Remedial Investigation/ Alternatives Analysis Report/ Interim Remedial Measures

NOCO #S-41 Site
1055 Genesee Street
Buffalo, New York

January 2009
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REMEDIAL INVESTIGATION/ ALTERNATIVES ANALYSIS REPORT/ INTERIM REMEDIAL MEASURES REPORT

NOCO #S-41 SITE
1055 GENESEE STREET
BUFFALO, NEW YORK
BCP SITE NO. C915211

January 2009 0112-010-300
October 2009 Revision

Prepared for:

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RI/AAR/IRM REPORT
NOCO #S-41 Site
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1.0 INTRODUCTION

This Remedial Investigation/Alternatives Analysis Report/Interim Remedial Measures (RI/AAR/IRM) Report has been prepared on behalf of NOCO Energy Corporation (NOCO) for the NOCO #S-41 Site in the City of Buffalo, New York (see Figures 1 and 2).

NOCO elected to pursue cleanup and redevelopment of the Site under the New York State Brownfield Cleanup Program (BCP), and executed a Brownfield Cleanup Agreement (BCA) with the New York State Department of Environmental Conservation (NYSDEC) on July 9, 2007 (BCP No. C915211). The RI/AAR/IRM Work Plan was approved by the NYSDEC on December 14, 2007. Benchmark performed RI/IRM activities at the Site from February 4 to 29, 2008. Based on the results of the RI fieldwork and subsequent discussions with NYSDEC, Benchmark prepared and submitted a Supplemental RI Work Plan to NYSDEC on May 23, 2008. The NYSDEC approved the Supplemental RI Work Plan, and Benchmark conducted field activities August 11 and 12, and October 9, 2008. A subsequent groundwater sampling event was completed in June 2009.

1.1 Purpose and Scope

This RI/AAR/IRM Report has been prepared on behalf of NOCO to describe and present the findings of the 2007-2009 IRM and RI activities, and evaluate the IRM as the final remedial alternative for the Site.

This report contains the following sections:

- Section 2.0 summarizes the IRM activities
- Section 3.0 presents the approach for the soil and groundwater investigation.
- Section 4.0 describes the physical characteristics of the Site as they pertain to the investigation findings.
- Section 5.0 presents the investigation results by media.
- Section 6.0 describes the fate and transport of the constituents of primary concern (COPCs).
- Section 7.0 presents the qualitative risk assessment.
- Section 8.0. evaluates remedial alternatives for the Site.
- Section 9.0 presents the RI/AAR/IRM summary and conclusions

- Section 10.0 provides a list of references for this report.

1.2 Background

1.2.1 Property and Site Description

The property located at 1055 Genesee Street, in the City of Buffalo, New York (Erie County S.B.L. No. 100.76-5-1) is an approximate 0.75-acre parcel owned by NOCO Energy Corporation (see Figures 1 and 2). The Site is an approximate 0.75-acre parcel located on the southeast corner of Genesee Street and Fillmore Avenue, partially bordered by Peterson Street to the southeast. The Site is currently vacant but was historically used as a retail gasoline station and convenience store.

1.2.2 Previous Investigations

A summary of the investigations that have occurred at the Site are presented below. Data from these investigations is presented in Appendix A. Historical sample locations are shown on Figure 3.

1.2.2.1 October 2004 – Limited Subsurface Investigation

A Subsurface Investigation Report was completed by Sentinel Technologies, Inc. (Sentinel) in October 2004 (Ref. 2) to further investigate groundwater impacts previously identified in a tank field observation well. Ten soil borings were completed in the area of the current USTs and pump islands and in an area where impacted soil was biologically treated on-site. Groundwater samples were collected from three of the soil boring locations via temporary wells. The results of that study indicated that petroleum-related VOCs were present above NYSDEC recommended soil cleanup objectives (RSCOs) and groundwater quality standards (GWQS) on-site.

1.2.2.2 June 2006 – Supplemental Environmental Investigation

Benchmark completed a Supplemental Environmental Investigation at 1055 Genesee Street in June 2006 (Ref. 3). A geophysical survey, thirteen test borings (SB-1 through SB-13) and three temporary monitoring wells (TPMW1-TPMW3) were completed in accessible areas of the subject property.

The geophysical survey identified metallic anomalies north of the current USTs and south of the building. The strength of the anomalies suggested that they could represent

buried metallic objects. The northern anomaly was located in the area of a historic UST adjacent to the existing USTs. The southern anomaly was located approximately 110 feet south of the building. Based on the historic records reviewed, the southern anomaly was not located in a known area of historic USTs.

Soil borings were advanced in the area of each of the anomalies. There were no metallic objects encountered in those borings. However, SB-2 in the area of the northern anomaly (i.e., historic UST area) encountered petroleum odors from zero to eight (0-8.0) fbgs. Soil samples detected the presence of VOCs in several soil boring locations across the site. Soil samples SB-1, SB-3, and SB-7 detected VOCs above applicable NYSDEC RSCOs.

Groundwater samples TPMW-1, TPMW-2, TPMW-3, OW-1, OW-2 and OW-3 detected VOCs above applicable GWQS. Groundwater contaminant concentrations were highest from TPMW-3 and OW-3 (32,030 ug/L total VOCs and 99,990 ug/L total VOCs, respectively).

1.3 Constituents of Primary Concern (COPCs)

Based on the data collected to date, Constituent of Primary Concern (COPCs) for the Site are petroleum-related VOCs and SVOCs in soil and groundwater.

2.0 INTERIM REMEDIAL MEASURES (IRM)

An IRM was implemented at the NOCO #S-41 Site concurrent with RI activities in accordance with the NYSDEC-approved RI/AAR/IRM Work Plan (Ref. 5). Based on the nature and extent of the petroleum-impacted soil/fill and groundwater, the Work Plan called for: UST system removal; petroleum-impacted soil source removal via excavation; off-site disposal or treatment of petroleum-impacted soil; and, extraction and treatment of groundwater within the excavation. The lateral extent of the impacted area as shown on Figure 4 was excavated and disposed off-site per the approved Work Plan. Specific elements of the IRM, as implemented, included:

- Removal of three 8,000-gallon fiberglass-reinforced plastic gasoline USTs, four product dispensers and associated underground product piping, and demolition of the product dispenser canopy. Approximately 1,054-gallons of gasoline/water mixture was extracted and disposed of at Environmental Products and Services of Vermont, Inc. facility in Syracuse, New York.
- Excavation of approximately 1,212 tons of non-hazardous petroleum-impacted soil/fill followed by off-site transportation (Pariso Trucking) and disposal at Modern Landfill in Model City, New York.
- Collection of 15 post-excavation confirmation samples for analysis of NYSDEC STARS List VOCs, SVOCs, and lead; all post-excavation soil sample results were below 6NYCRR Part 375 Restricted-Commercial Soil Cleanup Objectives (SCOs) (see Table 1).
- Extraction and treatment of approximately 17,790-gallons of groundwater from the excavation during remediation activities. The treated water was discharged to the City of Buffalo Municipal Sewer with permission from the Buffalo Sewer Authority.
- Placement and compaction of approximately 1,431 tons of 2" crusher run stone backfill from the Buffalo Crushed Stone, Inc. quarry at 8615 Wehrle Drive in Lancaster, NY to pre-existing grade.

Although not a required component of the IRM, as a "best management practice", NOCO installed an Oxygen Release Compound (ORC) sock within a well on-Site to further enhance bioremediation of residual VOCs and mitigate potential off-Site migration of contaminants. The Final Engineering Report, to be submitted as a separate document, includes additional details of the IRM. The Final Engineering Report is supplemented with a Site Management Plan.

3.0 INVESTIGATION APPROACH

The purpose of the February 2008 RI field activities was to more fully define the nature and extent of contamination on the BCP Site, and to collect data of sufficient quantity and quality to perform the remedial alternatives evaluation. On-site field activities included: soil borings and subsurface soil sampling; monitoring well installation; groundwater sampling of newly installed monitoring wells; and, collection of hydraulic data. Based on the results of the February 2008 RI activities, the NYSDEC requested a supplemental investigation. The primary objectives of the Supplemental RI were to:

- Collect additional groundwater samples to better delineate the nature and extent of petroleum-VOC contamination.
- Collect soil vapor samples from across the Site to evaluate whether petroleum VOCs in soil vapor are a concern.

The supplemental groundwater investigation was conducted in August 2008, and the soil vapor investigation was conducted in October 2008. A groundwater sampling event was completed in June 2009.

Field team personnel collected environmental samples in accordance with the rationale and protocols described in the Field Sampling Plan (FSP) presented in the Quality Assurance Project Plan (QAPP) (Ref. 4). USEPA and NYSDEC-approved sample collection and handling techniques were used. Samples for chemical analysis were analyzed in accordance with USEPA SW-846 methodology with an equivalent Category B deliverable package to meet the definitive-level data requirements. Analytical results were evaluated by a third-party data validation expert in accordance with provisions described in the QAPP.

3.1 Field Investigation Activities

3.1.1 Supplemental Soil/Fill Investigation

A soil/fill investigation was completed to supplement previous environmental data and to delineate VOC-impact on-site. Figure 3 depicts the locations of the ten borings completed on-Site using direct-push drilling techniques. The seven borings that were subsequently converted to monitoring well locations were designated BCP MW-1 through BCP MW-7; these borings were advanced to a depth of approximately 20 fbgs. The three additional soil borings were designated BCP SB-1 though BCP SB-3; these borings were

advanced to a depth of approximately 16 fbgs. Soil/fill samples were collected from the soil borings, as described below, and field-screened for the presence of VOCs using a field photoionization detector (PID). Upon reaching the completion depth of each boring, PID and visual/olfactory results were reviewed. For BCP MW-5 and BCP MW-6, the sample interval with the highest PID scan result (i.e., 0 to 4-foot interval) was selected for analysis. For the remaining four borings, the soil/fill horizon above the native silty clay soil was selected for analysis since no PID or visual/olfactory impacts were identified. Samples were not collected from boring BCP SB-1 through BCP SB-3 since no PID or visual/olfactory impacts were identified, per the NYSDEC's September 7, 2007 comment letter. Appendix B contains the boring logs.

Soil/fill samples were collected using dedicated stainless steel sampling tools. Representative soil samples were placed in pre-cleaned laboratory provided sample bottles, cooled to 4ºC in the field, and transported under chain-of-custody command to Test America, located in Amherst, New York, a New York State Department of Health (NYSDOH) ELAP-certified analytical laboratory. Each of the six soil/fill samples were analyzed for Target Compound List (TCL) plus NYSDEC STARS List VOCs, MtBE, lead, and tetraethyl lead. Three of the soil/fill samples were also analyzed for TCL semi-volatile organic compounds (SVOCs), Target Analyte List (TAL) metals, polychlorinated biphenyls (PCBs), pesticides, and herbicides.

3.1.2 Supplemental Groundwater Investigation

Previous investigations indicated that soil/fill and shallow groundwater had been impacted by VOCs. Benchmark installed six new groundwater monitoring wells (i.e., BCP MW-1 through BCP MW-6) on February 20-22, 2008 to provide groundwater flow and quality information. On August 11, 2008, Benchmark installed one additional downgradient groundwater monitoring well (i.e., BCP MW-7) to better delineate the nature and extent of petroleum VOC contamination. Figure 3 shows the locations of the monitoring wells. Monitoring well installation, well development, and groundwater sample collection are discussed in the following sections.

3.1.3 Monitoring Well Installation

The borings for BCP MW-1 through BCP MW-7 were advanced through unconsolidated overburden soil/fill material as described in Section 3.1.1 to facilitate monitoring well installation. Monitoring wells were installed in accordance with the

approved RI/AAR/IRM Work Plan. Monitoring well construction details are presented on the Field Borehole Logs in Appendix B.

3.1.4 Groundwater Sample Collection

Newly installed monitoring wells were developed prior to sampling to remove residual sediments and ensure good hydraulic connection with the water-bearing zone. A minimum of three well volumes were removed from each well. Prior to sample collection, static water levels were measured and recorded from all on-site monitoring wells. Following water level measurement, Benchmark personnel purged and sampled monitoring wells BCP MW-1 through BCP MW-7 using a peristaltic pump and dedicated pump tubing following low-flow/minimal drawdown purge and sample collection procedures. Prior to sample collection, groundwater was evacuated from each well at a low-flow rate (typically less than 0.1 L/min). Field measurements for pH, specific conductance, temperature, turbidity, and water level as well as visual and olfactory field observations were periodically recorded and monitored for stabilization. Purging was considered complete when pH, specific conductivity, and temperature stabilized, and when turbidity measurements fell below 50 Nephelometric Turbidity Units (NTU) or became stable above 50 NTU. Upon stabilization of field parameters, groundwater samples were collected.

Prior to and immediately following collection of groundwater samples, field measurements for pH, specific conductance, temperature, turbidity, dissolved oxygen, and water level as well as visual and olfactory field observations were recorded. All collected groundwater samples were placed in pre-cleaned, pre-preserved laboratory provided sample bottles, cooled to 4°C in the field, and transported under chain-of-custody command to Test America for analysis.

3.1.5 Groundwater Sample Analyses

Groundwater samples collected from wells BCP MW-1 through BCP MW-6 were analyzed for TCL plus NYSDEC STARS list VOCs, MtBE, lead, and tetraethyl lead in accordance with USEPA SW-846 methodology with equivalent NYSDEC Category B deliverables to allow for independent third-party data usability assessment. In addition, three groundwater samples (BCP MW-1, BCP MW-4, and BCP MW-6) were analyzed for TCL SVOCs, TAL Metals, and PCBs. The sample collected from well BCP MW-7 was analyzed for TCL plus NYSDEC STARS list VOCs in accordance with the Supplemental RI Work

Plan. The groundwater samples collected in June 2009 were also analyzed for TCL plus NYSDEC STARS list VOCs.

3.1.6 Soil Vapor Investigation

One of requests of the New York State Department of Health (NYSDOH) was to evaluate the potential vapor intrusion into the Site building during the supplemental RI. However, during subsequent discussions, Benchmark, NYSDEC and NYSDOH agreed that collection of sub-slab vapor and indoor air samples were not appropriate since the Site building was not occupied and may be demolished in the future. Therefore, the soil vapor investigation scope was modified to include one ambient air (i.e., background) sample and three soil vapor samples (designated SV-1 through SV-3) from exterior locations on-Site. Figure 3 shows the approximate sampling locations. A duplicate soil vapor sample was collected at the location of SV-3.

