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129 HOLDEN STREET
BUFFALO, NEW YORK

BROWNFIELD CLEANUP PROGRAM
SITE NO. C915261
REMEDIAL INVESTIGATION/ALTERNATIVE ANALYSIS REPORT
WORK PLAN

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1.0 INTRODUCTION

1.1 PURPOSE

This Remedial Investigation/Alternative Analysis Report (RI/AAR) Work Plan has been developed by GZA GeoEnvironmental of New York (GZA), on behalf of Strickler Development Group, LLC (SDG), for RI activities to be conducted at the 27.09-acre parcel of land identified as the 129 Holden Street Brownfield Cleanup Program (BCP) Site No. C915261 located in the City of Buffalo, Erie County, New York (see Figure 1).

The work described in this RI/AAR Work Plan is being done under a New York State Department of Environmental Conservation (NYSDEC) BCP Agreement. This RI/AAR Work Plan presents the project scope, objectives, planned activities, and reporting requirements.

The purpose of this Work Plan is to describe activities planned to assess the nature and extent of on-site contamination present in soil and groundwater, and to determine the degree to which the contamination poses a threat to human health and the environment. Based on the data collected as part of the RI, an appropriate remedial strategy will be developed to meet NYSDEC restricted residential and Track 2 cleanup criteria.

1.2 PROJECT BACKGROUND

129 Holden Street (Site) is situated in a commercially-zoned area of the City of Buffalo. Surrounding adjacent areas are zoned for residential and public service use. The Site currently consists of approximately 27.09- acres of land containing five (5) vacant buildings (see Figure 2).

The Site was originally developed for industrial use as early as 1874 for the mining industry and the production of limestone and natural rock cement. The property was owned and operated by the Buffalo Cement Co. Ltd. from 1877 to 1948. During that time, extensive mining operations occurred at the Site. Historical aerial photographs show that these operations were performed within the Site boundaries and extended beyond to the north and east. Specific mining depths have not been determined for the Site, however, it is documented that 5 to 6 feet of Bertie Limestone was extensively quarried by the Buffalo Cement Co. Ltd. for the production of natural cement at their Buffalo facility.

In 1958, the Site was developed by Central Park Shopping Center, Inc. with the construction of three Site buildings for commercial purposes. Two additional commercial buildings were constructed in 1967 and 1989, respectively. Various businesses occupied the Site including auto repair, photographic processing and dry cleaning facilities. The Site has been vacant since July 2011.
In August 2011, GZA performed a Phase I Environmental Site Assessment \(^1\) (Phase I ESA) at the Site. Pertinent findings of this report regarding the subject property are as follows:

- The Site was first utilized in at least the early 1900s by Buffalo Cement as a quarry, until the mid 1950s. The Site was first developed by the Central Park Plaza in 1958 with the construction of three Site buildings (Building 1 through Building 3). An additional building was constructed on the southern portion of the Site in 1967 (Building 4) and the fifth building on the western portion of the Site in 1989 (Building 5). The Site operated as a shopping plaza from 1958 until the last of the tenants vacated the Site in July 2011.

- Historic Site tenants of concern within Building 1 include a photo mart, laundromats, an automatic car wash, a dry cleaner and a chop shop. Several oil containers with missing covers and areas of staining were observed within the chop shop. No floor drains were apparent in the immediate vicinity of the chemical storage areas; however, observations were limited due to the amount of debris within the Site building. GZA observed several cracks in the foundation within the chop shop.

- Historic Site tenants of concern within Building 2 include an auto service shop.

- The Site was listed twice on the NY Spills database. The potential exists for soil and/or groundwater contamination to have resulted from the historic Site usage.

- A maintenance person with Site responsibilities informed GZA that the current owner had been dumping fill materials in the area east of Building 2 at the Site, and was unaware of the origin of the fill materials brought on-Site.

- GZA observed suspect ACM materials during our site reconnaissance including floor tiles, ceiling tiles and pipe wrap throughout the site buildings. The interior portions of the Site buildings were littered with debris piles including garbage, drywall, ceiling tiles, floor tiles, glass, wood, pipe wrap etc. Additionally, due to the age of the buildings (1958-1989) it is possible that ACM materials are present in areas that were not readily accessible.

- GZA observed painted surfaces in the interior portions of the Site building to be in poor condition. Due to the age of the buildings (1958-1989) it is possible that painted surfaces contain detectable quantities of lead.

- GZA observed extensive areas of mold growth on floors, ceilings and walls throughout Site buildings.

Based on the information obtained as part of the assessment, it was GZAs opinion that historic

\(^1\) "Phase I Environmental Site Assessment, Central Park Plaza, 129 Holden Street, Buffalo, New York" – prepared by GZA GeoEnvironmental of New York for LP Ciminelli Construction, dated August 2011.

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Site usage (i.e., mining operations, photo processing, dry cleaning, chop shop), spill history, and surrounding area usage represented recognized environmental concerns.

In October 2011, GZA performed a Phase II Environmental Site Assessment\(^2\) (Phase II ESA) at the Site. Figure 3 shows the investigation locations. Pertinent findings of this report regarding the subject property are as follows:

- The exterior surface cover generally consisted of asphalt or exposed sub-base. The subsurface conditions consisted of granular fill soils to depths of about 2 feet bgs. The granular soil extended deeper at SP-14 (4 feet bgs), SP-17 (8 feet bgs) and SP-18 (8 feet bgs). Underlying the granular soil generally was a cohesive fill soil (silts and clays) with lesser and various amounts of sand, gravel, brick, wood and glass at depths ranging from 4 to 10 feet bgs. At probe locations SP-5 through SP-8 and SP-19, granular fill soil was encountered at depths of 4 to 8 feet extending to the bottom of the soil probes.

- The interior surface cover inside the former chop shop was concrete. Cohesive fill soils (clayey silt) with lesser and various amounts of sand, gravel and brick, were encountered to a depth of 8 feet below grade in the two northern soil probes, SP-9 and SP-10. A sand and gravel fill layer was encountered at SP-9 from about 2 to 4 feet below grade. Subsurface soils at SP-11 in the southern portion of the former chop shop were granular fill soils (gravel and sand) with lesser and various amounts of silt and clay, to a depth of 1.5 feet below grade, overlying a cohesive soil (silty clay) to about 5 feet below grade and then back to a granular fill soil (sand) with lesser and varying amounts of gravel, clay, silt and brick.

- Groundwater was not encountered at soil probe locations completed during the Phase II ESA.

- Thirteen (13) volatile organic compounds (VOCs) were detected at concentrations above method detection limits in one soil fill sample, SP-9, from 0 to 4 feet bgs. This sample was collected from inside Building 1 in the former chop shop area. Of the 13 compounds detected, the total xylene concentration exceeded its respective NYSDEC Part 375\(^3\) Unrestricted Soil Cleanup Objectives (USCOs). No VOCs were detected above method detection limits in the other five samples submitted for analytical testing.

- Semi-volatile organic compounds (SVOCs) were detected above method detection limits in five of the six fill soil samples submitted for analysis. Six (6) of the detected

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compound concentrations exceeded their respective USCOs, and five (5) exceeded their respective NYSDEC Part 375 Residential Soil Cleanup Objectives (RSCOs) at two (2) samples locations: SP-4, 2 to 6 feet bgs and SP-15, 0 to 4 feet bgs. Location SP-4 was located south of Building 1 in the area of the former photo mart and SP-15 was in an area of fill material brought to the Site.

- Polychlorinated biphenyls (PCBs) were detected above method detection limits in one (1) sample, SP-9, 0 to 4 feet bgs. The detected concentration exceeds the USCO. This sample was collected from inside Building 1 in the former chop shop area. No PCBs were detected above method detection limits in the other five (5) samples submitted for analytical testing.

- Six (6) metals were detected above method detection limits in the six (6) fill soil samples sent for analysis. Cadmium, chromium and lead exceeded their respective USCOs and the concentrations of cadmium and chromium also exceed their respective RSCOs in the sample, SP-9, 0 to 4 feet bgs. Lead was detected at a concentration above its USCO in the sample SP-10, 0 to 4 feet bgs. Both probes SP-9 and SP-10 were completed inside the former chop shop area.

The results of the Phase II ESA identified VOC, SVOC, PCBs and metals contamination in the fill soil at the Site exceeding Part 375 USCOs and RSCOs. The petroleum related VOCs detected underneath the building in the former chop shop area characteristic of a petroleum release and total xylene was detected above its USCO. A petroleum release was called into NYSDEC on October 28, 2011 and Spill No. 1109473 was assigned based on the analytical results.

