*Final*

# Pre-Design Investigation

# Data Summary Report

# Sites FT005, LF008, ST010, SS014, DS002, and DS004

# Niagara Falls Air Reserve Station, New York

Prepared for

Air Force Civil Engineer Center

Environmental Restoration Division

Lackland Air Force Base, Texas 78236-9853

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# Acronyms and Abbreviations

| | |
|---|---|
| ASP | Analytical Services Protocol |
| bgs | below ground surface |
| CVOC | chlorinated volatile organic compound |
| DOD | Department of Defense |
| EA | EA Engineering, PC and its affiliate EA Science and Technology |
| EPA | United States Environmental Protection Agency |
| ft | foot/feet |
| HPT | hydraulic profiling tool |
| IDW | investigation-derived waste |
| in. | inch |
| IRP | Installation Restoration Program |
| MIP | membrane interface probe |
| NYSDEC | New York State Department of Environmental Conservation |
| PBR | Performance Based Remediation |
| PDB | passive diffusion bag |
| PID | photoionization detector |
| PVC | polyvinyl chloride |
| QAPP | Quality Assurance Project Plan |
| TAL | target analyte list |
| TCL | target compound list |
| VOC | volatile organic compound |

# 1.0 Introduction

The U.S. Department of the Air Force, Air Force Civil Engineer Center, has retained Versar, Inc. and its teaming partner EA Engineering, PC and its affiliate EA Science and Technology (EA) on behalf of the 914th Airlift Wing Mission Support Group/Civil Engineering-Environmental under Contract No. FA8903-09-D-8588, Task Order 0006, to perform remedial actions under a Performance Based Remediation (PBR) contract, at the Niagara Falls Air Reserve Station in Niagara Falls, New York.

As part of the PBR, pre-design investigations were conducted at six sites (Figure 1-1) managed under the U.S. Department of Defense (DOD) Installation Restoration Program (IRP) and in compliance with the requirements of a New York State Department of Environmental Conservation (NYSDEC) Part 373 hazardous waste storage permit (Permit Number 9-2999-00005/00008 issued on 9 March 2010).

This report provides a summary of the data collected during the pre-design investigations conducted during spring and summer 2014 including:

- soil and groundwater sampling at FT005 – Site 10 (Section 2)
- soil and groundwater sampling and well installation at LF008 – Site 3 (Section 3)
- groundwater sampling at ST010 – Site 13 (Section 4)
- soil and groundwater sampling at SS014 – Site 7 (Section 5)
- soil and groundwater sampling and well installation at DS002 – Site 8 (Section 6)
- soil and groundwater sampling and well installation at DS004 – Site 5 (Section 7)

Data collected as part of these investigations will be used to design and implement remedial actions at each site, which will be detailed in a subsequent remedial action work plan.

## 1.1 Overview of Field Activities

Field activities were performed in accordance with the Pre-Design Investigation Quality Assurance Project Plan for Sites FT005, LF008, ST010, SS014, DS002, and DS004 (EA 2014). A summary of samples collected during the investigations is presented in Table 1-1 (soil) and Table 1-2 (groundwater). A summary of wells installed as part of the investigations is presented in Table 1-3.

Monitoring wells and soil borings were installed by Zebra Environmental and SJB Services Inc. Prior to intrusive field activities, a Base Civil Engineering Work Clearance Request was obtained. In March 2014, EA retained a private utility locator firm (Nova Geophysics) to perform a detailed ground penetrating radar survey, which confirmed the locations of subsurface utilities and identified potential anomalies.

Investigative-derived waste (IDW) generated during field investigative activities included:

- drilling fluids and cuttings (soil) derived from well installation activities
- development and groundwater purging fluids
- decontamination fluids
- expendable material (e.g., gloves, tubing, etc.)

Soil and liquid IDW was collected in Department of Transportation approved 55-gallon drums at the point of generation. Drums were clearly labeled with their contents (i.e., drill cuttings, decontamination fluids, or purge water) and origin (i.e., monitoring well ID) and stored in a temporary staging area (storage POD). Soil and water samples representative of each media were collected and analyzed for Resource Recovery and Conservation Act characteristics (reactivity, cyanide, sulfide, ignitibility, and

corrosivity) and toxicity characteristic leaching procedure (including VOCs, SVOCs, metals, pesticides, and herbicides), PCBs, and pH. Following a review of analytical results, drummed IDW was disposed of at an off-site disposal facility as non-hazardous waste, as based on off-site disposal facility specifications. IDW disposal records are provided in Appendix A.

The majority of liquid IDW generated from monitoring well sampling and purging was disposed of at the Site 10 groundwater treatment system, as approved by the base IRP manager. Expendable waste materials generated during field investigative activities included used personal protective equipment, non-dedicated sampling materials (i.e., tubing, filters), and waste paper. Expendable materials were properly disposed of as general debris/trash.

## 1.2 Laboratory Analysis and Data Validation

Laboratory analyses were conducted by Accutest Laboratories, a DOD Environmental Laboratory Accreditation Program and New York State Department of Health, Environmental Laboratory Accreditation Program-certified laboratory, using the most current New York State Department of Environmental Conservation (NYSDEC) Analytical Services Protocol (ASP) methods, as per NYSDEC Division of Environmental Remediation-10 guidance (2010). As per NYSDEC ASP requirements, Category B laboratory data packages were obtained for data validation. Full laboratory reports are provided in Appendix B.

Laboratory data packages were submitted to SGD Environmental for independent, third-party data validation. All samples results were either usable as reported, or with minor qualification. No data were rejected Data Usability Summary Reports are provided in Appendix A.

TABLE 1-1

Soil Sample Collection Summary

*Pre-Design Investigation Data Summary Report*

*Niagara Falls Air Reserve Station, New York*

| Sample Location | Sample Date | Sample Interval (ft bgs) | Sample Analyses | Field Quality Control Samples[(a)] |
|---|---|---|---|---|
| **FT005 - Site 10** | | | | |
| SB10-22 | 3/31/14 | 5 – 7 | VOCs, metals, TOC, grain size, percent solids | MS/MSD |
| SB10-23 | 4/1/14 | 7 – 8 | VOCs and percent solids | |
| SB10-26 | 3/31/14 | 6.5 – 7.5 | VOCs, metals, TOC, grain size, percent solids | SB10-FD-140331 |
| **LF008 - Site 3** | | | | |
| SB3-9 | 6/16/14 | 2.8 – 3.8 | VOCs, metals, TOC, grain size, percent solids | MS/MSD |
| | | 3.8 – 4.8 | | SB3-FD-140616 |
| **SS014 - Site 7** | | | | |
| SB7-01 | 4/29/14 | 3.5-4.5 | VOCs, metals, TOC, grain size, percent solids | SB7-FD-140429 |
| **DS002 - Site 8** | | | | |
| SB8-04 | 4/30/14 | 7 – 8 | VOCs, metals, TOC, grain size, percent solids | |
| | | 8 – 10 | | MS/MSD |
| | | 12 – 14 | | |
| SB8-08 | 4/30/14 | 10 – 12 | | SB8-FD-140430 |
| **DS004 - Site 5** | | | | |
| SB5-03 | 4/4/14 | 8 – 10 | VOCs, metals, TOC, grain size, percent solids | |
| | | 10 – 12 | | SB5-FD-140403 |
| SB5-05 | 4/4/14 | 8 – 10 | | MS/MSD |
| | | 10 – 12 | | |

(a) A rinse blank was collected at the end of the sample collection event.

NOTE: VOC = Volatile organic compound.
TOC = Total organic compound.
MS/MSD = Matrix spike/matrix spike duplicate.
FD = Field duplicate.
ft bgs = Feet below ground surface.

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TABLE 1-2

Groundwater Sample Collection Summary

*Pre-Design Investigation Data Summary Report*

*Niagara Falls Air Reserve Station, New York*

| Well Number | Sample Date | Purge/Sample Method | Sample Analyses | Field Quality Control Samples[a] |
|---|---|---|---|---|
| **FT005 – Site 10** | | | | |
| MW10-2 | 4/30/14 | PDB | VOCs | |
| MW10-3 | 4/30/14 | PDB | VOCs | |
| MW10-4 | 4/30/14 | PDB | VOCs | |
| MW10-6 | 4/30/14 | PDB | VOCs | |
| MW10-7 | 4/30/14 | PDB | VOCs | |
| MW10-10D | 4/30/14 | PDB | VOCs | MS/MSD, Duplicate (MW10-FD-140430) |
| MW10-11 | 4/30/14 | PDB | VOCs | |
| MW10-13 | 4/30/14 | PDB | VOCs | |
| PP10-45 | 4/30/14 | Grab | VOCs | |
| PP10-26 | 4/30/14 | Grab | VOCs | MS/MSD, Duplicate (PP10-FD-140430) |
| PP10-54 | 4/30/14 | Grab | VOCs | |
| PW10-2 | 6/13/14 | Grab[b] | Geochemical[c] | MS/MSD, Duplicate (PW10-2-FD-140613) |
| **LF008 - Site 3** | | | | |
| MW3-1E | 5/1/14 | PDB | VOCs | MS/MSD |
| MW3-3DA | 5/1/14 | PDB | VOCs | |
| MW3-4DA | 5/1/14 | PDB | VOCs | |
| MW3-5D | 5/1/14 | PDB | VOCs | |
| PW3-3A | 5/1/14 | PDB | VOCs | |
| PZ3-1 | 5/1/14 | PDB | VOCs | |
| PZ3-1D | 5/1/14 | PDB | VOCs | Duplicate (PZ3-1D-FD-140501)[d] |
| PZ3-2 | 5/1/14 | PDB | VOCs | |
| PZ3-2D | 5/1/14 | PDB | VOCs | |
| PZ3-3 | 5/1/14 | PDB | VOCs | |
| PZ3-3D | 5/1/14 | PDB | VOCs | |

(a) A trip blank was collected at the beginning of the sample collection event. A rinse blank was collected at the end of the low-flow sample collection events.

(b) The grab sample was collected from the well during active pumping.

(c) Geochemical parameters included: cations/metals, anions (chloride, nitrate, nitrite, sulfate, sulfide), alkalinity, hardness, total organic carbon, dissolved organic carbon, biological oxygen demand, and chemical oxygen demand.

(d) The field duplicate sample field ID is MW3-FD-140501 on the Chain of Custody.

NOTES: ***PZ3-9D*** = Bold and Italicized wells were installed during the Pre-Design Investigation

QC = Quality control.

PDB = Passive diffusion bag.

VOC = Volatile organic compound (Method 8260B).

MS/MSD = Matrix spike/matrix spike duplicate.

FD = Field duplicate.

TABLE 1-2 (Continued)

| Well Number | Sample Date | Purge/Sample Method | Sample Analyses | Field Quality Control Samples[a] |
|---|---|---|---|---|
| PZ3-4 | 5/1/14 | PDB | VOCs | |
| PZ3-4D | 5/1/14 | PDB | VOCs | |
| PZ3-5 | 5/1/14 | PDB | VOCs | |
| PZ3-5D | 5/1/14 | PDB | VOCs | |
| PZ3-6D | 5/1/14 | PDB | VOCs | |
| PZ3-7D | 5/1/14 | PDB | VOCs | |
| PZ3-8D | 5/1/14 | PDB | VOCs | |
| MW3-4DA | 6/10/14 | Low-Flow | Geochemical | MS/MSD |
| PZ3-1D | 6/10/14 | Low-Flow | Geochemical | Duplicate (PZ3-FD-140610) |
| PZ3-1D (7-9 and 11-13 ft) | 6/27/14 | PDBs | VOCs | MS/MSD (7-9 ft) |
| ***PZ3-9D*** | 6/18/14 | Grab | VOCs | |
| | 6/26/14 | Low-Flow | VOCs | Duplicate (PZ3-FD-140626) |
| ***PZ3-06*** | 6/27/14 | Low-Flow | VOCs | |
| ***MW3-3A*** | 6/26/14 | Low-Flow | VOCs | |
| ***PZ3-09*** | 6/26/14 | Low-Flow | VOCs | MS/MSD |
| **ST010 - Site 13** | | | | |
| MW13-3 | 4/23/14 | PDB | VOCs | MS/MSD |
| MW13-4 | 4/23/14 | PDB | VOCs | |
| MW13-4D | 4/23/14 | PDB | VOCs | Duplicate (MW13-FD-140423) |
| MW13-5A | 4/23/14 | PDB | VOCs | |
| MW13-5D | 4/23/14 | PDB | VOCs | |
| PW13-1 | 4/23/14 | PDB | VOCs | |
| PW13-4D | 4/23/14 | PDB | VOCs | |
| PZ13-1 | 4/23/14 | PDB | VOCs | |
| PZ13-1D | 4/23/14 | PDB | VOCs | |
| PZ13-2 | 4/23/14 | Low-Flow | VOCs | |
| PZ13-2D | 4/23/14 | Low-Flow | VOCs | |
| PZ13-3D | 4/23/14 | PDB | VOCs | |
| PZ13-4 | 4/23/14 | PDB | VOCs | |
| PZ13-4D | 4/23/14 | PDB | VOCs | |
| PZ13-3D | 6/11/14 | Low-Flow | Geochemical | Duplicate (PZ13-FD-140611) |
| MW13-5D | 6/11/14 | Low-Flow | Geochemical | MS/MSD |
| MW13-1 | 6/12/14 | PDB | VOCs | |
| MW13-1D | 6/12/14 | PDB | VOCs | MS/MSD |
| MW13-6 | 6/12/14 | PDB | VOCs | Duplicate (MW13-FD-140612) |
| MW13-6D | 6/12/14 | PDB | VOCs | |

TABLE 1-2 (Continued)

| Well Number | Sample Date | Purge/Sample Method | Sample Analyses | Field Quality Control Samples[(a)] |
|---|---|---|---|---|
| **SS014 - Site 7** | | | | |
| MW7-1D | 4/8/14 | PDB | VOCs | |
| MW7-1D | 6/9/14 | Low-Flow | VOCs, Geochemical | MS/MSD, Duplicate (MW7-FD-140609) |
| MW7-2 | 6/9/14 | Low-Flow | VOCs, Geochemical | |
| GW7-01 | 4/30/14 | Grab | VOCs | MS/MSD, Duplicate (GW7-FD-140430) |
| GW7-02 | 4/30/14 | Grab | VOCs | |
| GW7-03 | 4/30/14 | Grab | VOCs | |
| GW7-04 | 4/30/14 | Grab | VOCs | |
| GW7-05 | 4/30/14 | Grab | VOCs | |
| GW7-06 | 4/30/14 | Grab | VOCs | |
| **DS002 - Site 8** | | | | |
| MW8-1 | 4/23/14 | PDB | VOCs | |
| MW8-1E | 4/8/14 | PDB | VOCs | MS/MSD |
| MW8-2D | 4/8/14 | PDB | VOCs | |
| MW8-3 | 4/8/14 | PDB | VOCs | |
| MW8-3DA | 4/8/14 | PDB | VOCs | |
| MW8-4A | 4/8/14 | PDB | VOCs | |
| MW8-8 | 4/8/14 | PDB | VOCs | Duplicate (MW8-FD-140408) |
| MW8-10D | 4/8/14 | PDB | VOCs | |
| PP8-01 | 4/30/14 | Grab | VOCs | |
| PP8-02 | 4/30/14 | Grab | VOCs | |
| PP8-03 | 4/30/14 | Grab | VOCs | MS/MSD, Duplicate (PP8-FD-140430) |
| PP8-04 | 4/30/14 | Grab | VOCs | |
| PP8-05 | 4/30/14 | Grab | VOCs | |
| PP8-06 | 4/30/14 | Grab | VOCs | |
| PP8-07 | 4/30/14 | Grab | VOCs | |
| PP8-08 | 4/30/14 | Grab | VOCs | |
| PP8-09 | 4/30/14 | Grab | VOCs | |
| PP8-10 | 4/30/14 | Grab | VOCs | |
| ***CH8-01*** | 5/21/14 | Grab | VOCs | |
| ***CH8-01*** | 6/10/14 | Low-Flow | VOCs | MS/MSD, Duplicate (CH8-FD-140610) |
| MW8-1 | 6/10/14 | Low-Flow | Geochemical | MS/MSD |

TABLE 1-2 (Continued)

| Well Number | Sample Date | Purge/Sample Method | Sample Analyses | Field Quality Control Samples[a] |
|---|---|---|---|---|
| DS004 - Site 5 | | | | |
| PP5-01 | 4/8/14 | Grab | VOCs | |
| PP5-02 | 4/8/14 | Grab | VOCs | |
| PP5-03 | 4/8/14 | Grab | VOCs | |
| PP5-05 | 4/8/14 | Grab | VOCs | |
| PP5-06 | 4/8/14 | Grab | VOCs | |
| PP5-07 | 4/8/14 | Grab | VOCs | Duplicate (PP5-FD-140408) |
| PP5-08 | 4/8/14 | Grab | VOCs | |
| PP5-09 | 4/8/14 | Grab | VOCs | |
| PP5-10 | 4/8/14 | Grab | VOCs | |
| PP5-11 | 4/8/14 | Grab | VOCs | MS/MSD |
| PP5-12 | 4/8/14 | Grab | VOCs | |
| PP5-13 | 4/8/14 | Grab | VOCs | |
| PP5-14 | 4/8/14 | Grab | VOCs | |
| PP5-15 | 4/8/14 | Grab | VOCs | |
| PP5-16 | 4/8/14 | Grab | VOCs | |
| *CH5-01* | 5/21/14 | Grab | VOCs | |
| *CH5-02* | 5/21/14 | Grab | VOCs | |
| *CH5-03* | 5/21/14 | Grab | VOCs | |
| *CH5-04* | 5/21/14 | Grab | VOCs | |
| MW5-5D | 6/10/14 | Low Flow | Geochemical | Duplicate (MW5-FD-140610) |
| RW5-1 | 6/10/14 | Low Flow | Geochemical | MS/MSD |
| MW5-4D | 6/12/14 | PDB | VOCs | MS/MSD |
| MW5-8D | 6/12/14 | PDB | VOCs | Duplicate (MW5-FD-140612) |
| *CH5-01 (upper)* | 6/12/14 | Low-Flow | VOCs | |
| *CH5-01 (middle)* | 6/13/14 | Low-Flow | VOCs | |
| *CH5-01 (lower)* | 6/12/14 | Low-Flow | VOCs | |
| *CH5-02 (upper)* | 6/12/14 | Low-Flow | VOCs | |
| *CH5-02(middle)* | 6/13/14 | Low-Flow | VOCs | |
| *CH5-02(lower)* | 6/11/14 | Low-Flow | VOCs | Duplicate (CH5-FD-140611) |
| *CH5-03 (upper)* | 6/12/14 | Low-Flow | VOCs | |
| *CH5-03(middle)* | 6/13/14 | Low-Flow | VOCs | |
| *CH5-03(lower)* | 6/12/14 | Low-Flow | VOCs | |
| *CH5-04 (upper)* | 6/11/14 | Low-Flow | VOCs | MS/MSD |
| *CH5-04(middle)* | 6/13/14 | Low-Flow | VOCs | |
| *CH5-04(lower)* | 6/11/14 | Low-Flow | VOCs | |

TABLE 1-3

Monitoring Well Construction Summary

*Pre-Design Investigation Data Summary Report*

*Niagara Falls Air Reserve Station, New York*

| Well Number | Installation Date | Well Diameter (in.) | Total Depth (ft bgs) | Casing Elevation (ft amsl) | Inner Casing Elevation (ft amsl) | Ground Surface Elevation (ft amsl) | Northing | Easting | Screened Interval (ft bgs) |
|---|---|---|---|---|---|---|---|---|---|
| **LF008 - Site 3** | | | | | | | | | |
| MW3-3A | 6/17/2014 | 2 | 4 | 588.3 | 588.07 | 588.2 | 1135107 | 1056459 | 3.0 – 4.0 |
| PZ3-9D | 6/18/2014 | 4 | 22.4 | 591.06 | 591.05 | 588.5 | 1135120 | 1056302 | 7.0 – 22.4 |
| PZ3-06 | 6/17/2014 | 2 | 4 | 588.34 | 588.11 | 588.3 | 1135250 | 1056467 | 3.0 – 4.0 |
| PZ3-09 | 6/17/2014 | 2 | 4.8 | 588.76 | 588.25 | 588.7 | 1135117 | 1056303 | 2.8 – 4.8 |
| **DS002 - Site 8** | | | | | | | | | |
| CH8-01 | 4/24/2014 | 4 | 32.7 | 597.93 | 597.48 | 597.9 | 1136653 | 1051345 | 17.1 – 32.7 |
| **DS004 - Site 5** | | | | | | | | | |
| CH5-01 | 4/22/2014 | 4 | 32.5 | 597.36 | 597.11 | 597.2 | 1135934 | 1050939 | 17.5 – 32.5 |
| CH5-02 | 4/24/2014 | 4 | 33.3 | 597.21 | 596.97 | 597.1 | 1135937 | 1050981 | 18.3 – 33.3 |
| CH5-03 | 4/23/2014 | 4 | 33.5 | 597.73 | 597.18 | 597.7 | 1135912 | 1050932 | 18.5 – 33.5 |
| CH5-04 | 4/23/2014 | 4 | 34.6 | 597.67 | 597.41 | 597.6 | 1135904 | 1050980 | 19.6 – 34.6 |

(a) Northing and Easting coordinates are in New York State Plane Coordinate System, Western Zone, NAD 83 Datum.

(b) Vertical values are referenced to the North American Vertical Datum of 1988 (NAVD 88).

NOTE: amsl = Above mean sea level

ft bgs = Feet below ground surface.

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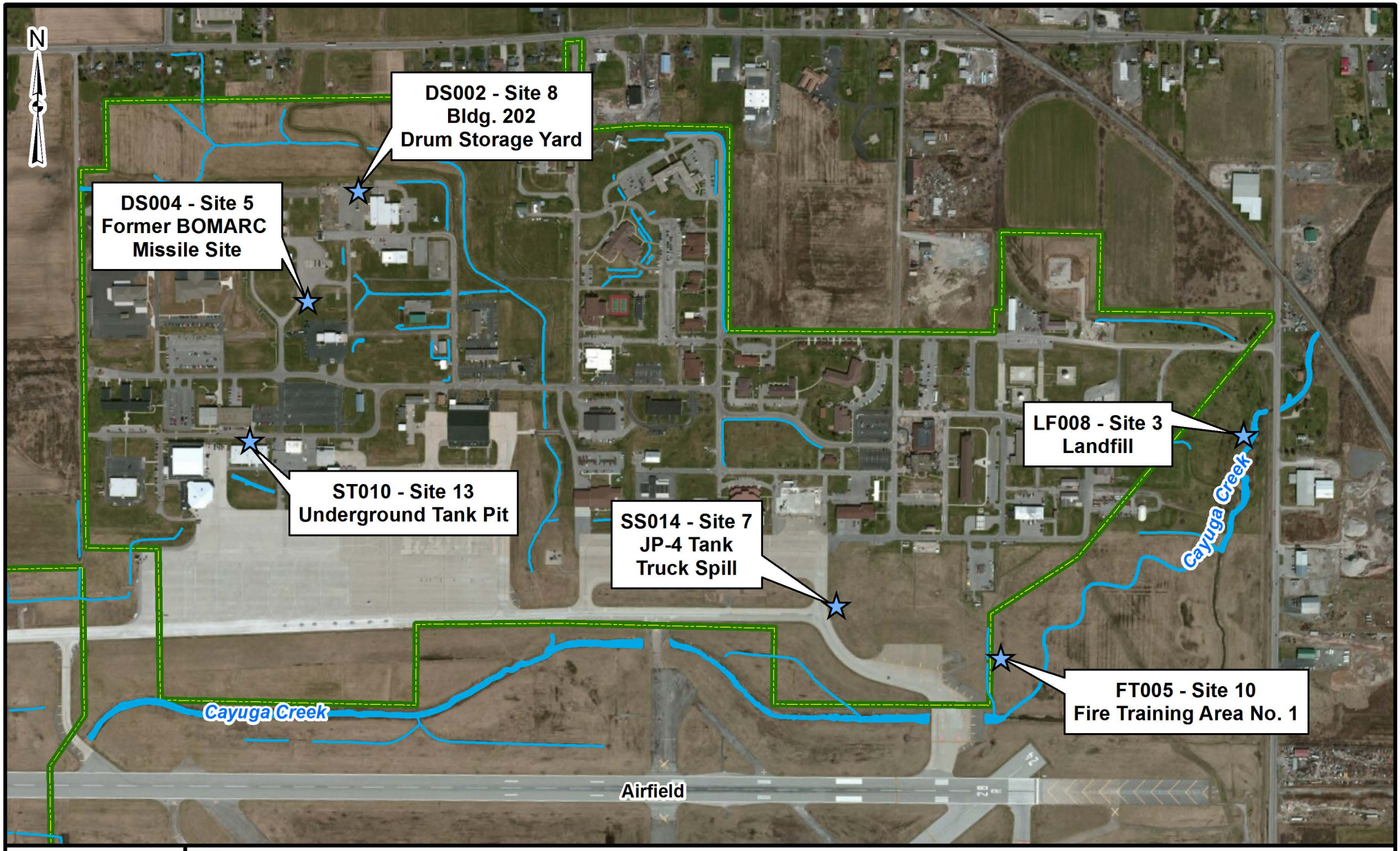


| | | | | | | | |
|---|---|---|---|---|---|---|---|
| EA® | Pre-Design Investigation<br>Data Summary Report<br>Niagara Falls Air Reserve Station<br>Niagara Falls, New York | | | | | FIGURE 1-1<br>Pre-Design Investigation Sites | |
| PROJECT MGR:<br>BY | DESIGNED BY:<br>HW | CREATED BY:<br>HW | CHECKED BY:<br>FD | SCALE:<br>AS SHOWN | DATE:<br>NOVEMBER 2014 | PROJECT NO:<br>6265401 | FILE NO:<br>G:\Projects\Federal\DOD\6265401_AFCEC |

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# 2.0 Soil and Groundwater Sampling at Site FT005 – Site 10

## 2.1 Introduction

Sampling activities at the site were completed from March through June 2014. The contaminants of potential concern associated with the site are chlorinated volatile organic compounds (CVOCs), including trichloroethene and its degradation products (*cis*-1,2-dichloroethene and vinyl chloride), and the potentially affected media are soil and groundwater. Field activities focused on the collection of data to evaluate the residual source material in overburden soil and groundwater.

## 2.2 Subsurface Investigation

### 2.2.1 Soil Profiling

During March – April 2014, 57 membrane interface probe (MIP) borings were completed to evaluate the potential area of residual source material that may be serving as an ongoing source of volatile organic compounds (VOCs) to groundwater (Figure 2-1). MIP borings were completed using direct-push drilling techniques, to the top of bedrock, which is approximately 8–11 feet (ft) below ground surface. Real-time field screening data were collected with the MIP, which is equipped with a flame ionization detector, photoionization detector (PID) and an electron capture detector. MIP logs are provided in Appendix C-1.

