8976 Wellington Road
Manassas, VA 20109

September 2, 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 Remedial Investigation Work Plan: SWMU S

Dear Mr. Heitzman:

The purpose of this letter is to transmit the referenced Supplemental Remedial Investigation Work Plan pursuant to Exhibit C, OU3, Order on Consent, Index # D3-10023-6-11.

After reviewing the information provided in this transmittal, should you have any questions please call Michael Kominek at (703) 257-2586.

Sincerely yours,

M. E. Meyers

Mitchell E. Meyers
Manager, Environmental Remediation
Corporate Environmental Affairs

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

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WORK PLAN

SUPPLEMENTAL REMEDIAL INVESTIGATION WORKPLAN

SOLID WASTE MANAGEMENT UNIT S: FORMER B001 WASTE TCA TANK

Former IBM Kingston Facility

Site # 356002

Order on Consent Index No. D3-10023-6-11

Submitted To: New York State Department of Environmental Conservation
Bureau of Hazardous Waste and Radiation Management
625 Broadway
9th Floor
Albany, NY 12233-7250

Submitted By: International Business Machines Corporation
8976 Wellington Road
Manassas, VA 20109

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1.0 INTRODUCTION AND BACKGROUND

1.1 Introduction

Golder Associates Inc. (Golder) has prepared this Supplemental Remedial Investigation/Feasibility Study Work Plan (RIWP) on behalf of International Business Machines Corporation (IBM), for Solid Waste Management Unit S: Former B001 Waste TCA Tank (SWMU S) at the former IBM Kingston Facility (site) located at 300 Enterprise Drive, Kingston, Ulster County, New York (see Figure 1).

This RIWP describes the objectives and methods proposed to further assess soil and groundwater quality conditions in the vicinity of SWMU S. The investigation approach includes the collection and analysis of real-time soil and groundwater quality data to allow for adjustment of the number, location, and depth of samples as the investigation proceeds. This "dynamic" work plan approach will allow for efficient assessment of site conditions.

1.2 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 currently vacant. The portion located west of Enterprise Drive is referred to as the West Campus and includes former IBM Buildings B201, B202 and 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 entire site was 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) (Permit) until the Order on Consent Index No. D3-10023-6-11 (Order) was signed with NYSDEC by IBM and TechCity on July 8, 2011.

The Order, which supersedes and replaces the former Permit, divides the site into ten Operable Units (OUs) as depicted in Figure 2.

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 a stormwater sewer system, an unsaturated portion of the Surficial Sand Unit that underlies the site, and a groundwater collection system (see Figure 2). Collected groundwater is treated at an onsite groundwater treatment plant by air stripping with treated effluent discharged through the stormwater sewer system to the Esopus Creek pursuant to NYSDEC State Pollutant Discharge Elimination System (SPDES) Permit #NY0260134. IBM currently performs groundwater quality monitoring to evaluate the effectiveness of the Corrective Measures. Semi-annual and annual monitoring reports are submitted to NYSDEC.

1.3 Purpose

The Order requires additional investigation related to SWMU S (Former B001 Waste TCA Tank). This Supplemental RIWP has been prepared in accordance with the Order requirement that all site activities be conducted pursuant to a NYSDEC-approved work plan. As such, IBM will undertake a supplemental investigation to identify the nature and extent of potential ongoing sources of VOC impacts to groundwater in the vicinity of SWMU S and evaluate the need for remedial action.

This RIWP outlines a proposed scope of work to meet the following objectives:

- Evaluate whether soil and/or groundwater conditions in the immediate SWMU S area represent a continuing source of VOC (primarily TCA) impacts to site groundwater.
- Better define the nature and extent of VOC-impacted groundwater downgradient of SWMU S.
- Obtain preliminary water quality, geologic, and hydrogeologic information to support an evaluation of potential additional Corrective Measures, if appropriate.

Section 2.0 of this RIWP provides a description of the site geology and hydrogeology and a summary of the nature and extent of site-wide groundwater impacts, including the immediate vicinity of SWMU S. Section 3.0 outlines the proposed supplemental assessment activities, including field investigation and sampling techniques and procedures. Section 4.0 describes the proposed schedule and reporting activities.

As previously required by the Permit and continued by the Order, the following Management Plans have been prepared:

- **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 RIWP, and the general public that may be exposed to potential site hazards.

These Management Plans were previously provided as separate documents, which accompanied the 2009 RCRA Facility Investigation Work Plans (RFIWPs). Due to the expansion in scope of the investigative activities at the site since the 2009 RFIWPs, these Management Plans will be appropriately updated and revised as warranted. Applicable portions of these Management Plans are referenced in this RIWP.

2.0 CONCEPTUAL SITE MODEL

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 Groundwater Sciences Corporation (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. A complete listing of documents reviewed in the preparation of this RIWP 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 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 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 Clay Unit (or bedrock where the Varved Clay Unit 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 (Transition Zone):** 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 Building 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 Building 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 Zone decreases coinciding with a shallowing of the depth to top-of-clay in the SWMU S area. The SWMU S area is located on the western edge of a clay unit "valley" identified by GSC in the *RCRA Facility Investigation on Groundwater Plumes* report (GSC, 1997b). This valley is deepest below Buildings 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 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 Clay Unit is under confined conditions. Groundwater within the Surficial Sand Unit that overlies the Varved 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., 3.5×10^{-2} centimeters per second [cm/sec] to 9.5×10^{-2} cm/sec), with an average hydraulic conductivity of approximately 120 ft/day [4.2×10^{-2} cm/sec]. The horizontal hydraulic conductivity of the Varved Clay Unit has been estimated at approximately one 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 Clay Unit as an aquitard.

An east-west trending groundwater divide has been identified at the site underlying Buildings B001, B002, B003, B004 and 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 southern and central portion of the site. 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 2), which comprises:

- A 42-inch diameter stormwater sewer pipe that extends to the south of Buildings B001 through B005, and then transects Enterprise Drive to the south of Building B021.
- An unsaturated portion of the Surficial Sand Unit that intersects the 42-inch stormwater sewer south of Building B021, transects east across Enterprise Drive, and then continues toward the north portion of the site near Old Neighborhood Road.
- The GWCS, which intersects the unsaturated portion of the Surficial Sand Unit near Old Neighborhood Road, and extends along the western and northern perimeter of the North Parking Lot Area. The GWCS comprises a set of groundwater cut-off trenches. Water collected in the trenches is treated via air stripping.
- A 60-inch diameter stormwater sewer pipe that intersects the GWCS and extends along the western portion of the North Parking Lot Area.

