Niagara Falls Air Reserve Station, New York

Final

Pre-Design Investigation Quality Assurance Project Plan Addendum No. 1

Investigations at Sites ST009 and ST011 and Amendment for Site LF008

May 2014

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This Final Quality Assurance Project Plan Addendum No. 1 details additional sampling at Sites ST009 and ST011 located at the Niagara Falls Air Reserve Station. Also included is an amendment to the original QAPP detailing a change in proposed monitoring well locations at LF008.

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Final

Pre-Design Investigation Quality Assurance Project Plan Addendum No. 1 Performance-based Remediation for Niagara Falls ARS, New York

Prepared for

Air Force Civil Engineer Center

Environmental Restoration Division
Lackland Air Force Base, Texas 78236-9853
Contract No: FA8903-09-D-8588, Task Order 0006

May 2014

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Acronyms and Abbreviations

AFCEC	Air Force Civil Engineer Center
ARS	Air Reserve Station
bgs	Below ground surface
COC	Constituent of Concern
COPC	Constituent of Potential Concern
DoD	Department of Defense
DQO	Data quality objective
EA	EA Engineering, Science, and Technology, Inc.
EB	Equipment Blank
E&E	Ecology and Environment, Inc.
EPA	U.S. Environmental Protection Agency
ERPIMS	Environmental Restoration Program Information Management System
FS	Feasibility Study
ft	Foot (feet)
in.	Inch(es)
mg/kg	Milligram(s) per kilogram
MS/MSD	Matrix Spike/Matrix Spike Duplicate
NYSDEC	New York State Department of Environmental Conservation
PDB	Passive Diffusion Bag
QA	Quality assurance
QAPP	Quality Assurance Project Plan
QC	Quality control
RAWP	Remedial Action Work Plan
RI	Remedial Investigation
SC	Site Closeout
SCO	Soil Cleanup Objective
µg/L	Micrograms per liter
UU	Unrestricted Use
VOC	Volatile organic compound

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EXECUTIVE SUMMARY

This Quality Assurance Project Plan (QAPP) Addendum No. 1, which has been prepared for the U.S. Air Force Civil Engineer Center (AFCEC), applies to the environmental investigations to be performed at ST009–Site 4 and ST011–Site 1 at the Niagara Falls Air Reserve Station, New York. This is a performance-based remediation project, which was awarded on 26 September 2012, by the AFCEC to Versar Inc. and teaming partner EA Engineering P.C. and its affiliate EA Science and Technology (EA), as Task Order 0006 under Contract No. FA8903-09-D-8588.

This QAPP is an Addendum to the *Pre-Design Investigation QAPP for Sites FT005, LF008, ST010, SS014, DS002, and DS004* (EA 2014a), and will present project-specific information for additional data collection activities at ST009–Site 4 and ST011–Site 1. Only select worksheets are presented in this Addendum. Refer to the both the *Unrestricted Use Characterization QAPP for Sites DS001, DS003, ST009, ST011, TU956, and TU962* (EA 2013) and the *Pre-Design Investigation QAPP for Sites FT005, LF008, ST010, SS014, DS002, and DS004* for additional information. Also, attached to this Addendum is a March 2014 Amendment to the *Pre-Design Investigation QAPP* (EA 2014a), which details a change in proposed monitoring well locations at site LF008-Site 3 (Appendix A).

Purpose

This QAPP Addendum No. 1 provides instruction and guidance associated with the collection, analysis, and reporting of data to ensure that the data collected are scientifically valid, meet the established quality control objectives, are legally defensible, and support project objectives. Project objectives include conducting pre-design investigations at the two sites to provide data needed to design and implement the planned remediation at each site.

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2.0 References

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QAPP WORKSHEETS #1A AND 2A

Title Page

Site Name/Project Name:	Niagara Falls Air Reserve Station (ARS), Performance-Based Remediation
Site Location/Number:	Niagara Falls ARS, New York
Contract/Work Assignment:	FA8903-09-D-8588, Task Order 0006
Document Title:	Pre-Design Investigation Quality Assurance Project Plan (QAPP) Addendum No. 1
Lead Organization:	Air Force Civil Engineering Center
Preparation Date (Month/Year):	May 2014

The QAPP is (select one): ___ Generic ___X_ Site-Specific

List dates and titles of QAPP documents written for previous site work, if applicable:

Title	Approval Date
UU Characterization QAPP for Sites DS001, DS003, ST009, ST011, TU956, and TU962	August 2013
Pre-Design Investigation QAPP for Sites FT005, LF008, ST010, SS014, DS002, and DS004	January 2014

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QAPP WORKSHEET #10G

Conceptual Site Model for ST009–Site 4

This worksheet describes the conceptual site model (CSM) as applicable to the objectives of this Quality Assurance Project Plan (QAPP) for ST009–Site 4, including site history, environmental setting, project background, contaminant nature and extent, and data gaps in the current CSM.

Site History

ST009–Site 4 (Base Exchange [BX] Motor Vehicle Gas [MOGAS] Leak) is a 0.35-acre open field located on the corner of Kinross and Olmstead Streets at the former BX Gas Station (former Building 405). In 1982, a pipe leading to a MOGAS metal underground storage tank (UST) ruptured at the former BX Gas Station (Building 405) (Engineering-Science 1983). The UST was in direct contact with overburden groundwater; therefore, groundwater entered the tank, displacing an undetermined amount of fuel into the surrounding soil. Gasoline was observed in storm sewers for several weeks after the pipe rupture. The USTs and associated piping were removed in 1990 (Ecology & Environment, Inc. [E&E] 1999).

Environmental Setting

Topography

Topography at ST009–Site 4 is relatively flat, with a gentle slope to the south. The average elevation at the site is 599 ft above mean sea level (AMSL).

Land Use

The site is located on the corner of Kinross and Olmstead Streets at the former BX Gas Station (former Building 405). While the site was paved over at the time of the pipeline rupture, the site is currently a grass covered lot. Current land use is not anticipated to change significantly in the near future. There are no groundwater production wells at or near the site or installation.

Drainage

The nearest surface water body to ST009–Site 4 is Cayuga Creek, which is located approximately 1,800 ft southeast of the site. Runoff from the site flows to a storm drain along the north side of Kinross Street.

Geology

Soils at the site consist of the Odessa Series, defined as gently sloping, poorly-drained, silty clay loams. The unconsolidated subsurface deposits (overburden) at the site consist of a relatively thin veneer of Pleistocene-age fine-grained glaciolacustrine and till deposits (Cadwell, et al., 1986), with an average thickness of 12 ft at the site (E&E 1999).

The bedrock underlying the relatively thin cover of overburden is a brownish-gray to dark gray, fine- to medium-grained, thick-bedded dolostone (Upper Silurian, Lockport Group, Guelph Dolostone Formation, formerly the Oak Orchard Dolostone), which is weathered and highly fractured in the upper 10–25 ft. Horizontal fractures are closely spaced and are occasionally intercepted by high angle vertical fractures (Yager 1997). Regionally, the bedrock dips gently to the south, with fracture sets oriented east-northeast.

Hydrogeology

Hydrostratigraphic units at the site include overburden (saturated unconsolidated materials), shallow bedrock (the upper 5–15 ft of closely-fractured and, hence, more permeable bedrock), and deep bedrock (the less fractured, more competent bedrock). Groundwater in former overburden wells installed at the site was encountered at approximately 6 ft below ground surface (bgs) and groundwater flows generally to the west/southwest (Science Application International Corporation [SAIC] 1991)[1].

In the underlying bedrock, most groundwater flow is within secondary porosity features (i.e., along horizontal bedding planes, vertical fractures, and joints), particularly in the upper 5–15 ft where these openings may be weathered and/or expanded by dissolution. Based on extrapolation of bedrock, groundwater contours based on groundwater elevations, and monitoring wells installed at nearby sites (ST011–Site 1, ST013–Site 2, and ST012–Site 6), groundwater flow in bedrock is generally west and southwest (E&E 1996).

Ecology

ST009–Site 4 is located in the northeastern portion of Niagara Falls Air Reserve Station (ARS), which is a highly developed area consisting of paved roads, parking lots, buildings, and mowed lawns. The area is regularly used by base personnel and provides limited to low quality ecological habitat (E&E 1999). Cayuga Creek provides some higher quality habitat, with riparian vegetation growing along the banks, but the site is not located within or near these riparian areas.

Project Background

Phase I/II and remedial investigation (RI)/feasibility study (FS) investigations were performed from 1983 through 1994, which included the installation and sampling of four monitoring wells (two upgradient [MW4-1 and MW4-2] and two downgradient [MW4-3 and MW4-4]) in 1984. Benzene (23 micrograms per liter [µg/L]) was detected in groundwater above New York State Department of Environmental Conservation (NYSDEC) Class GA standards (1 µg/L) at MW4-3. Total petroleum hydrocarbons and petroleum-related volatile organic compounds (VOCs) (specifically benzene, ethylbenzene, and xylenes) were detected in soil samples collected during the investigations.

