WORK PLAN

Remedial Investigation
Former Ithaca Gun Factory Site
Site No. C755019

IFR Development LLC

October 2013

O'BRIEN & GERE

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Remedial Investigation Work Plan
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Site No. C755019

Ithaca, New York

Prepared for:
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1.0 INTRODUCTION

This Remedial Investigation Work Plan (RIWP) has been prepared on behalf of IFR Development LLC for the Former Ithaca Gun Factory Site (Site) located at 121-125 Lake Street in Ithaca, New York (Figure 1). This property was accepted into the New York State Department of Environmental Conservation (NYSDEC) Brownfield Cleanup Program (BCP) per Title 6 New York State Official Compilation of Codes, Rules, and Regulations (NYCRR) Part 375-3.4, as Site No. C755019.

The Site, as depicted on Figure 2, is 1.63 acres in size and consists of 2 parcels. The Eastern Parcel formerly included the main manufacturing operations of the Ithaca Gun Company, and the smaller, Western Parcel contained the former boiler. The original Ithaca Gun Factory property consisted of approximately 2.6 acres. However, approximately 1 acre was granted to the City of Ithaca to be developed as a City park with a public walkway and overlook area for the adjacent Ithaca Falls (Figure 2).

The property formerly belonged to the Ithaca Gun Company that operated as the Ithaca Gun manufacturing plant and test site for approximately one hundred years. The company filed for bankruptcy in 1979. The Site is currently vacant, with primary buildings demolished in 2009, leaving only a small single-story building and the Ithaca Gun boiler stack on the Western Parcel. The current owner, IFR Development LLC, is in the process of designing a multi-tenant residential housing development that will cover most of the Site.

This RI Work Plan provides background information regarding Site conditions, describes the project objectives, and outlines the strategies and methodologies that will be implemented during the investigation. Four companion documents have been developed that document the procedures and protocols outlined in this Work Plan:

- The Field Sampling and Analysis Plan (FSAP) provides information regarding field sampling methods and procedures that will be used during the investigation.
- The Quality Control Document (QCD) specifies the quality assurance/quality control (QA/QC) procedures that will be implemented during the fieldwork and in the laboratory which performs the chemical analyses of the samples collected during the RI.
- A site-specific Health and Safety Plan (HASP) has been prepared to outline procedures that will be undertaken to protect O'Brien & Gere personnel from potential hazards that may exist as a result of the fieldwork performed at the property.
- A Community Air Monitoring Plan (CAMP) is included as part of the HASP that provides measures for monitoring and responding to volatile organic or dust generation during the implementation program that could potentially migrate to off-site receptors.

1.1 PROJECT OBJECTIVE

Several investigations and an EPA removal effort have been completed on this Site. In addition, the on-site buildings were demolished. As such, the objective of this RIWP is to address data gaps for the purpose of identifying impacted areas that need to be addressed as part of the redevelopment program. These data gaps include the identification of lead exceeding 400 ppm in shallow soils, and further evaluation of the extent of VOC-impacted groundwater within the underlying bedrock.

1.2 WORK PLAN ORGANIZATION

The remainder of this Work Plan describes the planned RI activities.

Section 2 – provides a description of the Site, summary of Site operational history, and the results of the previous investigation and remedial work performed at the Site.

Section 3 – presents the objectives for the investigation followed by a description of the specific tasks that will be undertaken to gather information to meet the project objectives.

Section 4 – describes the companion documents that are included as appendices to the Work Plan: Field Sampling and Analysis Plan (FSAP), Quality Control Plan (QCP), and the Health and Safety Plan (HASP) with the Community Air Monitoring Plan (CAMP).

Section 5 – provides the anticipated project schedule

2.0 BACKGROUND

2.1 SITE DESCRIPTION

The Site is located at 121-124 Lake Street in Ithaca, New York and encompasses approximately 1.6 acres. The Site is located in a residential area with the Ithaca Falls to the north, Cornell University to the east, Lake Street to the south, and City of Ithaca residential neighborhood to the west.

The Site is located on the eastern side of a broad glacial valley. The Site is bounded to the north by a deep gorge. Fall Creek is located at the base of this gorge. Ithaca Falls is located to the east along the gorge and Fall Creek flows westward to Cayuga Lake located in the valley as shown on Figure 1.

Due to the steep topography, the property was terraced into two flat areas for use. The upper area or Eastern Parcel was the primary location of the manufacturing facility and the lower terrace or Western Parcel housed the boiler house and other support facilities. The building occupied the majority of the flat surface of the upper terrace with the exception of a narrow access road on the eastern side. A raceway was constructed between the manufacturing buildings and the gorge to harness the natural water way for power, resulting in the construction of an "island" adjacent to the gorge.

Investigation and remedial activities completed at the Site reveal that the upper terrace of the property is underlain by less than 5 ft of unconsolidated material and the lower terrace contains approximately 10 ft of unconsolidated material. In the upper terrace, the majority of the material appears to be reworked soil and fill material consisting of cinders, ash mixed with gravel, and sand. No water was observed in the unconsolidated deposits. Bedrock at the Site consists of siltstone and shale with horizontal bedding plane fractures.

Based on the wells installed at the Site, groundwater occurs within the bedrock at depths of 10 to 18 ft below grade. The groundwater flow direction is to the west-northwest. Observations made during groundwater sampling activities reveal that the bedrock yields a minimal amount of water.

2.2 SITE HISTORY

As stated in an October 29, 2001 Phase I Environmental Site Assessment (ESA) prepared for the property by Prescott Environmental Associates, Inc. (Prescott, 2001), the property was originally developed for industrial use in 1813 and the property and related structures were expanded and modified several times over the years of operation. The facility was used for the manufacture of Ithaca shotguns. Operations at the facility ceased around 1986.

The former Ithaca Gun manufacturing included a variety of wood and metal machining operations, as well as the assembly and testing of guns. As noted in the Phase I ESA, historical practices during the Ithaca Gun operations reportedly included the use of indoor, rooftop, and outdoor shooting galleries as well as on-site disposal of lead shot from these test ranges. Subsequent investigations confirmed the presence of shot residues on the property as well as on neighboring properties and the adjacent gorge.

2.3 PREVIOUS INVESTIGATIONS AND REMEDIAL MEASURES

Various environmental investigations have taken place at the former Ithaca Gun property since its closure in 1986. Efforts began in 1995, when the NYSDEC observed lead shot on former Cornell University property northwest of the Site in the gorge. From 1995 through 1998, Cornell University and NYSDEC sampled this area and found elevated levels of lead and other metals. Background samples indicated that elevated levels of metals were widespread throughout the Ithaca Falls area (B&L, 2011). The following provides a summary of the investigation, demolition, and remedial efforts that have taken place since this initial discovery.

EPA Response and Removal

In August 2000, the EPA Region II Response and Prevention Branch and NYSDEC began a Removal Assessment of portions of the adjacent Island and Western Accessway (City parcel), the hillside east of the BCP Site (Sigma Nu fraternity), and within the gorge to the west, where lead shot and slag were observed on the surface soils and

slope. Additional sampling was conducted by the EPA in 2001 to delineate off-site impacts of lead (B&L, 2011). Between 2001 and 2004, USEPA delineated and removed soil containing lead and other heavy metals originating from lead shot and slag materials from several of the locations included in the assessment. The approximate locations of the removal areas are shown on Figure 3. Based on the report from the USEPA on-scene coordinator (www.epaosc.org/site/bulletins) a total of approximately 4,000 tons of non-hazardous materials and 2,000 tons of hazardous materials were removed as part of this action.

Voluntary Cleanup Program (VCP)

The former Ithaca Gun Company property was entered in NYSDEC's Voluntary Cleanup Program (VCP) in approximately 2001 with a Site Code of V00511. An initial investigation was completed by Prescott Environmental Associated Inc. in 2001. The investigation included completion of soil borings, collection and analysis of soil samples, installation of one bedrock monitoring well, and collection and analysis of groundwater samples from three of four wells present on the property (one well was dry). The investigation found several areas where soil contained lead at concentrations ranging from less than 100 ppm to over 40,000 ppm. Additionally, water and sediment in sumps in the basements of the main building and the forge building were analyzed. The report identified nine general areas where concentrations of lead were above 6 NYCRR Part 375 Soil Cleanup Objective (SCO) for lead of 400 ppm for Residential and Restricted Residential Use as follows. Locations of these areas are shown on Figure 3.

Map ID	Description	Action
A	Quonset building near former shooting cylinder – contained lead (2,840 ppm)	To be evaluated
B	South cyclone area – shallow soil (0 to 4 ft) contained lead (450 ppm to 8,210 ppm)	To be removed during Redevelopment
C	North cyclone area - shallow soil (0 to 4 ft) contained lead (7,850 ppm to 42,300 ppm)	Partially removed during Building Demo and with residual removal during redevelopment
D	Forge/Shop sump – sediment contained lead (6,100 ppm) and bis-2 ethylhexyl phthalate (44 ppm,)	Removed during Building Demo
E	Sediment in exterior trench adjacent to north end of Forge/Shop building - contained lead (14,400 ppm) and chromium (191 ppm)	Partially removed during Building Demo and with residual removal during redevelopment
F	Area adjacent to north west side of building – soils contained lead (800 ppm to 6,900 ppm)	Partially removed during Building Demo and with residual removal during redevelopment
G	Western slope above boiler house – soil contained lead (29,600 ppm and 36,300 ppm) – Located on City ERP Parcel	Ithaca ERP- Removed in 3rd quarter 2013
H	Soil behind boiler house – two soil samples collected from this area contained lead above 1,000 ppm.	Material removed during construction of Storm Water Detention Basin – the extent to which the lead-impacted soil that remains needs to be assessed.
I	Asphalt area south of repair shop – soil contained lead (6,030 ppm) – Located on City ERP Parcel	To be addressed as part of ERP

Building Demolition

As previously discussed, on-site structures included one main building and several other outbuildings. The total area of the building footprints demolished is approximately 40,000 sq ft. The buildings were demolished under the Empire State Development ReStore NY (ESCRNY) program. Work was completed in compliance with the Demolition Work Plan (DWP) as amended and approved by NYSDEC in correspondence dated November 21, 2008. The building demolition was completed by Bianchi Industrial Services (Bianchi) between January 2009 and June 2009. Demolition activities included:

- Removal/management of asbestos containing materials (ACM)
- Identification and management of lead-containing materials within the building
- Removal and disposal of electrical transformers
- Removal and disposal of residues within drains, sumps and pits
- Removal and disposal of lights and ballasts
- Removal and disposal of brick material as construction and demolition (C&D) material
- Characterization and demolition of buildings and slabs. The concrete was crushed in anticipation of reuse on the Site as aggregate but due to the presence of low levels of PCBs the material was disposed off-site.

In conjunction with the demolition program, a focused site investigation was also completed. The efforts were outlined in the Focused Site Investigation Work Plan (FSIWP) as approved by NYSDEC (O'Brien & Gere, 2009). The FSIWP identified thirteen activities that were to be completed. A summary of these items and a discussion of how they were addressed were provided in the Focused Site Investigation Report (FSIR) dated March 2011 (O'Brien & Gere, 2011a). Of the thirteen items, 6 were related to evaluation of the nature and extent of constituents of concern at the Site. A summary of these items is provided below. More detailed information can be found in the FSIR.

- ***Collection of soil vapor samples.*** This activity was completed following the demolition. One soil vapor sample was collected from the Western Parcel near the stack of the boiler house and the second sample was collected from the southern side of the Site near Lake Street. The results did not suggest that VOCs were migrating via soil vapor in these areas. Additional information can be found in Section 3 of the FSIR.
- ***Screen soils underneath the basement once the slab has been removed.*** This activity was completed following the demolition using an x-ray florescence (XRF) meter with laboratory analysis of selected samples. The results of the XRF and lead analysis evaluation are provided on Figure 4. An evaluation of the correlation between the XRF reading and laboratory analysis was also completed as part of the screening effort using 26 samples. Based on the results, an XRF reading of 200 ppm would be the screening level required to be sufficiently certain that the lead concentration is less than 400 ppm. Additional screening for the potential presence of radioactive materials was conducted using a Geiger counter. The readings were considered indicative of background levels or naturally occurring radiation from the shale bedrock. This is consistent with findings of historic radiological evaluations conducted at the Site. Additional information is provided in Section 4 of the FSIR.
- ***Sampling of soil remaining on-site following removal to confirm that it meets the restricted residential SCOs.*** The soil removal program has not been completed and the associated confirmation samples were not collected.
- ***Installation of a monitoring well within the footprint of the former building, if deemed appropriate by NYSDEC.*** Based on the fact that ground water is not present in the overburden, a well within the footprint of the building was not completed beneath the building footprint.
- ***Sampling and analysis of on-site monitoring wells on a semi-annual basis of a period of 1 year.*** Four monitoring wells (MW-1 through MW-4) were present at the Site at the start of the demolition program. One well, MW-2, had been dry. Two wells, MW-1 and MW-4, were replaced (as MW-1R and MW-4R) following demolition as they were damaged. Samples were collected from three remaining wells in November 2010 and a second set of samples was collected in August 2011 from two of the wells as MW-4R was found to be damaged. Ground water sample results show that the wells each contain VOCs, particularly trichloroethene (TCE) and cis-1,2-dichloroethene (CDCE). Concentrations in the upgradient well MW-1 were below 1 ppb. Concentrations in the downgradient wells, MW-3 and MW-4R, were above the groundwater standard of 5 ppb. A table summarizing the results is provided as Table 1. More information is provided in the FSIR and correspondence providing the revised ground water sampling and analysis results dated February 22, 2012.
- ***Sampling and analysis of water seeps emanating from bedrock if encountered during demolition.*** No seeps from bedrock were encountered during demolition.

ERP on City of Ithaca Parcel

As previously discussed, a portion of the original Ithaca Gun Company property was acquired by the City of Ithaca. The City of Ithaca Urban Renewal Agency subsequently entered this parcel into the NYSDEC Environmental Restoration Program (ERP) and was assigned a Site Number E755018. The City contracted Barton & Loguidice, PC (B&L) to complete investigation and remedial efforts associated with the ERP. In conjunction with this program, a Site Investigation Work Plan dated November 2011 was prepared and approved by NYSDEC. As part of the ERP activities the lead impacted soils located on the slope between the former Ithaca Gun manufacturing building and the boiler house were removed as an Interim Remedial Measure (IRM). This area is identified as G on Figure 3.

The report summarizing the investigations and IRM is currently being prepared by B&L and was not available for review. However, a preliminary summary of the ground water data was provided for review. The data reveal that well MW-5, which was installed at the base of the western slope immediately east of the former boiler house, contained total VOCs at concentrations of approximately 2,700 ppb. The predominant compounds identified were TCE and CDCE. In comparison, samples from MW-3 contained total VOCs at approximately 300 ppb and MW-4R contained total VOCs between 100 and 600 ppb. Furthermore wells MW-6 and MW-7 located near Lake Street to the west of the boiler house also contained low concentrations of VOCs.

2.4 FUTURE USE

As mentioned in Section 1, the current owner, IFR Development LLC, is working on plans to construct multi-tenant housing on the large Eastern Parcel where the former Ithaca Gun manufacturing buildings once stood. As shown on Figure 5, the redevelopment plan will include two rows on connected housing units separated by an asphalt parking lot. These hard surfaces will cover approximately 90 percent of the parcel and require leveling of the embankment on the east side of the parcel. It is anticipated that the base of the new structures will be constructed on top of the bedrock surface which lies between 6 inches and 3 ft below grade across most of the area. The northeast corner is the only area of the parcel that is not currently envisioned to be modified based on the preliminary plans. Although preliminary plans have not been developed for the Eastern Parcel, it is expected that structures will also be constructed at some point in the future. Accordingly, it is expected that the stack and the adjacent slab of the boiler house will be removed.

2.5 IDENTIFIED DATA GAPS

The investigations, demolition activities and remedial measures completed at the Site have identified and removed most of the identified areas of concern on the Ithaca Gun parcels that make up the BCP Site. These areas of concern include the pits and sumps within the former building, and some of the identified surface soils containing residuals from the lead shot and foundry slag that were identified as part of the NYSDEC sampling effort. Based on review of the activities completed, four general areas have been identified that warrant further evaluation as follows:

1. Lead containing soils on the Eastern Parcel - It is recognized that some shallow soils remain on the Eastern Parcel that contain lead at concentrations greater than 400 ppm. However, construction of the housing project will include removal of the soil to the bedrock across most of the area, with the exception of the northeast corner. The northeast corner contains as small area located south of the former Quonset Building where lead was identified to be present in the surface soil above 400 ppm.

2. Lead containing soils on the Western Parcel – Surface soil samples collected from an area north of the former boiler building collected during the VCP were found to contain lead above 400 ppm. A temporary storm water collection pond was constructed in this area as part of the demolition project. Construction of this structure required removal of some of the shallow soils in this area. No samples have been collected to assess whether all of the lead-containing soil was removed.

3. The stack and slab of the former boiler house will be removed from the Western Parcel to accommodate redevelopment. The former buildings covered the majority of this small parcel, which limited previous

investigations to the collection of surface soils from the exposed surface as discussed in Item 2 above, and installation of a monitoring well on the north side of the buildings.

4. Groundwater – Well MW-5 installed during the ERP Investigation contains concentrations of chlorinated VOCs totaling 2,700 ppb. This well is immediately west and downgradient of the former Ithaca Gun manufacturing building. Concentrations at other wells were significantly less. However, the extent of the elevated VOCs has not been defined.

2.6 CONSTITUENTS OF CONCERN

The historic gun manufacturing operations at the main manufacturing site and adjacent VCP site are the historic source of contamination at the Site. The primary contaminant of concern is lead from test firing of guns, dumping of spent shot, and other manufacturing processes such as forging. As previously mentioned, the cleanup goal for lead in soil at the Site is 400 ppm. VOCs, consisting primarily of chlorinated solvents, were also identified during investigations. Although not detected in the thin layer of unconsolidated material on the Ithaca Gun Factory property, the VOCs are present in ground water within the bedrock.

3.0 INVESTIGATION ACTIVITIES

3.1 INVESTIGATION OBJECTIVES

Although investigation and remedial work has been performed at the Site, data gaps remain for the characterization of the site media and impacts in a few locations. The overall objectives for the RI are to further evaluate the nature and extent of potential constituents of concern in the soil and groundwater at the Site and to assess potential exposure scenarios so that they may be addressed as part of the redevelopment program and be incorporated into a Site Management Plan (SMP).

As identified in Section 2.5, there are four general areas that warrant further evaluation prior to redevelopment:

- Lead containing soils on the Eastern Parcel south of the Quonset Building
- Lead containing soil on the Western Parcel north of the boiler house
- Limited environmental sampling on the Western Parcel at the boiler house
- The extent of VOCs within the bedrock on the Site

The discussion that follows will identify the investigative activities for each of the four areas. Activities that are common to the investigations, such as decontamination of equipment, are discussed in separate subsections. The locations of each of the proposed RI sample points are shown in Figure 7 and analyses that will be completed are summarized in Table 2. Additional details pertaining to procedures and protocols for sample collection are included in the FSAP provided in Appendix A, and sample analysis information is detailed in the Quality Control Document (QCD) provided in Appendix B.

In addition to the sampling and analysis activities the RI will include completion of a Qualitative Human Health Exposure Assessment (QHHEA).

3.2 INVESTIGATION APPROACH

Eastern Parcel Soils

The objective of the investigation in this area is to evaluate the horizontal and vertical extent of soil that exceeds the SCO for lead of 400 ppm south of the former Quonset Building. To meet this objective, XRF screening of surface soils will be conducted and soil borings will be advanced to the top of bedrock, which is estimated to lie within three feet of the ground surface. XRF screening will be completed in a gridded fashion at an approximate spacing of 10 ft by 10 ft over the area shown on Figure 7. The XRF screening methodology is described below. Up to 4 soil borings will be advanced in areas where XRF readings exceed 200 ppm to allow further evaluation of the concentration and vertical extent of soil with lead concentration exceeding 400 ppm. The soil borings will be advanced using direct-push drilling methods in accordance with the FSAP. Soil samples will be collected from the 0 to 6-inch, 6 to 12-inch, and 12 to 24-inch depth intervals at each location unless bedrock is encountered at shallower depths. These samples will be screened using XRF and a sample from each interval will be submitted for laboratory analysis for lead using USEPA Method 6010C.

XRF Screening Methodology

The XRF is a point-and-shoot instrument that requires contact with the surface of the material being screened. However, the x-rays will penetrate plastic and other low density material. Soil will be screened *in situ* by placing the window of the XRF instrument on the soil surface. Mylar or plastic may be inserted between the XRF window and the soil to protect the window from scratches. During drilling activities soil collected will be placed in a plastic zipper-close bag and homogenized. The bag will then be placed on a flat surface and the material spread out to a thickness of approximately ½ inch. The XRF window will then be placed directly on the plastic bag to take the measurement. If the sample interval is to be analyzed, the soil in the bag will be emptied in to a laboratory jar and placed on ice for delivery to the laboratory.

Western Parcel Soils

The investigation in this area will be conducted to meet two objectives. The first objective is to identify the limits of the shallow material containing lead greater than 400 ppm in an area on the northwest corner of this

parcel. The second objective will be to evaluate whether historic operations on this parcel resulted in other impacts to deeper soil.

Previous investigations found that soils in an area north of the boiler house contain lead at concentrations exceeding 400 ppm. This area will be further investigated to assess the horizontal and vertical extent of soil that exceeds the Part 375 Residential SCO for lead of 400 ppm. Similar to the Eastern Parcel soils, XRF screening of surface soils will be conducted and soil borings will be advanced to the top of bedrock, which is estimated to lie within ten feet of the ground surface. The XRF screening will be completed in a gridded fashion at an approximate grid spacing of 10 ft by 10 ft over the area shown on Figure 7.

Up to 4 soil borings will be advanced in areas where XRF readings exceed 200 ppm to further assess the vertical extent of soil that requires removal. The soil borings will be advanced using direct-push drilling methods in accordance with the FSAP. Soil samples will be collected from the 0 to 6-inch, 6 to 12-inch, and 12 to 24-inch depth intervals at each location. Each sample will be screened using XRF and a portion of the sample from each interval will be submitted for analytical testing for lead.

At depths greater than 24 inches, soil samples will be collected at 2-ft intervals to the top of bedrock. These samples will also be screened using XRF and samples that exceed 200 ppm will be submitted for laboratory analysis for lead using USEPA Method 6010C. In addition, if fill is present, a sample of the fill from one of the borings will be collected and submitted for laboratory analysis for TCL VOCs using USEPA Method 8260C, TCL SVOCs using USEPA Method 8270D, TCL PCBs using USEPA Method 8082A, TAL metals using USEPA Method 6010C, cyanide using USEPA Method 9010B/9012A, and mercury using USEPA Method 7471B. The sample interval selected for analysis will be based on field screening using the XRF, a photoionization detector (PID), and/or visual/olfactory evidence of impacts.

It is reported that the boiler house was powered by coal and at a later time by natural gas. As such, potential environmental impacts from operation of the boiler house are not expected. However, to provide general soil quality data in the area of the boiler house, one soil boring will be advanced to the west of the existing concrete foundation. The soil boring will be advanced to the top of bedrock, which is estimated to lie within ten feet of the ground surface. The proposed soil boring location is shown on Figure 7. Soil samples will be collected continuously from the ground surface to the top of bedrock using direct-push drilling methods. The soil samples will be screened using XRF and samples that exceed 200 ppm will be submitted for laboratory analysis for lead using USEPA Method 6010C. In addition, the soil samples will be screened using a PID. One soil sample exhibiting the highest PID reading and/or visual/olfactory evidence of impacts will be submitted for laboratory analysis for TCL VOCs using USEPA Method 8260C, TCL SVOCs using USEPA Method 8270D, TCL PCBs using USEPA Method 8082A, TAL metals using USEPA Method 6010C, cyanide using USEPA Method 9010B/9012A, and mercury using USEPA Method 7471B.

Groundwater

The objective of the investigation of bedrock groundwater is to evaluate location and extent of the source of the VOCs detected in monitoring wells MW-3, MW-4, and MW-5, each located downgradient of the former Manufacturing Building. Of these bedrock monitoring wells, the highest concentrations of VOCs have been detected in monitoring well MW-5. MW-5 screens bedrock between elevations of 470.3 ft above mean sea level (amsl) and 480.3 ft amsl. MW-5 is located west, and hydraulically downgradient of, the former Manufacturing Building (Figure 7). As previously discussed, the Manufacturing Building has been demolished and development plans include the construction of condominiums beginning in the spring of 2014. As such, if monitoring wells were installed they would have to be abandoned to accommodate the construction and would not be available for long-term monitoring.

Therefore, in lieu of installing bedrock monitoring wells upgradient of MW-5 beneath the former Manufacturing Building, it is proposed that two bedrock boreholes be advanced using coring methods at the locations shown on Figure 7. Bedrock coring will be conducted in accordance with the procedures described in the FSAP. It is anticipated that each bedrock borehole will be advanced to a depth of approximately 70 ft below grade, which is approximately 20 ft below the bottom of the screened interval of MW-5. The boreholes will be advanced at 10-ft intervals. Following advancement of each interval, packer sampling will be conducted. A packer system consisting of a slotted drop pipe with an affixed upper inflatable packer will be installed in the borehole. The

packer interval will be evacuated of one packer volume using a submersible pump or dedicated bailer. If the packer interval is purged dry, a groundwater sample will be collected once sufficient volume has recovered in the interval to fill the sample vials. If sufficient volume has not recovered in the packer interval after 30 minutes, a groundwater sample will not be collected, the packer string will be removed, and borehole advancement and packer sampling will continue. Groundwater samples will be analyzed for VOCs using USEPA Method 8260C. The analytical results will be provided by the laboratory on a standard 14 day turnaround time.

In addition to the two bedrock boreholes to be advanced beneath the former Manufacturing Building, one bedrock borehole will be advanced proximal to MW-4 for the purpose of evaluating the vertical distribution of VOCs and identifying depths for the installation of a monitoring well(s). It is anticipated that the bedrock borehole will be advanced to a depth of approximately 75 ft below grade, which is approximately 20 ft below the bottom of the screened interval of MW-4. Initially, 8-1/4 inch inside diameter hollow stem augers will be advanced to the top of bedrock. A nominal 8-inch diameter, 3-ft long socket will be advanced below the bedrock surface using a roller bit. A 6-inch diameter steel casing will be installed through the auger string and grouted in-place as the auger string is retracted. The grout will be allowed to cure for a minimum of 12 hours prior to advancement of the bedrock borehole. Subsequent to curing of the grout, the boreholes will be advanced at 10-ft intervals using coring methods. Subsequent to advancement of each interval, packer sampling will be conducted as described previously. If the packer interval is purged dry, a groundwater sample will be collected once sufficient volume has recovered in the interval to fill the sample vials. If sufficient volume has not recovered in the packer interval after 30 minutes, a groundwater sample will not be collected, the packer string will be removed, and borehole advancement and packer sampling will continue. Groundwater samples will be analyzed for VOCs using USEPA Method 8260C. The analytical results will be provided by the laboratory on a 24-hr turnaround, such that decisions can be made in the field concerning the need for installation of a well(s) with the borehole while the drilling subcontractor is still on-site.

If the packer sampling data suggest that a single well is warranted, then a 2-inch diameter PVC well will be positioned at the appropriate depth interval in the borehole. If the data suggest that two wells are warranted to screen intervals above and below the screened interval of MW-4, then the borehole will be reamed to 6-inch diameter, and 1-inch diameter wells will be installed in the 6-inch borehole. The screened intervals of these wells would be separated within the borehole with a bentonite seal. If monitoring wells are installed, they will be developed in accordance with the FSAP.

Subsequent to completion of the bedrock drilling and well installation/development (if considered necessary), a round of groundwater samples will be collected from the monitoring well network, which includes MW-1, MW-2, MW-3, MW-4, MW-5, MW-6, MW-7, and any newly installed monitoring wells near MW-4. Groundwater samples will be collected using hand-bailing methods as described in the FSAP. The groundwater samples will be submitted for laboratory analysis for VOCs using USEPA Method 8260C.

3.3 SAMPLE ANALYSIS

Details pertaining to the sample methods and procedures, including QA/QC requirements, are provided in the QCD, which is included as Appendix B. QA/QC samples including field duplicates, matrix spikes (MS), and matrix spike duplicates (MSD) will be obtained at a frequency of 1 per 20 samples, and trip blanks will be placed in coolers containing samples to be analyzed for VOCs. Equipment blanks are required in situations where equipment such as pumps is reused at sample multiple locations. Table 2 summarizes the anticipated number of samples to be collected for analysis by type and the expected QA/QC samples that will be needed. These numbers may change slightly based on field observations as described previously within this section.

In accordance with the QCD the analytical laboratory will be required to provide a data deliverable that meets the requirements of the most-current NYSDEC ASP Category B package in effect at the time of analysis. An electronic data deliverable will also be requested that is compatible with Earthsoft's EQuIS® data management program. Data management and validation is discussed in Section 3.6.

3.4 EQUIPMENT DECONTAMINATION PROCEDURES

Split spoon and direct-push samplers will be decontaminated after each use using a non-phosphate detergent wash followed by a potable water rinse. The decontamination water will be periodically changed during the drilling program. These decontamination fluids will be transferred to 55-gallon drums.

After the completion of each well, sampling rods, hollow stem augers, drill rods, and other miscellaneous drilling tools that contact potentially impacted soil or groundwater will be decontaminated using a high-pressure steam cleaner. This decontamination will be conducted on a temporary decontamination pad such that the decontamination fluids can be collected and transferred to 55-gallon drums. More detailed information is provided in Section 10 of the FSAP (Appendix A).

Dedicated or disposable sampling equipment will not require decontamination.

3.5 INVESTIGATION DERIVED WASTE (IDW) MANAGEMENT

The RI activities will produce investigation-derived wastes (IDW) which will require appropriate management. IDW includes the following:

- Drill cuttings
- Groundwater resulting from development of new monitoring wells
- Groundwater resulting from the sampling of the monitoring wells
- Decontamination fluids resulting from decontamination of the drill rig and sampling equipment
- Personnel protective equipment (PPE)
- Disposable materials and supplies.

The management of these materials will be in accordance with Section IV of Technical and Administrative Guidance Memorandum (TAGM) 4032 (NYSDEC, November 21, 1989). Specific IDW handling is discussed in Section 10 of the FSAP (Appendix A).

3.6 DATA MANAGEMENT AND VALIDATION

Analytical data from the laboratory will be received in hardcopy and electronic format as Electronic Data Deliverables (EDDs) compatible with EQuIS. The electronic data will be uploaded into an EQuIS database for storage and development of tables or output to other data analysis tools and GIS as needed.

The data package will be reviewed by a data validator. A Data Usability Summary Report (DUSR) will subsequently be prepared to document the usability of the data. Additional information pertaining to data validation and DUSR preparation is provided in the QCD (Appendix B).

Data qualifiers provided in the DUSR will be manually input into the database once received from the validator.

3.7 QUALITATIVE HUMAN HEALTH EXPOSURE ASSESSMENT

The qualitative human health exposure assessment will be conducted in accordance with Appendix 3B of DER-10, and will be documented in an Exposure Pathway Analysis Report (EPAR) and qualitative discussion of risk within the RI Report. The analysis will consist of evaluation of potential exposures of humans to Site constituents based on current and future potential uses of the Site. The assessment will include the following components:

- A description of the contaminant source(s) including the location of the contaminant release to the environment (waste disposal area or point of discharge) or, if the original source is unknown, the contaminated environmental medium (soil, indoor or outdoor air, biota, water) at the point of exposure
- An explanation of the contaminant release and transport mechanisms to the exposed population
- Identification of potential exposure point(s) where actual or potential human contact with a contaminated medium may occur
- Description(s) of the route(s) of exposure (i.e., ingestion, inhalation, dermal absorption)
- Characterization of the receptor populations who may be exposed to contaminants at a point of exposure.

The EPAR discussion will summarize potential exposure pathways at the site and identify whether each pathway is complete or incomplete.

3.8 RI REPORT

Upon completion of the RI field investigation, an RI Report will be completed. This report will summarize the data collected during the RI, as well as relevant data collected prior to the RI for the Site. The RI Report will include comparisons of site data to New York State screening values as presented in 6 NYCRR Part 375. Groundwater concentrations observed at the Site will be compared to screening values presented in the New York State Ambient Water Quality Standards and Guidance Values and Groundwater Effluent Limitations, Technical and Operational Guidance Series (TOGS 1.1.1, NYSDEC 1998). Conclusions based on the data and analyses will be provided, as well as the following information:

- An updated Site description, if necessary
- Site maps
- Field investigation observations
- Hydrogeology
- Chemical analyses results
- Nature and extent characterization
- Human health exposure assessment
- Assessment of existing data to assess whether there is the need for supplemental data collection

The RI Report will recommend either no further action or remediation based on the information generated by the investigation.

4. ASSOCIATED WORK PLAN DOCUMENTS

4.1 FIELD SAMPLING AND ANALYSIS PLAN

The Field Sampling Plan (FSP) for the Site is provided in Appendix A of this RIWP. The FSP presents the procedures for execution of field activities to be conducted as part of the RI as identified in Section 2. The FSAP also provides rationale and detailed procedures for collecting environmental samples including equipment and personnel requirements, drilling and well installation techniques, sampling techniques, and equipment decontamination procedures.

4.2 QUALITY CONTROL DOCUMENT

The Quality Control Document (QCD) for the Site is provided in Appendix B of this RIWP. The QCD provides quality assurance/quality control (QA/QC) criteria for work efforts associated with the sampling of environmental media as part of the RI.

This QCD will assist in generating data of a known and acceptable level of precision and accuracy. The QCP provides information regarding the project description and personnel responsibilities, and sets forth specific procedures to be used during sampling of relevant environmental matrices, other field activities, and the analyses of data. The procedures in this QCD will be followed by personnel participating in the field investigation and in the laboratory analyses of environmental samples.

4.3 HEALTH AND SAFETY PLAN

The Health and Safety Plan (HASP) for the Site is provided in Appendix C of this RIWP. The HASP has been developed to provide both general procedures and specific requirements to be followed by field personnel while performing RI activities at the Site.

The HASP describes the responsibilities, training requirements, protective equipment, and standard operating procedures to be used by personnel to address potential health and safety hazards while in investigation areas. The plan specifies procedures and equipment to be used by personnel during work activities and emergency response to minimize exposures of personnel to hazardous materials.

A Community Air Monitoring Plan (CAMP) that outlines the monitoring and response activities associated with monitoring VOCs and particulates at the property boundaries near the activities is included in the HASP.

5. SCHEDULE

Milestone Activity	Estimated Schedule
RI Work Plan Submittal to NYYSDEC for Review	October 29, 2013
NYSDEC RI Work Plan Approval	TBD
Public Comment Period	30 days following Approval
RI Field Program	Completed 90 days following Public Comment Period
RI Report	120 Days following Receipt of Data Validation Report

REFERENCES

O'Brien & Gere, 2009; Focused *Site Investigation Work Plan; Former Ithaca Gun Site, Ithaca New York;* April 2009.

O'Brien & Gere, 2011a; *Focused Site Investigation Report; Ithaca Gun Site, Ithaca New York*; March 2011.

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B&L 2011: *Site Investigation Work Plan, Ithaca Fall Overlook, City of Ithaca Urban Renewal Agency, Tomkins County, New York; ERP # E755018*; Barton & Loguidice, P.C.; November 2011.

Prescott, 2001; *Phase I Environmental Site Assessment, Former Ithaca Gun Factory Property. Falls Creek & Lake Street, Ithaca, Tompkins County, New York*; Prescott Environmental Associates, Inc.; October 29, 2001.

Prescott, 2002: *Voluntary Site Clean-Up Program Investigation Report, Former Ithaca Gun Factory Property, Falls Creek and Lake Street, Ithaca, Tompkins County, NY 14850*; Prescott Environmental Associates, Inc.; May 10, 2002.

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Table 1
Detected Constituents in Groundwater

Former Ithaca Gun Factory Site
Ithaca, NY

VOCs	Criteria[1]	MW-1			MW-1R			MW-3						MW-4					MW-4R	
Date		**2001**	**2002**	**2007**	**2010**	**2011**	**2011 DUP**	**2001**	**2002**	**2003**	**2007**	**2010**	**2011**	**2001**	**2002**	**2003**	**2007**	**2007 Dup**	**2010**	**2010 DUP**
1,1-Dichoroethane	5	ND		<0.5	<5	<5	<0.5	2			<5	0.7 J	1.8 J	ND			<5	0.26 J	0.6 J	0.6 J
Benzene	1	ND		<0.5	0.15 J	0.12 J	0.16 J				<5	<2.5	<5.0				<5	<0.5	<2.5	<2.5
Chloroform	7	ND		<0.5	0.43 J	0.38 J	0.36 J				<5	0.55 J	<5.0				<5	<0.5	<2.5	<2.5
cis-1,2-Dichloroethene	5	ND		<0.5	<5	<5	<5	**120**			**17**	**20**	**50.8**	**18**			**23.5**	**21.1**	**74.2**	**73.2**
Tetrachloroethene	5	ND		<0.5	<5	<5	<5	**6**			<5	1.7 J	3.2 J	2			**5**	**5.11**	4.9	4.75
trans-1,2-Dichloroethene	5	ND		<0.5	<0.5	<0.5	<0.5	4			<5	0.7	<5.0	ND			<5	0.39 J	0.65 J	0.5 J
Trichloroethene	5	ND		<0.5	0.17 J	0.22 J	0.26 J	**320**			**152**	**194**	**443**	**91**			**98.1**	**71.3** J	**181**	**180**
Acetone	50*	ND		NA	1.31 J	1.25 J	<10				**NA**	13 J	<5.0				**NA**	**NA**	10.6 J	9.25 J
Methylene Chloride	50	ND			<2 U	0.22 J	<2.0					<10	3 J						3.15 J	1.55 J
Ethylbenzene	5	ND			<0.5	0.11 J	<0.5					<2.5	<5.0						<2.5	<2.5
Xylenes	5	ND			<1	<0.5	0.52 J					<5	<5.0						<5	<5
Toluene	5	ND			<1	0.73	0.89					<5	<5.0						<5	<5

SVOCs	Criteria[1]	MW-1			MW-1R			MW-3						MW-4					MW-4R	
bis(2-Ethylhexyl)phthalate	5	ND		1.1 J	<10	0.72 J	0.62 J	ND			<10	<10	2.8 J	**76**			<10	<10	2.2 J	<10
Benzo(a)anthracene	0.002*	ND		<10	<10	<10	<10	ND			<10	<10	<10				<10	<10	**0.56** J	<10
Benzo(a)pyrene	ND	ND		<10	<10	<10	<10	ND			<10	<10	<10				<10	<10	**0.45** J	<10
Benzo(b)fluoranthene	0.002*	ND		<10	<10	<10	<10	ND			<10	<10	<10				<10	<10	**0.46** J	<10
Benzo(K)fluoranthene	0.002*	ND		<10	<10	<10	<10	ND			<10	<10	<10				<10	<10	**0.54** J	<10
Butyl benzyl phthalate	50	ND		<10	<10	<10	<10	ND			<10	<10	<10				<10	<10	0.41 J	<10
Chrysene	0.002	ND		<10	<10	<10	<10	ND			<10	<10	<10				<10	<10	**0.46** J	<10
Di-n-octyl phthalate	50	ND		<10	<10	<10	<10	ND			<10	<10	<10				<10	<10	0.4 J	<10
Fluoranthene	50	ND		<10	<10	<10	<10	ND			<10	<10	<10				<10	<10	0.48 J	<10
Phenanthrene	50	ND		<10	<10	<10	<10	ND			<10	<10	<10				<10	<10	0.47 J	<10
Pyrene	50	ND		<10	<10	<10	<10	ND			<10	<10	<10				<10	<10	0.53 J	<10

Metals	Criteria[1]	MW-1			MW-1R			MW-3						MW-4					MW-4R	
Barium	1000	**2830**	100	120	320	350	360	66.6	65.6		66 J	78 J	97 J	159	33.9		36 J	41 J	78 J	78 J
Chromium	50	**102**	1.5	2.8 J	<10	47	45	0.82	1.4		2.8 J	<10	21	44.7	1.5		2.1 J	3.5 J	<10	<10
Cyanide	200			<10	<10	<10	<10					<10	<10						5.4 J	<10
Lead	25	**261**	ND	<10	<10	<10	<10	**71.1**	8.1	**88**	**28**	14	**29**	**54.7**	ND	9	<10	<10	<10	<10
Selenium	10	5.5	ND	<10	<10	<10	<10	4.1	4.2		4.8 J	<10	<5.9	8.8	**55**		3.0 J	3.4 J	<10	<10
Mercury	5				<0.20	<0.20	<0.20					<0.20	0.15 J						<0.20	<0.20

Notes:
Results are presented in ug/L
2011 data samples were collected on August 9, 2011 and have not been validated.
1 - NYSDEC Technical and Operational Guidance Series (TOGS) 1.1.1: Ambient Water Quality Standards and Guidance; June 1998.
Water Quality Standards and Guidance. June, 1998 and Ammendment April 2000.
* - Groundwater guidance value.
Bold - Detected concentration exceeds Groundwater standard or guidance value
J - Analyte detected below PQL

Table 2
Sample Analysis and QA/QC Summary
Former Ithaca Gun Factory Site
Ithaca, New York

Investigation Area	Environmental Media	Analyses	Method	Number of Samples	Trip Blank[1]	Field Blank[2]	Field Duplicate[3]	MS[3]	MSD[3]	Total Number of Samples
Eastern Parcel South of Fromer Quonset Hut	**Soil**	Lead	USEPA Method 6010C	12	0	0	1	1	1	15
Western Parcel	**Soil**	TCL Volatiles + 10	USEPA Method 8260C	4	2	0	1	1	1	9
		TCL Semivolatiles + 20	USEPA Method 8270D	4	0	0	1	1	1	7
		TCL PCBs	USEPA Method 8082A	4	0	0	1	1	1	7
		TAL Metals	USEPA Method 6010C	4	0	0	1	1	1	7
		Mercury	USEPA Method 7471B	4	0	0	1	1	1	7
		Cyanide	USEPA Method 9014	4	0	0	1	1	1	7
		Lead	USEPA Method 6010C	12	0	0	1	1	1	15
Former Manufacturing Bldg.	**Groundwater**	TCL Volatiles + 10	USEPA Method 8260C	16	4	1	1	1	1	24
Site-Wide	**Groundwater**	TCL Volatiles + 10	USEPA Method 8260C	9[4]	2	0	1	1	1	14

Notes: **Notes:** [1] - Trip Blanks are required in each cooler shipped that contain samples to be analyzed for VOCs. The trip blank will be analyzed for VOCs only.

[2] - Field blanks are only required when reusable sampling equipment is used. Samples are to be collected for each set of sampling equipment for each event or at a frequency of 1 per 20 samples.

[3] - Field Duplicates, MS and MSD samples are to be collected and analyzed at a frequency of 1 per 20 samples.

[4] - Assumes that 2 monitoring wells will be installed in the bedrock borehole to be installed proximal to MW-4.

T:\z_misc\Meixell\IthacaGun.mxd

FIGURE 1

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PLOT DATE: 9/12/06 DIV. 732 JPS

ADAPTED FROM: ITHACA EAST AND ITHACA WEST, NEW YORK USGS QUADRANGLES.

QUADRANGLE LOCATION

FORMER ITHACA GUN COMPANY PROPERTY
121 - 125 LAKE STREET
ITHACA, NY

SITE LOCATION

0 1,000 2,000 4,000

Feet

1:24,000

FILE NO. (6)
SEPTEMBER 2006

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FIGURE 2

N

LEGEND

- PARCEL CONVEYED TO CITY OF ITHACA
- BCP PARCEL BOUNDARY

FORMER ITHACA GUN FACTORY SITE
ITHACA, NEW YORK

CURRENT SITE LAYOUT

0 30 60 120
Feet

OCTOBER 2013
17546.49289

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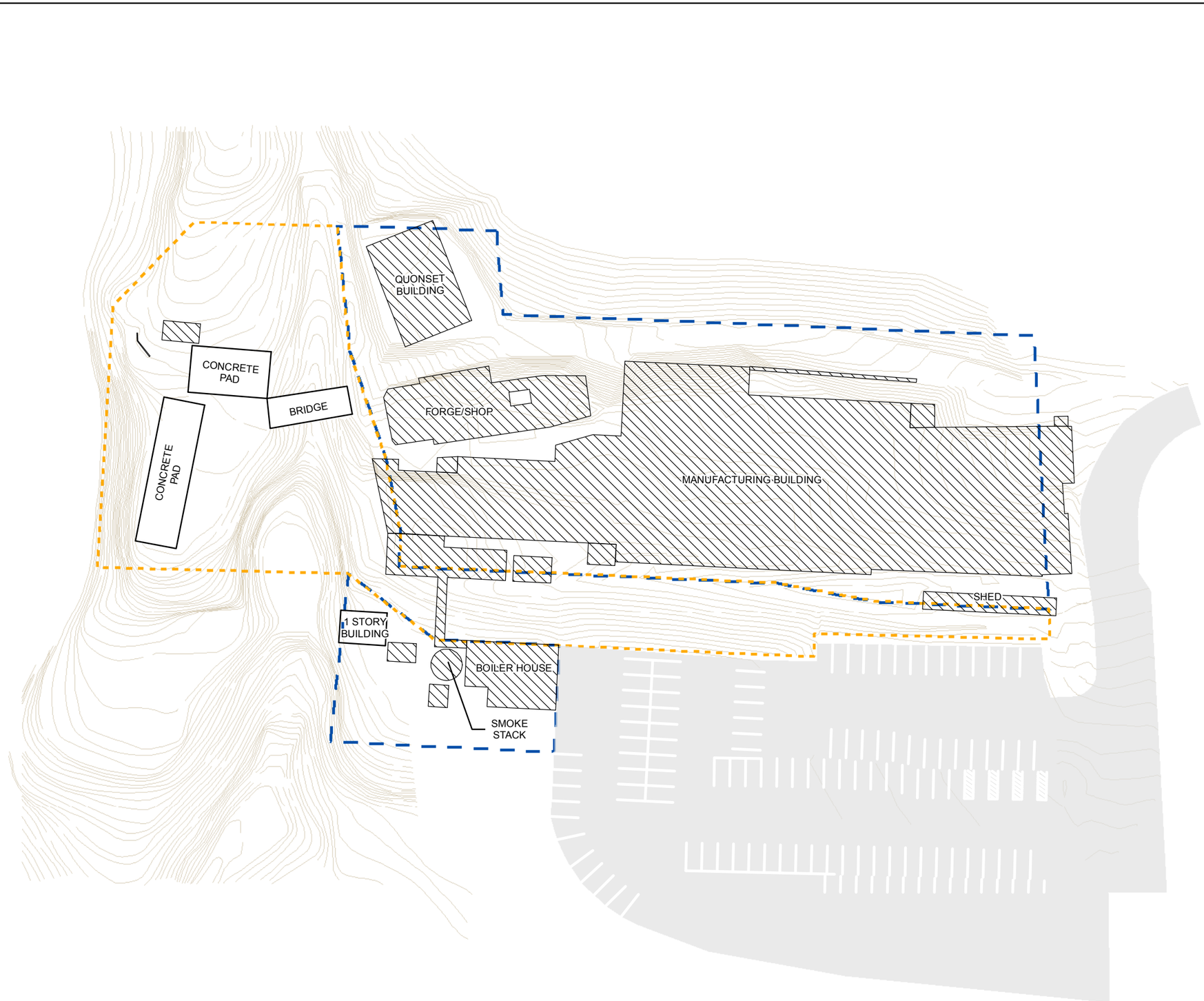
FIGURE 3



LEGEND

- FORMER BUILDING (REMOVED)
- STRUCTURE
- PARCEL CONVEYED TO CITY OF ITHACA
- BCP PARCEL BOUNDARY
- PAVEMENT
- TOPOGRAPHIC CONTOUR

FORMER ITHACA GUN FACTORY SITE
ITHACA, NEW YORK

FORMER SITE LAYOUT

0 30 60 120
Feet

OCTOBER 2013
17546.49289

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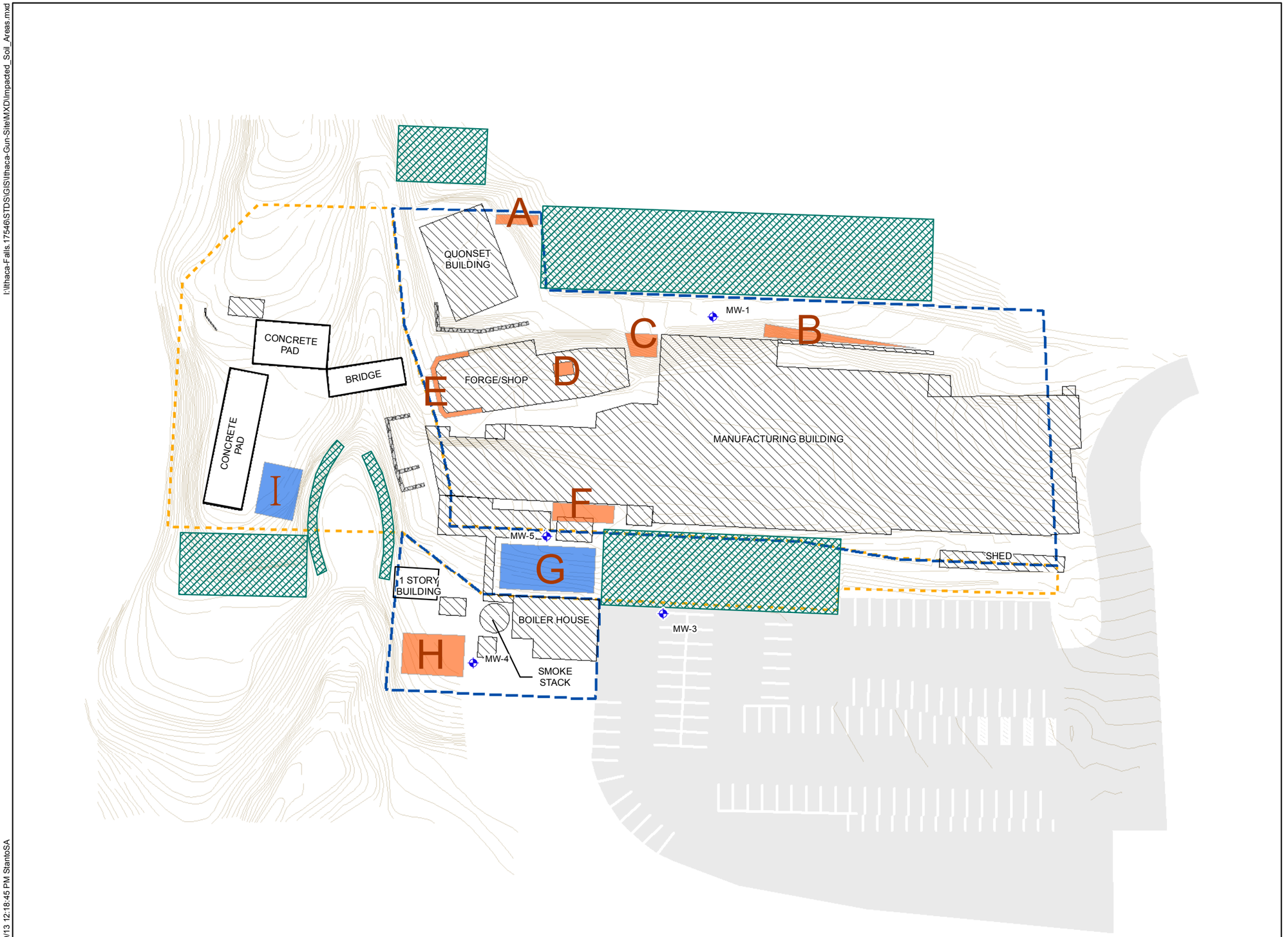
FIGURE 4



LEGEND

- MONITORING WELL
- FORMER BUILDING (REMOVED)
- STRUCTURE
- TO REMAIN
- BCP PARCEL BOUNDARY
- PARCEL CONVEYED TO CITY OF ITHACA
- TOPOGRAPHIC CONTOUR

CONTAMINATED SOIL

- IMPACTED SOILS BCP PARCEL
- IMPACTED SOIL ERP PARCEL
- PREVIOUS EPA REMOVAL AREA

FORMER ITHACA GUN FACTORY SITE
ITHACA, NEW YORK

IMPACTED SOIL AREAS

0 30 60 120
Feet

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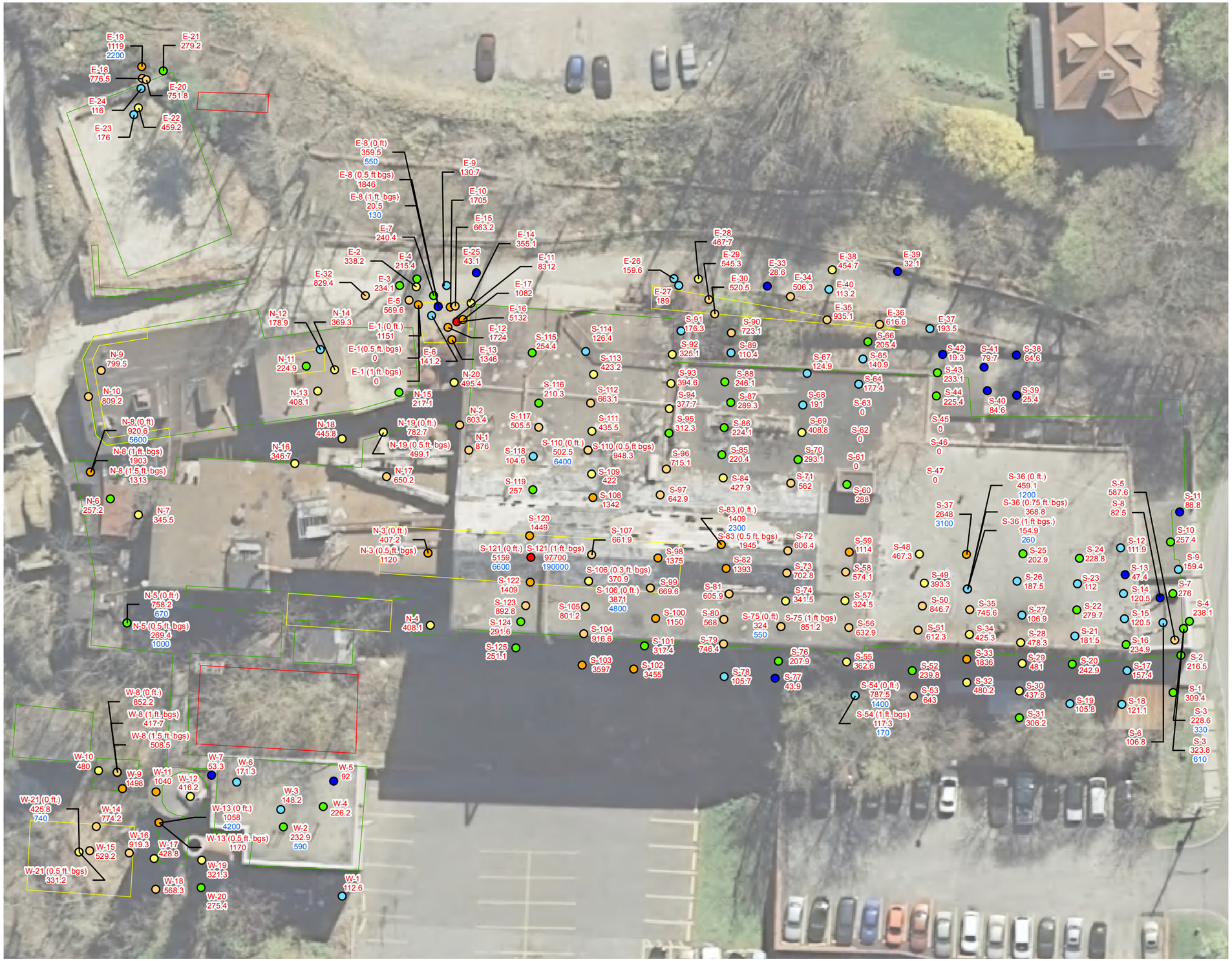

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FIGURE 5

N

LEGEND

XRF Lead Screening Data

- 19.3 - 100 ppm
- 100 - 200 ppm
- 200 - 320 ppm
- 320 - 500 ppm
- 500 - 1000 ppm
- 1000 - 4000 ppm
- >4000 ppm

Structural Outlines

- KNOWN CONTAMINATED SOILS
- SOIL TO BE REMOVED UNDER IRM
- TO BE DEMOLISHED
- S-117 XRF SAMPLE SCEENING POINT
- 140.9 LEAD CONCENTRATION (XRF)
- 3100 LEAD CONCENTRATION (LAB)

FORMER ITHACA GUN FACTORY SITE
ITHACA, NEW YORK

POST-DEMOLITION LEAD SCREENING RESULTS

0 17.5 35 70
Feet

OCTOBER 2013
17546.49289

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FIGURE 6

N

LEGEND

- ITHACA FALLS RESIDENCES
- PAVEMENT
- PARCEL CONVEYED TO CITY OF ITHACA
- BCP PARCEL BOUNDARY
- TOPOGRAPHIC CONTOUR

FORMER ITHACA GUN FACTORY SITE
ITHACA, NEW YORK

PRELIMINARY REDEVELOPMENT CONFIGURATION

0 30 60 120
Feet

OCTOBER 2013
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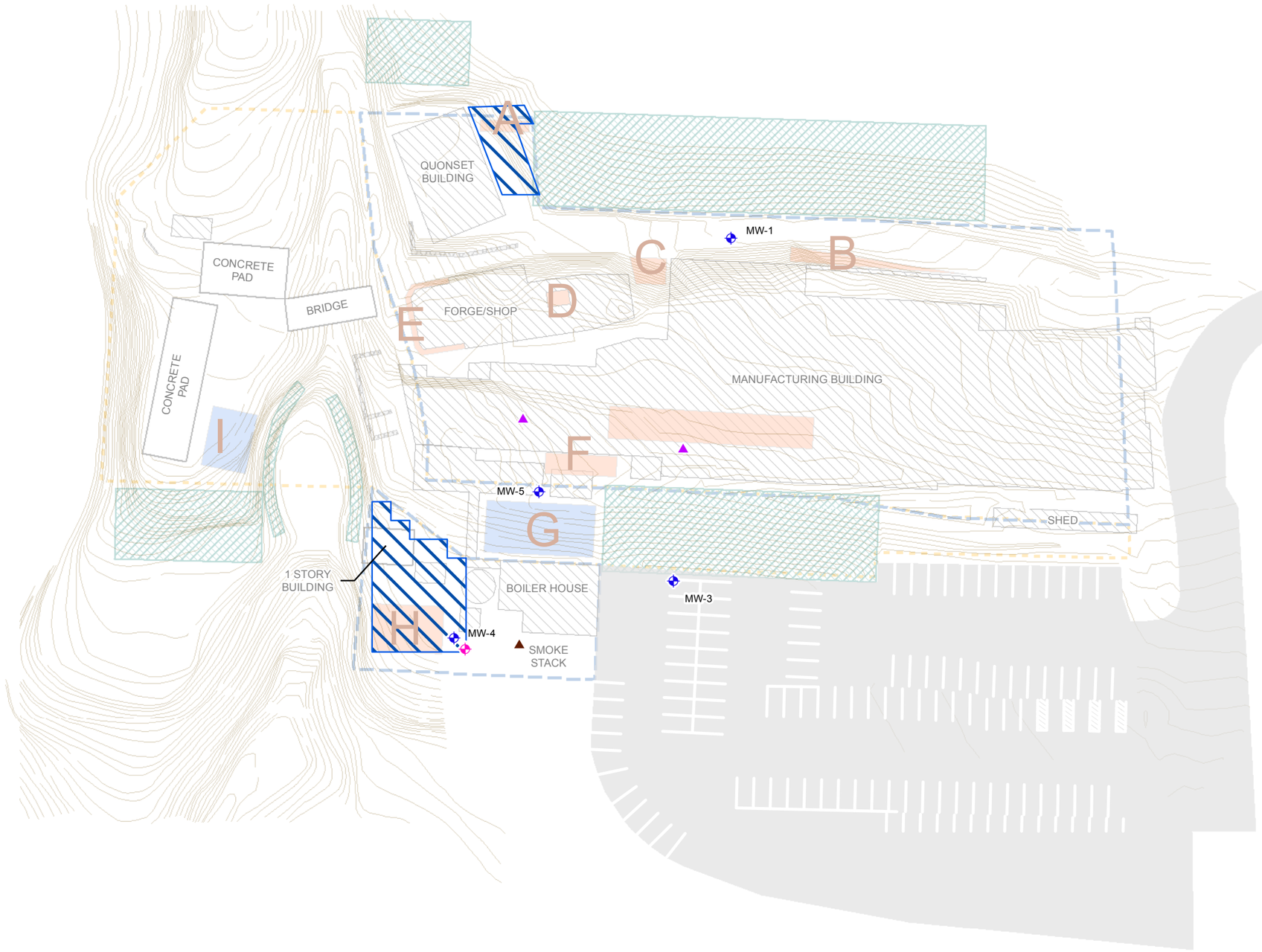

FIGURE 7

N

LEGEND

- EXISTING MONITORING WELL
- PROPOSED BEDROCK BORING WITH PACKER TESTING
- PROPOSED MONITORING WELL
- PROPOSED SOIL BORING
- PROPOSED XRF SCREENING LOCATION
- FORMER BUILDING (REMOVED)
- STRUCTURE
- TO REMAIN
- BCP PARCEL BOUNDARY
- PARCEL CONVEYED TO CITY OF ITHACA
- TOPOGRAPHIC CONTOUR

CONTAMINATED SOIL

- IMPACTED SOILS BCP PARCEL
- IMPACTED SOIL ERP PARCEL
- PREVIOUS EPA REMOVAL AREA

FORMER ITHACA GUN FACTORY SITE
ITHACA, NEW YORK

RI SAMPLING LOCATIONS

0 30 60 120
Feet

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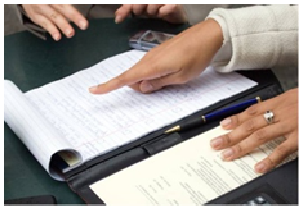
Field Sampling and Analysis Plan







Remedial Investigation
Former Ithaca Gun Factory Site
Ithaca, New York
Site No. C755019

IFR Development LLC

October 2013

O'BRIEN & GERE

TABLE OF CONTENTS

LIST OF TABLES

LIST OF APPENDICES

1. INTRODUCTION

This Field Sampling and Analysis Plan (FSAP) has been developed by O'Brien & Gere on behalf of IFR Development, LLC to outline procedures to be followed during implementation of field investigation activities to support the Remedial Investigation (RI) at the Former Ithaca Gun Factory Site (Site No. C755019) (the Site) located at 121-125 Lake Street in Ithaca, New York.

