LABELLA Associates, P.C.

Engineering
Architecture
Environmental
Planning

REMEDIAL INVESTIGATION (RI) REPORT

VOLUME I: Report Text and Appendices

15-ACRE PRAXAIR SITE
137 47TH STREET
NIAGARA FALLS, NEW YORK

Prepared for:

Covanta Niagara, L.P.
100 Energy Boulevard at 56th Street
Niagara Falls, New York 14304

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March 2013

Relationships. Resources. Results.

REMEDIAL INVESTIGATION OF 15-ACRE PRAXAIR SITE
137 47th STREET
NIAGARA FALLS, NEW YORK

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Certification

I ROBERT NAPIERALSKI certify that I am currently a Qualified Environmental Professional as defined in 6 NYCRR Part 375 and that this Remedial Investigation was conducted in accordance with all applicable statutes and regulations and in substantial conformance with the DER Technical Guidance for Site Investigation and Remediation (DER-10).

Signed:

CERTIFIED PROFESSIONAL GEOLOGIST # 10110

Date: 3/19/2013

1.0 INTRODUCTION

1.1 Purpose

LaBella Associates, P.C. was retained by Covanta Niagara, L.P. (Covanta) to complete a Remedial Investigation (RI) program at the 15-acre acquisition site (project site) located on the Praxair property at 137 47th Street, Niagara Falls, New York (see Figure 1). The RI was completed in general accordance with New York State Department of Environmental Conservation (NYSDEC) *DER-10, Technical Guidance for Site Investigation and Remediation*. The purpose of the RI program described herein was to characterize the nature and extent of contamination occurring on the project site.

LaBella has prepared this report on behalf of Covanta to provide a detailed description of the RI program implemented at the site. In addition to summarizing and documenting the methods used to investigate the project site, this RI Report describes the physical characteristics of the site; defines the nature, magnitude and extent of contamination encountered; and assesses the contamination with respect to fate, transport and exposure.

1.2 Site Background

1.2.1 Site Description

The project site encompasses approximately 15-acres of a larger, former industrial complex that is located at 137 47th Street in the City of Niagara Falls and is owned by Praxair, Inc. Portions of the project site occur within two tax parcels (SBL #160.09-1-7.111 and SBL #160.06-3-3). As shown by Figure 2, the project site is occupied by one building that was formerly utilized for the maintenance and repair of locomotives; an inactive rail yard; and concrete floor slabs representing remnants of the former industrial complex. The on-site structure encompasses approximately 13,700 square feet, is not currently utilized and is in a deteriorated state. The remaining portions of the project site generally consist of aged asphalt, concrete and gravel surfaces with some successional vegetation occurring along the eastern site boundary.

1.2.2 Site History

The project site, formerly part of a larger industrial complex, was owned and operated by the Union Carbide Corporation Metals Division, which first developed the complex in the early 1900’s. The plant reportedly produced special alloys, tungsten, ferroalloys, calcium carbide and ferrorvanadium ferrotungsten. Processes used at the plant included submerged arc, open arc, and globar electric furnaces, as well as exothermic and induction furnaces. Wastes generated by the plant included furnace slag (ferroalloys), hydrated lime and miscellaneous plant waste, which were reportedly disposed of at Union Carbide's former disposal site at 56th Street and Pine Avenue in Niagara Falls.

In 1942, the Atomic Energy Commission (AEC) and Manhattan Engineer District (MED) contracted for the construction and operation of a facility on the Union Carbide plant property that came to be known as Electromet. The Electromet facility produced uranium metal from uranium tetrafluoride by reacting it with magnesium in induction furnaces. The uranium metal was recast into ingots that were shipped off-site for testing or rolling. Process residue, including dolomite slag, uranium chips and crucible dross, was shipped to other sites for uranium recovery, storage or disposal. Electromet also recast scrap metal, supplied calcium metal to other facilities and conducted research and development activities. In 1948, Electromet became a subsidiary of the Union Carbide Metals Division called the Electro Metallurgical Company, and the last casting of uranium was conducted in 1949. The facility was reactivated in 1950 for casting zirconium metal sponge into ingots. During the early 1950s, portions of the facility were used under contract to the AEC for research and development activities that may have involved uranium, as well as titanium processing. The MED/AEC operations took place in one building that was demolished in 1957. This building was formerly located approximately 1,250 feet to the west of the project site as shown by Figure 2A. Additional information concerning historical radiological surveys of the Electromet facility is presented in Section 1.2.5 of this report.

Union Carbide's Linde Division also operated a welding flux manufacturing facility on the plant property. Waste from this operation included sludge from a rotary air filter, which was reportedly disposed of off-site.

The current owner of the property containing the project site, Praxair, Inc., is a corporate successor to Union Carbide's Linde Division. Other industrial operators on the Praxair property have included ESAB, L-Tech, Stratcor, Inc., US Vanadium and UMETCO. With the exception of the locomotive house, all of the buildings on the Praxair property have been demolished within the last decade.

From the time of the initial development of the Union Carbide plant, the 15-acre project site was primarily utilized for rail facilities that serviced the plant and other adjacent industries. A portion of the welding flux manufacturing facility that was operated by Union Carbide's Linde Division and later by ESAB/L-TEC, however, was located on the western portion of the project site.

1.2.3 Previous Environmental Investigations

1.2.3.1 Phase I ESA

In 2007, a Phase I Environmental Site Assessment (ESA) Report was prepared for the 70-acre Praxair property, inclusive of the project site. The following bullets summarize the recognized environmental conditions identified in the Phase I ESA that appear to be relevant to the project site:

- Former Underground Storage Tanks (USTs): Two USTs were formerly located near the southeast corner of the locomotive house. The USTs were removed along with contaminated soil, but residual soil contamination may remain and wells on the Covanta property to the west of the locomotive house showed signs of petroleum impact.
- Fill Material: Most of the Praxair site is suspected to be covered with fill material. This material is suspected to be up to 10 feet thick and may contain metals exceeding regulatory levels.
- Settling Basin: A settling pond was formerly located on the northern limits of the project site.
- Impacts from Adjacent Properties: Information pertaining to adjacent properties indicates that soil and groundwater are likely impacted from adjacent property use.
- Speculation Concerning Radioactive Materials: Anecdotal accounts of radioactive material processing at the site during World War II were noted, however, these accounts were not able to be verified.

In addition to these conclusions, the following additional relevant information was contained in the Phase I ESA report:

- In 1997, alleged violations involving the land disposal of manganese-containing fluids at the ESAB facility, a portion of which was located on the western side of the project site, were reported to the NYSDEC.
- In 1998, ESAB entered into an Administrative Order on Consent (AOC) with the NYSDEC to address the illegal disposal of off-specification product from the flux manufacturing process. This included flux waste buried with remnants of paper packaging labeled “Linde-Union Carbide Flux”. As a result, approximately 4,851 tons of soil and granular material were excavated from an area to the west of the project site in 2005 and NYSDEC confirmed compliance with the AOC.
- A 2002 Phase I ESA of an area containing the project site indicated the presence of liquid in the trenches within the locomotive house and staining on the interior and exterior of the building. It was noted that petroleum contamination was an issue relative to this building.

- The 2002 Phase I ESA also noted that the buildings, including the locomotive house, generally contained suspect asbestos containing materials, lead based paint and fluorescent light fixtures.

1.2.3.2 Limited Preliminary Subsurface Assessment

In February 2008, a limited Preliminary Subsurface Assessment was performed on the Praxair property in support of a NYS Brownfield Cleanup Program (BCP) application. The purpose of the assessment was to investigate select areas of concern identified in the 2007 Phase I ESA. The scope of the field investigation included the following major tasks:

- Collection and chemical analysis of surface soil samples.
- Drilling of 21 test borings across the site and in areas of potential concern to collect, screen, classify and analyze on-site soil/fill.
- Soil samples were screened for total organic vapors and radiation (alpha, beta and gamma) using a photo-ionization detector (PID) and a Model 4EC S.E. International Radiation Monitor.
- Installation of 3 groundwater monitoring wells to determine groundwater flow direction and facilitate the collection and chemical analysis of representative groundwater samples.

1.2.3.2.1 Field Observations

Field observations and geologic samples collected during the performance of the drilling program at the Praxair property indicated the presence of a layer of industrial fill containing angular gravel, slag, ash, cinders and other debris across the property. The fill layer extended from the ground surface to an average depth of approximately 4 feet below the ground surface (BGS). This material was underlain by a lacustrine deposit that generally consisted of reddish or grayish-brown silty clay from approximately 4-8 feet BGS and a reddish-brown clayey silt from 8-16 feet BGS. A lighter-colored (light gray to off-white) sand and silt deposit was observed in a boring drilled within the former settling pond located on the northern portion of the project site. Groundwater was generally encountered at depths greater than 12 feet BGS, and saturated soil generally consisted of soft reddish-brown clayey silt. Select borings were sampled to refusal or the apparent top of bedrock, at terminal depths ranging from 4 to 20 feet BGS.

No readings indicating emissions of radiation were detected in the soil samples. Elevated PID readings (greater than 5 parts per million (ppm)) were only observed in soil samples collected from the boring advanced near the locomotive house (B-A19-1), in the vicinity of the former USTs. A petroleum sheen was also observed on the groundwater sample collected from the monitoring well installed at this boring location.

1.2.3.2.2 Analytical Results

Analytical results from the 2008 subsurface assessment that are relevant to the project site are discussed in the following subsections, while Figure 3 illustrates significant findings.

Soil/Fill

A total of 14 soil samples were submitted for analysis to Test America of Buffalo, New York. The analytical results were provided in NYSDEC Analytical Services Protocol (ASP) Category B Deliverables data packages, as required under the NYSDEC Brownfield Cleanup Program (BCP). The laboratory analytical results for the soil/fill samples collected from the project site are discussed in the following subsections.

<u>Former Settling Pond</u>

Two (2) soil samples from the former settling pond located in the northern portion of the project site were submitted for analysis of Target Analyte List (TAL) metals using USEPA Methods 6010 and 7471. Analysis of both samples recorded detections of metals at concentrations above the laboratory method detection limits (MDLs).

The deeper of the soil samples submitted for analysis from this location was reported to contain concentrations of the following metals above their associated NYCRR Subpart 375-6 Restricted Use Soil Cleanup Objectives (SCOs) for the Protection of Public Health – Industrial Use:

- Arsenic; and
- Manganese.

In addition, analysis of this soil sample indicated concentrations of the following metals above their associated NYCRR Subpart 375-6 Restricted Use SCOs for the Protection of Groundwater:

- Arsenic;
- Barium;
- Lead;
- Manganese;

- Nickel; and
- Selenium.

<u>Railyard</u>

Four (4) surface (0'–0.5' BGS) soil samples were collected and submitted for laboratory analysis from the rail yard situated on the project site. These samples of soil and railroad "ballast" were observed to have a "greasy" texture and oily appearance. Analysis of one (1) of these surface soil samples detected the following SVOCs above their associated NYCRR Subpart 375-6 Restricted Use SCOs for the Protection of Groundwater:

- Benzo (a) anthracene;
- Benzo (b) fluoranthene; and
- Chrysene.

In addition, this surface soil sample was reported to contain a concentration of Benzo (a) pyrene above its associated NYCRR Subpart 375-6 Restricted Use SCOs for the Protection of Public Health – Industrial Use.

Groundwater

Groundwater samples were collected from groundwater monitoring wells that were installed in or near the following areas of concern on the project site:

- Former Settling Pond (monitoring well MW-A4-1);
- Locomotive House & Fuel Oil Storage (monitoring well MW-A19-1).

A review of the boring logs and well installation diagrams for these wells indicates that the wells were screened within the fill and underlying native deposits.

An apparent petroleum sheen was observed on the groundwater drawn from monitoring well MW-A19-1.

The groundwater samples were all submitted for laboratory analysis of the following:

- TCL VOCs including up to 20 tentatively identified compounds (TICs) using USEPA Method 8260;
- TCL SVOCs including up to 20 TICs using USEPA Method 8270;

- PCBs using USEPA Method 8082; and
- TAL Metals using USEPA Methods 6010 and 7471.

The laboratory analytical results associated with the groundwater samples were compared to NYSDEC Part 703 Groundwater Standards and Guidance Values [NYSDEC Division of Water Technical and Operational Guidance Series (TOGS 1.1.1) for the Ambient Water Quality Standards and Guidance Values and Groundwater Effluent Limitations dated June 1998 (Amended April 2000 and June 2004)], as summarized below:

Former Settling Pond

Three (3) SVOCs, including 4-methylphenol, benzo(a)anthracene and phenol, and two (2) metals (aluminum and sodium) were reported above their respective NYSDEC Part 703 Groundwater Standards.

Locomotive House & Fuel Oil Storage

Three (3) VOCs consisting of aromatic hydrocarbons; eleven (11) SVOCs consisting primarily of polycyclic aromatic hydrocarbons (PAHs); PCBs (Aroclor 1254), and sodium were reported above their respective NYSDEC Part 703 Groundwater Standards. Numerous VOC and SVOC TICs were also detected in this groundwater sample.

1.2.3.2.3 Significant Findings

The following bullets summarize the significant findings and recommendations pertaining to the project site contained in the Preliminary Subsurface Assessment report.

- Fill Material: The coarse-grained fill/slag material found across the Site was generally found to contain elevated levels of metals and SVOCs. Further delineation of the depth and composition of this fill material should be conducted during the remainder of the proposed Remedial Investigation of the Site.
- Former Settling Pond**:** Elevated concentrations of Arsenic and Calcium, as well as other metals, were found in soil samples from this area. Additional soil sampling is recommended in the area of the former settling pond to delineate the extent of these contaminants.

- Locomotive House & Fuel Oil Storage: Laboratory analytical results (reported detections of elevated VOCs, SVOCs, PCBs and sodium) and field observations (apparent petroleum sheen) associated with the groundwater sample collected near the former USTs warrant further investigation into the quality of groundwater and soil in the vicinity of this area of concern to confirm there is not a source area with higher concentrations.
- Railroad Ballast: Given the reported application/disposal of PCB-laden oils upon the railroad ballast on the eastern side of the Site, and the lack of significant PCB detections in surface soil samples collected and analyzed as part of this Preliminary Subsurface Assessment, it is recommended that deeper soil/ballast samples be collected from this area of concern, in order to confirm the absence of PCBs, as well as other potential contaminants, along the rail line.

1.2.4 Interagency Task Force on Hazardous Waste

The Interagency Task Force on Hazardous Wastes, representing the New York State Departments of Environmental Conservation and Health and the Region II office of the US Environmental Protection Agency (EPA), was established in 1978 to investigate past hazardous waste disposal practices in Erie and Niagara Counties. The Task Force published a Draft Report in March 1979 that includes information on the operations, waste generation and disposal practices at the Union Carbide Metals Division facility (the Praxair Property).

The Task Force's report indicated that furnace slag (ferroalloys), hydrated lime and miscellaneous plant waste was generated at the facility and was disposed of at an off-site disposal facility located at 56th Street and Pine Avenue in the City of Niagara Falls.

