IBM Corporation
Poughkeepsie, New York

Neptune Commerce Center

Former IBM Leased Buildings 952/982 Site

Town of Poughkeepsie, Dutchess County

Soil Vapor Investigation Work Plan

NYSDEC Site No. 314076

Prepared by

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December 2011
Revised February 2012

Former IBM B952/982 Site

DUTCHESS COUNTY, NEW YORK

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1.0 INTRODUCTION

This Soil Vapor Investigation Work Plan (SVIWP) was prepared to identify and evaluate potential sub-slab vapor intrusion concerns as a result of previously identified environmental impacts at the Former IBM Building 952/982 Site (hereinafter referred to as the "Site"). The site was remediated voluntarily, without a consent order but with oversight by New York State Department of Environmental Conservation (NYSDEC), by the International Business Machines Corporation (IBM). Although not the owner of the property, IBM is responsible for ongoing remedial activities conducted at the site. This SVIWP will focus on Building 982, evaluating the sub-slab vapors present under the slab of this building.

The Site is located in the Town of Poughkeepsie, County of Dutchess, New York and is identified as Block 01 and Lot 187926 on the Dutchess County Tax Map. The entire Site is an approximately 5-acre area bounded by a car dealership to the north, Neptune Road to the south, Route 9 to the east, and other buildings that are part of the same building complex to the west as shown on Figure 1.

This Work Plan has been prepared in accordance with the NYSDEC document DER-10, "Technical Guidance for Site Investigation and Remediation," dated May 2010 (DER-10), and the New York State Department of Health's (NYSDOH's) Final document, "Guidance for Evaluating Soil Vapor Intrusion in the State of New York," October 2006 (SVI Guidance).

2.0 SITE DESCRIPTION AND HISTORY

IBM occupied the Site as a lessee starting in the mid-1950s. At that time the Site was owned by South Road Associates. The Site was used primarily for manufacturing and parts cleaning and in later years for computer mainframe and ancillary parts salvage. IBM ended its lease on February 28, 1994. On April 25, 2005 South Road Associates sold the property to Neptune Capital Investors, LLC (NCI).

The Site consists of two vacant buildings joined by an enclosed walkway. The remainder of the Site is predominantly paved with the exception of the portion of the Site between the two buildings and the contiguous area north of Former Building 982. This portion of the Site is unpaved, graded fill. Surface drainage is collected in a series of dry wells located within the area between Buildings 952 and 982.

Various halogenated solvents and Sovasol were used on the Site as part of the previous manufacturing operations. These chemicals were stored in a central solvent holding tank located in the courtyard between Buildings 952 and 982 prior to pickup and transport to a waste handling facility. In the early 1980s, IBM began to conduct investigations to characterize the hydrogeology and groundwater quality of the Site. As a result of these investigations, IBM discovered that a solvent tank had leaked, impacting both groundwater and soils within the vicinity of the tank and under Building 952 and a portion of Building 982. Upon this discovery, IBM prepared a remedial action plan to remove the tank and surrounding impacted soils and that plan was approved by the NYSDEC. Under the supervision of the NYSDEC, IBM removed and disposed of approximately 5,000 cubic yards of material from August 1984 to November 1984. Following completion of the remedial action, IBM continued to conduct onsite and offsite groundwater monitoring, in addition to re-sampling impacted soils under Building 952.

The Site was first listed as an Inactive Hazardous Waste Disposal Site in 1984 as a Classification 2 site. Later at some point prior to 1989, the Site was listed as a Classification 2a site. On March 8, 1993 IBM submitted a petition to reclassify the Site from a Classification 2a to a Classification 4 on the New York State Register and Official Compilation of Codes, Rules and Regulations of the State of New York (NYCRR), Part 375 Environmental Remediation Programs, Subpart 375-2: Inactive Hazardous Waste Disposal Site Remedial Program (Part 375) Inactive Hazardous Waste Disposal Site Registry (IHWDS Registry), based on the results of the continued monitoring and investigations completed for the Site. NYSDEC determined that the Site could be reclassified after the design and installation of a groundwater pump and treatment system. Following IBM's installation of a NYSDEC approved groundwater pump and treatment system, the petition was approved on December 13, 1993. Although IBM no longer leases these buildings, IBM continues to operate and maintain the Site groundwater pump and treatment system in accordance with the NYSDEC approved Operation and Maintenance (O&M) Plan in place for the system.

