From: Gary Casper
To: kominek@us.ibm.com
CC: amacdonald@golder.com; dwieneke@techcityny.com; ed.hinchey@erm.com; k...
Date: 4/28/2009 1:34 PM
Subject: Remaining SWMU Investigation Work Plans - Approvals

Hi Mike,

The Department has reviewed, and is approving via this email, the following Draft RFI Work Plans for IBM's proposed investigations at the TechCity/Former IBM Kingston Site:

RCRA Facility Investigation Work Plan Solid Waste Management Unit V: Portions of the B005 Plume

RCRA Facility Investigation Work Plan Solid Waste Management Unit G: Former Waste PCE Tank

RCRA Facility Investigation Work Plan Solid Waste Management Unit AB: Former B001 TCA Recovery Unit, and

RCRA Facility Investigation Work Plan Solid Waste Management Unit M: Portions of the Industrial Waste Sewer Lines

The **Triangle Plume Area Work Plan** (as amended) was previously approved.

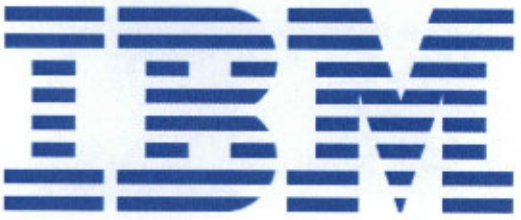
The proposed work in these additional areas may proceed as site access and conditions allow. Please keep the Department informed of schedule. I or other agency staff would like to have an opportunity to oversee some portions of these investigations.

If you have any questions at all, or if there are any changes necessary to these Work Plans, please contact me.

Regards,

Gary

Gary Casper
Engineering Geologist / Project Manager



RCRA FACILITY INVESTIGATION WORK PLAN
SOLID WASTE MANAGEMENT UNIT M:
PORTIONS OF THE INDUSTRIAL WASTE SEWER LINES
FORMER IBM KINGSTON FACILITY

Prepared for:

New York State Department of Environmental Conservation
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3 Copies	Golder Associates Inc.

March 2009

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1.0 INTRODUCTION

Golder Associates Inc. (Golder) has prepared this RCRA Facility Investigation Work Plan (RFIWP) on behalf of International Business Machines Corporation (IBM) for Solid Waste Management Unit M: Portions of the Industrial Waste Sewer Lines (SWMU-M) at the former IBM Kingston Facility (Facility) located at 300 Enterprise Drive, Kingston, Ulster County, New York (see Figure 1).

This RFIWP describes the objectives and methods proposed to further assess soil and groundwater quality conditions in the vicinity of SWMU-M. 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.

1.1 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 at the Facility during mid-1990s. In 1998 IBM sold the Facility to AG Properties of Kingston, LLC and Ulster Business Complex, LLC, who renamed the site TechCity (Site) and subdivided the property into multiple parcels. The Site is currently owned and 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 associated with the Facility, many of which are vacant. The portion located west of Enterprise Drive was previously referred to as the West Campus and includes the Bank of America building (former IBM Facility Buildings B201, B202 and B203); a large parking area south and west of the Bank of America facility (Parcel 1); and generally undeveloped land further to the southwest (Parcel 2) and north (Parcel 3) of the Bank of America facility.

The Site is listed as a New York State Inactive Hazardous Waste Disposal Site (6 NYCRR Part 375) and Resource Conservation and Recovery Act (RCRA) Hazardous Waste Site. The Site is currently managed in compliance with the October 4, 1996 Hazardous Waste Management Permit #3-5154-00067/00090 (6 NYCRR Part 373) referenced herein as the RCRA Permit. The RCRA Permit requires post-closure care and monitoring of the closed Industrial Waste Sludge Lagoon (IWSL) and implementation of Corrective Measures for groundwater exhibiting concentrations of volatile organic compounds (VOCs) above New York State Groundwater Quality (6 NYCRR Part 703) Standards (NYSGWQS). IBM completed extensive RCRA Facility Investigations (RFIs) during the 1990s to delineate the occurrence and extent of VOCs in groundwater beneath the Site.

Corrective Measures implemented by IBM include operation and maintenance of a perimeter control system that intercepts the groundwater plume. The perimeter control system consists of a storm sewer system, an unsaturated portion of the surficial sand unit that underlies the Site, and a groundwater collection system (GWCS). IBM currently performs groundwater quality monitoring to evaluate the effectiveness of the perimeter control system. Annual monitoring reports are submitted to the New York State Department of Environmental Conservation (NYSDEC).

1.2 Purpose

Certain SWMUs were previously determined to be inaccessible as referenced in the RCRA Permit. As part of its Site redevelopment plans TechCity plans to decommission (i.e., gut) and/or demolish select buildings at the Site. These activities will make formerly inaccessible SWMUs accessible for further investigation. Therefore, this RFIWP has been prepared pursuant to Module III Condition E.5(c) of the RCRA permit, which describes the Corrective Action Requirements for the "Inaccessible" SWMUs, and Appendix III-B, "Guidance for a RCRA Facility Investigation," of the RCRA permit.

Specifically, SWMU-M will become accessible for further investigation following decommissioning of Buildings B001 and B003. In accordance with the RCRA Permit, IBM will undertake a supplemental assessment to better define the nature and extent of soil and groundwater impacts in the vicinity of SWMU-M and to evaluate whether additional Corrective Measures can be effectively implemented to reduce or prevent further migration of VOC-impacted groundwater.

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

- Identify whether discrete source areas exist in the area of SWMU-M;
- Better define the nature and extent of VOC-impacted groundwater in and downgradient of SWMU-M; and
- Obtain preliminary water quality, geologic and hydrogeologic information to support an evaluation of potential additional Corrective Measures, if appropriate.

Section 2.0 of this RFIWP 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-M. 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 required by the RCRA Permit, the following RFI Management Plans have been prepared and will be followed during the performance of this RFIWP:

- **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 process by which 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 health and safety procedures that will be followed during implementation of the RFIWP ; and
- **Community Relations Plan** - includes a description of how information collected during the performance of the RFIWP will be disseminated to involved stakeholders.

These RFI Management Plans are provided in a separate document, which accompanies this RFIWP. Applicable portions of these RFI Management Plans are referenced as necessary in the RFIWP.

2.0 CONCEPTUAL SITE MODEL

This section presents the current understanding of the Conceptual Site Model (CSM) for both the entire Site and SWMU-M. The following description of geology and hydrogeology and the nature and extent of the VOC groundwater plume is based largely upon the findings of work completed by Groundwater Sciences Corporation (GSC), on behalf of IBM, including:

- IBM Kingston Phase I Environmental Site Assessment, June 5, 1995;
- IBM Kingston RCRA Facility Investigations Soil Gas Surveys and Sewer Systems Sampling, April 12, 1996;
- RCRA Facility Assessments, Newly Identified Solid Waste Management Units, March 14, 1997;
- RCRA Facility Investigation Groundwater Plumes and Sources, March 14, 1997; and
- 2007 Annual Groundwater Monitoring Report, March 28, 2008.

A complete listing of the documents reviewed in the preparation of this RFIWP is provided in Section 5.

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 (i.e., ridge) 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 indicates 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 that is interpreted to be of lacustrine origin, with a thickness of zero (0) feet in one (1) area of the bedrock ridge where it is absent, to over 180 feet in the central portion of East Campus as determined by Site borings.

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). This surficial sand unit is pervasive across the Site and ranges in thickness from approximately six (6) feet in the area of the bedrock ridge to greater than 30 feet in the central portion of the East Campus. Notably, this surficial sand unit is unsaturated in the vicinity of the bedrock ridge. A transition zone between the varved silt and clay and surficial sand unit is present in certain areas throughout the Site, primarily where the sand unit is thickest, and consists of finer-grained silty sand deposits.

2.2 Generalized Hydrogeology

The varved silt and clay unit serves as an aquitard throughout most the Site, except in the vicinity of the bedrock high where it is not present. 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] (GSC, 1995). 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] (GSC, 1995). 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 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 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 0.2 ft/day to 0.8 ft/day.

