March 9, 2018

New York State Department of Environmental Conservation
Division of Environmental Remediation – Region 7
615 Erie Boulevard West
Syracuse, New York 13204-2400
Attn: Ms. Stephanie Fitzgerald

RE: Remedial Investigation Work Plan
140 Cortland Avenue, Syracuse, New York
NYSDEC BCP Site Code: C734144
CHA Project No.: 23278/33525

Dear Ms. Fitzgerald:

On behalf of Ranalli/Taylor St., LLC, CHA Consulting, Inc. (CHA) offers the following responses based on comments received from the New York State Department of Environmental Conservation (NYSDEC) in their letter dated February 26, 2018 associated with the Remedial Investigation Work Plan (RIWP) for the above referenced site. These documents have been updated to reflect changes based upon comments from the NYSDEC. Responses to comments relative to the RIWP are provided below.

1.) ***DEC Comment:*** *An additional surface sample will be requested for the area next to the former waste water/sludge tank area (for a total of two proposed surface soil samples for the site) to be analyzed for TAL compounds (VOCs, SVOCs, metals, PCBs, and pesticides).*

    Response: The Volunteer's property lines associated with this BCP site do not align with fence lines. Please refer to Figure 3 of the Work Plan. The green space identified near the former WWTP area is associated with parcels owned by Alder Creek Properties LLC, therefore, an additional surface soil sample has not been added to the Work Plan.

2.) ***DEC Comment:*** *Two proposed sub-surface soil borings (SOIL-123 and SOIL-100 or 101) will also be analyzed for TAL compounds (in addition to soil borings already specified for full suite analysis in Table 4).*

    Response: Sub-surface soil borings SOIL-123, and SOIL-100 will be analyzed for the full suite analysis as shown in Table 4.

3.) ***DEC Comment:*** *Please include depths for historic monitoring wells (and historic soil borings) on the figures, as this information is important for defining extent, particularly* *if these results will be used to develop a site conceptual model. Also, the historic soil tables, labelled as "Detected Compounds Only", should not include locations that were not sampled (i.e. "NT" for Not Tested).*

Response: Figures 4, 5, 6, and 8 have been updated to reflect the depths for the monitoring wells and soil borings. Values that were not sampled have been removed from Table 1, where applicable.

4.) ***DEC Comment:*** *Include emerging contaminants, perfluorinated compounds (PFCs) and 1,4-dioxane, analysis at three monitoring wells, 103D, 104, and 105D.*

Response: PFAS and 1,4-dioxane have been added to GW-103D, GW-104, and GW-105D.

5.) ***DEC Comment:*** *Table 4, the text and corresponding figures should be updated to reflect the changes above.*

Response: Table 4, the text and the corresponding figures and plans have been updated to reflect the changes above.

If you have any questions, please do not hesitate to contact me at (315) 471-3920.

Sincerely,

Meghan M. Platt

Meghan M. Platt, P.E.
Senior Engineer V

ecc: Mr. Harry Warner, NYSDEC, harry.warner@dec.ny.gov
Ms. Angela Martin, NYSDOH, angela.martin@health.ny.gov
Ms. Maureen Schuck, NYSDOH, maureen.schuck@health.ny.gov
Mr. James Ranalli, Ranalli/Taylor St., LLC, jamesranalli@unitedautosupply.com
Mr. James Trasher, CHA, jtrasher@chacompanies.com

NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION

Division of Environmental Remediation, Region 7
615 Erie Boulevard West, Syracuse, NY 13204-2400
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February 26, 2018

Ranalli/Taylor St., LLC
Attn: James Ranalli
450 Tracy Street
Syracuse, NY 13204
jamesranalli@unitedautosupply.com

Re: Former Coyne Textile, Site ID No. C734144
City of Syracuse, Onondaga County
Remedial Investigation Work Plan – October 2017

Dear Mr. Ranalli:

The New York State Department of Environmental Conservation (Department) and the New York State Department of Health (NYSDOH) have reviewed the revised draft Remedial Investigation Work Plan (RIWP) for the Former Coyne Textile Site (site), dated October 2017, which was prepared by CHA Consulting, Inc. on behalf of Ranalli/Taylor St., LLC (Volunteer). The work plan is hereby approved with the modifications listed below:

- An additional surface sample will be requested for the area next to the former waste water/sludge tank area (for a total of two proposed surface soil samples for the site) to be analyzed for TAL compounds (VOCs, SVOCs, metals, PCBs, and pesticides).
- Two proposed sub-surface soil borings (SOIL-123 and SOIL-100 or 101) will also be analyzed for TAL compounds (in addition to soil borings already specified for full suite analysis in Table 4).
- Please include depths for historic monitoring wells (and historic soil borings) on the figures, as this information is important for defining extent, particularly if these results will be used to develop a site conceptual model. Also, the historic soil tables, labelled as "Detected Compounds Only", should not include locations that were not sampled (i.e. "NT" for Not Tested).
- Include emerging contaminants, perfluorinated compounds (PFCs) and 1,4-dioxane, analysis at three monitoring wells, 103D, 104, and 105D.
- Table 4, the text and corresponding figures should be updated to reflect the changes above.

Pursuant to 6 NYCRR 375-1.6(d)(3), the Volunteer must respond in writing within 15 days as to whether the modifications will be accepted. If accepted, this letter and the Volunteer's acceptance letter must be attached to the front of all copies of the work plan. The Department requires notification at least seven days in advance of field work.

If you have any questions, please do not hesitate to contact me at 315-426-7525 or stephanie.fitzgerald@dec.ny.gov.

Sincerely,

Stephanie Fitzgerald

Stephanie Fitzgerald
Project Manager

ec: Harry Warner (NYSDEC)
Stephanie Fitzgerald (NYSDEC)
Maureen Shuck (NYSDOH)
Angela Martin (NYSDOH)
James Trasher (CHA)
Meghan Platt (CHA)

REMEDIAL INVESTIGATION WORK PLAN

Former Coyne Textile Facility
BCP Site # C734144
140 Cortland Avenue
City of Syracuse, New York

CHA Project Number: 33525.1001

Prepared for:

Ranalli/Taylor St., LLC
450 Tracy Street
Syracuse, NY 13204

Prepared by:

One Park Place
300 South State Street, Suite 600
Syracuse, NY 13202
Phone: (315) 471-3920
Fax: (315) 471-3569

October 2017
Revised January 2018
Revised March 2018

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CERTIFICATION

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

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

For CHA Consulting, Inc.:

(Professional Seal)

SCOTT MICHAEL SMITH
No. 083885-1

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

Scott Smith
Signature of Certifying Engineer

03/09/18
Date of Certification

083885
NYS Professional Engineer Registration Number

CHA Consulting, Inc.
Company

Associate Vice President
Title

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LIST OF ACRONYMS & ABBREVIATIONS

AST	Aboveground Storage Tank
ASTM	American Society for Testing and Materials
BCA	Brownfield Cleanup Agreement
BCP	Brownfield Cleanup Program
BGS	Below Ground Surface
CAMP	Community Air Monitoring Program
CHA	CHA Consulting, Inc.
COC	Certificate of Completion
CPP	Citizen Participation Plan
DOH	Department of Health
DER	Division of Environmental Remediation
ELAP	Environmental Laboratory Accreditation Program
ESA	Environmental Site Assessment
FSP	Field Sampling Plan
GPR	Ground Penetrating Radar
GZA	GZA GeoEnvironmental of New York
HAS	Hollow Stem Auger
HASP	Health and Safety Plan
IDW	Investigation Derived Waste
MEK	Methyl ethyl ketone (2-Butanone)
MS/MSD	Matrix Spike/Matrix Spike Duplicate
NYCRR	New York Code, Rules and Regulations
NYSDEC	New York State Department of Environmental Conservation
NYSDOH	New York State Department of Health
PCE	Tetrachloroethylene
PID	Photoionization Detector
PFAS	Per- and Polyfluoroalkyl Substances
PPE	Personal Protection Equipment
PPM	Parts per Million
QA/QC	Quality Assurance/Quality Control
QAPP	Quality Assurance Project Plan
RAA	Remedial Alternatives Analysis
RCRA	Resource Conservation Recovery Act
REC	Recognized Environmental Condition
RI	Remedial Investigation
RIWP	Remedial Investigation Work Plan
SCO	Soil Cleanup Objective
SVOC	Semi-Volatile Organic Compound
TAL	Target Analyte List
TCE	Trichloroethene
TCLP	Toxicity Leaching Characteristic Procedure
TIC	Tentatively Identified Compound
TO-15	Toxic Organics EPA Method 15

LIST OF ACRONYMS & ABBREVIATIONS (CONTINUED)

TOGS	Technical & Operational Guidance Series
USDA	United States Department of Agriculture
USEPA	Environmental Protection Agency
UST	Underground Storage Tank
VOC	Volatile Organic Compound

1.0 INTRODUCTION

Ranalli/Taylor St., LLC (Ranalli/Taylor St.) entered into a Brownfield Cleanup Agreement (BCA) as a Volunteer, and will conduct a Remedial Investigation (RI) at the former Coyne Textile Facility (Site), located at 140 Cortland Avenue in Syracuse, New York, through the New York State Department of Environmental Conservation's (NYSDEC) Brownfield Cleanup Program (BCP). The Site location is shown in Figure 1. The purpose of the program is to encourage voluntary remediation of brownfield sites for reuse and development. This includes conducting a complete characterization of the Site. CHA Consulting, Inc. (CHA) has been retained by Ranalli/Taylor St. to conduct the RI, which will identify environmental concerns, and provide and evaluate remedial alternatives, as necessary.

CHA has prepared this Remedial Investigation Work Plan (RIWP) to be consistent with the guidance provided in the NYSDEC's Division of Environmental Remediation program policy 10 (DER-10) Technical Guidance for Site Investigation and Remediation" (May 2010). This RIWP has been prepared to outline the procedures and protocols that will be utilized to conduct a comprehensive environmental RI that will provide the necessary field data to develop a remedial alternative for the Site that will best address the environmental conditions associated with the Site. The primary objectives of the RI include the following:

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

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

To facilitate performance of the field investigation and Site characterization activities in a manner consistent with NYSDEC protocols, CHA has also prepared the following site-specific documents, which make up the RI Work Plan Documents Package:

1. Field Sampling Plan (FSP) (Appendix A);
2. Quality Assurance Project Plan (QAPP) (Appendix B)
3. Health and Safety Plan (HASP) (Appendix C); and
4. Community Air Monitoring Plan (CAMP) (Appendix D).

These documents are integral to this RIWP and are referenced throughout this report. A Citizen Participation Plan (CPP) has previously been submitted to the NYSDEC under separate cover.

2.0 SITE BACKGROUND

2.1 SITE DESCRIPTION

The Former Coyne Textile Facility is located in an urban area at 140 Cortland Avenue in the City of Syracuse, Onondaga County, New York. The Site limits are generally bounded by commercial buildings to the north, South Salina Street to the east, Tallman Street to the south and South Clinton Street to the west (Figure 2). The Site is identified as two non-contiguous areas as described below:

- The former main laundry facility and offices are known as 140 Cortland Avenue (Tax Map No. 094.-05-06.0) and consist of one parcel of land totaling approximately 1.75 acres (Figure 3). This parcel consists of the currently vacant former laundering facility and offices (approximately 118,500 square feet), sidewalks and limited vegetation. The building is a concrete block building with a slab-on-grade foundation.

- The park and employee parking area are known as 1002-1022 South Salina Street/Cortland Avenue (Tax Map No. 094.-20-01.0) and 1024-1040 South Salina Street/Tallman Street (Tax Map No. 094.-20-02.0) and consist of two parcels totaling approximately 1.70 acres (0.57 and 1.13 acres, respectively) (Figure 3). These parcels consist of a small park and a fenced in asphalt parking lot.

The Site is currently vacant and is zoned for commercial use. The general area surrounding the Site is highly developed and consists of commercial and industrial facilities. Several rows of multifamily houses are located northwest of the Site.

2.2 UTILITIES

Public utilities present at the Site include electrical service, natural gas, water and sewer.

2.3 SITE HISTORY

A Phase I Environmental Site Assessment (ESA) was prepared in 2014 by GZA GeoEnvironmental of New York (GZA) in general accordance with the American Society for Testing and Materials (ASTM) Standard Practice E 1527-13. This report has been previously provided to the NYSDEC; and is not included as part of this RIWP. According to the Phase I ESA, prior to Ranalli/Tracy St., LLC’s purchase of the property in 2016, the 140 Cortland Avenue property was owned by various entities of Coyne Textile Services since the mid-1930s and was utilized as an industrial laundry. Coyne Textile Services filed for bankruptcy and ceased operations in late 2015. Dry-cleaning activities using tetrachloroethylene (PCE) and Stoddard solvent (a petroleum mixture made from distilled alkanes, cycloalkanes (naphthenes) and aromatic compounds) were conducted at the property until 2000. These dry-cleaning products were noted to be stored in aboveground storage tanks (ASTs). Additionally, three underground storage tanks (USTs) were noted as being located beneath the dry-cleaning room floor (containing Stoddard solvent) and the boiler room at 140 Cortland Avenue. A gasoline filling station was present in the southern portion of the Site in the 1980s.

The former employee parking lot and park located east of the former laundering facility was owned by Coyne Textile Services from 1989-2016. Prior to Coyne Textile Services, previous Site uses included bus storage and repairs, the Syracuse Street Car Barn, retail stores, and a gasoline filling station (circa 1950-1970).

Based on historic use and conditions observed during the Phase I ESA, recognized environmental concerns were identified and subsequent investigation activities were completed. A complete description of the current information regarding nature and extent of contamination and previous environmental investigations is provided in Section 4.0.

Ranalli/Taylor St. entered into a BCA in September 2017.

2.4 PROPOSED SITE RE-USE

Ranalli/Taylor St. is now planning to complete the characterization of the entire three (3) parcels that make up the Site, remediate the Site as necessary, establish appropriate institutional/engineering controls (as necessary), and redevelop the Site. After the Site actions are complete and Ranalli/Taylor St. receives a Certificate of Completion (COC) from the NYSDEC, Ranalli/Taylor St. proposes to develop the Site in accordance with current City of Syracuse zoning for the Site that permits retail, commercial and light manufacturing uses (Commercial Class A). Based upon this zoning, the post remediation Site use may consist of office space, wholesale business and/or warehouses, light manufacturing accessory to a retail or wholesale establishment, and parking.

3.0 SITE SETTING

3.1 SURFACE FEATURES

The main parcel of the Site, on the west side of Cortland Avenue, primarily consists of one building surrounded by asphalt and chain link fencing. The parcels immediately to the east of Cortland Avenue are currently an asphalt parking lot and landscaped area deemed Coyne Park (Figure 2).

3.2 SITE GEOLOGY/HYDROGEOLOGY

3.2.1 Local Surficial Geology

According to the United States Department of Agriculture (USDA) Web Soil Survey, the soil beneath the Site is indicative of Urban Land, which by definition, is a soil material having a non-agricultural, manmade surface layer that has been produced by mixing, and filling, in urban and suburban areas. Surficial geology consists of lacustrine silt and clay.

3.2.2 Local Bedrock Geology

While bedrock was not encountered during the Phase I conducted by GZA, the bedrock at the Site is mapped as the Syracuse formation, which consists of dolostone, shale, gypsum and salts. Bedrock is anticipated to be present at fifty (50) feet bgs.

3.2.3 Local Hydrogeology and Groundwater Flow

The estimated depth to groundwater at the Site is estimated to be less than 20 feet below ground surface (bgs). Field activities performed by GZA identified a confining marl layer, consisting of silt and clay, between 7 and 11 feet bgs. Below the marl is glacio-lacustrine sediment mainly consisting of silt and clay to depths varying from 31 to 40 feet bgs. Both layers exhibit wet conditions. Additionally, groundwater encountered during these field activities is believed to have been perched water in a number of locations due to inconsistent findings.

Groundwater at the Site is generally assumed to flow from the east to the west toward Onondaga Creek. However, localized flow directions in the area of the Site may vary.

3.2.4 Surrounding Properties

Surrounding property uses include headquarters for Central New York Regional Transportation Authority and Centro Inc, several industrial facilities, commercial retail locations, and several religious affiliated facilities.

4.0 PREVIOUS INVESTIGATIONS AND REPORTS

4.1 Phase I Environmental Site Assessment

A Phase I ESA was prepared in 2014 by GZA in general accordance with the ASTM Standard Practice E 1527-00. The Phase I ESA identified the Site as having been used for a variety of industrial purposes between 1892 and the present. Historic uses have included mechanical manufacturing, textile manufacturing, a gasoline station, and industrial dry cleaning. Based on historic use and conditions observed during the Phase I ESA, recognized environmental conditions (RECs) were identified and subsequent investigation activities were completed. The resulting RECs are:

- USTs containing dry cleaning solvents were found under the floor of the dry-cleaning room. Use of PCE occurred until the year 2000. These tanks were said to be “closed in place” in 1986, but no closure documentation was provided.
- Former gasoline station where the building expansion (circa 1980) exists currently.
- UST for heating oil under the floor of the main boiler room.
- Evidence of potential leaks from in-ground hydraulic lifts located in the main building.
- The employee parking lot was previously owned by Syracuse Transit Corporation and used as a bus garage, repair location, and filling station until the early 1970s, thus indicating potential historic use of petroleum products.

4.2 Subsurface Investigations

A Phase II Environmental Site Assessment was conducted in November of 2014 by GZA. The soil and groundwater investigations are described below.

<u>November 2014 Phase II Subsurface Investigation</u>

This site assessment included a limited subsurface investigation to evaluate if historical site usage had impacted Site soil and/or groundwater. The following summarizes the activities and findings that occurred as part of this investigation:

- Subsurface soil samples were collected from 23 locations at depths up to 13 feet bgs. Native soils were typically encountered between 9 and 13 feet bgs.
- High photoionization detector (PID) readings of up to 1,500 parts per million (ppm) organic vapors in soil were recorded in association with borings near the Boiler Room of the main laundry facility.

- Groundwater was encountered in some of the soil borings at depths ranging from 6 to 11 feet bgs. The presence of groundwater was not consistent throughout the site, suggesting that it may be locally perched water.

- Groundwater samples were collected from two temporary monitoring wells. During the installation of TMW-2, an oil-like sheen was observed on the groundwater surface and elevated PID readings were observed. A spill was reported to NYSDEC (Spill #1408779) based upon these findings. The NYSDEC closed Spill #1408779 on March 30, 2015 and consolidated it with Spill #1412187 which occurred as part of the March 2015 Phase III Subsurface Investigation. Additional details are provided in the March 2015 Phase III Subsurface Investigation Section below.

- Soil analytical results indicated detectable concentrations of volatile organic compounds (VOCs), semi-volatile organic compounds (SVOCs) and Resource Conservation and Recovery Act (RCRA) 8 metals plus copper.

Based on the results including high PID readings, petroleum odors, black stained soil, and an oil-like sheen on groundwater samples from the Phase II ESA, GZA recommended additional soil and groundwater sampling to further define the extent of contamination at the Site. Additionally, it was suggested to pursue sampling in areas where boring was unsuccessful, particularly where floor trenches and drains are located in the chemical storage and distribution room and near the laundry machines.

March 2015 Phase III Subsurface Investigation

A report titled, Phase III Environmental Site Assessment, was prepared in 2015 by GZA to further delineate the vertical and horizontal extent of petroleum contamination near TMW-2 (associated with NYSDEC Spill #1408779), and to further evaluate the soil and groundwater conditions near the boiler room, and dry-cleaning area. It is noted that the NYSDEC closed Spill #1408779 on March 30, 2015 for administrative reasons. This spill was ultimately consolidated with Spill #1412187 which occurred as part of the March 2015 Phase III Subsurface Investigation. Spill #1412187 is reported as closed July 16, 2015.

A geophysical subsurface exploration using ground penetrating radar (GPR) was performed to identify locations that could hinder additional boring locations. An additional 23 soil borings were advanced to a maximum of 20 feet bgs, and 25 soil samples were collected to further delineate areas of contamination and evaluate areas that were previously inaccessible.

Three permanent 1-inch diameter PVC monitoring wells were installed in the vicinity of TMW-2, and four temporary 1-inch PVC monitoring wells were installed at four of the soil boring locations referenced above. Eight (8) groundwater samples were collected from these wells.

Analytical lab results identified several areas with VOC and SVOC contamination above their applicable soil and groundwater standards.

2015 Vapor Intrusion Investigation

A vapor intrusion investigation was performed in 2015 to identify the potential for soil vapors inside the building on the Site. GZA collected sub-slab vapor, indoor air, and outdoor ambient air samples as part of this assessment. A total of ten (10) indoor air, samples were collected approximately 4 to 5 feet above the floor, ten (10) sub-slab air samples were collected within ten (10) feet of the indoor air samples, and one (1) outdoor air sample was collected from an exterior upwind location. Samples were sent to the lab for analysis of for Toxic Organics, EPA Air Method 15 (TO-15).

The investigation determined that PCE and its breakdown daughter products were present in the northern portion of the Site building where the laundering activities were conducted and would require mitigation under New York State Department of Health (NYSDOH) Guidance for Evaluating Soil Vapor Intrusion, dated 2006 guidelines. Monitoring and/or source identification and exposure measures were determined to be necessary throughout the remainder of the Site building. GZA recommended the installation of a vapor mitigation system, to address the potential vapor intrusion conditions.

4.3 Sampling Data

As previously noted, numerous soil, groundwater, and vapor samples have been collected from the Site during previous environmental investigations. The samples have been analyzed for a variety of parameters including VOCs, SVOCs, and metals. The sampling data, for samples collected by GZA, has confirmed the presence of VOCs, SVOCs, and metals in the soil beneath the Site. In addition, the sampling data has confirmed the presence of VOCs, SVOCs and metals in the groundwater beneath the Site. Previous investigations have also confirmed that both, petroleum-related contaminants, and chlorinated solvents, are present beneath the Site.

A detailed summary of the results of the previous investigations is provided in the following sections.

4.3.1 Soil

As demonstrated by the previous investigations detailed above, nearly all soil samples collected from the Site, contained one or more parameters at concentrations above Title 6 New York State Codes, Rules, and Regulations (NYCRR) Part 375 Soil Cleanup Objectives (SCOs). Previous soil sample locations and detected compounds are shown on Figures 4-6 for VOCs, SVOCs, and metals, respectively. A summary of the analytical data is provided in Table 1.

The primary VOCs of concern include; 1,2,4-trimethylbenzene, 1,35-trimethylbenzene, 2-butanone (aka methyl ethyl ketone or MEK), acetone, dichlorobenzene, ethylbenzene, isopropylbenzene, m&p xylene, n-butylbenzene, n-propylbenzene, sec-butylbenzene, and chlorinated volatile organic compounds (CVOCs); cis-1,2-dichloroethene, PCE, trichloroethene (TCE), and vinyl chloride. Contamination appears to be spread throughout the Site, with the majority of PCE contamination located in the western corner near the former dry-cleaning units.

The primary SVOCs of concern are PAHs consisting of benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthrene, benzo(k)fluoranthene, dibenz(a,h) anthracene, indeno(1,2,3-cd)pyrene and chrysene, all of which were detected in many of the soil samples collected throughout the Site.

Metals were only analyzed during the Phase II investigation. Results from this investigation indicate arsenic, copper, lead, and mercury are present on the Site above the 6NYCRR Part 375 SCOs.

In summary, it is apparent that soil at the Site has been impacted by VOCs, SVOCs, and metals. Additional characterization is needed to determine the full nature and extent of the contamination, as well as to further define potential on-Site sources.

4.3.2 Soil Vapor

As described above, indoor air and sub-slab vapor samples were collected at ten (10) locations throughout the building on Site (Figure 7). TCE was detected at levels required to take reasonable and practical actions to identify source(s) and reduce exposures in four (4) locations, mitigate in three (3) locations and monitor in two (2) locations, per NYSDOH Guidance for Evaluating Soil Vapor Intrusion, dated 2006. PCE was detected at levels required to take reasonable and practical actions to identify source(s) and reduce exposure in eight (8) locations, and mitigate in two (2) locations. Cis-1,2 dichloroethene was detected levels requiring monitoring at one location. Historical data from investigation activities performed by GZA are summarized in Table 2. Detected compounds identified within the NYSDOH soil vapor intrusion matrices are shown on Figure 7.

These results suggest that vapor intrusion is a potential concern in any future on-site buildings and should be further evaluated and compared to current NYSDOH guidance criteria.

4.3.3 Groundwater

A total of three (3) permanent groundwater monitoring wells and six (6) temporary monitoring wells were sampled for analysis of VOCs and SVOCs (Figure 5). As part of the sampling events the VOC compounds identified above the NYSDEC Technical and Operational Guidance Series (TOGS) 1.1.1 were; benzene, cis-1,2-dichloroethene, PCE vinyl chloride, n-butylbenzene, sec-butylbenzene, tert-butylbenzene, and p-isopropyltoluene. Only one SVOC, bis(2-ethylhexyl)phthalate, was detected above TOGS 1.1.1. Historical data from investigation activities performed by GZA are summarized in Table 3. Detected compounds are shown on Figure 8.

In summary, it appears that groundwater at the Site has been impacted primarily by VOCs, and some SVOCs. Previous investigations focused primarily on shallow groundwater. Given that CVOCs are more dense than water, there is the potential that this contamination would not be observed in shallow wells. Additional characterization is needed to determine the full nature and extent of the contamination, including both, VOCs and SVOCs, as well as to further define potential remaining sources. In addition, on-Site groundwater has not been properly investigated for the presence of metals, PCBs and pesticides, thereby warranting further investigation.

5.0 PROPOSED REMEDIAL INVESTIGATION

The RI will be performed in accordance with this RIWP and will involve the fieldwork necessary to complete the site characterization. Based on a review of previous environmental investigation reports for the Former Coyne Textile Facility, several data gaps have been identified that require additional investigation. These include the following:

- Geophysical survey in areas where USTs have previously been identified, of which the current status is unknown;
- Additional characterization of surface and subsurface soils needed to more fully determine the extent of contamination;
- Additional characterization for Target Compound List (TCL) VOCs and TCL SVOCs including Tentatively Identified Compounds (TICs), total PCBs, TCL pesticides, and/or Target Analyte List (TAL) Metals;
- Additional soil vapor intrusion analysis in the building;
- Additional site-wide characterization of groundwater;
- Determination of groundwater flow direction; and
- Characterization of soils for determination of offsite disposal requirements during site preparation.

The RI will provide sufficient information to allow for identification of remedial alternatives that satisfy the proposed redevelopment plan as well as the NYSDEC requirements for the site based on the future use. All data will be obtained in such a manner to ensure sufficient quality to support subsequent decisions. The proposed investigation activities to be conducted consist of a limited geophysical survey to help determine the status of historical USTs, the installation of a series of soil borings, sub-slab soil vapor monitoring points, and groundwater monitoring wells, along with the subsequent collection and analysis of soil, soil vapor, and groundwater samples for parameters of concern.

The investigation activities are briefly summarized in the following sections and described in further detail in the FSP. Samples will be collected and analyzed in accordance with field sampling procedures and protocols as described in the FSP (Appendix A). Quality Assurance/Quality Control (QA/QC) samples will be collected and analyzed in accordance with the QAPP (Appendix B).

5.1 Geophysical Survey

A geophysical survey will be performed in the area of the historical USTs within the building (the former boiler room and former dry-cleaning room), and the employee parking lot in an attempt to identify anomalies beneath the surface that may represent USTs. The geophysical activities will be performed prior to the initiation of ground intrusive activities within these areas of concern. Anomalies identified as potential USTs will be addressed as part of the Final Design.

5.2 Soil Boring Installation and Soil Sampling

As part of the RI, one (1) surface soil sample will be collected in the green space area to the north of the former employee parking lot. The surface soil sample will be analyzed for a select set of parameters as described in Table 4. In addition, twenty-four (24) borings will be installed using either track-mounted Geoprobe hydraulic-push equipment or hollow-stem auger (HSA) drilling equipment. Proposed soil boring locations are shown on Figure 9. The soil borings will be advanced to the presence of a confining layer, refusal, or bedrock. The depth and location of each boring may vary depending upon geologic conditions.

Soil samples will be collected continuously from grade to final depth using either a Macrocore® sampling device or a split-spoon sampler. Each soil sample will then be screened in the field for visual, olfactory, and photoionic evidence of contamination. Soils will be logged in the field using a modified Burmeister soil classification method on Soil Probe Logs in accordance with the FSP.

Immediately upon opening the soil sampler, a PID or equivalent meter will be used to obtain readings along the length of the soil sample. Soil samples for laboratory analysis will be collected from each borehole in accordance with the following protocols:

1. A sample will be collected from the unsaturated interval which indicates the highest potential for the presence of contamination as determined by the highest PID or equivalent meter reading, and/or visual observation, or,

2. In the instance where elevated PID meter readings, or visible contamination are not present, a sample from the interval immediately above the water table may be collected for laboratory analysis.

One soil sample from each soil boring location will be submitted to an off-site NYSDOH Environmental Laboratory Approval Program (ELAP)-certified laboratory for a select set of parameters as described in Table 4. Subsurface soil samples analyzed for the presence of VOCs will be collected using a Terra Core^{TM} sampler or equivalent. The sampling device will be inserted into the undisturbed soil from the Geoprobe® Macrocore tube or split-spoon sampler. The 5-gram plug of soil will be capped and sent to the laboratory where it will be preserved, extracted, and analyzed. TICs will be included in the VOC analysis. The remaining sample volume will be homogenized to create a composite sample as described in the FSP. Drill cuttings will be managed as detailed in the FSP and holes will be backfilled with bentonite, unless converted into groundwater monitoring wells.

In addition to the soil samples described above, two duplicate samples and two matrix spike/matrix duplicate (MS/MSD) samples will be collected in accordance with the QAPP.

CHA will also collect two samples for characterization of soils for determination of offsite disposal requirements. These samples will be analyzed for full toxicity characteristic leaching procedure (TCLP) analyses and PCBs.

5.3 Soil Vapor Investigation

Sub-Slab soil vapor sample collection points will be installed within the building footprint in a total of six (6) locations, in an effort to identify the potential presence of VOCs. Sub-slab soil vapor points will be cored through the concrete floor in locations illustrated by Figure 10, where historical activities are of concern. Samples will be collected in accordance with the FSP and QAPP, and as summarized below.

Sampling points will be cored to a depth approximately 2-inches below the concrete slab. Polyethylene tubing will then be placed in the hole and backfilled with glass bead materials. A bentonite seal will be placed on the surface to provide an air tight seal. The polyethylene tubing will extend above this seal to provide a sampling point.

In addition to the sub-slab samples, two (2) indoor air quality, one (1) outdoor/ambient air and two (2) subsurface soil vapor point samples will be collected outside of the building along the north side, north parking lot, and former employee parking lot (Figure 10).

Summa canisters for each sample location will be provided by a NYSDOH ELAP-certified laboratory, and will be connected to the tubing to collect a sample over an 8-hour period. Samples will be analyzed for the United States Environmental Protection Agency (USEPA) TO-15. One additional duplicate sample will also be collected in accordance with the QAPP.

Sample container requirements, preservation measures, and handling procedures are presented in the QAPP. QA/QC samples will be collected in accordance with the QAPP.

5.4 Groundwater Investigation

A maximum of six (6) of the soil borings installed will be converted to permanent, flush-mount groundwater monitoring wells in accordance with the FSP. Due to both the potential presence of VOCs associated with petroleum products (which are less dense than water), and VOCS associated with chlorinated solvents (also referred to as CVOCs) which are denser than water, three (3) of these wells will be converted to clusters of three (3) in an effort to screen the shallow, intermediate, and deep groundwater zones. One of the well clusters will be installed in a presumed upgradient location, while the remaining clusters will be installed in presumed downgradient locations. The remaining three (3) monitoring wells will not be placed in clusters and will screen the shallow groundwater zone. Groundwater flow direction will be confirmed during these activities. Historical information provided in the GZA Off-Site Environmental Characterization Report (August 2015) indicates that groundwater flow direction is observed to be toward the northwest for shallow monitoring wells, and towards the north for intermediate and deep wells.

Wells will be constructed with two-inch diameter PVC riser pipe and well screen and will have a slot opening size of 0.010-inches. The screen will be installed to straddle the desired water table. A sand pack, consisting of a minimum thickness of one (1) inch, will be placed within the annulus between the borehole and the well screen. A 2-foot thick bentonite seal will then be placed above the screen. The remaining borehole between the bentonite seal and the ground surface will be backfilled with bentonite-cement grout. Flush-mounted steel protective casings will be set in a concrete pad installed at each well location to protect the riser pipes. Soil cuttings from drilling operations will not be used as backfill in any of the monitoring wells.

Once the wells are installed, each well will be developed using a combination of pumping and surging in accordance with the FSP. Purged water will be containerized in accordance with the FSP. The newly installed wells will be developed until the turbidity of the groundwater is less than 50 nephelometric turbidity unit (NTUs), or for a maximum of two hours each, whichever comes first. The locations of both, the proposed wells, and those previously installed are shown on Figure 11.

Groundwater samples will be collected from proposed wells, as well as all existing on-site monitoring wells (MW-1, MW-2, and MW-3), to the extent practical, to total fifteen (15) samples. Samples will be collected for a select set of parameters, further described in Table 4. Additional groundwater samples will also be collected, as necessary, in areas which exhibit evidence of gross contamination during field activities (i.e. elevated PID readings, sheen, etc.). Additional groundwater samples will be analyzed for VOCs and SVOCs only.

In addition to these samples, one duplicate, two field blanks, one equipment blank, two trip blanks, and one MS/MSD sample will be collected. Additionally, two waste characterization samples will be collected from the containerized purge water.

Dedicated/disposable polyethylene tubing will be installed at each well and a low-flow pump will be used to collect the sample. All non-disposable equipment will be cleaned in accordance with Section 5.0 of the FSP to minimize the potential for cross-contamination. These samples will be collected a minimum of 24 hours after the well installation activities are completed. Bottle requirements and handling procedures are presented in the QAPP. Sampling protocols are presented in the FSP.

5.5 Proposed Sampling and Analysis

Table 4 presents a summary of the proposed sampling and analysis plan, including the sample identifications, depths (if applicable), analytical parameters, and detailed sampling rationale. QA/QC samples will be collected according to the QAPP, included as Appendix B. Proposed sample locations are presented on Figures 9-11.

Table 4: Sampling Rationale

Sample ID	Matrix	Sample Depth(s)	Sample Location	Analytical Parameters	Rationale
SOIL-100	Sub-Surface Soil	Interval which indicates the highest potential for the presence of contamination	Tax Parcel 094.-20-02.0	TCL VOCs, TCL SVOCs, TAL Metals, PCBs, TCL Pesticides	To investigate the potential for contamination on this parcel, where limited investigation has been completed previously.
SOIL-101-SOIL-105	Sub-Surface Soil	Interval which indicates the highest potential for the presence of contamination	Tax Parcel 094.-20-02.0	TCLVOCs, TCL SVOCs, TAL Metals, PCBs	To investigate the potential for contamination on this parcel, where limited investigation has been completed previously.
SOIL-106	Sub-Surface Soil	Interval which indicates the highest potential for the presence of contamination	Tax Parcel 094.-20-02.0	TCL VOCs, TCL SVOCs, TAL Metals, PCBs, TCL Pesticides	To investigate the potential for contamination on this parcel, where limited investigation has been completed previously.
SOIL-107	Sub-Surface Soil	Interval which indicates the highest potential for the presence of contamination	Tax Parcel 094.-20-01.0	TCL VOCs, TCL SVOCs, TAL Metals, PCBs	To investigate the potential for contamination on this parcel, where limited investigation has been completed previously.
SOIL-108-SOIL-109	Sub-Surface Soil	Interval which indicates the highest potential for the presence of contamination	Southern portion of Tax Parcel 094.-05-06.0	TCL VOCs, TCL SVOCs, TAL Metals, PCBs	To investigate the potential for contamination near the location of the rear loading dock.
SOIL-110	Sub-Surface Soil	Interval which indicates the highest potential for the presence of contamination	Southern portion of Tax Parcel 094.-05-06.0	TCL VOCs, TCL SVOCs, TAL Metals, PCBs	To investigate the potential for contamination near the location of former mat repair area.
SOIL-111	Sub-Surface Soil	Interval which indicates the highest potential for the presence of contamination	Southern portion of Tax Parcel 094.-05-06.0	TCL VOCs, TCL SVOCs, TAL Metals, PCBs	To investigate the potential for contamination near the location of the former laundry chemical storage.

Sample ID	Matrix	Sample Depth(s)	Sample Location	Analytical Parameters	Rationale
SOIL-112	Sub-Surface Soil	Interval which indicates the highest potential for the presence of contamination	Southern portion of Tax Parcel 094.-05-06.0	TCL VOCs, TCL SVOCs, TAL Metals, PCBs, TCL Pesticides	To investigate the potential for contamination near the location of the former repair garage.
SOIL-113 SOIL-114	Sub-Surface Soil	Interval which indicates the highest potential for the presence of contamination	Central portion of Tax Parcel 094.-05-06.0	TCL VOCs, TCL SVOCs, TAL Metals, PCBs	To investigate the potential for contamination near the location of the former folding/product storage area.
SOIL-115- SOIL-121	Sub-Surface Soil	Interval which indicates the highest potential for the presence of contamination	Central portion of Tax Parcel 094.-05-06.0	TCL VOCs, TCL SVOCs, TAL Metals, PCBs	To investigate the potential for contamination near the location of the former dry cleaning units, wash chemical storage, boiler room, and former UST. Historical reports also indicate elevated PID readings in this area.
SOIL-122	Sub-Surface Soil	Interval which indicates the highest potential for the presence of contamination	Northern portion of Site Tax Parcel 094.-05-06.0	TCL VOCs, TCL SVOCs, TAL Metals, PCBs	To investigate the potential for contamination near the location of the former waste water holding tanks and sludge waste holding tanks.
SOIL-123	Sub-Surface Soil	Interval which indicates the highest potential for the presence of contamination	Northern portion of Site Tax Parcel 094.-05-06.0	TCL VOCs, TCL SVOCs, TAL Metals, PCBs, TCL Pesticides	To investigate the potential for contamination near the location of the former waste water holding tanks and sludge waste holding tanks.
SOIL-SS100	Surface Soil	Top 0-2-inches below vegetative cover	Center of Tax Parcel 094.-20-01.0	TCL VOCs, TCL SVOCs, TAL Metals, PCBs, TCL Pesticides	To investigate the potential for contamination within the greenspace areas present on Site.
SV-IA100	Sub-slab Soil Vapor	2 inches below concrete slab	Southern portion of Tax Parcel 094.-05-06.0	VOCs (TO-15)	To investigate the potential for sub-slab vapor near the former laundry chemical storage.

Sample ID	Matrix	Sample Depth(s)	Sample Location	Analytical Parameters	Rationale
SV-IA101	Sub-slab Soil Vapor	2 inches below concrete slab	Central portion of Tax Parcel 094.-05-06.0	VOCs (TO-15)	To investigate the potential for sub-slab vapor near the former machine shop.
SV-IA102	Sub-slab Soil Vapor	2 inches below concrete slab	Central Portion of Tax Parcel 094.-05-06.0	VOCs (TO-15)	To investigate the potential for sub-slab vapor near the former folding and product storage area.
SV-IA103-SV-IA105	Sub-slab Soil Vapor	2 inches below concrete slab	Central Portion of Tax Parcel 094.-05-06.0	VOCs (TO-15)	To investigate the potential for sub-slab vapor near the former dry-cleaning units, wash chemical storage, boiler room, and former UST. Historical reports also indicate elevated PID readings in this area.
SV-IAQ100 – SV-IAQ101	Indoor Air Quality	N/A	Interior of the building	VOCs (TO-15)	To investigate the ambient indoor air concentrations
SV-OA100	Outdoor Air	N/A	Central portion of Tax Parcel 094.-05-06.0	VOCs (TO-15)	To provide a comparison of the outdoor and sub-slab air quality.
SVP-100	Subsurface Soil Vapor	2-inches below asphalt	Northern portion of Tax Parcel 094.-05-06.0	VOCs (TO-15)	To provide data for areas that may be developed in the future.
SVP-101	Subsurface Soil Vapor	2-inches below asphalt	Center of Tax Parcel 094.-20-02.0	VOCs (TO-15)	To provide data for areas that may be developed in the future.

Sample ID	Matrix	Sample Depth(s)	Sample Location	Analytical Parameters	Rationale
GW-100	Groundwater	N/A	Southern portion of Tax Parcel 094.-05-06.0	TCL VOCs, TCL SVOCs, TAL Metals, PCBs	To investigate the potential groundwater contamination of the shallow groundwater zone near the former repair garage.
GW-101S GW-101I GW-101D	Groundwater	N/A	Southern portion of Tax Parcel 094.-05-06.0	TCL VOCs, TCL SVOCs, TAL Metals, PCBs	This cluster will screen shallow, intermediate, and deep groundwater zones for the potential groundwater contamination near the former mat and rear loading dock.
GW-102	Groundwater	N/A	Central portion of Tax Parcel 094.-05-06.0	TCL VOCs, TCL SVOCs, TAL Metals, PCBs	To investigate the potential groundwater contamination of the shallow groundwater zone near the folding/product storage area.
GW-103S GW-103I GW-103D[1]	Groundwater	N/A	Central portion of Tax Parcel 094.-05-06.0	TCL VOCs, TCL SVOCs, TAL Metals, PCBs, PFAS,[1] 1,4-Dioxane[1] ([1]103D only)	This cluster will screen shallow, intermediate, and deep groundwater zones for the potential groundwater contamination near the former dry cleaning units, wash chemical storage, boiler room, and former UST.
GW-104	Groundwater	N/A	Northern portion of Tax Parcel 094.-05-06.0	TCL VOCs, TCL SVOCs, TAL Metals, PCBs, TCL Pesticides, PFAS, 1,4-Dioxane	To investigate the potential groundwater contamination of the shallow groundwater zone near the loading docks and former waste water holding tanks.
GW-105S[2] GW-105I GW-105D[1]	Groundwater	N/A	Tax Parcel 094.-20-02.0	TCL VOCs, TCL SVOCs, TAL Metals, PCBs, TCL Pesticides[2], PFAS,[1] 1,4-Dioxane[1] ([1]105D only) ([2]shallow only)	This cluster will screen shallow, intermediate, and deep groundwater zones for the potential groundwater contamination along the former parking lot area. Historical data provided indicated VOC and SVOC contamination.