2.1 Geology

The Site is underlain with limestone bedrock that ranges from approximately 20 – 50 feet below the ground surface. The limestone bedrock is overlain by a variable thickness of unconsolidated sediments, including primarily glacially derived tills, outwash materials consisting of gravels, sands, and silts, lake deposits consisting of alluvial silts and clays, and man-made fill material. The thickness of unconsolidated sediments range from more than 55 feet thick, southeast of Building 982, to less than ten feet thick along Route 9. Groundwater flow occurs primarily

within the dolostone bedrock, with the exception of a few isolated zones of perched water on top of silt and clay lenses within the unconsolidated sediments.

2.1 Groundwater Conditions

Groundwater sampling results from 23 monitoring wells installed in 1982 indicated low concentrations of dichlorobenzenes (DCBs), 1,1,1-trichloroethane (TCA), and trichloroethylene (TCE) in or adjacent to the alcove between Buildings 952 and 982. These contaminants were not detected in downgradient wells, with the exception of TCA which was detected in a well located near the southern site boundary, at a concentration below the New York State Groundwater Quality Standard (NYSGWS).

After completion of the remedial actions at the Site including soil removal and removal of a solvent storage tank, IBM continued to conduct groundwater monitoring both on-site and off-site. Groundwater samples were collected and analyzed for various parameters from 1985 to 1992. Sampling results completed during November and December 1992 showed no concentrations exceeding the NYSGWS in any of the 13 off-site monitoring wells. For the ten on-site monitoring wells, the NYSGWS was exceeded for one or more constituents in the two wells immediately within or adjacent to the 1984 soil excavation area.

In 1993 IBM installed a groundwater pump and treatment system approved by the NYSDEC. This groundwater pump and treatment system has been in operation since that time and has effectively remediated and prevented the chemicals from migrating off-site. IBM continues to conduct routine groundwater monitoring at the Site.

2.1 Soil Vapor Intrusion Conditions

In 2008 the Site was identified as a legacy site where the New York State Department of Health (NYSDOH) requested soil vapor evaluations. The current owner of the Site conducted an investigation of this media in 2007 and 2008 without a NYSDEC or NYSDOH approved Work Plan. Sub-slab vapor samples were collected from Building 952 and Building 982, and soil gas samples were collected between the two buildings. Although the investigation was completed without an approved Work Plan, the NYSDEC reviewed the findings of the investigation prepared by the owner's consultant, and accepted the consultant's conclusion that exposure by the vapor intrusion pathway is likely. Currently Building 952 is unoccupied and Building 982 appears to be used for warehousing purposes; there is very little potential for human exposure at the current time.

The proposed plan for redevelopment of the Site by the current owners of the property includes the removal of Building 952. Building 982 will remain as part of the Site; however, it will be renovated and redeveloped prior to occupancy. This SVIWP focuses on the current sub-slab vapor conditions under the slab of Building 982 prior to redevelopment. When Building 952 is demolished and removed (including the slab) a separate supplemental investigation will be conducted by IBM to verify the contamination levels in the soils beneath this building prior to that parcel's redevelopment.

3.0 INVESTIGATION FIELD ACTIVITIES

Sampling activities outlined in this SVIWP will be completed to characterize the current sub-slab vapor conditions under Building 982 prior to renovation and redevelopment of the building to determine the potential for vapor intrusion into the building as an exposure pathway for volatile organic compounds (VOCs) detected during previous investigations in soils and/or groundwater in this area. The scope of work consists of the following:

- installation of permanent sub-slab vapor sample ports;
- collection of sub-slab soil vapor samples;
- documentation of sampling locations; and
- preparation of a sub-slab vapor evaluation summary report.

