8976 Wellington Road
Manassas, VA 20109

September 26, 2011

George Heitzman, P.E.
Division of Environmental Remediation
New York State Dept. of Environmental Conservation
625 Broadway, 11th Floor
Albany, NY 12233-7014

Re: Former IBM Kingston Facility, (TechCity)
Site Number: 356002
Supplemental Site Characterization Work Plan: Sanitary Sewer Evaluation, dated Sep 26, 2011

Dear Mr. Heitzman:

The purpose of this letter is to transmit the referenced Site Characterization Work Plan pursuant to Exhibit C of the Order on Consent, Index # D3-10023-6-11. Revisions to the work plan were made in response to NYSDEC's comments and IBM is requesting approval of the work plan.

After reviewing the information provided in this transmittal, should you have any questions please call Dean Chartrand at (703) 257-2583.

Sincerely yours,

M. E. Meyers

Mitchell E. Meyers
Manager, Environmental Remediation
Corporate Environmental Affairs

cc: w/ enclosure (1 hardcopy and 1 electronic copy)

Wayne Mizerak NYSDEC - Albany (1 hardcopy and 1 electronic copy)

Former IBM Kingston Facility (TechCity)
Site Number: 356002
Order on Consent Index: D3-10023-6-11
Supplemental Site Characterization Work Plan:
Sanitary Sewer Evaluation

Prepared for:

IBM Corporate Environmental Affairs
8976 Wellington Road
Manassas, VA 20109

September 26, 2011

Prepared by:
Groundwater Sciences Corporation

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1.0 INTRODUCTION

Groundwater Sciences Corporation (GSC) has prepared this Supplemental Site Characterization Work Plan (SC Work Plan) on behalf of International Business Machines Corporation (IBM) for the evaluation of the sanitary sewer piping as a potential for contaminant migration at the former IBM Kingston Facility located at 300 Enterprise Drive, Kingston, Ulster County, New York (see Figure 1).

This SC Work Plan describes the objectives and methods proposed to evaluate sanitary sewer piping as potential conduit for contaminant migration in response to the OU3 requirements set forth in Exhibit C of the Order on Consent (Order), Index # D3-10023-6-11, for Site 356002. This approach includes review of historical records, field surveys and comparing these results with known piping inverts as a means to evaluate the potential of impacted groundwater to infiltrate the sanitary sewer lines.

1.1 Site Background

The site is located north of the City of Kingston in the Town of Ulster, Ulster County, New York and is bounded by John M. Clarke Drive and Route 9W to the east, Old Neighborhood Road and Route 209 to the north, Esopus Creek to the west and Boices Lane to the south (see Figure 2). The approximately 258-acre property was first developed by IBM from farmland during the 1950s. The primary activities included the manufacturing of electric typewriters and the development, manufacture and testing of computer systems and related components and technologies. IBM ceased operations during the early-1990s and the property was subsequently subdivided into multiple parcels. In 1998, IBM sold the site to AG Properties of Kingston, LLC and Ulster Business Complex, LLC. The site is currently managed by TechCity Properties, Inc. (TechCity).

The portion of the site located east of Enterprise Drive is referred to as the East Campus and includes the majority of the buildings at the site, many of which are vacant. The portion located west of Enterprise Drive is referred to as the West Campus and includes Buildings 201 (B201), Building 202 (B202) and Building 203 (B203) (currently referred to as the Bank of America

facility); a large parking area south and west of the Bank of America facility; and generally undeveloped land further to the southwest and north of the Bank of America facility.

The site is listed as a Class 4 Site (Site # 356002) in the Registry of Inactive Hazardous Waste Disposal Sites in New York State and was managed in compliance with the October 4, 1996 Hazardous Waste Management Permit #3-5154-00067/00090 (6 NYCRR Part 373) (RCRA Permit) until the Order on Consent (Order) was signed with New York State Department of Environmental Conservation (NYSDEC) by IBM and TechCity on July 8, 2011.

The Order, which supersedes and replaces the former RCRA Permit, divides the site into ten Operable Units (OUs). The locations of the OUs are depicted in Figure 2. Table 1-1 presents a list of the OUs, including the proposed OU use and which OUs will remain listed as a Class 4 Inactive Hazardous Waste Disposal Site. Reference is made to Exhibit C of the Order for additional information.