The USTs and associated piping were removed in 1990. In 1992, a groundwater and soil vapor extraction system, consisting of two groundwater extraction wells and two soil vapor extraction wells, was installed and operated over a 6 month period. After the 6-month remediation period, only benzene (12 µg/L) was detected in groundwater above NYSDEC Class GA standards (1 µg/L).

Post-remedial soil samples were composited from two depth intervals (4–6 and 10 ft bgs, and 6–8 and 8–10 ft bgs) at two borings. These two soil samples were submitted for analysis by toxicity characteristic leaching procedure for VOCs and polycyclic aromatic hydrocarbons. Total benzene, toluene, and ethylene, and total xylenes (BTEX) concentrations were detected in each sample, but were one to two orders of magnitude less than pre-excavation concentrations. In March 1993, the NYSDEC acknowledged that additional remedial action was not required and listed the site as inactive. However, semiannual groundwater sampling was required for at least 2 years because of the residual contaminant concentrations in subsurface soil. Concentrations of BTEX in groundwater were reported in samples from MW4-3 in 1996 and 1997.

1 Per New York State Regulation 6 NYCRR Part 703, all groundwater in the state is classified as Class GA, which has a defined best usage as "a source of potable water supply."

Seven groundwater sampling events were conducted at monitoring well MW4-3. Total BTEX concentrations decreased to non-detect in November 1996, but increased to 170 µg/L during the following sampling event. Subsequent sampling through March 1998 indicated a decrease in BTEX concentrations (to approximately 40 µg/L) and only benzene (8.3 µg/L) was reported at a concentration exceeding the NYSDEC Class GA standard (1 µg/L) during the last sampling event in September 1998. Additionally, by 1999, no evidence of migration had been observed, as noted by the lack of petroleum-related constituents of concern detected in the furthest downgradient well (MW4-4). Based on the lack of migration and the decline in contaminant concentrations at MW4-3, No Further Action was approved by the NYSDEC for ST009 in 2001. Subsequently, monitoring wells MW4-3 and MW4-4 were abandoned in 2002.

In September 2013, soil and groundwater samples were collected from ST009–Site 4 to verify that the site met Unrestricted Use (UU) criteria (EA 2014b). Subsurface soil and groundwater samples were collected and analyzed for VOCs and semivolatile organic compounds. In addition, one sample from each media was also analyzed for metals (including chromium, cyanide, and mercury), pesticides, polychlorinated biphenyls, and herbicides. Results showed that site-related VOC concentrations in soil and groundwater exceeded NYSDEC UU Soil Cleanup Objectives (SCOs) and Class GA water standards, respectively (Figure 10-G1).

Based on existing subsurface soil and groundwater data, it is expected that active remedial action will be necessary to achieve Site Closeout under NYSDEC regulatory guidelines.

Nature and Extent of Contamination

Based on site history and the associated spill resulting from a ruptured pipeline, petroleum-related VOCs (BTEX constituents and methyl tertiary-butyl ether) and semivolatile organic compounds (naphthalene) were identified as site constituents of potential concern (COPCs).

Analytical results from subsurface soil samples collected during the September 2013 field event indicate the presence of elevated concentrations of COPCs at the site. Concentrations of petroleum-related VOCs (specifically benzene, ethylbenzene, xylenes, n-propylbenzene, 1,2,4-trimethylbenzene, and 1,3,5-trimethylbenzene) were detected in shallow subsurface soil at concentrations exceeding the NYSDEC UU SCOs at 5 of 16 soil borings (Figure 10-G1). Impacted soil boring locations were concentrated in the northeastern corner of the site and closer to the southern-central site boundary. Impacted soil depths ranged from 2 to 6 ft bgs (Figure 10-G2). COPC concentrations in soil collected from the other soil borings were below SCOs.

Analytical results from groundwater samples collected at ST009–Site 4 during this event indicate the presence of COPCs (petroleum-related VOCs) at the site at concentrations exceeding groundwater standards. Concentrations of petroleum-related VOCs (specifically benzene, ethylbenzene, xylenes, MTBE, isopropylbenzene, n-butylbenzene, n-propylbenzene, 1,2,4-trimethylbenzene, and 1,3,5-trimethylbenzene) were detected at concentrations exceeding groundwater standards at three of five groundwater samples. These three samples were taken from boring SB-01, located in the southeast corner of the site and screened from 7 to 12 ft bgs; SB-03, located closer to the northern-central boundary of the site and screened from 5 to 10 ft bgs; and SB-09, located closer to the southern-central boundary of the site and screened from 5.5 to 10.5 ft bgs. COPC concentrations in the other two groundwater samples were at or below groundwater standards.

Data Gaps

Further investigation of subsurface soil is needed to fully delineate soil contamination at the site in an effort to support an evaluation of future remedial actions. Additionally, information regarding the extent of groundwater impacts is necessary to assess remedial options for the treatment of groundwater.

Soil Borings

- Below UU SCOs
- Above UU SCOs

- Approximate Location of Subsurface Utility
- Approximate Site Boundary
- Approximate Groundwater Flow Direction

* = In-situ groundwater sample also collected at boring location. Groundwater impacts were observed at SB-01, SB-09, and SB-03

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Niagara Falls, New York

FIGURE 10-G1
September 2013
Sampling Results
ST009 - Site 4

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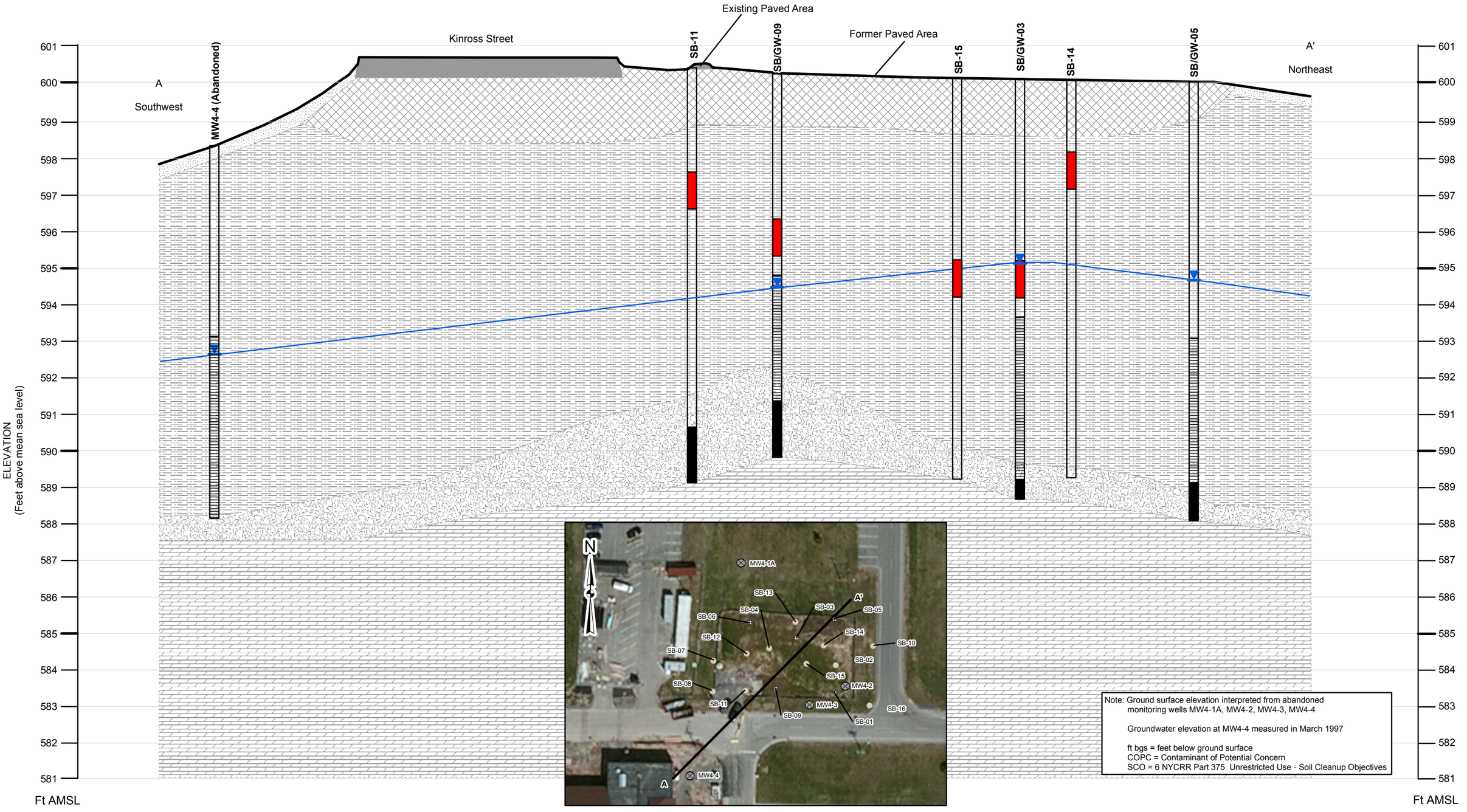

