



**CONESTOGA-ROVERS
& ASSOCIATES**

SITE MANAGEMENT PLAN

**FORMER BUFFALO CHINA SITE
BUFFALO, NEW YORK
BUFFALO, NEW YORK NYSDEC SITE No. C915209**

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1.0 INTRODUCTION AND DESCRIPTION OF REMEDIAL PROGRAM

This Site Management Plan (SMP) is required as an element of the remedial program at the Former Buffalo China Site (hereinafter referred to as the "Site") under the New York State (NYS) Brownfield Cleanup Program (BCP) administered by the New York State Department of Environmental Conservation (NYSDEC). The site was remediated in accordance with Brownfield Cleanup Agreement (BCA) Index #B9-0732-06-11 which was executed on May 17, 2007.

1.1 GENERAL

Buffalo China, Inc. (Buffalo China) entered into a BCA with the NYSDEC to perform Site characterization and remediation for the Site. The Site is a 9.73-acre property located in a mixed residential and industrialized area of Buffalo, New York. A figure showing the Site location and boundaries is provided in Figure 1.1. The boundaries of the Site are more fully described in the metes and bounds Site description that is part of the Environmental Easement for the Site.

After completion of the remedial work described in the NYSDEC approved Remedial Action Work Plan, some residual contamination was left in the subsurface at this Site, that is hereafter referred to as "remaining contamination." This SMP was prepared to manage remaining contamination at the Site until the Environmental Easement is repealed in accordance with ECL Article 71, Title 36. All reports associated with the Site can be viewed by contacting the NYSDEC or its successor agency managing environmental issues in New York State.

This SMP was prepared by CRA Infrastructure and Engineering, Inc. (CRA), on behalf of Buffalo China, in accordance with the requirements in NYSDEC DER-10 Technical Guidance for Site Investigation and Remediation, dated May 2010, and the guidelines provided by NYSDEC. This SMP addresses the means for implementing the Institutional Controls (ICs) and Engineering Controls (ECs) that are required by the Environmental Easement for the Site.

1.2 PURPOSE

The Site contains contamination left after completion of the Remedial Action. ECs have been incorporated into the Site remedy to control exposure to remaining contamination during the use of the Site to ensure protection of public health and the environment. An

Environmental Easement granted to the NYSDEC, and recorded with the Erie County Clerk, will require compliance with this SMP and all ECs and ICs placed on the Site. The ICs place restrictions on Site use, and this SMP mandates operation, maintenance, monitoring, and reporting measures for all ECs and ICs. This SMP specifies the methods necessary to ensure compliance with all ECs and ICs required by the Environmental Easement for the remaining contamination at the Site. Once approved by the NYSDEC, compliance with this plan is required by the grantor of the Environmental Easement and the grantor's successors and assigns. This SMP may only be revised with the approval of the NYSDEC.

This SMP provides a detailed description of all procedures required to manage remaining contamination at the Site after completion of the Remedial Action, including:

- i) Implementation and management of all ECs and ICs
- ii) Groundwater monitoring
- iii) Operation and maintenance of all treatment, collection, containment, or recovery systems
- iv) Performance of periodic inspections, certification of results, and submittal of Periodic Review Reports (PRRs)

To address these needs, this SMP includes three plans:

- i) An Engineering and Institutional Control Plan for implementation and management of ECs and ICs
- ii) A Monitoring Plan for implementation of Site Monitoring
- iii) An Operation and Maintenance Plan for implementation of the remedial treatment system

This plan also includes a description of PRRs for the periodic submittal of data, information, recommendations, and certifications to NYSDEC.

It is important to note that:

- This SMP details the Site-specific implementation procedures that are required by the Environmental Easement. Failure to properly implement the SMP is a violation of the Environmental Easement, which is grounds for revocation of the Certificate of Completion (COC).

- Failure to comply with this SMP is also a violation of Environmental Conservation Law, 6NYCRR Part 375 and the BCA (Index #B9-0732-06-11; Site #C915209), and, therefore, is subject to applicable penalties.

1.3 REVISIONS

In the future, appropriate and necessary revisions to this plan (if any) will be proposed in writing to the NYSDEC project manager. In accordance with the Environmental Easement for the Site, the NYSDEC will provide a notice of any approved changes to the SMP and append those notices to the SMP that is retained in its files.

Approved revisions will be identified on the Revisions Page located behind the title page of this SMP.

2.0 SITE BACKGROUND

2.1 SITE LOCATION AND DESCRIPTION

The Site is located in the City of Buffalo, County of Erie, New York and is identified on the City of Buffalo Tax Map #123.09. The Site includes the following properties:

<i>Parcel Address</i>	<i>Parcel No.</i>	<i>Section No.</i>	<i>Block No.</i>	<i>Lot No.</i>
51 Hayes Place, Buffalo NY, 14210	123	9	4	2
75 Hayes Place, Buffalo NY, 14210	123	9	4	17
55 Hayes Place, Buffalo NY, 14210	123	9	4	16.2
151 Harrison Street, Buffalo NY, 14210	123	38	3	1
133 Harrison Street, Buffalo NY, 14210	123	38	2	39
70 Lester St, Buffalo NY, 14210	123	38	2	1.1

The Site is situated on a 9.73-acre parcel and is bounded on the north by the CSX Railroad right-of-way, on the east by the Robinson Home Products warehouse and other commercial/industrial facilities, and on the south and west by commercial, industrial, and residential properties. Interstate I-190 is located nearby to the south of the Site, while the former City of Buffalo School 26 and adjacent playground is located a few hundred feet to the southwest. The nearest body of water is the Buffalo River, located approximately 1/4 to 1/2 mile south and east of the Site. The boundaries of the Site are more fully described in the Environmental Easement.

The Site includes a manufacturing building, a warehouse, outdoor storage silos, a rail spur, roadways, and parking areas. The manufacturing building is a multi-story structure covering approximately 4 acres. The building is connected to the Robinson Home Products Warehouse to the east. Another smaller building referred to as the Harrison Street Warehouse is located at the northwest end of the Site and covers an area of approximately 0.5 acres.

The Site is currently zoned for industrial use and there is an active manufacturing facility located within the boundaries of the Site.

2.2 SITE HISTORY

The property has been used for the manufacture of china for the past 100 years. During that period, the manufacturing facility expanded to adjacent industrial properties. The Harrison Street Warehouse was once a part of the Standard Mirror Company facility.

In November 2006 Buffalo China applied to New York State's Brownfield Cleanup Program (BCP) to address the contamination found at the Site. The BCA was signed by NYSDEC in May 2007. The intended future use of the Site is industrial.

2.3 GEOLOGIC CONDITIONS

The Site is underlain by fill materials ranging in thickness from zero to 4 feet below ground surface (bgs). Fill materials are underlain by clay deposits which range in depth from 4 feet bgs extending to a depth of at least 16.9 feet bgs (the maximum depth penetrated by boreholes). Underlying the clay deposits is bedrock, which for the Buffalo area typically consists of Onondaga Limestone. Geologic cross-sections are shown in Figures 2.1 through 2.4.

The major regional aquifer in the area of the Site is located in the upper bedrock and the depth to groundwater is approximately 6 to 7 feet. Groundwater flow is generally to the southwest towards an adjacent residential area. There also appears to be a slight flow component to the northeast. Groundwater is not used as a source of potable water in the portion of Erie County in which the Site is located. Overburden and bedrock groundwater surface contours are shown on Figures 2.5 and 2.6, respectively.

2.4 SUMMARY OF REMEDIAL INVESTIGATION FINDINGS

A remedial investigation (RI) was conducted by CRA on behalf of Buffalo China between July 2007 and July 2009. The results of the RI were reported in the "Remedial Investigation Report" prepared by CRA and dated September 2010.

Based upon investigations conducted as part of the RI, the primary contaminants of concern included trichloroethene (TCE) and its associated degradation products. In a limited area on the west side of the site TCE was found in subsurface soil at a maximum concentration of 670 parts per million (ppm), which is significantly above the soil cleanup objective (SCO) for the protection of groundwater (0.47 ppm) and above the industrial SCO of 400 ppm. Lead was also detected in soils at concentrations greater than the SCO for industrial use (3,900 ppm) in two of 32 samples, at concentrations of 4,980 ppm and 9,250 ppm. These two soil samples were collected from the top 2 feet of soil.

TCE and its associated degradation products were also found in groundwater at the Site, exceeding groundwater standards (typically 5 parts per billion (ppb)), with a maximum concentration of 650,000 ppb in the overburden groundwater and 290,000 ppb in bedrock groundwater. TCE, and its related degradation products, have migrated approximately 300 feet down-gradient off Site in the bedrock groundwater. The primary contaminant of the off-Site bedrock groundwater is TCE, which is present at a maximum concentration of 190 ppb, in bedrock groundwater. The Site is considered a significant threat due to the TCE contamination in off-Site groundwater and the potential for vapor intrusions into nearby structures.

The following sections provide a brief summary of the RI findings.

2.4.1 SOIL

A summary of Site soil analytical results that exceed the SCOs for restricted use in 6 NYCRR Part 375 is presented on Table 2.1. Shallow and subsurface soil analytical results for on-Site sample locations were compared to industrial use SCOs in order to characterize the Site and determine the need for remediation. A review of the data indicated the following:

- i) One VOC (TCE) was detected at a concentration exceeding the applicable SCO in one sample collected in 2006
- ii) Four semi-volatile compounds (SVOCs) were detected in Site subsurface soils at concentrations exceeding the applicable SCOs
- iii) Arsenic in soil was detected at a concentration exceeding the SCO for restricted industrial use at a depth of 3.5 to 8 feet bgs at one location on Site
- iv) Lead was detected at concentrations exceeding the applicable SCO in near surface soils at two locations on Site
- v) Lead was detected at concentrations exceeding the SCO for industrial use in one subsurface soil sample underneath the concrete slab of the manufacturing building
- vi) No PCBs, herbicides, or pesticides were detected in Site soils at concentrations exceeding applicable SCOs

2.4.2 GROUNDWATER

The concentrations of volatile organic compounds (VOCs) detected in the overburden and bedrock monitoring wells are shown on Figure 2.7 and summarized on Table 2.2. The analytical data have been compared to the NYSDEC standards and guidance values for Class GA (potable) groundwater. Detected concentrations exceeding the standards are highlighted on the tables. The data indicate the following:

- i) VOCs, primarily TCE and its degradation product cis-1,2-dichloroethene (cis-1,2-DCE) are present in Site overburden and bedrock groundwater at concentrations exceeding the relevant standards and guidance values
- ii) VOC-impacted groundwater has migrated off Site
- iii) No SVOCs, polychlorinated biphenyls (PCBs), or pesticides were detected at concentrations exceeding relevant standards and guidance values in groundwater samples
- iv) Total antimony, iron, lead, manganese, magnesium, sodium, and thallium were detected in concentrations exceeding the relevant standards; however, dissolved concentrations were below relevant standards for those metals except for manganese, magnesium, and sodium

2.4.3 OFF-SITE SOIL VAPOR INTRUSION

The approved Soil Vapor Intrusion (SVI) Investigation Work Plan included the collection of sub-slab soil vapor samples and indoor air samples from four off-Site properties, and outdoor air samples. Based on the evaluation of the data compared to the NYSDOH decision matrices, it was concluded that no further action such as monitoring or mitigation was warranted at three of the locations.

An evaluation of the soil vapor data collected from the fourth location (127 Harrison Street) compared to the NYSDOH decision matrices indicated that mitigation was necessary to address the presence of elevated VOC vapors beneath the building's basement slab.

SVI investigation activities were also proposed at off-Site residences located at 54 Lester Street and 64 Lester Street, which, until February 2012 were owned by the same individual. Despite numerous attempts, an access agreement with the property owner could not be executed and SVI sampling has not been completed at these properties. In April 2012 Buffalo China was informed that the 64 Lester Street property had been sold

and that the 54 Lester Street property was on the market. Buffalo China has made additional efforts to set up agreements with the owner of 54 Lester Street and the new owner of 64 Lester Street to conduct the sampling. The owner of 54 Lester Street has been unresponsive. NYSDEC sent a letter to the owner of 54 Lester Street summarizing Buffalo China's efforts to establish an access agreement and complete sampling. The letter also indicated that the offer to conduct SVI sampling in the residence in the future will be available at the owner's discretion and that the NYSDEC and NYSDOH will evaluate the need to mitigate based on environmental conditions at that time. If SVI sampling is requested or agreed to at this property in the future, the work will be done as an IRM.

An access agreement has been executed with the owner of 64 Lester Street. SVI sampling and, if necessary, mitigation and post mitigation sampling will be done as an IRM.

2.5 SUMMARY OF REMEDIAL ACTIONS

The Site was remediated in accordance with the NYSDEC-approved Remedial Action Work Plan dated September 2010.

The following is a summary of the Remedial Actions performed at the Site:

- Excavation and off-Site disposal of unsaturated soils that exhibited concentrations of VOCs, SVOCs, and metals in excess of applicable NYSDEC standards or objectives. These soils were located primarily on the south and west sides of the Harrison Street warehouse.
- Backfill and restoration of the excavated area similar to pre-excavation conditions.
- Monitored natural attenuation of VOCs and SVOCs in some discrete areas and institutional and engineering controls to minimize exposures to metals in Site soil.
- In situ treatment through chemical oxidation of on-Site and off-Site groundwater impacted by VOCs, followed by enhanced biodegradation.
- Post-remediation groundwater monitoring to evaluate the effectiveness of the remedy.

Remedial activities were completed at the Site in April 2012. Further details regarding the remediation of the Site are included in the Final Engineering Report (CRA, 2012).

In addition to the remedial actions that were undertaken on the property, the following actions were also implemented in order to prevent exposure to any impacted soil remaining on-Site:

- Development of institutional and engineering controls including execution of an Environmental Easement to restrict land use and prevent further exposure to any contamination remaining at the Site.
- Development and implementation of this SMP for long term management of remaining contamination as required by the Environmental Easement, which includes plans for (1) Institutional and Engineering Controls, (2) excavation and soil management in the Post-Remediation Excavation Work Plan (3) monitoring, (4) operation and maintenance, and (5) reporting.
- Annual Certification of the institutional and engineering controls.

2.5.1 REMOVAL OF CONTAMINATED MATERIALS FROM THE SITE

Approximately 3,313 tons of impacted soil were transported off Site for disposal. The excavated areas were backfilled with clean fill and restored to their approximate original grade and condition. A figure showing areas where excavation was performed is shown in Figure 2.8. A list of the SCOs for the primary contaminants of concern and applicable land use for this Site is provided below.

<i>Contaminant of Concern</i>	<i>Part 375.6 Industrial Use SCO (mg/kg)</i>	<i>Part 375.6 Protection of Groundwater SCO (mg/kg)</i>
TCE	NA	0.47
Lead	3,900	NA

2.5.2 SITE-RELATED TREATMENT SYSTEMS

The Site remedy requires in situ treatment of VOC-impacted groundwater by chemical oxidation. Chemical oxidation is to occur over a 21-month period, followed by enhanced biodegradation (i.e., injection of nutrients) to achieve complete degradation of the VOCs in groundwater. Ten horizontal piping galleries were installed in the open excavation east of the Harrison Street warehouse prior to backfilling. The piping galleries are used to more effectively distribute the oxidant and nutrients across the impacted area. In addition, 29 vertical injection wells (22 overburden wells and 7 bedrock wells) were installed upgradient and downgradient of the impacted area.

Figure 2.9 shows the layout of the piping galleries and injection wells.

2.5.3 REMAINING CONTAMINATION

The soil excavation and off-Site disposal element of the selected remedy at the Site was conducted to meet the industrial use SCOs as specified in Part 375.6 for metals and protection of groundwater criteria for VOCs. A table summarizing the analytical results from the remedial action is provided within the FER.

The Decision Document requires that a site cover be maintained as a component of any future site development, which will consist of either hard footprint structures such as buildings, pavement, or sidewalks, or a soil cover in areas where the upper one foot of exposed surface soil will exceed the applicable SCOs. The following sub sections discuss the isolated locations where soil that exceeds applicable criteria remains in place but soil cover is not required because of one or more factors.

2.5.3.1 REMAINING VOC IMPACTS

Although the current and anticipated Site use is industrial, the cleanup criteria for excavation of VOCs in soil were the protection of groundwater standards. VOC impacted soils were removed until sidewall confirmatory sample results were below the protection of groundwater SCOs. One sample (008) had results that exceeded the protection of groundwater standards. See Figure 2.10 for the sample location. The table below summarizes the exceedances and compares them to the commercial and industrial SCOs.

*Summary of Exceedances at
Sample Location 008*

<i>Compound</i>	<i>Result (mg/Kg)</i>	<i>Protection of Groundwater SCO</i>	<i>Commercial Use SCO</i>	<i>Industrial Use SCO</i>
Cis-1,2-Dichloroethene	0.32J	0.25	500	1,000
Tetrachloroethene	1.8	1.3	150	300
Trichloroethene	1.9	0.47	200	400

The soil in the area of Sample 008 was left in place with no further remedial efforts because:

- i) The location of the sample was along the outside building footer at a depth of 4 to 5 feet bgs
- ii) There were concerns about compromising the integrity of the building structure if additional soils were removed
- iii) The ISCO injection program will treat the remaining VOCs
- iv) The exceedances were in soil greater than 1-foot in depth, and are below the commercial and industrial SCOs

2.5.3.2 REMAINING SVOC IMPACTS

During the RI, two locations were identified as having benzo(a)pyrene at concentrations marginally exceeding the industrial SCOs.

<i>Location</i>	<i>Date</i>	<i>Depth ft. bgs</i>	<i>Concentration (mg/kg)</i>	<i>Industrial SCO (mg/kg)</i>
BH-13	5/3/2006	1.5 to 2.5	1.3	1.1
SB-2-07	7/27/07	6.5 to 8	1.4/ 2.7	1.1

Locations BH-13 and SB-2-07 are shown on Figure 2.10. The soil in these areas was left in place with no further remedial efforts required because:

- i) The depth of the sample results were both greater than 1 foot bgs
- ii) The exceedances were marginal and SVOCs degrade naturally overtime
- iii) SVOCs are not a contaminant of concern in groundwater
- iv) The groundwater program includes the sampling and analysis of the on Site plume wells for SVOCs to monitor the effectiveness of natural attenuation in protecting groundwater quality

2.5.3.3 REMAINING LEAD IMPACTS

In 2004 a Focused Phase II Environmental Assessment was completed by Environmental Audits, Inc. (EA). Interior soil boring sample location ISB3 was installed from 0 feet to 8 feet bgs within the main manufacturing area. The sample location is shown on

Figure 2.10. The sample had a lead result of 10,000 mg/kg exceeding the industrial SCOs (3,900 mg/kg). Because dissolved lead in groundwater is not a COC at the Site and the sample location is beneath an existing Engineering Control (existing Site structures) no further investigation or remediation was conducted. The sample location is identified in the SMP and any intrusive activities conducted in the area (removal of the floor slab or excavations) will need to be done in accordance with the SMP.

2.5.3.4 REMAINING GROUNDWATER IMPACTS

Groundwater VOC contamination remains beneath the Site and has migrated off -Site. The groundwater contamination is being addressed by the in situ chemical oxidation (ISCO) element of the selected remedy discussed in Section 5.

2.6 OFF-SITE SVI MITIGATION INTERIM REMEDIAL MEASURES

In accordance with the approved RAWP, mitigation of SVI at the off-Site residence located at 127 Harrison Street was addressed as an interim remedial measure (IRM) in accordance with the IRM Work Plan for the installation of a sub slab depressurization system dated July 25, 2011.

The mitigation IRM was implemented on August 4, 2011 and consisted of:

- Completion of a sub-slab diagnostic test procedure for optimum system configuration
- Installation of a RADONAWAY RP-145 centrifugal in-line fan to provide sub-slab depressurization via 3" schedule 40 PVC pipe to roof exhaust, via garage and garage attic, with roof flashing boot
- Installation of two UL listed fire stop devices at garage firewall penetrations
- Installation of one suction point connection to basement sub-slab suction cavity at drain tile
- Installation of a vacuum indicator on pipe (provides visual confirmation of system operation)
- Sealing of floor cracks, score lines and other openings to sub-slab with urethane sealant

- Installation of a lexan cover and airtight drain for sump crock
- At completion, measurements of pressure differentials and documentation, labeling of components.

Post mitigation sampling was conducted in December 2011. Details of the IRM and post mitigation sampling are provided in the FER.

3.0 ENGINEERING AND INSTITUTIONAL CONTROL PLAN

Since remaining contaminated soil, groundwater, and soil vapor exist beneath the Site, ECs and ICs are required to protect human health and the environment into the future. This Engineering and Institutional Control Plan describes the procedures for the implementation and management of all ECs/ICs at the Site. The EC/IC Plan is one component of the SMP and is subject to revision by NYSDEC.

3.1 PURPOSE

This plan provides:

- A description of all ECs/ICs on the Site
- The basic implementation and intended role of each EC/IC
- A description of the key components of the ICs set forth in the Environmental Easement
- A description of the features to be evaluated during each required inspection and periodic review
- A description of plans and procedures to be followed for implementation of ECs/ICs, such as the implementation of the Excavation Work Plan for the proper handling of remaining contamination that may be disturbed during maintenance or redevelopment work on the Site
- Any other provisions necessary to identify or establish methods for implementing the ECs/ICs required by the Site remedy, as determined by the NYSDEC

3.2 ENGINEERING CONTROLS

The purpose of the ECs is to eliminate the potential for human contact with impacted soil and eliminate the potential for contaminated runoff from the Site. The requirements for EC's as identified in the Environmental Easement include:

- All Engineering Controls must be operated and maintained as specified in the Site Management Plan (SMP)
- All Engineering Controls must be inspected at a frequency and in a manner defined in the SMP

- Groundwater and other environmental or public health monitoring must be performed as defined in the SMP
- All future activities on the property that will disturb remaining contaminated material must be conducted in accordance with the SMP
- Monitoring to assess the performance and effectiveness of the remedy must be performed as defined in the SMP
- The potential for vapor intrusion must be evaluated for any buildings developed on the Site, and any potential impacts that are identified must be monitored or managed through implementation of appropriate vapor mitigation measures
- Operation, maintenance, monitoring, inspection, and reporting of any mechanical or physical components of the remedy shall be performed as defined in the SMP

The existing and newly installed EC systems at the Site consist of:

- Cover System: Existing buildings and pavement at the Site will form the Site cover such that upon successful remediation, there will be no exposed soil exceeding industrial levels. The existing buildings and pavement at the Site that form the Site Cover System are shown on Figure 3.1.
- Soil Cover: In the absence of Site development, a soil cover is required in areas where the upper 1 foot of exposed surface soil exceeds the applicable SCOs. Since no areas where the upper 1 foot of exposed surface soil exceeds the applicable SCOs were left after the remedial activities, excavated areas were backfilled with imported clean fill and stone to existing grades. In the event (i.e. demolition of a building or paved area without replacement or restoration, regrading of undeveloped areas) that a soil cover is required at a later date, the soil cover will consist of a minimum of 1 foot of soil meeting the SCOs for commercial use.
- Groundwater Treatment System: An injection piping gallery and overburden and bedrock injection wells have been installed for the distribution of oxidants and nutrients as part of the chemical oxidation and enhanced biodegradation components of the Site remedy for groundwater. The selected oxidant, sodium hydroxide-activated sodium persulfate, will be injected into the gallery injection and well network over six quarterly events. Following the final oxidant injection event, an enhanced anaerobic biodegradation polishing treatment will be applied. A vegetable oil emulsion and microbial inoculum will be injected biennially, with semi-annual nutrient injections applied in the interim. The in situ groundwater treatment program began in April 2012.
- Groundwater Monitoring: Groundwater monitoring activities to assess the effectiveness of chemical oxidation, enhanced biodegradation, and natural

attenuation will continue, as determined by the NYSDEC, until residual groundwater concentrations are found to be consistently below NYSDEC standards or have become asymptotic at an acceptable level over an extended period. Monitoring will continue until permission to discontinue is granted in writing by the NYSDEC. If groundwater contaminant levels become asymptotic at a level that is not acceptable to the NYSDEC, additional source removal, treatment, and/or control measures will be evaluated. The groundwater monitoring program began in June 2012.

- SVI Mitigation System Operation and Maintenance: A sub-slab depressurization system has been installed off Site at 127 Harrison Street to minimize the potential for exposures through soil vapor intrusion.

The Excavation Work Plan/Soils Management Plan that appears in Appendix A outlines the procedures required to be implemented during all intrusive subsurface activities at the Site and in the event the Site cover system (see Figure 3.1) is breached, penetrated, or temporarily removed, and any underlying remaining contamination is disturbed. Procedures for the inspection and maintenance of this cover are provided in the Monitoring Plan included in Section 4.2 and 4.3 of this SMP.

3.3 INSTITUTIONAL CONTROLS

A series of ICs is required by the NYSDEC Decision Document to:

- i) Implement, maintain, and monitor EC systems
- ii) Prevent future exposure to remaining contamination by controlling disturbance of the subsurface contamination
- iii) Limit the use and development of the Site to industrial uses only

Adherence to these ICs on the Site is required by the Environmental Easement and will be implemented under this SMP. The ICs that are to be implemented are as follows:

- Compliance with the Environmental Easement and this SMP by the Grantor (Site owner) and the Grantor's successors and assigns
- The controlled property may be used for Industrial Use as described in 6 NYCRR Part 375-1.8(g)(2)(iv)
- Data and information pertinent to Site Management of the Controlled Property must be reported at the frequency and in a manner defined in this SMP

- Access to the Site must be provided to agents, employees or other representatives of the State of New York with reasonable prior notice to the property owner to assure compliance with the restrictions identified by the Environmental Easement

ICs identified in the Environmental Easement may not be discontinued without an amendment to or extinguishment of the Environmental Easement.

The Site has a series of ICs in the form of Site restrictions. Adherence to these ICs is required by the Environmental Easement. Site restrictions that apply to the Controlled Property are:

Property Use: The property may only be used for industrial use provided that the long-term ECs and ICs included in this SMP are adhered to. The property may not be used for a higher level of use, such as unrestricted, restricted residential, or commercial use without additional evaluation (including possible additional remediation) and amendment of the Environmental Easement, as approved by the NYSDEC.

- Prohibition of Groundwater Use: The use of the groundwater underlying the property as a source of potable or process water is prohibited without treatment rendering it safe for the intended use as determined by the NYSDEC, NYSDOH, or the Erie County Health Department.
- Prohibition of Vegetable Gardening: Vegetable gardens and farming on the property are prohibited.
- Annual Certification: The Site owner or remedial party will submit to NYSDEC a written statement that certifies, under penalty of perjury, that:
 - i) Controls employed at the Site are unchanged from the previous certification or that any changes to the controls were approved by the NYSDEC.
 - ii) Nothing has occurred that impairs the ability of the controls to protect public health and the environment or that constitutes a violation or failure to comply with the SMP. NYSDEC retains the right to access the Site at any time in order to evaluate the continued maintenance of any and all controls. This certification shall be submitted annually, or an alternate period of time that NYSDEC may allow and will be made by an expert that the NYSDEC finds acceptable.

3.4 EXCAVATION WORK PLAN

The Site has been remediated to a condition that allows for future use of the Site as industrial. Any future intrusive work that will penetrate the soil cover or cap, or encounter or disturb the remaining contamination, including any modifications or repairs to the existing cover system, will be performed in compliance with the post-remediation Excavation Work Plan (EWP) that is provided as Appendix A to this SMP. The EWP is applicable to any intrusive work activities conducted at the Site. Any work conducted pursuant to the EWP must also be conducted in accordance with the procedures defined in the Health and Safety Plan (HASP) and Community Air Monitoring Plan (CAMP) prepared for the Site. The current Site-specific HASP is provided as Appendix B to this SMP. The HASP is compliant with current DER-10, and 29 CFR 1910, 29 CFR 1926, and all other applicable Federal, State, and local regulations. Based on future changes to State and Federal health and safety requirements, and specific methods employed by future contractors, the HASP and CAMP will be updated and re-submitted with the notification provided in Section 1.0 of the EWP. Any intrusive construction work will be performed in compliance with the EWP, HASP, and CAMP, and will be reported upon in the periodic inspection and certification reports submitted under the Site Management Reporting Plan (See Section 6).

The Site owner and associated parties preparing the remedial documents submitted to the State, and parties performing this work, are completely responsible for the safe performance of all intrusive work, the structural integrity of excavations, proper disposal of excavation water, control of runoff from open excavations and surface contamination areas, and for structures that may be affected by excavations (such as building foundations and footings). The Site owner will ensure that Site development activities will not interfere with, or otherwise impair or compromise, the ECs described in this SMP.

3.5 SOIL VAPOR INTRUSION EVALUATION

Prior to the construction of any enclosed structures on the Site and for which the potential for soil vapor intrusion (SVI) has been identified, an SVI evaluation will be performed to determine whether any mitigation measures are necessary to eliminate potential exposure to vapors in the proposed structure. Alternatively, an SVI mitigation system may be installed as an element of the building foundation without first conducting an investigation. This mitigation system will include a vapor barrier and passive sub-slab depressurization system that is capable of being converted to an active system.

Prior to conducting an SVI investigation or installing a mitigation system, a work plan will be developed and submitted to the NYSDEC and NYSDOH for approval. This work plan will be developed in accordance with the most recent NYSDOH "Guidance for Evaluating Vapor Intrusion in the State of New York." Measures to be employed to mitigate potential vapor intrusion will be evaluated, selected, designed, installed, and maintained based on the SVI evaluation, the NYSDOH guidance, and construction details of the proposed structure.

Preliminary (unvalidated) SVI sampling data will be forwarded to the NYSDEC and NYSDOH for initial review and interpretation. Upon validation, the final data will be transmitted to the agencies, along with a recommendation for follow-up action, such as mitigation. SVI data will also be transmitted to the property owner within 30 days of validation.

SVI sampling results, evaluations, and follow-up actions will also be summarized in the next PRR.

3.6 INSPECTIONS AND NOTIFICATIONS

3.6.1 INSPECTIONS

Inspections of all remedial components installed at the Site will be conducted at the frequency specified in the SMP Monitoring Plan schedule. A comprehensive Site-wide inspection will be conducted annually, and the results will be reported annually in the PRR. The inspections will determine and document the following:

- Whether ECs continue to perform as designed
- Whether ECs continue to be protective of human health and the environment
- Compliance with requirements of this SMP and the Environmental Easement
- Achievement of remedial performance criteria
- Sampling and analysis of appropriate media during monitoring events
- Whether Site records are complete and up to date
- Necessary or required changes to the remedial or monitoring system

Inspections will be conducted in accordance with the procedures set forth in the Monitoring Plan of this SMP (Section 4). The reporting requirements are outlined in the PRR section of this plan (Section 6).

3.6.2 NOTIFICATIONS

Notifications will be submitted by the property owner to the NYSDEC for the following reasons:

- 60-day advance notice of any proposed changes in Site use that is required under the terms of the Brownfield Cleanup Agreement, 6NYCRR Part 375, and/or Environmental Conservation Law
- 7-day advance notice of any proposed ground-intrusive activities pursuant to the Excavation Work Plan
- Notice within 48 hours of any damage or defect to the foundations or structures that reduces or has the potential to reduce the effectiveness of other ECs, and any action to be taken to mitigate the damage or defect
- Verbal notice by noon of the following day of any emergency, such as a fire, flood, or earthquake, that reduces or has the potential to reduce the effectiveness of ECs in place at the Site, with written confirmation within 7 days that includes a summary of actions taken, or to be taken, and the potential impact to the environment and the public
- Follow-up status reports on actions taken to respond to any emergency event requiring ongoing responsive action shall be submitted to the NYSDEC within 45 days and shall describe and document actions taken to restore the effectiveness of the ECs

Any change in the ownership of the Site or the responsibility for implementing this SMP will include the following notifications:

- At least 60 days prior to the change, the NYSDEC will be notified in writing of the proposed change. This will include a certification that the prospective purchaser has been provided with a copy of the BCA, and all approved work plans and reports, including this SMP.
- Within 15 days after the transfer of all or part of the Site, the new owner's name, contact representative, and contact information will be confirmed in writing.

3.7 CONTINGENCY PLAN

Emergencies may include injury to personnel, fire or explosion, environmental release, or serious weather conditions. In the event of any environmentally-related situation or unplanned occurrence requiring assistance, the Owner or Owner's representative(s) should contact the appropriate party from the contact list below. For emergencies, appropriate emergency response personnel should be contacted. These emergency contact lists must be maintained in an easily accessible location at the Site.

<i>Organization/Name</i>	<i>Title/Location</i>	<i>Telephone</i>
Medical, Fire, and Police		911
South Buffalo Mercy Hospital	565 Abbott Road Buffalo, NY	716-826-7000
One Call Center (3-day notice required for utility markout)		800-272-4480
Poison Control Center		800-222-1222
National Response Center (Pollution/Toxic Chemical/Oil Spills)		800-424-8802
NYSDEC Spills Hotline		800-457-7362
Owner	Niagara Ceramics Corporation 75 Hayes Place Buffalo, NY 14210 Karl Franz	716-821-5600
Responsible Party	Buffalo China, Inc 163-181 Kenwood Avenue Oneida, NY 13421 Kerri Love	315-361-3718

<i>Organization/Name</i>	<i>Title/Location</i>	<i>Telephone</i>
Buffalo China's Consultant	Conestoga Rovers & Assoc. 285 Delaware Ave, Suite 500 Buffalo, NY 14202 Christine Barton	716-856-2142

In the case of an emergency, South Buffalo Mercy Hospital is the nearest health facility to the Site. The hospital is located at 565 Abbott Road, Buffalo, New York, a distance of approximately 2.3 miles (8 minutes). A hospital route map is provided as Figure 3.2

From the Site, proceed south on Hayes Place for 0.1 miles. Turn left onto Seneca Street and travel southeast for 1.8 miles. Turn right onto Cazenovia Street and travel southwest for 0.4 miles. The hospital is on the left at the corner of Cazenovia Street and Abbott Road.

4.0 SITE MONITORING PLAN

The Monitoring Plan describes the measures for evaluating the performance and effectiveness of the remedy to reduce or mitigate contamination at the Site, the soil cover system, and the affected Site media identified below. Monitoring of other ECs is described in Chapter 5: Operation, Monitoring, and Maintenance Plan. This Monitoring Plan may only be revised with the approval of NYSDEC.

If an emergency, such as a natural disaster or an unforeseen failure of any of the ECs occurs, an inspection of the Site will be conducted by a qualified environmental professional as determined by NYSDEC within 5 days of the event to verify the effectiveness of the ECs/ICs implemented at the Site.

4.1 PURPOSE AND SCHEDULE

This Monitoring Plan describes the methods to be used for:

- Sampling and analysis of groundwater
- Assessing compliance with applicable NYSDEC standards, criteria, and guidance, particularly ambient groundwater standards
- Assessing achievement of the remedial performance criteria
- Evaluating Site information periodically to confirm that the remedy continues to be effective in protecting public health and the environment
- Preparing the necessary reports for the various monitoring activities

To adequately address these issues, this Monitoring Plan provides information on:

- Sampling locations, protocols, and frequency
- Information on all designed monitoring systems (e.g., well logs)
- Analytical sampling program requirements
- Reporting requirements
- Quality Assurance/Quality Control (QA/QC) requirements
- Inspection and maintenance requirements for monitoring wells
- Monitoring well decommissioning procedures
- Annual Site inspection and periodic certification

Semi-annual monitoring of the performance of the remedy and overall reduction in contamination on-Site will be conducted for the first 5 years. Based on the monitoring results for the first 5 years the fifth annual report can recommend a reduction in monitoring frequency. Trends in contaminant concentrations in groundwater will be evaluated to determine if the remedy continues to be effective in achieving remedial goals. Monitoring programs are outlined in detail in Sections 4.2 through 4.4 below.

4.2 ASPHALT PAVEMENT/CONCRETE COVER SYSTEM MONITORING

The cover system at the Site is designed to prevent contact between Site visitors and workers, and the remaining contamination in the Site soil. The asphalt pavement and concrete cover systems (see Figure 3.1) are intended to be generally low-maintenance covers. Assessment of the severity of deterioration or damage to asphalt pavement or concrete is subjective, and inspection personnel must use professional judgment in assessing what type and extent of deterioration/damage warrant repair or maintenance. As a guideline, areas of asphalt pavement or concrete will be repaired when the pavement is deteriorated/damaged to the extent that underlying soil or sub-base material is exuded from beneath the pavement. As a minimum, soil exposed beneath the asphalt or concrete over an area greater than 1 square foot will require repair of the asphalt or concrete.

Deteriorated asphalt pavement will be evaluated, and repaired using cold mix for areas less than 4 square feet, or hot mix asphalt and/or liquid bituminous material for larger areas. Concrete surfaces, will be repaired using one or more appropriate methods selected based on the type and extent of concrete deterioration or damage. Such methods may include:

- Patching with cold mix asphalt (for areas less than 4 square feet)
- Patching with hot mix asphalt or bituminous material
- Saw cutting and removing the damaged concrete and replacement with new concrete
- Use of low-slump concrete
- Replacement using 1 foot of clean quarried stone or crushed demolition material

For cases where concrete material is used to make the repairs, the use of reinforcing mesh or re-bar and bonding agents may be used.

4.3 SURFACE SOIL/STONE COVER SYSTEM MONITORING

Excavated areas were backfilled with imported clean fill and stone to existing grades. In the event that a soil cover is placed over some of the Site at a later date (i.e. demolition of a building or paved area without replacement or restoration, regrading of undeveloped areas), the following procedures will be used. Assessment of the severity of deterioration or damage to the soil cover system is subjective, and inspection personnel must use professional judgment in assessing what type and extent of deterioration/damage warrants repair or maintenance. As a guideline, the soil cover system will be repaired if an area of the 1-foot cover soil layer is eroded or otherwise disturbed to a depth of 6 inches. Repair will consist of placement of clean soil material over the area to restore the cover thickness to 1 foot.

4.4 GROUNDWATER MONITORING

4.4.1 GROUNDWATER QUALITY MONITORING

Groundwater quality monitoring will be performed on a periodic basis to assess the performance of the remedy. The remedy includes both an overburden groundwater component and a bedrock groundwater component. The network of monitoring wells has been installed to monitor both upgradient and downgradient groundwater conditions at the Site. The network consists of:

- Monitoring wells that were installed as part of the remedial investigation of the Site
- Ten monitoring wells screened in the overburden to monitor shallow groundwater quality
- Twelve monitoring wells screened in the shallow bedrock to monitor for bedrock groundwater quality

The wells are listed on Table 4.1. Figure 4.1 shows the locations of the monitoring wells included in the monitoring program. Several wells are located off-Site and are installed on properties belonging to the City of Buffalo and private residents. The City has requested written notification prior to each event where City property must be accessed. Upon receipt of analytical data, copies of the data pertaining to each off-Site parcel must be provided to the respective property owners (i.e., City of Buffalo and private residents) within 30 days.

The wells are to be sampled on a quarterly basis during in situ chemical oxidation treatment and on a semi-annual basis during and following in situ enhanced biodegradation treatment. Copies of the well construction logs/details for those wells to be included in the groundwater quality monitoring program are provided in Appendix C. The monitoring wells will be sampled for the Site-specific contaminants of concern as listed in Table 4.2 and in accordance with EPA Low-Flow (Minimal Drawdown) Groundwater Sampling Procedures.

The sampling frequency may be modified with the approval of the NYSDEC. The SMP will be modified to reflect changes in sampling plans approved by the NYSDEC.

Deliverables for the groundwater monitoring program are specified in Section 6.3.

4.4.2 HYDRAULIC MONITORING

In conjunction with the groundwater quality monitoring described above, all available monitoring wells shown on Figure 4.1 will be hydraulically monitored to assess groundwater flow conditions. Water level measurements will be collected on the same frequency as the groundwater quality monitoring program and groundwater flow diagrams will be updated to evaluate the flow conditions at the Site.

4.5 GROUNDWATER SAMPLING PROTOCOL

All monitoring well sampling activities will be recorded in a field book and the groundwater sampling form presented in Appendix D. Other observations (e.g., well integrity, etc.) will be noted on the well sampling form. The completed well sampling forms will be provided with the Periodic Review Report discussed in Section 6.3.

4.5.1 WELL GAUGING

Prior to groundwater sampling, each monitoring well listed in Table 4.1 will be gauged using a groundwater probe. The depth of each well and the depth to groundwater will be measured from the top of the well casing. If observed, the presence of NAPL will be noted. The available water volume and gauging data will be recorded on the groundwater sampling form.

During well gauging, the monitoring well will be inspected for structural damage to the well cap, seal, protective pad and visible portion of the well casing. The presence and condition of plugs and locks will also be noted. Well maintenance and/or repairs will be completed as necessary and to the extent practicable. Any structural damage or repairs will be noted on the Site inspection form provided in Appendix E.

4.5.2 GROUNDWATER PURGING AND SAMPLING

Monitoring wells will be purged and sampled using low-flow purging (LFP) techniques in accordance with the USEPA's *Low Stress (Low Flow) Purging and Sampling Procedure for the Collection of Ground Water Samples from Monitoring Wells*. LFP results in minimal drawdown during well purging, so less purging is required before formation water is removed, as well as less agitation and mobilization of sediments compared to traditional sampling techniques.

An adjustable rate, submersible pump (e.g., bladder, centrifugal, peristaltic), constructed of stainless steel or Teflon, will be used for LFP. The pump will be positioned in the well so that the pump intake is set at the mid-point of the well screen, or a minimum of 2 feet above the bottom of the well or accumulated sediment level.

During LFP, the pumping rate will be between 100 and 500 milliliters per minute (mL/min). Groundwater levels will be measured during purging to maintain a maximum 0.4 feet of drawdown.

Field parameters including pH, temperature, specific conductance, oxidation-reduction potential (ORP), dissolved oxygen (DO), and turbidity will be monitored and recorded at 5-minute intervals during LFP. The measurement of these field parameters will be used to evaluate if stabilization of the purged groundwater has occurred prior to the collection of groundwater samples. Groundwater stabilization will be achieved when three consecutive readings for each of the field parameters, taken at 5-minute intervals, are within the following limits:

- pH ± 0.1 pH units of the average value of the three readings
- temperature ± 3 percent of the average value of the three readings
- conductivity ± 3 percent of the average value of the three readings
- ORP ± 10 millivolts (mV) of the average value of the three readings

- DO ± 10 percent of the average value of the three readings
- turbidity ± 10 percent of the average value of the three readings, or a final value of less than 50 NTU

Field parameters will be measured using a flow-through cell apparatus. At the start of LFP, the purge water will be visually inspected for clarity prior to connecting to the flow-through cell. If the purge water is turbid, LFP will be continued until the purge water is visually less turbid prior to connecting to the flow-through cell. All meters will be calibrated daily in accordance with the manufacturer's instructions, and a calibration record maintained in the field book.

4.5.3 GROUNDWATER SAMPLING PARAMETERS

Groundwater samples will be collected at the specified frequencies from each well within the monitoring well network. Collected groundwater samples will be analyzed for the parameters listed in Table 4.2. Analytical methods, holding times, and quality assurance/quality control (QA/QC) requirements are presented in the Site-specific Quality Assurance Project Plan (QAPP) provided as Appendix F.

4.6 MONITORING WELL REPAIRS, REPLACEMENT AND DECOMMISSIONING

The monitoring well network will be inspected annually as part of the monitoring program. If biofouling or silt accumulation occurs in the monitoring wells, the wells will be physically agitated/surged and redeveloped. Additionally, monitoring wells will be properly decommissioned and replaced (as per the Monitoring Plan), if an event renders the wells unusable.

Repairs and/or replacement of wells in the monitoring well network will be performed based on assessments of structural integrity and overall performance.

The NYSDEC will be notified prior to any repair or decommissioning of monitoring wells for the purpose of replacement, and the repair or decommissioning and replacement process will be documented in the subsequent Periodic Review Report. Well decommissioning without replacement will be done only with the prior approval of NYSDEC. Well abandonment will be performed in accordance with NYSDEC's "Groundwater Monitoring Well Decommissioning Procedures." Monitoring wells that

are decommissioned because they have been rendered unusable will be reinstalled in the nearest available location, unless otherwise approved by the NYSDEC.

4.7 MONITORING QUALITY ASSURANCE/QUALITY CONTROL

All sampling and analyses will be performed in accordance with the requirements of the QAPP prepared for the Site (Appendix F).

4.8 MONITORING REPORTING REQUIREMENTS

Forms and any other information generated during regular monitoring events and inspections will be kept on file on-Site or at Buffalo China's Oneida, New York office. All forms, and other relevant reporting formats used during the monitoring/inspection events, will be subject to approval by NYSDEC and submitted at the time of the PRR, as specified in the Reporting Plan of this SMP.

All monitoring results will be reported to NYSDEC on a periodic basis in the PRR. The report will include, at a minimum:

- Date of sampling event
- Description of the activities performed
- Type of samples collected (e.g., groundwater)
- Sampling results in comparison to appropriate standards/criteria
- A figure illustrating sample type and sampling locations
- Copies of all laboratory data sheets and the required laboratory data deliverables required for all points sampled (to be submitted electronically in the NYSDEC-identified format)
- Any observations, conclusions, or recommendations
- A determination as to whether groundwater conditions have changed since the last reporting event

4.9 SITE-WIDE INSPECTION

Site-wide inspections will be performed on a regular schedule at a minimum of once a year. Site-wide inspections will also be performed after all severe weather conditions

that may affect ECs or monitoring devices. During these inspections, an inspection form will be completed. The inspection form is provided as Appendix E to this SMP.

The form will compile sufficient information to assess the following:

- Compliance with all ICs, including Site usage
- An evaluation of the condition and continued effectiveness of ECs
- General Site conditions at the time of the inspection
- The site management activities being conducted including, where appropriate, confirmatory sampling
- Confirmation that Site records are up to date

4.10 OFF-SITE SVI MITIGATION SYSTEM ANNUAL INSPECTION

The annual inspections of the off-Site SVI mitigation system(s) will include:

- A visual inspection of the complete System (e.g., vent fan, piping, warning device, labeling on systems, etc.)
- An inspection of all surfaces to which vacuum is applied
- Inspection of all components for condition and proper operation
- Identification, documentation, and repair any leaks in accordance with Sections 4.3.1(a) and 4.3.4(a) of the New York State Department Of Health (NYSDOH) Guidance (i.e.; with the system running, smoke tubes will used to check for leaks through concrete cracks, floor joints and at the suction points, and any leaks identified will be resealed until smoke is no longer observed flowing through the opening)
- Inspection of the exhaust or discharge point to verify that no air intakes have been located nearby
- Pressure field extension testing (to ensure that the system is maintaining a vacuum beneath the entire slab)
- Interview of an appropriate occupant seeking comments and observations regarding the operation of the System
- The inspections and any corrective measures implemented will be documented in the PRRs discussed in Section 6.3 of this SMP

5.0 OPERATION AND MAINTENANCE PLAN

The Site remedy does not rely on any mechanical systems, such as sub-slab depressurization systems or air sparge/soil vapor extraction systems to protect public health and the environment; however, the remedy does include a physical component, specifically, periodic injection of oxidant, reagent, and nutrients as part of the in situ chemical oxidation treatment and enhanced biodegradation polishing treatment. This Operation and Maintenance (O&M) Plan:

- Includes the steps necessary to allow individuals unfamiliar with the Site to complete the chemical oxidation and enhanced biodegradation treatments
- Includes an operation and maintenance contingency plan
- Will be updated periodically to reflect changes in Site conditions or the manner in which the chemical oxidation and enhanced biodegradation treatments are conducted

Information on passive ECs (i.e., soil cover system) is provided in Section 3.0. A copy of the O&M Plan, along with the complete SMP, will be kept at the Site. This O&M Plan is not be used as a stand-alone document, but as a component document of the SMP.

5.1 GROUNDWATER TREATMENT SYSTEM OPERATION AND MAINTENANCE

5.1.1 CHEMICAL OXIDATION

The groundwater treatment system consists of 10 horizontal injection piping galleries and 29 injection wells (22 overburden wells and 7 bedrock wells). A laboratory bench-scale treatability study was completed in 2011 to determine the most appropriate oxidant and quantities to be used.

The oxidant solution utilized for the in-situ groundwater treatment program is sodium hydroxide (NaOH)-activated sodium persulfate. The recommended dose of NaOH-activated sodium persulfate for soils is 34 g of sodium persulfate and 12 g of NaOH per kilogram of saturated matrix. Assuming mixing of the solution in a 1,500-gallon batch tank, the following approximate quantities will be used:

- 2,920 pounds of sodium persulfate dissolved into 830 gallons of water to yield 950 gallons of a 30 percent solution

- Addition of 375 gallon of catalyst (25 percent NaOH solution)

The above formulation yields 1325 gallons of catalyzed sodium persulfate solution for injection into the infiltration gallery and the overburden and bedrock wells. Based on the infiltration rates of the injection wells and piping galleries, four batches of oxidant solution are expected to be used for each event. Each piping gallery will receive 250 gallons of oxidant solution, while each injection well will receive 95 gallons of oxidant. The oxidant solution will be injected to the wells and galleries using a portable electric pump. The pump applies slight pressure to the wells to distribute the solution. The pumping rate will be monitored and adjusted as necessary to ensure no adverse effects, including basement flooding or other deleterious effects on neighboring properties. Precautions and health and safety information for mixing and injection of the ISCO compounds is provided in Appendix B of the HASP which is provided as Appendix B to this report.

Following injection of the required volume of oxidant solution to the wells and piping galleries, the injection equipment will be rinsed with potable water. The rinsate will be pumped into the wells and injection galleries. The addition of the rinsate will aid in the dispersion of the oxidant solution and the prevention of corrosion caused by the accumulation of oxidant in the well points and piping systems. A minimum of 10 gallons of potable water will be injected into each injection point at the conclusion of each treatment event.

Application of oxidant solution will occur quarterly for an anticipated total of six injection events. The degradation of Site contaminants will be monitored by periodic groundwater monitoring as described in Section 5.2. The frequency and number of treatment events may be adjusted as the program proceeds based on the results of the groundwater monitoring. Following the final injection event, the groundwater chemistry will be allowed to equilibrate for 6 months before commencing enhanced biodegradation as a polishing treatment to achieve complete destruction of VOC contamination.

5.1.2 ENHANCED BIODEGRADATION

The 2011 treatability study showed that enhanced biodegradation is a viable option for polishing treatment of chlorinated VOCs at the Site; however, the native microbial population does not appear sufficient to achieve complete degradation to ethene. Therefore, the addition of a microbial inoculum will be required. A "slow release"

carbon substrate, such as emulsified vegetable oil that contains a vitamin B-12 additive, will be used in the field in addition to the microbial inoculum.

Quantities of inoculums, carbon substrate, and nutrients will be determined upon completion of the chemical oxidation and will be based on contaminant concentrations at that time.

An initial application of inoculum, carbon substrate, and nutrients will occur at least 6 months after the final oxidant application. Nutrients will be added semi-annually after the initial application for three events. A final application of carbon substrate and nutrients will occur 2 years after the initial application. The degradation of site contaminants will be monitored by periodic groundwater monitoring as described in Section 5.2. The frequency and number of treatment events may be adjusted as the program proceeds based on the results of the groundwater monitoring.

5.2 GROUNDWATER TREATMENT SYSTEM PERFORMANCE MONITORING

Groundwater monitoring will be conducted during the in-situ treatment program to collect the data necessary to verify the remaining chemical mass and make any necessary adjustments to the volumes and proportions of oxidant, reagent, nutrients, and/or inoculums. The monitoring events will be scheduled 6 weeks prior to each injection event to ensure sufficient time to analyze the samples and interpret the data. This will result in quarterly sampling during the chemical oxidation phase and semi-annual sampling during and after the enhanced biodegradation phase.

All groundwater sampling will be conducted using low-flow methods in accordance with the USEPA's *Low Stress (Low Flow) Purging and Sampling Procedure for the Collection of Ground Water Samples from Monitoring Wells*. The monitoring wells will be sampled for the Site-specific contaminants of concern as listed in Table 4.2. Groundwater sampling will be completed in accordance with the protocol presented in Section 4.5 of this SMP.

5.3 PERFORMANCE MONITORING REPORTING REQUIREMENTS

Performance monitoring reports and any other information generated during regular operations at the Site will be kept on file at the Site. All reports, forms, and other relevant information generated will be available upon request to the NYSDEC and submitted as part of the Periodic Review Report, as specified in Section 6.3 of this SMP.

5.4 SYSTEM DECOMMISSIONING

When, as approved by NYSDEC, the on-Site in situ groundwater treatment program is deemed complete, the treatment distribution system will be decommissioned to eliminate potential pathways for the introduction or transport of contaminants into the groundwater. Decommissioning of injection wells will be consistent with the NYSDEC procedures for abandonment of monitoring wells by grouting in place. Piping gallery distribution systems will be decommissioned by filling the pipes with grout using a tremie method. All curb boxes and below grade vaults will be removed at the time of decommissioning and the areas will be restored to be consistent with the surrounding area and anticipated area use.

6.0 INSPECTIONS, REPORTING, AND CERTIFICATIONS

6.1 SITE INSPECTIONS

6.1.1 INSPECTION FREQUENCY

All inspections will be conducted at the frequency specified in the schedules provided in Section 4 Monitoring Plan of this SMP. At a minimum, a Site-wide inspection will be conducted annually.

If an emergency, such as a natural disaster or an unforeseen failure of any of the ECs occurs, an inspection of the Site will be conducted within 5 days of the event to verify the effectiveness of the ECs/ICs implemented at the Site by a qualified environmental professional as determined by NYSDEC.

6.1.2 INSPECTION FORMS, SAMPLING DATA, AND MAINTENANCE REPORTS

All inspections and monitoring events will be recorded on the general Site-wide inspection form contained in Appendix E. This form is subject to NYSDEC revision.

All applicable inspection forms and other records, including all media sampling data, generated for the Site during the reporting period will be provided in electronic format in the Periodic Review Report.

6.1.3 EVALUATION OF RECORDS AND REPORTING

The results of the inspection and Site monitoring data will be evaluated as part of the EC/IC certification to confirm that the:

- ECs/ICs are in place, are performing properly, and remain effective
- Monitoring Plan is being implemented
- Site is being maintained in an appropriate condition
- Site monitoring wells are being maintained
- Site management activities are being conducted
- Site remedy continues to be protective of public health and the environment and is performing as designed in the Remedial Design Report and FER

6.2 CERTIFICATION OF ENGINEERING AND INSTITUTIONAL CONTROLS

After the annual inspection, a Professional Engineer licensed to practice in New York State or the Site Owner will prepare the following certification, consistent with the then current NYS Site Management Periodic Review Report format:

For each institutional or engineering control identified for the site, I certify that all of the following statements are true:

- The inspection of the Site to confirm the effectiveness of the institutional and engineering controls required by the remedial program was performed under my direction*
- The institutional control and/or engineering control employed at this Site is unchanged from the date the control was put in place, or last approved by the Department*
- Nothing has occurred that would impair the ability of the control to protect the public health and environment*
- Nothing has occurred that would constitute a violation or failure to comply with any Site management plan for this control*
- Access to the Site will continue to be provided to the Department to evaluate the remedy, including access to evaluate the continued maintenance of this control*
- Use of the Site is compliant with the environmental easement*
- The engineering control systems are performing as designed and are effective*
- To the best of my knowledge and belief, the work and conclusions described in this certification are in accordance with the requirements of the Site remedial program*
- The information presented in this report is accurate and complete*

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, [name], of [business address], am certifying as [Owner or Owner's Designated Site Representative] for the Site.

The signed certification will be included in the PRR described below.

6.3 PERIODIC REVIEW REPORT (PRR)

A PRR will be submitted to the Department every year, beginning eighteen months after the Certificate of Completion is issued. In the event that the Site is subdivided into

separate parcels with different ownership, a single PRR will be prepared that addresses the Site described in the Environmental Easement. The report will be prepared in accordance with NYSDEC DER-10 and submitted within 45 days of the end of each certification period. Media sampling results will also be incorporated into the PRR. The report will include:

- Identification, assessment, and certification of all ECs/ICs required by the remedy for the Site.
- Results of the required annual site inspections.
- All applicable inspection forms and other records generated for the Site during the reporting period in electronic format.
- A summary of any discharge monitoring data and/or information generated during the reporting period with comments and conclusions.
- Data summary tables and graphical representations of contaminants of concern by media (groundwater, soil vapor), which include a listing of all compounds analyzed, along with the applicable standards, with all exceedances highlighted. These will include a presentation of past data as part of an evaluation of contaminant concentration trends.
- Results of all analyses and the required laboratory data deliverables for all samples collected during the reporting period will be submitted electronically in a NYSDEC-approved format.
- A site evaluation, which includes the following:
 - o The compliance of the remedy with the requirements of the Site-specific Decision Document.
 - o Any new conclusions or observations regarding Site contamination based on inspections or data generated by the Monitoring Plan for the media being monitored.
 - o Recommendations regarding any necessary changes to the remedy and/or Monitoring Plan.
 - o The overall performance and effectiveness of the remedy.

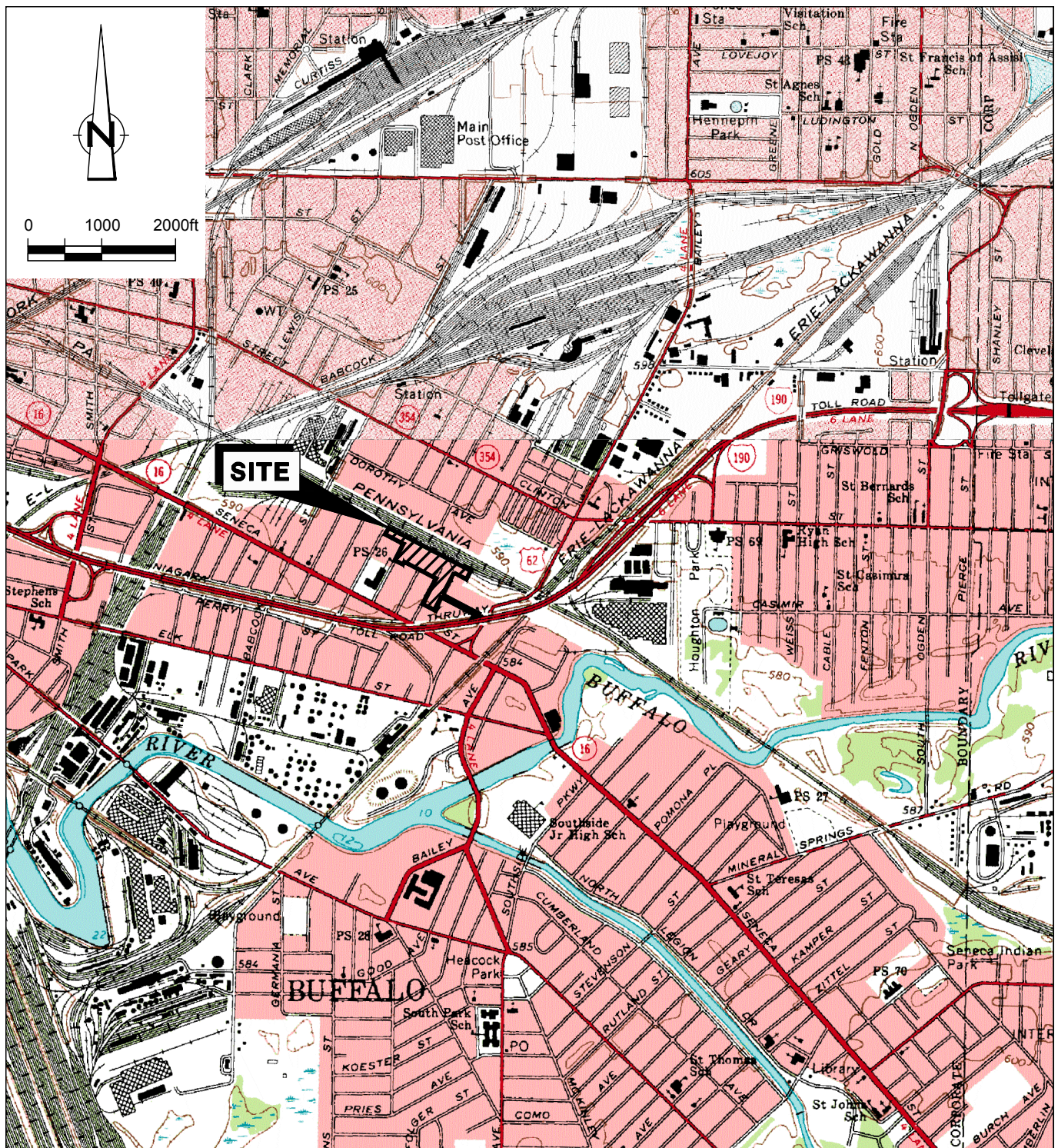
The PRR will be submitted, in hard-copy and electronic format, to the NYSDEC Region 9 Office.

6.4 CORRECTIVE MEASURES PLAN

If any component of the remedy is found to have failed, or if the periodic certification cannot be provided due to the failure of an EC or IC, a corrective measures plan will be submitted to the NYSDEC for approval. This plan will explain the failure and provide the details and schedule for performing work necessary to correct the failure. Unless an emergency condition exists, no work will be performed pursuant to the corrective measures plan until it is approved by the NYSDEC.