Groundwater flow is significantly influenced by the presence of the perimeter control system (see Figure 2), which is composed of:

- A 42-inch diameter storm 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 storm 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 is comprised of a set of groundwater cut-off trenches. Water collected in the trenches is treated via air stripping; and
- A 60-inch diameter storm sewer pipe that intersects the GWCS and extends along the western portion of the North Parking Lot Area.

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 quality data at the Site since the late 1970s. The Facility 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-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] and 1,2-dichloroethene [1,2-DCE]). 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 (4) groundwater plumes have been identified at the Site, including:

- The North Parking Lot Area (NPLA) Plume (located to the north of Buildings 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 Buildings B001, B002, B003, B004 and B005S. Based on previous investigatory work, 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. 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, originated from a release from a PCE tank located in the southeastern corner of Building B005; and

- The Industrial Waste Treatment Facility (IWTF) Plume, located in the vicinity of the former IWTF, near Building B036.

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

2.4 SWMU-M

A network of subsurface industrial waste (IW) sewer lines has existed at the Site since the 1950s. The IW sewer network was originally composed of four (4) primary IW sewer line systems including: a waste oil line that carried wastes to the Former Waste Oil Tank (SWMU-T); a general rinse line; and two plating rinse lines (i.e., chrome and cyanide), each of which carried waste to the Industrial Waste Treatment Facility (IWTF). These former industrial waste sewer lines compose SWMU-M.

The IW sewer lines were initially constructed of 6-inch to 10-inch diameter vitreous clay piping placed adjacent and parallel to each other on native materials in subsurface trenches. Initial IW sewer line investigations conducted in 1979 indicated that portions of the piping were broken and disjointed, and some areas exhibited evidence of sand and groundwater infiltration, particularly in areas north of Building B003. As a result of this investigation, the plating lines were slip-lined circa 1980 and the main carrier lines and plating lines were replaced with pipe-in-pipe systems during the early 1980s. The majority of the IW sewer lines were inactive during the 1980s and use of the IW sewer line system ceased completely in 1994 with the closing of the IWTF.

IBM conducted extensive IW sewer line investigations during the mid-1990s (GSC, 1996). The investigations were composed primarily of soil gas surveys and groundwater monitoring well installation and sampling. IBM selected the initial sampling locations based on known process areas that utilized organic solvents, including: a process area in Building B005S that utilized TCA, TCE, and PCE; a painting area in Building B004; and a TCA process area in Building B001. However, the initial results of the soil gas survey revealed relatively high soil gas

concentrations in the vicinity of the IW sewer lines beneath Building B003 and the soil gas investigation was expanded to include these lines.

IBM found the highest soil gas concentrations near the IW sewer lines beneath Building B003, particularly the easternmost primary piping line downgradient of the Building B004 and B005 process areas. These results suggested that the IW sewer lines beneath Building B003 were a primary source of the VOCs that compose the NPLA Plume and B005 Plume areas, rather than the initially investigated process areas.

The localized hydrogeology in the vicinity of Building B003 consists of the surficial sand unit, (which reportedly includes near-surface alluvial sand deposits in this area); the silty sand transition area at the base of the surficial sand unit; and the varved silt and clay unit. The thickness of the surficial sand unit in this area extends up to 25 feet below ground surface (ft bgs). The silty sand transition zone is pervasive in this area and ranges in thickness from five (5) to greater than eight (8) feet beneath the central portion of Building B003. The top of the varved silt and clay unit was not encountered in all borings advanced in this area (i.e, MW-267S and MW-272S) and is therefore estimated to occur at a depth greater than 29 ft bgs in the central portion of Building B003. A geologic cross section previously prepared by IBM is presented in Appendix A, which depicts general subsurface conditions in the area of SWMU-M.

The water table in this area has been encountered at a depth of approximately seven (7) ft bgs. The groundwater divide bifurcates Building B003 and therefore groundwater flows toward both the north-northwest and south-southwest depending on the position relative to the groundwater divide. The interpreted extent of the PCE, TCE, and TCA plumes in the vicinity of SWMU-M is shown on Figures 4, 5, and 6, respectively. These plumes are contained by the perimeter control system.

3.0 INVESTIGATION SCOPE OF WORK

As described above, the main objectives of this RFI are to:

- Identify whether discrete source areas exist in the area of SWMU-M;
- Better define the nature and extent of VOC-impacted groundwater in and downgradient of SWMU-M; and
- 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 adjustments and ultimate selection of the number, location, and depth of laboratory-analyzed soil and groundwater samples. This approach will allow for the time 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. IBM understands that, ultimately, all investigative work is subject to review, comments and approval by NYSDEC.

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; and
- Temporary well installation and groundwater sampling.

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

3.1 Refinement of Site Conceptual Model

To more fully-develop the existing CSM and to allow for refinement of the model as new field data are collected, IBM will develop 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 will be input into EVS/MVS® to model the two near-surface hydrostratigraphic units (i.e., the surficial sand and the top of the varved silt and clay units) at the Site and in the vicinity of SWMU-M. Existing soil and groundwater chemistry data will also be input into the model to enhance the three-dimensional definition of the Site contamination sources and dissolved constituent plumes.

Data collected during this RFI 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 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 and will assist in the understanding of contaminant fate and transport in the vicinity of SWMU-M.

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-AB. 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 an electron capture detector (ECD).

The PID is best for aromatic hydrocarbons such as benzene, toluene, ethylbenzene, and xylene (BTEX compounds). The ECD is best for 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 along and between the IW sewer lines. The MIP/EC investigation will be initiated in the area around existing monitoring well MW-265S and along the eastern-most industrial waste sewer line beneath Building B003 where higher soil gas VOC concentrations have been detected. The MIP/EC investigation will be advanced along the IW sewer lines and to the west in the general direction of groundwater flow, as necessary based on the results of the investigation. MIP/EC probes will also be advanced in the southern portion of Building B001in areas that were not investigated during the soil gas survey. The MIP/EC investigation will be advanced along the IW sewer lines and to the west in the general direction of groundwater flow, as necessary based on the results of the investigation (see Figure 7).

MIP/EC points will generally be advanced to the base of the surficial sand aquifer (approximately 25 ft bgs), through the silty sand transition zone, to the top of the varved silt and clay unit. Borings will be advanced approximately one (1) to two (2) feet into the upper portion of the varved clay unit to further evaluate the transition zone between the two units. 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 pre-cleared to approximately five (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 through a concrete building slab. These areas will be patched with concrete upon completion.

Decontamination of the down-hole direct push tools will be performed between boring locations in accordance with the SOP provided in the QAPP. Investigation-derived waste (IDW) is not typically generated during the MIP/EC investigation activities. However, in the event IDW is generated, it 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 silty sand transition zone, and at the top of the varved silt and clay unit. It is anticipated that up to eight (8) soil boring locations will be selected for soil sampling. However, the total number of borings and the boring locations will be adjusted based on the findings of the MIP/EC investigation. Multiple, discrete-depth samples may be collected at each 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. A subset of the soil samples will be analyzed for parameters such as natural oxygen demand, total organic carbon (TOC), grain size, and permeability for use in evaluating potential corrective measure technologies as warranted. 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 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.

Three (3) types of groundwater samples will be collected as follows:

- Up to eight (8) groundwater grab samples will be collected using GeoProbe® techniques (i.e., SP-15-Sampler or DT-21-Profiler) to confirm MIP readings from specific zones in the boreholes advanced to collect the soil samples described in Section 3.3. These samples will be analyzed for VOCs using EPA Method 8260B. No purging or field parameter sampling will be performed prior to collecting these groundwater samples.

- Up to five (5) groundwater samples will be collected from temporary well casings installed at select locations using a GeoProbe® drill rig. All samples will be analyzed for VOCs using EPA Method 8260B. Samples collected from two (2) locations will also be analyzed for biogeochemical parameters (excluding metals).

- Eight (8) groundwater samples will be collected and analyzed for VOCs and biogeochemical parameters from existing Site monitoring wells in the vicinity of SWMU-M (i.e., MW-265S, MW-266S, MW-267S, MW-268S, MW-269S, MW-271S, MW-272S, and MW-273S).

