DRAFT
Limited Subsurface Investigation

Former NuChrome Facility
161 Graham Road
Fall River, Massachusetts

September 16, 2015

Prepared for:

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1. Executive Summary

This report documents findings from the Limited Subsurface Investigation (LSI) that BETA Group, Inc. (BETA) has prepared for the former NuChrome property at 161 Graham Road in Fall River, Massachusetts (the Site, see Figure 1). The Site consists of an approximately 4.0-acre parcel of land that is further identified by the City of Fall River's Assessors Office as Parcel ID Z-03-0022. NuChrome was a metal restoration company that conducted re-chroming and plating of bumpers, pot metal, stainless steel, and aluminum. NuChrome also restored and plated parts for boats, cars, and motorcycles. The City of Fall River is utilizing a Brownfields Assessment Grant to complete this assessment.

Former operations at NuChrome included the storage of hazardous materials and the generation of hazardous waste. Chemical storage included trichloroethylene (TCE), 1,1,1-trichloroethane (TCA), cadmium, chromium, lead, cyanide, and sulfuric acid. Waste generated at the Site included but was not limited to corrosive waste water stored in tanks and vats, and sludge containing chromium, lead, cadmium, and cyanide compounds. The objectives of this investigation were to:

1) Identify contaminants of concern in surficial soil (less than 2 feet below grade) surrounding the northern and western portion of the Site building;

2) Assess surface water and sediment in the drainage ditch on the eastern portion of the Site;

3) Advance ten soil borings in areas that may have been impacted by historic operations and include areas that have not been previously investigated;

4) Install ten new monitoring wells and sample groundwater from the ten new wells and two existing wells to identify contaminants of concern; and,

5) Complete a hazardous building material investigation (HBMI) to identify building materials (equipment, building components, residue, dust, etc.) that may contain hazardous materials.

Background

BETA conducted a Phase I Environmental Site Assessment for the Site in 2014. The Phase I ESA identified the following Recognized Environmental Conditions (RECs):

- Past uses of the Site that included the storage of hazardous material and the generation of hazardous waste;

- Historic presence of TCE in groundwater;

- Possible impacts to indoor air from volatile organic compounds (VOCs) identified in groundwater;

- The historic presence of metals and cyanide in soil. Although EPA removed some contaminated soil from the Site, historic data indicates the potential for additional contaminated soil to exist at the Site;

- The observation of stained soil, areas of no vegetation near building doors, and a sheen on surface water emanating from the ground near the loading dock. The Site contact informed BETA that Nu-Chrome disposed of wastewater and wash water outside the doors of the building; and,

- Although EPA conducted a removal action within the Site building, it does not appear that the building was cleaned to a level where it could be currently occupied.

Preparation

BETA conducted the following activities to prepare for implementation of the field work for this investigation:

- Prepared and submitted the site-specific Quality Assurance Project Plan (QAPP) Addendum to the U.S. EPA for review and approval;
- Marked out proposed boring locations in the field for utility location purposes;
- 72 hours prior to the start of drilling activities, notified "Dig Safe" and the City of Fall River Water and Sewer Departments to mark utilities in the vicinity of the proposed boring locations;
- Re-located borings that conflicted with existing utilities at the Site.
- Prepared a project-specific Health and Safety Plan (HASP) prior to the commencement of field work to protect the health, safety, public welfare, and the environment from potential hazards which could arise during the investigation.

Soil Borings

BETA oversaw the advancement of ten soil borings at the Site. Soil samples were submitted from each of these borings for laboratory analysis of VOCs by EPA Method 8260B, total cyanide by EPA Method 9010C, the eight Resource Conservation and Recovery Act (RCRA) metals by various EPA methods, hexavalent chromium by EPA Method 7196A, extractable petroleum hydrocarbons (EPH) with target polycyclic aromatic hydrocarbons (PAHs) by the MassDEP methodology, and volatile petroleum hydrocarbons (VPH) with target VOCs by the MassDEP methodology. Please note that not every sample was submitted for all of these analyses.

Surficial Soil Sampling

BETA oversaw the advancement of 44 shallow soil borings (to a depth of 2 feet) in a grid pattern (approximately 25 foot spacing) along the northern and western part of the Site building. BETA field screened 166 soil samples using an X-ray Fluorescence (XRF) analyzer and a photoionization detector (PID).

Forty-four soil samples from various depths were submitted for laboratory analysis of VOCs by EPA Method 8260B, total cyanide by EPA Method 9010C, the eight RCRA metals by various EPA methods, hexavalent chromium by EPA Method 7196A, extractable petroleum hydrocarbons (EPH) with target PAHs by the MassDEP methodology, and VPH with target VOCs by the MassDEP methodology. Please note that not every sample was submitted for all of these analyses.

Groundwater

During advancement of the soil borings, BETA oversaw the installation of ten new monitoring wells including one well that was completed as a bedrock monitoring well 15 feet into bedrock. After developing the wells, BETA collected groundwater samples from the ten new monitoring wells and two existing monitoring wells at the Site. These samples were submitted for laboratory analysis of VOCs by EPA Method 8260, total cyanide by EPA Method 9010C, the eight RCRA metals by various EPA methods, EPH with target PAHs by the MassDEP methodology, VPH with target VOCs by the MassDEP methodology. Please note that not every sample was submitted for all of these analyses.

Surface Water and Sediment Sampling

BETA collected three surface water and sediment samples from the drainage ditch east of the Site building. These samples were submitted for laboratory analysis of VOCs by EPA Method 8260B, the eight RCRA metals by various EPA methods, hexavalent chromium by EPA method 7196A, and total cyanide by EPA method 9010C.

Soil Gas Sampling

BETA collected nine soil gas samples under the slab of the Site building. These samples were submitted for laboratory analysis of VOCs by EPA method TO-15.

Hazardous Building Material Investigation

Green Environmental, Inc. (Green) conducted a Hazardous Materials Survey at the Site to identify hazardous materials that would require special handling and/or disposal. The survey included the assessment for the presence of asbestos, a lead based paint survey; surface wipe sampling, a visual mold evaluation; and the cataloging of oils and hazardous materials located within the building.

Findings and Conclusions

Section 9.0 includes the findings and conclusions of this investigation.

2. Preparation

2.1 Quality Assurance Project Plan

Prior to initiating the field work at the Site, BETA developed a Site Specific Quality Assurance Project Plan (QAPP) Addendum to BETA's previously approved Generic QAPP. The QAPP addendum was prepared in accordance with guidance provided by the U.S. Environmental Protection Agency (EPA) Region 1 under its Brownfields program included additions to the Generic QAPP to address groundwater, soil, soil gas, surface water, and sediment quality at the Site. The QAPP addendum was based on guidelines set forth in Generic Quality Assurance Project Plans, and Site-Specific QAPP Addenda, March 2009. BETA submitted the QAPP Addendum to EPA for approval in January 2015. After addressing several rounds of comments and questions, the QAPP Addendum was approved on February 5, 2015. Appendix B contains a copy of the approved QAPP Addendum.

2.2 Site Preparation

BETA conducted the following activities in preparation for the implementation of the field work for this investigation:

- Marked out the proposed boring locations in the field for utility locations purposes;
- At least 72 hours prior to the start of the drilling activities, notified "Digsafe" and the City of Fall River to mark utilities in the vicinity of the proposed boring locations;
- Re-located borings that conflicted with existing utilities; and,
- Prepared a project-specific Health and Safety Plan (HASP) prior to the commencement of field work. The HASP addressed potential hazards to health, safety, public welfare, and the environment which could arise during the investigation. A copy of the HASP is included in Appendix K.

3. Soil Borings

3.1 Soil Borings

On April 7, 8, and 10, 2015, BETA oversaw the advancement of ten (10) soil borings at the Site (see below for boring locations). Drilling activities were completed by Technical Drilling Services, Inc. (TDS) of Sterling, Massachusetts using a track-mounted Geoprobe drilling unit or a hollow-stem auger drilling rig. One boring was completed as a bedrock monitoring well, cored 15 feet into competent bedrock using a diamond-bit corer. Soil samples were collected at each boring location during drilling operations using a core sampler from grade to a depth of approximately ten feet below grade. Soil boring logs are included in Appendix D. Soil boring locations are depicted on Figure 2.