On October 26, 2011, the former owner of the property, Central Park Plaza, LLC and Mr. Samuel Kurz, entered into a Consent Order and Judgment (Index No. 2011-4327) with the State of New York that resolved the public nuisance allegations asserted by the State against the former property owner related to the condition of the property and the buildings on the property. The Consent Order required the former owner to provide adequate parking lot lighting and Site security at the property; repair broken windows, exterior doors, and holes in the exterior of the building walls; cleanup site debris, trash, and broken glass, and cut overgrown weeds, underbrush and high grass.

In December 2011, SDG submitted a BCP Application to NYSDEC for the Site property. The Site was accepted into the BCP by NYSDEC in January 2012. A Brownfield Cleanup Agreement (BCA) was executed between SDG and NYSDEC in February 2012.

1.3 PROJECT DESCRIPTION

Site Redevelopment

SDG's redevelopment plan proposes to develop the Site with residential structures. The proposed "Central Park Village" will include a variety of residential units (single-units, double-
units, townhouses, and apartments) after the existing structures are razed and remedial activities are completed.

A Pre-sale Asbestos Screening Service\textsuperscript{4} was completed at the Site by Sienna Environmental Technologies Inc. in July 2011. Asbestos-contained materials (ACM) were identified throughout the Site buildings. An ACM building demolition survey will be completed followed by ACM abatement prior to completing building demolition. The building demolition will require a permit from the City of Buffalo, prior to initiating the demolition work. A copy of the permit will be provided to NYSDEC. The schedule for these activities is discussed in Section 8.0.

**BCP Remedial Investigation**

The RI activities will involve surface soil sampling and subsurface exploration for the collection and laboratory analysis of soil and groundwater samples via test pits, soil probes, and test boring/monitoring wells (see Figure 4 for approximate exploration locations). The objectives of the RI are as follows:

- Assess Site geology and hydrogeologic conditions;
- Evaluate aerial and vertical nature and extent of on-Site contamination;
- Evaluate transport mechanisms;
- Assess potential source(s) of contamination and assess impact to soil and groundwater;
- Identify potential pathways for human exposure; and
- Develop a remedial alternatives evaluation based on Site conditions.

The schedule for these activities is discussed in Section 8.0.

**1.4 PROJECT MANAGEMENT AND ORGANIZATION**

**1.4.1 Personnel**

The general responsibilities of key project personnel are listed below.

*NYSDEC Project Manager* – Jaspal S. Walia, P.E. will have the responsibility for regulatory oversight for the work associated with 129 Holden Street Site.

*Strickler Development Project Manager* – John Ciminelli will have the responsibility for implementing the project and has the authority to commit funding necessary to meet the objectives and requirements.

*LP Ciminelli Construction Project Manager* – Vince Kirsch will have the responsibility as construction manager from LPCiminelli Construction (LPC) for the work and report to

Strickler Development.

GZA Project Manager - Christopher Boron will be responsible for managing the implementation of the activities associated with the BCP remedial investigation and coordinating the collection of data during the project. The Project Manager is responsible for technical quality control and project oversight.

GZA Quality Assurance (QA) Officer – Daniel Troy P.E., will report to the GZA Project Manager and be responsible for ensuring that QA/QC procedures are being followed. The QA Officer will be responsible for overseeing the review of field and laboratory data.

GZA Field QA Officer – Thomas Bohlen will be responsible for the overall operation of the field team and reports directly to the Project Manager.

1.4.2 Specific Tasks and Services

GZA will utilize specialty subcontractors for various aspects of the RI. Subcontractors will be used for test pits, soil probes, test boring/monitoring well installations, analytical testing, data validation and surveying. The subcontractors to be utilized will be determined at a later time. NYSDEC will be notified of the various subcontractors selected before their services are used.

2.0 DESCRIPTION OF FIELD ACTIVITIES

The field activities related to the BCP RI described below are intended to accomplish the objectives of the RI.

2.1 GENERAL FIELD ACTIVITIES

General field activities include site meetings, mobilization, implementing the health and safety plan, test pits, soil probes, test boring/monitoring well installation, sampling and analytical testing, decontamination and handling of investigation wastes, and surveying.

2.1.1 Site Meeting

A Site “kick-off” meeting will be held with SDG, LPC, GZA and necessary subcontractor(s) prior to initiating field work activities. The purpose of the meeting will be to orient field team members, SDG staff and subcontractors with the Site, project personnel, Site background, scope of work, potential dangers, health and safety requirements, site-specific security and safety protocols, emergency contingencies and other field procedures. NYSDEC staff are welcome to attend and will be notified at least seven (7) days in advance of the meeting.
2.1.2 Mobilization

Following approval of the RI/AAR Work Plan by NYSDEC, the Underground Facilities Protection Organization (UFPO) will be contacted at 1-800-962-7962 to clear exploration locations. Utility clearance will require three working days by UFPO. GZA and its subcontractors will then mobilize necessary materials and equipment to the Site.

2.1.3 Health and Safety

It is anticipated that the work to be completed at the Site will be done at level D personal protection. Should health and safety monitoring during field activities warrant an upgrade to level C protection, work will stop, Site conditions will be re-evaluated prior to further investigation activities. See Section 6.0 for additional information on Health and Safety.

2.1.4 Decontamination and Handling of Investigation Derived Waste

The sampling methods and equipment selected limit both the need for decontamination and the volume of waste material to be generated. Decontamination procedures specific to each of the field activities are described in the QAPP. Personal protective equipment and disposable sampling equipment will be placed in plastic garbage bags for disposal as a solid waste.

2.1.5 Survey

Following completion of the RI investigation, a New York State licensed (NYS) land surveying firm will be subcontracted to locate the test pit, soil probe, test boring/monitoring well locations and prepare a Site base map. Elevation data (i.e., ground surface, top of well riser, and top of well casing) will also be collected.

2.2 RI FIELD INVESTIGATIONS

The RI will be completed in a phased approach consisting of test pits, spoil probes and test boring/monitoring well installations. Initially, 27 test pits will be completed (1 per acre) across the Site to assess subsurface conditions and collect analytical samples. The initial test pit samples will include a full suite of analyses for VOCs, SVOCs, PCBs, metals (including total cyanide), pesticides, and herbicides from various fill materials and native soils, if present, that are encountered. Based on the findings of the initial test pit work an assessment will be made regarding:

- the analytical testing parameters of concern to be the focus of additional investigations to be completed. If certain parameters are not found to be of concern during the initial investigation, GZA will confer with NYSDEC to consider reducing the sampling parameters for additional investigations to be completed.

- the type of investigation techniques (additional test pits or soil probes) and the number of
locations to be explored as part of the additional investigation. If the fill material encountered in the initial 27 test pits appears to be consistent across the site, the number of additional investigation locations made may be decreased. If consistent subsurface conditions are observed in portions of the Site, additional investigation locations made be adjusted.

The RI field work will be done in general compliance with NYSDEC's DER-10 “Technical Guidance for Site Investigation and Remediation”, dated June 2010.

2.2.1 Surface Soil Sampling

GZA is proposing to collect four (4) surface soil samples from four unpaved locations at the Site as shown on Figure 4. Locations to be sampled will be from areas of surficial staining, or potential surface discharge areas, if identified.

Soil samples will be collected from a depth of 0 to 2 inches bgs. Collection will be done using a pre-cleaned stainless steel spoon (the spoon will be cleaned as described in the QAPP). Vegetation will be removed from the area to be sampled. Roots, to the extent practical, will also be removed. The spoon will be used to scoop the soil into a stainless steel mixing bowl to be homogenized prior to placement into the appropriate laboratory provided containers. Sample analysis will include VOCs, SVOCs, PCBs, metals (including total cyanide), pesticides, and herbicides (see Table 1 for the proposed number of samples and analytical parameters).

2.2.2 Test Pits

GZA is proposing to complete 27 initial test pits as part of the RI at the approximate locations shown on Figure 4. Upon completion of the initial 27 test pits, an assessment will be made as to how the additional subsurface investigations will be completed (test pit, soil probes, or other means necessary). NYSDEC will be notified of the findings and the rationale for the additional investigation methods.