The report also indicates the following regarding radiological materials processing and disposal at the Praxair Site:

- From 1942 to 1953, the plant received uranium tetrafluoride from Union Carbide's Linde Division for conversion to uranium metal.
- Factory processing of uranium and thorium ores from 1965 through 1972 produced 505 tons of slag bearing 9,212 pounds of thorium dioxide and 1,293 pounds of "yellow cake" (U_3O_8).
- This slag material was placed in 55 gallon drums and buried in a designated area on plant property in a hole 20 feet deep with four to five feet of soil cover.
- Essentially all demolition debris and material from the building used for uranium and thorium processing were land disposed off-site at the Lake Ontario Ordinance Works.

- All combustible material was incinerated and disposed of at Union Carbide's off-site disposal location.
- The Oak Ridge National Laboratory conducted a cursory survey in 1976 and found no indication of contamination and the US Department of Energy (DOE) advised the Task Force that no radioactive contamination had been detected at the Metals Division plant.

1.2.5 Previous Radiological Surveys

A March 1980 Oak Ridge National Laboratory report summarizing a preliminary survey of the Union Carbide Corporation – Metals Division Plant (formerly the Electromet Corporation Plant) indicates that a portion of the plant site was utilized under the Manhattan Engineer District (MED) contract during the period of 1943 through 1946. According to the report, drums of green salt (uranium tetrafluoride) were received from the Linde Air plant in Tonawanda, New York, reacted in furnaces, converted into metal and then recasted into ingots. This process was reportedly performed in a portion of the plant that is situated to the west of 47th Street, west of the project site (see Figure 2A). The report also indicates that waste from the operation was disposed at the Lake Ontario Ordinance Works depot, and that residues of dolomite slag liners, uranium chips and crucible dross were shipped to other sites for uranium recovery. The preliminary survey detected slightly elevated radiation levels between two buildings on the Electromet Plant property to the west of 47th Street and recommended the collection of additional measurements to define the extent of the elevated readings in this area.

A follow up survey was conducted by the Oak Ridge National Laboratory in September 1980, the results of which were summarized in a report dated December 1980. This survey focused on the area of elevated measurements detected during the previous survey, which occurred in an area of the plant referred to as the "Technology Area" situated to the west of 47th Street (the former Electromet building shown in Figure 2A is located within the technology area). The survey detected wide-spread contamination over an extensive portion of the Technology Area, with relatively high concentrations of gamma-emitting radionuclides in localized areas, including areas occurring along two railroad spurs traversing the property. The radionuclides were associated with the thorium and uranium decay chains. The report indicates that thorium-bearing ores were used during operations at the plant, but that these operations were unrelated to MED/Atomic Energy Commission (AEC) activities. Therefore, the report concluded that the contamination was not likely related to MED/AEC activities, which were limited to reacting of uranium tetrafluoride to uranium metal. The report also recommended the completion of a detailed radiological survey of the Technology Area. No records of a subsequent radiological survey of this area were obtained during the course of this RI.

1.2.6 Areas of Potential Environmental Concern

Based upon previous documentation, including the results of the Phase I ESA and the Preliminary Subsurface Assessment, the following environmental concerns were identified in connection with the project site:

- Contaminated soil/fill and groundwater has been documented on the project site in connection with the former USTs in the vicinity of the locomotive house, the presence of slag across the site, and the historical industrial and rail-yard usage of the project site and adjacent properties.
- The potential on-site disposal of radioactive slag materials was identified by the Interagency Task Force on Hazardous Waste in 1979. Furthermore, radiological contamination was detected along rail spurs located to the west of the project site that were historically accessed via rail sidings that crossed the project site.
- Waste water and/or contaminated sediment may be present within pits and sumps within the locomotive house.
- The potential presence of Regulated Building Material (RBM) including asbestos containing materials (ACMs), lead based paint and lighting equipment containing polychlorinated biphenyls (PCBs) was identified in the locomotive house.

2.0 METHODS OF INVESTIGATION

The scope of the Remedial Investigation program was generally consistent with that outlined in the April 27, 2012 agreement between LaBella and Covanta. Modifications made to the scope of the program during the completion of the RI were approved by Covanta and are discussed within this report.

The purpose of the RI program was to determine the nature and extent of contamination associated with the areas of environmental concern discussed in Section 1.2.5. To accomplish these goals, the following tasks were completed during the field investigation:

- Completion of a geophysical survey to investigate metallic anomalies (e.g., potential buried tanks, vaults, underground utilities) potentially present in the area surrounding the locomotive house.
- Collection and analysis of on-site surface soil/fill samples to characterize the chemistry of these materials.
- Completion of test pits, test borings and soil probes to enable the classification, screening, sampling and chemical characterization of subsurface soil/fill.
- Radiological screening of soil/fill excavated from the test pits.
- Installation, development and sampling of groundwater monitoring wells in an effort to determine groundwater flow direction and gradient, as well as to enable the collection and chemical analysis of groundwater samples.

- Execution of a geophysical survey in areas of the site that were not historically occupied by rail facilities in an effort to identify subsurface anomalies potentially indicative of buried drums of radioactive slag.
- Performance of a radiological survey to assess baseline gamma radiation levels across the site and establish current background radiation levels.
- Completion of a radiological investigation, including the excavation of test pits and field screening and laboratory analysis of soil/fill samples, to characterize and delineate the extent of material exhibiting elevated gamma radiation levels, and to investigate subsurface anomalies identified by the geophysical survey.
- The collection and chemical analysis of liquid and sediment samples from onsite pits and sumps within and adjacent to the locomotive house to characterize these materials and profile them for disposal.
- Implementation of a Regulated Building Material (RBM) survey of the locomotive house to investigate ACM, LBP and/or PCB containing electrical equipment.
- The survey of surface soil sample locations, test pit locations, soil probe locations, monitoring well locations and elevations and the sediment sample locations.
- Evaluation of the resulting data and preparation of a report to:
    - Summarize and document the activities performed during the RI
    - Describe the physical characteristics of the project site
    - Describe the nature, magnitude and extent of contamination
    - Compare the analytical data to applicable regulatory levels
    - Evaluate contaminant fate and transport
    - Qualitatively assess exposure to site contaminants under current and future use scenarios.

The following section describes the RI field tasks in detail.

2.1 Field Investigation

The following subsections describe the scope of field activities implemented during the remedial investigation program. This scope reflects minor deviations and/or additions from the initial scope, as some minor modifications were necessary to account for information obtained during the field investigation.

The RI field program was conducted in two major phases. The first phase primarily involved the collection of physical and geochemical soil and groundwater data from across the site. The first phase also included geophysical and regulated building material surveys of the locomotive house. The second phase of the RI field program primarily involved radiological assessment tasks.

2.1.1 First Phase Field Program

Site Survey

Wendel completed boundary and topographic surveys of the project site. LaBella located the surface soil sample, test pit, soil probe, monitoring well and the sediment sample locations using Global Positioning System (GPS) methods. LaBella also surveyed the elevations of the monitoring wells using conventional survey techniques. A copy of the boundary and topographic surveys are included as Appendix A.

EM-61 Geophysical Survey

A time-domain electromagnetic geophysical survey was performed on May 11, 2012 in the area surrounding the locomotive house to determine if underground storage tanks (USTs) and/or other metallic anomalies existed in the subsurface. A subcontractor to LaBella, Geomatrix Consultants, Inc. (Geomatrix), employed a GEONICS EM61 High Sensitivity Metal Detector (EM61) and solid-state data logger to perform the geophysical survey. The survey was conducted utilizing a transect spacing of three feet over the selected areas. Data were recorded at a rate of approximately two measurements per foot along the survey transects.

Radiological Screening

Radiological screening of surface and subsurface soil/fill samples was performed using a Ludlum Model 2241-2RK Radiation Meter equipped with both a Geiger-Mueller Pancake Detector (Model 44-9) and a sodium iodide gamma scintillator (Model 44-2). The pancake probe detects alpha, beta and gamma radiation, while the sodium iodide probe is used for the detection of low-level gamma radiation. Screening of the soil/fill was performed at all test pit locations throughout the total depth of exploration at each test pit location.

Surface Soil/Fill Sampling

Six surface soil/fill samples (SS-1 through SS-6) were collected on May 15, 2012 to further characterize surface soil/fill contaminants identified during the previous investigation as well as to evaluate areas that were not previously characterized. Each of these samples was analyzed for TCL SVOCs, TCL Pesticides, PCBs and TAL metals. Table 1 identifies the analysis performed on each of the surface soil/fill samples, and Figure 4 shows the locations of the samples.

The surface soil/fill samples were collected from zero to two inches below the vegetative layer. If a vegetative layer was not present (i.e., gravel or railroad ballast areas) samples were collected two to four inches below grade, immediately below the gravel layer at the surface.

Test Pit Excavations

Thirty test pits were excavated across the site on May 14-16, 2012. The test pit locations are shown on Figure 5. The purposes of the test pits were to characterize the near-surface geology across the project site; identify and delineate to the extent practical areas of slag disposal; investigate magnetic anomalies identified during the geophysical survey; and identify and delineate areas of subsurface contamination via the field screening and chemical analysis of soil/fill samples.

Nature's Way Environmental Consultants and Contractors were subcontracted to provide an excavator and operator for the excavation of the test pits, while LaBella personnel completed field oversight, sample collection, and screening. Excavation occurred in one- to two-foot increments until the native glaciolacustrine clay unit was encountered or equipment refusal occurred. Excavated material was staged directly adjacent to the test pit. Visual characterization was performed for all test pits and the soil was screened for total organic vapors (TOVs) using a PID. Additionally, soils from the test pits were screened for radiation. Measurements were recorded on the field sheets. Following characterization and sample collection, the excavated soil/fill was returned to the test pit from which it originated. Logs that detail the observations made during the test pit activities are included in Appendix B.

A total of 15 soil/fill samples were collected from the test pits for chemical analysis. The samples were collected from horizons containing fill material or slag; areas with elevated TOV measurements; and/or soil/fill that exhibited visual and olfactory evidence of contamination. The test pit samples were analyzed for TCL VOCs and SVOCs, PCBs and TAL metals (see Table 1).

Soil Probes and Micro-Well Installation

A total of 23 soil probes were advanced on May 17-18, 2012 to characterize the near-surface geology in the vicinity of the locomotive house and to investigate the areal extent of subsurface petroleum contamination in the area of the former USTs. The soil probes were advanced at the locations shown on Figure 6 using direct-push soil sampling equipment to collect continuous samples. Nature's Way was subcontracted to provide and operate the direct-push drilling rig. The depths of the soil probes ranged from 2 to 15.5 feet below grade. Based upon a Building Condition Assessment completed by LaBella, the locomotive house was determined to be unsafe for human occupancy. Therefore, no soil probes were advanced within the interior of the structure due to safety concerns.

Soil samples from each probe were screened with a PID upon retrieval by separating the soil column with a decontaminated stainless steel spoon and placing the PID probe tip near the void. This was recorded as a “direct” TOV reading. The screening measurements and soil descriptions were recorded on Soil Probe Logs, which are included in Appendix C.

Fifteen soil/fill samples were collected from the soil probes for chemical analysis, which included the VOCs and SVOCs listed in Tables 2 and 3 of NYSDEC CP-51. The samples selected for analysis were based on TOV measurements as well as visual and olfactory observations.

Additionally, three of the soil probes were completed with 1-inch diameter micro-wells. These micro-wells (GP-MW-01, GP-MW-02 and GP-MW-03) ranged in depth from 12-14.5 feet BGS and were screened in the perched water occurring within the fill in this area of the site. The location of these micro-wells is depicted on Figure 6, while well completion reports are provided in Appendix D.

Test Borings and Monitoring Well Installation

A total of six test borings were advanced on the project site on May 21-24, 2012 to characterize the subsurface soil/fill and facilitate the installation of groundwater monitoring wells and the collection of groundwater samples. Five of these test borings were completed with 2-inch monitoring wells, while one test boring was terminated at a shallow depth due to equipment refusal. The test boring/monitoring well locations are shown on Figure 7.

The drilling, split-spoon sampling, and monitoring well installation were completed by Nature’s Way under the supervision of LaBella personnel. A truck-mounted rotary drilling rig equipped with hollow-stem augers was used to advance the test borings into the overburden materials and continuous split-spoon samples were collected throughout the depth of each test boring. The depths of the monitoring wells ranged from 16 to 21.7 feet BGS and the wells were screened in the uppermost water-bearing zone within the overburden.

During the drilling of these monitoring wells, running silt, sand and gravel was encountered within the augers once the rods were removed for installation of the monitoring wells. To counteract this phenomenon, potable water obtained from a fire hydrant on the adjacent Covanta property was introduced into the augers to create a “head” of water that prevented the geologic materials from flowing upward into the borings and enabled installation of the wells. The volume of potable water utilized at each well location was recorded on the boring logs.

Retrieved soil samples from each test boring were screened for TOVs using a PID. The screening values and soil descriptions are recorded on Test Boring Logs. These logs and Monitoring Well Completion Reports are included in Appendix E.

Five additional test borings were drilled on the project site to collect geotechnical data for use in the design of the proposed rail-to-truck intermodal facility. At each geotechnical boring location, continuous split-spoon sampling was conducted to a depth of 12 feet BGS, with standard interval sampling thereafter until split-spoon refusal depth or a depth of 20 feet BGS was encountered. The locations of these borings are shown on Figure 8 and field logs for these borings are included in Appendix F.

Groundwater Sampling

The five new monitoring wells, three new micro-wells and two existing wells from the previous investigation (MW-A19-1 and MW-A4-1) were developed and sampled by LaBella personnel. Prior to the initiation of groundwater sampling, each well was screened for TOVs using a PID and the TOV values were recorded on the development/sampling field logs. Additionally, groundwater levels were measured to determine the groundwater flow direction and gradient using an electronic oil/water interface indicator. Light non-aqueous phase liquids (LNAPL) and dense non-aqueous phase liquids (DNAPL) layers were not identified in any of the monitoring wells.

Each well was developed by removing well volumes equaling the total volume of potable water introduced into each test boring during well installation, plus a minimum of five additional well volumes using a peristaltic pump and dedicated polyethylene tubing or a bailer. After the completion of development, the monitoring wells were allowed to recharge. The samples were collected within 24 hours of completion of well development using a peristaltic pump and dedicated tubing. Well Development and Sampling Logs are included in Appendix G.

The groundwater samples collected from the two existing and five new 2-inch monitoring wells were analyzed for TCL VOCs and SVOCs, and TAL metals. Samples collected from the 3 new micro-wells were analyzed for the VOCs and SVOCs listed in Tables 2 and 3 of CP-51.

Pit and Sump Sampling

Water and sediment contained within the maintenance pit located inside the locomotive house were sampled for disposal profiling purposes. The water sample was collected using a dedicated polyethylene dipper, while the sediment was collected using a decontaminated shovel. These samples were analyzed for RCRA characteristics, including ignitability, corrosivity and reactivity, as well as PCBs. Additionally, both samples were analyzed for the metal, VOC and SVOC constituents specified in the Toxicity Characteristic Leaching Procedure (TCLP), with the sediment sample being extracted via the TCLP prior to analysis and the aqueous sample being analyzed for total concentrations of these constituents.

Additionally, water within the three manholes discovered around the locomotive house as a result of the geophysical survey was sampled using dedicated Teflon balers. The location of these manholes is shown on Figure 9. These samples were analyzed for TCL and CP-51 VOCs and SVOCs, PCBs and TAL Metals.