Groundwater purging (i.e., using low-flow procedures) 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. The biogeochemical parameters will be used in the subsequent evaluation of potential corrective measures technologies as warranted.

4.0 SCHEDULE AND REPORTING

IBM will implement the scope of work outlined in this RFIWP within 30 days of either NYSDEC's approval of this RFIWP or TechCity's gutting of Buildings B001 and B003, allowing unencumbered access, whichever occurs later. IBM anticipates that field activities can be completed within approximately six (6) to seven (7) weeks, including mobilization time. All work will be subject to subcontractor availability.

Within 60 days of receipt of validated analytical data, IBM will submit an RFI Report to NYSDEC. The RFI 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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TABLES

TABLE 1
SWMU-M: PORTIONS OF THE INDUSTRIAL WASTE SEWER LINES SAMPLING SCHEDULE
FORMER IBM KINGSTON FACILITY

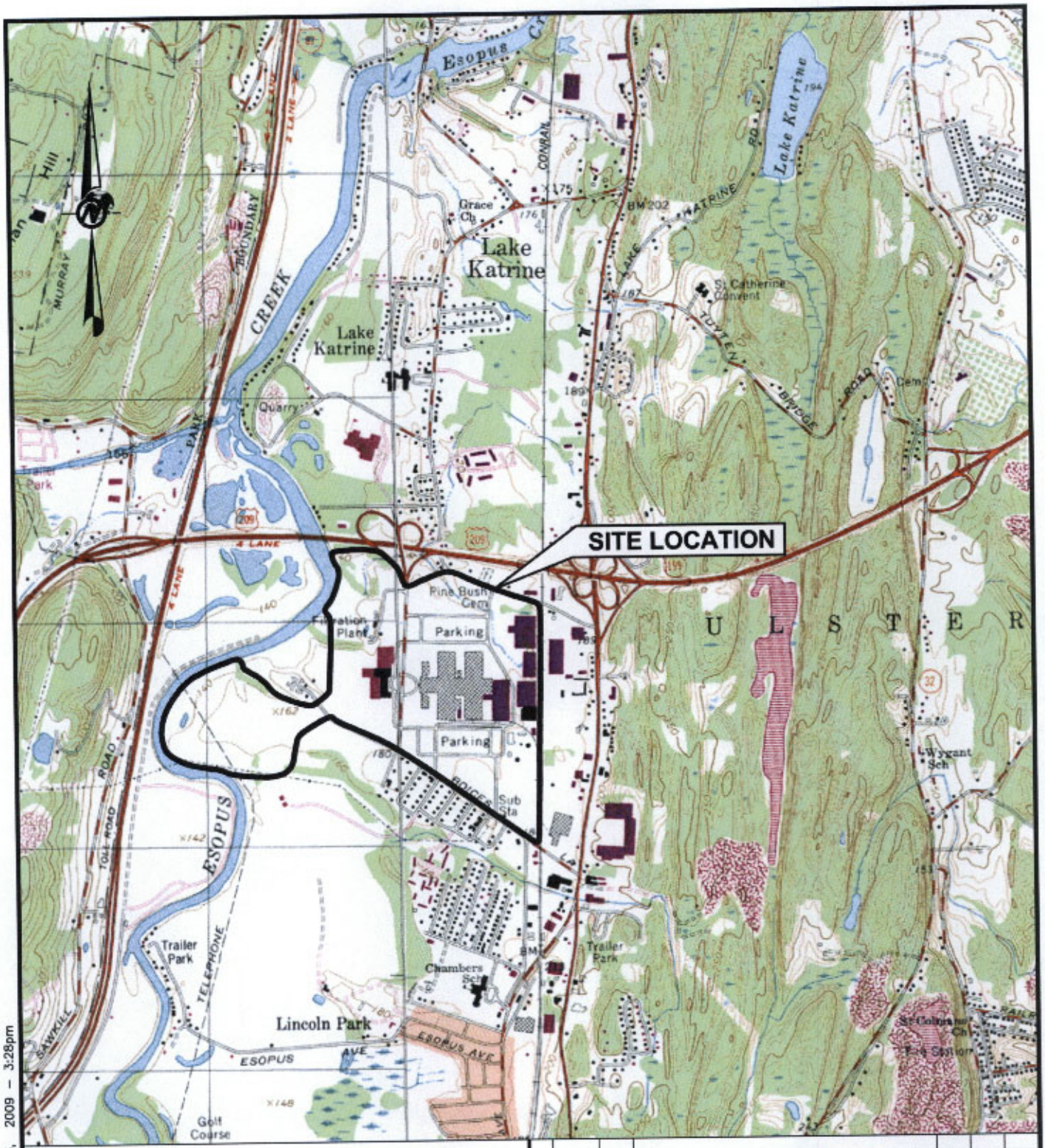
Media	Estimated Number of Primary Samples [1,2]	Sample Analyses[3]	Quality Assurance/Quality Control Samples
Soil	24	VOCs (EnCore® or equivalent)	1 Field Duplicate per 20 primary samples 1 MS/MSD per 20 primary samples
	2	Biogeochemical Parameters	
Groundwater (Grab and Temporary Wells)	13	VOCs	1 Field Duplicate per 20 primary samples 1 Trip Blank per sample group shipment 1 Rinsate Blank per day 1 MS/MSD per 20 primary samples[4]
	2	Biogeochemical Parameters (not including metals)	
Groundwater (Existing Wells)	8	VOCs	
	2	Biogeochemical Parameters	

Notes:
1. The number and location of samples may be added or deleted based on MIP/EC investigation results.
2. See Figure 7 for preliminary sampling locations.
3. See Table 2 for proposed sampling parameters.
4. MS/MSD samples will be collected for all samples, excluding groundwater grab samples.

TABLE 2
SWMU-M: PORTIONS OF THE INDUSTRIAL WASTE SEWER LINES CONSTITUENT LIST
FORMER IBM KINGSTON FACILITY

TCL Volatile Organic Compounds	Biogeochemical Parameters
Soil and Groundwater	**Groundwater**
1,1,1,2-Tetrachloroethane	Alkalinity as $CaCO_3$
1,1,1-Trichloroethane	Ammonia Nitrate
1,1,2,2-Tetrachloroethane	Biochemical Oxygen Demand (BOD)
1,1,2-Trichloro-1,2,2-Trifluoroethane	Chemical Oxygen Demand (COD)
1,1,2-Trichloroethane	Methane
1,1-Dichloroethane	Nitrate/Nitrite as N
1,1-Dichloroethylene	Phosphorous
1,2,3-Trichloropropane	Sulfate
1,2-Dichloro-1,2,2-Trifluoroethane	Sulfide
1,2-Dichlorobenzene	Total Dissolved Soilds (TDS)
1,2-Dichloroethane	Total Suspended Solids (TSS)
1,2-Dichloroethylene, Total	Total Organic Carbon (TOC)
1,2-Dichloropropane	**Metals**
1,3-Dichlorobenzene	Antimony
1,4-Dichlorobenzene	Arsenic
1-Chlorohexane	Barium
2-Chloroethylvinyl Ether	Cadmium
2-Chlorotoluene	Chromium
4-Chlorotoluene	Copper
Benzene	Iron
Benzyl Chloride	Lead
Bromobenzene	Manganese
Bromodichloromethane	Selenium
Bromoform	**Major Cations**
Bromomethane	Calcium
Carbon Tetrachloride	Magnesium
Chlorobenzene	Potassium
Chlorodibromomethane	Sodium
Chloroethane	**Major Anions**
Chloroform	Fluoride
Chloromethane	Chloride
Cis-1,3-Dichloropropylene	**Field Parameters**
Dibromomethane	Dissolved Oxygen (DO)
Dichlorodifluoromethane	Oxidation-Reduction Potential (ORP)
Ethylbenzene	pH
Methylene Chloride	Specific Conductance
Tetrachloroethylene	Temperature
Toluene	Water Level
Trans-1,3-Dichloropropene	**Soil**
Trichloroethylene	Natural Oxidant Demand
Trichlorofluoromethane	Grain Size Analysis
Vinyl Chloride	Total Organic Carbon (TOC)

