Former Friedrichsohn Cooperage
OU-2 Groundwater Monitoring Plan

153-155 Saratoga Avenue
Town of Waterford, Saratoga County, New York

Site No. 546045

CHA Project Number: 060017.000

Prepared for:

SI Group
The Substance Inside
1000 Main Street
Rotterdam Junction, New York 12150

General Electric
1 River Road
Schenectady, New York 12306

Prepared by:

CHA
III Winners Circle
Albany, New York 12205
Phone: (518) 453-4500

April 2022

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CERTIFICATION

I, Scott M. Smith, certify that I am currently a NYS registered professional engineer and that this Pre-Design Investigation Work Plan was prepared in accordance with all applicable statutes and regulations and in substantial conformance with the DER Technical Guidance for Site Investigation and Remediation (DER-10).

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

For CHA Consulting, Inc.:

Scott M. Smith, P.E.
Printed Name of Certifying Engineer

Signature of Certifying Engineer

April 29, 2022
Date of Certification

083885
NYS Professional Engineer Registration Number

CHA Consulting, Inc.
Company

Vice President
Title

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LIST OF ACRONYMS & ABBREVIATIONS

CAMP	Community Air Monitoring Plan
CHA	CHA Consulting, Inc.
CP-43	CP-43: Groundwater Monitoring Well Decommissioning Policy
CRA	Conestoga-Rovers & Associates
DER	Division of Environmental Remediation
ELAP	Environmental Laboratory Approval Program
EPA	Environmental Protection Agency
GE	General Electric
GMP	Groundwater Monitoring Plan
HASP	Health and Safety Plan
HSA	Hollow Stem Auger
ISS	In-Situ Stabilization
NTU	Nephelometric Turbidity Units
NYSDEC	New York State Department of Environmental Conservation
NYSDOH	New York State Department of Health
OCC	Old Champlain Canal
OU	Operable Unit
PCB	Polychlorinated Biphenyls
QA	Quality Assurance
QAPP	Quality Assurance Project Plan
QC	Quality Control
RI/FS	Remedial Investigation/Feasibility Study
ROD	Record of Decision
SI Group	SI Group, Inc.
SOP	Standard Operating Procedure
SVOC	Semivolatile Organic Compound
TAL	Target Analyte List
TBD	To Be Determined
TOGS 1.1.1	Technical and Operational Guidance Series 1.1.1
VOC	Volatile Organic Compound

1.0 INTRODUCTION

General Electric Company (GE) and Schenectady International Group, Inc. (SI Group) (responsible parties) entered an Order on Consent with the New York State Department of Environmental Conservation (NYSDEC) in January 2013, to investigate and remediate a 0.45-acre property in Waterford, New York. The Site is referred to as the Former Friedrichsohn Cooperage Site and is located at 153-155 Saratoga Avenue in the Town of Waterford, County of Saratoga, New York (Site). The project area also includes the portion of the Old Champlain Canal (OCC) extending from Burton Avenue in the north to O'Connor Drive in the south. (Figure 1).

Based on multiple investigations conducted at the Site, three Operable Units (OUs) were identified:

- OU-1 is comprised of the on-Site and off-site contaminated soils associated with the operation of the former cooperage;
- OU-2 is comprised of on-Site and off-site groundwater; and,
- OU-3 is comprised of the sediments in the OCC between O'Connor Drive and Burton Avenue and includes on-Site source area soils.

The responsible parties and the NYSDEC entered into a Consent Order to implement the selected remedies for OU-1 and OU-3, which was completed in 2021 with the final site restoration occurring in the spring of 2022. The Order on Consent also required the implementation of a groundwater monitoring program for OU-2. A Groundwater Monitoring Plan (GMP) was submitted by Conestoga-Rovers & Associates (CRA) in July 2013. The objective of the OU-2 GMP was to establish baseline conditions for groundwater quality and assess whether a Remedial Investigation/Feasibility Study (RI/FS) would be necessary for OU-2. Portions of the monitoring program were implemented in 2015 and 2016, but no additional work on OU-2 was conducted after that time. A record of decision (ROD) has not been issued by the NYSDEC for OU-2 at this time.

This OU-2 GMP has been prepared by CHA Consulting, Inc. (CHA) on behalf of the responsible parties and describes the additional investigative activities proposed for OU-2 to:

- Redevelop the groundwater monitoring network following disturbances from the remedial action associated with OU-1 and OU-3;
- Understand the current groundwater concentrations of contaminants of concern;
- Evaluate changes in concentrations in groundwater contaminants over time in response to remediation of on-site soils (source removal); and,
- Determine the applicability of monitored natural attenuation as a long-term remedial strategy.

This GMP is consistent with the guidance provided in the NYSDEC "Division of Environmental Remediation (DER)-10 Technical Guidance for Site Investigation and Remediation" (May 2010) and supersedes the 2013 GMP.

2.0 SITE DESCRIPTION & ABBREVIATED HISTORY

As previously indicated, the Site is located at 153-155 Saratoga Avenue, Waterford, in the County of Saratoga, New York. The OU-3 project area also included the portion of the OCC extending from Burton Avenue in the north to O'Connor Drive in the south. Friedrichsohn Cooperage operated at the Site from 1817 to 1991. During early operations, the cooperage made and refurbished wooden kegs and barrels. When the cooperage closed in 1991 the primary business had been cleaning and refurbishing metal drums. Industrial facilities in the area used materials shipped in drums in their industrial processes. Drums, some of which contained residual products or waste, were sent to the cooperage to be cleaned, repainted, and resold. The drum cleaning and refurbishing operations are alleged to be the source of the contamination identified at the Site.

During its most recent history, the cooperage operated out of five buildings at the Site. Three of the five buildings were constructed as slab-on-grade while two of the buildings included below-grade structures. One of the buildings had a basement area where sumps were located and one of the buildings on the southwest end of the Site was identified as a garage that included a sub-grade automobile service trench based on the review of historical drawings. All former structures have been razed.

In 2021, remedial construction of the selected remedies for OU-1 and OU-3 was completed. This included excavation of hazardous and non-hazardous soil and sediments to the design depths approved by the NYSDEC and capping the upland portion of the Site with an engineered cover system. Additionally, the canal bottom (where excavated to bedrock) and sidewalls were backfilled/restored with clay material. At this time, OU-1 and OU-3 have been remediated per the RODs and approved remedial design.

2.1 SITE GEOLOGY AND HYDROGEOLOGY

The Site geology and hydrogeology were described in the Remedial Investigation/Feasibility Study (RI/FS) prepared by Malcolm Pirnie, Inc. dated April 2010. Multiple bedrock and overburden wells were installed at that time. Generally, the overburden consists of brown medium sandy fine gravel overlain by silty sand. The bedrock in the area consists of the Canajoharie Shale.

The depth of bedrock varies from approximately 10 to 25 feet below ground surface (ft bgs) on the north side of the Site to 30 to 35 ft bgs on the south side of the OCC. Groundwater flow direction on the upland area of the Site generally flows perpendicular to the OCC.

3.0 GROUNDWATER MONITORING PLAN

3.1 WELL INSPECTION

Before implementation of the GMP, the condition of two existing monitoring wells that were part of the 2015-16 monitoring program will be inspected; specifically monitoring wells MW-2 and MW-2S located at 158 Saratoga Avenue, specifically in the Waterford Health Center parking lot located across the street from the main Friedrichsohn site. The following conditions will be evaluated:

- Integrity of the well cover and sealing plug;
- Function of the lock;
- Integrity of the surface seal/apron and casing;
- Identification of a measuring point on the well riser;
- Total depth of the well and volume of siltation;
- Recharge rate (qualitatively – no pump testing performed); and
- Need for the redevelopment of the well.

The need for any well repairs or maintenance will be determined following the well inspection. At the time of each groundwater monitoring event, the wells will be inspected for the same conditions and recommendations will be made to maintain wells in proper working order for the duration of the groundwater sampling program.

3.2 WELL DECOMMISSIONING

During the remedial construction associated with OU-1 and OU-3, monitoring wells MW-8, MW-10, MW-14, and MW-15 that were part of the 2015-16 groundwater monitoring program as well as a monitoring well with an unknown well identification number were decommissioned per *CP-43: Groundwater Monitoring Well Decommissioning Policy* (CP-43). The decommissioning logs are included in this document as Appendix A. Generally, the casings were pulled, and the well was backfilled with grout to the surface.

CHA and the remedial contractor completing the remediation for OU-1 and OU-3 could not locate existing monitoring wells MW-4, MW-5, MW-5S, MW-6, and MW-6S (see Figure 2) at the start of the remedial construction. However, all five existing wells that were part of the 2015-16 groundwater monitoring program were subsequently discovered by the remedial contractor when they were removing loose material from the towpath along the canal in preparation for restoring the pathway. Upon discovery, some of these five wells were missing their protective casings and most were missing protective gripper plugs allowing site soils from the towpath to fill the risers near the ground surface. Given that the wells have been compromised by filling them in with surface soils, CHA has proposed to decommission these wells and install new wells as further described in Section 3.3. The wells will be decommissioned by a qualified drilling contractor following CP-43 well decommissioning standards.

3.3 INSTALLATION OF NEW WELLS

To restore a representative groundwater monitoring network, CHA proposes installing six new groundwater monitoring wells, as shown in Figure 3 and summarized in Table 1.The monitoring wells installed on the Friedrichsohn upland area will be installed outside of the Source Area excavation where contaminated soil was removed to the depth of bedrock. An in-situ soil stabilization (ISS) slurry wall was along the perimeter of this excavation to excavate to bedrock during the OU-1 and OU-3 remedial construction. Since the area inside the ISS wall was backfilled with imported, virgin soils, the new wells will be installed to the north and south of the ISS where existing Site soils remain. A description of the proposed wells is included below, and as indicated in the table, include both shallow, overburden wells and bedrock wells. This approach is consistent with the prior monitoring network system and historical contaminant concentrations in the different geological formations.

Table 1. New Wells to be Installed

Well ID	Type of Well	Location Description
MW-100	Overburden Well	On the Friedrichsohn upland area south of the ISS slurry wall.
MW-101	Overburden Well	On the Friedrichsohn upland area north of the ISS slurry wall.
MW-101B	Bedrock Well	On the Friedrichsohn upland north of the ISS slurry wall and installed into bedrock.
MW-102	Overburden Well	Adjacent to the towpath on the eastern side of the OCC.

Well ID	Type of Well	Location Description
MW-102B	Bedrock Well	Adjacent to the towpath on the eastern side of the OCC and installed into bedrock.
MW-103	Overburden Well	Adjacent to the towpath, further south and on the eastern side of the OCC.

The new overburden monitoring wells will be installed using hollow-stem auger (HSA) drilling techniques. The bedrock wells will be installed by first installing a pilot hole through the overburden soils and advancing the borehole approximately six to twelve inches into the bedrock. An outer steel casing (six- or eight-inch diameter Schedule 40 steel) will then be installed into the bedrock socket and grouted in place. After the grout has set, the borehole will be advanced into bedrock using roller bit or air hammer system to the target depth (anticipated to be 15-feet into bedrock or less). If the borehole into bedrock does not remain open, a temporary, inner casing will be inserted into the borehole to facilitate the installation of a well screen and sand pack and then removed to allow the screen to be exposed to groundwater. The outer casing will serve as the protective casing. Soil/rock cuttings from the well installation will be managed as investigation derived waste and collected in 55-gallon steel drums for waste characterization and off-site disposal, as further described in Section 3.8 of this document.

Wells will be constructed with a two-inch diameter PVC riser pipe and well screen and the well screens will have a slot opening size of 0.010-inches. The overburden well screens will be installed to straddle the desired water table (typically approximately seven feet into the water table and three feet above the water table) while the bedrock wells will be screened in the first water-bearing unit encountered within the bedrock, which will facilitate monitoring of contaminants less dense and denser than water. A sand pack, consisting of a minimum thickness of two inches will be placed within the annulus between the borehole sidewall and the well screen. A two-foot-thick bentonite seal will then be placed above the screen. The remaining borehole between the bentonite seal and the ground surface will be backfilled with bentonite-cement grout. Flush-mounted steel protective casings will be set in a concrete pad (18-inches in diameter by 12-inches thick) installed at each overburden well location to protect the riser pipes and all riser pipes (both overburden and bedrock wells) will be sealed with a gripper plug.

Once the wells are installed, each overburden well will be developed using a combination of pumping and surging, as described in Section 3.5. Purged water will be containerized per Section 3.8. The newly installed wells will be developed until the turbidity of the groundwater is less than 50 nephelometric turbidity units (NTUs), or for a maximum of two hours each, whichever comes first. The locations of the proposed monitoring wells as well as those previously installed are shown in Figure 3.

3.4 MONITORING WELL NETWORK

Table 2 provides a summary of wells that will be monitored during future sampling events, with wells MW-2 and MW-2S representing background conditions relative to the upland area of the Site.

Table 2. Proposed Monitoring Well Network

Well ID	Type of Well	Top of Riser Elevation	Bottom of Well (ft bgs)	Screened Interval (ft bgs)
MW-2	Bedrock Well	54.89	42.2	
MW-2S	Overburden Well	54.56	9	7 - 9
MW-100	Overburden Well	TBD	TBD	TBD
MW-101	Overburden Well	TBD	TBD	TBD
MW-101B	Bedrock Well	TBD	TBD	TBD
MW-102	Overburden Well	TBD	TBD	TBD
MW-102B	Bedrock Well	TBD	TBD	TBD
MW-103	Overburden Well	TBD	TBD	TBD

TBD – To be determined. Monitoring wells to be installed before sampling.

3.5 SAMPLING PROCEDURES

Samples will be collected following CHA Standard Operating Procedures (SOPs), included in Appendix B and further detailed below.

3.5.1 Field Documentation

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

- Date and time of starting work;
- Names of all personnel at the Site;
- Weather conditions;
- Purpose of proposed work effort;
- Sampling equipment to be used and calibration of equipment, if necessary;
- Location of the work area, including map reference;
- Details of work effort, particularly any deviation from the SOPs;
- Field observations;
- Field measurements (e.g., water levels);
- Daily health and safety entries, including levels of protection;
- Type, number, and location of samples;
- Sampling method, particularly deviations from the SOPs;
- Sample location and number; and
- Sample handling, packaging, labeling, and shipping information (including destination).

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

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

3.5.2 Well Gauging, Purging and Sampling

All monitoring well sampling activities and additional notes will be recorded on field logs or tablets, as appropriate. A minimum of 24-hours following the well installation and development activities, the groundwater monitoring wells will be gauged, purged, and sampled following the procedures outlined in CHA SOP#s 313 and 317. Initially, the water level in all monitoring wells will be measured to the neared 0.01-foot using a water level meter and recorded on the field logs before purging.

