INVENTUM ENGINEERING, PC

Remedial Investigation Work Plan

3125 Highland Avenue BCP Site #932169

3219 and 3301 Highland Avenue

Niagara Falls, New York

October 2023

441 CARLISLE DRIVE
SUITE C
HERNDON, VA 20170
WWW.INVENTUMENG.COM

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1 Introduction

On behalf of Ganson Alternative Energy, LLC (GAE), Inventum Engineering, P.C. (Inventum) has prepared this Remedial Investigation Work Plan (RIWP) for the proposed 3125 Highland Avenue BCP Site (Site) located at 3219 and 3301 Highland Avenue in Niagara Falls, New York (Figure 1).

The New York State Department of Environmental Conservation (NYSDEC) and GAE entered into an Order on Consent and Administrative Settlement (2020 Order, Index No. CO 9-20200107-2) in January 2020 to appropriately characterize potential contamination on seven parcels including the two tax parcels that make up the proposed Site The Site is currently not listed in the Registry (the Registry) of Inactive Hazardous Waste Disposal Site (IHWS) or the Brownfield Cleanup Program (BCP) in New York State and was assigned Site Number 932169 with a "P" classification. This RIWP is a component of the BCP Application and is contingent on the Site entering the BCP and closure of the 2020 Order.

GAE's intent is to maintain the commercial/industrial use of the Site and construct additional office space, warehouses and limited manufacturing surrounded by additional paved parking, access roads and logistics areas.

The Site encompasses approximately 8 acres (Ac) consisting of two of the seven (7) tax parcels in the 2020 Order (Figure 2)[1]:

- 144.06-2-1 (4.9 Ac)
- 130.18-2-4 (3.14 Ac)

Five parcels were investigated in accordance with the 202 Order and the NYSDEC informed GAE that they do not qualify for the IHWS Program or the BCP:

- 144.23-1-2 (0.11 Ac)
- 144.23-1-3 (0.21 Ac)
- 144.23-1-4 (0.11 Ac)
- 144.23-1-5 (0.11 Ac)
- 144.23-1-6 (0.31 Ac)

This RIWP was prepared to facilitate entrance of two of the parcels (144.06-2-1 and 130.18-2-4) totaling approximately 8.04 Ac into the BCP. The removal of the P-Site listing of the remaining five parcels (144.23-1-2 through 144.23-1-6) with respect to the January 2020 Order on Consent are being managed by NYSDEC and GAE under a separate regulatory mechanism.

The boundary survey of the proposed BCP Site boundary is provided for reference in Appendix A.

This work plan has been prepared in accordance with NYSDEC *Technical Guidance for Site Investigation and Remediation*, DER-10, dated May 2010.

1.1 RI Program Objectives

The objectives of the RI program are to complete the RI and Alternatives Analysis (AA) for the BCP Site and recommend the applicable Standards, Criteria, and Guidance (SCGs), Cleanup Objectives, Remedial Actions (RAs) and potential IRMs that will address historical impacts from heavy industrial manufacturing on the property.

[1] Niagara County New York Department of Real Property Services

To achieve these goals, the following objectives will be the focus of the program. Progress towards achieving these objectives has been made through several phases of investigation at the Site by GAE since September 2020:

- Gather, compile, and evaluate existing historical investigation data;
- Develop a Conceptual Site Model (CSM);
- Complete the investigation of the BCP Site[2] addressing data gaps identified through the CSM;
- Identify and propose any additional IRM activities[3] that may be beneficial at this time to ensure public and environmental protections and to facilitates the safe execution of the RI scope of work;
- Conduct a quality risk assessment using the collective data for the BCP Site;
- Complete an AA and identify the preferred remedy for the NYSDEC consideration and public comment, and;
- Provide a draft schedule for the implementation of the RI, IRMs, and proposed remedy(ies).

1.2 RI Work Plan Organization

The RIWP is organized as follows:

- Section 1 – Introduction: provides a brief introduction to the property and ownership, and identifies the need, purpose, objectives, and organization of the RIWP and program.
- Section 2 – Site Description and History: highlights the former BCP Site uses and operations, regulatory program boundary, surrounding property use, local and regional geology and hydrology as well as BCP Site features that may govern contaminant movement.
- Section 3 – Site Investigation History: presents the history of investigations performed at the BCP Site.
- Section 4 – BCP Site Conditions: focuses on existing conditions in context of historical investigations, presents an initial CSM, and identifies potential data gaps to address in the RI.
- Section 5 – BCP Remedial Investigation Scope of Work: builds from the historical and baseline data presented and identified data gaps to define a scope of work necessary to complete the current conditions and characterization of the BCP Site.
- Section 6 – Interim Remedial Measures: presents the rationale for the proposed IRMs and summarize the proposed scope of work.
- Section 7 – Remedial Investigation Report: discusses the RI reporting process and outlines the anticipated contents of the RI report.
- Section 8 – Schedule: provides a schedule for implementation of the RI Work Plan through development and submittal of the Alternatives Analysis Report (AAR).
- Section 9 – Bibliography: lists references used in the development of the RI Work Plan.

[2] Note: the term Site and BCP Site are used to refer to the two tax parcels at 3219 and 3301 Highland Avenue. Although not in the BCP Program at the time this RIWP was prepared, the RIWP is contingent on execution of a BCP Agreement.

[3] An IRM Work Plan is included with the BCP Application to address know areas of soil with concentrations exhibiting the characteristics of hazardous waste and removal of buildings that prevent implementation of the IRMs and this RIWP.

2 Site Description and History

2.1 Site Background

GAE is the Site owner and formerly leased the Site to Stryten Energy. Tulip Richardson Manufacturing (Tulip), operating at the Site as Tulip Molded Plastics, was acquired by Stryten Energy in December 2021[4]. Tulip produced molded plastics products for the automotive industry and injection molded recycling containers and other specialized plastic containers for other industrial customers. All of Tulip's production operations have been moved to a new manufacturing facility constructed on 3123 Highland Avenue (aka Tract I parcel) to the south of the Site (Figure 1). The last operational component moved to the new facility was a chip receiving and washing process that was relocated in December 2021 (Figure 2) to the newer facility on the former Tract I parcel.

A September 2010 Phase I Environmental Site Assessment (ESA) conducted by AECOM on behalf of Tulip provides a summary of historical Site use. The Site was developed as early as 1914 and used for manufacturing by the U.S. Light & Heating Company, which manufactured axle lighting devices, storage batteries, and electric self-starters for automobiles. Electric Autolite Company operated on the Site until it merged with Prestolite Company as a Division of Eltra Corporation. Several name changes occurred through time, including AutoLite Battery Corporation, The Electric Auto-Lite Company, Prestolite Division of Eltra Corporation, Allied Chemical Corporation (later Allied Corporation), Niagara Molded Products, and Tulip Corporation.

Tulip owned the property from 1985 until purchased by GAE in October 2017. GAE has secured the property, conducted inspections, and performed appropriate site maintenance but has not conducted any manufacturing operations on the Site.

2.2 Site Location and Description

The BCP Site encompasses approximately 8.04 acres consisting of two (2) tax parcels (144.06-2-1 and 130.18-2-4) and is located at 3219 and 3301 Highland Avenue in Niagara Falls, New York (Figure 1). The BCP Site is in a commercial, industrial, and residential area and bounded to the south by the former Power City Warehouse (a.k.a Tract I Site; BCP Site No. C932157); to the east by a narrow strip of land owned by National Grid[5] and beyond by the Tract II Site (IHWS Site No. 932136); to the west by the remaining five (5) GAE owned parcels, two industrial parcels owned by James N. Gant, and Highland Avenue; and to the north by Braun Horticulture.

The Tract I site to the south (Figure 1) has been remediated in accordance with a NYSDEC-approved remedial program which included the excavation, treatment (if necessary), and off-site disposal of construction materials, debris, and soil that exceeded Commercial Use. Confirmation samples from the Tract I excavation with concentrations of lead in soil (1,250 milligrams per kilogram [mg/kg] and 7,050 mg/kg) have been identified along the southern boundary of the BCP Site (Figure 2).

The Tract II site to the east (Figure 1) has been remediated in accordance with a NYSDEC-approved remedial program. The components of that program relevant to the BCP Site are for the 15th Street right of way (ROW) and Eastern Commercial Area. The 15th Street ROW was remediated to meet Commercial Use Soil Cleanup Objectives (SCOs) and backfilled with soil meeting the Allowable Constituent Levels for Imported Fill for Commercial Use. Confirmation samples from the Tract II excavation with concentrations

[4] Tulip will be referenced in this document for clarity and consistency with the BCP Site name.
[5] This is a utility right of way and is also known as the 15th Street ROW in the Tract II (IHWS Site No. 932136) documentation.

of lead in soil (1,030 mg/kg and 19,400 mg/kg) have been identified along the eastern boundary of the BCP Site (Figure 2).

Natural gas is provided on the Site by National Fuel and electricity is provided by National Grid. Potable water is provided by the City of Niagara Falls municipal water and sanitary and storm sewer are maintained by the City of Niagara Falls public works. Utility ROWs and easements are identified on the BCP Site Boundary survey (Appendix A).

2.2.1 Land Use

The BCP Site is located (Figure 1) within the City of Niagara Falls and is zoned for commercial/industrial use. Historical aerial imagery and Sanborn Fire Insurance Maps are provided for reference in Appendix B as additional documentation of historical conditions and site use.

2.2.2 Topography

The BCP Site topography is mostly flat which is typical of this section of Niagara Falls. A topographic survey has not been conducted to document existing conditions; however, ground surface elevations from a survey of the five (5) monitoring wells on the BCP Site (Figure 2) range from 583 to 584 feet above mean sea level (ft. AMSL). The properties surrounding the BCP Site are generally flat as well and at a similar elevation profile. The Eastern Commercial Area on the Tract II site to the east rises above the average BCP Site grade by approximately 5 feet.

2.2.3 Geology

The BCP Site is covered by pavement, buildings, and building slab over all but less than 1 acre. There are grassy areas on the west side of the BCP Site abutting the National Grid ROW and two areas on the north side of the existing buildings (near the former coal silo) with a mix of gravel and vegetated cover.

The geology of the BCP Site is documented from both historical and recent site investigations. Fill material is present to depths of 5 to 8-feet below ground surface (bgs) across the BCP Site. The fill material primarily consists of reworked native clay, silty clay, and sands/gravels with more prevalent accumulations of coal, brick, and other materials in the near surface zone from ground surface to approximately 2-feet bgs. Native soils are typically encountered at depths of 5 to 8-feet below and consist of a reddish-brown clay, clayey silt, or silty clay that is generally stiff with moderate plasticity and trace amounts of fine sand and gravel.

The total depth to bedrock is anticipated to be 40 to 50-feet bgs based on borings installed by AECOM as part of a 2011 Phase II ESA. The BCP Site lies within the Silurian-aged Lockport Group. The Lockport Group consists of Geulph, Oak Orchard, Eramosa, and Goat Island Dolostone and the Gasport Limestone (AMEC 2018). Monitoring well MW-3 (Figure 2) was installed as part of the Phase II ESA and bedrock was encountered in that boring at a depth of approximately 40-feet bgs. The bedrock was described as a Dolostone.

2.2.4 Surface Water Hydrology

There are no natural surface water drainage features on the BCP Site. Standing water can accumulate in some areas during heavy participation events, particularly in the paved truck parking area on the northern half of the site. Surface water in the paved open areas of the Site can drain to storm drains and catch basins that are still present and in use.

2.2.5 Groundwater Hydrogeology

There monitoring wells (MW-1, MW-2, and MW-3) were installed in August 2011 as part of the AECOM Phase II ESA and are screened across the fill and native materials (AECOM 2012). Inventum installed two

additional monitoring wells (MW-4 and MW-5) as part of scoping investigations conducted under the January 2020 Order on Consent (Inventum 2022). Groundwater on the BCP Site is perched with a gradient towards the southeast (Figure 3). Groundwater elevations ranged between approximately 571 and 580 ft AMSL or 3.5 to 11.5 feet bgs.

3 Site Investigation History

Inventum has reviewed investigation reports to document historical conditions and conducted two phases of scoping investigations on the BCP Site between September 2020 and September 2021 on behalf of GAE.

The scope of work for these investigations are summarized below while Section 4 contains a more detailed discussion of the data and relevant conclusions applicable to describe existing conditions on the BCP Site. Table 1 provides a summary of samples collected based on the investigation phase and, if known to GAE, the rationale for analysis.

3.1 Phase II Environmental Site Assessment

AECOM completed a Phase II ESA in August 2011 on behalf of Tulip and collected soil and groundwater samples on the Site. Sampling locations and the analytical program appear to have been based on Recognized Environmental Conditions (RECs) identified in AECOM's 2010 Phase I ESA. The approximate REC areas and associated sampling locations are shown on Figure 4 and were compiled from available documentation provided to GAE. These sampling areas included:

- Stained Floor Beneath Testing Laboratory Sink: One soil boring (P-4B) to four feet bgs in the courtyard immediately outside the testing laboratory. The Phase II ESA report indicates that a sample was attempted inside testing laboratory but could not be completed due to the presence of asbestos coated floor tiles;
- Tool and Maintenance Room: Inspection of the room for indications of a release; no significant staining was observed in front of a paint storage area or flammable materials storage cabinet; de minimis staining was observed; no sampling was conducted;
- Boiler House Basement: Advanced one soil boring (SS-3) to two feet bgs and collected one soil sample for analysis of Volatile Organic Compounds (VOCs) and Semi-Volatile Organic Compounds (SVOCs);
- Courtyard Area: Advanced three soil borings (P-4A, P-4B, and P-4C) to four feet bgs and collected one soil sample for VOCs and SVOCs at each location;
- Compressor House: Advanced one soil boring (SS-5) to four feet bgs and collected one soil sample for SVOC analysis;
- Building Q: Advanced one soil boring (SS-6) to two feet bgs and collected one soil sample for SVOC analysis;
- Bushing Dip Room: Advanced one soil boring (P-7) to four feet bgs and collected one sample for VOC analysis;
- Truck and Rail Loading Docks: Inspected the dock area for indications of a release; no significant staining or stressed vegetation was observed; no sampling was conducted;
- Chip Storage Bin: Inspected the chip storage bin and sump areas for indications of a release; no significant staining was observed; no sampling was conducted;
- Wood-block Floor in Building H: Advanced two soil borings (SS-10A and SS-10B) to two feet bgs and collected one sample for VOCs, SVOCs, and polychlorinated biphenyls (PCBs) from each boring;
- Former Coal Storage Pile: Advanced three soil borings (P-11A, P-11B, and P-11C) to four feet bgs and collected one soil sample for SVOCs and Resource Conservation and Recovery Act (RCRA) metals from each boring;
- Naphthenic Oil AST: Advanced one soil boring (SS-14) to two feet bgs and collected one soil sample for lead analysis; and

- Adjoining Properties and Manufacturing History: Installed three monitoring wells (MW-1, MW-2, and MW-3) and collected one groundwater sample for VOCs and RCRA metals from each well; collected one soil sample from 5 to 7 feet bgs from the MW-1 soil boring for VOC, SVOC, and RCRA metals based on visual discoloration, petroleum-like odors, and photoionization detector (PID) readings of 52 parts per million (ppm).

3.2 Phase II Soil Stabilization

The Phase II ESA identified elevated concentrations of lead in an area north of the main building that AECOM had identified as the Former Coal Storage Pile (Figure 4 and 5). Lead was reported at a concentration of 90,100 mg/kg in a soil sample collected from P-11B and 13,400 mg/kg from P-11C (Table 2)[6]. AECOM, on behalf of Tulip, and 5 years prior to GAE ownership, implemented a remedial action in the historic coal pile storage area (Figure 5) from July 2012 to September 2013 that consisted of:

- Bench scale testing;
- Initial soil stabilization treatment with calcium oxide and soil confirmation sampling;
- A second spot/polishing soil treatment with a phosphate mixture and soil confirmation sampling;
- Removing and disposal of excess soils and debris resulting from the soil mixing remedial actions; and
- Installation of a cap/barrier.

The soil mixing process involved using a blender mounted on an excavator to distribute the chemical amendments in order to reduce the leachable lead to below the characteristically hazardous threshold of 5 mg/L. In summary the stabilization program included:

- Stabilization of approximately 2,300 tons of lead impacted soil via in situ blending with 153 tons of calcium oxide;
- Secondary/spot stabilization of approximately 390 to 425 tons of soil via in situ blending with 11,150 pounds of phosphate mixture;
- Collection of fifteen (15) post-treatment confirmation sampling stabilized soils to document concentrations below characteristically hazardous criteria;
- Offsite disposal of approximately 624 tons of non-hazardous stabilized lead impacted soils;
- Removal and offsite disposal of an additional approximate 90 tons of stabilized lead impacted soils due to the soft consistency of the blended soils;
- Installation of an engineered cap/barrier (geomembrane) over the southern one-third of the remediation area and resurfacing of the northern one-third with a combination of asphalt and concrete pavement;
- Offsite disposal of approximately 52 tons of construction debris consisting of buried railroad ties, concrete, and asphalt; and
- A final cap/barrier inspection review.

AECOM prepared a Remediation Documentation Report detailing the soil stabilization program and it is provided for reference as Appendix C[7].

[6] GAE does not have laboratory data reports for work completed under the Phase II ESA or Phase II Soil Stabilization.
[7] The document available to GAE/Inventum is incomplete. Available figures and appendices are provided with the report.

3.3 Scoping Investigations

Inventum conducted two phases of scoping investigations at the Site between September 2020 and September 2021 (Figure 6) on behalf of GAE. These investigations were completed under the January 2020 Site Characterization Order on Consent with a focus on gathering sufficient data to determine if the Site qualified for the Registry or the BCP. Data collected under these scoping investigations was summarized in a Draft Site Investigation Report (SIR) submitted to the NYSDEC in April 2022. In a letter dated November 17, 2022, the NYSDEC concluded that the Site qualifies for both the Registry and the BCP.

3.3.1 September 2020 Scope of Work

Five (5) direct-push soil borings (SB-001 through SB-005; Figure 6) were installed in the "area of documented disposal of hazardous waste" identified in the NYSDEC's December 2018 notification letter to GAE of the potential Site listing on the Registry. Six (6) direct-push soils borings (SB-006 through SB-011) were advanced along the southern and eastern perimeter property boundary. Soil borings were installed by Earth Dimensions, Inc. of Elma, New York under Inventum's direction.

Recovered soil was screened with a PID equipped with a 10.6 electron volt (eV) lamp. One (1) shallow (0 to 1 feet) soil sample was collected from the fill material at each boring. Two (2) subsurface samples were also collected at each boring. One (1) subsurface sample was collected from the top of the native material and one (1) sample was collected from native material at the base of the boring. All samples were analyzed for Target Analyte List (TAL) metals via EPA Method 6010C (Table 1). Samples were also analyzed for Target Compound List (TCL) VOCs using EPA Method 8260 and TCL SVOCs using EPA Method 8270 if there was visual or olfactory evidence of impact or PID readings indicative of organic contamination.

Six (6) of the soil samples were also analyzed for lead using the Toxicity Characteristic Leaching Procedure (TCLP). Three (3) samples were analyzed from borings installed along the southern (SB-006 and SB-007) and eastern (SB-010) property boundary. Three (3) samples were also analyzed from boring locations installed within the "area of documented disposal of hazardous waste" (SB-001, SB-002, and SB-003).

The three (3) monitoring wells (MW-1, MW-2, and MW-3) installed as part of the August 2011 Phase II ESA were redeveloped to sampling in September 2020. The depth to groundwater in each well was measured between 4 and 6-feet bgs. All three monitoring wells were sampled with a peristaltic pump using low-flow sampling procedures. Field parameters (pH, temperature, conductivity, turbidity, dissolved oxygen, and oxidation-reduction potential) were monitored during the purge process and recorded on field forms (Appendix D). Groundwater samples were collected for TCL VOCs by EPA Method 8260C, TCL SVOCs by EPA Method 8270D, and TAL metals by EPA Method 6010C.

3.3.2 August/September 2021 Scope of Work

Ten (10) direct-push soil borings (SB-012 through SB-019, MW-4, and MW-5) were installed to further characterize environmental conditions at the Site (Figure 6). Soil borings were installed by Nothnagle Drilling, Inc. of Scottsville, New York under Inventum's direction.

Borings were extended to the depth that groundwater was encountered, which was typically between 8 to 10-feet bgs. Recovered soil was screened with a PID equipped with a 10.6 eV lamp. One (1) soil sample was collected from the fill material at each boring generally between 0 and 2 feet bgs and analyzed for TAL Metals, TCL VOCs, TCL SVOCs, Polychlorinated biphenyls (PCBs) by EPA Method 8082A, Pesticides[8] by EPA Method 8081B, Herbicides by EPA Method 8151A, and Per- and Polyfluoroalkyl Substances

[8] Shallow fill (0 to 2 feet bgs) samples collected from SB-017 through SB-019 were not analyzed for Pesticides, Herbicides, or PFAS.

(PFAS) by EPA method 537 Mod (Table 1). A second sample was collected from each boring from the 1-foot interval immediately above the depth groundwater was encountered and analyzed for TAL Metals. The second sample from each boring was also analyzed for TCL VOCs and TCL SVOCs based on PID screening and/or visual/olfactory evidence indicative of organic compounds.

Two (2) new monitoring wells (MW-4 and MW-5) were installed to further characterize groundwater quality and flow conditions on the Site (Figure 3). MW-4 is an upgradient well installed north of the former manufacturing area and adjacent to the AECOM 2012-2013 In-Situ Soil Stabilization Area (Figure 5). MW-5 is a downgradient well on the southern property boundary with the Tract I parcel.

Borings for the new wells were advanced through the overlying fill material using 4.25-inch inside diameter hollow-stem augers to approximately 15-feet bgs to monitor shallow groundwater. The monitoring wells were constructed with 2-inch diameter polyvinyl chloride (PVC) for the casing and 10-feet of 2-inch PVC 0.010-inch slotted screen. One (1) foot of solid casing was installed at the bottom of the screened interval to function as a sump for the accumulation of sediment. Filter sand was installed from 1-foot below the bottom of the screened interval to a minimum of 1 foot above the top of the screen. A 2-foot bentonite seal was placed on top of the filter pack and allowed to hydrate and cure before completing the remaining annular space with a bentonite-cement grout. Both new monitoring wells were completed with flush-mounted traffic rated steel protective covers. Monitoring well construction logs are provided for reference in Appendix E. The new monitoring wells were developed a minimum of two weeks prior to sampling by removing a minimum of three well volumes of liquid, purging until dry, or purging and surging the well.

All five (5) monitoring wells were sampled with a peristaltic pump using low-flow sampling procedures. Field parameters (pH, temperature, conductivity, turbidity, dissolved oxygen, and oxidation-reduction potential) were monitored during the purge process and recorded on field forms (Appendix C). Groundwater samples were analyzed for TCL VOCs, TCL SVOCs, TAL Metals (Total and Dissolved), PCBs, Pesticides, and Herbicides.

3.3.3 Debris Piles

There are two piles of material stockpiled on the BCP Site on the north side of the building immediately to the west of MW-4 and along the northeastern property boundary (Figure 2). The piles existed prior to the property transaction and GAE is unaware of where the material originated from; however, there is some indication from the AECOM Phase I ESA that the stockpiles may contain soils and concrete from various onsite construction projects. The November 2013 AECOM Remediation Documentation Report (AECOM 2013) contains a drawing (Appendix C; Figure 5) which also indicates the debris piles were originally situated over the stabilization area and moved to the current location to facilitate the remediation work.

Inventum collected composite samples from the two piles of material in July 2021 (Table 1; Figure 6) and analyzed for TAL Metals, TCL VOCs, TCL SVOCs, PCBs, Pesticides, Herbicides, PFAS, and waste characterization parameters TCLP-Metals, VOCs, SVOCs, Pesticides, Herbicides, pH, Reactive Cyanide and Sulfide, Paint Filter Test, and Ignitability.

3.4 Survey

A survey was conducted of all the existing and new monitoring wells. The survey was conducted by a surveyor licensed in the State of New York consistent with standard technical practice. All horizontal locations were referenced to the North American datum of 1983 and the New York State Plane system. Vertical elevations were referenced to the North American Vertical datum of 1988 and reported in feet above mean sea level (ft AMSL).

4 BCP Site Conditions

The results of the scoping investigations are summarized in the sections below within the context and framework of the findings of the historical investigations to develop a current profile of constituents of concern (COCs) in environmental media on the BCP Site.

Detected concentrations of individual analytes are compared to applicable standards, criteria, and guidance values (SCGs):

- Soil samples are compared to the 6 NYCRR Part 375 Soil Cleanup Objectives (SCOs) for Commercial Use, Industrial Use, and Protection of Groundwater. These are considered an appropriate comparison based both on current and future use.
- Groundwater samples are compared to the Ambient Water Quality Standards and Guidance Values for Class GA groundwater (Class GA Standards) in 6 NYCRR Part 703 and presented in NYSDEC Technical and Operation Guidance Series (TOGS) 1.1.1.
- Emerging Contaminants (1,4 Dioxane and PFAS) are compared to the guidance values as outlined in the November 2022 NYSDEC document *Sampling, Analysis, and Assessment of Per- and Polyfluoroalkyl Substances (PFAS) Under NYSDEC's Part 375 Remedial Programs* for both soil and groundwater.

The analytical results from the historical investigations and the scoping investigations are summarized in Tables 2 through 4 and shown on Figures 6 through 10.

4.1 Existing Conditions

4.1.1 Soils

4.1.1.1 Metals

4.1.1.1.1 Lead

High concentrations of lead have historically been identified on the BCP Site and at the BCP Site boundary. Confirmation samples from the Tract I excavation along the southern boundary of the BCP Site contain concentrations of lead in soil between 1,250 mg/kg and 7,050 mg/kg. Two (2) confirmation samples from the Tract II excavation along the eastern boundary of the BCP Site contained lead in soil at concentrations of 1,030 mg/kg and 19,400 mg/kg. The Phase II ESA conducted by AECOM on behalf of Tulip identified lead in soil at concentrations of 90,100 mg/kg (Probe-11B) and 13,400 mg/kg (Probe-11C) in an area north of the main building (Table 2; Figure 4).

Lead was also detected at concentrations above the Commercial Use SCO (1,000 mg/kg) and/or the Toxicity Characteristic Leaching Procedure (TCLP) threshold of 5 milligrams per liter (mg/L) during the scoping investigations (Table 3; Figures 8 and 9):

- One sample (SB-018 from 0 to 2 feet) contained lead at a concentration of 1,650 mg/kg.
- The sample collected from 0 to 1 feet bgs at SB-003 contained total lead at a concentration of 801 mg/kg below the Commercial Use SCO but contained TCLP-lead at a concentration of 13.1 mg/L.
- The sample collected from 1.5 to 2 feet bgs at SB-007 contained total lead at a concentration of 258 mg/kg below the Commercial Use SCO but contained a TCLP-lead concentration of 5.03 mg/L, just slightly above the characteristic toxicity threshold.

The difference in total lead concentration at the Tract I/II and BCP Site boundaries are likely due to the operational history of the former facilities. Available historical aerial imagery (Appendix B) shows the BCP

Site boundary with Tract I has always been a paved access road. The BCP Site boundary survey identifies this southern boundary portion of the BCP Site as part of the Former Tennessee Avenue ROW. The Tract II record samples are from the extension of the Tract II excavation onto the BCP Site and up to the former rail spur paralleling the eastern boundary. The scoping investigation samples in this area (SB-009 through SB-011) were collected as close to the rail spur as possible, i.e., as close to the western limits of the Tract II excavation. None of the samples collected at SB-009 through SB-011 contained lead at concentrations above the Commercial Use SCO. Further, TCLP-Lead was non-detect in the sample from these three borings with the highest total lead concentration (340 mg/kg from 0 to 1-foot bgs at SB-009; Figure 7 and 9)

Lead was detected at concentrations above the Commercial Use SCO and the toxicity characteristic threshold in the composite samples collected from the debris piles on the north side of the BCP Site. Debris Pile 1 contained total lead at concentrations of 6,800 mg/kg and 8,290 mg/kg and TCLP-Lead at concentrations of 54.2 mg/L and 55.4 mg/L. Debris Pile 2 contained total lead a concentration of 4,1,40 mg/kg and TCLP-Lead at 17.8 mg/L.

Documentation available from AECOM indicate soils were stabilized through in situ blending with calcium oxide or a phosphate mixture in the Former Coal Pile Storage Area north of the main building (Figure 5). Post-treatment Total Lead and TCLP-Lead samples were collected to document that the chemically stabilized lead left in place was below the toxicity characteristic threshold of 5 mg/L. An engineered cap was placed over the southern two-thirds of the remediation area consisting of:

- A geotextile fabric (Mirafi 1100N) directly over the remediated soils;
- A geomembrane (Rufco 4000B) over the geotextile;
- 6-inches of sand over the geomembrane; and
- 4-inches of No.2 crusher stone over the sand.

The northern one-third of the remediation area was capped with a combination of asphalt and concrete to facilitate the use of the area for semi-trucks:

- A geotextile fabric (Mirafi 1100N) directly over the remediated soils;
- No.1 crusher stone to approximately 6-inches below the surrounding grade with two layers of Tensar (TX 140) Geoweb material; and
- Resurfacing with asphalt or concrete.

4.1.1.1.2 Other Metals

Lead is the primary metal COC identified on the BCP Site based on the historical data and scoping investigations. Copper was the only other metal detected in any scoping investigation soil sample at concentration above the Commercial Use SCO (Figure 9). The duplicate sample collected from 4 to 5-feet bgs at SB-001 contained copper at a concentration of 386 mg/kg, which is above the Commercial Use SCO of 270 mg/kg.

4.1.1.2 Pesticides/Herbicides

None of the soil samples collected contained concentrations of Pesticides or Herbicides above Commercial Use SCOs

4.1.1.3 PCBs

None of the soil samples collected contained concentrations of PCBs above Commercial Use SCOs.

4.1.1.4 SVOCs

Several SVOCs indicative of urban industrial fill (benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, chrysene, dibenzo(a,h)anthracene, and ideno(1,2,3-C,D)pyrene) were detected during the Phase II ESA in shallow samples at concentrations above Commercial and Industrial Use SCOs. The highest concentrations of SVOCs were in sub-slab samples collected from beneath the wood-block floor in Building H (Figure 7), which was noted in the Phase I ESA among a set of buildings (Buildings H, H-ADD, L, and L-ADD) as being used for offices, testing, laboratory, equipment, maintenance and parts storage, and a machine shop.

Several SVOCs indicative and typical of urban industrial fill (benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, and dibenzo(a,h)anthracene) were detected above Commercial SCOs during the scoping investigation (Figure 9). These detected above Commercial SCOs were isolated to MW-4 and SB-008 and not widespread across the BCP Site. There was a creosote like odor in the boring from SB-008 from approximately 4 to 8 feet bgs within the fill material and particularly within woody material recovered from approximately 5 to 5.5 feet bgs. This corresponds to detections of benzo(a)anthracene (8,100 micrograms per kilogram [ug/kg] above the Commercial Use SCO (5,600 ug/kg) and benzo(a)pyrene (4,500 ug/kg) above the Industrial Use SCO of 1,100 ug/kg.

4.1.1.5 VOCs

No VOCs were detected in any Phase II ESA samples at concentrations above Commercial Use SCOs. Tetrachloroethene (PCE) and Trichloroethylene (TCE) were detected at estimated concentrations well below Commercial Use SCOs from shallow sub-slab samples SS-10A and SS-10B (Figure 7) and direct-push samples in the Courtyard Area (P-4B). These sub-slab sample locations appear to have been located in the vicinity of a former testing laboratory where PCE was noted as a chemical present and staining was identified beneath a testing laboratory sink.

Field screening of recovered soils during the scoping investigation did not show any widespread indication of organic contamination on the BCP Site. None of the samples analyzed for VOCs contained detectable concentrations above Commercial Use SCOs.

4.1.1.6 Emerging Contaminants

None of the samples collected contained concentrations of 1,4-Dioxane or PFAS above Commercial Use SCOs (Table 3).

4.1.2 Groundwater

Five monitoring wells are installed on the BCP Site. Three of the monitoring wells (MW-1, MW-2, and MW-3) were installed as part of the Phase II ESA. Two monitoring wells (MW-4 and MW-5) were installed during the scoping investigation. Groundwater elevation data collected during both investigation phases suggest a southeasterly flow gradient in the perched water fill zone (Figure 3). MW-3 and MW-4 are upgradient and MW-1, MW-2, and MW-5 are aligned on the downgradient southern BCP Site boundary.

4.1.2.1 Metals

Sampling for metals was limited to Resource Conservation and Recovery Act (RCRA) Metals (Arsenic, Barium, Chromium, Lead, Mercury, Selenium, and Silver) as part of the Phase II ESA. There were no metals detected above Class GA Standards.

Samples were analyzed for the full TAL Metals list required under DER-10 during the scoping investigations (Figure 10). Several total metals (Antimony, Cadmium, Iron, Lead, Magnesium, Manganese, and Sodium) were detected in samples collected in September 2020 and August 2021 at concentrations

above their applicable Class GA Standards (Table 4). Dissolved metals exceeding Class GA Standards were primarily those metals that are assumed to be naturally occurring background constituents (Iron, Magnesium, Manganese, and Sodium).

Total Lead was detected in the sample from MW-2 in September 2020 (57 micrograms per liter [ug/L]) above the Class GA Standard of 25 ug/L. The lead concentration in the August 2021 (9.1 ug/L) sample from MW-2 was below the Class GA Standard. Total lead was also detected in the sample from MW-3 in August 2021 (33.32 ug/L) above the Class GA Standard. Total Lead was non-detect in the sample from MW-3 in September 2020; however, the laboratory reporting limit was elevated (50 ug/L) due to matrix interferences.

Dissolved lead has not been detected above Class GA Standards (Table 4). The data suggests there is no leaching from the elevated lead concentrations detected in soils, which is likely aided by the large areas of impermeable cover (pavement, concrete, and buildings) on the BCP Site.

4.1.2.2 Pesticides/Herbicides

Sampling for pesticides/herbicides was conducted in August 2021 as part of the scoping investigation and there were no detections above reporting limits.

Sampling for pesticides/herbicides was not conducted as part of the Phase II ESA.

4.1.2.3 PCBs

Sampling for PCBs was conducted in August 2021 as part of the scoping investigation and there were no detections above reporting limits.

Sampling for PCBs was not conducted as part of the Phase II ESA.

4.1.2.4 SVOCs

Several SVOCs were detected in groundwater samples collected during the scoping investigation (Table 4). Acenaphthene, Naphthalene, Benzo(a)anthracene, and Benzo(b)fluoranthene were detected above their respective Class GA Standards. This is not unusual as fill was identified to depths of 8 feet bgs and contained some coal/asphalt typical of urban/industrial fill, or as field screening suggested from the direct-push boring (SB-008) completed near MW-1, creosote from woody timbers in the fill material.

4.1.2.5 VOCs

Groundwater samples collected from MW-2 during the Phase II contained TCE, cis-1,2-dichloroethene (cis-1,2-DCE), and vinyl chloride at concentrations above Class GA Standards (Table 4). MW-2 is downgradient or slightly cross-gradient to both Building H (Figure 10) where the Phase I ESA identified PCE present, and the location of sub-slab samples collected during the Phase II ESA where PCE and TCE were detected but at concentrations below Commercial Use SCOs.

TCE and cis-1,2-DCE were detected at MW-2 in September 2020 at concentrations of 39 ug/L and 11 ug/L, respectively, above the Class GA Standards of 5 ug/L. Cis-1,2-DCE was also detected slightly above the Class GA Standard (6.9 ug/L) in the sample collected from MW-2 in August 2021. TCE was not detected above the Class GA Standard in the August 2021 sample.

TCE (110 ug/L), cis-1,2,-DCE (160 ug/L), and vinyl chloride (2.7 ug/L) were detected at MW-5 in August 2021 at concentrations above their Class GA Standards.

Ethylbenzene is the only other VOC (11 ug/L at MW-1 in August 2021) detected above Class GA Standards in any sample. This monitoring well is downgradient or slightly cross-gradient to boring SB-008 where

field screening indicated a creosote like odor. The other VOCs detected at MW-1 in August 2021 (Benzene, Xylenes, and Isopropylbenzene) but at concentrations below Class GA Standards support this assessment of an isolated and limited impact from historic fill.

The VOCs detected at MW-2 and MW-5 are not indicative of an extensive impact from historical operations. None of the soil samples from MW-5 or from the borings immediately upgradient of MW-2 and MW-5 (SB-017, SB-018, and SB-019) contained concentrations of TCE, cis-1,2-DCE, or Vinyl Chloride above Commercial SCOs. The overall decrease in concentrations of TCE and cis-1,2-DCE at MW-2 between 2011 and 2021 (TCE: 120 ug/L to 2.9 ug/L; cis-1,2-DCE: 19 ug/L to 6.9 ug/L) indicates there is evidence of ongoing natural attenuation. Further, these constituents were non-detect in groundwater samples collected from both the upgradient (MW-3 and MW-4) and downgradient (MW-1) monitoring wells (Table 4), in all other soil samples submitted for VOC analysis (Table 1 and 4), and there were no field screening observations indicative of a sitewide impact requiring further extensive investigation.

The source of the VOCs is likely the result of poor historical housekeeping. The chemical inventory conducted as part of the Phase I ESA identified that PCE was present in the former testing laboratory (Building H; Figure 2b) and stained flooring was identified beneath the testing laboratory sink. The Phase II ESA identified PCE and TCE in soil at very low concentrations in sub-slab samples collected in this area and TCE at low concentrations from a direct-push sample collected in the adjacent courtyard area.

4.1.2.6 Emerging Contaminants

Groundwater sampling for 1,4-Dioxane and PFAS has not been conducted and is recommended for further investigation.

4.2 Conceptual Site Model

A CSM for the BCP Site was developed incorporating the results of the limited historical investigation (Phase II ESA), source removal actions (AECOM soil stabilization), and the more recent scoping investigations that established existing conditions. The CSM establishes a baseline against which the RI data will be compared:

- Historical operations have impacted environmental media on the BCP Site;
- There is the potential for lead in historic urban fill because of historic operations (ex. building construction/demolition, waste management, or poor housekeeping) at concentrations above Commercial Use SCOs and/or the toxicity characteristic threshold across the BCP Site;
- Leachate from the lead identified in fill is not impacting groundwater on the BCP Site or at the BCP Site boundaries;
- Groundwater is nominally impacted on the BCP Site from poor historical material management practices. Chlorinated VOCs are present in an isolated area of the BCP Site, at low concentrations, and naturally degrading;
- Materials stockpiled on the BCP Site are likely composed of debris from past construction projects and/or general historical operations. These surface stockpiles contain lead at concentrations above Commercial Use SCOs and/or the toxicity characteristic threshold.
- PCBs, Pesticides, Herbicides, and PFAS are not COCs on the BCP Site based on the sitewide investigation.

4.3 Data Gaps

The historic and current data and CSM was used to identify specific data gaps where further investigation is proposed to either complete a comprehensive delineation and, as necessary, fine-tune the CSM as an aid

to development of IRMs or potential remedial alternatives in the AA. The RI scope of work (Section 5) is being proposed to comply with DER-10 and address the identified data gaps. The following data gaps were identified as shown in *italics* beneath each component of the CSM:

- Historical operations have impacted environmental media on the BCP Site;
    - *Additional delineation of the nature and extent of contamination on the BCP Site is proposed in this RIWP.*
- There is the potential for lead in fill because of historic operations (ex. building construction/demolition, waste management, or poor housekeeping) at concentrations above Commercial Use SCOs and/or the toxicity characteristic threshold across the BCP Site;
    - *Additional sampling is necessary to further define the extent of lead in soils on the BCP Site, specifically in areas underneath and adjacent to existing buildings which are inaccessible due to access restrictions (ex. drilling equipment access, ceiling height and thick concrete foundations) and/or health and safety restrictions (ex. asbestos and lead based paint).*
    - *Additional sampling is necessary along the perimeter of the former AECOM stabilization area to document work completed prior to GAE's acquisition, and as understood by Inventum, without NYSDEC oversight.*
- Leachate from the lead identified in fill is not impacting groundwater on the BCP Site or at the BCP Site boundaries;
    - *Additional groundwater monitoring is required to document baseline conditions identified in the scoping investigations across seasonal variations in groundwater levels and establish long-term monitoring requirements and trends.*
- Groundwater is nominally impacted on the BCP Site from poor historical material management practices. Chlorinated VOCs are present in an isolated area of the BCP Site, at low concentrations, and data indicate the VOCs are naturally degrading;
    - *Additional limited soil investigation is necessary to delineate a past "source", if present, of the VOCs identified in the groundwater on the BCP Site;*
    - *Soil-gas sampling is necessary to evaluate potential vapor intrusion to existing and future buildings on the BCP Site;*
    - *Additional monitoring wells are necessary to further define the extent of VOCs in groundwater on the BCP Site, specifically underneath Building H which is currently inaccessible to drilling due to access restrictions and/or health and safety restrictions (ex. asbestos and lead based paint).*
- Materials stockpiled on the BCP Site are likely composed of debris from past construction projects and/or general historical operations. These surface stockpiles contain lead at concentrations above Commercial Use SCOS and/or the toxicity characteristic threshold.
    - *Stabilization of these stockpiles is necessary prior to removal from the BCP Site.*
    - *Sampling below and inside the adjacent structures to define potential VOC impacts to underlying soils is required.*
    - *Sampling within the building adjacent to the AECOM stabilized soils is needed to define potential impact under the slab.*
- PCBs, Pesticides, Herbicides, and PFAS are not COCs on the BCP Site based on the sitewide investigation.
    - *Additional sampling for PFAS in groundwater is necessary to confirm this assessment.*

5 BCP Remedial Investigation Scope of Work

This section provides a scope of work to address the identified data gaps. IRMs have been proposed under separate cover (Inventum 2023) and are necessary to safely complete some of the proposed tasks.