Legend

- Asphalt
- Fill (Disturbed Soil, Gravel)
- Topsoil (Silt and Gravel)
- Lacustrine Deposits (Silt and Clay)
- Till (Unsorted Silty Clay with Sand to Boulders)
- Lockport Dolostone
- Well / Boring
- Screened Interval
- Groundwater Elevation September 2013
- Soil Sample Interval, COPCs exceeding SCOs
- Soil Sample Interval, COPCs Less Than SCOs

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FIGURE 10-G2
Geologic Cross Section
ST009 - Site 4

0 10 20 40 Feet
1 inch = 20 feet

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QAPP WORKSHEET #10H

Conceptual Site Model for ST011–Site 1

This worksheet describes the conceptual site model (CSM) as applicable to the objectives of this Quality Assurance Project Plan (QAPP) for ST011–Site 1, including site history, environmental setting, project background, contaminant nature and extent, and data gaps in the current CSM.

Site History

ST011–Site 1 (Jet Propellant [JP]-4 Pipeline Leak) is a 0.09-acre site located between McGuire Street and Building 600 that is currently used as a roadway and parking area. In 1969, an undetermined volume of JP-4 leaked from a hydrant system, saturating the soil. As an interim remedial measure, the leaking pipeline section was immediately drained, capped at both ends, and abandoned in place. There is no record of associated soil excavation. The area was capped with asphalt in 1986 and is currently used as a roadway and parking area.

Additional potential sources of hydrocarbon contamination in the vicinity of the site included a former diesel fuel service area and an adjacent former fuel oil underground storage tank (UST), which were located south of the former pipeline and Building 600. No documentation of the disposition of the fuel service area or the UST is included in the Niagara Falls Air Reserve Station (ARS) administrative record.

Environmental Setting

Topography

Topography at ST011–Site 1 is relatively flat, with a gentle slope to the south. The average elevation at the site is 592 ft above mean sea level, with a maximum relief of 5 ft (Ecology & Environment, Inc. [E&E] 1999).

Land Use

ST011–Site 1 is currently used as a roadway and parking area. The former diesel fuel service area and associated UST south of the site and Building 600 is located in a grassy area. Current land use is not anticipated to change significantly in the near future.

Drainage

The nearest surface water body to ST011–Site 1 is Cayuga Creek, which is located approximately 0.3 mi south of the site. There are no surface water bodies, drainages, or drainage ditches at the site. Surface runoff drains southward through overland flow to storm sewers that discharge to Cayuga Creek (E&E 1999).

Geology

Soils at the site consist of the Odessa Series, defined as gently sloping, poorly-drained, silty clay loams. The unconsolidated subsurface deposits (overburden) at the site consist of a relatively thin veneer of Pleistocene-age fine-grained glaciolacustrine and till deposits ranging from approximately 5.5 to 12-ft thick (Cadwell, et al. 1986).

The bedrock underlying the relatively thin cover of overburden is a brownish-gray to dark gray, fine- to medium-grained, thick-bedded dolostone (Upper Silurian, Lockport Group, Guelph Dolostone Formation, formerly the Oak Orchard Dolostone), which is weathered and highly fractured in the upper

10–25 ft. Horizontal fractures are closely spaced and are occasionally intercepted by high angle vertical fractures (Yager 1997). Regionally, the bedrock dips gently to the south, with fracture sets oriented east-northeast.

Hydrogeology

Hydrostratigraphic units at the site include overburden (saturated unconsolidated materials), shallow bedrock (the upper 5–15 ft of closely-fractured and more permeable bedrock), and deep bedrock (the less fractured, more competent bedrock). Groundwater exists within the overburden at approximately 5 ft below ground surface (bgs), with flow generally to the southwest.

In the underlying bedrock, most groundwater flow is within secondary porosity features (i.e., along horizontal bedding planes, vertical fractures, and joints), particularly in the upper 5–15 ft where these openings may be weathered and/or expanded by dissolution. Shallow groundwater flow in bedrock is generally to the southwest.

Ecology

Site 1–ST011 is located the northern portion of Niagara Falls ARS, which is a highly developed area consisting of paved roads, parking lots, buildings, and mowed lawns. The area is regularly used by base personnel and provides limited to low quality ecological habitat (E&E 1999). Cayuga Creek provides some higher quality habitat, with riparian vegetation growing along the banks, but the site is not located within or near these riparian areas.

Project Background

As part of a 1991 Installation Restoration Program Remedial Investigation (RI)/Feasibility Study (FS) (Science Application International Corporation 1991), two subsurface soil samples were collected from a single soil boring near the southwest side of Building 600. Total petroleum hydrocarbon concentrations were 18,000 mg/kg and 1,100 mg/kg in the two soil samples. Additional soil samples were collected as part of the 1994 Limited RI/FS (E&E) from locations near the 1991 RI/FS sampling location and immediately south of a former fuel service area. Total petroleum hydrocarbon was detected in those soil samples at concentrations of 150 mg/kg and 440 mg/kg, respectively.

Groundwater monitoring in 10 of 11 overburden and bedrock wells installed at the site showed that there were no contaminants present above New York State Department of Environmental Conservation (NYSDEC) Class GA standards and guidance values. Therefore, NYSDEC concurred with Niagara Falls ARS recommendation that no further action was required for the JP-4 Pipeline Leak according to the No Further Response Action Planned Decision Document (E&E 1999b). With the exception of MW1-3DA (one of the two bedrock monitoring wells at the site), the remaining onsite monitoring wells were abandoned by 1997. MW1-3DA was retained to monitor detections of chlorinated volatile organic compounds, which were not attributed to the JP-4 leak. MW1-3DA was last sampled 2008 and only *cis*-1,2-DCA remained at a concentration greater than the standard (7.1 µg/L) in groundwater. Based on the decreasing trend in chlorinated volatile organic compound concentrations, MW1-3DA was removed from the base-wide groundwater monitoring program and from the active monitoring requirements of the Resource Conservation and Recovery Act Permit in 2011.

In 2009, a petroleum odor was encountered when soil was excavated during installation of a water line west of the Building 600 loading dock. An additional site investigation was conducted, which included installation of 15 soil borings (SB01-501 through 514) and collection of 6 groundwater samples. Petroleum-related constituents of concern (including ethylbenzene, xylenes, and naphthalene) were detected at concentrations greater than NYSDEC Class GA groundwater standards in one *in situ*

groundwater sample from SB01-504 (Figure 10-H). No additional monitoring wells were installed. None of the compounds that were detected in the associated soil samples exceeded the Unrestricted Use (UU) criteria.

In September 2013, soil and groundwater samples were collected from ST011–Site 1 to verify that the site met UU criteria and NYSDEC Class GA water standards (EA 2014c). The sampling results indicate concentrations of site-related constituents of potential concern (COPCs) (benzene, isopropyl benzene, n-butylbenzene, and n-propylbenzene) in groundwater exceeded the NYSDEC Class GA Water standards (Figure 10-H). Soil concentrations of site-related COPCs were not detected above NYSDEC UU Soil Cleanup Objectives (SCOs). Based on the findings of the UU sampling, additional remedial action at the site is necessary to reduce concentrations of COPCs in groundwater below standards to achieve Site Closeout.

Analytical results from soil samples collected during the September 2013 sampling event indicate that soil meets UU/Unlimited Exposure criteria for site-related COPCs, which were not detected in soil at concentrations exceeding NYSDEC UU SCOs.

Nature and Extent of Contamination

The COPCs for the site, as based on the source (i.e., JP-4 leak), are VOCs (specifically petroleum-related compounds including benzene, toluene, ethylene, and total xylene) and semivolatile organic compounds (specifically polycyclic aromatic hydrocarbons). The 2013 groundwater analytical data indicate there is a localized impact to groundwater at the site. VOCs including benzene, isopropylbenzene, and n-propylbenzene were detected at estimated concentrations exceeding Class GA standards in the sample collected from one location, ST011-GW-SB-04. The depth to bedrock at this location was approximately 8.5 ft bgs. Elevated photoionization detector screening results were observed at 4–6 ft bgs in the associated soil boring; however, site-related COPC concentrations in soil were below respective UU SCO.