Prior to the execution of the Order, IBM completed extensive RCRA Facility Investigations (RFIs) beginning in the 1990s through 2002 to delineate the occurrence and extent of volatile organic compounds (VOCs) in groundwater beneath the site. Corrective Measures implemented by IBM include the operation and maintenance of a perimeter control system that intercepts the groundwater plume. The perimeter control system consists of two stormwater sewer systems, an unsaturated portion of the surficial sand unit that underlies the site, a utility trench barrier wall and a groundwater collection system (see Figure 2). IBM currently performs groundwater quality monitoring to evaluate the effectiveness of the Corrective Measures. Semi-annual and annual monitoring reports are submitted to NYSDEC.

Table 1-1 Listing of Operable Units, Proposed Use and Status		
Operable Unit	**Proposed Use**	**Status**
OU1	Commercial	
OU 2	Commercial	
OU 3	Commercial	Included as part of the Class 4 Inactive Hazardous Waste Disposal Site # 356002
OU 3a	Commercial	Included as part of the Class 4 Inactive Hazardous Waste Disposal Site # 356002
OU 4	Restricted Residential	
OU4a	Commercial	
OU5	Commercial	Included as part of the Class 4 Inactive Hazardous Waste Disposal Site # 356002
OU6	Commercial	
OU7	Commercial	
OU8	Commercial	

1.2 Purpose

With the approval of the Order, and based on current environmental conditions and available data, additional activities are required to evaluate if the sanitary sewers is potential conduit for contaminant migration, specifically in the east-west sections that lie north of Building 001 (B001) and Building 003 (B003) extending to the Utility Trench Barrier Wall. This SC Work Plan designed to evaluate the sanitary sewers based on current conditions, provide a mechanism for interim reporting on these evaluations with recommendations for investigation if needed.

This SC Work Plan has been prepared in accordance with the Order requirement that all site activities that comprise any element of a Class 4 Inactive Hazardous Waste Site Remedial Program be conducted pursuant to a NYSDEC-approved work plan. The Work Plan outlines a proposed scope of work to meet the objective for Operable Unit 3, which as detailed in Exhibit C of the

Order, which is to submit a work plan to evaluate sanitary sewer piping as a potential conduit for contaminant migration.

Section 2.0 of this SC Work Plan provides a description of the site geology and hydrogeology and a summary of the nature and extent of site-wide groundwater impacts, in addition to a brief summary of the previous assessment of the sanitary sewers. Section 3.0 outlines the proposed supplemental characterization activities, including evaluation techniques, field investigations and procedures. Section 4.0 describes the proposed schedule and reporting activities. Section 5.0 provides reference listing of historical documents used in the preparation of this SC Work Plan.

As previously developed pursuant to the RCRA Permit and continued by the Order, the following Management Plans have been prepared (Golder, 2009):

- **Project Management Plan** – includes a description of the project management approach, the Project Team Organization Chart, and the proposed project schedule.
- **Data Management Plan** – includes a description of the processes by which the investigation data will be documented, tracked, and presented.
- **Quality Assurance Project Plan (QAPP)** – includes a description of the data quality objectives; sampling and field measurement standard operating procedures (SOPs); and sample analysis procedures.
- **Health and Safety Plan (HASP)** – includes the procedures that will be followed for the protection of the field investigative team members implementing the SC Work Plan, and the general public that may be exposed to potential site hazards.
- **Citizen Participation Plan** – includes a description of how the information collected during the performance of the SC Work Plan will be disseminated to involved stakeholders.

These Management Plans were previously provided as separate documents, which accompanied the 2009 RCRA Facility Investigation Work Plans. In accordance with the Order, Paragraph III B.1. (a), applicable portions of these Management Plans are referenced in this SC Work Plan.

2.0 CURRENT CONDITIONS

This section presents the current Conceptual Site Model (CSM) for the entire site. The following description of geology and hydrogeology was originally based on information collected by GSC, on behalf of IBM, and has been refined by data collected at the site by Golder since 2009. The nature and extent of the VOC groundwater plume is based upon the findings of work completed by GSC, on behalf of IBM. The primary documents used to develop this CSM include:

- Sewer Systems Assessment Report, March 14, 1994.
- RCRA Facility Assessments, Four Recently Identified Solid Waste Management Units, January 16, 1995.
- RCRA Facility Assessments Newly Identified Solid Waste Management Units, March 14, 1997.
- RCRA Facility Investigation Groundwater Plumes and Sources, March 14, 1997.
- Triangle Plume Area Investigation Report, September, 2009.
- 2010 Annual Groundwater Monitoring Report, March 30, 2011.

A complete listing of documents reviewed in the preparation of this SC Work Plan is provided in Section 5.0.