### 2.2.2 Hydraulic Profiling

Additional borings were completed adjacent to three MIP locations: SB10-26, SB10-45, and SB10-54 (Figure 2-1). Relative permeability of soils at these locations was evaluated using a hydraulic profiling tool (HPT), which uses hydraulic pressure as a proxy for permeability. HPT logs are provided in Appendix C-2. Temporary, 1-inch-diameter groundwater monitoring points were installed at these locations to collect groundwater grab samples for laboratory analysis of VOCs. Temporary points were constructed with a 5-ft-long screened interval and a riser extending approximately 1 ft above ground surface.

### 2.2.3 Soil Boring

Soil samples were collected from seven soil borings located adjacent to MIP locations (SB10-22,SB10-23, SB10-24, SB10-25, SB10-26, SB10-51, and SB10-52) to allow comparison of the MIP readings to soil observations (e.g., soil classification, evidence of potential contamination including staining, sheens, elevated PID readings, and/or obvious odor). Soil boring logs are provided in Appendix C-3.

Soil samples from three of these additional borings were submitted for laboratory analysis including target compound list (TCL) VOCs by U.S. Environmental Protection Agency (EPA) Method 8260C, target analyte list (TAL) metals by EPA method 6010C, mercury by EPA method 7471B, total organic carbon by Lloyd Kahn, grain size by EPA method ASTM-D422-63, and percent solids. Soil analytical results are provided in Tables 2-1a through 2-1c.

## 2.3 Groundwater Sampling and Analysis

Groundwater sampling at Site 10 included collection of:

- grab samples from three temporary monitoring points (PP10-26, PP10-45, and PP10-54) and from pumping well PW10-2

- passive diffusion bag (PDB) samples collected from eight existing monitoring wells including seven overburden (MW10-2, MW10-3, MW10-4, MW10-6, MW10-7, MW10-11, and MW10-13) and one shallow bedrock well (MW10-10D)

Groundwater sample locations are shown on Figure 2-2.

Dedicated polyethylene bailers were used to collect grab samples from each monitoring point and from PW10-2 during active pumping[1]. Following sample collection, the temporary points were removed and the soil boring was backfilled with bentonite.

PDB samplers were deployed on 16 April 2014 and remained, undisturbed, in the wells until retrieval on 30 April 2014.

All groundwater samples were analyzed for target compound list (TCL) VOCs by U.S. Environmental Protection Agency (EPA) Method 8260C. Groundwater from PW10-2 was also analyzed for target analyte list (TAL) metals by EPA method 6020A, hardness by EPA method 2340B, sulfide by EPA method 4500-SE, chemical oxygen demand by EPA method 5220D, nitrate and nitrite by EPA method 300.0, chloride and sulfate by EPA method 300.0, alkalinity by EPA method 2320B, biological oxygen demand by EPA method 9060, dissolved organic carbon by EPA method 9060, and total organic carbon by EPA method 9060. Groundwater analytical detections are summarized in Tables 2-2a through 2-2c and exceedances of Part 373 Permit analytes (VOCs) are presented on Figure 2-3.

1 Low-flow groundwater samples were planned to be collected at MW10-2, MW10-3, and MW10-10D; however, PW10-2 was sampled in lieu of these 3 wells because there was insufficient water within these wells.

**TABLE 2-1a**

**Soil Volatile Organic Compounds Results - Detections Only (FT005 - Site 10)**

***Pre-Design Investigation Data Summary Report***

***Niagara Falls Air Reserve Station, New York***

| Analyte | SB10-22-5-7<br>3/31/2014 | SB10-23-7-8<br>4/1/2014 | SB10-26-6.5-7.5<br>3/31/2014 |
|---|---|---|---|
| **Volatile Organic Compounds Detected by Method SW8260B (mg/kg)** | | | |
| BENZENE | 0.0044 | 0.0038 | 0.038U |
| CIS-1,2-DICHLOROETHENE | 0.0028 | 0.0172 | 2.0 |
| ETHYLBENZENE | 0.0019U | 0.00085J | 0.15U |
| TOLUENE | 0.003J | 0.0061 | 0.38U |
| TRICHLOROETHENE | 0.0058 | 0.123 | 0.15U |
| XYLENE (TOTAL) | 0.0028 | 0.0055 | 0.15U |
| CYCLOHEXANE | 0.0018J | 0.0053 | 0.38U |
| METHYLCYCLOHEXANE | 0.0032J | 0.0099 | 0.38U |

NOTE: mg/kg = Milligrams per kilogram.

U = Analyte was analyzed for but not detected, reporting limit provided

J = Estimated concentration

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**TABLE 2-1b**

**Soil Metals Results (FT005 - Site 10)**

***Pre-Design Investigation Data Summary Report***

***Niagara Falls Air Reserve Station, New York***

| Analyte | SB10-22-5-7<br>3/31/2014 | SB10-26-6.5-7.5<br>3/31/2014 |
|---|---|---|
| **TAL Metals by Method SW6010C and SW7471 (mg/kg)** | | |
| ALUMINUM | 7,970 | 7,160 |
| ANTIMONY | 0.31J | 0.17B |
| ARSENIC | 3.8 | 3 |
| BARIUM | 113J | 38.9J |
| BERYLLIUM | 0.37 | 0.35 |
| CADMIUM | 0.08B | 0.053B |
| CALCIUM | 48,900J | 44,700 |
| CHROMIUM | 11.3 | 10.9 |
| COBALT | 8.2 | 7.6 |
| COPPER | 14.8 | 13.8 |
| IRON | 15,900 | 15,700 |
| LEAD | 6.2 | 4.2 |
| MAGNESIUM | 9,210 | 7,550 |
| MANGANESE | 592 | 535 |
| MERCURY | 0.037U | 0.0091B |
| NICKEL | 16.8 | 16.6 |
| POTASSIUM | 1,120 | 1,110 |
| SELENIUM | 0.89U | 0.89U |
| SILVER | 0.44U | 0.44U |
| SODIUM | 109B | 101B |
| THALLIUM | 0.33B | 0.12J |
| VANADIUM | 16.1 | 15.7 |
| ZINC | 38.6J | 31.7 |

NOTE: mg/kg = Milligrams per kilogram.

U = Not detected; associated value is the reporting limit.

B = Analyte detected in the associated method blank.

J = Estimated concentration.

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**TABLE 2-1c**

**Soil General Chemistry and Physical Properties Results (FT005 - Site 10)**

***Pre-Design Investigation Data Summary Report***

***Niagara Falls Air Reserve Station, New York***

| Analyte | SB10-22-5-7 | SB10-26-6.5-7.5 |
|---|---|---|
| | 3/31/2014 | 3/31/2014 |
| **General Chemistry by Lloyd Kahn (mg/kg)** | | |
| TOTAL ORGANIC CARBON | 628 | 373 |
| **Grain Size by D422 and Percent Solids by SM2540B (%)** | | |
| PERCENT SOLIDS | 89.6 | 89.6 |
| % GRAVEL | 0.29 | NA |
| % SAND | 31.4 | NA |
| % SILT, CLAY, COLLOIDS | 68.3 | NA |
| 0.0015 mm (HYDROMETER) | 9 | NA |
| 0.005 mm (HYDROMETER) | 16 | NA |
| 0.030 mm (HYDROMETER) | 46 | NA |
| 0.375 INCH SIEVE | 100 | NA |
| 0.75 INCH SIEVE | 100 | NA |
| 1.5 INCH SIEVE | 100 | NA |
| 3 INCH SIEVE | 100 | NA |
| No.10 SIEVE (2.00 mm) | 94.7 | NA |
| No.100 SIEVE (0.15 mm) | 74.5 | NA |
| No.16 SIEVE (1.18 mm) | 90.9 | NA |
| No.200 SIEVE (0.075 mm) | 68.3 | NA |
| No.30 SIEVE (0.60 mm) | 87.3 | NA |
| No.4 SIEVE (4.75 mm) | 99.7 | NA |
| No.50 SIEVE (0.30 mm) | 82.9 | NA |
| No.8 SIEVE (2.36 mm) | 95.8 | NA |

NOTE: mg/kg = Milligrams per kilogram.

NA = Not analyzed.

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**TABLE 2-2a**

**Groundwater Volatile Organic Compounds Results - Detections Only (FT005 - Site 10)**

***Pre-Design Investigation Data Summary Report***

***Niagara Falls Air Reserve Station, New York***

| Analyte | Screening Criteria [(a)] | MW10-2 | MW10-3 | MW10-4 | MW10-6 | MW10-07 | MW10-10D |
|---|---|---|---|---|---|---|---|
| | | 4/30/2014 | 4/30/2014 | 4/30/2014 | 4/30/2014 | 4/30/2014 | 4/30/2014 |
| **Part 373 Permit Volatile Organic Compounds by Method SW8260B (µg/L)** | | | | | | | |
| 1,1-DICHLOROETHENE | 5 | **1.0** | 1U | 1U | 1U | 1U | **1.6** |
| BENZENE | 1 | 0.5U | 0.5U | 0.5U | 0.5U | 0.5U | **1.2** |
| CARBON TETRACHLORIDE | 5 | 1U | 1U | 1U | 1U | 1U | **8.5** |
| CHLOROFORM | 7 | 1U | 1U | 1U | 1U | 1U | **66.7** |
| CIS-1,2-DICHLOROETHENE | 5 | **837J** | 1U | 1U | 1U | **11.8** | **1,530** |
| ETHYLBENZENE | 5 | 1U | 1U | 1U | 1U | 1U | 1U |
| TRANS-1,2-DICHLOROETHENE | 5 | **24.4** | 1U | 1U | 1U | 1U | **6.6** |
| TRICHLOROETHENE | 5 | **750J** | 1U | 1U | 1U | **10.4** | **293** |
| VINYL CHLORIDE | 2 | **1.8** | 1U | 1U | 1U | 1U | **56.3** |
| **Other Volatile Organic Compounds Detected by Method SW8260B (µg/L)** | | | | | | | |
| CARBON DISULFIDE | 60 | 5U | 5U | 5U | 5U | 5U | 5U |
| CYCLOHEXANE | NS | 5U | 5U | 5U | 5U | 5U | 5U |
| ISOPROPYLBENZENE | 5 | 5U | 5U | 5U | 5U | 5U | 5U |
| METHYLCYCLOHEXANE | NS | 5U | 5U | 5U | 5U | 5U | 5U |
| METHYLENE CHLORIDE | 5 | 2U | 2U | 2U | 2U | 2U | **3.2** |
| TOLUENE | 5 | 1U | 1U | 1U | 1U | 1U | 1U |
| XYLENE (TOTAL) | 5 | 1U | 1U | 1U | 1U | 1U | 1U |

(a) New York State Department of Environmental Conservation, Technical and Operational Guidance Series Memorandum #1.1.1: Ambient Water Quality Standards and Guidance Values and Groundwater Effluent Limitations, 1998 (with updates), Class GA Groundwater Standards and Guidance Values.

NOTE: µg/L = Micrograms per liter.

U = Analyte was analyzed for but not detected, reporting limit provided

J = Estimated concentration

NA = Compound not analyzed

NS = No standard available

Shaded cells exceed the screening value; **Bold** values denote detections.

**TABLE 2-2a**

**Groundwater Volatile Organic Compounds Results - Detections Only (FT005 - Site 10)**

***Pre-Design Investigation Data Summary Report***

***Niagara Falls Air Reserve Station, New York***

| Analyte | Screening Criteria [(a)] | MW10-11 4/30/2014 | MW10-13 4/30/2014 | PP10-26 4/30/2014 | PP10-45 4/30/2014 | PP10-54 4/30/2014 |
|---|---|---|---|---|---|---|
| **Part 373 Permit Volatile Organic Compounds by Method SW8260B (µg/L)** | | | | | | |
| 1,1-DICHLOROETHENE | 5 | 1U | 1U | **0.7J** | 1U | 1U |
| BENZENE | 1 | 0.5U | 0.5U | **0.63** | **5.0** | 0.5U |
| CARBON TETRACHLORIDE | 5 | 1U | 1U | 1U | 1U | 1U |
| CHLOROFORM | 7 | 1U | 1U | 1U | 1U | 1U |
| CIS-1,2-DICHLOROETHENE | 5 | 1U | 1U | **819J** | **1.8** | **2.3** |
| ETHYLBENZENE | 5 | 1U | 1U | 1U | **17.6** | 1U |
| TRANS-1,2-DICHLOROETHENE | 5 | 1U | 1U | **8.5** | 1U | 1U |
| TRICHLOROETHENE | 5 | 1U | **0.67J** | **3.4J** | **0.69J** | **32.7** |
| VINYL CHLORIDE | 2 | 1U | 1U | **8.4** | 1U | 1U |
| **Other Volatile Organic Compounds Detected by Method SW8260B (µg/L)** | | | | | | |
| CARBON DISULFIDE | 60 | 5U | 5U | 5U | 5U | **5.6** |
| CYCLOHEXANE | NS | 5U | 5U | 5U | **64.9** | 5U |
| ISOPROPYLBENZENE | 5 | 5U | 5U | 5U | **8.7** | 5U |
| METHYLCYCLOHEXANE | NS | 5U | 5U | **4.1J** | **39.9** | 5U |
| METHYLENE CHLORIDE | 5 | 2U | 2U | 2U | 2U | 2U |
| TOLUENE | 5 | 1U | 1U | 1U | **0.55J** | 1U |
| XYLENE (TOTAL) | 5 | 1U | 1U | 1U | **0.64J** | 1U |

**TABLE 2-2b**

**Groundwater Metals Results (FT005 - Site 10)**

***Pre-Design Investigation Data Summary Report***

***Niagara Falls Air Reserve Station, New York***

| Analyte | PW10-2 |
|---|---|
| | 6/13/2014 |
| **TAL Metals by Method SW6020 and SW7470A (µg/L)** | |
| ALUMINUM | 99.2 |
| ANTIMONY | 4U |
| ARSENIC | 8.1J |
| BARIUM | 191J |
| BERYLLIUM | 0.041B |
| CADMIUM | 0.75B |
| CALCIUM | 150,000 |
| CHROMIUM | 7.4J |
| COBALT | 0.95B |
| COPPER | 1.8B |
| IRON | 17,400J |
| LEAD | 55.4J |
| MAGNESIUM | 53,200 |
| MANGANESE | 1,240J |
| MERCURY | 0.2U |
| NICKEL | 5.5B |
| POTASSIUM | 1,330 |
| SELENIUM | 0.41B |
| SILVER | 2U |
| SODIUM | 42,200 |
| THALLIUM | 2U |
| VANADIUM | 27.7J |
| ZINC | 128J |

NOTE: µg/L = Micrograms per liter.

U = Not detected; associated value is the reporting limit.

B = Analyte detected in the associated method blank.

J = Estimated concentration

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**TABLE 2-2c**

**Groundwater Geochemical Results (FT005 - Site 10)**

***Pre-Design Investigation Data Summary Report***

***Niagara Falls Air Reserve Station, New York***

| Analyte | PW10-2 |
|---|---|
| | 6/13/2014 |
| **Anions and General Chemistry (mg/L)** | |
| ALKALINITY (A2320B) | 357 |
| BIOLOGICAL OXYGEN DEMAND (A5210) | 2U |
| CHEMICAL OXYGEN DEMAND (A5220C) | 23.8 |
| CHLORIDE (SM4500CL) | 78 |
| DISSOLVED ORGANIC CARBON (SW9060) | 6.7 |
| HARDNESS (A2340B) | 567 |
| NITROGEN, NITRATE (CALC) | 0.11U |
| NITROGEN, NITRATE + NITRITE (E353.2) | 0.1U |
| NITROGEN, NITRITE (SM4500-N02B) | 0.01U |
| SULFATE (D-516-90) | 203 |
| SULFIDE (SM4500) | 2U |
| TOTAL ORGANIC CARBON (SW9060) | 6.1 |

NOTE: mg/L = Milligrams per liter

U = Not detected; associated value is the reporting limit

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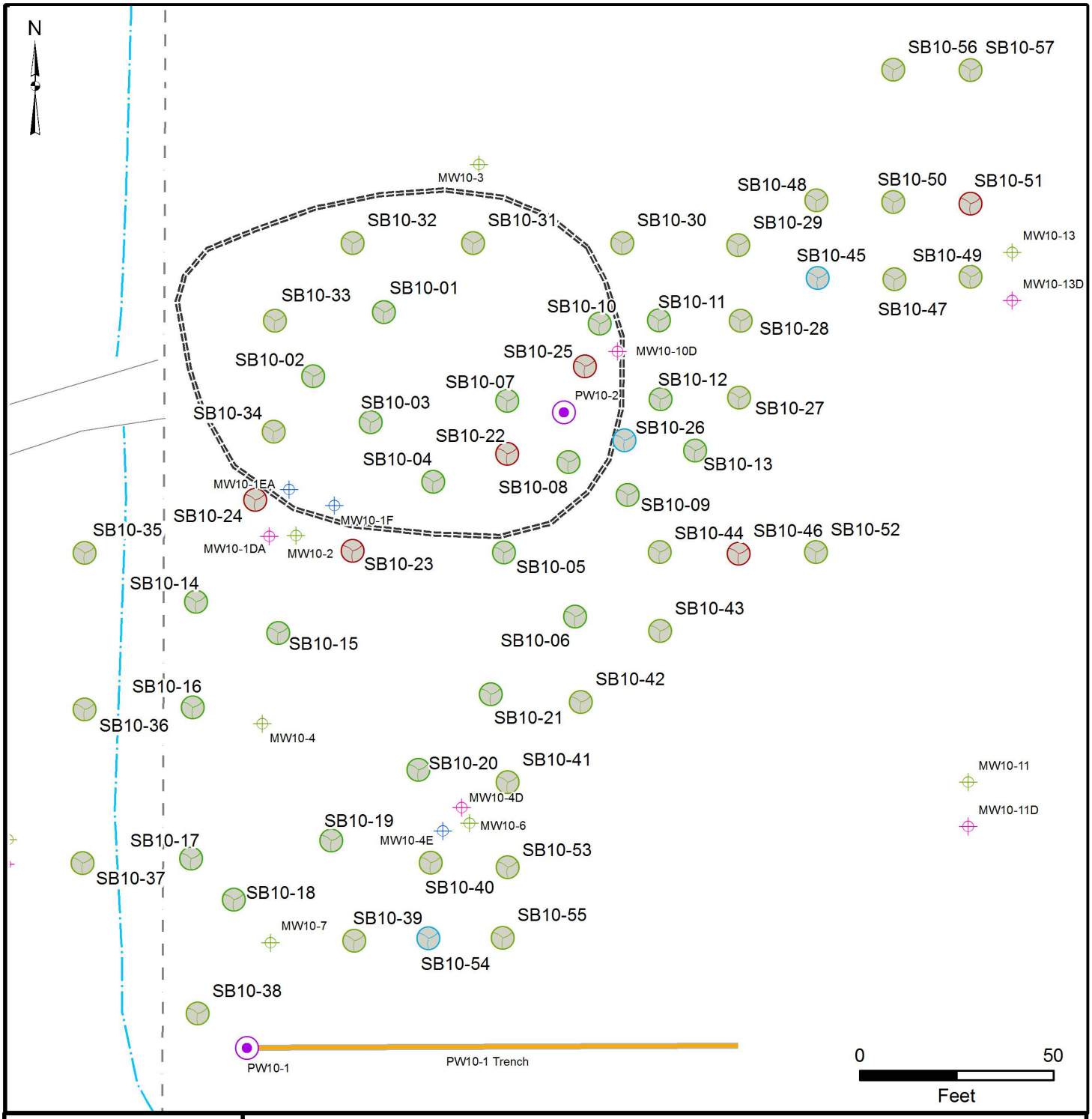


Overburden Well/Piezometer
Shallow Bedrock Well/Piezometer
Deep Bedrock Well
Pumping Well

**Subsurface Investigation**

MIP location
Soil Sample Location
HPT Location

Former Fire Training Pit

HPT = hydraulic profiling tool
MIP/EC = membrane interface probe/ electrical conductivity

Pre-Design Investigation
Data Summary Report
Niagara Falls Air Reserve Station
Niagara Falls, New York

FIGURE 2-1
Subsurface Investigation Locations
FT005-Site 10

| PROJECT MGR: | DESIGNED BY: | CREATED BY: | CHECKED BY: | SCALE: | DATE: | PROJECT NO: | FILE NO: |
|---|---|---|---|---|---|---|---|
| BY | FD | FD | BY | AS SHOWN | NOVEMBER 2014 | 6265401 | G:\Projects\Federal\DOD\ 6265401_AFCEC_PBR |

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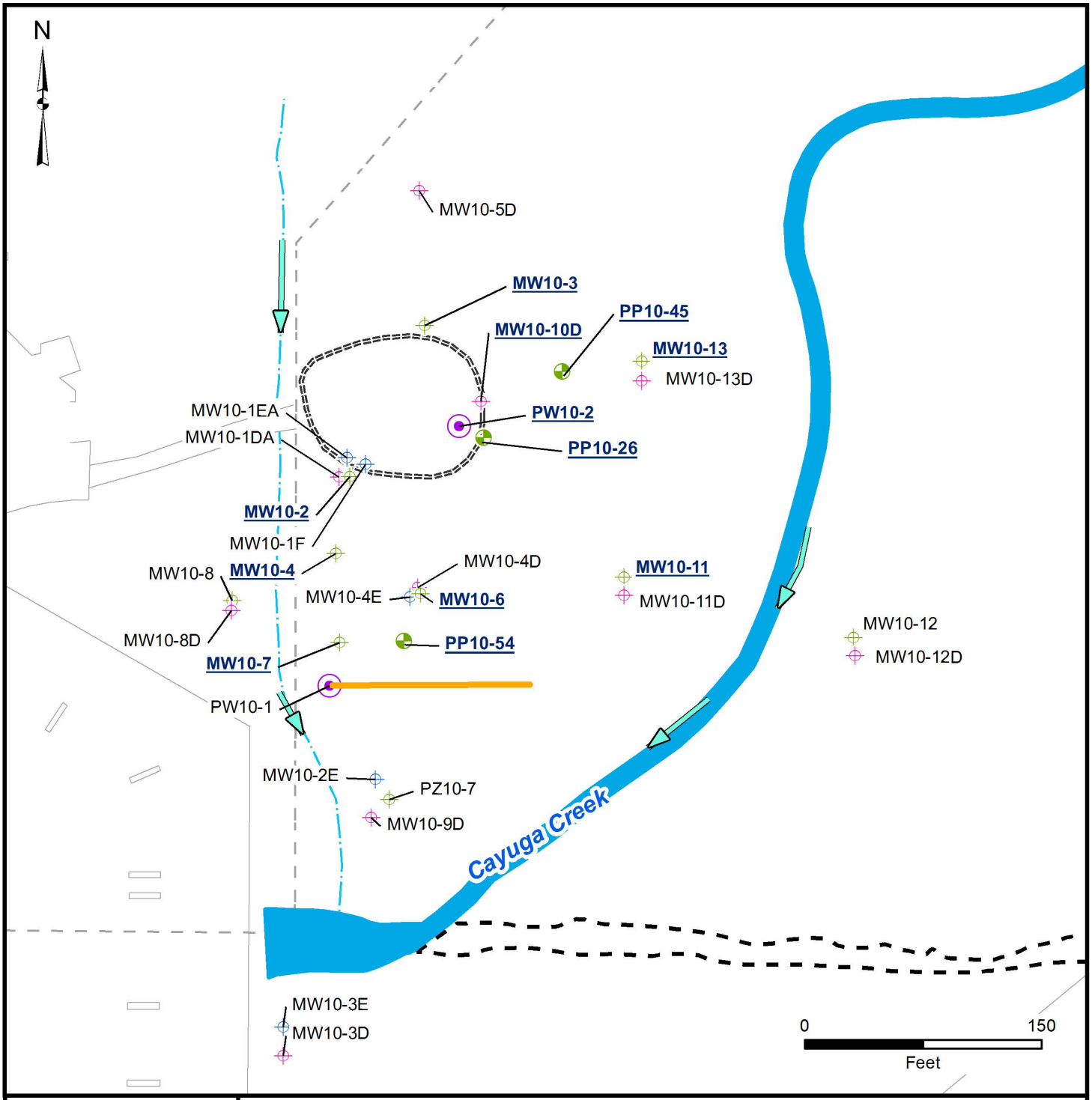


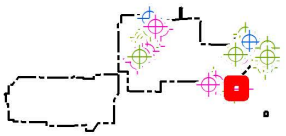

Overburden Well/Piezometer
Shallow Bedrock Well/Piezometer
Deep Bedrock Well
Pumping Well
Temporary Monitoring Point
Former Fire Training Pit
Groundwater Collection Trench
Surface Water Flow
MWX-X Sampled during Pre-Design Investigation

| | | |
|---|---|---|
| EA® | Pre-Design Investigation<br>Data Summary Report<br>Niagara Falls Air Reserve Station<br>Niagara Falls, New York | FIGURE 2-2<br>Groundwater Sampling Locations<br>FT005 - Site 10 |

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

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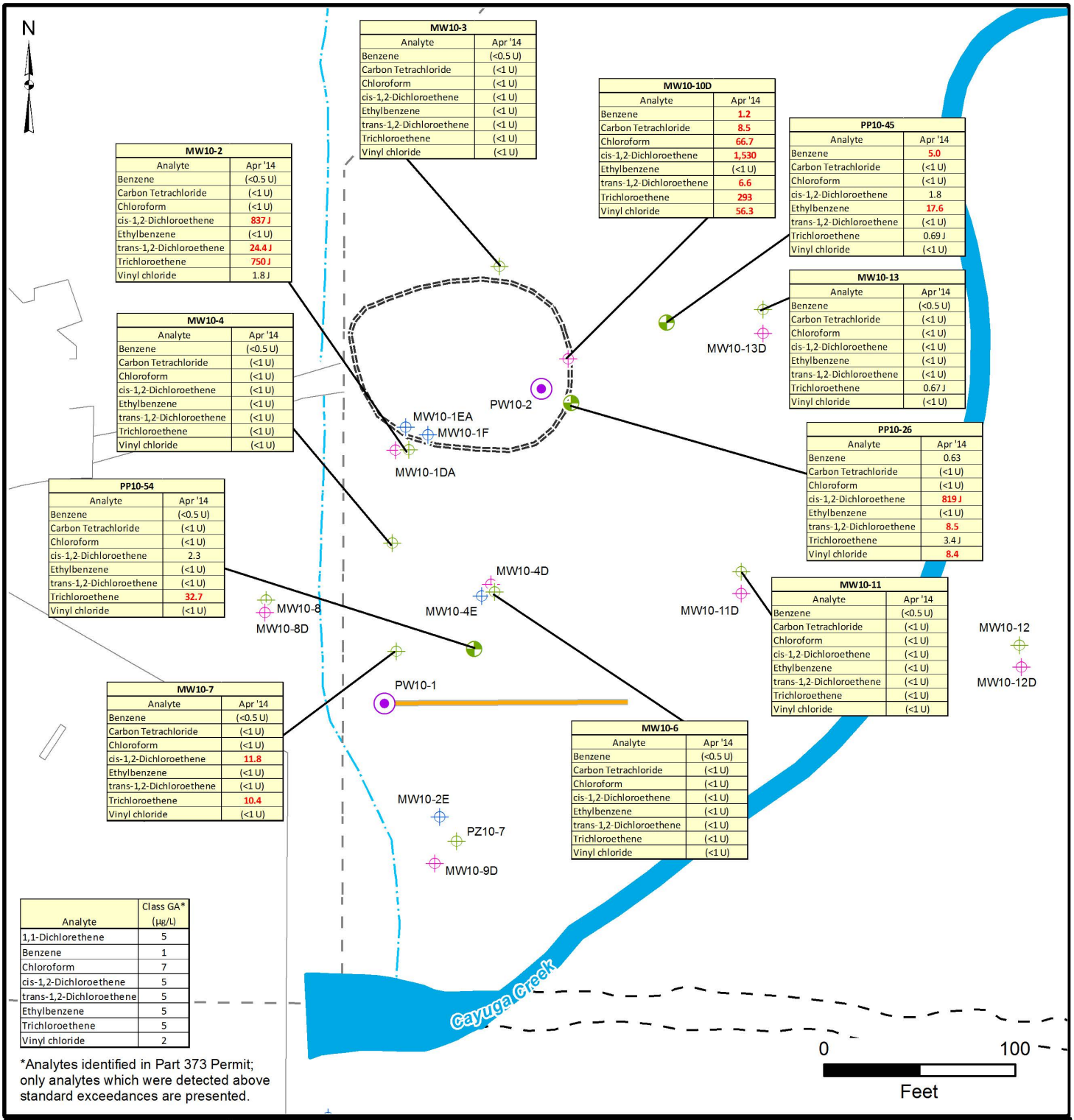


**Existing Wells**

- Overburden Well/Piezometer
- Shallow Bedrock Well/Piezometer
- Deep Bedrock Well
- Pumping System
- Groundwater Collection Trench
- Temporary Monitoring Point

89 = Indicates above NYSDEC Class GA Standards
J = Estimated concentration
U = Not detected above reporting limit
< 0.54 U = Not detected, value reported is reporting limit
All concentrations reported in micrograms per liter (µg/L)

Pre-Design Investigation
Data Summary Report
Niagara Falls Air Reserve Station
Niagara Falls, New York

FIGURE 2-3
Groundwater Results
FT005-Site 10

| PROJECT MGR: | DESIGNED BY: | CREATED BY: | CHECKED BY: | SCALE: | DATE: | PROJECT NO: | FILE NO: |
|---|---|---|---|---|---|---|---|
| BY | FD | RP | BY | AS SHOWN | NOVEMBER 2014 | 6265401 | G:\Projects\Federal\DOD\6265401_AFCEC_PBR |

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# 3.0 Soil and Groundwater Sampling at Site LF008 – Site 3

## 3.1 Introduction

Sampling activities were completed from May through June 2014. The contaminants of potential concern associated with the site are chlorinated volatile organic compounds, including trichloroethene and its degradation products (*cis*-1,2-dichloroethene and vinyl chloride), and the potentially affected media are soil and groundwater. Field activities focused on the collection of detailed geologic and hydrogeologic data to refine our understanding of flow in shallow bedrock groundwater.