FIGURES

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FIGURE 3.2	HOSPITAL ROUTE MAP
FIGURE 4.1	MONITORING WELL LOCATIONS



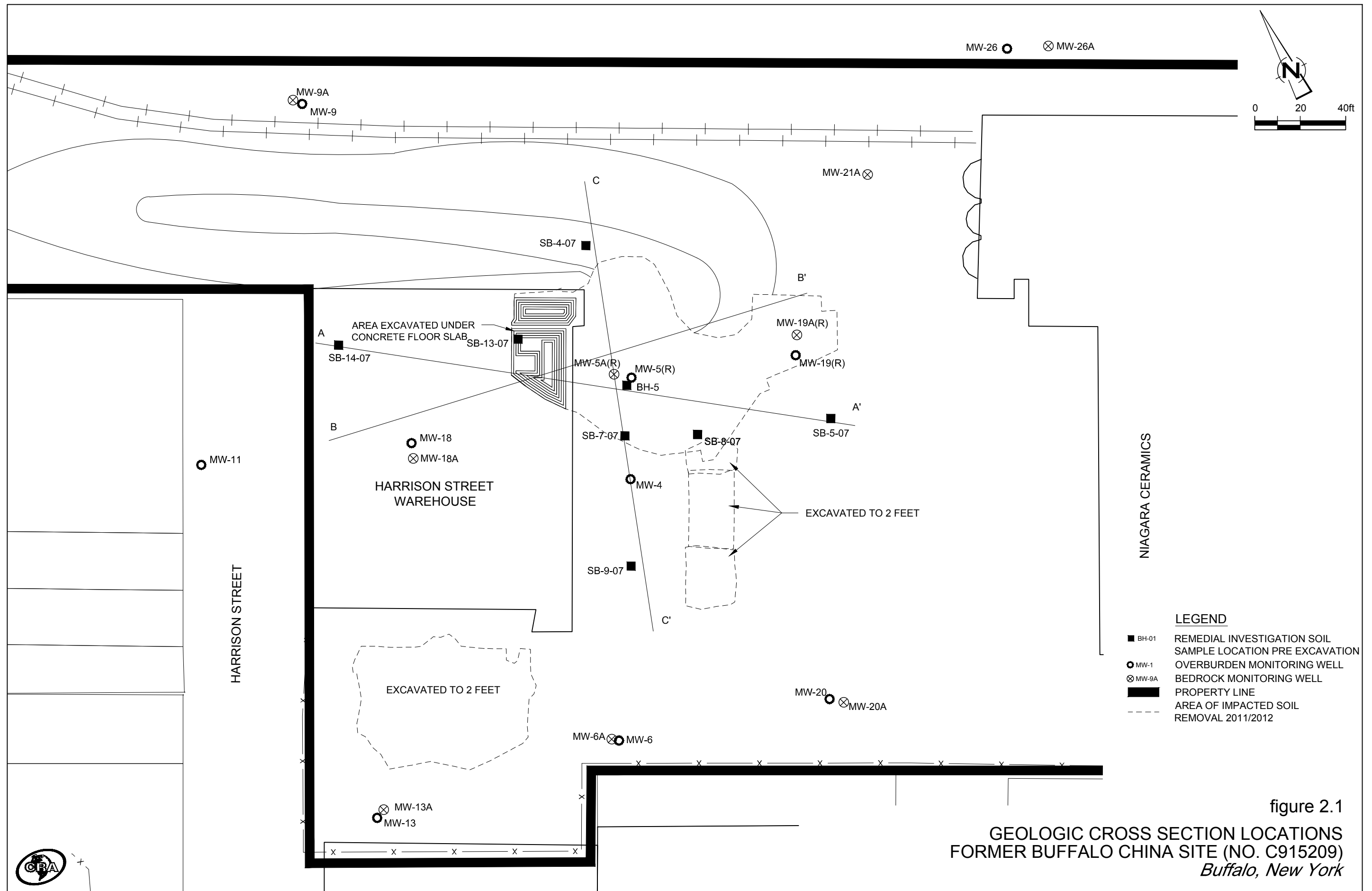
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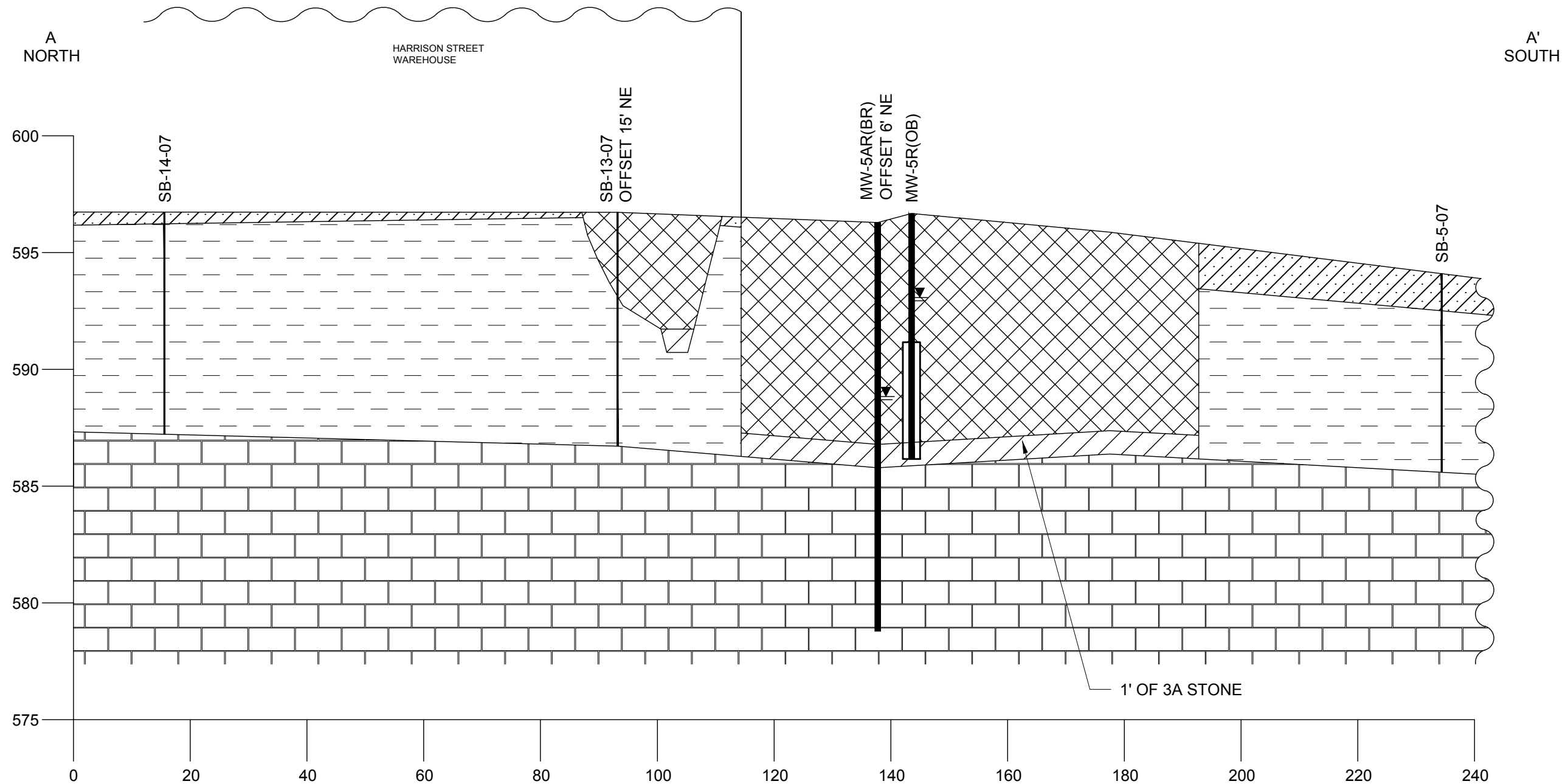
UNITED STATES GEOLOGIC SURVEY BUFFALO NE, BUFFALO SE QUADRANGLE, NY
 TOPOGRAPHIC, 7.5 MINUTES SERIES 1965
 SCALE: 1:24,000

figure 1.1

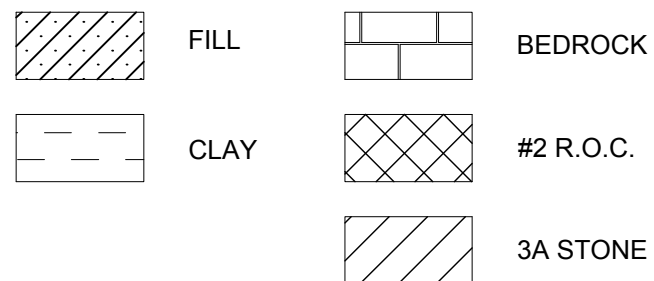
SITE LOCATION MAP
FORMER BUFFALO CHINA SITE (NO. C915209)
Buffalo, New York







LEGEND



PROFILE D
SCALE: HORIZ 1"=20'
VERT 1"=5'

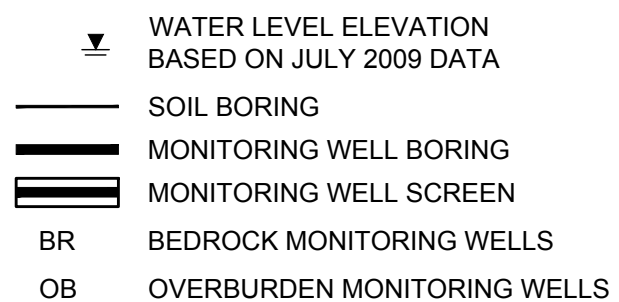
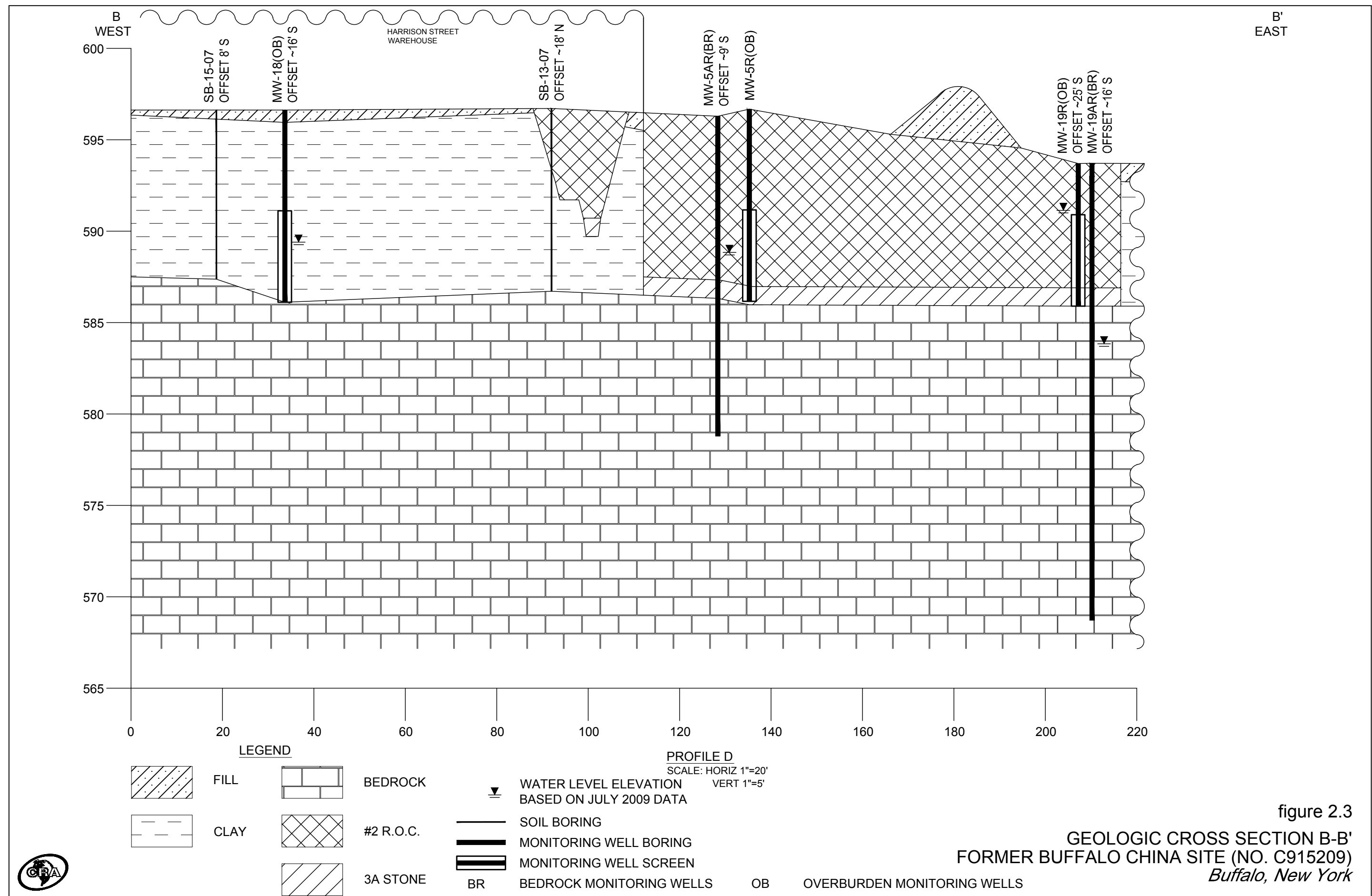


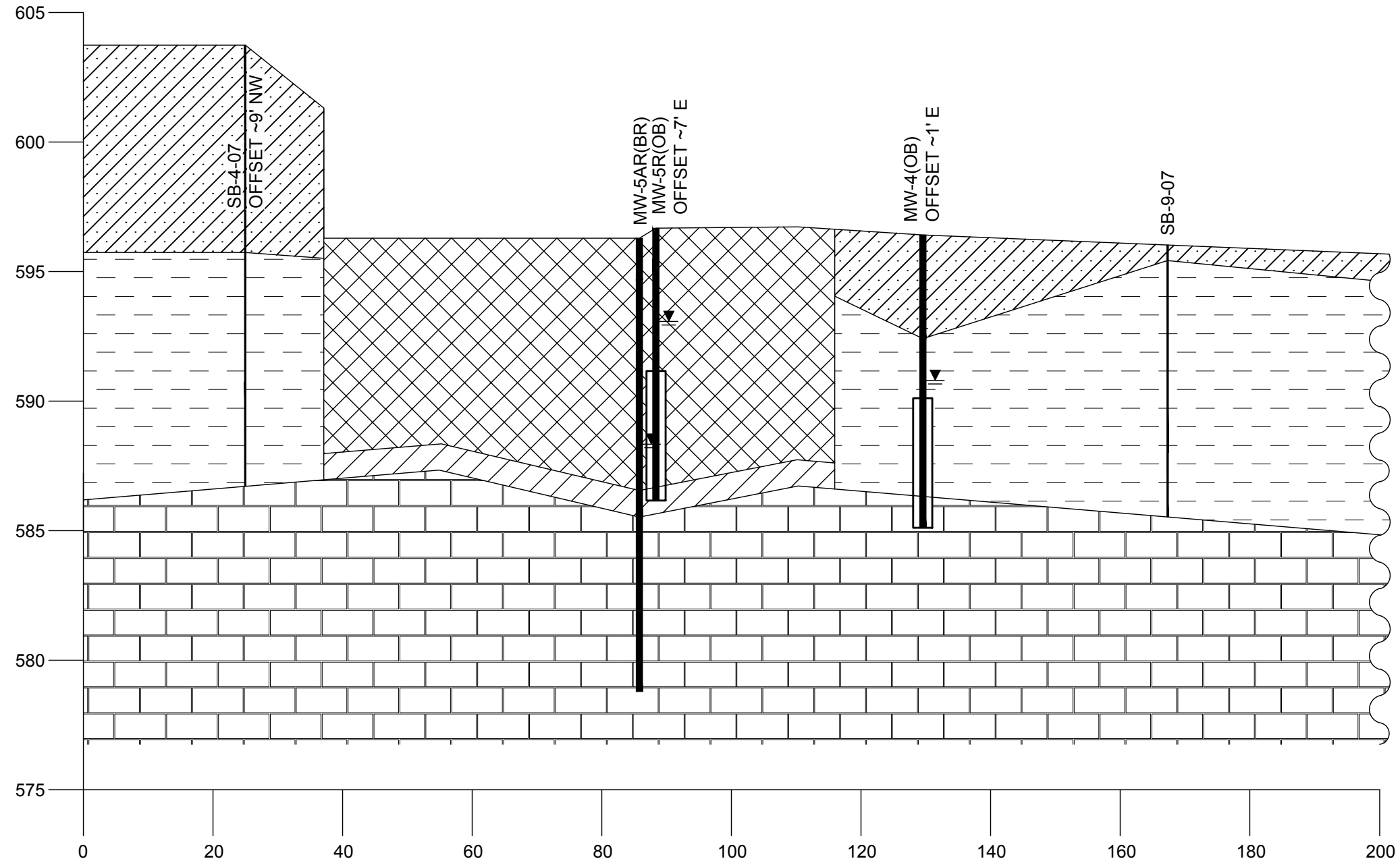
figure 2.2
GEOLOGIC CROSS SECTION A-A'
FORMER BUFFALO CHINA SITE (NO. C915209)
Buffalo, New York





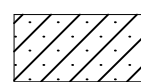
C
NORTH

C'
SOUTH

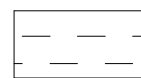


PROFILE D
SCALE: HORIZ 1"=20'
VERT 1"=5'

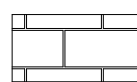
LEGEND



FILL



CLAY



BEDROCK



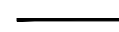
#2 R.O.C.



3A STONE



WATER LEVEL ELEVATION
BASED ON JULY 2009 DATA



SOIL BORING



MONITORING WELL BORING



MONITORING WELL SCREEN

BR

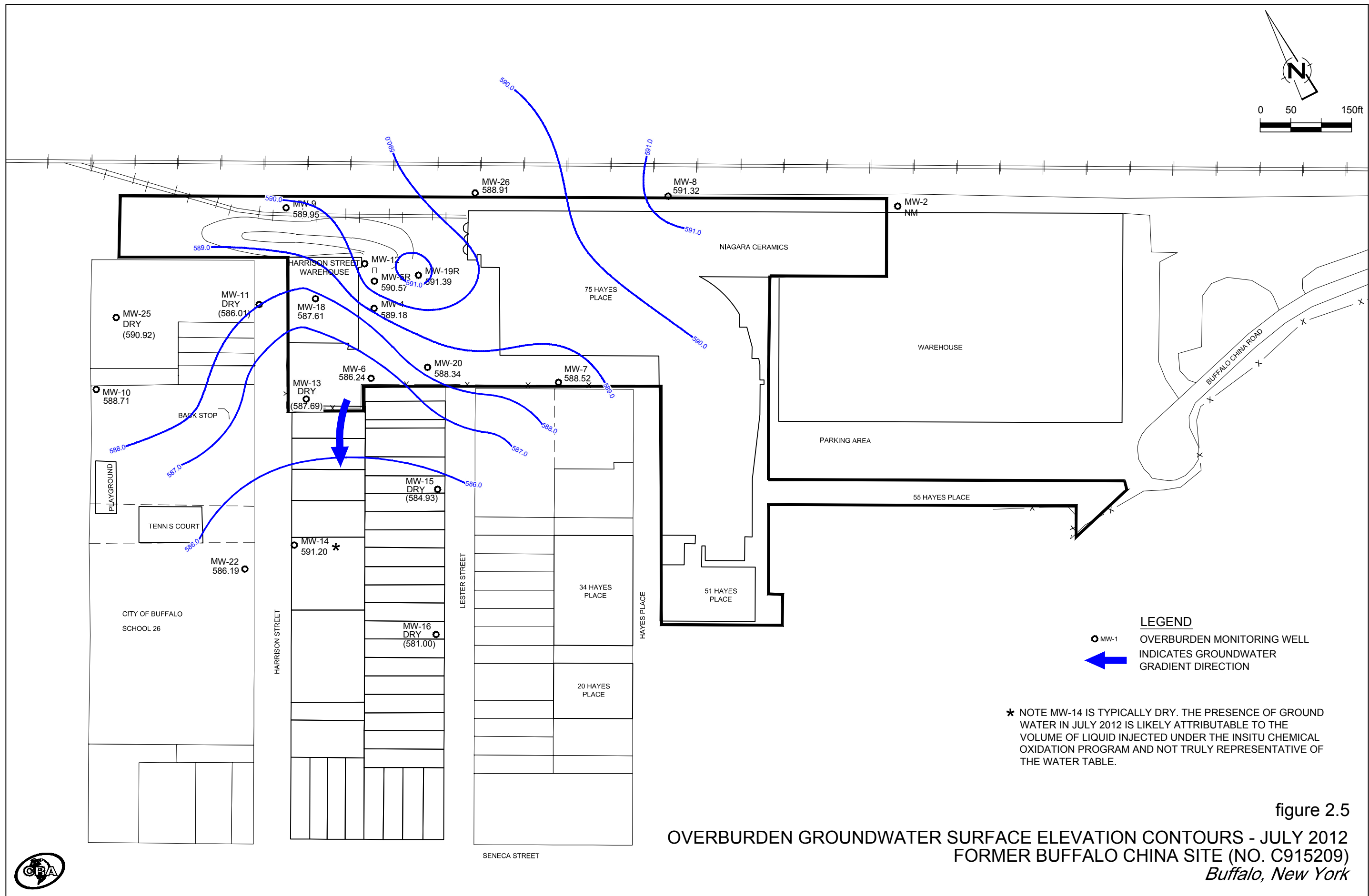
BEDROCK MONITORING WELLS

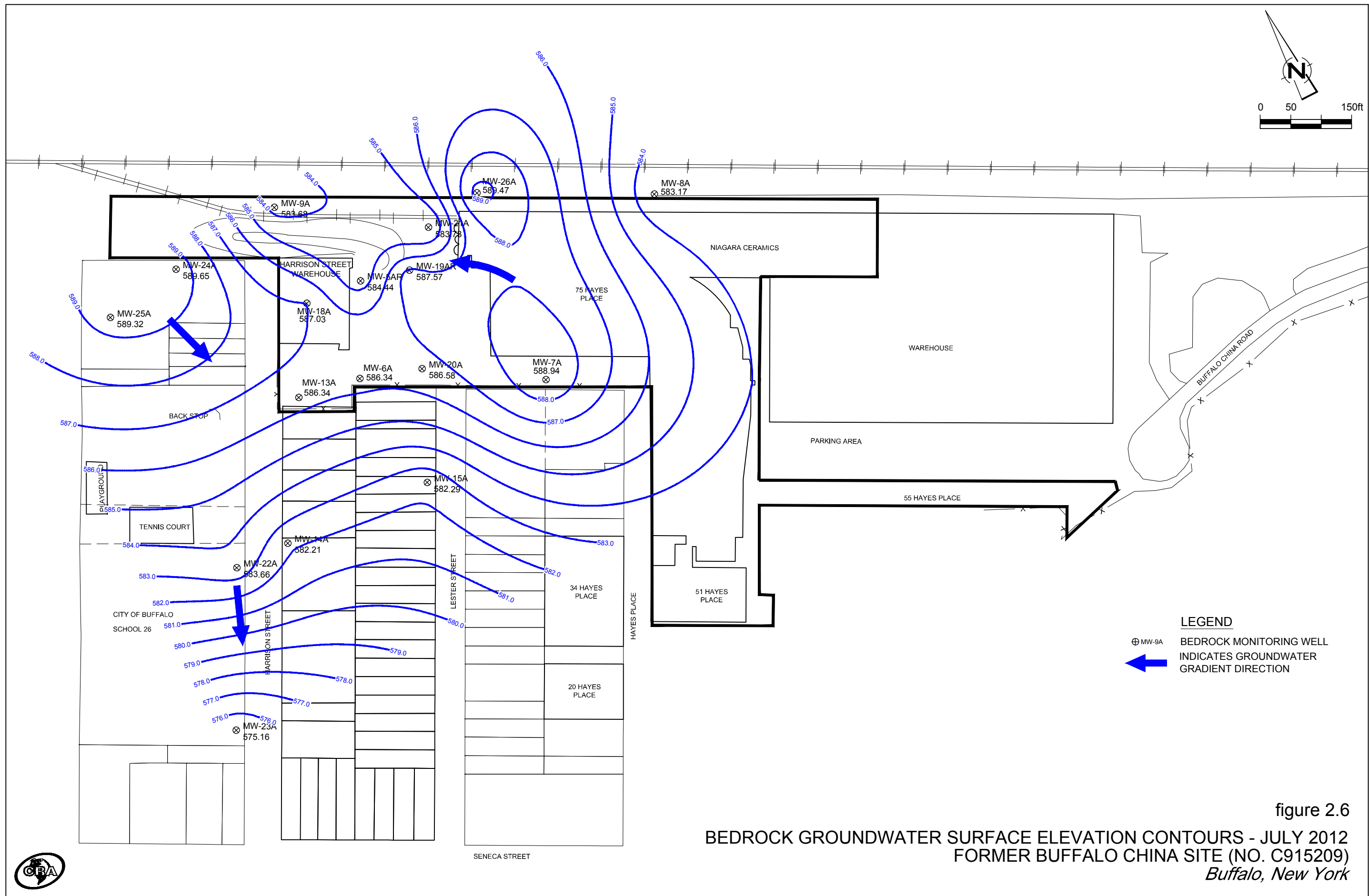
OB

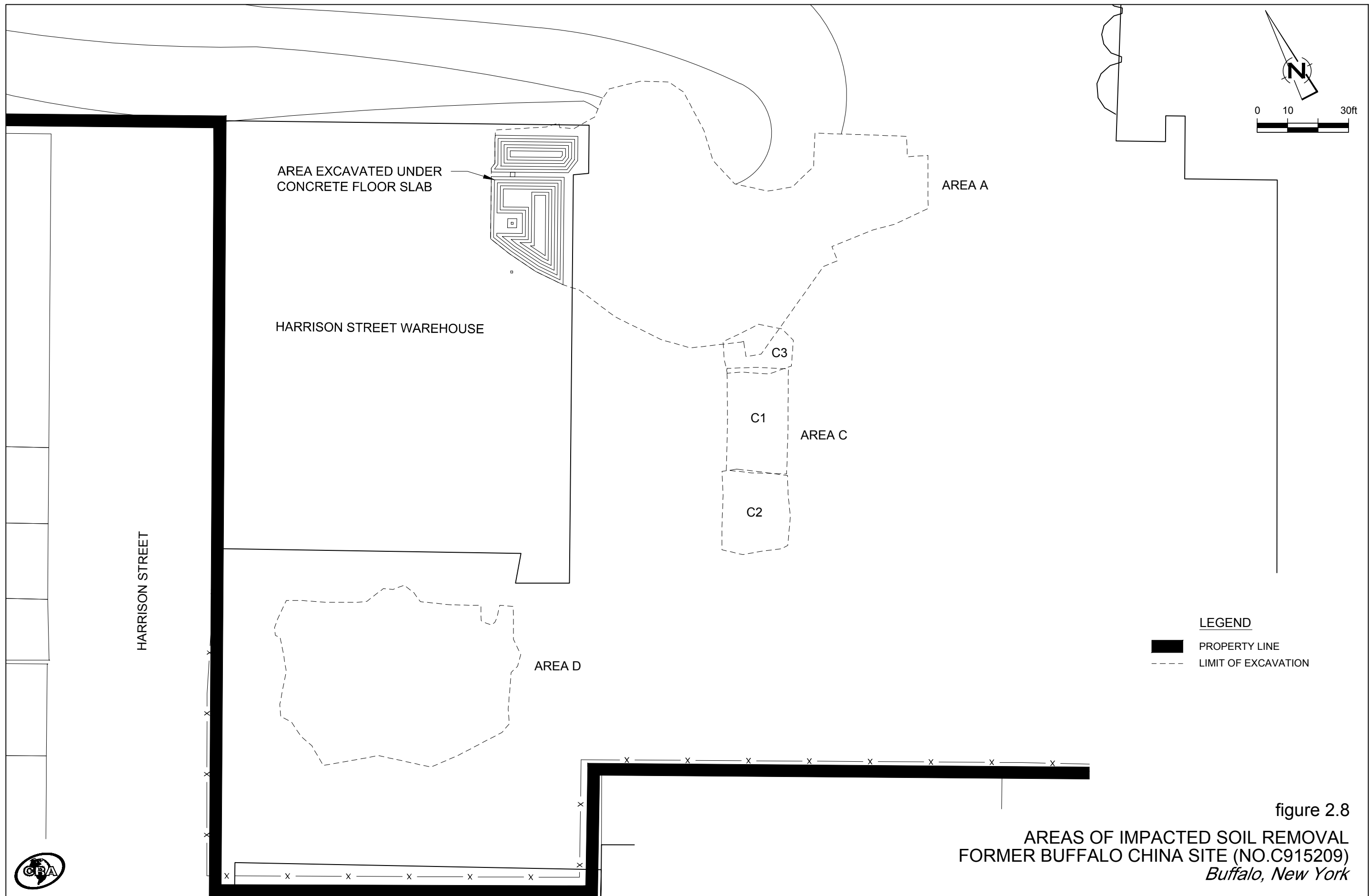
OVERBURDEN MONITORING WELLS

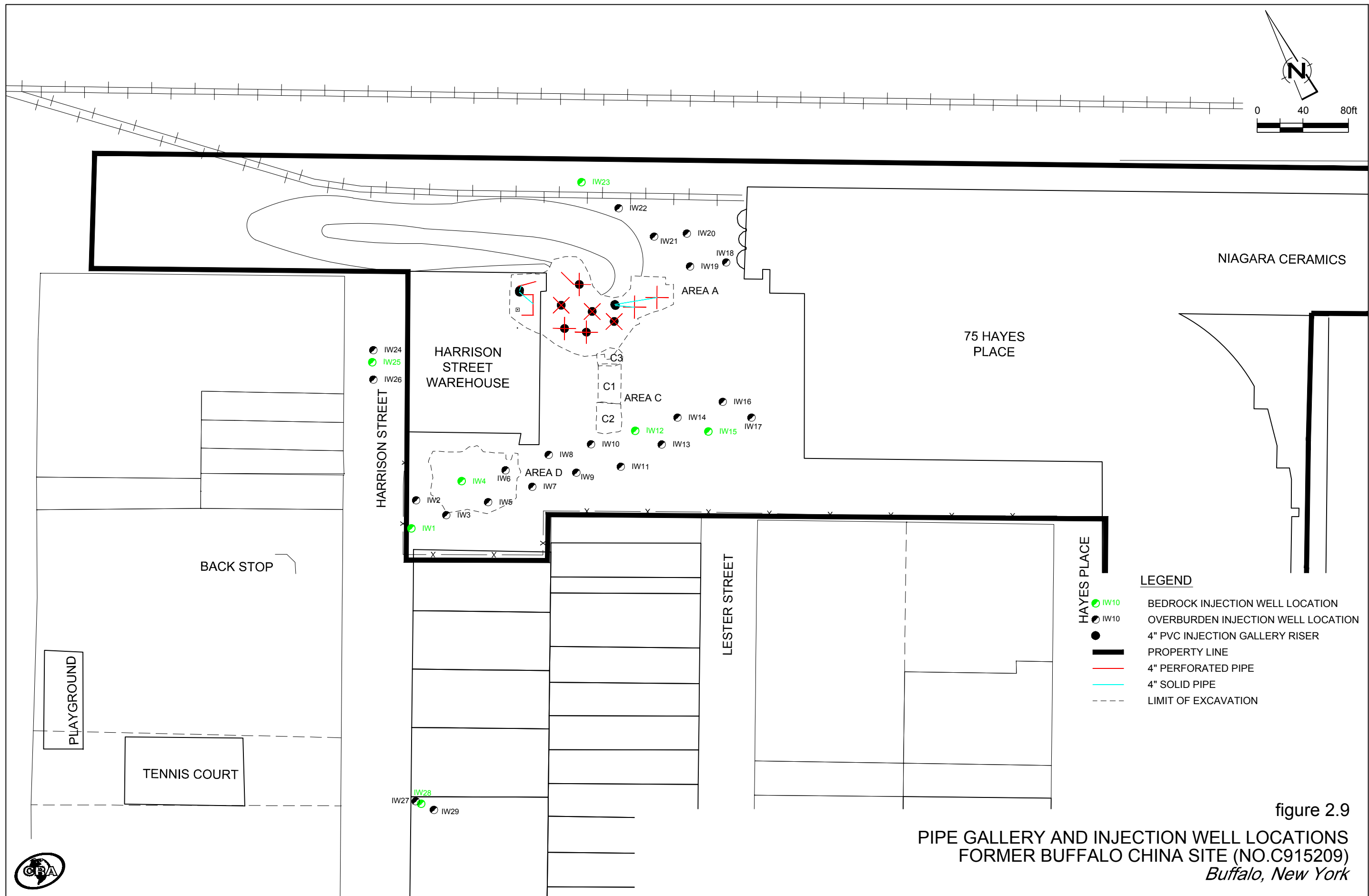
figure 2.4
GEOLOGIC CROSS SECTION C-C'
FORMER BUFFALO CHINA SITE (NO. C915209)
Buffalo, New York

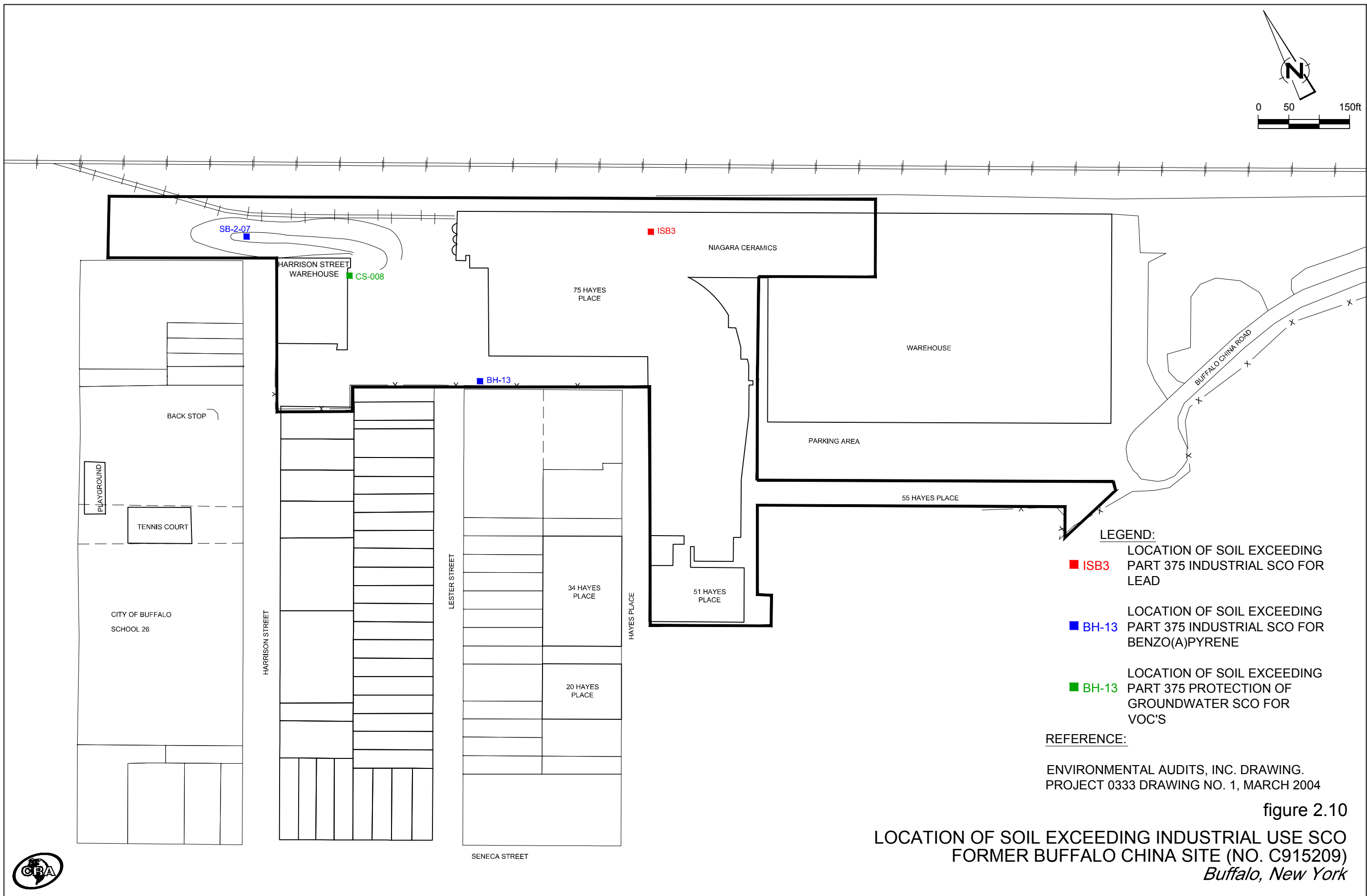


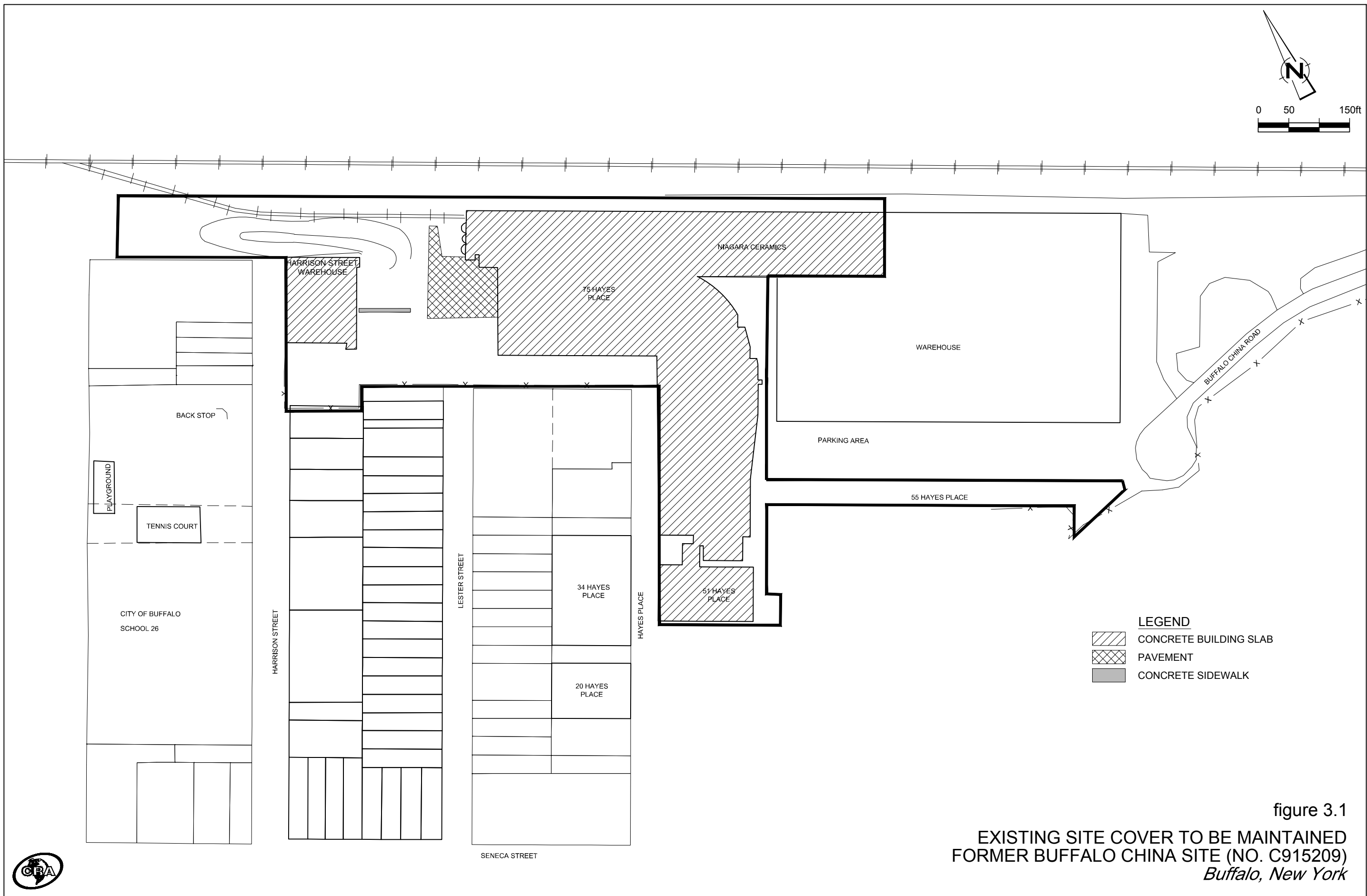


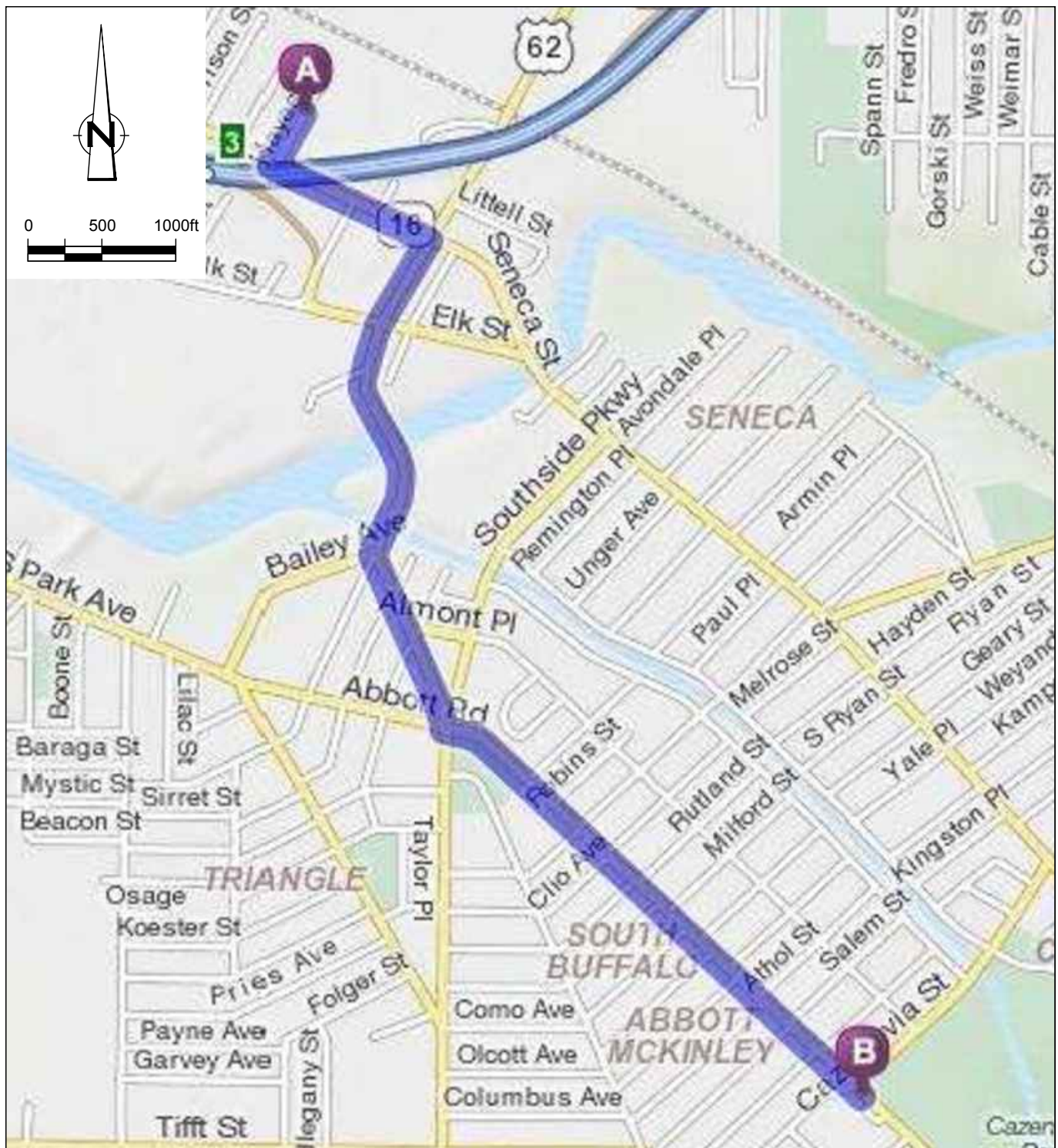












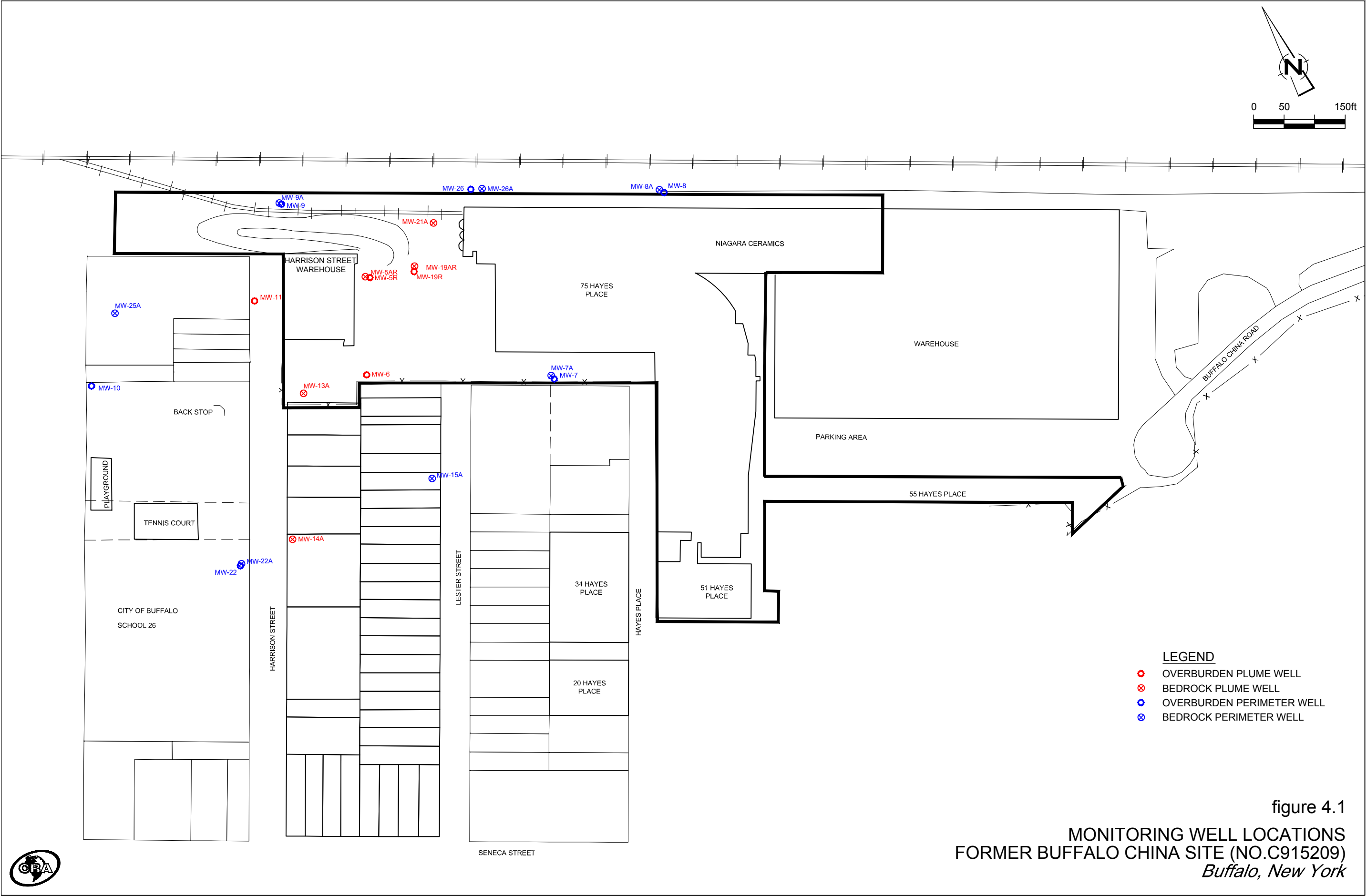
DIRECTIONS:

1. START OUT GOING SOUTHWEST ON HAYES PL TOWARD SENECA ST / NY-16.
2. TURN LEFT ONTO SENECA ST / NY-16.
3. TURN RIGHT ONTO BAILEY AVE / US-62.
4. TURN SLIGHT LEFT ONTO MCKINLEY PKWY.
5. MCKINLEY PKWY BECOMES SOUTHSIDE PKWY.
6. TURN LEFT ONTO ABBOTT RD / CR-4.
7. TURN SLIGHT RIGHT TO STAY ON ABBOTT RD / CR-4.
8. 565 ABBOTT RD IS ON THE RIGHT.

figure 3.2

HOSPITAL ROUTE
ALTERNATIVES ANALYSIS REPORT
FORMER BUFFALO CHINA SITE (NO. C915209)
Buffalo, New York





TABLES

TABLE 2.1	SUMMARY OF SOIL ANALYTICAL RESULTS EXCEEDING INDUSTRIAL USE CRITERIA
TABLE 2.2	SUMMARY OF GROUNDWATER ANALYTICAL RESULTS EXCEEDING CRITERIA
TABLE 4.1	GROUNDWATER MONITORING NETWORK
TABLE 4.2	GROUNDWATER MONITORING PLAN

TABLE 2.1

SUMMARY OF SOIL ANALYTICAL RESULTS EXCEEDING INDUSTRIAL USE CRITERIA
 SITE MANAGEMENT PLAN
 FORMER BUFFALO CHINA SITE (NO. C915209)
 BUFFALO, NEW YORK

<i>Location ID:</i>			<i>BH-5 S2</i>	<i>BH-7 S2</i>	<i>BH-9 S1</i>	<i>BH-13 S2</i>	<i>MW-17</i>
<i>Sample Name:</i>			<i>S-37191-050206-PK-021</i>	<i>S-37191-050206-PK-014</i>	<i>S-37191-050206-PK-018</i>	<i>S-37191-050306-PK-036</i>	<i>SB-37191-050908-JP-002</i>
<i>Sample Date:</i>			<i>5/2/2006</i>	<i>5/2/2006</i>	<i>5/2/2006</i>	<i>5/3/2006</i>	<i>5/9/2008</i>
<i>Depth:</i>			<i>1.6-2.5 ft BGS</i>	<i>1.4-1.8 ft BGS</i>	<i>0.5-1 ft BGS</i>	<i>1.5-2.5 ft BGS</i>	<i>0-2 ft BGS</i>
<i>On/Off - Site:</i>			<i>On-Site</i>	<i>On-Site</i>	<i>On-Site</i>	<i>On-Site</i>	<i>On-Site</i>
		<i>6 NYCRR Part 375-6.8(b): Restricted Use Soil Cleanup Objectives - Industrial</i>					
<i>Parameters</i>	<i>Units</i>						
<i>Volatile Organic Compounds</i>							
Trichloroethene	mg/kg	400	670	--	--	0.0014 J	0.0058 U
<i>Semivolatile Organic Compounds</i>							
Benzo(a)anthracene	mg/kg	11	0.26 J	--	--	1.3	3.7
Benzo(a)pyrene	mg/kg	1.1	0.11 J	--	--	1.3	2.8
Benzo(b)fluoranthene	mg/kg	11	0.24 J	--	--	2.7	5
Dibenz(a,h)anthracene	mg/kg	1.1	0.38 U	--	--	0.5 J	0.66
<i>Metals</i>							
Arsenic	mg/kg	16	--	--	--	--	5.2
Lead	mg/kg	3900	16.7	4980	9250	53.2	87.3 J

Notes:

1.0 - Exceeds criteria

U - Not present at the associated value

J - Estimated concentration

mg/kg - Milligrams per kilogram

TABLE 2.1

SUMMARY OF SOIL ANALYTICAL RESULTS EXCEEDING INDUSTRIAL USE CRITERIA
 SITE MANAGEMENT PLAN
 FORMER BUFFALO CHINA SITE (NO. C915209)
 BUFFALO, NEW YORK

<i>Location ID:</i>			<i>SB-2-07</i>	<i>SB-2-07</i>	<i>SB-7-07</i>	<i>SB-8-07</i>
<i>Sample Name:</i>			<i>SO-37191-072707-RN-SB-2</i>	<i>SO-37191-072707-RN-SB-20</i>	<i>SO-37191-072507-RN-SB-7</i>	<i>SO-37191-072507-RN-SB-8</i>
<i>Sample Date:</i>			<i>7/27/2007</i>	<i>7/27/2007</i>	<i>7/25/2007</i>	<i>7/25/2007</i>
<i>Depth:</i>			<i>6.5-8 ft BGS</i>	<i>6.5-8 ft BGS</i>	<i>3-6 ft BGS</i>	<i>3.5-8 ft BGS</i>
<i>On/Off - Site:</i>			<i>On-Site</i>	<i>On-Site</i>	<i>On-Site</i>	<i>On-Site</i>
				<i>Duplicate</i>		
		<i>6 NYCRR Part</i>				
		<i>375-6.8(b):</i>				
		<i>Restricted Use</i>				
		<i>Soil Cleanup</i>				
		<i>Objectives -</i>				
		<i>Industrial</i>				
<i>Parameters</i>	<i>Units</i>					
<i>Volatile Organic Compounds</i>						
Trichloroethene	mg/kg	400	0.0019 J	0.0067 U	6.8	0.058
<i>Semivolatile Organic Compounds</i>						
Benzo(a)anthracene	mg/kg	11	1.5	3	15	0.82
Benzo(a)pyrene	mg/kg	1.1	1.4	2.7	14	0.69
Benzo(b)fluoranthene	mg/kg	11	1.6	3.3	17	0.91
Dibenz(a,h)anthracene	mg/kg	1.1	0.23	0.46	2.4	0.14
<i>Metals</i>						
Arsenic	mg/kg	16	--	--	--	21.4
Lead	mg/kg	3900	229	567	46.0	2230

Notes:

1.0 - Exceeds criteria

U - Not present at the associated value

J - Estimated concentration

mg/kg - Milligrams per kilogram

TABLE 2.2

**SUMMARY OF GROUNDWATER ANALYTICAL RESULTS EXCEEDING CRITERIA
SITE MANAGEMENT PLAN
FORMER BUFFALO CHINA SITE (NO. C915209)
BUFFALO, NEW YORK**

Location ID:	MW-5R	MW-5AR	MW-6	MW-7	MW-7A	MW-8	MW-8A
Sample Name:	WG-37191-061312-001	WG-37191-061312-002	WG-37191-061412-014	WG-37191-061412-012	WG-37191-061412-013	WG-37191-061412-010	WG-37191-061412-011
Sample Date:	6/13/2012	6/13/2012	6/14/2012	6/14/2012	6/14/2012	6/14/2012	6/14/2012

New York State Water											
Parameters	Units	Quality									
		Standards	Guidance Values								
Volatile Organic Compounds											
1,1,2-Trichloroethane	ug/L	1	NC	1.6	2.8	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
1,1-Dichloroethene	ug/L	5	NC	2.5	34	0.63 J	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Acetone	ug/L	NC	50	15	10 U	10 U	10 U	10 U	10 U	4.2 J	
Benzene	ug/L	1	NC	0.43 J	0.44 J	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
cis-1,2-Dichloroethene	ug/L	5	NC	4700	16000	170	1.0 U	2.4	1.0 U	1.0 U	1.0 U
Tetrachloroethene	ug/L	5	NC	6.8	79	0.72 J	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Toluene	ug/L	5	NC	3.8	8.1	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
trans-1,2-Dichloroethene	ug/L	5	NC	130	110 J	1.9	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Trichloroethene	ug/L	5	NC	3700	21000	90	1.0 U	1.0 U	1.2	1.0 U	1.0 U
Vinyl chloride	ug/L	2	NC	24	270 J	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U

Notes:

1.0 - Exceeds criteria

U - Not present at the associated value

J - Estimated concentration

NC - No criteria

µg/L - Micrograms per liter

TABLE 2.2

**SUMMARY OF GROUNDWATER ANALYTICAL RESULTS EXCEEDING CRITERIA
SITE MANAGEMENT PLAN
FORMER BUFFALO CHINA SITE (NO. C915209)
BUFFALO, NEW YORK**

<i>Location ID:</i>	MW-9	MW-9A	MW-10	MW-11	MW-11	MW-13A	MW-14A	MW-15A
<i>Sample Name:</i>	WG-37191-061412-006	WG-37191-061412-007	WG-37191-061512-021	WG-37191-061512-023	WG-37191-061512-024	WG-37191-061412-015	WG-37191-061512-018	WG-37191-061512-016
<i>Sample Date:</i>	6/14/2012	6/14/2012	6/15/2012	6/15/2012	6/15/2012 <i>Duplicate</i>	6/14/2012	6/15/2012	6/15/2012

Parameters *Units*

Volatile Organic Compounds

1,1,2-Trichloroethane	ug/L	1.0 U	1.0 U	4.0 U	1.0 U	4.0 U	1.0 U	1.0 U	1.0 U
1,1-Dichloroethene	ug/L	1.0 U	1.0 U	4.0 U	0.67 J	4.0 U	3.3	1.0 U	1.0 U
Acetone	ug/L	10 U	10 U	40 U	10 U	40 U	10 U	3.5 J	10 U
Benzene	ug/L	1.0 U	1.0 U	4.0 U	1.0 U	4.0 U	1.0 U	1.0 U	1.0 U
cis-1,2-Dichloroethene	ug/L	1.0 U	1.0 U	4.0 U	440	410	1000	39	1.0 U
Tetrachloroethene	ug/L	1.0 U	1.0 U	4.0 U	1.0 U	4.0 U	5.4	1.0 U	1.0 U
Toluene	ug/L	1.0 U	1.0 U	4.0 U	1.0 U	4.0 U	1.0 U	1.0 U	1.0 U
trans-1,2-Dichloroethene	ug/L	1.0 U	1.0 U	4.0 U	1.7	4.0 U	18	2.5	1.0 U
Trichloroethene	ug/L	1.0 U	1.0 U	4.0 U	160	160	1300	11	0.73 J
Vinyl chloride	ug/L	1.0 U	1.0 U	4.0 U	1.0 U	4.0 U	27	15	1.0 U

Notes:

1.0 - Exceeds criteria

U - *Not present at the associated location*

J - Estimated concentration

NC - No criteria

µg/L - Micrograms per liter

TABLE 2.2

**SUMMARY OF GROUNDWATER ANALYTICAL RESULTS EXCEEDING CRITERIA
SITE MANAGEMENT PLAN
FORMER BUFFALO CHINA SITE (NO. C915209)
BUFFALO, NEW YORK**

<i>Location ID:</i>	MW-15A	MW-19R	MW-19AR	MW-21A	MW-22	MW-22A	MW-25A	MW-26
<i>Sample Name:</i>	WG-37191-061512-017	WG-37191-061312-003	WG-37191-061312-004	WG-37191-061312-005	WG-37191-061512-019	WG-37191-061512-020	WG-37191-061512-022	WG-37191-061412-008
<i>Sample Date:</i>	6/15/2012	6/13/2012	6/13/2012	6/13/2012	6/15/2012	6/15/2012	6/15/2012	6/14/2012
	Duplicate							

Parameters *Units*

Volatile Organic Compounds

1,1,2-Trichloroethane	ug/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	4.0 U	2.0 U
1,1-Dichloroethene	ug/L	1.0 U	1.0 U	1.0 U	5.5	1.0 U	1.0 U	4.0 U	2.0 U
Acetone	ug/L	10 U	150	110	10 U	10 U	10 U	40 U	7.1 J
Benzene	ug/L	1.0 U	3.3	0.45 J	1.0 U	1.0 U	0.58 J	4.0 U	2.0 U
cis-1,2-Dichloroethene	ug/L	1.0 U	300	170	1700	1.0 U	1.0 U	4.0 U	2.0 U
Tetrachloroethene	ug/L	1.0 U	1.0 U	11	1.0 U	1.0 U	1.0 U	4.0 U	2.0 U
Toluene	ug/L	1.0 U	4.2	0.59 J	1.0 U	1.0 U	1.0 U	4.0 U	2.0 U
trans-1,2-Dichloroethene	ug/L	1.0 U	34	16	96	1.0 U	1.0 U	4.0 U	2.0 U
Trichloroethene	ug/L	0.83 J	79	1100	2600	1.0 U	1.0 U	4.0 U	2.0 U
Vinyl chloride	ug/L	1.0 U	1.0 U	1.0 U	20	1.0 U	1.0 U	4.0 U	2.0 U

Notes:

1.0 - Exceeds criteria

U - *Not present at the associated location*

J - Estimated concentration

NC - No criteria

µg/L - Micrograms per liter

**SUMMARY OF GROUNDWATER ANALYTICAL RESULTS EXCEEDING CRITERIA
SITE MANAGEMENT PLAN
FORMER BUFFALO CHINA SITE (NO. C915209)
BUFFALO, NEW YORK**

Location ID: MW-26A
Sample Name: WG-37191-061412-009
Sample Date: 6/14/2012

Parameters Units

Volatile Organic Compounds

1,1,2-Trichloroethane	ug/L	1.0 U
1,1-Dichloroethene	ug/L	1.0 U
Acetone	ug/L	3.4 J
Benzene	ug/L	1.0 U
cis-1,2-Dichloroethene	ug/L	1.0 U
Tetrachloroethene	ug/L	1.0 U
Toluene	ug/L	0.61 J
trans-1,2-Dichloroethene	ug/L	1.0 U
Trichloroethene	ug/L	1.0 U
Vinyl chloride	ug/L	1.0 U

Notes:

1.0 - Exceeds criteria

U - Not present at the associated location

J - Estimated concentration

NC - No criteria

ug/L - Micrograms per liter

**GROUNDWATER MONITORING NETWORK
SITE MANAGEMENT PLAN
FORMER BUFFALO CHINA SITE (NO. C915209)
BUFFALO, NEW YORK**

OVERBURDEN MONITORING WELLS

Plume Wells

MW-5R
MW-6
MW-11
MW-19R

Perimeter Wells

MW-7
MW-8
MW-9
MW-10
MW-22
MW-26

BEDROCK MONITORING WELLS

Plume Wells

MW-5AR
MW-13A
MW-14A
MW-19AR
MW-21A

Perimeter Wells

MW-7A
MW-8A
MW-9A
MW-15A
MW-22A
MW-25A
MW-26A

**GROUNDWATER MONITORING PLAN
FORMER BUFFALO CHINA SITE (C915209)
SITE MANAGEMENT PLAN
BUFFALO, NEW YORK**

Parameters	New York State Water Quality		Plume Wells	Perimeter Wells
	Standards	Guidance Values		
Monitoring During ISCO Treatment				
VOCs			X	X
- 1,1-dichloroethene	5 µg/L	NC		
- 1,2-dichloroethane	0.6 µg/L	NC		
- Acetone	NC	50 µg/L		
- cis-1,2-Dichloroethene	5 µg/L	NC		
- Methylene chloride	5 µg/L	NC		
- Tetrachloroethene	5 µg/L	NC		
- Toluene	5 µg/L	NC		
- trans-1,2-Dichloroethene	5 µg/L	NC		
- Trichloroethene	5 µg/L	NC		
- Vinyl chloride	2 µg/L	NC		
Chloride	250,000 µg/L	NC	X	
Residual Sodium Persulfate	NC	NC	X	
SVOCs			X	
- Benzo(a)anthracene	NC	0.002 µg/L		
- Benzo(b)anthracene	NC	0.002 µg/L		
- Benzo(k)fluoranthene	NC	0.002 µg/L		
- Chrysene	NC	0.002 µg/L		
- Indeno(1,2,3-cd)pyrene	NC	0.002 µg/L		
Dissolved Lead	25 µg/L	NC	X	
Field Parameters (pH, conductivity, turbidity, redox, dissolved oxygen, temperature)	NC	NC	X	X
Monitoring During ISEB Treatment				
VOCs			X	X
- 1,1-dichloroethene	5 µg/L	NC		
- 1,2-dichloroethane	0.6 µg/L	NC		
- Acetone	NC	50 µg/L		
- cis-1,2-Dichloroethene	5 µg/L	NC		
- Methylene chloride	5 µg/L	NC		
- Tetrachloroethene	5 µg/L	NC		
- Toluene	5 µg/L	NC		
- trans-1,2-Dichloroethene	5 µg/L	NC		
- Trichloroethene	5 µg/L	NC		
- Vinyl chloride	2 µg/L	NC		
Chloride	250,000 µg/L	NC	X	
Residual Sodium Persulfate	NC	NC	X	
SVOCs			X	
- Benzo(a)anthracene	NC	0.002 µg/L		
- Benzo(b)anthracene	NC	0.002 µg/L		
- Benzo(k)fluoranthene	NC	0.002 µg/L		
- Chrysene	NC	0.002 µg/L		
- Indeno(1,2,3-cd)pyrene	NC	0.002 µg/L		
Dissolved Lead	25 µg/L	NC	X	
Field Parameters (pH, conductivity, turbidity, redox, dissolved oxygen, temperature)	NC	NC	X	X

TABLE 4.2

**GROUNDWATER MONITORING PLAN
FORMER BUFFALO CHINA SITE (C915209)
SITE MANAGEMENT PLAN
BUFFALO, NEW YORK**

Parameters	New York State Water Quality		Plume Wells	Perimeter Wells
	Standards	Guidance Values		
Semi-Annual Monitoring Post Treatment				
VOCs			X	X
- 1,1-dichloroethene	5 µg/L	NC		
- 1,2-dichloroethane	0.6 µg/L	NC		
- Acetone	NC	50 µg/L		
- cis-1,2-Dichloroethene	5 µg/L	NC		
- Methylene chloride	5 µg/L	NC		
- Tetrachloroethene	5 µg/L	NC		
- Toluene	5 µg/L	NC		
- trans-1,2-Dichloroethene	5 µg/L	NC		
- Trichloroethene	5 µg/L	NC		
- Vinyl chloride	2 µg/L	NC		
SVOCs			X	
- Benzo(a)anthracene	NC	0.002 µg/L		
- Benzo(b)anthracene	NC	0.002 µg/L		
- Benzo(k)fluoranthene	NC	0.002 µg/L		
- Chrysene	NC	0.002 µg/L		
- Indeno(1,2,3-cd)pyrene	NC	0.002 µg/L		
Dissolved Lead	25 µg/L	NC	X	
Field Parameters (pH, conductivity, turbidity, redox, dissolved oxygen, temperature)	NC	NC	X	X

Notes:

NC - No criteria

µg/L - micrograms per liter (parts per billion)

APPENDIX A

POST-REMEDIATION EXCAVATION WORK PLAN

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TABLE A-1	IMPORTED SOIL QUALITY STANDARDS

1.0 INTRODUCTION

This Post Remedial Action Excavation Work Plan (EWP) presents the procedures to be followed during any intrusive subsurface activities at the Site and in the event that an activity results in excavation beneath the Site cover following the implementation of the Remedial Action for the Former Buffalo China Site (Site) located in Buffalo, New York.