Soil vapor sampling probes were installed in general conformance with the NYSDOH Soil Vapor Intrusion Guidance (October 2006). Each soil vapor sampling probe was manually installed using specialized 4-foot long stainless steel soil probe rods. Sampling equipment included 6-inch long sampling screens, ¼-inch inside diameter inert sample tubing, and dedicated 6-liter Summa canisters. Boreholes were advanced to approximately 2 fbgs using ¾-inch inside diameter steel rods. The steel rod was equipped with an anchor point at the driving end of the rod. The anchor point was connected to the sampling screen and tubing on the inside of the steel rod. Once the steel rod was advanced to 2 fbgs, the steel rod was retracted, leaving the anchor point, sampling screen and sampling tubing within the borehole annulus. The vapor points were screened from 1.5 to 2 fbgs. Glass beads were poured around the sampling screen in a manner to cover the entire length of the sampling screen. Bentonite or bentonite/soil mixture was placed above the glass beads (beginning at approximately 1 fbgs) to the ground surface to create a seal to prohibit infiltration of ambient air into the sampling area.

Once the sample probes were installed, the probe and tubing was purged (three volumes) using a calibrated syringe as required by NYSDOH (2006) guidance. Helium tracer gas was used during the purging phase (in the same manner as recommended for soil vapor probes) to ensure that the probes were well sealed. Samples were collected over an approximate 8-hour period.

All soil vapor samples were collected and analyzed by USEPA Method TO-15. This method employs a 6-liter, passivated (inert), stainless-steel, evacuated sampling sphere for

collecting the air samples. The canister is received from the laboratory, certified clean, evacuated, and prepared for sampling. The pressure in the canister is approximately 50 millitorr (compared to 760 torr of pressure in the atmosphere at sea level).

The canisters were then fitted with a sampling valve that used a critical orifice and mass flow controller to regulate the air flow into the canister. The orifice was selected by size to allow for the selected 8-hour sampling period. The mass flow controller helped maintain relatively constant air flow rates throughout the sampling period. The canisters were then placed at the soil vapor sampling locations for sampling.

Concurrent with the soil vapor sampling, one outdoor field-located ground level air sample was collected to the west of the Station Building, which on the day of the sampling was upwind of the soil vapor sampling locations. Following sample collection, the Summa canisters were shipped to TestAmerica in South Burlington, VT for analysis of USEPA TCL VOCs in accordance with USEPA Method TO-15. The data was provided to Data Validation Services for validation.

3.1.7 Field Specific Quality Assurance/Quality Control Sampling

In addition to the soil/fill and groundwater samples described above, field-specific quality assurance/quality control (QA/QC) samples were collected and analyzed to ensure the reliability of the generated data as described in the QAPP and to support the required third-party data usability assessment effort. Site-specific QA/QC samples included matrix spikes, matrix spike duplicates, blind duplicates, and trip blanks.

3.2 Site Mapping

A Site map was developed during the RI field investigation. All sample points and relevant Site features were located on the map. Benchmark employed a Trimble GeoXT handheld GPS unit to identify the locations of all soil borings and newly installed wells relative to State planar grid coordinates. Monitoring well elevations were measured by Benchmark's surveyor. An isopotential map showing the general direction of groundwater flow was prepared based on water level measurements relative to USGS vertical datum (see Figure 5).

4.0 SITE PHYSICAL CHARACTERISTICS

The physical characteristics of the Site observed during the RI are described in the following sections.

4.1 Site Topography and Drainage

The Site is generally flat lying with limited distinguishable Site features. The surface is predominately covered with asphalt as well as a former convenience store; a small area on the southern boundary of the Site is grass-covered. Precipitation (i.e., rain or melting snow) moves to the storm drains on-Site and in the roadways via overland flow. Surface and shallow groundwater flow are likely impacted by various cycles of development and filling, as well as utility lines and foundations.

4.2 Geology and Hydrogeology

4.2.1 Overburden

The U.S. Department of Agriculture Soil Conservation Service soil survey map of Erie County (Ref. 1) describes the general soil type at the Site as urban land, indicating level to gently sloping land with at least 80 percent of the soil surface covered by asphalt, concrete, buildings, or other impervious structures typical of an urban environment. The presence of overburden fill material is widespread and common throughout the City of Buffalo.

The geology at the Site is generally described as fill materials overlying dense brown/reddish-brown silty clay. The fill materials consist of silt, sand, and gravel with varying amounts of brick fragments at depths ranging from 1.5 to 8 feet below ground surface (fbgs). Much of the fill material appears to be former building materials that were left in-place prior to construction of the existing building and site features. Native materials consist of dense clay with varying amounts of sand and gravel to depths up to 20 fbgs.

4.2.2 Bedrock

Based on the bedrock geologic map of Erie County, the Site is situated over the Onondaga Formation of the Middle Devonian Series. The Onondaga Formation is comprised of a varying texture from coarse to very finely crystalline with a dark gray to tan color and chert and fossils within. The unit has an approximate thickness of 110 to 160 feet.

Structurally, the bedrock formations strike in an east-west direction and exhibit a regional dip that approximates 40 feet per mile (3 to 5 degrees) toward the south and southwest. As a result of this dip, the older Onondaga limestone outcrops or subcrops north of the Hamilton Group. An intersecting, orthogonal patter of fractures and joint sets are common throughout the bedrock strata. The surficial geomorphology of the bedrock strata was modified by period subaerial erosion and continental glaciation. Bedrock was not encountered during RI soil boring advancement.

4.2.3 Hydrogeology

Based on the groundwater gauging completed in June 2009, localized groundwater flow was determined to be south/southeast based on the depth to water measurements. During a previous preliminary investigation groundwater flow was estimated to be in a north/northwest direction. However, that groundwater data was collected from temporary monitoring points and not from permanent wells that were fully developed prior to sampling. The groundwater gauging data collected during this RI was collected from properly installed permanent wells that were developed prior to sampling and gauging. To confirm groundwater flow direction, four groundwater gauging events were completed between March 2008 and June 2009. These gauging events indicate a general south/southeast groundwater flow direction. Figure 5 depicts the groundwater isopotential map from the June 2009 data. Groundwater elevation data from the gauging events is shown on Table 7.

5.0 INVESTIGATION RESULTS BY MEDIA

The following sections discuss the analytical results of the Remedial Investigation. Tables 2, 3 and 4 summarize the soil/fill, groundwater and soil vapor analytical data, respectively. Appendix C includes the laboratory analytical data packages. Figure 3 presents the soil borings, groundwater monitoring wells and soil vapor sample locations.

5.1 Soil/Fill

Table 2 presents a comparison of the detected soil/fill parameters to Soil Cleanup Objectives (SCOs) for protection of public health on restricted-commercial properties per regulations contained in 6NYCRR Part 375-6 (December 2006). Although the Site is intended to be used for commercial purposes, evaluating a more restricted-use scenario is a requirement of the BCP. Therefore, Table 2 also includes a comparison of the soil/fill analytical data to Part 375 Unrestricted SCOs (refer to Section 8.3.2 for a discussion of this comparison). Sample results are described below according to contaminant class.

5.1.1 Volatile Organic Compounds

The majority of the analyzed VOCs was reported as non-detectable or at trace (estimated) concentrations below the sample quantitation limit. None of the sample concentrations exceeded Part 375 restricted-commercial SCOs.

5.1.2 Semi-Volatile Organic Compounds

The majority of the analyzed SVOCs were reported as non-detectable or at trace (estimated) concentrations below the sample quantitation limit. Constituents detected slightly above the restricted-commercial SCOs were limited to four polycyclic aromatic hydrocarbons (PAHs) [i.e., benzo(a)anthracene, benzo(b)fluoranthene, benzo(a)pyrene, and dibenzo(a,h)anthracene] in the sample collected from the 0 to 4-foot interval from BCP MW-4. Based on the depth of the sample collected (i.e., 0-4 fbgs), the sample location (i.e., not in an area of historic petroleum storage), lack of elevated PID readings, as well as absence of any visual or olfactory evidence of contamination, the elevated SVOCs do not appear to be attributable to a petroleum release, but may be associated with the fill materials encountered in that sample location.

5.1.3 Inorganic Compounds

None of the soil/fill samples exceeded the Part 375 restricted-commercial SCOs.

5.1.4 Pesticides and Polychlorinated Biphenyls

Only one of the three samples analyzed detected pesticides and PCBs at trace (estimated) concentrations below the sample quantitation limit; however, none of the sample concentrations exceeded Part 375 restricted-commercial SCOs.

5.1.5 Summary

As described above, concentrations of VOCs, metals, pesticides, and PCBs were below Part 375 restricted-commercial SCOs. Four PAHs were detected at concentrations slightly above Part 375 restricted-commercial SCOs at sample location BCP MW-4 in the 0 to 4-foot interval. PAHs tend to be ubiquitous in the environment, as they are produced from incomplete combustion of fossil fuels and other organic fuel sources. PAHs are also prevalent in man-made, petroleum-based materials such as asphalt and roofing materials. PAHs are frequently detected in urban areas at concentrations exceeding the levels reported in Table 2.

5.2 Groundwater

Table 3 presents a comparison of the detected groundwater parameters to the Class GA Groundwater Quality Standards (GWQS) per NYSDEC TOGS 1.1.1 Ambient Water Quality Standards and Guidance Values and Groundwater Effluent Limitations (June 1988). The sampling results for groundwater monitoring completed in February 2008 (BCP-MW-1 through BCP MW-6), August 2008 (BCP MW-7) and June 2009 (BCP-MW-1 through BCP MW-7) are discussed in the following sections.

5.2.1 Volatile Organic Compounds

February/August 2008

Several petroleum VOCs were detected in monitoring wells BCP MW-3 and BCP MW-4 at concentrations above GWQS. Monitoring well BCP MW-4 is located downgradient of the former tank field and monitoring well BCP MW-3 is located downgradient of the former canopy. Petroleum-impacted soil/fill was removed from both

areas as part of IRM activities described in Section 2.0. Three VOCs (i.e., benzene, MtBE and toluene) were detected at concentrations above GWQS in the sample collected from monitoring well BCP MW-6, which is located in the hydraulically upgradient area of the Site.

June 2009

Three VOCs (i.e., benzene, MtBE and n-propylbenzene) were detected at concentrations above GWQS in the sample collected during the June 2009 groundwater sampling event. As shown on Table 3, concentrations of VOCs within the three monitoring wells (i.e., BCP MW-3, BCP MW-4 and BCP MW-6) with the highest residual VOCs concentrations noted during the February 2008 groundwater sampling event significantly decreased. Consistent with the February 2008 groundwater sampling event, the highest concentrations of VOCs were detected in the hydraulically up-gradient monitoring well BCP MW-6. However, MtBE was the only VOC present in the June 2009 sample. There were no detections of VOCs above GWQS in BCP-MW-2 (the down-gradient monitoring well) and BCP MW-5 and there were only minor exceedances of MtBE (13 ug/L) in BCP MW-1 and benzene (1.2 ug/L) BCP MW-7.

5.2.2 Semi-Volatile Organic Compounds

Only one SVOC, naphthalene, was detected above GWQS in monitoring well BCP MW-4.

5.2.3 Inorganic Compounds

Metals detected at concentrations above GWQS were limited to aluminum, iron, magnesium, and sodium.

5.2.4 Polychlorinated Biphenyls

All of the analyzed PCB Aroclors were reported as non-detectable in each of the wells sampled.

5.2.5 Summary

As described above and shown on Table 3, concentrations of petroleum-based VOCs were detected above GWQS in monitoring wells BCP MW-1, BCP MW-3, BCP MW-4, BCP MW-6 and BCP MW-7. The highest concentrations of VOCs were detected in the

hydraulically up-gradient monitoring well BCP MW-6 during February 2008 and June 2009 groundwater sampling events.

Based on the most recent groundwater sampling event, the monitoring wells with the highest VOCs concentrations range from 18 ug/L to 210 ug/L total VOCs, which are significantly lower than historic concentrations of petroleum VOCs on-Site (i.e., up to 99,990 ug/L), and are considered residual concentrations. The decrease in groundwater concentrations is attributable to the contaminant source removal (note- post-excavation confirmatory samples show excavation sidewalls and bottoms meet NYSDEC residential SCOs for all sample locations and also meet unrestricted SCOs, with minor exceptions as shown on Table 1), and extraction and treatment of impacted groundwater during the IRM. As the on-Site UST system and petroleum-impacted source soils have been removed, these concentrations will continue to naturally attenuate. It should also be noted that there were no detections of VOCs above GWQS in BCP-MW-2 (the down-gradient monitoring well) and BCP MW-5 and there were only minor exceedances of MtBE (13 ug/L) in BCP MW-1 and benzene (1.2 ug/L) in BCP MW-7. Overall, the groundwater data indicates: a potential off-site source of on-Site petroleum VOCs in groundwater; a significant decrease of petroleum VOCs concentrations in the monitoring wells with the highest residual impacts (i.e., BCP MW-3, BCP MW-4 and BCP MW-6) from the February 2008 to the June 2009 sampling events; and, an overall decrease in dissolved-phase VOCs.

One SVOC, naphthalene, was also detected in BCP MW-4 above it GWQS. Metals detected at concentrations above associated standards or guidance values are naturally occurring minerals.

5.3 Soil Vapor

As summarized on Table 4, soil vapor samples SV-1 through SV-3 were collected at the sampling locations shown on Figure 3. COPCs detected in the soil vapor samples included benzene, ethylbenzene, toluene, and xylene (BTEX), MtBE and 1,3,5-trimethylbenzene. The highest soil vapor concentrations were detected in the SV-3 duplicate sample followed by the sample collected at SV-2. Concentrations of COPCs were also detected in the ambient air sample.