Soil borings were advanced in the following locations:

- B/MW-101: In the southwest portion of the Site, west of the loading dock.
- B/MW-102-S: In the southern portion of the Site, in the paved area southeast of the ventilation unit
- B/MW-102-B: In the parking lot of the Site, about 37 feet southeast of the ventilation unit near the loading dock.
- B/MW-103: In the southern portion of the Site building
- B/MW-104: Inside the building, near the northwest corner
- B/MW-105: Inside the building, near the northeast corner
- B/MW-106: In the northeast portion of the Site, 17 feet southeast of the northeast corner of the Site building.
- B/MW-107: In the northeast portion of the Site, 15 northeast of the pad mounted transformer.
- B/MW-108: In the northwest portion of the Site, two feet west of the vapor degreaser cooling tower.
- B/MW-109: In the western portion of the Site, west of the Site building's overhead garage door.

Soil samples were collected and field screened for the presence of total volatile organic compounds (TVOCs) using a MiniRAE photoionization detector (PID) with an 11.7 eV lamp (used specifically to detect chlorinated solvent compounds) calibrated to measure TVOCs as benzene in parts per million by volume (ppm_v). Headspace readings for the soil samples from the borings ranged from 0.0 ppm_v to 2.0 ppm_v. The PID reading of 2.0 ppm_v was measured in a soil sample from B/MW-107 from a depth of two to five feet below ground surface. PID readings for each soil sample are shown on the soil boring logs in Appendix D.

3.2 Soil Classification

Since the proposed use of the Site is commercial and no residential properties exist within 500 feet of the project area, BETA has compared the soil results to MassDEP's RCS-2 reportable concentrations for purposes of identifying contaminated soils. BETA has also compared the results to the Method 1 S-1/GW-2 and S-1/GW-3 cleanup standards to determine if an Activity and Use Limitation (AUL) would be needed at the Site. Future risk characterization of the Site may identify differing exposures and cleanup standards.

3.3 Soil Sampling and Analytical Data

BETA submitted the following soil samples from the soil borings to AMRO Environmental Laboratories Corporation (AMRO) for laboratory analysis:

- B/MW-101 (2-5 feet): VOCs by EPA Method 8260B, the eight RCRA metals by various EPA methods, and hexavalent chromium by EPA Method 7196A.
- B/MW-102-S (2-5 feet): VOCs by EPA Method 8260B, the eight RCRA metals by various EPA methods, hexavalent chromium by EPA Method 7196A, EPH with target PAHs by MassDEP methodology, and VPH with target VOCs by MassDEP methodology.
- B/MW-103 (5-7 feet): VOCs by EPA Method 8260B, the eight RCRA metals by various EPA methods, and hexavalent chromium by EPA Method 7196A.
- B/MW-104 (2-5 feet): VOCs by EPA Method 8260B, the eight RCRA metals by various EPA methods, and hexavalent chromium by EPA Method 7196A.
- B/MW-105 (0-2 feet): VOCs by EPA Method 8260B, the eight RCRA metals by various EPA methods, and hexavalent chromium by EPA Method 7196A.
- B/MW-106 (5-7 feet): VOCs by EPA Method 8260B, the eight RCRA metals by various EPA methods, and hexavalent chromium by EPA Method 7196A.
- B/MW-107 (2-5 feet): VOCs by EPA Method 8260B, the eight RCRA metals by various EPA methods, hexavalent chromium by EPA Method 7196A, EPH with target PAHs by MassDEP methodology, and VPH with target VOCs by MassDEP methodology.
- B/MW-108 (2-5 feet): VOCs by EPA Method 8260B, the eight RCRA metals by various EPA methods, and hexavalent chromium by EPA Method 7196A.

- B/MW-109 (2-5 feet): VOCs by EPA Method 8260B, the eight RCRA metals by various EPA methods, hexavalent chromium by EPA Method 7196A, EPH with target PAHs by MassDEP methodology, and VPH with target VOCs by MassDEP methodology.

Table 1 summarizes the detected compounds from these analyses and Appendix E contains the laboratory certificates of analysis. As can be seen in Table 1, detected compounds were below MassDEP Method 1 S-1 cleanup standards and RCS-2 reportable concentrations.

BETA submitted quality assurance/quality control (QA/QC) samples to AMRO for laboratory analysis. BETA submitted trip blanks for VOC analysis at a rate of one per cooler during field activities. AMRO did not detect any compounds above the laboratory reporting limit in the trip blank samples. BETA submitted two field duplicates during field activities. The following summarizes the results from the duplicate samples:

- Duplicate F (from sample B/MW-102-S) was submitted for VPH with target VOCs by MassDEP methodology and EPH with target PAHs by MassDEP methodology. The relative percent difference was calculated for two compounds and ranged from 107.69% to 132.77%. The RPDs were outside the acceptable range for comparable data.
- Duplicate G was submitted for total cyanide, VOCs by EPA Method 8260B, the eight RCRA metals by various EPA methods, and hexavalent chromium by EPA Method 7196A. The RPD was calculated for seven compounds and ranged from 0.60% to 84.34%. The RPD for methylene chloride (84.34%) was outside the acceptable range for comparable data.

Although these RPDs are outside the acceptable range, as discussed below, the usability of the data has not been adversely affected.

3.4 Data Quality

BETA conducted a Modified Tier II Data Validation in accordance with the provisions of the QAPP and EPA guidance. The data validation included a review of the laboratory standard protocols such as method blanks, equipment blanks, trip blanks, matrix spikes, laboratory control samples, surrogate samples, and duplicate samples. Some data were qualified as estimated as a result of data quality limitations. However, based on the Tier II data review, the data for the Site is usable for the intended purpose of site characterization. A copy of the Modified Tier II Data Validation report is included in Appendix I.

4. Surficial Soil Sampling

4.1 Soil Sample Collection

Historic subsurface investigations conducted at the Site identified contaminated soil along the northern and western portions of the Site building. The contaminants in this area consisted of metals and VOCs. To determine the extent of the contamination in this area, BETA oversaw the advancement of 44 shallow soil borings (to a depth of 2 feet) in a grid pattern (approximately 20 foot spacing) along the northern and western portion of the Site buildings. At each location, three grab samples (one from 0-6 inches, one from 6-12 inches, and one from 12-24 inches) were collected and field screened for total metals using an XRF detector and VOCs using headspace testing with a PID.

4.2 Field Screening

Using an Olympus Innov-X Delta XRF Analyzer, BETA field screened three soil samples from each of the 44 boring locations. Overall, BETA field screened 166 soil samples. The following summarizes the results of the screening for the four metals that had screening results greater than the MassDEP standards. Table 2 presents the detailed results for each sample that was screened.

- Lead: One (1) sample, SS 232 (0-6) 4/6/15, contained lead above the Method 1 S-1/GW-3 cleanup standard of 200 mg/kg.
- Chromium: Twelve (12) samples contained chromium above the Method 1 S-1/GW-3 cleanup standard of 100 mg/kg, and of these, three (3) contained chromium above the Imminent Hazard threshold of 200 mg/kg.
- Arsenic: One (1) sample, SS 240 (0-6) 4/6/15, contained arsenic above the Method 1 S-1/GW-3 cleanup standard of 20 mg/kg and above the Imminent Hazard threshold of 40 mg/kg.
- Cadmium: One (1) sample, SS 205 (6-12) 4/6/15, contained cadmium above the Method 1 S-1/GW-3 cleanup standard of 70 mg/kg and above the Imminent Hazard threshold of 60 mg/kg.

Additionally, BETA field screened each of the soil samples with a MiniRAE 3000 photoionization detector (PID) calibrated to measure TVOCs as benzene in parts per million by volume (ppm_v) using an 11.7 eV lamp. Headspace readings for the soil samples from the borings ranged from 0.0 ppm_v to 6.8 ppm_v. PID readings for each soil sample are shown on the soil boring logs in Appendix A. Soil samples for VOC analysis (see Section 4.3 below) were selected based on elevated PID readings.