Test pits will be completed using a rubber tire backhoe or track excavator with an approximate 15 foot reach. Limits of the excavations will be defined by field screening, presence of groundwater, subsurface soil/fill conditions, and engineering judgment. If further depth exploration is required at a specific location, it will be completed with a soil probe or rotary drill rig.

A field engineer/geologist will observe the test pits and create a field log of the conditions observed. Real time air monitoring will be conducted while test pits are being completed using an organic vapor meter (OVM).

Soil excavated from the test pits will be placed on the ground adjacent to the test pit location. Soil samples will be collected from the excavations for classification, laboratory analysis and screening with an OVM. Soil samples will be collected at two-foot intervals to the bottom of the test pit. Samples for analytical testing will typically be collected from
contaminated soils or material that warrants analysis, based on visual, olfactory, field-screening techniques, engineering judgment and consultation with NYSDEC field representative. Excavated soil shall be returned to the test pit in the general order that it was excavated. Photographs of each excavated test pit will be taken as part of our documentation.

2.2.3 Soil Probes

GZA is proposing to complete 81 soil probes (3 per acre) at the approximate locations shown on Figure 4. Completion of the soil probes will be based on the finding of the initial 27 test pits discussed in Section 2.2.1. The soil probes will be completed to:

- delineate the contamination (VOC, SVOC, PCB, and metals) previously identified during the Phase II ESA;
- assess for the analytical testing parameters of concern identified during initial test pits, and
- assess the subsurface conditions in the remaining areas.

The soil probes will be advanced into overburden soils utilizing direct push technology via hydraulic hammer mounted on a truck or track mounted rig equipped with a 2-inch outer diameter by 48-inch long macrocore sampler. Soil probes will be advanced to at least 16 feet below ground surface (bgs). If contamination is encountered and still present at a depth of 16 feet bgs, the probe will be advanced until contamination is no longer present, refusal, or soil probe equipment limitations, whichever occurs first. Should it be required that additional depth is needed to explore the vertical extent of potential contamination, traditional hollow-stem auger drilling methods will be used.

A field engineer/geologist will observe the soil probes and create a field log for each probe. Real time air monitoring will be conducted while soil probes are being completed using an OVM. Soil samples will be collected from the soil probes for classification, laboratory analysis, and screening with the OVM. Soil samples will be collected at two-foot intervals to the bottom of the probes. Samples collected for analytical testing will typically be collected from contaminated soils or material that warrant further analysis, based on visual, olfactory, field screening and engineering judgment. Photographs of soil conditions at the soil probe locations will be taken as part of our documentation.

2.2.4 Test Borings, Monitoring Well Installation and Sampling

GZA is proposing to complete up to six (6) test borings to install six permanent groundwater monitoring wells at the approximate locations shown on Figure 4. The monitoring wells will be used to collect groundwater samples for laboratory analysis and to conduct field hydraulic conductivity testing.
NYSDEC provided GZA with a Site Investigation Report\textsuperscript{5} from the Main-Lasalle Revitalization project in the area of the former quarry located to the northeast of the Site. It was reported that Ecology & Environment installed three (3) groundwater monitoring wells within the footprint of the former quarry. Bedrock was encountered at approximately 45 feet below ground surface (bgs) due to bedrock being removed during quarry operations. Groundwater was encountered at depths ranging from approximately 33 to 45 feet bgs. If the depth to groundwater at the Site is greater than 30 feet bgs, only three (3) test boring/monitoring wells will be installed.

Test borings for monitoring well installations will be advanced in the overburden soils using a track or truck mounted rotary drill rig using 4 ¼-inch inside diameter hollow stem augers (HSA). Overburden soil samples will be obtained by driving a 1 3/8-inch inside diameter by 24-inch long split spoon sampler 24-inches ahead of the lead cutting shoe of the HSA.

Soil samples from the test borings will be collected from the split spoon sampler which will be opened at ground surface after retrieval. Soil samples will be collected for classification, screening with an OVM and laboratory analysis, if necessary. Soil samples will be assessed in two-foot intervals to the bottom of the test boring (approximately 20 feet bgs). Samples collected for analytical testing will typically be collected from contaminated soils or material that warrant further analysis, based on visual, olfactory, field screening and engineering judgment. Photographs of soil conditions at the test borings locations will be taken as part of our documentation.

The HSAs will be advanced 5 feet into the upper groundwater zone encountered, or until refusal is encountered. Drilling fluids will not be used while advancing the HSAs in overburden, so groundwater can be identified, if encountered.

If groundwater is encountered prior to reaching bedrock, the test boring will be converted to a groundwater monitoring well. The well will be constructed of 2-inch inner diameter flush coupled PVC riser and screen. The screen will consist of an approximate 10 foot long section of machine slotted PVC. A sand filter will be placed in the boring around the annulus space of the well screen such that the sand extends a minimum of 1-foot above the top of the screen. An approximate 3-foot thick layer of bentonite will be placed above the sand filter to provide a seal from the overburden conditions above the screen. A mixture of cement/bentonite grout will extend from the bentonite seal to approximately 1 foot bgs. The monitoring well will be completed by placing a flush mounted road box over the riser. Concrete will be placed in the boring around the protective casing and sloped away from the casing.

If groundwater is not encountered prior to reaching bedrock, the bedrock will be cored until bedrock is reached, to a maximum depth of 50 feet. A 3-7/8 inch diameter rock core barrel will be used to complete the boring to the designated depth.

The rock core samples will be logged including run number, sample interval, length of sample recovered, rock quality designation (RQD), depth where drill water was lost, and a description of the rock mass and individual discontinuities (bedding planes, joints, voids, etc.). This information will be included on the boring logs. Rock core samples will be placed in wooden core boxes, photographed and labeled with the project name and number, boring number, run number, depth interval of the run and date. The rock core boxes shall be stored by GZA for 1 year.

Once groundwater is encountered, a monitoring well will be installed. The screen will consist of an approximate 10 foot long section of machine slotted PVC. A sand filter will be placed in the boring around the annulus space of the well screen such that the sand extends a minimum of 1-foot above the top of the screen. An approximate 3-foot thick layer of bentonite will be placed above the sand filter to provide a seal from the overburden conditions above the screen. A mixture of cement/bentonite grout will extend from the bentonite seal to approximately 1 foot bgs. The monitoring well will be completed by placing a flush mounted road box over the riser. Concrete will be placed in the boring around the protective casing and sloped away from the casing.

Prior to sampling new monitoring wells, they will need to be developed to remove fines that may have accumulated within the well during drilling, and to develop the sand filter. Methodologies to be used for development and groundwater sampling are discussed in Section 2.4 of the QAPP.

### 2.2.4 Fish and Wildlife Resources Impact Analysis

A fish and wildlife impact analysis will be performed of the Site (Part I assessment – see NYSDEC Draft DER-10) to identify potential or actual impacts to these resources. If no fish or wildlife resources or ecological exposure pathways are identified, then this component of the work will be considered complete. If there is a potential for fish and wildlife impacts, then a plan will be developed to implement a preliminary ecological impact assessment (Part 2).

### 2.3 ENVIRONMENTAL ANALYTICAL TESTING PROGRAM

The proposed environmental testing program is summarized in Table 1. The location for sample collection will be determined based upon subsurface conditions, the results of the field screening, and engineering judgment. The samples collected as part of this RI will be subject to analytical testing methodologies that follow NYSDEC Analytical Service Protocol (ASP) Category B deliverables and data validation. Further information regarding sampling and testing methodologies can be found in the QAPP (see Section 4.0).

### 2.4 SURVEY

A New York State licensed land surveyor will locate soil probes, monitoring wells, and test pit locations upon completion of the fieldwork. Vertical measurements will include a ground surface elevation, and top of well casing and well riser for monitoring well locations. The top of
well riser will serve as the monitoring point. Vertical measurements will be made relative to the National Geodetic Vertical Datum (NGVD). Monitoring point measurements and top of protective casing measurements will be accurate to within 0.01 foot. Horizontal measurements and ground surface elevations will be accurate to within 0.1 foot.

The base map for the Site will include pertinent Site features and the RI exploration locations.

3.0 DATA DOCUMENTATION

Field notes will be kept during the RI work, in addition to field forms used during various aspects of the project. Section 5.0 of the QAPP discussed data documentation. Photographic documentation of the RI activities will be done. Pertinent photographs will be included in the RI Report.