This FSAP is a component of the Remedial Investigation Work Plan (RIWP) developed by O'Brien & Gere for the Site. It should be noted that not all of the activities identified in this FSAP are currently identified to be conducted; however, methods and procedures have been provided herein should such sampling be warranted.

1.1 OVERVIEW OF FIELD ACTIVITIES

The following field activities may be completed as part of the RI:

- Utility locating
- Exploratory test pits / excavations
- Soil boring and subsurface soil sampling
- Monitoring well installation and development
- Groundwater sampling
- Hydraulic conductivity testing
- Sediment sampling
- Soil vapor sampling
- Decontamination of sampling equipment
- Management of Investigation Derived Waste (IDW)

2. GENERAL FIELD GUIDELINES

2.1 SITE HAZARDS

Generally, potential hazards within the Site will be identified during site reconnaissance by the project team prior to the initiation of RI field activities. Additional safety measures to be undertaken for the work performed as part of the RI will be addressed in the site-specific Health and Safety Plan (HASP).

2.2 UNDERGROUND UTILITIES

New York State law requires that Dig Safely of New York be notified at least two working days, and not more than 10 working days, before subsurface work is conducted. Dig Safely New York (800-272-4480) will be contacted to initiate the locating activities. Companies with subsurface utilities present will locate and mark out subsurface utility lines. However, Dig Safely New York contractors will only locate utilities on public property and rights-of-way.

Underground utilities within the Site, including electric lines, gas lines, storm and sanitary sewers, and communication lines will need to be identified through a process other than Dig Safely of New York prior to initiation of drilling and other subsurface work. If additional subsurface utility locating is considered necessary, a private locating company will be contracted to locate on-site utilities that have not been identified by Dig Safely New York contractors or IFR Development LLC.

2.3 FIELD LOG BOOKS

Field activities will be documented in field log books to provide a record of the activities conducted. Entries will be of sufficient detail that a complete daily record of significant events, observations, and measurements is developed. Accordingly:

- Field books will be assigned a unique identification number.
- Field books will be bound with consecutively numbered pages.
- Field books will be controlled by the Field Manager while fieldwork is in progress.
- Entries will be written with waterproof ink.
- Entries will be signed and dated at the conclusion of each day of fieldwork.
- Erroneous entries made while fieldwork is in progress will be corrected by the person that made the entries. Corrections will be made by drawing a line through the error, entering the correct information, and initialing the correction.
- Corrections necessary after departing the field will be made by the person who entered the original information. Corrections will be made by drawing a line through the error, entering the correct information, and initialing and dating the time of the correction.

Daily field book entries, for those days when field activities are on-going, will include the following information:

- Location of field activity
- Date and time of entry
- Names, titles of any site visitors, as well as the date and time entering and leaving the site
- Weather information, for example: temperature, cloud coverage, wind speed, and direction
- Purpose of field activity
- A detailed description of the fieldwork conducted
- Sample media (e.g. soil, groundwater, etc.)
- Description of sampling point(s)

- Analytical parameters (e.g. VOCs, SVOCs)
- Date and time of collection
- Sample identification number(s)
- Field observations
- Field measurements made (e.g.; volatile organic compounds (VOCs) using a photoionization detector (PID), pH, temperature, conductivity, water level)
- References for maps and photographs of the sampling site(s)
- Information pertaining to sample documentation such as:
  - Bottle lot numbers
  - Dates and method of sample shipments
  - Chain-of-custody record numbers
  - Federal Express air bill number.

3. EXPLORATORY TEST PITS / EXCAVATIONS

Test pitting and/or excavating may be conducted during the RI, if necessary. Test pits will allow for visual characterization of subsurface soil conditions and the collection of grab soil samples. Prior to soil sample collection, headspace screening will be conducted to evaluate whether analysis of soil samples is warranted, and if so, which soils should be collected.

Prior to completing a test pit or excavation, underground utilities should be identified as discussed in Section 2.2 of this document. Should active underground utilities be located in the vicinity of the intended excavation, hand or vacuum excavation methods should be employed, as appropriate, to confirm the location and depth prior to initiating the excavation.

The size and type of excavator used to complete the test pits will be selected based on the anticipated depth and overall size of the excavation required to meet the project objectives. At no time will field personnel enter a test pit/excavation unless it has been deemed safe to enter by an Excavation Competent person based on training and experience required by 29CFR 1926.652.

The sampling approach from test pits/excavations will be to bring soil samples to the surface using the backhoe or excavator to avoid entry into the test pit/excavation. The field sampler will select a soil sample(s) that is representative of the excavated soil that best targets the zone of interest. Each soil sample will be placed in a re-sealable plastic (e.g., Ziploc®) bag filled approximately half full. The bag will be labeled with the boring number and interval sampled. After allowing the bagged soil to warm to the equivalent of room temperature, the tip of the sample probe attached to the PID will be inserted into the bag to measure the headspace for organic vapors.

Descriptions of the materials encountered in the test pit/excavation will be recorded on the Test Pit Log. An example of the Test Pit Log is provided in **Appendix 1**.

Soil samples selected for analysis will be based on PID screening and/or visual/olfactory indications of potential impacts. Soil samples will be placed in appropriate laboratory supplied jars for the identified analyses. Samples for laboratory analysis will be submitted to an approved NYSDOH Laboratories Approval Program (ELAP)-certified laboratory under Chain-of-custody procedures. An example Chain-of-custody is included in **Appendix 2**. Analyses will be conducted using U.S. Environmental Protection Agency (USEPA) methodologies as specified in **Section 11**. Samples will be managed in accordance with the Quality Control Document (QCD).

4. SOIL BORING AND SUBSURFACE SAMPLING PROCEDURES

Soil borings will be advanced to facilitate the collection of subsurface soil samples and the installation of monitoring wells. Subsurface soil samples will be used to develop an understanding of site-specific geologic conditions, and to document those conditions. Subsurface soil samples will also be submitted for laboratory analysis to evaluate soil quality and potential remedial activities, if necessary.

Depending on site-specific objectives and/or drilling conditions, soil borings may be advanced using direct-push, conventional hollow stem auger, or sonic drilling methods.

4.1 SOIL BORING DRILLING METHODS

4.1.1 Direct-Push

This drilling method is typically used to collect shallow overburden soils and create boreholes for temporary monitoring well installations or soil vapor sampling points. This method is advantageous in that it typically allows for the advancement of numerous borings in a relatively short period of time. The disadvantage of this method is that it is typically limited to shallow overburden soils (less than 50 feet below grade) which exhibit relatively low densities.

4.1.2 Conventional Hollow Stem Auger Method

Hollow stem auger drilling method is typically used to collect shallow and deeper overburden soils and create boreholes for permanent monitoring well installations. This method is advantageous in that it typically allows for the advancement of borings through denser soils, and when coupled with split spoon sampling conducted in accordance with ASTM Method D1586, can provide geotechnical information. The disadvantage of this method is that it is typically more time consuming to drill and sample, and to decontaminate the equipment than direct-push methods. In addition, this method can generate a high volume of soil cuttings that may require off-site disposal depending on the depth of the boring.

4.1.3 Sonic

A sonic drill rig looks and operates very much like any conventional top-drive rotary or auger rig. The sonic drilling system employs simultaneous high frequency vibration and low speed rotational motion along with down pressure to advance the cutting shoes of the drill string. This technique provides a continuous soil core and generates minimal cuttings. Due to the true continuous sampling of the system, accurate depictions of the stratigraphy and lithology of the overburden are obtained (minimal sloughing). Additionally, few cuttings are mobilized to the surface. Most of the formation material enters the core barrel, except small amounts, that are pushed into the borehole wall.

Drilling operations take place from the drill platform, which is about 4 feet above ground. Steel drill casing and core barrel are connected to the head from the work platform/support truck and are then hoisted to vertical in the derrick. Tool joints are connected and broken by a hydraulic vise/wrench that is in the base of the derrick. The sonic head is able to pivot 90 degrees to facilitate connection of the drilling rods.

The sonic drilling system uses an override core barrel system. A 4 or 6-inch diameter 10 or 20-foot long core barrel is first advanced into the ground. This is followed by the override casing drilled to the same depth as the core barrel cutting shoe. The core barrel is then removed and cores are extruded into plastic sleeves. The core barrel is sent back down the hole where it is advanced another 10 or 20 feet followed again by the override casing. The outer casing prevents cross contamination and formation mixing and allows for a very controlled placement of wells.

4.2 SUBSURFACE SOIL SAMPLING AND FIELD SCREENING

- Soil samples will be collected continuously from the ground surface to the bottom of the borings.

- Soil samples retrieved from the borehole will be described for: 1) percent recovery; 2) soil type; 3) color; 4) moisture content; 5) texture; 6) grain size and shape; 7) consistency; 8) evidence of staining or other chemically-related impacts; and 9) any other relevant observations. In addition, soil will be screened with a PID to allow evaluation of the bulk volatile organic concentration of each soil sample.
- Soils will be described in accordance with the Modified Wentworth classification system. This descriptive information will be recorded on a soil boring log form. An example of the typical soil boring log form is provided in **Appendix 3**.
- An initial screening of the soil core will be conducted using a PID equipped with an 10.6 eV lamp. The PID will be used to carefully scan the length of the soil core. Samples for headspace screening will be collected. A representative portion of each soil sample will be placed in a re-sealable plastic (e.g., Ziploc®) bag filled approximately half full. The bag will be labeled with the boring number and interval sampled. After allowing the bagged soil to warm, the tip of the sample probe attached to the PID will be inserted into the bag to measure the headspace for organic vapors.
- Samples for laboratory analysis will be submitted to an approved NYSDOH ELAP-certified laboratory under Chain-of-custody procedures. An example Chain-of-custody is included in **Appendix 2**. Analyses will be conducted using USEPA methodologies as specified in **Section 11**. Samples will be managed in accordance with the QCD.

4.3 BOREHOLE ABANDONMENT

Soils extracted during the advancement of the borings will be used to backfill the borings, provided that the borings are not to be used for installation of permanent monitoring wells. However, soils that exhibit "gross" contamination, as evidenced by staining or free-phase product, or any visual, olfactory, or PID readings greater than 100 ppm above background, will be managed in accordance with **Section 9**. In this event, bentonite chips or pellets will be used to backfill the boring(s).

5. MONITORING WELL INSTALLATION AND DEVELOPMENT

Monitoring wells will be used to evaluate the hydrogeologic conditions and groundwater quality. Monitoring wells will be installed to allow characterization of groundwater levels, groundwater flow systems, and groundwater quality.

5.1 TYPES OF MONITORING WELLS

Monitoring wells may be installed in overburden and/or bedrock, and may be temporary or permanent depending on the project objectives. A Well Completion Log will be completed for each well installed. An example of the Well Completion Log is provided in **Appendix 4**.

5.1.1 Temporary Overburden Monitoring Well Installation and Construction

The temporary monitoring well borings may be advanced using direct-push, hollow-stem auger, or sonic drilling methods. Regardless of the drilling method, soil samples will be collected continuously. When using augers, subsurface samples will be collected using 2 ft long, 2-inch diameter split barrel samplers in accordance with ASTM Method D1586.

Temporary wells will be constructed using 1-inch inside diameter (I.D.), Schedule 40 PVC, 0.010-inch slotted screen, flush-threaded to 1-inch I.D. Schedule 40 PVC riser casing. The well screen, plug, and riser should be certified clean from the manufacturer. If they are not, they will be cleaned using a high pressure steam cleaner. In general, well screens will be 10-feet long for shallow water table wells.

The annulus around the screens will be backfilled with clean silica sand having appropriate size in comparison to the screen slot size. The filter pack will be installed in increments as the augers or casings are withdrawn to enable monitoring of progress and to prevent bridging. If bridging occurs, break the bridge before proceeding with installation. The filter pack should extend a minimum of 2 ft above the top of the screen.

A bentonite chip or pellet seal with a minimum thickness of 2 feet will be placed above the filter pack. If the seal is installed above the water table, it will be manually hydrated using potable water. The remainder of the annular space will be backfilled with soil cuttings up to the ground surface.

A filter pack will be installed within the annular space between the well screen and borehole, as the drilling rod assembly is retracted. A bentonite seal will be installed on top of the filter pack to the ground surface.

5.1.2 Permanent Overburden Monitoring Well Installation and Construction

Permanent monitoring wells will be used when long-term monitoring data or hydraulic conductivity testing is required. The monitoring well borings will be advanced using 4.25-inch inner diameter (ID) hollow-stem augers or 4-inch sonic casing when 2-inch wells are to be installed. During advancement of the augers or casing, soil samples will be collected continuously. When using augers, subsurface samples will be collected using 2-ft long, 2-inch diameter split barrel samplers in accordance with ASTM Method D1586. When using sonic casing, subsurface soil samples will be collected as nominal 4-inch diameter cores.

Permanent monitoring wells will be constructed with 2-inch I.D., Schedule 40 PVC, 0.010-inch slotted screen, flush-threaded to 2-inch I.D., Schedule 40 PVC riser casing. The well screen, plug, and riser should be certified clean from the manufacturer. If they are not, they will be cleaned using a high pressure steam cleaner.

In general, well screens will be 10-feet long for shallow water table wells and 5-feet long for deeper overburden wells, unless greater lengths are required to meet project objectives. In general, it is anticipated that a slot size of 0.010-inch will be used.

The annulus around the screens will be backfilled with clean silica sand having appropriate size in comparison to the screen slot size. The volume of filter pack required to fill the annular space will be calculated and compared to the volume installed. This information will be recorded in the field log book. The filter pack will be installed in increments as the augers or casings are withdrawn to enable monitoring of progress and to prevent bridging. If bridging occurs, break the bridge before proceeding with installation. The filter pack should extend a minimum of 2 ft above the top of the screen.

A bentonite chip or pellet seal with a minimum thickness of 2 feet will be placed above the filter pack. If the seal is installed above the water table, it will be manually hydrated using potable water. The remainder of the annular space will be filled with cement-bentonite grout to ground surface. The grout will be allowed to set for a minimum of 24 hours before wells are developed.

Well heads may be completed either above grade, or flush with grade. For above grade completions, the well heads will extend approximately 3-ft above grade and will be fitted with a protective casing with a lockable lid. An approximate 2-ft diameter concrete well pad will be installed around the protective casing. The well pad will be sloped away from the protective casing to shed surface water away from the well head. The well identification will be clearly visible on the inside and outside of the lid of the protective casing.

Well heads in parking lots, roadways, or other areas accessed by vehicular traffic will be completed flush with grade. Flush-mount curb boxes will be fitted over the well head and will be flush to the surrounding grade. The curb box will be set in an approximate 2-ft diameter concrete pad. A locking J-plug will be installed on top of the well.

The top of the well casing and ground surface will be marked and surveyed to 0.01 foot, and the elevation will be determined relative to a fixed benchmark or datum. The measuring point on all wells will be on the innermost PVC casing.

5.1.3 Permanent Bedrock Monitoring Well Installation and Construction

Bedrock monitoring wells will be installed using sonic drilling methods, or a combination of hollow stem auger and rock coring, air rotary, or fluid rotary drilling methods.

When using sonic methods, a 4-inch core barrel and 6-inch override casing will be used through the overburden and bedrock to the target depth. Soil samples will be collected continuously through the overburden and bedrock. A 2-inch PVC monitoring well will be installed and centered in the 6-inch sonic casing. The 6-inch casing will be pulled from the ground. The sonic drill head will be engaged to pull the casing and this will serve to degas the grout, and knit the grout into the borehole wall.

If augers/coring or rotary methods are used, borings will be advanced through the overburden material using 6-1/4 inch inside diameter (I.D.) hollow-stem augers or similar equipment dictated by site conditions. Soil samples will be collected using 2-inch diameter split-barrel samplers in accordance with ASTM Method D1586. Once bedrock is encountered, a 6- inch “rock socket” will be installed into the competent rock using a tri-cone bit, assuming that rock cores are not to be collected. If rock cores are to be collected, the bedrock will be cored using NX or HQ core barrels.

Open bedrock monitoring wells may be used if they meet the project objectives. Bedrock monitoring wells may also be constructed with at least a ten foot section of appropriate slot size PVC (or other suitable well screen material) well screen and schedule 40 PVC flush-joint casing (or other suitable riser casing material)to ground surface. The length and slot size of the well screen will be determined by site-specific geologic conditions and the zones from which samples will be taken. The annular space between the bedrock wall and the PVC riser pipe will be backfilled with the appropriately sized clean silica sand to at least 2 feet above the top of the screened interval. A two foot layer of bentonite chips will be placed on top of the filter pack and hydrated. The remaining annular space will be backfilled with a cement/bentonite grout mixture to the ground surface.

Well heads may be completed either above grade, or flush with grade. For above grade completions, the well heads will extend approximately 3-ft above grade and will be fitted with a protective casing with a lockable lid. An approximate 2-ft diameter concrete well pad will be installed around the protective casing. The well pad will be sloped away from the protective casing to shed surface water away from the well head. The well identification will be clearly visible on the inside and outside of the lid of the protective casing.

Well heads in parking lots, roadways, or other areas accessed by vehicular traffic will be completed flush with grade. Flush-mount curb boxes will be fitted over the well head and will be flush to the surrounding grade. The curb box will be set in an approximate 2-ft diameter concrete pad. A locking J-plug will be installed on top of the PVC well.

5.2 MONITORING WELL DEVELOPMENT

Development will be performed by surging and purging the well, as appropriate. Following installation of the wells and prior to collection of ground water samples, each well will be developed to remove the fine material which may have settled within the monitoring wells, to remove introduced drilling fluids, and to provide better hydraulic communication with the surrounding formation. Development will consist of surging the well and removal of five well volumes using either a bailer or pump. Groundwater parameters will be recorded before, during, and after well development. Parameters will include turbidity, pH, temperature, and specific conductance. Well development data will be recorded on a Well Development Log. An example of the Well Development Log is provided in **Appendix 5**.

Water levels will be measured in each well to the nearest 0.01 foot prior to development.

The wells will be developed until turbidity is less than 50 nephlometric turbidity units (NTUs) or until pH, temperature, and specific conductivity stabilize.

Development water will be managed in accordance with **Section 10**.

Following development, wells will be allowed to recover for at least 7 days before groundwater is purged and sampled.

5.3 MONITORING WELL ABANDONMENT

There may be occasions when monitoring wells will require abandonment. For temporary monitoring wells, the approach will be to pull the PVC well materials from the borehole, and backfill the remaining open portion of the borehole with cement/bentonite grout to approximately 0.5 feet below the ground surface. The ground surface will be restored to a similar condition as the surrounding grade (*e.g.* topsoil, asphalt). For permanent overburden and bedrock monitoring wells, depending on the site-specific subsurface geologic conditions and nature of contamination, the abandonment approach will be in accordance with NYSDEC Policy CP-43 – Groundwater Monitoring Well Decommissioning Policy. Details regarding the well abandonment will be documented on the Well Decommissioning Record provided in **Appendix 6**.

6. GROUNDWATER SAMPLING PROCEDURES

Groundwater samples may be collected using various methods depending on specific project objectives. These methods may include hand bailing, pumping, or low-flow purging and sampling.

6.1 GROUNDWATER SAMPLING METHODS

6.1.1 Hand Bailing

- Prior to sampling, the static water level and thickness of any light non-aqueous phase liquid (LNAPL) or dense non-aqueous phase liquid (DNAPL) will be measured to the nearest 0.01 foot from the surveyed well elevation mark on the top of the PVC casing with a decontaminated oil/water interface probe. NAPL thickness will be confirmed using a clear bailer or a weighted string. The measurement will be recorded in the field book.
- Prior to commencing daily sampling activities, the groundwater quality monitoring probes/meters including pH, conductivity, and turbidity will be calibrated in accordance with the manufacturer's instructions. At a minimum, two-point calibrations will be conducted for pH, specific conductivity, and turbidity. Calibration results will be recorded in the field log notebook.
- Lower the bailer to the bottom of the well. Move the bailer up and down to suspend any material that may have settled to the bottom of the well.
- Initiate bailing of the well from the bottom. Pour the groundwater from the bailer into a graduated 5-gallon bucket to measure the volume withdrawn from the well.
- During the removal of successive well volumes, measure the water temperature, pH, specific conductivity, and turbidity with calibrated meters. Record this information on the Standard Groundwater Sampling Log. An example of the Standard Groundwater Sampling Log is provided in **Appendix 7**.
- Commence sample collection once a minimum of three well volumes have been purged and pH, temperature, conductivity, and turbidity have stabilized to within the following criteria:

  - Temperature ±3% of measurement
  - pH ±0.1 pH units
  - Specific conductivity ±3% of measurement
  - Turbidity ±10% of measurement

  If the well is purged dry, sample collection may commence once a sufficient volume of water is present in the well to fill the required sample bottles.
- Keep sample bottles in cooler containing ice with their caps on until they are ready to receive samples. The type of analysis for which a sample is collected determines the type of container, preservative, holding time, and filtering requirement as specified in the QCD. Samples are transferred directly from the bailer to the container. The container should hold any necessary preservative and should be correctly labeled before the sample is transferred to it.
- When ready to fill the bottles, remove them from their transport containers. Prepare them to receive the samples.
- Inspect labels to see that the samples are properly identified.
- Arrange the sampling containers to allow for convenient filling.
- The VOC containers should be filled first with zero headspace, from one bailer, and then securely capped.
- Minimize agitation of the water in the well; begin sampling by lowering the bailer slowly into the well. Lower it only far enough to fill it completely.

- Fill the containers that will undergo analysis for VOCs first. The VOC containers should be filled with zero headspace from one bailer, and then securely capped.
- Fill each sample container in accordance with the QCD or other sampling outline.
- Return each sample bottle to its proper transport container.
- Record the appearance of the groundwater on the Standard Groundwater Sampling Log (**Appendix 7**).
- Samples must not be allowed to freeze.
- Record the date and time.
- Secure the well head.
- Samples for laboratory analysis will be submitted to an approved NYSDOH ELAP-certified laboratory under Chain-of-custody procedures. An example Chain-of-custody is included in **Appendix 2**. The sample containers will be labeled, placed in a laboratory-supplied cooler, with protective packaging (i.e. bubble wrap) and packed on ice (to maintain a temperature of 4˚ C). The cooler will be shipped no later than 48 hours after sample collection. Analyses will be conducted using USEPA methodologies as specified in **Section 12** and the QCD. Samples will be managed in accordance with the QCD.
- Purge water will be managed in accordance with **Section 10**.

6.1.2 Pumping

- Prior to sampling, the static water level and thickness of any light non-aqueous phase liquid (LNAPL) or dense non-aqueous phase liquid (DNAPL) will be measured to the nearest 0.01 foot from the surveyed well elevation mark on the top of the PVC casing with a decontaminated oil/water interface probe. NAPL thickness will be confirmed using a clear bailer or a weighted string. The measurement will be recorded in the field book.
- Prior to commencing sampling activities and daily thereafter, the groundwater quality monitoring probes/meters including pH, conductivity, and turbidity will be calibrated in accordance with the manufacturer's instructions. At a minimum, two-point calibrations will be conducted for pH, conductivity, and turbidity. Calibration results will be recorded in the field log notebook.
- Prepare the pump for operation. Follow the manufacturer's instructions.
- Pump the groundwater into a graduated 5-gallon bucket.
- During the removal of successive well volumes, measure the water temperature, pH, specific conductivity, and turbidity with calibrated meters. Record this information on the Standard Groundwater Sampling Log. An example of the Standard Groundwater Sampling Log is provided in **Appendix 7**.
- Commence sample collection once a minimum of three well volumes have been purged and pH, temperature, conductivity, and turbidity have stabilized to within the following criteria:

  - Temperature ±3% of measurement
  - pH ±0.1 pH units
  - Specific conductivity ±3% of measurement
  - Turbidity ±10% of measurement

  If the well is purged dry, sample collection may commence once a sufficient volume of water is present in the well to fill the required sample bottles.
- Keep sample bottles in cooler containing ice with their caps on until they are ready to receive samples. The type of analysis for which a sample is collected determines the type of container, preservative, holding time, and filtering requirement as specified in the QCD. Samples are transferred directly from the bailer to the

container. The container should hold any necessary preservative and should be correctly labeled before the sample is transferred to it.

- When ready to fill the bottles, remove them from their transport containers. Prepare them to receive the samples.
- Inspect labels to see that the samples are properly identified.
- Arrange the sampling containers to allow for convenient filling.
- Fill the containers that will undergo analysis for VOCs first. The VOC containers should be filled with zero headspace from one bailer, and then securely capped.
- Fill each sample container in accordance with the QCD or other sampling outline.
- Return each sample bottle to its proper transport container.
- Record the appearance of the groundwater on the Standard Groundwater Sampling Log (**Appendix 7**).
- Samples must not be allowed to freeze.
- Record the date and time.
- Secure the well head.
- Samples for laboratory analysis will be submitted to an approved NYSDOH ELAP-certified laboratory under Chain-of-custody procedures. An example Chain-of-custody is included in **Appendix 2**. The sample containers will be labeled, placed in a laboratory-supplied cooler, with protective packaging (i.e. bubble wrap) and packed on ice (to maintain a temperature of 4˚ C). The cooler will be shipped no later than 48 hours after sample collection. Analyses will be conducted using USEPA methodologies as specified in **Section 12** and the QCD. Samples will be managed in accordance with the QCD.
- Samples for laboratory analysis will be submitted to an approved NYSDOH ELAP-certified laboratory under Chain-of-custody procedures. An example Chain-of-custody is included in **Appendix 2**. Analyses will be conducted using USEPA methodologies as specified in **Section 12**. Samples will be managed in accordance with the QCD.
- Purge water will be managed in accordance with **Section 10**.

6.1.3 Low Flow Purging and Sampling

- Equipment will be decontaminated prior to use at each location.
- Prior to sampling, the static water level and thickness of any light non-aqueous phase liquid (LNAPL) or dense non-aqueous phase liquid (DNAPL) will be measured to the nearest 0.01 foot from the surveyed well elevation mark on the top of the PVC casing with a decontaminated oil/water interface probe. NAPL thickness will be confirmed using a clear bailer or a weighted string. The measurement will be recorded in the field book.
- Prior to commencing daily sampling activities, the groundwater quality monitoring probes/meters including pH, conductivity, oxidation-reduction potential (ORP), dissolved oxygen, and turbidity will be calibrated in accordance with the manufacturer's instructions. At a minimum, two-point calibrations will be conducted for pH, conductivity, and turbidity. The dissolved oxygen probe will be checked against a zero-dissolved oxygen solution. In addition, the dissolved oxygen calibration will be corrected for local barometric pressure and elevation. Calibration results will be recorded in the field log notebook.
- The intake of the peristaltic or submersible pump will be positioned in the center of the screened interval and the upper end of the tubing will be connected to the flow through cell. Flow rate shall not exceed 0.5 liters/min (500 ml/min). Initially, a flow rate between 200 ml/min and 500 ml/min will be used. The

drawdown will be monitored using a water level probe and the flow rate will be reduced if the drawdown exceeds 0.3 ft. Efforts should be made to minimize the generation of air bubbles in the sample tubing by either increasing the flow rate as appropriate, or restricting the flow by clamping the tubing

- During purging, pH, specific conductivity, temperature, ORP, dissolved oxygen, and turbidity will be monitored and recorded at time intervals sufficient to evacuate the volume of the flow-through cell. This information along with water level readings to monitor drawdown will be recorded on the Low Flow Groundwater Sampling Log. An example of the Low Flow Groundwater Sampling Log is provided in **Appendix 8**.
- Well sampling will commence after equilibration of water quality parameters. The equilibration guidelines are as follows:

  - Temperature ± 3% of measurement
  - pH ± 0.1 pH units
  - Specific conductivity ± 3% of measurement
  - Redox ±10 mV
  - DO ±10% of measurement
  - Turbidity ± 10% of measurement

  If the water level will not stabilize even at lower flow rates then the well will not be able to be sampled using the low flow method. In this situation, the well will be pumped to dryness and sample collection may commence once a sufficient volume of water is present in the well to fill the required sample bottles.
- Prior to collecting the sample, the flow-through cell will be disconnected from the tubing. Groundwater will be allowed to flow from the tubing into the sample container carefully so as to limit aeration of the sample. If preservative is present in a container, the container will not be overfilled.
- Keep sample bottles in cooler containing ice with their caps on until they are ready to receive samples. The type of analysis for which a sample is collected determines the type of container, preservative, holding time, and filtering requirement as specified in the QCD. Samples are transferred directly from the bailer to the container. The container should hold any necessary preservative and should be correctly labeled before the sample is transferred to it.
- When ready to fill the bottles, remove them from their transport containers. Prepare them to receive the samples.
- Inspect labels to see that the samples are properly identified.
- Arrange the sampling containers to allow for convenient filling.
- Fill the containers that will undergo analysis for VOCs first. The VOC containers should be filled with zero headspace from one bailer, and then securely capped.
- Fill each sample container in accordance with the QCD or other sampling outline.
- Return each sample bottle to its proper transport container.
- Record the appearance of the groundwater on the Low Flow Groundwater Sampling Log (**Appendix 8**).
- Samples must not be allowed to freeze.
- Record the date and time.
- Secure the well head.
- Samples for laboratory analysis will be submitted to an approved NYSDOH ELAP-certified laboratory under Chain-of-custody procedures. An example Chain-of-custody is included in **Appendix 2**. The sample containers will be labeled, placed in a laboratory-supplied cooler, with protective packaging (i.e. bubble

wrap) and packed on ice (to maintain a temperature of <6˚ C). The cooler will be shipped no later than 48 hours after sample collection. Analyses will be conducted using USEPA methodologies as specified in **Section 12** and the QCD. Samples will be managed in accordance with the QCD.

- Purge water will be managed in accordance with **Section 10.**

7. HYDRAULIC CONDUCTIVITY TESTING

Hydraulic conductivity "slug" tests involve observing the recovery of water levels toward an equilibrium level after an initial perturbation. The perturbation may be either a sudden rise or fall in water level. During a falling head slug test, an inert rod of known volume will be quickly introduced into the well to cause a water level rise. Following equilibration of the water level a rising head slug test can be initiated by removing the slug to lower the water level. Procedures and equipment requirements may vary depending on the rate of the water-level recovery.

Select wells will be tested in accordance with the following procedures:

Intial Activities and Setup

- Determine the type of test to be performed based on the following:
  - » If the screened interval of the well straddles the water table, only use a rising head test;
  - » If the screened interval of the well is fully submerged below the water, then a rising and falling head test will be conducted
- Record appropriate data on the Hydraulic Conductivity Test Log. An example of the Hydraulic Conductivity Test Log is provided in **Appendix 9**.
- Measure the static depth to water (only wells which have fully recovered to static level conditions after drilling and development should be tested) and the depth to the bottom of the well to be tested and calculate the length of the water column.
- Clean the downhole equipment (e.g., pressure transducer, associated cable and, if used, the bailer or slug and associated line) following the decontamination procedures provided in **Section 10** before initiating test(s) at each well.
- A solid slug, that will provide a theoretical displacement of approximately 1.4 feet will be used.
- Program the data collection frequency into the data logger/pressure transducer that is suitable for the anticipated permeability of the water-bearing formation. For example, water levels in highly permeable formations will likely recover very quickly, sometimes within tens of seconds. In this case, the data collection interval should small enough to capture the anticipated high rate of recovery. Water levels in low to moderately permeable formations may take tens of minutes to hours to recover. In this case, a variable data collection frequency may be more appropriate where initially data is collected at very small intervals whereas later data collection occurs at larger intervals. This is helpful in reducing the size of the data file and subsequent data manipulation and reduction.

Rising Head Test

- Connect the pressure transducer to the data logger and lower the transducer into the well to a depth that will not interfere with the insertion of the slug but does not exceed the operating range of the transducer.
- Secure the transducer cable such that it does not slip deeper into the well. If the edges of the well casing are sharp, cover them with cloth or duct tape to protect the transducer cable.
- Check the data logger for connectivity and communication with the transducer.
- Monitor the static water level recorded by the transducer for one to two minutes.
- Insert the slug into the well such that the top of the slug is approximately 0.5 feet below the initial static water level.
- Prior to beginning the rising head test, monitor the water level for a period of time to make sure water levels have reached near-static conditions after the slug has been introduced.
- Begin data logging for 5 to 10 seconds before insertion of the slug.

- Quickly create a water level change by removing the slug from the well. Avoid entanglement of the slug and rope with the transducer cable.
- Monitor water level rise both from the data logger and by periodic hand measurements. Record hand measurements on Hydraulic Conductivity Test Log (**Appendix 9**).
- Continue to collect data until water level in the well has reached at least 5% of static, after which the test will be terminated.
- Review the data file and associated data plot to make sure data has been collected in an appropriate manner. The observed initial displacement in the transducer file should be comparable (within 95%) of the anticipated initial displacement based on the slug geometry. If not, the test will be repeated to confirm the data.

Combined Falling Head and Rising Head Test

- Double check data logger settings.
- Begin data logging for 5 to 10 seconds before insertion of the slug.
- Tie a sufficient length of polypropylene rope to the slug.
- Quickly create a water level change by inserting the slug into the well making sure to that the top of the slug has been fully submerged below the static water level, but no more than 1 ft below the static water level to avoid contact with the transducer. Avoid entanglement of the slug and rope with the transducer cable.
- Secure the rope from the slug to the well casing such that the slug will not slip deeper into the well during the test.
- Monitor water level decline both from the data logger and by periodic hand measurements. Record hand measurements on Hydraulic Conductivity Test Log (**Appendix 9**).
- Continue to collect data until water level in the well has recovered to within 5% of static, after which the test will be terminated.
- Review the data file and associated data plot to make sure data has been collected in an appropriate manner.
- Re-program the data logger/pressure transducer for the start of the rising head test.
- Double check data logger settings.
- Begin data logging for 5 to 10 seconds before removal of the slug.
- Quickly create a water level change by removing the slug from the well. Avoid entanglement of the slug and rope with the transducer cable.
- Monitor water level rise both from the data logger and by periodic hand measurements. Record hand measurements on Hydraulic Conductivity Test Log (**Appendix 9**).
- Continue to collect data until water level in the well has recovered to within 5% of static, after which the test will be terminated.
- Review the data file and associated data plot to make sure data has been collected in an appropriate manner. The observed initial displacement in the transducer file should be comparable (within 95%) of the anticipated initial displacement based on the slug geometry. If not, the test will be repeated to confirm the data.

Rising head or combined rising and falling head tests should be repeated at least twice, or ideally three times at each well.

8. SEDIMENT SAMPLING

Procedures for obtaining samples of sediment are described in this section.

8.1 Sediment Sampling Method

- Sediment sampling will be performed by wading if water depths are less than 3 feet. If water depths are greater than 3 feet, alternative measures will be implemented, which may include using a boat or floating platform.
- For each sediment core collected, observations of sediment type will be recorded in the field notebook.
- Sediment samples will be collected from 0-6 inch, 6-12 inch, and 24 inch intervals thereafter until refusal to hand sampling tools is encountered, or sediment is no longer observed in the sample.
- Sediment samples will be collected using push core techniques or a technique that is appropriate for the site-specific sediment type.
- Push core sampling techniques employ manual penetration of sediment using a sampling device that contains a polycarbonate tube to collect the sediment core. The device includes a check valve to allow air to escape during sediment penetration and develops a vacuum to retain the core as it is recovered. It is anticipated that 2.75 or 3-inch diameter polycarbonate tubes will be used.
- A hand auger and/or stainless steel shovel may be used in areas where the coring device will not penetrate (e.g., substrate primarily of rock and cobble).
- Upon retrieval, sediment cores will be processed in the field. Samples will be obtained from the inner portion of the core, avoiding sediment that has contacted the tube or sampling device, when possible.
- Volatile organic compound samples will be obtained first and placed in sample containers without headspace. The remainder of the sample interval will be homogenized in a stainless steel mixing bowl and distributed to the appropriate sample jars. Subsequent depth intervals will be processed in the same manner for each interval collected.
- Reusable equipment will be decontaminated prior to use at each location.

9. SOIL VAPOR SAMPLING PROCEDURE

Temporary soil vapor probes will be installed and samples collected using the procedure outlined below, and pertinent information will be recorded on the Soil Vapor (Canister) Sample Collection Field Form included **Appendix 10**:

9.1 SOIL VAPOR PROBE INSTALLATION

- Record weather information (temperature, barometric pressure, rainfall, wind speed, and wind direction). Record substantial changes to these conditions that may occur during the course of the probe installation. The information may be measured with on-site equipment or obtained from a reliable source of local measurements (e.g., a local airport).
- Install soil vapor probes using a direct-push drill rig (e.g., GeoProbe® or similar) or manually using a slide hammer. Probes will consist of stainless-steel drive points with stainless steel screens attached to food-grade (inert) Teflon® tubing through which the soil vapor sample will be drawn.
- Attach the drive points to a drive rod (stainless-steel tube) and drive the rod to the target depth.
- Withdraw the drive rods from the hole, leaving the drive point and tubing.
- Place filter pack material, such as glass beads or clean silica sand, in the annular space surrounding the tubing directly above the sample point to a height of approximately 1 to 2 foot. The depth of the filter pack material should always be adequate to prevent the bentonite slurry above from going over the drive point and sample inlet screen.
- Place bentonite slurry in the annulus above the filter pack material to provide a seal in the borehole. Ideally, place the bentonite annular seal at least 3 feet thick, although adjustments to this thickness may be required based on site-specific conditions. The entire borehole must be filled to the ground surface with either entirely bentonite or with natural fill between two bentonite seals (one above the filter pack material and one at the ground surface).
- For permanent installations, install flush-mounted protective covers to protect the probe and the tubing.
- Cut the end of the tubing to allow proper closure of the flush-mounted protective cover, but with a sufficient length of tubing exposed at the surface to facilitate connection of sampling equipment.
- Close or cap the sample tubing following installation and following collection of each sample.
- Collecting soil vapor samples will be accomplished by using the following procedure:

9.2 COLLECTION OF SOIL VAPOR SAMPLES

Record weather information (i.e., temperature, barometric pressure, rainfall, wind speed, and wind direction) at the beginning of the sampling event. Also, record substantial changes to these conditions that may have occurred over the past 24 to 48 hours and that do occur during the course of sampling. The information may be measured with on-site equipment or obtained from a reliable source of local measurements (e.g., a local airport).

- Sampling personnel must avoid activities immediately before and during the sampling that may contaminate the sample (e.g., using markers, fueling vehicles).
- Identify sampling locations on a plot plan that also identifies buildings, other landmarks, and potential sources of VOC contamination to both the surface and outdoor air. Record the depth of the probe screen below grade.
- If necessary, connect additional tubing to the tubing extending from the soil vapor probe to allow for connection to sample collection equipment.
- Calculate the volume of air in the probe, tubing (volume = $\pi r^2 h$), including any additional tubing added in the step above and the annular space between the probe and the native material if sand or glass beads were used.

- Connect a vacuum pump or gas-tight syringe (~60 cubic centimeters [cc]) to the sample tubing. At a flow rate of no more than 0.2 liter per minute (lpm), purge air from the tubing until one to three of the above-calculated air volumes are removed.
- During purging, evaluate the potential for ambient air to be introduced in the soil vapor sample through the annulus of the soil vapor probe or tubing connections using a tracer gas such as helium. The procedures for the tracer gas evaluation are described below. Note that the bentonite used in the probe installation should have sufficient time to seal before the samples are collected. The tracer gas evaluation will verify if the seal is sufficient.
- Use an evacuated 6-liter (L) Summa® passivated (or equivalent) stainless-steel canister to collect the soil vapor sample. The canister will be provided by the laboratory, along with a flow controller equipped with an in-line particulate filter and a vacuum gauge. The flow controller will be pre-calibrated by the laboratory for a 4-hour sample collection at a flow rate that does not exceed 0.2 lpm. The canisters will be batch certified as clean by the laboratory.
- Remove the protective brass plug from the canister. Connect the pre-calibrated flow controller to the canister.
- Record the identification numbers for the canister and flow controller. Record the initial canister pressure on the vacuum gauge (check equipment-specific instructions for taking this measurement). A canister with a significantly different pressure than originally recorded by the testing laboratory should not be used for sampling. Record these numbers and values on the Chain-of-custody form for each sample.
- Connect the tubing from the soil vapor probe to the flow controller.
- Completely open the valve on the canister. Record the time that the valve was opened (beginning of sampling) and the canister pressure on the vacuum gauge.
- Photograph the canister and the area surrounding the canister.
- Monitor the vacuum pressure in the canister routinely during sampling.
- Stop sample collection when the canister still has a minimum amount of vacuum remaining. Check with the laboratory supplying the canister and flow controller for the ideal final vacuum pressure. Typically, the minimum vacuum is between 2 and 5 inches of mercury, but not zero. If there is no vacuum remaining, the sample will be rejected and collected again in a new canister.
- Record the final vacuum pressure and close the canister valve. Record the date and time that sample collection was stopped.
- Remove the flow controller from the canister and replace the protective brass plug.
- Attach labels/tags (sample name, time/date of sampling, etc.) to the canister as directed by the laboratory.
- Place the canister and other laboratory-supplied equipment in the packaging provided by the laboratory.
- Enter the information required for each sample on the Chain-of-custody form, making sure to include the identification numbers for the canister and flow controller, and the initial and final canister pressures on the vacuum gauge.
- Include the required copies of the Chain-of-custody form in the shipping packaging, as directed by the laboratory. The field crew will retain a copy of the Chain-of-custody form for the project file.
- Deliver or ship the samples to the laboratory within one business day of sample collection and via overnight delivery (when shipping).

- Provided that no additional sampling is expected to be conducted, either pull out (if practical) or abandon in place the sampling probe. When abandoning, cut the tubing back as far down as practical and cover to surface with native soil.

9.3 TRACER GAS EVALUATION

The tracer gas evaluation provides a means to evaluate the integrity of the soil vapor probe seal and assess the potential for introduction of ambient air into the soil vapor sample. A tracer gas evaluation should be conducted on all soil vapor probes. After the initial round of sampling and with the approval of the regulating agency, the use of tracer gas may be reduced to a minimum of 10 percent for permanent and semi-permanent probes if the initial round results showed installations with competent seals.

The following tracer gas evaluation procedure uses in-field tracer gas measurements and tracer gases (e.g., helium) that can be measured by portable detectors.

- Retain the tracer gas around the sample probe by filling an air-tight chamber (such as a plastic bucket) positioned over the sample location.
- Make sure the chamber is suitably sealed to the ground surface.
- Introduce the tracer gas into the chamber. The chamber will have tubing at the top of the chamber to introduce the tracer gas into the chamber and a valved fitting at the bottom to let the ambient air out while introducing tracer gas. A tracer gas detector will be attached to the valved fitting at the bottom of the chamber to verify the presence of the tracer gas. Close the valve after the chamber has been enriched with tracer gas at concentrations >50%.
- The chamber will have a gas-tight fitting or sealable penetration to allow the soil vapor sample probe tubing to pass through and exit the chamber.
- After the chamber has been filled with tracer gas, attach the sample probe tubing to a pump that will be pre-calibrated to extract soil vapor at a rate of no more than 0.2 liters per minute. Purge the tubing using the pump. Calculate the volume of air in the tubing and probe and purge one to three tubing/probe volumes prior measuring the tracer gas concentration.
- Use the tracer gas detector to measure the tracer gas concentration in the pump exhaust.
- Record the tracer gas concentrations in the chamber and in the soil vapor sample.

If the evaluation indicates a high concentration of tracer gas in the sample (>10% of the concentration of the tracer gas in the chamber), then the surface seal is not sufficient and requires improvement via repair or replacement prior to commencement of the sample collection. A non-detectable level of tracer gas is preferred; however, if the evaluation indicates a low potential for introduction of ambient air into the sample (<10% of the concentration of the tracer gas in the chamber), then proceed with the soil vapor sampling.

10. FIELD EQUIPMENT DECONTAMINATION AND MANAGEMENT OF INVESTIGATION-DERIVED WASTE

10.1 DECONTAMINATION AREA

A temporary decontamination area lined with polyethylene sheeting will be constructed on site for use during decontamination of the drilling equipment, if a suitable decontamination area does not exist at the Facility. Water collected from decontamination activities will be collected in 55-gallon drums and managed as described in **Section 10**.

10.2 EQUIPMENT DECONTAMINATION

The following procedures will be used to decontaminate equipment used during the RI activities.

- Drilling equipment such as augers, bits, rods, tools, split-spoon samplers, and tremie pipes, and backhoe and bucket will be cleaned with a high-pressure, hot water pressure washing unit before beginning work, following the completion of borings and wells, and prior to exiting the site.
- Tools, drill rods, and augers will be placed on polyethylene plastic sheets following pressure washing. Direct contact with the ground will be avoided.
- Augers, rods, and tools will be decontaminated between each drilling location according to the above procedures.
- The back of the drill rig and tools, augers, and rods will be decontaminated at the completion of the work and prior to leaving the site.

10.2.1 Sampling Equipment Decontamination

Prior to sampling, the non-dedicated sampling equipment (e.g., bowls, spoons, interface probes) will be washed with potable water and a phosphate-free detergent. Decontamination may take place at the sampling location as long as all liquids are contained in pails, buckets, etc.

The sampling equipment will then be rinsed with potable water followed by a distilled water rinse. Between rinses, equipment will be placed on polyethylene sheets or aluminum foil, if necessary. At no time will washed equipment be placed directly on the ground.

Equipment will be wrapped in aluminum foil for storage or transportation from the designated decontamination area to the sampling location.

10.3 MANAGEMENT OF INVESTIGATION-DERIVED WASTE

IDW produced during this project include soil, groundwater, decontamination water, personal protective equipment, and dedicated sampling equipment that may be potentially contaminated. Investigation derived wastes will be handled and disposed of in accordance with all applicable state and federal regulations. Disposal options will be evaluated after characterization of the wastes.

The following paragraphs describe procedures to be followed for handling each waste material.

10.3.1 Decontamination Fluids

Hot water pressure wash and decontamination fluids will be collected in 55-gallon drums. The drums will be labeled. The drums will be temporarily staged within the Site boundary as specified by IFR Development LLC.

10.3.2 Drilling Cuttings

Drilling cuttings will be contained in 55-gallon drums. The drums will be labeled. The drums will be temporarily staged within the Site boundary as specified by IFR Development LLC.

10.3.3 Development and Purge Water

Development and purge water will be contained in 55-gallon drums. The drums will be labeled. The drums will be temporarily staged within the Site boundary as specified by IFR Development LLC.

10.3.5 Dedicated Sampling Equipment and Personal Protective Equipment (PPE)

Dedicated sampling equipment (e.g., direct-push sample liners, disposable polyethylene bailer and polypropylene line) and PPE will managed and disposed of as solid waste.

11. FIELD INSTRUMENTS AND CALIBRATION

Field analytical equipment will be calibrated prior to each daily sampling, or more frequently if required. The calibration procedures will conform to manufacturer's standard instructions. Calibration will be conducted in accordance with manufacturer's instructions such that the equipment is functioning within the allowable tolerances established by the manufacturer and required by the project. Instrument calibrations will be documented in the project field book. Records of instrument calibration will be maintained by the Field Team Leader. Copies of the instrument manuals will be maintained on site by the Field Team Leader. All changes to instrumentation will be noted in the field log book.

The following field instruments will be used during the investigation:

- PID with 10.6 eV lamp
- pH probe
- specific conductivity probe
- temperature probe
- ORP probe
- dissolved oxygen probe
- turbidity probe

12. ANALYTICAL PROGRAM

12.1 ENVIRONMENTAL SAMPLE ANALYSES

The laboratory samples for each media and the chemical analyses to be performed, including the quality assurance/quality control (QA/QC) samples are summarized in Table 2 of the RI Work Plan. A more detailed discussion of the analytical methods and procedures is provided in the QCD.

12.2 IDW CHARACTERIZATION

Samples of the IDW generated during the investigation will be collected as needed and characterized for disposal. The objective of the sampling will be to determine if materials generated meet the requirements of the facility that will be receiving the material for disposal. As requested by the facility receiving the waste, analysis may include the following analyses:

- TCLP Zero Headspace Extraction
- TCLP VOC
- TCLP SVOC
- TCLP Metals
- Corrosivity
- Ignitability

12.3 FIELD QUALITY CONTROL SAMPLES

Field quality control samples will be collected and analyzed to document the accuracy and precision of the samples. Field quality control samples will be analyzed for parameters as specified in Table 2 of the RI Work Plan and as specified in the QCD. The quality control samples are described as follows:

- Trip Blank: One trip blank will accompany each shipment of samples for VOC analysis sent to the laboratory. The trip blank will be analyzed to test for any contaminants introduced while samples are being stored or transported to the laboratory. The trip blanks will be analyzed for VOCs only.
- Field Blank: The purpose of the equipment blank is to detect any contamination from sampling equipment, cross-contamination from previously sampled locations, and contamination caused by conditions at sampling locations (e.g., airborne contaminants).
- Field Duplicate: Field duplicates are collected to determine the precision of the soil samples collected. This is achieved by compositing soil and splitting it evenly between separate sample jars. The field duplicate is not identified by the location from which it was collected on the Chain-of-custody but should be identified in a field book for later reference during the validation process.
- Matrix Spike and Matrix Spike Duplicate: These samples are laboratory quality control samples and will be completed as part of the laboratory analytical batch quality control. These samples will be collected in the same manner as the field duplicates. Both the matrix spike and matrix spike duplicate will be collected at the same sample location.

12.4 SAMPLE LOCATION NUMBERING SYSTEM

Each sample that is collected will be designated by a unique sample identification number. The following information will be utilized to identify samples for the RI.

Each sample will be given a unique alphanumeric identifier in accordance with the following classification system:

Table 12-1 Sample Identification Format

Sample Type	Sample Location	Depth Code	QC Identifier	Date
SB – Soil Boring MW- Monitoring Well SED - Sediment AA- Ambient Air SV-Soil Vapor	Number referenced to a sample location map	Depth in feet of sample interval (0-0.5, 2-4, 10-12, etc.)	TB-Trip Blank FD-Field Duplicate EB–Equipment Blank MS-Matrix Spike MSD-Matrix Spike Duplicate	Numeric Date (010111)

Field duplicate samples will be assigned identifiers that do not allow the laboratory to distinguish them as field duplicates. Each sample container will be labeled prior to packing for shipment. The sample identifier, site name, date and time of sampling, and analytical parameters will be written on the label in waterproof ink and recorded in the field book.

12.5 CHAIN-OF-CUSTODY

For aqueous and solid samples, Chain-of-custody records will be kept starting at the time that sample containers are placed in the coolers for transportation to the laboratory. One completed Chain-of-custody record must be kept with each sample cooler at all times.

Example Chain-of-custody forms are provided in **Appendix 2**. The laboratory will provide Chain-of-custody forms with the sample containers.

The following measures will be taken when completing a Chain-of-custody record:

- Chain-of-custody forms will be completed in waterproof, non-erasable ink.
- Chain-of-custody forms will be completed neatly using printed text. If a simple mistake is made, the error will be lined out with a single line and initialed and dated.
- Each separate sample entry will be unique.
- The use of "Ditto" or quotation marks to indicate repetitive information in columnar entries should be avoided. If numerous repetitive entries must be made in the same column, a continuous vertical arrow will be used between the first entry and the next different entry.
- When more than one Chain-of-custody form is used for a single shipment, each form will be consecutively numbered using the "Page ___ of ___" format.
- If necessary, additional instructions will be placed directly onto the Chain-of-custody form.
- Acronyms used on a Chain-of-custody form will be defined.

More detailed information pertaining to completion of the Chain-of-custody form is provided in the QCD.

For air samples, in addition to the Chain-of custody form, the Field Test Data Sheet (FTDS) must be completed for each sample canister and included with the sample shipment. The FTDS is initiated by the laboratory and accompanies the canisters to and from the Site. The form includes the following information:

- Site information
- Canister size, serial number, and flow controller number
- Sampling dates and shipping date
- Sampling information: ambient temperature and barometric pressure, canister pressure, sampling times, and interior temperature (where applicable)
- Laboratory information: flow rates (shipping out from laboratory and received from Site) canister pressure (initial and final)
- Date container shipped out and received back, canister certification number, individual certification number and signature of gas chromatography/mass spectrometry (GC/MS) analyst.

Additional information pertaining to sample Chain-of-custody and shipping requirements are provided in the QCD.

Test Pit Log

TEST PIT LOG

SITE: _____ **JOB #:** _____

OBG FIELD SUPERVISOR: _____ **TEST PIT:** _____

WEATHER: _____ **DATE:** _____

DEPTH (FT)	HNU (ppm)	DESCRIPTION
0		
1		
2		
3		
4		
5		
6		
7		
8		
9		
10		
11		
12		
13		
14		
15		

NOTES:

TEST PIT PLOT PLAN:

Chain of Custody Form

Job No. _____

Sheet No. _____

Office: _____

Address: _____

Phone: _____

CHAIN OF CUSTODY

CLIENT:				COLLECTED BY:		
LOCATION:				(Signature)		
Sample	**Date**	**Time**	**Sample Matrix (1)**	**Sample Type (2)**	**No. of Containers**	**Analysis Requested**

(1) Matrix = water, wastewater, air, sludge, sediment, etc.