4.3 Soil Sampling and Analytical Data

To corroborate the PID and XRF field screening data, BETA submitted twenty samples for laboratory analysis of VOCs by EPA Method 8260, thirty samples for total RCRA 8 metals by various EPA methods, thirty samples for hexavalent chromium by EPA Method 7196A, and thirty samples for total cyanide by EPA Method 9010C. These samples were selected based on the field screening results and included a mix of samples with elevated and low field screening results. BETA submitted the following soil samples from the following surficial soil samples to AMRO for laboratory analysis:

- SS-201 (0-6 inches): RCRA 8 Metals by various EPA methods, hexavalent chromium by EPA Method 7916A, and total cyanide by EPA Method 9010C;
- SS-202 (0-6 inches): VOCs by EPA Method 8260;
- SS-202 (6-12 inches): VOCs by EPA Method 8260;
- SS-205 (0-6 inches): RCRA 8 Metals by various EPA methods, hexavalent chromium by EPA Method 7916A, and total cyanide by EPA Method 9010C;
- SS-205 (6-12 inches): VOCs by EPA Method 8260, RCRA 8 Metals by various EPA methods, hexavalent chromium by EPA Method 7916A, and total cyanide by EPA Method 9010C;
- SS-205 (12-24 inches): VOCs by EPA Method 8260, RCRA 8 Metals by various EPA methods, hexavalent chromium by EPA Method 7916A, and total cyanide by EPA Method 9010C;
- SS-206 (6-12 inches): VOCs by EPA Method 8260;
- SS-208 (12-24 inches): RCRA 8 Metals by various EPA methods, hexavalent chromium by EPA Method 7916A, and total cyanide by EPA Method 9010C;
- SS-209 (0-6 inches): RCRA 8 Metals by various EPA methods, hexavalent chromium by EPA Method 7916A, and total cyanide by EPA Method 9010C;
- SS-214 (0-6 inches): RCRA 8 Metals by various EPA methods, hexavalent chromium by EPA Method 7916A, and total cyanide by EPA Method 9010C;
- SS-215 (0-6 inches): VOCs by EPA Method 8260, RCRA 8 Metals by various EPA methods, hexavalent chromium by EPA Method 7916A, and total cyanide by EPA Method 9010C;
- SS-215 (6-12 inches): RCRA 8 Metals by various EPA methods, hexavalent chromium by EPA Method 7916A, and total cyanide by EPA Method 9010C;
- SS-215 (12-24 inches): VOCs by EPA Method 8260;
- SS-216 (0-6 inches): RCRA 8 Metals by various EPA methods, hexavalent chromium by EPA Method 7916A, and total cyanide by EPA Method 9010C;
- SS-216 (6-12 inches): VOCs by EPA Method 8260;
- SS-216 (12-24 inches): VOCs by EPA Method 8260;

- SS-217 (0-6 inches): VOCs by EPA Method 8260, RCRA 8 Metals by various EPA methods, hexavalent chromium by EPA Method 7916A, and total cyanide by EPA Method 9010C;
- SS-217 (6-12 inches): VOCs by EPA Method 8260;
- SS-217 (12-24 inches): VOCs by EPA Method 8260;
- SS-218 (0-6 inches): RCRA 8 Metals by various EPA methods, hexavalent chromium by EPA Method 7916A, and total cyanide by EPA Method 9010C;
- SS-218 (6-12 inches): RCRA 8 Metals by various EPA methods, hexavalent chromium by EPA Method 7916A, and total cyanide by EPA Method 9010C;
- SS-219 (0-6 inches): RCRA 8 Metals by various EPA methods, hexavalent chromium by EPA Method 7916A, and total cyanide by EPA Method 9010C;
- SS-220 (12-24 inches): RCRA 8 Metals by various EPA methods, hexavalent chromium by EPA Method 7916A, and total cyanide by EPA Method 9010C;
- SS-222 (0-6 inches): VOCs by EPA Method 8260;
- SS-223 (0-6 inches): RCRA 8 Metals by various EPA methods, hexavalent chromium by EPA Method 7916A, and total cyanide by EPA Method 9010C;
- SS-224 (0-6 inches): VOCs by EPA Method 8260;
- SS-226 (0-6 inches): RCRA 8 Metals by various EPA methods, hexavalent chromium by EPA Method 7916A, and total cyanide by EPA Method 9010C;
- SS-227 (0-6 inches): RCRA 8 Metals by various EPA methods, hexavalent chromium by EPA Method 7916A, and total cyanide by EPA Method 9010C;
- SS-232 (0-6 inches): RCRA 8 Metals by various EPA methods, hexavalent chromium by EPA Method 7916A, and total cyanide by EPA Method 9010C;
- SS-233 (0-6 inches): VOCs by EPA Method 8260, RCRA 8 Metals by various EPA methods, hexavalent chromium by EPA Method 7916A, and total cyanide by EPA Method 9010C;
- SS-233 (12-24 inches): VOCs by EPA Method 8260;
- SS-234 (0-6 inches): VOCs by EPA Method 8260;
- SS-234 (12-24 inches): VOCs by EPA Method 8260;
- SS-236 (12-24 inches): RCRA 8 Metals by various EPA methods, hexavalent chromium by EPA Method 7916A, and total cyanide by EPA Method 9010C;
- SS-238 (0-6 inches): RCRA 8 Metals by various EPA methods, hexavalent chromium by EPA Method 7916A, and total cyanide by EPA Method 9010C;
- SS-238 (6-12 inches): VOCs by EPA Method 8260;
- SS-238 (12-24 inches): VOCs by EPA Method 8260;
- SS-239 (0-6 inches): RCRA 8 Metals by various EPA methods, hexavalent chromium by EPA Method 7916A, and total cyanide by EPA Method 9010C;

- SS-240 (0-6 inches): RCRA 8 Metals by various EPA methods, hexavalent chromium by EPA Method 7916A, and total cyanide by EPA Method 9010C;
- SS-241 (6-12 inches): RCRA 8 Metals by various EPA methods, hexavalent chromium by EPA Method 7916A, and total cyanide by EPA Method 9010C;
- SS-242 (0-6 inches): RCRA 8 Metals by various EPA methods, hexavalent chromium by EPA Method 7916A, and total cyanide by EPA Method 9010C;
- SS-243 (12-24 inches): RCRA 8 Metals by various EPA methods, hexavalent chromium by EPA Method 7916A, and total cyanide by EPA Method 9010C;
- SS-244 (0-6 inches): RCRA 8 Metals by various EPA methods, hexavalent chromium by EPA Method 7916A, and total cyanide by EPA Method 9010C;
- SS-244 (6-12 inches): RCRA 8 Metals by various EPA methods, hexavalent chromium by EPA Method 7916A, and total cyanide by EPA Method 9010C;
- SS-244 (12-24 inches): RCRA 8 Metals by various EPA methods, hexavalent chromium by EPA Method 7916A, and total cyanide by EPA Method 9010C;

Tables 3 and 4 summarize the detected compounds from these analyses and Appendix F contains the laboratory certificates of analysis. As can be seen in Tables 3 and 4, the following compounds exceeded MassDEP Method 1 standards:

Metals

- Total chromium in the samples from SS-215 (6-12 inches) (327 mg/kg), SS-226 (0-6 inches) (318 mg/kg), and SS-232 (0-6 inches) (104 mg/kg) exceeds the Method 1 S-1/GW-3 cleanup standard of 100 mg/kg and the RCS-2 reportable concentration of 200 mg/kg;
- Total lead in the samples from SS-215 (6-12 inches) (1,320 mg/kg) and SS-232 (0-6 inches) (237 mg/kg) exceeds the Method 1 S-1/GW-3 cleanup standard of 200 mg/kg and the RCS-2 reportable concentration of 600 mg/kg;
- Total nickel in the samples SS-226 (0-6 inches) (22,700 mg/kg) and SS-232 (0-6 inches) (2,600 mg/kg) exceeds the Method 1 S-1/GW-3 cleanup standard of 600 mg/kg. Additionally, the concentration of nickel in sample SS-226 exceeds the MassDEP's Upper Concentration Limit of 10,000 mg/kg and the RCS-2 reportable concentration of 1,000 mg/kg; and,
- Total zinc in the samples from SS-226 (0-6 inches) (7,300 mg/kg) and SS-232 (0-6 inches) (2,720 mg/kg) exceeds the Method 1 S-1/GW-3 cleanup standard of 1,000 mg/kg and the RCS-2 reportable concentration of 3,000 mg/kg.