4.0 REPORT

4.1 REMEDIAL INVESTIGATION REPORT

The RI report will be prepared in accordance with Section 3.14 of DER-10. It will include the following:

- RI data, engineering and geologic interpretations of the data, and conclusions appropriate to the Site;
- Comparisons of Site data to Standards, Criteria and Guidelines used by NYSDEC and/or the soil cleanup levels developed for BCP;
- Nature and extent of on-Site contamination;
- Provide a qualitative human exposure assessment;
- Fish and wildlife impact analysis; and
- Recommendation on required remediation.

4.1 ALTERNATIVE ANALYSIS REPORT

The results of the RI work will be utilized to establish remedial goals and remedial action objectives. A list of potentially applicable remedial technologies will be developed and screened. Criteria used to initially evaluate how the remedy would be protective of public health and the environment are included below.

1. Overall protection of human health and the environment;
2. Compliance with applicable or relevant and appropriate SCGs and Site remediation goals;
3. Short-term effectiveness & impacts;
4. Long-term effectiveness and permanence;
5. Reduction of toxicity, mobility, or volume;
6. Implementability;
7. Cost effectiveness;
8. Community acceptance; and
9. Land use.

A remedial alternative will be selected based on the comparative analysis of the alternatives that satisfies the remedial action objectives.

5.0 QUALITY ASSURANCE/QUALITY CONTROL

The Quality Assurance Project Plan (QAPP) to be used for the Site RI activities is the “Quality Assurance Project Plan, 129 Holden Street, Buffalo, New York, Brownfield Cleanup Program, Site No. C915261” dated March 2012 (see Appendix A). The QAPP presents the sampling procedures, analytical methods and QA/QC procedures associated with the activities planned for the BCP Site. Protocols for sample collection, sample handling and storage, chain of custody procedures, and laboratory and field analyses are described or specifically referenced to related investigation documents.

6.0 HEALTH AND SAFETY PROTOCOLS

The health and safety protocols to be used for the Site RI activities are in the “Health and Safety Plan, 129 Holden Street, Buffalo, New York, Brownfield Cleanup Program, Site No. C915261” dated March 2012. The Health and Safety Plan (HASP) presents the specific health and safety protocols associated with the activities planned for the BCP Site (see Appendix B).

7.0 CITIZEN PARTICIPATION

The Citizen Participation (CP) component for the 129 Holden Street BCP Site is discussed in the “Brownfield Cleanup Program, Citizen Participation Plans, 129 Holden Street, City of Buffalo, Erie County, New York, Site Number: C915261” dated March 2012. The CP Plan outlines how members of the affected and interested public are provided with information about how NYSDEC will inform and involve them during the investigation and remediation of the Site. Information such as project contacts, document repositories, site contact lists, and CP activities are provided in the CP Plan.

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8.0 SCHEDULE

The following schedule is proposed for project and RI-related activities.

<table>
<thead>
<tr>
<th>Activity</th>
<th>Duration</th>
<th>Anticipated Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>Submit RI Work Plans:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>NYDEC Review of RI Work Plans:</td>
<td>30 days</td>
<td>April 9, 2012</td>
</tr>
<tr>
<td>Address NYSDEC Comment, if any and resubmit:</td>
<td>15 days</td>
<td>May 9, 2012</td>
</tr>
<tr>
<td>NYDEC Accepts Revised RI Work Plans:</td>
<td>15 days</td>
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NYSDEC will be notified in monthly progress reports if the proposed schedule is to be changed.
TABLES
### Table 1
Proposed Analytical Testing Program Summary
Remedial Investigation Work Plan
129 Holden Street
Buffalo, New York

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**Notes:**
1) Actual sample location to be selected based on field observation.
   MS/MSD - Matrix Spike/Matrix Spike Duplicate.
   TCL VOCs - Target Compound List Volatile Organic Compounds.
   TCL SVOCs - Target Compound List Semi-volatile Organic Compounds.
   TAL Metals - Target Analyte List Metals.
   TCL PCBs - Target Compound List Polychlorinated Biphenyls.
1. BASE MAP ADAPTED FROM A 2008 AERIAL PHOTO AND PROPERTY LINE DOWNLOADED FROM http://www.nysgis.state.ny.us/gateway/mg/index.html AND FIELD OBSERVATIONS.

2. THE SIZE AND LOCATION OF EXISTING SITE FEATURES SHOULD BE CONSIDERED APPROXIMATE.
LEGEND:

APPROMATE LOCATION AND DESIGNATION OF
SOIL PROBES COMPLETED BY TREC ENVIRONMENTAL,
INC. ON OCTOBER 11, 2011

SP-16

APPROXIMATE AREA OF FILL
BROUGHT ON-SITE

SP-17

SP-18

SP-19

APPROXIMATE
SITE LIMITS

SP-4

NOTES:

1. BASE MAP ADAPTED FROM AN AERIAL PHOTO
AND PROPERTY LINE DOWNLOADED FROM
http://www.bing.com/maps/ AND FIELD
OBSERVATIONS.

2. THE SIZE AND LOCATION OF EXISTING SITE
FEATURES SHOULD BE CONSIDERED APPROXIMATE.

1. BASE MAP ADAPTED FROM AN AERIAL PHOTO
AND PROPERTY LINE DOWNLOADED FROM
http://www.bing.com/maps/ AND FIELD
OBSERVATIONS.
1. BASE MAP ADAPTED FROM A 2008 AERIAL PHOTO AND PROPERTY LINE DOWNLOADED FROM http://www.nysgis.state.ny.us/gateway/mglindex.html AND FIELD OBSERVATIONS.

2. THE SIZE AND LOCATION OF EXISTING SITE FEATURES SHOULD BE CONSIDERED APPROXIMATE.

NOTES:

LEGEND:

- APPROXIMATE LOCATION OF PROPOSED SOIL PROBES
- APPROXIMATE LOCATION OF PROPOSED MONITORING WELLS
- APPROXIMATE LOCATION OF PROPOSED TEST PITS
- GRID SHOWN IS 1 ACRE INTERVALS
QUALITY ASSURANCE
PROJECT PLAN
129 HOLDEN STREET
BUFFALO, NEW YORK
BROWNFIELD CLEANUP PROGRAM
SITE NO. C915261

Prepared For:
New York State Department of Environmental Conservation
Region 9
Buffalo, New York

Prepared By:
GZA GeoEnvironmental of New York
Buffalo, New York

April 2012
File No: 21.0056642.0

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# QUALITY ASSURANCE PROJECT PLAN

129 HOLDEN STREET  
BUFFALO, NEW YORK  
BROWNFIELD CLEANUP PROGRAM  
SITE NO. C915261

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1.0 INTRODUCTION

1.1 PURPOSE AND OBJECTIVE

This Quality Assurance Project Plan (QAPP) has been developed by GZA GeoEnvironmental of New York (GZA) for project activities associated with the 129 Holden Street Brownfield Cleanup Program (BCP) Site No. C915261 located in Buffalo, New York (see Figure 1). This QAPP presents the project scope, objectives, organization, planned activities, sampling procedures, data quality objectives and quality assurance/quality control (QA/QC) procedures.

Protocols for sample collection, sample handling and storage, equipment decontamination, chain-of-custody procedures, etc. are described in Section 3. This QAPP was developed in general accordance with the requirements of Section 2.4 of the New York State Department of Environmental Conservation (NYSDEC) DER-10/Technical Guidance for Site Investigation and Remediation, June 18, 2010 (NYSDEC DER-10).

1.2 PROJECT BACKGROUND

The 27.09-acre Site is located at 129 Holden Street, in a commercially-zoned area of the City of Buffalo, New York (see Figure 1). Five (5) vacant buildings currently occupy the property (see Figure 2). Surrounding adjacent areas are zoned for residential and public service use. The site was originally developed for industrial use as early as 1874 for the mining industry and the production of limestone and natural rock cement.

The following environmental site assessments have been completed at the Site.

- In August 2011, GZA performed a Phase I Environmental Site Assessment (Phase I ESA) at the site. Based on the information obtained as part of the assessment, it was GZAs opinion that historic site usage (i.e., mining operations, photo processing, dry cleaning, chop shop), spill history (the site was listed twice on the NY Spills Database) and surrounding area usage represented recognized environmental concerns. In addition, during GZAs site reconnaissance, an abundance of suspect asbestos-containing materials including floor tiles, ceiling tiles and pipe wrap were observed. These suspect materials were observed throughout the Site buildings and as large piles of debris on the building floor.