2.1 Generalized Geology

The site is located within the Hudson-Mohawk Lowland Physiographic Province. The bedrock underlying the western portion of the site consists of siltstone and shale of the Middle Devonian Age Lower Hamilton Group. The eastern portion of the site is underlain by both the Lower Hamilton Group and the Lower Devonian Age Onondaga Limestone. The exact location and nature of the contact between these units is not known. The Lower Hamilton Group forms a north-northwest trending bedrock high approximately coincident with Enterprise Drive, and is described as a calcareous shale in boring logs completed during previous site investigations.

Literature on regional geologic conditions indicate that a glacially-derived sand and gravel unit directly overlies the bedrock west of Enterprise Drive and a glacial till unit overlies the bedrock east of Enterprise Drive. These unconsolidated units are overlain by a varved silt and clay unit that is interpreted to be of lacustrine origin, with a thickness of zero feet in an area where it is absent proximate to the bedrock high, to over 180-feet in the central portion of East Campus as determined by previous site borings. The clay portion of the varved silt and clay unit serves as an aquitard throughout most the site, except in the localized area in the vicinity of the bedrock high where it is absent.

A well sorted, fine to coarse-grained sand of lacustrine origin, with intermittent, thin, silty-clay zones, overlies the varved silt and clay (or bedrock where the varved silt and clay is absent in the vicinity of the bedrock high). This surficial sand unit ranges in thickness across the site from approximately 6-feet in the area of the bedrock ridge to greater than 30-feet in the central portion of the East Campus. A discontinuous transition zone of relatively fine-grained materials is present at the base of the surficial sand unit in some areas of the site (GSC, 1997).

Generalized descriptions of the near-surface lithologic units encountered at the site are as follows:

- **Surficial SAND Unit:** Consists of a light brown, fine to medium grained sand containing variable amounts of finer-grained silt and clay. This unit is typically saturated below a depth of approximately 6 to 7-feet below ground surface (ft bgs).
- **SILTY-SAND and CLAY Transition Unit:** Consists of variable amounts of reddish-brown to gray silt, sand, and clay. Typical appearance in a soil core is a silty-sand matrix containing thin lenses of silt and sandy clay. This unit, if present, is generally encountered between 15 to 20-ft bgs in the vicinity of B001.
- **Varved CLAY Unit:** Consists of red-brown and gray, plastic, cohesive, wet clay with intermittent silt zones. Typical appearance in a soil core is clay with laminae of silt and sometimes very fine-grained sand. This unit is typically encountered at approximately 20 to 25-ft bgs in the B001 area, with greater or lesser depths of first occurrence in localized areas.

The thickness of the sand unit increases and the thickness of the transition unit decreases coinciding with a shallowing of the depth to top-of-clay along the western edge of a clay unit "valley" identified in the *RCRA Facility Investigation on Groundwater Plumes* report (GSC, 1997b). This valley is deepest below B001 and B003 (i.e., approximately 30 ft bgs to the top of the clay unit) and extends southward to the east of Building B025 (B025) and then west towards Boices Lane.

2.2 Generalized Hydrogeology

The varved clay unit serves as an aquitard throughout most the site. Therefore groundwater in the bedrock and in the deep sand and gravel and glacial till units that underlie the varved silt and clay is under confined conditions. Groundwater within the surficial sand unit that overlies the varved silt and clay unit is unconfined. The surficial sand unit is typically unsaturated in the area of the bedrock high along Enterprise Drive.

The estimated horizontal hydraulic conductivity of the surficial sand unit ranges from approximately 65 feet per day (ft/day) to 270 ft/day (i.e., 2.3×10^{-2} centimeters per second [cm/sec] to 9.5×10^{-2} cm/sec), with an average hydraulic conductivity of approximately 100 ft/day [2.3×10^{-2} cm/sec]. The horizontal hydraulic conductivity of the varved silt and clay unit has been estimated at approximately one (1) foot per day [3.5×10^{-4} cm/sec]. The vertical hydraulic conductivity of this unit is likely significantly lower than its horizontal hydraulic conductivity due to the horizontal bedding structure. The low vertical hydraulic conductivity and thickness of the unit support the designation of the varved silt and clay as an aquitard.

An east-west trending groundwater divide has been identified at the site underlying B001, Building 002 (B002), B003, Building 004 (B004) and Building 005 (B005) (see Figure 3). Groundwater to the north of the divide flows west and northwest. Groundwater to the south of the divide flows west and southwest. The water table gradient in the eastern portion of the site and in the vicinity of the Groundwater Collection System (GWCS) is reportedly higher than the water table gradient in the south and central portion of the site, and estimated horizontal groundwater flow velocities range from approximately 0.8 ft/day to 2 ft/day (GSC, 1997b).