2.0 NOTIFICATION

At least 15 days prior to the start of any subsurface activity, the Site owner or their representative will notify the New York State Department of Environmental Conservation (NYSDEC). Currently, this notification will be made to:

Mr. Jaspal Walia
NYSDEC Region 9
270 Michigan Avenue
Buffalo, New York 14203
(716) 851-7220

This notification will include:

- A detailed description of the work to be performed, including the location and areal extent, plans for Site re-grading, intrusive elements or utilities to be installed below the Site cover, estimated volumes of contaminated soil to be excavated and any work that may impact an engineering control
- A summary of environmental conditions anticipated in the work areas, including the nature and concentration levels of contaminants of concern, potential presence of grossly contaminated media, and plans for any pre-construction sampling
- A schedule for the work, detailing the start and completion of all intrusive work
- A summary of the applicable components of this EWP
- A statement that the work will be performed in compliance with this EWP and 29 CFR 1910.120
- A copy of the contractor's health and safety plan, in electronic format, if it differs from the HASP provided as Attachment C to the Soil Management Plan (SMP)
- Identification of disposal facilities for potential waste streams
- Identification of sources of any anticipated backfill, along with all required chemical testing results

3.0 SOIL SCREENING METHODS

Visual, olfactory, and instrument-based soil screening (e.g., PID screening) will be performed by a qualified environmental professional during all remedial and development excavations into known or potentially-contaminated material (remaining contamination). Soil screening will be performed regardless of when the invasive work is done and will include all excavation and invasive work performed during development, such as excavations for foundations and utility work, after issuance of the Certificate of Completion.

Excavated soil or fill from previously remediated areas can be returned to the subsurface in the area from which it came. Excess soil or fill that is excavated will be assumed to be impacted and must be further characterized to determine the proper disposition (e.g., use as Site cover soil, off-Site disposal, etc.). Likewise, soil or fill excavated from areas that were not previously remediated will require testing to determine the proper disposition. Cover material (asphalt, concrete, and the top 1 foot of soil material) shall be segregated and reused to the extent practicable.

For excavated soil/fill that requires testing, soil shall be placed in separate stockpiles. Composite 5-point soil samples will be collected for analysis of volatile organic compounds (VOCs) and lead based on the volume of material as shown below:

<i>Soil Quantity (CY)</i>	<i>Sample Quantity</i>
0 - 50	1
50 - 100	2
100 - 200	3
200 - 400	4
400 - 500	5
500 - 800	6
800 - 1,000	7
>1,000	Add two samples for every 1,000 CY

Soil that exceeds the 6 NYCRR Part 375-6 (or current regulation) soil cleanup objectives for industrial use will require off-Site disposal/treatment. All other soil will be used as backfill. Excess soil below regulatory thresholds that cannot be used as backfill will require off-Site disposal.

If the soil/fill material requires off-site disposal, additional parameters (e.g., semivolatile organic compounds, metals, PCBs, and/or TCLP) may be analyzed as required by the disposal facility.

4.0 STOCKPILE METHODS

Soil/fill stockpiles will be continuously encircled with a soil or asphalt/concrete berm and/or silt fence to prevent surface water run-off from the stockpiles and surface water run-on from the surrounding ground surface. Hay bales will be used as needed near catch basins, surface water, and other discharge points.

Stockpiles will be kept covered at all times with appropriately anchored tarps. The piles will be inspected at a minimum once each week and after every storm event. Results of inspections will be recorded in a logbook and maintained at the Site and available for inspection by NYSDEC. Any damaged tarp covers will be promptly replaced.

5.0 MATERIALS EXCAVATION AND LOAD OUT

A qualified environmental professional or person under their supervision will oversee all invasive work and the excavation and load-out of all excavated material.

The owner of the property and its contractors are solely responsible for safe execution of all invasive and other work performed under this EWP.

The presence of utilities and easements on the Site will be investigated by the qualified environmental professional. It will be determined whether a risk or impediment to the planned work is posed by utilities or easements on the Site.

Loaded vehicles leaving the Site will be appropriately lined, tarped, securely covered, manifested, and placarded in accordance with appropriate Federal, State, local, and NYSDOT requirements (and all other applicable transportation requirements).

A truck wash will be operated on-Site. The qualified environmental professional will be responsible for ensuring that all outbound trucks will be washed at the truck wash before leaving the Site until the activities performed under this section are complete. As an alternative, truck routes on the Site can be delineated in such a manner as to prevent the truck's tires and undercarriages from coming in contact with contaminated soil. If this method is used, trucks need only be inspected (and cleaned if necessary) rather than washed.

Locations where vehicles enter or exit the Site shall be inspected daily for evidence of off-Site soil tracking.

The qualified environmental professional will be responsible for ensuring that all egress points for truck and equipment transport from the Site are clean of dirt and other materials derived from the Site during intrusive excavation activities. Cleaning of the adjacent streets will be performed as needed to maintain a clean condition with respect to Site-derived materials.

6.0 MATERIALS TRANSPORT OFF-SITE

All transport of excavated soil will be performed by licensed haulers in accordance with appropriate local, State, and Federal regulations, including 6 NYCRR Part 364, consistent with the material being hauled. Haulers will be appropriately licensed and trucks properly placarded.

Excavated soil transported by trucks exiting the Site will be secured with tight-fitting covers. Loose-fitting canvas-type truck covers will be prohibited. If loads contain wet material capable of producing free liquid, truck liners will be used.

With the noted exception described in Section 5.0, all trucks will be washed prior to leaving the Site. Truck wash waters will be collected and disposed off-Site in an appropriate manner. Sediment from the truck washing will be disposed off-Site with one of the loads of soil being exported.

The truck transport route is as follows:

- Upon exiting the Site, trucks shall travel south on Hayes Place to Seneca Street (Route 16)
- Seneca Street is a designated truck route with direct access to Interstate I-190 and other truck routes

All trucks loaded with Site materials will enter and exit the Site using only this approved truck route. This is the most appropriate route and takes into account:

- i) Limiting transport through residential areas and past sensitive areas
- ii) Use of city mapped truck routes
- iii) Prohibiting off-Site queuing of trucks entering the facility
- iv) Limiting total distance to major highways
- v) Promoting safety in access to highways
- vi) Overall safety in transport

Trucks will be prohibited from stopping and idling on the roadways surrounding the project Site.

Egress points for truck and equipment transport from the Site will be kept clean of dirt and other materials during the work.

Queuing of trucks will be performed on-Site or in pre-designated areas in order to minimize off-Site disturbance.

7.0 MATERIALS DISPOSAL OFF-SITE

All soil/fill/solid waste excavated and removed from the Site will be treated as contaminated and regulated material (unless otherwise determined through appropriate testing or knowledge) and will be transported and disposed in accordance with all local, State (including 6NYCRR Part 360), and Federal regulations. If disposal of soil/fill from this Site is proposed for unregulated off-Site disposal (i.e., clean soil removed for development purposes), a formal request with an associated plan will be made to the NYSDEC. Unregulated off-Site management of materials from this Site will not occur without formal NYSDEC approval.

Off-Site disposal locations for excavated soil will be identified in the pre-excavation notification. This will include estimated quantities and a breakdown by class of disposal facility if appropriate, i.e., hazardous waste disposal facility, solid waste landfill, petroleum treatment facility, construction/demolition recycling facility, etc. Actual disposal quantities and associated documentation will be reported to the NYSDEC in the Periodic Review Report. This documentation will include: waste profiles, test results, facility acceptance letters, manifests, bills of lading, and facility receipts.

Non-hazardous historic fill and contaminated soil taken off-Site will be handled, at a minimum, as a Municipal Solid Waste per 6NYCRR Part 360-1.2. Material that does not meet Track 1 unrestricted soil cleanup objectives (SCOs) is prohibited from being taken to a New York State recycling facility (6NYCRR Part 360-16 Registration Facility).

8.0 MATERIALS REUSE ON-SITE

Excavated soil will be segregated based on previous environmental data and screening results into material that requires testing and potential off-Site disposal, material that can be returned to the subsurface, and material that can be used as cover soil (the top 1-foot of material).

Soil stockpiles will be managed in accordance with Section 4.0.

The qualified environmental professional will ensure that procedures defined for materials reuse in this SMP are followed and that unacceptable material does not remain on-Site. Contaminated on-Site material, including historic fill and contaminated soil, that is acceptable for re-use on-Site will be placed below the demarcation layer or impervious surface, and will not be reused within the cover, within landscaping berms, or as backfill for subsurface utility lines.

Any demolition material proposed for reuse on-Site will be sampled for asbestos, where appropriate, and the results will be reported to the NYSDEC for acceptance. Concrete crushing or processing on-Site will not be performed without prior NYSDEC approval. Organic matter (wood, roots, stumps, etc.) or other solid waste derived from clearing and grubbing of the Site will not be reused on-Site.

9.0 FLUIDS MANAGEMENT

All liquids generated from the Site, including excavation dewatering, truck washing, and groundwater monitoring well purge and development waters, will be handled, transported, and disposed in accordance with applicable local, State, and Federal regulations. Dewatering, purge, and development fluids will be recharged back to the land surface or subsurface of the Site, but will be managed off-Site.

Discharge of water generated during large-scale construction activities to surface waters (i.e., a local pond, stream, or river) will be performed under a State Pollutant Discharge Elimination System (SPDES) permit.

10.0 COVER SYSTEM RESTORATION

After the completion of soil removal and any other invasive activities, the cover system will be restored in a manner that complies with the Decision Document. The Decision Document requires that site soils be covered with buildings, asphalt, concrete, or one foot of clean fill material. If the type of cover system changes from that which exists prior to the excavation (i.e., a soil cover is replaced by asphalt), this will constitute a modification of the cover element of the remedy and the upper surface of the remaining contamination. A figure showing the modified surface will be included in the subsequent Periodic Review Report and in any updates to the SMP.

11.0 BACKFILL FROM OFF-SITE SOURCES

All materials proposed for import onto the Site will be approved by the qualified environmental professional and will be in compliance with provisions in this SMP prior to receipt at the Site. Off-Site borrow areas will be documented as having no evidence of disposal or release of solid or hazardous wastes, hazardous or toxic substances, radioactive materials, or petroleum products. Material from industrial sites, spill sites, or other environmental remediation sites or potentially contaminated sites will not be imported to the Site. Off-Site soil intended for use as backfill cannot otherwise be defined as a solid waste in accordance with 6 NYCRR Part 360.

Solid waste will not be imported onto the Site.

Sampling of imported soil shall be conducted at a rate of one representative composite sample per source for virgin soils, and one composite sample per 500 cubic yards of material for non-virgin soils. If more than 1,000 cubic yards of soil are obtained from a given off-Site non-virgin soil source area, the sample collection frequency will be reduced to one composite sample for every 2,500 cubic yards. For sources greater than 5,000 cubic yards, the sampling frequency may be reduced further to one sample per 5,000 cubic yards. All samples will be analyzed for Target Compound List (TCL) volatile organic compounds (VOCs), semivolatile organic compounds (SVOCs), pesticides, and PCBs, as well as arsenic, barium, cadmium, chromium, lead, mercury, selenium, silver, and cyanide. The soil may not exceed any standards listed in Table B-1.

Trucks entering the Site with imported soil will be securely covered with tight fitting covers. Imported soil will be stockpiled separately from excavated material and covered to prevent dust releases.

12.0 STORMWATER POLLUTION PREVENTION

Runoff from the Site could impact municipal sewers and/or surface waters. For small excavations, silt fencing, hay bales, or berms will be installed around the entire perimeter of the construction area. Barriers and hay bale checks will be installed and inspected once a week and after every storm event. Results of inspections will be recorded in a logbook and maintained at the Site and available for inspection by NYSDEC. All necessary repairs shall be made immediately. Accumulated sediments will be removed as required to keep the barrier and hay bale check functional.

If silt fencing is used, all undercutting or erosion of the silt fence toe anchor shall be repaired immediately with appropriate backfill materials. Manufacturer's recommendations will be followed for replacing silt fencing damaged due to weathering.

Erosion and sediment control measures identified in the SMP shall be observed to ensure that they are operating correctly. Where discharge locations or points are accessible, they shall be inspected to ascertain whether erosion control measures are effective in preventing significant impacts to receiving waters.

Any disturbance of more than 1 acre of the Site will require the Owner to follow the requirements for coverage under the Construction Storm Water General Permit including the submittal of a Notice of Intent (NOI) form and the development of a Storm Water Pollution Prevention Plan (SWPPP). The SWPPP must fulfill all permit requirements and must be prepared in accordance with Part III of the New York State General Permit No. GP-0-10-001. The SWPPP, in accordance with permit requirements, must provide the following information:

- A background discussion of the scope of the construction project
- A statement of the storm water management objectives
- An evaluation of post-development runoff conditions
- A description of proposed storm water control measures
- A description of the type and frequency of maintenance activities required to support the control measure

The SWPPP will address issues such as erosion prevention, sedimentation control, hydraulic loading, pollutant loading, ecological protection, physical site characteristics that impact design, and Site management planning. All descriptions of proposed

features and structures at the Site will include a description of structure placement, supporting engineering data and calculations, construction scheduling, and references to established detailed design criteria. The SWPPP will conform to all requirements as established by applicable regulatory agencies.

13.0 CONTINGENCY PLAN

If underground tanks, drums, or other previously unidentified contaminant sources are found during post-remedial subsurface excavations or development-related construction, excavation activities will be suspended until sufficient equipment is mobilized to address the condition.

Sampling will be performed on product, sediment, and surrounding soil, etc. as necessary to determine the nature of the material and proper disposal method. Chemical analysis will be performed for a full list of analytes (TAL metals, TCL volatiles and semi-volatiles, TCL pesticides, and PCBs) unless the Site history and previous sampling results provide a reasonable justification to limit the list of analytes. In this case, a reduced list of analytes will be proposed to the NYSDEC for approval prior to sampling.

Identification of unknown or unexpected contaminated media identified by screening during invasive Site work will be promptly communicated by phone to NYSDEC's Project Manager. Reportable quantities of petroleum product will also be reported to the NYSDEC spills hotline. These findings will also be included in the Periodic Review Reports prepared pursuant to Section 6 of the SMP.

14.0 COMMUNITY AIR MONITORING PLAN

The Community Air Monitoring Plan (CAMP) requires real-time monitoring for VOCs and particulates (i.e., dust) at the Site property boundary downwind of each designated work area when intrusive and certain non-intrusive activities are in progress at contaminated sites. All monitoring will be conducted in accordance with the CAMP submitted to the NYSDEC as part of the October 2010 Remedial Action Work Plan. A copy of this plan is included in the HASP (SMP Attachment C) and will be kept on-Site during construction activities.

Exceedances of action levels listed in the CAMP will be reported to the NYSDEC Project Manager.

15.0 ODOR CONTROL PLAN

This odor control plan is capable of controlling emissions of nuisance odors off-Site. Specific odor control methods to be used on a routine basis will include screening excavated soils with a PID and storage of soils with PID readings in excess of 100 ppm beneath tarps or possibly within an enclosed structure. If nuisance odors are identified at the Site boundary, or if odor complaints are received, work will be halted and the source of odors will be identified and corrected. Work will not resume until all nuisance odors have been appropriately abated to the extent necessary. NYSDEC and NYSDOH will be notified of all odor events and of any other complaints about the project. Implementation of all odor controls, including the halt of work, is the responsibility of the property owner's engineer, and any measures that are implemented will be discussed in the Periodic Review Report.

All necessary means will be employed to prevent on- and off-Site nuisances. At a minimum, these measures will include:

- i) Limiting the area of open excavations and size of soil stockpiles
- ii) Shrouding open excavations with tarps and other covers
- iii) Using foams to cover exposed odorous soil

If odors develop and cannot be otherwise controlled, additional means to eliminate odor nuisances will include:

- iv) Direct load-out of soil to trucks for off-Site disposal
- v) Use of chemical odorants in spray or misting systems
- vi) Use of staff to monitor odors in surrounding neighborhoods

If nuisance odors develop during intrusive work that cannot be corrected, or where the control of nuisance odors cannot otherwise be achieved due to on-Site conditions or close proximity to sensitive receptors, odor control will be achieved by sheltering the excavation and handling areas in a temporary containment structure equipped with appropriate air venting/filtering systems, or other appropriate methods developed in conjunction with the NYSDEC.

16.0 DUST CONTROL PLAN

A dust suppression plan that addresses dust management during invasive on-Site work will include, at a minimum, the items listed below:

- Dust suppression will be achieved through the use of a dedicated on-Site water truck or system for road wetting. The truck (or system) will be equipped with a water cannon capable of spraying water directly onto off-road areas including excavations and stockpiles.
- If necessary, gravel will be used on roadways to provide a clean and dust-free road surface.
- On-Site roads will be limited in total area to minimize the area required for water sprinkling.

17.0 OTHER NUISANCES

A plan for rodent control will be developed by the contractor prior to initiation of all remedial work. This plan will be implemented during remedial work if deemed necessary.

A plan will be developed and utilized by the contractor for all remedial work to ensure compliance with local noise control ordinances.

TABLE A-1

**IMPORTED SOIL QUALITY STANDARDS
FORMER BUFFALO CHINA SITE
BUFFALO, NEW YORK**

<i>Contaminant</i>	<i>CAS Number</i>	<i>Criteria (mg/kg)</i>
<i>Volatiles</i>		
1,1,1-Trichloroethane	71-55-6	0.68
1,1-Dichloroethane	75-34-3	0.27
1,1-Dichloroethene	75-35-4	0.33
1,2-Dichlorobenzene	95-50-1	1.1
1,2-Dichloroethane	107-06-2	0.02
cis-1,2-Dichloroethene	156-59-2	0.25
trans-1,2-Dichloroethene	156-60-5	0.19
1,3-Dichlorobenzene	541-73-1	2.4
1,4-Dichlorobenzene	106-46-7	1.8
1,4-Dioxane	123-91-1	0.1
Acetone	67-64-1	0.05
Benzene	71-43-2	0.06
Butylbenzene	104-51-8	12
Carbon tetrachloride	56-23-5	0.76
Chlorobenzene	108-90-7	1.1
Chloroform	67-66-3	0.37
Ethylbenzene	100-41-4	1
Hexachlorobenzene	118-74-1	3.2
Methyl ethyl ketone	78-93-3	0.12
Methyl tert-butyl ether	1634-04-4	0.93
Methylene chloride	75-09-2	0.05
n-Propylbenzene	103-65-1	3.9
sec-Butylbenzene	135-98-8	11
tert-Butylbenzene	98-06-6	5.9
Tetrachloroethene	127-18-4	1.3
Toluene	108-88-3	0.7
Trichloroethene	79-01-6	0.47
1,2,4-Trimethylbenzene	95-63-6	3.6
1,3,5- Trimethylbenzene	108-67-8	8.4
Vinyl chloride	75-01-4	0.02
Xylene (mixed)	1330-20-7	1.6

TABLE A-1

**IMPORTED SOIL QUALITY STANDARDS
FORMER BUFFALO CHINA SITE
BUFFALO, NEW YORK**

<i>Contaminant</i>	<i>CAS Number</i>	<i>Criteria (mg/kg)</i>
<i>Semivolatiles</i>		
Acenaphthene	83-32-9	98
Acenaphthylene	208-96-8	107
Anthracene	120-12-7	500
Benz(a)anthracene	56-55-3	1
Benzo(a)pyrene	50-32-8	1
Benzo(b)fluoranthene	205-99-2	1.7
Benzo(g,h,i)perylene	191-24-2	500
Benzo(k)fluoranthene	207-08-9	1.7
Chrysene	218-01-9	1
Dibenz(a,h)anthracene	53-70-3	0.56
Fluoranthene	206-44-0	500
Fluorene	86-73-7	386
Indeno(1,2,3-cd)pyrene	193-39-5	5.6
m-Cresol	108-39-4	0.33
Naphthalene	91-20-3	12
o-Cresol	95-48-7	0.33
p-Cresol	106-44-5	0.33
Pentachlorophenol	87-86-5	0.8
Phenanthrene	85-01-8	500
Phenol	108-95-2	0.33
Pyrene	129-00-0	500
<i>PCBs/Pesticides</i>		
2,4,5-TP Acid (Silvex)	93-72-1	3.8
4,4'-DDE	72-55-9	17
4,4'-DDT	50-29-3	47
4,4'-DDD	72-54-8	14
Aldrin	309-00-2	0.19
alpha-BHC	319-84-6	0.02
beta-BHC	319-85-7	0.09
Chlordane (alpha)	5103-71-9	2.9
delta-BHC	319-86-8	0.25
Dibenzofuran	132-64-9	210
Dieldrin	60-57-1	0.1
Endosulfan I	959-98-8	102
Endosulfan II	33213-65-9	102
Endosulfan sulfate	1031-07-8	200
Endrin	72-20-8	0.06
Heptachlor	76-44-8	0.38
Lindane	58-89-9	0.1
Polychlorinated biphenyls	1336-36-3	1

TABLE A-1

**IMPORTED SOIL QUALITY STANDARDS
FORMER BUFFALO CHINA SITE
BUFFALO, NEW YORK**

<i>Contaminant</i>	<i>CAS Number</i>	<i>Criteria (mg/kg)</i>
<i>Metals</i>		
Arsenic	7440-38-2	16
Barium	7440-39-3	400
Beryllium	7440-41-7	47
Cadmium	7440-43-9	7.5
Chromium, hexavalent	18540-29-9	19
Chromium, trivalent	16065-83-1	1,500
Copper	7440-50-8	270
Total Cyanide		27
Lead	7439-92-1	450
Manganese	7439-96-5	2,000
Total Mercury		0.73
Nickel	7440-02-0	130
Selenium	7782-49-2	4
Silver	7440-22-4	8.3
Zinc	7440-66-6	2,480

APPENDIX B

SITE-SPECIFIC HEALTH AND SAFETY PLAN

SITE-SPECIFIC HEALTH AND SAFETY PLAN

**FORMER BUFFALO CHINA SITE
51 HAYES PLACE, BUFFALO, NEW YORK**

BROWNFIELD CLEANUP SITE No. C915209

**Prepared For:
Buffalo China**

**NOVEMBER 2011
REF. NO. 037191 (11)**

EMERGENCY CONTACT LIST AND HOSPITAL ROUTE MAP
[INSERT HERE]

**EMERGENCY CONTACT LIST
FORMER BUFFALO CHINA SITE**

EMERGENCY INFORMATION		
Contact	Phone Number	Hospital Directions
Local Police	911	Depart the Site heading south on Hayes Place. Turn left on to Seneca Street. Go approximately 1.5 miles and turn right onto Cazenovia Street. Go approximately 0.4 miles. Hospital is at intersection of Cazenovia and Abbott Roads.
Fire Department	911	
Ambulance: Rural Metro Ambulance and Buffalo Fire	911	
Local Hospital: Mercy Hospital 565 Abbott Rd. Buffalo, NY 14210	716-826-7000	
National Poison Center	800-222-1222	
Project Manager: Rick Shepherd	Work: 519-884-0510 Cell: 519-748-8831	Driving Time: 4 to 8 minutes Driving Distance: +/- 2 miles Attach Map. CRA – Accident Reporting System Please call 866-529-4886 and provide: • Name and location of caller • Description of incident • Name of any injured persons • Description of injuries • Phone number for return call
Site Supervisor Doug Oscar	Work: 716-297-6150 Cell: 716-570-4786	
CRA Regional SHM Craig Gebhardt	Work: 716-297-6150 Cell: 716-604-684	
Site Contact Karl Franz	Work: 716-821-5600 Cell:	
Client Contact Kerri Love	Work: (740) 681-6024 Cell: (614) 546-7140	
Other Contact (Name)	Work: Cell:	

Hospital route must be field validated before site work commences.



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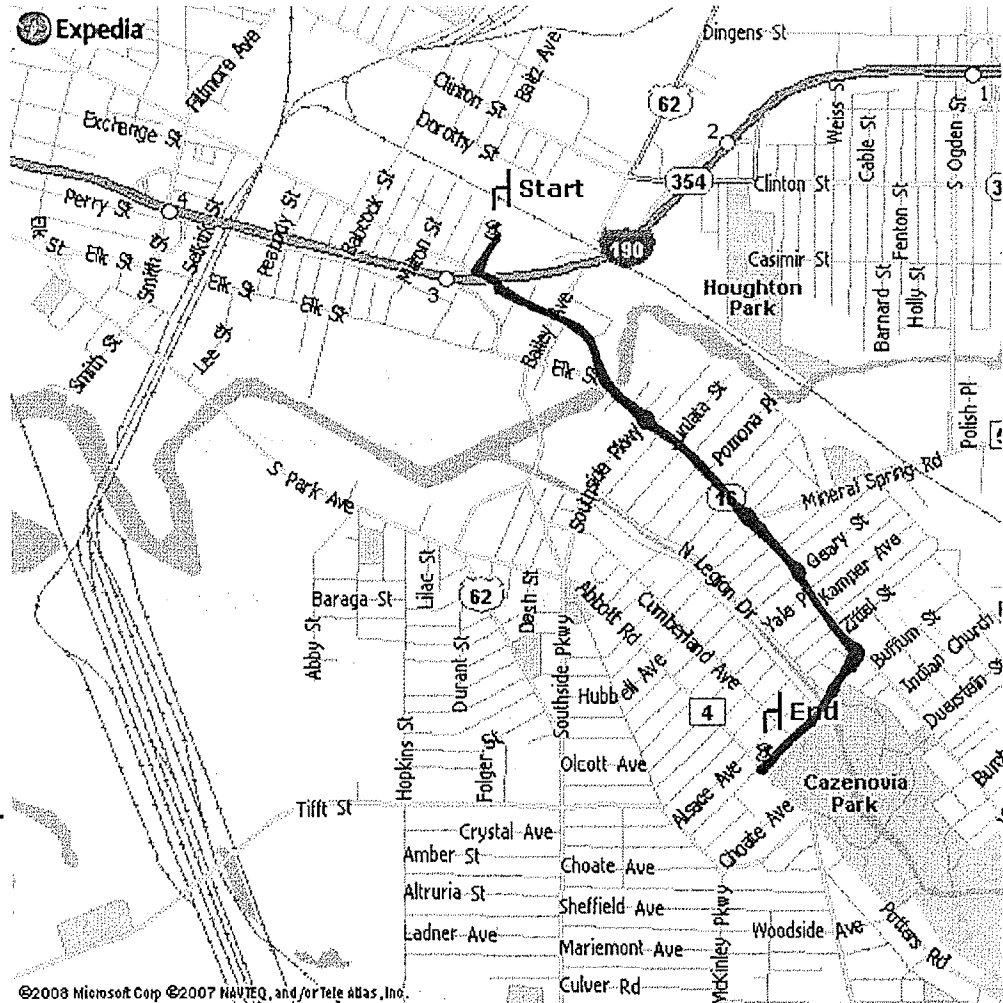
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Directions	Distance	Time
Start: Depart Start on Hayes Pl (South)	0.1	< 1min
1: Turn LEFT (East) onto SR-16 [Seneca St]	1.5	0:03
2: Turn RIGHT (South) onto Cazenovia St	0.4	0:02
End: Arrive End	< 0.1	< 1min
Total Route	2.0 mi	5 mins

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APPENDIX C	COMMUNITY AIR MONITORING PLAN

HEALTH AND SAFETY PLAN

Signature Page

Site Name: The Former Buffalo China Site

Location Address: 51 Hayes Place, Buffalo, New York 14210

Ref. No. 037191 CRA Office: Buffalo

Anticipated Start Date: On-going Anticipated Project Duration: 5 years

Prepared By (Signature): _____ Date: _____

Project Manager (Signature): _____ Date: _____

Reviewed By (Signature): _____ Date: _____

This signature page must be completed and be available on site for review. This page does not, however, replace the QSF-016 requirements.

1.0 INTRODUCTION

1.1 PURPOSE

The purpose of this site-specific health and safety plan (HASP) is to provide specific guidelines and establish procedures for the protection of personnel performing the activities described in Section 2.0 Site Operations. The information in this HASP has been developed in accordance with applicable standards and is, to the extent possible, based on information available to date. The HASP is also a living document, in that it must continually evolve as site conditions and knowledge of the site work activities develop.

A vital element of CRA's Safety and Health Policies and Procedures is the implementation of a site-specific HASP for field activities. The HASP, as applicable to this project, includes the following measures:

- Communicate the contents of this HASP to site personnel.
- Eliminate unsafe conditions. Efforts must be initiated to identify conditions that can contribute to an incident and to remove exposure to these conditions.
- Utilize the STAR (Stop, Think, Act, and Review) process before beginning any activity/task/job, after an incident, and/or during any unusual circumstances. Stop the activities to think about the task, analyze the task hazards and determine methods to reduce risk, and review the results with affected personnel.
- Revise or develop Job Safety Analysis (JSA) forms for activities. Supervisors and affected personnel are responsible for JSA development. A blank JSA form has been included in Appendix B of this HASP.
- Complete behavioral-based safety (BBS) observations via the use of the Safe Task Evaluation Process (STEP).
- Reduce unsafe acts. **Please note that 88 percent of all incidents are directly caused by unsafe acts. Use the CRA BBS tools (STEPs, JSAs, STAR, etc.) to reduce the number of unsafe acts.** Personnel shall make a conscious effort to work safely. A high degree of safety awareness must be maintained so that safety factors become an integral part of the task. Supervisory personnel shall ensure that personnel committing unsafe acts are held accountable via counseling, mentoring, and, if necessary, reprimand.
- Inspect frequently. Regular documented safety inspections of the work site, materials, and equipment by qualified persons ensure early detection of unsafe

conditions. Safety and health deficiencies shall be corrected as soon as possible or project activities shall be suspended. Documentation of daily inspections and corrective actions should be kept with the project files.

1.2 STOP WORK AUTHORITY

All CRA employees are empowered and expected to stop the work of co-workers, subcontractors, client employees, or other contractors if any person's safety or the environment are at risk. No repercussions will result from this action. Reporting of unsafe condition/acts and/or Stop Work Authority (SWA) shall be documented using the Unsafe Condition/Acts and SWA form located in Appendix A.

The discovery of any condition that would suggest the existence of a situation more hazardous than anticipated shall result in the removal of site personnel from that area and re-evaluation of the hazard and the levels of protection.

1.3 PERSONNEL REQUIREMENTS

All personnel conducting activities on site must conduct their activities in compliance with all applicable safety and health legislation throughout North America to include, but not limited to, the Occupational Safety and Health Administration (OSHA) 29 CFR 1910, 29 CFR 1926, Provincial Canadian legislation, and CRA policies and procedures. **Project personnel must also be familiar with the procedures and requirements of this HASP.** In the event of conflicting safety procedures/requirements, personnel must implement those safety practices that afford the highest level of safety and protection.

Employees identified as CRA Short Service Employees (6 months or less) shall not be permitted to work without another non-short service CRA employee present.

1.4 SHORT SERVICE EMPLOYEES

CRA Employees identified, as Short Service Employees (SSE) (6 months or less) shall not be permitted to work without another non-SSE employee present.

1.5 PROJECT ORGANIZATION

Project Manager – CRA – (Richard Shepherd)

The CRA Project Manager (PM) shall be responsible for the overall implementation of the HASP, and for ensuring that all health and safety responsibilities are carried out in conjunction with this project. This shall include, but is not limited to, review and approval of the HASP. The PM will also ensure the appropriate resources are provided to support the project with respect to all operations.

Site Supervisor – CRA – (Doug Oscar)

The Site Supervisor (SS) is the person who, under the supervision of the project manager, shall be responsible for the communication of the site requirements to site project personnel and subcontractors, and is responsible for carrying out the health and safety responsibilities by making sure that:

1. All necessary cleanup and maintenance of safety equipment is conducted by project personnel.
2. Emergency phone numbers/services including hospital/clinic locations are verified/contacted.
3. Forms attached to the HASP are completed, filed, and submitted correctly.
4. A pre-entry briefing is conducted and documented, which will serve to familiarize on-site personnel with the procedures, requirements, and provisions of this HASP.
5. Implement the requirements of the OSHA lead standard 1926.62 as required.

Other duties include overall implementation of the HASP, and ensuring all health and safety responsibilities are carried out in conjunction with this project. This shall include, but is not limited to, review and approval of the HASP, communication of site requirements to subcontractor personnel, and consultation with the client/site representative regarding appropriate changes to the HASP.

The SS also has the responsibility of enforcing safe work practices for project employees. The SS watches for any ill affects on any crewmember, especially those symptoms caused by cold/heat stress or chemical exposure. The SS oversees the safety of any visitors who enter the site. The SS maintains communication with the client/site representative(s).

Other specific duties of the SS include:

- i) all underground utilities have been properly located prior to initiating work activities;
- ii) CRA's Property Access and Utility Locate form has been completed prior to initiating intrusive work;
- iii) all necessary cleanup and maintenance of safety equipment is conducted by project personnel;
- iv) JSA forms are developed, reviewed and revised accordingly;
- v) project personnel are implementing the STAR process before initiating activities;
- vi) forms attached to the HASP are completed, filed, and submitted correctly; and
- vii) a pre-entry briefing is conducted and documented, which will serve to familiarize on-site personnel with the procedures, requirements, and provisions of this HASP;
- viii) safe work practices are enforced;
- ix) personnel are observed for any ill affects, especially those symptoms caused by heat stress or chemical exposure;
- x) project activities are immediately shut down in the case of a medical emergency, unsafe condition, or unsafe practice;
- xi) job site inspections are conducted as a part of quality assurance for safety and health; and
- xii) safety and health concerns are reported to project management as necessary.

Regional Safety and Health Manager - CRA - (Craig Gebhardt)

The Regional Safety and Health Manager (SHM) is a full-time CRA employee who is trained as a health and safety professional, who serves in a consulting role to the PM, and SS regarding potential health and safety issues.

Personnel Safety Responsibility

CRA personnel are responsible for their own safety as well as the safety of those around them. CRA personnel shall use any equipment provided in a safe and responsible manner, as directed by their supervisor and will also follow the policies set forth in this HASP and the CRA Safety and Health Program.

Personnel are directed to take the following actions when appropriate:

- i) utilize the STAR process before initiating work;
- ii) assist in the development/revision of JSA forms that are appropriate to their current scope of work;
- iii) suspend any operations, which may cause an imminent health hazard to all project personnel;
- iv) inspect tools and other equipment before each use or as manufacturer and/or OSHA dictates;
- v) correct job site hazards when possible to do so, without endangering life or health; and
- vi) report safety and health concerns and incidents to the SS.

Subcontractors

Any selected subcontractor(s), if needed, will be responsible for providing both a Site Supervisor ("competent person") and a Health and Safety Officer (HSO) to direct their activities and to meet all applicable OSHA Regulations. This may be the same individual if so qualified. These individuals will be responsible for ensuring that all contract specifications are met, including those related to Site health and safety. The names of these individuals will be presented in the subcontractor Site-specific HASP.

All subcontractor personnel working at the Site will report to the CRA SS and in keeping with OSHA requirements are required to comply with all procedures referenced in this HASP, the subcontractor HASP, and the OSHA Construction Standards as referenced in 29 CFR 1926.

Subcontractors working for CRA shall prepare and implement their own Site specific HASP for their contract work and provide all applicable Health and Safety SOPs and/or Safety Programs for use by their Site personnel. The subcontractor's HASP shall meet the minimum requirements of this HASP. CRA will review the subcontractor HASP prior to subcontractor mobilization to the Site. Subcontractors will be responsible for the health and safety of their personnel, which includes following all applicable OSHA Regulations and the subcontractors' Site-specific HASP. Subcontractors will be required to attend an initial Site briefing put on by CRA and subsequent safety meetings.

Authorized Visitors

Authorized Visitors shall be provided with all known information with respect to the project operations and hazards, as applicable to the purpose of their visit.

2.0 SITE CHARACTERIZATION AND POTENTIALLY HAZARDOUS COMPOUNDS

2.1 SITE DESCRIPTION AND BACKGROUND

The Former Buffalo China Site (Site) is located at 51 Hayes Place in Buffalo, New York. The Site location and Site layout are shown on Figures 2.1 and 2.2, respectively. Work Plan. The Site comprises approximately 10 acres and is bounded on the north by Conrail railroad tracks, on the east by the adjoining Buffalo China warehouse and other commercial/industrial facilities, and on the south and west by commercial, industrial, and residential properties. Interstate I-190 is located nearby to the south of the Site while the City of Buffalo School 26 and adjacent playground is located a few hundred feet to the southwest. The nearest body of water is the Buffalo River, located approximately 1/4 to 1/2 mile south and east of the site.

The Site includes buildings, outdoor storage silos, a rail spur, and roadways and parking areas. The manufacturing building is a multi-story structure covering approximately four acres. The building is connected to the Robinson Home Products Warehouse to the east. Another smaller building referred to as the Harrison Street warehouse is located in the northwest end of the Site, and covers an area of approximately 0.5 acres. The primary access to the Site is via Hayes Place.

The property has been used for the manufacture of china for the past 100 plus years. During that time period, the manufacturing facility expanded to adjacent industrial properties that historically included the Standard Mirror Company and Atlas Wrecking. The Harrison Street Warehouse was once a part of the Standard Mirror Company facility.

2.2 CURRENT OPERATIONS

The property is currently owned by Niagara Ceramics. Niagara Ceramics continues to manufacture china dinnerware at the Site. The Harrison Street Warehouse is presently used for storage.

2.3 SITE CHARACTERIZATION

A remedial investigation (RI) was conducted by CRA on behalf of Buffalo China between July 2007 and July 2009. The results of the RI identified the presence of metals

and volatile organic compounds (VOCs) in site soils and VOCs in overburden and bedrock groundwater both on and off-site.

Table 1 presents a list of the chemical compounds of concern that have been identified at the Site, the exposure routes and acceptable exposure levels for the chemical compounds of concern.

2.4 SCOPE OF WORK

The objectives of this project are to remediate soil and groundwater contamination at the Site, specifically in the area surrounding the Harrison Street warehouse, and off-Site areas to the southwest of the Site.

This HASP covers the specific site activities that will be conducted by CRA personnel and their subcontractors. These activities are as follows:

- Mobilization of personnel, materials, and equipment to and from the site;
- Surveying;
- Excavation and off-Site disposal of contaminated soils;
- Installation of soil borings and subsurface soil sampling activities;
- Installation of overburden and bedrock injection and groundwater monitoring wells;
- Installation of piping gallery;
- Backfilling;
- Injection of chemical oxidants into the subsurface;
- Groundwater sampling activities;
- Hydraulic monitoring and hydraulic conductivity testing;
- Decontamination activities; and
- Installation and monitoring of a sub-slab depressurizations system.

If site operations are altered or if additional tasks are assigned, an addendum to this HASP shall be developed to address the specific hazards associated with these changes. All addenda are to be developed in conjunction with project management and a CRA safety professional.

3.0 **BASIS FOR DESIGN**

Regulations set forth by OSHA in Title 29, CFR, Parts 1910 and 1926 (29 CFR 1910 and 1926) form the basis of this HASP. Emphasis is placed on Section 1926.65 (Hazardous Waste Operations and Emergency Response), 1910 Subpart I (Personal Protective Equipment), 1910 Subpart Z (Toxic and Hazardous Substances), 1926 Subpart O (Motor Vehicles and Mechanized Equipment), and 1926 Subpart F (Excavations). Some of the specifications within this section are in addition to the OSHA regulations, and reflect the positions of the United States Environmental Protection Agency (USEPA), the National Institute for Occupational Safety and Health (NIOSH), and the United States Coast Guard (USCG) regarding safe operating procedures at hazardous waste sites.

This HASP follows the guidelines established in the following:

- i) *Standard Operating Safety Guides*, USEPA (Publications 9285.1-03, June 1992);
- ii) *Occupational Safety and Health Guidance Manual for Hazardous Waste Site Activities*, NIOSH, OSHA, USCG, USEPA (86-116), October 1985);
- iii) Title 29 of the CFR, Part 1926.62;
- iv) Title 29 of the CFR, Part 1926.65;
- v) Title 29 of the CFR, Parts 1910 and 1926;
- vi) *Pocket Guide to Chemical Hazards*, DHHS, PHS, CDC, NIOSH (1997);
- vii) *Threshold Limit Values*, ACGIH (1998-1999); and
- viii) *Quick Selection Guide to Chemical Protective Clothing*, Forsberg, K. and S.Z. Mandsorf, 2nd Ed. (1993).

The health and safety of the public and project personnel and the protection of the environment will take precedence over cost and scheduling considerations for all project work.

3.1 **DEFINITIONS**

The following definitions are applicable to this HASP:

- i) *Site* - the area where the work is to be performed;
- ii) *Project* - all on-Site work performed under the scope of work;

- iii) *On-Site Personnel* - all client personnel, contractors, and subcontractor personnel involved with the project;
- iv) *Visitor* - all other personnel, except the on-Site personnel. All visitors must receive approval to enter the Site;
- v) *Exclusion Zone (EZ)* - any portion of the Site where hazardous substances are, or are reasonably expected to be, present in the air, water, waste materials or soil;
- vi) *Contamination Reduction Zone (CRZ)* - area between the EZ and Support Zone (SZ) that provides a transition between contaminated and clean areas. Decontamination stations are located in this zone;
- vii) *Support Zone (SZ)* - the rest of the Site where exposure to hazardous substances is not anticipated. Support equipment is located in this zone.

4.0 PERSONAL PROTECTIVE EQUIPMENT (PPE)

PPE is required to safeguard project personnel from various hazards. Varying levels of protection may be required depending on the level of contaminants and the degree of physical hazard. This section presents the various levels of protection and defines the conditions of use for each level.

4.1 LEVELS OF PROTECTION

Protection levels are determined based upon contaminants present in the work area. The specific protection levels to be employed at the Site for each work task are presented in each JSA form, which are found in Appendix B. The sections presented below provide additional information on the specific PPE that will be worn during the project activities.

4.1.1 LEVEL D PROTECTION

The minimum level of protection that will be required for all project personnel working at the Site will be Level D. The following equipment will be worn:

- i) work clothing as prescribed by the weather;
- ii) steel-toed work boots, meeting American National Standard Institute (ANSI) Z41;
- iii) safety glasses or goggles, meeting ANSI Z87;
- iv) reflective safety vest when working near heavy equipment;
- v) hard hat, meeting ANSI Z89; and
- i) hearing protection (if noise levels exceed 85 dBA, then hearing protection with a USEPA Noise Reduction Rating (NRR) of at least 20 dBA must be used).

4.1.2 MODIFIED LEVEL D PROTECTION

Modified Level D will be worn when airborne contaminants are not present at levels of concern, but project activities present an increased potential for skin contact with hazardous materials, such as during excavation, construction and operation and maintenance activities. Modified Level D consists of:

- i) Tyvek® coveralls;
- ii) steel-toed toe work boots;
- iii) outer reusable or disposable neoprene, rubber or latex over boots;
- iv) safety glasses or chemical goggles;
- v) hard hat;
- i) face shield in addition to safety glasses or chemical goggles when projectiles or splash hazards are a potential hazard;
- ii) reflective safety vest when working near heavy equipment;
- viii) nitrile inner and outer gloves; and
- ix) hearing protection (as necessary).

4.1.3 LEVEL C PROTECTION

Level C protection will be required when the airborne concentration of suspected contaminants exceeds the ACGIH TLV or the OSHA permissible exposure limits (PELs). It will also be required during the start up of activities where personnel may potentially come into contact with lead.

The following equipment will be worn for Level C protection:

- i) full-face air purifying respirator (APR) with organic vapor/acid gas cartridges in combination with particulate filters (P-100) which are NIOSH/MSHA approved;
- ii) Tyvek® or polyethylene coated Tyvek® suit, as determined by the SS, ankles, and cuffs taped to boots and gloves;
- iii) nitrile inner and outer gloves;
- iv) steel-toed toe work boots;
- v) outer reusable or disposable neoprene, rubber or latex over boots;
- vi) reflective safety vest when working near heavy equipment;
- vi) hard hat, ANSI approved; and
- vii) hearing protection (as necessary).

4.1.4 SELECTION OF PPE

Equipment for personal protection will be selected based on the potential for contact, current conditions at the Site, ambient air quality, and the judgment of the PM, SS and the RSHM. The PPE used will be chosen to be effective against the contaminants of concern present at the Site.

4.2 RESPIRATORY PROTECTION

Respiratory protection is an integral part of personnel health and safety at sites with potential airborne contamination.

4.2.1 SITE RESPIRATORY PROTECTION PROGRAM

The Site respiratory protection program will consist of the following:

- i) all project personnel who may use respiratory protection will have an assigned respirator;
- ii) all project personnel who may use respiratory protection will have been fit tested and trained in the use of a full-face piece APR within the past 6 months;
- iii) all project personnel who may use respiratory protection must, within the past year, have been medically certified as being capable of wearing a respirator. The SS will verify the medical surveillance for all project personnel who may potentially wear an APR;
- iv) only cleaned, maintained, NIOSH approved respirators are to be used on this Site;
- v) When respirators are used, the respirator cartridge is to be properly disposed of at the end of each work shift, prior to expected breakthrough or when filter load-up occurs;
- vi) contact lenses are not to be worn when a respirator is worn;
- vii) all project personnel who may use respiratory protection must be clean-shaven. Mustaches and sideburns are permitted, but they must not touch the sealing surface of the respirator;
- viii) respirators will be inspected and a negative pressure test performed prior to each use; and

- ix) after each use, the respirator will be thoroughly cleaned at the end of the work shift. The respirator will be stored in a clean plastic bag, away from direct sunlight in a clean, dry location, in a manner that will not distort the face piece.

Respiratory protection will be required during some of the activities. This is to ensure worker protection from potentially contaminated particulates, lead, and volatile organic compounds (VOCs).

A photoionization detector (PID) equipped with an 11.7 eV lamp will be used to determine if organic vapors are present. A background reading will be established prior to commencing work activities at each active work area.

Action levels to determine the level of respiratory protection necessary for organic vapors are based on the concentration of Site contaminants measured within the breathing zone. The action levels and appropriate respiratory protection are as follows:

<i>Sustained Organic Vapor Reading Above Background Within Worker Breathing Zone in Parts per Million (ppm) and lead is not present</i>	<i>Action Taken</i>
0 or Background	Full-Face Respirator Available
25 to 50	Wear Full-Face Respirator
>50	Wear Supplied Air Respirator, Implement Additional Engineering Controls

Note: Action levels are based on Site Contaminants of Concern listed on Table 1. Other contaminants detected at the Site and the maximum concentration that were detected at are listed on Table 2. If it is determined that sustained levels of lead are present stop work authority will be used and the PM and RSHM will be contacted to determine the future course of work.

If the ambient concentrations of organic vapors are due to identifiable substances, the level of respiratory protection may be altered by the SS.

The potential presence of lead in some of the project excavation areas presents a health and safety hazard for project personnel during excavation activities. OSHA has a specific construction standard for lead (1926.62) that shall be implemented as required. This standard requires employers to document the level of exposure to lead when it is present in the work place. Project personnel will be advised by the PM or SS as to the locations of lead at the Site prior to initiation of work activities. The lead standard

requires employers to treat employees as if they are being exposed to lead above the action level until such time they can demonstrate that they are not. This determination will be accomplished with the exposure assessment monitoring that will be conducted during initial stages of that project (See section 8.0). Until it is demonstrated that project personnel are not being exposed to lead above the action level, project personnel will wear air-purifying respirators with cartridges that will provide protection against the lead and disposable Tyvek® coveralls.

4.3 USING PPE

Depending upon the level of protection selected for this project, specific donning and doffing procedures may be required. The procedures presented in this section are mandatory if Level C PPE is used.

All personnel entering the Exclusion Zone (EZ) must put on the required PPE in accordance with the requirements of this plan. When leaving the EZ, PPE will be removed in accordance with the procedures listed, to minimize the spread of contamination.

4.3.1 DONNING PROCEDURES

These procedures are mandatory only if Level C PPE is used on the project:

- i) remove bulky outerwear. Remove street clothes and store in clean location;
- ii) put on work clothes or coveralls;
- iii) put on the required chemical protective coveralls or rain gear;
- iv) put on the required chemical protective boots or boot covers;
- v) tape the legs of the coveralls to the boots with duct tape;
- vi) put on the required chemical protective gloves;
- vii) tape the wrists of the protective coveralls to the gloves;
- viii) don the required respirator and perform appropriate fit check;
- ix) put hood or head covering over head and respirator straps and tape hood to face piece; and
- x) don remaining PPE, such as hard hat.

When these procedures are instituted, one person must remain outside the work area to ensure that each person entering has the proper protective equipment.

4.3.2 DOFFING PROCEDURES

The following procedures are only mandatory if Level C PPE is required for this project. Whenever a person leaves a Level C work site, the following decontamination sequence will be followed:

- i) upon entering the Contaminant Reduction Zone (CRZ), rinse contaminated materials from the boots or remove contaminated boot covers;
- ii) clean reusable protective equipment;
- iii) remove protective garments, equipment, and respirator. All disposable clothing should be placed in a covered container which is labeled;
- iv) wash hands, face, and neck and shower as soon as possible;
- v) proceed to clean area and dress in clean clothing; and
- vi) clean and disinfect respirator for next use.

All disposable equipment, garments, and PPE must be placed in covered containers and labeled for disposal. See Section 8.0 for detailed information on decontamination stations.

4.4 SELECTION MATRIX

The level of personal protection selected is based upon the potential presence of lead, real time air monitoring of the work environment and an assessment by the SS of the potential for skin contact with contaminated materials. The PPE selection matrix is presented on each JSA form, which are presented in Appendix B. This matrix is based upon the information that is available at the time this plan was written. The exposure levels presented in Table 1 should be used to verify that the PPE prescribed is appropriate.

4.5 DURATION OF WORK TASKS

The duration of activities involving the usage of PPE will be established by the SS based upon ambient temperature and weather conditions, the capacity of personnel to work in the designated level of PPE (heat stress, see Section 5.2.16) and limitations of the protective equipment (i.e., ensemble permeation rates, life expectancy of the APR cartridges, etc.) As a minimum, rest breaks will be observed at the following intervals:

- i) 15 minutes midway between shift start-up and lunch;
- ii) one-half to one hour for lunch; and
- iii) 15 minutes in the afternoon, between lunch and shift end.

All rest breaks will be taken in the clean area (Support Zone [SZ]) after full decontamination and PPE removal. Additional rest breaks will be observed, based upon the heat stress monitoring guidelines presented in Section 5.2.16.

4.6 LIMITATIONS OF PROTECTIVE CLOTHING

PPE ensembles have been selected to provide protection against contaminants at anticipated concentrations in the groundwater. However, no protective garment, glove, or boot is chemical-proof, nor will it afford protection against all chemical types. Permeation of a given chemical through PPE is a complex process governed by contaminant concentrations, environmental conditions, physical condition of the protection garment, and the resistance of a garment to a specific contaminant; chemical permeation may continue even after the source of contamination has been removed from the garment.

In order to obtain optimum usage from PPE, the following procedures are to be followed by all project personnel using PPE:

- i) when using disposable coveralls, don a clean, new garment after each rest break or at the beginning of each shift;
- ii) inspect all clothing, gloves, and boots both prior to and during use for:
 - a) imperfect seams,
 - b) non-uniform coatings,
 - c) tears,

- d) poorly functioning closures; and
- iii) inspect reusable garments, boots, and gloves both prior to and during use for:
 - a) visible signs of chemical permeation,
 - b) swelling,
 - c) discoloration,
 - d) stiffness,
 - e) brittleness,
 - f) cracks,
 - g) any sign of puncture, and
 - h) any sign of abrasion.

Reusable gloves, boots, or coveralls exhibiting any of the characteristics listed above will be discarded. PPE used in areas known or suspected to exhibit elevated concentrations of contaminants will not be reused.

5.0 PROJECT HAZARDS AND CONTROL MEASURES

This section identifies and evaluates the potential chemical, physical, and biological hazards, which may be encountered during the completion of this project. Specific activity Job Safety Analysis (JSA) forms (located in Appendix B) have been developed to address the hazards associated with the site operations outlined in Section 2.

5.1 CHEMICAL HAZARDS

The chemical hazards associated with conducting site operations include the potential exposure to on-site contaminants encountered during field activities such as soil and groundwater sampling, products used in decontamination of equipment, and support products such as fuel. The potential routes of exposure from these products during normal use may occur through inhalation of vapors/dusts or direct contact or absorption with the materials. The chemical hazards of concern that may be encountered during the tasks identified in the project's scope of work include lead, trichloroethene, tetrachloroethene, and methylene chloride. A listing of the contaminants of concern are found in Table 1.0, which includes exposure limits, signs and symptoms of exposure, chemical properties, and physical characteristics.

5.1.1 CHEMICAL HAZARD CONTROLS

Exposure to potential on site contaminants/chemicals, such as those listed in Table 1.0 and to any chemical-containing products that are brought to the Site shall be controlled by:

- Monitoring air concentrations for volatile organic vapors shall be conducted in the breathing zone.
- Dust control measures, such as wetting the immediate area, shall be employed.
- Using PPE/respiratory protection as appropriate, in areas known to have concentrations above the specified action level for each contaminant.

5.1.2 SKIN CONTACT AND ABSORPTION CONTAMINANTS

Skin contact with chemicals may be controlled by use of the proper PPE and good housekeeping procedures. The proper PPE (e.g., Tyvek, gloves) as described in

Section 4.0 shall be worn for all activities where contact with potentially harmful media or materials is anticipated. Utilize manufacturer data on permeation and degradation to minimize skin contact potential (see Section 4.4 for additional information).

5.1.3 HAZARD COMMUNICATION

Personnel required to handle or use hazardous materials as part of their job duties will be trained and educated in accordance with the Hazard Communication standard as applicable. The training shall include instruction on the safe use and handling procedures of hazardous materials, how to read and access Material Safety Data Sheets (MSDS), and the proper labeling requirements.

The appropriate MSDS for the chemicals in use at the site will be maintained by and available for project personnel throughout the course of the project. The SS shall obtain and maintain copies of all MSDSs.

5.1.4 FLAMMABLE AND COMBUSTIBLE LIQUIDS

The storage, dispensing, and handling of flammable and combustible liquids must be in accordance with industry standards such as National Fire Protection Agency (NFPA) guidelines. The specific flammable or combustible liquids used at the site may include gasoline, diesel, kerosene, oils, and solvents.

Flammable and combustible liquids are classified according to flash point. This is the temperature at which the liquid gives off sufficient vapors to readily ignite. Flammable liquids have flash points below 100°F (37.8°C). Combustible liquids have flash points above 100°F (37.8°C) and below 200°F (93.3°C).

Storage

Many flammables can ignite at temperatures at or below room temperature. They are far more dangerous than combustibles when they are heated. As a result, these products must be handled very carefully. At normal temperatures, these liquids can release vapors that are explosive and hazardous to employee health. Exposure to heat can cause some of these liquids to break down into acids, corrosives, or toxic gases. For this reason, flammable/combustible liquids should be stored in cool, well ventilated areas

away from any source of ignition. Always consult the MSDS of the product for specific information.

Flammable and combustible liquids must be stored in designated areas. Such areas must be isolated from equipment and work activity, which may produce flames, sparks, heat, or any form of ignition, including smoking. The most practical method is the use of one or more approved (commercially available) flammable/combustible liquid storage cabinets.

Cabinets must be labeled "Flammable - Keep Fire Away." Doors must be kept closed and labeled accordingly. Containers must be kept in the cabinet when not in use.

General Requirements

- Keep containers of flammable/combustible liquids closed when not in use.
- Keep flammable/combustible liquids in designated areas and approved cabinets.
- Do not allow use of unapproved containers for transfer or storage. Use only approved safety cans (5-gallon maximum) with a spring closing lid and spout cover, designated to safely relieve internal pressure when exposed to heat or fire.
- Use only approved self-closing spigots, faucets, and manual pumps when drawing flammable/combustible liquids from larger containers/barrels.
- Use only approved metal waste cans with lids for disposal of shop towels/oily rags.
- Designate "Smoking" and "No Smoking" areas.
- Designate fueling areas.
- Observe all signs indicating "No Smoking," "No Flames," "No Ignition."

Transferring Flammable/Combustible Liquids

- This seemingly routine task can be hazardous if certain precautions are not followed. Grounding and bonding must be observed at all times to prevent the accumulation of static electricity when transferring containers/barrels one to another.
- Drums should be grounded (No. 4 copper conductor) to a grounding rod.
- Bonding is necessary between conductive containers (e.g., a barrel and a 5-gallon container).

5.2 PHYSICAL HAZARDS

Physical hazards that may be present during project work include: potential for close proximity to heavy equipment and drilling devices, noise, overhead or under ground utilities, vehicle traffic, material handling, heavy lifting use of hand and power tools, slip/trip/hit/fall injuries, heat stress/cold stress, biological hazards, and other potential adverse weather conditions. In addition, personnel must be aware that the PPE worn may limit dexterity and visibility and may increase the difficulty of performing some tasks.

5.2.1 HEAVY EQUIPMENT AND DRILLING SAFETY

Heavy Equipment

The following practices shall be adhered to by personnel operating heavy equipment (such as backhoes) and personnel working in the vicinity of heavy equipment:

- Heavy equipment is to be inspected when equipment is initially mobilized, delivered to a job site, or after it is repaired and returned to service, to ensure that it meets all manufacturer and OSHA specifications (e.g., fire extinguishers, backup alarms, etc.).
- Heavy equipment is to be inspected on a daily basis. Documentation of this daily pre-operational inspection is to be filed with the project files.
- Heavy equipment is only to be operated by authorized, competent operators.
- Seat belts are to be provided on heavy equipment that is not designed for stand-up operation.
- Equipment/vehicles whose payload is loaded by crane, excavator, loader, etc. will have a cab shield and/or canopy to protect the operator.
- Personnel will not be raised/lowered in buckets.
- Personnel will not ride on fender steps or any place outside the cab.
- Before leaving the equipment controls, ensure that the equipment is in its safe resting position. For a backhoe, apply the parking brake, put the front loader bucket down on the ground level, and ensure that the rear excavator bucket is locked in the travel position. Bulldozers and scraper blades, loader buckets, dump bodies, and similar equipment will be fully lowered or blocked when not in use.
- Before raising any booms, buckets, etc., check for overhead obstructions.

- Employees involved in the operation shall not wear any loose-fitting clothing, as it has the potential to be caught in moving machinery.
- Personnel shall wear high visibility safety vests, steel toed shoes, safety glasses, hearing protection, and hard hats during heavy equipment operations.
- When moving heavy equipment or when working within 10 feet of a stationary object or in tight quarters, a spotter will be used.

Drilling Equipment

The following practices shall be adhered to by drilling personnel:

- Equipment should be inspected daily by the operator to ensure that there are no operational problems.
- The kill switch will be function-checked and verified to be operational during the documented daily equipment check.
- Personnel shall be instructed in the location and use of the emergency kill switch on the drill rig.
- Employees involved in the operation shall not wear any loose-fitting clothing, including untied shoe/boot laces, draw strings, etc., which have the potential to be caught in moving machinery.
- Before leaving the controls, shift the transmission controlling the rotary drive into neutral and place the feed lever in neutral. Before leaving the vicinity of the drill, shut down the drill engine.
- Before raising the mast, check for overhead obstructions.
- Before the mast of a drill rig is raised, the drill rig must first be leveled and stabilized with leveling jacks and/or cribbing. Re-level the drill rig if it settles after initial setup. Lower the mast only when the leveling jacks are down, and do not raise the leveling jack pads until the mast is lowered completely.
- During freezing weather, do not touch any metal parts of the drill rig with exposed flesh. Freezing of moist skin to metal can occur almost instantaneously.
- Personnel shall wear steel toed shoes, safety glasses, hearing protection, and hard hats during drilling operations.
- The area shall be roped off, marked, or posted to keep the area clear of pedestrian traffic or spectators.

5.2.2 NOISE

Project activities that include working in close proximity to heavy equipment and/or drilling operations, or using power tools, that generate noise levels exceeding the decibel range of 85 dBA will require the use of hearing protection with a Noise Reduction Rating (NRR) of at least 20. Hearing protection (earplugs/muffs) will be available to personnel and visitors that would require entry into these areas.

When it is difficult to hear a coworker at normal conversation distance, the noise level is approaching or exceeding 85 dBA, and hearing protection is necessary. All Site personnel who may be exposed to high noise levels will participate in CRA's Hearing Conservation Program.

5.2.3 UTILITY CLEARANCES

Elevated superstructures (e.g., drill rigs, back hoes, scaffolding, ladders, cranes) shall remain a distance of 10 feet away from utility lines (<50 kV) and 20 feet away from power lines (>50 kV). Underground utilities, if present, shall be clearly marked and identified prior to commencement of work. Follow local/state/provincial regulations with regards to utility locating requirements (i.e., One-Call, etc.).

Personnel involved in intrusive work shall:

- Review and adhere to CRA's Subsurface Utility Clearance Protocol.
- Utilize the Property Access/Utility Clearance Data Sheet (QSF-019).
- Be able to determine the minimum distance from marked utilities which work can be conducted with the assistance of the locator line service.

5.2.4 VEHICLE TRAFFIC AND CONTROL

The following safety measures are to be taken by CRA personnel that have the potential to be exposed to vehicle traffic:

- A high visibility safety vest meeting ANSI Class II garment requirements is to be worn at all times.
- Employees will work using the "buddy system."

- Cones, etc. will be used to demarcate a safe work zone around the work zones.
- Appropriate signage will be posted as necessary to inform roadway/parking lot users of any additional control measures necessary to protect the public and CRA employees.

5.2.5 MATERIAL HANDLING AND STORAGE

Material handling and storage practices to be conducted at the site include manual lifting of materials and possibly the use of hoisting and rigging equipment. As a rule, use mechanical means for lifting heavy loads whenever possible.

General Storage Practices

The basic safety requirement for storage areas is that the storage of materials and supplies shall not create a hazard. Additional general storage area practices include the following:

- Bags, containers, bundles, etc. stored in tiers shall be stacked, blocked, interlocked, and limited in height so that they are stable and secure against sliding or collapse.
- All stacked materials, cargo, etc. shall be examined for sharp edges, protrusions, signs of damage, or other factors likely to cause injury to persons handling these objects. Defects should be corrected as they are attached.
- Storage areas shall be kept free from accumulation of materials that constitute hazards from tripping, fire, explosion, or pest haborage.
- Storage areas shall have provisions to minimize manual lifting and carrying. Aisles and passageways shall provide for the movement of mechanical lifting and conveyance devices.
- Stored materials shall not block or obstruct access to emergency exits, fire extinguishers, alarm boxes, first aid equipment, lights, electrical control panels, or other control boxes.
- "NO SMOKING" signs shall be conspicuously posted, as needed, in areas where combustible or flammable materials are stored and handled.
- Cylindrical materials such as pipes and poles shall be stored in racks, or stacked on the ground and blocked.