2.3 Nature and Extent of Site Groundwater Contamination

IBM has been collecting groundwater quality data 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 Unit include the following chlorinated VOCs: 1,1,1-trichloroethane [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 TCA and TCE/PCE series and related degradation compounds.

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

- The North Parking Lot Area Plume (located to the north of Buildings B001 and B003), which 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 Buildings B001, B002, B003, B004 and B005S. The primary source area appears to be the industrial waste sewer lines located north of Building B001 and northeast of Building B003. Concentrations of PCE originate in the northeastern portion of the plume, while TCE and TCA appear to originate in the central and western portions of the site.
- The Building B005 Plume Area, located beneath Buildings B001, B002, B003, B004 and B005, is primarily composed of TCE and TCA. Based on historic groundwater quality sampling and soil vapor screening investigations, the plume is believed to have originated from activities in Buildings B001, B003, B004 and B005S. The primary source area appears to be the industrial waste sewer lines located in Building B003.
- An isolated PCE plume, located along the southern portion of Building B005, which originated from a release from a PCE tank located in the southeastern corner of Building B005.
- The Industrial Waste Treatment Facility (IWTF) Plume, located in the vicinity of the former IWTF, near Building B036.

Figure 3 presents a generalized interpretation of the extent of groundwater impacted by VOCs.

2.4 SWMU S

SWMU S includes a former 4,000-gallon TCA waste underground storage tank (UST) and associated 1,000-gallon supply UST (TCA tanks), which were co-located on the west side of Building B001 north of Building B021, between Buildings B001 and B023 (see Figure 4). The steel tanks were installed circa 1955 and were used in the manufacture of printed circuit cards through 1967. TCA was pumped both northward and southward into Building B001 from these tanks for use in multiple manufacturing operations, including use by the operation known as the "carousel", a series of solvent filled dip tanks located in northern Building B001, and the TCA Recovery Unit (SWMU AB)[1], located on the concrete floor along the western wall of Building B001 (see Figure 2).

The 4,000-gallon waste tank was converted to a gasoline UST for site security vehicles sometime between 1967 and 1971. Tank testing documents from 1978 identify the tank as a 4,000-gallon gasoline UST and indicated that the tank is "leaking" with the additional notation "out". A subsurface search for these tanks was conducted by IBM in 1991. Both tanks had apparently been closed by removal at some point between 1982 and 1991, as metal strapping used to secure the tanks was the only evidence located during the search[2].

The Surficial Sand Unit in this area extends to the top of the Varved Clay Unit located approximately 20 to 25 ft bgs. Depth to bedrock decreases sharply to the north-northwest of this area toward Enterprise Drive and the Surficial Sand Unit becomes unsaturated west and north of this area in the vicinity of the bedrock ridge. The water table in this area of the site has been encountered at a depth of approximately 7 ft bgs. Groundwater flows toward the north-northwest where it is intercepted by the groundwater collection system.

The TCA Tanks were initially investigated using a fine-grid soil gas survey performed by GSC (GSC, 1996) that included installation of temporary groundwater monitoring wells. TCA-series compounds were detected during this investigation, though concentrations of these compounds in soil gas were approximately two orders of magnitude lower than the highest concentrations detected beneath Building B003. Elevated concentrations of TCA in groundwater were subsequently detected in a temporary monitoring well (TMP-8) located approximately 400 to 500 feet downgradient of the TCA Tanks.

To further investigate the Building B001 area, including SWMU S, IBM installed five monitoring wells (MW-275S through MW-279S) in 1996. Soil samples collected from the borings for these wells were analyzed for VOCs. Analytical results from vadose zone soil samples did not indicate constituent levels

[1] SWMU AB is currently inaccessible and will be investigated in accordance with the NYSDEC approved 2009 RCRA Facility Investigation Work Plan Solid Waste Management Unit AB: Former B001 TCA Waste Recovery Unit once the demolition of B001 is complete and the area becomes accessible.

[2] An IBM capital equipment list compiled circa 1982 lists both the 4,000-gallon and 1,000-gallon tanks. These tanks were potentially removed contemporaneously with the 3,000-gallon Waste Oil Tank (SWMU T) that was closed by removal in September of 1982.

above applicable NYSDEC criteria. Groundwater sample analytical results indicated constituents detected at concentrations greater than NYSGWQS.

The current interpreted extent of the TCA plume in the vicinity of SWMU S is shown on Figure 4. The inferred presence of a groundwater plume emanating from SWMU S is based on recent TCA detections above NYSGWQS in monitoring wells MW-275S, MW-276S, MW-277S, MW-278S, MW-605 and MW-204 (GSC, 2010). The highest concentrations of TCA degradation products 1,1-DCE and 1,2-DCA detected in site groundwater are reported in the same monitoring wells that make up the core of the TCA plume in the vicinity of SWMU S indicating that some degree of TCA degradation is occurring.

3.0 INVESTIGATION SCOPE OF WORK

As described previously, the main objectives of this RIWP are to:

- Evaluate whether soil and/or groundwater conditions in the immediate SWMU S area represent a continuing source of VOC (primarily TCA) impacts to site groundwater.
- Better define the nature and extent of VOC-impacted groundwater downgradient of SWMU S.
- Obtain preliminary water quality, geologic, and hydrogeologic information to support an evaluation of potential additional Corrective Measures, if appropriate.

To meet these objectives, IBM has developed an investigation approach that includes the collection and analysis of real-time data to allow for field adjustment of the number, location, and depth of samples based on investigation findings. This approach will allow for efficient assessment of site conditions. As such, the scope and extent of investigations described below should be considered preliminary and subject to refinement during the course of the field investigation based on the judgment of the Project Team. Portions of the investigation as proposed herein are located in a section of Building B001 that is currently inaccessible. However, the need to collect investigatory information in that direction may not be necessary based on the information obtained in the accessible areas.