Groundwater flow is influenced by the presence of the perimeter control system (see Figure 3), which is composed of:

- A 42-inch diameter storm sewer pipe that extends from east to west along a line south of B001 through B005, and then passes under Enterprise Drive to the south of B201.
- An unsaturated portion of the surficial sand unit that intersects the 42-inch storm sewer south of B201, and extends east-northeast back across Enterprise Drive, and then continues toward the north portion of the site.
- The GWCS, extends along the western and northern perimeter of the North Parking Lot Area. The GWCS is comprised of a set of groundwater cut-off trenches. Water collected in the trenches is treated via air stripping.
- A 60-inch diameter storm sewer pipe that intersects the GWCS and extends along the western portion of the North Parking Lot Area.
- A utility trench barrier wall, consisting of an approximately 250-foot long trench backfilled with clay with the base keyed into the Varved Clay Unit and the top of the barrier wall completed a minimum of two feet above the recorded high water table. This barrier wall was installed to mitigate the potential for groundwater migration along the underground utility pipes which ultimately terminate at the former IWTF.

The groundwater VOC plume is contained within the site by this system.

2.3 Nature and Extent of Site Groundwater Contamination

IBM has been collecting groundwater samples at the site since the late 1970s. The existing site monitoring well network is shown on Figure 3. Identified compounds of concern in the surficial sand aquifer include the following chlorinated VOCs: 1,1,1-trichloroethance [TCA], trichloroethene [TCE] and tetrachloroethene [PCE], and related degradation products (i.e., 1,1-dichloroethene [1,1-DCE], 1,1-dichloroethane [1,1-DCA], 1,2-cis-dichloroethene [1,2-DCE] and 1,2-dichloroethane [1,2-DCA]). Other VOCs have been detected in groundwater, including carbon tetrachloride, freon and petroleum hydrocarbons; however, concentrations of these VOCs are generally lower and less extensive than the chlorinated compounds.

Four groundwater plumes have been identified at the site, including:

- The North Parking Lot Area (NPLA) Plume (located to the north of B001 and B003) is primarily composed of TCE and TCA, and to a lesser degree PCE. Based on historic groundwater quality sampling and soil vapor screening investigations, the source areas for this plume are likely associated with historic manufacturing activities in B001, B002, B003, B004 and B005S. The primary source area appears to be the industrial waste sewer lines located beneath these buildings (as noted below) and north of B001 and B003. Concentrations of PCE, TCE and TCA in the NPLA Plume appear to originate in the central and western portions of the site.
- The B005 Plume Area, located beneath B001, B002, B003, B004 and B005, is primarily composed of TCE and TCA. Based on historic groundwater quality sampling and soil vapor screening investigations, this plume is believed to have originated from activities in B001, B003, B004 and B005S.
- An isolated PCE plume, extending from the southern portion of B005 to the 42-inch sewer and originating from a release(s) at a PCE tank located in the southeastern corner of B005.
- The Industrial Waste Treatment Facility (IWTF) Plume, located near Building 036 (B036). The plume in this area is not likely to have originated from the IWTF, but is believed to have migrated from the eastern campus plume along the underground utility pipes prior to the installation of the utility trench barrier wall.

Figure 3 presents a generalized depiction of areas where groundwater is impacted by VOCs.

2.4 Sanitary Sewers

As noted in the Sewer Systems Assessment Report, the sanitary sewer system is above the water table throughout nearly the entire site and so there are limited opportunities for infiltration of groundwater into the system. Since that report was prepared and in response to those assessments, several actions have been implemented at the site, including the installation of the Utility Trench Barrier Wall.

The purpose of this SC Work Plan is to examine available information and gather additional data regarding the sanitary sewers in the NPLA to evaluate the potential for infiltration of groundwater containing VOCs into the sanitary sewers. This will include the sanitary sewers that extend from the east side of B003 westward along and parallel to the north end of B001 to the intersection of these sewers with Enterprise Drive at the location of the Utility Trench Barrier Wall (Figure 2-1). In addition, the potential for exfiltration from the sanitary sewers in areas west of the Utility Trench Barrier Wall will also be evaluated. To the extent appropriate, this sanitary sewer evaluation will incorporate information derived from the Permit required activities including the evaluations presented in the Sewer Systems Assessment Report (GSC, 1994).

3.0 SCOPE OF WORK

The main objectives of this SC Work Plan are to:

- Evaluate the potential for impacted groundwater to infiltrate into the sanitary sewer lines;
- Provide interim reporting on the findings of this evaluation;
- And, as necessary, develop supplemental work plans to characterize
    - the relationship between groundwater quality and water quality in the sanitary sewers north of B001, B003 and in the vicinity of the Utility Trench Barrier Wall and;
    - mechanisms for the transport of impacted groundwater via the sanitary sewers.

