Voluntary Cleanup Program

Remedial Investigation Report
At American Cleaners Kingston

734 Ulster Avenue
Kingston, NY
Site No: V-00601-3
Index No: W3-0952-03-03

For Submittal to

New York State Department of
Environmental Conservation
Division of Environmental Remediation
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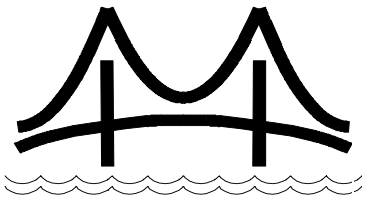

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1. Introduction

This Remedial Investigation Report presents the results and findings of the Remedial Investigation (RI) conducted at and near the American Cleaners site at 734 Ulster Avenue, Kingston, NY as a participant in the Voluntary Cleanup Program (Site Number V-00601-3, Index Number W3-0952-03-03) administered by the New York State Department of Environmental Conservation (NYSDEC). A Voluntary Cleanup Agreement was executed on March 17, 2003 between NYSDEC Division of Environmental Remediation (DER) and American Cleaners, Inc. (Kingston) and Gesher Enterprises of Kingston, LLC, the Volunteers. The Remedial Investigation work has been carried out in compliance with the Draft DER-10 Technical Guidance for Site Investigation and Remediation (December 25, 2002). The remedial investigation has been conducted from 2003 until 2009 with several work plans, revisions, interim reports of findings, and proposed supplemental investigations written and carried out by the staff of Berninger Environmental, Inc.

In March of 2009, Mid-Hudson Geosciences took over the consulting work for American Cleaners and has prepared this report from documents and information provided by Walter Berninger and his staff at Berninger Environmental, Inc. of 90-B Knickerbocker Avenue, Bohemia, NY 11716 (Telephone 613-589-6521).

1.1. Purpose of Report

This Remedial Investigation Report is prepared for the purpose of summarizing and interpreting the field and laboratory work to

- Delineate the area and vertical extent and mass of contaminants in all media at or emanating from the site;
- Determine the surface and subsurface characteristics of the site, including topography and depth to groundwater;
- Identify and characterize the source(s) of contamination from dry-cleaning chemicals, the migration paths, and actual or potential receptors of contaminants on or through air soil bedrock, sediment, groundwater, surface water, utilities and structures at the site, without regard to property boundaries;
- Describe the concentrations, fate and transport, material phase and state(s), locations, and other significant properties of the contamination present from dry cleaning activities;
- Define hydrogeological factors and conditions on the site and potential transport pathways;
- Evaluate actual and potential threats to public health and the environment, including potential public health exposure pathways and potential impacts to fish and wildlife;
- Collect field data needed for selection and design of remedial alternatives; and
- Identify remedial action objectives.

By documenting the nature and extent of contamination on and near American Cleaners, this RI Report will provide a basis to develop an effective and reliable remediation strategy.

1.2. Report Organization

This Report is organized as follows:

- Section 1: Introduction – Discusses the Site setting and history

- Section 2: Summary of Previous Investigations – Summarizes the results and findings of the Site Characterization Study (SC), indoor air quality study, and soil gas survey that were completed for the Site
- Section 3: Investigation Activities – Describes the investigation activities, sampling locations, and sampling and analytical methods of the RI
- Section 4: Field Observations and Findings – Discusses the Site hydrogeology and the distribution of observed Site contamination and environmental impacts
- Section 5: Analytical Results – Presents and interprets the results of the soil, groundwater, indoor air, and soil vapor testing conducted as part of the RI and the observed distribution of volatile organic compounds detected on and off site
- Section 6. Qualitative Human Health Exposure Assessment- Identifies the Compounds of Potential Concern (COPCs) encountered during the RI, potential receptors on and near the site, and potential exposure pathways
- Section 7. Conceptual Site Model – Discusses the nature and extent of volatile organic compounds in air, vapors, soil and groundwater across the site and on neighboring properties
- Section 8. Conclusions and Recommendations – Presents a summary of the findings and conclusions drawn, and identifies potential data gaps and recommendations to address potential data gaps
- Section 9. References – Lists the references used in preparing the RI Report

This Report also includes a significant number of attached tables, figures, boring logs and appendices. The compact disk (in pdf format) included with this Report contains additional documentation, including previous investigation reports, laboratory data reports, and data usability reports. A complete list of these items can be found in the Table of Contents.

■ 1.3. Site Description

American Cleaners of Kingston is actually located in the Town of Ulster, about 0.35 miles north of the Kingston City Boundary at 734 Ulster Avenue, which is also known as Albany Avenue (Figure 1). The Town of Ulster is the shopping center for Ulster County because most of the shopping and commercial development in the 1980s to present has occurred in the Town, which geographically wraps around the northern, northwestern and southwestern area of the City of Kingston (County seat of Ulster County).

The Section Block and Lot (SBL) number designated for the American Cleaners property is 48.58-0-17 on the Ulster County Real Property Tax Map (Figure 2). The parcel is located on the east side of Ulster Avenue north of the cross street Stahlman Place entering Ulster Avenue from the west and south of Mentnech Court also enters Ulster Avenue from the west. The 0.44-acre parcel has 100 feet of road frontage and a depth of approximately 194 feet between Ulster Avenue on the west and the Conrail railroad tracks on the east. In the Real Property Tax database, the land-use is classified as “484” indicated as a “one-story small structure.”

Neighboring properties include Merchant Wine and Liquor Store to the north, Meineke Muffler to the south, Pauline’s Restaurant directly across Ulster Avenue, and Resource Center for Accessible Living to the northwest across the street. The site parcel and neighboring properties are generally flat at an approximate elevation of 175 feet above sea level.

■ 1.4. American Cleaners Site History

In 1982, the American Cleaners property was purchased by Mr. Erez Halevah. Previously a house was situated on the southwest corner of the parcel. The roof of the house can be seen on the historical air photo from 1978 included in the EDR database search provided in Appendix B. In 1982, Mr Halevh designed and constructed a one-story building, specifically for operation of a dry-cleaning establishment. From 1982 to date, the building has been in continuous operation for dry-cleaning and customer drop-off and pick-up. The design for dry-cleaning services was planned with a customer counter across the front of the store and five 4-foot by 4-foot wide trenches running from the front of the store to the rear. Cleaning, washing, drying, steaming and pressing equipment is placed around the perimeter of the store. The trenches are designed to provide maximum hanging capacity on three tiers of clothes rods running from front to back. The clothes-hanger rods can be reached by the employees to store and retrieve customers' garments.

The chemical of concern, Tetrachloroethylene (or tetrachloroethene or perchlorethylene and know in the vernacular as "perc" or "PCE"), has been used a the site since 1982. Unintentional and unregulated releases of PCE began in 1982 when PCE-saturated filters were placed in the dumpster outside the back of the building for disposal with trash and garbage. The dry-cleaning processing equipment was updated periodically on the following schedule:

1982-1992 First Generation Equipment
1992-1997 Third Generation Equipment
1997-Present Fourth Generation Equipment

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A fire occurred in 1991 in a machined call a "Sniffer" along the north inside wall near the back of the store. The "Sniffer" collected fumes from the air during daily operations. The collected fumes were distilled to recover and reuse the PCE. The secondary source area of contamination (identified in Section 6.1) originated from a spill associated with the fire.

An 18-wheeler trailer was brought to the site in 2002 or 2003 with a load of wire coat hangers for use in the store. The trailer was placed on the back of the property parallel to the railroad tracks. The trailer was removed in 2008 for soil sampling beneath the former location. The primary source area of contamination (identified in Section 6.1) is associated with the location of the trailer, although it is not know if any PCE storage took place in the trailer. The trailer location may have been an earlier location of the dumpster.

■ 1.5. American Cleaners Construction and Site Plan

The construction of the building (Figure 1-3) and use for the past 28 years has involved the following elements:

- One large open room
- Underground water supply line installed from the west side of Ulster Avenue, under the street to the left front of the store, under the building to the boiler room in the southeast (right rear) corner of the building.
- Underground sewer line from the street to the front of the building and under the building on the inside of the south wall to the southeast corner near the boiler room and bathrooms.
- Underground 3000-gallon double-wall heating oil storage tank to the right as one goes out the back door, in front of the double doors to the boiler room. The tank was removed and replaced with a 1000-gallong double-wall tank sometime around the turn of the century.

• Peripheral foundation drainage line around the building with discharge to the highway department's stormwater drainage system at the street.
• Rear parking lot drainage grate behind the building connecting to the subsurface foundation drain on the east side of the building about 10 feet from the northeast corner.
• Front parking lot provides for cars to park perpendicular to the front of the building.
• Two stormwater drainage grates are situated in the front parking lot. They are connected with a north-south pipeline. The peripheral foundation drain connects to the north-south line. Another pipe connects the north-south pipe to the stormwater drainage system at the street.
• Electric and telephone wires are overhead from poles at the street.
• The building was designed and constructed with 5 parallel 5-foot wide and 4-foot deep trenches in the floor running from front to back of the store. The trenches allow for storage of clothing on three tiers of hanger racks, which the employees can reach from the floor without a ladder or step stool.
• Near the back of the trenches, pipes lead from the bottom of the trenches laterally to the peripheral foundation (orangeburg) drain-pipe. The pipes are sealed closed in the bottom of the trenches. The design was planned to allow for the potential need to drain floodwaters, if ever needed.
• A similar arrangement of lateral pipes connecting the bottoms of the front of the trenches to the peripheral foundation drain in the center front of the building. These pipes are also sealed in the bottom of the trenches.
• The boiler room is located in the southeast corner of the building with double doors opening on the back of the building.
Two bathrooms are located on the south wall near the back of the building close to the boiler room.
• The building has another special design of a shallow trench about two feet wide and three feet deep along the north, east and south walls of the building. These trenches house pipes to supply water, steam, and air to any of the cleaning, washing, drying, steaming, and pressing machines around the inside of the building walls.
• In 1997, a shed was constructed on the back northeast corner of the building for storage.

2. Summary of Previous Investigations

This remedial investigation report is based on previous work documented in the following workplans and reports prepared by Berninger Environmental:

• Interim Findings & Proposed Supplemental Investigation (Berninger, Sep. 2005) .
• Interim Remedial Measure Work Plan (Berninger, Dec. 2007) .
• Interim Findings & Proposed Supplemental Investigation (Berninger, Mar. 2008) .
• Supplemental Investigation Work Plan (Berninger, May 2008) .
• Proposed Supplemental Investigation Work Plan (Berninger, Sep. 2008) .

To date, the investigative work has consisted of collections of soil samples behind the American Cleaners building; groundwater samples onsite, at the nearby Liquor Store and along the west side of Ulster Avenue; and soil gas and air samples at American Cleaners and the neighboring properties including the liquor store, Pauline's restaurant, the Resouce Center for Accessible Living (RCAL), and the RCAL vacant building. This report provides summaries and interpretations of that data for use in selecting appropriate remedial actions for on and off site.

3. Remedial Investigation Activities

The following activities were described in the RI Work Plan and Supplemental Investigation Work Plans to address the purposes of this RI Report listed above in section 1. The specific RI activities are generally defined as underground utility clearance, soil investigation, groundwater investigation, soil vapor and air sampling, data usability assessment, and survey elevations of monitoring wells.

The majority of site work was conducted by staff members of Berninger Environmental, Inc of 90-B Knickerbocker Avenue, Bohemia, NY 11716 (Telephone 631-589-6521). All samples collected by Berninger employees were analyzed by H2M Labs, Inc of 575 Broad Hollow Road, Melville, NY 11747 (Telephone 631-694-3040). The latest round of monitoring well sampling was conducted by Mid-Hudson Geosciences and analyses were conducted by York Analytical Laboratories, Inc. of 120 Research Drive, Stratford, CT 06615 (Telephone 203-325-1371).

All work conducted during the remedial investigation was completed in general conformance with the following documents:

- Draft DER-10 Technical Guidance for Site Investigation and Remediation (NYSDEC, 2002)
- Draft Guidance for Evaluating Soil Vapor Intrusion in the State of New York (NYSDOH, 2002)
- Final Guidance for Evaluating Soil Vapor Intrusion in the State of New York (NYSDOH, 2006)
- Remedial Investigation and Supplemental Investigation Work Plans for American Cleaners, Inc (Kingston) for NYSDEC Voluntary Cleanup Program prepared by Berninger Environmental, Inc.
- Health and Safety Plan for American Cleaners, Inc. Kingston prepared by Berninger Environmental, Inc.
- Quality Assurance/Quality Control Project Plan stated in Work Plans by Berninger Environmental, Inc.
- Draft Voluntary Cleanup Program Guide (NYSDEC, DER, May 2003)
- Low Stess (low flow) Purging and Sampling Procedure for the Collection of Ground Water Samples from Monitoring Wells (US EPA, Region 1, July 30, 1996 Revision 2)

3.1. Underground Utility Clearance

Prior to initiation of intrusive investigation activities, utility markouts were requested from the NY call before you dig service. Underground utility lines for water and sewer and stormwater drainage were marked out for the American Cleaners, the Liquor Store, Pauline's Restaurant, and the RCAL sites at various times during the remedial investigations.

3.2. Soil Investigation

Soil borings were advanced using a Geoprobe® (rotosonic or direct push method) to reach various depths and obtain samples. Samples were collected continuously to the bottom of borings using plastic sleeves in the core barrel. A total of 33 soil samples were collected and sent for laboratory analyses of Volatile Organic Compounds. The following table indicates the particular dates and identification of samples.