Following gauging of the wells, dedicated/disposable polyethylene tubing will be installed at each well and a low-flow pump will be used to purge the well before sample collection. Field parameters measured through a water quality meter flow-through cell during purging include:

- Temperature
- Specific Conductivity
- pH
- Oxidation Reduction Potential
- Dissolved Oxygen
- Turbidity

In summary, purging of the wells will continue until the field parameters have stabilized. Additionally, the static water level should not fluctuate more than 0.1 meters (~4 inches). Once stability has been reached per SOP #317, a water sample will be collected. Low-flow sampling techniques will be utilized to reduce the volatilization of volatile organic compounds. All non-disposable equipment (e.g. the pump) will be decontaminated per Section 3.7 of this plan to minimize the potential for cross-contamination.

3.5.3 Sample Designation

Groundwater samples will be labeled with the monitoring well identification number and date of the sampling event. An example is as follows:

MW-100-YYYYMMDD

3.5.4 Sample Handling

A new pair of disposable latex or nitrile gloves will be used at each location sampled for chemical analyses. Additional glove changes will be undertaken as conditions warrant (e.g. gloves become soiled).

Sample containers will be new and delivered from the laboratory before the sampling event. Sample containers will be delivered from the laboratory with the proper volume of chemical preservatives appropriate for the type of analysis as detailed in CHA SOP#603, Sample Containers, Volumes, Preservations, and Holding Times.

After sample collection, the sample containers will be logged onto a chain of custody record as described in the Quality Assurance Project Plan (QAPP) included in Appendix C. The sample containers will be placed on ice and/or ice packs in laboratory-supplied rigid coolers after collection and labeling. The remaining space will be filled with packing material to cushion the containers during transportation or shipment.

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

3.5.5 Quality Assurance/Quality Control Sampling

As further described in the QAPP, one blind duplicate will be collected during each sampling event. The blind duplicate will be collected at the same time as the parent sample and given a sample designation of "CHA-1-YYYYMMDD". The purpose of the blind duplicate is to measure the accuracy of analyses by the laboratory. Relative percent difference will be calculated between the parent sample and blind duplicate sample. At least 80 percent (%) of the parameters shall be within a relative percent difference of 20% for the analyses to be considered usable. Additional QA/QC samples (e.g. trip blanks and equipment blanks) will be collected per the QAPP included in Appendix C.

3.6 PROPOSED ANALYSES

Samples will be submitted to a New York State Department of Health (NYSDOH) Environmental Laboratory Approved Program (ELAP) certified laboratory for the parameters identified below. Reporting and deliverables from the laboratory will be per the NYSDEC July 2005 Category B Deliverables.

- Volatile Organic Compounds (VOCs) via the United States Environmental Protection Agency (EPA) Method 8260C;
- Semivolatile Organic Compounds (SVOCs) via EPA Method 8270D;
- Polychlorinated Biphenyls (PCBs) via EPA Method 8082A;
- Target Analyte List (TAL) Metals via EPA 6010C and 7471;
- Total Organic Carbon via EPA Method 9060;
- Nitrate via EPA Method 353.2;
- Alkalinity via EPA Method 310.2;
- Ammonia via EPA Method 350.1;
- Total and Dissolved Iron via EPA Method 7381; and,
- Sulfate via EPA Method 9038.

3.7 DECONTAMINATION PROCEDURES

Before mobilization for the monitoring well installation, the drill rig shall be thoroughly cleaned to remove oil, grease, mud, and other foreign matter. Subsequently, before initiating drilling at each well location, samplers, downhole drill steel (e.g. augers, rods, sampling spoons, etc.), and associated equipment will be cleaned to prevent cross-contamination. All cleaning will be conducted at a predetermined on-Site location. Cleaning will be accomplished using the procedures outlined in the following sections.

3.7.1 Small Equipment

For all activities, dedicated sampling equipment is preferred. However, if non-dedicated equipment is used (i.e. Macrocore barrel, augers, or split spoon sampler), the required decontamination procedure will include:

1. Disassemble equipment, as required.

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

Decontaminated equipment will be placed on polyethylene sheeting to avoid contacting a contaminated surface. Field personnel will use a new pair of outer gloves before handling sample equipment after it is cleaned.

3.7.2 Large Equipment

The permanent components of the drill rig (body, tracks, etc.) are not expected to come into contact with contaminated soils since the work will be performed primarily in areas with either a two-foot thick clean, imported soil cover system on the upland area or along the newly installed run-of-crush OCC towpath. Therefore, large equipment will not require decontamination.

3.8 INVESTIGATION DERIVED WASTE

All soil cuttings from the well installation and groundwater generated from well development as well as purged during monitoring events will be placed into separate drums for characterization and off-site disposal at a permitted disposal facility. One waste characterization sample will be collected from the drums of soil cuttings and one sample for groundwater analysis will be conducted for the purge water collected in the drums at the initial groundwater sampling event. The specific analyses are discussed in the QAPP. Subsequent groundwater monitoring events will be similar; therefore, additional sampling of the purge water is not anticipated to be required by the disposal facility for subsequent sampling events. The disposal facility will be provided the analytical information for the landfill or wastewater treatment plant acceptance policies.

Gloves, personal protection equipment, sampling materials, etc., will be collected daily and disposed of as solid waste.

3.9 REPORTING REQUIREMENTS

After the completion of each groundwater monitoring event, CHA will prepare a letter report that will include water level measurements, tables with current and historical groundwater data compared to NYSDEC *Technical and Operational Guidance Series 1.1.1* (TOGS 1.1.1) Class GA groundwater standards/guidance values, full analytical laboratory reports, a summary of the field sampling procedures and a discussion of the results. After the fourth sampling event (scheduled for April 2024), CHA will provide contaminant concentration trend analysis and evaluation to determine if monitored natural attenuation is appropriate for the continued remedy at the Site. CHA will then make a recommendation to the NYSDEC for a sampling frequency and reporting requirements thereafter for approval by the Department.

4.0 REMEDIAL ACTION PROJECT PLANS

The following project plans incorporated within the Pre-Design Investigation Work Plan are discussed in the following sections:

- Quality Assurance Project Plan (QAPP)
- Health and Safety Plan (HASP)
- Community Air Monitoring Plan (CAMP)

4.1 QUALITY ASSURANCE PROJECT PLAN

A QAPP has been prepared for the activities described in this Groundwater Monitoring Plan. The QAPP presents the policies, organization, objectives, functional activities, and specific Quality Assurance (QA) and Quality Control (QC) activities designed to achieve the specific data quality goals associated with this investigation. A copy of the QAPP is provided in Appendix C.

4.2 HEALTH & SAFETY PLAN

A Site-specific HASP for CHA personnel was prepared to provide specific guidelines and establish procedures for the protection of on-Site personnel during Site activities. A copy of the HASP is included in Appendix D. Following the completion of the remedial activities associated with OU-1 and OU-3, the remaining contamination expected to be encountered in the borings associated with the new well installation is expected to be limited. Contractors and sub-contractors are responsible for providing their own HASP.

The health and safety requirements for the pre-design investigation activities were developed following 29 Code of Federal Regulations 1910 and 1926. Major elements of the plan include:

1. Health and safety risk or hazard analysis (i.e., physical or chemical hazard involved, concentration, primary hazard) for each Site task or operation referenced in the work plan.
2. Personal protective level/equipment to be used for each Site task or operation [29 CFR1910.120 (g)] selected as a result of the hazard analysis and consistent with OSHA Permissible Exposure Limits referenced in 29 CFR 1910.1000. This includes the identification of head, eye, ear, face, body, foot, skin, and respiratory protection necessary and the minimum level of protection that should be worn on-Site at all times.
3. Emergency response plan including location of and directions to the nearest hospital, fire/police emergency numbers, and on-Site first aid available.

4.3 COMMUNITY AIR MONITORING PLAN

A CAMP has been prepared to provide a measure of protection for the downwind community (i.e. off-site receptors including residences and businesses and on-Site workers not directly involved with the subject work activities) from potential airborne contaminant releases as a direct result of the proposed groundwater monitoring well installation. Air monitoring will be conducted in general accordance with the NYSDOH *Generic Community Air Monitoring Plan*. A copy of the CAMP is provided in Appendix E.

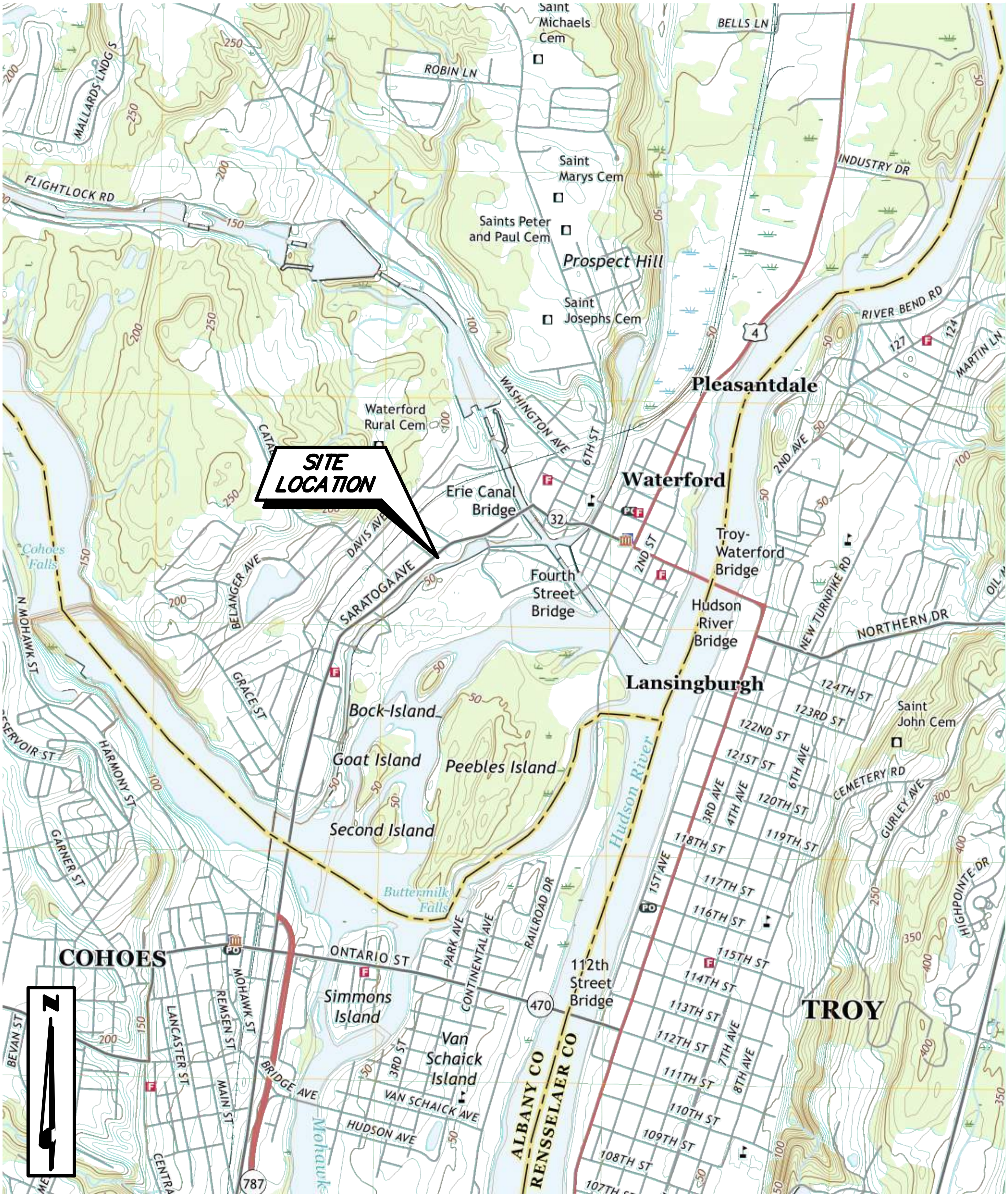
5.0 REPORTING AND SCHEDULE

Semiannual sampling of groundwater for the first two years following completion of the remedial construction at OU-1 and OU-3 is proposed. The frequency thereafter will be determined by the NYSDEC based upon an evaluation of the data and recommendations by CHA. Trends in contaminant concentrations will be evaluated to determine if monitored natural attenuation is the appropriate long-term solution for OU-2. Each event will include an inspection of the monitoring well network, gauging of all monitoring wells, and sampling of the wells identified in Section 3.4. The sampling frequency and reporting requirement will be as follows:

Table 3. Proposed Schedule

Groundwater Monitoring Event	Reporting Requirement
October 2022	Letter report
April 2023	Letter report
October 2023	Letter report
April 2024	Letter report with trend analysis for a decision on monitored natural attenuation

FIGURES



SOURCE: U.S.G.S. 7.5' Topographic
QUADRANGLE: TROY NORTH, NY

SCALE: 1"=2000'

CHA
III Winners Circle, PO Box 5269
Albany, NY 12205-0269
518.453.4500 · www.chacompanies.com

SITE LOCATION MAP

FORMER FRIEDRICHSOHN COOPERAGE
153–155 SARATOGA AVENUE
TOWN OF WATERFORD, NEW YORK

PROJECT NO. 060017

DATE: 04/2022

FIGURE 1

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CHA

One Park Place, 300 South State Street, Suite 600
Syracuse, NY 13202
315.471.3920 . www.chacompanies.com

WELLS TO DECOMMISSION

FORMER FRIEDRICHSOHN COOPERAGE
153-155 SARATOGA AVE
TOWN OF WATERFORD, NEW YORK

PROJECT NO. 060017.000

DATE: 04/2022

FIGURE 2

File: V:\PROJECTS\ANY\K5\060017.000\CADD\FIGURES\60017_MW_LOCATIONS_KE.DWG Saved: 4/26/2022 3:54:04 PM Plotted: 4/26/2022 3:54:20 PM Current User: Ehmann, Karyn LastSavedBy: 5768

MONITORING WELLS MW-2 AND MW-2S WILL BE INSPECTED FOR DEFICIENCIES PRIOR TO IMPLEMENTATION OF THE GROUNDWATER MONITORING PLAN.
OTHERS WILL BE NEWLY CONSTRUCTED AND DEVELOPED MONITORING WELLS.