Sample ID	Matrix	Sample Depth(s)	Sample Location	Analytical Parameters	Rationale
GW-MW1 – GW-MW-3	Groundwater	N/A	Tax Parcel 094.-20-02.0	TCL VOCs, TCL SVOCs, TAL Metals, PCBs	Historically installed permanent monitoring wells.
To be Determined	Groundwater	N/A	Entire Site, as Needed	TCL VOCs, TCL SVOCs	Soil borings that exhibit gross contamination will be converted into temporary monitoring wells and sampled.
SOIL-WC-100 SOIL-WC-101	Soil	N/A	Soil Stockpile(s)	TCLP VOCs, TCLP SVOCs, TAL Metals, PCBs, TCLP Herbicides, TCLP Pesticides, Reactivity, Ignitability, Corrosivity, pH	Two waste characterization soil samples will be collected to adequately characterize the soil stockpile for off-site disposal at a permitted facility.
GW-WC-100 GW-WC-101	Groundwater	N/A	Drums/containers of purged water	TCL VOCs, TCL SVOCs, TAL Metals, PCBs, TCL Herbicides, TCL Pesticides, Corrosivity, pH	Two waste characterization groundwater samples will be collected to adequately characterize the purged groundwater for off-site disposal at a permitted facility.
SOIL-DUP100 SOIL-DUP101	Soil	TBD	TBD	TCL VOCs, TCL SVOCs, TAL Metals, PCBs	Per QAQC procedure, two blind duplicate samples will be collected with selected soil samples to determine the precision of laboratory analysis.
GW-DUP100	Groundwater	N/A	TBD	TCL VOCs, TCL SVOCs, TAL Metals, PCBs	Per QAQC procedure one blind duplicate sample will be collected with a selected groundwater sample to determine the precision of laboratory analysis.

Sample ID	Matrix	Sample Depth(s)	Sample Location	Analytical Parameters	Rationale
GW-FB100 GW-FB101	Groundwater	N/A	TBD	TCL VOCs	Per QAQC procedure one field blank is required for each day of onsite groundwater sampling.
GW-EB100	Groundwater	N/A	TBD	TCL VOCs, TCL SVOCs, TAL Metals, PCBs	Per QAQC procedure, one equipment blank is required for every 20 groundwater samples collected.
GW-TB100 GW-TB101	Groundwater	N/A	TBD	VOCs	Per QAQC procedure, one trip blank is required for each cooler containing samples for VOC analysis. VOC samples should be combined into one cooler each day.
SOIL-MS100 SOIL-MS101	Soil	N/A	TBD	TCL VOCs, TCL SVOCs, TAL Metals, PCBs	Per QAQC procedure, one matrix spike (MS) sample is required for every 20 samples (including duplicate samples and field or equipment blank samples).
SOIL-MSD100 SOIL-MSD101	Soil	N/A	TBD	TCLVOCs, TCL SVOCs, TAL Metals, PCBs	Per QAQC procedure, one matrix spike duplicate (MSD) sample is required for every 20 samples (including duplicate samples and field or equipment blank samples).
GW-MS100	Groundwater	N/A	TBD	TCL VOCs, TCL SVOCs, TAL Metals, PCBs	Per QAQC procedure, one matrix spike (MS) sample is required for every 20 samples (including duplicate samples and field or equipment blank samples).
GW-MSD100	Groundwater	N/A	TBD	TCL VOCs, TCL SVOCs, TAL Metals, PCBs	Per QAQC procedure, one matrix spike duplicate (MSD) sample is required for every 20 samples (including duplicate samples and field or equipment blank samples).

5.6 Decontamination Procedure

Decontamination procedures related to the investigative activities at the Site are described in the FSP, included as Appendix A.

5.7 Investigation Derived Waste

Investigation Derived Waste (IDW) generated during the investigation will include soil cuttings, purge water, and decontamination water, as well as empty soil jars, personal protective equipment (PPE) and other project-related waste. Handling procedure for the IDW has been outlined in the FSP, included as Appendix A.

5.8 Reporting

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

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

1. Boring/sub-slab vapor points/monitoring well installation/field sampling logs.
2. Tables summarizing the analytical data for soil, soil vapor, and groundwater samples collected including comparisons to appropriate standards, criteria, and guidance (e.g., 6 NYCRR Subpart 375 Soil Cleanup Objectives and NYSDEC Groundwater Standards)
3. A discussion regarding the existence or non-existence of subsurface contamination.
4. A narrative that summarizes the results of the investigation including a discussion of the physical and analytical results.
5. A characterization of the soil, sub-slab soil vapor, and groundwater of the site to allow for the confirmation of the source(s) of the contamination, movement of the contamination, and possible receptors at risk.
6. Groundwater contour maps, assuming groundwater is encountered, to show the direction of the local groundwater flow.
7. Figures showing the locations of the borings, sub-slab vapor points, and monitoring wells at the Site.
8. A qualitative exposure assessment for contamination, if any, emanating from the Site.
9. Conclusions and recommendations regarding the environmental status of the site.

6.0 FIELD SAMPLING PLAN

The work described in this Work Plan for the RI will be performed in accordance with the Field Sampling Plan (FSP) that has been developed for this project. The FSP details the specific sampling objectives, procedures, and protocols associated with this project.

A copy of the FSP is provided in Appendix A.

7.0 QUALITY ASSURANCE PROJECT PLAN

A Quality Assurance Project Plan (QAPP) has also been prepared for the site investigation activities. The QAPP presents the policies, organization, objectives, functional activities and specific Quality Assurance (QA) and Quality Control (QC) activities designed to achieve the specific data quality goals associated with the Remedial Investigation (RI) that will be conducted at the Site.

A copy of the QAPP is provided in Appendix B.

8.0 HEALTH AND SAFETY PROTOCOLS

A site-specific Health and Safety Plan (HASP) was prepared following an assessment of known physical and chemical hazards present at the site and an evaluation of the risks associated with the assessment and remedial actions. Available site information was examined and adequate warnings and safeguards for field personnel were selected and implemented. All CHA field personnel are required to review and sign the HASP before entering the field. Subcontractors to CHA are required to develop and implement their own HASP.

A copy of the site-specific HASP is provided in Appendix C.

9.0 COMMUNITY AIR MONITORING PROGRAM

A Community Air Monitoring Plan (CAMP) has been prepared to provide a measure of protection for the downwind community (i.e. off-site receptors including residences and businesses and on-site workers not directly involved with the subject work activities) from potential airborne contaminant releases as a direct result of the proposed remedial investigation activities. Air monitoring will be conducted in general accordance with the New York State Department of Health (NYSDOH) *Generic Community Air Monitoring Plan (CAMP).*

A copy of the site-specific CAMP is provided in Appendix D.

10.0 CITIZEN PARTICIPATION ACTIVITIES

The Brownfield Program includes an active role for Citizen Participation during the execution of the project. As part of that effort, CHA has developed a Citizen Participation Plan (CPP). The CPP enables citizens to become informed and participate more fully in the decision-making process that may affect their neighborhood. NYSDEC requires several opportunities for citizen involvement during the investigation and cleanup of Brownfield sites. The CPP has previously been provided under separate cover.

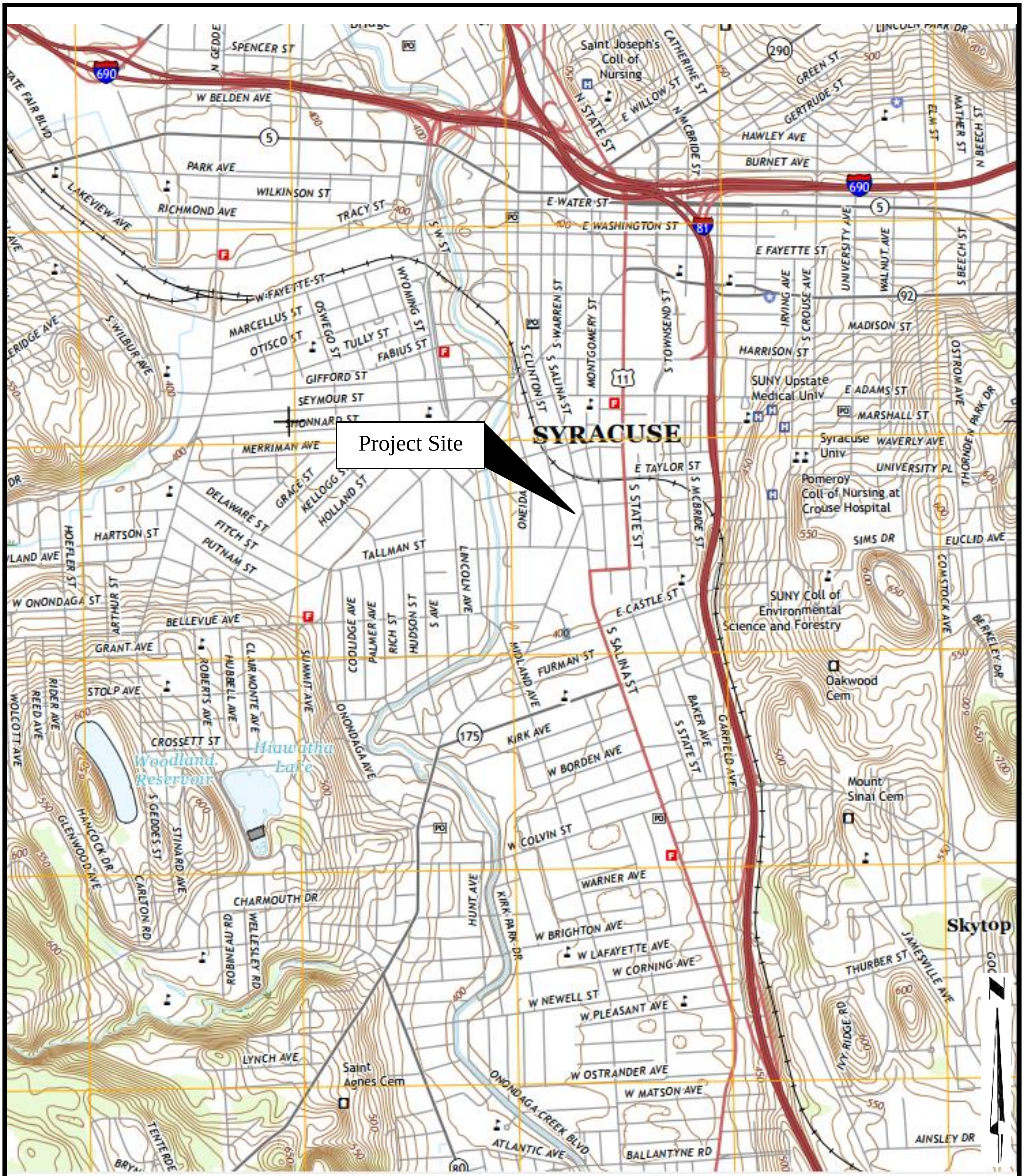
11.0 SCHEDULE

The following table provides an estimated schedule for completion of the Former Coyne Textile Facility BCP Project. The overall progress of the project will be dependent upon a number of factors including, but not limited to, NYSDEC review and approval timeframes, time of year at which the final design documents are complete, weather conditions at the time of remedial construction, etc. Note that in particular, the field activities associated with the Remedial Investigation are currently scheduled for winter months, which may result in delays due to inclement weather.

Table 5: Project Schedule

DESCRIPTION	ESTIMATED START	ESTIMATED FINISH
Execution of BCP Agreement	August 2017	September 2017
Remedial Investigation Work Plan	September 2017	October 2017
Comment Period & Review of Work Plan	October 2017	March 2018
Remedial Investigation	March 2018	April 2018
Remedial Investigation Report	March 2018	June 2018
Review & Approval of Investigation Report	May 2018	July 2018

FIGURES



SOURCE: USGS MapViewer

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NOT TO SCALE

DATE: January 2018

FIGURE 1
SITE LOCATION MAP
140 CORTLAND AVE
SYRACUSE,
ONONDAGA COUNTY, NEW YORK

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NOTE:
Site layout and characteristics generalized from previous investigations and historical data. All features are approximated and are NOT TO SCALE.

- - -	Site Boundary
⌐ ‐ ‐ ¬	Features

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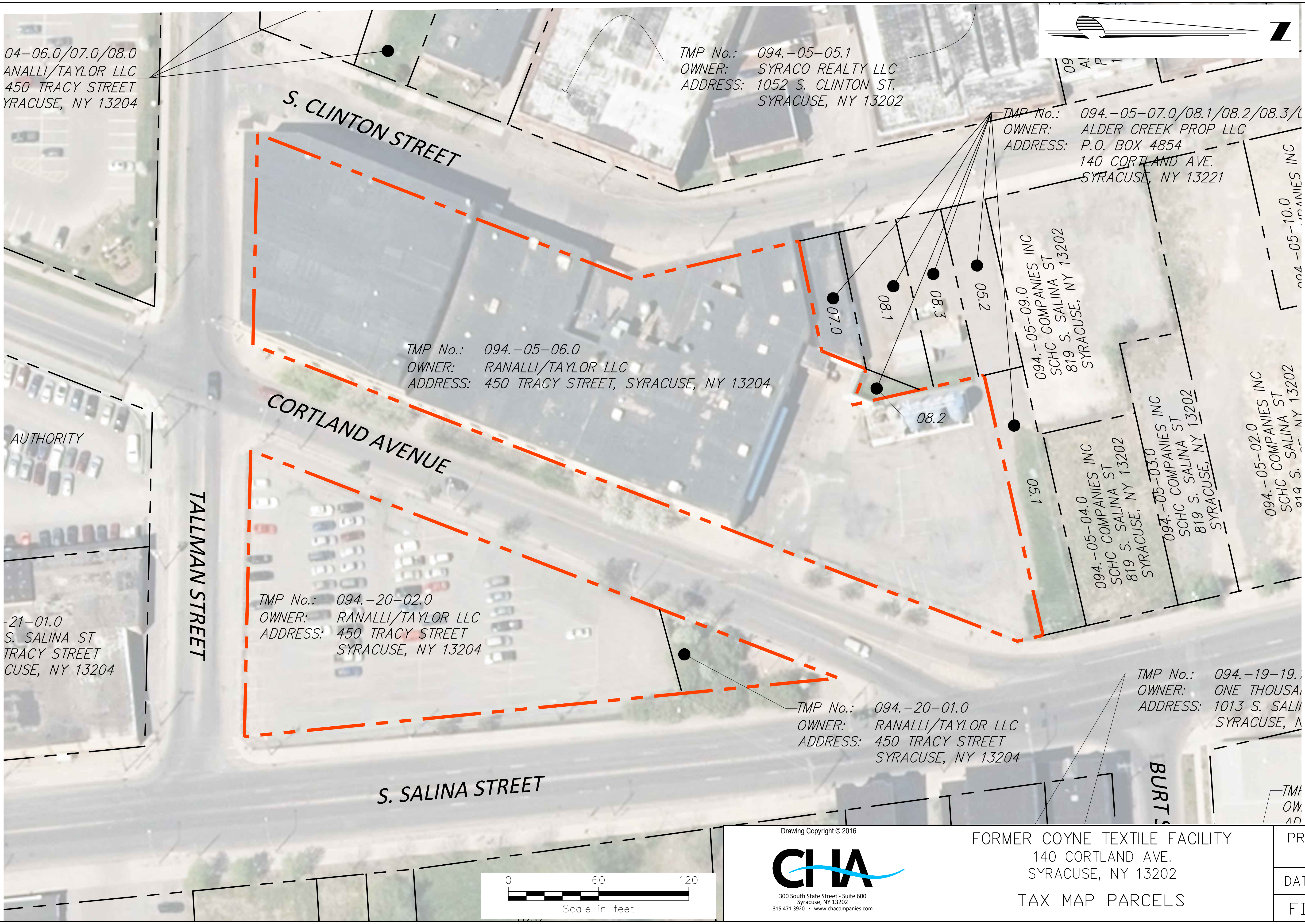
MAP NOT TO SCALE

DATE: January 2018

FIGURE 2
SITE LAYOUT
140 CORTLAND AVE
SYRACUSE
ONONDAGA COUNTY, STATE OF NEW YORK



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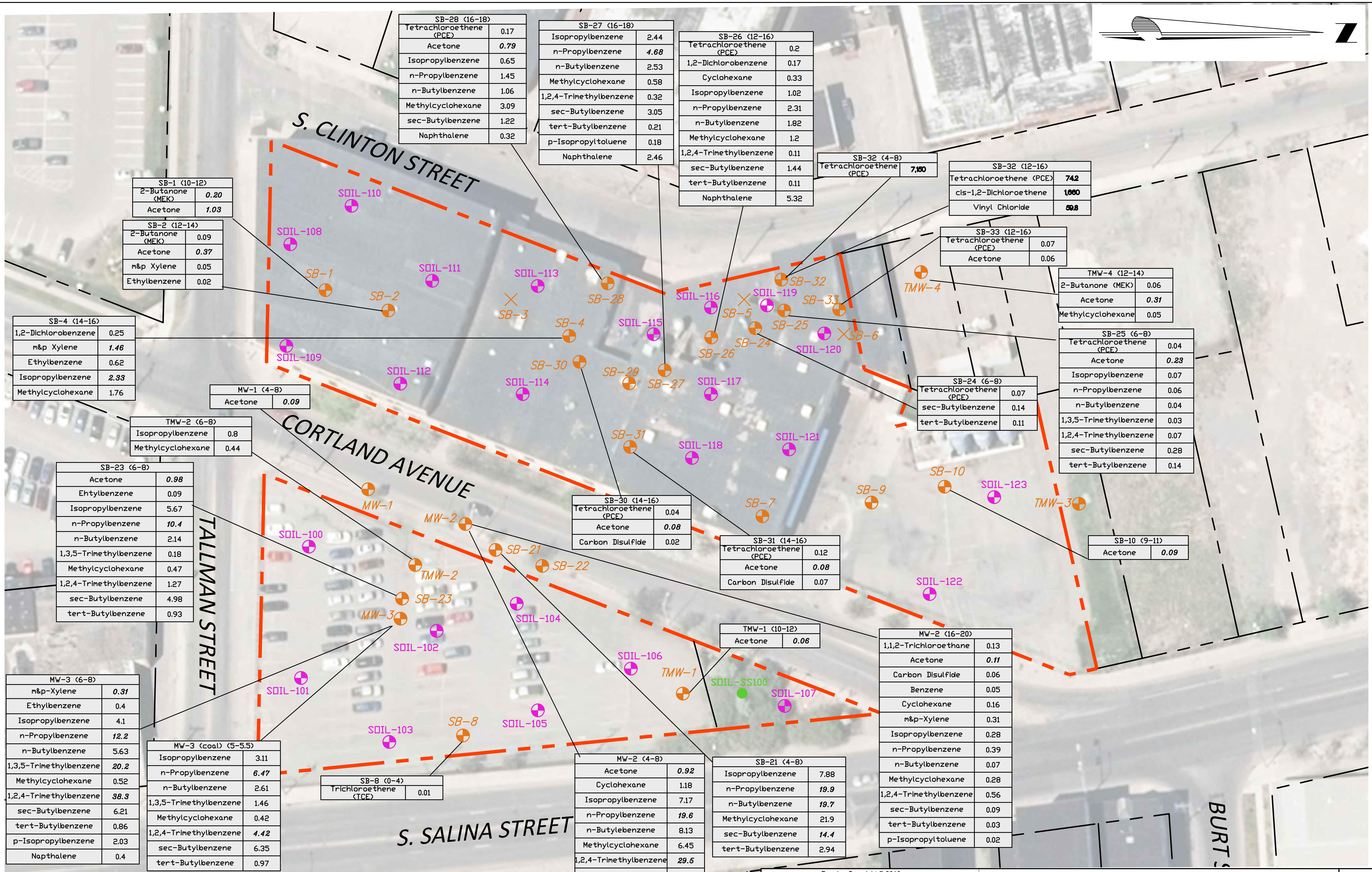
TAX MAP PARCELS

PROJECT NO.
33525

DATE: 01/2018

FIGURE 3

File: V:\PROJECTS\ANY\K4\33525\CADD_ACAD\ENVP\TAX MAP.DWG Saved: 1/22/2018 9:41:43 AM Plotted: 1/22/2018 9:42:36 AM Current User: Miller, Samantha LastSavedBy: 4187



SB-28 (16-18)	
Tetrachloroethene (PCE)	0.17
Acetone	*0.79*
Isopropylbenzene	0.65
n-Propylbenzene	1.45
n-Butylbenzene	1.06
Methylcyclohexane	3.09
sec-Butylbenzene	1.22
Naphthalene	0.32

SB-27 (16-18)	
Isopropylbenzene	2.44
n-Propylbenzene	*4.68*
n-Butylbenzene	2.53
Methylcyclohexane	0.58
1,2,4-Trimethylbenzene	0.32
sec-Butylbenzene	3.05
tert-Butylbenzene	0.21
p-Isopropyltoluene	0.18
Naphthalene	2.46

SB-26 (12-16)	
Tetrachloroethene (PCE)	0.2
1,2-Dichlorobenzene	0.17
Cyclohexane	0.33
Isopropylbenzene	1.02
n-Propylbenzene	2.31
n-Butylbenzene	1.82
Methylcyclohexane	1.2
1,2,4-Trimethylbenzene	0.11
sec-Butylbenzene	1.44
tert-Butylbenzene	0.11
Naphthalene	5.32

SB-32 (4-8)	
Tetrachloroethene (PCE)	**7,150**

SB-32 (12-16)	
Tetrachloroethene (PCE)	**74.2**
cis-1,2-Dichloroethene	**1,660**
Vinyl Chloride	**59.8**

SB-33 (12-16)	
Tetrachloroethene (PCE)	0.07
Acetone	0.06

TMW-4 (12-14)	
2-Butanone (MEK)	0.06
Acetone	*0.31*
Methylcyclohexane	0.05

SB-25 (6-8)	
Tetrachloroethene (PCE)	0.04
Acetone	*0.23*
Isopropylbenzene	0.07
n-Propylbenzene	0.06
n-Butylbenzene	0.04
1,3,5-Trimethylbenzene	0.03
1,2,4-Trimethylbenzene	0.07
sec-Butylbenzene	0.28
tert-Butylbenzene	0.14

SB-24 (6-8)	
Tetrachloroethene (PCE)	0.07
sec-Butylbenzene	0.14
tert-Butylbenzene	0.11

SB-1 (10-12)	
2-Butanone (MEK)	*0.20*
Acetone	*1.03*

SB-2 (12-14)	
2-Butanone (MEK)	0.09
Acetone	*0.37*
m&p Xylene	0.05
Ethylbenzene	0.02

SB-4 (14-16)	
1,2-Dichlorobenzene	0.25
m&p Xylene	*1.46*
Ethylbenzene	0.62
Isopropylbenzene	*2.33*
Methylcyclohexane	1.76

MW-1 (4-8)	
Acetone	*0.09*

TMW-2 (6-8)	
Isopropylbenzene	0.8
Methylcyclohexane	0.44

SB-23 (6-8)	
Acetone	*0.98*
Ehtylbenzene	0.09
Isopropylbenzene	5.67
n-Propylbenzene	*10.4*
n-Butylbenzene	2.14
1,3,5-Trimethylbenzene	0.18
Methylcyclohexane	0.47
1,2,4-Trimethylbenzene	1.27
sec-Butylbenzene	4.98
tert-Butylbenzene	0.93

SB-30 (14-16)	
Tetrachloroethene (PCE)	0.04
Acetone	*0.08*
Carbon Disulfide	0.02

SB-31 (14-16)	
Tetrachloroethene (PCE)	0.12
Acetone	*0.08*
Carbon Disulfide	0.07

SB-10 (9-11)	
Acetone	*0.09*

TMW-1 (10-12)	
Acetone	*0.06*

MW-2 (16-20)	
1,1,2-Trichloroethane	0.13
Acetone	*0.11*
Carbon Disulfide	0.06
Benzene	0.05
Cyclohexane	0.16
m&p-Xylene	0.31
Isopropylbenzene	0.28
n-Propylbenzene	0.39
n-Butylbenzene	0.07
Methylcyclohexane	0.28
1,2,4-Trimethylbenzene	0.56
sec-Butylbenzene	0.09
tert-Butylbenzene	0.03
p-Isopropyltoluene	0.02

MW-3 (6-8)	
m&p-Xylene	*0.31*
Ethylbenzene	0.4
Isopropylbenzene	4.1
n-Propylbenzene	*12.2*
n-Butylbenzene	5.63
1,3,5-Trimethylbenzene	*20.2*
Methylcyclohexane	0.52
1,2,4-Trimethylbenzene	*38.3*
sec-Butylbenzene	6.21
tert-Butylbenzene	0.86
p-Isopropylbenzene	2.03
Napthalene	0.4

MW-3 (coal) (5-5.5)	
Isopropylbenzene	3.11
n-Propylbenzene	*6.47*
n-Butylbenzene	2.61
1,3,5-Trimethylbenzene	1.46
Methylcyclohexane	0.42
1,2,4-Trimethylbenzene	*4.42*
sec-Butylbenzene	6.35
tert-Butylbenzene	0.97

SB-8 (0-4)	
Trichloroethene (TCE)	0.01

MW-2 (4-8)	
Acetone	*0.92*
Cyclohexane	1.18
Isopropylbenzene	7.17
n-Propylbenzene	*19.6*
n-Butylebenzene	8.13
Methylcyclohexane	6.45
1,2,4-Trimethylbenzene	*29.5*
sec-Butylbenzene	7.41
tert-Butylbenzene	1.12
p-Isopropyltoluene	1.25

SB-21 (4-8)	
Isopropylbenzene	7.88
n-Propylbenzene	*19.9*
n-Butylbenzene	*19.7*
Methylcyclohexane	21.9
sec-Butylbenzene	*14.4*
tert-Butylbenzene	2.94

LEGEND:

- 🟠 GZA 2014/2015 SOIL BORING LOCATIONS
- × GZA 2014/2015 ATTEMPTED SOIL BORING
- ● CHA RIWP SOIL BORING LOCATIONS
- ● CHA RIWP SURFACE SOIL SAMPLE

ND - NOT DETECTED
SAMPLES COLLECTED BY GZA 2015-2016
SAMPLE RESULTS LISTED IN mg/kg (PPM)
ITALIC RESULTS EXCEED UNRESTRICTED SCOs
BOLD RESULTS EXCEED COMMERCIAL SCOs

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LOCATIONS - VOCs ONLY

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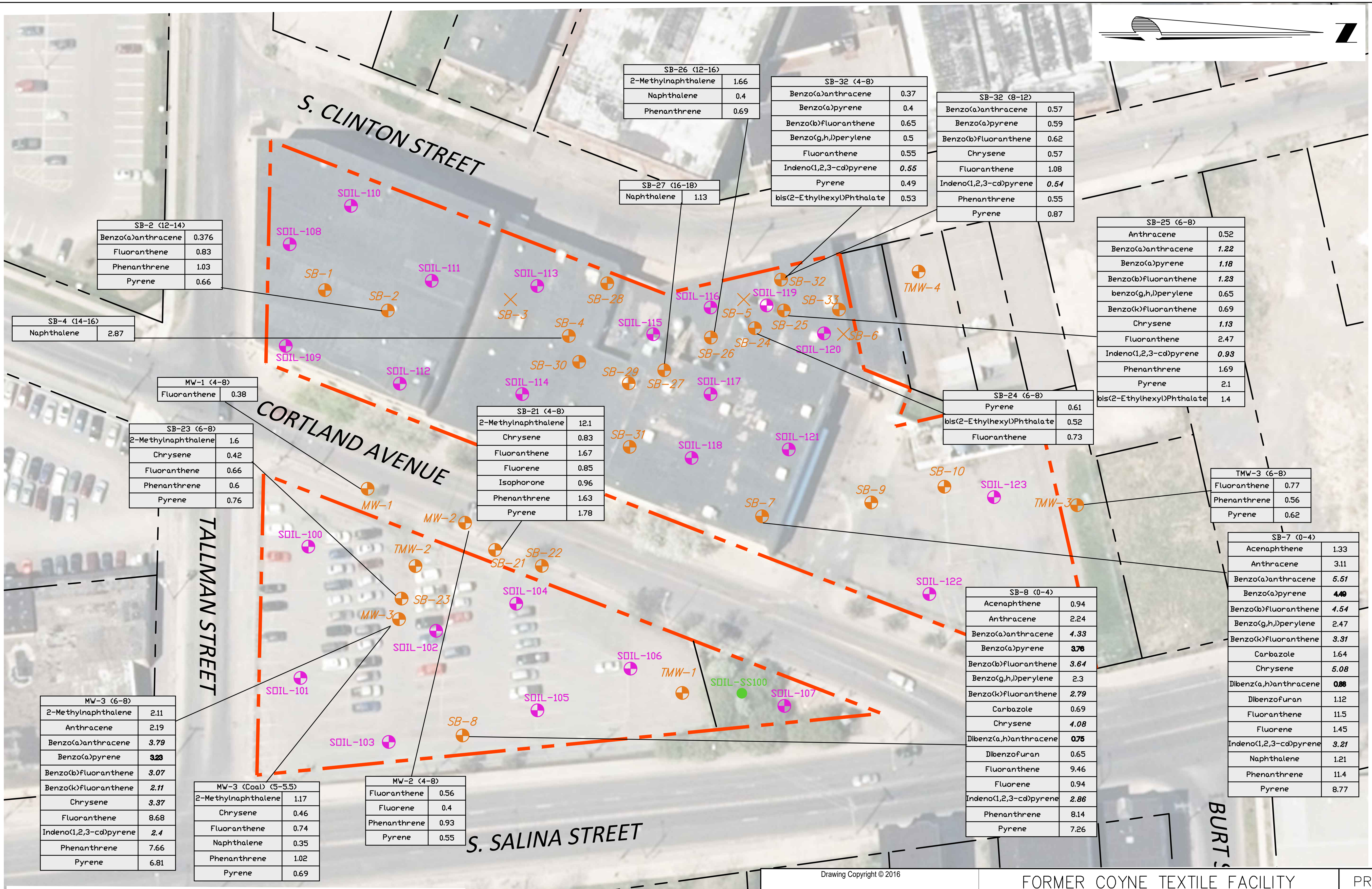
FIGURE 4

File: V:\PROJECTS\ANY\K4\33525\CADD_ACAD\ENVP\FIGURE 4 - FORMER COYNE TEXTILE FACILITY_VOC MAP.DWG Saved: 3/7/2018 11:54:34 AM Plotted: 3/7/2018 12:25:52 PM Current User: Miller, Samantha LastSavedBy: 4187

File: V:\PROJECTS\ANY\K4\33525\CADD_ACAD\ENVP\FIGURE 5 - FORMER COYNE TEXTILE FACILITY_SVOC MAP.DWG Saved: 3/7/2018 12:07:57 PM Plotted: 3/7/2018 12:27:11 PM Current User: Miller, Samantha LastSavedBy: 4187



SB-26 (12-16)	
2-Methylnaphthalene	1.66
Naphthalene	0.4
Phenanthrene	0.69

SB-27 (16-18)	
Naphthalene	1.13

SB-32 (4-8)	
Benzo(a)anthracene	0.37
Benzo(a)pyrene	0.4
Benzo(b)fluoranthene	0.65
Benzo(g,h,i)perylene	0.5
Fluoranthene	0.55
Indeno(1,2,3-cd)pyrene	*0.55*
Pyrene	0.49
bis(2-Ethylhexyl)Phthalate	0.53

SB-32 (8-12)	
Benzo(a)anthracene	0.57
Benzo(a)pyrene	0.59
Benzo(b)fluoranthene	0.62
Chrysene	0.57
Fluoranthene	1.08
Indeno(1,2,3-cd)pyrene	*0.54*
Phenanthrene	0.55
Pyrene	0.87

SB-2 (12-14)	
Benzo(a)anthracene	0.376
Fluoranthene	0.83
Phenanthrene	1.03
Pyrene	0.66

SB-4 (14-16)	
Naphthalene	2.87

SB-25 (6-8)	
Anthracene	0.52
Benzo(a)anthracene	*1.22*
Benzo(a)pyrene	*1.18*
Benzo(b)fluoranthene	*1.23*
benzo(g,h,i)perylene	0.65
Benzo(k)fluoranthene	0.69
Chrysene	*1.13*
Fluoranthene	2.47
Indeno(1,2,3-cd)pyrene	*0.93*
Phenanthrene	1.69
Pyrene	2.1
bis(2-Ethylhexyl)Phthalate	1.4

MW-1 (4-8)	
Fluoranthene	0.38

SB-23 (6-8)	
2-Methylnaphthalene	1.6
Chrysene	0.42
Fluoranthene	0.66
Phenanthrene	0.6
Pyrene	0.76

SB-21 (4-8)	
2-Methylnaphthalene	12.1
Chrysene	0.83
Fluoranthene	1.67
Fluorene	0.85
Isophorone	0.96
Phenanthrene	1.63
Pyrene	1.78

SB-24 (6-8)	
Pyrene	0.61
bis(2-Ethylhexyl)Phthalate	0.52
Fluoranthene	0.73

TMW-3 (6-8)	
Fluoranthene	0.77
Phenanthrene	0.56
Pyrene	0.62

SB-7 (0-4)	
Acenaphthene	1.33
Anthracene	3.11
Benzo(a)anthracene	*5.51*
Benzo(a)pyrene	**4.49**
Benzo(b)fluoranthene	*4.54*
Benzo(g,h,i)perylene	2.47
Benzo(k)fluoranthene	*3.31*
Carbazole	1.64
Chrysene	*5.08*
Dibenz(a,h)anthracene	**0.88**
Dibenzofuran	1.12
Fluoranthene	11.5
Fluorene	1.45
Indeno(1,2,3-cd)pyrene	*3.21*
Naphthalene	1.21
Phenanthrene	11.4
Pyrene	8.77

SB-8 (0-4)	
Acenaphthene	0.94
Anthracene	2.24
Benzo(a)anthracene	*4.33*
Benzo(a)pyrene	**3.76**
Benzo(b)fluoranthene	*3.64*
Benzo(g,h,i)perylene	2.3
Benzo(k)fluoranthene	*2.79*
Carbazole	0.69
Chrysene	*4.08*
Dibenz(a,h)anthracene	**0.75**
Dibenzofuran	0.65
Fluoranthene	9.46
Fluorene	0.94
Indeno(1,2,3-cd)pyrene	*2.86*
Phenanthrene	8.14
Pyrene	7.26

MW-3 (6-8)	
2-Methylnaphthalene	2.11
Anthracene	2.19
Benzo(a)anthracene	*3.79*
Benzo(a)pyrene	**3.23**
Benzo(b)fluoranthene	*3.07*
Benzo(k)fluoranthene	*2.11*
Chrysene	*3.37*
Fluoranthene	8.68
Indeno(1,2,3-cd)pyrene	*2.4*
Phenanthrene	7.66
Pyrene	6.81

MW-3 (Coal) (5-5.5)	
2-Methylnaphthalene	1.17
Chrysene	0.46
Fluoranthene	0.74
Naphthalene	0.35
Phenanthrene	1.02
Pyrene	0.69

MW-2 (4-8)	
Fluoranthene	0.56
Fluorene	0.4
Phenanthrene	0.93
Pyrene	0.55

LEGEND:

- GZA 2014/2015 SOIL BORING LOCATIONS
- × GZA 2014/2015 ATTEMPTED SOIL BORING
- CHA RIWP SOIL BORING LOCATIONS
- ● CHA RIWP SURFACE SOIL SAMPLE

ND - NOT DETECTED
SAMPLES COLLECTED BY GZA 2015-2016
SAMPLE RESULTS LISTED IN mg/kg (PPM)
ITALIC RESULTS EXCEED UNRESTRICTED SCOs
BOLD RESULTS EXCEED COMMERCIAL SCOs

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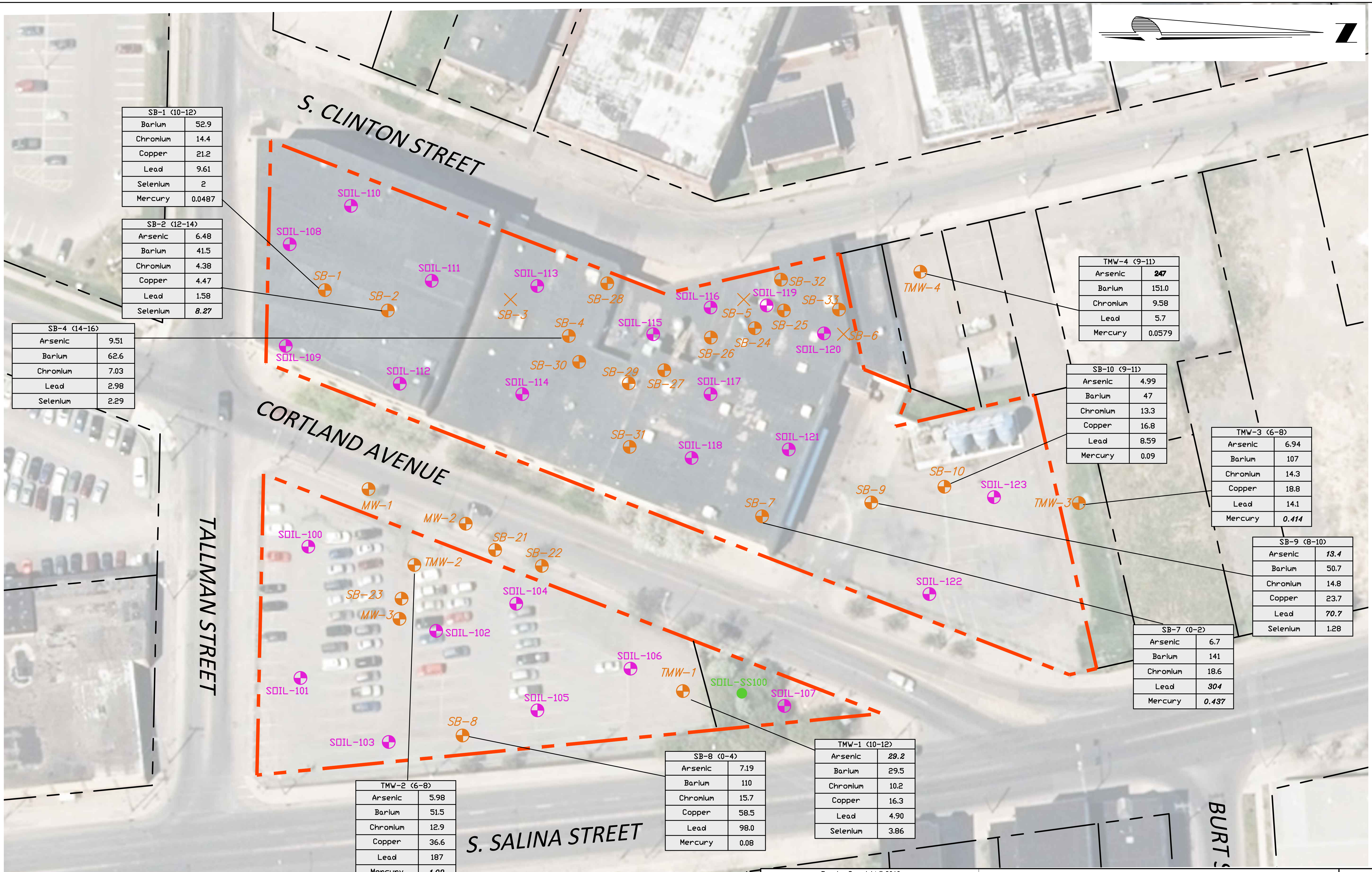
HISTORIC SOIL BORING
LOCATIONS - SVOCs ONLY

PROJECT NO.
33525

DATE: 01/2018

FIGURE 5



SB-1 (10-12)	
Barium	52.9
Chromium	14.4
Copper	21.2
Lead	9.61
Selenium	2
Mercury	0.0487

SB-2 (12-14)	
Arsenic	6.48
Barium	41.5
Chromium	4.38
Copper	4.47
Lead	1.58
Selenium	*8.27*

SB-4 (14-16)	
Arsenic	9.51
Barium	62.6
Chromium	7.03
Lead	2.98
Selenium	2.29

TMW-4 (9-11)	
Arsenic	**247**
Barium	151.0
Chromium	9.58
Lead	5.7
Mercury	0.0579

SB-10 (9-11)	
Arsenic	4.99
Barium	47
Chromium	13.3
Copper	16.8
Lead	8.59
Mercury	0.09

TMW-3 (6-8)	
Arsenic	6.94
Barium	107
Chromium	14.3
Copper	18.8
Lead	14.1
Mercury	*0.414*

SB-9 (8-10)	
Arsenic	*13.4*
Barium	50.7
Chromium	14.8
Copper	23.7
Lead	*70.7*
Selenium	1.28

SB-7 (0-2)	
Arsenic	6.7
Barium	141
Chromium	18.6
Lead	*304*
Mercury	*0.437*

TMW-2 (6-8)	
Arsenic	5.98
Barium	51.5
Chromium	12.9
Copper	36.6
Lead	187
Mercury	*1.09*

SB-8 (0-4)	
Arsenic	7.19
Barium	110
Chromium	15.7
Copper	58.5
Lead	98.0
Mercury	0.08

TMW-1 (10-12)	
Arsenic	*29.2*
Barium	29.5
Chromium	10.2
Copper	16.3
Lead	4.90
Selenium	3.86

LEGEND:

- GZA 2014/2015 SOIL BORING LOCATIONS
- × GZA 2014/2015 ATTEMPTED SOIL BORING
- CHA RIWP SOIL BORING LOCATIONS
- ● CHA RIWP SURFACE SOIL SAMPLE