FIGURES



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

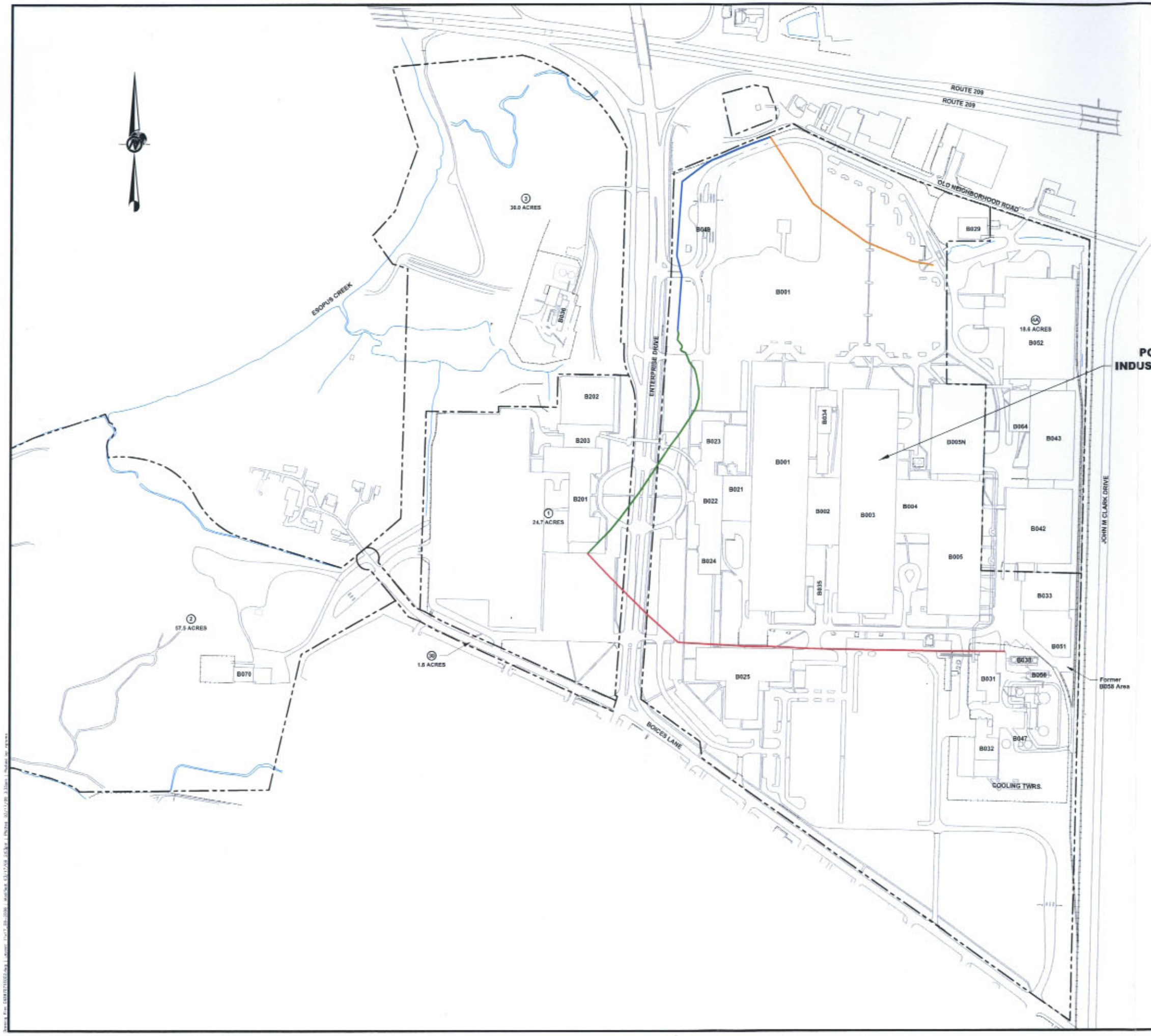
1.) BASE MAP TAKEN FROM USGS 7.5 MINUTE SERIES QUADRANGLES OF KINGSTON EAST, NY, DATED 1963, PHOTOREVISED 1980, AND KINGSTON WEST, NY, DATED 1997.

NJ Authorization #24GA28029100

Golder Associates
Newark, New Jersey

PROJECT No.		083-87071	FILE No. 08387071A005
DESIGN	CEJ	03/09/09	SCALE AS SHOWN REV. 0
CADD	RG	03/09/09	
CHECK			FIGURE 1
REVIEW			

Drawing file: 08387071A005.DWG Mar 13, 2009 - 3:28pm



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)
- B003 — BUILDING NUMBER
- (1) — ENVIRONMENTAL PARCEL NUMBER AND APPROXIMATE ACREAGE

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.

SWMU-M
PORTIONS OF THE
INDUSTRIAL SEWER LINES

200 0 200 400
SCALE FEET

REV	DATE	DES.	REVISION DESCRIPTION	CADD	CHK	RVW

PROJECT

FORMER IBM FACILITY
KINGSTON, NEW YORK

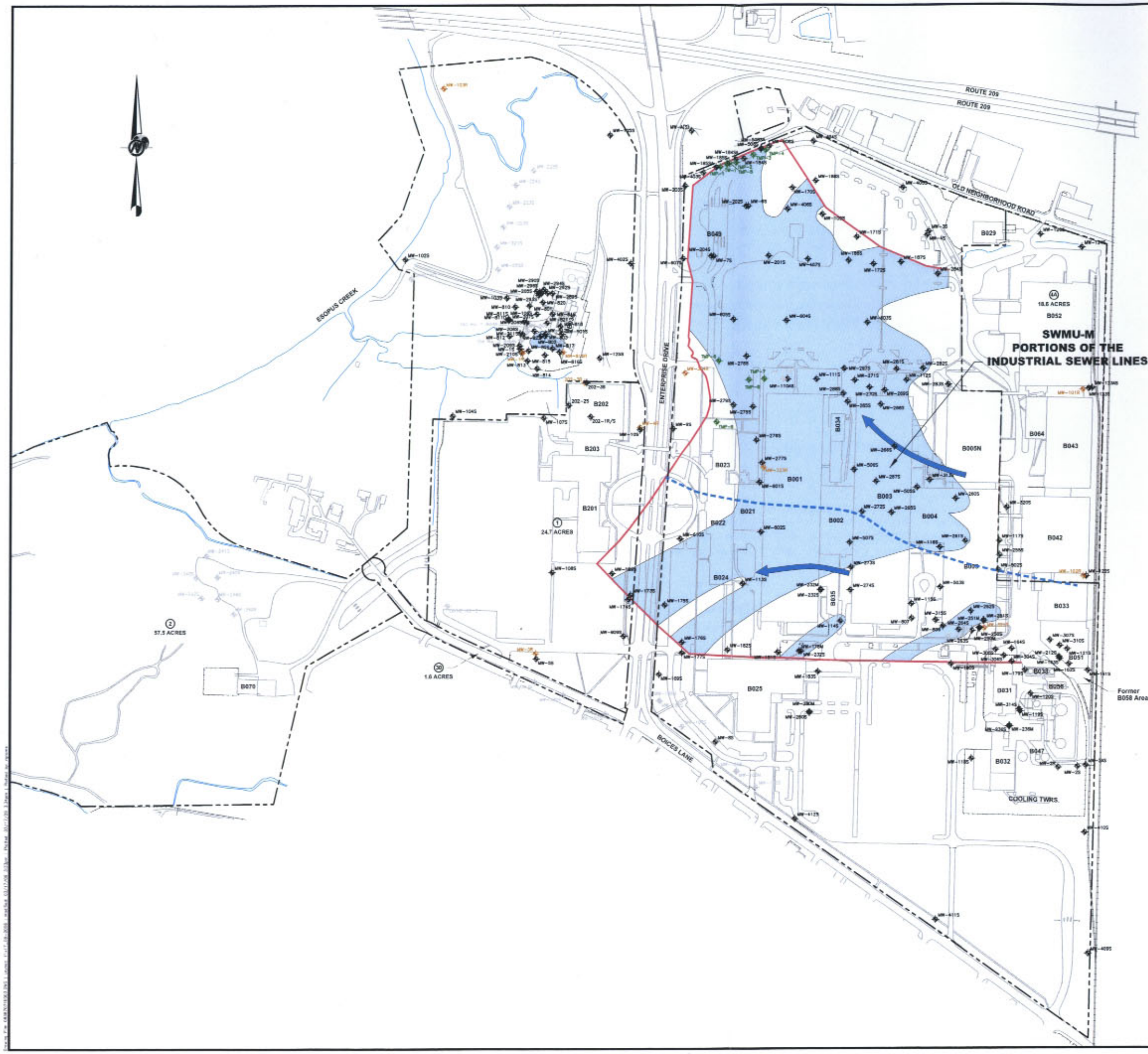
TITLE

SITE LAYOUT AND INVESTIGATION AREA MAP (SWMU-M)