NYSDEC and NYSDOH do not currently have standards, criteria or guidance values for concentrations of petroleum compounds in soil vapor. Additionally, there are currently

no databases available for background levels of volatile chemicals in soil vapor. Therefore, no comparative regulatory guidance values or cleanup concentrations are included in Table 4. NYSDOH's October 2006 Soil Vapor Intrusion guidance document states that soil vapor sampling results are reviewed "as a whole," in conjunction with the results of other environmental sampling, to identify trends and spatial variations in the data. It also indicates that to put some perspective on the data, soil vapor results might be compared to background outdoor air levels, site-related outdoor air sampling results, or the NYSDOH's guidelines for volatile chemicals in air [Table 3.1 of the NYSDOH guidance document]. Tetrachloroethene (PCE) was detected in SV-2 at a concentration of 23 ug/m^3, below the NYSDOH indoor air guideline of 100 ug/m^3. No petroleum-related VOCs are included on Table 3.1 of the NYSDOH guidance document for comparison to Site soil vapor results.

5.4 Data Usability Summary

In accordance with the RI Work Plan, the laboratory analytical data from this investigation was independently assessed and, as required, submitted for independent review. Ms. Judy Harry of Data Validation Services located in North Creek, New York performed the data usability summary assessment, which involved a review of the summary form information and sample raw data, and a limited review of associated QC raw data. Specifically, the following items were reviewed:

- Laboratory Narrative Discussion
- Custody Documentation
- Holding Times
- Surrogate and Internal Standard Recoveries
- Matrix Spike Recoveries/Duplicate Recoveries
- Field Duplicate Correlation
- Preparation/Calibration Blanks
- Control Spike/Laboratory Control Samples
- Instrumental IDLs
- Calibration/CRI/CRA Standards
- ICP Interference Check Standards
- ICP Serial Dilution Correlations
- Sample Results Verification

The Data Usability Summary Report (DUSR) was conducted using guidance from the USEPA Region 2 validation Standard Operating Procedures, the USEPA National Functional Guidelines for Data Review, as well as professional judgment.

In summary, no data were rejected, but some data were further qualified during the data validation. Any additional qualifications of the data have been incorporated to the summary data tables. Appendix D includes the DUSR (Ref. 6).

6.0 FATE AND TRANSPORT OF COPCS

The soil/fill and groundwater sample analytical results were incorporated with the physical characterization of the Site to evaluate the fate and transport of COPCs in Site media. The mechanisms by which the COPCs can migrate to other areas or media are briefly outlined below.

6.1 Fugitive Dust Generation

Volatile and non-volatile chemicals present in soil can be released to ambient air as a result of fugitive dust generation. However, the entire the Site is covered by clean imported gravel, vegetation, concrete, asphalt or building that prevents the suspension of surface soil particles due to wind erosion or physical disturbance of surface soil particles.

Under a hypothetical future commercial land use, the majority of the Site would be covered by structures, concrete, asphalt, and vegetation. Since fugitive dusts may be generated during excavation activities under both the current and future use scenarios, this migration pathway is potentially relevant under the current and reasonably anticipated future land use.

6.2 Volatilization

Volatile chemicals present in soil/fill and groundwater may be released to ambient or indoor air through volatilization either from or through the soil/fill underlying current or future building structures. Volatile chemicals typically have a low organic-carbon partition coefficient (K_{oc}), low molecular weight, and a high Henry's Law constant.

No volatile organic compounds were detected in site soils above 6NYCRR Part 375 unrestricted use SCOs, with one minor exception (xylene [0.42 ug/kg] at sample location PI-S2). Therefore, the release of VOCs from soils is not considered relevant.

Numerous petroleum VOCs were detected in Site groundwater at concentrations above Class GA GWQS at several locations. However, these petroleum-related volatile chemicals are present in Site soil/fill at trace (estimated) concentrations and in groundwater at relatively low (i.e., up to 210 ug/L total VOCs) concentrations. Significant reduction of petroleum VOCs in groundwater has occurred when comparing current concentration to historic groundwater concentrations; this is attributed to the source soil removal and impacted groundwater extraction and treatment activities completed during the IRM; VOCs will continue to degrade over time as a result of natural biodegradation. It should also be

noted that there were no detections of VOCs in BCP-MW-2 and only minor detection of MtBE (below GWQS) in BCP MW-1 and benzene 1.2 ug/L BCP MW-7, which are down-gradient monitoring wells.

There were no VOCs that are currently regulated by NYSDOH guidance detected in soil vapor samples above applicable NYSDOH guidance values and only low-level concentrations of petroleum VOCs. Furthermore, in a letter dated July 30, 2009 to the NYSDEC, the NYSDOH has indicated that, based on the low levels of VOCs in groundwater and soil gas samples, a subslab depressurization system is not required at the Site.

6.3 Surface Water Runoff

Erosion and transport of surface soils and associated sorbed chemicals in surface water runoff is a potential migration pathway. The potential for soil particle transport with surface water runoff is low, as the entire the Site is covered by clean imported gravel, vegetation, concrete, asphalt or building, and is serviced by the Buffalo Sewer Authority's (BSA's) combined sanitary/storm water collection system. BSA's collection system provides a mechanism for controlled surface water transport but will ultimately result in sediment capture in the BSA's grit chambers followed by disposal at a permitted sanitary landfill.

6.4 Leaching

Leaching refers to chemicals present in soil/fill migrating downward to groundwater as a result of infiltration of precipitation. However, the petroleum-impacted source soils have been removed from the Site during IRM activities. Furthermore, the entire the Site is covered by clean imported gravel, vegetation, concrete, asphalt or building, and is serviced by the BSA's combined sanitary/storm water collection system As such, leaching is not considered a relevant migration pathway.

6.5 Groundwater Transport

Groundwater underlying the Site migrates to the south/southeast. Chemicals present in groundwater may be transported across the Site via this pathway. However, petroleum-related volatile chemicals detected groundwater are present at relatively low (i.e., up to 210 ug/L total VOCs) concentrations. Groundwater flows through a relatively low permeability silty-clay geologic unit, with an estimated hydraulic conductivity of $1x10^{-4}$ to $1x10^{-6}$

centimeters per second (cm/s) and porosity of 0.4 (ref. 8) and a measured hydraulic gradient of approximately 0.025 ft/ft. Darcy's Law velocity calculation indicates that shallow overburden groundwater migrates to the south/southeast at a rate of approximately 0.0002 to 0.02 ft/day.

It is noteworthy that the sample location with the highest VOCs concentrations is BCP-MW-6, which is the hydraulically upgradient monitoring well on-Site. Furthermore, there were no detections of VOCs in BCP-MW-2 (the down-gradient monitoring well), and there were only minor exceedances of MtBE (13 ug/L) in BCP MW-1 and benzene (1.2 ug/L) BCP MW-7, which are also down-gradient monitoring wells. In addition, the Site and surrounding area are serviced by a municipal (supplied) water service, with no evidence of potable wells within 1 mile of the subject property.

6.6 Exposure Pathways

Based on the analysis of chemical fate and transport provided above, the pathway through which Site COPCs could reach receptors at significant exposure point concentrations is fugitive dust emissions via physical disturbance of subsurface soil/fill. The fugitive dust emissions potential exposure pathway is not relevant for all Site soils. Only one soil sample location (BCP MW-4) had concentrations of certain SVOCs above restricted-commercial SCOs in fill materials. However, the analytes were detected in fill materials at relatively low concentrations and representative of typical urban fill, which is ubiquitous in the City of Buffalo. Furthermore, that area of Site is covered with asphalt pavement, eliminating the potential exposure pathway.

7.0 QUALITATIVE RISK ASSESSMENT

7.1 Potential Human Health Risks

The identification of potential human receptors is based on the characteristics of the Site, the surrounding land uses, and the probable future land uses. The NOCO #S-41 Site is currently vacant. Under unremediated Site use conditions, human contact with site-related COPCs can be expected to occur primarily by three type of receptors: trespassers who may traverse or use the property; on-Site commercial workers; and, construction workers that may access subsurface soil and/or groundwater the Site. Trespassers may be comprised of children, adolescents, and adults, whereas construction workers would be limited to adults. However, trespassers could be considered receptors only if the existing asphalt were compromised, such as during subsurface construction activities.

In terms of planned future use, the current Site owner (NOCO) intends to redevelop the Site for commercial use. This planned use is consistent with surrounding property use and Site zoning. Accordingly, the reasonably anticipated future use of the Site is for commercial purposes, with potential exposed receptors comprised of the on-Site commercial worker potentially exposed to the VOC vapors and construction worker potentially exposed to SVOC-impacted soil in the area of BCP MW-4 and petroleum VOC-impacted groundwater during Site redevelopment.

For the trespasser and construction worker scenarios, health-risk based lookup values specifically addressing these types of receptors are not widely published, since estimates of exposure frequency and duration tend to be site-specific in nature. However, the NYSDEC has published health risk-based lookup values for several chemicals under various exposure scenarios in the June 2006 document entitled "New York State Brownfield Cleanup Program Development of Soil Cleanup Objectives Technical Support Document" (a.k.a., "Technical Support Document"). The Technical Support Document forms the basis for the health-based SCOs presented in 6NYCRR Part 375-6. Based on incorporation of these types of receptors and exposures, the commercial health-based SCOs presented in the Technical Support Document are considered protective of human health under both the current and future site use condition.

Historic soil/fill data was reviewed to determine the highest exposure point concentration for VOCs and SVOCs on-Site. Table 5 presents a comparison of the highest

VOC and SVOC concentrations observed during the RI and previous investigations to the above-discussed health-based cleanup objectives. As shown on Table 5, no VOCs were detected above the health-based SCOs. Accordingly, no unacceptable health risks attributable to site-related VOCs are indicated for potential receptors under the current and future use scenario. The health-based criteria described above are for individual constituents; cumulative or synergistic effects among chemicals may yield greater risks.

Certain SVOCs were detected at one sample location above their respective health-based SCOs, indicating a potential unacceptable human health risk for incidental ingestion, dermal contact and/or inhalation of re-suspended particulates. However, that area of Site is covered with asphalt pavement, eliminating the potential exposure pathway and associated health risk.

The IRM was completed to reduce/eliminate CPOCs; however, residual petroleum VOCs remain in Site groundwater. Furthermore, SVOCs, apparently associated with historic fill materials, are present in soil/fill slightly above commercial SCOs at one sample location. Under the future (commercial) use conditions, potential exposure routes are: incidental ingestion, dermal contact and inhalation of re-suspended particulates and/or CPOCs in air; and, dermal contact with compounds in groundwater. Based on the presence of these constituents and as discussed with the NYSDEC and the NYSDOH, there will be institutional controls implemented in accordance with a Site Management Plan for the Site as part of the final remedy. The AAR (Section 8) includes a discussion of the institutional controls that may be used at the Site. The institutional controls will serve to eliminate potential human health risks at the Site.

7.2 Potential Ecological Risks

The NOCO #S-41 BCP Site is a former commercial facility located within a highly developed, urban area in the City of Buffalo. The Site is currently vacant and covered primarily with asphalt, providing little or no wildlife habitat or food value. No natural waterways are present on or adjacent to the Site. The reasonably anticipated future use is commercial with the majority of the Site covered by buildings, concrete sidewalks and asphalt. As such, no unacceptable ecological risks are anticipated under the current or reasonably anticipated future use scenario.

8.0 REMEDIAL ALTERNATIVES EVALUATION

8.1 Remedial Action Objectives

The final remedial measures for the NOCO #S-41 Site must satisfy Remedial Action Objectives (RAOs). Remedial Action Objectives are site-specific statements that convey the goals for minimizing or eliminating substantial risks to public health and the environment. Appropriate RAOs for the NOCO #S-41 Site are:

- Removal of petroleum-impacted soil/fill within the tank farm and dispenser fill area to levels protective of human health (restricted-commercial SCOs).
- Prevention of ingestion or direct contact with soil that contains contaminants above restricted-commercial SCOs.
- Mitigate contaminant loadings to groundwater from petroleum-impacted soil/fill sufficiently to or nearly achieve compliance with groundwater quality standards and prevent the discharge of contaminants off-Site.

In addition to achieving RAOs, NYSDEC's Brownfield Cleanup Program calls for remedy evaluation in accordance with DER-10 Technical Guidance for Site Investigation and Remediation (Ref. 6). Specifically, the guidance states "When proposing an appropriate remedy, the person responsible for conducting the investigation and/or remediation should identify and develop a remedial action that is based on the following criteria..:"

- **Overall Protection of Public Health and the Environment**. This criterion is an evaluation of the remedy's ability to protect public health and the environment, assessing how risks posed through each existing or potential pathway of exposure are eliminated, reduced, or controlled through removal, treatment, engineering controls, or institutional controls.
- **Compliance with Standards, Criteria, and Guidance (SCGs)**. Compliance with SCGs addresses whether a remedy will meet applicable environmental laws, regulations, standards, and guidance.
- **Long-Term Effectiveness and Permanence**. This criterion evaluates the long-term effectiveness of the remedy after implementation. If wastes or treated residuals remain on-site after the selected remedy has been implemented, the following items are evaluated: (i) the magnitude of the remaining risks (i.e., will there be any significant threats, exposure pathways, or risks to the community and environment from the remaining wastes or treated residuals), (ii) the adequacy of the engineering and institutional controls intended to limit the risk, (iii) the

reliability of these controls, and (iv) the ability of the remedy to continue to meet RAOs in the future.

- **Reduction of Toxicity, Mobility or Volume with Treatment**. This criterion evaluates the remedy's ability to reduce the toxicity, mobility, or volume of Site contamination. Preference is given to remedies that permanently and significantly reduce the toxicity, mobility, or volume of the wastes at the Site.
- **Short-Term Effectiveness**. Short-term effectiveness is an evaluation of the potential short-term adverse impacts and risks of the remedy upon the community, the workers, and the environment during construction and/or implementation. This includes a discussion of how the identified adverse impacts and health risks to the community or workers at the Site will be controlled, and the effectiveness of the controls. This criterion also includes a discussion of engineering controls that will be used to mitigate short term impacts (i.e., dust control measures), and an estimate of the length of time needed to achieve the remedial objectives.
- **Implementability**. The implementability criterion evaluates the technical and administrative feasibility of implementing the remedy. Technical feasibility includes the difficulties associated with the construction and the ability to monitor the effectiveness of the remedy. For administrative feasibility, the availability of the necessary personnel and material is evaluated along with potential difficulties in obtaining specific operating approvals, access for construction, etc.
- **Cost**. Capital, operation, maintenance, and monitoring costs are estimated for the remedy and presented on a present worth basis.
- **Community Acceptance**. This criterion evaluates the public's comments, concerns, and overall perception of the remedy.