CHA
One Park Place, 300 South State Street, Suite 600
Syracuse, NY 13202
315.471.3920 . www.chacompanies.com

PROPOSED MONITORING WELL NETWORK

FORMER FRIEDRICHSOHN COOPERAGE
153–155 SARATOGA AVENUE
TOWN OF WATERFORD, NEW YORK

PROJECT NO.	060017.000
DATE:	04/2022
FIGURE 3	

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APPENDIX A

Well Decommissioning Logs

FIGURE 3
WELL DECOMMISSIONING RECORD

Site Name: Land Remediation Friedrichsohn Cooperage	Well I.D.: MW-8
Site Location: 155 Saratoga Ave. Waterford NY.	Driller: Raymond Hammond
Drilling Co.: Aztech	Inspector:
	Date: 3/5/20

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	pulled
Casing retrieved (feet)	12'
Casing type/dia. (in)	2"

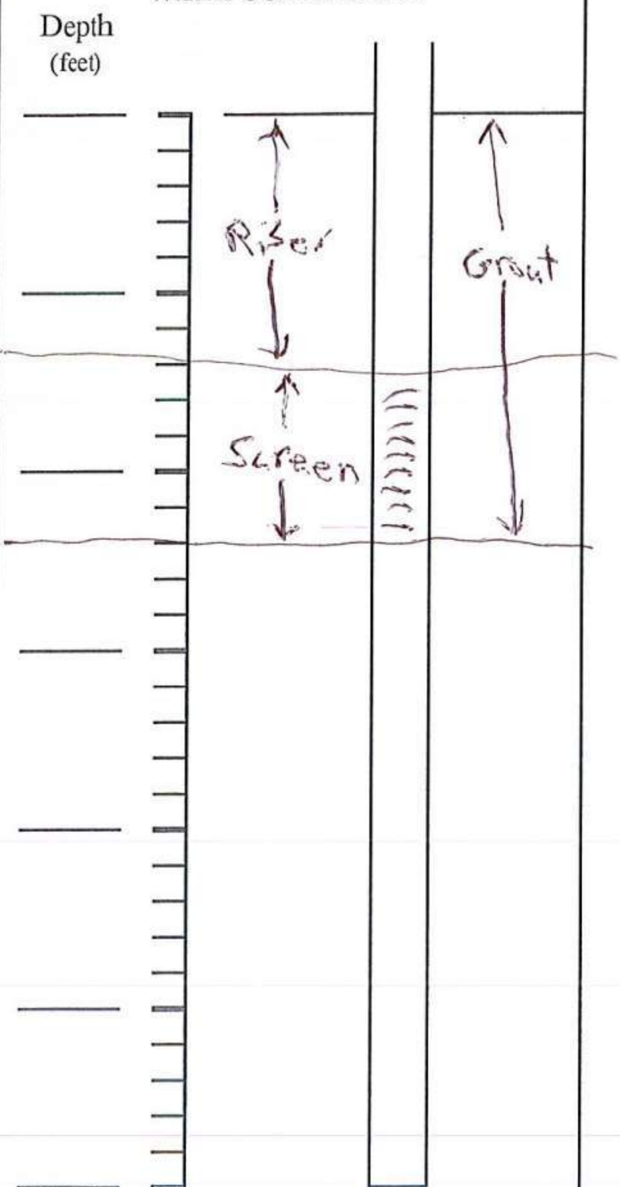
CASING PERFORATING

Equipment used	
Number of perforations/foot	
Size of perforations	
Interval perforated	

GROUTING

Interval grouted (FBLS)	
# of batches prepared	1
For each batch record:	
Quantity of water used (gal.)	3
Quantity of cement used (lbs.)	20#
Cement type	Portland
Quantity of bentonite used (lbs.)	5#
Quantity of calcium chloride used (lbs.)	
Volume of grout prepared (gal.)	5 gal.
Volume of grout used (gal.)	5 gal

WELL SCHEMATIC*



COMMENTS:

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

Drilling Contractor: [signature]

Department Representative

FIGURE 3

WELL DECOMMISSIONING RECORD

Site Name: Friedrichson Cooperage	Well I.D.: MW-10
Site Location: 155 Saratoga Ave. Waterford NY.	Driller: Raymond Hammond
Drilling Co.: AZtech	Inspector:
	Date: 3/5/20

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	pulled
Casing retrieved (feet)	14'
Casing type/dia. (in)	2"

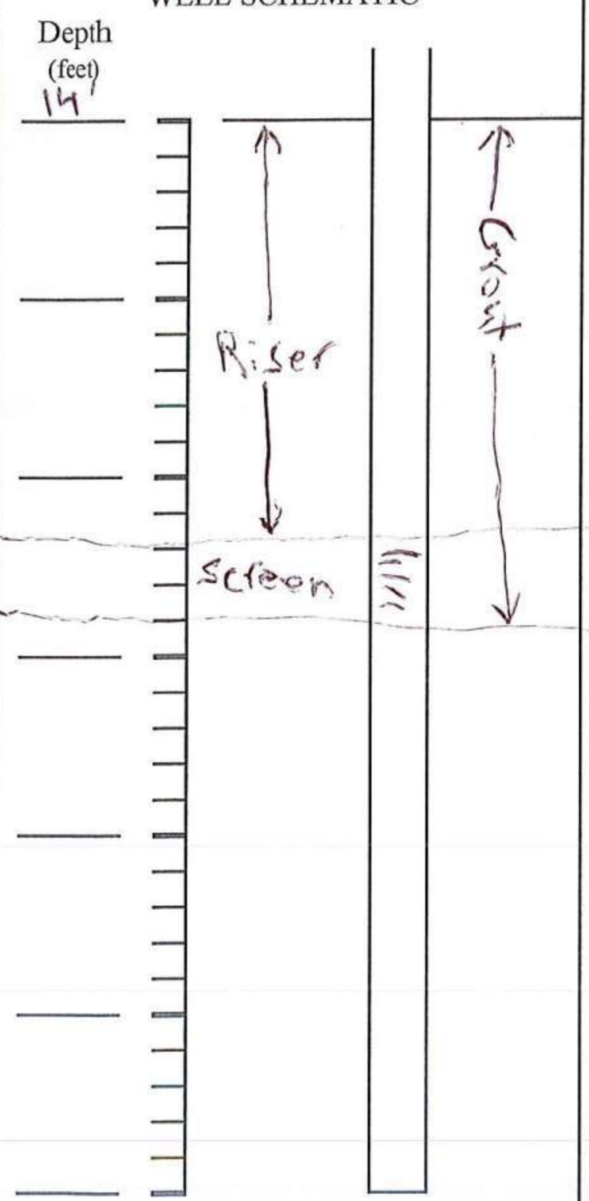
CASING PERFORATING

Equipment used	
Number of perforations/foot	
Size of perforations	
Interval perforated	

GROUTING

Interval grouted (FBLS)	
# of batches prepared	1
For each batch record:	
Quantity of water used (gal.)	3
Quantity of cement used (lbs.)	20#
Cement type	Portland
Quantity of bentonite used (lbs.)	5#
Quantity of calcium chloride used (lbs.)	
Volume of grout prepared (gal.)	5 gal.
Volume of grout used (gal.)	5 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

FIGURE 3
WELL DECOMMISSIONING RECORD

Site Name: Friedrichson Cooperage	Well I.D.: MW-14
Site Location: 155 Saratoga Ave. Waterford NY.	Driller: Raymond Hammond
Drilling Co.: AZtech	Inspector:
	Date: 3/5/20

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	pulled
Casing retrieved (feet)	13'
Casing type/dia. (in)	2"

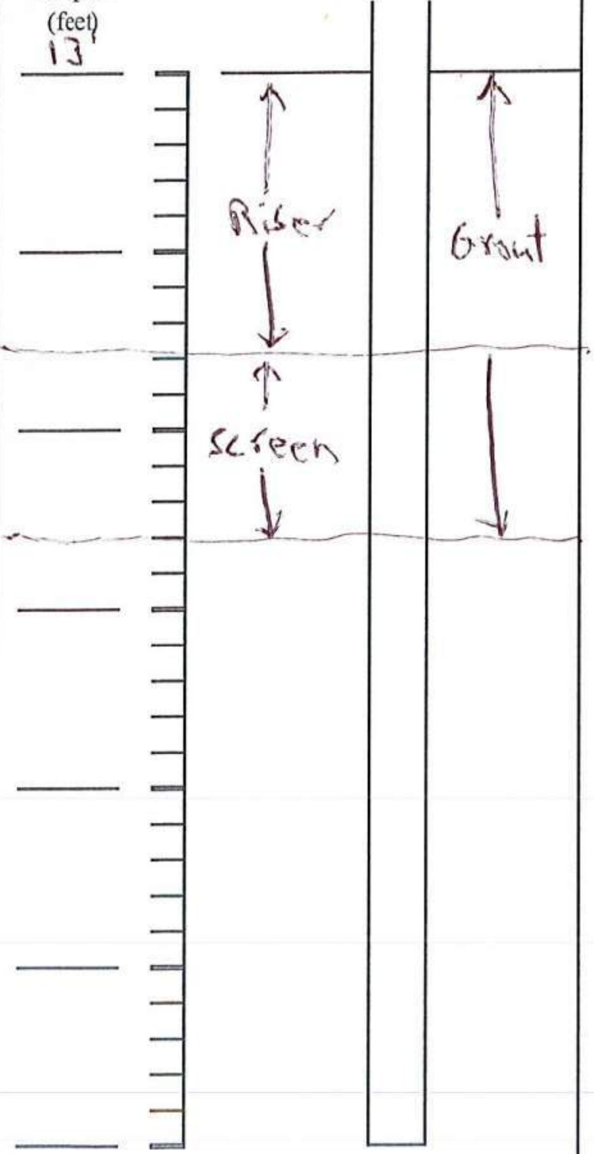
CASING PERFORATING

Equipment used	
Number of perforations/foot	
Size of perforations	
Interval perforated	

GROUTING

Interval grouted (FBLS)	
# of batches prepared	1
For each batch record:	
Quantity of water used (gal.)	3
Quantity of cement used (lbs.)	20#
Cement type	Portland
Quantity of bentonite used (lbs.)	5#
Quantity of calcium chloride used (lbs.)	
Volume of grout prepared (gal.)	5 gal.
Volume of grout used (gal.)	5 gal

WELL SCHEMATIC*
Depth (feet)



COMMENTS:

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

Drilling Contractor

Department Representative

FIGURE 3

WELL DECOMMISSIONING RECORD

Site Name: Friedrichsohn Cooperage	Well I.D.: MW-15
Site Location: 155 Saratoga Ave. Waterford NY.	Driller: Raymond Hammond
Drilling Co.: AZtech	Inspector:
	Date: 3/5/20

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	Pulled
Casing retrieved (feet)	1'
Casing type/dia. (in)	2"

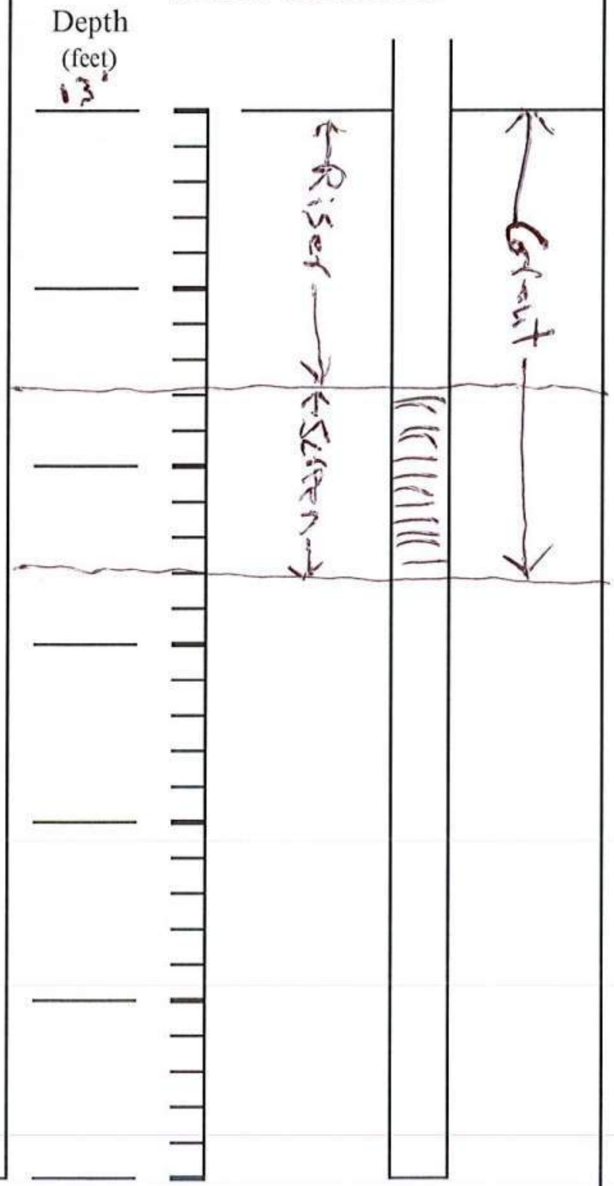
CASING PERFORATING

Equipment used	
Number of perforations/foot	
Size of perforations	
Interval perforated	

GROUTING

Interval grouted (FBLS)	
# of batches prepared	1
For each batch record:	
Quantity of water used (gal.)	3
Quantity of cement used (lbs.)	20#
Cement type	Portland
Quantity of bentonite used (lbs.)	5#
Quantity of calcium chloride used (lbs.)	
Volume of grout prepared (gal.)	5 gal.
Volume of grout used (gal.)	5 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

FIGURE 3

WELL DECOMMISSIONING RECORD

Site Name: Friedrichsen Cooperage	Well I.D.: unknown
Site Location: 155 Saratoga Ave. Waterford NY.	Driller: Raymond Hammond
Drilling Co.: AZtech	Inspector:
	Date: 3/5/20

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	pulled
Casing retrieved (feet)	1'
Casing type/dia. (in)	2"

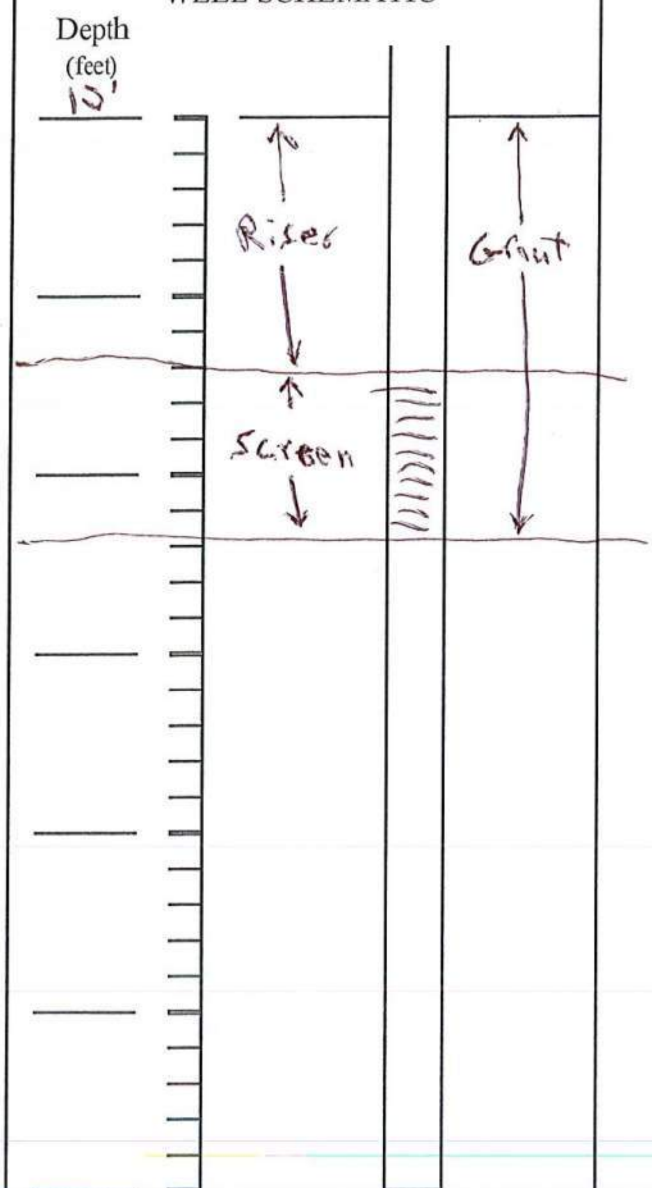
CASING PERFORATING

Equipment used	
Number of perforations/foot	
Size of perforations	
Interval perforated	

GROUTING

Interval grouted (FBLS)	
# of batches prepared	1
For each batch record:	
Quantity of water used (gal.)	3
Quantity of cement used (lbs.)	20#
Cement type	Portland
Quantity of bentonite used (lbs.)	5#
Quantity of calcium chloride used (lbs.)	
Volume of grout prepared (gal.)	5 gal.
Volume of grout used (gal.)	5 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

APPENDIX B

Standard Operating Procedures

Author: Chris Burns
Reviewer: Seth Fowler
Sandy Warner

FIELD LOGBOOK AND PHOTOGRAPHS

A. PURPOSE/SCOPE:

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

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

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

B. EQUIPMENT/MATERIALS:

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

C. PROCEDURE:

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

FIELD LOGBOOK AND PHOTOGRAPHS

o. Sampling method, particularly deviations from the standard operating procedures
p. Sample location and number
q. Sample handling, packaging, labeling, and shipping information (including destination)
r. Time of leaving site.