Regulated Building Material Survey

A pre-demolition survey for asbestos-containing material (ACM), lead-based paint (LBP), PCB caulk, mercury containing materials and other Regulated Building Material (RBM) was completed by LaBella to evaluate the potential presence of these materials in the locomotive house. A New York State Department of Labor (NYSDOL) certified asbestos inspector completed an inspection of accessible portions of the structure to visually identify, quantify and assess the condition of RBM. Sample collection and analytical procedures employed in connection with this survey are detailed in Appendix H and summarized as follows:

- Bulk samples of suspect ACM were collected and analyzed via Polarized Light Microscopy (PLM);
- Transmission Electron Microscopy (TEM) analysis of non-friable, organically bound (NOB) materials was performed;
- Suspect LBP was screened in the field using “Lead Check” color-metric swab testing procedures;
- Bulk samples of suspect PCB-containing caulk were collected and analyzed for PCBs using Method 8082;
- One wipe sample was collected from the exterior surface of the wall-mounted transformer located on the east side of the building and was analyzed for PCBs using Method 8082; and
- One surface soil sample was collected from the stained area beneath the wall-mounted transformer and was analyzed for PCBs using Method 8082.

2.1.2 Second Phase Field Program

2.1.2.1 Baseline Radiological Survey

Greater Radiological Dimensions, Inc. (GRD) was subcontracted to conduct a baseline radiological survey of the entire project site for the purpose of establishing background gamma radiation levels and identifying areas of elevated gamma radiation levels. The survey was comprised of gamma walkover surveys using GPS-enabled sodium iodide instrumentation and was conducted between July 23, 2012 and August 3, 2012.

The survey design was based on applicable manuals and guidance from the United States Nuclear Regulatory Commission (NRC). The walkover gamma surveys were performed using a Trimble receiver and data logger connected to a Ludlum 2221 rate-meter/scaler equipped with a 44-10 detector. The Ludlum 44-10 was calibrated to a Cs-137 source by an approved vendor and daily performance checks were performed using a Cs-137 button source.

Data from the radiation detection instrument was fed, on a real-time basis, to the Trimble data logger at a rate of 1 measurement/second. Coordinates and individual gross gamma measurements were recorded in counts per minute (CPM). Accessible areas of the site were traversed and the measurements were directly correlated to the X, Y and Z coordinates and the time data parameters provided by the Trimble unit.

The individual gamma measurement (count rate at each logged location) was assigned a corresponding colorimetric code and was plotted on a map of the project site to graphically illustrate gamma radiation levels detected across the surface of the site.

2.1.2.2 EM-31 Geophysical Survey

AMEC Environment and Infrastructure, Inc. (AMEC) was subcontracted to conduct a geophysical survey on the portion of the project site shown in Figure 10. In light of the information contained in the 1979 Draft Report published by the Interagency Task Force on Hazardous Waste, the objective of this survey was to explore for subsurface anomalies potentially indicative of a cluster(s) of buried drums. Areas of the site that were historically occupied by rail facilities dating back to prior to 1920 were delimited from the survey area as they were considered unlikely locations for drum burial. The area surrounding the locomotive house was also excluded based upon the results of the previous geophysical survey conducted in that area. Furthermore, the area to the south of the locomotive house was also excluded because the depth to bedrock was determined to be less than the 20-foot depth of the burial trench cited in the aforementioned Interagency Task Force report.

A Geonics EM-31 Terrain Conductivity meter was used to measure and record the quadrature component (ground conductivity) and the inphase component (metal detection) of the EM field along survey lines established using a reference grid laid out using GPS equipment. Comparison of the quadrature phase of the field data and the inphase component data results in increased anomaly definition.

Data acquisition was performed by AMEC on July 27 and August 2, 2012. All readings were taken with the instrument oriented parallel to the direction of travel, in the vertical dipole mode and with the instrument at waist height. The depth of penetration with the instrument in this configuration is approximately 12 to 15 feet BGS. During the survey, data were collected and stored in a solid state memory data logger. A survey base station was established on-site and was revisited throughout the survey to check for instrument drift and malfunction, neither of which was observed.

The terrain conductivity and inphase data were initially edited and then plotted as profile lines for interpretation. Contour maps of the data were then constructed and utilized for final interpretation.

2.1.2.3 Radiological Investigation

Based upon the results of the radiological and geophysical surveys described in the preceding subsections, a radiological investigation was performed by GRD on August 27-28, 2012. The investigation was designed to characterize and delineate soil/fill exhibiting elevated gamma radiation levels, and to investigate anomalies potentially indicative of buried drum clusters. A series of machine-excavated test pits were installed in areas of elevated gamma measurements by Nature's Way under the direction of radiological technicians from GRD. Additionally, one test pit was excavated in the vicinity of a subsurface anomaly identified by AMEC.

At each test pit location, excavation occurred in one-foot increments until native overburden was encountered. Excavated material was screened for gamma radiation using a Ludlum Model 2221 sodium iodide detector paired with a 44-10 probe and staged directly adjacent to the test pit. Samples of apparent radioactive slag material were collected for laboratory analysis and logs detailing the observations and measurements made during the test pit activities were completed. Following screening, characterization and sample collection, the excavated material was returned to the test pit from which it originated.

A series of soil probes were also advanced through concrete building pads where potentially elevated gamma radiation measurements had been recorded to enable the screening of underlying fill materials. Direct hydraulic push equipment was utilized by Nature's Way, under the supervision of GRD personnel, to advance these soil probes through the concrete pads. At each location, a down-hole gamma survey was performed by lowering the 44-10 probe into the probe hole and recording a gamma measurement.

A total of five samples were collected from the test pits for laboratory analysis. Additionally, a discrete piece of slag encountered on the ground surface that exhibited the highest gamma radiation level detected on the site was also submitted for laboratory analysis. These samples were submitted for gamma spectroscopy analysis for the purpose of establishing the type of radiological material present on the project site.

2.2 Sample Analysis/Validation

2.2.1 Laboratory Analysis

Paradigm Environmental Services (PES) performed the chemical analyses of all soil/fill, groundwater, aqueous and sediment samples collected during Phase 1 of the RI. PES is accredited under the New York State Environmental Laboratory Approval Program (ELAP) Contract Laboratory Program (CLP). With the exception of disposal profiling samples collected from the pit inside the locomotive house, all samples collected during the RI were analyzed using the applicable methods prescribed by the NYSDEC Analytical Services Protocol (ASP), June 2000. Category B deliverables were generated for these samples. The target analytes for the project are identified and summarized in Table 1.

Asbestos analysis by PLM was performed by LaBella Laboratories, while TEM analyses were performed by AMA Laboratories. Both of these laboratories are New York State ELAP certified for these analytical procedures.

The PCB analyses conducted in connection with the RBM survey of the locomotive house were performed by Schneider Laboratories, Inc., which is accredited under the New York State ELAP CLP.

Gamma spectroscopy analyses conducted in connection with the radiological investigation of the project site were performed by Pace Analytical Services, Inc., which is certified for radiochemistry methods under the National Environmental Laboratory Accreditation Program.

2.2.2. Quality Assurance/Quality Control Samples

In addition to field samples, Quality Assurance/Quality Control (QA/QC) samples were collected to evaluate the effectiveness of the QA/QC procedures implemented during the field and laboratory activities associated with the project. As reflected by Table 1, QA/QC samples included matrix spike (MS), matrix spike duplicate (MSD) and matrix duplicate (MD) samples, trip blanks, blind field duplicates and rinseate (i.e., equipment) blank samples.

2.2.3 Data Validation

Validation of the laboratory data generated from the chemical analysis of soil/fill and groundwater samples in accordance with the *NYSDEC Guidance for the Development of Data Usability Summary Reports* (DUSRs) was performed by DATAVAL, Inc. The data packages were reviewed for completeness and compliance relative to the criteria specified in the aforementioned NYSDEC document. A detailed comparison of the reported data with the raw data submitted as part of the supporting documentation package, and applied protocol-defined procedures for the identification and quantitation of the individual analytes was also conducted to determine the validity of the data. A DUSR was prepared for each data package, and includes a narrative summary discussing all quality issues and their impact on the reported results. The DUSRs are presented in Volume II of this report.

A DUSR was not prepared for waste characterization, disposal profiling, regulated building material or gamma spectroscopy analyses.

3.0 PHYSICAL CHARACTERISTICS OF THE STUDY AREA

3.1 <u>Site Structures</u>

The project site contains one structure formerly utilized for locomotive maintenance and repair, which occupies 13,700 square feet. The building is in an advanced state of disrepair and is not suitable for human occupancy or use. No other structures are present on the project site, but several large concrete floor slabs associated with former industrial buildings remain in the western and northern areas of the project site.

3.2 <u>Setting</u>

The topography of the project site is generally flat with an elevation of approximately 565 to 570 feet above mean sea level according to the USGS quadrangle map for Niagara Falls, New York.

Based upon a review of the Soil Survey of Niagara County, New York, the project site, like much of the developed land area within the City of Niagara Falls, is located in an unsurveyed area. The *Surficial Geologic Map of New York – Niagara Sheet (1988)* indicates that the overburden underlying the site consists of lacustrine silt and clay deposits. The site is located within the Erie-Ontario Lowlands physiographic province and is underlain by bedrock consisting of Silurian-age dolostone of the Lockport Group, according to the Geologic Map of New York – Niagara Sheet (1970).

A Flood Insurance Rate Map of the area indicates that the project site is not within the boundaries of the 100- and/or 500-year floodplains.

Precipitation that falls on the project site appears to infiltrate the ground surface. No surface water drainage was observed on the project site. The on-site drainage and wastewater systems are reportedly abandoned and capped, and no surface water bodies exist on or adjacent to the project site. Historical facility plans and records obtained from the City of Niagara Falls Engineering Department indicate that the following active utilities cross the site:

- A 60-inch diameter sanitary sewer crosses the northern-central portion of the project site. This sewer parallels an older, 44-inch sanitary sewer line that reportedly collapsed some time prior to 1960. The newer, 60-inch line connects with the older, 44-inch line near the middle of the project site, down-stream of the collapsed segment. Drawings obtained from the City indicate that the sewer is keyed into the top of bedrock, with the invert occurring approximately 25 feet below the ground surface. During the RI field program, flow was observed in this sewer via a manhole located on the project site.

- Two parallel, pressurized water lines operated by Praxair reportedly cross the southern portion of the project site in the vicinity of the former locomotive house. These lines include a 24-inch service water supply line and a 30-inch cooling water return line. The depth of these lines is not known.

The New York State Department of Environmental Conservation (NYSDEC) Freshwater Wetland Map and the U.S. Department of Interior Fish and Wildlife Service National Wetlands Inventory Map for Niagara Falls, New York Quadrangle were reviewed. These maps indicate that no state or federally designated wetland areas are located on or adjoining the site.

3.3 Geology

An evaluation of the subsurface stratigraphy of the project site was completed by integrating the data collected during the subsurface investigation with existing published information on the geology and hydrogeology of the project area. As previously discussed, the subsurface investigation included the drilling of 11 test borings, the excavation of 30 test pits, and the advancement of 23 soil probes across the project site. The subsurface stratigraphy of the project site can be divided into five significant units, which are described in descending order as follows:

- Fill material
- Alluvial deposits
- Glaciolacustrine deposits
- Glacial till
- Dolostone bedrock

Geologic sections illustrating this stratigraphy were constructed along the section lines shown in Figure 10A and are presented in Figures 10B and 10C.

3.3.1 Fill Material

Fill material was encountered across the project site and was observed from the ground surface to a maximum depth of 8' BGS. The greatest thickness of fill was encountered in the vicinity of buried utilities, and likely represents utility trench backfill. The thickness of the fill across the remainder of the site generally ranged from 2' to 6' BGS and consisted of a mixture of brown to black granular material, angular gravel, slag, railroad materials (i.e., ballast, buried railroad ties) and wood, metal and concrete debris. The slag that was encountered across the project site varied in color and structure, ranging from crushed to bolder-sized. The color of the slag ranged from light gray to black with purple, orange and blue iridescence.

In addition, test pits excavated in the vicinity of the former settling pond (TP-02 and TP-03) in the northern portion of the site revealed the presence of fill material that appeared to be similar to the description of the off-specification welding product and/or flux waste that was documented to have been disposed of in low areas on the Praxair property to the west. Packaging waste labeled “Union Carbide Welding Product” was comingled with this fill material.

The hardness of the slag resulted in backhoe refusal at numerous test pit locations. Based upon test boring data, the variable relative density of the fill ranged from loose to very compact, but was typically firm to compact. Perched water was observed within the fill material across the site.

3.3.2 Alluvial Material

Beneath the fill, native soils consisting of predominantly gray and brown silt and fine sand, with occasional layers of cohesive clayey silt, was encountered to depths of 6.5' to 8' BGS. This unit had a variable relative density ranging from loose to compact; however, it was typically loose to firm. At various locations across the site, localized perched groundwater was also observed in this unit, which overlies low permeability glaciolacustrine deposits.

3.3.3 Glaciolacustrine Material

A layer of glaciolacustrine, or glacial lake, deposits, consisting of red-brown silty clay underlies the alluvial deposits across the site and extends to depths of 14.5' to 17' BGS. This unit is typically of a stiff to very stiff consistency in its upper reaches and then becomes medium to very soft at a depth of around 12-14' BGS. Based upon field observations and laboratory testing, this deposit becomes saturated around a depth of 12-14' BGS.

3.3.4 Glacial Till

Beneath the silty clay deposits, glacial till consisting of brown clayey silt intermixed with sand and angular rock fragments were encountered and found to extend to the top of apparent bedrock, which ranged from 15.2 to 21.7 feet BGS. The relative density of the till ranged from firm to compact.

3.3.5 Dolostone Bedrock

Split-spoon refusal, which was presumed to represent the top of bedrock, was encountered at depths ranging from 15.2 to 21.7 feet BGS across the site, with the shallowest depth to apparent bedrock encountered in the southern portion of the site. Although rock coring was not performed to confirm the presence, characteristics and quality of the apparent bedrock, rock fragments observed in the split spoon sampler at refusal depth consisted of gray dolostone consistent with the bedrock that underlies the area. The depths at which apparent bedrock was encountered on the project site are also consistent with the depths at which bedrock has been documented on the adjacent Covanta property. Slightly to moderately weathered, gray, hard dolostone of the Oak Orchard Formation, Lockport Group was encountered during geotechnical investigations of the Covanta property to the west.

3.4 Hydrogeology

Hydrogeologic conditions across the site were investigated through the installation of five 2-inch diameter groundwater monitoring wells and three 1-inch diameter micro-wells, as well as the use of two existing on-site wells.

Although localized perched water was encountered within the permeable fill and alluvial deposits, saturated conditions were not consistently observed in these units. Therefore, the upper-most water bearing zone defined on the project site occurs within the lacustrine and till deposits. This water-bearing zone was encountered in all of the test borings across the site. The five 2-inch wells (MW-01, MW-02, MW-03, MW-05 and MW-06) were screened across the apparent phreatic surface within this upper-most hydrostratigraphic unit.