Table 5 provides a summary of the proposed samples, analytical methods, and rationale for collection.

5.1 Soils

Soils samples will be collected from thirteen (13) test pits completed in previously unsampled areas of the BCP Site (Figure 11; Table 5). These are in locations currently covered by existing buildings and foundations which must be removed, in whole or part, to access the locations effectively and safely. Test pits will be approximately 15-feet in length and extended a minimum of 2-feet into the native silty clay underneath the fill which is anticipated to be between 5 and 8 feet bgs. Actual length and depths may vary based on site access and depth to groundwater. A minimum of two (2) soil samples will be collected at each location. One (1) shallow (0 to 1 feet below the top of soil[9]) composite sample will be collected at each location and analyzed for TAL Metals, TCL VOCs, and TCL SVOCs. The shallow sample will also be analyzed for TCLP-Lead. One (1) subsurface composite sample will be collected from the base of the test pit in the native material and analyzed for TAL Metals, TCL VOCs, and TCL SVOCs. Each composite sample will be comprised of soil collected from five locations along the length of the test pit.

Field screening with a photoionization detector (PID) will also be conducted across the entire depth of the test pit at 2-foot intervals and additional samples will be collected for TCL VOC and TCL SVOC analysis if visual or olfactory evidence of impact or PID readings (>10 ppm sustained in a Ziploc bag) indicate evidence of organic contamination. Photographs will be taken of each test pit.

Soils from the test pit(s) will be temporarily stockpiled adjacent to the excavation and placed back in the trench after sampling.

5.2 Soil Vapor

Sub-slab vapor samples and/or soil vapor samples will be collected from the five (5) locations shown on Figure 11. The samples will either be collected from temporary sub-slab vapor probes installed in the existing building foundations slabs, or alternatively, after the buildings/foundations have been removed as part of IRMs. Soil vapor analysis will also be included in the Site Management Plan (SMP) for any future building constructed over an area potentially containing VOC impact.

Samples will be collected in general accordance with the following guidance document:

- Final Guidance for Evaluating Soil Vapor Intrusion in the State of New York, New York State Department of Health (NYSDOH), Center for Environmental Health Bureau of Environmental Exposure Investigation. October 2006.

Temporary probes will be installed at each location in accordance with Sections 2.7.1 (Soil Vapor) or 2.7.2 (Sub-slab Vapor) of the above referenced guidance document. One (1) 8-hour sample will be collected at each location in a laboratory certified clean Summa® canister and submitted to Alpha Analytical Laboratories of Buffalo, New York for VOC analysis using EPA Method TO-15. The laboratory will be contracted for analysis of Matrix A and C compounds as listed within the NYSDOH guidance document

[9] Note: the depth will be measured from the top of the soil surface, not including any slab thickness.

targeting a minimum reporting limit of 0.20 micrograms per cubic meter (ug/m^3). Matrix B compounds will target a reporting limit of 1.0 ug/m^3.

Field sampling personnel will document any site operations within the general sampling area, weather conditions, and other field observations that may influence results interpretation.

5.3 Groundwater

5.3.1 Monitoring Well Installation

Four monitoring wells are proposed to complete, along with the five existing monitoring wells, the assessment of the site:

- One (1) additional monitoring well (MW-6) will be installed at the approximate location shown on Figure 11 following any necessary asbestos abatement and building removal under the proposed IRM. MW-6 will be in the area formerly identified as laboratory from which a sample containing PCE (area of staining beneath a laboratory sink). MW-6 is assumed to be upgradient of MW-2 and MW-5 where VOCs (TCE, cis-1,2-DCE, and Vinyl Chloride) have been detected above Class GA Standards.
- One (1) additional monitoring well (MW-7) will be installed in the former courtyard and area of the former acid tanks following building demolition. MW-7 is assumed to be downgradient of MW-5, the former oil storage and maintenance area, and in the location formerly used for acid storage.
- One (1) additional monitoring well (MW-8) will be installed in the former plastics production area (Building W) down and side gradient of the former oil storage tank and AECOM remediation area.
- One (1) additional well will be installed at the presumed downgradient boundary immediately downgradient of the western debris pile to provide data at the downgradient boundary and data to evaluate any impact from the debris piles.

The locations of the new monitoring wells may be adjusted from the location shown based on the results of the test pit (Figure 11) and soil samples collected in that area. Further, additional monitoring wells may be installed at other locations on the BCP Site if evidence of lead or organic contamination is identified either through field screening or soil sampling.

The boring for the new monitoring wells will be advanced through the overlying fill material to approximately 15-feet bgs to monitor shallow groundwater. Unconsolidated material samples will be collected for observation and screening with a PID equipped with a 10.6 eV lamp in a continuous interval over the total depth of the boring with a split barrel sampler driven through the augers. One (1) shallow (0 to 1 feet) and one (1) subsurface (1-foot above the saturated interval, if present) soil sample will be collected at each boring location and analyzed for TAL Metals, TCL VOCs, and TCL SVOCs. Additional soil samples will be collected for VOC and SVOC analysis only if there is visual or olfactory evidence of impact or PID readings indicate evidence of organic contamination.

Each monitoring well will be screened with a 2-inch diameter Schedule 40 polyvinyl chloride (PVC) well casing and a minimum of 10-feet of 0.010-inch slotted screen from 5 to 15-feet bgs. A sand filter pack will be placed for the bottom of the screened interval to a minimum of 1 foot above the top of the screen. A 2-foot bentonite seal will be placed on top of the filter pack and the remaining annular space will be completed with a cement grout (Portland Type I cement with 3 to 5 percent bentonite). The monitoring wells will be completed with either an above-grade steel stickup enclosure or within a flush to-grade traffic rated box depending on site work being completed in each area.

The monitoring wells will be developed a minimum of two weeks prior to collection of samples. The water level in the new and pre-existing wells will be manually measured using a water interface probe and depth to water and the total depth of the wells will be recorded in the field notebook. The new monitoring wells will be developed by removing a minimum of three well volumes, purging the well until dry, or purging and surging the well.

5.3.2 Groundwater Sampling

One round of sampling at the nine (9) monitoring wells on the BCP Site will be conducted with a peristaltic pump using low-flow sampling procedures. All purge water will be containerized in DOT-compliant 55-gallons open topped steel drums or totes, filtered, and discharged to the City of Niagara Falls sanitary sewer. Prior to sampling, the depth to groundwater will be measured and recorded for each monitoring well. Groundwater samples will be collected for TAL Metals (Total and Dissolved), TCL VOCs, TCL SVOCs, PFAS and 1,4-Dioxane.

Additional sampling may be conducted as a component of the proposed IRMs.

5.4 Survey

A survey will be conducted of all the sampling locations installed/completed during the RI. The survey will be conducted by a surveyor licensed in New York State consistent with standard technical practice. All horizontal locations will be referenced to the North American Datum of 1983 and the New York York State Plan system. Vertical elevations will be referenced to the North American Vertical Datum of 1988 and reported in ft. AMSL. In addition to the sample locations, the survey will include the horizontal and vertical locations of:

- All sanitary and storm sewer manholes (including pipe inverts);
- The sump location and sump invert within the Chip Wash Room;
- Locations of pits and sumps, if any, within the buildings identified during demolition; and
- The limits, to the extent practicable based on available data, of the 2012 AECOM soil stabilization area.

5.5 Supporting Documentation

5.5.1 Quality Assurance Project Plan

The Quality Assurance Project Plan (QAPP) governing the data collection of the BCP RI program is included as Appendix F. The QAPP contains the following elements:

- Project Quality Organization, Roles, and Responsibilities
- Quality Assurance Objectives and Criteria
- Data Quality Requirements and Criteria
- Chemical Analyses and Quality Assurance Protos
- Field Sampling Procedures
- Sampling Equipment Decontamination Procedures
- Quality Assurance Samples
- Sample Volume, Preservation, and Holding Times
- Documentation and Reporting and Chain-of-Custody Requirements
- Calibration Procedures and Frequency
- Sample Preparation and Analytical Procedures
- Internal, Field, and Laboratory Quality Control Checks

- Data Reduction, Validation, and Reporting
- Performance, System Audits, and Corrective Action

All observations and notations will be recorded in a dedicated field notebook or field sampling forms. The QAPP may be updated as needed to address unexpected conditions and sampling requirements that may not be covered by the current document.

5.5.2 Health and Safety Plan and Community Air Monitoring Plan

The HASP is included as Appendix G. The HASP contains detailed procedures designed to protect health of site workers and the public during field work. The HASP will be closely adhered to during all field activities and contains the following elements:

- Project Organization
- Description of Planned Onsite Activities
- Monitoring Procedures, Site Controls, and Decontamination
- Personal Protective Equipment
- Onsite Safety Equipment
- Training and Medical Monitoring Requirements
- Contingency Plan and Emergency Procedures

Any subcontractors utilized to complete this work will be required to provide and adhere to a HASP for use by their employees that, at minimum, meets the same requirements as the HASP in Appendix G.

A Community Air Monitoring Plan (CAMP) is included as Appendix H. The CAMP will be used during any intrusive activities associated with implementation of the BCP RI.

6 Interim Remedial Measures

Several Interim Remedial Measures (IRMs) have been proposed to address three known issues on the proposed BCP Site:

1. Demolition of Unstable Structures
2. Stabilization and Offsite Disposal of Debris Piles; and
3. Stabilization and Offsite Disposal of Soil Exhibiting the Characteristic of Toxicity

The IRMs are necessary to support implementation of the additional investigatory work proposed in this RIWP. An IRM Work Plan (Inventum 2023) was submitted to the NYSDEC concurrent with submittal of this RIWP as part of the BCP application. A summary of each IRM of the proposed IRMs is provided below:

6.1 Demolition

The demolition and dismantlement of structures on the BCP Site is necessary to provide access to conduct the required remedial investigations and anticipated remedial actions. The buildings to be removed are either unsuitable for occupancy, unstable, or too restrictive to allow the needed access. Buildings that do not limit the ability to complete the RI will be addressed by future work plans.

6.2 Soil Excavation, Stabilization, and Disposal

Soils and debris identified on the proposed BCP Site with concentrations of lead above the characteristic toxicity threshold will be stabilized and disposed offsite. This includes the debris piles and two isolated hot spot areas identified during the scoping investigation (Figure 12). A bench scale test was conducted during the scoping investigation (Inventum 2020) and confirmed an admixture of 5-percent (by weight) Portland Cement is efficient at eliminating the hazardous characteristic of toxicity for lead.

6.3 Site Materials Management

The Site Materials Management IRM includes procedures to follow whenever ground intrusive stie work is conducted during the demolition, remedial investigation, and site management during the BCP. These include:

- Requirements for excavating/grading activities, stockpiling and soil staging areas, waste characterization sampling, onsite reuse criteria, soil loading and transportation, and requirements for offsite disposal;
- Stabilization procedures to be utilized if additional soils exceeding the toxicity characteristic for lead are identified;
- Requirements for site cover and imported fill;
- Health and Safety for construction personnel, including requirements for Site and community air monitoring;
- Quality Assurance/Quality Control Plan;
- Community Air Monitoring Plan; and
- NYSDEC and NYSDOH notification and reporting requirements

7 Remedial Investigation Report

An RIR will be prepared consistent with NYSDEC DER-10 and will include, at a minimum, the following components:

- Introduction
- Site Description and History
- Site Physical Characteristics
- RI Scope of Work and Results Summary
- Implemented IRM Summary (if applicable)
- Data Validation and Usability
- Nature and Extent of Contamination
- Contaminant Fate and Transport
- Qualitative Exposure Assessment
- Cleanup Objectives
- Summary and Conclusions

The RIR will include a discussion of the RI results compared to appliable SCGs. The discussion in the RIR on the nature and extent of contamination will be focused on exceedances of applicable Commercial or Industrial Use SCOs. The RIR will include proposed Remedial Action Objectives (RAOs), and if warranted, a schedule for completion of an Alternatives Analysis Report (AAR).

7.1 Schedule

A schedule for completion of the RIWP is included as Figure 13. The schedule for completion of the Demolition and Soil Excavation, Stabilization, and Disposal IRMs will be coordinated with the remedial investigation activities.

The RIWP will be implemented as soon as the BCP Agreement and Community Participation Plan are approved.

8 Bibliography

Phase I Environmental Site Assessment of the Tulip Corporation Site. 3125 Highland Avenue, Niagara Falls, New York 14305. AECOM. September 2010.

Phase II Environmental Site Assessment. 3125 Highland Avenue Property. Niagara Falls, New York. AECOM. October 2011.

Remediation Documentation Report. Tulip Corporation. 3125 Highland Avenue. Niagara Falls, New York. AECOM. November 2013.

Lead, Arsenic, and SVOC Remediation Technical Memorandum. Tulip Corporation. AECOM. September 2012

Potential Hazardous Waste Disposal Site Notification. NYSDEC. December 2018.

NYSDEC. May 2019. Technical Guidance for Site Investigation and Remediation.

NYSDEC. June 2021. Sampling, Analysis, and Assessment of Per- and Polyfluoroalkyl Substances (PFAS) Under NYSDEC's Part 375 Remedial Programs.

NYSDOH. October 2006 (May 2017 Update). Final Guidance for Evaluating Soil Vapor Intrusion in the State of New York.

Inactive Hazardous Waste Disposal Site Determination Investigation. Tulip Molded Plastics Corporation Site. Inventum Engineering, PC. June 2020.

Site Investigation Report. Tulip Molded Plastics Corporation Site #932169. 3125 Highland Avenue. Niagara Falls, New York. Inventum Engineering, PC. April 2022.

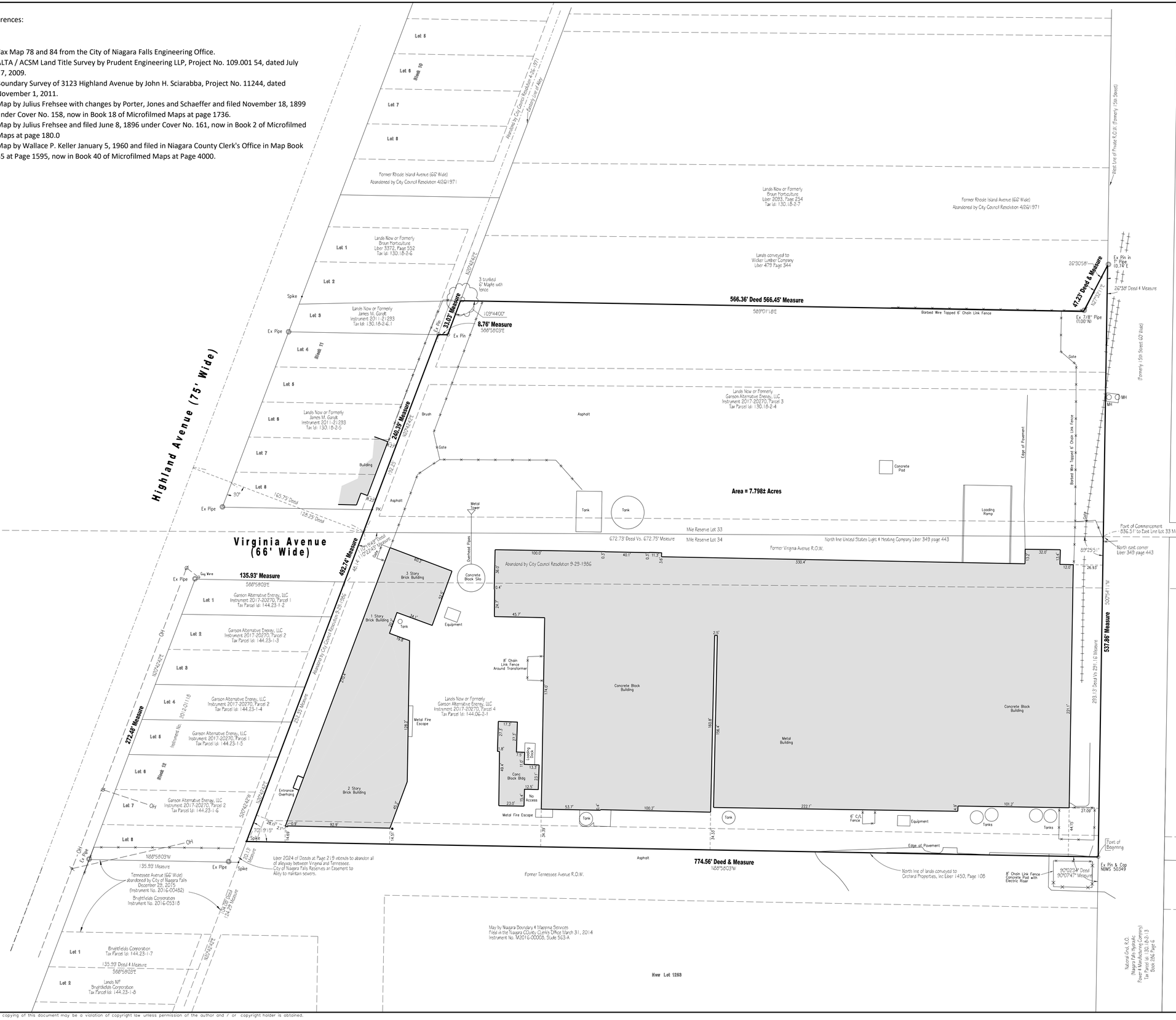
Tables

Figures

Appendix A – BCP Boundary Survey

Map references:

1. Tax Map 78 and 84 from the City of Niagara Falls Engineering Office.
2. ALTA / ACSM Land Title Survey by Prudent Engineering LLP, Project No. 109.001 54, dated July 17, 2009.
3. Boundary Survey of 3123 Highland Avenue by John H. Sciarabba, Project No. 11244, dated November 1, 2011.
4. Map by Julius Frehsee with changes by Porter, Jones and Schaeffer and filed November 18, 1899 under Cover No. 158, now in Book 18 of Microfilmed Maps at page 1736.
5. Map by Julius Frehsee and filed June 8, 1896 under Cover No. 161, now in Book 2 of Microfilmed Maps at page 180.0
6. Map by Wallace P. Keller January 5, 1960 and filed in Niagara County Clerk's Office in Map Book 65 at Page 1595, now in Book 40 of Microfilmed Maps at Page 4000.



Legend

Abbreviations

- Ex - Existing
- E - East
- N - North
- W - West
- S - South
- R.O.W. - Right of Way
- A.K.A. - also known as
- EM Electric Meter
- Well Monitoring Well
- ELHH Electric Hand Hole
- Deciduous Tree
- Bush
- Coniferous Tree
- Electric Manhole
- SignalPole
- Cable Manhole
- Water Manhole
- Traffic Manhole
- Large Rock

Symbols

- Sanitary Manhole
- CO Cleanout
- CB Catch Basin
- DI Drain Inlet
- Storm Manhole
- YD Yard Drain
- CATV Cable TV
- Electric Riser
- Power Pole
- Guy Wire Anchor
- Telephone Riser
- Fire Hydrant
- HYD
- WV Water Valve
- WSV Water Service Valve
- Gas Line Marker
- GV Gas Valve
- GSV Gas Service Valve
- Sign
- MB Mailbox
- MP Metal Post
- Mon Concrete R.O.W. Monument
- Light Standard
- Telephone Manhole
- Bollard
- ICV Irrigation Control Valve
- Traffic ControlBox

Line Styles

- SA Sanitary Sewer
- ST Storm Sewer
- W Water Line
- G Gas Line
- T Telephone Wires or Cables
- E Electric Wires or Cables
- OH Overhead Wires
- 100 Contour Line
- Centerline of Ditch
- Crown of Pavement
- Centerline of Road
- Right of Way Line
- Building Setback Line
- Easement Line
- Property Line
- UE Underground Electric
- Paint Stripe
- Former Boundary Parcel Line
- UFC Underground Cable TV
- UFO Underground Fiber Optic

NBMS 50349

Cap Detail

40' 0 40' 80'

SCALE BAR IN FEET

Niagara Boundary And Mapping Services

PO. Box 1120
Lewiston, NY 14092
(716) 297-9584

E-Mail:
lee@niagaraboundary.com

Map Showing Boundary Survey of Property Owned by

Ganson Alternative Energy, LLC

3125 Highland Avenue

Deed Reference: Instrument 2017-20270

LOT	33 & 34 Mile Reserve	SECTION	TOWNSHIP	RANGE
City	Niagara Falls			
COUNTY	Niagara			
STATE	New York			
DATE	February 2, 2023			
SCALE	1" = 40'			
JOB NO.	9501-23			
RESURVEYED				

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Appendix B – Sanborn Fire Insurance Maps/Historical Aerials

Tulip Molded Plastics Facilty

3125 Highland Avenue

Niagara Falls, NY 14305

Inquiry Number: 6912321.3

March 25, 2022

The EDR Aerial Photo Decade Package

6 Armstrong Road, 4th floor
Shelton, CT 06484
Toll Free: 800.352.0050
www.edrnet.com

EDR Aerial Photo Decade Package

03/25/22

Site Name:

Tulip Molded Plastics Facilty
3125 Highland Avenue
Niagara Falls, NY 14305
EDR Inquiry # 6912321.3

Client Name:

Inventum Engineering, LLC
441 Carlisle Drive, Suite C
Herndon, VA 20170
Contact: Todd Waldrop

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Search Results:

Year	*Scale*	*Details*	*Source*
2017	1"=500'	Flight Year: 2017	USDA/NAIP
2013	1"=500'	Flight Year: 2013	USDA/NAIP
1995	1"=500'	Acquisition Date: March 28, 1995	USGS/DOQQ
1985	1"=500'	Flight Date: May 03, 1985	USDA
1978	1"=500'	Flight Date: October 31, 1978	USDA
1972	1"=500'	Flight Date: May 13, 1972	USGS
1962	1"=500'	Flight Date: November 26, 1962	USGS
1958	1"=500'	Flight Date: June 03, 1958	USGS
1951	1"=500'	Flight Date: October 14, 1951	USDA
1938	1"=500'	Flight Date: January 01, 1938	FirstSearch

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INQUIRY #: 6912321.3

YEAR: 2017

= 500'

N

EDR


INQUIRY #: 6912321.3
YEAR: 2013
= 500'
N
EDR

INQUIRY #: 6912321.3

YEAR: 1995

= 500'

N

EDR

Subject boundary not shown because it exceeds image extent or image is not georeferenced.

INQUIRY #: 6912321.3

YEAR: 1985

= 500'

N

EDR


INQUIRY #: 6912321.3
YEAR: 1978
= 500'
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EDR

INQUIRY #: 6912321.3

YEAR: 1972

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N

EDR

INQUIRY #: 6912321.3

YEAR: 1962

= 500'

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EDR

INQUIRY #: 6912321.3

YEAR: 1958

= 500'

N

EDR

INQUIRY #: 6912321.3

YEAR: 1951

= 500'

N

EDR


INQUIRY #: 6912321.3
YEAR: 1938
= 500'
N
EDR

Tulip Molded Plastics Facilty

3125 Highland Avenue

Niagara Falls, NY 14305

Inquiry Number: 6912321.1

March 25, 2022

Certified Sanborn® Map Report

6 Armstrong Road, 4th floor
Shelton, CT 06484
Toll Free: 800.352.0050
www.edrnet.com

Certified Sanborn® Map Report

03/25/22

Site Name:

Tulip Molded Plastics Facilty
3125 Highland Avenue
Niagara Falls, NY 14305
EDR Inquiry # 6912321.1

Client Name:

Inventum Engineering, LLC
441 Carlisle Drive, Suite C
Herndon, VA 20170
Contact: Todd Waldrop

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Certified Sanborn Results:

Certification # 6D98-4D83-BF44

PO # TULIP

Project Tulip Molded Plastics

Maps Provided:

1985
1979
1965
1958
1955
1950
1914

Sanborn® Library search results

Certification #: 6D98-4D83-BF44

The Sanborn Library includes more than 1.2 million fire insurance maps from Sanborn, Bromley, Perris & Browne, Hopkins, Barlow and others which track historical property usage in approximately 12,000 American cities and towns. Collections searched:

- ☑ Library of Congress
- ☑ University Publications of America
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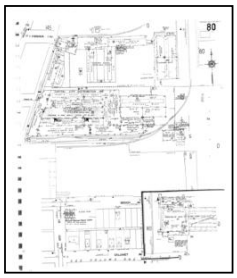
Sanborn Sheet Key

This Certified Sanborn Map Report is based upon the following Sanborn Fire Insurance map sheets.

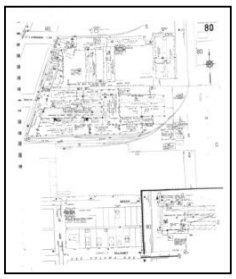
1985 Source Sheets



Volume 2, Sheet 80
1985

Volume 2, Sheet 145
1985

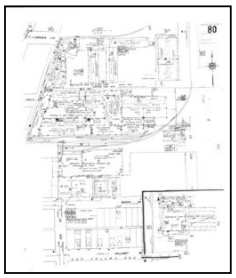
1979 Source Sheets



Volume 2, Sheet 80
1979

Volume 2, Sheet 145
1979

1965 Source Sheets

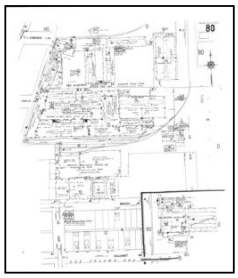


Volume 2, Sheet 80
1965

Volume 2, Sheet 145
1965

1958 Source Sheets

Volume 2, Sheet 145
1958



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1958

Sanborn Sheet Key

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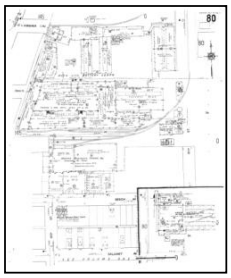
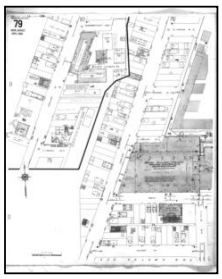
1955 Source Sheets



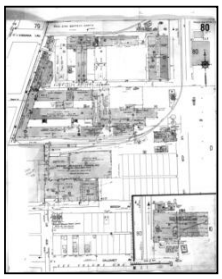
Volume 2, Sheet 80
1955

Volume 2, Sheet 145
1955

1950 Source Sheets

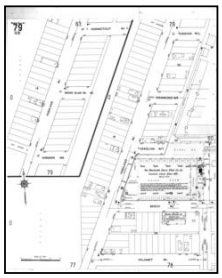


Volume 2, Sheet 79
1950

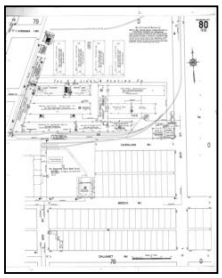


Volume 2, Sheet 80
1950

1914 Source Sheets



Volume 1, Sheet 79
1914

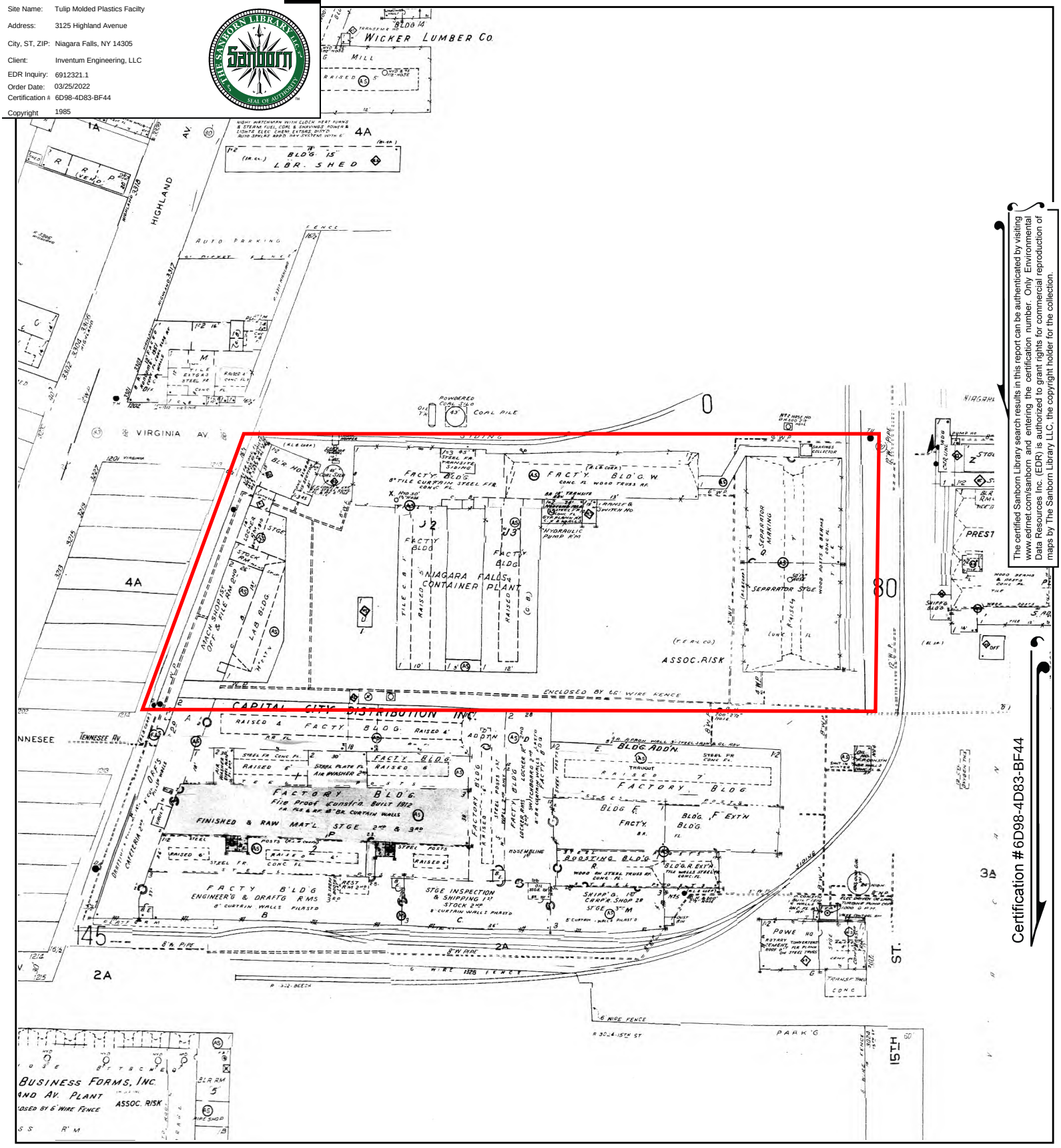


Volume 1, Sheet 80
1914

Certified Sanborn® Map

1985

Site Name: Tulip Molded Plastics Facilty
Address: 3125 Highland Avenue
City, ST, ZIP: Niagara Falls, NY 14305
Client: Inventum Engineering, LLC
EDR Inquiry: 6912321.1
Order Date: 03/25/2022
Certification #: 6D98-4D83-BF44
Copyright: 1985



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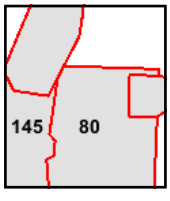

Volume 2, Sheet 145
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0 Feet 150 300 600

N

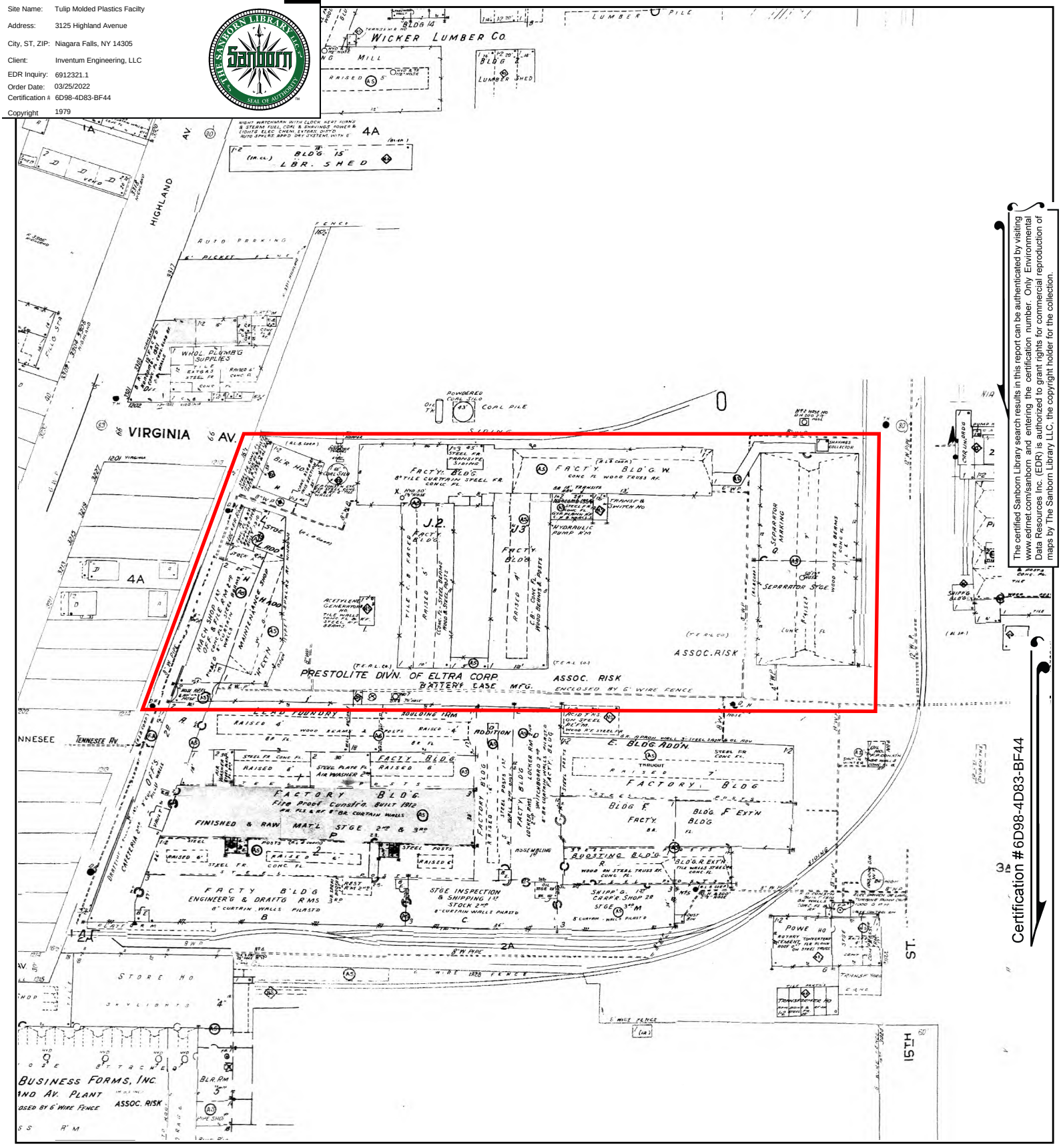
6912321 - 1 page 5

Certification #6D98-4D83-BF44

Certified Sanborn® Map

1979

Site Name:	Tulip Molded Plastics Facilty
Address:	3125 Highland Avenue
City, ST, ZIP:	Niagara Falls, NY 14305
Client:	Inventum Engineering, LLC
EDR Inquiry:	6912321.1
Order Date:	03/25/2022
Certification #	6D98-4D83-BF44
Copyright	1979



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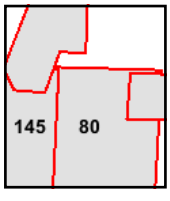

Volume 2, Sheet 145
Volume 2, Sheet 80

0 Feet 150 300 600

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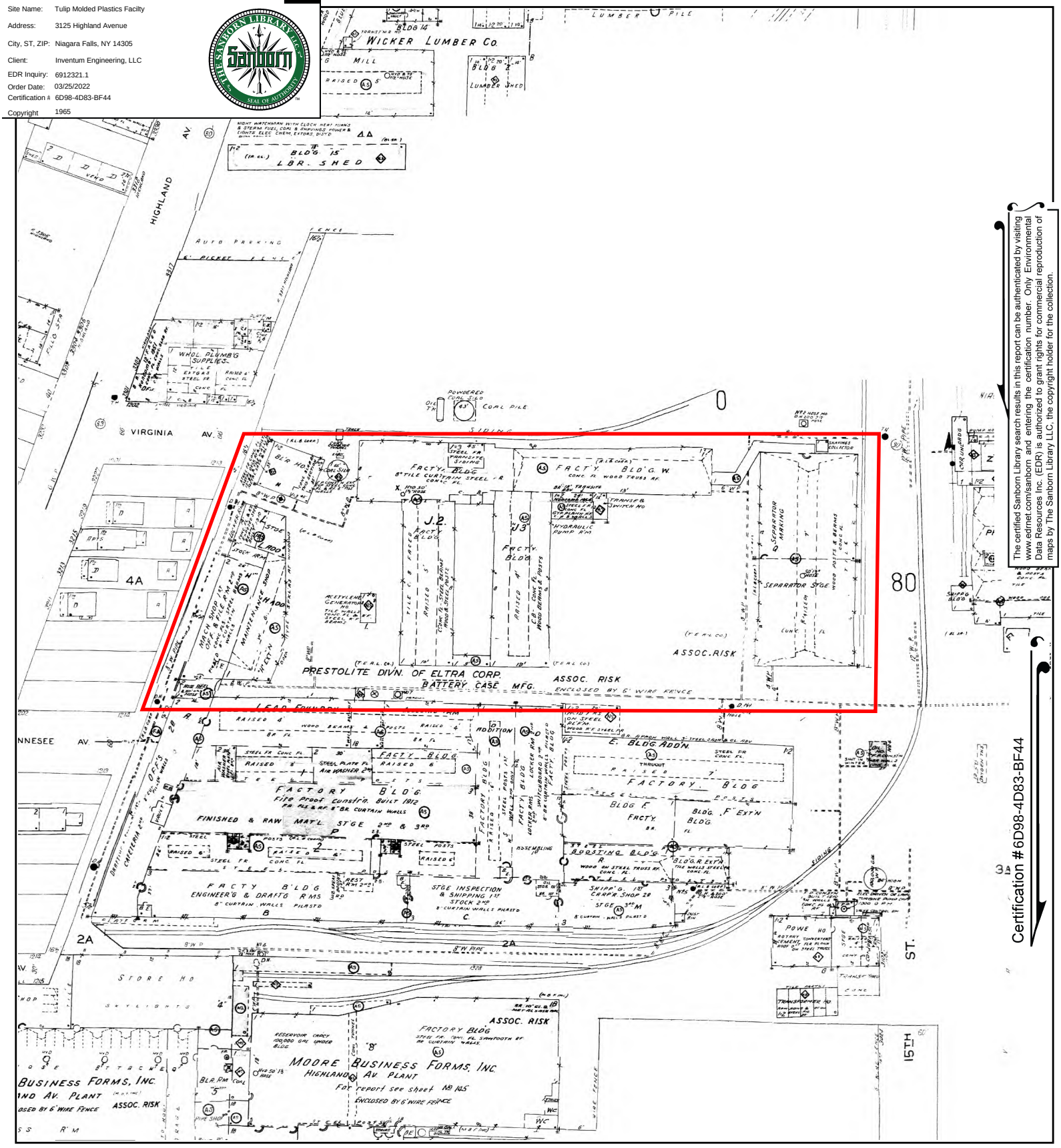
Certification #6D98-4D83-BF44

Certified Sanborn® Map

1965

Site Name: Tulip Molded Plastics Facilty
Address: 3125 Highland Avenue
City, ST, ZIP: Niagara Falls, NY 14305
Client: Inventum Engineering, LLC
EDR Inquiry: 6912321.1
Order Date: 03/25/2022
Certification #: 6D98-4D83-BF44
Copyright: 1965



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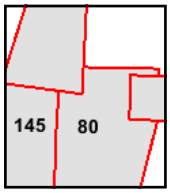

Volume 2, Sheet 145
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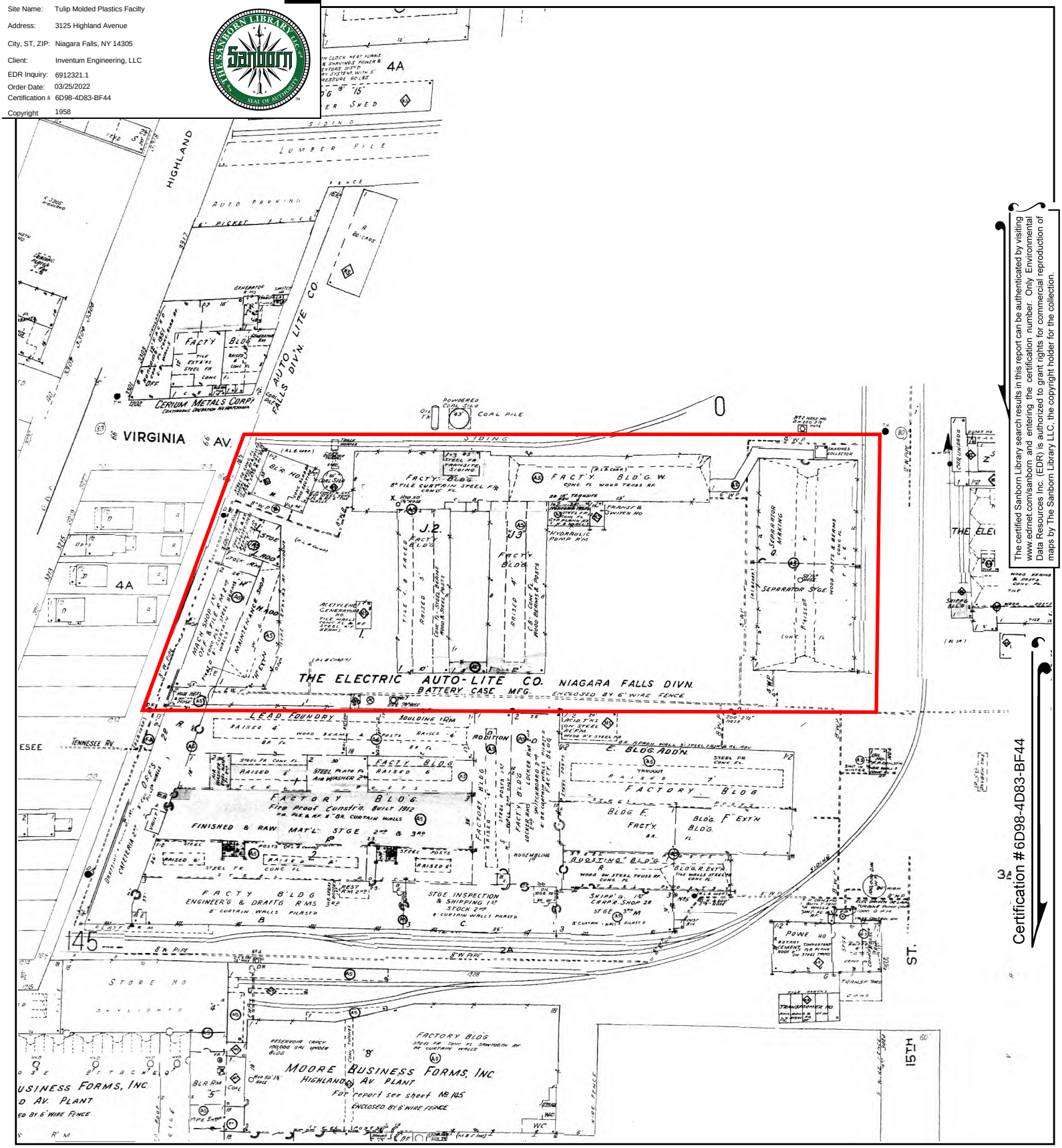
N