## 3.2 Subsurface Investigation

Soil samples were collected from three borings (MW3-3A, PZ3-06, and PZ3-09) for soil observations (e.g., soil classification, evidence of potential contamination including staining, sheens, elevated photoionization detector readings, and/or obvious odor) (Figure 3-1). Soil boring logs are provided in Appendix D-1.

Two soil samples were collected from PZ3-09 at depths of 2.8–3.8 and 3.8–4.8 feet (ft) below ground surface (bgs) and submitted for laboratory analysis including TCL VOCs by EPA Method 8260B, TAL metals by EPA method 6010C, mercury by EPA method 7471B, total organic carbon by Lloyd Kahn, grain size by EPA method ASTM-D422-63, and percent solids. Soil analytical results are provided in Tables 3-1a through 3-1c.

## 3.3 Groundwater Sampling and Analysis

### 3.3.1 Monitoring Well Installation

Overburden monitoring wells were installed in the three soil borings: MW3-3A, PZ3-06, and PZ3-09 (Table 1-3 and Figure 3-1). These wells were advanced to the top of bedrock using 4.25-inch (in.)-internal diameter hollow-stem augers. The wells were completed with 2-in.-diameter polyvinyl chloride (PVC) monitoring wells and flush-mount protective covers. The monitoring wells were constructed with 1–2 ft long sections of 0.010-in. slot screen and an appropriate length of Schedule 40 PVC riser to the ground surface. Sand packs were installed extending 2 ft above the top of the screens. A 2-ft thick bentonite seal was placed above the sand pack and the remaining annular space was filled with bentonite grout.

One shallow bedrock monitoring well (PZ3-9D) was also installed at the site (Table 1-3 and Figure 3-1). Drive and wash drilling methods were used to advance to the top of bedrock. Upon reaching bedrock, a roller bit was used to drill approximately 2 ft into bedrock and a 5⅞-in.-internal diameter rock socket was set. A 4-in. internal diameter casing was placed into the borehole and grouted in place to seal off the overburden. Bedrock coring was performed using fluid rotary and N/Q-size wireline coring. Rock cores were collected in 5-ft long core runs and used to determine bedrock stratigraphy, fracture locations, and orientations. The well was completed as an open borehole into the bedrock aquifer and the well was completed at the surface with an 8-in.-diameter flush-mount cover. Boring logs are provided in Appendix D-1.

### 3.3.2 Groundwater Sampling

Groundwater sampling at Site 3 included collection of:

- a grab sample from newly installed bedrock monitoring well PZ3-9D
- PDB samples collected from 17 existing monitoring wells, including five overburden wells (PZ3-1, PZ3-2, PZ3-3, PZ3-4, and PZ3-5) and 12 shallow bedrock wells (MW3-3DA, MW3-4DA, MW3-5D, PZ3-1D, and PZ3-1D through PZ3-8D). A PDB sample was also collected from the inactive pumping well, PW3-3A
- low-flow samples collected from two existing monitoring wells (MW3-4DA and PZ3-1D) and the four newly installed monitoring wells (PZ3-9D, MW3-3A, PZ3-06, and PZ3-09)

Groundwater sample locations are shown on Figure 3-1.

The grab sample from PZ3-9D was collected using a dedicated polyethylene bailer. PDB samplers were deployed on 24 March 2014 and remained, undisturbed, in the well until retrieval on 1 May 2014. In addition, two supplemental PDBs were placed in one shallow bedrock well (PZ3-1D) at two different depth intervals to allow for an assessment of vertical distribution of contaminants in the shallow bedrock aquifer. .

Low-flow sampling was conducted using a submersible pump and dedicated tubing. Groundwater purge forms are provided in Appendix D-2.

All groundwater samples were analyzed for TCL VOCs by EPA Method 8260C. Low-flow samples were also analyzed for TAL metals by EPA method 6020A, hardness by EPA method 2340B, sulfide by EPA method 4500-SE, chemical oxygen demand by EPA method 5220D, nitrate and nitrite by EPA method 300.0, chloride and sulfate by EPA method 300.0, alkalinity by EPA method 2320B, biological oxygen demand by EPA method 9060, dissolved organic carbon by EPA method 9060, and total organic carbon by EPA method 9060. Groundwater analytical detections are summarized in Tables 3-2a through 3-2c and exceedances of Part 373 Permit analytes (VOCs) are presented on Figures 3-2 and 3-3.

**TABLE 3-1a**

**Soil Volatile Organic Compounds Results - Detections Only (LF008 - Site 3)**

***Pre-Design Investigation Data Summary Report***

***Niagara Falls Air Reserve Station, New York***

| Analyte | SB3-9-2.8-3.8<br>6/16/2014 | SB3-9-3.8-4.8<br>6/16/2014 |
|---|---|---|
| **Volatile Organic Compounds Detected by Method SW8260B (mg/kg)** | | |
| BENZENE | 0.004UJ | 0.0035J |
| ETHYLBENZENE | 0.0011J | 0.001J |
| TOLUENE | 0.0074 | 0.0068 |
| XYLENE (TOTAL) | 0.0069 | 0.0064 |
| CYCLOHEXANE | 0.0064 | 0.006 |
| METHYLCYCLOHEXANE | 0.0101 | 0.0098 |

NOTE: mg/kg = Milligrams per kilogram.

U = Analyte was analyzed for but not detected, reporting limit provided

J = Estimated concentration

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**TABLE 3-1b**

**Soil Metals Results (LF008 - Site 3)**

***Pre-Design Investigation Data Summary Report***

***Niagara Falls Air Reserve Station, New York***

| Analyte | SB3-9-2.8-3.8<br>6/16/2014 | SB3-9-3.8-4.8<br>6/16/2014 |
|---|---|---|
| **TAL Metals by Method SW6010C and SW7471 (mg/kg)** | | |
| ALUMINUM | 4,010 | 3,910 |
| ANTIMONY | 0.93UJ | 0.88U |
| ARSENIC | 1.8 | 2.1 |
| BARIUM | 28.8 | 40.5 |
| BERYLLIUM | 0.19 | 0.15B |
| CADMIUM | 0.85 | 0.64 |
| CALCIUM | 136,000 | 144,000 |
| CHROMIUM | 6.0 | 4.4 |
| COBALT | 3B | 2.4B |
| COPPER | 16.7 | 13.5 |
| IRON | 7,990 | 7,520 |
| LEAD | 54.5 | 81.9 |
| MAGNESIUM | 60,900 | 74,300 |
| MANGANESE | 671 | 535 |
| MERCURY | 0.035U | 0.034U |
| NICKEL | 7.1 | 6.2 |
| POTASSIUM | 847 | 780 |
| SELENIUM | 0.32B | 0.29B |
| SILVER | 0.47U | 0.44U |
| SODIUM | 165B | 176B |
| THALLIUM | 0.3B | 0.26B |
| VANADIUM | 8.8 | 7.9 |
| ZINC | 290 | 321 |

NOTE: mg/kg = Milligrams per kilogram.

U = Not detected; associated value is the reporting limit

J = Estimated concentration.

B = Analyte detected in the associated method blank.

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**TABLE 3-1c**

**Soil General Chemistry and Physical Properties Results (LF008 - Site 3)**

***Pre-Design Investigation Data Summary Report***

***Niagara Falls Air Reserve Station, New York***

| Analyte | SB3-9-2.8-3.8<br>6/16/2014 | SB3-9-3.8-4.8<br>6/16/2014 |
|---|---|---|
| **General Chemistry by Lloyd Kahn (mg/kg)** | | |
| TOTAL ORGANIC CARBON | 677 | 724 |
| **Grain Size by D422 and Percent Solids by SM2540B (%)** | | |
| PERCENT SOLIDS | 91.6 | 91.4 |
| % GRAVEL | 25.6 | 17.7 |
| % SAND | 52.3 | 47.2 |
| % SILT, CLAY, COLLOIDS | 22.0 | 35.1 |
| 0.0015 mm (HYDROMETER) | 5.5 | 6.0 |
| 0.005 mm (HYDROMETER) | 8.0 | 10.0 |
| 0.030 mm (HYDROMETER) | 14.0 | 18.0 |
| 0.375 INCH SIEVE | 89.7 | 96.3 |
| 0.75 INCH SIEVE | 100 | 100 |
| 1.5 INCH SIEVE | 100 | 100 |
| 3 INCH SIEVE | 100 | 100 |
| No.10 SIEVE (2.00 mm) | 57.2 | 60.2 |
| No.100 SIEVE (0.15 mm) | 24.8 | 38.5 |
| No.16 SIEVE (1.18 mm) | 54.9 | 57.6 |
| No.200 SIEVE (0.075 mm) | 22.0 | 35.1 |
| No.30 SIEVE (0.60 mm) | 46.4 | 53.4 |
| No.4 SIEVE (4.75 mm) | 74.4 | 82.3 |
| No.50 SIEVE (0.30 mm) | 33.5 | 47.5 |
| No.8 SIEVE (2.36 mm) | 59.6 | 63.4 |

NOTE: mg/kg = Milligrams per kilogram.

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**TABLE 3-2a**

**Groundwater Volatile Organic Compounds Results - Detections Only (LF008 - Site 3)**

***Pre-Design Investigation Data Summary Report***

***Niagara Falls Air Reserve Station, New York***

| Analyte | Screening Criteria [a] | CH3-01 [b] | | MW3-1E | MW3-3DA | MW3-4DA | MW3-5D | PW3-3A | PZ3-1 |
|---|---|---|---|---|---|---|---|---|---|
| | | 6/18/2014 | 6/26/2014 | 5/1/2014 | 5/1/2014 | 5/1/2014 | 5/1/2014 | 5/1/2014 | 5/1/2014 |
| **Part 373 Permit Volatile Organic Compounds Detected by Method SW8260B (µg/L)** | | | | | | | | | |
| BENZENE | 1 | **4.4** | **0.44J** | 0.5U | 0.5U | 0.5U | 0.5U | 0.5UJ | 0.5U |
| CHLOROFORM | 7 | **15.2** | **1.1** | 1U | 1U | 1U | 1U | 1U | 1U |
| CIS-1,2-DICHLOROETHENE | 5 | **1.4** | **3.6** | 1U | **4.6** | **4.1** | **0.97J** | **2.9** | 1U |
| TRANS-1,2-DICHLOROETHENE | 5 | 1U | 1U | 1U | 1U | 1U | 1U | 1U | 1U |
| ETHYLBENZENE | 5 | **1.5** | 1U | 1U | 1U | 1U | 1U | 1U | 1U |
| TOLUENE | 5 | **8.4** | **0.71J** | 1U | 1U | 1U | 1U | 1U | 1U |
| TRICHLOROETHENE | 5 | 1U | 1U | 1U | 1U | 1U | 1U | **0.54J** | 1U |
| VINYL CHLORIDE | 2 | **1.3** | **6.2** | 1UJ | **33.9J** | **5.9J** | 1UJ | **6.7J** | 1UJ |
| XYLENE (TOTAL) | 5 | **9.1** | **0.89J** | 1U | 1U | 1U | 1U | 1U | 1U |
| **Other Volatile Organic Compounds Detected by Method SW8260B (µg/L)** | | | | | | | | | |
| ACETONE | 50 | 10U | 10UJ | 10UJ | 10UJ | 10UJ | 10UJ | 10UJ | 10UJ |
| BROMODICHLOROMETHANE | 50 | **3.3** | 1U | 1UJ | 1UJ | 1UJ | 1UJ | 1UJ | 1UJ |
| CARBON DISULFIDE | NS | 5U | 5U | 5U | 5U | 5U | 5U | 5U | 5U |
| CYCLOHEXANE | NS | **6.0** | NA | 5U | 5U | 5U | 5U | 5U | 5U |
| DIBROMOCHLOROMETHANE | 50 | **1.3** | 1U | 1U | 1U | 1U | 1U | 1U | 1U |
| METHYLCYCLOHEXANE | NS | **7.7** | NA | 5U | 5U | 5U | 5U | 5U | 5U |

(a) New York State Department of Environmental Conservation, Technical and Operational Guidance Series Memorandum #1.1.1: Ambient Water Quality Standards and Guidance Values and Groundwater Effluent Limitations, 1998 (with updates), Class GA Groundwater Standards and Guidance Values.

(b) CH3-01 and PZ3-08 were mislabeled in the field and have been changed to PZ3-9D and MW3-3A, respectively.

NOTE: µg/L = Micrograms per liter.

U = Analyte was analyzed for but not detected, reporting limit provided

J = Estimated concentration

NA = Compound not analyzed

NS = No standard available

Shaded cells exceed the screening value; **Bold** values denote detections.

**TABLE 3-2a**

**Groundwater Volatile Organic Compounds Results - Detections Only (LF008 - Site 3)**

***Pre-Design Investigation Data Summary Report***

***Niagara Falls Air Reserve Station, New York***

| Analyte | Screening Criteria [(a)] | PZ3-1D 5/1/2014 | PZ3-1D-7-9 6/27/2014 | PZ3-1D-11-13 6/25/2013 | PZ3-2 5/1/2014 | PZ3-2D 5/1/2014 | PZ3-3 5/1/2014 | PZ3-3D 5/1/2014 | PZ3-4 5/1/2014 |
|---|---|---|---|---|---|---|---|---|---|
| **Part 373 Permit Volatile Organic Compounds Detected by Method SW8260B (µg/L)** | | | | | | | | | |
| BENZENE | 1 | 0.5UJ | 0.5U | 0.5U | 0.5U | 0.5U | 0.5U | 0.5U | 0.5U |
| CHLOROFORM | 7 | **1.4** | 1U | 1U | 1U | 1U | 1U | 1U | 1U |
| CIS-1,2-DICHLOROETHENE | 5 | **33.5** | **11.7** | **21.2** | 1U | 1U | **7.7** | **1.1** | 1U |
| TRANS-1,2-DICHLOROETHENE | 5 | **1.3** | **0.94J** | **1.5** | 1U | 1U | 1U | 1U | 1U |
| ETHYLBENZENE | 5 | 1U | 1U | 1U | 1U | 1U | 1U | 1U | 1U |
| TOLUENE | 5 | 1U | **0.44J** | 1U | 1U | 1U | 1U | 1U | 1U |
| TRICHLOROETHENE | 5 | **0.97J** | **1.3** | **2.3** | 1U | 1U | 1U | 1U | 1U |
| VINYL CHLORIDE | 2 | **86.2J** | **11.4** | **19.8** | 1UJ | 1UJ | **5J** | **0.98J** | 1UJ |
| XYLENE (TOTAL) | 5 | 1U | 1U | 1U | 1U | 1U | 1U | 1U | 1U |
| **Other Volatile Organic Compounds Detected by Method SW8260B (µg/L)** | | | | | | | | | |
| ACETONE | 50 | 10UJ | 10UJ | 10U | 10UJ | 10UJ | 10UJ | 10UJ | 10UJ |
| BROMODICHLOROMETHANE | 50 | 1U | 1U | 1U | 1U | 1UJ | 1UJ | 1UJ | 1U |
| CARBON DISULFIDE | NS | 5U | 5U | 5U | 5U | 5U | 5U | 5U | 5U |
| CYCLOHEXANE | NS | 5U | 5U | 5U | 5U | 5U | 5U | 5U | 5U |
| DIBROMOCHLOROMETHANE | 50 | 1U | 1U | 1U | 1U | 1U | 1U | 1U | 1U |
| METHYLCYCLOHEXANE | NS | 5U | 5U | 5U | 5U | 5U | 5U | 5U | 5U |

**TABLE 3-2a**

**Groundwater Volatile Organic Compounds Results - Detections Only (LF008 - Site 3)**

***Pre-Design Investigation Data Summary Report***

***Niagara Falls Air Reserve Station, New York***

| Analyte | Screening Criteria [a] | PZ3-4D 5/1/2014 | PZ3-5 5/1/2014 | PZ3-5D 5/1/2014 | PZ3-6 6/27/2014 | PZ3-6D 5/1/2014 | PZ3-7D 5/1/2014 | PZ3-8 [b] 6/26/2014 | PZ3-8D 5/1/2014 | PZ3-9 6/26/2014 |
|---|---|---|---|---|---|---|---|---|---|---|
| **Part 373 Permit Volatile Organic Compounds Detected by Method SW8260B (µg/L)** | | | | | | | | | | |
| BENZENE | 1 | 0.5U | 0.5U | 0.5U | **0.89** | 0.5U | 0.5U | 0.5U | 0.5U | **0.98** |
| CHLOROFORM | 7 | 1U | 1U | 1U | 1U | 1U | 1U | 1U | 1U | 1U |
| CIS-1,2-DICHLOROETHENE | 5 | 1U | 1U | **3.6** | 1U | 1U | **6.6** | 1U | 1U | 1U |
| TRANS-1,2-DICHLOROETHENE | 5 | 1U | 1U | 1U | 1U | 1U | 1U | 1U | 1U | 1U |
| ETHYLBENZENE | 5 | 1U | 1U | 1U | 1U | 1U | 1U | 1U | 1U | **0.45J** |
| TOLUENE | 5 | 1U | 1U | 1U | **1.5** | 1U | 1U | 1U | 1U | **1.8** |
| TRICHLOROETHENE | 5 | 1U | 1U | 1U | 1U | 1U | 1U | 1U | 1U | 1U |
| VINYL CHLORIDE | 2 | 1UJ | 1UJ | **6.7J** | 1U | **2.0J** | **51.8J** | 1U | **4.3J** | 1U |
| XYLENE (TOTAL) | 5 | 1U | 1U | 1U | **1.5** | 1U | 1U | 1U | 1U | **2.3** |
| **Other Volatile Organic Compounds Detected by Method SW8260B (µg/L)** | | | | | | | | | | |
| ACETONE | 50 | 10UJ | 10UJ | 10UJ | **8.1J** | 10UJ | 10UJ | 10UJ | 10UJ | **15.1J** |
| BROMODICHLOROMETHANE | 50 | 1U | 1UJ | 1UJ | 1U | 1UJ | 1UJ | 1U | 1UJ | 1U |
| CARBON DISULFIDE | NS | 5U | 5U | 5U | **6.4** | 5U | 5U | 5U | 5U | **1.4J** |
| CYCLOHEXANE | NS | 5U | 5U | 5U | NA | 5U | 5U | NA | 5U | NA |
| DIBROMOCHLOROMETHANE | 50 | 1U | 1U | 1U | 1U | 1U | 1U | 1U | 1U | 1U |
| METHYLCYCLOHEXANE | NS | 5U | 5U | 5U | NA | 5U | 5U | NA | 5U | NA |

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**TABLE 3-2b**

**Groundwater Metals Results (LF008 - Site 3)**

***Pre-Design Investigation Data Summary Report***

***Niagara Falls Air Reserve Station, New York***

| Analyte | MW3-4DA | PZ3-1D |
|---|---|---|
| | 6/10/2014 | 6/10/2014 |
| **TAL Metals by Method SW6020 and SW7470A (µg/L)** | | |
| ALUMINUM | 50.9 | 315 |
| ANTIMONY | 0.13B | 0.2B |
| ARSENIC | 3.3B | 3.6B |
| BARIUM | 33.9 | 95.9 |
| BERYLLIUM | 2U | 2U |
| CADMIUM | 6U | 0.079B |
| CALCIUM | 292,000J | 232,000 |
| CHROMIUM | 0.76B | 8.9 |
| COBALT | 0.11B | 1.4 |
| COPPER | 4B | 1.4B |
| IRON | 109 | 7,540 |
| LEAD | 0.82B | 0.93B |
| MAGNESIUM | 60,500 | 58,600 |
| MANGANESE | 24.5 | 543 |
| MERCURY | 0.2U | 0.2U |
| NICKEL | 2B | 41.3 |
| POTASSIUM | 2,640 | 3,450 |
| SELENIUM | 2U | 2U |
| SILVER | 2U | 2U |
| SODIUM | 42,700 | 252,000 |
| THALLIUM | 0.02B | 2U |
| VANADIUM | 3.3B | 2.8B |
| ZINC | 27.8 | 4,960 |

NOTE: µg/L = Micrograms per liter.

U = Not detected; associated value is the reporting limit.

J = Estimated concentration.

B = Analyte detected in the associated method blank.

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**TABLE 3-2c**

**Groundwater Geochemical Results (LF008 - Site 3)**

***Pre-Design Investigation Data Summary Report***

***Niagara Falls Air Reserve Station, New York***

| Analyte | MW3-4DA | PZ3-1D |
|---|---|---|
| | 6/10/2014 | 6/10/2014 |
| **Anions and General Chemistry (mg/L)** | | |
| ALKALINITY (A2320B) | 307 | 386 |
| BIOLOGICAL OXYGEN DEMAND (A5210) | 2U | 2U |
| CHEMICAL OXYGEN DEMAND (A5220C) | 20U | 20U |
| CHLORIDE (SM4500CL) | 81 | 400 |
| DISSOLVED ORGANIC CARBON (SW9060) | 1.9 | 4.1 |
| HARDNESS (A2340B) | 965 | 786 |
| NITROGEN, NITRATE (CALC) | 0.11U | 0.11U |
| NITROGEN, NITRATE + NITRITE (E353.2) | 0.1U | 0.1U |
| NITROGEN, NITRITE (SM4500-N02B) | 0.01U | 0.01U |
| SULFATE (D-516-90) | 610 | 360 |
| SULFIDE (SM4500) | 2U | 2U |
| TOTAL ORGANIC CARBON (SW9060) | 1.8 | 5.0 |

NOTE: mg/L = Milligrams per liter.

U = Not detected; associated value is the reporting limit.