Meanwhile, the three new micro-wells were intended to investigate documented petroleum impacts in the vicinity of the USTs formerly located near the southeast corner of the locomotive house. These micro-wells were installed in the zone of perched water occurring within the fill material encountered in the former UST cavity and the area surrounding the locomotive house, and were screened across the top of the perched water to investigate the potential occurrence of Light Non-Aqueous Phase Liquid (LNAPL) in this area.

Static water level measurements taken from the 2-inch wells on June 26, 2012 are shown in the table below, as are the corresponding groundwater elevations. The depth to groundwater measured in the wells ranged from 8.20-12.12 feet from the top of the well risers. A comparison of the depth to water during the drilling of these wells with that observed following installation indicates that the groundwater in this hydrostratigraphic unit is under confined or semi-confined conditions, with the overlying lacustrine unit functioning as an upper confining layer.

Summary of Static Groundwater Measurements in New 2-Inch Monitoring Wells

WELL NUMBER	TOTAL DEPTH OF WELL (FT)	STATIC WATER LEVEL (FROM TOP OF RISER)	GROUNDWATER ELEVATION (FT)
C4R-MW-01	20.2	11.30	92.36
C4R-MW-02	21.7	10.71	92.66
C4R-MW-03	20.1	10.72	91.97

WELL NUMBER	TOTAL DEPTH OF WELL (FT)	STATIC WATER LEVEL (FROM TOP OF RISER)	GROUNDWATER ELEVATION (FT)
C4R-MW-05	21.7	12.12	91.75
C4R-MW-06	16.0	8.20	95.49
Note: No well was installed at the C4R-MW-04 location due to an obstruction encountered at 10' BGS during hollow stem auger drilling.			

A review of the groundwater elevations recorded in the new 2-inch monitoring wells indicates that the gradient of the groundwater potentiometric surface across the central and northern portions of the site is relatively flat. The elevation of the groundwater in the southern portion of the site, however, is several feet higher. The cause of this variation is not currently known, but this difference does indicate the likelihood of localized variations in groundwater flow and gradient on the project site.

A groundwater potentiometric surface map for the upper-most water bearing zone has not been provided in this report because the impact of the groundwater pumping system currently in operation on the adjacent Occidental Chemical Corporation site to the south has not been sufficiently defined to enable reliable modeling and interpretation of the groundwater elevations recorded on the project site. Both overburden and bedrock groundwater zones on the Occidental site are hydraulically controlled by groundwater extraction wells on this adjacent site. Furthermore, the presence of the Fall Street Tunnel, which is situated to the west of the project site near Royal Avenue, likely influences local groundwater flow. The combined impact of these groundwater "sinks", coupled with the presence of active and abandoned utility lines and foundation walls across the project site further complicates the interpretation of the groundwater data from the site.

4.0 GEOPHYSICAL SURVEY RESULTS

4.1 EM-61 Survey

The report summarizing the results of the EM-61 geophysical survey conducted in the area surrounding the locomotive house is presented in Appendix I, and identified five potentially significant anomalies (see Figure 1 in Appendix I). A discussion of these anomalies is presented below:

- Two buried metal anomalies (Anomalies A and B) were identified near the southeast and southwest corners of the locomotive house, respectively. Field investigations of these anomalies determined that they consist of manhole covers that were buried just below the ground surface. The locations of these structures were correlated with manholes shown on a historic facility drawing that depicts them as components of a sewer system present around the locomotive house. Based on this drawing, a third manhole was uncovered near the northeast corner of the building. These manholes, designated MH-01, MH-02 and MH-03 area shown on Figure 9, and were incorporated in the RI sampling and analysis program.

- A linear anomaly (Anomaly C) was identified to the north of the locomotive house, extending northward from the eastern most maintenance bay. The response from this anomaly was similar to that observed from buried railroad tracks observed elsewhere on the site. Furthermore, the location and geometry of this anomaly correlates with a rail line shown on a historic facility drawing that depicts the line exiting from the northeast side of the building and extending to the north.

- Two anomalies (Anomalies D and E) were observed along the eastern and northern walls of the locomotive house, respectively. These anomalies have been attributed to the presence of surface metals that were obscured from sight by overgrown vegetation that occurs along the building perimeter.

No other metallic anomalies identified as a result of the geophysical survey were characterized as potentially significant.

4.2 EM-31 Survey

Appendix J contains the report summarizing the EM-31 geophysical survey conducted in the northwestern portion of the site to explore for subsurface anomalies indicative of a cluster(s) of buried drums. The conductivity and inphase data results are shown along with surface features observed during data acquisition in Figures 11 and 12, respectively. The inphase data exhibits a response that is similar to the conductivity data, and the majority of the anomalies evident within both the conductivity and inphase data are likely related to surface or near surface anthropogenic features (e.g., rail lines, fences, reinforced concrete, etc.).

Three anomalies were identified as potentially being related to clusters of buried drums and are labeled A through C on the figures. The geophysical data set is very “noisy” due to the historic features remaining on the site. A review of historic fire insurance maps for the site indicates that numerous rail lines were present. Linear anomalies within the geophysical data suggest that many of these lines may still be present at or near the ground surface, but obscured by fill and/or brush. The AMEC report concluded that anomalies A-C are very likely related to these remnant rail lines and/or former building structures.

A discussion of these anomalies is presented below:

- Anomaly A is a large buried metal anomaly observed on both the conductivity and inphase data sets and represented in shades of dark blue on the figures. This anomaly is located northwest of the intersection of the rail lines. The rectilinear shape of this anomaly correlates with the footprint of Building No. 98, which was formerly located in this area of the site according to historical site plans. Building debris is also present at the ground surface in this area. Consequently, this anomaly appears to be associated with a reinforced concrete slab that remains in the area of former Building No. 98.

- Anomaly B is a smaller buried metal anomaly located immediately west of a north-south trending rail line and is expressed in shades of dark blue on the figures. Test pits excavated in this area revealed the presence of buried metal within two feet of the ground surface. This anomaly is, therefore, attributed to the presence of shallow buried metal.

- Anomaly C is a subtle buried metal anomaly located in the northeast portion of the survey area and is expressed in shades of dark blue on the figures. The location of this anomaly coincides with the area of a former settling pond shown on historical site plans and investigated through the excavation of a series of test pits. Apparent off-specification welding products were observed in this area during the test pit program, and this anomaly appears to be associated with the presence of this material.

Other unlabeled anomalies shown on the figures were interpreted by AMEC to be too small to represent a cluster of buried drums or are believed to be associated with surface metal features. Therefore, the EM-31 survey did not result in the identification of subsurface anomalies that were interpreted to be representative of a cluster(s) of buried drums.

5.0 FIELD SCREENING RESULTS AND VISUAL/OLFACTORY EVIDENCE OF IMPAIRMENT

The following subsections present and discuss the results of organic vapor field screening of soil/fill samples conducted during the Phase 1 RI drilling and excavation programs, as well as visual and olfactory evidence of impairment noted during these field programs. Radiological screening and survey results are discussed in Section 7.

5.1 Organic Vapor Screening Results

Direct screening of subsurface soil/fill samples collected from the test pits, test borings and soil probes for Total Organic Vapors (TOVs) was conducted using a photo-ionization detector (PID) and the resulting measurements were recorded on the field logs. The following bullets summarize the PID screening results from the test pits and test borings:

- No TOVs were detected in materials excavated from the test pits; and

- TOVs were not detected at levels exceeding 1 PPM in the split-spoon samples collected from the test borings.

Of the 23 soil probes advanced in the vicinity of the locomotive house, TOVs were detected in 16 soil probes. The highest concentration of TOVs detected during the direct screening of samples from these soil probes was 313 PPM in GP-16 at a depth of approximately 2' BGS. TOV measurements above 100 PPM were also recorded in GP-03 (156 PPM), GP-07 (195 PPM), GP-09 (159 PPM), and GP-10 (130 PPM). These soil probes are located along the eastern side of the locomotive house and in the vicinity of the former USTs near the southeastern corner of the building. The highest TOV levels were generally detected within fill occurring within 2-5' BGS. TOVs were not detected in the soil probes installed to the west or north of the locomotive house.

5.2 Visual/Olfactory Evidence of Impairment

Visual and/or olfactory evidence of contamination, including staining, odor and sheen, was encountered during the subsurface investigation of the project site and was noted on the field logs. The following bullets summarize significant observations indicative of contamination:

- Petroleum odor was noted in the fill samples collected from a majority of the soil probes installed to the south and east of the locomotive house;
- A sheen was noted within the fill samples collected from soil probes placed within and adjacent to the former USTs and in the fill to the east of the locomotive house;
- Slight petroleum odor was noted in the split-spoon sample collected at a depth of approximately 2' BGS in test borings C4R-MW-05 and C4R-MW-06;
- Staining was observed at the top of the native soil, immediately below the fill, at numerous test pit and test boring locations across the site;
- A chemical odor was noted in the fill sample collected from GP-16 at a depth of approximately 3' BGS;
- A sulfur odor was noted in the fill excavated from TP-07 at a depth of approximately 2.5' BGS; and
- A "fishy" odor was noted in the fill excavated from TP-30 at a depth of approximately 2.5' BGS.

6.0 ANALYTICAL RESULTS

The following sections summarize and discuss the analytical results generated during the Phase 1 RI. Surface and subsurface soil/fill, groundwater, sediment, and building material and component samples were collected for chemical analysis to determine the magnitude and extent of potential contamination occurring in various media at the site. A summary of the Phase 1 RI sampling program, including the number and type of QA/QC samples is presented in Table 1.

For discussion purposes, this data is compared with the Standards Criteria and Guidance values (SCGs) applicable to each medium sampled, and include:

- Soil/Fill: NYSDEC's 6NYCRR Part 375 Environmental Remediation Programs: Part 375-6.8: Residential, Commercial and Industrial Use Soil Cleanup Objectives; and
- Groundwater: NYSDEC's June 1998 Ambient Water Quality Standards and Guidance Values and Groundwater Effluent Limitations in the Technical and Operational Guidance Series (TOGS) 1.1.1.

The analytical laboratory reports are included in Appendices K through R. This data was validated in accordance with NYSDEC guidelines and was qualified, where appropriate, based on the data usability evaluation. Qualifies codes were used to indicate the qualitative and quantitative reliability of the data. All analytical laboratory data were found to be valid and usable with the qualifications noted in the DUSR (see Volume II of RI Report). A series of summary tables (Tables 2 through 6) presenting the data with the final validation qualifiers and comparing the results to the applicable SCGs has been integrated into the discussion of the data in the following subsections.

Consistent with NYSDEC guidelines, the ASP Category B deliverables are not presented as appendices to the RI Report. The data has been transmitted electronically to the NYSDEC in a format consistent with the Electronic Data Deliverable (EDD) Manual.

6.1 Surface Soil/Fill

Five surface soil/fill samples were collected during this investigation (SS-1 through SS-5). Each of the surface soil/fill samples collected from the project site were analyzed for TCL SVOCs, Pesticides and PCBs, and TAL metals. The analytical results are summarized in Table 2, and Figure 4 shows the sampling locations.

SVOCs, primarily polycyclic aromatic hydrocarbons (PAHs), were detected in each of the surface soil/fill samples. However, only SS-1 contained multiple compounds at concentrations that exceeded both Industrial Use SCOs and Restricted Use SCOs for the Protection of Groundwater. The concentration of one SVOC slightly exceeded the Industrial Use SCO in SS-2. With a few minor exceptions, the concentrations of SVOCs in the remaining soil samples were below Unrestricted Use SCOs.

One or more pesticides were detected in each of the five soil/fill samples. However, pesticide concentrations above Industrial Use SCOs were only detected in SS-4. Both SS-2 and SS-4 contained pesticides at levels that exceeded the Restricted Use SCOs for Protection of Groundwater.

With the exception of Aroclor 1254 in SS-1 and SS-2, PCBs were not detected in the surface soil/fill samples. The concentrations of PCBs in SS-1 and SS-2 were well below the Industrial Use SCO and the Restricted Use SCO for Protection of Groundwater.

The concentration of arsenic in SS-1 and SS-6 and manganese in SS-1, SS-2, SS-3 and SS-4 exceeded both the Industrial Use SCOs and the Restricted Use SCOs for Protection of Groundwater for these parameters. The concentrations of barium, calcium, cobalt, iron and vanadium also exceeded the Restricted Use SCOs for Protection of Groundwater in four or more surface soil/fill samples. No other inorganic analytes were detected at concentrations exceeding the Industrial Use SCOs.

6.2 Subsurface Soil/Fill

A total of 35 subsurface soil/fill samples were collected from test pits, test borings and soil probes from across the project site to characterize the subsurface soil/fill material. Twenty of the subsurface soil/fill samples (those originating from the test borings and test pits) were analyzed for the following parameters: TCL VOCs and SVOCs, PCBs, and TAL metals. The 15 samples collected from the soil probes installed in the vicinity of the locomotive house were analyzed for CP-51 VOCs and SVOCs, and PCBs. The analytical results for the subsurface soil/fill samples are summarized in Tables 3-5, and the locations of subsurface investigation points are depicted on Figures 5-7.

6.2.1 Test Pit/Test Boring Samples

No TCL VOCs were detected in the subsurface soil/fill samples collected from the test pits or test borings at concentrations exceeding the Industrial Use SCOs. Acetone was detected in multiple samples above the Restricted Use SCO for Groundwater Protection; however, this compound is a common laboratory contaminant and was also detected in the method blank.

Only one SVOC, benzo(a)pyrene, was detected in one of the subsurface soil/fill samples collected from the test pits or test borings at a concentration exceeding the Industrial Use SCOs. This compound was detected in the fill sample collected from TP-14, which also contained four other SVOCs at levels that exceeded the Restricted Use SCOs for Protection of Groundwater

No TCL Pesticides were detected in the subsurface soil/fill samples collected from the test pits or test borings at concentrations exceeding the Industrial Use SCOs or Restricted Use SCOs for Groundwater Protection.

With the exception of Aroclor 1254 in TP-02, PCBs were not detected in the subsurface soil/fill samples. The concentration of PCBs in TP-02 was well below the Industrial Use SCO and the Restricted Use SCO for Protection of Groundwater.

The concentrations of arsenic and manganese each exceeded both the Industrial Use SCOs and the Restricted Use SCOs for Protection of Groundwater for these parameters in three of the subsurface fill samples collected from the test pits. The concentrations of aluminum, barium, calcium, chromium, cobalt, iron and vanadium also exceeded the Restricted Use SCOs for Protection of Groundwater in multiple subsurface soil/fill samples. Additionally, the concentration of chromium in one subsurface fill sample (TP-14) exceeded the Restricted Use SCOs for Protection of Groundwater. No other inorganic analytes were detected at concentrations exceeding the Industrial Use SCOs.

6.2.2 Soil Probe Samples

With the exception of acetone in one sample, No CP-51 VOCs or SVOCs were detected in the subsurface soil/fill samples collected from the soil probes at concentrations exceeding the CP-51 Soil Cleanup Levels. Acetone was detected in the sample from GP-16 above the CP-51 cleanup level; however, this compound is a common laboratory contaminant and was also detected in the method blank.

No PCBs were detected in the subsurface soil/fill samples collected from the soil probes.

