to SOP#607. The Chain of Custody (COC) document should be completed according to SOP#105.

**SURFACE SOIL SAMPLING**

D. QA/QC REQUIREMENTS:

When possible, the samples should be collected using the same type of equipment and in the same manner to ensure comparability of data. Field quality control samples must be prepared the same as regular investigation samples with regard to sample volume, containers, and preservation.

QA/QC samples should be collected following the same procedures as described above. The type and quantity of QA/QC samples is to be determined by the project scope, and in accordance with SOP# 605.

E. SPECIAL CONDITIONS:

If testing will be performed for metals, it must be recognized that metals can be present naturally and can be present from man-made sources. Moreover, different metals will be present in different concentrations depending on the soil type. Another class of compounds, polycyclic aromatic compounds, can be widely distributed in urban environments. To determine the natural concentrations of metals and PAHs in a particular area, it is important to collect background samples. At a minimum, one background sample should be collected from an area that is near the site, has similar soil types and similar topography. For some applications (e.g., human health risk assessment), it may be necessary to collect three background samples to provide sufficient statistical information.

F. REFERENCES:

New Jersey Department of Environmental Protection (August 2005), *Field Sampling Procedures Manual*, Chap. 6, retrieved January 5, 2009 from http://www.nj.gov/dep/srp/guidance/fspm/.

G. APPENDICES/FORMS:

Surface Soil Sampling Log

**END OF SOP**

Final Check by C. Burns 11/3/15

Author: Sarah Johnston
Reviewer: Keith Cowan

# WASTE PILE SAMPLING

## A. PURPOSE/SCOPE:

This SOP reviews general protocol for field screening and sampling waste stock piles of contaminated soils and other mixtures of solid waste with soils. The variable nature of waste materials, site histories, potential contaminants, pile size and shape, etc., necessitates that sampling approaches will differ between projects and requires best engineering judgment. Many of the specifics included in this SOP are written for application to petroleum-contaminated soil sampling; however the main aspects of the approach can be applied to other situations with minor modifications. Standard operating procedure SOP #305, *Hand Auger Sampling*, and SOP #405, *Surface Soil Sampling*, should also be reviewed for general soil sampling techniques.

## B. EQUIPMENT/MATERIALS:

- Shovel or spade
- Disposable scoops or trowel (should not be chrome-plated)
- Hand augers
- Stainless steel mixing bowls
- Sample bottles and coolers
- Ice
- Disposable gloves
- Decontamination supplies (tap water, Alconox®, wash and rinse buckets)
- Survey tape and stakes
- Field note forms
- Soil boring logs (for use with auger).

## C. PROCEDURE:

1. Use a decontaminated spade or shovel to clear the surface soils of any debris or vegetation at the desired sample location.
2. If samples are being taken from the surface, carefully remove and discard the layer that contacted the spade with a disposable scoop and then collect the sample. Note that surface samples are generally not acceptable for VOC sample collection. See SOP #405, *Surface Soil Sampling*.
3. For slightly deeper samples (1 to 2 ft), the spade may be used to access the correct depth. The hole dug should be broad enough to prevent surface soils from spilling into the hole. Collect the sample as described in Step 2 with a disposable scoop. VOC samples should be collected without disturbing the sample matrix.
4. An auger may also be used for sample collection, and may be more efficient for samples taken from relatively deep portions of the pile. A spade or shovel should be used to clear and somewhat level the area to prevent soils from spilling into the auger hole. Use the auger to advance the hole to the desired depth. A second auger can then be used to sample the desired depth. See SOP #305, *Hand Auger Sampling*.
5. Mark all sample locations with stakes.

**WASTE PILE SAMPLING**

D. QA/QC REQUIREMENTS:

Not Applicable

E. SPECIAL CONDITIONS:

None

F. REFERENCES:

New Jersey Department of Environmental Protection (2005): *Field Sampling Procedures Manual*: http://www.nj.gov/dep/srp/guidance/fspm/

New Jersey Department of Environmental Protection Site Remediation Program (1998): *1998 Revised Guidance Document for the Remediation of Contaminated Soils*: http://www.state.nj.us/dep/srp/regs/soilguide/

New York State Department of Environmental Conservation (1992): *Spill Technology and Remediation Series (STARS) Memo #1, Petroleum-Contaminated Soil Guidance Policy*: http://www.dec.ny.gov/regulations/30902.html#Management

New York State Department of Transportation (2007): *Engineering Instruction 07-034, Standard Specifications – Section 205 Contaminated Soil*: https://www.nysdot.gov/portal/pls/portal/mexis_app.pa_ei_eb_admin_app.show_pdf?id=6803

United States Environmental Protection Agency (1994): *Waste Pile Sampling, SOP #2017* http://www.dem.ri.gov/pubs/sops/wmsr2017.pdf

G. APPENDICES/FORMS:

Soil Boring Logs (for use with auger)

**END OF SOP**
Final Check by C. Burns 11/3/15

Author: Matt Renko
Reviewer: Seth Fowler

# SMALL EQUIPMENT DECONTAMINATION

## A. PURPOSE/SCOPE:

Proper decontamination of small equipment prevents cross-contamination of samples, introduction of contaminants to clean sites, and the mixture of incompatible substances. Equipment decontamination also assures the health and safety of all equipment users. Procedures for decontamination procedures vary depending on the matrix sampled, level of contamination, type of contaminants, and the target analytes of the sampling event. The procedure outlined in this SOP is a general procedure for field/ warehouse decontamination of equipment associated with water, soil and other surficial sampling activities.

Decontamination should be performed before sampling work commences and after each sampling event. Decontaminated equipment should be protected from contact with surroundings during storage and transport, and should be handled as little as possible before its use and always with disposable gloves. Note that all waste generated by decontamination procedures including liquids, solids, rags, gloves, etc., will be collected and disposed of properly according to the procedures outlined in SOP #507.

## B. EQUIPMENT/MATERIALS:

- Alconox®
- Tap water
- Distilled and deionized water
- 10% Nitric acid rinse
- Acetone (or other pesticide grade organic solvent)
- 1-Gallon pressure spray bottles
- Long-handled brushes
- 5-Gallon plastic buckets

## C. PROCEDURE:

Note that if it is logistically impractical/ impossible to complete all steps listed below at the field site, Steps 1-4 should be performed prior to transport of equipment to a facility where all steps can be completed if required. All field decontamination should take place over a container and liquids should be properly disposed of.

1. Disassemble equipment as necessary.
2. Remove gross contamination from equipment by scraping, brushing and rinsing with tap water
3. Wash with Alconox® or other laboratory grade detergent to remove all visible particulate matter and residual oils and grease.
4. Rinse with tap water to remove detergent.
5. Rinse with distilled and deionized water.
6. Field personnel will use a new pair of outer gloves before handling sample equipment after it is cleaned.
7. If equipment will not be used immediately, wrap in aluminum foil (unless sampling for metals analysis) or seal in plastic bags (unless sampling for organics analysis) and store.
8. Record the date and method of decontamination on foil/bag and equipment log.

# SMALL EQUIPMENT DECONTAMINATION

## D. QA/QC REQUIREMENTS:

When necessary, field equipment rinsate blanks will be collected by pouring analyte-free water over decontaminated equipment and submitting them to the lab with the other blanks and samples. These blanks are used to assess the quality of equipment decontamination.

## E. SPECIAL CONDITIONS:

Reusable PPE such as respirators, chemical-resistant overboots and gloves shall also undergo the equipment decontamination sequence. See SOP #505 for related information on Personnel decontamination.

If acetone is a known or expected contaminant another solvent may be substituted. Note that methanol cannot be used for decontamination when sampling gasoline or its by-products.

Additional decontamination procedures may be required for particular contaminants or when samples are to be analyzed at very low concentrations. Identify methods as needed but see for example Wilde, 2004.

## F. REFERENCES:

New Jersey Department of Environmental Protection, August 2005. *Field Sampling Procedures Manual*.

USEPA, 1994. Sampling Equipment Decontamination. Environmental Response Team SOP #2006, Revision #0.0. Edison, NJ. http://www.ert.org.

USEPA, 1996. *Environmental Investigations Standard Operating Procedures and Quality Assurance Manual*. Region 4, Science and Ecosystem Support Division. Athens, GA. http://www.epa.gov/region04/sesd/eisopqam/eisopqam.html

Wilde, F.D., ed., 2004. *Cleaning of Equipment for water sampling (ver. 2.0)*: U.S. Geological Survey Techniques of Water-Resources Investigations, book 9, chap. A3, April, accessed January 5, 2009 at http://pubs.water.usgs.gov/twri9A3/

## G. APPENDICES/FORMS:

Not Applicable

**END OF SOP**

Final Check by C. Burns 10/27/15

Author: Matt Renko
Reviewer: John Favreau

# LARGE EQUIPMENT DECONTAMINATION

## A. PURPOSE/SCOPE:

Decontamination of large equipment (drilling rigs, backhoe excavators, bulldozers, etc.) is necessary to prevent cross-contamination between sampling points and to prevent the removal of contaminants from a hazardous waste site.

## B. EQUIPMENT/MATERIALS:

- Steam cleaner
- Generator
- Decontamination pad or supplies to construct a temporary pad
- Centrifugal pump
- Discharge hose
- 55-Gallon drums
- Alconox®
- Hexane
- Potable water source

## C. PROCEDURE:

1. Drilling rigs and excavation equipment and materials should arrive on-site in a clean condition, free of oil, grease, and debris. Inspect rigs for any fluid leaks.
2. Unless otherwise approved, all decontamination of large equipment will take place on a decontamination pad designed to collect all rinsate generated during cleaning. Temporary pads should be lined with a water-impermeable material with no seams, and if possible, constructed on a level, paved surface. Pads should be constructed so as to facilitate the collection of wastewater, with a sump in one corner or side, or with one corner generally lower than others. Where appropriate, side shields should be placed around the decon pad to prevent overspray.
3. Steam clean the drill rig/ excavator, tools, drill bits, buckets, etc. prior to the start of work. Smaller equipment and tools should be elevated on saw horses to avoid any splashing. After steam cleaning, the equipment should be inspected for residues such as machine oil. If residues are observed, the equipment should be steam cleaned until such residues are removed. Steam cleaning procedures can be supplemented with manual scrubbing with Alconox® where necessary to remove contamination.
4. In the event that equipment is contaminated with heavy oils or products that cannot be removed by the standard decontamination procedures outlined above, the following modifications will be made. First, wipe all excess oil/tar from the equipment with a paper towel or clean rag. Second, with a paper towel or clean rag that has been soaked in hexane, wipe any residual contamination off the equipment. When equipment is relatively free of gross oil or tar contamination, proceed with the usual decontamination procedure.
5. At the completion of the project, or when required, all rinsate generated from decontamination activities shall be pumped from the decontamination pad to 55-gallon drums for disposal.

**LARGE EQUIPMENT DECONTAMINATION**

D. QA/QC REQUIREMENTS:

Equipment field blanks may be required depending on job specifics.

E. SPECIAL CONDITIONS:

Not Applicable

F. REFERENCES:

New Jersey Department of Environmental Protection, 2005. *Field Sampling Procedures Manual. August*.

USEPA, 1996. *Environmental Investigations Standard Operating Procedures and Quality Assurance Manual*. Region 4, Science and Ecosystem Support Division. Athens, GA. http://www.epa.gov/region04/sesd/eisopqam/eisopqam.html

G. APPENDICES/FORMS:

Not Applicable

**END OF SOP**
Final Check by C. Burns 10/22/15

Author: Matt Renko
Reviewer: John Favreau

# DECONTAMINATION OF PERSONNEL

## A. PURPOSE/SCOPE:

The objective of decontamination is to prevent the transmission of contaminants to personnel and equipment and to prevent the spread of contaminants off-site. Decontamination is performed as a quality assurance measure and as a safety precaution during sampling. The following SOP outlines general decontamination procedures that apply to personal protection Level C. Projects that necessitate higher levels of protection (Levels B or A) require site-specific decontamination plans as part of the project's Health and Safety Plan.

The decontamination area must be set up before any entry into contaminated areas or the Exclusion Zone. All personnel must undergo decontamination prior to leaving the site. Sites with relatively low contamination levels and no Exclusion Zone activities (Level D PPE) still may require decontamination. At Level D activity sites, decontamination should be provided for the following: washing of boots, or the removal and disposal of boot covers (booties); removal and disposal of disposable coveralls; removal and disposal of outer and inner gloves; and the washing of hands, arms and face prior to leaving the site, or taking any breaks for eating, drinking, etc.

## B. EQUIPMENT/MATERIALS:

- Decontamination pad
- Brushes
- Polyethylene
- Tap water
- Detergent
- Appropriate decontamination solutions
- 55-Gallon drum
- Shallow wash buckets

## C. PROCEDURE:

1. Maximum and minimum decontamination procedures for Level C protection are described in detail in Tables 1 and 2 on the following pages, and the procedure sequence is shown on associated flow-charts.
2. Arrange disposal of all waste generated during decontamination procedures according to guidelines in SOP #507. Check that all reusable PPE has been adequately decontaminated for future use.

## D. QA/QC REQUIREMENTS:

Not Applicable

## E. SPECIAL CONDITIONS:

Note that decontamination procedures will vary between sites depending on contaminants present.

**DECONTAMINATION OF PERSONNEL**

F. REFERENCES:

New Jersey Department of Environmental Protection *Field Sampling Procedures Manual*, August, 2005.

NIOSH, OSHA, USCG, EPA, *Occupational Safety and Health Guidance Manual for Hazardous Waste Site Activities*, DHHS (NIOSH) Publication No. 85-115, October, 1985.

G. APPENDICES/FORMS:

Associated Flow Charts - The following Tables are included:

- Table 1. Maximum Measures for Level C Decontamination and Procedure Sequence
- Table 2. Minimum Measures for Level C Decontamination and Procedure Sequence

**END OF SOP**

Final Check by C. Burns 10/22/15

**DECONTAMINATION OF PERSONNEL**

**Table 1. Maximum Measures for Level C Decontamination**

| | | | | |
|---|---|---|---|---|
| Station | 1: | Segregated Equipment Drop | 1. | Deposit equipment used on site (tools, sampling devices and containers, monitoring instruments, radios, clipboards, etc.) on plastic drop cloths or in different containers with plastic liners. Segregation at the drop reduces the probability of cross contamination. During hot weather operations, a cool down station may be set up within this area. |
| Station | 2: | Boot Cover and Glove Wash | 2. | Scrub outer boot covers and gloves with decon solution or detergent and water. |
| Station | 3: | Boot Cover and Glove Rinse | 3. | Rinse off decon solution from station 2 using copious amounts of water. |
| Station | 4: | Tape Removal | 4. | Remove tape around boots and gloves and deposit in container with plastic liner. |
| Station | 5: | Boot Cover Removal | 5. | Remove boot covers and deposit in containers with plastic liner. |
| Station | 6: | Outer Glove Removal | 6. | Remove outer gloves and deposit in container with plastic liner. |
| Station | 7: | Suit and Boot Wash | 7. | Wash splash suit, gloves, and safety boots. Scrub with long-handle scrub brush and decon solution. |
| Station | 8: | Suit and Boot, and Glove Rinse | 8. | Rinse off decon solution using water. Repeat as many times as necessary. |
| Station | 9: | Canister or Mask Change | 9. | If worker leaves exclusion zone to change canister (or mask), this is the last step in the decontamination procedure. Worker's canister is exchanged, new outer gloves and boot covers donned, and joints taped worker returns to duty. |
| Station | 10: | Safety Boot Removal | 10. | Remove safety boots and deposit in container with plastic liner. |
| Station | 11: | Splash Suit Removal | 11. | With assistance of helper, remove splash suit. Deposit in container with plastic liner. |
| Station | 12: | Inner Glove Rinse | 12. | Wash inner gloves with decon solution. |
| Station | 13: | Inner Glove Wash | 13. | Rinse inner gloves with water. |
| Station | 14: | Face Piece Removal | 14. | Remove face piece. Deposit in container with plastic liner. Avoid touching face with fingers. |

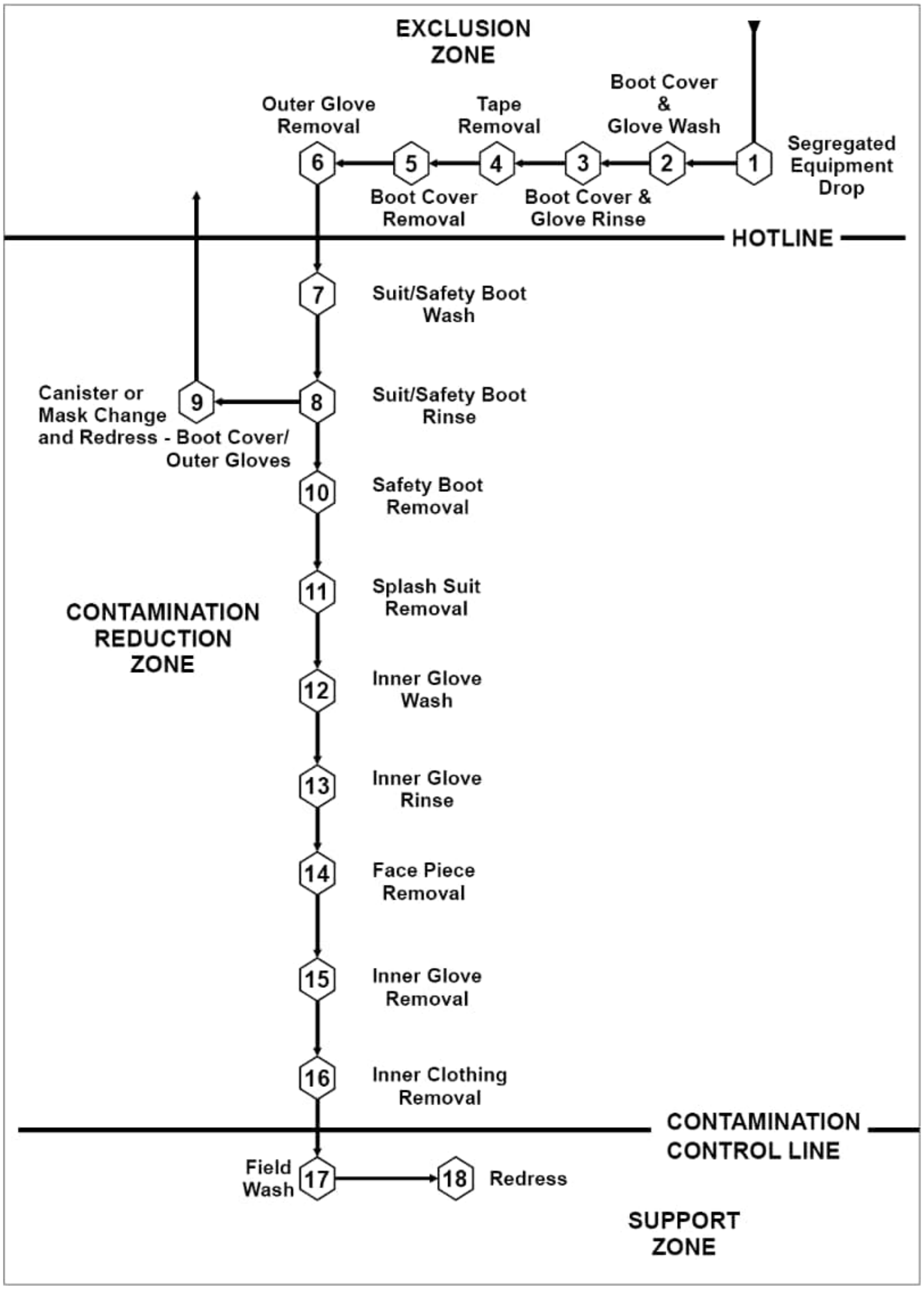
**DECONTAMINATION OF PERSONNEL**

**Table 1. Maximum Measures for Level C Decontamination continued**

| | | | | |
|---|---|---|---|---|
| Station | 15: | Inner Glove Removal | 15. | Remove inner glove and deposit in lined container. |
| Station | 16: | Inner Clothing Removal | 16. | Remove clothing soaked with perspiration and place in lined container. Do not wear inner clothing off-site since there is a possibility that small amounts of contaminants might have been transferred in removing the fully-encapsulating suit. |
| Station | 17: | Field Wash | 17. | Shower if highly toxic, skin-corrosive or skin-absorbable materials are known or suspected to be present. Wash hands and face if shower is not available. |
| Station | 18: | Redress | 18. | Put on clean clothes. |

**DECONTAMINATION OF PERSONNEL**

## Maximum Measures for Level C Decontamination



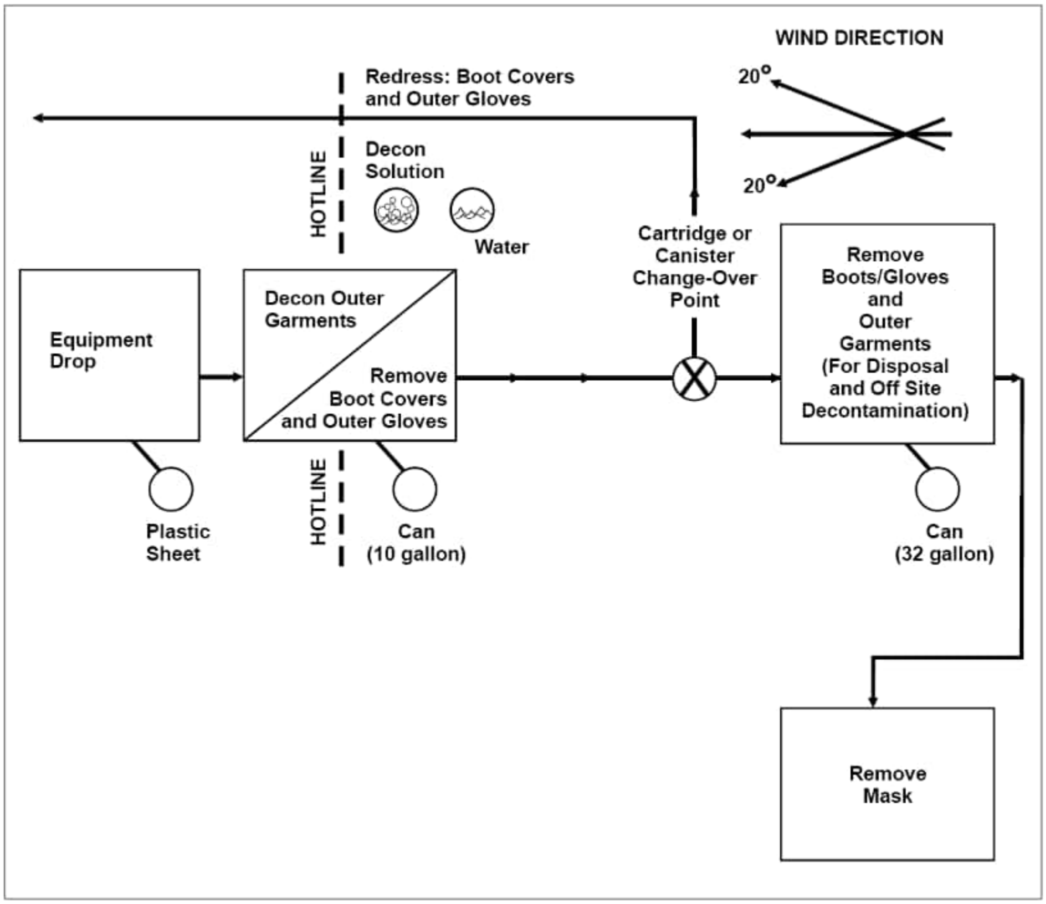
**DECONTAMINATION OF PERSONNEL**

**Table 2. Minimum Measures for Level C Decontamination**

| | | | | |
|---|---|---|---|---|
| Station | 1: | Equipment Drop | 1. | Deposit equipment used on-site (tools, sampling devices and containers, monitoring instruments, radios, clipboards, etc.) on plastic drop cloths. Segregation at the drop reduces the probability of cross contamination. During hot weather operations, a cool down station may be set up within this area. |
| Station | 2: | Outer Garment, Boots, and Gloves Wash and Rinse | 2. | Scrub outer boots, outer gloves and splash suit with decon solution or detergent water. Rinse off using copious amounts of water. |
| Station | 3: | Outer Boot and Glove Removal | 3. | Remove outer boots and gloves. Deposit in container with plastic liner. |
| Station | 4: | Canister or Mask Change | 4. | If worker leaves exclusive zone to change canister (or mask), this is the last step in the decontamination procedure. Worker's canister is exchanged, new outer gloves and boot covers donned, joints taped, and worker returns to duty. |
| Station | 5: | Boot, Gloves and Outer Garment Removal | 5. | Boots, chemical-resistant splash suit, inner gloves removed and deposited in separate containers lined with plastic. |
| Station | 6: | Face Piece Removal | 6. | Facepiece is removed. Avoid touching face with fingers. Facepiece deposited on plastic sheet. |
| Station | 7: | Field Wash | 7. | Hands and face are thoroughly washed. Shower as soon as possible. |

**DECONTAMINATION OF PERSONNEL**

## Minimum Measures for Level C Decontamination



**Author: Meghan Platt, P.E.**
**Reviewer: Scott Smith, P.E.**

# RESIDUALS MANAGEMENT

## A. PURPOSE/SCOPE:

The following standard operating procedure (SOP) presents a description of the methods generally employed for the management of residual waste. Field personnel are responsible for ensuring that state-specific standards/guidelines/regulations are followed, where applicable. In addition, field personnel are responsible for coordination efforts associated with the waste disposal facility, if known.