- In October 2011, GZA performed a Phase II Environmental Site Assessment (Phase II ESA) at the site. The results of GZAs Phase II ESA identified volatile organic compounds (VOCs), semi-volatile organic compounds (SVOCs), polychlorinated biphenyls (PCBs) and metals contamination at the site exceeding Part 375 Unrestricted and Residential Soil Cleanup Objectives. The petroleum related VOCs detected underneath Building 1 (located at the northwestern portion of the site) in the former chop shop are characteristic of a petroleum release. Total xylene was detected above soil cleanup guidance criteria. A petroleum release was called into the New York State Department of Environmental Conservation (NYSDEC) on October 28, 2011 and Spill No. 1109473 was assigned based on April 12, 2012
on the analytical results.

The Site was accepted by NYSDEC into the BCP on January 31, 2012. The BCA requires a site-wide remedial investigation be completed.

1.3 PROJECT DESCRIPTION

This QAPP is the quality control basis for the scope of work, which is further described in the Field Activity Plan. The major tasks involved at the Site are:

- Remedial Investigation Work Plan Development;
- Remedial Investigation;
- Develop Remedial Strategy and Methods; and
- Implement Remedial Strategy.

1.4 PROJECT MANAGEMENT AND ORGANIZATION

1.4.1 Personnel

The general responsibilities of key project personnel are listed below.

_NYSDEC Project Manager_ -- Jaspal S. Walia, P.E. will have the responsibility for regulatory oversight for the work associated with 129 Holden Street Site.

_Strickler Development Project Manager_ -- John Ciminelli will have the responsibility for implementing the project and has the authority to commit funding necessary to meet the objectives and requirements.

_LP Ciminelli Construction Project Manager_ -- Vince Kirsch will have the responsibility as construction manager for the work and report to Strickler Development.

_GZA Project Manager_ - Christopher Boron will be responsible for managing the implementation of the activities associated with the BCP remedial investigation and coordinating the collection of data during the project. The Project Manager is responsible for technical quality control and project oversight.

_GZA Quality Assurance (QA) Officer_ – Daniel Troy P.E., will report to the GZA Project Manager and be responsible for ensuring that QA/QC procedures are being followed. The QA Officer will be responsible for overseeing the review of field and laboratory data.

_Field QA Officer_ – Thomas Bohlen will be responsible for the overall operation of the field team and reports directly to the Project Manager.

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Page 2
1.4.2 Specific Tasks and Services

GZA will obtain subcontractor specialists for services relating to rotary drilling and monitoring well installation, soil probes, test pit excavations, laboratory/analytical services and data validation services. The subcontractors to be utilized will be determined at a later time.

2.0 SITE INVESTIGATION PROCEDURES AND RATIONALE

The 129 Holden Street Site contains contamination in the overburden soil based on the Phase II ESA discussed in Section 1.2. The investigation fieldwork proposed by GZA is focused on obtaining a better understanding of site-specific soil and groundwater conditions. Environmental sampling and other field activities will be performed in general accordance with the NYSDEC DER-10 guidance document.

General field activities are described in the following sections and described in further detail in the Remedial Investigation Work Plan.

2.1 AIR SURVEILLANCE AND MONITORING

Air surveillance screening for total volatile organics for health and safety concerns will be performed with a portable organic vapor meter (OVM) equipped with a photoionization detector (PID) using a 10.6 electron volt (eV) bulb. Monitoring will be done during invasive activities such as monitoring well installation, soil probes, test pit excavations, well development, and groundwater sampling. An OVM will also be used to field screen samples. Additional details are presented in the Site-specific Health and Safety Plan.

2.2 SOIL SAMPLING

Soil sampling will occur during various remedial investigation activities such as soil probes, test boring/monitoring well installation, and test pit excavations. Samples will be collected and transferred to laboratory-supplied sample containers as soon as possible after being retrieved from the subsurface (i.e., splitspoon, acetate liner, excavator bucket).

The excavator, drill rig, soil probe rig, tools, augers, splitspoon and/or macrocore samplers, etc. will be decontaminated by the subcontractor prior to arrival on-Site. Should gross contamination be detected during the investigation and remediation, equipment decontamination will be accomplished using steam cleaning or high pressure wash equipment prior to the next investigation location. Sampling equipment, such as the split spoon samplers, macrocore samplers, and stainless steel sampling devices will be cleaned manually with non-phosphate detergent wash (i.e., alconox) and potable water followed by a potable water rinse followed by a deionized water rinse. Equipment will also be cleaned prior to leaving the Site.
Analytical soil samples, with the exception of those for VOCs, will be homogenized using a "coning and quartering" procedure. The soil will be removed from the sampling equipment and transferred to a clean surface (metal foil, steel pan, bowl, etc.). Observed debris, such as bricks, organics, etc. will be removed from the sample. The soil will be mixed to provide a more homogeneous sample for lab analysis. The soil will be scraped from the sides, corners, and bottom of the clean surface, rolled to the middle, and thoroughly mixed until the material appears homogeneous. An aliquot of this pile will then be transferred to the required sample containers, slightly tamped-down, filled to near the top of the container, and sealed with the appropriate cap. Soil or sediment on the threads of the container will be removed prior to placing the cap on the sample container.

Soil probe samples will be obtained by removing the acetate liner from the macrocore sampler and opening the acetate liner with a sharp knife or similar blade. Samples for VOC analysis will be collected after initial field screening is complete. If the core is not homogeneous, representative portions of each type of material within the sampler may be collected. There may also be situations where it will be appropriate to grab-sample specific zones due to textural variations, the presence of apparent staining, or "hot spot" preliminary field screening results.

Soil field screening will be completed in two ways: (1) by holding the probe of the OVM directly over the sample once it is retrieved from the subsurface and (2) by headspace screening after a representative portion of the soil sample has been placed in plastic bags allowed to warm to ambient temperature, and placing the tip of the OVM into the plastic bag. The peak response observed from the field screening method will be recorded. A response indicating below background levels will not be considered significant and will be reported as not detected. A blank will be run between test samples to check that extraneous contamination was not carried over. The OVM used will be equipped with a PID with 10.6 eV bulb. The OVM will be calibrated daily, in accordance to manufacturer's requirements using a standard gas (isobutylene).

2.3 MONITORING WELL INSTALLATION

Monitoring wells will be constructed of 2-inch inner diameter (ID) flush coupled Schedule 40, polyvinyl chloride (PVC) riser and screen. The actual installation depth of the screen will be selected based upon the intended purpose of the well (the zone to be monitored), observation of subsurface materials and headspace screening test results. The actual length of the well screen may vary depending on the conditions encountered, but will not exceed 10 feet in length.

Following determination of the monitoring zone and placement of the assembled screen and riser, the borehole will be backfilled. Generally, this will include placement of a sand filter around the well screen such that the sand extends a minimum of 1-foot above the top of the screen. A minimum 3-foot thick layer of bentonite will be placed above the sand filter and allowed to hydrate to seal off the overburden conditions above the screen. A mixture of cement/bentonite grout will be placed above the bentonite seal extending to about 1-foot below ground surface (bgs). The monitoring well will be completed by placing protective covers (i.e., flush mounted road box or stick up casings) over the riser. Concrete will be then placed in the borehole around the protective casing and sloped away from the protective casing to facilitate
drainage.

Materials used in the well installation will be clean and in like-new condition. Well materials will not be accepted if they are not observed in such condition or if their respective packaging is torn and well materials are dirty. Site personnel handling well equipment will wear clean gloves.

Newly installed monitoring wells will be developed prior to sampling to remove fines that may have accumulated within the well during drilling, and develop the sand filter. A polyethylene bailer and water quality meter will be used to develop the wells until visible fines are minimized in the observed discharge and water quality parameters (pH, temperature, specific conductivity, and turbidity) have stabilized (i.e., 10% for specific conductivity, ±0.5 units for pH, ±0.5°F for temperature, and turbidity is less than 50 nephelometric turbidity units (NTU)).

2.4 GROUNDWATER SAMPLING

Groundwater sampling of monitoring wells will include initial data recording, purging of the well, and collection of the sample. The text below addresses these items. Installation and development of monitoring wells is discussed in the previous section.