Certified Sanborn® Map

1958

Site Name: Tulip Molded Plastics Facilty
Address: 3125 Highland Avenue
City, ST, ZIP: Niagara Falls, NY 14305
Client: Inventum Engineering, LLC
EDR Inquiry: 6912321.1
Order Date: 03/25/2022
Certification #: 6D98-4D83-BF44
Copyright: 1958



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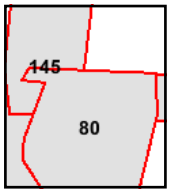

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0 Feet 150 300 600

N

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Certification #6D98-4D83-BF44

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1955

Site Name: Tulip Molded Plastics Facilty
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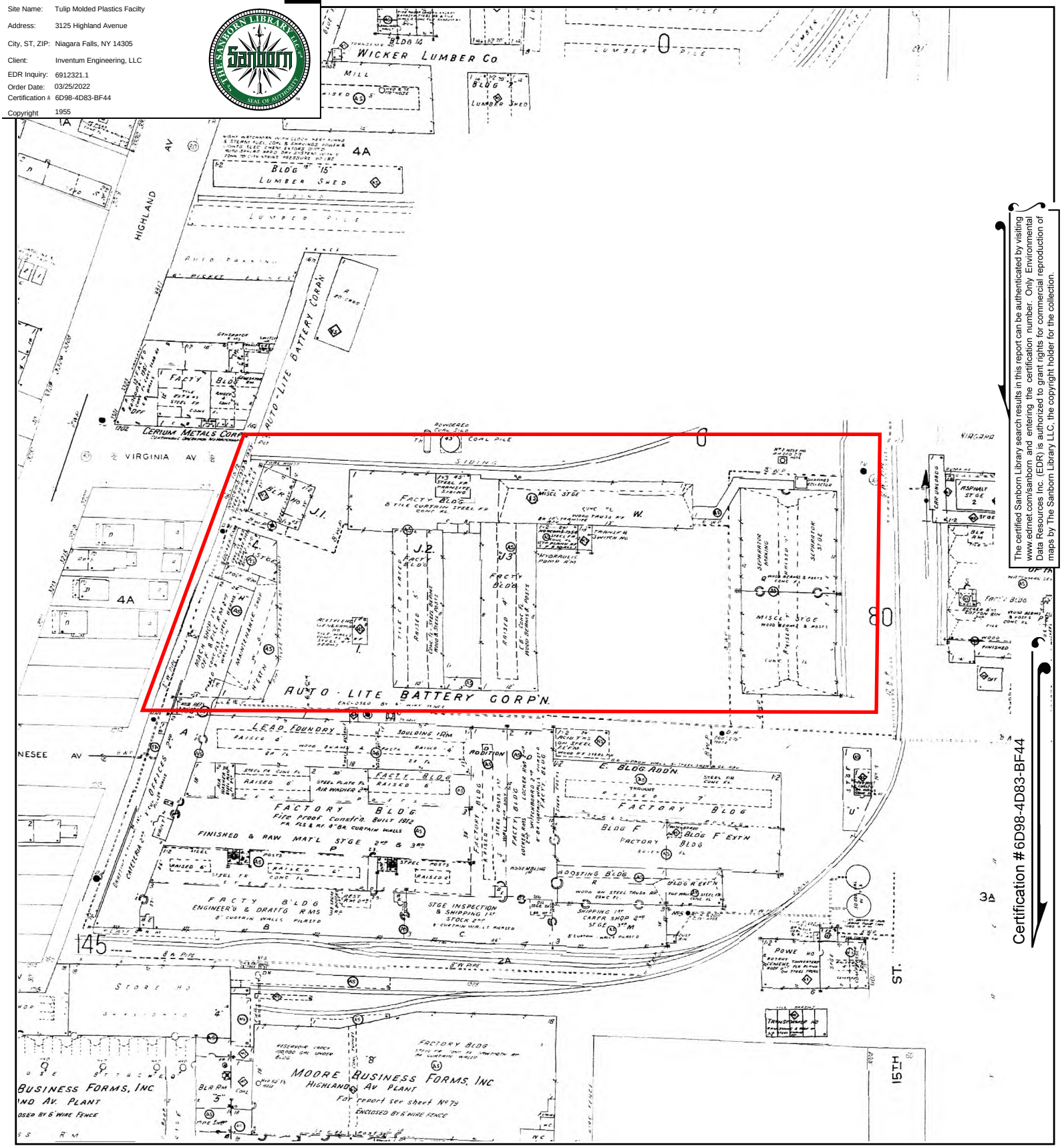
City, ST, ZIP: Niagara Falls, NY 14305
Client: Inventum Engineering, LLC
EDR Inquiry: 6912321.1
Order Date: 03/25/2022
Certification #: 6D98-4D83-BF44
Copyright 1955



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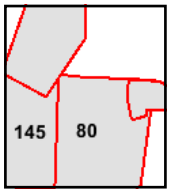

Volume 2, Sheet 145
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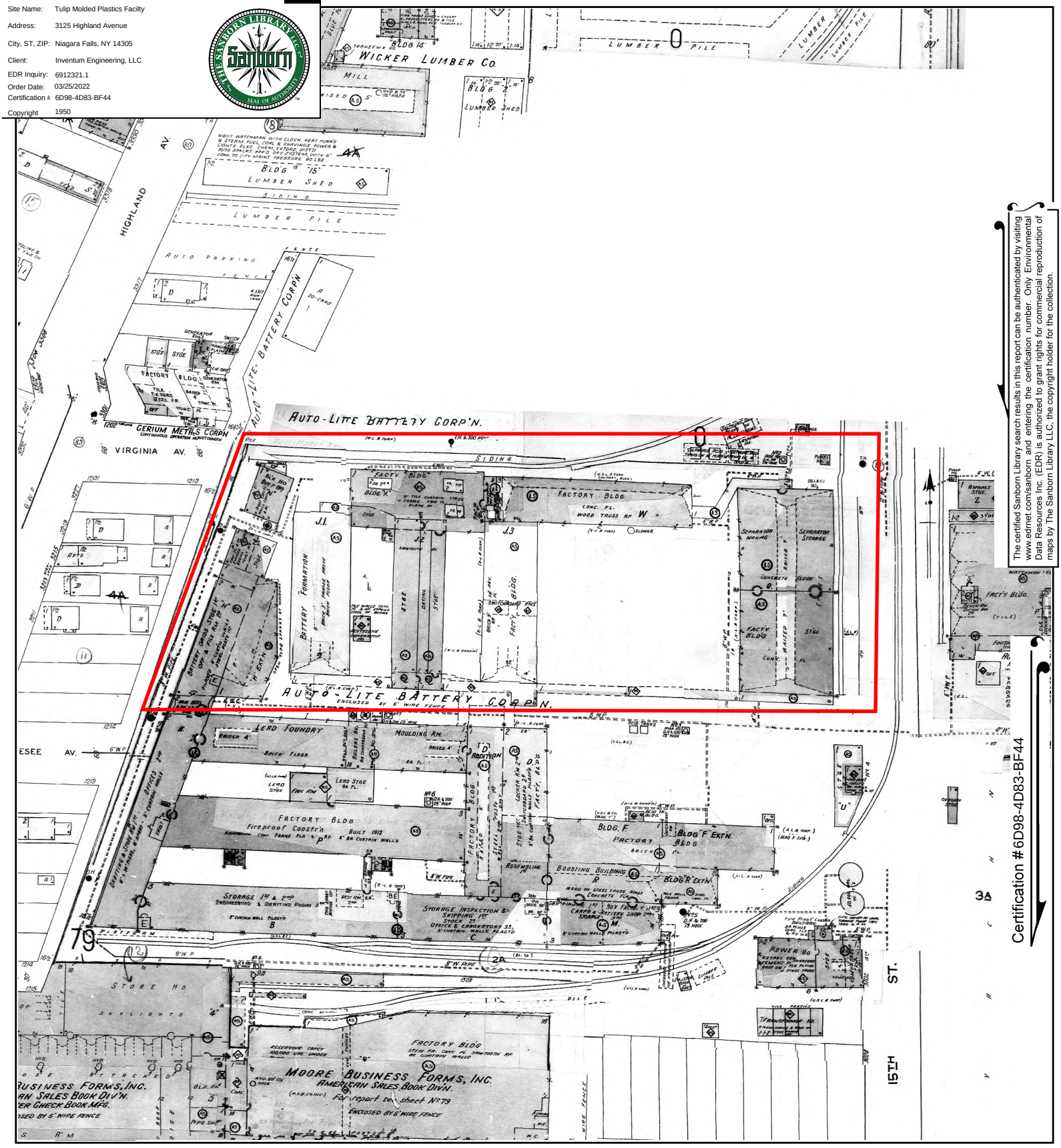
N

Certified Sanborn® Map

1950

Site Name:	Tulip Molded Plastics Facilty
Address:	3125 Highland Avenue
City, ST, ZIP:	Niagara Falls, NY 14305
Client:	Inventum Engineering, LLC
EDR Inquiry:	6912321.1
Order Date:	03/25/2022
Certification #	6D98-4D83-BF44
Copyright	1950



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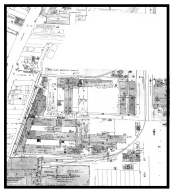

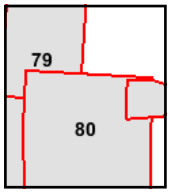

Volume 2, Sheet 80
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0 Feet 150 300 600

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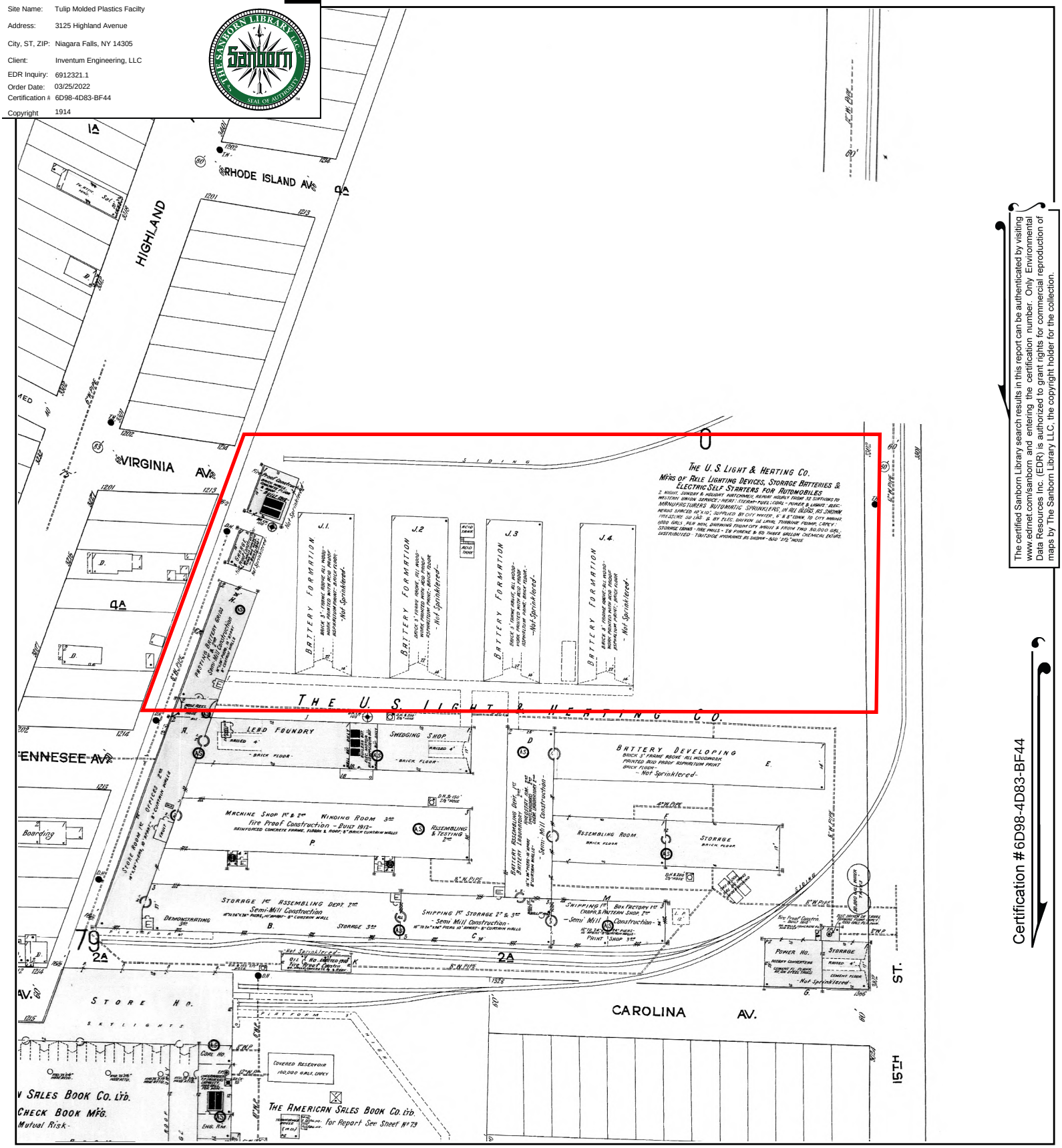
Certification #6D98-4D83-BF44

Certified Sanborn® Map

1914

Site Name: Tulip Molded Plastics Facilty
Address: 3125 Highland Avenue
City, ST, ZIP: Niagara Falls, NY 14305
Client: Inventum Engineering, LLC
EDR Inquiry: 6912321.1
Order Date: 03/25/2022
Certification #: 6D98-4D83-BF44
Copyright: 1914



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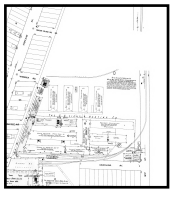

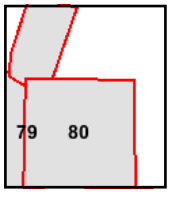

Volume 1, Sheet 80
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0 Feet 150 300 600

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Certification #6D98-4D83-BF44

Appendix C – AECOM Remediation Documentation Report (DRAFT)

AECOM
1555 North RiverCenter Drive
Milwaukee, WI 53212

414 944.6080 tel
414 944.6081 fax

November 20, 2013

Mr. James Carter
Tulip Corporation
14955 Salt Lake Avenue
City Of Industry, California 91746

Subject: Remediation Documentation Report
Tulip Corporation
3125 Highland Avenue
Niagara Falls, New York
AECOM Project 60271770

Dear Mr. Carter,

AECOM Technical Services, Inc. (AECOM) submits this report for the lead-impacted soil remediation activities that were conducted at the subject property (Site). The purpose of the remediation was to chemically stabilize the area of lead impact at the Site as identified in AECOM's October 10, 2011, *Phase II Environmental Site Assessment* (ESA) report. The soil stabilization area is located on the north side of the building, near the location of a historical coal pile storage area.

Background

On August 15-19, 2011, at the request of Tulip Corporation (Tulip Corp.), AECOM performed Phase II ESA activities at the Site for a potential property transfer. The ESA included advancing three soil probes (P-11A, P-11B, and P-11C) near the north side of the building, in the location of a former coal pile storage area. The probe locations around the former coal pile area and Site features are illustrated on **Figure 1**.

Shallow (1 to 3 feet deep) soil samples in the former coal pile area were collected for laboratory analysis of semi-volatile organic compounds (SVOCs) and Resource Conservation and Recovery Act (RCRA) metals. Several SVOCs were detected in the soil samples with concentrations above the New York State Department of Environmental Conservation (NYSDEC) Subpart 375-6, Remedial Program Soil Cleanup Objectives (SCOs; December 14, 2006) for the groundwater pathway, the ecological resources route, and/or the industrial public health pathway (direct contact). The RCRA metals analyzed were detected in one or more of the soil samples. Lead and arsenic concentrations exceeding the SCOs for the groundwater pathway, the ecological resources route, and/or the industrial public health pathway (direct contact) were documented in soil samples collected from borings P-11B and P-11C. Lead was reported at a concentration of 90,100 milligrams per kilogram (mg/kg) in the soil sample collected from P-11B. Lead was also reported at a concentration of 13,400 mg/kg in a soil sample collected from boring P-11C. The results of investigation were documented in AECOM's October 10, 2011, *Phase II Environmental Site Assessment* report.

In November 2011, AECOM completed a supplemental assessment (SA) in the location of the former coal pile area to further characterize the nature and extent of specific impacts identified during the Phase II ESA. The SA was focused on lead, arsenic, and SVOCs at concentrations that were above the NYSDEC SCOs in soil in the former coal pile storage area.

Lead, arsenic, and SVOC concentrations exceeded the applicable SCOs in one or more samples from each of the borings sampled as part of the SA. The highest lead and arsenic impacts are located outside the north side of the building, east of the plastic bead storage silo. The highest SVOC impacts are located north and east of the former coal pile area. Exceedances are typically limited to the shallower samples collected from the fill material and from near the fill-clay interface. The results of the SA were documented in AECOM's April 4, 2012, *Supplemental Assessment* report.

On June 20, 2012, AECOM provided Tulip with a proposal for remediation services at the Site. The proposal included options to treat the lead, arsenic, and SVOC impacts in soil near the historical coal pile storage area on the north side of the building, within a defined area. On June 27, 2012 Tulip Corp. retained AECOM to implement treatment of the lead and arsenic contaminants by in situ chemical stabilization to render the soil non-hazardous by leachability characteristics and to then cover the area with an engineered cap/barrier to provide a physical barrier to mitigate the future potential for direct human contact with the impacted soil.

AECOM implemented the remedial action (in situ soil stabilization and engineered cap/barrier) at the Site in October 2012. The remainder of this report documents the implementation of the soil stabilization activities and presents the results of the post remedial soil analytical results.

Soil Treatment Overview

A phased approach was utilized to remediate the lead impacted soil at the Site. The phases were as follows:

- Bench scale testing;
- Initial soil stabilization treatment with calcium oxide and soil confirmation sampling;
- A second spot/"polishing" soil treatment with a phosphate mixture and soil confirmation sampling;
- Removal and proper disposal of excess soils and area debris resulting from the soil mixing remedial action; and
- Installation of the cap/barrier.

The soil mixing process utilized involved using a blender mounted on an excavator to distribute chemical amendments throughout the target soil area to treat contaminants of concern. The blending process loosens and reduces the bearing capacity of the soils. As such, the treatment area excluded a zone of approximately 8 feet along the storage silo or other structures/utilities to protect the structural stability of the building/structure/utilities. The estimated lateral and vertical extents of soil impacts were based on the results of AECOM's August and November 2011 ESA activities. The treatment area is illustrated on **Figure 1**. The impacted soil within the remediation area was blended to depths of 2, 5, and 8 feet below ground surface (bgs) as illustrated on **Figure 2**.

Bench Scale Testing

On July 18, 2012, AECOM collected pre-remediation samples from the target soil treatment area for bench scale testing to evaluate the efficacy of amendment chemicals and evaluate dosing to stabilize the

leachable lead in the soil. The bench scale testing results indicated that the arsenic concentrations in soil in the planned remediation area are non-hazardous by leachability characteristics, thus do not have to be chemically stabilized. Note that the soil mixing remedial option chosen for the Site does not directly address the SVOC impacts in soil; however, some reduction of SVOCs will occur during the soil-mixing process through volatilization. AECOM retained Redox Tech, LLC (Redox-Tech) located in Downers Grove, Illinois to do the bench scale testing and their results concluded that a mix design of 7% calcium oxide by weight stabilized the lead in the soil in the remediation area to below the United States Environmental Protection Agency (US EPA) toxicity characteristic leaching procedure (TCLP) hazardous level of 5 milligrams per liter (mg/L). Mixing lead-affected soil with calcium oxide precipitates lead to a relatively non-leachable form of lead hydroxide. Redox-Tech's bench scale testing results showed a reduction in leachable lead from between 99.7 to 99.9% (based on the highest pre-remediation TCLP result of 930 mg/L).

Soil Mixing with Calcium Oxide

The initial soil mixing for stabilization of the lead-affected soil at the Site with calcium oxide was completed between October 8 and 23, 2012. A total of 153 tons of calcium oxide was blended into approximately 2,300 tons of lead impacted soil. The remediation area (approximately 80 feet by 80 feet) was divided into 41 cells as illustrated on **Figure 3**. AECOM collected a total of 13 post-remediation TCLP lead samples (C-10, C-11, and C-20 on October 15, 2012 and C-12, C-13, C-18, C-21, C-25, C-26, C-33, C-35, C-38, and C-41 on October 23, 2012) after the soil mixing to evaluate the effectiveness of the field scale soil stabilization. The post remediation TCLP results ranged from 22.6 to 0.01 mg/L, which is a significant reduction in leachable lead (99.4%). However, to be below the US EPA TCLP hazardous criteria of 5 mg/L, the reduction in leachable lead needed to be greater than 99.5% in aggregate (based on the highest pre-remediation TCLP result of 930 mg/L). As a result, soil samples collected from 4 of the 13 treatment cells tested (C-10, C-11, C-20, and C-35), had post remediation TCLP lead results above the US EPA hazardous TCLP level of 5 mg/L, which represents only an estimated less than 20% of the treatment area. Soil lead TCLP results are summarized on **Table 1** and the cell locations of the post-remediation TCLP samples are illustrated on **Figure 3**. The soil confirmation laboratory analytical reports are provided as **Attachment A**.

Additional Soil Mixing/Polishing with Phosphate

On November 19, 2012, AECOM collected eight additional lead TCLP samples to evaluate supplementary amendments to reach the leachable lead target concentration of less than 5 mg/L. Redox-Tech's evaluation concluded that a mixture of tricalcium phosphate, trisodium phosphate, and dicalcium phosphate could be utilized to further lower the residual leachable lead, with their results indicating that he mixed soil would be to below the 5 mg/L level. The additional mixing of lead-affected soil with the phosphate mixture precipitates lead to a relatively non-leachable form of lead phosphate.

Based on the project objective of getting leachable lead within the remediation area to below 5 mg/L, AECOM recommended remixing approximately 11,150 pounds of the phosphate mixture into nine treatment cells (C-6, C-7, and C-8 to 2 feet deep; C-9, C-34, and C-35 to 5 feet deep; and C-10, C-11, and C-20 to 8 feet deep) within the remediation area (approximately 230 to 250 cubic yards).

The remixing was completed from December 13 through 18, 2012. AECOM collected three post-polishing TCLP lead samples from cells 34, 10, and 8. AECOM selected these three cells, which had the highest post calcium oxide mixing lead TCLP concentrations, to evaluate the efficacy of the phosphate re-treatment. Post phosphate treatment lead TCLP samples were collected on December 15, 2012. The TCLP lead results from cells C-10 and C-34 were below 5.0 mg/L and the lead TCLP result from cell C-8 was above 5.0 mg/L. Redox-Tech stated that phosphate mixture may take a little longer to dissolve completely and help bind to the lead. The phosphate mixture was allowed to chemically react for an

additional week and another lead TCLP sample was collected from cell C-8 on December 21, 2012. The December 21, 2012 lead TCLP result was below 5.0 mg/L.

Soil Analytical Results

Fifteen post-treatment lead TCLP laboratory results, representing cells 8, 10, 12, 13, 18, 19, 21, 24, 25, 26, 33, 34, 36, 38, and 41, document that the chemically-stabilized lead impacted soil in the remediation area is below the US EPA TCLP hazardous criteria. Soil lead TCLP results are summarized on **Table 1** and the locations of the post-remediation TCLP samples are illustrated on **Figure 3**. The soil confirmation laboratory analytical reports are provided as **Attachment A**.

In addition, two composite waste samples, WC-3 and WC-4, were collected for landfill waste characterization. On December 17, 2012, AECOM collected waste composite samples from 10 locations (each composite sample comprised of 5 samples). The composite waste sample locations were spatially located to be representative of the soils to be removed from the Site as a result of the soil blending remediation process (WC-3 representing the south half of the remediation area and WC-4 representing the north half of the remediation area). The waste composite samples document that:

- Lead TCLP analytical results were below the applicable US EPA TCLP hazardous level of 5.0 mg/L (WC-3, 3.8 mg/L and WC-4, 1.7 mg/L);
- Arsenic TCLP analytical results are below the applicable US EPA TCLP hazardous criteria of 5 mg/L (WC-3, 0.0097 mg/L and WC-4, <0.0056 mg/L); and
- VOC TCLP analytical results were below the laboratory method detection limits.

The locations of the waste composite samples are illustrated on **Figure 4** and the waste characterization laboratory analytical report is provided as **Attachment B**.

Excess Soil Removal

On June 13 and 14, 2013, Op-Tech Environmental Services Inc. (Op-Tech; Buffalo, New York) removed approximately 624 tons of chemically stabilized lead impacted soils. The soils were taken to Waste Management, Inc.'s (Waste Management) recycling and disposal facility located in Chaffee, New York. The soil for disposal was a result of the blending process, *i.e.* the addition of chemical stabilizers added to the soil which created additional soil volume. The lead-impacted soil taken off-Site was chemically stabilized with a mixture of calcium oxide and a phosphate mixture to reduce the lead concentration to below the US EPA TCLP hazardous level for lead of 5.0 mg/L.

As previously mentioned above, composite waste samples WC-3 and WC-4 were obtained from 10 locations subsequent to soil blending with calcium oxide. The composite waste sample locations were spatially located to be representative of the soils to be removed from the remediation area as a result of the soil blending remediation process (WC-3 representing the south half of the remediation area and WC-4 representing the north half of the remediation area).

The waste profile sample analytical consisted of TCLP metals, TCLP volatile organic compounds (VOCs), TCLP SVOCs, gasoline range organics, diesel range organics, polychlorinated biphenyls, pH, and flashpoint. The composite waste characterization laboratory analytical results document that the soil taken off-Site is not characteristically hazardous. The signed waste characterization profile form and landfill soil disposal inventory list is provided as **Attachment C** (the waste composite laboratory report is included in **Attachment B**).

Site Health & Safety

Plan

A Site-specific Health and Safety Plan (in accordance with the Occupational Safety and Health Administration [OSHA] 29 CFR 1910) was prepared for the soil blending remediation activities. AECOM reviewed the Site Health and Safety Plan with all field personnel prior to commencing the field activities. A qualified AECOM employee was present during all remediation fieldwork. A copy of AECOM's Site-specific Health and Safety Plan was presented to each subcontractor providing construction services prior to commencing work.

Dig Safely New York, Inc. was contacted at least three days prior to commencing field activities to locate public utilities. In addition, a private utility locator (The Underground Detective, Cincinnati, Ohio) was utilized to locate on-Site private utilities within and around the soil remediation area. Other than encountering two unknown historical sewer utilities while completing the soil blending (see Underground Utility Management below), no health and safety incidents occurred.

Community Air Monitoring

AECOM completed air dust monitoring, as required by the New York Community Air Monitoring Program (CAMP) during the soil mixing and excess soil excavation activities. Three dust monitoring stations (one, monitor #65, located at the up-wind property boundary to the northwest of the work area, nearest to Highland Avenue) and two at the down-wind property boundary (monitor #13, located along the northeast property boundary, and monitor #47, located along the southeast of the work area). The air monitoring locations are illustrated on **Figure 1**. The air monitoring was established prior to initiating soil mixing and excess soil removal activities.

AECOM utilized three tripod mounted Dusttrak II 8530 aerosol monitors to continuously monitor dust conditions during soil mixing activities. Each dust monitor was mounted on a tripod stand with the monitor situated approximately 5 feet above the ground surface. The purpose of the air monitoring is to measure construction generated dust so AECOM could implement measures, if necessary, to limit dust from leaving the Site. The air monitor readings are a time weighted 15 minute average. If particulate levels at the down-wind property boundary were more than the dust risk action level (after subtracting the up-wind/ambient levels), dust suppression measures (spraying the work area with water and/or waiting until winds reduce) were implemented.

AECOM developed a Site-specific dust risk action level that ensures adherence to both the CAMP fence line total dust level of 150 micrograms per cubic meter ($\mu g/m^3$) and the US EPA ambient air quality standard for lead (adjusted for the duration of the soil mixing work [16 days]). The calculated dust action level for lead is 233 $\mu g/m^3$. Note that the calculated lead action level is a conservative value that assumes all of the dust particles measured at the downgradient property boundary has a lead concentration with the highest measured on-Site concentration (90,100 mg/kg). AECOM measured five excursions of the CAMP air monitoring action level of 150 $\mu g/m^3$ (one each on October 15, 16 17, 21, and 22, 2012). There was only one reading (October 15, 2012, 334 $\mu g/m^3$) that exceeded the calculated lead dust action level of 233 $\mu g/m^3$. Each of the dust monitoring excursions occurred during times when initial cell blending occurred (when bags of calcium oxide were being opened and dispensed). Corrective action after each excursion of the dust action level consisted of both ceasing the physical soil blending and adding water to the mix area before continuing. The Dusttrak II monitoring data is provided as **Attachment D**.

Dust monitoring was also completed during the June 13 and 14, 2013 excess soil removal activities. AECOM utilized two tripod mounted Dusttrak II 8530 aerosol monitors to continuously monitor dust conditions during the excess soil excavation activities (one, monitor #65, located at the up-wind property

boundary and the other, monitor #47, located along the southeast of the work area). Each dust monitor was mounted on a tripod stand with the monitor situated approximately 5 feet above the ground surface. AECOM completed hourly visual checks at the downgradient (#47) monitoring station. There were no excursions dust action levels. Note that the consistency of the post remediated soil was soft and wet and there were intermittent light showers during the June 13, 2013 soil removal activities.

Personal Air Monitoring

AECOM followed the OSHA lead standard for construction sites (1926.62) and was compliant with OSHA 1926.62, biological monitoring (1926.62(j)(2). AECOM field personnel wore a personal air monitoring pump with filter media that was analyzed in a laboratory to monitor potential lead exposure of which the results were compared to the applicable Permissible Exposure Limit, 8-hour average, of 50 $\mu g/m^3$ (1926.62(c)(1). AECOM also informed each subcontractor providing construction services of the OSHA lead standard for construction sites prior to commencing work.

AECOM completed personal monitoring on October 9 and 10, 2012 (during the first two days of soil mixing) in an effort to measure the risk of potential lead exposure. AECOM field personnel wore a BDX II constant flow air sampler (2 liter per minute flow rate). A new filter cassette was placed into the air sampler and the sampler pump was started at the beginning of the work day. The filter cassette with the amount of time worn recorded on the chain-of-custody form was sent to Schneider Laboratories Global (Richmond, Virginia) via overnight delivery. The personal air monitoring laboratory results were reported at below the laboratory method detection limits for both October 9 and 10, 2012. The personal air monitoring laboratory analytical reports are provided as **Attachment E**.

Underground Utility Management

On October 8, 2012, AECOM disconnected the catch basin located on the north end of the remediation area because the stormwater conveyance pipe passed through the planned remediation area. The catch basin was plugged and grouted at the catch basin end. The catch basin pipe was cut and plugged approximately 20 feet to the south, where the pipe entered the remediation area. The catch basin was re-routed around the eastern edge of the remediation area and reconnected on January 29, 2013. The sewer pipe was re-routed around the remediation area because the remediated soil was still too soft from the soil blending process.

On October 11, 2012, AECOM encountered a previously undisclosed or/and unknown stormwater sewer utility located in cell 10 (**Figure 5**). The utility consisted of a 10-inch diameter clay tile pipe (4 feet deep) running parallel to, and 8 feet out from, the building. The pipe was traced to the west within the remediation area and was found to elbow (90 degrees) towards the building, 3 feet west of the sewer manhole. The pipe was in deteriorated condition. Water appeared to be flowing out of the pipe; however, it was unclear if it was an active or abandoned utility. AECOM discussed the sewer pipe with the plant manager, Mr. John Signore. Mr. Signore was not aware of the pipe but requested that it be reconnected after the soil mixing and testing was completed. On February 4, 2013, the pipe was reconnected to the existing sewer that runs parallel to the building (5 feet out from the building).

On October 13, 2012, AECOM encountered a second 10-inch diameter clay tile pipe (running perpendicular from the building and in line with the manhole located 5 feet from the building) in the remediation area. The perpendicular pipe was traced to the north and was broken and discontinuous and appeared to be a formerly abandoned utility. Water was not observed in the pipe. Mr. Signore was notified of the perpendicular pipe. Mr. Signore was not aware of the perpendicular pipe's existence. Based on no water appearing in the pipe and its broken and discontinuous condition, Mr. Signore did not request that the pipe be reconnected. The sewer utility locations are illustrated on **Figure 5**.

Engineered Cap/Barrier Installation

The purpose of the geomembrane and pavement surfaces covering the remediated soils will serve two functions 1) as a surface barrier to mitigate direct contact with the remediated soils and 2) mitigate surface water infiltration through the remediated soils. On July 29, 2013 through August 1, 2013 AECOM provided oversight over the installation of an engineered cap/barrier (geomembrane) over the southern two-thirds of the remediation area by Op-Tech. A geomembrane was selected as a cover for the southern portion of the remediated area due to the soft consistency of the blended remediated soils. The geomembrane was constructed by laying down a geotextile fabric (Marafi 1100N) directly over the remediated soils. A geomembrane (Rufco 4000B) was placed directly over the geotextile fabric. The geomembrane was covered with a 6-inch layer of sand for protection. The final surface was covered with 4 inches of No. 2 crusher stone (gravel). The geomembrane surface was constructed so that it is slightly crowned near the center (approximately 15 inches higher than the surrounding grade).

The northern one-third portion of the remediation area was finished with a combination of asphalt (northeastern) and concrete (northwestern) pavement by Tulip Corp. to facilitate the use of the area for semi-trucks accessing the storage silo to the west of the remediation area. On July 29, 2013, AECOM provided oversight over the removal of approximately 90 tons of chemically stabilized lead impacted soils down to 2 feet bgs due to the soft consistency of the blended soils beneath the paved area. The excavated soil was taken to the Waste Management recycling and disposal facility in Chaffee, New York. A heavy geotextile fabric (Marafi 1100N) was applied over the treated soil, which was then backfilled with No. 1 crusher stone to approximately 6 inches below the surrounding grade. The backfill was statically compacted (rolling without vibration). Based on field observations of soft soil beneath the western half of the paved area, Op-Tech put down two layers of Tensar (TX 140) Geoweb material at 9 and 5 inches below the top of the No. 1 crusher stone. Tulip Corp. selected to resurface the western half of the paved area with concrete, which would be a more resilient material over the soft remediated soils in this area. Mr. John Signore notified AECOM on September 27, 2013 that the asphalt and concrete pavement work was completed.. AECOM performed the final cap/barrier review at the Site on October 8, 2013. The geomembrane cap/barrier and pavement locations are illustrated on **Figure 6**. A photographic log depicting various portions of the remediation process, including pictures of the geomembrane and pavement cap/barrier, is provided as **Attachment F**. The landfill waste disposal documentation for the removal of the soft soils under the paved area is provided as **Attachment G**.

Construction Debris Disposal

Construction debris consisting of buried railroad ties, concrete, and asphalt from the northern and western portions of the remediation area were piled and and covered with plastic sheeting while performing the soil remediation activities. On August 5, 2013, approximately 52 tons of construction debris was removed from the Site by Op-Tech. The construction debris was taken to Waste Management's landfill located in Chaffee, New York. Copies of the construction debris waste characterization profile form, waste sampling laboratory analytical report, and landfill waste disposal documentation is provided as **Attachment H**.

Conclusions

AECOM concludes the following, based on the soil remediation activities conducted at the Site from July 2012 to September 2013:

- In August 15-19, 2011, elevated concentrations of lead above the NYDEC SCO were found in shallow (1 to 3 feet bgs) soil samples collected on the north side of the Tulip Corp. building near the location of a historical coal pile storage area (east of the plastic bead storage silo).
- Bench scale testing was performed by Redox-Tech in order to find the appropriate amendment to treat the approximate 2,300 tons of lead impacted soil in the former coal pile area. The bench scale testing was performed on soil samples collected from the areas that had the highest total lead concentrations as a conservative measure to ensure that the lead-impacted soil within the treatment area would be stabilized to less than the US EPA TCLP hazardous criteria of 5 mg/L. Redox-Tech reported a TCLP result of 930 mg/L for a soil sample collected near P-11B during laboratory bench scale testing, exceeding the US EPA TCLP hazardous criteria of 5 mg/L;
- On October 8 through 23, 2012, a total of approximately 2,300 tons of lead impacted soil in the former coal pile area was chemically treated by Redox-Tech via in situ blending with 153 tons of calcium oxide;
- On December 13 through 18, 2012, 11,150 pounds of phosphate mixture was blended into approximately 390 to 425 tons of soil in nine treatment cells located near the northwest and southeast corners of the remediation area. The additional phosphate treatment was based on soil confirmation sampling results that documented post-calcium oxide treated soil lead TCLP results above 5 mg/L in these areas;
- Fifteen post-treatment lead TCLP laboratory results document that the chemically stabilized lead impacted soil in the remediation area is below the US EPA TCLP hazardous criteria. In addition, two composite waste samples, WC-3 and WC-4, were collected for landfill waste characterization. The waste composite samples document that lead and arsenic TCLP results were below the applicable US EPA TCLP hazardous criteria. The laboratory analytical results of waste composite samples also document that TCLP SVOC concentrations are below the laboratory method detection limits. Thus, the in situ soil blending at the Site have appeared to adequately stabilized the lead, arsenic, and SVOC impacts within the remediation area;
- On January 29 through February 4, 2013, the storm water catch basin (located to the north of the remediation area) and an unknown sewer (running parallel to, and 8 north of, the building) were reconnected to the existing sewer utility running parallel to the building;
- On June 13 and 14, 2013, Op-Tech removed approximately 624 tons of non-hazardous chemically stabilized lead impacted soils from the Site. The soils were taken to Waste Management's recycling and disposal facility located in Chaffee, New York. The soil for disposal was a result of the blending process, *i.e.* the addition of chemical stabilizers added to the soil and from the un-compaction (fluffing) of the blended soils;
- On July 29, 2013, AECOM provided oversight over the removal of an additional approximate 90 tons of chemically stabilized lead impacted soils beneath the paved portion of the remediation area due to the soft consistency of the blended soils;
- On July 30, 2013 through August 1, 2013, Op-Tech installed an engineered cap/barrier (geomembrane) over the southern one-third of the remediation area and in September 2013, the northern one-third portion of the remediation area was resurfaced with a combination of asphalt and concrete pavement by Tulip Corp. The purpose of the geomembrane and pavement surfaces

is to 1) provide a surface barrier to prevent direct contact with the remediated soils and 2) prevent surface water infiltration through the remediated soils;

- On August 5, 2013, approximately 52 tons of construction debris consisting of buried railroad ties, concrete, and asphalt from the northern and western portions of the remediation area was removed from the Site by Op-Tech. The construction debris was taken to Waste Management's landfill located in Chaffee, New York; and
- AECOM performed a final cap/barrier review at the Site on October 8, 2013, documenting that the direct contact pathway is incomplete and that the cap/barrier will inhibit surface water infiltration through the remediated soils.

Closing

Please contact either of the undersigned with any questions or comments.

Sincerely yours,

AECOM, Inc.