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

a. Date and time – Camera set to record on photo
b. Name of photographer
c. General direction faced and description of the subject
d. Sequential number of the photograph
e. Always attempt to include an object in the photograph that helps show scale
f. Always try to shoot at approximately 50mm focal length (what human eye sees).

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

D. QA/QC REQUIREMENTS:

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

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

E. SPECIAL CONDITIONS:

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

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

F. REFERENCES:

None

G. APPENDICES/FORMS:

Not Applicable

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

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

COMPLETING A CHAIN-OF-CUSTODY RECORD

A. PURPOSE/SCOPE:

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

Sample Collector → Sample Courier/Operator → Sample Custodian

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

B. EQUIPMENT/MATERIALS:

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

C. PROCEDURE:

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

COMPLETING A CHAIN-OF-CUSTODY RECORD

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

D. QA/QC REQUIREMENTS:

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

E. SPECIAL CONDITIONS:

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

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

F. REFERENCES:

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

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

COMPLETING A CHAIN-OF-CUSTODY RECORD

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

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

G. APPENDICES/FORMS:

CHA COC Form

END OF SOP
Final Check by C. Burns 10/7/15

Author: Sarah Johnston
Reviewer: Keith Cowan

MEASUREMENT OF WATER LEVEL/ FREE PRODUCT THICKNESS

A. PURPOSE/SCOPE:

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

B. EQUIPMENT/MATERIALS:

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

C. PROCEDURE:

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

MEASUREMENT OF WATER LEVEL/ FREE PRODUCT THICKNESS

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

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

D. QA/QC REQUIREMENTS:

Not Applicable

E. SPECIAL CONDITIONS:

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

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

F. REFERENCES:

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

G. APPENDICES/FORMS:

Field Data Sheets

END OF SOP

Final Check by C. Burns 10/07/15

LOW-FLOW GROUNDWATER PURGING/SAMPLING

A. PURPOSE/SCOPE:

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

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

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

B. EQUIPMENT/MATERIALS:

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

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

LOW-FLOW GROUNDWATER PURGING/SAMPLING

Table 1
Acceptable Sampling Methods for Compounds of Concern

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

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

C. PROCEDURE:

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

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

   b. Portable Systems

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

LOW-FLOW GROUNDWATER PURGING/SAMPLING

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

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

Table 2
Stability Criteria for Low-Flow Purging

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

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

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

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

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

D. QA/QC REQUIREMENTS:

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

E. SPECIAL CONDITIONS:

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

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

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

LOW-FLOW GROUNDWATER PURGING/SAMPLING

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

F. REFERENCES:

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

G. APPENDICES/FORMS:

Well Sampling Forms

END OF SOP

Final Check by C. Burns 11/4/15

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

SAMPLE CONTAINERS, VOLUMES, PRESERVATIONS AND HOLDING TIMES

A. PURPOSE/SCOPE:

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

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

B. EQUIPMENT/MATERIALS:

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

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

C. PROCEDURE:

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

SAMPLE CONTAINERS, VOLUMES, PRESERVATIONS AND HOLDING TIMES

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

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

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

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

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

<u>Volatile Organic Compounds:</u>

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

SAMPLE CONTAINERS, VOLUMES, PRESERVATIONS AND HOLDING TIMES

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

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

Cyanide

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

E. SPECIAL CONDITIONS:

Not Applicable

F. REFERENCES:

Alpha Analytical Aqueous and Soil/Solid Reference Guides.

G. APPENDICES/FORMS:

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

END OF SOP
Final Check by C. Burns 10/27/15

Table 1

Laboratory Analysis	EPA Method	Standard Method and/or SW846 Method	Preservation	Container	Holding Time	Minimum Volume
WATER						
Acid 5oluble & Insoluble 5ulfide	-----	9030B	Cool to 4 deg C No Headspace	P or G	7 Days	8 oz.
Acidity as CaCO3	305.1	2310B	Cool to 4 deg C	P or G	14 Days	100 mL
Alkalinity	-----	2320B	Cool to 4 deg C	P or G	14 Days	100 mL
Alkalinity as CaCO3	310.1	2320B	Cool to 4 deg C	P or G	14 Days	100 mL
Ammonia	350.2/.3	4500-NH3 B,E	Cool to 4 deg C, H25O4 to pH<2	P or G	28 Days	400 mL
Aromatic Hydrocarbons	602	8021B	1:1 HCl to pH <2, Cool to 4 deg C 0.008% Na252O3 if residual chlorine present	G, Vial screw cap with center hole Teflon- faced silicone septum	14 Days	40 mL
Biochemical Oxygen Demand	405.1	5210B	Cool to 4 deg C	P or G	48 Hrs.	500 mL
Bromide	300	-----	None	P or G	28 Days	250 mL
Calcium	-----	3120B	HNO3 to pH<2	P or G	6 Months	100 mL
Calcium- Hardness	200.7	3111B	HNO3 to pH<2	P or G	6 Months	100 mL
Carbamates	531.1	-----	Cool to 4 deg C, 0.08% Na252O3 if residual chlorine present	G, screw cap Teflon faced silicone septum	14 Days	100 mL mL
Carbonaceous BOD	-----	5210B	Cool to 4 deg C	P or G	48 Hrs.	1000 mL
Chloride	300	4500-CL D 4110	Cool to 4 deg C	P or G	28 Days	100 mL
Chloride, Residual Disinfectant	-----	4500Cl-G	Cool to 4 deg C	P or G	Analyze Immediately	200 mL
COD	410.4	5220D	H2S04 to pH<2, Cool to 4 deg C	P	28 days	250 mL
Color	-----	2120B	Cool to 4 deg C	P or G	24 Hrs	100 mL
Conductivity	-----	2510B	Cool to 4 deg C	P or G	28 Days	100 mL
Cyanide	335.4	4500-CN C&E	Cool to 4 deg C NaOH pH>12	P or G	14 Days	250 mL
Cyanide	335.2	9010B, 9012A, 9014	Cool to 4 deg C, NaOH to pH>12 0.6 g ascorbic acid if residual chlorine present	P or G	5ulfide absent, 14 days; sulfide present 24 Hrs	250 mL
Cyanide, Amenable	335.1					
Dioxin	-----	8280A	Cool to 4 deg C 0.008% Na2S2O3 if residual chlorine present	G, Amber Teflon-lined screw cap	7 days until extraction 40 days after extraction	1000 mL
DRO	-----	8015B	Cool to 4 deg C 0.008% Na252O3 if residual chlorine present	G, Amber Teflon-lined screw cap	7 days until extraction 40 days after extraction	1000 mL
Escherichia Coli	-----	9222B	0.008% Na25203 if residual chlorine present 0.3 mL/125 mL 15% EDTA if > 0.01 mg/L heavy metals	5terile P or G	30 Hrs. for Drinking Water 6 Hrs. for Waste Water	125 mL
Extractable Org. Compounds			Cool to 4 deg C, 5tore in dark	G, Amber Teflon-lined screw cap	*7 days	4000 mL

Table 1

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

Table 1

Laboratory Analysis	EPA Method	Standard Method and/or SW846 Method	Preservation	Container	Holding Time	Minimum Volume
Organochlorine Pesticides/PCB	608	8081A,8082	Cool to 4 deg C 0.008% Na2S2O3 if residual chlorine present If aldrin is to be determined bind to pH S-9.	G, Amber Teflon-lined screw cap	7 days until extraction 40 days after extraction	1000 mL
Ortho Phosphate	300	4S00 P-E	Cool to 4 deg C	P or G	48 Hrs	50 mL
Orthophosphate	36S.2	-----	Filter immediately, Cool to 4 deg C	P or G	48 Hrs.	50 mL
pH, Hydrogen ion	-----	4S00-H-B	Cool to 4 deg C	P or G	Analyze Immediately	25 mL
Phenols	420.1	9065, 510ABC	Cool to 4 deg C, H2SO4 to pH<2	G	28 Days	500 mL
Pseudomanas Aeruginosa	-----	9213E	Cool to 4 deg C 0.008% Na2S2O3 if residual chlorine present	Sterile P or G	30 Hrs. for Drinking Water 6 Hrs. for Waste Water	12S mL
Purgeable Halocarbons	601	8021B	Cool to 4 deg C 0.008% Na2S2O3 if residual chlorine present	G, Vial screw cap with center hole Teflon- faced silicone septum	14 Days	40 mL
Radiological	-----	-----	HNO3 to pH<2	P or G	6 Months	100 mL
Residue- Settleable (SS)	160.S	-----	Cool to 4 deg C	P or G	48 Hrs.	1000 mL
Residue-filtered (TDS)	160.1	-----	Cool to 4 deg C	P or G	7 Days	100 mL
Residue-non- filtered (TSS)	160.2	-----	Cool to 4 deg C	P or G	7 Days	100 mL
Residue-Total Volatile Solids	160.4	2540 E	Cool to 4 deg C	P or G	7 Days	100 mL
Salinity	-----	2520 C	Cool to 4 deg C	G	28 Days	100 mL
Semivolatile Organic Compounds (Unregulated)	52S.2	-----	If residual chlorine is present, add 40-S0 mg Sodium Thiosulfate. If not chlorinated, add 6N HCl to pH<2 Cool to 4 deg C	G, Amber Teflon-lined screw cap	7 Days for extraction, 30 after extraction	1000 mL
Semivolatile Organics	62S	8270C	Cool to 4 deg C 0.008% Na2S2O3 if residual chlorine present	G, Amber Teflon-lined screw cap	7 days for extraction 40 days after extraction	1000 mL
Silica	200.7	-----	Cool to 4 deg C	P only	7 Days	S0 mL
Specific Conductance	120.1	-----	Cool to 4 deg C	P or G	28 Days	100 mL
Sulfate	300	4S00-SO4	Cool to 4 deg C	P or G	28 Days	S0 mL
Sulfate	37S.4	-----	Cool to 4 deg C	P or G	28 Days	50 mL
Sulfide	376.2	9030 B, 4S00S2-AD	Cool to 4 deg C, add zinc plus NaOH to pH>9	P or G	7 Days	50 mL
Sulfite (SO3)	377.1	-----	None Required	G, Bottle and Top	Analyze immediately	50 mL
Surfactants (MBAS)	42S.1	-----	Cool to 4 deg C	P or G	48 Hrs.	2S0 mL

Table 1

Laboratory Analysis	EPA Method	Standard Method and/or SW846 Method	Preservation	Container	Holding Time	Minimum Volume
TDS			Cool to 4 deg C	P	7 days	500 mL
Temperature	-----	2550B	None	P or G	Analyze Immediately	1000 mL
Temperature	170.1	-----	None Required	G, Bottle and Top	Analyze immediately	1000 mL
Total Kjeldahl Nitrogen	353.3/.1	4500Norg-C	H2S04 to pH<2 , Cool to 4 deg C	P	28 days	250 mL
Total Coliform	-----	9221D	0.008% Na2S203 if residual chlorine present 0.3 mL/125 mL 15% EDTA if > 0.01 mg/L heavy metals	Sterile P or G	30 Hrs. for Drinking Water 6 Hrs. for Waste Water	125 mL
Total Dissolved Solids	160.1	2540C	Cool to 4 deg C	P or G	7 Days	100 mL
Total Hardness	130.2 , 200.7	-----	HNO3 to pH<2 H2SO4 to pH<2	P or G	6 Months	100 mL
Total Kjeldahl Nitrogen	351.3	-----	H2SO4 to pH<2	P or G	28 Days	500 mL
Total Metals	200.7 200.8	6010B, 6020, 7000A	HNO3 to pH<2	P	6 months (Hg 28 days)	500 mL
Total Organic Carbon (TOC)	415.1	9060, 5310C	H2SO4 to pH<2, Cool to 4 deg C	G, Amber Teflon-lined screw cap	28 days	80 mL
Total Organic Halides		5320B	1N H2SO4 to pH<2	P or G	28 Days	50 mL
Total Phosphorus	365.2	-----	Cool to 4 deg C, H2SO4 to pH<2	G	28 Days	50 mL
Total Recoverable Oil & Grease	413.1,166 4A	-----	Cool to 4 deg C, HCL or H2SO4 to pH<2	G	Petroleum Based 3 Days; Non-Petroleum Based 24 hours	1000 mL
Total-Residue (TS)	160.3	2540B	Cool to 4 deg C	P or G	7 Days	100 mL
Turbidity	180.1	2130B	Cool to 4 deg C	P or G	48 Hrs	100 mL
Volatile Organics	624	8260B	1:1 HCl to pH <2, Cool to 4 deg C 0.008% Na2S2O3 if residual chlorine present	G, Vial screw cap with center hole Teflon-faced silicone septum	7 days w/o HCl 14 days w/HCl	40 mL
Volatiles (Regulated)	524.2	-----	Cool to 4 deg C HCl to pH<2	G, Vial screw cap with center hole Teflon-faced silicone septum	14 Days	60-120 mL
SOIL						
Acid Soluble & Insoluble Sulfide	-----	9030B	Cool to 4 deg C, no headspace	P or G	7 Days	8 oz.
Amenable Cyanide	-----	9213	Cool to 4 deg C	P or G	14 Days	4 oz.
Bromide	-----	9211	Cool to 4 deg C	P or G	28 Days	8 oz.
Cation - Exchange Capacity	-----	9080, 9081	None	P	-----	8 oz.
Chloride	-----	9212, 9056, 9253	None	P or G	28 Days	8 oz.
Chlorinated Herbicides	-----	8151A	Cool to 4 deg C	G, wide mouth, teflon liner	14 Days	8 oz.
Corrosivity pH Waste>20% water	-----	9040B	Cool to 4 deg C	P	Analyze Immediately	4 oz.