The investigation scope of work includes the following tasks:

- Refinement of the CSM.
- A subsurface investigation consisting of a membrane interface probe/electrical conductivity (MIP/EC) investigation.
- Soil sampling.
- Temporary well installation and groundwater sampling.

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

3.1 Refinement of the Conceptual Site Model

To more fully-develop the existing CSM and to allow for refinement of the model as new field data are collected, IBM has created a three-dimensional geologic and geochemical computer model of the site using Environmental Visualization System/Mining Visualization System (EVS/MVS®, C-Tech Development Corporation, 2008) modeling software. Existing site subsurface data has been input into EVS/MVS® to model the three near-surface hydrostratigraphic units (i.e., the Surficial Sand Unit, Transition Zone, and the top of the Varved Clay Units) at the site and in the vicinity of SWMU S. Existing soil and groundwater chemistry data have also been input into the model to enhance the three-dimensional definition of the site contamination sources and dissolved constituent plumes.

Data collected during the RI/FS investigations will be incorporated into the EVS/MVS® as the field investigations progress to update the CSM. The updated CSM will be used as a decision making tool for the adjustment of drilling and sampling locations. EVS/MVS® is particularly useful for evaluation of membrane interface probe/electrical conductivity (MIP/EC) data (see Section 3.2). At the completion of the field investigations, the model will be used to assess the vertical and horizontal extent of soil and groundwater impacts.

3.2 MIP/EC Investigation

A MIP/EC investigation will be conducted to better define the stratigraphy and distribution of VOCs in the subsurface in the vicinity of SWMU S. MIP/EC is a direct-sensing tool that is advanced into the subsurface using direct-push equipment (e.g., GeoProbe®).

The MIP detects the presence of total VOCs in the vapor, sorbed, and dissolved phases. The permeable membrane, which is located on the side of the probe, is a thin film polymer impregnated into a stainless steel screen for support. The membrane is heated to approximately 100 to 120 degrees Celsius to accelerate the volatilization of any VOCs in the vicinity of the probe. A clean carrier gas is continuously swept behind the membrane, which creates a concentration gradient, thereby causing the volatilized VOCs to diffuse across the membrane into the carrier gas. The carrier gas then flows to separate gas detectors located at the surface, including a photo-ionization detector (PID) and a halogen specific detector (XSD).

The PID is most effective at detecting aromatic hydrocarbons such as benzene, toluene, ethylbenzene, and xylene (BTEX compounds). The XSD is most effective at detecting chlorinated compounds such as PCE, TCE, TCA, and Freon. Information from the detectors is logged in real-time as the probe is advanced into the subsurface, thereby producing a continuous log of VOC concentration with depth.

The EC element measures soil conductivity with depth as the probe is driven into the ground. Conductivity data can be used to identify changes in lithology, the presence of contaminants, and/or other subsurface conditions (e.g. soil moisture) that change subsurface conductivity. The conductivity data are electronically logged along with depth and rate of penetration.

The MIP and EC tools are combined into one probe; therefore, simultaneous collection of both MIP and EC data are achieved in a single push and permit the field team to correlate stratigraphy and chemistry data. In addition, the real-time analysis of data allows the field team to modify and expand the depth and location of boreholes as needed to allow for a more rapid and complete assessment of the nature and extent of soil and groundwater impacts.

The general approach to the MIP/EC investigation will be to advance probes in a series of transects in the vicinity of SWMU S, parallel and perpendicular to groundwater flow. A preliminary layout is presented in Figure 5, portions of which are currently inaccessible. The MIP/EC investigation will be initiated in the immediate area of the former Building B001 TCA tanks to evaluate whether soil and/or groundwater conditions in this area represent a potential ongoing source of VOC impacts to site groundwater. As described in Section 2.4, groundwater flows north-northwest in this area. As such, the investigation will be advanced to the north and west to better assess the downgradient nature and extent of VOC impacts.

MIP/EC points will generally be advanced to the base of the Surficial Sand Unit (approximately 15 to 20 ft bgs) to the top of the Varved Clay Unit (approximately 20 to 25 ft bgs), and then approximately 5 feet into the upper portion of the Varved Clay Unit to confirm its presence. If MIP/EC or soil boring results indicate the potential presence of non-aqueous phase liquid (NAPL), borings will be terminated prior to penetrating through the Varved Clay Unit. Data will be evaluated daily and probe locations and depths will be modified as appropriate based on the findings.

Before positioning the direct-push equipment for subsurface activities, each location will be hand-augured to approximately 5 ft bgs as an additional precaution to reduce the potential for hitting any subsurface obstructions. The MIP/EC investigation will be conducted in general accordance with American Society for Testing and Materials (ASTM) *Standard Practice for Direct Push Technology for Volatile Contaminant Logging with the Membrane Interface Probe (MIP)–D7532-07* and the SOP provided in the QAPP.

Given the nature of the Surficial Sand Unit, it is anticipated that the boreholes will collapse upon removal of the probe. In the event the resultant boreholes remain open, the borehole will be grouted with a cement-bentonite slurry following completion in accordance with the SOP provided in the QAPP. The majority of these borings are anticipated to be advanced in the landscaped area between Buildings B001 and B023. In the event a concrete or an asphalt surface in the investigation area is disturbed, the appropriate surface cover will be restored upon completion.

Decontamination of the down-hole direct push tools will be performed between boring locations in accordance with the SOP provided the QAPP. Investigation-derived waste (IDW) will be managed in accordance with the SOP provided in the QAPP.

3.3 Soil Sampling

Using information collected during the MIP/EC investigation, IBM will identify locations for collection and analysis of soil samples. Soil samples will be targeted in zones of high MIP/EC response, transition areas between the Surficial Sand Unit and Transition Zone, and at the top of the Varved Clay Unit. It is anticipated that up to six soil boring locations will be selected for soil sampling. Preliminary locations are shown on Figure 5. Multiple, discrete-depth samples may be collected at each boring location.

Borings for the collection of soil samples will be advanced using a direct-push rig. A piston sampler or dual-tube continuous sampler will be used to collect soil cores from the zones of interest in each boring, which will then be field-screened and lithologically logged by Golder staff. Samples will be collected from the soil core using an Encore® sampler (or equivalent) and submitted to the laboratory under appropriate chain-of-custody for analysis of VOCs using EPA Method 8260B as described in the QAPP. Table 1 presents a summary of the proposed soil samples and analyses to be performed. Table 2 presents the parameters proposed for field and laboratory analysis.