These objectives will be met through the performance of the following tasks:

- Examine historical records and other sources to compile current drawings and plans of the sanitary sewers and the utility trench barrier wall;
- Perform field inspections to verify the information on the compiled site utility drawings and to identify any newly constructed sanitary sewer infrastructure which differ from the available drawings and records, including inspections of accessible components (manholes, sumps, vaults) to ascertain the general conditions of the active system;
- Collect groundwater elevation data from available monitoring points to compare the invert elevations of the sanitary sewer with groundwater elevations; and
- Prepare an interim report of findings (current conditions report) with recommendations for additional activities, if necessary.

The following sections describe the scope of work for each of these tasks.

3.1 Evaluation of Available Data

The first task will be to compile existing data and information relative to the sanitary sewers and the utility trench barrier wall installation and construction. This will include the understanding of their layout, construction details and invert elevations.

3.2 Field Inspections and Data Collection

The second task that must be completed with respect to these systems is to field verify not only the information presented on the sources used to acquire this information, but also to check on the current condition and the availability of access for sampling or other measurements.

3.3 Supplemental Data Collection and Evaluation

Using information from the historical records review and field inspections, relevant groundwater elevation monitoring locations will be identified followed by the collection and contouring of groundwater elevation data. Groundwater elevation determinations will be based on protocols specified in the QAPP. The final step will be to analyze and interpret the data collected. The principal purpose of this analysis will be to identify sewer segments that have the potential for infiltration of groundwater containing VOCs.

4.0 SCHEDULE AND REPORTING

IBM will implement the scope of work outlined in this SC Work Plan within 30 days of NYSDEC approval of this SC Work Plan. IBM anticipates that field activities can be completed within approximately eight (8) to ten (10) days, including mobilization time.

Within 60 days of NYSDEC approval of this SC Work Plan, IBM will submit an Interim SC Report to NYSDEC. The SC Report will present the results of the characterizations, including a description of implemented field activities and procedures, and the data results. Based on this analysis, a supplemental work plan may be prepared to perform additional groundwater characterization, including water quality sampling, potential source identification, and sewer line inspections and sampling. This work plan would then be presented as Modification #1 to this Work Plan.

5.0 REFERENCES

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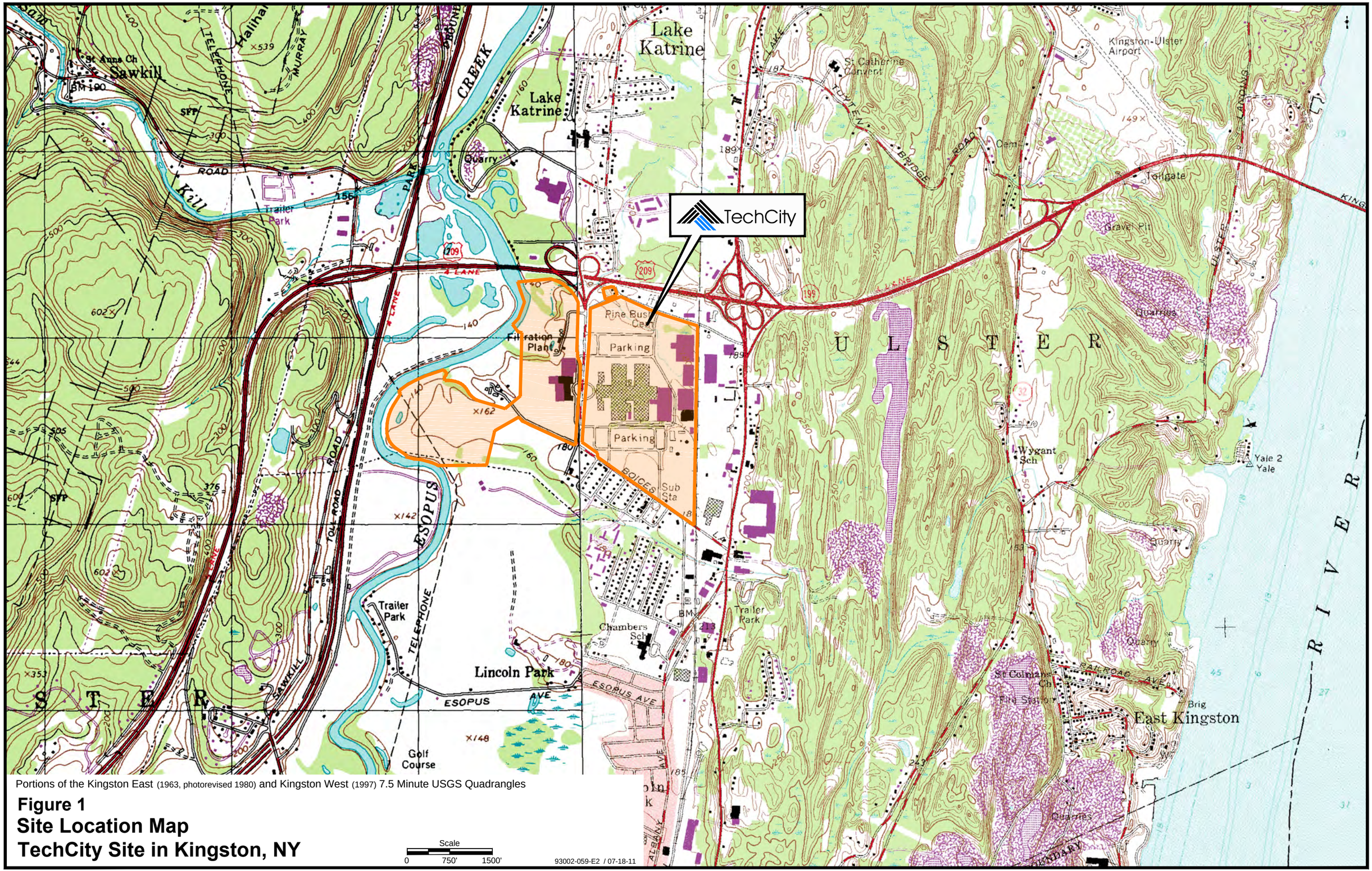