Delineation of potential sub-slab and indoor sources within residential dwellings and commercial businesses is essential to evaluating the potential human health risk. Commercial facilities frequently include indoor sources of VOCs relative to their business. For example, carpeting is known to emit a number of VOCs, welding shops would be expected to use degreasing solvents, and auto repair and car dealer businesses are likely to have indoor air impacts from petroleum hydrocarbons. In addition, prior spills and diffusion into concrete floors could also represent an ongoing source of indoor VOCs. In these cases, a variety of different sources may be involved, and it can be difficult to differentiate sub-slab and indoor sources if VOCs are detected in the subsurface. In accordance with the NYSDOH SVI Guidance, both sub-slab vapor and indoor air sampling may be undertaken concurrently at both residential and commercial facilities, and analyzed for the full TO-15 VOC parameter list. Ambient outdoor samples are often collected concurrently with indoor air samples to evaluate the potential influence, if any, of the ambient outdoor air on indoor air quality.

However, as mentioned previously, Building 982 is currently being used as a warehousing facility and is not accessed frequently; there are a couple of broken windows and the building is not heated. Collection and analysis of indoor samples at this time likely would not yield data representative of conditions when the building is redeveloped and occupied, and possibly used for a commercial purpose. No indoor air or ambient outdoor air samples will be collected and analyzed as part of this SVIWP at this time.

After Building 982 has been renovated and redeveloped by the current owner, an additional sampling event will be required that includes the collection of sub-slab vapor samples as well as indoor air samples and an outdoor air sample to provide a proper assessment of the potential for a vapor intrusion exposure pathway into the building when it is occupied. This post-redevelopment sampling activity will require an inventory of the building to document the uses and storage of volatile chemicals by the occupants and/or the owner that could potentially influence the results of the indoor air samples.

To investigate the potential for contaminants in the subsurface to volatilize from soil and groundwater and potentially collect under the slab of Building 982, the installation and sampling of permanent sub-slab vapor sample ports at select locations is proposed for this investigation. Based on the fact that the solvent storage tank was located between the buildings along the eastern side of Building 982, and VOC groundwater concentrations have been highest in the monitoring wells between the two buildings, three sub-slab sample locations are proposed to be sampled along the eastern side of the building. Three additional sub-slab sample locations are proposed to be sampled in the remainder of the building. Proposed sub-slab vapor sample locations are shown on Figure 2; a total of six sub-slab vapor samples are proposed to be collected and analyzed from Building 982 as part of this SVIWP.

Sub-slab vapor samples will be collected in accordance with the NYSDOH's Final Guidance for Evaluating Soil Vapor Intrusion in the Sate of New York, October 2006 (NYSDOH Soil Vapor Guidance). In accordance with the NYSDOH SVI Guidance, the preferred seasonal period for the collection of sub-slab vapor samples (and indoor air samples) is during the heating season. For the Northeast, the heating season generally runs from November 15 to March 31; however, since Building 982 is currently not heated and there are a number of broken windows, the samples would not be required to be collected during the heating season for this assessment of sub-slab vapor conditions prior to redevelopment of the site.

3.1 Sub-Slab Vapor Sample Port Installation

Permanent sub-slab vapor sample ports will be installed away from foundation or column footings, just below the slab. Before drilling, the location of all sub-slab utilities, both public and building-specific, will be identified and marked. The sub-slab vapor sample ports will be installed by drilling a small hole (1/2- to 1-inch diameter) through the slab with a hammer drill. No water will be used during the installation of the sample ports. If dust prevention is necessary, the location may be covered by a damp towel or cloth and drilling will proceed through a pre-cut hole in the cloth. After drilling though the slab, the slab thickness will be measured and recorded.

Each sample port will be constructed of brass tubing and connectors as suggested in the SVI Guidance. The space below the slab under the hole will be filled with a porous inert backfill material (e.g., clean coarse sand or glass beads) such that the bottom of the sample port tubing is in this backfill material. The brass tube will extend from the bottom of the slab up to a coupler at the top of the slab. The top of the sample port will be flush with or just below the top of the slab so it is not a potential trip hazard when not in use. The annular space around the brass coupler at the top of the sample port will be filled with cement to permanently seal the sample port in place. The sample port will be sealed with a threaded plug or insert when it is not in use to maintain the integrity of the building slab. The installation of these permanent sample ports will allow the collection of additional samples from these locations during subsequent sampling events if required.