Improper handling and storage of residual waste can result in leaks and spills and pose a serious threat to the quality of the environment. Timely characterization and disposal of residual wastes shall be conducted in order to not exceed onsite quantity and/or storage regulations.

## B. EQUIPMENT/MATERIALS:

Off-Site transportation and disposal of residual waste will be performed by a licensed waste hauler under the direction of CHA. The company will supply the necessary equipment and materials needed to remove the residual waste from the Site and transport it to an approved waste disposal facility.

The field geologist/engineer will obtain the necessary sample bottles with the associated preservatives, if required, from the analytical laboratory. See SOP #603, Sample Containers, Volumes, Preservations and Holding Times, for additional information on these topics. In addition, if a flame ionization detector (FID), photoionization detector (PID) and/or gas meter will be used to screen waste containers soils for the presence of volatile organic compounds (VOCs).

All other equipment required during transportation/disposal activities is the responsibility of the Contractor (waste hauler).

## C. PROCEDURE:

1. During remedial activities all residual waste, including, but not limited to, soil cuttings, decontamination wash/rinse water, purge water and personal protective equipment (PPE) shall be containerized in United States Department of Transportation (USDOT) approved 55-gallon drums or similar waste containers, unless the Work Plan indicates otherwise. Each drum shall contain similar materials/matrices (e.g., soil, water, PPE).
2. Label each waste container using a permanent marker and weather proof label with the following:
   a. Description of the container contents
   b. Site name and address
   c. Name of Site contact and associated phone number

   Waste container labels shall be legible and easily understood by those unfamiliar with the Site.

3. Upon completion of remedial activities, the field geologist/engineer will conduct waste characterization of the residual waste prior to off-Site transportation and disposal. Depending upon the type of waste present, various waste disposal facilities may have different testing requirements. CHA will complete the required analytical testing. Upon receipt of analytical data and coordination with the disposal facility, the field geologist/engineer will supervise the removal of the waste from the Site.

**RESIDUALS MANAGEMENT**

4. Waste containers shall be transported and stored in a secure location on-Site. All waste containers shall be located in one location, if possible.
5. If waste containers are stored for a period of time prior to collecting waste characterization samples, all waste containers shall be inspected for signs of the potential presence of explosive/flammable gases and/or toxic vapors. These signs include pressurization (bulging/dimples); crystals formed around the drum opening; leaks, holes, stains; labels, marking; composition and type (steel/poly and open/bung); condition, age, rust; and sampling accessibility. Drums showing evidence of pressurization and crystals shall be further assessed to determine proper drum opening techniques.
6. All metal waste containers not in direct contact with the earth shall be grounded.
7. Open the waste container with spark resistant tools (e.g., brass, beryllium).
8. Screen the waste containers for explosive gases and/or toxic vapor with appropriate air monitoring instruments as necessary.
9. Obtain the necessary sample bottles with the associated preservatives, if required, from the analytical laboratory. See SOP #603, Sample Containers, Volumes, Preservations and Holding Times, for information regarding field preservation of sample containers, if necessary.
10. Each matrix (e.g., soil, water) shall be sampled for waste characterization purposes. The field geologist/engineer shall determine the quantity of similar waste characterization samples to be collected from the waste containers in conjunction with the project manager and/or waste disposal facility. Containers with similar wastes (e.g., soil, water) generated from one area of the site may require only one composite sample from each of the waste containers. This determination shall also be made in conjunction with the project manager and/or waste disposal facility.
11. Use a decontaminated spade or shovel to collect representative solid waste samples from each waste container or use a beaker, bailer or similar mechanism to collect representative liquid waste samples from each waste container.
12. Immediately place sample in the pre-preserved sample containers and close the waste container(s).
13. Chill all samples to 4$^{o}$C from sample collection until laboratory analysis.
14. Package and ship samples per SOP #607.

D. <u>QA/QC REQUIREMENTS:</u>

This section includes QA/QC requirements associated with tank closure activities. The following general requirements apply to this SOP:

1. All data must be documented on field data sheets or within site logbooks.
2. All instrumentation must be operated in accordance with operating instructions as supplied by the manufacturer, unless otherwise specified in the work plan.
3. Equipment checkout and calibration activities must occur prior to sampling/operation, and must be documented.

## RESIDUALS MANAGEMENT

E. SPECIAL CONDITIONS:

In no case, will CHA be considered the generator of the waste. The site owner shall always take responsibility for waste disposal. Additionally, CHA may only act as agent for the owner relative to signing manifests with specific permission from CHA's in-house counsel. In most every case, the owner should sign waste manifests.

F. REFERENCES:

United States Environmental Protection Agency, Science and Ecosystem Support Division, Waste Sampling Standard Operating Procedure: http://www.epa.gov/region4/sesd/fbqstp/Waste-Sampling.pdf

G. APPENDICES/FORMS:

Not Applicable

**END OF SOP**

Final Check by C. Burns 10/26/15

**Author: Meghan Platt, P.E.**
**Reviewer: Scott Smith, P.E.**

# SAMPLE CONTAINERS, VOLUMES, PRESERVATIONS AND HOLDING TIMES

A. PURPOSE/SCOPE:

The following standard operating procedure (SOP) presents general guidelines for sample containers, volumes, preservations and holding times associated with air, water and soil/sediment samples. Field personnel are responsible for ensuring that state-specific standards/guidelines/regulations are followed, where applicable.

Improper preserving, storing and handling of air, water and soil/sediment samples are critical if the integrity of the samples are to be maintained. Samples collected in the field may undergo biological, chemical or physical changes following removal from their environment. In order to minimize those changes, many samples must have preservatives in the form of strong acids or bases added prior to delivery to the laboratory. If samples are to be collected as part of a government program, the governing agency typically must be notified 30 days prior to sample collection.

B. EQUIPMENT/MATERIALS:

Pre-cleaned sample containers along with associated preservations within the sample containers will be provided to CHA from the analytical laboratory. The field geologist/engineer will provide the necessary personal protective equipment to place samples collected within the appropriate sample containers per SOPs 300 through 417. However, if field preservation is required the following equipment and materials shall be obtained:

- Hydrochloric (HCl) Acid Reagent A.S.C. 38%
- Nitric (HNO3) Acid Reagent A.S.C. 71%
- Sodium Hydroxide (NaOH) 97%
- 10 mL glass pipettes
- Narrow range (0-3 and 12-14) pH paper
- Nitrile gloves

C. PROCEDURE:

1. Review Table 1 which details typical parameters of interest at environmental sites and the associated methods, preservation, container type, holding time and required sample volume.
2. Obtain pre-cleaned and pre-preserved sample containers from the laboratory. If pre-preserved sample containers were provided skip to Step 7; if not proceed to Step 3.
3. Put on a clean pair of nitrile gloves.
4. In a clean, non-dusty environment, remove the cap of the sample container.
5. Using a clean, 10 mL glass pipette draw the required amount of acid or base and insert into the sample container.
6. Volatile Organic Compounds – 2 mL of HCl acid (water samples).
7. Total and Dissolved Metals (including mercury) – 5 mL Nitric acid (water samples).
8. Cyanide – 15-20 Sodium Hydroxide pellets (water samples).

**SAMPLE CONTAINERS, VOLUMES, PRESERVATIONS AND HOLDING TIMES**

9. Chemical Oxygen Demand, Oil and Grease, Organic Carbon, Phenolics, Total Dissolved Phosphorous, Hydrolyzable Phosphorus, Ammonia, Nitrate and Nitrite – 5 mL Sulfuric acid (water samples).
10. Immediately replace and tighten the sample container cap.
11. Collect sample using equipment and procedures outlined in other SOPs as appropriate. The volume of the sample collected shall be sufficient to conduct the analysis required, as well as associated quality assurance/quality control samples (QA/QC). QA/QC samples shall be collected in accordance with SOP 605.
12. Place samples immediately in the pre-preserved sample containers.
13. Chill all samples to 4ºC from sample collection until laboratory analysis.
14. Package and ship samples per SOP #607.

D. QA/QC REQUIREMENTS:

This section includes QA/QC requirements associated with sample containers, volumes, preservations, and holding times. The following general requirements apply to this SOP:

1. All data must be documented on field data sheets or within site logbooks.
2. All instrumentation must be operated in accordance with operating instructions as supplied by the manufacturer, unless otherwise specified in the work plan.
3. Equipment checkout and calibration activities must occur prior to sampling/operation, and must be documented.
4. QA/QC samples shall be collected in accordance with SOP 605.

The following procedure shall be conducted to provide a QA/QC check of water (aqueous) samples to ensure the samples were preserved to the proper pH prior to shipping for laboratory analysis.

Volatile Organic Compounds:

1. Collect one additional VOA vial at every third aqueous sampling location.
2. Fill the extra vial with the sample.
3. Using the extra VOA vial, remove the cap and using a clean, 10 mL glass pipette extract approximately 1 mL of water.
4. Place two drops of the water on a 1-inch strip of 0-3 range pH paper.
5. Compare pH strip's color while wet with that of the color key included on the pH paper container.
6. If pH is not less than 2, add additional HCL to the remaining 3 VOA vials prior to collecting the sample.
7. Discard the vial used to check the pH.

**SAMPLE CONTAINERS, VOLUMES, PRESERVATIONS AND HOLDING TIMES**

Total and Dissolved Metals, Mercury, Ammonia, Nitrate plus Nitrite, Total Dissolved Phosphorus, COD, Oil & Grease, Organic Carbon, Phenolics

1. Collect sample and tightly reseal the cap.
2. Agitate the sample by gently shaking the sample bottle to mix the acid and water.
3. Remove the cap and using a clean, 10 mL glass pipette extract approximately 1 mL of sample.
4. Place approximately two drops of sample on a 1 inch strip of 0-3 range pH paper.
5. Compare pH strip's color while wet with that of the color key included on the pH paper container.
6. If pH is not less than 2, add appropriate additional Sulfuric Acid to the sample using a clean pipette.
7. Recheck sample using steps 2 through 6 until sample pH is less than 2.

Cyanide

1. Collect sample and tightly reseal the cap.
2. Agitate the sample by gently shaking the sample bottle until the NaOH pellets are dissolved.
3. Remove the cap and using a clean 10 mL glass pipette extract approximately 1 mL of sample.
4. Place approximately two drops of sample on a 1-inch strip of 12-14 range pH paper.
5. Compare pH strip's color while wet with that of the color key included on the pH paper container.
6. If pH is not greater than 12, add additional NaOH to the sample using standard procedures.
7. Recheck sample using steps 2 through 6 until sample pH is greater than 12.

E. SPECIAL CONDITIONS:

Not Applicable

F. REFERENCES:

Alpha Analytical Aqueous and Soil/Solid Reference Guides.

G. APPENDICES/FORMS:

Table 1 Laboratory Analysis: Summarizing parameters, methods, preservations, container type, holding times and minimum sample volumes are included as an attachment to this SOP.

**END OF SOP**

Final Check by C. Burns 10/27/15

| Laboratory Analysis | EPA Method | Standard Method and/or SW846 Method | Preservation | Container | Holding Time | Minimum Volume |
|---|---|---|---|---|---|---|
| WATER | | | | | | |
| Acid Soluble & Insoluble Sulfide | ----- | 9030B | Cool to 4 deg C No Headspace | P or G | 7 Days | 8 oz. |
| Acidity as CaCO3 | 305.1 | 2310B | Cool to 4 deg C | P or G | 14 Days | 100 mL |
| Alkalinity | ----- | 2320B | Cool to 4 deg C | P or G | 14 Days | 100 mL |
| Alkalinity as CaCO3 | 310.1 | 2320B | Cool to 4 deg C | P or G | 14 Days | 100 mL |
| Ammonia | 350.2/.3 | 4500-NH3 B,E | Cool to 4 deg C, H2SO4 to pH<2 | P or G | 28 Days | 400 mL |
| Aromatic<br>Hydrocarbons | 602 | 8021B | 1:1 HCl to pH <2, Cool to 4 deg C<br>0.008% Na2S2O3 if residual chlorine present | G, Vial screw cap with center hole<br>Teflon- faced silicone septum | 14 Days | 40 mL |
| Biochemical Oxygen Demand | 405.1 | 5210B | Cool to 4 deg C | P or G | 48 Hrs. | 500 mL |
| Bromide | 300 | ----- | None | P or G | 28 Days | 250 mL |
| Calcium | ----- | 3120B | HNO3 to pH<2 | P or G | 6 Months | 100 mL |
| Calcium- Hardness | 200.7 | 3111B | HNO3 to pH<2 | P or G | 6 Months | 100 mL |
| Carbamates | 531.1 | ----- | Cool to 4 deg C, 0.08% Na2S2O3 if residual chlorine present | G, screw cap Teflon faced silicone septum | 14 Days | 100 mL mL |
| Carbonaceous BOD | ----- | 5210B | Cool to 4 deg C | P or G | 48 Hrs. | 1000 mL |
| Chloride | 300 | 4500-CL D<br>4110 | Cool to 4 deg C | P or G | 28 Days | 100 mL |
| Chloride, Residual Disinfectant | ----- | 4500Cl-G | Cool to 4 deg C | P or G | Analyze Immediately | 200 mL |
| COD | 410.4 | 5220D | H2S04 to pH<2, Cool to 4 deg C | P | 28 days | 250 mL |
| Color | ----- | 2120B | Cool to 4 deg C | P or G | 24 Hrs | 100 mL |
| Conductivity | ----- | 2510B | Cool to 4 deg C | P or G | 28 Days | 100 mL |
| Cyanide | 335.4 | 4500-CN C&E | Cool to 4 deg C NaOH pH>12 | P or G | 14 Days | 250 mL |
| Cyanide | 335.2 | 9010B, 9012A, 9014 | Cool to 4 deg C, NaOH to pH>12<br>0.6 g ascorbic acid if residual chlorine present | P or G | Sulfide absent, 14 days; sulfide present 24 Hrs | 250 mL |
| Cyanide, Amenable | 335.1 | | | | | |
| Dioxin | ----- | 8280A | Cool to 4 deg C<br>0.008% Na2S2O3 if residual chlorine present | G, Amber Teflon-lined screw cap | 7 days until extraction 40 days after extraction | 1000 mL |
| DRO | ----- | 8015B | Cool to 4 deg C<br>0.008% Na2S2O3 if residual chlorine present | G, Amber Teflon-lined screw cap | 7 days until extraction 40 days after extraction | 1000 mL |
| Escherichia Coli | ----- | 9222B | 0.008% Na2S203 if residual chlorine present<br>0.3 mL/125 mL<br>15% EDTA if ><br>0.01 mg/L heavy metals | Sterile<br>P or G | 30 Hrs. for Drinking Water<br>6 Hrs. for Waste Water | 125 mL |
| Extractable Org. Compounds | | | Cool to 4 deg C, Store in dark | G, Amber Teflon-lined screw cap | *7 days | 4000 mL |

| Laboratory Analysis | EPA Method | Standard Method and/or SW846 Method | Preservation | Container | Holding Time | Minimum Volume |
|---|---|---|---|---|---|---|
| Fecal Coliform | ----- | 9222B or D | 0.008% Na2S203 if residual chlorine present<br>0.3 mL/125 mL<br>15% EDTA if ><br>0.01 mg/L heavy metals | Sterile<br>P or G | 30 Hrs. for Drinking Water<br>6 Hrs. for Waste Water | 125 mL |
| Fecal<br>Streptococci | ----- | 9230C | Cool to 4 deg C<br>0.008% Na2S2O3 if residual chlorine present | Sterile<br>P or G | 30 Hrs. for Drinking Water<br>6 Hrs. for Waste Water | 125 mL |
| Fluoride | 300 | 4500 F-B,C S | Cool to 4 deg C | P or G | 28 Days | 300 mL |
| Foaming Agents (MBAS) | ----- | 5540C | Cool to 4 deg C | P or G | 48 Hrs | 250 mL |
| Gases | ----- | 3810 | Cool to 4 deg C<br>0.008% Na2S2O3 if residual chlorine present<br>1:1 HCl to pH <2 | G, Vial screw cap with center hole Teflon- faced silicone septum | 7 days without HCl<br>14 days with HCl | 40 mL |
| GRO | ----- | 8015B | 1:1 HCl to pH <2, Cool to 4 deg C<br>0.008% Na2S2O3 if residual chlorine present | G, Vial screw cap with center hole Teflon- faced silicone septum | 7 days w/o HCl<br>14 days w/HCl | 40 mL |
| Hardness | | | HNO3 to pH<2 | P | 6 months | 1000 mL |
| Heterotrophic<br>Plate Count | ----- | 9215B | Cool to 4 deg C<br>0.008% Na2S2O3 if residual chlorine present | Sterile<br>P or G | 30 Hrs. for Drinking Water<br>6 Hrs. for Waste Water | 125 mL |
| Hexavalent Chromium | 7196A | 3500Cr-D | Cool to 4 deg C | P | 24 hours | 500 mL |
| HPLC (Explosive) | ------ | 8330 | Cool to 4 deg C | G, Amber Teflon-lined screw cap | 7 days until extraction 40 days after extraction | 1000mL |
| HPLC (Explosive) | ------ | 8310 | Cool to 4 deg C | G, Amber Teflon-lined screw cap | | 1000mL |
| Mercury | ----- | 7470A | Cool to 4 deg C | P or G | 28 Days | 8 oz. |
| Metals | 200.7 | ----- | HNO3 to pH<2 | P | 6 Months | 100 mL |
| Nitrate | 300 | ----- | Cool to 4 deg C | P or G | 48 Hrs. | 100 mL |
| Nitrate (Chlorinated) | 353.2 | 4500-NO3 F | Cool to 4 deg C | P or G | 48 Hrs | 250 mL |
| Nitrate (Non- chlorinated) | 353.2 | 4500-NO3 F | H2SO4 to pH<2, Cool to 4 deg C | P or G | 14 Days | 250 mL |
| Nitrite | 300,<br>353.2,<br>354.1 | 4500-NO3 D | Cool to 4 deg C | P or G | 48 Hrs | 100 mL |
| Odor | ----- | 2150B | Cool to 4 deg C | G only | 24 Hrs | 200 mL |
| Oil and Grease | | 1664 | HCl to pH<2, Cool to 4 deg C | G, Amber Teflon-lined screw cap | 28 days | 1000 mL |
| Organic Nitrogen | 351.1 | ----- | Cool to 4 deg C, H2SO4 to pH<2 | G | 28 Days | 500 mL |

| Laboratory Analysis | EPA Method | Standard Method and/or SW846 Method | Preservation | Container | Holding Time | Minimum Volume |
|---|---|---|---|---|---|---|
| Organochlorine Pesticides/PCB | 608 | 8081A,8082 | Cool to 4 deg C 0.008% Na2S2O3 if residual chlorine present If aldrin is to be determined bind to pH 5-9. | G, Amber Teflon-lined screw cap | 7 days until extraction 40 days after extraction | 1000 mL |
| Ortho Phosphate | 300 | 4500 P-E | Cool to 4 deg C | P or G | 48 Hrs | 50 mL |
| Orthophosphate | 365.2 | ----- | Filter immediately, Cool to 4 deg C | P or G | 48 Hrs. | 50 mL |
| PFAS/PFCs | 1633.0 | | Cool to 4 deg C | P - HDPE only with no teflon liner | 28 Days | 2(250 mL) |
| pH, Hydrogen ion | ----- | 4500-H-B | Cool to 4 deg C | P or G | Analyze Immediately | 25 mL |
| Phenols | 420.1 | 9065, 510ABC | Cool to 4 deg C, H2SO4 to pH<2 | G | 28 Days | 500 mL |
| Pseudomanas Aeruginosa | ----- | 9213E | Cool to 4 deg C 0.008% Na2S2O3 if residual chlorine present | Sterile P or G | 30 Hrs. for Drinking Water 6 Hrs. for Waste Water | 125 mL |
| Purgeable Halocarbons | 601 | 8021B | Cool to 4 deg C 0.008% Na2S2O3 if residual chlorine present | G, Vial screw cap with center hole Teflon- faced silicone septum | 14 Days | 40 mL |
| Radiological | ----- | ----- | HNO3 to pH<2 | P or G | 6 Months | 100 mL |
| Residue- Settleable (SS) | 160.5 | ----- | Cool to 4 deg C | P or G | 48 Hrs. | 1000 mL |
| Residue-filtered (TDS) | 160.1 | ----- | Cool to 4 deg C | P or G | 7 Days | 100 mL |
| Residue-non- filtered (TSS) | 160.2 | ----- | Cool to 4 deg C | P or G | 7 Days | 100 mL |
| Residue-Total Volatile Solids | 160.4 | 2540 E | Cool to 4 deg C | P or G | 7 Days | 100 mL |
| Salinity | ----- | 2520 C | Cool to 4 deg C | G | 28 Days | 100 mL |
| Semivolatile Organic Compounds (Unregulated) | 525.2 | ----- | If residual chlorine is present, add 40-50 mg Sodium Thiosulfate. If not chlorinated, add 6N HCl to pH<2 Cool to 4 deg C | G, Amber Teflon-lined screw cap | 7 Days for extraction, 30 after extraction | 1000 mL |
| Semivolatile Organics | 625 | 8270C | Cool to 4 deg C 0.008% Na2S2O3 if residual chlorine present | G, Amber Teflon-lined screw cap | 7 days for extraction 40 days after extraction | 1000 mL |
| Silica | 200.7 | ----- | Cool to 4 deg C | P only | 7 Days | 50 mL |
| Specific Conductance | 120.1 | ----- | Cool to 4 deg C | P or G | 28 Days | 100 mL |
| Sulfate | 300 | 4500-SO4 | Cool to 4 deg C | P or G | 28 Days | 50 mL |
| Sulfate | 375.4 | ----- | Cool to 4 deg C | P or G | 28 Days | 50 mL |
| Sulfide | 376.2 | 9030 B, 4500S2-AD | Cool to 4 deg C, add zinc plus NaOH to pH>9 | P or G | 7 Days | 50 mL |
| Sulfite (SO3) | 377.1 | ----- | None Required | G, Bottle and Top | Analyze immediately | 50 mL |
| Surfactants (MBAS) | 425.1 | ----- | Cool to 4 deg C | P or G | 48 Hrs. | 250 mL |
| TDS | | | Cool to 4 deg C | P | 7 days | 500 mL |

| Laboratory Analysis | EPA Method | Standard Method and/or SW846 Method | Preservation | Container | Holding Time | Minimum Volume |
|---|---|---|---|---|---|---|
| Temperature | ----- | 2550B | None | P or G | Analyze Immediately | 1000 mL |
| Temperature | 170.1 | ----- | None Required | G, Bottle and Top | Analyze immediately | 1000 mL |
| Total Kjeldahl Nitrogen | 353.3/.1 | 4500Norg-C | H2S04 to pH<2 , Cool to 4 deg C | P | 28 days | 250 mL |
| Total Coliform | ----- | 9221D | 0.008% Na2S203 if residual chlorine present 0.3 mL/125 mL 15% EDTA if > 0.01 mg/L heavy metals | Sterile P or G | 30 Hrs. for Drinking Water 6 Hrs. for Waste Water | 125 mL |
| Total Dissolved Solids | 160.1 | 2540C | Cool to 4 deg C | P or G | 7 Days | 100 mL |
| Total Hardness | 130.2 , 200.7 | ----- | HNO3 to pH<2 H2SO4 to pH<2 | P or G | 6 Months | 100 mL |
| Total Kjeldahl Nitrogen | 351.3 | ----- | H2SO4 to pH<2 | P or G | 28 Days | 500 mL |
| Total Metals | 200.7 200.8 | 6010B, 6020, 7000A | HNO3 to pH<2 | P | 6 months (Hg 28 days) | 500 mL |
| Total Organic Carbon (TOC) | 415.1 | 9060, 5310C | H2SO4 to pH<2, Cool to 4 deg C | G, Amber Teflon-lined screw cap | 28 days | 80 mL |
| Total Organic Halides | | 5320B | 1N H2SO4 to pH<2 | P or G | 28 Days | 50 mL |
| Total Phosphorus | 365.2 | ----- | Cool to 4 deg C, H2SO4 to pH<2 | G | 28 Days | 50 mL |
| Total Recoverable Oil & Grease | 413.1,1664A | ----- | Cool to 4 deg C, HCL or H2SO4 to pH<2 | G | Petroleum Based 3 Days; Non-Petroleum Based 24 hours | 1000 mL |
| Total-Residue (TS) | 160.3 | 2540B | Cool to 4 deg C | P or G | 7 Days | 100 mL |
| Turbidity | 180.1 | 2130B | Cool to 4 deg C | P or G | 48 Hrs | 100 mL |
| Volatile Organics | 624 | 8260B | 1:1 HCl to pH <2, Cool to 4 deg C 0.008% Na2S2O3 if residual chlorine present | G, Vial screw cap with center hole Teflon-faced silicone septum | 7 days w/o HCl 14 days w/HCl | 40 mL |
| Volatiles (Regulated) | 524.2 | ----- | Cool to 4 deg C HCl to pH<2 | G, Vial screw cap with center hole Teflon-faced silicone septum | 14 Days | 60-120 mL |
| SOIL | | | | | | |
| Acid Soluble & Insoluble Sulfide | ----- | 9030B | Cool to 4 deg C, no headspace | P or G | 7 Days | 8 oz. |
| Amenable Cyanide | ----- | 9213 | Cool to 4 deg C | P or G | 14 Days | 4 oz. |
| Bromide | ----- | 9211 | Cool to 4 deg C | P or G | 28 Days | 8 oz. |
| Cation - Exchange Capacity | ----- | 9080, 9081 | None | P | ----- | 8 oz. |
| Chloride | ----- | 9212, 9056, 9253 | None | P or G | 28 Days | 8 oz. |
| Chlorinated Herbicides | ----- | 8151A | Cool to 4 deg C | G, wide mouth, teflon liner | 14 Days | 8 oz. |
| Corrosivity pH Waste>20% water | ----- | 9040B | Cool to 4 deg C | P | Analyze Immediately | 4 oz. |
| Corrosivity Toward Steel | ----- | 1110 | Cool to 4 deg C | P | 14 Days | 4 oz. |