Table 1

Laboratory Analysis	EPA Method	Standard Method and/or SW846 Method	Preservation	Container	Holding Time	Minimum Volume
Corrosivity Toward Steel	-----	1110	Cool to 4 deg C	P	14 Days	4 oz.
Cyanide		9010B, 4S00CN	Cool to 4 deg C	G, Amber	14 Days	4 oz
Dioxin	-----	8280A	Cool to 4 deg C	G	14 Days	8 oz.
DRO	-----	8015B	Cool to 4 deg C	G, Amber	14 Days	4 oz.
Extractable Organic Compounds			Cool to 4 deg C, Store in dark	G	14 days	8 oz
Extractable Sulfide	-----	9031	Cool to 4 deg C, fill top of sample with 2N Zinc Acetate until moistened	P or G	7 Days	8 oz.
Fluoride	-----	9214	None	P	28 Days	8 oz.
Gases	-----	3810	Cool to 4 deg C	G, Amber	14 Days	8 oz.
Grain Size			N/A	G	N/A	8 oz
GRO	-----	801SB	Cool to 4 deg C, check state regulations for proper preservative. NJ (methanol), PA (encore samplers) NY (cool to 4 deg C).	G, Amber VOA vial	14 Days	1S Grams
HPLC (PAH)	------	8310	Cool to 4 deg C	G, Amber Teflon-lined screw cap	14 days until extraction 40 days after extraction	4 oz.
Ignitability	-----	1010	None	P or G	None	8 oz.
Ignitability of Solids		1030	None	P or G	None	8 oz.
Mercury	24S.1	7471A	Cool to 4 deg C	G, Amber	28 Days	4 oz.
Metals	-----	6010B, 6020, 7000A	Cool to 4 deg C	G, Amber	6 Months	8 oz.
Moisture Content			Store in airtight jar 3-30 deg C	G	N/A	8 oz
Nitrate	-----	9210	Cool to 4 deg C	P or G	48 Hrs	8 oz.
Oil & Grease (Sludge, Sludge- Hem)	-----	9071B	Cool to 4 deg C	G	28 Days	8 oz.
Organochlorine	-----	8081A	Cool to 4 deg C	P or G	14 Days	8 oz.
Paint Filter Liquids Test	-----	9095A	Cool to 4 deg C	P or G	-----	8 oz.
PCBs	-----	8082	Cool to 4 deg C	G, Amber Teflon-lined screw cap	14 Days	4 oz.
pH	-----	904SC	Cool to 4 deg C	G, Amber	Analyze Immediately	4 oz.
pH, Soil and Waste	-----	904SA	Cool to 4 deg C	G	Analyze Immediately	8 oz.
Phenol	-----	906S, 9066, 9067	Cool to 4 deg C	G, Amber	28 Days	4 oz.
Radiological	-----	-----	Cool to 4 deg C	G	6 Months	8 oz.
Reactivity Cyanide	-----	SW-846 7.3.3.2	Cool to 4 deg C	P	14 Days	8 oz.
Reactivity Sulfide	-----	SW-846 7.3.4.2	Cool to 4 deg C	P	14 Days	8 oz.
Semivolatile Organics	-----	8270C	Cool to 4 deg C	G, Amber	14 Days	8 oz.

Table 1

Laboratory Analysis	EPA Method	Standard Method and/or SW846 Method	Preservation	Container	Holding Time	Minimum Volume
Sulfate	-----	9035, 9036, 9038	Cool to 4 deg C	P or G	28 Days	8 oz.
Sulfides	-----	9215	Cool to 4 deg C	P or G	7 Days	8 oz.
TCLP Metals	-----	1311, 6010B, 6020, 7000A, 7470A	Cool to 4 deg C	G, Amber	180 Days (Hg 28 days)	8 oz
TCLP Herbicides	-----	1311	Cool to 4 deg C	G, Amber	14 Days	8 oz.
TCLP Pesticides	-----	1311	Cool to 4 deg C	G, Amber	14 Days	8 oz.
TCLP Semivolatile Organics	-----	1311, 8270C, 8081A, 8151A	Cool to 4 deg C	G, Amber Teflon Lined	14 Days	8 oz.
TCLP Volatile Organics	-----	1311, 8260B	Cool to 4 deg C	G, Amber VOA Vial Teflon Lined	14 Days	8 oz.
Temperature	-----	2550	-----	P	Analyze Immediately	4 oz.
TOC		Lloyd Kahn Method	Cool to 4 deg C	G, Amber	14 days	4 oz.
Total Coliform	-----	9131	Cool to 4 deg C	Sterile, P or G	6 Hrs	4 oz.
Total Coliform	-----	9132	Cool to 4 deg C	Sterile, P or G	6 Hrs	4 oz.
Total Cyanide	-----	9013	Cool to 4 deg C	P or G	14 Days	8 oz.
Volatile Organic Compounds	-----	8260B	Cool to 4 deg C Check individual state regulations for proper preservative. NJ (methanol), PA (encore samplers), NY (cool to 4 deg C)	G, wide mouth, teflon liner	14 Days	4 oz.
Volatile Organic Compounds	-----	8021		G, wide mouth, teflon liner	14 Days	4 oz.
CLP Sampling and Holding Time Information						
Cyanide (aqueous)	ILM04.1		NaOH to pH>12, Cool to 4 deg C	P	12 Days VTSR	1000ml
Cyanide**	ILM04.1		Cool to 4 deg C	G		8 oz
Mercury (aqueous)	ILM04.1		HNO3 to pH<2, Cool to 4 deg C	P	26 Days VTSR	1000ml
Mercury (solid/soils)	ILM04.1		Cool to 4 deg C	G		8 oz
Metals (aqueous)	ILM04.1		HNO3 to pH<2, Cool to 4 deg C	P	180 Days VTSR	1000ml
Metals (solid/soils)	ILM04.1		Cool to 4 deg C	G		8 oz
PCBs (aqueous)	OLM04.2		Na2S203, Cool to 4 deg C	G	See Note 7	1000ml
PCBs (solid/soils)	OLM04.2		Cool to 4 deg C	G	See Note 6	8 oz
Pesticides (aqueous)	OLM04.2		Na2S203, Cool to 4 deg C	G	See Note 7	1000ml
Pesticides (solid/soils)	OLM04.2		Cool to 4 deg C	G	See Note 6	8 oz
Semivolatile Organic Compounds (aqueous)	OMLO4.2		Cool to 4 deg C	G	See Note 8	1000ml
Semivolatile Organic Compounds (solid/soils)	OLM04.2		Cool to 4 deg C	G	See Note 6	8 oz
Volatile Organic Compounds (aqueous)	OLM04.2		HCL pH < 2, Cool to 4 deg C	G	W/preservative: 10 days VTSR; W/O: 7 days VTSR	40ml
Volatile Organic Compounds (solid/soils)	OLM04.2		Cool to 4 deg C	G	10 Days VTSR	4 oz

Table 1

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

Notes:

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

Author: Will Pierce
Reviewer: Chris Burns

QUALITY ASSURANCE/QUALITY CONTROL SAMPLES

A. PURPOSE/SCOPE:

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

B. EQUIPMENT/MATERIALS:

QA/QC samples require the following materials:

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

C. PROCEDURE:

The following are types of QA/QC samples.

1. Duplicate Sample

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

Example:

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

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

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

2. Field Blank

The Field Blank sample is a type of QA/QC sample used to account for possible external contamination of the routine samples, usually by exposure to the air from being on site. It consists of an additional set of sample containers to be analyzed for the same parameters as the routine samples. It is common to only conduct a Field Blank for volatile organic compound (VOC) parameters even when sampling

QUALITY ASSURANCE/QUALITY CONTROL SAMPLES

to additional parameters. This is because VOCs are more likely to be present in the atmosphere at the site then a parameter like metals. However a Field Blank can be conducted for any parameter.

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

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

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

3. Equipment Blank

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

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

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

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

4. Matrix Spike/Matrix Spike Duplicate Sample

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

Example:

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

QUALITY ASSURANCE/QUALITY CONTROL SAMPLES

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

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

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

5. Trip Blank

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

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

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

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

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

D. QA/QC REQUIREMENTS:

Not Applicable

QUALITY ASSURANCE/QUALITY CONTROL SAMPLES

E. SPECIAL CONDITIONS:

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

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

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

F. REFERENCES:

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

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

G. APPENDICES/FORMS:

Not Applicable

END OF SOP

Final Check by C. Burns 10/27/15

APPENDIX C

Quality Assurance Project Plan

Quality Assurance Project Plan

Former Friedrichsohn Cooperage

153-155 Saratoga Avenue
Town of Waterford,
Saratoga County,
New York

Site No. 546045

CHA Project Number: 060017.000

Prepared for:

SI Group
The Substance Inside

1000 Main Street
Rotterdam Junction, New York 12150

General Electric

1 River Road
Schenectady, New York 12306

Prepared by:

CHA

III Winners Circle
Albany, New York 12205
Phone: (518) 453-4500

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LIST OF ACRONYMS & ABBREVIATIONS

ASP	Analytical Services Protocol
CAMP	Community Air Monitoring Plan
CHA	CHA Consulting, Inc.
COC	Chain of Custody
DER-10	Division of Environmental Remediation Technical Guidance for Site Investigation and Remediation
ELAP	Environmental Laboratory Approval Program
EPA	Environmental Protection Agency
GC/MS	Gas Chromatography/Mass Spectrometry
GMP	Groundwater Monitoring Plan
MS/MSD	Matrix Spike/Matrix Spike Duplicate
NYSDEC	New York State Department of Environmental Conservation
NYSDOH	New York State Department of Health
PCB	Polychlorinated Biphenyl
PID	Photoionization detector
QA	Quality Assurance
QAPP	Quality Assurance Project Plan
QC	Quality Control
RPD	Relative Percent Difference
SOP	Standard Operation Procedure
SVOC	Semivolatile Organic Compound
TAL	Target Analyte List
TCL	Target Contaminant List
TCLP	Toxicity Characteristic Leaching Procedure
VOC	Volatile Organic Compounds

1.0 INTRODUCTION

This Quality Assurance Project Plan (QAPP) presents the policies, organization, objectives, functional activities and specific Quality Assurance (QA) and Quality Control (QC) activities designed to achieve the specific data quality goals associated with the implementation of the Groundwater Monitoring Plan (GMP) at the Former Friedrichsohn Cooperage Site located at 153-155 Saratoga Avenue, Town of Waterford, New York (Site). The scope of work is summarized in the GMP.

This QAPP has been prepared to identify procedures for sample preparation and handling, sample chain-of-custody (COC), laboratory analyses, and reporting to be implemented during this investigation to ensure the accuracy and integrity of the data generated during the monitoring. This QAPP has been prepared in accordance with the New York State Department of Environmental Conservation's (NYSDEC) Department of Remediation (DER-10) Technical Guidance for Site Investigation and Remediation. The objective of the QAPP is to provide thorough and concise descriptions of the measures to be applied during the groundwater monitoring program such that the data generated will be of an acceptable level of precision and accuracy. Field activities will be performed in accordance with CHA Consulting, Inc. (CHA) standard operating procedures (SOPs), included in the GMP.

2.0 PROJECT ORGANIZATION AND RESPONSIBILITY

Table 1, below, identifies key personnel assigned to the project and provides contact information.

Table 1: Key Project Personnel

Name/Title	Contact Information	Responsibilities
Steven Scharf, P.E. NYSDEC Project Manager	(518) 402-9620 steven.scharf@dec.ny.gov	Mr. Scharf will represent the NYSDEC and approve the GMP and all appendices, including this QAPP, and any modifications to the project.
Sarita Wagh NYSDOH Project Manager	(315) 426-7400 sarita.wagh@dec.ny.gov	Ms. Wagh will represent the NYSDOH and approve the GMP and all appendices, including this QAPP, and oversee the Community Air Monitoring Program (CAMP) implementation and data review
Charles Gardner SI Group, Inc. Owner's Representative	(518) 347-6256 charles.gardner@siigroup.com	Mr. Gardner will represent SI Group and is responsible for the overall management of the remedial program and adherence to the Consent Order for SI Group, Inc.
Bob Gibson General Electric Owner's Representative	(518) 388-7505 bob.gibson@ge.com	Mr. Gibson will represent General Electric and is responsible for the overall management of the remedial program and adherence to the Consent Order for General Electric.
Keith Cowan, P.G. CHA Project Manager	(518) 466-8157 kcowan@chacompanies.com	Mr. Cowan will oversee the project, provide quality control on documents and mentor the daily task manager. Mr. Cowan is responsible for following the approved GMP, notifying the NYSDEC of any deficiencies, and obtaining approval by the NYSDEC for all modifications to the project; provides overall and day-to-day project management; ensures all resources of CHA are available on an as required basis; participates in key technical negotiations with the NYSDEC, as necessary; evaluate data; provide immediate supervision of all on site activities; assists in preparation and review of final report; and provides technical representation for field activities.
Scott Smith, P.E. CHA Project Engineer	(315) 257-7227 ssmith2@chacompanies.com	Mr. Smith is responsible for the design of the GMP; provides oversight and guidance on the implementation of the GMP; assists in the preparation and review of final reports; and provides technical guidance to CHA's environmental group.
Karyn Ehmann CHA Engineer II	(315) 257-7250 (office) (585) 721-2402 (cell) kehmann@chacompanies.com	Ms. Ehmann will be responsible for coordinating the field staff and designating the Health and Safety point of contact for CHA staff. Ms. Ehmann will serve as the database manager and prepare written reports.
Melissa Deyo Alpha Analytical, Inc. Laboratory Project Manager	(508) 898-9220 mdeyo@alphalab.com	Ms. Deyo will act as CHA's point of contact with the contracted laboratory.