The concentrations of total chromium in the samples from SS-215 (6-12 inches) and SS-226 (0-6 inches) exceed the MassDEP's Imminent Hazard threshold. However, the laboratory also analyzed these samples for hexavalent chromium to address the possibility of an imminent hazard. The laboratory did not detect hexavalent chromium above the method detection limits for either of these samples, thus, an Imminent Hazard does not exist at these two locations.

BETA submitted trip blanks for VOC analysis at a rate of one per cooler during field activities. AMRO did not detect any compounds above the laboratory reporting limit in the trip blank samples. BETA collected QA/QC surficial soil samples during field activities. BETA submitted field duplicates Duplicate A (the sample from SS-217 (0-6")), Duplicate B (the sample from SS-205(12-24"), Duplicate C (the sample from SS-223 (0-6"), and Duplicate D (the sample from SS-219 (0-6")) for analysis of RCRA 8 Metals by various EPA methods, hexavalent chromium by EPA Method 7916A, and total cyanide by EPA Method 9010C. The following summarizes the results from the duplicate samples:

- The relative percent difference (RPD) in the data from Duplicate A and sample SS-217 (0-6") was not calculated as detected compounds were different in the samples.
- Duplicate B contained one detected compound and had a RPD of 10.75% and was in the acceptable range for comparable data.
- The RPD for Duplicate C ranged from 3.57 to 81.66%. The RPDs for copper (55.63%) and nickel (81.66%) were outside of the acceptable range.
- The RPD for Duplicate D was calculated for six metals. The RPD range was 10.25 to 56.10%. The RPDs for chromium (56.10%) and lead (51.78%) were outside of the acceptable range.

Although these RPDs are outside the acceptable range, as discussed below, the usability of the data has not been adversely affected.

4.4 Data Analysis

In accordance with the QAPP Addendum, BETA performed a regression analysis on the XRF data to evaluate whether the field screening data is comparable to the fixed lab data, similar to the approach detailed in Section 9.7 of SW 846 Method 6200. If the measured concentrations spanned more than an order of magnitude, the data were log-transformed to standardize variance. The correlation coefficient (r) of the results should be 0.7 or greater for the XRF data to be considered screening level data. R values greater than 0.8 and slopes between 0.9 and 1 would indicate good correlation between the XRF and lab data. This analysis was used to determine how good a fit the screening data is and what corrections to the data need to be made (i.e., screening data overestimates or underestimates actual concentrations and by how much).

The following summarizes the R-values for the standard and log-transformed data.

Metal	Standard R-value	Log-transformed R-value
Lead	0.7108	0.8057
Chromium	0.7256	0.5331
Silver	0.8231	0.7496
Mercury	0.1296	0.0791

As can be seen in the table, the standard R-values for lead, chromium, and silver fall within the EPA's acceptable limits for use of the data. Thus, the lead, chromium and silver field screening results can be used to delineate extents of impact. The chromium data has not been used to determine if an Imminent Hazard exists at the Site. Neither of the R-values for mercury is within the EPA's acceptable limits for use of the data.

4.5 Data Quality

BETA conducted a Modified Tier II Data Validation in accordance with the provisions of the QAPP and EPA guidance. The data validation included a review of the laboratory standard protocols such as method blanks, equipment blanks, trip blanks, matrix spikes, laboratory control samples, surrogate samples, and duplicate samples. Some data were qualified as estimated as a result of data quality limitations. However, based on the Tier II data review, the data for the Site is usable for their intended purpose of site characterization. A copy of the Modified Tier II Data Validation report is included in Appendix I.

5. Groundwater Monitoring Wells

5.1 Groundwater Monitoring Wells

During advancement of the soil borings on April 7, 8, and 10, 2015, BETA oversaw the installation of ten monitoring wells. Seven of the borings were completed as 2-inch diameter groundwater monitoring wells. Groundwater monitoring wells installed inside the Site building were completed as 1-inch diameter wells. Monitoring wells were installed in the following locations:

- B/MW-101: In the southwest portion of the Site, west of the loading dock.
- B/MW-102-S: In the southern portion of the Site, in the paved area southeast of the ventilation unit
- B/MW-102-B: In the parking lot of the Site, about 37 feet southeast of the ventilation unit near the loading dock.
- B/MW-103: Inside the building, in the southern portion.
- B/MW-104: Inside the building, near the northwest corner
- B/MW-105: Inside the building, near the northeast corner
- B/MW-106: In the northeast portion of the Site, 17 feet southeast of the northeast corner of the Site building.
- B/MW-107: In the northeast portion of the Site, 15 northeast of the pad mounted transformer.
- B/MW-108: In the northwest portion of the Site, two feet west of the vapor degreaser cooling tower.
- B/MW-109: In the western portion of the Site, west of the Site building's overhead garage door.

The depth of the new monitoring wells ranges from 6.5 to 25 feet below the ground surface. All monitoring wells located outside the Site building were completed using 2-inch schedule 40 PVC material. An appropriate amount of 0.010 inch slotted screen and riser material, sand and bentonite were used to complete each well. The monitoring wells located inside the Site building were completed using 1-inch schedule 40 PVC. The new wells were completed with a flush-mounted roadbox and cemented in place. Soil boring and monitoring well logs are included as Appendix A. Monitoring well and soil boring locations are depicted on Figure 2.

5.2 Groundwater Monitoring Well Development and Sampling

On April 17, 2015, the depth to groundwater was gauged in three of the new monitoring wells (B/MW-103, B/MW-104, and B/MW-105). A check valve was used to over pump these wells to complete well development. On April 22, 2015, the depth to groundwater was gauged in seven of the new monitoring wells (B/MW-101, B/MW-102-S, B/MW-102-B, B/MW-106, B/MW-107, B/MW-108, and B/MW-109) and two of the existing monitoring wells (MW-1 and MW-3). A Grundfos Redi-Flo 2 submersible pump was used to over pump these wells to complete well development. In accordance with state and federal protocols, the monitoring wells were developed to remove fine silt and sand from the well and to ensure a proper connection between the well and the surrounding aquifer prior to the collection of groundwater samples.

On April 30, 2015, the depth to groundwater was gauged in three of the new monitoring wells (B/MW-101, B/MW-102-S, and B/MW-102-B) and one existing monitoring well (MW-1) and samples were collected from each well. On May 1, 2015, the depth to groundwater was gauged in six of the new monitoring wells (B/MW-103, B/MW-104, B/MW-105, B/MW-106, B/MW-107, and B/MW-109) and samples were collected from each well. On May 4, 2015, the depth to groundwater was gauged in one new monitoring well (B/MW-108) and one existing monitoring well (MW-3) and samples were collected from each well. Samples were collected using low-flow methodology. A summary of the groundwater sampling data and the depth to groundwater elevations are included in Table 2.

During development and sampling, reusable equipment was decontaminated between sampling locations. BETA collected equipment blanks to ensure proper decontamination each day. Equipment blanks were submitted to AMRO for laboratory analysis of VOCs by EPA Method 8260B, RCRA 8 Metals by various EPA methods, total cyanide by EPA Method 9010C, EPH by MassDEP methodology, and VPH by MassDEP methodology.