Sample Date	Sample Source	No. of Samples	QC Samples	Boring Logs
May 2005	11 Soil Borings	11	Field Blank	SB1 to SB11
May 2006	2 Drain Sediments	2	N/A	N/A
Dec 2007	12 Soil Borings Trailer Area	14	SB (water)	SBA to SBL
Jan 2009	4 Soil Borings, B11,B12,B13,B14	6	Dup B12	N/A

Soil boring and sampling consisted of the following methodology;

- Soil samples were retrieved continuously from grade to the total boring depth using plastic lined core barrels (rotosonic drilling).
- Recovered soil samples were reviewed and screened for VOCs using a photoionization detector (PID).
- Selected samples were submitted for analyses at H2M Labs by US EPA Method 8260 for the complete list of analytes and tentatively identified compounds (TICs).
- Upon completion, bore holes were backfilled or grouted from bottom of the boring to grade.
- The NYSDEC ASP Category B Data Package was request for all laboratory analyses.

A synopsis of all detected concentrations of Volatile Organic Compounds in soil and sediment samples are listed in Table 1.

■ 3.3. Groundwater Investigation

Groundwater samples were collected in two different ways on the American Cleaners site and neighboring properties. A permanent monitoring well system was installed on site to be able to compare groundwater quality over the duration of remedial investigation and operation of selected remedial measures. Both on and offsite, groundwater samples were obtained from specific depth intervals using a Geoprobe® screen point sampler. Such samplers can be extended from a few to forty inches of vertical soil column.

▪ 3.3.1. Geoprobe® Sampling at Various Depths

As soil borings were advanced at selected locations, the unconsolidated sediments were scanned with a PID for VOCs, examined and described for continuous boring log, and degree of saturation observed and recorded using the adjectives dry, damp, moist, wet, and saturated. A shallow persistent water table was found at about 10 feet. Additional groundwater samples were collected from four vertical intervals at approximately ten foot spacing down from the ground surface. The table below summarizes the dates, location, and levels of 74 groundwater samples collected from discrete intervals on and off the American Cleaners site.

Sampling Date	No Boring Locations	No of Samples	Number of Depths or Levels Sampled	Description of Locations
May 2005	13	18	1 to 3	Front & Rear of Building
May 2006	10	22	1 to 4	Next to shed, along north, east & south property lines, near back stormwater drain and between front stormwater drains
Dec 2007	6	24	4	Front & south side of Liquor Store 2 behind former trailer location near RR tracks
Jan 2009	3	10	3	3 West side of Ulster Avenue

▪ 3.3.2. Monitoring Well Installation and Sampling

Groundwater monitoring wells were installed during the RI to characterize the groundwater quality and flow beneath the site. Specifically, six monitoring wells were installed on the American Cleaners Kingston site, five to a depth of approximately 16 feet and a deep one (MW4) to a depth of 32 feet next to MW6 near the back door.

Each monitoring well was installed and constructed in conformance with the following specifications:

- Wells were constructed with 2-inch-inside-diameter (ID), threaded, flush-joint, schedule 40 PVC casing and screen;
- Screens were 5 feet long with 10-slot (0.01-inch) openings;
- The annulus around the screens was backfilled with appropriately sized clean silica sand (e.g., Morie No. 1) to a minimum height of 2 feet above the top of the screen
- A bentonite pellet seal with a minimum thickness of 2 feet was placed above the sand pack. The bentonite seal was allowed to hydrate before placement of grout above the seal;
- The remainder of the annular space was filled with a cement-bentonite grout to near the ground surface. The grout was allowed to set for a minimum of 24 hours before well development;
- Each monitoring well had a sealed cap (J-plug) and was contained in a flush-mount drive-over vault. The J-plug keeps surface water from infiltrating into the well during rain events and high water conditions;
- The concrete seal or pad was sloped slightly to channel water away from the well, and was deep enough to remain stable during freezing and thawing of the ground.
- The vaults and concrete pads were completed so that they would not pose a trip hazard;

Table 1 summarizes the monitoring well construction details for each well installed at the site. Appendix A includes the monitoring well construction details for MW4 and MW6 and boring logs for each monitoring well.

No record of well development was found in the project transfer documents provided by Berninger. For that reason, all the wells were developed on December 8, 2009 prior to the sampling of the wells by Mid-Hudson Geosciences on December 14 and 15, 2009. The following points summarize the well development work.

- A one-inch diameter whale pump was lowered and raised thoughout the screened interval while pumping at a rate of 2 gallons per minute for 30 minutes or until the well went dry.
- MW1, MW3, MW5, and MW6 were pumped for 30 minutes at 2 gpm, except for MW5, which was pumped at 4 gpm.
- MW2 and MW4 produced brown sediment-laiden water and went dry. After waiting a few minutes, they were pumped repeatedly until clear water was produced.
- All purge water was passed through a gravity action 2-gallon activated carbon filter and discharged to the stormwater drainage system.

▪ 3.3.3. Groundwater Sampling from Monitoring Wells

Monitoring well sampling events were conducted by Berninger in December 2007 and by Mid-Hudson Geosciences in December 2009 involving the 6 onsite monitoring wells. Berninger used a traditional sampling method by removing three well volumes of water from the wells and then taking samples. Mid-Hudson Geosciences used the EPA Low Flow Sampling Protocol, which involves the following steps:

- At 3-5 minute intervals, depth to water is measured with a water level indicator
- Rate of flow and volume of water pumped is measured with a calibrated 1000-milliliter cylinder and a watch with second hand;
- Pumping rate of flow is established at 0.1 to 0.4 liters per minute using a variable speed peristaltic pump with dedicated ¼ inch tubing, pre-measured for each well;
- For the same time interval, water quality parameters are measured including pH, conductivity, turbidity, dissolved oxygen, temperature, and oxidation reduction potential,
- After about 20 minutes, when the water quality parameters usually stabilize, samples are collected in 40-milliliter glass vials with HCl preservative.
- After measuring the purge water was passed through a gravity action 2-gallon activated carbon filter and discharged to the stormwater drainage system.
- Quality Assurance samples were collected as follows: one trip blank originating from York Laboratories, one equipment blank passed through a dedicated ¼-in vinyl tubing, one duplicate sample (Dec 15, 2009 from MW5), matrix spike and matrix spike duplicate samples (Dec 15, 2009 from MW3).
- All samples were shipped with ice and chain of custody to York Analytical Laboratories for analyses by US EPA Method 8260 for the full list of analytes. The NYSDEC ASP Category B data package was requested.
- Water levels were measured at the completion of sampling.

Once the complete data valuation package is received from the lab, a data usability study will be conducted and sent to NYSDEC as a supplementary appendix to this report.

A strange odor was noted when developing the Deep Well MW4. A calibrated hnu meter was used to detect any volatile organic vapors emanating from the well when it was opened for sampling. A background reading of 2.1 ppm was detected, indicating that the odor is not organic in origin.

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■ 3.4. Soil Vapor and Air Sampling

Air sampling consisted of two methods of sampling for (1) soil vapor and (2) ambient air including building subslab locations, indoor building air, and nearby outdoor air. Both methods involve sample collection in a SUMMA® Canister for a specified period of time and analysis by EPA Method TO-15 full analyte list plus tentative identified compounds.

All gas samples were collected, analyzed and evaluated in accordance with the Draft Vapor Intrusion Guidance Document (New York State Department of Health, February 2005). Berninger used dedicated SUMMA® canisters provided by H2M Labs, Inc. Each sample was collected using a six-liter SUMMA® canister equipped with an attached pre-set flow regulator. Batch-certified clean canisters with an initial vacuum of approximately 26 inches of mercury were provided by the laboratory for sample collection. Flow regulators were pre-set by the

laboratory to provide uniform sample collection over a 24-hour sampling period except where site conditions or constraints necessitated a shorter sampling period. The flow controller/ regulator on the SUMMA® canister, as well as with the vacuum in the canister, was used to collect the air samples directly from the subsurface sampling points. The valve on the SUMMA® canister was closed when a minimum of two inches of mercury vacuum remained in the canister, leaving a vacuum in the canister as a means for the laboratory to verify the canister did not leak while in transit.

A helium tracer gas was used as a QA/QC tool to assess the integrity of the soil vapor probe seal and to confirm that infiltration of air from above the slab did not occur. An inverted plastic bucket was used as an enclosure to keep the tracer gas in contact with the probe during integrity testing, as described in the NYSDOH guidance document. A portable helium-monitoring device was used to analyze a sample of soil vapor prior to and after sample collection.

Detailed information was gathered at the time of sampling to document conditions during sampling and to aid in interpreting the test results. The following information was recorded in the field book:

- Weather conditions (precipitation, temperature and wind direction) prior to and during the sampling activities
- Date and time (start and end time) each sample was colleted
- Sample identification
- Identification of laboratory samplers/regulators/devices
- Purge volumes
- Volume of air/vapor extracted
- Vacuum pressure of canister (before and after sample was collected)
- Chain of custody identification
- Inventory of potential sources of VOCs in the area of the sampling

The SUMMA® canisters were delivered to H2M Labs with 24 hours of completion of sampling. Samples were submitted for laboratory analysis in accordance with the USEPA Compendium Method TO-15, entitled *Determination of VOCs in Air Collected in Specially Prepared Canisters and Analyzed by Gas Chromatography/Mass Spectrometry (GC/MS)*. Analyses for the TO-15 Target List and Helium were specified as well as the NYSDEC ASP Category B Data Package.

▪ 3.4.1. Soil Vapor Sampling

Soil gas collected from a natural soil column outdoors was accomplished a Geoprobe® equipped with a Post-Run Tubing System (PRT) and an expendable tip with Teflon tubing. The Geoprobe® PRT drilling system was used to selectively set a subsurface soil gas sampling interval. After setting up the sealed penetration using hydraulic cement around the top of the PRT, the area around the soil gas sample collection point was encompassed by a plastic container for the introduction of a tracer gas. Helium was used for the tracer gas in order to quantify any potential gas leak in the sampling system. After the introduction of the helium tracer gas, the annular space was purged a minimum of one volume of soil gas using a personal sampling pump. During purging and sampling, the flow rate was controlled not to exceed 0.2 liters per minute. After soil gas sample collection, the sample area on the ground

surface was scanned with a PID to ascertain if there were any VOCs in the air above the sample area.

The following table summarizes the dates and locations of 14 soil gas samples collected at and near the American Cleaners Kingston site.

Date	Sample Identification	No. Samples	Description of Sample Locations
N/A	SSSV1 SG1	2	Inside NE corner of Building and outside near back door
May 2006	SG2 through SG6	5	North & South Property Lines and between front Stormwater Drains
Feb 2007	SG7, SG8	2	Outside near SE & SW corner of Liquor Store
Jan 2009	SG10 through SG13	4	NW corner of Liquore Store and 3 across Ulster Avenue
Mar 2009	SG9	1	Parking Lot at Pauline's Restaurant directly across from Meinecke/AC Property Line

▪ 3.4.2. Air Sampling

For most building locations, a set of three air samples are collected with three separate SUMMA canisters, one each for sub-slab vapor, indoor air and outdoor or ambient air. The sub-slab samples are collected from beneath a first floor or basement slab floor similar to the method used for soil vapor sampling described above. The indoor and outdoor air sampling requires no additional probing or equipment beyond the SUMMA® canisters.

For concrete floors, a ½- to 1-inch diameter hole was drilled through the slab and a sample of the soil gas from beneath the slab was collected using a ¼-inch outside diameter stainless steel probe. The hole was sealed around the probe during sample collection using modeling clay. The probe was then installed into the sub-slab aggregate material (i.e., approximately 2 to 6 inches below the bottom of the slab, depending on conditions encountered). Teflon™-lined tubing was used to connect the sample point to the SUMMA® canister. After installation of the probes, one to three volumes of vapor (i.e., the volume of the sample probe and tube) was purged using the PID prior to collecting the samples. The flow rates for both purging and sample collection did not exceed 0.2 liters per minute. The temporary sample probes were installed and removed the immediately after the samples were collected. Berninger confirmed with NYSDOH that no helium is required for the sampling of sub-slab gas inside the building. At the completion of sampling, the floor was repaired using a similar material (e.g., Portland cement concrete patch).

For indoor air sampling, the SUMMA® canisters were deployed in the breathing zone on a counter, shelf or other object about 3 to 4 feet above the floor. For outdoor sampling, the canister location was usually on the ground because it should in located in an open area, but there is concern for potential vandalism of a shiny metallic instrument, which has to remain in place for 24 hours. Behind shrubs or fences proved to be secure or fortuitous locations.

The following table summarizes the date and locations of 10 air samples collected for offsite buildings in the vicinity of American Cleaners Kingston.

Sampling Date	Building of Sample Location	Samples		
		Subslab	Indoor Air	Outdoor Air
Jan 2009	Liquor Store	1	1	1
Mar 2009	Pauline's Restaurant	1	1	1
	Vacant Building (Front of RCAL)	1	1	
	Occupied Rear RCAL Building	1	1	

■ 3.5. Data Usability Assessment

Berninger hired independent contractors to provide data validation services for all of the batches of samples analyzed by H2M Labs. Berninger sent the NYSDEC ASP Category B Data Package to the contractor after it was received from the laboratory. The data usability reports are summarized in section 5.7 and the actual summary reports are provided in extensive PDF files in Appendix D.

■ 3.6. Survey of Monitoring Well Elevations

Berninger measured relative elevations of the measuring point on the top of PVC riser inside the protective casing to the nearest hundredths of a foot. The location or elevation of the benchmark used in this survey task is unknown. These elevations are recorded on a contour map of the water table elevations measured on October 17, 2007. The same elevations will be used for future water table and groundwater flow direction mapping.

4. Field Observations and Findings

Soils, fill material, unconsolidated sedimentary surficial deposits,and bedrock comprise the sub-aerial setting beneath the American Cleaners Kingston site. Surface water from stormwater and snowmelt provides recharge to the water-bearing zones in these geologic materials along with the downgradient groundwater flow from higher elevations on the uphill side of the Conrail tracks to the east. These elements provide the physical framework to investigate the nature and extent of contamination, to trace the fate and transport of contaminants, and to select and implement remedial measures to cleanup the remnants of dry-cleaning spillage.