Richard Mazurkiewicz
Senior Hydrogeologist
414.944.6174
richard.mazurkiewicz@aecom.com

Kevin L. Brehm
Principal/Office Manager
414.944.6145
kevin.brehm@aecom.com

Attachments:

Table 1 – Soil Lead TCLP Results

Figure 1 – Site Layout and Remediation Area
Figure 2 – Lead Remediation Area Depths
Figure 3 – Lead Remediation Area - Soil Blending Cells
Figure 4 – Waste Disposal Sample Locations
Figure 5 – Sewer Maintenance Map
Figure 6 – Cap/Barrier Location Map

Attachment A – TCLP Soil Confirmation Sampling Laboratory Analytical Reports
Attachment B – Excess Soil Waste Profile Form and Laboratory Analytical Reports
Attachment C – Landfill Soil Inventory List
Attachment D – Air Monitoring Data
Attachment E – Personal Air Monitoring Laboratory Analytical Reports
Attachment F – Photographic Log of Remediation Activities
Attachment G – Landfill Waste Disposal Documentation - Soft Soils Beneath Paved Portion of Remediation Area
Attachment H – Construction Debris Waste Profile Form, Waste Characterization Laboratory Analytical Report, and Landfill Waste Disposal

Figures

SITE LOCATION MAP
Tulip Corporation Property
3125 Highland Avenue
Niagara Falls, New York 14305

AECOM Project: 60220285.1

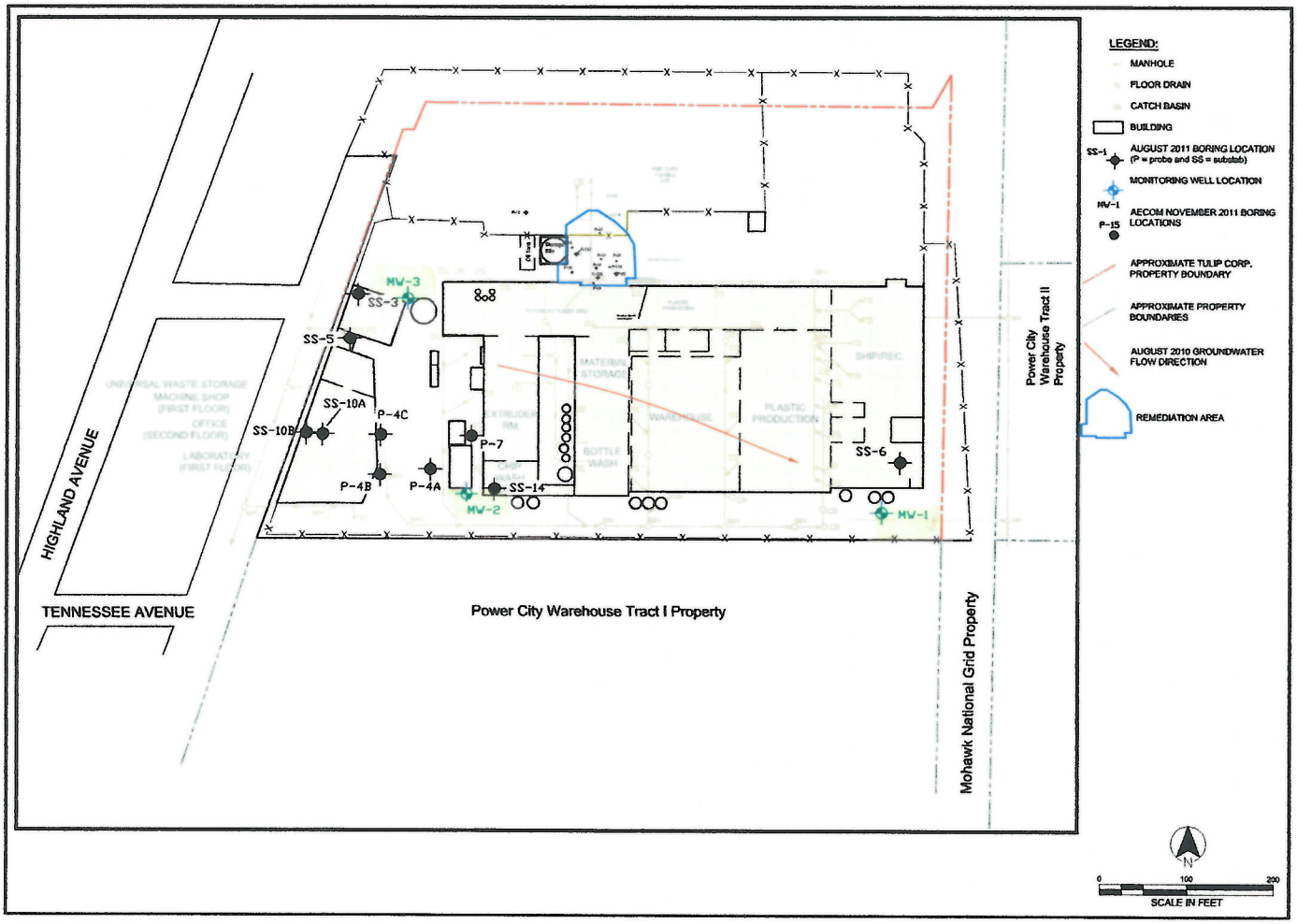
Date: 08/22/11

0 0.25 0.5 0.75 1 Miles

Source: NGS USA Topographic Maps
Copyright: © 2009 National Geographic Society

AECOM Environment
11425 W Lake Park Dr, Suite 100
Milwaukee, WI 53224
T 414.359.3030
F 414.359.0822
www.aecom.com

FIGURE 1

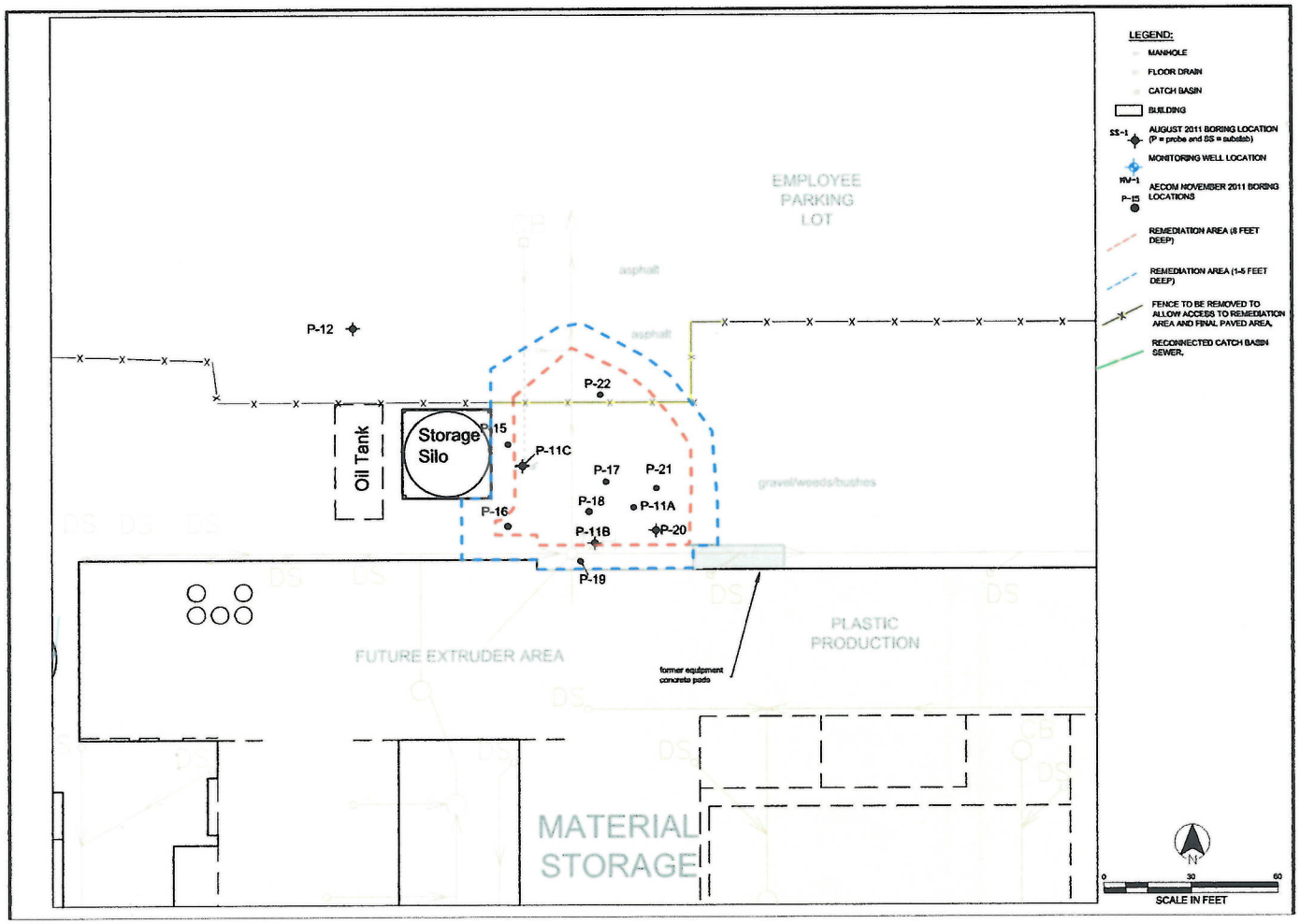


AECOM Environment
Milwaukee, Wisconsin 53212
T 414.944.6000 F 414.944.6081
www.aecom.com

Site Layout Map
Tulip Corporation
3125 Highland Avenue
Niagara Falls, New York

SCALE: AS NOTED
DATE: 03/15/2012
AECOM PROJECT: 60277770

Figure
2



NO.	DESCRIPTION	DATE	BY

DRAWN BY: MPP
CHECKED BY: TS
APPROVED BY: KB

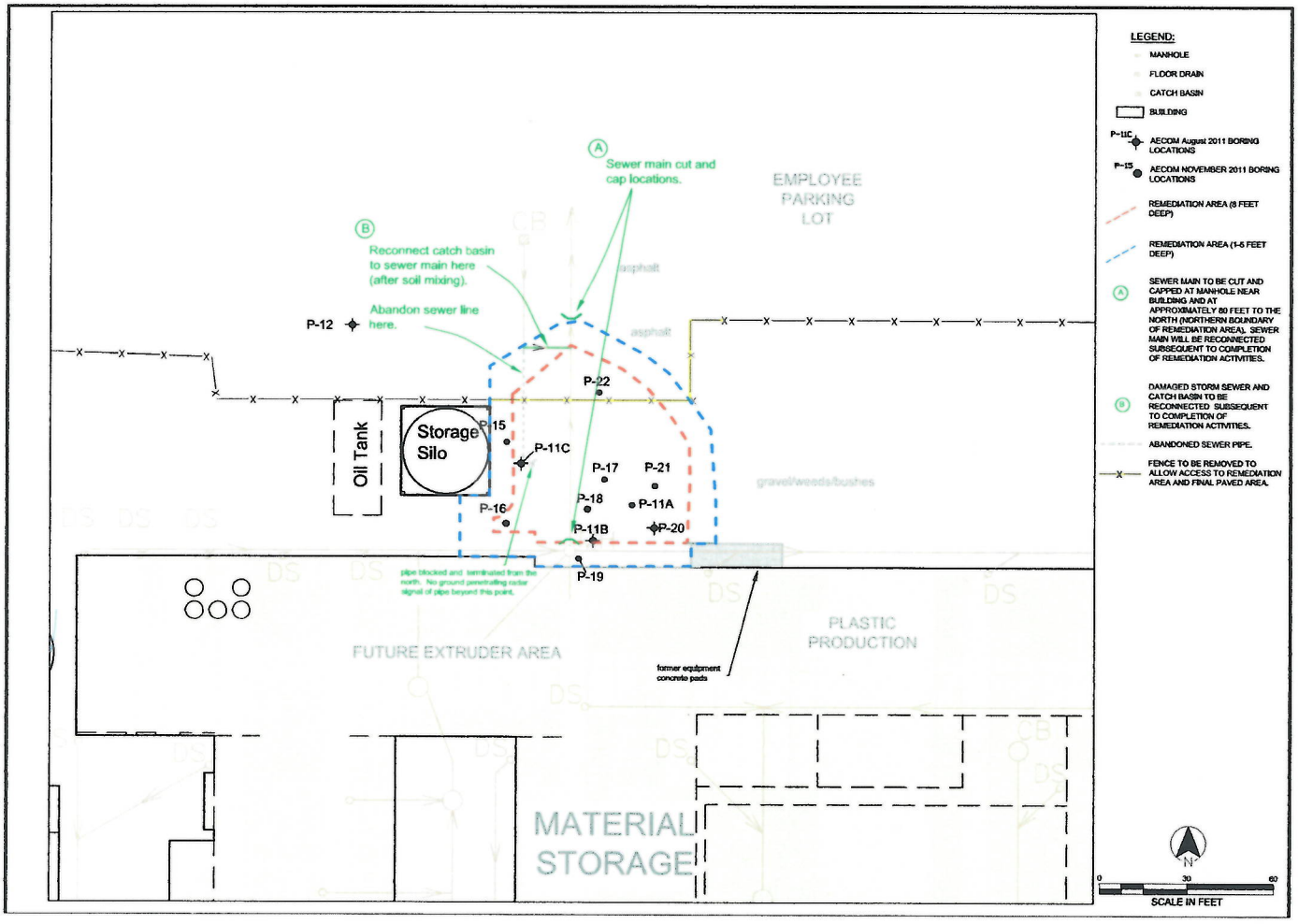
AECOM

AECOM Environment
1365 N Rivercenter Dr., Ste 214
Milwaukee, WI 53212
T 414.944.6000 F 414.944.6081
www.aecom.com

Remediation Area Map
Tulip Corporation
3125 Highland Avenue
Niagara Falls, New York

SCALE:	DATE:	AECOM PROJECT:
AS NOTED	08/01/2012	60271770

Figure
3



NO.	DESCRIPTION	DATE	BY

DRAWN BY: mm
CHECKED BY: ts
APPROVED BY: cb

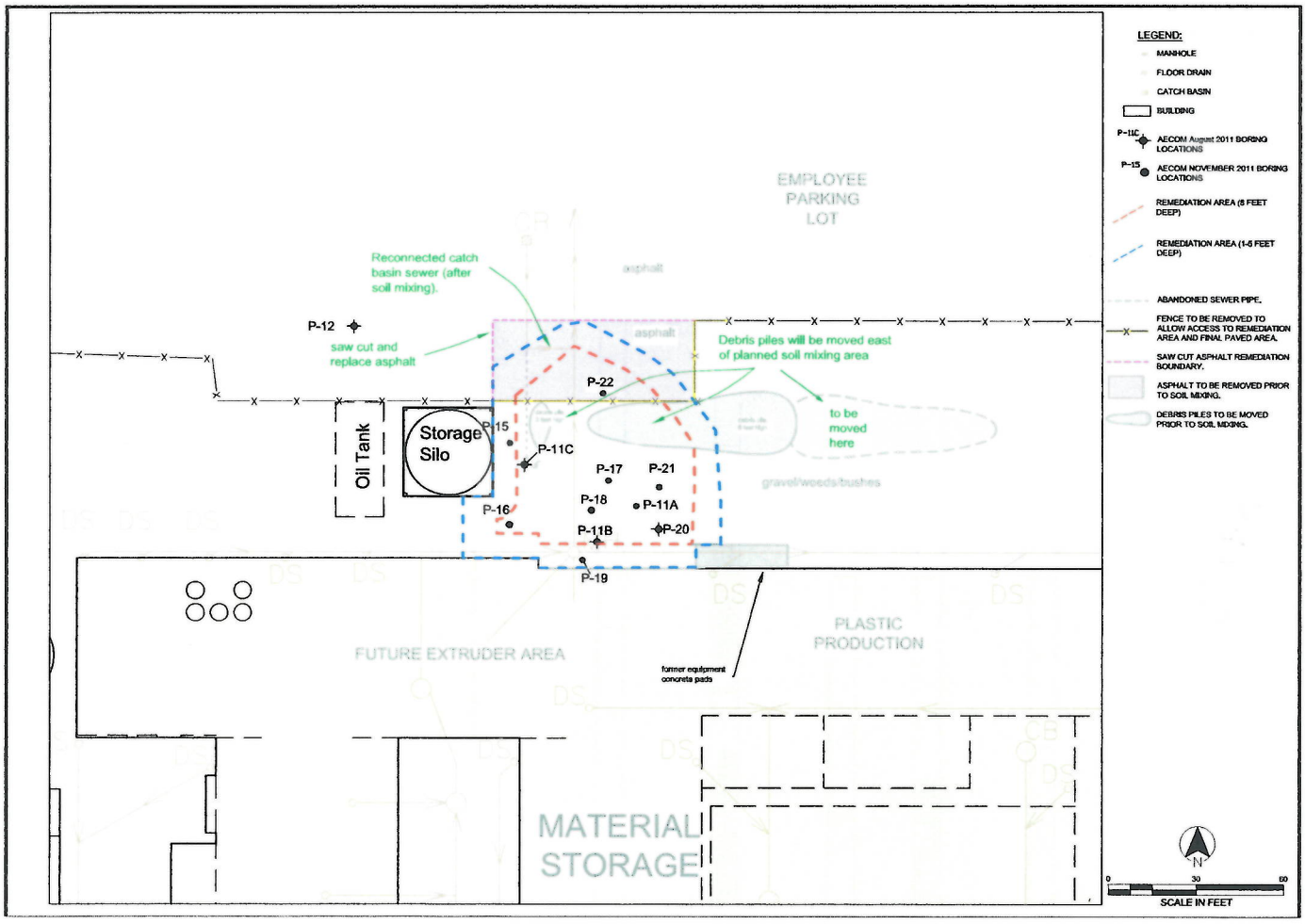
AECOM

AECOM Environment
155 Fleet Street, Suite 214
Milwaukee, Wisconsin 53212
T 414.944.6080 F 414.944.6081
www.aecom.com

Sewer Preservation and Repair Map
Tulip Corporation
3125 Highland Avenue
Niagara Falls, New York

SCALE:	DATE:	AECOM PROJECT:
AS NOTED	09/19/2012	60271770

Figure
4



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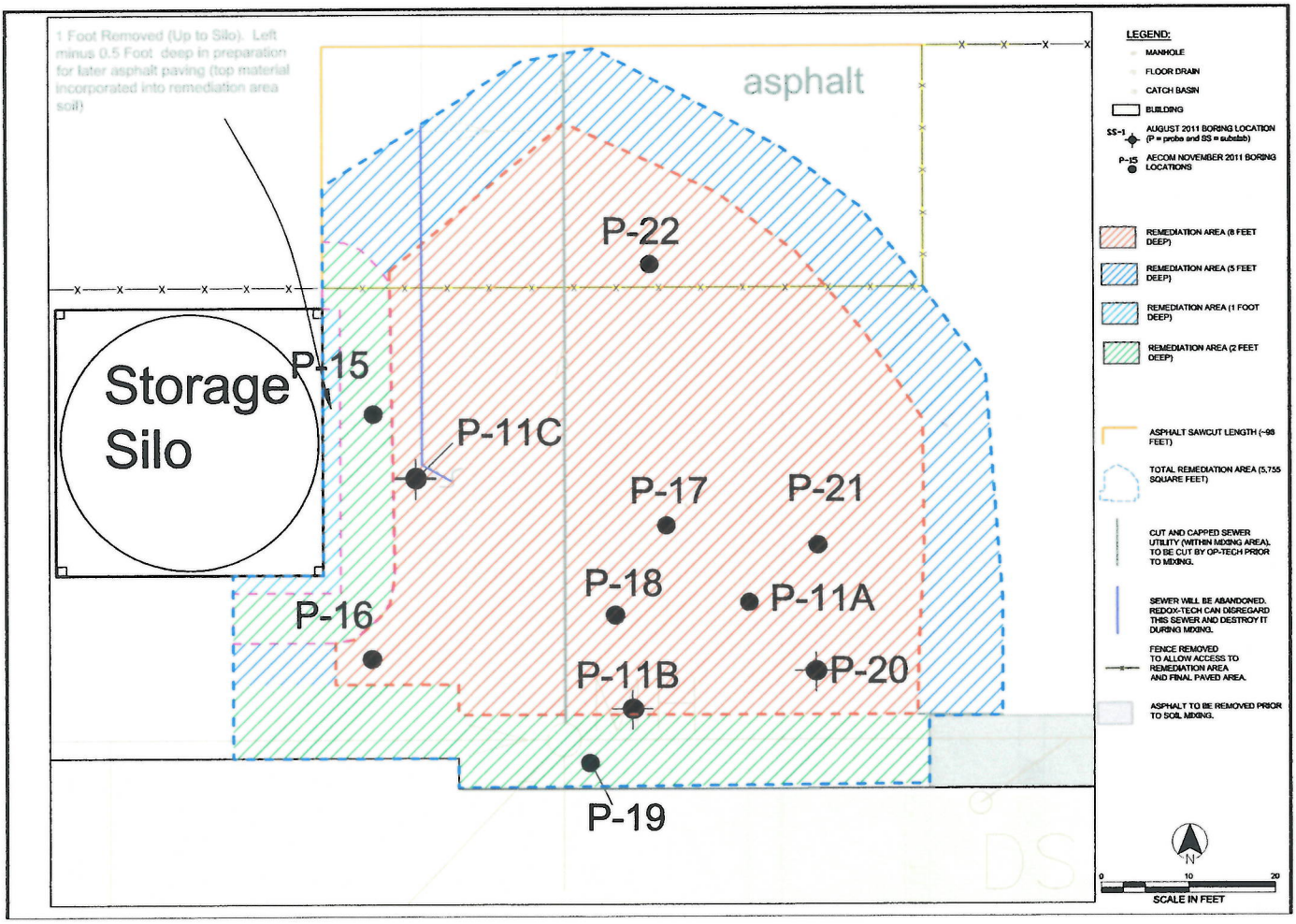
DRAWN BY: MPH
CHECKED BY: TS
APPROVED BY: KD

AECOM
AECOM Environment
1555 N. RiverCenter Dr, Ste 214
Milwaukee, Wisconsin 53212
T 414.944.6060 F 414.944.6081
www.aecom.com

Remediation Area Preparation Map
Tullo Corporation
3125 Highland Avenue
Niagara Falls, New York

SCALE: AS NOTED
DATE: 06/07/2012
AECOM PROJECT: 60271770

Figure
5



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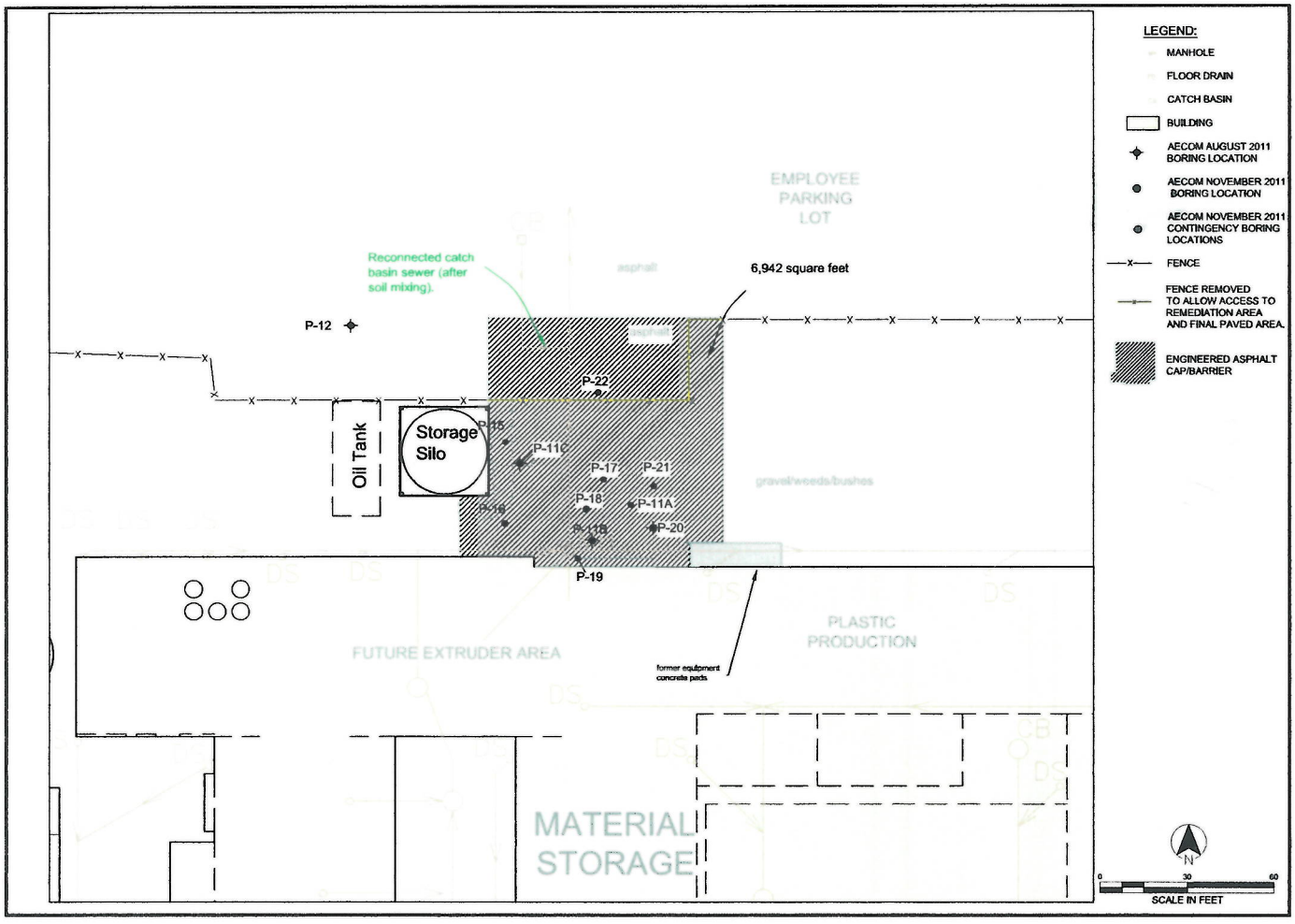
CHECKED BY: TS
APPROVED BY: KB

AECOM Environment
1555 N. RiverCenter Dr., Ste 214
Milwaukee, Wisconsin 53212
T 414.944.6080 F 414.944.6051
www.aecom.com

Remediation Area Soil Mixing Depth Map
Tullo Corporation
3125 Highland Avenue
Niagara Falls, New York

SCALE: AS NOTED
DATE: 06/01/2012
AECOM PROJECT: 60271770

Figure
6



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DRAWN BY:	PDH		
CHECKED BY:	TS		
APPROVED BY:	KB		

AECOM Environment
1555 N RiverCenter Dr., Ste 214
Milwaukee, Wisconsin 53212
T 414.944.6580 F 414.944.6581
www.aecom.com

Engineered Asphalt Cap/Barrier Map
Tulip Corporation
3125 Highland Avenue
Niagara Falls, New York

SCALE:	DATE:	AECOM PROJECT:
AS NOTED	09/01/2012	60271770

Figure
7

CELL FIELD MAP

REMIX AREAS IN RED

AECOM Environment
1555 N RiverCenter Drv. Ste 214
Milwaukee, WI 53212
T 414.944.6080 F 414.944.6081
www.aecom.com

Figure 1

Attachment A

REDOX TECH, LLC

"Providing Innovative In Situ Soil and Groundwater Treatment"

August 6, 2012

Via Email

Richard Mazurkiewicz
AECOM
11425 W. Lake Park Dr. Ste 100
Milwaukee, WI 53224
T: 414.359.3030
F: 414.359.0822
Email: Richard.mazurkiewicz.com

RE: Lead and Arsenic Treatability Study Report
Tulip Corporation Site, Niagara Falls, NY

Dear Mr. Mazurkiewicz:

Redox Tech is pleased to present the following treatability study report. This testing was conducted on site-specific soil for purposes of determining an appropriate method for stabilizing lead and arsenic.

Introduction

Redox Tech, LLC (Redox Tech) proposes to stabilize lead and arsenic in soil at the Tulip Corporation site in Niagara Falls, New York using a soil blending technique, addressing soils to a depth of up to 8 feet below ground surface. Area soil is sand and gravel. As part of the cleanup strategy, the remediation area will likely be paved after stabilization activities area completed. To avoid a dewatering step, the chemistry evaluation for this project focused on dry reagents. Current site soil is adequate for construction of the parking lot.

Soil samples indicate lead concentrations as high as 17,000 mg/kg, and arsenic concentrations as high as 30 mg/kg. The goal is to stabilize lead and arsenic to achieve a non-hazardous, TCLP goal of 5.0 mg/L for both lead and arsenic.

Sample Collection.

The following samples collected by AECOM were used in the treatability study:

- Sample A: P-20 (0-1') – 071812 (ReSP Lab. No 2012 07 001)
- Sample B: P-16 (0-1') – 071812 (ReSP Lab. No 2012 07 002)
- Sample C: P-18 (0-1') – 071812 (ReSP Lab. No 2012 07 003)
- Sample D: P-11b (0-1') – 071812 (ReSP Lab. No 2012 07 004)

Initial Sample Characterization.

Each soil sample was reduced in size to pass through a 3/8-inch sieve and homogenized. Each sample was analyzed for total and untreated TCLP arsenic and lead. A summary of the initial analyses and treatability study results is provided in **Table 1**.

Arsenic

Study samples A, B, C and D had total arsenic concentrations of 16, <15, <16, and 37 mg/kg, respectively; and TCLP arsenic concentrations of <0.030, 0.035, <0.030 and 0.045 mg/L, respectively (see Table 1). All of these TCLP values are well below the TCLP regulatory level of 5 mg/L. There appears to be no correlation between the total arsenic concentrations and the untreated arsenic TCLP concentrations.

Lead

Samples A, B, C, and D had total lead concentrations of 2200, 42,000, 19,000 and 85,000 mg/kg lead, respectively; and TCLP lead concentrations of 220, 690, 210 and 930 mg/L, respectively (see Table 1). Lead has a weak correlation between the total lead concentrations and the TCLP lead concentration with a correlation coefficient of 0.79.

Stabilization Study.

Each soil sample was subjected to a series of dosage trials (1%, 5% and 8% by weight) of three different commercial-grade basic reagents including calcium oxide (CaO), magnesium oxide (MgO) and Portland Cement. The dosed samples were subsequently leached using the TCLP screening level procedure.

Arsenic

The arsenic concentrations in the untreated TCLP leachate were well below the regulatory level of 5 mg/L (see Table 1). The leachate of the dosed samples for all three reagents was analyzed for arsenic to document any effect the stabilization chemistry used for lead had on the arsenic solubility. The TCLP arsenic remained very low (at or less than 0.21 mg/L) for all of the dosage trials. Most results (37 of the 44 dosage trials) were below the detection limit.

Lead

Calcium Oxide

All of the Samples A, B, C and D were effectively stabilized below the TCLP regulatory level of 5 mg/L for lead when dosed with 8% CaO with leachable concentrations of 1.4, 0.14, 0.10 and 0.20 mg/L, respectively. This represents lead reductions of 99.4, 99.98, 99.95 and 99.98 percent, respectively. At dosages of 1% and 5% CaO, lead remained relatively soluble in the TCLP test.

Since, 8% CaO dosage demonstrated an effective remedy for all samples, a series of dosages between 5% and 8% CaO were tested for lead on each of the samples to identify the optimal treatment dose. All of the Samples A, B, C and D were effectively stabilized below the TCLP regulatory level for lead when dosed with 7% CaO with leachable concentrations of 0.70, 0.067, 0.066 and 0.16 mg/L, respectively. This represents lead reductions of 99.7, 99.99, 99.97 and 99.99 percent, respectively. At 6% CaO dosage, lead in all four samples remained relatively soluble in the TCLP test and exceed the target concentration of 5 mg/L.

Magnesium Oxide

Samples A, B and D were effectively stabilized below the TCLP regulatory level of 5 mg/L for lead when dosed with 8% MgO with leachable concentrations of 4.8, 2.3 and 0.83 mg/L, respectively. This represents lead reductions of 98.1, 99.7 and 99.9 percent respectively. Sample C had a TCLP lead concentration of 8.8 mg/L, slightly above the regulatory limit. For dosages of 1% and 5% MgO, lead remained relatively soluble in the TCLP test.

Portland Cement

Lead remained relatively soluble in the TCLP test for each of the Portland Cement dosage trials in all four samples at cement dosages of up to 8 weight percent. The leachable lead results in these trials were all above 80 mg/L.

The TCLP extract from the 7% CaO treatment from each sample was sent to ESC Laboratory in Mt. Juliet, Tennessee for certified verification of the screening arsenic and lead analysis. The verification results are provided in Table 1. The certified lab and the screening arsenic and lead results demonstrate excellent agreement of between the analyses.

Application Parameters.

The best performing reagent for the site samples is CaO, which demonstrated the highest reduction in leachable lead at 8% dosage and performed equally well at the 7% dosage. The application and mixing of the reagent at the site has raised concerns about post-application geotechnical strength and heat generation. Three empirical bench tests on the samples were performed to help provide information in making application decisions. The three tests, performed on all four samples, included percent moisture, heat generation and strength. The results of the application parameters are provided in Table 2.

Percent moisture was tested for samples that were untreated and dosed with 7% CaO. The moisture results were between 4.5% and 6.8%. The 7% dosed samples experienced a drying effect where each sample had a decrease in moisture between 0.2% and 0.6%.

Heat generation and strength testing was performed for samples that were either untreated or dosed with 8% CaO, and then saturated with deionized water. The untreated samples experienced no temperature increase. Each of the samples dosed with CaO experienced a

temperature increase between 3.1 C^O and 5.5 C^O. None of the samples had measurable geotechnical strength as measured with a hand penetrometer. However, each of the samples dosed with CaO had the ability to support the weight of the penetrometer, in that the penetrometer did not sink into the sample. None of the untreated samples could support the weight of the penetrometer.

Conclusions.

For the site samples, there appears to be a weak correlation between the total concentrations for lead and the untreated TCLP concentrations. There appears to be no correlation between the total concentrations for arsenic and the untreated TCLP arsenic concentrations.

All of the samples had untreated arsenic concentrations in the TCLP test well below the regulatory level. The arsenic concentrations remained very low in the TCLP test for all of the reagent dosage trials.

Three of the four samples were stabilized for lead using 8% MgO. All of the samples were stabilized for lead using 7% CaO.

The addition of CaO has a slight drying effect on the site samples as demonstrated by the moisture measurements.

There is a measurable increase in temperature with the addition of CaO and water to each of the samples, indicating heat generation.

There is noticeable improvement in geotechnical strength with the addition of CaO to the site samples.

The certified lab and the screening arsenic and lead results demonstrate excellent agreement between the analyses.

Thank you for the opportunity to conduct these tests for AECOM. If you have any questions or concerns, please do not hesitate to call me at (630) 705-0390.

Regards,

Steve Markesic
Redox Tech, LLC

Table 1
Treatability Study Results - AECOM, Niagara Falls, New York

Soil Sample	Formulation (wt %)			Arsenic			Lead		
	CaO	MgO	Portland Cement	Total Arsenic (mg/kg)	Leachable Arsenic (mg/L)	Reduction in Arsenic (%)	Total Lead (mg/kg)	Leachable Lead (mg/L)	Reduction in Lead (%)
Treatment Goals					5			5	
A P-20 (0'-1') 071812 2012 07 001	--	--	--	16	<0.030		2,200	220	
	1.0	--	--		<0.030	N/A		210	16
	5.0	--	--		<0.030	N/A		100	60
	6.0	--	--		<0.030	N/A		57	77
	7.0	--	--		<0.030	N/A		0.70	99.7
				lab verification	<0.020	N/A	*lab verification*	0.08	99.97
	8.0	--	--		<0.030	N/A		1.4	99.4
	--	1.0	--		<0.030	N/A		210	16
	--	5.0	--		<0.030	N/A		150	40
	--	8.0	--		<0.030	N/A		4.8	98.1
	--	--	1.0		<0.030	N/A		250	0.0
	--	--	5.0		<0.030	N/A		220	12
	--	--	8.0		<0.030	N/A		100	60
B P-16 (0'-1') 071812 2012 07 002	--	--	--	<15	0.035		42,000	690	
	1.0	--	--		<0.030	N/A		440	36
	5.0	--	--		<0.030	N/A		150	78
	6.0	--	--		<0.030	N/A		52	93
	7.0	--	--		<0.030	N/A		0.067	99.99
				lab verification	<0.020	N/A	*lab verification*	0.055	99.99
	8.0	--	--		<0.030	N/A		0.14	99.98
	--	1.0	--		<0.030	N/A		510	26
	--	5.0	--		<0.030	N/A		210	70
	--	8.0	--		<0.030	N/A		2.3	99.67
	--	--	1.0		0.049	0.0		620	10
	--	--	5.0		<0.030	N/A		470	32
	--	--	8.0		<0.030	N/A		100	86
C P-18 (0'-1') 071812 2012 07 003	--	--	--	<16	<0.030		19,000	210	
	1.0	--	--		<0.030	N/A		219	0.5
	5.0	--	--		<0.030	N/A		120	45
	6.0	--	--		<0.030	N/A		76	66
	7.0	--	--		<0.030	N/A		0.066	99.97
				lab verification	<0.020	N/A	*lab verification*	0.059	99.97
	8.0	--	--		<0.030	N/A		0.10	99.95
	--	1.0	--		<0.030	N/A		220	0.0
	--	5.0	--		<0.030	N/A		160	27
	--	8.0	--		<0.030	N/A		8.8	96
	--	--	1.0		<0.030	N/A		210	4.5
	--	--	5.0		<0.030	N/A		170	23
	--	--	8.0		<0.030	N/A		80	64

Table 1
Treatability Study Results - AECOM, Niagara Falls, New York

Soil Sample	Formulation (wt %)			Arsenic			Lead		
	CaO	MgO	Portland Cement	Total Arsenic (mg/kg)	Leachable Arsenic (mg/L)	Reduction in Arsenic (%)	Total Lead (mg/kg)	Leachable Lead (mg/L)	Reduction in Lead (%)
Treatment Goals					5			5	
D P-11b (0'-1') 071812 2012 07 004	--	--	--	37	0.045		85,000	930	
	1.0	--	--		<0.030	N/A		640	43
	5.0	--	--		0.036	83		440	61
	6.0	--	--		<0.030	N/A		170	85
	7.0	--	--		<0.030	N/A		0.16	99.99
				lab verification	<0.020	N/A	*lab verification*	0.18	99.98
	8.0	--	--		<0.030	N/A		0.20	99.98
	--	1.0	--		0.13	38		920	19
	--	5.0	--		0.031	85		440	61
	--	8.0	--		<0.030	N/A		0.83	99.9
	--	--	1.0		0.21	0.0		1110	1.8
	--	--	5.0		0.10	51		1130	0.0
	--	--	8.0		0.10	51		200	82

Notes:
-- No chemical added for the treatment.
N/A Data is not available.
The result is at or below the treatment goal.

Table 2
Application Parameters - AECOM, Niagara Falls, New York

Sample	CaO (Quicklime) (% by weight)	Maximum Temperature [1] (C^O)	Strength [2] (ton/ft^2 penetrometer)	Moisture [3] (% by weight)
P-20 (0'-1') - 071812	0	24.0	<0.5	5.3
	7	N/A	N/A	5.1
(ReSP Lab No. 2012 07 001)	8	29.5	<0.5	N/A
P-16 (0'-1') - 071812	0	24.1	<0.5	6.8
	7	N/A	N/A	6.2
(ReSP Lab No. 2012 07 002)	8	27.9	<0.5	N/A
P-18 (0'-1') - 071812	0	23.7	<0.5	6.0
	7	N/A	N/A	5.4
(ReSP Lab No. 2012 07 003)	8	27.5	<0.5	N/A
P-11b (0'-1') - 071812	0	23.4	<0.5	5.1
	7	N/A	N/A	4.5
(ReSP Lab No. 2012 07 004)	8	26.5	<0.5	N/A

Notes:

1 Fifty grams of the untreated material was mixed with 8% by weight CaO and then mixed with 30% by weight deionized water. The temperature measured for the table above indicates the highest temperature reached within the first 30 minutes following the addition of water to the treated sample.

2 The samples from the maximum temperature test were allowed to rest for 24 hours in sealed containers. Then each sample was measured for strength using a pocket penetrometer. None of the samples had strength above 0.5 ton/ft^2. None of the untreated samples could support the weight of the penetrometer. However, all of the samples with 8% CaO could support the weight of the penetrometer.

3 Each of the as-received samples were mixed with 7% by weight CaO and tested for moisture content.

Appendix D – Groundwater Sampling Purge Forms

AECOM

GROUNDWATER SAMPLING LOG

Date (mo/day/yr): 8/19/2011
Field Personnel: E. Laity
Site Name: **Tulip Corp.**
Earth Tech Job #: **60220285**
Well ID #: MW-1
___ Upgradient ___ Downgradient
Weather Conditions: Sunny
Air Temperature: 80 ° F
Total Depth (TWD) Below Top of Casing = 16 1/100 ft
Depth to Groundwater (DGW) Below Top of Casing = 9.3 1/100 ft
Length of Water Column (LWC) = TWD - DGW = 6.7 1/100 ft
1 Casing Volume (OCV) = LWC x 0.163 = 1.0921 gal
3 Casing Volumes = 3.2763 gal
Method of Well Evacuation: Peristaltic Pump
Method of Sample Collection: Peristaltic Pump/Poly Tubing
Total Volume of Water Removed: 3 liter

Casing Diameter: 2 inches
Casing Material: PVC
Measuring Point Elevation: 582.64 1/100 ft
Height of Riser (above land surface): -0.59 1/100 ft
Land Surface Elevation: 583.23 1/100 ft
Screened Interval (below land surface): 6-16 1/100 ft

Container	Analysis (Method)	# Bottles	Preservative	Dup - MS/MSD
VOA 40 mL glass	TCL VOCs (8260B)	3	HCL, 4°C	
250 mL poly	Metasl	1	HNO3	

FIELD ANALYSES

Flow Rate (ml/min)	125	125	100	100	100	100		
Time (Military)	12:00	12:05	12:10	12:15	12:20	12:25		
Depth to Groundwater Below Top of Casing (ft)	9.72	9.91	10.01	10.11	10.25	10.36		
Drawdown (ft)	-0.42	-0.19	-0.10	-0.10	-0.14	-0.11		
pH (S.U.)	7.54	7.5	7.39	7.33	7.29	7.28		
Sp. Cond. (mS/cm)	1.035	0.963	0.958	0.959	0.973	0.981		
Turbidity (NTUs)	23.7	24.1	32.2	44.5	58.6	51.7		
Dissolved Oxygen (mg/L)	3.82	1.83	1.22	1.28	1.39	1.48		
Water Temperature (°C)	20.13	19.52	20.17	20.37	20.39	20.28		
ORP (mV)	-109.8	-110	-123.7	-133.5	-137.3	-142.6		

Physical appearance at start: Color clear; Odor no
Sheen/Free Product: no

Physical appearance at sampling: Color pale cloudy; Odor no
Sheen/Free Product: no

COMMENTS/OBSERVATIONS: Start purging at 11:55. Set tubing at center of well screen. Samples collected at 12:30.