| Laboratory Analysis | EPA Method | Standard Method and/or SW846 Method | Preservation | Container | Holding Time | Minimum Volume |
|---|---|---|---|---|---|---|
| Cyanide | | 9010B, 4500CN | Cool to 4 deg C | G, Amber | 14 Days | 4 oz |
| Dioxin | ----- | 8280A | Cool to 4 deg C | G | 14 Days | 8 oz. |
| DRO | ----- | 8015B | Cool to 4 deg C | G, Amber | 14 Days | 4 oz. |
| Extractable Organic Compounds | | | Cool to 4 deg C, Store in dark | G | 14 days | 8 oz |
| Extractable Sulfide | ----- | 9031 | Cool to 4 deg C, fill top of sample with 2N Zinc Acetate until moistened | P or G | 7 Days | 8 oz. |
| Fluoride | ----- | 9214 | None | P | 28 Days | 8 oz. |
| Gases | ----- | 3810 | Cool to 4 deg C | G, Amber | 14 Days | 8 oz. |
| Grain Size | | | N/A | G | N/A | 8 oz |
| GRO | ----- | 8015B | Cool to 4 deg C, check state regulations for proper preservative. NJ (methanol), PA (encore samplers) NY (cool to 4 deg C). | G, Amber VOA vial | 14 Days | 15 Grams |
| HPLC (PAH) | ------ | 8310 | Cool to 4 deg C | G, Amber Teflon-lined screw cap | 14 days until extraction 40 days after extraction | 4 oz. |
| Ignitability | ----- | 1010 | None | P or G | None | 8 oz. |
| Ignitability of Solids | | 1030 | None | P or G | None | 8 oz. |
| Mercury | 245.1 | 7471A | Cool to 4 deg C | G, Amber | 28 Days | 4 oz. |
| Metals | ----- | 6010B, 6020, 7000A | Cool to 4 deg C | G, Amber | 6 Months | 8 oz. |
| Moisture Content | | | Store in airtight jar 3-30 deg C | G | N/A | 8 oz |
| Nitrate | ----- | 9210 | Cool to 4 deg C | P or G | 48 Hrs | 8 oz. |
| Oil & Grease (Sludge, Sludge- Hem) | ----- | 9071B | Cool to 4 deg C | G | 28 Days | 8 oz. |
| Organochlorine | ----- | 8081A | Cool to 4 deg C | P or G | 14 Days | 8 oz. |
| Paint Filter Liquids Test | ----- | 9095A | Cool to 4 deg C | P or G | ----- | 8 oz. |
| PCBs | ----- | 8082 | Cool to 4 deg C | G, Amber Teflon-lined screw cap | 14 Days | 4 oz. |
| PFAS/PFCs | 1633 | ----- | Cool to 4 deg C | HDPE w/o lined cap | 28 days | 8 oz. |
| pH | ----- | 9045C | Cool to 4 deg C | G, Amber | Analyze Immediately | 4 oz. |
| pH, Soil and Waste | ----- | 9045A | Cool to 4 deg C | G | Analyze Immediately | 8 oz. |
| Phenol | ----- | 9065, 9066, 9067 | Cool to 4 deg C | G, Amber | 28 Days | 4 oz. |
| Radiological | ----- | ----- | Cool to 4 deg C | G | 6 Months | 8 oz. |
| Reactivity Cyanide | ----- | SW-846 7.3.3.2 | Cool to 4 deg C | P | 14 Days | 8 oz. |
| Reactivity Sulfide | ----- | SW-846 7.3.4.2 | Cool to 4 deg C | P | 14 Days | 8 oz. |
| Semivolatile Organics | ----- | 8270C | Cool to 4 deg C | G, Amber | 14 Days | 8 oz. |
| Sulfate | ----- | 9035, 9036, 9038 | Cool to 4 deg C | P or G | 28 Days | 8 oz. |

| Laboratory Analysis | EPA Method | Standard Method and/or SW846 Method | Preservation | Container | Holding Time | Minimum Volume |
|---|---|---|---|---|---|---|
| Sulfides | ----- | 9215 | Cool to 4 deg C | P or G | 7 Days | 8 oz. |
| TCLP Metals | ----- | 1311, 6010B, 6020, 7000A, 7470A | Cool to 4 deg C | G, Amber | 180 Days (Hg 28 days) | 8 oz |
| TCLP Herbicides | ----- | 1311 | Cool to 4 deg C | G, Amber | 14 Days | 8 oz. |
| TCLP Pesticides | ----- | 1311 | Cool to 4 deg C | G, Amber | 14 Days | 8 oz. |
| TCLP Semivolatile Organics | ----- | 1311, 8270C, 8081A, 8151A | Cool to 4 deg C | G, Amber Teflon Lined | 14 Days | 8 oz. |
| TCLP Volatile Organics | ----- | 1311, 8260B | Cool to 4 deg C | G, Amber VOA Vial Teflon Lined | 14 Days | 8 oz. |
| Temperature | ----- | 2550 | ----- | P | Analyze Immediately | 4 oz. |
| TOC | | Lloyd Kahn Method | Cool to 4 deg C | G, Amber | 14 days | 4 oz. |
| Total Coliform | ----- | 9131 | Cool to 4 deg C | Sterile, P or G | 6 Hrs | 4 oz. |
| Total Coliform | ----- | 9132 | Cool to 4 deg C | Sterile, P or G | 6 Hrs | 4 oz. |
| Total Cyanide | ----- | 9013 | Cool to 4 deg C | P or G | 14 Days | 8 oz. |
| Volatile Organic Compounds | ----- | 8260B | Cool to 4 deg C Check individual state regulations for proper preservative. NJ (methanol), PA (encore samplers), NY (cool to 4 deg C) | G, wide mouth, teflon liner | 14 Days | 4 oz. |
| Volatile Organic Compounds | ----- | 8021 | | G, wide mouth, teflon liner | 14 Days | 4 oz. |
| CLP Sampling and Holding Time Information | | | | | | |
| Cyanide (aqueous) | ILM04.1 | | NaOH to pH>12, Cool to 4 deg C | P | 12 Days VTSR | 1000ml |
| Cyanide** | ILM04.1 | | Cool to 4 deg C | G | | 8 oz |
| Mercury (aqueous) | ILM04.1 | | HNO3 to pH<2, Cool to 4 deg C | P | 26 Days VTSR | 1000ml |
| Mercury (solid/soils) | ILM04.1 | | Cool to 4 deg C | G | | 8 oz |
| Metals (aqueous) | ILM04.1 | | HNO3 to pH<2, Cool to 4 deg C | P | 180 Days VTSR | 1000ml |
| Metals (solid/soils) | ILM04.1 | | Cool to 4 deg C | G | | 8 oz |
| PCBs (aqueous) | OLM04.2 | | Na2S203, Cool to 4 deg C | G | See Note 7 | 1000ml |
| PCBs (solid/soils) | OLM04.2 | | Cool to 4 deg C | G | See Note 6 | 8 oz |
| Pesticides (aqueous) | OLM04.2 | | Na2S203, Cool to 4 deg C | G | See Note 7 | 1000ml |
| Pesticides (solid/soils) | OLM04.2 | | Cool to 4 deg C | G | See Note 6 | 8 oz |
| Semivolatile Organic Compounds (aqueous) | OMLO4.2 | | Cool to 4 deg C | G | See Note 8 | 1000ml |
| Semivolatile Organic Compounds (solid/soils) | OLM04.2 | | Cool to 4 deg C | G | See Note 6 | 8 oz |
| Volatile Organic Compounds (aqueous) | OLM04.2 | | HCL pH < 2, Cool to 4 deg C | G | W/preservative: 10 days VTSR; W/O: 7 days VTSR | 40ml |
| Volatile Organic Compounds (solid/soils) | OLM04.2 | | Cool to 4 deg C | G | 10 Days VTSR | 4 oz |

| Laboratory Analysis | EPA Method | Standard Method and/or SW846 Method | Preservation | Container | Holding Time | Minimum Volume |
|---|---|---|---|---|---|---|

Notes:

1. P - Plastic.
2. G - Glass.
3. Minimum volume is the minimum volume required by the laboratory to conduct the analysis. The laboratory will likely require additional sample volume.
4. * Extraction within seven (7) days of collection; analysis within 40 days of extraction.
5. **When chlorine is present ascorbic acid is used to remove the interference (0.6 g ascorbic acid).
6. VTSR - Validated time of sample receipt.
7. Ten (10) days from VTSR for extraction and 40 days following extraction.
8. Five (5) days from VTSR for extration 14 days after extraction.
9. Five (5) days from VTSR for extraction 40 days after extraction.
10. Holding times are from the time of sample collection unless otherwise noted.

**Author: Will Pierce**
**Reviewer: Chris Burns**

# QUALITY ASSURANCE/QUALITY CONTROL SAMPLES

A. PURPOSE/SCOPE:

This standard operating procedure explains the purpose and correct usage of Quality Assurance/Quality Control (QA/QC) samples. QA/QC samples are intended to validate the results of sample analysis by providing the means to determine the influence of outside factors on the sample and analysis. There are several types of QA/QC samples in use to ensure the best practices are being followed by both the laboratory preforming the analysis and the sampling team in the field. This is a general procedure for the use of QA/QC samples. Also refer to any guidelines provided by the laboratory.

B. EQUIPMENT/MATERIALS:

QA/QC samples require the following materials:

- Sample containers:
  They should be the same containers in number and type of preservative as the containers for the samples for which QA/QC samples are being taken.
- Analyte-free water
- Any laboratory supplied QA/QC materials.

C. PROCEDURE:

The following are types of QA/QC samples.

1. Duplicate Sample

A duplicate sample is a sample that is collected concurrently with the routine samples. It consists of an additional set of sample containers to be analyzed for the same parameters as the routine samples. It is taken at a sample point of the samplers choosing and at the same time as the routine sample for that sample point is taken. It is labeled and included on the Chain of Custody (COC) Form (see SOP 105) with a name unknown to the laboratory.

**Example:**

- Sample Point ID is **MW-1**
- Duplicate Sample ID is **CHA-1**

The duplicate sample is submitted as a 'blind' sample to the laboratory. The purpose of a duplicate sample is to allow the sampler to determine the precision of laboratory analysis. The results of the duplicate sample are compared with the results of the concurrent routine sample by the sampler. These results should be within the margin of error for the test being performed.

One duplicate sample should be taken for every twenty (20) routine samples. For example if 16 samples points were sampled, there would be 1 duplicate sample taken at one of the sample points for a total of 17 sample sets submitted to the lab.

2. Field Blank

The Field Blank sample is a type of QA/QC sample used to account for possible external contamination of the routine samples, usually by exposure to the air from being on site. It consists of an additional set of sample containers to be analyzed for the same parameters as the routine samples. It is common to only conduct a Field Blank for volatile organic compound (VOC) parameters even when sampling to additional parameters. This is because VOCs are more likely to be present in the atmosphere at the site then a parameter like metals. However a Field Blank can be conducted for any parameter.

The containers are prepared prior to sampling by filling the containers with analyte-free water. The containers are then transported with the routine sample containers to the site. Once at the site the containers are placed in a location representative of the site conditions and their caps are removed. At the end of the sampling event the caps are then replaced. The sample is labeled and included on the COC as **Field Blank** or **FB**.

If any results are positive for the Field Blank it can be assumed that the routine samples have also been exposed to a similar amount of contaminant and that contaminant is probably present in the atmosphere at the site.

One Field Blank should be taken as required for each day of sampling at the site. They are only used for the collection of aqueous samples.

3. Equipment Blank

An Equipment Blank is a QA/QC sample designed to measure the effectiveness of the decontamination of field equipment. It consists of an additional set of sample containers being analyzed for the same parameters as the routine samples.

An Equipment Blank is collected by pouring analyte-free water directly over/on/into the decontaminated sampling equipment coming into contact with the samples being collected. The water is then collected in the sample containers. Once the containers are filled they are capped and sent to the lab with the other routine samples. The sample is labeled and included on the COC as **Equipment Blank** or **EQ Blank**.

A positive result for the analysis of the Equipment Blank could signal inadequate decontamination of the equipment which may result in cross-contaminated samples and thus suspect results.

One Equipment Blank should be taken for every twenty (20) routine samples collected. The Equipment Blank is not necessary when using dedicated sampling equipment or sampling equipment that is disposed of between each sample point.

4. Matrix Spike/Matrix Spike Duplicate Sample

The Matrix Spike/Matrix Spike Duplicate (MS/MSD) Sample is a quality control system used by the laboratory to check the accuracy of their instruments. It consists of a set of two (2) samples taken at a sample point concurrently with the routine sample for a total of three (3) sets of containers for that sample point. Therefore, the MS/MSD samples should be collected from sample points with sufficient sample volume (e.g., monitoring wells that have low recharge are not good candidates). They are labeled and included on the COC as ‘Sample ID’ MS and ‘Sample ID MSD’.

**Example:**

- Sample Point ID is **MW-1**
- Matrix Spike would be **MW-1 MS**
- Matrix Spike Duplicate would be **MW-1 MSD**

**QUALITY ASSURANCE/QUALITY CONTROL SAMPLES**

The MS/MSD samples are submitted to the laboratory with the routine samples. Once at the laboratory they will have a known amount of an analyte added, known as the spike. The sample will then be run as a routine sample. Once the results are received they are compared to the results of the routine sample (MW-1 results are compared to MW-1 MS results). There should be a difference in the amount of analyte detected between the samples that should be within the margin of error of the amount of analyte spike that was added to the MS sample. This process is repeated for the MSD sample. This process is an internal review of results for the laboratory to determine the accuracy of their instruments.

One MS/MSD set should be taken for every twenty (20) samples (including Duplicate Samples and Field or Equipment Blank Samples). For example if 12 samples are taken, there should also be a set of MS/MSD samples taken for a total of 14 sample sets submitted to the lab. If 20 samples will be taken, only one set of MS/MSD samples needs to be submitted (total number of samples being 22).

*The following QA/QC samples are used for only specific analyses or functions.*

5. Trip Blank

A Trip Blank is a form of QA/QC that is utilized to account for possible exposure to an external source of VOCs during storage and transport of the sample containers and samples to and from the laboratory. It consists of a VOC sample container prepared by the laboratory and filled with analyte-free water. Trip Blanks are only required when aqueous samples are being collected for VOC analysis, all other parameters do not need one.

The Trip Blank is placed in the cooler with the sample containers when they are sent form the lab to the client. The Trip Blanks will remain in the cooler with the sample containers at all times. When the samples are collected they are placed in the cooler and put on ice with the Trip Blanks for shipment to the lab. At no time should the Trip Blanks be opened or removed from the coolers containing VOC samples. The Trip Blank should be labeled and included on the COC as **Trip Blank** or **TB**.

Each cooler that contains samples for VOC analysis must have a Trip Blank. It is good practice to combine all VOC containers from a site into one cooler to minimize the number of Trip Blanks required. For example if there are five coolers of samples, place all the VOC containers into one cooler and the remaining containers in the other four coolers. Thus only the VOC cooler requires a Trip Blank, which saves on the cost of analysis.

A positive result on the Trip Blank for a VOC could indicate the samples had been exposed during transportation which can have an effect on the results of the routine samples.

Different laboratories have different practices concerning their Trip Blanks. For example some laboratories will include just one VOA vial as their trip blank while others will utilize multiple vials for theirs. The extra vials are often included only as a backup in the event one of the Trip Blank vials is broken during transport, and will not be analyzed unless necessary.

D. QA/QC REQUIREMENTS:

Not Applicable

**QUALITY ASSURANCE/QUALITY CONTROL SAMPLES**

E. SPECIAL CONDITIONS:

**Temperature Blanks** are a type of QA/QC that fall outside of the umbrella of QA/QC Samples.

A Temperature Blank is a container provided by the lab and is used to obtain the temperature of the cooler upon receipt at the lab, usually with an infrared thermometer. It is generally a ~125 mL plastic bottle filled with tap water.

- The Temperature Blank should be left in the cooler during sampling. When the cooler is being prepared for shipment, place the Temperature Blank in the center of the cooler next to the sample containers. There is no need to open the container; it is filled with tap water and therefore harmless unless otherwise noted on the container.
- It should be noted that not all laboratories require a Temperature Blank. There is no cost associated with the Temperature Blanks in the coolers.

F. REFERENCES:

United States Environmental Protection Agency (July 2007), *Samplers Guide, Contract Laboratory Program Guidance for Field Samplers*, Section 3.4, retrieved April 6, 2009, from http://www.epa.gov/superfund/programs/clp/download/sampler/clp_sampler_guidance.pdf

United States Environmental Protection Agency (May 2002), *Ground-Water Sampling Guidelines for Superfund and RCRA Project Managers*, Page 34, retrieved December 15, 2010, from http://www.epa.gov/tio/tsp/download/gw_sampling_guide.pdf

G. APPENDICES/FORMS:

Not Applicable

**END OF SOP**

Final Check by C. Burns 10/27/15

# FIELD HANDLING, PACKAGING, AND SHIPPING

A. PURPOSE/SCOPE:

This procedure describes proper methods for the handling, packaging, and shipping of samples from the field to the laboratory. When preparing samples for transportation to the laboratory it is important to maintain the integrity of the samples in order to obtain the most accurate results possible and to prevent possible contamination of other samples or the package itself. These procedures generally apply to samples collected in the field, any state or federal regulations or guidelines applying to the shipment of hazardous samples must be followed. In addition any guidelines provided by the laboratory should be consulted.

These procedures refer to the shipment of soil, sediment or water samples. For the shipment of air canisters refer to section J: Special Conditions.

B. EQUIPMENT/MATERIALS:

The following materials are required to adequately package samples

- Appropriately sized coolers that can accommodate samples and ice
- Plastic bags (i.e. garbage bags) large enough to contain all samples and ice
- Zip lock bags
- Ice sufficient to keep samples cool. DO NOT USE DRY ICE
- Bubble wrap or similar padding material
- Bubble bags or a similar padding material for any glassware
- Packing tape. Do not use duct tape inside coolers as it can contain volatile chemicals which could contaminate samples
- Custody seals and/or tamper-evident tape
- Appropriate labels (including 'UP' Arrows, Ice labels, Regulatory Compliance Labels (49 CFR 173.4), Shipping bills/labels).

C. PROCEDURE:

Once the samples have been collected, properly labeled and documented (See SOP's #103 and #105) the following steps should be followed to pack and ship the samples.

For aqueous, sediment, soil or other solid samples:

1. Prepare the cooler for shipment
   - Seal and/or plug the cooler drain if present.
   - Place a layer of bubble wrap or other cushioning material on the bottom of the cooler.
   - Use a large plastic bag (liner) to line the cooler. It should fill the cooler with little void space between bag and cooler walls, if not use a smaller cooler or additional cushioning material. Double bag the cooler if using thin plastic bags. Place a thin layer of ice in the bottom of the liner.
2. Prepare the sample containers
   - Ensure all caps and lids are securely attached.
   - Check that all labels have been properly filled out and attached
   - Check that the samples are properly noted on the Chain-of-Custody (COC) and on any applicable field sheets.
   - Place sample containers into zip lock bags if they are being used.

## FIELD HANDLING, PACKAGING, AND SHIPPING

3. If the sample is in a glass container place that container in a bubble bag or other cushioning material (bubble wrap roll, foam block, etc.) and secure it with tape. Try to avoid having glass in direct contact with ice as this can lead to the glass breaking (because the ice does melt).

4. Place samples in the cooler inside the liner.

   - All containers should be upright in cooler inside the bag liners.
   - Try to place glass containers towards the middle of the cooler.
   - Do not overfill the cooler. Try to keep weight below 60 lbs. to allow for easier maneuvering of the cooler.
   - Add a Trip Blank and a Temperature Blank if required. Include the Trip Blank on the COC. Place the Temperature Blank in the center of the cooler.

5. Add more ice, making sure that all containers are covered. The samples should arrive at the laboratory at 4° Celsius (+/- 2° C).

6. When all samples are in the cooler, or the cooler is full, gather the bags and tie or twist the loose ends to contain the ice and samples. Use packing tape, and a Custody seal if desired, to seal the bag liner.

7. Place another layer of bubble wrap or cushioning material on top of the bag for further protection and insulation of the samples. Make sure any void space in the cooler is filled to prevent the samples from shifting during transportation.

8. Put the COC along with any other required documentation inside a sealed zip lock bag and place it in the cooler.

9. Seal the cooler.

   - Place a signed and dated Custody seal on the cooler (if being used). The seal should extend from the top of the cooler, across the seam between the lid and the front, and down the front of the cooler. Tape over the custody seal using a length of tape continuously around the cooler. The seal should be placed such that it will be broken if the cooler is opened.
   - Using packing tape, tape around the cooler from front to back crossing both the top and the bottom of the cooler, use a continuous length of tape to help maintain integrity. Tape the cooler in at least two locations (i.e. left and right sides to create two bands of tape encircling the cooler.)

10. Place all required labels on the cooler. These can include ‘UP’ directional arrows, Wet Ice labels and regulatory labels (49 CFR 173.4). Tape them down as needed.

11. Fill out and affix the necessary shipping labels to the lid of the cooler.

12. All samples should be shipped overnight to the laboratory.

13. Alert the laboratory that the samples are en route. This is especially important for samples being delivered on a Saturday or around a holiday as the laboratory may be closed or have different hours. It is good practice to coordinate with the lab ahead of sampling to determine when the lab will receive samples.

## FIELD HANDLING, PACKAGING, AND SHIPPING

For air samples:

1. Remove any regulators or valves from the canister.
2. Replace the canister and associated equipment in the container they were received in.
3. Place the COC in a zip lock bag with any required documentation and seal the bag. Put the COC into the container.
4. Add any necessary padding materials to fill void space and ensure the canister is protected and cannot shift during transport.
5. Seal the cooler with Custody Seals and packing tape.
6. Affix the necessary labels and shipping bills to the container.
7. Alert the laboratory that the samples are en route.

D. QA/QC REQUIREMENTS:

If aqueous samples for Volatile Organic Compound (VOC) analysis are being shipped use a Trip Blank (See SOP#605).

Some laboratories require Temperature Blanks (See SOP# 605) in each cooler of samples.

E. SPECIAL CONDITIONS:

These procedures apply to environmental samples only. An environmental sample usually consists of possibly contaminated water, soil, or sediment or air to be analyzed. In order to comply with regulations (ex. 49 CFR 173), no more the 30 mL of a product may be shipped in any one container inside the cooler (For example you can ship 3 containers with 20 mL of an oil to be tested, but not 2 containers with 40 mL of oil in them). Consult state and federal regulatory agencies and the laboratory receiving the samples if you are unsure of the regulations on the samples being taken.

F. REFERENCES:

United States Environmental Protection Agency (June 2010), *Sample Collection Information Document,* Section 5, retrieved August 31, 2012 from http://www.epa.gov/sam/sample_collection_information_document_SAM_companion.pdf

United States Environmental Protection Agency (July 2007), *Samplers Guide, Contract Laboratory Program Guidance for Field Samplers,* Section 3.4, retrieved April 6, 2009 from http://www.epa.gov/superfund/programs/clp/download/sampler/clp_sampler_guidance.pdf

Tennessee Valley Authority, *Standard Operating Procedure For: Sample Labeling, Packing, and Shipping* (July 2010), retrieved August 31, 2012 from http://www.tva.gov/kingston/sap/

G. APPENDICIES/FORMS:

Not Applicable

**END OF SOP**

Final Check by C. Burns 10/27/15

Author: Meghan Platt, P.E.
Reviewer: Scott Smith, P.E.

# DRUM/SOIL EXCAVTION AND STOCKPILING

## A. PURPOSE/SCOPE:

The following standard operating procedure (SOP) presents a description of the methods generally employed for the excavation and stockpiling of drums and/or impacted soil. Stockpiling/storing of drums containing petroleum and/or hazardous chemicals must meet minimum standards established by the United States Environmental Protection Agency (EPA) and any state-specific governing agency. Field personnel are responsible for ensuring that state-specific standards, guidelines and/or regulations are followed, where applicable.

Improper handling and storage of drums or soil can result in leaks and spills and pose a serious threat to the quality of the environment. Therefore, most states require that drum contents must be characterized, labeled and transported for disposal/recycling within a specific timeframe. In addition, impacted soil is typically required to be placed within bermed containment areas and covered. State agencies typically must be notified if evidence of a spill or release is identified during soil excavation activities.