■ 4.1. Regional Geological Setting

The Kingston site is located in the northern extent of the Great Valley section of the Appalachian Valley and Ridge physiographic province, where underlying carbonate bedrock has been folded in long anticlines and sysclines trending North 30 degrees East. The folded carbonate rocks were the source of cement, which was mined in both open pit and underground shafts and stopes in the 19th century and early 20th century. Kingston is located on the convergence of the Rondout Creek and the Hudson River, both water bodies and the Delaware & Hudson Canal connecting the south flowing drainage to the north-flowing Rondout provided transportation routes for the shipment of cement to markets to the south in Pennsylvania, New Jersey, and New York City.

The bedrock underlying the American Cleaners site is the Onondaga Limestone, a carbonate rock unit known for it's caves and flint content. The outcrop band of the Onondaga Limestone (the highest carbonate stratum in the Silurian-Devonian sequence in the fold belt) is quite soft with respect to erosion and the Rondout Creek has carved its valley in the Onondaga on the

northwestern side of the Shawangunk Ridge. Several caves and karst features are found along the valley floor of the Rondout from Ellenvile to Kingston in Ulster County. The Onondaga is also know for it's flint nodules which the native American Indians of the eastern New York mined for arrow heads and other cutting instruments.

The Conrail Railroad tracks immediately to the east of the site are laid along the eastern edge of the low floodplain of the meandering Esopus Creek located about 1 mile west o the site. East of the tracks the folded Silurian-Devonian fold-thrust belt rises up between the tracks and the Hudson River. The railroad comes from the south along the Hudson River and crosses the carbonate belt between the towns of Wilbur and Connelly and makes a right angle turn to the north south of the Kingston and Benedictine Hospitals in downtown Kingston. At that location, the belt was thinnest and many commercial interests were served by the railroad line in the older sections of the City of Kingston. Closer to the Esopus Creek and west of the American Cleaners site, the contact between the Hamilton Group and the underlying Onondaga dips gently west beneath the Catskill Plateau can be traced west beyond Buffalo and south into Pennsylvania. The Hamilton Group is the upper silt, sand, and shale unit of the Hamilton and the Onondaga Limestone is the lower carbonate unit making up the entire Middle Devonian (400 to 385 million years ago) stratigraphic column in eastern New York.

East of the Conrail tracks, the topography rises slowly (about 50 feet in about 1000 feet) to Route 9W. The Onondaga can be seen in outcrops on the east side of Route 9W near the bowling alley and the UPS terminal. Between Routes 9W and 32, the Onondaga limestone bedrock is found to top of ridges protected from mining interests and in wetlands where mines have removed the limestone for masonry products.

The topography all along Ulster Avenue (aka Albany Avenue) from Flatbush Avenue to Route 209 is relatively flat the street and the railroad tracks lie on the eastern side of the floodplain of the north-flowing Esopus Creek. The Federal designated 100-year and 500-year floodplains and a NYS-protected wetland are located just two blocks west of the site (about 1000 feet). The area called "Lincoln Park" on the USGS Kingston West topographic map is centered on the wetland area. The Esopus Creek and the eastern edge of its meander belt are located about 1300 feet due west of the site. The elevation of the site is reported at about 174 feet above sea level by Berninger; however the topographic map shows elevation of the site above 180 feet. The DeLorme® 3-TopoQuads show the site at 203 feet above sea level for both the WGS84 and the NAD27 datum. When the Esopus is within its banks the water is below 140 feet. Considering the topographic map, the gradient from the site to the Esopus Creek is about 40 feet over a distance of 1300 feet or a gradient of about 0.03.

The Soil Survey of Ulster County New York (USDA, 1979) shows that the Esopus floodplain is underlain by Riverhead fine sandy loam, 0 to 3 percent slopes (map symbol RvA). The general description of the RvA soil type is as follows:

"This deep, well drained, nearly level soil formed mainly in water-laid deltaic deposits from streams that entered glacial lakes. It is on the top of deltas, and some areas extend more than 1 mile. Most areas are irregular in shape and are 25 to 400 acres.
"Typically, the surface layer is dark brown fine sandy loam about 8 inches thick. The subsoil is very friable, dark yellowish brown and strong brown sandy load that extends to a depth of about 26 inches. The substratum to a depth of about 62 inches is dark yellowish brown and brown loamy silt and sand.

"Some of the Riverhead soils have seasonal high water table below a depth of 3 ½ feet. The soil warms up early in spring. After frost leaves the soil in spring, the level of free water falls rapidly. Roots are mainly confined to the upper 3 feet of the soil, but a few deep-rooted crops obtain water at a greater depth. Available water capacity is moderate. Permeability is moderately rapid in the surface layer and subsoil and is very rapid in the substratum. Runoff is slow, in unlimed areas reaction is very strongly acid or strongly acid throughout the soil.

"The soil is well suited to orchards and vineyards. The crops are deep-rooted so they are not as susceptible to drought. Irrigation is necessary during prolonged dry periods for high production.

"This soil is better than most soils in the county for a wide variety of urban and recreational uses. The included areas where the water table fluctuates to within 3 ½ feet of the surface are poorly suited to buildings with basements. In areas where the soil is used for disposal of septic tank effluent, very rapid permeability in the substratum can result in contamination of ground water. Sloughing is a hazard in excavations in this soil. The soil is a good source of sand and topsoil.

■ 4.2. Site Geology

As mentioned previously in section 3.2, 29 soil borings were drilled and sampled. Boring logs for a total of 6 monitoring wells and 25 soil borings were described by the staff of Berninger Environmental (Appendix A). Other soil borings were advanced into the unconsolidated sediments for the purpose of obtaining samples of groundwater or soil vapor, but the soils in those boring were not described or logged in any detail. The soil borings were reviewed meticulously and the locations mapped to scale for the purpose of creating a stratigraphic fence diagram (Figure 4-1 of the unconsolidated sediments beneath the site. As noted above the soil profiles of this area are usually developed by processes of weathering to a depth of feet and the additional material from base of soil profile to top of bedrock is a record of sedimentation associated with glacial, Aeolian, and stream deposition over the last 10,000 years identified as the Pleistocene and Holocene Epochs of geologic time.

The boring logs from four monitoring wells (MW1, MW2, MW3, MW5) were described from zero to 16 feet below ground surface. A well couplet was installed near the back door of the American Cleaners building with MW6 to 16 feet and MW4 logged to 45 feet. MW4 provides the only description of overburden deeper than 16 feet. Other soil borings in the series identified as SB1 through SB11 were used in creating the fence diagram. A fence diagram is a bunch of cross sections shown in their relative locations to show the correlation of strata between borings and to show lateral changes in sediments (as in facies changes reflective of gradual transitions from one depositional environment to another).

Examination of the soil sample descriptions indicated there are six or seven stratigraphic units (see legend on fence diagram). Three units are comprised of fill material that has been deposited on various parts of the site: Gravel, Black Organic Fill, and some of the Mixed Sand, Silt, and Clay. The soils under the building are disturbed to at least a depth of 5 feet because of the installation of the five trenches (four-feet deep inside) in the building as well as construction of underground utility lines such as water, sewer, heating oil fuel tank, and stormwater drains. The unconsolidated strata are described below in vertical sequence from

top down. This is contrary to the order of deposition, but in this case, the man-made fill deposits and the construction disturbance are easiest to describe first and then work down to the more continuous water bearing sand unit and the underlying confining clay layer.

Gravel was noted in MW5 and MW4 and is likely a remnant of site construction activities, since no gravel deposits are found at depth, nor in continuity from boring to boring.

The fine-grained ***Black Organic Fill*** is found just below the ground surface and restricted to the back of the lot behind the building. An isopach map (Figure 4-2) indicates that the unit is consistently about 2 feet thick with a 3 to 5 foot thick area observed in SB1 and SB3.

A distinctive 2-foot ***Silty Sand*** is found beneath most of the Black Organic Fill, east and south of the back door (Figures 4-1 and 4-3) is not found in front of the building, nor on the north side of the backyard. Mid-Hudson Geosciences believes this soil unit is in place and has not been disturbed. The isopach map of the thickness of the Silty Sand delineates a bar trending from MW3 south to SB6 and SB5. The Silty Sand unit has not been observed in front of the American Cleaners building.

Mixtures of Sand, Silt and Clay were observed at the surface in MW2 and MW5, in MW3 and SB3 and at just beneath the Black Organic Fill in SB10. These sediments are likely from construction activities prior to and contemporaneous with the distribution of the Black Organic Fill (see correlations with MW3 and SB10, SB3 and SB6, MW2 and MW5). Note that the Gravel is under this unit in MW5.

An ***Upper Clay Laye****r* was observed beneath the Silty Sand unit in an arc along the back property line and up to the backdoor (SB10, MW4, SB7, SB1, SB4, SB2, SB6), averaging about 6 feet thick and thinning to zero (Figures 4-1 and 4-4). Also this clay unit is fairly thick at MW1 (5 feet), but there is uncertainty if the clay was continuous from the front to the back of the property because most of that volume has been disturbed by construction of the building in 1982. This unit is very thin on the north side of the property as shown by only 1 foot in MW5 (4-5 ft) and 2.5 feet in SB8 (Figure 4-4).

A contour map (Figure 4-5) shows that the ***interface between the base of the Upper Clay Layer and the underlying top of the Water-Bearing Sand Unit*** is not flat, but it slopes from the northwest down to the southeast part of the property. In this part of New York, where glacial deposition is responsible for most of the overburden deposits, two potential environments of deposition are likely for this unit. One origin could be a delta where a glacial meltwater drops its sedimentary load when its stream enters a lake or another possibility is a meander bend in the old Esopus Creek channel. Some old oxbow lakes are visible on the topographic map supporting that genesis while the description of the deltaic deposits is presented in the Soil Survey of Ulster County. The slope beneath the clay and the delta shape of the deposit could support either environment of deposition, so for now there is not sufficient data to chose the best interpretation. Also the origin of the deposit may not be significant to understanding the hydrogeology of the site and its role in the fate and transport of contaminants.

In every soil boring drilled deep enough, the ***Water-Bearing Sand Unit*** was observed. The unit is correlated under the entire property and is the unconfined water table is associated with it at every location. The only location where the base of the sand has been penetrated is in

MW4, the deep well completed at 32.6 feet with a soil boring log to 45 feet. The Water-Bearing Sand Unit is a total of 18.5 feet (8.5 to 27 feet below ground surface). The water table is reported to be within a foot of the top of the sand in all borings.

A ***Confining Clay Layer*** is beneath the Water-Bearing Sand Unit (Figure 4-1). In MW4, it was found to be 13 feet thick (27 to 40 feet below ground surface). This saturated unit was described as "plastic clay inter-bedded with lenses of fine sand." The screen interval of MW4 was constructed at 27.6 to 32.6 feet in the Confining Clay.

A ***Mixture of Sand, Silt and Clay*** was reported beneath the Confining Clay at depths of 40 to 45 feet. This mixture of unconsolidated sediments is not related to the similar mixtures described as fill near the surface. The content is generally similar, but there is no stratigraphic correlation. The stratigraphic legend on the fence diagram (Figure 4-1) is based strictly on physical characteristics of the boring samples and not related to stratigraphic position, nor environment of deposition.

Bedrock was not reached in any of the soil borings. It is at a depth of more than 45 feet below grade.

Mid-Hudson Geosciences believes both the Water-Bearing Sand Unit and the Confining Clay Layer are fairly ***consistent in thickness and continuity*** under the American Cleaners site and very likely to found to the west of the property possibly reaching the Esopus Creek.

■ 4.3. Site Hydrogeology

The stratigraphic fence diagram (Figure 4-1) presented in the last section is a good starting place for defining the hydrologic conditions at the American Cleaners Kingston site because the porosity in the unconsolidated sediments and soils provide the conduits for the pathways of surface water recharge and groundwater flow. The Water-Bearing Sand Unit and the Confining Clay Layer were named for their significant hydrologic characteristics.

Monitoring Well Dimensions- During soil sample collection and monitoring well installation, the depth to the top of the zone of saturation was recorded on boring logs at about 10 feet below grade associated with the Water-Bearing Sand Unit. Once monitoring wells were installed with a screened interval of 10 feet from about 6 to 16 feet below grade (exact measurements for monitoring wells are summarized in Table 1 and the only available well construction details are shown in the "Proposed Well Construction Diagram with Lithologic Log" for MW4 and MW6 prepared by Berninger Environmental (included in Appendix A).

Note on Well Construction and Location of Couplet Wells- Although the monitoring well location maps show MW4 close to the building and MW6 farther away and the Proposed Construction Diagram indicates MW4 will be the shallow well and MW6 will be the deep well; field measurement has proven that MW4 is the deep well with a total depth of 32.6 feet and MW6 is the shallow well with a total depth of 16.1 feet. Although the diagram shows 5 feet of screen from 33 to 38 feet in MW6, the actual screened interval must be 27.6 to 32.6 feet. The diagram shows a 10-foot screen for the shallow wells, so it is assumed that all of the shallow wells (MW1, MW2, MW3, MW5, and MW6) have 10 feet of screened interval. [Note: underlining above indicates true conditions for MW4 and MW6 to eliminate any confusion.]

Vertical Occurrence of Groundwater beneath Site- The Water-Bearing Sand Unit has been identified as the hydrostratigraphic unit in the subsurface at this site and probably surrounding properties. The water table is shown on the fence diagram in the Sand. Below the Sand, the Confining Clay is saturated over its entire interval of 27 to 40 feet below ground surface. In fact, MW4 shows saturation from near the top of the Water-Bearing Sand Unit, through the Confining Clay Layer and down through the 5 feet of Mixed Sand, Silt, and Clay sediments from 40 to 45 feet at the base of the boring.