(2) Type = grab, composite

Relinquished by: _____	Date	Time	Received b _____	Date	Time
of:			of:		
Use this space if shipped via courier (e.g. Fed. Ex.)			***attached delivery/courier receipt to Chain of Custody**		
Relinquished by: _____	Date	Time	Courier Name: _____	Date	Time
of:			tracking #:		
Relinquished by: _____	Date	Time	Received by: _____	Date	Time
of:			of:		

Notes:

Boring Log

	TEST BORING LOG	REPORT OF BORING
Client: BMS -Syracuse BCP Investigation Proj. Loc: Syracuse, NY File No.:	Drilling Method: Sampler: Hammer: Fall:	Page 1 of Location: Start Date: End Date:
Boring Company: Foreman: OBG Geologist:		Screen = \ Grout Riser Sand Pack Bentonite

Depth Below Grade	No.	Depth (feet)	Blows /6"	Penetr/ Recovery	"N" Value	Sample Description	Stratum Change General Descript	Equip. Installed	Field Testing PID (ppm) 11.7 Lamp	Field Testing Time

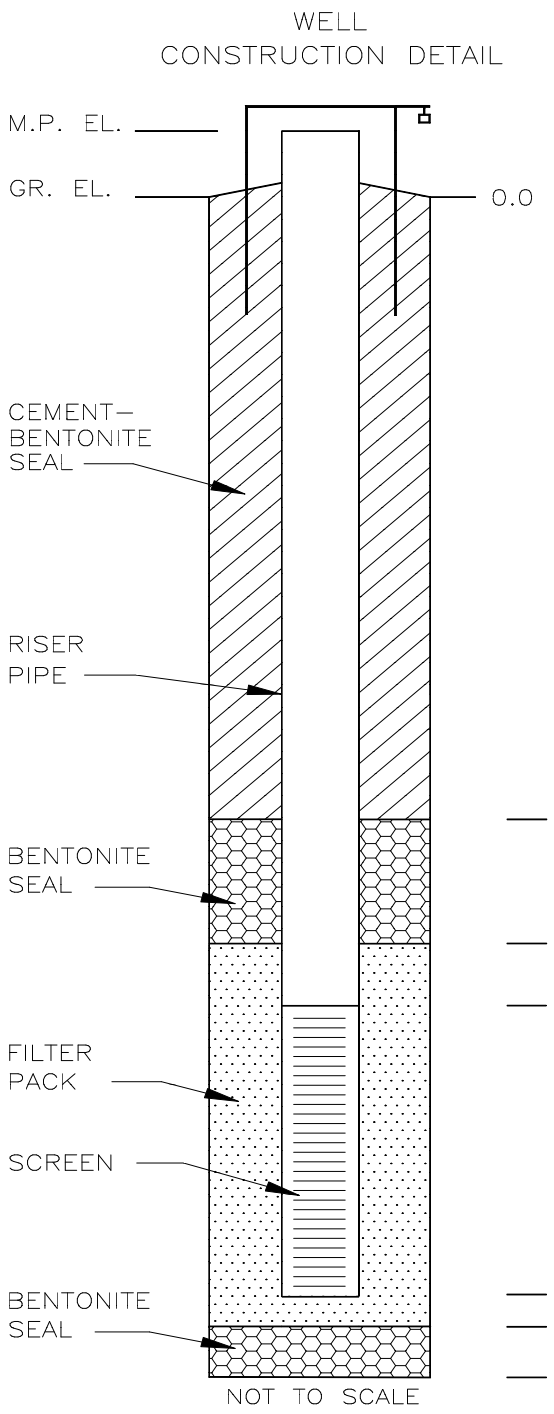
Monitoring Well Completion Log

WELL COMPLETION LOG

Well ID: _____

Project: _____
Location: _____
Project No.: _____

Client: _____
Date Drilled: _____
Date Developed: _____



Inspection Notes:

Inspector: _____
Drilling Contractor: _____
Type of Well: Environmental Monitoring Well

Static Water Level (ft bmp): _____ Date: _____
Measuring Point: Top of PVC
Total Depth of Well (ft bmp): _____

Drilling Method - Overburden:

Type: HSA Diameter: 4 1/4 " ID
Casing: NA

Sampling Method - Overburden:

Type: Split-Spoon Diameter: 2" OD
Weight: 140 # Fall: 30"
Interval: _____

Riser Pipe Left in Place:

Material: Sch 40 PVC Diameter: 2" ID
Length: _____ Joint Type Flush Thread

Screen:

Material: Sch 40 PVC Diameter: 2" ID
Slot Size: _____ Joint Type Flush Thread

Filter Pack:

Type: Sand Grade: _____
Interval: _____

Seal(s):

Type: Cement-Bentonite Interval: _____
Type: Bentonite Pellets Interval: _____
Type: Bentonite Pellets Interval: _____

Locking Casing: [X] Yes [ ] No

Form 002

Monitoring Well Development Log

WELL DEVELOPMENT LOG

Well ID:

Site :

Date _____ Field Personnel _____ Weather _____

Site Name _____ Contractor _____ Project No. _____

Site Location _____ Evacuation Method _____

Well information:

Depth to Bottom (Initial) * _____ ft. Date(s) Installed _____ Date(s) Developed _____

Depth to Bottom (Final)* _____ ft. Well condition _____ Development Time Start: _____

Depth to Water (Initial)* _____ ft. Well Diameter _____ in. Stop: _____

Depth to Water (Final)* _____ ft. Casing Volume _____ gal.

Length of Water Column (LWC) _____ ft. Air Monitoring _____ Development Method _____

1 Well Volume (0.163xLWC) _____ gall. Pump setting* (intake) _____ * Measuring point _____

Well Volumes	Volume of Water Removed (Gallons)	Temperature ^{o}C	pH s.u	Conductivity mS/cm or µS/cm	Turbidity (NTU)	Approximate Flow Rate (gal/min)	Hydrometer	Depth to Water (ft.)
Start								
1								
2								
3								
4								
5								
6								
7								
8								
9								
10								

Development Water Characteristics:

Total volume of Development water removed: _____

Development Water Disposal Method: _____

Physical appearance at start

Color _____

Odor _____

Sheen/Free Product _____

Physical appearance at end

Color _____

Odor _____

Sheen/Free Product _____

NOTES: _____

Geologist Signature: _____

Well Decommissioning Record

FIGURE 3

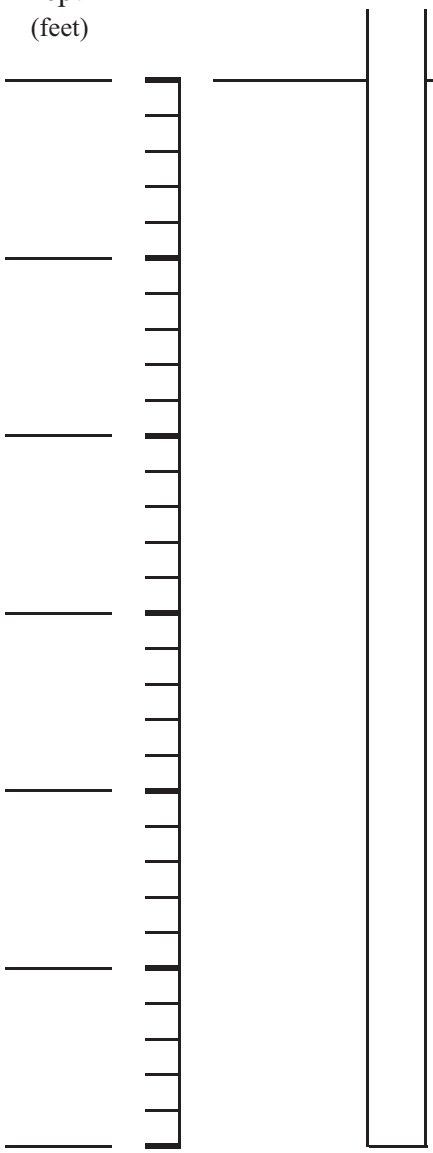
WELL DECOMMISSIONING RECORD

Site Name:	Well I.D.:
Site Location:	Driller:
Drilling Co.:	Inspector:
	Date:

DECOMMISSIONING DATA
(Fill in all that apply)

OVERDRILLING	
Interval Drilled	
Drilling Method(s)	
Borehole Dia. (in.)	
Temporary Casing Installed? (y/n)	
Depth temporary casing installed	
Casing type/dia. (in.)	
Method of installing	
CASING PULLING	
Method employed	
Casing retrieved (feet)	
Casing type/dia. (in)	
CASING PERFORATING	
Equipment used	
Number of perforations/foot	
Size of perforations	
Interval perforated	
GROUTING	
Interval grouted (FBLS)	
# of batches prepared	
For each batch record:	
Quantity of water used (gal.)	
Quantity of cement used (lbs.)	
Cement type	
Quantity of bentonite used (lbs.)	
Quantity of calcium chloride used (lbs.)	
Volume of grout prepared (gal.)	
Volume of grout used (gal.)	

WELL SCHEMATIC*



COMMENTS:

* Sketch in all relevant decommissioning data, including: interval overdrilled, interval grouted, casing left in hole, well stickup, etc.

Drilling Contractor

Department Representative

Standard Groundwater Sampling Log

Standard Ground Water Sampling Log

Date _____
Site Name _____
Location _____
Project No. _____
Personnel _____

Weather _____
Well # _____
Evacuation Method _____
Sampling Method _____

Well Information:

Depth of Well * _____ ft.
Depth to Water * _____ ft.
Length of Water Column _____ ft.
Volume of Water in Well _____ gal.(s)
3X Volume of Water in Well _____ gal.(s)

Water Volume /ft. for:
_____ 2" Diameter Well = 0.163 X LWC
_____ 4" Diameter Well = 0.653 X LWC
_____ 6" Diameter Well = 1.469 X LWC

Volume removed before sampling _____ gal.(s)
Did well go dry? _____

* Measurements taken from _____ Well Casing _____ Protective Casing _____ (Other, Specify) _____

Instrument Calibration:

pH Buffer Readings		Conductivity Standard Readings	
4.0 Standard		84 S Standard	
7.0 Standard		1413 S Standard	
10.0 Standard			

Water parameters:

Gallons Removed	**Temperature Readings**	**pH Readings**	**Conductivity Readings uS/cm**	**Turbidity Readings Ntu**
initial	initial	initial	initial	initial

Water Sample:

Time Collected _____

Physical Appearance at Start		Physical Appearance at Sampling	
Color		Color	
Odor		Odor	
Turbidity (> 100 NTU)		Turbidity (> 100 NTU)	
Sheen/Free Product		Sheen/Free Product	

Samples collected:

Container Size	Container Type	# Collected	Field Filtered	Preservative	Container pH

Notes:

Low Flow Groundwater Sampling Log

Low Flow Ground Water Sampling Log

Date		Personnel		Weather	
Site Name		Evacuation Method		Well #	
Site Location		Sampling Method		Project #	

Well information:

Depth of Well * _____ ft.

Depth to Water * _____ ft.

Length of Water Column _____ ft.

* Measurements taken from

_____ Top of Well Casing

_____ Top of Protective Casing

_____ (Other, Specify)

Start Purge Time: _____

Elapsed Time ( )	Depth To Water ( )	Temperature ( )	pH	Conductivity ( )	Oxidation Reduction Potential	Dissolved Oxygen (mg/l)	Turbidity (NTU)	Flow Rate (ml/min).

End Purge Time: _____

Water sample:

Time collected: _____

Total volume of purged water removed: _____

Physical appearance at start

Color _____

Odor _____

Sheen/Free Product _____

Physical appearance at sampling

Color _____

Odor _____

Sheen/Free Product _____

Analytical Parameters:

Container Size	Container Type	# Collected	Field Filtered	Preservative	Container pH

Hydraulic Conductivity Test Log

	HYDRAULIC CONDUCTIVITY TEST LOG	WELL ID
Site:	**Project #:**	**Page 1 of**
Client:	**Personnel:**	
Project Loc.:	**Weather:**	**Start Date:**
Test Objective:		**End Date:**

Well information	**K-Test Information**	**Transducer Information**
DTW (static):	Screen:	Type:
Well depth:	Interval (ft):	SN #:
Well diameter:	Length (ft):	Model #:
LWC:	Partially submerged*: y / n	PSI Rating:
Measurement Datum: (TOC) (Casing) (Other)	Lithology:	Data Storage ☐ *Laptop* ☐ *PocketPC* ☐ *Other* SN#:
Slug type: ☐ *Solid* Length (ft): Diameter (inches): ☐ *Pneumatic** Disp. (inch H_2O):	Test Method(s) Used: ☐ *Falling Head* ☐ *Rising Head* Head change during test (ft): Falling head: Rising head:	DTW_o WLI (ft bmp): DTW_o Transducer (ft bmp): File Name:
Well condition: Obstructions Siltation	Recovery %: (95% optimal) Falling test Rising test	Time Start: Time End: Recording Interval:

Conversions: 1 inch H2O = 0.03609psi

Acronyms: DTW = Depth to Water; WLI = Water level Indicator; SN = Serial Number; ET = Elapsed Time

Manually collected K-Test data:

Falling Test				Rising Test			
Date/Time	ET	Depth (ft)	ΔH (ft)	Date/Time	ET	Depth (ft)	ΔH (ft)

*If **yes** perform rising head test only.

over →

Manually conducted K-Test:

Falling Test				Rising Test			
Date/Time	ET	Depth (ft)	ΔH (ft)	Date/Time	ET	Depth (ft)	ΔH (ft)

Soil Vapor Sample Collection Field Forms

Soil Vapor (Canister) Sample Collection Field Form

Project # _____ Consultant _____

Project Name _____ Collector _____

Sample ID _____

Start Date/Time _____ Vacuum gauge "zero" ("Hg) _____

End Date/Time _____ Start Pressure ("Hg) _____

Canister ID _____ End Pressure ("Hg) _____

Flow controller ID _____ End pressure > "zero"? _____

Associated ambient air sample ID _____ Sampling duration (intended) _____

Depth of sample point below grade _____

Tubing type used _____ Length of tubing _____ cm Tubing volume _____ cc

Volume purged _____ cc @ _____ min 1 to 3 volumes purged @ < 200cc/min? _____

Chamber tracer gas conc. _____ Tracer gas conc. during purging _____

Weather Conditions during Probe Installation:

Air temperature (^{o}F) _____ Rainfall _____ Wind direction _____

Barometric pressure _____ Wind speed (mph) _____

Substantial changes in weather conditions during sampling or over the past 24 to 48 hrs:

Weather Conditions at Start of Sampling:

Air temperature (^{o}F) _____ Rainfall _____ Wind direction _____

Barometric pressure _____ Wind speed (mph) _____

Substantial changes in weather conditions during sampling or over the past 24 to 48 hrs:

Site Plan showing sample location, buildings, landmarks, potential soil vapor and outdoor air sources, preferential pathways

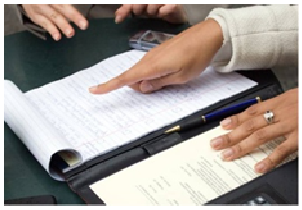
Comments: _____

Quality Control Document

QUALITY CONTROL DOCUMENT







Remedial Investigation
Former Ithaca Gun Factory Site
Ithaca, New York
Site No. C755019

IFR Development LLC

October 2013

O'BRIEN & GERE

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1. INTRODUCTION

This Quality Control Document (QCD) has been developed by O'Brien & Gere on behalf of IFR Development, LLC for the Remedial Investigation (RI) at the Former Ithaca Gun Factory (the Site) located in Ithaca, New York. The RI is being conducted under the New York State Brownfield Cleanup Program (BCP) assigned as BCP Site #C755019. This document is provided as part of the RI Work Plan (O'Brien & Gere. 2013).

The primary objective of the RI activities is to collect soil and ground water samples to further assess the concentration of target constituents at the Site.

This QCD presents the investigation objectives and quality assurance/quality control (QA/QC) activities and associated work efforts associated with sampling and analysis of environmental samples at the Site. The procedures in this QCD are designed to be followed by personnel participating in the field investigation and in the laboratory analyses of environmental samples and the data validation performed on the samples.

2. PROJECT BACKGROUND AND DESCRIPTION

This section presents the project site location, description and brief site history.

2.1 PROJECT BACKGROUND

The Former Ithaca Gun Factory located at 121-125 Lake Street in Ithaca, New York. The Site is 1.63 acres in size and consists of 2 parcels. The eastern parcel formerly included the main manufacturing operations of the Ithaca Gun Factory and the smaller, western parcel contained the former boiler. The original Ithaca Gun Factory property consisted of approximately 2.6 acres. However, approximately 1 acre was granted to the City of Ithaca to be developed as a City park with a public walkway and overlook area for the adjacent Ithaca Falls.

The property formerly belonged to the Ithaca Gun Company that operated as the Ithaca Gun manufacturing plant and test site for approximately one hundred years. The company filed for bankruptcy in 1979. The Site is currently vacant, with primary buildings demolished in 2009, leaving only a small single-story building and Ithaca Gun boiler stack on the western parcel. The current owner, IFR Development LLC, is in the process of designing a multi-tenant residential housing development that will cover most of the Site.

2.2 PROJECT SCOPE

Several investigations and an EPA removal effort have been completed on this Site. In addition the on-site buildings were demolished. The primary objective of this RI is to collect soil and ground water samples to address data gaps for the purpose of identifying impacted areas that need to be addressed as part of the redevelopment program. These data gaps include the identification of lead in shallow soils exceeding 400 parts per million (ppm) and further evaluation of the extent of volatile organic compound (VOC)-impacted groundwater within the underlying bedrock.

Site activities include the following prior to redevelopment:

- Evaluation of lead containing soils on the Eastern Parcel
- Evaluation of lead containing soil on the Western Parcel
- Limited environmental sampling on the Western Parcel
- Evaluation of the extent of the VOC plume within the bedrock on the Site

Sampling locations are presented in the Work Plan.

2.2.1. Laboratory Analysis

The groundwater and soil samples will be submitted to TestAmerica Buffalo (TA Buffalo) of Amherst, New York. the National Environmental Laboratory Accreditation Program/Conference) (NELAP)-certified laboratory (Certification Number 10026) for the analyses listed in **Table 1**.

Groundwater and soil samples collected for the methods listed in **Table 1** will be shipped from the field location to TA Buffalo.

Table 1 presents the analytical methods, sample collection containers and volumes, preservation, holding times and associated quality control sample frequency.

The target analytes are listed in **Table 2-1A, Table 2-1B, Table 2-2A, Table 2-2B, Table 2-3A, Table 2-3B, Table 2-4A and Table 2-4B**.

The QC requirements and corrective actions listed in **Tables 3-1** through **3-4**, which supplement the method requirements, are to be followed by the laboratory.

TA Buffalo will perform the analyses for this project and will be responsible for the quality control of the data reported for this project. Samples will not be shipped to another laboratory without permission of the O'Brien & Gere Project Manager.

TA Buffalo will evaluate non-detected results for groundwater and soils to the method detection limits (MDLs) and report the non-detected results referencing the quantitation limit (QL). The QL concentration is established by the lowest standard in the instrument calibration. For the remaining data, results that are less than the QLs but greater than or equal to the MDLs will be reported using the "J" flag. For example, for a target analyte with a QL of 10 ug/L and an MDL of 2 ug/L, a non-detected result is reported as 10 ug/L "U", indicating that a concentration greater than or equal to the MDL was not detected by the laboratory. A detected concentration of 6 ug/L is reported as 6 "J" and a detected concentration of 23 ug/L is reported without a laboratory flag. The laboratory must include both QLs and MDLs on the sample result sheet reported to the data user.

Where applicable, the QLs and MDLs listed in **Table 2-1A, Table 2-1B, Table 2-2A, Table 2-2B, Table 2-3A, Table 2-3B, Table 2-4A and Table 2-4B**, or the most recent MDLs and QLs, will be reported by the laboratory.

The laboratory will provide sample containers for the investigation, prepared in accordance with method requirements.

Communications with O'Brien & Gere will be documented by the laboratory in the data packages.

The analytical data will be reported in New York State Department of Environmental Conservation (NYSDEC) Analytical Services Protocol (ASP) Category B deliverable format, including the forms described in the NYSDEC guidance, in both hardcopy and electronic data format.

2.2.2. Data Validation

Following completion of investigation activities and receipt of final laboratory data, data validation will be performed in accordance with this QCD applying current NYSDEC Data Usability Summary Report (DUSR) guidance.

2.2.3. Documentation

Laboratory analytical data will be provided in EDD format, in accordance with the laboratory's internal protocol for deliverable requirements for electronic data.

Data will be managed in a relational database management system (DBMS). Laboratory analytical data will be provided in electronic disk deliverable (EDD) format for direct upload into the DBMS. Associated data validation qualifiers will be manually entered into the DBMS.

The RI Report will include the findings of the RI activities at the Site.

Records will be incorporated into the final project files for the samples. The field logs, data packages, and records will be included in the project files, which will be archived by O'Brien & Gere for a period of ten years.

3. DATA QUALITY OBJECTIVES AND CRITERIA

The Data Quality Objective (DQO) Process, as it has been applied to this RI, comprises the following steps, consistent with guidance presented in the United States Environmental Protection Agency (USEPA) Guidance for the Data Quality Objectives Process (EPA QA/G-4), February 2006. The DQO process establishes the acceptance criteria, which serve as the basis for collecting data of sufficient quality and quantity to support the goals of the project activities.

3.1. DQO PROCESS

The process consists of the following seven iterative steps for the DQO process:

1) **Step 1** - State the Problem – Additional investigations are required to evaluate the extent of compounds of concern (COCs) in soil and groundwater to address data gaps at the Site for as part of the redevelopment program.

2) **Step 2** - Identify the Goal of the Study – To collect additional data to evaluate the extent of COCs in soil and groundwater. Site activities include evaluation of lead containing soils on the Eastern Parcel and Western Parcel, environmental sampling on the Western Parcel and evaluation of the extent of the VOC plume within the bedrock on the Site.

3) **Step 3** - Identify information inputs (the data types that will be required before project decisions can be made) - The primary required data types will be analytical results from groundwater and soil results from the Site.

4) **Step 4** -Define the Boundaries of the Study (the spatial and temporal features pertinent for decision making). – The sampling will be completed at the Former Ithaca Gun Factory located at 121-125 Lake Street in Ithaca, New York. The Site is 1.63 acres in size and consists of 2 parcels. The eastern parcel formerly included the main manufacturing operations of the Ithaca Gun Factory and the smaller, western parcel contained the former boiler. The original Ithaca Gun Factory property consisted of approximately 2.6 acres.

5) **Step 5** - Develop the analytic approach (how will the study results be analyzed and conclusions made from the data) - Based on the results of previous investigations, additional RI activities are necessary to fill the data gaps that remain to fully characterize the Site.

6) **Step 6** - Specify performance or acceptance criteria (performance or acceptance criteria that the collected data will need to achieve) - Data must be of known quality relative to its intended purpose. Completeness is the measure of the amount of valid data obtained from a measurement system compared to the amount expected to be obtained under normal conditions. If the completeness objective of 95 percent is not met, additional sampling may be justified.

7) **Step 7** - Develop the plan for obtaining data- The groundwater and soil samples will be collected and analyzed as described in the Work Plan and this QCD.

The following remediation standards are applicable to the RI activities and will be utilized to evaluate data from the sampling events:

For groundwater samples:

- New York State Class GA Ground Water Standards, current as of October 2013.

For soil samples:

- Maximum Concentration of Contaminants for the Toxicity Characteristic concentrations current as of October 2013.
- Unrestricted SCOs indicates 6 NYCRR Part 375 soil cleanup objectives, current as of October 2013.

4. PROJECT ORGANIZATION AND RESPONSIBILITY

O'Brien & Gere will be responsible for project management, sample collection, data validation and data reporting. TA Buffalo of Amherst, New York will perform sample analyses for groundwater and soil. Responsibilities for key project team members are summarized below.

4.1. REGULATORY AGENCY AND CLIENT KEY PERSONNEL

4.1.1. NYSDEC PROJECT MANAGER

Mr. Gary Holmes is the NYSDEC Project Manager for the Site. As such, he will be responsible for reviewing submissions and overseeing project activities on behalf of NYSDEC.

4.1.2. IFR DEVELOPMENT, LLC PROJECT MANAGER

Mr. Frost Travis is the IFR Development, LLC Project Manager for the Site. As such, he will be responsible for reviewing submissions and overseeing project activities.

4.2. O'BRIEN & GERE KEY PERSONNEL

4.2.1. O'Brien & Gere Project Officer

Mr. James R. Heckathore, P.E. is the O'Brien & Gere Project Officer and has overall responsibility for meeting the stated project objectives. In addition, he is responsible for providing the O'Brien & Gere Project Manager with access to O'Brien & Gere corporate resources.

4.2.2. O'Brien & Gere Project Manager

Ms. Deb Wright, C.P.G. is the O'Brien & Gere Project Manager and is responsible for implementing the project and has the authority to commit the resources necessary to meet project objectives and requirements. His primary function is to meet the technical, financial, and scheduling objectives and will provide direction to O'Brien & Gere Project Team.

4.2.3. O'Brien & Gere QA Officer

Ms. Karen Storne is the O'Brien & Gere QA Officer (QAO) for this project. She will manage and be responsible for QA/QC review of data generated during the sample collection activities. Data processing and validation will be overseen and reviewed by the O'Brien & Gere QAO. If QA problems or deficiencies requiring special action are identified, the O'Brien & Gere QAO, Project Manager, and Project Officer will determine the appropriate corrective action. The QAO will then be responsible for follow-up and oversight of corrective action implementation, to the satisfaction of IFR Development and the NYSDEC.

The QAO may perform data validation activities or designate additional data validators to work under her direction. Data validators will be responsible for review of laboratory data for compliance with the project-specific DQOs and for such parameters as precision, accuracy, representativeness, comparability, sensitivity and completeness. Data validators will notify the QAO of any major QA deficiencies.

4.2.4. O'Brien & Gere Field Investigation Manager

The O'Brien & Gere Field Investigation Manager will be responsible for directing and coordinating the day-to-day activities while field activities are underway.

The Field Investigation Manager's responsibilities include:

- Communicate and coordinate with laboratory prior to sample collection and during shipment of sample coolers to the laboratory
- Develop and implement field-related sampling plans and schedule
- Coordinate and manage field staff
- Supervise or act as the field sample custodian
- Implement QC for technical data, including field measurements
- Adhere to work schedules

- Coordinate and oversee technical efforts of subcontractors assisting the field team
- Identify problems at the field team level and resolve difficulties
- Implement and document corrective action procedures

4.2.5. Field Sampling Personnel

O'Brien & Gere field sampling personnel will be responsible for collection, packaging, preservation, and shipping of environmental samples in accordance with the QCD and applicable NYSDEC requirements. Field sampling personnel will also collect field data and monitor Site health and safety.

4.2.6. Health and Safety Coordinator

The O'Brien & Gere Health & Safety Coordinator will be responsible for monitoring Site health and safety during the sampling events.

4.3. LABORATORY MANAGEMENT

TA Buffalo of Amherst, New York will analyze groundwater and soil samples collected during the sampling activities. The laboratory shipping addresses and National Environmental Laboratory Accreditation Conference (NELAC) Certification number is as follows:

TestAmerica Buffalo
10 Hazelwood Drive
Amherst, NY 14228
716.504.9874

NELAC Certification Number: 10026

4.3.1. Laboratory Project Manager

Ms. Melissa Deyo is the Laboratory Project Manager for TA Buffalo. The Laboratory Project Manager will be responsible for:

- Coordinating laboratory analysis for the laboratory.
- Supervising in-house chain-of-custody documents.
- Scheduling sample analysis.
- Overseeing data review.
- Overseeing preparation of analytical reports.

It will be the responsibility of the Laboratory Project Manager to approve final analytical reports prior to submission to O'Brien & Gere.

5. CHAIN-OF-CUSTODY AND SAMPLING HANDLING PROCEDURES

5.1. FIELD AND LABORATORY CUSTODY PROCEDURES

Chain-of-custody procedures will be instituted and followed throughout the investigation. These procedures include field custody, laboratory custody, and evidence files. Samples are physical evidence and will be handled according to strict chain-of-custody protocols. The O'Brien & Gere QAO must be prepared to produce documentation that traces the samples from the field to the laboratory and through analysis. USEPA has defined custody of evidence as follows:

- In actual possession
- In view after being in physical possession
- In a locked laboratory
- In a secure, restricted area.

5.2. SAMPLE CONTAINERS AND FIELD STORAGE

TA Buffalo will supply appropriate sample containers for groundwater and soil samples in coolers as well as preservatives (as presented in **Table 1**). QA measures for these samples will begin with the sample containers; pre-cleaned containers will be purchased from a USEPA-certified manufacturer (I-Chem 200 or equivalent).

Immediately after collection, samples will be transferred to properly labeled sample containers, and properly preserved. **Table 1** lists the proper sample container, sample volumes, preservation, and holding times.

Samples requiring refrigeration for preservation will be promptly transferred to coolers packed with wet ice and/or ice packs. If field storage is required, the samples will be stored in a secured storage facility and a cooler temperature of 4 °C ±2 °C will be maintained.

5.3. FIELD DOCUMENTATION

The field sampler is personally responsible for the care and custody of the sample until transferred.

The field logbook will be used to note information regarding collection of samples and any observations. All entries will be signed and dated. Field logbooks will be waterproof and bound. The logbook will be dedicated to the project and pages will not be removed. Corrections will be made by drawing a single line through the incorrect data and initialing and dating the correction that was made to the side of the error. An initialed diagonal line will be used to indicate the end of an entry or the end of the day's activities.

The following information will be recorded in the field logbook by the field sampling team:

- Name and title of author, date, and time of site entry, and physical/environmental conditions during the field activity;
- Meteorological data;
- Project number, client name, and Site name;
- Name and title of field crew members;
- Sample media;
- Sample collection method, including equipment utilized;
- Number and volume of samples collected;
- Description of sample locations;
- Date and start and end time of sample collection;
- Diagrams of sampling process;

- Sample and QA/QC identification numbers;
- Sample distribution;
- Field observations;
- Field measurements made and equipment used;
- Calculations, results, and calibration data for field sampling and measurements;
- References for maps and photographs of the sample location;
- Bottle lot numbers; and
- Dates and method of sample shipments.

A completed sample identification label or tag that will be sequentially numbered, will be attached to each investigative or QC sample and the sample placed in a shipping container. The identification on the label/tag must be sufficient to enable cross-reference with the logbook. The sample label/tag will be recorded using waterproof, non-erasable ink and will be attached to the sample container using adhesive.

The sample labels/tags will contain the following information:

- Sample location/number identification;
- Site/Project name;
- Date and time of sample collection;
- Designation of the sample as a grab or composite;
- Type of sample matrix;
- Name/initials of the sampler;
- Whether the sample is preserved or unpreserved;
- Space for laboratory sample number (only on the sample tag); and
- General types of analysis to be performed.

5.4. FIELD CUSTODY PROCEDURES AND DOCUMENTATION

For groundwater and soil samples, chain-of-custody records will be kept starting at the time that sample containers are placed in the coolers for transportation to the laboratory. One completed chain-of-custody record must be kept with each sample cooler at all times. Example chain-of-custody forms are provided in the laboratory's Quality Assurance Manual (QAM).

The following measures will be taken when completing a chain-of-custody record:

- Chain-of-custody forms will be completed in waterproof, non-erasable ink.
- Chain-of-custody forms will be completed neatly using printed text. If a simple mistake is made, the error will be lined out with a single line and initialed and dated.
- Each separate sample entry will be sequentially numbered.
- The use of "Ditto" or quotation marks to indicate repetitive information in columnar entries should be avoided. If numerous repetitive entries must be made in the same column, a continuous vertical arrow will be used between the first entry and the next different entry.
- When more than one chain-of-custody form is used for a single shipment, each form will be consecutively numbered using the "Page ___ of ___" format.
- If necessary, additional instructions will be placed directly onto the chain-of-custody form.
- Acronyms used on a chain-of-custody form will be defined.

For groundwater and soil samples, the chain-of-custody form will contain the following information:

- Project identification and number;
- Sample description/location;
- Required analysis;
- Date and time of sample collection;
- Type and matrix of sample;
- Number of sample containers;
- Analysis requested/comments;
- Sampler signature/date/time;
- Date and signature of the field representative;
- Date and signature of the laboratory representative;
- Carrier used to ship coolers; and
- Air bill number (if shipped by a commercial carrier).

In the case that high concentrations are suspected to be present in the samples, a note to that effect will be included on the chain-of-custody form.

Environmental samples will be packed prior to shipment using the following procedures (where applicable):

- Select a sturdy cooler in good repair and clean. Secure and tape the drain plug with fiber or duct tape.
- Be sure the lids on all bottles are tight (will not leak) and baggies are sealed.
- Where applicable, add ice that has been placed in heavy-duty polyethylene bags and properly sealed on top of or between the samples. Pack samples securely to eliminate breakage during shipment with ice packs to maintain the inside temperature at approximately 4 °C ±2 °C.
- Sampling containers will be packed with packing materials. When possible, sample container preparation and packing for shipment will be completed in a well-organized and clean area. Sample containers will be prepared for shipment by wiping containers clean of debris/water using paper towels. Paper towels will be disposed with the personal protective equipment (PPE).
- Place chain-of-custody record into a Ziploc plastic bag, tape the bag to the inner side of the cooler lid, and close the cooler and securely tape (preferably with fiber tape) the top of the cooler shut. Two custody seals will be affixed to the latch and lid of the cooler. The number of the security seal will be recorded on the

chain-of-custody form. The custody seals will consist of adhesive-backed tape that easily rips if it is disturbed. The field sampler will initial and date the seal. The seals must be broken to open the cooler and will indicate tampering if the seal is broken before receipt at the laboratory.

- A label containing the name and address of the shipper will be placed on the outside of the container.

5.5. SAMPLE TRANSPORTATION

The field sampling team will either hand deliver or ship the cooler via an overnight delivery service or contact the laboratory to send a courier for pick up. Prior to shipment of sample coolers, the field sampling team will contact the laboratory to notify the laboratory of the shipment.

Samples will remain in the custody of the sampler until transfer of custody is completed. Transfer consists of:

- Delivery of samples to the Laboratory Sample Custodian; and/or
- Signature of the Laboratory Sample Custodian on the chain-of-custody form as receiving the samples and signature of sampler as relinquishing the samples.

The field sampling team will ship by commercial carrier the coolers containing groundwater and soil samples to TA Buffalo.

The chain-of-custody document will be completed by the field sampler and provided for each sample cooler or box. When transferring the possession of samples, individuals relinquishing and receiving will sign, date, and note the time on the chain-of-custody. Custody of samples must be continuous between parties and time gaps must not be present. Each shipment of samples to the laboratory must have its own chain-of-custody record with the contents of the shipment, method of shipment, name of courier, and other pertinent information written on the record. The original record accompanies the shipment and the copies are kept with the field logbook and distributed to the O'Brien & Gere Project Manager. The laboratory will be notified daily of each sample shipment. Freight bills, postal service receipts, and bills of lading will be retained as permanent documentation.

If a carrier is used to take samples between the sampler and the laboratory, the air bill number must be written on the chain-of-custody.

Groundwater and soil samples will be shipped or transported within 24 hours of being collected and will arrive at the laboratory no later than 48 hours after sample collection.

5.6. LABORATORY CUSTODY PROCEDURES

Laboratory custody procedures continue when the samples are received by the laboratory. When the samples arrive at the laboratory, the Laboratory Sample Custodian will sign the courier's air bill or bill of lading (unless hand-delivered) and will note the cooler temperature on the chain-of-custody form, where applicable. If the cooler temperature is greater than 6 °C, the O'Brien & Gere Project Manager will be notified. If the samples were shipped, the courier's air bill number will be attached to the chain-of-custody and the air bill number will be written on the chain-of-custody form. If the cooler or box arrives at the laboratory after hours, an external chain-of-custody will be properly filled out and will accompany the cooler until the laboratory receives the cooler.

The Laboratory Sample Custodian's duties and responsibilities upon sample receipt will be to:

- Document receipt of samples by signing the record with the date and time of sample receipt.
- Note the cooler temperature on the chain-of-custody form.
- Inspect sample shipping containers for the presence or absence of custody seals (only if shipped via overnight courier) and for container integrity.
- Sign the appropriate forms or documents, verify, and record the agreement or disagreement of information on sample documents and, if there are discrepancies, record the problem and notify the O'Brien & Gere

Project Manager.

- Assign a number for each sample upon receipt. That sample number will be placed on the sample label which will remain attached to the sample container.
- Log sample information into the laboratory sample tracking system.
- Label sample with a unique, sequential laboratory sample number.
- Place samples in the walk-in cooler or sample storage area that is a secure, limited-access storage.

If QC samples have not been properly identified during sample collection, the Laboratory Project Manager will contact the O'Brien & Gere Project Manager to assign QC samples prior to the start of sample analysis.

The laboratory will immediately contact the O'Brien & Gere Project Manager if issues pertaining to sample condition or documentation are detected (e.g., broken security seal; broken, open, or otherwise compromised sample containers; chain-of-custody information in disagreement with sample labels).

5.7. FINAL EVIDENCE FILES

The final evidence file will be the central repository for documents that constitute evidence relevant to sampling and analysis activities as described in this QCD. O'Brien & Gere is the custodian of the evidence file and maintains the contents of evidence files for the Site, including relevant records, reported, logs, field notebooks, pictures, subcontractor reports, and data reviews.

Copies of the laboratory data packages will be stored by the laboratory for incorporation into the sample file. The Laboratory Project Manager will be responsible for laboratory data packages.

Upon completion of the analyses, the O'Brien & Gere Project Manager will begin assimilating the field and laboratory data. In this way, the file for the samples will be generated. The final file for the sample will be stored at O'Brien & Gere and will consist of the following:

- Laboratory data packages, including summary and raw data from the analysis of environmental and QC samples, chromatograms, mass spectra, calibration data, work sheets, and sample preparation log
- Chain-of-custody records
- Data validation reports
- Field notebooks and data
- Field collection report
- Pictures and drawings, if applicable
- Progress and QA reports
- Contractor and subcontractor reports
- Correspondence.

The evidence file must be maintained in a secured, limited access area until submittals for the project have been reviewed and approved, and for a minimum of 10 years past the submittal date of the final report.

6. LABORATORY SAMPLE STORAGE AND HANDLING

At the laboratory, the analysts will be required to log samples and extracts in and out of storage as the analysis proceeds.

There must not be a lapse in the custody for the sample containers and exchanges of custody must be documented on the form. Samples will be returned to secure storage at the close of business. Care must be exercised to properly complete, date, and sign records needed to generate the data package.

Procedures to be followed by the laboratory include:

- Samples will be handled by the minimum number of people possible.
- The laboratory will set aside a secured sample storage area consisting of a clean, dry, refrigerated, isolated room.
- A specific person will be designated sample custodian. Incoming samples will be received by the custodian who will indicate receipt by signing the chain-of-custody form.
- The custodian will ensure that samples which are heat-sensitive, light-sensitive, radioactive, or which require special handling in other ways, are properly stored and maintained prior to analysis.
- The analytical area will be restricted to authorized personnel only.
- After sample analyses are complete, the analytical data will be kept secured and released to authorized personnel only.

7. ANALYTICAL METHODS, TARGET ANALYTES AND REGULATORY CRITERIA

Tables **Table 2-1A, Table 2-1B, Table 2-2A, Table 2-2B, Table 2-3A, Table 2-3B, Table 2-4A and Table 2-4B** present the analytical methods, target analytes, detection limits and regulatory criteria for the sampling activities.

7.1. ANALYTICAL METHODS AND LABORATORY ANALYSIS

To obtain data of a quality sufficient to meet the project DQOs, the following methods will be used for analysis of the sample collected for the RI:

- VOCs and SVOC analyses by gas chromatography/mass spectrometry (GC/MS)
- PCBs by GC
- Metals by inductively coupled plasma (ICP)
- Mercury by cold-vapor atomic absorption
- Total cyanide by colorimetric technique

The laboratory will adhere to the specific analyses and QA/QC requirements in the analytical methods listed in **Table 1** and additional requirements listed in this QCD. The most recent laboratory control limits for accuracy and precision, will be used to evaluate the sample data. In addition, the QC requirements and corrective actions listed in **Tables 3-1 to 3-4**, which augment the method requirements, will be followed by the laboratory.

In the event of an analytical system failure, the Laboratory Project Manager will identify the situation and provide corrective action guidance. The O'Brien & Gere QAO will be notified and the situation will be documented in the data package case narrative.

Matrix interferences will be identified and documented during the analytical process. Samples may be diluted only if analytes of concern generate responses in excess of the linear range of the instrument. MDLs and QLs may only be achieved in an undiluted sample free of matrix interferences or of high concentrations of target analytes. If matrix interferences are encountered or if high concentrations of target compounds are present, established MDLs and QLs may not be achievable without impacting the instrument quality. If the laboratory has taken appropriate actions and matrix interferences prevent the laboratory from achieving the specified detection limits, the O'Brien & Gere QAO will be contacted as soon as the situation is identified. The Laboratory Project Manager will document, in the data package case narrative, how the laboratory demonstrated good analytical practices in order to attempt to achieve the specified reporting detection limits.

Blanks will not be subtracted from target analyte results.

The generated data will be input into the laboratory DBMS.

Complete descriptions of analytical procedures to be used in the laboratory are described in the methods, the QC requirements and corrective actions listed in this QCD and the laboratory SOPs. The laboratory SOPs and QAM are available upon request.

7.2. TARGET ANALYTES AND DETECTION LIMITS

The MDL is defined as the minimum concentration of a substance that can be measured and reported with 99% confidence that the analyte concentration is greater than zero and is determined from analysis of a sample in a given matrix containing the analyte. The QL is the lowest concentration that can be reliably quantified within specified limits of precision and accuracy during routine laboratory operations.

TA Buffalo will evaluate non-detected results for groundwater and soils to the MDLs and report the non-detected results referencing the QL.). The QL concentration is established by the lowest standard in the instrument calibration. For the remaining data, results that are less than the QLs but greater than or equal to the MDLs will be reported using the "J" flag. For example, for a target analyte with a QL of 10 ug/L and an MDL of 2 ug/L, a non-detected result is reported as 10 ug/L "U", indicating that a concentration greater

than or equal to the MDL was not detected by the laboratory. A detected concentration of 6 ug/L is reported as 6 "J" and a detected concentration of 23 ug/L is reported without a laboratory flag. The laboratory must include both QLs and MDLs on the sample result sheet reported to the data user.

The QLs and MDLs listed in Tables **Table 2-1A, Table 2-1B, Table 2-2A, Table 2-2B, Table 2-3A, Table 2-3B, Table 2-4A and Table 2-4B**, or the most recent MDLs and QLs, will be reported by the laboratory on the sample result sheets. Laboratories periodically update the MDL and QL values as part of internal laboratory policy.

The lowest calibration standard will establish the QLs for the target analytes that will be reported by the laboratory.

7.3. REGULATORY CRITERIA

Tables Table 2-1A, Table 2-1B, Table 2-2A, Table 2-2B, Table 2-3A, Table 2-3B, Table 2-4A and Table 2-4B present the applicable regulatory criteria which will be used to evaluate analytical data for the sampling activities. The following remediation standards are applicable to the RI activities and will be utilized to evaluate data from the sampling events:

For groundwater samples:

- New York State Class GA Ground Water Standards, current as of October 2013.

For soil samples:

- Maximum Concentration of Contaminants for the Toxicity Characteristic concentrations current as of October 2013.
- Unrestricted SCOs indicates 6 NYCRR Part 375 soil cleanup objectives, current as of October 2013.

8. QUALITY CONTROL REQUIREMENTS AND MEASUREMENT PERFORMANCE CRITERIA

The overall effectiveness of a QA/QC program depends on operating in the field and laboratory according to a program that systematically ensures the precision and accuracy of analyses by detecting errors and preventing their recurrence or measuring the degree of error inherent in the methods applied.

Quality Assurance is an integrated system of activities involving planning, quality assessment, reporting and quality improvement to ensure that a program meets defined standards of quality with a stated level of confidence. Quality Control involves the technical activities that measure the quality of a program so that it meets the needs of users.

The following sections describe the QC checks that will be utilized in the field and laboratory during this project.

8.1. LABORATORY QA/QC CHECKS

Tables 3-1 to 3-4 summarize the laboratory QC checks, frequency of analysis, control limits, and laboratory corrective actions for the analytical method to be used in this project. A brief description of laboratory QA/QC analyses is presented in the following subsections.

8.1.1. GC/MS Tuning

Tuning and performance criteria are established to verify mass resolution, identification, and to some degree, instrument sensitivity. These criteria are not sample specific; conformance is determined using standard materials. Therefore, these criteria should be met in all circumstances.

8.1.2. Calibration

Compliance requirements for satisfactory instrument calibration are established to verify that the instrument is capable of producing acceptable quantitative data. Initial calibration demonstrates that the instrument is capable of acceptable performance at the beginning of analysis, and continuing calibration and performance checks document satisfactory maintenance and adjustment of the instrument on a day-to-day basis.

8.1.3. Blanks

Several types of blanks will be analyzed by the laboratory. Corrective action procedures will be implemented for blank analyses if target compounds are detected at concentrations greater than the applicable criteria. The criteria for evaluation of blanks apply to any blank associated with a group of samples collected, prepared and/or analyzed at the same time, where applicable. If problems with a blank exist, data associated with the project must be carefully evaluated to determine whether or not there is an inherent variability in the data for the project, or if the problem is an isolated occurrence not affecting other data.

For groundwater and soil samples, a method blank is an analyte-free blank that undergoes the preparation procedures applied to a sample. These samples are analyzed to examine whether sample preparation and analysis techniques result in sample contamination. The laboratory will prepare and analyze a method blank with each group of samples that are extracted, digested, or analyzed at the same time.

Field rinsate blanks are analyzed to assess contamination introduced during field sampling procedures and sample shipment, respectively. Field rinsate blank collection begins with two sets of identical bottles; one set filled with target analyte-free water provided by the laboratory, and one empty set of bottles identical to those provided for aqueous sample collection. At the field location, in an area suspected to be contaminated, the water is passed from the full set of bottles through the dedicated or field decontaminated sampling device(s) and into the empty set of bottles. This will constitute identical bottle to bottle transfer. The field rinsate blank samples will be subject to the same analyses as the environmental samples. One field rinsate blank will be collected during each day of the sampling event or one per 10 samples.

Trip blanks will be prepared as other samples submitted for VOC analysis and will contain analyte-free water or preservative, as appropriate. A trip blank will be prepared by the laboratory, using the same preservation technique as that used to prepare the sample containers, from the same source as the method blank water, and sent to the Site in the cooler with the other sample containers. The trip blank will undergo shipment from the

sampling site to the laboratory in coolers with the environmental samples to be analyzed for VOCs. Trip blanks will be analyzed for VOCs to determine if contamination has taken place during sample handling and/or shipment. Trip blanks will be included in sample coolers at a frequency of either one trip blank per cooler, consistent with O'Brien & Gere's internal policy, or one trip blank per shipment of samples sent to the laboratory for VOCs.

8.1.4. Internal Standards Performance

Internal standards, which are compounds not found in environmental samples, will be spiked into samples, blanks, MS/MSDs, and laboratory control samples (LCSs) at the time of sample preparation. Internal standards must meet retention time and performance criteria specified in the analytical method or the sample will be reanalyzed.

8.1.5. Surrogate Recovery

Accuracy and matrix biases for individual samples are monitored for organic analyses using surrogate additions. Surrogates are compounds similar in nature to the target analytes; the surrogates are spiked into aqueous and solid samples, blanks, and QC samples prior to sample preparation for organic analyses. The evaluation of the results of these surrogate spikes is not necessarily straightforward. The sample itself may produce effects due to such factors as interferences and high concentrations of analytes. Since the effects of the sample matrix are frequently outside the control of the laboratory and may present relatively unique problems, the review and validation of data based on specific sample results is frequently subjective.

8.1.6. Laboratory Control Samples

LCSs are standard solutions that consist of known concentrations of the complete list of target analytes spiked into laboratory analyte-free water or sand. They are prepared or purchased from a certified manufacturer from a source independent from the calibration standards to provide an independent verification of the calibration procedure. These QC samples are then prepared and analyzed following the same procedures employed for environmental sample analysis to assess method accuracy independently of sample matrix effects. The laboratory will prepare and analyze a LCS with each group of samples of similar matrix that are extracted, digested, or analyzed at the same time. For VOC analysis, one LCS will be analyzed with each analytical sequence in a 12-hour period for each matrix. Percent recoveries will be evaluated to assess the efficiency of the preparation and analysis method independent of sample matrix effects.

8.1.7. MS/MSD Samples

MS/MSD data are generated to determine long-term precision and accuracy of the analytical method with respect to sample matrices. Generally, the MS/MSD data alone are not used to evaluate the precision and accuracy for associated organic samples since data may reflect specific matrix effects only present within one sample.

One set of MS/MSD samples will be collected for every 20 environmental samples (minimum frequency of 5%) or one per matrix for less than 20 samples. If less than 20 samples are collected, one MS/MSD set will be collected. Whenever possible, MS/MSD samples will be prepared and analyzed within the same batch as the environmental samples. MS/MSD samples will be spiked at the laboratory with the complete list of target analytes.

8.1.8. Compound Identification and Quantitation

The objective of the qualitative criteria is to minimize the number of erroneous identifications of compounds. An erroneous identification can either be a false positive (reporting a compound present when it is not) or a false negative (not reporting a compound that is present). The identification criteria can be applied much more easily in detecting false positives than false negatives. Negatives, or non-detect compounds on the other hand, represent an absence of data and are therefore much more difficult to assess. The objective for quantitative requirements is to maximize the accuracy of data and sensitivity of the instrument. Unless sample screening indicates the presence of high concentration target analytes, samples will be analyzed undiluted to maximize sensitivity. Samples must be reanalyzed at the appropriate dilution when concentrations exceed the linear

calibration range to maximize accuracy. Matrix interferences will be identified and documented. Samples may be diluted only if analytes of concern generate responses in excess of the linear range of the instrument.

8.2. FIELD QA/QC CHECKS

In order to evaluate data quality, QA/QC samples will be collected during the sampling activities. Table 1 lists the environmental samples and corresponding QC samples to be collected by analysis.

8.2.1. Field Duplicate Samples

Collection of field duplicate samples provides for the evaluation of the laboratory's precision performance by comparing analytical results of two samples from the same location. They are also collected to evaluate field sample collection precision procedures. Samples are collected from one location and sent to the laboratory blind (with two different sample identifications).

Duplicates of solid samples submitted for VOC analysis are obtained from discrete locations without mixing. Duplicates for the remaining analyses require homogenization by filling a decontaminated stainless steel tray or bowl with the sample and mixing it with a decontaminated stainless steel instrument. The mixed sample is divided in half and scooped alternatively from each half to fill the sample container. One field duplicate sample will be collected for every 20 environmental samples (minimum frequency of 5%) or one per matrix for less than 20 samples. If less than 20 samples are collected, one field duplicate sample will be collected.

8.2.2. MS/MSDs

MS/MSD samples are duplicate samples that are collected in the field and have spiking solutions added at the laboratory during sample preparation. MS/MSD samples are considered identical to the original sample. The percent recovery of the spiked amount indicates the accuracy of the extraction as well as interferences caused by the matrix. Relative percent differences (%RPD) between spike sample recoveries or between duplicate samples will indicate the precision of the data. One MS/MSD sample set will be collected for every 20 environmental samples submitted to the laboratory (minimum frequency of 5%) or one MS/MSD for less than 20 samples.

8.2.3. Field Rinsate Blanks

One field rinsate blank, presented in Section 10.1.3, will be collected per 10 samples or once per day, whichever is more conservative.

8.2.4. Trip Blanks

Trip blanks, presented in Section 10.1.3, will be included in sample coolers at a frequency of either one trip blank per cooler, consistent with O'Brien & Gere's internal policy, or one trip blank per shipment of samples sent to the laboratory for VOCs.

8.2.5. Temperature Blanks

Temperature blanks will consist of vials of water that have undergone shipment from the sampling site to the laboratory in coolers with the environmental samples to be analyzed for the sampling program. The temperature of these blanks will be measured at the laboratory upon receipt of the sample cooler to verify compliance with the cooler temperature requirement.

8.3. CORRECTIVE ACTION

Generally, the following corrective actions may be taken by the laboratory. When analytical parameters that are within the control of the laboratory, including calibration, instrument performance, and blank criteria, are not met, the cause of the problem will be located and corrected. The analytical system will then be recalibrated. Sample analysis will not begin until calibration, instrument performance, and blank criteria are met. When matrix spike, standard, or duplicate analyses are out of control, samples analysis will cease. The problem will be investigated. Depending on the results of the overall QC program for the sample set, the data may be accepted, accepted with qualification, or determined to be unusable.

If, through the application of the corrective actions listed in this QCD, the data is determined to be unusable, the QC analysis will be re-prepared and reanalyzed. If QC criteria are met upon reanalysis, only the new results are reported. If QC criteria are still not met upon reanalysis, both sets of sample results will be reported and the O'Brien & Gere QAO will be notified of the situation at the time of sample analysis.

If matrix interferences are suspected, the O'Brien & Gere QAO will be contacted. Unless sample screening indicates the presence of high concentration target analytes, samples may be diluted in the analysis only if analytes of concern generate responses in excess of the linear range of the instrument.

If the laboratory has taken appropriate actions and matrix interferences prevent the laboratory from achieving the specified detection limits, the O'Brien & Gere QAO will be contacted as soon as the situation is identified. The Laboratory Project Manager will document, in the data package case narrative, how the laboratory demonstrated good analytical practices in order to attempt to achieve the specified reporting detection limits.

9. DATA DELIVERABLES

Definitive data will be generated in the laboratory. The laboratory-generated data will be entered into the laboratory DBMS and presented in data packages. The laboratory will perform the data review process, including a minimum of 10 percent check of the data back to raw data in the secondary review by a laboratory supervisor. Validation of the sample data will be performed as described in this QCD.

Laboratory analytical data will be provided in EDD format, in accordance with the laboratory's internal protocol for NYSDEC deliverable requirements for electronic data.

Data will be managed in a relational DBMS. Laboratory analytical data will be provided in electronic disk deliverable format for direct upload into the DBMS.

Records will be incorporated into the final project files. Field logs, data packages, and records will be included in the O'Brien & Gere project file which will be archived for a period of ten years.

The laboratory is responsible for providing an EDD that matches the hardcopy and electronic data package for sample and analysis information. The EDD records must be the same format (i.e., flat file format). Field samples that are not collected from the project site should not be included in the laboratory report or EDD.

The DBMS will be used to provide custom queries and reports to support data validation, data analysis, and report preparation. Data validation qualifiers will be entered into the DBMS by hand. The DBMS will be checked independently to minimize data transmittal error and loss.

Generally, the information flow will include the following steps:

- Samples will be collected in the field and transported to the laboratory.
- Samples will be analyzed at the laboratory and data generated.
- The laboratory data will be sent to the data validator for evaluation and to the Project Manager for preliminary evaluation.
- Qualified data will be sent to data management personnel and entered into the DBMS.
- The final data set from the DBMS will be provided to the Project Manager for data evaluation in terms of project goals.
- Project decisions based on results of the data analysis will be reported to Sunoco.

Records will be incorporated into the final project files for the samples. The field logs, data packages, and records will be included in the project files. The project files will be archived by O'Brien & Gere for a period of ten years.

10. DATA VALIDATION AND USABILITY

Data validation will be performed on the data from the groundwater and soil sampling activities. Data validators from O'Brien & Gere will provide data validation services. USEPA Region II validation guidance and NYSDEC DUSR guidance (NYSDEC, 2010) will be applied as described in the following section.

Upon request by the data validator, the laboratory will provide additional or supplemental information within three working days of the request.

10.1. VALIDATION PROCEDURES

Data Validation is a process of determining the suitability of a measurement system for providing useful analytical data. Data validation is essentially a three-step process in which the analytical data's QA/QC information is first compared to a series of QA/QC criteria. Based on the results of this comparison, the analytical data are then assigned qualifiers, which provide an indication of the data's usability. Finally, an overall evaluation of the data's usability is performed.

Full validation will be performed on the groundwater and soil data generated for this project for each analytical method.

Data will be evaluated during validation using the QA/QC criteria established in the analytical methods, the quality control requirements and corrective actions listed in Tables 3-1 to 3-4 and laboratory established control limits.

Full data validation consists of a review of data summary forms and raw analytical data that are provided in the data packages. During the full validation, data validators will recalculate selected laboratory sample calculations using raw data when verifying sample results. In addition, data validators will review raw data to verify that compound identification was performed correctly and transcription errors are not present.

Utilizing the DUSR process as guidance, the following questions will be considered during the validation:

1. Is the data package complete as defined under the requirements for the most current DEC ASP Category B or USEPA Contract Laboratory Program (CLP) deliverables?
2. Have the holding times been met?
3. Do all the QC data: blanks, instrument tunings, calibration standards, calibration verifications, surrogate recoveries, spike recoveries, duplicate analyses, laboratory controls and sample data fall within the protocol required limits and specifications?
4. Have the data been generated using established and agreed upon analytical protocols?
5. Does an evaluation of the raw data confirm the results provided in the data summary sheets and quality control verification forms?
6. Have the correct data qualifiers been used?
7. Have any exceedances been specifically noted in the report?

The following parameters will be included in the full data validation for organic and inorganic analyses, where applicable for each analysis method, unless otherwise noted:

- QCD compliance
- Chain-of-custody records

- Sample collection and sample preservation
- Percent solids
- Holding times
- GC/MS tuning criteria
- Instrument performance
- Calibration
- Analytical sequence
- Blank analysis
- Surrogate recovery
- MS/MSD analysis
- Laboratory duplicate analysis
- Field duplicate analysis
- LCS analysis
- ICP interference check sample analysis
- ICP serial dilution analysis
- Internal standards performance
- Target analyte identification, quantitation, and QLs
- Confirmation analysis
- Deliverables and documentation completeness

Unless requested, TICs for VOC and SVOC analyses will not be evaluated as part of the validation process

10.2. ASSIGNMENT OF QUALIFIERS

Data affected by excursions from the QA/QC criteria will be qualified using the following USEPA Region II data validation guidance documents or the most current documents and professional judgment.

- USEPA. 2006c. Reviewed 2009. *USEPA Region II Evaluation of Metals Data for the CLP Program, SOP HW-2 Revision 13*. New York, NY.
- USEPA. 2006d. *USEPA Region II Data Validation SOP of PCBs by Gas Chromatography SW-846 Method 8082A, SOP HW-45 Revision 1*. New York, NY.
- USEPA. 2008. Reviewed 2009. *USEPA Region II Validating Volatile Organic Compounds by SW-846 Method 8260B, SOP HW-24 Revision 2*. New York, NY.
- USEPA. 2009. *USEPA Region II Validating Semivolatile Organic Compounds by SW-846 Method 8270, SOP HW-22 Revision 4*. New York, NY.