8.2 Future Land Use Evaluation

In developing and screening remedial alternatives, NYSDEC's Part 375 regulations require that the reasonableness of the anticipated future land be factored into the evaluation. The regulations identify 16 criteria that must be considered. These criteria and the resultant outcome for the NOCO #S-41 Site are presented in Appendix E. As indicated, this evaluation supports commercial redevelopment as the reasonably anticipated future use of the Site, consistent with past use. Accordingly, remedial alternatives to clean up the Site to restricted commercial end use are identified and evaluated herein.

In addition to the evaluation of alternatives to remediate to the likely end use of the Site, NYSDEC regulation and policy calls for evaluation of more restrictive end-use scenarios. These include an unrestricted use scenario (considered under 6NYCRR Part 375-

2.8 to be representative of cleanup to pre-disposal conditions), and a scenario less restrictive than the reasonably anticipated future use (which again is unrestricted use). Per NYSDEC DER-10 Technical Guidance for Site Investigation and Remediation (Ref. 6), evaluation of a "no-action" alternative is also required to provide a baseline for comparison against other alternatives. Since an IRM has already been completed for the Site, the alternatives discussed in greater detail in Section 8.3 include:

- No Further Action;
- Implementation of a Site Management Plan; and,
- Unrestricted Use Cleanup

8.3 Alternatives Evaluation

8.3.1 No Further Action

Under this alternative, the Site would remain in its current state, with no additional controls in-place.

Overall Protection of Public Health and the Environment – The Site as it exists is not protective of human health and the environment, due to the absence of institutional controls to prevent less restrictive forms of future site use (e.g., unrestricted) or export of site soils to uncontrolled off-site locations. Accordingly, no further action is not protective of public health and does not satisfy the RAOs.

Compliance with SCGs – Under the current and reasonably anticipated future use scenario, the concentrations of constituents detected in the soil/fill and groundwater generally comply with applicable SCOs and GWQS, with SVOCs in soil/fill at BCP MW-4 and low-level residual petroleum VOCs in groundwater posing notable exceptions.

Long-Term Effectiveness and Permanence – The no further action alternative involves no additional equipment, institutional controls or facilities subject to maintenance, but provides no long-term effectiveness toward achieving the RAOs.

Reduction of Toxicity, Mobility, or Volume with Treatment – The interim remedial measures completed at the Site have reduced the toxicity, mobility and volume of

prior constituents of concern. With the exception of SVOCs in soil/fill at BCP MW-4 and low-level residual petroleum VOCs in groundwater, further reduction in toxicity, mobility, or volume of constituents in the soil/fill, surface soil, or groundwater is not necessary based on the RI findings.

Short-Term Effectiveness – There would be no short-term adverse impacts and risks to the community, workers, or the environment attributable to implementation of the no further action alternative.

Implementability – No technical or administrative implementability issues are associated with the no further action alternative.

Cost – The capital cost of the IRM was approximately $250,000. There would be no capital or long-term operation, maintenance, or monitoring costs associated with the no further action alternative.

8.3.2 Implementation of a Site Management Plan

The IRM achieved removal of the petroleum-impacted soil/fill on-site to below restricted-commercial SCOs, which is expected to protect and improve on-site groundwater quality. The "Implementation of a Site Management Plan" alternative is defined as performing no additional cleanup activities at the Site beyond that which was already performed as an IRM (refer to Section 2.0) with implementation of a Site Management Plan (SMP). The SMP will include:

- **An Institutional Controls Plan**. Institutional controls at the Site would include groundwater use restrictions and a use restriction allowing commercial/industrial use of the Site, but preventing less restrictive land use (i.e., unrestricted or residential use).

- **An Excavation Work Plan** to assure that future intrusive activities and soil/fill handling at the Site are completed in a safe and environmentally responsible manner.

- **A Site Monitoring Plan** that includes a groundwater monitoring plan for long-term groundwater monitoring on-Site and a Site-wide Inspection program to assure that the Institutional controls have not been altered and remain effective.

Overall Protection of Public Health and the Environment **–** Since the IRM achieved removal of impacted soil/fill to restricted-commercial SCOs, this alternative is fully protective of human health and the environment and successfully achieves all RAOs for the Site. The Site Management Plan will include a groundwater monitoring plan to monitor residual constituents in groundwater, an excavation work plan to address any impacted soil/fill encountered during post-development maintenance activities, including fill materials in the area of BCP MW-4, and a Site-wide Inspection program to assure that the Institutional controls placed on the Site have not been altered and remain effective. Furthermore, although residual VOCs in groundwater have significantly decreased over time, and not a required component of the IRM, as a "best management practice", NOCO installed an Oxygen Release Compound (ORC) sock within BCP MW-4 to further enhance bioremediation of residual VOCs and mitigate potential off-Site migration of contaminants.

Compliance with SCGs – The IRM was performed in accordance with applicable, relevant, and appropriate standards, guidance, and criteria. The IRM achieved removal of impacted soil/fill to restricted-commercial SCOs, this alternative is fully protective of human health and the environment and successfully achieves all RAOs for the Site. The Site Management Plan will include a groundwater monitoring plan to monitor residual constituents in groundwater, an excavation work plan to address any impacted soil/fill encountered during post-development maintenance activities, including fill materials in the area of BCP MW-4, and a Site-wide Inspection program to assure that the Institutional controls placed on the Site have not been altered and remain effective.

Long-Term Effectiveness and Permanence **–** The IRM achieved removal of petroleum-impacted soil/fill in the area of former UST and product dispensers to restricted-commercial SCOs and no residual soil/fill above restricted-commercial SCOs remain in those areas (note- post-excavation confirmatory samples show excavation sidewalls and bottoms meet NYSDEC residential SCOs for all sample locations and also meet unrestricted SCOs, with minor exceptions as shown on Table 1). The Site Management Plan will include a groundwater monitoring plan to monitor residual constituents in groundwater, an excavation work plan to address any impacted soil/fill encountered during post-development maintenance activities, including fill materials in the area of BCP MW-4, and a

Site-wide Inspection program to assure that the Institutional controls placed on the Site have not been altered and remain effective. Furthermore, although residual VOCs in groundwater have significantly decreased over time, and not a required component of the IRM, as a "best management practice", NOCO installed an Oxygen Release Compound (ORC) sock within BCP MW-4 to further enhance bioremediation of residual VOCs and mitigate potential off-Site migration of contaminants. As such, this alternative is expected to provide long-term effectiveness and permanence.

Reduction of Toxicity, Mobility, or Volume with Treatment – Through removal of impacted soil/fill exceeding restricted-commercial SCOs, the IRM permanently and significantly reduced the toxicity, mobility, and volume of Site contamination. The Site Management Plan will include a groundwater monitoring plan to monitor residual constituents in groundwater, an excavation work plan to address any impacted soil/fill encountered during post-development maintenance activities, including fill materials in the area of BCP MW-4, and a Site-wide Inspection program to assure that the Institutional controls placed on the Site have not been altered and remain effective. Furthermore, although residual VOCs in groundwater have significantly decreased over time, and not a required component of the IRM, as a "best management practice", NOCO installed an Oxygen Release Compound (ORC) sock within BCP MW-4 to further enhance bioremediation of residual VOCs and mitigate potential off-Site migration of contaminants. Accordingly, this alternative satisfies this criterion.

Short-Term Effectiveness – The short-term adverse impacts and risks to the community, workers, and environment during implementation of the IRM were effectively controlled. Temporary safety construction fencing was placed around the outer perimeter of the work area to distinguish the work zone and discourage trespassing. During soil/fill excavation and loading activities, dust monitoring was performed to assure conformance with NYSDOH-approved community air monitoring action levels. The potential for chemical exposures and physical injuries were reduced through safe work practices; proper personal protection equipment; environmental monitoring; establishment of work zones and Site control; and appropriate decontamination procedures. The IRM achieved the RAOs for the Site in approximately 1 month.

Implementability – No technical or action-specific administrative implementability issues are associated with implementation of the IRM or the SMP. An Environmental Easement will be filed with Erie County documenting the controls placed on the Site.

Cost – The capital cost of the IRM was approximately $250,000. Groundwater monitoring and annual certification is estimated at approximately $10,000 per year. Based on an assumed 30 years of groundwater monitoring and annual certifications, the net present value of this alternative is approximately $420,000 as shown on Table 6a. Table 6c is a summary of costs of each of the alternatives.

Community Acceptance – The RI/AAR/IRM Work Plan was advertised and made available for comment from November 13, 2007 through December 15, 2007. No comments opposing the work were received.

8.3.3 Unrestricted Use Alternative

An Unrestricted Use alternative would necessitate remediation of all soil/fill where concentrations exceed the unrestricted use SCO per 6NYCRR Part 375 (see Table 2). At a minimum, this would involve additional remedial work in three areas (see Figure 6). For Unrestricted Use scenarios, excavation and off-site disposal of impacted soil/fill is generally regarded as the most applicable remedial measure, because institutional controls cannot be used to supplement the remedy. As such, the Unrestricted Use alternative assumes that the following areas would be excavated and disposed at an off-site commercial solid waste landfill:

- Area 1 (vicinity of BCP MW-1 and BCP MW-3) would be excavated to approximately 6 fbgs.
- Area 2 (vicinity of BCP MW-2) would be excavated to approximately 2 fbgs.
- Area 3 (vicinity of BCP MW-4, BCP MW-5 and BCP MW-6) would be excavated to approximately 5 fbgs.

The estimated total volume of impacted soil/fill that would be removed from these areas is approximately 1,758 cubic yards. This alternative assumes that no groundwater remediation or long-term monitoring is required.

Overall Protection of Public Health and the Environment – The Unrestricted Use alternative would achieve the corresponding Part 375 SCOs, which are designed to be protective of human health under any reuse scenario.

Compliance with SCGs – Similar to the IRM soil/fill removal activities, the Unrestricted Use alternative would need to be performed in accordance with applicable, relevant, and appropriate standards, guidance, and criteria.

Long-Term Effectiveness and Permanence – The Unrestricted Use alternative would achieve removal of all residual impacted soil/fill; therefore, no soil/fill exceeding the unrestricted use SCOs would remain on the Site. As such, the Unrestricted Use alternative would provide long-term effectiveness and permanence. Post-remedial monitoring and certifications would not be required.

Reduction of Toxicity, Mobility, or Volume with Treatment – Through removal of all impacted soil/fill, the Unrestricted Use alternative would permanently and significantly reduce the toxicity, mobility, and volume of Site contamination.

Short-Term Effectiveness – The short-term adverse impacts and risks to the community, workers, and environment during implementation of the Unrestricted Use alternative are not considered significant and are controllable, but would increase the duration of time community, workers, and the environment is exposed to fugitive dust and off-site exposures during remediation.

Implementability – No technical implementability issues would be encountered in construction of the Unrestricted Use alternative. Administrative implementability issues may include the need for rezoning of the area, since residential, agricultural, and other unrestricted uses are not consistent with current zoning or the reasonably anticipated future use of the Site.

Cost – The capital cost of implementing an Unrestricted Use alternative (post-IRM) is estimated at $535,000 (see Table 6b), which is cost of the unrestricted use cleanup plus the capital costs of the IRM that was completed. Post-remedial groundwater monitoring and

annual certification costs would not be incurred. Table 6c is a summary of costs of each of the alternatives.

Community Acceptance – Community acceptance will be evaluated based on comments to be received from the public in response to Fact Sheets and other planned Citizen Participation activities.

8.4 Recommended Remedial Measure

Based on the Alternatives Analysis evaluation, the completed IRM and Implementation of Site Management Plan fully satisfies the remedial action objectives and is fully protective of human health and the environment. Accordingly, the implementation of a Site Management Plan is the recommended final remedial approach for the NOCO #S-41 Site.

9.0 RI/IRM/AAR SUMMARY AND CONCLUSIONS

Based on the data and analyses presented in the preceding sections, we offer the following summary and conclusions:

- An IRM was implemented at the NOCO #S-41 Site concurrent with RI activities. The IRM included: removal of three 8,000-gallon gasoline USTs, four product dispensers and associated underground product piping; demolition of the product dispenser canopy; extraction and disposal approximately 1,054-gallons of gasoline/water mixture from the USTs; excavation of approximately 1,212 tons of non-hazardous petroleum-impacted soil/fill followed by off-site transportation and disposal at a permitted solid waste landfill; extraction and treatment of approximately 17,790-gallons of groundwater from within the excavation; and, placement and compaction of approximately 1,431 tons of crusher run stone backfill. Post-excavation soil sample results were below 6NYCRR Part 375 Restricted-Commercial SCOs for NYSDEC STARS List VOCs, NYSDEC STARS List SVOCs, and lead. The Final Engineering Report, to be submitted as a separate document, includes additional details of the IRM.

- Based on the soil data collected during the RI, concentrations of VOCs, metals, pesticides, and PCBs were below Part 375 restricted-commercial SCOs. Four SVOCs [i.e., benzo(a)anthracene, benzo(b)fluoranthene, benzo(a)pyrene, and dibenzo(a,h)anthracene] were detected at concentrations slightly above their respective Part 375 restricted-commercial SCOs at sample location BCP MW-4 in the 0 to 4-foot interval. Based on the depth of the sample collected (i.e., 0-4 fbgs), the sample location (i.e., not in an area of historic petroleum storage), lack of elevated PID readings, as well as absence of any visual or olfactory evidence of contamination, the elevated SVOCs do not appear to be attributable to a petroleum release, but appear to be associated with the historic fill materials encountered in that sample location.