3.4 Groundwater Sampling

IBM will select the location and depth of groundwater samples based on the results of the MIP/EC investigation. Targeted areas will include zones of high MIP/EC response and/or zones of hydrogeologic interest (i.e., high flow zones or zones of distinct hydraulic contrast). These samples will be used to confirm the MIP results and better quantify constituent concentrations in groundwater.

Groundwater samples will be collected as follows:

- Groundwater grab samples will be collected from specific zones in the boreholes advanced to collect soil samples (i.e., the dual-tube soil sampling boreholes) to corroborate MIP readings. These samples will be analyzed for VOCs using EPA Method 8260B and field parameter sampling will be performed prior to collecting the groundwater samples.
- Four groundwater samples will be collected and analyzed for VOCs from four existing site monitoring wells in the vicinity of SWMU S (i.e., MW-275S, MW-276S, MW-277S, and MW-601).

Groundwater samples may also be collected from temporary wells if warranted following evaluation of the preliminary results of the MIP investigation, field conditions, and after consultation with the Project Team. If temporary well points are installed, groundwater samples will be collected using low-flow purging and sampling techniques and analyzed for VOCs.

Groundwater purging and sampling will be performed in accordance with the SOPs provided in the QAPP. Table 1 presents a summary of the proposed groundwater samples and analyses to be performed. Table 2 presents the parameters proposed for field and laboratory analysis.

4.0 SCHEDULE AND REPORTING

IBM will implement the scope of work outlined in this RIWP in accessible areas within 30 days of NYSDEC approval. IBM anticipates that field activities can be completed within approximately five to seven days, including mobilization time. All work will be subject to subcontractor availability.

Within 60 days of receipt of validated analytical data, IBM will submit an RI Report to NYSDEC. The RI Report will present the results of the investigations, including a description of implemented field activities and procedures, the data results, and conclusions and recommendations for additional field investigation or Corrective Measures evaluations.

5.0 REFERENCES

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NYSDEC, 2010, “DER-10 Technical Guidance for Site Investigation and Remediation, Appendix B Guidance for the Development of Data Usability Summary Reports” 25 December, 2002

NYSDEC, 2011, “Development and Implementation of a Remedial Program for an Inactive Hazardous Waste Disposal Site Order on Consent Site #356002”, July 18, 2011

Ravella, et al, 2007, “Application of the Membrane Interface Probe (MIP) to Delineate Subsurface DNAPL Contamination”, The Environmental Engineer – Volume 1, Winter 2007.

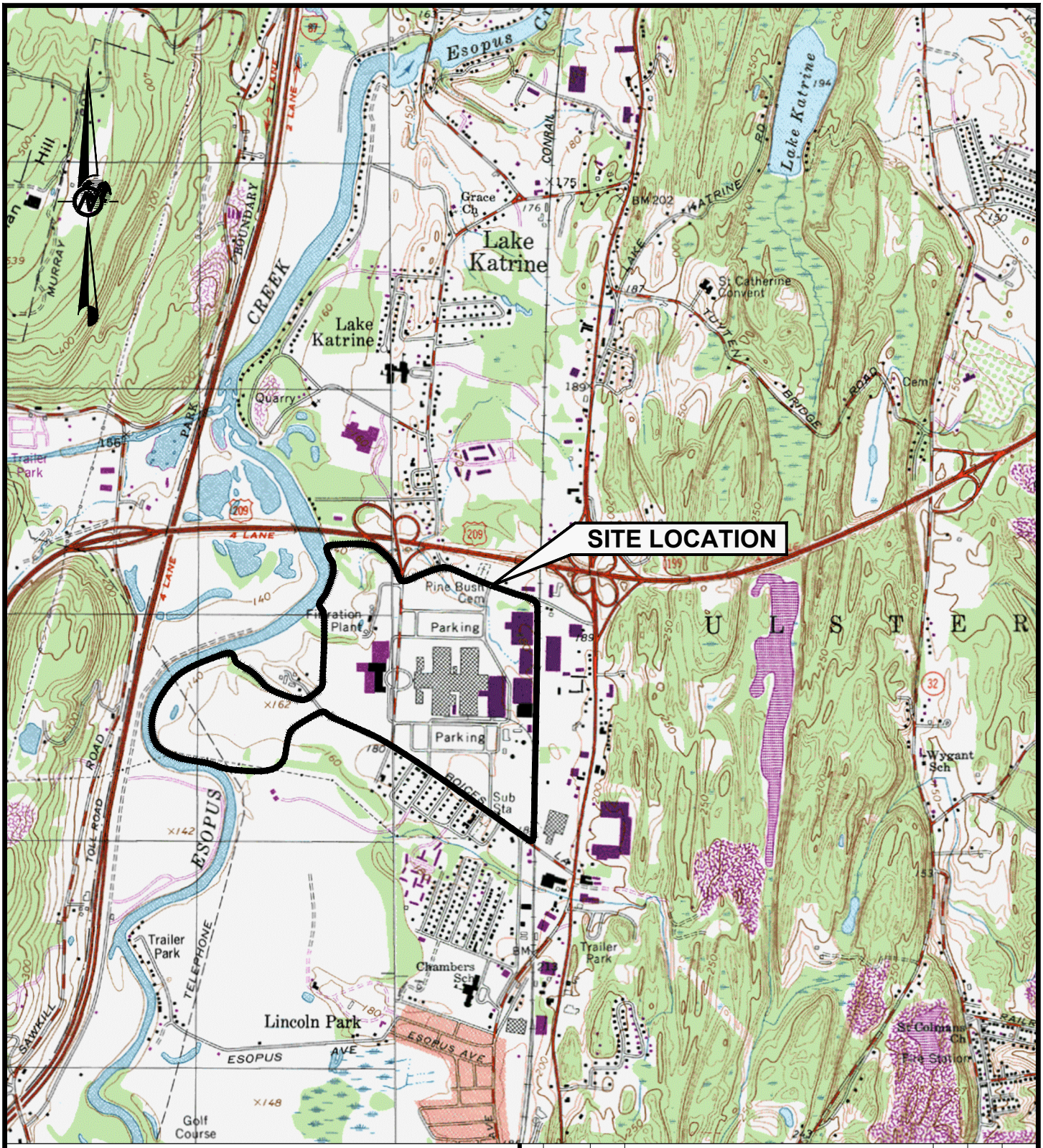
TABLE 1
SWMU S: FORMER B001 TCA WASTE TANK SAMPLING SCHEDULE
FORMER IBM KINGSTON FACILITY