3.2 Tracer Gas Testing of Sample Ports

Sub-slab vapor samples are collected from a sample port installed in the concrete slab by drilling though the concrete slab and installing the sample port. For sub-slab vapor sample ports, whether they are temporary, semi-permanent, or permanent, the concrete slab provides an effective barrier against the potential for air inside the building to migrate under the slab and possibly dilute the sub-slab vapor sample. The sample port is sealed in place in the slab with concrete or a non-VOC-containing sealant such as permagum putty or beeswax. The permanent sub-slab vapor sample ports proposed for this investigation will be sealed in place with concrete.

If the seal of the port through the concrete is suspect, a tracer gas may be utilized to verify that the sample port is not leaking ambient air into the sample. The tracer gas (e.g., helium) is used to enrich the atmosphere in the immediate vicinity of the area where the probe intersects the ground surface with some type of shroud or container.

A tracer gas will not be required for the collection of the sub-slab vapor samples from under the slab of Building 982 because the concrete floor in Building 982 is in excellent condition (few cracks and holes). Rather, the field scientists will inspect the concrete slab in the area of the installed sample ports to document there are no openings, penetrations, or cracks in the floor that could compromise the integrity of the sub-slab vapor samples collected for analysis. Photographs will be taken to document the integrity of the completed sample ports and any cracks or penetrations observed in the floor slab.

3.3 Sample Collection Procedures

The sub-slab vapor sample collection event will be conducted a minimum of 72 hours following the installation of the sub-slab vapor sample ports. Equilibration time is needed since oxygen can be introduced into anaerobic portions of the vadose zone during soil probe installation and the sub-slab vapors could become diluted with indoor air during the sample port installation process. Sub-slab vapor samples will be collected as outlined below:

- remove the threaded plug or insert from the sub-slab vapor sample port;
- attach a section of Teflon® tubing to the sample port in the floor with an air-tight connection such as compression fittings;
- purge one to three volumes of air from the tubing and sample port at a low rate (less than 0.2 liters per minute);
- after purging the tubing and sample port, connect the tubing to the to a 6-liter Summa™ canister outfitted with a flow regulator provided by the analytical laboratory (the analytical laboratory will provide flow regulators that will collect the samples over an approximate 4-hour sample interval);
- inspect all connections to ensure they are all tight;
- open the gauge on the Summa™ canister to begin the sample collection interval;
- record the starting vacuum in the canister;
- record the final vacuum in the canister at the end of the targeted sample interval and close the Summa™ canister valve; there should be some vacuum left in the Summa™ canister when it is shut down, and
- disconnect tubing and prepare the Summa™ canister for delivery/shipment to the analytical laboratory.

The field notes and documentation for the sampling will include the following:

- sample identification;
- date and time of sample collection;
- record the sample canister and flow regulator identification numbers for each sample location;
- sampling methods and devices;
- photo documentation of sampling setups and any pertinent observations;
- volume of soil vapor purged prior to sample collection;
- canister vacuum before and after samples collected;
- apparent moisture content (dry, moist, saturated, etc.) under the slab, and
- chain of custody protocols and records used to track samples from sampling point to analysis.

Summa™ canisters will be shipped via overnight courier or delivered through a delivery service under proper chain-of-custody to a NYSDOH-certified laboratory for VOC analyses by EPA Method T0-15.

4.0 QUALITY ASSURANCE/QUALITY CONTROL

QA/QC samples will be collected during the sampling activities as part of this SVIWP. One field duplicate sample will be collected during this sampling event. The field duplicate sample will be collected by connecting two Summa™ canisters in parallel using a T-connector to attach both canisters to the same sample port. The air sample canisters will be opened at the same time allowing the sub-slab vapors to be drawn into both canisters simultaneously. Prior to use, all canisters will be batch-certified clean by the analytical laboratory, in accordance with USEPA Method TO-15 and the USEPA guidance document entitled "Specifications and Guidance for Contaminant-Free Sample Containers," EPA 540/R-93/051. Documentation of the cleaning activities including the post-cleaning sample results will be maintained by the laboratory and provided with the laboratory's data report package.