Data Gaps

Recent groundwater data at the site are limited to *in situ* groundwater sampling. The installation of overburden monitoring wells is needed to further characterize groundwater impact. These two monitoring wells will also serve as performance monitoring points for future remedial actions.

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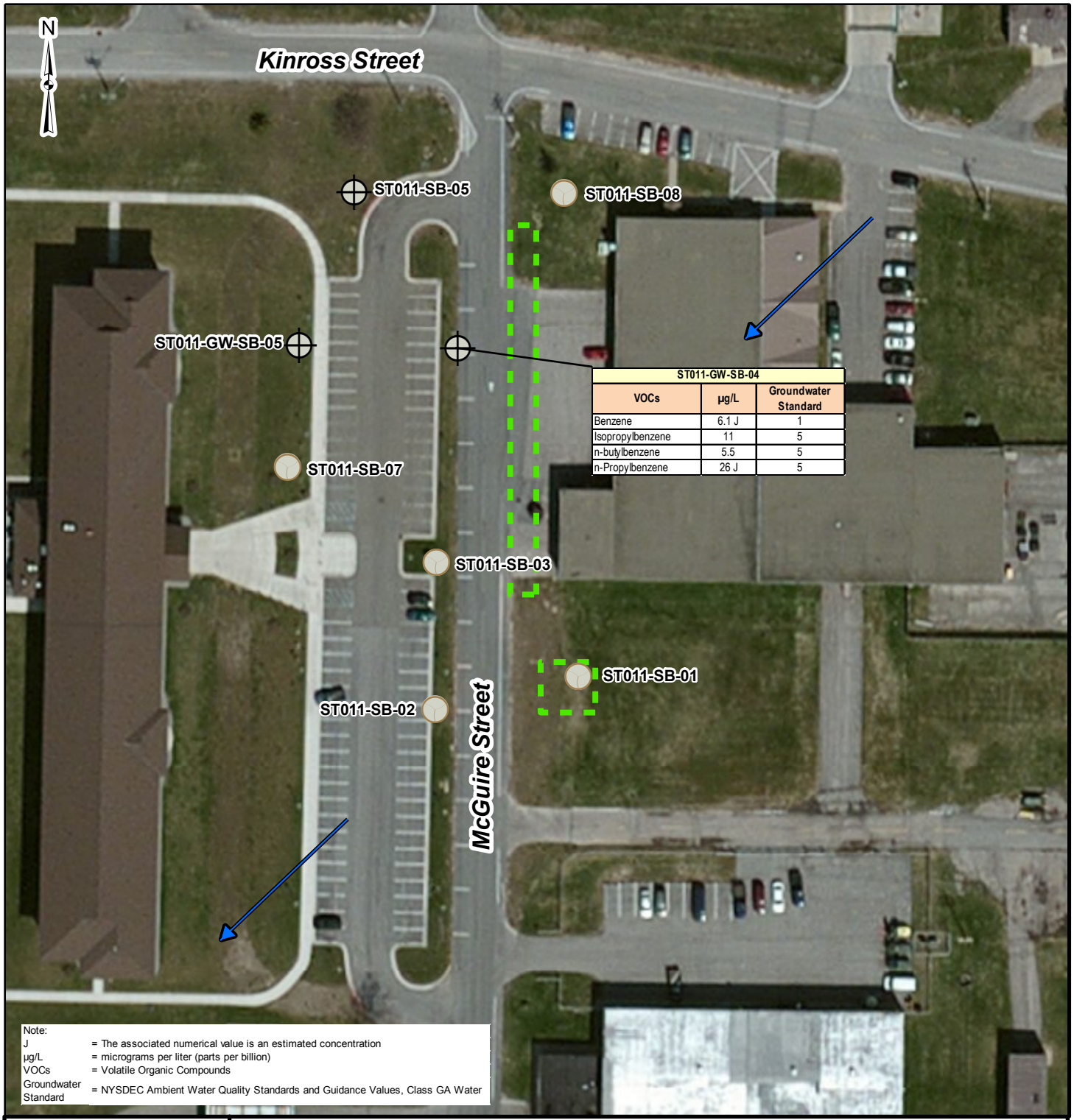
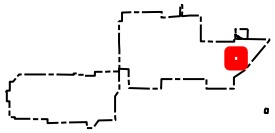


ST011-GW-SB-04		
VOCs	µg/L	Groundwater Standard
Benzene	6.1 J	1
Isopropylbenzene	11	5
n-butylbenzene	5.5	5
n-Propylbenzene	26 J	5

Note:
J = The associated numerical value is an estimated concentration
µg/L = micrograms per liter (parts per billion)
VOCs = Volatile Organic Compounds
Groundwater Standard = NYSDEC Ambient Water Quality Standards and Guidance Values, Class GA Water



Subsurface Soil Sample Location

Approximate Groundwater Flow Direction

Subsurface Soil and Groundwater Sample Location

Approximate Former Source Area

0 150

Feet

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PDI QAPP Addendum No. 1
Niagara Falls Air Reserve Station
Niagara Falls, New York

FIGURE 10-H
September 2013
Sampling Results
ST011 - Site 1

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BY	FD	HW	FD	AS SHOWN	MAY, 2014	6265401	G:\Projects\Federal\DOD\6265401_AFCEC_NFARS\

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QAPP WORKSHEET #11G

Project/Data Quality Objectives for ST009–Site 4

This worksheet is used to develop and document project data quality objectives (DQOs) using a systematic planning process that follows the U.S. Environmental Protection Agency (EPA) DQO Process, and documents the environmental decisions that need to be made and the level of data quality needed. The DQO process is outlined in the EPA 2006 guidance document entitled *Guidance on Systematic Planning Using the DQOs Process* (EPA/240/B-06/001, February 2006) (EPA 2006).

The seven steps are as follows: (1) State the Problem, (2) Identify the Goals of the Study, (3) Identify Information Inputs, (4) Define the Boundaries of the Study, (5) Develop the Analytic Approach, (6) Specify Performance or Acceptance Criteria, and (7) Develop a Detailed Plan for Data Collection. The specific quality assurance (QA)/quality control (QC) requirements developed for the site are consistent with those presented in the Department of Defense (DoD) Quality Systems Manual, Version 4.2 (DoD 2010).

1. State the Problem

Soil and groundwater sampling was conducted in September 2013 at ST009–Site 4 in accordance with the *Unrestricted Use (UU) Characterization Quality Assurance Project Plan (QAPP) for Sites DS001, DS003, ST009, ST011, TU956, and TU962* (EA 2013). The sampling results for soil indicate that concentrations of site-related constituents of potential concern, including volatile organic compounds (VOCs) (1,2,4-trimethylbenzene, 1,3,5-trimethylbenzene, benzene, ethylbenzene, n-propylbenzene, and xylenes), exceed New York State Department of Environmental Conservation (NYSDEC) UU Soil Cleanup Objectives in 5 of the 16 soil borings. The sampling results for groundwater indicate that concentrations of site-related VOCs (1,2,4-trimethylbenzene, 1,3,5-trimethylbenzene, benzene, ethylbenzene, isopropylbenzene, m,p-xylene, methyl tert-butyl-ether, n-butylbenzene, and n-propylbenzene) exceeded the NYSDEC Class GA Water standards in 3 of 5 sampling locations (ST009-GW-SB-01, ST009-GW-SB-03, and ST009-GW-SB-09).

2. Identify the Goals of the Study

The data collected under this plan will be used to delineate the extent of soil contamination, groundwater contamination, and collect data to design the remedial actions at ST009–Site 4.

3. Identify Information Inputs

To delineate soil contamination at ST009–Site 4, the following data will be collected:

1. Soil borings (ST009-SB-01A through ST009-SB-32A) will be installed in the centroid of the 10 ft × 10 ft grid cell adjacent to the limits of excavations (Figure 11-G) to collect soil samples for laboratory analysis.
2. A lithological description of the soil retrieved from the soil boring will be created.

To delineate groundwater contamination at ST009–Site 4, the following data will be collected:

1. Overburden groundwater monitoring wells MW4-5 through MW4-8 will be installed as seen in Figure 11-G to collect groundwater samples for laboratory analysis.

Samples will be submitted for VOCs. Sample design and rationale is discussed in Worksheet #17A. Worksheet #18A summarizes the sampling program (including target analytes, analytical groups, and sample collection methods) that is proposed to satisfy the scope of the investigation.

4. Define Boundaries of the Study

Figure 11-G presents the proposed soil sampling location; thereby, defining the lateral boundaries for this media. Step 3 of the DQOs lists target analytes for soil and will be detailed further in Worksheet #18A. The vertical extent of the investigation will be 1–7 ft below ground surface (bgs) based on the previous sampling results.