Media	Estimated Number of Primary Samples [1,2]	Sample Analyses[3]	Quality Assurance/Quality Control Samples
Soil	18	VOCs (EnCore® or equivalent) & Gasoline Range TPH	1 Field Duplicate per 20 primary samples 1 MS/MSD per 20 primary samples
Groundwater (Grab and/or Temporary Wells)	9	VOCs & Gasoline Range TPH	1 Field Duplicate per 20 primary samples 1 Trip Blank per sample group shipment 1 Rinsate Blank per day
Groundwater (Existing Wells)	4	VOCs Gasoline Range TPH	1 MS/MSD per 20 primary samples

Notes:
1. The number and location of samples may be adjusted based on MIP investigation results.
2. See Figure 5 for preliminary sampling locations.
3. See Table 2 for proposed sampling parameters.

TABLE 2
SWMU S: FORMER B001 TCA WASTE TANK CONSTITUENT LIST
FORMER IBM KINGSTON FACILITY

TCL VOLATILE ORGANIC COMPOUNDS
Soil and Groundwater
1,1,1,2-Tetrachloroethane
1,1,1-Trichloroethane
1,1,2,2-Tetrachloroethane
1,1,2-Trichloro-1,2,2-Trifluoroethane
1,1,2-Trichloroethane
1,1-Dichloroethane
1,1-Dichloroethylene
1,2,3-Trichloropropane
1,2-Dichloro-1,2,2-Trifluoroethane
1,2-Dichlorobenzene
1,2-Dichloroethane
1,2-Dichloroethylene, Total
1,2-Dichloropropane
1,3-Dichlorobenzene
1,4-Dichlorobenzene
1-Chlorohexane
2-Chloroethylvinyl Ether
2-Chlorotoluene
4-Chlorotoluene
Benzene
Benzyl Chloride
Bromobenzene
Bromodichloromethane
Bromoform
Bromomethane
Carbon Tetrachloride
Chlorobenzene
Chlorodibromomethane
Chloroethane
Chloroform
Chloromethane
Cis-1,3-Dichloropropylene
Dibromomethane
Dichlorodifluoromethane
Ethylbenzene
Methylene Chloride
Tetrachloroethylene
Toluene
Trans-1,3-Dichloropropene
Trichloroethylene
Trichlorofluoromethane
Vinyl Chloride
Xylene, Total



2000 0 2000

SCALE FEET

REV	DATE	DES	REVISION DESCRIPTION	CADD	CHK	RVW

PROJECT

FORMER IBM FACILITY
KINGSTON, NEW YORK

TITLE

SITE LOCATION MAP

REFERENCE

1.) BASE MAP TAKEN FROM USGS 7.5 MINUTE SERIES QUADRANGLES OF KINGSTON EAST, NY, DATED 1963, PHOTOREVISED 1980, AND KINGSTON WEST, NY, DATED 1997.