Laboratory

Alpha Analytical, Inc. is the analytical laboratory chosen to perform the proposed work and is certified by the New York State Department of Health (NYSDOH) Environmental Laboratory Approval Program (ELAP) Number 11148 to perform the required analyses in accordance with the most recent version of the NYSDEC Analytical Services Protocol (ASP).

Project Manager, Analytical Contractor

- Coordinates laboratory resources on an as-required basis;
- Coordinate laboratory analyses;
- Supervise laboratory's in-house COC;
- Schedule analyses of samples;
- Oversee review of data;
- Oversee preparation of analytical reports; and,
- Approve final analytical reports prior to submission to CHA.

Quality Assurance/Quality Control Officer, Analytical Contractor

- Overview laboratory QA/QC;
- Overview QA/QC documentation;
- Conduct detailed data review;
- Decide laboratory corrective actions, if required; and,
- Provide technical representation for laboratory QA/QC procedures.

Sample Custodian, Analytical Contractor

- Receive and inspect the sample containers;
- Record the condition of the sample containers;
- Sign appropriate documents;
- Verify chain-of-custodies and their correctness;
- Notify laboratory project manager and laboratory QA/QC Officer of sample receipt and inspection;
- Assign a unique laboratory identification number correlated to CHA's sample identification number, and enter each into the sample receiving log;
- Initiate transfer of the samples to the appropriate lab sections with assistance from the laboratory project manager; and,
- Control and monitor access to and storage of samples and extracts.

3.0 QUALITY ASSURANCE OBJECTIVES FOR MEASUREMENT DATA

The overall QA objective is to develop and implement procedures for sample preparation and handling, sample COC, laboratory analyses, and reporting, in order to provide accurate data. Specific procedures to be followed for sampling, sample custody and document control, calibration, laboratory analyses and data reduction, validation, assessment and reporting are presented in Sections 4.0 through 10.0 of this QAPP.

The purpose of this document is to define the goals for the level of QA effort; namely, accuracy; precision and sensitivity of analyses; and completeness, representativeness and comparability of measurement data from the analytical laboratories. QA objectives for field measurements are also discussed.

4.0 LEVEL OF QA EFFORT

To assess the quality of data resulting from the field sampling program, field duplicate samples, equipment blanks, samples for laboratory matrix spike/matrix spike duplicate (MS/MSD) analyses, and trip blank samples will be collected (where appropriate) and submitted to the contract laboratory. CHA SOP#605 will be adhered to for all QA/QC procedures.

For field samples collected, blind duplicate samples will be submitted at a frequency of one per 20 investigative samples, or in the event that a sampling round consists of less than 20 samples, one field duplicate will be collected. Similarly, MS/MSD samples will be analyzed at a minimum frequency of one set per 20 investigative samples. In the event that a sampling event consists of less than 20 samples, one MS/MSD sample will be collected. One equipment blank samples will be collected and analyzed for each sampling event. Trip blanks will be submitted with each cooler containing aqueous samples to be analyzed for volatile organic compounds (VOCs).

The sampling and analysis program is summarized below and lists the specific parameters to be measured, the number of samples to be collected and the level of QA effort required for each matrix.

Soil samples will be analyzed for all or some of the following:

- Target Compound List (TCL) Volatile Organic Compounds (VOCs) via United States Environmental Protection Agency (EPA) Method 8260C;
- TCL Semivolatile Organic Compounds (SVOCs) via EPA Method 8270D;
- Polychlorinated Biphenyls (PCBs) via EPA Method 8082A;
- Target Analyte List (TAL) Metals via EPA 6010C and 7471;
- Total Organic Carbon via EPA Method 9060;
- Nitrate via EPA Method 9060;
- Alkalinity via EPA Method 310.2;
- Ammonia via EPA Method 350.1;
- Total and Dissolved Iron via EPA Method 7381; and,
- Sulfate via EPA Method 9038.

During each sampling event, a blind duplicate sample will be collected and analyzed as a check on the aggregate analytical and sampling protocol precision. An MS/MSD sample will be analyzed as a check on the analytical method's accuracy and precision. An equipment blank will be collected and analyzed to identify potential cross-contamination between groundwater monitoring wells from improper decontamination procedures. A trip blank samples (for VOC determinations only) will be shipped by the laboratory to the Site and back to the laboratory without opening in the field. The trip blank will provide a measure of potential cross contamination of samples resulting from shipment, handling and/or ambient conditions at the Site.

4.1 ACCURACY, PRECISION AND SENSITIVITY OF ANALYSIS

The fundamental QA objective with respect to the accuracy, precision and sensitivity of analytical data is to achieve the QC acceptance of each analytical protocol. The method(s) precision (relative percent difference of duplicate analysis) will be determined from the duplicate analyses of MS samples. A minimum of one sample will be spiked and analyzed in duplicate. Additional details are provided in CHA SOP#605. Analysis will compare with the criteria presented in the appropriate methods identified in Section 4.0.

The method(s) accuracy (percent recovery) be determined by spiking selected samples (matrix spikes) with test compounds. Accuracy will be reported as the percent recovery of the test compound and will compare with the criteria given in the appropriate methods as identified in Section 4.0.

Project-specific accuracy and precision goals are identified in Section 9.0.

4.2 COMPLETENESS, REPRESENTATIVENESS AND COMPARABILITY

It is expected that all analyses conducted in accordance with the selected methods will provide data meeting QC acceptance criteria for 80 percent of all samples tested. Any reasons for variances will be documented.

The sampling program has been designed to provide data representative of Site conditions. During development of these networks, consideration was given to location of historic activities, existing data from past studies completed for the Site and the physical Site setting. The extent to which existing and planned analytical data will be comparable depends on the similarity of sampling and analytical methods. The procedures used to obtain the planned analytical data are documented in this QAPP. Comparability of laboratory analyses will be confirmed by the use of consistent units. Following completion of data collection, the existing database will be evaluated for representativeness.

4.3 FIELD DOCUMENTATION

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

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

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

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

Additional protocols specific to each sampling method are presented in the following sections. The general QA objective for measurement data is to obtain reproducible and comparable measurements to a degree of accuracy consistent with the use of standardized procedures.

5.0 SAMPLING PROCEDURES

Prior to the semiannual groundwater monitoring, six new monitoring wells will be installed. The soil cuttings from the installation of these six wells will be containerized in 55-gallon steel drums and sampled for waste characterization and disposal purposes (i.e. toxicity characteristic leaching procedure [TCLP]), as directed by the selected disposal facility. Although the selected disposal facility may request additional analyses, the proposed general waste characterization analyses are listed, below.

The GMP to be implemented will include the collection and analyses of groundwater samples from the monitoring well network. Purge water from each monitoring well will be containerized in 55-gallon steel drums. During the first groundwater sampling event, a one purge water sample for waste characterization will be collected for analyses of TCL VOCs, TCL SVOCs, TCL PCBs, and TAL Metals. During sampling events thereafter, purge water sampling is not anticipated as the water quality and chemistry for waste characterization purposes will likely not change appreciably. Details regarding specific sampling activities and procedures for collecting the samples are provided in the GMP. The number of samples, analytical methods, sample volumes, preservation techniques and holding times are provided in Table 2, below.

Matrix (Sample Type)	EPA Method Analysis	Parameter/Fraction	Number of Primary Samples	Waste Characterization Samples	Number of Blind Duplicates	Number of MS/MSD	Number of Equipment Blanks	Number of Trip Blanks	Sampling Locations	Minimum Sample Volume (number of containers)	Sample Preservation	Technical Holding Time
Groundwater	8260C	TCL VOCs	8	1	1	1 / 1	1	1	All groundwater monitoring wells at each groundwater sampling event. (MW-2, MW-2S, MW-100, MW-101, MW-101B, MW-102, MW-102B, MW-103) One purge water sample at the initial groundwater sampling event.	(3) 40 mL	1:1 HCl to pH<2, Cool to 4°C	14 days
	8270D	TCL SVOCs	8	1	1	1 / 1	1	0		(2) 250 mL	Cool to 4°C	7 days for extraction, 40 days after extraction
	8082A	TCL PCBs	8	1	1	1 / 1	1	0		(2) 1,000 mL	Cool to 4°C	7 days for extraction, 40 days after extraction
	6010C/7471	TAL Metals	8	1	1	1 / 1	1	0		100 mL	HNO3 to pH <2	6 months
	9060	Total Organic Carbon	8	0	1	1 / 1	1	0		(2) 40 mL	H2SO4 to pH < 2, cool to 4°C	28 days
	353.2	Nitrate	8	0	1	1 / 1	1	0		250 mL	Cool to 4°C	48 hours
	310.2	Alkalinity	8	0	1	1 / 1	1	0		250 mL	Cool to 4°C	14 days
	350.1	Ammonia	8	0	1	1 / 1	1	0		250 mL	H2SO4 to pH <2, Cool to 4°C	28 days
	7381	Dissolved Iron	8	0	1	1 / 1	1	0		100 mL	HNO3 to pH <2	6 months
	9038	Sulfate	8	0	1	1 / 1	1	0		250 mL	Cool to 4°C	28 days
Soil Cuttings	8260C	TCLP VOCs	1	1	0	0	0	0	Soil cuttings from monitoring well installation.	4 oz.	Cool to 4°C	14 days
	8270D	TCLP SVOCs	1	1	0	0	0	0		8 oz.	Cool to 4°C	14 days
	8082A	TCL PCBs	1	1	0	0	0	0		4 oz.	Cool to 4 °C	14 days
	6010D/7470A	TCLP Metals	1	1	0	0	0	0		4 oz.	Cool to 4°C	180 days
	8081B	TCLP Pesticides	1	1	0	0	0	0		8 oz	Cool to 4°C	14 days
	8151A	TCLP Herbicides	1	1	0	0	0	0		8 oz	Cool to 4°C	14 days
	9045, 7.3, 1030	pH, Reactivity (Cyanide & Sulfide), Ignitability	1	1	0	0	0	0		8 oz.	Cool to 4°C	14 days

6.0 SAMPLE CUSTODY AND DOCUMENT CONTROL

6.1 CHAIN-OF-CUSTODY

As per CHA SOP#105, a COC will be maintained to document the transfer of all samples. Each sample container will be properly sealed. Sample container labels will include the sample name, required analysis, and date and time of collection. Sample containers will be taken to the Contract Laboratory courier center at 4°C (±2°C) in sealed coolers.

Each sample cooler will contain an appropriately completed COC form. One copy will be returned to CHA upon receipt of the samples by the laboratory and one copy will be returned to CHA with the data deliverables package.

Upon receipt of the cooler at the laboratory, it will be inspected by the designated sample custodian. The condition of the cooler and sample containers will be noted on the COC record sheet by the sample custodian. The sample custodian will also document the date and time of receipt of the container and sign the form.

If damage or discrepancies are noticed, they will be recorded in the remarks column of the record sheet, and be dated and signed. Any damage or discrepancies will be reported to the lab supervisor who will inform the lab manager, QA Officer and CHA Project Manager.

6.2 SAMPLE DOCUMENTATION IN THE LABORATORY

Each sample or group of samples shipped to the laboratory for analysis will be given a unique identification number by the laboratory. The laboratory sample custodian will record the client name, number of samples and date of receipt of samples in the Sample Control Log Book.

The Contract Laboratory will be responsible for maintaining analytical log books and laboratory data as well as sample inventory on hand for submittal to CHA on an "as required" basis. Samples will be maintained by the laboratory for a period of 30 days, under the conditions prescribed by the appropriate United States EPA methods, for additional analyses, if necessary. Raw laboratory data files will be inventoried and maintained by the Contract Laboratory for a period of five years, at which time CHA will advise them as to the need for additional storage.

6.3 STORAGE OF SAMPLES

Evidentiary files for the entire project will be inventoried and maintained by CHA and will consist of the following:

1. Project related plans;
2. Project log books;
3. Field data records;
4. Sample identification documents;
5. Chain-of-Custody records;
6. Report notes, calculations, etc.;
7. References, literature;
8. Miscellaneous - photos, maps, drawings, etc.; and
9. Copies of all final reports pertaining to the project.

The project file materials will be the responsibility of CHA's Project Manager with respect to document maintenance and management.

7.0 CALIBRATION PROCEDURES AND FREQUENCY

7.1 INSTRUMENT CALIBRATION AND TUNING

Calibration of instrumentation is required to ensure that the analytical system is operating correctly and functioning at the proper sensitivity to meet established reporting limits. Each instrument is calibrated with standard solutions appropriate to the type of instrument and the linear range established for the analytical method. The frequency of calibration and the concentration of calibration standards is determined by the manufacturer's guidelines, the analytical method, or the requirements of special contracts.

7.2 FIELD INSTRUMENT CALIBRATION

Calibration of the field instruments will be completed prior to each day's use in accordance with the manufacturer's instructions. The field equipment will be maintained, calibrated and operated in a manner consistent with the manufacturer's guidelines and EPA standard methods. However, since the majority of field measurements will be limited to organic vapor readings (PID readings) the calibration procedures will be conducted at a minimum frequency of once per day. Records of calibration, repair or replacement will be filed and maintained by the Field Team Leader.

8.0 DATA REDUCTION, VALIDATION, ASSESSMENT AND REPORTING

8.1 GENERAL

The Contract Laboratory will perform analytical data reduction and validation in-house under the direction of the laboratory QA Officer. The laboratory's QA Officer will be responsible for assessing data quality and advising of any data which were rated "preliminary" or "unacceptable" or other qualifications based on the QC criteria outlined in the methods, which would caution the data user of possible unreliability.

Assessment of analytical and field data will include checks for data consistency by looking for comparability of duplicate analyses, laboratory QA procedures, adherence to accuracy and precision criteria, transmittal errors and anomalously high or low parameter values. The results of these data validations will be reported to the project managers, noting any discrepancies and their effect upon acceptability of the data.

8.2 FIELD DATA

Raw data from field measurements and sample collection activities that are used in project reports will be appropriately identified and appended to the report. Where data have been reduced or summarized, the method of reduction will be documented in the report. Field data will be reviewed for anomalously high or low values that may appear to be inconsistent with other data.

Field sampling data will be reviewed by the CHA QA/QC Officer to ensure the following information has been properly documented:

- Sample identification;
- Source;
- Date and time of sampling;
- Sampling equipment;
- Person(s) collecting the sample; and
- Results of field monitoring and/or observations.

In addition, the field sampling data will be evaluated to ensure:

- The use of approved sampling and sample handling procedures;
- Proper packing/shipping procedures were used; and

- Proper COC was maintained.

8.3 LABORATORY REPORTING

Reporting and deliverables for soil samples will be in accordance with NYSDEC July 2005 ASP Category B Deliverable. Reports will be received by CHA within 30 days of the last day of sampling. Sample data and its corresponding QA/QC data shall be maintained accessible to CHA in hard copy. All other reporting and deliverables (i.e. waste characterization samples) will be in accordance with standard laboratory procedure.