6.3 Groundwater

Groundwater samples were collected from the five newly installed 2-inch monitoring wells, the three newly installed 1-inch micro-wells and the two existing wells. The samples from the five new 2-inch wells and the two existing wells were analyzed for TCL VOCs and SVOCs, PCBs and TAL metals. The samples from the three new micro-wells installed in the vicinity of the locomotive house were analyzed for NYSDEC CP-51 VOCs and SVOCs. The analytical results for the groundwater samples are summarized in Table 6 and the locations of monitoring wells are depicted on Figure 7.

Prior to the initiation of groundwater sampling, an electronic oil/water interface probe was lowered into each monitoring well to evaluate for the presence of LNAPL. No LNAPL layers were identified in any of the monitoring wells.

6.3.1 Perched Water

The three newly installed micro-wells and the two existing monitoring wells were screened in the perched water occurring within the fill. The three micro-wells and existing well MW-A19-1 are located in the vicinity of the locomotive house, while existing well MW-A4-1 is located within the former settling pond in the northern portion of the site. For ease of review, these two discrete areas are discussed separately below.

Locomotive House Area

Low concentrations of VOCs, primarily consisting of aromatic hydrocarbons such as benzene and xylene, were detected in two of the three micro-wells (GP-MW-01 and GP-MW03) and in existing well MW-A19-1. Only one of the detected compounds, n-propylbenzene in GP-MW-01, was found at a concentration that slightly exceeded the groundwater standard. No other contraventions of the groundwater standards were noted for the detected compounds, and no VOCs were detected in GP-MW-02. Low concentrations of VOC TICs were detected in existing well MW-A19-1.

Two SVOCs were detected in GP-MW-01. The concentrations of the PAHs detected, however, were below the groundwater standards. SVOC TICs were detected in existing well MW-A19-1. No SVOCs or SVOC TICs were detected in the remaining two micro-wells.

Of the wells screened in the perched water in the vicinity of the locomotive house, only existing well MW-A19-1 was analyzed for PCBs and TAL metals. No PCBs were detected in this well; however, numerous inorganic parameters were detected at concentrations exceeding the groundwater standards at this location. The only contraventions of the water quality standards for barium, chromium and manganese encountered on the project site were recorded at this well, which also contained levels of aluminum, iron, magnesium and sodium that exceeded the groundwater standards.

Settling Pond Area

With the exception of low concentrations of VOC TICs, no VOCs or SVOCs were detected in existing well MW-A4-1. No PCBs were detected in this well either. However, this well was the only well on the project site that exceeded the groundwater standards for arsenic and vanadium. Additionally, aluminum and sodium levels in this well also exceeded the groundwater standards.

6.3.2 Overburden Groundwater

One to five VOCs were detected at low concentrations in each of the new monitoring wells. Only the concentration of acetone in C4R-MW-01 exceeded the groundwater standard. However, acetone is a common laboratory contaminant and was also detected in the trip blank.

No SVOCs or PCBs were detected in the new wells. However, low levels of SVOC TICs were encountered in all of these wells.

Two or more metals were detected in each of the new wells at concentrations exceeding the groundwater standards. These included aluminum, iron, magnesium and sodium. No contraventions of the groundwater standards for arsenic, chromium, manganese or vanadium were recorded in these wells.

6.4 Pit and Sump Samples

6.4.1 Maintenance Pit

One aqueous (C4R-Sump-1) and one sediment (C4R-Sed-1) sample were collected from the large maintenance pit located within the central bay of the locomotive house for disposal profiling analysis. The samples were analyzed for RCRA characteristics, including reactivity, corrosivity and ignitability, as well as PCBs. Additionally, both samples were analyzed for the metal, VOC and SVOC constituents specified in the Toxicity Characteristic Leaching Procedure (TCLP), with the sediment sample being extracted via the TCLP prior to analysis and the aqueous sample being analyzed for total concentrations of these constituents.

The laboratory results from these samples are presented in Appendix P and indicate that the liquid and sediment within this pit are non-hazardous and do not contain PCBs. The only organic compounds detected were found in the liquid, which contained low concentrations of methylene chloride, acetone, 2-Butanone and 4-Methyl-2-pentanone.

6.4.2 Sewer Manholes

Aqueous samples were collected from each of the three manholes discovered around the perimeter of the locomotive house. These samples were analyzed for TCL and CP-51 VOCs and SVOCs, TCL pesticides, PCBs and TAL metals. The laboratory results for these samples are presented in Appendix Q.

No VOCs or VOC TICs were detected in any of the samples collected from the manholes. With the exception of one SVOC (2-methylnapthalene) and two pesticides (alpha-BHC and Delta-BHC) detected at low concentrations in MH-02, no SVOCs, pesticides or PCBs were detected in any of the samples. However, one or more SVOC TICs were detected in each of the manhole samples, with the highest occurrence and concentration of TICs reported for MH-02.

Calcium, chromium, iron, magnesium, manganese, potassium and sodium were detected in two or more of the manholes. The levels of chromium detected in MH-01 and MH-03 were below the groundwater standard, and this analyte was not detected in MH-02. Slight exceedances of the groundwater standards for iron, manganese and sodium were detected in the samples from MH-01 and MH-02. Additionally, the concentration of sodium in MH-02 also exceeded the groundwater standard.

6.5 RBM Survey

As described in the Pre-Demolition Regulated Building Material Inspection report presented in Appendix H, ACM, LBP, PCB-containing light fixtures, and mercury vapor-containing light bulbs were identified in the locomotive house. These RBM area discussed in the following sections:

6.5.1 Asbestos Containing Materials

Approximately 8,000 SF of non-friable ACM were confirmed via laboratory analysis. Additionally, 54 light fixtures containing friable ACM in the form of gaskets were identified in the building. A summary of the type, location, estimated amount, friability and conditions of the ACMs detected in the building is provided in the following table:

Asbestos Containing Materials Summary Table

Rail House				
Type of Material	**Typical Location [1]**	**Estimated Amount [2]**	**Friability**	**Condition**
Black Built-Up Roofing	West Portion of the Roof and Remnants on Other Roofs	7500 SF	Non-Friable	Damaged
Grey Roof Cement	Around Flashing, Curbs, Penetrations on All Roofs	280 SF	Non-Friable	Good
Black Caulk	Around Door on Smaller Roof	10 LF	Non-Friable	Good
Grey Window Caulk	Around Exterior Wooden Windows	125 LF	Non-Friable	Good
Electrical Panel	In Electrical Panels in the West Bay	3 SF	Non-Friable	Good
Black Pier Packing	Between Concrete Supports and Concrete Slab in West Bay	50 SF	Non-Friable	Good
Light Fixture Gasket	In Bathroom, Main and West Bay Lights	54 SF	Friable	Good

Notes:

1 *Typical Location may not be inclusive of all material locations present at the subject structure.*
2 *For general reference only: Estimated amounts of confirmed ACMs listed above were obtained through field observations made during site visits. Quantities are approximations and LaBella assumes no responsibility if used for bidding.*

In addition to these materials, it was noted that asbestos-containing caulk may be present on the ground surface around the perimeter of the building and that corrugated metal fastened to some of the window frames may conceal additional ACM.

6.5.2 PCB Containing Materials

Several fluorescent light fixtures assumed to be equipped with PCB-containing ballasts were identified in the building.

The laboratory results from the wipe sample collected from the exterior of the wall-mounted transformer and the stained surface soil beneath this unit are presented in Appendix R and indicate that the concentration of PCBs in both of these samples were below the quantitation limits.

Appendix R also contains the laboratory results from the analysis of the suspect PCB-containing caulks. These results indicate that the concentrations of PCBs in the black roof caulk were below the EPA threshold, and that PCB levels in the gray caulk were below the quantitation limits.

6.5.3 Mercury-Containing Materials

Fluorescent, mercury vapor and high pressure sodium light fixtures were observed within the locomotive house. These fixtures are equipped with bulbs that contain varying amounts of mercury vapor.

6.5.4 Lead-Based Paint

Based upon the results of the color-metric swab testing conducted on the interior and exterior painted surfaces of the locomotive house, all painted surfaces were found to be positive for lead. The paint on many of these surfaces has undergone substantial weathering and is in very poor condition. Therefore, LBP may also be present in the debris on the floor within the buildings and on the ground surface around the exterior of the structure.

7.0 RADIOLOGICAL SURVEY RESULTS

7.1 Phase 1 RI Radiological Screening

No radiological activity above background levels was detected as a result of radiological screening of soil/fill from the 30 test pits excavated across the project site during the first phase of the RI. No responses above 50 uR/hr were detected in any of the slag, fill or soil materials encountered in the test pits. However, as discussed in the following subsections, the results of a subsequent radiological survey and radiological investigation of the project site indicated the presence of radiologically impacted material. Therefore, the Phase 1 RI radiological screening results are considered inconclusive and have been excluded from further consideration in this report.

7.2 Phase 2 RI Baseline Radiological Assessment

The GRD report summarizing the results of the baseline radiological assessment is presented in Appendix S. Natural background gamma radiation levels for the site were determined to range from 5,526-7,522 CPM. As illustrated by Figure 13, gamma radiation levels determined during the walkover survey were within the background range for the majority of the site. However, a number of areas situated adjacent to rail lines in the northern portion of the site displayed elevated gamma readings ranging from approximately 16,000-40,000 CPM, with isolated “hot spots” exceeding this range. The peak measurement recorded in these hot spots during the survey was 420,000 CPM.

Isolated occurrences of elevated gamma radiation measurements were also observed sporadically across the remainder of the site as shown on Figure 13. In addition, measurements taken in the areas of some of the concrete building pads indicated the potential presence of radioactive material under the concrete.

7.3 Phase 2 RI Radiological Investigation

A series of test pits were excavated in the areas of elevated gamma radiation identified during the baseline assessment in an attempt to better characterize and delineate the radiological material present on the site. Test pits were excavated in ten radiological hot spot areas as illustrated on Figure 14. Additionally, ten shallow borings were completed through the concrete slabs to enable radiological screening of the underlying fill material for gamma radiation. Six samples of the radiologically impacted materials were also collected and submitted for laboratory analysis.

The GRD report presenting the results of this investigation is contained in Appendix T and is summarized below:

- The laboratory results indicate that the material exhibiting elevated gamma radiation consists primarily of slag comprised of 50% iron (FE), 25% calcium oxide (CaO) and 13% silcon monoxide (SiO), which has been previously identified as cyclowollastonite.

- This slag material is typically a by-product of the electrochemical production of elemental phosphorous using uranium-bearing raw materials. Previous radiological surveys of the Niagara Falls area indicate that this material was historically utilized for bedding under paved surfaces (e.g., roads, building slabs) as well as for general hard fill applications.

- No large continuous lenses or laterally extensive subsurface layers of radioactive slag were observed.

- The radioactive slag occurs primarily within two feet of the ground surface in the hot spot areas and appears to be mixed with other non-radiologically impacted fill materials. Gamma radiation levels detected in this material during the on-site investigation generally ranged from 15,000 – 60,000 CPM, with higher readings of 120,000-170,000 CPM limited to the area in the vicinity of the TP03 test pit cluster.

- The source of the previously detected peak gamma reading of 420,000 CPM was determined to be a single, football-sized piece of slag that was partially exposed at the ground surface. This piece of slag was removed from the site for laboratory analysis.

- With the exception of two boring locations, no radiological material was detected via "down-hole" gamma readings taken under the concrete pads. The exceptions to this occurred at locations DH-4 and DH-6, located on the central portion of the large concrete pad that occurs along the western side of the project site. Slightly elevated gamma radiation readings of 22,000 CPM and 19,000 CPM were recorded in the non-native fill material underlying the slab at these locations. Furthermore, some of the concrete appeared to have slag-like material incorporated in the concrete matrix, which may have contributed to the slightly elevated gamma readings in this area.

Based upon the results of this investigation, GRD identified five discrete areas containing technologically enhanced naturally occurring radioactive materials (TENORM) slag with activity levels exceeding local background levels. These areas are located in the northern portion of the site and are depicted on Figure 15. The maximum depth of the impacted slag observed within these areas was 2.5 feet BGS, and GRD estimated the total amount of radioactive material on the project site at 7,149 tons. This estimate also includes the potential sporadic occurrences of impacted slag in other areas of the site, outside of the five areas of radiological concern.

8.0 CONTAMINATION ASSESSMENT

8.1 Nature, Extent and Source of Contamination

8.1.1 Surface Soil/Fill

Arsenic and manganese levels exceeding the Industrial Use SCOs and the Restricted Use SCOs for Groundwater Protection were detected in the surface soil/fill samples collected from several areas of the site. A number of other metals exceeding the Restricted Use SCOs for Groundwater Protection were detected in surface soils/fill across the project site. The presence of these metals is likely related to the deposition of slag, off-specification products and various other processing wastes (e.g., manganese-containing liquids) associated with former industrial operations on and/or adjacent to the project site. This is supported by a correlation with the analytical results from the subsurface fill material and the locations of the samples relative to the welding-flux production facility formerly operated along the western side of the project site.

PAHs exceeding the Industrial Use SCOs and the Restricted Use SCOs for Groundwater Protection were detected in surface soil/fill samples collected from the northern portion of the project site. The presence of these contaminants is likely related to past industrial operations in that area. The PAHs may also be associated with the operation of railroad spurs in that area.

Pesticide levels exceeding the Industrial Use SCOs were detected in only one location along the edge of the former rail yard on the project site. Levels of pesticides exceeding the Restricted Use SCOs for Groundwater Protection were also detected in several locations along the former rail yard. The presence of these compounds is likely related to the surface application of pesticides on the project site for the control of vegetation during operation of the rail yard and industrial complex.

Radiologically impacted slag was encountered in the surface fill in multiple areas of the project site. Slag with gamma activity exceeding local background levels primarily occurs in the northern portion of the project site, in five radiological (RAD) hot spot areas situated in the vicinity of a network of rail sidings. The impacted slag likely originated from the phosphorous extraction process conducted at the industrial complex formerly located to the west of the project site. This material may have been deposited on the project site as hard fill and/or accumulated as a result of rail loading and shipping activities. This material may also occur sporadically in surface fill across the remainder of the project site as a result of the reworking of surface fill during plant decommissioning and demolition activities.

8.1.2 Subsurface Soil/Fill

Site-Wide Contaminants of Concern

Arsenic and manganese levels exceeding the Industrial Use SCOs and the Restricted Use SCOs for Groundwater Protection were detected in the subsurface fill samples collected from the southern, central and northern portions of the project site. A number of other metals exceeding the Restricted Use SCOs for Groundwater Protection were also detected in subsurface fill samples from across the project site. These results appear to reflect the chemistry of the slag and other industrial fill that is present across the project site to depths ranging from 2 to 8 feet BGS, as well as the fill material that appeared to contain off-specification welding product, which was encountered in the area of the former settling pond near the northern limits of the project site.

The disposal of various other processing wastes (e.g., manganese-containing liquids) associated with former industrial operations on and/or adjacent to the project site may also have contributed to the metals levels in the fill material.

PAHs exceeding the Industrial Use SCOs and the Restricted Use SCOs for Groundwater Protection were detected in one sample (TP-14) originating from subsurface fill located in the north-central portion of the site. The presence of these contaminants likely reflects the chemistry of the fill in that location, but could also be related to past industrial and/or rail activities in that area.