Golder Associates
Newark, New Jersey

PROJECT No.	063-87071		FILE No.	0638707 1E002
DESIGN	CDH	03/12/09	SCALE	AS SHOWN REV. 0
CADD	RG	03/12/09		
CHECK				
REVIEW				

FIGURE 2



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 DIGITIZED FROM 2007 ANNUAL GROUNDWATER MONITORING REPORT, DATED MARCH 28, 2008, 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 ELEVATION CONTOUR MAP, DECEMBER 6, 2007 (FOURTH QUARTER 2007), DATED MARCH 24, 2008, PREPARED BY GROUNDWATER SCIENCES CORPORATION.

200 0 200 400
SCALE FEET

REV	DATE	DES	REVISION DESCRIPTION	CADD	CHK	RVW

PROJECT

FORMER IBM FACILITY
KINGSTON, NEW YORK

TITLE

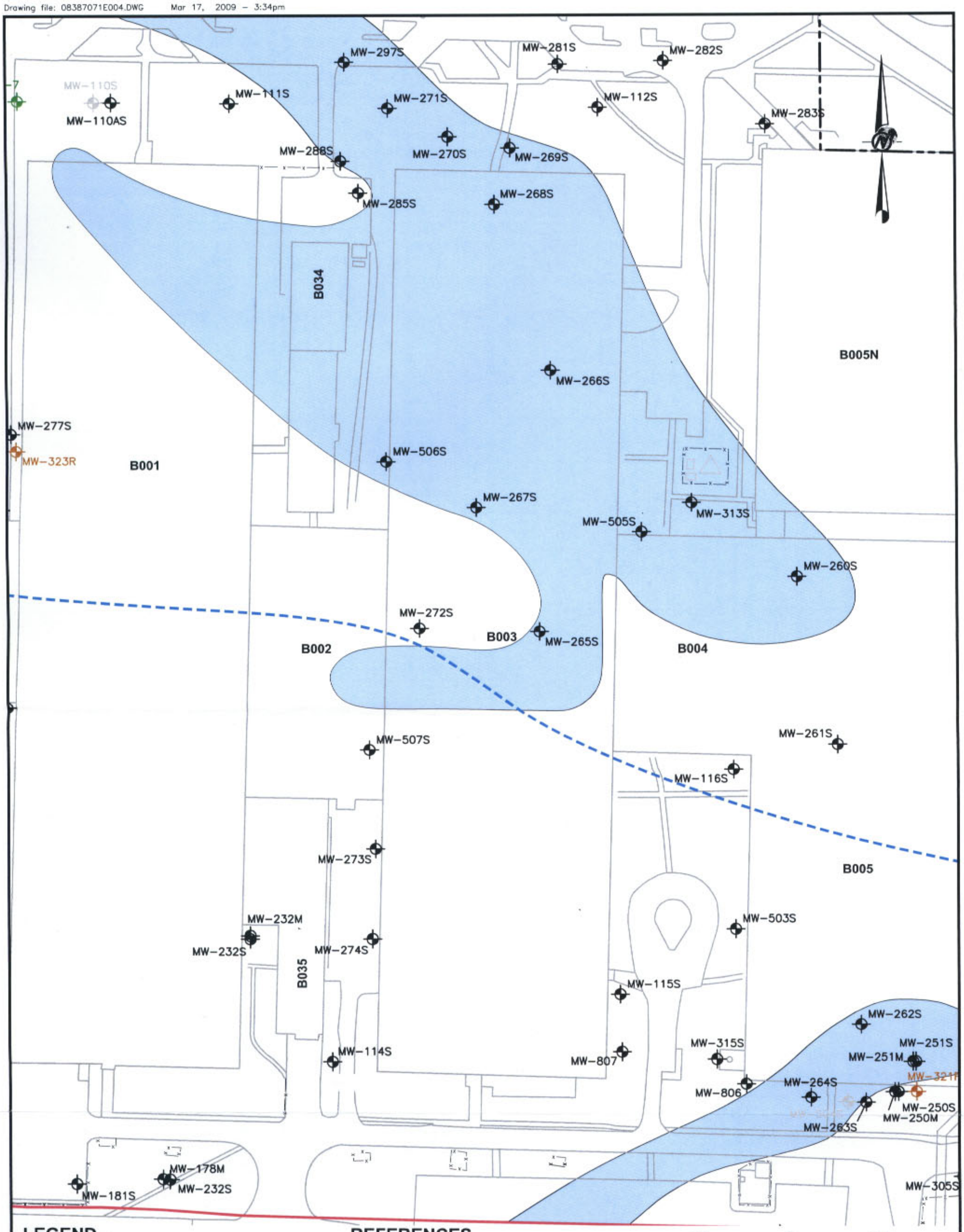
MONITORING WELL NETWORK AND GENERALIZED VOC PLUME AREA MAP (SWMU-M)

Golder Associates
Newark, New Jersey

PROJECT No.	083-87071		FILE No.	083871071E003	
DESIGN	CDH	03/12/09	SCALE	AS SHOWN	REV. 0
CADD	RC	03/12/09			
CHECK					
REVIEW					

FIGURE 3

Drawing file: 08387071E004.DWG Mar 17, 2009 - 3:34pm



LEGEND

- PROPERTY/PARCEL BOUNDARY
- SITE PERIMETER CONTROL SYSTEM
- INFERRED GROUNDWATER DIVIDE
- B003 BUILDING NUMBER
- GROUNDWATER MONITORING WELL
- BEDROCK MONITORING WELL
- ABANDONED MONITORING WELL
- GENERALIZED PCE 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 DIGITIZED FROM A HARD COPY FIGURE ENTITLED "ENVIRONMENTAL PARCELS," DATED DECEMBER 12, 2006, FIGURE 2, PREPARED BY DIVNEY TUNG SCHWALBE.

3.) GENERALIZED AREA OF PCE IN THE PLUME AREA DIGITIZED FROM "2007 ANNUAL GROUNDWATER MONITORING REPORT," DATED MARCH 28, 2008, PREPARED BY GROUNDWATER SCIENCES CORPORATION.

4.) INFERRED GROUNDWATER DIVIDE DIGITIZED FROM A HARD COPY FIGURE ENTITLED "SURFICIAL SAND AQUIFER GROUNDWATER ELEVATION CONTOUR MAP, DECEMBER 6, 2007 (FOURTH QUARTER 2007), DATED MARCH 24, 2008, PREPARED BY GROUNDWATER SCIENCES CORPORATION.