5.3 Groundwater Classification

BETA obtained a copy of the Priority Resource Map for the project area from the MassDEP website (see Figure 3). Based on this map, the project area is not within a Current Drinking Water Source Area or a Potential Drinking Water Source Area. Additionally, the entire project area is served by municipal water and no known private drinking water wells are known to exist. Thus, for the purposes of this report and since the depth to groundwater is less than 15 feet below the ground surface, groundwater at the Site that is within 30 feet of an existing building is classified as Method 1 GW-2. Please note that if new buildings are constructed at the Site, groundwater within 30 feet of such buildings would also be classified as Method 1 GW-2. Since all groundwater is, at a minimum classified as GW-3, BETA has also compared the groundwater analytical results to the Method 1 GW-3 standards. BETA compared the results to RCGW-2 standards as well to identify any possible reportable conditions in areas that were previously uninvestigated.

5.4 Groundwater Analytical Data

BETA submitted the following groundwater samples from the monitoring wells to AMRO for laboratory analysis:

- B/MW-101: VOCs by EPA Method 8260B, RCRA 8 Metals by various EPA methods, hexavalent chromium by EPA Method 7916A, total cyanide by EPA Method 9010C, EPH by MassDEP methodology, and VPH by MassDEP methodology;
- B/MW-102-S: VOCs by EPA Method 8260B, RCRA 8 Metals by various EPA methods, hexavalent chromium by EPA Method 7916A, total cyanide by EPA Method 9010C, EPH by MassDEP methodology, and VPH by MassDEP methodology;
- B/MW-102-B: VOCs by EPA Method 8260B;
- B/MW-103: VOCs by EPA Method 8260B, RCRA 8 Metals by various EPA methods, hexavalent chromium by EPA Method 7916A, and total cyanide by EPA Method 9010C;
- B/MW-104: VOCs by EPA Method 8260B, RCRA 8 Metals by various EPA methods, hexavalent chromium by EPA Method 7916A, and total cyanide by EPA Method 9010C;
- B/MW-105: VOCs by EPA Method 8260B, RCRA 8 Metals by various EPA methods, hexavalent chromium by EPA Method 7916A, and total cyanide by EPA Method 9010C;
- B/MW-106: VOCs by EPA Method 8260B, RCRA 8 Metals by various EPA methods, hexavalent chromium by EPA Method 7916A, and total cyanide by EPA Method 9010C;
- B/MW-107: VOCs by EPA Method 8260B, RCRA 8 Metals by various EPA methods, hexavalent chromium by EPA Method 7916A, total cyanide by EPA Method 9010C, EPH by MassDEP methodology, and VPH by MassDEP methodology;
- B/MW-108: VOCs by EPA Method 8260B, RCRA 8 Metals by various EPA methods, hexavalent chromium by EPA Method 7916A, and total cyanide by EPA Method 9010C;
- B/MW-109: VOCs by EPA Method 8260B, RCRA 8 Metals by various EPA methods, hexavalent chromium by EPA Method 7916A, total cyanide by EPA Method 9010C, EPH by MassDEP methodology, and VPH by MassDEP methodology; and,
- Duplicate H: VOCs by EPA Method 8260B, RCRA 8 Metals by various EPA methods, hexavalent chromium by EPA Method 7916A, total cyanide by EPA Method 9010C, EPH by MassDEP methodology, and VPH by MassDEP methodology.

Table 5 summarizes the detected compounds from these analyses and Appendix G contains the laboratory certificates of analysis. As can be seen in Table 5, the following compounds exceeded MassDEP Method 1 standards:

- Total lead in the samples from B/MW-101 (21 micrograms per liter [µg/L]) and B/MW-106 (12 µg/L) exceeded the Method 1 GW-3 Standard and the RCGW-2 reportable concentration of 10 µg/L.
- Trichloroethene in the sample from B/MW-105 (100 µg/L) exceeded the Method 1 GW-2 standard and the RCGW-2 reportable concentration of 5 µg/L.

As can be seen in Table 5, other detections were below Method 1 GW-2/GW-3 cleanup standards and RCGW-2 reportable concentrations. Turbidity readings of the samples from B/MW-105 (146 ntu) and B/MW-101 (72.8 ntu) were elevated and possibly contained sediment leading to the exceedances.

BETA submitted trip blanks for VOC analysis at a rate of one per cooler during field activities. AMRO did not detect any compounds above the laboratory reporting limit in the trip blank samples. Field duplicate sample Duplicate H (the sample from B/MW-102-S) was submitted for analysis of VOCs by EPA Method 8260B, RCRA 8 Metals by various EPA methods, hexavalent chromium, total cyanide by EPA Method 9010C, EPH by MassDEP methodology, and VPH by MassDEP methodology. The data from Duplicate H is comparable to the B/MW-102-S data as no compounds were detected.

5.5 July Groundwater Sampling Event

On July 6, 2015, the depth to groundwater was gauged in seven of the monitoring wells (B/MW-101, B/MW-103, B/MW-106, B/MW-107, B/MW-109, MW-1, and MW-3) and a sample was collected from each. A duplicate sample was also collected in accordance with BETA's QAPP. On July 7, 2015, the depth to groundwater was gauged in five of the monitoring wells (B/MW-102-S, B/MW-102-B, B/MW-104, B/MW-105, and B/MW-108) and a sample was collected from each well. The low-flow sampling method was used to collect samples from the groundwater monitoring wells. A summary of the groundwater sampling data and the depth to groundwater elevations are included in Table 2.

BETA submitted groundwater samples from each monitoring well to Alpha Analytical, Inc. (Alpha) of Westborough, MA for the following laboratory analysis:

- B/MW-101: VOCs by EPA Method 8260B, RCRA 8 Metals by various EPA methods, hexavalent chromium by EPA Method 7916A, and total cyanide by EPA Method 9010C, EPH by MassDEP methodology, and VPH by MassDEP methodology;
- B/MW-102-S: VOCs by EPA Method 8260B, RCRA 8 Metals by various EPA methods, hexavalent chromium by EPA Method 7916A, and total cyanide by EPA Method 9010C, EPH by MassDEP methodology, and VPH by MassDEP methodology;
- B/MW-102-B: VOCs by EPA Method 8260B;
- B/MW-103: VOCs by EPA Method 8260B, RCRA 8 Metals by various EPA methods, hexavalent chromium by EPA Method 7916A, and total cyanide by EPA Method 9010C;
- B/MW-104: VOCs by EPA Method 8260B, RCRA 8 Metals by various EPA methods, hexavalent chromium by EPA Method 7916A, and total cyanide by EPA Method 9010C;
- B/MW-105: VOCs by EPA Method 8260B, RCRA 8 Metals by various EPA methods, hexavalent chromium by EPA Method 7916A, and total cyanide by EPA Method 9010C;
- B/MW-106: VOCs by EPA Method 8260B, RCRA 8 Metals by various EPA methods, hexavalent chromium by EPA Method 7916A, and total cyanide by EPA Method 9010C;

- B/MW-107: VOCs by EPA Method 8260B, RCRA 8 Metals by various EPA methods, hexavalent chromium by EPA Method 7916A, and total cyanide by EPA Method 9010C, EPH by MassDEP methodology, and VPH by MassDEP methodology;
- B/MW-108: VOCs by EPA Method 8260B, RCRA 8 Metals by various EPA methods, hexavalent chromium by EPA Method 7916A, and total cyanide by EPA Method 9010C;
- B/MW-109: VOCs by EPA Method 8260B, RCRA 8 Metals by various EPA methods, hexavalent chromium by EPA Method 7916A, and total cyanide by EPA Method 9010C, EPH by MassDEP methodology, and VPH by MassDEP methodology;
- Duplicate I: VOCs by EPA Method 8260B, RCRA 8 Metals by various EPA methods, hexavalent chromium by EPA Method 7916A, and total cyanide by EPA Method 9010C, EPH by MassDEP methodology, and VPH by MassDEP methodology;

Table 5 summarizes the detected compounds from these analyses and Appendix G contains the laboratory certificates of analysis. As can be seen in Table 5, the following compounds exceeded MassDEP Method 1 standards:

- The concentration of total cadmium in the sample from B/MW-105 (7 µg/L) exceeds the Method 1 GW-3 standard and RCGW-2 reportable concentration of 4 µg/L;
- The concentration of total chromium in the sample from B/MW-101 (700 µg/L) exceeds the Method 1 GW-3 cleanup standard and RCGW-2 reportable concentration of 300 µg/L;
- The concentration of total lead in the sample from B/MW-101 (400 µg/L), B/MW-106 (14 µg/L), B/MW-109 (13 µg/L), and Duplicate I (27 µg/L) exceed the Method 1 GW-3 cleanup standard and RCGW-2 reportable concentration;
- The concentration of cyanide in the sample from B/MW-109 (36 µg/L) exceeds the Method 1 GW-3 cleanup standard and RCGW-2 reportable concentration of 30 µg/L; and,
- The concentration of TCE in the sample from B/MW-105 (93 µg/L) exceeds the Method 1 GW-2 cleanup standard and the RCGW-2 reportable concentration of 5 µg/L.