Petroleum Contamination in the Former USTs/Locomotive House Area

Although the analytical results from subsurface soil/fill samples collected in the vicinity of the former USTs and locomotive house did not indicate the presence of VOCs or SVOCs at levels exceeding CP-51 soil cleanup levels, evidence of petroleum impacts consisting of elevated PID measurements, staining, sheen and petroleum odors were observed in this area during the field investigation.

Based upon the field screening data and observations collected during the soil probe, test pit and monitoring well programs, the fill displaying petroleum nuisance characteristics occurs in the former UST cavity near the southeast corner of the locomotive house and in the shallow fill to the east and south of the building. The presence of residual petroleum contamination in this area is likely related to leaks or spills associated with the former USTs and related piping and/or incidental releases associated with maintenance and repair activities conducted in this area.

Radiological Slag

Subsurface fill containing TENORM slag with gamma activity exceeding local background levels was identified to a depth of 2-2.5 feet BGS in the northern portion of the project site. This slag is concentrated in five RAD hot spots that occur in the vicinity of a network of rail sidings and likely originated from the historic production of phosphorous slag by area industries. This slag material may have been deposited on the project site as hard fill and/or accumulated as a result of rail loading and shipping activities. This material may also occur sporadically in subsurface fill across the remainder of the project site as a result of the reworking of surface fill during plant decommissioning and demolition activities.

8.1.3 Groundwater

Perched Water

The three new micro-wells and existing well MW-A19-1 are screened in perched water contained in the fill surrounding the locomotive house. The detection of low levels of aromatic hydrocarbons and PAHs, as well as VOC and SVOC TICs, in the perched water in this area of the site is consistent with the evidence of residual petroleum contamination observed in the fill. Only one VOC was detected in one of the micro-wells at a concentration that slightly exceeded the groundwater standard.

Numerous metals were also detected in the perched water occurring in the fill in the vicinity of the locomotive house, and existing well MW-A19-1 contained the only contraventions of the groundwater standards for chromium and manganese encountered on the project site. The presence of these contaminants likely reflects the chemistry of the fill in this area.

The same is true of the perched water occurring within the fill in the vicinity of the former settling pond in the northern portion of the site. The only contraventions of the groundwater standards for arsenic and vanadium on the project site were detected in existing well MW-A4-1, which is screened in the fill in this area. Concentrations of arsenic and vanadium in subsurface fill in this area exceed the Restricted Use SCOs for groundwater protection. Therefore, the presence of these contaminants in the perched water likely reflects the chemistry of the fill in this area.

Overburden Groundwater

The five new 2-inch monitoring wells are screened in the upper-most water-bearing unit, which occurs within the glaciolacustrine and glacial till deposits on the project site. With the exception of low concentrations of several VOCs in the southern portion of the site and low level, unknown SVOC TICs across the site, organic contaminants were not detected in this hydrostratigraphic unit. The low level VOCs in the southern portion of the site could be related to petroleum contamination in the locomotive house area and/or could have migrated onto the site from an off-site source. The nature and source of the unknown SVOC TICs are not currently known, but they are likely reflective of the industrial character of the project site and surrounding properties.

Metals detected above the groundwater standards in this hydrostratigraphic unit were limited to aluminum, iron, magnesium and sodium. These parameters are commonly encountered in uncontaminated, natural environments and do not appear to be associated with the contaminated fill on the project site. No exceedances of the groundwater standards for arsenic, chromium or manganese were detected in this groundwater zone.

8.1.4 Pits and Sumps

Low concentrations of a handful of VOCs commonly associated with solvents and degreasers were detected in the water present in the maintenance pit located within the central bay of the locomotive house. These contaminants are likely related to the maintenance and repair activities formerly conducted in this building. The elevation of the water within this pit is higher than the water level within the micro-wells installed around the building. Therefore, it would appear that this water is the result of precipitation that has entered the building through the failing roof and collected in the pit, rather than groundwater infiltration.

Contamination was detected in the historic sewer system discovered around the perimeter of the locomotive house. This contamination was characterized by SVOC TICs detected in aqueous samples collected from the manholes, as well as sheen and odor when sediments within these structures were disturbed. The highest concentration of SVOC TICs was detected in MH-02, which is a brick structure that is situated near the former USTs. Floating globules of Liquid Phase Hydrocarbon (LPH) were observed on the surface of the fluid within this manhole, and a strong petroleum odor was noted when the manhole cover at this location was removed.

A 1977 plant drawing indicated that the three manholes were part of the same sewer system and were interconnected (see Figure 9). It was reported by Praxair that all utilities within the project site had been closed and capped; however, no information regarding this specific sewer system was provided. Therefore, the extent and corresponding volume of this system is not known. No flow was observed in any of the manholes on multiple occasions during the RI field program.

8.1.5 Regulated Building Materials

Asbestos containing materials, LBP, PCB-containing light fixtures and mercury vapor-containing light bulbs were used in the construction and operation of the former locomotive house. The ACM and LBP occur on both interior and exterior surfaces of the building, whereas the light fixtures and bulbs are confined within the structure. Friable asbestos was documented in interior locations only.

8.2 Contaminant Fate and Transport

The probable fate and transport of contaminants detected on the project site is a function of the properties of the individual contaminants and available pathways for the contaminants to migrate. The project site is currently an unutilized industrial property, and the planned future use of the project site is for a rail-to-truck intermodal operation. The degree to which, as well as the route by which, contaminants migrate is dependent on the physical characteristics of the site and the type and distribution of contaminants. The following sections discuss the probable fate and transport of contaminants in the different types of media at the project site.

8.2.1 Surface Soil/Fill

Contaminants of concern detected in the surface soil/fill primarily consist of SVOCs, metals and pesticides. Additionally, gamma-emitting radionuclides were detected in slag material that is a component of the surface fill.

The SVOCs detected include PAHs, a number of which are known carcinogens (cPAHs). The SVOCs are characterized by low solubilities and high octanol-water partition coefficients, and therefore, have a tendency to adsorb onto soil particles. In addition, the PAHs have relatively low vapor pressures and are expected to remain in a solid or liquid state and undergo degradation via naturally occurring microbes. Due to the low solubility, SVOCs are not expected to impact groundwater quality or migrate substantially into the subsurface. This is supported by the lack of, or low concentrations of, these compounds in the on-site groundwater.

Arsenic was detected in two surface soil/fill samples collected in the northern portion of the site at concentrations above Industrial Use SCOs. Arsenic has a low solubility and does not readily degrade under natural conditions. Due to the low solubility, arsenic is not expected to impact groundwater quality or migrate substantially in the subsurface. With the exception of the area around existing well MW-A4-1, which is screened within the perched water present within the fill in the area of the former settling pond, arsenic was not detected at levels exceeding the water quality standard in the groundwater on the project site. The low permeability glaciolacustrine deposits that underlie the site are likely to minimize the downward migration of this contaminant.

Manganese was detected in the surface soil/fill across the site at levels above the Industrial Use SCOs. Some manganese compounds are readily soluble in water, and could, therefore, impact groundwater quality and migrate in the dissolved phase in the subsurface. Manganese levels above the groundwater standard were only detected in existing well MW-A19-1, which is screened within the perched water present within the fill near the locomotive house. The low permeability glaciolacustrine deposits that underlie the site are likely to minimize the downward migration of this contaminant. This is supported by the absence of manganese levels above the groundwater standards in the upper-most groundwater zone.

Pesticides levels exceeding the Industrial Use SCOs and Restricted Use SCOs for Groundwater Protection were detected in the surface soil/fill in the rail yard area. The pesticides detected in this area are characterized by low to extremely low solubilities and moderately high to extremely high octanol-water partition coefficients. Consequently, these contaminants have a tendency to adsorb onto soil particles, are relatively immobile and are not expected to impact groundwater quality or migrate substantially in the subsurface. This is supported by the absence of pesticides in the subsurface soil/fill at levels exceeding the SCOs.

The radioactive slag that is interspersed in the surface soil/fill on the site contains naturally occurring radioactive material (NORM) that has been enhanced through the phosphorous extraction process. The radionuclides that occur within the slag are primarily thorium and radium, both of which are naturally occurring radioactive metals. Thorium occurs at very low levels in virtually all rock, soil and water. Radium is formed by the decay of uranium and thorium in the environment. Both the thorium and radium isotopes detected in the slag are expected to persist in the environment and emit gamma radiation as they decay. However, based upon the physical properties of the slag, these radionuclides are not expected to impact groundwater or migrate substantially in the subsurface.

8.2.2 Subsurface Soil/Fill

Contaminants of concern detected in the subsurface fill occurring on the project site include metals across the site and PAHs, petroleum and TENORM slag in localized areas of the site.

Elevated metals levels were detected in the slag fill deposited across the site and are also associated with the apparent off-specification welding products deposited in the area of the former settling pond. Arsenic and manganese concentrations exceeded Industrial Use SCOs and Restricted Use SCOs for Groundwater Protection in these fill materials. These contaminants have been detected above the groundwater standards in the perched water within the fill, but are not present at these levels in the groundwater at the site. This is likely a result of the low permeability of the underlying glaciolacustrine deposits, which restrict the downward migration of contaminants occurring in the fill.

Carcinogenic PAHs at levels exceeding the SCOs were also encountered in the subsurface fill in one area of the site, at TP-14. The cPAHs detected are characterized by low solubilities and high octanol-water partition coefficients, and therefore, have a tendency to adsorb onto soil particles. In addition, these compounds have relatively low vapor pressures and are expected to remain in a solid or liquid state and undergo degradation via naturally occurring microbes. Due to the low solubility, these contaminants are not expected to impact groundwater quality or migrate substantially into the subsurface. This is supported by the lack of, or low concentrations of, these compounds in the on-site groundwater.

Residual petroleum contamination exhibiting nuisance characteristics (e.g., staining, odor) was documented in the subsurface fill in the vicinity of the former USTs and locomotive house. Based upon field observations and the analytical results from fill samples in this area, the petroleum appears to be substantially weathered or degraded. Natural attenuation of the residual petroleum contamination is expected to continue in the subsurface, however, these contaminants have the potential to migrate laterally in the perched water and along utility lines that pass through this area. Additionally, migration via soil vapor is also possible. The downward vertical migration of these contaminants is restricted by the low permeability of the underlying glaciolacustrine deposits.

The radioactive slag that is interspersed in the shallow subsurface fill on the northern portion of the project site is consistent with that documented in the surface soil/fill. As previously discussed, the radioisotopes in the slag are expected to persist in the environment and emit gamma radiation as they decay. These contaminants, however, are not expected to impact groundwater or migrate substantially in the subsurface based upon the physical properties of the matrix in which they occur.

8.2.3 Groundwater

Perched Water

The perched water that occurs within the fill material across the site has been impacted by metals, including arsenic, chromium, manganese and vanadium. These contaminants have the potential to migrate laterally in the dissolved phase through the fill material and along utility lines. Furthermore, these contaminants are likely to persist in the subsurface.

The residual petroleum contamination detected in the perched water occurring within the fill material in the area of the locomotive house primarily consisted of aromatic hydrocarbons, which are moderately to highly soluble, have low to moderate octanol-water partition coefficients and are relatively mobile in the subsurface. Consequently, these contaminants have the potential to migrate laterally in the fill material and along utility lines. However, unlike the metals, these organic contaminants area expected to continue to undergo biodegradation within the subsurface.

Overburden Groundwater

Organic contaminants were not detected at concentrations above groundwater standards in the upper-most water-bearing zone, which occurs within the glaciolacustrine and glacial till deposits. The low concentrations of VOCs and SVOCs detected in this hydrostratigraphic unit may have originated from on-site sources (e.g., fill material, historic spills, etc.) and/or may have migrated onto the project site.

The metals that were detected in the shallow groundwater above the groundwater standards appear to be representative of local groundwater quality as opposed to contaminants encountered in the overlying fill and perched groundwater. No exceedances of the groundwater standards for arsenic, chromium, manganese or vanadium were detected in this groundwater zone.

8.2.4 Pits and Sumps

Water and the minor amount of sediment/scale in the maintenance pit within the locomotive house appear to be contained within this concrete structure. Therefore, the migration of contaminants from this pit into the subsurface does not appear to represent a significant concern.

Contaminants observed in the abandoned sewer system discovered in the vicinity of the locomotive house appear to be contained within this system. This system was reportedly capped in conjunction with the demolition of the industrial complex formerly located on the Praxair site. However, the integrity and extent of this sewer system is not known, and the potential for discharges of liquids within this system to the subsurface or an off-site sewer system may exist.

8.2.5 Regulated Building Materials

Non-friable ACM are relatively resistant to weathering and are not expected to migrate from the project site. However, asbestos fibers released as a result of the degradation of friable ACM are susceptible to dispersion via wind currents and/or transport via storm water. Based upon the interior location and condition of the light fixtures within the locomotive house, the potential for wind and water erosion of friable ACM does not appear to be significant.

Similarly, the majority of the surfaces coated in LBP occur on interior surfaces that are somewhat sheltered from wind and water dispersal. Although much of the LBP within the structure is in severely deteriorated, it appears to be mostly contained within the building. Exterior painted surfaces are susceptible to wind and water erosion, but are limited in surface area and not expected to migrate off-site.

8.3 Evaluation of Potential Receptors

The project site is located in an area that is characterized primarily by industrial properties. A railroad bounds the property to the east, a waste-to-energy facility and vacant industrial property are located to the west, a chemical plant is located to the south, and industrial properties lie to the north of the project site, beyond Niagara Falls Boulevard. No residences occur within 1,000 feet of the project site and the surrounding area is serviced by the municipal water supply system of the City of Niagara Falls that relies on water withdrawn from the Niagara River.

The project site is currently a vacant industrial property and was utilized for industrial purposes for the last century. Access to the site is restricted by perimeter fencing. However, access to trespassers is possible due to openings in the fence where rail sidings enter the site.

Under current conditions, potential human receptors include persons working or trespassing on the project site; persons living and working in the area surrounding the project site; and persons involved in utility work on and adjacent to the project site. In addition, potential environmental receptors include wildlife living on and migrating through the project site (e.g., rodents, birds, etc.).

The planned future use of the project site is for a rail-to-truck intermodal facility. The redevelopment of the site will be controlled through the implementation of engineering and institutional controls. These controls may include the following:

- Implementation of a Soil/Fill Management Plan
- Placement of a surface cover over the entire site that includes a minimum of twelve inches of clean cover soil and/or railroad ballast; asphalt and/or concrete pavement; and/or buildings
- Implementation of erosion and dust control measures
- Maintenance of fencing around the project site or areas undergoing redevelopment
- Implementation of a storm water pollution prevention plan
- Adhering to NYSDEC/NYSDOH notification and reporting requirements
- Instituting health and safety procedures for construction activities and protection of the surrounding community

Under the intended future use scenario for the project site, the primary consideration in the determination of acceptable clean-up levels is the potential risk to human health posed by residual contaminants in the soil/fill.

With regard to residual chemical contaminants, no human and/or environmental receptors have been identified in connection with the post-redevelopment period, assuming that the contaminated media has been controlled through the implementation of engineering and institutional controls. These controls are also anticipated to prevent site worker exposure to unacceptable doses of ionizing radiation from residual TENORM slag during the post-redevelopment period.