AECOM

GROUNDWATER SAMPLING LOG

Date (mo/day/yr): 8/19/2011
Field Personnel: E. Laity
Site Name: **Tulip Corp.**
Earth Tech Job #: **60220285**
Well ID #: MW-2
_____ Upgradient _____ Downgradient
Weather Conditions: Sunny
Air Temperature: 80 ° F
Total Depth (TWD) Below Top of Casing = 16 1/100 ft
Depth to Groundwater (DGW) Below Top of Casing = 4.9 1/100 ft
Length of Water Column (LWC) = TWD - DGW = 11.1 1/100 ft
1 Casing Volume (OCV) = LWC x 0.163 = 1.8093 gal
3 Casing Volumes = 5.4279 gal
Method of Well Evacuation: Peristaltic Pump
Method of Sample Collection: Peristaltic Pump/Poly Tubing
Total Volume of Water Removed: 4 liter

Casing Diameter: 2 inches
Casing Material: PVC
Measuring Point Elevation: 582.74 1/100 ft
Height of Riser (above land surface): -0.72 1/100 ft
Land Surface Elevation: 583.46 1/100 ft
Screened Interval (below land surface): 6-16 1/100 ft

Container	Analysis (Method)	# Bottles	Preservative	Dup - MS/MSD
VOA 40 mL glass	TCL VOCs (8260B)	3	HCL, 4°C	
250 mL poly	Metasl	1	HNO3	

FIELD ANALYSES

Flow Rate (ml/min)	175	100	100	100	100	100	100	100
Time (Military)	10:50	10:55	11:00	11:05	11:10	11:15	11:20	11:25
Depth to Groundwater Below Top of Casing (ft)	5.45	5.45	5.55	5.63	5.7	5.8	5.9	5.95
Drawdown (ft)	-0.55	0.00	-0.10	-0.08	-0.07	-0.10	-0.10	-0.05
pH (S.U.)	7.87	7.82	7.63	7.38	7.22	7.15	7.1	7.03
Sp. Cond. (mS/cm)	3.178	3.161	3.156	3.163	3.14	3.139	3.129	3.117
Turbidity (NTUs)	11.02	12.12	13.14	14.25	14.17	16.33	15.3	14.01
Dissolved Oxygen (mg/L)	3.09	2.45	2.61	2.81	3.11	3.19	3.1	2.92
Water Temperature (°C)	19.44	20.51	21.87	21.64	21.4	21.43	21.36	21.56
ORP (mV)	-135.9	-137.8	-136.9	-140	-138.9	-139.4	-141.7	-140.2

Physical appearance at start: Color clear; Odor no
Sheen/Free Product: no

Physical appearance at sampling: Color clear; Odor no
Sheen/Free Product: no

COMMENTS/OBSERVATIONS: Start purging at 10:45. Set tubing at center of well screen. Samples collected at 11:30.

AECOM

GROUNDWATER SAMPLING LOG

Date (mo/day/yr): 8/19/2011
Field Personnel: E. Laity
Site Name: **Tulip Corp.**
Earth Tech Job #: **60220285**
Well ID #: MW-3
___ Upgradient ___ Downgradient
Weather Conditions: Sunny
Air Temperature: 80 ° F
Total Depth (TWD) Below Top of Casing = 14 1/100 ft
Depth to Groundwater (DGW) Below Top of Casing = 4.95 1/100 ft
Length of Water Column (LWC) = TWD - DGW = 9.05 1/100 ft
1 Casing Volume (OCV) = LWC x 0.163 = 1.47515 gal
3 Casing Volumes = 4.42545 gal
Method of Well Evacuation: Peristaltic Pump
Method of Sample Collection: Peristaltic Pump/Poly Tubing
Total Volume of Water Removed: 12 liter

Casing Diameter: 2 inches
Casing Material: PVC
Measuring Point Elevation: 583.69 1/100 ft
Height of Riser (above land surface): -0.33 1/100 ft
Land Surface Elevation: 584.02 1/100 ft
Screened Interval (below land surface): 4-14 1/100 ft

Container	Analysis (Method)	# Bottles	Preservative	Dup - MS/MSD
VOA 40 mL glass	TCL VOCs (8260B)	3	HCL, 4°C	
250 mL poly	Metasl	1	HNO3	

FIELD ANALYSES

Flow Rate (ml/min)	210	210	210	210	210	210	210	210
Time (Military)	9:30	9:35	9:40	9:45	9:50	9:55	10:00	10:05
Depth to Groundwater Below Top of Casing (ft)	4.95	4.95	4.95	4.95	4.95	4.95	4.95	4.95
Drawdown (ft)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
pH (S.U.)	8.01	7.66	7.69	7.77	7.87	7.91	8.02	8.04
Sp. Cond. (mS/cm)	1.603	1.027	0.942	0.907	0.899	0.895	0.883	0.881
Turbidity (NTUs)	14.08	9.28	7.36	4.51	2.84	2.41	1.62	1.51
Dissolved Oxygen (mg/L)	0.61	0.25	0.23	0.24	0.22	0.2	0.19	0.18
Water Temperature (°C)	13.78	14.02	14.38	14.51	14.62	14.61	14.75	14.76
ORP (mV)	-106.3	-113.1	-130.3	-144.3	-159.8	-160.1	-169.9	-170.5

Physical appearance at start: Color clear; Odor no
Sheen/Free Product: no
Physical appearance at sampling: Color clear; Odor no
Sheen/Free Product: no

COMMENTS/OBSERVATIONS: Start purging at 9:25. Set tubing at center of well screen. Samples collected at 10:10.

GROUNDWATER MONITORING WELL PURGE FORM

Site:

Well ID: MW-01	Depth to Water (ft BTOC): 9.5
Inventum Sampler: Todd W	Depth to Product (ft BTOC): _____
Date: 9/23/2020	Total Depth (ft BTOC): 15.85

Purge Details

Time Start: 1205	Comments/Notes: Well re-developed dry on 9/22/20. Let recharge then purge/sample. Low-Flow w/Peristaltic Pump
Time Ended: 1223	
Total Purge Volume: <1 gal	

DTW (ft BTOC)	pH	Temperature (deg. C)	Turbidity (NTUs)	Conductivity (uS/cm)	ORP (mV)	DO (mg/L)
10.22	7.52	19.76	27	0.866	-22	2.8
10.48	7.42	18.94	26.8	0.831	-26	0.93
10.93	7.4	18.56	304	0.834	8	0.9
11.28	7.37	18.77	297	0.842	27	1.35
11.46	7.36	18.58	263	0.856	31	1.37
11.63	7.36	18.7	209	0.865	28	1.22

Sample Details

Sample Date: 9/23/2020	Analysis: VOCs (8260), SVOCs (8270), TAL Metals (6010C)
Sample Time: 1235	
Sampled By: TW	

GROUNDWATER MONITORING WELL PURGE FORM						
Site:						
Well ID: MW-02			Depth to Water (ft BTOC): 5.3			
Inventum Sampler: Todd W			Depth to Product (ft BTOC): _____			
Date: 9/23/2020			Total Depth (ft BTOC):			
Purge Details						
Time Start: 1250			Comments/Notes: WLow-Flow w/Peristaltic Pump			
Time Ended: 1305						
Total Purge Volume: <1 gal						
DTW (ft BTOC)	pH	Temperature (deg. C)	Turbidity (NTUs)	Conductivity (uS/cm)	ORP (mV)	DO (mg/L)
6.1	7.11	19.14	85.1	3.87	178	5.35
6.31	7.06	18.47	113	3.91	166	4.12
6.61	7.07	18.35	223	3.93	164	3.19
6.94	7.06	18.39	380	3.93	164	3.23
Sample Details						
Sample Date: 9/23/2020			Analysis: VOCs (8260), SVOCs (8270), TAL Metals (6010C)			
Sample Time: 1320						
Sampled By: TW						

GROUNDWATER MONITORING WELL PURGE FORM						
Site:						
Well ID: MW-03			Depth to Water (ft BTOC): 4.85			
Inventum Sampler: Todd W			Depth to Product (ft BTOC): _____			
Date: 9/23/2020			Total Depth (ft BTOC):			
Purge Details						
Time Start: 1340			Comments/Notes: Low-Flow w/Peristaltic Pump			
Time Ended: 1400						
Total Purge Volume: <1 gal						
DTW (ft BTOC)	pH	Temperature (deg. C)	Turbidity (NTUs)	Conductivity (uS/cm)	ORP (mV)	DO (mg/L)
4.9	7.31	15.81	50.3	1.46	231	0.66
4.9	7.31	15.95	25.1	1.43	203	0.03
4.9	7.29	16.07	15.5	1.43	179	0
4.9	7.33	16.01	11.8	1.42	167	0
Sample Details						
Sample Date: 9/23/2020			Analysis: VOCs (8260), SVOCs (8270), TAL Metals (6010C). Collecte			
Sample Time: 1405			Duplicate labeled MW-300 and MS/MSD labeled MW-3-MS/MSD			
Sampled By: TW						

APPENDIX C

EXAMPLE (Minimum Requirements)

WELL PURGING-FIELD WATER QUALITY MEASUREMENTS FORM

Location (Site/Facility Name) Tulip Facility
Well Number MW-1 Date 8-25-21
Field Personnel Tom Webster Eric Swartzmeyer
Sampling Organization Alpha Analytical
Identify MP

Depth to ____/____ of screen
(below MP) top bottom
Pump Intake at (ft. below MP) ____
Purging Device; (pump type) geo pump
Total Volume Purged ~29 gal

Clock Time 24 HR	Water Depth below MP ft	Pump Dial[1]	Purge Rate ml/min	Cum. Volume Purged ~~liters~~ gal	Temp. °C	Spec. Cond.[2] µS/cm	pH	ORP[3] mv	DO mg/L	Tur-bidity NTU	Comments
1405	11.49	HI	~100	~0.75	17.3	1,046	6.84	-66.3	1.25	23.26	pump started @
1410	11.88	↓		~1	17.4	1,049	6.89	-77.2	1.72	36.49	1355
1415	12.23			~1.2	17.4	969	6.90	-83.5	0.61	44.21	
1420	12.58			~1.4	17.3	1009	6.87	-84.5	0.58	46.79	
1425	13.09			~2	17.4	1018	6.87	-86.5	0.59	48.32	~~well taste~~
											well got sl. turbid
											@ End of purging
											Sampled @ 1427
Stabilization Criteria					3%	3%	±0.1	±10 mv	10%	10%	on 8-25-21

1. Pump dial setting (for example: hertz, cycles/min, etc).
2. µSiemens per cm(same as µmhos/cm)at 25°C.
3. Oxidation reduction potential (ORP)

APPENDIX C

EXAMPLE (Minimum Requirements)

WELL PURGING-FIELD WATER QUALITY MEASUREMENTS FORM

Location (Site/Facility Name) Tolip Facility
Well Number MW-5 Date 8-25-2021
Field Personnel Tom Webster & Eric Swartzmeyer
Sampling Organization Alpha Analytical
Identify MP

Depth to ____/____ of screen
(below MP) top bottom
Pump Intake at (ft. below MP) ____
Purging Device; (pump type) geo pump
Total Volume Purged ≈1.25

Clock Time 24 HR	Water Depth below MP ft	Pump Dial[1]	Purge Rate ml/min	Cum. Volume Purged liters	Temp. °C	Spec. Cond.[2] µS/cm	pH	ORP[3] mv	DO mg/L	Tur-bidity NTU	Comments
1305	6.84	1/4	~150	0.5	21.6	1549	7.11	245.8	4.84	15.9	pump started @
1310	6.91			0.75	21.7	1554	7.13	244.9	4.73	16.2	1300
1315	7.08			1.0	21.6	1565	7.13	245.3	4.89	16.8	
1320	7.16			≈1.25	20.8	1573	7.12	246.4	4.78	16.5	
											Sampled @ 1322
Stabilization Criteria					3%	3%	±0.1	±10 mv	10%	10%	on 8-25-21

1. Pump dial setting (for example: hertz, cycles/min, etc).
2. µSiemens per cm(same as µmhos/cm)at 25°C.
3. Oxidation reduction potential (ORP)

APPENDIX C

EXAMPLE (Minimum Requirements)

WELL PURGING-FIELD WATER QUALITY MEASUREMENTS FORM

Location (Site/Facility Name) Tolip Facility
Well Number MW-2 Date 8-25-2021
Field Personnel Tom Webster & Eric Swartzmeyer
Sampling Organization Alpha Analytical
Identify MP

Depth to ____/____ of screen
(below MP) top bottom
Pump Intake at (ft. below MP) ____
Purging Device; (pump type) geo pump
Total Volume Purged ~1.75

Clock Time 24 HR	Water Depth below MP ft	Pump Dial[1]	Purge Rate ml/min	Cum. Volume Purged ~~liters~~ gal	Temp. °C	Spec. Cond.[2] µS/cm	pH	ORP[3] mv	DO mg/L	Tur-bidity NTU	Comments
1150	6.28	4	@ ~150	~0.75	19.3	3,300	6.85	-19.8	0.61	5.40	Pump started @
1155	6.32			~1.0	19.3	3,251	6.85	-24.2	0.62	10.62	1140
1200	6.36			~1.25	19.2	3,018	6.88	-32.5	0.78	12.62	
1205	6.42			~1.5	19.2	2940	6.89	-31.8	0.84	11.49	
1210	6.50			~1.75	19.1	2963	6.88	-29.7	0.81	11.28	
											well Sampled
											@ 1212 on 8-25-21
Stabilization Criteria					3%	3%	±0.1	±10 mv	10%	10%	Dup taken

1. Pump dial setting (for example: hertz, cycles/min, etc).
2. µSiemens per cm(same as µmhos/cm)at 25°C.
3. Oxidation reduction potential (ORP)

APPENDIX C

EXAMPLE (Minimum Requirements)

WELL PURGING-FIELD WATER QUALITY MEASUREMENTS FORM

Location (Site/Facility Name) Tolip Facility
Well Number MW-4 Date 8-25-2021
Field Personnel Tom Webster & Eric Swartzmeyer
Sampling Organization Alpha Analytical
Identify MP

Depth to ____ / ____ of screen
(below MP) top bottom
Pump Intake at (ft. below MP) ____
Purging Device; (pump type) geo pump
Total Volume Purged 22.5 gal

Clock Time 24 HR	Water Depth below MP ft	Pump Dial[1]	Purge Rate ml/min	Cum. Volume Purged ~~liters~~ gal	Temp. °C	Spec. Cond.[2] µS/cm	pH	ORP[3] mv	DO mg/L	Tur-bidity NTU	Comments
1045	5.12	1/4	100 mL	0.75	19.0	988	6.66	191.2	0.74	95.82	pump started @
1050	5.12	↓	↓	1	18.9	999	6.65	171.0	0.69	87.75	1035
1055	5.12			1.5	19.3	999	6.65	152.3	0.63	28.52	
1100	5.12			1.75	19.4	998	6.65	145.9	0.62	26.09	
1105	5.12			2	19.4	997	6.64	145.2	0.61	26.86	
1110	5.12			2.5	19.3	997	6.65	145.6	0.62	26.03	
											well Sampled
											@ 1112 on 8-25-21
Stabilization Criteria					3%	3%	±0.1	±10 mv	10%	10%	

1. Pump dial setting (for example: hertz, cycles/min, etc).
2. µSiemens per cm(same as µmhos/cm)at 25°C.
3. Oxidation reduction potential (ORP)

APPENDIX C

EXAMPLE (Minimum Requirements)

WELL PURGING-FIELD WATER QUALITY MEASUREMENTS FORM

Location (Site/Facility Name) Tolip Facility
Well Number MW-3 Date 8-25-2021
Field Personnel Tom Webster & Eric Swartzmeyer
Sampling Organization Alpha Analytical
Identify MP

Depth to ____/____ of screen
(below MP) top bottom
Pump Intake at (ft. below MP) ____
Purging Device; (pump type) geo pump
Total Volume Purged ~1gal

Clock Time 24 HR	Water Depth below MP ft	Pump Dial[1]	Purge Rate ml/min	Cum. Volume Purged ~~liters~~ gal	Temp. °C	Spec. Cond.[2] µS/cm	pH	ORP[3] mv	DO mg/L	Tur-bidity NTU	Comments
930	3.76	44	100mL		15.1	547	7.08	128.1	0.72	49.64	pump started @ 920
935	3.76	↓	↓		15.1	540	7.10	77.9	0.66	44.01	
940	3.76				15.7	540	7.11	46.6	0.66	29.82	
945	3.76				15.8	541	7.13	37.1	0.66	25.90	
950	3.76			~0.5	15.9	542	7.14	34.7	0.68	26.33	
955	3.76	↓	↓	1gal	15.9	543	7.14	33.5	0.68	26.88	
											well Sampled @
											957 on 8-25-21
Stabilization Criteria					3%	3%	±0.1	±10 mv	10%	10%	

1. Pump dial setting (for example: hertz, cycles/min, etc).
2. µSiemens per cm(same as µmhos/cm)at 25°C.
3. Oxidation reduction potential (ORP)

Appendix E – Monitoring Well Construction Logs

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BORING NO. MW-4 SHEET 1 OF 1
PROJECT Tulip Molded Plastics - P932169
LOCATION 3125 Highland Avenue, Niagara Falls, New York
DATUM Ft. AMSL
LOGGED BY TW

COORDINATES N 1,136,291.7 E 1,025,097.2
SURFACE ELEVATION 583.0

DEPTH FEET	LAB SAMPLE	BLOW COUNTS	Recovery %	PID (ppm)	STRATA	DESCRIPTION	ELEVATION FEET
	MW-4-02		100	0		[FILL] Coal fines, asphalt, reworked reddish-brown clay (dry, low plasticity, some silt, some rounded gravel, trace organics), coal fines dominate 3-4 '	
			100	0			580
5						SAA	
			25	0		[FILL] Coal w/slag and gravel layer from 6.5 to 7' bgs (wet), some brick fragments	
						Black to Dark Grey SILTY CLAY, little fine to medium sand, moist, soft, low plasticity	
						Reddish Brown CLAY, little silt, low to medium plasticity, medium stiff, moist	575
10			100	0			
						Reddish Brown CLAY, trace gravel, stiff, medium plasticity, increasing moisture with depth	
	MW-4-1415		100	0			570
15						SAA, increasing moisture to wet @ 15' bgs	
			100	0			565

WELL CONSTRUCTION DETAIL

DRILLING CONTRACTOR Nothnagle
DRILLING METHOD Direct Push and HSA
DRILLING EQUIPMENT CME Rig
DRILLING STARTED 7/20/21 ENDED 7/21/21

REMARKS

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BORING NO. MW-5 SHEET 1 OF 1
PROJECT Tulip Molded Plastics - P932169
LOCATION 3125 Highland Avenue, Niagara Falls, New York
DATUM Ft. AMSL
LOGGED BY TW

COORDINATES N 1,135,995.5 E 1,024,907.4
SURFACE ELEVATION 582.9

DEPTH FEET	LAB SAMPLE	BLOW COUNTS	Recovery %	PID (ppm)	STRATA	DESCRIPTION	WELL CONSTRUCTION DETAIL	ELEVATION FEET
						CONCRETE		
	MW-5-02		100	5		[FILL] reworked silty clay, with brick fragments, trace slag, moist, los tplasticity, trace fine sand and gravel	2" Schedule 40 PVc Riser	580
						SAA, Dark Grey, no odor, high organics		
						SAA, 0 to 0.5 ppm on PID		
5						Reddish Brown SILTY CLAY, moist, stiff, low plasticity, trace fine sand Grey soft clay @ 7.5-8' bgs wtih odor (PID = 30 ppm - max). Collect Sample of material		
	MW-5-758		100	30				575
						Reddish Brown SILTY CLAY, moist, stiff, low plasticiity, no odor or PID hits past 8' bgs		
10							10-slot 2" Schedule 40 PVC Screen	
						[TILL] Reddish brown SILTY CLAY w/ Medium to coarse gravel and sands, medium dense, wet, low plasticity clay		570
15								
	MW-5-15155		100	0			Sediment Sump	

DRILLING CONTRACTOR Nothnagle
DRILLING METHOD Direct Push and HSA
DRILLING EQUIPMENT CME Rig
DRILLING STARTED 7/20/21 ENDED 7/21/21

REMARKS

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BORING NO. SB-001 SHEET 1 OF 1
PROJECT Tulip Molded Plastics - P932169
LOCATION 3125 Highland Avenue, Niagara Falls, New York
DATUM Ft. AMSL
LOGGED BY TW

COORDINATES
SURFACE ELEVATION

SAMPLE INFORMATION					STRATA	DESCRIPTION	WELL CONSTRUCTION DETAIL		ELEVATION FEET
DEPTH FEET	LAB SAMPLE	BLOW COUNTS	Recovery %	PID (ppm)					
						Alphalt and Concrete			
	SB-001-01			0		[FILL] coal fines, some slag, re-worked clay			
	SB-001-45					Reddish brown CLAY, high plasticity, moist, trace sand @ 5.5' bgs			
5									
	SB-001-910					Reddish brown SILTY CLAY, dense, medium plasticity, moist to wet @ 10' bgs			
10									

DRILLING CONTRACTOR Earth Dimensions
DRILLING METHOD Direct Push
DRILLING EQUIPMENT CME Rig
DRILLING STARTED 9/22/20 ENDED 9/22/20

REMARKS

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BORING NO. SB-002 SHEET 1 OF 1
PROJECT Tulip Molded Plastics - P932169
LOCATION 3125 Highland Avenue, Niagara Falls, New York
DATUM Ft. AMSL
LOGGED BY TW

COORDINATES
SURFACE ELEVATION

SAMPLE INFORMATION					STRATA	DESCRIPTION	WELL CONSTRUCTION DETAIL		ELEVATION FEET
DEPTH FEET	LAB SAMPLE	BLOW COUNTS	Recovery %	PID (ppm)					
						Asphalt Pavement and pavement bedding			
	SB-002-01			0		[FILL] coal fines, reworked native silty clays, little sands, dry, dense, lost plasticity			
	SB-002-34			0					
5						[FILL] reworked silty clays, mosit dense, some gravel, brick fragement at 6 to 6.5' bgs			
						SAA, wet @ 8.5' bgs			
	SB-002-910					Reddish brown SILTY CLAY, medium plasticity, moist to wet , medium density			
10									

DRILLING CONTRACTOR Earth Dimensions
DRILLING METHOD Direct Push
DRILLING EQUIPMENT CME Rig
DRILLING STARTED 9/22/20 ENDED 9/22/20

REMARKS

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BORING NO. SB-003 SHEET 1 OF 1
PROJECT Tulip Molded Plastics - P932169
LOCATION 3125 Highland Avenue, Niagara Falls, New York
DATUM Ft. AMSL
LOGGED BY TW

COORDINATES
SURFACE ELEVATION

SAMPLE INFORMATION					STRATA	DESCRIPTION	WELL CONSTRUCTION DETAIL		ELEVATION FEET
DEPTH FEET	LAB SAMPLE	BLOW COUNTS	Recovery %	PID (ppm)					
	SB-003-01			0		Asphalt and pavement bedding [FILL] reworked reddish brown silty clay, coal fines, dense, medium plasticity			
	SB-003-34			0		SAA, moist @ 6' bgs, wood [black] from 5.5 to 6' bgs			
5						Reddish brown SILTY CLAY, medium dense, medium plasticity, moist to wet at 7.5' bgs			
						SAA			
	SB-003-910			0					
10									

DRILLING CONTRACTOR Earth Dimensions
DRILLING METHOD Direct Push
DRILLING EQUIPMENT CME Rig
DRILLING STARTED 9/22/20 ENDED 9/22/20

REMARKS

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BORING NO. SB-004 SHEET 1 OF 1
PROJECT Tulip Molded Plastics - P932169
LOCATION 3125 Highland Avenue, Niagara Falls, New York
DATUM Ft. AMSL
LOGGED BY TW

COORDINATES
SURFACE ELEVATION

SAMPLE INFORMATION					STRATA	DESCRIPTION	WELL CONSTRUCTION DETAIL		ELEVATION FEET
DEPTH FEET	LAB SAMPLE	BLOW COUNTS	Recovery %	PID (ppm)					
	SB-004-01			0		Asphalt and pavement bedding Gravel and crushed stone			
						[FILL] Gravel and brick fragments, reworked reddish brown silty clay, dense, dry			
	SB-004-34			0					
5									
						Reddish brown SILTY CLAY, dense, medium plasticity, moist to wet @ 8' bgs			
	SB-004-78			0					

DRILLING CONTRACTOR Earth Dimensions
DRILLING METHOD Direct Push
DRILLING EQUIPMENT CME Rig
DRILLING STARTED 9/22/20 ENDED 9/22/20

REMARKS

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BORING NO. SB-005 SHEET 1 OF 1
PROJECT Tulip Molded Plastics - P932169
LOCATION 3125 Highland Avenue, Niagara Falls, New York
DATUM Ft. AMSL
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COORDINATES
SURFACE ELEVATION

SAMPLE INFORMATION					STRATA	DESCRIPTION	WELL CONSTRUCTION DETAIL		ELEVATION FEET
DEPTH FEET	LAB SAMPLE	BLOW COUNTS	Recovery %	PID (ppm)					
						Asphalt/Concrete and subbase gravels			
	SB-005-12					[FILL] white to grey reworked sandy silt with fine to medium gr. sand, trace gravels, moist to wet, medium density			
	SB-005-45								
5						Reddish brown SILTY CLAY, medium density, medium plastiticy, moist to wet			
	SB-005-78								

DRILLING CONTRACTOR Earth Dimensions
DRILLING METHOD Direct Push
DRILLING EQUIPMENT CME Rig
DRILLING STARTED 9/22/20 ENDED 9/22/20

REMARKS

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BORING NO. SB-006 SHEET 1 OF 1
PROJECT Tulip Molded Plastics - P932169
LOCATION 3125 Highland Avenue, Niagara Falls, New York
DATUM Ft. AMSL
LOGGED BY TW

COORDINATES
SURFACE ELEVATION

SAMPLE INFORMATION					STRATA	DESCRIPTION	WELL CONSTRUCTION DETAIL		ELEVATION FEET
DEPTH FEET	LAB SAMPLE	BLOW COUNTS	Recovery %	PID (ppm)					
						Aslphalt/Concrete/Slough			
	SB-006-23					[FILL] reworked reddish brown silty clay, hard, trace fine sands and gravels, wood, brick, medium plasticity clays, moist			
5	SB-006-56					Brown to greyish brown SILTY CLAY, moist, medium dense, medium plasticity, trace fine sand, wet @ 10' bgs			
	SB-006-910								
10									

DRILLING CONTRACTOR Earth Dimensions
DRILLING METHOD Direct Push
DRILLING EQUIPMENT CME Rig
DRILLING STARTED 9/22/20 ENDED 9/22/20

REMARKS

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BORING NO. SB-007 SHEET 1 OF 1
PROJECT Tulip Molded Plastics - P932169
LOCATION 3125 Highland Avenue, Niagara Falls, New York
DATUM Ft. AMSL
LOGGED BY TW

COORDINATES
SURFACE ELEVATION

SAMPLE INFORMATION					STRATA	DESCRIPTION	WELL CONSTRUCTION DETAIL		ELEVATION FEET
DEPTH FEET	LAB SAMPLE	BLOW COUNTS	Recovery %	PID (ppm)					
						Asphalt/Concrete			
						[FILL] red brick/asphalt fill			
	SB-007-152					[FILL] reworked reddish brown to grey silty clay, dense, moist, medium plasticity, trace fine sand/gravel			
	SB-007-45					Greyish brown SILTY CLAY, medium dense,medium plasticity, moist			
5									
						SAA, moist to wet @ 10' bgs [moisture on acetate liner]			
	SB-007-910								
10									

DRILLING CONTRACTOR Earth Dimensions
DRILLING METHOD Direct Push
DRILLING EQUIPMENT CME Rig
DRILLING STARTED 9/22/20 ENDED 9/22/20

REMARKS

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BORING NO. SB-008 SHEET 1 OF 1
PROJECT Tulip Molded Plastics - P932169
LOCATION 3125 Highland Avenue, Niagara Falls, New York
DATUM Ft. AMSL
LOGGED BY TW

COORDINATES
SURFACE ELEVATION

SAMPLE INFORMATION					STRATA	DESCRIPTION	WELL CONSTRUCTION DETAIL		ELEVATION FEET
DEPTH FEET	LAB SAMPLE	BLOW COUNTS	Recovery %	PID (ppm)					
						Asphalt/Concrete			
	SB-008-12					[FILL] reworked reddish brown silty clay, moist			
5	SB-008-56					[FILL] SAA, wood debris from 5 to 5.5' bgs with strong odor [creosote] [5 to 10 ppm on PID]; collect sample			
						SAA, odor may be slough from above			
	SB-008-910					Grey SILTY CLAY, slight odor (0.4 ppm; slough?); moist, medium dense, low to medium plasticity. Wet @ 10' bgs			
10									

DRILLING CONTRACTOR Earth Dimensions
DRILLING METHOD Direct Push
DRILLING EQUIPMENT CME Rig
DRILLING STARTED 9/22/20 ENDED 9/22/20

REMARKS

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BORING NO. SB-009 SHEET 1 OF 1
PROJECT Tulip Molded Plastics - P932169
LOCATION 3125 Highland Avenue, Niagara Falls, New York
DATUM Ft. AMSL
LOGGED BY TW

COORDINATES
SURFACE ELEVATION

SAMPLE INFORMATION					STRATA	DESCRIPTION	WELL CONSTRUCTION DETAIL		ELEVATION FEET
DEPTH FEET	LAB SAMPLE	BLOW COUNTS	Recovery %	PID (ppm)					
	SB-009-01					Light brown to brown SILTY CLAY, dry, medium dense, low plasticity			
	SB-009-23					SAA, increasing moisture with depth			
5						Brown to reddish brown SILTY CLAY, medium plasticity, moist, dense			
	SB-009-910								
10									

DRILLING CONTRACTOR Earth Dimensions
DRILLING METHOD Direct Push
DRILLING EQUIPMENT CME Rig
DRILLING STARTED 9/22/20 ENDED 9/22/20

REMARKS

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BORING NO. SB-010 SHEET 1 OF 1
PROJECT Tulip Molded Plastics - P932169
LOCATION 3125 Highland Avenue, Niagara Falls, New York
DATUM Ft. AMSL
LOGGED BY TW

COORDINATES
SURFACE ELEVATION

SAMPLE INFORMATION					STRATA	DESCRIPTION	WELL CONSTRUCTION DETAIL		ELEVATION FEET
DEPTH FEET	LAB SAMPLE	BLOW COUNTS	Recovery %	PID (ppm)					
	SB-010-01					Wood/Vegetation/Top Soil			
						Light brown to brown SILTY CLAY, dry, medium dense, trace organics (woody)			
	SB-010-23								
5									
						Light brown to brown SILTY CLAY, moist, medium to dense, medium plasticity, wet @ 10' bgs			
	SB-010-910								
10									

DRILLING CONTRACTOR Earth Dimensions
DRILLING METHOD Direct Push
DRILLING EQUIPMENT CME Rig
DRILLING STARTED 9/22/20 ENDED 9/22/20

REMARKS

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BORING NO. SB-011 SHEET 1 OF 1
PROJECT Tulip Molded Plastics - P932169
LOCATION 3125 Highland Avenue, Niagara Falls, New York
DATUM Ft. AMSL
LOGGED BY TW

COORDINATES
SURFACE ELEVATION

SAMPLE INFORMATION					STRATA	DESCRIPTION	WELL CONSTRUCTION DETAIL		ELEVATION FEET
DEPTH FEET	LAB SAMPLE	BLOW COUNTS	Recovery %	PID (ppm)					
	SB-011-01					[FILL] reworked light brown silty clay, dry, medium dense, some organics (woody), trace sands and gravels			
	SB-011-23								
						SAA, increasing moisture with depth			
5									
						Light brown to brown SILTY CLAY, medium dense, medium plasticity, trace gravels, moist to wet @ 10'bgs			
	SB-011-910								
10									

DRILLING CONTRACTOR Earth Dimensions
DRILLING METHOD Direct Push
DRILLING EQUIPMENT CME Rig
DRILLING STARTED 9/22/20 ENDED 9/22/20

REMARKS

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BORING NO. SB-012 SHEET 1 OF 1
PROJECT Tulip Molded Plastics - P932169
LOCATION 3125 Highland Avenue, Niagara Falls, New York
DATUM Ft. AMSL
LOGGED BY TW

COORDINATES
SURFACE ELEVATION

SAMPLE INFORMATION					STRATA	DESCRIPTION	WELL CONSTRUCTION DETAIL		ELEVATION FEET
DEPTH FEET	LAB SAMPLE	BLOW COUNTS	Recovery %	PID (ppm)					
						Topsoil and Grass			
	SB-12-02		100	0		Reddish Brown CLAY, some silt, stiff, dry, low plasticity			
5						Reddish Brown SILTY CLAY, moisture from 7 to 8' bgs, stiff, low plasticity clay			
10						Reddish Brown CLAY; moist, stiff, medium plasticity, increasing moisture with depth, wet @ 14.75' bgs			
	SB-12-1314		100	0					
15									

DRILLING CONTRACTOR Nothnagle
DRILLING METHOD Direct Push
DRILLING EQUIPMENT CME Rig
DRILLING STARTED 7/20/21 ENDED 7/20/21

REMARKS

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BORING NO. SB-013 SHEET 1 OF 1
PROJECT Tulip Molded Plastics - P932169
LOCATION 3125 Highland Avenue, Niagara Falls, New York
DATUM Ft. AMSL
LOGGED BY TW

COORDINATES
SURFACE ELEVATION

SAMPLE INFORMATION					STRATA	DESCRIPTION	WELL CONSTRUCTION DETAIL		ELEVATION FEET
DEPTH FEET	LAB SAMPLE	BLOW COUNTS	Recovery %	PID (ppm)					
						Topsoil and grass			
	SB-13-02		100	0		Reddish Brown CLAY, some silt, dry, stiff, litle organics, low plasticity			
	SB-13-1314		100	0					
5						Reddish Brown SILTY CLAY, dry but moisture increasing with depth, low plsticity, trace organics (root fragments)			
10						Reddish Brown CLAY, moist, stiff, medium plasticity, increasing moisture with depth			
						SAA, wet @ 15.5' bgs			
15									

DRILLING CONTRACTOR Nothnagle
DRILLING METHOD Direct Push
DRILLING EQUIPMENT CME Rig
DRILLING STARTED 7/20/21 ENDED 7/20/21

REMARKS

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BORING NO. SB-014 SHEET 1 OF 1
PROJECT Tulip Molded Plastics - P932169
LOCATION 3125 Highland Avenue, Niagara Falls, New York
DATUM Ft. AMSL
LOGGED BY TW

COORDINATES
SURFACE ELEVATION

SAMPLE INFORMATION					STRATA	DESCRIPTION	WELL CONSTRUCTION DETAIL		ELEVATION FEET
DEPTH FEET	LAB SAMPLE	BLOW COUNTS	Recovery %	PID (ppm)					
	SB-14-02		100	0		Loose coal/debris, orgnics [FILL] brown re-worked silty clay, dry, trace fine sand and gravel, stiff, low plasticity			
5						Reddish Brown SILTY CLAY, low stiffness, low plasticity clay, dry but increasing moisture and plasticity with depth			
10						Reddish Brown CLAY, little silt, stiff, medium plasticity, moist to wet @ 12' bgs			
	SB-14-1314		100	0		SAA, wet @ 14' bgs			
15									

DRILLING CONTRACTOR Nothnagle
DRILLING METHOD Direct Push
DRILLING EQUIPMENT CME Rig
DRILLING STARTED 7/20/21 ENDED 7/20/21

REMARKS

Inventum Engineering
441 Carlisle Drive; Suite C
Herndon, VA 20170

BORING NO. SB-015 SHEET 1 OF 1
PROJECT Tulip Molded Plastics - P932169
LOCATION 3125 Highland Avenue, Niagara Falls, New York
DATUM Ft. AMSL
LOGGED BY TW

COORDINATES
SURFACE ELEVATION

SAMPLE INFORMATION					STRATA	DESCRIPTION	WELL CONSTRUCTION DETAIL		ELEVATION FEET
DEPTH FEET	LAB SAMPLE	BLOW COUNTS	Recovery %	PID (ppm)					
						Asphalt			
	SB-15-02			0		[FILL] re-worked brown clay with interbedded slag and coal, brick fragments, wet in slag layers, some organics			
5						SAA			
						Reddish Brown CLAY, little silt, stiff, dry, low to medium plasticity			
10						Reddish brown CLAY, trace silt, stiff, medium plasticity, increasing moisture with depth			
						SAA, moist to wet @ 15.5 bgs			
	SB-15-1314			0					
15									

DRILLING CONTRACTOR Nothnagle
DRILLING METHOD Direct Push
DRILLING EQUIPMENT CME Rig
DRILLING STARTED 7/20/21 ENDED 7/20/21

REMARKS

LOG A EWNN03 - LOG A EWNN03.GDT - 4/11/22 17:01 - C:\USERS\PUBLIC\DOCUMENTS\BENTLEY\GINTCL\PROJECTS\TULIP SIR.GPJ

Inventum Engineering
441 Carlisle Drive; Suite C
Herndon, VA 20170

BORING NO. SB-016 SHEET 1 OF 1
PROJECT Tulip Molded Plastics - P932169
LOCATION 3125 Highland Avenue, Niagara Falls, New York
DATUM Ft. AMSL
LOGGED BY TW

COORDINATES
SURFACE ELEVATION

SAMPLE INFORMATION					STRATA	DESCRIPTION	WELL CONSTRUCTION DETAIL		ELEVATION FEET
DEPTH FEET	LAB SAMPLE	BLOW COUNTS	Recovery %	PID (ppm)					
						Alphalt and Concrete			
	SB-16-02		100	0		[FILL] Coal, asphalt, slag, some organic woody debris			
			100	0		Brown SILTY CLAY, trace fine sand and organics, dry, low plasticity, med. stiff			
5			100	0		Light Brown to Brown SILTY CLAY, trace fine sand and organics, increasing moisture and plasticity with depth, stiff			
10			100	0		Brown CLAY, some silt, trace fine to medium sand and gravel, stiffness decreasing with depth, moisture and plasticity increasing with depth.			
	SB-16-1314		100	0		Reddish Brown CLAY, little silt, medium to high plasticity Wet @ 15' bgs			
15									

DRILLING CONTRACTOR Nothnagle
DRILLING METHOD Direct Push
DRILLING EQUIPMENT CME Rig
DRILLING STARTED 7/20/21 ENDED 7/20/21

REMARKS

LOG A EWNN03 - LOG A EWNN03.GDT - 4/11/22 17:01 - C:\USERS\PUBLIC\DOCUMENTS\BENTLEY\GINTCL\PROJECTS\TULIP SIR.GPJ

Inventum Engineering
441 Carlisle Drive; Suite C
Herndon, VA 20170

BORING NO. SB-017 SHEET 1 OF 1
PROJECT Tulip Molded Plastics - P932169
LOCATION 3125 Highland Avenue, Niagara Falls, New York
DATUM Ft. AMSL
LOGGED BY JE

COORDINATES
SURFACE ELEVATION

SAMPLE INFORMATION					STRATA	DESCRIPTION	WELL CONSTRUCTION DETAIL		ELEVATION FEET
DEPTH FEET	LAB SAMPLE	BLOW COUNTS	Recovery %	PID (ppm)					
						Aslphat pavement and Gravel			
	SB-017-02		100	1.2		[FILL] coal, slag, re-worked brown to light brown silty clays, slag fragments, dry to moist,			
5						Grey to Brown SILTY CLAY, moist, trace roots and fine gravel			
10	SB-017-1012		100	0.9		Reddish Brown SILTY CLAY, very moist to wet @ 12' bgs			
						Reddish Brown SILTY CLAY, trace gravel, soft, high plasticity			
15									

DRILLING CONTRACTOR Nothnagle
DRILLING METHOD Direct Push
DRILLING EQUIPMENT Geoprobe
DRILLING STARTED 8/31/21 ENDED 8/31/21

REMARKS

LOG A EWNN03 - LOG A EWNN03.GDT - 4/11/22 17:01 - C:\USERS\PUBLIC\DOCUMENTS\BENTLEY\GINTCL\PROJECTS\TULIP SIR.GPJ

Inventum Engineering
441 Carlisle Drive; Suite C
Herndon, VA 20170

BORING NO. SB-018 SHEET 1 OF 1
PROJECT Tulip Molded Plastics - P932169
LOCATION 3125 Highland Avenue, Niagara Falls, New York
DATUM Ft. AMSL
LOGGED BY JE

COORDINATES
SURFACE ELEVATION

SAMPLE INFORMATION					STRATA	DESCRIPTION	WELL CONSTRUCTION DETAIL		ELEVATION FEET
DEPTH FEET	LAB SAMPLE	BLOW COUNTS	Recovery %	PID (ppm)					
						Asphalt/Concrete Pavement			
	SB-018-02		100	6.5		[FILL] re-worked grey to reddish brown to dark brown SILTY CLAY, dense, moist, low plasticity,			
5						SAA			
						Greyish brown SILTY CLAY, dense, moist, medium plasticity but increasing with depth, becoming wet @ 14' bgs			
10	SB-018-1214		100	2.3					
15						[TILL] Greyish brown SILTY CLAY with medium to coarse gravel and some fine sand, wet, soft			

DRILLING CONTRACTOR Nothnagle
DRILLING METHOD Direct Push
DRILLING EQUIPMENT Geoprobe
DRILLING STARTED 8/31/21 ENDED 8/31/21

REMARKS

LOG A EWNN03 - LOG A EWNN03.GDT - 4/11/22 17:01 - C:\USERS\PUBLIC\DOCUMENTS\BENTLEY\GINTCL\PROJECTS\TULIP SIR.GPJ

Inventum Engineering
441 Carlisle Drive; Suite C
Herndon, VA 20170

BORING NO. SB-019 SHEET 1 OF 1
PROJECT Tulip Molded Plastics - P932169
LOCATION 3125 Highland Avenue, Niagara Falls, New York
DATUM Ft. AMSL
LOGGED BY JE

COORDINATES
SURFACE ELEVATION

SAMPLE INFORMATION					STRATA	DESCRIPTION	WELL CONSTRUCTION DETAIL		ELEVATION FEET
DEPTH FEET	LAB SAMPLE	BLOW COUNTS	Recovery %	PID (ppm)					
						Concrete Pavement			
	SB-19-02		100	0		[FILL] brick, coal/ash, cinders, slag (moist to wet), re-worked grey to reddish brown clay [dry, medium plasticity, trace gravel)			
5						SAA, wood fibers			
						Grey to brown SILTY CLAY, dense, medium plasticity to high plasticity, 3.0 ppm max			
10									
	SB-19-1113		100	0		[TILL] Grey to reddish brown SILTY CLAY with medium to coarse gravel, some medium to coarse sand, low plastiicty, wet @ 13' bgs, soft			
15									

DRILLING CONTRACTOR Nothnagle
DRILLING METHOD Direct Push
DRILLING EQUIPMENT Geoprobe
DRILLING STARTED 8/31/21 ENDED 8/31/21

REMARKS

LOG A EWNN03 - LOG A EWNN03.GDT - 4/11/22 17:01 - C:\USERS\PUBLIC\DOCUMENTS\BENTLEY\GINTCL\PROJECTS\TULIP SIR.GPJ

AECOM

Client: Tulip Corporation
Project Number: 60220285
Site Location: Niagara Falls NY
Coordinates: Elevation:
Drilling Method: HSA
Sample Type(s): SS
Boring Diameter: 4¼
Weather: sunny 75°F
Logged By: Emily Laity
Drilling Contractor: Earth Dimensions
Ground Elevation:
Date/Time Started: 8/16/11 15:00
Date/Time Finished: 8/17/11 9:45

Boring ID: MW-1
Sheet: 1 of 1
Monitoring Well Installed:
Screened Interval: 6-16'
Depth of Boring: 22
Water Level:

Depth (ft)	Geologic sample ID	Sample Depth (ft)	Blows per 6"	Recovery (inches)	Headspace (ppm)	USCS	MATERIALS: Color, size, range, MAIN COMPONENT, minor component(s), moisture content, structure, angularity, maximum grain size, odor, and Geologic Unit (If Known)	Lab Sample ID	Lab Sample Depth (ft)
1							Concrete 0 - 6"		
2							6" Dk Brown f-c SAND & f-M gravel, little silt (angular to sub rounded) 2.3' bgs		1
3						@	1.3 Red silty clay / clayey silt, little f. sand little f-M gravel sub rounded Native or Reworked native moist		
4									4
5									
6		5-7	1 2 2 4	17" or 22" w/ 5" void	52 ppm		0-9" (0-1" slough from above) Then Red brown clay, moist, plastic 9-14" VOID 14-22" Black organic material (0.8 ppm) w/ SILTY SAND	ODOR	6
7									
8							22"-24" and clay, no plasticity Dry to moist, loose mottled olive green to grey clay, ~~dense~~ med. stiff, slightly plastic, Dry to moist. ODOR		
9									
10							Jarred 5-7' black material and olive clay		
11		10-12	4 8 10 12	24"	4.5		PINKISH BROWN SILTY CLAY w/ TANISH Brown mottling, medium stiff to stiff, moist Native		10.0
12									
13									
14									
15									
16		15-17	9 12 11 15	24"	2.5		TILL Red brown silt, some clay little f-c gravel sub angular to sub rounded weathered shist noted, wet or moist to wet		16
17									
18									
19									
20									20
22'		20-22	13 25 35 52	24"	4.3		fine Red brown silt w/ f. sand or f sand w/ silt dry to moist angular gravel in bottom 3" top, med. dense top 8" has clay content (Little)		

NOTES:

Date	Time	Depth to groundwater while drilling

Checked by _____ Date: _____

Jarred 20-22' for vels

8/17/11 water @ 10' bgs 7:30

Flus Mount

Concrete

Bentonite

SAND

Bentonite

AECOM

Client:	Tulip Corp.
Project Number:	6022 0285
Site Location:	Niagara Falls, NY
Coordinates:	Elevation:
Drilling Method:	HSA
Sample Type(s):	HSA
Boring Diameter:	4 1/4 ID
Weather:	Sunny, 75°F
Logged By:	E. Laity
Date/Time Started:	8/16/11 9:45
Drilling Contractor:	Earth Dimensions
Ground Elevation:	
Date/Time Finished:	Abandoned

Boring ID: MW-2
Sheet: 1 of 1
Monitoring Well Installed:
Screened Interval: N/A
Depth of Boring: 2'
Water Level: N/A

Depth (ft)	Geologic sample ID	Sample Depth (ft)	Blows per 6"	Recovery (inches)	Headspace (ppm)	USCS	MATERIALS: Color, size, range, MAIN COMPONENT, minor component(s), moisture content, structure, angularity, maximum grain size, odor, and Geologic Unit (If Known)	Lab Sample ID	Lab Sample Depth (ft)	PID BACK GROUND (PPM)
1			NA	NA	NA	NA	Standard sampling. Asphalt 0-0.15ft Concrete 0.15'-0.7' bgs			0.1
2		0.7-1.7	100/5	5"	0.1		0-1" lt. brownish SAND (f-m), some clay, moist tr. fine gravel, sub rounded, piece dk grey slag. (FILL) 1"-5" Red brown silt, some clay low plasticity, little f. gravel, tr. brick subrounded, moist, trace black slag (coal?) At 1.5' possibly hit more concrete.			0.1
3										
4										
5										
6										
7										
8										
9										
10										
11										
12										
13										
14										
15										
16										
17										
18										
19										
20										

Hit void ~2' bgs w/ pipe at bottom ~3' down pull out stop move over.