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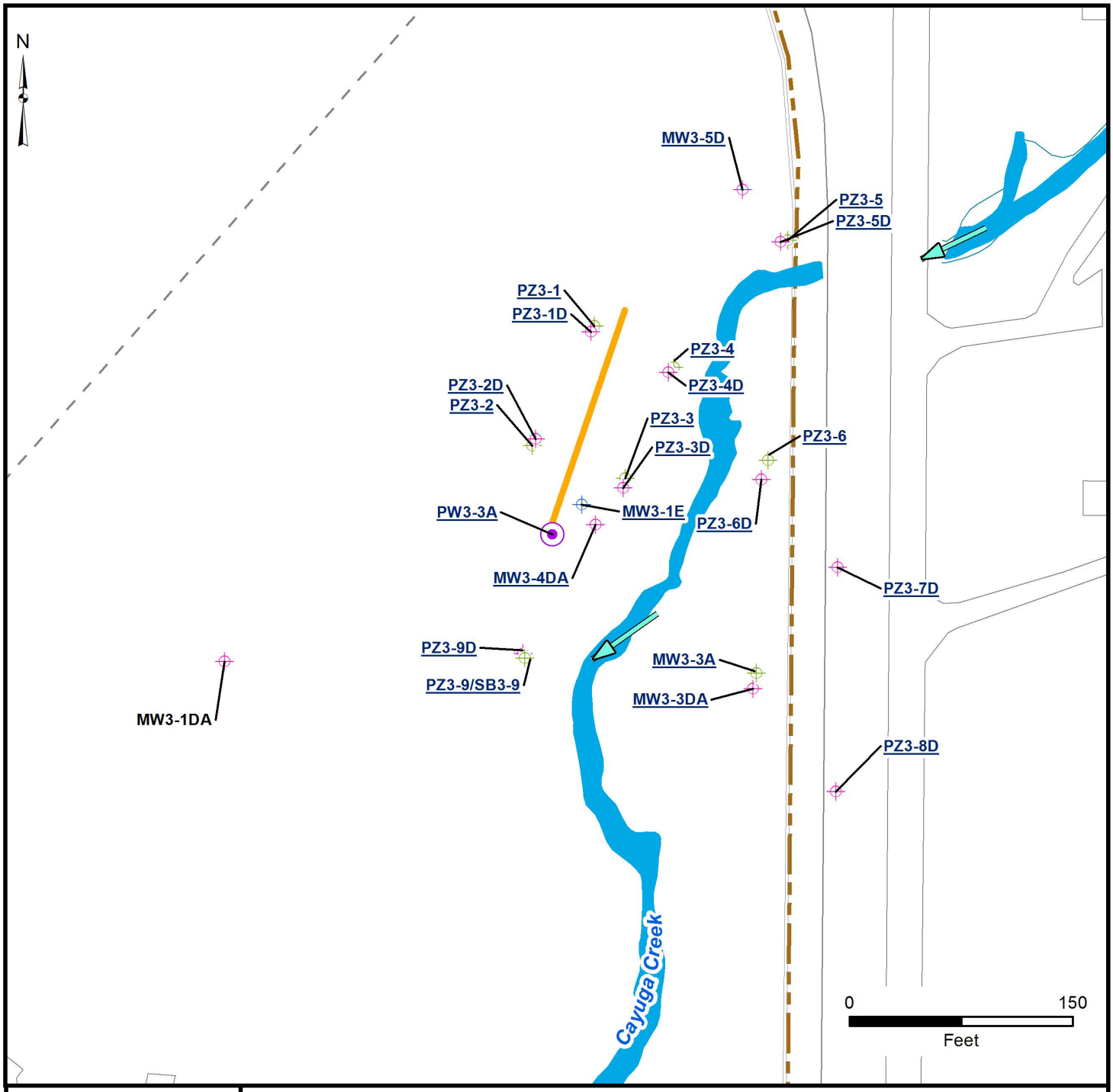


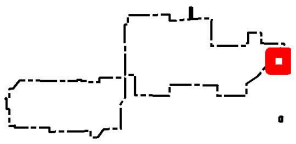

Overburden Well/Piezometer

Shallow Bedrock Well/Piezometer

Deep Bedrock Well

Pumping Well (Not Active)

Groundwater Collection Trench

Surface Water Flow

MWX-X Sampled during Pre-Design Investigation

| | | |
|---|---|---|
| EA | Pre-Design Investigation<br>Data Summary Report<br>Niagara Falls Air Reserve Station<br>Niagara Falls, New York | FIGURE 3-1<br>Pre-Design Investigation Locations<br>LF008 - Site 3 |

| PROJECT MGR: | DESIGNED BY: | CREATED BY: | CHECKED BY: | SCALE: | DATE: | PROJECT NO: | FILE NO: |
|---|---|---|---|---|---|---|---|
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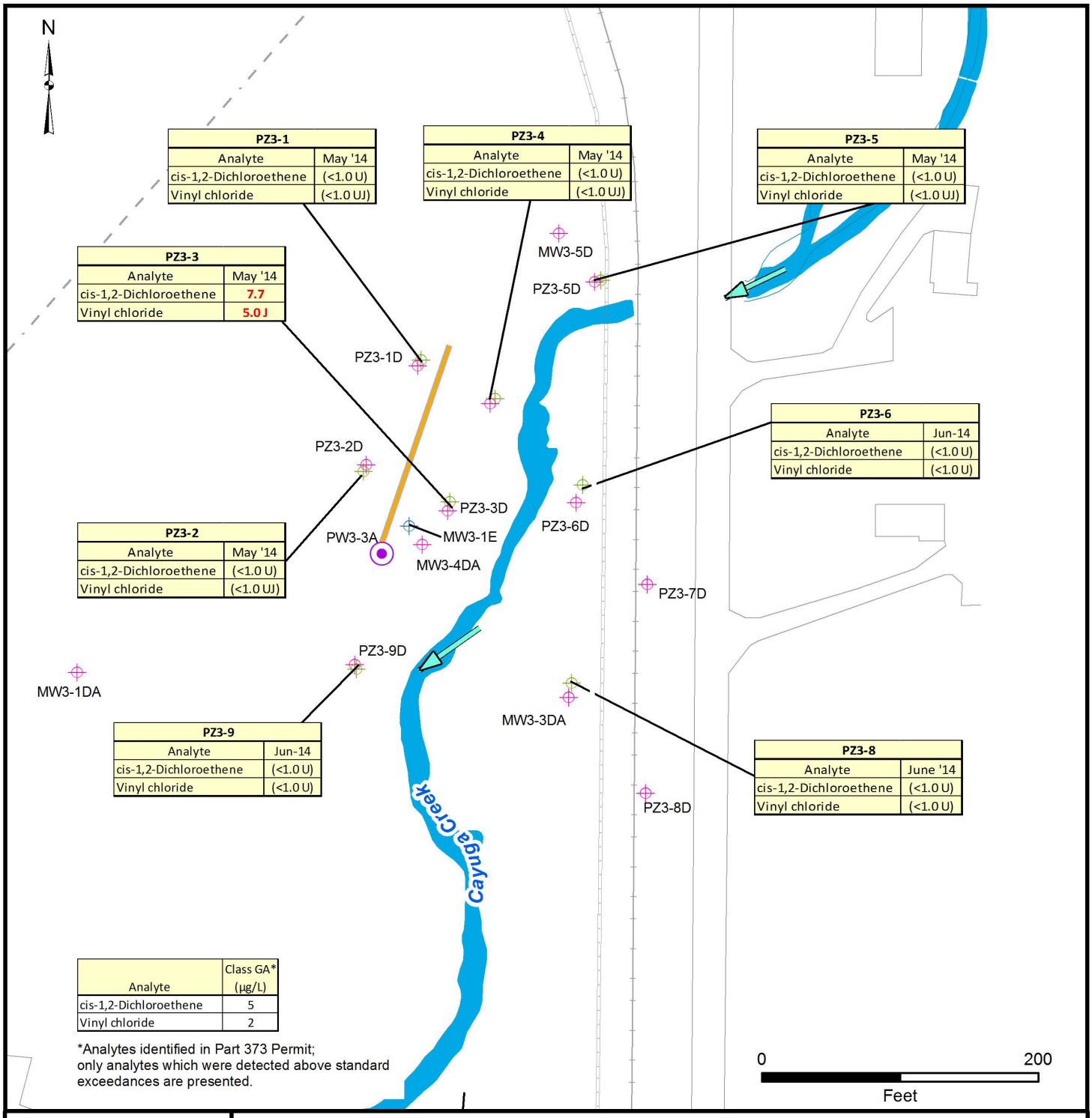


Pre-Design Investigation
Data Summary Report
Niagara Falls Air Reserve Station
Niagara Falls, New York

FIGURE 3-2
Overburden Groundwater Results
LF008-Site 3

| PROJECT MGR: | DESIGNED BY: | CREATED BY: | CHECKED BY: | SCALE: | DATE: | PROJECT NO: | FILE NO: |
|---|---|---|---|---|---|---|---|
| BY | FD | RP | BY | AS SHOWN | NOVEMBER 2014 | 6265401 | G:\Projects\Federal\DOD\ 6265401-Niagara Falls ARS |

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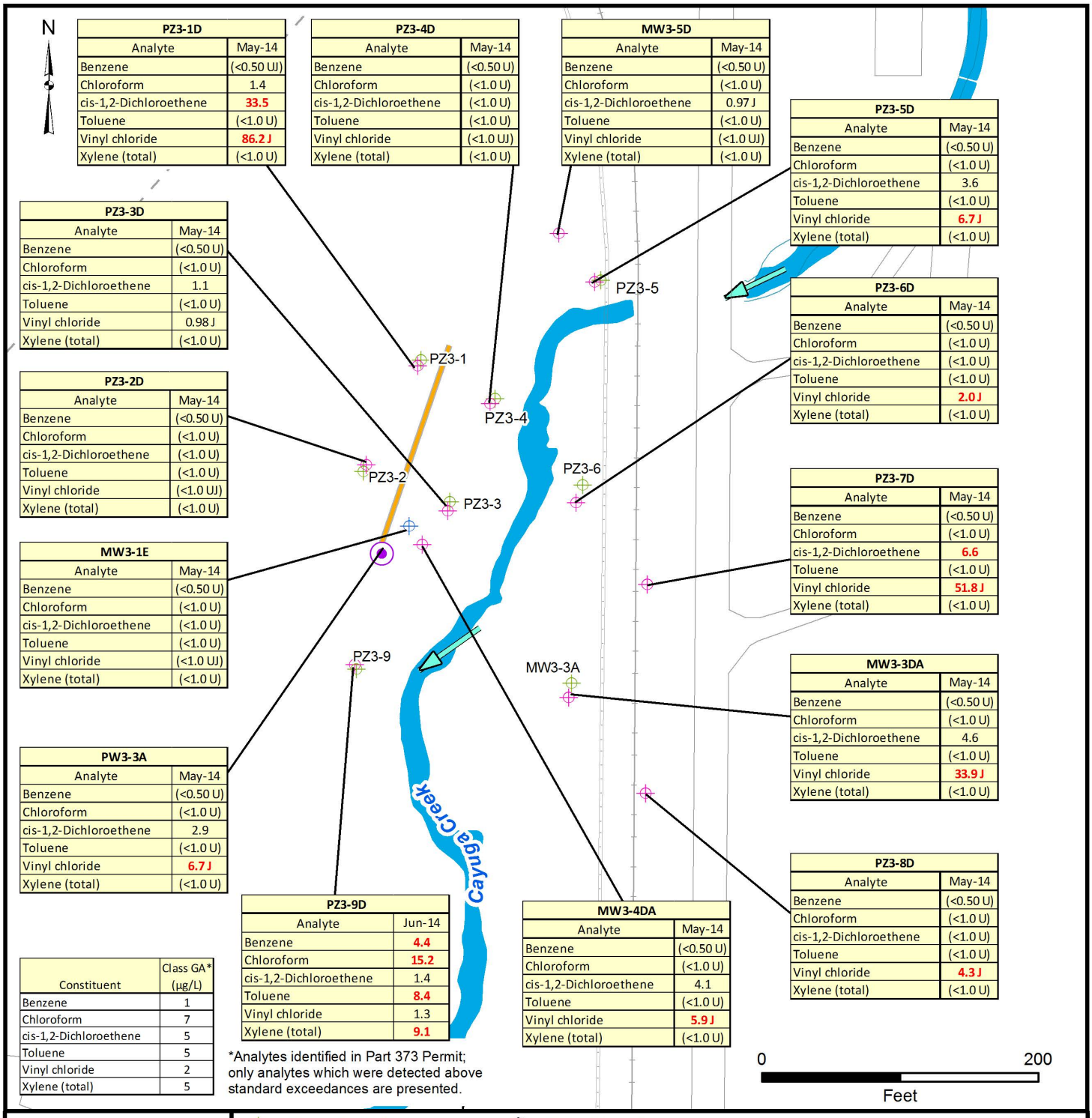


Pre-Design Investigation
Data Summary Report
Niagara Falls Air Reserve Station
Niagara Falls, New York

FIGURE 3-3
Shallow Bedrock Groundwater Results
LF008-Site 3

| PROJECT MGR: | DESIGNED BY: | CREATED BY: | CHECKED BY: | SCALE: | DATE: | PROJECT NO: | FILE NO: |
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| BY | FD | RP | BY | AS SHOWN | NOVEMBER 2014 | 6265401 | G:\Projects\Federal\DOD\ 6265401-Niagara Falls ARS |

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# 4.0 Soil and Groundwater Sampling at Site ST010 – Site 13

## 4.1 Introduction

Sampling activities were completed from May through June 2014. The contaminants of potential concern associated with the site are chlorinated volatile organic compounds, including trichloroethene, *cis*- and *trans*-1,2-dichloroethene, and vinyl chloride, and the potentially affected media includes overburden and bedrock groundwater. Field activities focused on the delineation and characterization of groundwater contamination in overburden and bedrock.

## 4.2 Groundwater Sampling and Analysis

Groundwater sampling at Site 13 included collection of:

- PDB samples from 14 existing monitoring wells including seven overburden wells (MW13-1, MW13-3, MW13-4, MW13-5A, MW13-6, PZ13-1, and PZ13-4) and seven shallow bedrock wells (MW13-1D, MW13-4D, MW13-5D, MW13-6D, PZ13-1D, PZ13-3D, PZ13-4D). PDB samples were also collected from the two pumping wells, PW13-1 and PW13-4D, which were inactive at the time of sampling
- low-flow sampling conducted at four existing monitoring wells including one overburden well (and three shallow bedrock wells)

Groundwater sample locations are shown on Figure 4-1.

PDB samplers were initially deployed in 12 monitoring wells (6 overburden wells and6 shallow bedrock) on 24 March 2014 and remained, undisturbed, in the wells until retrieval on 23 April 2014. Supplemental PDB sampling was conducted in June 2014, with samples collected from four additional monitoring wells (two overburden and two shallow bedrock) to collect additional information on current volatile organic compound (VOC) concentrations. The supplemental PDB samplers were deployed on 28 May 2014 and remained, undisturbed, in the wells until retrieval on 12 June 2014.

Low-flow sampling was conducted on 23 April 2014 at two monitoring wells (PZ13-2 and PZ13-2D), originally planned for PDB sampling but were not accessible during the March 2014 PDB deployment. PZ13-3D and MW13-5D were also sampled using low-flow on 11 June 2014. Low-flow sampling was conducted using a submersible pump and dedicated tubing. Groundwater purge forms are provided in Appendix E.

All groundwater samples were analyzed for target compound list VOCs by U.S. Environmental Protection Agency (EPA) Method 8260C. Groundwater samples from PZ13-3D and MW13-5D were also analyzed for target analyte list metals by EPA method 6020A, hardness by EPA method 2340B, sulfide by EPA method 4500-SE, chemical oxygen demand by EPA method 5220D, nitrate and nitrite by EPA method 300.0, chloride and sulfate by EPA method 300.0, alkalinity by EPA method 2320B, biological oxygen demand by EPA method 9060, dissolved organic carbon by EPA method 9060, and total organic carbon by EPA method 9060. Groundwater analytical detections are summarized in Tables 4-1a through 4-1c and exceedances of Part 373 Permit analytes (VOCs) are presented on Figure 4-2.

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**TABLE 4-1a**

**Groundwater Volatile Organic Compounds Results - Detections Only (ST010 - Site 13)**

***Pre-Design Investigation Data Summary Report***

***Niagara Falls Air Reserve Station, New York***

| Analyte | Screening Criteria [a] | MW13-1 | MW13-1D | MW13-3 | MW13-4 | MW13-4D | MW13-5A | MW13-5D | MW13-6 | MW13-6D |
|---|---|---|---|---|---|---|---|---|---|---|
| | | 6/12/2014 | 6/12/2014 | 4/23/2014 | 4/23/2014 | 4/23/2014 | 4/23/2014 | 4/23/2014 | 6/12/2014 | 6/12/2014 |
| **Part 373 Permit Volatile Organic Compounds Detected by Method SW8260B (µg/L)[b]** | | | | | | | | | | |
| 1,1-DICHLOROETHENE | 5 | 1U | 1U | 1U | 1U | 1U | 1U | 1U | 1U | 1U |
| CIS-1,2-DICHLOROETHENE | 5 | 1U | 1U | 1UJ | 1UJ | **10.4J** | **5.4J** | **15.9J** | 1U | 1U |
| TRANS-1,2-DICHLOROETHENE | 5 | 1U | 1U | 1U | 1U | 1U | 1U | 1U | 1U | 1U |
| TRICHLOROETHENE | 5 | 1U | 1U | 1U | 1U | 1U | **4.6** | **0.81J** | 1U | **0.82J** |
| VINYL CHLORIDE | 2 | 1U | 1U | 1UJ | 1UJ | 1UJ | 1UJ | **4J** | 1U | 1U |

(a) New York State Department of Environmental Conservation, Technical and Operational Guidance Series Memorandum #1.1.1: Ambient Water Quality Standards and Guidance Values and Groundwater Effluent Limitations, 1998 (with updates), Class GA Groundwater Standards and Guidance Values.

(b) No other chemicals were detected.

NOTE: µg/L = Micrograms per liter.

U = Analyte was analyzed for but not detected, reporting limit provided

J = Estimated concentration

NS = No standard available

Shaded cells exceed the screening value; **Bold** values denote detections.

**TABLE 4-1a**

**Groundwater Volatile Organic Compounds Results - Detections Only (ST010 - Site 13)**

***Pre-Design Investigation Data Summary Report***

***Niagara Falls Air Reserve Station, New York***

| Analyte | Screening Criteria | PW13-1 | PW13-4D | PZ13-1 | PZ13-1D | PZ13-2 | PZ13-2D | PZ13-3D | PZ13-4 | PZ13-4D |
|---|---|---|---|---|---|---|---|---|---|---|
| | | 4/23/2014 | 4/23/2014 | 4/23/2014 | 4/23/2014 | 4/23/2014 | 4/23/2014 | 4/23/2014 | 4/23/2014 | 4/23/2014 |
| **Part 373 Permit Volatile Organic Compounds Detected by Method SW8260B (µg/L)** | | | | | | | | | | |
| 1,1-DICHLOROETHENE | 5 | 1U | 1U | 1U | 1U | 1U | 1U | **1.8** | 1U | 1U |
| CIS-1,2-DICHLOROETHENE | 5 | **6.7J** | **2.1J** | 1UJ | **11.5J** | 1UJ | **6.6J** | **186J** | 1UJ | **3.6J** |
| TRANS-1,2-DICHLOROETHENE | 5 | 1U | 1U | 1U | 1U | 1U | 1U | **1.7** | 1U | 1U |
| TRICHLOROETHENE | 5 | **6.8** | 1U | 1U | 1U | 1U | **0.94J** | **6.8** | 1U | 1U |
| VINYL CHLORIDE | 2 | 1UJ | 1UJ | 1UJ | **11.1J** | 1UJ | **4.7J** | **4.1J** | 1UJ | 1UJ |

**TABLE 4-1b**

**Groundwater Metals Results (ST010 - Site 13)**

***Pre-Design Investigation Data Summary Report***

***Niagara Falls Air Reserve Station, New York***

| Analyte | MW13-5D | PZ13-3D |
|---|---|---|
| | 6/11/2014 | 6/11/2014 |
| **TAL Metals by Method SW6020 and SW7470A (µg/L)** | | |
| ALUMINUM | 31.2B,J | 24.7B |
| ANTIMONY | 0.46B,J | 0.2B |
| ARSENIC | 7.9 | 4.6 |
| BARIUM | 13.8J | 45.6 |
| BERYLLIUM | 2U | 2U |
| CADMIUM | 0.51B | 8.3 |
| CALCIUM | 536,000J | 271,000 |
| CHROMIUM | 22.5 | 4.8B |
| COBALT | 8 | 0.95B |
| COPPER | 88.9 | 11.2 |
| IRON | 908 | 19,100 |
| LEAD | 6.4J | 34.4 |
| MAGNESIUM | 206,000 | 180,000 |
| MANGANESE | 1,310J | 745 |
| MERCURY | 0.2U | 0.2U |
| NICKEL | 18.9 | 9.3 |
| POTASSIUM | 3,370J | 1,280 |
| SELENIUM | 0.67B | 0.53B |
| SILVER | 0.23B | 0.027B |
| SODIUM | 265,000J | 390,000 |
| THALLIUM | 0.024B,J | 0.031B |
| VANADIUM | 4.1 | 2.5B |
| ZINC | 509J | 11,600 |

NOTE: µg/L = Micrograms per liter.

U = Not detected; associated value is the reporting limit.

J = Estimated concentration.

B = Analyte detected in the associated method blank.

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**TABLE 4-1c**

**Groundwater Geochemical Results (ST010 - Site 13)**

***Pre-Design Investigation Data Summary Report***

***Niagara Falls Air Reserve Station, New York***

| Analyte | MW13-5D | PZ13-3D |
|---|---|---|
| | 6/11/2014 | 6/11/2014 |
| **Anions and General Chemistry (mg/L)** | | |
| ALKALINITY (A2320B) | 289 | 412 |
| BIOLOGICAL OXYGEN DEMAND (A5210) | 2U | 2U |
| CHEMICAL OXYGEN DEMAND (A5220C) | 20U | 20U |
| CHLORIDE (SM4500CL) | 770 | 780 |
| DISSOLVED ORGANIC CARBON (SW9060) | 3 | 3 |
| HARDNESS (A2340B) | 1,940 | 1,190 |
| NITROGEN, NITRATE (CALC) | 0.29 | 0.17 |
| NITROGEN, NITRATE + NITRITE (E353.2) | 0.29 | 0.17 |
| NITROGEN, NITRITE (SM4500-N02B) | 0.01U | 0.01U |
| SULFATE (D-516-90) | 1,450 | 724 |
| SULFIDE (SM4500) | 2U | 2U |
| TOTAL ORGANIC CARBON (SW9060) | 3.9 | 3.8 |

NOTE: mg/L = Milligrams per liter.

U = Not detected; associated value is the reporting limit.

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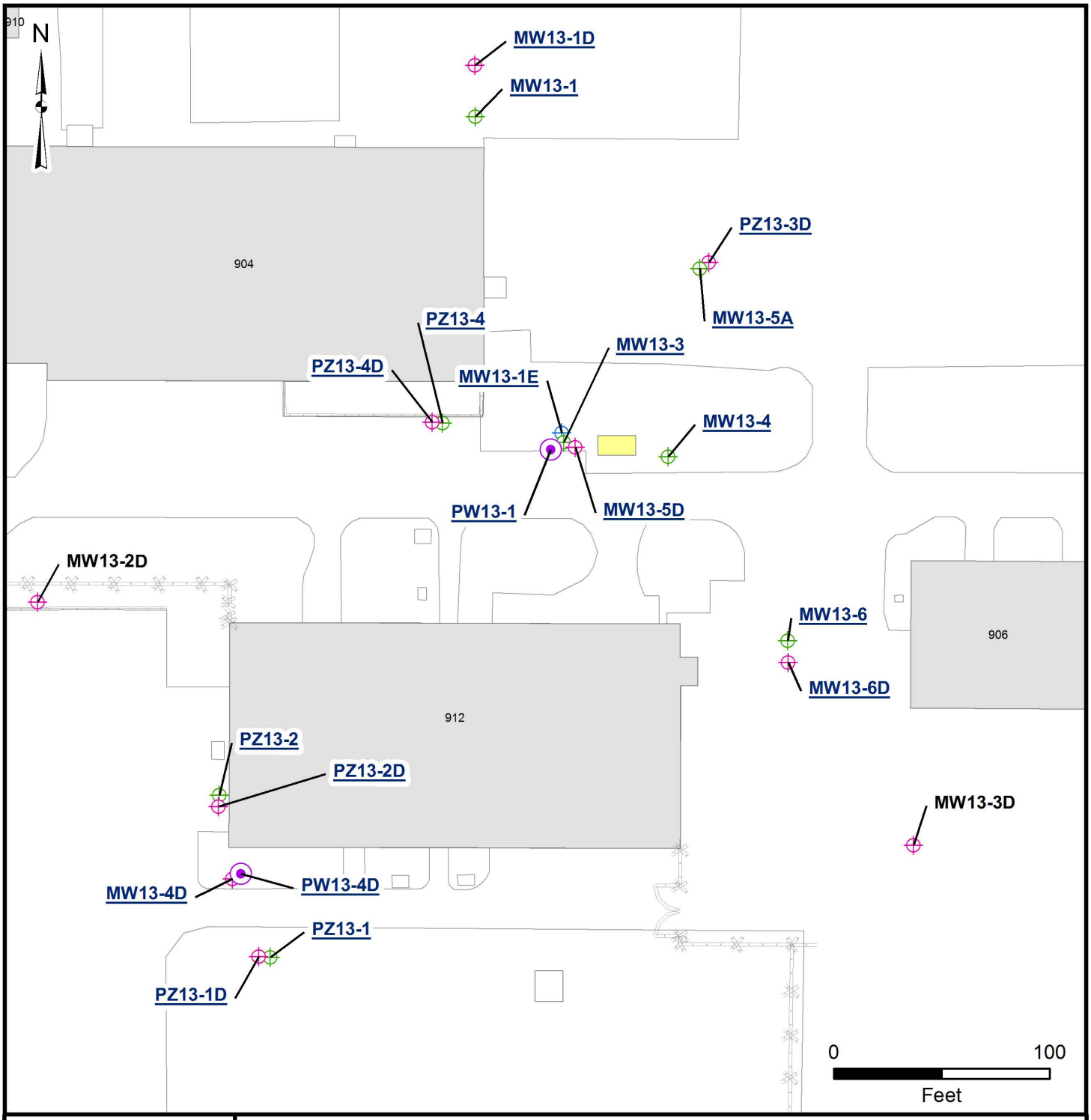


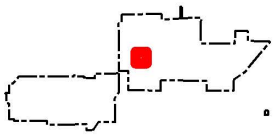

- Overburden Well/Piezometer
- Shallow Bedrock Well/Piezometer
- Deep Bedrock Well
- Pumping Well
- Approximate Location of Former Underground Storage Tank Pit
- MWX-X Sampled during Pre-Design Investigation

| | | |
|---|---|---|
| EA | Pre-Design Investigation<br>Data Summary Report<br>Niagara Falls Air Reserve Station<br>Niagara Falls, New York | FIGURE 4-1<br>Groundwater Sampling Locations<br>ST010 - Site 13 |

| PROJECT MGR: | DESIGNED BY: | CREATED BY: | CHECKED BY: | SCALE: | | PROJECT NO: | FILE NO: |
|---|---|---|---|---|---|---|---|
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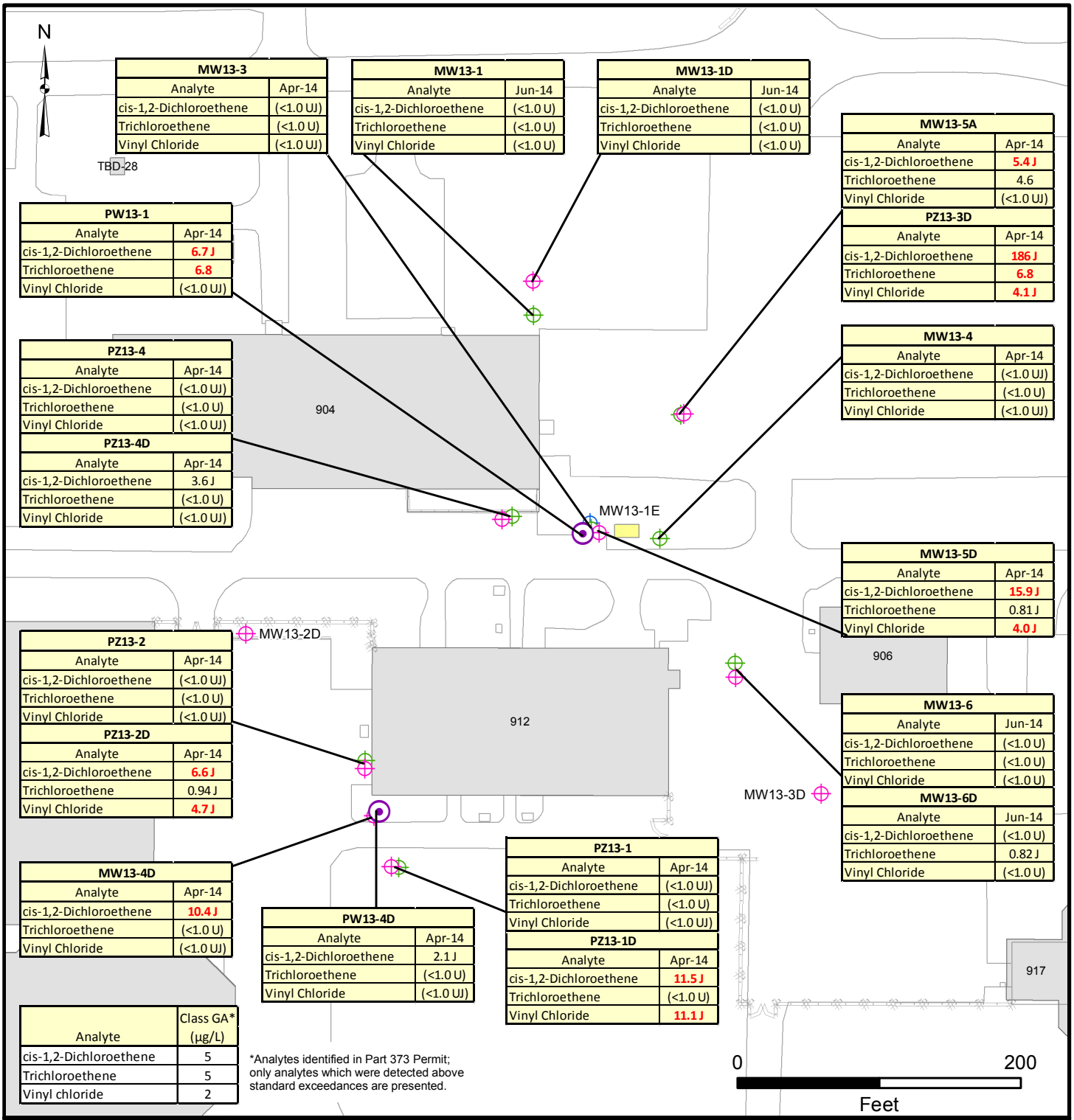


Pre-Design Investigation
Data Summary Report
Niagara Falls Air Reserve Station
Niagara Falls, New York

FIGURE 4-2
Groundwater Results
ST010-Site 13

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# 5.0 Soil and Groundwater Sampling at Site SS014 – Site 7

## 5.1 Introduction

Sampling activities were completed from March through June 2014. The contaminants of potential concern associated with the site are primarily petroleum-related volatile organic compounds (VOCs), including benzene, toluene, ethylene, and total xylene constituents, and the potentially affected media are soil and groundwater. Field activities focused on the collection of data to evaluate residual source material in overburden soil and to evaluate groundwater at the overburden/bedrock interface and in shallow bedrock.