A **perched water table** (Figure 4-7) was identified in the following soil borings:

Well or Boring Identification	Date of Observation	Perched Water Table Interval	Boring Log Description
MW4/MW6	May 3-10, 2006	7-7.5	wet plastic clay
SB10	May 11-12, 2005	6-7	plastic clay
H	December 10, 2007	7.5-8	plastic wet clay layer
I	December 10, 2007	7.5-8	plastic wet clay layer
J	December 10, 2007	7.5-8	plastic wet clay layer
K	December 10, 2007	7.5-8	plastic wet clay layer

Perched Water Table- The perched water table seems to persist through time since it was observed and reported in three consecutive years. The areal distribution of the perched water is restricted to behind the building generally under the former trailer location and extending north to SB10 and west to MW4. On the east side of the trailer, most of the borings were not advanced deep enough to penetrate the perched water table. Those borings that did not reach the perched water table include A, B, D, G, and L.

The formation and dissipation of the Perched Water Table is not known at this time. It's relationship to the deeper unconfined and confined water tables is unknown. Most likely there is a stratum of limited extent, which entraps the water in a shallow bowl. When rainfall or snowmelt fills the bowl, it probably infiltrates deeper into the underlying Water-Bearing Sand Unit. The spill point is probably along the east side of the trailer because the base of the perched water is lowest at 8 feet below ground surface in soil borings K, J, I, and H along the west side of the former trailer location.

An alternative explanation of the Perched Water Table is that the water is reported to be in plastic clay and the plastic clay slow down the rate of vertical infiltration of rainfall and snowmelt thereby saturating the clay. Clays can hold a lot of water due to a porosity average of 40-70 percent. Water is held within the layered sheet structure of the clay. However clay is slow to give up water as evidenced by a range of low specific yields from 5 to 10 percent. For that reason clay hydrostratigraphic units are often considered aquitards or confining layers because limited amounts of water are transmitted through them. In this situation, It may be that the saturated plastic clay layer containing the perched water is in equilibrium with the infiltration rate. When water enters the top of the thin plastic clay layer, the same amount of water leaves the base of the layer.

Groundwater Flow Direction- Although the six- monitoring wells were installed around mid-2006, the first record of depth to water and contouring of the unconfined water table surface associated with the Water-Bearing Sand Unit is Berninger's map for October 17, 2006 site conditions (Figure 4-5) and the first sampling of the groundwater from the wells was December 11, 2007 (Table 4). In preparation for this report, Mid-Hudson Geosciences measured the depth to water while re-developing the wells on December 8 and sampling the wells on December 14 and 15, 2009. The water table configuration is very similar when conditions of

2007 and 2009 are compared (Figures 4-5 and 4-6). The direction of groundwater flow is along an ***azimuth of N65ºW [or 295º]*** and parallel to a line drawn between wells MW6 and MW5 (Figure 4-6).

Hydraulic Gradient- Based on a difference in water table elevation (162.71 minus 162.42 feet) in MW6 and MMW2 and the distance between them (about 100 feet), the ***hydraulic gradient is about 0.003***.

Little Impact of Building on Water-Bearing Sand- Because the water table is about 12 feet below ground surface, the foundation and utilities of the building have little effect on the water-bearing zone except to reduce vertical recharge to the sand directly under the building.

Upward Vertical Groundwater Flow Component- Another observation of the water levels is that the potentiometric surface of the confined water table screened in the deep well MW4 is higher than the phreatic surface of the unconfined water table in shallow well MW6. This differential is interpreted as evidence of an ***upward component of vertical flow of groundwater***.

Confining Clay at Beneath Water-Bearing Sand Unit- The difference in head in these two zones is created by the ***confining nature of the Confined Clay Layer*** between the screened intervals in the shallow and deep wells. Such subsurface flow conditions are important because they keep contaminants from sinking deeper into the overburden.and may sweep dissolved contaminants to the surface at some point downgradient.

Persistent Downgradient Groundwater Flow- Groundwater flow from southeast to northwest from upgradient on the other side of the Conrail tracks maintains the near constant water table

Evidence of Onsite Vertical Recharge via Infiltration- Some near instantaneous variations in water table height were observed in December 7 to December 14 when the water levels were monitored with transducers. The rapid rise in water table followed by a quick decline is interpreted as a response to infiltration of rainfall or possibly snowmelt.

No Pumping Effect Observed in Other Wells- The day after the transducers were installed in each of the 6 monitoring wells and set to measuring water levels every 5 minutes, each of the wells was developed with approximately a half hour of pumping at 2 gallons per minute. No impact on the water levels of other wells were observed during pumping.

Good Transmissivity and Storativity Properties of Sand Unit- The limited or virtually unobserved cone of depression effects during pumping indicates that the sand is relatively transmissive and has good storativity. In other words, the sand is highly permeable and porosity is good, allowing water to move through quickly the sand through a network of well-connected pore spaces to adjust for any water withdrawn with pumping.

Hydraulic Conductivity- To accurately measure hydraulic conductivity, a series of slug tests will be performed on each of the wells to have a quantitative measure of permeability of the Water-Bearing Sand Unit.

Estimated Permeability and Effective Porosity- For the Water-Bearing Sand Unit an estimate of permeability is about $1x10^{-3}$ using an average value range for silty sand presented in Freeze & Cherry (1979, Table 2.3, page 29). Effective porosity for fine sand is selected from a table of Specific Yields (Fetter, 1988, second edition, Table 4-3, page 74) averaged at 0.21 from a reported range of 10 to 28 percent. Specific yield is actual water given up by a unit pore volume of sediments, so it is a better approximation than actual porosity because porosity is measured by heating the sediment and driving all water out of the sample.

Average Linear Groundwater Flow Velocity- The average linear velocity of groundwater flow is the actual rate at which one could observe a tracer moving in the groundwater from one point to another. As Freeze and Cherry (1979, page 71) state average linear velocity (V_X) "does not represent the average velocity of water particles traveling through pore spaces. These true, microscopic velocities are generally larger than V_X, because the water particles must travel along irregular paths that are longer than the linearized path represented by V_X." The average linear velocity is found by multiplying the hydraulic conductivity ($1x10^{-3}$ cm/sec) times the hydraulic gradient (0.003) and dividing by the effective porosity (0.21). Using those values, V_X is found to be 1.42 $x10^{-5}$ cm/sec, which is equivalent to an average linear groundwater flow of 4.47 meters per year.

Physical-Chemical Properties of Groundwater- With the low flow sampling method, several water quality parameters are measured while pumping to obtain stabilization. During the purging process, the following parameters were measured in each of the monitoring wells for a minimum of 4 times, every 5 minutes for a total of 20 minutes or more: pH, conductivity, Turbidity, Dissolves Oxygen, temperature, and Oxidation Reduction Potential. These readings are important to define the nature of the groundwater environment for the potential for bioremediation or chemical oxidation remediation. If the environment is not suitable with respect to these qualities, remediation may be ineffective. Hence, it is important to collect this information now and during the remedial design phase.

■ 4.4. Field Observations of Dry-Cleaning Impacts

At the American Cleaners Kingston site, there do not seem to be any actual field observations that one could make on a daily basis, such as stains on the ground or chemical buildups on solid surfaces or persistent odor in the air. The contamination that has been detected requires digging to depth in the soils, sampling groundwater at depth, and sampling air for 24 hours.

As will be described in great detail in Section 5, Low levels of VOCs at background levels of 2-3 parts per million were detected from soil samples using a Photoionization Detector. Low levels of tetrachloroethylene have been found in soils where the molecules apparently are sorbed onto soil particles. Dissolved product has been detected in groundwater. Gaseous tetraethylene has been detected in soil gas and air samples collected from subsurface soils, sub-slab locations under buildings or parking lots, indoor air, and outdoor air samples.

Other anthropogenic activities, which may relate to subsurface contamination include the installation an underground storage tank for heating oil and distribution of black organic fill in the backyard of the American Cleaners building. When the oil tank was replaced with a new smaller one, sampling at that time and in soil borings SB1 through SB4 of this investigation indicated no contamination at that location. The nature and origin of the black organic fill

material is unknown. The remedial investigation has had many soil boring penetrate and scan this black material many times over the years with no indication of VOC contamination.

■ 4.5. Land Use & Database Search

On June 12, 2009, a three-part database search was obtained from Environmental Data Resouces, Inc. of 4340 Wheelers Farms Road, Milford, CT 06461 (phone 800-352-0050, www.edrnet.com). The entire EDR Environmental Database Search within 0.5 miles of American Cleaners Kingston is contained in Appendix B of this report. The search within a half mile radius around American Cleaners Kingston included a Certified Sanborn Map search (no maps found), Aerial Photo Package (6 photos, only 1978 and 2006 were useful), and ERD Radius Map™ Report with GeoCheck®.

The map findings summary listed the following sites of interest within 0.25 miles of the site:

Record Type	Miles from 734 Ulster Ave	Number of Sites Plotted on Map
RCRA-SQG	1/8 -1/4	1
RCRA-CESQG	1/8 - ¼	1
LTANKS	1/8-1/4	6
LTANKS	1/4-1/2	14
HIST LTANKS	1/8 - ¼	5
HIST LTANKS	1/4 - ½	10
UST	1/4 - 1/8	4
AST	< 1/8	2
AST	1/8 -1/4	5
HIST AST	< 1/8	1
HIST AST	1/8 - ¼	6
NY Spills	< 1/8 *	1
NY Hist Spills	< 1/8 *	1
RCRA - Nongen	1/8 - ¼	4
MANIFEST	1/8 - ¼	4

Of these items, the “NY Spills” and “NY Hist Spills” at less than 1/8 mile refer to a place named “Auto Repair,” which actually has a record of contamination and is located directly across the street from American Cleaners, behind and to the left of Pauline’s Restaurant. The text in the EDR Report (page Executive Summary 9) states:

Page Map ID Direction / Distance Address Lower Elevation _____ _____ _____ ____

_____

AUTO REPAIR 721 UISTER AVE. WSW 0 - 1/8 (0.115 mi.) 6 106
Date Closed: 11/29/1994
NY Hist Spills: This database contains records of chemical and petroleum spill incidents. Under State law, petroleum and hazardous chemical spills that can impact the waters of the state must be reported by the spiller (and, in some cases, by anyone who has knowledge of the spills). In 2002, the Department of Environmental Conservation stopped providing updates to its original Spills Information Database. This database includes fields that are no longer available from the NYDEC as of January 1, 2002. Current information may be found in the NY SPILLS database.
A review of the NY Hist Spills list, as provided by EDR, and dated 01/01/2002 has revealed that there is 1 NY Hist Spills site within approximately 0.125 miles of the target property.
Page Map ID Direction / Distance Address Lower Elevation _____ _____ _____ ____

_____

AUTO REPAIR 721 UISTER AVE. WSW 0 - 1/8 (0.115 mi.) 6 106
DRIPPING ON GROUND ONGOING FOR FIVE MONTHS
A 275 GAL ABOVEGROUND TANK WASTE OIL AND ANTIFREEZE) WITH HOLE IN BOTTOM Remark:
Not reported DEC Remarks:

The report contains two maps. An over view map shows a radius of 1 mile and with 13 sites within ¼ mile and 9 sites within ¼ to ½ mile from American Cleaners Kingston (Figure 4-8 in this report). On the detailed map (Figure 4-9 this report), the following 3 sites are shown within1/8 mile of American Cleaners

Map Number	Business Name	Street Address	Role in Listing	Elevation	Distance (ft) & Direction
4	Meineke Car Care	716 Ulster Ave	Waste Oil	180	140 South
5	Prestige Auto	786 East Chester	ASTs, USTs	189	438 East
6	Auto Repair	721 Ulster Ave	AST spill	176	609 West

As mentioned above the Auto Repair site is the only one to have a history of spills, Although it is located downgradient, it is located within 200 feet of American Cleaners. The distance of 609 feet in the database is an error. Meineke Car Care Center is located on the adjacent property to the south of American Cleaners. Many USTs and ASTs are reported there and they store waste oil. Allthough Meineke may have a risk of spills, the site is cross gradient in terms of groundwater flow relative to the American Cleaners location, but Meineke is upgradient from building on the west side of Ulster Avenue. Prestige Auto is located upgradient, but it is a significant distance away. If hydrocarbon contaminants are detected on the upgradient (east) boundary of the property, sources such as Prestige Auto, Conrail (did have a spill on tracks, but chemicals and location unknown), Laidlaw Transit at 6 Keiffer Lane, NY PreCast, LLC (6 Kieffer Lane), and Kingston Block & Mansonry Supply, LLC (1 Kiefer Lane). Kieffer Lane (aka Keiffer Lane and Kiefer Lane) are all located directly opposite American Cleaners on the east side of the Conrail tracks. At this time no contaminants other than tetrachloroethylene have been found in groundwater on the east side of American Cleaners Kingston parcel.

On the overview map (Figure 4-8), on the western edge the meandering Esopus Creek is shown and the area of a wetland to the northwest of American Cleaners is show.

5. Analytical Results Define Nature and Extent of Contamination

This section presents the environmental conditions present in soil, groundwater, soil gas (vapor), and air (sub-slab, indoor, and outdoor) samples and field observations collected during several phases of field investigation. Analytical results are provided in tabular form for each environmental media. Where appropriate applicable analytical data for each medium are compared to cleanup objectives and/or screening criteria to identify *constituents of potential concern* (COPCs). COPCs are defined as any constituent that is detected at a concentration greater than a cleanup objective or screening value. The environmental conditions in each sample media are also illustrated in figures as an aid to evaluate the vertical and horizontal distribution of the target compound at the Site.