8.4 ELECTRONIC DATA

The laboratory will provide the analytical data in an electronic format. The data will be added into the existing database maintained by CHA staff. From there the data can be processed and compared to existing standards using the existing software. An electronic copy of the analytical data in EQuIS format will be provided to NYSDEC.

8.5 DATA VALIDATION

The contract laboratory will perform analytical data reduction and validation under the direction of the laboratory QA Officer. The Laboratory's QA Officer will be responsible for assessing data quality and advising of any data which were rated "preliminary" or "unacceptable" of other qualifications based on the QC criteria outlined in the analytical methods. This will caution the data user of potential unreliability of the data.

9.0 INTERNAL QUALITY CONTROL CHECKS AND FREQUENCY

9.1 FIELD QUALITY CONTROL

QC procedures for field measurements will be limited to checking the reproducibility of the measurement in the field by obtaining multiple readings and by calibrating the instruments (where appropriate).

QC of field sampling will involve collecting field duplicates, equipment blanks, and trip blanks with the applicable site activities described in the GMP. Field QC samples are also discussed in Section 4.0.

9.2 LABORATORY QUALITY CONTROL

Specific procedures related to internal laboratory QC samples (namely blanks, MS/MSD, surrogates and QC check samples) are described in the following subsections.

9.2.1 Reagent Blank Samples

A reagent blank will be analyzed by the laboratory at a frequency of one blank per 10 analyses, or in the event that an analytical round consists of less than 10 samples, one reagent blank will be analyzed. The reagent blank, an aliquot of analyte-free water or solvent, will be carried through the entire analytical procedure.

9.2.2 Matrix Spike/Matrix Spike Duplicates

An MS/MSD sample will be analyzed at a minimum frequency one sample for every 20 investigative samples that are collected. For sampling events consisting of less than 20 investigative samples, one MS/MSD sample set will be collected. Acceptable criteria and compounds that will be used for matrix spikes are identified in the appropriate methods. Percent spike recoveries will be used to evaluate analytical accuracy while percent relative standard deviation or the relative percent difference (RPD) between matrix spike analyses will be used to assess analytical precision.

9.2.3 Surrogate Analyses

Surrogates are organic compounds which are similar to the analytes of interest, but which are not normally found in environmental samples. Surrogates are added to samples, by the laboratory, to monitor the effect of the matrix on the accuracy of the analysis. Every blank, standard and environmental sample analyzed by gas chromatography (GC) or GC/mass spectrometry (MS), including MS/MSD samples, will be spiked with surrogate compounds prior to sample preparation.

Surrogates will be spiked into samples according to the appropriate analytical methods. Surrogate spike recoveries will be compared with the control limits set by procedures specified in the method (or from laboratory specific control limits) for analytes falling within the quantification limits without dilution. Dilution of samples to bring the analyte concentration into the linear range of calibration may dilute the surrogates out of the quantification limit; assessment of analytical quality in these cases will be based on the quality control embodied in the check and MS/MSD sample analysis results.

10.0 PROCEDURES USED TO ASSESS PERFORMANCE

10.1 PRECISION

Precision will be assessed by comparing the analytical results between duplicate spike analyses. Precision as relative percent difference (RPD) will be calculated as follows:

$$\text{Precision} = \frac{[D_2 - D_1]}{(D_1 + D_2)/2} \times 100$$

D_1 = matrix spike recovery

D_2 = matrix spike duplicate spike recovery

Acceptance criteria for duplicate water samples will be ≤20% RPD between field and laboratory data.

Percent relative standard deviation or the RPD between matrix spike analyses will be used to assess laboratory analytical precision. Acceptable criteria and compounds that will be used are identified in the appropriate EPA methods.

10.2 ACCURACY

Accuracy will be assessed by comparing a set of analytical results to the accepted or "true" values that would be expected. In general, MS/MSD and surrogate spike recoveries will be used to assess accuracy. Accuracy as percent recovery will be calculated as follows:

$$\text{Accuracy} = \frac{A-B}{C} \times 100$$

A = The analyte determined experimentally from the spike sample.

B = The background level determined by a separate analysis of the unspiked sample.

C = The amount of spike added.

Percent spike recoveries in MS/MSD and surrogate spike recoveries will be used to evaluate analytical accuracy. Acceptable criteria and compounds that will be used for matrix spikes are identified in the appropriate EPA methods.

The evaluation of accuracy of field measurements will be limited to checking the reproducibility of the measurement in the field by obtaining multiple readings and by calibrating the instruments (where appropriate).

10.3 COMPLETENESS, REPRESENTATIVENESS AND COMPARABILITY

Completeness is a measure of the amount of valid data obtained from a measurement system compared with the amount that was expected to be obtained under normal conditions.

To be considered complete, the data set must contain all QC check analyses verifying precision and accuracy for the analytical protocol. In addition, all data are reviewed in terms of stated goals in order to determine if the database is sufficient.

When possible, the percent completeness for each set of samples will be calculated as follows:

$$\text{Completeness} = \frac{\text{valid data obtained}}{\text{total data planned}} \text{ X 100 percent}$$

A completeness goal of 100 percent has been established for this project. However, if the completeness goal is not met, site decisions may be based on any, or all of, the remaining, validated data. Representativeness will be addressed by collecting the samples as described in this document. Comparability will be addressed by collecting, analyzing, and reporting the data as described in this document.

10.4 OUTLIERS

Procedures discussed previously will be followed for documenting deviations. In the event that a result deviates significantly from method established control limits, this deviation will be noted and its effect on the quality of the remaining data will be assessed and documented.

11.0 QUALITY ASSURANCE REPORT TO MANAGEMENT

The CHA Project Manager will receive reports on the performance of the measurement system and the data quality following each sampling round and at the conclusion of the project.

At a minimum, these reports will include:

1. Assessment of measurement quality indicators; (i.e. data accuracy, precision and completeness);
2. Results of systems audits; and
3. QA problems and recommended solutions.

CHA's QA/QC Officer will be responsible within the organizational structure for preparing these periodic reports. The final report for the project will also include a separate QA section which will summarize data quality information contained in the periodic QA/QC reports to management and present an overall data assessment and validation in accordance with the data quality objectives outlined in this QAPP.

APPENDIX D

Health and Safety Plan

SITE HEALTH AND SAFETY PLAN

PROJECT INFORMATION

Project Name: Friedrichsohn Groundwater Monitoring Plan	**CHA Project No.** 060017.000
Project Start Date: TBD **Completion Date:** TBD	**Weather:** °F
Project Location: 153-155 Saratoga Ave, Town of Waterford, New York	**Project Task:** Monitoring well installation and Groundwater Monitoring Plan (GMP) implementation *Complete a Site Health & Safety Plan per Task*

Description of Work:
Be Specific: CHA staff will observe and document the installation of the new groundwater monitoring wells proposed to be installed to facilitate the groundwater monitoring program (GMP). After the installation of the wells, CHA staff will perform groundwater sampling for all monitoring wells within the proposed monitoring well network.

Staff performing work at the Site shall be 40-Hour HAZWOPER trained and be familiar with the typical hazards associated with the installation of groundwater monitoring wells and groundwater monitoring programs.

Key Personnel: *Responsibilities:*	Keith Cowan *Project Manager*	Karyn Ehmann *Field Team Leader*	Karyn Ehmann *Site Safety Officer*

Description of Hazards:
Toxic Substance Control Act (TSCA) level soil and sediment has been removed from the Site after the OU-1 and OU-3 remedial construction. Therefore, contaminant exposure risk is low (low levels of VOCs and PCBs <1 ppm). Typical hazards associated with monitoring well installation and groundwater sampling include, but are not limited to, proximity to drilling equipment, noise, contact with contaminated (non-TSCA) soil and groundwater, slips, trips and falls, exposure to heat and cold, and environmental hazards such as ticks, poisonous insects, and poisonous plants.

*Hard hat and ear plugs necessary during monitoring well installation only.

TASK HAZARDS			TASK SAFETY MEASURES & PPE
Eye	Chemical Exposure High Heat/Cold Dust/Flying Debris Impact Light/Radiation	Yes ☒ No ☐ Yes ☐ No ☒ Yes ☒ No ☐ Yes ☐ No ☒ Yes ☐ No ☒	☒ Safety Glasses ☐ Safety Goggles ☐ Face Shield ☐ Shaded Lenses
Head	Impact Electrical Shock Lack of Visibility	Yes ☒ No ☐ Yes ☐ No ☒ Yes ☐ No ☒	☒ Hard Hat: ☐ Orange or ☐ White or ☐ Blue ☐ Reflector Tape (Required for night operations)
Foot	Chemical Exposure High Heat/Cold Impact/Compression Slips/Trips Puncture Slippery/Wet Surface Explosive/Flammable Atmospheres Electrical	Yes ☐ No ☒ Yes ☒ No ☐ Yes ☐ No ☒ Yes ☒ No ☐ Yes ☐ No ☒ Yes ☒ No ☐ Yes ☐ No ☒ Yes ☐ No ☒	☒ Work Boots ☐ Ankle Protection ☐ Rubber Boots ☐ Insulated Boots ☐ Non-slip Soles ☐ Chemical resistant ☒ Steel Toed Boots ☐ I/75 C/75 (Impact/Compression) ☐ Cd Type 1 or 2 (Conductive) ☐ PR (Puncture Resistant) ☐ Mt/70 or 50 or 30 (Metatarsal) ☐ EH (Electrical Hazard) ☐ SD Type I or II (Static Dissipative)
Hand	Chemical Exposure High Heat or Cold Cuts/Abrasion Puncture Electrical Shock Bloodborne Pathogen	Yes ☒ No ☐ Yes ☒ No ☐ Yes ☒ No ☐ Yes ☐ No ☒ Yes ☐ No ☒ Yes ☐ No ☒	☐ Work Gloves ☐ Leather Gloves ☒ Latex Gloves ☐ Vinyl Gloves ☐ Neoprene Gloves ☐ Butyl Gloves ☐ Rubber Gloves ☒ Nitrile Gloves ☐ Insulated Gloves ☐ Metal Mesh Gloves

Body/Torso	Chemical Exposure Extreme Heat/Cold Abrasion Lack of Visibility Impact Electrical Arc	Yes ☐ No ☒ Yes ☒ No ☐ Yes ☐ No ☒ Yes ☐ No ☒ Yes ☐ No ☒ Yes ☐ No ☒	☐ Tyvek Suits: ☐ White or ☐ Yellow ☒ UV Protection ☐ Cooling/Heating Vests ☐ Coveralls ☒ Reflective Vest ☐ Electrical Safety PPE
Fall	Fall Hazard	Yes ☐ No ☒	☐ Harness ☐ Fall Protection Lanyard
Noise	Noise Hazard	Yes ☒ No ☐	☒ Ear Plugs ☐ Ear Muffs
Respiratory	Chemical Exposure Confined Spaces Particulate Exposure	Yes ☐ No ☒ Yes ☐ No ☒ Yes ☐ No ☒	☐ Respirator: ☐ ½ Face or ☐ Full Face ☐ Cartridge: ☐ P or ☐ OV or ☐ C ☐ PA/PR
Biohazards	Poisonous Plants Ticks Bee Stings Poisonous Snakes Pigeon Guano Large Mammals Dry Weather (e.g. wildfires)	Yes ☒ No ☐ Yes ☒ No ☐ Yes ☒ No ☐ Yes ☐ No ☒ Yes ☒ No ☐ Yes ☒ No ☐ Yes ☐ No ☒	☒ SOPs ☐ Long Pants/Sleeves ☒ Ivy Block ☒ Tick Removal Kit ☒ Insect Repellent ☒ Epipen ☒ Allergy Kits ☒ Be Alert/Observant ☐ Chaps ☐ Dust/Nuisance Respirator ☐ PPE
Additional Equipment	As Needed		☐ Traffic Cones ☐ Signage ☐ Flags ☐ 2- Way Radios ☐ Flashlight/Floodlights ☒ First Aid Kit ☐ Hand/Power Tools ☐ Beacon Light ☐ Ladders

SITE CONTROL

Site Control/Site Security[1]: ***Describe Measures***	Enter through the locked gate to drive to the Treatment Plant side of the landfill.	M & PT: ☐ Y ☒ N *If yes, sketch information on separate sheet*
Confined Space Entry: *If Yes, Attach Permit*	☐ Y ☒ N	
Decontamination: *If Yes, Describe Procedures*	☒ Y ☐ N Equipment will be decontaminated after each sample using Alconox detergent and distilled	
Site Monitoring[2]: *If Yes, Describe Procedures*	☐ Y ☒ N A PID will be utilized to screen soil cuttings/samples and work zone vapor concentrations during the installation of the new monitoring wells. Additionally, a CAMP will be implemented to monitor for vapors and fugitive dust emissions during the installation of the wells.	