Portions of the Kingston East (1963, photorevised 1980) and Kingston West (1997) 7.5 Minute USGS Quadrangles

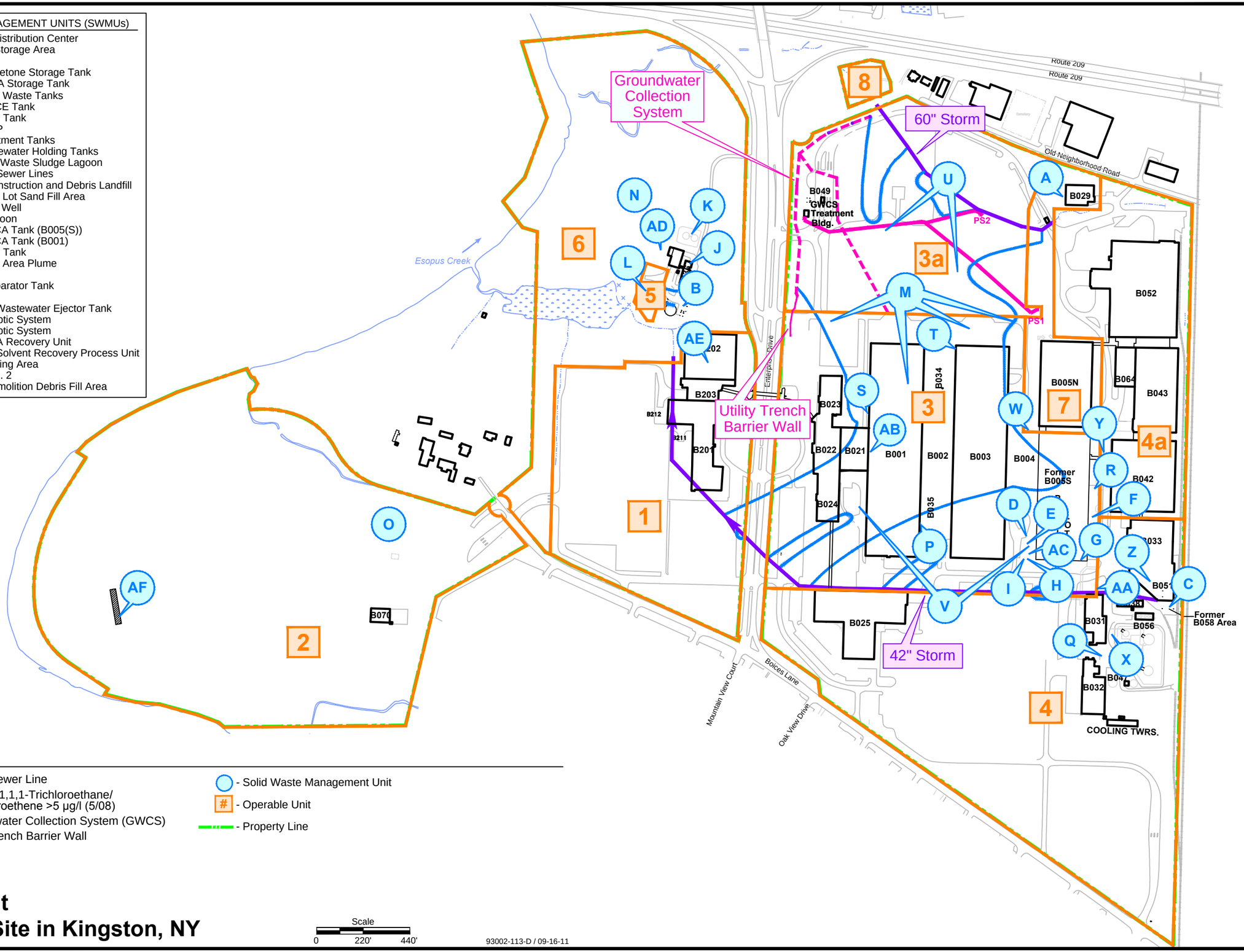
Figure 1
Site Location Map
TechCity Site in Kingston, NY