## B. EQUIPMENT/MATERIALS

The drum/soil excavation and stockpiling activities will be performed by a firm qualified to perform excavation services under a separate contract with the Owner/Client. The company will supply the heavy equipment and materials needed to conduct the excavation and stockpiling activities. The field geologist/engineer will supervise the excavation activities and conduct the post-excavation and/or drum characterization sampling.

## C. PROCEDURE

### SOIL EXCAVATION

1. Establish Site Controls, including, but not limited to the following:
    a. Installation of appropriate sediment and erosion controls
    b. Identification of appropriate work zones
    c. Identification of air monitoring station locations as required to comply with the requirements of the Community Air Monitoring Plan (CAMP)
    d. Construction of containment pads, see Step 4
    e. Construction of decontamination pads.
2. If material to be excavated will be directly loaded into trucks for immediate hauling to the disposal facility conduct pre-excavation sampling and analysis as described below. Excavate the area described within the work plan using visual, olfactory and instrument-based (e.g. PID) soil screening methods. To minimize potential cross-contamination on-Site via tracking and reduce the amount of required decontamination, the following work practices should be implemented:
    a. Efforts will be made to advance the excavation face towards the excavator such that the tracks on the machine do not come into contact with the impacted soils.

## DRUM/SOIL EXCAVTION AND STOCKPILING

b. Where possible, all trucks will be loaded adjacent to the excavation. Care will be taken to ensure that impacted soil is not spilled on the sides of the trucks as they are loaded and that the trucks do not drive through contaminated soils. If wet soils are encountered, dry soils will be placed near the rear tailgate of the truck and wetter soils will be placed near the front of the truck. If the soils are saturated, liners will need to be installed in the dump box or the soils will be stabilized prior to loading to avoid drippage out of the truck during the hauling process.

c. Efforts will be made to minimize the amount of equipment and machinery that comes into contact with the impacted soils.

3. Stockpile excavated soils on temporary containment pads within the exclusion zone. The temporary containment pads will be of sufficient size to store up to a minimum of 110 percent of the maximum amount of soil that will be stockpiled prior to re-use or off-site disposal. At a minimum, any soil containment pads will include the following:

   a. A sufficiently large area with accessibility for trucks and construction equipment. The area shall be relatively flat and away from drainage inlets or waterfront areas.

   b. A 10-mil thick polyethylene sheeting liner with a minimum of two-foot wide overlaps between successive rows.

   c. A minimum of a one-foot high soil berm around the perimeter of each pad to control runoff/run-on to and from the stockpiles. Gravel/stone ramps with gentler slopes at locations of ingress and egress for each pad.

   d. When handling saturated soils (e.g. soils below the groundwater table), a minimum of a continuous (no laps unless the seams are sealed/welded) 20-mil thick polyethylene sheeting shall line the containment area and the side berms shall be a minimum of two (2) feet high. The Contractor will be responsible for sizing the containment pad area and berm height to ensure that all water is contained and no water drains onto the Site. The berms must be of sufficient height to contain the soils, any water draining from the material, and still provide sufficient freeboard (a minimum of six (6) inches) for precipitation events. All water on the pad will be collected and handled in accordance with Fluids Management.

   e. Soil stockpiles that will remain in place for more than one (1) week shall be continuously encircled with silt fence.

   f. Hay bales and other erosion and sediment controls shall be installed as needed near catch basins, surface waters, and other discharge points.

   g. Stockpiles shall be kept covered at all times with appropriately anchored tarps. Stockpiles shall be routinely inspected and damaged tarps will be promptly replaced.

   h. Stockpiles shall be maintained at a maximum of 15 feet above surrounding area grades with a maximum slope of 1.5:1 to maintain stability. However, the appropriate slope may vary by material and the contractor performing stockpiling activities shall be responsible for determining the safe allowable slopes for each material stockpiled on Site.

   i. Stockpiles shall be inspected at a minimum once each week and after every storm event. Results of inspections shall be recorded in a logbook and maintained at the Site and available for inspection by Agency personnel upon request.

**DRUM/SOIL EXCAVTION AND STOCKPILING**

4. Collect waste characterization samples from on-Site stockpiles at the sampling frequency specified by the disposal facility based upon the total volume of material requiring disposal. Typical sampling frequency is one (1) sample per every 1,000 cubic yards (CY) of material requiring disposal at a minimum; however, in no case should the frequency be less than one (1) sample per work area. The sampling program will require the collection of both grab samples and composite samples. Unless otherwise specified by the disposal facility, samples collected for VOC analysis will be discrete grab samples and other analyses will be performed on composite samples. The basic sampling methodology is described in SOP #417.
5. Identify the locations of each soil sample on a map or sketch.
6. Submit samples to a state-certified laboratory, if necessary, for analysis following appropriate chain-of-custody protocols detailed in SOP #105. The specific analytical waste characterization requirements of the waste disposal facility may vary and shall be verified prior to sampling. Typical parameters required for waste disposal characterization include following:
   - Target compound list (TCL) volatile organic compounds (VOCs) by EPA Method 8260.
   - TCL semivolatile organic compounds (SVOCs) by EPA Method 8270.
   - TCL polychlorinated biphenyls (PCBs) by EPA Method 8082.
   - Pesticides by EPA Method 8081.
   - Herbicides by EPA Method 8151.
   - Target Analyte List (TAL) metals and cyanide by EPA Methods 6010/7471.
   - Toxicity Leaching Characteristic Procedure (TCLP) Extraction
   - Hazardous Waste Characteristics as defined under the Resource Conservation and Recovery Act (RCRA), including ignitability, corrosivity, and reactivity.
   - pH via EPA Method 9045
   - Percent Solids via Method 160.3
   - Paint Filter Test via Method 9095
   - Additional analyses as required by the disposal facility.

<u>MATERIALS EXCAVATION & LOAD OUT</u>

1. If field screening processes indicate a change in material is encountered (e.g. change in color, noticeable odors, etc.), the newly encountered material should be stockpiled and characterized separately.
2. If excavation beneath the water table is required, the material will need to be dewatered prior to placement back on-Site or transportation off-site for disposal. Additional measures should be implemented to collect all water on the containment pads for future off-site disposal (e.g. construction of a sump on containment pad).
3. All excavations faces must be covered with a minimum of 10-mil polyethylene sheeting at the end of each work day at a minimum. Additionally, all excavations shall be backfilled within 48-hours of commencement, unless special circumstances require the excavation to be open longer. In such cases, the anticipated duration of the open excavation should be identified to the NYSDEC during the notification process.

# DRUM/SOIL EXCAVTION AND STOCKPILING

4. A truck wash/decontamination pad will be operated on-Site. The qualified environmental professional will be responsible for ensuring that all outbound trucks will be washed at the truck wash before leaving the Site until the activities performed under this section are complete. Locations where vehicles enter or exit the Site shall be inspected daily for evidence of off-site soil tracking.
5. The qualified environmental professional will be responsible for ensuring that all egress points for truck and equipment transport from the Site are clean of dirt and other materials derived from the Site during intrusive excavation activities. Cleaning of the adjacent streets will be performed as needed to maintain a clean condition with respect to Site-derived materials.

## MATERIALS TRANSPORT OFF-SITE

The following requirements have been established for all materials being transported off-site:

1. All transport of materials will be performed by licensed haulers in accordance with appropriate local, State, and Federal regulations. Haulers will be appropriately licensed and trucks properly registered and placarded. In addition, all haulers will maintain appropriate shipping papers and/or waste manifests (e.g., 6 NYCRR Part 372). Emergency response procedures and emergency telephone numbers will be maintained in all vehicles, and operators will be trained in emergency response procedures.
2. Loaded vehicles will be in compliance with load height and weight regulations.
3. Loaded vehicles leaving the Site will be appropriately lined, tarped, securely covered, manifested, and placarded in accordance with appropriate Federal, State, local, and NYSDOT requirements (and all other applicable transportation requirements).
4. Material transported by trucks exiting the Site will be secured with tight-fitting covers. Loose-fitting canvas-type truck covers or mesh/open weave type covers will be prohibited. If loads contain wet material capable of producing free liquid, truck liners will be used.
5. All trucks will be washed prior to leaving the Site. Truck wash waters will be collected and disposed of off-site in an appropriate manner.
6. Truck operators shall comply with all applicable regulations, including, but not limited to 6 NYCRR Subpart 217-3, relative to idling engines.
7. Egress points for truck and equipment transport from the Site will be kept clean of dirt and other materials during intrusive activities.
8. Queuing of trucks will be performed on-Site in order to minimize off-site disturbance.

## MATERIAL DISPOSAL OFF-SITE

1. All soil/solid waste excavated and removed from the Site will be treated as contaminated and regulated material and will be transported and disposed in accordance with all local, State and Federal regulations.

## DRUM/SOIL EXCAVTION AND STOCKPILING

2. Off-site disposal locations for excavated soils will be identified in the pre-excavation notification. This will include estimated quantities and a breakdown by class of disposal facility if appropriate (i.e. hazardous waste disposal facility, solid waste landfill, petroleum treatment facility, etc.). Actual disposal quantities and associated documentation will be reported to the NYSDEC following completion of excavation activities. This documentation will include: waste profiles, test results, facility acceptance letters, manifests, bills of lading and facility receipts.

FLUIDS MANAGEMENT

1. All liquids to be removed from the Site, including excavation dewatering and decontamination water, etc. will be handled, transported and disposed in accordance with applicable local, State, and Federal regulations. Dewatering fluid will not be recharged back to the land surface or subsurface of the Site, but will be managed off-site. Discharge of water generated during large-scale construction activities to surface waters (i.e. a local pond, stream or river) will be performed under a SPDES permit.

2. Water collected will be stored in drums or temporary storage tanks (e.g. polyethylene tanks or frac tanks) that are approved and labeled in accordance with United States Department of Transportation (USDOT) requirements.

3. The water collected will be sampled by persons performing the intrusive activity on a frequency of one sample per every ten drums or one sample per every 2,000 gallons of water collected in larger vessels. However, more frequent sampling may be directed by the NYSDEC or the disposal facility (e.g. a local publicly-owned treatment works (POTW)), should observable changes in the water quality be identified in the field. The water samples will be analyzed for parameters required by the selected disposal facility for characterization purposes.

4. Oil-absorbent pads will be deployed on the water surface if sheens or NAPLs are observed in the groundwater within the excavation area to remove product. If absorbent pads are ineffective at removing the product, additional measures will be required to control the product, including, but not limited to the following:

   - Dewatering of the excavation in its entirety, if feasible (preferred method)
   - The use of floating booms with solid curtains
   - The use of pumps and floating oil skimmers
   - The use of vacuum trucks

5. Under no circumstances will the use of any type of dispersant be permitted to control product observed on water surfaces.

**DRUM/SOIL EXCAVTION AND STOCKPILING**

6. Additionally, appropriate controls will be used to prevent spills and overflows, including but not limited to, monitoring, gauging, quick-close shut-off valves, and secondary containment. All storage containers will be decontaminated following disposal or discharge activities. Any residual sediment in the storage containers will be dewatered/stabilized, if necessary, and disposed of off-site in a similar manner as other materials requiring off-site disposal.

D. QA/QC REQUIREMENTS:

Not Applicable

E. SPECIAL CONDITIONS:

Not Applicable

F. REFERENCES:

Not Applicable

G. APPENDICES/FORMS:

Not Applicable

**END OF SOP**
Final Check by C. Burns 11/19/15

# APPENDIX B

Additional Sampling Protocols

AMPLIFIED GEOCHEMICAL IMAGING, LLC

# How to install AGI Passive Samplers for soil gas sampling

## Tools and Supplies


AGI Survey Kit


AGI Passive Sampler


Numbered vials


Corks


String


Insertion rods


Chain of custody, Installation and Retrieval e-log


Gloves

**Not included in kit:**

- Scissors
- Gloves
- Pen or pencil
- Watch
- Rubber mallet (for subslab installations)

## Preparation

Site map & field notebook necessary to record sampling information

Locate and mark buried utilities and other obstacles.

Lay out sampling grid prior to hole drilling.

## Making the hole

Choose the best method for soil conditions:

Slide hammer and tile probe

Rotary hammer drill and 36 in (1 m) long, 0.5 in (1 cm) diameter carbide-tipped bit

Hammer and 36 in (1 m) long, narrow diameter steel rod

To make hole through slab, use a rotary hammer drill.

Make a 0.5 –1.0 inch (1 cm) hole 36 in (1 m) deep.

## Inserting AGI Passive Sampler and recording information

Note: Procedure is the same for sub-slab soil gas sampling.


Cut 72 in (2 m) length of string, tie end to end.


Loop string through eyelet of cork.


Remove the AGI Passive Sampler from vial.


Compare serial numbers of sampler and vial.


Loop string through looped end of sampler and secure.


Place insertion rod into pocket of sampler.


Insert rod and sampler into hole.


Push rod and sampler to depth of hole.


Push rod to the side and twist to detach sampler.


Insert cork to seal the hole. (Rubber mallet may be necessary to secure cork in sub-slab installations).


Record installation date and time on e-log.


Record serial number on sitemap.

## How to retrieve AGI Passive Samplers for soil gas sampling

Note: Procedure is the same for sub-slab soil gas sampling.

Remove cork by hand or with screwdriver.

Pull string to remove sampler.

Compare sampler serial number to map location.

Compare sampler serial number to vial number.

Cut and discard string and cork.

Wipe   clean.

Return sampler to vial. Clean top of vial and threads, and secure cap.

Attach custody seal to vial.

Record retrieval time and date in e-log.

Return vial to box.

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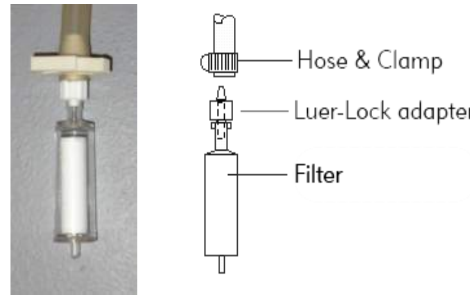
## SAMPLING INSTRUCTIONS




1. Purge the well.
2. Prepare the pump (Peristaltic preferred, Grundfos, or air bladder) as normal. Use the clamp provided to ensure a leak-proof connection.
3. Remove the filter from the Falcon tube.
4. Attach the inlet of the filter with a 1/4" - 5/16" inner diameter (I.D.) tubing using the clamp to secure.
5. Place the filter within a receiving container so that the amount of water filtered can be measured accurately.
6. The amount of water filtered will vary depending upon the turbidity of the water. We recommend filtering 1-2 L.
7. Record the volume of water that passed through the filter, and then submit the filter for analysis. The water may then be discarded. Please cap the filter on both ends. The thinner end should be closed with the red rubber cap and the thicker end should be closed with the clear luer plug.

Note: If the filter clogs before 1L has been filtered, record how much water was passed through the first filter, and then collect an additional filter, also recording the volume of water that went through the second filter. In this case, both filters are then submitted for testing. For each location there should be **no more than 2 filters** used and there is no need to filter more than 2L of water.

Hold time for this analysis is 24-48 hours.

***To Submit Sample:***

1. Place the filter in the Falcon tube provided.
2. Affix the label to the Falcon tube and note the amount of water that passed through the filter, the well location, sampling date, and the analyses requested.

## SHIPPING INSTRUCTIONS

***Packaging Samples***:

1. Samples should be shipped in a cooler with ice or blue ice for next day delivery. If regular ice is used, the ice should be double bagged.
2. A chain of custody form must be included with each shipment of samples. Access our chain of custody at www.microbe.com

***Shipment for Weekday Delivery:***

Samples for weekday delivery should be shipped to:

Sample Custodian
Microbial Insights, Inc.
10515 Research Drive
Knoxville, TN 37932
(865) 573-8188

***Shipment for Saturday Delivery:***

Coolers to be delivered on Saturday must be sent to our FedEx Drop Location. To ensure proper handling the following steps must be taken:

1. FedEx shipping label should be marked under (6) Special Handling, check Hold Saturday.
2. The cooler must be taped with FedEx SATURDAY tape.
3. The shipping label must be filled out with the Drop Location address below. Our laboratory name must be on the address label.
4. You MUST ***notify by email*** customerservice@microbe.com with the tracking number of the package on Friday (prior to 4pm Eastern Time) to arrange for Saturday pickup. Please make sure you write "Saturday Delivery" in the subject line of the message. Without proper labeling and the tracking number, there is no guarantee that the samples will be collected.

Samples for Saturday delivery should be shipped to:

Microbial Insights, Inc.
FedEx Drop Location
10601 Murdock Drive
Knoxville, TN 37932
(865) 300-8053

10515 Research Drive
Knoxville, TN 37932
Phone: 865.573.8188
Fax: 865.573.8133
www.microbe.com

# APPENDIX B

Quality Assurance Project Plan

# QUALITY ASSURANCE PROJECT PLAN

**JMA Campus Plan**
1074 South Clinton Street
Syracuse, New York 13202

CHA Project Number: 059294.002

**March 2024**

**Prepared for:**
**JMA Tech Properties, LLC**
**dba GEC Consulting, Inc.**
168 Brampton Road
Syracuse, New York 13205

**Prepared by:**
**CHA Consulting, Inc.**
300 South State Street, Suite 600
Syracuse, New York 13202
Phone: (315) 471-3920

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# LIST OF ACRONYMS & ABBREVIATIONS

| | |
|---|---|
| AMSL | Above Mean Sea Level |
| ASP | Analytical Services Protocol |
| AST | Aboveground Storage Tank |
| CHA | CHA Consulting, Inc. |
| COC | Chain of Custody |
| DER | Division of Environmental Remediation |
| ELAP | Environmental Laboratory Approval Program |
| ESA | Environmental Site Assessment |
| FSP | Field Sampling Plan |
| GC/MS | Gas Chromatography/Mass Spectrometry |
| GZA | GZA GeoEnvironmental, Inc. |
| MS/MSD | Matrix Spike/Matrix Spike Duplicate |
| NYSDEC | New York State Department of Environmental Conservation |
| NYSDOH | New York State Department of Health |
| PFAS | Per- and Polyfluorinated Substances |
| PCB | Polychlorinated Biphenyl |
| PCE | Tetrachloroethylene |
| PE | Professional Engineer |
| PG | Professional Geologist |
| PID | Photoionization Detector |
| QA | Quality Assurance |
| QAPP | Quality Assurance Project Plan |
| QC | Quality Control |
| RAA | Remedial Alternatives Analysis |
| RI | Remedial Investigation |
| RIWP | Remedial Investigation Work Plan |
| RPD | Relative Percent Difference |
| SOP | Standard Operating Procedure |
| SVOC | Semi Volatile Organic Compound |
| TAL | Target Analyte List |
| TCL | Target Compound List |
| TCLP | Toxicity Characteristic Leaching Procedure |
| USEPA | United States Environmental Protection Agency |
| UST | Underground Storage Tanks |
| VOC | Volatile Organic Compound |

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# 1.0 INTRODUCTION

This Quality Assurance Project Plan (QAPP) presents the policies, organization, objectives, functional activities and specific Quality Assurance (QA) and Quality Control (QC) activities designed to achieve the specific data quality goals associated with the Remedial Investigation (RI) that will be conducted at the JMA Campus Plan located at 1074 Clinton Avenue, City of Syracuse, New York (Site or JMA Campus Plan). The scope of work associated with the investigation activities and specific areas of concern that will be addressed are summarized in the Remedial Investigation Work Plan (RIWP).

This QAPP has been prepared to identify procedures for sample preparation and handling, sample chain-of-custody, laboratory analyses, and reporting to be implemented during this investigation to ensure the accuracy and integrity of the data generated during the investigation. This QAPP has been prepared in accordance with the New York State Department of Environmental Conservation's (NYSDEC) Department of Remediation (DER-10) Technical Guidance for Site Investigation and Remediation. Field activities will be performed in accordance with CHA Consulting, Inc. (CHA) standard operating procedures (SOPs), included in Appendix A of the Field Sampling Plan.

A description of the Site history, summary of previous investigations, and a detailed scope of work is included in the RIWP. A brief summary of the scope of work is included in the following section.

## 1.1 Scope of Work

This QAPP has been prepared in accordance with NYSDEC DER-10 (May 2010) to outline the procedures and protocols that will be utilized to conduct a RI that will provide the necessary data to develop a remedial alternative and will ultimately address the environmental conditions associated with the Site. The primary objectives of this RIWP include the following:

- Further define the nature/extent of contamination;
- Identify additional potential source areas;
- Assess impacts; and
- Provide additional data necessary for a Remedial Alternatives Analysis (RAA)

In general, the RIWP will include the following activities:

- Collection of surface soil sample for environmental parameters;
- Collection of shallow subsurface soil samples for per- and polyfluoroalkyl substances (PFAS);
- Collection of subsurface samples for total oxidant demand (TOD);
- Collection of groundwater samples for environmental parameters including PFAS;
- Collection of groundwater samples for microbiological indicators;
- Collection of passive gas samplers (PGSs) to screen the subsurface for total volatile organic compounds (VOCs);
- Waste characterization sampling;
- Equipment decontamination; and
- Waste handling.

The data derived from the RI will facilitate an evaluation of the migration or possible future migration of identified contamination, identify potential routes of exposure and populations at risk, and provide the data necessary to develop remedial plans for the Site.

# 2.0 PROJECT ORGANIZATION AND RESPONSIBILITY

The RI activities are being conducted by JMA Tech Properties, LLC (JMA) under the supervision of the GEC Consulting, Inc. Project Manager, Gail Cawley, who is the prime contact for communication with the NYSDEC. Engineering oversight and coordination of these activities are to be provided by CHA. The CHA Project Manager is responsible for the delivery of CHA services. Resumes for CHA staff providing environmental services can be provided upon request.

**NYSDEC Regulatory Authority**

**Michael Belveg - NYSDEC Project Manager**

- Approve the Remedial Investigation Work Plan (RIWP) and all appendices, including this QAPP, and any modifications to the project

**GEC Consulting, Inc.**

**Gail Cawley, GEC Consulting, Inc.**

- Responsible for the overall program management of the JMA Campus Plan Remedial Investigation as a representative of JMA Tech Properties, LLC.

**CHA Consulting, Inc.**

**Samantha Miller – CHA Project Manager, Technical Manager/Project Coordinator**

- Responsible for following the approved RIWP, notifying the NYSDEC of any deficiencies, and obtaining approval by the NYSDEC for all modifications to the project;
- Provide overall and day-to-day project management;
- Ensure all resources of CHA are available on an as-required basis;
- Participate in key technical negotiations with the NYSDEC, as necessary;
- Provide managerial guidance to CHA's technical group;
- Evaluate data;
- Prepare and coordinate the issuance of reports;
- Provide immediate supervision of all on-site activities;
- Assist in preparation and review of final report; and
- Provide technical representation for field activities.

**Scott Smith - CHA Quality Assurance/ Quality Control (QA/QC)**

- Conduct internal audit of field investigation and sampling;
- Review laboratory activities;
- Determine laboratory data corrective action;
- Review analytical data validation and assessment;
- Review laboratory QA/QC;
- Assist in preparation and review of final report; and,
- Provide technical representation for analytical activities.

**Karyn Ehmann - Field Oversight and Quality Control Coordinator**

- Serve as Field Team Leader;

- Work with field crew to prepare for field activities and conduct investigations; and,
- On-Site to
    1. Provide oversight and coordination of field activities.
    2. Ensure that required QC procedures are followed for soil boring and monitoring well installation activities, material handling, and sample collection.
    3. Initiate informal and/or formal corrective actions as necessary.
    4. Maintain and report QC records (i.e. chain-of-custody, field equipment calibration, etc.).
    5. Report to the Project Manager.
- Provide field management of sample collection and field QA/QC;
- Responsible for maintenance of the field equipment; and
- Assist in preparation and review of final report.

**<u>Laboratory</u>**

Pace Analytical Services is the analytical laboratory chosen to perform the proposed work and is certified by the New York State Department of Health (NYSDOH) Environmental Laboratory Approval Program (ELAP) Number 11148 to perform the required analyses in accordance with the most recent version of the NYSDEC Analytical Services Protocol (ASP).

**Project Manager, Analytical Contractor**

- Ensure resources of laboratory are available on an as-required basis;
- Coordinate laboratory analyses;
- Supervise laboratory's in-house chain-of-custody (COC);
- Schedule analyses of samples;
- Oversee review of data;
- Oversee preparation of analytical reports; and,
- Approve final analytical reports prior to submission to CHA.

**Quality Assurance/ Quality Control Officer, Analytical Contractor**

- Overview laboratory QA/QC;
- Overview QA/QC documentation;
- Conduct detailed data review;
- Decide laboratory corrective actions, if required; and,
- Provide technical representation for laboratory QA/QC procedures

**Sample Custodian, Analytical Contractor**

- Receive and inspect the sample containers;
- Record the condition of the sample containers;
- Sign appropriate documents;
- Verify chain-of-custodies and their correctness;
- Notify laboratory project manager and laboratory QA/QC Officer of sample receipt and inspection;
- Assign a unique laboratory identification number correlated to CHA's sample identification
  number, and enter each into the sample receiving log;
- Initiate transfer of the samples to the appropriate lab sections with assistance from the laboratory project manager; and
- Control and monitor access to and storage of samples and extracts.