Special Precautions for Hazardous or Incomplete Materials Storage

Generally, materials are considered hazardous if they are ignitable, corrosive, reactive, or toxic. Manufacturers and suppliers of these materials must provide the recipient with MSDSs, which describe their hazardous characteristics and give instructions for their safe handling and storage.

Many hazardous materials are incompatible, which means they form mixtures that may have hazardous characteristics not described on the individual MSDSs. The following special precautions shall be followed regarding the storage of hazardous materials:

- Based on the information available on the MSDSs, incompatible materials shall be kept in separate storage areas.
- Warning signs shall be conspicuously posted, as needed, in areas where hazardous materials are stored.

5.2.6 HOISTING AND RIGGING

Wire ropes, chains, ropes, and other rigging equipment will be inspected prior to each use and as necessary during use to assure their safety. Defective rigging equipment will be immediately removed from service.

Rigging will not be used unless the weight of the load falls within the rigging's safe work operating range. The authorized rigger prior to any "pick" or lifting operation must verify this.

Only personnel trained in safe rigging procedures will be authorized to engage in rigging procedures. Additionally, the rigger must understand and use recognized crane signals.

Job or shop hooks and links and other makeshift fasteners shall not be used. When U-bolts are used for eye splices, the U-bolt will be applied so the "U" section is in contact with the dead end of the rope.

Wire ropes, chains, ropes, and other rigging equipment shall be stored where they will remain clean, dry, and protected from the weather and corrosive fumes.

The proper length of rope or chain slings will be used to avoid wide-angle lifts and dangerous slack. Knotted ropes or lengths of ropes reduced by bolts, knots, or other keepers will not be used.

5.2.7 CRANES AND HOISTS

The use of cranes will take place during project activities, and carries many associated hazards. Potential contact with overhead electrical lines and potential crushing of workers who may wander into the swing path radius of the crane are just two. When cranes are brought on-site for use, CRA will ensure that the following safety practices are enforced:

- Crane operator will provide a copy of the crane's annual inspection report to the SS prior to initiating operations.
- Operators of cranes and hoists will make visual and operational inspections of the equipment prior to use. Any discrepancies that would jeopardize the safe operation of the equipment will be corrected prior to use. These inspections are to be documented via a daily inspection checklist or equivalent.
- The posted capacity of the crane will be adhered to and overloading of the equipment will not be allowed.
- The accessible swing radius of the crane will be demarcated and/or barricaded to prevent employees from entering the area.
- The crane's load and boom will be kept a minimum of 10 feet away from utility lines and 20 feet from power lines. Any deviation must be approved by the PM in conjunction with the RSHM.
- A competent person will investigate the soil for stability and determine the necessary amount of "cribbing" to be placed under the outrigger pads or if crane mats are necessary.
- No personnel will be permitted to work under a suspended load.
- Except for emergency communications, the operator will only recognize signs and signals from one designated signal person. This signal person will serve as the crane operator's eyes in areas that the crane operator cannot see. This person will be familiar with crane signals, operation of the crane, and safe methods of securing and handling a load.

5.2.8 MANUAL LIFTING

When lifting objects, use the following proper lifting techniques:

- Feet must be parted, with one foot alongside the object being lifted and one foot behind. When the feet are comfortably spread, a more stable lift can occur and the rear foot is in a better position for the upward thrust of the lift.
- Use the squat position and keep the back straight – but remember that straight does not mean vertical. A straight back keeps the spine, back muscles, and organs of the body in correct alignment. It minimizes the compression of the guts that can cause a hernia.
- Grip is one of the most important elements of correct lifting. The fingers and the hand are extended around the object you're going to lift – using the full palm. Fingers have very little power – use the strength of your entire hand.
- The load must be drawn close, and the arms and elbows must be tucked into the side of the body. Holding the arms away from the body increases the strain on the arms and elbows. Keeping the arms tucked in helps keep the body weight centered.
- Do not lift more than 50 pounds without getting assistance from a coworker or using a device that will provide a mechanical assist.

The body must be positioned so that the weight of the body is centered over the feet. This provides a more powerful line of thrust and also ensures better balance. Start the lift with a thrust of the rear foot. Do not twist your back when lifting or moving heavy objects.

5.2.9 HAND AND POWER TOOLS

Hand Tools

- Hand tools must meet the manufacturer's safety standards.
- Hand tools must not be altered in any way.
- At a minimum, eye protection must be used when working with hand tools.
- Wrenches (including adjustable, pipe, end, and socket wrenches) must not be used when jaws are sprung to the point that slippage occurs.
- Impact tools (such as drift pins, wedges, and chisels) must be kept free of mushroom heads.

- Wooden handles must be free of splinters or cracks and secured tightly to the tool.

Power Tools

- All power tools must be inspected regularly and used in accordance with the manufacturer's instructions and the tool's capabilities.
- Electric tools must not be used in areas subject to fire or explosion hazards, unless they are approved for that purpose.
- Portable electric tools must be connected to a Ground Fault Circuit Interrupter (GFCI) when working in wet areas.
- Proper eye protection must be used when working with power tools.
- Personnel must be trained in the proper use of each specific tool.
- Any damaged or defective power tools must be immediately tagged and removed from service.

5.2.10 ELECTRICAL HAZARDS

Only qualified individuals will be allowed to perform work on electrical circuits or perform electrical work on equipment. No employee shall be permitted to work on any part of an electrical power circuit unless the person is protected against electric shock by de-energizing the circuit and grounding it, or ensuring that it has been locked and tagged out:

- All electrical wiring and equipment shall be a type listed by Underwriters Laboratories (UL) or Factory Mutual (FM) for the specific application.
- All installations shall comply with the National Electric Code (NEC) and the National Electric Safety Code (NESC).
- All electrical circuits shall be grounded according to NEC and NESC Code. GFCIs shall be used in the absence of properly grounded circuitry or when portable tools must be used around wet areas.
- Generators and like equipment will be grounded in accordance with NEC, unless exempted by NEC 250-6.
- All live wiring or equipment shall be guarded to protect all persons or objects from harm.

5.2.11 CONTROL OF HAZARDOUS ENERGY

Hazardous energy sources may be encountered during the servicing and maintenance of machines and equipment, in which the unexpected energization or startup of the machines or equipment could cause injury to employees.

The minimum performance requirements to control hazardous energy require that employers develop and implement an energy control program. The elements of an energy control program are as follows:

- Lockout/tagout
- Employee protection
- Energy control procedure
- Protective materials and hardware
- Periodic inspections
- Training and communication
- Energy isolation
- Employee notification

Project personnel who are required to conduct operations and maintenance activities that will require the isolation of an energy hazard through the use of a lockout/tagout device shall follow the CRA program requirements and written procedures for that operation.

Employee Training

Employees authorized to attach and remove lockout/tagout devices shall be provided with initial training regarding the safe application, usage, and removal of such devices. Each authorized employee will receive training in the recognition of applicable hazardous energy sources, the type and magnitude of the associated energy, and the methods necessary for energy isolation and control.

All authorized employees will be provided with refresher training annually, or at more frequent intervals whenever the following conditions apply:

- A job assignment change
- A change in machinery or equipment, or a process change that presents new hazards

- A change in the energy control procedures
- Possible deficiencies in the employee's understanding of the following
 - The hazards associated with the energy that controls the machinery or equipment in the employee's work area
 - Application and removal procedures for lockout/tagout devices

Employees who work in areas where lockout/tagout procedures are used shall receive initial and annual refresher training in the purpose and use of lockout/tagout devices and principles behind their use.

5.2.12 EXCAVATIONS

A designated competent person will observe all CRA excavation and trenching operations that employees shall enter. The competent person shall be responsible for evaluating and inspecting excavation and trenching operations to prevent possible cave-in and entrapment, and to avoid other hazards presented by excavation activities.

Each employee in an excavation shall be protected from cave-ins by one of three systems:

- Sloping and benching systems
- Shoring
- Shielding systems

All excavation and trenching operations shall be conducted in accordance and in compliance with OSHA's Standards for the Construction Industry, specifically outlined in CRA's Safety and Health Program for excavation and trenching activities. At a minimum, the following safety guidelines shall be adhered to while conducting excavation and trenching activities:

- Excavation and trenching operations require pre-planning to determine whether sloping or shoring systems are required, and to develop appropriate designs for such systems. Also, the estimated location of all underground installations must be determined before digging/drilling begins. Necessary clearances must be observed.
- If there are any nearby buildings, walls, sidewalks, trees, or roads that may be threatened or undermined by the excavation, or where the stability of any of these

items may be endangered by the excavation, they must be removed or supported by adequate shoring, bracing, or underpinning.

- Excavations may **not** go below the base of footings, foundations, or retaining walls unless they are adequately supported or a person who is registered as a Professional Engineer (PE) has determined that they will not be affected by the soil removal. Civil engineers or those with licenses in a related discipline and experience should be consulted in the design and use of sloping and shoring systems. PE qualifications must be documented in writing.

Access and Egress

Personnel access and egress from trench and/or excavations are as follows:

- A stairway, ladder, ramp, or other means of egress must be provided in trenches greater than 4 feet deep and for every 25 feet of lateral travel
- All ladders shall extend 3 feet above the top of the excavation
- Structural ramps used for access or egress of equipment will be designed by a competent person qualified in structural design or by a licensed professional engineer

Atmosphere Monitoring and Testing

Air quality is measured using three parameters: oxygen concentration, flammability, and the presence of hazardous substances.

Employees should not be exposed to atmospheres containing less than 19.5 percent oxygen or having a lower flammable limit greater than 10 percent, and employees should not be exposed to hazardous levels of atmospheric contaminants.

Whenever potentially hazardous atmospheres are suspected in excavations and trenches, a competent person shall test the atmosphere. Detector tubes, gas monitors, and explosion meters are examples of monitoring equipment that may be used.

In the event that an unusual odor or liquid is suspected in excavations and trenches, the competent person shall stop work on the site and arrange for air quality assessment and mitigation, if necessary.

Atmospheric testing and monitoring shall be performed in excavations in or adjacent to landfill areas, in areas where hazardous materials are/were stored, or in areas where the presence of hazardous materials is suspected.

Daily Inspections

The competent person shall perform daily inspections of excavations, the adjacent areas, and all protective systems for situations that could potentially result in slope failure.

Additionally, the competent person shall be aware of the potential for confined space situations and other hazardous work conditions.

The competent person shall inspect, evaluate, and complete the excavation checklist at the following intervals:

- Prior to the start of work, after each extended halt in work, and as needed throughout the shift, as new sections of the excavation or trench are opened
- After every rainstorm and other natural or manmade event that may increase the load on the walls of the excavation, or otherwise affect their stability

The inspections shall be documented using the CRA Excavation Inspection Checklist Form, which is presented in Appendix A.

The competent person shall stop the work and instruct all employees to leave the excavation or trench when any potential hazards are detected. The competent person has the authority to immediately suspend work if any unsafe condition is detected.

5.2.13 FALL HAZARDS

Personnel that will use aerial lifts, ladders and have the potential hazard of working on elevated surfaces or platforms of 6 feet or greater during project activities shall follow CRA's Safety and Health Program for fall protection. The fall protection program includes leading edge work including excavations, rooftop work, aerial lifts, ladders, and scaffolds. Specific guidelines for portable ladders are outlined below.

The SS is required to prepare a written emergency rescue plan prior to personnel wearing personal fall arrest equipment. The purpose of this is to enable a quick and safe rescue as individuals suspended in air may go into shock as soon as 15 minutes.

5.2.14 LADDERS

Employees who use ladders on work sites must be familiar with safe ladder usage.

- Use the 4-to-1 ratio. Place the ladder so its feet are 1 foot away from what it leans against for every 4 feet in height to the point where the ladder rests. Example: If the top of a 16-foot ladder leans against a wall, its feet should be placed 4 feet from the wall. The "fireman's method" is a convenient way of checking the angle of the ladder. Place your toes against the base of the ladder; fully extend both arms toward the side rail and parallel to the ground. When standing erect you should be able to hold the ladder's side rails.
- Do not use a ladder in a horizontal position as a runway or a scaffold.
- Do not place a ladder in front of a door that opens toward it unless the door is locked, blocked, or guarded by someone.
- Place a portable ladder so that both side rails have a secure footing. Provide solid footing on soft ground to prevent the ladder from sinking.
- Place the ladder's feet on a substantial and level base, not on a movable object.
- On uneven surfaces, use a block, wedge, or ladder foot.
- On wet or oily pavement, a smooth floor, or an icy or metal surface, the ladder footing must be lashed, blocked, or otherwise secured.
- Do not lean a ladder against unsafe backing, such as loose boxes or barrels.
- When using a ladder for access to high places, securely lash or otherwise fasten the ladder to prevent it from slipping.
- To gain access to a roof or elevated platform, extend the ladder at least three rungs (3 feet) above the point of support.

Ascending or Descending of Ladders

- Maintain three points of contact at all time when going up or down. If material must be handled, raise or lower it with a rope.
- Always face the ladder when ascending or descending.
- Maintain clean, dry footwear as much as possible to prevent slipping on the rungs.

5.2.15 SLIP/TRIP/HIT/FALL

Slip/trip/hit/fall injuries are the most frequent of all injuries to workers. They occur for a wide variety of reasons, but can be minimized by the following prudent practices:

- Spot check the work area to identify hazards.
- Establish and utilize a pathway which is most free of slip and trip hazards.
- Beware of trip hazards such as wet floors, slippery floors, and uneven surfaces or terrain.
- Carry only loads which you can see over.
- Keep work areas clean and free of clutter, especially in storage rooms and walkways.
- Communicate hazards to on-site personnel.
- Secure all loose clothing and ties, and remove jewelry while around machinery.
- Report and/or remove hazards.
- Keep a safe buffer zone between workers using equipment and tools.

5.2.16 HEAT STRESS

Recognition and Symptoms

Temperature stress is one of the most common illnesses that project personnel face when working during periods when temperatures and/or humidity are elevated. Acclimatization and frequent rest periods must be established for conducting activities where temperature stress may occur. Below are listed signs and symptoms of heat stress. Personnel should follow appropriate guidelines if any personnel exhibit these symptoms:

Heat Rash	Redness of skin. Frequent rest and change of clothing.
Heat Cramps	Painful muscle spasms in hands, feet, and/or abdomen. Administer lightly salted water by mouth, unless there are medical restrictions.
Heat Exhaustion	Clammy, moist, pale skin, along with dizziness, nausea, rapid pulse, fainting. Remove to cooler area and administer fluids.
Heat Stroke	Hot dry skin; red, spotted or bluish; high body temperature of 104°F; mental confusion; loss of consciousness; convulsions or coma. Immediately cool victim by immersion in cool water. Wrap with

wet sheet while fanning, sponge with cool liquid while fanning; treat for shock. **DO NOT DELAY TREATMENT. COOL BODY WHILE AWAITING AMBULANCE.**

Work Practices

The following procedures will be carried out to reduce heat stress:

- Heat stress monitoring.
- Acclimatization.
- Work/rest regimes (schedule of breaks) – Mandatory breaks scheduled in summer months or during high risk activities for heat stress.
- Heat stress safety personal protective equipment (cool-vests, bandanas, etc.).
- Liquids that replace electrolytes, water, and salty foods available during rest.
- Use of buddy system.

Acclimatization

The level of heat stress at which excessive heat strain will result depends on the heat tolerance capabilities of the worker. Each worker has an upper limit for heat stress beyond which the resulting heat strain can cause the worker to become a heat casualty. In most workers, appropriate repeated exposure to elevated heat stress causes a series of physiologic adaptations called acclimatization, whereby the body becomes more efficient in coping with the heat stress. Work/rest regimes planned as a component of project preparation and discussed during the daily tailgate safety meetings.

Worker Information and Training

All new and current employees who work in areas where there is a reasonable likelihood of heat injury or illness should be kept informed through continuing education programs (hazards, effects, preventative measures, drug/alcohol interaction, etc.).

5.2.17 SUN EXPOSURE

Overexposure to sunlight is a common concern when field activities occur during warm weather conditions. Overexposure can occur on clear, sunny days as well as on overcast

and cloudy days. Ultraviolet (UV) rays from the sun can cause skin damage or sunburn, but can also result in vision problems, allergic reactions, and other skin concerns. Two types of UV rays are emitted from the sun: UVA and UVB rays.

UVB rays cause sunburn, skin cancer, and premature aging of the skin. UVB rays stimulate tanning but are also linked to other problems such as impaired vision, skin rashes, and some allergic and other reactions to certain drugs. Extra care should be taken if activities are to be conducted on or near water. Sunlight reflected off the surface of the water is intensified resulting in accelerated effects. The following steps should be taken to protect against overexposure to sunlight:

- **Always Use Sunscreen:** Apply a broad-spectrum sunscreen with Sun Protection Factor (SPF) of at least 15 or higher liberally on exposed skin. Reapply every 2 hours or more. Even waterproof sunscreen can come off when you towel off or sweat.
- **Cover Up:** Wearing tightly woven, loose-fitting, and full-length clothing is a good way to protect your skin from UV rays.
- **Wear a Hat:** A hat with a wide brim offers good sun protection to your eyes, ears, face, and the back of your neck – areas particularly prone to overexposure to the sun.
- **Wear Sunglasses That Block 99 to 100 Percent of UV Radiation:** Sunglasses that provide 99 to 100 percent UVA and UVB protection will greatly reduce sun exposure that can lead to cataracts and other eye damage. Check the label when buying sunglasses.
- **Seek Shade:** Shade is a good source of protection, but keep in mind that shade structures (e.g., trees, umbrellas, canopies) do not offer complete sun protection.
- **Limit Time in the Midday Sun:** The sun's rays are strongest between 10 a.m. and 4 p.m. Whenever possible, limit exposure to the sun during these hours.

5.2.18 COLD STRESS

Cold stress is similar to heat stress in that it is caused by a number of interacting factors including environmental conditions, clothing, workload, etc., as well as the physical and conditioning characteristics of the individual. Fatal exposures to cold have been reported in employees failing to escape from low environmental air temperatures or from immersion in low temperature water. Hypothermia, a condition in which the body's deep core temperature falls significantly below 98.6°F (37°C), can be life threatening. A drop in core temperature to 95°F (35°C) or lower must be prevented.

Air temperature is not sufficient to determine the cold hazard of the work environment. The wind chill must be considered as it contributes to the effective temperature and insulating capabilities of clothing. The equivalent chill temperature should be used when estimating the combined cooling effect of wind and low air temperatures on exposed skin or when determining clothing insulation requirements to maintain the body's core temperature.

The body's physiologic defense against cold includes constriction of the blood vessels, inhibition of the sweat glands to prevent loss of heat via evaporation, glucose production, and involuntary shivering to produce heat by rapid muscle contraction.

The frequency of accidents increases with cold temperature exposures as the body's nerve impulses slow down, individuals react sluggishly, and numb extremities make for increased clumsiness. Additional safety hazards include ice, snow blindness, reflections from snow, and possible skin burns from contact with cold metal.

Pain in the extremities may be the first early warning of danger to cold stress. During exposure to cold, maximum severe shivering develops when the body temperature has fallen to 95°F (35°C). This must be taken as a sign of danger to the employees on site, and cold exposures should be immediately terminated for any employee when severe shivering becomes evident. Useful physical or mental work is limited when severe shivering occurs.

Predisposing Factors for Cold Stress

There are certain predisposing factors that make an individual more susceptible to cold stress. It is the responsibility of the project team members to inform the SS to monitor an individual, if necessary, or use other means of preventing/reducing the individual's likelihood of experiencing a cold related illness or disorder.

Predisposing factors that will increase an individual's susceptibility to cold stress are listed below:

- **Dehydration:** The use of diuretics and/or alcohol, or diarrhea can cause dehydration. Dehydration reduces blood circulation to the extremities.
- **Fatigue During Physical Activity:** Exhaustion reduces the body's ability to constrict blood vessels. This results in the blood circulation occurring closer to the surface of the skin and the rapid loss of body heat.

- **Age:** Some older and very young individuals may have an impaired ability to sense cold.
- **Poor Circulation:** Vasoconstriction of peripheral vessels reduces blood flow to the skin surface.
- **Heavy Work Load:** Heavy workloads generate metabolic heat and make an individual perspire even in extremely cold environments. If perspiration is absorbed by the individual's clothing and is in contact with the skin, cooling of the body will occur.
- **The Use of PPE:** PPE usage that traps sweat inside the PPE may increase an individual's susceptibility to cold stress.
- **Lack of Acclimatization:** Acclimatization, the gradual introduction of workers into a cold environment, allows the body to physiologically adjust to cold working conditions.
- **History of Cold Injury:** Previous injury from cold exposures may result in increased cold sensitivity.

Prevention of Cold Stress

There are a variety of measures that can be implemented to prevent or reduce the likelihood of employees developing cold related ailments and disorders. These include acclimatization, fluid and electrolyte replenishment, eating a well balanced diet, wearing warm clothing, the provision of shelter from the cold, thermal insulation of metal surfaces, adjusting work schedules, and employee education.

- **Acclimatization:** Acclimatization is the gradual introduction of workers into the cold environment to allow their bodies to physiologically adjust to cold working conditions. However, the physiological changes are usually minor and require repeated uncomfortably cold exposures to induce them.
- **Fluid and Electrolyte Replenishment:** Cold, dry air can cause employees to lose significant amounts of water through the skin and lungs. Dehydration affects the flow of blood to the extremities and increases the risk of cold injury. Warm, sweet, caffeine-free, non-alcoholic drinks and soup are good sources to replenish body fluids.
- **Eating a Well Balanced Diet:** Restricted diets including low salt diets can deprive the body of elements needed to withstand cold stress. Eat high-energy foods throughout the day.

- **Warm Clothing:** It is beneficial to maintain air space between the body and outer layers of clothing in order to retain body heat. However, the insulating effect provided by such air spaces is lost when the skin or clothing is wet.
- **Work/Rest Regimes:** Schedule work during the warmest part of the day, if possible. Rotate personnel and adjust the work/rest schedule to enable employees to recover from the effects of cold stress.

The parts of the body most important to keep warm are the feet, hands, head, and face. As much as 40 percent of body heat can be lost when the head is exposed.

5.2.19 ADVERSE WEATHER CONDITIONS

The SS shall decide on the continuation or discontinuation of work based on current and pending weather conditions. Electrical storms, heavy rains, hurricanes, tornado warnings, and sustained strong winds [approximately 40 mph (65 k/hr)] are examples of conditions that would call for the discontinuation of work and evacuation of site.

In addition, no work with elevated super structures (e.g., drilling, crane operations, etc.) will be permitted during any type of electrical storm or during wind events that have wind speeds exceeding 40 mph (65 k/hr).

5.2.20 HOT WORK HAZARDS

Personnel conducting hot work, including burning, pipe welding, cutting, brazing, grinding, or other activities capable of producing ignition sources, or personnel working in the vicinity of hot work, must adhere to the following practices:

- No open flames will be used without prior approval by SS.
- Torches will be equipped with anti-flashback devices.
- Where electrode holders are left unattended, electrodes will be removed and the holders will be replaced so they cannot make electrical contact.
- All arc welding and cutting cables will be completely insulated. No repairs or splices will be located within 10 feet of the electrode holder, except where splices are insulated equal to the insulation of the original cable. Defective cable will be repaired or replaced.

- No welding, cutting, or hot work will be conducted on used drums, tanks, or containers until they have been cleaned and purged.
- Only employees with documented training and work experience in these activities shall conduct hot work.
- At a minimum, a 2A/10BC-type fire extinguisher and a first aid kit must be available. When hot work is underway, and for an agreed upon period afterwards, a fire watch must be maintained.
- Employees involved in the operation shall wear appropriate personal protective equipment specific to the task, such as a welder's helmet with an appropriate eye shade, leather or heavy duty cloth gloves, coveralls or a long-sleeved shirt and pants to prevent skin exposure, steel toed or safety shoes, hearing protection, etc.
- Use CRA's Hotwork Permit for all hot work activity.
- Appropriate activity segregation equipment, such as welding screens for welding operations, should be erected whenever practical to isolate the hot work from the remainder of the site activities and site personnel.
- The area should be cleared of any flammable and combustible materials before hot work begins.

5.3 BIOLOGICAL HAZARDS

CRA employees conduct numerous project activities that have the possibility of encountering biological hazards, which include bloodborne pathogens, insects, spiders, scorpions, rodents, snakes, and large predators. This section identifies precautions to be taken if these hazards are encountered.

5.3.1 VEGETATION OVERGROWTH

Overgrown weeds, bushes, trees, grass, and other vegetation are fire and safety hazards.

There are a number of hidden hazards not immediately recognized due to the overgrowth of vegetation in areas where field activities may occur, including discarded junk, litter, and debris. Construction materials such as boards, nails, concrete, and other debris may be hidden beneath blades of tall grass, weeds, and bushes. Other hazards may include steep slopes, potholes, trenches, soft spots, dips, etc.; all dangerously concealed from the view of the individual walking or operating motorized equipment in

the area. Additionally, there are biological hazards such as snakes, ticks, chiggers, and mosquitoes that breed in overgrowth conditions.

Here are some simple actions you can take:

- Assess the work area and determine if the area requires vegetation clearance. Consider that overgrowth that extends above the lowest level of motorized equipment (i.e., bumper or fender) or 6 inches (15 cm) above your ankle has hidden hazards that you will not be able to readily identify.
- Determine if the area is safe to walk or whether you need motorized equipment. Consider the limitations of the equipment.
- Identify slip, trip, and fall hazards and remove from the general work area. Remember to give adequate clearance so that the items being removed do not pose future hazards.
- Adequately protect yourself against the hazards by wearing boots that protect the ankles, long pants, and using insecticides.
- Consider the limitations of manual or mechanical equipment for the clearance of overgrowth, particularly the safety hazards when using sling blades, machetes, weed eaters, bush hogs, or other brush removing equipment.

Before taking any action, determine whether there any ecological issues that would affect or prevent the removal of overgrowth in protected areas such as wetlands, wildlife habitats, or sanctuaries for endangered and/or protected species.

5.3.2 POISONOUS PLANTS

Common **Poison Ivy** grows as a small plant, a vine, and a shrub. Poison Ivy occurs in every state. The leaves always consist of three glossy leaflets. **Poison Sumac** grows as a woody shrub or small tree 5 to 25 feet (1.5 to 7.5 meters) tall. It usually contains nine leaves, with eight paired leaves and one on top, and is common in swampy areas. The plants are potent sensitizers and can cause a mild to severe allergic reaction, referred to as "contact dermatitis." These plants are found in the U.S. and Canada.

Dermatitis, in Rhus-sensitive persons, may result from contact with the milky sap found in the roots, stems, leaves, and fruit, and may be carried by contacted animals, equipment or APPCrel.

The best form of prevention is to avoid contact. Wearing long sleeves and gloves, and disposable clothing, such as Tyvek, is recommended in high-risk areas to avoid exposure from contaminated APPCrel. Barrier creams and cleaners are also recommended.

5.3.3 INSECTS

Bees, Wasps, and Yellow Jackets

Insects that sting are members of the order Hymenoptera of the class Insecta. There are two major subgroups: aphids (honeybees, bumblebees) and vespids (wasps, yellow jackets, hornets). Aphids are docile and usually do not sting unless provoked. The stinger of the honeybee has multiple barbs, which usually detaches after a sting. Vespids have few barbs and can inflict multiple stings.

Types of stinging insects that might be encountered on a site may include:

- Carpenter Bees
- Bumblebees
- Mud Dauber Wasps
- Yellow Jackets
- Cicada Killer Wasps
- Giant Hornets
- Honeybees
- Paper Wasps

Symptoms

If you are stung there are three types of reactions you can have, a normal, a toxic, or an allergic reaction.

- Normal reaction – only lasts a few hours and consists of pain, redness, swelling, itching, and warmth near the sting area.
- Toxic reaction – will last for several days and results from multiple stings and may cause cramps, headaches, fever, and drowsiness.
- Allergic reaction – might cause hives, itching, swelling, tightness in the chest area and a possibility of breathing difficulties, dizziness, unconsciousness, and cardiac arrest.

The stingers of many Hymenoptera may remain in the skin and should be removed as quickly as possible without concern for the method of removal. An ice cube placed over the sting will reduce pain; aspirin may also be useful. Persons with known

hypersensitivity to such stings should carry a kit containing epinephrine in a prefilled syringe. Antihistamines may help decrease hives and angioedema. Persons who have severe symptoms of anaphylaxis, have positive venom skin test results, and are at risk for subsequent stings should receive immunotherapy regardless of age or time since anaphylaxis.

Precautions

The following precautions can help you avoid stings. Try to wear light colored clothing and shy away from dark or floral prints. Avoid wearing perfumes, hairsprays, colognes, and scented deodorants while working outside. If eating outside, keep all food and drinks covered; sweet foods and strong scents attract stinging insects as well. Never swat or swing at the insect, it is best to wait for it to leave, softly blow it away, or gently brush it aside. Seek medical attention when the reaction to a sting includes swelling, itching, dizziness or shortness of breath.

If physical control measures are not effective, use a pesticide that will have a minimal impact on both you and the environment.

Mosquitoes

Mosquitoes are common pests that can be found in any state and any work environment where warm, humid conditions exist. Mosquitoes can pass along diseases such as West Nile virus and Malaria. Several different methods can be used to control adult mosquito populations: repellants such as DEET, mosquito traps, foggers, and vegetation and water management. Mosquitoes are found from the tropics to the Arctic Circle and from lowlands to the peaks of high mountains.

5.3.4 THREATENING DOGS

If you are approached by a frightened or menacing dog:

- i) do not attempt to run and don't turn your back;
- ii) stay quiet, and remember to breathe;
- iii) be still, with arms at sides or folded over chest with hands in fists;
- iv) slowly walk away sideways;

- v) don't stare a dog in the eyes, as this will be interpreted as a threat;
- vi) avoid eye contact;
- vii) if you have a jacket, you could wrap it around your arm and should he snap, take the bite harmlessly; and
- viii) try calling it's bluff. Yell, "sit!" "Stay!" or "go home!" You might convince the dog that you are the stronger in the situation.

5.3.5 RODENTS

Rodentia: (rats, mice, beavers, squirrels, guinea pigs, capybaras, coypu)

Rodents, or Rodentia, are the most abundant order of mammals. There are hundreds of species of rats; the most common being the black and brown rat.

The **Brown Rat** has small ears, blunt nose, and short hair. It is approximately 14 to 18 inches long (with tail). They frequently infest garbage/rubbish, slaughterhouses, domestic dwellings, warehouses, shops, and supermarkets, in fact anywhere there is an easy meal and potential nesting sites.

The **Black Rat** can be identified by its tail, which is always longer than the combined length of the head and body. It is also slimmer and more agile than the Norwegian or Brown rat. Its size varies according to its environment and food supply.

The **House Mouse** has the amazing ability to adapt and it now occurs more or less in human dwellings. In buildings, mice will live anywhere and they are very difficult to keep out. Mice are also totally omnivorous; in other words, they will eat anything.

Rats and mice often become a serious problem in cold winter months when they seek food and warmth inside buildings. They may suddenly appear in large numbers when excavation work disturbs their in-ground nesting locations or their food source is changed.

There are six major problems caused by rats and mice:

- i) they eat food and contaminate it with urine and excrement;

- ii) they gnaw into materials such as paper, books, wood, or upholstery, which they use as nest material. They also gnaw plastic, cinder blocks, soft metals such as lead and aluminum, and wiring, which may cause a fire hazard;
- iii) rats occasionally bite people and may kill small animals;
- iv) they, or the parasites they carry (such as fleas, mites, and worms), spread many diseases such as salmonella, trichinosis, rat bite fever, hantavirus, Weil's disease, and the bubonic plague;
- v) rats can damage ornamental plants by burrowing among the roots or feeding on new growth or twigs. They also eat some garden vegetables, such as corn and squash; and
- vi) rats and mice are socially unacceptable. These rodents have been a problem for centuries, chiefly because they have an incredible ability to survive and are so difficult to eliminate. In addition, they are extremely compatible with human behavior and needs.

5.3.6 SNAKES

Snakes may be found in any region of the country. While many snakes encountered are not venomous, a few are; so it is best that you give a wide berth to all snakes. Of the 7,000 venomous snakebites reported each year, only about 15 prove to be fatal, so your chances of survival are extremely high. The usual snake encounter is one in which they see you before you see them, and they slither away from you quickly, startling you. If you see a snake, back away from it slowly and do not touch it. If you or someone you know are bitten try to see and remember the color and shape of the snake, which can help with treatment of the snakebite.

Venomous snakes include the Coral Snake, Cobra, and Pit Vipers, such as the Cottonmouth (Water Moccasin), Copperhead, and Rattlesnake. The venom of pit vipers is primarily *hematoxic* because it acts upon the victim's blood system. This venom breaks down blood cells and blood vessels and affects heart action. Bite victims experience severe burning pain, localized swelling and discoloration for the first 3 to 30 minutes, followed by nausea, vomiting, and occasional diarrhea and usually shock.

Preventing Snakebites

Watching where you step, put your hands, or sit down is one of the best ways to prevent snakebites. Poisonous snakes live on or near the ground and often like rocks,

woodpiles, and other spots that offer both a place to sun and a place to hide. Most bites occur in and around the ankle. About 99 percent of all bites occur below the knee, except when someone accidentally picks up or falls on the snake.

Watching where you step and wearing boots in tall grass can prevent most snakebites. Another means to protect against snakebites is snake chaps.

Emergency First Aid for Poisonous Snakebite

Although it is important to obtain medical aid immediately, emergency first aid can slow the spread of poison from the bite. Remain calm and avoid unnecessary movement, especially if someone is with you. The rate of venom distribution throughout your body will be slower if you are still and quiet. *Do not* use home remedies, and *do not* drink alcoholic beverages.

In addition, learn the following procedures so you do not waste time before getting medical attention.

If less than 60 minutes is required to reach a hospital or other medical aid, follow this procedure:

- i) apply a constricting band 2 to 4 inches on each side of the bite. The band should be loose enough to slip your finger under without difficulty, so that you do not cut off circulation completely. Properly applied, the constricting band can be left safely in place for 1 hour without adjustment;
- ii) if ice is available, place some in a towel, shirt, or other piece of cloth and apply it to the bite area. Do not bind it to the bite, but keep it loosely in place. Do not use the ice pack for more than *1 hour*. The objective is to cool the venom and slow its action, but not to freeze the tissue; and
- iii) the primary function of the constricting band and ice pack is to slow the spread of venom through your body. Remove them slowly so there will not be a sudden rush of venom through your blood stream.

6.0 AIR MONITORING PROGRAM

The air-monitoring program will consist of an initial exposure assessment for lead, monitoring for organic vapors using instruments that will provide real time data and a community air-monitoring program for particulate.

All monitoring equipment will be calibrated on a daily basis in accordance with the manufacturer's guidelines, and such calibrations will be recorded in the Site daily logbook. Results of all daily air monitoring also will be recorded in the Site daily log book.

A photo-ionization detector (PID) equipped with an 11.7 eV lamp will be used for monitoring the potential presence of organic vapors. A background reading will be established daily prior to any Site activities, or if the wind changes direction during the course of the day a new background reading will be recorded. Air monitoring will be conducted hourly in the breathing zone of workers in the EZ or as deemed necessary by the SS based on Site-specific conditions.

6.1 INITIAL EXPOSURE ASSESSMENT MONITORING PROGRAM

The presence of lead in the soils at the Site presents a health and safety hazard for project personnel during excavation activities. OSHA has a specific construction standard for lead (1926.62). This standard requires employers to document the level of lead that personnel are being exposed to when it is present in the work place. The lead standard requires employers to treat employees as if they are being exposed to lead above the action level until such time they can demonstrate that their personnel are not. This determination will be accomplished with the exposure assessment monitoring that will be conducted during initial stages of the project where samples will be collected during the startup of activities where personnel will face the potential for exposure. The SS will determine the number and frequency of sampling events. At a minimum, sampling will be conducted at the initiation of each new task where there is potential for exposure or when Site conditions change significantly (e.g. from wet to dry conditions). Until it is demonstrated that project personnel are not being exposed to lead above the action levels, project personnel will wear air purifying respirators and disposable Tyvek® coveralls.

The PM and SS will implement other required elements of the lead standard as may be required based on a review of the air sampling analytical data. In addition to sampling

for lead, the samples may be analyzed for the presence of other metals known to be present on Site. NIOSH Method 7300 for metals will be followed during sample collection and analysis. The samples will be sent to an American Industrial Hygiene Association (AIHA) accredited laboratory for analysis with a request for a rush turn around time. Results for all personnel air sampling will be shared with all project personnel.

6.2 COMMUNITY AIR MONITORING

Air monitoring will also be performed during performance of the project activities to ensure that the community will not be adversely impacted during the project activities. A Community Air Monitoring Plan has been developed in accordance with NYSDEC Department of Remediation Technical Guidance for Site Investigation and Remediation (DER-10) Appendix 1A New York State Department of Health (NYSDOH) Generic Community Air Monitoring Plan and is provided as Appendix C.

6.2 PERSONAL AIR MONITORING PROGRAM

The PM and SS shall also implement a personnel air-monitoring program for those project personnel who have the highest risk of potential for exposure to chemicals present on Site. This monitoring will be done in compliance with 1926.65(h). Samples will be collected during startup of those project activities where personnel face potential exposure. The PM and SS will determine the number and frequency of sampling events. Appropriate NIOSH methodology will be followed and all samples are to be sent to an American Industrial Hygiene Association (AIHA) accredited laboratory. Results for all personnel air sampling will be posted for all project personnel to review.

7.0 GENERAL SAFETY PRACTICES

7.1 GENERAL SAFETY ISSUES

- i) at least one copy of this HASP must be at the project Site, in a location readily available to all personnel, and reviewed by all project personnel prior to starting work;
- ii) all project personnel must use the buddy system (working in pairs or teams).
- iii) food, beverages, or tobacco products must not be present or consumed in the EZ and CRZ. Cosmetics must not be applied within these zones;
- iv) emergency equipment such as eyewash, fire extinguishers, etc., must be removed from storage areas and staged in readily accessible locations;
- v) contaminated waste, debris, and clothing must be properly contained and legible and understandable precautionary labels must be affixed to the containers;
- vi) removing contaminated soil from protective clothing or equipment with compressed air, shaking, or any other means that disperses contaminants into the air is prohibited;
- vii) containers must be moved only with the proper equipment, and must be secured to prevent dropping or loss of control during transport;
- viii) visitors to the Site must abide by the following; and
- ix) all visitors must be instructed to stay outside the EZ and CRZ and remain within the SZ during the extent of their stay. Visitors must be cautioned to avoid skin contact with surfaces which are contaminated or suspected to be contaminated.

7.2 BUDDY SYSTEM

All project personnel must use the buddy system. Visual contact must be maintained between crew members at all times, and crew members must observe each other for signs of chemical exposure, heat, or cold stress. Indications of adverse effects include, but are not limited to:

- i) changes in complexion and skin coloration;
- ii) changes in coordination;

- iii) excessive salivation and pupillary response; and
- iv) changes in speech pattern.

Project personnel must also be aware of potential exposure to possible safety hazards, unsafe acts, or noncompliance with safety procedures. Individuals must inform their partners or fellow team members of non-visible effects of exposure to toxic materials. The symptoms of such exposure may include:

- i) headaches;
- ii) dizziness;
- iii) nausea;
- iv) blurred vision;
- v) cramps; and
- vi) irritation of eyes, skin, or respiratory tract.

If protective equipment or noise levels impair communications, prearranged hand signals must be used for communication. Personnel must stay within line of sight of another team member.

7.3 SANITATION

Site sanitation will be maintained according to OSHA and Department of Health requirements.

7.3.1 BREAK AREA

Breaks must be taken in the SZ, away from the active work area after Site personnel go through decontamination procedures. There will be no smoking, eating, drinking, or chewing gum or tobacco in the area other than the SZ.

7.3.2 POTABLE WATER

The following rules apply for all project field operations:

- i) an adequate supply of potable water will be provided at the Site. Potable water must be kept away from hazardous materials, contaminated clothing, and contaminated equipment;
- ii) portable containers used to dispense drinking water must be capable of being tightly closed, and must be equipped with a tap dispenser. Water must not be drunk directly from the container, nor dipped from the container;
- iii) containers used for drinking water must be clearly marked and not used for any other purpose; and
- iv) disposable cups must be supplied, and both a sanitary container for unused cups and a receptacle for disposing of used cups must be provided.

7.3.3 SANITARY FACILITIES

Access to facilities for washing before eating, drinking, or smoking will be provided.

7.3.4 TRASH COLLECTION

Trash collected from the CRZ will be separated as potentially contaminated waste. Trash collected in the support and break areas will be disposed of as non-hazardous waste. Trash receptacles will be set up in the CRZ and in the SZ.

8.0 SITE CONTROL

8.1 AUTHORIZATION TO ENTER

All personnel working in EZs must have completed hazardous waste operations and emergency response (HAZWOPER) initial training as defined under OSHA Regulation 29 CFR 1926.65; have completed their HAZWOPER training or refresher training within the past 12 months, receive training in accordance with the lead standard (for excavation activities) and have been certified by a physician as fit for hazardous waste operations in order to enter a Site area designated as an EZ or CRZ. Personnel without such training or medical certification may enter the designated SZ only. The SS will maintain a list of authorized persons; only personnel on the authorized list will be allowed within the EZ or CRZ.

8.2 SITE ORIENTATION AND HAZARD BRIEFING

No person will be allowed in the general work area during project operations without first being given a Site orientation and hazard briefing. This orientation will be presented by the SS, and will consist of a review of this HASP. This review must cover the chemical, physical, and biological hazards, training required by the lead standard (for excavation activities), protective equipment, safe work procedures, and emergency procedures for the project. A Training Acknowledgement Form is provided in Appendix A for documentation purposes. In addition to this meeting, Daily Safety Meetings will be held each day before work begins. All individuals on the Site, including visitors, must document their attendance to the initial briefing as well attending the Daily Safety Meetings. Appendix A also presents the forms that will be used for documenting the Daily Safety Meeting.

8.3 CERTIFICATION DOCUMENTS

The PM and SS are responsible for ensuring that all personnel working at the Site meet the training and medical surveillance requirements. Subcontractor personnel must provide their training and medical documentation to the SS prior to the start of fieldwork.

8.4 ENTRY REQUIREMENTS

In addition to the authorization, hazard briefing and certification requirements listed above, no person will be allowed to enter the Site unless he or she is wearing the minimum support zone PPE as described in Section 4.0. Personnel entering the EZ or CRZ must wear the required PPE for those locations.

8.5 EMERGENCY ENTRY AND EXIT

Individuals who must enter the Site on an emergency basis will be briefed of the hazards by the SS. All hazardous activities will cease in the event of an emergency and any sources of emissions will be controlled, if possible.

People exiting the Site because of an emergency will gather in a safe area for a head count. The SS is responsible for ensuring that all people who entered the work area have exited in the event of an emergency.

8.6 CONTAMINATION CONTROL ZONES

Contamination control zones are maintained to prevent the spread of contamination and to prevent unauthorized people from entering hazardous areas.

8.6.1 EXCLUSION ZONE (EZ)

The EZ consists of the specific work area, or may be the entire area of suspected contamination. All personnel entering the EZ must use the required PPE, and must have the appropriate training and medical clearance for hazardous waste work. The EZ is the defined area where there is a possible respiratory and/or contact health hazard. Cones, caution tape, or other appropriate means will identify the location of each EZ.

8.6.2 CONTAMINATION REDUCTION ZONE (CRZ)

The CRZ or transition area will be established, if necessary, to perform decontamination of personnel and equipment. All personnel entering or leaving the EZ will pass through this area to prevent any cross-contamination. Tools, equipment, and machinery will be

decontaminated in a specific location. The decontamination of all personnel will be performed on-Site adjacent to the EZ. Personal protective outer garments and respiratory protection will be removed in the CRZ and prepared for cleaning or disposal. This zone is the only appropriate corridor between the EZ and the SZ.

8.6.3 SUPPORT ZONE (SZ)

The SZ is a clean area outside the CRZ located to prevent personnel from exposure to hazardous substances. Eating and drinking will be permitted in the support area only after proper decontamination. Smoking may be permitted in the SZ, subject to Site requirements.

9.0 SITE DECONTAMINATION PROGRAM

It is the responsibility of the SS to ensure that all personnel and pieces of equipment are properly decontaminated according to the procedures outlined below.

9.1 CONTAMINATION PREVENTION

One of the most important aspects of decontamination is the prevention of the spread of contamination. Good contamination prevention will minimize personnel and public exposure. Proper decontamination procedures and the following procedures of contamination avoidance shall reduce the potential spread of contamination include:

- i) do not walk through areas of obvious or known contamination;
- ii) do not handle or touch contaminated materials directly;
- iii) fasten all closures on suits, covering with tape if necessary;
- iv) take particular care to protect any skin injuries; and
- v) stay upwind of airborne contaminants, when possible.

9.2 PERSONAL DECONTAMINATION

All PPE will be disposed of and/or decontaminated at the conclusion of each workday as described below. Decontamination procedures will follow the concept of deconning the most contaminated PPE first.

All disposable equipment shall be removed before meal breaks and at the conclusion of the workday and replaced with new equipment prior to commencing work. In addition, respirator cartridges will be changed as breakthrough is obtained, as directed by the SS. Respiratory equipment and other non-disposables will be fully decontaminated and then placed in a clean storage area. Respirator decontamination will be conducted daily whenever respirators are being worn. Project personnel will inspect their respirator on a daily basis to ensure its proper operation.

9.2.1 LEVEL D DECONTAMINATION

Level D decontamination procedures are as follows:

Step 1 - Remove all visible contamination and loose debris by washing with clean, water;

Step 2 - Remove all outer clothing that came in contact with the contamination (i.e., boot covers and outer gloves) and either dispose of in disposable container or wash in detergent solution and rinse;

Step 3 - Remove protective clothing; dispose of in disposable container; and

Step 4 - Wash and rinse hands.

9.2.2 LEVEL C DECONTAMINATION

Level C decontamination procedures to be utilized as follows:

Step 1 - Remove all visible contamination and loose debris by washing with clean water;

Step 2 - Remove all outer clothing that came in contact with the contamination (i.e., boot covers and outer gloves) and either dispose of in disposable container or wash in detergent solution and rinse;

Step 3 - Remove protective clothing; dispose of in disposable container;

Step 4 - Remove respirator, sanitize prior to reuse;

Step 5 - Remove inner gloves; dispose of in disposable container; and

Step 6 - Wash and rinse hands with soap and water.

9.2.3 EQUIPMENT DECONTAMINATION

All vehicles and pieces of equipment (e.g., excavators) that have entered any EZ will be decontaminated at the decontamination pad prior to leaving the Site. If the level of vehicle contamination is low, decontamination may be limited to rinsing the body, frame and tracks or wheels on the equipment with water. If the vehicle or piece of equipment is significantly contaminated, steam cleaning or pressure washing of vehicles and equipment may be required.

A designated decontamination area will also be established/set up so that pieces of equipment may be cleaned (decontaminated as necessary).

The wash waters from all decontamination stations will be collected and disposed of according to the appropriate environmental regulations.

10.0 PERSONNEL TRAINING

10.1 GENERAL

Required project personnel as discussed in Section 1.0 must have completed HAZWOPER training, as required by the OSHA Standard 29 CFR 1926.65. Field personnel also receive a minimum of 3 days of actual field experience under the direct supervision of a trained, experienced supervisor. Personnel who completed their training more than 12 months prior to the start of the project must have, if required, completed an 8-hour refresher course within the past 12 months. The SS must also have completed an additional 8 hours of training that is required by OSHA for supervisors.

10.2 BASIC 40-HOUR COURSE

The following is a list of the topics typically covered in a 40 hour training course:

- i) general safety procedures;
- ii) physical hazards (fall protection, noise, and heat stress, cold stress);
- iii) names and job descriptions of key personnel responsible for Site health and safety;
- iv) safety, health, and other hazards typically present at hazardous waste sites;
- v) use, application, and limitations of PPE;
- vi) work practices by which individuals can minimize risks from hazards;
- vii) safe use of engineering controls and equipment on site;
- viii) medical surveillance requirements;
- ix) recognition of symptoms and signs, which might indicate overexposure to hazards;
- x) worker right-to-know (Hazard Communication OSHA 1926.59/1910.1200);
- xi) routes of exposure to contaminants;
- xii) engineering controls and safe work practices;
- xiii) components of a Site HASP;
- xiv) decontamination practices for personnel and equipment;
- xv) confined space entry procedures; and
- xvi) general emergency response procedures.

10.3 SUPERVISOR COURSE

Management and supervisors receive an additional 8 hours of training that typically includes:

- i) general Site safety and health procedures;
- ii) emergency procedures;
- iii) PPE programs; and
- iv) air monitoring techniques.

10.4 SITE-SPECIFIC TRAINING

Site-specific training will be accomplished through a Site briefing on the contents of this HASP before work begins. The training will be presented by the Project Manager or SS. The training will include a discussion of the chemical, physical, and biological hazards, the protective equipment and safety procedures, and emergency procedures. The Training Acknowledgement Form that shall be used is found in Appendix A.

10.5 DAILY SAFETY MEETINGS

Daily Safety Meetings will be held to cover safety concerns for the work that will be conducted each day. The meeting will cover emergency response procedures and the hazards anticipated during the project work on this day, the protective clothing required and any required procedure that will minimize hazards. These meetings will be presented by the SS prior to beginning the day's fieldwork. No work will be performed in an EZ before the daily safety meeting has been held. The daily safety meeting must also be held prior to new tasks, and repeated if new hazards are encountered. The forms that shall be used for documenting the daily safety meetings are also found in Appendix A.

10.6 FIRST AID AND CPR

At least one individual current in First Aid/CPR will be assigned to the work crew and will be on the Site during operations. Refresher training in First Aid (triennially) and CPR (annually) is required to keep the certificate current. These individuals must also

receive training regarding the precautions and protective equipment necessary to protect against exposure to blood-borne pathogens.

11.0 MEDICAL SURVEILLANCE PROGRAM

11.1 MEDICAL EXAMINATION

All required personnel who will enter a Site EZ or CRZ must have successfully completed a pre-placement and/or annual physical examination prior to entering one of these work zones. This medical surveillance program must comply with OSHA 29 CFR 1926.65(f).

11.1.1 PRE-PLACEMENT MEDICAL EXAMINATION

All on-Site project personnel who will enter an EZ or CRZ must have completed a comprehensive medical examination within the past 12 months that meets the requirements of applicable OSHA Regulations. The annual medical examination typically includes the following elements:

- i) medical and occupational history questionnaire;
- ii) physical examination;
- iii) complete blood count, with differential;
- iv) liver enzyme profile;
- v) chest X-ray, once every 3 years, for non-asbestos workers;
- vi) pulmonary function test;
- vii) audiogram;
- viii) electrocardiogram for persons older than 45 years of age, or if indicated during the physical examination;
- ix) drug and alcohol screening, as required by job assignment;
- x) visual acuity; and
- xi) follow-up examinations, at the discretion of the examining physician or the corporate medical director.

The examining physician provides the individual and employer with a report summarizing the findings confirming the worker's fitness for work and ability to wear a respirator. Documentation of medical clearance will be available for project personnel during all project work.

Subcontractors will certify that all of their personnel have successfully completed a physical examination by a qualified physician. The physical examination must meet the requirements of 29 CFR 1926.65 and 29 CFR 1910.134 as described above. Subcontractors will supply copies of the medical examination certificate for each of their on-Site workers.

11.1.2 OTHER MEDICAL EXAMINATION

In addition to pre-employment, annual, and exit physicals, personnel may be examined:

- i) at any individual's request after known or suspected exposure to toxic or hazardous materials;
- ii) at the discretion of the client, SS, or occupational physician in anticipation of, or after known or suspected exposure to toxic or hazardous materials; and
- iii) at the discretion of the occupational physician.

11.1.3 PERIODIC EXAM

Following the placement examination, all personnel must undergo a periodic examination, similar in scope to the placement examination. For individuals potentially exposed over 30 days per year, the frequency of periodic examinations will be annual. For personnel potentially exposed less than 30 days per year, the frequency for periodic examinations may be 24 months or as determined by the physician.

11.2 MEDICAL RESTRICTION

When the examining physician identifies a need to restrict work activity, the individual's supervisor must communicate the restriction to the individual, the individual's supervisor, and the SS. The terms of the restriction will be discussed with the individual and his/her supervisor. Every attempt should be made to keep the individual working, while not violating the terms of the medical restriction.

12.0 EMERGENCY PROCEDURES

12.1 GENERAL

The work area will be evaluated for the potential for fire, explosion, chemical release, or other catastrophic events. Unusual events, activities, chemicals, and conditions will be reported to the SS immediately.

The SS will establish evacuation routes and assembly areas for each work area and will communicate them to project personnel. All personnel entering the Site will be informed of these routes and assembly areas. If necessary, a Site plan will be made marking the evacuation routes and will be posted at conspicuous locations.

12.2 EMERGENCY RESPONSE

If an incident occurs, the following steps will be taken:

- i) the SS will evaluate the incident and assess the need for assistance and/or evacuation;
- ii) the SS will call for outside assistance as needed and report the incident **within 1 hour** through the CRA Incident Reporting Hotline. The number is 1-866-529-4886;
- iii) the SS will act as liaison between outside agencies and on-Site personnel;
- iv) the SS will ensure the Project Manager and the RSHM are notified promptly of the incident; and
- v) the SS will take appropriate measures to stabilize the incident scene.

12.2.1 FIRE

In the case of a fire on the Site, the SS will assess the situation and direct fire fighting activities. The SS will ensure that the client Site representative (as appropriate) is immediately notified of any fires. Site personnel will attempt to extinguish the fire with available extinguishers, if safe to do so. In the event of a fire that Site personnel are unable to safely extinguish, the local fire department will be summoned via 911 or other number.

12.2.2 SPILL

If a spill occurs, the following steps will be taken:

- i) notify SS immediately;
- ii) evacuate immediate area of spill;
- iii) conduct air monitoring to determine needed level of PPE;
- iv) don required level of PPE and prepare to make entry to apply spill containment and control procedures; and
- v) absorb or otherwise clean up the spill and containerize the material, sorbent, and affected soils. If the spill has occurred inside the treatment facility wash down the spill into the floor sump.

The SS has the authority to commit resources as needed to contain and control released material and to prevent its spread to off-Site areas.

12.3 MEDICAL EMERGENCY

All personnel injuries must be promptly reported to the SS. The SS will:

- i) ensure that the injured person receives prompt first aid and medical attention;
- ii) in emergency situations, the worker is to be transported by appropriate means to the nearest urgent care facility (normally a hospital emergency room);
- iv) the Project Manager and RSHM are to be notified by project personnel as soon as possible after the worker has left the Site;
- v) will call the CRA incident hotline as soon as possible.

12.3.1 FIRST AID - GENERAL

All persons must report any near loss incident, accident, injury, or illness to their immediate Supervisor and the SS. Trained personnel will provide First Aid. Injuries and illnesses requiring medical treatment must be documented. The PM with the help of the SS must conduct an accident investigation as soon as emergency conditions no longer exist and first aid and/or medical treatment has been ensured. These two reports

must be completed and submitted to the PM and RSHM within 24 hours after the incident.

If first aid treatment is required, first aid kits are kept at the CRZ. If treatment beyond first aid is required, the injured should be transported to the medical facility. If the injured is not ambulatory, or shows any sign of not being in a comfortable and stable condition for transport, then an ambulance/paramedics should be summoned. If there is any doubt as to the injured worker's condition, it is best to let the local paramedic or ambulance service examine and transport the worker. Otherwise, perform the following:

- i) Survey the Scene: Determine if it is safe to proceed. Try to determine if the conditions which caused the incident are still a threat. Protect yourself from exposure before attempting to rescue the victim;
- ii) Do a Primary Survey of the Victim: Check for airway obstruction, breathing, and pulse. Assess likely routes of chemical exposure by examining the eyes, mouth, nose, and skin of the victim for symptoms;
- iii) Phone Emergency Medical Services (EMS): Give the location, telephone number used, caller's name, what happened, number of victims, victims' condition, and help being given;
- iv) Maintain Airway and Perform Rescue Breathing: As necessary;
- v) Perform CPR: As necessary;
- vi) Do a Secondary Survey of the Victim: Check vital signs and do a head-to-toe exam; and
- vii) Treat Other Conditions: As necessary. If the victim can be moved, take him to a location away from the work area where EMS can gain access.

12.3.2 FIRST AID - INHALATION

Any individual complaining of symptoms of chemical overexposure will be removed from the work area and transported to the designated medical facility for examination and treatment.

12.3.3 FIRST AID - INGESTION

Call 911 and consult a poison control center for advice. If known and available, refer to the MSDS for treatment information, if recommended. If unconscious, keep the victim on his side and clear the airway if vomiting occurs.

12.3.4 FIRST AID - SKIN CONTACT

Project personnel who have had skin contact with contaminants will, unless the contact is severe, proceed through the decontamination zone, to the wash-up area. Personnel will remove any contaminated clothing, and then flush the affected area with water for at least 15 minutes. The worker should be transported to the medical facility if he/she shows any sign of skin reddening, irritation, or if he requests a medical examination.

12.3.5 FIRST AID - EYE CONTACT

Project personnel who have had contaminants splashed in their eyes or who have experienced eye irritation while in the contaminated zone, must immediately proceed to the eyewash station, set up in the decontamination zone. Do not decontaminate prior to using the eyewash. Remove whatever protective clothing is necessary to use the eyewash. Flush the eye with clean running water for at least 15 minutes. Arrange prompt transport to the designated medical facility.

12.4 REPORTING INJURIES AND ILLNESSES

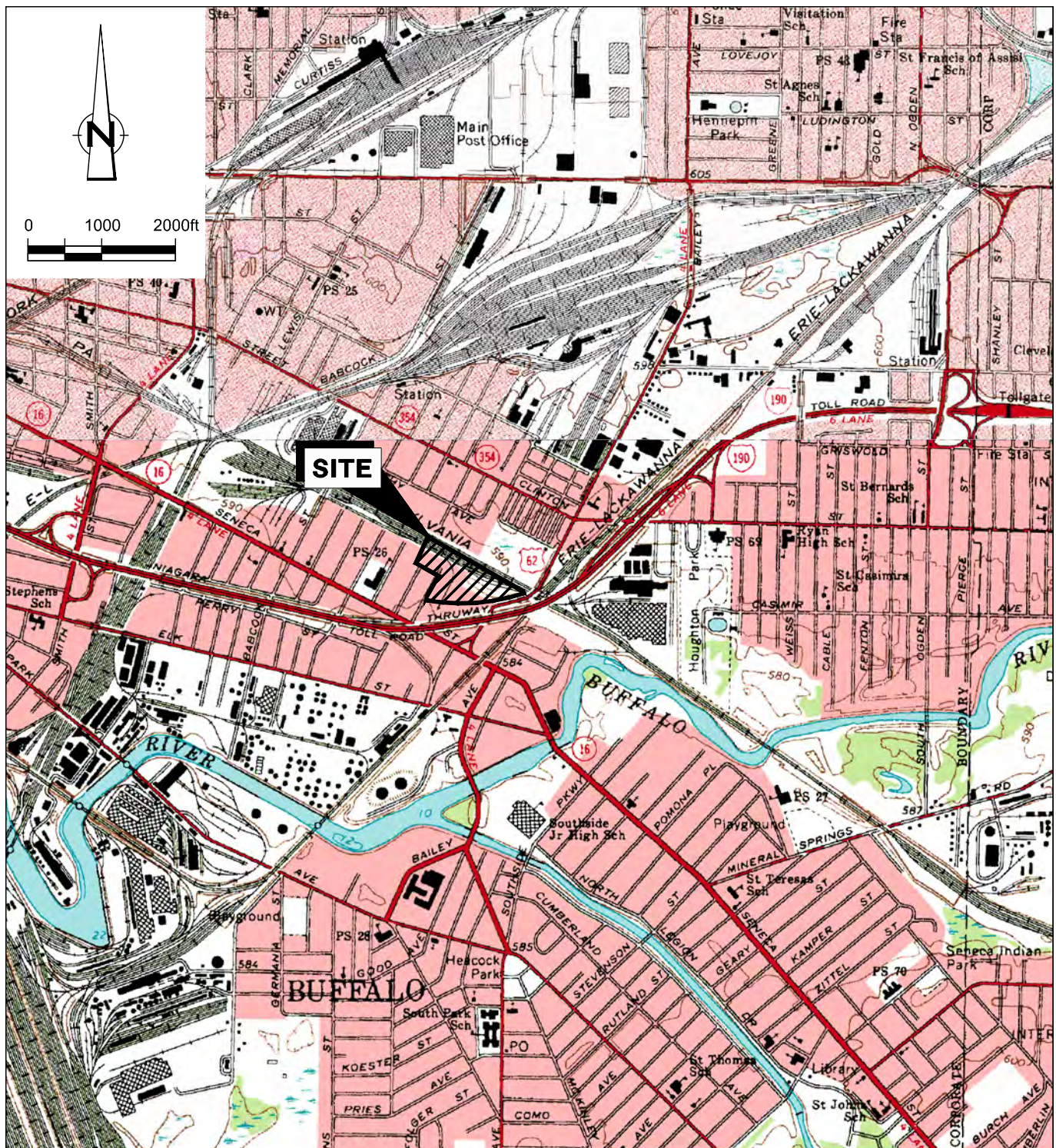
All injuries and illnesses, however minor, will be reported to the CRA Incident Reporting Hotline (1-866-529-4886), the SS immediately. The SS will complete an Incident Report and submit it to the Project Manager and RSHM within 24 hours.