The temporal extent of the field activities to be performed under this plan is May/June 2014.

5. Develop the Analytic Approach

Groundwater and sub-surface soil (1–7 ft bgs) samples will be collected and analyzed for VOCs.

6. Specify Performance or Acceptance Criteria

The analyte groups need to be sufficient to allow for comparison of the data to the VOC list of UU criteria. Therefore, the laboratory reporting limits and achievable laboratory detection limits need to be below those criteria. Laboratory analyses will be conducted by a DoD and New York State Department of Health Environmental Laboratory Accreditation Program-certified laboratory, using the most current NYSDEC Analytical Services Protocol methods, as per NYSDEC Division of Environmental Remediation-10 guidance (2010). Category B laboratory data deliverables will be obtained. Following the receipt of analytical laboratory results, Data Usability Summary Reports will be prepared by an independent third party. The validated data will be compared to the appropriate regulatory criteria.

Additional detail on sampling methodology, analyses, and equipment is provided in subsequent QAPP worksheets.

7. Develop a Detailed Plan for Data Collection

The location for field activities was chosen based on results from the September 2013 soils sampling results. Worksheet #17G provides the sample design and rationale; Worksheet #18A provides additional detail on sample locations, media, suite of analytes, and sample collection tools; and Worksheet #20A provides information on QC samples.

How Will Data Be Reported

A Remedial Action Work Plan (RAWP) will be prepared at the conclusion of the field operations and will consist of a comprehensive compilation of the data collected under this project. The RAWP will include a detailed narrative of each field activity; a summary of the sampling conducted; any deviations from the *Pre-Design Investigation QAPP for Sites FT005, LF008, ST010, SS014, DS002, and DS004* (EA 2014a) and this QAPP Addendum; data assessment and evaluation; an interpretation of data as per the scope of this plan; proposed remedial action; and proposed confirmation sampling. Site drawings, figures, laboratory analytical reports, field forms, and photographs documenting field activities will be included as attachments to the work plan. Ultimately, the RAWP will be comprehensive in nature and will outline implementation procedures for the proposed remedial actions and confirmation sampling.

How Will Data Be Archived

The electronic data deliverables and laboratory data reports will be collected in project archives in existing electronic formats provided by the analytical laboratory. Data will be submitted to, and archived with, Air Force Civil Engineer Center through the Environmental Resources Program Information Management System (ERPIMS). ERPIMS is the database that the Air Force uses for data management and validation from environmental projects at all Air Force Bases. Data will also be archived in the Niagara Falls Air Reserve Station base-specific database, as well as the NYSDEC Environmental Information Management System in the EQuIS™ electronic data deliverable format.

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Proposed Monitoring Well

Soil Borings

Below UU SCOs

Above UU SCOs

Potential Impact Area

Excavation Required

Potential Area of Impact

Approximate Groundwater Flow Direction

Approximate Location of Subsurface Utility

Approximate Site Boundary

Note: Groundwater impact were observed at SB-01, SB-09, and SB-03

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FIGURE 11-G
Additional Investigation Area and Proposed Monitoring Wells
ST009 - Site 4

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QAPP WORKSHEET #11H

Project/Data Quality Objectives for ST011–Site 1

This worksheet is used to develop and document project data quality objectives (DQOs) using a systematic planning process that follows the U.S. Environmental Protection Agency (EPA) DQO Process and documents the environmental decisions that need to be made and the level of data quality needed. The DQO process is outlined in the EPA 2006 guidance document entitled *Guidance on Systematic Planning Using the DQOs Process* (EPA/240/B-06/001, February 2006) (EPA 2006).

The seven steps are as follows: (1) State the Problem, (2) Identify the Goals of the Study, (3) Identify Information Inputs, (4) Define the Boundaries of the Study, (5) Develop the Analytic Approach, (6) Specify Performance or Acceptance Criteria, and (7) Develop a Detailed Plan for Data Collection. The specific quality assurance (QA)/quality control (QC) requirements developed for the site are consistent with those presented in the Department of Defense (DoD) Quality Systems Manual, Version 4.2 (DoD 2010).

1. State the Problem

Soil and groundwater sampling was conducted in September 2013 at ST011–Site 1 in accordance with the *Unrestricted Use (UU) Characterization Quality Assurance Project Plan (QAPP) for Sites DS001, DS003, ST009, ST011, TU956, and TU962* (EA 2013). Soil sample results for constituents of potential concern (COPCs) from all locations at ST011–Site 1 were below UU criteria. Groundwater sampling results indicated that site-related volatile organic compounds (VOCs) (benzene, isopropylbenzene, and n-propylbenze) exceeded New York State Department of Environmental Conservation (NYSDEC) Class GA standards at one sampling location, ST011-GW-SB-04 (EA 2014c). Elevated photoionization detector screening readings were observed at 4-6 ft below ground surface in the associated soil boring; however, site-related COPC concentrations in soil were below respective UU Soil Cleanup Objective. Therefore, analytical results from soil samples collected at ST011–Site 1 indicate that the soil meets UU/Unlimited Exposure criteria for site related COPCs. However, analytical results from groundwater samples collected at the site indicate that there is a localized impact to groundwater at ST011–Site 1.

2. Identify the Goals of the Study

The data collected under this plan will be used to validate *in-situ* groundwater sampling results at ST001-Site 1 and monitor performance of remedial actions at the site.

3. Identify Information Inputs

To validate and monitor groundwater contamination at ST011–Site 1, the following data will be collected:

1. As seen in Figure 11-H, overburden groundwater monitoring wells ST011-MW-01A and ST011-MW-02A will be installed at sampling location ST011-GW-SB-04 and near the historic sampling location SB-01-504-GW to collect groundwater samples for laboratory analysis.

Samples will be submitted for VOCs. Sample design and rationale is discussed in Worksheet #17H. Worksheet #18A summarizes the sampling program (including target analytes, analytical groups, and sample collection methods) that is proposed to satisfy the scope of the investigation.

4. Define Boundaries of the Study

Figure 11-H1 presents the proposed groundwater monitoring well locations; thereby, defining the lateral boundaries for this media. Step 3 of the DQOs lists target analytes for groundwater and will be detailed further in Worksheet #18A. The vertical extent of the investigation will be 7–12 ft below ground surface based on the previous sampling results and the location of the water table at the site.

The temporal extent of the field activities to be performed under this plan is May 2014.

5. Develop the Analytic Approach

Groundwater samples from wells screened across the water table will be collected and analyzed for VOCs.

6. Specify Performance or Acceptance Criteria

The analyte groups need to be sufficient to allow for comparison of the data to the VOC list of UU criteria. Therefore, the laboratory reporting limits and achievable laboratory detection limits need to be below those criteria. Laboratory analyses will be conducted by a DoD and New York State Department of Health Environmental Laboratory Accreditation Program-certified laboratory, using the most current NYSDEC Analytical Services Protocol methods, as per NYSDEC Division of Environmental Remediation-10 guidance (2010). Category B laboratory data deliverables will be obtained. Following the receipt of analytical laboratory results, Data Usability Summary Reports will be prepared by an independent third party. The validated data will be compared to the appropriate regulatory criteria.

Additional detail on sampling methodology, analyses, and equipment is provided in subsequent QAPP worksheets.

7. Develop a Detailed Plan for Data Collection

The location for field activities was chosen based on results from the September 2013 soils sampling results. Worksheet #17H provides the sample design and rationale; Worksheet #18A provides additional detail on sample locations, media, suite of analytes, and sample collection tools; and Worksheet #20A provides information on QC samples.

How Will Data Be Reported

A Remedial Action Work Plan (RAWP) will be prepared at the conclusion of the field operations and will consist of a comprehensive compilation of the data collected under this project. The RAWP will include a detailed narrative of each field activity; a summary of the sampling conducted; any deviations from the *Pre-Design Investigation QAPP for Sites FT005, LF008, ST010, SS014, DS002, and DS004* (EA 2014a) and this QAPP Addendum; data assessment and evaluation; an interpretation of data as per the scope of this plan; proposed remedial action; and proposed confirmation sampling. Site drawings, figures, laboratory analytical reports, field forms, and photographs documenting field activities will be included as attachments to the work plan. Ultimately, the RAWP will be comprehensive in nature and will outline implementation procedures for the proposed remedial actions and confirmation sampling.