A bound logbook will be used to record all pertinent sampling data during the sampling event. Field logbooks will be numbered and maintained in a safe location. Entries will be made only in indelible ink. Any corrections will be marked through with a single line so as to remain legible and will be initialed. Sampling team members should avoid actions that could potentially cause sample interference in the field such as wearing freshly dry-cleaned clothing, fueling vehicles

just prior to the sampling event, etc. Sampling procedures should be consistent between sample locations.

4.1 Analytical Method/Laboratory

All samples will be analyzed by a NYSDOH-approved analytical laboratory that has Environmental Laboratory Approval Program (ELAP) certification for the appropriate analyte and environmental matrix. The sub-slab vapor samples will be analyzed with USEPA TO-15 gas chromatograph/mass spectrometer (GC/MS) methodology for this investigation. All sample analyses will be conducted in accordance with NYSDEC ASP Category B protocols. The analytical laboratory should verify that they will be able to meet the objectives of the sampling program including detection of the appropriate analytes and can report the data with the appropriate reporting limits. Typically the minimum reporting limit for most sub-slab vapor analytes should be 1 $\mu g/m^3$ or less.

4.2 Data Validation

Since this initial sampling event to collect sub-slab vapor samples is planned to be conducted prior to redevelopment of the building, the analytical data will not be validated by an independent data validator/chemist. However, the analytical data collected during subsequent sampling events conducted after the building has been redeveloped for occupancy, that will include sub-slab vapor, indoor air, and outdoor air samples, will be validated to demonstrate the usability of the data to support the conclusions of the investigation and the assessment of the potential for a vapor intrusion pathway into the building once it is redeveloped and occupied. The data generated by the analytical laboratory during subsequent sampling events after the building has been redeveloped will be assessed and validated by an independent data validator/chemist and a Data Usability Summary Report will be prepared in accordance with DER-10.