## 5.2 Subsurface Investigation

### 5.2.1 Hydraulic Profiling

Six soil borings were completed to evaluate the relative permeability of soils using a hydraulic profiling tool (HPT). The borings were completed using direct-push drilling techniques, to the top of bedrock, which is approximately 5-7 ft below ground surface. HPT logs are provided in Appendix F-1. Temporary, 1-inch-diameter groundwater monitoring points were installed at these locations to collect groundwater grab samples for laboratory analysis of VOCs. Temporary points were constructed with a 5-ft-long screened interval and a riser extending approximately 1 ft above ground surface.

### 5.2.2 Soil Boring

One soil sample was collected adjacent to one HPT boring (SB7-01) to allow comparison of the HPT readings to soil observations (e.g., soil classification, evidence of potential contamination including staining, sheens, elevated photoionization detector readings, and/or obvious odor) (Figure 5-1). The soil boring log is provided in Appendix F-2.

The soil sample was submitted for laboratory analysis including target compound list (TCL) VOCs by U.S. Environmental Protection Agency (EPA) Method 8260C, target analyte list (TAL) metals by EPA method 6010C, mercury by EPA Method 7471B, total organic carbon by Lloyd Kahn, grain size by EPA Method ASTM-D422-63, and percent solids. Soil analytical results are provided in Tables 5-1a through 5-1c.

## 5.3 Groundwater Sampling and Analysis

Groundwater sampling at Site 7 included collection of:

- grab samples from six temporary monitoring points (GW7-01 through GW7-06).
- passive diffusion bag (PDB) sampling conducted at one existing shallow bedrock monitoring well (MW7-1D).
- low-flow sampling conducted at two existing monitoring wells including overburden well MW7-2 and shallow bedrock well MW7-1D

Groundwater sample locations are shown on Figure 5-1.

Dedicated polyethylene bailers were used to collect the grab samples from each monitoring point. Following sample collection, the temporary points were removed and the soil boring was backfilled with bentonite.

A PDB sampler was deployed in MW7-1D on 24 March 2014 and remained, undisturbed, in the well until retrieval on 8 April 2014.

Low-flow sampling was conducted using a submersible pump. Groundwater purge forms are provided in Appendix F-3. Low-flow sampling of only MW7-1D was initially planned; however, as site-related contaminants of potential concern were detected in temporary monitoring wells, additional low-flow sampling was conducted at MW7-2 to evaluate the overburden groundwater chemistry.

All groundwater samples were analyzed for TCL VOCs by EPA Method 8260C. Low-flow groundwater samples from the existing monitoring wells were also analyzed for TAL metals by EPA method 6020A, hardness by EPA method 2340B, sulfide by EPA method 4500-SE, chemical oxygen demand by EPA method 5220D, nitrate and nitrite by EPA method 300.0, chloride and sulfate by EPA method 300.0, alkalinity by EPA method 2320B, biological oxygen demand by EPA method 9060, dissolved organic carbon by EPA method 9060, and total organic carbon by EPA method 9060. Groundwater analytical detections are summarized in Tables 5-2a through 5-2c and exceedances of Part 373 Permit analytes (VOCs) are presented on Figure 5-2.

**TABLE 5-1a**

**Soil Volatile Organic Compounds Results - Detections Only (SS014 - Site 7)**

***Pre-Design Investigation Data Summary Report***

***Niagara Falls Air Reserve Station, New York***

| Analyte | SB7-01-3.5-4.5<br>4/29/2014 | SB7-FD-140429<br>4/29/2014 |
|---|---|---|
| **Volatile Organic Compounds Detected by Method SW8260B (mg/kg)** | | |
| ETHYLBENZENE | 0.665 | 0.176 J |
| XYLENE (TOTAL) | 1.14 | 0.037 J |
| ISOPROPYLBENZENE | 0.17J | 0.618 J |

NOTE: mg/kg = Milligrams per kilogram.

J = Estimated concentration

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**TABLE 5-1b**

**Soil Metals Results (SS014 - Site 7)**

***Pre-Design Investigation Data Summary Report***

***Niagara Falls Air Reserve Station, New York***

| Analyte | SB7-01-3.5-4.5<br>4/29/2014 |
|---|---|
| **TAL Metals by Method SW6010C and SW7471 (mg/kg)** | |
| ALUMINUM | 12,000 |
| ANTIMONY | 0.98UJ |
| ARSENIC | 3.4J |
| BARIUM | 158 |
| BERYLLIUM | 0.59 |
| CADMIUM | 0.29B |
| CALCIUM | 90,300 |
| CHROMIUM | 15.1 |
| COBALT | 10.4 |
| COPPER | 17.4 |
| IRON | 18,100J |
| LEAD | 7.9 |
| MAGNESIUM | 14,300 |
| MANGANESE | 515 |
| MERCURY | 0.039U |
| NICKEL | 21.3 |
| POTASSIUM | 1,670 |
| SELENIUM | 0.98U |
| SILVER | 0.49U |
| SODIUM | 122B |
| THALLIUM | 0.98U |
| VANADIUM | 22.5 |
| ZINC | 443J |

NOTE: mg/kg = Milligrams per kilogram.

U = Not detected; associated value is the reporting limit.

B = Analyte detected in the associated method blank.

j = Estimated concentration

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**TABLE 5-1c**

**Soil General Chemistry and Physical Properties Results (SS014 - Site 7)**

***Pre-Design Investigation Data Summary Report***

***Niagara Falls Air Reserve Station, New York***

| Analyte | SB7-01-3.5-4.5<br>4/29/2014 |
|---|---|
| **General Chemistry by Lloyd Kahn (mg/kg)** | |
| TOTAL ORGANIC CARBON | 1,770 |
| **Grain Size by D422 and Percent Solids by SM2540B (%)** | |
| PERCENT SOLIDS | 82.0 |
| % GRAVEL | 19.5 |
| % SAND | 30.2 |
| % SILT, CLAY, COLLOIDS | 50.3 |
| 0.0015 mm (HYDROMETER) | 19.0 |
| 0.005 mm (HYDROMETER) | 27.0 |
| 0.030 mm (HYDROMETER) | 47.0 |
| 0.375 INCH SIEVE | 92.7 |
| 0.75 INCH SIEVE | 100 |
| 1.5 INCH SIEVE | 100 |
| 3 INCH SIEVE | 100 |
| No.10 SIEVE (2.00 mm) | 61.9 |
| No.100 SIEVE (0.15 mm) | 52.1 |
| No.16 SIEVE (1.18 mm) | 60.4 |
| No.200 SIEVE (0.075 mm) | 50.3 |
| No.30 SIEVE (0.60 mm) | 58.2 |
| No.4 SIEVE (4.75 mm) | 80.5 |
| No.50 SIEVE (0.30 mm) | 56.2 |
| No.8 SIEVE (2.36 mm) | 65.0 |

NOTE: mg/kg = Milligrams per kilogram.

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**TABLE 5-2a**

**Groundwater Volatile Organic Compounds Results Detections Only (SS014 - Site 7)**

***Pre-Design Investigation Data Summary Report***

***Niagara Falls Air Reserve Station, New York***

| Analyte | Screening Criteria [(a)] | GW7-01 | GW7-02 | GW7-03 | GW7-04 | GW7-05 | GW7-06 | MW7-1D | | MW7-2 |
|---|---|---|---|---|---|---|---|---|---|---|
| | | 4/30/2014 | 4/30/2014 | 4/30/2014 | 4/30/2014 | 4/30/2014 | 4/30/2014 | 4/8/2014 | 6/9/2014 | 6/9/2014 |
| **Part 373 Permit Volatile Organic Compounds Detected by Method SW8260B (µg/L)** | | | | | | | | | | |
| BENZENE | 1 | **1.3** | **0.42J** | **85** | **5.2** | **1.7** | **0.83** | **3.9** | **47.7** | 0.5U |
| CIS-1,2-DICHLOROETHENE | 5 | 1U | 1U | 5U | 1U | 1U | 1U | 1U | **1.6** | 1U |
| ETHYLBENZENE | 5 | **0.56J** | **0.52J** | **319** | **148** | **34** | 1U | **0.56J** | **24.9** | 1U |
| TOLUENE | 5 | 1U | **0.77J** | 5U | **6.9** | **1.2** | **1.7** | 1U | **0.51J** | 1U |
| XYLENE (TOTAL) | 5 | 1U | 1U | **73.8** | **797** | **43.2** | **0.84J** | 1U | **35.7** | 1U |
| **Other Volatile Organic Compounds Detected by Method SW8260B (µg/L)** | | | | | | | | | | |
| ACETONE | 50 | 10UJ | 10UJ | 50UJ | 10UJ | 10UJ | **8J** | 10U | 10UJ | 10UJ |
| CYCLOHEXANE | NS | 5UJ | **22.4** | **575** | **169** | **69.8J** | 5U | 5U | **260** | 5U |
| ISOPROPYLBENZENE | 5 | **1.2J** | **1J** | **87.1** | **59.8** | **4.4J** | 5U | 5U | **29** | 5U |
| METHYLCYCLOHEXANE | NS | **9** | **27.6** | **554** | **205** | **98.8** | **3.4J** | 5U | **89.5J** | 5U |
| METHYLENE CHLORIDE | 5 | 2U | **1.3J** | 10U | 2U | 2U | 2U | 2U | 2U | 2U |

(a) New York State Department of Environmental Conservation, Technical and Operational Guidance Series Memorandum #1.1.1: Ambient Water Quality Standards and Guidance Values and Groundwater Effluent Limitations, 1998 (with updates), Class GA Groundwater Standards and Guidance Values.

NOTE: µg/L = Micrograms per liter.

U = Analyte was analyzed for but not detected, reporting limit provided

J = Estimated concentration

NS = No standard available

Shaded cells exceed the screening value; **Bold** values denote detections.

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**TABLE 5-2b**

**Groundwater Metals Results (SS014 - Site 7)**

***Pre-Design Investigation Data Summary Report***

***Niagara Falls Air Reserve Station, New York***

| Analyte | MW7-1D<br>6/9/2014 | MW7-2<br>6/9/2014 |
|---|---|---|
| **TAL Metals by Method SW6020 and SW7470A (µg/L)** | | |
| ALUMINUM | 70.6 | 413 |
| ANTIMONY | 4U | 4U |
| ARSENIC | 4U | 4U |
| BARIUM | 59.3 | 35.2 |
| BERYLLIUM | 2U | 2U |
| CADMIUM | 6U | 0.059B |
| CALCIUM | 80,300J | 92,300 |
| CHROMIUM | 12.7J | 0.74B |
| COBALT | 0.38B | 1.4 |
| COPPER | 26.6 | 2.3B |
| IRON | 4,610 | 2,860 |
| LEAD | 3U | 3U |
| MAGNESIUM | 40,900J | 47,200 |
| MANGANESE | 166 | 218 |
| MERCURY | 0.2U | 0.2U |
| NICKEL | 50.5 | 2.2B |
| POTASSIUM | 969 | 832 |
| SELENIUM | 2U | 2U |
| SILVER | 2U | 2U |
| SODIUM | 7,670 | 5,740 |
| THALLIUM | 2U | 2U |
| VANADIUM | 4U | 4U |
| ZINC | 15.6 | 34.8 |

NOTE: µg/L = Micrograms per liter.

U = Not detected; associated value is the reporting limit.

J = Estimated concentration.

B = Analyte detected in the associated method blank.

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**TABLE 5-2c**

**Groundwater Geochemical Results (SS014 - Site 7)**

***Pre-Design Investigation Data Summary Report***

***Niagara Falls Air Reserve Station, New York***

| Analyte | MW7-1D | MW7-2 |
|---|---|---|
| | 6/9/2014 | 6/9/2014 |
| **Anions and General Chemistry (mg/L)** | | |
| ALKALINITY (A2320B) | 335 | 326 |
| BIOLOGICAL OXYGEN DEMAND (A5210) | 4U | 4U |
| CHEMICAL OXYGEN DEMAND (A5220C) | 20U | 20U |
| CHLORIDE (SM4500CL) | 3.5 | 3.5 |
| DISSOLVED ORGANIC CARBON (SW9060) | 4.1 | 3.7 |
| HARDNESS (A2340B) | 358 | 388 |
| NITROGEN, NITRATE (CALC) | 0.11U | 0.11U |
| NITROGEN, NITRATE + NITRITE (E353.2) | 0.1U | 0.1U |
| NITROGEN, NITRITE (SM4500-N02B) | 0.01U | 0.01U |
| SULFATE (D-516-90) | 52.5 | 53.7 |
| SULFIDE (SM4500) | 2U | 2U |
| TOTAL ORGANIC CARBON (SW9060) | 6.5 | 3.7 |

NOTE: mg/L = Milligrams per liter.

U = Not detected; associated value is the reporting limit.

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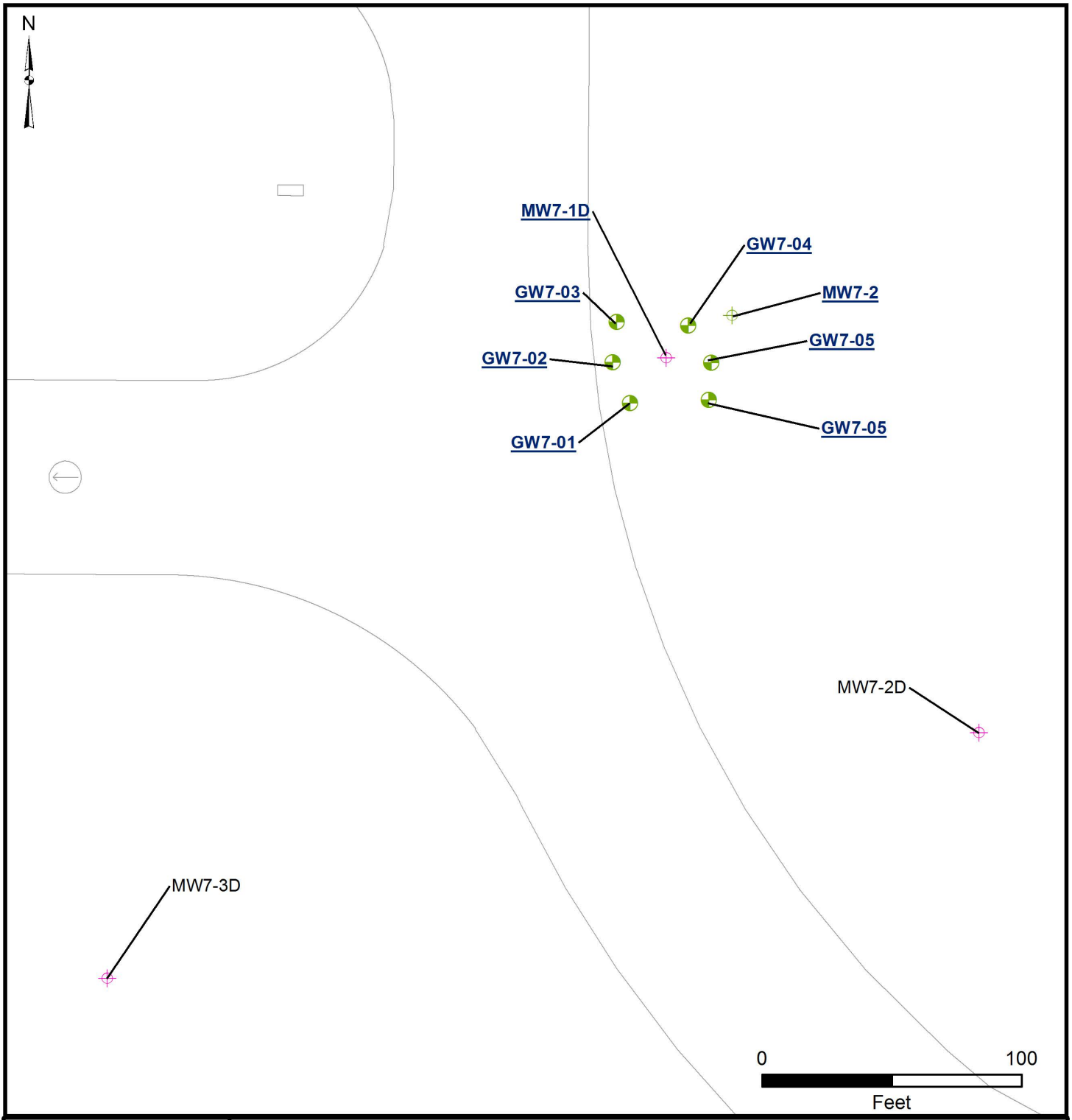


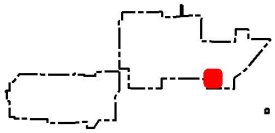

Overburden Well/Piezometer
Shallow Bedrock Well/Piezometer
Temporary Monitoting Point

MWX-X Sampled during Pre-Design Investigation

Pre-Design Investigation
Data Summary Report
Niagara Falls Air Reserve Station
Niagara Falls, New York

FIGURE 5-1
Pre-Design Investigations
SS014 - Site 7

| PROJECT MGR: | DESIGNED BY: | CREATED BY: | CHECKED BY: | SCALE: | DATE: | PROJECT NO: | FILE NO: |
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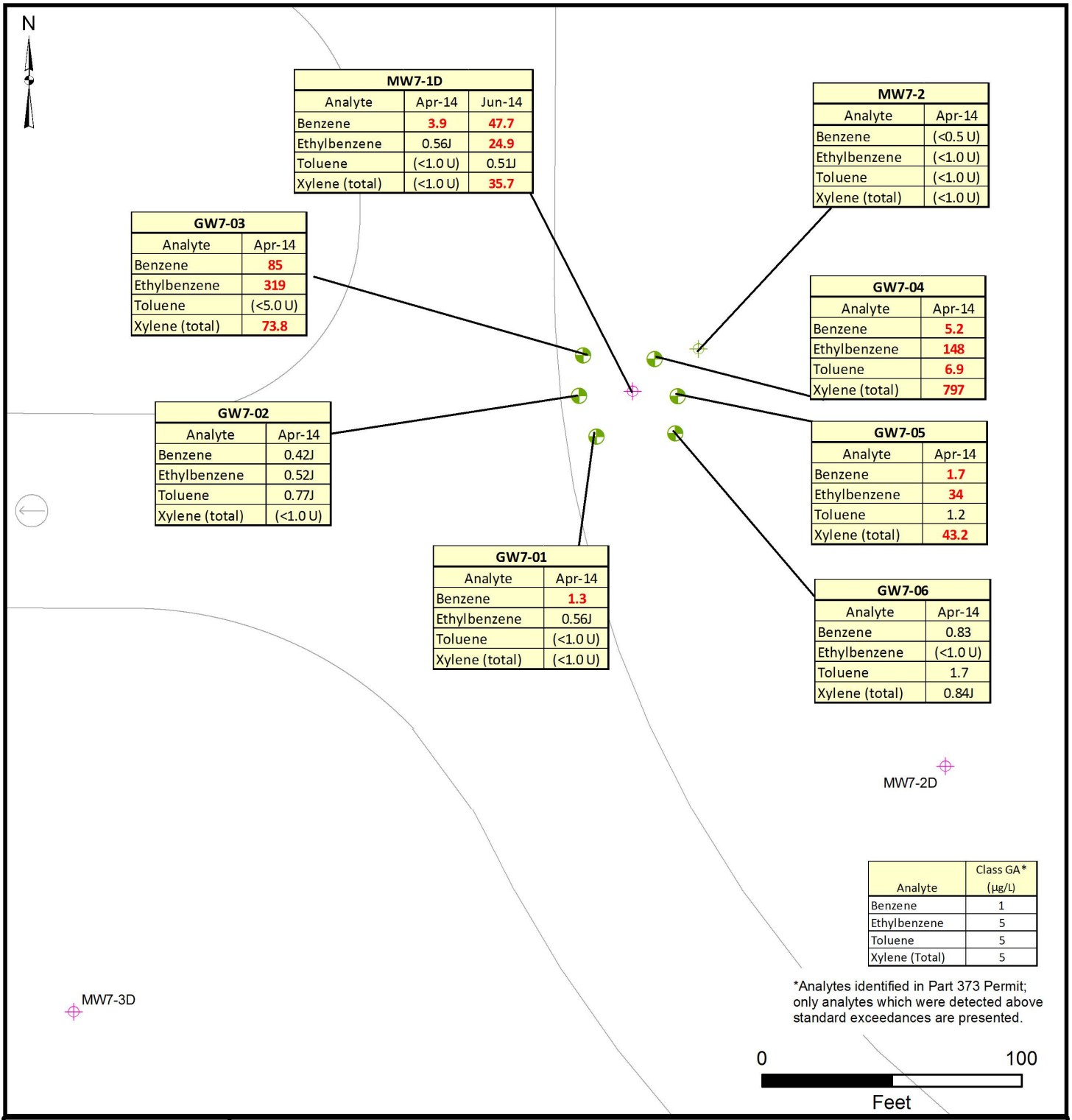


Overburden Well/Piezometer
Shallow Bedrock Well/Piezometer
Temporary Wells

89 = Indicates above NYSDEC Class GA Standards
J = Estimated concentration
U = Not detected above reporting limit
< 0.54 U = Not detected, value reported is reporting limit
All concentrations reported in micrograms per liter (µg/L)

Pre-Design Investigation
Data Summary Report
Niagara Falls Air Reserve Station
Niagara Falls, New York

FIGURE 5-2
Groundwater Results
SS014 - Site 7

| PROJECT MGR: | DESIGNED BY: | CREATED BY: | CHECKED BY: | SCALE: | DATE: | PROJECT NO: | FILE NO: |
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# 6.0 Soil and Groundwater Sampling at Site DS002 – Site 8

## 6.1 Introduction

Sampling activities were completed from March through June 2014. The contaminants of potential concern associated with the site are primarily chlorinated volatile organic compounds, including trichloroethene and its degradation products (*cis*- and *trans*-1,2-dichloroethene, and vinyl chloride), and the potentially affected media are soil and groundwater.

## 6.2 Subsurface Investigation

### 6.2.1 Hydraulic Profiling

Ten soil borings were completed to evaluate the relative permeability of soils using HPT. The borings were completed using direct-push drilling techniques, to the top of bedrock, which is approximately 12-15 ft bgs. HPT logs are provided in Appendix G-1. Temporary, 1- in.-diameter groundwater monitoring points were installed at these locations to collect groundwater grab samples for laboratory analysis of VOCs. Temporary points were constructed with a 5-ft-long screened interval and a riser extending approximately 1 ft above ground surface.

### 6.2.2 Soil Boring

Soil samples were collected adjacent to two of the HPT locations (SB8-04 and SB8-08), to allow comparison of the HPT readings to soil observations (e.g., soil classification, evidence of potential contamination including staining, sheens, elevated photoionization detector readings, and/or obvious odor) (Figure 6-1). Soil boring logs are provided in Appendix G-2.

Soil samples were submitted for laboratory analysis including target compound list (TCL) VOCs by U.S. Environmental Protection Agency (EPA) Method 8260C, target analyte list (TAL) metals by EPA method 6010C, mercury by EPA Method 7471B, total organic carbon by Lloyd Kahn, grain size by EPA Method ASTM-D422-63, and percent solids. Soil analytical results are provided in Tables 6-1a through 6-1c.