How Will Data Be Archived

The electronic data deliverables and laboratory data reports will be collected in project archives in existing electronic formats provided by the analytical laboratory. Data will be submitted to, and archived with, Air Force Civil Engineer Center through the Environmental Resources Program Information Management System (ERPIMS). ERPIMS is the database that the Air Force uses for data management and validation from environmental projects at all Air Force bases. Data will also be archived in the Niagara Falls Air Reserve Station base-specific database, as well as the NYSDEC Environmental Information Management System in the EQuIS™ electronic data deliverable format.

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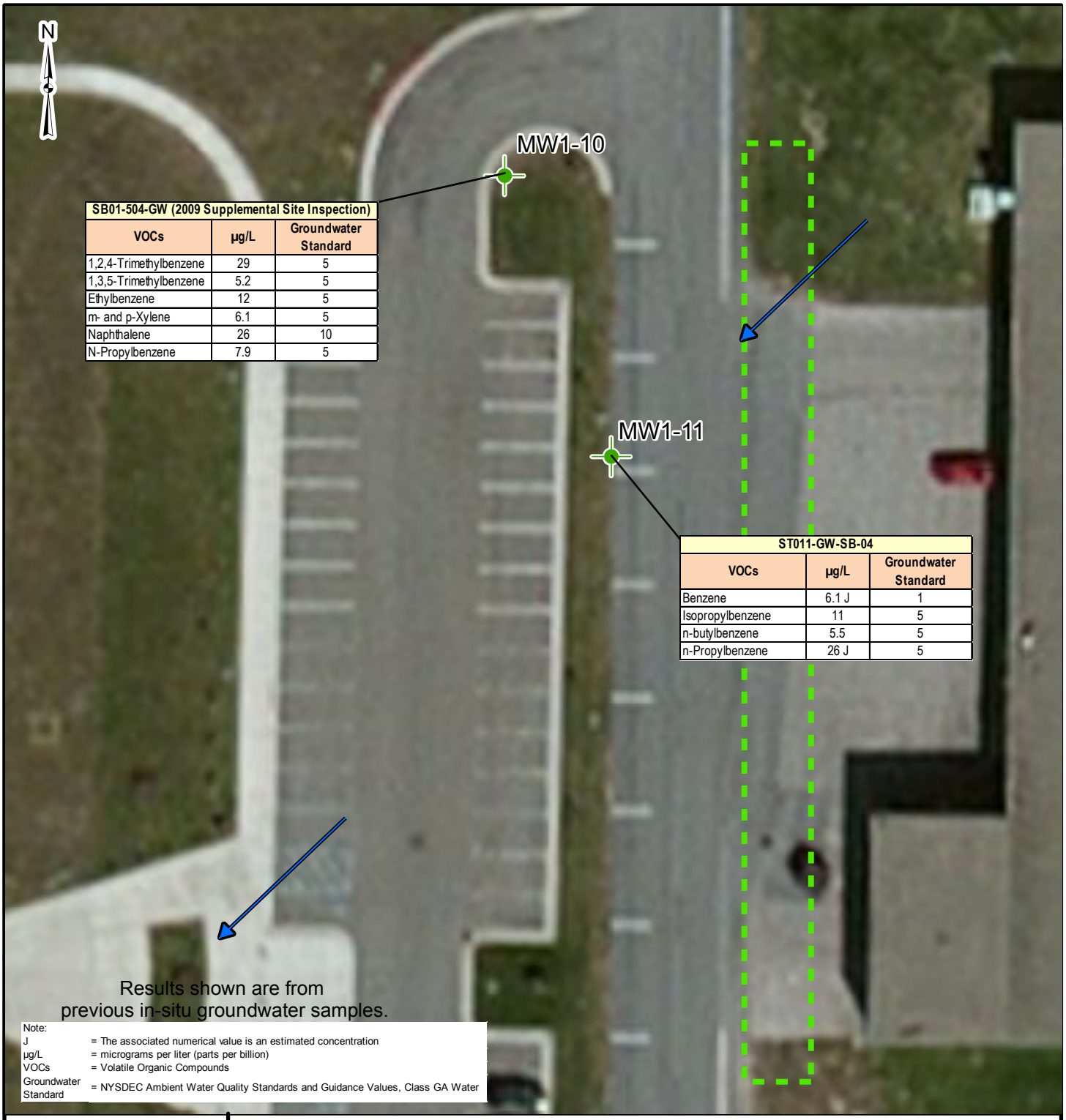
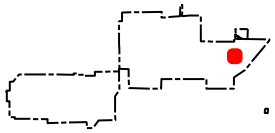


SB01-504-GW (2009 Supplemental Site Inspection)		
VOCs	µg/L	Groundwater Standard
1,2,4-Trimethylbenzene	29	5
1,3,5-Trimethylbenzene	5.2	5
Ethylbenzene	12	5
m- and p-Xylene	6.1	5
Naphthalene	26	10
N-Propylbenzene	7.9	5

ST011-GW-SB-04		
VOCs	µg/L	Groundwater Standard
Benzene	6.1 J	1
Isopropylbenzene	11	5
n-butylbenzene	5.5	5
n-Propylbenzene	26 J	5

Note:
J = The associated numerical value is an estimated concentration
µg/L = micrograms per liter (parts per billion)
VOCs = Volatile Organic Compounds
Groundwater Standard = NYSDEC Ambient Water Quality Standards and Guidance Values, Class GA Water



Approximate Former Source Area

Proposed Overburden Well

Approximate Groundwater Flow Direction

0 50

Feet

Service Layer Credits: Source: Esri, DigitalGlobe, GeoEye, i-cubed, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community

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FIGURE 11-H
Proposed Monitoring Well Locations
ST011 - Site 1

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QAPP WORKSHEET #17G

Sample Design and Rationale for ST009–Site 4

Describe and provide a rationale for choosing the sampling approach (e.g., grid system, biased statistical approach)

The rationale for choosing the sampling approach is focused on obtaining additional data necessary to identify the extent of soil and groundwater impacts at the site. As described in Worksheet #11A, the constituents of potential concern (COPCs) associated with the subject site are volatile organic compounds (VOCs). Based on sampling conducted in September 2013, soil impacts were observed in five boring locations at the site. Soil sampling will be conducted in the vicinity of these locations to delineate the vertical and horizontal extent of contamination. The sampling approach consists of a establishing a systematic, modified sampling grid with 10 ft spacing. Soil samples will be collected from the centroid of the 10 ft × 10 ft grid cells stepping out from the estimated areas of excavation (Figure 17-G). The gridded approach will provide a better understanding of the extent of any residual source material and also allow refinement of the area where remediation is required. Additionally, four overburden monitoring wells will be installed and used to determine the extent of groundwater contamination. These wells will also be used to sample groundwater during and following the injection of oxygen-release compound in the saturated overburden.

General Procedures

Field methodologies and activities will be consistent with those detailed in the *Pre-Design Investigation Quality Assurance Project Plan (QAPP) for Sites FT005, LF008, ST010, SS014, DS002, and DS004 (EA 2014a).*

Soil Sampling

The proposed soil boring locations are shown on Figure 17-G. The soil borings will be completed using direct-push drilling techniques with a targeted boring depth of 4–6 ft based on previous investigations. Soil will be recovered continuously, described by the onsite geologist according to the Unified Soil Classification System, and screened with a photoionization detector. A soil sample will be submitted for analysis from each soil boring location if there are observations of impact (e.g., soil staining, photoionization detector measurements). In the event that an interval exhibits evidence of impacts, the soil boring will be advanced to the next 1 ft-depth interval and that interval will be evaluated. If impacts are observed, a sample will be collected and the process repeated until no impacts are observed or the water table is reached. If impacts are observed in a boring, a step-out boring will be advanced and sampled using similar evaluation procedures.

Laboratory analysis will be completed in an iterative process based on the results from each tier of sampling (e.g., analytical on remaining samples will not be completed if exceedances of site-related COPCs are not observed in the previous set of samples).

Sampling will be conducted in accordance with the *Unrestricted Use Site Characterization QAPP for Site DS001, DS003, ST009, ST011, TU956, and TU962 (EA 2013)* and the *Pre-Design Investigation QAPP for Sites FT005, LF008, ST010, SS014, DS002, and DS004 (EA 2014a)*.

Additional information regarding the number of samples to be taken and sampling frequency is presented in Worksheets #18A and #20A.

Well Installation

The proposed locations for groundwater monitoring wells ST009-MW-01A through ST009-MW-04A are shown on Figure 11-G. The four new overburden monitoring wells will be installed in borings advanced to the top of bedrock using 4.25-in. diameter hollow-stem augers. The wells will be completed with 2-in. diameter polyvinyl chloride monitoring wells and flush-mount protective covers. The monitoring wells will be constructed with 5–10 ft length of 0.010-in. slot screen and an appropriate length of Schedule 40 polyvinyl chloride riser to the ground surface. A sand pack will be installed around the screen up to 2 ft above the top of the screen. Groundwater is expected at approximately 6 ft bgs. A 2-ft bentonite seal will be placed above the sand pack and the remaining annular space will be filled with bentonite grout to approximately 0.5-ft below the surface.