The application of these validation guidelines will be modified to reflect method and QCD requirements

In accordance with the USEPA guidance and utilizing professional judgment, the following qualifiers will be used in the data validation:

"R" Indicates that the QL or sample result is determined to be unusable due to a major deficiency in the data generation process. The data should not be used for any qualitative or quantitative purposes.

"U" Indicates that the analyte was analyzed for, but a concentration was not detected. The sample QL is reported. This qualifier is also used in the validation process to signify that the detection limit of an analyte was revised due to blank contamination.

"J" Indicates that the concentration should be considered approximate. This qualifier is used when the data validation process identifies a deficiency in the data generation process. This qualifier is also applied by the laboratory when the analyte concentration is greater than the MDL but less than the QL. In the latter case, the identification of the analyte is not in question but the quantitation of the analyte concentration may be uncertain.

"UJ" Indicates that the analyte was analyzed for, but a concentration was not detected. The sample QL is reported and should be considered approximate. This qualifier is used when the data validation process identifies a deficiency in the data generation process.

"JN " Indicates that there is presumptive evidence that the analyte is present, but it has not been confirmed due to confirmation excursions.

The following guidelines will be used regarding the assignment of qualifiers and the evaluation of data. The data quality evaluation results in only one type of qualifier ("U", "J", "UJ," or "R") for each analyte. In a case when several qualifiers are applicable for the same analyte, the cumulative effect of the various QA/QC excursions is employed in assigning the final data qualifiers. For example, the final data qualifier is the "R" qualifier if a sample result is affected by low surrogate recoveries, for which the "UJ" qualifier is applied, but low MS/MSD recoveries result in the rejection of the sample result (application of the "R" qualifier).

10.3. DATA USABILITY EVALUATION

The specific data quality requirements including precision, accuracy, representativeness, comparability, sensitivity, and completeness will be assessed during data validation. Data usability with respect to the DQOs and data uses will be compared to the project requirements. In the event that the completeness objective of 95 percent is not achieved, samples may be recollected at the discretion of the O'Brien & Gere Project Manager.

Based on the QA/QC information review and the qualifiers assigned to the analytical data, an overall evaluation of the data's usability will be performed. Data usability is defined as the percentage of data that remains unqualified or is qualified as approximate or non-detected due to blank contamination, divided by the data reported by the laboratory times 100. The percent usability excludes the data qualified as rejected due to major QA/QC excursions. The non-usable data is defined as the percentage of the data qualified as rejected divided by the data reported by the laboratory times 100. The data usability will be provided for each type of analysis performed.

The data usability evaluation considers the data parameters of precision, sensitivity, accuracy, representativeness, comparability, and completeness which are described as follows:

- Precision is evaluated through the review of field duplicate samples, laboratory duplicates, and MS/MSD samples.
- Sensitivity is evaluated through the review of reported detection limits.
- Accuracy is evaluated through the review of MS/MSD samples, internal standards, surrogate recoveries, LCS recoveries, calibration, and instrument performance checks.
- Representativeness is evaluated through the review of holding times, sample preparation, blank analysis, and target compound identification and quantification.
- Comparability is evaluated through the review of the analytical methods and reporting procedures for consistency.
- Completeness is defined as the overall percentage of sample results that are determined to be usable.

10.4. DATA VALIDATION REPORT

The DUSR will contain separate QA sections in which data quality information collected during the investigation is summarized. The DUSR will include the following:

- Guidelines used to evaluate the data.
- Data qualifiers applied to sample results.
- Summary of samples collected and analyses performed.
- Narrative that identifies major and minor analysis excursions detected for each parameter evaluated for each analysis.
- Additional issues and information that may be beneficial to the data user are discussed.
- Data summary forms.
- Data usability.

The DUSR will be prepared under the direction of the QAO.

11. REFERENCES

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USEPA. 2009. *USEPA Region II Validating Semivolatile Organic Compounds by SW-846 Method 8270, SOP HW-22 Revision 4*. New York, NY.

ITHACA GUN - QUALITY CONTROL DOCUMENT

Table 1. Field Sampling Summary									
Parameter (Method)	**Matrix**	**Sample Containers and Volumes**	**Preservation**	**Holding Times**	**Number of Investigative Samples**	**QC sample frequency**			
						Field Duplicate	**Trip Blank**	**MS/MSD and Spike Duplicate**	**Field Rinsate Blank**
VOCs (USEPA Methods 5030C/5035A/8000C/ 8260C)[2A]	Groundwater	3 - 40-milliliter glass vials with Teflon® lined septum caps	≤6°C HCL to pH≤2 FC Sealed and Headspace Free	Analysis within 14 days from collection for preserved samples. Analysis within 7 days from collection for samples not acid preserved.	TBD	One per 20 samples or one per matrix (for less than 20 samples)	1 each in cooler with VOC samples	One per 20 samples or one per matrix (for less than 20 samples)	One per 10 samples or one per sampling event as required for each matrix
Vinyl chloride, Styrene (USEPA Methods 5030C/5035A/8000C/ 8260C)[2A]	Groundwater	3- 40-milliliter glass vials with Teflon® lined septum caps	≤6°C Unpreserved	Analysis within 7 days from collection for unpreserved samples.	TBD	One per 20 samples or one per matrix (for less than 20 samples)	1 each in cooler with VOC samples	One per 20 samples or one per matrix (for less than 20 samples)	One per 10 samples or one per sampling event as required for each matrix

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Parameter (Method)	**Matrix**	**Sample Containers and Volumes**	**Preservation**	**Holding Times**	**Number of Investigative Samples**	**QC sample frequency**			
						Field Duplicate	**Trip Blank**	**MS/MSD and Spike Duplicate**	**Field Rinsate Blank**
VOCs Low Level (USEPA Methods 5035A/8000C/8260C)[2A]	Soil	Encore sampler used to collect and transport sample in accordance with USEPA Method 5035A.	≤6°C Sealed and Headspace Free	At the laboratory: For Encore sampler: extrude sample to a sealed vial and freeze to -7°C within 48 hours from collection. Analysis must be performed within 14 days from collection. Otherwise, 48 hours from collection to analysis. For TCLP :14 days from collection to extraction. 14 days from extraction to analysis.	TBD	One per 20 samples or one per matrix (for less than 20 samples)	1 each in cooler with VOC samples	One per 20 samples or one per matrix (for less than 20 samples)	One per 10 samples or one per sampling event as required for each matrix

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Table 1. Field Sampling Summary									
Parameter (Method)	**Matrix**	**Sample Containers and Volumes**	**Preservation**	**Holding Times**	**Number of Investigative Samples**	**QC sample frequency**			
						Field Duplicate	**Trip Blank**	**MS/MSD and Spike Duplicate**	**Field Rinsate Blank**
Vinyl chloride, Styrene Low Level **(USEPA Methods 5035A/8000B/8260C)[2A]**	Soil	Encore sampler used to collect and transport sample in accordance with USEPA Method 5035A.	≤6°C Sealed and Headspace Free	At the laboratory: For Encore sampler: extrude sample to a sealed vial and freeze to -7°C within 48 hours from collection. Analysis must be performed within 7 days from collection. Otherwise, 48 hours from collection to analysis.	TBD	One per 20 samples or one per matrix (for less than 20 samples)	1 each in cooler with VOC samples	One per 20 samples or one per matrix (for less than 20 samples)	One per 10 samples or one per sampling event as required for each matrix
VOCs Low Level **(USEPA Methods 5035A/8000C/8260C)[2A]**	Wet Soil	1-40 or 60 milliliter wide-mouth glass vials with Teflon® lined septum caps, for air-tight and headspace free seal.	≤6°C Sealed and Headspace Free	Within 48 hours of collection: De-ionized water added, sample preserved at 4®C. Or sample frozen to -7°C Analysis within 14 days from collection. Otherwise 48 hours from collection to analysis.	TBD	One per 20 samples or one per matrix (for less than 20 samples)	1 each in cooler with VOC samples	One per 20 samples or one per matrix (for less than 20 samples)	One per 10 samples or one per sampling event as required for each matrix

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Table 1. Field Sampling Summary									
Parameter (Method)	**Matrix**	**Sample Containers and Volumes**	**Preservation**	**Holding Times**	**Number of Investigative Samples**	**QC sample frequency**			
						Field Duplicate	**Trip Blank**	**MS/MSD and Spike Duplicate**	**Field Rinsate Blank**
VOCs Medium Level (USEPA Methods 5035A/8000C/8260C)[2A]	Soil	Encore sampler in accordance with USEPA Method 5035A. Or 1-40 milliliter glass vials with Teflon® lined septum caps, for air-tight and headspace free seal in accordance with USEPA Method 5035A. 5 grams sample volume required.	≤6°C Sealed and Headspace Free	At the laboratory within 48 hours of collection: Add methanol solution to 5 grams of sample in accordance with USEPA Method 5035A. 14 days from collection to analysis	TBD	One per 20 samples or one per matrix (for less than 20 samples)	1 each in cooler with VOC samples	One per 20 samples or one per matrix (for less than 20 samples)	One per 10 samples or one per sampling event as required for each matrix
SVOCs (USEPA Methods 3510C/8000C/8270D)[1,2,2A]	Groundwater	2-one liter amber glass container with Teflon® lined screw caps	≤6°C	7 days from collection to extraction; 40 days from extraction to analysis.	TBD	One per 20 samples or one per matrix (for less than 20 samples)	NA	One per 20 samples or one per matrix (for less than 20 samples)	One per 10 samples or one per sampling event as required for each matrix

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Table 1. Field Sampling Summary

Parameter (Method)	Matrix	Sample Containers and Volumes	Preservation	Holding Times	Number of Investigative Samples	QC sample frequency			
						Field Duplicate	Trip Blank	MS/MSD and Spike Duplicate	Field Rinsate Blank
SVOCs (USEPA Methods 3541/3550C/8000C/ 8270D)[2,2B]	Soil	250 milliliter wide mouth glass container with Teflon® lined lid. 100 grams sample volume required	≤6°C	14 days from collection to extraction; 40 days from extraction to analysis. For SPLP: 14 days from collection to extraction, 7 days from extraction to extraction. 40 days from extraction to analysis	TBD	One per 20 samples or one per matrix (for less than 20 samples)	NA	One per 20 samples or one per matrix (for less than 20 samples)	One per 10 samples or one per sampling event as required for each matrix
PCBs (USEPA Methods 8000C/8082A)[2,2B]	Groundwater	2-one liter amber glass containers with Teflon® lined screw caps	≤6°C	None. Project Holding Time: 7 days from collection to extraction; 40 days from extraction to analysis	TBD	One per 20 samples or one per matrix (for less than 20 samples)	NA	One per 20 samples or one per matrix (for less than 20 samples)	One per 10 samples or one per sampling event as required for each matrix
PCBs (USEPA Methods 8000C/8082A)[2,2B]	Soil Boring, Surface Soil	250 milliliter wide mouth glass container with Teflon® lined lid. 100 grams sample volume required	≤6°C	None. Project Holding Time:14 days from collection to extraction; 40 days from extraction to analysis	TBD	One per 20 samples or one per matrix (for less than 20 samples)	NA	One per 20 samples or one per matrix (for less than 20 samples)	One per 10 samples or one per sampling event as required for each matrix

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Table 1. Field Sampling Summary									
Parameter (Method)	**Matrix**	**Sample Containers and Volumes**	**Preservation**	**Holding Times**	**Number of Investigative Samples**	**QC sample frequency**			
						Field Duplicate	**Trip Blank**	**MS/MSD and Spike Duplicate**	**Field Rinsate Blank**
Total Metals **(USEPA Methods 3010A/6010C)[2,2C]**	Groundwater	1-1000 milliliter polyethylene or fluorocarbon (TFE or PFA) container. 500 milliliters sample volume required.	HNO3 to pH<2 ≤6°C	180 days from collection to analysis	TBD	One per 20 samples or one per matrix (for less than 20 samples)	NA	One per 20 samples or one per matrix (for less than 20 samples)	One per 10 samples or one per sampling event as required for each matrix
Total Metals **(USEPA Methods 3050B/6010C)[1,2]**	Soil	4 ounce wide mouth polyethylene or fluorocarbon (TFE or PFA) container. 50 grams sample volume required.	≤6°C	180 days from collection to analysis For SPLP: 180 days from collection to extraction, 180 days from extraction to analysis	TBD	One per 20 samples or one per matrix (for less than 20 samples)	NA	One per 20 samples or one per matrix (for less than 20 samples)	One per 10 samples or one per sampling event as required for each matrix
Mercury **(USEPA Method 7470A)[2B]**	Groundwater	1-1000 milliliter polyethylene or fluorocarbon (TFE or PFA) container. 500 milliliters sample volume required.	≤6°C HNO3 to pH<2	28 days from collection to analysis	TBD	One per 20 samples or one per matrix (for less than 20 samples)	NA	One per 20 samples or one per matrix (for less than 20 samples)	One per 10 samples or one per sampling event as required for each matrix

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Table 1. Field Sampling Summary									
Parameter (Method)	**Matrix**	**Sample Containers and Volumes**	**Preservation**	**Holding Times**	**Number of Investigative Samples**	**QC sample frequency**			
						Field Duplicate	**Trip Blank**	**MS/MSD and Spike Duplicate**	**Field Rinsate Blank**
Mercury (USEPA Method 7471B)[2]	Soil	4 ounce wide mouth polyethylene or fluorocarbon (TFE or PFA) container. 50 grams sample volume required.	≤6°C	28 days from collection to analysis For SPLP: 28 days from collection to extract generation, 28 days from extraction to analysis	TBD	One per 20 samples or one per matrix (for less than 20 samples)	NA	One per 20 samples or one per matrix (for less than 20 samples)	One per 10 samples or one per sampling event as required for each matrix
Total Cyanide (USEPA Method 9012B)[1]	Groundwater	1-1000 milliliter polyethylene or fluorocarbon (TFE or PFA) container. 500 milliliters sample volume required.	<6°C NaOH to pH≥12 OA	14 days from collection to analysis	TBD	One per 20 samples or one per matrix (for less than 20 samples)	NA	One per 20 samples or one per matrix (for less than 20 samples)	One per 10 samples or one per sampling event as required for each matrix
Total Cyanide (USEPA Method 9012B)[1]	Soil	1-1000 milliliter polyethylene or fluorocarbon (TFE or PFA) container. 500 milliliters sample volume required.	<6°C NaOH to pH≥12 OA	14 days from collection to analysis	TBD	One per 20 samples or one per matrix (for less than 20 samples)	NA	One per 20 samples or one per matrix (for less than 20 samples)	One per 10 samples or one per sampling event as required for each matrix
TCLP (USEPA Method 1311)[2C]	Soil	250 milliliter wide mouth glass container with Teflon® lined lid. 100 grams sample volume required	NA	NA	NA	NA	NA	NA	NA

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Table 1. Field Sampling Summary

Parameter (Method)	Matrix	Sample Containers and Volumes	Preservation	Holding Times	Number of Investigative Samples	QC sample frequency			
						Field Duplicate	Trip Blank	MS/MSD and Spike Duplicate	Field Rinsate Blank
Percent Solids (SM20 2540G)[3]	Soil	100 milliliter wide mouth glass container with Teflon® lined lid. 100 grams sample volume required	4°C	NA	NA	NA	NA	NA	NA

NOTES:

MS/MSD indicates matrix spike/matrix spike duplicate sample for organic analyses. Spike duplicate may be performed for inorganic analyses.

Field blank is required at a frequency of one per 10 samples or one per sampling event if less than 10 samples are collected, for each matrix type. Field blank is not required if disposable equipment is used.

VOCs indicate volatile organic compounds.

SVOCs indicates semivolatile organic compounds.

PCBs indicates polychlorinated biphenyls.

TCLP indicates toxicity characteristic leaching procedure.

Method references:

1- USEPA. 2004. ***Test Methods for Evaluating Solid Waste: Physical/Chemical Methods, SW-846, 3rd Edition, Update IIIB*****. Washington D.C.**

2- USEPA. 2007. ***Test Methods for Evaluating Solid Waste: Physical/Chemical Methods, SW-846, 3rd Edition, Update IV.*** **Washington D.C.**

2A- USEPA. 2002-2006. ***SW-846.*** **Washington D.C.**

2B- USEPA. 1995. ***Test Methods for Evaluating Solid Waste: Physical/Chemical Methods, SW-846, Update IIB*****. Washington D.C.**

2C- USEPA. 1992. ***Test Methods for Evaluating Solid Waste: Physical/Chemical Methods, SW-846, Update*** **. Washington D.C.**

3- AWWA, APHA and WEF. 1998. ***Standard Methods for the Examination of Water and Wastewater, 20th Edition*****. Washington, D.C**

Source: O'Brien & Gere

Table 2-1A. Laboratory limits and regulatory limits for VOCs in aqueous samples

Target Analyte	USEPA Method	Laboratory Aqueous QL (ug/L)	Laboratory Aqueous MDL (ug/L)	Laboratory TCLP QL (ug/L)	Laboratory TCLP MDL (ug/L)	Maximum Concentration of Contaminants for the Toxicity Characteristic (ug/L)	New York State Class GA Ground Water Standards (ug/L)
1,1,1-Trichloroethane	8260C	1	0.82	-	0.82	NL	*
1,1,2,2-Tetrachloroethane	8260C	1	0.21	-	0.21	NL	*
1,1,2-Trichloro-1,2,2-trifluoroethane	8260C	1	0.31	-	0.31	NL	*
1,1,2-Trichloroethane	8260C	1	0.23	-	0.23	NL	1.0
1,1-Dichloroethane	8260C	1	0.38	-	0.38	NL	*
1,1-Dichloroethene	8260C	1	0.29	1	0.29	700	*
1,2,3-Trichlorobenzene	8260C	1	0.41	-	0.41	NL	5
1,2,4-Trichlorobenzene	8260C	1	0.41	-	0.41	NL	*
1,2-Dibromo-3-chloropropane	8260C	1	0.39	-	0.39	NL	0.4
1,2-Dibromoethane	8260C	1	0.73	-	0.73	NL	*
1,2-Dichlorobenzene	8260C	1	0.79	-	0.79	NL	3.0
1,2-Dichloroethane	8260C	1	0.21	1	0.21	500	0.6
1,2-Dichloropropane	8260C	1	0.72	-	0.72	NL	1.0
1,3-Dichlorobenzene	8260C	1	0.78	-	0.78	NL	3.0
1,4-Dichlorobenzene	8260C	1	0.84	1	0.84	7,500	3.0
2-Butanone	8260C	10	1.32	10	1.32	200,000	NL
2-Hexanone	8260C	5.0	1.24	-	1.24	NL	NL
4-Methyl-2-pentanone	8260C	5.0	2.1	-	2.1	NL	NL
Acetone	8260C	10	3	-	3	NL	NL
Benzene	8260C	1	0.41	1	0.41	500	1.0
Bromochloromethane	8260C	1	0.87	-	0.87	NL	5.0
Bromodichloromethane	8260C	1	0.39	-	0.39	NL	NL
Bromoform	8260C	1	0.26	-	0.26	NL	NL
Bromomethane	8260C	1	0.69	-	0.69	NL	NL
Carbon disulfide	8260C	1	0.19	-	0.19	NL	NL
Carbon tetrachloride	8260C	1	0.27	1	0.27	500	5.0
Chlorobenzene	8260C	1	0.75	1	0.75	100,000	*
Chloroethane	8260C	1	0.32	-	0.32	NL	*
Chloroform	8260C	1	0.34	1	0.34	6,000	7.0
Chloromethane	8260C	1	0.35	-	0.35	NL	NL
cis-1,2-Dichloroethene	8260C	1	0.81	-	0.81	NL	*
cis-1,3-Dichloropropene	8260C	1	0.36	-	0.36	NL	0.4
Cyclohexane	8260C	1	0.18	-	0.18	NL	NL
Dibromochloromethane	8260C	1	0.32	-	0.32	NL	NL
Dichlorodifluoromethane	8260C	1	0.68	-	0.68	NL	*
Ethylbenzene	8260C	1	0.74	-	0.74	NL	*
Isopropylbenzene	8260C	1	0.79	-	0.79	NL	*
Methyl acetate	8260C	1	0.5	-	0.5	NL	NL
Methyl tert-butyl ether	8260C	1	0.16	-	0.16	NL	NL
Methylcyclohexane	8260C	1	0.16	-	0.16	NL	NL
Methylene chloride	8260C	1	0.44	-	0.44	NL	*
Styrene	8260C	1	0.73	-	0.73	NL	*
Tetrachloroethene	8260C	1	0.36	1	0.36	700	*
Toluene	8260C	1	0.51	-	0.51	NL	*
trans-1,2-Dichloroethene	8260C	1	0.9	-	0.9	NL	*
trans-1,3-Dichloropropene	8260C	1	0.37	-	0.37	NL	0.4
Trichloroethene	8260C	1	0.46	1	0.46	500	*
Trichlorofluoromethane	8260C	1	0.88	-	0.88	NL	*
Vinyl chloride	8260C	1	0.9	1	0.9	200	2.0
Xylene-m,p	8260C	2	0.66	-	0.66	NL	5.0
Xylene-o	8260C	1	0.76	-	0.76	NL	5.0
Xylenes (total)	8260C	2	0.66	-	0.66	NL	*

Notes:

QLs indicates quantitation limits.

MDLs indicate method detection limits.

ug/L indicates microgram per liter.

TCLP indicates toxicity characteristic leachate procedure

NL indicates not listed

MDLs and QLs provided by TA Buffalo, current as of October 2013.

VOC target analyte list source:

USEPA. September 2013. Statement of Work For Organic Superfund Methods, Multi-Media, Multi-Concentration (SOM02.1). Washington, D.C.

Method reference

USEPA. 2006. *Test Methods for Evaluating Solid Waste: Physical/Chemical Methods, SW-846.* Washington D.C.

Regulatory Criteria:

New York State Class GA Ground Water Standards, current as of October 2013.

*The principle organic contaminant standard for ground water of 5 ug/L applies to this compound.

Maximum Concentration of Contaminants for the Toxicity Characteristic concentrations current as of October 2013.

Table 2-1B. Laboratory limits and regulatory limits for VOCs in soil samples

Target Analytes	USEPA Method	Laboratory Low Level Soil QL (ug/kg)	Laboratory Low Level Soil MDL (ug/kg)	Laboratory Medium Level Soil QL (ug/kg)	Laboratory Medium Level Soil MDL (ug/kg)	Un-restricted SCOs (mg/kg)	*Un-restricted SCOs (ug/kg)*
1,1,1-Trichloroethane	8260C	5	0.363	100	27.7	0.68	680
1,1,2,2-Tetrachloroethane	8260C	5	0.811	100	16.24	NL	NL
1,1,2-Trichloro-1,2,2-trifluoroethane	8260C	5	1.14	100	50	NL	NL
1,1,2-Trichloroethane	8260C	5	0.65	100	21	NL	NL
1,1-Dichloroethane	8260C	5	0.61	100	30.9	0.27	270
1,1-Dichloroethene	8260C	5	0.612	100	34.6	0.33	330
1,2,3-Trichlorobenzene	8260C	5	0.531	100	46	NL	NL
1,2,4-Trichlorobenzene	8260C	5	0.304	100	37.9	NL	NL
1,2-Dibromo-3-chloropropane	8260C	5	2.5	100	50	NL	NL
1,2-Dibromoethane	8260C	5	0.642	100	3.8	NL	NL
1,2-Dichlorobenzene	8260C	5	0.391	100	25.5	1.1	1100
1,2-Dichloroethane	8260C	5	0.251	100	40.9	0.02	20
1,2-Dichloropropane	8260C	5	2.5	100	16.2	NL	NL
1,3-Dichlorobenzene	8260C	5	0.257	100	26.7	2.4	2400
1,4-Dichlorobenzene	8260C	5	0.7	100	14	1.8	1800
2-Butanone	8260C	25	1.83	500	297	0.12	120
2-Hexanone	8260C	25	2.5	500	205	NL	NL
4-Methyl-2-pentanone	8260C	25	1.64	500	32	NL	NL
Acetone	8260C	25	4.21	500	411	0.05	50
Benzene	8260C	5	0.245	100	4.8	0.06	60
Bromochloromethane	8260C	5	0.361	100	36.1	NL	NL
Bromodichloromethane	8260C	5	0.67	100	20	NL	NL
Bromoform	8260C	5	2.5	100	50	NL	NL
Bromomethane	8260C	5	0.5	100	22	NL	NL
Carbon disulfide	8260C	5	2.5	100	45.5	NL	NL
Carbon tetrachloride	8260C	5	0.484	100	25.5	0.76	760
Chlorobenzene	8260C	5	0.66	100	13.2	1.1	1100
Chloroethane	8260C	5	1.1	100	20.8	NL	NL
Chloroform	8260C	5	0.309	100	68.6	0.37	370
Chloromethane	8260C	5	0.302	100	23.8	NL	NL
cis-1,2-Dichloroethene	8260C	5	0.64	100	27.6	0.25	250
cis-1,3-Dichloropropene	8260C	5	0.72	100	23.9	NL	NL
Cyclohexane	8260C	5	0.7	100	22.2	NL	NL
Dibromochloromethane	8260C	5	0.64	100	48.4	NL	NL
Dichlorodifluoromethane	8260C	5	0.413	100	43.6	NL	NL
Ethylbenzene	8260C	5	0.345	100	29.1	1	1000
Isopropylbenzene	8260C	5	0.754	100	15	NL	NL
Methyl acetate	8260C	5	0.93	100	47.6	NL	NL
Methyl tert-butyl ether	8260C	5	0.491	100	37.8	0.93	930
Methylcyclohexane	8260C	5	0.76	100	46.8	NL	NL
Methylene chloride	8260C	5	2.3	100	19.8	0.05	50
Styrene	8260C	5	0.25	100	24.1	NL	NL
Tetrachloroethene	8260C	5	0.671	100	13.44	1.3	1300
Toluene	8260C	5	0.378	100	26.8	0.7	700
trans-1,2-Dichloroethene	8260C	5	0.516	100	23.6	0.19	190
trans-1,3-Dichloropropene	8260C	5	2.2	100	4.8	NL	NL
Trichloroethene	8260C	5	1.1	100	27.8	0.47	470
Trichlorofluoromethane	8260C	5	0.473	100	46.9	NL	NL
Vinyl chloride	8260C	5	0.6	100	33.5	0.02	20
Xylene-m,p	8260C	10	0.8	200	55.4	NL	NL
Xylene-o	8260C	5	0.7	100	13	NL	NL
Xylenes (total)	8260C	10	0.8	200	16.8	0.26	260

Notes:

QLs indicates quantitation limits.

MDLs indicate method detection limits.

ug/Kg indicates microgram per killogram.

MDLs and QLs provided by TA Buffalo, current as of October 2013.

NL indicates not listed.

VOC target analyte list source:

USEPA. September 2013. Statement of Work For Organic Superfund Methods, Multi-Media, Multi-Concentration (SOM02.1). Washington, D.C.

Method reference:

1. USEPA. 2006. Test Methods for Evaluating Solid Waste: Physical/Chemical Methods, SW-846. Washington D.C.

Regulatory Criteria:

Unrestricted SCOs indicates 6 NYCRR Part 375 soil cleanup objectives, current as of October 2013.

Table 2-2A. Laboratory limits and regulatory limits for SVOCs in aqueous samples

Target Analytes	USEPA Method	Laboratory Aqueous QL (ug/L)	Laboratory Aqueous MDL (ug/L)	Laboratory TCLP QL (ug/L)	Laboratory TCLP MDL (ug/L)	Maximum Concentration of Contaminants for the Toxicity Characteristic (ug/L)	GWGA (ug/L)
1,1´-Biphenyl	8270D	5	0.653	-	-	NL	*
1,4-Dioxane	8270D	10	1.1	-	-	NL	
1,2,4,5-Tetrachlorobenzene	8270D	5	0.58	-	0.58	NL	5
2,3,4,6-Tetrachlorophenol	8270D	5	0.32	-	0.32	NL	NL
2,4,5-Trichlorophenol	8270D	5	0.48	-	-	NL	NL
2,4,6-Trichlorophenol	8270D	5	0.61	-	-	NL	NL
2,4-Dichlorophenol	8270D	5	0.51	-	-	NL	*
2,4-Dimethylphenol	8270D	5	0.5	-	-	NL	*
2,4-Dinitrophenol	8270D	10	2.22	-	-	NL	*
2,4-Dinitrotoluene	8270D	5	0.4	5	0.4	130	**
2,6-Dinitrotoluene	8270D	5	0.4	-	-	NL	**
2-Chloronaphthalene	8270D	5	0.46	-	-	NL	NL
2-Chlorophenol	8270D	5	0.53	-	-	NL	NL
2-Methylnaphthalene	8270D	5	0.6	-	-	NL	NL
2-Methylphenol	8270D	5	0.4	5	0.4	200,000	NL
2-Nitroaniline	8270D	10	0.4	-	-	NL	**
2-Nitrophenol	8270D	5	0.48	-	-	NL	NL
3 & 4 - Methylphenol	8270D	10	0.36	10	0.36	200,000	??
3,3´-Dichlorobenzidine	8270D	5	0.4	-	-	NL	**
3-Nitroaniline	8270D	10	0.5	-	-	NL	**
4,6-Dinitro-2-methylphenol	8270D	10	2.2	-	-	NL	NL
4-Bromophenyl phenyl ether	8270D	5	0.45	-	-	NL	NL
4-Chloro-3-methylphenol	8270D	5	0.45	-	-	NL	NL
4-Chloroaniline	8270D	5	0.59	-	-	NL	**
4-Chlorophenyl phenyl ether	8270D	5	0.35	-	-	NL	NL
4-Nitroaniline	8270D	10	0.25	-	-	NL	**
4-Nitrophenol	8270D	10	1.52	-	-	NL	NL
Acenaphthene	8270D	5	0.41	-	-	NL	**
Acenaphthylene	8270D	5	0.38	-	-	NL	NL
Acetophenone	8270D	5	0.54	-	-	NL	NL
Anthracene	8270D	5	0.28	-	-	NL	NL
Atrazine	8270D	5	0.46	-	-	NL	7.5
Benzaldehyde	8270D	5	0.27	-	-	NL	NL
Benzo[a]anthracene	8270D	5	0.36	-	-	NL	NL
Benzo[a]pyrene	8270D	5	0.47	-	-	NL	NL
Benzo[b]fluoranthene	8270D	5	0.34	-	-	NL	NL
Benzo[g,h,i]perylene	8270D	5	0.35	-	-	NL	NL
Benzo[k]fluoranthene	8270D	5	0.73	-	-	NL	NL
bis(2-Chloroethoxy)methane	8270D	5	0.35	-	-	NL	**
bis(2-chloroethyl)ether	8270D	5	0.4	-	-	NL	1
bis(2-chloroisopropyl)ether	8270D	5	0.52	-	-	NL	NL
bis(2-Ethylhexyl)phthalate	8270D	5	1.8	-	-	NL	5
Butyl benzyl phthalate	8270D	5	0.42	-	-	NL	NL
Caprolactam	8270D	5	2.2	-	-	NL	NL
Carbazole	8270D	5	0.3	-	-	NL	NL
Chrysene	8270D	5	0.33	-	-	NL	NL
Dibenz[a,h]anthracene	8270D	5	0.42	-	-	NL	NL
Dibenzofuran	8270D	10	0.51	-	-	NL	NL
Diethyl phthalate	8270D	5	0.22	-	-	NL	NL
Dimethyl phthalate	8270D	5	0.36	-	-	NL	NL
Di-n-butyl phthalate	8270D	5	0.31	-	-	NL	NL
Di-n-octyl phthalate	8270D	5	0.47	-	-	NL	NL
Fluoranthene	8270D	5	0.4	-	-	NL	NL
Fluorene	8270D	5	0.36	-	-	NL	NL
Hexachlorobenzene	8270D	5	0.51	5	0.51	130	0.04
Hexachlorobutadiene	8270D	5	0.68	5	0.68	500	0.5
Hexachlorocyclopentadiene	8270D	5	0.59	-	-	NL	**
Hexachloroethane	8270D	5	0.59	5	0.59	3,000	**
Indeno[1,2,3-cd]pyrene	8270D	5	0.47	-	-	NL	NL

Table 2-2A. Laboratory limits and regulatory limits for SVOCs in aqueous samples

Target Analytes	USEPA Method	Laboratory Aqueous QL (ug/L)	Laboratory Aqueous MDL (ug/L)	Laboratory TCLP QL (ug/L)	Laboratory TCLP MDL (ug/L)	Maximum Concentration of Contaminants for the Toxicity Characteristic (ug/L)	GWGA (ug/L)
Isophorone	8270D	5	0.43	-	-	NL	NL
Naphthalene	8270D	5	0.76	-	-	NL	NL
Nitrobenzene	8270D	5	0.29	5	0.29	2,000	0.4
N-Nitroso-di-n-propylamine	8270D	5	0.54	-	-	NL	NL
N-Nitrosodiphenylamine	8270D	5	0.51	-	-	NL	NL
Pentachlorophenol	8270D	10	2.2	10	2.2	100,000	*
Phenanthrene	8270D	5	0.44	-	-	NL	NL
Phenol	8270D	5	0.39	-	-	NL	*
Pyrene	8270D	5	0.34	-	-	NL	50
Pyridine	8270D	25	0.41	25	0.41	5,000	50

Notes:

QLs indicates quantitation limits.
MDLs indicate method detection limits.
ug/L indicates microgram per liter.
MDLs and QLs provided by TA Buffalo and are current as of October 2013.
TCLP indicates toxicity characteristic leachate procedure
NL indicates not listed.

SVOC target analyte list source:

Pyridine and USEPA. September 2013. Statement of Work For Organic Superfund Methods, Multi-Media, Multi-Concentration (SOM02.1). Washington, D.C.

Method reference:

1. USEPA. 2007. *Test Methods for Evaluating Solid Waste: Physical/Chemical Methods, SW-846, 3rd Edition, Update IV.* Washington D.C.

Regulatory Criteria Reference:

Maximum Concentration of Contaminants for the Toxicity Characteristic concentrations, current as of October 2013.
GWGA indicates New York State Class GA Ground Water Standards/Guidance current as of October 2013.
* Included in "Phenolic Compounds" standard of 1 ug/L.
** The priniciple organic contaminant standard for ground water of 5 ug/L applies to this compound.

Table 2-2B. Laboratory limits and regulatory limits for SVOCs in soil samples

SVOC Target Analytes	Method Reference	Laboratory Soil QL (µg/Kg)	Laboratory Soil MDL (µg/Kg)	Unrestricted SCOs (mg/Kg)	Unrestricted SCOs (µg/Kg)
1,1´-Biphenyl	8270D	170	10.51	NL	NL
1,4-Dioxane	8270D	200	37.58	0.1	100
1,2,4,5-Tetrachlorobenzene	8270D	170	15.4	NL	NL
2,3,4,6-Tetrachlorophenol	8270D	170	170	NL	NL
2,4,5-Trichlorophenol	8270D	170	36.81	NL	NL
2,4,6-Trichlorophenol	8270D	170	11.14	NL	NL
2,4-Dichlorophenol	8270D	170	8.85	NL	NL
2,4-Dimethylphenol	8270D	170	45.6	NL	NL
2,4-Dinitrophenol	8270D	330	59.06	NL	NL
2,4-Dinitrotoluene	8270D	170	26.13	NL	NL
2,6-Dinitrotoluene	8270D	170	41.3	NL	NL
2-Chloronaphthalene	8270D	170	11.33	NL	NL
2-Chlorophenol	8270D	170	8.59	NL	NL
2-Methylnaphthalene	8270D	170	2.04	NL	NL
2-Methylphenol	8270D	170	5.19	NL	NL
2-Nitroaniline	8270D	330	54.15	NL	NL
2-Nitrophenol	8270D	170	7.72	NL	NL
3,3´-Dichlorobenzidine	8270D	170	148	NL	NL
3 & 4 -Methylphenol	8270D	330	9.4	0.33	330
3-Nitroaniline	8270D	330	38.81	NL	NL
4,6-Dinitro-2-methylphenol	8270D	330	58.29	NL	NL
4-Bromophenyl phenyl ether	8270D	170	53.71	NL	NL
4-Chloro-3-methylphenol	8270D	170	6.94	NL	NL
4-Chloroaniline	8270D	170	49.55	NL	NL
4-Chlorophenyl phenyl ether	8270D	170	3.6	NL	NL
4-Nitroaniline	8270D	330	18.86	NL	NL
4-Nitrophenol	8270D	330	40.92	NL	NL
Acenaphthene	8270D	170	1.98	20	20,000
Acenaphthylene	8270D	170	1.38	100	100,000
Acetophenone	8270D	170	8.66	NL	NL
Anthracene	8270D	170	4.32	100	100,000
Atrazine	8270D	170	7.51	NL	NL
Benzaldehyde	8270D	170	18.51	NL	NL
Benzo[a]anthracene	8270D	170	2.91	1	1,000
Benzo[a]pyrene	8270D	170	4.07	1	1,000
Benzo[b]fluoranthene	8270D	170	3.28	1	1,000
Benzo[g,h,i]perylene	8270D	170	2.03	100	100,000
Benzo[k]fluoranthene	8270D	170	1.86	0.8	800
bis(2-Chloroethoxy)methane	8270D	170	9.18	NL	NL
bis(2-chloroethyl)ether	8270D	170	14.57	NL	NL
bis(2-chloroisopropyl)ether	8270D	170	17.64	NL	NL
bis(2-Ethylhexyl)phthalate	8270D	170	54.39	NL	NL
Butyl benzyl phthalate	8270D	170	45.33	NL	NL
Caprolactam	8270D	170	73.02	NL	NL
Carbazole	8270D	170	1.95	NL	NL
Chrysene	8270D	170	1.69	1	1,000
Dibenz[a,h]anthracene	8270D	170	1.99	0.33	330
Dibenzofuran	8270D	170	1.76	NL	NL
Diethyl phthalate	8270D	170	5.1	NL	NL
Dimethyl phthalate	8270D	170	4.4	NL	NL
Di-n-butyl phthalate	8270D	170	58.35	NL	NL
Di-n-octyl phthalate	8270D	170	3.95	NL	NL
Fluoranthene	8270D	170	2.45	100	100,000
Fluorene	8270D	170	3.89	30	30,000
Hexachlorobenzene	8270D	170	8.39	NL	NL
Hexachlorobutadiene	8270D	170	8.64	NL	NL
Hexachlorocyclopentadiene	8270D	170	51.04	NL	NL
Hexachloroethane	8270D	170	13.06	NL	NL
Indeno[1,2,3-cd]pyrene	8270D	170	4.67	0.5	500
Isophorone	8270D	170	8.44	NL	NL

Table 2-2B. Laboratory limits and regulatory limits for SVOCs in soil samples

SVOC Target Analytes	Method Reference	Laboratory Soil QL (µg/Kg)	Laboratory Soil MDL (µg/Kg)	Unrestricted SCOs (mg/Kg)	Unrestricted SCOs (µg/Kg)
Naphthalene	8270D	170	2.81	12	12,000
Nitrobenzene	8270D	170	7.48	NL	NL
N-Nitroso-di-n-propylamine	8270D	170	13.37	NL	NL
N-Nitrosodiphenylamine	8270D	170	9.23	NL	NL
Pentachlorophenol	8270D	330	57.9	0.8	800
Phenanthrene	8270D	170	3.54	100	100,000
Phenol	8270D	170	17.77	0.33	330
Pyrene	8270D	170	1.09	100	100,000
Pyridine	8270D	330	94.99	NL	NL

Notes:
SVOC indicates semivolatile organic compound.
QLs indicates quantitation limits.
MDLs indicate method detection limits.
mg/kg indicates milligrams per kilogram.
MDLs and QLs provided by TA Buffalo, current as of October 2013.
NL indicates not listed.

SVOC target analyte list source:
USEPA. September 2013. Statement of Work For Organic Superfund Methods, Multi-Media, Multi-Concentration (SOM02.1).

Method reference:
1. USEPA. 2007. Test Methods for Evaluating Solid Waste: Physical/Chemical Methods, SW-846, 3rd Edition, Update IV. Washington D.C.

Regulatory Criteria References:
SCOs indicates 6 NYCRR Part 375 soil cleanup objectives current as of October 2013.

Table 2-3A. Laboratory limits and regulatory limits for PCBs in aqueous samples

PCB Target Analytes	USEPA Method	Method Reference	Laboratory Aqueous QL (ug/L)	Laboratory Aqueous MDL (ug/L)	GWGA (ug/L)
Aroclor 1016	8082A	1	0.06	0.038	0.09
Aroclor 1221	8082A	1	0.06	0.038	0.09
Aroclor 1232	8082A	1	0.06	0.038	0.09
Aroclor 1242	8082A	1	0.06	0.038	0.09
Aroclor 1248	8082A	1	0.06	0.038	0.09
Aroclor 1254	8082A	1	0.06	0.038	0.09
Aroclor 1260	8082A	1	0.06	0.038	0.09
Aroclor 1262	8082A	1	0.06	0.038	0.09
Aroclor 1268	8082A	1	0.06	0.038	0.09

Notes:
QLs indicates quantitation limits.
MDLs indicate method detection limits.
ug/L indicates micrograms per liter.
MDLs and QLs provided by TA Buffalo, current as of October 2013.

PCB target analyte list source:
USEPA. September 2013. Statement of Work For Organic Superfund Methods, Multi-Media, Multi-Concentration (SOM02.1). Washington, D.C.

Method Reference:

1. USEPA. 2007. Test Methods for Evaluating Solid Waste: Physical/Chemical Methods, SW-846, 3rd Edition, Update IV. Washington D.C.

Regulatory Criteria:
GWGA indicates New York State Class GA Ground Water Standards current as of October 2013.

Table 2-3B. Laboratory limits and regulatory limits for PCBs in soil samples

PCB Target Analytes	USEPA Method	Method Reference	Laboratory Soil QL (ug/kg)	Laboratory Soil MDL (ug/kg)	Unrestricted SCOs (mg/kg)	Unrestricted SCOs (ug/kg)
Aroclor 1016	8082A	1	16.7	3.26	0.1	100
Aroclor 1221	8082A	1	16.7	3.26	0.1	100
Aroclor 1232	8082A	1	16.7	3.26	0.1	100
Aroclor 1242	8082A	1	16.7	3.26	0.1	100
Aroclor 1248	8082A	1	16.7	3.26	0.1	100
Aroclor 1254	8082A	1	16.7	7.82	0.1	100
Aroclor 1260	8082A	1	16.7	7.82	0.1	100
Aroclor 1262	8082A	1	16.7	7.82	0.1	100
Aroclor 1268	8082A	1	16.7	7.82	0.1	100

Notes:
PCBs indicates polychlorinated biphenyls.
QLs indicates quantitation limits.
MDLs indicate method detection limits.
mg/Kg indicates milligram per kilogram.
ug/Kg indicates microgram per kilogram.
MDLs and QLs provided by TA Buffalo, current as of October 2013.

PCB target analyte list source:

USEPA. September 2013. Statement of Work For Organic Superfund Methods, Multi-Media, Multi-Concentration (SOM02.1). Washington, D.C.

Method Reference:

1. USEPA. 2007. Test Methods for Evaluating Solid Waste: Physical/Chemical Methods, SW-846, 3rd Edition, Update IV. Washington D.C.

Regulatory Criteria:

SCOs indicates 6 NYCRR Part 375 soil cleanup objectives current as of October 2013.

Table 2-4A. Laboratory limits and regulatory limits for metals and other inorganics in aqueous samples

Target Analytes	Method	Method Reference	Laboratory Aqueous QL (ug/L)	Laboratory Aqueous MDL (ug/L)	Laboratory TCLP QL (ug/L)	Laboratory TCLP MDL (ug/L)	Maximum Concentration of Contaminants for the Toxicity Characteristic (ug/L)	GWGA (ug/L)
Aluminum	6010C	1	200.0	60.00	200.0	60.00	5,000	NL
Antimony	6010C	1	20.0	6.80	20.0	6.80	NL	3
Arsenic	6010C	1	10.0	5.60	10.0	5.60	NL	25
Barium	6010C	1	2.0	0.70	2.0	0.70	100,000	1,000
Beryllium	6010C	1	2.0	0.30	2.0	0.30	NL	NL
Cadmium	6010C	1	1.0	0.50	1.0	0.50	1,000	5
Calcium	6010C	1	500	100.0	500	100.0	NL	NL
Chromium	6010C	1	4.0	1.00	4.0	1.00	5,000	50
Cobalt	6010C	1	4.0	0.60	4.0	0.60	NL	NL
Copper	6010C	1	10.0	1.60	10.0	1.60	NL	200
Iron	6010C	1	50.0	19.30	50.0	19.30	NL	300
Lead	6010C	1	5.0	3.00	5.0	3.00	5,000	25
Magnesium	6010C	1	200	43.4	200	43.4	NL	NL
Manganese	6010C	1	3.0	0.40	3.0	0.40	NL	300
Mercury	7470A	2A	0.200	0.12	0.200	0.12	200	0.7
Nickel	6010C	1	10.0	1.26	10.0	1.26	NL	100
Potassium	6010C	1	500	100.00	500	100.00	NL	NL
Selenium	6010C	1	15.0	8.70	15.0	8.70	1,000	10
Silver	6010C	1	3.0	1.70	3.0	1.70	5,000	50
Sodium	6010C	1	1000	324.0	1000	324.0	NL	20,000
Thallium	6010C	1	20.0	10.20	20.0	10.20	NL	NL
Vanadium	6010C	1	5.0	1.50	5.0	1.50	NL	NL
Zinc	6010C	1	10.0	1.50	10.0	1.50	NL	NL
Other Analytes								
Total Cyanide	9012B	2	NP	NP	10.0	5	NL	200

Notes:

QLs indicates quantitation limits.
MDLs indicate method detection limits.
ug/L indicates micrograms per liter.
MDLs and QLs provided by TA Buffalo, current as of October 2013.
NL indicates not listed
TCLP indicates toxicity characteristic leachate procedure

Target analyte source List:

Metals- Target analyte list (TAL) resource - USEPA. 2007. Multi-Media, Multi-Concentration Inorganic Analytical Service for Superfund (ILM05.4). Washington, D.C.

Method references:

1. USEPA. 2007. Test Methods for Evaluating Solid Waste: Physical/Chemical Methods, SW-846, 3rd Edition, Update IV. Washington D.C.
2. USEPA. 2004. Test Methods for Evaluating Solid Waste: Physical/Chemical Methods, SW-846, 3rd Edition, Update IIIB. Washington D.C.
2A- USEPA. 1995. Test Methods for Evaluating Solid Waste: Physical/Chemical Methods, SW-846, Update IIB. Washington D.C.

Regulatory Criteria:

GWGA indicates New York State Class GA Ground Water Standards current as of April 2008

Table 2-4B. Laboratory limits and regulatory limits for metals and other inorganics in soil samples

Target Analytes	USEPA Method	Method Reference	Laboratory Soil QL (mg/Kg)	Laboratory Soil MDL (mg/Kg)	Unrestricted SCOs (mg/Kg)
Aluminum	6010C	1	10.0	4.4	NL
Antimony	6010C	1	15.0	0.4	NL
Arsenic	6010C	1	2.0	0.4	13
Barium	6010C	1	0.5	0.11	350
Beryllium	6010C	1	0.2	0.028	7.2
Cadmium	6010C	1	0.2	0.03	2.5
Calcium	6010C	1	50.0	3.3	NL
Chromium	6010C	1	0.5	0.2	30
Cobalt	6010C	1	0.5	0.05	NL
Copper	6010C	1	1.0	0.21	50
Iron	6010C	1	10.0	1.1	NL
Lead	6010C	1	1.0	0.24	63
Magnesium	6010C	1	20.0	0.927	NL
Manganese	6010C	1	0.2	0.032	1,600
Mercury	7471B	2	0.02	0.0081	0.18
Nickel	6010C	1	5.0	0.23	30
Potassium	6010C	1	30.0	20	NL
Selenium	6010C	1	4.0	0.4	3.9
Silver	6010C	1	0.5	0.2	2
Sodium	6010C	1	140.0	13	NL
Thallium	6010C	1	6.0	0.3	NL
Vanadium	6010C	1	0.5	0.11	NL
Zinc	6010C	1	2.0	0.153	109
Other Analytes					
Total Cyanide	9012B	2	1.0	0.48	27

Notes:

QLs indicates quantitation limits.

MDLs indicate method detection limits.

mg/Kg indicates milligram per kilogram.

MDLs and QLs provided by TA Buffalo, current as of October 2013.

Target analyte source List:

Metals- Target analyte list (TAL) resource - USEPA. 2007. Multi-Media, Multi-Concentration Inorganic Analytical Service for Superfund (ILM05.4). Washington, D.C.

Method references:

1. USEPA. 2007. Test Methods for Evaluating Solid Waste: Physical/Chemical Methods, SW-846, 3rd Edition, Update IV. Washington D.C.

2. USEPA. 2004. Test Methods for Evaluating Solid Waste: Physical/Chemical Methods, SW-846, 3rd Edition, Update IIIB. Washington D.C.

Regulatory Criteria:

SCOs indicates 6 NYCRR Part 375 soil cleanup objectives current as of April 2008

Table 3-1. VOCs using USEPA Methods 8000C/8260C quality control requirements and corrective actions

Audit	Frequency	Control Limits	Corrective Action
Holding times	Samples must be analyzed within holding time.	For aqueous and solid samples: Analyze within 14 days from collection for preserved samples. Analysis within 7 days from collection to analysis for aqueous samples not acid preserved. For vinyl chloride, styrene - analyze within 7 days from collection. For TCLP - 14 days from collection to extraction. 14 days from extraction to analysis.	1. If holding times are exceeded for initial or any re-analyses required due to QC excursions. 2. Notify QAO since re-sampling may be required. 3. Document corrective action in the case narrative.
MS Tuning	Once every 12 hours prior to initial calibration and calibration verifications. Analytical sequence must be completed within 12 hours of the GC/MS Instrument Performance Check	1. Bromofluorobenzene (BFB) key ions and abundance criteria listed in the method Table 3 must be met for all 9 ions and analyses must be performed within 12 hours of injection of the BFB. 2. Part of the BFB peak will not be background subtracted to meet tune criteria. 3. Documentation of all bromofluorobenzene analyses and evaluation must be included in the data packages.	1. Tune the mass spectrometer. 2. Document corrective action in the case narrative. 3. Samples cannot be analyzed until control limit criteria have been met.

Table 3-1. VOCs using USEPA Methods 8000C/8260C quality control requirements and corrective actions

Audit	Frequency	Control Limits	Corrective Action
Initial Calibration	Prior to sample analysis and when calibration verifications criteria are not met. Initial calibration will contain all target analytes in each standard. Quantitation of analyses will utilize the initial calibration results.	1. Five concentrations bracketing expected concentration range for all compounds of interest. 2. One second-source standard must be analyzed immediately following the initial calibration at the mid-calibration concentration. This standard must be within 30% recovery or within laboratory control limits. It is also recommended that a separate standard at the MDL level be analyzed after calibration is complete to check sensitivity. 3. Response factor (RF) as listed in Table 4, Method 8260C, with remaining RFs factor $\geq$ 0.050 except for ketones with allowable response factor $\geq$ 0.010. 4. For compound with %RSD >20, quantitation must be performed using a separate calibration curve and the Coefficient of Determination (COD) must be $\geq$ 0.99. If linear regression is used for the calibration curve, the low initial calibration standard should be evaluated for accuracy using criteria of %D <30% from true value. 5. Relative retention time (RRT) for each target analyte in each calibration standard must agree within $\pm$ 0.06 RRT units	1. Identify and correct problem. 2. If criteria are still not met, recalibrate. 3. Document corrective action in the case narrative. 4. Samples should not be analyzed until calibration control limit criteria are met. 5. Contact QAO to discuss problem target analytes before proceeding with analysis.
Calibration Verification	Every 12 hours, following BFB. The calibration verification will contain all target analytes in each standard at a concentration that is representative of the midpoint of the initial calibration.	1. Within percent drift or percent difference (%D) $\leq$ 20 for compounds, RF same as listed in initial calibration. 2. The internal standards areas and retention times must meet the method criteria.	1. Reanalyze. 2. If criteria are still not met, identify and correct problem, recalibrate. 3. Document corrective action in the case narrative; samples should not be analyzed until calibration control limit criteria are met.

Table 3-1. VOCs using USEPA Methods 8000C/8260C quality control requirements and corrective actions

Audit	Frequency	Control Limits	Corrective Action
Preparation Blank Analysis	Every 12 hours, following calibration verification	Methylene chloride less than 3 times QL and 2-butanone and acetone less than 5 times QL remaining analytes less than QL will be provided along with the preparation blank results.	1. Reanalyze blank. 2. If limits are still exceeded, clean instrument, recalibrate analytical system, and reanalyze all samples if detected for same compounds as in blank. 3. Document corrective action in the case narrative - samples cannot be analyzed until blank criteria have been met.
Field Blank Analysis	Collected one per sampling equipment and after every 10 samples.	Methylene chloride less than 3 times QL and 2-butanone and acetone less than 5 times QL remaining analytes less than QL will be provided along with the preparation blank results.	1. Investigate problem. 2. Document in the case narrative.
Trip Blank	1 per cooler containing VOC samples.	Methylene chloride less than 3 times QL and 2-butanone and acetone less than 5 times QL remaining analytes less than QL will be provided along with the preparation blank results.	1. Investigate problem. 2. Document in the case narrative.
Laboratory Control Sample Analysis	Each analytical batch (every 12 hours). Prepared independently from calibration standards. Spike must contain all target analytes and should be at a concentration, which is in the lower 1/2 of the calibration curve.	Recovery within laboratory control limits. For compounds without established laboratory control limits, 70-130% recovery will be used. The lowest acceptable control limits for recovery will be 10%.	1. If recovery failures are above control limits and these compounds are not detected in the associated samples, corrective action is not required. 2. If recovery failures are below control limits, reanalyze LCS and examine results of other QC analyses. 3. If other QC criteria have not been met, stop analysis, locate and correct problem, recalibrate instrument and reanalyze samples since last satisfactory LCS. 4. Document corrective action in the case narrative.

Table 3-1. VOCs using USEPA Methods 8000C/8260C quality control requirements and corrective actions

Audit	Frequency	Control Limits	Corrective Action
Internal Standards	All samples and blanks (including MS/MSD)	1. Response -50% - +200% of internal standards from continuing calibration of the day. 2. RT must be ± 30 sec. from associated calibration verification standard of that sequence.	1. Reanalyze. 2. If still outside of the limits, report both analyses. 3. Document corrective action in the case narrative.
Surrogate Spike	All samples and blanks (including MS/MSD)	Recovery within laboratory control limits. The lowest acceptable control limits for recovery will be 10%.	1. Reanalyze any environmental or QC sample with surrogates that exceed control limits. 2. If still outside of the limits, report both analyses. 3. Document corrective action in the case narrative.
Matrix Spike/ Matrix Spike Dup. (MS/MSD) Analysis	Collected one per 20 samples or one per matrix (for less than 20 samples) Samples from the investigation must be used for MS/MSD analysis. Spike must contain complete list of target analytes.	Recovery and RPD within laboratory control limits. For compounds without established laboratory control limits, 70-130% recovery will be used. The lowest acceptable control limits for recovery will be 10%.	1. Reanalyze if <10%. 2. If reanalysis is still <10%, report both analyses and document in the case narrative. 3. If >10% and LCS criteria are met, document in case narrative; no additional corrective action required. 4. If LCS criteria are exceeded also, examine other QC data for source of problem; *i.e.,* surrogate recoveries for extraction efficiency and calibration data for instrument performance issues. 5. Reanalyze samples and associated MS/MSD and LCSs as required. 6. Document corrective action in the case narrative

Table 3-1. VOCs using USEPA Methods 8000C/8260C quality control requirements and corrective actions

Audit	Frequency	Control Limits	Corrective Action
Field Dup. Analysis	Collected one per 20 samples or one per matrix (for less than 20 samples) Field duplicate will not be identified to the laboratory.	Validation criteria: 50% RPD for waters, 100% RPD for solids. For sample results that are less than or equal to five times the QL, the criterion of plus or minus two times the QL will be applied to evaluate field duplicates.	No corrective action required of the laboratory since the laboratory will not know the identity of the field duplicate samples. If these criteria are not met, sample results will be evaluated on a case-by-case basis.
Target Analyte Identification	As required for identification of target analytes	1. The intensities of the characteristic ions of a compound maximize in the same scan or within one scan of each other. Selection of a peak by a data system target compound search routine where the search is based on the presence of a target chromatographic peak containing ions specific for the target compound at a compound-specific retention time will be accepted as meeting this criterion. 2. The relative retention time (RRT) of the sample component is within ± 0.06 RRT units of the RRT of the standard component. 3. The relative intensities of the characteristic ions agree within 30% of the relative intensities of these ions in the reference spectrum. (Example: For an ion with an abundance of 50% in the reference spectrum, the corresponding abundance in a sample spectrum can range between 20% and 80%.) 4. Structural isomers that produce very similar mass spectra should be identified as individual isomers if they have sufficiently different GC retention times 5. Identification is hampered when sample components are not resolved chromatographically and produce mass spectra containing ions contributed by more than one analyte. When gas chromatographic peaks obviously represent more than one sample component (i.e., a broadened peak with shoulder(s) or a valley between two or more maxima), appropriate selection of analyte spectra and background spectra is important.	Not applicable

Table 3-1. VOCs using USEPA Methods 8000C/8260C quality control requirements and corrective actions

Audit	Frequency	Control Limits	Corrective Action
Target Analyte Identification	As required for identification of target analytes	Examination of extracted ion current profiles of appropriate ions can aid in the selection of spectra, and in qualitative identification of compounds. When analytes co-elute (i.e., only one chromatographic peak is apparent), the identification criteria may be met, but each analyte spectrum will contain extraneous ions contributed by the co-eluting compound.	Not applicable
Target Analyte Quantitation	Apply USEPA Method 8000C for medium level extraction technique	Moisture correction in accordance with USEPA Method 8000C will be applied to the complete set of solid samples, regardless of the percent moisture content..	Not applicable
Tentatively Identified Compound	If required, perform for each sample and blank analysis. Non-target compounds will be reported using a Mass Spectral Library search.	Not applicable	Not applicable
Dilutions	1. When target analyte concentration exceeds upper limit of calibration curve. 2. When matrix interference is demonstrated by the lab and documented in the case narrative (highly viscous samples or a large number of non-target peaks on the chromatogram). 3. It is recommended that a reagent blank be analyzed if an analyte saturates the detector or if highly concentrated analytes are detected. Otherwise data impacted from carryover cannot be used. 4. Laboratory will note in the data deliverables which analytical runs were reported.	1. The reagent blank will meet the method blank criteria.	1. Reanalyze reagent blank until method blank criteria are met. 2. Document corrective action in the case narrative.
pH Determination	Once sample aliquot is taken from the VOC vial, the pH of water samples must be determined.	Record pH and report in the case narrative.	Not applicable
Sample Batching	The laboratory will batch project samples together along with QC samples specified from the project. Non-project information will not be included in the data packages.	Not applicable	Not applicable

Table 3-1. VOCs using USEPA Methods 8000C/8260C quality control requirements and corrective actions

Audit	Frequency	Control Limits	Corrective Action
Laboratory control limits	Generated with results for an analyte from a minimum of 20 sample analyses. The average of the sample results and the standard deviation are calculated. The internal warning limits are established at 2 times the standard deviation and the control limits are established at 3 times the standard deviation. The control limits are updated annually.	Not applicable	Not applicable
Deliverables	1. Full deliverables must be provided to document each audit item for easy reference and inspection. 2. An example calculation will be provided for each analysis, for each type of matrix in the data package using samples from the project. 3. Any laboratory abbreviations or notations presented in the raw data or summary information will be explained or referenced in the case narrative. 4. Final spiking concentrations will be presented in summary form. 5. Standard tracing information will be provided. 6. Cooler temperatures and any observations of bubbles in sample containers will be provided in the data packages. 7. Run logs will be provided in the data packages.	Not applicable	Provide missing or additional deliverables for validation purposes.
Method and QCD requirements	The laboratory will perform the method as presented in this QCD and will adhere to the QCD requirements presented herein. Otherwise the laboratory will specifically note any procedures that differ from the method or the QCD in the data package case narrative.	Not applicable	Not applicable

Notes:
Data validation will be performed in accordance with QA/QC criteria established in these tables and the analytical methods. Excursions from QA/QC criteria will be qualified based on guidance provided in this QCD.
Communications with O'Brien & Gere will be documented and included in the data packages.
Source: O'Brien & Gere

Table 3-2. SVOCs using USEPA Methods 8000C/8270D quality control requirements and corrective actions			
Audit	**Frequency**	**Control Limits**	**Corrective Action**
Holding Times	Samples must be extracted and analyzed within holding time.	Extract within 7 days from collection for aqueous samples; 14 days for soil samples. Analyze extracts within 40 days of extraction. For TCLP: 14 days from collection to extraction, 7 days from extraction to extraction. 40 days from extraction to analysis	If holding times are exceeded for initial or any re-analyses required due to QC excursions, notify the QAO since re-sampling may be required.
GC/MS Instrument Performance Check	Once every 12 hours prior to initial calibration and calibration verification. Must contain 50ng/uL of 4,4-DDT, pentachlorophenol, and benzidine. Analytical sequence must be completed within 12 hours of the GC/MS Instrument Performance Check	1. Decafluorotriphenylphosphine (DFTPP) key ions and abundance criteria listed in the method must be met for all 13 ions and analyses must be performed within 12 hours of injection of the DFTPP. 2. Part of the DFTPP peak will not be background subtracted to meet tune criteria. 3. Documentation of all DFTPP analyses and evaluations must be included in the data packages. 4. Degradation of 4,4-DDT <20%. Peak tailing must not be evident.	1. Tune the mass spectrometer. 2. Document corrective action in the case narrative - samples cannot be analyzed until control limit criteria have been met.