## 6.3 Groundwater Sampling and Analysis

### 6.3.1 Monitoring Well Installation

One bedrock monitoring well (CH8-01) was installed between exiting monitoring wells MW8-1 and MW8-10D (Figure 6-1). The well was installed using 4.25-in. internal diameter hollow-stem augers to drill through overburden to bedrock. Upon reaching bedrock, augers were removed and a temporary 6-in. steel casing was installed. A roller bit was used to drill approximately 2 ft into bedrock and a 5⅞-in.-internal diameter rock socket was set. A 4-in. internal diameter casing was placed into the borehole and grouted in place to seal off the overburden. Coring was performed using fluid rotary and N/Q-size wireline coring. Rock cores were collected in 5-ft core runs and used to determine bedrock stratigraphy, fracture locations, and orientations. The bedrock core hole was left open to formation water, and the well was completed at the surface with an 8-in.-diameter flush-mount cover. Boring logs are provided in Appendix G-2.

### 6.3.2 Groundwater Sampling

Groundwater sampling at Site 8 included collection of:

- grab samples from the 10 temporary monitoring points (PP8-01 through PP8-10) and the newly installed bedrock monitoring well (CH8-01)
- PDB sampling at eight existing monitoring wells including four overburden wells (MW8-1, MW8-3, MW8-4A, MW8-8), three shallow bedrock wells (MW8-2D, MW8-3DA, and MW8-10D), and one deep bedrock well (MW8-1E)
- low-flow sampling conducted at two existing monitoring wells (MW8-01 and MW8-10D) and the newly installed bedrock monitoring well (CH8-01)

Groundwater sample locations are shown on Figure 6-1.

Dedicated polyethylene bailers were used to collect the grab samples from each monitoring point. Following sample collection, the temporary points were removed and the soil boring was backfilled with bentonite.

PDB sampling was conducted at eight existing monitoring wells. The PDB samplers were deployed on 24 March 2014 and remained, undisturbed, in the well until retrieval on 8 April 2014. An additional PDB sampler was deployed in bedrock well MW8-10D on 10 June 2014 and remained, undisturbed, in the well until retrieval on 27 June 2014.

Low-flow sampling was conducted using a submersible pump. Low flow sampling of only MW8-1 and MW8-10D was initially planned; however, low-flow sampling was also conducted at newly installed bedrock well CH8-01 to collect groundwater samples for VOC analysis. Groundwater purge forms are provided in Appendix G-3.

All samples were analyzed for TCL VOCs by EPA Method 8260C. Low-flow groundwater samples from MW8-01 and MW8-10D were also analyzed for TAL metals by EPA method 6020A, hardness by EPA method 2340B, sulfide by EPA method 4500-SE, chemical oxygen demand by EPA method 5220D, nitrate and nitrite by EPA method 300.0, chloride and sulfate by EPA method 300.0, alkalinity by EPA method 2320B, biological oxygen demand by EPA method 9060, dissolved organic carbon by EPA method 9060, and total organic carbon by EPA method 9060. Groundwater analytical detections are summarized in Tables 6-2a through 6-2c and exceedances of Part 373 Permit analytes (VOCs) are presented on Figures 6-2 and 6-3.

**TABLE 6-1a**

**Soil Volatile Organic Compounds Results - Detections Only (SS002 - Site 8)**

***Pre-Design Investigation Data Summary Report***

***Niagara Falls Air Reserve Station, New York***

| Analyte | SB8-04-7-8<br>4/30/2014 | SB8-04-8-10<br>4/30/2014 | SB8-04-12-14<br>4/30/2014 | SB8-08-10-12<br>4/30/2014 |
|---|---|---|---|---|
| **Volatile Organic Compounds Detected by Method SW8260B (mg/kg)** | | | | |
| BENZENE | 0.00082 | 0.0033 | 0.0022 | 0.00087 |
| CIS-1,2-DICHLOROETHENE | 0.0029 | 0.0026U | 0.0019U | 0.0066 |
| TOLUENE | 0.0017J | 0.0055J | 0.0022J | 0.0012J |
| TRICHLOROETHENE | 0.0012U | 0.0026U | 0.0019U | 0.0367 |
| XYLENE (TOTAL) | 0.0016 | 0.0044 | 0.002 | 0.00092J |
| CYCLOHEXANE | 0.0015J | 0.0057J | 0.0038J | 0.0011J |
| METHYLCYCLOHEXANE | 0.0025J | 0.0092 | 0.0067 | 0.0018J |
| TETRACHLOROETHENE | 0.0012U | 0.0026U | 0.0019U | 0.0016 |

NOTE: mg/kg = Milligrams per kilogram.

U = Analyte was analyzed for but not detected, reporting limit provided

J = Estimated concentration

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**TABLE 6-1b**

**Soil Metals Results (DS002 - Site 8)**

***Pre-Design Investigation Data Summary Report***

***Niagara Falls Air Reserve Station, New York***

| Analyte | SB8-04-7-8 | SB8-04-8-10 | SB8-04-12-14 | SB8-08-10-12 |
|---|---|---|---|---|
| | 4/30/2014 | 4/30/2014 | 4/30/2014 | 4/30/2014 |
| **TAL Metals by Method SW6010C and SW7471 (mg/kg)** | | | | |
| ALUMINUM | 6,610 | 19,200 | 14,700 | 10,700J |
| ANTIMONY | 0.89U | 0.26J | 0.19B | 1.1U |
| ARSENIC | 8.9 | 3.8 | 4.7 | 6.8J |
| BARIUM | 57.8 | 143 | 112 | 62.7 |
| BERYLLIUM | 0.31B | 0.91 | 0.69 | 0.5 |
| CADMIUM | 2.0 | 0.14B | 0.15B | 0.095B |
| CALCIUM | 146,000 | 43,600 | 46,000 | 55,700 |
| CHROMIUM | 8.8 | 25 | 19.4 | 15J |
| COBALT | 4.7 | 12.4 | 10.6 | 11.6 |
| COPPER | 8.6 | 20.8 | 18.1 | 15.8 |
| IRON | 10,300 | 32,800 | 21,400 | 19,000J |
| LEAD | 39.4 | 10.5 | 9.7 | 10.9 |
| MAGNESIUM | 83,900 | 14,000 | 16,400 | 22,200 |
| MANGANESE | 471 | 555 | 526 | 510 |
| MERCURY | 0.0094B | 0.035U | 0.0075B | 0.039U |
| NICKEL | 10.8 | 29.1 | 23.1 | 20.9J |
| POTASSIUM | 1,550 | 4,120 | 3,630 | 2,030J |
| SELENIUM | 0.45B | 1U | 1.1U | 1.1U |
| SILVER | 0.37B | 0.52U | 0.54U | 0.53U |
| SODIUM | 227B | 228B | 221B | 153B |
| THALLIUM | 0.26B | 0.29B | 1.1U | 0.3B |
| VANADIUM | 14.2 | 32.4 | 27.5 | 20.9 |
| ZINC | 520 | 71.2J | 64.8 | 86.6 |

NOTE: mg/kg = Milligrams per kilogram.

U = Not detected; associated value is the reporting limit.

B = Analyte detected in the associated method blank.

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**TABLE 6-1c**

**Soil General Chemistry and Physical Properties Results (DS002 - Site 8)**

***Pre-Design Investigation Data Summary Report***

***Niagara Falls Air Reserve Station, New York***

| Analyte | SB8-04-7-8 | SB8-04-8-10 | SB8-04-12-14 | SB8-08-10-12 |
|---|---|---|---|---|
| | 4/30/2014 | 4/30/2014 | 4/30/2014 | 4/30/2014 |
| **General Chemistry by Lloyd Kahn (mg/kg)** | | | | |
| TOTAL ORGANIC CARBON | 1,180 | 2,100 | 1,170 | 1,150 |
| **Grain Size by D422 and Percent Solids by SM2540B (%)** | | | | |
| PERCENT SOLIDS | 95.4 | 75.7 | 77.1 | 80.6 |
| % GRAVEL | NA | NA | 25.1 | 0.0 |
| % SAND | NA | NA | 23.7 | 5.7 |
| % SILT, CLAY, COLLOIDS | NA | NA | 51.2 | 94.3 |
| 0.0015 mm (HYDROMETER) | NA | NA | 6.0 | 34.0 |
| 0.005 mm (HYDROMETER) | NA | NA | 8.0 | 53.0 |
| 0.030 mm (HYDROMETER) | NA | NA | 27.0 | 85.0 |
| 0.375 INCH SIEVE | NA | NA | 81.8 | 100 |
| 0.75 INCH SIEVE | NA | NA | 93.6 | 100 |
| 1.5 INCH SIEVE | NA | NA | 100 | 100 |
| 3 INCH SIEVE | NA | NA | 100 | 100 |
| No.10 SIEVE (2.00 mm) | NA | NA | 61.6 | 98.0 |
| No.100 SIEVE (0.15 mm) | NA | NA | 56.6 | 95.9 |
| No.16 SIEVE (1.18 mm) | NA | NA | 60.5 | 97.7 |
| No.200 SIEVE (0.075 mm) | NA | NA | 51.2 | 94.3 |
| No.30 SIEVE (0.60 mm) | NA | NA | 59.4 | 97.4 |
| No.4 SIEVE (4.75 mm) | NA | NA | 75.0 | 100 |
| No.50 SIEVE (0.30 mm) | NA | NA | 58.4 | 96.9 |
| No.8 SIEVE (2.36 mm) | NA | NA | 63.8 | 98.9 |

NOTE: mg/kg = Milligrams per kilogram.

NA = Not analyzed.

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**TABLE 6-2a**

**Groundwater Volatile Organic Compounds Results - Detections Only (DS002 - Site 8)**

***Pre-Design Investigation Data Summary Report***

***Niagara Falls Air Reserve Station, New York***

| Analyte | Screening Criteria (a) | CH8-01 | | MW8-10D | MW8-10D-23-25 | MW8-1 | MW8-1E | MW8-2D | MW8-3 |
|---|---|---|---|---|---|---|---|---|---|
| | | 5/21/2014 | 6/10/2014 | 4/8/2014 | 6/27/2014 | 4/23/2014 | 4/8/2014 | 4/8/2014 | 4/8/2014 |
| **Part 373 Permit Volatile Organic Compounds Detected by Method SW8260B (µg/L)** | | | | | | | | | |
| 1,1-DICHLOROETHENE | 5 | 1U | 1U | 1U | 1U | 1U | 1U | 1U | 1U |
| BENZENE | 1 | **1.3** | 0.5U | 0.5U | 0.5U | 0.5UJ | 0.5U | 0.5U | 0.5U |
| CARBON TETRACHLORIDE | 5 | 1U | 1U | 1U | 1U | 1U | 1U | 1U | 1U |
| CHLOROFORM | 7 | **10.5** | 1U | 1U | 1U | 1U | 1U | 1U | 1U |
| CIS-1,2-DICHLOROETHENE | 5 | **1.7** | **6.3** | **5.2** | **8.3** | **7.3J** | 1U | **1.8** | 1U |
| TRANS-1,2-DICHLOROETHENE | 5 | 1U | **0.52J** | 1U | **1.3** | 1U | 1U | 1U | 1U |
| ETHYLBENZENE | 5 | **0.47J** | 1U | 1U | 1U | 1U | 1U | 1U | 1U |
| TOLUENE | 5 | **2.7** | 1U | 1U | 1U | 1U | 1U | 1U | 1U |
| TRICHLOROETHENE | 5 | 1U | 1U | 1U | **1.1** | 1U | 1U | 1U | 1U |
| VINYL CHLORIDE | 2 | 1U | **1.3** | **3.9** | **2.0** | **26J** | 1U | **0.78J** | 1U |
| XYLENE (TOTAL) | 5 | **2.5** | 1U | 1U | 1U | 1U | 1U | 1U | 1U |
| **Other Volatile Organic Compounds Detected by Method SW8260B (µg/L)** | | | | | | | | | |
| 1,2-DICHLOROBENZENE | 3 | 1U | 1U | 1U | 1U | 1U | 1U | 1U | 1U |
| 1,2-DICHLOROPROPANE | 1 | 2U | 2U | 2U | 2U | 2UJ | 2U | 2U | 2U |
| 1,4-DICHLOROBENZENE | 3 | 1U | 1U | 1U | 1U | 1U | 1U | 1U | 1U |
| CHLOROBENZENE | 5 | 1U | 1U | 1U | 1U | 1U | 1U | 1U | 1U |
| METHYLCYCLOHEXANE | NS | **1.4J** | 5U | 5U | 5U | 5UJ | 5U | 5U | 5U |

(a) New York State Department of Environmental Conservation, Technical and Operational Guidance Series Memorandum #1.1.1: Ambient Water Quality Standards and Guidance Values and Groundwater Effluent Limitations, 1998 (with updates), Class GA Groundwater Standards and Guidance Values.

NOTE: µg/L = Micrograms per liter.

U = Analyte was analyzed for but not detected, reporting limit provided

J = Estimated concentration

NS = No standard available

Shaded cells exceed the screening value; **Bold** values denote detections.

**TABLE 6-2a**

**Groundwater Volatile Organic Compounds Results - Detections Only (DS002 - Site 8)**

***Pre-Design Investigation Data Summary Report***

***Niagara Falls Air Reserve Station, New York***

| Analyte | Screening Criteria | MW8-3DA 4/8/2014 | MW8-4A 4/8/2014 | MW8-8 4/8/2014 | PP8-01 4/30/2014 | PP8-02 4/30/2014 | PP8-03 4/30/2014 | PP8-04 4/30/2014 | PP8-05 4/30/2014 |
|---|---|---|---|---|---|---|---|---|---|
| **Part 373 Permit Volatile Organic Compounds Detected by Method SW8260B (µg/L)** | | | | | | | | | |
| 1,1-DICHLOROETHENE | 5 | 1U | 1U | 1U | 1U | 1U | 1U | 1U | 1U |
| BENZENE | 1 | 0.5U | 0.5U | 0.5U | 0.5U | **0.59** | 0.5U | **1.1** | 0.5U |
| CARBON TETRACHLORIDE | 5 | 1U | 1U | 1U | 1U | 1U | 1U | 1U | 1U |
| CHLOROFORM | 7 | 1U | 1U | 1U | 1U | 1U | 1U | 1U | 1U |
| CIS-1,2-DICHLOROETHENE | 5 | 1U | 1U | **8.3** | 1U | **13.7** | **1.6J** | 1U | 1U |
| TRANS-1,2-DICHLOROETHENE | 5 | 1U | 1U | 1U | 1U | **1.0** | 1U | 1U | 1U |
| ETHYLBENZENE | 5 | 1U | 1U | 1U | 1U | 1U | 1U | 1U | 1U |
| TOLUENE | 5 | 1U | 1U | 1U | **0.72J** | **0.48J** | 1U | **1.7** | 1U |
| TRICHLOROETHENE | 5 | 1U | 1U | **0.49J** | 1U | **2.9** | **5.4J** | 1U | 1U |
| VINYL CHLORIDE | 2 | 1U | 1U | **1.5** | 1U | **4.3** | 1U | 1U | 1U |
| XYLENE (TOTAL) | 5 | 1U | 1U | 1U | 1U | 1U | 1U | **0.54J** | 1U |
| **Other Volatile Organic Compounds Detected by Method SW8260B (µg/L)** | | | | | | | | | |
| 1,2-DICHLOROBENZENE | 3 | 1U | 1U | 1U | 1U | **249** | 1U | 1U | 1U |
| 1,2-DICHLOROPROPANE | 1 | 2U | 2U | 2U | 2U | 2U | 2U | 2U | 2U |
| 1,4-DICHLOROBENZENE | 3 | 1U | 1U | 1U | 1U | **6.7** | 1U | 1U | 1U |
| CHLOROBENZENE | 5 | 1U | 1U | 1U | 1U | **332** | 1U | 1U | 1U |
| METHYLCYCLOHEXANE | NS | 5U | 5U | 5U | 5U | 5U | 5U | 5U | 5U |

**TABLE 6-2a**

**Groundwater Volatile Organic Compounds Results - Detections Only (DS002 - Site 8)**

***Pre-Design Investigation Data Summary Report***

***Niagara Falls Air Reserve Station, New York***

| Analyte | Screening Criteria | PP8-06 | PP8-07 | PP8-08 | PP8-09 | PP8-10 |
|---|---|---|---|---|---|---|
| | | 4/30/2014 | 4/30/2014 | 4/30/2014 | 4/30/2014 | 4/30/2014 |
| **Part 373 Permit Volatile Organic Compounds Detected by Method SW8260B (µg/L)** | | | | | | |
| 1,1-DICHLOROETHENE | 5 | 1U | 1U | **1.8** | 1U | 1U |
| BENZENE | 1 | **0.75** | **2.2** | 0.5U | 0.5U | **1.7** |
| CARBON TETRACHLORIDE | 5 | 1U | 1U | 1U | 1U | 1U |
| CHLOROFORM | 7 | **0.6J** | 1U | 1U | 1U | **1.3** |
| CIS-1,2-DICHLOROETHENE | 5 | **13.8** | **17.4** | **74.7** | 1U | **21.3** |
| TRANS-1,2-DICHLOROETHENE | 5 | **1.5** | 1U | 1U | 1U | 1U |
| ETHYLBENZENE | 5 | 1U | 1U | 1U | 1U | 1U |
| TOLUENE | 5 | **1.9** | **3.8** | **10.8** | 1U | **3.1** |
| TRICHLOROETHENE | 5 | **0.84J** | **1.9** | **17.2** | 1U | **3.5** |
| VINYL CHLORIDE | 2 | **10.8** | **3.6** | **11.5** | 1U | **7.3** |
| XYLENE (TOTAL) | 5 | **0.59J** | **1.6** | 1U | 1U | **1.4** |
| **Other Volatile Organic Compounds Detected by Method SW8260B (µg/L)** | | | | | | |
| 1,2-DICHLOROBENZENE | 3 | 1U | 1U | 1U | 1U | 1U |
| 1,2-DICHLOROPROPANE | 1 | 2U | 2U | **3.2** | 2U | 2U |
| 1,4-DICHLOROBENZENE | 3 | 1U | 1U | 1U | 1U | 1U |
| CHLOROBENZENE | 5 | 1U | 1U | 1U | 1U | 1U |
| METHYLCYCLOHEXANE | NS | 5U | **3.5J** | 5U | 5U | **3.4J** |

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**TABLE 6-2b**

**Groundwater Metals Results (DS002 - Site 8)**

***Pre-Design Investigation Data Summary Report***

***Niagara Falls Air Reserve Station, New York***

| Analyte | MW8-10D | MW8-1 |
|---|---|---|
| | 6/10/2014 | 6/10/2014 |
| **TAL Metals by Method SW6020 and SW7470A (µg/L)** | | |
| ALUMINUM | 22.3B | 17.3B |
| ANTIMONY | 0.14B | 0.17B |
| ARSENIC | 3.1B | 3.1B |
| BARIUM | 69 | 104 |
| BERYLLIUM | 2U | 2U |
| CADMIUM | 6U | 6U |
| CALCIUM | 179,000 | 193,000J |
| CHROMIUM | 0.55B | 0.29B |
| COBALT | 0.16B | 0.34B |
| COPPER | 1.7B | 1.1B |
| IRON | 1,740 | 508J |
| LEAD | 0.24B | 0.098B |
| MAGNESIUM | 69,900 | 93,200J |
| MANGANESE | 58.8 | 132 |
| MERCURY | 0.2U | 0.2U |
| NICKEL | 1.3B | 2.5B |
| POTASSIUM | 3,160 | 3,440 |
| SELENIUM | 0.78B | 0.71B |
| SILVER | 2U | 2U |
| SODIUM | 269,000 | 164,000J |
| THALLIUM | 0.086B | 0.042B |
| VANADIUM | 2B | 4.2 |
| ZINC | 123 | 20 |

NOTE: µg/L = Micrograms per liter.

U = Not detected; associated value is the reporting limit.

J = Estimated concentration.

B = Analyte detected in the associated method blank.

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**TABLE 6-2c**

**Groundwater Geochemical Results (DS002 - Site 8)**

***Pre-Design Investigation Data Summary Report***

***Niagara Falls Air Reserve Station, New York***

| Analyte | MW8-10D | MW8-1 |
|---|---|---|
| | 6/10/2014 | 6/10/2014 |
| **Anions and General Chemistry (mg/L)** | | |
| ALKALINITY (A2320B) | 266 | 321 |
| BIOLOGICAL OXYGEN DEMAND (A5210) | 2U | 4.6 |
| CHEMICAL OXYGEN DEMAND (A5220C) | 20U | 20U |
| CHLORIDE (SM4500CL) | 480 | 305 |
| DISSOLVED ORGANIC CARBON (SW9060) | 3.3 | 3.1 |
| HARDNESS (A2340B) | 701 | 806 |
| NITROGEN, NITRATE (CALC) | 0.11U | 0.11U |
| NITROGEN, NITRATE + NITRITE (E353.2) | 0.1U | 0.1U |
| NITROGEN, NITRITE (SM4500-N02B) | 0.01U | 0.01U |
| SULFATE (D-516-90) | 345 | 378 |
| SULFIDE (SM4500) | 2U | 2UJ |
| TOTAL ORGANIC CARBON (SW9060) | 2.3 | 2.8 |

NOTE: mg/L = Milligrams per liter

U = Not detected; associated value is the reporting limit

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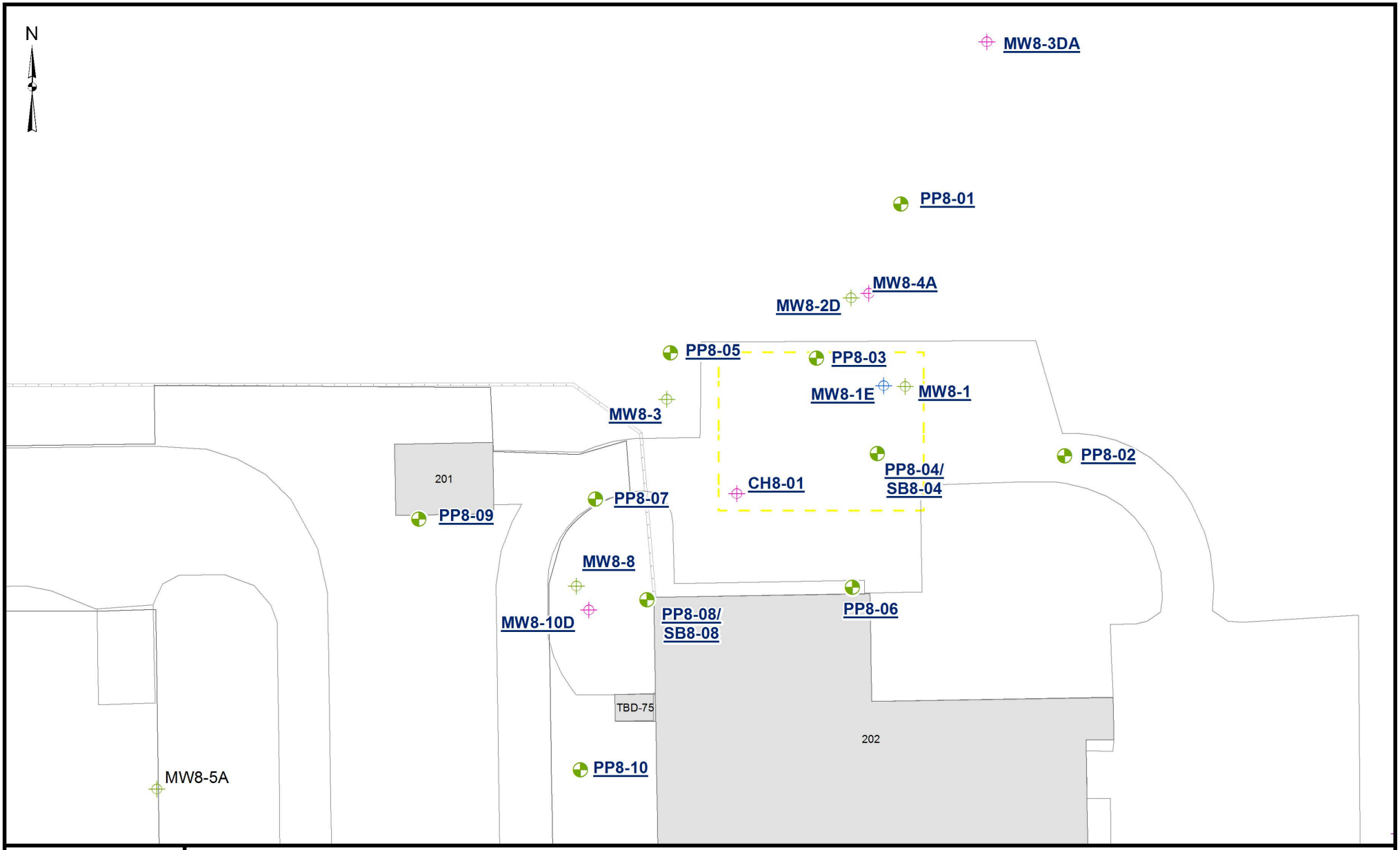


Pre-Design Investigation
Data Summary Report
Niagara Falls Air Reserve Station
Niagara Falls, New York

FIGURE 6-1
Pre-Design Investigation Locations
DS002 - Site 8

| PROJECT MGR: | DESIGNED BY: | CREATED BY: | CHECKED BY: | SCALE: | DATE: | PROJECT NO: | FILE NO: |
|---|---|---|---|---|---|---|---|
| BY | HW | ALK | FD | AS SHOWN | NOVEMBER 2014 | 6265401 | G:\Projects\Federal\DOD\6265401_AFCEC |