The wells will be secured with a locking J-plug and a bolt-down flush-mount cover or an above grade locking steel protective casing. A concrete pad will be installed around the protective casing.

Newly installed monitoring wells will be developed no sooner than 24-hrs following installation.

Groundwater Sampling

Groundwater samples will be collected from the installed monitoring wells using passive diffusion bag (PDB) samplers. Water levels and total well depths will be measured at each well prior to placement of the PDB sampler. Samples from monitoring wells ST009-MW-01A through ST-MW-04A will be analyzed for VOCs using the PDB samplers. Sampling will be conducted in accordance with the *Pre-Design Investigation QAPP for Sites FT005, LF008, ST010, SS014, DS002, and DS004 (EA 2014a)*.

Additional information regarding the number of samples to be taken and sampling frequency is presented in Worksheets #18A and #20A.

Surveying

Newly installed and existing wells will be surveyed by a New York State-licensed, professional surveyor. Horizontal coordinates will be determined to the nearest foot and referenced to the New York State Plane coordinates, Western Zone, 3130, NAD 1983. Ground surface elevation and top of well casing elevation will be determined to the nearest 0.01 in. and referenced to a vertical datum (1929 mean sea level).

Quality Assurance and Quality Control

The types of trip blanks, rinsate blanks, duplicates, and matrix spike/matrix spike duplicate sample sets to be collected during subsurface soil and groundwater sampling are described below. The number of quality assurance / quality control samples to be collected is provided in Worksheet #18A.

Field Duplicates—One duplicate will be collected at a rate of 20 percent from pre-selected sampling locations.

Matrix Spike/Matrix Spike Duplicate (MS/MSD)—MS/MSD samples will be collected at a rate of 20 percent from pre-selected sampling locations. One MS/MSD sample will be collected during each groundwater sampling event.

Equipment Blanks (EBs)—EBs will be collected by passing deionized water over non-dedicated, decontaminated sampling equipment. As tubing will be dedicated for single use and disposed of after sampling, tubing will not be included in EB sampling. One EB will be collected at a rate of 20 percent.

Trip Blanks—Trip blanks will be laboratory supplied and will be submitted with the sample delivery group.

Additional information regarding concentration levels, sampling locations, number of samples to be taken, and sampling frequency is presented in Worksheets #18A and #20.

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Soil Borings

- Below UU SCOs
- Above UU SCOs
- Proposed Soil Borings

- Proposed Monitoring Well

Potential Impact Area

- Excavation Required
- Potential Area of Impact

- Approximate Location of Subsurface Utility
- Approximate Site Boundary
- Approximate Groundwater Flow Direction

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FIGURE 17-G
Proposed Soil Boring Locations
ST009 - Site 4

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QAPP WORKSHEET #17H

Sample Design and Rationale for ST011–Site 1

Describe and provide a rationale for choosing the sampling approach (e.g., grid system, biased statistical approach)

The rationale for choosing the sampling approach focused on obtaining the additional data necessary to validate the *in situ* groundwater sampling results of September 2013, while monitoring the performance of the proposed remedial action. As described in Worksheet #11H, the constituents of potential concern associated with the subject site are volatile organic compounds (VOCs). The affected medium at ST011-Site 1 is groundwater. Based on sampling conducted in September 2013, potential impacts are limited to one sampling location (i.e., ST011-GW-SB-04). Sampling will be conducted at this location and at SB-01-504-GW to monitor the performance of remedial actions, and to verify that VOCs concentrations in groundwater meet New York State Department of Environmental Conservation (NYSDEC) Class GA standards. Demonstrating that potentially affected site media meet the Unrestricted Use (UU) criteria for a full suite of analytes will allow for site closure without reliance on institutional or administrative controls (NYSDEC 2010).

General Procedures

Field methodologies and activities will be consistent with those detailed in the *Pre-Design Investigation Quality Assurance Project Plan (QAPP) for Sites FT005, LF008, ST010, SS014, DS002, and DS004 (EA 2014a)*.

Well Installation

The proposed locations for groundwater monitoring wells ST011-MW-01A and ST011-MW-02A are sampling locations ST011-GW-SB-04 and SB-01-504-GW, respectively. These locations are shown on Figure 11-H1. The two new overburden monitoring wells/piezometers will be installed in borings advanced to the top of bedrock using 4.25-in. diameter hollow-stem augers. The wells will be completed with 2-in. diameter polyvinyl chloride monitoring wells and flush-mount protective covers. The monitoring wells will be constructed with 5–10 ft length of 0.010-in. slot screen and an appropriate length of Schedule 40 polyvinyl chloride riser to the ground surface. A sand pack will be installed around the screen up to 2 ft above the top of the screen. Groundwater exists within the overburden at approximately 5 ft below ground surface. A 2-ft bentonite seal will be placed above the sand pack and the remaining annular space will be filled with bentonite grout to approximately 0.5 ft below the surface.

The wells will be secured with a locking J-plug and a bolt-down flush-mount cover, or an above-grade locking steel protective casing. A concrete pad will be installed around the protective casing. Newly installed monitoring wells will be developed no sooner than 24-hrs following installation.

Groundwater Sampling

Groundwater samples will be collected from the installed monitoring wells using passive diffusion bag (PDB) samplers. Water levels and total well depths will be measured at each well prior to placement of the PDB sampler. Samples from monitoring wells ST011-MW-01A and ST011-MW-02A will be analyzed for VOCs using the PDB samplers. Sampling will be conducted in accordance with the *Pre-Design Investigation QAPP for Sites FT005, LF008, ST010, SS014, DS002, and DS004 (EA 2014a)*.

Additional information regarding the number of samples to be taken and sampling frequency is presented in Worksheets #18A and #20A.

Surveying

Newly installed and existing wells will be surveyed by a New York State-licensed, professional surveyor. Horizontal coordinates will be determined to the nearest foot and referenced to the New York State Plane coordinates, Western Zone, 3130, NAD 1983. Ground surface elevation and top of well casing elevation will be determined to the nearest 0.01 in. and referenced to a vertical datum (1929 mean sea level).

Quality Assurance and Quality Control

The types of trip blanks, rinsate blanks, duplicates, and matrix spike/matrix spike duplicate sample sets to be collected during subsurface soil and groundwater sampling are described below. The number of quality assurance / quality control samples to be collected is provided in Worksheet #18A.

Field Duplicates—One duplicate will be collected at a rate of 20 percent from pre-selected sampling locations.

Matrix Spike/Matrix Spike Duplicate (MS/MSD)—MS/MSD samples will be collected at a rate of 20 percent from pre-selected sampling locations. One MS/MSD sample will be collected during each groundwater sampling event.

Equipment Blanks (EBs)—EBs will be collected by passing deionized water over non-dedicated, decontaminated sampling equipment. As tubing will be dedicated for single use and disposed of after sampling, tubing will not be included in EB sampling. One EB will be collected at a rate of 20 percent.

Trip Blanks—Trip blanks will be laboratory supplied and will be submitted with the sample delivery group.

Additional information regarding concentration levels, sampling locations, number of samples to be taken, and sampling frequency is presented in Worksheets #18A and #20.

QAPP WORKSHEET #18A

Sampling Locations and Methods

Sampling Location/ Identification Number	Matrix/ Collection Method	Depth (ft bgs)	Analytical Group(s)	Number of Samples (identify field duplicates)[1]	Sampling SOP Reference[1]	Rationale for Sampling Location[3]
ST009-Site 4						
ST009-SB-(rest of ID based on grid coordinate)	Subsurface Soil/direct-push drilling rig; VOCs collected with En Core® or similar.	1-7	• VOCs	• To Be Determined	1-5, 11, 15-16, 25, 31, 39, 47, and 59	Confirm sampling results from September 2013 sampling event; Delineate extent of soil contamination
ST009-MW-01A through ST009-MW-04A	Groundwater/Low-flow sampling/Passive diffusion bag sampling	7-12[2]	• VOCs	• 4 per sampling event • 1 duplicate • 1 matrix spike/matrix	1-5, 10-11, 13, 15-16, 31, 43, 48, and 59	Delineate groundwater contamination; Performance monitoring for future remedial action
ST011-Site 1						
ST011-MW-01A and ST011-MW-02A	Groundwater/Low-flow sampling/Passive diffusion bag sampling	7-12[2]	• VOCs	• 2 per sampling event • 1 duplicate • 1 matrix spike/matrix	1-5, 10-11, 13, 15-16, 31, 43, 48, and 59	Delineate groundwater contamination; Performance monitoring for future remedial actions

1. From the Project Sampling SOP References table (Worksheet #21 of UU QAPP [EA 2013]).
2. Monitoring wells ST009-MW-01A – ST009-MW-04A, ST011-MW-01A, and ST011-MW-02A will be water table wells. Depths may be adjusted in the field.