- Based on the groundwater data collected in during the RI, residual concentrations of petroleum-related VOCs were detected in monitoring wells BCP MW-1, BCP MW-3, BCP MW-4, BCP MW-6 and BCP MW-7. One SVOC, naphthalene, was also detected in BCP MW-4 slightly above it GWQS. Metals detected at concentrations above GWQS are limited to naturally occurring minerals. The source of residual VOCs in BCP MW-6 is not known; this well is located on the northern property boundary hydraulically up-gradient of the source soils that were removed during the IRM. The petroleum-impacted soil/fill upgradient of wells BCP MW-1, BCP-MW-3, BCP MW-4 and BCP MW-7 was removed to residential SCOs as part of the IRM activities. It is noted that the residual groundwater concentrations in the wells with VOC concentrations above GWQS range from 18 ug/L to 210 ug/L total VOCs, which are significantly lower than historic

concentrations of petroleum VOCs on-Site (i.e., up to 99,990 ug/L). The decrease in groundwater concentrations is attributable to the contaminant source removal (note- post-excavation confirmatory samples show excavation sidewalls and bottoms meet NYSDEC residential SCOs for all sample locations and also meet unrestricted SCOs, with minor exceptions as shown on Table 1), and extraction and treatment of impacted groundwater during the IRM. As the on-Site UST system and petroleum-impacted source soils have been removed, these concentrations will continue to naturally attenuate over time. It is also noted that there were no detections of VOCs in groundwater above GWQS in BCP-MW-2, which is the hydraulically down-gradient monitoring well. Overall, the groundwater data indicates: a potential off-site source of on-Site petroleum VOCs in groundwater; a significant decrease of petroleum VOCs concentrations in the monitoring wells with the highest residual impacts (i.e., BCP MW-3, BCP MW-4 and BCP MW-6) from the February 2008 to the June 2009 sampling events; and, an overall decrease in dissolved-phase VOCs.

- Based on the soil vapor data collected during the RI, COPCs detected in the soil vapor samples included benzene, ethylbenzene, toluene, and xylene (BTEX), MtBE and 1,3,5-trimethylbenzene. However, concentrations of COPCs were also detected in the ambient air sample. One chlorinated VOC (PCE) was detected in SV-2, located on the northern property boundary, at a concentration of 23 ug/m^3, below the NYSDOH indoor air guideline of 100 ug/m^3. However, PCE was also detected in the ambient air sample. NYSDEC and NYSDOH do not currently have standards, criteria or guidance values for concentrations of petroleum compounds in soil vapor. The highest individual COPC concentration was 90 ug/m^3 toluene. Published studies regarding transport of petroleum VOCs (e.g., Hers et al, 2006 (Ref. 7)) have shown that petroleum compounds subject to aerobic degradation, such as the Site COPCs, have low soil gas to indoor air attenuation factors and are much less likely to cause indoor air concerns compared to chlorinated VOCs. Furthermore, the NYSDOH has indicated that, based on the low levels of VOCs in groundwater and soil gas samples, a subslab depressurization system is not required at the Site.

- Based on the Alternatives Analysis evaluation, the IRM satisfies the remedial action objectives and is protective of human health and the environment. Accordingly, Implementation of a Site Management Plan is the recommended final remedial approach for the NOCO #S-41 Site.

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TABLES

BENCHMARK ENVIRONMENTAL ENGINEERING & SCIENCE, PLLC

TABLE 1
POST-EXCAVATION SOIL ANALYTICAL DATA SUMMARY

NOCO SITE #S-41
1055 GENESEE STREET
BUFFALO, NEW YORK

Parameter [1]	Sample Locations															Commercial SCOs [3] (ppm)	Unrestricted SCOs[3] (ppm)
	UST Area					Pump Island Area							Product Piping				
	UST 1- S1	UST 1-S2	UST 1-S3	UST 1-S4 [2]	UST 1-F1	PI-S1	PI-S2	PI-S3	PI-S4	PI-S5	PI-F1	PI-F2	Pipe 1	Pipe 2	Pipe 3		
STARS List Volatile Organic Compounds (VOCs) - mg/kg [4]																	
Benzene	ND	0.001 J	ND	ND	ND	ND	0.059	ND	0.002 J	ND	ND	ND	0.014	0.02	0.008	**44**	**0.06**
Ethylbenzene	ND	0.028	ND	ND	ND	ND	0.31	ND	0.002 J	ND	ND	0.012	0.068	0.087 DJ	0.08	**390**	**1**
Isopropylbenzene (Cumene)	ND	0.004 J	ND	ND	ND	ND	0.14	ND	0.003 J	ND	ND	0.007	0.01	0.042	0.012	**--**	**--**
n-Butylbenzene	ND	0.014	ND	0.002 J	ND	ND	0.25	ND	0.001 J	ND	ND	0.016	0.016	0.08	0.018	**500**	**12**
n-Propylbenzene	ND	0.016	ND	ND	ND	ND	0.58	ND	0.006	ND	ND	0.035	0.044	0.19	0.045	**500**	**3.9**
p-Cymene (p-isopropyltoluene)	ND	ND	ND	ND	ND	ND	0.02 J	ND	ND	ND	ND	ND	0.001 J	0.006	0.003 J	**--**	**--**
sec-Butylbenzene	ND	0.003 J	ND	ND	ND	ND	0.055	ND	ND	ND	ND	0.009	0.004 J	0.018	0.004 J	**500**	**11**
tert-Butylbenzene	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	**500**	**5.9**
1,2,4-Trimethylbenzene	ND	0.12	0.003 J	0.005 J	ND	0.001 J	0.16 D	ND	0.026	ND	ND	0.044	0.14	0.35 D	0.15	**190**	**3.6**
1,3,5-Trimethylbenzene	ND	0.036	ND	0.001 J	ND	ND	0.38	ND	0.006	ND	ND	ND	0.035	0.12 DJ	0.048	**190**	**8.4**
Total Xylene	ND	0.07	ND	ND	ND	ND	0.42	ND	0.013 J	ND	ND	0.007 J	0.093	0.13 DJ	0.09	**500**	**0.26**
Methyl tert butyl ether (MTBE)	0.037	0.04	0.18	0.5 D	0.35 D	0.002 J	ND	ND	ND	ND	0.006	ND	0.012	0.12	0.028	**190**	**0.93**
Toluene	ND	ND	ND	ND	ND	0.001 J	0.009 J	ND	ND	ND	ND	0.003 J	0.003 J	0.004 J	0.002 J	**500**	**0.7**
Total VOCs	0.037	0.332	0.183	0.508	0.35	0.004	2.383	0	0.059	0	0.006	0.133	0.44	1.167	0.488	**--**	**--**
STARS List Semi-Volatile Organic Compounds (SVOCs) - mg/kg																	
Acenaphthylene	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	**500**	**100**
Acenaphthene	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.18 J	ND	ND	ND	ND	ND	**500**	**20**
Anthracene	ND	ND	ND	ND	ND	0.04 J	ND	0.016 J	ND	0.095 J	ND	ND	ND	ND	ND	**500**	**100**
Benzo(a)anthracene	ND	ND	ND	ND	0.0064 J	0.11 J	0.022 J	0.076 J	0.13 J	0.5	0.0081 J	ND	ND	ND	ND	**5.6**	**1**
Benzo(b)fluoranthene	ND	ND	ND	ND	ND	0.11 J	0.023 J	0.076 J	0.098 J	0.56	ND	ND	ND	ND	ND	**5.6**	**1**
Benzo(k)fluoranthene	ND	ND	ND	ND	ND	0.028 J	0.011 J	0.026 J	ND	0.16 J	ND	ND	ND	ND	ND	**56**	**0.8**
Benzo(g,h,i)perylene	ND	ND	ND	ND	ND	0.058 J	0.02 J	0.046 J	0.06 J	0.34 J	ND	ND	ND	ND	ND	**500**	**100**
Benzo(a)pyrene	ND	ND	ND	ND	ND	0.085 J	0.02 J	0.064 J	0.092 J	0.45	ND	ND	ND	ND	ND	**1**	**1**
Chrysene	ND	ND	ND	ND	ND	0.098 J	0.021 J	0.065 J	0.11 J	0.42	ND	ND	ND	ND	ND	**56**	**1**
Dibenzo(a,h)anthracene	ND	ND	ND	ND	ND	0.02 J	ND	0.011 J	ND	0.1 J	ND	ND	ND	ND	ND	**0.56**	**0.33**
Fluoranthene	ND	ND	ND	ND	ND	0.22	0.034 J	0.12 J	0.18 J	0.82	ND	ND	ND	ND	ND	**500**	**100**
Fluorene	ND	ND	ND	ND	ND	0.02 J	ND	ND	ND	0.021 J	ND	ND	ND	ND	ND	**500**	**30**
Indeno(1,2,3-cd)pyrene	ND	ND	ND	ND	ND	0.048 J	0.015 J	0.043 J	0.052 J	0.3 J	ND	ND	ND	ND	ND	**5.6**	**0.5**
Naphthalene	ND	0.012 J	ND	ND	ND	ND	0.012 J	0.0082 J	ND	0.04 J	ND	ND	0.074 J	0.13 J	0.036 J	**500**	**12**
Phenanthrene	ND	ND	0.0064 J	ND	0.0061 J	0.19 J	0.023 J	0.074 J	0.13 J	0.41	ND	ND	ND	ND	ND	**500**	**100**
Pyrene	ND	ND	ND	ND	ND	0.2 J	0.028 J	0.11 J	0.16 J	0.67	ND	ND	ND	ND	ND	**500**	**100**
Total SVOCs	0	0.012	0.0064	0	0.0125	1.227	0.229	0.7352	1.012	5.066	0.0081	0	0.074	0.13	0.036	**--**	**--**
Total Lead - mg/kg																	
Lead	13.2	14.7	12.5	11.3	11.3	275	25.3	32.5	198	94.3	15.3	20.7	23.4	12.6	14.5	**1000**	**63**

Notes:
1. Only those parameters detected at a minimum of one sample location are presented in this table; all other compounds were reported as non-detect.
2. Blind Duplicate was taken on UST 1-S4.
3. Values per NYSDEC Part 375 Soil Cleanup Objectives (December 2006).
4. Sample results were reported by the laboratory in ug/kg and converted to mg/kg for comparison to SCOs.

Definitions:
ND = Parameter not detected above laboratory detection limit.
NA = Sample not analyzed for parameter.
"--" = No SCO available.
J = Estimated value; result is less than the sample quantitation limit but greater than zero.
D = All compounds were identified in an analyisis at the secondary dilution factor.
Exceeds NYSDEC Part 375 SCOs for Unrestricted standards

TABLE 2
SOIL BORING ANALYTICAL DATA SUMMARY
COMPARISON TO NYSDEC PART 375 SOIL CLEANUP OBJECTIVES

NOCO SITE #S-41
1055 GENESEE STREET
BUFFALO, NEW YORK

Parameter [1]	Boring Locations							Restricted-Commercial SCOs [4] (ppm)	Unrestricted SCOs [4] (ppm)
	BCP MW-1 (0-5')	BCP MW-2 (0-2')	BCP MW-3 (0-4')	BCP MW-4 (0-4')	BCP MW-5 (0-4')	BCP MW-6 [2] (0-4')	DUP [3] (0-4')		
8260B Full List Volatile Organic Compounds (VOCs) - mg/kg [5]									
Acetone	0.007 J	ND	0.008 J	ND	0.009 J	ND	ND	**500**	**0.05**
n-Butylbenzene	ND	ND	ND	ND	0.001 J	ND	ND	**500**	**12**
Ethylbenzene	0.002 J	ND	ND	ND	ND	ND	ND	**390**	**1**
Methylene chloride	0.01	0.009	0.008	0.012	0.01	ND	ND	**500**	**0.05**
Toluene	0.003 J	ND	ND	ND	ND	ND	ND	**500**	**0.7**
1,2,4-Trimethylbenzene	0.007	ND	ND	ND	0.004 J	ND	ND	**190**	**3.6**
1,3,5-Trimethylbenzene	0.002 J	ND	ND	ND	0.001 J	ND	ND	**190**	**8.4**
Total Xylene	0.013 J	ND	ND	ND	ND	ND	ND	**500**	**0.26**
Total VOCs	0.044	0.009	0.016	0.012	0.025	0	0	**--**	**--**
TCL Semi-Volatile Organic Compounds (SVOCs) - mg/kg [5] (Base/Neutral Compounds)									
Acenaphthene	ND	ND	NA	0.88 J	NA	NA	NA	**500**	**20**
Acenaphthylene	ND	ND	NA	0.28 J	NA	NA	NA	**500**	**100**
Anthracene	ND	0.1 J	NA	2.7 J	NA	NA	NA	**500**	**100**
Benzo(a)anthracene	**1.8 J**	0.52 J	NA	**8.2**	NA	NA	NA	**5.6**	**1**
Benzo(b)fluoranthene	ND	0.58 J	NA	**8.9**	NA	NA	NA	**5.6**	**1**
Benzo(k)fluoranthene	ND	0.23 J	NA	**3.5 J**	NA	NA	NA	**56**	**0.8**
Benzo(g,h,i)perylene	ND	0.38 J	NA	5.4	NA	NA	NA	**500**	**100**
Benzo(a)pyrene	ND	0.48 J	NA	**7.2**	NA	NA	NA	**1**	**1**
Carbazole	ND	0.05 J	NA	1.2 J	NA	NA	NA	**--**	**--**
Chrysene	ND	0.53 J	NA	**7.9**	NA	NA	NA	**56**	**1**
Dibenzo(a,h)anthracene	ND	0.1 J	NA	**1.5 J**	NA	NA	NA	**0.56**	**0.33**
Dibenzofuran	ND	ND	NA	0.73 J	NA	NA	NA	**--**	**--**
Fluoranthene	3.5 J	1.1	NA	20	NA	NA	NA	**500**	**100**
Fluorene	ND	ND	NA	1.4 J	NA	NA	NA	**500**	**30**
Indeno(1,2,3-cd)pyrene	ND	0.32 J	NA	**5**	NA	NA	NA	**5.6**	**0.5**
2-Methylnaphthalene	ND	ND	NA	ND	NA	NA	NA	**--**	**--**
Naphthalene	ND	ND	NA	ND	NA	NA	NA	**500**	**12**
Phenanthrene	2.1 J	0.74 J	NA	14	NA	NA	NA	**500**	**100**
Pyrene	2.4 J	0.9 J	NA	14	NA	NA	NA	**500**	**100**
Total SVOCs	9.8	6.0	0	103	0	0	0	**--**	**--**
PCBs/Pesticides- mg/kg [5]									
4,4'-DDD	**0.14 J**	ND	NA	ND	NA	NA	NA	**92**	**0.0033**
4,4'-DDE	**0.1 J**	ND	NA	ND	NA	NA	NA	**62**	**0.0033**
4,4'-DDT	**0.17 J**	ND	NA	**0.11 J**	NA	NA	NA	**47**	**0.0033**
Aroclor 1260	0.036 J	ND J	NA	ND J	NA	NA	NA	**--**	**0.1**