12.5 EMERGENCY INFORMATION

The means to summon local public response agencies such as police, fire, and ambulance will be reviewed in the Daily Safety Meeting. Agencies include:

Police Department.....	911
Fire Department	911
Hospital (Mercy Hospital)	716-826-7000
Poison Control Center	800-888-7655
CRA Project Manager (Richard Shepherd)	519-884-0510
CRA Project Coordinator (Christine Barton)	716-856-2142
CRA Regional Safety and Health Manager (Craig Gebhardt).....	716-297-2160
CRA Site Supervisor (Doug Oscar)	716-570-4786
USEPA (Hotline)	800-424-9346
National Response Center	800-424-8802
NYSDEC (Albany)	800-457-7362
CRA Incident Reporting Hotline	866-529-4886

FIGURES



REFERENCE:

UNITED STATES GEOLOGIC SURVEY BUFFALO NE, BUFFALO SE QUADRANGLE, NY
 TOPOGRAPHIC, 7.5 MINUTES SERIES 1965
 SCALE: 1:24,000

figure 2.1

SITE LOCATION MAP
ALTERNATIVES ANALYSIS REPORT
FORMER BUFFALO CHINA SITE (NO. C915209)
Buffalo, New York





TABLES

TABLE 1

PROPERTIES OF POTENTIAL SITE CONTAMINANTS OF CONCERN

<i>Chemical Name (Synonyms)</i>	<i>Concentration at Site</i>	<i>Exposure Limits</i>	<i>Routes Of Entry</i>	<i>Symptoms/Health Effects</i>	<i>Chemical Properties</i>	<i>Physical Characteristics</i>
Lead (metal) CAS-7439-92-1	9250 mg/kg	TLV: 0.05 mg/m ³ PEL: 0.05 mg/m ³ STEL: NE IDLH: 100 mg/m ³	Inhalation Ingestion Skin contact Eye contact	ACUTE: Lead is a cumulative poison, however, it may cause eye and skin irritation. CHRONIC: Effects blood, bone marrow, CNS, PNS and kidneys resulting in anemia, convulsions, peripheral nerve disease and kidney impairment. Toxicity to human reproduction or development.	(FP) NA (VP) NA (IP) NA (UEL) NA (LEL) NA	A heavy, ductile, soft, gray solid. Turns tarnished on exposure to air.
Methylene Chloride DMC Dichloromethane CAS-75-09-2	850 ppb	TLV: 50 ppm PEL: 25 ppm STEL: 125 ppm IDLH: 2,300 ppm	Inhalation Ingestion Absorption	ACUTE: Irritation of the eyes, skin and respiratory tract. Exposure could cause lowering of consciousness and formation of carboxyhemoglobin. CHRONIC: Dermatitis. May cause damage to CNS and liver. Possible human carcinogen.	(FP) NE (VP) 350 mm (IP) 11.32 eV (UEL) 23.0% (LEL) 13.0%	Colorless liquid with a chloroform-like odor. Gas above 104°F.
Tetrachloroethene PCE Perchloroethylene Tetrachloroethylene CAS-127-18-4	1,300 ppb	TLV: 25 ppm PEL: 100 ppm STEL: 100 ppm IDLH: 150 ppm	Inhalation Ingestion Absorption	ACUTE: Irritation to skin, eyes and respiratory tract. Ingestion may cause chemical pneumonitis. Affects CNS. Unconsciousness at high level exposures. CHRONIC: Dermatitis. May cause liver and kidney damage. Probable human carcinogen.	(FP) NA (VP) 14 mm (IP) 9.32 eV (UEL) NA (LEL) NA	Colorless liquid with a mild, chloroform-like odor.
Trichloroethene TCE Trichloroethylene Ethylene trichloride CAS-79-01-6	670,000 ppb	TLV: 50 ppm PEL: 100 ppm STEL: 100 ppm IDLH: 1,000 ppm	Inhalation Ingestion Absorption	ACUTE: Irritation to eyes and skin. Ingestion may cause chemical pneumonitis. Affects CNS. Unconsciousness due to exposure. CHRONIC: Dermatitis. Affects CNS, loss of memory. May damage liver and kidneys. Probable human carcinogen.	(FP) NE (VP) 58 mm (IP) 9.45 eV (UEL) 10.5% @ 77°F (LEL) 8.0% @ 77°F	Colorless liquid with a chloroform-like odor. Sometimes dyed blue.

TABLE 1

PROPERTIES OF POTENTIAL SITE CONTAMINANTS

Notes:

FP	FP - Flash Point	PEL	PEL - OSHA Permissible Exposure Limit
IDLH	IDLH - Immediately Dangerous to Life and Health	STEL	STEL - Short Term Exposure Limit
IP	IP - Ionization Potential	TLV	TLV - ACGIH Threshold Limit Value
NE	NE - Not Established (Information Not Available)	VP	VP - Vapor Pressure
NA	NA - Not Applicable	C	C - Ceiling Exposure Limit
CNS	CNS - Central Nervous System	[skin]	[skin] - potential for dermal absorption
PNS	PNS - Peripheral Nervous System	mm	mm - millimeters Hg (mercury)
ppm	ppm - parts per million	eV	eV - electronvolts
mg/m ³	mg/m ³ - milligrams per cubic meter		

TABLE 1

PROPERTIES OF POTENTIAL SITE CONTAMINANTS

CHEMICAL NAME	SYNONYM 1	SYNONYM 2	SYNONYM 3
Acetone	2-Propanone	Methyl ketone	Dimethyl ketone
Arsenic			
Benzene	Benzol		
2-Butanone	MEK	Methyl ethyl ketone	Methyl acetone
Cadmium			
Carbon Disulfide	Carbon bisulfide	Carbon sulfide	
Chlorobenzene	Benzene chloride	Chlorobenzol	Phenyl chloride
Chromium	Chrome		
Copper			
1,1-Dichloroethane	Ethylidene chloride		
1,2 Dichloroethane	Ethylene dichloride	1,2-Ethylene dichloride	Ethane dichloride
Ethylbenzene	Ethylbenzol	EB	Phenylethane
Formaldehyde	Methanal	Methylene oxide	Formalin
Heptachlor			
Hydrazine	Diamide	Nitrogen hydride	Diamine
Hydrogen Sulfide	Sulfur hydride		
Kerosene	Lamp oil/petroleum	Fuel oil no°1	Kerosine
Lead	Lead metal	Plumbum	
Lindane	Gamma-BHC	Gamma-HCH	
MIBK	Hexone	Methyl isobutyl ketone	4-methyl-2-pentanone
Methane	Methyl hydride		
Mercury	Quicksilver	Liquid silver	
Methylene Chloride	Dichloromethane	DMC	
Naphtha	Crude solvent coal tar naphtha		
Nickel			
Polyaromatic Hydrocarbons	PAHs		
Polychlorinated Biphenyls (54%)	PCB (54%)	Chlorodiphenyl (54% chlorine)	Aroclor 1254
Polychlorinated Biphenyls (42%)	PCB (42%)	Chlorodiphenyl (42% chlorine)	Aroclor 1242
Silver	Argentium		
Tetrachloroethene	Perchloroethylene	Tetrachloroethene	PCE
Toluene	Methylbenzene	Toluol	Phenylmethane
Trichloroethene	TCE	Trichloroethylene	Ethylene trichloride
1,1,1 Trichloroethane	Methyl chloroform	Chloroethene	
1,3,5 Trimethylbenzene	Mesitylene	Trimethyl benzene (symmetrical)	
Vinyl Chloride	Chloroethene	VCM	Chloroethylene
Xylene			
Phenol	Hydroxybenzene	Carbolic acid	Phenyl alcohol
Hexane	normal-Hexane	Hexyl hydride	
Isopropyl Alcohol	Isopropanol	2-Propanol	
MTBE	tert-Butyl methyl ether	2-Methoxy-2-methyl propane	

TABLE 1

PROPERTIES OF POTENTIAL SITE CONTAMINANTS

CHEMICAL NAME	SYNONYM 1	SYNONYM 2	SYNONYM 3
1,1,1,2-Tetrachloroethane	(Acetylene tetrachloride)		
1,1,2-Trichloroethane	(Vinyl trichloride)	(Ethane trichloride)	
1,1-Dichloroethene	(1,1-DCE)	(VDC)	(Vinylidene chloride)
Carbon tetrachloride	(Carbon chloride)	(Tetrachloromethane)	(Tetrachlorocarbon)
	(Methane trichloride)	(Trichloromethane)	
	(DMC)	(Dichloromethane)	
Tetrachloroethene	(PCE)	(Perchloroethylene)	(Tetrachloroethylene)
cis-1,2-Dichloroethene	(Acetylene dichloride)	(1,2-Dichloroethylene)	(trans-1,2-Dichloroethene)
Trichloroethene	(TCE)	(Trichloroethylene)	(Ethylene trichloride)
Vinyl Chloride	(Chloroethene)	(VCM)	(Chloroethylene)
Hexachlorobutadiene	(HCBD)	(Perchlorobutadiene)	(1,3-Hexachlorobutadiene)
Hexachlorobenzene	(HCB)	(Perchlorobenzene)	(Phenyl perchloryl)
Pentachlorophenol	(PCP)		
Thallium (metal)			
Zinc (metal)			
Gasoline	Motor fuel	Petrol	Natural Gasoline
Hydraulic (lube) oil			
Diesel fuel			
Asbestos			
Diesel oil			
Fuel oil			
Titanium			
Naphthalene			
Anthracene (PAH)			
Benzo(a)pyrene (PAH)			
Chrysene (PAH)			
Pyrene (PAH)			
Dibenzofuran			
Fluorine			
4,4-DDT			
Iron			

TABLE 2

ALL ANALYTES DETECTED AT THE MAXIMUM CONCENTRATION

FORMER BUFFALO CHINA SITE
BUFFALO NEW YORK

<i>Matrix</i>	<i>Parameter</i>	<i>Analyte</i>	<i>Max Detection at the Site in ppm</i>
SO	Metals	Aluminum	18700
SO	Metals	Antimony	3
SO	Metals	Arsenic	21.4
SO	Metals	Barium	2310
SO	Metals	Beryllium	2.9
SO	Metals	Cadmium	1.4
SO	Metals	Calcium	110000
SO	Metals	Chromium	63.9
SO	Metals	Cobalt	15.2
SO	Metals	Copper	114
SO	Metals	Iron	32500
SO	Metals	Lead	9250
SO	Metals	Magnesium	21100
SO	Metals	Manganese	3240
SO	Metals	Mercury	0.48
SO	Metals	Nickel	35.1
SO	Metals	Potassium	2320
SO	Metals	Selenium	1.2
SO	Metals	Silver	189
SO	Metals	Sodium	572
SO	Metals	Vanadium	31.4
SO	Metals	Zinc	305
SO	PCBs	Aroclor-1254 (PCB-1254)	0.03
SO	PCBs	Aroclor-1260 (PCB-1260)	0.018
SO	Pesticides	4,4'-DDD	0.0015
SO	Pesticides	4,4'-DDE	0.0046
SO	Pesticides	4,4'-DDT	0.0068
SO	Pesticides	Aldrin	0.0021
SO	Pesticides	delta-BHC	0.00054
SO	Pesticides	Endosulfan sulfate	0.00077
SO	Pesticides	Endrin ketone	0.00091
SO	Pesticides	gamma-BHC (lindane)	0.017
SO	Pesticides	Heptachlor	0.0016
SO	Pesticides	Methoxychlor	0.0035
SO	SVOCs	2,4-Dimethylphenol	0.1
SO	SVOCs	2-Methylnaphthalene	0.9
SO	SVOCs	2-Methylphenol	0.0087
SO	SVOCs	4-Methylphenol	0.19
SO	SVOCs	Acenaphthene	0.69
SO	SVOCs	Acenaphthylene	4.5
SO	SVOCs	Anthracene	6
SO	SVOCs	Benzo(a)anthracene	15
SO	SVOCs	Benzo(a)pyrene	14
SO	SVOCs	Benzo(b)fluoranthene	17

TABLE 2

ALL ANALYTES DETECTED AT THE MAXIMUM CONCENTRATION

FORMER BUFFALO CHINA SITE
BUFFALO NEW YORK

SO	SVOCs	Benzo(g,h,i)perylene	9.2
SO	SVOCs	Benzo(k)fluoranthene	4.5
SO	SVOCs	Biphenyl (1,1-Biphenyl)	0.22
SO	SVOCs	bis(2-Ethylhexyl)phthalate (DEHP)	1
SO	SVOCs	Butyl benzylphthalate (BBP)	0.12
SO	SVOCs	Caprolactam	0.085
SO	SVOCs	Carbazole	1.1
SO	SVOCs	Chrysene	13
SO	SVOCs	Dibenz(a,h)anthracene	2.4
SO	SVOCs	Dibenzofuran	1.6
SO	SVOCs	Diethyl phthalate	0.54
SO	SVOCs	Di-n-butylphthalate (DBP)	1
SO	SVOCs	Fluoranthene	30
SO	SVOCs	Fluorene	2.5
SO	SVOCs	Hexachlorobenzene	0.11
SO	SVOCs	Hexachlorobutadiene	0.09
SO	SVOCs	Indeno(1,2,3-cd)pyrene	8.5
SO	SVOCs	Naphthalene	1.4
SO	SVOCs	Phenanthrene	20
SO	SVOCs	Phenol	0.018
SO	SVOCs	Pyrene	26
SO	VOCs	1,1-Dichloroethene	0.0019
SO	VOCs	2-Butanone (Methyl ethyl ketone) (MEK)	0.26
SO	VOCs	Acetone	0.1
SO	VOCs	cis-1,2-Dichloroethene	15
SO	VOCs	Ethylbenzene	0.2
SO	VOCs	Methylene chloride	0.85
SO	VOCs	Tetrachloroethene	1.3
SO	VOCs	Toluene	0.4
SO	VOCs	trans-1,2-Dichloroethene	0.0048
SO	VOCs	Trichloroethene	670
SO	VOCs	Vinyl chloride	0.017
SO	VOCs	Xylenes (total)	0.79
SO	Wet	Cyanide (total)	5.2
WG	Metals	Aluminum	8.25
WG	Metals	Antimony	0.0075
WG	Metals	Antimony (dissolved)	0.0033
WG	Metals	Arsenic	0.0094
WG	Metals	Barium	0.11
WG	Metals	Barium (dissolved)	0.0431
WG	Metals	Calcium	301
WG	Metals	Calcium (dissolved)	249
WG	Metals	Chromium	0.0145
WG	Metals	Cobalt	0.0065
WG	Metals	Cobalt (dissolved)	0.0032

TABLE 2

ALL ANALYTES DETECTED AT THE MAXIMUM CONCENTRATION

FORMER BUFFALO CHINA SITE
BUFFALO NEW YORK

WG	Metals	Copper	0.0246
WG	Metals	Iron	14.3
WG	Metals	Iron (dissolved)	0.62
WG	Metals	Lead	0.0568
WG	Metals	Magnesium	58.5
WG	Metals	Magnesium (dissolved)	44.7
WG	Metals	Manganese	0.915
WG	Metals	Manganese (dissolved)	0.799
WG	Metals	Mercury	0.000097
WG	Metals	Mercury (dissolved)	0.000067
WG	Metals	Nickel	0.0185
WG	Metals	Nickel (dissolved)	0.0056
WG	Metals	Potassium	10.6
WG	Metals	Potassium (dissolved)	7.61
WG	Metals	Selenium	0.0026
WG	Metals	Silver	0.0021
WG	Metals	Sodium	173
WG	Metals	Sodium (dissolved)	193
WG	Metals	Thallium	0.005
WG	Metals	Vanadium	0.0216
WG	Metals	Vanadium (dissolved)	0.0118
WG	Metals	Zinc	0.0933
WG	Pesticides	alpha-BHC	0.000021
WG	Pesticides	Endosulfan sulfate	0.000024
WG	Pesticides	Endrin	0.000011
WG	SVOCs	2-Methylnaphthalene	0.00062
WG	SVOCs	Benzo(a)anthracene	0.00084
WG	SVOCs	Benzo(b)fluoranthene	0.00081
WG	SVOCs	bis(2-Ethylhexyl)phthalate (DEHP)	0.0024
WG	SVOCs	Caprolactam	1.4
WG	SVOCs	Diethyl phthalate	0.003
WG	SVOCs	Fluoranthene	0.0015
WG	SVOCs	Phenanthrene	0.0011
WG	SVOCs	Phenol	0.00072
WG	SVOCs	Pyrene	0.0012
WG	VOCs	1,1,2-Trichloroethane	9.8
WG	VOCs	1,1-Dichloroethane	0.0014
WG	VOCs	1,1-Dichloroethene	0.04
WG	VOCs	1,2,4-Trichlorobenzene	0.015
WG	VOCs	1,2-Dichloroethane	0.32
WG	VOCs	2-Butanone (Methyl ethyl ketone) (MEK)	0.02
WG	VOCs	4-Methyl-2-pentanone (Methyl isobutyl ketone) (MIBK)	0.12
WG	VOCs	Acetone	0.28
WG	VOCs	Chloroform (Trichloromethane)	0.0026
WG	VOCs	cis-1,2-Dichloroethene	320

TABLE 2**ALL ANALYTES DETECTED AT THE MAXIMUM CONCENTRATION****FORMER BUFFALO CHINA SITE
BUFFALO NEW YORK**

WG	VOCs	Cyclohexane	0.39
WG	VOCs	Ethylbenzene	0.0029
WG	VOCs	Methyl cyclohexane	0.26
WG	VOCs	Methyl tert butyl ether (MTBE)	0.0011
WG	VOCs	Methylene chloride	0.33
WG	VOCs	Tetrachloroethene	0.71
WG	VOCs	Toluene	96
WG	VOCs	trans-1,2-Dichloroethene	0.35
WG	VOCs	Trichloroethene	600
WG	VOCs	Vinyl chloride	0.91
WG	VOCs	Xylenes (total)	17
WG	Wet	Cyanide (total)	0.0064

APPENDIX A

PROJECT SAFETY FORMS

**EMERGENCY CONTACT LIST
FORMER BUFFALO CHINA SITE**

EMERGENCY INFORMATION		
Contact	Phone Number	Hospital Directions
Local Police	911	Depart the Site heading south on Hayes Place. Turn left on to Seneca Street. Go approximately 1.5 miles and turn right onto Cazenovia Street. Go approximately 0.4 miles. Hospital is at intersection of Cazenovia and Abbott Roads.
Fire Department	911	
Ambulance: Rural Metro Ambulance and Buffalo Fire	911	
Local Hospital: Mercy Hospital 565 Abbott Rd. Buffalo, NY 14210	716-826-7000	
National Poison Center	800-222-1222	
Project Manager: Rick Shepherd	Work: 519-884-0510 Cell: 519-748-8831	Driving Time: 4 to 8 minutes Driving Distance: +/- 2 miles Attach Map. CRA – Accident Reporting System Please call 866-529-4886 and provide: • Name and location of caller • Description of incident • Name of any injured persons • Description of injuries • Phone number for return call
Site Supervisor Doug Oscar	Work: 716-297-6150 Cell: 716-570-4786	
CRA Regional SHM Craig Gebhardt	Work: 716-297-6150 Cell: 716-604-684	
Site Contact Karl Franz	Work: 716-821-5600 Cell:	
Client Contact Kerri Love	Work: (740) 681-6024 Cell: (614) 546-7140	
Other Contact (Name)	Work: Cell:	

Hospital route must be field validated before site work commences.



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Search Results

From: 51 Hayes Pl, Buffalo, NY 14210-1613

To: 565 Abbott Rd, Buffalo, NY 14220-2039

[Print this route](#)

[Save this route](#)

[E-mail this route](#)

Travel Resources

LOW FARES
from Buffalo
\$287 to Atlanta
\$256 to Las Vegas
\$147 to Orlando
\$126 to Chicago
\$266 to San Francisco

HOTELS
in Buffalo
[Choose a different city](#)

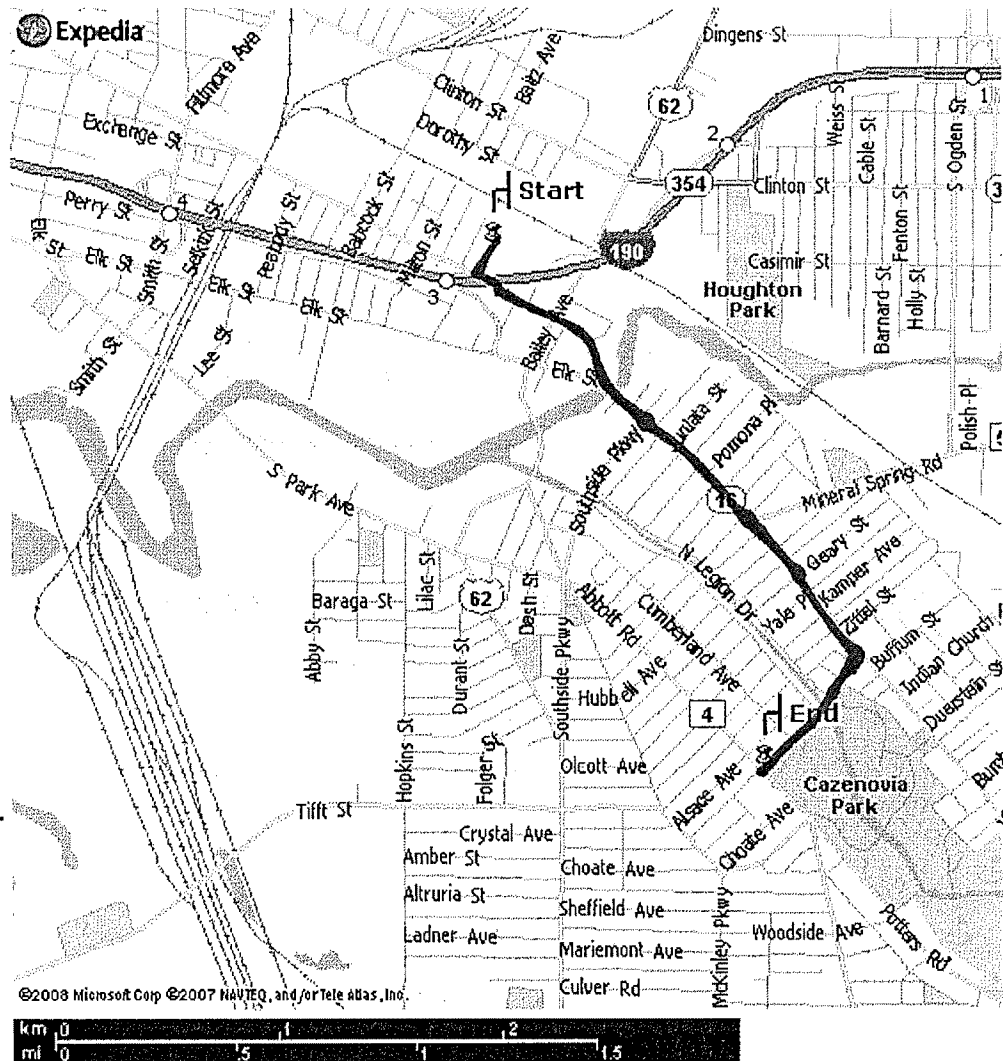
CAR RENTALS
in Buffalo

GUIDE
[Travel Information](#)

QUESTIONS?

[Maps FAQ's](#)

[Need help with Maps?](#)



Directions	Distance	Time
Start: Depart Start on Hayes Pl (South)	0.1	< 1min
1: Turn LEFT (East) onto SR-16 [Seneca St]	1.5	0:03
2: Turn RIGHT (South) onto Cazenovia St	0.4	0:02
End: Arrive End	< 0.1	< 1min
Total Route	2.0 mi	5 mins



CONESTOGA-ROVERS & ASSOCIATES (CRA) INCIDENT REPORTING FORM

Incidents must be called into Incident Hot Line: 1-866-529-4886



Instructions: For Personal Injuries, Occupational Illnesses, and Property Damage, complete Sections 1 and 2.
For Vehicle Accidents, Complete Sections 1, 2, and 4. **Initial report must be submitted within 24 hours.**

Report Status (insert date)	Initial Report	Update Report	Final Report	Verification/Validation	Report Input into SMART Database

SECTION 1

A. Employee Identification ☐ CRA Employee ☐ Temporary Employee ☐ Subcontractor						
Employee No.	Last Name	First Name	Middle Name/Initial	☐ Male ☐ Female		
Area Code ()	Telephone Number	Employee Home Address (Street, City, State, Province, Zip Code)				
Date of Hire	Position/Title	Supervisor	Employee's Company/Home Office Location			
B. General Information						
Where did the Incident occur and which country? ☐ Office ☐ Project Site ☐ Other _____ ☐ Canada ☐ United States ☐ UK			Type of incident (Check all that apply) ☐ Employee Injury/Illness ☐ Vehicle Accident ☐ Property Damage Only			
Address of Incident (City, State, Province, Zip Code)			Specific Location of incident (e.g., where on site)			
Date and Hour of Incident MM/DD/YYYY a.m. p.m.		Date and Hour Reported to Employer MM/DD/YYYY a.m. p.m.		Date and Hour Last Worked MM/DD/YYYY a.m. p.m.		Time Employee Began Work a.m. p.m.
Normal Work Hours From: To:		Witnesses? ☐ Yes ☐ No		Witness Name and Telephone Number		

C. Project Information (Project Related Incident Only) Project Related? ☐ Yes ☐ No				
Project #	Project Name	Project Manager	Site Telephone Number ()	Project Manager Cell Number ()
Client Name	Was the Client Advised of the Incident? ☐ Yes ☐ No	Name of Person Contacted	Date and Time Contacted	

SECTION 2

A. Details of the Incident	
1. What job/task was being performed when the incident occurred? (Example: collecting groundwater samples).	
2. Provide a detailed description of the employee's specific activities at the time of the incident. Include details of equipment/materials being used, including the size and weight of objects being handled, and weather conditions at time of the incident. If necessary, attach additional pages to the report.	
3. For injuries, identify the specific part of body injured, and specify left or right side. For illnesses, identify and describe the affected area/body part.	
4. Identify the object or substance that directly injured the employee and how. Include size, weight, and shape of object, quantity of substance, etc.	
5. Identify property damaged and how it was damaged (include owner of property, nature and source of damage, and model and serial number, if appropriate).	
B. Health Care/Medical Treatment	
Employee received health care? ☐ Yes ☐ No	Identify the type of health care provided and where it was performed. (Check all that apply). ☐ First Aid ☐ Medical treatment other than first aid (sutures, etc.) ☐ Hospitalized ☐ Clinic ☐ Hospital emergency room ☐ On location by self or CRA employee ☐ On site by EMT
Name of Health Care Provider, Physician's Name, Phone Number, Address (Street, City, Province/State, and Postal/Zip Code)	

SECTION 2 (continued)
C. Incident Investigation

- ☐ **5 Why Root Cause Analysis Investigation [Non-OSHA Recordable, <\$5,000 damage]**
☐ **Tap Root Cause Analysis [OSHA Recordable, and/or >\$5,000 damages]**

HASP prepared? ☐ Yes ☐ No ☐ N/A Submit a PDF of HASP and relevant JSA(s) to Investigation Team. If yes, was the HASP on site? ☐ Yes ☐ No	Did the safety plan identify and provide safety procedures for the specific tasks the employee was conducting when injured? ☐ Yes ☐ No If no, why not? (Explain) _____ Did the employee utilize the STAR process before initiating the task? ☐ Yes ☐ No If no, why not? (Explain) _____ Was the employee drug & alcohol tested post incident? ☐ Yes ☐ No

5-Why Root Cause: Incident Statement
1. Why did "above" happen?
2. Why did "1" happen?
3. Why did "2" happen?
4. Why did "3" happen?
5. Why did "4" happen?
6. Why did "5" happen?

Additional information: Attach photos, witness statement(s), affected employee statement, accident diagrams, as applicable, to the end of this document.

See *Corrective Actions/Verification and Validation* Section (Page 4)

D. Accountability

Initial Report Date Month Day Year	Initial Report Prepared by: (please print)	Initial Report Prepared by: (signature)
Investigation Team	Company	Position/Title
Final Report Date Month Day Year	Final Report Prepared by: (please print)	Final Report Prepared by: (signature)

E. Stewardship

Will an Incident Summary be Prepared? ☐ Yes ☐ No By:	Disciplinary Action Taken? ☐ Yes ☐ No	
Quality Review By:	Date:	Findings:

Fax Completed Form to CRA's Incident Reporting Fax: (832) 485-5259
Send Original to CRA's Incident Reporting Department, Houston, Texas

SECTION 3

A. Agency Reporting and Recording Information (To be completed by the Regional Safety and Health Manager)

CANADA

Form 7 Sent to WSIB? ☐ Yes ☐ Not required	Employee Injury Information (Injury met the following criteria): ☐ First Aid ☐ Medical Treatment ☐ Critical Injury ☐ Modified Duty ☐ Lost Time Injury If medical treatment, what?		
Joint Safety and Health Committee Notified? ☐ Yes ☐ No	Total days of modified duty If exceeds 7 days, report to WSIB	Total days of lost time (if any)	Date employee returned to work Month Day Year

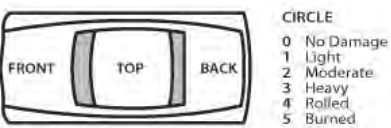
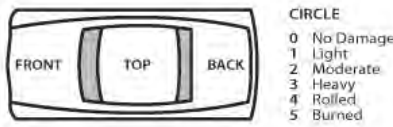
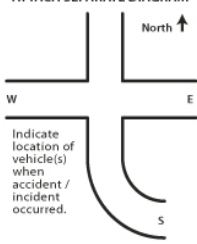
UNITED STATES

OSHA Recordable Injury? ☐ Yes ☐ No	Employee Injury Information (Injury met the following OSHA 300 Log criteria) ☐ First Aid ☐ Medical Treatment ☐ Restricted Duty ☐ Lost Time Injury If medical treatment, what?		
Total days of restricted duty:	Total days of lost time (if any)		Date employee returned to work Month Day Year

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VEHICLE ACCIDENT SECTION
(Complete this Section for all Vehicle Accidents)

SECTION 4

A. Vehicle CRA Employee was Operating ☐ Personal ☐ CRA-Owned ☐ Rental - Rental Company:					
License Plate No.	State/Province	Police Department	City	State/Province	
Vehicle Year/Make/Model	Odometer Reading at Time of Accident		Police Report Number	Weather Conditions	
Name of Person Operating Vehicle		"X" IN AREA OF VEHICLE DAMAGE 			
Address					
City	State/Province				Zip Code
Telephone: Area Code ()					
Description of Vehicle Damage:					
B. Other Vehicles Involved					
Name of Owner	Address	City/State/Prov./Zip	Area Code and Telephone Number ()		
Operator's Name (if different from above)	Address	City/State/Prov./Zip	Area Code and Telephone Number ()		
Year/Make/Model	Description of Property Damage:	"x" IN AREA OF VEHICLE DAMAGE 			
Insurance Co. Name & Telephone					
License Plate No./State/Province					
C. Injured Persons					
Name	Address Street, City, State/Prov./Zip Code	Phone Number	Nature of Injury	Indicate if Injured was a Vehicle Driver/ Passenger, CRA Employee, Other, or Pedestrian	
1.					
2.					
3.					
D. Witnesses					
Name	Address Street, City, State/Prov./Zip Code	Area Code and Telephone Number			
1.		()			
2.		()			
E. Description of Accident					
PLEASE COMPLETE OR ATTACH SEPARATE DIAGRAM 					
Was Ticket Issued? ☐ Other Operator ☐ CRA Operator		Reason: _____ _____ _____			
Report Date Month Day Year	Report Prepared by: (please print)		Report Prepared by: (signature)		

Note: If Additional Space is Required to Complete this Report, Use Separate Sheet of Paper and Attach.

Fax Completed Form to CRA's Incident Reporting Fax: (832) 485-5259
Send Original to CRA's Incident Reporting Department, Houston, Texas



INCIDENT REPORT

CORRECTIVE ACTIONS/VERIFICATION AND VALIDATION



Causative Factors and Corrective Actions						Verification (Did we do what we said we would do?) and Validation (Is it working?)		
Item No.	CF	Corrective Actions (Must match Causative Factor)	Responsible Party	Date Due	Date Completed	Verified By/ Validated By	Date	Details
						Verified By:		
						Validated By:		
						Verified By:		
						Validated By:		
						Verified By:		
						Validated By:		
						Verified By:		
						Validated By:		

CRA 10 CAUSATIVE FACTORS

Personal Factors		Company Factors		External Factors	
1	Insufficient training for task	5	Incomplete or no procedures	10	Exposure to conditions
2	Hurrying to complete the task	6	Procedures not known or enforced		
3	Easier if proper process not followed	7	Improper PPE		
4	Took shortcuts without prior incident	8	Improper tools		
		9	Improper workplace layout		

NL**CONESTOGA-ROVERS & ASSOCIATES (CRA) NEAR LOSS REPORTING FORM****A Significant Near Loss must be called into Incident Hot Line: 1-866-529-4886**

- Instructions:
- 1) Employee completes the Near Loss Report and submits to Supervisor.
 - 2) Supervisor reviews and makes other comments.
 - 3) Employee discusses Near Loss with Project Manager.
 - 4) Submit to Regional Safety & Health Manager.

Report Status (insert date)	Initial Report	Update Report	Final Report	Verification/Validation	Report Input into SMART Database

SECTION 1

A. Employee Identification		☐ CRA Employee	☐ Temporary Employee	☐ Subcontractor
Employee No.	Last Name	First Name		Employee's Company - if Subcontractor
Date of Hire	Position/Title	Supervisor		Home Office Location - if CRA Employee
B. General Information				
Where did the Near Loss occur?		Type of Near Loss (Check all that apply)		
☐ Office ☐ Project Site ☐ Other _____ ☐ Canada ☐ United States ☐ UK		☐ Employee Injury/Illness ☐ Vehicle Accident ☐ Property Damage ☐ Environmental		
Address of Near Loss (City, State, Providence, Zip Code)			Specific Location of Near Loss (e.g., where on site)	
Date and Hour of Near Loss		Date and Hour Reported to CRA		Time Employee Began Work
Month Day Year	a.m. p.m.	Month Day Year	a.m. p.m.	a.m. p.m.
Witnesses? ☐ Yes ☐ No		Witness Name and Telephone Number		
C. Project Information (Project Related Near Loss Only): Project Related: () Yes () No				
Project #	Project Name	CRA Project Manager	Client	Client Contact
Was the Client Advised of the Near Loss? ☐ Yes ☐ No ☐ N/A		Name:		Date and Time

SECTION 2

A Details of the Near Loss
1. What job/task was being performed when the Near Loss occurred? (Example: collecting groundwater samples).
2. Provide a detailed description of the employee's specific activities at the time of the Near Loss. Include details of equipment/materials being used, including the size and weights of objects being handled, and weather conditions at time of the Near Loss. If necessary, attach additional pages to the report.

B. Near Loss Investigation

Conduct a 5-Why Root Cause Analysis Investigation. In addition, if there was the potential for a significant injury or loss, report the Near Loss to the Incident Hot Line (this will determine if a Tap Root Cause Analysis is necessary).	
HASP prepared? ☐ Yes ☐ No ☐ N/A Submit a PDF of HASP to Investigation Team. If yes, was the HASP on site? ☐ Yes ☐ No	Did the safety plan identify and provide safety procedures for the specific tasks being performed when the Near Loss occurred? ☐ Yes ☐ No If no, why not? (Explain) _____ Did the employee utilize the STAR process before initiating the task? ☐ Yes ☐ No If no, why not? (Explain) _____

SECTION 2 (continued)

5-Why Root Cause:			Additional information: Attach photos, witness statement(s), affected employee statement, as applicable, to the end of this document.
1. Why did "above" happen?			
2. Why did "1" happen?			
3. Why did "2" happen?			
4. Why did "3" happen?			
5. Why did "4" happen?			See Section 3 Below: Corrective Actions/ Verification and Validation
6. Why did "5" happen?			
C. Accountability			
Initial Report Date Month Day Year		Initial Report Prepared by: (please print)	Initial Report Prepared by: (signature)
Investigation Team		Company	Position/Title
Final Report Date Month Day Year		Final Report Prepared by: (please print)	Final Report Prepared by: (signature)
D. Stewardship			
Will a Near Loss Summary be Prepared? ☐ Yes ☐ No If yes, by:			
Quality Review By:		Date:	Findings:

SECTION 3

Corrective Action					Validation & Verification		
CF	Corrective Actions (Must match Causative Factor)	Responsible Party	Due Date	Date Completed	Verified By/ Validated By	Date	Details
					Verified By		
					Validated By		
					Verified By		
					Validated By		
					Verified By		
					Validated By		

CRA 10 CAUSATIVE FACTORS (CF)

PERSONAL FACTORS		COMPANY FACTORS		EXTERNAL FACTORS	
1	Insufficient training for task	5	Incomplete or no procedures	10	Exposure to conditions
2	Hurrying to complete the task	6	Procedures not known or enforced		
3	Easier if proper process not followed	7	Improper PPE		
4	Took shortcuts without prior incident	8	Improper tools		
		9	Improper workplace layout		



FIELD SAFE TASK EVALUATION PROCESS (F-STEP)



Report Status:

(insert date) Initial Report Updated Report Final Report Verification/Validation Report Input to SMART Database

Observer's Name		Date:	Time:
Client:		Project Name:	
Observer's Office:		Site Location:	
Observer's Supervisor:		Project No. (If applicable):	
Subcontractor: ☐ Yes ☐ No		Subcontractor Company Name:	

Feedback Conducted By:	Date:
Observee's Supervisor:	Time:

Check Task Being Observed (if not listed here, go to columns at right)		If checking this column, write in the specific task	
☐ Air Knifing	☐ Mob/Demob	☐ Agricultural Services	
☐ Clearing	☐ Project Oversight	☐ Construction	
☐ Demolition	☐ Soil Sampling	☐ Landfill	
☐ Drilling	☐ Stack Testing	☐ Office Operations	
☐ Electrical Work	☐ Surveys & Audits	☐ O&M	
☐ Excavation	☐ Traffic Control	☐ Pipeline	
☐ General Site Cleaning	☐ UST Removal	☐ Refinery	
☐ Heavy Equipment Operations	☐ Water Sampling	☐ Treatment Plants	
☐ IH Sampling	☐ Well Management	☐ Other	
☐ Manual Lifting			

Give a brief description of task being performed and your surroundings

Observer's Positive Comments
1. 2. 3.

Feedback Session Conclusion:
If NO Questionable Items: Brief Recap of Positive Actions/Comments
If Questionable Items: Brief Recap of Positive Actions/Comments AND Why the Questionable Item(s) Occurred



FIELD SAFE TASK EVALUATION PROCESS (F-STEP)



PERSONAL PROTECTIVE EQUIPMENT	Meets Work Standards	???	N/A	Evaluation Comments
1. Hearing Protection (e.g., Ear Plugs)			☐	
2. Head Protection (e.g., Hard Hat)			☐	
3. Eye Protection (e.g., Safety Glasses/Goggles)			☐	
4. Hand Protection (e.g., Gloves)			☐	
5. Foot Protection (e.g., Steel-toe Boots)			☐	
6. Respiratory Protection			☐	
7. Fall Protection (e.g., lanyard/harness)			☐	
8. High Visibility Clothing (e.g., Work Vest)			☐	
9. First Aid Kit/Fire Extinguisher			☐	
10. Other (be specific)			☐	
BODY POSITION	Meets Work Standards	???	N/A	Evaluation Comments
11. Proper Body Positioning When Exerting Force (Lifting/Pushing/Pulling)			☐	
12. Pinch Points/Moving Equipment - Hands/Body Placement			☐	
13. 3-Points of Contact			☐	
14. Other (be specific)			☐	
WORK ENVIRONMENT	Meets Work Standards	???	N/A	Evaluation Comments
15. Work/Walk Surface Clear (Free And Clear Pathway)			☐	
16. Housekeeping/Equipment Storage			☐	
17. Controlled Work Zone (e.g., Warning Devices, Barricades, Cones, Flags)			☐	
18. Emergency Stop/Safety Switches			☐	
19. Materials Labeled Correctly			☐	
20. Storage/Disposal of Waste			☐	
21. Other (be specific)			☐	
OPERATING PROCEDURES	Meets Work Standards	???	N/A	Evaluation Comments
22. STAR Performed/Job Planning			☐	
23. Stop Work Authority Process – understood and considered			☐	
24. JSA/JLA Reviewed and Followed			☐	
25. Daily Site Inspection			☐	
26. High Risk Task Specific (Hot Work, Confined Space, LOTO, Excavation/Trenching)			☐	
27. Inspect Work Zone for Hazards			☐	
28. Coordinate/Communicate with Site Rep and/or others on site			☐	
29. Spotters used appropriately			☐	
30. Underground/Overhead Utilities Identified			☐	
31. Other (be specific)			☐	
TOOLS/EQUIPMENT	Meets Work Standards	???	N/A	Evaluation Comments
32. Hand/Power Tool - Selection, Condition, and Use			☐	
33. Field/Test Equipment - Selection, Condition, and Use			☐	
34. Heavy Equipment - Selection, Condition, and Use			☐	
35. Other (be specific)			☐	
Observation Total Occurrences				
% Observations to Meet Work Standards				
Item Specific to Work Task	Meets Work Standards	???		Evaluation Comments
Insert Task/JSA/SOP Step				
Insert Task/JSA/SOP Step				
Insert Task/JSA/SOP Step				

FIELD SAFE TASK EVALUATION PROCESS (F-STEP)

Causative Factors and Corrective Actions						Verification (Did we do what we said we would do?) and Validation (Is it working?)		
Item No.	CF	Corrective Actions (Must match Causative Factor)	Responsible Party	Date Due	Date Completed	Verified By/ Validated By	Date	Details
						Verified By:		
						Validated By:		
						Verified By:		
						Validated By:		
						Verified By:		
						Validated By:		
						Verified By:		
						Validated By:		

CRA 10 CAUSATIVE FACTORS

Personal Factors		Company Factors		External Factors	
1	Insufficient training for task	5	Incomplete or no procedures	10	Exposure to conditions
2	Hurrying to complete the task	6	Procedures not known or enforced		
3	Easier if proper process not followed	7	Improper PPE		
4	Took shortcuts without prior incident	8	Improper tools		
		9	Improper workplace layout		

CRA SAFETY COORDINATION REVIEW

SECTION A - JOB SCOPE

	Pre-Job Meeting/Prep HASP	Completed by: _____
	On-Site Orientation Meeting	_____
	End of Job Evaluation	_____
	Tailgate Safety Meeting Planning Tool	_____
	Site Audit	_____
Date: _____ Project Name: _____ Project Number: _____		
Project Location: _____		
Project Description _____		
CRA Project Team		
PM: _____ Resident Inspector: _____ SHO: _____		
Technician(s): _____ Others: _____		
CLIENT INFORMATION		
Company Name: _____		
Address: _____		
Primary Contact: _____		
Phone: _____ Cell: _____ Fax: _____		
SUBCONTRACTOR INFORMATION		
Company Name: _____		
Address: _____		
Primary Contact: _____		
Phone: _____ Cell: _____ Fax: _____		
additional subcontractors listed on last page		

SECTION B - PROJECT SAFETY COORDINATION

1.1 High Risk Activities

Confirm activities to be conducted during project

Working at or above 6 feet (fall protection)

Aerial lift

Heavy equipment

Drilling

Excavation

Lock-Out Tag-Out permit(s) required

Hot work

Hot work permit(s) required

Confined space entry

Confined space entry permit required

Subsurface activities

ATV, Snowmobile, 4 wheeler

Access agreements in-hand and signed by property owner

Permit requirements communicated to affected employees

Resource**Yes No**

PM

PM

PM

PM

PM

PM

PM

PM

PM

PM

PM

PM

PM

PM

CRA SAFETY COORDINATION REVIEW

1.2	Guiding Principals <i>(All items identified, verified and discussed)</i>	Resource	Yes	No	
	Safety Commitment	SMART	☐	☐	
	Injury Free Operation (IFO)	SMART	☐	☐	
	Stop Work Authority	SMART	☐	☐	
	Lessons Learned	SMART	☐	☐	
	Any unresolved safety concerns or issues	RI	☐	☐	
1.3	Personnel Requirements <i>(All items identified, verified and discussed)</i>	Resource	Yes	No	N/A
	Site personnel trained to execute the Scope of Work	PM	☐	☐	☐
	Verification of all personnel's training certifications	PM	☐	☐	☐
	Potential for language barrier issues for this project	PM	☐	☐	☐
	Potential technical understanding barriers for this project	PM	☐	☐	☐
	Number of SSE(s) on site concurrent with CRA/client policy	PM	☐	☐	☐
	Short Service Employee(s) identification	PM	☐	☐	☐
	Mentor assignment for each SSE(s)	PM	☐	☐	☐
	Employees trained to use the tools/equipment	PM	☐	☐	☐
	Verification of all personnel's:		☐	☐	☐
	- Medical clearance & respirator fit test (as required)	Safety Admin	☐	☐	☐
	- Alcohol & drug clearance	Safety Admin	☐	☐	☐
	Daily personnel evaluation if they are fit to function and working safely	RI	☐	☐	☐
	Safety Health Officer required for the site	PM	☐	☐	☐
1.4	Behavior Based Safety - SMART Tools <i>(All items identified, verified and discussed)</i>	Resource	Yes	No	N/A
	STAR/Loss Prevention Self Assessment (LPSAs)	SMART	☐	☐	☐
	Near loss/incident reporting procedure	SMART	☐	☐	☐
	STEP/LPO	SMART	☐	☐	☐
	At-risk behaviors and observation trends	SMART	☐	☐	☐
1.5	HASP Development & Review <i>(All items identified, verified and discussed)</i>	Resource	Yes	No	N/A
	Site-specific Health & Safety Plan developed	HASP	☐	☐	☐
	Site-specific Health & Safety Plan approval by CRA safety professional	HASP	☐	☐	☐
	System to modify the Health & Safety Plan in the field (i.e., "dirty JSA")	HASP	☐	☐	☐
1.6	JSA <i>(All items identified, verified and discussed)</i>	Resource	Yes	No	N/A
	On-site hazard assessment	PM	☐	☐	☐
	JSAs available for all tasks including those performed by subcontractors	HASP	☐	☐	☐
	Requirement to have JSAs modified in the field daily (i.e., "dirty JSA")	RI	☐	☐	☐
	MSDSs obtained, reviewed, and hazards incorporated into JSAs	HASP	☐	☐	☐

CRA SAFETY COORDINATION REVIEW

1.7	PPE <i>(All items identified, verified and discussed)</i>	Resource	Yes	No	N/A
	Confirm task-specific PPE per JSA/JLAs	HASP			
	System to inspect PPE before start of work	RI			
1.8	Site Emergency Response <i>(All items identified, verified and discussed)</i>	Resource	Yes	No	N/A
	First-aid requirements	HASP			
	Minimum - one first-aid trained person on-site	HASP			
	First-aid equipment within 50 feet of risk	HASP			
	Eye wash/shower within 50 feet of risk	HASP			
	Spill response equipment inspected and available within 50 feet of risk	HASP			
	Emergency Action Plan (EAP) - specific personnel identified for key incident				
	command roles - discussed role responsibilities and actions with all site personnel,				
	mustering/meeting location set	HASP			
	Site emergency evacuation alarm confirmed	RI			
	EAP drill schedule	HASP			
	Nearest hospital confirmation	HASP			
	Nearest hardwired telephone confirmation	Site Drawing			
	Emergency shut-off switch/valve locations confirmation	Site Drawing			
	Emergency contact confirmation - coordinate with facility and client	HASP			
1.9	Utility Locates <i>(All items identified, verified and discussed)</i>	Resource	Yes	No	N/A
	CRA and/or client-specific Subsurface Utility Clearance Protocol reviewed and adhered to				
	QSF-019 Property Access Form completed	PM			
	Client-specific requirements communicated to all affected employees	PM			
	One-call responses verified	PM			
1.10	Traffic Control Program <i>(All items identified, verified and discussed)</i>	Resource	Yes	No	N/A
	Temporary Traffic Control Plan (TTCP) required	PM			
	TTCP provided	PM			
	TTCP approval by the client, if required	PM			
1.11	Site Control <i>(All items identified, verified and discussed)</i>	Resource	Yes	No	N/A
	Have the following areas been considered for site control:				
	Fencing, barricades or other identifiers	RI			
	Signage to control pedestrian traffic	RI			
	Safety perimeter around equipment and work zone	RI			
	Swing radius barricades and/or signage struck-by (crush zones) reviewed and controlled.	RI			
1.12	Equipment <i>(All items identified, verified and discussed)</i>	Resource	Yes	No	N/A
	Proper lifting/transport of heavy objects (drums, augers)	RI			
	Equipment inspected and documented where required	RI			
	GFCI used and tested	RI			

CRA SAFETY COORDINATION REVIEW

1.13 Weather <i>(All items identified, verified and discussed)</i>	Resource	Yes	No	N/A
Weather condition changes discussed - how to handle during work	HASP			
Weather monitoring- who is responsible	HASP			
Weather related hazards (heat/cold accommodations)	HASP			
Hold time after lightning and thunder	RI			
1.14 Crew Commitment <i>(All items identified, verified and discussed)</i>	Resource	Yes	No	N/A
Crew is aware of Safety Commitment that they are making	TBD			
1.15 Materials <i>(All items identified, verified and discussed)</i>	Resource	Yes	No	N/A
MSDSs availability for all HAZCOM/WHMIS regulated materials on the job site	HASP			
Affected employees aware of special handling instructions for hazardous materials	HASP			
Hazardous materials stored appropriately	HASP			
Plan for dealing with leftover and/or waste materials	WP			
1.16 Sub-Contractors <i>(All items identified, verified and discussed)</i>	Resource	Yes	No	N/A
Approval through the QSF 12, 22, 30, 31	PM			
CRA Safety Coordination Review Form completed with the subcontractor as applicable	PM			
1.17 Documentation		Yes	No	N/A
All required QS Forms are available and attached to the project file	PM			
- QSF-12	PM			
- QSF-13	PM			
- QSF-16	PM			
- QSF-19	PM			
- QSF-22	PM			
- QSF-30/31	PM			
- Meeting attendance sign in sheets	PM			
Daily Tailgate sign in sheets	PM			
Permits/air monitoring records	PM			
STEP observation form	PM			
Equipment inspection forms	PM			
Client specific forms	PM			

SECTION C - ACTION ITEMS

[illegible]

HASP	Health and Safety Plan
PM	Project Manager
RI	Resident Inspector
SHO	Safety & Health Officer

SUBCONTRACTOR INFORMATION

Company Name: _____
Address: _____
Primary Contact: _____
Phone: _____ Cell: _____ FAX: _____

SUBCONTRACTOR INFORMATION

Company Name: _____
Address: _____
Primary Contact: _____
Phone: _____ Cell: _____ FAX: _____

Copies of the forms for Pre-Job Meeting and On-Site Orientation shall be maintained in the Project File

**CRA FALL PROTECTION
MANLIFT DAILY EQUIPMENT CHECKLIST**

Equipment/Vehicle No.: _____ Week Beginning: _____

1. Check that all functions of the equipment are operating properly (forward, reverse, up, down, horn, etc.)

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday

Note any problems found during inspection below:

2. Check all hardware for looseness (hose reels, guard rails, doors, covers, etc.).

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday

Note any problems found during inspection below:

3. Check for hydraulic line leaks, worn hoses or lines, crimped lines, or lines in danger of being damaged.

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday

Note any problems found during inspection below:

4. Check battery water level, gauge, leads.

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday

Note any problems found during inspection below:

**POWERED INDUSTRIAL TRUCK
PRE-OPERATIONAL INSPECTION FORM**

Inspector's Name

Company Name

Type of Powered Industrial Truck (Forklift):

☐ LPG ☐ Electric ☐ Gas/Diesel Other: _____
☐ Sit Down ☐ Stand-Up (Type): _____ Other: _____

Meter Reading: _____ Model/Serial Number: _____

Directions: Check **Good**, Service (**SVC**), or Not Applicable (**NA**) for each item:

Visual Check	Good	SVC	NA
Tire condition			
Headlights			
Warning lights			
Seatbelt			
Battery			
Mirrors			
Forks			
Overhead guard			
LPG tank			
Fluid levels (hydraulic)			
Fluid levels (oil)			
Fluid leaks			

Operational Check	Good	SVC	NA
Horn			
Steering			
Service brake			
Parking brake			
Hydraulic controls			
Mast			
Attachments			
Engine			
Lift and tilt system			
Gauges			
Forward/Reverse			
Other: _____			

If any item(s) are checked for service, the vehicle will be tagged and **not** be permitted for use until the proper servicing has been conducted.

Inspector's Signature

Date

This is to certify that I have received a pre-entry briefing regarding this HASP (Former Buffalo China Site) and I understand its contents. My failure to follow and comply with the requirements contained in this plan may result in disciplinary action and/or removal from the Site.

Date _____

[illegible]

SITE HEALTH AND SAFETY PLAN MINOR AMENDMENT FORM

Amendment #	_____
Site Name/Project ID	_____
JSA/JLA Title	_____
Date	_____
Type of Amendment	_____
Reason for Amendment	_____

Alternate or Additional Safeguard Procedures	_____

Required changes in PPE	_____

Project Manager Notified ☐

RSHM Notified ☐

Client PM Notified (if necessary) ☐

Site Safety and Health Officer

Date

Note: To be used for changes such as MSDS additives, JSA changes, and equipment changes.

This original form must remain on site and a copy placed in the project file. Any changes to the original HASP must be discussed with all affected site personnel prior to commencing work.

HOT WORK PERMIT AND HOT WORK CHECKLIST

Location (facility, well name, rig, etc.):									
Description of Hot Work:									
I have reviewed the proposed work, agree that hot work is necessary and may proceed without unreasonable risk.									
Initial authorization:			Date:			Expiration time:			
The following precautions must be taken to complete the work safely (attach details of specific procedures or checklist if appropriate).									
Check	Yes	NA	Check	Yes	NA	Check	Yes	NA	
All lines depressurized?			Area/space gas free?			Standby man/fire watch?			
All liquids drained?			Combustibles removed?			Pre-job safety meeting complete?			
Space cleaned and purged?			Continuous atmosphere monitoring?			Emergency procedure established?			
Space properly ventilated?			Fire extinguisher/water available?			Special PPE required?			
Lockout/tagout complete?			Respiratory protection required?						
Positive Isolation ☐ NA ☐ Blind ☐ Double Block and Bleed ☐ Disconnect ☐ Full thickness Skillet	Electric lighting and equipment properly rated for hazardous area location ☐ Yes ☐ No ☐ NA					Communication Method ☐ NA ☐ Hand signal ☐ Voice ☐ Radio ☐ Horn			
PPE			Rescue Equipment			Emergency Phone Numbers			
Head: ☐ Hardhat ☐ Other: _____ Eye/Face: ☐ Safety glasses w/side shields ☐ Face shield ☐ Goggles ☐ Other: _____ Arms/ Hands: ☐ Leather gloves ☐ Leather gloves w/long sleeves ☐ Other: _____ Footwear: ☐ Leather Boots Clothing: ☐ Flame-resistant clothing			Emergency Response Plan? ☐ Yes ☐ No ☐ NA If no, notify outside rescue services GPS Coordinates: _____ ☐ Full body harness ☐ Lifeline ☐ Personnel basket ☐ Rigid stretcher ☐ Mechanical lift for >5 degrees vertical			Ambulance/EMS: Rescue Services: Air Rescue: Fire Department: Other:			
Atmospheric Testing		Results		Results		Results		Results	
Acceptable Conditions Time →		: AM/PM		: AM/PM		: AM/PM		: AM/PM	
Oxygen 19.5% to 23.5%									
Flammability <10% LEL									
H ₂ S <10 ppm									
Norm <50 Micrograms									
Vessel Temperature <100°F (43°C)									
Tester Signature: X		Initials		Initials		Initials		Initials	
Direct Reading Monitor		Model and Unit Number:				Calibration Date: / /			
This permit is approved for ____ hours on this date ____/____/____ Signature of On-site Supervisor: X Start Time: :					Signature of person(s) performing Hot Work: X				
Only the On-site Supervisor may extend the permit time (Max. 12 hours) Time was extended to: _____ hours. Rep. Initials: _____ Time: _____ : Permit start time shall be the same as the initial test time.					X				
					X				
					X				
Cancellation of Permit Signature of On-site Supervisor: X Date: ____/____/____					Signature of Fire Watch: X				
Permit Retention: 1 year or until audited					Signature of Contract Supervisor: X				
Distribution: Original - Client Representative and Work Site Copy - Initial Authorization									

HOT WORK CHECKLIST

Signature	All welding machines shall be located in an unclassified area while in use (for offshore welding, machines must be 3 m or 10 feet away from a well-bay or production area and 0.5 m or 18 inches or away from deck drains – refer to Electrical Area Classification drawing).
	Welding machines with AC power convenience receptacles shall be labelled as AC power and shall be used with ground fault circuit interrupter (GFCI) adapters. The adapters should be placed as close to the welding machine as possible.
	Welding machines with DC power convenience receptacles shall be removed or otherwise disabled and must not be used.
	Welding machines used offshore shall be equipped with drip pans, shut down devices, and spark arresters.
	All welding leads shall be grounded as close as possible to the work area.
	All welding leads and extension cords shall be completely insulated, UL rated, and in good working condition.
	Welding rods shall not be left in the electrode holder when laid down on steel decks. The stud ends shall be put into a container – not on the floor or deck.
	Oxygen and acetylene bottles shall be separated by a or 5-foot high metal barrier, secured in a rack. Acetylene bottles shall be kept in an upright position.
	Regulators shall be equipped with properly operating gauges.
	Oxygen and acetylene hoses shall be leak-free and routed to prevent mechanical damage.
	Oxygen and acetylene hoses shall not be hung on cylinders when in use.
	Oxygen and acetylene shall be turned off at the cylinder valve and hoses bled anytime the equipment is not in use. Regulators shall be removed and protective cylinder caps put in place anytime cylinders are to be moved.
	Acetylene pressure downstream of the regulator shall be kept at or below 15 psi.
	Check valves/flame arresters shall be installed on the torch and the regulator.
	Only friction spark devices shall be used for ignition of cutting torches. Due to a potential ignition source, friction sparkers shall not be permitted to be carried throughout the facility.
	When lighting the cutting torch, the fuel gas valve shall be opened before opening the oxygen valve.
	Equipment containing hydrocarbons or other flammable substances has been relocated at least 35 feet horizontally from the hot work site. Similar equipment located at a lower elevation where slag, sparks, or other burning material could fall has been relocated at least 35 feet from the point of impact. When relocation is impractical, the equipment has been either shielded or the contents rendered inert.
	Fire resistant blankets (if used) shall be of a good quality and should be installed in a manner that does not create pockets or folds.
	Instrument gas systems and devices isolated or shielded.
On-Site Supervisor: _____ Date: _____	
Welder: _____ Date: _____	

INITIAL SAFETY INSPECTION CHECKLIST FOR ELECTRICAL INSPECTION
REFERENCED FROM OSHA STANDARDS AND STANDARD OPERATING PROCEDURES

(This checklist is to be completed at project startup.)

Job Location: _____

Project No.: _____

Inspected By: _____

Date: _____

Signature _____

Subject		OSHA Standard 29 CFR	NA	Yes	No	Date Inspected
1.	Has a competent person been assigned to inspect and test electrical equipment?	1926.404(b)(1)(iii)(B)				
2.	Has equipment been inspected to ensure there are no hazards which would cause death or physical harm?	1926.403(b)(1)				
3.	Is all electrical equipment marked with the manufacturers' name, trademark, another descriptive marking, and are voltage, current, wattage, and other necessary ratings present?	1926.403(g)				
4.	Will work be performed within 10 feet of energized overhead power lines? If yes, see Item 6.					
5.	Is all equipment and conductors approved (i.e., UL approved)?	1926.403(a)				
6.	If work is to be performed around power lines, are the lines de-energized and grounded and a lockout/tagout program instituted?	1926.416(a) 1926.416(g)(2)				
7.	Are live parts of electric equipment operating at 50 volts or more guarded?	1926.403(i)(2)(i)				
8.	Are ground fault circuit interrupters (GFCI) readily available?	1926.404(b)(1)				
9.	Do all extension cords have functional ground conductors?	1926.405(i)(1)				
10.	Does all equipment intended to break current have an interrupting rating sufficient to break the current?	1926.403(c)				
11.	Is all electric equipment firmly secured to the surface which it is mounted?	1926.403(d)(1)				
12.	Are parts of electric equipment which in ordinary operation produce arcs, sparks, or flames isolated from all combustible materials?	1926.403(f)				

Subject		OSHA Standard 29 CFR	NA	Yes	No	Date Inspected
13.	Are all disconnecting means (i.e., switches, circuit breakers, etc.) marked to indicate its purpose?	1926.403(h)				
14.	Are all conductors used in grounding equipment identifiable and distinguishable from all other conductors?	1926.404(a)(1)				
15.	Are systems, circuits, and equipment properly grounded.	1926.404(f)				
16.	Are working spaces and walkways kept clean of cords so as not to create a hazard to employees?	1926.416(b)(2)				
17.	Is a written copy of lockout/tagout procedures on site?	1926.417(a)(1)				
18.	Are all pull boxes, junction boxes, and fittings provided with covers?	1926.405(b)(2)				
19.	Are flexible cords and cables located in areas suitable for their use?	1926.405(g)				
20.	Are splices or joints capped or insulated?	1926.403(e)				
21.	Are all circuit boxes and control boards clearly labelled indicating their purpose?	1926.403(h)				
22.	Is the work area around control panels and circuit boxes clear and easily accessible?	1926.403(i)(1)				
23.	Is a record of inspection on equipment part of the assured equipment grounding conductor program? Documentation attesting that each receptacle, cord set, and cord and plug connected equipment have passed inspection is to be maintained.	1926.404(b)(iii)(G)				
24.	Have all cord sets been inspected and tested? Have worn or frayed cords been removed from work area?	1926.416(e)(1) 1926.404(b)(1)(iii)(C) 1926.404(c)(d)(e)				
25.	Has an individual been appointed to keep the inspections current?	1926.404(b)(1)(iii)				
26.	If open conductors (non-insulated wire) are used, do they meet clearance requirements?	1926.404(c)(1)(ii-iv)				
27.	Is lighting protected from accidental contact or breakage?	1926.405(a)(2)(ii)(E)				

PROPERTY ACCESS/UTILITY CLEARANCE DATA SHEET

(QSF-019)

PROJECT NAME: _____ PROJECT NUMBER: _____

CRA REPRESENTATIVE: _____

CLIENT: _____ CLIENT REPRESENTATIVE: _____ PHONE: _____

ON-SITE PROPERTY ACCESS APPROVAL _____ (OWNER OR AUTHORIZED AGENT SIGNATURE)

OFF-SITE PROPERTY ACCESS APPROVAL (if applicable) _____ (OWNER OR AUTHORIZED AGENT SIGNATURE)

UTILITY CLEARANCE APPROVAL _____ (OWNER OR AUTHORIZED AGENT SIGNATURE)

CONTRACTOR VERIFICATION APPROVAL _____ (OWNER OR AUTHORIZED AGENT SIGNATURE)

UTILITIES (INDICATE THAT LOCATION/UTILITY PRESENCE WAS CHECKED) *												
Borehole/ Excavation Location	Date (m/d/y)	Telephone	Water	Storm Sewer	Sanitary Sewer	Process Sewer	Gas	Electrical	Cable	Overhead Utilities	Other	Comments/Warnings

Additional Comments:

* Note as appropriate, Contractor, Client or Owner, or Agent to sign, indicating no utilities are at the selected borehole/excavation locations.

SAFETY INSPECTION CHECKLIST - MOBILE EQUIPMENT SAFETY

Week Ending:		Job No.:		Equipment:						
(This form is to be completed daily by the operator. Deficiencies should be addressed immediately.)										
Superintendent: _____										
		Date:	Mon.	Tues.	Wed.	Thurs.	Fri.	Sat.	Sun.	Comments
Equipment Hours:		Start:								
		Stop:								
Fluid Levels:										
☐	Oil									
☐	Hydraulic									
☐	Transmission									
☐	Radiator									
☐	Grease Fittings									
☐	Fuel									
Safety Checks:										
☐	Fire Extinguisher									
☐	Seat and Safety Belts									
☐	Warning Devices (backup alarms, lights, etc.)									
☐	Housekeeping									
☐	Brakes									
☐	Mirrors									
☐	Windshield and Wipers									
☐	Steering									
☐	Horn									
☐	Lights									
☐	Tires									
☐	Guards									
☐	Instruments									
☐	Exhaust System									
Accessories:										
☐	Boom or Mast									
☐	Controls									
☐	Level Indicators									
☐	Tracks									
☐	Other									
Sign-Off:										
☐	Operator's Initials									
☐	Supervisor's Initials									

Additional Comments: (Please write any additional comments here. Use the back of this form if necessary.)