Table 3-2. SVOCs using USEPA Methods 8000C/8270D quality control requirements and corrective actions			
Audit	**Frequency**	**Control Limits**	**Corrective Action**
Initial Calibration	Prior to sample analysis and when calibration verification criteria are not met. Initial calibration will contain all target analytes in each standard. Quantitation of analyses will utilize the initial calibration results.	1 Five concentrations bracketing expected concentration range for all compounds of interest with one standard at or less than the QL 2. One second-source standard should be analyzed immediately following the initial calibration at the mid-calibration concentration. This standard must be within 30% recovery or within laboratory control limits. 3. It is also recommended that a separate standard at the MDL level be analyzed after calibration is complete to check sensitivity. 4. RFs must meet criteria listed in Method 8270D; remaining RFs must be 0.05 with RF of 0.01 for n-nitroso-di-n-propylamine and 2,4-dimethylphenol. 6. For compounds with %RSD >20, quantification must be performed using a separate calibration curve and the COD must be $\geq$ 0.990. If linear regression is used for the calibration curve, the low level initial calibration standard should be evaluated for accuracy using criteria of %D < 30% from the true value. 8. Relative retention for each target analyte in each calibration standard must agree within + 0.06 units.	1. Identify and correct problem. 2. If criteria are still not met, recalibrate. 3. Document corrective action in the case narrative - samples should not be analyzed until calibration control limit criteria are met.
Calibration Verification	Every 12 hours, following DFTPP. Calibration verification will contain all target analytes in each standard at a concentration that is representative of the midpoint of the initial calibration.	1. Within method specified criteria, percent drift or percent difference (%D) $\leq$ 20 for all compounds. Response factor requirements as listed in initial calibration. 2. The internal standards areas and retention times must meet the method criteria.	1. Reanalyze. 2. If criteria are still not met, identify and correct problem, recalibrate. 3. Document corrective action in the case narrative - samples should not be analyzed until calibration control limit criteria are met.

Table 3-2. SVOCs using USEPA Methods 8000C/8270D quality control requirements and corrective actions			
Audit	**Frequency**	**Control Limits**	**Corrective Action**
Preparation Blank Analysis	Prepared with each extraction batch of no more than 20 analytical samples.	1. Common laboratory contaminants (phthalate) less than 5 x QL. Remaining analytes less than QL. 2. QLs and MDLs will be provided along with the preparation blank results.	1. Reanalyze blank. 2. If limits are still exceeded, clean instrument, recalibrate analytical system and re-extract and reanalyze all samples if detected for same compounds as in the blank. 3. Document corrective action in the case narrative - samples should not be analyzed until blank criteria have been met.
Field Blank Analysis	Collected one per 10 samples or one per sampling event.	1. Common laboratory contaminants (phthalate) less than 5 x QL. Remaining analytes less than QL. 2. QLs and MDLS will be provided along with the blank results.	1. Investigate problem. 2. Document in the case narrative.
Laboratory Control Sample (LCS) or Matrix Spike Blank (MSB) Analysis	Prepared with each extraction batch, of no more than 20 analytical samples. Prepared independently from calibration standards. LCS or MSB must contain all target compounds and should be at a concentration that is approximately in the lower 1/2 of the calibration curve.	Recovery within laboratory control limits. For compounds without established laboratory control limits, 70 to 130% recovery will be used. The lowest acceptable control limits for recovery will be 10%.	1. If recovery failures are above control limits and these compounds are not detected in the associated samples, no corrective action is required. 2. If recovery failures are below the control limits, reanalyze LCS and examine results of other QC analyses. 3. If other QC criteria have not been met, stop analysis, locate and correct problem, recalibrate instrument and reanalyze samples since last satisfactory LCS. 4. Document corrective action in the case narrative.
Internal Standards	All samples and blanks (including MS/MSD).	1. Response -50% - +200% of the internal standards from the continuing cal of the day. 2. RT must be ± 30 sec. from calibration verification of that sequence.	1. Reanalyze. 2. If recovery is still outside criteria, report both analyses. 3. Document corrective action in the case narrative.

Table 3-2. SVOCs using USEPA Methods 8000C/8270D quality control requirements and corrective actions			
Audit	**Frequency**	**Control Limits**	**Corrective Action**
Surrogate Spike	All samples and blanks (including MS/MSD).	Recovery within laboratory control limits. The lowest acceptable control limits for recovery will be 10%.	1. Reanalyze if more than 1 AE or 1 BN fails, or if any one surrogate recovery is < 10%. 2. If recovery meets criteria, report both analyses. 3. If re-analysis recovery fails and if the recovery is <10%, re-extract sample if within holding time and re-analyze. 4. If re-analysis recovery fails and if the recovery is >10%, report both analyses. 5. Document corrective action in the case narrative.
Matrix Spike/ Matrix Spike Dup. (MS/MSD) Analysis	Collected one per 20 samples or one per matrix (for less than 20 samples) Samples from the investigation must be used for MS/MSD analysis. Spike must contain complete list of target analytes.	Recovery and RPD within laboratory control limits. For compounds without established laboratory control limits, 70-130% recovery will be used. The lowest acceptable control limits for recovery will be 10%.	1. Reanalyze if <10%. 2. If reanalysis is < 10%, report both analyses and document in the case narrative. 3. If reanalysis is >10%, and LCS criteria are met, document in the case narrative. 4. If LCS criteria are exceeded also, examine other QC data for source of problem; i.e. surrogate recoveries for extraction efficiency and calibration data for instrument performance issues; re-extract or reanalyze samples and associated MS/MSD and LCSs as required.

Table 3-2. SVOCs using USEPA Methods 8000C/8270D quality control requirements and corrective actions			
Audit	**Frequency**	**Control Limits**	**Corrective Action**
Field Duplicate Analysis	Collected one per 20 samples or one per matrix (for less than 20 samples) Field duplicate will not be identified to the laboratory.	Validation criteria: 50% RPD for waters, 100% RPD for solids. For sample results that are less than or equal to five times the QL, the criterion of plus or minus two times the QL will be applied to evaluate field duplicates.	No corrective action required of the laboratory since the laboratory will not know the identity of the field duplicate samples. sample results will be evaluated on a case-by-case basis.
Percent solids	For soil/ samples, the percent solids will be determined and sample results will be corrected for percent solids.	Not applicable	Not applicable
Target Analyte Identification	As required for identification of target analytes	1. The intensities of the characteristic ions of a compound maximize in the same scan or within one scan of each other. Selection of a peak by a data system target compound search routine where the search is based on the presence of a target chromatographic peak containing ions specific for the target compound at a compound-specific retention time will be accepted as meeting this criterion. 2. The relative retention time (RRT) of the sample component is within ± 0.06 RRT units of the RRT of the standard component. 3. The relative intensities of the characteristic ions agree within 30% of the relative intensities of these ions in the reference spectrum. (Example: For an ion with an abundance of 50% in the reference spectrum, the corresponding abundance in a sample spectrum can range between 20% and 80%.) 4. Structural isomers that produce very similar mass spectra should be identified as individual isomers if they have sufficiently different GC retention times. 5. Identification is hampered when sample components are not resolved chromatographically and produce mass spectra containing ions contributed by more than one analyte. When gas chromatographic peaks obviously represent more than one sample component (i.e., a broadened peak with shoulder(s) or a valley between two or more maxima), appropriate selection of analyte spectra and	Not applicable

Table 3-2. SVOCs using USEPA Methods 8000C/8270D quality control requirements and corrective actions			
Audit	**Frequency**	**Control Limits**	**Corrective Action**
		background spectra is important. 6. Examination of extracted ion current profiles of appropriate ions can aid in the selection of spectra, and in qualitative identification of compounds. When analytes coelute (i.e., only one chromatographic peak is apparent), the identification criteria may be met, but each analyte spectrum will contain extraneous ions contributed by the co-eluting compound.	
Cleanup	Gel permeation chromatography should be performed for water extracts with high molecular weight contaminants.	Calibrate according to method. Criteria must be met as listed in method for calibration and blank analysis.	Clean GPC column or replace.
Tentatively Identified Compound (where applicable)	Report 30 SVOCs for each sample and blank analysis. Non-target compounds will be reported using a Mass Spectral Library search.	Not applicable	Not applicable
Sample Batching	The laboratory will batch project samples together along with QC samples specified from the project. Non-project information will not be included in the data packages.	Not applicable	Not applicable
Dilutions	1. When target analyte concentration exceed upper limit of calibration curve. 2. When matrix interference demonstrated by lab and documented in the case narrative (highly viscous samples or a large number of non-target peaks on the chromatogram). 3. Samples should be cleaned up during sample preparation/extraction procedure using appropriate methods when matrix interference is present. 4. Laboratory will note in the data deliverables which analytical runs were reported.	Not applicable	Not applicable

Table 3-2. SVOCs using USEPA Methods 8000C/8270D quality control requirements and corrective actions			
Audit	**Frequency**	**Control Limits**	**Corrective Action**
Laboratory control limits	1. Generated with results for an analyte from a minimum of 20 sample analyses. The average of the sample results and the standard deviation are calculated. The internal warning limits are established at 2 times the standard deviation and the control limits are established at 3 times the standard deviation. The control limits are updated annually.	Not applicable	Not applicable
Deliverables	1. Full deliverables must be provided to document each audit item for easy reference and inspection. 2. An example calculation will be provided for each analysis, for each type of matrix in the data package using samples from the project. 3. Any laboratory abbreviations or notations presented in the raw data or summary information will be explained or referenced in the case narrative. 4. Final spiking concentrations will be presented in summary form. 5. Standard tracing information will be provided. 6. Cooler temperatures will be provided in the data packages. 7. Run logs will be provided in the data packages.	Not applicable	Provide missing or additional deliverables for validation purposes.
Method and QCD requirements	The laboratory will perform the method as presented in this QCD and will adhere to the QCD requirements presented herein. Otherwise the laboratory will specifically note any procedures that differ from the method or the QCD in the data package case narrative.	Not applicable	Not applicable

Notes: Data validation will be performed in accordance with QA/QC criteria established in these tables and the analytical methods. Excursions from QA/QC criteria will be qualified based on guidance provided in this QCD. Communications with O'Brien & Gere will be documented and included in the data package

Source: O'Brien & Gere

Table 3-3. PCBs using Methods 8000C/8082A quality control requirements and corrective actions.

Audit	Frequency (Applies to both primary and confirmation columns)	Control Limits (Applies to both primary and confirmation columns)	Laboratory Corrective Action (Applies to both primary and confirmation columns)
Holding Times	Samples must be extracted and analyzed within holding time.	Extract within 7 days from collection for aqueous samples and 14 days from collection for solid samples. Analyze extracts within 40 days of extraction.	1. If holding times are exceeded for initial or any re-analyses required due to QC excursions, notify the QAO immediately since re-sampling may be required. 2. Document corrective action in the case narrative.
Initial Calibration	Prior to start up and when criteria are exceeded for continuing calibration. Calibrations must contain all target analytes. Quantitation of analyses will utilize the initial calibration results.	1. Minimally five concentrations for Aroclor 1016/1260 (one point calibration for the remaining Aroclors), one calibration standard must be at concentration less than or equal to the QL. 2. Recommended that if results are reported below the QL, a separate standard at the MDL level analyzed after calibration is complete to check sensitivity. 3. If RSD ≤20%, the average relative response factor (internal calibration) or average calibration factor (external calibration) is used for quantitation. If RSD >20%, a linear regression calibration that does not pass through the origin with a correlation coefficient (r) ≥0.990 is used for quantitation; or a nonlinear first or second order calibration curve with a coefficient of determination (COD) of ≥0.990 is used for quantitation.	1. Identify and correct problem. 2. Recalibrate instrument; samples should not be analyzed until initial calibration criteria are met. 3. Document corrective action in the case narrative.
Calibration Verification	Calibration standards must contain Aroclor 1016/1260 at the mid-range concentration. Calibration verification standards must be analyzed every 20 samples and must bracket each end of the sample sequence. In the case that Aroclors are detected above the MDL concentration in the associated samples, the identified Aroclor must be analyzed within the same 48 hour period as the sample in a valid analytical sequence.	Calibration verification response %D ≤ 20%. RT for each target analyte must be within established RT windows.	1. Reanalyze. 2. If criteria are still not met, identify and correct problem, recalibrate; reanalyze samples back to last compliant calibration standard. Samples must be bracketed by compliant calibration standards. 3. Document corrective action in the case narrative.

Table 3-3. PCBs using Methods 8000C/8082A quality control requirements and corrective actions.			
Retention Time Windows	Retention time windows (absolute retention time) must be established in accordance with USEPA Method 8000B/8000C or relative retention times must be used if internal standards are employed.	Compounds must be within established retention time windows or within laboratory established relative retention time criteria for the succeeding calibration standards. Retention time windows must be provided for each calibration verification. Retention times for each surrogate analyzed for samples and QC samples must be provided on a summary form.	1. Reanalyze. 2. If criteria are still not met, identify and correct problem, recalibrate; reanalyze samples back to last compliant calibration standard. 3. Document corrective action in the case narrative.
Method Blank Analysis	Method Blank : 1 per 20 samples of similar matrix extracted at the same time and undergo same cleanup procedures as samples or a separate cleanup blank must be prepared and analyzed.	Compound concentrations must be <QL.	1. Reanalyze. 2. If limits are still exceeded, re-extract and reanalyze method blank and associated samples. Samples must not be analyzed until method blank criteria are met. 3. Document corrective action in the case narrative.
Blank Analysis	Instrument blank: Must be analyzed at the beginning of 12 hour sequence, following the initial calibration verification standard.	Compound concentrations must be <QL.	1. Reanalyze. 2. If limits are still exceeded, re-extract and reanalyze method blank and associated samples. Samples must not be analyzed until method blank criteria are met. 3. Document corrective action in the case narrative.

Table 3-3. PCBs using Methods 8000C/8082A quality control requirements and corrective actions.			
Laboratory Control Sample Or Matrix Spike Blank Analysis	1 per 20 samples of similar matrix extracted at the same times. LCS must be spiked with the Aroclor suspected to be at the site at concentrations near the low end of the calibration curve. Otherwise, Aroclor 1016/1260 or other Aroclors may be used in the LCS analysis.	Percent recoveries must be within laboratory control limits. For compounds without established laboratory control limits, 70-130% recovery will be used. The lowest acceptable control limits for recovery will be 10%.	1. Reanalyze and examine results of other QC analyses. 2. If the percent recovery is above laboratory control limits and the affected compound is not detected in the associated samples, corrective action is not required; document in case narrative. 3. If percent recovery is below laboratory control limits or <10%, reanalyze LCS. If recoveries remain below limits and other QC criteria have been met, report both analyses and document in case narrative report. 4. If recoveries are below laboratory control limits and additional QC excursions are observed, locate and correct problem, recalibrate instrument and re-extract and/or re-analyze samples since last satisfactory LCS. 5. Document corrective action in the case narrative.
MS/MSD Analysis	1 per 20 samples of similar matrix extracted at the same times. MS/MSDs must be spiked with the Aroclor suspected to be at the site at concentrations near the low end of the calibration curve. Otherwise, Aroclor 1016/1260 or other Aroclors may be used. Samples from the investigation must be used for MS/MSD analysis.	Recovery and RPD within laboratory control limits. For compounds without established laboratory control limits, 70-130% recovery will be used. The lowest acceptable control limits for recovery will be 10%.	1. Reanalyze if <10%. 2. If reanalysis is still <10%, report both analyses and document in the case narrative. 3. If re-analysis is >10% and LCS criteria are met, document in case narrative; no additional corrective action required. 4. If LCS criteria are exceeded also, examine other QC data for source of problem; i.e., surrogate recoveries for extraction efficiency and calibration data for instrument performance issues. 5. Re-extract or reanalyze samples and associated MS/MSD and LCSs as required. 6. Document corrective action in the case narrative.

Table 3-3. PCBs using Methods 8000C/8082A quality control requirements and corrective actions.			
Surrogate Spike	Samples, blanks, MS/MSDs, and LCSs must be spiked with method specified surrogate compounds on each column used in the analysis.	Recovery within laboratory control limits. Corrective action is not required if one of the four surrogates (for two columns) has recovery outside of control limits if the recovery is >10% and the remaining three surrogates are within control limits. Surrogate recoveries for each surrogate on each column must be provided in a summary form. The lowest acceptable control limits for recovery will be 10%.	1. Reanalyze. 2. If reanalysis recovery fails criteria but is >10%, report both analyses and document in case narrative report. 3. If reanalysis recovery is <10%, re-extract and reanalyze the sample. Special Circumstances. If matrix interference is present (as documented in the case narrative): 1. Reanalyze sample; may be at a higher dilution. 2. Report both analyses. Document corrective action in the case narrative.
Identification	Samples, blanks, and QC data.	Retention times must be within established retention time windows or must meet relative retention time criteria. Confirmation analysis is required. Retention time windows must be provided for each calibration verification. USEPA CLP Form 10 Summary form, providing the percent difference and retention times for all detected analytes in samples and QC samples, will be provided. Percent difference calculation: Difference between Primary column concentration and the Confirmation column divided by the Primary column times 100.	1. Investigate problem; reanalyze calibration standards to check for retention time shift. 2. Document corrective action in the case narrative.

Table 3-3. PCBs using Methods 8000C/8082A quality control requirements and corrective actions.			
Quantitation	Samples, blanks, and QC data.	Confirmation analysis is required. Internal or external standard method may be used. Verify concentration is within linear calibration range of standards. Aroclor concentration is determined using response factor for each of the characteristic peaks and then averaging the five concentrations. Peak areas from a minimum of three Aroclor peaks unique to the target Aroclor will be used to quantitate the Aroclor concentration. Every effort must be made to meet specified QL requirements. Lab must state the technique used for quantitation of results for the samples.	1. If concentration is above linear calibration range, dilute sample and reanalyze. Dilution should result in concentration in the upper calibration range of the instrument. 2. Document corrective action in the case narrative.
Field/ Equipment Blank Analysis	Collected one per sampling equipment and after every 20 samples.	Compounds concentrations must be <QL.	1. Investigate problem; reanalyze to verify laboratory cross contamination is not a factor. 2. Document in the case narrative.
Field Duplicate Analysis	Collected 1 per matrix type; every 20 samples of similar matrix.	Validation criteria: 50% RPD for waters and 100% RPD for solids. For sample results that are less than or equal to five times the QL, the criterion of plus or minus two times the QL will be applied to evaluate field duplicates.	No corrective action required of the laboratory since the laboratory will not know the identity of the field duplicate samples. If these criteria are not met, sample results will be evaluated on a case-by-case basis during the validation process.
Chromatography Presentation	For each standard, sample and QC sample analysis.	Copies of chromatograms provided in the data package must be large enough to view during validation; detail of each peak involved in the Aroclor identification, including peak shape and associated baseline. In the case that matrix interference is detected or manual integration is performed, enlarged copies of those manipulations will be included in the data package for review.	1. Provide requested information.

Table 3-3. PCBs using Methods 8000C/8082A quality control requirements and corrective actions.			
Cleanup	Acid wash clean-up is used for PCB extracts.	Not applicable	Not applicable
Sample Batching	The laboratory will batch project samples together along with QC samples specified from the project. Non-project information will not be included in the data packages. USEPA Form 8 Summary form, providing the date, time of analysis of samples and QC samples, surrogate retention times and surrogate retention time window, will be provided.	Not applicable	Not applicable
Confirmation Analysis	Dual column quantitation and qualitative confirmation will be performed. The information presented in CLP Form 10 will be provided in the data package for evaluation.	Not Applicable	Not Applicable
Laboratory control limits	Generated with results for an analyte from a minimum of 20 sample analyses. The average of the sample results and the standard deviation are calculated. The internal warning limits are established at 2 times the standard deviation and the control limits are established at 3 times the standard deviation. The control limits are updated annually.	Not applicable	Not applicable
Percent solids	For solids samples, the percent solids will be determined and sample results will be corrected for percent solids.	Not applicable	Not applicable

Table 3-3. PCBs using Methods 8000C/8082A quality control requirements and corrective actions.			
Dilutions	1. When target analyte concentration exceed upper limit of calibration curve. 2. When matrix interference demonstrated by lab and documented in the case narrative (highly viscous samples or a large number of non-target peaks on the chromatogram). 3. Samples should be cleaned up during sample preparation/extraction procedure using appropriate methods when matrix interference is present. 4. Laboratory will note in the data deliverables which analytical runs were reported.	1. The reagent blank will meet the method blank criteria.	1. Reanalyze reagent blank until method blank criteria are met.
Deliverables	1. Full deliverables must be provided to document each audit item for easy reference and inspection. 2. An example calculation will be provided for each analysis, for each type of matrix in the data package using samples from the project. 3. Any laboratory abbreviations or notations presented in the raw data or summary information will be explained or referenced in the case narrative. 4. Final spiking concentrations will be presented in summary form. 5. Standard tracing information will be provided. 6. Cooler temperatures will be provided in the data packages. 7. Run logs will be provided in the data packages.	Not applicable	Provide missing or additional deliverables for validation purposes.

Table 3-3. PCBs using Methods 8000C/8082A quality control requirements and corrective actions.			
Method and QCD requirements	The laboratory will perform the method as presented in this QCD and will adhere to the QCD requirements presented herein. Otherwise the laboratory will specifically note any procedures that differ from the method or the QCD in the data package case narrative.	Not applicable	Not applicable

Note- Data validation will be performed in accordance with QA/QC criteria established in these tables and the analytical methods that are currently used by the laboratory. Excursions from QA/QC criteria will be qualified based on guidance provided in this QCD.

Communications with the QAO will be documented and included in the data packages.

Source: O'Brien & Gere

Table 3-4. Metals using USEPA Method 6010C, mercury using USEPA Methods 7470A/7471B and total cyanide using USEPA Method 9012B quality control requirements and corrective actions

Audit	Frequency	Control Limits	Corrective Action
Holding Times	Samples must be digested and analyzed within holding time.	Metals: 180 days from collection to analysis. TCLP: 180 days from collection to extraction, 180 days from extraction to analysis. Mercury: 28 days from collection to analysis. TCLP: 28 days from collection to extract generation, 28 days from extraction to analysis Total Cyanide: 14 days from collection to analysis.	If holding times are exceeded for initial or any re-analyses required due to QC excursions. Notify QAO since re-sampling may be required. Document corrective action in the case narrative.
Initial Calibration Verification and Continuous Calibration Verification **(ICV, CCV)**	Two point calibration for ICP consisting of one standard and one blank. Five point calibration for remaining methods, with one standard at the QL level. Calibrate each time instrument is set up. After calibration, Initial calibration verification (ICV) is performed. The ICV is from a source independent of the calibration standards. A continuing calibration verification (CCV) is analyzed at the beginning of the run, at 10% or every 2 hours. Also verify at the end of each run.	ICV, CCV - 90% to 110% of expected value for ICP, cold vapor AA and colorimeter ICV for Mercury – 90% to 110% of expected true value. CCV for Mercury - 80% to 120% of expected true value. Correlation coefficient for first or second order curve must be ≥ 0.995.	Reanalyze. If criteria are still not met, identify and correct problem, recalibrate. Document corrective action in the case narrative - samples should not be analyzed until calibration control limit criteria have been met.

Table 3-4. Metals using USEPA Method 6010C, mercury using USEPA Methods 7470A/7471B and total cyanide using USEPA Method 9012B quality control requirements and corrective actions

Audit	Frequency	Control Limits	Corrective Action
Contract Required Detection Limit (CRDL) Standard for ICP CRI) and AA (CRA)	CRDL is the QL concentration at the beginning of each run for all elements at the QL level The CRDL shall be run for every wavelength used for analysis, except those for Al, Ba, Ca, Fe, Mg, Na, and K.	The percent recovery of the CRDL must meet the control limits of 70-130%.	The CRDL shall be re-analyzed immediately for those analytes; if the results of the re-analysis for those analytes fall within the control limits, no further corrective action is required. If the results of the re-analysis for those analytes do not fall within the control limits, the analysis shall be terminated, the problem corrected, the instrument recalibrated, the CRDL analyzed, and the samples associated with the CRDL re-analyzed. Document corrective action in case narrative.
Initial and Continuing Calibration Blank (ICB/CCB)	After ICV, CCV, at beginning and end of run and at a rate of 10% or every 2 hours during run.	The absolute value of the ICB and CCB must not exceed the QL.	Identify and correct problem. If criteria are still not met, recalibrate and reanalyze affected samples. Document corrective action in the case narrative - samples should not be analyzed until blank control limit criteria have been met.
Preparation Blank Analysis	1 per batch of samples digested, or 1 in 20, whichever is greater. PB shall be carried through the complete procedure and contain the same acid concentration in the final solution as the sample solution used for analysis.	The absolute value of the method blank must not exceed the QL.	Reanalyze blank. If limits are still exceeded, clean instrument and recalibrate analytical system and re-preparation and reanalyze affected samples if detected. Document corrective action in the case narrative - samples cannot be analyzed until blank criteria are met.

Table 3-4. Metals using USEPA Method 6010C, mercury using USEPA Methods 7470A/7471B and total cyanide using USEPA Method 9012B quality control requirements and corrective actions

Audit	Frequency	Control Limits	Corrective Action
Field Blank Analysis	Collected one per 10 samples or once per sampling event.	Less than QL	Investigate problem. Document in the case narrative.
Laboratory Control Sample (LCS)	Every 20 samples or each digestion batch. Prepared independently from calibration standards. LCS or MSB must contain all target analytes.	Recovery within laboratory control limits. The lowest acceptable control limits for recovery will be 10%.	Reanalyze LCS and examine results of other QC analyses. If recovery is still outside limits, and other QC criteria are met, report both runs. If other QC criteria have not been met, stop analysis, locate and correct problem, recalibrate instrument and reanalyze samples since last satisfactory LCS. Document corrective action in the case narrative.
Serial Dilution Analysis for ICP (Metals)	Required once per analytical batch when analyte concentration is >50 times the instrument detection limit (IDL) (or MDL if applicable). Samples from the investigation must be used for Serial dilution analysis.	An analysis of a 1:5 dilution of the sample should provide a result with 90% to 110% of the original determination (for concentrations 50x the IDL (or MDL if applicable).	Report results. Document corrective action in the case narrative.
Interference Check Sample Analysis for ICP (Metals)	Beginning and end of each analytical run or twice during every 8 hours, whichever is more frequent for ICP. Solution A consists of the interferents, and Solution AB consists of the analytes mixed with the interferents.	Results for the ICS Solution AB (ICSAB) during the analytical runs shall fall within the control limit of ±2 times the QL of the true value or ±20% of the true value, whichever is greater, for the analytes included in the ICSAB	Reanalyze. If limits are still exceeded, adjust instrument. Restart analytical run and reanalyze samples analyzed since last satisfactory ICS. Document corrective action in the case narrative.

Table 3-4. Metals using USEPA Method 6010C, mercury using USEPA Methods 7470A/7471B and total cyanide using USEPA Method 9012B quality control requirements and corrective actions

Audit	Frequency	Control Limits	Corrective Action
Matrix Spike Analysis	Collected one per 20 samples or one per matrix (for less than 20 samples) Samples from the investigation must be used for MS/MSD analysis.	Recovery within laboratory control limits or 75-125%, or in-house laboratory limits. Recovery does not apply if sample concentration > 4 X spike concentration. Spike must contain all analytes. The lowest acceptable laboratory control limits for recovery will be 10%.	Analyze post-digestion/post-distillation spike. Document corrective action in the case narrative.
Post-Digestion Spike (Recommended for Metals)	Spike must contain all target elements. Performed every 20 samples as necessary.	Recovery within 75-125% of true value.	Dilute sample and reanalyze. If recovery is outside limits, document in the case narrative. Standard additions may be used to compensate for matrix effects.
Internal standard **(Metals)**	May be used for each sample instead of post-digestion spike.	Internal Standard counts must be within 30% of Internal Standard counts of ICB	Reanalyze.
Laboratory Duplicate or Matrix Spike Duplicate Analysis	Collected one per 20 samples or one per matrix (for less than 20 samples) Samples from the investigation must be used for Laboratory Duplicate and MSD analysis	Laboratory control limit or 20% for RPD shall be used for original and duplicate sample values greater than or equal to five times the QL. A control limit of the QL value shall be used if either the sample or duplicate value is less than five times the CRQL.	Investigate problem and reanalyze. Document corrective action in the case narrative.
Field Dup. Analysis	Collected 1 per matrix; every 20 samples of similar matrix. The field duplicate identification will not be provided to the laboratory.	Validation criteria: 50% RPD for waters and 100% RPD for solids. For sample results that are less than or equal to five times the QL, the criterion of plus or minus two times the QL will be applied to evaluate field duplicates.	No corrective action required of the laboratory since the laboratory will not know the identity of the field duplicate samples. If these criteria are not met, sample results will be evaluated on a case-by-case basis.

Table 3-4. Metals using USEPA Method 6010C, mercury using USEPA Methods 7470A/7471B and total cyanide using USEPA Method 9012B quality control requirements and corrective actions

Audit	Frequency	Control Limits	Corrective Action
Percent solids	For solid samples, the percent solids will be determined and sample results will be corrected for percent solids.	Not applicable	Not applicable
Laboratory control limits	Generated with results for an analyte from a minimum of 20 sample analyses. The average of the sample results and the standard deviation are calculated. The internal warning limits are established at 2 times the standard deviation and the control limits are established at 3 times the standard deviation. The control limits are updated annually.	Not applicable	Not applicable
IDL Determination for ICP	Recommended within 30 days of the start of analysis and semiannually.	Not applicable	Not applicable
Analyte quantitation	Concentrations for ICP, cyanide and mercury analysis are reported based on dry weight of the sample. If interference is detected, elements impacted are flagged to indicate percentage interference correction applied to the data or an uncorrected interference because of the equation used for quantitation.	Not applicable	Not applicable
MDL Determination	Before any field samples are analyzed, the MDLs shall be determined for non-prepared analyses, each digestion procedure and instrument used, prior to the start of analyses, and annually thereafter.	Not applicable	Not Applicable
Linear Range Analysis for ICP	Every 6 months.	Not applicable	Not applicable

Table 3-4. Metals using USEPA Method 6010C, mercury using USEPA Methods 7470A/7471B and total cyanide using USEPA Method 9012B quality control requirements and corrective actions

Audit	Frequency	Control Limits	Corrective Action
Interelement Correction For ICP	Within 6 months of the start of analysis and annually. Correction factors for Al, Ca, Fe, and Mg must be reported and for others if they are applied.	Not applicable	Not applicable
Sample Batching	The laboratory will batch project samples together along with QC samples specified from the project. Non-project information will not be included in the data packages	Not applicable	Not applicable
Dilutions	When target analyte concentration exceed upper limit of calibration curve. When matrix interference demonstrated by lab and documented in the case narrative. Laboratory will note in the data deliverables which analytical runs were reported.	Not applicable	Not applicable
Deliverables	Full deliverables must be provided to document each audit item for easy reference and inspection. An example calculation will be provided for each analysis, for each type of matrix in the data package using samples from the project. Any laboratory abbreviations or notations presented in the raw data or summary information will be explained or referenced in the case narrative. Final spiking concentrations will be presented in summary form. Standard tracing information will be provided.	Not applicable	Provide missing or additional deliverables for validation purposes.

Table 3-4. Metals using USEPA Method 6010C, mercury using USEPA Methods 7470A/7471B and total cyanide using USEPA Method 9012B quality control requirements and corrective actions

Audit	Frequency	Control Limits	Corrective Action
	Cooler temperatures will be provided in the data packages. Run logs will be provided in the data packages.		
Method and QCD requirements	The laboratory will perform the method as presented in this QCD and will adhere to the QCD requirements presented herein. Otherwise the laboratory will specifically note any procedures that differ from the method or the QCD in the data package case narrative.	Not applicable	Not applicable

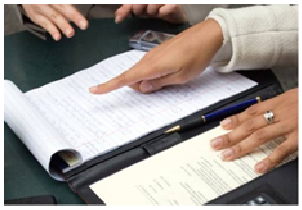
Notes:
Data validation will be performed in accordance with QA/QC criteria established in these tables and the analytical methods. Excursions from QA/QC criteria will be qualified based on guidance provided in this QCD.
Communications with O'Brien & Gere will be documented and included in the data packages.
Source: O'Brien & Gere

Health and Safety Plan

HEALTH AND SAFETY PLAN







Remedial Investigation
Former Ithaca Gun Factory Site
Ithaca, New York
Site No. C755019

IFR Development LLC

October 2013

O'BRIEN & GERE

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1. INTRODUCTION

This Health and Safety Plan (HASP) has been developed to provide both general procedures and specific requirements to be followed by O'Brien & Gere Engineers, Inc. (O'Brien & Gere) personnel while performing Remedial Investigation (RI) activities at the Former Ithaca Gun Factory Site (the Site), in Ithaca, New York.

This HASP describes the responsibilities, training requirements, protective equipment, and standard operating procedures to be used by O'Brien & Gere personnel to address potential health and safety hazards while in investigation areas. This plan specifies procedures and equipment to be used by O'Brien & Gere personnel during work activities and emergency response to minimize exposures of O'Brien & Gere personnel to hazardous materials.

The health and safety considerations of subcontractors to O'Brien & Gere will be set forth in HASPs provided by each subcontractor. Documentation of the subcontractor's HASP will be obtained prior to the start of the subcontractor's work.

1.1 SITE LOCATION AND DESCRIPTION

The Site is 1.63 acres in size and consists of two parcels. The eastern parcel formerly included the main manufacturing operations of the Ithaca Gun Factory and the smaller, western parcel contained the former boiler. The original Ithaca Gun Factory property consisted of approximately 2.6 acres. However, approximately 1 acre was granted to the City of Ithaca to be developed as a City park with a public walkway and overlook area for the adjacent Ithaca Falls.

The property formerly belonged to the Ithaca Gun Company that operated as the Ithaca Gun manufacturing plant and test site for approximately one hundred years. The company filed for bankruptcy in 1979. The Site is currently vacant, with primary buildings demolished in 2009, leaving only a small single-story building and Ithaca Gun boiler stack on the western parcel. The current owner, IFR Development LLC, is in the process of designing a multi-tenant residential housing development that will cover most of the Site.

1.2 IMPLEMENTATION OF HEALTH AND SAFETY PLAN

The requirements and guidelines presented in this HASP are based on a review of available information and an evaluation of potential hazards. This HASP incorporates by reference the applicable Occupational Safety and Health Administration (OSHA) requirements in 29 CFR Part 1910 and 29 CFR Part 1926. The protective equipment selection was made according to Subpart I of 29 CFR 1910. O'Brien & Gere personnel are required to read this HASP before beginning work. This HASP will be available for inspection and review by O'Brien & Gere employees while work activities are underway.

When conducting the RI activities listed in the Work Plan, O'Brien & Gere personnel will comply with this HASP. On-site O'Brien & Gere personnel will notify the O'Brien & Gere Site Safety and Health Coordinator (SSHC) of matters of health and safety. The SSHC is responsible to the Project Manager for monitoring activities, monitoring compliance with the provisions of this HASP, and for modifying this HASP to the extent necessary if conditions change.

This HASP is specifically intended for guiding the conduct of O'Brien & Gere activities defined in the Work Plan in the areas of the Site specified for these work activities. Although this HASP can be made available to interested persons for informational purposes, O'Brien & Gere does not assume responsibility for the interpretations or activities of any persons or entities other than employees of O'Brien & Gere.

The health and safety considerations of subcontractors to O'Brien & Gere will be set forth in HASPs provided by each subcontractor. Documentation of the subcontractor's HASP will be obtained prior to the start of the subcontractor's work.

1.3 PROJECT ORGANIZATION

Personnel involved in the RI activities at the Site implicitly have a part in implementing the HASP. Among them, the Project Officer, the Project Manager, the Corporate Associate for Safety and Health, the SSHC, and the Site Supervisor have specifically designated responsibilities. Their names and telephone numbers are listed in Table 1-1. Other key O'Brien & Gere project personnel, the project's organization, and other primary contacts for the project are presented in the Work Plan.

Key project personnel and their responsibilities with regard to the sampling activities are discussed below.

Project Officer

James R. Heckathorne, P.E. is the Project Officer. The Project Officer is responsible for the overall administration and technical execution of the project. The Project Officer is further responsible for the acquisition and delegation of resources necessary for project completion and HASP implementation.

Project Manager

Deb Wright, C.P.G. is the Project Manager. The Project Manager reports to the Project Officer and is directly responsible for the technical progress and financial control of the project.

Corporate Associate for Safety and Health

Mr. Jeff Parsons, C.I.H. is the Corporate Associate for Safety and Health. Mr. Parsons will be responsible for implementation of this HASP. Procedural changes and modifications to this HASP must be approved by Mr. Parsons.

Site Safety and Health Coordinator

The O'Brien & Gere Site Safety and Health Coordinator (SSHC) for this investigation will be designated by the O'Brien & Gere Project Manager. The SSHC for O'Brien & Gere reports to the O'Brien & Gere Project Manager, coordinates his activities with the O'Brien & Gere Corporate Associate for Safety and Health, and establishes operating standards and coordinates overall project safety and health activities associated with implementation of the RI field activities. The SSHC reviews project plans and revisions to plans to determine that safety and health procedures are maintained throughout the investigation. The SSHC audits the effectiveness of the HASP on a continuing basis and suggests changes, if necessary, to the Project Manager.

Specifically, the SSHC is responsible for the conducting the following actions:

- Provide a complete copy of the HASP before the start of activities;
- Familiarize workers with the HASP;
- Conduct health and safety training and briefing sessions;
- Document the availability, use, and maintenance of personal protective and other safety or health equipment;
- Maintain safety awareness among O'Brien & Gere employees and communicating safety and health matters to them;
- Review field activities for performance in a manner consistent with O'Brien & Gere policy and this HASP;
- Monitor health and safety conditions during field activities;
- Coordinate with emergency response personnel and medical support facilities;
- Notify the Project Manager of the need to initiate corrective actions in the event of an emergency, an accident, or identification of a potentially unsafe condition;

- Notify the Project Manager of an emergency, an accident, the presence of a potentially unsafe condition, a health or safety problem encountered, or an exception to this HASP;
- Recommend improvements in safety and health measures to the Project Manager; and,
- Conduct safety and health performance and system audits.

The SSHC has the authority to recommend that the Project Manager take the following actions:

- Suspend field activities or otherwise limit exposures if the health or safety of any O'Brien & Gere employee appears to be endangered;
- Notify O'Brien & Gere personnel to alter work practices that the SSHC deems to not protect them; and,
- Suspend an O'Brien & Gere employee from field activities for violating the requirements of this HASP.

Site Supervisor

The Site Supervisor, designated by the O'Brien & Gere Project Manager, will be responsible for the implementation of sampling programs. The Site Supervisor will be responsible for overall coordination including field sampling collection and chain-of-custody. The Site Supervisor will report directly to the Project Manager or designee.

Table 1-1 Project Personnel

Name and Title	Telephone
James R. Heckathorne, P.E. **Project Officer** **Syracuse, New York**	(315) 956-6277
Deb Wright, C.P.G. **Project Manager** **Syracuse, New York**	(315) 956-6377
Jeff Parsons, C.I.H. **Manager Corporate Health and Safety** **Syracuse, New York**	(315) 956-6871
NYSDEC Key Personnel **Gary Priscott** **Project Manager** **Region 7 – Kirkwood, New York**	(607) 775-2545 x116

2. HAZARD ANALYSIS

General chemical and environmental hazards that may be encountered while implementing the RI field activities are summarized in Section 2.1. Specific health and safety considerations for field tasks detailed in the RI Work Plan are presented in the Job Safety Analyses (JSAs) provided in Attachment 1 of this HASP.

Both the potential health and safety hazards and the hazard and contaminant control procedures for each task of the RI are discussed in the sections below.

2.1 GENERAL RI FIELD ACTIVITY HAZARDS

2.1.1 Chemical Hazards

Chemical hazards that may be encountered during the RI field implementation are related to inhalation, ingestion, and skin exposure to constituents of potential concern (COPC's). COPC's may include volatile organic compounds (VOCs) and lead.

The potential for unprotected personnel for inhalation of constituents during intrusive RI field activities is low to moderate. The potential for unprotected personnel for dermal contact with soils, sediments or water containing COPCs during drilling and sampling operations is moderate to high. Proper use of personnel protective equipment is intended to reduce potential exposure to contaminants.

2.1.2 Potential Environmental and Physical Hazards

Prior to initiating activity, the work conditions will be discussed with all employees. Hazards will be identified and protective measures will be explained.

Environmental hazards, in addition to contaminants, include fauna and flora. Aggressive fauna, such as ticks, fleas, mosquitoes, bees, wasps, spiders and snakes may be present. Poison ivy and poison oak may also be present.

Physical Hazards involved with RI field activities are primarily associated with the work environment. The work area presents hazards of slips, trips, and falls from scattered debris and irregular walking surfaces. Weather related hazard include wet, muddy, slick, walking surfaces and unstable soil, sunburn, lightning, rain, snow, ice, and heat and cold related illnesses. There exists a potential for incidents involving personnel struck by or struck against objects resulting in fractures, cuts, punctures, or abrasions. Walking and working surfaces during activities may involve slip, trip, and fall hazards.

Materials handling and manual site preparation work associated with the RI field activities may cause blisters, sore muscles, and joint and skeletal injuries; and may present eye, contusion and laceration hazards. A common type of accident that occurs in material handling operations is the "caught between" situation when a load is being handled and a finger or toe gets caught between two objects. Extreme care must be taken when loading and unloading material. Proper lifting technique must be employed.

Working surfaces that are slippery can increase the likelihood of back injuries, overexertion injuries, and slips and falls. All personnel should frequently inspect working surfaces and keep working surfaces clear of debris and moisture.

2.1.3 Hazard and Contaminant Control

For each field task, Level D personal protective equipment (PPE) is to be worn initially. Protective equipment will also include boots with good treads will be worn and personnel will be reminded to remain alert of the area where they are walking to decrease the chance of slipping. Eye protection will be worn to minimize splashing into eyes. The specific requirements for Level D PPE are presented in Section 4.

If odors are observed during field activities, air monitoring with a PID should be conducted to evaluate the concentrations that are present. Action levels for upgrading PPE are presented in Section 6.2.

Field equipment will be inspected and in proper working condition. Mechanical assistance will be provided for large lifting tasks. Ground Fault Circuit Interrupter (GFCI) will be used on all electric power tools and extension cords in outdoor work locations. Electrical extension cords will be protected or guarded from damage (i.e., cuts from other machinery) and be maintained in good condition.

3. PERSONNEL TRAINING

3.1 FIELD WORKERS

O'Brien & Gere employees performing the activities listed in the Work Plan must have completed a training course of at least 40 hours meeting the requirements of 29 CFR 1910.120(e) for safety and health at hazardous waste operations. If the course was completed more than 12 months before the date of work, completion of an approved, 8 hour, refresher course on health and safety at hazardous waste operations is required.

3.2 MANAGEMENT AND SUPERVISORS

In addition to the requirements described in Section 3.1 for O'Brien & Gere field workers, O'Brien & Gere field supervisors performing on-site operations must have completed a training course of at least 8-hr meeting the requirements of 29 CFR 1910.120(e) on supervisor responsibilities for safety and health at hazardous waste operations.

3.3 EMERGENCY RESPONSE PERSONNEL

O'Brien & Gere employees who respond to emergency situations involving health and safety hazards must be trained in how to respond to such emergencies in accordance with the provisions of 29 CFR 1910.120(l). Skills such as cardiopulmonary resuscitation (CPR), mouth-to-mouth rescue breathing, and basic first aid skills may be necessary. Personnel who respond to emergencies on site will be briefed on potential hazards by the SSHC before being permitted to enter the buffer and exclusion zones.

3.4 PROJECT SPECIFIC TRAINING

Project-specific training will be provided to each O'Brien & Gere employee and reviewed before implementing field assignments. O'Brien & Gere personnel will be briefed daily by the Site Supervisor or by the SSHC as to the potential hazards that may be encountered during that day. Topics will include:

- Availability of this HASP;
- General hazards and specific hazards in the work areas;
- Selection, use, testing, and care of the body, eye, hand, foot and respiratory protective equipment being worn and the limitations of each;
- Emergency response procedures and requirements;
- Emergency notification procedures and evacuation routes to be followed; and,
- Procedures for obtaining emergency assistance and medical attention.

3.5 TRAINING CERTIFICATION

A record of employee training completion will be maintained by the SSHC for each O'Brien & Gere employee who is trained. This record will include the dates of the completion of worker training, supervisor training, refresher training, emergency response training, and specific training for on-site O'Brien & Gere employees.

4. PERSONNEL PROTECTION

The basic level of personal protective equipment (PPE) to be used during field activities associated with implementation of the RI is OSHA Level D. PPE may be upgraded based on air monitoring results or at the discretion of the Project Manager and based on the SSHC's recommendations. A downgrade of PPE must be approved by the SSHC and the Project Manager.

If the SSHC determines that field measurements or observations indicate that a potential exposure is greater than the protection afforded by the equipment or procedures specified in this or other sections of this HASP, the work will be stopped. O'Brien & Gere personnel will be removed from the site until the exposure has been reduced or the level of protection has been increased.

O'Brien & Gere respirator users have been trained, medically approved, and fit tested to use respiratory protection. Respirators issued are approved for protection against dust and organic vapors by the National Institute for Occupational Safety and Health (NIOSH). Respirators are issued for the exclusive use of one worker and will be cleaned and disinfected after each use by the worker. Respirator users must check the fit of the respirator before each day's use to see that it seals properly. The respirator must seal against the face so that the wearer receives air only through the air purifying cartridges attached to the respirator. No facial hair that interferes with the effectiveness of a respirator will be permitted on personnel required to wear respiratory PPE. Cartridges and filters for air-purifying respirators in use will be changed at the end of each workday that an air-purifying respirator is worn, unless the SSHC determines that a change is not necessary.

4.1 PROTECTIVE EQUIPMENT DESCRIPTION

The level of PPE is categorized as Level A, B, C, or D, based upon the degree of protection required. For each level, hard hats will be required if dangers related to overhead objects may be present. For drilling and test pitting activities, hard hats will be worn at all times. For other tasks, hard hats will be worn, as necessary. The following is a brief summary of the PPE levels that may be used on this site.

Level C - The concentration(s) and type(s) of airborne substance(s) is known and the criteria for using air-purifying respirators are met. The following constitute Level C equipment:

- NIOSH approved full-face air purifying respirator with organic vapor/acid gases cartridges and P100 filters;
- Chemical-resistant clothing (polyethylene coated overalls, chemical-splash suit, disposable chemical-resistant overalls) with ankles and cuffs taped closed;
- Gloves, outer, nitrile, chemical-resistant;
- Gloves, inner, nitrile, chemical-resistant;
- Shoes, with steel toe and shank meeting ANSI requirements;
- Boots, outer neoprene or Chemical resistant (latex or neoprene) boot covers;
- Hearing protection, if necessary
- Hard hat, if necessary; and,
- Face shield when not wearing a full-face respirator.

Modified Level D - A work uniform providing additional skin protection when respiratory protection is not necessary. The following constitute Modified Level D equipment:

- Chemical-resistant clothing (polyethylene coated overalls, chemical-splash suit, disposable chemical-resistant overalls) with ankles and cuffs taped closed;
- Gloves, outer, nitrile, chemical-resistant;
- Gloves, inner, nitrile, chemical-resistant;
- Shoes, with steel toe and shank meeting ANSI requirements;
- Boots, outer neoprene or chemical resistant (latex or neoprene) boot covers;
- Hearing protection, if necessary
- Hard hat, if necessary;
- Escape mask (optional); and,
- Face shield when not wearing other eye protection.
- Filtering respirator (*i.e.* dust mask) voluntary use.

Level D - A work uniform affording minimal protection, used for nuisance contamination only. The following constitute Level D equipment:

- Coveralls or other appropriate work clothing;
- Shoes, with steel toe and shank meeting ANSI requirements;
- Optional chemical resistant boot covers;
- Safety glasses or chemical splash goggles;
- Gloves, nitrile if handling wet materials;
- Hearing protection, if necessary
- Hard hat, if necessary; and
- Escape mask (optional)
- Filtering respirator (*i.e.* dust mask) voluntary use.

4.2 PROTECTIVE EQUIPMENT FAILURE

If an individual experiences a failure or other alteration of PPE that may affect its protective ability, that person is to leave the work area immediately. The Project Manager or the SSHC must be notified and, after reviewing the situation, is to determine the effect of the failure on the continuation of on-going operations. If the Project Manager or the SSHC determine that the failure affects the safety of workers, the work site, or the surrounding environment, workers are to be evacuated until corrective actions have been taken. The SSHC will not allow re-entry until the equipment has been repaired or replaced and the cause of the failure has been identified.

5. MEDICAL MONITORING

5.1 MEDICAL SURVEILLANCE PROGRAM

O'Brien & Gere has implemented a medical monitoring program in accordance with 29 CFR 1910.120. The O'Brien & Gere program is designed to monitor and reduce health risks to employees potentially exposed to hazardous materials and to provide baseline medical data for each employee involved in work activities. It is also designed to determine the employee's ability to wear personal protective equipment such as chemical resistant clothing and respirators.

Medical examinations are administered on a post-employment and annual basis and as warranted by symptoms of exposure or specialized activities. The examining physician is required to make a report to O'Brien & Gere of any medical condition that would increase the employee's risk when wearing a respirator or other PPE. O'Brien & Gere maintains site personnel medical records as required by 29 CFR 1910.120 and by 29 CFR 1910.1020, as applicable.

O'Brien & Gere employees performing the activities listed in the Work Plan of this document have or will receive medical tests as regulated by 29 CFR 1910.120. Where medical requirements of 29 CFR 1910.120 overlap those of 29 CFR 1910.134, the more stringent of the two will be enforced.

5.2 RESPIRATOR CLEARANCE

Employees who wear or may wear respiratory protection have been provided respirators as required by 29 CFR 1910.134. This standard requires that an individual's ability to wear respiratory protection be medically certified before performing designated duties.

6. AIR MONITORING

Unidentified organic vapors may be present in the investigation areas. Real time monitoring of these substances may be conducted on-site by, or under the supervision of, the SSHC. The SSHC will evaluate whether the personal protective measures employed during field activities are appropriate and will modify the protective measures accordingly. The SSHC will be responsible to maintain monitoring instruments throughout the investigation.

Personal monitoring must be conducted in the breathing zone and, if workers are wearing respiratory protective equipment, outside the face piece.

6.1 FIELD INSTRUMENTATION AND SAMPLING

Field health and safety air sampling for the RI field investigation will consist of organic vapor monitoring using a PID (Section 6.1.1) according to provisions of Section 2.

6.1.1 Photoionization Detector (PID)

The air will be monitored with a portable PID equipped with a 10.2 electron volt detector to determine the presence and concentration of organic vapors before sampling, during intrusive field activities (monitoring well installations and test pit excavations). PID monitoring is conducted in the work zone.

PID monitoring will be initiated before starting sampling and, if the action levels are exceeded, continuously in the breathing zone of the worker collecting the samples.

Personnel monitoring samples will be collected in the breathing zone and, if workers are wearing respiratory protective equipment, outside the face piece. The sampling strategies may change if work tasks or operations change. Monitoring instruments will be checked for appropriate response, in accordance with the manufacturer's instructions, before use each sampling day.

Hazard Monitored: Many organic and some inorganic gases and vapors.

Application: Detects the presence and total concentration of many organic and some inorganic gases and vapors.

Detection Method: Ionizes molecules using UV radiation, produces a current that is proportional to the number of ions present.

General Care and Maintenance: Recharge daily or replace the battery. Regularly clean the lamp window. Regularly clean and maintain the instrument and its accessories. Turn the function switch to "stand-by" and allow the instrument to "warm up" for 5 min.

Typical Operating Time: 10 hours, or 5 hours with strip chart recorder.

6.2 ACTION LEVELS

Refer to the attached JSAs provided in Attachment 1 of this HASP for work zone monitoring action levels.

6.3 COMMUNITY AIR MONITORING PLAN

This section serves as the Community Air Monitoring Plan (CAMP). Monitoring described in this CAMP will be implemented during invasive RI field activities, which will include drilling of soil and bedrock borings.

The upwind and downwind perimeter of the exclusion zone will be monitored during intrusive work. A PID will monitor total organic vapors while a particulate meter will monitor particulate concentrations. The monitors will be equipped with audible and visual alarms, have recorders and display 15 minute time weighted averages. All readings will be downloaded and available for New York State Department of Health (NYSDOH) and NYSDEC personnel to review. Action levels for organic vapors and particulate emissions are outlined in the following subsections as well as on Table 6-2.

6.3.1 Organic Vapors

If the 15-minute average VOC level remains below 5 ppm above background, intrusive work activities may continue. If the 15-minute average VOCs level exceeds 5 ppm above background, intrusive work activities will be suspended. Monitoring will continue under the provisions of the Vapor Emission Response Plan described below. If the 15-minute average VOCs level exceeds 25 ppm above background, intrusive work will be stopped and the Major Vapor Emissions Plan described below will be activated. Monitoring will continue under the provisions of the Major Vapor Emission Plan described below.

Vapor emission response plan.

If the vapor levels increase above 5 ppm above background at the downwind perimeter of the exclusion zone but remain below 25 ppm above background, work can resume provided:

- The source of the vapors has been identified and corrective actions have been taken to abate the emissions. These actions must reduce the exclusion zone perimeter emissions below 5 ppm.
- The organic vapor level 200 feet downwind of the work area or half of the distance to the nearest residential or commercial structure, whichever is less, is less than 5 ppm over background. If the distance to the nearest occupied building is less than 20 feet, the monitor will be placed at the perimeter of the work area.
- Continuous monitoring continues.

Major vapor emission plan.

If organic levels greater than 5 ppm over background are identified 200 feet downwind from the work area or half of the distance to the nearest residential or commercial property, whichever is less, all work activities at the site will be halted.

If, following the cessation of the work activities, the downwind organic levels persist above 5 ppm above background, then the air quality must be monitored within 20 feet of the perimeter of the nearest residential or commercial structure (20-Foot Zone).

If efforts to abate the emission source are unsuccessful and if organic vapors persist at levels_≥5 ppm for more than 30 minutes or any level ≥10 ppm in the 20-foot Zone, then the following actions will be taken:

1. Monitoring will be conducted continuously in the "20 foot zone" until VOC levels are below 5 ppm. All intrusive site activities will be halted during this time.
2. The site owner will be notified.
3. The NYSDEC will be notified.

6.3.2 Dust/Particles

When the 15-minute average dust level remains below 0.1 milligrams per cubic meter (mg/m^3) above background, intrusive work activities may continue.

If the downwind PM-10 particulate level is 0.1 mg/m^3 greater than background (upwind perimeter) for the 15-minute period or if airborne dust is observed leaving the work area, then dust suppression techniques must be employed.