NOTES:

Date	Time	Depth to groundwater while drilling

Checked by _____ Date: _____

AECOM

Client: Tulip Corp.
Project Number: 60220285
Site Location: Niagara Falls NY
Coordinates: Elevation:
Drilling Method: HSA
Sample Type(s): SS
Boring Diameter: 4¼" ID
Logged By: Emily Laity
Ground Elevation:
Weather: Sunny 80°F
Drilling Contractor: Earth Dimensions
Date/Time Started: 8/16/11 11:15
Date/Time Finished: 8/17/11 12:00

Boring ID: MW-2
Sheet: 1 of 1
Monitoring Well Installed:
Screened Interval: 6-16
Depth of Boring: 22'
Water Level: ~9' bgs

Depth (ft)	Geologic sample ID	Sample Depth (ft)	Blows per 6"	Recovery (inches)	Headspace (ppm)	U.S.C.S.	MATERIALS: Color, size, range, MAIN COMPONENT, minor component(s), moisture content, structure, angularity, maximum grain size, odor, and Geologic Unit (If Known)	Lab Sample ID	Lab Sample Depth (Ft.)
1							Asphalt 0-0.15'. Concrete 0.15'-0.7' bgs.		0.1
2		0.7 to 1.7	1 1 2	12	0.1	SM CL	0-6" = FILL - Grey to brown (f-c) SAND, little silt & cinders, ~~trace~~ little f. gravel moist 6-12" - CLAY Red brown, little silt, little f. gravel subangular		0.1
2.17									moist to wet
3	NA	NA	3 NA	NA	NA	NA	NA	NA	NA
4		3-5	2 1 2	6"	0.7	SM CL	0-1" - SLOUGH - GREY Brown SAND 1-6" - CLAY Red Brown - SAA, (Reworked?)		4 0.0
5									
6		5-7	2 2 3 6	20"	2.2	CL CH CL	0-~~9~~11" - Grey Brown CLAY, little silt, soft, moist to wet, little f. gravel angular, plastic 11-16" - Pinkish grey clay, little f-c sand to f. gravel, stiff, moist, moderate plasticity 16-20" - Red Brown CLAY, little silt, med. stiff, moist, low plasticity - NATIVE?		0.0 6
7									
8		7-9	5 6 7 7	24"	2.6	CL	0-24" - RED Brown CLAY, SAA - little f sand and SILT, moist to wet, last 4" wet.		0.0
9									
10		9-11	4 3 3 4	24"	2.6	CL	0-24" SAA Red Brown CLAY, little silt, trace ~~clay~~ f sand moderate plasticity, 4-24" wet 0-4" moist NATIVE		0.0
11									
12/28		11-13	15 20 15 11	16"	2.4	SC-CL	0-~~7~~11" Red brown CLAY w/ ~~some~~ little olive green CLAY mottles little silt, some f-c sand to f. gravel subangular to angular, ~~wet~~ wet		0.0
12									
13		13-15	19 12 12 21	5"	5.6	SC-CL GM SM	7"-16" SAA but w/ Larger Angular cobbles and f-c gravel angular to subrounded, TILL? SAA TILL?		0.0
14									
15									
16		15-17	9 16 21 32	20"	3.1	GM SM	0-10" SAA but Brown instead of Red brown, wet med. stiff 10"-20" Brown silt with little f. sand, little clay, little f-c gravel and cobbles, moist. med. dense		0.0 16
17							TILL		
18		17-19	34 26 31 29	24	0.8	GM-SM	SAA TILL 0-24" moist.		0.0
19									0.0
20		19-21	100/4						

Flushmount
Concrete
Bentonite
#1 Sand

Date	Time	Depth to groundwater while drilling

NOTES:

Checked by _____ Date: _____

AECOM

Client: Tulip Corp
Project Number: 60220285
Site Location: Niagara Falls NY
Coordinates: Elevation:
Drilling Method: HSA
Sample Type(s): SS
Boring Diameter: 4¼" ID
Weather: Sunny 80°F
Logged By: Emily Laidy
Drilling Contractor: Earth Dimensions
Ground Elevation:
Date/Time Started: 8/16/11 11:15
Date/Time Finished: 8/17/11 13:00

Boring ID: MW-2
Sheet: 1 of 1
Monitoring Well Installed:
Screened Interval: 6-16'
Depth of Boring: 22'
Water Level: ~9' bgs

Depth (ft)	Geologic sample ID	Sample Depth (ft)	Blows per 6"	Recovery (inches)	Headspace (ppm)	USCS	MATERIALS: Color, size, range, MAIN COMPONENT, minor component(s), moisture content, structure, angularity, maximum grain size, odor, and Geologic Unit (If Known)	Lab Sample ID	Lab Sample Depth (ft)
21		20-22	29 35 40 36	24"			TILL - SAA		
22									
23									
24									
25									
26									
27									
28									
29									
30									
11									
12									
13									
14									
15									
16									
17									
18									
19									
20									

NOTES:

Date	Time	Depth to groundwater while drilling

Checked by _____ Date: _____

AECOM

Client: Tulip Corp.
Project Number: 60220285
Site Location: Niagara Falls NY
Coordinates: Elevation:
Drilling Method: HSA / Core
Sample Type(s): SS
Boring Diameter: 4 1/4" ID

Boring ID: MW-3.
Sheet: 1 of 1
Monitoring Well Installed:
Screened Interval: (4-14) new location
Depth of Boring: 40.7' bgs
Water Level: ~6' bgs

Weather: Cloudy, 80°F
Logged By: E. Laity
Date/Time Started: 8/15/11 9:00hrs
Drilling Contractor: Earth Dimensions
Ground Elevation:
Date/Time Finished: 8/15/11 16:00

Depth (ft)	Geologic sample ID	Sample Depth (ft)	Blows per 6"	Recovery (inches)	Headspace (ppm)	U.S.C.S	MATERIALS: Color, size, range, MAIN COMPONENT, minor component(s), moisture content, structure, angularity, maximum grain size, odor, and Geologic Unit (If Known)	Lab Sample ID	Lab Sample Depth (ft)
1		0-2'	4	5"	0.0	SP	0"-3" Red brown f-c SAND w/ f-m gravel trace brick loose, dry Trace organics. FILL		PID Background 0.0
2			11						
			18						
3		2-4'	9	3"	0.0	SP	0-3" Red brown f-c sand, some f. gravel, dry to moist little grey & white sand f. gravel Angular FILL		0.0
4			8						
			7						
5		4-6'	7	6"	0.0	PT	0-1" PK Grey m. SAND and silt, trace clay, wet Fill		0.0
6	▽	WATER TABLE	5				1"-6" COAL SLAG Black Angular, wet		
			1						
7		6'-8'	1	4"	0.0	PT	0-4" SAA f-c gravel sized coal slag, wet.		0.1
8			1/12						
9		8-10'	1	1.3'	0.0	PT	0-3" SAA COAL Slag, wet.		0.1
10			5			SW	3"-5' Light white to l.grey SAND w/ Trace gravel, wet. (potash??)		
			4				5"-13" L.brown to tan f-c sand and silt w/ some		
			6			ML-CL	Coarse gravel (Angular) loose		
11		10-12	7	0	NA	NA	- Red clay, med. stiff, little silt moist to wet		
12			10				low plasticity (NATIVE)		
			12				NO Recovery		
			14						0.2
13		12-14'	8	24" (21")	0.2	CL	0-2" Sloughed med.		
14			8				2"-24" Red clay, stiff, little silt, low plasticity		
			11				moist to wet (NATIVE)		0.2
15			11						
16		14-16'	7	24"	0.2	CL	0-24" SAA. Red clay, slightly mottled w/ Red brown & med brown mottling. wet.		0.1
			10						
			8						
17			9						
18		16-18'	2	24"	0.1	CH	0-2" SAA Red clay		0.1
			2				2"-24" transitions to olive grey CLAY & SILT		
			2				very plastic, soft/wet		
19		18-20'	1	24"	0.1	CH	0-24" SAA color changing from olive grey to		
20			2				brownish grey, soft, wet		
			3						

9:20 Add Auger Flight
9:44 Add Auger Flight
10:05 Add Auger
1:30 Add Auger

NOTES: NO Auger Spoils Returned Augered to 20' bgs

Date	Time	Depth to groundwater while drilling

Checked by _____ Date: _____

AECOM

Client:	Tulip corn
Project Number:	60220285
Site Location:	Niagara Falls NY
Coordinates:	
Elevation:	
Drilling Method:	HSA / core barrel Rotary
Sample Type(s):	SS
Boring Diameter:	4¼" 10
Boring ID:	MW-3
Sheet:	1 of 1
Monitoring Well Installed:	
Screened Interval:	4-14
Weather:	P. cloudy 75°F
Logged By:	E. Laity
Date/Time Started:	8/15/11 9:00AM
Depth of Boring:	40.7'
Drilling Contractor:	Earth Dimensions
Ground Elevation:	
Date/Time Finished:	8/15/11 16:00
Water Level:	6' bgs

Time (margin)	Depth (ft)	Geologic sample ID	Sample Depth (ft)	Blows per 6"	Recovery (inches)	Headspace (ppm)	U.S.C.S	MATERIALS: Color, size, range, MAIN COMPONENT, minor component(s), moisture content, structure, angularity, maximum grain size, odor, and Geologic Unit (If Known)	Lab Sample ID	PID Back ground (ppm)
	21, 22		20-22'	1, 1, 2, 2	24"	0.1	CH	SAA CLAY Brownish, grey, soft wet. (new) tr. f.-m. angular gravel in last few inches & in shoe.		0.1
10:42	23, 24		22-24'	1, 3, 3, 3	24"	0.2	CH	SAA color change back to Red (Gray) 5% increase in silt content, Stn med. plasticity lower than above wet. * no spoils from Augers.		0.2
	25, 26		24-26'	1, 2, 3, 3	24"	0.2	CH	SAA		0.2
Add 11:00 Auger 25-30'	27, 28		26-28	17, 16, 19	24	0.2	CH / SC	0-16" SAA; 16-24" TILL; Red Brown SILT, little gravel (f-c angular) tr. f. cobbles angular, little f-c sand, little clay, wet. very stiff		0.2
	29, 30		28-30	23, 31, 25, 27	19"	0.1	SC	0-19" TILL SAA		0.1
12:05 30-35 Auger	31, 32		30-32	25, 28, 29, 35	24"	0.1	SC	0-24" SAA TILL but lower ~~clay~~ only tr. clay compared to above.		0.1
	33, 34		32-34'	17, 24, 34, 34	24"	0.1	SC / SP-SM	0-12" SAA TILL; 12"-24" Red Brown ~~fine sand~~ f. SAND little silt ~~little sand~~ no more f. gravel or cobbles in 12-24" portion		0.1
	35, 36		34-	7, 10, 10, 13	24"	0.2	SP	0-24" f. SAND Red-brown, medium dense, wet.		0.2
12:35 Add 35-40' Auger	37, 38, 39, 40							Augered to 40' bgs; — harder material		

NOTES:

Date	Time	Depth to groundwater while drilling

Checked by ____________ Date: ____________

AECOM

Client: Tulip Corp.
Project Number: 60320285
Site Location: Niagara Falls, NY
Coordinates: Elevation:
Drilling Method: HSA
Sample Type(s): SS
Boring Diameter: 4 1/4" ID

Boring ID: MW-3
Sheet: 1 of 1
Monitoring Well Installed:
Screened Interval: 4-14
Depth of Boring: 6' bgs = 40.7'
Water Level:

Weather: P. Cloudy 75°F
Logged By: E. Leity
Date/Time Started: 8/15/11 9:00
Drilling Contractor: Earth Dimensions
Ground Elevation:
Date/Time Finished: 8/15/11 16:00

Depth (ft)	Geologic sample ID	Sample Depth (ft)	Blows per 6"	Recovery (inches)	Headspace (ppm)	U.S.C.S	MATERIALS: Color, size, range, MAIN COMPONENT, minor component(s), moisture content, structure, angularity, maximum grain size, odor, and Geologic Unit (If Known)	Lab Sample ID	Lab Sample Depth (Ft.)
SS Refusal 4			34 100/2	3"	0.2		split spoon Refusal @ 40.7' bgs. Rock chips Dolostone		0.2
42									
43							B.O.B @ 40.7' bgs SS Refusal		
44									
45							Grouted hole		
46									
47							moved over to the west ~ 4'		
48									
49							will install well in overburden		
50									
51							screened 4' - 14' bgs.		
52									
53									
54									
55									
56									
57									
58									
59									
60									

NOTES:

Date	Time	Depth to groundwater while drilling

Checked by _____ Date: _____

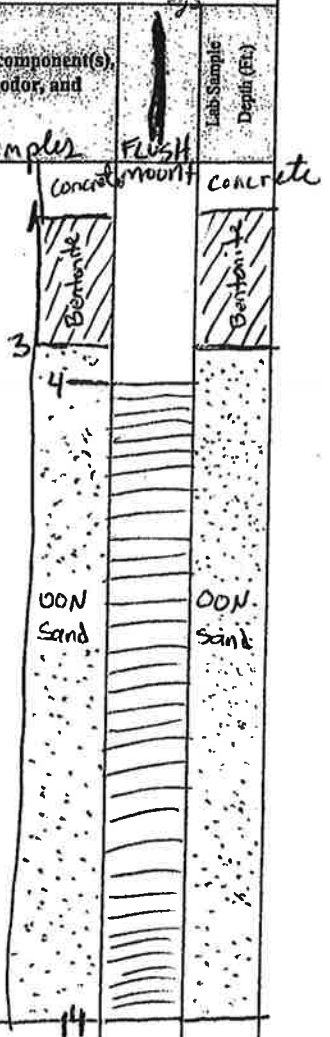
AECOM

Client:	Tulip Corp.
Project Number:	60220285
Site Location:	Niagara Falls, NY
Coordinates:	Elevation:
Drilling Method:	HSA
Sample Type(s):	Boring Diameter: 4¼" ID
Weather: Sunny 75°F	Logged By: E. Laity
Drilling Contractor: Earth Dimensions	Ground Elevation:
	Date/Time Started: 8/16/11 7:30
	Date/Time Finished: 8/16/11 9:30

Boring ID: MW-3

Sheet: 1 of 1
Monitoring Well Installed:
Screened Interval: 4-14
Depth of Boring: 14'
Water Level: ~6' bgs

Depth (ft)	Geologic sample ID	Sample Depth (ft)	Blows per 6"	Recovery (inches)	Headspace (ppm)	USCS	MATERIALS: Color, size, range, MAIN COMPONENT, minor component(s), moisture content, structure, angularity, maximum grain size, odor, and Geologic Unit (If Known)
1–14							Reinstall for MW-3 no samples see previous pgs for description Auger to 14' bgs set well 2" PVC 10slot screen
15–20							B.O.B. @ 14' bgs



NOTES:

Date	Time	Depth to groundwater while drilling

Checked by _____ Date: _____

Appendix F – Quality Assurance Project Plan

INVENTUM ENGINEERING, P.C.

Quality Assurance Project Plan

3125 Highland Avenue

Proposed BCP Site #932169

3219 and 3301 Highland Avenue

Niagara Falls, NY

October 2023

441 CARLISLE DRIVE
SUITE C
HERNDON, VA 20170
WWW.INVENTUMENG.COM

Table of Contents

1 Introduction

The purpose of this Quality Assurance Project Plan (QAPP) is to serve as a guidance document during implementation of the Remedial Investigation Work Plan (RIWP) and proposed Interim Remedial Measures (IRMs) for the proposed Brownfield Cleanup Program Site (BCP Site) located at 3125 Highland Avenue, Niagara Falls, NY (Existing NYSDEC Site No. P932169).

This QAPP is designed to provide an overview of Quality Assurance/Quality Control (QA/QC) procedures. Specific methods and QA/QC procedure for chemical testing of environmental samples obtained from the site as part of the Site Management.

An Inventum Engineering, P.C. (Inventum) Project Manager will be responsible for verifying that QA procedures are followed during the investigation and analysis. This will provide for the valid collection of representative samples. The Project Manager will be in direct contact with the analytical laboratory to ensure that holding times and other QA/QC requirements are met. The selected laboratory will be responsible for overseeing analytical QA/QC activities.

The estimated number of environmental samples and corresponding analytical parameters/methods that will be collected on a routine annual basis in accordance with the SMP are provided in Table 1 below. Additional samples may be collected as necessary.

Table 1 – Analytical Parameters and Methods

Parameter	EPA Method Reference	Soil	Groundwater	Soil Gas
TAL Metals	6010C	26	9	
TAL Metals (Dissolved)	6010C		9	
Mercury	7470A	26	9	
Mercury (Dissolved)	7470A		9	
Volatile Organic Compounds	8260C	26	9	
Volatile Organic Compounds	TO-15			5
Semi-Volatile Organic Compounds	8270D	26	9	

1,4 Dioxane	8270 SIM		9	
PFAS	1633 (Draft)		9	
TCLP Lead	1311/6010	13		
Field Duplicates			1 per semi-annual sample event	
MS/MSD			1 per semi-annual sample event	
Trip Blanks	8260		One per Volatile Shipment	
Rinsate (Equipment) Blanks	All Above Parameters		1 per semi-annual sample event if equipment is decontaminated/reused	

The analytical laboratory utilized will be a certified NYSDOH ELAP laboratory for the appropriate categories. The laboratory QA Manager will be responsible for performing project-specific audits and overseeing the quality control data generated.

2 Data Quality Objectives

Data Quality Objectives (DQOs) are qualitative and quantitative statements which specify the quality of data required to support the investigation of the Site. DQOs focus on the identification of the end use of the data to be collected. The project DQOs will be achieved utilizing the definitive data category, as outlined in Guidance for the Data Quality Objectives Process, EPA QA/G-4 (September 1994). All samples will provide definitive data, which are generated using rigorous analytical methods, such as the reference methods approved by the United States Environmental Protection Agency (USEPA). The purpose of this investigation is to establish a baseline of current conditions in order to aid in the development of an Alternatives Analysis (AA) for the proposed BCP Site.

Within the context of the purpose stated above, the project DQOs for data collected during the investigation are:

- To assess the current nature and extent of contamination in environmental media at the site above applicable Standards, Criteria, and Guidelines.

2.1 QA Objectives for Chemical Data Management

Sample analytical methodology for the media sampled and data deliverables will meet the requirements in the most recent NYSDEC Analytical Services Protocol (ASP). Laboratories will be instructed that completed Sample Preparation and Analysis Summary forms are to be submitted with the analytical data packages. The laboratory will also be instructed that matrix interferences must be cleaned up, to the extent practicable. The laboratory will be instructed to report all non-detect values to the method detection limit (MDL). In order to achieve the definitive data category described above, the data quality indicators of

precision, accuracy, representativeness, comparability, and completeness will be measured during offsite chemical analysis.

2.1.1 Precision

Precision examines the distribution of the reported values about their mean. The distribution of reported values refers to how different the individual reported values are from the average reported value. Precision may be affected by the natural variation of the matrix or contamination within that matrix, as well as by errors made in field and/or laboratory handling procedures. Precision is evaluated using analyses of a laboratory matrix spike/matrix spike duplicate (for organics) and matrix duplicates (for inorganics), which not only exhibit sampling and analytical precision, but indicate analytical precision through the reproducibility of the analytical results. Relative Percent Difference (RPD) is used to evaluate precision. RPD criteria must meet the method requirements identified in QAPP Section 6.1.

2.1.2 Accuracy

Accuracy measures the analytical bias in a measurement system. Sources of error are the sampling process, field contamination, preservation, handling, sample matrix, sample preparation, and analysis techniques. These data help to assess the potential concentration contribution from various outside sources. The laboratory objective for accuracy is to equal or exceeds the accuracy demonstrated for the applied analytical methods on samples of the same matrix. The percent recovery criterion is used to estimate accuracy based on recovery in the matrix spike/matrix spike duplicate and matrix spike blank samples. The spike and spike duplicate, which will give an indication of matrix effects that may be affecting target compounds is also a good gauge of method efficiency.

2.1.3 Representativeness

Representativeness expresses the degree to which the sample data accurately and precisely represent the characteristics of a population of samples, parameter variations at a sampling point, or environmental conditions. Representativeness is a qualitative parameter, which is most concerned with the proper design of the sampling program or sub-sampling of a given sample. Objectives for representativeness are defined for sampling and analysis tasks and are a function of the investigative objectives. The sampling procedures have been selected with the goal of obtaining representative samples for the media of concern.

2.1.4 Comparability

Comparability is a qualitative parameter expressing the confidence with which one data set can be compared with another. A DQO for this program is to produce data with the greatest practicable degree of comparability. This goal is achieved through using standard techniques to collect and analyze representative samples and reporting analytical results in appropriate units. Complete field documentation will support the assessment of comparability. Comparability is limited by the other parameters (e.g., precision, accuracy, representativeness, completeness, comparability), because only when precision and accuracy are known can data sets be compared with confidence. In order for data sets may be comparable, it is imperative that contract-required methods and procedures be explicitly followed.

2.1.5 Completeness

Completeness is defined as a measure of the amount of valid data obtainable from a measurement system compared to the amount that was expected to be obtained under normal conditions. It is important that appropriate QA procedures be maintained to verify that valid data are obtained in order to meet project needs. For the data generated, a goal of 90% is required for completeness (or usability) of the analytical data. If this goal is not met, then NYSDEC, Inventum, and the 3821 River Road project personnel will determine whether the deviations might cause the data to be rejected.

3 Sampling Locations, Custody, Holding Times, and Analysis

Sample locations and procedures are discussed SMP. Procedures for chain of custody, holding times and laboratory analyses shall be followed as per SW-846 and as per the laboratory's Quality Assurance Plan. All holding times begin with validated time of sample receipt (VTSR) at the laboratory. The laboratory must meet the method required detection limits which are referenced within the EPA Methods (QAPP Table 1).

4 Calibration Procedures and Frequency

In order to obtain a high level of precision and accuracy during sample processing procedures laboratory instruments must be calibrated property. Several analytical support areas must be considered so the integrity of standards and reagents is upheld prior to instrument calibration. The following section describe the analytical support areas and laboratory instrument calibration procedures.

4.1 Analytical Support Areas

Prior to generating quality data, several analytical support areas must be considered; these are detailed in the following paragraphs.

- Standard/Reagent Preparation - Primary reference standards and secondary standard solutions shall be obtained from National Institute of Standards and Technology (NIST), or other reliable commercial sources to verify the highest purity possible. The preparation and maintenance of standards and reagents will be accomplished according to the methods referenced. All standards and standard solutions are to be formally documented (i.e., in a logbook) and should identify the supplier, lot number, purity/concentration, receipt/preparation date, preparers name, method of preparation, expiration date, and any other pertinent information. All standard solutions shall be validated prior to use. Care shall be exercised in the proper storage and handling of standard solutions (e.g., separating volatile standards from nonvolatile standards). The laboratory shall continually monitor the quality of the standards and reagents through well documented procedures.

- Balances - The analytical balances shall be calibrated and maintained in accordance with manufacturer specifications. Calibration is conducted with two Class AS" weights that bracket the expected balance use range. The laboratory shall check the accuracy of the balances daily and they must be properly documented in permanently bound logbooks.

- Refrigerators/Freezers - The temperature of the refrigerators and freezers within the laboratory shall be monitored and recorded daily. This will verify that the quality of the standards and reagents is not compromised, and the integrity of the analytical samples is upheld. Appropriate acceptance ranges (2 to 6°C for refrigerators) shall be clearly posted on each unit in service.

- Water Supply System - The laboratory must maintain a sufficient water supply for all project needs. The grade of the water must be of the highest quality (analyte-free) in order to eliminate false-positives from the analytical results. Ultraviolet cartridges or carbon absorption treatments are recommended for organic analyses and ion-exchange treatment is recommended for inorganic tests. Appropriate documentation of the quality of the water supply system(s) will be performed on a regular basis.

4.2 Laboratory Instruments

Calibration of instruments is required to verify that the analytical system is operating properly and at the sensitivity necessary to meet established quantitation limits. Each instrument for organic and inorganic analyses shall be calibrated with standards appropriate to the type of instrument and linear range established within the analytical method(s). Calibration of laboratory instruments will be performed according to specified methods.

In addition to the requirements stated within the analytical methods, the contract laboratory will be required to analyze an additional low-level standard at or near the detection limits. In general, standards will be used that bracket the expected concentration of the samples. This will require the use of different concentration levels, which are used to demonstrate the instrument's linear range of calibration.

Calibration of an instrument must be performed prior to the analysis of any samples and then at periodic intervals (continuing calibration) during the sample analysis to verify that the instrument is still calibrated. If the contract laboratory cannot meet the method required calibration requirements, corrective action shall be taken as discussed in QAPP Section 7. All corrective action procedures taken by the contract laboratory are to be documented, summarized within the case narrative, and submitted with the analytical results.

5 Internal Quality Control Checks

Internal QC checks are used to determine if analytical operations at the laboratory are in control, as well as determining the effect sample matrix may have on data being generated. Two types of internal checks are performed and are described as batch QC and matrix-specific QC procedures. The type and frequency of specific QC samples performed by the contract laboratory will be according to the specified analytical method and project specific requirements. Acceptable criteria and/or target ranges for these QC samples are presented within the referenced analytical methods.

QC results which vary from acceptable ranges shall result in the implementation of appropriate corrective measures, potential application of qualifiers, and/or an assessment of the impact these corrective measures have on the established data quality objectives. Quality control samples including any project-specific QC will be analyzed are discussed below.

5.1 Batch QC

Method Blanks - A method blank is defined as laboratory-distilled or deionized water that is carried through the entire analytical procedure. The method blank is used to determine the level of laboratory background contamination. Method blanks are analyzed at a frequency of one per analytical batch.

Matrix Spike Blank Samples - A matrix spike blank (MSB) sample is an aliquot of water spiked (fortified) with all the elements being analyzed for calculation of precision and accuracy to verify that the analysis that is being performed is in control. An MSB will be performed for each matrix and organic parameter only.

5.2 Matrix-Specific QC

Matrix Spike Samples - An aliquot of a matrix is spiked with known concentrations of specific compounds as stipulated by the methodology. The matrix spike (MS) and matrix spike duplicate (MSD) are subjected to the entire analytical procedure in order to assess both accuracy and precision of the method for the matrix by measuring the percent recovery and relative percent difference of the two spiked

samples. The samples are used to assess matrix interference effects on the method, as well as to evaluate instrument performance. MS/MSDs are analyzed at a frequency of one each per 20 samples per matrix.

Matrix Duplicates - The matrix duplicate (MD) is two representative aliquots of the same sample which are prepared and analyzed identically. Collection of duplicate samples provides for the evaluation of precision both in the field and at the laboratory by comparing the analytical results of two samples taken from the same location. Obtaining duplicate samples from a soil matrix requires homogenization (except for volatile organic compounds) of the sample aliquot prior to filling sample containers, in order to best achieve representative samples. Every effort will be made to obtain replicate samples; however, due to interferences, lack of homogeneity, and the nature of the soil samples, the analytical results are not always reproducible.

Rinsate (Equipment) Blanks - A rinsate blank is a sample of laboratory demonstrated analyte free water passed through and over the cleaned sampling equipment. A rinsate blank is used to indicate potential contamination from ambient air and from sample instruments used to collect and transfer samples. This water must originate from one common source within the laboratory and must be the same water used by the laboratory performing the analysis. The rinsate blank should be collected, transported, and analyzed in the same manner as the samples acquired that day. Rinsate blanks for nonaqueous matrices should be performed at a rate of 10 percent of the total number of samples collected throughout the sampling event. Rinse blanks will not be performed on samples (i.e., groundwater) where dedicated disposable equipment is used.

Trip Blanks - Trip blanks are not required for nonaqueous matrices. Trip blanks are required for aqueous sampling events. They consist of a set of sample bottles filled at the laboratory with laboratory demonstrated analyte free water. These samples then accompany the bottles that are prepared at the lab into the field and back to the laboratory, along with the collected samples for analysis. These bottles are never opened in the field. Trip blanks must return to the lab with the same set of bottles they accompanied to the field. Trip blanks will be analyzed for volatile organic parameters. Trip blanks must be included at a rate of one per volatile sample shipment.

6 Calculation of Data Quality Indicators

6.1 Precision

Precision is evaluated using analyses of a field duplicate and/or a laboratory MS/MSD which not only exhibit sampling and analytical precision but indicate analytical precision through the reproducibility of the analytical results. RPD is used to evaluate precision by the following formula:

$$RPD = \frac{(X1 - X2) \times 100\%}{[(X1 + X2)/2]}$$

Where:

X1= Measured value of sample or matrix spike

X2= Measured value of duplicate or matrix spike duplicate

Precision will be determined through the use of MS/MSD (for organics) and matrix duplicates (for inorganics) analyses.

6.2 Accuracy

Accuracy is defined as the degree of difference between the measured or calculated value and the true value. The closer the numerical value of the measurement comes to the true value or actual concentration, the more accurate the measurement is. Analytical accuracy is expressed as the percent recovery of a compound or element that has been added to the environmental sample at known concentrations before analysis. Analytical accuracy may be assessed through the use of known and unknown QC samples and spiked samples. It is presented as percent recovery. Accuracy will be determined from matrix spike, matrix spike duplicate, and matrix spike blank samples, as well as from surrogate compounds added to organic fractions (i.e., volatiles, semi volatiles, PCB), and is calculated as follows:

$$\text{Accuracy (\%R)} = \frac{(Xs - Xu) \times 100\%}{K}$$

Where:

Xs- Measured value of the spike sample

Xu- Measured value of the unspiked sample

K - Known amount of spike in the sample

6.3 Completeness

Completeness is calculated on a per matrix basis for the project and is calculated as follows:

$$\text{Completeness (\%C)} = \frac{(Xv - Xn) \times 100\%}{N}$$

Where:

Xv- Number of valid measurements

Xn- Number of invalid measurements

N - Number of valid measurements expected to be obtained

7 Corrective Actions

Laboratory corrective actions shall be implemented to resolve problems and restore proper functioning to the analytical system when errors, deficiencies, or out-of-control situations exist at the laboratory. Full documentation of the corrective action procedure needed to resolve the problem shall be filed in the project records, and the information summarized in the case narrative. A discussion of the corrective actions to be taken is presented in the following sections.

7.1 Incoming Samples

Problems noted during sample receipt shall be documented by the laboratory. The Inventum Project Manager shall be contacted immediately for problem resolution. All corrective actions shall be documented thoroughly.

7.2 Sample Holding Times

If any sample extraction and/or analyses exceed method holding time requirements, the Inventum Project Manager shall be notified immediately for problem resolution. All corrective actions shall be documented thoroughly.

7.3 Instrument Calibration

Sample analysis shall not be allowed until all initial calibrations meet the appropriate requirements. All laboratory instrumentation must be calibrated in accordance with method requirements. If any initial/continuing calibration standards exceed method QC limits, recalibration must be performed and, if necessary, reanalysis of all samples affected back to the previous acceptable calibration check.

7.4 Reporting Limits

The laboratory must meet the method required detection limits listed in NYSDEC ASP, 10/95 criteria. If difficulties arise in achieving these limits due to a particular sample matrix, the laboratory must notify Inventum personnel for problem resolution. In order to achieve those detection limits, the laboratory must utilize all appropriate cleanup procedures in an attempt to retain the project required detection limits. When any sample requires a secondary dilution due to high levels of target analytes, the laboratory must document all initial analyses and secondary dilution results. Secondary dilution will be permitted only to bring target analytes within the linear range of calibration. If samples are analyzed at a secondary dilution with no target analytes detected, the Project Manager will be immediately notified so that appropriate corrective actions can be initiated.

7.5 Method QC

All QC method-specified QC samples shall meet the method requirements referenced in the analytical methods. Failure of method-required QC will result in the review and possible qualification of all affected data. If the laboratory cannot find any errors, the affected sample(s) shall be reanalyzed and/or re-extracted/redigested, then reanalyzed within method-required holding times to verify the presence or absence of matrix effects. If matrix effect is confirmed, the corresponding data shall be flagged accordingly using the flagging symbols and criteria. If matrix effect is not confirmed, then the entire batch of samples may have to be reanalyzed and/or re-extracted/redigested, then reanalyzed. Inventum shall be notified as soon as possible to discuss possible corrective actions should unusually difficult sample matrices be encountered.

7.6 Calculation Errors

All analytical results must be reviewed systematically for accuracy prior to submittal. If upon data review calculation and/or reporting errors exist, the laboratory will be required to reissue the analytical data report with the corrective actions appropriately documented in the case narrative.

8 Data Reduction, Validation, and usability

8.1 Data Reduction

Laboratory analytical data are first generated in raw form at the instrument. These data may be either in a graphic or printed tabular format. Specific data generation procedures and calculations are found in each of the referenced. Analytical results must be reported consistently. Identification of all analytes must be accomplished with an authentic standard of the analyte traceable to NIST or USEPA sources. Individuals experienced with a method's particular analysis and knowledgeable of requirements will perform data reduction.

8.2 Data Validation

Data validation is a systematic procedure of reviewing a body of data against a set of established criteria to provide a specified level of assurance of validity prior to its intended use. All analytical samples collected will receive a data review by Inventum. All analytical samples will also receive a third-party verification and validation based on completeness and compliance checks of sample receipt conditions and both sample-related and instrument-related QC results. In addition, a minimum of 10 percent of the samples will also receive third-party recalculations checks and review of actual instrument outputs. A third-party Data Usability Summary Report (DUSR) will be prepared for all samples collected during the RI. Inventum personnel may recommend further third-party validation if significant deviations and problems with the analytical data are uncovered during completion of the work.

The methods as well as the general guidelines presented in the following documents will be used during the data review USEPA Contract Laboratory Program (CLP) Organic Data Review, SOP Nos. HW-6, Revision #11 and USEPA Evaluation of Metals Data for the Contract Laboratory Program based on 3/90, SOW, Revision XI. These documents will be used with the following exceptions:

- Technical holding times will be in accordance with NYSDEC ASP, 10/95 edition.
- Organic calibration and QC criteria will be in accordance with NYSDEC ASP, 10/95 edition. Data will be qualified if it does not meet NYSDEC ASP, 10/95 criteria.

Where possible, discrepancies will be resolved by the project manager (i.e., no letters will be written to laboratories).

Category B deliverables will be provided for all samples collected to delineate the nature and extent of contamination. Electronic Data Deliverables (EDDs) consistent with the most recent NYSDEC Environmental Information Management System (EIMS) format will be included with the deliverables and will be uploaded to the EIMS.

9 References

- Comprehensive Environmental Response Compensation and Liability Act (CERCLA) Quality Assurance Manual, Final Copy, Revision I, October 1989.
- National Enforcement Investigations Center of USEPA Office of Enforcement. NEIC Policies and Procedures. Washington: USEPA.
- New York State Department of Environmental Conservation (NYSDEC). 1995. Analytical Services Protocol, (ASP) 10/95 Edition. Albany: NYSDEC.

Appendix G – Health and Safety Plan

Inventum Engineering
Site-Specific Health and Safety Plan (HASP)

(Required for all Type 2 and 3 projects.)

1. General Information

Client Name: 3125 Highland Avenue, Inc.

Project #:

Project Name: 3125 Highland Avenue BCP Site Remedial Investigations and Interim Remedial Measures

Project Manager: John Black, PE

Street Address:

3219 and 3301 Highland Avenue

Niagara Falls, New York

Prepared By: Peter Zaffram Date: February 9, 2023

Approved By: John Black, P.E. Date:

Proposed Date(s) of Work: TBD

Proposed Scope of Work:

Inventum Engineering, P.C. (Inventum) will be the owner's representative and engineer for the site management, site investigation(s), remedial investigation(s), and Interim Remedial Measures (IRMs) through the New York State Brownfield Cleanup Program (BCP) for 3125 Highland Avenue, Inc. located on the 3125 Highland Avenue proposed BCP Site (Site). The general scope of work is provided below, and tasks will be updated with additional details/specifications as the project progresses through the BCP.

Task 1 - Site Management and Oversight

Inventum will conduct site visits, general management, and general contractor and subcontractor oversight related to the Site's entry into the BCP. This task includes site visits related to performance of Site maintenance, relocation of equipment and products, and housekeeping, but specifically excludes Inventum personnel directly performing any intrusive site work or oversight of contractors/subcontractors performing intrusive site work. Direct intrusive site work and/or intrusive site work oversight is covered under the tasks listed below.