**Other Testing Services Provided**

Additional sampling for purposes of providing information for potential remedial alternatives is proposed including PGS collection, sampling of microorganisms in water, additional anion chemical parameters to better understand the groundwater chemistry and TOD on soil within the potential treatment zone.

Since the purpose of this additional sampling is for remedial design rather than site characterization, no QA/QC sampling is proposed other than that specified by the laboratories.

Amplified Geochemical Imaging, LLC (AGI), with a laboratory in Newark, Delaware, will perform analytical testing on the PGSs using a screening method of their design. AGI will provide a minimum of two trip blank samples to accompany the PGSs during the transport and sampling process to identify any potential leakage or mishandling that caused undue elevated readings.

Loureiro Engineering Associates, Inc., with a laboratory in Portsmouth, New Hampshire, will perform TOD analysis on the soil samples. All QA/QC performed for this analysis will be conducted by Loureiro Engineering.

The contract laboratory for the microbiology analysis is expected to be Microbial Insights based out of Knoxville, Tennessee. Similarly, all QA/QC performed for this analysis will be conducted by Microbial Insights.

Table 1 below, identifies key personnel assigned to the project and provides contact information.

**Table 1: Key Project Personnel**

| Name | Address | Responsibilities |
|---|---|---|
| Michael Belveg<br>NYSDEC<br>NYSDEC Project Manager | 5786 Widewaters Parkway<br>Syracuse, NY 13214<br>(315) 426-7400<br>Michael.Belveg@dec.ny.gov | Mr. Belveg will represent the NYSDEC in its review and oversight function, in its financial sponsorship, and as arbiter on technical matters. |
| Gail Cawley<br>GEC Consulting, Inc.<br>Project Manager | 168 Brampton Road<br>Syracuse, NY 13205<br>gcawley@jmawireless.com | Ms. Cawley will represent JMA Wireless in the review and oversight of the project, participate in citizen participation activities, and serve as the point of contact. |
| Samantha Miller, PE<br>CHA Technical Manager/ Project Coordinator | 300 South State Street<br>Syracuse, NY 13202<br>(315) 257-7154 | Ms. Miller will oversee the project, provide quality control on documents and determinations and mentor the daily task manager. Ms. Miller will provide immediate supervision of all on-site activities, provide field management |

| Name | Address | Responsibilities |
| --- | --- | --- |
| | | of sample collection and field QA/QC, assist in preparation and review of final reports. |
| Scott Smith, PE<br>CHA Quality Assurance/ Quality Control Officer | 300 South State Street<br>Syracuse, NY 13202<br>(315) 257-7227 | Mr. Smith will act as the QA/QC Officer, which will include providing an internal audit of field sampling procedures, a review of laboratory activities and QA/QC, assistance in the preparation and review of final reports. |
| Karyn Ehmann<br>CHA Field Team Leader & Health and Safety Officer | 300 South State Street<br>Syracuse, NY 13202<br>(315) 257-7250 | Ms. Ehmann will supervise field investigation activities and will also serve as database manager. Ms. Ehmann will serve as the Health and Safety point of contact for CHA staff. |
| Patrick Filey<br>Pace Analytical Services<br>Project Manager | 275 Cooper Avenue, Suite 105<br>Tonawanda, NY 14150<br>Patrick.Filey@pacelabs.com | Mr. Filey will act as CHA's point of contact with the contracted laboratory. |
| Dennis Keane<br>Loureiro Engineering Associates, Inc.<br>Director | 112 Corporate Drive #2<br>Portsmouth, NH 03801<br>dkeane@loureiro.com | Mr. Keane will provide technical support on designing remedial alternatives for the Site and coordinate the TOD analysis at their laboratory. |
| Ray Fenstermacher<br>Amplified Geochemical Imaging, LLC<br>Senior Project Manager | 210 Executive Drive, Suite 1<br>Newark, DE 19702<br>fenstermacher@agisurveys.net | Mr. Fenstermacher will be the point of contact at AGI for the passive gas sampling effort and analysis. |

# 3.0 QUALITY ASSURANCE OBJECTIVES FOR MEASUREMENT DATA

The overall QA objective is to develop and implement procedures for sample preparation and handling, sample COC, laboratory analyses, and reporting, in order to provide accurate data. Specific procedures to be followed for sampling, sample custody and document control, calibration, laboratory analyses and data reduction, validation, assessment and reporting are presented in Sections 4.0 through 8.0 of this QAPP.

The purpose of this Section is to define the goals for the level of QA effort; namely, accuracy; precision and sensitivity of analyses; and completeness, representativeness and comparability of measurement data from the analytical laboratories. QA objectives for field measurements are also discussed.

# 4.0 LEVEL OF QA EFFORT

To assess the quality of data resulting from the field sampling program, field duplicate samples, field blank samples, samples for laboratory matrix spike/matrix spike duplicate (MS/MSD) analyses, and trip blank samples will be collected (where appropriate) and submitted to the contract laboratory. CHA SOP#605 will be adhered to for all QAQC procedures.

For field samples collected, field duplicate samples will be submitted at a frequency of one per 20 investigative samples or in the event that a sampling round consists of less than 20 samples, one field duplicate will be collected. MS/MSD samples will be analyzed at a minimum frequency of one set per 20 investigative samples. In the event that a sampling event consists of less than 20 samples, one MS/MSD sample will be collected. Trip blanks will be submitted with each cooler containing aqueous samples to be analyzed for volatile organic compounds (VOCs).

The sampling and analysis program is summarized below and lists the specific parameters to be measured, the number of samples to be collected and the level of QA effort required for each matrix.

Groundwater, and soil samples will be analyzed for all or some of the following:

- Target compound list (TCL) volatile organic compounds (VOCs);
- TCL semi-volatile organic compounds (TCL SVOCs) including 1,4-Dioxane;
- Target Analyte List (TAL) metals;
- Polychlorinated biphenyls (PCBs); and
- Per- and Polyfluorinated Substances (PFAS)

Field duplicate samples for subsurface soil matrices will be collected and analyzed as a check on the aggregate analytical and sampling protocol precision. MS/MSD samples will be analyzed as a check on the analytical method's accuracy and precision. Trip blank samples (for VOC determinations only) will be shipped by the laboratory to the Site and back to the laboratory without opening in the field. The trip blank will provide a measure of potential cross-contamination of samples resulting from shipment, handling and/or ambient conditions at the Site.

## 4.1 Accuracy, Precisions, and Sensitivity of Analyses

The fundamental QA objective with respect to the accuracy, precision and sensitivity of analytical data is to achieve the QC acceptance of each analytical protocol. The method(s) precision (relative percent difference of duplicate analysis) will be determined from the duplicate analyses of MS samples. A minimum of one sample will be spiked and analyzed in duplicate. Additional details are provided in CHA SOP#605. Analysis will compare with the criteria presented in the appropriate methods identified in Section 4.0.

The method(s) accuracy (percent recovery) for water and soil samples will be determined by spiking selected samples (matrix spikes) with test compounds. Accuracy will be reported as the percent recovery of the test compound and will compare with the criteria given in the appropriate methods as identified in Section 4.0.

Project-specific accuracy and precision goals are identified in Section 9.0.

## 4.2 Completeness, Representativeness, and Comparability

It is expected that all analyses conducted in accordance with the selected methods will provide data meeting QC acceptance criteria for 80 percent of all samples tested. Any reasons for variances will be documented.

The sampling program has been designed to provide data representative of Site conditions. During development of these networks, consideration was given to location of historic activities, existing data from past studies completed for the Site and the physical Site setting. The extent to which existing and planned analytical data will be comparable depends on the similarity of sampling and analytical methods. The procedures used to obtain the planned analytical data are documented in this QAPP. Comparability of laboratory analyses will be ensured by the use of consistent units. Following completion of data collection, the existing database will be evaluated for representativeness.

## 4.3 Field Documentation

Pertinent field survey and sampling information shall be recorded in a logbook or on field logs during each day of the field effort per CHA SOP#101 Field Logbook and Photographs.

At a minimum, entries in a logbook shall include:

- Date and time of starting work;
- Names of all personnel at site;
- Weather conditions
- Purpose of proposed work effort;
- Sampling equipment to be used and calibration of equipment;
- Description of work area;
- Location of work area, including map reference;
- Details of work effort, particularly any deviation from the field operations plan or standard operating procedures;
- Field observations;
- Field measurements (e.g., Photoionization Detector (PID) readings);
- Field laboratory analytical results;
- Daily health and safety entries, including levels of protection;
- Type, number, and location of samples;
- Sampling method, particularly deviations from the standard operating procedures;
- Sample location and number; and
- Sample handling, packaging, labeling, and shipping information (including destination).

In addition to keeping logs, photographs will be taken to provide a physical record to augment the fieldworker's written observations. For each photograph taken, several items shall be recorded in the field logbooks:

- Date and time;
- Name of photographer;
- General direction faced and description of the subject

Additional protocols specific to each sampling method are presented in the following sections.

The general QA objective for measurement data is to obtain reproducible and comparable measurements to a degree of accuracy consistent with the use of standardized procedures.

## 5.0 SAMPLING PROCEDURES

The sampling program to be implemented will include the collection and analyses of surface and subsurface soil, groundwater, and soil vapor samples. Details regarding specific sampling activities are provided in the RIWP and the procedures for collecting samples and for performing related field activities are described in detail in the Field Sampling Plan (FSP), included in Appendix A of the RIWP. The number of samples, analytical methods, sample volumes, preservation techniques and holding times are provided in Table 2, below.

**Table 2: Analytical Methods/Quality Assurance Summary**

| Matrix | Type of Sample | Analysis | Parameter | Total Primary Samples | Total Duplicates/ MS/MSD | Total Trip Blanks | Total Field Blanks | Total Equipment Blanks | Sampling Locations | Minimum Sample Volume/ Container | Preservation | Technical Holding Time |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Water | Groundwater | EPA Method 8260 | TCL VOCs | 8 | 1/1/1 | 1 | 1 | 1 | MW-201S, MW-201D, MW-202S, MW-202D, MW-203 through MW-206 | 2- 40mL - Glass, Vial | 1:1 HCl to pH<2; Cool to 4°C | 14 days |
| | | EPA Method 8270 | TCL SVOCs | 8 | 1/1/1 | 0 | 1 | 1 | | 2- 250 mL amber | Cool to 4°C | 7 days |
| | | EPA Methods 6010/7471 | TAL Metals | 8 | 1/1/1 | 0 | 1 | 1 | | 1- 500 mL plastic | HNO3 to pH<2; Cool to 4°C | 180 days (28 days for mercury) |
| | | EPA Method 8082 | Total PCBs | 8 | 1/1/1 | 0 | 1 | 1 | | 2-250 mL amber | Cool to 4°C | 7 days |
| | | EPA Method 1633 | PFAS | 8 | 1/1/1 | 0 | 1 | 1 | | 2-250 mL HDPE plastic | Cool to 4°C | 28 days |
| | | EPA Method 300.0 | Anions – Chloride and Sulfate | 3 | 1/1/1 | 0 | 1 | 1 | MW-201S, MW-202D, MW-204 | 100 mL glass or plastic | Cool to 4°C | 28 days |
| Soil | Surface Soil | EPA Method 8270 | TCL SVOCs | 1 | 0/0/0 | 0 | 0 | 0 | SURF-201 | 4 oz glass wide | Cool to 4°C | 14 days |
| | | EPA Methods 6010/7471 | TAL Metals | 1 | 0/0/0 | 0 | 0 | 0 | | 8 oz glass wide | Cool to 4°C | 180 days (28 days for mercury) |
| | | EPA Method 8082 | Total PCBs | 1 | 0/0/0 | 0 | 0 | 0 | | 4 oz glass wide | Cool to 4°C | 14 days |
| | | EPA Method 1633 | PFAS | 1 | 0/0/0 | 0 | 0 | 0 | | 16 oz HDPE jar | Cool to 4°C | 90 days |
| | | EPA Method 8081 | TCL Pesticides | 1 | 0/0/0 | 0 | 0 | 0 | | 4 oz. amber jar | Cool to 4°C | 14 days |
| | | EPA Method 8151 | TCL Herbicides | 1 | 0/0/0 | 0 | 0 | 0 | | 4 oz. amber jar | Cool to 4°C | 14 days |
| | Subsurface Soil from Test Pits | EPA Method 8260 | CP-51 List VOCs | 2 | 0/0/0 | 0 | 0 | 0 | TP-201, TP-202 | 8 oz. amber jar | Cool to 4°C | 14 days |
| | | EPA Method 8270 | CP-51 List SVOCs | 2 | 0/0/0 | 0 | 0 | 0 | | 4 oz glass wide | Cool to 4°C | 14 days |
| | Shallow Surface Soil | EPA Method 1633 | PFAS | 6 | 1/1/1 | 0 | 0 | 0 | SOIL-201 to SOIL-206 | 16 oz HDPE jar | Cool to 4°C | 90 days |
| Air | Soil Vapor | EPA Method TO-15 | VOCs | 2 | 0/0/0 | 0 | 0 | 0 | SV-201, SV-202 | 2.7 L canister | NA | 30 days |
| Soil Waste Characterization | Investigation Derived Waste - Soil | EPA Method 8260/1311 | TCLP VOCs | 1 | 0/0/0 | 0 | 0 | 0 | SOIL-WC-1 | 8 oz. amber jar | Cool to 4°C | 14 days |
| | | EPA Method 8270/1311 | TCLP SVOCs | 1 | 0/0/0 | 0 | 0 | 0 | | 8 oz. amber jar | Cool to 4°C | 14 days |
| | | EPA Methods 6010/7471/1311 | TAL Metals | 1 | 0/0/0 | 0 | 0 | 0 | | 8 oz glass wide | Cool to 4°C | 180 days (28 days for mercury) |
| | | EPA Method 8082 | Total PCBs | 1 | 0/0/0 | 0 | 0 | 0 | | 4 oz glass wide | Cool to 4°C | 14 days |
| | | EPA Method 8081/1311 | TCLP Herbicides | 1 | 0/0/0 | 0 | 0 | 0 | | 4 oz. amber jar | Cool to 4°C | 14 days |
| | | EPA Method 8151/1311 | Pesticides | 1 | 0/0/0 | 0 | 0 | 0 | | 4 oz. amber jar | Cool to 4°C | 14 days |
| | | N/A | Reactivity, Ignitability, Corrosivity | 1 | 0/0/0 | 0 | 0 | 0 | | 2 - 8oz plastic jar<br>1 – 4 oz plastic jar | Cool to 4°C | 14 days |
| Water Waste Characterization | Investigation Derived Waste - Water | EPA Method 8260 | TCL VOCs | 1 | 0/0/0 | 0 | 0 | 0 | WATER-WC-1 | 2- 40mL - Glass, Vial | 1:1 HCl to pH<2; Cool to 4°C | 14 days |
| | | EPA Method 8270 | TCL SVOCs | 1 | 0/0/0 | 0 | 0 | 0 | | 2-250 mL amber | Cool to 4°C | 7 days |
| | | EPA Methods 6010/7471 | TAL Metals | 1 | 0/0/0 | 0 | 0 | 0 | | 1- 500 mL plastic | HNO3 to pH<2; Cool to 4°C | 180 days (28 days for mercury) |
| | | EPA Method 8082 | Total PCBs | 1 | 0/0/0 | 0 | 0 | 0 | | 2- 250 mL amber | Cool to 4°C | 7 days |

# 6.0 SAMPLE CUSTODY AND DOCUMENT CONTROL

## 6.1 Chain-of-Custody

As per CHA SOP#105, a COC will be maintained to document the transfer of all samples. Each sample container will be properly sealed. Sample container labels will include the sample name, required analysis, and date and time of collection. Sample containers will be taken to the Contract Laboratory courier center at 4°C (±2°C) in sealed coolers.

Each sample cooler will contain an appropriately completed COC form. One copy will be returned to CHA upon receipt of the samples by the laboratory. One copy will be returned to CHA with the data deliverables package.

Upon receipt of the cooler at the laboratory, it will be inspected by the designated sample custodian. The condition of the cooler and sample containers will be noted on the COC record sheet by the sample custodian. The sample custodian will also document the date and time of receipt of the container and sign the form.

If damage or discrepancies are noticed, they will be recorded in the remarks column of the record sheet, and be dated and signed. Any damage or discrepancies will be reported to the lab supervisor who will inform the lab manager, QA Officer and CHA Project Manager.

## 6.2 Sample Documentation in the Laboratory

Each sample or group of samples shipped to the laboratory for analysis will be given a unique identification number by the laboratory. The laboratory sample custodian will record the client name, number of samples and date of receipt of samples in the Sample Control Log Book.

The Contract Laboratory will be responsible for maintaining analytical log books and laboratory data as well as sample inventory on hand for submittal to CHA on an "as required" basis. Samples will be maintained by the laboratory for a period of 30 days, under the conditions prescribed by the appropriate USEPA methods, for additional analyses, if necessary. Raw laboratory data files will be inventoried and maintained by the Contract Laboratory for a period of five years, at which time CHA will advise them as to the need for additional storage.

## 6.3 Storage of Samples

Evidentiary files for the entire project will be inventoried and maintained by CHA and will consist of the following:

1. Project related plans;
2. Project log books;
3. Field data records;
4. Sample identification documents;
5. Chain-of-Custody records;
6. Report notes, calculations, etc.;
7. References, literature;
8. Miscellaneous - photos, maps, drawings, etc.; and
9. Copies of all final reports pertaining to the project.

The project file materials will be the responsibility of CHA's Project Manager with respect to document maintenance and management.

# 7.0 CALIBRATION PROCEDURES AND FREQUENCY

## 7.1 Instrument Calibration and Tuning

Calibration of instrumentation I required to ensure that the analytical system is operating correctly and functioning at the proper sensitivity to meet established reporting limits. Each instrument is calibrated with standard solutions appropriate to the type of instrument and the linear range established for the analytical method. The frequency of calibration and concentration of calibration standards is determined by the manufacturer's guidelines, the analytical method, or the requirements of special contracts.

## 7.2 Field Instrument Calibration

Calibration of the field instruments will be completed prior to each day's use in accordance with the manufacturer's instructions. During groundwater sampling activities if the data indicates a change (>+/-10 percent) in pH and/or conductivity from the last location sampled, the field equipment will be recalibrated. The field equipment will be maintained, calibrated, and operated in a manner consistent with the manufacturer's guidelines and EPA standard methods. However, since the majority of field measurements will be limited to organic vapor readings (PID readings), pH, conductivity, turbidity and depth (water level) the calibration procedures will be conducted at a minimum frequency of once per day. Records of calibration, repair or replacement will be filed and maintained by the Field Team Leader.

# 8.0 DATA REDUCTION, VALIDATION, ASSESSMENT AND REPORTING

## 8.1 General

The Contract Laboratory will perform analytical data reduction and validation in-house under the direction of the laboratory QA Officer. The laboratory's QA Officer will be responsible for assessing data quality and advising of any data which were rated "preliminary" or "unacceptable" or other qualifications based on the QC criteria outlined in the methods, which would caution the data user of possible unreliability.

Assessment of analytical and field data will include checks for data consistency by looking for comparability of duplicate analyses, laboratory QA procedures, adherence to accuracy and precision criteria, transmittal errors and anomalously high or low parameter values. The results of these data validations will be reported to the project managers, noting any discrepancies and their effect upon acceptability of the data.

## 8.2 Field Data

Raw data from field measurements and sample collection activities that are used in project reports will be appropriately identified and appended to the report. Where data have been reduced or summarized, the method of reduction will be documented in the report. Field data will be reviewed for anomalously high or low values that may appear to be inconsistent with other data.

Field sampling data will be reviewed by the CHA QA/QC Officer to ensure the following information has been properly documented:

- Sample identification;
- Source;

- Date and time of sampling;
- Sampling equipment;
- Person(s) collecting the sample; and
- Results of field monitoring and/or observations.

In addition, the field sampling data will be evaluated to ensure:

- The use of approved sampling and sample handling procedures;
- Proper packing/shipping procedures were used; and
- Proper COC was maintained.

### 8.3 Laboratory Reporting

Reporting and deliverables for groundwater and soil samples will be in accordance with NYSDEC July 2005 ASP, Category B. Reports will be received by CHA within 30 days of the last day of sampling. Sample data and its corresponding QA/QC data shall be maintained accessible to CHA either in hard copy or on disk. All other reporting and deliverables (i.e. waste characterization samples) will be in accordance with Standard Laboratory Procedure.

### 8.4 Electronic Data

The laboratory will also provide the analytical data in an electronic format. The data will be added into the existing database maintained by CHA staff. From there the data can be processed and compared to existing standards using the existing software. An electronic copy of the analytical data in Category B format and in EQuIS format will be provided to NYSDEC.

### 8.5 Data Validation

A qualified third party will conduct an independent evaluation of the Category B data reduction and reporting by the laboratory. The data validation will be performed in accordance with the following documents: "USEPA Contract Laboratory Program National Functional Guidelines for Organic Data Review EPA 540/R-99-008, October 1999" and "USEPA Contract Laboratory Program National Functional Guidelines for Inorganic Data Review EPA 540/R-04-004, October 2004". Data analyzed using methods not covered in these documents will be validated using the general principles used in these documents, and the analytical requirements specified in the methods pertaining to USEPA Region 2 Data Validation.

# 9.0 INTERNAL QUALITY CONTROL CHECKS AND FREQUENCY

## 9.1 Field Quality Control

QC procedures for field measurements will be limited to checking the reproducibility of the measurement in the field by obtaining multiple readings and by calibrating the instruments (where appropriate).

QC of field sampling will involve collecting field duplicates and trip blanks with the applicable site activities described in the RIWP/FSP. Field QC samples are also discussed in Section 4.0.

## 9.2 Laboratory Quality Control

Specific procedures related to internal laboratory QC samples (namely blanks, MS/MSD, surrogates and QC check samples) are described in the following subsections.

### 9.2.1 Blank Samples

A reagent blank will be analyzed by the laboratory at a frequency of one blank per 10 analyses, or in the event that an analytical round consists of less than 10 samples, one reagent blank will be analyzed. The reagent blank, an aliquot of analyte-free water or solvent, will be carried through the entire analytical procedure.

### 9.2.2 Matrix Spike/Matrix Spike Duplicates

An MS/MSD sample will be analyzed at a minimum frequency one sample for every 20 investigative samples that are collected. For sampling events consisting of less than 20 investigative samples, one MS/MSD sample set will be collected. Acceptable criteria and compounds that will be used for matrix spikes are identified in the appropriate methods. Percent spike recoveries will be used to evaluate analytical accuracy while percent relative standard deviation or the relative percent difference (RPD) between matrix spike analyses will be used to assess analytical precision.

### 9.2.3 Surrogate Analyses

Surrogates are organic compounds which are similar to the analytes of interest, but which are not normally found in environmental samples. Surrogates are added to samples, by the laboratory, to monitor the effect of the matrix on the accuracy of the analysis. Every blank, standard and environmental sample analyzed by GC or GC/MS, including MS/MSD samples, will be spiked with surrogate compounds prior to sample preparation.

Surrogates will be spiked into samples according to the appropriate analytical methods. Surrogate spike recoveries will be compared with the control limits set by procedures specified in the method (or from laboratory specific control limits) for analytes falling within the quantification limits without dilution. Dilution of samples to bring the analyte concentration into the linear range of calibration may dilute the surrogates out of the quantification limit; assessment of analytical quality in these cases will be based on the quality control embodied in the check and MS/MSD samples.

# 10.0 PROCEDURES USED TO ASSESS PERFORMANCE

## 10.1 Precision

Precision will be assessed by comparing the analytical results between duplicate spike analyses. Precision as RPD will be calculated as follows:

$$\text{Precision} = \frac{[D2 - D1]}{(D1 + D2)/2} \times 100$$

D1 = matrix spike recovery
D2 = matrix spike duplicate spike recovery

Acceptance criteria for duplicate soil samples will be ≤30% RPD. Acceptance criteria for duplicate water samples will be ≤20% RPD between field and laboratory data.

Percent relative standard deviation or the RPD between matrix spike analyses will be used to assess laboratory analytical precision. Acceptable criteria and compounds that will be used are identified in the appropriate EPA methods.

## 10.2 Accuracy

Accuracy will be assessed by comparing a set of analytical results to the accepted or "true" values that would be expected. In general, MS/MSD and surrogate spike recoveries will be used to assess accuracy. Accuracy as percent recovery will be calculated as follows:

$$\text{Accuracy} = \frac{A-B}{C} \times 100$$

A = The analyte determined experimentally from the spike sample.
B = The background level determined by a separate analysis of the unspiked sample.
C = The amount of spike added.

Percent spike recoveries in MS/MSD and surrogate spike recoveries will be used to evaluate analytical accuracy. Acceptable criteria and compounds that will be used for matrix spikes are identified in the appropriate EPA methods.

The evaluation of accuracy of field measurements will be limited to checking the reproducibility of the measurement in the field by obtaining multiple readings and by calibrating the instruments (where appropriate).

## 10.3 Representativeness, Completeness, and Comparability

Completeness is a measure of the amount of valid data obtained from a measurement system compared with the amount that was expected to be obtained under normal conditions.

To be considered complete, the data set must contain all QC check analyses verifying precision and accuracy for the analytical protocol. In addition, all data are reviewed in terms of stated goals in order to determine if the database is sufficient.