If, after implementation of dust suppression techniques, downwind PM-10 particulate levels are greater than 0.15 mg/m3 above the upwind level, work must be stopped and a re-evaluation of activities initiated. Work can resume provided that dust suppression measures and other controls are successful in reducing the downwind PM-10 particulate concentration to within 0.15 mg/m3 of the upwind level and in preventing visible dust migration.

Particulate emission response plan.

If the pariculate levels increase above 0.1 mg/m^3 over background at the downwind perimeter of the exclusion zone but remain below 0.15 mg/m^3 above background, work can resume provided dust suppression techniques are employed and no visible dust is migrating from the work area.

If the particulate levels increase above 0.15 mg/m^3 over background at the downwind perimeter of the exclusion zone, work can resume provided dust suppression measures and other controls are successful in reducing the downwind PM-10 particulate concentration to within 150 mcg/m3 of the upwind level and in preventing visible dust migration.

Table 6-2 COMMUNITY AIR MONITORING PLAN (CAMP) ACTION LEVELS

Contaminant (equipment/method)	Frequency	Downwind Action Levels*	SSHC Action/Response
Volatile Organic Vapors **Odor observations and PID (PID with 10.6 eV lamp)**	1. Continuously downwind during invasive work activities. 2. When observations of any unusual odors are reported to the SSHC.	<5 ppm (at the exclusion zone perimeter)	1. Work may continue. 2. Readings shall be recorded and made available for NYSDEC/NYSDOH review.
		5 ppm (at the exclusion zone perimeter)	1. STOP work. 2. Move to a location 200' downwind or at half the distance between the exclusion zone and nearest dwelling (but not closer than 20') and continue air monitoring and recording readings at this location. If the VOC level at the downwind location is <5 ppm, return to the exclusion zone perimeter and take additional VOC readings. 3. Work may continue if exclusion zone perimeter readings are <5 ppm and additional vapor controls have been implemented. 4. Monitoring must continue at the exclusion zone perimeter for a s long as VOC levels are ≥5 ppm.
		25 ppm (at the exclusion zone perimeter)	1. STOP work. 2. Implement additional vapor emission controls to reduce VOC levels below 5 ppm (at the exclusion zone perimeter) 3. Notify the O'Brien & Gere Project Manager and NYSDEC representative.
Dust **Observations and Dust Meter (Dust Trak or MiniRam)**	1. Continuously downwind during invasive work activities. 2. When observations of any unusual odors are reported to the SSHC.	<0.1 mg/m^3 (at the exclusion zone perimeter)	1. Work may continue. 2. Readings shall be recorded and made available for NYSDEC/NYSDOH review.
		0.1 – 0.15 mg/m^3 (at the exclusion zone perimeter)	1. Work may continue but use dust suppression controls.
		>0.15 mg/m^3 (at the exclusion zone perimeter)	1. STOP work. 2. Work may continue if exclusion zone dust readings are <0.15 mg/m^3 and additional dust controls have been implemented. 3. Immediately notify the O'Brien & Gere Project Manager, O'Brien & Gere Manager of Corporate Health and Safety, and NYSDEC representative. 4. Work will not restart until the cause of the elevated dust levels has been evaluated and corrective action identified.

* Sustained readings for 1-minute above background. Background readings are taken at upwind locations relative to exclusion zones.

7. SITE CONTROL

7.1 SITE SEQURITY

Site security will be monitored and controlled by the Project Manager, the Site Supervisor, and the SSHC. Their duties will include limiting access to the work area to authorized personnel, overseeing project equipment and materials, and overseeing work activities. The procedures specified below will be followed to control access to each work site to prevent persons who may be unaware of site conditions from exposure to hazards. Work area control procedures may be modified as required by site conditions.

7.2 SITE CONTROL

Work zones will be required during site activities identified in this HASP. The following two categories of work zones will be established at each sampling point: an exclusion zone and a buffer zone. The remainder of the site will be the support zone.

7.2.1 Exclusion Zone

The exclusion zone is where sampling activities are conducted. The SSHC will identify this zone. It must be at least 30 ft in diameter and centered on the work activities.

7.2.2 Buffer Zone

The buffer zone contains personnel and equipment decontamination stations and staging areas for samples. The buffer zone will be located upwind of the work activities. It will only be large enough to contain equipment and personnel necessary to keep potentially contaminated media and materials in the immediate work area.

7.2.3 Support Zone

The remainder of the area is defined as the support zone. The support zone contains support facilities, extra equipment, transport vehicles, and additional personnel and equipment necessary to manage and perform work activities.

7.3 SITE ACCESS PROCEDURES

Access during field activities will be limited to those personnel required. Such personnel are anticipated to include, but will not necessarily be limited to, O'Brien & Gere employees or subcontractors and those representatives as designated by the NYSDEC or local agencies. Site access will be monitored by the SSHC, who will maintain a log-in sheet. The log will include O'Brien & Gere and other personnel on the site, their arrival and departure times and their destination on the site.

7.4 SITE COMMUNICATIONS

A cellular telephone will be used during activities to facilitate communications for emergency response and other purposes and to serve as the primary off-site communication network.

7.5 CONFINED SPACE ENTRY

No entry of permit required confined spaces is expected while O'Brien & Gere personnel perform the tasks listed in the RI Work Plan. A confined space is defined as a space that has limited or restricted means for entry (for example tanks, vessels, silos, storage bins, hoppers, vaults, and pits), is not designed for continuous employee occupancy, and large enough to enter.

8. DECONTAMINATION

8.1 PERSONNEL DECONTAMINATION PROCEDURES

The SSHC will be responsible for supervising the proper use and decontamination of PPE. The SSHC will also establish and monitor the decontamination line.

If personnel decontamination is considered necessary, it will involve scrubbing with a soap and water solution followed by rinses with potable water. Decontamination will take place on a decontamination pad. Dirt, oil, grease, or other foreign materials that are visible will be removed from surfaces. Scrubbing with a brush may be required to remove materials that adhere to the surfaces. Splash protection garments will be washed with soap and potable water before removal. Non-disposable garments will be air dried before storage. Waste waters from personnel decontamination will be disposed of with the waste waters from equipment decontamination. Respirators will be sanitized as well as decontaminated each day before re-use. The manufacturer's instructions will be followed to sanitize the respirator masks.

The following decontamination protocol, or one providing the same level of decontamination, will be followed:

Station 1: Equipment Drop

Provide an area covered with a plastic drop cloth. Deposit equipment used on-site including tools, sampling devices and containers, monitoring instruments, radios and clipboards on the plastic drop cloth. During hot weather a cool down station with chairs, fans, and replenishing beverages may be set up in this area.

Station 2: Outer Garment, Boots, and Gloves Wash and Rinse

Establish a wash station for gloves, boots, and the protective suit (when worn). Scrub outer boots, outer gloves, and protective suit with detergent and water. Rinse with potable water.

Station 3a: Outer Boot and Glove Removal

Provide seating for use during the removal and collection of outer boots. Remove outer boots. Deposit them in a container with a plastic liner. If the boots are to be reused after cleaning, place them in a secure location near the work site. Provide a location for removal, collection, and disposal of outer gloves. Remove the outer gloves. Deposit them in a container for disposal.

Station 3b: Filter or Cartridge Exchange

This station will be established only if respirators are worn. The worker's respirator cartridges and filters can be exchanged, new outer gloves and outer boots donned, and joints taped at this station. From here the worker can return to work duties in the exclusion zone.

Station 4: Outer Garment Removal

This station will only be provided if a protective outer garment is worn. Provide a bench to sit on during the removal of the protective garment. If the garment is disposable, deposit it in a container with a plastic liner; otherwise, hang it up to air dry.

Station 5: Respirator Removal

This station will be established only if respirators are worn. Remove the respirator. Avoid touching the face with gloved fingers. Deposit the respirator on a plastic sheet.

Station 6: Inner Glove Removal

Remove and dispose of inner gloves. Deposit them in a container with a plastic liner. If the gloves are to be reused, place them in a secure location near the work site, preferably in a plastic container.

Station 7: Field Wash

Provide a place for a field wash. Wash hands and face thoroughly. Shower if body contamination is suspected.

8.2 EMERGENCY DECONTAMINATION PROCEDURES

Although no contact with chemicals that present a hazard is anticipated for the field program, this section has been included in the event of an emergency. The extent of emergency decontamination depends on the severity of the injury or illness and the nature of the contamination. Minimum decontamination will consist of detergent washing, rinsing and removal of contaminated outer clothing and equipment. If time does not permit the completion of all of these actions, it is acceptable to remove the contaminated clothing without washing it. If the situation is such that the contaminated clothing cannot be removed, the person should be given required first aid treatment, and then wrapped in plastic or a blanket prior to transport to medical care. If heat stress is a factor in the victim's illness/injury, outer clothing will be removed from the victim immediately.

8.3 MONITORING EQUIPMENT DECONTAMINATION PROCEDURES

Sampling equipment used for health monitoring purposes will be cleaned of visible contamination and debris before initial use on site, between uses, and after final use. Monitoring equipment that contacts contaminated media will be decontaminated after each use by a low phosphate detergent brushing followed by a clean water rinse. After decontamination, monitoring equipment will be stored separately from personal protective equipment. Decontaminated or clean equipment not in use will be covered with plastic and stored in a designated storage area in the support zone.

8.4 DECONTAMINATION SUPPLIES

The following supplies will be available on site for the decontamination of personnel and equipment:

- Plastic drop cloths;
- Plastic bags or DOT-approved fiberboard drums to collect non-reusable protective clothing;
- Plastic wash tubs;
- Soft bristled long-handle brushes;
- DOT-approved drums or appropriate other containers, to collect wash and rinse water;
- Hand spray units for decontamination;
- Soap, water, alcohol wipes, and towels to wash hands, faces, and respirators; and,
- Washable tables and benches or chairs.

8.5 COLLECTION AND DISPOSITION OF CONTAMINATED MATERIALS

Cuttings and field decontamination wastes are to be collected, drummed, and disposed of in accordance with the procedures in the FAP. Investigation derived waste will be managed as described in the FAP.

8.6 REFUSE DISPOSAL

Site refuse will be contained in appropriate areas or facilities. Trash from the project will be properly disposed.

9. EMERGENCY RESPONSE

9.1 NOTIFICATION OF SITE EMERGENCIES

In an emergency, site personnel will signal distress either by yelling or with three blasts from a horn (vehicle horn, air horn and so forth). The SSHC, Site Supervisor, or the Project Manager will immediately be notified of the nature and extent of the emergency.

Directions to Cayuga Medical Center and emergency telephone numbers are in each of the JSAs provided in Attachment 1 of this HASP.

9.2 RESPONSIBILITIES

The SSHC is responsible for responding to, or coordinating the response of off-site personnel to, emergencies. In the event of an emergency, the SSHC will direct notification and response, and will assist the Site Supervisor in arranging follow-up actions. Upon notification of an exposure incident, the SSHC will call the hospital, fire, and police emergency response personnel for recommended medical diagnosis, treatment if necessary, and transportation to the hospital.

Before the start of investigation activities, the SSHC will:

- Confirm that the following safety equipment is available: eyewash station, first aid supplies, and a fire extinguisher
- Have a working knowledge of the O'Brien & Gere safety equipment.
- Confirm the most direct route to Faxton-St. Luke's Healthcare is prominently posted with the emergency telephone numbers.
- Confirm that employees who will respond to emergencies have been appropriately trained.

Before work may resume following an emergency, used emergency equipment must be recharged, refilled, or replaced and government agencies must be notified as required.

The Project Manager, assisted by the SSHC and the Site Supervisor, must investigate the incident as soon as possible. The Project Manager will determine whether and to what extent exposure actually occurred, the cause of exposure, and the means to prevent similar incidents. The resulting report must be signed and dated by the Project Manager, the SSHC, and the Site Supervisor.

9.3 ACCIDENTS AND INJURIES

In the event of an accident or injury, workers will immediately implement emergency isolation measures to assist those who have been injured or exposed and to protect others from hazards. Upon notification of an exposure incident, the SSHC will contact emergency response personnel who can provide medical diagnosis and treatment. If necessary, immediate medical care will be provided by personnel trained in first aid procedures. Other on-site medical or first aid response to an injury or illness will be provided only by personnel competent in such matters. In addition, the O'Brien & Gere Corporate Associate for Safety and Health will be notified within 24-hours of an accident involving O'Brien & Gere personnel and/or its subcontractors.

9.4 SAFE REFUGE

Before commencing site activities the SSHC will identify the location that will serve as the place of refuge for O'Brien & Gere workers in case of an emergency evacuation. During an emergency evacuation, personnel in the exclusion zone should evacuate the work area both for their own safety and to prevent hampering rescue efforts. Following an evacuation, the SSHC will account for site personnel.

9.5 FIRE FIGHTING PROCEDURES

A fire extinguisher meeting the requirements of 29 CFR Part 1910 Subpart L, as a minimum, will be available in the support zone during on-site activities. This is intended to control small fires. When a fire cannot be

controlled with the extinguisher, the exclusion zone will be evacuated, and the fire department will be contacted immediately. The SSHC or the Site Supervisor will determine when to contact the fire department.

9.6 EMERGENCY EQUIPMENT

The following equipment, selected based on potential site hazards, will be maintained in the support zone for safety and emergency response purposes:

- Fire extinguisher;
- First aid kit; and,
- Eye wash bottles.

9.7 EMERGENCY SITE COMMUNICATIONS

Hand and verbal signals will be used at the site. Portable telephones will be available during site activities for emergency response communications.

9.8 SECURITY AND CONTROL

Work zone security and control during emergencies, accidents, and incidents will be monitored by the SSHC or the Site Supervisor. The duties of the SSHC or the Site Supervisor include limiting access to the work zones to authorized personnel and overseeing emergency response activities.

10. SPECIAL PRECAUTIONS AND PROCEDURES

The activities listed in the Work Plan may expose personnel to both chemical and physical hazards. The hazards associated with specific site activities are discussed in Section 2 and the attached JSAs (Attachment 1). The potential for exposure to hazardous situations will be significantly reduced through the use of air monitoring, PPE, hazard awareness training, and administrative and engineering controls. Other general hazards that may be present on a hazardous waste work site are discussed below.

10.1 HEAT STRESS

The timing and location of this project may be such that heat stress could pose a threat to the health and safety of site personnel. The SSHC will implement work and rest regimens so that O'Brien & Gere Engineers personnel do not suffer adverse effects from heat. These regimens will be developed by the SSHC following the guidelines in the 1997 edition of the ACGIH Threshold Limit Values for Physical Agents in the Work Environment. Special clothing and an appropriate diet and fluid intake will be recommended to O'Brien & Gere Engineers personnel involved in the activities specified in Section 2 to further reduce this hazard. In addition, ice and fluids will be provided as appropriate in the support zone.

10.2 COLD INJURY

The project requires work over water and thus the timing and location of this project may be such that cold injury could pose a threat to the health and safety of site personnel. Factors that influence the development of a cold related injury include ambient temperatures, wind velocity and wet clothing and skin. The SSHC will implement work and rest regimens so that O'Brien & Gere Engineers personnel do not suffer adverse effects from cold. These regimens will be developed by the SSHC following the guidelines in the 1997 edition of the ACGIH Threshold Limit Values for Physical Agents in the Work Environment. Special clothing and an appropriate diet and fluid intake will be recommended to O'Brien & Gere Engineers personnel involved in the activities specified in Section 2 to further reduce this hazard. In addition, ice and fluids will be provided as appropriate in the support zone.

10.3 HEAVY EQUIPMENT / MACHINERY

O'Brien & Gere employees performing site activities may use or work near operating heavy equipment and machinery. Respiratory protection and protective eyewear may be worn during portions of work activities. Since this protective equipment reduces peripheral vision of the wearer, O'Brien & Gere Engineers personnel should exercise extreme caution in the vicinity of operating equipment and machinery to avoid physical injury to themselves or others.

10.4 ADDITIONAL SAFETY PRACTICES

The following are important safety precautions that will be enforced during the completion of the activities listed in Section 2:

- Contact with potentially contaminated surfaces should be avoided whenever possible. Workers should minimize walking through puddles, mud, or other discolored surfaces; kneeling on ground; and leaning, sitting, or placing equipment on drums, containers, vehicles, or the ground.
- Medicine and alcohol can mask the effects of exposure to certain compounds. Consumption of prescribed drugs must be at the direction of a physician.
- O'Brien & Gere Engineers personnel and equipment in the work areas will be minimized consistent with effective site operations.
- Unsafe or inoperable equipment left unattended will be identified by a "DANGER, DO NOT OPERATE" tag.
- Activities in the exclusion zone will be conducted using the "Buddy System." The Buddy is another worker fully dressed in the appropriate personal protective equipment who can perform the following activities:

- Provide partner with assistance
- Observe partner for sign of chemical or heat exposure
- Periodically check the integrity of partner's PPE
- Notify others if emergency help is needed.
- The HASP will be reviewed frequently for its applicability to the current and upcoming operations and activities.

10.5 DAILY LOG CONTENTS

The Project Manager and the SSHC will establish a documentation system that will record, at a minimum, the following information:

- The O'Brien & Gere Engineers personnel and other personnel conducting the site activities, their arrival and departure times, and their destination at the investigation areas
- Incidents and unusual activities that occur on the site such as, but not limited to, accidents, breaches of security, injuries, equipment failures and weather related problems
- Changes to the Work Plan and the HASP
- Daily Information such as:
  - Work accomplished and the current site status
  - Air monitoring results

Job Safety Analyses

Safety to Zero (S_20) – Safety Planning Is Critical To Our Ultimate Goal Of Zero Injuries

Project Name:	Former Ithaca Gun Factory Site	**OBG Project Officer:**	James R. Heckathorne
Project Number:		**OBG Project Manager (PM):**	Deb Wright
JSA Title:	Soil Boring/Bedrock Drilling/Well Install	**OBG Site Supervisor:**	TBD
JSA Revision Date:	10/24/13	**OBG Site Safety Coordinator:**	TBD
JSA Prepared By:	Dave Carnevale		
Client Name:	IFR Development LLC	**Subcontractor Company Name:**	(☐ NA) Multiple (see below)
Project Location:	Ithaca, New York	**Subcontractor Project Manager:**	TBD
Project Phone No.:	TBD	**Subcontractor Superintendent:**	TBD
Project Fax No.:	TBD	**Sub Safety Competent Person:**	TBD

Scope of Work covered by this JSA (identify subcontractors covered by this JSA)	Drilling of four (4) bedrock borings utilizing auger drilling and bedrock coring techniques, advancement of 8 soil borings using direct-pusg drilling methods, well installation, well development by surging and purging. Subcontractors include: TBD
References (existing safety plans, manuals, spec's, etc.)	O'Brien & Gere, May 2008, Ithaca Gun Site Health and Safety Plan.
Key Hazards (focus on highly hazardous tasks)	Drilling/borings, heavy machinery, hydraulically and electrically powered equipment, shock hazards, pinch points, slips trips falls, exposure/contact with contaminated materials, heat/cold stress.
Personal Protective Equipment Summary	*(additional safety equipment may be required for specific hazards identified in the following sections)* ☒ Hard Hat ☒ Safety Glasses ☒ Safety Shoes ☒ Cut-Resistant Gloves ☒ Ear Protection Other (specify): ☒ **High Visibility Vests** (required for all on site work) ☒ **Ear Protection** (heavy equipment, loud power tools, etc.) ☒ Fall Protection Harness & Lanyard (falls >6') ☐ Respiratory Protection (☐ N95 dust mask, ☐ half face, ☐ full-face) Specify cartridge in JSA. ☐ **Tyvek** or other chemical protective coverall: (when there is the potential for contact with contaminated materials / biological hazards.) ☐ Face Shield (chemical handling, line breaks, pressure washing.) ☒ **Nitrile Gloves** (☐ Surgical Type and/or ☐ "Dishwashing" Type) ☒ **Cut-resistant gloves** are required when handling cable, rods, and sharp or "splintery" materials.

Pre-Work Documentation & Certifications *(Refer to JSA content for additional certifications and documentation that may be required.)*	**Documentation and Certifications**	**To Be Submitted or Provided By…….**
	☐ Drug Testing (☐ alcohol testing is also required)	
	☒ **Project Safety Plan or Job Safety Analysis (JSA)**	**OBG Project Manager – Deb Wright**
	☐ Client/Facility Contractor Safety Orientation	
	☒ **Project Safety Orientation (JSA Review)**	**OBG Site Safety Coordinator – TBD**
	☒ **Daily Safety Meetings (Daily Pre-Task Planner)**	**OBG Site Safety Coordinator – TBD**
	☐ Verification of Hazwoper Medical Surveillance	
	☒ **OSHA 40-hr Hazwoper w/ current 8-hr Refresher**	**All on site OBG and subcontractor personnel**
	☐ Respirator Training, Fit Test, and Resp. Medical	
	☐ Confined Space Entry Certification (necessary for permit-required entry or non-permit designations)	
	☐ Excavation Competent Person designation	
	☐	
Permits applicable to	☐ Confined Space Entry Permit	☐ Daily Excavation Inspection Checklist

scope of work	☐ Hot Work Permit	☐
	☐ Energized Electrical Work Permit (from sub)	☐

Individuals must sign the "Pre-Work Briefing" form on the last page after reviewing this JSA.

	HAZARD	HAZARD CONTROLS (check all that apply and comment as required)
ELEVATED WORK		
☒ NA	FALLS > **6'** or within **15'** of a ROOF OR MEZZANINE EDGE where the fall is >6'	☐ Existing Guardrails ☐ Hole Covers Marked "HOLE" ☐ Fall Restraint ☐ Temporary Guardrails ☐ Manlifts used for elevated work ☐ _____ ☐ Warning Line 15' from Edge ☐ Fall Arrest w/ harness/lanyard (identify tie-off points) **Fall Protection Comments (describe equipment used):**
☒ NA	LADDERS / STAIRS ☐ Extension Ladders ☐ Step Ladders ☐ Fixed Ladders ☐ Stairs	☐ Employees training in safe ladder use at toolbox safety meeting ☐ Extension ladders are properly footed, secured at top, and setup at proper angle ☐ Stepladders are set on level ground or properly shimmed with spreaders locked. ☐ Stairs have proper rise over run and stairs >4 steps or 4' have guardrails. **LADDERS/STAIRS COMMENTS:**
EXCAVATIONS / TRENCHING		
☒ **NA**	☐ Max Depth ≥ 20' ☐ Max Depth ≥ 5' ☐ Max Depth <5' with potential cave-in hazard ☐ Potential permit-required confined space at depth ≥ 4' ☐ Underground utilities ☐ Structures/foundations ☐ Falls into excavations ☐ Other:	☐ Excavation Competent Person Name:_____ Company _____ ☐ Sloping & shoring for excavations ≥20' are approved by a professional engineer ☐ Sloping & shoring for excavations ≥5' when persons are exposed to cave-in. (specify below) ☐ Sloping & shoring for shallow (<5') excavations with cave-in hazard (specify below) ☐ O'Brien & Gere *Daily Excavation Checklist* to be completed by the Competent Person. ☐ Excavations ≥ 4' are classified as a non-permit confined space ☐ Excavations ≥ 4' are classified as Alternate Entry or Permit-Required (see confined space) ☐ Underground utilities have been identified and marked. ☐ Local "dig safe" organization has been notified for utility locations in public areas or rights of way. Number: _____ Date: _____ ☐ Hand digging within 3' of utility locations. ☐ Soft-dig/vacuum dig within ____' of utility locations. ☐ Excavations are protected by perimeter fencing (not barricade tape): (☐ rigid fence - chain link or wood ☐ safety fence 6' from edge.) **EXCAVATION COMMENTS:**
CONFINED SPACES		
☒ **NA**	☐ No Serious Hazards ☐ Toxic Atmosphere ☐ carbon monoxide ☐ hydrogen sulfide ☐ ☐ Flammable Atmosphere	☐ Confined space is altered so that it is no longer a confined space. (describe below) ☐ Confined space is downgraded to a non-permit confined space. (identify which spaces below) ☐ Alternate Entry is used. (Identify which space qualify for confined space entry below) ☐ Full permit-required confined space entry is used due to presence of serious hazards. ☐ Rescue team has been notified (☐ Paid FD ☐ Volunteer FD ☐ Plant Rescue)

HAZARD		HAZARD CONTROLS (check all that apply and comment as required)
	☐ Low Oxygen ☐ Combustible dust ☐ Drowning - high water level or potential for sudden changes in flow or level ☐ Other Serious Hazard:	Rescue Team:_____Phone Number: _____ ☐ All entrants and attendants for Alternate Entry and Permit-Required Entry have confined space entry training. ☐ Refer to "Manual Lifting" section of this JSA for manhole cover removal safety. **CONFINED SPACE COMMENTS:**
OVERHEAD POWERLINES		
☒ NA	OVERHEAD POWER LINES _____ KV _____ ft above ground _____ KV _____ ft above ground	☐ Request to de-energize lines will be submitted for work within 20' of power lines. Request sent to: _____ Date: _____ ☐ No one will be permitted to work <10' to power lines without lines being de-energized. ☐ Project persons are informed of 20' safety zone around energized power lines. ☐ Project persons are informed of additional restrictions required when working ≤20' but >10': ☐ Dedicated spotter for all elevated work or operation of equipment that can contact lines ☐ Barricades setup at 20' from base of power lines to establish a "restricted work area." ☐ "Power Line Safety Permit' required to work within 20' of power lines. ☐ Power lines are shielded and/or marked with high visibility material **POWER LINE COMMENTS:**
DRILLING / BORING - All self-propelled rigs including trailer-mounted drilling/boring equipment		
☐ NA	Struck By, Run-Over, Caught In Between (pinch points), Roll Over, Hot Work (open flame) Fluid Leaks ☒ Drilling/Boring Rig: specify type(s) below: Hollow Stem Auger Direct Push	☒ **Qualified persons operate all drilling/boring equipment. Qualifications were determined by:** ☐ Work Experience Summary on company letterhead or email with company email address. ☒ **Work experience verified by subcontractor.** ☒ **Equipment will be inspected upon mobilization by: Site Safety Coordinator and Operator.** NOTE - Inspections will include (but not be limited to) the following: leaks, defective safety equipment, and loose/unsecured parts that could fall during operation ☐ Operators will be reminded of **seatbelt** use by: _____ ☒ **High visibility vests are required for: All on site work.** ☒ **Cut-resistant gloves are required when handling cable, rods, and other sharp or "splintery" materials** ☒ **Chemical-resistant gloves and clothing are required while handling grout, cement, chemicals, or contaminated materials including soil or groundwater.** (Refer to "Environmental Hazards" section for more information.) ☒ **Operators and helpers will maintain a safe distance to moving parts. All those working near moving or rotating parts will secure loose hair, clothing, and equipment. All those working near the rods/casings are instructed to not put themselves in a position where they could get hurt if the rods/casings should turn or drop.** ☒ **Drill rods, casings, and other equipment will be stored neatly when not in use and secured to prevent them from falling on, or rolling into, site personnel.** ☒ **The area will be cleared of rope, cords, weed-block fabric, or similar material that could become wrapped around the auger, entangle someone and then pull them into the auger.** ☒ **Fall protection will be worn whenever (if) the drilling/boring mast must be climbed above 6'. (Tie-off Points are specified: ☒ in "Comments" below ☐ in the "Fall Protection" section)** ☐ Masts located within 20' of an **overhead power line** will only be lowered or raised with a

HAZARD		HAZARD CONTROLS (check all that apply and comment as required)
		dedicated spotter. (Refer to the "Overhead Powerlines" section of this JSA for additional safety precautions) ☒ **Drill rigs will only be moved with masts lowered**. ☐ Masts will be erected with **outriggers fully extended** when equipped with outriggers. ☐ Outriggers will be placed on a **firm, stable surface** or will be cribbed to prevent sinking of outriggers and collapse of the drilling/boring rig. ☒ **Drilling on sloped surfaces will be conducted such that the drilling/boring equipment remains stable and otherwise in accordance with requirements outlined below in Drilling/Boring comments.** ☐ Damage to **underground utilities** will be prevented by cribbing outriggers to spread the load or relocated outriggers so they are not placed on utilities. ☐ Procedures for responding to **natural gas emissions** (explosive vapors) are: ☐ Outlined in "Comments" below. ☐ Outlined in an attached procedure. ☐ Procedures for drilling/boring from a **barge** or otherwise working over water are: ☐ Outlined in "Comments" below. ☐ in the "Working Over Water" section. ☒ **Drilling/boring equipment will be de-energized and locked-out prior to maintenance.** ☒ **Site personnel working in the area surrounding the drilling/boring rig have will be informed where the emergency shutoff in the event of an emergency.** Specify the location of the shutoff in the "Comments" section below. ☒ **Spill equipment is available for fuel and hydraulic fluid leaks. Location; Drillers support vehicle.** **DRILLING/BORING COMMENTS:** **Emergency shutoff (kill switch) location to be identified prior to drilling activities.** **Drilling locations will be inspected prior to mobilization of the drill rig.** **Sloped areas, saturated ground surfaces and heavily rutted areas will be avoided if possible.** **Access improvements may be required if significant vegetation is present.** **Prior to climbing the mast, tie-off points for fall protection will be identified and inspected by the Site Safety Coordinator and Operator.**
HEAVY EQUIPMENT (other than cranes)		
☐ NA	Struck By, Run-Over, Caught In Between (pinch points), Roll Over, Fluid Leaks ☐ Excavator ☐ Dump Truck ☒ **mini Skid Steer (bobcat)** ☐ mini Excavator ☒ **Gator/Off-Road Vehicle** ☒ **Other: Stake Rack** ☐ Other:_____ ☐ Manlift - specify type(s):	☒ **Qualified persons operate all heavy equipment. Qualifications were determined by:** ☐ Work Experience Summary on company letterhead or email w/ company email address. ☒ Other (describe): **Work experience verified by subcontractor.** ☒ **Equipment will be inspected upon mobilization by: Site Safety Coordinator and Operator.** (NOTE - All leaks or defective safety equipment must be repaired before use.) ☒ **Operators are required to wear seatbelts for all equipment provided with seatbelts.** ☒ **High visibility vests are required for: All on site work.** ☐ Operators will review manufacturer's safety guidelines for all **equipment operated on slopes** including Gators© and similar ATVs/4x4's. (In the "Comments" section below, specify the maximum slope for each piece of equipment that will be operated on slopes. This may be completed upon mobilization.)

HAZARD		HAZARD CONTROLS (check all that apply and comment as required)
		☐ Dump trucks, 4x4's, or other haul vehicles will not be loaded beyond manufacturer **capacities or weight limits** established by state and local authorities for transportation. ☐ **Counterweight swing radius** will be barricaded. ☐ **Spotters** are required when trucks or other heavy equipment are backing up. Clarify procedure in "Comments" below. ☒ Operators and helpers will maintain a **safe distance to moving parts**. All those working near moving or rotating parts will secure loose hair, clothing, and equipment. ☐ Fall protection will be worn by all those in **manlifts** (scissor lifts are excepted: ☐ Yes ☐ NO) ☒ **Spill equipment is available for fuel and hydraulic fluid leaks. Location; Support vehicle.** **HEAVY EQUIPMENT COMMENTS:** **Personnel to remain upwind of heavy equipment exhausts whenever possible.** **Personnel should exercise extreme caution in the vicinity of operating equipment and machinery to avoid physical injury to themselves or others.** **Cell phones will not be used while operating heavy equipment and machinery or by workers on the ground in the area of heavy equipment and machinery operations to avoid physical injury to themselves or others.** **ATV operators will wear helmets and eye protection during operation.**
POWER TOOLS, HAND TOOLS, and EXTENSION CORDS		
☐ NA	eye injury, hand/arm cuts, electrical shock, strains, foot injuries, dust ☒ **Misc Handtools (shovels, hammers, trowels, etc.)** ☐ Chainsaws (Clearing & Grubbing) ☒ **Sharp hand-tools (knives, cutters, scissors)** ☐ Electrofishing (Fish Shocking) Equipment ☐ Hand Augers - Iwan or Spiral type ☐ Hand Sampler - Split Spoon or Thin Wall ☐ Hand Probe (GeoProbe) with ____ lb weight ☒ **Manual Cathead Hoist with 140 lb weight** ☒ **Motorized Cathead Hoist with 140 lb weight** ☐ Light-weight Motorized Auger drills (not truck-mounted) ☐ Manhole Lifting Devices **(specify in Comments)** ☐ Other (specify):	☒ **All tools and electrical cords in-use will be inspected daily by:** ☒ **Users** ☐ Site Supervisor/Safety Coordinator ☐ Other: _____ ☒ **Only the right tools will be used in a manner for which they were designed.** ☒ **GFCIs will be used on all extension cords and 120v power tools.** ☒ **All extension cords are in good condition with no cuts through outer insulation, ground plugs are present, and no "vinyl tape" repairs. (Only 12 gauge extension cords may be repaired.)** ☐ **Face shield** and safety glasses used (required for chain saws and chemical handling) ☐ **Kevlar chaps and jacket** (required for all chainsaw work) ☒ **Cut-resistant gloves are worn whenever cutting tools are used.** ☐ **Safety cutters or scissors are required for all cutting activities (no fixed-blade knives).** ☒ **Hearing protection required for which tools or areas: Power tools, equipment that generates sustained noise above 85 db.** ☐ All **hand augers and sampling probes** will be inspected and verified to be in good conditions with ALL parts required by the manufacturer. Inspections will be completed by: ☐ Users ☐ Site Supervisor/Safety Coordinator ☐ Other: _____ ☐ Persons using sampling probes equipped with **manual slide hammers** are physically capable of handling the weight without difficulty and keep hands clear of pinch-points. ☒ **Persons using manual and motorized cathead hoists have been trained on how to operate them in accordance with manufacturer guidelines. (Identify qualified persons by name in the "Comments" Section below.)** ☐ Electrofishing equipment will be **inspected** and verified to be in good conditions with ALL parts required by the manufacturer and exterior cords have no cuts through outer insulation and no "vinyl tape" repairs. Inspections will be completed by: ☐ Users ☐ Site Supervisor/Safety Coordinator ☐ Other: _____ ☐ Persons using **Electrofishing Equipment** have been **trained** on how to operate it in accordance with manufacturer guidelines. **(Identify qualified persons by name in the "Comments" Section below.)**

HAZARD		HAZARD CONTROLS (check all that apply and comment as required)
		☐ Electrofishing will be discontinued if the **public** approaches within **100'** ☐ Electrofishing boats will be marked with "**Danger Electricity**" signs (or equivalent) that can be read at a distance of **150'**. ☐ All electrofishing team members wear **electrically-rated rubber gloves** that are inspected daily by users and replaced every 6 months. Use leather or other cut-resistant gloves to protect the rubber gloves. (Similar to NFPA 70E requirements.) ☐ All electrofishing team members wear **chest or hip waders** to insulate the wearer from electrical shock. ☐ **Net handles** for nets used during electrofishing will be nonconductive and long enough to keep hands out of the water. ☐ The positive electrode (anode) on portable electroshockers is equipped with a **manual switch** that stops the current when released and is **not "bypassed'** with a hold-down mechanism (i.e., tape) ☐ At least **two (2) persons** on each Electrofishing boat or location are trained in **CPR**. ☐ All persons involved in electrofishing know the location of the **emergency shutoff switch**. ☐ **Backpack electrofishing equipment** is equipped with a **tilt switch** that stops the current if the operator falls. **POWER TOOLS, HAND TOOLS & AUGERS, EXTENSION CORDS, & ELECTROFISHING COMMENTS:** **Cathead hoists to by operated by: Drilling subcontractor** **Anticipated tools to be used may include but are not limited to: hammers, wrenches, screwdrivers, power drills/impact drivers, knives/cutting implements, pry bars, shovels, drum dollies.**
WORKING OVER/NEAR WATER OR ON ICE		
☒ NA	**drowning, hypothermia (winter months), spills to surface waterways, fall through ice** ☐ Barge-mounted drilling/boring rigs ☐ Sampling from a boat ☐ Boat required for site access ☐ Work on an ice covered body of water ☐ Other: **NOTE – See "Walking Surfaces" section of JSA for slipping hazards on icy surfaces.**	☐ 100% Fall Protection while working over water or when otherwise exposed to a drowning hazard. **(Describe how fall protection will be implemented, Tie-off points, and the equipment that will be used.** ☐ in "Comments" below ☐ in the "Fall Protection" section) ☐ A "**safety observer**" will remain on shore with the ability to contact emergency response personnel and communicate with those on boats/barges. ☐ USG-approved **flotation vests** will be used. ☐ **Ring-buoy** with 90' of rope and placed within 100' of site personnel. ☐ **Rescue skiff** will be staged such that one person can immediately launch the skiff. ☐ At least **one person will be available to launch** and operate the rescue skiff. NOTE - "Safety Observer" may launch rescue skiff after making emergency response notification(s). ☐ Ice Safety - **Core samples** will be taken every 100' on lakes or 50' on rivers to evaluate the thickness and quality of ice (i.e., *clear/blue ice* = best quality, *white/opaque ice* = moderate quality/use caution, *gray/slushy ice* = poor quality/unsafe). ☐ Ice Safety - Conservative **load estimates** are established for static and/or moving loads as appropriate for the type of work being conducted. Load estimates are explained: ☐ in "Comments" below ☐ in an attached document ☐ Spill Control - **Floating booms** will be used around barges, shore-based heavy equipment, or other locations where hydraulic fluid may leak from equipment into surface water. ☐ Spill Control - **Silt curtains** will be suspended below floating booms. ☐ Boats and Barges will not be operated above their **weight capacity**. ☐ Boats and barges operated (or potentially operated) in **bad weather** will be operated below their weight capacity by _____% (suggest at least 25%). ☐ Boat and barge emergency calls - **Weather resistant radios** that broadcast on Coast Guard frequencies (Channel 16 VHF/FM or 2182 MHZ) will be available for emergency calls. ☐ Boat or barge-based operations will be discontinued when NOAA issues a **small craft**

HAZARD		HAZARD CONTROLS (check all that apply and comment as required)
		advisory or when sustained **wind speeds of 20 mph** are observed and create dangerous wave or boat/barge handling conditions. ☐ **NOAA Weather Radio Receiver** will be used to monitor weather conditions that may affect boat or barge-based activities. **WORKING OVER WATER COMMENTS:**
MANUAL MATERIAL HANDLING & STORAGE / HOUSEKEEPING / WALKING SURFACES (includes manhole covers, heavy lifting, slippery surfaces, and steep slopes)		
☐ NA	back or shoulder strain, struck by falling objects, trips and falls, incompatible materials (fire or explosion) ☒ **hvy manual lifting (>50 lbs)** ☐ chemical storage ☒ **compressed gas storage** ☐ Tall storage greater than 2 pallets stacked. ☒ **Material & equipment laydown areas** ☒ **Trash & debris removal** ☐ Manhole Cover Removal ☒ **Tripping Hazard (cords, hoses, uneven surfaces)** ☒ **Slipping Hazard (icy, muddy, oily, etc.)** ☒ **Steep sloped surfaces** ☐ ☐	☒ **Mechanical lifting equipment used to reduce manual material handling:** (☐ Forklift/Lull ☒ **Heavy Equipment** ☐ Dolly ☐ _____) ☒ **Manual lifting more than 75 lbs by a single person will be avoided.** ☐ Good manual lifting techniques will be reviewed with the following trades/persons prior to site work: _____ ☐ Incompatible chemicals will be separated by 20' or a concrete block wall. ☐ Secondary containment will be provided for the following chemicals: _____ _____ ☐ Safety equipment will be located near chemical storage. ☐ Spill Kit ☐ Emergency Shower ☐ Eyewash ☐ Drench Hose ☐ Splash PPE ☐ Flammable gases and oxygen will be separated by 20'. ☒ **All compressed gas cylinders will be transported vertically and secured upright.** ☒ **Equipment and materials will be stacked in laydown areas with aisles as necessary for safe access. All un-used equipment & materials will be returned to laydown areas daily. Designated laydown areas:**_____ ☐ Materials will not be stacked greater than 2 pallets high without being secured. ☒ **Trash and debris will be removed daily and placed in designated containers. Specify debris segregation and location of disposal containers below.** ☐ Hoses & Cords will be run out of walkways (e.g., within 6" of walls or 7.5' overhead) whenever possible or will be clearly marked by cones or barricades. ☐ All chemical containers will be labeled per Hazard Communication requirements. ☐ **Manhole covers** will ONLY be removed with tools specifically designed to remove them including J-hooks that are at least **30"** long. No pry bars, shovels, or screw drivers. ☐ **"Stuck" manhole** removal equipment and procedures are described in "comments." ☐ **"Paved-over"** manhole removal equipment and procedures are described in "comments." ☒ **Slippery surface – work area inspected for icy surfaces which will be salted/sanded.** ☒ **Slippery surface –YakTrax® or similar slip-on traction devices will be used for icy areas.** **MATERIAL HANDLING & HOUSEKEEPING COMMENTS:** **Proper lifting techniques will be employed (*e.g.*, two-man lift, bending at the knees, limited pivoting at the waist).** **Heavy manual lifting may include but is not limited to: generators, submersible pumps/control boxes, air compressors, gas cylinders, drilling rods/equipment.**
ROADWAY, RAILROAD, & SIDEWALK OBSTRUCTION		
☒ NA	☐ Vehicle accidents ☐ Pedestrians struck by vehicles or heavy equipment ☐ Pedestrians falls ☐ Pedestrian struck-by falling objects ☐ Railroad accidents	☐ DOT signal devices will be used to re-route vehicles around excavations or busy site entrances/exits that affect road traffic. ☐ Roadway Flaggers will be used and have DOT Flagger Training ☐ Procedures for work vehicles to enter/exit traffic work zones are required when work zones are setup in high speed roadways or when potential blind-spots exist. Explain in "Comments." ☐ Pedestrian traffic will be safely routed around or over excavations. ☐ Pedestrian traffic will be safely routed around or under overhead work.

HAZARD		HAZARD CONTROLS (check all that apply and comment as required)
		☐ Railroad owner notified for permission to work on the railroad right-of-way. ☐ Railroad flagger is required for work in the right-of-way. ☐ Equipment, materials, and personnel may not be closer than 15' to the nearest railroad rail if the railroad flagger or the flagger's signal is not visible. ☐ Derailer(s)/bumper(s) will be installed on railroad tracks to isolate the work area. **ROADWAY, RAILROAD, & SIDEWALK COMMENTS:**
BIOLOGICAL HAZARDS		
☐ NA	Infection, Lyme Disease, West Nile Virus, Eastern Equine Encephalitis (EEE), Severe Rash, Allergic Reaction, Venom effects ☒ **Ticks** ☒ **Mosquitoes (EEE, WNV, etc)** ☐ Venomous Snakes ☐ Venomous Spiders ☒ **Poison Ivy, Oak, or Sumac** ☒ **Bees & Wasps** ☐ Fire Ants ☒ Other (identify below): Biting Animals	☒ **Use DEET (25%-98%) repellent on skin for protection against mosquitoes, ticks, and similar insects. Use higher concentrations for heavily infested areas.** ☒ **Use Permethrin repellent on clothing in areas heavily infested with ticks, chiggers, etc.** ☐ All site personnel will be instructed on how to **identify poison ivy, sumac, and oak**. (O'Brien & Gere Field Identification Guide or equiv. has been posted? ☐ YES ☐ NO) ☐ Poison ivy **barrier creams** (e.g., Ivy Block) will be used on exposed skin prior to the workday. ☒ **Poison ivy neutralizing wipes or rubbing alcohol will be used on hands and exposed skin following work activities or incidents where contact with poison ivy/oak/sumac is suspected.** ☒ **Protective coveralls (such as Tyvek™) may be used to prevent contact with ticks or poison ivy.** ☐ All site personnel will be instructed on how to identify venomous snakes indigenous to the area. List venomous snakes of concern in the "Comments" section below. (O'Brien & Gere Field Identification Guide or equiv. has been posted? ☐ YES ☐ NO) ☐ All field personnel with a potential to **encounter venomous snakes** will wear: ☐ Snake Chaps AND/OR ☐ High Leather Safety Boots (NOT ankle-high boots/shoes) ☐ All site personnel will be instructed on how to identify **venomous spiders** indigenous to the area. List venomous spiders of concern in the "Comments" section below. (O'Brien & Gere Field Identification Guide or equiv. has been posted? ☐ YES ☐ NO) ☒ **Site personnel with known allergies to bee/wasp stings, fire ant bites, or other insect bites carry an "EpiPen" or equivalent medication prescribed for treating allergic reaction. Site Safety Coordinator will be notified by personnel with allergies.** **BIOLOGICAL HAZARDS COMMENTS:**
ENVIRONMENTAL HAZARDS / HAZARDOUS WASTE SITE WORK		
☐ NA	Exposure to hazardous vapors or dust, contact with contaminated materials, fire, explosion. Contaminants of Concern and hazardous chemicals include: ☒ **volatile organic compounds (describe: chlorinated solvents)** ☐ **semi-volatile organic compounds (describe: dichlorobenzene, trichlorobenzene and phenol compounds)**	☒ **Site workers with a potential for contact with contaminated materials and work in Level C PPE will have OSHA 40-hour training, current 8-hour refresher, and medical exam.** ☒ **Site workers with minimal contact with contaminated materials and no work in Level C PPE will have OSHA 40-hour OR 24-hour training, current 8-hour refresher, and medical exam.** ☐ Foremen or Supervisors overseeing field crews will have 8-hour OSHA Supervisor training. ☐ No intrusive work activities or areas are anticipated with current scope of work. ☒ **Intrusive work activities include: Drilling and installation of soil borings and bedrock borings/groundwater monitoring wells** ☒ **The perimeter of intrusive work areas are identified by: Site Safety Coordinator** ☐ Decontamination of personnel or equipment is not anticipated with the current scope of work. ☒ **Decontamination of personnel and small tools will be conducted as follows: Phosphate-free detergent wash and distilled water rinse.** ☒ **Decontamination of heavy equipment will be conducted as follows: Pressure /**

HAZARD	HAZARD CONTROLS (check all that apply and comment as required)
☒ metal dusts (describe:Lead) ☐ PCBs ☐ Caustic (NaOH) ☐ Acid (H2SO4, HCL) ☐ **BTEX** ☐ (many other hazardous waste site hazards are covered elsewhere in this JSA)	**Steam-wash or equivalent.** ☒ **Heavy equipment leaving the site will be inspected by: Site Safety Coordinator** ☐ **Work area air monitoring** is not anticipated with the current scope of work. ☒ **Work area air monitoring will be conducted per attached air monitoring plan.** ☒ **Work Area Air Monitoring as follows for:** ☐ **Dust,** ☒ **VOCs,** ☐ **Other:**_____ **Description:**

Action Levels[1]	Description & Response Actions
<5 ppm for Total VOCs	Level D PPE (General PPE as required in this JSA)
5 – 50 ppm for Total VOCs	1. Half or Full Face Level C PPE - Tyvek, boot covers, nitrile gloves, half or full face w/ respirator with Organic vapor/P100 cartridges changed (☒ daily, ☐ _____) OR 2. Implement additional engineering or administrative controls to reduce contaminant concentrations below action level(s).
50 – 200 ppm for Total VOCs	1. Full Face Level C PPE - Tyvek, boot covers, nitrile gloves, full face w/ respirator with Organic vapor/P100 cartridges changed (☒ daily, ☐ _____) OR 2. Implement additional engineering or administrative controls to reduce contaminant concentrations below action level(s).
>200 ppm for Total VOCs	1. STOP work until contaminant levels can be reduced. 2. Notify the Project Manager and Client Representative.
1. Sustained 1 minute	

☐ **Community Air Monitoring** is not anticipated with the current scope of work.
☒ **Community Air Monitoring** is required per the CAMP provided in the HASP.
☒ **Community Air Monitoring** as follows for: ☒ Dust, ☒ VOCs, ☐ Other:_____
Description: _____

ENVIRONMENTAL & CHEMICAL HAZARD COMMENTS:

To minimize potential exposure to COCs, disposable gloves will be worn. Personnel should remain upwind of the well being drilled whenever possible.

OTHER HAZARDS & CONTROLS not addressed in other sections of this JSA

☐ NA	☒ **Heat Stress** ☒ **Cold Stress** ☐	☒ **Site workers will be trained to recognize the symptoms of heat/cold stress.** ☒ **Work/rest regimens will be employed by as necessary so that personnel do not suffer adverse effects from heat/cold stress.**

EMERGENCY RESPONSE

(911 Service is Available ☒ Yes ☐ No **Cell Phone Required** ☒ Yes ☐ No)

Alternate Emergency Number (if not "911"):

Site Address: 121-125 Lake Street, Ithaca, NY

Muster Point in case of site evacuation: Evacuated personnel will assemble south of the site along Lake Street.

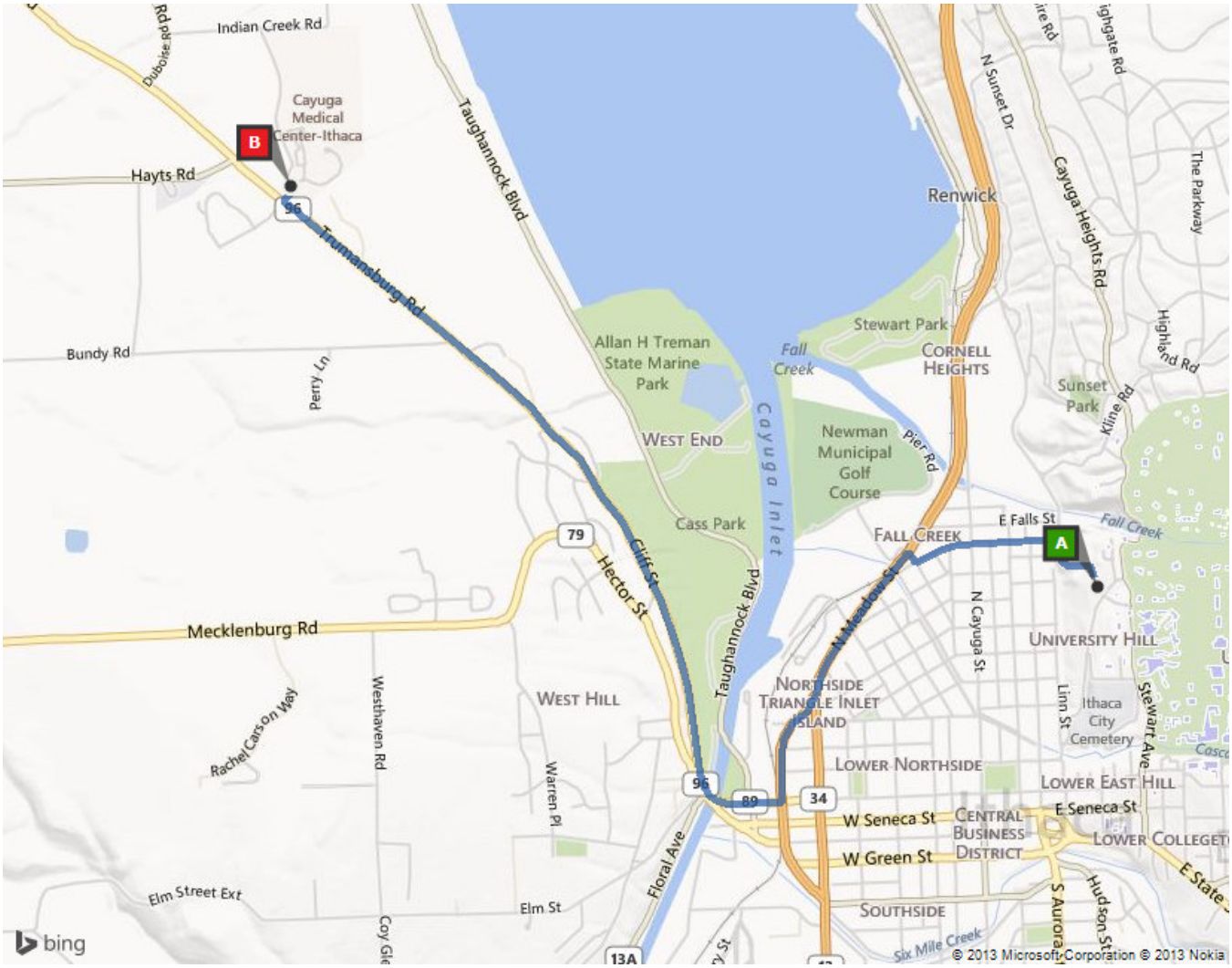
Emergency Medical Treatment - Hospital Name: Hospital Address:	**Cayuga Medical Center** **101 Dates Drive, Ithaca, NY 14850**	**Number:**	**(607) 274-4011**
Non-Emergency Med. Treatment - Clinic Name: Occupational Clinic Address:		**Number:**	
Minor Injury Support for OBG Employees:	**WorkCare Incident Intervention**	**Number:**	(888) 449-7787
Fire Department Name		**Number:**	**(607) 272-1234**
Spill Response:	**National Spill Response Center**	**Number:**	**(800) 424-8802**
Client Representative Name::	**Frost Travis**	**Office Number:**	
		Cell Number:	
O'Brien & Gere **Project Manager** Name:	**Deb Wright**	**Office Number:**	**(315) 956-6377**
		Cell Number:	**(315) 546-4541**
O'Brien & Gere **Corporate H&S** Name:	**Jeff Parsons**	**Office Number:**	**(315) 956-6871**
		Cell Number:	**(315) 391-0638**
Contact Name:	**TBD**	**Office Number:**	
		Cell Number:	
Contact Name:		**Office Number:**	
		Cell Number:	

EMERGENCY RESPONSE COMMENTS:

1. NOTIFICATIONS - Upon occurrence of any injury, fire, explosion, major spill (beyond incidental), property damage >$1,000, or near-miss that could have resulted in a fatality or disabling injury, **IMMEDIATELY NOTIFY** the O'Brien & Gere Project Manager, O'Brien & Gere Manager of Corporate H&S, and the Client Representative.
2. WRITTEN REPORT - Complete an *Incident Report* within **24 hours** and submit to the O'Brien & Gere Manager of Corporate H&S for review. Report may be submitted as a "draft" or "preliminary" and updated as additional information is identified.
3. INJURY RESPONSE
   - First aid injuries will be handled on site with FA-trained personnel. First aid and CPR supplies are located: **Inside Field Vehicle**.
   - **All O'Brien & Gere employees will call WorkCare for minor injuries** that include any strains, cuts for which an employee is not confident that a band aid is sufficient, tick/insect bites for which the employee is concerned about infection or Lyme, and any other work-related injury for which the employee would like to talk to a WorkCare medical professional regarding proper treatment or follow-up.
   - **WorkCare posters must be posted at each job site with a field office or trailer.**
   - Minor (not life threatening) injuries that require medical attention will be treated at the "Non-Emergency Med Treatment" clinic identified above **unless an alternate clinic is recommended by WorkCare**. If no clinic is available or identified, then default to the "Emergency Medical Treatment" facility.
   - Life Threatening injuries are an emergency and require implementing emergency response (911 or alternate).
4. FIRE or EXPLOSION
   - Incipient stage (trash can size) fires may be handled by site personnel using fire extinguishers or hoses.
   - Larger fires will require that affected personnel are evacuation to the identified muster point and implementing emergency response (911 or alternate).
5. SPILL RESPONSE
   - Major spills that exceed the available supplies and resources to safely control and cleanup will require contacting an off-site spill responder indicated above for "Spill Response" and in accordance with existing site spill response plans. If a specific spill responder is not identified, a large spill will require implementing emergency response (911 or alternate).
   - Review available spill control and prevention plans that may be applicable to the work area. Ensure project personnel are familiar with plan requirements.

- Minor or incident spills will be cleaned up by site personnel using supplies that are located: At the pole barn or vehicle.
- The site owner will make notifications for reportable spills unless O'Brien & Gere is authorized to make those notifications.

6. POSTING - Emergency numbers and Hospital Route Map are posted: At the pole barn or vehicle.
7. OTHER EMERGENCY INFORMATION:



1. Depart Lake St toward E Lincoln St / Lincoln St E 0.2 mi

2. Turn left onto E Lincoln St / Lincoln St E 0.3 mi

3. Road name changes to W Lincoln St 0.2 mi

4. Turn right onto Dey St, and then immediately turn left onto RT-13 / RT-34 / N Meadow St 0.5 mi

5. Bear right onto RT-13 S / RT-34 S / N Fulton St 0.4 mi

6. Turn right onto RT-89 / RT-96 / W Buffalo St 505 ft

7. Keep straight onto RT-96 / W Buffalo St 2.4 mi

8. Turn right onto Harris B Dates Dr 253 ft

9. Turn left to stay on Harris B Dates Dr 49 ft

10. Arrive at 101 Harris B Dates Dr, Ithaca, NY 14850

The last intersection is W Hill Dr

If you reach Indian Creek Rd, you've gone too far

Pre-Work Briefing Acknowledgement: Individuals who are performing work covered by this JSA have received a **project-specific safety orientation** that includes a review of the safety requirements outlined in this JSA. The undersigned individuals acknowledge that have read this JSA and/or reviewed this JSA with a designated project representative and agree to comply with safety requirements outlined herein. The undersigned individuals understand that these safety requirements are not "all-inclusive" and that they are expected to follow any additional safe work practices applicable or customary to their specific scope of work or trade.