ND - NOT DETECTED
SAMPLES COLLECTED BY GZA 2015-2016

SAMPLE RESULTS LISTED IN mg/kg (PPM)
ITALIC RESULTS EXCEED UNRESTRICTED SCOs
BOLD RESULTS EXCEED COMMERCIAL SCOs

0 60 120
Scale in feet

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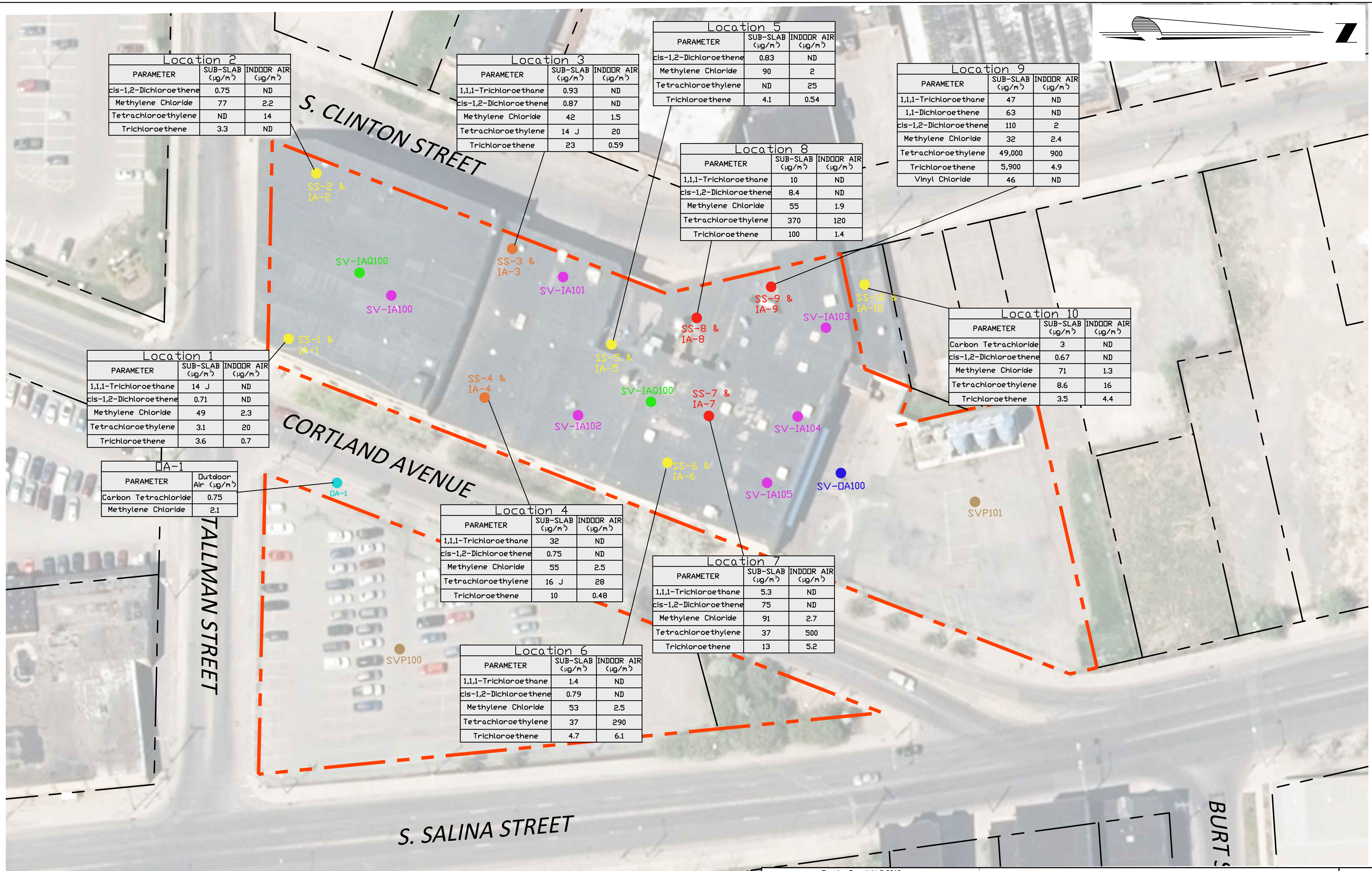
HISTORIC SOIL BORING LOCATIONS - METALS ONLY

PROJECT NO. 33525
DATE: 01/2018
FIGURE 6

File: V:\PROJECTS\ANY\K4\33525\CADD_ACAD\ENVP\FIGURE 6 - FORMER COYNE TEXTILE FACILITY_METALS.DWG Saved: 3/7/2018 12:15:20 PM Plotted: 3/7/2018 12:27:39 PM Current User: Miller, Samantha LastSavedBy: 4187



Location 1

PARAMETER	SUB-SLAB (μg/m³)	INDOOR AIR (μg/m³)
1,1,1-Trichloroethane	14 J	ND
cis-1,2-Dichloroethene	0.71	ND
Methylene Chloride	49	2.3
Tetrachloroethylene	3.1	20
Trichloroethene	3.6	0.7

Location 2

PARAMETER	SUB-SLAB (μg/m³)	INDOOR AIR (μg/m³)
cis-1,2-Dichloroethene	0.75	ND
Methylene Chloride	77	2.2
Tetrachloroethylene	ND	14
Trichloroethene	3.3	ND

Location 3

PARAMETER	SUB-SLAB (μg/m³)	INDOOR AIR (μg/m³)
1,1,1-Trichloroethane	0.93	ND
cis-1,2-Dichloroethene	0.87	ND
Methylene Chloride	42	1.5
Tetrachloroethylene	14 J	20
Trichloroethene	23	0.59

Location 4

PARAMETER	SUB-SLAB (μg/m³)	INDOOR AIR (μg/m³)
1,1,1-Trichloroethane	32	ND
cis-1,2-Dichloroethene	0.75	ND
Methylene Chloride	55	2.5
Tetrachloroethylene	16 J	28
Trichloroethene	10	0.48

Location 5

PARAMETER	SUB-SLAB (μg/m³)	INDOOR AIR (μg/m³)
cis-1,2-Dichloroethene	0.83	ND
Methylene Chloride	90	2
Tetrachloroethylene	ND	25
Trichloroethene	4.1	0.54

Location 6

PARAMETER	SUB-SLAB (μg/m³)	INDOOR AIR (μg/m³)
1,1,1-Trichloroethane	1.4	ND
cis-1,2-Dichloroethene	0.79	ND
Methylene Chloride	53	2.5
Tetrachloroethylene	37	290
Trichloroethene	4.7	6.1

Location 7

PARAMETER	SUB-SLAB (μg/m³)	INDOOR AIR (μg/m³)
1,1,1-Trichloroethane	5.3	ND
cis-1,2-Dichloroethene	75	ND
Methylene Chloride	91	2.7
Tetrachloroethylene	37	500
Trichloroethene	13	5.2

Location 8

PARAMETER	SUB-SLAB (μg/m³)	INDOOR AIR (μg/m³)
1,1,1-Trichloroethane	10	ND
cis-1,2-Dichloroethene	8.4	ND
Methylene Chloride	55	1.9
Tetrachloroethylene	370	120
Trichloroethene	100	1.4

Location 9

PARAMETER	SUB-SLAB (μg/m³)	INDOOR AIR (μg/m³)
1,1,1-Trichloroethane	47	ND
1,1-Dichloroethene	63	ND
cis-1,2-Dichloroethene	110	2
Methylene Chloride	32	2.4
Tetrachloroethylene	49,000	900
Trichloroethene	5,900	4.9
Vinyl Chloride	46	ND

Location 10

PARAMETER	SUB-SLAB (μg/m³)	INDOOR AIR (μg/m³)
Carbon Tetrachloride	3	ND
cis-1,2-Dichloroethene	0.67	ND
Methylene Chloride	71	1.3
Tetrachloroethylene	8.6	16
Trichloroethene	3.5	4.4

OA-1

PARAMETER	Outdoor Air (μg/m³)
Carbon Tetrachloride	0.75
Methylene Chloride	2.1

LEGEND:

●	GZA 2015 SUB-SLAB SOIL VAPOR (TPA)
●	GZA 2015 SUB-SLAB SOIL VAPOR (MONITOR)
●	GZA 2015 SUB-SLAB SOIL VAPOR (MITIGATE)
●	GZA 2015 OUTDOOR AIR
●	CHA RIWP SUB-SLAB INDOOR AIR
●	CHA RIWP SOIL VAPOR POINT
●	CHA RIWP OUTDOOR AIR
●	CHA RIWP Indoor Air Quality

SAMPLES COLLECTED BY GZA 2015-2016

0 60 120
Scale in feet

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HISTORIC SOIL VAPOR LOCATIONS

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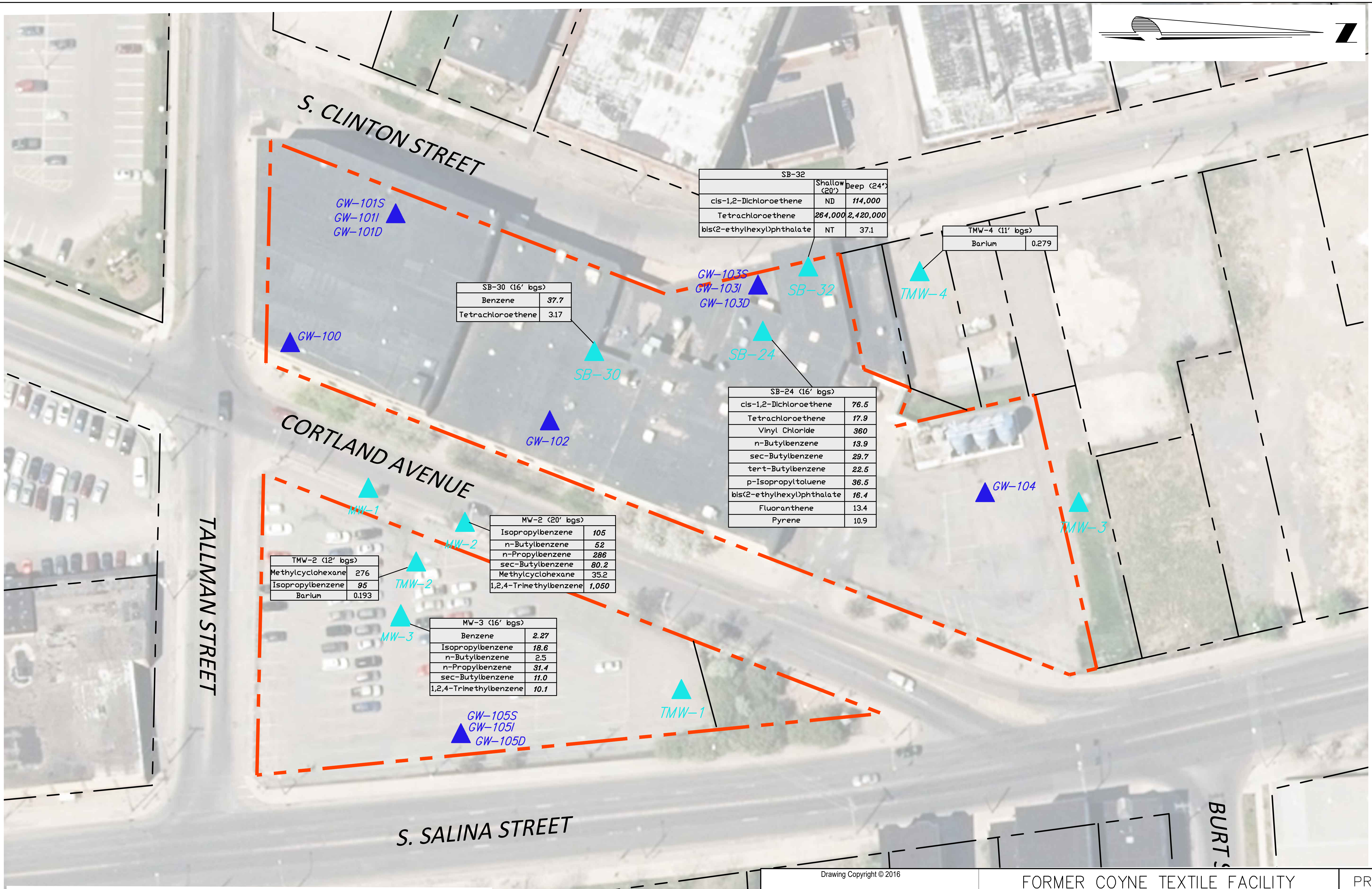
DATE: 01/2018

FIGURE 7

File: V:\PROJECTS\ANY\K4\33525\CADD_ACAD\ENVP\FORMER COYNE TEXTILE FACILITY_INDIVIDUAL CONTAMINANTS.DWG Saved: 1/26/2018 3:55:26 PM Plotted: 1/26/2018 3:55:37 PM Current User: Miller, Samantha LastSavedBy: 4187



SB-32		
	Shallow (20')	Deep (24')
cis-1,2-Dichloroethene	ND	*114,000*
Tetrachloroethene	*264,000*	*2,420,000*
bis(2-ethylhexyl)phthalate	NT	37.1

TMW-4 (11' bgs)	
Barium	0.279

SB-30 (16' bgs)	
Benzene	*37.7*
Tetrachloroethene	3.17

SB-24 (16' bgs)	
cis-1,2-Dichloroethene	*76.5*
Tetrachloroethene	*17.9*
Vinyl Chloride	*360*
n-Butylbenzene	*13.9*
sec-Butylbenzene	*29.7*
tert-Butylbenzene	*22.5*
p-Isopropyltoluene	*36.5*
bis(2-ethylhexyl)phthalate	*16.4*
Fluoranthene	13.4
Pyrene	10.9

MW-2 (20' bgs)	
Isopropylbenzene	*105*
n-Butylbenzene	*52*
n-Propylbenzene	*286*
sec-Butylbenzene	*80.2*
Methylcyclohexane	35.2
1,2,4-Trimethylbenzene	*1,050*

TMW-2 (12' bgs)	
Methylcyclohexane	276
Isopropylbenzene	*95*
Barium	0.193

MW-3 (16' bgs)	
Benzene	*2.27*
Isopropylbenzene	*18.6*
n-Butylbenzene	2.5
n-Propylbenzene	*31.4*
sec-Butylbenzene	*11.0*
1,2,4-Trimethylbenzene	*10.1*

LEGEND:

▲ GZA 2014/2015 GROUNDWATER WELL LOCATION	NT - NOT TESTED
▲ CHA RIWP GROUNDWATER WELL LOCATION	SAMPLE RESULTS ARE LISTED IN $\mu g/m^3$ (ppb)
SAMPLES COLLECTED BY GZA 2015-2016	*ITALIC* ITEMS EXCEED TOGS 1.1.1 CLASS GA LIMITATIONS

0 60 120
Scale in feet

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HISTORIC GROUNDWATER MONITORING
WELL LOCATIONS

PROJECT NO.
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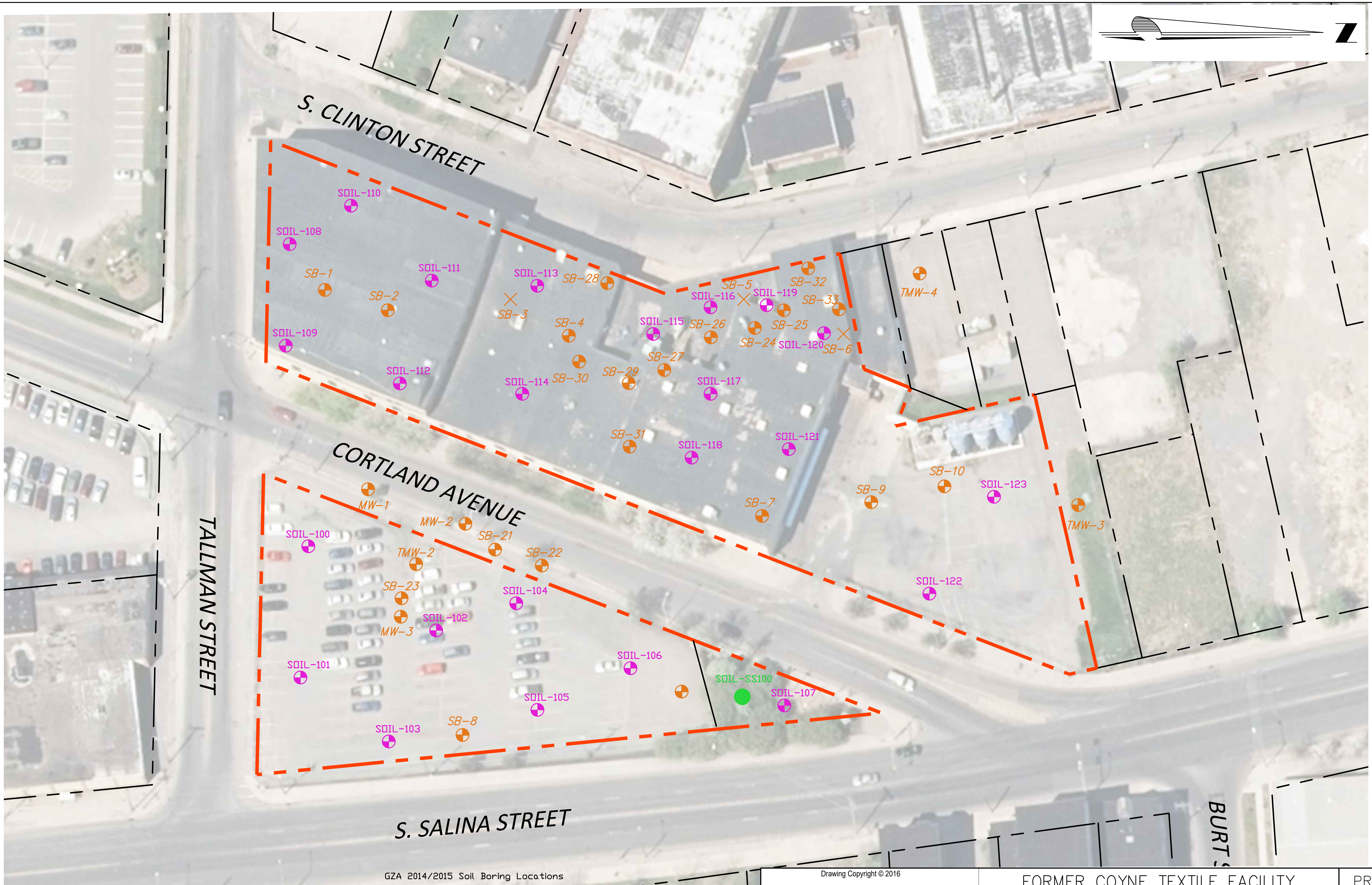
DATE: 01/2018

FIGURE 8

File: V:\PROJECTS\ANY\K4\33525\CADD_ACAD\ENVP\FIGURE 8 - FORMER COYNE TEXTILE FACILITY_GROUNDWATER.DWG Saved: 3/7/2018 12:24:21 PM Plotted: 3/7/2018 12:27:58 PM Current User: Miller, Samantha LastSavedBy: 4187



LEGEND:

● GZA 2014/2015 Soil Boring Locations
× GZA 2014/2015 Attempted Soil Boring
● CHA 2017 RI Soil Boring Locations
● CHA 2017 RI Surface Soil Sample Location

0 60 120
Scale in feet

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PROPOSED SOIL BORING
LOCATION MAP

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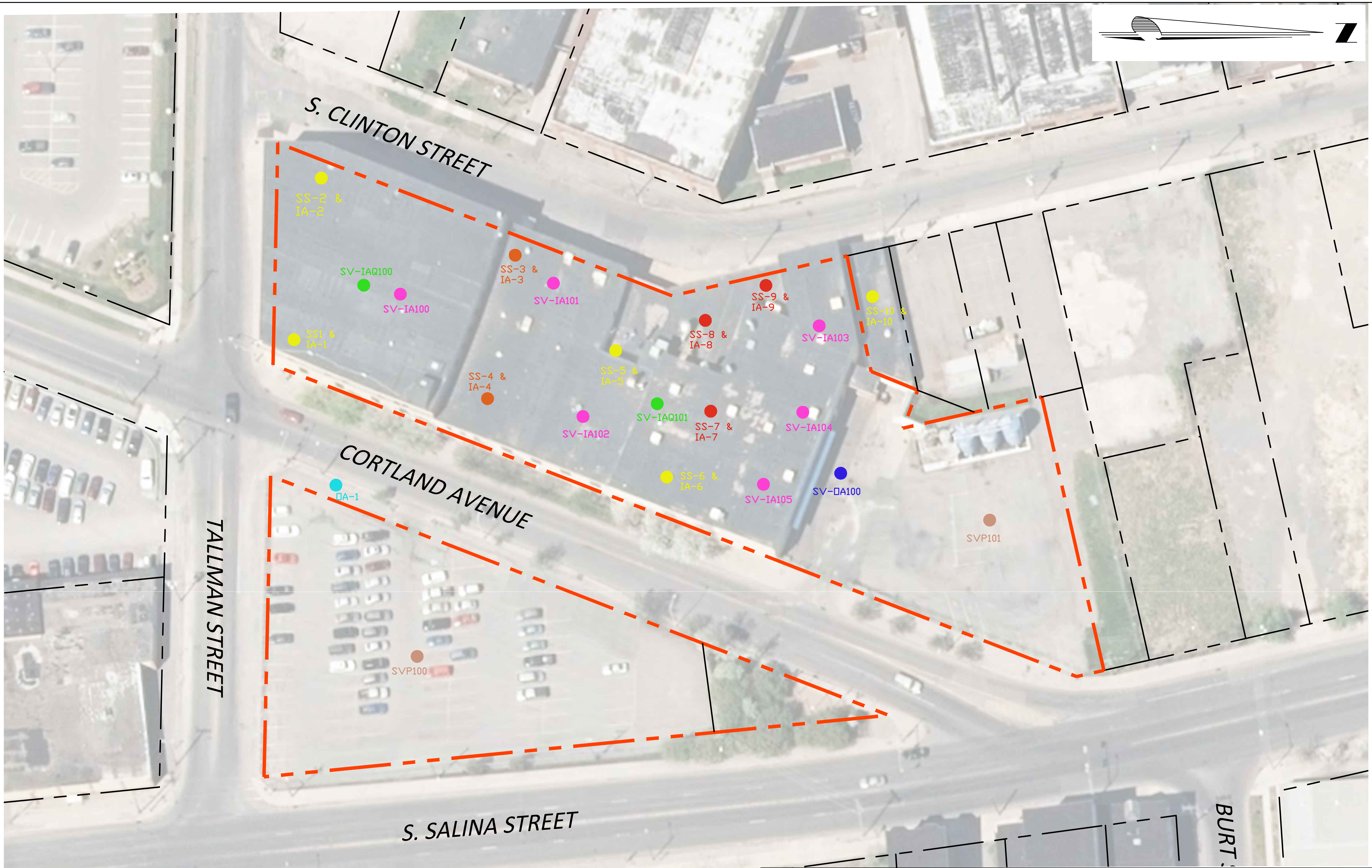
FIGURE 9

File: V:\PROJECTS\ANY\K4\33525\CADD_ACAD\ENVP\PROPOSED SOIL BORING LOCATION MAP.DWG Saved: 1/22/2018 10:05:29 AM Plotted: 1/22/2018 10:05:19 AM Current User: Miller, Samantha LastSavedBy: 4187



LEGEND:
- ● GZA 2015 Sub-Slab Soil Vapor (TPA)
- ● GZA 2015 Sub-Slab Soil Vapor (Monitor)
- ● GZA 2015 Sub-Slab Soil Vapor (Mitigate)
- ● GZA 2015 Outdoor Air
- ● CHA 2017 RI Sub-Slab Indoor Air
- ● CHA 2017 RI Outdoor Air
- ● CHA 2017 RI Soil Vapor Point
- ● CHA 2017 RI Indoor Air Quality

0 60 120
Scale in feet

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PROPOSED SOIL VAPOR INTRUSION
SAMPLE LOCATION MAP

PROJECT NO.
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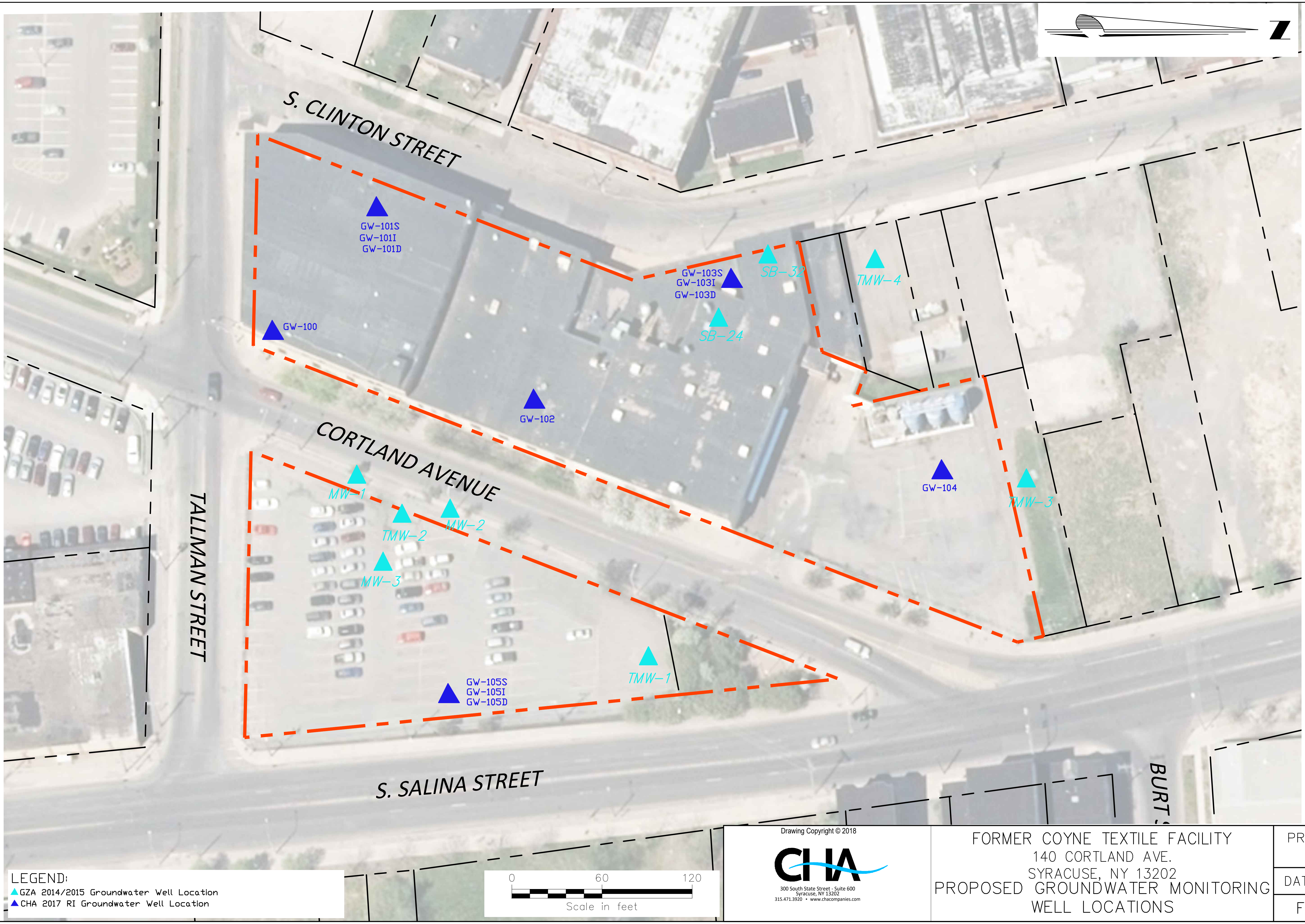
DATE: 01/2018

FIGURE 10

File: V:\PROJECTS\ANY\K4\33525\CADD_ACAD\ENVP\PROPOSED SOIL VAPOR LOCATIONS.DWG Saved: 1/26/2018 3:50:59 PM Plotted: 1/26/2018 3:51:14 PM Current User: Miller, Samantha LastSavedBy: 4187



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PROPOSED GROUNDWATER MONITORING
WELL LOCATIONS

PROJECT NO.
33525

DATE: 01/2018

FIGURE 11

File: V:\PROJECTS\ANY\K4\33525\CADD_ACAD\ENVP\PROPOSED MONITORING WELL LOCATION MAP.DWG Saved: 1/22/2018 12:26:13 PM Plotted: 1/22/2018 12:26:36 PM Current User: Miller, Samantha LastSavedBy: 4187

TABLES

Table 1 - Historical Soil Analytical Testing Results Summary
Detected Compounds Only

	Part 375 Unrestricted Use SCOs	Part 375 Commercial Use SCOs	Units	Phase II										
				SB-1	SB-2	SB-4	SB-7	SB-8	SB-9	SB-10	TMW-1	TMW-2	TMW-3	TMW-4
				10-12	12-14	14-16	0-2	0-4	8-10	9-11	10-12	6-8	6-8	9-11
Volatile Organic Compounds														
1,1,2-Trichloroethane	NV	NV	µg/kg	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,2-Dichlorobenzene	1,100	1,000,000	µg/kg	ND	ND	248	ND	ND	ND	ND	ND	ND	ND	ND
1,2,4-Trimethylbenzene	3,600	380,000	µg/kg	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,3,5-Trimethylbenzene	8,400	380,000	µg/kg	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
2-Butanone (MEK)	120	1,000,000	µg/kg	*204*	86.3	ND	ND	ND	ND	ND	ND	ND	ND	62.5
Acetone	50	1,000,000	µg/kg	*1,030*	*371*	ND	ND	ND	ND	*87.6*	*62.4*	ND	ND	*305*
Benzene	60	89,000	µg/kg	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Carbon Disulfide	NV	NV	µg/kg	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
cis-1,2-Dichloroethene	250	1,000,000	µg/kg	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Cyclohexane	*NV*	*NV*	µg/kg	*ND*	*ND*	*ND*	*ND*	*ND*	*ND*	*ND*	*ND*	*ND*	*ND*	*ND*
Ethyl Benzene	1,000	780,000	µg/kg	ND	15.1	620	ND	ND	ND	ND	ND	ND	ND	ND
Isopropylbenzene	2,300	NV	µg/kg	ND	ND	*2,330*	ND	ND	ND	ND	ND	797	ND	ND
m&p-Xylene	260	1,000,000	µg/kg	ND	47.2	*1,460*	ND	ND	ND	ND	ND	ND	ND	ND
Methylcyclohexane	NV	NV	µg/kg	ND	ND	1,760	ND	ND	ND	ND	ND	443	ND	48
Naphthalene	12,000	1,000,000	µg/kg	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
n-Butylbenzene	12,000	1,000,000	µg/kg	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
n-Propylbenzene	3,900	1,000,000	µg/kg	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
p-Isopropyltoluene	NV	NV	µg/kg	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
sec-Butylbenzene	11,000	1,000,000	µg/kg	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
tert-Butylbenzene	5,900	1,000,000	µg/kg	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Tetrachloroethene (PCE)	1,300	300,000	µg/kg	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Trichloroethene (TCE)	470	400,000	µg/kg	ND	ND	ND	ND	8.34	ND	ND	ND	ND	ND	ND
Vinyl Chloride	20	27,000	µg/kg	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Total VOCs	NV	NV	µg/kg	1,234	519.6	6,418	ND	8.3	ND	87.6	62.4	1,240	ND	415.5

Notes:

Samples were collected by GZA geoEnvironmental of New York in 2014 & 2015

Analytical testing was completed by Paradigm Environmental Services in Rochester, NY

Italic values exceed 6NYCRR Part 375 Unrestricted Use SCOs

Bold values exceed 6NYCRR Part 375 Commercial Use SCOs

E - Result has been estimated, calibration limit exceeded.

M - Laboratory qualifier. Matrix spike recoveries outside QC limits. Matrix bias indicated.

ND - not detected above laboratory detection limits

NT - not tested

NV - no value

Table 1 - Historical Soil Analytical Testing Results Summary
Detected Compounds Only

	Part 375 Unrestricted Use SCOs	Part 375 Commercial Use SCOs	Units	Phase II										
				SB-1	SB-2	SB-4	SB-7	SB-8	SB-9	SB-10	TMW-1	TMW-2	TMW-3	TMW-4
				10-12	12-14	14-16	0-2	0-4	8-10	9-11	10-12	6-8	6-8	9-11
Semi-Volatile Organic Compounds														
1-Methylnaphthalene	NV	NV	µg/kg	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Acenaphthene	20,000	500,000	µg/kg	ND	ND	ND	1,330	937M	ND	ND	ND	ND	ND	ND
Acenaphthylene	100,000	500,000	µg/kg	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Anthracene	100,000	500,000	µg/kg	ND	ND	ND	3,110	2,240	ND	ND	ND	ND	ND	ND
Benzo[a]anthracene	1,000	5,600	µg/kg	ND	376	ND	*5,510*	*4,330*	ND	ND	ND	ND	ND	ND
Benzo[a]pyrene	100	1,000	µg/kg	ND	ND	ND	*4,490*	*3,760*	ND	ND	ND	ND	ND	ND
Benzo[b]fluoranthene	1,000	5,600	µg/kg	ND	ND	ND	*4,540*	*3,640*	ND	ND	ND	ND	ND	ND
Benzo[g,h,i]perylene	100,000	500,000	µg/kg	ND	ND	ND	2,470	2,300	ND	ND	ND	ND	ND	ND
Benzo[k]fluoranthene	800	56,000	µg/kg	ND	ND	ND	*3,310*	*2,790*	ND	ND	ND	ND	ND	ND
bis(2-Ethylhexyl)Phthalate	NV	NV	µg/kg	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Carbazole	NV	NV	µg/kg	ND	ND	ND	1,640	690	ND	ND	ND	ND	ND	ND
Chrysene	1,000	56,000	µg/kg	ND	ND	ND	*5,080*	*4,080*	ND	ND	ND	ND	ND	ND
Dibenz(a,h)anthracene	330	560	µg/kg	ND	ND	ND	**882**	**746**	ND	ND	ND	ND	ND	ND
Dibenzofuran	NV	NV	µg/kg	ND	ND	ND	1,120	653	ND	ND	ND	ND	ND	ND
Fluoranthene	100,000	500,000	µg/kg	ND	827	ND	11,500	9,460	ND	ND	ND	ND	769	ND
Fluorene	30,000	500,000	µg/kg	ND	ND	ND	1,450	944	ND	ND	ND	ND	ND	ND
Indeno[1,2,3-cd]pyrene	500	5,600	µg/kg	ND	ND	ND	*3,210*	*2,860*	ND	ND	ND	ND	ND	ND
Isophorone	NV	NV	µg/kg	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Naphthalene	12,000	500,000	µg/kg	ND	ND	2,870	1,210	ND	ND	ND	ND	ND	ND	ND
Phenanthrene	100,000	500,000	µg/kg	ND	1,030	ND	11,400	8,140	ND	ND	ND	ND	561	ND
Pyrene	100,000	500,000	µg/kg	ND	664	ND	8,770	7,260	ND	ND	ND	ND	624	ND
Total SVOCs	NV	NV	µg/kg	ND	2,897	2,870	71,022	54,830	ND	ND	ND	ND	1,954	ND

Notes:

Samples were collected by GZA geoEnvironmental of New York in 2014 & 2015

Analytical testing was completed by Paradigm Environmental Services in Rochester, NY

Italic values exceed 6NYCRR Part 375 Unrestricted Use SCOs

Bold values exceed 6NYCRR Part 375 Commercial Use SCOs

E - Result has been estimated, calibration limit exceeded.

M - Laboratory qualifier. Matrix spike recoveries outside QC limits. Matrix bias indicated.

ND - not detected above laboratory detection limits

NT - not tested

NV - no value

Table 1 - Historical Soil Analytical Testing Results Summary
Detected Compounds Only

	Part 375 Unrestricted Use SCOs	**Part 375 Commercial Use SCOs**	**Units**	**Phase II**										
				SB-1	**SB-2**	**SB-4**	**SB-7**	**SB-8**	**SB-9**	**SB-10**	**TMW-1**	**TMW-2**	**TMW-3**	**TMW-4**
				10-12	**12-14**	**14-16**	**0-2**	**0-4**	**8-10**	**9-11**	**10-12**	**6-8**	**6-8**	**9-11**
Metals														
Arsenic	13	16	mg/kg	ND	6.48	9.51	6.7	7.19	*13.4*	4.99	**29.2**	5.98	6.94	**247**
Barium	350	10,000	mg/kg	52.9	41.5	62.6	141	110	50.7	47	29.5	51.5	107	151
Cadmium	2.5	60	mg/kg	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Chromium	30	6,800	mg/kg	14.4	4.38	7.03	18.6	15.7	14.8	13.3	10.2	12.9	14.3	9.58
Copper	50	10,000	mg/kg	21.2	4.47	NT	NT	58.5	23.7	16.8	16.3	36.6	18.8	NT
Lead	63	3,900	mg/kg	9.61	1.58	2.98	*304*	*98*	*70.7*	8.59	4.9	187	14.1	5.7
Selenium	3.9	6,800	mg/kg	2	*8.27*	2.29	ND	ND	1.28	ND	3.86	ND	ND	ND
Silver	36	6,800	mg/kg	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Mercury	0.18	5.7	mg/kg	0.0487	ND	ND	*0.437*	0.0805	ND	0.0903	ND	**1.09**	*0.414*	0.0579

Notes:

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Analytical testing was completed by Paradigm Environmental Services in Rochester, NY

Italic values exceed 6NYCRR Part 375 Unrestricted Use SCOs

Bold values exceed 6NYCRR Part 375 Commercial Use SCOs

E - Result has been estimated, calibration limit exceeded.

M - Laboratory qualifier. Matrix spike recoveries outside QC limits. Matrix bias indicated.

ND - not detected above laboratory detection limits

NT - not tested

NV - no value

Table 1 - Historical Soil Analytical Testing Results Summary
Detected Compounds Only

	Part 375 Unrestricted Use SCOs	**Part 375 Commercial Use SCOs**	**Units**	**Phase III**											
				SB-21	**SB-23**	**SB-24**	**SB-25**	**SB-26**	**SB-27**	**SB-28**	**SB-30**	**SB-31**	**SB-32**	**SB-32**	**SB-33**
				4-8	**6-8**	**6-8**	**6-8**	**12-16**	**16-18**	**16-18**	**14-16**	**14-16**	**4-8**	**8-12**	**12-16**
Volatile Organic Compounds															
1,1,2-Trichloroethane	NV	NV	µg/kg	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,2-Dichlorobenzene	1,100	1,000,000	µg/kg	ND	ND	ND	ND	169	ND	ND	ND	ND	ND	ND	ND
1,2,4-Trimethylbenzene	3,600	380,000	µg/kg	ND	1,270	ND	64.8	108	319	ND	ND	ND	ND	ND	ND
1,3,5-Trimethylbenzene	8,400	380,000	µg/kg	ND	178	ND	29.2	ND	ND	ND	ND	ND	ND	ND	ND
2-Butanone (MEK)	120	1,000,000	µg/kg	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Acetone	50	1,000,000	µg/kg	ND	976	ND	229	ND	ND	793	76.9	83.2	ND	ND	60.6
Benzene	60	89,000	µg/kg	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Carbon Disulfide	NV	NV	µg/kg	ND	ND	ND	ND	ND	ND	ND	20.8	ND	ND	ND	ND
cis-1,2-Dichloroethene	250	1,000,000	µg/kg	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	**1,660,000**	ND
Cyclohexane	*NV*	*NV*	µg/kg	*ND*	*ND*	*ND*	*ND*	*329*	*ND*	*ND*	*ND*	*ND*	*ND*	*ND*	*ND*
Ethyl Benzene	1,000	780,000	µg/kg	ND	88.9	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Isopropylbenzene	2,300	NV	µg/kg	7,880	5,670	ND	64.6	1,020	2,440	649	ND	ND	ND	ND	ND
m&p-Xylene	260	1,000,000	µg/kg	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Methylcyclohexane	NV	NV	µg/kg	21,900	466	ND	ND	1,200	583	ND	ND	ND	ND	ND	ND
Naphthalene	12,000	1,000,000	µg/kg	ND	ND	ND	ND	5,320	2,460	321	ND	ND	ND	ND	ND
n-Butylbenzene	12,000	1,000,000	µg/kg	19,700	2,140	ND	36	1,820	2,530	1,060	ND	ND	ND	ND	ND
n-Propylbenzene	3,900	1,000,000	µg/kg	19,900	10,400 E	ND	56.2	2,310	4,680	1,450	ND	ND	ND	ND	ND
p-Isopropyltoluene	NV	NV	µg/kg	ND	ND	ND	ND	ND	180	ND	ND	ND	ND	ND	ND
sec-Butylbenzene	11,000	1,000,000	µg/kg	14,400	4,980	138	282	1,440	3,050	1,220	ND	ND	ND	ND	ND
tert-Butylbenzene	5,900	1,000,000	µg/kg	2,940	926	113	144	113	212	ND	ND	ND	ND	ND	ND
Tetrachloroethene (PCE)	1,300	300,000	µg/kg	ND	ND	66.9	40.4	197	ND	166	44	123	**7,150,000**	**74,200**	73
Trichloroethene (TCE)	470	400,000	µg/kg	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Vinyl Chloride	20	27,000	µg/kg	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	**59,800**	ND
Total VOCs	NV	NV	µg/kg	86,720	27,095	318	946	14,026	16,454	5,659	142	206	7,150,000	1,794,000	134

Notes:

Samples were collected by GZA geoEnvironmental of New York in 2014 & 2015

Analytical testing was completed by Paradigm Environmental Services in Rochester, NY

Italic values exceed 6NYCRR Part 375 Unrestricted Use SCOs

Bold values exceed 6NYCRR Part 375 Commercial Use SCOs

E - Result has been estimated, calibration limit exceeded.

M - Laboratory qualifier. Matrix spike recoveries outside QC limits. Matrix bias indicated.