100 0 100
SCALE FEET

REV	DATE	DES	REVISION DESCRIPTION	CADD	CHK	RVW

PROJECT

FORMER IBM FACILITY
KINGSTON, NEW YORK

TITLE

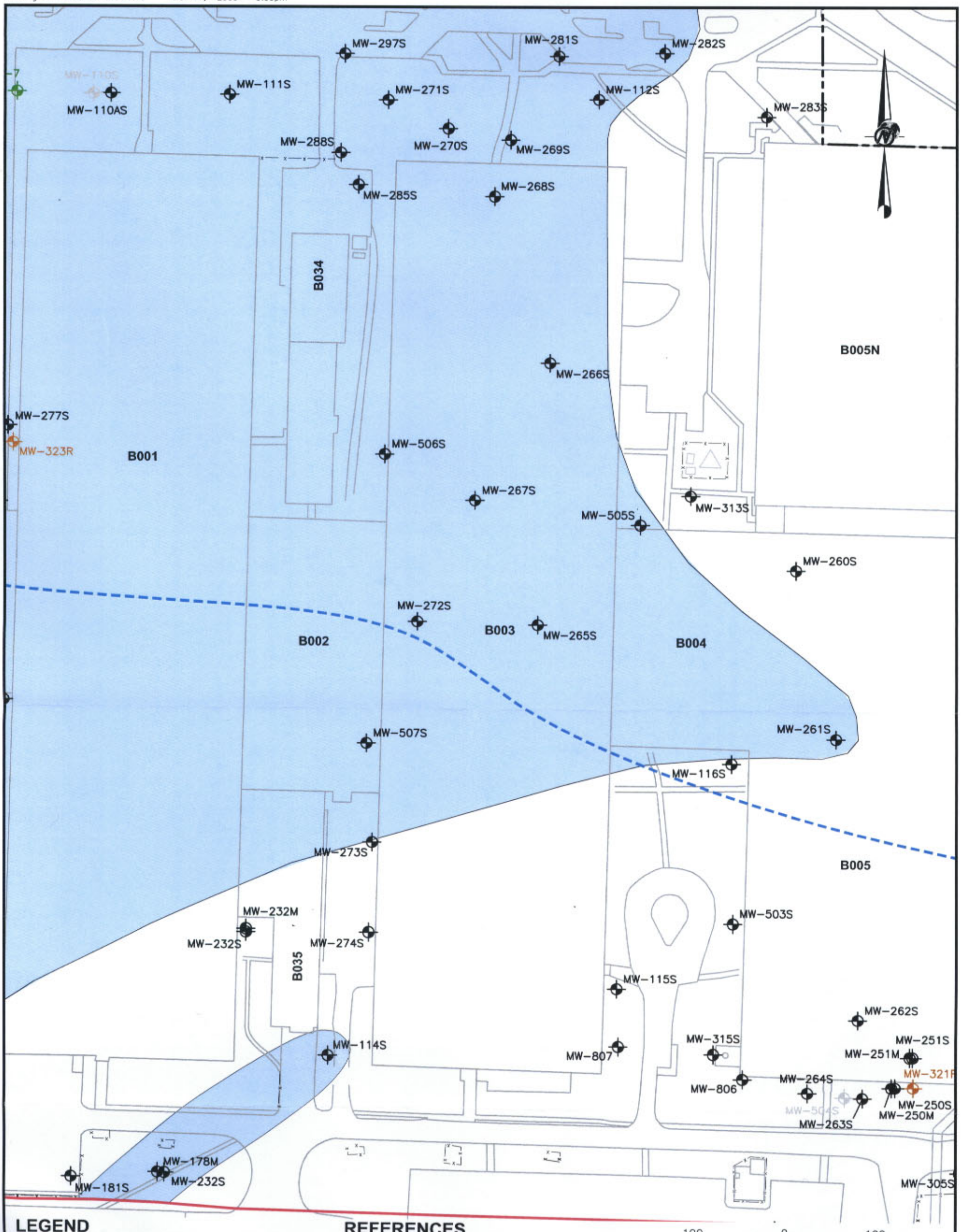
GENERALIZED PCE GROUNDWATER PLUME IN THE SWMU M AREA

NJ Authorization #24GA28029100
Golder Associates
Newark, New Jersey

PROJECT No.	083-87071		FILE No.	08387071E004	
DESIGN	CDH	03/09/09	SCALE	AS SHOWN	REV. 0
CADD	RG	03/09/09			
CHECK					
REVIEW					

FIGURE 4

Drawing file: 08387071E005.DWG Mar 17, 2009 - 3:35pm



LEGEND

- PROPERTY/PARCEL BOUNDARY
- SITE PERIMETER CONTROL SYSTEM
- INFERRED GROUNDWATER DIVIDE
- B003 BUILDING NUMBER
- GROUNDWATER MONITORING WELL
- BEDROCK MONITORING WELL
- ABANDONED MONITORING WELL
- GENERALIZED TCE 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 DIGITIZED FROM A HARD COPY FIGURE ENTITLED "ENVIRONMENTAL PARCELS," DATED DECEMBER 12, 2006, FIGURE 2, PREPARED BY DIVNEY TUNG SCHWALBE.

3.) GENERALIZED AREA OF TCE IN THE PLUME AREA DIGITIZED FROM "2007 ANNUAL GROUNDWATER MONITORING REPORT," DATED MARCH 28, 2008, PREPARED BY GROUNDWATER SCIENCES CORPORATION.

4.) GROUNDWATER DIVIDE DIGITIZED FROM A HARD COPY FIGURE ENTITLED "SURFICIAL SAND AQUIFER GROUNDWATER ELEVATION CONTOUR MAP, DECEMBER 6, 2007 (FOURTH QUARTER 2007), DATED MARCH 24, 2008, PREPARED BY GROUNDWATER SCIENCES CORPORATION.

100 0 100
SCALE FEET

REV	DATE	DES	REVISION DESCRIPTION	CADD	CHK	RVW

PROJECT

FORMER IBM FACILITY
KINGSTON, NEW YORK

TITLE

GENERALIZED TCE GROUNDWATER PLUME IN THE SWMU M AREA

NJ Authorization #24GA28029100
Golder Associates
Newark, New Jersey

PROJECT No.	083-87071		FILE No.	08387071E005
DESIGN	CDH	03/09/09	SCALE AS SHOWN	REV. 0
CADD	RG	03/09/09		
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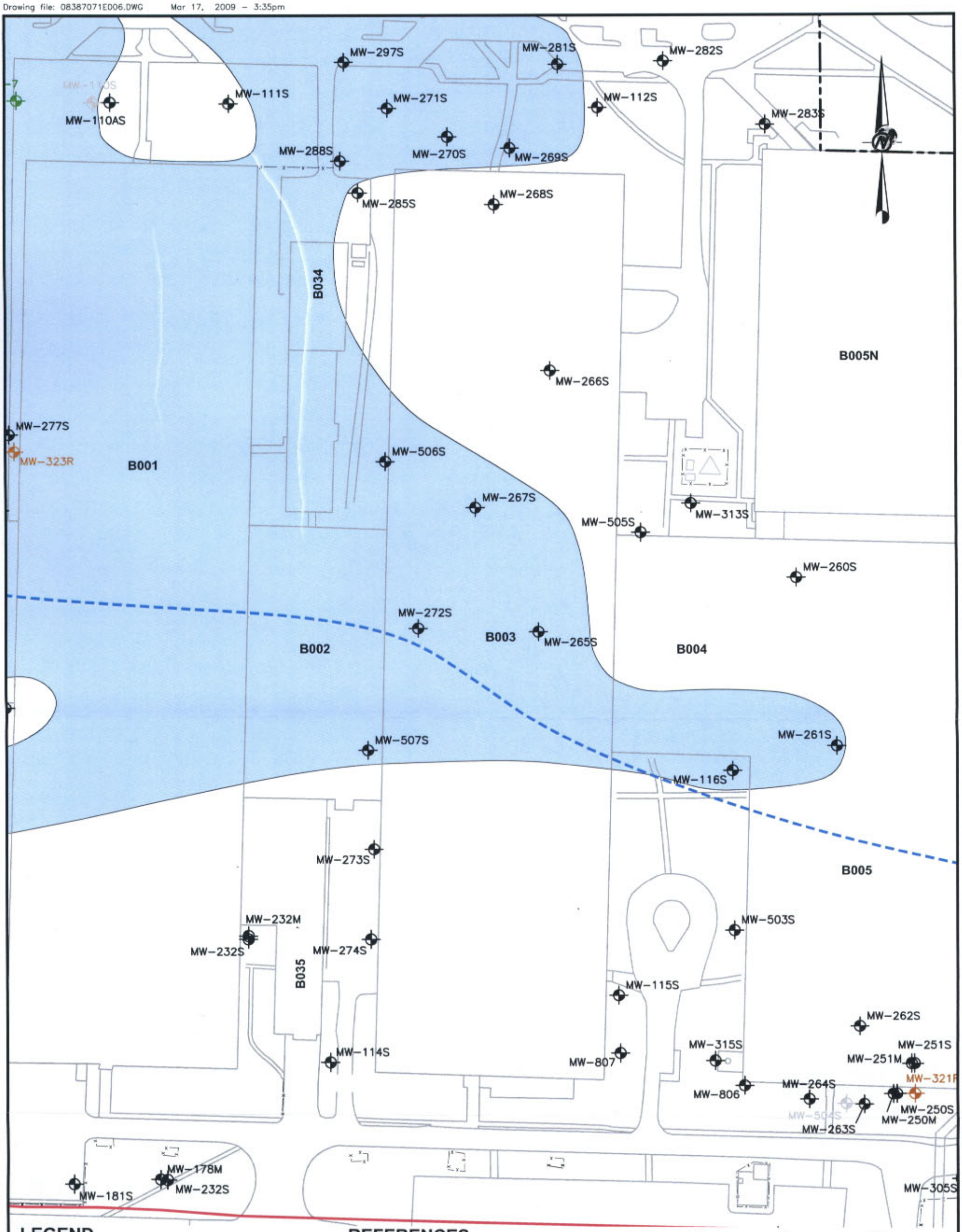
REVIEW				