Print Name	Signature	Company	Date

Safety to Zero (S_20) – Safety Planning Is Critical To Our Ultimate Goal Of Zero Injuries

Project Name:	Former Ithaca Gun Factory Site	**OBG Project Officer:**	James R. Heckathorne
Project Number:		**OBG Project Manager (PM):**	Deb Wright
JSA Title:	Decontamination	**OBG Site Supervisor:**	TBD
JSA Revision Date:	10/24/13	**OBG Site Safety Coordinator:**	TBD
JSA Prepared By:	Dave Carnevale		
Client Name:	IFR Development LLC	**Subcontractor Company Name:**	(☐ NA) Multiple (see below)
Project Location:	Ithaca, New York	**Subcontractor Project Manager:**	TBD
Project Phone No.:	TBD	**Subcontractor Superintendent:**	TBD
Project Fax No.:	TBD	**Sub Safety Competent Person:**	TBD

Scope of Work covered by this JSA (identify subcontractors covered by this JSA)	Decontamination procedures will be implemented to minimize the potential for cross-contamination between drilling and testing locations, and to minimize tracking of subsurface contaminants across the site. All tools and equipment, machinery, pumps PPE, etc. that has been in contact with contaminated soils/groundwater will undergo decontamination. In addition, drill rigs and support vehicles will be decontaminated prior to entry to the site, and prior to leaving the site. Clean water will be used for all decontamination procedures. On-Site subcontractors include: TBD
References (existing safety plans, manuals, spec's, etc.)	O'Brien & Gere, May 2008, Ithaca Gun Site Health and Safety Plan.
Key Hazards (focus on highly hazardous tasks)	Exposure/contact with contaminated materials, heat/cold stress, slips trips falls,
Personal Protective Equipment Summary	*(additional safety equipment may be required for specific hazards identified in the following sections)* ☒ Hard Hat ☒ Safety Glasses ☒ Safety Shoes ☒ Cut-Resistant Gloves ☒ Ear Protection Other (specify): ☒ **High Visibility Vests** (required for all on site work.) ☒ **Ear Protection** (heavy equipment, generator, pressure washer, etc.) ☐ Fall Protection Harness & Lanyard (falls >6') ☐ Respiratory Protection (☐ N95 dust mask, ☐ half face, ☐ full-face) Specify cartridge in JSA. ☒ **Tyvek** or other chemical protective coverall: (when there is the potential for contact with contaminated materials / biological hazards.) ☒ Face Shield (chemical handling, line breaks, pressure washing.) ☒ **Nitrile Gloves** (☐ Surgical Type and/or ☐ "Dishwashing" Type) ☒ **Cut-resistant gloves** are required when handling cable, rods, and sharp or "splintery" materials

Pre-Work Documentation & Certifications *(Refer to JSA content for additional certifications and documentation that may be required.)*	**Documentation and Certifications**	**To Be Submitted or Provided By…….**
	☐ Drug Testing (☐ alcohol testing is also required)	
	☒ **Project Safety Plan or Job Safety Analysis (JSA)**	**OBG Project Manager – Deb Wright**
	☐ Client/Facility Contractor Safety Orientation	
	☒ **Project Safety Orientation (JSA Review)**	**OBG Site Safety Coordinator – TBD**
	☒ **Daily Safety Meetings (Daily Pre-Task Planner)**	**OBG Site Safety Coordinator – TBD**
	☐ Verification of Hazwoper Medical Surveillance	
	☒ **OSHA 40-hr Hazwoper w/ current 8-hr Refresher**	**All on site OBG and subcontractor personnel**
	☐ Respirator Training, Fit Test, and Resp. Medical	
	☐ Confined Space Entry Certification (necessary for permit-required entry or non-permit designations)	
	☐ Excavation Competent Person designation	
	☐	

Permits applicable to scope of work	☐ Confined Space Entry Permit ☐ Hot Work Permit ☐ Energized Electrical Work Permit (from sub)	☐ Daily Excavation Inspection Checklist ☐ ☐

Individuals must sign the "Pre-Work Briefing" form on the last page after reviewing this JSA.

HAZARD		HAZARD CONTROLS (check all that apply and comment as required)
ELEVATED WORK		
☒ NA	FALLS > **6'** or within **15'** of a ROOF OR MEZZANINE EDGE where the fall is >6'	☐ Existing Guardrails ☐ Hole Covers Marked "HOLE" ☐ Fall Restraint ☐ Temporary Guardrails ☐ Manlifts used for elevated work ☐ _____ ☐ Warning Line 15' from Edge ☐ Fall Arrest w/ harness/lanyard (identify tie-off points) **Fall Protection Comments (describe equipment used):**
☒ NA	LADDERS / STAIRS ☐ Extension Ladders ☐ Step Ladders ☐ Fixed Ladders ☐ Stairs	☐ Employees training in safe ladder use at toolbox safety meeting ☐ Extension ladders are properly footed, secured at top, and setup at proper angle ☐ Stepladders are set on level ground or properly shimmed with spreaders locked. ☐ Stairs have proper rise over run and stairs >4 steps or 4' have guardrails. **LADDERS/STAIRS COMMENTS:**
EXCAVATIONS / TRENCHING		
☒ **NA**	☐ Max Depth ≥ 20' ☐ Max Depth ≥ 5' ☐ Max Depth <5' with potential cave-in hazard ☐ Potential permit-required confined space at depth ≥ 4' ☐ Underground utilities ☐ Structures/foundations ☐ Falls into excavations ☐ Other:	☐ Excavation Competent Person Name:_____ Company _____ ☐ Sloping & shoring for excavations ≥20' are approved by a professional engineer ☐ Sloping & shoring for excavations ≥5' when persons are exposed to cave-in. (specify below) ☐ Sloping & shoring for shallow (<5') excavations with cave-in hazard (specify below) ☐ O'Brien & Gere *Daily Excavation Checklist* to be completed by the Competent Person. ☐ Excavations ≥ 4' are classified as a non-permit confined space ☐ Excavations ≥ 4' are classified as Alternate Entry or Permit-Required (see confined space) ☐ Underground utilities have been identified and marked. ☐ Local "dig safe" organization has been notified for utility locations in public areas or rights of way. Number: _____ Date: _____ ☐ Hand digging within 3' of utility locations. ☐ Soft-dig/vacuum dig within ____' of utility locations. ☐ Excavations are protected by perimeter fencing (not barricade tape): (☐ rigid fence - chain link or wood ☐ safety fence 6' from edge.) **EXCAVATION COMMENTS:**
CONFINED SPACES		
☒ **NA**	☐ No Serious Hazards ☐ Toxic Atmosphere ☐ carbon monoxide ☐ hydrogen sulfide ☐ ☐ Flammable Atmosphere ☐ Low Oxygen ☐ Combustible dust ☐ Drowning - high water level or potential for	☐ Confined space is altered so that it is no longer a confined space. (describe below) ☐ Confined space is downgraded to a non-permit confined space. (identify which spaces below) ☐ Alternate Entry is used. (Identify which space qualify for confined space entry below) ☐ Full permit-required confined space entry is used due to presence of serious hazards. ☐ Rescue team has been notified (☐ Paid FD ☐ Volunteer FD ☐ Plant Rescue) Rescue Team:_____Phone Number: _____ ☐ All entrants and attendants for Alternate Entry and Permit-Required Entry have confined space entry training. ☐ Refer to "Manual Lifting" section of this JSA for manhole cover removal safety.

	HAZARD	HAZARD CONTROLS (check all that apply and comment as required)
	sudden changes in flow or level ☐ Other Serious Hazard:	**CONFINED SPACE COMMENTS:**
OVERHEAD POWERLINES		
☒ NA	OVERHEAD POWER LINES _____ KV _____ ft above ground _____ KV _____ ft above ground	☐ Request to de-energize lines will be submitted for work within 20' of power lines. Request sent to: _____ Date: _____ ☐ No one will be permitted to work <10' to power lines without lines being de-energized. ☐ Project persons are informed of 20' safety zone around energized power lines. ☐ Project persons are informed of additional restrictions required when working ≤20' but >10': ☐ Dedicated spotter for all elevated work or operation of equipment that can contact lines ☐ Barricades setup at 20' from base of power lines to establish a "restricted work area." ☐ "Power Line Safety Permit' required to work within 20' of power lines. ☐ Power lines are shielded and/or marked with high visibility material **POWER LINE COMMENTS:**
DRILLING / BORING - All self-propelled rigs including trailer-mounted drilling/boring equipment		
☒ NA	Struck By, Run-Over, Caught In Between (pinch points), Roll Over, Hot Work (open flame) Fluid Leaks ☐ Drilling/Boring Rig: specify type(s) below: Hollow Stem Auger Air Rotary Other	☐ Qualified persons operate all drilling/boring equipment. Qualifications were determined by: ☐ Work Experience Summary on company letterhead or email with company email address. ☐ ☐ Equipment will be inspected upon mobilization by: NOTE - Inspections will include (but not be limited to) the following: leaks, defective safety equipment, and loose/unsecured parts that could fall during operation) ☐ Operators will be reminded of seatbelt use by: _____ ☐ High visibility vests are required for: ☐ Cut-resistant gloves are required when handling cable, rods, and other sharp or "splintery" materials ☐ Chemical-resistant gloves and clothing are required while handling grout, cement, chemicals, or contaminated materials including soil or groundwater. (Refer to "Environmental Hazards" section for more information.) ☐ Operators and helpers will maintain a safe distance to moving parts. All those working near moving or rotating parts will secure loose hair, clothing, and equipment. All those working near the rods/casings are instructed to not put themselves in a position where they could get hurt if the rods/casings should turn or drop. ☐ Drill rods, casings, and other equipment will be stored neatly when not in use and secured to prevent them from falling on, or rolling into, site personnel. ☐ The area will be cleared of rope, cords, weed-block fabric, or similar material that could become wrapped around the auger, entangle someone and then pull them into the auger. ☐ Fall protection will be worn whenever (if) the drilling/boring mast must be climbed above 6'. (Tie-off Points are specified: ☐ in "Comments" below ☐ in the "Fall Protection" section) ☐ Masts located within 20' of an overhead power line will only be lowered or raised with a dedicated spotter. (Refer to the "Overhead Powerlines" section of this JSA for additional safety precautions) ☐ Drill rigs will only be moved with masts lowered. ☐ Masts will be erected with outriggers fully extended when equipped with outriggers. ☐ Outriggers will be placed on a firm, stable surface or will be cribbed to prevent sinking of outriggers and collapse of the drilling/boring rig. ☐ Drilling on sloped surfaces will be conducted such that the drilling/boring equipment remains stable and otherwise in accordance with requirements outlined below in Drilling/Boring comments.

HAZARD		HAZARD CONTROLS (check all that apply and comment as required)
		☐ Damage to underground utilities will be prevented by cribbing outriggers to spread the load or relocated outriggers so they are not placed on utilities. ☐ Procedures for responding to natural gas emissions (explosive vapors) are: ☐ Outlined in "Comments" below. ☐ Outlined in an attached procedure. ☐ Procedures for drilling/boring from a barge or otherwise working over water are: ☐ Outlined in "Comments" below. ☐ in the "Working Over Water" section. ☐ Drilling/boring equipment will be de-energized and locked-out prior to maintenance. ☐ Site personnel working in the area surrounding the drilling/boring rig have will be informed where the emergency shutoff in the event of an emergency. Specify the location of the shutoff in the "Comments" section below. ☐ Spill equipment is available for fuel and hydraulic fluid leaks. Location; _____ **DRILLING/BORING COMMENTS:**
HEAVY EQUIPMENT (other than cranes)		
☐ NA	Struck By, Run-Over, Caught In Between (pinch points), Roll Over, Fluid Leaks ☐ Excavator ☐ Dump Truck ☒ mini Skid Steer (bobcat) ☐ mini Excavator ☐ Gator/Off-Road Vehicle ☐ Other: ☐ Other: ☐ Manlift - specify type(s):	☒ Qualified persons operate all heavy equipment. Qualifications were determined by: ☐ Work Experience Summary on company letterhead or email w/ company email address. ☒ Other (describe): **Work experience verified by subcontractor.** ☒ Equipment will be inspected upon mobilization by: Operator. (NOTE - All leaks or defective safety equipment must be repaired before use.) ☒ Operators are required to wear seatbelts for all equipment provided with seatbelts. ☐ High visibility vests are required for: Working on Bow Hunters Club property. ☐ Operators will review manufacturer's safety guidelines for all equipment operated on slopes including Gators© and similar ATVs/4x4's. (In the "Comments" section below, specify the maximum slope for each piece of equipment that will be operated on slopes. This may be completed upon mobilization.) ☐ Dump trucks, 4x4's, or other haul vehicles will not be loaded beyond manufacturer capacities or weight limits established by state and local authorities for transportation. ☐ Counterweight swing radius will be barricaded. ☐ Spotters are required when trucks or other heavy equipment are backing up. Clarify procedure in "Comments" below. ☒ Operators and helpers will maintain a safe distance to moving parts. All those working near moving or rotating parts will secure loose hair, clothing, and equipment. ☐ Fall protection will be worn by all those in manlifts (scissor lifts are excepted: ☐ Yes ☐ NO) ☐ Spill equipment is available for fuel and hydraulic fluid leaks. Location; **Field support vehicle** HEAVY EQUIPMENT COMMENTS: **Personnel to remain upwind of heavy equipment exhausts whenever possible.** **Sloped areas, saturated ground surfaces and heavily rutted areas will be avoided if possible.** **Personnel should exercise extreme caution in the vicinity of operating equipment and machinery to avoid physical injury to themselves or others.** **Cell phones will not be used while operating heavy equipment and machinery or by workers on the ground in the area of heavy equipment and machinery operations to avoid physical injury to themselves or others.**
POWER TOOLS, HAND TOOLS, and EXTENSION CORDS		

HAZARD		HAZARD CONTROLS (check all that apply and comment as required)
☒ NA	eye injury, hand/arm cuts, electrical shock, strains, foot injuries, dust ☐ Misc Handtools (shovels, hammers, trowels, etc.) ☐ Chainsaws (Clearing & Grubbing) ☐ Sharp hand-tools (knives, cutters, scissors) ☐ Electrofishing (Fish Shocking) Equipment ☐ Hand Augers - Iwan or Spiral type ☐ Hand Sampler - Split Spoon or Thin Wall ☐ Hand Probe (GeoProbe) with ____ lb weight ☐ Manual Cathead Hoist with 140 lb weight ☐ Motorized Cathead Hoist with 140 lb weight ☐ Light-weight Motorized Auger drills (not truck-mounted) ☐ Manhole Lifting Devices (specify in Comments) ☐ Other (specify):	☐ All tools and electrical cords in-use will be inspected daily by: ☐ Users ☐ Site Supervisor/Safety Coordinator ☐ Other: _____ ☐ Only the right tools will be used in a manner for which they were designed. ☐ GFCIs will be used on all extension cords and 120v power tools. ☐ All extension cords are in good condition with no cuts through outer insulation, ground plugs are present, and no "vinyl tape" repairs. (Only 12 gauge extension cords may be repaired.) ☐ Face shield and safety glasses used (required for chain saws and chemical handling) ☐ Kevlar chaps and jacket (required for all chainsaw work) ☐ Cut-resistant gloves are worn whenever cutting tools are used. ☐ Safety cutters or scissors are required for all cutting activities (no fixed-blade knives). ☐ Hearing protection required for which tools or areas: Power tools, equipment that generate sustained noise above 85 db. ☐ All hand augers and sampling probes will be inspected and verified to be in good conditions with ALL parts required by the manufacturer. Inspections will be completed by: ☐ Users ☐ Site Supervisor/Safety Coordinator ☐ Other: _____ ☐ Persons using sampling probes equipped with manual slide hammers are physically capable of handling the weight without difficulty and keep hands clear of pinch-points. ☐ Persons using manual and motorized cathead hoists have been trained on how to operate them in accordance with manufacturer guidelines. (Identify qualified persons by name in the "Comments" Section below.) ☐ Electrofishing equipment will be inspected and verified to be in good conditions with ALL parts required by the manufacturer and exterior cords have no cuts through outer insulation and no "vinyl tape" repairs. Inspections will be completed by: ☐ Users ☐ Site Supervisor/Safety Coordinator ☐ Other: _____ ☐ Persons using Electrofishing Equipment have been trained on how to operate it in accordance with manufacturer guidelines. (Identify qualified persons by name in the "Comments" Section below.) ☐ Electrofishing will be discontinued if the public approaches within 100' ☐ Electrofishing boats will be marked with "Danger Electricity" signs (or equivalent) that can be read at a distance of 150'. ☐ All electrofishing team members wear electrically-rated rubber gloves that are inspected daily by users and replaced every 6 months. Use leather or other cut-resistant gloves to protect the rubber gloves. (Similar to NFPA 70E requirements.) ☐ All electrofishing team members wear chest or hip waders to insulate the wearer from electrical shock. ☐ Net handles for nets used during electrofishing will be nonconductive and long enough to keep hands out of the water. ☐ The positive electrode (anode) on portable electroshockers is equipped with a manual switch that stops the current when released and is not "bypassed' with a hold-down mechanism (i.e., tape) ☐ At least two (2) persons on each Electrofishing boat or location are trained in CPR. ☐ All persons involved in electrofishing know the location of the emergency shutoff switch. ☐ Backpack electrofishing equipment is equipped with a tilt switch that stops the current if the operator falls. POWER TOOLS, HAND TOOLS & AUGERS, EXTENSION CORDS, & ELECTROFISHING COMMENTS:
WORKING OVER/NEAR WATER OR ON ICE		
☒ NA	**drowning, hypothermia (winter months), spills to surface waterways, fall through ice** ☐ Barge-mounted drilling/boring rigs ☐ Sampling from a boat	☐ 100% Fall Protection while working over water or when otherwise exposed to a drowning hazard. **(Describe how fall protection will be implemented, Tie-off points, and the equipment that will be used.** ☐ in "Comments" below ☐ in the "Fall Protection" section) ☐ A "**safety observer**" will remain on shore with the ability to contact emergency response personnel and communicate with those on boats/barges. ☐ USG-approved **flotation vests** will be used. ☐ **Ring-buoy** with 90' of rope and placed within 100' of site personnel.

	HAZARD	HAZARD CONTROLS (check all that apply and comment as required)
	☐ Boat required for site access ☐ Work on an ice covered body of water ☐ Other: **NOTE – See "Walking Surfaces" section of JSA for slipping hazards on icy surfaces.**	☐ **Rescue skiff** will be staged such that one person can immediately launch the skiff. ☐ At least **one person will be available to launch** and operate the rescue skiff. NOTE - "Safety Observer" may launch rescue skiff after making emergency response notification(s). ☐ Ice Safety - **Core samples** will be taken every 100' on lakes or 50' on rivers to evaluate the thickness and quality of ice (i.e., *clear/blue ice* = best quality, *white/opaque ice* = moderate quality/use caution, *gray/slushy ice* = poor quality/unsafe). ☐ Ice Safety - Conservative **load estimates** are established for static and/or moving loads as appropriate for the type of work being conducted. Load estimates are explained: ☐ in "Comments" below ☐ in an attached document ☐ Spill Control - **Floating booms** will be used around barges, shore-based heavy equipment, or other locations where hydraulic fluid may leak from equipment into surface water. ☐ Spill Control - **Silt curtains** will be suspended below floating booms. ☐ Boats and Barges will not be operated above their **weight capacity**. ☐ Boats and barges operated (or potentially operated) in **bad weather** will be operated below their weight capacity by _____% (suggest at least 25%). ☐ Boat and barge emergency calls - **Weather resistant radios** that broadcast on Coast Guard frequencies (Channel 16 VHF/FM or 2182 MHZ) will be available for emergency calls. ☐ Boat or barge-based operations will be discontinued when NOAA issues a **small craft advisory** or when sustained **wind speeds of 20 mph** are observed and create dangerous wave or boat/barge handling conditions. ☐ **NOAA Weather Radio Receiver** will be used to monitor weather conditions that may affect boat or barge-based activities. **WORKING OVER WATER COMMENTS:**
	MANUAL MATERIAL HANDLING & STORAGE / HOUSEKEEPING / WALKING SURFACES (includes manhole covers, heavy lifting, slippery surfaces, and steep slopes)	
☐ NA	back or shoulder strain, struck by falling objects, trips and falls, incompatible materials (fire or explosion) ☒ hvy manual lifting (>50 lbs) ☐ chemical storage ☐ compressed gas storage ☐ Tall storage greater than 2 pallets stacked. ☒ Material & equipment laydown areas ☒ Trash & debris removal ☐ Manhole Cover Removal ☒ Tripping Hazard (cords, hoses, uneven surfaces) ☒ Slipping Hazard (icy, muddy, oily, etc.) ☐ Steep sloped surfaces ☐ ☐	☒ Mechanical lifting equipment used to reduce manual material handling: (☐ Forklift/Lull ☒ **Heavy Equipment** ☒ **Dolly** ☐ _____) ☒ Manual lifting more than 75 lbs by a single person will be avoided. ☐ Good manual lifting techniques will be reviewed with the following trades/persons prior to site work: _____ ☐ Incompatible chemicals will be separated by 20' or a concrete block wall. ☐ Secondary containment will be provided for the following chemicals: _____ _____ ☐ Safety equipment will be located near chemical storage. ☐ Spill Kit ☐ Emergency Shower ☐ Eyewash ☐ Drench Hose ☐ Splash PPE ☐ Flammable gases and oxygen will be separated by 20'. ☐ All compressed gas cylinders will be transported vertically and secured upright. ☒ Equipment and materials will be stacked in laydown areas with aisles as necessary for safe access. All un-used equipment & materials will be returned to laydown areas daily. Designated laydown areas:_____ ☐ Materials will not be stacked greater than 2 pallets high without being secured. ☒ Trash and debris will be removed daily and placed in designated containers. Specify debris segregation and location of disposal containers below. ☒ Hoses & Cords will be run out of walkways (e.g., within 6" of walls or 7.5' overhead) whenever possible or will be clearly marked by cones or barricades. ☒ All chemical containers will be labeled per Hazard Communication requirements. ☐ Manhole covers will ONLY be removed with tools specifically designed to remove them including J-hooks that are at least 30" long. No pry bars, shovels, or screw drivers. ☐ "Stuck" manhole removal equipment and procedures are described in "comments." ☐ "Paved-over" manhole removal equipment and procedures are described in "comments." ☒ Slippery surface – work area inspected for icy surfaces which will be salted/sanded. ☒ Slippery surface –YakTrax® or similar slip-on traction devices will be used for icy areas. MATERIAL HANDLING & HOUSEKEEPING COMMENTS:

HAZARD		HAZARD CONTROLS (check all that apply and comment as required)
		Proper lifting techniques will be employed (*e.g.*, two-man lift, bending at the knees, limited pivoting at the waist). **Heavy manual lifting may include but is not limited to: generators, submersible pumps/control boxes, air compressors, gas cylinders, geophysical logging equipment, drilling rods/equipment.**
ROADWAY, RAILROAD, & SIDEWALK OBSTRUCTION		
☒ NA	☐ Vehicle accidents ☐ Pedestrians struck by vehicles or heavy equipment ☐ Pedestrians falls ☐ Pedestrian struck-by falling objects ☐ Railroad accidents	☐ DOT signal devices will be used to re-route vehicles around excavations or busy site entrances/exits that affect road traffic. ☐ Roadway Flaggers will be used and have DOT Flagger Training ☐ Procedures for work vehicles to enter/exit traffic work zones are required when work zones are setup in high speed roadways or when potential blind-spots exist. Explain in "Comments." ☐ Pedestrian traffic will be safely routed around or over excavations. ☐ Pedestrian traffic will be safely routed around or under overhead work. ☐ Railroad owner notified for permission to work on the railroad right-of-way. ☐ Railroad flagger is required for work in the right-of-way. ☐ Equipment, materials, and personnel may not be closer than 15' to the nearest railroad rail if the railroad flagger or the flagger's signal is not visible. ☐ Derailer(s)/bumper(s) will be installed on railroad tracks to isolate the work area. **ROADWAY, RAILROAD, & SIDEWALK COMMENTS:**
BIOLOGICAL HAZARDS		
☐ NA	Infection, Lyme Disease, West Nile Virus, Eastern Equine Encephalitis (EEE), Severe Rash, Allergic Reaction, Venom effects ☒ **Ticks** ☒ **Mosquitoes (EEE, WNV, etc)** ☐ Venomous Snakes ☐ Venomous Spiders ☒ **Poison Ivy, Oak, or Sumac** ☒ **Bees & Wasps** ☐ Fire Ants ☒ Other (identify below): Biting animals	☒ **Use DEET (25%-98%) repellent on skin for protection against mosquitoes, ticks, and similar insects. Use higher concentrations for heavily infested areas.** ☒ **Use Permethrin repellent on clothing in areas heavily infested with ticks, chiggers, etc.** ☐ All site personnel will be instructed on how to **identify poison ivy, sumac, and oak**. (O'Brien & Gere Field Identification Guide or equiv. has been posted? ☐ YES ☐ NO) ☐ Poison ivy **barrier creams** (e.g., Ivy Block) will be used on exposed skin prior to the workday. ☒ **Poison ivy neutralizing wipes or rubbing alcohol will be used on hands and exposed skin following work activities or incidents where contact with poison ivy/oak/sumac is suspected.** ☒ **Protective coveralls (such as Tyvek™) may be used to prevent contact with ticks or poison ivy.** ☐ All site personnel will be instructed on how to identify venomous snakes indigenous to the area. List venomous snakes of concern in the "Comments" section below. (O'Brien & Gere Field Identification Guide or equiv. has been posted? ☐ YES ☐ NO) ☐ All field personnel with a potential to **encounter venomous snakes** will wear: ☐ Snake Chaps AND/OR ☐ High Leather Safety Boots (NOT ankle-high boots/shoes) ☐ All site personnel will be instructed on how to identify **venomous spiders** indigenous to the area. List venomous spiders of concern in the "Comments" section below. (O'Brien & Gere Field Identification Guide or equiv. has been posted? ☐ YES ☐ NO) ☒ **Site personnel with known allergies to bee/wasp stings, fire ant bites, or other insect bites carry an "EpiPen" or equivalent medication prescribed for treating allergic reaction. Site Safety Coordinator will be notified by personnel with allergies.**

HAZARD		HAZARD CONTROLS (check all that apply and comment as required)
		BIOLOGICAL HAZARDS COMMENTS:

ENVIRONMENTAL HAZARDS / HAZARDOUS WASTE SITE WORK

☐ NA

Exposure to hazardous vapors or dust, contact with contaminated materials, fire, explosion.

Contaminants of Concern and hazardous chemicals include:

- ☒ **volatile organic compounds (describe: benzene, chlorinated solvents)**
- ☐ **semi-volatile organic compounds (describe: dichlorobenzene, trichlorobenzene and phenol compounds)**
- ☐ metal dusts (describe:_____ _____)
- ☐ PCBs
- ☐ Caustic (NaOH)
- ☐ Acid (H2SO4, HCL)
- ☐ **BTEX**
- ☐

(many other hazardous waste site hazards are covered elsewhere in this JSA)

☒ **Site workers with a potential for contact with contaminated materials and work in Level C PPE will have OSHA 40-hour training, current 8-hour refresher, and medical exam.**

☒ **Site workers with minimal contact with contaminated materials and no work in Level C PPE will have OSHA 40-hour OR 24-hour training, current 8-hour refresher, and medical exam.**

☐ Foremen or Supervisors overseeing field crews will have 8-hour OSHA Supervisor training.

☒ No intrusive work activities or areas are anticipated with current scope of work.

☐ Intrusive work activities include:

☒ **The perimeter of intrusive work areas are identified by: Site Safety Coordinator**

☐ Decontamination of personnel or equipment is not anticipated with the current scope of work.

☒ **Decontamination of personnel and small tools will be conducted as follows:**

Phosphate-free detergent wash and distilled water rinse.

☒ **Decontamination of heavy equipment will be conducted as follows: Pressurized steam washer or equivalent.**

☒ **Heavy equipment leaving the site will be inspected by: Site Safety Coordinator**

☐ **Work area air monitoring** is not anticipated with the current scope of work.

☒ **Work area air monitoring will be conducted per attached air monitoring plan.**

☒ **Work Area Air Monitoring as follows for:** ☐ **Dust,** ☒ **VOCs,** ☐ **Other:**_____

Description:

Action Levels[1]	Description & Response Actions
<5 ppm for Total VOCs	Level D PPE (General PPE as required in this JSA)
5 – 50 ppm for Total VOCs	1. Half or Full Face Level C PPE - Tyvek, boot covers, nitrile gloves, half or full face w/ respirator with Organic vapor/P100 cartridges changed (☒ daily, ☐ _____) OR 2. Implement additional engineering or administrative controls to reduce contaminant concentrations below action level(s).
50 – 200 ppm for Total VOCs	1. Full Face Level C PPE - Tyvek, boot covers, nitrile gloves, full face w/ respirator with Organic vapor/P100 cartridges changed (☒ daily, ☐ _____) OR 2. Implement additional engineering or administrative controls to reduce contaminant concentrations below action level(s).
>200 ppm for Total VOCs	1. STOP work until contaminant levels can be reduced. 2. Notify the Project Manager and Client Representative.
1. Sustained 1 minute above background	

☒ **Community Air Monitoring** is not anticipated with the current scope of work.

☐ **Community Air Monitoring** is required per the attached air monitoring plan.

☐ **Community Air Monitoring** as follows for: ☐ Dust, ☐ VOCs, ☐ Other:_____

Description: _____

ENVIRONMENTAL & CHEMICAL HAZARD COMMENTS:

To minimize potential exposure to COCs, disposable gloves will be worn.

HAZARD		HAZARD CONTROLS (check all that apply and comment as required)
OTHER HAZARDS & CONTROLS not addressed in other sections of this JSA		
☐ NA	☒ Heat Stress ☒ Cold Stress ☐	☒ Site workers will be trained to recognize the symptoms of heat/cold stress. ☒ Work/rest regimens will be employed by as necessary so that personnel do not suffer adverse effects from heat/cold stress.

EMERGENCY RESPONSE

(911 Service is Available ☒ Yes ☐ No **Cell Phone Required** ☒ Yes ☐ No)

Alternate Emergency Number (if not "911"):

Site Address: 121-125 Lake Street, Ithaca, NY

Muster Point in case of site evacuation: Evacuated personnel will assemble south of the site along Lake Street.

Emergency Medical Treatment - Hospital Name: Hospital Address:	**Cayuga Medical Center** **101 Dates Drive, Ithaca, NY 14850**	**Number:**	**(607) 274-4011**
Non-Emergency Med. Treatment - Clinic Name: Occupational Clinic Address:		**Number:**	
Minor Injury Support for OBG Employees:	**WorkCare Incident Intervention**	**Number:**	(888) 449-7787
Fire Department Name		**Number:**	**(607) 272-1234**
Spill Response:	**National Spill Response Center**	**Number:**	**(800) 424-8802**
Client Representative Name::	**Frost Travis**	**Office Number:** **Cell Number:**	
O'Brien & Gere **Project Manager** Name:	**Deb Wright**	**Office Number:** **Cell Number:**	**(315) 956-6377** **(315) 546-4541**
O'Brien & Gere **Corporate H&S** Name:	**Jeff Parsons**	**Office Number:** **Cell Number:**	**(315) 956-6871** **(315) 391-0638**
Contact Name:	**TBD**	**Office Number:** **Cell Number:**	
Contact Name:		**Office Number:** **Cell Number:**	

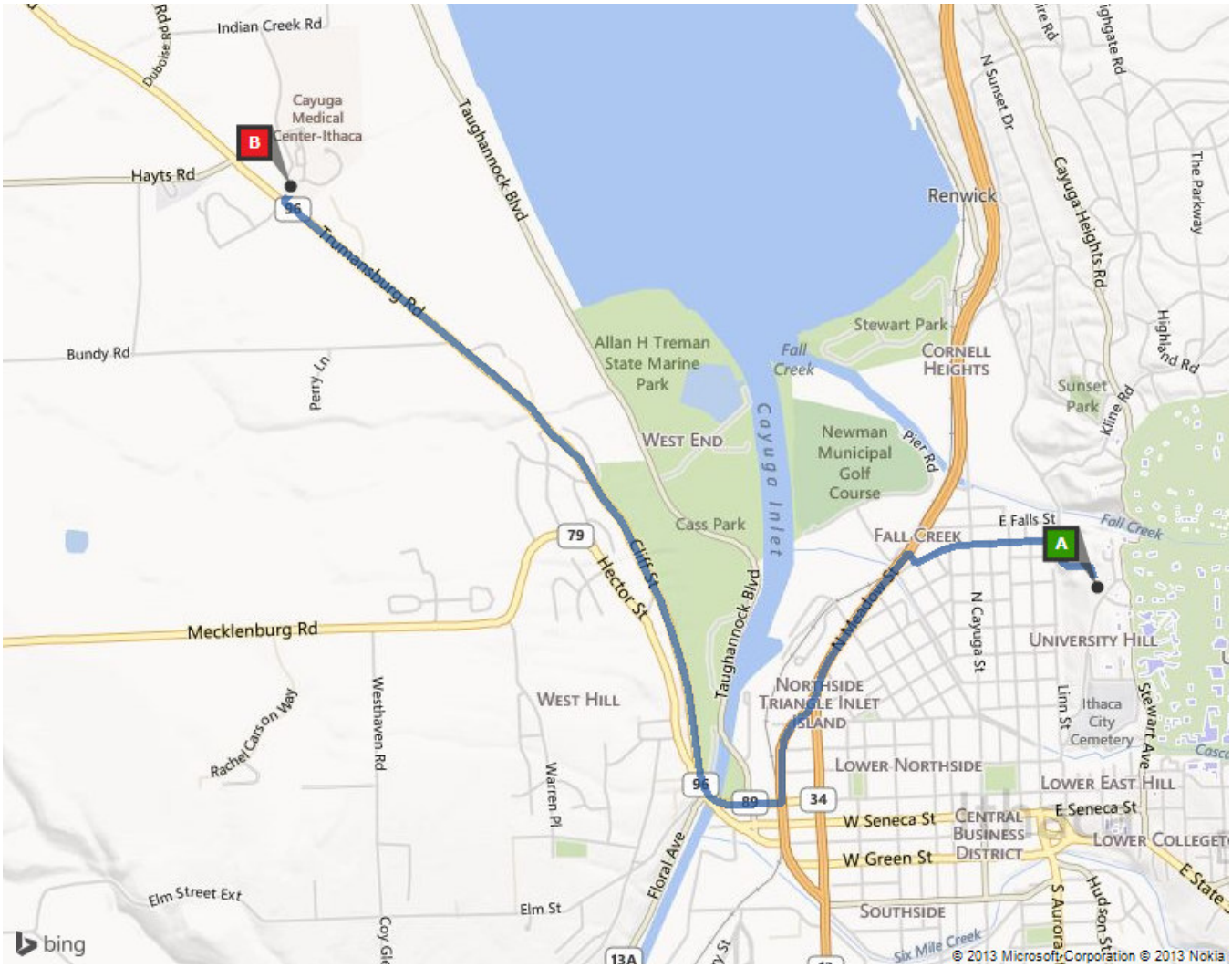
EMERGENCY RESPONSE COMMENTS:

1. NOTIFICATIONS - Upon occurrence of any injury, fire, explosion, major spill (beyond incidental), property damage >$1,000, or near-miss that could have resulted in a fatality or disabling injury, **IMMEDIATELY NOTIFY** the O'Brien & Gere Project Manager, O'Brien & Gere Manager of Corporate H&S, and the Client Representative.
2. WRITTEN REPORT - Complete an *Incident Report* within **24 hours** and submit to the O'Brien & Gere Manager of Corporate H&S for review. Report may be submitted as a "draft" or "preliminary" and updated as additional information is identified.
3. INJURY RESPONSE
   - First aid injuries will be handled on site with FA-trained personnel. First aid and CPR supplies are located: **Inside Field Vehicle**.
   - **All O'Brien & Gere employees will call WorkCare for minor injuries** that include any strains, cuts for which an employee is not confident that a band aid is sufficient, tick/insect bites for which the employee is concerned about infection or Lyme, and any other work-related injury for which the employee would like to talk to a WorkCare medical professional regarding proper treatment or follow-up.
   - **WorkCare posters must be posted at each job site with a field office or trailer.**
   - Minor (not life threatening) injuries that require medical attention will be treated at the "Non-Emergency Med Treatment" clinic identified above **unless an alternate clinic is recommended by WorkCare**. If no clinic is available or identified, then default to the "Emergency Medical Treatment" facility.
   - Life Threatening injuries are an emergency and require implementing emergency response (911 or alternate).
4. FIRE or EXPLOSION

HAZARD	HAZARD CONTROLS (check all that apply and comment as required)

- Incipient stage (trash can size) fires may be handled by site personnel using fire extinguishers or hoses.
- Larger fires will require that affected personnel are evacuation to the identified muster point and implementing emergency response (911 or alternate).

5. SPILL RESPONSE
   - Major spills that exceed the available supplies and resources to safely control and cleanup will require contacting an off-site spill responder indicated above for "Spill Response" and in accordance with existing site spill response plans. If a specific spill responder is not identified, a large spill will require implementing emergency response (911 or alternate).
   - Review available spill control and prevention plans that may be applicable to the work area. Ensure project personnel are familiar with plan requirements.
   - Minor or incident spills will be cleaned up by site personnel using supplies that are located: At the pole barn or vehicle.
   - The site owner will make notifications for reportable spills unless O'Brien & Gere is authorized to make those notifications.
6. POSTING - Emergency numbers and Hospital Route Map are posted: At the pole barn or vehicle.
7. OTHER EMERGENCY INFORMATION:



1. Depart Lake St toward E Lincoln St / Lincoln St E 0.2 mi

2. Turn left onto E Lincoln St / Lincoln St E 0.3 mi

 3. Road name changes to W Lincoln St 0.2 mi

 4. Turn right onto Dey St, and then immediately turn left onto RT-13 / RT-34 / N Meadow St 0.5 mi

 5. Bear right onto RT-13 S / RT-34 S / N Fulton St 0.4 mi

 6. Turn right onto RT-89 / RT-96 / W Buffalo St 505 ft

 7. Keep straight onto RT-96 / W Buffalo St 2.4 mi

 8. Turn right onto Harris B Dates Dr 253 ft

 9. Turn left to stay on Harris B Dates Dr 49 ft

10. Arrive at 101 Harris B Dates Dr, Ithaca, NY 14850

The last intersection is W Hill Dr.

If you reach Indian Creek Rd, you've gone too far

Pre-Work Briefing Acknowledgement: Individuals who are performing work covered by this JSA have received a **project-specific safety orientation** that includes a review of the safety requirements outlined in this JSA. The undersigned individuals acknowledge that have read this JSA and/or reviewed this JSA with a designated project representative and agree to comply with safety requirements outlined herein. The undersigned individuals understand that these safety requirements are not "all-inclusive" and that they are expected to follow any additional safe work practices applicable or customary to their specific scope of work or trade.

Print Name	Signature	Company	Date

Safety to Zero (S_20) – Safety Planning Is Critical To Our Ultimate Goal Of Zero Injuries

Project Name:	Former Ithaca Gun Factory Site	**OBG Project Officer:**	James R. Heckathorne
Project Number:		**OBG Project Manager (PM):**	Deb Wright
JSA Title:	Groundwater Sampling	**OBG Site Supervisor:**	TBD
JSA Revision Date:	10/24/13	**OBG Site Safety Coordinator:**	TBD
JSA Prepared By:	Dave Carnevale		
Client Name:	IFR Development LLC	**Subcontractor Company Name:**	(☒ NA) Multiple (see below)
Project Location:	Ithaca, New York	**Subcontractor Project Manager:**	TBD
Project Phone No.:	TBD	**Subcontractor Superintendent:**	TBD
Project Fax No.:	TBD	**Sub Safety Competent Person:**	TBD
Scope of Work covered by this JSA (identify subcontractors covered by this JSA)	Groundwater elevation and quality data will be collected to monitor the contaminant plume. Procedures will include: groundwater elevation monitoring, groundwater quality monitoring and groundwater sample collection		
References (existing safety plans, manuals, spec's, etc.)	O'Brien & Gere, May 2008, Ithaca Gun Site Health and Safety Plan.		
Key Hazards (focus on highly hazardous tasks)	Pinch points, slips trips falls, shock hazards, exposure/contact with contaminated materials, heat/cold stress.		

Personal Protective Equipment Summary

(additional safety equipment may be required for specific hazards identified in the following sections)

☒ Hard Hat ☒ Safety Glasses ☒ Safety Shoes ☒ Cut-Resistant Gloves ☒ Ear Protection

Other (specify):

- ☒ **High Visibility Vests** (required for work on roads and in many construction & remediation sites)
- ☒ **Ear Protection** (heavy equipment, loud power tools, etc.)
- ☐ Fall Protection Harness & Lanyard (falls >6')
- ☐ Respiratory Protection (☐ N95 dust mask, ☐ half face, ☐ full-face) Specify cartridge in JSA.
- ☒ **Tyvek** or other chemical protective coverall: (when there is the potential for contact with contaminated materials / biological hazards.)
- ☐ Face Shield (chemical handling, line breaks, pressure washing)
- ☒ **Nitrile Gloves** (☐ Surgical Type and/or ☐ "Dishwashing" Type)
- ☒ **Cut-resistant gloves** are required when handling cable, rods, and sharp or "splintery" materials

Pre-Work Documentation & Certifications ***(Refer to JSA content for additional certifications and documentation that may be required.)***

Documentation and Certifications	To Be Submitted or Provided By…….
☐ Drug Testing (☐ alcohol testing is also required)	
☒ **Project Safety Plan or Job Safety Analysis (JSA)**	**OBG Project Manager – Deb Wright**
☐ Client/Facility Contractor Safety Orientation	
☒ **Project Safety Orientation (JSA Review)**	**OBG Site Safety Coordinator – TBD**
☒ **Daily Safety Meetings (Daily Pre-Task Planner)**	**OBG Site Safety Coordinator – TBD**
☐ Verification of Hazwoper Medical Surveillance	
☒ **OSHA 40-hr Hazwoper w/ current 8-hr Refresher**	**All on site OBG and subcontractor personnel**
☐ Respirator Training, Fit Test, and Resp. Medical	
☐ Confined Space Entry Certification (necessary for permit-required entry or non-permit designations)	
☐ Excavation Competent Person designation	
☐	

Permits applicable to scope of work

☐ Confined Space Entry Permit	☐ Daily Excavation Inspection Checklist
☐ Hot Work Permit	☐

	☐ Energized Electrical Work Permit (from sub)	☐

Individuals must sign the "Pre-Work Briefing" form on the last page after reviewing this JSA.

HAZARD		HAZARD CONTROLS (check all that apply and comment as required)
ELEVATED WORK		
☒ NA	FALLS > **6'** or within **15'** of a ROOF OR MEZZANINE EDGE where the fall is >6'	☐ Existing Guardrails ☐ Hole Covers Marked "HOLE" ☐ Fall Restraint ☐ Temporary Guardrails ☐ Manlifts used for elevated work ☐ _____ ☐ Warning Line 15' from Edge ☐ Fall Arrest w/ harness/lanyard (identify tie-off points) **Fall Protection Comments (describe equipment used):**
☒ NA	LADDERS / STAIRS ☐ Extension Ladders ☐ Step Ladders ☐ Fixed Ladders ☐ Stairs	☐ Employees training in safe ladder use at toolbox safety meeting ☐ Extension ladders are properly footed, secured at top, and setup at proper angle ☐ Stepladders are set on level ground or properly shimmed with spreaders locked. ☐ Stairs have proper rise over run and stairs >4 steps or 4' have guardrails. **LADDERS/STAIRS COMMENTS:**
EXCAVATIONS / TRENCHING		
☒ **NA**	☐ Max Depth ≥ 20' ☐ Max Depth ≥ 5' ☐ Max Depth <5' with potential cave-in hazard ☐ Potential permit-required confined space at depth ≥ 4' ☐ Underground utilities ☐ Structures/foundations ☐ Falls into excavations ☐ Other:	☐ Excavation Competent Person Name:_____ Company _____ ☐ Sloping & shoring for excavations ≥20' are approved by a professional engineer ☐ Sloping & shoring for excavations ≥5' when persons are exposed to cave-in. (specify below) ☐ Sloping & shoring for shallow (<5') excavations with cave-in hazard (specify below) ☐ O'Brien & Gere *Daily Excavation Checklist* to be completed by the Competent Person. ☐ Excavations ≥ 4' are classified as a non-permit confined space ☐ Excavations ≥ 4' are classified as Alternate Entry or Permit-Required (see confined space) ☐ Underground utilities have been identified and marked. ☐ Local "dig safe" organization has been notified for utility locations in public areas or rights of way. Number: _____ Date: _____ ☐ Hand digging within 3' of utility locations. ☐ Soft-dig/vacuum dig within ____' of utility locations. ☐ Excavations are protected by perimeter fencing (not barricade tape): (☐ rigid fence - chain link or wood ☐ safety fence 6' from edge.) **EXCAVATION COMMENTS:**
CONFINED SPACES		
☒ **NA**	☐ No Serious Hazards ☐ Toxic Atmosphere ☐ carbon monoxide ☐ hydrogen sulfide ☐ ☐ Flammable Atmosphere ☐ Low Oxygen ☐ Combustible dust ☐ Drowning - high water	☐ Confined space is altered so that it is no longer a confined space. (describe below) ☐ Confined space is downgraded to a non-permit confined space. (identify which spaces below) ☐ Alternate Entry is used. (Identify which space qualify for confined space entry below) ☐ Full permit-required confined space entry is used due to presence of serious hazards. ☐ Rescue team has been notified (☐ Paid FD ☐ Volunteer FD ☐ Plant Rescue) Rescue Team:_____Phone Number: _____ ☐ All entrants and attendants for Alternate Entry and Permit-Required Entry have confined space entry training.

	HAZARD	HAZARD CONTROLS (check all that apply and comment as required)
	level or potential for sudden changes in flow or level ☐ Other Serious Hazard:	☐ Refer to "Manual Lifting" section of this JSA for manhole cover removal safety. **CONFINED SPACE COMMENTS:**
OVERHEAD POWERLINES		
☒ NA	OVERHEAD POWER LINES _____ KV _____ ft above ground _____ KV _____ ft above ground	☐ Request to de-energize lines will be submitted for work within 20' of power lines. Request sent to: _____ Date: _____ ☐ No one will be permitted to work <10' to power lines without lines being de-energized. ☐ Project persons are informed of 20' safety zone around energized power lines. ☐ Project persons are informed of additional restrictions required when working ≤20' but >10': ☐ Dedicated spotter for all elevated work or operation of equipment that can contact lines ☐ Barricades setup at 20' from base of power lines to establish a "restricted work area." ☐ "Power Line Safety Permit' required to work within 20' of power lines. ☐ Power lines are shielded and/or marked with high visibility material **POWER LINE COMMENTS:**
DRILLING / BORING - All self-propelled rigs including trailer-mounted drilling/boring equipment		
☒ NA	Struck By, Run-Over, Caught In Between (pinch points), Roll Over, Hot Work (open flame) Fluid Leaks ☐ Drilling/Boring Rig: specify type(s) below: Hollow Stem Auger Air Rotary Other	☐ Qualified persons operate all drilling/boring equipment. Qualifications were determined by: ☐ Work Experience Summary on company letterhead or email with company email address. ☐ ☐ Equipment will be inspected upon mobilization by: NOTE - Inspections will include (but not be limited to) the following: leaks, defective safety equipment, and loose/unsecured parts that could fall during operation) ☐ Operators will be reminded of seatbelt use by: _____ ☐ High visibility vests are required for: ☐ Cut-resistant gloves are required when handling cable, rods, and other sharp or "splintery" materials ☐ Chemical-resistant gloves and clothing are required while handling grout, cement, chemicals, or contaminated materials including soil or groundwater. (Refer to "Environmental Hazards" section for more information.) ☐ Operators and helpers will maintain a safe distance to moving parts. All those working near moving or rotating parts will secure loose hair, clothing, and equipment. All those working near the rods/casings are instructed to not put themselves in a position where they could get hurt if the rods/casings should turn or drop. ☐ Drill rods, casings, and other equipment will be stored neatly when not in use and secured to prevent them from falling on, or rolling into, site personnel. ☐ The area will be cleared of rope, cords, weed-block fabric, or similar material that could become wrapped around the auger, entangle someone and then pull them into the auger. ☐ Fall protection will be worn whenever (if) the drilling/boring mast must be climbed above 6'. (Tie-off Points are specified: ☐ in "Comments" below ☐ in the "Fall Protection" section) ☐ Masts located within 20' of an overhead power line will only be lowered or raised with a dedicated spotter. (Refer to the "Overhead Powerlines" section of this JSA for additional safety precautions) ☐ Drill rigs will only be moved with masts lowered. ☐ Masts will be erected with outriggers fully extended when equipped with outriggers. ☐ Outriggers will be placed on a firm, stable surface or will be cribbed to prevent sinking of outriggers and collapse of the drilling/boring rig.

HAZARD		HAZARD CONTROLS (check all that apply and comment as required)
		☐ Drilling on sloped surfaces will be conducted such that the drilling/boring equipment remains stable and otherwise in accordance with requirements outlined below in Drilling/Boring comments. ☐ Damage to underground utilities will be prevented by cribbing outriggers to spread the load or relocated outriggers so they are not placed on utilities. ☐ Procedures for responding to natural gas emissions (explosive vapors) are: ☐ Outlined in "Comments" below. ☐ Outlined in an attached procedure. ☐ Procedures for drilling/boring from a barge or otherwise working over water are: ☐ Outlined in "Comments" below. ☐ in the "Working Over Water" section. ☐ Drilling/boring equipment will be de-energized and locked-out prior to maintenance. ☐ Site personnel working in the area surrounding the drilling/boring rig have will be informed where the emergency shutoff in the event of an emergency. Specify the location of the shutoff in the "Comments" section below. ☐ Spill equipment is available for fuel and hydraulic fluid leaks. Location; _____ **DRILLING/BORING COMMENTS:**
HEAVY EQUIPMENT (other than cranes)		
☐ NA	Struck By, Run-Over, Caught In Between (pinch points), Roll Over, Fluid Leaks ☐ Excavator ☐ Dump Truck ☐ mini Skid Steer (bobcat) ☐ mini Excavator ☐ **Gator/Off-Road Vehicle** ☐ Other: ☒ **Other: Field vehicle** ☐ Manlift - specify type(s):	☒ **Qualified persons operate all heavy equipment. Qualifications were determined by:** ☐ Work Experience Summary on company letterhead or email w/ company email address. ☒ Other (describe): **Work experience verified by subcontractor.** ☒ **Equipment will be inspected upon mobilization by: Site Safety Coordinator and Operator.** (NOTE - All leaks or defective safety equipment must be repaired before use.) ☒ **Operators are required to wear seatbelts for all equipment provided with seatbelts.** ☒ **High visibility vests are required for: All on site work.** ☐ Operators will review manufacturer's safety guidelines for all **equipment operated on slopes** including Gators© and similar ATVs/4x4's. (In the "Comments" section below, specify the maximum slope for each piece of equipment that will be operated on slopes. This may be completed upon mobilization.) ☐ Dump trucks, 4x4's, or other haul vehicles will not be loaded beyond manufacturer **capacities or weight limits** established by state and local authorities for transportation. ☐ **Counterweight swing radius** will be barricaded. ☐ **Spotters** are required when trucks or other heavy equipment are backing up. Clarify procedure in "Comments" below. ☒ Operators and helpers will maintain a **safe distance to moving parts**. All those working near moving or rotating parts will secure loose hair, clothing, and equipment. ☐ Fall protection will be worn by all those in **manlifts** (scissor lifts are excepted: ☐ Yes ☐ NO) ☒ **Spill equipment** is available for fuel and hydraulic fluid leaks. Location; **Field support vehicle** **HEAVY EQUIPMENT COMMENTS:** **Personnel to remain upwind of heavy equipment exhausts whenever possible.** **Locations will be inspected prior to mobilization of the heavy equipment.** **Sloped areas, saturated ground surfaces and heavily rutted areas will be avoided if possible.** **Personnel should exercise extreme caution in the vicinity of operating equipment and machinery to avoid physical injury to themselves or others.**

HAZARD		HAZARD CONTROLS (check all that apply and comment as required)
		Cell phones will not be used while operating heavy equipment and machinery or by workers on the ground in the area of heavy equipment and machinery operations to avoid physical injury to themselves or others. **ATV operators will wear helmets and eye protection during operation.**
POWER TOOLS, HAND TOOLS, and EXTENSION CORDS		
☐ NA	eye injury, hand/arm cuts, electrical shock, strains, foot injuries, dust ☒ **Misc Handtools (shovels, hammers, trowels, etc.)** ☐ Chainsaws (Clearing & Grubbing) ☒ **Sharp hand-tools (knives, cutters, scissors)** ☐ Electrofishing (Fish Shocking) Equipment ☐ Hand Augers - Iwan or Spiral type ☐ Hand Sampler - Split Spoon or Thin Wall ☐ Hand Probe (GeoProbe) with ____ lb weight ☐ Manual Cathead Hoist with 140 lb weight ☐ Motorized Cathead Hoist with 140 lb weight ☐ Light-weight Motorized Auger drills (not truck-mounted) ☐ Manhole Lifting Devices **(specify in Comments)** ☐ Other (specify):	☒ **All tools and electrical cords in-use will be inspected daily by:** ☒ **Users** ☐ Site Supervisor/Safety Coordinator ☐ Other: _____ ☒ **Only the right tools will be used in a manner for which they were designed.** ☒ **GFCIs will be used on all extension cords and 120v power tools.** ☒ **All extension cords are in good condition with no cuts through outer insulation, ground plugs are present, and no "vinyl tape" repairs. (Only 12 gauge extension cords may be repaired.)** ☐ **Face shield** and safety glasses used (required for chain saws and chemical handling) ☐ **Kevlar chaps and jacket** (required for all chainsaw work) ☒ **Cut-resistant gloves are worn whenever cutting tools are used.** ☐ **Safety cutters or scissors are required for all cutting activities (no fixed-blade knives).** ☒ **Hearing protection required for which tools or areas: Power tools, equipment that generates sustained noise above 85 db.** ☐ All **hand augers and sampling probes** will be inspected and verified to be in good conditions with ALL parts required by the manufacturer. Inspections will be completed by: ☐ Users ☐ Site Supervisor/Safety Coordinator ☐ Other: _____ ☐ Persons using sampling probes equipped with **manual slide hammers** are physically capable of handling the weight without difficulty and keep hands clear of pinch-points. ☐ Persons using manual and motorized cathead hoists have been trained on how to operate them in accordance with manufacturer guidelines. (Identify qualified persons by name in the "Comments" Section below.) ☐ Electrofishing equipment will be **inspected** and verified to be in good conditions with ALL parts required by the manufacturer and exterior cords have no cuts through outer insulation and no "vinyl tape" repairs. Inspections will be completed by: ☐ Users ☐ Site Supervisor/Safety Coordinator ☐ Other: _____ ☐ Persons using **Electrofishing Equipment** have been **trained** on how to operate it in accordance with manufacturer guidelines. **(Identify qualified persons by name in the "Comments" Section below.)** ☐ Electrofishing will be discontinued if the **public** approaches within **100'** ☐ Electrofishing boats will be marked with "**Danger Electricity**" signs (or equivalent) that can be read at a distance of **150'**. ☐ All electrofishing team members wear **electrically-rated rubber gloves** that are inspected daily by users and replaced every 6 months. Use leather or other cut-resistant gloves to protect the rubber gloves. (Similar to NFPA 70E requirements.) ☐ All electrofishing team members wear **chest or hip waders** to insulate the wearer from electrical shock. ☐ **Net handles** for nets used during electrofishing will be nonconductive and long enough to keep hands out of the water. ☐ The positive electrode (anode) on portable electroshockers is equipped with a **manual switch** that stops the current when released and is **not "bypassed'** with a hold-down mechanism (i.e., tape) ☐ At least **two (2) persons** on each Electrofishing boat or location are trained in **CPR**. ☐ All persons involved in electrofishing know the location of the **emergency shutoff switch**. ☐ **Backpack electrofishing equipment** is equipped with a **tilt switch** that stops the current if the operator falls. **POWER TOOLS, HAND TOOLS & AUGERS, EXTENSION CORDS, & ELECTROFISHING COMMENTS:**

HAZARD		HAZARD CONTROLS (check all that apply and comment as required)
		Anticipated tools to be used may include but are not limited to: hammers, wrenches, screwdrivers, power drills/impact drivers, knives/cutting implements, pry bars, shovels, drum dollies.
WORKING OVER/NEAR WATER OR ON ICE		
☒ NA	**drowning, hypothermia (winter months), spills to surface waterways, fall through ice** ☐ Barge-mounted drilling/boring rigs ☐ Sampling from a boat ☐ Boat required for site access ☐ Work on an ice covered body of water ☐ Other: **NOTE – See "Walking Surfaces" section of JSA for slipping hazards on icy surfaces.**	☐ 100% Fall Protection while working over water or when otherwise exposed to a drowning hazard. **(Describe how fall protection will be implemented, Tie-off points, and the equipment that will be used.** ☐ in "Comments" below ☐ in the "Fall Protection" section) ☐ A "**safety observer**" will remain on shore with the ability to contact emergency response personnel and communicate with those on boats/barges. ☐ USG-approved **flotation vests** will be used. ☐ **Ring-buoy** with 90' of rope and placed within 100' of site personnel. ☐ **Rescue skiff** will be staged such that one person can immediately launch the skiff. ☐ At least **one person will be available to launch** and operate the rescue skiff. NOTE - "Safety Observer" may launch rescue skiff after making emergency response notification(s). ☐ Ice Safety - **Core samples** will be taken every 100' on lakes or 50' on rivers to evaluate the thickness and quality of ice (i.e., *clear/blue ice* = best quality, *white/opaque ice* = moderate quality/use caution, *gray/slushy ice* = poor quality/unsafe). ☐ Ice Safety - Conservative **load estimates** are established for static and/or moving loads as appropriate for the type of work being conducted. Load estimates are explained: ☐ in "Comments" below ☐ in an attached document ☐ Spill Control - **Floating booms** will be used around barges, shore-based heavy equipment, or other locations where hydraulic fluid may leak from equipment into surface water. ☐ Spill Control - **Silt curtains** will be suspended below floating booms. ☐ Boats and Barges will not be operated above their **weight capacity**. ☐ Boats and barges operated (or potentially operated) in **bad weather** will be operated below their weight capacity by _____% (suggest at least 25%). ☐ Boat and barge emergency calls - **Weather resistant radios** that broadcast on Coast Guard frequencies (Channel 16 VHF/FM or 2182 MHZ) will be available for emergency calls. ☐ Boat or barge-based operations will be discontinued when NOAA issues a **small craft advisory** or when sustained **wind speeds of 20 mph** are observed and create dangerous wave or boat/barge handling conditions. ☐ **NOAA Weather Radio Receiver** will be used to monitor weather conditions that may affect boat or barge-based activities. **WORKING OVER WATER COMMENTS:**
MANUAL MATERIAL HANDLING & STORAGE / HOUSEKEEPING / WALKING SURFACES (includes manhole covers, heavy lifting, slippery surfaces, and steep slopes)		
☐ NA	back or shoulder strain, struck by falling objects, trips and falls, incompatible materials (fire or explosion) ☒ **hvy manual lifting (>50 lbs)** ☐ chemical storage ☒ compressed gas storage ☐ Tall storage greater than 2 pallets stacked. ☒ **Material & equipment**	☒ **Mechanical lifting equipment used to reduce manual material handling:** (☐ Forklift/Lull ☒ **Heavy Equipment** ☒ Dolly ☐ _____) ☒ **Manual lifting more than 75 lbs by a single person will be avoided.** ☐ Good manual lifting techniques will be reviewed with the following trades/persons prior to site work: _____ ☐ Incompatible chemicals will be separated by 20' or a concrete block wall. ☐ Secondary containment will be provided for the following chemicals: _____ _____ ☐ Safety equipment will be located near chemical storage. ☐ Spill Kit ☐ Emergency Shower ☐ Eyewash ☐ Drench Hose ☐ Splash PPE

HAZARD		HAZARD CONTROLS (check all that apply and comment as required)
	laydown areas ☒ **Trash & debris removal** ☐ Manhole Cover Removal ☒ **Tripping Hazard (cords, hoses, uneven surfaces)** ☒ **Slipping Hazard (icy, muddy, oily, etc.)** ☒ **Steep sloped surfaces** ☐ ☐	☐ Flammable gases and oxygen will be separated by 20'. ☒ All compressed gas cylinders will be transported vertically and secured upright. ☒ **Equipment and materials will be stacked in laydown areas with aisles as necessary for safe access. All un-used equipment & materials will be returned to laydown areas daily. Designated laydown areas:**_____ ☐ Materials will not be stacked greater than 2 pallets high without being secured. ☒ **Trash and debris will be removed daily and placed in designated containers. Specify debris segregation and location of disposal containers below.** ☐ Hoses & Cords will be run out of walkways (e.g., within 6" of walls or 7.5' overhead) whenever possible or will be clearly marked by cones or barricades. ☐ All chemical containers will be labeled per Hazard Communication requirements. ☐ **Manhole covers** will ONLY be removed with tools specifically designed to remove them including J-hooks that are at least **30"** long. No pry bars, shovels, or screw drivers. ☐ **"Stuck" manhole** removal equipment and procedures are described in "comments." ☐ **"Paved-over"** manhole removal equipment and procedures are described in "comments." ☒ **Slippery surface – work area inspected for icy surfaces which will be salted/sanded.** ☒ **Slippery surface –YakTrax® or similar slip-on traction devices will be used for icy areas.** **MATERIAL HANDLING & HOUSEKEEPING COMMENTS:** **Proper lifting techniques will be employed (*e.g.*, two-man lift, bending at the knees, limited pivoting at the waist).** **Heavy manual lifting may include but is not limited to: generators, submersible pumps/control boxes, air compressors, gas cylinders.**
ROADWAY, RAILROAD, & SIDEWALK OBSTRUCTION		
☒ NA	☐ Vehicle accidents ☐ Pedestrians struck by vehicles or heavy equipment ☐ Pedestrians falls ☐ Pedestrian struck-by falling objects ☐ Railroad accidents	☐ DOT signal devices will be used to re-route vehicles around excavations or busy site entrances/exits that affect road traffic. ☐ Roadway Flaggers will be used and have DOT Flagger Training ☐ Procedures for work vehicles to enter/exit traffic work zones are required when work zones are setup in high speed roadways or when potential blind-spots exist. Explain in "Comments." ☐ Pedestrian traffic will be safely routed around or over excavations. ☐ Pedestrian traffic will be safely routed around or under overhead work. ☐ Railroad owner notified for permission to work on the railroad right-of-way. ☐ Railroad flagger is required for work in the right-of-way. ☐ Equipment, materials, and personnel may not be closer than 15' to the nearest railroad rail if the railroad flagger or the flagger's signal is not visible. ☐ Derailer(s)/bumper(s) will be installed on railroad tracks to isolate the work area. **ROADWAY, RAILROAD, & SIDEWALK COMMENTS:**
BIOLOGICAL HAZARDS		
☐ NA	Infection, Lyme Disease, West Nile Virus, Eastern Equine Encephalitis (EEE), Severe Rash, Allergic Reaction, Venom effects ☒ **Ticks** ☒ **Mosquitoes (EEE, WNV, etc)** ☐ Venomous Snakes ☐ Venomous Spiders ☒ **Poison Ivy, Oak, or Sumac**	☒ **Use DEET (25%-98%) repellent on skin for protection against mosquitoes, ticks, and similar insects. Use higher concentrations for heavily infested areas.** ☒ **Use Permethrin repellent on clothing in areas heavily infested with ticks, chiggers, etc.** ☐ All site personnel will be instructed on how to **identify poison ivy, sumac, and oak**. (O'Brien & Gere Field Identification Guide or equiv. has been posted? ☐ YES ☐ NO) ☐ Poison ivy **barrier creams** (e.g., Ivy Block) will be used on exposed skin prior to the workday. ☒ **Poison ivy neutralizing wipes or rubbing alcohol will be used on hands and exposed skin following work activities or incidents where contact with poison ivy/oak/sumac is suspected.** ☒ **Protective coveralls (such as Tyvek™) may be used to prevent contact with ticks or**

HAZARD	HAZARD CONTROLS (check all that apply and comment as required)
☒ **Bees & Wasps** ☐ Fire Ants ☒ Other (identify below): Biting animals	**poison ivy.** ☐ All site personnel will be instructed on how to identify venomous snakes indigenous to the area. List venomous snakes of concern in the "Comments" section below. (O'Brien & Gere Field Identification Guide or equiv. has been posted? ☐ YES ☐ NO) ☐ All field personnel with a potential to **encounter venomous snakes** will wear: ☐ Snake Chaps AND/OR ☐ High Leather Safety Boots (NOT ankle-high boots/shoes) ☐ All site personnel will be instructed on how to identify **venomous spiders** indigenous to the area. List venomous spiders of concern in the "Comments" section below. (O'Brien & Gere Field Identification Guide or equiv. has been posted? ☐ YES ☐ NO) ☒ **Site personnel with known allergies to bee/wasp stings, fire ant bites, or other insect bites carry an "EpiPen" or equivalent medication prescribed for treating allergic reaction. Site Safety Coordinator will be notified by personnel with allergies.** **BIOLOGICAL HAZARDS COMMENTS:**

ENVIRONMENTAL HAZARDS / HAZARDOUS WASTE SITE WORK

☐ NA

Exposure to hazardous vapors or dust, contact with contaminated materials, fire, explosion.