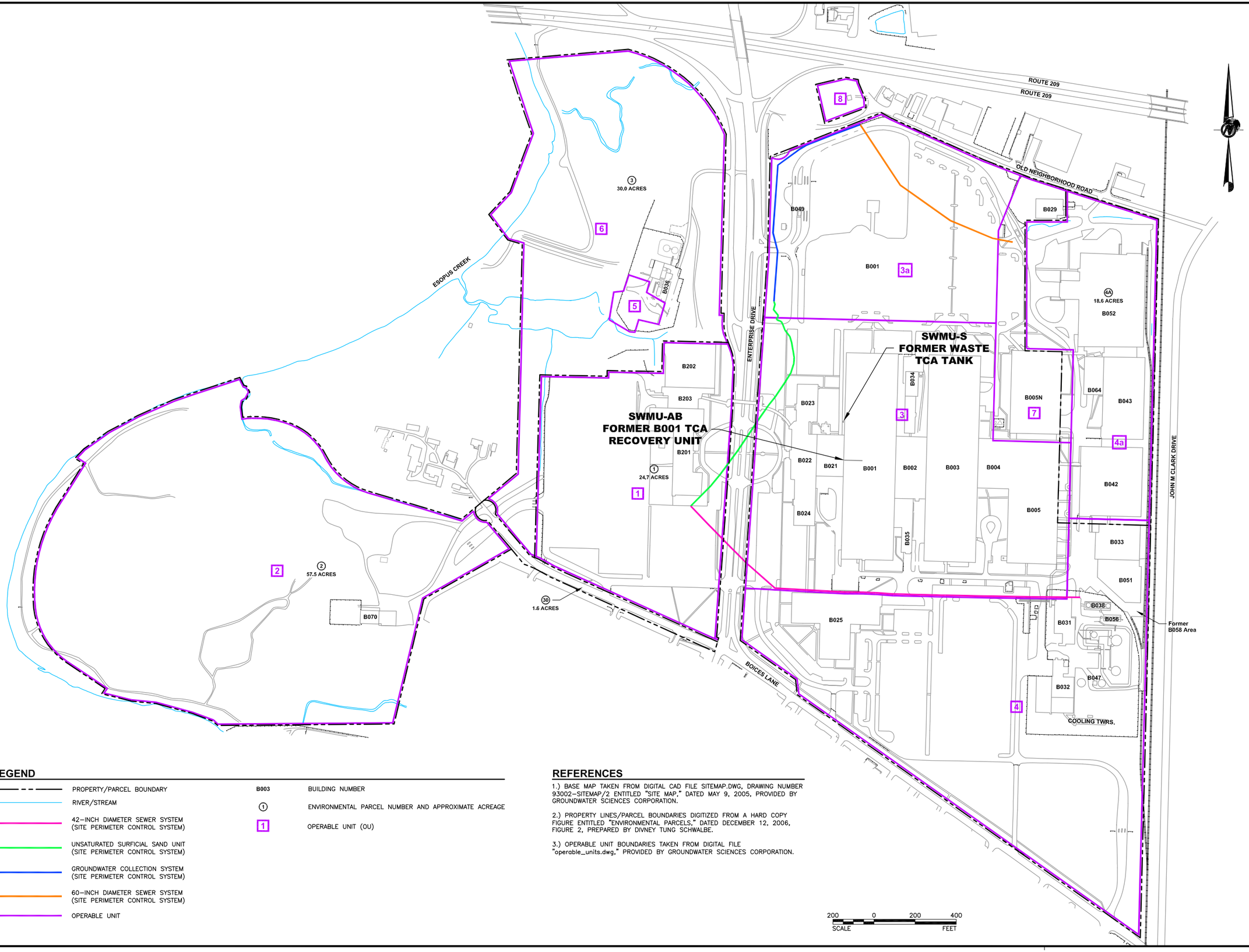
NJ Authorization #24GA28029100

Golder Associates
Newark, New Jersey

PROJECT No.		083-87071	FILE No.	08387071K001	
DESIGN	DPG	08/17/11	SCALE	AS SHOWN	REV. 0
CADD	RG	08/17/11			
CHECK	CDH	08/17/11			
REVIEW	APTM	08/17/11			

FIGURE 1

Drawing file: 08387071K001.DWG Sep 02, 2011 - 1:04pm



LEGEND

- PROPERTY/PARCEL BOUNDARY
- RIVER/STREAM
- 42–INCH DIAMETER SEWER SYSTEM (SITE PERIMETER CONTROL SYSTEM)
- UNSATURATED SURFICIAL SAND UNIT (SITE PERIMETER CONTROL SYSTEM)
- GROUNDWATER COLLECTION SYSTEM (SITE PERIMETER CONTROL SYSTEM)
- 60–INCH DIAMETER SEWER SYSTEM (SITE PERIMETER CONTROL SYSTEM)
- OPERABLE UNIT

B003 BUILDING NUMBER

(1) ENVIRONMENTAL PARCEL NUMBER AND APPROXIMATE ACREAGE

[1] OPERABLE UNIT (OU)

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.) OPERABLE UNIT BOUNDARIES TAKEN FROM DIGITAL FILE "operable_units.dwg," PROVIDED BY GROUNDWATER SCIENCES CORPORATION.

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Newark, New Jersey

REV	DATE	DES	REVISION DESCRIPTION	CADD	CHK	RVW

PROJECT
FORMER IBM FACILITY
KINGSTON, NEW YORK

TITLE
OPERABLE UNITS AND INVESTIGATION AREA (SWMU S)

PROJECT No.	083–87071	
FILE No.	08387071K002	
REV. 0	SCALE	AS SHOWN
DESIGN	DPG	08/17/11
CADD	RG	08/17/11
CHECK	CDH	08/17/11
REVIEW	APTM	08/17/11

FIGURE 2

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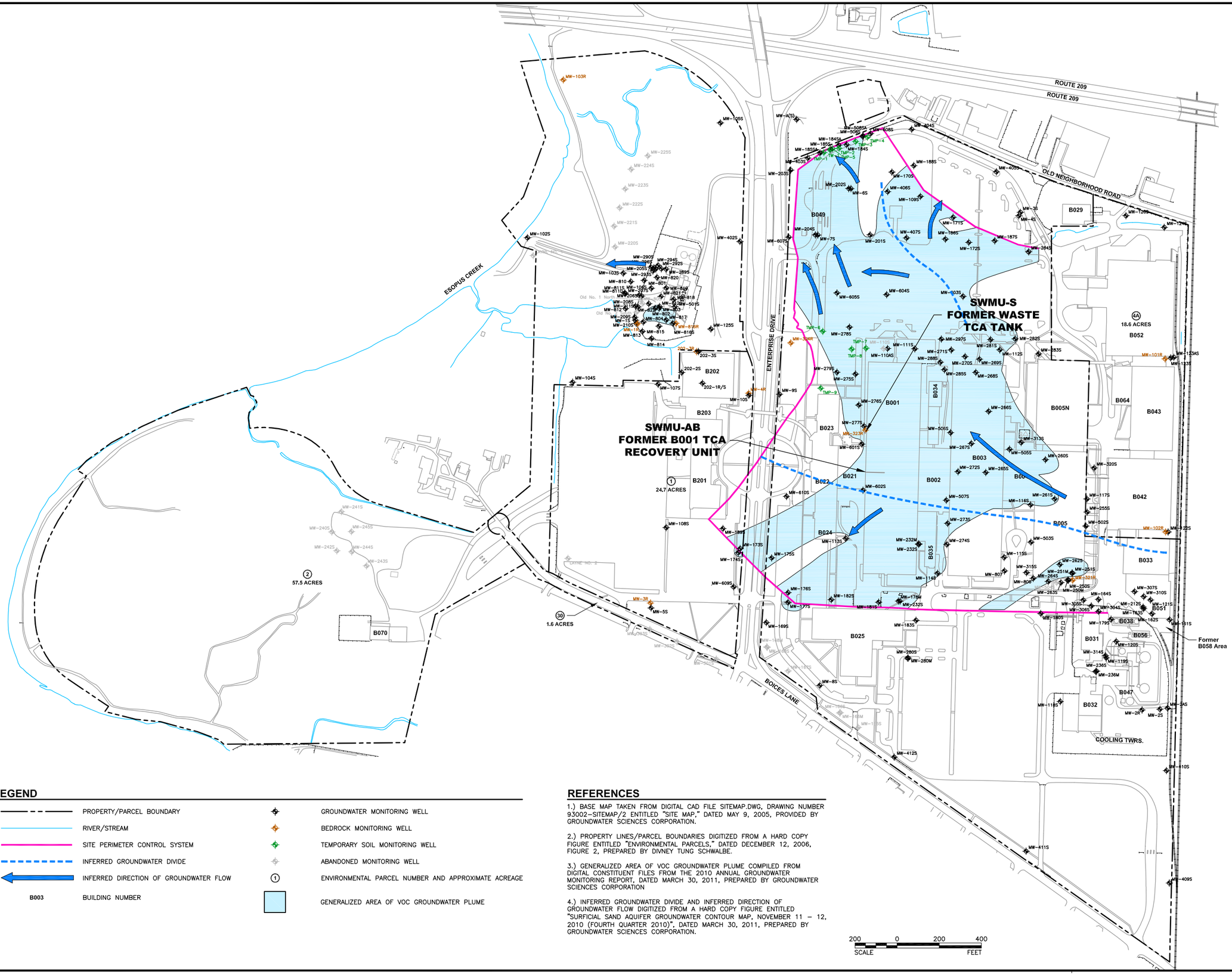

LEGEND

- 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.