Task 2 – Surficial Soil Sampling

Surficial (approximately 0 to 1 foot below ground surface [bgs]) soil samples will be collected from various locations of the BCP Site to establish current conditions. Shallow borings will be installed using a hand-auger, shovel, or trowel and the material will be recovered for lithological characterization and field screening with a PID equipped with a 10.6 eV lamp. All observations and measurements will be logged in the field notebook. Samples may be collected for various constituents including Metals, Semi-Volatile Organic Compounds (SVOCs), Volatile Organic

Compounds (VOCs), Polychlorinated Biphenyls (PCBs), 1,4-Dioxane, and Per- and Polyfluoroalkyl Substances (PFAS).

Task 3 – Subsurface Soil Sampling

Subsurface (> 1 feet bgs) soils samples will be collected from various locations of the BCP Site to establish current conditions. Depending on the depth of sample, subsurface borings may be installed using a hand-auger, shovel, trowel, light or heavy excavating equipment, direct-push equipment, or rotary drilling equipment. Material will be recovered for lithological characterization and field screening with a PID equipped with a 10.6 eV lamp. All observations and measurements will be logged in the field notebook. Samples may be collected for various constituents including Metals, SVOCs, VOCs, PCBs, 1,4-Dioxane, and PFAS.

Task 4 – Permit Compliance Water and Wastewater Sampling

Water samples will be collected periodically in accordance with a City of Niagara Falls Sewer Discharge Permit.

Compliance samples in accordance with requirements of the Sewer Discharge Permit will be collected in accordance with the project specific requirements of the permit.

Task 5 – Monitoring Well Installation

New monitoring wells may be installed as part of the BCP investigation(s) and remedial activities. The borings for the wells will be advanced to depth using hollow-stem augers for the collection of soil samples for lithological characterization. Unconsolidated material samples will be collected for observation and screening with a photo-ionization detector (PID) equipped with a 10.6 eV lamp in a continuous interval over the total depth of the boring with a split barrel sampler driven through the augers. All lithological observations, field measurements, and well construction details will be logged in the field notebook. Surface and subsurface soil samples may be collected in accordance with Tasks 2 and 3.

The new wells will be completed with a 2-inch Schedule 40 polyvinyl chloride (PVC) well casing and 5-feet of 0.010-inch slotted screen. A sand filter pack will be placed from the bottom of the screened interval to a minimum of 1 foot above the top of the screen. A 2-foot bentonite seal will be placed on top the filter pack and the remaining annular space will be completed with a cement grout (Portland Type I cement with 3 – 5% bentonite). The wells may either be completed flush-to-grade within a traffic rated box or within a steel bollard enclosure that protrudes a minimum of 2-feet above ground surface.

All newly installed wells will be developed prior to sampling and any existing monitoring wells may be redeveloped prior to sampling. The water levels in the monitoring wells will be manually measured using an oil/water interface probe prior to redevelopment and the depth to water, depth and thickness of any Light Non-Aqueous Phase Liquid (LNAPL), and the total depth of the well will be measured and logged in the field notebook. The wells will be redeveloped by removing three well volumes, purging the wells until dry, or purging and surging the wells using a submersible pump.

Field parameters (temperature, pH, conductivity, ORP, turbidity) will be measured and logged in the field notebook at least three (3) times during the development process (beginning, middle, and end) using a hand-held water quality monitor. All development water will be containerized and stored in appropriately labeled drums or totes and disposed offsite in accordance with applicable local, state, and federal regulations.

Task 6 – Groundwater Monitoring and Sampling

Inspections will be conducted prior to sampling and will include visual observations of the well head, seal, and cover. Measurements of the depth to liquid (if LNAPL is present), depth to water, and the overall total depth of the well will be collected using an oil/water interface probe and recorded in the field notebook for comparison to construction dimensions and previous records.

Monitoring wells will be sampled using a peristaltic pump following low-flow sampling procedures. Field parameters (temperature, pH, conductivity, ORP, turbidity) will be measured and logged in the field notebook at periodic intervals using a hand-held water quality monitor. All purge water will be containerized and stored in appropriately labeled drums or totes and disposed offsite in accordance with applicable local, state, and federal regulations.

Samples may be collected for various constituents including Metals, SVOCs, VOCs, PCBs, 1,4-Dioxane, and PFAS.

Task 7 – Demolition Monitoring

Inspections and air monitoring will be conducted throughout the process of demolition of buildings, process equipment and pavement. Inspections will include; observing and documenting the collection and proper management of containers and liquid filled equipment; proper placement of erosion and sediment controls, dust control, tire washing and inlet control, and materials management.

Monitoring will include compliance monitoring defined by the Community Air Monitoring Plan (CAMP), photographs to document progress, and documentation of progress and generation of material for offsite disposal.

Samples may be collected from liquids and solid debris for various constituents including Metals, SVOCs, VOCs, and PCBs.

Task 8 – Soil Excavation and Stabilization

There are soils and piles of debris known to contain materials that exhibit the characteristics of hazardous waste for lead. Onsite activities will include sampling materials for offsite analysis, documenting the activities associated with stabilization of the soils, documentation of the excavation of the soils, and monitoring the placement of fill.

Monitoring will include compliance monitoring defined by the Community Air Monitoring Plan (CAMP), photographs to document progress, and documentation of progress and generation of material for offsite disposal.

Samples will be collected from soil and solid debris for various constituents including Metals, SVOCs, VOCs, and PCBs.

Inventum Engineering
Site-Specific Health and Safety Plan (HASP)

(Required for all Type 2 and 3 projects.)

Inventum Role(s) On Site:

- ☐ Inventum Staff Will Not Be On Site (HASP and Risk Analysis is for subcontractor information only)
- ☐ Resident Project Representative (*e.g.,* "Observe and Document")
- ☐ Construction Manager (*e.g.,* CM, Managing/General Contractor)
- ☒ Representative for Client (*e.g.,* "Agent for Owner")
- ☒ General On-site Consulting/Engineering Services
- ☒ Other

☒ Soil Sampling	☒ Solid Waste Sampling	☒ Liquid Waste Sampling
☒ Groundwater Sampling	☒ Surface Water Sampling	☒ Wastewater Sampling
☒ Sediment Sampling	☐ Surveying	☐ Confined Space Entry

Risk Analysis (RA)

(Required for all Inventum Type 2 or Type 3 field projects.)

Major Project Tasks	Inventum Task	Subcontractor Task	Minimum PPE Level Required see HASP for details (suggested levels for Subcontractor work)
1. Site Management and Oversight	☒	☐	☐ N/A ☒ D ☐ C ☐ B ☐ A
2. Surficial Soil Sampling	☒	☒	☐ N/A ☒ D ☐ C ☐ B ☐ A
3. Subsurface Soil Sampling	☒	☒	☐ N/A ☒ D ☐ C ☐ B ☐ A
4. Permit Compliance Water and Wastewater Sampling	☒	☒	☐ N/A ☒ D ☐ C ☐ B ☐ A
5. Monitoring Well Installation	☒	☒	☐ N/A ☒ D ☐ C ☐ B ☐ A
6.			

2. Contingency Planning

LOCAL EMERGENCY RESOURCES:	
Ambulance: 911	Emergency Room:
Police: 911	Fire Department: 911
NYSDEC Contact:	Poison Control Center: 1-800-222-1222 ☐ Specify:
Other (client services offered, etc.):	

SITE RESOURCES:			
Drinking Water Supply	☐ Inventum	☐ Subcontractor	☒ Client
Wash Water Supply	☐ Inventum	☐ Subcontractor	☒ Client
Telephone – Land Line		☐ Subcontractor	☒ Client
Telephone - Cellular	☒ Inventum	☐ Subcontractor	
First Aid Kit	☒ Inventum	☒ Subcontractor	
Fire Extinguisher	☐ Inventum	☒ Subcontractor	☒ Client
Emergency Shower N/A	☐ Inventum	☐ Subcontractor	☐ Client
Eye Wash	☐ Inventum	☐ Subcontractor	☒ Client
Other: Confined space retrieval device N/A	☐ Inventum	☐ Subcontractor	☐ Client

Risk Analysis (RA)

(Required for all Inventum Type 2 or Type 3 field projects.)

EMERGENCY/SAFETY CONTACTS:	
Inventum Technical Contacts	John Black (571.217.6761); Todd Waldrop (571.217.3627); James Edwards (571.232.5048)
Inventum Project Manager (PM): John Black	571.217.6761
Inventum Office Safety Coordinator (OSC)	John Black (571.217.6761); Todd Waldrop (571.217.3627); James Edwards (571.232.5048)
Inventum Field Contact:	John Black (571.217.6761); Todd Waldrop (571.217.3627); James Edwards (571.232.5048); Roxanne Birx (585.734.5255); Peter Zaffram (716.553.5129)
Contractor Contact (To Vary – Main Remedial Contractor provided):	Ontario Specialty Contracting; 716.856.3333
Client Contact:	Jon Williams: 716.856.3333; John Yensan (716.856.3333)

Emergency Route:

Hospitals or clinics identified for emergency medical care should be contacted, to verify that emergency care is provided at that location. Verify the exact location of the medical facility during this call. See directions and map of route to _____ Hospital on the following page:

Hospital: Other: NA

Map to Hospital

Directions to Hospital:

Emergency Procedures:

If an emergency develops at the site, the first responder should take the following course of action:

- Notify the proper emergency services for assistance.
- Notify other personnel at the site.
- As soon as possible, contact the Inventum Project Manager to inform them of the incident.
- Complete the Inventum Incident Report Form (see Appendices) within 24 hours of the incident and client notifications, as required.

Risk Analysis (RA)

(Required for all Inventum Type 2 or Type 3 field projects.)

Investigation of Near Miss Incident and Initial Report of Incident/Exposure:

Inventum employees are required to report any incident, near miss, or injury, as soon as possible, by contacting the following:

☒ Inventum Managing Partner ☒ Notify supervisor ☒ Notify project manager

☐ Notify Site Manager () ☐ Complete client report: as required

(name):

(phone number):

Emergency Equipment Required On Site:

☒ First Aid Kit

☐ Emergency Eye Wash

☐ Emergency Shower

☐ Fire Extinguisher

☐ Spill Control Media

☐ Tripod/Hoist/Harness for non-entry confined space rescue

Risk Analysis (RA)

(Required for all Inventum Type 2 or Type 3 field projects.)

3. Site Classification

Identification of Potential Hazards		YES	NO	SITE TYPE(1)
1.	Is the work a Phase I ESA (i.e., supervised plant walk-through, etc.)?	☒	☐	1
2.	Is the work being performed solely by a subcontractor (i.e., INVENTUM not on site)?	☐	☒	1
3.	Is the work just a supervised inspection for process evaluation, other inspections, meetings, records review, or a tour?	☒	☐	1
4.[1]	Is the work completely absent any chemical, physical, biological, or radiological hazards which would require a site-specific health and safety plan?	☐	☒	1
5.	Does the work include any mandatory client H&S requirements?	☒	☐	1, 2, or 3
6.	Does the project include on-site work other than office type areas?	☒	☐	2 or 3
7.	Does the proposed work scope involve any of the following:			
	Known and controlled chemical or biological hazards	☒	☐	2
	Unprotected work at elevation (fall protection required)	☐	☒	2
	Invasive activities (*i.e.,* Phase II ESA, UST Removal, sampling, etc.)	☒	☐	2 or 3
	Exposure to ionizing radiation (i.e., using nuclear gauges, etc.)	☐	☒	2 or 3
	Open excavations/trenches (Competent Person may be required on site)	☒	☐	2 or 3
	Confined space entry (permit may be required)	☐	☒	2 or 3
	The use of scaffolding (qualified inspections are required)	☐	☒	2 or 3
	Heavy equipment	☒	☐	2 or 3
	Facility maintenance (O&M, piping, electrical, lockout/tagout, etc.)	☐	☒	2 or 3
	Underground utilities may be encountered	☒	☐	2 or 3
	Overhead utilities may be encountered	☒	☐	2 or 3
	Stack testing	☐	☒	2 or 3
	Geotechnical drilling	☒	☐	2 or 3
	Demolition Activities with known or suspected contamination	☒	☐	2 or 3
	Unknown or uncontrolled chemical or biological hazards	☐	☒	3
	Known and uncontrolled chemical or biological hazards	☒	☐	3
	Waste sampling	☒	☐	3
	Construction activities with known or suspected contamination	☒	☐	3
	Remedial activities (RCRA, CERCLA, EnviroBlend®, Oxigent, etc.)	☒	☐	3
8.	Is the work regulated by 29 CFR 1910.120 (OSHA) or 30 CFR (MSHA)?	☒	☐	3
9.	Is the work regulated by NPL, CERCLA, RCRA, TSD, or SARA?	☒	☐	3

(1) Denotes typical site level (based on activities).

Risk Analysis (RA)

(Required for all Inventum Type 2 or Type 3 field projects.)

Site Type Designation:

☐ Type 1 Known and controlled hazards associated with consulting/engineering services.

☐ Type 2 Known and controlled hazards, but with invasive, hazardous activities and/or civil/mechanical construction related services, or sampling.

☒ Type 3 Unknown and/or uncontrolled hazards associated with corrective action clean-up, and/or remediation of hazardous substances.

4. Site Characterization

Client Requirement(s)[1]:	☒ None	☐ Site Orientation	☐ H&S Orientation
	☐ Permits or Other Requirements (specify and attach, if available):		
Site Information:	☒ Map/Diagram (attach)	☐ Map/Diagram Unavailable	
	☐ Inactive Site	☒ Active Site (specify below)	
General Environmental Concerns:	☒ Contaminated Water	☒ Wastewater	☒ Dust
	☒ Contaminated Soil	☒ Solid Waste	☒ Noise
	☒ Contaminated Air	☒ Waterways	☐ Other:
Site Security/Access Control:	☐ None	☒ On Site	
	☐ Other (explain):		
Amenities Available for Work:	☐ None	☒ Waste Storage	☒ Restrooms
	☒ Tools/Equipment Storage	☒ Office/Trailer Space	☒ Supplies Storage
Utilities Available For Work:	☐ None	☒ As Listed: Water, electric	
Medical Services Available:	☐ None On Site	☒ As Listed: First aid	
Facility Alarms/Signals:	☒ None	☐ As Listed:	
Traffic/Parking/Railway Issues:	☐ None	☒ As Listed (On-Site/Off-Site): On-site parking	
☐ Permits Required (specify)[2]:	☐ Confined Space Entry	☐ Local:	☐ State:
	☐ Federal:	☐ Other:	☒ N/A
☒ Utility Locate Service(s):	☒ On Site	☐ Client	☒ Other: Former Site employees contracted to client for daily site management
	☐ Off Site	☐	☒ One Call
		☐	☐ N/A

[1] If relying on the client for any specific hazard identification and control, implemented control and effectiveness should be documented prior to beginning any work activities. This is recommended for all field projects.

[2] Permit examples: Utilities (electrical, water, gas, etc.); Excavations; Explosives; Cranes; Burning; Fuel storage; Traffic control; Hoists; Cutting; Welding; Demolition; Confined space; Restricted access areas; etc.

Risk Analysis (RA)

(Required for all Inventum Type 2 or Type 3 field projects.)

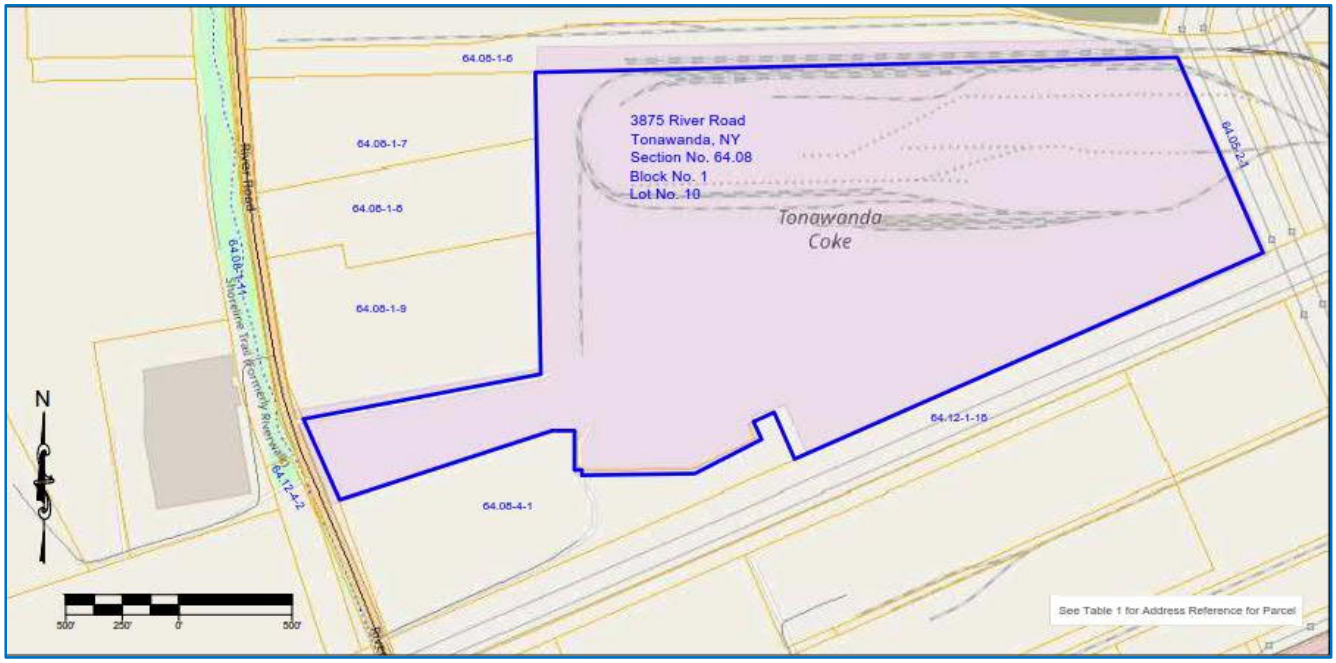
Detailed Physical Description of Site/Facility: ☒ Map/Diagram Attached

The Site is located at 3875 River Road, Town of Tonawanda, Erie County, New York. The portion of the Site in the BCP program encompasses approximately 86.5 acres of land although Riverview Innovation Technology Campus, Inc (client) will control additional acreage outside the BCP program within the federal/state superfund programs. The Site is located approximately 0.25 miles west of I-90 on the east side of River Road. The surrounding properties are primarily industrial or vacant.

The former coke production facility is located in the northern center portion of the property which includes coke ovens, coke by-product plant, storage tanks, and railway line spurs. The southern portion of the property is mainly open with multiple former raw material coal and coke piles located throughout the area. The facility is no longer in operation; however, activities on site include surficial mining of remaining coal/coke storage areas and water management from secondary containment areas.

Historically, manufacturing processes used at the plant have included: by products coking, light oil distillation, ammonia recovery, and ethene, toluene, and xylene extraction. Historical investigations that were performed at the site have identified some conditions that previously required remediation.

Figure 1; Site Location



Site Activities/Current Operations: ☐ None ☒ As Specified

Other Concurrent Site Activities, Work, and/or Other Adjacent Hazards or Concerns:

☐ None

As Specified:

☐ Schools	☐ Daycare	☐ Hospital	☐ Airport
☐ Residential	☒ Offices	☐ Shopping	☐ Active parking lot in work space

5. Hazard Evaluation

Complete (1) Substance Name (be specific)	Specific Applicable OSHA Standard (if any)	Physical State (2) (S, L, G, Aq, Vap, F, P)	Max. (3) Conc. Level Per Physical State	General (4) Control Measures (Eng., Admin., PPE)
Coal Tar	0.2 mg/m3	S	Coal Tar Product	Eng., PPE
Benzo(a)pyrene	0.2 mg/m3	S	4,100 ug/kg	Eng., PPE
Benzo(b)fluoranthene	N/A	S	4,600 ug/kg	Eng., PPE
Benzo(a)anthracene	N/A	S	20,000 ug/kg	Eng., PPE
Chrysene	0.2 mg/m3	S	21,000 ug/kg	Eng., PPE
Dibenz(a,h)anthracene	N/A	S	1,700 ug/kg	Eng., PPE
Indeno(1,2,3-cd)pyrene	N/A	S	15,000 ug/kg	Eng., PPE
Cyanide	N/A	L	2.75 mg/L	Eng., PPE
1,4-Dichlorobenzene	75 ppm	L	29 ug/L	Eng., PPE
Benzene	1 ppm	L	85 ug/L	Eng., PPE
Chlorobenzene	75 ppm	L	22 ug/L	Eng., PPE
Xylenes	100 ppm	L	36 ug/L	Eng., PPE
Toluene	200 ppm	L	59 ug/L	Eng., PPE
Iron	N/A	L	160 mg/L	Eng., PPE
Manganese	N/A	L	11.2 mg/L	Eng., PPE
Phenolics	5 ppm	L	0.61 mg/L	Eng., PPE
1,1,1-Trichloroethane	350 ppm	L	12.2 ug/L	Eng., PPE
Methylene chloride	25 ppm	L	52 ug/L	Eng., PPE
Selenium	0.2 mg/m3	L	0.0116 mg/L	Eng., PPE
Nickel	N/A	L	0.153 mg/L	Eng., PPE
Cadmium	0.005 mg/m3	L	0.19 mg/L	Eng., PPE
Chromium Total	1 mg/m3	L	0.086 mg/L	Eng., PPE
Lead	0.050 mg/m3	L	0.025 mg/L	Eng., PPE

(1) Use OSHA regulated name, not elemental forms. If available, attach SDS. Identify any sample preservative or O&M chemicals or subcontractor chemicals in this table also.
(2) S = Solids, L = Liquid, G = Gas, Aq = Aqueous, Vap = Vapor, F = Fume, P = Airborne Particulate.
(3) If available, attach laboratory results or summary tables.
(4) See the following sections for detailed control measures: personal protection equipment (PPE), Air Monitoring (Admin), or Site Control (Admin and Eng.).
(6) IP = Ionization Potential, VP = Vapor Pressure, LEL = Lower Explosive Limit, UEL = Upper Explosive Limit, N/A = Not Applicable, N.D. = Not Determined
(7) IDLH = Immediately Dangerous to Life and Health. NEVER enter IDLH conditions on site without proper respiratory protection.
(8) C = Ceiling Value, ST = Short-Term Exposure Limit, TWA = Time-Weighted Average, None Est. = None Established
(9) R = Respirable Limit, T = Total Limit
(10) Warning Properties: Good (G), Poor (P), None (N)

5. Hazard Evaluation (continued)

Site-Specific Physical Hazards

HAZARD	SPECIFIC CONTROL MEASURE
Slip/Trip/Fall Injury	— Use roads or trails whenever possible. — Occasionally reassess route to avoid dangerous terrain. — Maintain good housekeeping and keep work area clear of loose materials and equipment. — Use portable steps to mount and dismount sampling vehicle.
Ingestion of or contact with impacted soil	— Wear safety glasses. — Wear nitrile and appropriate cut-/puncture-resistant gloves (see Glove Selection Guideline) when performing tasks. — Wash hands and arms thoroughly when daily work is completed. — No eating, drinking, or smoking while conducting monitoring or sampling activities.
Pinched fingers or toes	— Where appropriate cut-/puncture-resistant gloves (see Glove Selection Guideline) when the potential for hand injury exists. — Where steel-toed safety shoes with steel shanks while on site.
Strained muscles	— Use proper lifting posture, techniques, and equipment when handling heavy objects. — Use two people for loads >40 lbs. or awkward items. — Take rests as needed during and between carries.
Cutting activities	
Flying debris/eye injuries	— Wear ANSI-approved safety glasses when the potential for flying debris and eye injuries exists.

Risk Analysis (RA)

(Required for all Inventum Type 2 or Type 3 field projects.)

Other Common Physical Hazards

(modify as needed, but include with all project hazard assessments)

☒	PHYSICAL HAZARD	GENERAL CONTROL MEASURE
☒	Aboveground Storage Tanks (AST)	Be aware of any aboveground storage tanks and the type of material being stored in them. Be aware of the potential of spills, fires, explosions, etc., while working near the tanks. Stay clear of tanks whenever possible, and be aware of any equipment operators near the tank(s).
☒	Animals (dogs, etc.)	Be aware of any animals on site or adjacent to the site. Appropriate care should be taken if any feral (wild) animals are encountered.
☐	Blasting/Explosives	INVENTUM personnel shall not handle any explosive devices or materials. INVENTUM personnel should understand the blasting procedures being used by the subcontractor, and all of the associated health & safety precautions. The subcontractor shall handle, store, and use the explosives in accordance with 29 CFR 1926.900, Subpart H and U.
☐	Boat or Barge	A boat or barge should be used that is adequately stable for the type of activity conducted. The boat or barge should have all of the appropriate and current licensing and registrations required by the applicable regulatory agencies. All applicable laws and regulations will be followed when launching the boat or barge, and when navigating to and from the work site. Personal floatation devices should always be worn while navigating the boat or barge. The boat must be equipped with the following approved United States Coast Guard (USCG) safety equipment: — A Type 1, 2, or 3 personal flotation device (PFD) for every person aboard (should be worn while navigating) The following equipment is recommended: — A Type 4 throwable PFD — Audible distress signal device (air horn, whistle) — Fire extinguisher (if engine-propelled) — Auxiliary propulsion (spare paddles, trolling motor) — Bow and stern lines — Anchor and anchor line — First aid kit — Visual distress signal device(s) (flares, dyes) — Additional PFDs Be familiar with local weather and tidal characteristics. Do not conduct sampling from a boat/barge when threatening weather is imminent, or poor visibility exists. Sampling from a boat is prohibited in water containing substances likely to cause injury upon short-term or prolonged contact. Sampling from a boat is prohibited when the temperature of the water is high or low enough to cause injury upon short-term or prolonged exposure. Avoid sampling from a boat when unsafe water turbulence (waves) exists. Avoid standing in a boat. Always use the buddy system when sampling from a boat or barge; one person should be on shore with visual contact of the barge and should be able to summon emergency assistance if needed. Be familiar with local weather and tidal characteristics. Work on a boat or barge will not be performed when threatening or severe weather is impending or present.

Risk Analysis (RA)

(Required for all Inventum Type 2 or Type 3 field projects.)

Other Common Physical Hazards

(modify as needed, but include with all project hazard assessments)

☒	PHYSICAL HAZARD	GENERAL CONTROL MEASURE
☒	Briars or Thistles	Be aware of any briars or thistles on site. Wear appropriate clothing and gloves. Avoid contact with briars or thistles whenever possible.
☒	Business Traffic	Be aware of traffic patterns associated with local businesses near the work site. Allow traffic to enter and exit the businesses in such a manner to avoid creating traffic hazards, back-ups, delays, or potential accident situations.
☐	Cement Dust	Stay clear of mixing operations and avoid contact with or breathing of the dust.
☐	Chain Saws	Stay clear of any chain saw operations. Subcontractor is responsible for the safe use of chain saws on site.
☐	Cleaning Agents	Use caution when applying cleaning agent to equipment. Use gloves, safety glasses, splash shields, and protective clothing as needed.
☒	Client Activities	Be aware of client activities at or adjacent to the site. Work activities should be coordinated with other site activities to avoid conflicts. Contact EDP offices prior to starting work.
☒	Cold Stress	Work schedules may be modified when temperatures are below 20° F as measured by the wind chill factor. Take frequent breaks to warm up. Drink plenty of fluids. Wear appropriate clothing, and monitor for cold stress symptoms (frostbite, hypothermia, etc.).
☒	Compressed Air or Gas Cylinders	Compressed air or gas cylinders should be clearly marked, and they should be stored, transported, and secured in an approved manner.
☒	Compressed Air/Gas or Pressurized Liquids Hoses, Lines & Fittings	Compressed air or gas, or pressurized liquid lines or hoses should be inspected at least daily, or in the event a leak develops, or if a line or hose is run over or crimped.
☐	Concrete/Masonry/ Foundations	No construction loads shall be placed on a concrete structure or portion of a concrete structure unless a person who is qualified in structural design has determined that the structure or portion of the structure is capable of supporting the loads. All protruding reinforcing steel, onto and into which employees could fall, shall be guarded to eliminate the hazard of impalement. No employee shall be permitted to work under concrete buckets while buckets are being elevated or lowered into position. To the extent practical, elevated concrete buckets shall be routed so that no employee, or the fewest number of employees, are exposed to the hazards associated with falling concrete buckets. A limited access zone shall be established whenever a masonry wall is being constructed. All masonry walls over eight feet in height shall be adequately braced to prevent overturning and to prevent collapse unless the wall is adequately supported so that it will not overturn or collapse. The bracing shall remain in place until permanent supporting elements of the structure are in place.
☐	Confined Spaces (tanks, vaults, vessels, trenches, manholes, some excavations, etc.)	The scope of this project does entail entry into confined spaces. Confined spaces will not be entered unless a confined space entry permit has been completed, signed, and approved, and all participating personnel are trained in confined space entry procedures, including safety, and rescue procedures. All potential hazards of confined space may not be addressed by this hazard assessment, and health and safety plan.
☒	Cutting Tools	Stay clear of contractors' cutting tools, especially saws and torches. Be aware that cutting operations could create other hazards, such as falling objects, or shifting materials, etc. Safety glasses should be worn while using cutting tools. Spark-proof tools should be used when working in areas of potential explosive or flammable conditions. Fixed-open blade knives are prohibited.

Risk Analysis (RA)

(Required for all Inventum Type 2 or Type 3 field projects.)

Other Common Physical Hazards

(modify as needed, but include with all project hazard assessments)

☒	PHYSICAL HAZARD	GENERAL CONTROL MEASURE
☒	Demolition Activities	Stay clear of walls, ceilings, roofs, etc., as they are being demolished.
☒	Demolition Debris	Demolition material should only be handled by appropriate equipment because of sharp points, edges, etc. Demolition material may also pose a trip hazard, fall, or puncture hazard, so avoid walking or climbing on debris piles, etc.
☒	Drums	If drums are used on-site, they should be clearly labeled with the name of the contents and the appropriate label. Drums should only be handled with the appropriate equipment. Drums discovered during excavations, etc., shall not be opened or moved until appropriate identification can be performed. At a minimum, Level B protection is required for sampling any unlabeled drums discovered during remediation procedures.
☒	Dust/Particulates (Particulates Not Otherwise Regulated) (PNOR) (OSHA PEL = 15 mg./m^3, total) (OSHA PEL = 5 mg./m^3, respirable)	For general dust, work should be performed up-wind if possible. If conditions warrant it, monitoring should be done with a PM-10. Monitoring should occur at least 3 times per day, and every time re-entering the site. Readings should be taken downwind from the work area or inside the equipment as indicated by the conditions on site. If the OSHA PEL is exceeded, or is likely to be exceeded, engineering or administrative controls should be used, or a dust respirator must be worn. For hazardous dusts, a detailed air monitoring plan and a respiratory protection plan should be developed for the site activities.
☐	Elevated Work	For any construction work activities elevated 6 feet or more, or other non-construction activities elevated 4 feet or more, fall protection must be provided. Caution should be taken on catwalks and ladders because of potential slippery conditions, or the potential for footwear to catch on the surfaces.
☐	Energized Sources (electrical equipment or hookups, lines, etc.,) (Lockout/Tagout)	Contractors for all electrical activities, and any facility equipment with moving parts should follow proper lock-out/tag-out procedures, and only properly trained employees will perform the work. Employees will not perform any lock-out/tag-out activities unless personnel are properly trained in lockout/tagout procedures. Heed any caution signs or labels.
☒	Equipment Exhaust	Equipment exhaust should be ventilated away from the work area while drilling inside structures. Industrial fans can be used to move exhaust out of the area.
☒	Ergonomic Issues (job hazard analysis)	Ergonomic hazards will be addressed on a site-specific basis once mobilization to the field has occurred. Workstations will be evaluated on an individual basis.
☒	Evening Work	If work is performed during the evening hours, work shall be limited by the availability and the quality of artificial lighting. Care should also be taken to avoid slip, trip, and fall hazards that are not as easy to identify during low light conditions.
☒	Excavations	Stay clear of excavation walls. INVENTUM personnel will not enter an excavation, in accordance with 1926 Sub Part P. Subcontractor must provide a Competent Person on site, if one is required by the planned activities. Side cuts should conform to 1926 Subpart P requirements, or shoring should be used. All open excavations should be secured using traffic cones, barrier tape, or barricade signs stating “Do Not Enter Excavations”, especially if left open overnight.
☐	Explosives	Be aware of potential explosive materials and how to identify them. No smoking is allowed on-site or near where potential explosive materials may be present.
☐	Facility Conveyors (product or waste lines)	Stay clear of facility conveyors, product process lines, and waste disposal lines. Be aware of any client-specific health and safety requirements to work in these areas.

Risk Analysis (RA)

(Required for all Inventum Type 2 or Type 3 field projects.)

Other Common Physical Hazards

(modify as needed, but include with all project hazard assessments)

☒	PHYSICAL HAZARD	GENERAL CONTROL MEASURE
☒	Facility Equipment/Machinery	Be aware of active and moving client equipment on site.
☒	Facility Piping - aboveground	Stay clear of aboveground pipes. Client is responsible to identify all applicable aboveground facility pipes prior to any work activities in the area. Pipes can be overhead hazards, or trip hazards. Pipes can be hazardous because of the material flowing through them, such as steam, natural gas, toxic chemicals, etc. Some pipes are also coated with hazardous material such as asbestos.
☒	Facility Piping - belowground	Client is responsible to identify all applicable underground facility pipe locations prior to any subsurface activities.
☐	Fall Hazard	Proper tie-off, harnesses, railings, etc. should be used when performing work on ladders, scaffolding, man-lifts, or on the roof of buildings, etc. Stay clear of the edges of pits, trenches, quarries, etc.
☒	Falling Objects	Be aware of any potential falling objects or materials on site. Stay clear of any areas identified as potential falling object areas.
☒	Fences	Be aware of fences in disrepair that may be trip hazards or may have materials that could cause punctures or cuts. Use caution when crossing over or under fences.
☒	Field Equipment	If field equipment is heavy or awkward to carry, get assistance or use carts to help move around the site.
☒	Field Vehicle	Inventum personnel shall follow all applicable state and federal traffic laws while traveling to and from the site, and while working on the site. In particular, the following laws should be followed: speed limits, parking restrictions, use of wipers and lights during precipitation events, limiting cell phone use, etc. It is the responsibility of the driver to verify that all safety equipment on the vehicle is working properly before driving the vehicle. In particular, the following items should be checked: tire pressure, tire tread, windshield wipers, windshield washer, headlights, tail lights, brake lights, spare tire, fire extinguisher, first aid kit, etc.
☒	Fire Hazards	Eliminate sources of ignition in work areas that have ignitable materials. Provide an ABC fire extinguisher in close proximity to the support zone.
☒	Flooded Areas	Do not drive through flooded areas or standing water. Do not wade into moving water, or water deeper than 2 feet without adequate assistance.
☒	Flying Debris/ Eye Injuries	Be aware of any flying debris on site and wear protective eyewear when necessary.
☒	Fork Lifts	Be aware of forklift patterns and stay clear of those routes.
☒	Hand Tools	Use only the appropriate tool for the task at hand. Use the tool(s) as designed, described, and intended by the manufacturer.
☒	Heat Stress	The work schedule may be modified if the ambient temperature is more than 80° F. Take breaks as necessary, and drink plenty of fluids. If necessary, wear sunscreen and sunglasses on bright days. Monitor site personnel for signs of heat stress symptoms (heat rash, heat cramps, heat exhaustion, or heat stroke).

Risk Analysis (RA)

(Required for all Inventum Type 2 or Type 3 field projects.)

Other Common Physical Hazards

(modify as needed, but include with all project hazard assessments)

☒	PHYSICAL HAZARD	GENERAL CONTROL MEASURE
☒	Heavy Equipment	Contractor is responsible for safe operation of equipment. All mobile heavy equipment must have a functioning backup alarm, and operators must comply with equipment manufacturer's instructions. Maintain proper distance and remain in line of sight of operator and out of reach of equipment. Isolate equipment swings, if possible. Make eye contact with the equipment operator before approaching the equipment. Understand and review hand signals, and wear orange safety vest, if necessary.
☒	Heavy Lifting	Use proper lifting procedures and equipment when handling heavy objects such as drums, manhole covers, tank covers, etc.
☒	High Pressure Gas Lines, etc.	Be aware of high-pressure gas lines and follow approved safety precautions when working with or around the lines.
☐	Highway Traffic	Traffic control within the right-of-way will be in accordance with the WDOT "Work Zone Safety – Guidelines for Construction, Maintenance, and Utility Operations" procedures. Work may be restricted within specific lanes during peak traffic times. Verify peak traffic times, and review planned activities with the WDOT, so that appropriate lane closures can be coordinated.
☒	Housekeeping	All field vehicles, job trailers, and field offices will be properly cleaned and organized to prevent cluttered work and storage areas.
☐	Hunters/Firing Range, etc.	Be aware of surrounding activities that may involve hunting, firearms, etc. that may not be in your immediate area, but could create an unsafe work environment.
☒	Ice (thin)	When project activities include either crossing ice or working directly on the ice, a detailed plan should be developed that will be used to continually evaluate the ice conditions, and to determine when work should be terminated due to unsafe conditions. All staff working on the ice will wear an appropriate and approved personal floatation device. Other emergency equipment such as ropes, a throwable floatation device, a means to warm a wet and cold worker, etc. must be available. A buddy system should also be used for this type of work, such that one person is always on shore or at least on previously determined safe ice.
☒	Insects (ticks, bees, spiders, etc.)	Site workers with known allergies to insect bites should carry their own medication. In case of emergencies, inform fellow workers of any severe allergies. Use insect repellant as necessary, and as specifically allowed on site. If possible, wear long-sleeved shirts and pants. If appropriate, check for ticks at the end of each day. Have other appropriate first aid supplies handy for bites.
☒	Stakeholders	Be aware of the potential for irate neighbors or outsiders that may interfere with work activities, or that may potentially damage equipment or on-site materials, etc.
☐	Ladders	Ladders should only be used if they are in good condition, conform to OSHA requirements, and if they will be used in an appropriate manner. Be especially cautious of slipping on ladders when the ladder or footwear is wet or dirty.
☐	Landfill Gas (Methane, CO2, Hydrogen Sulfide)	Avoid breathing gas, especially in low oxygen areas (simple asphyxiant). Potentially flammable and explosive, so keep ignition sources away from gas. Explosive conditions of LEL >5% in a work area should be ventilated as soon as possible, or the area should be evacuated.

Risk Analysis (RA)

(Required for all Inventum Type 2 or Type 3 field projects.)

Other Common Physical Hazards

(modify as needed, but include with all project hazard assessments)

☒	PHYSICAL HAZARD	GENERAL CONTROL MEASURE
☐	Leachate (Municipal Solid Waste (MSW))	MSW leachate may contain hazardous biological substances, so avoid physical contact with leachate and, if possible, stay up-wind. If contact is made with leachate, wash affected areas thoroughly with soap and water. If boots contact leachate, they should be thoroughly washed with soap and water also.
☒	Lead	Wear gloves when in contact with lead contaminated soil, etc. Thoroughly wash hands and arms when daily work is completed.
☒	Long Hours/Fatigue	Long work hours can lead to fatigue, and fatigue can lead to the physical inability to perform the work in a safe manner, or travel to or from, a work site in a safe manner. If long work hours are scheduled, or if the scheduled work takes longer than planned, field staff should determine if fatigue is, or will be, an issue. Field staff should evaluate whether they are able to complete the work in a safe manner, or whether they are able to travel in a safe manner. If fatigue is an issue, appropriate breaks should be planned or taken, including overnight stays when necessary.
☒	Material Handling	Move containers and heavy material only with the proper equipment, and secure them to prevent dropping, falling, or loss of control during transport. Stay clear of material handling operations, especially near slopes. Do not stand down the slope from equipment, supplies or materials being moved above on the slope, or being deployed onto the slope.
☒	Material Storage	Stored material may be a falling hazard, or a crush hazard. Do not stand adjacent to materials stacked up, such as pipes, geosynthetic rolls, etc., or in the area of deployment.
☐	Methane Gas (Landfill Gas)	Explosive conditions (5% LEL) will be ventilated, if encountered, prior to working in an area. Methane is a simple asphyxiant.
☐	Mine or Quarry	No work shall be performed within 15 feet (or other designated client setback, whichever is greatest) of the mine or quarry walls. Be aware of the potential for falling rocks or slope failures.
☐	Municipal Solid Waste (MSW)	MSW may contain hazardous biological substances, so avoid physical contact, and if possible, stay up-wind. Wear appropriate PPE, such as gloves, safety shoes, and safety glasses. Wash hands, arms, and face after working near MSW. Reusable PPE and equipment should be thoroughly decontaminated after exposure to MSW. MSW may also contain sharp objects with the potential to puncture PPE.
☒	Natural Gas	Natural gas is flammable and explosive. Keep ignition sources away from gas sources. Use spark-proof tools when working with gas lines, etc.
☒	Noise	Hearing protection must be worn when noise levels exceed 85 dBA in the work area. If you need to raise your voice to be heard at the work site, then hearing protection should be worn. Hearing protection will be worn near drill rigs.
☒	Overhead Hazards	Pay attention to overhead equipment, piping, and structures. A hard hat must be worn at all times when overhead hazards are present on site including the operation of a drill rig.
☒	Pedestrian Traffic (public, client, workers)	Be aware of pedestrian traffic patterns and, route traffic around the exclusion zone(s), as necessary, to avoid distractions and the potential for exposures or accidents. Use appropriate barricades and caution tape to mark work areas.
☒	Poisonous Plants	Be able to identify any local poisonous plants and avoid them if possible or wear protective clothing as necessary. When removing potentially exposed clothing or PPE, the clothing or PPE should be carefully and thoroughly washed or decontaminated.
☒	Portable Heaters	Be aware of portable heater locations and stay a safe distance from them.

Risk Analysis (RA)

(Required for all Inventum Type 2 or Type 3 field projects.)