8.4 Potential Exposure Pathways

8.4.1 Surface Soil/Fill

Under the current use scenario, persons living and working in the vicinity of the project site and/or persons trespassing on the site could be exposed to SVOCs, pesticides and metals in the surface soil/fill via inhalation of airborne particles, incidental ingestion of, or dermal contact with the contaminated media. Additionally, persons working or trespassing on the project site could be exposed to ionizing radiation emitted from the radioactive slag present in the surface fill.

Construction workers, site visitors and persons living, working and traveling through the area near the project site could be exposed to the SVOCs, pesticides and metals in the surface soil/fill during excavation of the contaminated soil/fill in connection with site redevelopment. Potential exposure routes for these receptors include inhalation of contaminated dust and incidental ingestion of, and/or dermal contact with the contaminated soil/fill. Additionally, remedial contractors, construction workers and site visitors could be exposed to ionizing radiation in the surface fill during site remediation and redevelopment. The exposure of remedial contractors and constructions workers via the inhalation of radiologically contaminated dust could also result during cleanup and redevelopment activities that involve the crushing, scraping or pulverization of TENORM slag. However, the use of appropriate personal protective equipment, dust suppression techniques and personal/air monitoring; and the development and implementation of a Site Management Plan would minimize the risk of exposure during this stage of the project.

No complete exposure pathways to the chemical contaminants in the surface soil/fill have been identified in connection with the post-redevelopment period, assuming that the contaminated surface soil/fill has been covered. The exposure of site workers and site visitors to ionizing radiation from TENORM slag that remains at the site is possible post-development. However, it is anticipated that the shielding affect of the planned cover system will result in worker dose rates that are below applicable limits and monitoring will be conducted to ensure that this is the case.

8.4.2 Subsurface Soil/Fill

The presence of elevated concentrations of SVOCs and metals in subsurface soil/fill is not interpreted to represent a human or environmental exposure risk because no complete exposure pathways were identified under the current use scenario for the project site. This is a function of the subsurface disposition of the contamination, which effectively minimizes the potential for the incidental ingestion of, or dermal contact with the contaminated media. These factors also reduce the potential for the emission of vapors and particulates that could pose an exposure risk via inhalation. This applies to persons living, working and traveling through the area surrounding the project site, as well as persons visiting, working or trespassing on the project site.

Under the current use scenario, persons working or trespassing on the project site could be exposed to ionizing radiation emitted from the radioactive slag present in the shallow subsurface fill.

Environmental receptors, construction workers, site visitors and persons living, working and traveling through the project site could be exposed to the SVOCs and metals in the subsurface soil/fill during excavation of the contaminated soil/fill in connection with site redevelopment activities. Potential exposure routes for these receptors include inhalation of contaminated dust and incidental ingestion of and/or dermal contact with the contaminated soil/fill. Additionally, remedial contractors, construction workers and site visitors could be exposed to ionizing radiation in the shallow subsurface fill during site remediation and redevelopment activities. The exposure of remedial contractors and constructions workers via the inhalation of radiologically contaminated dust could also result during cleanup and redevelopment activities that involve the crushing, scraping or pulverization of TENORM slag. However, the use of appropriate personal protective equipment, dust suppression techniques and personal/air monitoring, and the development of a Site Management Plan would minimize the risk of exposure during this stage of the project.

No complete exposure pathways have been identified in connection with the post-redevelopment period, assuming that the subsurface soil/fill has been covered. The exposure of site workers and site visitors to ionizing radiation from TENORM slag that remains at the site is possible post-development. However, it is anticipated that the shielding affect of the planned cover system will result in worker dose rates that are below applicable limits and monitoring will be conducted to ensure that this is the case.

8.4.3 Groundwater

Groundwater in the vicinity of the project site is not utilized as a source of potable water. Therefore, no human exposure via ingestion of contaminated groundwater is likely.

8.4.4 Sewer System

Because little information is available regarding the abandoned sewer system, the potential exists for contaminants in the water and sediment located in this system to enter the City system. Under this scenario, there is the potential for utility workers involved with the cleaning and/or maintenance of the system to be exposed to the contaminated liquid and sediment in this system. Construction workers could also be exposed to the contaminated materials during excavation activities performed in connection with redevelopment activities. Potential exposure routes for these receptors include inhalation of organic vapors and/or dermal contact with the liquid and sediment. However, the use of appropriate personal protective equipment and monitoring techniques would likely minimize the risk of exposure during site redevelopment.

No complete exposure pathways have been identified in connection with the post-redevelopment period, assuming that all drainage systems have been properly cleaned and closed.

8.4.5 Regulated Building Material

Under the current use scenario, there is little risk of human exposure to ACM or LBP present in the locomotive house. The risk of exposure to these materials during building demolition would be minimized through the implementation of proper abatement, control and monitoring procedures as required by applicable state and federal regulations. The future risk posed by the RBM would be eliminated with the removal and proper disposal of the materials in conjunction with demolition.

8.5 Fish and Wildlife Resources Impact Analysis

The project site and surrounding area within one-quarter mile of the site consists of urban, industrial land that is not proximate to a surface water body, wetland or other ecologically significant area. Written inquiries to NYSDEC and the New York Natural Heritage Program regarding the potential occurrence of rare, threatened or endangered species in the site vicinity were submitted in conjunction with the Environmental Assessment Form prepared for the RTIF project. The NYSDEC's response, dated October 12, 2012, indicated that no threatened or endangered species or rare plants were identified on the site according to the State's data bases. A review of information concerning endangered and threatened species in Niagara County, available via the U.S. Fish and Wildlife Service website, also indicated the absence of any such species in the vicinity of the project site. Furthermore, the site is not located in or substantially contiguous to a Critical Environmental Area designated pursuant to Article 8 or the ECL and 6 NYCRR 617, nor are any state or federally designated wetlands located on or adjacent to the project site.

Based upon the information summarized above, there are no ecological resources present on or in the vicinity of the site and, consequently, no fish and wildlife resource impacts have been identified.

9.0 SUMMARY AND CONCLUSIONS

A Remedial Investigation (RI) program was implemented at the 15-acre Praxair site on behalf of Covanta Niagara, L.P (Covanta). The project site is located at 137 47th Street, Niagara Falls, New York. The project site is occupied by one structure and an inactive rail yard, and is currently vacant. Covanta is considering the acquisition of the project site for development of a rail-to-truck intermodal facility to service their adjacent waste-to-energy facility. The objective of this program was to characterize the site and determine the nature and extent of contamination in the surface soil, subsurface soil/fill, groundwater, and building materials. The resulting data was used to qualitatively evaluate potential risks to human health and the environment associated with current site conditions and the intended future use scenario.

9.1 Site Conditions

The project site consists of approximately 15 acres of a larger, former industrial complex that is located within the City of Niagara Falls limits. The project site was first developed in the early 1900's and was primarily utilized for rail facilities that serviced the industrial complex and other adjacent industries. This site has been vacant following the cessation of manufacturing activities in the mid 1990's.

The project site is occupied by one structure that was formerly utilized for the maintenance and repair of locomotives and which occupies approximately 13,700 square feet. Additionally, an inactive rail yard and portions of concrete floor slabs representing remnants of the former industrial complex occur on the project site.

Previous Environmental Site Assesments (ESAs) and investigations were completed for the industrial property that contains the project site. These studies identified the following environmental concerns in connection with the project site:

- Contaminated soil/fill and groundwater has been documented on the project site in connection with the former USTs in the vicinity of the locomotive house, the presence of slag across the site, and the historical industrial and rail-yard usage of the project site and adjacent properties.
- The potential on-site disposal of radioactive slag materials was identified by the Interagency Task Force on Hazardous Waste in 1979. Furthermore, radiological contamination was detected along rail spurs located to the west of the project site that were historically accessed via rail sidings that crossed the project site.
- Waste water and/or contaminated sediment may be present within pits and sumps within the locomotive house.
- The potential presence of Regulated Building Material (RBM) including asbestos containing materials (ACMs), lead based paint and lighting equipment containing polychlorinated biphenyls (PCBs) was identified in the locomotive house.

9.2 Investigation Approach

The Remedial Investigation was conducted in general accordance with NYSDEC DER-10 and included the following activities:

- Geophysical Surveys
- Surface Soil Sampling
- Test Pit Excavations
- Soil Probe Advancement
- Subsurface Soil/Fill Sampling
- Test Boring Advancement
- Monitoring Well Installation
- Groundwater Elevation Monitoring
- Groundwater Sampling
- Sampling of Pits and Sumps
- Regulated Building Material Survey
- Radiological Survey/Investigation
- Data Validation
- Data Evaluation

9.3 Site Structures

The project site includes one 13,700 SF structure. All other former site structures have been demolished, although floor slabs remain on the site.

9.4 Physical Setting

The topography of the project site is generally flat-lying and has an average elevation of approximately 575 feet above mean sea level. This site is located on a vacant, former industrial property and is bounded to the east by an active railroad, to the south by a chemical plant, to the west by a waste-to-energy facility and vacant industrial land, and to the north by vacant industrial land. No residential properties are located with 1,000 feet of the project site.

The results of the remedial investigation indicate that soil/fill overlies native material and dolostone bedrock across the site. The subsurface stratigraphy can be divided into five significant units, which are described in descending order as follows:

- Fill material
- Alluvial deposits
- Glaciolacustrine deposits
- Glacial till
- Dolostone bedrock

Perched water was present in soil/fill material, while groundwater was encountered in the glaciolacustrine and glacial till deposits. The depths to groundwater generally ranged from approximately 6 to 10 feet below the existing ground surface, although perched water was encountered at more shallow depths. Groundwater flow across the site appears to be variable, and is likely influenced by a number of factors including, the groundwater pumping system on the adjacent Occidental Chemical site, the Falls Street Tunnel to the west, active and abandoned utilities, and buried foundation walls.

9.5 Nature and Extent of Contamination

9.5.1 Surface Soil/Fill

Surface soil/fill throughout the site contains SVOCs and metals at levels that exceed the Industrial Use SCOs (see Table 7 for Contaminants of Concern). Pesticides were also encountered in the surface soil/fill in the vicinity of the inactive rail yard at concentrations exceeding these SCOs.

Slag material exhibiting gamma radiation levels greater than two times the background level is intermingled with surface fill on the project site. The radioactive slag is mostly concentrated in a handful of radiological hot spots located in the northern portion of the site, although sporadic occurrences of this material were noted in other areas of the site.

9.5.2 Subsurface Soil/Fill Material

Contaminants of concern in the subsurface fill include SVOCs and metals. Elevated concentrations of arsenic and manganese that are likely related to the deposition of slag, off-specification welding materials and other byproducts of former manufacturing operations, were detected in the fill material across the site.

Petroleum impacted fill displaying nuisance characteristics (e.g., staining, odor, etc.) was also encountered in the vicinity of the locomotive house and former UST area.

Additionally, radioactive slag is interspersed with shallow subsurface fill in a handful of radiological hot spots located in the northern portion of the site. Gamma radiation levels detected in this slag were greater than two times the background level.

9.5.3 Groundwater

Metals, including arsenic, manganese and chromium, were detected in the perched water contained in the fill across the site at levels that exceeded the groundwater standards. Low concentrations of aromatic hydrocarbons were also encountered in the perched water occurring within the fill in the vicinity of the locomotive house.

Groundwater encountered within the upper-most water bearing zone, which occurs within the glaciolacustrine and glacial till deposits, contained low levels of aromatic hydrocarbons and PAHs. Metals detected above the groundwater standards in the samples from this hydrostratigraphic unit were limited to aluminum, iron, magnesium and sodium.

9.5.4 Pits and Sumps

Water and sediment/scale occurring in the pit within the locomotive house was determined to be non-hazardous. Low concentrations of VOCs commonly associated with solvents and degreasers were detected in the water within the pit. The water and minor amount of sediment/scale within this pit appear to be contained within this structure.

SVOCs were detected in the liquid within the sewer system discovered around the perimeter of the locomotive house. Liquid phase hydrocarbon globules were also observed on the surface of the liquid in the manhole closest to the former UST area, and petroleum sheen and odor were also observed in all manholes when the sediment was disturbed. The integrity and extent of this abandoned sewer system are not known, although no flow was observed within the system during the RI field program.

9.5.5 Regulated Building Material

Non-friable and limited quantities of friable asbestos, lead-based paint and mercury-containing light fixtures were found in the locomotive house.

9.6 Contamination Assessment

9.6.1 Potential Receptors

Under current (vacant) and planned future use (industrial) conditions, potential human receptors for onsite contaminants include:

- Persons living and working in the area surrounding the project site
- Persons trespassing on the site and entering onsite structures
- Remediation and construction contractors working on the project site
- Persons working on the project site (future use)
- Persons involved in utility work on and adjacent to the project site

Potential environmental receptors include wildlife utilizing the project site (e.g., rodents, birds, etc.).

9.6.2 Exposure Pathways

Under current conditions, human and environmental receptors could be exposed to onsite contaminants via: the inhalation of airborne fibers, particles or vapors; the incidental ingestion of, or dermal contact, with the contaminated media; and/or ionizing radiation.

During construction activities, receptors at and near the project site could be exposed to contaminants and regulated building materials via the inhalation of asbestos fibers and/or contaminated dust and vapors, and incidental ingestion of and/or dermal contact with the contaminated media. Additionally, remedial contractors and construction workers could be exposed to ionizing radiation and radiologically contaminated dust during site remediation and construction activities. However, the use of appropriate personal protective equipment, dust suppression techniques and personal/air monitoring procedures; and the development and implementation of a Site Management Plan would minimize the risk of exposure during these activities.

No complete exposure pathways to the chemical contaminants at the project site have been identified in connection with the post-remediation period, assuming that said contaminants have been properly removed, treated, and/or engineering controls are instituted. The exposure of site workers and site visitors to ionizing radiation from radioactive slag that remains at the site is possible post-development. However, it is anticipated that the shielding affect of the planned cover system will result in worker dose rates that are below applicable limits and monitoring will be conducted to ensure that this is the case.

9.7 Remedial Goals and Objectives

The results of this investigation have confirmed the presence of contaminants on the project site at concentrations exceeding applicable standards, criteria and guidance (SCGs). The contaminated media and corresponding SCGs applied to the site include:

- Soil/Fill: 6 NYCRR Part 375 Environmental Remediation Programs: Part 375-6.8 – Residential, Commercial and Industrial Use Soil Cleanup Objectives (SCOs); and
- Groundwater: Technical and Operational Guidance Series (TOGS) 1.1.1 – Ambient Water Quality Standards and Guidance Values and Groundwater Effluent Limitations.