NJ Authorization #24GA28029100

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Newark, New Jersey

REV	DATE	DES	REVISION DESCRIPTION	CADD	CHK	RVW

PROJECT

FORMER IBM FACILITY
KINGSTON, NEW YORK

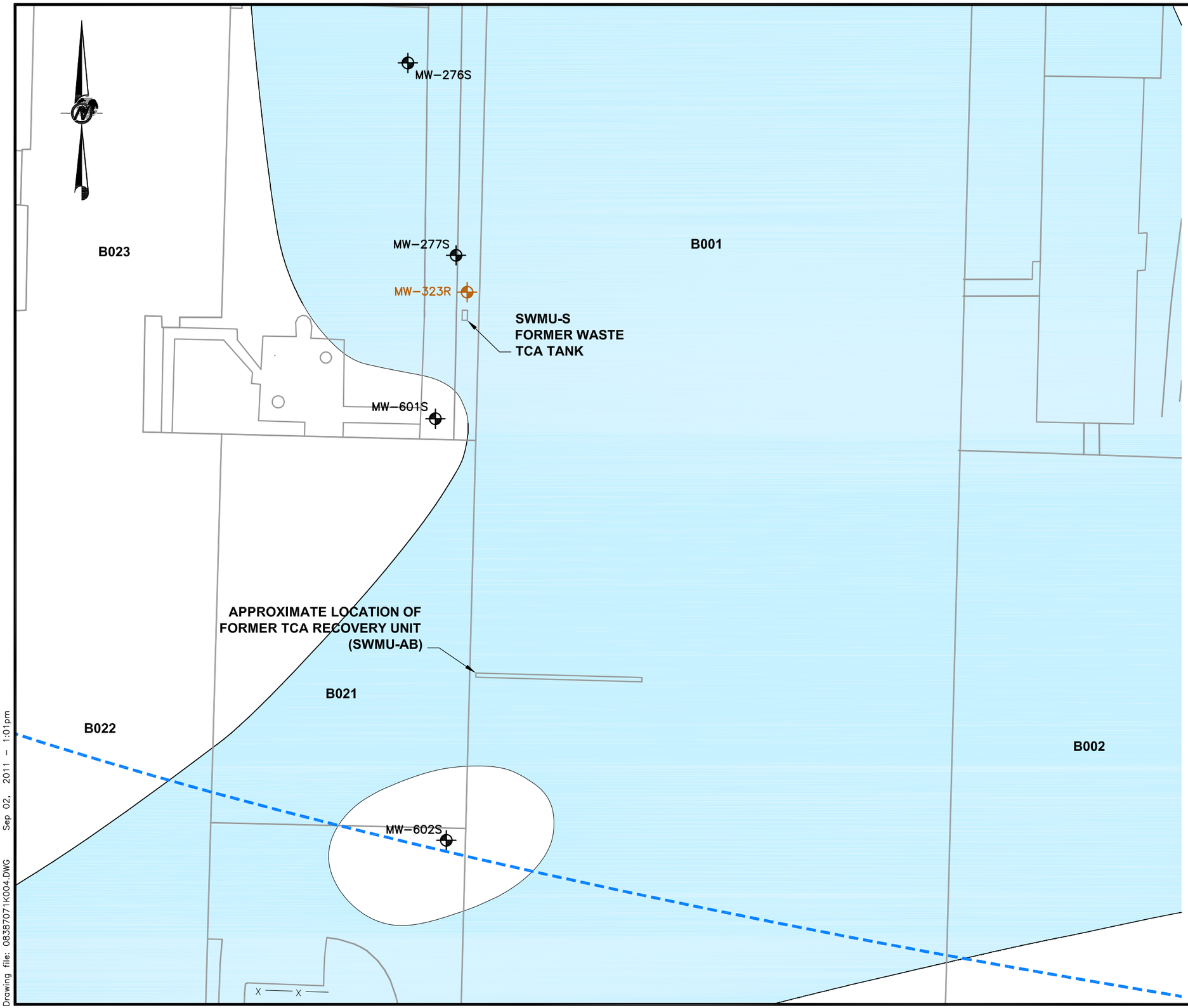
TITLE

MONITORING WELL NETWORK AND GENERALIZED VOC PLUME AREA MAP (SWMU S)

PROJECT No.		083-87071
FILE No.		08387071K003
REV. 0	SCALE	AS SHOWN
DESIGN	DPG	08/17/11
CADD	RG	08/17/11
CHECK	CDH	08/17/11
REVIEW	APTM	08/17/11

FIGURE 3

Drawing File: 08387071K003.DWG | Layout: 11x17_08-2006 | Modified: 08/17/11 10:37am | Plotted: 09/02/11 1:04pm | Plotted by: AMacales



LEGEND

- PROPERTY/PARCEL BOUNDARY
- B003 — BUILDING NUMBER
- INFERRED GROUNDWATER DIVIDE
- GROUNDWATER MONITORING WELL
- BEDROCK MONITORING WELL
- GENERALIZED 1,1,1-TCA 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.) 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.

3.) GENERALIZED AREA OF 1,1,1-TCA IN THE PLUME AREA TAKEN FROM DIGITAL FILE "111TCA_2010-12.dwg," PROVIDED BY GROUNDWATER SCIENCES CORPORATION.