When possible, the percent completeness for each set of samples will be calculated as follows:

$$\text{Completeness} = \frac{\text{valid data obtained}}{\text{total data planned}} \times 100 \text{ percent}$$

A completeness goal of 100 percent has been established for this project. However, if the completeness goal is not met, site decisions may be based on any, or all of, the remaining, validated data. Representativeness will be addressed by collecting the samples as described in this document. Comparability will be addressed by collecting, analyzing, and reporting the data as described in this document.

## 10.4 Outliers

Procedures discussed previously will be followed for documenting deviations. In the event that a result deviates significantly from method established control limits, this deviation will be noted and its effect on the quality of the remaining data will be assessed and documented.

## 11.0 QUALITY ASSURANCE REPORT TO MANAGEMENT

The CHA Project Manager will receive reports on the performance of the measurement system and the data quality following each sampling round and at the conclusion of the project.

At a minimum, these reports will include:

1) Assessment of measurement quality indicators; (i.e. data accuracy, precision and completeness);
2) Results of systems audits; and
3) QA problems and recommended solutions.

CHA's QA/QC Officer will be responsible within the organizational structure for preparing these periodic reports. The final report for the project will also include a separate QA section which will summarize data quality information contained in the periodic QA/QC reports to management and present an overall data assessment and validation in accordance with the data quality objectives outlined in this QAPP.

# APPENDIX C
Health and Safety Plan

# HEALTH AND SAFETY PLAN

**JMA Campus Plan**
**1074 South Clinton Street**
**Syracuse, New York**

CHA Project Number: 059294.002

**February 2024**

**Prepared for:**
**GEC Consulting, LLC**
168 Brampton Road
Syracuse, New York 13205

**Prepared by:**
**CHA Consulting, Inc.**
300 South State Street, Suite 600
Syracuse, New York, 13202
Phone: (315) 471-3920

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# LIST OF APPENDICES

# LIST OF ACRONYMS & ABBREVIATIONS

| | |
|---|---|
| C | Ceiling Value |
| Ca | Potentially Cancerous |
| CAMP | Community Air Monitoring Plan |
| CFR | Code of Federal Regulations |
| CHA | CHA Consulting, Inc. |
| DCE | Cis- 1,2- Dichloroethene |
| CPR | Cardiopulmonary Resuscitation |
| CRZ | Contaminant Reduction Zone |
| EZ | Exclusion Zone |
| FTL | Field Team Leader |
| HASP | Health and Safety Plan |
| HAZWOPER | Hazardous Waste Operations and Emergency Response |
| HSC | Health and Safety Coordinator |
| IDLH | Immediately Dangerous to Life and Health |
| JHA | Job Hazard Analysis |
| LEL | Lower Explosive Limit |
| NIOSH | National Institute for Occupational Health and Safety |
| NYSDEC | New York State Department of Environmental Conservation |
| OSHA | Occupational Safety and Health Administration |
| PCE | Tetrachloroethene |
| PEL | Permissible Exposure Limit |
| PID | Photoionization Detector |
| PM | Project Manager |
| PPE | Personal Protection Equipment |
| REL | Recommended Exposure Limit |
| RIWP | Remedial Investigation Work Plan |
| SSO | Site Safety Officer |
| ST/STEL | Short Term Exposure Limit |
| SZ | Support Zone |
| TCE | Trichloroethene |
| TWA | Time Weighted Average |
| UST | Underground Storage Tank |
| | |
| ppm | Part per Million |
| $mg/m^3$ | Milligram per Cubic Meter |

# 1.0 INTRODUCTION

The following Health and Safety Plan (HASP) has been created for the protection of CHA Consulting, Inc. (CHA) staff conducting remedial activities at the JMA Campus Plan Facility (Site), located at 1074 South Clinton Street in the City of Syracuse, New York. Remedial activities will be performed in accordance with an approved work plan. This project's various assignments require CHA employees to perform tasks where personal safety could be endangered due to chemical, physical, and/or biological hazards. While conducting field work, CHA employees may be exposed to hazards including but not limited to:

- Chemical exposure due to the presence of subsurface contamination during intrusive activities such as the installation of soil borings and further investigating the potential impacts of the underground storage tank (UST).
- Slip/Trips/Falls
- Cold Stress/Heat Stress
- Excessive noise for certain operations
- Heavy equipment operation
- Environmental and Biological hazards (e.g. insects, plants, ultra-violet exposure, etc.)

The requirements and guidelines in this HASP are based on a review of available information and an evaluation of potential on-Site hazards, including a subsurface investigation conducted by CHA in 2023, and a Remedial Investigation (RI) conducted by CHA in 2018. This HASP will be discussed with Site personnel and will be available on-Site for review while work is underway. CHA personnel will report to the Project Manager (PM) and consult with the Health and Safety Coordinator (HSC) in matters of health and safety. The Site Safety Officer (SSO) and Field Team Leader (FTL) is the same person for this project and is responsible for compliance with this HASP, stopping work when necessary, and for implementation of this HASP for daily site activities.

Non-intrusive activities within CHA's Scope of work are those that do NOT have the potential to jeopardize the health and safety of Site workers, the public, or the environment with respect to Site contaminants in the soil or groundwater.

Intrusive activities within CHA's Scope of Work are those that have the potential to cause health and safety concerns to Site workers, the public, or the environment in regard to Site contaminants. These activities and any non-intrusive activities conducted in an Exclusion Zone require training per 29 CFR 1910.120 on a NYSDEC Brownfield hazardous waste site.

# 2.0 KEY PERSONNEL

## 2.1 Off-Site Personnel

**<u>Title:</u> CHA Corporate Director of Health & Safety**
*<u>Description:</u>* Responsible for the CHA's corporate health and safety program and developing procedures, policies, and coordinating training programs. Additionally, provides senior level guidance on development of HASPs and interpretation of regulations.
***<u>Contact:</u>***

Anthony Tremblay

(518) 302-9452 (Office)
(617) 908-7058 (Cell)

**<u>Title:</u> Project Manager**
*<u>Description:</u>* Reports to upper-level management, provides sufficient authority and resources to satisfy health and safety requirements, and assumes total control over Site activities. The Project Manager is ultimately responsible for ensuring field implementation of this HASP. The Project Manager may visit the Site from time to time to check status of fieldwork.
***<u>Contact:</u>***
Samantha Miller

(315) 257-7154 (Office)
(915) 329-9898 (Cell)

**<u>Title:</u> Project Engineer**
*<u>Description:</u>* Guides the Project Manager in scientific, engineering, and remedial matters.
***<u>Contact:</u>***
Scott Smith, PE
(315) 257-7227 (Office)
(315) 427-1033 (Cell)

**<u>Title:</u> Client Account Manager**
*<u>Description:</u>* Acts as an advocate for the client and assists the Project Team Leaders in management of the project as needed.
***<u>Contact:</u>***
Patrick Rabideau, PG
(518) 453-3911 (Office)
(518) 894-2444 (Cell)

**<u>Title:</u> Scientific Advisor**
*<u>Description:</u>* Guides the Project Team Leader in scientific matters, if project engineer is not available or a second opinion is needed.
***<u>Contact:</u>***
Scott Smith, PE
(315) 257-7227 (Office)
(315) 427-1033 (Cell)

## 2.2 On-Site Personnel

**Title: Site Safety Officer**
*Description:* Advises the field team on all aspects of health and safety issues, recommends stopping work if any operation threatens worker or public health and safety.
***Contact:***
Karyn Ehmann
(315) 257-7250 (Office)
(585) 721-2402 (Cell)

**Title: Field Team Leader**
*Description:* Responsible for coordinating project requirements in the field. The Field Team Leader oversees daily activities of the project and are, therefore, responsible for implementing health and safety requirements and following safety procedures in the field. The Field Team Leader will contact the local emergency response organizations to notify concerned affiliates of the hazards associated with this project.
***Contact:***
Karyn Ehmann
(315) 257-7250 (Office)
(585) 721-2402 (Cell)

**Title: Work Party**
*Description:* Performs field operations.
***Contacts:***
Karyn Ehmann
(315) 257-7250 (Office)
(585) 721-2402 (Cell)

Andrew Hodgens
(315) 228-0915 (Office)
(315) 414-8675 (Cell)

## 2.3 optional On-Site Personnel

**Title: Health and Safety Coordinator**
*Description:* Responsible for making recommendations regarding the work area to the SSO. Inspections may be periodically conducted to monitor worker health and safety and will address such issues as appropriate PPE, required air monitoring, decontamination procedures, and worker safety. The Health and Safety Coordinator is only expected to visit the site if higher levels of contamination are encountered requiring unusual mitigation or an accident occurs.
***Contact:***
Anthony Tremblay
(518) 302-9452 (Office)
(617) 908-7058 (Cell)

**Title: Project Manager**
*Description:* Reports to upper-level management, provides sufficient authority and resources to satisfy health and safety requirements, and assumes total control over Site activities. The Project Manager is ultimately responsible for ensuring field implementation of this HASP. The Project Manager may visit the Site from time to time to check status of fieldwork.
***Contact:***
Samantha Miller
(315) 257-7154 (Office)
(915) 329-9898 (Cell)

## 2.4 As-Needed Personnel

**Title: Fire Department**
*Description:* Responds to fires and performs rescues.
***Contact:***
911
Syracuse Fire Department (315) 473-5525

**Title: Ambulance**
*Description:* Responds to medical emergencies.
***Contact:***
911
American Medical Response of CNY (315) 471-0102

**Title: Police**
*Description:* Responds to emergencies and performs rescues.
***Contact:***
911
(315) 442-5200

**Title: New York State DEC Spill Hotline**
*Description:* Responds to all petroleum and other hazardous releases into the environment, anywhere in New York State.
**Contact:**
(800) 457-7362

**Title: EPA National Response Center**
*Description*: Responds to all oil, chemical, radiological, biological and etiological discharges into the environment, anywhere in the United States and its territories.
**Contact:**
(800) 424-8802

## 2.5 Client-Specific Contacts

**Title: JMA Staff Consultant**
*Description:* Oversees environmental operations on site. Point of contact for onsite field work, emergencies and compliance matters.
***Contact:***
Gail Cawley
(315) 569-1482 (Office)

**Title: Head of Security**
*Description:* Oversees site security. Point of contact for site access.
***Contact:***
Kevin Schaeffer
(315) 399-8632 (Office)

# 3.0 SITE ENTRY

## 3.1 Objectives

This HASP has been developed for the protection of CHA employees on the Site. Subcontractors will be responsible for developing a HASP to protect their employees. Modifications to this HASP and its PPE requirements must occur if Site activities indicate higher levels of exposure than previously encountered or anticipated.

The objectives of the Site entry are to provide the following services, as needed/requested by JMA Wireless:

- Delineate vertical and horizontal contamination in areas where contamination has been previously identified across the Site.
- Further Investigate the potential impacts of the underground storage tank.

The intrusive Site activities may include the following:

- Soil borings.
- Sampling of soil and groundwater for laboratory analysis.

## 3.2 Safety Meetings

To ensure that the HASP is being followed, the SSO shall conduct a safety meeting prior to entry to the Site or the initiation of any Site activity, if any conditions change, and before each workday. The attached Daily Jobsite Safety Brief Form should be utilized to document these daily jobsite briefings. The Daily Job Site Safety Brief form in Appendix A will be utilized to document the daily job Site safety briefings.

## 3.3 Safety Training

The SSO will confirm that every person assigned to a task has had adequate training for that task and that the training is up to date by checking with the CHA Safety Coordinator and online database. CHA staff working on this project shall have a minimum of:

- 40-Hour Initial Hazardous Waste Operations and Emergency Response (HAZWOPER) training in accordance with 29 CFR 1910.120;
- Current 8-hour HAZWOPER Refresher Training;
- Field equipment safety training where applicable
- CHA Respiratory Protection Plan;
- Field equipment safety training where applicable; and
- Applicable Job Hazard Analyses (JHAs).

Training will have been conducted and certified by CHA in accordance with Occupational Safety and Health Administration (OSHA) regulations.

## 3.4 Medical Surveillance

All CHA personnel will have had a medical surveillance physical consistent with OSHA regulations and performed by a qualified occupational health physician if deemed necessary by project requirements. The SSO shall confirm prior to initiation of work on this Site that every CHA person assigned to a task has had an annual physical, has passed the medical examination, and has been determined medically fit by the occupational health physician for respirator use and this type of work if deemed necessary by the PM.

### 3.5 Site Mapping

Site mapping has been included in the Figures section of the Remediation Investigation Work Plan (RIWP). Figure 1 of the RIWP illustrates the location of the subject Site. Directions and a map illustrating the route to the nearest hospital from the subject Site is provided in Appendix B of this HASP.

## 4.0 SITE CHARACTERIZATION

### 4.1 Site Description

The Site is located at 140 Cortland Avenue, between West Taylor Street and Tallman Avenue in the City of Syracuse, Onondaga County, New York. The Site is 6.96 acres in area and encompasses the block bounded by Oneida Street to the west, West Taylor Street to the north, the private access road formerly known as South Clinton Street to the east, and Tallman Street to the south. The Site is located in an urban area and generally consists of and is surrounded by commercial and industrial development. Some multi-family dwellings are located on the west side of Oneida Street. The Site location is shown in Figure 1 of the RIWP.

The Site was historically several tax map parcels with various owners. In 2023, JMA merged the parcels into Lot 1000. Most recently, the Site was occupied by the following uses:

- Former Horizon Transport – A slab-on-grade, steel frame and concrete block building with high ceilings and multiple overhead doors to allow for vehicle and equipment access inside the building. The Former Horizon Building and the asphalt parking lots to the east and west of the building are located on the northern portion of the Site. The property is vacant at the time of this report.
- Former Tompkins Manufacturing – A single-story concrete and brick building formerly occupied by a warehouse and office area of Tompkins USA Manufacturing, a manufacturer of circular knitting equipment. The parking lot to the south of the building is unpaved gravel. The property is vacant at the time of this report.
- Former Syracuse Stamp – Formerly a two-story industrial use building located in the central and eastern portion of the Site. This facility was formerly a manufacturer of garage door hardware, gate faucets, and inked ribbon spools. In 2020/2021, the building was demolished for redevelopment of the JMA Wireless facility employee parking area. At the time of this report, the area known as the Former Syracuse Stamp is occupied by a vegetated area with a geotextile demarcation barrier and one foot of imported fill material and an employee parking lot constructed with at least six inches of crushed stone covered by asphalt or concrete sidewalks. A small berm of soil was placed in the vegetated area to reduce visibility of the derelict Former Tompkins Manufacturing building.
- Former Catholic Charities Men’s Shelter – A single-story brick building formerly housing the men’s shelter and offices for Catholic Charities of Onondaga County and located on the southeastern portion of the Site. The property is vacant at the time of this report.

Additional description of the Site and a summary of previous investigations have been included in the RIWP.

Appropriate personal protective equipment (PPE), as discussed in Section 10.0, is required for working anywhere within the Site boundaries.

Alterations to this HASP and its PPE requirements may occur if air monitoring and soil screening activities indicate higher levels of contamination are present than the previous investigations noted.

## 4.2 Neighboring Properties

The Site is bordered by the following:

- **North:** West Taylor Street and National Grid Electrical Substation.
- **East:** Syracuse Community Health Center and JMA Wireless – 5G Campus and Headquarters.
- **South:** Tallman Street and Syracuse Centro Bus Garage.
- **West:** Oneida Street, Residential Housing, and Upstate Farms Garage Distribution Center.

## 4.3 Meteorologic Data

Field work is expected to be conducted in the spring/summer of 2024. The weather and temperature for that time of year is expected to vary, but warmer temperatures are typically expected this time of year. Prior to each day's activities, the daily forecast should be monitored for indications of adverse work conditions. If poor weather hinders the continuation of the day's activities the Field Team Leader may notify the PM and stop work for the day.

# 5.0 HAZARD EVALUATION

Hazards are generally divided into three categories, exposure to chemicals and hazardous materials, safety/physical hazards, and biological hazards. Safety/physical hazards are generally hazards such as electrical shock, slips/trips/falls, and confined spaces. Chemical hazards are further segregated by their routes of exposure that may cause adverse health effects. Biological hazards typically include plants, animals, and insects.

### 5.1 Chemical Hazards

| Chemical | OSHA PEL | NIOSH REL | IDLH | Ionization Potential (I.P) | Characteristics | Routes of Exposure | Symptoms of Exposure and Health Effects |
|---|---|---|---|---|---|---|---|
| Tetrachloroethene (PCE) | TWA 100 ppm C 200 ppm (for 5 mins in any 3-hr period) max peak of 300 ppm | NA, Ca Minimize workplace exposure concentration | 150 ppm | 9.32 eV | Colorless liquid with a mild chloroform-like odor | Inhalation, skin absorption, ingestion, skin and/or eye contact | Irritation eyes, skin, nose, throat, respiratory system; nausea; flush face, neck; dizziness, incoordination; headache, drowsiness; skin erythema, liver damage; carcinogenic |
| Trichloroethene (TCE) | TWA 100 ppm C 200 ppm 300 ppm (5 min max in 2-hr period) | NA Ca | 1000 ppm | 9.45 eV | Colorless liquid (unless dyed blue) with a chloroform-like odor | Inhalation, skin absorption, ingestion, skin and/or eye contact | Irritation eyes, skin; headache, visual disturbance; lassitude (weakness, exhaustion); dizziness, tremors, drowsiness, nausea, vomiting; dermatitis; cardiac arrhythmias; paresthesia; liver injury; carcinogenic |
| Cis- 1,2-Dichloroethene (DCE) | TWA 200 ppm | TWA 200 pm | 1000 ppm | 9.65 eV | Colorless liquid (usually a mixture of the cis & trans isomers) with a slightly acrid, chloroform-like odor. | Inhalation, ingestion, skin and/or eye contact | Irritation skin; central nervous system depressed; liver, kidney, and lung damage |

| Chemical | OSHA PEL | NIOSH REL | IDLH | Ionization Potential (I.P) | Characteristics | Routes of Exposure | Symptoms of Exposure and Health Effects |
|---|---|---|---|---|---|---|---|
| Vinyl Chloride | TWA 1 ppm<br>C 5 ppm (15-minute) | NA<br>Ca | N/A | 10.0 eV | Colorless gas or liquid (below 7°) with a pleasant odor at high concentrations | Inhalation, skin and/or eye contact (as a liquid). | Lassitude (weakness, exhaustion); abdominal pain, Gastrointestinal bleeding; enlarged liver; pallor or cyanosis of extremities; liquid: frostbite; carcinogenic. |
| Benzene | TWA 1 ppm<br>ST 5 ppm | Ca<br>TWA 0.1 ppm | CA<br>500 ppm | 9.24 eV | Colorless to light-yellow liquid with an aromatic odor | Inhalation, skin absorption, ingestion, skin and/or eye contact. | Irritation eyes, skin, nose, respiratory system; dizziness; headache, nausea, staggered gait; anorexia, lassitude (weakness, exhaustion); dermatitis; bone marrow depression; [potential occupational carcinogen]. |
| benzo[a] pyrene | TWA 0.2 mg/m3 | Ca TWA 0.1 mg/m3 | 80 mg/m3 | N/A | Black or dark-brown amorphous residue. | inhalation, skin and/or eye contact. | dermatitis; bronchitis; carcinogenic. |
| Benzo [a] anthracene | TWA<br>0.2 $mg/m^3$ | Ca<br>TWA 0.1 $mg/m^3$ | 80 $mg/m^3$ | N/A | Black or dark-brown amorphous residue. | inhalation, skin and/or eye contact. | dermatitis; bronchitis; carcinogenic. |

| Chemical | OSHA PEL | NIOSH REL | IDLH | Ionization Potential (I.P) | Characteristics | Routes of Exposure | Symptoms of Exposure and Health Effects |
|---|---|---|---|---|---|---|---|
| benzo[b] fluoranthene | 8-hour TWA (ST) STEL (C) Ceiling Peak | Up to 10-hour TWA (ST) STEL (C) Ceiling | N/A | N/A | solid with very low volatility and low solubility. | inhalation, skin and/or eye contact. | Skin and eye irritation and carcinogenic. |
| indeno(1,2,3-cd)pyrene, | TWA 10 ppm (45 mg/m3) | N/A | N/A | 8.81 eV | Colorless liquid. Solid below 29°F | inhalation, ingestion, skin and/or eye contact | In Animals: irritation eyes, skin, mucous membrane; dermatitis, skin sensitization; chemical pneumonitis (aspiration liquid); liver, kidney, spleen injury |
| Lead | TWA 0.05 $mg/m^3$ | TWA 0.05 $mg/m^3$ | 100 $mg/m^3$ | NA | Heavy, ductile, soft and gray solid. Non-combustible in solid form | Inhalation, ingestion, skin and/or eye contact | Lassitude; insomnia; facial pallor; anorexia; weight loss; malnutrition; constipation; abdominal pain; colic; anemia; gingival lead line; tremor; paralysis of the wrist, ankles; encephalopathy; kidney disease; irritation of the eyes; hypertension |

C – Ceiling value
Ca – Potentially Cancerous
IDLH – Immediately Dangerous to Life and Health
NIOSH – National Institute for Occupational Safety and Health
OSHA – Occupational Safety and Health Administration
PEL – Permissible Exposure Limit
REL – Recommended Exposure Limit
ST – Short Term Exposure Limit
TWA – Time Weighted Average

## 5.2 Dispersion Pathways

The potential exposure mechanism that can transport particulates and volatile organic compounds (VOCs) from the areas of the intrusive Site activities to other areas of the Site as well as beyond the boundaries of the Site are:

- Contact with contaminated groundwater or soil;
- Projection of contaminated material in air;
- Conveyance in water runoff;
- Failure to adhere to decontamination procedures; and
- Failure to adhere to the Field Sampling Plan and/or Standard Operating Procedures.

Visible emissions can be a problem at any Site that involves intrusive activities and should be controlled to the extent feasible. To monitor VOC and particulate emissions during intrusive work, CHA will implement a Community Air Monitoring Plan (CAMP) in accordance with Section 6.0 below and the NYSDOH generic CAMP. In support of CAMP requirements, and to control VOC and particulate emissions in the work area, the following corrective actions can be implemented if emissions are produced:

- Minimizing the amount of exposed ground surface/covering exposed surfaces;
- Lightly wetting surfaces;
- Using chemical or foam dust suppressants (with authorization only),
- Reducing vehicle speeds.

## 5.3 Physical Hazards

Physical hazards such as the following may be encountered on-Site:

- Slip/trip/fall;
- Excavations;
- Heat stress;
- UV radiation;
- Heavy equipment operation;
- Excessive noise;
- Moving parts or equipment (including heavy construction equipment);
- Lifting (generators, drums, equipment); and
- Traffic – on access roadways at the facility.

## 5.4 Biological Hazards

Biological hazards such as the following may be encountered on-Site:

- Ticks, mosquitoes, stinging insects, arachnids, chiggers (allergic reactions and/or infectious diseases that can be transmitted to humans by animals)
- Rodents, snakes, zoonotic diseases (physical contact and/or infectious diseases that can be transmitted to humans by animals)

### 5.5 Hazard Identification and Control

Hazard controls generally consist of following specific safety procedures, training, engineering controls, air monitoring, and PPE selection. CHA employees are required to use the PPE appropriate to their work task and potential exposures as outlined in this HASP.