Based on the data validation as provided in data usability reports (Appendix D) by independent contractors it is concluded that the data quality is usable for the purposes of satisfying the project objectives.

5.1. Screening Criteria

PCE concentrations in soil samples was compared to Recommended Soil Cleanup Objective (RSCO) of 700 ug/L listed in NYSDEC TAGM 4046. That RSCO represents a conservative

value for protection of human health, groundwater, and ecological systems. Specifically, the human-health based RSCOs were developed in consideration of exposure of a child resident and an adult resident to soils via ingestion, inhalation, dermal contact, and through consumption of homegrown vegetable and animal products. The groundwater RSCOs are protective of groundwater via the soil to groundwater migration pathway (i.e., soil leaching and groundwater transport). The ecological RSCOs are protective of ecological resources (i.e., wildlife).

For groundwater, standards and/or guidance values from the NYSDEC (1998) Technical and Operational Guidance Series (TOGS) 1.1.1 Ambient Water Quality Standards and Guidance Values and Groundwater Effluent Limitations were used to identify constituents of potential concern. Specifically, Class GA standards and guidance values of 5 ug/L was used to screen groundwater data. That standard and guidance value is considered protective of drinking water sources.

Air samples were collected as part of the field investigation to determine if there is a complete transport pathway of PCE from soil gas and/or sub-slab vapor to indoor air. If a complete transport pathway for PCE in indoor air then both of the following environmental conditions must be present:

- PCE must be present in indoor air and ambient air or soil vapor
- PCE concentration in ambient air or soil vapor must be greater than the concentration in indoor air.

Note the second condition assumes there is no indoor source of PCE present. Indoor air sample results were compared to ambient air, soil gas and sub-slab vapor results as well as the NYSDOH Guideline for PCE in air (100 ug/m3 = 15 ppbv, NYSDOH, 2006).

■ 5.2. Soils in the Vadose Zone

The evaluation of the PCE contamination in soil is based on 33 soil samples from 29 soil borings. Validated analytical results for VOCs are provided in Table 2. Independent soil sample data validation reports and the laboratory Category B data packages are provided in Appendix D.

Total VOC concentrations ranged from ND (not detected) to 430 and PCE concentrations ranged from ND to 370 ug/kg. No samples exceed the TAGM 4046 Recommended Soil Cleanup Objective for PCE of 1.4 ppm of 1400 ug/L. The individual concentrations are posted next to boring locations with the sample depth shown as concentration @ depth format (Figure 5-1).

No degradation products of PCE were detected in the soil samples except for one sample obtained from the sediments in the stormwater drain behind the building. Such degradation products of PCE are from the reaction series

PCE → TCE → DCE → VC → Carbon Dioxide

Where PCE is tetrachloroethylene (aka perchloroethylene or “perc”), TCE is tricholorethene, DCE is 1,2-Dichloroethylene, and VC is vinyl chloride.

The laboratory analysis of the sediment sample from the stormwater drain did show 280 ug/kg 12DCE and 130 ug/L vinyl chloride indicating that some form of biodegradation or natural attenuation is occurring in the drain environment.

Figure 5-2 shows areas of PCE concentrations in unsaturated soils at two depth intervals. The surface zone of zero to 4 feet is centered on the stormwater drain and extending about 50 feet to northeast to SB10 and 40 feet east beyond the former trailer location. This upper soil zone of PCE contamination is associated with the Black Organic Fill and the underlying Silty Sand unit. A deeper zone from 6 to 10 feet is smaller and concentrated under the former trailer location and is associated with the Upper Clay Layer.

■ 5.3. Groundwater

The evaluation of the PCE contaminant conditions in groundwater is based on laboratory analyses of 72 samples of groundwater from Geoprobe® soil borings and two rounds of sampling from 6 onsite monitoring wells. For the Geoprobe® groundwater samples, a summary of validated PCE and other VOC analytical results are provided with the sampling depth interval Table 3. Validated PCE concentrations for PCE are shown in Table 4 for the monitioring well samples.

The Geoprobe® samples were collected from four depth intervals: 9.5 to 16, 19.5 to 25, 29.5 to 36 and 42 to 44 feet below grade. Examination of Table 3 indicates that no PCE was detected in the two deeper sampling zones (29.5 to 36 and 42 to 44 feet). Maps of the upper two zones were prepared to show contours (isopleths) of the PCE concentrations in the groundwater (Figures 5-3 and 5-4).

PCE concentrations in the 9.5 to 16 feet interval are clustered in two areas, one north of the shed next to the back wall of the American Cleaners building (samples boring GW8 and GW18) with concentrations of 7200 and 1900 ug/L and a larger linear trend from the trailer area to the building (samples GW17, GW11, and GW7) with concentrations of 9700, 6000, and 7300 ug/L. The PCE plume seems to emanate outward from these two source areas as a result of hydrodynamic dispersion of groundwater. Also the PCE-plume seems to be moving to the northwest along linear pathways from the trailer area to the front of the building where it seems to diminish to low levels under Ulster Avenue. There also seems to be a component of flow due west from the source area under the trailer with groundwater moving toward MW1.

Figure 5-4 shows the PCE concentrations in the second zone of 19.5 to 25 feet, which indicates that areas of PCE are not continuous and are restricted to four areas. The three areas on the American Cleaners property seem to the results of vertical dispersion of PCE in the groundwater in the lower Water-Bearing Sand Unit.

The fourth area on the west side of Ulster Avenue, where PCE concentrations of 78 and 28 ug/L were detected in the upper zone and second zone, respectively. This area of PCE contamination may be reaching the driveway area to the Auto Repair building from a source other than American Cleaners. More evidence of this is cited in the section 5.5 in the evaluation of soil gas and sub-slab air samples.

In groundwater samples, the highest concentrations of PCE is 9700 ug/L, which is two orders of magnitude less than any reported solubility values (Montgomery, 1996, page 949). There is

no evidence of discovery of free product in any of the remedial investigative sampling and the level of PCE concentrations indicate that the PCE is dissolved in groundwater.

The distribution of PCE in the groundwater (Figures 5-3 and 5-4) indicates the presence of a fan-shaped plume emanating from the source area under the former trailer location. A secondary source seems to be located under the northeast corner of the building. Most of the PCE plume is in contravention of the NYSDEC Class GA groundwater standard of 5ug/L.

■ 5.4. Surface Drainage and Sediment

Surface drainage of stormwater is directed by gently sloping ground surfaces to the three drainage grates, one directly behind the building in the back parking area and two in the front parking lot (shown on most of the figures). Sediment was sampled from the back drainage line and PCE was detected at 71 ug/L as reported in Table 2 and Section 5.2.

■ 5.5. Soil Vapor and Air Sampling

Soil vapor samples were collected for 13 sample points and air samples were collected from 5 sub-slab locations, 4 indoor air and 2 outdoor air locations. The sub-slab and soil vapor samples are discussed together as they are comparable because the samples are obtained from similar unconsolidated soil media.

▪ 5.5.1. Soil Vapor and Sub-Slab Air Sampling

Validated laboratory analyses for VOCs for the 13 soil vapor samples are reported in Table 5. Analyses of air samples are provided in Table 6. Since “New York State currently does not have any standards, criteria or guidance values for concentrations of compounds in soil vapor.” (NYSDOH, 2006, page 41), there are no screening criteria for these samples.

Concentrations in soil vapor and sub-slab samples are shown on Figure 5-5. Soil vapors originating from the American Cleaners source area in shallow soils appear to follow subsurface pathways where soils have been disturbed for construction of underground utility lines. American Cleaners constructed an underground tunnel beneath Ulster Avenue (along a line parallel to the north side of the building) for connection to the municipal water line, which runs along the west side of Ulster Avenue. The tunnel is likely a conduit, through which PCE vapors may migrate westward under Ulster Avenue. The presence of PCE in the soil vapor samples near the Liquor Store to the north of American Cleaners indicates that a subsurface pathway exists (Figure 5-5). However, the specific subsurface conditions or construction activities responsible for the pathway are unknown.

The soil vapor sample collected at SG14 in the southeast corner of the Auto Repair property does not seem to have migrated from the American Cleaners site. A different suite of VOCs, specifically BTEX, was detected at SG14 compared to those found in samples collected at SG4 and SG6 on the American Cleaners property. Also a different suite of VOCs was detected in the sub-slab sample collected at Pauline’s Restaurant.

▪ 5.5.2. Indoor Air and Outdoor Air Sampling

Validated sample analyses for air samples are listed in Table 6 and summarized on small tables shown on Figure 5-6. A review of the laboratory results indicates that no indoor air samples exceed the NYSDOH air guideline value of PCE of 100 ug/m^3, equivalent to 15 ppbv. VOCs found in the indoor air samples are generally two orders of magnitude less than the sub-slab sample collected at the same building. In the three neighboring buildings across Ulster Avenue, many of the VOCs are detected at higher levels than measured at American Cleaners. The differing suites of VOCs indicate that vapors from sources other than American Cleaners may have migrated to the buildings on the west side of Ulster Avenue. Other possible sources could be Meineke Care Care Center or Auto Repair or other businesses such as gas stations shown on the detailed map presented in the EDR database search and included in this report as Figure 4-10.

■ 5.6. Data Validation

All of the data validation reports conveyed to Mid-Hudson Geosciences by Berninger are included in Appendix D.

6. Conceptual Site Model Reveals Contaminant Fate and Transport

This section of the RI presents the conceptual site model, which pertains to the nature, extent, and transport of PCE in subsurface soil and groundwater.

■ 6.1. Sources, Nature, and Movement of PCE

Based on information obtained during the remedial investigation, there is one primary source and one secondary source PCE behind and under the American Cleaners building, where presumably PCE was inadvertently spilled on the ground or leaked out of containers or filters.

▪ 6.1.1. Primary Source

Figure 5-2 shows the isopleths of the PCE impacted contamination area in shallow fill and soils from zero to 4 feet depth interval and a deeper zone at 6 to 10 feet (Figure 5-3) with a more focused area of impact. The center of mass of the deeper PCE-laden soil zone is farther to the southeast from the building than the near surface one. Maximum concentrations in the soil are 310 and 280 ug/kg in the upper and lower zones, respectively. From the surface interval apparently PCE moves downward and southeastward into the 6 to 10 zone. The movement is the result of PCE dissolving in rainwater infiltrating down through the vadose zone.

The dissolved PCE enters the water table at approximately 10 feet below grade. The maximum concentrations of PCE in groundwater are 9700 and 3400 ug/L for the upper (9.5 to 16 feet) and lower (19-25 feet) groundwater zones, respectively. Once PCE is in the groundwater, the process of hydrodynamic dispersion spreads the PCE plume outward and downward from the focused area in the soils. Also the PCE dissolved in the groundwater travels predominantly N65°W at least in the area from the former trailer location under the American Cleaners building and out to Ulster Avenue. The average linear velocity is estimated as 4.5 meters per year (Section 4.3). As delineated by isopleths on Figure 5-3, the PCE plume seems spread out in a fan shape from N65W counterclockwise to about due west. The flow of

N65W seems to apply to the northern half of the American Cleaners property, but a more westerly flow direction may be present under the southern half of the property. Also near the front door of the building, the plume seems to bifurcate into two "streams" moving in the directions described above.

▪ 6.1.2. Secondary Source

The area of high concentrations near the northeast corner of the building is split form the trend of higher concentrations originating under the old trailer location (Figure 5-3). The split is characterized as a linear area of low PCE concentration and may be a result of two original spills on the site or the pumping of MW4 and MW6 removing. Apparently, a spill did occur in the building and the PCE entered the soil and groundwater under the building because PCE was not detected in GW8 just outside the building north of the shed.

The effect of development and purging of monitoring wells may have lowered concentrations in the immediate vicinity since the following monitoring wells shows a lower PCE concentration than nearby Geoprobe® samples: MW6, MW3, MW5, and MW1.

During redevelopment of the wells (December 2009), there was no observable impact on other wells with pumping at 2 gallons per minute (GPM) for 30 minutes. That condition may result because the best groundwater flow may be restricted to highly-permeable thin pathways in the Water-Bearing Sand Unit. It may be that such express water flow paths are oriented N65°W on the north half of the property and closer to N90°W on the south half, thereby explaining the divergence of the plume (Figure 5-3).

▪ 6.1.3. Vertical and Horizontal Extent of Contamination

The vertical extent of PCE in the groundwater is as deep as 25 feet below grade (Figure 5-4), but is mostly contained within the first 10 feet of the Water-bearing Sand Unit as shown on the fence diagram (Figure 4-1) and the isopleth map for the 9.5 to 16 feet (Figure 5-3). Considering the areas of PCE contamination in that deeper interval (Figure 5-4), the areas on the north side of the building and behind the building are likely a result of hydrodynamic dispersion and somewhat higher porosity and permeability in those areas.

Originally the PCE concentrations at GW27 and GW26 were considered an extension of the plume from behind the American Cleaners building. A first interpretation was that the secondary WSW component of the plume may be traveling farther west than the N65W component. The majority of the PCE is contained in the upper in the 9.5 to 16 foot interval. However the extent of the WSW moving plume shown on Figure 5-3 also has PCE in the next deeper interval at 19.5 to 25 feet as depicted on Figure 5-4. A more plausible interpretation arises from further review of the location of GW27 and SG14 sampling points on the west side of Ulster Avenue (near the entry driveway to Auto Repair). By looking at both soil gas and groundwater results, one can conclude that the soil vapor has a different suite of VOCs, which are not present in the closest soil vapor samples at American Cleaners. It is quite likely the PCE at that location come from another source, perhaps a spill of brake cleaning fluid at the Meineke Car Care Center located immediately to the south of American Cleaners.