ND - not detected above laboratory detection limits

NT - not tested

NV - no value

Table 1 - Historical Soil Analytical Testing Results Summary
Detected Compounds Only

	Part 375 Unrestricted Use SCOs	Part 375 Commercial Use SCOs	Units	Phase III											
				SB-21	SB-23	SB-24	SB-25	SB-26	SB-27	SB-28	SB-30	SB-31	SB-32	SB-32	SB-33
				4-8	6-8	6-8	6-8	12-16	16-18	16-18	14-16	14-16	4-8	8-12	12-16
Semi-Volatile Organic Compounds															
1-Methylnaphthalene	NV	NV	µg/kg	12,100	1,600	ND	ND	1,660	ND	ND	ND	ND	ND	ND	ND
Acenaphthene	20,000	500,000	µg/kg	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Acenaphthylene	100,000	500,000	µg/kg	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Anthracene	100,000	500,000	µg/kg	ND	ND	ND	518	ND	ND	ND	ND	ND	ND	ND	ND
Benzo[a]anthracene	1,000	5,600	µg/kg	ND	ND	ND	**1,220**	ND	ND	ND	ND	ND	370	566	ND
Benzo[a]pyrene	100	1,000	µg/kg	ND	ND	ND	**1,180**	ND	ND	ND	ND	ND	397	588	ND
Benzo[b]fluoranthene	1,000	5,600	µg/kg	ND	ND	ND	**1,230**	ND	ND	ND	ND	ND	649	622	ND
Benzo[g,h,i]perylene	100,000	500,000	µg/kg	ND	ND	ND	650	ND	ND	ND	ND	ND	496	ND	ND
Benzo[k]fluoranthene	800	56,000	µg/kg	ND	ND	ND	688	ND	ND	ND	ND	ND	ND	ND	ND
bis(2-Ethylhexyl)Phthalate	NV	NV	µg/kg	ND	ND	522	1,400	ND	ND	ND	ND	ND	526	ND	ND
Carbazole	NV	NV	µg/kg	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Chrysene	1,000	56,000	µg/kg	828	419	ND	**1,130**	ND	ND	ND	ND	ND	ND	571	ND
Dibenz(a,h)anthracene	330	560	µg/kg	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Dibenzofuran	NV	NV	µg/kg	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Fluoranthene	100,000	500,000	µg/kg	1,670	656	731	2,470	ND	ND	ND	ND	ND	547	1080	ND
Fluorene	30,000	500,000	µg/kg	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Indeno[1,2,3-cd]pyrene	500	5,600	µg/kg	ND	ND	ND	**928**	ND	ND	ND	ND	ND	**545**	**540**	ND
Isophorone	NV	NV	µg/kg	955	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Naphthalene	12,000	500,000	µg/kg	ND	ND	ND	ND	401	1,130	ND	ND	ND	ND	ND	ND
Phenanthrene	100,000	500,000	µg/kg	1,630	595	ND	1,690	686	ND	ND	ND	ND	ND	554	ND
Pyrene	100,000	500,000	µg/kg	1,780	758	610	2,100 M	ND	ND	ND	ND	ND	486	872	ND
Total SVOCs	NV	NV	µg/kg	18,963	4,028	1,863	15,204	2,747	1,130	ND	ND	ND	ND	ND	ND

Notes:

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Table 1 - Historical Soil Analytical Testing Results Summary
Detected Compounds Only

	Part 375 Unrestricted Use SCOs	Part 375 Commercial Use SCOs	Units	Phase III				
				MW-1	MW-2	MW-2	M-3	MW-3 (Coal)
				4-8	4-8	16-20	6-8	5-5.5
Volatile Organic Compounds								
1,1,2-Trichloroethane	NV	NV	µg/kg	ND	ND	125.0	ND	ND
1,2-Dichlorobenzene	1,100	1,000,000	µg/kg	ND	ND	ND	ND	ND
1,2,4-Trimethylbenzene	3,600	380,000	µg/kg	ND	*29,500* E	559.0	*38,300* E	*4,420*
1,3,5-Trimethylbenzene	8,400	380,000	µg/kg	ND	ND	ND	*20,200* E	1,460
2-Butanone (MEK)	120	1,000,000	µg/kg	ND	ND	ND	ND	ND
Acetone	50	1,000,000	µg/kg	*86.7*	*922*	*114*	ND	ND
Benzene	60	89,000	µg/kg	ND	ND	47.5	ND	ND
Carbon Disulfide	NV	NV	µg/kg	ND	ND	61.6	ND	ND
cis-1,2-Dichloroethene	250	1,000,000	µg/kg	ND	ND	ND	ND	ND
Cyclohexane	*NV*	*NV*	µg/kg	*ND*	*1,180*	*155*	*ND*	*ND*
Ethyl Benzene	1,000	780,000	µg/kg	ND	ND	ND	398	ND
Isopropylbenzene	2,300	NV	µg/kg	ND	7,170	280	4,070	3,110
m&p-Xylene	260	1,000,000	µg/kg	ND	ND	20.9	308	ND
Methylcyclohexane	NV	NV	µg/kg	ND	6,450	278	522	421
Naphthalene	12,000	1,000,000	µg/kg	ND	ND	ND	400	ND
n-Butylbenzene	12,000	1,000,000	µg/kg	ND	8,130	70.1	5,630	2,610
n-Propylbenzene	3,900	1,000,000	µg/kg	ND	19,600 E	391	*12,200* E	*6,470*
p-Isopropyltoluene	NV	NV	µg/kg	ND	1,250	22.8	2,030	ND
sec-Butylbenzene	11,000	1,000,000	µg/kg	ND	7,410	87.6	6,210	6,350
tert-Butylbenzene	5,900	1,000,000	µg/kg	ND	1,120	34.3	858	974
Tetrachloroethene (PCE)	1,300	300,000	µg/kg	ND	ND	ND	ND	ND
Trichloroethene (TCE)	470	400,000	µg/kg	ND	ND	ND	ND	ND
Vinyl Chloride	20	27,000	µg/kg	ND	ND	ND	ND	ND
Total VOCs	NV	NV	µg/kg	87	82,732	2,122	91,126	74,915

Notes:

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Italic values exceed 6NYCRR Part 375 Unrestricted Use SCOs

Bold values exceed 6NYCRR Part 375 Commercial Use SCOs

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M - Laboratory qualifier. Matrix spike recoveries outside QC limits. Matrix bias indicated.

ND - not detected above laboratory detection limits

NT - not tested

NV - no value

Table 1 - Historical Soil Analytical Testing Results Summary
Detected Compounds Only

	Part 375 Unrestricted Use SCOs	Part 375 Commercial Use SCOs	Units	Phase III				
				MW-1	MW-2	MW-2	M-3	MW-3 (Coal)
				4-8	4-8	16-20	6-8	5-5.5
Semi-Volatile Organic Compounds								
1-Methylnaphthalene	NV	NV	µg/kg	ND	ND	ND	2,110	1,170
Acenaphthene	20,000	500,000	µg/kg	ND	ND	ND	ND	ND
Acenaphthylene	100,000	500,000	µg/kg	ND	ND	ND	ND	ND
Anthracene	100,000	500,000	µg/kg	ND	ND	ND	2,190	ND
Benzo[a]anthracene	1,000	5,600	µg/kg	ND	ND	ND	**3,790**	ND
Benzo[a]pyrene	100	1,000	µg/kg	ND	ND	ND	**3,230**	ND
Benzo[b]fluoranthene	1,000	5,600	µg/kg	ND	ND	ND	**3,070**	ND
Benzo[g,h,i]perylene	100,000	500,000	µg/kg	ND	ND	ND	ND	ND
Benzo[k]fluoranthene	800	56,000	µg/kg	ND	ND	ND	**2,110**	ND
bis(2-Ethylhexyl)Phthalate	NV	NV	µg/kg	ND	ND	ND	ND	ND
Carbazole	NV	NV	µg/kg	ND	ND	ND	ND	ND
Chrysene	1,000	56,000	µg/kg	ND	ND	ND	**3,370**	460
Dibenz(a,h)anthracene	330	560	µg/kg	ND	ND	ND	ND	ND
Dibenzofuran	NV	NV	µg/kg	ND	ND	ND	ND	ND
Fluoranthene	100,000	500,000	µg/kg	382	564	ND	8,680	739
Fluorene	30,000	500,000	µg/kg	ND	ND	ND	ND	ND
Indeno[1,2,3-cd]pyrene	500	5,600	µg/kg	ND	ND	ND	**2,400**	ND
Isophorone	NV	NV	µg/kg	ND	ND	ND	ND	ND
Naphthalene	12,000	500,000	µg/kg	ND	ND	ND	ND	346
Phenanthrene	100,000	500,000	µg/kg	ND	929	ND	7,660	1,020
Pyrene	100,000	500,000	µg/kg	ND	545	ND	6,810	690
Total SVOCs	NV	NV	µg/kg	382	2,038	ND	45,420	4,425

Notes:

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Analytical testing was completed by Paradigm Environmental Services in Rochester, NY

Italic values exceed 6NYCRR Part 375 Unrestricted Use SCOs

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M - Laboratory qualifier. Matrix spike recoveries outside QC limits. Matrix bias indicated.

ND - not detected above laboratory detection limits

NT - not tested

NV - no value

Table 2 - Historical Soil Vapor Intrusion Air Analytical Testing Results Summary

Detected Compounds Only

	Location 1		Location 2		Location 3		Location 4		Location 5		Location 6		Location 7		Location 8		Location 9		Location 10		
	Sub-slab	**Indoor Air**	**Sub-slab**	**Indoor Air**	**Sub-slab**	**Indoor Air**	**Sub-slab**	**Indoor Air**	**Sub-slab**	**Indoor Air**	**Sub-slab**	**Indoor Air**	**Sub-slab**	**Indoor Air**	**Sub-slab**	**Indoor Air**	**Sub-slab**	**Indoor Air**	**Sub-slab**	**Indoor Air**	**Outdoor Air**
1,1,1-Trichloroethane	*14* J	ND	ND	ND	*0.93*	ND	*32*	ND	ND	ND	*1.4*	ND	*5.3*	ND	*10*	ND	*47*	ND	ND	*ND*	ND
1,1-Dichloroethene	*ND*	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	63	ND	ND	ND	ND
1,2,4-Trimethylbenzene	*14*	77	12	26	13	64	13 J	220	12	99	23	600	34	4,600	16	610	14	5,600	9.3	280	5.2
1,2-Dichloroethane	*ND*	ND	ND	ND	ND	ND	ND	ND	0.49 J	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,3,5-trimethylbenzene	*5.6*	32	5.1	15	5.3	29	7.4	62	6.4	46	16	310	18	2,100	9.2	270	5.9 J	3,800	5.8	120	2.2
1,4-Dioxane	*ND*	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	4 J	ND	ND	ND	ND
2,2,4-trimethylpentane	*2.6*	ND	3.6	0.56	2.1	ND	2.3	ND	3.5	ND	2.4	ND	4.6	ND	2.1	ND	ND	ND	1.4	0.61 J	ND
4-ethyltoluene	*5.4*	34	5.1	18 J	5.2	32	7.7	76	5.7	55	15	340	21	1,800	9	320	5.9 J	3,100	5.3	140	2.2
Acetone	*770*	110	3,700	62	150	110	150	270	170	110	2,500	3,500	260	4,800	150	760	2,600	4,900	170	110	40
Benzene	*2.1*	ND	ND	0.99	2.7	ND	ND	ND	1.1	ND	ND	ND	ND	ND	1.9	ND	ND	ND	ND	ND	0.54
Bromodichloromethane	*ND*	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	1.2	ND	ND	ND	2.9	ND	ND	ND
Carbon Disulfide	*3.4*	2.6	ND	1.3	ND	1.4	1.1	1.7	ND	1.7	2.3	0.56	ND	ND	ND	0.37 J	6.5	0.72	1.7	ND	0.37 J
Carbon tetrachloride	*ND*	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	3	ND	0.75
Chloroform	*1.7*	1.2	0.93	0.59	4.1	1.3	40	1.4	1.1	1.5	14 J	7.1	16	67	14	10	88	150	1.6	4.4	ND
Chloromethane	*1*	1.1	1.6	1.2 J	0.7	1.1	1.1	1.1	ND	0.97	0.97	1	ND	ND	0.7	0.72	ND	0.7	ND	0.74	1
cis-1,2-Dichloroethene	*0.71*	ND	0.75	ND	0.87	ND	0.75	ND	0.83	ND	0.79	ND	75	ND	8.4	ND	110	2	0.67	ND	ND
Cyclohexane	*15*	ND	17	ND	20	ND	14	ND	4.2	ND	25	ND	6.1	ND	29	ND	46	ND	28	ND	ND
Ethyl acetate	*1.8*	6.6	1.7	2.2	1.4	3	1.6	2.8	1.8	2.8	7.1	6.8	5	32 J	1.8	ND	ND	32 J	1.6	0.83 J	ND
Ethylbenzene	*8.2*	8.7	5.6	6.3	6.1	8.7	7.6	13	6.5	13	19	140	26	380	7.2	78	6.9	770	4.6	19	0.65
Freon 11	*1.8*	2.3 J	1.5	2.1	1.6	2 J	1.6	2	1.3	1.9	1.3	1.6	1.5	1.4	1.5	1.2	ND	1.2	1.1	1.1	1.8
Freon 12	*1,100*	6.5	12,000	8.5	46	4.3	4.5	4	3.4	3.4	2.6	2.9	2.4	2.4	2.2	2.1	ND	2.2	2.1	2	4.5
Freon 113	*ND*	0.92	ND	0.92	ND	0.92	ND	0.92 J	ND	0.84 J	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.84 J
Heptane	*16*	5.7 J	12	4.4 J	13	7.2 J	ND	7.1	ND	8.3	36	110	23	180	17	33	54	240	11	8.8	0.98
Hexane	*88*	ND	78	ND	110	ND	55	ND	19	ND	140	ND	ND	ND	130	ND	130	ND	220	ND	1
Isopropyl alcohol	*ND*	38	ND	23	ND	37	ND	49	ND	49	540	1,300	51	1,700	ND	290	41	1,600	ND	42	2.9
m&p-Xylene	*16*	31	17 J	23	14 J	38	20 J	56	19	61	66	310	86	1,100	21	240	21	2,000	17	86	2.4
Methyl Ethyl Ketone	*ND* J	58	ND	36	ND	24	ND	19	ND	23	100	110	59	560	ND	66 J	ND	540	ND	17 J	1.8
Methyl Isobutyl Ketone	*5.4*	2.5	ND	2	13	3.6	12	9.4 J	3.6	7.3	9	39	5	310	12	74	38 J	700 J	6.6	20 J	ND
Methyl tert-butyl ether	*ND*	ND	1.1	ND	1.3	ND	ND	ND	1.6	ND	ND	ND	ND	ND	1.2	ND	ND	ND	ND	ND	ND
Methylene chloride	*49*	*2.3*	*77*	*2.2*	*42*	*1.5*	*55*	*2.5*	*90*	*2*	*53*	*2.5*	*91*	*2.7*	*55*	*1.9*	*32*	*2.4*	*71*	*1.3*	2.1
o-Xylene	8.9	12	7.7	9.4	8.7	14	9.8	24	9.6	22	23	120	32	740	9.6	100	8.2	1,300	7.6	40	1
Styrene	9.5	ND J	8.8	ND	10	ND	9.5	ND	8.5	ND	13	ND	11	ND	7.7	ND	9.4	ND	5.1	ND	ND
Tetrachloroethylene	3.1	**20**	ND	**14**	14 J	**20**	16 J	**28**	ND	**25**	37	**290**	37	500	370	120	49,000	900	8.6	16	ND
Tetrahydrofuran	*ND*	3.8	ND	ND	ND	ND	ND	ND	13	ND	ND	ND	ND	48	ND	ND	ND	ND	ND	ND	ND
Toluene	*13*	35	15	26	14	26	17	40	18	39	63	190	340	760	30	170	44	1,700	22	81	3.7
trans-1,2-Dichloroethene	*ND*	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	22	ND	ND	ND	95	ND	ND	ND	ND
Trichloroethene	*3.6*	*0.7*	*3.3*	ND	23	0.59	10	0.48	*4.1*	*0.54*	*4.7*	*6.1*	13	5.2	100	1.4	5,900	4.9	*3.5*	*4.4*	ND
Vinyl chloride	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	46	ND	ND	ND	ND

Notes:

Samples were collected by GZA geoEnvironmental of New York in 2014 & 2015

Analytical testing was completed by Centek Laboratory in Syracuse, NY

Compounds are subject to NYSDOH decision matrices

Results are displayed in µg/m³

Italic - No Further Action

🟧 Monitor

🟥 Mitigate

Table 3 - Historical Groundwater Analytical Testing Results Summary
Detected Compounds Only

	NYSDEC Class GA Criteria	**Units**	**Phase II**		**Phase III**					
			TMW-2	**TMW-4**	**SB-24**	**SB-30**	**SB-32 Shallow**	**SB-32 Deep**	**MW-2**	**M-3**
Volatile Organic Compounds										
Benzene	1	µg/L	ND	ND	ND	**37.7**	ND	ND	ND	**2.27**
cis-1,2-Dichloroethene	5	µg/L	ND	ND	**76.5**	ND	ND	**114,000**	ND	ND
Trichloroethene	5	µg/L	ND	ND	ND	ND	ND	ND	ND	ND
Tetrachloroethene	5	µg/L	ND	ND	**17.9**	3.17	**264,000**	**2,420,000**	ND	ND
Vinyl Chloride	2	µg/L	ND	ND	**360**	ND	ND	ND	ND	ND
Isopropylbenzene	5	µg/L	**95**	ND	ND	ND	ND	ND	**105**	**18.6**
n-Butylbenzene	5	µg/L	ND	ND	**13.9**	ND	ND	ND	**52**	2.5
n-Propylbenzene	5	µg/L	ND	ND	ND	ND	ND	ND	**286**	**31.4**
sec-Butylbenzene	5	µg/L	ND	ND	**29.7**	ND	ND	ND	**80.2**	**11**
tert-Butylbenzene	5	µg/L	ND	ND	**22.5**	ND	ND	ND	ND	ND
p-Isopropyltoluene	5	µg/L	ND	ND	**36.5**	ND	ND	ND	ND	ND
Methylcyclohexane	NV	µg/L	276	ND	ND	ND	ND	ND	35.2	ND
1,2,4-Trimethylbenzene	5	µg/L	ND	ND	ND	ND	ND	ND	**1,050**	**10.1**
Semi-Volatile Organic Compounds										
bis(2-ethylhexyle)phthalate	5	µg/L	ND	ND	**16.4**	ND	NT	**37.1**	ND	**13.1**
Fluoranthene	50	µg/L	ND	ND	ND	ND	NT	ND	ND	ND
Pyrene	50	µg/L	ND	ND	ND	ND	NT	ND	ND	ND
Dissolved Metals										
Barium	1	µg/L	0.193	0.279	NT	NT	NT	NT	NT	NT

Notes:

Samples were collected by GZA geoEnvironmental of New York in 2014 & 2015

Analytical testing was completed by Paradigm Environmental Services in Rochester, NY

Bold values exceed NYSDEC Class GA Criteria/TOGS 1.1.1

ND - not detected above laboratory detection limits

NT - not tested

APPENDIX A

Field Sampling Plan

FIELD SAMPLING PLAN

Former Coyne Textile Facility
BCP Site #C734144
140 Cortland Avenue
City of Syracuse, New York

CHA Project Number: 33525

Prepared for:

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LIST OF ACRONYMS & ABBREVIATIONS

BGS	Below Ground Surface
BCP	Brownfield Cleanup Program
CHA	CHA Consulting, Inc.
CVOC	Chlorinated Volatile Organic Compounds
DO	Dissolved Oxygen
ELAP	Environmental Laboratory Accreditation Program
EPA	Environmental Protection Agency
FSP	Field Sampling Plan
HASP	Health and Safety Plan
HSA	Hollow Stem Auger
MW	Monitoring Well
NTU	Nephelometric Turbidity Unit
NYS	New York State
NYSDEC	New York State Department of Environmental Conservation
NYSDOH	New York State Department of Health
PCB	Polychlorinated Biphenyls
PFAS	Per- and Polyfluoroalkyl Substances
PID	Photoionization Detector
PPE	Personal Protection Equipment
PPM	Parts Per Million
QAPP	Quality Assurance Project Plan
QA/QC	Quality Assurance/Quality Control
RI	Remedial Investigation
SOP	Standard Operating Procedure
SVOC	Semi-Volatile Organic Compound
TAL	Target Analyte List
TCL	Target Compound List
TICs	Tentatively Identified Compounds
TMP	Tax Map Parcel
TO-15	Toxic Organics Method 15
US	United States
UST	Underground Storage Tank
VOC	Volatile Organic Compound
WP	Work Plan

1.0 INTRODUCTION

This Field Sampling Plan (FSP) has been prepared for the Former Coyne Textile Facility (Site), located at 140 Cortland Avenue in the City of Syracuse, New York, and is to be utilized during the Remedial Investigation (RI) at the Site. The Site is a part of the New York State Department of Environmental Conservation's (NYSDEC) Brownfield Cleanup Program (BCP). The Site location is shown on Figure 1. A Site plan is provided on Figure 2.

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

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

- Installation of soil borings, monitoring wells, and soil vapor extraction wells;
- Collection of subsurface soil samples;
- Collection of indoor soil vapor samples;
- Collection of outdoor air samples;
- Collection of groundwater samples;
- Performance of slug tests;
- Waste characterization sampling;
- Equipment cleaning; and
- Waste handling.

2.0 GENERAL SAMPLING PROTOCOLS

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

2.1 SAMPLE DESIGNATION

Subsurface soil samples will be identified in accordance with CHA SOP#103 Sample Naming and Numbering. In summary, each sample will be uniquely defined by including the media type and sequential number. To avoid confusion with samples collected prior to this RI Work Plan, CHA will start at number 100 on all media types (e.g. SOIL-100)

The following abbreviations will be used to identify media types:

Groundwater	GW
Indoor Air	IA
Indoor Air Quality	IAQ
Outdoor Air	OA
Soil Vapor	SV
Soil Vapor Point	SVP
Subsurface Soil	SOIL
Surface Soil	SS

2.2 SAMPLE HANDLING

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

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

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

For this project CHA staff will hand deliver the sample coolers to the Alpha Analytical Service Center located in Syracuse, New York, or coordinate with their courier service.

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

2.3 FIELD DOCUMENTATION

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

At a minimum, entries in a logbook shall include:

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

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

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

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

3.0 INVESTIGATION ACTIVITIES

3.1 Soil Borings

As part of the RI, twenty-four (24) borings will be installed using either track-mounted Geoprobe hydraulic-push equipment or hollow-stem auger (HSA) drilling equipment. Proposed soil boring locations are shown on Figure 3. The soil borings will be advanced to the presence of a confining layer, refusal, or bedrock. Bedrock is anticipated to be present at fifty (50) feet below ground surface (BGS). The depth and location of each boring may vary depending upon geologic conditions.

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

Immediately upon opening the soil sampler, a photoionization detector (PID) or equivalent meter will be used to obtain readings along the length of the soil sample. Soil samples for laboratory analysis will be collected from each borehole in accordance with the following protocols:

1. A sample will be collected from the unsaturated interval which indicates the highest potential for the presence of contamination as determined by the highest PID or equivalent meter reading, and/or visual observation, or,

2. In the instance where elevated PID meter readings, or visible contamination are not present, a sample from the interval immediately above the water table may be collected for laboratory analysis.

One soil sample from each soil boring location will be submitted to an off-site New York State Department of Health (NYSDOH) Environmental Laboratory Approval Program (ELAP)-certified laboratory for a select set of parameters as described in Table 1. Subsurface soil samples analyzed for the presence of volatile organic compounds (VOCs) will be collected using a Terra Core^{TM} sampler or equivalent. The sampling device will be inserted into the undisturbed soil from the Geoprobe® Macrocore tube or split-spoon sampler. The 5-gram plug of soil will be capped and sent to the laboratory where it will be preserved, extracted, and analyzed. Tentatively Identified Compounds (TICs) will be included in the VOC analysis. The remaining sample volume will be homogenized by the following process:

1. Remove rocks, twigs, leaves and other debris from the sampling device.
2. Place the sample into a stainless-steel bowl and thoroughly mix using a stainless steel spoon.
3. Scrape the sample from the sides, corners and bottom of bowl, roll to the middle of the bowl and mix.

4. Quarter the sample and move to the four corners of the bowl. Each quarter will be individually mixed and rolled to the center of the bowl and then the entire sample will be mixed again.

5. Place the sample into the appropriate glassware required for each of the remaining parameters; semi-volatile organic compounds (SVOCs), Total polychlorinated biphenyls (PCBs) and target analyte list (TAL) Metals.

Before drilling at each boring location and after drilling at the last location, the drilling equipment and all non-disposable sampling equipment will be decontaminated in accordance with the protocols established in Section 4. Drill cuttings will be managed as described in Section 5. Soil borings will be backfilled with bentonite, unless converted into groundwater monitoring wells as described in Section 3.3.

3.1.1 Surface Soil Sampling

One surface soil sample will be collected in the green space area located north of the former employee parking lot. The sample will be collected approximately 0-2-inches below the vegetative cover in accordance with CHA SOP#405. Sample analyses are further described in Table 1.

3.2 Soil Vapor Intrusion Sampling

Sub-Slab soil vapor sample collection points will be installed within the building footprint in a total of six (6) locations, in an effort to identify the potential presence of VOCs. Sub-slab soil vapor points will be cored through the concrete floor in locations illustrated by Figure 4, where historical activities are of concern. Samples will be collected in accordance with CHA SOP#335, summarized below.

Additionally, two (2) indoor air, one (1) outdoor/ambient air, and one (1) subsurface soil vapor sample collection points will be installed to the north of the building, and one (1) subsurface soil vapor sample collection point will be installed in the center of the former employee parking lot.

Sampling points will be cored to a depth approximately 2-inches below the concrete slab, where applicable. Polyethylene tubing will then be placed in the hole and backfilled with glass bead materials. A bentonite seal will be placed on the surface to provide an air tight seal. The polyethylene tubing will extend above this seal to provide a sampling point. Summa canisters for each sample location will be provided by a NYSDOH ELAP-certified laboratory, and will be connected to the tubing to collect a sample over an 8-hour period. Samples will be analyzed for Environmental Protection Agency (EPA) Toxic Organics Method 15 (TO-15).

Sample container requirements, preservation measures, and handling procedures are presented in the QAPP. QA/QC samples will be collected in accordance with the QAPP.

3.3 Monitoring Well Installation Procedures

A maximum of six (6) of the soil borings installed will be converted to permanent, flush-mount groundwater monitoring wells in accordance with CHA SOP#309. Due to both, the potential presence of petroleum products (which are less dense than water), and chlorinated volatile organic compounds (CVOCs), which are denser than water, three (3) of these wells will be converted into clusters of three (3) in an effort to screen the shallow, intermediate, and deep groundwater zones. One of the well clusters will be installed in a presumed upgradient location, while the remaining clusters will be installed in presumed downgradient locations. The remaining three (3) monitoring wells will not be placed in clusters and will screen the shallow groundwater zone.

Wells will be constructed with two-inch diameter PVC riser pipe and well screen and will have a slot opening size of 0.010-inches. The screen for the shallowest well will be installed to straddle the desired water table. A sand pack, consisting of a minimum thickness of one (1) inch, will be placed within the annulus between the borehole and the well screen. A 2-foot bentonite seal will then be placed above the screen. The remaining borehole between the bentonite seal and the ground surface will be backfilled with bentonite-cement grout. Flush-mounted steel protective casings will be installed at each well location to protect the riser pipes. Soil cuttings from drilling operations will not be used as backfill in any of the monitoring wells.

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

3.4 Groundwater Sampling

Groundwater samples will be collected from proposed wells, as well as all existing on-site monitoring wells (MW-1, MW-2, and MW-3), to the extent practical (Figure 5). Samples will be collected for a select set of parameters, further described in Table 1. Dedicated/disposable polyethylene tubing will be installed at each well and a low-flow pump will be used to collect the sample. For MW-1, MW-2, and MW-3, a peri-pump will be used on a low setting, given that they were installed as 1-inch wells. All non-disposable equipment will be cleaned in accordance with Section 5.0 to minimize the potential for cross-contamination. These samples will be collected a minimum of 24 hours after the well installation activities are completed. Bottle requirements and handling procedures are presented in the QAPP. Sampling protocols are presented in the following sub-sections.

3.4.1 Water Level Measurements

Groundwater levels will be collected from available wells at the site and will be used with monitoring well elevation data to determine direction of groundwater flow. Groundwater level measurements will be collected on at least two (2) separate occasions following installation and development: once immediately following development, and once immediately prior to groundwater sampling.

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

3.4.2 Well Sampling

Monitoring well sampling will be carried out in accordance with CHA SOP#317 for Low-Flow Groundwater Purging and Sampling and CHA SOP#341 for Sampling Perfluoralkyl Substances (PFAS) and Perfluorinated Compounds (PFCS). In summary the following protocol will be adhered to:

1. Personnel involved in well purging will wear a new pair of disposable latex gloves for each well.

2. Flow rate used during purging must be low enough to avoid increasing the water turbidity.

3. Water quality measurements for dissolved oxygen (DO), oxidation-reduction potential, specific conductance, pH, turbidity, and temperature will be taken every 3 to 5 minutes.

4. The well will have reached stability and purging will be considered complete when they are within the following ranges for three (3) consecutive readings:

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

5. Water will be pumped using a submersible Monsoon pump, or equivalent.

6. Water extraction equipment will be cleaned in accordance with the protocols presented in Section 4.0.

7. New polyethylene tubing will be used at each well.

8. Groundwater samples will be analyzed for a select set of parameters as described in Table 1.

9. Sample preservation details are presented in the QAPP. Sample containers will be prepared by the laboratory, and will be pre-labeled and pre-preserved.

10. Calibration of all field instruments will be conducted in accordance with the manufacturer's instructions.

11. QA/QC samples will be collected in accordance with the QAPP.

12. Non-disposable sampling equipment will be decontaminated in accordance with the protocols established in Section 4. Purge water will be managed as described in Section 5.

13. All field personnel shall remove personal protective equipment (PPE) after decontamination of equipment has been completed. Removal of PPE and decontamination of personnel will be in accordance with CHA SOP#505.

3.5 Slug Tests

After sampling of the monitoring wells, a slug test will be performed on a minimum of 9 wells, 3 from each groundwater zone for each of the 3 well clusters, in an effort to adequately characterize the impacted aquifer on the Site. Slug tests allow for a determination of the hydraulic conductivity of the soils at each of the well locations and depths. Slug tests will be performed by dropping a solid PVC cylinder into the water column to displace a known volume of water. The water level in the well will be continuously monitored as the displaced water flows back into the formation. This will also be performed in reverse, by removing the slug and monitoring the rising water level as water from the formation enters. Water levels will be measured and recorded using an In-Situ Incorporated Level Troll 700, or similar. Hydraulic conductivity will be calculated using the water level data and the software program Aqteseolv^{TM}. Slug testing will be performed in accordance with CHA SOP#321.

3.6 Survey

After installation, the elevation of the top of the flush-mount casings at each new well location will be surveyed by CHA personnel and tied into the existing site survey data. The survey data is necessary to determine the overall direction of groundwater flow. All soil boring, and sub-slab vapor locations will also be surveyed.

4.0 EQUIPMENT DECONTAMINATION

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

4.1.1 Small Equipment

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

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

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

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

4.1.2 Large Equipment

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

5.0 INVESTIGATION DERIVED WASTE

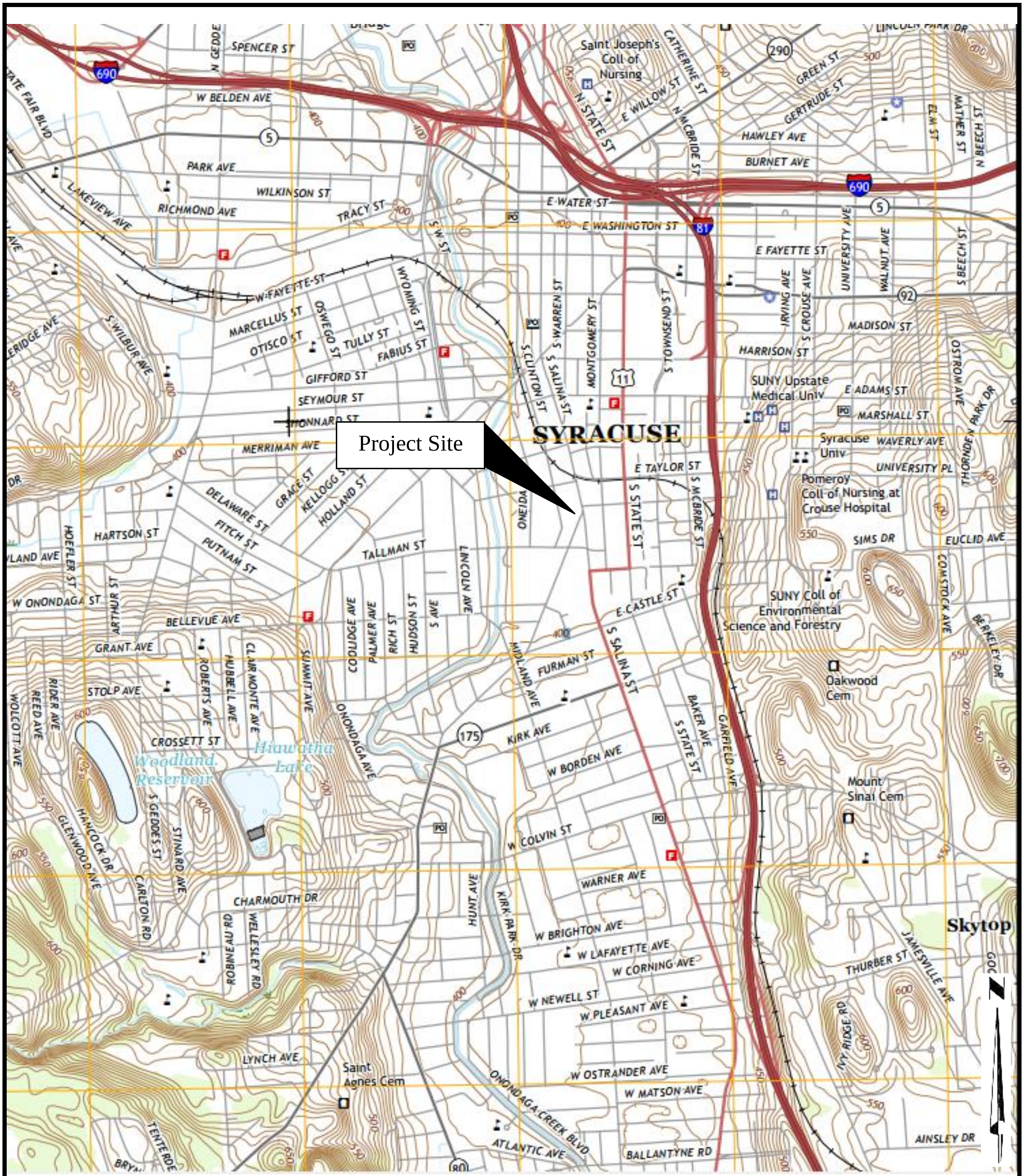
All soil removed from intrusive activities will be stockpiled on polyethylene sheeting and covered, in a predetermined staging area to be characterized and disposed of at a permitted disposal facility. Up to approximately twelve (12) cubic yards of soil are anticipated from these activities.

Additionally, all purged water from groundwater sampling and slug testing activities will be containerized in 55-gallon drums, characterized, and disposed of at a permitted disposal facility. It is anticipated that up to approximately 300 gallons of water will result from these activities.

Samples for waste characterization purposes will be collected from both soil and groundwater. Based upon the estimates provided above, two (2) composite soil samples from the soil stockpile(s), and two (2) groundwater samples from the drummed water, will be collected for a select set of parameters, further described in Table 1.

Gloves, personal protection equipment, sampling materials, etc. will be collected daily and disposed of as solid waste. All work will be performed in accordance with CHA SOP#507.

FIGURES



SOURCE: USGS MapViewer

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NOT TO SCALE

DATE: January 2018

FIGURE 1
SITE LOCATION MAP
140 CORTLAND AVE
SYRACUSE,
ONONDAGA COUNTY, NEW YORK

V:\Projects\ANY\K4\33525\Reports\RIWP\DRAFT\Figures\Figure 1 - Site Location.doc

NOTE:
Site layout and characteristics generalized from previous investigations and historical data. All features are approximated and are NOT TO SCALE.