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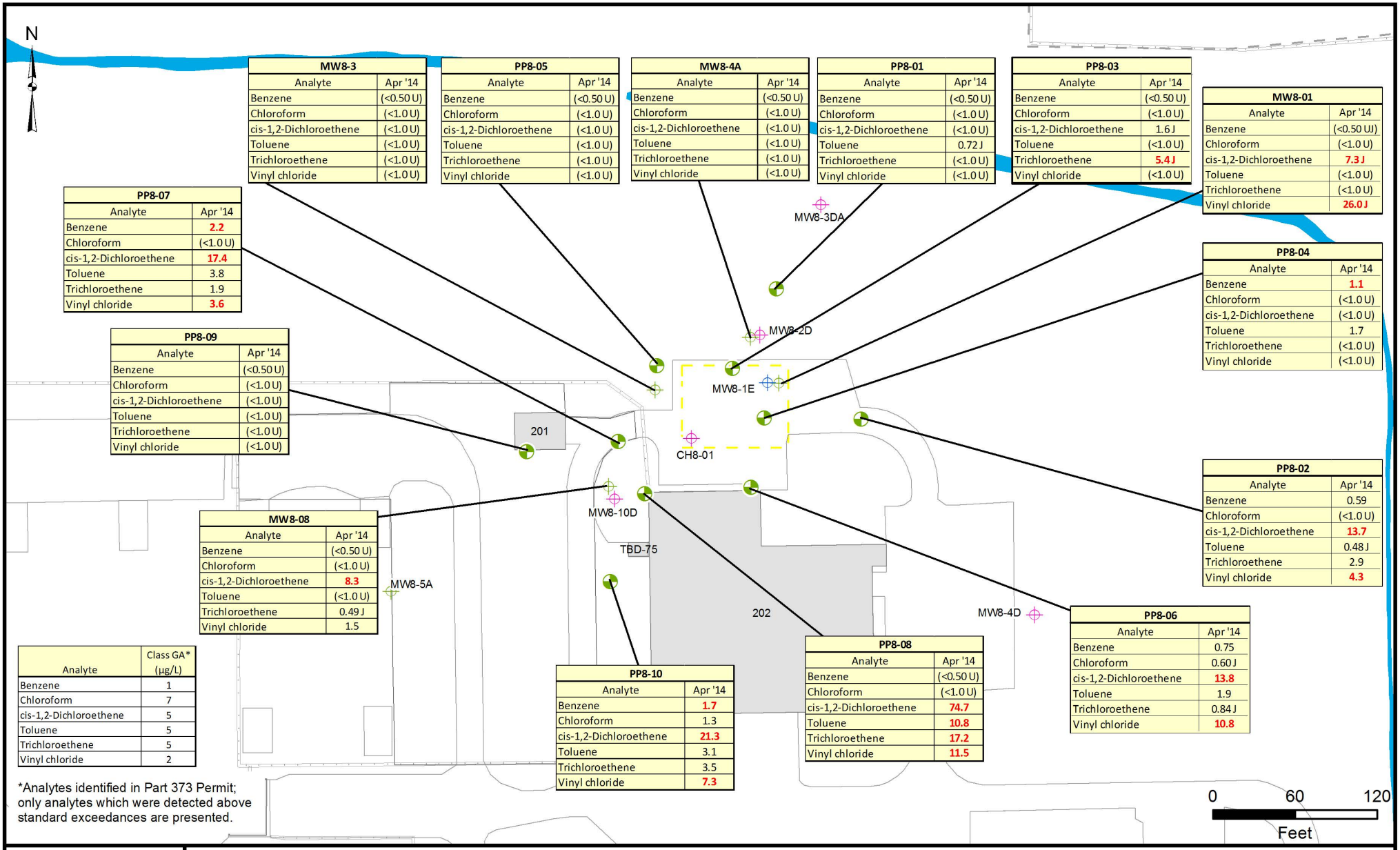


Overburden Well/Piezometer
Shallow Bedrock Well/Piezometer
Deep Bedrock Well
Temporary Monitoring Point
Drum Storage Yard

89 = Indicates above NYSDEC Class GA Standards
J = Estimated concentration
U = Not detected above reporting limit
< 0.54 U = Not detected, value reported is reporting limit
All concentrations reported in micrograms per liter (µg/L)

Pre-Design Investigation
Data Summary Report
Niagara Falls Air Reserve Station
Niagara Falls, New York

FIGURE 6-2
Overburden Groundwater Results
DS002 - Site 8

| PROJECT MGR: | DESIGNED BY: | CREATED BY: | CHECKED BY: | SCALE: | DATE: | PROJECT NO: | FILE NO: |
|---|---|---|---|---|---|---|---|
| BY | HW | RP | FD | AS SHOWN | NOVEMBER 2014 | 6265401 | G:\Projects\Federal\DOD\6265401_AFCEC |

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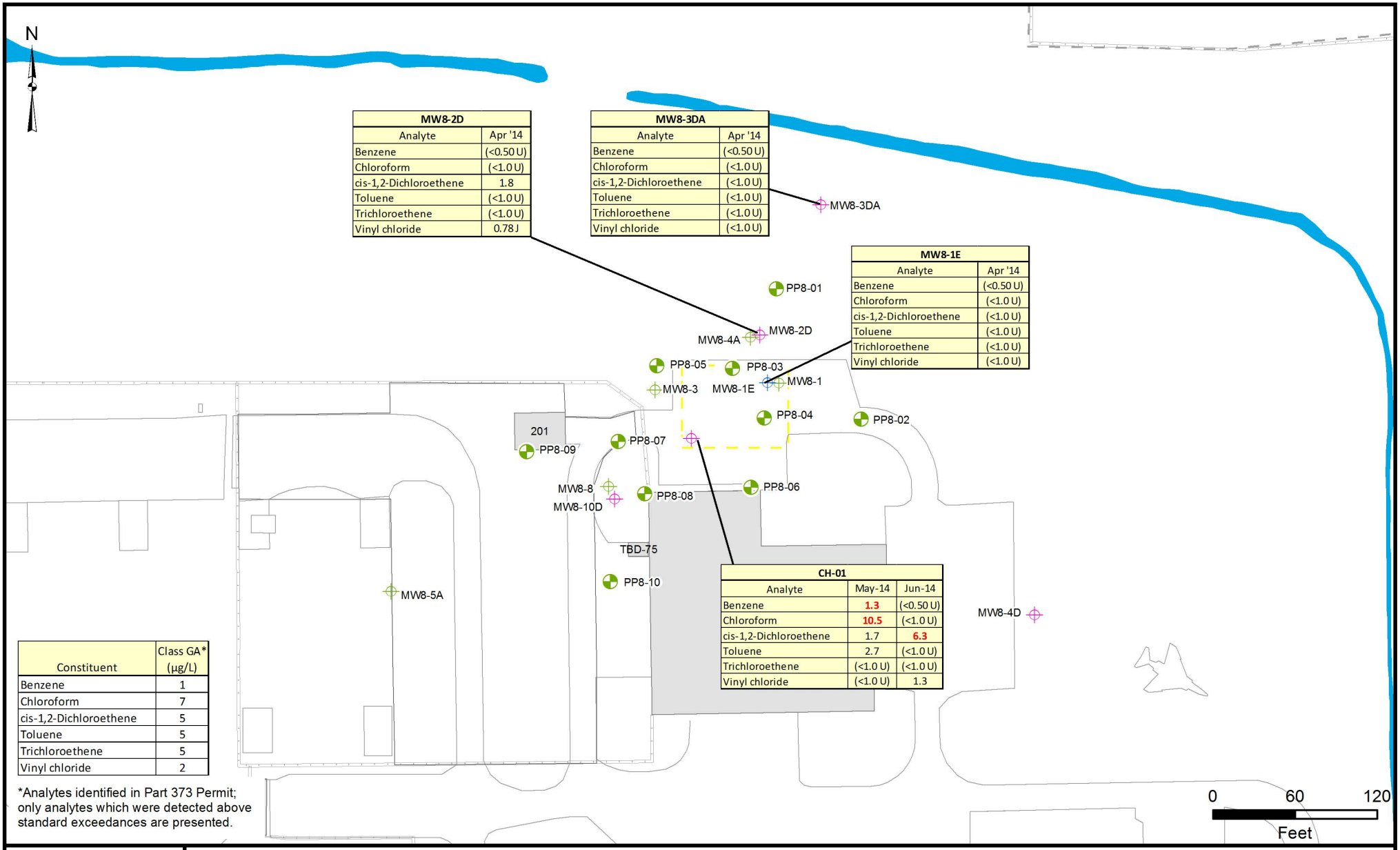


| Constituent | Class GA* (µg/L) |
|---|---|
| Benzene | 1 |
| Chloroform | 7 |
| cis-1,2-Dichloroethene | 5 |
| Toluene | 5 |
| Trichloroethene | 5 |
| Vinyl chloride | 2 |

*Analytes identified in Part 373 Permit; only analytes which were detected above standard exceedances are presented.

Overburden Well/Piezometer
Shallow Bedrock Well/Piezometer
Deep Bedrock Well
Temporary Monitorint Point
Drum Storage Yard

89 = Indicates above NYSDEC Class GA Standards
J = Estimated concentration
U = Not detected above reporting limit
< 0.54 U = Not detected, value reported is reporting limit
All concentrations reported in micrograms per liter (µg/L)

Pre-Design Investigation
Data Summary Report
Niagara Falls Air Reserve Station
Niagara Falls, New York

FIGURE 6-3
Bedrock Groundwater Results
DS002 - Site 8

| PROJECT MGR: | DESIGNED BY: | CREATED BY: | CHECKED BY: | SCALE: | DATE: | PROJECT NO: | FILE NO: |
|---|---|---|---|---|---|---|---|
| BY | HW | RP | FD | AS SHOWN | NOVEMBER 2014 | 6265401 | G:\Projects\Federal\DOD\6265401_AFCEC |

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# 7.0 Soil and Groundwater Sampling at Site DS004 – Site 5

## 7.1 Introduction

Sampling activities were completed from March through June 2014. The contaminants of potential concern associated with the site are primarily chlorinated volatile organic compounds, including trichloroethene and its degradation products (i.e., cis- and trans-1,2-dichloroethene, and vinyl chloride), and the potentially affected media are soil and groundwater.

## 7.2 Subsurface Investigation

### 7.2.1 Hydraulic Profiling

Sixteen soil borings were completed to evaluate the relative permeability of soils using HPT. These borings were completed using direct-push drilling techniques, to the top of bedrock, which is approximately 13-16 ft bgs. HPT logs are provided in Appendix H-1. Temporary, 1- in.-diameter groundwater monitoring points were installed at all but one (PP5-04) of these locations to collect groundwater grab samples for laboratory analysis of VOCs. Temporary points were constructed with a 5-ft-long screened interval and a riser extending approximately 1 ft above ground surface. A temporary point was not installed at PP5-04 due to an obstruction encountered at approximately 5.7 ft bgs, above the water table.

### 7.2.2 Soil Boring

Soil samples were collected adjacent to two of the HPT locations (PP5-03 and PP5-05), to allow comparison of the HPT readings to soil observations (e.g., soil classification, evidence of potential contamination including staining, sheens, elevated PID readings, and/or obvious odor) (Figure 7-1). Soil samples were submitted for laboratory analysis including target compound list VOCs by U.S. Environmental Protection Agency (EPA) Method 8260C, target analyte list metals by EPA method 6010C, mercury by EPA Method 7471B, total organic carbon by Lloyd Kahn, grain size by EPA Method ASTM-D422-63, and percent solids. Soil analytical results are summarized in Tables 7-1a through 7-1c.

## 7.3 Groundwater Sampling and Analysis

### 7.3.1 Monitoring Well Installation

Four bedrock monitoring wells were installed in the vicinity of MW5-5D using drive and wash drilling and NQ coring techniques (Figure 7-1). Drive and wash drilling methods were used to advance to the top of bedrock. Upon reaching bedrock, a roller bit was used to drill approximately 2 ft into bedrock and a 5⅞-in.-internal diameter rock socket was set. A 4-in. internal diameter casing was placed into the borehole and grouted in place to seal off the overburden. Coring was performed using fluid rotary and N/Q-size wireline coring. Rock cores were collected in 5-ft long core runs and used to determine bedrock stratigraphy, fracture locations, and orientations. The bedrock core hole was left open to formation water, and the well was completed at the surface with an 8-in.-diameter flush-mount cover. Boring logs are provided in Appendix H-2.

### 7.3.2 Groundwater Sampling

Groundwater sampling at Site 5 included collection of:

- grab samples from 15 temporary monitoring points (PP5-01 through PP5-03 and PP5-04 through PP5-16) and the four newly installed bedrock wells (CH5-01 through CH5-04)
- PDB sampling at two existing shallow bedrock wells (MW5-4D and MW5-8D)
- low-flow sampling conducted at two existing monitoring wells (MW5-5D and RW5-1).
- packer testing and collection of grab samples from three intervals within each of the four newly installed bedrock wells

Groundwater sample locations are shown on Figure 7-1.

Dedicated polyethylene bailers were used to collect the grab samples from each monitoring point. Following sample collection, the temporary points were removed and the soil boring was backfilled with bentonite. Dedicated polyethylene bailers were also used to collect grab samples from each of the newly installed bedrock wells following development.

PDB samplers were deployed on 28 May 2014 and remained, undisturbed, in the well until retrieval on 12 June 2014.

Low-flow sampling was conducted using a submersible pump. Groundwater purge forms are provided in Appendix H-3.

Packer testing/sampling was conducted at each of the four newly installed bedrock wells. Three intervals (upper, middle, and lower) were tested at each well location. Each interval was isolated using either a single packer setup or a straddle packer setup. Shallow intervals at bedrock wells CH5-01, CH5-02, CH5-03, and CH5-04 were purged at a high flow rate with a whaler pump in conjunction with the peristaltic pump; these intervals were purged dry and grab samples were collected after water levels recovered sufficiently. The remaining intervals were purged at a high flow rate using a peristaltic pump to evacuate three well volumes. After three well volumes were removed, the purge rate was reduced for low flow sampling.

Groundwater analytical detections are summarized in Tables 7-2a through 7-2c and exceedances of Part 373 Permit analytes (VOCs) are presented on Figures 7-2 and 7-3.

**TABLE 7-1a**

**Soil Volatile Organic Compounds Results - Detections Only (DS004 - Site 5)**

***Pre-Design Investigation Data Summary Report***

***Niagara Falls Air Reserve Station, New York***

| Analyte | SB5-03-8-10 | SB5-03-10-12 | SB5-05-8-10 | SB5-05-10-12 |
|---|---|---|---|---|
| | 4/4/2014 | 4/4/2014 | 4/4/2014 | 4/4/2014 |
| **Volatile Organic Compounds Detected by Method SW8260B (mg/kg)** | | | | |
| BENZENE | 0.068U | 0.066U | 0.0023 | 0.0042 |
| CIS-1,2-DICHLOROETHENE | 0.27U | 0.41 | 0.025J | 0.0172 |
| TOLUENE | 0.68U | 0.66U | 0.0027J | 0.0045J |
| TRICHLOROETHENE | 4.39 | 18.5 | 0.0991J | 0.006 |
| VINYL CHLORIDE | 0.27U | 0.27U | 0.002UJ | 0.0065 |
| XYLENE (TOTAL) | 0.27U | 0.27U | 0.0026 | 0.0037 |
| CARBON DISULFIDE | 0.68U | 0.66U | 0.0051U | 0.0014J |
| CHLOROETHANE | 0.68U | 0.66U | 0.0051U | 0.0014J |
| CYCLOHEXANE | 0.68U | 0.66U | 0.0028J | 0.0055J |
| METHYLCYCLOHEXANE | 0.68U | 0.66U | 0.0043J | 0.01 |

NOTE: mg/kg = Milligrams per kilogram.

U = Analyte was analyzed for but not detected, reporting limit provided

J = Estimated concentration

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**TABLE 7-1b**

**Soil Metals Results (DS004 - Site 5)**

***Pre-Design Investigation Data Summary Report***

***Niagara Falls Air Reserve Station, New York***

| Analyte | SB5-03-8-10 | SB5-03-10-12 | SB5-05-8-10 | SB5-05-10-12 |
|---|---|---|---|---|
| | 4/4/2014 | 4/4/2014 | 4/4/2014 | 4/4/2014 |
| **TAL Metals by Method SW6010C and SW7471 (mg/kg)** | | | | |
| ALUMINUM | 23,600 | 18,800 | 15,000 | 11,700 |
| ANTIMONY | 0.2J | 1.1UJ | 1UJ | 1UJ |
| ARSENIC | 4.3 | 14J | 8.9 | 3.3 |
| BARIUM | 84.2 | 114 | 156 | 150 |
| BERYLLIUM | 1.1 | 0.97 | 0.77J | 0.56 |
| CADMIUM | 0.18B | 0.23B | 0.29J | 0.21B |
| CALCIUM | 47,400 | 48,600 | 56,200J | 51,300 |
| CHROMIUM | 30.9 | 25 | 21.4 | 17 |
| COBALT | 21.5 | 22.6 | 13.9 | 10.7 |
| COPPER | 24.9 | 26.7 | 25 | 13.8 |
| IRON | 35,300 | 32,300 | 27,000J | 20,400 |
| LEAD | 11.5 | 11.4 | 11.8 | 8.7 |
| MAGNESIUM | 13,000 | 13,600 | 14,600 | 12,900 |
| MANGANESE | 596 | 882 | 618J | 522 |
| MERCURY | 0.04U | 0.01B | 0.041U | 0.038U |
| NICKEL | 39 | 43.4 | 28.8 | 22.4 |
| POTASSIUM | 4,720 | 3,650 | 2,950 | 2,290 |
| SELENIUM | 1.1U | 1.1U | 1U | 1U |
| SILVER | 0.19B | 0.53U | 0.52U | 0.17B |
| SODIUM | 175B | 155B | 185J | 161B |
| THALLIUM | 0.27B | 0.21B | 0.57B | 0.4B |
| VANADIUM | 40 | 35.1 | 31.7 | 22.8 |
| ZINC | 72.8 | 66.2 | 76.4J | 61.8 |

NOTE: mg/kg = Milligrams per kilogram.

U = Not detected; associated value is the reporting limit.

B = Analyte detected in the associated method blank.

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**TABLE 7-1c**

**Soil General Chemistry and Physical Properties Results (DS004 - Site 5)**

***Pre-Design Investigation Data Summary Report***

***Niagara Falls Air Reserve Station, New York***

| Analyte | SB5-03-8-10 | SB5-03-10-12 | SB5-05-8-10 | SB5-05-10-12 |
|---|---|---|---|---|
| | 4/4/2014 | 4/4/2014 | 4/4/2014 | 4/4/2014 |
| **General Chemistry by Lloyd Kahn (mg/kg)** | | | | |
| TOTAL ORGANIC CARBON | 731 | 1150 | 738 | 628 |
| **Grain Size by D422 and Percent Solids by SM2540B (%)** | | | | |
| PERCENT SOLIDS | 75.8 | 75.8 | 78.0 | 76.1 |
| % GRAVEL | 0 | NA | 0 | NA |
| % SAND | 4.2 | NA | 3.6 | NA |
| % SILT, CLAY, COLLOIDS | 95.8 | NA | 96.4 | NA |
| 0.0015 mm (HYDROMETER) | 47 | NA | 51 | NA |
| 0.005 mm (HYDROMETER) | 67 | NA | 71 | NA |
| 0.030 mm (HYDROMETER) | 83 | NA | 87 | NA |
| 0.375 INCH SIEVE | 100 | NA | 100 | NA |
| 0.75 INCH SIEVE | 100 | NA | 100 | NA |
| 1.5 INCH SIEVE | 100 | NA | 100 | NA |
| 3 INCH SIEVE | 100 | NA | 100 | NA |
| No.10 SIEVE (2.00 mm) | 100 | NA | 100 | NA |
| No.100 SIEVE (0.15 mm) | 96.7 | NA | 97 | NA |
| No.16 SIEVE (1.18 mm) | 99.3 | NA | 99.5 | NA |
| No.200 SIEVE (0.075 mm) | 95.8 | NA | 96.4 | NA |
| No.30 SIEVE (0.60 mm) | 98.6 | NA | 99 | NA |
| No.4 SIEVE (4.75 mm) | 100 | NA | 100 | NA |
| No.50 SIEVE (0.30 mm) | 97.8 | NA | 98.4 | NA |
| No.8 SIEVE (2.36 mm) | 100 | NA | 100 | NA |

NOTE: mg/kg = Milligrams per kilogram.

NA = Not analyzed.

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**TABLE 7-2a**

**Groundwater Volatile Organic Compounds Results - Detections Only (DS004 - Site 5)**

***Pre-Design Investigation Data Summary Report***

***Niagara Falls Air Reserve Station, New York***

| Analyte | Screening Criteria [(a)] | CH5-01 | CH5-01-LOWER | CH5-01-MIDDLE | CH5-01-UPPER | CH5-02 | CH5-02-LOWER | CH5-02-MIDDLE | CH5-02-UPPER |
|---|---|---|---|---|---|---|---|---|---|
| | | 5/21/2014 | 6/12/2014 | 6/13/2014 | 6/12/2014 | 5/21/2014 | 6/11/2014 | 6/13/2014 | 6/12/2014 |
| **Part 373 Permit Volatile Organic Compounds Detected by Method SW8260B (µg/L)** | | | | | | | | | |
| 1,1-DICHLOROETHENE | 5 | 1U | 1U | 1U | **3.5** | 1U | **1.6** | **11.2** | **5.6** |
| BENZENE | 1 | **1.8** | 0.5U | 0.5U | **0.85** | 0.5U | 0.5U | 0.5U | 0.5U |
| CHLOROFORM | 7 | **8.0** | 1U | 1U | **1.4** | **13.5** | 1U | 1U | **1.6** |
| CIS-1,2-DICHLOROETHENE | 5 | **286** | **93.2** | **732** | **4,470** | **161** | **420** | **5,600** | **3,940** |
| TRANS-1,2-DICHLOROETHENE | 5 | **2.6** | **1.5** | **8.7** | **23.8** | **0.67J** | **3.4** | **30.2** | **18** |
| ETHYLBENZENE | 5 | **0.6J** | 1U | **1.4** | **5.9** | 1U | 1U | **0.41J** | **2.2** |
| TOLUENE | 5 | **3.8** | 1U | **0.57J** | **1.8** | **0.61J** | 1U | **0.53J** | **1.2** |
| TRICHLOROETHENE | 5 | **0.59J** | 1U | 1U | 1U | **0.55J** | 1U | **3.6** | **5.2** |
| VINYL CHLORIDE | 2 | **406** | **1,020** | **8,030** | **6,100** | **75.4** | **186** | **6,840** | **3,810** |
| XYLENE (TOTAL) | 5 | **3.3** | 1U | 1U | **1.4** | **0.66J** | 1U | 1U | 1U |
| **Other Volatile Organic Compounds Detected by Method SW8260B (µg/L)** | | | | | | | | | |
| 2-BUTANONE (MEK) | 50 | 5U | 5UJ | **10.9** | **30.9J** | 5U | 5U | 5U | **32.9J** |
| ACETONE | 50 | **10.1** | 10UJ | **7.8J** | **32.2J** | 10U | 10U | **3.1J** | **32.5J** |
| CARBON DISULFIDE | NS | 5U | **2.1J** | 5U | **4.6J** | 5U | 5U | 5U | 5U |
| CYCLOHEXANE | NS | 5U | 5U | 5U | 5U | 5U | 5U | 5U | 5U |
| METHYLCYCLOHEXANE | NS | **2.1J** | 5U | 5U | **1.1J** | **0.53J** | 5U | 5U | 5U |
| METHYLENE CHLORIDE | 5 | **0.29J** | 2U | 2U | 2U | 2U | 2U | 2U | 2U |

(a) New York State Department of Environmental Conservation, Technical and Operational Guidance Series Memorandum #1.1.1: Ambient Water Quality Standards and Guidance Values and Groundwater Effluent Limitations, 1998 (with updates), Class GA Groundwater Standards and Guidance Values.

NOTE: µg/L = Micrograms per liter.

U = Analyte was analyzed for but not detected, reporting limit provided

J = Estimated concentration

NS = No standard available

Shaded cells exceed the screening value; **Bold** values denote detections.

**TABLE 7-2a**

**Groundwater Volatile Organic Compounds Results - Detections Only (DS004 - Site 5)**

***Pre-Design Investigation Data Summary Report***

***Niagara Falls Air Reserve Station, New York***

| Analyte | Screening Criteria [(a)] | CH5-03 | CH5-03-LOWER | CH5-03-MIDDLE | CH5-03-UPPER | CH5-04 | CH5-04-LOWER | CH5-04-MIDDLE | CH5-04-UPPER |
|---|---|---|---|---|---|---|---|---|---|
| | | 5/21/2014 | 6/12/2014 | 6/13/2014 | 6/12/2014 | 5/21/2014 | 6/11/2014 | 6/13/2014 | 6/11/2014 |
| **Part 373 Permit Volatile Organic Compounds Detected by Method SW8260B (µg/L)** | | | | | | | | | |
| 1,1-DICHLOROETHENE | 5 | 1U | **3.9** | **9.6** | **12** | **0.7J** | **1.1** | **0.96J** | **1.3** |
| BENZENE | 1 | **1.3** | 0.5U | 0.5U | 0.5U | 0.5U | 0.5U | 0.5U | 0.5U |
| CHLOROFORM | 7 | **10.6** | 1U | 1U | 1U | 1U | 1U | 1U | 1U |
| CIS-1,2-DICHLOROETHENE | 5 | **249** | **1,180** | **3,510** | **4,240** | **247** | **319** | **290** | **273** |
| TRANS-1,2-DICHLOROETHENE | 5 | **0.47J** | **1.8** | **5.2** | **5.5** | **0.66J** | **1.7** | **0.97J** | **0.69J** |
| ETHYLBENZENE | 5 | **2.7** | 1U | 1U | 1U | 1U | 1U | 1U | 1U |
| TOLUENE | 5 | **3.8** | 1U | **0.4J** | 1U | 1U | 1U | **0.43J** | 1U |
| TRICHLOROETHENE | 5 | **2.4** | **0.93J** | **4.4** | **2.4** | **1.2** | **0.92J** | **1.2** | **1.4** |
| VINYL CHLORIDE | 2 | **154** | **1,150** | **3,260** | **3,840** | **202** | **284** | **263** | **237** |
| XYLENE (TOTAL) | 5 | **2.4** | 1U | 1U | 1U | 1U | 1U | 1U | 1U |
| **Other Volatile Organic Compounds Detected by Method SW8260B (µg/L)** | | | | | | | | | |
| 2-BUTANONE (MEK) | 50 | 5U | 5U | 5UJ | 5UJ | 5U | **45.3** | 5U | **33** |
| ACETONE | 50 | **9.4J** | 10U | 10UJ | 10UJ | 10U | **5.1J** | 10U | **6J** |
| CARBON DISULFIDE | NS | 5U | **1J** | 5U | **0.94J** | 5U | 5U | 5U | 5U |
| CYCLOHEXANE | NS | 5U | 5U | 5U | 5U | 5U | 5U | 5U | 5U |
| METHYLCYCLOHEXANE | NS | **2.2J** | 5U | 5U | 5U | 5U | 5U | 5U | 5U |
| METHYLENE CHLORIDE | 5 | **0.36J** | 2U | 2U | 2U | 2U | 2U | 2U | 2U |