Contaminants of Concern and hazardous chemicals include:

☒ **volatile organic compounds (describe: chlorinated solvents)**
☐ **semi-volatile organic compounds (describe: dichlorobenzene, trichlorobenzene and phenol compounds)**
☐ metal dusts (describe:_____ _____)
☐ PCBs
☐ Caustic (NaOH)
☐ Acid (H2SO4, HCL)
☐ **BTEX**
☐

(many other hazardous waste site hazards are covered elsewhere in this JSA)

☒ **Site workers with a potential for contact with contaminated materials and work in Level C PPE will have OSHA 40-hour training, current 8-hour refresher, and medical exam.**
☒ **Site workers with minimal contact with contaminated materials and no work in Level C PPE will have OSHA 40-hour OR 24-hour training, current 8-hour refresher, and medical exam.**
☐ Foremen or Supervisors overseeing field crews will have 8-hour OSHA Supervisor training.
☐ No intrusive work activities or areas are anticipated with current scope of work.
☒ **Intrusive work activities include: Groundwater sampling of wells.**
☒ **The perimeter of intrusive work areas are identified by: Site Safety Coordinator**
☐ Decontamination of personnel or equipment is not anticipated with the current scope of work.
☒ **Decontamination of personnel and small tools will be conducted as follows:**
Phosphate-free detergent wash and distilled water rinse.
☒ **Decontamination of heavy equipment will be conducted as follows:**
☐ **Heavy equipment leaving the site will be inspected by: Site Safety Coordinator**
☐ **Work area air monitoring** is not anticipated with the current scope of work.
☒ **Work area air monitoring will be conducted per attached air monitoring plan.**
☒ **Work Area Air Monitoring as follows for:** ☐ **Dust,** ☒ **VOCs,** ☐ **Other:**_____
Description:

Action Levels[1]	Description & Response Actions
<5 ppm for Total VOCs	Level D PPE (General PPE as required in this JSA)
5 – 50 ppm for Total VOCs	1. Half or Full Face Level C PPE - Tyvek, boot covers, nitrile gloves, half or full face w/ respirator with Organic vapor/P100 cartridges changed (☒ daily, ☐ _____) OR 2. Implement additional engineering or administrative controls to reduce contaminant concentrations below action level(s).
50 – 200 ppm for Total VOCs	1. Full Face Level C PPE - Tyvek, boot covers, nitrile gloves, full face w/ respirator with Organic vapor/P100 cartridges changed (☒ daily, ☐ _____) OR 2. Implement additional engineering or administrative controls to reduce contaminant concentrations below action level(s).

HAZARD		HAZARD CONTROLS (check all that apply and comment as required)
		>200 ppm for Total VOCs: 1. STOP work until contaminant levels can be reduced. 2. Notify the Project Manager and Client Representative. 1. Sustained 1 minute above background ☒ **Community Air Monitoring** is not anticipated with the current scope of work. ☐ **Community Air Monitoring** is required per the attached air monitoring plan. ☐ **Community Air Monitoring** as follows for: ☐ Dust, ☐ VOCs, ☐ Other:_____ Description: _____ **ENVIRONMENTAL & CHEMICAL HAZARD COMMENTS:** **To minimize potential exposure to COCs, disposable gloves will be worn.** **Wells will be allowed to vent prior to initiating testing activities to minimize potential exposure to COCs that may have built up in the air inside the well.** **Personnel should remain upwind of the well being tested whenever possible.**
OTHER HAZARDS & CONTROLS not addressed in other sections of this JSA		
☐ NA	☒ **Heat Stress** ☒ **Cold Stress** ☐	☒ **Site workers will be trained to recognize the symptoms of heat/cold stress.** ☒ **Work/rest regimens will be employed by as necessary so that personnel do not suffer adverse effects from heat/cold stress.**

EMERGENCY RESPONSE

(911 Service is Available ☒ Yes ☐ No **Cell Phone Required** ☒ Yes ☐ No)

Alternate Emergency Number (if not "911"):

Site Address: 121-125 Lake Street, Ithaca, NY

Muster Point in case of site evacuation: Evacuated personnel will assemble south of the site along Lake Street.

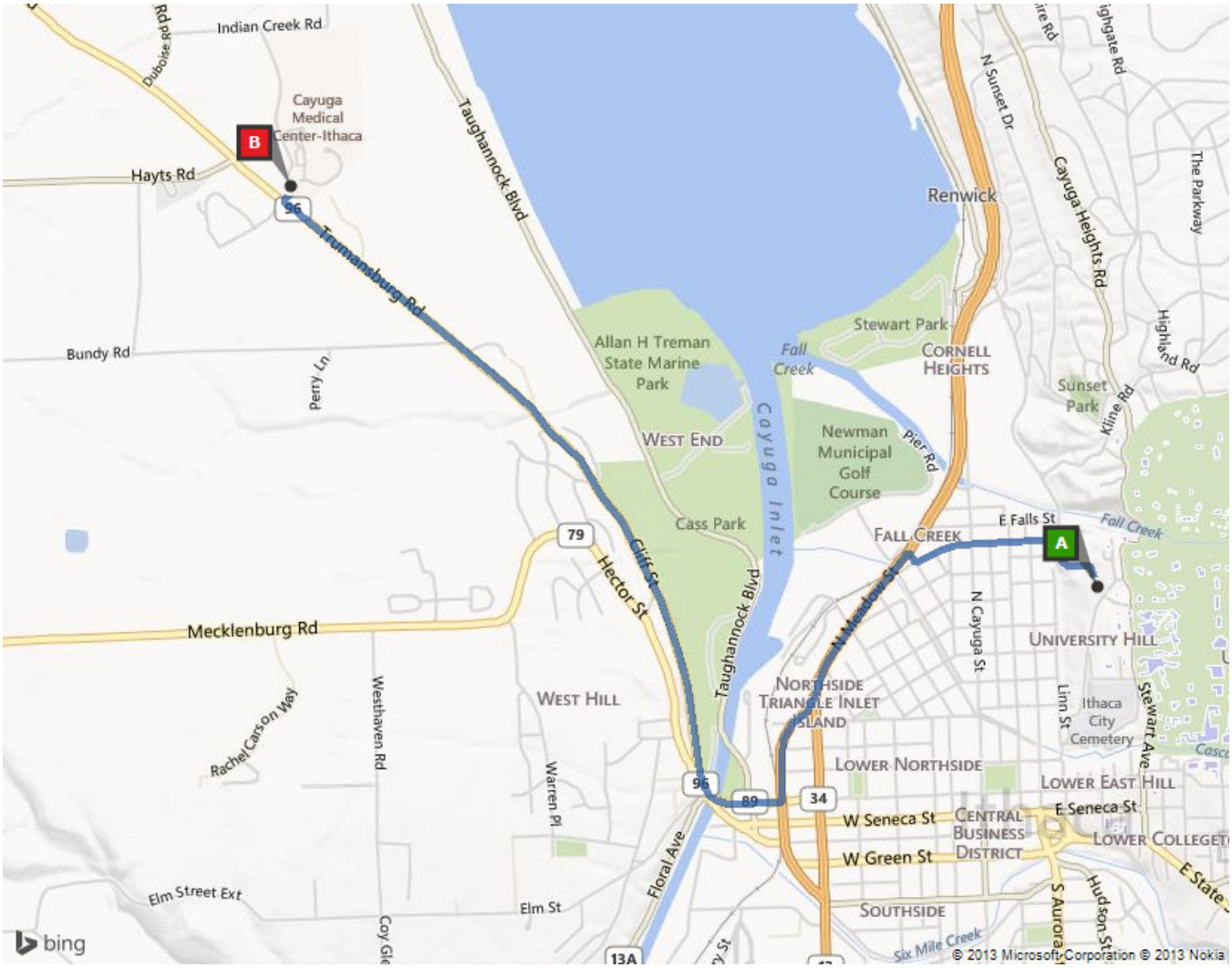
Emergency Medical Treatment - Hospital Name: Hospital Address:	**Cayuga Medical Center** **101 Dates Drive, Ithaca, NY 14850**	**Number:**	**(607) 274-4011**
Non-Emergency Med. Treatment - Clinic Name: Occupational Clinic Address:		**Number:**	
Minor Injury Support for OBG Employees:	**WorkCare Incident Intervention**	**Number:**	(888) 449-7787
Fire Department Name		**Number:**	**(607) 272-1234**
Spill Response:	**National Spill Response Center**	**Number:**	**(800) 424-8802**
Client Representative Name::	**Frost Travis**	**Office Number:**	
		Cell Number:	
O'Brien & Gere **Project Manager** Name:	**Deb Wright**	**Office Number:**	**(315) 956-6377**
		Cell Number:	**(315) 546-4541**
O'Brien & Gere **Corporate H&S** Name:	**Jeff Parsons**	**Office Number:**	**(315) 956-6871**
		Cell Number:	**(315) 391-0638**
Contact Name:	**TBD**	**Office Number:**	
		Cell Number:	
Contact Name:		**Office Number:**	
		Cell Number:	

EMERGENCY RESPONSE COMMENTS:

1. NOTIFICATIONS - Upon occurrence of any injury, fire, explosion, major spill (beyond incidental), property damage >$1,000, or near-miss that could have resulted in a fatality or disabling injury, **IMMEDIATELY NOTIFY** the O'Brien & Gere Project Manager, O'Brien & Gere Manager of Corporate H&S, and the Client Representative.
2. WRITTEN REPORT - Complete an *Incident Report* within **24 hours** and submit to the O'Brien & Gere Manager of Corporate H&S for review. Report may be submitted as a "draft" or "preliminary" and updated as additional information is identified.
3. INJURY RESPONSE
   - First aid injuries will be handled on site with FA-trained personnel. First aid and CPR supplies are located: **Inside Field Vehicle**.
   - **All O'Brien & Gere employees will call WorkCare for minor injuries** that include any strains, cuts for which an employee is not confident that a band aid is sufficient, tick/insect bites for which the employee is concerned about infection or Lyme, and any other work-related injury for which the employee would like to talk to a WorkCare medical professional regarding proper treatment or follow-up.
   - **WorkCare posters must be posted at each job site with a field office or trailer.**
   - Minor (not life threatening) injuries that require medical attention will be treated at the "Non-Emergency Med Treatment" clinic identified above **unless an alternate clinic is recommended by WorkCare**. If no clinic is available or identified, then default to the "Emergency Medical Treatment" facility.
   - Life Threatening injuries are an emergency and require implementing emergency response (911 or alternate).
4. FIRE or EXPLOSION
   - Incipient stage (trash can size) fires may be handled by site personnel using fire extinguishers or hoses.
   - Larger fires will require that affected personnel are evacuation to the identified muster point and implementing emergency response (911 or alternate).
5. SPILL RESPONSE
   - Major spills that exceed the available supplies and resources to safely control and cleanup will require contacting an off-site spill responder indicated above for "Spill Response" and in accordance with existing site spill response plans. If a specific spill responder is not identified, a large spill will require implementing emergency response (911 or alternate).
   - Review available spill control and prevention plans that may be applicable to the work area. Ensure project personnel are familiar with plan requirements.

- Minor or incident spills will be cleaned up by site personnel using supplies that are located: At the pole barn or vehicle.
- The site owner will make notifications for reportable spills unless O'Brien & Gere is authorized to make those notifications.

6. POSTING - Emergency numbers and Hospital Route Map are posted: At the pole barn or vehicle.
7. OTHER EMERGENCY INFORMATION:



Depart Lake St toward E Lincoln St / Lincoln St E 0.2 mi

2. Turn left onto E Lincoln St / Lincoln St E 0.3 mi

3. Road name changes to W Lincoln St 0.2 mi

4. Turn right onto Dey St, and then immediately turn left onto RT-13 / RT-34 / N Meadow St 0.5 mi

5. Bear right onto RT-13 S / RT-34 S / N Fulton St 0.4 mi

6. Turn right onto RT-89 / RT-96 / W Buffalo St 505 ft

7. Keep straight onto RT-96 / W Buffalo St 2.4 mi

8. Turn right onto Harris B Dates Dr 253 ft

9. Turn left to stay on Harris B Dates Dr 49 ft

10. Arrive at 101 Harris B Dates Dr, Ithaca, NY 14850

The last intersection is W Hill Dr

If you reach Indian Creek Rd, you've gone too far

Pre-Work Briefing Acknowledgement: Individuals who are performing work covered by this JSA have received a **project-specific safety orientation** that includes a review of the safety requirements outlined in this JSA. The undersigned individuals acknowledge that have read this JSA and/or reviewed this JSA with a designated project representative and agree to comply with safety requirements outlined herein. The undersigned individuals understand that these safety requirements are not "all-inclusive" and that they are expected to follow any additional safe work practices applicable or customary to their specific scope of work or trade.

Print Name	Signature	Company	Date

Safety to Zero (S_20) – Safety Planning Is Critical To Our Ultimate Goal Of Zero Injuries

Project Name:	Former Ithaca Gun Factory Site	**OBG Project Officer:**	James R. Heckathorne
Project Number:		**OBG Project Manager (PM):**	Deb Wright
JSA Title:	Investigation Derived Waste Management	**OBG Site Supervisor:**	TBD
JSA Revision Date:	4/08/13	**OBG Site Safety Coordinator:**	TBD
JSA Prepared By:	10/24/13		
Client Name:	Dave Carnevale	**Subcontractor Company Name:**	(☐ NA) Multiple (see below)
Project Location:	IFR Development LLC	**Subcontractor Project Manager:**	TBD
Project Phone No.:	Ithaca, New York	**Subcontractor Superintendent:**	TBD
Project Fax No.:	TBD	**Sub Safety Competent Person:**	TBD

Scope of Work covered by this JSA (identify subcontractors covered by this JSA)	Investigation-derived wastes (IDW) will require appropriate management. The potential IDW include: drill cuttings, groundwater from drilling activities, groundwater from packer sampling activities, decontamination fluids, sediment settling out of suspension in groundwater, PPE and associated debris from field activities. Subcontractors includeTBD
References (existing safety plans, manuals, spec's, etc.)	O'Brien & Gere, May 2008, Ithaca Gun Site Health and Safety Plan.
Key Hazards (focus on highly hazardous tasks)	Heavy machinery, hydraulically and electrically powered equipment, slips trips falls, exposure/contact with contaminated materials, heat/cold stress.
Personal Protective Equipment Summary	*(additional safety equipment may be required for specific hazards identified in the following sections)* ☒ Hard Hat ☒ Safety Glasses ☒ Safety Shoes ☒ Cut-Resistant Gloves ☒ Ear Protection Other (specify): ☒ **High Visibility Vests** (required for all on site work.) ☒ **Ear Protection** (when working around heavy equipment, loud power tools, etc.) ☐ Fall Protection Harness & Lanyard (falls >6') ☐ Respiratory Protection (☐ N95 dust mask, ☐ half face, ☐ full-face) Specify cartridge in JSA. ☒ **Tyvek or other chemical protective coverall: (when there is the potential for contact with contaminated materials / biological hazards.)** ☐ **Face Shield** (chemical handling, line breaks, pressure washing.) ☒ **Nitrile Gloves** (☐ Surgical Type and/or ☐ "Dishwashing" Type) ☒ **Cut-resistant gloves** are required when handling cable, rods, and sharp or "splintery" materials.

Pre-Work Documentation & Certifications *(Refer to JSA content for additional certifications and documentation that may be required.)*	**Documentation and Certifications**	**To Be Submitted or Provided By…….**
	☐ Drug Testing (☐ alcohol testing is also required)	
	☒ **Project Safety Plan or Job Safety Analysis (JSA)**	**OBG Project Manager – Deb Wright**
	☐ Client/Facility Contractor Safety Orientation	
	☒ **Project Safety Orientation (JSA Review)**	**OBG Site Safety Coordinator – TBD**
	☒ **Daily Safety Meetings (Daily Pre-Task Planner)**	**OBG Site Safety Coordinator – TBD**
	☐ Verification of Hazwoper Medical Surveillance	
	☒ **OSHA 40-hr Hazwoper w/ current 8-hr Refresher**	**All on site OBG and subcontractor personnel**
	☐ Respirator Training, Fit Test, and Resp. Medical	
	☐ Confined Space Entry Certification (necessary for permit-required entry or non-permit designations)	
	☐ Excavation Competent Person designation	
	☐	

Permits applicable to scope of work	☐ Confined Space Entry Permit ☐ Hot Work Permit ☐ Energized Electrical Work Permit (from sub)	☐ Daily Excavation Inspection Checklist ☐ ☐

Individuals must sign the "Pre-Work Briefing" form on the last page after reviewing this JSA.

HAZARD		HAZARD CONTROLS (check all that apply and comment as required)
ELEVATED WORK		
☒ NA	FALLS > **6'** or within **15'** of a ROOF OR MEZZANINE EDGE where the fall is >6'	☐ Existing Guardrails ☐ Hole Covers Marked "HOLE" ☐ Fall Restraint ☐ Temporary Guardrails ☐ Manlifts used for elevated work ☐ _____ ☐ Warning Line 15' from Edge ☐ Fall Arrest w/ harness/lanyard (identify tie-off points) **Fall Protection Comments (describe equipment used):**
☒ NA	LADDERS / STAIRS ☐ Extension Ladders ☐ Step Ladders ☐ Fixed Ladders ☐ Stairs	☐ Employees training in safe ladder use at toolbox safety meeting ☐ Extension ladders are properly footed, secured at top, and setup at proper angle ☐ Stepladders are set on level ground or properly shimmed with spreaders locked. ☐ Stairs have proper rise over run and stairs >4 steps or 4' have guardrails. **LADDERS/STAIRS COMMENTS:**
EXCAVATIONS / TRENCHING		
☒ **NA**	☐ Max Depth ≥ 20' ☐ Max Depth ≥ 5' ☐ Max Depth <5' with potential cave-in hazard ☐ Potential permit-required confined space at depth ≥ 4' ☐ Underground utilities ☐ Structures/foundations ☐ Falls into excavations ☐ Other:	☐ Excavation Competent Person Name:_____ Company _____ ☐ Sloping & shoring for excavations ≥20' are approved by a professional engineer ☐ Sloping & shoring for excavations ≥5' when persons are exposed to cave-in. (specify below) ☐ Sloping & shoring for shallow (<5') excavations with cave-in hazard (specify below) ☐ O'Brien & Gere *Daily Excavation Checklist* to be completed by the Competent Person. ☐ Excavations ≥ 4' are classified as a non-permit confined space ☐ Excavations ≥ 4' are classified as Alternate Entry or Permit-Required (see confined space) ☐ Underground utilities have been identified and marked. ☐ Local "dig safe" organization has been notified for utility locations in public areas or rights of way. Number: _____ Date: _____ ☐ Hand digging within 3' of utility locations. ☐ Soft-dig/vacuum dig within ____' of utility locations. ☐ Excavations are protected by perimeter fencing (not barricade tape): (☐ rigid fence - chain link or wood ☐ safety fence 6' from edge.) **EXCAVATION COMMENTS:**
CONFINED SPACES		
☒ **NA**	☐ No Serious Hazards ☐ Toxic Atmosphere ☐ carbon monoxide ☐ hydrogen sulfide ☐ ☐ Flammable Atmosphere ☐ Low Oxygen	☐ Confined space is altered so that it is no longer a confined space. (describe below) ☐ Confined space is downgraded to a non-permit confined space. (identify which spaces below) ☐ Alternate Entry is used. (Identify which space qualify for confined space entry below) ☐ Full permit-required confined space entry is used due to presence of serious hazards. ☐ Rescue team has been notified (☐ Paid FD ☐ Volunteer FD ☐ Plant Rescue) Rescue Team:_____Phone Number: _____

HAZARD		HAZARD CONTROLS (check all that apply and comment as required)
	☐ Combustible dust ☐ Drowning - high water level or potential for sudden changes in flow or level ☐ Other Serious Hazard:	☐ All entrants and attendants for Alternate Entry and Permit-Required Entry have confined space entry training. ☐ Refer to "Manual Lifting" section of this JSA for manhole cover removal safety. **CONFINED SPACE COMMENTS:**
OVERHEAD POWERLINES		
☒ NA	OVERHEAD POWER LINES _____ KV _____ ft above ground _____ KV _____ ft above ground	☐ Request to de-energize lines will be submitted for work within 20' of power lines. Request sent to: _____ Date: _____ ☐ No one will be permitted to work <10' to power lines without lines being de-energized. ☐ Project persons are informed of 20' safety zone around energized power lines. ☐ Project persons are informed of additional restrictions required when working ≤20' but >10': ☐ Dedicated spotter for all elevated work or operation of equipment that can contact lines ☐ Barricades setup at 20' from base of power lines to establish a "restricted work area." ☐ "Power Line Safety Permit' required to work within 20' of power lines. ☐ Power lines are shielded and/or marked with high visibility material **POWER LINE COMMENTS:**
DRILLING / BORING - All self-propelled rigs including trailer-mounted drilling/boring equipment		
☒ NA	Struck By, Run-Over, Caught In Between (pinch points), Roll Over, Hot Work (open flame) Fluid Leaks ☐ Drilling/Boring Rig: specify type(s) below: Hollow Stem Auger Air Rotary Other	☐ Qualified persons operate all drilling/boring equipment. Qualifications were determined by: ☐ Work Experience Summary on company letterhead or email with company email address. ☐ ☐ Equipment will be inspected upon mobilization by: NOTE - Inspections will include (but not be limited to) the following: leaks, defective safety equipment, and loose/unsecured parts that could fall during operation ☐ Operators will be reminded of seatbelt use by: _____ ☐ High visibility vests are required for: ☐ Cut-resistant gloves are required when handling cable, rods, and other sharp or "splintery" materials ☐ Chemical-resistant gloves and clothing are required while handling grout, cement, chemicals, or contaminated materials including soil or groundwater. (Refer to "Environmental Hazards" section for more information.) ☐ Operators and helpers will maintain a safe distance to moving parts. All those working near moving or rotating parts will secure loose hair, clothing, and equipment. All those working near the rods/casings are instructed to not put themselves in a position where they could get hurt if the rods/casings should turn or drop. ☐ Drill rods, casings, and other equipment will be stored neatly when not in use and secured to prevent them from falling on, or rolling into, site personnel. ☐ The area will be cleared of rope, cords, weed-block fabric, or similar material that could become wrapped around the auger, entangle someone and then pull them into the auger. ☐ Fall protection will be worn whenever (if) the drilling/boring mast must be climbed above 6'. (Tie-off Points are specified: ☐ in "Comments" below ☐ in the "Fall Protection" section) ☐ Masts located within 20' of an overhead power line will only be lowered or raised with a dedicated spotter. (Refer to the "Overhead Powerlines" section of this JSA for additional safety precautions) ☐ Drill rigs will only be moved with masts lowered. ☐ Masts will be erected with outriggers fully extended when equipped with outriggers.

HAZARD		HAZARD CONTROLS (check all that apply and comment as required)
		☐ Outriggers will be placed on a firm, stable surface or will be cribbed to prevent sinking of outriggers and collapse of the drilling/boring rig. ☐ Drilling on sloped surfaces will be conducted such that the drilling/boring equipment remains stable and otherwise in accordance with requirements outlined below in Drilling/Boring comments. ☐ Damage to underground utilities will be prevented by cribbing outriggers to spread the load or relocated outriggers so they are not placed on utilities. ☐ Procedures for responding to natural gas emissions (explosive vapors) are: ☐ Outlined in "Comments" below. ☐ Outlined in an attached procedure. ☐ Procedures for drilling/boring from a barge or otherwise working over water are: ☐ Outlined in "Comments" below. ☐ in the "Working Over Water" section. ☐ Drilling/boring equipment will be de-energized and locked-out prior to maintenance. ☐ Site personnel working in the area surrounding the drilling/boring rig have will be informed where the emergency shutoff in the event of an emergency. Specify the location of the shutoff in the "Comments" section below. ☐ Spill equipment is available for fuel and hydraulic fluid leaks. Location; _____ **DRILLING/BORING COMMENTS:**
HEAVY EQUIPMENT (other than cranes)		
☐ NA	Struck By, Run-Over, Caught In Between (pinch points), Roll Over, Fluid Leaks ☐ Excavator ☐ Dump Truck ☐ mini Skid Steer (bobcat) ☐ mini Excavator ☐ **Gator/Off-Road Vehicle** ☐ Other: ☒ **Other: Field vehicle** ☐ Manlift - specify type(s):	☒ **Qualified persons operate all heavy equipment. Qualifications were determined by:** ☐ Work Experience Summary on company letterhead or email w/ company email address. ☒ Other (describe): **Work experience verified by subcontractor.** ☒ **Equipment will be inspected upon mobilization by: Site Safety Coordinator and Operator.** (NOTE - All leaks or defective safety equipment must be repaired before use.) ☒ **Operators are required to wear seatbelts for all equipment provided with seatbelts.** ☒ **High visibility vests are required for: All on site work.** ☐ Operators will review manufacturer's safety guidelines for all **equipment operated on slopes** including Gators© and similar ATVs/4x4's. (In the "Comments" section below, specify the maximum slope for each piece of equipment that will be operated on slopes. This may be completed upon mobilization.) ☐ Dump trucks, 4x4's, or other haul vehicles will not be loaded beyond manufacturer **capacities or weight limits** established by state and local authorities for transportation. ☐ **Counterweight swing radius** will be barricaded. ☐ **Spotters** are required when trucks or other heavy equipment are backing up. Clarify procedure in "Comments" below. ☒ Operators and helpers will maintain a **safe distance to moving parts**. All those working near moving or rotating parts will secure loose hair, clothing, and equipment. ☐ Fall protection will be worn by all those in **manlifts** (scissor lifts are excepted: ☐ Yes ☐ NO) ☒ **Spill equipment** is available for fuel and hydraulic fluid leaks. Location; **Field support vehicle** **HEAVY EQUIPMENT COMMENTS:** **Personnel to remain upwind of heavy equipment exhausts whenever possible.** **Locations will be inspected prior to mobilization of the heavy equipment.** **Sloped areas, saturated ground surfaces and heavily rutted areas will be avoided if possible.**

HAZARD		HAZARD CONTROLS (check all that apply and comment as required)
		Personnel should exercise extreme caution in the vicinity of operating equipment and machinery to avoid physical injury to themselves or others. **Cell phones will not be used while operating heavy equipment and machinery or by workers on the ground in the area of heavy equipment and machinery operations to avoid physical injury to themselves or others.** **ATV operators will wear helmets and eye protection during operation.**
POWER TOOLS, HAND TOOLS, and EXTENSION CORDS		
☐ NA	eye injury, hand/arm cuts, electrical shock, strains, foot injuries, dust ☒ **Misc Handtools (shovels, hammers, trowels, etc.)** ☐ Chainsaws (Clearing & Grubbing) ☒ **Sharp hand-tools (knives, cutters, scissors)** ☐ Electrofishing (Fish Shocking) Equipment ☐ Hand Augers - Iwan or Spiral type ☐ Hand Sampler - Split Spoon or Thin Wall ☐ Hand Probe (GeoProbe) with ____ lb weight ☐ Manual Cathead Hoist with 140 lb weight ☐ Motorized Cathead Hoist with 140 lb weight ☐ Light-weight Motorized Auger drills (not truck-mounted) ☐ Manhole Lifting Devices **(specify in Comments)** ☐ Other (specify):	☒ **All tools and electrical cords in-use will be inspected daily by:** ☒ **Users** ☐ Site Supervisor/Safety Coordinator ☐ Other: _____ ☒ **Only the right tools will be used in a manner for which they were designed.** ☒ **GFCIs will be used on all extension cords and 120v power tools.** ☒ **All extension cords are in good condition with no cuts through outer insulation, ground plugs are present, and no "vinyl tape" repairs. (Only 12 gauge extension cords may be repaired.)** ☐ **Face shield** and safety glasses used (required for chain saws and chemical handling) ☐ **Kevlar chaps and jacket** (required for all chainsaw work) ☒ **Cut-resistant gloves are worn whenever cutting tools are used.** ☐ **Safety cutters or scissors are required for all cutting activities (no fixed-blade knives).** ☒ **Hearing protection required for which tools or areas: Power tools, equipment that generates sustained noise above 85 db.** ☐ All **hand augers and sampling probes** will be inspected and verified to be in good conditions with ALL parts required by the manufacturer. Inspections will be completed by: ☐ Users ☐ Site Supervisor/Safety Coordinator ☐ Other: _____ ☐ Persons using sampling probes equipped with **manual slide hammers** are physically capable of handling the weight without difficulty and keep hands clear of pinch-points. ☐ Persons using manual and motorized cathead hoists have been trained on how to operate them in accordance with manufacturer guidelines. (Identify qualified persons by name in the "Comments" Section below.) ☐ Electrofishing equipment will be **inspected** and verified to be in good conditions with ALL parts required by the manufacturer and exterior cords have no cuts through outer insulation and no "vinyl tape" repairs. Inspections will be completed by: ☐ Users ☐ Site Supervisor/Safety Coordinator ☐ Other: _____ ☐ Persons using **Electrofishing Equipment** have been **trained** on how to operate it in accordance with manufacturer guidelines. **(Identify qualified persons by name in the "Comments" Section below.)** ☐ Electrofishing will be discontinued if the **public** approaches within **100'** ☐ Electrofishing boats will be marked with "**Danger Electricity**" signs (or equivalent) that can be read at a distance of **150'**. ☐ All electrofishing team members wear **electrically-rated rubber gloves** that are inspected daily by users and replaced every 6 months. Use leather or other cut-resistant gloves to protect the rubber gloves. (Similar to NFPA 70E requirements.) ☐ All electrofishing team members wear **chest or hip waders** to insulate the wearer from electrical shock. ☐ **Net handles** for nets used during electrofishing will be nonconductive and long enough to keep hands out of the water. ☐ The positive electrode (anode) on portable electroshockers is equipped with a **manual switch** that stops the current when released and is **not "bypassed'** with a hold-down mechanism (i.e., tape) ☐ At least **two (2) persons** on each Electrofishing boat or location are trained in **CPR**. ☐ All persons involved in electrofishing know the location of the **emergency shutoff switch**. ☐ **Backpack electrofishing equipment** is equipped with a **tilt switch** that stops the current if the operator falls.

HAZARD		HAZARD CONTROLS (check all that apply and comment as required)
		POWER TOOLS, HAND TOOLS & AUGERS, EXTENSION CORDS, & ELECTROFISHING **COMMENTS:** **Anticipated tools to be used may include but are not limited to: hammers, wrenches, screwdrivers, power drills/impact drivers, knives/cutting implements, pry bars, shovels, drum dollies.**
WORKING OVER/NEAR WATER OR ON ICE		
☒ NA	**drowning, hypothermia (winter months), spills to surface waterways, fall through ice** ☐ Barge-mounted drilling/boring rigs ☐ Sampling from a boat ☐ Boat required for site access ☐ Work on an ice covered body of water ☐ Other: **NOTE – See "Walking Surfaces" section of JSA for slipping hazards on icy surfaces.**	☐ 100% Fall Protection while working over water or when otherwise exposed to a drowning hazard. **(Describe how fall protection will be implemented, Tie-off points, and the equipment that will be used.** ☐ in "Comments" below ☐ in the "Fall Protection" section) ☐ A "**safety observer**" will remain on shore with the ability to contact emergency response personnel and communicate with those on boats/barges. ☐ USG-approved **flotation vests** will be used. ☐ **Ring-buoy** with 90' of rope and placed within 100' of site personnel. ☐ **Rescue skiff** will be staged such that one person can immediately launch the skiff. ☐ At least **one person will be available to launch** and operate the rescue skiff. NOTE - "Safety Observer" may launch rescue skiff after making emergency response notification(s). ☐ Ice Safety - **Core samples** will be taken every 100' on lakes or 50' on rivers to evaluate the thickness and quality of ice (i.e., *clear/blue ice* = best quality, *white/opaque ice* = moderate quality/use caution, *gray/slushy ice* = poor quality/unsafe). ☐ Ice Safety - Conservative **load estimates** are established for static and/or moving loads as appropriate for the type of work being conducted. Load estimates are explained: ☐ in "Comments" below ☐ in an attached document ☐ Spill Control - **Floating booms** will be used around barges, shore-based heavy equipment, or other locations where hydraulic fluid may leak from equipment into surface water. ☐ Spill Control - **Silt curtains** will be suspended below floating booms. ☐ Boats and Barges will not be operated above their **weight capacity**. ☐ Boats and barges operated (or potentially operated) in **bad weather** will be operated below their weight capacity by _____% (suggest at least 25%). ☐ Boat and barge emergency calls - **Weather resistant radios** that broadcast on Coast Guard frequencies (Channel 16 VHF/FM or 2182 MHZ) will be available for emergency calls. ☐ Boat or barge-based operations will be discontinued when NOAA issues a **small craft advisory** or when sustained **wind speeds of 20 mph** are observed and create dangerous wave or boat/barge handling conditions. ☐ **NOAA Weather Radio Receiver** will be used to monitor weather conditions that may affect boat or barge-based activities. **WORKING OVER WATER COMMENTS:**
MANUAL MATERIAL HANDLING & STORAGE / HOUSEKEEPING / WALKING SURFACES (includes manhole covers, heavy lifting, slippery surfaces, and steep slopes)		
☐ NA	back or shoulder strain, struck by falling objects, trips and falls, incompatible materials (fire or explosion) ☒ **hvy manual lifting (>50 lbs)** ☐ chemical storage ☐ compressed gas storage ☐ Tall storage greater than 2 pallets stacked.	☒ **Mechanical lifting equipment used to reduce manual material handling:** (☐Forklift/Lull ☒ **Heavy Equipment** ☒ Dolly ☐_____) ☒ **Manual lifting more than 75 lbs by a single person will be avoided.** ☐ Good manual lifting techniques will be reviewed with the following trades/persons prior to site work: _____ ☐ Incompatible chemicals will be separated by 20' or a concrete block wall. ☐ Secondary containment will be provided for the following chemicals: _____ _____ ☐ Safety equipment will be located near chemical storage.

HAZARD		HAZARD CONTROLS (check all that apply and comment as required)
	☒ **Material & equipment laydown areas** ☒ **Trash & debris removal** ☐ Manhole Cover Removal ☒ **Tripping Hazard (cords, hoses, uneven surfaces)** ☒ **Slipping Hazard (icy, muddy, oily, etc.)** ☐ Steep sloped surfaces ☐ ☐	☐ Spill Kit ☐ Emergency Shower ☐ Eyewash ☐ Drench Hose ☐ Splash PPE ☐ Flammable gases and oxygen will be separated by 20'. ☐ All compressed gas cylinders will be transported vertically and secured upright. ☒ **Equipment and materials will be stacked in laydown areas with aisles as necessary for safe access. All un-used equipment & materials will be returned to laydown areas daily. Designated laydown areas:**_____ ☐ Materials will not be stacked greater than 2 pallets high without being secured. ☒ **Trash and debris will be removed daily and placed in designated containers. Specify debris segregation and location of disposal containers below.** ☐ Hoses & Cords will be run out of walkways (e.g., within 6" of walls or 7.5' overhead) whenever possible or will be clearly marked by cones or barricades. ☐ All chemical containers will be labeled per Hazard Communication requirements. ☐ **Manhole covers** will ONLY be removed with tools specifically designed to remove them including J-hooks that are at least **30"** long. No pry bars, shovels, or screw drivers. ☐ **"Stuck" manhole** removal equipment and procedures are described in "comments." ☐ **"Paved-over"** manhole removal equipment and procedures are described in "comments." ☒ **Slippery surface – work area inspected for icy surfaces which will be salted/sanded.** ☒ **Slippery surface –YakTrax® or similar slip-on traction devices will be used for icy areas.** **MATERIAL HANDLING & HOUSEKEEPING COMMENTS:** **Proper lifting techniques will be employed (*e.g.*, two-man lift, bending at the knees, limited pivoting at the waist).** **Heavy manual lifting/moving may include but is not limited to: generators, air compressors, gas cylinders, drums.**
ROADWAY, RAILROAD, & SIDEWALK OBSTRUCTION		
☒ NA	☐ Vehicle accidents ☐ Pedestrians struck by vehicles or heavy equipment ☐ Pedestrians falls ☐ Pedestrian struck-by falling objects ☐ Railroad accidents	☐ DOT signal devices will be used to re-route vehicles around excavations or busy site entrances/exits that affect road traffic. ☐ Roadway Flaggers will be used and have DOT Flagger Training ☐ Procedures for work vehicles to enter/exit traffic work zones are required when work zones are setup in high speed roadways or when potential blind-spots exist. Explain in "Comments." ☐ Pedestrian traffic will be safely routed around or over excavations. ☐ Pedestrian traffic will be safely routed around or under overhead work. ☐ Railroad owner notified for permission to work on the railroad right-of-way. ☐ Railroad flagger is required for work in the right-of-way. ☐ Equipment, materials, and personnel may not be closer than 15' to the nearest railroad rail if the railroad flagger or the flagger's signal is not visible. ☐ Derailer(s)/bumper(s) will be installed on railroad tracks to isolate the work area. **ROADWAY, RAILROAD, & SIDEWALK COMMENTS:**
BIOLOGICAL HAZARDS		
☐ NA	Infection, Lyme Disease, West Nile Virus, Eastern Equine Encephalitis (EEE), Severe Rash, Allergic Reaction, Venom effects ☒ **Ticks** ☒ **Mosquitoes (EEE, WNV, etc)** ☐ Venomous Snakes ☐ Venomous Spiders	☒ **Use DEET (25%-98%) repellent on skin for protection against mosquitoes, ticks, and similar insects. Use higher concentrations for heavily infested areas.** ☒ **Use Permethrin repellent on clothing in areas heavily infested with ticks, chiggers, etc.** ☐ All site personnel will be instructed on how to **identify poison ivy, sumac, and oak**. (O'Brien & Gere Field Identification Guide or equiv. has been posted? ☐ YES ☐ NO) ☐ Poison ivy **barrier creams** (e.g., Ivy Block) will be used on exposed skin prior to the workday. ☒ **Poison ivy neutralizing wipes or rubbing alcohol will be used on hands and exposed skin following work activities or incidents where contact with poison ivy/oak/sumac is suspected.**

HAZARD	HAZARD CONTROLS (check all that apply and comment as required)
☒ **Poison Ivy, Oak, or Sumac** ☒ **Bees & Wasps** ☐ Fire Ants ☒ Other (identify below): Biting animals	☒ **Protective coveralls (such as Tyvek™) may be used to prevent contact with ticks or poison ivy.** ☐ All site personnel will be instructed on how to identify venomous snakes indigenous to the area. List venomous snakes of concern in the "Comments" section below. (O'Brien & Gere Field Identification Guide or equiv. has been posted? ☐ YES ☐ NO) ☐ All field personnel with a potential to **encounter venomous snakes** will wear: ☐ Snake Chaps AND/OR ☐ High Leather Safety Boots (NOT ankle-high boots/shoes) ☐ All site personnel will be instructed on how to identify **venomous spiders** indigenous to the area. List venomous spiders of concern in the "Comments" section below. (O'Brien & Gere Field Identification Guide or equiv. has been posted? ☐ YES ☐ NO) ☒ **Site personnel with known allergies to bee/wasp stings, fire ant bites, or other insect bites carry an "EpiPen" or equivalent medication prescribed for treating allergic reaction.** **Site Safety Coordinator will be notified by personnel with allergies.** **BIOLOGICAL HAZARDS COMMENTS:**

ENVIRONMENTAL HAZARDS / HAZARDOUS WASTE SITE WORK

☐ NA

Exposure to hazardous vapors or dust, contact with contaminated materials, fire, explosion.

Contaminants of Concern and hazardous chemicals include:

- ☒ **volatile organic compounds (describe: chlorinated solvents)**
- ☐ **semi-volatile organic compounds (describe: dichlorobenzene, trichlorobenzene and phenol compounds)**
- ☒ metal dusts (describe:Lead)
- ☐ PCBs
- ☐ Caustic (NaOH)
- ☐ Acid (H2SO4, HCL)
- ☐ **BTEX**
- ☐

(many other hazardous waste site hazards are covered elsewhere in this JSA)

☒ **Site workers with a potential for contact with contaminated materials and work in Level C PPE will have OSHA 40-hour training, current 8-hour refresher, and medical exam.**

☒ **Site workers with minimal contact with contaminated materials and no work in Level C PPE will have OSHA 40-hour OR 24-hour training, current 8-hour refresher, and medical exam.**

☐ Foremen or Supervisors overseeing field crews will have 8-hour OSHA Supervisor training.

☐ No intrusive work activities or areas are anticipated with current scope of work.

☒ **Intrusive work activities include: Groundwater sampling of wells.**

☒ **The perimeter of intrusive work areas are identified by: Site Safety Coordinator**

☐ Decontamination of personnel or equipment is <u>not</u> anticipated with the current scope of work.

☒ **Decontamination of personnel and small tools will be conducted as follows:**

Phosphate-free detergent wash and distilled water rinse.

☒ **Decontamination of heavy equipment will be conducted as follows:**

☐ **Heavy equipment leaving the site will be inspected by: Site Safety Coordinator**

☐ **Work area air monitoring** is not anticipated with the current scope of work.

☒ **Work area air monitoring will be conducted per attached air monitoring plan.**

☒ **Work Area Air Monitoring as follows for:** ☐ **Dust,** ☒ **VOCs,** ☐ **Other:**_____

Description:

Action Levels[1]	Description & Response Actions
<5 ppm for Total VOCs	<u>Level D PPE</u> (General PPE as required in this JSA)
5 – 50 ppm for Total VOCs	1. <u>Half or Full Face Level C PPE</u> - Tyvek, boot covers, nitrile gloves, half or full face w/ respirator with Organic vapor/P100 cartridges changed (☒ daily, ☐ _____) OR 2. Implement additional engineering or administrative controls to reduce contaminant concentrations below action level(s).
50 – 200 ppm for Total VOCs	1. <u>Full Face Level C PPE</u> - Tyvek, boot covers, nitrile gloves, full face w/ respirator with Organic vapor/P100 cartridges changed (☒ daily, ☐ _____) OR 2. Implement additional engineering or administrative controls to reduce contaminant concentrations below action level(s).
200 ppm above	1. STOP work until contaminant levels can be reduced. 2. Notify the Project Manager and Client Representative.

HAZARD		HAZARD CONTROLS (check all that apply and comment as required)
		backgournd 1. Sustained 1 minute above background ☒ **Community Air Monitoring** is not anticipated with the current scope of work. ☐ **Community Air Monitoring** is required per the attached air monitoring plan. ☐ **Community Air Monitoring** as follows for: ☐ Dust, ☐ VOCs, ☐ Other:_____ Description: _____ **ENVIRONMENTAL & CHEMICAL HAZARD COMMENTS:** **To minimize potential exposure to COCs, disposable gloves will be worn.** **Wells will be allowed to vent prior to initiating testing activities to minimize potential exposure to COCs that may have built up in the air inside the well.** **Personnel should remain upwind of the well being tested whenever possible.**
OTHER HAZARDS & CONTROLS not addressed in other sections of this JSA		
☐ NA	☒ **Heat Stress** ☒ **Cold Stress** ☐	☒ **Site workers will be trained to recognize the symptoms of heat/cold stress.** ☒ **Work/rest regimens will be employed by as necessary so that personnel do not suffer adverse effects from heat/cold stress.**

EMERGENCY RESPONSE

(911 Service is Available ☒ Yes ☐ No **Cell Phone Required** ☒ Yes ☐ No)

Alternate Emergency Number (if not "911"):

Site Address: 121-125 Lake Street, Ithaca, NY

Muster Point in case of site evacuation: Evacuated personnel will assemble south of the site along Lake Street.

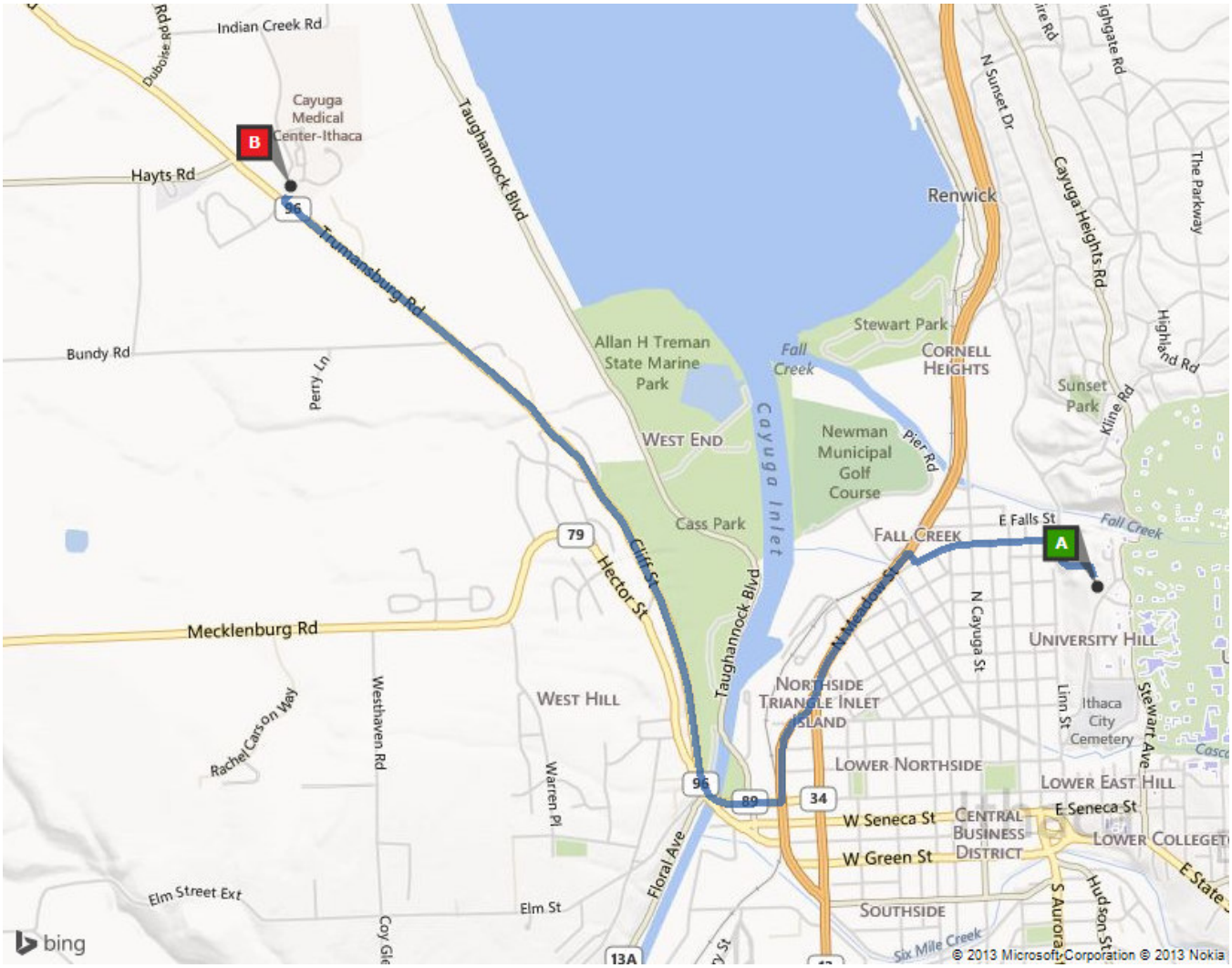
Emergency Medical Treatment - Hospital Name: Hospital Address:	**Cayuga Medical Center** **101 Dates Drive, Ithaca, NY 14850**	**Number:**	**(607) 274-4011**
Non-Emergency Med. Treatment - Clinic Name: Occupational Clinic Address:		**Number:**	
Minor Injury Support for OBG Employees:	**WorkCare Incident Intervention**	**Number:**	(888) 449-7787
Fire Department Name		**Number:**	**(607) 272-1234**
Spill Response:	**National Spill Response Center**	**Number:**	**(800) 424-8802**
Client Representative Name::	**Frost Travis**	**Office Number:**	
		Cell Number:	
O'Brien & Gere **Project Manager** Name:	**Deb Wright**	**Office Number:**	**(315) 956-6377**
		Cell Number:	**(315) 546-4541**
O'Brien & Gere **Corporate H&S** Name:	**Jeff Parsons**	**Office Number:**	**(315) 956-6871**
		Cell Number:	**(315) 391-0638**
Contact Name:	**TBD**	**Office Number:**	
		Cell Number:	
Contact Name:		**Office Number:**	
		Cell Number:	

EMERGENCY RESPONSE COMMENTS:

1. NOTIFICATIONS - Upon occurrence of any injury, fire, explosion, major spill (beyond incidental), property damage >$1,000, or near-miss that could have resulted in a fatality or disabling injury, **IMMEDIATELY NOTIFY** the O'Brien & Gere Project Manager, O'Brien & Gere Manager of Corporate H&S, and the Client Representative.
2. WRITTEN REPORT - Complete an *Incident Report* within **24 hours** and submit to the O'Brien & Gere Manager of Corporate H&S for review. Report may be submitted as a "draft" or "preliminary" and updated as additional information is identified.
3. INJURY RESPONSE
   - First aid injuries will be handled on site with FA-trained personnel. First aid and CPR supplies are located: **Inside Field Vehicle**.
   - **All O'Brien & Gere employees will call WorkCare for minor injuries** that include any strains, cuts for which an employee is not confident that a band aid is sufficient, tick/insect bites for which the employee is concerned about infection or Lyme, and any other work-related injury for which the employee would like to talk to a WorkCare medical professional regarding proper treatment or follow-up.
   - **WorkCare posters must be posted at each job site with a field office or trailer.**
   - Minor (not life threatening) injuries that require medical attention will be treated at the "Non-Emergency Med Treatment" clinic identified above **unless an alternate clinic is recommended by WorkCare**. If no clinic is available or identified, then default to the "Emergency Medical Treatment" facility.
   - Life Threatening injuries are an emergency and require implementing emergency response (911 or alternate).
4. FIRE or EXPLOSION
   - Incipient stage (trash can size) fires may be handled by site personnel using fire extinguishers or hoses.
   - Larger fires will require that affected personnel are evacuation to the identified muster point and implementing emergency response (911 or alternate).
5. SPILL RESPONSE
   - Major spills that exceed the available supplies and resources to safely control and cleanup will require contacting an off-site spill responder indicated above for "Spill Response" and in accordance with existing site spill response plans. If a specific spill responder is not identified, a large spill will require implementing emergency response (911 or alternate).
   - Review available spill control and prevention plans that may be applicable to the work area. Ensure project personnel are familiar with plan requirements.

- Minor or incident spills will be cleaned up by site personnel using supplies that are located: At the pole barn or vehicle.
- The site owner will make notifications for reportable spills unless O'Brien & Gere is authorized to make those notifications.

6. POSTING - Emergency numbers and Hospital Route Map are posted: At the pole barn or vehicle.
7. OTHER EMERGENCY INFORMATION:



1. Depart Lake St toward E Lincoln St / Lincoln St E 0.2 mi

2. Turn left onto E Lincoln St / Lincoln St E 0.3 mi

3. Road name changes to W Lincoln St 0.2 mi

4. Turn right onto Dey St, and then immediately turn left onto RT-13 / RT-34 / N Meadow St 0.5 mi

5. Bear right onto RT-13 S / RT-34 S / N Fulton St 0.4 mi

6. Turn right onto RT-89 / RT-96 / W Buffalo St 505 ft

7. Keep straight onto RT-96 / W Buffalo St 2.4 mi

8. Turn right onto Harris B Dates Dr 253 ft

9. Turn left to stay on Harris B Dates Dr 49 ft

10. Arrive at 101 Harris B Dates Dr, Ithaca, NY 14850

The last intersection is W Hill Dr

If you reach Indian Creek Rd, you've gone too far

Pre-Work Briefing Acknowledgement: Individuals who are performing work covered by this JSA have received a **project-specific safety orientation** that includes a review of the safety requirements outlined in this JSA. The undersigned individuals acknowledge that have read this JSA and/or reviewed this JSA with a designated project representative and agree to comply with safety requirements outlined herein. The undersigned individuals understand that these safety requirements are not "all-inclusive" and that they are expected to follow any additional safe work practices applicable or customary to their specific scope of work or trade.

Print Name	Signature	Company	Date