- - - Site Boundary

[_ _] Features

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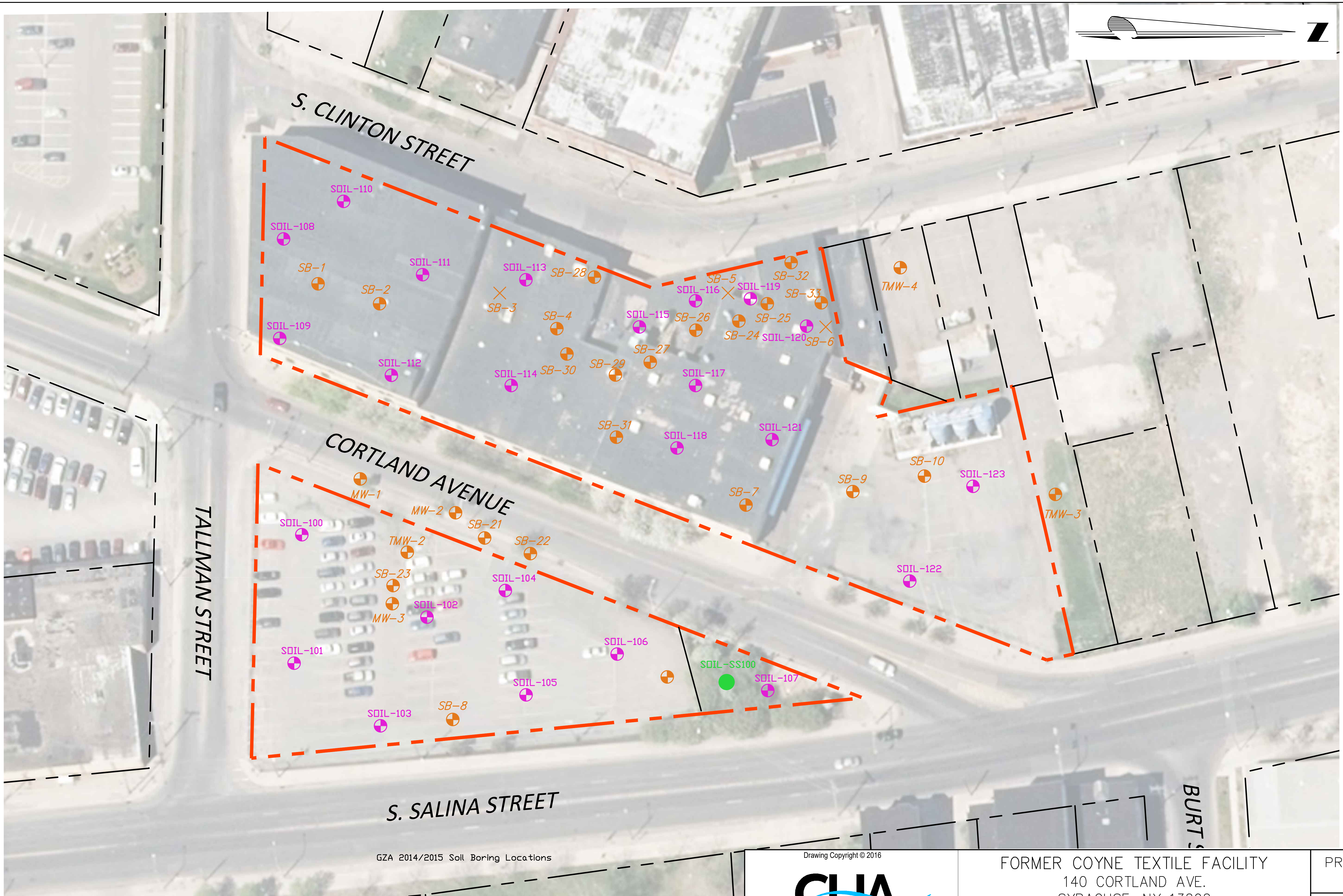
MAP NOT TO SCALE

DATE: January 2018

FIGURE 2
SITE LAYOUT
140 CORTLAND AVE
SYRACUSE
ONONDAGA COUNTY, STATE OF NEW YORK

V:\Projects\ANY\K4\133525\Reports\RIWP\DRAFT\Figures\Figure 2 - Site Plan.docx



GZA 2014/2015 Soil Boring Locations

LEGEND:
- ● GZA 2014/2015 Soil Boring Locations
- × GZA 2014/2015 Attempted Soil Boring
- ● CHA 2017 RI Soil Boring Locations
- ● CHA 2017 RI Surface Soil Sample Location

0 60 120
Scale in feet

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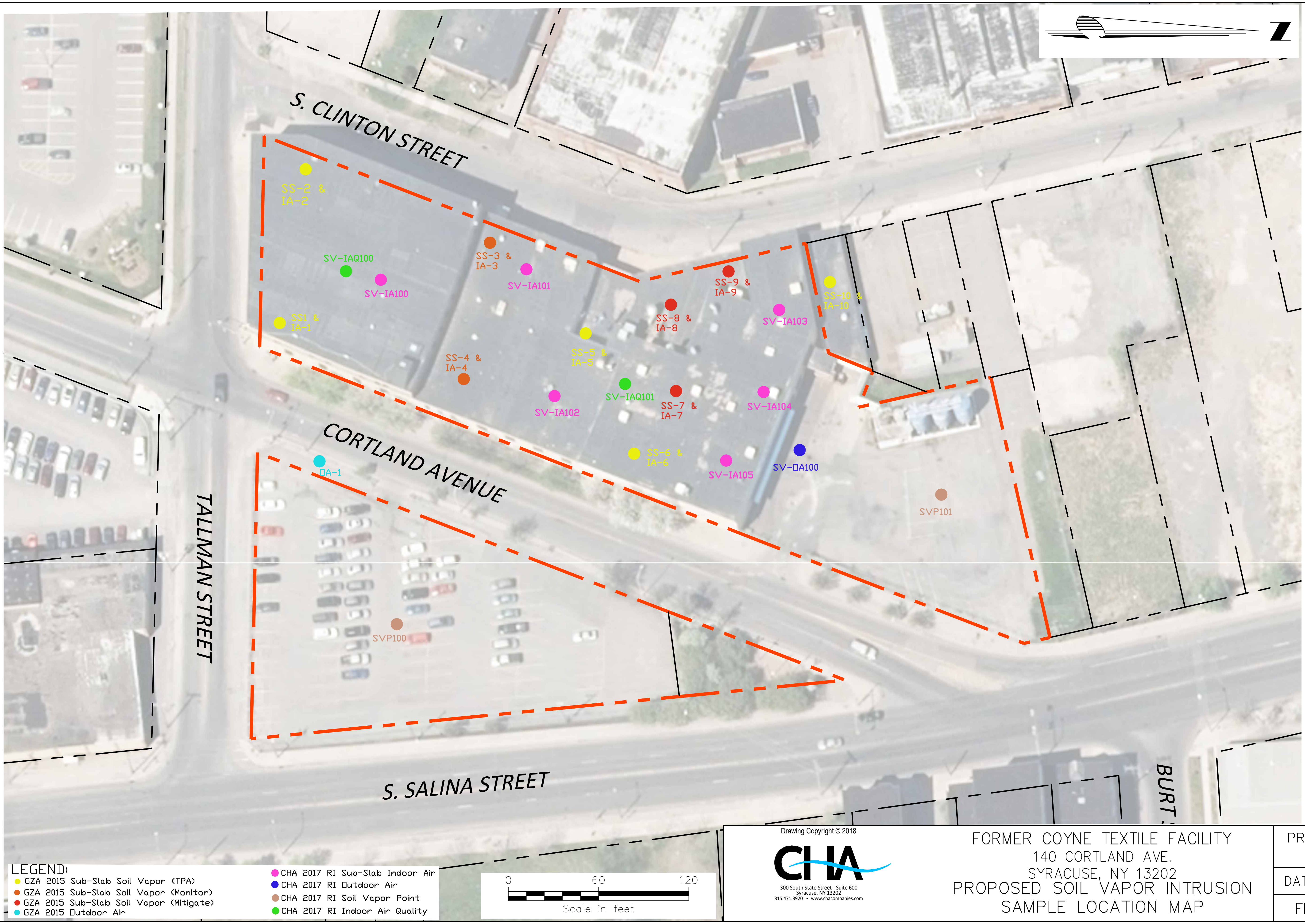
140 CORTLAND AVE.
SYRACUSE, NY 13202
PROPOSED SOIL BORING
LOCATION MAP

PROJECT NO.
33525

DATE: 01/2018

FIGURE 3

File: V:\PROJECTS\ANY\K4\33525\CADD_ACAD\ENV\PROPOSED SOIL BORING LOCATION MAP.DWG Saved: 1/22/2018 10:05:19 AM Plotted: 1/22/2018 10:05:29 AM Current User: Miller, Samantha LastSavedBy: 4187



LEGEND:

- ● GZA 2015 Sub-Slab Soil Vapor (TPA)
- ● GZA 2015 Sub-Slab Soil Vapor (Monitor)
- ● GZA 2015 Sub-Slab Soil Vapor (Mitigate)
- ● GZA 2015 Outdoor Air
- ● CHA 2017 RI Sub-Slab Indoor Air
- ● CHA 2017 RI Outdoor Air
- ● CHA 2017 RI Soil Vapor Point
- ● CHA 2017 RI Indoor Air Quality

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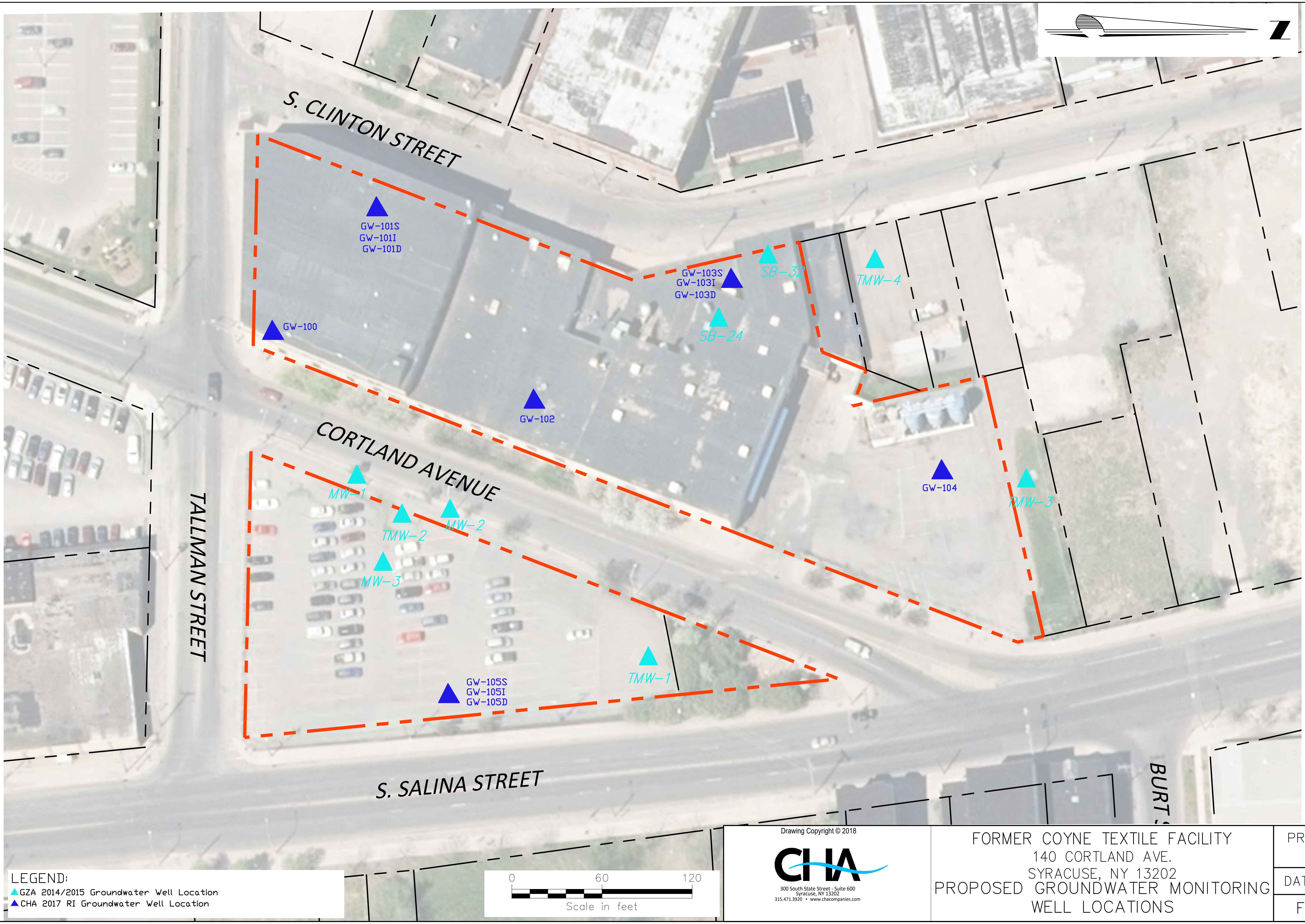
PROPOSED SOIL VAPOR INTRUSION SAMPLE LOCATION MAP

PROJECT NO.
33525

DATE: 01/2018

FIGURE 4

File: V:\PROJECTS\ANY\K4\33525\CADD_ACAD\ENVP\PROPOSED SOIL VAPOR LOCATIONS.DWG Saved: 1/26/2018 3:50:59 PM Plotted: 1/26/2018 3:51:14 PM Current User: Miller, Samantha LastSavedBy: 4187



LEGEND:
▲ GZA 2014/2015 Groundwater Well Location
▲ CHA 2017 RI Groundwater Well Location

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PROPOSED GROUNDWATER MONITORING
WELL LOCATIONS

PROJECT NO.
33525

DATE: 01/2018

FIGURE 5

File: V:\PROJECTS\ANY\K4\33525\CADD_ACAD\ENVP\PROPOSED MONITORING WELL LOCATION MAP.DWG Saved: 1/22/2018 12:26:13 PM Plotted: 1/22/2018 12:26:36 PM Current User: Miller, Samantha LastSavedBy: 4187

TABLES

Table 1: Sampling Rationale

Sample ID	Matrix	Sample Depth(s)	Sample Location	Analytical Parameters	Rationale
SOIL-100	Sub-Surface Soil	Interval which indicates the highest potential for the presence of contamination	Tax Parcel 094.-20-02.0	TCL VOCs, TCL SVOCs, TAL Metals, PCBs, TCL Pesticides	To investigate the potential for contamination on this parcel, where limited investigation has been completed previously.
SOIL-101-SOIL-105	Sub-Surface Soil	Interval which indicates the highest potential for the presence of contamination	Tax Parcel 094.-20-02.0	TCL VOCs, TCL SVOCs, TAL Metals, PCBs	To investigate the potential for contamination on this parcel, where limited investigation has been completed previously.
SOIL-106	Sub-Surface Soil	Interval which indicates the highest potential for the presence of contamination	Tax Parcel 094.-20-02.0	TCL VOCs, TCL SVOCs, TAL Metals, PCBs, TCL Pesticides	To investigate the potential for contamination on this parcel, where limited investigation has been completed previously.
SOIL-107	Sub-Surface Soil	Interval which indicates the highest potential for the presence of contamination	Tax Parcel 094.-20-01.0	TCL VOCs, TCL SVOCs, TAL Metals, PCBs	To investigate the potential for contamination on this parcel, where limited investigation has been completed previously.
SOIL-108-SOIL-109	Sub-Surface Soil	Interval which indicates the highest potential for the presence of contamination	Southern portion of Tax Parcel 094.-05-06.0	TCL VOCs, TCL SVOCs, TAL Metals, PCBs	To investigate the potential for contamination near the location of the rear loading dock.
SOIL-110	Sub-Surface Soil	Interval which indicates the highest potential for the presence of contamination	Southern portion of Tax Parcel 094.-05-06.0	TCL VOCs, TCL SVOCs, TAL Metals, PCBs	To investigate the potential for contamination near the location of former mat repair area.
SOIL-111	Sub-Surface Soil	Interval which indicates the highest potential for the presence of contamination	Southern portion of Tax Parcel 094.-05-06.0	TCL VOCs, TCL SVOCs, TAL Metals, PCBs	To investigate the potential for contamination near the location of the former laundry chemical storage.

Sample ID	Matrix	Sample Depth(s)	Sample Location	Analytical Parameters	Rationale
SOIL-112	Sub-Surface Soil	Interval which indicates the highest potential for the presence of contamination	Southern portion of Tax Parcel 094.-05-06.0	TCL VOCs, TCL SVOCs, TAL Metals, PCBs, TCL Pesticides	To investigate the potential for contamination near the location of the former repair garage.
SOIL-113 SOIL-114	Sub-Surface Soil	Interval which indicates the highest potential for the presence of contamination	Central portion of Tax Parcel 094.-05-06.0	TCL VOCs, TCL SVOCs, TAL Metals, PCBs	To investigate the potential for contamination near the location of the former folding/product storage area.
SOIL-115- SOIL-121	Sub-Surface Soil	Interval which indicates the highest potential for the presence of contamination	Central portion of Tax Parcel 094.-05-06.0	TCL VOCs, TCL SVOCs, TAL Metals, PCBs	To investigate the potential for contamination near the location of the former dry cleaning units, wash chemical storage, boiler room, and former UST. Historical reports also indicate elevated PID readings in this area.
SOIL-122	Sub-Surface Soil	Interval which indicates the highest potential for the presence of contamination	Northern portion of Site Tax Parcel 094.-05-06.0	TCL VOCs, TCL SVOCs, TAL Metals, PCBs	To investigate the potential for contamination near the location of the former waste water holding tanks and sludge waste holding tanks.
SOIL-123	Sub-Surface Soil	Interval which indicates the highest potential for the presence of contamination	Northern portion of Site Tax Parcel 094.-05-06.0	TCL VOCs, TCL SVOCs, TAL Metals, PCBs, TCL Pesticides	To investigate the potential for contamination near the location of the former waste water holding tanks and sludge waste holding tanks.
SOIL-SS100	Surface Soil	Top 0-2-inches below vegetative cover	Center of Tax Parcel 094.-20-01.0	TCL VOCs, TCL SVOCs, TAL Metals, PCBs, TCL Pesticides	To investigate the potential for contamination within the greenspace areas present on Site.
SV-IA100	Sub-slab Soil Vapor	2 inches below concrete slab	Southern portion of Tax Parcel 094.-05-06.0	VOCs (TO-15)	To investigate the potential for sub-slab vapor near the former laundry chemical storage.

Sample ID	Matrix	Sample Depth(s)	Sample Location	Analytical Parameters	Rationale
SV-IA101	Sub-slab Soil Vapor	2 inches below concrete slab	Central portion of Tax Parcel 094.-05-06.0	VOCs (TO-15)	To investigate the potential for sub-slab vapor near the former machine shop.
SV-IA102	Sub-slab Soil Vapor	2 inches below concrete slab	Central Portion of Tax Parcel 094.-05-06.0	VOCs (TO-15)	To investigate the potential for sub-slab vapor near the former folding and product storage area.
SV-IA103-SV-IA105	Sub-slab Soil Vapor	2 inches below concrete slab	Central Portion of Tax Parcel 094.-05-06.0	VOCs (TO-15)	To investigate the potential for sub-slab vapor near the former dry cleaning units, wash chemical storage, boiler room, and former UST. Historical reports also indicate elevated PID readings in this area.
SV-IAQ100-SV-IAQ101	Indoor Air Quality	N/A	Interior of the building	VOCs (TO-15)	To investigate the ambient indoor air concentrations inside the building
SV-OA100	Ambient Air	N/A	Central portion of Tax Parcel 094.-05-06.0	VOCs (TO-15)	To provide a comparison of the outdoor and sub-slab air quality.
SVP-100	Subsurface Soil Vapor	2-inches below asphalt	Center of Tax Parcel 094.-20-02.0	VOCs (TO-15)	To provide data for areas that may be developed in the future.
SVP-101	Subsurface Soil Vapor	2-inches below asphalt	Northern portion of Tax Parcel 094.-05-06.0	VOCs (TO-15)	To provide data for areas that may be developed in the future.

Sample ID	Matrix	Sample Depth(s)	Sample Location	Analytical Parameters	Rationale
GW-100	Groundwater	N/A	Southern portion of Tax Parcel 094.-05-06.0	TCL VOCs, TCL SVOCs, TAL Metals, PCBs	To investigate the potential groundwater contamination of the shallow groundwater zone near the former repair garage.
GW-101S GW-101I GW-101D	Groundwater	N/A	Southern portion of Tax Parcel 094.-05-06.0	TCL VOCs, TCL SVOCs, TAL Metals, PCBs	This cluster will screen shallow, intermediate, and deep groundwater zones for the potential groundwater contamination near the former mat and rear loading dock.
GW-102	Groundwater	N/A	Central portion of Tax Parcel 094.-05-06.0	TCL VOCs, TCL SVOCs, TAL Metals, PCBs	To investigate the potential groundwater contamination of the shallow groundwater zone near the folding/product storage area.
GW-103S GW-103I GW-103D[1]	Groundwater	N/A	Central portion of Tax Parcel 094.-05-06.0	TCL VOCs, TCL SVOCs, TAL Metals, PCBs, PFAS,[1] 1,4-Dioxane[1] ([1]103D only)	This cluster will screen shallow, intermediate, and deep groundwater zones for the potential groundwater contamination near the former dry cleaning units, wash chemical storage, boiler room, and former UST.
GW-104	Groundwater	N/A	Northern portion of Tax Parcel 094.-05-06.0	TCL VOCs, TCL SVOCs, TAL Metals, PCBs, TCL Pesticides PFAS, 1,4-Dioxane	To investigate the potential groundwater contamination of the shallow groundwater zone near the loading docks and former waste water holding tanks.
GW-105S[2] GW-105I GW-105D[1]	Groundwater	N/A	Tax Parcel 094.-20-01.0	TCL VOCs, TCL SVOCs, TAL Metals, PCBs, TCL Pesticides[2], PFAS,[1] 1,4-Dioxane[1] ([1]103D only) ([2]shallow only)	This cluster will screen shallow, intermediate, and deep groundwater zones for the potential groundwater contamination along the former parking lot area. Historical data provided indicated VOC and SVOC contamination.

Sample ID	Matrix	Sample Depth(s)	Sample Location	Analytical Parameters	Rationale
GW-MW1 – GW-MW-3	Groundwater	N/A	Tax Parcel 094.-20-02.0	TCL VOCs, TCL SVOCs, TAL Metals, PCBs	Historically installed permanent monitoring wells.
To be Determined	Groundwater	N/A	Entire Site, as Needed	VOCs, SVOCs	Soil borings that exhibit gross contamination will be converted into temporary monitoring wells and sampled.
SOIL-WC-100 SOIL-WC-101	Soil	N/A	Soil Stockpile(s)	TCLP VOCs, TCLP SVOCs, TAL Metals, PCBs, TCLP Herbicides, TCLP Pesticides, Reactivity, Ignitability, Corrosivity, pH	Two waste characterization soil samples will be collected to adequately characterize the soil stockpile for off-site disposal at a permitted facility.
GW-WC-100 GW-WC-101	Groundwater	N/A	Drums/containers of purged water	TCL VOCs, TCL SVOCs, TAL Metals, PCBs, TCL Herbicides, TCL Pesticides, , , Corrosivity, pH	Two waste characterization groundwater samples will be collected to adequately characterize the purged groundwater for off-site disposal at a permitted facility.
SOIL-DUP100 SOIL-DUP101	Soil	TBD	TBD	TCL VOCs, TCL SVOCs, TAL Metals, PCBs	Per QAQC procedure, two blind duplicate samples will be collected with selected soil samples to determine the precision of laboratory analysis.
GW-DUP100	Groundwater	N/A	TBD	TCL VOCs, TCL SVOCs, TAL Metals, PCBs	Per QAQC procedure one blind duplicate sample will be collected with a selected groundwater sample to determine the precision of laboratory analysis.

Sample ID	Matrix	Sample Depth(s)	Sample Location	Analytical Parameters	Rationale
GW-FB100 GW-FB101	Groundwater	N/A	TBD	TCL VOCs	Per QAQC procedure one field blank is required for each day of onsite groundwater sampling.
GW-EB100	Groundwater	N/A	TBD	TCL VOCs, TCL SVOCs, TAL Metals, PCBs	Per QAQC procedure, one equipment blank is required for every 20 groundwater samples collected.
GW-TB100 GW-TB101	Groundwater	N/A	TBD	TCL VOCs	Per QAQC procedure, one trip blank is required for each cooler containing samples for VOC analysis. VOC samples should be combined into one cooler each day.
SOIL-MS100 SOIL-MS101	Soil	N/A	TBD	TCL VOCs, TCL SVOCs, TAL Metals, PCBs	Per QAQC procedure, one matrix spike (MS) sample is required for every 20 samples (including duplicate samples and field or equipment blank samples).
SOIL-MSD100 SOIL-MSD101	Soil	N/A	TBD	TCL VOCs, TCL SVOCs, TAL Metals, PCBs	Per QAQC procedure, one matrix spike duplicate (MSD) sample is required for every 20 samples (including duplicate samples and field or equipment blank samples).
GW-MS100	Groundwater	N/A	TBD	TCL VOCs, TCL SVOCs, TAL Metals, PCBs	Per QAQC procedure, one matrix spike (MS) sample is required for every 20 samples (including duplicate samples and field or equipment blank samples).
GW-MSD100	Groundwater	N/A	TBD	TCL VOCs, TCL SVOCs, TAL Metals, PCBs	Per QAQC procedure, one matrix spike duplicate (MSD) sample is required for every 20 samples (including duplicate samples and field or equipment blank samples).

APPENDIX A

CHA Standard Operating Procedures

SOP #101
REV. #1
August 18, 2015
Page 1 OF 2
Author: Chris Burns
Reviewer: Seth Fowler
Sandy Warner

FIELD LOGBOOK AND PHOTOGRAPHS

A. PURPOSE/SCOPE:

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

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

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

B. EQUIPMENT/MATERIALS:

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

C. PROCEDURE:

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

FIELD LOGBOOK AND PHOTOGRAPHS

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

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

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

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

D. QA/QC REQUIREMENTS:

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

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

E. SPECIAL CONDITIONS:

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

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

F. REFERENCES:

None

G. APPENDICES/FORMS:

Not Applicable

END OF SOP

Final Check by C. Burns 10/2/15

SAMPLE NAMING AND NUMBERING

A. PURPOSE/SCOPE:

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

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

a. To ensure that every sample collected at a site has a unique identifier
b. To enhance clarity in cases of potential ambiguity
c. To help avoid "naming collisions" that might occur when the data is imported into our Equis or other databases; and
d. To provide meaningful data to be used in project handovers.

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

B. EQUIPMENT/MATERIALS:

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

C. PROCEDURE:

1. Each sample shall be uniquely defined by a multi-field name. In general, three fields are required: [Project # or Name] – [Media Type] – [Location Name/Sequential Number].
2. If using a site name, abbreviate to 2-3 letters. (e.g., Congress St site would be “CS”).
3. Use the following abbreviations for media types:

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

SAMPLE NAMING AND NUMBERING

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

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

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

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

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

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

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

D. QA/QC REQUIREMENTS:

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

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

SAMPLE NAMING AND NUMBERING

E. SPECIAL CONDITIONS:

NYSDEC EQUIS Considerations:

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

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

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

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

F. REFERENCES:

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

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

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

G. APPENDICES/FORMS:

Not Applicable

END OF SOP
Final Check by C. Burns 12/2/15

Authors: Sarah Newell and Mark Corey
Reviewer: Keith Cowan

BOREHOLE INSTALLATION AND SAMPLING

A. PURPOSE/SCOPE:

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

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

B. EQUIPMENT/MATERIALS:

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

C. PROCEDURE:

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

BOREHOLE INSTALLATION AND SAMPLING

Hollow Stem Auger/Flush Joint Driven Casing

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

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

Direct Push Technology

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

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

Shelby Tube Sampling

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

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

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

5. Upon completion of the test boring, all drill cuttings shall either be placed back in the borehole or will be drummed based on potential contaminants encountered.
6. Note the locations of the borings on a site map and/or mark the locations of the boreholes with a labeled wooden stake.

BOREHOLE INSTALLATION AND SAMPLING

D. QA/QC REQUIREMENTS:

Follow QA/QC requirements for field documentation.

E. SPECIAL CONDITIONS:

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

F. REFERENCES:

ASTM Standard D 1586

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

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

CHA’s Legend to Subsurface Logs

G. APPENDICES/FORMS:

Boring Log Form

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

CHA

PROBE LOG

BORING NO.

PROJECT & LOCATION:

CLIENT:

PROJECT NO.:

CONTRACTOR:

SHEET NO.: 1 OF

GROUNDWATER MEASUREMENT				
DATE	TIME	DEPTH TO (FT.): WATER	DEPTH TO (FT.): BOTTOM OF CASING	DEPTH TO (FT.): BOTTOM OF BORING

IF BORING IS DRY, CHECK HERE: ☐

	CASING	SAMPLER
TYPE:		
SIZE I.D.:		
SYSTEM TYPE:	☐SINGLE ROD	☐DOUBLE TUBE
MONITORING WELL: ☐ YES ☐ NO	☐TEMPORARY	☐PERMANENT

CHECKED BY:

DATE:

ELEVATION:

START DATE: TIME:

FINISH DATE: TIME:

RIG TYPE/MODEL:

DRILLER:

INSPECTOR:

DEPTH IN FEET	SAMPLE NO.	RECOVERY LENGTH	PID READING (PPM)	BORING HEADSPACE (PPM)	NOTES (Evidence of Contamination)	FIELD CLASSIFICATION
5						
10						
15						
20						

Soil Gas Reading: _____%

Depth:_____feet bgs

Soil Sample Collected:
☐ Yes ☐ No

Time: ____ Depth: ____ to ____

Water Sample Collected:
☐ Yes ☐ No

Time: ____ Screen Interval:___

BORING NO.

MONITORING WELL INSTALLATION

A. PURPOSE/SCOPE:

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

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

B. EQUIPMENT/MATERIALS:

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

a. Heavy Equipment

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

b. Sampling Tools

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

c. Well Casing Materials

- Varies with job requirements

d. Other Well Construction Materials

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

e. Miscellaneous Equipment/Materials

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

MONITORING WELL INSTALLATION

C. METHODS:

1. Hollow Stem Auger

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

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

Advantages of hollow-stem auger drilling include:

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

Disadvantages of hollow-stem auger drilling include:

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

2. Air Rotary

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

The advantages of air rotary drilling include:

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

The disadvantages of air rotary drilling include:

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

MONITORING WELL INSTALLATION

D. PROCEDURE:

Wells Installed in Unconfined Aquifers

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

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

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

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

9. The drilling rig and sampling equipment may be required to be decontaminated by steam-cleaning (high pressure, hot water) prior to drilling and in between borings depending on the job requirements.
10. Drilling progress and information about the formations encountered shall be recorded by the geologist on the field boring log. The information should include:

    - Borehole Depth
    - Well Screen Depth
    - Filter Pack Interval
    - Seal Interval
    - Grout Interval
    - Surface Cap Detail
    - Well Material
    - Well Riser and Screen Length
    - Well Diameter
    - Filter Pack Material
    - Date Installed

Wells Installed in Confined Aquifers

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

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

E. QA/QC REQUIREMENTS:

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

MONITORING WELL INSTALLATION

F. SPECIAL CONDITIONS:

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

G. REFERENCES:

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

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

H. APPENDICES/FORMS:

Monitoring Well Construction Log

END OF SOP

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

SOP #311
Revision #1
03/05/2009
Page 1 of 3
Author: Sarah Burke
Reviewer: Keith Cowan

WELL DEVELOPMENT

A. PURPOSE/SCOPE:

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

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

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

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

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

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

B. EQUIPMENT/MATERIALS:

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

WELL DEVELOPMENT

C. PROCEDURE:

1. Mechanical Surging and Pumping
   a. Before starting to surge, the well should be evacuated to ensure water will flow into it.
   b. Lower the surge block into the well until it is 10 to 15 feet beneath the static water level, but above the well screen. The water column will effectively transmit the action of the surge block to the screen section. The initial surging motion should be relatively gentle, allowing any material blocking the screen to break up, go into suspension, and move into the well.
   c. As water begins to move easily both into and out of the screen, the surging tool is usually lowered progressively downward through the entire length of the screen. As the block is lowered, the force of the surging movement is increased.
   d. Continue surging for approximately 20 minutes, then pull the block from the well. A pump or bailer may be used to remove the sediment out of the well. Pumping should continue for approximately 20 minutes.
   e. Continue alternating the surging and pumping action until little or no sand or fines can be pulled into the well. The turbidity of the final discharge water should be below 50 NTU.
2. Airlift Development
   a. Place the airline into the water at a shallow depth. Initially, the airlift should be operated to pump fluids at a reduced rate from the well. Once a constant flow rate from the well has been established, the airline is lowered to within five feet of the bottom of the screen, assuming that sufficient pressure is available to overcome the static head. Development can also start near the top of the screen, depending on the preference of the driller.
   b. A surging action is created by injecting air into the well to lift the water to the surface. As the water reaches the top of the casing, the air supply is shut off, allowing the aerated water column to fall (this procedure is called "rawhiding"). This tends to drive the water outward through the well screen openings.
   c. After surging the well for a period of 20 to 30 minutes, the air should be applied in a continuous manner so that the water is expelled from the casing. The airline should be lowered to the bottom of the well so that accumulated sediment will be expelled. Surging and lifting cycles are repeated until the water is relatively free of sand and fine particles. The turbidity of the final discharge water should be below 50 NTU.
3. Overpumping / Backwashing
   a. Place the pump in the well and lower until it is 10 to 15 feet beneath the static water level.
   b. Pump the groundwater from the well at a rate that substantially exceeds the rate that the formation can deliver the water.
   c. Alternately start and stop the pump to allow the column of water that is initially picked up by the pump to be alternately dropped and raised up in a surging action.
   d. After surging the well for a period of 20-30 minutes, the pump should be lowered to the bottom of the well and operated in a continuous matter so that accumulated sediment will be expelled.

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

4. Bailing

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

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

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

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

   e. QA/QC REQUIREMENTS:

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

D. SPECIAL CONDITIONS:

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

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

E. REFERENCES:

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

F. APPENDICES/FORMS:

Well Development Log

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

MEASUREMENT OF WATER LEVEL/ FREE PRODUCT THICKNESS

A. PURPOSE/SCOPE:

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

B. EQUIPMENT/MATERIALS:

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

C. PROCEDURE:

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

MEASUREMENT OF WATER LEVEL/ FREE PRODUCT THICKNESS

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

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

D. QA/QC REQUIREMENTS:

Not Applicable

E. SPECIAL CONDITIONS:

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

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

F. REFERENCES:

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

G. APPENDICES/FORMS:

Field Data Sheets

END OF SOP

Final Check by C. Burns 10/07/15

SLUG TEST

A. PURPOSE/SCOPE:

The following SOP presents a description of the methods generally employed for a slug test. A slug test involves the instantaneous injection or withdrawal of a volume or slug of water or solid cylinder of known volume. The slug test is completed in two steps – the falling head test (FHT) and the rising head test (RHT). A solid slug or known amount of water is inserted to a level beneath the groundwater surface and the water level is allowed to reach equilibrium (FHT). The slug is then removed and the rise in water level is measured with time (RFT). This data can then be used to calculate the hydraulic conductivity of the aquifer being tested. Slug test derived hydraulic conductivities are considered accurate within one order of magnitude.

The time required for a slug test is a function of the volume of the slug, the hydraulic conductivity of the formation, and the type of well completion. The slug volume should be large enough that a sufficient number of water level measurements can be made before the water level returns to equilibrium conditions. The length of the test may range from less than a minute to several hours.

One of the primary advantages of using slug tests to estimate hydraulic conductivities is that the tests can be performed quickly at relatively low costs because a pumping well and observation wells are not required. Estimates can be made in situ and errors incurred in the laboratory testing of disturbed samples can be avoided. Also, the hydraulic conductivity of small, discrete portions of a saturated medium can be estimated.

However, there are limitations to slug testing. Only the hydraulic conductivities of the saturated material immediately surrounding the well is estimated, which may not be representative of the larger area. Also, certain assumptions are made in the analysis process and if these assumptions are inappropriate for the geologic conditions at the site, the slug test data is invalid. Lastly, the storage coefficient, S, usually cannot be determined.

B. EQUIPMENT/MATERIALS:

The equipment necessary to perform slug tests includes:

- Sand filled PVC pipe (slug)
- Rope
- Water level indicator
- Data logger and pressure transducer
- Decontamination materials (alconox, distilled water, scrub brush, etc.)
- Large plastic bags, if necessary, for temporary tubing storage

C. PROCEDURE:

1. Prior to starting the slug test, record a static water level. The water level should be measured and recorded from the top of the PVC riser pipe (TOR). Time must be allowed following well development to insure that the water level is fully recovered by the time of the slug test.
2. If sample tubing is present, remove from well and store temporarily in a plastic bag.

SLUG TEST

3. After removing tubing, install the data logger transducer in the well. The pressure transducer should be properly decontaminated prior to inserting into well. A transducer depth should be selected which places the transducer no less than five (5) feet deeper than the fully submerged slug and at least two (2) feet above the bottom of the well. The transducer cable should be temporarily attached to the well casing so that the transducer probe depth remains stable during the test.

   The transducer manufacturer recommends that the transducer sit in the well for one (1) hour prior to testing to allow for temperature equilibration.

4. After installing the transducer, the water level in the well should be allowed to return to static. If the water level after installing the transducer is substantially above the static water level, a bailer can be used to remove water from the well.
5. Determine the optimal slug length. The standard slug length is ten (10) feet. However, if the water column in the well is too small to fit the transducer and a ten (10) foot long slug, a shorter slug must be assembled. Five foot and one foot PVC sections can be used to construct a shorter slug. The slug should be properly decontaminated prior to inserting in well.
6. Once the water level has returned to static, the first part of the slug test, the FHT, can be conducted. After starting the data logger, smoothly lower the slug into the water column until the slug is completely submerged. Data collection should continue for a minimum of 15 minutes, or until the water level has stabilized (within 0.1 feet).
7. The water level should be allowed to return to static following the FHT. If the water level is substantially above the static water level, a bailer can be used to remove water from the well.
8. Once the water level has returned to static, the second part of the slug test, the RHT, can be conducted. Remove the slug or volume as quickly and smoothly as possible because the analysis assumes that an instantaneous change in volume is created in the well. The slug should be removed from the well to prevent water level impacts from water dripping off the slug. Care should be taken to avoid tangling the slug (or rope attached to the slug) with the transducer cable. If the slug and cable do become tangled, the transducer probe will be raised temporarily, thereby distorting the water levels recorded.
9. Continue measuring and recording depth/time measurements until the water level returns to equilibrium conditions or a sufficient number of readings have been made to clearly show a trend on a plot of water level recovery versus the logarithm of time.

D. QA/QC REQUIREMENTS:

Prior to leaving the project site, all tests should be reviewed to confirm that accurate and useful data has been collected.

E. SPECIAL CONDITIONS:

Note that every pressure transducer has a rated pressure range for use. Do not install the pressure transducer at a greater depth than its rated pressure range.

SLUG TEST

There are various software programs that can be used to determine hydraulic conductivity after the data from the datalogger is inputted into the program. Hvorslev's expression is often used to calculate hydraulic conductivity (K) due to its simplicity. The analysis assumes a homogenous, isotropic medium in which soil and water are incompressible. Hvorslev's expression for hydraulic conductivity is:

$$K = \frac{r^2 * \ln(L/R)}{2*L*T}$$

For L/R > 8

Where:
K = Hydraulic Conductivity [Feet/Second]
R = Casing Radius [Feet]
L = Length of Open Screen (Or Open Borehole) [Feet]
R = Filter Pack (Borehole) Radius [Feet]
T = Basic Time Lag [Seconds]; Value Of T On Semilogarithmic Plot Of (H-H)/(H-H°) Vs. T, When (H-H)/(H-H°) = 0.37

Where:
H = Initial Water Level Prior To Removal Of Slug
H = Water Level at T = 0
H = Recorded Water Level at T > 0

F. REFERENCES:

Bouwer, H. and R.C. Rice, 1976. A Slug Test for Hydraulic Conductivity of Unconfined Aquifers with Completely or Partially Penetrating Wells. Water Resources Research, Vol. 12, No. 3, p. 423-428.

Freeze, R. Allan and John A. Cherry, 1979. Groundwater. Prentice-Hall, Inc., Englewood Cliffs, New Jersey, 604 p.

Hvorslev, M.J., 1951. Time Lag and Soil Permeability in Groundwater Observations. U.S. Army Corps of Engineers, Waterways Experiment Station, Vicksburg, Mississippi, Bull. No. 36, 51 p.

United States Environmental Protection Agency, January 1999. Compendium of ERT Groundwater Sampling Procedures. Section 8.0 Slug Test: SOP #2158. EPA/540/P-91/007. OSWER 9360.4-06.

G. APPENDICES/FORMS:

Not Applicable

END OF SOP

Final Check by C. Burns 10/30/15

SUB-SLAB SOIL VAPOR SAMPLING

A. PURPOSE/SCOPE:

Sub-slab soil vapor sampling is performed to assess the presence of volatile organic compounds (VOCs) in soil vapor within the vadose zone directly beneath a building and evaluate the potential for impacts to indoor air quality from vapor intrusion into the building.

B. EQUIPMENT/MATERIALS:

- Core drill with 3-inch diameter bit
- Hammer drill with ¾-inch bit
- Extension cord(s) and GFCI
- Flat-blade screwdriver or small pry bar
- 3/8-inch outside diameter by ¼-inch inside diameter black metal pipe
- Coarse sand
- Cement
- 3-inch diameter plastic protective cover
- Silicone caulk
- Small cylinder/tank of helium with regulator
- Helium detector (Dielectric MGD-2002 or equivalent)
- Plastic sheeting
- Utility knife
- Powdered bentonite
- Plumbers putty
- Plastic bucket
- SUMMA canisters and laboratory-calibrated flow regulators
- 3/8-inch inside diameter polyethylene tubing
- Personal air sampling pump (Gilian model ___________ or equivalent)
- Canister labels/tags and laboratory chain of custody form(s)

C. PROCEDURE:

To facilitate sample collection, perform the following steps to install sub-slab sampling probes:

1. Prior to sampling probe installation, discuss with the building owner/owner representative the locations of any sub-slab utilities.
2. At each selected sampling location, drill a 3-inch diameter hole to a depth of 2-inches into the concrete slab, using a core drill. Remove the concrete core.
3. Drill a ¾-inch diameter hole in the center of the 3-inch diameter hole, using a hammer drill, to a depth of no more than 2 inches into the sub-slab material.
4. Insert a 3/8-inch outside diameter by ¼-inch inside diameter black metal pipe (sampling probe) into the hole and add coarse sand around the pipe to cover approximately 1 inch of the probe tip.
5. Fill the annular space between the concrete slab and the probe with cement.
6. Install a flush-mounted protective cover over the probe, in the 3-inch diameter hole, and seal with silicone caulk.

SUB-SLAB SOIL VAPOR SAMPLING

A minimum of 24 hours after sampling probe installation, and prior to collection of sub-slab soil vapor samples, perform a tracer gas study, using helium, at each sampling probe location to verify the integrity of the sampling probe. To complete the tracer gas study, the following steps should be followed:

1. Spread bentonite slurry on the concrete surface in a 2-foot diameter circle around the sampling probe.
2. Place a 2-foot square piece of plastic sheeting over the bentonite slurry, creating an enclosure.
3. Cut a small hole in the plastic sheeting at the location of the sampling probe to allow the sample tubing to be inserted and connected to the probe.
4. Seal the plastic sheeting/sample tubing interface with a small amount of plumber's putty.
5. Cut another small hole in the plastic sheeting to allow the tracer gas (helium) to be introduced into the enclosure.
6. Release helium into the enclosure to displace ambient air and provide positive pressure.
7. Use a calibrated helium detector to monitor for potential leaks by purging soil vapor through the sample tubing. Record the helium concentration detected at each sampling location. (Note: Per NYS Dept. of Health guidance, helium concentrations below 10,000 ppm are acceptable.)

Subsequent to completion of the tracer gas study, perform the following steps to collect sub-slab soil vapor samples:

1. Purge one to three implant volumes of air (volume of sample probe and tubing) using a personal air pump.
2. Connect the pre-calibrated flow regulators to the SUMMA canisters, and then connect each canister/flow regulator to its corresponding sampling probe using polyethylene tubing.
3. Each canister will have its own identification number; document which canister is used for each sampling location.
4. Open the valve on each flow regulator and document the time that sample collection began at each location. Periodically check to see that the canisters have not been disturbed.
5. At the end of the pre-determined sampling duration, at each sampling location, document the time of sample termination and the pressure gauge reading on the flow regulator. Close the valve on the flow regulator.
6. Disconnect the flow regulator from each SUMMA canister and replace the provided cap on the canister and tighten to secure.
7. Complete sample labels/tags and chain of custody.

SUB-SLAB SOIL VAPOR SAMPLING

D. QA/QC REQUIREMENTS:

If the project requires one or more duplicate samples for QA/QC purposes, perform the following steps:

1. Request that the laboratory provide an additional SUMMA canister and flow regulator for each duplicate sample required.
2. At each duplicate sample location, utilize a “T” or “Y” fitting to connect the tubing from the sampling probe to the two SUMMA canisters.
3. Identify the duplicate sample differently from the primary sample (such as “CHA-1”) and note a different collection time on the label/tag and the chain-of-custody.