Scale
0 750' 1500'

93002-059-E2 / 07-18-11

SOLID WASTE MANAGEMENT UNITS (SWMUs)

A: B029 Chemical Distribution Center
B: B036 Container Storage Area
C: Former B058
D: Former Waste Acetone Storage Tank
E: Former Waste IPA Storage Tank
F: Former East Side Waste Tanks
G: Former Waste PCE Tank
H: Former East SRP Tank
I: Former West SRP
J: Wastewater Treatment Tanks
K: Emergency Wastewater Holding Tanks
L: Former Industrial Waste Sludge Lagoon
M: Industrial Waste Sewer Lines
N: Inactive B036 Construction and Debris Landfill
O: Salt Barn Parking Lot Sand Fill Area
P: Former B035 Dry Well
Q: Former B031 Lagoon
R: Former Waste TCA Tank (B005(S))
S: Former Waste TCA Tank (B001)
T: Former Waste Oil Tank
U: North Parking Lot Area Plume
V: B005 Plume
W: Former B004 Separator Tank
X: B031 Separator
Y: Former Fluoride Wastewater Ejector Tank
Z: Inactive B033 Septic System
AA: Inactive B031 Septic System
AB: Former B001 TCA Recovery Unit
AC: Former B005(S) Solvent Recovery Process Unit
AD: Former Fire Training Area
AE: B202 Elevator No. 2
AF: Inactive West Demolition Debris Fill Area