TABLE 2
SOIL BORING ANALYTICAL DATA SUMMARY
COMPARISON TO NYSDEC PART 375 SOIL CLEANUP OBJECTIVES

NOCO SITE #S-41
1055 GENESEE STREET
BUFFALO, NEW YORK

Parameter [1]	Boring Locations							Restricted-Commercial SCOs [4] (ppm)	Unrestricted SCOs [4] (ppm)
	BCP MW-1 (0-5')	BCP MW-2 (0-2')	BCP MW-3 (0-4')	BCP MW-4 (0-4')	BCP MW-5 (0-4')	BCP MW-6 [2] (0-4')	DUP [3] (0-4')		
TAL Metals - mg/kg									
Aluminum	4680	10300	NA	4670	NA	NA	NA	--	--
Arsenic	3.8	6.5	NA	5.5	NA	NA	NA	**16**	**13**
Barium	70.4 N J	112 N J	NA	105 N J	NA	NA	NA	**400**	**350**
Beryllium	0.75	0.52	NA	0.27	NA	NA	NA	**590**	**7.2**
Cadmium	ND	ND	NA	0.87	NA	NA	NA	**9.3**	**2.5**
Calcium	192000 *	43600 E	NA	13800 E	NA	NA	NA	--	--
Chromium, trivalent	5.1	14.8	NA	10.4	NA	NA	NA	**1500**	**30**
Cobalt	1.8	7.3	NA	4.5	NA	NA	NA	--	--
Copper	8.7	36.2	NA	31.7	NA	NA	NA	**270**	**50**
Iron	5410 N*J	16600 N*J	NA	10600 N*J	NA	NA	NA	--	--
Lead	37.2 N J	**129 N J**	**66 N**	**337 N J**	**493 N**	**130**	**71.1**	**1000**	**63**
Magnesium	6860 N* J	16400 N* J	NA	4310 N* J	NA	NA	NA	--	--
Manganese	383 *	395 *	NA	190 *	NA	NA	NA	**10000**	**1600**
Mercury	ND	**0.231**	NA	**1.2**	NA	NA	NA	**2.8**	**0.18**
Nickel	6.5 E J	16.3 E J	NA	11.7 E J	NA	NA	NA	**310**	**30**
Potassium	696	2020	NA	790	NA	NA	NA	--	--
Sodium	596	179	NA	ND	NA	NA	NA	--	--
Vanadium	8.3	21.5	NA	10.8	NA	NA	NA	--	--
Zinc	23.8	**122**	NA	**351**	NA	NA	NA	**10000**	**109**

Notes:

1. Only those parameters detected at a minimum of one sample location are presented in this table; all other compounds were reported as non-detect.
2. BCP MW-6 was mislabeled on the chain-of-custody as BCP MW-8.
3. Blind duplicate collected from BCP MW-6.
4. Values per NYSDEC draft Part 375 Soil Cleanup Objectives (June 2006)
5. Sample results were reported by the laboratory in ug/kg and converted to mg/kg for comparison to SCOs.

Definitions:

ND = Parameter not detected above laboratory detection limit.
NA = Sample not analyzed for parameter.
"--" = No SCO available.
B = Indicates a value greater than or equal to the instrument detection limit, but less than the quantitation limit.
* = Indicates the spike or duplicate analysis is not within the quality control limits.
N = Indicates spike sample recovery is not within the quality control limits.
E = Indicates value estimated or not reported due to the presence of interferences.
J = Estimated value; result is less than the sample quantitation limit but greater than zero.

BOLD = Result exceeds Part 375 restricted-commercial SCO.

BOLD = Result exceeds Part 375 unrestricted SCO.

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TABLE 3
GROUNDWATER ANALYTICAL DATA SUMMARY

NOCO SITE #S-41
1055 GENESEE STREET
BUFFALO, NEW YORK

Parameter [1]	Well Locations														Class GA GWQS [2]
	BCP MW-1		BCP MW-2		BCP MW-3		BCP MW-4		BCP MW-5		BCP MW-6		BCP MW-7		
	2/29/08	6/17/09	2/29/08	6/17/09	2/29/08	6/17/09	2/29/08	6/17/09	2/29/08	6/17/09	2/29/08	6/17/09	8/12/08	6/17/09	
Volatile Organic Compounds (VOCs) - ug/L															
Acetone	ND	ND	ND	ND	4 J	ND	ND	ND	ND	ND	ND	ND	ND	14	**50**
Benzene	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	**18 NJ**	ND	ND	**1.2**	**1**
2-Butanone (MEK)	ND	ND	ND	ND	6	ND	ND	ND	ND	ND	ND	ND	ND	ND	**50**
Carbon disulfide	5	ND	ND	ND	5	ND	ND	ND	ND	ND	ND	ND	ND	ND	**--**
Cyclohexane	ND	ND	ND	ND	0.8 J	ND	ND	ND	ND	ND	ND	ND	ND	0.61 J	**--**
Ethylbenzene	ND	ND	ND	ND	**25**	ND	**26**	ND	ND	ND	ND	ND	ND	ND	**5**
Isopropylbenzene (Cumene)	ND	ND	ND	ND	**8**	3.8	**9**	ND	ND	ND	ND	ND	ND	ND	**5**
Methylcyclohexane	ND	ND	ND	ND	3	ND	ND	ND	ND	ND	ND	ND	ND	ND	**--**
Methyl tert butyl ether (MTBE)	1	**13**	ND	ND	**11**	**130 D**	ND	**18**	6 J	3.2	**370**	**210**	ND	2.3	**10**
Toluene	ND	ND	ND	ND	**8**	ND	**14**	ND	ND	ND	**49**	ND	ND	ND	**5**
m/p-Xylenes	ND	ND	ND	ND	**69**	ND	**56**	ND	ND	ND	ND	ND	ND	ND	**5**
o-Xylenes	ND	ND	ND	ND	**35**	ND	**100**	ND	ND	ND	ND	ND	ND	ND	**5**
n-Butylbenzene	ND	ND	ND	ND	0	2.4	ND	ND	ND	ND	ND	ND	ND	ND	
n-Propylbenzene	ND	ND	ND	ND	**14**	**5.3**	**10**	ND	ND	ND	ND	ND	ND	ND	**5**
p-Cymene (p-isopropyltoluene)	ND	ND	ND	ND	5	1.8	ND	ND	ND	ND	ND	ND	ND	ND	**5**
1,2,4-Trimethylbenzene	ND	ND	ND	ND	**120 D**	ND	**36**	ND	ND	ND	ND	ND	ND	ND	**5**
1,3,5-Trimethylbenzene	ND	ND	ND	ND	**42**	1.4	**40**	ND	ND	ND	ND	ND	ND	ND	**5**
sec-Butylbenzene	ND	ND	ND	ND	5	2.4	ND	ND	ND	ND	ND	ND	ND	ND	**5**
Total TCL plus STARS VOCs	6	13	0	0	361	147	291	18	6	3.2	437	210	0	18.1	
Semi-Volatile Organic Compounds (SVOCs) - ug/L															
Acenaphthene	ND	NA	NA	NA	NA	NA	1 J	NA	NA	NA	ND	NA	NA	NA	**20**
1,1'-Biphenyl	0.3 J	NA	NA	NA	NA	NA	4 J	NA	NA	NA	0.2 J	NA	NA	NA	**5**
Carbazole	0.2 J	NA	NA	NA	NA	NA	0.6 J	NA	NA	NA	ND	NA	NA	NA	**--**
Dibenzofuran	0.5 J	NA	NA	NA	NA	NA	0.8 J	NA	NA	NA	0.3 J	NA	NA	NA	**--**
Di-n-butylphthalate	ND	NA	NA	NA	NA	NA	ND	NA	NA	NA	ND	NA	NA	NA	**50**
Diethylphthalate	0.9 J	NA	NA	NA	NA	NA	0.3 J	NA	NA	NA	ND	NA	NA	NA	**50**
2,4-Dimethylphenol	ND	NA	NA	NA	NA	NA	7	NA	NA	NA	ND	NA	NA	NA	**50**
Fluorene	ND	NA	NA	NA	NA	NA	ND	NA	NA	NA	0.3 J	NA	NA	NA	**50**
2-Methylnaphthalene	0.7 J	NA	NA	NA	NA	NA	33 J	NA	NA	NA	ND	NA	NA	NA	**--**
2-Methylphenol (o-Cresol)	ND	NA	NA	NA	NA	NA	1 J	NA	NA	NA	1 J	NA	NA	NA	**--**
4-Methylphenol (p-Cresol)	ND	NA	NA	NA	NA	NA	0.6 J	NA	NA	NA	2 J	NA	NA	NA	**--**
Naphthalene	0.3 J	NA	NA	NA	NA	NA	**32**	NA	NA	NA	0.4 J	NA	NA	NA	**10**
Phenanthrene	2 J	NA	NA	NA	NA	NA	2 J	NA	NA	NA	2 J	NA	NA	NA	**50**
Total TCL SVOCs	4.9	NA	NA	NA	NA	NA	49.3	NA	NA	NA	6.2	NA	NA	NA	
TAL Metals - ug/L															
Aluminum	ND	NA	NA	NA	NA	NA	**212**	NA	NA	NA	ND	NA	NA	NA	**100**
Barium	34.4	NA	NA	NA	NA	NA	36.8	NA	NA	NA	189	NA	NA	NA	**1000**
Calcium	87000	NA	NA	NA	NA	NA	67300	NA	NA	NA	300000	NA	NA	NA	**--**
Iron	180	NA	NA	NA	NA	NA	234	NA	NA	NA	**529**	NA	NA	NA	**300**
Magnesium	**104000**	NA	NA	NA	NA	NA	**95600**	NA	NA	NA	**125000**	NA	NA	NA	**35000**
Manganese	159	NA	NA	NA	NA	NA	158	NA	NA	NA	288	NA	NA	NA	**300**
Potassium	3090ENJ	NA	NA	NA	NA	NA	2680ENJ	NA	NA	NA	31300ENJ	NA	NA	NA	**--**
Sodium	**96000**	NA	NA	NA	NA	NA	**68800**	NA	NA	NA	**777000**	NA	NA	NA	**20000**

Notes:

1. Only those parameters detected at a minimum of one sample location are presented in table; all other compounds reported as non-detect.

2. Regulatory limits are NYSDEC Class "GA" Groundwater Quality Standards (GWQS) as published in NYSDEC Ambient Water Quality Standards and Guidance Values and Groundwater Effluent Limitations (June 1998).

Definitions:

ND = Parameter not detected above laboratory detection limit.
NA = Sample not analyzed for parameter.
"--" = No guidance value available.
J = Estimated value; result is less than the sample quantitation limit but greater than zero.
B = Indicates a value greater than or equal to the instrument detection limit, but less than the quantitation limit.
D = All compounds were identified in an analyisis at the secondary dilution factor.
N = Indicates spike sample recovery is not within the quality control limits.
E = Indicates value estimated or not reported due to the presence of interferences.
BOLD = Result exceeds NYSDEC Class GA Groundwater Quality Standard.

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TABLE 4
SUMMARY OF SOIL VAPOR ANALYTICAL RESULTS

NOCO SITE #S-41
1055 GENESEE STREET
BUFFALO, NEW YORK

Parameter [1]	Sample Location				
	SV-1	SV-2	SV-3	DUP [2]	AMBIENT
TCL Volatile Organic Compounds (VOCs) - ug/m^3					
Benzene	1.8	15	0.61 J	23 J	0.61
1,3-Butadiene	ND	0.93	ND	ND	ND
Chloroform	0.83	ND	ND	ND	ND
Cyclohexane	1.4	5.5	ND J	62 J	0.65
Ethylbenzene	ND	2.6	ND J	12 J	ND
4-Ethyltoluene	ND	2.7	ND J	2.7 J	ND
n-Heptane	1.6	6.1	ND J	70 J	1.1
n-Hexane	1.9	6.7	ND J	160 J	ND
Methyl tert-Butyl Ether	ND	1.8	ND	ND	ND
Tetrachloroethene	ND	23	ND	ND	1.4
Toluene	3.2	21	2.5 J	90 J	3.1
Trichlorofluoromethane	1.3	1.2	0.96 J	ND J	1.0
1,3,5-Trimethylbenzene	ND	1.3	ND	ND	ND
2,2,4-Trimethylpentane	1.5	3.8	1.4 J	47 J	1.7
Xylene (m,p)	2.1	7.8	ND J	28 J	1.9
Xylene (o)	0.83	3.0	ND J	19 J	ND
Xylene (total)	3.0	11	ND J	48 J	2.0

Notes:

1. Only those compounds detected above the laboratory reporting limit are presented in this table.
2. Duplicate of SV-3.

Definitions:

ND = Not detected above laboratory detection limits.

TABLE 5
COMPARISON OF HISTORIC VOC CONCENTRATIONS TO HEALTH-BASED SOIL CLEANUP OBJECTIVES

NOCO SITE #S-41
1055 GENESEE STREET
BUFFALO, NEW YORK

Parameter	Highest Exposure Point Concentration[1]	*Part 375 Commercial SCOs (ppm)*[2]
VOCs		
Benzene [3]	0.15	***44***
Ethylbenzene	3.4	***390***
Methyl tert butyl ether (MTBE) [4]	1.2	***1100***
1,2,4-Trimethylbenzene	31	***190***
1,3,5-Trimethylbenzene	9.3	***190***
Total Xylenes	29	***3100***
SVOCs[5]		
Benzo(a)anthracene	**8.2**	***5.6***
Benzo(b)fluoranthene	**8.9**	***5.6***
Benzo(a)pyrene	**7.2**	***0.56***
Dibenzo(a,h)anthracene	**1.5 J**	***0.56***

Notes:

1. Sample SB-7 (4-6 fbgs); 2006 Supplemental Investigation.
2. NYSDEC June 2006, Technical Support Document; Table 5.6-1 Human Health-Based Soil Cleanup Objectives.
3. Sample SB-3 (2-4 fbgs); 2006 Supplemental Investigation.
4. Sample B-5 (4-8 fbgs); 2004 Subsurface Investigation.
5. Sample BCP MW-4 (0-4'); 2008 Remedial Investigation.