E. SPECIAL CONDITIONS:

Not Applicable

F. REFERENCES:

1. New York State Department of Health, *Guidance for Evaluating Soil Vapor Intrusion in the State of New York, October 2006* https://www.health.ny.gov/environmental/investigations/soil_gas/svi_guidance/docs/svig_final2006_complete.pdf

G. APPENDICES/FORMS:

Not Applicable

END OF SOP
Final Check by C. Burns 9/__/17

SOP #405
Revision #01
03/23/2012
Page 1 of 3
Author: Katie Flood
Reviewer: Scott Smith

SURFACE SOIL SAMPLING

A. PURPOSE/SCOPE:

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

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

B. EQUIPMENT/MATERIALS:

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

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

C. PROCEDURE:

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

   Discrete Sample Collection:

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

SURFACE SOIL SAMPLING

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

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

Composite Sampling:

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

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

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

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

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

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

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

SURFACE SOIL SAMPLING

D. QA/QC REQUIREMENTS:

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

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

E. SPECIAL CONDITIONS:

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

F. REFERENCES:

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

G. APPENDICES/FORMS:

Surface Soil Sampling Log

END OF SOP

Final Check by C. Burns 11/3/15

SMALL EQUIPMENT DECONTAMINATION

A. PURPOSE/SCOPE:

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

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

B. EQUIPMENT/MATERIALS:

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

C. PROCEDURE:

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

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

SMALL EQUIPMENT DECONTAMINATION

D. QA/QC REQUIREMENTS:

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

E. SPECIAL CONDITIONS:

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

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

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

F. REFERENCES:

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

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

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

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

G. APPENDICES/FORMS:

Not Applicable

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

DECONTAMINATION OF PERSONNEL

A. PURPOSE/SCOPE:

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

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

B. EQUIPMENT/MATERIALS:

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

C. PROCEDURE:

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

D. QA/QC REQUIREMENTS:

Not Applicable

E. SPECIAL CONDITIONS:

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

DECONTAMINATION OF PERSONNEL

F. REFERENCES:

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

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

G. APPENDICES/FORMS:

Associated Flow Charts - The following Tables are included:

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

END OF SOP

Final Check by C. Burns 10/22/15

DECONTAMINATION OF PERSONNEL

Table 1. Maximum Measures for Level C Decontamination

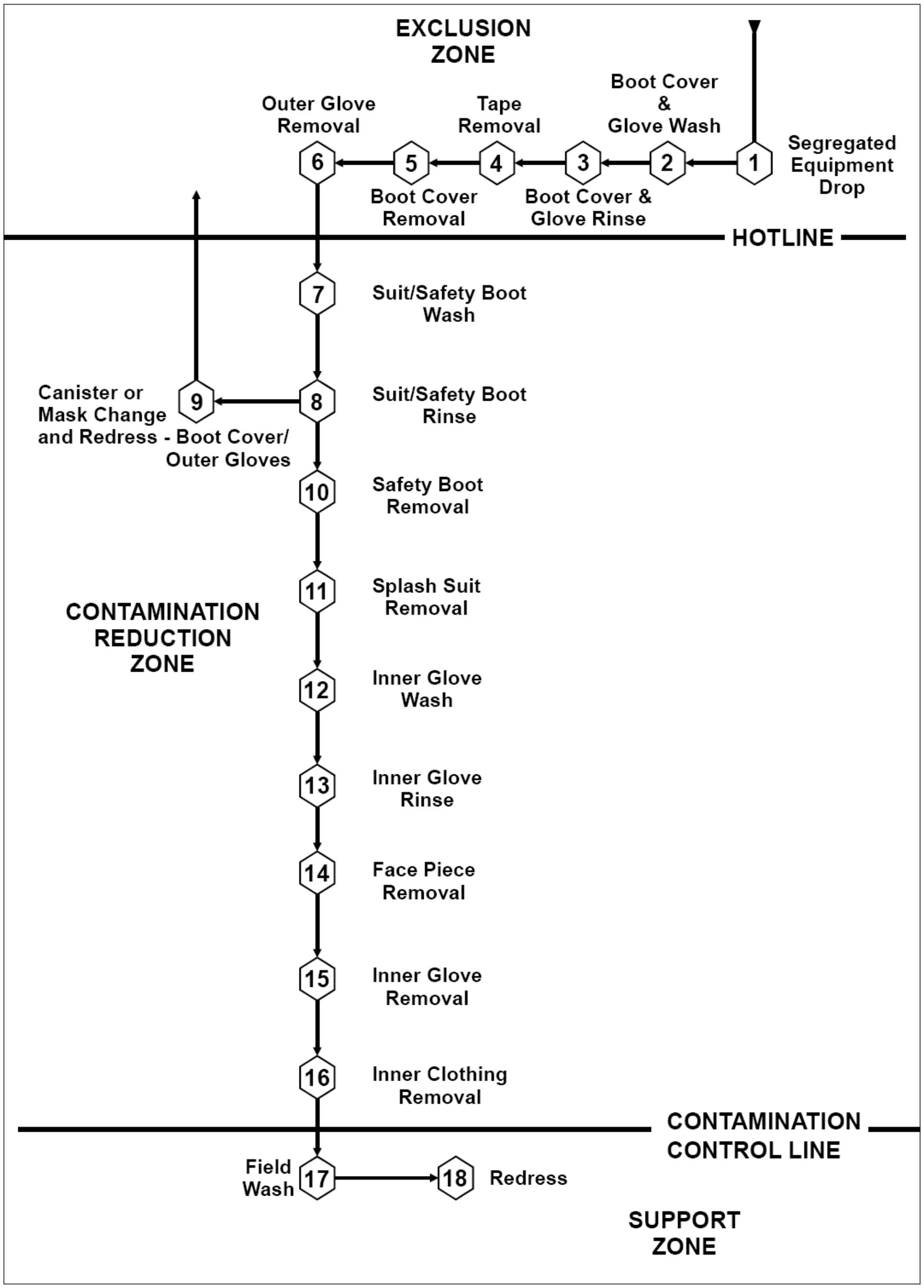
Station	1:	Segregated Equipment Drop	1.	Deposit equipment used on site (tools, sampling devices and containers, monitoring instruments, radios, clipboards, etc.) on plastic drop cloths or in different containers with plastic liners. Segregation at the drop reduces the probability of cross contamination.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

Table 1. Maximum Measures for Level C Decontamination continued

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

DECONTAMINATION OF PERSONNEL

Maximum Measures for Level C Decontamination



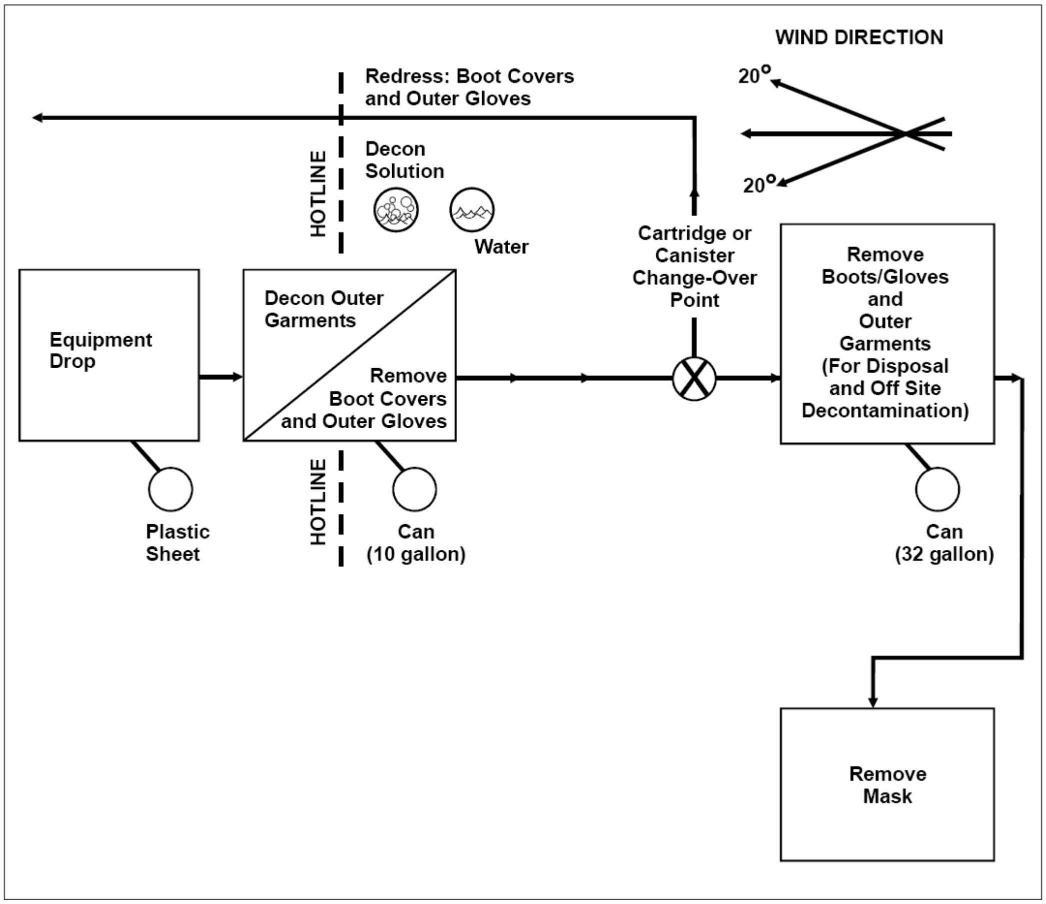
DECONTAMINATION OF PERSONNEL

Table 2. Minimum Measures for Level C Decontamination

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

DECONTAMINATION OF PERSONNEL

Minimum Measures for Level C Decontamination



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

RESIDUALS MANAGEMENT

A. PURPOSE/SCOPE:

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

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

B. EQUIPMENT/MATERIALS:

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

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

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

C. PROCEDURE:

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

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

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

RESIDUALS MANAGEMENT

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

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

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

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

RESIDUALS MANAGEMENT

E. SPECIAL CONDITIONS:

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

F. REFERENCES:

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

G. APPENDICES/FORMS:

Not Applicable

END OF SOP

Final Check by C. Burns 10/26/15

SAMPLE CONTAINERS, VOLUMES, PRESERVATIONS AND HOLDING TIMES

A. PURPOSE/SCOPE:

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

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

B. EQUIPMENT/MATERIALS:

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

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

C. PROCEDURE:

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

SAMPLE CONTAINERS, VOLUMES, PRESERVATIONS AND HOLDING TIMES

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

D. QA/QC REQUIREMENTS:

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

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

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

Volatile Organic Compounds:

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

SAMPLE CONTAINERS, VOLUMES, PRESERVATIONS AND HOLDING TIMES

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

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

Cyanide

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

E. SPECIAL CONDITIONS:

Not Applicable

F. REFERENCES:

Alpha Analytical Aqueous and Soil/Solid Reference Guides.

G. APPENDICES/FORMS:

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

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

Table 1

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

Table 1

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

Table 1

Laboratory Analysis	EPA Method	Standard Method and/or SW846 Method	Preservation	Container	Holding Time	Minimum Volume
Organochlorine Pesticides/PCB	608	8081A,8082	Cool to 4 deg C 0.008% Na2S2O3 if residual chlorine present If aldrin is to be determined bind to pH 5-9.	G, Amber Teflon-lined screw cap	7 days until extraction 40 days after extraction	1000 mL
Ortho Phosphate	300	4500 P-E	Cool to 4 deg C	P or G	48 Hrs	50 mL
Orthophosphate	365.2	-----	Filter immediately, Cool to 4 deg C	P or G	48 Hrs.	50 mL
pH, Hydrogen ion	-----	4500-H-B	Cool to 4 deg C	P or G	Analyze Immediately	25 mL
Phenols	420.1	9065, 510ABC	Cool to 4 deg C, H2SO4 to pH<2	G	28 Days	500 mL
Pseudomanas Aeruginosa	-----	9213E	Cool to 4 deg C 0.008% Na2S2O3 if residual chlorine present	Sterile P or G	30 Hrs. for Drinking Water 6 Hrs. for Waste Water	125 mL
Purgeable Halocarbons	601	8021B	Cool to 4 deg C 0.008% Na2S2O3 if residual chlorine present	G, Vial screw cap with center hole Teflon- faced silicone septum	14 Days	40 mL
Radiological	-----	-----	HNO3 to pH<2	P or G	6 Months	100 mL
Residue- Settleable (SS)	160.5	-----	Cool to 4 deg C	P or G	48 Hrs.	1000 mL
Residue-filtered (TDS)	160.1	-----	Cool to 4 deg C	P or G	7 Days	100 mL
Residue-non- filtered (TSS)	160.2	-----	Cool to 4 deg C	P or G	7 Days	100 mL
Residue-Total Volatile Solids	160.4	2540 E	Cool to 4 deg C	P or G	7 Days	100 mL
Salinity	-----	2520 C	Cool to 4 deg C	G	28 Days	100 mL
Semivolatile Organic Compounds (Unregulated)	525.2	-----	If residual chlorine is present, add 40-50 mg Sodium Thiosulfate. If not chlorinated, add 6N HCl to pH<2 Cool to 4 deg C	G, Amber Teflon-lined screw cap	7 Days for extraction, 30 after extraction	1000 mL
Semivolatile Organics	625	8270C	Cool to 4 deg C 0.008% Na2S2O3 if residual chlorine present	G, Amber Teflon-lined screw cap	7 days for extraction 40 days after extraction	1000 mL
Silica	200.7	-----	Cool to 4 deg C	P only	7 Days	50 mL
Specific Conductance	120.1	-----	Cool to 4 deg C	P or G	28 Days	100 mL
Sulfate	300	4500-SO4	Cool to 4 deg C	P or G	28 Days	50 mL
Sulfate	375.4	-----	Cool to 4 deg C	P or G	28 Days	50 mL
Sulfide	376.2	9030 B, 4500S2-AD	Cool to 4 deg C, add zinc plus NaOH to pH>9	P or G	7 Days	50 mL
Sulfite (SO3)	377.1	-----	None Required	G, Bottle and Top	Analyze immediately	50 mL
Surfactants (MBAS)	425.1	-----	Cool to 4 deg C	P or G	48 Hrs.	250 mL

Table 1

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

Table 1

Laboratory Analysis	EPA Method	Standard Method and/or SW846 Method	Preservation	Container	Holding Time	Minimum Volume
Corrosivity Toward Steel	-----	1110	Cool to 4 deg C	P	14 Days	4 oz.
Cyanide		9010B, 4500CN	Cool to 4 deg C	G, Amber	14 Days	4 oz
Dioxin	-----	8280A	Cool to 4 deg C	G	14 Days	8 oz.
DRO	-----	8015B	Cool to 4 deg C	G, Amber	14 Days	4 oz.
Extractable Organic Compounds			Cool to 4 deg C, Store in dark	G	14 days	8 oz
Extractable Sulfide	-----	9031	Cool to 4 deg C, fill top of sample with 2N Zinc Acetate until moistened	P or G	7 Days	8 oz.
Fluoride	-----	9214	None	P	28 Days	8 oz.
Gases	-----	3810	Cool to 4 deg C	G, Amber	14 Days	8 oz.
Grain Size			N/A	G	N/A	8 oz
GRO	-----	8015B	Cool to 4 deg C, check state regulations for proper preservative. NJ (methanol), PA (encore samplers) NY (cool to 4 deg C).	G, Amber VOA vial	14 Days	15 Grams
HPLC (PAH)	------	8310	Cool to 4 deg C	G, Amber Teflon-lined screw cap	14 days until extraction 40 days after extraction	4 oz.
Ignitability	-----	1010	None	P or G	None	8 oz.
Ignitability of Solids		1030	None	P or G	None	8 oz.
Mercury	245.1	7471A	Cool to 4 deg C	G, Amber	28 Days	4 oz.
Metals	-----	6010B, 6020, 7000A	Cool to 4 deg C	G, Amber	6 Months	8 oz.
Moisture Content			Store in airtight jar 3-30 deg C	G	N/A	8 oz
Nitrate	-----	9210	Cool to 4 deg C	P or G	48 Hrs	8 oz.
Oil & Grease (Sludge, Sludge- Hem)	-----	9071B	Cool to 4 deg C	G	28 Days	8 oz.
Organochlorine	-----	8081A	Cool to 4 deg C	P or G	14 Days	8 oz.
Paint Filter Liquids Test	-----	9095A	Cool to 4 deg C	P or G	-----	8 oz.
PCBs	-----	8082	Cool to 4 deg C	G, Amber Teflon-lined screw cap	14 Days	4 oz.
pH	-----	9045C	Cool to 4 deg C	G, Amber	Analyze Immediately	4 oz.
pH, Soil and Waste	-----	9045A	Cool to 4 deg C	G	Analyze Immediately	8 oz.
Phenol	-----	9065, 9066, 9067	Cool to 4 deg C	G, Amber	28 Days	4 oz.
Radiological	-----	-----	Cool to 4 deg C	G	6 Months	8 oz.
Reactivity Cyanide	-----	SW-846 7.3.3.2	Cool to 4 deg C	P	14 Days	8 oz.
Reactivity Sulfide	-----	SW-846 7.3.4.2	Cool to 4 deg C	P	14 Days	8 oz.
Semivolatile Organics	-----	8270C	Cool to 4 deg C	G, Amber	14 Days	8 oz.

Table 1

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

Table 1

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

Notes:

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

APPENDIX B

Quality Assurance Quality Control Plan

QUALITY ASSURANCE PROJECT PLAN

Former Coyne Textile Facility
BCP Site #C734144
140 Cortland Avenue
City of Syracuse, New York

CHA Project Number: 33525

Prepared for:

Ranalli/Taylor St., LLC
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Syracuse, NY 13204

Prepared by:

CHA

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September 2017
Revised January 2018
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TABLES

APPENDICES

LIST OF ACRONYMS & ABBREVIATIONS

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

1.0 INTRODUCTION

This Quality Assurance Project Plan (QAPP) presents the policies, organization, objectives, functional activities and specific Quality Assurance (QA) and Quality Control (QC) activities designed to achieve the specific data quality goals associated with the Remedial Investigation (RI) that will be conducted at the Former Coyne Textile Facility Brownfield Cleanup Program (BCP) Site in Syracuse, New York. The scope of work associated with the investigation activities and specific areas of concern that will be addressed are summarized in the Remedial Investigation Work Plan (RIWP).

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

1.1 SITE DESCRIPTION

The Former Coyne Textile Facility is located in an urban area at 140 Cortland Avenue in the City of Syracuse, Onondaga County, New York. The Site limits are generally bounded by commercial buildings to the north, South Salina Street to the east, Tallman Street to the south and South Clinton Street to the west. The Site is identified as two non-contiguous areas as described below:

- The former main laundry facility and offices are known as 140 Cortland Avenue (Tax Map No. 094.-05-06.0) and consist of one parcel of land totaling approximately 1.75 acres. This parcel consists of the currently vacant former laundering facility and offices (approximately 118,500 square feet), sidewalks and limited vegetation. The building is a concrete block building with a slab-on-grade foundation.

- The park and former employee parking area consist of two parcels known as 1002-1022 South Salina Street/Cortland Avenue (Tax Map No. 094.-20-01.0) and 1024-1040 South Salina Street/Tallman Street (Tax Map No. 094.-20-02.0), respectively, totaling approximately 1.70 acres (0.57 and 1.13 acres, respectively). These parcels consist of a small park and a fenced in asphalt parking lot.

The site is currently inactive and is zoned for commercial use. The general area surrounding the Site is highly developed and consists of commercial and industrial facilities. Several rows of multifamily houses are located northwest of the Site.

Based on a review of the 1973 U.S. Geologic Survey Map 7.5-minute Quadrangle for Syracuse West, New York, the Site has an approximate elevation of 390 feet above mean sea level (AMSL) and is relatively flat. The surrounding areas to the east and west slope downward toward Onondaga Creek. Onondaga Creek is located approximately 600 feet west of the Site.

According to the Phase I Environmental Site Assessment (ESA), prepared by GZA GeoEnvironmental, Inc. (GZA) in 2014, prior to Ranalli/Taylor St., LLC obtaining ownership, the 140 Cortland Avenue property was owned by various entities of Coyne Textile Services since the mid-1930s and was utilized as an industrial laundry. Coyne Textile Services filed for bankruptcy and ceased operations in late 2015. Dry cleaning activities using tetrachloroethylene (PCE) and Stoddard solvent (a petroleum mixture made from distilled alkanes, cycloalkanes (naphthenes) and aromatic compounds) were conducted at the Site until 2000. These dry-cleaning products were noted to be stored in aboveground storage tanks (ASTs). Additionally, three underground storage tanks (USTs) were noted as being located beneath the dry-cleaning room floor (containing Stoddard solvent) and the boiler room at 140 Cortland Avenue. Formerly, a gasoline filling station was present in the southern portion of the Site until a building expansion occurred circa 1980.

The former employee parking lot and park located east of the former laundering facility was owned by Coyne Textile Services from 1989-2016. Prior to Coyne Textile Services previous Site uses included bus storage and repairs, the Syracuse Street Car Barn, retail stores, and a gasoline filling station (circa 1950-1970).

Based on historic use and conditions observed during the Phase I ESA, recognized environmental conditions were identified and subsequent investigation activities were completed. A complete description of the current information regarding nature and extent of contamination and previous environmental investigations is provided in the RIWP.

1.2 SCOPE OF WORK

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

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

In general, the RI program will include the following activities:

- Installation of soil borings, monitoring wells, and soil vapor extraction wells;
- Collection of subsurface soil samples;
- Collection of sub-slab soil vapor samples;
- Collection of indoor and outdoor air samples;
- Collection of groundwater samples;
- Performance of slug tests;
- Waste characterization sampling;
- Equipment cleaning; and
- Waste handling.

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

2.0 PROJECT ORGANIZATION AND RESPONSIBILITY

The RI activities are being conducted by Ranalli/Taylor St. under the supervision of the Ranalli/Taylor St. Project Manager, who is the prime contact for communication with the NYSDEC. Engineering oversight and coordination of these activities are to be provided by CHA. The CHA Project Manager is responsible for the delivery of CHA services. Resumes for CHA staff providing environmental services are included in Appendix B.

NYSDEC Regulatory Authority

Stephanie Fitzgerald, PE- NYSDEC Project Manager

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

Ranalli/Taylor St.

James Ranalli – Ranalli/Taylor St. Project Manager

- Responsible for the overall program management of the Former Coyne Textile Facility Remedial Investigation.

CHA

Meghan Platt – CHA Project Manager, Technical Manager/Project Coordinator

- Responsible for following the approved RIWP, notifying the NYSDEC of any deficiencies, and obtaining approval by the NYSDEC for all modifications to the project;
- Provide overall and day-to-day project management;
- Ensure all resources of CHA are available on an as-required basis;
- Participate in key technical negotiations with the NYSDEC, as necessary;
- Provide managerial guidance to CHA's technical group;
- Evaluate data;
- Prepare and coordinate the issuance of reports;
- Provide immediate supervision of all on-site activities;
- Assist in preparation and review of final report; and
- Provide technical representation for field activities.

Dr. Christopher Burns, PG - CHA Quality Assurance/ Quality Control (QA/QC)

- Conduct internal audit of field investigation and sampling;
- Review laboratory activities;
- Determine laboratory data corrective action;

- Review analytical data validation and assessment;
- Review laboratory QA/QC;
- Assist in preparation and review of final report; and,
- Provide technical representation for analytical activities.

Samantha Miller - Field Oversight and Quality Control Coordinator

- Serve as Field Team Leader;
- Work with field crew to prepare for field activities and conduct investigations; and,
- On-Site to
    1. Provide oversight and coordination of field activities.
    2. Ensure that required QC procedures are followed for soil boring and monitoring well installation activities, material handling, and sample collection.
    3. Initiate informal and/or formal corrective actions as necessary.
    4. Maintain and report QC records (i.e. chain-of-custody, field equipment calibration, etc.).
    5. Report to the Project Manager.
- Provide field management of sample collection and field QA/QC;
- Responsible for maintenance of the field equipment; and
- Assist in preparation and review of final report.

Laboratory

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

Project Manager, Analytical Contractor

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

Quality Assurance/ Quality Control Officer, Analytical Contractor

- Overview laboratory QA/QC;
- Overview QA/QC documentation;

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

Sample Custodian, Analytical Contractor

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

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

Table 1: Key Project Personnel

Name	Address	Responsibilities
Stephanie Fitzgerald NYSDEC Project Manager	615 Erie Boulevard West Syracuse, NY 13204 (315) 426-7400 Stephanie.fitzgerald@dec.ny.gov	Ms. Fitzgerald will represent the NYSDEC in its review and oversight function, in its financial sponsorship, and as arbiter on technical matters
James Ranalli Ranalli/Taylor St., LLC Owner	450 Tracy Street Syracuse, NY 13204 (800) 772-1667 jamesranalli@unitedautosupply.com	Mr. Ranalli will represent Ranalli/Taylor St. in the review and oversight of the project, participate in citizen participation activities, and serve as the point of contact for Ranalli/Taylor St.
Meghan Platt CHA Project Manager	300 South State Street Syracuse, NY 13202 (315) 257-7145 meghanplatt@chacompanies.com	Ms. Platt will oversee the project, provide quality control on documents and determinations and mentor the daily task manager.

Name	Address	Responsibilities
Dr. Christopher Burns, P.G. CHA CHA Quality Assurance/ Quality Control Officer	9020 Stony Point Parkway Suite 160 Richmond, VA 23235-4700 (804) 897-0954 ext. 248 cburns@chacompanies.com	Dr. Burns will act as CHA's QA/QC Officer, which will include providing an internal audit of field sampling procedures, a review of laboratory activities and QA/QC, assistance in the preparation and review of final reports.
Meghan Platt CHA Technical Manager/ Project Coordinator	300 South State Street Syracuse, NY 13202 (315) 257-7145 meghanplatt@chacompanies.com	Ms. Platt will provide immediate supervision of all on-site activities, provide field management of sample collection and field QA/QC, assist in preparation and review of final report, and provide technical representation for field activities.
Samantha Miller CHA Field Leader & Health and Safety Officer	300 South State Street Syracuse, NY 13202 (315) 257-7154 smiller@chacompanies.com	Ms. Miller will supervise field investigation activities and will also serve as database manager. Ms. Miller will serve as the Health and Safety point of contact for CHA staff.
Candace Fox Alpha Analytical, Inc. Laboratory Project Manager	8 Walkup Drive Westborough, MA 01581 (508) 898-9220	Ms. Fox will act as CHA's point of contact with the contracted laboratory.

3.0 QUALITY ASSURANCE OBJECTIVES FOR MEASUREMENT DATA

The overall QA objective is to develop and implement procedures for sample preparation and handling, sample COC, laboratory analyses, and reporting, in order to provide accurate data. Specific procedures to be followed for sampling, sample custody and document control, calibration, laboratory analyses and data reduction, validation, assessment and reporting are presented in Sections 4.0 through 8.0 of this QAPP and CHA SOP#603.

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

4.0 LEVEL OF QA EFFORT

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

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

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

Groundwater, and soil samples will be analyzed for all or some of the following:

- Target compound list (TCL) volatile organic compounds (VOCs);
- TCL semi-volatile organic compounds (TCL SVOCs);
- Target Analyte List (TAL) metals;
- Polychlorinated biphenyls (PCBs);
- TCL Pesticides;
- 1,4-Dioxane; and
- Per- and Polyfluoroalkyl Substances (PFAS).

Field duplicate samples for subsurface soil matrices will be collected and analyzed as a check on the aggregate analytical and sampling protocol precision. MS/MSD samples will be analyzed as a check on the analytical method's accuracy and precision. Trip blank samples (for VOC determinations only) will be shipped by the laboratory to the Site and back to the laboratory without opening in the field. The trip blank will provide a measure of potential cross-contamination of samples resulting from shipment, handling and/or ambient conditions at the Site.

4.1 ACCURACY, PRECISIONS AND SENSITIVITY OF ANALYSES

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

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

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

4.2 COMPLETENESS, REPRESENTATIVENESS AND COMPARABILITY

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

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

4.3 FIELD DOCUMENTATION

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

At a minimum, entries in a logbook shall include:

- Date and time of starting work;
- Names of all personnel at site;
- Weather conditions
- Purpose of proposed work effort;
- Sampling equipment to be used and calibration of equipment;
- Description of work area;
- Location of work area, including map reference;

- Details of work effort, particularly any deviation from the field operations plan or standard operating procedures;
- Field observations;
- Field measurements (e.g., Photoionization Detector (PID) readings);
- Field laboratory analytical results;
- Daily health and safety entries, including levels of protection;
- Type, number, and location of samples;
- Sampling method, particularly deviations from the standard operating procedures;
- Sample location and number; and
- Sample handling, packaging, labeling, and shipping information (including destination).

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

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

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

The general QA objective for measurement data is to obtain reproducible and comparable measurements to a degree of accuracy consistent with the use of standardized procedures.

5.0 SAMPLING PROCEDURES

The sampling program to be implemented will include the collection and analyses of groundwater, subsurface soil, and soil vapor (sub-slab and outdoor) samples. Details regarding specific sampling activities are provided in the RIWP and the procedures for collecting samples and for performing related field activities are described in detail in the Field Sampling Plan (FSP), included in Appendix A of the RIWP. The number of samples, analytical methods, sample volumes, preservation techniques and holding times are provided in Table 2, below.

Table 2: Analytical Methods/Quality Assurance Summary

Matrix (Sample Type)	Type of Sample	Analysis	Parameter/Fraction	Number of Primary Samples	Number of Duplicates/ MS/MSD	Number of Trip Blanks	Number of Field Blanks	Number of Equipment Blanks	Sampling Locations	Minimum Sample Volume/ Container	Sample Preservation	Technical Holding Time
Soil	Subsurface Soil	EPA Method 8260C	TCL VOCs	24	2/2	0	0	0	SOIL-100 through SOIL-123	5 grams/40mL Amber VOA	$NaSO_4$, Cool to 4 ºC	14 days
	Subsurface Soil	EPA Method 8270D	TCL SVOCs	24	2/2	0	0	0	SOIL-100 through SOIL-123	4 oz glass wide	Cool to 4ºC	14 days
	Subsurface Soil	EPA 6010C, 7471B	TAL Metals	24	2/2	0	0	0	SOIL-100 through SOIL-123	8 oz glass wide	Cool to 4ºC	180 days (28 days for mercury)
	Subsurface Soil	EPA Method 8082A	PCBs	24	2/2	0	0	0	SOIL-100 through SOIL-123	4 oz glass wide	Cool to 4ºC	14 days
	Subsurface Soil	EPA Method 8081A	TCL Pesticides	4	0/0	0	0	0	SOIL-100 SOIL-106 SOIL-112 SOIL-123	4 oz. glass wide	Cool to 4ºC	14 days

Matrix (Sample Type)	Type of Sample	Analysis	Parameter/Fraction	Number of Primary Samples	Number of Duplicates/ MS/MSD	Number of Trip Blanks	Number of Field Blanks	Number of Equipment Blanks	Sampling Locations	Minimum Sample Volume/ Container	Sample Preservation	Technical Holding Time
Soil	Surface Soil	EPA Method 8260C	TCL VOCs	1	0/0	0	0	0	SOIL-SS100	5 grams/40mL Amber VOA	$NaSO_4$, Cool to 4ºC	14 days
	Surface Soil	EPA Method 8270D	TCL SVOCs	1	0/0	0	0	0	SOIL-SS100	4 oz glass wide	Cool to 4ºC	14 days
	Surface Soil	EPA 6010C, 7471B	TAL Metals	1	0/0	0	0	0	SOIL-SS100	8 oz glass wide	Cool to 4ºC	180 days (28 days for mercury)
	Surface Soil	EPA Method 8082A	PCBs	1	0/0	0	0	0	SOIL-SS100	4 oz glass wide	Cool to 4ºC	14 days
	Surface Soil	EPA Method 8081A	TCL Pesticides	1	0/0	0	0	0	SOIL-SS100	4 oz. glass wide	Cool to 4ºC	14 days

Matrix (Sample Type)	Type of Sample	Analysis	Parameter/Fraction	Number of Primary Samples	Number of Duplicates/ MS/MSD	Number of Trip Blanks	Number of Field Blanks	Number of Equipment Blanks	Sampling Locations	Minimum Sample Volume/ Container	Sample Preservation	Technical Holding Time
Water	Groundwater	EPA Method 8260C	TCL VOCs	17	1/1	2	2	1	GW-100 through GW-105D, MW-1 to MW-3, and GW-WC-100 to GW-WC-101	2- 40 ml VOC vial with Teflon lined septum.	1:1 HC1 to pH<2; Cool to 4ºC	14 days
	Groundwater	EPA Method 8270D	TCL SVOCs	17	1/1	0	0	1	GW-100 through GW-105D, MW-1 to MW-3, and GW-WC-100 to GW-WC-101	2-1 liter amber	Cool to 4°C	7 days extract
	Groundwater	EPA 6010C, 7470A	TAL Metals	17	1/1	0	0	1	GW-100 through GW-105D, MW-1 to MW-3, and GW-WC-100 to GW-WC-101	1- 500 mL plastic	Cool to 4°C HNO_3 to pH<2	180 days (28 days for mercury)
	Groundwater	EPA 8082A	PCBs	17	1/1	0	0	1	GW-100 through GW-105D, MW-1 to MW-3, and GW-WC-100 to GW-WC-101	2-1 liter amber	Cool to 4°C	7 days extract
	Groundwater	EPA 8082A	TCL Pesticides	2	1/1	0	0	1	GW-104 and GW-105S, and GW-WC-100 to GW-WC-101	1-1 liter amber	Cool to 4°C	7 days extract

Matrix (Sample Type)	**Type of Sample**	**Analysis**	**Parameter/Fraction**	**Number of Primary Samples**	**Number of Duplicates/ MS/MSD**	**Number of Trip Blanks**	**Number of Field Blanks**	**Number of Equipment Blanks**	**Sampling Locations**	**Minimum Sample Volume/ Container**	**Sample Preservation**	**Technical Holding Time**
Water	Groundwater	EPA Method 537	PFAS	3	0/0	0/0	0/0	0/0	GW-103D, GW-104, GW-105D	250 mL Plastic container (3)	1.25g Trizma, Cool to 4°C	14 days
	Groundwater	EPA Method 8270D SIM ID	1,4-Dioxane	3	0/0	0/0	0/0	0/0	GW-103D, GW-104, GW-105D	4 oz glass wide	Cool to 4°C	14 days
Air	Sub-Slab Soil Vapor	EPA Method TO-15	TCL VOCs	6	1/0	0	0	0	SV-IA100 through SV-IA105	2.7 liter canister	NA	30 days
	Indoor Air Quality	EPA Method TO-15	TCL VOCs	2	0/0	0	0	0	SV-IAQ100 through SV-IAQ101	2.7 liter canister	NA	30 days
	Sub-Surface Soil Vapor	EPA Method TO-15	TCL VOCs	2	0/0	0	0	0	SVP-100 SVP-101	2.7 liter canister	NA	30 days

Matrix (Sample Type)	Type of Sample	Analysis	Parameter/Fraction	Number of Primary Samples	Number of Duplicates/ MS/MSD	Number of Trip Blanks	Number of Field Blanks	Number of Equipment Blanks	Sampling Locations	Minimum Sample Volume/ Container	Sample Preservation	Technical Holding Time
	Outdoor Air	EPA Method TO-15	TCL VOCs	1	0/0	0	0	0	SV-OA100	2.7 liter canister	NA	30 days
Soil Stockpile Waste Characterization Samples	Waste Soil	EPA Method 8260C	TCLP VOCs	2	0/0	0	0	0	SOIL-WC-100, SOIL-WC-101	8 oz. amber jar	Cool to 4ºC	14 days extract
	Waste Soil	EPA Method 8270D	TCLP SVOCs	2	0/0	0	0	0	SOIL-WC-100, SOIL-WC-101	8 oz. amber jar	Cool to 4ºC	14 days extract
	Waste Soil	EPA Method 6010C, 7470A	TCLP Metals	2	0/0	0	0	0	SOIL-WC-100, SOIL-WC-101	8 oz. amber jar	Cool to 4ºC	180 days (6010) 28 days (mercury) 14 days (cyanide)
	Waste Soil	EPA Method 8151	TCLP Pesticides	2	0/0	0	0	0	SOIL-WC-100, SOIL-WC-101	4 oz. amber jar	Cool to 4ºC	14 days extract

Matrix (Sample Type)	Type of Sample	Analysis	Parameter/Fraction	Number of Primary Samples	Number of Duplicates/ MS/MSD	Number of Trip Blanks	Number of Field Blanks	Number of Equipment Blanks	Sampling Locations	Minimum Sample Volume/ Container	Sample Preservation	Technical Holding Time
	Waste Soil	EPA Method 8081B	TCLP Herbicides	2	0/0	0	0	0	Soil Stockpiles	4 oz. amber jar	Cool to 4ºC	14 days extract

6.0 SAMPLE CUSTODY AND DOCUMENT CONTROL

6.1 CHAIN-OF-CUSTODY

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

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

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

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

6.2 SAMPLE DOCUMENTATION IN THE LABORATORY

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

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

6.3 STORAGE OF SAMPLES

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

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

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

7.0 CALIBRATION PROCEDURES AND FREQUENCY

7.1 INSTRUMENT CALIBRATION AND TUNING

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

7.2 FIELD INSTRUMENT CALIBRATION

Calibration of the field instruments will be completed prior to each day’s use in accordance with the manufacturer’s instructions. During groundwater sampling activities if the data indicates a change (>±10 percent) in pH and/or conductivity from the last location sampled, the field equipment will be recalibrated. The field equipment will be maintained, calibrated and operated in a manner consistent with the manufacturer's guidelines and EPA standard methods. However, since the majority of field measurements will be limited to organic vapor readings (PID readings), pH, conductivity, turbidity, and depth (water level) the calibration procedures will be conducted at a minimum frequency of once per day. Records of calibration, repair or replacement will be filed and maintained by the Field Team Leader on the log provided in Appendix C.

8.0 DATA REDUCTION, VALIDATION, ASSESSMENT AND REPORTING

8.1 GENERAL

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

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

8.2 FIELD DATA

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

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

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

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

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

8.3 LABORATORY REPORTING

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

8.4 ELECTRONIC DATA

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

8.5 DATA VALIDATION

A qualified third party will conduct an independent evaluation of the Category B data reduction and reporting by the laboratory. The data validation will be performed in accordance with the following documents: "USEPA Contract Laboratory Program National Functional Guidelines for Organic Data Review EPA 540/R-99-008, October 1999" and "USEPA Contract Laboratory Program National Functional Guidelines for Inorganic Data Review EPA 540/R-04-004, October 2004". Data analyzed using methods not covered in these documents will be validated using the general principles used in these documents, and the analytical requirements specified in the methods pertaining to USEPA Region 2 Data Validation.

9.0 INTERNAL QUALITY CONTROL CHECKS AND FREQUENCY

9.1 FIELD QUALITY CONTROL

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

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

9.2 LABORATORY QUALITY CONTROL

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

9.2.1 Blank Samples

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

9.2.2 Matrix Spike/Matrix Spike Duplicates

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

9.2.3 Surrogate Analyses

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

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

10.0 PROCEDURES USED TO ASSESS PERFORMANCE

10.1 PRECISION

Precision will be assessed by comparing the analytical results between duplicate spike analyses. Precision as RPD will be calculated as follows:

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

D_1 = matrix spike recovery
D_2 = matrix spike duplicate spike recovery

Acceptance criteria for duplicate soil samples will be ≤30% RPD. Acceptance criteria for duplicate water samples will be ≤20% RPD between field and laboratory data.

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

10.2 ACCURACY

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

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

A = The analyte determined experimentally from the spike sample.
B = The background level determined by a separate analysis of the unspiked sample.
C = The amount of spike added.

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

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

10.3 REPRESENTATIVENESS, COMPLETENESS AND COMPARABILITY

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

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

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

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

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

10.4 OUTLIERS

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

11.0 QUALITY ASSURANCE REPORT TO MANAGEMENT

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

At a minimum, these reports will include:

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

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

APPENDIX A

CHA Standard Operating Procedures

Author: Chris Burns
Reviewer: Seth Fowler
Sandy Warner

FIELD LOGBOOK AND PHOTOGRAPHS

A. PURPOSE/SCOPE:

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

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

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

B. EQUIPMENT/MATERIALS:

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

C. PROCEDURE:

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

FIELD LOGBOOK AND PHOTOGRAPHS

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

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

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

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

D. QA/QC REQUIREMENTS:

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

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

E. SPECIAL CONDITIONS:

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

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

F. REFERENCES:

None

G. APPENDICES/FORMS:

Not Applicable

END OF SOP

Final Check by C. Burns 10/2/15

SOP #105
Revision #01
02/13/2013

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

COMPLETING A CHAIN-OF-CUSTODY RECORD

A. PURPOSE/SCOPE:

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

Sample Collector → Sample Courier/Operator → Sample Custodian

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

B. EQUIPMENT/MATERIALS:

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

C. PROCEDURE:

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

COMPLETING A CHAIN-OF-CUSTODY RECORD

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

D. QA/QC REQUIREMENTS:

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

E. SPECIAL CONDITIONS:

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

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

F. REFERENCES:

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

COMPLETING A CHAIN-OF-CUSTODY RECORD

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

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

G. APPENDICES/FORMS:

CHA COC Form

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

SOP #603
Revision #0
03/09/2012
Page 1 of 3
Author: Meghan Platt, P.E.
Reviewer: Scott Smith, P.E.

SAMPLE CONTAINERS, VOLUMES, PRESERVATIONS AND HOLDING TIMES

A. PURPOSE/SCOPE:

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

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

B. EQUIPMENT/MATERIALS:

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

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

C. PROCEDURE:

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

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

D. QA/QC REQUIREMENTS:

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

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

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

Volatile Organic Compounds:

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

SAMPLE CONTAINERS, VOLUMES, PRESERVATIONS AND HOLDING TIMES

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

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

Cyanide

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

E. SPECIAL CONDITIONS:

Not Applicable

F. REFERENCES:

Alpha Analytical Aqueous and Soil/Solid Reference Guides.