√ = OK

NR = Needs Repair

NA = Not Applicable

SAFETY INSPECTION CHECKLIST FOR EXCAVATIONS REFERENCED BY OSHA STANDARDS

This checklist is to be completed by the competent person at the start of work and as needed throughout the shift (i.e., after rain events, etc.). *(A competent person has been trained in the current OSHA excavation standard, is knowledgeable about soil analysis and protective systems, and has the authority to shut down the job.)*

Site Location: _____	Project #: _____
Date: _____ Time: _____	Competent Person: _____
Were visual soil tests made? If Yes, what type? _____	YES NO ☐ Type: _____
Were manual soil tests made? If yes, what type? _____	YES ☐ NO ☐ Type: _____
Soil Type: _____	Signature: _____
Soil Classification: _____	
Excavation Depth: _____	Excavation Width: _____
Protective System Used: _____	

In the following table, please place a Y for Yes, N for No, or N/A for Not Applicable in the right hand column for each item. If No, place the date of correction.

Subject		Y, N, or NA	Date Corrected
GENERAL INSPECTION OF THE JOB SITE			
1.	Does the competent person have the authority to remove employees from the excavation immediately?	Y	
2.	ARE SURFACE OBSTRUCTIONS REMOVED OR SUPPORTED?	Y	
3.	Are employees protected from loose rock or soil that could pose a hazard by falling or rolling into the excavation?	Y	
4.	Are hard hats worn by all employees?	Y	
5.	Are excavated soil, materials, and equipment placed at least 2 feet from the edge of the excavation?	Y	
6.	Are walkways and bridges over excavations 4 feet or more in depth equipped with standard guardrails and toe-boards?	N/A	
7.	Are warning vests or other highly visible clothing provided and worn by all employees exposed to public vehicular traffic?	Y	
8.	Are employees required to stand away from vehicles being loaded or unloaded?	Y	
9.	Is a warning system established and used when mobile equipment operates near the edge of the excavation?	N/A	
10.	Are employees prohibited from going beneath suspended loads?	N/A	
11.	Are employees prohibited from working on the faces of sloped or benched excavations above other employees?	N/A	
UTILITIES			
12.	Were utility companies contacted and/or utilities located?	N/A	
13.	Are the exact locations of the utilities marked?	N/A	
14.	Are underground installations protected, supported, or removed when excavation is opened?	N/A	
MEANS OF ENTERING AND EXITING THE TRENCH			
15.	Is the distance along the trench to an exit no greater than 25 feet in excavations 4 feet or more in depth?	N/A	
16.	IS A SUPPORT SYSTEM, SUCH AS UNDERPINNING, BEING USED?	N/A	
17.	Are ladders used in excavations secured and extended 3 feet above edge of the trench?	N/A	
18.	Are structural ramps used by employees designed by a competent person?	N/A	
19.	Are structural ramps used for equipment designed by a registered professional engineer?	N/A	
20.	Are employees protected from cave-ins when entering or exiting the excavation?	N/A	

Subject		Y, N, or NA	Date Corrected
WET CONDITIONS			
21.	Is water removal equipment monitored by a competent person?	Y	
22.	Is surface water or run-off diverted or controlled to prevent accumulation in the excavation?	Y	
23.	Are inspections made after every rainstorm or other hazard-increasing occurrence?	Y	
HAZARDOUS ATMOSPHERE			
24.	Is the atmosphere within the excavation tested where there is a reasonable possibility of an oxygen deficiency, combustible, or other harmful contaminant exposing employees to a hazard?	N/A	
25.	Are adequate precautions taken to protect employees from exposure to an atmosphere containing less than 19.5% oxygen and/or other hazardous atmospheres?	N/A	
26.	Is ventilation provided to prevent employee exposure to an atmosphere containing flammable gas 10% above the lower explosive limit of a gas?	N/A	
27.	Is testing conducted often to ensure that the atmosphere remains safe?	N/A	
28.	Is emergency equipment, such as breathing apparatus, safety harness and lifeline, and/or basket stretcher readily available where hazardous atmospheres could or do exist?	N/A	
SUPPORT SYSTEMS			
29.	Are materials and/or equipment for support systems selected based on soil analysis, trench depth, and expected loads?	N/A	
30.	Are materials and equipment used for protective systems inspected and in good condition?	N/A	
31.	Are protective systems installed without exposing employees to the hazards of cave-ins (including end walls), collapses, or threat of being struck by materials or equipment?	N/A	
32.	Are excavations below the level of the base, or footing supported, approved by a registered professional engineer?	N/A	
33.	Does the removal of support systems progress from the bottom and members are released slowly? Note any indication of possible failure.	N/A	
34.	Is the excavation of material a level no greater than 2 feet below the bottom of the support system and only if the system is designed to support the loads calculated for the full depth?	N/A	
35.	Is there a shield system placed to prevent lateral movement?	N/A	

**TAILGATE SAFETY MEETING FORM
SMALL GROUP FORMAT - MULTIPLE DAYS
037191 FORMER BUFFALO CHINA SITE BUFFALO, NY**

Date: _____ Time: _____ Presenter: _____

Safety topics/items discussed:

Site personnel in attendance:

Print Name	Signature	Company
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____

Date: _____ Time: _____ Presenter: _____

Safety topics/items discussed:

Print Name	Signature	Company
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____

Date: _____ Time: _____ Presenter: _____

Safety topics/items discussed:

Print Name	Signature	Company
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____



UNSAFE ACTS/UNSAFE CONDITIONS/ STOP WORK AUTHORITY (SWA) REPORT



Reported By:					
To:	CRA RSHM -	Date:		Time:	
Employee Supervisor:		Employee Shareholder:			
Project Related:		☐ No ☐ Yes If yes, Name of Client _____			

Re: (check all that apply)
Location: (check one)

☐ Unsafe Act
☐ Driving

☐ Unsafe Condition
☐ Field

☐ Stop Work Authority (SWA)
☐ Office

Date Reported to Supervisor/PM:		Date Corrected:	
Time Reported to Supervisor/PM:		Time Corrected:	

Describe the unsafe act, unsafe condition, or SWA Situation:

List corrective action(s) implemented:

Did the corrective action(s) mitigate the unsafe act/unsafe condition?

For SMART Administrators Use Only:

CRA Category:

- ☐ PPE - Personal Protective Equipment
- ☐ BP - Body Positioning
- ☐ WE - Work Environment
- ☐ OP - Operating Procedures
- ☐ TE - Tools and Equipment
- ☐ CU - Computer Usage
- ☐ PD - Pre-Driving
- ☐ OPP - Operating Procedures - Parking

Chevron Category:

- ☐ A - Person or People
- ☐ B - Equipment
- ☐ C - Environmental
- ☐ D - Procedures/
Processes/JSA-
review/revise
- ☐ E - Visitors

Energy Source:

- ☐ G - Gravity
- ☐ M - Motion
- ☐ ME - Mechanical
- ☐ E - Electrical
- ☐ P - Pressure
- ☐ T - Temperature
- ☐ C - Chemical
- ☐ B - Biological
- ☐ R - Radiation
- ☐ S - Sound

Are additional actions required? ☐ No ☐ Yes If yes, what? _____

APPENDIX B

JOB SAFETY ANALYSIS FORMS (JSAs)



JOB SAFETY ANALYSIS (JSA)

Land Surveying



Field staff must review job-specific work plan and coordinate with project manager to verify that all up-front logistics are completed prior to starting work including, but not limited to, permitting, access agreements, and notification to required contacts (e.g., site managers, inspectors, clients, subcontractors, etc.). Additionally, a tailgate safety meeting must be performed and documented at the beginning of each workday. **Stop, Think, Act, Review (STAR)** must be used prior to any activity. All personnel must possess the appropriate training prior to initiating scheduled tasks. Also consider weather conditions. CRA personnel have the authority and responsibility to use **Stop Work Authority (SWA)**.

Date Issued/Revised:	June 16, 2011	JSA Type:	Surveying
Work Type:	Surveying	Client:	Oneida, Inc.
Work Activity:	Land surveying		
Work Site:	Former Buffalo China Site 51 Hayes Place Buffalo, NY 14210		
Key Equipment:	Survey Equipment		
Task-specific Training:	Motor Vehicle Safety; Task-specific Training; Personal Protective Equipment; Utility/ATV Training (as necessary)		

MINIMUM REQUIRED PERSONAL PROTECTIVE EQUIPMENT (see job steps for task-specific requirements)					
☒ Reflective Vest	☐ Goggles	☒ Gloves*	Supplied Air	APR	
☒ Hard Hat	☐ Face Shield*	☐ Coveralls*	☐ SCBA	☐ Full Face APR	☐ Particulate ☐ Organic Vapor
☐ Lifeline/Harness*	☐ Hearing Protection*	☐ PPE Clothing*	☐ Airline Respirator (attach description)	☐ Half Mask APR	☐ Particulate/Organic Vapor Combined
☒ Safety Glasses	☒ Safety-toed Boots				☐ Acid Gas
☐ Other*		☐ Other*		☐ Other*	
ADDITIONAL PPE (*provide specific type(s) or descriptions of this item below)					
Class II vest; leather gloves to mob/demob equipment or using hand tools					

Project Development Team Name	Position/Title	Modified By	Reviewed By	Position/Title	Date
Christine Barton	PC				
Craig Gebhardt	RSHM				



JOB SAFETY ANALYSIS (JSA)

Land Surveying



Safety Means Awareness
Responsibility Teamwork

Job Steps ⁽¹⁾	Task Activity	Potential Hazard(s) ⁽²⁾	Corrective Measure(s) ⁽³⁾	Person Responsible
1	Discuss STAR and SWA	Site personnel not aware of STAR and SWA	- Project team (CRA) discusses importance of and documentation procedures for SWA during pre-job safety meeting - Use SWA to stop any work that is unsafe	Project Personnel
2	Mob equipment to surveying area with CRA vehicle: - Plan route of travel before leaving - Review weather conditions and plan accordingly - Fasten seatbelt and obey all traffic rules	- Lifting hazards - Manual material handling - Back injury - Pinch points - Moving or flying projectiles inside vehicle while transporting equipment - Slip/trip/fall hazards - Biological hazards	- Reduce travel distance when there is a need to carry/lift materials - Make sure grip is adequate; wear leather/cotton gloves - Size up the load; if the object is too large or odd shaped OR is in excess of 50 pounds (23 kg) then assistance (mechanical or a buddy lift) will be required - Lift with the legs (bend at the knees and use the leg muscles) to protect the lower back and keep lower back in a neutral position - Avoid one-handed carrying if possible; maintain awareness of footing - Review JSA and HASP – Revise JSA as necessary “Dirty JSA” - Practice STAR - Properly secure all equipment inside the vehicle - Use defensive driving techniques - Do not drive while fatigued - Park in a safe area; be aware of surroundings - Inspect work area and note hazards (mitigate if necessary)	Survey Team
3	Note traffic flow (on-site and off-site vehicles and heavy equipment)	- Struck by oncoming traffic - Slip/trip/fall hazards - Biological hazards - Threatening dogs	- Stage the CRA vehicle to aid in the protection of the survey crew if they need to set up a Temporary Traffic Control Zone (TTCZ) - Review JSA and HASP; document accordingly - Practice STAR	Survey Team
4	Develop the Temporary Traffic Control Plan (TTCP) and set up the Temporary Traffic Control Zone (TTCZ) as necessary	- Struck by oncoming traffic - Slip/trip/fall - Biological hazards - Threatening dogs - Lifting hazards - Manual material handling - Back safety - Heat/cold stress	- Review the requirements of the TTCP ahead of time - Make sure that all temporary traffic control equipment (signs/cones/etc.) is available - Carefully set up TTCZ using the buddy system - Refer to step 1 and HASP for additional lifting methods/information - Position CRA's truck with flashers on for added protection - Follow heat/cold stress procedures presented in the HASP - Review JSA and HASP - Practice STAR	Survey Team
5	General use of hand tools and surveying equipment (setup, staking, measuring, locating – these tasks could involve working on slopes or other uneven/rough terrain)	- Struck by oncoming traffic - Slip/trip/fall hazards - Heavy lifting - Biological hazards - Threatening dogs - Potential injuries from misuse of tools or use of tools in disrepair	- Wear ANSI Class II reflective safety vest, safety-toed boots, leather work gloves, and hard hat - If its not safe then use SWA and review work - Use buddy system and team lifting; do not lift more than 40 pounds by yourself; avoid excessive body twisting motions - Do not use old or faded PPE - Inspect tools – use the proper tool for the task - Repair/replace tools as necessary - Store tools and equipment properly after use - Practice STAR – review work area for safer means to work	Survey Team



JOB SAFETY ANALYSIS (JSA)

Land Surveying



Job Steps ⁽¹⁾	Task Activity	Potential Hazard(s) ⁽²⁾	Corrective Measure(s) ⁽³⁾	Person Responsible
6	Conduct survey activities – this work will involve: - traversing uneven or rough terrain – inspect/review work area and path of travel for hazards - minor clearing activities during “line clearing” – review weed/brush cutting JSA; use and store machete properly	- Struck by oncoming traffic - Slip/trip/fall hazards - Biological hazards - Pinch points - Cuts/abrasions/slivers - Threatening dogs - Equipment damage	- Surveyor will enter roadway after clearance from flagman - Surveyor will maintain contact with flagman during survey - Make sure that proper PPE is being worn - Review JSA and HASP - Practice STAR; If its not safe then use SWA to review work - Inspect work area and note hazards (use RCA to mitigate as necessary) - Avoid climbing over fences and over rough/uneven terrain as much as possible - Avoid log/brush/rock piles - Use insect repellant as directed and if necessary review PPE for stinging/biting insects (mosquito nets, face hoods, etc.) - Wisk machete in front of you away from body parts; keep in sheath when not in use - Choose a safe path of travel; work smart - Protect equipment during use and store properly after use	Survey Team
7	Exit roadway and/or heavy equipment traffic pattern	- Struck by oncoming traffic - Slip/trip/fall - Biological hazards - Threatening dogs	- Surveyor should exit roadway first, followed by flagman nearest oncoming traffic (spotter) - Review JSA and HASP - Practice STAR	Survey Team

- (1) Each Job or Task consists of a set of steps. Be sure to list all the steps in the sequence that they are performed. Specify the equipment or other details to set the basis for the potential (associated) hazards.
- (2) A hazard is a potential danger. What can go wrong? How can someone get hurt? Consider, but do not limit, the analysis to: **Contact** - victim is struck by or strikes an object; **Caught** - victim is caught on, caught in or caught between objects; **Fall** - victim falls to ground or lower level (includes slips and trips); **Exertion** - excessive strain or stress/ergonomics/lifting techniques; **Exposure** - inhalation/skin hazards. Specify the hazards and do not limit the description to a single word such as "Caught".
- (3) Aligning with the Job Steps, Task Activity Description, and Potential Hazard columns, describe what actions or procedures are necessary to eliminate or minimize the hazards. Be clear, concise and specific. Use objective, observable, and quantified terms. Avoid subjective general statements such as "be careful" or "use as appropriate".



JOB SAFETY ANALYSIS (JSA)

Mobilization/Demobilization



Field staff must review job-specific work plan and coordinate with project manager to verify that all up-front logistics are completed prior to starting work including, but not limited to, permitting, access agreements, and notification to required contacts (e.g., site managers, inspectors, clients, subcontractors, etc.). Additionally, a tailgate safety meeting must be performed and documented at the beginning of each workday. **Stop, Think, Act, Review (STAR)** must be used prior to any activity. All personnel must possess the appropriate training prior to initiating scheduled tasks. Also consider weather conditions. CRA personnel have the authority and responsibility to use **Stop Work Authority (SWA)**.

Date Issued/Revised:	June 14, 2011	JSA Type:	Mobilization/Demobilization
Work Type:	Environmental	Client:	Oneida, Inc.
Work Activity:			
Work Site:	Former Buffalo China Site 51 Hayes Place Buffalo, NY 14210		
Key Equipment:	Vehicle, 360 degree topper and tools		
Task-specific Training:	Valid Drivers License, PPE HAZCOM		

MINIMUM REQUIRED PERSONAL PROTECTIVE EQUIPMENT (see job steps for task-specific requirements)					
☐ Reflective Vest	☐ Goggles	☒ Gloves*	Supplied Air	APR	
☐ Hard Hat	☐ Face Shield*	☐ Coveralls*	☐ SCBA	☐ Full Face APR	☐ Particulate ☐ Organic Vapor
☐ Lifeline/Harness*	☐ Hearing Protection*	☐ PPE Clothing*	☐ Airline Respirator (attach description)	☐ Half Mask APR	☐ Particulate/Organic Vapor Combined
☐ Safety Glasses	☒ Safety-toed Boots				☐ Acid Gas
☐ Other*			☐ Other*	☐ Other*	
ADDITIONAL PPE (*provide specific type(s) or descriptions of this item below)					

Project Development Team Name	Position/Title	Modified By	Reviewed By	Position/Title	Date
Chris Barton	PC				
Craig Gebhardt	RSBM				



JOB SAFETY ANALYSIS (JSA)

Mobilization/Demobilization



Job Steps ⁽¹⁾	Task Activity	Potential Hazard(s) ⁽²⁾	Corrective Measure(s) ⁽³⁾	Person Responsible
1	Discuss STAR and SWA	Site personnel not aware of STAR and SWA	- Project team (CRA) discusses importance of and documentation procedures for SWA during pre-job safety meeting - Use SWA to stop any work that is unsafe	Project Personnel
2	Check weather	- Unexpected storm - Fog, rain, snow; lightening/thunder - Heat/cold stress	- Check local weather forecast - If adverse weather conditions are likely, prepare a contingency plan for lodging, etc. with project manager - Discuss weather issues and precautions to take while driving and on site during the pre-job safety meeting - If weather conditions (e.g., fog, rain, snow, etc.) impair the ability/vision of the driver, exit at nearest safe location and assess the situation - While on site, at first sign of lightening/thunder utilize SWA and assess weather conditions - In extreme temperatures, ensure all personnel have proper clothing, hydration, and heat/cold protection (e.g., canopy, fan, glove warmers)	Project Personnel
3	Load equipment into vehicle	- Lifting hazards - Manual material handling - Back injury - Cuts - Pinch points - Hand/foot injury - Forgotten or damaged equipment	- Reduce travel distance when there is a need to carry/lift materials - Make sure grip is adequate; wear leather/cotton gloves - Size up the load; if the object is too large or odd shaped OR is in excess of 50 pounds (23 kg) then assistance (mechanical or a buddy lift) will be required - Lift with the legs (bend at the knees and use the leg muscles) to protect the lower back and keep lower back in a neutral position - Avoid one-handed carrying if possible; maintain awareness of footing - Avoid placing hands/fingers in pinch point locations - Wear safety-toed boots - Verify requested equipment against warehouse form - Load equipment in an organized manner to prevent shifting during transport or use cargo netting	Project Personnel
4	Complete CRA Daily Operator Vehicle Checklist	- Damaged vehicle lights, tires, windows, mirrors, horn - Inadequate vehicle documents and/or safety items	- Check for fluid leaks under vehicle - Test operation of headlights, front/rear turn signals, backup lights, brake lights, and emergency flashers - Visually check the pressure/wear of tires - Ensure the vehicle has a spare tire - Assure windshield and window glass is clean and free from obstructions - Test the windshield wipers and horn - Verify vehicle registration, insurance card, and inspection sticker is present and valid - Ensure the vehicle contains a first aid kit, fire extinguisher, and road hazard kit - Check immediate vehicle perimeter and initial path of travel for obstructions	Project Personnel
5	Check and adjust seat, steering wheel, headrest, and mirrors	- Back/body strain - Blind spot - Impaired vision	- Adjust seat, headrest, and steering wheel height so body is fully supported/comfortable and pedals are within easy reach - Ensure mirrors are properly adjusted	Project Personnel
6	Fasten seat belt(s) and ensure passenger(s) seat belts are fastened	Serious injury, ejection, or death from collision and/or traffic citation	Verify driver and passenger(s) seat belts are in good condition and properly latched	Project Personnel



JOB SAFETY ANALYSIS (JSA)

Mobilization/Demobilization



Job Steps ⁽¹⁾	Task Activity	Potential Hazard(s) ⁽²⁾	Corrective Measure(s) ⁽³⁾	Person Responsible
7	Ensure vehicle doors are locked	- Serious injury, ejection, or death from collision - Unwanted intrusion - Lost equipment	Manually lock all doors to vehicle	Project Personnel
8	Start engine and check gauges and warning lights	Vehicle breakdown	Verify sufficient fuel and other hazard lamps (e.g., battery, oil, and temperature) are not lit	Project Personnel
9	Mobilize to site	- Arriving late - Collision - Injury or death to occupants or other parties	- Do not use cell phones or perform other distracting activities while vehicle is in motion - Constantly scan intersections, move eyes, check mirrors, and assess traffic lights (fresh vs. stale) - Maintain safety cushion around vehicle (front, sides, and rear) and 4-second following distance - Utilize all driving defensive techniques	Project Personnel
10	Arrive at site	- Pedestrian injury - Collision	Maintain awareness of pedestrian/vehicular traffic when entering site and traveling to work zone	Project Personnel
11	Park vehicle	- Pedestrian injury - Collision - Property damage	- Maintain awareness of pedestrian/vehicular traffic - Park vehicle in pull-through parking space or facing the exit - Parking in a parking space that is not a designated parking space will require the placement of the 360-degree topper on the hood of the vehicle - Use caution and mirrors/spotter when backing vehicle - Set parking brake	Project Personnel
12	Demobilization	- Collision - Injury or death to occupants or other parties	- Check immediate vehicle perimeter and initial path of travel for obstructions - Maintain awareness of pedestrian/vehicular traffic when exiting site - Utilize defensive driving techniques - Complete post-departure checklist and report vehicle problems to company vehicle maintenance manager or rental car agency	Project Personnel

- (1) Each Job or Task consists of a set of steps. Be sure to list all the steps in the sequence that they are performed. Specify the equipment or other details to set the basis for the potential (associated) hazards.
- (2) A hazard is a potential danger. What can go wrong? How can someone get hurt? Consider, but do not limit, the analysis to: **Contact** - victim is struck by or strikes an object; **Caught** - victim is caught on, caught in or caught between objects; **Fall** - victim falls to ground or lower level (includes slips and trips); **Exertion** - excessive strain or stress/ergonomics/lifting techniques; **Exposure** - inhalation/skin hazards. Specify the hazards and do not limit the description to a single word such as "Caught".
- (3) Aligning with the Job Steps, Task Activity Description, and Potential Hazard columns, describe what actions or procedures are necessary to eliminate or minimize the hazards. Be clear, concise and specific. Use objective, observable, and quantified terms. Avoid subjective general statements such as "be careful" or "use as appropriate".



JOB SAFETY ANALYSIS (JSA)

Oversight of Monitoring Well Installation and/or Soil Boring



Safety Means Awareness
Responsibility Teamwork

Field staff must review job-specific work plan and coordinate with project manager to verify that all up-front logistics are completed prior to starting work including, but not limited to, permitting, access agreements, and notification to required contacts (e.g., site managers, inspectors, clients, subcontractors, etc.). Additionally, a tailgate safety meeting must be performed and documented at the beginning of each workday. **Stop, Think, Act, Review (STAR)** must be used prior to any activity. All personnel must possess the appropriate training prior to initiating scheduled tasks. Also consider weather conditions. CRA personnel have the authority and responsibility to use **Stop Work Authority (SWA)**.

Date Issued/Revised:	June 14, 2011	JSA Type:	Drilling/Environmental
Work Type:	Environmental - Oversight	Client:	Oneida, Inc.
Work Activity:	Oversight of installation of soil borings, monitoring wells, and abandonment of monitoring wells		
Work Site:	Former Buffalo China Site 51 Hayes Place Buffalo, NY 14210		
Key Equipment:	Safety cones/fencing/barricades		
Task-specific Training:	Previous experience in procedures of monitoring well installation, 40 Hour and 8 Hour HAZWOPER, Mobil Equipment Operations, Hearing Conservation and PPE		

MINIMUM REQUIRED PERSONAL PROTECTIVE EQUIPMENT (see job steps for task-specific requirements)

☒ Reflective Vest	☐ Goggles	☒ Gloves*	Supplied Air	APR	
☒ Hard Hat	☐ Face Shield*	☐ Coveralls*	☐ SCBA	☐ Full Face APR	☐ Particulate ☐ Organic Vapor
☐ Lifeline/Harness*	☒ Hearing Protection*	☐ PPE Clothing*	☐ Airline Respirator (attach description)	☐ Half Mask APR	☐ Particulate/Organic Vapor Combined
☒ Safety Glasses	☒ Safety-toed Boots				☐ Acid Gas
☐ Other*		☐ Other*		☐ Other*	

ADDITIONAL PPE (*provide specific type(s) or descriptions of this item below)

Nitrile gloves will be worn.

Project Development Team Name	Position/Title	Modified By	Reviewed By	Position/Title	Date
Chris Barton	PC				
Craig Gebhardt	RSHM				



JOB SAFETY ANALYSIS (JSA)

Oversight of Monitoring Well Installation and/or Soil Boring



Safety Means Awareness
Responsibility Teamwork

Job Steps ⁽¹⁾	Task Activity	Potential Hazard(s) ⁽²⁾	Corrective Measure(s) ⁽³⁾	Person Responsible
1	Discuss STAR and SWA	Site personnel not aware of STAR and SWA	- Project team (CRA) discusses importance of and documentation procedures for SWA during pre-job safety meeting - Use SWA to stop any work that is unsafe	Site Personnel
2	Markout underground utilities	- Property damage - Explosion - Electrocution - Injury - Death	- Call public underground utility agency (One-Call) at least 5 or more days prior to work activities - Review State Law pertaining to underground pipe line safety and have private utility mark-out performed - Expose lines if warranted (i.e., hand dig, test pit, or daylight)	Project Manager and Site Supervisor
3	Conduct site walk - identify unsafe conditions and determine sample point locations	- Traffic hazard - Slip/trip/fall hazards - Biological hazard - Overhead/underground hazards	- Maintain awareness of on-site traffic and walking surfaces - When selecting soil boring locations, be aware of biological hazards (e.g., ants, poison ivy, wasps) and overhead/underground hazards (e.g., overhead utilities, concrete scarring, station canopy)	Site Personnel
4	Equipment inspection	- Pinch points - Property damage - Lost time due to damaged equipment/parts	- Discuss pinch points on equipment (e.g., drill rig, air knife, pressure washer, etc.) - Familiarize all personnel with location/operation of fire extinguisher(s) and kill switch on drill rig - Visually inspect equipment/parts for damage and document inspections	Site Personnel
5	Set up work zone for drilling	- Traffic hazard - Slip/trip/fall hazards - Property damage - Overhead hazards - Environmental impact	- Maintain awareness of on-site traffic, work zones, walking surfaces, overhead hazards (e.g., canopy and low hanging overhead lines) - Utilize barricades/cones/caution tape to define work zone and direct traffic - Wear leather/cotton when setting up barricades - Be aware of any potential sensitive receptors and verify all personnel are aware of the location of spill kit	Site Personnel
6	Set up staging area	- Traffic hazard - Slip/trip/fall hazards - Lifting hazards - Back injury - Manual material handling - Pinch points - Heat/cold stress	- Maintain awareness of on-site traffic and walking surfaces - Utilize barricades/cones/caution tape to define work zone and direct traffic - Reduce distance needed to travel when carrying materials and or equipment - Wear leather/cotton gloves when setting up barricades - Size up the load, if the object is too large or odd shaped OR is in excess of 50 pounds (23 kg) then assistance (mechanical or a buddy lift) will be required - Lift with the legs (bend at the knees and use the leg muscles) to protect the lower back and keep lower back in a neutral position - Avoid one-handed carrying if possible; maintain awareness of footing - Avoid placing hands/fingers in pinch point locations - In extreme temperatures, ensure all personnel have proper clothing, hydration, and heat/cold protection (e.g., canopy, fan, glove warmers)	Site Personnel



JOB SAFETY ANALYSIS (JSA)

Oversight of Monitoring Well Installation and/or Soil Boring



Safety Means Awareness
Responsibility Teamwork

Job Steps ⁽¹⁾	Task Activity	Potential Hazard(s) ⁽²⁾	Corrective Measure(s) ⁽³⁾	Person Responsible
7	Contractor oversight/ management of hole clearance/drilling activities	- Traffic hazard - Slip/trip/fall hazards - Lifting hazards - Back injury - Manual material handling - Damage to underground utilities - Contaminant exposure - Heat/cold stress - Injury to personnel and public - Cross-contamination - Equipment failure	- Maintain awareness of on-site traffic and practice good housekeeping - Perform a prestart meeting, inform subcontractor of safe lifting practices - Refer to step 5 and the HASP for additional lifting information - Ensure subcontractors don proper PPE (e.g., face shield, leather/cotton gloves, hearing protection); no loose clothing - Complete and sign off utility clearance - If non-native material (e.g., pea gravel, sand, fill material) or underground utilities are observed, utilize SWA and assess situation - Monitor breathing zone and refer to HASP for action levels - Monitor all personnel for signs and symptoms of heat/cold stress and refer to HASP for recommendations - Be aware of unsafe hoisting and material handling practices - Be aware of proper augering and auger handling techniques - Visually monitor performance and functioning of drill rig for signs of failure - Monitor safe drill movement/positional setup - Decontaminate sampling equipment after collecting a sample and decontaminate drilling equipment after each borehole - Watch where you step, look for debris which may be covered by brush or rubble	Site Personnel
8	Construct well	- Lifting hazards - Back injury - Manual material handling - Cross-contamination - Non-approved construction - Slip/trip/fall hazards - Eye injury - Cuts	- Use proper lifting techniques as discussed in Step 5 and HASP - Prior to going into the borehole, inspect casing and other materials to ensure they are free of jagged/sharp edges - Confirm construction with project manager - Ensure presence or other authorization by any required inspectors for well installation/grouting - Keep pathways and work area clean of debris and possible tripping hazards - Use PPE and monitoring in accordance with the JSA - Use safe cutting tools (no fixed open blade knives)	Site Personnel
9	Site/boring security, clean site, demobilize	- Traffic hazard - Slip/trip/fall hazards - Lifting hazards - Back safety - Manual material handling	- Use buddy system as necessary to remove traffic control - Do not work with your back to traffic - Wear leather/cotton gloves when moving barricades - Maintain awareness of on-site traffic and walking surfaces - Maintain proper lifting techniques as described in Step 5 and HASP. - Ensure good house keeping methods are practiced. Work area is kept clean of debris - Leave site clean of refuse and debris - Clearly mark/barricade any borings that need later topping off or curing - Notify property personnel of departure - Secure boring location if open overnight	Site Personnel



JOB SAFETY ANALYSIS (JSA)

Oversight of Monitoring Well Installation and/or Soil Boring



- (1) Each Job or Task consists of a set of steps. Be sure to list all the steps in the sequence that they are performed. Specify the equipment or other details to set the basis for the potential (associated) hazards.
- (2) A hazard is a potential danger. What can go wrong? How can someone get hurt? Consider, but do not limit, the analysis to: **Contact** - victim is struck by or strikes an object; **Caught** - victim is caught on, caught in or caught between objects; **Fall** - victim falls to ground or lower level (includes slips and trips); **Exertion** - excessive strain or stress/ergonomics/lifting techniques; **Exposure** - inhalation/skin hazards. Specify the hazards and do not limit the description to a single word such as "Caught".
- (3) Aligning with the Job Steps, Task Activity Description, and Potential Hazard columns, describe what actions or procedures are necessary to eliminate or minimize the hazards. Be clear, concise and specific. Use objective, observable, and quantified terms. Avoid subjective general statements such as "be careful" or "use as appropriate".



JOB SAFETY ANALYSIS (JSA)

Soil Sampling



Safety Means Awareness
Responsibility Teamwork

Field staff must review job-specific work plan and coordinate with project manager to verify that all up-front logistics are completed prior to starting work including, but not limited to, permitting, access agreements, and notification to required contacts (e.g., site managers, inspectors, clients, subcontractors, etc.). Additionally, a tailgate safety meeting must be performed and documented at the beginning of each workday. **Stop, Think, Act, Review (STAR)** must be used prior to any activity. All personnel must possess the appropriate training prior to initiating scheduled tasks. Also consider weather conditions. CRA personnel have the authority and responsibility to use **Stop Work Authority (SWA)**.

Date Issued/Revised:	June 16, 2011	JSA Type:	Drilling, Soil Sampling
Work Type:	Environmental	Client:	Oneida, Inc.
Work Activity:	Soil sampling		
Work Site:	Former Buffalo China Site 51 Hayes Place Buffalo, NY 14210		
Key Equipment:	Air monitoring equipment, PPE		
Task-specific Training:	CRA Field Method Training on Soil Sampling Procedures, 40 Hour and 8 Hour HAZWOPER, Mobil Equipment Operations, HAZAOM and PPE		

MINIMUM REQUIRED PERSONAL PROTECTIVE EQUIPMENT (see job steps for task-specific requirements)					
☒ Reflective Vest	☐ Goggles	☒ Gloves*	Supplied Air	APR	
☒ Hard Hat	☐ Face Shield*	☐ Coveralls*	☐ SCBA	☐ Full Face APR	☐ Particulate ☐ Organic Vapor
☐ Lifeline/Harness*	☐ Hearing Protection*	☒ PPE Clothing*	☐ Airline Respirator (attach description)	☐ Half Mask APR	☐ Particulate/Organic Vapor Combined
☒ Safety Glasses	☒ Safety-toed Boots				☐ Acid Gas
☐ Other*		☐ Other*		☐ Other*	
ADDITIONAL PPE (*provide specific type(s) or descriptions of this item below)					
Tyvek if Level C initiated; gloves dependent on the task and chemical contamination present or suspected present					

Project Development Team Name	Position/Title	Modified By	Reviewed By	Position/Title	Date
Christine Barton	PC				
Craig Gebhardt	RSHM				



JOB SAFETY ANALYSIS (JSA)

Soil Sampling



Safety Means Awareness
Responsibility Teamwork

Job Steps ⁽¹⁾	Task Activity	Potential Hazard(s) ⁽²⁾	Corrective Measure(s) ⁽³⁾	Person Responsible
1	Discuss STAR and SWA	Site personnel not aware of STAR and SWA	- Project team (CRA) discusses importance of and documentation procedures for SWA during pre-job safety meeting - Use SWA to stop any work that is unsafe	Site Personnel
2	Inspect and calibrate sampling and monitoring equipment	- Lost time from improperly functioning equipment - Incorrect sampling procedures/ collection due to malfunctioning equipment	- Ensure all equipment is functioning properly - Complete Quality Control documents	Sampling Technician
3	Prepare to collect soil samples	- Lifting hazards - Back injury - Manual material handling - Pinch points - Cuts - Punctures - Sample misidentification	- Size up the load; if the object is too large or odd shaped OR is in excess of 50 pounds (23 kg) then assistance (mechanical or a buddy lift) will be required - Lift with the legs (bend at the knees and use the leg muscles) to protect the lower back and keep lower back in a neutral position - Avoid one-handed carrying if possible; maintain awareness of footing - No bending or twisting while under load - Refer to the HASP for additional lifting information - Avoid placing hands/fingers in pinch point locations - Use proper tools when opening container packaging - Do not use fixed open blade knives when opening boxes or containers - Ensure the sample id label matches sample location with site plan/CRA site supervisor/subcontractor	Sampling Technician
4	Opening the sample sleeve (if applicable)	- Cuts due to sharp edges of sample sleeve - Contaminant exposure	- Use sleeve cutter for opening the sample sleeves - Keep hands clear of the sleeve when cutting - Wear nitrile gloves - Maintain awareness of sharp edges of sample sleeve	Sampling Technician
5	Sample collection	- Contaminant exposure - Cuts from container breakage - Sample misidentification	- Wear nitrile gloves and replace between soil samples - Inspect glass bottles for breaks/cracks - Do not attempt to use any suspect containers - Close glass sample containers carefully to avoid breakage - Check sample labels for accuracy prior to placing in cooler	Sampling Technician
6	Headspace screening of samples	- Contaminant exposure - Incorrect headspace readings	- Wear nitrile gloves - Ensure proper calibration of equipment	Sampling Technician
7	Sample selection	- Bottle breakage - Contaminant exposure - Pinch points - Lost time due to incorrect sample selection	- Wear nitrile gloves when handling sample containers - Confirm selected samples are correct based on work plan selection criteria, PID readings, and soil boring logs - Avoid placing hands/fingers in pinch point locations (e.g., between cooler and lid)	Sampling Technician



JOB SAFETY ANALYSIS (JSA)

Soil Sampling



Safety Means Awareness
Responsibility Teamwork

Job Steps ⁽¹⁾	Task Activity	Potential Hazard(s) ⁽²⁾	Corrective Measure(s) ⁽³⁾	Person Responsible
8	Packing samples in cooler(s)	• Bottle breakage • Contaminant exposure • Cuts • Pinch points • Lifting hazards • Back injury • Manual material handling • Lost time due to incorrect sample packaging or hold time exceedances	• Wear nitrile gloves when handling sample containers • Pack glass containers in bubble wrap • Check COC against sample labels and SSOW for accuracy before shipping • Avoid placing hands/fingers in pinch point locations (e.g., between cooler and lid) • Use proper lifting techniques as discussed in step 3 • If possible use a dolly or cart if cooler is heavy or has to be moved over a long distance • Ensure equipment and supplies are loaded correctly and do not shift during transport	Sampling Technician
9	Investigation derived waste (IDW) management	• Contaminant exposure • Lifting hazards • Back injury • Manual material handling • Pinch points • Slips/trips/fall hazards • Misabeled waste	• Wear nitrile gloves when handling IDW • Use proper lifting techniques as discussed in step 3 • Avoid placing hands/fingers in pinch point locations • Maintain awareness of walking surfaces • Label IDW with generator, a contact number, identification of contents, and site location • Specify IDW as either hazardous or non-hazardous material	Sampling Technician

- (1) Each Job or Task consists of a set of steps. Be sure to list all the steps in the sequence that they are performed. Specify the equipment or other details to set the basis for the potential (associated) hazards.
- (2) A hazard is a potential danger. What can go wrong? How can someone get hurt? Consider, but do not limit, the analysis to: **Contact** - victim is struck by or strikes an object; **Caught** - victim is caught on, caught in or caught between objects; **Fall** - victim falls to ground or lower level (includes slips and trips); **Exertion** - excessive strain or stress/ergonomics/lifting techniques; **Exposure** - inhalation/skin hazards. Specify the hazards and do not limit the description to a single word such as "Caught".
- (3) Aligning with the Job Steps, Task Activity Description, and Potential Hazard columns, describe what actions or procedures are necessary to eliminate or minimize the hazards. Be clear, concise and specific. Use objective, observable, and quantified terms. Avoid subjective general statements such as "be careful" or "use as appropriate".



JOB SAFETY ANALYSIS (JSA)

Groundwater Sampling (Peristaltic Pump)



Field staff must review job-specific work plan and coordinate with project manager to verify that all up-front logistics are completed prior to starting work including, but not limited to, permitting, access agreements, and notification to required contacts (e.g., site managers, inspectors, clients, subcontractors, etc.). Additionally, a tailgate safety meeting must be performed and documented at the beginning of each workday. **Stop, Think, Act, Review (STAR)** must be used prior to any activity. All personnel must possess the appropriate training prior to initiating scheduled tasks. Also consider weather conditions. CRA personnel have the authority and responsibility to use **Stop Work Authority (SWA)**.

Date Issued/Revised:	June 16, 2011	JSA Type:	Groundwater Sampling
Work Type:	Environmental	Client:	Oneida, Inc.
Work Activity:	Groundwater sampling		
Work Site:	Former Buffalo China Site 51 Hayes Place Buffalo, NY 14210		
Key Equipment:	peristaltic pump, photoionization detector; safety cones/barricades		
Task-specific Training:	Electrical Safety (if using pump), Groundwater Sampling Procedures 40 Hour and 8 Hour HAZWOPER, HAZCOM, PPE.		

MINIMUM REQUIRED PERSONAL PROTECTIVE EQUIPMENT (see job steps for task-specific requirements)					
☒ Reflective Vest	☐ Goggles	☒ Gloves*	Supplied Air	APR	
☒ Hard Hat	☐ Face Shield*	☐ Coveralls*		☐ Full Face APR	☐ Particulate ☐ Organic Vapor
☐ Lifeline/Harness*	☒ Hearing Protection*	☐ PPE Clothing*	☐ Airline Respirator (attach description)	☐ Half Mask APR	☐ Particulate/Organic Vapor Combined
☒ Safety Glasses	☒ Safety-toed Boots				☐ Acid Gas
☒ Other* Sunscreen and Insect Repellant		☐ Other*		☐ Other*	
ADDITIONAL PPE (*provide specific type(s) or descriptions of this item below)					
Use Ndex nitrile gloves when handling wet sampling containers; use abrasion/cut-resistant gloves for other tasks; use hearing protection as necessary based on site conditions.					

Project Development Team Name	Position/Title	Modified By	Reviewed By	Position/Title	Date
Christine Barton	PC				
Craig Gebhardt	RSHM				



JOB SAFETY ANALYSIS (JSA)

Groundwater Sampling (Peristaltic Pump)



Job Steps ⁽¹⁾	Task Activity	Potential Hazard(s) ⁽²⁾	Corrective Measure(s) ⁽³⁾	Person Responsible
1	Discuss STAR and SWA	Site personnel not aware of STAR and SWA	- Project team (CRA) discusses importance of and documentation procedures for SWA during pre-job safety meeting - Use SWA to stop any work that is unsafe	Site Personnel
2	Inspect/calibrate sampling equipment	Loss due to malfunctioning equipment	Check all equipment to ensure it is in proper working order and has been calibrated to CRA and manufacturer's standards, and document	Sampling Technician
3	Establish work zone at monitoring well location	- Traffic - Pinch points - Lifting hazards - Back injury - Manual material handling	- Maintain awareness of on-site traffic patterns and walking paths; setup barricades - Reduce travel distance when there is a need to carry/lift materials - Make sure grip is adequate; wear leather/cotton gloves when setting up barricades - Size up the load; if the object is too large or odd shaped OR is in excess of 50 pounds (23 kg) then assistance (mechanical or a buddy lift) will be required - Lift with the legs (bend at the knees and use the leg muscles) to protect the lower back and keep lower back in a neutral position - Avoid one-handed carrying if possible; maintain awareness of footing	Sampling Technician
4	Open monitoring well cover(s)	- Pinch points - Hand injury - Biological hazards	- Avoid placing hands in pinch points - Wear proper PPE (gloves) for task and use the proper tool(s) when opening well covers (open face wrench/socket wrench) - Inspect for other hazards that may affect the hands (hypodermic needles, etc.) - Heightened awareness of wasps, ants, bees, spiders, and poison plants	Sampling Technician
5	Measure water levels	- Contaminant exposure - Cross contamination	- Wear proper PPE (Ndex nitrile gloves) - use PID to monitor air quality - Decon probe and measuring tape following gauging of well	Sampling Technician
6	Develop/purge monitoring well location using peristaltic pump	- Slip/trip/fall hazards - Cuts - Pinch points - Electrical (AC or DC) - Back and shoulder strain	- Maintain housekeeping; be aware of ground conditions - Use PPE and proper tools - Keep hands away from pinch points - Inspect wiring, clamps, cables, etc.; avoid arcing - Stretch affected muscles (triceps, back, neck, and shoulder) prior to/during/after activity - Avoid repetitive motions and overhead lifts; use proper lifting techniques and neutral postures and take breaks	Sampling Technician
7	Collect groundwater sample peristaltic pump	- Chemical exposure - Cuts from container breaking - Sample misidentification	- Wear proper PPE - Inspect bottles for signs of breakage/damage; do not use suspect containers - Close glass bottles carefully – avoid cross threading lid and bottle - Ensure sample id numbers match sample location/site plan - Check sample labels for accuracy prior to placing in container	Sampling Technician
8	Close monitoring well cover	- Traffic - Hand injury - Pinch points	- Maintain awareness of on-site traffic patterns; verify barricades are still in place - Wear appropriate gloves and use proper tool(s) - Avoid placing hands in pinch points	Sampling Technician



JOB SAFETY ANALYSIS (JSA)

Groundwater Sampling (Peristaltic Pump)



Job Steps ⁽¹⁾	Task Activity	Potential Hazard(s) ⁽²⁾	Corrective Measure(s) ⁽³⁾	Person Responsible
9	Pack samples in container (i.e., cooler)	• Bottle breakage • Chemical exposure • Lifting hazards • Back injury • Manual material handling • Lost time due to sampling error	• Pack glass containers in bubble wrap or equivalent protection • Wear appropriate PPE (Ndex nitrile gloves) • Refer to step 2 and the HASP for additional lifting techniques/information • Ensure samples are packed/labeled/shipped correctly – double check	Sampling Technician
10	Manage any investigative derived waste (IDW)	• Chemical exposure • Pinch points • Slip/trip/fall hazards • Lifting hazards • Back injury • Manual material handling • Mislabeling waste	• Wear appropriate PPE (Ndex gloves) and work gloves • Avoid pinch points • Use proper PPE • Inspect for proper housekeeping; clean up work area • Refer to step 2 and the HASP for additional lifting techniques/information • Label IDW appropriately (generator, contact number, identification of contents, and site location); specify type of contents; arrange for disposal	Sampling Technician and Project Manager

- (1) Each Job or Task consists of a set of steps. Be sure to list all the steps in the sequence that they are performed. Specify the equipment or other details to set the basis for the potential (associated) hazards.
- (2) A hazard is a potential danger. What can go wrong? How can someone get hurt? Consider, but do not limit, the analysis to: **Contact** - victim is struck by or strikes an object; **Caught** - victim is caught on, caught in or caught between objects; **Fall** - victim falls to ground or lower level (includes slips and trips); **Exertion** - excessive strain or stress/ergonomics/lifting techniques; **Exposure** - inhalation/skin hazards. Specify the hazards and do not limit the description to a single word such as "Caught".
- (3) Aligning with the Job Steps, Task Activity Description, and Potential Hazard columns, describe what actions or procedures are necessary to eliminate or minimize the hazards. Be clear, concise and specific. Use objective, observable, and quantified terms. Avoid subjective general statements such as "be careful" or "use as appropriate".



JOB SAFETY ANALYSIS (JSA)

Excavation Oversight - Confirmation Sample Collection



Field staff must review job-specific work plan and coordinate with project manager to verify that all up-front logistics are completed prior to starting work including, but not limited to, permitting, access agreements, and notification to required contacts (e.g., site managers, inspectors, clients, subcontractors, etc.). Additionally, a tailgate safety meeting must be performed and documented at the beginning of each workday. **Stop, Think, Act, Review (STAR)** must be used prior to any activity. All personnel must possess the appropriate training prior to initiating scheduled tasks. Also consider weather conditions. CRA personnel have the authority and responsibility to use **Stop Work Authority (SWA)**.

Date Issued/Revised:	June 16, 2011	JSA Type:	Excavation oversight and confirmatory sampling
Work Type:	Environmental	Client:	Oneida, Inc.
Work Activity:	Excavation oversight - confirmation sample collection		
Work Site:	Former Buffalo China Site 51 Hayes Place Buffalo, NY 14210		
Key Equipment:	PPE and sampling tools		
Task-specific Training:	Excavation Safety, 40 Hour and 8 Hour HAZWOPER, Mobil Equipment Operations, Fall Protection, and PPE		

MINIMUM REQUIRED PERSONAL PROTECTIVE EQUIPMENT (see job steps for task-specific requirements)

☒ Reflective Vest	☐ Goggles	☒ Gloves*	Supplied Air	APR	
☒ Hard Hat	☒ Face Shield*	☐ Coveralls*	☐ SCBA	☐ Full Face APR	☐ Particulate ☐ Organic Vapor
☐ Lifeline/Harness*	☒ Hearing Protection*	☒ PPE Clothing*	☐ Airline Respirator (attach description)	☐ Half Mask APR	☐ Particulate/Organic Vapor Combined
☒ Safety Glasses	☒ Safety-toed Boots				☐ Acid Gas
☒ Other* Photoionization Protector		☐ Other*		☐ Other*	

ADDITIONAL PPE (*provide specific type(s) or descriptions of this item below)

Modified Level D (MLD); leather and nitrile gloves

Project Development Team Name	Position/Title	Modified By	Reviewed By	Position/Title	Date
Christine Barton	PC				
Craig Gebhardt	RSHM				



JOB SAFETY ANALYSIS (JSA)

Excavation Oversight - Confirmation Sample Collection



Safety Means Awareness
Responsibility Teamwork

Job Steps ⁽¹⁾	Task Activity	Potential Hazard(s) ⁽²⁾	Corrective Measure(s) ⁽³⁾	Person Responsible
1	Discuss STAR and SWA	Site personnel not aware of STAR and SWA	- Project team (CRA) discusses importance of and documentation procedures for SWA during pre-job safety meeting - Use SWA to stop any work that is unsafe	Site Personnel
2	General site activities/traverse site to set up and remove sampling supplies at predetermined sampling location	- Property damage and personal injury from contact with heavy equipment (i.e., excavator, trucks, etc.) - Slip/trip/fall hazards from uneven terrain, piping, weather conditions, and/or overloading/awkward load - Injury from biological hazards - Personal injury from poor ergonomics - Lifting hazards - Back injury - Manual material handling - Personal injury from falling into excavation/ engulfment	- Keep visual contact with the operator at all times when approaching equipment; have a clear view of your surroundings - Keep a clear view of other moving equipment on site to assure no unexpected movements - Restrict dump trucks to designated roads and/or paths - Recognize and identify surface anomalies caused by traffic, existing structures (i.e., piping), and vegetation (STAR) - Use mechanical assistance or take multiple trips to carry equipment - Inspect travel path for weather-related hazards (i.e., puddles and/or mud; use established path and/or access ways - Lift with your legs when moving sampling supplies - Size up the load; if the object is too large or odd shaped OR is in excess of 50 pounds (23 kg) then assistance (mechanical or a buddy lift) will be required - Lift with the legs (bend at the knees and use the leg muscles) to protect the lower back and keep lower back in a neutral position - Avoid one-handed carrying if possible; maintain awareness of footing - Make sure grip is adequate; use gloves to enhance grip when necessary - Reduce travel distance when carrying materials or equipment - Personnel should stay at least 2 feet from edge of excavation - Install orange construction fencing around excavated area if left unattended - If temporary security fencing is utilized, inspect it and remove hazards related to protruding wire ties, fencing, etc. - No personnel should enter a trench >4 feet in depth - Trenches >4 feet should have the walls sloped backwards; note the competency of the soil to assess degree of slope - Provide OSHA acceptable exits into trenches and excavations at an interval <25 feet - Keep all excavated material a minimum of 2 feet from the edge of the excavation	Project Personnel



JOB SAFETY ANALYSIS (JSA)

Excavation Oversight - Confirmation Sample Collection



Job Steps ⁽¹⁾	Task Activity	Potential Hazard(s) ⁽²⁾	Corrective Measure(s) ⁽³⁾	Person Responsible
3	Collect soil sample from excavator bucket	- Hearing loss from excessive noise - Exposure to contaminants; soil, water, particulates and vapor - Personal injury from broken glass container - Personal injury from contact with excavator bucket	- When sound level exceeds 85 dB, wear hearing protection - Rule of Sound: If you are normal conversation distance and need to raise voice, put on hearing protection - Monitor breathing zone with PID and upgrade PPE as per HASP - Wear nitrile gloves when handling impacted materials - See General Site Activities Step 1 - Utilize dust mask to minimize inhalation of particulates - Inspect container/cooler for broken glass - Inspect glassware prior to filling for cracks - Dispose of broken glassware in appropriate waste receptacle - Make sure bucket is lowered to ground surface prior to approaching - Do not approach bucket until the operator indicates it is safe - Do not turn your back to the bucket until >10 feet out of swing radius of equipment - Communicate to operator when safe to lift the bucket and proceed with work activities	Project Personnel
4	Decontaminate sampling equipment	- Exposure to contaminants; soil, water, particulates and vapor - Personal injury from contact with sharp tools	- Wear nitrile gloves when handling impacted materials - See General Site Activities Step 1 - Utilize dust mask to minimize inhalation of particulates - Dispose of affected materials in designated containers that are labeled with type of waste - Don leather gloves to prevent cuts from sharp or rough edges - Place sampling tools with sharp or pointed edge down in decontamination container	Project Personnel

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- (2) A hazard is a potential danger. What can go wrong? How can someone get hurt? Consider, but do not limit, the analysis to: **Contact** - victim is struck by or strikes an object; **Caught** - victim is caught on, caught in or caught between objects; **Fall** - victim falls to ground or lower level (includes slips and trips); **Exertion** - excessive strain or stress/ergonomics/lifting techniques; **Exposure** - inhalation/skin hazards. Specify the hazards and do not limit the description to a single word such as "Caught".
- (3) Aligning with the Job Steps, Task Activity Description, and Potential Hazard columns, describe what actions or procedures are necessary to eliminate or minimize the hazards. Be clear, concise and specific. Use objective, observable, and quantified terms. Avoid subjective general statements such as "be careful" or "use as appropriate".



JOB SAFETY ANALYSIS (JSA)

Sodium Persulfate ($\text{Na}_2\text{O}_8\text{S}_2$) and Hydrogen Peroxide (H_2O_2) Delivery and Storage



Field staff must review job-specific work plan and coordinate with project manager to verify that all up-front logistics are completed prior to starting work including, but not limited to, permitting, access agreements, and notification to required contacts (e.g., site managers, inspectors, clients, subcontractors, etc.). Additionally, a tailgate safety meeting must be performed and documented at the beginning of each workday. **Stop, Think, Act, Review (STAR)** must be used prior to any activity. All personnel must possess the appropriate training prior to initiating scheduled tasks. Also consider weather conditions. CRA personnel have the authority and responsibility to use **Stop Work Authority (SWA)**.

Date Issued/Revised:	June 16, 2011	JSA Type:	Environmental
Work Type:	Environmental	Client:	Oneida, Inc.
Work Activity:	Storage of sodium persulfate ($\text{Na}_2\text{O}_8\text{S}_2$) and hydrogen peroxide (H_2O_2) solution		
Work Site:	Former Buffalo China Site 51 Hayes Place Buffalo, NY 14210		
Key Equipment:	Chemical storage, secondary containment, fork lift or hand truck, PPE		
Task-specific Training:	40-Hour HAZWOPER; 8 Hour HAZWOPER training (as applicable); Hazard Communications training for hazardous substances brought onto the job site. Supervisor shall have First Aid, CPR, and Supervisor Training; HAZCOM (MSDS $\text{Na}_2\text{O}_8\text{S}_2$); Mixing Solution Properly, PPE		

MINIMUM REQUIRED PERSONAL PROTECTIVE EQUIPMENT (see job steps for task-specific requirements)					
☒ Reflective Vest	☒ Goggles	☒ Gloves*	Supplied Air	APR	
☐ Hard Hat	☐ Face Shield*	☐ Coveralls*		☐ Full Face APR	☒ Particulate ☐ Organic Vapor
☐ Lifeline/Harness*	☐ Hearing Protection*	☒ PPE Clothing*	☐ Airline Respirator (attach description)	☐ Half Mask APR	☐ Particulate/Organic Vapor Combined
☒ Safety Glasses	☒ Safety-toed Boots				☐ Acid Gas
☐ Chem-Tyvek Suit		☐ Other*		☐ Other*	
ADDITIONAL PPE (*provide specific type(s) or descriptions of this item below)					
Minimum Level D PPE; type of gloves dependent on job-specific requirements. Additional PPE may be required in the Health and Safety Plan (HASP). Also refer to the HASP for required traffic control, air monitoring, and emergency procedures. Tyvek coveralls; chemical-resistant gloves.					

Project Development Team Name	Position/Title	Modified By	Reviewed By	Position/Title	Date
Christine Barton	PC				
Craig Gebhardt	RSHM				



JOB SAFETY ANALYSIS (JSA)

Sodium Persulfate ($\text{Na}_2\text{O}_8\text{S}_2$) and Hydrogen Peroxide (H_2O_2) Delivery and Storage



Safety Means Awareness
Responsibility Teamwork

Job Steps ⁽¹⁾	Task Activity	Potential Hazard(s) ⁽²⁾	Corrective Measure(s) ⁽³⁾	Person Responsible
1	Discuss STAR and SWA	Site personnel not aware of STAR and SWA	- Project team (CRA) discusses importance of and documentation procedures for SWA during pre-job safety meeting - Use SWA to stop any work that is unsafe	Site Personnel
2	Transfer of sodium persulfate from delivery vessel to on-site storage	- Slip/trip/fall hazards when placing chemical in temporary storage boxes or other lined storage pads - Pinch points - Hand injury - Slip/trip/fall hazards - Heavy lifting - Release to environment and human exposure	- Initiate in Level D with leather and nitrile gloves - Inspect work areas before access for obstructions, moisture, and clear pathways - Pick up chemical loaded pallet with forklift and position it for storage - Keep dry chemical containers closed when not in use - Keep a large quantity of water available for fire suppression and emergency decontamination - In case of accidental opening: ACGIH = 0.1 mg/m³ (TWA) - Use a two-person system to lift bags over 50 pounds - Carry with both hands in front of you to avoid back stress - Lift bag to carrying position using heavy lifting techniques, keeping back vertical and straight, lifting with leg muscles as opposed to back muscles - Solution preparation must be lined with plastic sheeting to prevent spillage onto soil - When handling chemical, wear nitrile gloves, Tyvek overalls, rubber boots, and full-face shield - When handling compromised bags, wear nitrile gloves, Tyvek coveralls, rubber boots, full face shield, and dust respirator - Have neutralizing solution (water) on hand in sufficient quantity for managing splashes to clothing or ground surface and equipment	Site Personnel
3	Storage of sodium persulfate on site	- Incompatibility with other chemicals - Fire hazard	- Store in cool, dry, ventilated location away from grease, oil, heat, or ignition sources - Do not store in close proximity to water, acids, organics - Do not store on or near wood, metal salts, peroxides, or reducing agents	Site Personnel



JOB SAFETY ANALYSIS (JSA)

Sodium Persulfate ($\text{Na}_2\text{O}_8\text{S}_2$) and Hydrogen Peroxide (H_2O_2) Delivery and Storage



Safety Means Awareness
Responsibility Teamwork

Job Steps ⁽¹⁾	Task Activity	Potential Hazard(s) ⁽²⁾	Corrective Measure(s) ⁽³⁾	Person Responsible
4	Transfer of hydrogen peroxide from delivery vessel to on-site storage	- Slip/trip/fall hazards when moving drums from delivery vessel to storage container - Pinch points - Hand injury - Lifting hazards - Manual material handling - Back injury - Release to environment and human exposure	- Initiate in Level D with leather gloves - Ensure that drums are sealed properly before maneuvering - Reduce travel distance when there is a need to carry/lift materials. - Make sure grip is adequate; wear leather/cotton gloves - Use moving/lifting device (drum dolly) to move 55-gallon drums; if an object is too large or odd shaped OR is in excess of 50 pounds (23 kg) then assistance (mechanical or a buddy lift) will be required - Lift with the legs (bend at the knees and use the leg muscles) to protect the lower back and keep lower back in a neutral position - Avoid one-handed carrying if possible; maintain awareness of footing - Should the drums be excessively heavy, personnel may need to consider alternative lifting/moving device - Ensure that drum is fastened to drum dolly prior to moving drum - Remove trip hazards in the area around the drums before moving - Have neutralizing solution (water) on hand in sufficient quantity for managing splashes to clothing or ground surface and equipment - Solution preparation must be lined with plastic sheeting to prevent spillage onto soil - Have neutralizing solution (water) on hand in sufficient quantity for managing splashes to clothing or ground surface and equipment - Allow no more than one person in chemical mixing area if possible and keep all containers of prepared liquid permanganate solution closed/covered at all times - Modified Level D with full-face splash shields, Tyvek suit/gloves, and rubber boots	Site Personnel
5	Storage of hydrogen peroxide on site	Incompatibility with other chemicals	- Store in cool, dry, ventilated location away from grease, oil, heat, or ignition sources - Do not store in close proximity to water, acids, organics - Do not store on or near wood, metal salts, peroxides, or reducing agents	Site Personnel

- (1) Each Job or Task consists of a set of steps. Be sure to list all the steps in the sequence that they are performed. Specify the equipment or other details to set the basis for the potential (associated) hazards.
- (2) A hazard is a potential danger. What can go wrong? How can someone get hurt? Consider, but do not limit, the analysis to: **Contact** - victim is struck by or strikes an object; **Caught** - victim is caught on, caught in or caught between objects; **Fall** - victim falls to ground or lower level (includes slips and trips); **Exertion** - excessive strain or stress/ergonomics/lifting techniques; **Exposure** - inhalation/skin hazards. Specify the hazards and do not limit the description to a single word such as "Caught".
- (3) Aligning with the Job Steps, Task Activity Description, and Potential Hazard columns, describe what actions or procedures are necessary to eliminate or minimize the hazards. Be clear, concise and specific. Use objective, observable, and quantified terms. Avoid subjective general statements such as "be careful" or "use as appropriate".



JOB SAFETY ANALYSIS (JSA)

Sodium Persulfate ($\text{Na}_2\text{O}_8\text{S}_2$) and Hydrogen Peroxide (H_2O_2) Preparation and Injection



Field staff must review job-specific work plan and coordinate with project manager to verify that all up-front logistics are completed prior to starting work including, but not limited to, permitting, access agreements, and notification to required contacts (e.g., site managers, inspectors, clients, subcontractors, etc.). Additionally, a tailgate safety meeting must be performed and documented at the beginning of each workday. **Stop, Think, Act, Review (STAR)** must be used prior to any activity. All personnel must possess the appropriate training prior to initiating scheduled tasks. Also consider weather conditions. CRA personnel have the authority and responsibility to use **Stop Work Authority (SWA)**.

Date Issued/Revised:	June 19, 2011	JSA Type:	Remediation
Work Type:	Environmental/Remediation	Client:	Onedra, Inc.
Work Activity:	Storage, preparation, and injection of sodium permanganate ($\text{Na}_2\text{O}_8\text{S}_2$) and hydrogen peroxide (H_2O_2) solution		
Work Site:	Former Buffalo China Site 51 Hayes Place Buffalo, NY 14210		
Key Equipment:	Poly tanks, hoses, transfer pump, barrel pump, connecting equipment		
Task-specific Training:	40-Hour HAZWOPER; 8 Hour HAZWOPER training (as applicable); Hazard Communications training for hazardous substances brought onto the job site. Supervisor shall have First Aid, CPR, and Supervisor Training; HAZCOM (MSDS $\text{Na}_2\text{O}_8\text{S}_2$); Mixing Solution Properly, PPE		

MINIMUM REQUIRED PERSONAL PROTECTIVE EQUIPMENT (see job steps for task-specific requirements)					
☒ Reflective Vest	☒ Goggles	☒ Gloves*	Supplied Air	APR	
☒ Hard Hat	☒ Face Shield*	☐ Coveralls*		☐ Full Face APR	☒ Particulate ☐ Organic Vapor
☐ Lifeline/Harness*	☐ Hearing Protection*	☒ PPE Clothing*	☐ Airline Respirator (attach description)	☐ Half Mask APR	☐ Particulate/Organic Vapor Combined
☒ Safety Glasses	☒ Safety-toed Boots	☒ Rubber Boots			☐ Acid Gas
☒ Chem-Tyvek Suit		☐ Other*		☐ Other*	
ADDITIONAL PPE (*provide specific type(s) or descriptions of this item below)					
Minimum Level D PPE; type of gloves dependent on job-specific requirements. Additional PPE may be required in the Health and Safety Plan (HASP). Also refer to the HASP for required traffic control, air monitoring, and emergency procedures. Tyvek coveralls; chemical-resistant gloves.					