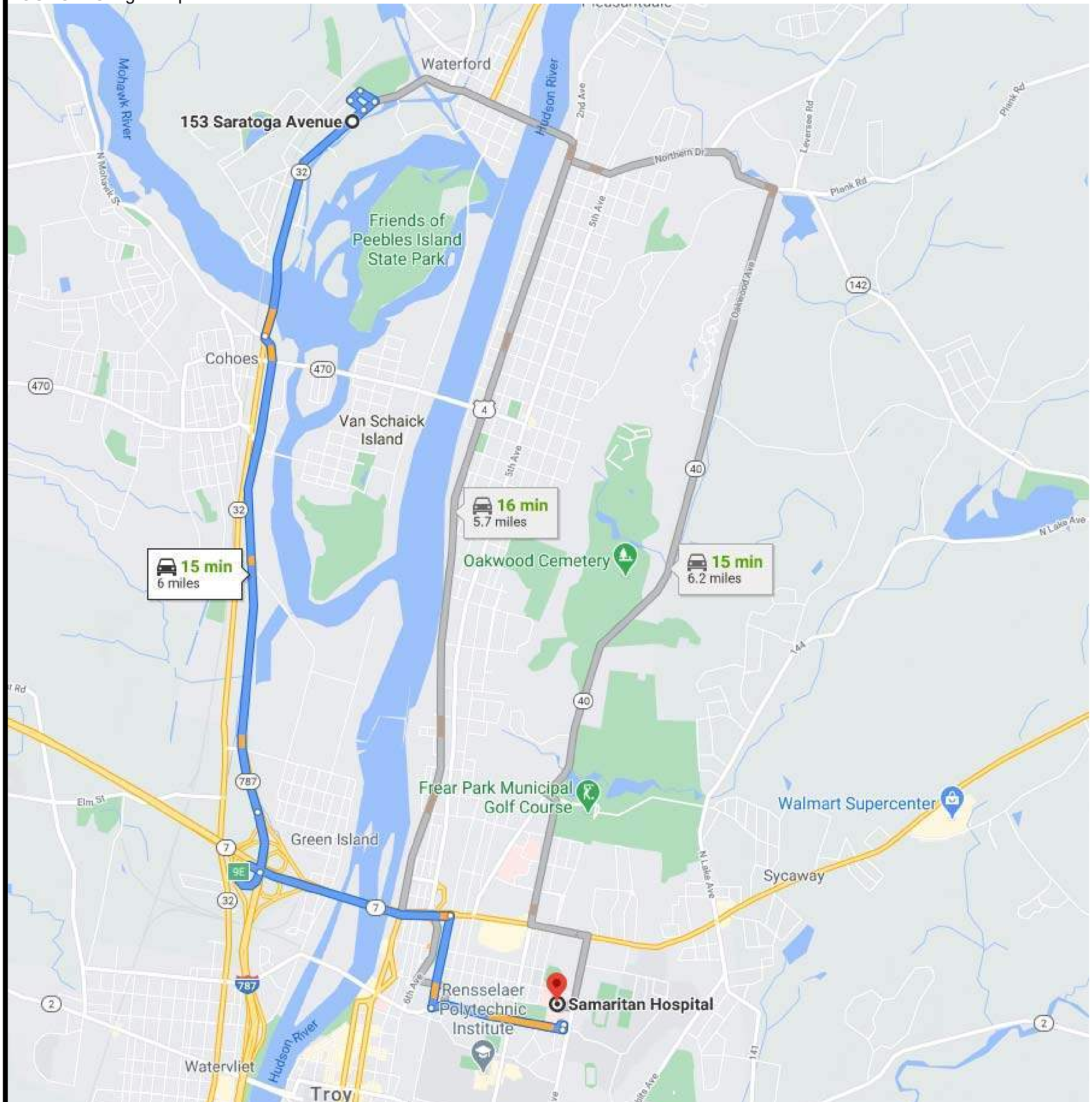
CONTINGENCY PLAN

Emergency Contacts: *Provide Telephone Numbers*	Police: 911 Ambulance: 911 Fire: 911 Hospital: Samaritan Hospital	Client Contact: Chuck Gardner (SI Group, Inc.) / Bob Gibson (General Electric) Client Phone #: 518-347-4256 / 518-388-7505 CHA PM Phone #: Keith Cowan 518-466-8157 Poison Control: 1-800-222-1222
Route to Hospital: (Directions attached to the end of this HASP)		
Communication:	☒ Cell Phone ☐ Nearest Pay Phone ☐ Pager	

Comments:			
PLAN SIGN-OFF			
Name:	Name:	Name:	Name:
X:	X:	X:	X:
Date:	Date:	Date:	Date:
Name:	Name:	Name:	Name:
X:	X:	X:	X:
Date:	Date:	Date:	Date:
SAFETY TRAINING/MEDICAL MONITORING			
Type:	Type:	Type:	Type:
Date:	Date:	Date:	Date:
Type:	Type:	Type:	Type:
Date:	Date:	Date:	Date:

1. Who is providing site control/site security, if any, for this task? Examples of Site Control/Site Security include police, client representative(s), owner(s), CHA or client supervisors
2. What are you monitoring on site, if any, for this task? Examples of Site Monitoring include air monitoring, like carbon monoxide or oxygen levels or wet bulb temperatures

SOURCE: Google Maps



153-155 Saratoga Ave
Waterford, New York 12188

1. Take NY-32/Saratoga Ave to NY-787 South
2. Take exit 9E to merge onto NY-7 East toward Troy/Bennington
3. Turn right onto 8th Street
4. Turn left onto Peoples Ave
5. Destination is on the left.

Samaritan Hospital
2215 Burdett Ave
Troy, New York 12180

CHA ©2022
III Winners Circle, Albany, NY 12205
www.chacompanies.com

NOT TO SCALE | DATE: APRIL 2022

FIGURE 1
DIRECTIONS TO NEAREST HOSPITAL
Friedrichsohn Cooperage Site
Town of Waterford, New York

APPENDIX E

Community Air Monitoring Plan

Community Air Monitoring Plan
Former Friedrichsohn Cooperage

153-155 Saratoga Avenue
Town of Waterford,
Saratoga County,
New York

Site No. 546045

CHA Project Number: 060017.000

Prepared for:

SI Group
The Substance Inside
1000 Main Street
Rotterdam Junction, New York 12150

General Electric
1 River Road
Schenectady, New York 12306

Prepared by:

CHA
III Winners Circle
Albany, New York 12205
Phone: (518) 453-4500

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LIST OF ACRONYMS & ABBREVIATIONS

BTEX	Benzene, Toluene, Ethylbenzene, Xylene
CAMP	Community Air Monitoring Plan
CHA	CHA Consulting, Inc.
CVOC	Chlorinated Volatile Organic Compounds
DER-10	DER-10: Technical Guidance for Site Investigation and Remediation
NYSDEC	New York State Department of Environmental Conservation
NYSDOH	New York State Department of Health
PCB	Polychlorinated Biphenyls
PID	Photoionization Detector
PM10	Particulate Matter less than 10 microns
QA/QC	Quality Assurance/Quality Control
STEL	Short Term Exposure Limit

eV	Electron Volts
g/m^3	Grams per Cubic Meter
mg/m^3	Milligrams per Cubic Meter
ppm	Part per Million
$\mu g/m^3$	Micrograms per Cubic Meter
µm	Micrometers/microns

1.0 COMMUNITY AIR MONITORING PLAN

Air monitoring at the Site will be performed during all intrusive activities where there is a potential to come into contact with existing soil in accordance with the New York State Department of Health (NYSDOH) Generic Community Air Monitoring Plan (CAMP), and Appendix 1A and 1B of DER-10: Technical Guidance for Site Investigation and Remediation (DER-10). All air monitoring will be conducted on a real-time basis for particulates (i.e. dust) and organic vapors.

The primary contaminants of concern associated with the Site are polychlorinated biphenyls (PCBs), chlorinated volatile organic compounds (CVOCs), and other volatile organic compounds (VOCs) such as benzene, toluene, ethylbenzene, and xylene (collectively, BTEX), phenolic compounds, hexachlorobenzene, and metals. Particulates and total VOCs will be monitored concurrently within a CAMP station containing a DustTrak aerosol monitor and photoionization detector (PID), or similar.

Air monitoring readings will be uploaded in real-time and made available for review by both the New York State Department of Environmental Conservation (NYSDEC) and NYSDOH. Any exceedances that may occur will be addressed and recorded in the field logbook. Air monitoring will be performed during all ground intrusive activities at one location upwind and one location downwind of the work area. The direction of the wind will be monitored daily to determine upwind and downwind locations.

Enclosures will be provided for remote air monitoring stations to reduce potential weather-induced performance issues. The enclosures will be located in areas where they are not subject to damage from vehicular traffic and there is minimal potential for tampering in publicly accessible areas. Additionally, all intake ports on the instruments will be equipped with rain guards/shields to minimize the potential for water intrusion.

The CAMP is not intended for use in establishing action levels for worker respiratory protection. Rather, it is intended to provide a measure of protection for the downwind community (i.e., off-Site receptors including residences and businesses and on-Site workers not directly involved with the subject work activities) from potential airborne contaminant releases as a direct result of remedial activities. Reliance on the CAMP should not preclude simple, common-sense measures to keep VOCs and dust to a minimum around the work areas. Supplements to the CAMP may be required depending on the nature of the planned intrusive activities. The action levels specified herein require increased monitoring, corrective actions to abate emissions, and/or work shutdown.

Additionally, the CAMP helps to confirm that work activities did not spread contamination off-Site through the air.

"Continuous monitoring" will be required for all ground intrusive activities. Ground intrusive activities include, but are not limited to, the installation of the groundwater monitoring wells.

"Periodic monitoring" is not anticipated to be required during this work.

To verify that the fugitive dust and VOC measurements are performed correctly, there must be appropriate Quality Assurance/Quality Control (QA/QC). It is the responsibility of the remedial party to conduct periodic instrument calibration, operator training, daily instrument performance checks, and maintain a record-keeping plan.

2.0 FUGITIVE DUST AND PARTICULATE MONITORING, RESPONSE LEVELS, & ACTIONS

Fugitive dust is described as discrete particles, liquid droplets or solids, which become airborne and contribute to air quality as a nuisance and potential threat to human health and the environment. The following fugitive dust suppression and particulate monitoring program will be employed at the Site during intrusive activities which warrant its use.

1. Reasonable fugitive dust suppression techniques must be employed during all Site activities which may generate fugitive dust.
2. Particulate monitoring must be employed during the handling of waste or contaminated soil or when activities on Site may generate fugitive dust from exposed waste or contaminated soil. Remedial activities may also include the placement of clean fill. These control measures are not considered necessary for the placement of clean fill.
3. Particulate monitoring will be performed using real-time particulate monitors and will monitor particulate matter less than ten microns (PM10) with the following minimum performance standards:
    a. Objects to be measured: Dust, mists, or aerosols;
    b. Measurement Ranges: 0.001 to 400 mg/m^3 (1 to 400,000 µg/m^3);
    c. Precision (2-sigma) at constant temperature: +/- 10 g/m^3 for one second averaging; and +/- 1.5 g/m^3 for sixty second averaging;
    d. Accuracy: +/- 5% of reading +/- precision (Referred to gravimetric calibration with SAE fine test dust (mass median diameter (mmd)= 2 to 3; g-2.5, as aerosolized);
    e. Resolution: 0.1% of reading or 1g/m^3, whichever is larger;
    f. Particle Size Range of Maximum Response: <0.1 to 10 microns (µm);

g. Total Number of Data Points in Memory: 10,000 or greater;
h. Logged Data: Each data point with average concentration, time/date, and data point number
i. Run Summary: overall average, maximum concentrations, time/date of maximum, the total number of logged points, start time/date, total elapsed time (run duration), STEL concentration and time/date occurrence, averaging (logging) period, calibration factor, and tag number;
j. Alarm Averaging Time (user selectable): real-time (1-60 seconds) or short-term exposure limit (STEL) (15 minutes), alarms required. Personnel conducting air monitoring must be immediately notified of any alarms by remote sensors, text messaging, or other similar equipment. Utilizing periodic checks of instrumentation in alarm mode only is not acceptable monitoring practice.
k. Operating Time: 48 hours (fully charged NiCd battery); continuously with charger;
l. Operating Temperature: 0 to 50 ˚C (14 to 122˚ F); and
m. Operating Humidity: 10 to 99 percent Relative Humidity.

4. Particulate levels will be monitored immediately downwind at the working Site and integrated over a period not to exceed 15 minutes. Consequently, instrumentation shall require the necessary averaging hardware to accomplish this task.

5. The action level will be established at 150 µg/m³ (15-minute average). While conservative, this short-term interval will provide a real-time assessment of on-site air quality to assure both health and safety. If particulate levels are detected in excess of 150 µg/m³, the upwind background level must be confirmed immediately. If the working site particulate measurement is greater than 100 µg/m³ above the background level, additional dust suppression techniques must be implemented to reduce the generation of fugitive dust and corrective action taken to protect site personnel and reduce the potential for contaminant migration. Corrective measures may include increasing the level of personal protection for on-Site personnel and implementing additional dust suppression techniques. Should the action level of 150 µg/m³ continue to be exceeded work must stop and Project Managers from CHA Consulting, Inc. (CHA), NYSDEC, and NYSDOH must be notified. The notification shall include a description of the control measures implemented to prevent further exceedances.

6. It must be recognized that the generation of dust from waste or contaminated soil that migrates off-site, has the potential for transporting contaminants off-site. There may be situations when dust is being generated and leaving the site and the monitoring equipment does not measure PM10 at or above the action level. Since this situation has the potential to allow for the migration of contaminants off-site, it is unacceptable. While it is not practical to quantify total suspended particulates on a real-time basis, it is appropriate to rely on visual observation. If dust is observed leaving the working site, additional dust suppression techniques must be employed.

The following techniques are effective for the controlling the generation and migration of dust during construction activities:

- Wetting equipment and excavation faces;

- Spraying water on buckets during excavation and dumping;
- Hauling materials in properly tarped or watertight containers;
- Restricting vehicle speeds to 10 miles per hour; and
- Covering excavated areas and material after excavation activity ceases.

When techniques involving water application are used, care must be taken not to use excess water, which can result in unacceptably wet conditions. Using atomizing sprays will prevent overly wet conditions, conserve water, and provide an effective means of suppressing fugitive dust.

The evaluation of weather conditions is necessary for proper fugitive dust control. When extreme wind conditions make dust control ineffective, as a last resort remedial actions may need to be suspended. There may be situations that require fugitive dust suppression and particulate monitoring requirements with action levels more stringent than those provided above. Under some circumstances, the contaminant concentration and/or toxicity may require additional monitoring to protect site personnel and the public. Additional integrated sampling and chemical analysis of the dust may also be in order. This must be evaluated when a health and safety plan is developed and when appropriate suppression and monitoring requirements are established for the protection of health and the environment.

3.0 VOLATILE ORGANIC COMPOUND MONITORING, RESPONSE LEVELS, & ACTIONS

VOCs will be monitored at the upwind and downwind locations adjacent to the ground intrusive work area. VOCs will be monitored continuously, concurrently with fugitive dust monitoring. The monitoring work should be performed using a 10.6 electron volts (eV) PID. The equipment should be calibrated at least daily for the contaminant(s) of concern or an appropriate surrogate (e.g. isobutylene). The equipment should be capable of calculating 15-minute running average concentrations, which will be compared to the levels specified below.

If the ambient air concentration of total organic vapors at the downwind perimeter of the work area exceeds 5 parts per million (ppm) above background for the 15-minute average, work activities must be temporarily halted and monitoring continued. If the total organic vapor level readily decreases (per instantaneous readings) below 5 ppm over the background, work activities can resume with continued monitoring.

If total organic vapor levels at the downwind perimeter of the work area or exclusion zone persist at levels in excess of 5 ppm over the background but less than 25 ppm, work activities must be halted, the source of vapors identified, corrective actions taken to abate emissions, and monitoring continued. After these steps, work activities can resume provided that the total organic vapor level 200 feet downwind of the exclusion zone or half the distance to the nearest potential receptor or residential/commercial structure, whichever is less - but in no case less than 20 feet, is below 5 ppm over background for the 15-minute average.

If the organic vapor level is above 25 ppm at the perimeter of the work area; activities must be shut down. The NYSDEC, NYSDOH, and the CHA Project Manager will be notified of the situation. Emergency Response Contacts identified in the Health and Safety Plan, including the local police and fire departments, may be contacted by CHA.

Air monitoring will be conducted at 15-minute intervals at a 20-foot offset from the exclusion zone. If two successive readings below 25 ppm are measured by the field instrument and documented, the work may resume following the previously described monitoring plan.

All 15-minute readings will be recorded and be available for State (NYSDEC and NYSDOH) personnel to review. Instantaneous readings, if any, used for decision purposes will also be recorded.

CHA