G. APPENDICES/FORMS:

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

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

Table 1

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

Table 1

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

Table 1

Laboratory Analysis	EPA Method	Standard Method and/or SW846 Method	Preservation	Container	Holding Time	Minimum Volume
Organochlorine Pesticides/PCB	608	8081A,8082	Cool to 4 deg C 0.008% Na2S2O3 if residual chlorine present If aldrin is to be determined bind to pH 5-9.	G, Amber Teflon-lined screw cap	7 days until extraction 40 days after extraction	1000 mL
Ortho Phosphate	300	4500 P-E	Cool to 4 deg C	P or G	48 Hrs	50 mL
Orthophosphate	365.2	-----	Filter immediately, Cool to 4 deg C	P or G	48 Hrs.	50 mL
pH, Hydrogen ion	-----	4500-H-B	Cool to 4 deg C	P or G	Analyze Immediately	25 mL
Phenols	420.1	9065, 510ABC	Cool to 4 deg C, H2SO4 to pH<2	G	28 Days	500 mL
Pseudomanas Aeruginosa	-----	9213E	Cool to 4 deg C 0.008% Na2S2O3 if residual chlorine present	Sterile P or G	30 Hrs. for Drinking Water 6 Hrs. for Waste Water	125 mL
Purgeable Halocarbons	601	8021B	Cool to 4 deg C 0.008% Na2S2O3 if residual chlorine present	G, Vial screw cap with center hole Teflon- faced silicone septum	14 Days	40 mL
Radiological	-----	-----	HNO3 to pH<2	P or G	6 Months	100 mL
Residue- Settleable (SS)	160.5	-----	Cool to 4 deg C	P or G	48 Hrs.	1000 mL
Residue-filtered (TDS)	160.1	-----	Cool to 4 deg C	P or G	7 Days	100 mL
Residue-non- filtered (TSS)	160.2	-----	Cool to 4 deg C	P or G	7 Days	100 mL
Residue-Total Volatile Solids	160.4	2540 E	Cool to 4 deg C	P or G	7 Days	100 mL
Salinity	-----	2520 C	Cool to 4 deg C	G	28 Days	100 mL
Semivolatile Organic Compounds (Unregulated)	525.2	-----	If residual chlorine is present, add 40-50 mg Sodium Thiosulfate. If not chlorinated, add 6N HCl to pH<2 Cool to 4 deg C	G, Amber Teflon-lined screw cap	7 Days for extraction, 30 after extraction	1000 mL
Semivolatile Organics	625	8270C	Cool to 4 deg C 0.008% Na2S2O3 if residual chlorine present	G, Amber Teflon-lined screw cap	7 days for extraction 40 days after extraction	1000 mL
Silica	200.7	-----	Cool to 4 deg C	P only	7 Days	50 mL
Specific Conductance	120.1	-----	Cool to 4 deg C	P or G	28 Days	100 mL
Sulfate	300	4500-SO4	Cool to 4 deg C	P or G	28 Days	50 mL
Sulfate	375.4	-----	Cool to 4 deg C	P or G	28 Days	50 mL
Sulfide	376.2	9030 B, 4500S2-AD	Cool to 4 deg C, add zinc plus NaOH to pH>9	P or G	7 Days	50 mL
Sulfite (SO3)	377.1	-----	None Required	G, Bottle and Top	Analyze immediately	50 mL
Surfactants (MBAS)	425.1	-----	Cool to 4 deg C	P or G	48 Hrs.	250 mL

Table 1

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

Table 1

Laboratory Analysis	EPA Method	Standard Method and/or SW846 Method	Preservation	Container	Holding Time	Minimum Volume
Corrosivity Toward Steel	-----	1110	Cool to 4 deg C	P	14 Days	4 oz.
Cyanide		9010B, 4500CN	Cool to 4 deg C	G, Amber	14 Days	4 oz
Dioxin	-----	8280A	Cool to 4 deg C	G	14 Days	8 oz.
DRO	-----	8015B	Cool to 4 deg C	G, Amber	14 Days	4 oz.
Extractable Organic Compounds			Cool to 4 deg C, Store in dark	G	14 days	8 oz
Extractable Sulfide	-----	9031	Cool to 4 deg C, fill top of sample with 2N Zinc Acetate until moistened	P or G	7 Days	8 oz.
Fluoride	-----	9214	None	P	28 Days	8 oz.
Gases	-----	3810	Cool to 4 deg C	G, Amber	14 Days	8 oz.
Grain Size			N/A	G	N/A	8 oz
GRO	-----	8015B	Cool to 4 deg C, check state regulations for proper preservative. NJ (methanol), PA (encore samplers) NY (cool to 4 deg C).	G, Amber VOA vial	14 Days	15 Grams
HPLC (PAH)	------	8310	Cool to 4 deg C	G, Amber Teflon-lined screw cap	14 days until extraction 40 days after extraction	4 oz.
Ignitability	-----	1010	None	P or G	None	8 oz.
Ignitability of Solids		1030	None	P or G	None	8 oz.
Mercury	245.1	7471A	Cool to 4 deg C	G, Amber	28 Days	4 oz.
Metals	-----	6010B, 6020, 7000A	Cool to 4 deg C	G, Amber	6 Months	8 oz.
Moisture Content			Store in airtight jar 3-30 deg C	G	N/A	8 oz
Nitrate	-----	9210	Cool to 4 deg C	P or G	48 Hrs	8 oz.
Oil & Grease (Sludge, Sludge- Hem)	-----	9071B	Cool to 4 deg C	G	28 Days	8 oz.
Organochlorine	-----	8081A	Cool to 4 deg C	P or G	14 Days	8 oz.
Paint Filter Liquids Test	-----	9095A	Cool to 4 deg C	P or G	-----	8 oz.
PCBs	-----	8082	Cool to 4 deg C	G, Amber Teflon-lined screw cap	14 Days	4 oz.
pH	-----	9045C	Cool to 4 deg C	G, Amber	Analyze Immediately	4 oz.
pH, Soil and Waste	-----	9045A	Cool to 4 deg C	G	Analyze Immediately	8 oz.
Phenol	-----	9065, 9066, 9067	Cool to 4 deg C	G, Amber	28 Days	4 oz.
Radiological	-----	-----	Cool to 4 deg C	G	6 Months	8 oz.
Reactivity Cyanide	-----	SW-846 7.3.3.2	Cool to 4 deg C	P	14 Days	8 oz.
Reactivity Sulfide	-----	SW-846 7.3.4.2	Cool to 4 deg C	P	14 Days	8 oz.
Semivolatile Organics	-----	8270C	Cool to 4 deg C	G, Amber	14 Days	8 oz.

Table 1

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

Table 1

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

Notes:

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

QUALITY ASSURANCE/QUALITY CONTROL SAMPLES

A. PURPOSE/SCOPE:

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

B. EQUIPMENT/MATERIALS:

QA/QC samples require the following materials:

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

C. PROCEDURE:

The following are types of QA/QC samples.

1. Duplicate Sample

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

Example:

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

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

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

2. Field Blank

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

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

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

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

3. Equipment Blank

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

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

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

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

4. Matrix Spike/Matrix Spike Duplicate Sample

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

Example:

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

QUALITY ASSURANCE/QUALITY CONTROL SAMPLES

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

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

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

5. Trip Blank

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

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

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

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

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

D. QA/QC REQUIREMENTS:

Not Applicable

QUALITY ASSURANCE/QUALITY CONTROL SAMPLES

E. SPECIAL CONDITIONS:

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

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

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

F. REFERENCES:

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

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

G. APPENDICES/FORMS:

Not Applicable

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

APPENDIX B

CHA Staff Resumes

Christopher A. Burns, PhD, PG

Chief Scientist

Education

University of Delaware, DE, Ph.D. in Geology

University of Delaware, DE, M.S. in Geology

Colgate University, NY, B.A. in Geology

Registration & Certification

Professional Geologist- DE, IN, NH, VA, NY

Memberships & Affiliations

National Ground Water Association

Solid Waste Association of North America

Years Experience

Total: 29 With CHA: 23

Dr. Burns has 29 years of experience managing CERCLA remedial investigations and feasibility studies, hydrogeological investigations, Phase I & II site assessments, and siting studies for solid waste management facilities. He has provided project management for new municipal wells, well contamination investigations, and water resource protection:

Town of Salina, NY, Salina Landfill Superfund Site. Project Manager for completion of a Remedial Investigation, Feasibility Study, and Remedial Design of 55-acre inactive hazardous waste landfill. Investigated extent of contamination associated with PCBs and solvents and impact on surface waters and ground waters. Project also included a search for Potentially Responsible Parties and a Human Health and Ecological Risk Assessment. Project was challenging because it required review and interaction with both the NYSDEC and the USEPA.

HDR, Inc., Utica City Dump, NY Inactive Hazardous Waste Site. Project Manager for completion of a Remedial Investigation and Feasibility Study (RI/FS) of 110-acre inactive hazardous waste landfill. Used magnetometry, test pits, historical aerial photography to define nature and limits of waste. Investigated impact to surface water bodies bordering the site to the north and to the south. Conducted groundwater investigation influenced by controlled discharge through adjacent Erie Canal. Documented that groundwater flow direction can vary seasonally as influenced by flow in adjacent surface water bodies.

Solvents & Petroleum Service, RCRA Facility Investigation. Project Manager responsible for completing RCRA Facility Investigation Report for solvent and petroleum distribution facility. The Report consisted of a summary of all activities and sampling performed over the last 7 years. A review of historical information revealed gaps in the understanding of groundwater contamination.

Confidential Client, Buffalo, NY Inactive Hazardous Waste Sites. Project Manager for 7 Buffalo, NY- area sites involving potential disposal of hazardous -wastes. Projects were in different phases of investigation and clean-up. Directly communicated with NYSDEC and City Officials on project and supervised team of consultants and attorneys.

USEPA Region III, Butz Landfill Superfund Site, PA. Project Manager of RI/FS to define nature and extent of TCE plume in fractured bedrock aquifer. Used borehole geophysics, packer testing, pump testing, and ground water sampling to delineate plume and performed fate and transport analysis to predict plume migration.

Education
Clarkson University, NY, M.A. in Engineering Management

SUNY College of Environmental Science and Forestry, NY, B.S. in Environmental Engineering

Registration & Certification
Engineer-in-Training, NY

Certified Professional in Erosion & Sediment Control (In Training)

Memberships & Affiliations
Air and Waste Management Association

Years Experience
Total: 5 With CHA: 5

Samantha J. Miller, EIT, CPESC-IT

Project Engineer

Ms. Miller has over five years' experience providing consulting engineering services for environmental projects. Her experience to date includes performing environmental monitoring, construction inspection services, remediation system operations and maintenance, Phase I and Phase II Environmental Assessments, geotechnical field investigations, SWPPP reports, stormwater inspections, and chemical bulk storage inspections. Representative project experience includes:

LPCiminelli, Riverbend Site Redevelopment. Lead Field Environmental Engineer for the construction of a 1.2-million square foot solar panel manufacturing facility as part of the redevelopment of an approximately 88-acre parcel that was once the former Republic Steel. Responsible for assisting in the preparation of a detailed work plan, health and safety plans, and negotiations with NYSDEC. Responsible for developing and implementing a community air monitoring plan, field screening services during intrusive activities, sampling soils, delineating and providing guidance to the contractor on the management of contaminated media, and conducting SWPPP inspections during the redevelopment of the property. Designed field changes as necessary when site conditions changed and negotiated with NYSDEC for approval to implement these changes. Prepared a construction completion report which included; historical site information, volume calculations and delineations of areas of contaminated material removed from the site, interpretation of air monitoring data, and an overview of all environmental work completed on the site during construction.

Confidential Client, Planned Pipe Rack and RTO. Lead Field Environmental Engineer for the construction of a regenerative thermal oxidizer (RTO) for the Rotterdam Junction Facility. Responsibilities included soil screening, air monitoring, implementation of a health and safety plan, negotiations and discussions with NYSDEC, waste disposal tracking/documentation, and waste characterization and end point sampling.

AMERCO Real Estate Company, U-Haul Facility. Environmental Engineer responsible for the preparation of technical documents including a Soil/Fill Management Work Plan and Community Air Monitoring Plan, in accordance with NYSDEC DER-10 Technical Guidance for Site Investigation and Remediation. Coordinated directly with regulatory officials, the client, the landfill, and the contractor to design Work Plan amendments and a field sampling plan that would adequately address the concerns of all parties involved while maintaining regulatory compliance. Performed all field activities including soil sampling, contractor oversight, and air monitoring.

Meghan M. Platt, PE

Senior Engineer

Education
SUNY College of Environmental Science and Forestry, NY, B.S. in Forest Engineering

Registration & Certification
Professional Engineer-NY

Memberships & Affiliations
Air and Waste Management Association-CNY

Chair – SUNY ESF Department of Environmental Resources Engineering Advisory Council

Visiting Instructor – SUNY College of Environmental Science & Forestry

Years Experience
Total: 17 With CHA: 7

Ms. Platt has over 15 years of environmental engineering and construction experience. Her experience includes Phase I ESAs, Phase II ESAs, environmental investigations, soil and groundwater remediation and compliance and permitting activities. Ms. Platt's experience also includes water and wastewater treatment system design, construction and operation, maintenance, and monitoring activities. Representative project experience includes:

Former Sampson Air Force Base Physical Hazard Abatement, Romulus, NY. Provided engineering services for the demolition, excavation, removal and appropriate disposal of abandoned structures including an incinerator with contaminated soils and liquids, a pump station and associated equipment, a wastewater treatment plant with buildings and nine process tanks (including digesters, clarifiers, trickling filters with mercury bearings and associated liquid waste). The scope of services included establishing an overall work plan (WP), regulatory impact assessment, environmental protection plan, sampling plan, quality assurance project plan (QAPP) in accordance with the Uniform Federal Policy, activity hazard assessment, accident prevention plan (HASP) in accordance with EM 385-1-1, construction oversight and documentation, and closure reporting in compliance with US Corp of Engineers requirements.

Town of Salina, NY, Salina Landfill Superfund Site. Provided engineering services related to the completion of a Remedial Investigation and Feasibility Study of 55-acre inactive hazardous waste landfill. Investigated the extent of contamination associated with PCBs and solvents and the associated impact on soil, surface waters and ground waters.

Solvents & Petroleum Service, RCRA Facility Investigation. Provided engineering services for this 6NYCRR Part 373 facility used for temporary storage of both virgin and spent solvents. Tasks have included the collection of field data and groundwater samples and the preparation of periodic groundwater monitoring reports.

Confidential Client, Schenectady, NY. Environmental Engineer responsible for preparing design documents for an in-situ remedial system, including a thermally enhance soil vapor extraction (TESVE) system, a conductive soil heating system, a groundwater extraction system for dewatering the treatment zone, and a controls system. Also responsible for the preparation of construction completion reports, final engineering report, site management plans, and operation, maintenance and monitoring (OM&M) plan. Responsible for the implementation and oversight of OM&M activities associated with the in-situ remedial system.

APPENDIX C

Field Calibration Log

PID Calibration Log

Meter Make and Model:	**Serial Number:**
Name of Person Performing Calibration:	**CHA Project Number:**

Test Type (Bump/full cal.)	Gas Tested	Calibration Parameters	Results	Pass/Fail	Date/Time	Signature

CHA

APPENDIX C

Health and Safety Plan

HEALTH AND SAFETY PLAN

for

BROWNFIELD CLEANUP PROGRAM
FORMER COYNE TEXTILE FACILITY
140 CORTLAND AVENUE
SYRACUSE, NEW YORK 13202

CHA Project Number:33525

Prepared for:

Ranalli/Taylor St., LLC
450 Tracy St
Syracuse, NY 13204

September 27, 2017
Revised January 2018

Prepared by:

One Park Place
300 South State Street, Suite 600
Syracuse, NY 13202
Phone: (315) 471-3920
Fax: (315) 471-3569

Table of Contents

SITE SPECIFIC HEALTH AND SAFETY PLAN

1.0 INTRODUCTION

The following Health and Safety Plan (HASP) has been created for the protection of CHA Consulting, Inc. (CHA) staff on the Remedial Investigation activities, located at 140 Cortland Avenue in the City of Syracuse, New York (see Figure 1). This project's various assignments require CHA employees to perform tasks where personal safety could be compromised due to chemical, physical, and/or biological hazards. While conducting field work, CHA employees may be exposed to chemical, physical, and/or biological hazards including but not limited to:

- Chemical exposure due to the presence of subsurface contamination in areas of proposed soil boring and monitoring well installation
- Slip/Trips/Falls
- Cold Stress
- Fire or ignition of flammable vapors in boring areas
- Excessive noise for certain operations
- Heavy equipment operation
- Environmental and Biological hazards (e.g. insects, plants, UV exposure, etc.)

The requirements and guidelines in this HASP are based on a review of available information and an evaluation of potential on-site hazards, including: Environmental Site Assessments conducted by GZA GeoEnvironmental. This HASP will be discussed with site personnel and will be available on-site for review while work is underway. CHA personnel will report to the Project Manager (PM) and consult with the Health and Safety Coordinator (HSC) in matters of health and safety. The Site Safety Officer (SSO) and Field Team Leader (FTL) is the same person for this project and is responsible for ensuring compliance with this HASP, stopping work when necessary, and for implementation of this HASP for daily site activities.

Non-intrusive activities within CHA's Scope of work are those that do NOT have the potential to jeopardize the health and safety of site workers, the public, or the environment with respect to site contaminants. Intrusive activities within CHA's Scope of Work are those that have the potential to cause health and safety concerns to site workers, the public, or the environment. These activities and any non-intrusive activities conducted in an Exclusion Zone require training per 29 CFR 1910.120 on a NYSDEC Brownfield hazardous waste site.

2.0 KEY PERSONNEL

2.1 OFF-SITE PERSONNEL

Title: CHA Corporate Director of Health & Safety
Description: Responsible for the CHA's corporate health and safety program and developing procedures, policies, and coordinating training programs. Additionally, provides senior level guidance on development of HASPs and interpretation of regulations.
Contact:
Margaret Rudzinski
(518) 453-2830 (Office)
(518) 469-9259 (Cell)

Title: Project Manager
Description: Reports to upper level management, provides sufficient authority and resources to satisfy health and safety requirements, and assumes total control over site activities. The Project Manager is ultimately responsible for ensuring field implementation of this HASP.
Contact:
Meghan Platt
(315) 257-7145 (Office)
(315) 657-6916 (Cell)

2.2 ON-SITE PERSONNEL

Title: Site Safety Officer
Description: Advises the field team on all aspects of health and safety issues, recommends stopping work if any operation threatens worker or public health and safety.
Contact:
Samantha Miller
(315) 257-7154 (Office)
(915) 329-9898 (Cell)

Title: Field Team Leader
Description: Responsible for coordinating project requirements in the field. The Field Team Leader oversees daily activities of the project and are, therefore, responsible for implementing health and safety requirements and following safety procedures in the field. The Field Team Leader will contact the local emergency response organizations to notify concerned affiliates of the hazards associated with this project.
Contact:
Samantha Miller
(315) 257-7154 (Office)
(915) 329-9898 (Cell)

Title: Work Party
Description: Performs field operations
Contact:
Samantha Miller
(315) 257-7154 (Office)
(915) 329-9898 (Cell)

2.3 ON-SITE OPTIONAL PERSONNEL

Title: Health and Safety Coordinator
Description: Responsible for making recommendations regarding the work area to the SSO. Inspections may be periodically conducted to monitor worker health and safety and will address such issues as appropriate PPE, required air monitoring, decontamination procedures, and worker safety.
Contact:
Christopher Mullin
(315) 471-3920 (Office)

Title: Scientific Advisor
Description: Guides the Project Team Leader in scientific matters.
Contact:
Christopher Burns, Ph.D., PG
(804) 897-0954 x 248 (Office)

2.4 AS-NEEDED PERSONNEL

Title: Fire Department
Description: Responds to fires and performs rescues
Contact:
911

Title: Paragon Environmental Construction
Description: Responds to spills and other environmental emergencies that may arise
Contact:
(315) 699-0840

Title: EPA National Response Center
Description: Responds to all oil, chemical, radiological, biological and etiological discharges into the environment, anywhere in the United States and its territories.
Contact:
(800) 424-8802

2.5 CLIENT-SPECIFIC CONTACTS

James Ranalli of Ranalli/Taylor St. LLC
Contact:
(800) 772-1667

3.0 SITE ENTRY

3.1 OBJECTIVES

The objectives of the site entry are to:

1. Collect soil, soil vapor, and groundwater samples according to the remedial investigation work plan (RIWP)
2. Document contractor activities
3. Screen soils (visual, olfactory, and photoionic) for level of contamination in accordance with the NYSDEC 6NYCRR Part 360 Soil Cleanup Guidance Objectives.

The intrusive site activities may include the following:

1. Oversight of soil boring, sub-slab vapor, and monitoring well installation
2. Sampling of soil, groundwater, and soil vapor for laboratory analysis
3. Oversight of proper spoil disposal (i.e. drill cuttings and purged groundwater) into trucks for off-site transport to permitted facilities

3.2 SAFETY MEETINGS

To ensure that the HASP is being followed, the SSO shall conduct a safety meeting prior to entry to the site or the initiation of any site activity, if any conditions change, and before each work day. The attached “Take Five” form should be utilized to document these daily jobsite briefings.

3.3 SAFETY TRAINING

The SSO will confirm that every person assigned to a task has had adequate training for that task and that the training is up-to-date by checking with the CHA Safety Coordinator and online database. CHA staff working on this project shall have a minimum of

- 40-Hour Initial Hazardous Waste Operations and Emergency Response (HAZWOPER) training in accordance with 29 CFR 1910.120
- Current 8-hour HAZWOPER Refresher Training
- Training on CHA Respiratory Protection Plan (Checklist included in Appendix B)inc
- Field equipment safety training where applicable

All training will have been conducted and certified in accordance with OSHA regulations.

3.4 MEDICAL SURVEILLANCE

All CHA personnel will have had a medical surveillance physical consistent with OSHA regulations and performed by a qualified occupational health physician if deemed necessary by project requirements. The SSO shall confirm prior to initiation of work on this site that every CHA person assigned to a task has had an annual physical and respiratory fit test, has passed the medical examination, and has been determined medically fit by the occupational health physician for respirator use and this type of work if deemed necessary by the PM.

3.5 SITE MAPPING

Site mapping has been included in the Figures section of the HASP. Figure 1 illustrates the location of the subject Site. Figure 2 illustrates the route to the nearest hospital from the subject site.

4.0 SITE CHARACTERIZATION

4.1 SITE DESCRIPTION

The Former Coyne Textile Facility is located in an urban area at 140 Cortland Avenue in the City of Syracuse, Onondaga County, New York. The Site limits are generally bounded by commercial buildings to the north, South Salina Street to the east, Tallman Street to the south and South Clinton Street to the west. The Site is identified as two non-contiguous areas as described below:

- The former main laundry facility and offices are known as 140 Cortland Avenue (Tax Map No. 094.-05-06.0) and consist of one parcel of land totaling approximately 1.75 acres. This parcel consists of the currently vacant former laundering facility and offices (approximately 118,500 square feet), sidewalks and limited vegetation. The building is a concrete block building with a slab-on-grade foundation.

- The park and employee parking area are known as 1002-1022 South Salina Street/Cortland Avenue (Tax Map No. 094.-20-01.0) and 1024-1040 South Salina Street/Tallman Street (Tax Map No. 094.-20-02.0) and consist of two parcels totaling approximately 1.70 acres (0.57 and 1.13 acres, respectively). These parcels consist of a small recreational park and a fenced in asphalt parking lot.

The Site is currently inactive and is zoned for commercial use. The general area surrounding the Site is highly developed and consists of commercial and industrial facilities. Several rows of multifamily houses are located northwest of the Site.

Based on a review of the 1973 U.S. Geologic Survey Map 7.5-minute Quadrangle for Syracuse West, New York, the Site has an approximate elevation of 390 feet above mean sea level and is relatively flat. The surrounding areas to the east and west have a topographic gradient that slopes toward Onondaga Creek, located approximately 600 feet west of the Site.

Characterization of the contamination via Phase I, II, and III investigation by GZA GeoEnvironmental in 2014 indicated a central location of PCE contamination near the northwest portion of the main building at 140 Cortland Avenue. Widespread volatile organic compound, semi-volatile organic compound, and metal contamination is present throughout the site. In addition, several above-ground and underground storage tanks exist on the property. Appropriate personal protective equipment (PPE), as discussed in section 10.0, is required for the entire site. A complete description of the current information regarding nature and extent of contamination and previous environmental investigations is provided in the RIWP.

Alterations to this HASP and its PPE requirements may occur if site investigations indicate higher levels of contamination than the previous investigations noted.

4.2 NEIGHBORING PROPERTIES

The site is bordered by the following:

- **North:** Commercial Buildings, West Taylor Street
- **East:** Commercial Buildings, South Salina Street
- **South:** Commercial Buildings, Tallman Street
- **West:** Commercial Buildings, South Clinton Street

4.3 SITE TOPOGRAPHY

The topography of the site is relatively flat, with an elevation of approximately 390 feet above mean sea level. Onondaga Creek is approximately 600 feet to the west of the site and flows north to Onondaga Lake. The project area is relatively flat, but surface and groundwater movement is generally westward towards Onondaga Creek.

4.4 METEROLOGIC DATA

Time of year work is to be conducted is during November through December. The weather and temperature for that time of year is expected to vary, but cooler temperatures are typically expected this time of year. Prior to each day’s activities, the daily forecast should be monitored for indications of adverse work conditions. If poor weather hinders the continuation of the day’s activities the Team Leader may notify the PM and stop work for the day. Information on cold stress are included in Appendix A.

5.0 HAZARD EVALUATION

Hazards are generally divided into three (3) categories, exposure to chemicals and hazardous materials, safety/physical hazards, and biological hazards. Safety/physical hazards are generally hazards such as electrical shock, slips/trips/falls, and confined spaces. Chemical hazards are further segregated by their routes of exposure that may cause adverse health effects. Biological hazards typically include plants, animals, and insects.

5.1 CHEMICAL HAZARDS

Chemical	OSHA PEL	NIOSH REL	IDLH	Ionization Potential (I.P)	Characteristics	Routes of Exposure	Symptoms of Exposure and Health Effects
Tetrachloroethene (PCE)	TWA 100 ppm C 200 ppm (for 5 mins in any 3-hr period) max peak of 300 ppm	N/A, Ca Minimize workplace exposure concentration	150 ppm	9.32 eV	Colorless liquid with a mild chloroform-like odor	inhalation, skin absorption, ingestion, skin and/or eye contact	irritation eyes, skin, nose, throat, respiratory system; nausea; flush face, neck; dizziness, incoordination; headache, drowsiness; skin erythema, liver damage; carcinogenic
Trichloroethene (TCE)	TWA 100 ppm C 200 ppm 300 ppm (5 min max in 2-hr period)	N/A Ca	1000 ppm	9.45 eV	Colorless liquid (unless dyed blue) with a chloroform-like odor	inhalation, skin absorption, ingestion, skin and/or eye contact	irritation eyes, skin; headache, visual disturbance; lassitude (weakness, exhaustion); dizziness, tremors, drowsiness, nausea, vomiting; dermatitis; cardiac arrhythmias; paresthesia; liver injury; carcinogenic
Cis- 1,2-Dichloroethene (DCE)	TWA 200 ppm	TWA 200 pm	1000 ppm	9.65 eV	Colorless, oily liquid with a chloroform-like odor	inhalation, ingestion, skin and/or eye contact	irritation skin; central nervous system depressed; liver, kidney, and lung damage
Vinyl Chloride	TWA 1 ppm C 5 ppm (15-minute)	N/A Ca	N/A	10.0 eV	Colorless gas or liquid (below 7°) with a pleasant odor at high concentrations	inhalation, skin and/or eye contact (as a liquid)	lassitude (weakness, exhaustion); abdominal pain, GI bleeding; enlarged liver; pallor or cyan of extremities; liquid: frostbite; carcinogenic
Benzo [a] anthracene	TWA 0.2 mg/m^3	Ca TWA 0.1 mg/m^3	80 mg/m^3	N/A	Black or dark-brown amorphous residue	inhalation, skin and/or eye contact	dermatitis; bronchitis; carcinogenic
Benzo [a] pyrene	TWA 0.2 mg/m^3	Ca TWA 0.1 mg/m^3	80 mg/m^3	N/A	Black or dark-brown amorphous residue	inhalation, skin and/or eye contact	dermatitis; bronchitis; carcinogenic

Chemical	OSHA PEL	NIOSH REL	IDLH	Ionization Potential (I.P)	Characteristics	Routes of Exposure	Symptoms of Exposure and Health Effects
Benzo [b] fluoranthene	TWA 0.2 mg/m^3	Ca TWA 0.1 mg/m^3	80 mg/m^3	N/A	Black or dark-brown amorphous residue	inhalation, skin and/or eye contact	dermatitis; bronchitis; carcinogenic
Benzo [g,h,i] perylene	TWA 0.2 mg/m^3	Ca TWA 0.1 mg/m^3	80 mg/m^3	N/A	Black or dark-brown amorphous residue	inhalation, skin and/or eye contact	dermatitis; bronchitis; carcinogenic
Benzo [k] fluoranthene	TWA 0.2 mg/m^3	Ca TWA 0.1 mg/m^3	80 mg/m^3	N/A	Black or dark-brown amorphous residue	inhalation, skin and/or eye contact	dermatitis; bronchitis; carcinogenic
Indeno [1,2,3-cd] pyrene	TWA 0.2 mg/m^3	Ca TWA 0.1 mg/m^3	80 mg/m^3	N/A	Black or dark-brown amorphous residue	inhalation, skin and/or eye contact	dermatitis; bronchitis; carcinogenic
Arsenic	TWA 0.010 mg/m^3	Ca C 0.002 mg/m^3 (15-minute)	5 mg/m^3	N/A	Metal: silver-gray or tin-white, brittle, odorless solid	inhalation, skin absorption, skin and/or eye contact, ingestion	Ulceration of nasal septum; dermatitis; GI disturbances; peripheral neuropathy; respiratory irritation; hyperpigmentation of the skin; carcinogenic

Ca – Cancerous
C – Ceiling value
TWA – Time Weighted Average
IDLH – Immediately Dangerous to Life and Health
OSHA – Occupational Safety and Health Administration
PEL – Permissible Exposure Limit
NIOSH – National Institute for Occupational Safety and Health
REL – Recommended Exposure Limit
N/A – Not Available

5.2 DISPERSION PATHWAYS

The potential exposure mechanism that can transport particulates and VOC's from the areas of the intrusive site activities to other areas of the site as well as beyond the boundaries of the site are:

- Contact with contaminated groundwater or soil,
- Projection of contaminated material in air,
- Conveyance in water runoff
- Failure to adhere to decontamination procedures,
- Failure to adhere to the Field Sampling Plan and/or Standard Operating Procedures.

Visible emissions can be a problem at any site that involves intrusive activities and should be controlled to the extent feasible. Visible dust can be controlled by utilizing dust suppression techniques discussed in this HASP. The primary effect of visible dust is irritation of the eyes, nose, and throat. While it is not anticipated, visible emissions should be monitored and the following corrective actions can be implemented if irritation or concern of dust arises.

- Minimizing the amount of exposed ground surface/covering exposed surfaces
- Lightly wetting surfaces
- Using chemical or foam dust suppressants (with authorization only)
- Reducing vehicle speeds

5.3 PHYSICAL HAZARDS

Physical hazards such as the following may be encountered on site:

- Slip/Trip/Fall
- UV rays
- Lifting (generators, drums, equipment)
- Traffic – on access roadways at the facility
- Moving parts or equipment (including heavy construction equipment)
- Cold Stress/Frost Bite

5.4 BIOLOGICAL HAZARDS

Biological hazards such as the following may be encountered on site:

- Ticks, mosquitoes, stinging insects, arachnids, chiggers
- Rodents, snakes, Hantavirus
- Physically damaging plants, poisonous plants

Note that many of the biological hazards listed above may not be present at the time the field work is scheduled to occur in winter months.

5.5 HAZARD IDENTIFICATION AND CONTROL

Hazard controls generally consist of following specific safety procedures, training, engineering controls, air monitoring, and PPE selection. CHA employees are required to use the PPE appropriate to their work task and potential exposures as outlined in this HASP.

The levels of PPE assigned to each activity are based on available information on the estimation of exposure potential associated with each work task.

Affected Personnel	Task/Operation	Hazards	Hazard Control
All personnel in Exclusion Zone and Contamination Reduction Zone	Installation of soil borings, monitoring wells, and soil vapor extraction	• Skin and/or eye contact with contaminated soil and/or groundwater, decontamination solutions, and sample preservation agents. • The inhalation of volatile organic vapors, dusts, and other airborne particulates during site activities.	• Conduct air monitoring in accordance with Section 6.0. Wear the required personal protective equipment when conditions or activities indicate the need for it. Stand upwind to extent possible to reduce inhalation hazard. • Avoid walking through puddles, and contacting other potential sources of contaminants such as drums. • Keep airborne dust levels to a minimum by wetting down surfaces.

Affected Personnel	Task/Operation	Hazards	Hazard Control
All personnel in Exclusion Zone and Contamination Reduction Zone	Collection of soil, soil vapor, and groundwater samples	• Skin and/or eye contact with contaminated soil and/or groundwater, decontamination solutions, and sample preservation agents. • The inhalation of volatile organic vapors, dusts, and other airborne particulates during site activities.	• Conduct air monitoring in accordance with Section 6.0. Wear the required personal protective equipment when conditions or activities indicate the need for it. Stand upwind to extent possible to reduce inhalation hazard. • Avoid walking through puddles, and contacting other potential sources of contaminants such as drums. • Keep airborne dust levels to a minimum by wetting down surfaces.
All personnel	All field activities	Slips, trips, & falls	• Wear appropriate work boots. • Avoid slippery surfaces. • Remind field personnel to exercise good housekeeping practices • Be observant of activities around.
All personnel	All field activities	Physical injuries, such as abrasions or cuts	• Use safe work practices • Don proper PPE • Have a first aid kit readily available at site
All personnel	Heavy lifting	Back injuries from lifting	• Practice safe lifting techniques. • Always use a minimum of 2 people for heavy lifts • Lift with legs
All personnel	Cold stress	Exposure to low temperatures associated with working outdoors in variable weather conditions	• Wear warm, dry clothing & layers • Take frequent breaks in warm areas

Affected Personnel	Task/Operation	Hazards	Hazard Control
All personnel	All field activities	Fire (general)	• Identify location of fire extinguisher(s) – contractor sourced • Keep ignition sources away from flammable materials and atmospheres.
All personnel	All field activities	Noise Exposure	• Wear hearing protection if you must shout to hear someone who is standing one foot or less away.
All personnel	All field activities	Contact with heavy equipment and traffic	• Do not stand unnecessarily close to the geoprobe® when it is operating • Do not stand in lanes of traffic. Use cones or barricades to delineate work areas when work within access roads is required. • Wear a hard hat and high visibility clothing • Make eye contact with the operator/drivers
All personnel	All field activities	Security	• Stay alert to all on-site activities • Report suspicious activities to PM and/or Ranalli/Taylor St. LLC

Affected Personnel	**Task/Operation**	**Hazards**	**Hazard Control**
All personnel	All field activities	Ticks	• Avoid unnecessary entry into tall grass and brushy areas. • Wear insect repellents containing DEET or Permethrin. • Wear light colored clothing to easily identify ticks. • Inspect yourself throughout the day and following completion of field activities. • Tuck pants into socks or boots, wear long sleeves and minimize skin exposure.
All personnel	All field activities	Stinging insects (bees, hornets, wasps and yellow jackets)	• Do not agitate nests unless absolutely necessary. • Be aware of holes in the ground within the work area. • Avoid wearing bright or patterned clothing. • Avoid wearing/using scented items (e.g., perfume, cologne, soaps). • Inspect food and drinks prior to consumption. • Use insecticide when necessary.
All personnel	All field activities	Hantavirus	• Avoid dermal contact with rodent droppings. • Avoid inhalation of dust that is contaminated with rodent droppings.

Affected Personnel	Task/Operation	Hazards	Hazard Control
All personnel	All field activities	Mosquitos/West Nile Virus	• Eliminate mosquito breeding areas (standing water) at the work site. • Apply insect repellent containing DEET to exposed, unbroken skin per the manufacturer's instructions. • Wear light colored clothing (pants, long sleeved shirts and socks).
All personnel	All field activities	Snakes	• Avoid actions which increase the risk of encountering a snake (e.g., overturning logs, rocks, etc.).
All personnel	All field activities	Rodents	• Avoid contact with rodents and burrowing animals.
All personnel	All field activities	Arachnids	• Avoid actions which increase the risk of encountering arachnids (e.g., overturning logs, placing hands in dark places).
All personnel	All field activities	Physically Damaging Plants (e.g., briars, thistles)	• Remove plants prior to implementing the work activity. • Use briar resistant pants or chaps if working in dense thorny vegetation.

All personnel	All field activities	Poisonous Plants	• Avoid contact with the plant. • Cover arms and hands when working in the vicinity of the plants. • Frequently wash potentially exposed skin. • Treat every surface that may have come in contact with the plant as contaminated.
All personnel	All field activities	UV Exposure	• Cover skin and limit time in sun to extent practical. • Apply sunscreen.

6.0 AIR MONITORING AND ACTION LEVELS

6.1 AIR MONITORING

The following environmental monitoring instruments shall be used on site at the specified intervals. Monitoring instruments will be calibrated prior to each full day of equipment usage or more frequently in accordance with manufacturer's recommendations. Calibrations will be performed and specified as noted in the QAPP, included in Appendix B of the RIWP.

- Photoionization Detector
- Personal Air Sampling Pump

A personal air pump shall be used to obtain initial levels of air contamination during the first day of investigative activities only, unless laboratory results deem further use of personal air pumps necessary. The photoionization detector (PID) shall be used to detect volatile organic compounds in the ambient air and will be calibrated and setup prior to the start of the days' activities.

Contaminant/Method	Frequency	Action Level	SSO Action
Organic Vapors	At least hourly	50 ppm	Stop work and notify PM of elevated organic vapors

6.2 ACTION LEVELS

Should action levels be reached, work operations shall cease until further evaluation is performed and safe levels are prevalent. If through engineering controls and monitoring, safe levels (below action levels) cannot be achieved, an upgrade in personal protection equipment shall be mandated by the SSO, or operations shall cease in that portion of the site. The PM will be notified of any changes in PPE.

7.0 SITE CONTROL MEASURES

Exclusion Zone (EZ): Will include a 25-foot buffer around all boring areas and all areas where soil sampling and screening activities will occur.

Hazards within the EZ include excessive noise, slips/trips/falls, contact with heavy equipment, and hazards associated with proximity to boring activities; including direct contact with contaminated soil or water and inhalation of vapors from contamination.

Contamination Reduction Zone (CRZ): Will be established immediately adjacent to the Exclusion Zone and will be utilized for decontamination of personnel and equipment donning and doffing of PPE. Whenever possible, the CRZ shall be placed upwind of the EZ.

Hazards within the CRZ include contact with contaminated soil or water, inhalation of vapors from contamination, and slips/trips/falls. Physical hazardous within the facility may pose a risk and good judgement should be utilized.

Support Zone: Will include all areas outside the EZ and CRZ.

Hazards within the support zone include slips/trips/falls and other physical hazards associated with a former industrial facility.

7.1 COMMUNICATION

Communication shall be accomplished by person to person verbal correspondence and through the use of cellular telephones. Communication procedures will be reviewed at the Safety Meeting before entering the work zone.

8.0 HAZARD COMMUNICATION

In compliance with 29 CFR 1910.1200, any hazardous materials brought on site by any personnel (CHA or its sub-contractors) shall be accompanied with the material's Safety Data Sheet (SDS). The SSO shall be responsible for maintaining the SDSs on site, reviewing them for hazards that working personnel may be exposed to, and evaluating their use on site with respect to compatibility with other materials including personal protective equipment, and their hazards. Should the SSO deem the material too hazardous for use on the subject site, the party responsible for bringing the material on site will be required to remove it from the site.

9.0 CONFINED SPACE

During this project CHA personnel will not be permitted to enter any confined space. If a confined space entry becomes necessary, this HASP will be revised to outline all confined space entry procedures, techniques, and equipment to be consistent with OSHA regulations in 29 CFR 1910.146. Additionally, all entrants and attendants will be trained in Confined Space Awareness training consistent with 29 CFR 1910.146.

10.0 PERSONAL PROTECTIVE EQUIPMENT

At this time, Level A and B PPE are not expected to be needed. If site conditions change and contamination is present at levels above the action level, this HASP will be updated to reflect greater protection of personnel. The following is a list of required PPE at this time.

Task/Operation	Level of PPE	Equipment
General site observation at a distance greater than 25 feet from intrusive activities. • No drums present • No free product visible • 2-Minute Breathing Zone PID Readings < 50 ppm with the 10.6 eV bulb • No strong odors present	D	• Long pants (no shorts) • Shirts with sleeves • Hard hat • Safety glasses • Reflective vests or yellow safety shirt • Work boots with safety toe • Hearing protection (if required) • Gloves (as appropriate)
Site Observation or Screening/Sampling Activities within the Exclusion Zone • No drums present • No free product visible • 2-Minute Breathing Zone PID Readings >50 ppm with the 10.6 eV bulb • Strong, pungent odors noted	C	• Same as D, plus • Full-faced air purifying respirator (APR) with organic/acid vapor cartridges • Protective coveralls (e.g. Tyvek) • Protective outer boot covers • Outer gloves with disposable nitrile or latex inner gloves Inner polyethylene boot covers with outer latex boot covers • Both inner and outer gloves must be chemically resistant • Flame retardant coveralls under protective coveralls whenever drums or drum carcasses are encountered.

11.0 DECONTAMINATION

Personnel working in the Exclusion Zone (within 25 feet of Site activities) will be required to enter and exit the work area through the Contamination Reduction Zone. Personnel engaged in decontamination will wear protective equipment including appropriate disposable clothing and respiratory protection and will also undergo decontamination procedures prior to leaving the decontamination area. The decontamination area will be placed upwind of the Exclusion Zone. The following equipment is needed for decontamination:

- Alconox
- Water
- Impermeable Containers

The following list summarizes typical decontamination steps for personnel existing the Exclusion Zone. Additional steps may be warranted based upon specific site conditions.

Level D

- Remove any protective equipment.
- Discard disposable garments.
- Wash/rinse boots.
- Containerize wash and decontamination water for disposal, as necessary.

Level C

- Wash/rinse outer suit and boots.
- Wash/rinse outer gloves.
- Remove outer boots.
- Remove outer gloves.
- Deposit disposables in container for proper disposal.
- Remove suit.
- Remove respirator.
- Remove inner gloves.
- Containerize wash and decontamination water for disposal, as necessary.

Level B

- Will not be used at this time.

Level A

- Will not be used at this time.

PPE will be decontaminated with soap (i.e. Alconox) and water. Disposable items will be disposed of in dry, impermeable containers.

Equipment and vehicles used by the Contractor in the Exclusion zone to handle contaminated materials will undergo decontamination procedure in the Contamination Reduction Zone prior to leaving the Site. The SSO will document that each piece of equipment has been decontaminated prior to removal from the Site. The decontamination procedures will include but are not limited to:

- Movement of equipment to the decontamination pad
- Removal of heavily-caked material with brushes or shovels and
- Triple-rinsing with high pressure water or steam.

***Small Equipment*:**
For soil sampling, dedicated sampling equipment is preferred. However, if non-dedicated equipment is used (i.e. stainless steel soil sampling equipment), the required decontamination procedure for all manual sampling equipment used to collect samples for chemical analysis is:

- Disassemble equipment, as required.
- Remove gross contamination from the equipment by brushing and then rinsing with tap water.
- Wash and scrub with low phosphate detergent (e.g. Alconox®);
- Tap water rinse;
- Distilled water rinse;
- Air dry.

All decontaminated equipment will be placed on polyethylene sheeting or aluminum foil in order to avoid contacting a contaminated surface prior to use. Field personnel will use a new pair of outer gloves before handling sample equipment after it is cleaned. During periods of transportation and non-use, all decontaminated sampling equipment will be wrapped in aluminum foil.

***Large Equipment*:**
CHA personnel are not responsible for the decontamination of large equipment. Information for large equipment decontamination is provided by the site contractor. Decontamination of heavy construction equipment will be performed by the contractor under the contractor's HASP.

12.0 EMERGENCY PROCEDURES

911 service is available and confirmed at this location; always call 911 immediately as the first option for emergency medical assistance. Only if 911 is unavailable or has a long lead time should someone be driven to the nearest medical facility.

On-site emergencies can range in intensity from minor to serious conditions. Various procedures for responding to site emergencies are listed in this section. The designated SSO is responsible for contacting the CHA Project Manager who will notify the Ranalli/Taylor St. LLC Representative and local emergency services as appropriate in emergency situations (however, others must assume responsibility if the situation warrants). An injured person shall be accompanied by another worker at all times.