2.4.1 Initial Data Recording

Groundwater sampling will begin by recording the appropriate field data, as summarized below:

- Observations of the well (conditions of cap, collar, casing, etc.) and the ambient conditions (weather; surrounding area; date and time; sampling crew members and observers if any (see also Section 5.1 for information to be recorded in the field notebook).
- Unlocking the well cover, monitoring ambient air, upwind air, and air directly at the top of the well with an OVM.
- Collect a water level measurement, noting the reference point from which the measurement is made (typically the north side of the riser).
- Sound the bottom of the well and check the measured depth against the well log to determine if silt/sediment have accumulated. If significant sediment has accumulated (greater than 1 foot) the well will be re-developed to remove sediment prior to sampling).
- Record the standing volume of water within the monitoring well.

2.4.2 Well Purging/Evacuation

After the initial observations are recorded, the well is then purged of at least three volumes of standing water. Purging will be done using a variable speed peristaltic pump to remove water from the wells and minimize drawdown of the water column. Prior to removal of the first volume of water, and after each subsequent volume of water removed, field parameters (pH, turbidity, temperature and specific conductance) will be measured and recorded to
document the presence of representative water in the well (i.e., equilibration to steady readings), or as an indicator that conditions have not reached a steady state. Prior to sample collection, the variability of field testing results between consecutive readings should not vary by more than 10% for turbidity and specific conductance, ±0.5 units for pH, and ±0.5°F for temperature, with a minimum of three well volumes purged, and an upper limit of five volumes. The turbidity objective is less than 50 NTU; if other parameters are stable but turbidity is still greater than 50 NTU, purging will continue until 50 NTU is achieved, or five well volumes are evacuated, or the well is purged to dry-like conditions (whichever comes first).

After the water level has returned to its pre-purge level (or within a maximum of two hours, if the well has recharged sufficiently to allow sampling), samples will be collected. If the water level is slow to recharge and does not reach its pre-purge level within two hours, then samples can be collected after sufficient water has recharged.

Requirements for end-disposal of purge water are discussed in Section 2.7.

2.4.3 Groundwater Sample Collection

Low-flow sampling techniques will be used for sample collection. A peristaltic pump and new disposable high density polyethylene (HDPE) tubing will be used at each location. Tubing and sampling equipment will be clean upon arrival at the Site. Low-flow sampling will be used to minimize drawdown of the water column within the well and ensure the samples are collected from groundwater within the formation within the well.

The first sample collected will be for VOCs. Semi-volatile organics will follow along with metals and other parameters required. Three, 40-ml glass vials (with Teflon septa) will be used to collect samples for volatile organic analysis (VOA). The vials will be filled by slowing the pump to achieve a steady flow of water from the tubing into the vial until overflowing and a convex meniscus is formed. The vial will then be capped, inverted and inspected for air pockets/bubbles that may be present on the inside surfaces of the vial. If any bubbles or aggregate of bubbles are observed, then a new sample will be obtained either using a new vial or the same vial. Sample bottles are discussed in more detail in Section 3.2.

2.5 HYDRAULIC ASSESSMENT

Hydraulic assessment will include the completion of hydraulic conductivity tests and measurement of water levels in monitoring wells.

Hydraulic conductivity testing will be done using either rising or falling head methods utilizing a down-hole electronic pressure transducer. Tests will be completed using a slug to displace water within the well or by removing water from the well with a bailer and/or pump. The recovery of the initial water level will be measured with respect to time. Hydraulic conductivity data obtained will be evaluated using procedures presented in "The Bouwer and Rice Slug Test - An Update", Bouwer, H., Groundwater Journal, Vol. 27, No. 3, May-June 1989.
Water level measurements will include measuring the depth of water within the wells from a monitoring point of known elevation established at the top of the well riser. The depth to water will be measured relative to the monitoring point. The water elevations will then be calculated based on the known elevation and measured depth to water. Wells will be allowed to equilibrate a minimum of 24 hours after purging or testing prior to measuring the water levels.

2.6 EQUIPMENT DECONTAMINATION

To avoid cross contamination, sampling equipment (defined as any piece of equipment which may contact a sample) will be decontaminated according to the following procedures outlined below.

2.6.1 Non-Dedicated Reusable Equipment

Non-dedicated reusable equipment such as split spoons, stainless steel mixing bowls; pumps used for groundwater evacuation (and sampling, if applicable) etc. will require field decontamination. Acids and solvents will not be used in the field decontamination of such equipment. Decontamination typically involves scrubbing/washing with a laboratory grade detergent (e.g. alconox) to remove visible contamination, followed by potable (tap) water and analyte-free water rinses. Tap water may be used from any treated municipal water system; the use of an untreated potable water supply is not an acceptable substitute. Equipment should be allowed to dry prior to use. Steam cleaning or high pressure hot water cleaning may be used in the initial removal of gross, visible contamination. Tubing will not be re-used (new tubing will be used for each well).

2.6.2 Disposable Sampling Equipment

Disposable sampling equipment includes latex gloves, disposable bailers, and tubing which will be used one time. Such equipment will not be field-decontaminated and will be disposed of as solid waste after use.

2.6.3 Heavy Equipment

Certain heavy equipment such as excavator buckets and hollow stem augers will be used to obtain soil samples. Such equipment will be subject to high pressure hot water or steam cleaning between uses, if gross contamination is encountered and observed on the equipment. A member of the sampling team will visually inspect the equipment to check that visible contamination has been removed by this procedure prior to sampling. The drilling augers, and split spoon samplers will be cleaned between boring locations. Decontamination of the split spoon sampler between samples at a single location will be done using alconox and water to clean the samplers. Samples submitted for analysis will not include material, which has been in contact with the excavator bucket and/or drilling augers.
2.7 STORAGE AND DISPOSAL OF INVESTIGATION-DERIVED WASTE

The sampling methods and equipment have been selected to limit both the need for decontamination and the volume of waste material to be generated. Investigation-derived material (e.g., drill cuttings and purge water) generated during this project will be presumed to be non-hazardous waste and disposed at the boring or well from which the material was derived. Auger cuttings will be drummed and stored on-site for future disposal if the OVM readings are greater than 1 ppm. If less than 1 ppm, the material will be placed at ground surface at the location it was generated. If off-site disposal is required, waste characterization samples will be collected. Analysis will be based on the requirements of the disposal facility selected.

Well development and purge water will be containerized in 55-gallon drums and stored on-site until analytical results are received. If analytical results are non-detect, the drummed water will be discharged to the ground surface at the Site. If minor contaminants are present, but meet the requirements of the City of Buffalo wastewater treatment facility (COBWTF), permission will be obtained from the COBWTF and drummed water will be discharged to the sanitary sewer. If analytical results do not permit discharge to the sanitary sewer, drummed water will be sampled and characterized for proper disposal. If off-site disposal is required, waste characterization samples will be collected. Analysis will be based on the requirements of the disposal facility selected.

Personal protective equipment and disposable sampling equipment will be placed in plastic garbage bags for disposal as a non-hazardous waste.

Decontamination Fluids

Wash water and rinse water, including detergent, may be generated during Site work and will be containerized in 55-gallon drums and stored on-site. If analytical results are non-detect, the drummed water will be discharged to the ground surface at the Site. If minor contaminants are present, but meet the requirements of the COBWTF, permission will be obtained from the COBWTF and drummed water will be discharged to the sanitary sewer. If analytical results do not permit discharge to the sanitary sewer, drummed water will be sampled and characterized for proper disposal. If off-site disposal is required, waste characterization samples will be collected. Analysis will be based on the requirements of the disposal facility selected.

3.0 SAMPLE HANDLING

3.1 SAMPLE IDENTIFICATION/LABELING

Samples will be assigned a unique identification using the sample location or other sample-specific identifier. Sample identification will be limited to seven alphanumeric characters to be consistent with the limitations of the laboratory tracking/reporting software. The general sample identification format will be as follows.
Where:

\[ \text{ST-XX-Y-Y-ZZZZZZ} \]

\[ \text{ST} = \] Sample type (i.e., soil probe (SP), test pit (TP), monitoring well (MW));

\[ \text{XX} = \] Numeric character indicating the number from which the sample was obtained;

\[ \text{Y-Y} = \] Depth range of the sample; and

\[ \text{ZZZZZZ} = \] Sample date.

Example: TP-12-8-10-041212

Quality control (QC) field duplicate samples will be submitted blind to the laboratory. A fictitious sample identification will be created using the same system as the original. The sample identifications (of the original sample and its field duplicate) will be marked in the project field book and on the copy of the chain-of-custody kept by the sampler. Sample containers will be labeled in the field. Affixed to each sampling container will be a non-removable label on which the following information will be recorded with permanent water-proof ink:

- Site name and location;
- Sample identification code;
- Date and time;
- Sampler's initials;
- Preservative; and
- Requested analyses.