50 0 50
SCALE FEET

REV	DATE	DES	REVISION DESCRIPTION	CADD	CHK	RVW

PROJECT

FORMER IBM FACILITY
KINGSTON, NEW YORK

TITLE

GENERALIZED 1,1,1-TCA GROUNDWATER PLUME IN THE SWMU S AREA

NJ Authorization #24GA28029100
Golder Associates
Newark, New Jersey

PROJECT No.	083-87071		FILE No.	08387071K004	
DESIGN	DPG	08/17/11	SCALE	AS SHOWN	REV. 0
CADD	RG	08/17/11			
CHECK	CDH	08/17/11			
REVIEW	APTM	08/17/11			

FIGURE 4

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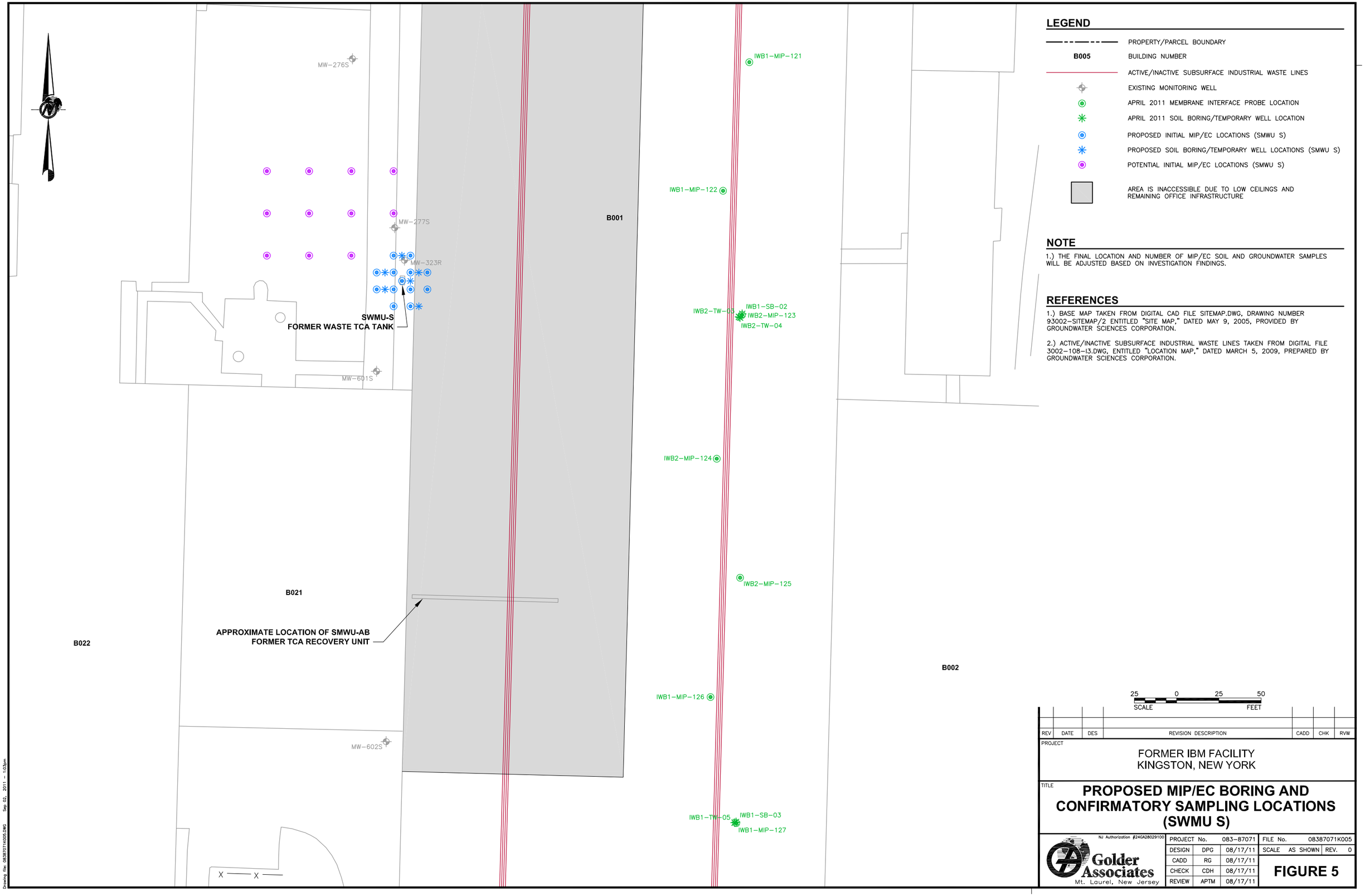

LEGEND

- PROPERTY/PARCEL BOUNDARY
- B005 — BUILDING NUMBER
- ACTIVE/INACTIVE SUBSURFACE INDUSTRIAL WASTE LINES
- EXISTING MONITORING WELL
- APRIL 2011 MEMBRANE INTERFACE PROBE LOCATION
- APRIL 2011 SOIL BORING/TEMPORARY WELL LOCATION
- PROPOSED INITIAL MIP/EC LOCATIONS (SMWU S)
- PROPOSED SOIL BORING/TEMPORARY WELL LOCATIONS (SMWU S)
- POTENTIAL INITIAL MIP/EC LOCATIONS (SMWU S)
- AREA IS INACCESSIBLE DUE TO LOW CEILINGS AND REMAINING OFFICE INFRASTRUCTURE

NOTE

1.) THE FINAL LOCATION AND NUMBER OF MIP/EC SOIL AND GROUNDWATER SAMPLES WILL BE ADJUSTED BASED ON INVESTIGATION FINDINGS.

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.) ACTIVE/INACTIVE SUBSURFACE INDUSTRIAL WASTE LINES TAKEN FROM DIGITAL FILE 3002-108-I3.DWG, ENTITLED "LOCATION MAP," DATED MARCH 5, 2009, PREPARED BY GROUNDWATER SCIENCES CORPORATION.

25 0 25 50
SCALE FEET

REV	DATE	DES	REVISION DESCRIPTION	CADD	CHK	RVW

PROJECT

FORMER IBM FACILITY
KINGSTON, NEW YORK

TITLE

PROPOSED MIP/EC BORING AND CONFIRMATORY SAMPLING LOCATIONS (SWMU S)

NJ Authorization #24GA28029100

Golder Associates
Mt. Laurel, New Jersey

PROJECT No.	083-87071		FILE No.	08387071K005	
DESIGN	DPG	08/17/11	SCALE	AS SHOWN	REV. 0
CADD	RG	08/17/11			
CHECK	CDH	08/17/11			
REVIEW	APTM	08/17/11			

FIGURE 5

Drawing file: 08387071K005.DWG Sep 02, 2011 - 1:43pm