Acronyms:

SCOs = Soil Cleanup Objectives

BOLD = Concentration exceeds human-health based SCO.

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TABLE 6a
COST FOR IRM and IMPLEMENTATION OF A SITE MANAGEMENT PLAN

NOCO SITE #S-41
1055 GENESEE STREET
BUFFALO, NEW YORK

Item	Quantity	Units	Unit Cost	Total Cost
Interim Remedial Measures				
	1	EST	$ 250,000.00	$ 250,000
Institutional Controls				
Develop Site Management Plan	1	LS	$ 10,000.00	$ 10,000
Environmental Easement	1	LS	$ 6,500.00	$ 6,500
Subtotal:				**$ 266,500**
Total Capital Cost				**$ 266,500**
Annual Operation Maintenance & Monitoring (OM&M):				
Annual Groundwater Monitoring	1	Yr	$ 8,500.00	$ 8,500
Annual Certifications	1	Yr	$ 1,500.00	$ 1,500
Total Annual OM&M Cost				**$ 10,000**
Number of Years (n):				30
Interest Rate (I):				5%
p/A value:				15.3725
OM&M Present Worth (PW):				**$ 153,725**

Total Present Worth (PW): Capital Cost + OM&M PW	**$ 420,225**

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TABLE 6b
COST ESTIMATE FOR UNRESTRICTED USE ALTERNATIVE

NOCO SITE #S-41
1055 GENESEE STREET
BUFFALO, NEW YORK

Item	Quantity[2]	Units	Unit Cost	Total Cost
Impacted Soil/Fill Removal				
Soil/Fill Excavating & Hauling	1758	CY	$ 20.00	$ 35,160
Disposal at TSDF (1.5 tons per CY)	2637	TON	$ 50.00	$ 131,850
Verification Sampling[1]	20	EA	$ 350.00	$ 7,000
Subtotal:				**$ 174,010**
Site Restoration				
Backfill, Place & Compact	1758	CY	$ 15.00	$ 26,370
Subtotal:				**$ 26,370**
Subtotal Capital Cost				**$ 200,380**
Contractor Mobilization/Demobilization (5%)				$ 10,019
Health and Safety (2%)				$ 4,008
Engineering/Contingency (35%)				$ 70,133
Total Unrestricted Cleanup Cost				**$ 284,540**
Total IRM Cost				**$ 250,000**
Total Capital Cost				**$ 534,540**

Notes:

1. STARS List VOCs and SVOCs; expedited turn around time of 3 days.
2. The volume of impacted soil/fill was determined as follows:

	Area (ft^2)	Depth (ft)	Volume (ft^3)	Volume (CY)
Area 1	2898	6	17388	644
Area 2	4439	2	8878	329
Area 3	4239	5	21195	785
TOTAL			**47461**	**1758**

TABLE 6C
SUMMARY OF REMEDIAL ALTERNATIVES COSTS

NOCO SITE #S-41
1055 GENESEE STREET
BUFFALO, NEW YORK

Remedial Alternative	Estimated Cost
No Further Action (Cost of completed IRM)	**$250,000**
IRM and Implementation of Site Management Plan (SMP) (Cost of completed IRM, plus SMP and future O&M)	**$420,000**
Unrestricted Use Cleanup (Cost of completed IRM, plus unrestricted use cleanup)	**$535,000**

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TABLE 7

GROUNDWATER ELEVATION MEASUREMENTS

RI/AAR/IRM Report
NOCO S-41 Site

Monitoring Location	Grade Elevation [2]	TOR Elevation [2]	March 2008		May 2008		October 2008		June 2009	
			DTW	GWE	DTW	GWE	DTW	GWE	DTW	GWE
MW-1	100.42	99.98	10.35	89.63	10.30	89.68	9.96	90.02	9.33	90.65
MW-2	99.38	99.16	12.36	86.80	12.31	86.85	12.04	87.12	13.00	86.16
MW-3	99.74	99.36	8.80	90.56	8.76	90.60	8.49	90.87	7.80	91.56
MW-4	100.77	100.16	10.90	89.26	10.78	89.38	10.10	90.06	8.40	91.76
MW-5	100.81	100.35	8.90	91.45	8.88	91.47	8.45	91.90	8.28	92.07
MW-6	99.98	99.63	5.86	93.77	5.80	93.83	5.71	93.92	5.55	94.08

Notes:
1. All wells were surveyed on 3/04/08 with a site specific datum of 100 feet.
2. All elevations are measured in feet; distance above mean sea level.
3. DTW = depth to water, measured in feet below top of riser
4. TOR = top of riser
5. GWE = calculated groundwater elevation, measured in feet above mean sea level

FIGURES

FIGURE 1

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726 EXCHANGE STREET
SUITE 624
BUFFALO, NEW YORK 14210
(716) 856-0599

PROJECT NO.: 0112-010-300

DATE: APRIL 2009

DRAFTED BY: NTM

FILEPATH:

SITE LOCATION AND VICINITY MAP

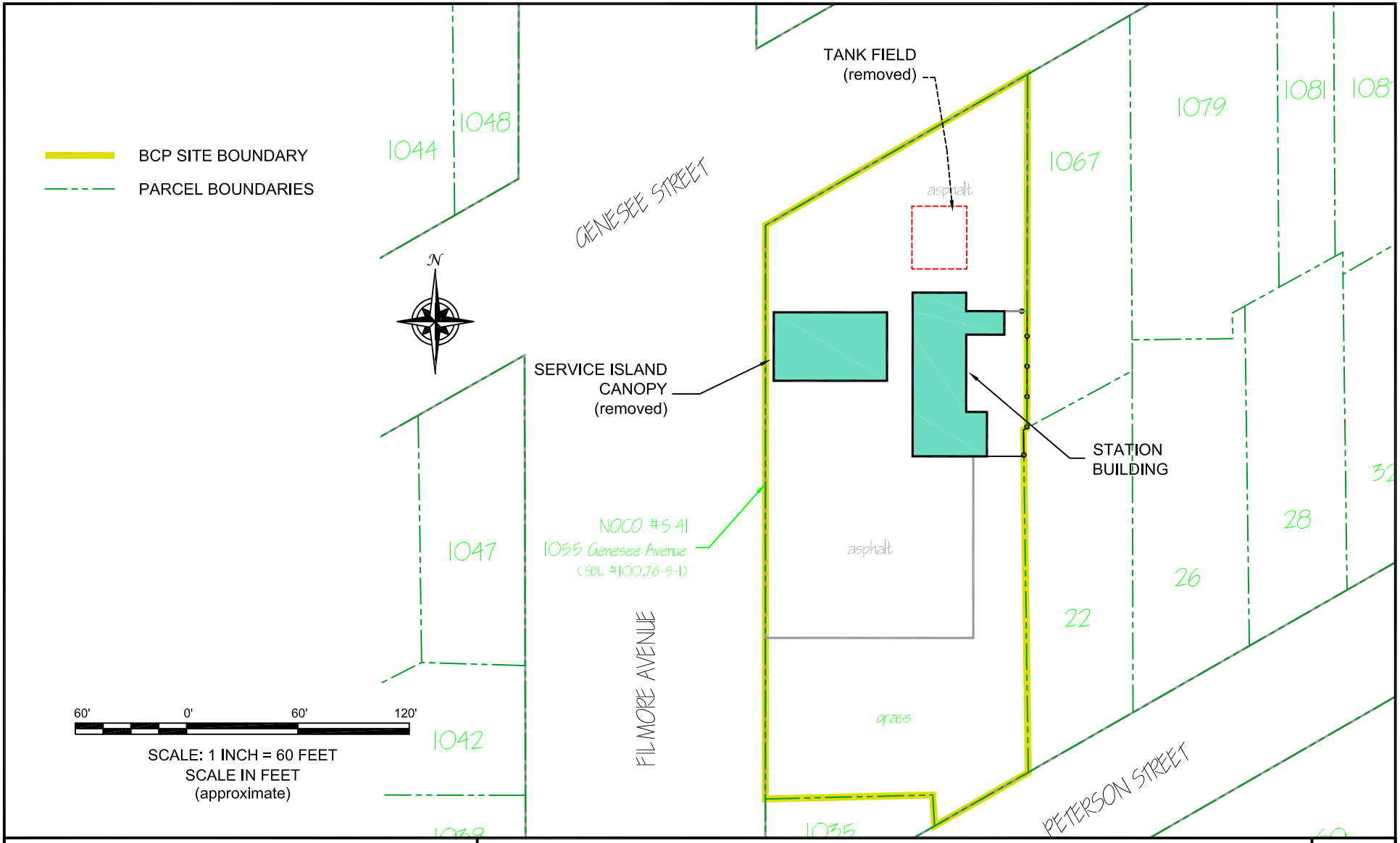
RI / AAR / IRM REPORT

NOCO S-41 SITE
BCP SITE No. C915211
BUFFALO, NEW YORK

PREPARED FOR

NOCO ENERGY CORPORATION

F:\CAD\Benchmark\NOCO\1055 Genesee Street BCP\RI-AAR-IRM (Jan 09)\Figure 2; Site Plan.dwg



BENCHMARK ENVIRONMENTAL ENGINEERING & SCIENCE, PLLC

726 EXCHANGE STREET
SUITE 624
BUFFALO, NEW YORK 14210
(716) 856-0599

PROJECT NO.: 0112-010-300

DATE: APRIL 2009

DRAFTED BY: BCH/NTM

SITE PLAN

RI / AAR / IRM REPORT

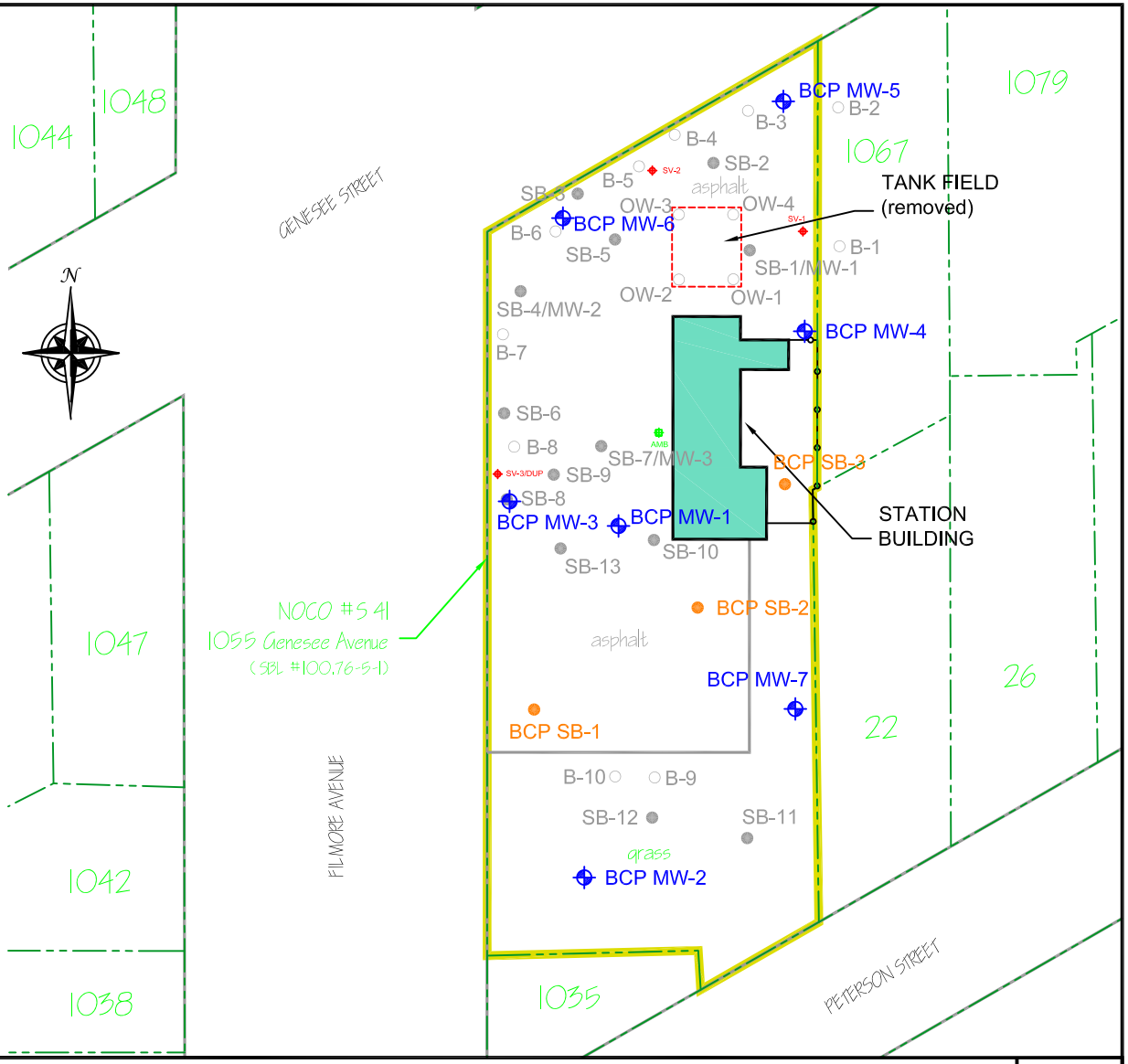
NOCO #S 41
BCP SITE No. C915211
BUFFALO, NEW YORK
PREPARED FOR
NOCO ENERGY CORPORATION

FIGURE 2

F:\CAD\Benchmark\NOCO\1055 Genesee Street BCP\RI-AAR-IRM (Jan 09)\Figure 3; Historic and RI Sample Locations.dwg