■ 6.3. Fate and Transport of Contaminants

The following table lists the processes or mechanisms involved in the fate and transport of PCE contaminants:

Contaminant Fate and Transport Processes		
Medium	**Process**	**Result**
Ground surface	Volatilization	Liquid to gas and dispersal in atmosphere
Air	Wind	Moves and disperses gases in atmosphere
Soil	Gravity	Moves liquid into soil
Soil	Dissolution	Contaminants dissolved in rainfall or snowmelt and infiltrate deeper into the soil
Soil	Sorption	Temporary adhesion of PCE molecules to soil
Soil	Leaching	Desorption of PCE and movement into groundwater
Groundwater	Hydrodynamic Dispersion	Mixes dissolved PCE with cleaner water and spreads out the plume
Groundwater	Hydrodynamic Flow Advection, Dispersion	Moves PCE plume downgradient through preferrential pathways of porous & permeable media in the Water-Bearing Sand Unit
Groundwater	Volitilization	At water table, releases PCE as a gas beck into soils in the vadose zone.
Soil & Groundwater	Biodegradation	Breakdown of PCE into series of products PCE → TCE → DCE → VC
Soil & Groundwater	Biodegradation as Type 2 Behavior anaerobic conditions	in the presence of biologically available native organic Carbon, microbes use the carbon as a source and they metabolize the ethene solvents by reductive dechlorination.
Soil & Groundwater	Biodegradation under aerobic conditions	In the presence of dissolved oxygen, VC can be oxidized rapidly.

One question, which arises from the examination of the analytical data for this site is “why are degradation products not detected in the groundwater and only tiny amounts in the soil vapor analyses?” One explanation may relate to the possibility of high organic carbon content of the Black Organic Fill, which is found in the upper two feet of soil in the entire area behind the American Cleaners building. It could be that during saturated infiltration conditions, the presence of the carbon allows the microbial population to degrade the PCE down to VC under reducing conditions. When the soil dries out and oxidizing conditions recur, the VC is oxidized. Hence, near surface fluctuating conditions may be responsible for some PCE degradation.

■ 6.4. Potential Exposure Pathways and Receptors

Analytical data indicate that there PCE concentrations in soil samples and indoor air quality samples are within NYS guidelines. Groundwater beneath the site is not used as a potable source and therefore exposure via ingestion of groundwater is unlikely. Likewise, there is relatively little potential for direct contact to groundwater for residents, recreational users, and workers given the depth to groundwater and because these receptors would not be involved in intrusive activities. Due to the nature of groundwater and the lack of surface waters at this site and neighboring properties, there is no potential impact on wildlife and fish.

■ 6.5. Potential Changes in PCE Contaminant over Time

The maps of PCE concentrations in groundwater have been constructed to show variations in three dimensional space for the two contaminated intervals. The groundwater samples taken with the Geoprobe® represent plume conditions at one point in time at one depth. Sampling of the monitoring wells will be used to document changes in PCE concentrations in the future.

🏛 7. Qualitative Human Health Exposure Assessment

This section of the RI presents a qualitative human health exposure assessment, which evaluates the potential for human exposure to PCE released at the American Cleaners Kingston site. This assessment is prepared consistent with the NYSDOH guidance as presented in *Draft DER-10 Technical Guidance for Site Investigation and Remediation* (NYSDOH, 2002) and uses information regarding current and foreseeable land uses and available site data to evaluate the potential for exposure of human receptors. The assessment includes an evaluation of contaminant fate and transport for PCE and the identification and characterization of complete exposure pathways. The results of this qualitative exposure evaluation will be used, in part, to help evaluate proposed remedial actions for the site.

■ 7.1. Site-Specific COPC

PCE is the site-specific COPC for soil, groundwater, and indoor air. Other VOCs such as the BTEX compounds may be present in neighboring properties, but they have not come from a source on the American Cleaners.

■ 7.2. Contaminant Fate and Transport

PCE has a high vapor pressure and will partition into the atmosphere from surface soil and surface water. Rates of volatilization from soils depend on temperature, humidity and soil type. Subsurface soil infiltration will also occur. This chemical has a relatively high mobility in soils because sorption is not significant enough to prevent migration. PCE will leach into the groundwater particularly in soils with low organic carbon. In surface water, PCE can be transformed via photooxidation and biodegradation. In soils, anaerobic soil microbes are responsible for biodegradation.

■ 7.3. Exposure Assessment (potential exposure points, receptors and route of exposure)

An initial step in evaluating potential human exposure is the identification of potentially complete exposure pathways. For an exposure pathway to be complete, the following five elements must exist: 1) a contaminant source; 2) contaminant release and transport mechanisms; 3) a point of exposure; 4) a route of exposure; and 5) a receptor population. If all five elements exist, then that exposure pathway is considered to be complete (NYSDOH, 2002).

▪ 7.3.1. Potential Direct Contact with Soil

Potential direct contact with soil is not a concern because the PCE concentrations measured in all of the soil samples were below the Recommended Soil Cleanup Objective.

▪ 7.3.2. Potential Inhalation of Vapors from Surface Soil

Potential inhalation of vapors from soil is not a concern because the PCE concentrations measured in all of the soil samples were below the Recommended Soil Cleanup Objective.

▪ 7.3.3. Direct Contact with Groundwater

The groundwater Table beneath the site ranges from approximately 9 to 12 feet below grade. Groundwater is not used as a potable source at the site, and depth to groundwater precludes potential direct exposures of human receptors to this medium. Construction workers may be exposed to site groundwater during intrusive activities, but potential exposures could be mitigated by use of personal protective equipment. Based on the lack of an exposure point, groundwater is not considered to be a complete exposure pathway.

▪ 7.3.4 Inhalation of Indoor Air

Since concentrations of PCE detected in air samples were below the NYSDOH air guidance value of 100 ug/L (15 ppbv), an exposure pathway is not considered.

■ 7.4. Impact on Fish and Wildlife Summary

PCE at the American Cleaners site and surrounding properties does not impact fish or wildlife because the groundwater is the only contaminated medium to exceed NYS guidance values. The groundwater is buried 9 to 12 feet below grade making wildlife exposure unlikely. There are no surface waters on any of the subject properties, except stormwater and snowmelt flowing to drainage grates and entering the highway department's stormwater drainage system. For that reason, there is no exposure for fish and wildlife to surface water.

■ 7.5. Summary

Analytical data indicate that PCE concentrations measured in soil samples and indoor air quality samples are within NYS guidelines. Groundwater beneath the site is not used as a potable source and therefore exposure via ingestion of groundwater is unlikely. Likewise, there is relatively little potential for direct contact to groundwater for residents, recreational users, and workers given the depth with groundwater and because these receptors would not be involved in intrusive activities. Construction workers may be exposed to groundwater during future intrusive activities, although these exposures could be mitigated with the use of personal protective equipment.

🏛 8. Summary and Conclusions .

■ 8.1. Summary

The horizontal and vertical extent of PCE contamination at American Cleaners Kingston and neighboring properties has been outlined on maps of soil samples (Figures 5-1 and 5-2), groundwater samples from Geoprobe® locations and monitoring wells (Figures 5-3 and 5-4), soil vapor samples and sub-slab air samples (Figure 5-5) and indoor and outdoor ambient air (Figure 5-6).

There is concern that BTEX and other VOC compounds may be migrating onto neighboring properties from unidentified external sources, not controlled or owned by American Cleaners Kingston. Those neighboring properties are on the west side of Ulster Avenue.

There are no significant exposure pathways because the only groundwater is in contravention of NYSDEC standards and guidance values. Groundwater is 9 to 12 feet below grade, so it is not likely to be in contact with receptors except possibly during during construction activities.

■ 8.2. Conclusions

The RI objectives are achieved. In groundwater on the west side of Ulster Avenue, the most southwest sampling point (SG14 and GW27) is considered beyond and separate from the American Cleaners plume, because suites of BTEX and other VOCs are detected there in greater concentrations than observed at sampling points on the east side of Ulster Avenue on the property of American Cleaners.

■ 8.3 Recommendations for Future Work

Some data gaps which may prove useful for the Remedial Action Selection Report may include:

- Measurement of hydraulic conductivity (permeability) of the Water-bearing Sand Unit in the screened interval of the five shallow monitoring wells. Slug tests can be conducted prior to preparing the remedial design.
- Obtain information on location, depth, and construction details for underground utility lines on the site and impacted neighboring properties.
- Evaluation of soil vapor, sub-slab, and air sampling to identify other sources of non-PCE contamination with VOCs on the neighboring properties.
- Collect new Indoor and Sub-slab Air Samples in the northeast interior of the American Cleaners Kingston building to assess current conditions.
- Continue sampling the onsite monitoring wells.

■ 8.4. Recommended Remedial Action Objectives

Appropriate remedial action objectives are selected to attain the goal of restoring the site to pre-contaminant conditions to the extent feasible. At a minimum, the remedy shall eliminate or mitigate all significant threats to public health and the environment presented by the contamination identified a the site through the proper application of scientific and engineering principles. The following protective remedial objectives may be appropriate, if significant threats to public health can be substantiated:

Remedial Action Objective #1 - Public Health Protection of Groundwater

- § Prevent people from drinking groundwater with contaminant levels exceeding drinking water standards.
- § Prevent contact with contaminated groundwater.
- § Prevent inhalation of contaminants from groundwater.

Remedial Action Objective #2 - Environmental Protection of Groundwater

- § Restore the groundwater aquifer to meet ambient groundwater quality criteria, to the extent feasible.

§ Prevent discharge of contaminated groundwater to surface water.

For each of the preventive objectives for groundwater, mitigating measures already exist because the groundwater is at a depth of 9 to 12 feet below grade and the groundwater does not discharge to surface water. The restorative measure may not be needed if the site groundwater is similar in quality to the ambient groundwater in the neighborhood.

Remedial Action Objective #3 - Public Health of Soil Vapor Intrusion

§ Mitigate impacts to public health resulting from existing, or potential for, soil vapor intrusion into the indoor air of buildings at or near the site.

To date, on neighboring properties, all air sampling has shown that all indoor air quality is within the NYSDOH Guideline for PCE of 100 ug/m3, equivalent to 15 ppbv. Hence, there is no need to mitigate soil vapor concentrations of PCE on neighboring properties.

If a new sub-slab air sample shall be collected and analysis compared with the previous level of PCE trapped under the American Cleaners building. If levels are comparable, remedial measures such as active soil vapor extraction shall be appropriate. If levels have dropped and the indoor air quality is less than the NYSDOH Guidance value for PCE, then mitigation measures will not be necessary.

9. References

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TABLES

Voluntary Cleanup Program

Remedial Investigation Report
At American Cleaners Kingston

734 Ulster Avenue
Kingston, NY
Site No: V-00601-3
Index No: W3-0952-03-03

For Submittal to
New York State Department of Environmental Conservation
Division of Environmental Remediation
625 Broadway
Albany, NY 12233-7016

December 31, 2009

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Table 1
Summary of Monitoring Well Dimensions
and Water Level Measurements
Remedial Investigation Report, December 2009
American Cleaners, Inc. Kingston, NY
NYSDEC DER VCP Site V-00601-3
Prepared by Mid-Hudson Geosciences

Well Identification	Diameter ID - inches	Total Depth (ft)	Top Casing Elevation (feet)	12/07/09 Depth to Water
MW1	2	16.9	173.2	11.61
MW2	2	16.4	173.19	11.71
MW3	2	16.9	174	12.24
MW4	2	32.6	173.57	11.13
MW5	2	16.3	173.9	12.29
MW6	2	16.1	173.74	11.88

Water Table Elevations

	10/17/06 Elevation of Water	12/09/09 Elevation of Water
MW1	162.37	161.59
MW2	162.35	161.48
MW3	162.65	161.76
MW4	162.89	162.44
MW5	162.42	161.61
MW6	162.71	161.86

Table 2
Summary of Concentrations of PCE (Tetrachloroethylene) and Other VOCs
Detected in Soil Samples using EPA Method 8260
Remedial Investigation Report, December 2009
American Cleaners, Inc. 734 Ulster Avenue, Kingston, NY
NYSDEC DER VCP Site V-00601-3
Compiled by Mid-Hudson Geosciences from Records of Beringer Environmental, Inc.

				Analytes						
Data Source	Location Identity	Depth (feet)	Sampling Date	Tetra chloro ehene ug/kg	Acetone ug/kg	Methyl ene Chloride ug/kg	1,2 Dichloro ethene ug/kg	Total VOCs ug/kg	Miscellaneous Detections ug/kg	Other Sample IDs Same Location
a	SB1	7	05/11/05	2J				2J		
a	SB2	9	05/11/05	2J				2J		
a	SB3	9	05/11/05	ND @ 12				ND		
a	SB4	10	05/11/05	9J	7J			16		
a	SB5	5	05/11/05	ND @ 13				ND		
a	SB6	5	05/11/05	ND @ 12				ND		
a	SB7	9-9.5	05/12/05	35	7J			42		
a	SB8	9	05/12/05	1J				1J		
a	SB9	9-9.5	05/12/05	2J				2J		
a	SB10	7	05/12/05	1J				1J		
a	SB11	2	05/12/05	310	25			335		
b	RearDrain3	2-3	05/10/06	71	ND			71		
b	Drain Sediment		05/10/06	5J	9J		280J	430	Vinyl chloride = 130 2-Butanone = 8J	
c	A	4-5.5	12/10/07	5J		2J		7		
c	B	2-4	12/10/07	94				94		
c	C	2-4	12/10/07	44		3J		47		
c	C	7-8	12/11/07	18				18		
c	D	4-8	12/10/07	160				160		GW17
c	E	6-8	12/10/07	280				280		GW27
c	F	6-8	12/11/07	14				14		
c	G	4-8	12/11/07	13				13		
c	H	8-10	12/11/07	36				38	Chloroethane = 2J	
c	I	8-10	12/11/07	ND				2J	Chloroethane = 2J	
c	J	6-8	12/11/07	170		3J		173		
c	K	0-2	12/11/07	170		3J		173		
c	K	8-10	12/11/07	11J @ 12		2J		13J		
c	L	0-2	12/11/07	100		3J		103		
d	B11	0-2	01/07/09	150		4BJ		150		
d	B12	0-2	01/07/09	370		4BJ		370		
d	B12	0-2DL	01/07/09	330		4BJ		330		
d	B12	0-2Dup	01/07/09	170		4BJ		170		
d	B13	0-2	01/07/09	150		4BJ		150		
d	B14	0-2	01/07/09	5J		4BJ		ND		

Data Sources
a = BerningerTransferDisk\2005\Sept05\BER018, Soil Samples 5/11-12/05
b = BerningerTransferDisk\June2006\BER028, Drain Soil Samples 5/10/06
c = BerningerTransferDisk\2007\Dec2007\BER046, Soil Samples 12/10-11/07
d = H2M Labs Analytical Data Pkg, SDB No BER081, Soil Samples received 1/8/09

Table 3, page 1 of 2
Summary of Concentrations of PCE (Tetrachloroethylene) and Other VOCs
Detected in Groundwater Samples using EPA Method 8260
Remedial Investigation Report, December 2009
American Cleaners, Inc. 734 Ulster Avenue, Kingston, NY
NYSDEC DER VCP Site V-00601-3
Compiled by Mid-Hudson Geosciences from Records of Beringer Environmental, Inc.