The levels of PPE assigned to each activity are based on available information on the estimation of exposure potential associated with each work task.

| Affected Personnel | Task/Operation | Hazards | Hazard Control |
|---|---|---|---|
| All personnel in Exclusion Zone and Contamination Reduction Zone | Investigate potential impacts of the UST. | • Inhalation of organic vapors, dusts, and other airborne particulates.<br>• Skin and/or eye contact with contaminated soil and/or groundwater, decontamination solutions, and sample preservation agents. | • Conduct air monitoring in accordance with Section 6.0. Wear the required personal protective equipment when conditions or activities indicate the need for it. Stand upwind to extent possible to reduce inhalation hazard.<br>• Keep airborne dust levels to a minimum by wetting down surfaces.<br>• Maintain eye contact with equipment operator when moving in or around the excavation. |
| All personnel in Exclusion Zone and Contamination Reduction Zone | Collection of soil samples. | • Inhalation of organic vapors, dusts, and other airborne particulates.<br>• Skin and/or eye contact with contaminated soil, decontamination solutions, and sample preservation agents. | • Conduct air monitoring in accordance with Section 6.0. Wear the required personal protective equipment when conditions or activities indicate the need for it. Stand upwind to extent possible to reduce inhalation hazard.<br>• Keep airborne dust levels to a minimum by wetting down surfaces. |

| Affected Personnel | Task/Operation | Hazards | Hazard Control |
|---|---|---|---|
| All personnel in Exclusion Zone and Contaminant Reduction Zone | Installation of soil borings. | • Inhalation of organic vapors, dusts, and other airborne particulates.<br>• Skin and/or eye contact with contaminated soil and/or groundwater, decontamination solutions, and sample preservation agents. | • Conduct air monitoring in accordance with Section 6.0. Wear the required personal protective equipment when conditions or activities indicate the need for it. Stand upwind to extent possible to reduce inhalation hazard.<br>• Maintain eye contact with equipment operator when moving near or around the drill rig. |
| All personnel | All field activities | Slips, trips, & falls | • Wear appropriate work boots.<br>• Avoid slippery surfaces.<br>• Remind field personnel to exercise good housekeeping practices.<br>• Be observant of activities around. |
| All personnel | All field activities | Physical injuries, such as abrasions or cuts | • Use safe work practices.<br>• Don proper PPE.<br>• Have a first aid kit readily available at site. |
| All personnel | Heavy lifting | Back injuries from lifting | • Practice safe lifting techniques.<br>• Always use a minimum of 2 people for heavy lifts.<br>• Lift with legs. Do not twist while carrying the load. |
| All personnel | Heat stress | Exposure to elevated temperatures associated with working outdoors in warm/hot weather conditions. | • Wear lightweight clothing.<br>• Drink lots of water.<br>• Take breaks in the shade or cool areas. |
| All personnel | Cold stress | Exposure to low temperatures associated with working outdoors in variable weather conditions | • Wear warm, dry clothing & layers.<br>• Take frequent breaks in warm areas. |
| All personnel | All field activities | Fire (general) | • Identify location of fire extinguisher(s) – contractor sourced.<br>• Keep ignition sources away from flammable materials and atmospheres. |

| Affected Personnel | Task/Operation | Hazards | Hazard Control |
|---|---|---|---|
| All personnel | All field activities | Noise Exposure | • Wear hearing protection if you must shout to hear someone who is standing one foot or less away. |
| All personnel | All field activities | Contact with heavy equipment and traffic | • Do not stand unnecessarily close to the excavator when it is operating.<br>• Do not stand in lanes of traffic. Use cones or barricades to delineate work areas when work within access roads is required.<br>• Wear a hard hat and high visibility clothing.<br>• Make eye contact with the operator/drivers. |
| All personnel | All field activities | Security | • Stay alert to all on-site activities.<br>• Report suspicious activities to PM and/or client. |
| All personnel | All field activities | Ticks | • Avoid unnecessary entry into tall grass and brushy areas.<br>• Wear insect repellents containing DEET or Permethrin.<br>• Wear light colored clothing to easily identify ticks.<br>• Inspect yourself throughout the day and following completion of field activities.<br>• Tuck pants into socks or boots, wear long sleeves and minimize skin exposure. |
| All personnel | All field activities | Stinging insects (bees, hornets, wasps and yellow jackets) | • Do not agitate nests unless absolutely necessary.<br>• Be aware of holes in the ground within the work area.<br>• Avoid wearing bright or patterned clothing.<br>• Avoid wearing/using scented items (e.g., perfume, cologne, soaps).<br>• Inspect food and drinks prior to consumption.<br>• Use insecticide when necessary. |
| All personnel | All field activities | Zoonotic diseases | • Avoid dermal contact with animals, droppings, or carcasses.<br>• Avoid inhalation of dust that is contaminated with droppings or carcasses.<br>• See Appendix D for information regarding the SARS-COV-2 (COVID-19) pandemic. |

| Affected Personnel | Task/Operation | Hazards | Hazard Control |
|---|---|---|---|
| All personnel | All field activities | Hantavirus | • Avoid dermal contact with rodent droppings.<br>• Avoid inhalation of dust that is contaminated with rodent droppings. |
| All personnel | All field activities | Mosquitos/West Nile Virus | • Eliminate mosquito breeding areas (standing water) at the work site.<br>• Apply insect repellent containing DEET to exposed, unbroken skin per the manufacturer's instructions.<br>• Wear light colored clothing (pants, long sleeved shirts and socks). |
| All personnel | All field activities | Snakes | • Avoid actions which increase the risk of encountering a snake (e.g., overturning logs, rocks, etc.). |
| All personnel | All field activities | Rodents | • Avoid contact with rodents and burrowing animals. |
| All personnel | All field activities | Arachnids | • Avoid actions which increase the risk of encountering arachnids (e.g., overturning logs, placing hands in dark places). |
| All personnel | All field activities | Physically Damaging Plants (e.g., briars, thistles) | • Remove plants prior to implementing the work activity.<br>• Use briar resistant pants or chaps if working in dense thorny vegetation. |
| All personnel | All field activities | Ultraviolet Exposure | • Cover skin and limit time in sun to extent practical.<br>• Apply sunscreen. |

# 6.0 AIR MONITORING & ACTION LEVELS

## 6.1 Air Monitoring

The CAMP will be implemented during the intrusive activities at the Site. The purpose of the CAMP is to provide a measure of protection for the downwind community, more specifically off-Site receptors including residents and workers, from potential airborne contaminant releases as a result of excavation activities performed at the Site. The CAMP will be implemented following NYSDOH's Generic CAMP protocol with one upwind and one downwind air monitoring station.

In support of the CAMP and to monitor air quality in the immediate work area, the following environmental monitoring instruments will be used within the Exclusion Zone:

- Photoionization Detector (PID) with 10.6 eV lamp or higher

The (PID) shall be used to detect volatile organic compounds in the ambient air in the work zone and will be calibrated and setup prior to the start of the days' activities.

| Contaminant/Method | Frequency | Action Level | SSO Action |
|---|---|---|---|
| VOC Meter | Continuous | Downwind meter is 5 ppm or more above background/upwind meter sustained for 5 minutes. | Stop work and notify PM. PM will notify JMA contact. |

Monitoring instruments will be calibrated at the start each full day of equipment usage or more frequently in accordance with manufacturer's recommendations.

## 6.2 Action Levels

Should action levels be reached, work operations shall cease until further evaluation is performed and safe levels are prevalent. If through engineering controls and monitoring, safe levels (below action levels) cannot be achieved, an upgrade in personal protection equipment shall be mandated by the SSO, or operations shall cease in that portion of the Site. The PM will be notified of any changes in PPE.

# 7.0 SITE CONTROL MEASURES

**Exclusion Zone (EZ):** Will include a 25-foot buffer around all boring areas and all areas where subsurface activities will occur. This will be delineated by cones/flagging or positioning field vehicles to block off the area.

Hazards within the EZ include excessive noise, slips/trips/falls, contact with heavy equipment, and hazards associated with proximity to boring activities; including direct contact with contaminated soil or water and inhalation of vapors from contamination.

**Contamination Reduction Zone (CRZ):** Will be established immediately adjacent to the Exclusion Zone and will be utilized for decontamination of personnel and equipment donning and doffing of PPE. Whenever possible, the CRZ shall be placed upwind of the EZ. The CRZ will also be coned/flagged to prevent facility personnel from entering the area.

Hazards within the CRZ include contact with contaminated soil or water, inhalation of vapors from contamination, and slips/trips/falls. Physical hazardous within the facility may pose a risk and good judgement should be utilized.

**Support Zone (SZ):** Will include all areas outside the EZ and CRZ.

Hazards within the support zone include slips/trips/falls, contact with heavy equipment, and other physical hazards associated with the work area and physical setting at the Site. Personnel within the SZ do not require HAZWOPER training.

## 8.0 HAZARD COMMUNICATION

In compliance with 29 CFR 1910.1200, any hazardous materials brought on Site by any personnel (CHA or its sub-contractors) shall be accompanied with the material's Safety Data Sheet (SDS). The SSO shall be responsible for maintaining the SDSs on Site, reviewing them for hazards that working personnel may be exposed to, and evaluating their use on Site with respect to compatibility with other materials including personal protective equipment, and their hazards. Should the SSO deem the material too hazardous for use on the subject Site, the party responsible for bringing the material on Site will be required to remove it from the Site.

## 9.0 CONFINED SPACE

During this project CHA personnel will not be permitted to enter any confined space. No confined space work is anticipated during this project.

If a confined space entry becomes necessary, this HASP will be revised to outline all confined space entry procedures, techniques, and equipment to be consistent with OSHA regulations in 29 CFR 1910.146. Additionally, all entrants and attendants will be trained in Confined Space Awareness training consistent with 29 CFR 1910.146.

## 10.0 PERSONAL PROTECTIVE EQUIPMENT

At this time, Level A, B and C PPE are not expected to be needed. If Site conditions change and contamination is present at levels above the action level, this HASP will be updated to reflect greater protection of personnel. The following is a list of required PPE at this time.

| Task/Operation | Level of PPE | Equipment |
|---|---|---|
| General Site observation at a distance greater than 25 feet from intrusive activities.<br>• No drums present<br>• No free product visible<br>• 2-Minute Breathing Zone PID Readings < 5 ppm with the 10.6 eV bulb<br>• No strong odors present | D | • Long pants (no shorts)<br>• Hard hat<br>• Safety glasses<br>• Reflective vests or yellow safety shirt<br>• Work boots with safety toe<br>• Hearing protection (where required)<br>• Gloves (as appropriate) |

## 11.0 DECONTAMINATION

Personnel working in the Exclusion Zone (within 25 feet of Site activities) will be required to enter and exit the work area through the Contamination Reduction Zone. Personnel engaged in decontamination will wear protective equipment including appropriate disposable clothing and respiratory protection and will also undergo decontamination procedures prior to leaving the decontamination area. The decontamination area will be placed upwind of the Exclusion Zone and may change based on the wind direction that day. The following equipment is needed for decontamination:

- Alconox®
- Distilled water
- Clean 5-gallon buckets
- Impermeable containers
- Polyethylene sheeting
- Garbage bags

The following list summarizes typical decontamination steps for personnel exiting the Exclusion Zone. Additional steps may be warranted based upon specific Site conditions.

***Level D***

- Remove any protective equipment within the decontamination area, as needed.
- Discard disposable garments.
- Wash/rinse boots.
- Containerize wash and decontamination water for disposal, as necessary.

***Level C***

- Will not be used at this time.

***Level B***

- Will not be used at this time.

***Level A***

- Will not be used at this time.

PPE will be decontaminated with soap (i.e. Alconox®) and water. Expendable, non-reusable items will be disposed of in garbage bags and disposed off-site as solid waste. Heavily contaminated PPE will be drummed with soil cuttings for offsite disposal.

Equipment and vehicles used by the Contractor in the Exclusion zone to handle contaminated materials will undergo decontamination procedure in the Contamination Reduction Zone prior to leaving the Site. The SSO will document that each piece of equipment has been decontaminated prior to removal from the Site. The decontamination procedures will include but are not limited to:

- Movement of equipment to the temporary decontamination pad;
- Removal of heavily-caked material with brushes or shovels; and
- Triple-rinsing with high pressure water or steam.

***Small Equipment:***
For soil sampling, dedicated sampling equipment is preferred. However, if non-dedicated equipment is used (i.e. stainless steel soil sampling equipment), the required decontamination procedure for all manual sampling equipment used to collect samples for chemical analysis is:

- Disassemble equipment, as required;
- Remove gross contamination from the equipment by brushing and then rinsing with tap water;
- Wash and scrub with low phosphate detergent (e.g. Alconox®);
- Tap water rinse;
- Distilled water rinse;
- Air dry.

All decontaminated equipment will be placed on or wrapped in polyethylene sheeting in order to avoid contacting a contaminated surface prior to use. Field personnel will use a new pair of outer gloves before handling sample equipment after it is cleaned. During periods of transportation and non-use, all decontaminated sampling equipment will be wrapped in polyethylene sheeting or aluminum foil.

***Large Equipment:***
CHA personnel are not responsible for the decontamination of large equipment. Information for large equipment decontamination will be provided by the drilling subcontractor. Decontamination of heavy construction equipment will be performed by the contractor under the contractor's HASP.

## 12.0 EMERGENCY PROCEDURES

On-Site emergencies can range in intensity from minor to serious conditions. Various procedures for responding to Site emergencies are listed in this section. The designated SSO is responsible for contacting the CHA Project Manager who will notify the JMA Wireless representative in emergency situations (however, others must assume responsibility if the situation warrants). An injured person shall be accompanied by another worker at all times.

Should an on-Site emergency occur at the project Site (related to the project or otherwise) the following procedures shall be followed:

- Call 911 for additional emergency response.
- If the emergency occurs and is project specific, notify your assigned HSC after emergency care is provided to activate the appropriate actions.
- Properly trained personnel will determine if the emergency can be contained or remediated and initiate the appropriate action(s). Personnel shall not respond beyond their level of training.
- Employees are not to risk their health or life in taking aggressive action(s) to fight fire or stop releases. Only defensive actions shall occur until an action plan is resolved.
- Choose an exit route that provides fast, and safe, egress from the work area. The route taken should always be away from obvious obstructions or other hazardous conditions. Consult an evacuation map if you are unsure of where the nearest exit route is located.
- Do not delay evacuation to retrieve personal items or equipment.
- Persons shall exit areas in groups and attempt to stay together during evacuation procedures.
- While evacuating, notice any conditions which should be reported to emergency personnel. Be alert for the location of smoke, fire and/or vapors. Report any of these conditions to emergency personnel.
- Be aware of emergency response vehicles and avoid interference with these.

Remain calm, keep voices low and wait for instructions from the Incident Commander. Do not leave the scene prior to notifying your assigned Project Manager and Field Team Leader. An incident report form is included in Appendix C.

# 13.0 EMERGENCY MEDICAL CARE

In general, if emergency care is needed, personnel will call 911. However, if necessary, transport injured personnel to the nearest hospital using the following directions (map available in Appendix B):

Address: Crouse Hospital
736 Irving Ave
Syracuse, NY 13210

Emergency Room Telephone Number: (315) 470-7111

**Directions from Site:**

1. Head east on W Taylor St toward S Clinton St 0.1 mi.
2. Turn right onto S Salina St 397 ft.
3. Turn left onto Burt St 0.4 mi.
4. Turn left onto Almond St/Van Buren St 0.3 mi.
5. Turn right onto E Adams St 0.2 mi.
6. Turn right onto Irving Ave 397 ft.
7. Hospital will be on the right.
8. Follow signs to the Emergency Department.

## 13.1 Emergency Notification Numbers

CHA Contact: Samantha Miller, (915) 329-9898 (Cell)
JMA Contact: Gail Cawley, (315) 569-1482
Fire Dept.: 911
Police Dept.: 911
Department of Emergency Services: 911
Poison Control: (800) 222-1222

## 13.2 On-Site First Aid

First aid kits will be available in the Support Zone (e.g. vehicles). General first aid procedures include:

**Skin/Eye Contact:** Flush eyes and/or skin thoroughly with water for 15 minutes. Remove contaminated clothing. If skin was contacted with a dry material, brush it off first, then flush with water. Seek medical attention if irritation develops.

**Ingestion:** Do not induce vomiting. Call Poison Control Center. Tell them what was swallowed, if possible. Follow instructions. Have SDS available for reference.

**Inhalation:** Remove person from contaminated environment without risking your own safety. **DO NOT ENTER A CONFINED SPACE. DO NOT ENTER EXCLUSION ZONE UNLESS WEARING ONE LEVEL HIGHER PROTECTION THAN VICTIM WAS WEARING.**

Administer cardiopulmonary resuscitation (CPR) if victim does not have a pulse and if you are currently certified in CPR.

**Injuries:** Do not move a victim who may have a back injury. Cover them with coats, blankets, or other appropriate items to keep them warm. Personnel will immediately dial emergency services (i.e. 911).

Apply pressure to bleeding wounds. If the victim is able, have the victim apply pressure to the wound. If they are not able, wear gloves to protect from exposure to blood. Put gauze bandages or other clean cloth over the wound. Do not remove blood-soaked bandages or cloth - instead put additional bandages or cloths over the blood-soaked bandages. Elevate the limb with the injury above the heart.

Administer CPR if victim does not have a pulse and if you are currently certified in CPR. Have someone call for an ambulance immediately if there is any possibility that the victim is having or had a heart attack.

Shock is likely to develop in any serious injury or illness. The following are signals of shock: restlessness or irritability; altered consciousness; pale, cool, moist skin; rapid breathing; and/or rapid pulse. In the event of shock, do the following: Immediately have someone call for an ambulance; have the victim lie down; elevate legs 12 inches unless you suspect head, neck, or back injuries; if victim is cool, cover the victim to prevent chilling; do not give the victim anything to drink, even if thirsty. Note time symptoms began and report to emergency responders.

## 14.0 CERTIFICATION

All Site personnel covered by this plan have read the HASP and are familiar with its contents and provisions.

| Name | Title | Date |
| --- | --- | --- |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |

## 15.0 JOB HAZARD ANALYSIS

- ✓ **Environmental Sampling/Outdoor Hazards**
- ✓ **Excavation**
- ✓ **Heat Stress**
- ✓ **Heavy Equipment**
- ✓ **Slips, Trips, Falls**
- ✓ **Noise (Decibel Summary)**

OSHA Quick Cards, Job Hazard Analysis and applicable standard operating procedures are available in Appendix D of this HASP.

# APPENDIX A

Daily Job Briefings

# DAILY JOBSITE SAFETY BRIEF

| PROJECT INFORMATION | | | |
|---|---|---|---|
| **Project Name: JMA Campus Plan** | | **CHA Project No. 059294.001** | |
| **Project Start Date:** | **Completion Date:** | **Weather:** | |
| **Project Location: Syracuse, NY** | | **Project Task:** *Complete a Site Health & Safety Plan per Task* | |
| **Description of Work:** *Be Specific:* | | | |
| **Key Personnel:** *Responsibilities:* | *Project Manager: Sam Miller* | *Field Team Leader: Karyn Ehmann* | *Site Safety Officer: Karyn Ehmann* |
| **Description of Hazards:** | | | |

**The Daily Jobsite Safety Brief must be completed before work begins daily or Scope of Work changes**

**Weather:** ____________________

| | | | |
|---|---|---|---|
| All staff have reviewed and signed site and safety plan | ☐Yes ☐No | All staff have proper PPE | ☐Yes ☐No |
| Hazards and precautions have been discussed | ☐Yes ☐No | Safety Controls in place | ☐Yes ☐No |

**Additional Notes/Comments:** ____________________

**Signed:** ____________________ **Date/Time:** ____________________

**Signed:** ____________________ **Date/Time:** ____________________

**Signed:** ____________________ **Date/Time:** ____________________

**Weather:** ____________________

| | | | |
|---|---|---|---|
| All staff have reviewed and signed site and safety plan | ☐Yes ☐No | All staff have proper PPE | ☐Yes ☐No |
| Hazards and precautions have been discussed | ☐Yes ☐No | Safety Controls in place | ☐Yes ☐No |

**Additional Notes/Comments:** ____________________

**Signed:** ____________________ **Date/Time:** ____________________

**Signed:** ____________________ **Date/Time:** ____________________

**Signed:** ____________________ **Date/Time:** ____________________

**Weather:** ____________________

| | | | |
|---|---|---|---|
| All staff have reviewed and signed site and safety plan | ☐Yes ☐No | All staff have proper PPE | ☐Yes ☐No |
| Hazards and precautions have been discussed | ☐Yes ☐No | Safety Controls in place | ☐Yes ☐No |

**Additional Notes/Comments:** ____________________

**Signed:** ____________________ **Date/Time:** ____________________

**Signed:** ____________________ **Date/Time:** ____________________

**Signed:** ____________________ **Date/Time:** ____________________

# APPENDIX B

Hospital Route


1. Directions from site: Head east on W Taylor St toward S Clinton St 0.1 mi.
2. Turn right onto S Salina St 397 ft.
3. Turn left onto Burt St 0.4 mi.
4. Turn left onto Almond St/Van Buren St 0.3 mi.
5. Turn right onto E Adams St 0.2 mi.
6. Turn right onto Irving Ave 397 ft.
7. Hospital will be on the right.
8. Follow signs to the Emergency Department.

SOURCE: Google Maps



300 South State Street Suite 600 Syracuse, New York 13202
Main: (315) 471-3920 • www.chacompanies.com

**HOSPITAL ROUTE**
JMA CAMPUS PLAN
SYRACUSE, NY

PROJECT NO. 059294

DATE: 2024

Appendix B

# APPENDIX C

Incident Report

CHA

# Incident Report

Please Note: this form must be completed within 24 hours of an employee's injury or illness during the workday. This form can be completed by the employee or supervisor (or a witness if his/her supervisor is unavailable).

## Employee

| Date of Incident | Employee's Name | Employee # | Full Address where Incident Occurred | County |
|---|---|---|---|---|
| | | | | |

| Time Started Work (on the day of injury) | Number of Years of Experience in Completing the Task Related to Injury | Working alone and the only one on-site? | Client | Project Number |
|---|---|---|---|---|
| | | | | |

| Time of Incident | Employee's Sector and Group | Employee's Occupation/Title |
|---|---|---|
| | | |

| Please describe, in detail, what happened to cause the incident (conditions working under, how accident happened, etc.) |
|---|
| |

| List the Nature of the Employee's Injury and Body Parts Affected (Describe here): | | | | | |
|---|---|---|---|---|---|
| Injury type | | Body Part | | Indicate whether a similar work-related injury occurred in the past | |

| What Was Employee Doing When Incident Occurred? (Be specific. If any tools/equipment involved, list them.) |
|---|
| |
| How Did the Incident or Exposure Occur? (Describe fully the events, which resulted in the injury/illness.) |
| |
| Object or Substance That Directly Injured Employee or Caused Illness? (Describe what caused injury/illness.) |
| |

| | | | |
|---|---|---|---|
| Were there any witnesses to the incident? | ☐ Yes ☐ No | | |
| If Yes, list contact information here | | | |
| Signature | | Date | |

## Supervisor

| Was this a first aid only incident? | Was Medical Care Beyond First Aid Treatment Provided? | Was employee treated in ER and/or hospitalized? | Summarize first aid or medical care received. (Be specific with procedures performed, medication provided, etc.) |
|---|---|---|---|
| | | | |

| Name & Address of Medical Treatment Facility | Doctor Name | When was the date of treatment? | Date Supervisor First Notified of Employee Injury/Illness | Has employee provided supevisor with work status/discharge papers? |
|---|---|---|---|---|
| | | | | |

| Describe the reason(s) why the incident occurred - unsafe acts and conditions. | Root Causes (Select the primary root cause for this injury) |
|---|---|
| | |

| Immediate Actions Taken (List actions that will successfully prevent recurrence.) |
|---|
| |

| | | | | | |
|---|---|---|---|---|---|
| Does the Client have injury notification requirements? | | | If yes, has CHA notified client? | | |
| Print Name | | Signature: | | Date | |

## H&S

| Is Case OSHA Recordable? | If Yes, OSHA Case/File No. | Lost Time | Restricted Duty | Date H&S First Notified Of Injury/Illness |
|---|---|---|---|---|
| | | ☐ Yes ☐ No | ☐ Yes ☐ No | |

| | | | | | |
|---|---|---|---|---|---|
| Comments: | | | | | |
| Print Name | | Signature: | | Date | |

RETURN COMPLETED FORM WITHIN 24 HOURS OF THE INCIDENT TO Sherry Lingle, Tony Tremblay, Michael Platt, Lauren Perry