Other Common Physical Hazards

(modify as needed, but include with all project hazard assessments)

☒	PHYSICAL HAZARD	GENERAL CONTROL MEASURE
☒	Power Washing Equipment	Stay clear of the power washing nozzles and equipment.
☒	Propane Tanks	Be aware of propane tank locations, and any gas lines leading to or from the tanks.
☐	Radiation (ionizing)	Exposure to ionizing radiation can be controlled by one of three methods: time, distance, or shielding. Limit your time near the radioactive source. Keep your distance from the radioactive source. Shield yourself from the radioactive source with appropriate shielding material. If the radioactive source(s) are from INVENTUM equipment, the INVENTUM employee using the equipment needs required training to use the equipment and must be monitored using a dosimeter badge.
☐	Rock Blasting	Contractor is responsible for following safe blasting protocol. Heed all contractor warnings at time of blasting and stay well clear until safe to return to area, as indicated by the contractor.
☒	Sample Preservative Chemicals:	Wear safety glasses and nitrile gloves when adding preservative chemicals to sample bottles or vials. Have clean wash water nearby.
☐	Scaffolding	Stay clear of scaffolding. Be aware of the OSHA safety requirements for using constructing and scaffolding.
☒	Severe Weather	Work may be suspended if dangerous weather conditions (lightning, tornadoes, high winds, heavy rain, freezing rain, etc.) occur. Be aware of changing weather conditions and be prepared to take shelter as necessary. Potential shelters should be identified prior to beginning work.
☒	Sharp Objects	Wear appropriate gloves when handling sharp objects or use appropriate equipment to move objects.
☒	Slippery Ground/Surfaces	Exercise caution, especially on slopes, field trailer floors and stairs, after a precipitation event. Use slip resistant boots or implement surface preparations to eliminate the slippery nature of the surface prior to accessing the area. Spill control measures and general housekeeping should be utilized to help prevent slipping on wet floors, wet pavement, and general work areas.
☒	Slips, Trips, and Falls:	Maintain clear walkways for work areas.
☒	Snakes	Be aware of the potential for snakes in the area and wear snake boots, snake chaps, gaiters, or leggings as needed.
☒	Steam Cleaning Equipment	Stay clear of the steam cleaning nozzles and equipment.
☐	Steel Erection	All materials, equipment, and tools, which are not in use while aloft, shall be secured against accidental displacement. The controlling contractor shall bar other construction processes below steel erection unless overhead protection for the employees below is provided. Employees engaged in steel erection activities on a walking/working surface with an unprotected side or edge more than 15 feet above a lower level shall be protected from fall hazards by guardrail systems, safety net systems, personal fall arrest systems, positioning device systems or fall restraint systems.
☐	Steep Slopes or Banks	Pay attention to footing and walking. Stay a safe distance from unstable or extremely steep slopes. Wear appropriate footwear. Be aware of potential slope or bank failures. Heavy equipment should not be operated on or near unstable slopes or banks.
☒	Strong Nuisance Odors	Strong odors should be ventilated before entering a work area, or a respirator shall be worn as needed.

Risk Analysis (RA)

(Required for all Inventum Type 2 or Type 3 field projects.)

Other Common Physical Hazards

(modify as needed, but include with all project hazard assessments)

☒	PHYSICAL HAZARD	GENERAL CONTROL MEASURE
☒	Sunburn	For extended periods of time outdoors on sunny days, sunglasses, long-sleeved shirts and long pants should be worn to help prevent sunburn and eye problems. Wear sunscreen as appropriate for the project.
☒	Surface Water	Working next to or on, bodies of water shall be done using the buddy system. Staff shall wear USCG-approved personal floatation devices when on or adjacent to bodies of water.
☒	Terrain	Uneven or steep terrain can cause hazardous conditions for walking and transporting equipment around the site. Site personnel should use caution when working on uneven surfaces, and they should avoid working down-slope from heavy equipment, or materials being moved or stored.
☒	Traffic (client, contractors, public, semi-trucks, forklifts, etc.)	Obey all posted speed limits. Park in designated areas only. Be aware of traffic patterns on site, and during access to the site. Use orange traffic cones and barrier warning tape, as needed, or if within 25 feet of the right-of-way. INVENTUM personnel must wear orange safety vests when working in or near traffic areas. Class 2 traffic vests are required with traffic speeds 25 mph or higher. Class 3 traffic vests are required with traffic speeds 50 mph or higher.
☐	Trains/Railroad Tracks	Be aware of any train activities on the site, entering or leaving the site, or immediately adjacent to the site. Do not walk between the rails or on the railroad ties. When driving, stop at all railroad crossings, even if they are unmarked, and look in both directions before proceeding across the tracks.
☒	Transporting Hazardous Materials	INVENTUM personnel who transport hazardous materials shall have the required DOT training prior to transporting materials, and will comply with all applicable DOT regulations and requirements for labeling, packaging, etc.
☐	Tree Cutting	Stay clear of tree cutting activities.
☒	Trenching	INVENTUM personnel will enter trenches in accordance with 1926 Sub Part P. Be aware that some trenching conditions may result in a confined space condition.
☒	Trip Hazards (wires, cords, hoses, debris, corn stubble, uneven surfaces, etc.)	Temporary wires, cords, hoses, etc., should be properly located, marked, and protected to help prevent tripping and disruption to work activities. Trip hazards are particularly a problem early in the morning, late in the day, or under other poor lighting conditions.
☒	Underground Storage Tanks (USTs) (Septic Tanks)	If any unknown USTs are encountered, drilling or excavations will be terminated in that location until a new scope of work, Risk Assessment and Health & Safety Plan can be developed.
☒	Uneven Surfaces	Be aware of uneven walking or driving surfaces and exercise caution when moving around the site.
☒	Utilities – Overhead (electrical, telephone, cable TV, etc.)	A subcontractor, the client, or INVENTUM will locate and identify all overhead utilities. The owner or client will be responsible for identifying all applicable overhead utilities, product lines, pipes, and aboveground tanks. A minimum clearance of 20 feet must be maintained between equipment and overhead utility lines.
☒	Utilities – Underground (electric, gas, telephone, water, storm sewer, sanitary sewer, cable TV, etc.)	A subcontractor, the client, or INVENTUM will call Digger's Hotline to locate all underground utilities. The owner or client will be responsible for marking all applicable on-site underground utilities, product lines, pipes, and tanks.

Risk Analysis (RA)

(Required for all Inventum Type 2 or Type 3 field projects.)

Other Common Physical Hazards

(modify as needed, but include with all project hazard assessments)

☒	PHYSICAL HAZARD	GENERAL CONTROL MEASURE
☒	Waterways	Exercise caution near, around, or in waterways. Harnesses should be worn when working in, or within 4 feet of, the waterway, especially when attempting to sample from shore or a boat or barge. All applicable laws and regulations will be followed when navigating a boat or barge to and from a work site.
☒	Welding Tools	Stay clear of welding operations, and do not look directly at the welding process without appropriate eyewear and shield.
☐	Traffic Control	Traffic Control: Traffic control within the right-of-way will be in accordance with the local Public Right-of-Way Agency. Work may be restricted within specific lanes during peak traffic times. Verify peak traffic times and review planned activities with the local Public Right-of-Way Agency, so that appropriate lane closures can be coordinated.

Proposed Date(s) of Inventum Work: TBD

ON-SITE PROJECT TEAM MEMBER	ON-SITE PROJECT RESPONSIBILITIES
John Black	Inventum Site Health and Safety Representative (Supervisor); Remedial Contractor Oversight
Todd Waldrop	Inventum Site Health and Safety Representative (Supervisor); Remedial Contractor Oversight
James Edwards	Inventum Site Health and Safety Representative (Supervisor); Remedial Contractor Oversight

Any required construction/demolition activities: ☒ No ☐ Yes If Yes, complete Section 1

Site-Specific Health and Safety Plan

(Required for all Inventum Type 2 or Type 3 field projects.)

1. Construction Tasks: work tasks to be performed by Inventum staff or Inventum subcontractors

Civil

- ☐ Sewer (utility)
- ☐ Water (utility)
- ☐ Electric (utility)
- ☐ Communications (utility)
- ☐ Siding
- ☐ Roofing
- ☐ Drywall
- ☐ Flooring
- ☐ Ceilings
- ☐ Casework
- ☐ Masonry
- ☐ Escalator

- ☐ Steel (erection)
- ☐ Pre-cast (erection)
- ☐ Concrete (erection)
- ☐ Re-bar
- ☐ Elevator
- ☐ Fireproofing
- ☐ Windows
- ☐ Landscaping
- ☐ Painting
- ☐ Insulation
- ☐ Doors
- ☐ Finish Concrete

- ☐ Others
- ☐ Others
- ☐ Others

Mechanical

- ☐ Insulation
- ☐ Millwright
- ☐ Fire Protection
- ☐ Boiler
- ☐ Industrial Ventilation
- ☐ Steel Fabrication/Erection

Other

- ☐ Electrical
- ☐ Demolition (attach a detailed "Demolition Plan")

Estimated Direct-Hire Inventum Employees:

Home Office: ☐ Not Applicable ☐ Specify:

Craft Labor: ☐ Not Applicable ☐ Specify:

Craft	Quantity
Craft	Quantity

Site-Specific Health and Safety Plan

(Required for all Inventum Type 2 or Type 3 field projects.)

2. Applicable Safety Standards or Regulations:

☒ Federal OSHA ☐ State OSHA ☐ Owner/Client

Specific Standards:	29 CFR 1910 (OSHA)	29 CFR 1926 (Other Regulations)
☒ Medical Services and First Aid	1910.151	1926.50
☒ Hazard Communication (HAZCOM)	1910.1200	1926.59
☐ Lead Exposure	1910.1025	1926.62
☒ HAZWOPER	1910.120	1926.65
☒ Personal Protective Equipment (PPE)	1910.132-138	1926.95-107
☒ Respiratory Protection	1910.134	1926.103
☒ Ventilation	1910.94	1926.57
☒ Noise Exposure	1910.95	1926.52
☐ Illumination	N/A	1926.56
☐ Fire Protection	1910.157	1926.24 and 150-155
☐ Sanitation	1910.141	1926.51
☐ Materials Handling (rigging, etc.)	1910.176	1926.250-251
☐ Welding/Cutting	1910.251-255	1926.350-354
☐ Lockout/Tagout	1910.147	1926.417
☐ Electrical (flexible cords, etc.)	1910.305	1926.400-449
☐ Scaffolding	1910.28-29	1926.450-454
☐ Fall Protection (elevated work)	1910.23-29, 1910.66-68	1926.104-107; 500-503
☐ Ladders/Stairways	1910.25-27	1926.1050 and 1060
☐ Cranes, Derricks, Hoists, Elevators, etc.	1910.179-181	1926.550-555
☐ Aerial Lifts	1910.66-68	1926.556
☐ Earthmoving Equipment	N/A	1926.602
☐ Powered Industrial Trucks (forklifts)	1910.178	1926.602
☒ Excavations and Trenching	N/A	1926.650-652
☐ Concrete and Masonry	N/A	1926.700-706
☐ Steel Erection	N/A	1926.750-761
☐ Demolition	N/A	1926.850-860
☒ Asbestos	1910.1001	1926.1101
☐ Confined Space Entry	1910.146	1926.21

Site-Specific Health and Safety Plan

(Required for all Inventum Type 2 or Type 3 field projects.)

☐ Commercial Diving	1910.401-441	1926.1071-1092
☒ Compressed Gases	1910.101-105	N/A
☐ Ionizing Radiation	1910.1096	1926.53
☒ Benzene	1910.1028	1926.1128
☒ Cadmium	1910.1027	1926.1127
☒ Tools - Hand and Power	N/A	1926.300-307
☐ Blasting and Using Explosives	N/A	1926.900-914

Site-Specific Health and Safety Plan

(Required for all Inventum Type 2 or Type 3 field projects.)

3. Training Required

(* required for all "Type 3" sites; but minimum recommended)

Check "A" if training required for everyone, and check "T" if training required for specific task.

A	T	SUBJECT	REFERENCE	
			29 CFR 1910	29 CFR 1926 or Other
☐	☒	HAZWOPER 40 hour*	1910.120	1926.65
☐	☐	3-Day HAZWOPER Supervised On-Site*	1910.120	1926.65
☐	☒	8-Hour HAZWOPER Refresher*	1910.120	1926.65
☐	☐	8-Hour Supervisor HAZWOPER*	1910.120	1926.65
☐	☒	First Aid, CPR*	1910.151	1926.23,.50
☐	☒	Respiratory Protection	1910.134	1926.103
☐	☐	Confined Space ☐ Permit attached	1910.146	1926.21
☐	☐	Mine Safety (MSHA)	N/A	30 CFR 48.8
☐	☐	Lockout/Tagout ☐ Permit attached	1910.147	1926.417
☒	☐	Bloodborne Pathogens	1910.1030	N/A
☒	☐	Noise Exposure	1910.95	1926.52
☐	☒	Competent Person	N/A	1926.32,.450,.650
☐	☐	Construction Health and Safety OSHA 10-Hour	N/A	1926.21
☐	☐	Demolition	N/A	1926.850
☐	☐	Excavations ☐ Permit attached	N/A	1926.650-652
☐	☐	Electrical Work	1910.332	1926.400-.449
☐	☐	Ladders/Stairways	N/A	1926.1050-1060
☐	☐	Scaffolding	1910.28	1926.450-454
☐	☐	Fall Protection	1910.23-29; 1910.66-68	1926.104,.501
☐	☐	Commercial Diving	1910.410	1926.1071-1092
☐	☐	Hot Work ☐ Permit attached	1910.251-255	1926.350
☐	☐	Lead Awareness	1910.1025	1926.62
☐	☐	Asbestos Awareness	1910.1001	1926.1101
☐	☐	Cadmium	1910.1027	1926.1127
☐	☐	Benzene	1910.1028	1926.1128
☐	☐	Ionizing Radiation	1910.1096	1926.53; 10 CFR 19.12
☐	☐	Troxler or NITON Gauge User	1910.1096	10 CFR 19.12
☐	☐	Radiation Safety Program	1910.1096	10 CFR 20.1101
☐	☐	Hazard Communication (HAZCOM)	1910.1200	1926.59
☐	☒	DOT Hazardous Materials Shipping	1910.1201	49 CFR 172.704

Client-specific training: ☒ Not Applicable ☐ Specify

Site-specific orientation: ☒ Not Applicable ☐ Specify

Competent person: ☒ Not Applicable ☐ Specify

Direct-hire employee training/certification: ☒ Not Applicable ☐ Specify

Site-Specific Health and Safety Plan

(Required for all Inventum Type 2 or Type 3 field projects.)

4. Medical Surveillance

Surveillance Required: * required for all "Type 3" sites; baseline is minimum recommended
** Specify frequency below

	29 CFR 1910	29 CFR 1926 or Other
☐ HAZWOPER Physical - Baseline*	1910.120	1926.65
☐ HAZWOPER Physical – Annual	1910.120	1926.65
☐ HAZWOPER Physical - Biennial*	1910.120	1926.65
☐ OSHA Respiratory Protection Questionnaire	1910.134	1926.103
☐ Respiratory Certification Exam	1910.134	1926.103
☐ Arsenic (urine) **	1910.1018	N/A
☐ Asbestos **	1910.1001	1926.1101
☐ Cadmium (blood) **	1910.1027	1926.1127
☐ Lead/ZPP (blood) **	1910.1025	1926.62
☐ Mercury (blood) **	N/A	N/A
☐ PCB **	N/A	N/A
☐ Vinyl Chloride **	1910.1017	1926.117
☐ Hepatitis B Vaccine (series) **	1910.1030	N/A
☐ Tetanus/Diphtheria	N/A	Stay Current
☐ Stress Test	N/A	Only as requested
☐ Visual Acuity Test	N/A	Only as requested
☐ Hearing Test (Audiometry)	N/A	Only as requested
☐ Pulmonary Function	N/A	Only as requested

Client-specific drug testing: ☒ Not Applicable ☐ Specify

Client-specific medical monitoring[1]: ☒ Not Applicable ☐ Specify

Site-specific medical monitoring: ☒ Not Applicable ☐ Specify

**Frequency of medical monitoring: ☒ Not Applicable ☐ Specify

Site-Specific Health and Safety Plan

(Required for all Inventum Type 2 or Type 3 field projects.)

5. Personal Protective Equipment (PPE)

Based on evaluation of potential hazards, the following levels of personal protection have been designated for the applicable work tasks:

Specific Inventum Job Task or Function	Minimum Level of Protection
Task 1 – Site management and Oversight	☒ D
Level D: safety glasses (ANSI), safety shoes (ANSI), ear plugs (ANSI); safety vest (ANSI)	
Task 2 – Surficial Soil Sampling	☒ D ☐ C ☐ B ☐ A
Level D: safety glasses (ANSI), safety shoes (ANSI), ear plugs (ANSI); safety vest (ANSI), nitrile gloves,	
Task 3 – Subsurface Soil Sampling	☒ D ☐ C ☐ B ☐ A
Level D: Hard hat, safety glasses (ANSI), safety shoes (ANSI), nitrile gloves	
Task 4 – Permit Compliance Water and Wastewater Sampling	☒ D ☐ C ☐ B ☐ A
Level D: Hard hat, safety glasses (ANSI), safety shoes (ANSI), nitrile gloves	
Task 5 – Monitoring Well Abandonment	☒ D ☐ C ☐ B ☐ A
Level D: safety glasses (ANSI), safety shoes (ANSI), ear plugs (ANSI); safety vest (ANSI)	
Task 6 – Monitoring Well Installation	☒ D ☐ C ☐ B ☐ A
Level D: safety glasses (ANSI), safety shoes (ANSI), ear plugs (ANSI); safety vest (ANSI)	
Task 7 – Groundwater Monitoring and Sampling	☒ D ☐ C ☐ B ☐ A
Level D: Hard hat, safety glasses (ANSI), safety shoes (ANSI), nitrile gloves	

Site-Specific Health and Safety Plan

(Required for all Inventum Type 2 or Type 3 field projects.)

Criteria for changing protection levels are as follows:

EVACUATION[2] or PROTECTION LEVEL CHANGE[3] CRITERIA	APPROVALS REQUIRED [1] OSC
Site Evacuation Plan: ☒ Not Applicable ☐ Specify or Attach Plan:	
Change to Level D when: ☐ Not Applicable ☒	☒N/A All site work in Level D
Change to Level C when: ☒ Not Applicable ☐ dust levels exceed 2.5 mg/m^3 in the breathing zone continuously for 5 minutes.	☒ No work will be conducted in Level C. Site work will stop, controls reevaluated, and HASP updated as necessary
Change to Level B when: ☒ Not Applicable ☐ Specify	☒ Inventum will not conduct any work in Level B.
Change to Level A when: ☒ Not Applicable ☐ Specify	☒ Inventum will not conduct any work in Level A. ☒

[1] OSC: Office Safety Coordinator

[2] General Recommendations: Evacuate the area when LEL readings are >10% LEL in the atmosphere, or when PID readings are greater than the PEL in the breathing zone.

[3] General Recommendation: To Level C when PID readings are greater than the PEL in the breathing zone. To Level B or A only after detailed evaluation and planning.

Note: Changes to the level of protection shall be made only after the required approvals are obtained. All changes shall be recorded in the field log and reported to the Project Manager as soon as possible. Inventum's goal is to avoid using respiratory protection unless it is absolutely necessary or required. Administrative controls or engineering controls should always be considered as a means to reduce potential exposures, before PPE is required or considered.

Site-Specific Health and Safety Plan

(Required for all Inventum Type 2 or Type 3 field projects.)

6. Air Monitoring [1]

The following monitoring instruments shall be used on site to measure airborne contaminant concentrations in either the breathing zone, or as part of the overall site Air Monitoring Plan (attach detailed plan):

MONITORING EQUIPMENT	LOCATION OF MONITORING	FREQUENCY OF MONITORING	ACTION LEVELS
☐ Combustible Gas Indicator	☐ N/A ☐ Monitoring Plan Attached ☐ Confined Space ☐ Manhole	☐ Continuously when potential combustible gases or lack of oxygen are suspected. ☐ Specify	5-10% LEL: continue with caution > 10 % LEL: evacuate the area ☐ Specify
☐ O2 Monitor ☐ CO Monitor ☐ H_2S Monitor	☐ N/A ☐ Confined Space ☐ Manhole – monitor oxygen, carbon monoxide, hydrogen sulfide , and lower explosive limit	☐ Continuously when excess oxygen (>22.5%) or lack of oxygen (<19.5%) are suspected. ☐ Test atmosphere prior to entry and continuous during confined space entry.	< 19.5% Oxygen: evacuate the area; supplied air may be needed. > 22.5% Oxygen: evacuate the area; potential fire hazard. ☐ Specify
☐ Colorimetric Tubes Type: Type: Type:	☐ N/A ☐ Specify ☐ Sample Container ☐ Confined Space ☐ Specify	☐ Periodically during sampling for analytical purposes only. ☐ Whenever noticeable odor is present. ☐ Specify	☐ Specify
☒ PID Lamp Needed: ☐ 9.8 eV ☒ 10.6 eV ☐ 11.7 eV Calibration Gas: Isobutylene Correction Factor:	☒ Personal Monitoring ☒ Sample Container ☐ Confined Space ☐ Specify	☒ Periodically during sampling for analytical purposes only. ☒ Continuously within the employee breathing zone. ☐ Specify ☐ Specify	☒ None. ☒ >5 ppm above background in breathing zone for 5+ min. Stop work and reevaluate potential sources and controls.
☐ FID	☐ N/A ☐ Specify	☐ Specify	☐ Specify
☒ Personal Dust Monitor	☐ N/A ☒ Personal Monitoring in Breathing Zone (Task 2 - 6 only)	☒ Continuously within the employee breathing zone	☒ >2.5 mg/m3 at work perimeter for 15 min sustained. Stop work and apply dust controls

☒Other: Perimeter Monitoring	☒ Perimeter Air Monitoring in accordance with the CAMP	☐ Specify	☐ Specify
☐Laboratory Supported ☐Personal ☐Area ☒Perimeter	☐ N/A ☐ Specify Employee breathing zone	☐ Specify continuous	☒ When visible dust is present apply dust control measures (water spray) until abated.

(1) Whenever air monitoring is required to be performed, a detailed Air-Monitoring Plan should be developed and attached to the HASP. The plan should include Monitoring Locations, Frequency of Readings, and any Action Levels being used to control the work site.

Air Monitoring Plan

Field monitoring of dust production is anticipated only during subsurface soil sampling (Task 2) and installation of monitoring wells (Task 7). A visual assessment of dust levels will be used continuously during the work along with personal employee monitoring and perimeter air monitoring in accordance with an approved CAMP.

Dust production during monitoring well abandoned, monitoring well installation, and surficial soil sampling is not anticipated due to the typical moisture content of the soil.

This level of nuisance dust is visually observable. If dust is observable continuously in the breathing zone for 5 minutes, dust control methods will be used (*e.g.*, water spray will be applied) until dust is abated. Work will be temporarily discontinued until dust is reduced to acceptable levels within the breathing zone. Should particulate levels above the action level be a continual problem, relevant field personnel will reassess the situation with the project manager.

Site-Specific Health and Safety Plan

(Required for all Inventum Type 2 or Type 3 field projects.)

7. Site Controls and Work Zones (describe in detail)

Facility Alarms or Signals: ☒ Not Applicable ☐ Specify

Work Permits Required: ☒ Not Applicable ☐ Specify

Work Traffic Issues: ☒ Not Applicable ☐ Specify

Parking Issues: ☒ Not Applicable ☐ Specify

Railway Traffic Issues: ☒ Not Applicable ☐

Support Zone(s):

☒ Field vehicle ☒ Job Trailer On Site ☐ Other:

Contamination Reduction Zone(s):

☒ Field vehicle ☐ Facility restroom/utility room ☐ Other:

Exclusion Zone(s):

☒ Area immediately surrounding work area ☐ Other:

Site Entry Procedures:

☒ Notify Site Safety Contact Representative.

☒ Read HASP Plan and sign Acknowledgment Statement.

☒ Check in with the facility contact person. ☒ Check in with owners full time site representatives.

☒ Check in with facility security guard. ☒ All visitors must check in and sign visitor logbook in guard house.

☒ Wear proper personal protective equipment.

☐ Attend facility orientation. ☐

☒ Conduct daily safety meeting (document).

☐ Other: Confined space – do not enter the confined space if LEL >10%, oxygen <21% or >23.5%, carbon monoxide >35 ppm, or hydrogen sulfide >7 ppm. Exit the confined space if the atmospheric conditions become hazards as noted.

Site-Specific Health and Safety Plan

(Required for all Inventum Type 2 or Type 3 field projects.)

Decontamination Procedures:

Personnel: (specify)	Work will be performed in Level D or Modified Level D, and minimal contamination is expected. Follow standard decontamination procedures, and good personal hygiene. Disposable PPE should be removed, contained, and disposed in an appropriate manner. Prior arrangements should be made if disposal is planned for at the project site. Site workers should plan and stage for wash water and soap at the site, prior to beginning the work. Site workers should wash hands and any exposed skin extremely well with soap and water, prior to leaving the contamination reduction zone, eating, drinking, driving, or leaving the site. Any soiled or contaminated clothing should be removed and handled appropriately, by either washing as soon as possible, or if necessary, disposing. Soiled or contaminated clothing should be carefully bagged prior to disposal or washing, to reduce potential exposure.
Equipment: (specify)	Site workers should plan and stage for the appropriate decontamination method at the site prior to beginning the work. Any contaminated single-use disposable equipment or PPE should be appropriately containerized and disposed as soon as possible in an appropriate manner. Prior arrangements should be made if disposal is planned for at the project site. Contaminated equipment or PPE that will be re-used should be handled and cleaned while wearing the appropriate PPE. Typically, equipment is decontaminated using Alconox soap and deionized water.

Disposal of Investigation-derived Material:

☒ Leave on site for disposal. Location TBD ☐ Other:

Work Limitations (time of day, buddy system, etc.):

☐ Buddy system required for some tasks.

☒ Work will be performed during daylight hours only.

☐ Work will be performed using artificial light.

Describe or attach a lighting plan: A lighting plan is attached.

☒ No eating, drinking, or smoking in contamination reduction zone(s) or exclusion zone(s).

☒ When temperatures are either above 80°F or below 20°F, work schedules may be modified.

☒ Other site-specific limitations: Do not enter battery building

Site-Specific Health and Safety Plan

(Required for all Inventum Type 2 or Type 3 field projects.)

Radiation Safety:

- ☒ Radiation information is not applicable to this project.
- ☐ Notify RSO.
- ☐ Wear dosimeter badge when handling gauge.
- ☐ Post applicable radiation signs and documents.
- ☐ Post emergency numbers.
- ☐ Provide at least two lock systems for overnight storage.
- ☐ Maintain storage at least 15 feet from full-time workstations.
- ☐ Block, brace, and securely lock the gauge during “all” transportation.
- ☐ Limit “public” exposure to gauge while in use.
- ☐ Provide sketch of gauge storage to RSO.

Site-Specific Health and Safety Plan

(Required for all Inventum Type 2 or Type 3 field projects.)

Acknowledgment Statement:

As an employee of Inventum, I have reviewed the Hazard Assessment (HA)/Health & Safety Plan (HASP). I hereby acknowledge that I have received the required level of training and medical surveillance as necessary, that I am knowledgeable about the contents of this site-specific RA/HSP, and that I will use personal protective equipment (PPE) and follow procedures specified in the HASP.

Signatures of Inventum Site Personnel:

	Date:	
	Date:	
	Date:	
	Date:	
	Date:	
	Date:	
	Date:	
	Date:	
	Date:	
	Date:	
	Date:	
	Date:	

INVENTUM SAFETY OBSERVATION FORM

Revised March 2019

Location/Project Name: _____	**Date:** _____
Observer Name: _____	
Observee Name: _____	**Time:** _____
Task Observed	
Description of Task Observed and Background Information	
Positive Comments	

INVENTUM SAFETY OBSERVATION FORM

Revised March 2019

Conclusions / Why the Questionable Items Occurred?

Feedback Session Conducted By: _____ **Date:** _____

Name of Observee's Supervisor: _____ **Time:** _____

At-Risk Observations/Root Cause Analysis

Personal Factor:
(1) Lack of skill or knowledge
(2) Correct way takes more time/requires more effort
(3) Shortcutting standard procedures is rewarded or appreciated
(4) In past, did not follow procedures or acceptable practices and no incident occurred

Job Factor:
(5) Lack of or inadequate operational procedures or work standards
(6) Inadequate communication of expectations or work standards
(7) Inadequate tools or equipment

At-Risk Observation #	Root Cause Analysis #	Solution(s) To Prevent Potential Incident from Occurring	Person Responsible	Agreed Due Date	Date Completed

Results of Verification (were solutions done?) and Validation (were solutions effective?)

Reviewed by (PM/Supervisor): _____ **Date:** _____

Approved by (Practice Safety Leader): _____ **Date:** _____

INVENTUM SAFETY OBSERVATION FORM

Revised March 2019

PERSONAL PROTECTIVE EQUIPMENT	Safe	At-Risk	Comments
1. Hearing Protection (e.g., Ear Plugs)			
2. Head Protection (e.g., Hard Hat)			
3. ANSI Rated Eye Protection (e.g., Safety Glasses)			
4. Hand Protection (e.g., Kevlar Gloves)			
5. Foot Protection (e.g., Safety Shoes)			
6. Respiratory Protection			
7. Fall Protection Inspected (e.g., Harness)			
8. ANSI Rated Reflective Vest/High Visibility Clothing			
9. Other (Specify)			
BODY USE AND POSITIONING	**Safe**	**At-Risk**	**Comments**
10. Correct Body Use and Positioning When Lifting/Pushing/Pulling			
11. Pinch Points/Moving Equipment - Hands/Body Clear			
12. Mounts/Dismounts Using 3-Points of Contact			
13. Other (Specify)			

INVENTUM SAFETY OBSERVATION FORM

Revised March 2019

WORK ENVIRONMENT	Safe	At-Risk	Comments
14. Work/Walk Surface Free of Obstructions (e.g., Tripping Hazards)			
15. Housekeeping/Storage			
16. Defined and Secured (e.g., warning devices, barricades, cones, flags)			
17. Suspended Load, Swing Radius & Lift Area is Barricaded			
18. Safety Shutdown Devices			
19. Proper Storage & Labeling /Disposal of Sample & Waste Materials			
20. Cylinders Stored Upright, Secured, & Caps in Place			
21. Manhole/vault Inspected for Hazards			
22. Other (Specify)			

INVENTUM SAFETY OBSERVATION FORM

Revised March 2019

OPERATING PROCEDURES	Safe	At-Risk	Comments
23. Job Planning (HASP reviewed, JSAs, etc.)			
24. Fire Extinguishers Accessible and Inspections Current			
25. Work Permit/Authorization to Work (Hot, Cold, LOTO, Confined Space)			
26. JSA Reviewed & Followed			
27. Hazard Assessment - Hazard Hunt			
28. Interfaces with Other Functions (awareness with other personnel on site)			
29. Operators Looking Behind Prior to Backing Up			
30. Operators Wearing Seat Belts While Operating Equipment			
31. Subsurface Structures Identified			
32. Proper Trench Protective Equipment in Place			
33. Adequate Egress Is Available for Excavation & Trench (within 25 ft. if depth is <4 ft.)			
34. All Materials Set Back at Least 2 Feet From Edge of Trench/Excavation			
35. Other (Specify)			

INVENTUM SAFETY OBSERVATION FORM

Revised March 2019

TOOLS/EQUIPMENT	Safe	At-Risk	Comments
36. Hand Tools (Proper Equipment Selection, Condition, and Use)			
37. Power Tools (Proper Equipment Selection, Condition, and Use)			
38. Equipment, Including Heavy (Proper Equipment Selection, Condition, and Use)			
39. Hoses Inspected			
40. Required Monitoring Equipment Calibrated & Used			
41. Ladders Set up Correctly & Inspected			
42. Right Tools for the Job are Available and in Good Condition - No Fixed Open Blade Knives (FOBKs)			
43. Other (Specify)			
Total #	0	0	

Daily Hazard Review Topic and Sign-In:

Daily Review Topic	Date

Acknowledgment Statement:

As an affected employee of Inventum Engineering, I hereby acknowledge that I have reviewed the contents of this site-specific HSP and the daily safety meeting topic, and that I will use the applicable personal protective equipment (PPE) and follow the procedures specified in the HASP.

Signatures of all onsite Inventum Personnel, including Direct-Hires (Required):

_____ Date: _____

_____ Date: _____

_____ Date: _____

_____ Date: _____

_____ Date: _____

_____ Date: _____

_____ Date: _____

_____ Date: _____

_____ Date: _____

_____ Date: _____

Appendix H – Community Air Monitoring Plan

INVENTUM ENGINEERING, PC

Appendix D
Community Air Monitoring Plan

3125 Highland Avenue Site

Brownfield Cleanup Program Site No. C932169

3219 and 3301 Highland Avenue

Niagara Falls, NY 14305

February 9, 2023

441 CARLISLE DRIVE
SUITE C
HERNDON, VA 20170
WWW.INVENTUMENG.COM

Table of Contents

1 Overview

This Community Air Monitoring Plan (CAMP) requires real-time monitoring for volatile organic compounds (VOCs) and particulates (i.e., dust) at the downwind perimeter of each designated work area when certain activities are in progress at the 3125 Highland Avenue Brownfield Cleanup Program (BCP) Site, located at 3219 and 3301 Highland Avenue, Niagara Falls, New York. The CAMP is not intended for use in establishing action levels for worker respiratory protection. Rather, its intent is to provide a measure of protection for the downwind community (i.e., off-site receptors including residences and businesses and on-site workers not directly involved with the subject work activities) from potential airborne contaminant releases as a direct result of investigative and remedial work activities. The action levels specified herein require increased monitoring, corrective actions to abate emissions, and/or work shutdown. Additionally, the CAMP helps to confirm that work activities did not spread contamination off-site through the air.

The generic CAMP presented below will be sufficient to cover many, if not most, sites. Specific requirements should be reviewed for each situation in consultation with NYSDOH to ensure proper applicability. In some cases, a separate site-specific CAMP or supplement may be required. Depending upon the nature of contamination, chemical- specific monitoring with appropriately-sensitive methods may be required.

- *The 3125 Highland Avenue Site will have intermittent activity. The CAMP will be activity specific. If there are detections at the downwind station, additional monitoring requirements will be considered*[1].

Depending upon the proximity of potentially exposed individuals, more stringent monitoring or response levels than those presented below may be required. Special requirements will be necessary for work within 20 feet of potentially exposed individuals or structures and for indoor work with co-located residences or facilities. These requirements should be determined in consultation with NYSDOH.

- *There are no sensitive receptors on the property. Depending on wind direction; the closest residence is 1,000 feet east of the proposed activity boundary, and more than 200 feet est of the activity boundary. Industrial properties are north and south of the proposed activities.*

Reliance on the CAMP should not preclude simple, common-sense measures to keep VOCs, dust, and odors at a minimum around the work areas.

2 Community Air Monitoring Plan

Depending upon the nature of known or potential contaminants at each site, real-time air monitoring for VOCs and/or particulate levels at the perimeter of the exclusion zone or work area will be necessary. Most sites will involve VOC and particulate monitoring; sites known to be contaminated with heavy metals alone may only require particulate monitoring. If radiological contamination is a concern, additional monitoring requirements may be necessary per consultation with appropriate DEC/NYSDOH staff.

- *VOC and particulate monitoring will be incorporated into the RI and IRM activities.*

[1] The text in *italic font* are comments inserted by 3125 Highland Avenue in addition to the standard CAMP Template.

Continuous monitoring will be required for all ground intrusive activities and during the demolition of contaminated or potentially contaminated structures. Ground intrusive activities include, but are not limited to, soil/waste excavation and handling, test pitting or trenching, and the installation of soil borings or monitoring wells.

Periodic monitoring for VOCs will be required during non-intrusive activities such as the collection of soil and sediment samples or the collection of groundwater samples from existing monitoring wells. "Periodic" monitoring during sample collection might reasonably consist of taking a reading upon arrival at a sample location, monitoring while opening a well cap or overturning soil, monitoring during well baling/purging, and taking a reading prior to leaving a sample location. In some instances, depending upon the proximity of potentially exposed individuals, continuous monitoring may be required during sampling activities. Examples of such situations include groundwater sampling at wells on the curb of a busy urban street, in the midst of a public park, or adjacent to a school or residence.

- *During demolition and excavation activities, up- and downwind stations will be in place. During sampling, periodic monitoring will be implemented with hand-held instruments.*

3 VOC Monitoring, Response Levels, and Actions

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

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

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

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

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

4 Particulate Monitoring, Response Levels, and Actions

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

1. If the downwind PM-10 particulate level is 100 micrograms per cubic meter (mcg/m^3) greater than background (upwind perimeter) for the 15-minute period or if airborne dust is observed leaving the work area, then dust suppression techniques must be employed. Work may continue with dust suppression techniques provided that downwind PM-10 particulate levels do not exceed 150 mcg/m3 above the upwind level and provided that no visible dust is migrating from the work area.

2. If, after implementation of dust suppression techniques, downwind PM-10 particulate levels are greater than 150 mcg/m^3 above the upwind level, work must be stopped and a re-evaluation of activities initiated. Work can resume provided that dust suppression measures and other controls are successful in reducing the downwind PM-10 particulate concentration to within 150 mcg/m^3 of the upwind level and in preventing visible dust migration.

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

Appendix D-1
Fugitive Dust and Particulate Monitoring

A program for suppressing fugitive dust and particulate matter monitoring at hazardous waste sites is a responsibility of the remedial party performing the work. These procedures must be incorporated into appropriate intrusive work plans. The following fugitive dust suppression and particulate monitoring program should be employed at sites during construction and other intrusive activities which warrant its use:

1. Reasonable fugitive dust suppression techniques must be employed during all site activities which may generate fugitive dust.

2. Particulate monitoring must be employed during the handling of waste or contaminated soil or when activities on site may generate fugitive dust from exposed waste or contaminated soil. Remedial activities may also include the excavation, grading, or placement of clean fill. These control measures should not be considered necessary for these activities.

3. Particulate monitoring must be performed using real-time particulate monitors and shall monitor particulate matter less than ten microns (PM_{10}) with the following minimum performance standards:

(a) Objects to be measured: Dust, mists or aerosols;

(b) Measurement Ranges: 0.001 to 400 mg/m^3 (1 to 400,000 :ug/m^3);

(c) Precision (2-sigma) at constant temperature: +/- 10 :g/m^3 for one second averaging; and +/- 1.5 g/m^3 for sixty second averaging;

(d) Accuracy: +/- 5% of reading +/- precision (Referred to gravimetric calibration with SAE fine test dust (mmd= 2 to 3 :m, g= 2.5, as aerosolized);

(e) Resolution: 0.1% of reading or $1g/m^3$, whichever is larger;

(f) Particle Size Range of Maximum Response: 0.1-10;

(g) Total Number of Data Points in Memory: 10,000;

(h) Logged Data: Each data point with average concentration, time/date and data point number

(i) Run Summary: overall average, maximum concentrations, time/date of maximum, total number of logged points, start time/date, total elapsed time (run duration), STEL concentration and time/date occurrence, averaging (logging) period, calibration factor, and tag number;

(j) Alarm Averaging Time (user selectable): real-time (1-60 seconds) or STEL (15 minutes), alarms required;

(k) Operating Time: 48 hours (fully charged NiCd battery); continuously with charger;

(l) Operating Temperature: -10 to 50^o C (14 to 122^o F);

(m) Particulate levels will be monitored upwind and immediately downwind at the working site and integrated over a period not to exceed 15 minutes.

4. In order to ensure the validity of the fugitive dust measurements performed, there must be appropriate Quality Assurance/Quality Control (QA/QC). It is the responsibility of the remedial party to adequately supplement QA/QC Plans to include the following critical features: periodic instrument calibration, operator training, daily instrument performance (span) checks, and a record keeping plan.

5. The action level will be established at 150 ug/m^3 (15 minutes average). While conservative, this short-term interval will provide a real-time assessment of on-site air quality to assure both health and safety. If particulate levels are detected in excess of 150 ug/m^3, the upwind background level must be confirmed immediately. If the working site particulate measurement is greater than 100 ug/m^3 above the background level, additional dust suppression techniques must be implemented to reduce the generation of fugitive dust and corrective action taken to protect site personnel and reduce the potential for contaminant migration. Corrective measures may include increasing the level of personal protection for on-site personnel and implementing additional dust suppression techniques (see paragraph 7). Should the action level of 150 ug/m^3 continue to be exceeded work must stop and DER must be notified as provided in the site design or remedial work plan. The notification shall include a description of the control measures implemented to prevent further exceedances.

6. It must be recognized that the generation of dust from waste or contaminated soil that migrates off-site, has the potential for transporting contaminants off-site. There may be situations when dust is being generated and leaving the site and the monitoring equipment does not measure PM10 at or above the action level. Since this situation has the potential to allow for the migration of contaminants off-site, it is unacceptable. While it is not practical to quantify total suspended particulates on a real-time basis, it is appropriate to rely on visual observation. If dust is observed leaving the working site, additional dust suppression techniques must be employed. Activities that have a high dusting potential-- such as solidification and treatment involving materials like kiln dust and lime--will require the need for special measures to be considered.

7. The following techniques have been shown to be effective for the controlling of the generation and migration of dust during construction activities:

(a) Applying water on haul roads;

(b) Wetting equipment and excavation faces;

(c) Spraying water on buckets during excavation and dumping;

(d) Hauling materials in properly tarped or watertight containers;

(e) Restricting on site vehicle speeds to 10 mph;

(f) Covering excavated areas and material after excavation activity ceases; and

(g) Reducing the excavation size and/or number of excavations.

Experience has shown that the chance of exceeding the 150 ug/m^3 action level is remote when the above-mentioned techniques are used. When techniques involving water application are used, care must be taken not to use excess water, which can result in unacceptably wet conditions. Using atomizing sprays will prevent overly wet conditions, conserve water, and provide an effective means of suppressing the fugitive dust.

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