Data Source	Location Identity	Depth (feet)	Sampling Date	Tetra chloro ehene ug/L	Acetone ug/L	Tri chloro ethene ug/L	1,2 Dichloro ethene ug/L	Total VOCs ug/L	Miscellaneous Detections ug/L	Other Sample IDs Same Location
a	GW1	9.5-11.5	05/11/05	220	ND	ND	ND	220		SB1
a	GW2	9.5-11.5	05/11/05	140	ND	ND	ND	140		SB2
a	GW3	9.5-11.5	05/11/05	62	ND	ND	ND	62		SB3
a	GW4	10-12	05/11/05	110	ND	ND	ND	110		SB4
a	GW4	20-22	05/11/05	ND	ND	ND	ND	ND		SB4
a	GW5	10-12	05/11/05	ND	ND	ND	ND	ND		SB5
a	GW6	10-12	05/11/05	32	ND	ND	ND	32		SB6
a	GW7	9.5-11.5	05/12/05	7300	ND	ND	ND	7300		SB7, SG1
b	GW7	19.5-21.5	05/03/06	2J	ND	ND	ND	2J		SB7
b	GW7	29.5-31.5	05/03/06	ND	5J	ND	ND	5J		SB7
a	GW8	9.5-11.5	05/12/05	7200	ND	2J	ND	7202		SB8
b	GW8	19.5-21.5	05/03/06	6	ND	ND	ND	6		SB8
b	GW8	29.5-31.5	05/03/06	ND	ND	ND	ND	5J		SB8
a	GW9	9.5-11.5	05/12/05	71	ND	ND	ND	71		SB9
a	GW9	19.5-21.5	05/12/05	10	ND	ND	ND	10		SB9
a	GW10	12-14	05/12/05	190	ND	ND	ND	190		SB10
b	GW11	10-12	05/03/06	6000	ND	2J	ND	6002		SB11
b	GW11	20-22	05/03/06	15	ND	ND	ND	15		SB11
b	GW11	30-32	05/03/06	ND	8J	ND	ND	8J		SB11
a	GW12	9.5-11.5	05/12/05	480	ND	2J	10	494	Chloroform = 2J	
a	GW12	19.5-21.5	05/12/05	ND	ND	ND	ND	ND		
a	GW13	9.5-11.5	05/12/05	160	ND	3J	17	180		
a	GW14	9.5-11.5	05/12/05	760	ND	ND	6	766		
b	GW15	12.5-14.5	05/03/06	3J	ND	ND	ND	3J		
b	GW15	22.5-24.5	05/03/06	ND	ND	ND	ND	ND		
b	GW16	12-14	05/09/06	41	ND	ND	ND	41		
b	GW16	22-24	05/09/06	ND	ND	ND	ND	ND		
b	GW17	12-14	05/09/06	9700	ND	ND	ND	9700		
b	GW17	22-24	05/09/06	3400	6J	15	ND	3421		
c	DGW17	13-15	12/10/07	ND	4J	ND	ND	4		
c	DGW17	22-24	12/10/07	22	ND	ND	ND	22		
c	DGW17	32-34	12/10/07	ND	5J	ND	ND	5		
c	DGW17	42-44	12/10/07	ND	7J	ND	ND	7		
b	GW18	11.5-13.5	05/09/06	1900	ND	ND	ND	1900		SG2
b	GW18	21.5-23.5	05/09/06	50	ND	ND	ND	50		
b	GW19	13.5-15.5	05/09/06	5	ND	ND	ND	5		SG3
b	GW19	23.5-25.5	05/09/06	ND	ND	ND	ND	ND		
b	GW20	11-15	05/10/06	44	ND	ND	ND	44		SG4
b	GW20	21-25	05/10/06	27	ND	ND	ND	26		
b	GW21	11-15	05/10/06	16	ND	ND	ND	16		SG6
b	GW21	21-25	05/10/06	2J	ND	ND	ND	2J		
b	GW22	11-13	05/09/06	20	ND	ND	ND	20		SG5
b	GW22	21-25	05/09/06	ND	ND	ND	ND	ND		
b	GW22	31-35	05/09/06	ND	ND	ND	ND	ND		
c	GW23	14-16	12/10/07	4	3J	ND	ND	7		SG7
c	GW23	22-24	12/10/07	ND	2J	ND	ND	2		

Table 3, page 2 of 2
Summary of Concentrations of PCE (Tetrachloroethylene) and Other VOCs
Detected in Groundwater Samples using EPA Method 8260
Remedial Investigation Report, December 2009
American Cleaners, Inc. 734 Ulster Avenue, Kingston, NY
NYSDEC DER VCP Site V-00601-3
Compiled by Mid-Hudson Geosciences from Records of Beringer Environmental, Inc.

Data Source	Location Identity	Depth (feet)	Sampling Date	Tetra chloro ehene ug/L	Acetone ug/L	Tri chloro ethene ug/L	1,2 Dichloro ethene ug/L	Total VOCs ug/L	Miscellaneous Detections ug/L	Other Sample IDs Same Location
c	GW23	32-34	12/10/07	ND	ND	ND	ND	ND		
c	GW23	42-44	12/10/07	ND	3J	ND	ND	3		
c	GW24	14-16	12/10/07	180	ND	ND	ND	180		SG8
c	GW24	22-24	12/10/07	ND	ND	ND	ND	ND		
c	GW24	32-34	12/12/07	ND	ND	ND	ND	ND		
c	GW24	42-44	12/12/07	ND	5J	ND	ND	10	Methylene chloride = 5J	
c	GW25	14-16	12/12/07	ND	ND	ND	ND	ND		
c	GW25	22-24	12/12/07	ND	ND	ND	ND	ND		
c	GW25	32-34	12/12/07	ND	3J	ND	ND	3J		
c	GW25	42-44	12/12/07	ND	3J	ND	ND	3J		
c	GW26	14-16	12/12/07	ND	ND	ND	ND	ND		
c	GW26	22-24	12/12/07	ND	7	ND	ND	7		
c	GW26	32-34	12/12/07	ND	ND	ND	ND	ND		
c	GW26	42-44	12/12/07	ND	ND	ND	ND	ND		
c	EGW27	13-15	12/10/07	34	ND	ND	ND	34		
c	EGW27	22-24	12/10/07	2	3J	ND	ND	5		
c	EGW27	32-34	12/10/07	ND	6J	ND	ND	6J		
c	EGW27	42-44	12/10/07	ND	8J	ND	ND	8J		
d	GW27	13-15	01/07/09	18	5	ND	ND	23		
d	GW27	20-24	01/07/09	28	1J	ND	ND	29		
d	GW27	30-34	01/07/09	ND	ND	ND	ND	ND		
d	GW28	12-16	01/07/09	ND	3J	ND	ND	6J	Carbon disulfide = 3J	
d	GW28	22-26	01/07/09	ND	4J	ND	ND	4J		
d	GW28	32-36	01/07/09	ND	2J	ND	ND	2J		
d	GW29	12-16	01/07/09	8	2J	ND	ND	11	Carbon disulfide = 1J	
d	GW29	16-19 Dup	01/07/09	5	2J	ND	ND	8	Carbon disulfide = 1J	
d	GW29	22-26	01/07/09	ND	6	ND	ND	6		
d	GW29	32-36	01/07/09	ND	ND	ND	ND	ND		

Note: NYSDEC Class GA Ambient Groundwater Quality Standard Guidance Values for Site-Specific VOCs
Tetrachloroethene = 5 ug/L, Trichloroethene = 5 ug/L, 12Dichloroethene = 5ug/L, Acetone = 5 ug/L
Methylene chloride = 50 ug/L, Carbon disulfide = 50 ug/L, Chloroform = 7ug/L

Data Sources
a = BerningerTransferDisk\2005\BER017, Groundwater Sample Data, 5/11-12/05
b = BerningerTransferDisk\2006\June2006\LabValidation\BER027, Groundwater Sample Data, 5/3&9/06
c = BerningerTransferDisk\2008\Feb2008\BER045, Groundwater Sample Data, 12/12/07
d = BerningerTransferDisk\2009\January2009\BER080, Groundwater Sample Data, 01/07/09

Table 4
Concentrations of PCE Detected in Monitoring Wells
PCE (Tetrachloroethylene) units of measure = ug/L
Remedial Investigation Report, December 2009
American Cleaners, Inc. Kingston, NY
NYSDEC DER VCP Site V-00601-3
Prepared by Mid-Hudson Geosciences

Monitoring Well Sampling Data

	12/11/07	12/13-14/09
MW1	38	13
MW2	22	13
MW3	7	ND
MW4	ND Acetone=3J	3J
MW5	49	55
MW5dup		42
MW6	34	89

Table 5
Summary of Concentrations of PCE (Tetrachloroethylene) and Other VOCs
Detected in Soil Gas Samples using EPA Method TO-15
Remedial Investigation Report, December 2009
American Cleaners, Inc. 734 Ulster Avenue, Kingston, NY
NYSDEC DER VCP Site V-00601-3
Compiled by Mid-Hudson Geosciences from Records of Beringer Environmental, Inc.

Sample Identification	SSSV1	SG1	SG2	SG3	SG4	SG5	SG6	SG7	SG8	SG9	SG10	SG11	SG12	SG13	
Sample Depth			4-5.5	4-5.5	4-5.5	4-5.5	4-5.5			14					
Sampling Date			05/02/06	05/02/06	05/02/06	05/02/06	05/02/06	02/11/07	02/11/07	03/12/09	01/07/09	01/07/09	01/07/09	01/07/09	
Data Source	a	a	b	b	b	b	b	c	c	e	d	d	d	d	
RDL =			0.2	0.2	0.2	0.2	0.2	0.2	2	0.4	0.2	0.2	0.2	0.2	
Analyte															
Dichlorodifluoromethane	ND	0.1	0.79	0.71	0.74	0.66	0.99	2.4	ND	1.47	0.76	0.7	ND	0.76	ppbv
Chloromethane	ND	ND	0.94	0.8	0.88	0.8	0.66	ND	ND	ND	0.58	0.62	ND	ND	ppbv
1,3-Butadiene	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.831	ND	ND	ND	ND	ppbv
Methylene Chloride	ND	ND	ND	ND	ND	ND	ND	3.5	4.6	ND	5.9	0.33	0.26	0.31	ppbv
Carbon Disulfide	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.97	ND	1.49	0.41	ppbv
Trichlorofluoromethane	25.2	25.2	0.34	0.31	0.33	0.29	0.32	2.53	ND	ND	0.21	0.26	0.25	ND	ppbv
Hexane	ND	ND	1.7	1.2	1.5	0.95	1.5	5.98	5.4	2.55	2.97	0.44	2.06	6.06	ppbv
Chloroform	ND	ND	ND	ND	ND	ND	ND	0.2	ND	ND	ND	ND	ND	0.39	ppbv
1,1,1-Trichloroethane	1.3	ND	ND	ND	ND	ND	ND	1.97	ND	0.428	0.25	ND	0.95	ND	ppbv
Cyclohexane	ND	ND	ND	ND	ND	ND	ND	1.19	ND	1.01	0.85	ND	0.37	0.53	ppbv
2,2,4-Trimethylpentane	ND	ND	0.2	0.25	0.23	ND	ND	0.57	ND	4.71	1.66	ND	0.87	1.32	ppbv
Trichloroethene	51.7	295	ND	ND	ND	ND	ND	0.21	ND	0.231	ND	ND	0.05	6.44	ppbv
Benzene	15.0	31.5	0.32	0.67	0.52	0.28	0.29	1.96	8.3	1.62	2.32	0.6	1.72	1.72	ppbv
Heptane	ND	ND	0.41	0.33	0.45	0.22	0.41	1.43	5.1	3.03	2.25	ND	2.06	6.06	ppbv
Tetrachloroethene	198	11	7.3	0.42	0.9	0.47	7.2	55.1	3390	56.7	1.54	ND	20.7	394D	ppbv
Toluene	26.7	25.6	2.4	2.3	2.2	0.99	1.9	34.4	135	23.9	22.5	1.21	26.5	19.3	ppbv
Ethylbenzene	22.8	26.1	0.28	0.32	0.3	0.2	0.24	9.38	20.4	4.86	4.48	ND	4.97	2.37	ppbv
Styrene	ND	ND	0.22	0.2	0.25	0.2	0.23	0.68	0.8	3.82	0.26	ND	ND	ND	ppbv
Xylene (m,p)	21.7	22.9	0.86	0.91	0.97	0.5	0.81	34.2	74.1	0.898	15.8	0.47	17.4	8.18	ppbv
Xylene (o)	19.7	29.2	0.21	0.31	0.26	0.2	0.2	12.2	21.4	6.31	5.18	ND	5.52	2.48	ppbv
4-Ethyltoluene	ND	ND	0.27	0.28	0.26	0.2	0.22	4.49J	3.30J	1.19	0.91	ND	0.96	0.68	ppbv
1,3,5-Trimethylbenzene	0.9	0.9	ND	ND	ND	ND	ND	3.49	2.5	1.23	0.89	ND	1.04	0.8	ppbv
1,2,4-Trimethylbenzene	25.4	27.3	0.27	0.29	0.26	ND	ND	14.1J	8.70J	3.73	3.26	ND	3.79	3.09	ppbv
cis12Dichloroethane	93.6	69.3													
Data Sources		zoom	ND = Not Detected												

a = BerningerTransferDisk\2005\"SoilGas", file with errors in chem cpd names, sampling data unknown
b = BerningerTransferDisk\2006\June2006\LabValidation\"TO15", Soil Gas Sample Results 5/2/06
c = BerningerTransferDisk\2008\Feb2008\BER047, Soil Gas Sample Results, 2/11/07
d = BerningerTransferDisk\2009\Jan2009\BER079, Soil Gas Sample Results, 01/07/09
e = H2M Labs, Inc. ASP B Data Package, SDG No BER087, Air Samples, 03/12/09
Note: RDL is the Reported Detection Limit measured in ppbv (parts per billion volume). Differing RDLs are the result of different dilution factors.