3.2 SAMPLES, BOTTLES, PRESERVATION, AND HOLDING TIME

Table 1 specifies the analytical method, matrix, holding time, containers, and preservatives for the various analyses to be completed. Sample bottle requirements and holding times are discussed further below.

3.2.1 Sample Bottles

The selection of sample containers used to collect samples is based on the criteria of sample matrix, analytical method, potential contaminants of concern, reactivity of container material with the sample, QA/QC requirements and regulatory protocol requirements. Sample bottles will be provided by the analytical laboratory and will conform to the requirements of USEPA's Specifications and Guidance for Contaminant-Free sample Containers.
3.2.2 Holding Times

Holding times are judged from the verified time of sample receipt (VTSR) by the laboratory; samples will be shipped from the field to arrive at the lab no later than 48 hours from the time of sample collection. Holding time requirements will be those specified in the NYSDEC ASP; it should be noted that for some analyses, these holding times are more stringent than the holding time for the corresponding USEPA method.

Although trip blanks are prepared in the analytical laboratory and shipped to the Site prior to the collection of environmental samples, for the purposes of determining holding time conformance, trip blanks will be considered to have been generated on the same day as the environmental samples with which they are shipped and delivered. Procurement of bottles and blanks will be scheduled to prevent trip blanks from being stored for excessive periods prior to their return to the laboratory; the goal is that trip blanks should be held for no longer than one week prior to use.

3.3 CHAIN OF CUSTODY AND SHIPPING

A chain-of-custody form will trace the path of sample containers from the project site to the laboratory. A sample Chain of Custody is included in Attachment 1, Field Forms. Sample/bottle tracking sheets or the chain-of-custody will be used to track the containers from the laboratory to the containers' destination. The project manager will notify the laboratory of upcoming field sampling events and the subsequent transfer of samples. This notification will include information concerning the number and type of samples, and the anticipated date of arrival. Insulated sample shipping containers (typically coolers) will be provided by the laboratory for shipping samples. All sample bottles within each shipping container will be individually labeled with an adhesive identification label provided by the laboratory. Project personnel receiving the sample containers from the laboratory will check each cooler for the condition and integrity of the bottles prior to field work.

Once the sample containers are filled, they will be immediately placed in the cooler with ice (in plastic bags to prevent leaking) or synthetic ice packs to maintain the samples at 4 °C. The field sampler will indicate the sample designation/location number in the space provided on the chain-of-custody form for each sample. The chain of custody forms will be signed and placed in a sealed plastic bag in the cooler. The completed shipping container will be closed for transport with nylon strapping, or a similar shipping tape, and a paper seal will be affixed to the lid. The seal must be broken to open the cooler and will indicate tampering if the seals are broken before receipt at the laboratory. The cooler will be shipped by an overnight delivery service to the laboratory. When the laboratory receives the coolers, the custody seals will be checked and lab personnel will sign the chain-of-custody form.
4.0 QUALITY ASSURANCE/QUALITY CONTROL PROTOCOLS

This section describes the analytical methods, principles and procedures that will be used to generate quality data. These protocols include laboratory calibration, field equipment calibration, QC sample collection and analysis, quantitative evaluation of data quality protocols and data qualification, if necessary.

4.1 ANALYTICAL METHODS, PROCEDURES & CALIBRATION

4.1.1 Methods

Analytical methods to be used during this project are presented in the NYSDEC Analytical Services Protocol (ASP), June 2005. Specific methods and references for each parameter are shown in Table 1. The sample preservation and holding time requirements are also identified in Table 1. Quantification and detections limits for all analyses are those specified under the appropriate test methods.

The laboratory will be familiar with this document, procedures and deliverables pertaining to the 129 Holden Street Site work. The laboratory selected to perform the analytical testing will be certified by the NYSDOH Environmental Laboratory Approval Program and Contract Laboratory Protocol.

4.1.2 Laboratory Instrumentation & Equipment

Laboratory instruments and equipment will be calibrated following SW-846 analytical methods protocol. Initial calibrations will be performed before samples analysis. Calibration checks will be performed at the frequencies specified in each analytical method.

4.1.3 Field Equipment

Field equipment will be used during various activities and the project and during the collection of environmental samples. Field equipment to be used includes:

- Water quality meter with a flow through cell. The water quality meter will read, at a minimum, turbidity, pH, specific conductance, and temperature.
- OVM with a PID and 10.6 eV bulb.
- Electronic water level indicator.
- Peristaltic pump.

Field equipment will be cleaned and calibrated prior to use. The Operating and Maintenance (O&M) manuals for the field equipment will be kept in the field when in use and a copy will be retained in project files.
Calibration and standardization for the field equipment during project use will be in accordance with the manufacturer's recommendations, and will be recorded in the field log book. If instrument performance or data fall outside acceptable limits, then corrective actions will be taken. These actions may include recalibration of instruments, acquiring new standards, replacing equipment or repairing equipment. Subcontractors providing analytical services are required to perform their own internal laboratory audits and calibration procedures with data review conducted at a frequency so that errors and problems are detected early, thus avoiding the prospect of redoing large segments of work.

4.2 QUALITY CONTROL SAMPLES

4.2.1 Analytical Equipment

The analytical methods to be utilized (see Table 1) for laboratory sample analysis address the quality control to be used and the frequency of replicates, blanks and calibration standards for laboratory analytical equipment.

4.2.2 Field Samples

Field quality control samples will consist of trip blanks, sample duplicates, matrix spike and matrix spike duplicates. Trip blanks, for VOC water samples only, will consist of analyte free reagent grade water in VOC sampling containers to be used for the project. Trip blanks will be prepared at the laboratory, sealed, transported to the Site and returned without being opened to assess contamination that may have occurred during transport. Trip blanks will be submitted at a rate of one per sampling event when VOCs are shipped to the laboratory.

Field duplicate samples are used to assess the variability of a matrix at a specific sampling point and to assess the reproducibility of the sampling method. For soil samples, these samples are separate aliquots of the same sample; prior to dividing the sample into "sample" and "duplicate" aliquots, the samples are homogenized (except for the VOC aliquots, which are not homogenized). Aqueous field duplicate samples are second samples collected from the same location, at the same time, in the same manner as the first, and placed into a separate container. Each duplicate sample will be analyzed for the same parameters as the original sample collected that day. The blind field duplicate Relative Percent Difference (RPD) objective will be ±50% RPD for all matrices. Field duplicates will be collected at a frequency of 1 per 20 environmental samples for both matrices (aqueous and non-aqueous) and test parameters.

Matrix spike/matrix spike duplicate (MS/MSD) samples are used to assess the laboratory method's accuracy and precision. These samples are spiked with known quantities of target analytes at the laboratory. The samples are collected at a frequency of five percent (1 in 20).
5.0 DATA DOCUMENTATION

5.1 FIELD NOTEBOOK

A project-specific field notebook will be initiated at the start of field work, in addition to field forms that will be filled out summarizing field work and become part of the project file. The field notebook will include the following daily information for Site activities:

- Date;
- Meteorological conditions (temperature, wind, precipitation);
- Site conditions (e.g., dry, damp, dusty, etc.);
- Identification of crew members (GZA and subcontractor present) and other personnel (e.g., agency or site owner) present;
- Equipment calibration information;
- Description of field activities;
- Location(s) where work is performed;
- Problems encountered and corrective actions taken;
- Records of field measurements or descriptions recorded; and
- Notice of modifications to the scope of work.

5.2 FIELD REPORTING FORMS

Field reporting forms (or their equivalent) will be utilized during the investigation and remediation. These include:

- Soil Probe and Boring Installation log;
- Monitoring Well Field Measurements Log;
- Hydraulic Conductivity Test Form; and
- Chain of Custody Form.

These forms, when completed, will become part of the project file and included in the remedial investigation report, as appropriate.

7.0 CORRECTIVE ACTIONS

If instrument performance or data fall outside acceptable limits, then corrective actions will be taken. These actions may include recalibration or standardization of instruments, acquiring new standards, replacing equipment, repairing equipment, and reanalyzing samples or redoing sections of work. Subcontractors providing analytical services are required to perform their own internal laboratory audits and calibration procedures with data review conducted at a frequency.
so that errors and problems are detected early, thus avoiding the prospect of redoing large segments of work.