5.0 VAPOR INTRUSION EVALUATION REPORT

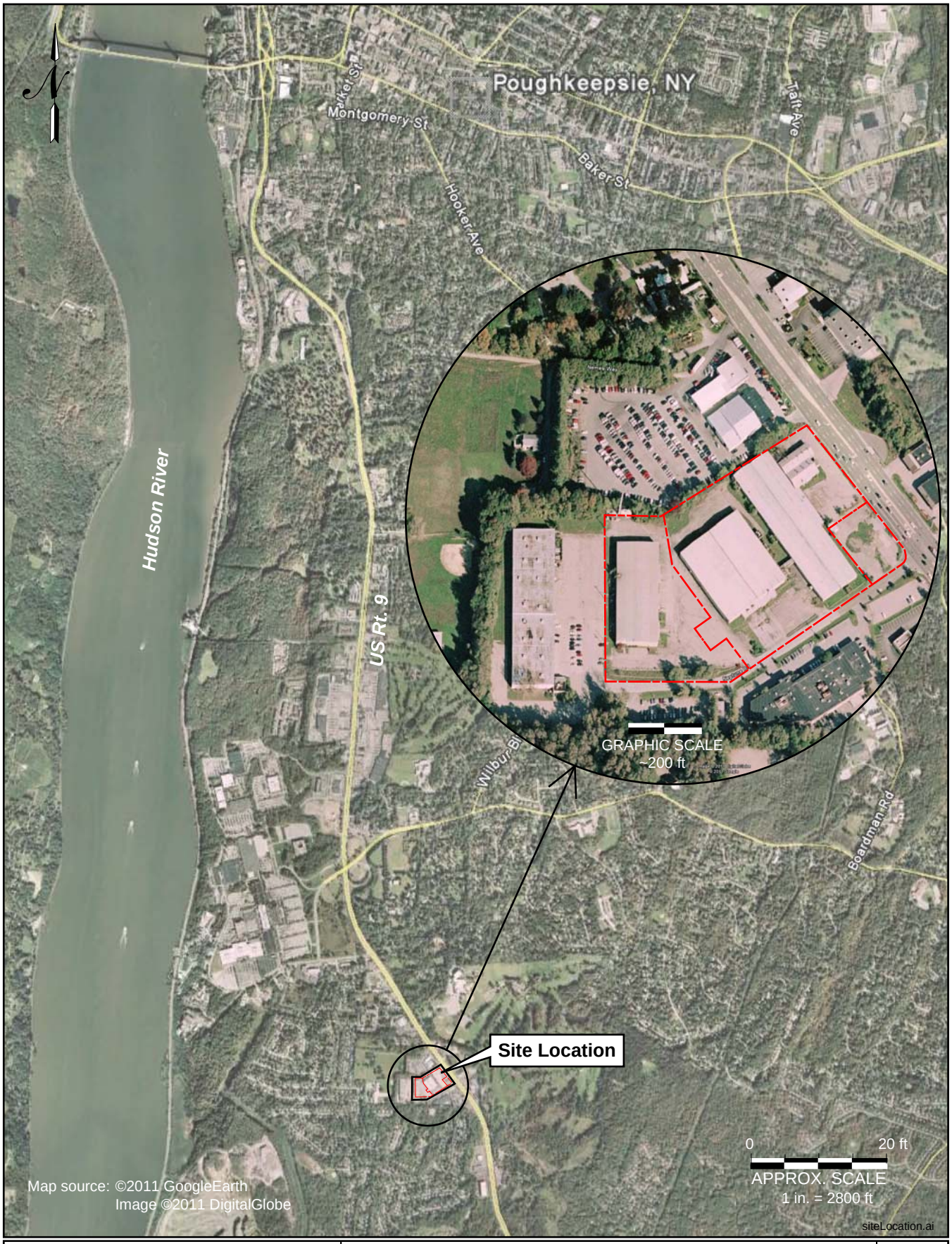
The objectives of collecting sub-slab vapor samples are to identify potential exposures associated with vapor intrusion and to characterize the nature and extent of subsurface vapor contamination. As an initial assessment of the significance of the soil gas sample analytical results, the chemical concentrations detected in the soil gas samples will be compared to, or screened against, chemical-specific generic soil gas screening criteria. As part of the SVI Guidance, NYSDOH have developed decision matrices tables for a limited number of chlorinated VOCs (CVOCs).

These tables are used to evaluate these CVOCs with respect to their concentrations under the slab and in the indoor air of a building to provide guidance on the required action to be taken. The specific CVOCs currently included in the NYSDOH decision matrices tables are:

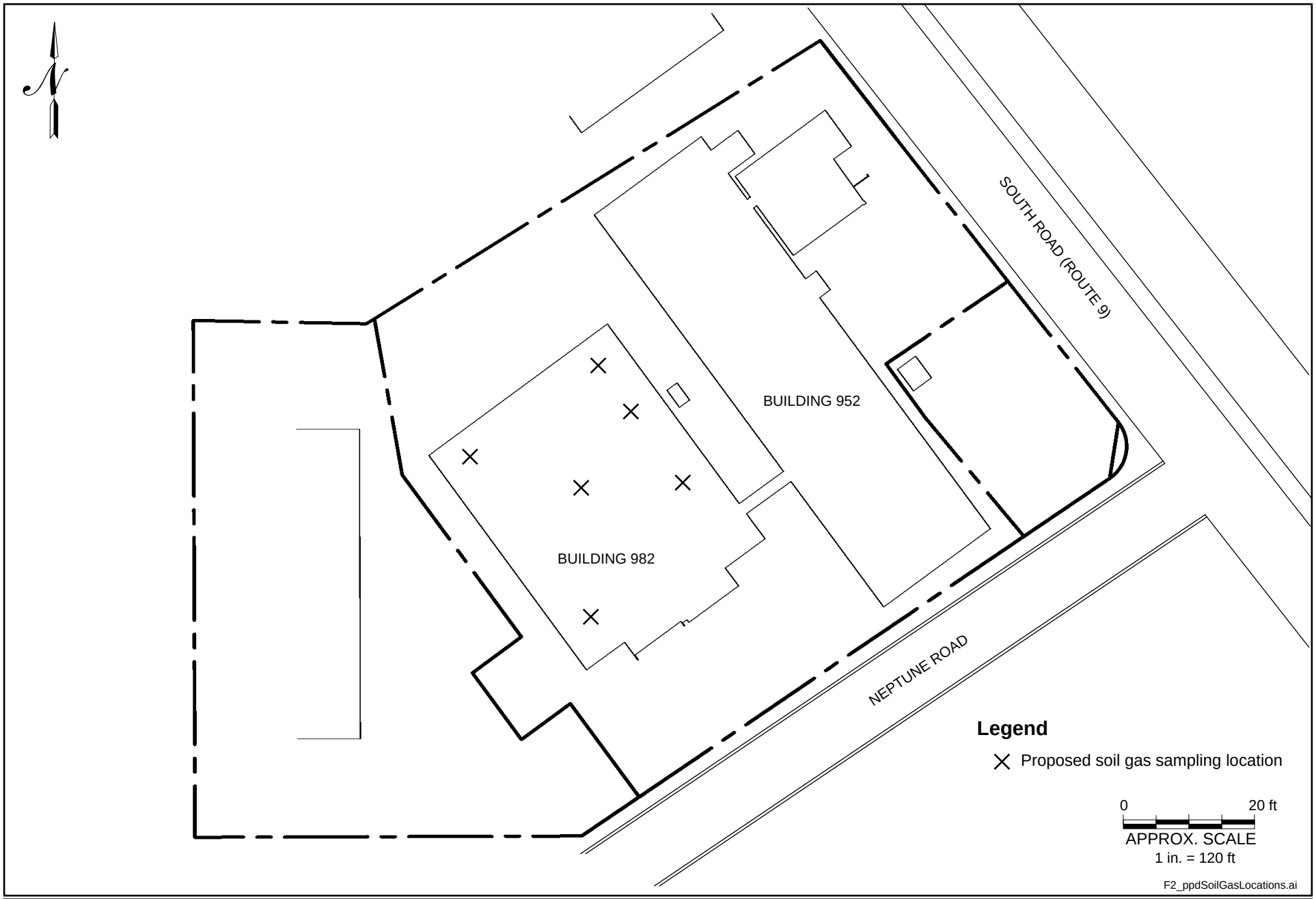
- tetrachloroethene (PCE)
- trichloroethene (TCE)
- 1,1,1-trichloroethane (TCA)
- carbon tetrachloride
- vinyl chloride
- 1,1-dichloroethene
- cis-1.2-dichloroethene

The USEPA has also developed chemical-specific generic soil gas screening criteria (USEPA 2002). Sub-slab soil vapor analyte concentrations from Building 982, in conjunction with other factors, including but not limited to, the nature and extent of environmental contamination in all media and the potential for preferential pathways, will be evaluated to assess the potential for soil vapor intrusion into this building. The soil vapor data will be compared to both the NYSDOH decision matrices tables as well as the USEPA chemical-specific generic soil gas screening criteria.

Following completion of the sampling activities and receipt of the analytical data package, a draft summary report will be prepared to present the results. The summary report will include all background information, the analytical and testing data collected during the investigation activities, an evaluation of the current Site conditions, references, and recommendations for additional investigation activities to completely define the nature and extent of any identified impacts or for the development of mitigation system(s), if deemed necessary. Data will be presented in both tabulated and graphic forms. The draft summary report will be submitted to IBM for review. Comments by IBM regarding the draft report will be addressed and the final report will be revised accordingly. The revised summary report will then be submitted final to the NYSDEC and NYSDOH and a copy of the report will be submitted to NCI for their files.



HDR Henningson, Durham & Richardson Architecture and Engineering, P.C. One Blue Hill Plaza Pearl River, NY 10965	**Site Location** Former IBM Facility Neptune Road, Town of Poughkeepsie, Dutchess County, New York	Figure 1



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Proposed Sub-Slab Vapor Sampling Locations

Former IBM Facility
Neptune Road, Town of Poughkeepsie, Dutchess County, New York

Figure
2