FIGURE 5

Drawing file: 08387071E006.DWG Mar 17, 2009 - 3:35pm



LEGEND

- PROPERTY/PARCEL BOUNDARY
- SITE PERIMETER CONTROL SYSTEM
- INFERRED GROUNDWATER DIVIDE
- B003 BUILDING NUMBER
- GROUNDWATER MONITORING WELL
- BEDROCK MONITORING WELL
- ABANDONED 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.) PROPERTY LINES DIGITIZED FROM A HARD COPY FIGURE ENTITLED "ENVIRONMENTAL PARCELS," DATED DECEMBER 12, 2006, FIGURE 2, PREPARED BY DIVNEY TUNG SCHWALBE.

3.) GENERALIZED AREA OF 1,1,1-TCA IN THE PLUME AREA DIGITIZED FROM "2007 ANNUAL GROUNDWATER MONITORING REPORT," DATED MARCH 28, 2008, PREPARED BY GROUNDWATER SCIENCES CORPORATION.

4.) INFERRED GROUNDWATER DIVIDE DIGITIZED FROM A HARD COPY FIGURE ENTITLED "SURFICIAL SAND AQUIFER GROUNDWATER ELEVATION CONTOUR MAP, DECEMBER 6, 2007 (FOURTH QUARTER 2007), DATED MARCH 24, 2008, PREPARED BY GROUNDWATER SCIENCES CORPORATION.

100 0 100
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 M AREA

NJ Authorization #24GA28029100
Golder Associates
Newark, New Jersey

PROJECT No.	083-87071		FILE No.	08387071E005	
DESIGN	CDH	03/09/09	SCALE	AS SHOWN	REV. 0
CADD	RG	03/09/09			
CHECK					
REVIEW					

FIGURE 6

Drawing file: 08387071E007.DWG Mar 17, 2009 - 4:03pm

REFERENCES

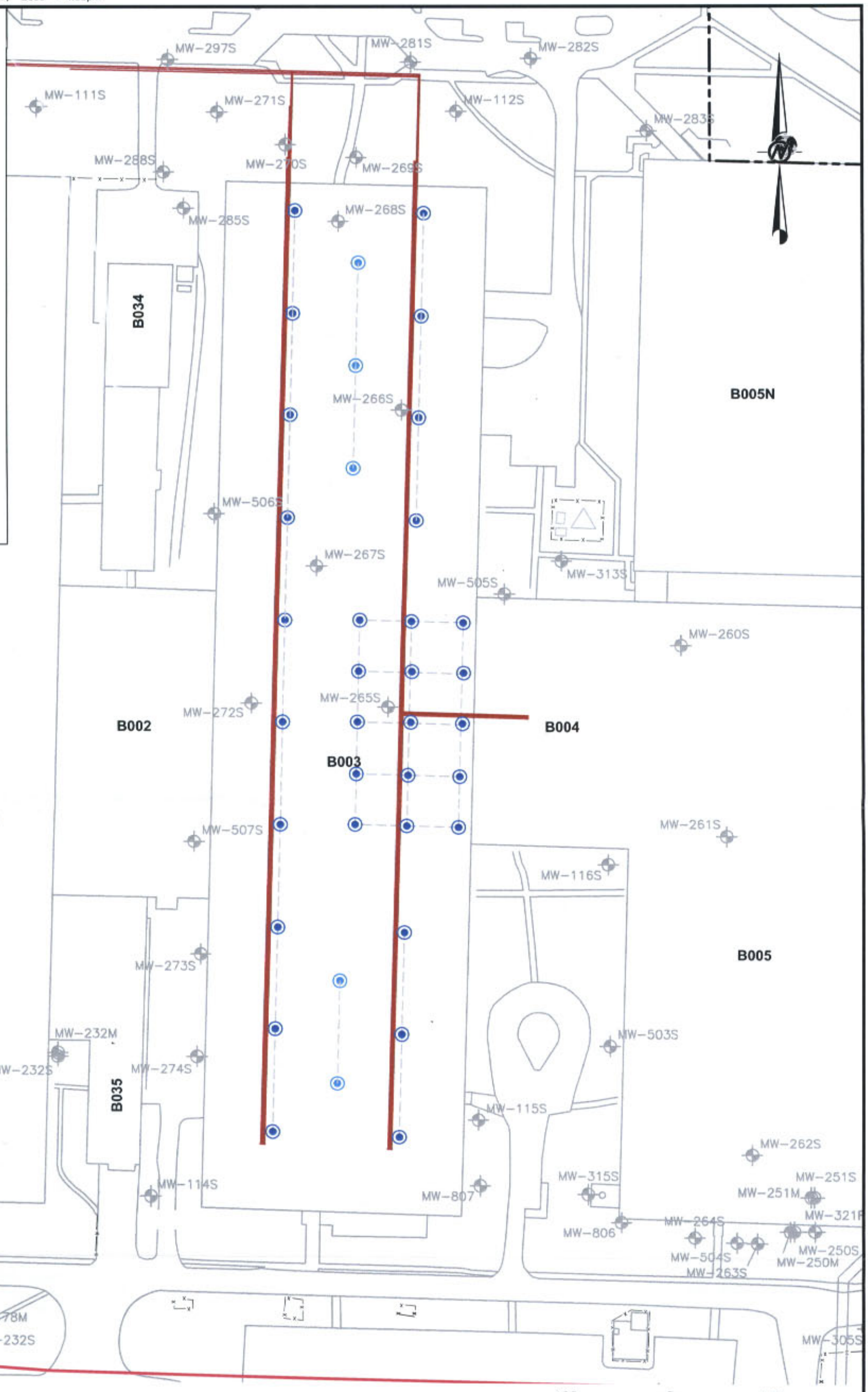
1.) BASE MAP TAKEN FROM DIGITAL CAD FILE SITEMAP.DWG, DRAWING NUMBER 93002-SITEMAP/2 ENTITLED "SITE MAP," DATED MAY 9, 2005, PROVIDED BY GROUNDWATER SCIENCES CORPORATION.

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

3.) ACTIVE/INACTIVE SUBSURFACE INDUSTRIAL WASTE LINES TAKEN FROM DIGITAL FILE 3002-108-13.DWG, ENTITLED "LOCATION MAP," DATED MARCH 5, 2009, PREPARED BY GROUNDWATER SCIENCES CORPORATION.