The turbidity in the samples from B/MW-101 (10.1 ntu), B/MW-105 (146.1 ntu), B/MW-106 (584.1 ntu) was elevated at the time of sampling. The exceedances could be attributed to sediment in the samples. The turbidity in the sample from B/MW-109 (1.0 ntu) was low and most likely unaffected by sediment.

BETA submitted trip blanks for VOC analysis at a rate of one per cooler during field activities. Alpha did not detect any compounds above the laboratory reporting limit in the trip blank samples. Field duplicate samples Duplicate I (the sample from B/MW-107) was submitted for analysis of VOCs by EPA Method 8260B, RCRA 8 Metals by various EPA methods, hexavalent chromium, total cyanide by EPA Method 9010C, EPH by MassDEP methodology, and VPH by MassDEP methodology. The RPD between the duplicate and sample B/MW-107 for arsenic (58.82 %) and barium (80.52 %) were outside the acceptable range, therefore the data from the was not comparable. Although these RPDs are outside the acceptable range, as discussed below, the usability of the data has not been adversely affected.

5.6 Data Quality

BETA conducted a Modified Tier II Data Validation in accordance with the provisions of the QAPP and EPA guidance. The data validation included a review of the laboratory standard protocols such as method blanks, equipment blanks, trip blanks, matrix spikes, laboratory control samples, surrogate samples, and duplicate samples. Some data were qualified as estimated as a result of data quality limitations. However, based on the Tier II data review, the data for the Site is usable for the intended purpose of site characterization. A copy of the Modified Tier II Data Validation report is included in Appendix I.

6. Surface Water and Sediment Sampling

6.1 Stream Sampling

On May 12, 2015, BETA collected three surface water samples from the drainage ditch on the eastern portion of the Site and submitted them to AMRO for the following laboratory analysis:

- SW-101: VOCs by EPA Method 8260B, RCRA 8 Metals by various EPA methods, hexavalent chromium by EPA Method 7916A, and total cyanide by EPA Method 9010C;
- SW-102: VOCs by EPA Method 8260B, RCRA 8 Metals by various EPA methods, hexavalent chromium by EPA Method 7916A, and total cyanide by EPA Method 9010C;
- SW-103: VOCs by EPA Method 8260B, RCRA 8 Metals by various EPA methods, hexavalent chromium by EPA Method 7916A, and total cyanide by EPA Method 9010C;

Figure 2 depicts the three sample locations and Table 5 summarizes the detected compounds from these analyses. Appendix H contains the laboratory certificates of analysis. As can be seen in Table 5, the following compounds were detected:

- Total arsenic in the samples from SW-101 (0.0059 mg/L) and SW-102 (0.0032 mg/L);
- Total lead in the samples from SW-101 (0.018 mg/L), SW-102 (0.02 mg/L), and SW-103 (0.0064 mg/L); and,
- Toluene in the samples from SW-101 (0.017 mg/L) and SW-102 (0.002 mg/L).

As can be seen in Table 5, detected compounds were below National Recommended Water Quality Criteria.

BETA submitted trip blanks for VOC analysis at a rate of one per cooler during field activities. Alpha did not detect any compounds above the laboratory reporting limit in the trip blank samples. Field duplicate samples Duplicate I (the sample from SW-103) was submitted for analysis of VOCs by EPA Method 8260B, RCRA 8 Metals by various EPA methods, hexavalent chromium, total cyanide by EPA Method 9010C. The concentration of lead in Duplicate I and sample SW-103 was the same and the data was comparable.

6.2 Sediment Sampling

On May 12, 2015, BETA also collected three sediment samples from the drainage ditch on the eastern portion of the Site (from the same locations as the surface water samples) and submitted them to AMRO for the following laboratory analysis:

- SED-101: VOCs by EPA Method 8260B, RCRA 8 Metals by various EPA methods, hexavalent chromium by EPA Method 7916A, and total cyanide by EPA Method 9010C;
- SED-102: VOCs by EPA Method 8260B, RCRA 8 Metals by various EPA methods, hexavalent chromium by EPA Method 7916A, and total cyanide by EPA Method 9010C;

- SED-103: VOCs by EPA Method 8260B, RCRA 8 Metals by various EPA methods, hexavalent chromium by EPA Method 7916A, and total cyanide by EPA Method 9010C;

Figure 2 depicts the three sample locations and Table 6 summarizes the detected compounds from these analyses. Appendix H contains the laboratory certificates of analysis. As can be seen in Table 6, the following compounds were detected:

- Total barium in the SED-101 sample (49.5 mg/kg) and the SED-103 sample (59.1 mg/kg);
- Total chromium in the SED-101 (24.8 mg/kg), SED-102 (11 mg/kg), and SED-103 (50.3 mg/kg);
- Total lead in the SED-101 (152 mg/kg), SED-102 (15.1 mg/kg), and SED-103 (89 mg/kg);
- Total mercury in the SED-101 (0.155 mg/kg) and SED-103 (0.116 mg/kg)

As can be seen in Table 6, detected compounds were below Method 1 S-1/GW-2 and S-1/GW-3 cleanup standards.

BETA submitted trip blanks for VOC analysis at a rate of one per cooler during field activities. Alpha did not detect any compounds above the laboratory reporting limit in the trip blank samples. Field duplicate samples Duplicate J (the sample from SED-103) was submitted for analysis of VOCs by EPA Method 8260B, RCRA 8 Metals by various EPA methods, hexavalent chromium, and total cyanide by EPA Method 9010C. The RPD for Duplicate J ranged from 3.61% to 80.61%. The RPD for chromium was 80.61% and was above the acceptable range, therefore not comparable.

6.3 Data Quality

BETA conducted a Modified Tier II Data Validation in accordance with the provisions of the QAPP and EPA guidance. The data validation included a review of the laboratory standard protocols such as method blanks, equipment blanks, trip blanks, matrix spikes, laboratory control samples, surrogate samples, and duplicate samples. Some data were qualified as estimated as a result of data quality limitations. However, based on the Tier II data review, the data for the Site is usable for the intended purpose of site characterization. A copy of the Modified Tier II Data Validation report is included in Appendix I.

7. Soil Gas Survey

7.1 Soil Gas Sampling

To assess the potential for solvents to enter the indoor air of the building, BETA completed a soil gas survey on May 12 and 13, 2015. BETA drilled nine small diameter holes through the concrete slab of the Site building using a KVA Hefty Soil Vapor Probe. Soil gas points were advanced to a depth of one foot from the surface of the concrete slab. Soil gas samples were collected at each location during drilling operations using an aluminum point and Teflon tubing. Soil gas sample locations are depicted on Figure 2. Upon completion of the drilling, an aluminum point with Teflon tubing was anchored under the slab. All penetrations were sealed with hydraulic cement.