**TABLE 7-2a**

**Groundwater Volatile Organic Compounds Results - Detections Only (DS004 - Site 5)**

***Pre-Design Investigation Data Summary Report***

***Niagara Falls Air Reserve Station, New York***

| Analyte | Screening Criteria [(a)] | MW5-4D 6/12/2014 | MW5-8D 6/12/2014 | PP5-01 4/8/2014 | PP5-02 4/8/2014 | PP5-03 4/8/2014 | PP5-05 4/8/2014 | PP5-06 4/8/2014 | PP5-07 4/8/2014 | PP5-08 4/8/2014 |
|---|---|---|---|---|---|---|---|---|---|---|
| **Part 373 Permit Volatile Organic Compounds Detected by Method SW8260B (µg/L)** | | | | | | | | | | |
| 1,1-DICHLOROETHENE | 5 | 1U | 1U | **1.9** | 1U | 1U | 1U | 1U | 1U | 1U |
| BENZENE | 1 | 0.5U | 0.5U | 0.5U | **0.8** | 0.5U | 0.5U | 0.5U | 0.5U | **0.48J** |
| CHLOROFORM | 7 | 1U | 1U | 1U | 1U | 1U | 1U | 1U | 1U | **0.73J** |
| CIS-1,2-DICHLOROETHENE | 5 | **18.8** | 1U | **300** | **9.1** | **39.2** | 1U | **34.4** | 1U | **53.4** |
| TRANS-1,2-DICHLOROETHENE | 5 | 1U | 1U | **2.7** | **2.5** | 1U | 1U | 1U | 1U | **2.1** |
| ETHYLBENZENE | 5 | 1U | 1U | 1U | 1UJ | 1U | 1U | 1U | 1U | 1U |
| TOLUENE | 5 | 1U | 1U | 1U | **0.95J** | 1U | 1U | 1U | 1U | 1U |
| TRICHLOROETHENE | 5 | 1U | 1U | **1,340** | **88.1** | **35** | 1U | **6.4** | 1U | **72.5** |
| VINYL CHLORIDE | 2 | **8.5** | 1U | 1UJ | **1.2** | **12.1** | 1UJ | **1.7** | 1UJ | **2.8** |
| XYLENE (TOTAL) | 5 | 1U | 1U | 1U | 1U | 1U | 1U | 1U | 1U | 1U |
| **Other Volatile Organic Compounds Detected by Method SW8260B (µg/L)** | | | | | | | | | | |
| 2-BUTANONE (MEK) | 50 | 5UJ | 5UJ | 5U | 5U | 5U | 5U | 5U | 5U | 5U |
| ACETONE | 50 | 10UJ | 10UJ | **157** | 10U | 10U | 10U | **53.5** | **173** | 10U |
| CARBON DISULFIDE | NS | 5U | 5U | 5U | 5U | 5U | **2.7J** | 5U | 5U | 5U |
| CYCLOHEXANE | NS | 5U | 5U | 5U | 5U | 5U | 5U | 5U | 5U | 5U |
| METHYLCYCLOHEXANE | NS | 5U | 5U | 5U | 5U | 5U | 5U | 5U | 5U | 5U |
| METHYLENE CHLORIDE | 5 | 2U | 2U | 2U | 2U | 2U | 2U | 2U | 2U | 2U |

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**TABLE 7-2a**

**Groundwater Volatile Organic Compounds Results - Detections Only (DS004 - Site 5)**

***Pre-Design Investigation Data Summary Report***

***Niagara Falls Air Reserve Station, New York***

| Analyte | Screening Criteria [(a)] | PP5-09 4/8/2014 | PP5-10 4/8/2014 | PP5-11 4/8/2014 | PP5-12 4/8/2014 | PP5-13 4/8/2014 | PP5-14 4/8/2014 | PP5-15 4/8/2014 | PP5-16 4/8/2014 |
|---|---|---|---|---|---|---|---|---|---|
| **Part 373 Permit Volatile Organic Compounds Detected by Method SW8260B (µg/L)** | | | | | | | | | |
| 1,1-DICHLOROETHENE | 5 | 1U | 1U | 1U | 1U | 1U | 1U | 1U | 1U |
| BENZENE | 1 | 0.5U | 0.5U | 0.5U | **2.5** | 0.5U | **3.3** | 0.5U | 0.5U |
| CHLOROFORM | 7 | 1U | 1U | 1U | **1.3** | 1U | **0.71J** | 1U | 1U |
| CIS-1,2-DICHLOROETHENE | 5 | 1U | **4.4** | 1U | **19.9** | 1U | **27.5** | **12.8** | **1.7** |
| TRANS-1,2-DICHLOROETHENE | 5 | 1U | 1U | 1U | **4.6** | 1U | 1U | 1U | 1U |
| ETHYLBENZENE | 5 | 1U | 1U | 1U | **0.47J** | 1U | **0.57J** | 1U | 1U |
| TOLUENE | 5 | 1U | 1U | 1U | **3.7** | 1U | **5** | 1U | 1U |
| TRICHLOROETHENE | 5 | **1.6** | 1U | 1U | **7.5** | 1U | 1U | **2.4** | 1U |
| VINYL CHLORIDE | 2 | 1UJ | 1UJ | 1UJ | **2.1** | 1UJ | **8.1** | **2.4** | 1UJ |
| XYLENE (TOTAL) | 5 | 1U | 1U | 1U | **1.7** | 1U | **2.9** | 1U | 1U |
| **Other Volatile Organic Compounds Detected by Method SW8260B (µg/L)** | | | | | | | | | |
| 2-BUTANONE (MEK) | 50 | 5U | 5U | 5U | 5U | 5U | 5U | 5U | 5U |
| ACETONE | 50 | 10U | 10U | 10U | **66** | **18.2** | **52.8** | **105** | **18.6** |
| CARBON DISULFIDE | NS | 5U | 5U | 5U | 5U | 5U | 5U | 5U | 5U |
| CYCLOHEXANE | NS | 5U | 5U | 5U | **0.98J** | 5U | **1.1J** | 5U | 5U |
| METHYLCYCLOHEXANE | NS | 5U | 5U | 5U | **0.83J** | 5U | **0.8J** | 5U | 5U |
| METHYLENE CHLORIDE | 5 | 2U | 2U | 2U | 2U | 2U | 2U | 2U | 2U |

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**TABLE 7-2b**

**DS004 - Site 5 Detected Groundwater Analytical Results**

***Pre-Design Investigation Data Summary Report***

***Niagara Falls Air Reserve Station, New York***

| Analyte | MW5-5D | RW5-1 |
|---|---|---|
| | 6/10/2014 | 6/10/2014 |
| **TAL Metals by Method SW6020 and SW7470A (µg/L)** | | |
| ALUMINUM | 50U | 50U |
| ANTIMONY | 4U | 4U |
| ARSENIC | 3.2B | 2.6B |
| BARIUM | 1,890 | 23.2 |
| BERYLLIUM | 2U | 2U |
| CADMIUM | 6U | 6U |
| CALCIUM | 264,000 | 126,000J |
| CHROMIUM | 8U | 8U |
| COBALT | 1U | 1U |
| COPPER | 8U | 8U |
| IRON | 137 | 316J |
| LEAD | 3U | 3U |
| MAGNESIUM | 79,900 | 106,000 |
| MANGANESE | 108 | 95 |
| MERCURY | 0.2U | 0.2U |
| NICKEL | 8U | 8U |
| POTASSIUM | 9,340 | 1,710 |
| SELENIUM | 2U | 2U |
| SILVER | 2U | 2U |
| SODIUM | 25,300 | 34,200 |
| THALLIUM | 2U | 2U |
| VANADIUM | 3.1B | 3.5B |
| ZINC | 8U | 8U |

NOTE: µg/L = Micrograms per liter.

U = Not detected; associated value is the reporting limit.

J = Estimated concentration.

B = Analyte detected in the associated method blank.

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**TABLE 7-2c**

**DS004 - Site 5 Detected Groundwater Analytical Results**

***Pre-Design Investigation Data Summary Report***

***Niagara Falls Air Reserve Station, New York***

| Analyte | MW5-5D | RW5-1 |
|---|---|---|
| | 6/10/2014 | 6/10/2014 |
| **Anions and General Chemistry (mg/L)** | | |
| ALKALINITY (A2320B) | 732 | 532 |
| BIOLOGICAL OXYGEN DEMAND (A5210) | 238 | 5.6 |
| CHEMICAL OXYGEN DEMAND (A5220C) | 462 | 20U |
| CHLORIDE (SM4500CL) | 140 | 10 |
| DISSOLVED ORGANIC CARBON (SW9060) | 118 | 2.4 |
| HARDNESS (A2340B) | 935 | 682 |
| NITROGEN, NITRATE (CALC) | 0.11U | 0.11U |
| NITROGEN, NITRATE + NITRITE (E353.2) | 0.1U | 0.1U |
| NITROGEN, NITRITE (SM4500-N02B) | 0.01U | 0.01U |
| SULFATE (D-516-90) | 64.4 | 238 |
| SULFIDE (SM4500) | 2U | 2U |
| TOTAL ORGANIC CARBON (SW9060) | 122 | 2.2 |

NOTE: mg/L = Milligrams per liter.

U = Not detected; associated value is the reporting limit.

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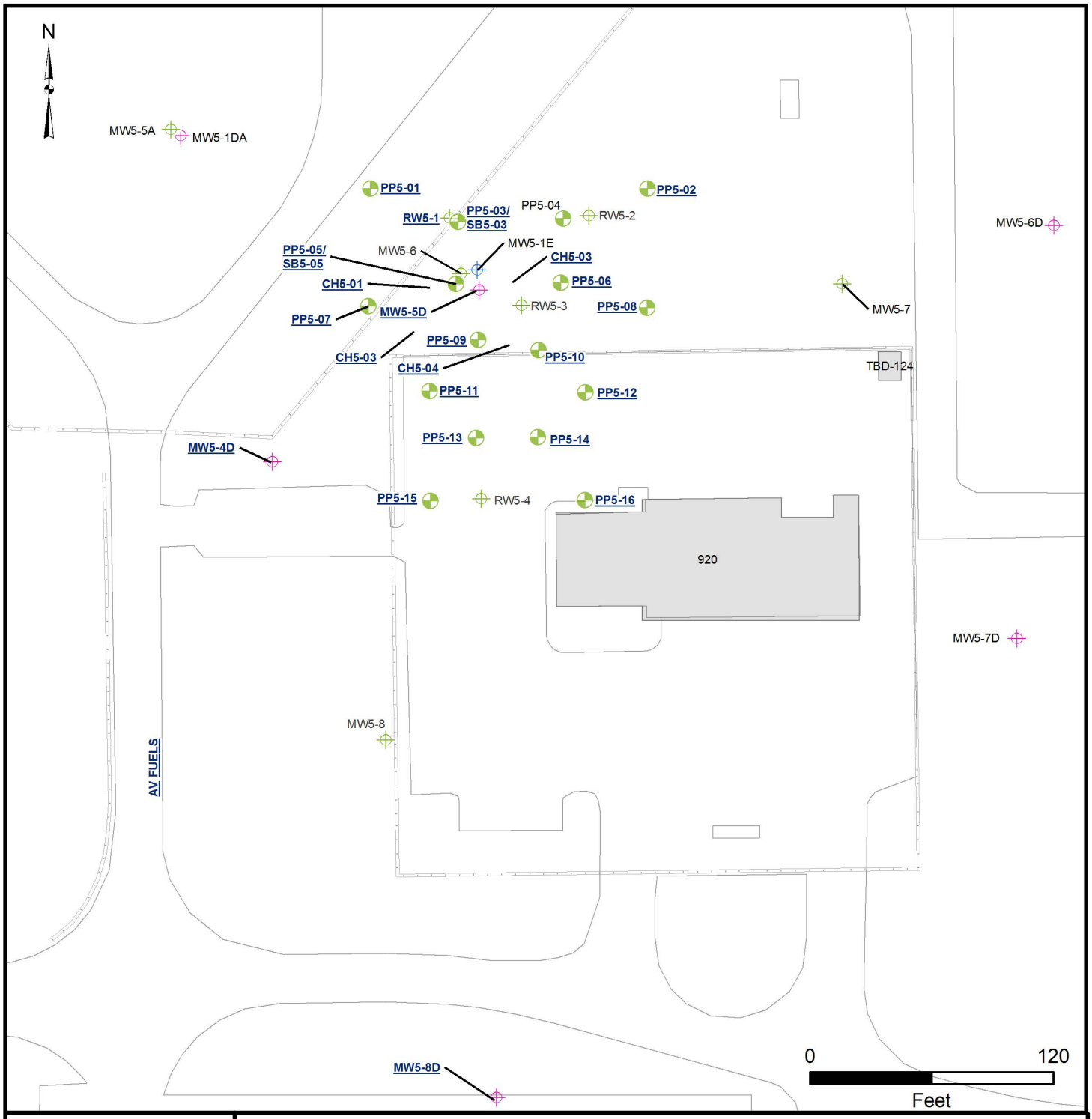


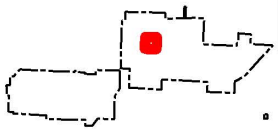

- Overburden Well/Piezometer
- Shallow Bedrock Well/Piezometer
- Deep Bedrock Well
- Temporary Monitoring Point

MWX-X Sampled during Pre-Design Investigation

Pre-Design Investigation
Data Summary Report
Niagara Falls Air Reserve Station
Niagara Falls, New York

FIGURE 7-1
Pre-Design Investigation Locations
DS004 - Site 5

| PROJECT MGR: | DESIGNED BY: | CREATED BY: | CHECKED BY: | SCALE: | DATE: | PROJECT NO: | FILE NO: |
|---|---|---|---|---|---|---|---|
| BY | RP | FD | BY | AS SHOWN | NOVEMBER 2014 | 6265401 | G:\Projects\Federal\DOD\6265401_AFCEC_NFARS\ |

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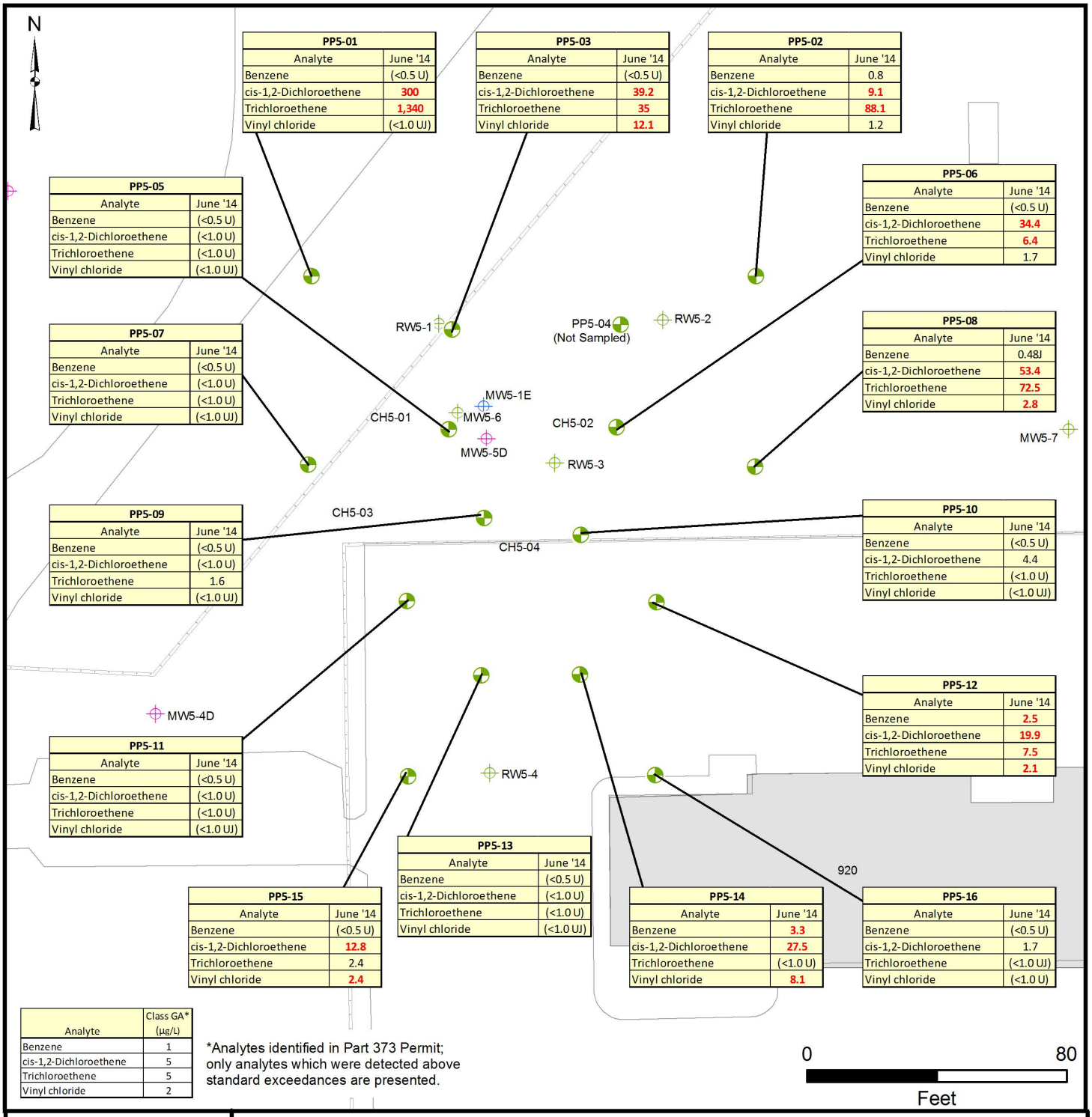


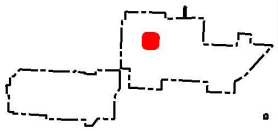

- Overburden Well/Piezometer
- Shallow Bedrock Well/Piezometer
- Deep Bedrock Well
- Temporary Monitoring Point

89 = Indicates above NYSDEC Class GA Standards
J = Estimated concentration
U = Not detected above reporting limit
< 0.54 U = Not detected, value reported is reporting limit
All concentrations reported in micrograms per liter (µg/L)

Pre-Design Investigation
Data Summary Report
Niagara Falls Air Reserve Station
Niagara Falls, New York

FIGURE 7-2
Overburden Groundwater Results
DS004 - Site 5

| PROJECT MGR: | DESIGNED BY: | CREATED BY: | CHECKED BY: | SCALE: | DATE: | PROJECT NO: | FILE NO: |
|---|---|---|---|---|---|---|---|
| BY | RP | FD | BY | AS SHOWN | NOVEMBER 2014 | 6265401 | G:\Projects\Federal\DOD\ 6265401_AFCEC_NFARS\ |

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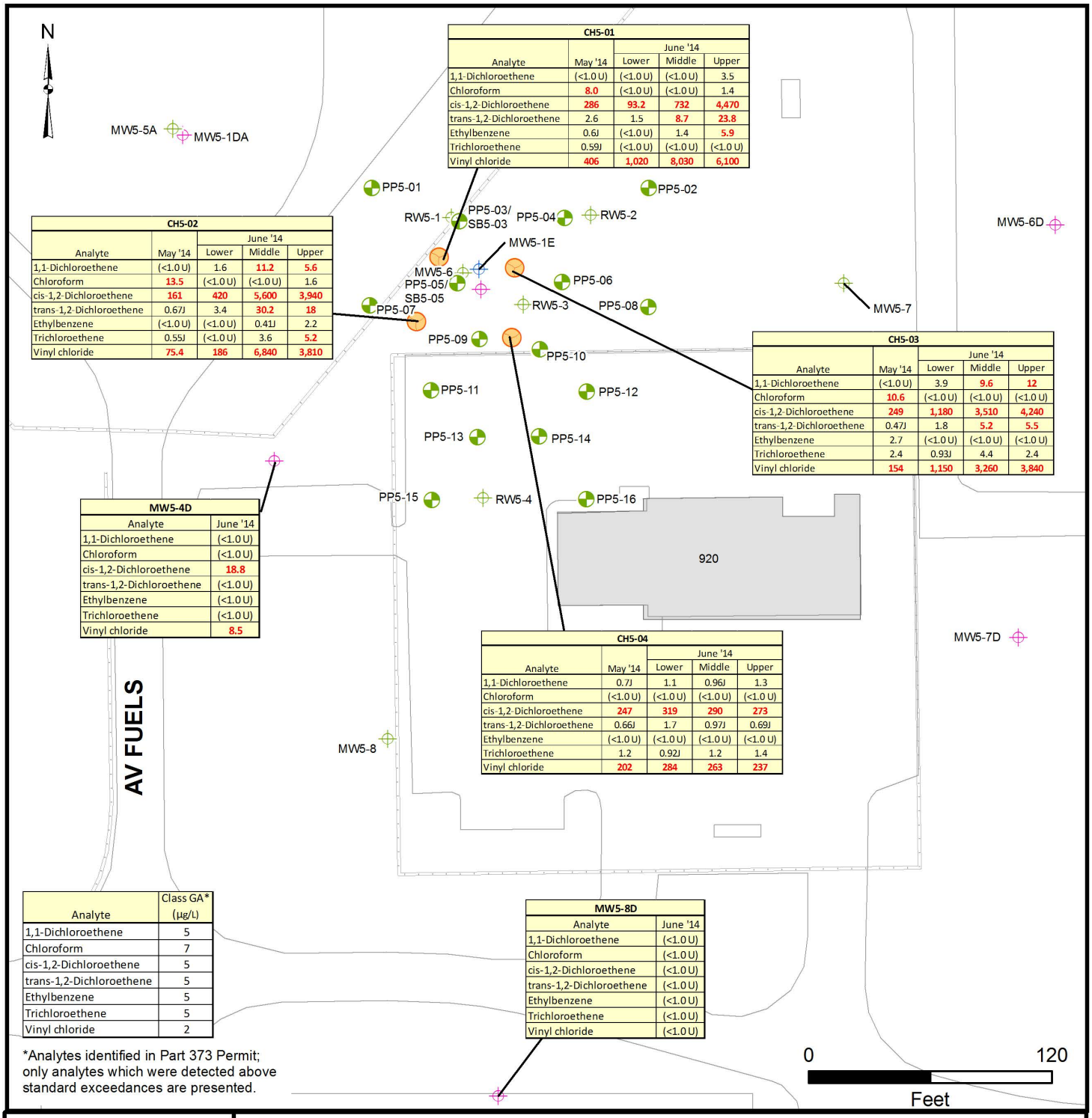



**CH5-01**

| Analyte | May '14 | June '14 Lower | June '14 Middle | June '14 Upper |
|---|---|---|---|---|
| 1,1-Dichloroethene | (<1.0 U) | (<1.0 U) | (<1.0 U) | 3.5 |
| Chloroform | 8.0 | (<1.0 U) | (<1.0 U) | 1.4 |
| cis-1,2-Dichloroethene | 286 | 93.2 | 732 | 4,470 |
| trans-1,2-Dichloroethene | 2.6 | 1.5 | 8.7 | 23.8 |
| Ethylbenzene | 0.6J | (<1.0 U) | 1.4 | 5.9 |
| Trichloroethene | 0.59J | (<1.0 U) | (<1.0 U) | (<1.0 U) |
| Vinyl chloride | 406 | 1,020 | 8,030 | 6,100 |

**CH5-02**

| Analyte | May '14 | June '14 Lower | June '14 Middle | June '14 Upper |
|---|---|---|---|---|
| 1,1-Dichloroethene | (<1.0 U) | 1.6 | 11.2 | 5.6 |
| Chloroform | 13.5 | (<1.0 U) | (<1.0 U) | 1.6 |
| cis-1,2-Dichloroethene | 161 | 420 | 5,600 | 3,940 |
| trans-1,2-Dichloroethene | 0.67J | 3.4 | 30.2 | 18 |
| Ethylbenzene | (<1.0 U) | (<1.0 U) | 0.41J | 2.2 |
| Trichloroethene | 0.55J | (<1.0 U) | 3.6 | 5.2 |
| Vinyl chloride | 75.4 | 186 | 6,840 | 3,810 |

**CH5-03**

| Analyte | May '14 | June '14 Lower | June '14 Middle | June '14 Upper |
|---|---|---|---|---|
| 1,1-Dichloroethene | (<1.0 U) | 3.9 | 9.6 | 12 |
| Chloroform | 10.6 | (<1.0 U) | (<1.0 U) | (<1.0 U) |
| cis-1,2-Dichloroethene | 249 | 1,180 | 3,510 | 4,240 |
| trans-1,2-Dichloroethene | 0.47J | 1.8 | 5.2 | 5.5 |
| Ethylbenzene | 2.7 | (<1.0 U) | (<1.0 U) | (<1.0 U) |
| Trichloroethene | 2.4 | 0.93J | 4.4 | 2.4 |
| Vinyl chloride | 154 | 1,150 | 3,260 | 3,840 |

**MW5-4D**

| Analyte | June '14 |
|---|---|
| 1,1-Dichloroethene | (<1.0 U) |
| Chloroform | (<1.0 U) |
| cis-1,2-Dichloroethene | 18.8 |
| trans-1,2-Dichloroethene | (<1.0 U) |
| Ethylbenzene | (<1.0 U) |
| Trichloroethene | (<1.0 U) |
| Vinyl chloride | 8.5 |

**CH5-04**

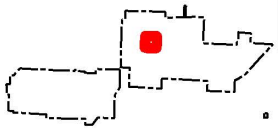
| Analyte | May '14 | June '14 Lower | June '14 Middle | June '14 Upper |
|---|---|---|---|---|
| 1,1-Dichloroethene | 0.7J | 1.1 | 0.96J | 1.3 |
| Chloroform | (<1.0 U) | (<1.0 U) | (<1.0 U) | (<1.0 U) |
| cis-1,2-Dichloroethene | 247 | 319 | 290 | 273 |
| trans-1,2-Dichloroethene | 0.66J | 1.7 | 0.97J | 0.69J |
| Ethylbenzene | (<1.0 U) | (<1.0 U) | (<1.0 U) | (<1.0 U) |
| Trichloroethene | 1.2 | 0.92J | 1.2 | 1.4 |
| Vinyl chloride | 202 | 284 | 263 | 237 |

| Analyte | Class GA* (µg/L) |
|---|---|
| 1,1-Dichloroethene | 5 |
| Chloroform | 7 |
| cis-1,2-Dichloroethene | 5 |
| trans-1,2-Dichloroethene | 5 |
| Ethylbenzene | 5 |
| Trichloroethene | 5 |
| Vinyl chloride | 2 |

*Analytes identified in Part 373 Permit; only analytes which were detected above standard exceedances are presented.

**MW5-8D**

| Analyte | June '14 |
|---|---|
| 1,1-Dichloroethene | (<1.0 U) |
| Chloroform | (<1.0 U) |
| cis-1,2-Dichloroethene | (<1.0 U) |
| trans-1,2-Dichloroethene | (<1.0 U) |
| Ethylbenzene | (<1.0 U) |
| Trichloroethene | (<1.0 U) |
| Vinyl chloride | (<1.0 U) |



Overburden Well/Piezometer
Shallow Bedrock Well/Piezometer
Deep Bedrock Well
Temporary Monitoring Point
Bedrock Coring location

89 = Indicates above NYSDEC Class GA Standards
J = Estimated concentration
U = Not detected above reporting limit
< 0.54 U = Not detected, value reported is reporting limit
All concentrations reported in micrograms per liter (µg/L)

Pre-Design Investigation
Data Summary Report
Niagara Falls Air Reserve Station
Niagara Falls, New York

FIGURE 7-3
Bedrock Groundwater Results
DS004 - Site 5

| PROJECT MGR: | DESIGNED BY: | CREATED BY: | CHECKED BY: | SCALE: | DATE: | PROJECT NO: | FILE NO: |
|---|---|---|---|---|---|---|---|
| BY | RP | FD | BY | AS SHOWN | NOVEMBER 2014 | 6265401 | G:\Projects\Federal\DOD\ 6265401_AFCEC_NFARS\ |

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