LEGEND:

- BCP SITE BOUNDARY
- PARCEL BOUNDARIES
- P-3 HISTORIC BORING (by others - 2004)
- OW-1 HISTORIC OBSERVATION WELL (by others - 2004)
- SB-2 GEOPROBE BORING (Benchmark - June 2006)
- SB-1/MW-1 GEOPROBE BORING & TEMPORARY MONITORING WELL (Benchmark - June 2006)
- BCP MW-1 MONITORING WELL
- BCP SB-2 SOIL BORING
- SV-3 SOIL VAPOR TEST POINT
- AMB AMBIENT AIR TEST POINT



60' 0' 60' 120'

SCALE: 1 INCH = 60 FEET
SCALE IN FEET
(approximate)

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SUITE 624
BUFFALO, NEW YORK 14210
(716) 856-0599

PROJECT NO.: 0112-010-300

DATE: APRIL 2009

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HISTORIC AND RI SAMPLE LOCATIONS

RI / AAR / IRM REPORT

NOCO #S 41 SITE
BCP SITE No. C915211
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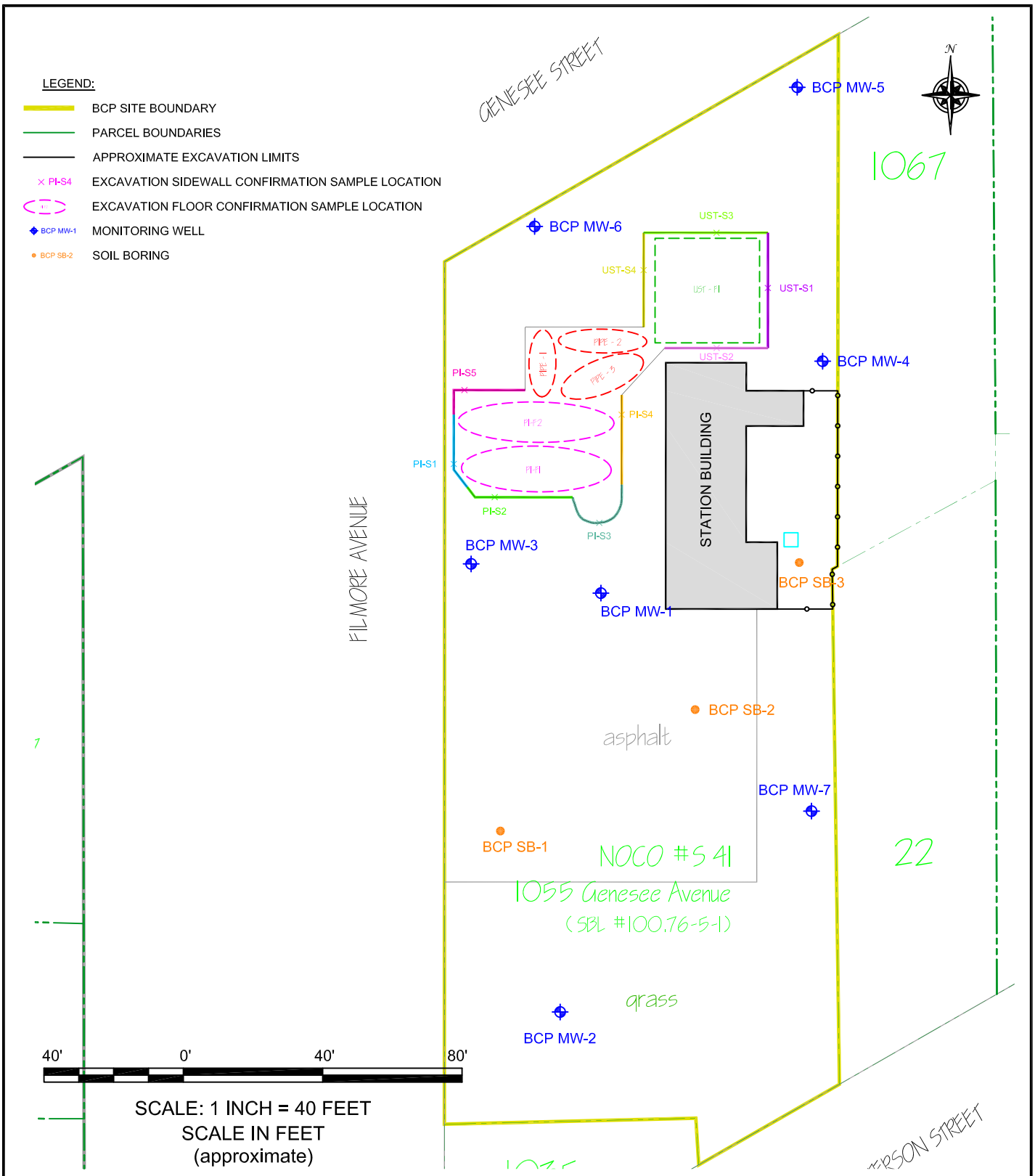
FIGURE 3

F:\CAD\Benchmark\NOCO\1055 Genesee Street BCP\RI-AAR-IRM (Jan 09)\Figure 4; IRM Excavation Limits.dwg

FIGURE 4



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IRM EXCAVATION LIMITS

RI / AAR / IRM REPORT

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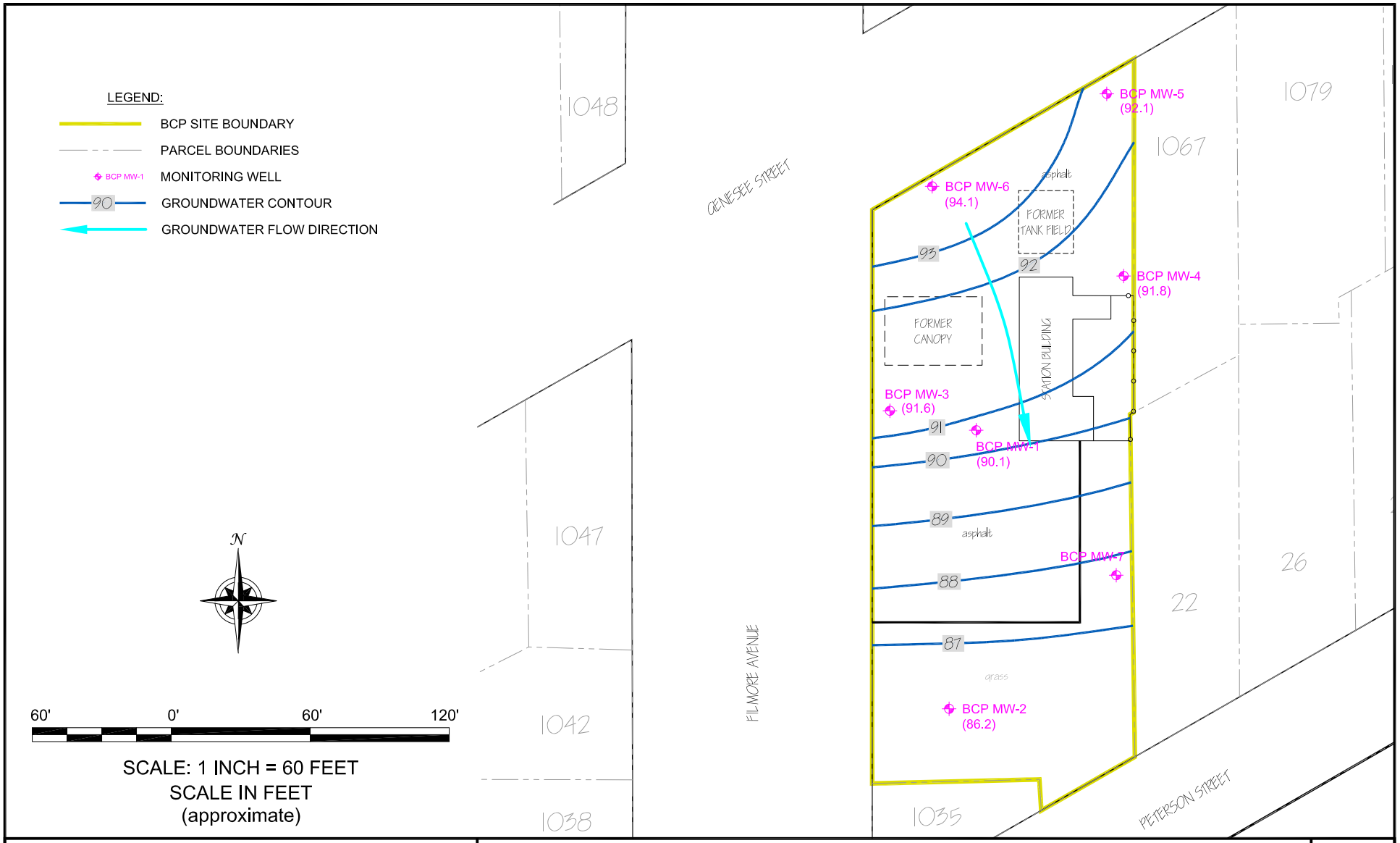
F:\CAD\Benchmark\NOCO\1055 Genesee Street BCP\RI-AAR-IRM (Jan 09)\Figure 5; GW Isopotential Map.dwg



BENCHMARK ENVIRONMENTAL ENGINEERING & SCIENCE, PLLC
2558 HAMBURG TURNPIKE
SUITE 300
BUFFALO, NY 14218
(716) 856-0599

PROJECT NO.: 0112-010-300

DATE: APRIL 2009

DRAFTED BY: NTM

GROUNDWATER ISOPOTENTIAL MAP

RI/AAR/IRM REPORT

NOCO #S 41 SITE
BCP SITE No. C915211
BUFFALO, NEW YORK

PREPARED FOR

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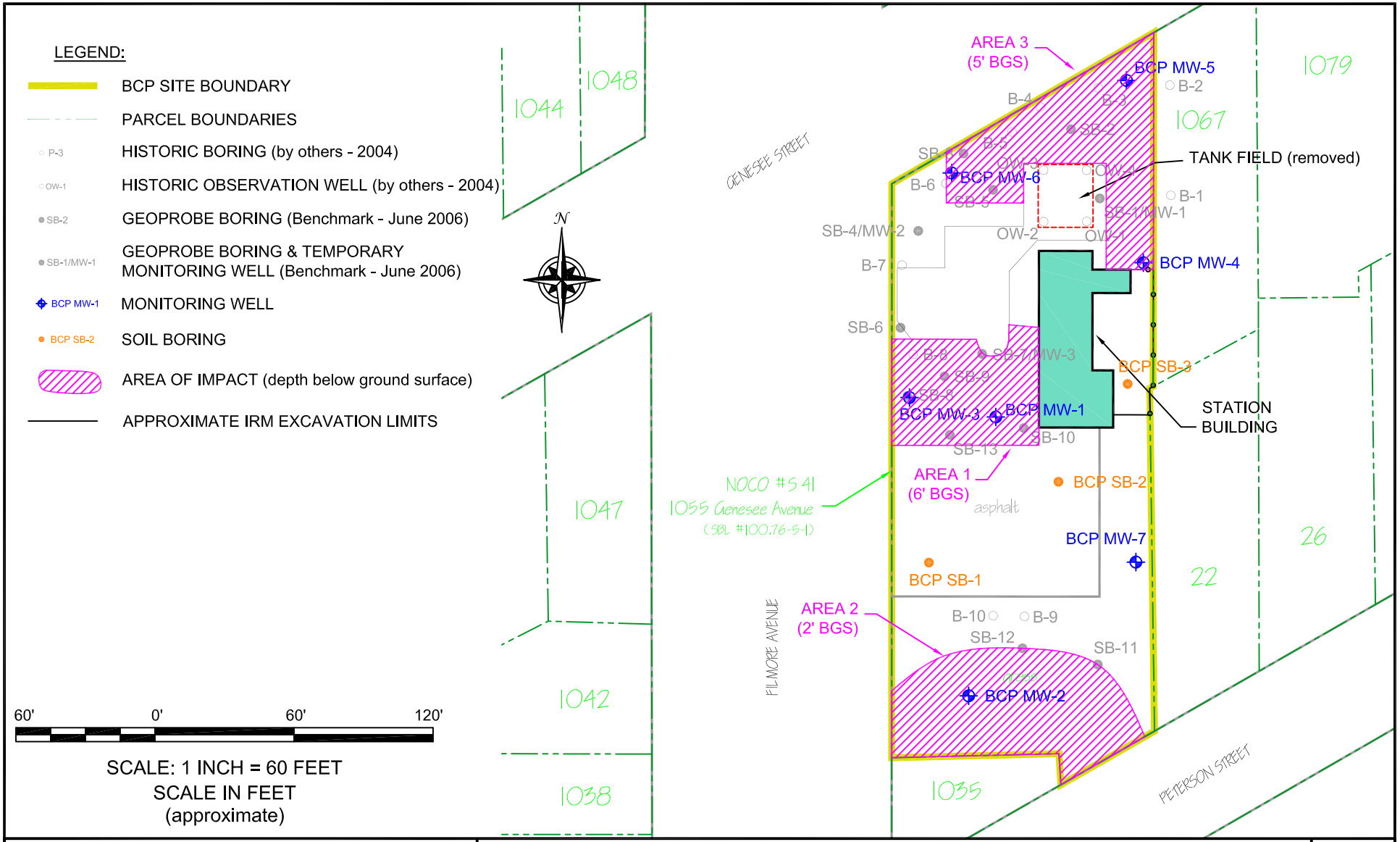
FIGURE 5

F:\CAD\Benchmark\NOCO\1055 Genesee Street BCP\RI-AAR-IRM (Jan 09)\Figure 6; Unrestricted Use Alternatives.dwg



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726 EXCHANGE STREET
SUITE 624
BUFFALO, NEW YORK 14210
(716) 856-0599

PROJECT NO.: 0112-010-300

DATE: APRIL 2009

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AREAS OF IMPACT
UNRESTRICTED USE ALTERNATIVE

RI / AAR / IRM REPORT

NOCO #S 41 SITE
BCP SITE No. C915211
BUFFALO, NEW YORK
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FIGURE 6