Soil gas samples were advanced in the following locations:

- SG-1: In the northwest corner of the building, south of B/MW-104.
- SG-2: In the northern portion of the building.
- SG-3: In the northeast corner of the building, west of B/MW-105.
- SG-4: In the western portion of the building
- SG-5: In the center of the building, adjacent to the office.
- SG-6: In the central portion of the building, on the eastern side.
- SG-7: In the southwest corner of the building.
- SG-8: In the southern portion of the building, adjacent to B/MW-103
- SG-9: In the southwestern corner of the building

Soil gas samples were collected and field screened for the presence of total volatile organic compounds (TVOCs) using a MiniRAE 3000 PID with an 11.7 eV lamp (used specifically to detect chlorinated solvent compounds) calibrated to measure TVOCs as benzene in parts per million by volume (ppm_v). Headspace readings for the soil gas samples ranged from 0.0 ppm_v to 3.8 ppm_v. The PID reading of 3.8 ppm_v was measured at sample location SG-3. PID readings for each soil sample are shown on the soil boring logs in Appendix D.

7.2 Soil Gas Sampling and Analytical Data

BETA submitted soil gas samples from the soil gas survey to Alpha of Westborough, Massachusetts for laboratory analysis of VOCs by EPA Method TO-15. Table 7 summarizes the detected compounds from this analysis. Table 7 summarizes the detected compounds from this analysis and Appendix E contains the laboratory certificates of analysis. As can be seen in Table 7, the following detected compounds exceeded the MassDEP Commercial/Industrial Sub-slab Soil Gas Screening Values:

- Chloroform in the sample from SG-3 (606 µg/m^3) above the standard of 210 µg/m^3;
- Trichloroethene in the sample from SG-2 (3,270 µg/m^3), SG-3 (6,560 µg/m^3), and SG-6 (543 µg/m^3) above the standard of 130 µg/m^3; and,
- Tetrachloroethene in the sample from SG-1 (661 µg/m^3), SG-2 (2,770 µg/m^3), and SG-3 (793 µg/m^3) above the standard of 290 µg/m^3.

7.3 Data Quality

BETA conducted a Modified Tier II Data Validation in accordance with the provisions of the QAPP and EPA guidance. The data validation included a review of the laboratory standard protocols such as method blanks, equipment blanks, trip blanks, matrix spikes, laboratory control samples, surrogate samples, and duplicate samples. Some data were qualified as estimated as a result of data quality limitations. However, based on the Tier II data review, the data for the Site is usable for the intended purpose of site characterization. A copy of the Modified Tier II Data Validation report is included in Appendix I.

8. Hazardous Materials Survey

8.1 Hazardous Materials Survey

BETA contracted Green to conduct a hazardous materials survey at the Site. The survey included assessment for the presence of asbestos-containing material (ACM), lead-based paint, surface wipe sampling, a visual mold evaluation, and cataloging of oil and hazardous materials located within the Site building. A copy of the Hazardous Materials Survey is located in Appendix G.

8.2 Asbestos Containing Material

On April 16, 2015, Green collected bulk samples of suspect ACM from within the Site building. Thirty bulk samples of suspect ACM were collected and included sheetrock, ceramic tile grout, fume hood liner, laboratory bench tops, and sink sealant. Samples were submitted to Asbestos Identification Laboratory in Woburn, MA for polarized light microscopy (PLM) analysis by EPA Method 600. Asbestos Identification Laboratory identified asbestos in the fume hood liner and sink sealant sampled. The sample from the fume hood liner contained twenty percent chrysotile asbestos. The sample from the sink sealant contained five percent chrysotile asbestos. Laboratory certificates are included in Green's report in Appendix G.

8.3 Lead Based Paint Survey

On April 16, 2015, Green analyzed representative surfaces for lead based paint using an XRF. The survey identified concentrations of lead in the buildings large and small metal "I" beams and the yellow painted metal rails in the building. The lead content in the yellow metal rails ranged from 1.0 to 1.5 milligram per centimeter squared (mg/cm^2) and the lead content in the large and small metal "I" beams ranged from 0.5 to 1.5 mg/cm^2. The Massachusetts Lead Law defines a lead content of greater than 1.2 mg/cm^2 as a dangerous level of lead.

8.4 Oil and Hazardous/Universal Waste

Green identified fluorescent light bulbs and ballasts throughout the interior of the Site building. Fluorescent light bulbs may contain mercury and lead and have special disposal requirements. Ballasts manufactured prior to 1979 may contain PCBs and would also require disposal. Green also noted five transformers throughout the Site.

8.5 Wipe Sampling

During the investigation, wipe sampling was conducted to determine the presence of metals on interior surfaces of the Site building. Samples were submitted to ESS Laboratory (ESS) for analysis of RCRA 8 metals and total cyanide. Green collected ten wipe samples from various surfaces of the building. Metals concentrations were detected in each wipe sample. The following summarizes the metals detected in the wipe samples:

- Arsenic was detected in sample Wipe-2 only, at a concentration of 21.1 micrograms per 10 cm^2 ($\mu g/10cm^2$);
- Barium ranged from 44.6 to 7,210 $\mu g/10cm^2$;
- Cadmium ranged from non-detect to 2.26 $\mu g/10cm^2$;
- Chromium ranged from 31.7 to 1,840 $\mu g/10cm^2$;
- Lead ranged from 16.9 to 400 $\mu g/10cm^2$;
- Mercury ranged from 0.076 to 0.91 $\mu g/10cm^2$;
- Silver ranged from 4.36 to 151 $\mu g/10cm^2$; and,
- Cyanide ranged from 2.2 to 59.5 $\mu g/10cm^2$.

The EPA Lead Dust Hazard Standards "clearance number" for a residence floor is 40 $\mu g/ft^2$. The concentration of lead in the sample from Wipe-2 (400 $\mu g/10\ cm^2$) was taken from the production line floor of the building and exceeds the Lead Dust Hazard standard. Laboratory certificates of analysis are included in Green's report in Appendix G.

9. Evaluation

9.1 Findings

The following summarizes the findings of this LSI:

Soil Borings

BETA oversaw the advancement of ten soil borings at the Site. Soil samples from each of these borings were submitted for laboratory analysis. The laboratory detected methylene chloride, naphthalene, beryllium, chromium, copper, lead, nickel, zinc, and mercury above the method detection limits in some of these samples. The detected compounds were below RCS-2 reportable concentrations and Method 1 S-1/GW-2 and S-1/GW-3 cleanup standards.

Surficial Soil Sampling

BETA oversaw the advancement of 44 shallow soil borings (to a depth of 2 feet) in a grid pattern (approximately 25 foot spacing) along the northern and western part of the Site building. BETA field screened 166 soil samples using an X-ray Fluorescence (XRF) analyzer and a photoionization detector (PID). The XRF screening identified chromium greater than the Method 1 S-1/GW-3 standard in twelve samples, arsenic greater than the Method 1 S-1/GW-3 standard in one sample, cadmium greater than the Method 1 S-1/GW-3 standard in one sample, and chromium greater than the Method 1 S-1/GW-3 standard in one sample.

The laboratory detected chromium in three samples, lead in two samples, nickel in two samples, and zinc in two samples above the Method 1 S-1 standards and RCS-2 reportable concentrations. The concentrations of total chromium in the samples from SS-215 (6-12 inches) and SS-226 (0-6 inches) exceed the MassDEP's Imminent Hazard threshold. However, the laboratory also analyzed these samples for hexavalent chromium to address the possibility of an imminent hazard. The laboratory did not detect hexavalent chromium above the method detection limits for either of these samples, thus, an Imminent Hazard does not exist at these two locations

Groundwater

The laboratory identified total lead, total cadmium, total chromium, cyanide, and TCE in Site groundwater above the RCGW-2 reportable concentrations and Method 1 GW-2/GW-3 cleanup standards for these compounds. Despite using low-flow sampling techniques, turbidity in some of the groundwater samples was elevated.

Surface Water and Sediment Sampling

The laboratory detected lead in three of the surface water samples. Toluene and arsenic were detected in two of the surface water samples. The laboratory detected barium and mercury in two sediment samples. Chromium and lead were detected in all three sediment samples. Chromium in one of the sediment samples was above the Massachusetts Freshwater Sediment Criteria. Lead in two of the sediment samples was detected above the Massachusetts Freshwater Sediment Criteria.