Revision 6,June 2022

# APPENDIX D
Job Hazard Analyses

# CHA Consulting, Inc.

# Job Hazard Analysis

# Environmental Sampling/Outdoor Hazards

| **Task** | **Hazard Type and Description** | **Hazard Control** |
|---|---|---|
| | | |
| Working in hot environments | Heat disorders including heat cramps, heat exhaustion, and heat stroke | Employers can control this hazard by providing heat stress training to exposed employees, providing access to shade, and allowing employees to gradually get used to hot environments. Employees working in hot environments are advised to take breaks in cool rest areas, rotate physically demanding tasks, save most demanding work for cooler times of day, and utilize the heat index chart to determine exposure risk. Be sure that every employee working in the hot environments is drinking one cup of water ever fifteen minutes. Recognize the signs such as above normal body temperature, headaches, nausea, cramping, fainting, increased heart rate, and pale as well as clammy skin |
| | Sunburn | The risk of sunburn is higher when working at high elevations, or when working around water (from reflection). In these conditions, you can be burned even in overcast conditions; therefore, wear protective clothing and use sunscreen |
| High wind events | Severe wind events can create | Employees should avoid areas |

| | | |
|---|---|---|
| | "wind throws" where strong winds can blow down trees | during high wind occurrences that exhibit previous wind damage |
| Working at high altitudes | Altitude sickness | Recognize signs of acute mountain sickness including headaches, light-headedness, inability to catch one's breath, nausea, and vomiting. Practice prevention by acclimating slowly to high elevations and staying hydrated. If the following symptoms progress, immediately descend to lower elevations and seek medical attention: difficulty breathing, chest pain, confusion, decreased consciousness, and loss of balance |
| Electrical storms | Being struck by lightning | While working outside, watch the sky for thunderstorms and seek shelter before the weather deteriorates. Stop working in streams and lakes. Someone at the job site must be able to begin revival techniques (i.e. CPR) if someone is struck by lightning. Do not use telephones. If caught in electrical storms, seek shelter inside a vehicle or building. When in a building, keep away from doors, windows, plugged in appliances, and metal. When in a vehicle, avoid contact with metal objects inside. If outside with no shelter, obey the following procedures: do not congregate, do not use metal objects, avoid standing near isolated trees, seek lower elevations such as valleys or canyons, and avoid being on peaks as well as trees. If you feel your hairs standing on end and your skin tingling, this is a sign that lightening might be about to strike so crouch immediately (feet together, hands on knees). Wait a minimum of 20-30 minutes after the last lightning flash to return to the field or outside area. |

| | | |
|---|---|---|
| Being outdoors in cold weather for extended periods of time | Hypothermia<br><br>Frostbite | Recognize the signs including shivering, numbness, drowsiness, muscle weakness, dizziness, nausea, unconsciousness, low/weak pulse, and large pupils. Exercise practice prevention such as staying dry, wearing the appropriate clothing (layers), listen to the weather forecast to plan accordingly, stay hydrated, cover head with warm clothing, and stay active. Be aware of the role that wind-chill can play in hypothermia; under certain conditions, hypothermia can occur without any rain or being wet.<br><br>Dress for the weather- layers are best, and mittens are better than gloves (keeps your warm fingers together while warming each other). Wear two pairs of socks with the inner layer made of synthetic fiber, such as polypropylene, to wick water away from the skin and the outer layer made of wool for increased insulation. Shoes should be waterproof. Keep your head, face, nose, and ears covered at all times. Clothes should fit loosely to avoid a decrease in blood flow to the arms and legs. Always travel with a friend in case help is needed. Be especially wary of wet and windy conditions; the "feels like" temperature (wind chill) is actually much lower than the stated air temperature. The very old, those who are not in good physical condition, and people with diabetes and anyone with vessel disease should take extra precautions. |
| Working in areas with | Giardia | Treat, filter, or boil drinking water. |

| | | |
|---|---|---|
| limited access to clean drinking water | | Do not drink untreated water from streams, lakes or springs. |
| Working outdoors | Rattlesnakes<br><br>Bears<br><br>Mountain Lions | Be alert and do not put your feet or hands where you cannot see what is on the ground (for example if you are stepping over a log and you cannot see what's on the other side). If you encounter a rattle snake do not pick it up- give it a wide berth and walk around it. If bitten, seek immediate professional medical attention and remove jewelry. If bitten on an extremity lower than the heart, cover wound with a sterile band while seeking medical attention.<br><br>If you encounter a bear, be alert but stay calm, and give it as much room as possible. Try to leave the area, but DO NOT RUN. Back away slowly. If the bear follows, stop and hold your ground: wave your arms to make yourself look big and talk in a normal voice. Work in teams of two to deter bear attacks. If the bear makes contact, surrender: fall to the ground and play dead (a bear will break off an attack once it feels the threat has been eliminated). If the bear continues to bite after you assume a defensive posture. Their attack is predatory and you should fight back vigorously<br><br>Be alert, calm, and do not panic. If you see a mountain lion, do not run as it may stimulate its predatory nature. Instead, shout and wave arms to let it know that you are not prey: fight back |

| | | |
|---|---|---|
| | Tick bites<br><br><br><br><br><br><br><br><br><br><br><br>Roughskin Newts<br><br><br><br><br><br><br><br><br><br>Bee stings | Use DEET based repellants on exposed skin and/or permethrin on clothes. Check for ticks during and after field work. If you find a tick remove it with tweezers within 24 hours, preferably immediately: do not leave the head embedded or extract the tick with matches, petroleum jelly, or other coatings (e.g. motor oil)<br><br>Avoiding handling them as their skin contains a potent neurotoxin. If necessary for the protocol, handle only when wearing gloves. Do not "lick" for "killer buzz" as people have died from attempting to eat roughskin newts<br><br>If you know or suspect you are allergic to bee stings, carry appropriate allergy kits prescribed by a doctor for treating anaphylactic shock. Carry and take diphenhydramine (Benadryl). Follow the label instructions for allergy control. Inform your supervisor if you suspect you are allergic. Watch for ground nests |
| Travel movement or work in area with poison oak or poison ivy | Allergic reaction to poison oak/poison ivy plants | Learn to recognize poison oak. Avoid contact by using ivy block and wearing long pants and long-sleeve shirts if traveling in dense areas. If skin contact is made, flush the area with cold water as soon as possible. Do not flush your skin with warm water or soap as it can open your pores and increase the reaction. To wash and rinse use |

| | | |
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| | | Tecnu or similar product with cold water to remove oils |
| Encountering irrigation pipes, marijuana plantation, or grow operations | Unfriendly encounters with criminal elements | Do not wear uniforms and carry a radio backpack that is not visible. Do not confront strangers and act like a tourist if you must speak. Work in pairs or groups. If working in areas likely to contain operations, check in with park staff when leaving vehicle and returning to vehicle. Watch for black piping or other signs. If you find a definite grow operation, leave immediately, note the location, and report it to the authorities |

# CHA Consulting, Inc.

# Job Hazard Analysis

# Excavations

| Task | Hazard Type and Description | Hazard Control |
|---|---|---|
| | | |
| Noise exposure | Hearing loss & psychological stress | Utilize muffler systems and other engineering controls with increasing working distance. Wear approved safety ear plugs when working close enough to heavy equipment/backhoe |
| Drilling | Inhalation hazards from dust and dirt.<br><br>Struck-by and caught between. | Wear appropriate PPE to protect from dust such as a fit- tested half-face air purifying respirator with appropriate dust cartridges. The respirator should be worn whenever field instruments indicate the need, or when wind-blown dust is obvious in combination with detected contaminates<br><br>Stay alert and maintain safe distance from operating parts. |
| General excavation activity | Contact of dirt or dust after work activities on one's skin | Wear coveralls or tyvek suits to protect clothing, boots, hair, and skin. Remove work clothes including boots before entering environments outside of the work site |
| Being near moving parts of machinery | Physical injury from moving parts<br><br>Struck-by and caught between | Avoid moving parts of machinery. Keep finger, hand and arms away from backhoe bucket and other pinch points. Wear leather gloves when using hands for activities other than sampling, and steel-toed boots. Wear hard hat at all times |
| Working in the vicinity of heavy machinery | Struck-by and caught between | Personnel on the ground should keep away from the work area and backhoe unless they are required for the task. Ask for assistance when |

| | | |
|---|---|---|
| | | carrying or moving heavy loads. Use legs to lift. Do not carry heavy equipment without first establishing eye contact with the operator. Use standard hand signals when noise levels inhibit auditory communication. Ensure that all heavy machinery have audible back-up signals. All workers must wear reflective traffic vests when appropriate. Barricade work area and permit only excavation personnel in the area |
| Working where there is site vehicle traffic | Struck-by and caught between | Restrict outside vehicular traffic on the job site. Use flaggers and a specific traffic route if necessary |
| Digging where there are unknown underground utilities and pipes | Striking underground utilities or other significant obstructions<br><br>Running into an electrical duct bank<br><br>Potential for fires, spills, damaged underground utilities, high noise<br><br>Slips, trips and falls walking in general vicinity of planned excavation | Observe marked locations of underground utilities if marked. Excavate by hand when within five feet in any direction of known underground obstructions. Machine digging allowed within two feet after visual identification and de-energized. If utilities can be confirmed as abandoned, hand digging is not required. Use detection systems if applicable!<br><br>Hand digging required to visually establish location. Machine digging per competent person evaluation and JSA/STA<br><br>Utilize a qualified spotter probe bar, appropriate PPE (hard hat, safety glasses, steel toed boots, Nomex coveralls, ear plugs and gloves as necessary)<br><br>Review general terrain and evaluate surface conditions. Look for ruts, large rocks, and uneven terrain |
| Scanning with electronic | Trips and falls, strain from | Have an assistant help spot various |

| | | |
|---|---|---|
| equipment | lifting heavy instruments | hazards in area if focusing on instrument is too distracting. If lifting or pushing scanning instruments of heavier weights, get assistance with movements to avoid strains |
| Probing with metal tipped fiberglass rods | Slips, trips, and falls walking in general area of intended excavation<br><br>Back strains, hand injury from probing rod | Review overall terrain and identify surface conditions. Look for ruts, large rocks, and uneven terrain<br><br>Avoid excessive force attempting to penetrate deeper with rods. Wear leather gloves to avoid blisters and other hand injuries |
| Working in the Ditch | Potential for cave-in, atmospheric hazards, struck0by/caught-between.<br><br>Ladder safety<br><br>Water accumulation | Have a competent person evaluate the excavations. Excavations over 5 feet deep shall properly protected from cave-ins (protective systems – sloped, benched, shoring, A competent person shall oversee all excavation safety issues and properly assess working conditions. shielding). Utilize a 4 way calibrated monitor at all times while employees are in the ditch. Only one person act as signalman, but anyone can call emergency stop. The spoil pile shall be located at least two feet from the edge of the trench if not as far away as possible and slope the pile away from the excavation<br><br>Ladders used for access must be tied off and extend 3' over landing. When ascending/descending employee must face ladder and maintain three (3) points of contact. Angle ladder at a ¼ of working length (75degrees) for safe climbing.<br><br>The competent person shall inspect the installation of the protective |

| | | |
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| | | barrier and the conditions of trenching before it is entered and daily before every shift thereafter, or after a rain storm. Thus, the competent person shall also monitor the water level, and determine when safe limits have been exceeded. Any accumulation of water in the trench shall be kept at a minimum by portable pumps |
| Working near the ditch | Falling into eight foot deep trench | At a minimum, barricades shall be erected six feet away from the edge of the trench. Such barricades must be made visible by using high visibility methods when left unattended. Anyone within a six feet boundary must be protected from falls utilizing fall protection (i.e. railing or fall restrain by tethering workers). Provide a walkway or bridge with standard guardrails if employee must cross over the excavation |
| Equipment Damage | Excavations left open and unattended near roadways & walkways, equipment roll over hazard, high noise, airborne dust | Confirm location of all power lines. If lines are unable to shut-in maintain a minimum of ten feet clearance from equipment. Verify and increase distance (per approach charts) for lines in excess of 50,000 volts. Maintain spotter with no other duties than watching for interference, if power lines are within swing radius. Inform local operations and any remote operation of activities. Do not use cell phones while operating equipment. Tape and/or barricade unattended excavations. |
| Working outside | Bad weather (rain, cold/heat, etc..) | If rain and/or lightning starts, stop all activities and allow competent person to advise further regarding safety practices and procedures. |
| Excavator with grapple attachment | Employees working near building(s) can potentially have a crushing injury and atmospheric hazard. Striking | Keep personnel at a safe distance from the equipment. Monitor atmospheric conditions. Make eye contact with the operator before |

| | | |
|---|---|---|
| | a person within radius of boom | approaching equipment. Only one person is to act as signalman; however, anyone can call emergency stop |

OSHA® QUICK CARD™

# Protecting Workers from Heat Stress

## Heat Illness

Exposure to heat can cause illness and death. The most serious heat illness is heat stroke. Other heat illnesses, such as heat exhaustion, heat cramps and heat rash, should also be avoided.

There are precautions that can be taken any time temperatures are high and the job involves physical work.

## Risk Factors for Heat Illness

- High temperature and humidity, direct sun exposure, no breeze or wind
- Heavy physical labor
- No recent exposure to hot workplaces
- Low liquid intake
- Waterproof clothing

## Symptoms of Heat Exhaustion

- Headache, dizziness, or fainting
- Weakness and wet skin
- Irritability or confusion
- Thirst, nausea, or vomiting

## Symptoms of Heat Stroke

- May be confused, unable to think clearly, pass out, collapse, or have seizures (fits)
- May stop sweating

## To Prevent Heat Illness:

- Establish a complete heat illness prevention program.
- Provide training about the hazards leading to heat stress and how to prevent them.
- Provide a lot of cool water to workers close to the work area. At least one pint of water per hour is needed.

U.S. Department of Labor

For more information:

OSHA® Occupational Safety and Health Administration

www.osha.gov (800) 321-OSHA (6742)

OSHA 3154-06R 2017

# OSHA® QUICK CARD™

- Modify work schedules and arrange frequent rest periods with water breaks in shaded or air-conditioned areas.
- Gradually increase workloads and allow more frequent breaks for workers new to the heat or those that have been away from work to adapt to working in the heat (acclimatization).
- Designate a responsible person to monitor conditions and protect workers who are at risk of heat stress.
- Consider protective clothing that provides cooling.

## How to Protect Workers


- Know signs/symptoms of heat illnesses; monitor yourself; use a buddy system.
- Block out direct sun and other heat sources.
- Drink plenty of fluids. Drink often and BEFORE you are thirsty. Drink water every 15 minutes.
- Avoid beverages containing alcohol or caffeine.
- Wear lightweight, light colored, loose-fitting clothes.

## What to Do When a Worker is Ill from the Heat

- Call a supervisor for help. If the supervisor is not available, call 911.
- Have someone stay with the worker until help arrives.
- Move the worker to a cooler/shaded area.
- Remove outer clothing.
- Fan and mist the worker with water; apply ice (ice bags or ice towels).
- Provide cool drinking water, if able to drink.

IF THE WORKER IS NOT ALERT or seems confused, this may be a heat stroke. CALL 911 IMMEDIATELY and apply ice as soon as possible.

U.S. Department of Labor

**For more information:**

OSHA® Occupational Safety and Health Administration

www.osha.gov (800) 321-OSHA (6742)

# OSHA QUICK CARD™

Protect Yourself

# Construction Personal Protective Equipment (PPE)

## Eye and Face Protection

- Safety glasses or face shields are worn any time work operations can cause foreign objects to get in the eye. For example, during welding, cutting, grinding, nailing (or when working with concrete and/or harmful chemicals or when exposed to flying particles). Wear when exposed to any electrical hazards, including working on energized electrical systems.
- Eye and face protectors – select based on anticipated hazards.

## Foot Protection

- Construction workers should wear work shoes or boots with slip-resistant and puncture-resistant soles.
- Safety-toed footwear is worn to prevent crushed toes when working around heavy equipment or falling objects.

## Hand Protection

- Gloves should fit snugly.
- Workers should wear the right gloves for the job (examples: heavy-duty rubber gloves for concrete work; welding gloves for welding; insulated gloves and sleeves when exposed to electrical hazards).

## Head Protection

- Wear hard hats where there is a potential for objects falling from above, bumps to the head from fixed objects, or of accidental head contact with electrical hazards.
- Hard hats – routinely inspect them for dents, cracks or deterioration; replace after a heavy blow or electrical shock; maintain in good condition.

## Hearing Protection

- Use earplugs/earmuffs in high noise work areas where chainsaws or heavy equipment are used; clean or replace earplugs regularly.

**For more complete information:**

OSHA Occupational Safety and Health Administration
**U.S. Department of Labor**
www.osha.gov (800) 321-OSHA

OSHA 3260-09N-05

# CHA Consulting, Inc.

# Job Hazard Analysis

# Heavy Equipment

| **Task** | **Hazard Type and Description** | **Hazard Control** |
|---|---|---|
| | | |
| Heavy equipment | Pinch points<br>Struck-by/Caught between | Never work or walk under loads, and only one person is to act as the signal person.<br>Avoid working near swing radius's.<br>Maintain eye contact with operators when approaching equipment.<br>Rigger s and Operators must possess additional safety training for competency. (Competent/Qualified Training) |
| Road grading and material cleanup | Potential for personnel to be run over with equipment<br>Struck-by/Caught between | Ensure equipment is operated by qualified operator, and all personnel working on or near roadway wear reflective vests. Be sure that equipment back-up alarms are working properly. Always make eye contact with equipment operators prior to approaching |
| Personnel working near heavy equipment | Slips and falls<br>Struck-by/Caught between | Make sure there is a good working surface. Cover or barricade excavations as soon as practical. Wear a hard hat, safety glasses, ear plugs, a Class II ANSI safety vest as well as steel toed boots when necessary |
| Operation | Strains and sprains | Think about your body position; avoid over- reaching, hyper-extending, location/ position of extremities, and think if you are in the best position for leverage |

# CHA Consulting, Inc.

# Job Hazard Analysis

# Slips/Trips/Falls

## Common hazards

- Slippery surfaces (e.g., wet, oily or greasy)
- Seasonal trip hazards (snow and ice)
- Spills of wet or dry substances
- Changes in walkway levels and slopes
- Unsecured mats
- Poor lighting
- Debris and items stored in walkways
- Trailing cables in pedestrian walkways
- Smoke, steam or dust obscuring view
- Unsuitable footwear

## Controlling hazards

When establishing safe work practices, consider:

- Characteristics of physical work area
- Weather conditions (snow, ice, rain)
- Tasks performed
- Workers' work practices
- Equipment

## Hazard Control/Engineering Controls

- Type of flooring
- Slope of surface (ramps, handrails)
- Surface free of obstructions/holes
- Drainage
- Lighting levels, non-glare, contrast
- Equipment to be used/not carrying too much at once
- Signage
- Sufficient space
- Minimizing environmental influences, e.g., blocking wind to prevent wet surfaces icing at entrances

# Hazard Control/Administrative Controls

- Training workers/awareness
- Safe practices such as a procedure for cleaning spills or requirement for two workers to transport a large equipment that one worker cannot see around or can't handle
- Reporting hazards
- Prompt maintenance
- Job design (identifying tasks requiring excessive pushing/pulling, line-of-sight obstruction)
- Equipment readily available
- Addressing poor work practices
- Inspections
- Review slips, trips and same-level fall hazards

# Hazard Control/Housekeeping

- Clean spills
- Remove debris, snow and ice
- Keep equipment clean
- Keep wires, etc. controlled, taped, etc.

# Hazard Control/Personal Protective Equipment

- Appropriate footwear for task, which may include appropriate heels, soles and anti-slip boots

# Decibel (Loudness) Comparison Chart

Here are some interesting numbers, collected from a variety of sources, that help one to understand the volume levels of various sources and how they can affect our hearing.

| Environmental Noise | |
|---|---|
| Weakest sound heard | 0dB |
| Whisper Quiet Library at 6' | 30dB |
| Normal conversation at 3' | 60-65dB |
| Telephone dial tone | 80dB |
| City Traffic (inside car) | 85dB |
| Train whistle at 500', Truck Traffic | 90dB |
| Jackhammer at 50' | 95dB |
| Subway train at 200' | 95dB |
| *Level at which sustained exposure may result in hearing loss* | *90 - 95dB* |
| Hand Drill | 98dB |
| Power mower at 3' | 107dB |
| Snowmobile, Motorcycle | 100dB |
| Power saw at 3' | 110dB |
| Sandblasting, Loud Rock Concert | 115dB |
| *Pain begins* | *125dB* |
| Pneumatic riveter at 4' | 125dB |
| *Even short term exposure can cause permanent damage - Loudest recommended exposure WITH hearing protection* | *140dB* |
| Jet engine at 100' | 140dB |
| 12 Gauge Shotgun Blast | 165dB |
| Death of hearing tissue | 180dB |
| Loudest sound possible | 194dB |

| OSHA Daily Permissible Noise Level Exposure | |
|---|---|
| Hours per day | Sound level |
| 8 | 90dB |
| 6 | 92dB |
| 4 | 95dB |
| 3 | 97dB |
| 2 | 100dB |
| 1.5 | 102dB |
| 1 | 105dB |
| .5 | 110dB |

| | |
|---|---|
| .25 or less | 115dB |

| **NIOSH Daily Permissible Noise Level Exposure** | |
|---|---|
| Hours per day | Sound level |
| 8 | 85dBA |
| 6 | 86dBA |
| 4 | 88dBA |
| 3 | 89dBA |
| 2 | 90dBA |
| 1.5 | 92dBA |
| 1 | 94dBA |
| .5 | 97dBA |
| .25 or less | 100dBA |
| 0 | 112dBA |

| **Perceptions of Increases in Decibel Level** | |
|---|---|
| Imperceptible Change | 1dB |
| Barely Perceptible Change | 3dB |
| Clearly Noticeable Change | 5dB |
| About Twice as Loud | 10dB |
| About Four Times as Loud | 20dB |

| **Sound Levels of Music** | |
|---|---|
| Normal piano practice | 60 -70dB |
| Fortissimo Singer, 3' | 70dB |
| Chamber music, small auditorium | 75 - 85dB |
| Piano Fortissimo | 84 - 103dB |
| Violin | 82 - 92dB |
| Cello | 85 -111dB |
| Oboe | 95-112dB |
| Flute | 92 -103dB |
| Piccolo | 90 -106dB |
| Clarinet | 85 - 114dB |
| French horn | 90 - 106dB |
| Trombone | 85 - 114dB |
| Tympani & bass drum | 106dB |
| Walkman on 5/10 | 94dB |
| Symphonic music peak | 120 - 137dB |
| Amplifier, rock, 4-6' | 120dB |
| Rock music peak | 150dB |

NOTES:

- One-third of the total power of a 75-piece orchestra comes from the bass drum.
- High frequency sounds of 2-4,000 Hz are the most damaging. The uppermost octave of the piccolo is 2,048-4,096 Hz.
- Aging causes gradual hearing loss, mostly in the high frequencies.
- Speech reception is not seriously impaired until there is about 30 dB loss; by that time severe damage may have occurred.
- Hypertension and various psychological difficulties can be related to noise exposure.
- The incidence of hearing loss in classical musicians has been estimated at 4-43%, in rock musicians 13-30%.
- Recent NIOSH studies of sound levels from weapons fires have shown that they may range from a low of 144 dB SPL for small caliber weapons such as a 0.22 caliber rifle to as high as a 172 dB SPL for a 0.357 caliber revolver. *Double* ear protection is recommended for shooters, combining soft, insertable ear plugs and external ear muffs.

Statistics for the Decibel (Loudness) Comparison Chart were taken from a study by Marshall Chasin , M.Sc., Aud(C), FAAA, Centre for Human Performance & Health, Ontario, Canada. There were some conflicting readings and, in many cases, authors did not specify at what distance the readings were taken or what the musician was actually playing. In general, when there were several readings, the higher one was chosen.

**Additional Resources**

The National Institute for Occupational Safety and Health (NIOSH) -http://www.cdc.gov/niosh/topics/noise/

American Tinnitus Association – Information and help for those with tinnitus

Hear Tomorrow – The Hearing Conservation Workshop

H.E.A.R. – Hearing Education and Awareness for Rockers

American Tinnitus Association – for musicians and music lovers

Turn It to the Left – from the American Academy of Audiology

Listen to Your Buds – from the American Speech-Language-Hearing Association

Binge Listening: Is exposure to leisure noise causing hearing loss in young Australians? [pdf] – report from Australian Hearing, National Acoustic Laboratories

Hearing Aids and Music: Interview with Marshall Chasin, AuD – from the American Academy of Audiology

Safe Listening Resources – from the National Hearing Conservation Association

OSHA Noise and Hearing Conservation -

# APPENDIX D
Community Air Monitoring Plan

# Community Air Monitoring Plan (CAMP)

**JMA Campus Plan**
**1074 South Clinton Street**
**Syracuse, New York**

The following Community Air Monitoring Plan (CAMP) will be implemented for the Remedial Investigation activities to be performed at the site located at 1074 South Clinton Street, City of Syracuse, New York (Site), also known as the JMA Campus Plan. Air monitoring will be conducted in general accordance with the New York State Department of Health (NYSDOH) *Generic Community Air Monitoring Plan (CAMP).* Air monitoring will be conducted on a real-time basis using hand-held field instruments and readings will be recorded in a logbook and made available for review.

This CAMP is not intended for use in establishing action levels for worker respiratory protection which is described in the Site-specific Health and Safety Plan (HASP) included as Appendix C to the Remediation Investigation Work Plan (RIWP). 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 the proposed RI activities. Reliance on this CAMP should not preclude simple, common-sense measures to keep volatile organic compounds (VOCs) at a minimum around the work areas. The action levels specified herein require increased monitoring, corrective actions to abate emissions, and/or work shutdown. Additionally, this CAMP helps to confirm that the RI activities did not spread contamination off-Site through the air.

## Fugitive Dust Monitoring and Control

No significant air monitoring is anticipated to be necessary to implement the RIWP. Soil disturbance during the RI subsurface investigation will be minimal. Borings advanced as part of the investigation are small in diameter and do not constitute significant ground intrusive activities. Therefore, no significant migration of fugitive dust is expected and no fugitive dust monitoring will be conducted. However, fugitive dust migration will be visually assessed during all investigation activities. Should there be visible evidence of fugitive dust leaving the Site, CHA will implement one or more techniques to control dust, in accordance with the New York State Department of Health's (NYSDOH's) *Generic Community Air Monitoring Plan (CAMP)*.

## Organic Vapor Monitoring and Control

Based on the nature of the Site contaminants, it is anticipated that organic vapors may be emitted during RI activities. As a result, organic vapors will be monitored periodically. VOCs will be monitored at the downwind perimeter of the immediate work area (i.e., the exclusion zone). Upwind concentrations should be measured at the start of each workday and periodically thereafter to establish background conditions.

Periodic monitoring for VOCs consists of taking a reading upon arrival at a sample location, monitoring while opening a well cap or advancing a boring, monitoring during well bailing/purging, and taking a reading prior to leaving a sample location.

The monitoring work will be performed using equipment appropriate to measure the types of contaminants known or suspected to be present. The equipment will be calibrated at least daily for the contaminant(s) of concern or for an appropriate surrogate.

- 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) over a 15-minute average, work activities will 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.

- 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 are less than 25 ppm, work activities will 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 is no case less than 20 feet, is below 5 ppm over background for a 15-minute average.

- If the organic vapor level in the downwind work area perimeter exceeds the upwind perimeter concentration by more than 25 ppm, the following actions will be taken:

    1. All work will be halted.
    2. Air monitoring will be conducted at 15 minute intervals at a 20-foot offset from the exclusion zone. If two successive readings below 5 ppm are measured by the field instrument and documented, the work may resume following the previously described monitoring plan.

All instantaneous readings used for decision making purposes will be recorded and will be available onsite for Agency (i.e., New York State Department of Environmental Conservation and New York State Department of Health) personnel to review.

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