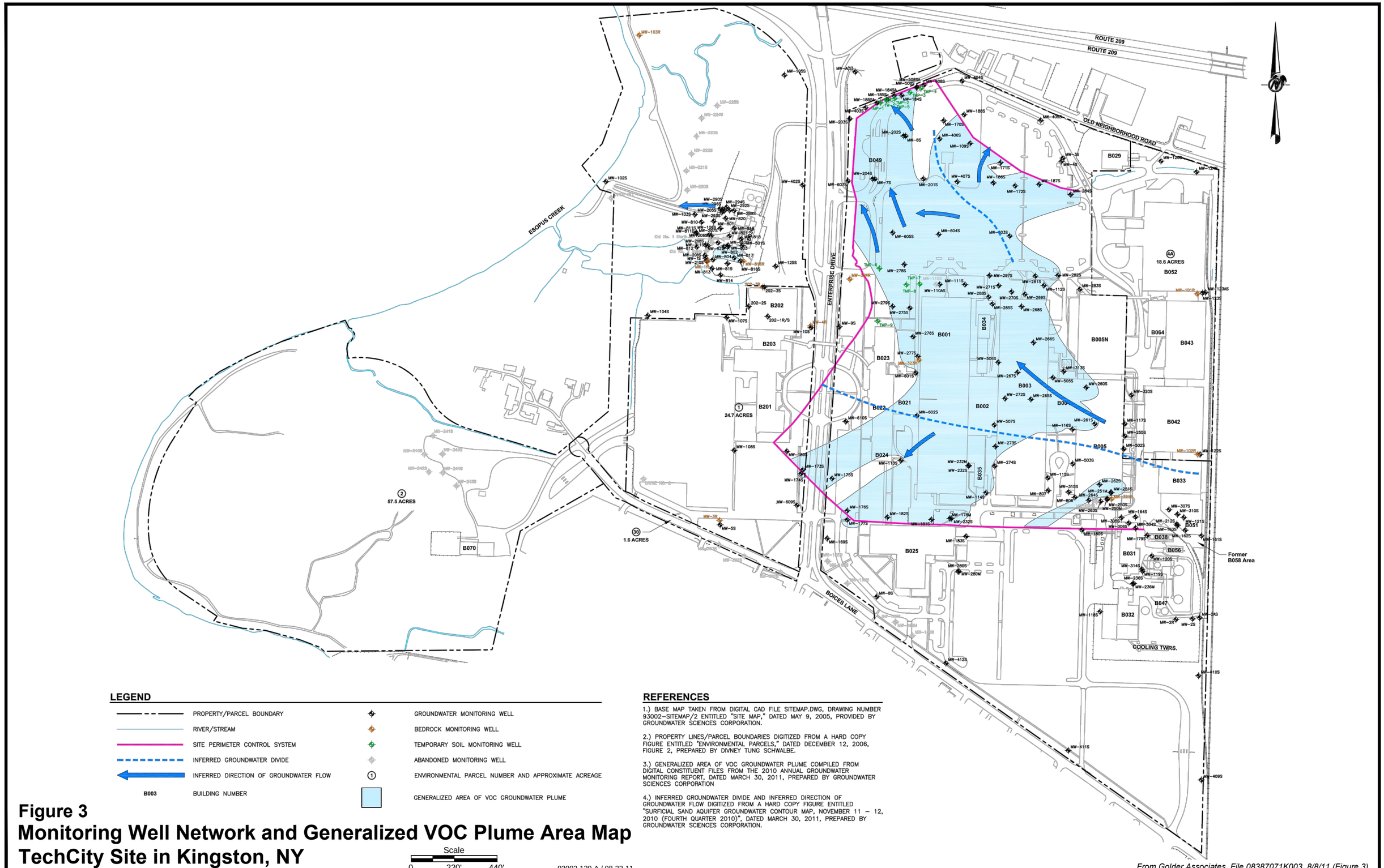
LEGEND

- Storm Sewer Line
- Area of 1,1,1-Trichloroethane/ Tricholoroethene >5 µg/l (5/08)
- Groundwater Collection System (GWCS)
- Utility Trench Barrier Wall
- Solid Waste Management Unit
- # - Operable Unit
- Property Line

Figure 2
Site Layout
TechCity Site in Kingston, NY

Scale
0 220' 440'

93002-113-D / 09-16-11



LEGEND

- PROPERTY/PARCEL BOUNDARY
- RIVER/STREAM
- SITE PERIMETER CONTROL SYSTEM
- INFERRED GROUNDWATER DIVIDE
- INFERRED DIRECTION OF GROUNDWATER FLOW
- B003 BUILDING NUMBER
- GROUNDWATER MONITORING WELL
- BEDROCK MONITORING WELL
- TEMPORARY SOIL MONITORING WELL
- ABANDONED MONITORING WELL
- (1) ENVIRONMENTAL PARCEL NUMBER AND APPROXIMATE ACREAGE
- GENERALIZED AREA OF VOC GROUNDWATER PLUME

REFERENCES

1.) BASE MAP TAKEN FROM DIGITAL CAD FILE SITEMAP.DWG, DRAWING NUMBER 93002–SITEMAP/2 ENTITLED "SITE MAP," DATED MAY 9, 2005, PROVIDED BY GROUNDWATER SCIENCES CORPORATION.

2.) PROPERTY LINES/PARCEL BOUNDARIES DIGITIZED FROM A HARD COPY FIGURE ENTITLED "ENVIRONMENTAL PARCELS," DATED DECEMBER 12, 2006, FIGURE 2, PREPARED BY DIVNEY TUNG SCHWALBE.

3.) GENERALIZED AREA OF VOC GROUNDWATER PLUME COMPILED FROM DIGITAL CONSTITUENT FILES FROM THE 2010 ANNUAL GROUNDWATER MONITORING REPORT, DATED MARCH 30, 2011, PREPARED BY GROUNDWATER SCIENCES CORPORATION

4.) INFERRED GROUNDWATER DIVIDE AND INFERRED DIRECTION OF GROUNDWATER FLOW DIGITIZED FROM A HARD COPY FIGURE ENTITLED "SURFICIAL SAND AQUIFER GROUNDWATER CONTOUR MAP, NOVEMBER 11 – 12, 2010 (FOURTH QUARTER 2010)", DATED MARCH 30, 2011, PREPARED BY GROUNDWATER SCIENCES CORPORATION.

Figure 3

Monitoring Well Network and Generalized VOC Plume Area Map
TechCity Site in Kingston, NY

Scale
0 220' 440'

93002-120-A / 08-22-11

From Golder Associates, File 08387071K003, 8/8/11 (Figure 3).