Soil Gas Sampling

The laboratory detected TCE in three samples, chloroform in one sample, and tetrachloroethene (PCE) in three samples above the Massachusetts Commercial and Industrial Sub-Slab Soil Gas Screening Values.

Hazardous Building Material Investigation

The Hazardous Materials Survey performed by Green identified lead based paint in the Site building ranging from 0.5 to 1.5 mg/cm^2. Bulk samples of suspect ACM identified asbestos in the fume hood liner of the laboratory located in the Site building. Asbestos was also identified in a sample collected from sink sealant. Wipe sampling identified arsenic, barium, cadmium, chromium, lead, mercury, silver, and cyanide on tested surfaces. Lead levels on the production line floor were above the EPA Led Dust Hazard Standard "clearance number". Green identified fluorescent lightbulbs and ballasts, and five transformers throughout the Site building. Ballasts and transformers may contain PCBs.

9.2 Conclusions

BETA performed an LSI in conformance with the scope and limitations submitted to the City of Fall River for the property at 161 Graham Road in Fall River, Massachusetts. Any exceptions to, or deletions from, the scope are described in Appendix A. The following summarizes our findings:

- Surficial soil sampling identified concentrations of chromium, lead, nickel, and zinc above the RCS-2 reportable concentrations and the Method 1 S-1 cleanup standards. Although XRF readings exceeded MassDEP's Imminent Hazard criteria, none of the laboratory data exceeded the Imminent Hazard criteria;
- Groundwater sampling identified concentrations of total lead, total cadmium, total chromium, and cyanide above the RCGW-2 reportable concentration and the Method 1 GW-3 cleanup standards and TCE above the RCGW-2 reportable concentration and the Method 1 GW-2 standards. The metals in the groundwater may be attributed to the elevated turbidity in the samples;
- Surface water sampling identified arsenic, lead, and toluene at the Site. Detected compounds were below the National Recommended Water Quality Criteria standards;
- Sediment sampling identified concentrations of total barium, total chromium, total lead, and total mercury. Detected compounds were below Method 1 S-1/GW-2 and S-1/GW-3 standards;
- Soil gas sampling identified concentrations of TCE, PCE, and chloroform above MassDEP Commercial and Industrial Sub-Slab Soil Gas Screening Values. If the building were occupied, an Imminent Hazard could exist from these compounds; and,

- A Hazardous Materials Survey conducted by Green Environmental identified lead-based paint throughout the Site building. ACM was also identified inside the Site building. Wipe sampling identified metals on surfaces in the building that may pose a hazard to future occupants of the building.

9.3 Recommendations

In the Phase I ESA for the Site, BETA stated, "Although an RAO was filed for the Site in 1998, conditions at the Site have changed and MassDEP has adjusted some of the applicable standards for the contaminants associated with the Site. It is possible that a condition of Significant Risk and/or an Imminent Hazard (as defined by MassDEP) exists at the Site."

Based on the concentrations of the contaminants identified in soil, groundwater, and soil gas at the Site, BETA recommends reporting these results to the MassDEP within 120 days and initiating response actions to address these contaminants. The presence of these contaminants could pose a risk to future Site occupants. Upon reporting to MassDEP, a plan should be developed to further assess the soil, groundwater, soil gas, and indoor air at the Site and response actions should be implemented to address risks for future Site occupants.

Prior to re-occupancy of the Site building, hazardous building materials (lead-based paint, ACM, and metal-containing dust) should be abated prior to re-occupancy of the Site building.

10. List of Acronyms

ACM	Asbestos Containing Materials
AST	Aboveground Storage Tank
ASTM	American Society of Testing and Materials
CERCLIS	Comprehensive Environmental Response Compensation and Liability Information System
CESQG	Conditionally Exempt Small Quantity Generator
CORRACTS	Corrective Action Tracking System
MASSDEP	Massachusetts Department of Energy and Environmental Protection
DPW	Department of Public Works
EDR	Environmental First Search Report
ETPH	Extractable Total Petroleum Hydrocarbons
ERNS	Emergency Response Notification System
ESA	Phase I Environmental Site Assessment
FINDS	Facility Index System
GEN	Generators
HWS	Hazardous Waste Sites
IRA	Immediate Response Action
Kg	Kilogram
LBP	Lead Based Paint
Lbs	Pounds
LPG	Liquid Petroleum Gas
LTBI	Locations To Be Investigated
LUST	Leaking Underground Storage Tank
MSL	Mean Sea Level
NLR	No Longer Regulated
NPDES	National Pollutant Discharge Elimination System
NPL	National Priorities List
OHM	Oil and/or Hazardous Material
PBS	Petroleum Bulk Storage
PCB	Polychlorinated Biphenyls
pCi/L	PicoCuries per liter
Ppb	Parts per billion
RAATS	RCRA Administrative Action Tracking System

RCRA	Resource Conservation and Recovery Act
RCRIS	Resource Conservation and Recovery Information System
REC	Recognized Environmental Conditions
SF	Square feet
SQG	Small Quantity Generator
SPILLS	State Spills List
STATE	State Sites
SVOC	Semi-volatile Organic Compound
SWL	Solid Waste Landfills
TPH	Total Petroleum Hydrocarbons
TPH-DRO	Total Petroleum Hydrocarbons – Diesel Range Organics
TRIS	Toxic Release Inventory System
TSD	Transportation, Storage, Disposal Facility
USEPA/EPA	United States Environmental Protection Agency
USGS	United States Geological Survey
UST	Underground Storage Tank
VOC	Volatile Organic Compounds

The Site: 161 Graham Road, Fall River, Massachusetts (Fall River Assessor's Parcel ID Z-03-0022)

- This report has been prepared for the sole and exclusive use of the Client and is subject to and issued in connection with the Agreement and the provisions thereof. Any use or reliance upon information provided in this report, without the specific written authorization of Client and BETA, shall be at the User's sole risk.
- In conducting this assessment and investigation, BETA has obtained and relied upon information from multiple sources to form certain conclusions regarding potential environmental issues at and in the vicinity of the subject property. Except as otherwise noted, no attempt has been made to verify the accuracy or completeness of such information.
- The objectives of the assessment and investigation described in this report were to assess the physical characteristics of the subject property with respect to overt evidence of past or present use, storage, and/or disposal of oil or hazardous materials, as defined in applicable state and federal environmental laws and regulations, and to gather information regarding current and past operations and environmental conditions at and in the vicinity of the subject property.
- The scope of this report does not include an assessment of the suitability of Site soil for development/construction. Please note that certain soils, particularly in urban areas, may include low levels of contaminants such as lead, metals, or ash constituents. The presence of such contaminants in soil, while not representing a "release," may result in the need for special handling at increased costs to allow for off Site soil reuse during Site development.
- No attempt has been made to assess the compliance status of any past or present Owner or Operator of the Site with any federal, state, or local laws or regulations.
- The findings, observations, and conclusions presented in this report are limited by the scope of services outlined in our Agreement, which reflects schedule and budgetary constraints imposed by Client for the current phase of environmental assessment. Furthermore, the assessment has been performed in accordance with generally accepted engineering practices and standards set forth by ASTM. No other warranty, expressed or implied, is made.
- The assessment presented in this report is based solely upon: readily-available data, visible portions of the Site, and information gathered to date. Should further environmental or other relevant information be developed at a later date, Client should bring the information to the attention of BETA as soon as possible. Based upon an evaluation, BETA may modify the report and its conclusions.
- It should be noted that the Executive Summary does not contain all the information that is found in the full report. The report should be read in its entirety to obtain a more complete understanding of the information provided and to aid in any decisions made or actions taken based on this information. This report documents the recognized environmental conditions as defined in ASTM and where appropriate other suspect environmental conditions noted on the Site and associated risks to the environment. Although the survey may not disclose all potential liabilities, a reasonable attempt has been made to do so within the scope of work.
- BETA cannot and does not warrant or guarantee that the information provided by these sources is accurate or complete. The methodologies of this assessment are not intended to produce all inclusive or comprehensive results, but rather to provide the client with information regarding overt evidence of past use storage, and/or release or threat of release of OHM the Site.