NOTE

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



100 0 100

SCALE FEET

LEGEND

- PROPERTY/PARCEL BOUNDARY
- SITE PERIMETER CONTROL SYSTEM
- ACTIVE/INACTIVE SUBSURFACE INDUSTRIAL WASTE LINES
- B003 BUILDING NUMBER
- EXISTING MONITORING WELL
- PROPOSED INITIAL MIP/EC POINT
- POTENTIAL MIP/EC POINT (SEE NOTE 1)

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-M)

NJ Authorization #24GA28029100
Golder Associates
Newark, New Jersey

PROJECT No.		083-87071	FILE No.	08387071E007	
DESIGN	CDH	03/09/09	SCALE	AS SHOWN	REV. 0
CADD	RG	03/09/09			
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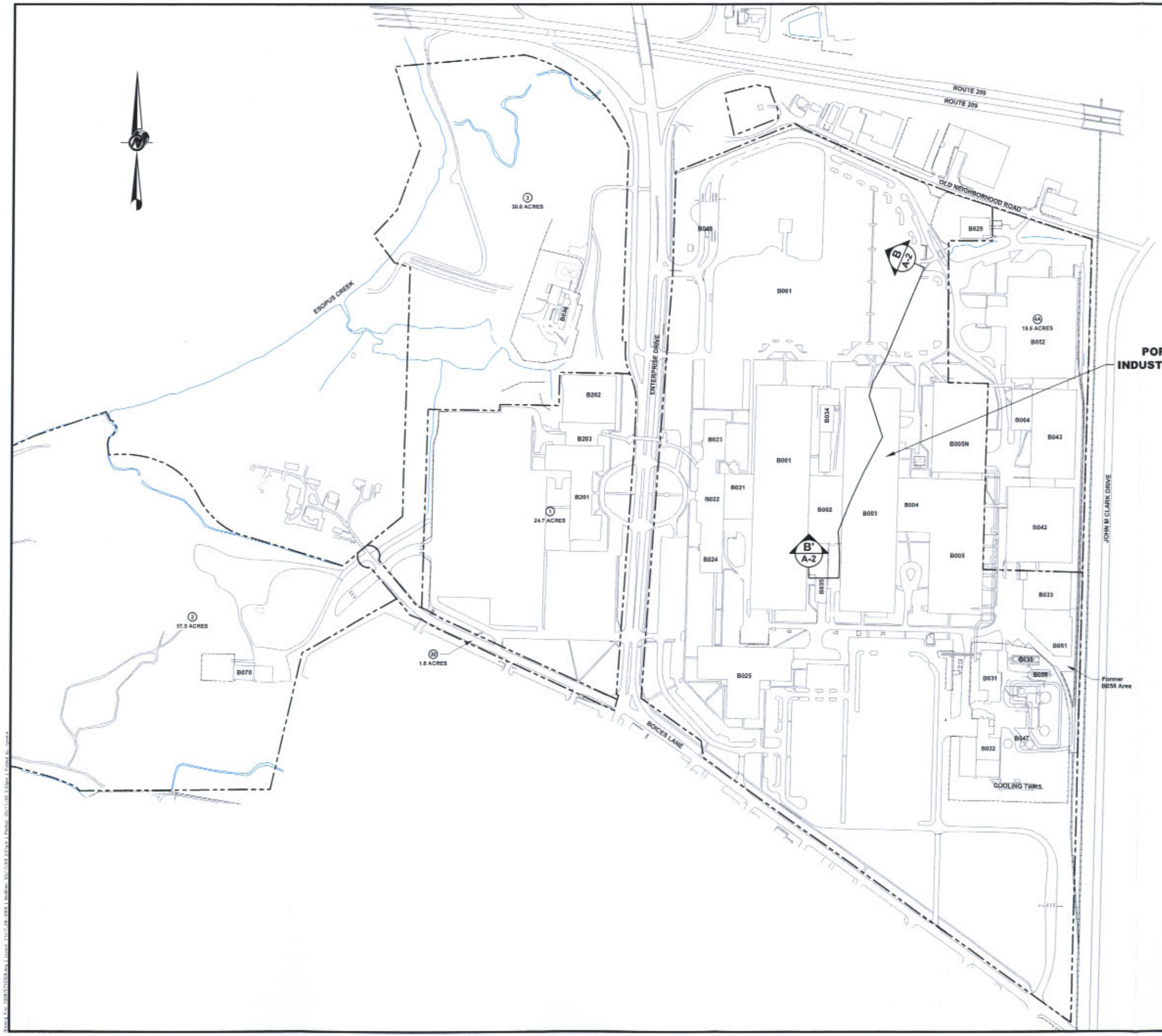
REVIEW					

FIGURE 7

APPENDIX A



LEGEND

- B / A-2 — CROSS SECTION DESIGNATION; FIGURE NUMBER WHERE CROSS SECTION IS PRESENTED
- PROPERTY/PARCEL BOUNDARY
- RIVER/STREAM
- B003 — BUILDING NUMBER
- (1) — ENVIRONMENTAL PARCEL NUMBER AND APPROXIMATE ACREAGE

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.

1.) CROSS SECTION LOCATIONS TAKEN FROM DIGITAL CAD FILE CS_LAYER.DWG, DRAWING NUMBER 96011-CS01, DATED MAY 6, 1997, PROVIDED BY GROUNDWATER SCIENCES CORPORATION.

SWMU-M
PORTIONS OF THE
INDUSTRIAL SEWER LINES

200 0 200 400
SCALE FEET

REV	DATE	DES	REVISION DESCRIPTION	CADD	CHK	PM

PROJECT

FORMER IBM FACILITY
KINGSTON, NEW YORK

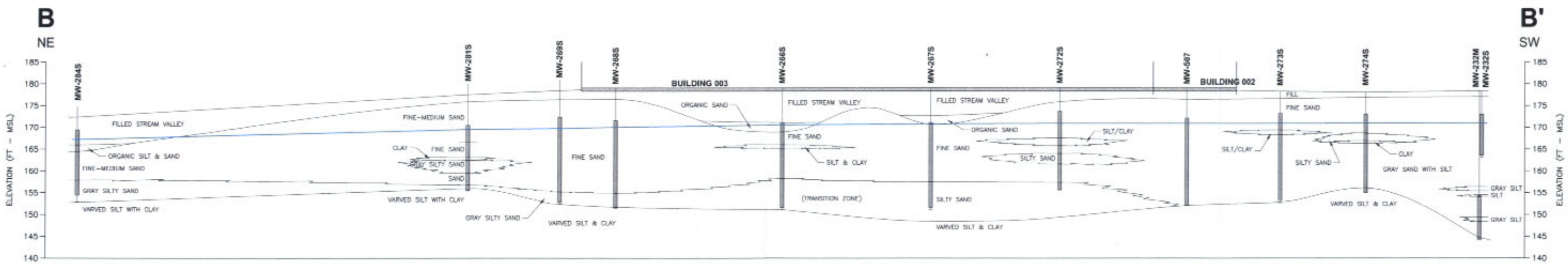
TITLE

SITE LAYOUT AND INVESTIGATION AREA MAP

Golder Associates
Newark, New Jersey

PROJECT No.	083-57071		FILE No.	083870716008	
DESIGN	CDH	03/12/09	SCALE	AS SHOWN	REV. 0
CADD	RG	03/12/09			
CHECK					
REVIEW					

FIGURE A-1



60 0 60 120
HORIZONATAL SCALE FEET

12 0 12 24
VERTICAL SCALE FEET

VERTICAL EXAGGERATION X5

LEGEND

MW-284S — WELL DESIGNATION

WELL SCREEN

WATER LEVEL

REFERENCE

1.) CROSS SECTIONS TAKEN FROM DIGITAL CAD FILE 6011CS01.DWG.DWG, ENTITLED "CROSS SECTIONS A-A' TO F-F'," DATED MAY 6, 1997, PROVIDED BY GROUNDWATER SCIENCES CORPORATION.

REV	DATE	DES	REVISION DESCRIPTION	CADD	CHK	RVW

PROJECT

FORMER IBM FACILITY
KINGSTON, NEW YORK

TITLE

CROSS SECTION B-B'

NJ Authorization #24GA28029100

Golder Associates
Newark, New Jersey

PROJECT No.		083-87071	FILE No.		083870711E009
DESIGN	CDH	03/17/09	SCALE	AS SHOWN	REV. 0
CADD	RG	03/17/09			
CHECK					
REVIEW					

FIGURE A-2

Drawing File: 083870711E009.dwg Mar 17, 2009 - 2:27pm