Project Development Team Name	Position/Title	Modified By	Reviewed By	Position/Title	Date
Christine Barton	PC				
Craig Gebhardt	RSHM				



JOB SAFETY ANALYSIS (JSA)

Sodium Persulfate ($\text{Na}_2\text{O}_8\text{S}_2$) and Hydrogen Peroxide (H_2O_2) Preparation and Injection



Job Steps ⁽¹⁾	Task Activity	Potential Hazard(s) ⁽²⁾	Corrective Measure(s) ⁽³⁾	Person Responsible
1	Discuss STAR and SWA	Site personnel not aware of STAR and SWA	- Project team (CRA) discusses importance of and documentation procedures for SWA during pre-job safety meeting - Use SWA to stop any work that is unsafe	Site Personnel
2	Transfer sodium persulfate from storage to mixing tank (poly)	- Slip/trip/fall hazards when placing chemical in mixing tank (poly) - Heavy lifting - Human exposure - Release	- Initiate in Level D with Tyvek coveralls, rubber steel toe boots, nitrile gloves, full face shield, and dust respirator - Inspect work areas before access for obstructions, moisture, and clear pathways - Keep dry chemical containers closed when not in use - In case of accidental opening: ACGIH = 0.1 mg/m^3 (TWA) - Use a two-person system to lift bags over 50 pounds - Carry with both hands in front of you to avoid back stress - Lift bag to carrying position using heavy lifting techniques, keeping back vertical and straight, lifting with leg muscles as opposed to back muscles	Project Personnel
3	Agitate sodium persulfate by recirculating fluid in poly tank using trash pump	- Slip/trip/fall hazards when moving within secondary containment - Pressurized line rupture, spillage - Disconnection drips and associated releases - Human exposure	- Initiate in Level D with Tyvek coveralls, rubber steel toe boots, two layers of chemical resistant gloves, goggles, and full face shield. - Inspect work areas before access for obstructions, moisture, and clear pathways - Depressurize and bleed lines to buckets before depressurizing and buckets should contain neutralizing solution - Watch for emanation of liquid from other boreholes, creek banks, and monitoring wells in the area during injection - Stop injection if excessive pressure (>50 psi) is experienced or releases are evident, or if any other unusual condition is observed - Inspect all fittings and lines from solution batch tank to pump	Project Personnel
4	Transfer concentrated hydrogen peroxide using barrel pump if applicable	- Slip/trip/fall hazards when moving within secondary containment - Pressurized line rupture, spillage - Disconnection drips and associated releases - Human exposure	- Initiate in Level D with Tyvek coveralls, rubber steel toe boots, two layers of chemical resistant gloves, goggles, and full face shield - Inspect work areas before access for obstructions, moisture, and clear pathways - Depressurize and bleed lines to buckets before depressurizing and buckets should contain neutralizing solution - Watch for emanation of liquid from other boreholes, creek banks, and monitoring wells in the area during injection - Stop injection if excessive pressure (>50 psi) is experienced or releases are evident, or if any other unusual condition is observed - Inspect all fittings and lines from solution batch tank to pump	Project Personnel



JOB SAFETY ANALYSIS (JSA)

Sodium Persulfate ($\text{Na}_2\text{O}_8\text{S}_2$) and Hydrogen Peroxide (H_2O_2) Preparation and Injection



Job Steps ⁽¹⁾	Task Activity	Potential Hazard(s) ⁽²⁾	Corrective Measure(s) ⁽³⁾	Person Responsible
5	Transfer 10% hydrogen peroxide solution to sodium persulfate solution using transfer pump	• Slip/trip/fall hazards when moving within secondary containment • Pressurized line rupture, spillage • Disconnection drips and associated releases • Human exposure	• Initiate in Level D with Tyvek coveralls, rubber steel toe boots, two layers of chemical resistant gloves, goggles, and full face shield • Inspect work areas before access for obstructions, moisture, and clear pathways • Have neutralizing solution (water) on hand in sufficient quantity for managing splashes to clothing or ground surface and equipment • Allow no more than one person in chemical mixing area if possible and keep all containers of prepared liquid persulfate solution closed/covered at all times • Inspect all fittings and lines from hydrogen peroxide tank to persulfate tank	Project Personnel
6	Injection of solution into subsurface	• Pressurized line rupture, spillage • Disconnection drips and associated releases • Human exposure	• Initiate in Level D with Tyvek coveralls, rubber steel toe boots, two layers of chemical resistant gloves, goggles, and full face shield • All personnel within proximity (50 feet) of pumps, lines, rig, drill-string, and probe should wear full-face splash shields, rubber aprons and boots, and nitrile gloves or be behind splash guard. • Depressurize and bleed lines to buckets before depressurizing and buckets should contain neutralizing solution • Watch for emanation of liquid from other boreholes, creek banks, and monitoring wells in the area during injection • Stop injection if excessive pressure (>50 psi) is experienced or releases are evident, or if any other unusual condition is observed • Inspect all fittings and lines from solution batch tank to injection point prior to use	Project Personnel

- (1) Each Job or Task consists of a set of steps. Be sure to list all the steps in the sequence that they are performed. Specify the equipment or other details to set the basis for the potential (associated) hazards.
- (2) A hazard is a potential danger. What can go wrong? How can someone get hurt? Consider, but do not limit, the analysis to: **Contact** - victim is struck by or strikes an object; **Caught** - victim is caught on, caught in or caught between objects; **Fall** - victim falls to ground or lower level (includes slips and trips); **Exertion** - excessive strain or stress/ergonomics/lifting techniques; **Exposure** - inhalation/skin hazards. Specify the hazards and do not limit the description to a single word such as "Caught".
- (3) Aligning with the Job Steps, Task Activity Description, and Potential Hazard columns, describe what actions or procedures are necessary to eliminate or minimize the hazards. Be clear, concise and specific. Use objective, observable, and quantified terms. Avoid subjective general statements such as "be careful" or "use as appropriate".



Job Safety Analysis (JSA) EQUIPMENT FUELING



Safety Means Awareness
Responsibility Teamwork

Field staff must review job-specific work plan and coordinate with project manager to verify that all up-front logistics are completed prior to starting work including, but not limited to, permitting, access agreements and notification to required contacts (e.g., site managers, inspectors, clients, subcontractors, etc.). Additionally, a tailgate safety meeting must be performed and documented at the beginning of each workday. **Stop, Think, Act, Review (STAR)** must be used prior to any activity. All personnel must possess the appropriate training prior to initiating scheduled tasks. Also consider weather conditions. CRA personnel have the authority and responsibility to use **Stop Work Authority**.

Date Issued/Revised	June 17, 2011	JSA Type:	Excavation/Remediation
Work Type	Environmental	Client:	Oneida, Inc.
Work Activity	Pumping fuel into equipment		
Work Site	Former Buffalo China Site 51 Hayes Place Buffalo, NY 14210		
Key Equipment	Pickup Truck w/ Fuel Tank and Temporary fuel storage tank w/ secondary containment or Fuel cans		
Task-specific Training	HAZCOM, PPE, Mobile Equipment Operations		

MINIMUM REQUIRED PERSONAL PROTECTIVE EQUIPMENT (SEE JOB STEPS FOR TASK-SPECIFIC REQUIREMENTS)

☒ REFLECTIVE VEST*	☐ GOGGLES	☐ APR: _____*	☒ GLOVES*
☒ HARD HAT	☐ FACE SHIELD*	☐ SUPPLIED AIR RESPIRATOR*	☐ COVERALLS*
☐ LIFELINE / HARNESS*	☐ HEARING PROTECTION*	☐ PPE CLOTHING*	☐ OTHER*
☒ SAFETY GLASSES	☒ STEEL TOED BOOTS	☐ OTHER* _____	☐ OTHER*

ADDITIONAL PPE: * Provide specific type(s) or descriptions of this item below

Reflective Vest - Class II

Development Team	Position/Title	Reviewed By	Position/Title	Date
Christine Barton	PC			
Craig Gebhardt	RSHM			



Job Safety Analysis (JSA) EQUIPMENT FUELING



Safety Means Awareness
Responsibility Teamwork

JOB STEPS ⁽¹⁾	TASK ACTIVITY	POTENTIAL HAZARD(S) ⁽²⁾	CORRECTIVE MEASURE(S) ⁽³⁾	Person Responsible
1	Perform the STAR Process and discuss Stop Work Authority (SWA) - Refer to the equipment manufacturer's operating manual before using any machinery	Slips, trips, falls; situational risks - use STAR; short service employees	• Verify personnel training is sufficient for scheduled task(s). Is Job Instruction (hands-on) Training necessary?	All Personnel
2	Place Nozzle in tank	Property damage and personal injury from fire; fire potential from static/contact spark	• No cell phones in fueling areas. No smoking. No fueling during storm events. Have two 20lb fire extinguishers within 25 feet of the fueling area.	All Personnel
3	Turn on pump and/or dispense fuel into equipment	Property damage and personal injury from fire; fire potential from static/contact spark; personal injury due to skin /eye contact with fuel due to splash/ spills of fuel	• No cell phones in fueling areas. No smoking. No fueling during storm events. Have two 20lb fire extinguishers within 25 feet of the fueling area. Ensure the end of the nozzle is secured in the tank before turning on the pump and/or dispensing fuel. Wear the proper PPE. Stay upwind when fueling equipment. Remain in attendance of the nozzle at all times during fueling. Avoid overfilling of the equipment.	All Personnel
4	Turn off pump and return nozzle to the fuel tank	Property damage and personal injury from fire; fire potential from static/contact spark; slips/ trips/ falls; pinch points	• No cell phones in fueling areas. No smoking. No fueling during storm events. Meet with owner's representative to determine appropriate area for fueling. Have two 20lb fire extinguishers within 25 feet of the fueling area. Ensure the end of the nozzle is secured in the tank before turning on the pump and/or dispensing fuel. Wear the proper PPE. Stay upwind when fueling equipment. Remain in attendance of the nozzle at all times during fueling. Avoid overfilling of the equipment. Pay Attention to surroundings. Pick up tools, equipment, and trash in the fueling area. Pay attention to the surroundings. Wear gloves. Do not rush.	All Personnel

¹ Each Job or Task consists of a set of steps. Be sure to list all the steps in the sequence that they are performed. Specify the equipment or other details to set the basis for the potential (associated) hazards.

² A hazard is a potential danger. What can go wrong? How can someone get hurt? Consider, but do not limit, the analysis to: **Contact** - victim is struck by or strikes an object; **Caught** - victim is caught on, caught in or caught between objects; **Fall** - victim falls to ground or lower level (includes slips and trips); **Exertion** - excessive strain or stress / ergonomics / lifting techniques; **Exposure** - inhalation/skin hazards. Specify the hazards and do not limit the description to a single word such as "Caught"



Job Safety Analysis (JSA) EQUIPMENT FUELING



³ Aligning with the Job Steps, Task Activity Description, and Potential Hazard columns, describe what actions or procedures are necessary to eliminate or minimize the hazards. Be clear, concise and specific. Use objective, observable and quantified terms. Avoid subjective general statements such as, "be careful" or "use as appropriate".

APPENDIX C

COMMUNITY AIR MONITORING PLAN

Appendix C
Community Air Monitoring Plan
Former Buffalo China Site
Buffalo, New York

Overview

A Community Air Monitoring Plan (CAMP) requires real-time monitoring for volatile organic compounds (VOCs) and particulates (i.e., dust) at the downwind perimeter of each designated work area when certain activities are in progress at contaminated sites. This CAMP is not intended for use in establishing action levels for worker respiratory protection. Rather, its intent is to provide a measure of protection for the downwind community (i.e., off-site receptors including residences and businesses and on-site workers not directly involved with the subject work activities) from potential airborne contaminant releases as a direct result of investigative and remedial work activities. The action levels specified herein require increased monitoring, corrective actions to abate emissions, and/or work shutdown. Additionally, the CAMP helps to confirm that work activities do not spread contamination off-site through the air.

Community Air Monitoring Plan

Real-time air monitoring for VOCs and particulate levels at the perimeter of the exclusion zone and/or work area will be necessary..

Continuous monitoring will be required for all ground intrusive activities and during the demolition of contaminated or potentially contaminated structures (the concrete floor inside the Harrison Street Warehouse). Ground intrusive activities include, but are not limited to, soil/waste excavation and handling, and test pitting or trenching.

Periodic monitoring for VOCs may be required during non-intrusive activities such as the collection of soil and sediment samples or the collection of groundwater samples from existing monitoring wells. "Periodic" monitoring during sample collection might reasonably consist of taking a reading upon arrival at a sample location, monitoring while opening a well cap or overturning soil, monitoring during well baling/purging, and taking a reading prior to leaving a sample location.

VOC Monitoring, Response Levels, and Actions

Volatile organic compounds (VOCs) must be monitored at the downwind perimeter of the immediate work area (i.e., the exclusion zone) on a continuous basis or as otherwise specified. Upwind concentrations should be measured at the start of each workday and periodically thereafter to establish background conditions, particularly if wind direction changes. The monitoring will be performed using equipment appropriate to measure chlorinated solvents (trichloroethene (TCE)) and provide real time data. The equipment will be calibrated daily for the contaminant(s) of concern or for an appropriate surrogate. The equipment will be capable of calculating 15-minute running average concentrations, which will be compared to the levels specified below.

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

resume with continued monitoring.

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

3. If the organic vapor level is above 25 ppm at the perimeter of the work area, activities must be shutdown.

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

Particulate Monitoring, Response Levels, and Actions

Particulate concentrations will be monitored continuously at the upwind and downwind perimeters of the exclusion zone at temporary particulate monitoring stations. The particulate monitoring should be performed using real-time monitoring equipment capable of measuring particulate matter less than 10 micrometers in size (PM-10) and capable of integrating over a period of 15 minutes (or less) for comparison to the airborne particulate action level. The equipment must be equipped with an audible alarm to indicate exceedance of the action level. In addition, fugitive dust migration should be visually assessed during all work activities.

1. If the downwind PM-10 particulate level is 100 micrograms per cubic meter (mcg/m³) greater than background (upwind perimeter) for the 15-minute period or if airborne dust is observed leaving the work area, then dust suppression techniques must be employed. Work may continue with dust suppression techniques provided that downwind PM-10 particulate levels do not exceed 150 mcg/m³ above the upwind level and provided that no visible dust is migrating from the work area.

2. If, after implementation of dust suppression techniques, downwind PM-10 particulate levels are greater than 150 mcg/m³ above the upwind level, work must be stopped and a re-evaluation of activities initiated. Work can resume provided that dust suppression measures and other controls are successful in reducing the downwind PM-10 particulate concentration to within 150 mcg/m³ of the upwind level and in preventing visible dust migration.

3. All readings must be recorded and be available for State (DEC and NYSDOH) and County Health personnel to review.

REFERENCES

Final DER-10 Technical Guidance for Site Investigation and Remediation May 2010.

APPENDIX C

GROUNDWATER MONITORING WELL CONSTRUCTION LOGS



STRATIGRAPHIC AND INSTRUMENTATION LOG (OVERBURDEN)

Page 1 of 1

PROJECT NAME: Former Buffalo China Site

PROJECT NUMBER: 37191

CLIENT: Hodgson Russ

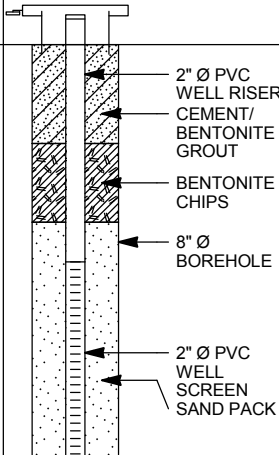
LOCATION: Buffalo, NY

HOLE DESIGNATION: MW-5(R)

DATE COMPLETED: January 26, 2012

DRILLING METHOD: HSA/HQ Core

FIELD PERSONNEL: D. Oscar

DEPTH ft BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	ELEV. ft AMSL	MONITORING WELL	SAMPLE			
				NUMBER	INTERVAL	REC (ft)	'N' VALUE
	NORTHING: 1046176.05 EASTING: 1082703.79 TOP OF RISER TOP OF CASING GROUND SURFACE	598.81 598.66 595.73					
2	SEE MW-5 WELL LOG IN CRA REPORT 37191 (8) FOR OVERBURDEN STRATIGRAPHY						
4	WELL WAS INSTALLED IN NO. 2 CRUSHER RUN GRAVEL BACKFILL						
6							
8							
10							
12	END OF BOREHOLE @ 10.5ft BGS	585.23					
14	NOTE: REPLACEMENT WELL FOR MW-5 ABANDONED DUE TO SOIL EXCAVATION		<u>WELL DETAILS</u> Screened interval: 590.23 to 585.23ft AMSL 5.50 to 10.50ft BGS Length: 5ft Diameter: 2in Slot Size: 0.010 Material: PVC Seal: 593.23 to 591.23ft AMSL 2.50 to 4.50ft BGS Material: CEMENT/ BENTONITE GROUT Sand Pack: 591.23 to 585.23ft AMSL 4.50 to 10.50ft BGS Material: SAND				
16							
18							
20							
22							
24							
26							
28							
30							
32							
34							

NOTES: MEASURING POINT ELEVATIONS MAY CHANGE; REFER TO CURRENT ELEVATION TABLE

OVERBURDEN LOG 037191WIN.GPJ CRA CORP.GDT 5/23/12



STRATIGRAPHIC AND INSTRUMENTATION LOG (OVERBURDEN)

Page 1 of 2

PROJECT NAME: Former Buffalo China Site

HOLE DESIGNATION: MW-5A(R)

PROJECT NUMBER: 37191

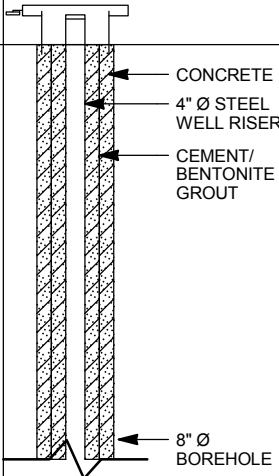
DATE COMPLETED: January 27, 2012

CLIENT: Hodgson Russ

DRILLING METHOD: HSA/HQ Core

LOCATION: Buffalo, NY

FIELD PERSONNEL: D. Oscar

DEPTH ft BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	ELEV. ft AMSL	MONITORING WELL	SAMPLE				
				NUMBER	INTERVAL	REC (ft)	'N' VALUE	
	NORTHING: 1046180.63 EASTING: 1082697.86 TOP OF CASING TOP OF RISER GROUND SURFACE	598.74 596.29 595.81						
2	SEE MW-5A WELL LOG IN CRA REPORT 37191 (8) FOR BEDROCK STRATIGRAPHY							
4	WELL WAS INSTALLED IN NO. 2 CRUSHER RUN GRAVEL BACKFILL							
6								
8								
10	END OF OVERBURDEN HOLE @ 10.5ft BGS							
12								
14								
16								
18								
20								
22								
24								
26								
28								
30								
32								
34								

NOTES: MEASURING POINT ELEVATIONS MAY CHANGE; REFER TO CURRENT ELEVATION TABLE

OVERBURDEN LOG 037191WIN.GPJ CRA CORP.GDT 5/23/12



STRATIGRAPHIC AND INSTRUMENTATION LOG (BEDROCK)

Page 2 of 2

PROJECT NAME: Former Buffalo China Site
PROJECT NUMBER: 37191
CLIENT: Hodgson Russ
LOCATION: Buffalo, NY

HOLE DESIGNATION: MW-5A(R)
DATE COMPLETED: January 27, 2012
DRILLING METHOD: HSA/HQ Core
FIELD PERSONNEL: D. Oscar

DEPTH ft BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	DEPTH ft BGS	MONITORING WELL	RUN NUMBER	CORE RECOVERY %	RQD %
10		10.50	8" Ø BOREHOLE			
12	BEDROCK, not logged	12.50	6" Ø ROCK SOCKET			
14	LIMESTONE (Onondaga Formation, Moorehouse member) fine to medium grained, light to medium gray limestone, light buff to dark gray chert nodules, occasional fossils		4" Ø COREHOLE			
16		17.50				
18	END OF BOREHOLE @ 17.5ft BGS					
20						
22						
24						
26						
28						
30						
32						
34						
36						
38						
40						
42						

WELL DETAILS
Material: STEEL
Seal:
0.00 to 12.50ft BGS
Material: CEMENT/ BENTONITE GROUT

NOTES: MEASURING POINT ELEVATIONS MAY CHANGE; REFER TO CURRENT ELEVATION TABLE



STRATIGRAPHIC AND INSTRUMENTATION LOG (OVERBURDEN)

Page 1 of 1

PROJECT NAME: Former Buffalo China Site

HOLE DESIGNATION: BH-3-0506 / MW-6

PROJECT NUMBER: 37191

DATE COMPLETED: May 2, 2006

CLIENT: Hodgson Russ

DRILLING METHOD: Direct Push / HSA

LOCATION: Buffalo, NY

FIELD PERSONNEL: P. Kryger

(Former Buffalo China Site)

DEPTH ft BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	ELEV. ft AMSL	Monitoring Well	SAMPLE				
				NUMBER	INTERVAL	REC (ft)	'N' VALUE	PID (ppm)
	NORTHING: 1045600.18 EASTING: 1081969.89 TOP OF CASING GROUND SURFACE TOP OF RISER	594.40 594.31 594.15						
2	FILL, sand and gravel with trace silt, loose, coarse, no structure, gray to medium brown, dry	593.31		027				0
	FILL, clay and red brick, slightly plastic, no structure, medium brown and red, dry to slightly damp	591.51		028				
4	CL-CLAY with SILT, stiff, vertical gray mottling within orange brown, black nodules, moderately plastic			029				
6								
8								
10	- Refusal @ 9.7 ft BGS END OF BOREHOLE @ 9.7ft BGS	584.61						
12	Soil samples for chemical analysis from 0.5 to 1.0, 2.4 to 3.0, and 8.0 to 10.0 feet BGS. Well installed through HSA.							
14								
16								
18								
20								
22								
24								
26								
28								
30								
32								
34								

NOTES: MEASURING POINT ELEVATIONS MAY CHANGE; REFER TO CURRENT ELEVATION TABLE

CHEMICAL ANALYSIS



OVERBURDEN LOG 37191.GPJ CRA_CORP.GDT 2/23/10



STRATIGRAPHIC AND INSTRUMENTATION LOG (OVERBURDEN)

Page 1 of 1

PROJECT NAME: Former Buffalo China Site

PROJECT NUMBER: 37191

CLIENT: Hodgson Russ

LOCATION: Buffalo, NY

HOLE DESIGNATION: BH-14-0506 / MW-7

DATE COMPLETED: May 2, 2006

DRILLING METHOD: Direct Push / HSA

FIELD PERSONNEL: P. Kryger / J Raby

(Former Buffalo China Site)

DEPTH ft BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	ELEV. ft AMSL	Monitoring Well	SAMPLE				
				NUMBER	INTERVAL	REC (ft)	'N' VALUE	PID (ppm)
	NORTHING: 1045333.81 EASTING: 1082122.73	TOP OF CASING 592.61 GROUND SURFACE 592.48 TOP OF RISER 592.03						
2	FILL, clay and red brick, slightly plastic, no structure, medium brown and red, dry to slightly damp		FLUSHMOUNT CASING CONCRETE 2"Ø PVC RISER BENTONITE WELL SCREEN SAND PACK 8" Ø BOREHOLE	030				0
4	CL-CLAY with SILT, stiff, vertical gray mottling within orange brown, black nodules, moderately plastic	589.48		031				0
6								0
8	- Refusal @ 8.7 ft BGS							
10	END OF BOREHOLE @ 8.7ft BGS	583.78						
12	Soil samples for chemical analysis from 0.5 to 1.5 and 2.5 to 3.0 feet BGS. Well installed through HSA.		WELL DETAILS Screened interval: 588.78 to 583.78ft AMSL 3.70 to 8.70ft BGS Length: 5ft Diameter: 2in Slot Size: .02 Material: PVC Seal: 590.78 to 589.28ft AMSL 1.70 to 3.20ft BGS Material: Bentonite Sand Pack: 589.28 to 583.78ft AMSL 3.20 to 8.70ft BGS Material: Size 00N Sand					
14								
16								
18								
20								
22								
24								
26								
28								
30								
32								
34								

NOTES: MEASURING POINT ELEVATIONS MAY CHANGE; REFER TO CURRENT ELEVATION TABLE

CHEMICAL ANALYSIS



OVERBURDEN LOG 37191.GPJ CRA_CORP.GDT 2/23/10



STRATIGRAPHIC AND INSTRUMENTATION LOG (OVERBURDEN)

Page 1 of 1

PROJECT NAME: Former Buffalo China Site

HOLE DESIGNATION: MW-7A

PROJECT NUMBER: 37191

DATE COMPLETED: December 12, 2008

CLIENT: Hodgson Russ

DRILLING METHOD: HSA/HQ Core

LOCATION: Buffalo, NY

FIELD PERSONNEL: J. Williams

(Former Buffalo China Site)

DEPTH ft BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	ELEV. ft AMSL	MONITORING WELL	SAMPLE				
				NUMBER	INTERVAL	REC (ft)	'N' VALUE	PID (ppm)
	NORTHING: 1045338.18 EASTING: 1082119.63 TOP OF CASING GROUND SURFACE TOP OF RISER	592.68 592.54 592.31						
2	Auger without sampling. For overburden stratigraphy, refer to log BH-14-0506/ MW-7.							0.9
4								
6								
8								
10	END OF OVERBURDEN HOLE @ 9.1ft BGS	583.44						0
12								
14								
16								
18								
20								
22								
24								
26								
28								
30								
32								
34								

NOTES: MEASURING POINT ELEVATIONS MAY CHANGE; REFER TO CURRENT ELEVATION TABLE

WATER BEARING ZONE ▼

OVERBURDEN LOG 37191.GPJ CRA_CORP.GDT 2/23/10



STRATIGRAPHIC AND INSTRUMENTATION LOG (BEDROCK)

Page 1 of 1

PROJECT NAME: Former Buffalo China Site

PROJECT NUMBER: 37191

CLIENT: Hodgson Russ

LOCATION: Buffalo, NY

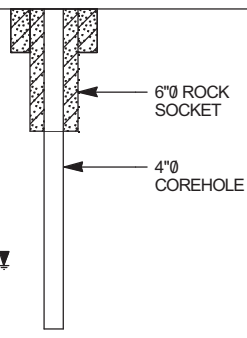
(Former Buffalo China Site)

HOLE DESIGNATION: MW-7A

DATE COMPLETED: December 12, 2008

DRILLING METHOD: HSA/HQ Core

FIELD PERSONNEL: J. Williams

DEPTH ft BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	ELEV. ft AMSL	MONITORING WELL	RUN NUMBER	CORE RECOVERY %	RQD %	Vol. Water (gal)
10	Auger Refusal - BEDROCK (Not sampled)	583.44		1	92	90	20
12	LIMESTONE (Onondaga formation, Moorehouse member) fine to medium grained, light to medium gray limestone, light buff to dark gray chert nodules, occasional fossils	581.44					
14	- fracture, moderately weathered @ 14.5 feet BGS						
16	END OF BOREHOLE @ 16.1ft BGS	576.44					
18							
20							
22							
24							
26							
28							
30							
32							
34							
36							
38							
40							
42							

NOTES: MEASURING POINT ELEVATIONS MAY CHANGE; REFER TO CURRENT ELEVATION TABLE

WATER BEARING ZONE ▼

BEDROCK LOG 37191.GPJ CRA_CORP.GDT 2/23/10



STRATIGRAPHIC AND INSTRUMENTATION LOG (OVERBURDEN)

Page 1 of 1

PROJECT NAME: Former Buffalo China Site

PROJECT NUMBER: 37191

CLIENT: Hodgson Russ

LOCATION: Buffalo, NY

(Former Buffalo China Site)

HOLE DESIGNATION: BH-15-0506 / MW-8

DATE COMPLETED: May 2, 2006

DRILLING METHOD: Direct Push / HSA

FIELD PERSONNEL: P. Kryger / J Raby

DEPTH ft BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	ELEV. ft AMSL	Monitoring Well	SAMPLE				
				NUMBER	INTERVAL	REC (ft)	'N' VALUE	PID (ppm)
	NORTHING: 1045332.04 EASTING: 1082477.03	TOP OF CASING 594.61 GROUND SURFACE 594.49 TOP OF RISER 594.00						
2	FILL, sand and gravel with trace silt, loose, coarse, no structure, gray to medium brown, dry		FLUSHMOUNT CASING CONCRETE 2"Ø PVC RISER BENTONITE WELL SCREEN SAND PACK 8" Ø BOREHOLE WELL DETAILS Screened interval: 590.99 to 585.99ft AMSL 3.50 to 8.50ft BGS Length: 5ft Diameter: 2in Slot Size: .02 Material: PVC Seal: 592.99 to 591.19ft AMSL 1.50 to 3.30ft BGS Material: Bentonite Sand Pack: 591.19 to 585.99ft AMSL 3.30 to 8.50ft BGS Material: Size 00N Sand	007				0
4	CL-CLAY with SILT, stiff, vertical gray mottling within orange brown, black nodules, moderately plastic	591.49		008				0
6								
8	Not Sampled	586.99						
10								
12	CH-CLAY, stiff, plastic with added water, massive structure, light brown, dry	582.49		SS1			5	
14				SS2			4	
16	- Refusal @ 16.9 ft BGS			SS3			>50	
18	END OF BOREHOLE @ 16.9ft BGS	577.59						
20	Soil samples for chemical analysis from 1.5 to 2.0 and 3.0 to 3.5 feet BGS. Well installed through HSA.							
22								
24								
26								
28								
30								
32								
34								

NOTES: MEASURING POINT ELEVATIONS MAY CHANGE; REFER TO CURRENT ELEVATION TABLE

CHEMICAL ANALYSIS



OVERBURDEN LOG 37191.GPJ CRA_CORP.GDT 2/23/10



STRATIGRAPHIC AND INSTRUMENTATION LOG (OVERBURDEN)

Page 1 of 2

PROJECT NAME: Former Buffalo China Site

PROJECT NUMBER: 37191

CLIENT: Hodgson Russ

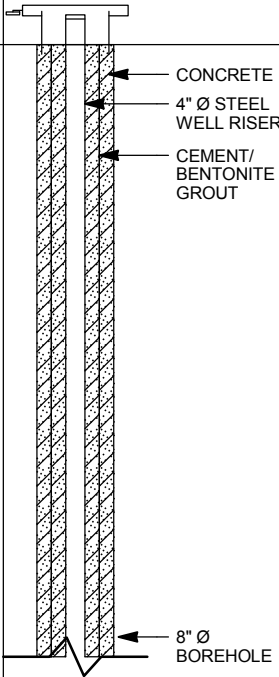
LOCATION: Buffalo, NY

HOLE DESIGNATION: MW-8A

DATE COMPLETED: November 29, 2012

DRILLING METHOD: HSA/ Wet Rotary

FIELD PERSONNEL: D. Oscar

DEPTH ft BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	ELEV. ft AMSL	MONITORING WELL	SAMPLE				
				NUMBER	INTERVAL	REC (ft)	'N' VALUE	
	NORTHING: 1046085.54 EASTING: 1083190.75 TOP OF CASING GROUND SURFACE TOP OF RISER	594.52 594.16 594.10						
2	AUGER TO TOP OF BEDROCK							
4								
6								
8								
10								
12								
14								
16	- REFUSAL END OF OVERBURDEN HOLE @ 15.5ft BGS							
18								
20								
22								
24								
26								
28								
30								
32								
34								

NOTES: MEASURING POINT ELEVATIONS MAY CHANGE; REFER TO CURRENT ELEVATION TABLE

OVERBURDEN LOG 037191WIN.GPJ CRA CORP.GDT 5/23/12



STRATIGRAPHIC AND INSTRUMENTATION LOG (BEDROCK)

Page 2 of 2

PROJECT NAME: Former Buffalo China Site

PROJECT NUMBER: 37191

CLIENT: Hodgson Russ

LOCATION: Buffalo, NY

HOLE DESIGNATION: MW-8A

DATE COMPLETED: November 29, 2012

DRILLING METHOD: HSA/ Wet Rotary

FIELD PERSONNEL: D. Oscar

DEPTH ft BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	DEPTH ft BGS	MONITORING WELL	RUN NUMBER	CORE RECOVERY %	RQD %
16	- REFUSAL BEDROCK, not logged	15.50	8" Ø BOREHOLE 6" Ø ROCK SOCKET			
18	LIMESTONE (Onondaga Formation, Moorehouse member) fine to medium grained, light to medium gray limestone, light buff to dark gray chert nodules, occasional fossils	17.50		1	100	30
20	- open highly weathered fractures at 17.9, 18.2, 18.4, 18.5, 18.6, 19.3, 19.6, 19.7, 19.9, 20, 20.1, 20.3, 20.5, 20.7, 20.8, 21.2, 21.4, 21.6, 21.9 and 22.0ft BGS					
22	- slightly weathered fracture		4" Ø COREHOLE			
24	- moderately weathered fracture			2	100	69
26	- moderately weathered fracture					
28	- slightly weathered fracture					
30	- slightly weathered fracture					
32	- highly weathered fracture					
34	- slightly weathered fracture					
36	- highly weathered fracture					
38	- highly weathered fracture					
40	- moderately weathered fracture					
42	END OF BOREHOLE @ 27.4ft BGS	27.40				
44						
46						
48						

WELL DETAILS

Material: STEEL

Seal:

1.00 to 17.00ft BGS

Material: CEMENT/ BENTONITE
GROUT

NOTES: MEASURING POINT ELEVATIONS MAY CHANGE; REFER TO CURRENT ELEVATION TABLE



STRATIGRAPHIC AND INSTRUMENTATION LOG (OVERBURDEN)

Page 1 of 1

PROJECT NAME: Former Buffalo China Site

PROJECT NUMBER: 37191

CLIENT: Hodgson Russ

LOCATION: Buffalo, NY

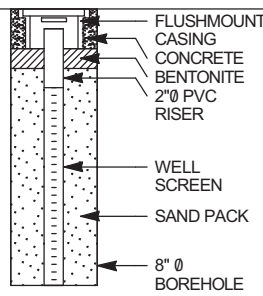
(Former Buffalo China Site)

HOLE DESIGNATION: BH-1-0506 / MW-9

DATE COMPLETED: May 2, 2006

DRILLING METHOD: Direct Push / HSA

FIELD PERSONNEL: P. Kryger

DEPTH ft BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	ELEV. ft AMSL	Monitoring Well	SAMPLE				
				NUMBER	INTERVAL	REC (ft)	'N' VALUE	PID (ppm)
	NORTHING: 1045861.83 EASTING: 1082141	TOP OF CASING 595.12 TOP OF RISER 594.81 GROUND SURFACE 594.66						
2	FIL, sand and gravel, non-plastic, no structure, medium brown to gray, damp, loose	592.26	 FLUSHMOUNT CASING CONCRETE BENTONITE 2"Ø PVC RISER WELL SCREEN SAND PACK 8" Ø BOREHOLE	023				0
4	FILL- sand, well sorted fine grained, loose, medium to dark brown, damp	591.56		024				0
6	CL- CLAY with SILT, stiff, vertical gray mottling within orange brown, black nodules, moderately plastic							0
8	- Refusal @ 7.5 ft BGS END OF BOREHOLE @ 7.5ft BGS	587.16						
10	Soil samples for chemical analysis from 0.5 to 1.0 and 2.0 to 2.4 feet BGS. Well installed through HSA.		<u>WELL DETAILS</u> Screened interval: 592.66 to 587.66ft AMSL 2.00 to 7.00ft BGS Length: 5ft Diameter: 2in Slot Size: .02 Material: PVC Seal: 593.66 to 593.16ft AMSL 1.00 to 1.50ft BGS Material: Bentonite Sand Pack: 593.16 to 587.66ft AMSL 1.50 to 7.00ft BGS Material: Size 00N Sand					
12								
14								
16								
18								
20								
22								
24								
26								
28								
30								
32								
34								

NOTES: MEASURING POINT ELEVATIONS MAY CHANGE; REFER TO CURRENT ELEVATION TABLE

CHEMICAL ANALYSIS



OVERBURDEN LOG 37191.GPJ CRA_CORP.GDT 2/23/10



STRATIGRAPHIC AND INSTRUMENTATION LOG (OVERBURDEN)

Page 1 of 1

PROJECT NAME: Former Buffalo China Site

PROJECT NUMBER: 37191

CLIENT: Hodgson Russ

LOCATION: Buffalo, NY

(118 Harrison Street)

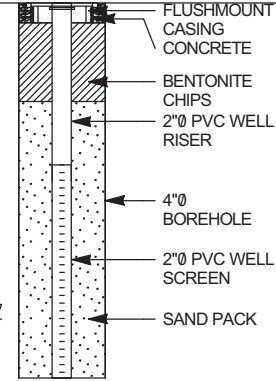
HOLE DESIGNATION: MW-10

DATE COMPLETED: August 12, 2008

DRILLING METHOD: Direct Push/HSA

FIELD PERSONNEL: C. Barton

DEPTH ft BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	ELEV. ft AMSL	MONITORING WELL	SAMPLE				
				NUMBER	INTERVAL	REC (ft)	'N' VALUE	PID (ppm)
	NORTHING: 1045981.14 EASTING: 1081729.8	TOP OF CASING 596.82 GROUND SURFACE 596.75 TOP OF RISER 596.45						
	TOPSOIL	596.45						
2	CLS-SANDY CLAY, brown, damp			SS1		4.0		0
4	- trace gravel below 4 ft BGS							0
6				SS2		1.5		0
8	SC-CLAYEY SAND, some gravel, brown-gray, wet	588.75		SS3		1.0		0
10	END OF BOREHOLE @ 9.8ft BGS	586.95						
12	Auger Refusal @ 9.8 ft BGS							
14								
16								
18								
20								
22								
24								
26								
28								
30								
32								
34								



WELL DETAILS
Screened interval:
592.25 to 587.25ft AMSL
4.50 to 9.50ft BGS
Length: 5ft
Diameter: 2in
Slot Size: 0.010
Material: PVC
Seal:
596.75 to 594.25ft AMSL
0.00 to 2.50ft BGS
Material: BENTONITE
Sand Pack:
594.25 to 587.25ft AMSL
2.50 to 9.50ft BGS
Material: SAND

NOTES: MEASURING POINT ELEVATIONS MAY CHANGE; REFER TO CURRENT ELEVATION TABLE
WATER FOUND ∇

OVERBURDEN LOG 37191.GPJ CRA_CORP.GDT 2/23/10



STRATIGRAPHIC AND INSTRUMENTATION LOG (OVERBURDEN)

Page 1 of 1

PROJECT NAME: Former Buffalo China Site

PROJECT NUMBER: 37191

CLIENT: Hodgson Russ

LOCATION: Buffalo, NY

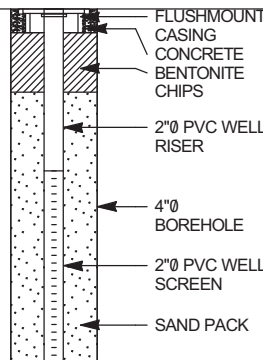
(ROW Behind 141 Milton St)

HOLE DESIGNATION: MW-11

DATE COMPLETED: August 12, 2008

DRILLING METHOD: Direct Push/HSA

FIELD PERSONNEL: C. Barton

DEPTH ft BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	ELEV. ft AMSL	MONITORING WELL	SAMPLE				
				NUMBER	INTERVAL	REC (ft)	'N' VALUE	PID (ppm)
	NORTHING: 1045821.59 EASTING: 1081985.27	TOP OF CASING 595.23 GROUND SURFACE 595.11 TOP OF RISER 595.04						
	BRICK, red	594.11	 FLUSHMOUNT CASING CONCRETE BENTONITE CHIPS 2"Ø PVC WELL RISER 4"Ø BOREHOLE 2"Ø PVC WELL SCREEN SAND PACK	SS1		3.0		0
2	GW-SANDY GRAVEL, brown, dry	593.81						0
4	CLS-SANDY CLAY, brown, damp							0
6				SS2		4.0		0.1
8	- soft, moist below 7 ft BGS							2.8
10	SC-CLAYEY SAND, some gravel, wet	586.61		SS3		1.1		
12	END OF BOREHOLE @ 9.1ft BGS	586.01						
14	Auger Refusal @ 9.1 ft BGS							
16								
18								
20								
22								
24								
26								
28								
30								
32								
34								

NOTES: MEASURING POINT ELEVATIONS MAY CHANGE; REFER TO CURRENT ELEVATION TABLE
WATER FOUND ∇

OVERBURDEN LOG 37191.GPJ CRA_CORP.GDT 2/23/10



STRATIGRAPHIC AND INSTRUMENTATION LOG (OVERBURDEN)

Page 1 of 1

PROJECT NAME: Former Buffalo China Site

HOLE DESIGNATION: MW-13A

PROJECT NUMBER: 37191

DATE COMPLETED: December 15, 2008

CLIENT: Hodgson Russ

DRILLING METHOD: HSA/HQ Core

LOCATION: Buffalo, NY

FIELD PERSONNEL: J. Williams

(Former Buffalo China Site)

DEPTH ft BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	ELEV. ft AMSL	MONITORING WELL	SAMPLE				
				NUMBER	INTERVAL	REC (ft)	'N' VALUE	PID (ppm)
	NORTHING: 1045673.86 EASTING: 1081890.61	TOP OF CASING 594.97 GROUND SURFACE 594.81 TOP OF RISER 594.75						
2	Auger without sampling. For overburden stratigraphy, refer to log MW-13.							0
4								
6								
8	END OF OVERBURDEN HOLE @ 7.9ft BGS	586.91						
10								
12								
14								
16								
18								
20								
22								
24								
26								
28								
30								
32								
34								

NOTES: MEASURING POINT ELEVATIONS MAY CHANGE; REFER TO CURRENT ELEVATION TABLE

OVERBURDEN LOG 37191.GPJ CRA_CORP.GDT 2/23/10



STRATIGRAPHIC AND INSTRUMENTATION LOG (BEDROCK)

Page 1 of 1

PROJECT NAME: Former Buffalo China Site

PROJECT NUMBER: 37191

CLIENT: Hodgson Russ

LOCATION: Buffalo, NY

(Former Buffalo China Site)

HOLE DESIGNATION: MW-13A

DATE COMPLETED: December 15, 2008

DRILLING METHOD: HSA/HQ Core

FIELD PERSONNEL: J. Williams

DEPTH ft BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	ELEV. ft AMSL	MONITORING WELL	RUN NUMBER	CORE RECOVERY %	RQD %	Vol. Water (gal)
8	Auger Refusal - BEDROCK (Not sampled)	586.91	8"Ø BOREHOLE				
10	LIMESTONE (Onondaga formation, Moorehouse member) fine to medium grained, light to medium gray limestone, light buff to dark gray chert nodules, occasional fossils	584.91	6"Ø ROCK SOCKET				
12			4"Ø COREHOLE	1	100	88	30
14	END OF BOREHOLE @ 14.9ft BGS	579.91					
16							
18							
20							
22							
24							
26							
28							
30							
32							
34							
36							
38							
40							

NOTES: MEASURING POINT ELEVATIONS MAY CHANGE; REFER TO CURRENT ELEVATION TABLE

BEDROCK LOG 37191.GPJ CRA CORP.GDT 2/23/10



STRATIGRAPHIC AND INSTRUMENTATION LOG (OVERBURDEN)

Page 1 of 1

PROJECT NAME: Former Buffalo China Site

HOLE DESIGNATION: MW-14A

PROJECT NUMBER: 37191

DATE COMPLETED: December 16, 2008

CLIENT: Hodgson Russ

DRILLING METHOD: HSA/HQ Core

LOCATION: Buffalo, NY

FIELD PERSONNEL: J. Williams

(103 Harrison Street)

DEPTH ft BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	ELEV. ft AMSL	MONITORING WELL	SAMPLE				
				NUMBER	INTERVAL	REC (ft)	'N' VALUE	
	NORTHING: 1045585.17 EASTING: 1081683.81	TOP OF CASING 593.77 GROUND SURFACE 593.65 TOP OF RISER 593.37						
2	Auger without sampling. For overburden stratigraphy, refer to log MW-14.							
4								
6								
8								
10	END OF OVERBURDEN HOLE @ 8.6ft BGS	585.05						
12								
14								
16								
18								
20								
22								
24								
26								
28								
30								
32								
34								

NOTES: MEASURING POINT ELEVATIONS MAY CHANGE; REFER TO CURRENT ELEVATION TABLE

WATER BEARING ZONE ▼

OVERBURDEN LOG 37191.GPJ CRA_CORP.GDT 2/23/10



STRATIGRAPHIC AND INSTRUMENTATION LOG (BEDROCK)

Page 1 of 1

PROJECT NAME: Former Buffalo China Site

PROJECT NUMBER: 37191

CLIENT: Hodgson Russ

LOCATION: Buffalo, NY

(103 Harrison Street)

HOLE DESIGNATION: MW-14A

DATE COMPLETED: December 16, 2008

DRILLING METHOD: HSA/HQ Core

FIELD PERSONNEL: J. Williams

DEPTH ft BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	ELEV. ft AMSL	MONITORING WELL	RUN NUMBER	CORE RECOVERY %	RQD %	Vol. Water (gal)
8							
10	Auger Refusal - BEDROCK (Not sampled)	585.05					
12	LIMESTONE (Onondaga formation, Moorehouse member) fine to medium grained, light to medium gray limestone, light buff to dark gray chert nodules, occasional fossils	583.45					
14	- fracture, moderately weathered, ~0.25-inch aperture @ 13.2 feet BGS						
16	END OF BOREHOLE @ 15.2ft BGS	578.45					
18							
20							
22							
24							
26							
28							
30							
32							
34							
36							
38							
40							

NOTES: MEASURING POINT ELEVATIONS MAY CHANGE; REFER TO CURRENT ELEVATION TABLE

WATER BEARING ZONE ▼

BEDROCK LOG 37191.GPJ CRA_CORP.GDT 2/23/10



STRATIGRAPHIC AND INSTRUMENTATION LOG (OVERBURDEN)

Page 1 of 1

PROJECT NAME: Former Buffalo China Site

HOLE DESIGNATION: MW-15A

PROJECT NUMBER: 37191

DATE COMPLETED: December 12, 2008

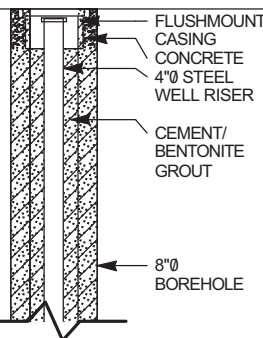
CLIENT: Hodgson Russ

DRILLING METHOD: HSA/HQ Core

LOCATION: Buffalo, NY

FIELD PERSONNEL: J. Williams

(58 Lester Street)

DEPTH ft BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	ELEV. ft AMSL	MONITORING WELL	SAMPLE				
				NUMBER	INTERVAL	REC (ft)	'N' VALUE	PID (ppm)
	NORTHING: 1045421.9 EASTING: 1081877.4	TOP OF CASING 592.90 GROUND SURFACE 592.82 TOP OF RISER 592.70						
2	Auger without sampling. For overburden stratigraphy, refer to log MW-15.							0
4								
6								
8	END OF OVERBURDEN HOLE @ 7.9ft BGS	584.92						
10								
12								
14								
16								
18								
20								
22								
24								
26								
28								
30								
32								
34								

NOTES: MEASURING POINT ELEVATIONS MAY CHANGE; REFER TO CURRENT ELEVATION TABLE

WATER BEARING ZONE ▼

OVERBURDEN LOG 37191.GPJ CRA_CORP.GDT 2/23/10



STRATIGRAPHIC AND INSTRUMENTATION LOG (BEDROCK)

Page 1 of 1

PROJECT NAME: Former Buffalo China Site

PROJECT NUMBER: 37191

CLIENT: Hodgson Russ

LOCATION: Buffalo, NY

(58 Lester Street)

HOLE DESIGNATION: MW-15A

DATE COMPLETED: December 12, 2008

DRILLING METHOD: HSA/HQ Core

FIELD PERSONNEL: J. Williams

DEPTH ft BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	ELEV. ft AMSL	MONITORING WELL	RUN NUMBER	CORE RECOVERY %	RQD %	Vol. Water (gal)
8	Auger Refusal - BEDROCK (Not sampled)	584.92	8"Ø BOREHOLE				
10	LIMESTONE (Onondaga formation, Moorehouse member) fine to medium grained, light to medium gray limestone, light buff to dark gray chert nodules, occasional fossils - fracture, slightly weathered, ~0.25-inch aperture @ 10.5 feet BGS	582.92	6"Ø ROCK SOCKET				
12			4"Ø COREHOLE	1	93	87	50
14	END OF BOREHOLE @ 14.4ft BGS	578.42					
16							
18							
20							
22							
24							
26							
28							
30							
32							
34							
36							
38							
40							

NOTES: MEASURING POINT ELEVATIONS MAY CHANGE; REFER TO CURRENT ELEVATION TABLE

WATER BEARING ZONE ▼

BEDROCK LOG 37191.GPJ CRA CORP.GDT 2/23/10



STRATIGRAPHIC AND INSTRUMENTATION LOG (OVERBURDEN)

Page 1 of 1

PROJECT NAME: Former Buffalo China Site

HOLE DESIGNATION: MW-19(R)

PROJECT NUMBER: 37191

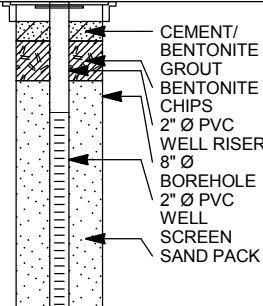
DATE COMPLETED: January 27, 2012

CLIENT: Hodgson Russ

DRILLING METHOD: HSA/HQ Core

LOCATION: Buffalo, NY

FIELD PERSONNEL: D. Oscar

DEPTH ft BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	ELEV. ft AMSL	MONITORING WELL	SAMPLE			
				NUMBER	INTERVAL	REC (ft)	'N' VALUE
	NORTHING: 1046151.46 EASTING: 1082772.24 TOP OF CASING GROUND SURFACE TOP OF RISER	593.81 593.70 593.28					
2	SEE MW-19 WELL LOGS IN CRA REPORT 37191 (8) FOR OVERBURDEN STRATIGRAPHY		 CEMENT/ BENTONITE GROUT BENTONITE CHIPS 2" Ø PVC WELL RISER 8" Ø BOREHOLE 2" Ø PVC WELL SCREEN SAND PACK				
4	WELL WAS INSTALLED IN NO. 2 CRUSHER RUN GRAVEL BACKFILL						
6							
8	END OF BOREHOLE @ 7.8ft BGS	585.90					
10	NOTE: REPLACEMENT WELL FOR MW-19 ABANDONED DUE TO SOIL EXCAVATION						
12							
14							
16							
18							
20							
22							
24							
26							
28							
30							
32							
34							

NOTES: MEASURING POINT ELEVATIONS MAY CHANGE; REFER TO CURRENT ELEVATION TABLE

OVERBURDEN LOG 037191WIN.GPJ CRA CORP.GDT 5/23/12



STRATIGRAPHIC AND INSTRUMENTATION LOG (OVERBURDEN)

Page 1 of 2

PROJECT NAME: Former Buffalo China Site

HOLE DESIGNATION: MW-19A(R)

PROJECT NUMBER: 37191

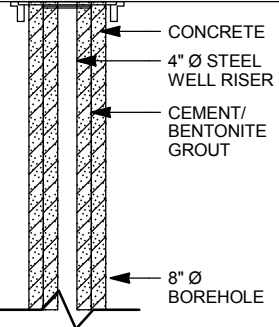
DATE COMPLETED: January 27, 2012

CLIENT: Hodgson Russ

DRILLING METHOD: HSA/HQ Core

LOCATION: Buffalo, NY

FIELD PERSONNEL: D. Oscar

DEPTH ft BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	ELEV. ft AMSL	MONITORING WELL	SAMPLE				
				NUMBER	INTERVAL	REC (ft)	'N' VALUE	
	NORTHING: 1046159.2 EASTING: 1082776.72 TOP OF CASING GROUND SURFACE TOP OF RISER	593.80 593.71 593.40						
2	SEE MW-19A WELL LOG IN CRA REPORT 37191 (8) FOR BEDROCK STRATIGRAPHY							
4	WELL WAS INSTALLED IN NO. 2 CRUSHER RUN GRAVEL BACKFILL							
6								
8	END OF OVERBURDEN HOLE @ 7.8ft BGS							
10								
12								
14								
16								
18								
20								
22								
24								
26								
28								
30								
32								
34								

NOTES: MEASURING POINT ELEVATIONS MAY CHANGE; REFER TO CURRENT ELEVATION TABLE

OVERBURDEN LOG 037191WIN.GPJ CRA CORP.GDT 5/23/12



STRATIGRAPHIC AND INSTRUMENTATION LOG (BEDROCK)

Page 2 of 2

PROJECT NAME: Former Buffalo China Site

HOLE DESIGNATION: MW-19A(R)

PROJECT NUMBER: 37191

DATE COMPLETED: January 27, 2012

CLIENT: Hodgson Russ

DRILLING METHOD: HSA/HQ Core

LOCATION: Buffalo, NY

FIELD PERSONNEL: D. Oscar

DEPTH ft BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	DEPTH ft BGS	MONITORING WELL	RUN NUMBER	CORE RECOVERY %	RQD %	
8	BEDROCK, not logged	7.80	8" Ø BOREHOLE				
10	LIMESTONE (Onondaga Formation, Moorehouse member) fine to medium grained, light to medium gray limestone, light buff to dark gray chert nodules, occasional fossils	9.80	6" Ø ROCK SOCKET				
12							
14							
16			4" Ø COREHOLE				
18							
20							
22							
24							
26	END OF BOREHOLE @ 25.0ft BGS	25.00					
28	NOTE: REPLACEMENT WELL FOR MW-19A ABANDONED DUE TO SOIL EXCAVATION						
30							
32							
34							
36							
38							
40							

WELL DETAILS

Material: STEEL

Seal:

0.00 to 9.80ft BGS

Material: CEMENT/ BENTONITE GROUT

NOTES: MEASURING POINT ELEVATIONS MAY CHANGE; REFER TO CURRENT ELEVATION TABLE



STRATIGRAPHIC AND INSTRUMENTATION LOG (OVERBURDEN)

Page 1 of 1

PROJECT NAME: Former Buffalo China Site

PROJECT NUMBER: 37191

CLIENT: Hodgson Russ

LOCATION: Buffalo, NY

HOLE DESIGNATION: MW-21A

DATE COMPLETED: June 4, 2009

DRILLING METHOD: 6.25 HSA/HQ Core

FIELD PERSONNEL: J. Williams

(Former Buffalo China Site)

DEPTH ft BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	ELEV. ft AMSL	MONITORING WELL	SAMPLE				
				NUMBER	INTERVAL	REC (ft)	'N' VALUE	PID (ppm)
	NORTHING: 1045631.4 EASTING: 1082238.77 TOP OF CASING GROUND SURFACE TOP OF RISER	591.42 591.28 590.98						
2	GM-GRAVEL, some silt, angular, loose, gray, wet (FILL) FILL-china fragments, white CL-CLAY, little silt, stiff, brown, moist (NATIVE)	590.88 590.58		SS1		1.2	7	0
4	ML-SILT, some clay, little gravel, dense, brown, moist (TILL) - rock fragments below 4.1 ft BGS	587.68 587.08 586.88		SS2		1.7	16	0
6	NOT SAMPLED -Auger Refusal - bedrock encountered @ 4.4 ft BGS END OF OVERBURDEN HOLE @ 4.4ft BGS			SS3		0.2	>50	0
8								
10								
12								
14								
16								
18								
20								
22								
24								
26								
28								
30								
32								
34								

NOTES: MEASURING POINT ELEVATIONS MAY CHANGE; REFER TO CURRENT ELEVATION TABLE

WATER BEARING ZONE ▼

CHEMICAL ANALYSIS ○

OVERBURDEN LOG 37191.GPJ CRA_CORP.GDT 2/23/10



STRATIGRAPHIC AND INSTRUMENTATION LOG (BEDROCK)

Page 1 of 1

PROJECT NAME: Former Buffalo China Site

PROJECT NUMBER: 37191

CLIENT: Hodgson Russ

LOCATION: Buffalo, NY

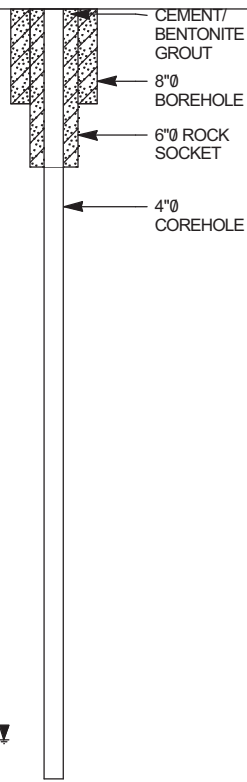
(Former Buffalo China Site)

HOLE DESIGNATION: MW-21A

DATE COMPLETED: June 4, 2009

DRILLING METHOD: 6.25 HSA/HQ Core

FIELD PERSONNEL: J. Williams

DEPTH ft BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	ELEV. ft AMSL	MONITORING WELL	RUN NUMBER	CORE RECOVERY %	RQD %	Vol. Water (gal)
4	ML-SILT, some clay, little gravel, dense, brown, moist (TILL) - rock fragments below 4.1 ft BGS	587.68 587.08 586.88					
6	NOT SAMPLED -Auger Refusal - bedrock encountered @ 4.4 ft BGS	585.28		1	100	100	0
8	BEDROCK (Not sampled) LIMESTONE (Onondaga formation, Moorehouse member) fine to medium grained, light to medium gray limestone, light buff to dark gray chert nodules, occasional fossils			2	99	86	0
10							
12							
14				3	100	92	0
16							
18							
20	- fracture, moderately weathered, bedding plane parallel below 20.5 ft BGS			4	100	95	50
22	END OF BOREHOLE @ 21.5ft BGS	569.78					
24							
26							
28							
30							
32							
34							
36							

NOTES: MEASURING POINT ELEVATIONS MAY CHANGE; REFER TO CURRENT ELEVATION TABLE

WATER BEARING ZONE ▼

CHEMICAL ANALYSIS ○

BEDROCK LOG 37191.GPJ CRA CORP.GDT 2/23/10



STRATIGRAPHIC AND INSTRUMENTATION LOG (OVERBURDEN)

Page 1 of 1

PROJECT NAME: Former Buffalo China Site

HOLE DESIGNATION: MW-22

PROJECT NUMBER: 37191

DATE COMPLETED: June 8, 2009

CLIENT: Hodgson Russ

DRILLING METHOD: 4.25 HSA

LOCATION: Buffalo, NY

FIELD PERSONNEL: J. Williams

(82 Harrison Street)

DEPTH ft BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	ELEV. ft AMSL	MONITORING WELL	SAMPLE				
				NUMBER	INTERVAL	REC (ft)	'N' VALUE	PID (ppm)
	NORTHING: 1045620.7 EASTING: 1081594.66	TOP OF CASING 592.68 GROUND SURFACE 592.58 TOP OF RISER 592.34						
2	ML-SILT, some clay, dense, firm, dark brown to black, moist (TOPSOIL)	591.48	FLUSHMOUNT CASING CONCRETE	SS1	X	1.0	7	0
4	CL-CLAY, little silt, dense, stiff, brown with yellow mottling, moist (NATIVE)		CEMENT GROUT	SS2	X	2.0	14	0
6			BENTONITE CHIPS	SS3	X	2.0	18	0
8			2"Ø PVC WELL RISER	SS4	X	2.0	16	0
10	ML-SILT, little clay and gravel, trace fine sand, brown to gray, moist to wet, becoming soft (TILL) - some gravel, trace clay, wet below 11.1 ft BGS	583.08	8"Ø BOREHOLE	SS5	X	2.0	8	0
12	END OF BOREHOLE @ 12.0ft BGS	580.58	2"Ø PVC WELL SCREEN	SS6	X	2.0	6	0
14	Auger Refusal @ 12 ft BGS		SAND PACK					
16								
18								
20								
22								
24								
26								
28								
30								
32								
34								

WELL DETAILS

Screened interval:

585.58 to 580.58ft AMSL

7.00 to 12.00ft BGS

Length: 5ft

Diameter: 2in

Slot Size: 0.010

Material: PVC

Seal:

589.58 to 587.58ft AMSL

3.00 to 5.00ft BGS

Material: Bentonite

Sand Pack:

587.58 to 580.58ft AMSL

5.00 to 12.00ft BGS

Material: Size 00N Sand

NOTES: MEASURING POINT ELEVATIONS MAY CHANGE; REFER TO CURRENT ELEVATION TABLE

WATER FOUND ∇

CHEMICAL ANALYSIS ○

OVERBURDEN LOG 37191.GPJ CRA_CORP.GDT 2/23/10



STRATIGRAPHIC AND INSTRUMENTATION LOG (OVERBURDEN)

Page 1 of 1

PROJECT NAME: Former Buffalo China Site

PROJECT NUMBER: 37191

CLIENT: Hodgson Russ

LOCATION: Buffalo, NY

(82 Harrison Street)

HOLE DESIGNATION: MW-22A

DATE COMPLETED: June 8, 2009

DRILLING METHOD: 6.25 HSA/HQ Core

FIELD PERSONNEL: J. Williams

DEPTH ft BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	ELEV. ft AMSL	MONITORING WELL	SAMPLE				
				NUMBER	INTERVAL	REC (ft)	'N' VALUE	PID (ppm)
	NORTHING: 1045620.56 EASTING: 1081598.23	TOP OF CASING 592.61 GROUND SURFACE 592.53 TOP OF RISER 592.23						
2	ML-SILT, some clay, dense, firm, dark brown to black, moist (TOPSOIL)	591.73		SS1	X	1.7	9	0
4	CL-CLAY, little silt, dense, stiff, brown with yellow mottling, moist (NATIVE)			SS2	X	1.7	11	0
6				SS3	X	2.0	15	0
8				SS4	X	2.0	14	0
10	ML-SILT, little clay and gravel, trace fine sand, dense, brown to gray, moist to wet, becoming soft (TILL)	583.33		SS5	X	2.0	4	0
12	- some gravel, becoming wet below 10 ft BGS	580.93		SS6	X	1.0	10	0
14	NOT SAMPLED	580.73						
16	-Auger Refusal - bedrock encountered @ 11.8 ft BGS							
18	END OF OVERBURDEN HOLE @ 11.8ft BGS							
20								
22								
24								
26								
28								
30								
32								
34								

NOTES: MEASURING POINT ELEVATIONS MAY CHANGE; REFER TO CURRENT ELEVATION TABLE

WATER FOUND ▼

WATER BEARING ZONE ▼

CHEMICAL ANALYSIS ○

OVERBURDEN LOG 37191.GPJ CRA_CORP.GDT 2/23/10



STRATIGRAPHIC AND INSTRUMENTATION LOG (BEDROCK)

Page 1 of 1

PROJECT NAME: Former Buffalo China Site

PROJECT NUMBER: 37191

CLIENT: Hodgson Russ

LOCATION: Buffalo, NY

(82 Harrison Street)

HOLE DESIGNATION: MW-22A

DATE COMPLETED: June 8, 2009

DRILLING METHOD: 6.25 HSA/HQ Core

FIELD PERSONNEL: J. Williams

DEPTH ft BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	ELEV. ft AMSL	MONITORING WELL	RUN NUMBER	CORE RECOVERY %	RQD %	Vol. Water (gal)
12	NOT SAMPLED -Auger Refusal - bedrock encountered @ 11.8 ft BGS	580.93 580.73	6"Ø ROCK SOCKET				
14	BEDROCK (Not sampled)						
16	LIMESTONE (Onondaga formation, Moorehouse member) fine to medium grained, light to medium gray limestone, light buff to dark gray chert nodules, occasional fossils	577.93	4"Ø COREHOLE	1	100	86	0
18							
20							
22				2	98	82	0
24							
26							
28				3	102	90	0
30							
32				4	100	90	30
34	- fracture, slightly weathered, bedding plane parallel below 33.5 ft BGS	557.93					
36	END OF BOREHOLE @ 34.6ft BGS						
38							
40							
42							
44							