NOTE: bgs = Below ground surface
SOP = Standard Operating Procedure
VOC = Volatile organic compound

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QAPP WORKSHEET #20A

Field Quality Control Summary

Matrix	Analytical Group	Concentration Level	Analytical Preparation Method/SOP Reference[1]	No. of Samples	No. of Trip Blanks	No. of Equipment Blanks	No. of Field Duplicate Pairs	No. of Matrix Spike/Matrix Spike Duplicate Pairs
ST009-Site 4								
Subsurface Soil	• VOCs	Low	EPA Method 8260C	TBD	1	1 per day	2	2
Groundwater (monitoring wells)	• VOCs	Low	EPA Method 8260C	4	1	1 per day	1	1
ST011-Site 1								
Groundwater (monitoring wells)	• VOCs	Low	EPA Method 8260C	2	1	1 per day	1	1

1. SOPs included in Appendices A (lab) and B (field) of the Unrestricted Use Characterization Quality Assurance Project Plan (EA 2013). Note that SOPs for standard methods are not included.

NOTE: SOP = Standard Operating Procedure
VOC = Volatile organic compound
EPA = U.S. Environmental Protection Agency
TBD = To Be Determined

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Appendix A

Pre-Design Investigation Quality Assurance Project Plan

March 2014 Amendment for

LF008–Site 3

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EA Engineering, P.C.
EA Science and Technology

6712 Brooklawn Parkway, Suite 104
Syracuse, New York 13211
Telephone: 315-431-4610
www.eaest.com

25 March 2014

Kim Powell
914th MSG/CEV
2405 Franklin Drive
Niagara Falls, NY 14304-5063

RE: **Niagara Falls Air Reserve Station – Pre-Design Investigation Modification for LF008 (Site 3) – Overburden Well Locations**

Dear Ms. Powell:

Versar Inc., and its teaming partner, EA Engineering, P.C. and its affiliate EA Science and Technology (EA) are submitting this letter regarding the pre-design investigation at LF008 (Site 3). The existing pre-design investigation included installation of two overburden monitoring wells east of Cayuga Creek. In the Pre-Design Investigation Quality Assurance Project Plan (EA 2014)[1], these wells were shown paired with existing shallow bedrock wells located east of the Niagara Falls Air Reserve Station property fence. After further evaluation, EA is proposing to move these wells west of the fence and pair them with other existing shallow bedrock wells (Figure 17B, attached).

The primary purpose for these new overburden monitoring wells is to provide additional data to evaluate the hydraulic connection between the overburden, shallow bedrock, and surface water. These overburden wells will augment existing shallow bedrock well locations east of the creek, forming a well cluster. This will allow for calculation of vertical hydraulic gradients between overburden and shallow bedrock at these locations, as well as evaluation of hydraulic changes during the aquifer test. Shifting the location of the two proposed shallow bedrock wells closer to the creek, versus the originally proposed locations, will not impact the effectiveness of the monitoring network in evaluating groundwater flow conditions. In fact, it is anticipated that the newly proposed locations will provide better data to evaluate the hydraulic connection between groundwater and surface water, given the reduced distance from the creek channel.

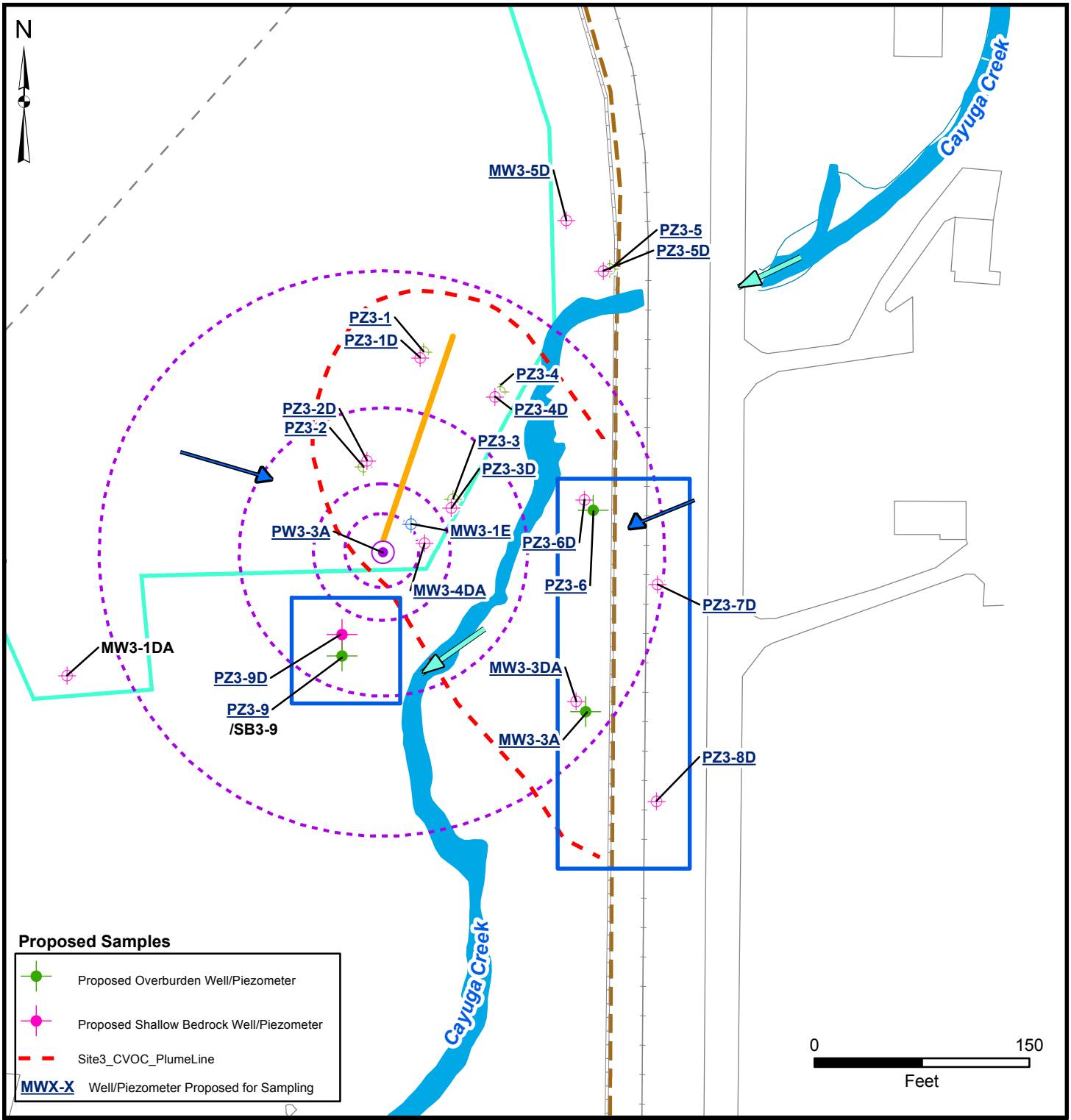
We are requesting approval to install these wells at the revised location. If you have any questions, please feel free to contact me at 315-565-6570.

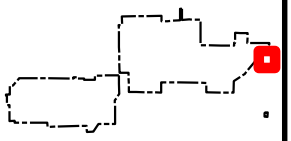
Sincerely,

EA SCIENCE AND TECHNOLOGY

Benjamin Young
Project Manager

[1] EA. 2014. Final Pre-Design Investigation Quality Assurance project Plan for Sites FT005, LF008, ST010, SS014, DS002, and DS004 Performance-Based Remediation for Niagara Falls ARS, New York. January.





Overburden Well/Piezometer
Shallow Bedrock Well/Piezometer
Deep Bedrock Well
Pumping System (Not Active)
Groundwater Collection Trench
Approximate Plume Boundary
Proposed Investigation Area
Proposed Aquifer Test Radii
Groundwater Flow
Surface Water Flow

Pre-Design Investigation
Quality Assurance Project Plan
Niagara Falls Air Reserve Station
Niagara Falls, New York

FIGURE 17B
LF008 - Site 3
Proposed Sample Locations

PROJECT MGR: BY	DESIGNED BY: FD	CREATED BY: FD	CHECKED BY: MH	SCALE: AS SHOWN	DATE: MARCH 2014	PROJECT NO: 6265401	FILE NO: G:\Projects\Federal\DOD\ 6265401_AFCEC_NFARS\