Remedial Action Objectives (RAOs) are medium-specific objectives for the protection of human health and the environment and are developed based upon contaminant-specific SCGs. Preliminary RAOs identified for the contaminated media on the project site are as follows:

Contaminated Fill:

RAOs for Public Health Protection:

- Prevent ingestion/direct contact with contaminated fill
- Prevent exposure to elevated radiation levels within slag fill
- NYSCRR Subpart 375-6 Remedial Program Soil Cleanup Objectives (RPSCOs) for the Protection of Public Health/industrial Use
- NYCRR Subpart 375-6 RPSCOs for the Protection of Groundwater

RAOs for Environmental Protection:

- Prevent migration of contaminants that would result in groundwater or surface water contamination
- Prevent impacts to biota from the ingestion/direct contact with the fill causing toxicity or impacts from bioaccumulation through the terrestrial food chain

Pits and Sumps:

RAOs for Public Health Protection

- Prevent ingestion/direct contact with water impacted by contaminants
- Prevent surface water contamination

RAOs for Environmental Protection

- Prevent impacts to biota from the ingestion/direct contact with water causing toxicity or impacts from bioaccumulation through the terrestrial food chain

Regulated Building Materials:

RAOs for Public Health Protection

- Prevent contact with or inhalation of contaminants in building materials
- Prevent the release of contaminants via wind erosion of deteriorated asbestos containing materials

The process of identifying and evaluating remedial alternatives available to achieve the preliminary RAOs outlined above is detailed in the Remedial Alternatives Analysis Report (RAAR). Remedial alternatives are comparatively analyzed with regard to the following criteria in the RAAR:

- Overall Protection of Public Health and the Environment
- Compliance with SCGs
- Long-Term Effectiveness and Permanence
- Reduction of Toxicity, Mobility or Volume with Treatment
- Short-Term Effectiveness
- Implementability
- Cost
- Community Acceptance
- Land Use

The alternatives analysis detailed in the RAAR culminates in a recommendation for a site-wide remedial strategy that achieves the RAOs and is supportive of the intended re-use of the property as a rail-to-truck intermodal facility.

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300 PEARL STREET
BUFFALO, NY 14202
P: (716) 551-6281
F: (716) 551-6282
www.labellapc.com

LABELLA Associates, P.C.

PROJECT/CLIENT

REMEDIAL INVESTIGATION OF 15-ACRE SITE at

137 47TH ST, NIAGARA FALLS, NY

COVANTA 4RECOVERY, L.P.

DRAWING TITLE

FORMER ELECTROMET FACILITY BUILDING LOCATION

ISSUED FOR: REVIEW

DATE: MAR. 2013

DESIGNED BY: RCN

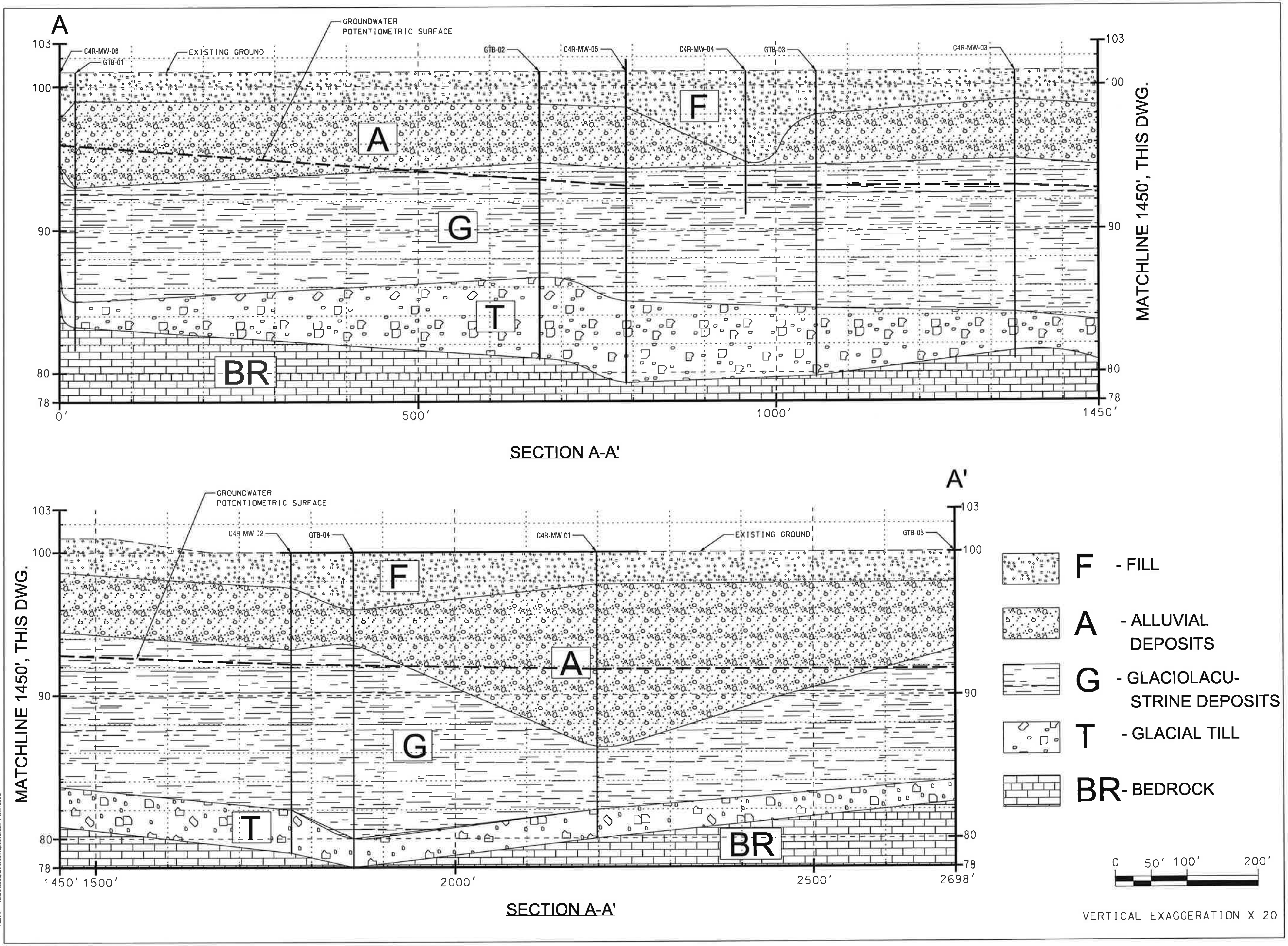
DRAWN BY: KMN

REVIEWED BY: RRN

PROJECT/DRAWING NUMBER

212399

FIGURE 2A



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www.labellapc.com
300 STATE STREET
ROCHESTER, NY 14614
P: (585) 454-6110
F: (585) 454-3066
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NIAGARA RAIL TO TRUCK INTERMODAL FACILITY (RTIF)
NIAGARA FALLS, NY

PROJECT NUMBER 212399

NO.	DATE	REVISION
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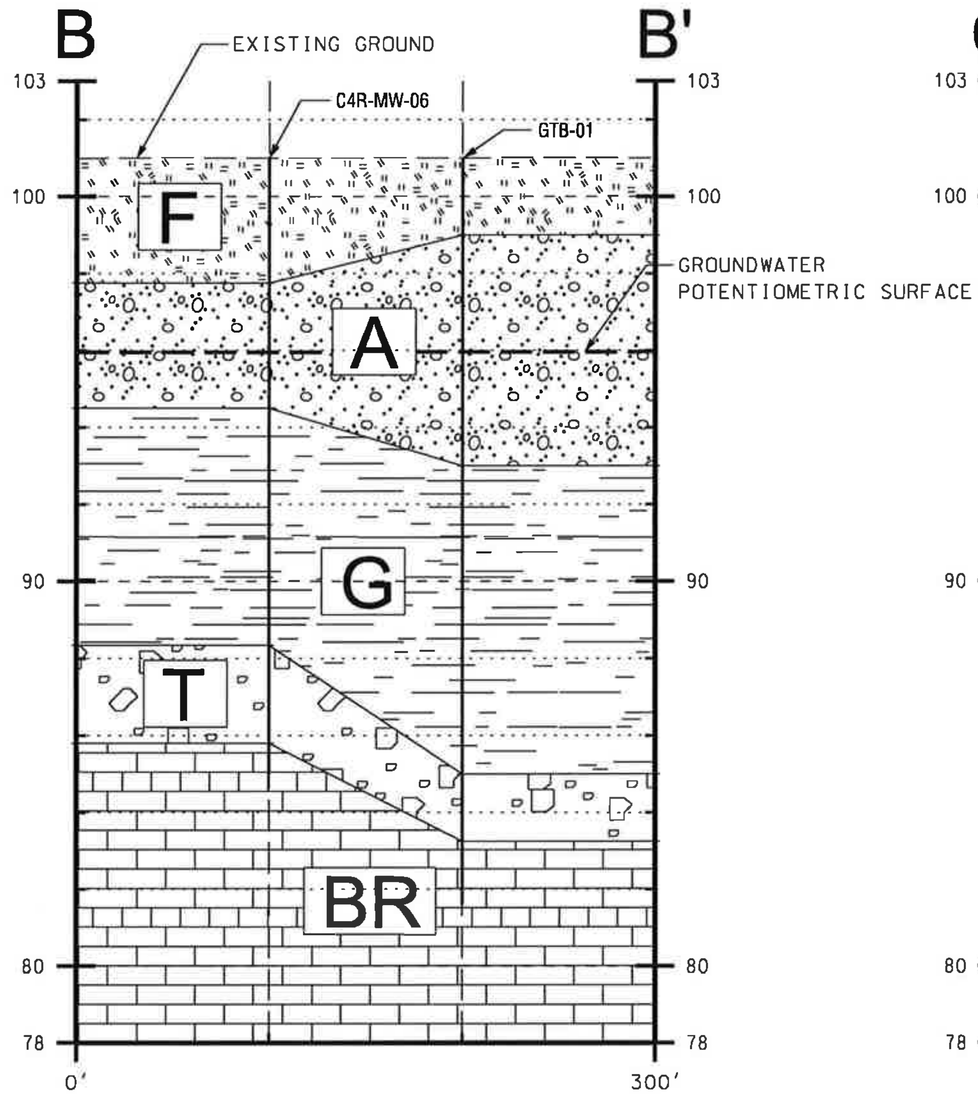
APPROVED BY:

ISSUED FOR
REMEDIAL INVESTIAGTION REPORT

DATE: MARCH 2013

GEOLOGIC SECTIONS

FIGURE 10B



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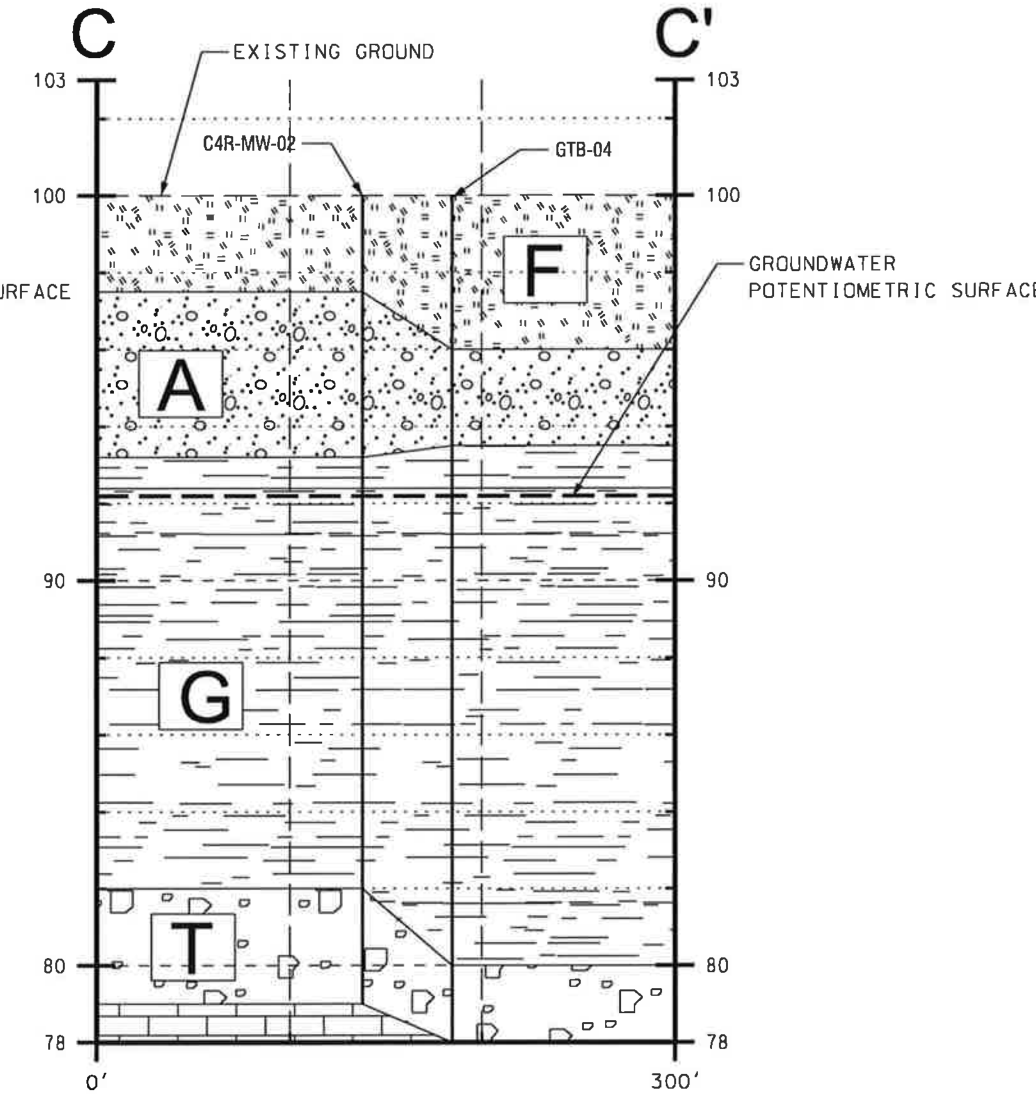

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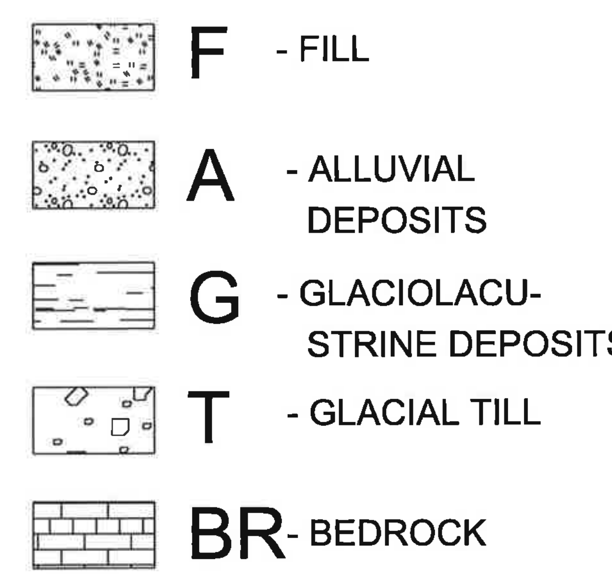

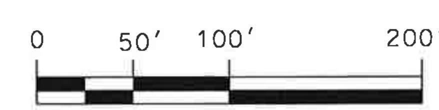

VERTICAL EXAGGERATION X 20

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P: (585) 454-6110
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PROJECT NUMBER
212399

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GEOLOGIC SECTIONS

FIGURE 10C

24"X36" PLOT SHEET