NOTES: MEASURING POINT ELEVATIONS MAY CHANGE; REFER TO CURRENT ELEVATION TABLE

WATER FOUND ▼

WATER BEARING ZONE ▼

CHEMICAL ANALYSIS ○

BEDROCK LOG 37191.GPJ CRA_CORP.GDT 2/23/10



STRATIGRAPHIC AND INSTRUMENTATION LOG (OVERBURDEN)

Page 1 of 1

PROJECT NAME: Former Buffalo China Site

PROJECT NUMBER: 37191

CLIENT: Hodgson Russ

LOCATION: Buffalo, NY

(141 Milton Street)

HOLE DESIGNATION: MW-25A

DATE COMPLETED: June 23, 2009

DRILLING METHOD: 6.25 HSA/HQ Core

FIELD PERSONNEL: J. Williams

DEPTH ft BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	ELEV. ft AMSL	MONITORING WELL	SAMPLE				
				NUMBER	INTERVAL	REC (ft)	'N' VALUE	PID (ppm)
	NORTHING: 1046007.18 EASTING: 1081847.89	GROUND SURFACE 598.47 TOP OF CASING 598.46 TOP OF RISER 598.13						
	CONCRETE	598.17						
2	GM-GRAVEL and SILT, little sand, angular, loose, black, dry to moist	597.67		SS1		1.2	6	0
	SP-SAND, trace silt, loose, fine grained, brown, dry to moist	596.37		SS2		1.5	9	0
4	ML/CL-SILT and CLAY, brown, moist							
	CL-CLAY, trace silt and gravel, dense, medium plasticity, brown, moist to wet	594.27		SS3		2.0	15	0
6								
8	NOT SAMPLED -Auger Refusal - bedrock encountered @ 7.5 ft BGS END OF OVERBURDEN HOLE @ 7.5ft BGS	591.07 590.97		SS4		1.5	>50	0
10								
12								
14								
16								
18								
20								
22								
24								
26								
28								
30								
32								
34								

NOTES: MEASURING POINT ELEVATIONS MAY CHANGE; REFER TO CURRENT ELEVATION TABLE

WATER BEARING ZONE ▼

CHEMICAL ANALYSIS ○

OVERBURDEN LOG 37191.GPJ CRA_CORP.GDT 2/23/10



STRATIGRAPHIC AND INSTRUMENTATION LOG (BEDROCK)

Page 1 of 1

PROJECT NAME: Former Buffalo China Site

PROJECT NUMBER: 37191

CLIENT: Hodgson Russ

LOCATION: Buffalo, NY

(141 Milton Street)

HOLE DESIGNATION: MW-25A

DATE COMPLETED: June 23, 2009

DRILLING METHOD: 6.25 HSA/HQ Core

FIELD PERSONNEL: J. Williams

DEPTH ft BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	ELEV. ft AMSL	MONITORING WELL	RUN NUMBER	CORE RECOVERY %	RQD %	Vol. Water (gal)
8	NOT SAMPLED -Auger Refusal - bedrock encountered @ 7.5 ft BGS	591.07 590.97	8"Ø BOREHOLE				
10	BEDROCK (Not sampled) LIMESTONE (Onondaga formation, Moorehouse member) fine to medium grained, light to medium gray limestone, light buff to dark gray chert nodules, occasional fossils	588.97	6"Ø ROCK SOCKET	1	71	58	0
12	- fracture, moderately weathered, vertical between 10.7 and 11.8 ft BGS		4"Ø COREHOLE	2	100	91	100
14	- fracture, moderately weathered, bedding plane parallel below 12.4 ft BGS	583.97					
16	END OF BOREHOLE @ 14.5ft BGS						
18							
20							
22							
24							
26							
28							
30							
32							
34							
36							
38							
40							

NOTES: MEASURING POINT ELEVATIONS MAY CHANGE; REFER TO CURRENT ELEVATION TABLE

WATER BEARING ZONE ▼

CHEMICAL ANALYSIS ○

BEDROCK LOG 37191.GPJ CRA CORP.GDT 2/23/10



STRATIGRAPHIC AND INSTRUMENTATION LOG (OVERBURDEN)

Page 1 of 1

PROJECT NAME: Former Buffalo China Site

HOLE DESIGNATION: MW-26

PROJECT NUMBER: 37191

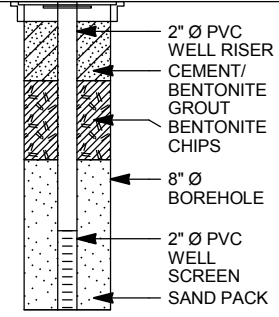
DATE COMPLETED: November 29, 2011

CLIENT: Hodgson Russ

DRILLING METHOD: HSA

LOCATION: Buffalo, NY

FIELD PERSONNEL: D. Oscar

DEPTH ft BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	ELEV. ft AMSL	MONITORING WELL	SAMPLE				
				NUMBER	INTERVAL	REC (ft)	'N' VALUE	
	NORTHING: 1046228.35 EASTING: 1082917 GROUND SURFACE TOP OF CASING TOP OF RISER	593.61 593.57 593.22						
2	SP/GP-SAND AND GRAVEL (FILL), with silt, trace vegetation, dark brown and black, moist		 2" Ø PVC WELL RISER CEMENT/ BENTONITE GROUT BENTONITE CHIPS 8" Ø BOREHOLE 2" Ø PVC WELL SCREEN SAND PACK					
4	SW-SAND, some gravel, little silt, fine to medium grained sand, brown, moist	590.81 590.41						
	CL/ML-CLAY AND SILT, gray-brown, moist	589.31						
6	SM-SAND (till), some silt, little clay, trace fine gravel, fine grained sand, brown and gray-brown, moist to wet							
8	- REFUSAL REFUSAL END OF BOREHOLE @ 7.8ft BGS	585.81 585.71						
10			WELL DETAILS Screened interval: 587.81 to 585.81ft AMSL 5.80 to 7.80ft BGS Length: 2ft Diameter: 2in Slot Size: 0.010 Material: PVC Seal: 591.61 to 589.61ft AMSL 2.00 to 4.00ft BGS Material: BENTONITE CHIPS Sand Pack: 589.61 to 585.81ft AMSL 4.00 to 7.80ft BGS Material: SAND					
12								
14								
16								
18								
20								
22								
24								
26								
28								
30								
32								
34								

NOTES: MEASURING POINT ELEVATIONS MAY CHANGE; REFER TO CURRENT ELEVATION TABLE



STRATIGRAPHIC AND INSTRUMENTATION LOG (OVERBURDEN)

Page 1 of 2

PROJECT NAME: Former Buffalo China Site
PROJECT NUMBER: 37191
CLIENT: Hodgson Russ
LOCATION: Buffalo, NY

HOLE DESIGNATION: MW-26A
DATE COMPLETED: November 30, 2011
DRILLING METHOD: HSA/ Wet Rotary Drill
FIELD PERSONNEL: D. Oscar

DEPTH ft BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	ELEV. ft AMSL	MONITORING WELL	SAMPLE				
				NUMBER	INTERVAL	REC (ft)	'N' VALUE	
	NORTHING: 1046220.46 EASTING: 1082933.63 TOP OF CASING GROUND SURFACE TOP OF RISER	593.62 593.53 593.05						
2	AUGER ONLY TO REFUSAL, for overburden stratigraphy, see MW-26 Log							
4								
6	- REFUSAL END OF OVERBURDEN HOLE @ 5.5ft BGS							
8								
10								
12								
14								
16								
18								
20								
22								
24								
26								
28								
30								
32								
34								

NOTES: MEASURING POINT ELEVATIONS MAY CHANGE; REFER TO CURRENT ELEVATION TABLE

OVERBURDEN LOG 037191WIN.GPJ CRA CORP.GDT 5/23/12



STRATIGRAPHIC AND INSTRUMENTATION LOG (BEDROCK)

Page 2 of 2

PROJECT NAME: Former Buffalo China Site

HOLE DESIGNATION: MW-26A

PROJECT NUMBER: 37191

DATE COMPLETED: November 30, 2011

CLIENT: Hodgson Russ

DRILLING METHOD: HSA/ Wet Rotary Drill

LOCATION: Buffalo, NY

FIELD PERSONNEL: D. Oscar

DEPTH ft BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	DEPTH ft BGS	MONITORING WELL	RUN NUMBER	CORE RECOVERY %	RQD %
6	- REFUSAL BEDROCK, not logged	5.50	8" Ø BOREHOLE 6" Ø ROCK SOCKET 4" Ø COREHOLE			
8	LIMESTONE (Onondaga Formation, Moorehouse member) fine to medium grained, light to medium gray limestone, light buff to dark gray chert nodules, occasional fossils	7.50		1	96	100
10	- closed fracture					
12	- open weathered fracture					
14	- closed fracture					
16	- slightly weathered fracture					
18	- slightly weathered fracture					
20	- open highly weathered fracture					
22	- slightly weathered fracture					
24	- moderately weathered fracture					
26	- slightly weathered fracture					
28	- slightly weathered fracture					
30	- slightly weathered fracture					
32	END OF BOREHOLE @ 17.5ft BGS	17.50		2	94	94
34						
36						
38						

WELL DETAILS

Material: STEEL

Seal:

0.00 to 7.50ft BGS

Material: CEMENT/ BENTONITE
GROUT

NOTES: MEASURING POINT ELEVATIONS MAY CHANGE; REFER TO CURRENT ELEVATION TABLE

BEDROCK LOG 037191WIN.GPJ CRA CORP.GDT 5/9/12

APPENDIX D

LOW-FLOW GROUNDWATER SAMPLING FORM

MONITORING WELL RECORD FOR LOW-FLOW PURGING

Project Data:

Project Name: _____
Ref. No.: _____

Date: _____
Personnel: _____

Monitoring Well Data:

Well No.: _____

Vapour PID (ppm): _____

Measurement Point:

Constructed Well Depth (m/ft): _____

Measured Well Depth (m/ft): _____

Depth of Sediment (m/ft): _____

Saturated Screen Length (m/ft): _____

Depth to Pump Intake (m/ft)⁽¹⁾: _____

Well Diameter, D (cm/in): _____

Well Screen Volume, V_s (L)⁽²⁾: _____

Initial Depth to Water (m/ft): _____

[illegible]

Notes:

- (1) The pump intake will be placed at the well screen mid-point or at a minimum of 0.6 m (2 ft) above any sediment accumulated at the well bottom.
- (2) The well screen volume will be based on a 1.52 metres (5-foot) screen length (L). For metric units, $V_s = \pi \cdot (r^2) \cdot L$ in mL, where $r = (D/2)$ and L are in cm. For Imperial units, $V_s = \pi \cdot (r^2) \cdot L \cdot (2.54)^3$, where r and L are in inches
- (3) The drawdown from the initial water level should not exceed 0.1 m (0.3 ft). The pumping rate should not exceed 600 mL/min.
- (4) Purging will continue until stabilization is achieved or until 20 well screen volumes have been purged (unless purge water remains visually turbid and appears to be clearing, or unless stabilization parameters are varying slightly outside of the stabilization criteria and appear to be stabilizing), No. of Well Screen Volumes Purged= V_p/V_s .

APPENDIX E

SITE INSPECTION FORM

**SITE INSPECTION FORM
FORMER BUFFALO CHINA SITE
BUFFALO, NEW YORK
NYSDEC SITE NO. C915209**

INSPECTION DATE: _____

INSPECTED BY: _____

Overall Site

Has the Site use changed since the last inspection? **Yes** _____ **No** _____

If yes, please describe the changes: _____

Have neighboring property uses changed? **Yes** _____ **No** _____

If yes, please describe the changes: _____

Asphalt/Concrete Cover System

Potential Problems

Concern

Corrective Action

Potholes and cracks	• Deterioration of asphalt pavement or concrete • Safety hazard	• Use cold mix or hot mix asphalt and liquid bituminous material to patch, repair, or replace asphalt • For concrete, select repair method based on type and extent of damage
Ponding water	• Safety hazard	• No action required if ponding is minor • If ponding is significant, install drainage holes in asphalt/concrete pavement
Obstructions/Debris	• Safety hazard	• Remove obstructions as soon as possible

<i>Inspect For</i>	<i>Inspection Item Identified (circle one)</i>		<i>Action Required (circle one)</i>		<i>Comments</i>
Deterioration	Yes	No	Yes	No	
Obstruction/Debris	Yes	No	Yes	No	
Potholes	Yes	No	Yes	No	
Drainage/Puddles	Yes	No	Yes	No	
Other	Yes	No	Yes	No	

**SITE INSPECTION FORM
FORMER BUFFALO CHINA SITE
BUFFALO, NEW YORK
NYSDEC SITE NO. C915209**

INSPECTION DATE: _____

INSPECTED BY: _____

Surface Soil/Stone Cover System

Potential Problems

Concern

Corrective Action

Erosion	• Deterioration of integrity of cover • Washed out soil/stone	• Backfill with additional imported stone/common fill as needed • If persistent erosion occurs, erosion control mats may be required in selected areas
Animal burrows	• Potential for soil cover erosion • Safety hazard	• Contract exterminator regarding trapping and relocation of persistent rodents • Seal all holes with common fill and compact
Damage to fence	• Potential access to Site by unauthorized persons	• No action if damage is minor and does not allow access by unauthorized persons • Repair fence if appropriate

<i>Inspect For</i>	<i>Inspection Item Identified (circle one)</i>		<i>Action Required (circle one)</i>		<i>Comments</i>
Erosion	Yes	No	Yes	No	
Animal Burrows	Yes	No	Yes	No	
Damage to fence	Yes	No	Yes	No	
Other	Yes	No	Yes	No	

**SITE INSPECTION FORM
FORMER BUFFALO CHINA SITE
BUFFALO, NEW YORK
NYSDEC SITE NO. C915209**

INSPECTION DATE: _____

INSPECTED BY: _____

Monitoring Wells

Potential Problems

Concern

Corrective Action

Missing locks

• Potential access by unauthorized persons

• Replace lock

Missing J-plugs

• Potential well contamination from surface water or rain water

• Replace J-plug

Concrete surface seal

• Damaged seal can allow water infiltration around casing and contamination of groundwater

• Contract drilling subcontractor to have surface seal replaced

Damaged flush-mount or stickup casing

• Damaged casing can result in damage to riser

• Contract drilling subcontractor to have casing replaced

<i>Monitoring Well</i>	<i>Well Condition (circle one)</i>			<i>Comments</i>
MW-5	Good	Fair	Needs Repair	
MW-5A	Good	Fair	Needs Repair	
MW-6	Good	Fair	Needs Repair	
MW-7	Good	Fair	Needs Repair	
MW-7A	Good	Fair	Needs Repair	
MW-8	Good	Fair	Needs Repair	
MW-8A	Good	Fair	Needs Repair	
MW-9	Good	Fair	Needs Repair	
MW-9A	Good	Fair	Needs Repair	
MW-10	Good	Fair	Needs Repair	
MW-11	Good	Fair	Needs Repair	
MW-13A	Good	Fair	Needs Repair	
MW-14A	Good	Fair	Needs Repair	
MW-15A	Good	Fair	Needs Repair	
MW-19	Good	Fair	Needs Repair	
MW-19A	Good	Fair	Needs Repair	
MW-21A	Good	Fair	Needs Repair	
MW-22	Good	Fair	Needs Repair	

**SITE INSPECTION FORM
FORMER BUFFALO CHINA SITE
BUFFALO, NEW YORK
NYSDEC SITE NO. C915209**

INSPECTION DATE: _____

INSPECTED BY: _____

<i>Monitoring Well</i>	<i>Well Condition (circle one)</i>			<i>Comments</i>
MW-22A	Good	Fair	Needs Repair	
MW-25A	Good	Fair	Needs Repair	
MW-26	Good	Fair	Needs Repair	
MW-26A	Good	Fair	Needs Repair	

Injection Wells

Potential Problems

Concern

Corrective Action

Missing caps

- Potential well contamination from surface water or rain water

- Replace cap

Damaged stickup

- Inability to distribute oxidant, inoculum, substrate, nutrients to subsurface

- Repair stickup or contract drilling subcontractor to replace injection well

<i>Injection Well/Gallery</i>	<i>Well Condition (circle one)</i>			<i>Comments</i>
IW-1	Good	Fair	Needs Repair	
IW-2	Good	Fair	Needs Repair	
IW-3	Good	Fair	Needs Repair	
IW-4	Good	Fair	Needs Repair	
IW-5	Good	Fair	Needs Repair	
IW-6	Good	Fair	Needs Repair	
IW-7	Good	Fair	Needs Repair	
IW-8	Good	Fair	Needs Repair	
IW-9	Good	Fair	Needs Repair	
IW-10	Good	Fair	Needs Repair	
IW-11	Good	Fair	Needs Repair	
IW-12	Good	Fair	Needs Repair	
IW-13	Good	Fair	Needs Repair	
IW-14	Good	Fair	Needs Repair	
IW-15	Good	Fair	Needs Repair	
IW-16	Good	Fair	Needs Repair	

**SITE INSPECTION FORM
FORMER BUFFALO CHINA SITE
BUFFALO, NEW YORK
NYSDEC SITE NO. C915209**

INSPECTION DATE: _____

INSPECTED BY: _____

<i>Injection Well/Gallery</i>	<i>Well Condition (circle one)</i>			<i>Comments</i>
IW-17	Good	Fair	Needs Repair	
IW-18	Good	Fair	Needs Repair	
IW-19	Good	Fair	Needs Repair	
IW-20	Good	Fair	Needs Repair	
IW-21	Good	Fair	Needs Repair	
IW-22	Good	Fair	Needs Repair	
IW-23	Good	Fair	Needs Repair	
IW-24	Good	Fair	Needs Repair	
IW-25	Good	Fair	Needs Repair	
IW-26	Good	Fair	Needs Repair	
IW-27	Good	Fair	Needs Repair	
IW-28	Good	Fair	Needs Repair	
IW-29	Good	Fair	Needs Repair	
IG-1	Good	Fair	Needs Repair	
IG-2	Good	Fair	Needs Repair	
IG-3	Good	Fair	Needs Repair	
IG-4	Good	Fair	Needs Repair	
IG-5	Good	Fair	Needs Repair	
IG-6	Good	Fair	Needs Repair	
IG-7	Good	Fair	Needs Repair	
IG-8	Good	Fair	Needs Repair	
IG-9	Good	Fair	Needs Repair	
IG-10	Good	Fair	Needs Repair	

**SITE INSPECTION FORM
FORMER BUFFALO CHINA SITE
BUFFALO, NEW YORK
NYSDEC SITE NO. C915209**

INSPECTION DATE: _____

INSPECTED BY: _____

Subslab Depressurization System

SYSTEM ADDRESS: _____

Does the Owner or Resident have any questions, concerns, or observations about the system to report? **Yes** _____ **No** _____

If yes, please document concerns and how addressed: _____

Have changes been made to the HVAC/Heating system? **Yes** _____ **No** _____

If yes, please describe and document effects in subslab depressurization system: _____

Have any air intakes been located near the exhaust? **Yes** _____ **No** _____

If yes, please describe: _____

Visual Inspection of System

<i>System Component</i>	<i>Condition (circle one)</i>			<i>Comments/Reading</i>
Vent fan	Good	Fair	Needs Repair	
Piping	Good	Fair	Needs Repair	
Manometer (take reading)	Good	Fair	Needs Repair	
Labeling	Good	Fair	Needs Repair	
Sump crock cover	Good	Fair	Needs Repair	
Electrical system	Good	Fair	Needs Repair	

Potential Problems

Concern

Corrective Action

Cracks

- Reduced vacuum under slab
- Repair and seal any cracks in the concrete floor, lexan cover
- Potential for vapor intrusion or piping.
- Safety hazard

**SITE INSPECTION FORM
FORMER BUFFALO CHINA SITE
BUFFALO, NEW YORK
NYSDEC SITE NO. C915209**

INSPECTION DATE: _____

INSPECTED BY: _____

Subslab Depressurization Sysytem (cont.)

Air intake near exhaust • Potential for vapor intrusior • Contact owner of air intake
by exhaust entering air • Move or remove intake or exhaust
intakes
• Safety hazard

Obstructions/Debris • Potential for vapor intrusior • Remove obstructions as soon as possible
by exhaust backing up into
residence
• Safety hazard

Fan not operating • Potential for vapor intrusior • Check for power to fan
• Repair or replace fan as necessary

Field Extension Testing

Perform field extension test and document measured vaccum:

Measurement Equipment ID number: _____

Measured Vacuum: _____

APPENDIX F

SITE-SPECIFIC QUALITY ASSURANCE PROJECT PLAN (QAPP)

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1.0 INTRODUCTION

This Quality Assurance Project Plan (QAPP) is Site-specific and has been prepared for the Remedial Action Work Plan for the Former Buffalo China property, 51 Hayes Place, Buffalo, New York (Site).

The objectives of this QAPP are to provide data and documentation confirmation that the cleanup criteria for the Site are being met and that the selected remedy is effective in meeting the remedial actions objectives (RAOs). This QAPP provides comprehensive information regarding the project personnel responsibilities, and sets forth specific procedures to be used during sampling of relevant environmental matrices and analyses of data.

2.0 PROJECT BACKGROUND

2.1 GENERAL

This QAPP provides quality assurance/quality control (QA/QC) criteria for work efforts associated with soil and groundwater analyses. Methods for sample analyses have been selected to provide results, which characterize the samples, such that the sampling objectives can be met.

3.0 **PROJECT ORGANIZATION AND RESPONSIBILITY**

A brief description of the duties of the key project personnel is presented below.

Project Director

- i) provides overall project management;
- ii) ensures professional services by the Contractor are cost effective and of highest quality;
- iii) ensures all resources of the Contractor are available on an as-required basis;
- iv) participates in key technical negotiations; and
- v) provides managerial and technical guidance to the Contractor's Coordinator.

Project Manager

- i) provides day-to-day project management;
- ii) provides managerial guidance to the QA/QC Officer - Sampling and Analytical Activities;
- iii) prepares and reviews reports;
- iv) conducts preliminary chemical data interpretation and assessment; and
- v) responsible for overall project completion in accordance with the approved design.

QA/QC Officer - Sampling and Analytical Activities

- i) oversees and reviews laboratory activities;
- ii) determines laboratory data corrective action;
- iii) performs analytical data validation and assessment;
- iv) reviews laboratory QA/QC;
- v) assists in preparation and review of final report;
- vi) provides technical representation for analytical activities;
- vii) oversees and reviews field activities;
- viii) provides managerial and technical guidance to the Field Sampling Supervisor;
- ix) performs field sampling performance audit(s);
- x) ensures that field and Chain of Custody records are properly maintained; and
- xi) determines field procedure corrective actions.

Field Sampling Supervisor

- i) provides immediate supervision of all on-Site activities;
- ii) provides field management of sample collection and field QA/QC;
- iii) provides technical representation for field activities; and
- iv) is responsible for maintenance of the field equipment.

Laboratory - Project Manager, Analytical Contractor

- i) ensures resources of laboratory are available on an as-required basis;
- ii) coordinates laboratory analyses;
- iii) supervises laboratory's in-house Chain of Custody;
- iv) schedules analyses of samples;
- v) oversees review of data;
- vi) oversees preparation of analytical reports; and
- vii) approves final analytical reports.

Laboratory - Quality Assurance/Quality Control Officer, Analytical Contractor

- i) overviews laboratory QA/QC;
- ii) overviews QA/QC documentation;
- iii) conducts detailed data review;
- iv) decides laboratory corrective actions, if required; and
- v) provides technical representation for laboratory QA/QC procedures.

Laboratory - Sample Custodian - Analytical Contractor

- i) receives and inspects the sample containers;
- ii) records the condition of the sample containers;
- iii) signs appropriate documents;
- iv) verifies Chain of Custody and their correctness;
- v) notifies laboratory Project Manager and laboratory QA/QC Officer of sample receipt and inspection;
- vi) assigns a unique laboratory identification number correlated to the field sample identification number, and enters each into the sample receiving log;
- vii) initiates transfer of samples to the appropriate lab sections with assistance from the laboratory project manager; and

viii) controls and monitors access to and storage of samples and extracts.

The analytical laboratory selected to perform the environmental analyses will be a full-service chemical analytical laboratory certified by the New York State Department of Health (NYSDOH) through the National Environmental Laboratory Approval Program (NELAP). The treatability analyses will be performed at the CRA Treatability Laboratory located in Niagara Falls, New York.

4.0 PROJECT OBJECTIVES

4.1 QUALITY ASSURANCE OBJECTIVES FOR MEASUREMENT DATA

The overall QA objective is to develop and implement procedures for sample collection and analyses which will provide data with an acceptable level of accuracy and precision.

Quality assurance measures for this project will begin with sample containers. Sample containers will be purchased from a certified manufacturer and will be precleaned (I-Chem Series 200 or equivalent).

4.2 LABORATORY QUALITY ASSURANCE

The following subsections define the QA goals required to meet the Data Quality Objectives (DQOs) of the project.

4.2.1 ACCURACY, PRECISION, AND SENSITIVITY OF ANALYSES

The fundamental QA objective with respect to the accuracy, precision, and sensitivity of analytical data is to meet the QC acceptance criteria of each analytical protocol. Analytical methods and targeted detection limits listed have been specified to meet DQOs.

Summaries of the targeted detection limits are provided in Tables 4.1, 4.2 and 4.3. It should be noted that these limits are targeted detection limits only; limits are highly matrix dependent and may not always be achieved.

The method accuracy (percent recovery) will be determined by spiking selected samples (matrix spikes) with the method recommended spiking compounds. Accuracy will be reported as the percent recovery of the spiking compound(s) and will compare with the criteria given in the appropriate methods, as identified in Section 7.0.

The method(s) precision (reproducibility between duplicate analyses) will be determined based on the duplicate analysis of matrix spike samples for organic parameters and duplicate sample analyses for inorganic parameters. Precision will be

reported as Relative Percent Differences (RPDs) between duplicate analyses; acceptance criteria will be as specified in the appropriate methods identified in Section 7.0.

4.2.2 COMPLETENESS, REPRESENTATIVENESS AND COMPARABILITY

A completeness requirement of 90 percent will be targeted for the program (see Section 13.1.3 for definition of completeness).

The quantity of samples to be collected has been estimated in an effort to effectively represent the population being studied.

4.3 FIELD MEASUREMENT QUALITY ASSURANCE

Measurement data will be generated during field activities. These activities include, but are not limited to, the following:

- i) documenting time and weather conditions; and
- iii) observation of sample appearance and other conditions.

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

Sampling activities will be conducted in accordance with CRA's standard operating procedures. The sample container, preservation, and holding time requirements are identified in Table 5.1.

6.0 SAMPLE CUSTODY AND DOCUMENT CONTROL

The following documentation procedures will be used during sampling and analysis to provide Chain of Custody control during transfer of samples from collection through storage. Record keeping documentation will include use of the following:

- i) field log books (bound with numbered pages) to document sampling activities in the field;
- ii) labels to identify individual samples;
- iii) Chain of Custody record sheet to document analyses to be performed; and
- iv) laboratory sample custody log book.

6.1 FIELD LOG BOOK

In the field, the sampler will record the following information in the field log book (bound) for each sample collected:

- i) project number;
- ii) sample matrix;
- iii) name of sampler;
- iv) sample source;
- v) time and date;
- vi) pertinent data (e.g., depth);
- vii) analysis to be conducted;
- viii) sampling method;
- ix) appearance of each sample (i.e., color, evidence of soil staining);
- x) preservation added, if any;
- xi) number of sample bottles collected; and
- xii) pertinent weather data.

Each field log book page will be signed by the sampler.

6.2 SAMPLE NUMBERING

A sample numbering system will be used that assigns a unique number to each sample. This system will provide a tracking number to allow retrieval and cross-referencing of sample information. The sample numbering system to be used is described as follows:

Example:	SO-12345-092610 - AA-XXX
Where:	SO - Designates sample Type (SO = Soil, WG = Groundwater)
12345:	CRA Project Number
092610:	Date of collection (mm/dd/yy)
AA:	Sampler initials
XXX:	Unique sample number

Field duplicate and field blank samples will be numbered with unique sample numbers.

6.3 CHAIN OF CUSTODY RECORDS

Chain of Custody forms will be completed for all samples collected during the program.

The Chain of Custody form will document the transfer of sample containers. Custody seals will be placed on each cooler. The cooler will then be sealed with packing tape. Sample container labels will include sample number, place of collection and date and time of collection. All samples will be refrigerated using wet ice at 4°C (±2°C) and delivered to the analytical laboratory within 24 to 48 hours of collection. All samples will be delivered to the laboratory by commercial courier or Contractor personnel. All samples will be stored at 4°C (±2°C) at the laboratory.

The Chain of Custody record, completed at the time of sampling, will contain, but not be limited to, the sample number, date and time of sampling, and the name of the sampler. The Chain of Custody document will be signed, timed, and dated by the sampler when transferring the samples.

Each sample cooler being shipped to the laboratory will contain a Chain of Custody form. The Chain of Custody form will consist of four copies which will be distributed as follows: the shipper will maintain a copy while the other three copies will be enclosed in a waterproof envelop within the cooler with the samples. The cooler will then be affixed with a custody seal and sealed properly for shipment. The laboratory, upon

receiving the samples, will complete the three remaining copies. The laboratory will maintain one copy for their records. One copy will be returned to the QA/QC Officer-Sampling and Analytical Activities upon receipt of the samples by the laboratory. One copy will be returned with the data deliverables package.

Upon receipt of the cooler at the laboratory, the shipping cooler and the custody seal will be inspected by the Sample Custodian. The condition of the cooler and the custody seal will be noted on the Chain of Custody record sheet by the Sample Custodian. The Sample Custodian will record the temperature of one sample (or temperature blank) from each cooler and the temperature will be noted on the Chain of Custody. If the shipping cooler seal is intact, the sample containers will be accepted for analyses. The Sample Custodian will document the date and time of receipt of the container, and sign the form.

If damage or discrepancies are noticed (including sample temperature exceedances), they will be recorded in the remarks column of the record sheet, dated and signed. Any damage or discrepancies will be reported to the Laboratory Project Manager and Laboratory QA/QC Officer before samples are processed.

6.4 SAMPLE DOCUMENTATION IN THE LABORATORY

Each sample or group of samples shipped to the laboratory for analysis will be given a unique identification number. The Sample Custodian will record the client name, number of samples and date of receipt of samples in the Sample Control Log book. Samples removed from storage for analyses will be documented in the Sample Control Log book.

The laboratory will be responsible for maintaining analytical log books and laboratory data as well as a sample (on hand) inventory for submittal to the QA/QC Officer - Sampling and Analytical Activities on an "as required" basis. Raw laboratory data produced from the analysis of samples submitted for this program will be inventoried and maintained by the laboratory for a period of 5 years at which time the QA/QC Officer - Sampling and Analytical Activities will advise the laboratory regarding the need for additional storage.

6.5 STORAGE OF SAMPLES

After the Sample Custodian has completed the Chain of Custody forms and the incoming sample log, the Chain of Custody will be checked to ensure that all samples are stored in the appropriate locations. All samples will be stored within an access-controlled custody room and will be maintained at 4°C (±2°C) until all analytical work is complete.

6.6 SAMPLE DOCUMENTATION

Evidentiary files for the entire project shall be inventoried and maintained by the QA/QC Officer - Sampling and Analytical Activities and shall consist of the following:

- i) project related plans;
- ii) project log books;
- iii) field data records;
- iv) sample identification documents;
- v) Chain of Custody records;
- vi) report notes, calculations, etc.;
- vii) lab data, etc.;
- viii) references, copies of pertinent literature;
- ix) miscellaneous - photos, maps, drawings, etc.; and
- x) copies of all final reports pertaining to the project.

The evidentiary file materials shall be the responsibility of the Project Manager with respect to maintenance and document removal.

7.0 ANALYTICAL PROCEDURES FOR CHEMICAL ANALYSES

Samples collected for laboratory chemical analyses will be analyzed for the parameters listed in Tables 4.1, 4.2 and 4.3, using the methods cited in Table 4.4. These methods have been selected to meet the DQOs for each sampling activity. The data package should include all items listed in Table 9.1.

Internal standards or isotopic dilution will be employed for analyte quantitation as detailed in the appropriate analytical methods.

8.0 CALIBRATION PROCEDURES AND FREQUENCY

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.

A bound notebook will be kept with each instrument requiring calibration in which will be recorded activities associated with QA monitoring and repairs program. These records will be checked during periodic equipment review and internal and external QA/QC audits.

8.1 GAS CHROMATOGRAPHY/MASS SPECTROMETRY (GC/MS)

It is necessary to establish that a given GC/MS meets the standard mass spectral abundance criteria prior to initiating any ongoing data collection. This is accomplished through the analyses of tuning compounds as specified in the analytical methods.

Calibration of the GC/MS system will be performed daily at the beginning of the day or with each 12 hours of instrument operating time. All method-specified calibration criteria must be met prior to sample analyses. All calibrations must be performed using either average response factors or first-order linear regression (with a correlation coefficient requirement of ≥ 0.995).

9.0 DATA REDUCTION, VALIDATION ASSESSMENT AND REPORTING

9.1 GENERAL

The contract laboratory will perform analytical data reduction and validation in-house under the direction of the Laboratory QA/QC Officer. The Laboratory QA/QC 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 relevant methods, which would caution the data user of possible unreliability. Data reduction, validation and reporting by the laboratory will be conducted as detailed in the following:

- i) raw data produced and checked by the responsible analysts is turned over for independent review by another analyst;
- ii) the area supervisor reviews the data for attainment of quality control criteria presented in the referenced analytical methods;
- iii) upon completion of all reviews and acceptance of the raw data by the laboratory operations manager, a computerized report will be generated and sent to the Laboratory QA/QC Officer;
- iv) the Laboratory QA/QC Officer will complete a thorough inspection of all reports;
- v) the Laboratory QA/QC Officer and area supervisor will decide whether any sample reanalysis is required; and
- vi) upon acceptance of the preliminary reports by the Laboratory QA/QC Officer, final reports will be generated and signed by the Laboratory Project Manager.

Validation of the analytical data will be performed by the QA/QC Officer - Sampling and Analytical Activities. Assessment of analytical data will include checks on data consistency by looking for comparability of duplicate analyses, comparability to previous data from the same sampling location (if available), adherence to accuracy and precision control criteria detailed in this QAPP and anomalously high or low parameter values. The results of these data validations will be reported to the Project Manager and the contract laboratory, noting any discrepancies and their effect upon acceptability of the 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 audited for anomalously high or low values that may appear to be inconsistent with other data.

9.2 LABORATORY REPORTING, DATA, PRESENTATION AND FINAL REPORT

Reporting and deliverables should be ASP Category A and shall include, but not be limited to, all items listed in Table 9.1.

All sample data and corresponding QA/QC data as specified in the analytical methods, shall be maintained accessible either in hard copy or on magnetic tape or disk (computer data files).

The laboratory will submit one copy of the final analytical report within 14 calendar days of receipt of the final sample included in the sample delivery group (SDG) and an electronic data deliverable in EQuIS format.

9.3 DOCUMENT CONTROL SYSTEM

A document control system ensures that all documents are accounted for when the project is complete.

A project number will be assigned to the project. This number will appear on sample identification tags, log books, data sheets, control charts, project memos and analytical reports, document control logs, corrective action forms and logs, QA plans, and other project analytical records.

9.4 QC CHECK POINTS AND DATA FLOW

The following specific QC check points will be common to all metals, GC, and GC/MS analyses. They are presented with the decision points:

Chemist - bench level checks

- i) systems check: sensitivity, linearity, and reproducibility within specified limits;
- ii) duplicate analyses within control limits;

- iii) matrix spike results within control limits;
- iv) surrogate spike results within control limits (organics only); and
- v) calculation/ data reduction checks: calculations cross-checked, any discrepancies between forms and results evident, results tabulated sequentially on the correct forms.

Laboratory Project Manager

- i) systems operating within limits;
- ii) data transcription correct;
- iii) data complete; and
- iv) data acceptable.

Sample Control

- i) samples returned to sample control following analysis.

Laboratory QA/QC Officer

- i) QA objectives met;
- ii) QC checks are completed; and
- iii) final data and report package is complete.

10.0 INTERNAL QUALITY CONTROL CHECKS AND FREQUENCY

10.1 QC FOR LABORATORY ANALYSES

Specific procedures related to internal laboratory QC samples are described in the following subsections.

10.1.1 REAGENT BLANKS

A reagent blank will be analyzed by the laboratory at a frequency of one blank per analytical batch. The reagent blank, an aliquot of analyte-free water or solvent, will be carried through the entire analytical procedure.

10.1.2 MATRIX SPIKE/MATRIX SPIKE DUPLICATE (MS/MSD)/DUPLICATE ANALYSES

An MS/MSD sample will be analyzed for organic parameters (except high resolution gas chromatograph/high resolution mass spectrometer [HRGC/HRMS]) and a duplicate and matrix spike will be analyzed for inorganic parameters at a minimum frequency of one per analytical batch. Acceptable criteria and analytes that will be used for matrix spikes are identified in the methods. Where method specified limits were not available, general control limits should be used. Percent spike recoveries will be used to evaluate analytical accuracy while percent relative standard deviation or the RPD between duplicate analyses will be used to assess analytical precision.

10.1.3 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 to monitor the effect of the matrix on the accuracy of the analysis. Every blank, standard and environmental sample analyzed by GC or GC/MS, including MS/MSD samples, will be spiked with surrogate compounds prior to sample preparation.

The compounds that will be used as surrogates and the levels of recommended spiking are specified in the methods. Surrogate spike recoveries must fall within the control limits specified in the methods. If surrogate recoveries are excessively low

(<10 percent), the laboratory will contact the QA/QC Officer - Sampling and Analytical Activities for further instructions. Dilution of samples to bring the analyte concentration into the linear range of calibration may dilute the surrogates out of the quantification limit. Reanalysis of these samples is not required. Assessment of analytical quality in these cases will be based on the MS/MSD sample analysis results.

10.2 QC FOR FIELD SAMPLING

To assess the quality of data resulting from the field sampling program, field duplicate and field blank samples will be collected (where appropriate) and submitted to the analytical laboratory as samples.

10.2.1 FIELD (RINSE) BLANKS

Field blanks will be used during the sampling programs to detect contamination introduced through sample collection procedures and equipment, external field conditions, sample transport, sample container preparation, sample storage, and/or the analytical process.

10.2.2 FIELD DUPLICATE SAMPLES

Field duplicate samples will be collected and used to assess the aggregate precision of sampling techniques and laboratory analysis. For every 20 investigative samples, a field duplicate sample will be collected using standard sampling procedures. This duplicate will be packed and shipped to the laboratory for analysis.

11.0 PERFORMANCE AND SYSTEM AUDITS

For the purpose of external evaluation, performance evaluation check samples are analyzed periodically by the laboratory. Internally, the evaluation of data from these samples is done on a continuing basis over the duration of a given project.

The QA/QC Officer - Sampling and Analytical Activities may carry out performance and/or systems audits to insure that data of known and defensible quality are consistently produced during this program.

Systems audits are qualitative evaluations of all components of field and laboratory quality control measurement systems. They determine if the measurement systems are being used appropriately. The audits may be carried out before all systems are operational, during the program, or after completion of the program. Such audits typically involve a comparison of the activities given in the QA/QC Plan described herein, with activities actually scheduled or performed. A special type of systems audit is the data management audit. This audit addresses only data collection and management activities.

The performance audit is a quantitative evaluation of the measurement systems used for a monitoring program. It requires testing the measurement systems with samples of known composition or behavior to quantitatively evaluate precision and accuracy. A performance audit may be carried out by or under the auspices of the QA/QC Officer - Sampling and Analytical Activities without the knowledge of the analyst during each sampling event for this program.

It should be noted, however, that any additional external QA audits will only be performed if deemed necessary.

12.0 PREVENTATIVE MAINTENANCE

This section applies to both field and laboratory equipment. Specific preventive maintenance procedures for field equipment will be consistent with the manufacturer's guidelines. Specific preventive maintenance protocols for laboratory equipment will be consistent with the contract laboratory's standard operating procedures.

All analytical instruments to be used in this project will be serviced by laboratory personnel at regularly scheduled intervals in accordance with the manufacturers' recommendations. Instruments may also be serviced at other times due to failure. Requisite servicing beyond the abilities of laboratory personnel will be performed by the equipment manufacturer or their designated representative.

Routine maintenance of the instruments will be performed as per manufacturers' recommendations. The Laboratory Project Manager is responsible for the preventive maintenance of the instruments.

13.0 SPECIFIC ROUTINE PROCEDURES USES TO ASSESS DATA PRECISION, ACCURACY AND COMPLETENESS

13.1 QA MEASUREMENT QUALITY INDICATORS

13.1.1 PRECISION

Precision will be assessed by comparing the analytical results between duplicate spike analyses. Precision as percent relative difference will be calculated as follows for values significantly greater than the associated detection limit:

$$\text{Precision} = \left| \frac{(D_2 - D_1)}{(D_1 + D_2)/2} \right| \times 100$$

D₁ = matrix spike recovery

D₂ = matrix spike duplicate spike recovery

For results near the associated detection limits, precision will be assessed based on the following criteria:

$$\text{Precision} = \left| \text{Original result} - \text{duplicate result} \right| < \text{CRDL}^1$$

13.1.2 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 check sample 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

¹ Contract Required Detection Limit (CRDL).

In some cases, MS and/or MSD recoveries may not be available due to elevated levels of the spiked analyte in the investigative sample. In such cases, accuracy will be assessed based on surrogate spike recoveries and/or laboratory control samples.

13.1.3 COMPLETENESS

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:

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

13.1.4 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 assessed and documented.

14.0 CORRECTIVE ACTION

The need for corrective action may be identified by system or performance audits or by standard QC procedures. The essential steps in the corrective actions system will be:

- i) checking the predetermined limits for data acceptability beyond which corrective action is required;
- ii) identifying and defining problems;
- iii) assigning responsibility for investigating the problem;
- iv) investigating and determining the cause of the problem;
- v) determination of a corrective action to eliminate the problem (this may include reanalysis or resampling and analyses);
- vi) assigning and accepting responsibility for implementing the corrective action;
- vii) implementing the corrective action and evaluating the effectiveness;
- viii) verifying that the corrective action has eliminated the problem; and
- ix) documenting the corrective action taken.

For each measurement system, the laboratory QA/QC Officer will be responsible for initiating the corrective action and the Laboratory Project Manager will be responsible for implementing the corrective action.

15.0 QUALITY ASSURANCE REPORTS

Final reports will contain a discussion on QA/QC summarizing the quality of the data collected and/or used as appropriate for each phase of the project. The Project Manager who has responsibility for these summaries, will rely on written reports/memoranda documenting the data assessment activities, performance and systems audits and footnotes identifying qualifications to the data, if any.

Each summary of sampling activities will include a tabulation of the data including:

- i) field blank and field duplicate sample results;
- ii) maps showing well locations; and
- iii) an explanation of any sampling conditions or quality assurance problems and their effect on data quality.

QA reports will be prepared by the QA/QC Officer - Sampling and Analytical Activities following receipt of all analytical data. These reports will include discussions of the following and their effects on the quality of the data reported:

- i) sample holding times,
- ii) laboratory/reagent blank data
- iii) surrogate spike, matrix spike and matrix spike duplicate data;
- iv) field QA/QC data;
- v) pertinent instrument performance per method protocols; and
- vi) audit results (if performed).

In addition, the QA reports will summarize all QA problems, and give a general assessment of QA results versus control criteria for such parameters as accuracy, precision, etc.

The QA reports will be forwarded to the Project Manager.

TABLE 4.1
TARGET QUANTITATION LIMITS - WATER SAMPLES
QUALITY ASSURANCE PROJECT PLAN
FORMER BUFFALO CHINA SITE
BUFFALO, NEW YORK

	<i>CAS Number</i>	<i>Quantitation Limits</i>
<i>Volatiles (ug/L)</i>		
1,1,2,2-Tetrachloroethane	79-34-5	10
1,1,2-Trichloroethane	79-00-5	10
1,1-Dichloroethane	75-34-3	10
1,1-Dichloroethylene	75-35-4	10
1,2-Dibromo-3-chloropropane	96-12-8	10
1,2-Dibromoethane	106-93-4	10
1,2-Dichloroethane	107-06-2	10
1,2-Dichloropropane	78-87-5	10
Bromodichloromethane	75-27-4	10
Bromoform	75-25-2	10
Carbon tetrachloride	56-23-5	10
Chlorobenzene	108-90-7	10
Chloroethane	75-00-3	10
Chloroform	67-66-3	10
cis-1,3-Dichloropropene	10061-01-5	10
Dibromochloromethane	124-48-1	10
Dichlorodifluoromethane	75-71-8	10
m-Dichlorobenzene	541-73-1	10
Bromomethane	74-83-9	10
Chloromethane	74-87-3	10
Methylene chloride	75-09-2	10
o-Dichlorobenzene	95-50-1	10
p-Dichlorobenzene	106-46-7	10
Tetrachloroethylene	127-18-4	10
trans-1,2-Dichloroethylene	156-60-5	10
trans-1,3-Dichloropropene	10061-02-6	10
Trichloroethylene	79-01-6	10
Trichlorofluoromethane	75-69-4	10
Vinyl chloride	75-01-4	10
4-Methyl-2-pentanone	108-10-1	10
2-Butanone	78-93-3	10
Benzene	71-43-2	10
Ethylbenzene	100-41-4	10
Styrene	100-42-5	10
Toluene	108-88-3	10
Xylene(total)	1330-20-7	10
1,1,1-Trichloroethane	71-55-6	10
2-Hexanone	591-78-6	10
Acetone	67-64-1	10
Carbon disulfide	75-15-0	10
1,1,2-Trichloro-1,2,2-trifluoroethane	76-13-1	10
Methyl Acetate	79-20-9	10
Methyl tert-Butyl Ether	1634-04-4	10
cis-1,2-Dichloroethene	156-59-2	10
Cyclohexane	110-82-7	10
Methylcyclohexane	108-87-2	10
Isopropylbenzene	98-82-8	10
1,2-Trichlorobenzene	120-82-1	10

TABLE 4.1
 TARGET QUANTITATION LIMITS - WATER SAMPLES
 QUALITY ASSURANCE PROJECT PLAN
 FORMER BUFFALO CHINA SITE
 BUFFALO, NEW YORK

	CAS Number	Quantitation Limits
<i>Semi-Volatiles (ug/L)</i>		
2,4,6-Trichlorophenol	88-06-2	10
2,4-Dichlorophenol	120-83-2	10
2,4-Dimethylphenol	105-67-9	10
2,4-Dinitrophenol	51-28-5	25
2-Chlorophenol	95-57-8	10
4,6-Dinitro-o-cresol	534-52-1	25
o-Nitrophenol	88-75-5	10
p-Chloro-m-cresol	59-50-7	10
Pentachlorophenol	87-86-5	25
Phenol	108-95-2	10
p-Nitrophenol	100-02-7	25
Bis(2-ethylhexyl) phthalate	117-81-7	10
Butyl benzyl phthalate	85-68-7	10
Diethyl phthalate	84-66-2	10
Dimethyl phthalate	131-11-3	10
Di-n-butyl phthalate	84-74-2	10
Di-n-octyl phthalate	117-84-0	10
2,4-Dinitrotoluene	121-14-2	10
2,6-Dinitrotoluene	606-20-2	10
Isophorone	78-59-1	10
Nitrobenzene	98-95-3	10
Acenaphthene	83-32-9	10
Acenaphthylene	208-96-8	10
Anthracene	120-12-7	10
Benzo[a]anthracene	56-55-3	10
Benzo[a]pyrene	50-32-8	10
Benzo[b]fluoranthene	205-99-2	10
Benzo[ghi]perylene	191-24-2	10
Benzo[k]fluoranthene	207-08-9	10
Chrysene	218-01-9	10
Dibenz[a,h]anthracene	53-70-3	10
Fluoranthene	206-44-0	10
Fluorene	86-73-7	10
Indeno(1,2,3 cd)pyrene	193-39-5	10
Naphthalene	91-20-3	10
Phenanthrene	85-01-8	10
Pyrene	129-00-0	10
2-Chloronaphthalene	91-58-7	10
Hexachlorobenzene	118-74-1	10
Hexachlorobutadiene	87-68-3	10
Hexachlorocyclopentadiene	77-47-4	10
Hexachloroethane	67-72-1	10
2,4,5-Trichlorophenol	95-95-4	25
2-Methylnaphthalene	91-57-6	10
3,3'-Dichlorobenzidine	91-94-1	10
4-Chlorophenyl phenyl ether	7005-72-3	10
Bis(2-chloroethoxy)methane	111-91-1	10
Bis(2-chloroethyl)ether	111-44-4	10
Dibenzofuran	132-64-9	10
m-Nitroaniline	99-09-2	25
N-Nitrosodiphenylamine	86-30-6	10

TABLE 4.1
TARGET QUANTITATION LIMITS - WATER SAMPLES
QUALITY ASSURANCE PROJECT PLAN
FORMER BUFFALO CHINA SITE
BUFFALO, NEW YORK

	<i>CAS Number</i>	<i>Quantitation Limits</i>
<i>Semi-Volatiles (ug/L) (cont)</i>		
N-Nitrosodipropylamine	621-64-7 1	10
o-Cresol	95-48-7	10
o-Nitroaniline	88-74-4	25
p-Chloroaniline	106-47-8	10
p-Cresol	106-44-5	10
p-Nitroaniline	100-01-6	25
Benzaldehyde	100-52-7	10
2,2'-oxybis(1-Chloropropane)	108-60-1	10
Acetophenone	98-86-2	10
Caprolactam	105-60-2	10
1,1'-Biphenyl	92-52-4	10
4-Bromophenyl-phenylether	101-55-3	10
Atrazine	1912-24-9	10
Carbazole	86-74-8	10
<i>TAL Metals (ug/L)</i>		
Aluminum	7429-90-5	200
Antimony	7440-36-0	60
Arsenic	7440-38-2	10
Barium	7440-39-3	200
Beryllium	7440-41-7	5.0
Cadmium	7440-43-9	5.0
Calcium	7440-70-2	5000
Chromium	7440-47-3	10
Cobalt	7440-48-4	50
Copper	7440-50-8	25
Iron	7439-89-6	100
Dissolved Lead	7439-92-1	10.0
Magnesium	7439-95-4	5000
Manganese	7439-96-5	15
Mercury	7439-97-6	0.2
Nickel	7440-02-0	40
Potassium	7440-09-7	5000
Selenium	7782-49-2	35.0
Silver	7440-22-4	10
Sodium	7440-23-5	5000
Thallium	7440-28-0	25
Vanadium	7440-62-2	50
Zinc	7440-66-6	60
<i>General Chemistry (mg/L)</i>		
Cyanide	57-12-5	0.010
Total Organic Carbon	-	10
Sulfate	18785-72-2	10
Chloride	16887-00-6	10
<i>Treatability Parameters</i>		
Total Heterotrophic Microbial Count	-	NA
Total TCE Specific Microbial Count	-	NA
Residual Persulfate	-	NA

TABLE 4.2
 TARGET QUANTITATION LIMITS - SOIL
 QUALITY ASSURANCE PROJECT PLAN
 FORMER BUFFALO CHINA SITE
 BUFFALO, NEW YORK

	CAS Number	Quantitation Limits
<i>Volatiles (ug/Kg)</i>		
1,1,2,2-Tetrachloroethane	79-34-5	10
1,1,2-Trichloroethane	79-00-5	10
1,1-Dichloroethane	75-34-3	10
1,1-Dichloroethylene	75-35-4	10
1,2-Dibromo-3-chloropropane	96-12-8	10
1,2-Dibromoethane	106-93-4	10
1,2-Dichloroethane	107-06-2	10
1,2-Dichloropropane	78-87-5	10
Bromodichloromethane	75-27-4	10
Bromoform	75-25-2	10
Carbon tetrachloride	56-23-5	10
Chlorobenzene	108-90-7	10
Chloroethane	75-00-3	10
Chloroform	67-66-3	10
cis-1,3-Dichloropropene	10061-01-5	10
Dibromochloromethane	124-48-1	10
Dichlorodifluoromethane	75-71-8	10
m-Dichlorobenzene	541-73-1	10
Bromomethane	74-83-9	10
Chloromethane	74-87-3	10
Methylene chloride	75-09-2	10
o-Dichlorobenzene	95-50-1	10
p-Dichlorobenzene	106-46-7	10
Tetrachloroethylene	127-18-4	10
trans-1,2-Dichloroethylene	156-60-5	10
trans-1,3-Dichloropropene	10061-02-6	10
Trichloroethylene	79-01-6	10
Trichlorofluoromethane	75-69-4	10
Vinyl chloride	75-01-4	10
4-Methyl-2-pentanone	108-10-1	10
2-Butanone	78-93-3	10
Benzene	71-43-2	10
Ethylbenzene	100-41-4	10
Styrene	100-42-5	10
Toluene	108-88-3	10
Xylene(total)	1330-20-7	10
1,1,1-Trichloroethane	71-55-6	10
2-Hexanone	591-78-6	10
Acetone	67-64-1	10
Carbon disulfide	75-15-0	10
1,1,2-Trichloro-1,2,2-trifluoroethane	76-13-1	10
Methyl Acetate	79-20-9	10
Methyl tert-Butyl Ether	1634-04-4	10
cis-1,2-Dichloroethene	156-59-2	10
Cyclohexane	110-82-7	10
Methylcyclohexane	108-87-2	10
Isopropylbenzene	98-82-8	10
1,2-Trichlorobenzene	120-82-1	10
<i>Metals (mg/Kg)</i>		
Lead	7439-92-1	1

TABLE 4.3
 TARGET QUANTITATION LIMITS - TCLP
 QUALITY ASSURANCE PROJECT PLAN
 FORMER BUFFALO CHINA SITE
 BUFFALO, NEW YORK

<i>TCLP Volatiles</i>	<i>Regulatory Limits</i>	<i>Units</i>
Vinyl chloride	0.2	mg/L
1,1-Dichloroethene	0.7	mg/L
Chloroform	6.0	mg/L
1,2-Dichloroethane	0.5	mg/L
2-Butanone	200	mg/L
Carbon Tetrachloride	0.5	mg/L
Trichloroethene	0.5	mg/L
Benzene	0.5	mg/L
Tetrachloroethene	0.7	mg/L
Chlorobenzene	100	mg/L
<i>TCLP Semi-Volatiles</i>		
Pyridine	5.0	mg/L
1,4-Dichlorobenzene	7.5	mg/L
2-Methylphenol	200	mg/L
3- and/or 4-Methylphenol	200	mg/L
Hexachloroethane	3.0	mg/L
Nitrobenzene	2.0	mg/L
Hexachlorobutadiene	0.5	mg/L
2,4,6-Trichlorophenol	2.0	mg/L
2,4,5-Trichlorophenol	400	mg/L
2,4-Dinitrotoluene	0.13	mg/L
Hexachlorobenzene	0.13	mg/L
Pentachlorophenol	100	mg/L
<i>TCLP Metals</i>		
Silver	5.0	mg/L
Arsenic	5.0	mg/L
Barium	100	mg/L
Cadmium	1.0	mg/L
Chromium	5.0	mg/L
Lead	5.0	mg/L
Mercury	0.2	mg/L
Selenium	1.0	mg/L
<i>RCRA Characteristics</i>		
Ignitability	<140	° F
Cyanide, Reactive (mg/L)	250	mg/Kg
Corrosivity by pH	2.0-12.5	S.U.
Sulfide, Reactive (mg/L)	500	mg/Kg
<i>Polychlorinated Biphenyls</i>		
Aroclor-1016	33	ug/Kg
Aroclor-1221	67	ug/Kg
Aroclor-1232	33	ug/Kg
Aroclor-1242	33	ug/Kg
Aroclor-1248	33	ug/Kg
Aroclor-1254	33	ug/Kg
Aroclor-1260	33	ug/Kg

TABLE 4.4
SAMPLING AND ANALYSIS SUMMARY
QUALITY ASSURANCE PROJECT PLAN
FORMER BUFFALO CHINA SITE
BUFFALO, NEW YORK

<i>Sample Matrix</i>	<i>Analytical Parameters</i>	<i>Analytical Method</i>	<i>Estimated Number of Samples</i>	<i>Field Duplicates</i>	<i>Trip Blanks</i>	<i>MS/MSD</i>
Soil						
Confirmatory for Excavations	TCL VOCs	SW-846 8260	TBD	1/20	1/day	1/20
	Lead	SW-846 6010	TBD	1/20	NA	1/20
Waste Characterization	TCLP VOCs	SW-8461311/8260	TBD	NA	NA	NA
	TCLP SVOCs	SW-846 1311/8270	TBD	NA	NA	NA
	TCLP Metals	SW-846 1311/6010/7470	TBD	NA	NA	NA
	PCBs	SW-846 8082	TBD	NA	NA	NA
	Ignitability	SW-846 1030	TBD	NA	NA	NA
	Corrosivity	SW-846 8082	TBD	NA	NA	NA
	Reactivity	SW-846 8082	TBD	NA	NA	NA
Groundwater						
Perimeter Monitoring	TCL VOCs	SW-846 8260	TBD	2	1/day	2/2
Plume Monitoring	TCL VOCs					
	TCL SVOCs	SW-846 8270	TBD	1/20	NA	1/20
	Dissolved Lead	SW-846 6010	TBD	1/20	NA	1/20
ISCO Monitoring	TCL VOCs	SW-846 8260	TBD	1/20	1/day	1/20
	Total Organic Carbon	SW-846 9060	TBD	1/20	NA	1/20
	Sulfate	EPA 300.0	TBD	1/20	NA	1/20
	Chloride	EPA 300.0	TBD	1/20	NA	1/20
	Sodium	SW-846 6010	TBD	1/20	NA	1/20
	Total Heterotrophic Microbial Count	SM 9215B	TBD	NA	NA	NA
	Total TCE Specific Microbial Count	SM 9215B	TBD	NA	NA	NA
	Residual Persulfate	Huang et al (2002)	TBD	NA	NA	NA
ISEB Monitoring	TCL VOCs					
	Total Organic Carbon					
	Ammonia-nitrogen					
	Orthophosphate-phosphorus					
	Sulfate					
	Nitrate					
	Total Iron and Manganese					
	Dissolved Iron and Manganese					
	Ethene					
	Ethane					
	Methane					
	Total Heterotrophic Microbial Count					
	Total TCE Specific Microbial Count					

Notes:

Dup	Laboratory Duplicate.
MS	Matrix Spike.
MSD	Matrix Spike Duplicate.
PCBs	Polychlorinated Biphenyls.
SVOCs	Semi-Volatile Organic Compounds.
TAL	Target Analyte List.
TCL	Target Compound List.
VOCs	Volatile Organic Compounds.

TABLE 5.1
SAMPLE CONTAINER, PRESERVATION, AND HOLDING TIME PERIODS
QUALITY ASSURANCE PROJECT PLAN
FORMER BUFFALO CHINA SITE
BUFFALO, NEW YORK

<i>Analyses</i>	<i>Sample Containers</i>	<i>Preservation</i>	<i>Maximum Holding Time</i>	<i>Notes</i>
<u>Soil*</u>				
TCL VOCs	1 - 4 oz. glass jar with Teflon-lined septum	Cool to 4°C	14 days from collection to analysis	Fill completely, little or no headspace
Lead	1 - 4 oz. glass jar with Teflon-lined septum	Cool to 4°C	180 days from collection to analysis with	Fill completely
TCLP VOCs	1 - 4 oz. glass jar with Teflon-lined septum	Cool to 4°C	14 days from collection to leaching 14 days from leaching to analysis	Fill completely
TCLP SVOCs	1 - 8 oz. glass jar with Teflon-lined septum	Cool to 4°C	14 days from collection to leaching 7 days from leaching to extraction 40 days from extraction to analysis	Fill completely
TCLP Metals	1 - 8 oz. glass jar with Teflon-lined septum	Cool to 4°C	180 days from collection to leaching (28 for 180 days from leaching to analysis (28 for Hg)	Fill completely
PCBs	1 - 8 oz. glass jar with Teflon-lined septum	Cool to 4°C	None	Fill completely
RCRA Characteristics	1 - 8 oz. glass jar with Teflon-lined septum	Cool to 4°C	ASAP	Fill completely
<u>Water</u>				
TCL VOCs	2 - 40 mL glass vial with Teflon-lined septum	HCl to pH<2, cool to 4°C	14 days from collection to analysis	Fill completely, no headspace
TCL SVOCs	1 - 1L glass jar	Cool to 4°C	14 days from collection to analysis 40 days from extraction to analysis	Fill to neck of bottle
TAL Metals	1 - 1L plastic bottle	HNO ₃ to pH<2 cool to 4°C	180 days from collection to analysis with exception of mercury which is 28 days	Fill to neck of bottle
Total Organic Carbon	2 - 40 mL glass vial with Teflon-lined septum	H ₂ SO ₄ to pH<2, cool to 4°C	28 days from collection to analysis	Fill to neck of bottle
Sulfate/Chloride	1 - 250 mL plastic bottle	cool to 4°C	28 days from collection to analysis	Fill to neck of bottle
Sodium	1 - 500 ml plastic bottle	HNO ₃ to pH<2 cool to 4°C	180 days from collection to analysis	Fill to neck of bottle

Notes:

* Non-volatile soil analyses could be collected in one sample jar at the laboratory's discretion.

PCBs Polychlorinated Biphenyls

RCRA Resource Conservation and Recovery Act

SVOCs Semi-volatile Organic Compounds

TAL Target Analyte List.

TCL Target Compound List.

TCLP Toxicity Characteristic Leaching Procedure

VOCs Volatile Organic Compounds.

TABLE 9.1
LABORATORY REPORTING DELIVERABLES - STANDARD DATA PACKAGE
QUALITY ASSURANCE PROJECT PLAN
FORMER BUFFALO CHINA SITE
BUFFALO, NEW YORK

A detailed report narrative should accompany each submission, summarizing the contents and results.

- A. Chain of Custody Documentation and Detailed Narrative ⁽¹⁾

- B. Sample Information
 - i) date collected
 - ii) date extracted or digested
 - iii) date analyzed
 - iv) analytical method and reference

- C. Field Results
 - i) samples
 - ii) laboratory duplicates ⁽²⁾
 - iii) method blanks
 - iv) spikes; spike duplicates ⁽²⁾⁽³⁾
 - v) surrogate recoveries ⁽²⁾
 - vi) internal standard recoveries
 - vii) TICs (if applicable)

- D. Miscellaneous
 - i) method detection limits and/or instrument detection limits
 - ii) percent solids (where applicable)
 - iii) metals run logs
 - iv) dates of extraction or digestion and analysis for method blanks and blank spikes

All sample data and its corresponding QA/QC data shall be maintained accessible to CRA either in hard copy or on magnetic tape or disc (computer data files). All solid sample results must be reported on a dry-weight basis.

Notes:

- ⁽¹⁾ Any QC outliers must be addressed, and corrective action taken must be specified.
- ⁽²⁾ Laboratory must specify applicable control limits for all QC sample results.
- ⁽³⁾ A blank spike must be prepared and analyzed with each sample batch.
- TICs Tentative Identified Compounds.