Should an on-site emergency occur at the project site (related to the project or otherwise) the following procedures shall be followed:

- Call 911 for emergency support.
- If the emergency occurs and is project specific, notify your assigned Health and Safety Coordinator to activate the appropriate actions.
- Properly trained personnel will determine if the emergency can be contained or remediated and initiate the appropriate action(s). Personnel shall not respond beyond their level of training.
- Employees are not to risk their health or life in taking aggressive action(s) to fight fire or stop releases. Only defensive actions shall occur until an action plan is resolved.
- Choose an exit route that provides fast, and safe, egress from the work area. The route taken should always be away from obvious obstructions or other hazardous conditions. Consult an evacuation map if you are unsure of where the nearest exit route is located.
- Do not delay evacuation to retrieve personal items or equipment.
- All persons shall exit areas in groups and attempt to stay together during evacuation procedures.
- While evacuating, notice any conditions which should be reported to emergency personnel. Be alert for the location of smoke, fire and/or vapors. Report any of these conditions to emergency personnel.
- Be aware of emergency response vehicles and avoid interference with these.

Remain calm, keep voices low and wait for instructions from the Incident Commander. Do not leave the scene prior to notifying your assigned Project Manager and Site Field Team Leader. An incident report form is included in Appendix C.

13.0 EMERGENCY MEDICAL CARE

911 service is available and confirmed at this location; always call 911 immediately as the first option for emergency medical assistance. Only if 911 is unavailable or has a long lead time should someone be driven to the nearest medical facility.

Nearest hospital: Crouse Hospital

Address: 736 Irving Avenue,
Syracuse, New York 13210

Emergency Room Telephone Number: (315) 470-7111

Directions from site:

1. Head north on Cortland Ave toward South Salina Street
2. Use any lane to turn left onto South Salina Street
3. Continue approximately 2.5 blocks to South Warren Street
4. Turn right onto South Warren Street
5. Turn right at the first cross street onto East Adams Street
6. Continue straight
7. Continue under the I-81 overpass
8. Turn right onto Irving Ave
9. Follow signs to the Emergency Department

13.1 EMERGENCY NOTIFICATION NUMBERS

Fire Dept.: 911
Police Dept.: 911
Department of Emergency Services: 911
Poison Control: (800) 222-1222
CHA Contact: Meghan Platt, (315) 257-7145

13.2 ON-SITE FIRST AID

First aid kits will be available in the Support Zone (e.g. vehicles). General first aid procedures include:

Skin/Eye Contact: Flush eyes and/or skin thoroughly with water for 15 minutes. Remove contaminated clothing. If skin was contacted with a dry material, brush it off first, then flush with water. Seek medical attention if irritation develops.

Ingestion: Do not induce vomiting. Call Poison Control Center. Tell them what was swallowed, if possible. Follow instructions. Have SDS available for reference.

Inhalation: Remove person from contaminated environment without risking your own safety. **DO NOT ENTER A CONFINED SPACE. DO NOT ENTER EXCLUSION ZONE UNLESS WEARING ONE LEVEL HIGHER PROTECTION THAN VICTIM WAS WEARING.**
Administer CPR, if necessary.

Injuries: Do not move a victim who may have a back injury. Cover them with coats, blankets, or other appropriate items to keep them warm. Personnel should immediately dial emergency services (i.e. 911).

Apply pressure to bleeding wounds. If the victim is able, have the victim apply pressure to the wound. If they are not able, wear gloves to protect from exposure to blood. Put gauze bandages or other clean cloth over the wound. Do not remove blood-soaked bandages or cloth - instead put additional bandages or cloths over the blood-soaked bandages. Elevate the limb with the injury above the heart.

Administer CPR if victim does not have a pulse and if you are currently certified in CPR. Have someone call for an ambulance immediately if there is any possibility that the victim is having or had a heart attack.

Shock is likely to develop in any serious injury or illness. The following are signals of shock: restlessness or irritability; altered consciousness; pale, cool, moist skin; rapid breathing; and/or rapid pulse. In the event of shock, do the following: Immediately have someone call for an ambulance; have the victim lie down; elevate legs 12 inches unless you suspect head, neck, or back injuries; if victim is cool, cover the victim to prevent chilling; do not give the victim anything to drink, even if thirsty.

14.0 CERTIFICATION

All site personnel covered by this HASP have read the HASP and are familiar with its contents and provisions.

Name	Title	Date

15.0 STANDARD OPERATING PROCEDURES

OSHA Quick Cards and applicable standard operating procedures are available in Appendix A.

16.0 JOB HAZARD ANALYSIS -– attach the following if needed

- ☐ Airport Safety
- ☐ Asbestos Abatement
- ☐ ATV-4 Wheeler
- ☐ Bridge Inspection
- ☐ **Cold Stress/Winter Weather**
- ☐ Confined Space
- ☐ Dogs
- ☐ Electrical Safety
- ☐ **Environmental Sampling/Outdoor Hazards**
- ☐ Excavation
- ☐ Exposure to Electrical Transmission Lines
- ☐ Hand-Power Tools
- ☐ Heat Stress
- ☐ **Heavy Equipment**
- ☐ Pressurized Cans
- ☐ Rail Safety
- ☐ **Slips, Trips, Falls**
- ☐ **Working In-Around Traffic**
- ☐ Working Over Water
- ☐ Working With Ladders

DAILY JOBSITE SAFETY BRIEF

PROJECT INFORMATION

Project Name:		**CHA Project No.**	
Project Start Date:	**Completion Date:**	**Weather:**	
Project Location:		**Project Task:** ***Complete a Site Health & Safety Plan per Task***	
Description of Work: ***Be Specific:***			
Key Personnel: *Responsibilities:*	*Project Manager*	*Field Team Leader*	*Site Safety Officer*
Description of Hazards:			

The Daily Jobsite Safety Brief must be completed before work begins daily or Scope of Work changes

Weather: ______________________________

All staff have reviewed and signed site and safety plan	☐Yes	☐No	All staff have proper PPE	☐Yes	☐No
Hazards and precautions have been discussed	☐Yes	☐No	Safety Controls in place	☐Yes	☐No

Additional Notes/Comments: ______________________________

Signed: ____________________ **Date/Time:** ____________________

Signed: ____________________ **Date/Time:** ____________________

Signed: ____________________ **Date/Time:** ____________________

Weather: ______________________________

All staff have reviewed and signed site and safety plan	☐Yes	☐No	All staff have proper PPE	☐Yes	☐No
Hazards and precautions have been discussed	☐Yes	☐No	Safety Controls in place	☐Yes	☐No

Additional Notes/Comments: ______________________________

Signed: ____________________ **Date/Time:** ____________________

Signed: ____________________ **Date/Time:** ____________________

Signed: ____________________ **Date/Time:** ____________________

Weather: ______________________________

All staff have reviewed and signed site and safety plan	☐Yes	☐No	All staff have proper PPE	☐Yes	☐No
Hazards and precautions have been discussed	☐Yes	☐No	Safety Controls in place	☐Yes	☐No

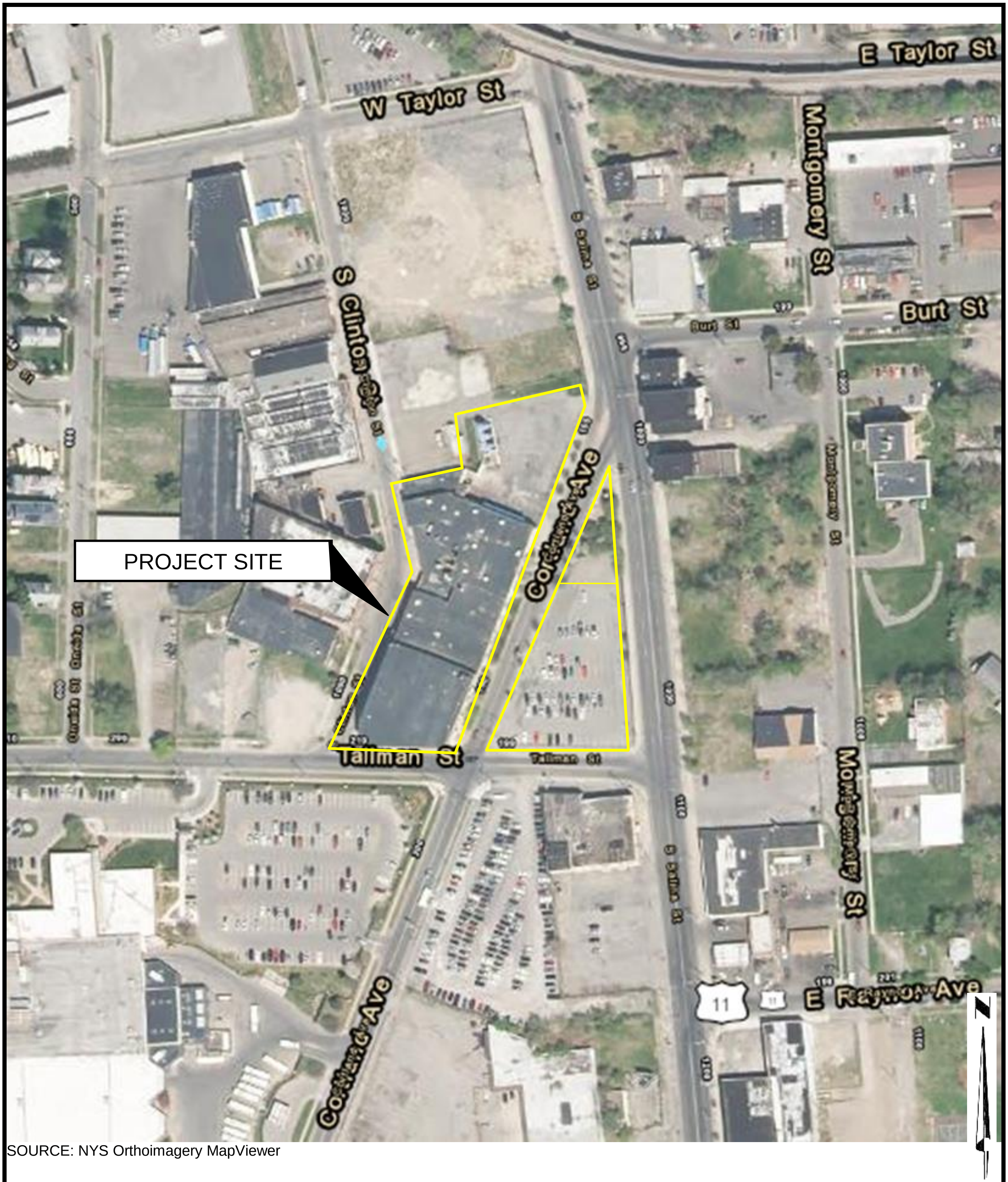
Additional Notes/Comments: ______________________________

Signed: ____________________ **Date/Time:** ____________________

Signed: ____________________ **Date/Time:** ____________________

Signed: ____________________ **Date/Time:** ____________________

FIGURES



SOURCE: NYS Orthoimagery MapViewer

V:\Projects\ANY\K2\23278\Reports\Coyne Textile\Remedial Investigation Work

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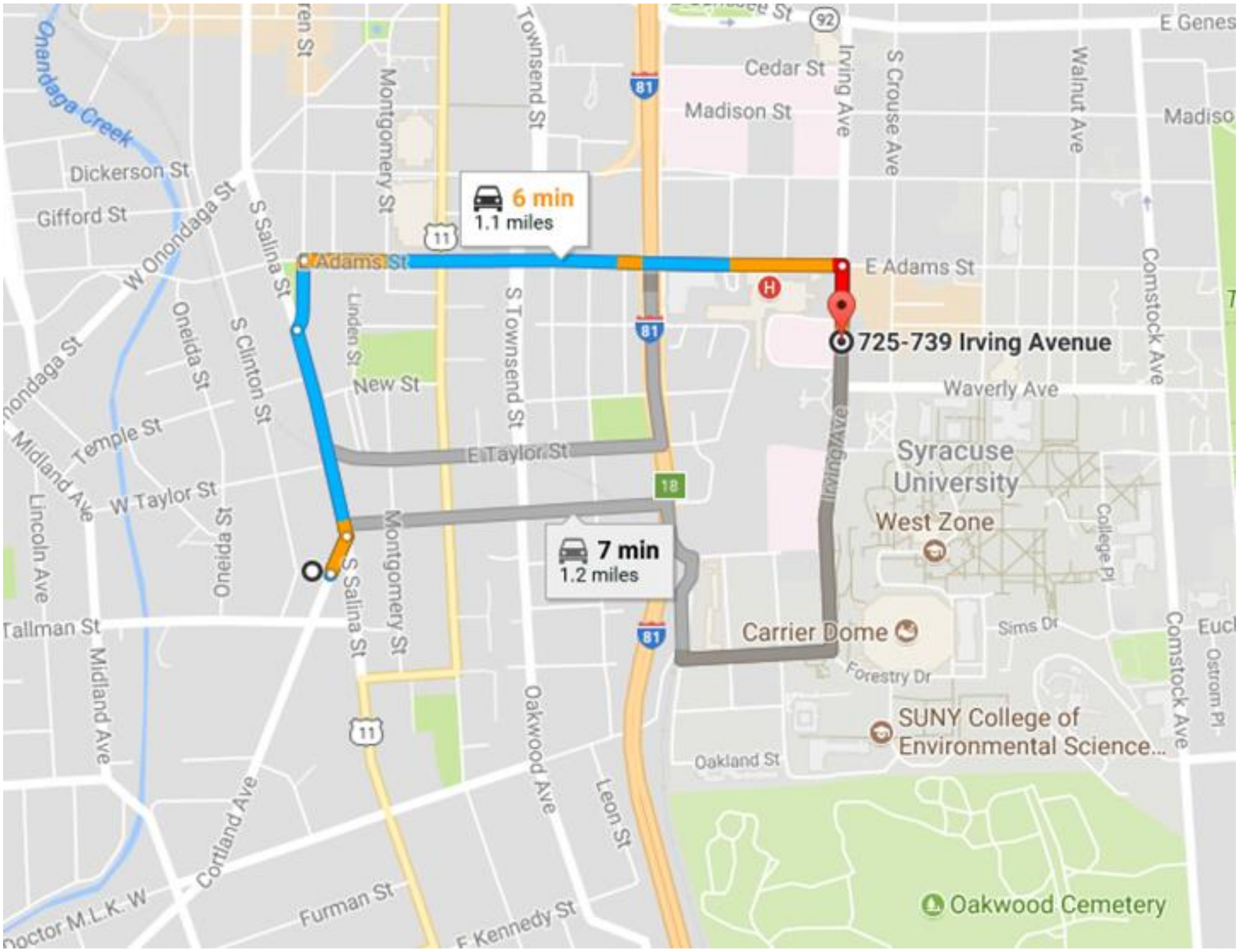
300 South State Street, Suite 600 Syracuse, NY 13202
www.chacompanies.com

NOT TO SCALE

DATE: January 2018

FIGURE 1
AERIAL PHOTO
140 CORTLAND AVE
SYRACUSE,
ONONDAGA COUNTY, NEW YORK

SOURCE: Google Maps



Directions from site:

1. Head north on Cortland Ave toward South Salina Street
2. Use any lane to turn left onto South Salina Street
3. Continue approximately 2.5 blocks to South Warren Street
4. Turn right onto South Warren Street
5. Turn right at the first cross street onto East Adams Street
6. Continue straight
7. Continue under the I-81 overpass
8. Turn right onto Irving Ave
9. Follow signs to the Emergency Department

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300 South State Street, Suite 600, Syracuse, NY 13202
www.chacompanies.com

NOT TO SCALE

DATE: January 2018

FIGURE 2
DIRECTIONS TO NEAREST HOSPITAL
140 CORTLAND AVE
SYRACUSE,
ONONDAGA COUNTY, NEW YORK

V:\Projects\ANY\K2\23278\Reports\Coyne Textile\Remedial Investigation Work Plan\Draft\HASP\Draft\HASP Figures\Figure 2 - Hospital Route.doc

APPENDIX A

OSHA QUICK CARD™

Protect Yourself

Construction Personal Protective Equipment (PPE)

Eye and Face Protection

- Safety glasses or face shields are worn any time work operations can cause foreign objects to get in the eye. For example, during welding, cutting, grinding, nailing (or when working with concrete and/or harmful chemicals or when exposed to flying particles). Wear when exposed to any electrical hazards, including working on energized electrical systems.
- Eye and face protectors – select based on anticipated hazards.

Foot Protection

- Construction workers should wear work shoes or boots with slip-resistant and puncture-resistant soles.
- Safety-toed footwear is worn to prevent crushed toes when working around heavy equipment or falling objects.

Hand Protection

- Gloves should fit snugly.
- Workers should wear the right gloves for the job (examples: heavy-duty rubber gloves for concrete work; welding gloves for welding; insulated gloves and sleeves when exposed to electrical hazards).

Head Protection

- Wear hard hats where there is a potential for objects falling from above, bumps to the head from fixed objects, or of accidental head contact with electrical hazards.
- Hard hats – routinely inspect them for dents, cracks or deterioration; replace after a heavy blow or electrical shock; maintain in good condition.

Hearing Protection

- Use earplugs/earmuffs in high noise work areas where chainsaws or heavy equipment are used; clean or replace earplugs regularly.

For more complete information:

OSHA Occupational
Safety and Health
Administration
U.S. Department of Labor
www.osha.gov (800) 321-OSHA

OSHA 3260-09N-05

CHA Consulting, Inc.

Job Hazard Analysis

Environmental Sampling/Outdoor Hazards

Task	**Hazard Type and Description**	**Hazard Control**
Working in hot environments	Heat disorders including heat cramps, heat exhaustion, and heat stroke	Employers can control this hazard by providing heat stress training to exposed employees, providing access to shade, and allowing employees to gradually get used to hot environments. Employees working in hot environments are advised to take breaks in cool rest areas, rotate physically demanding tasks, save most demanding work for cooler times of day, and utilize the heat index chart to determine exposure risk. Be sure that every employee working in the hot environments is drinking one cup of water ever fifteen minutes. Recognize the signs such as above normal body temperature, headaches, nausea, cramping, fainting, increased heart rate, and pale as well as clammy skin
	Sunburn	The risk of sunburn is higher when working at high elevations, or when working around water (from reflection). In these conditions, you can be burned even in overcast conditions; therefore, wear protective clothing and use sunscreen
High wind events	Severe wind events can create	Employees should avoid areas

	“wind throws” where strong winds can blow down trees	during high wind occurrences that exhibit previous wind damage
Working at high altitudes	Altitude sickness	Recognize signs of acute mountain sickness including headaches, light-headedness, inability to catch one’s breath, nausea, and vomiting. Practice prevention by acclimating slowly to high elevations and staying hydrated. If the following symptoms progress, immediately descend to lower elevations and seek medical attention: difficulty breathing, chest pain, confusion, decreased consciousness, and loss of balance
Electrical storms	Being struck by lightning	While working outside, watch the sky for thunderstorms and seek shelter before the weather deteriorates. Stop working in streams and lakes. Someone at the job site must be able to begin revival techniques (i.e. CPR) if someone is struck by lightning. Do not use telephones. If caught in electrical storms, seek shelter inside a vehicle or building. When in a building, keep away from doors, windows, plugged in appliances, and metal. When in a vehicle, avoid contact with metal objects inside. If outside with no shelter, obey the following procedures: do not congregate, do not use metal objects, avoid standing near isolated trees, seek lower elevations such as valleys or canyons, and avoid being on peaks as well as trees. If you feel your hairs standing on end and your skin tingling, this is a sign that lightening might be about to strike so crouch immediately (feet together, hands on knees). Wait a minimum of 20-30 minutes after the last lightning flash to return to the field or outside area.

Being outdoors in cold weather for extended periods of time	Hypothermia	Recognize the signs including shivering, numbness, drowsiness, muscle weakness, dizziness, nausea, unconsciousness, low/weak pulse, and large pupils. Exercise practice prevention such as staying dry, wearing the appropriate clothing (layers), listen to the weather forecast to plan accordingly, stay hydrated, cover head with warm clothing, and stay active. Be aware of the role that wind-chill can play in hypothermia; under certain conditions, hypothermia can occur without any rain or being wet.
	Frostbite	Dress for the weather- layers are best, and mittens are better than gloves (keeps your warm fingers together while warming each other). Wear two pairs of socks with the inner layer made of synthetic fiber, such as polypropylene, to wick water away from the skin and the outer layer made of wool for increased insulation. Shoes should be waterproof. Keep your head, face, nose, and ears covered at all times. Clothes should fit loosely to avoid a decrease in blood flow to the arms and legs. Always travel with a friend in case help is needed. Be especially wary of wet and windy conditions; the "feels like" temperature (wind chill) is actually much lower than the stated air temperature. The very old, those who are not in good physical condition, and people with diabetes and anyone with vessel disease should take extra precautions.
Working in areas with	Giardia	Treat, filter, or boil drinking water.

limited access to clean drinking water		Do not drink untreated water from streams, lakes or springs.
Working outdoors	Rattlesnakes	Be alert and do not put your feet or hands where you cannot see what is on the ground (for example if you are stepping over a log and you cannot see what's on the other side). If you encounter a rattle snake do not pick it up- give it a wide berth and walk around it. If bitten, seek immediate professional medical attention and remove jewelry. If bitten on an extremity lower than the heart, cover wound with a sterile band while seeking medical attention.
	Bears	If you encounter a bear, be alert but stay calm, and give it as much room as possible. Try to leave the area, but DO NOT RUN. Back away slowly. If the bear follows, stop and hold your ground: wave your arms to make yourself look big and talk in a normal voice. Work in teams of two to deter bear attacks. If the bear makes contact, surrender: fall to the ground and play dead (a bear will break off an attack once it feels the threat has been eliminated). If the bear continues to bite after you assume a defensive posture. Their attack is predatory and you should fight back vigorously
	Mountain Lions	Be alert, calm, and do not panic. If you see a mountain lion, do not run as it may stimulate its predatory nature. Instead, shout and wave arms to let it know that you are not prey: fight back

	Tick bites Roughskin Newts Bee stings	Use DEET based repellants on exposed skin and/or permethrin on clothes. Check for ticks during and after field work. If you find a tick remove it with tweezers within 24 hours, preferably immediately: do not leave the head embedded or extract the tick with matches, petroleum jelly, or other coatings (e.g. motor oil) Avoiding handling them as their skin contains a potent neurotoxin. If necessary for the protocol, handle only when wearing gloves. Do not “lick” for “killer buzz” as people have died from attempting to eat roughskin newts If you know or suspect you are allergic to bee stings, carry appropriate allergy kits prescribed by a doctor for treating anaphylactic shock. Carry and take diphenhydramine (Benadryl). Follow the label instructions for allergy control. Inform your supervisor if you suspect you are allergic. Watch for ground nests
Travel movement or work in area with poison oak or poison ivy	Allergic reaction to poison oak/poison ivy plants	Learn to recognize poison oak. Avoid contact by using ivy block and wearing long pants and long-sleeve shirts if traveling in dense areas. If skin contact is made, flush the area with cold water as soon as possible. Do not flush your skin with warm water or soap as it can open your pores and increase the reaction. To wash and rinse use

		Tecnu or similar product with cold water to remove oils
Encountering irrigation pipes, marijuana plantation, or grow operations	Unfriendly encounters with criminal elements	Do not wear uniforms and carry a radio backpack that is not visible. Do not confront strangers and act like a tourist if you must speak. Work in pairs or groups. If working in areas likely to contain operations, check in with park staff when leaving vehicle and returning to vehicle. Watch for black piping or other signs. If you find a definite grow operation, leave immediately, note the location, and report it to the authorities

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Occupational Health
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Population Health Management

Home > NEWS & MEDIA > 2017 > 01 > 17 > How to Stay Safe and Warm in Cold Temperatures

How to Stay Safe and Warm in Cold Temperatures

7 Tips for Working in Extreme Cold

The risks of being exposed to the extreme cold are numerous and dangerous. The AllOne Health medical expertise has compiled information on how to stay warm in the cold and how to notice the warning signs of hypothermia.

Tips for Working in the Extreme Cold

- *Wear appropriate clothing.*
    - *Wear several layers of clothing. The layers should fit loosely because tight clothing reduces blood circulation and warm blood needs to be circulated to the extremities.*
    - *When choosing clothing, be aware that some clothing may restrict movement which, in and of itself, may create a hazardous working situation.*

- *Make sure to protect the ears, face, hands and feet in extremely cold weather.*
    - *Boots should be waterproof and insulated.*
    - *Be sure to wear a hat.*
    - *The goal should be to expose as little skin as possible to the cold environment.*

- *Workers in extreme conditions should take frequent, short breaks in warm, dry shelters to allow their bodies to warm up.*
- *Drink warm beverages and eat warm, high-calorie foods.*
- *Avoid exhaustion and fatigue because they sap*

RELATED NEWS ITEMS

- Preventing Heat Related Illness
- Everything You Need to Know About Ticks
- Scary Incident Highlights Importance of DOT Changes Going Into Effect This Week
- Are You Ready for the Summer? A Guide for Staying Safe in the Heat!
- Leading Indicators: The Future for Great Safety Performance
- Recent Developments in the Ebola Outbreak
- Quarantines During the Ebola Outbreak
- The Long Term Benefits of Audiometric Testing
- E-Cigarettes in the Workplace
- The Dangers of Ebola Waste Disposal
- Corporate Medical Director Fred Kohanna, MD, MBA, FACOEM Presenting at OSHA Oil and Gas Conference
- AllOne Health Executive

- *Avoid exhaustion and fatigue because they sap energy, and energy is needed to keep muscles warm.*
- *Use the buddy system - work in pairs so that one worker can recognize danger signs.*
- *Learn the signs and symptoms of cold-induced illnesses and injuries and what to do to help workers.*

Signs and Symptoms of Hypothermia (dangerously low body temperature)

Early Stage

- *Shivering*
- *Fatigue*
- *Loss of coordination*
- *Confusion and disorientation*

Hypothermia is a medical emergency. If not treated in the early stage, the condition will become life-threatening.

Late Stage

- *No shivering*
- *Blue skin*
- *Dilated pupils*
- *Slowed pulse and breathing*
- *Loss of consciousness*
- *Request immediate medical assistance.*

First Aid for Hypothermia

- *Request emergency medical assistance.*
- *Move the victim into a warm room or shelter.*
- *Remove any wet clothing.*
- *Warm the center of the victim's body first, that is, the chest, neck, head, and groin. One may also use loose, dry layers of blankets, clothing, towels, or sheets.*
- *If the victim is conscious, warm beverages may help increase the body temperature, but do not give alcoholic beverages.*
- *After the victim's body temperature has increased, keep the victim dry and wrapped in a warm blanket, including the head and neck.*

If victim has no pulse, begin cardiopulmonary resuscitation (CPR).

Extremely cold weather presents unique challenges to employers and employees. The best weapon against the cold is knowledge of how to prepare for it and what to do in the event of an emergency.

AllOne Health Executive Leader Deborah Talbot, RN, COHN-S/CM Featured in Safety + Health Magazine
Surviving the Stresses of the Holiday Season: A Guide
Importance of a Safety Culture in the Workplace
The Real Cost of Workplace Injuries and How to Prevent Them
Your Complete Guide to Understanding and Managing Stress
Understanding the New OSHA Recordkeeping Requirements
One of the Biggest Reasons Workers Don't Return from Injury
Tuberculosis: Still a Modern Threat
Handle Heat Hazards with Prevention and Preparation
A Safety Guide for Outdoor Workers
Commonly Overlooked OSHA Standards
Decrease in the Death Rate in the Oil & Gas Industry
The Benefits of Pre-Work Screening Programs
Are You Prepared for Employees' Exposure to Heavy Metals?

To keep you and your workplace safe during the harsh winter months remember planning ahead, dressing in loose layers that cover all of your body and checking the forecast before leaving the house goes a long way to protect you from the cold.

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Email or call

1.877.720.7770

to speak with a specialist now.

CHA Consulting, Inc.

Job Hazard Analysis

Heavy Equipment

Task	**Hazard Type and Description**	**Hazard Control**
Heavy equipment	Pinch points Struck-by/Caught between	Never work or walk under loads, and only one person is to act as the signal person. Avoid working near swing radius's. Maintain eye contact with operators when approaching equipment. Rigger s and Operators must possess additional safety training for competency. (Competent/Qualified Training)
Road grading and material cleanup	Potential for personnel to be run over with equipment Struck-by/Caught between	Ensure equipment is operated by qualified operator, and all personnel working on or near roadway wear reflective vests. Be sure that equipment back-up alarms are working properly. Always make eye contact with equipment operators prior to approaching
Personnel working near heavy equipment	Slips and falls Struck-by/Caught between	Make sure there is a good working surface. Cover or barricade excavations as soon as practical. Wear a hard hat, safety glasses, ear plugs, a Class II ANSI safety vest as well as steel toed boots when necessary
Operation	Strains and sprains	Think about your body position; avoid over- reaching, hyper-extending, location/ position of extremities, and think if you are in the best position for leverage

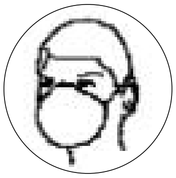
OSHA QUICK CARD™

Protect Yourself

Respirators

Respiratory protection must be worn whenever you are working in a hazardous atmosphere. The appropriate respirator will depend on the contaminant(s) to which you are exposed and the protection factor (PF) required. Required respirators must be NIOSH-approved and medical evaluation and training must be provided before use.

Single-strap dust masks are usually not NIOSH-approved. They must not be used to protect from hazardous atmospheres. However, they may be useful in providing comfort from pollen or other allergens.

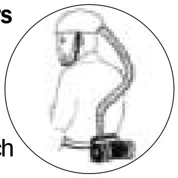


Approved filtering facepieces (dust masks) can be used for dust, mists, welding fumes, etc. They do not provide protection from gases or vapors. DO NOT USE FOR ASBESTOS OR LEAD; instead, select from the respirators below.

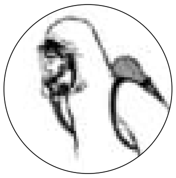
Half-face respirators can be used for protection against most vapors, acid gases, dust or welding fumes. Cartridges/filters must match contaminant(s) and be changed periodically.

Full-face respirators are more protective than half-face respirators. They can also be used for protection against most vapors, acid gases, dust or welding fumes. The face-shield protects face and eyes from irritants and contaminants. Cartridges/filters must match contaminant(s) and be changed periodically.

Loose-fitting powered-air-purifying respirators (PAPR) offer breathing comfort from a battery-powered fan which pulls air through filters and circulates air throughout helmet/hood. They can be worn by most workers who have beards. Cartridges/filters must match contaminant(s) and be changed periodically.



A Self-Contained Breathing Apparatus (SCBA) is used for entry and escape from atmospheres that are considered immediately dangerous to life and health (IDLH) or oxygen deficient. They use their own air tank.



For more complete information:

OSHA Occupational Safety and Health Administration
U.S. Department of Labor
www.osha.gov (800) 321-OSHA

OSHA 3280-10N-05

CHA Consulting, Inc.

Job Hazard Analysis

Slips/Trips/Falls

Common hazards

- Slippery surfaces (e.g., wet, oily or greasy)
- Seasonal trip hazards (snow and ice)
- Spills of wet or dry substances
- Changes in walkway levels and slopes
- Unsecured mats
- Poor lighting
- Debris and items stored in walkways
- Trailing cables in pedestrian walkways
- Smoke, steam or dust obscuring view
- Unsuitable footwear

Controlling hazards

When establishing safe work practices, consider:

- Characteristics of physical work area
- Weather conditions (snow, ice, rain)
- Tasks performed
- Workers' work practices
- Equipment

Hazard Control/Engineering Controls

- Type of flooring
- Slope of surface (ramps, handrails)
- Surface free of obstructions/holes
- Drainage
- Lighting levels, non-glare, contrast
- Equipment to be used/not carrying too much at once
- Signage
- Sufficient space
- Minimizing environmental influences, e.g., blocking wind to prevent wet surfaces icing at entrances

Hazard Control/Administrative Controls

- Training workers/awareness
- Safe practices such as a procedure for cleaning spills or requirement for two workers to transport a large equipment that one worker cannot see around or can’t handle
- Reporting hazards
- Prompt maintenance
- Job design (identifying tasks requiring excessive pushing/pulling, line-of-sight obstruction)
- Equipment readily available
- Addressing poor work practices
- Inspections
- Review slips, trips and same-level fall hazards

Hazard Control/Housekeeping

- Clean spills
- Remove debris, snow and ice
- Keep equipment clean
- Keep wires, etc. controlled, taped, etc.

Hazard Control/Personal Protective Equipment

- Appropriate footwear for task, which may include appropriate heels, soles and anti-slip boots

APPENDIX B

CHA

RESPIRATOR INSPECTION RECORD

(To Be Completed Daily when Respirator is Used)

Name_______________________________ Project________________________________

Date________________________________

1. TYPE_____________________________ 2. MODEL_______________________________

3. Half Mask APR ☐ Full Face APR ☐

SAR ☐ SCBA ☐

PAPR ☐

4. Respirator Component:	**Defects: NO**	**YES**
A. Facepiece	☐	☐
B. Inhalation/ Exhalation Valve	☐	☐
C. Headbands	☐	☐
D. Cartridge Holder	☐	☐
E. Cartridge/Canister	☐	☐
F. Filter	☐	☐
G. Harness Assembly	☐	☐
H. Hose Assembly	☐	☐
I. Speaking Diaphragm	☐	☐
J. Gaskets	☐	☐
K. Connections	☐	☐

L. Defective Component Not Mentioned Above ___________________________________

If any of the above were answered yes, please complete the following pages and contact Margaret Rudzinski in the Health & Safety Department at 518-453-2830 or Amanda Fripp at 518-453-3903 <u>before using this respirator</u>.

Signed:_________________________________ Date:______________________

Potential Defect:	**Defected: Yes**	**Elaborate:**
Facepiece		
Excessive dirt	☐	
Distorted (not flexible)	☐	
Cracks/Tears/Holes	☐	
Valves not properly inserted	☐	
Purifying units damaged	☐	
Threads badly worn	☐	
Missing gaskets	☐	
Other	☐	
Inhalation/ Exhalation Valve		
Foreign material	☐	
Cracks/Tears/Distortions	☐	
Defects in sealing surface	☐	
Valve put in facepiece incorrectly	☐	
Valve put in valve body incorrectly	☐	
Defective/Missing valve cover	☐	
Other	☐	
Headbands		
Breaks	☐	
Loss of elasticity or twists	☐	
Buckles in poor condition	☐	
Other	☐	
Cartridge Holder		
Cracks/Distortions	☐	
Other	☐	
Cartridge/Canister		
Incorrect cartridge	☐	
Used/Seal broken	☐	
Expired	☐	
Cracks/Dents	☐	
Incorrect installation	☐	
Loose connections	☐	
Thread-crossing in holder	☐	
Missing/Worn gaskets	☐	
Other	☐	
Filter		
Leaks detected	☐	
Other	☐	
Harness Assembly		
Attachments damaged	☐	
Other	☐	

Hose Assembly

Material contains cracks/tears ☐ ________________________________
Missing/Defective parts ☐ ________________________________
Other ☐ _________________________________

Speaking Diaphragm

Not working properly ☐ ________________________________
Other ☐ _________________________________

Gaskets

In poor condition ☐ ________________________________
Missing gaskets ☐ ________________________________
Other ☐ _________________________________

Connections

Connections not all firmly sealed ☐ ________________________________
Leaks/Defects ☐ ________________________________
Other ☐ _________________________________

Other Defects Not Mentioned Above

____

____

____

____

Donning/Doffing Procedures for APR's

Donning Procedures:

- Extend the straps out to the end tabs. Pull back over facepiece.
- Put the facepiece on, chin first, pull the head harness over the head with the opening in the web centered in position on the back of the head. (Clear hair from seal.)
- Pull the straps snug, starting with the chin straps, then the temple straps and finishing with the forehead strap.
- The straps should be pulled snug enough to ensure a good seal but not so tight that you are uncomfortable or distort your face.

Doffing procedures shall be the reverse of the above procedures.

- The head harness should be pulled over the facepiece for storage.

APPENDIX C

Incident Report

Please note: This form must be completed within (24) hours of an employee's injury or illness during the workday. This form can be completed by the employee or supervisor (or a witness if his/her supervisor is unavailable).

Employee Information

Employee's Name	Title	Group	Supervisor

Incident Details

Date of Incident	Time of Incident	Location of Incident *(provide address, if available)*

List the Nature of the Employee's Injury & Body Parts Affected (Indicate whether a similar work-related injury has occurred in the past)**:**

Explain What the Employee Was Doing When the Incident Occurred:

Describe How the Incident Occurred:

List any Applicable Objects That Were Directly Involved in the Injury *(i.e. motor vehicle, etc):*

Did the Employee Stop Work Due to the Injury?	If Yes, Has the Employee Returned to Work?

Medical Treatment *(if known)*

Did the Employee Seek Medical Treatment?	Date of First Medical Treatment	Location of Treatment *(provide address, if available)*	Type of Facility *(i.e. emergency room, hospital, urgent care, doctor's office)*	What Type of Treatment

Acknowledgment

Employee Signature:	Date:

Supervisor (or Witness) Name (Printed):	Supervisor (or Witness) Signature:

RETURN COMPLETED FORM TO MEGAN ROBERTSON IN HUMAN RESOURCES
PHONE NUMBER - (518) 453-8750
FAX NUMBER – (518) 453-2889
E-MAIL ADDRESS – MROBERTSON@CHACOMPANIES.COM

cc: Health & Safety
M. Platt

CHA (Your Location) Office

- What to do for Accidents, Incidents, Safety Hazards & Near Misses

1) **If any injury occurs, no matter how minor:**

   a. Get it treated immediately as required. Notify supervisor.
   b. Contact Megan Robertson as soon as possible. Contact Margaret Rudzinski if Megan cannot be reached.
   c. Complete a CHA incident report form and return to Megan Robertson within 24 hours. (V:\Public\ANY\Health_&_Safety\Incident Reporting)

'Contact' means phone until you talk to the person directly. Voicemails and emails do not count.

(Employees should not provide their personal medical insurance information to the medical facility for work-related incidents. Please contact HR for further direction on how your work-related medical claim will be paid.)

2) **For any accident, incident, safety hazard or near miss (no injury occurs)**

   a. Use your 'Stop Work' Authority as required. EVERYONE has the authority to stop work if they see a significant safety issue.
   b. For all – Report to your supervisor within 24 hours.

'Report' means phone, leave voicemail or email as appropriate.

Megan Robertson (Director of HR Operations)	1-518-453-8750 – Office phone 1-518-453-2889 – Fax mrobertson@chacompanies.com	For all Project accidents and incident and/or potential workmen's compensation claims
Margaret Rudzinski (Sr. VP, Corporate Environmental Health & Safety)	1-518-453-2830 – Office phone 1-518-469-9259 – Cell phone mrudzinski@chacompanies.com	Report all safety hazards/issues to Margaret Rudzinski

Recommendations for additional contacts:

- Office Leader
- Safety Coordinator

APPENDIX D

Community Air Monitoring Plan

Community Air Monitoring Plan (CAMP)

Remedial Investigation
Former Coyne Textile Facility
BCP Site #C734144

The following Community Air Monitoring Plan (CAMP) will be implemented for the Remedial Investigation activities to be performed at the Former Coyne Textile Facility (Site) Brownfield Cleanup Program (BCP) Site #C734144. Air monitoring will be conducted in general accordance with the New York State Department of Health (NYSDOH) *Generic Community Air Monitoring Plan (CAMP).* Air monitoring will be conducted on a real-time basis using hand-held field instruments and readings will be recorded in a logbook and made available for review.

This CAMP is not intended for use in establishing action levels for worker respiratory protection which is described in the Site-specific Health and Safety Plan (HASP) included as Appendix C to the Remediation Investigation (RI) Work Plan. Rather, its intent is to provide a measure of protection for the downwind community (i.e., off-Site receptors including residences and businesses and on-Site workers not directly involved with the subject work activities) from potential airborne contaminant releases as a direct result of the proposed RI activities. Reliance on this CAMP should not preclude simple, common-sense measures to keep volatile organic compounds (VOCs) at a minimum around the work areas. The action levels specified herein require increased monitoring, corrective actions to abate emissions, and/or work shutdown. Additionally, this CAMP helps to confirm that the RI activities did not spread contamination off-Site through the air.

<u>Fugitive Dust Monitoring and Control</u>

No significant air monitoring is anticipated to be necessary to implement the RI Work Plan. Soil disturbance during the RI subsurface investigation will be minimal. Borings advanced as part of the investigation are small in diameter and do not constitute significant ground intrusive activities. Therefore, no significant migration of fugitive dust is expected and no fugitive dust monitoring will be conducted. However, fugitive dust migration will be visually assessed during all investigation activities. Should there be visible evidence of fugitive dust leaving the Site, CHA will implement one or more techniques to control dust, in accordance with the New York State Department of Health's (NYSDOH's) *Generic Community Air Monitoring Plan (CAMP).*

<u>Organic Vapor Monitoring and Control</u>

Based on the nature of the Site contaminants, it is anticipated that organic vapors may be emitted during RI activities. As a result, organic vapors will be monitored periodically. VOCs will be monitored at the downwind perimeter of the immediate work area (i.e., the exclusion zone). Upwind concentrations should be measured at the start of each workday and periodically thereafter to establish background conditions.

Periodic monitoring for VOCs consists of taking a reading upon arrival at a sample location, monitoring while opening a well cap or advancing a boring, monitoring during well bailing/purging, and taking a reading prior to leaving a sample location.

The monitoring work will be performed using equipment appropriate to measure the types of contaminants known or suspected to be present. The equipment will be calibrated at least daily for the contaminant(s) of concern or for an appropriate surrogate.

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

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

- If the organic vapor level in the downwind work area perimeter exceeds the upwind perimeter concentration by more than 25 ppm, the following actions will be taken:

    1. All work will be halted.
    2. Air monitoring will be conducted at 15 minute intervals at a 20-foot offset from the exclusion zone. If two successive readings below 5 ppm are measured by the field instrument and documented, the work may resume following the previously described monitoring plan.

All fifteen minute readings will be recorded and will be available onsite for Agency (i.e., New York State Department of Environmental Conservation and New York State Department of Health) personnel to review. Instantaneous readings, if any, used for decision purposes will also be recorded.