Situations related to this project requiring corrective action will be documented and made part of the project file. For each measurement system identified requiring corrective action, responsible individual(s) will be identified, if necessary, for initiating the corrective action and approving the corrective action. As part of its total quality management program, GZA makes the results of laboratory audits and data validation reports available to the analytical laboratories.

8.0 DATA REDUCTION, VALIDATION, AND REPORTING

The guidance followed to perform quality data validation, and the methods and procedures outlined herein pertain to initiating and performing data validation, as well as reviewing data validation performed by others (if applicable). An outline of the data validation process is presented here, followed by a description of data validation review summaries.

8.1 LABORATORY DATA REPORTING AND REDUCTION

The laboratory will meet the applicable documentation, data reduction, and reporting protocols as specified in the 2005 revision of the NYSDEC ASP CLP. Laboratory data reports for non-CLP data will conform to NYSDEC Category B deliverable requirements. With full CLP documentation, deliverables will include the following, at a minimum:

<table>
<thead>
<tr>
<th>Organics</th>
<th>Inorganics</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chains of Custody</td>
<td>Chains of Custody</td>
</tr>
<tr>
<td>Blanks</td>
<td>Holding Times</td>
</tr>
<tr>
<td>Holding Times</td>
<td>Blanks</td>
</tr>
<tr>
<td>Internal Standards</td>
<td>Furnace AA QC</td>
</tr>
<tr>
<td>Laboratory Duplicates</td>
<td>CRDL Standards</td>
</tr>
<tr>
<td>Tentatively Identified Compounds</td>
<td>ICP Serial Dilutions</td>
</tr>
<tr>
<td>GC/MS Instrument Performance Check</td>
<td>Laboratory Control Samples</td>
</tr>
<tr>
<td>System Monitoring Compound Recovery</td>
<td>Laboratory Duplicates</td>
</tr>
<tr>
<td>Matrix Spike &amp; Matrix Spike Duplicates</td>
<td>ICP Interference Check</td>
</tr>
<tr>
<td>GC/MS Tuning</td>
<td>Spiked Sample</td>
</tr>
<tr>
<td>Surrogate Recoveries</td>
<td>Recovery</td>
</tr>
</tbody>
</table>

Copies of the laboratory's generic Quality Assurance Plan (QAP) will be on file at GZA. The laboratory's QAP will indicate the standard methods and practices for obtaining and assessing data, and how data are reduced from the analytical instruments to a finished report, indicating levels of review along the way.

In addition to the hard copy of the data report, the laboratory will be asked to provide the sample
data in spreadsheet form to minimize possible transcription errors resulting from the manual
transcription of data.

The project laboratory will provide electronic data deliverables (EDDs) in an EQuIS® format. The laboratory data will be downloaded into the EDDs directly from the laboratory information management system (LIMS). The EDDs are imported into EQuIS and the data are maintained in the database for reporting and presentation.

8.2 DATA VALIDATION AND DATA USABILITY SUMMARY REPORT

CLP data will be validated by a data validation subcontractor. Data validation will be performed in accordance with guidelines established in Appendix 2B of the NYSDEC DER-10. Where necessary and appropriate, supplemental validation criteria may be derived from the EPA Functional Guidelines (USEPA Contract Laboratory Program National Functional Guidelines for Organic Data Review, EPA-540/R-94/012, February 1993; and USEPA Contract Laboratory Program National Functional Guidelines for Inorganic Data Review, EPA-540/R-94/013, February, 1994).

Data Usability Summary Reports (DUSRs) will consist of text results of the review and marked up copies of Form I (results with qualifiers applied by the validator). Validation will consist of target and non-target compounds with corresponding method blank data, spike and surrogate recoveries, sample data, and a final note of validation decision or qualification, along with any pertinent footnote references. Qualifiers applied to the data will be documented in the report text.

There may be some analyses for which there is no established USEPA or NYSDEC data validation protocol. In such cases, validation will be based on the EPA Region II SOPs and EPA Functional Guidelines as much as possible, as well as the laboratory's adherence to the technical requirements of the method, and the professional judgment of the validator. The degree of rigor in such validation will correspond to the nature of the data and the significance of the data and its intended use. Unless otherwise requested, non-CLP data (e.g., total organic carbon) is not subject to validation.

8.3 FIELD DATA

Field chemistry data collected during air monitoring, soil screening (e.g., OVM readings), and water monitoring (i.e., pH, turbidity, specific conductance, and temperature) will be presented on field logs and provided in the appendices of the report.

9.0 PERFORMANCE AND SYSTEM AUDITS

An audit of the laboratory(s) during the BCP work will not be performed unless warranted by a problem(s) that cannot be resolved by any other means, or at the discretion of GZA or NYSDEC.
10.0 QUALITY ASSURANCE REPORTS TO MANAGEMENT

Monthly project status reporting to NYSDEC will include aspects of quality control that were pertinent during the month's activities. Problems revealed during review of the month's activities will be documented and addressed. These reports will include a description of completed and ongoing activities, and an indication how each task is progressing relative to the project schedule.

The project manager, through task managers, will be responsible for verifying that records and files related to this project are stored appropriately and are retrievable.

The laboratory will submit memoranda or correspondence related to quality control of this project's samples as part of its deliverables package.
TABLES
<table>
<thead>
<tr>
<th>Analysis</th>
<th>Method</th>
<th>Holding Time (days)</th>
<th>Containers</th>
<th>Preservative</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>To Extraction</td>
<td>To Analyze</td>
<td>Number</td>
</tr>
<tr>
<td><strong>Soil Samples</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Volatile Organic Compounds</td>
<td>SW-846 8260B</td>
<td>14</td>
<td>2</td>
<td>L</td>
</tr>
<tr>
<td>Semivolatile Organic Compounds</td>
<td>SW-846 8270C</td>
<td>14</td>
<td>40</td>
<td>2*</td>
</tr>
<tr>
<td>Metals</td>
<td>SW-846 6010B/7470A</td>
<td>180 (28 for Hg)</td>
<td>J</td>
<td>Cool</td>
</tr>
<tr>
<td>Pesticides</td>
<td>SW-846 8082</td>
<td>14</td>
<td>40</td>
<td>J</td>
</tr>
<tr>
<td>Herbicides</td>
<td>SW-846 8151</td>
<td>14</td>
<td>40</td>
<td>J</td>
</tr>
<tr>
<td><strong>Aqueous Samples</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Volatile Organic Compounds</td>
<td>SW-846 8260B</td>
<td>14</td>
<td>3</td>
<td>G</td>
</tr>
<tr>
<td>Semivolatile Organic Compounds</td>
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<td>40</td>
<td>1</td>
</tr>
<tr>
<td>Metals</td>
<td>SW-846 6010B/7470A</td>
<td>180 (28 for Hg)</td>
<td>1</td>
<td>I</td>
</tr>
<tr>
<td>Pesticides</td>
<td>SW-846 8082</td>
<td>7</td>
<td>40</td>
<td>1</td>
</tr>
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<td>Herbicides</td>
<td>SW-846 8151</td>
<td>7</td>
<td>40</td>
<td>1</td>
</tr>
</tbody>
</table>

Notes:
- Container Types:
  - G - 40 ml glass, Teflon septum cap liner, HCL
  - H - 1L glass, Teflon cap liner
  - I - 250 ml, polyethylene, Teflon cap liner
  - J - 8 oz. wide mouth glass, Teflon cap liner
  - L - 2 oz. glass widemouth with Teflon cap liner
  - M - 1 liter vacuum canister
- Preservatives
  - Cool - Cool to 4 degrees Celsius
  - HNO3 - Nitric Acid to <2 pH
  - NaOH - Sodium Hydroxide to >12 pH
  - HCl - Hydrochloric acid to pH<2
  - * - Semivolatiles, PCBs, metals pesticides, and herbicides analyses can take place from two 8 ounce glass widemouth jar with a teflon lined cap.
NOTES:

1. BASE MAP ADAPTED FROM A 2008 AERIAL PHOTO AND PROPERTY LINE DOWNLOADED FROM http://www.nygc.state.ny.us/nygcvr/index.html AND FIELD OBSERVATIONS.

2. THE SIZE AND LOCATION OF EXISTING SITE FEATURES SHOULD BE CONSIDERED APPROXIMATE.