Table 6
Summary of Concentrations of PCE (Tetrachloroethylene) and Other VOCs
Detected in Air Samples using EPA Method TO-15
Sample identification: LIQ = Merchant Wine & Liquor, Rest = Pauline's Restaurant
RCAL = Resource Center for Accessible Linving, Inc. VAC = Vacant RCAL Building
SS = Sub-slab, IA = Indoor Air, 09 = Year, OA = Outdoor Air, King = Kingston
Remedial Investigation Report, December 2009
American Cleaners, Inc. 734 Ulster Avenue, Kingston, NY
NYSDEC DER VCP Site V-00601-3
Compiled by Mid-Hudson Geosciences from Records of Beringer Environmental, Inc

	LIQ IA-1	LIQ OA-1	LIQ SS-1	IA09-REST	SS09-REST	IA09-VAC	SS09-VAC	IA09-RCAL	SS09-RCAL	OA09KING	Units
	01/07/09	01/07/09	01/07/09	03/12/09	03/12/09	03/12/09	03/12/09	03/12/09	03/12/09	03/12/09	of
Data Source	a	a	a	b	b	b	b	b	b	b	Measure
RDL =	0.2	0.2	0.2	0.2	2	0.2	0.2	0.2	0.5	0.2	
Analyte											
Ethylbenzene	0.2 U	0.2 U	0.55	0.251	4.87	U	4.46	0.348	13.7	U	ppbv
Styrene	0.2 U	0.2 U	0.2 U	U	U	U	1.31	U	5.25	U	ppbv
1,3-Butadiene	0.2 U	0.2 U	0.2 U	0.283	U	U	U	U	U	U	ppbv
Xylenes (m&p)	0.2 U	0.2 U	2.10	0.805	21.2	U	16.8	0.667	61.9	U	ppbv
1,3,5-Trimethylbenzene	0.2 U	0.2 U	0.22	U	2.23	U	1.55	U	7.19	U	ppbv
Toluene	0.55	0.65	4.75	8.49	35	0.446	25.2	1.1	83.5	0.559	ppbv
n-Hexane	0.24	0.31	1.26	0.538	2.24	U	1.48	0.231	3.8	U	ppbv
Cyclohexane	0.2 U	0.2 U	0.2 U	0.236	2.01	U	1.11	0.306	5.88	U	ppbv
Tetrachloroethene	0.74	0.60	0.35	0.639	273	0.517	16.5	0.511	1.36	U	ppbv
n-Heptane	0.2 U	0.2 U	0.22	0.474	4.28	U	3.47	0.946	10.2	U	ppbv
2,2,4-Trimethylpentane	0.2 U	0.2 U	0.2 U	U	U	U	0.429	U	1.27	U	ppbv
4-Ethyltoluene	0.2 U	0.2 U	0.2 U	U	U	U	1.35	U	5.71	U	ppbv
Chloroform	0.2 U	0.2 U	0.2 U	0.51	U	U	U	U	U	U	ppbv
Benzene	0.27	0.34	0.2 U	0.666	U	0.241	1.11	0.316	3.07	0.231	ppbv
Chloromethane	0.58	0.62	0.2 U	0.851	U	0.533	0.202	0.63	U	0.503	ppbv
Methylene chloride	0.43	0.50	0.90	U	U	U	U	U	U	U	ppbv
Trichlorofluoromethane	0.41	0.28	0.22	0.263	U	0.219	0.289	0.222	1.15	0.213	ppbv
Dichlorodifluoromethane	0.91	0.80	0.56	0.559	U	0.509	0.593	0.53	0.676	0.479	ppbv
Trichloroethene	0.05 U	0.05 U	0.05 U	U	U	U	0.043	0.042	0.061	U	ppbv
Xylenes (o)	0.2 U	0.2 U	0.76	0.305	7.25	U	5.68	0.222	23.5	U	ppbv
1,2,4-Trimethylbenzene	0.2 U	0.2 U	1.03	0.228	6.57	U	4.58	U	20.1	U	ppbv

Data Sources U = Not Detected
a = H2M Labs, Inc. Sample Data Summary Pkg, SDG No BER079, Air Samples including Soil Vapor Samples, 01/07/09
b = H2M Labs, Inc. ASP B Data Pkg, SDG No BER087, Air Samples, 03/12/09
Note: RDL is the Reported Detection Limit measured in ppbv (parts per billion volume). Differing RDLs are the result of different dilution factors.

FIGURES

Voluntary Cleanup Program
Remedial Investigation Report
At American Cleaners Kingston
734 Ulster Avenue
Kingston, NY
Site No: V-00601-3
Index No: W3-0952-03-03

For Submittal to
New York State Department of
Environmental Conservation
Division of Environmental Remediation
625 Broadway
Albany, NY 12233-7016
December 31, 2009

Prepared by
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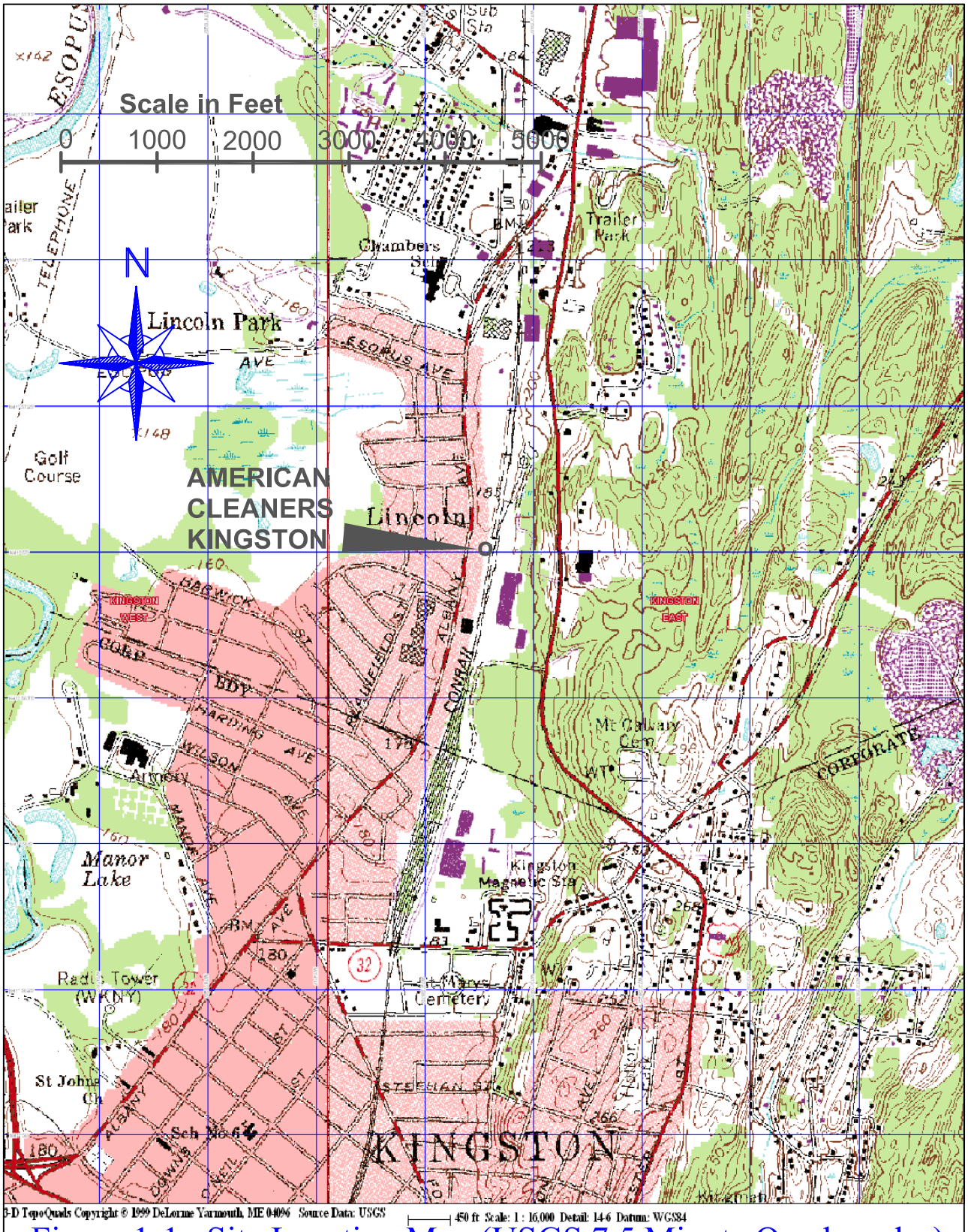

Figure 1-1, Site Location Map (USGS 7.5 Minute Quadrangles)

American Cleaners Inc, 734 Ulster Avenue, Kingston, NY

NYSDEC DER VCP Site V-00601-3 December 31, 2009

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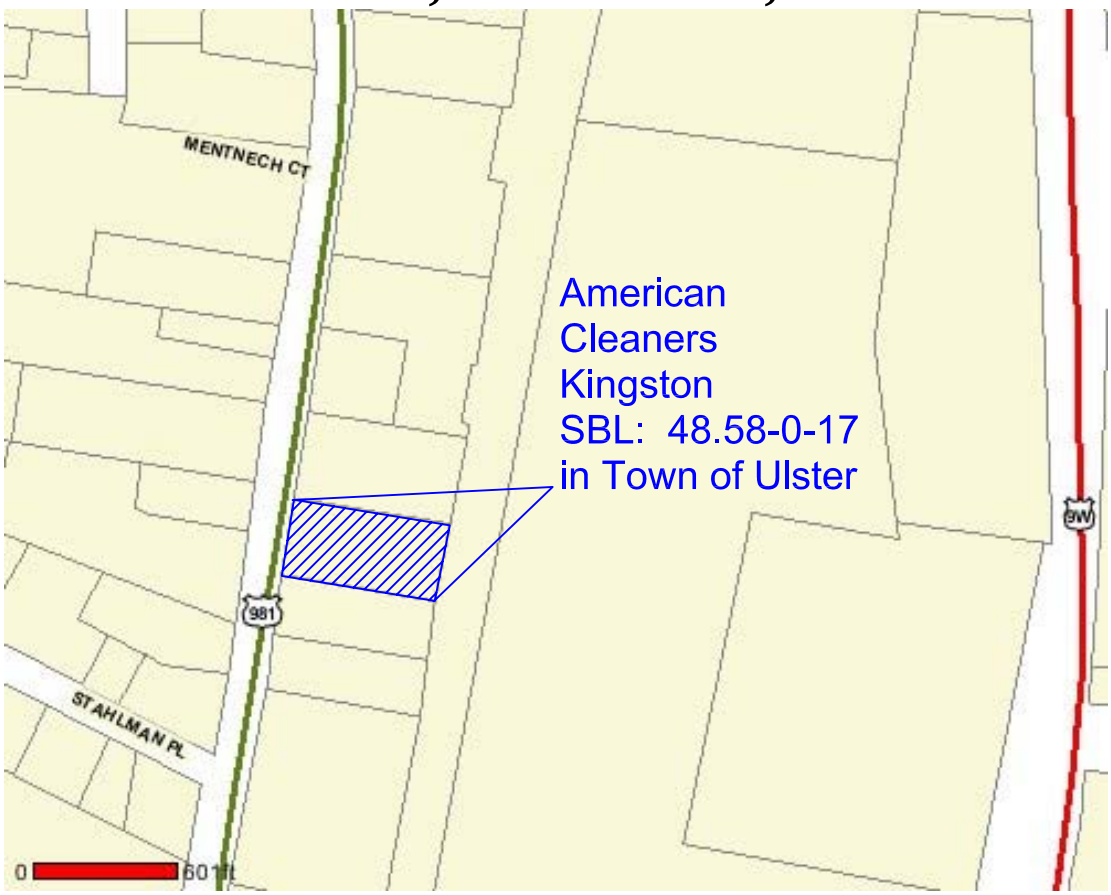
American Cleaners, 734 Ulster Av, T of Ulster



Ulster County Information Services 12/28/2009 12:26:53 PM

Figure 1-2. American Cleaners Kingston Tax Map Location

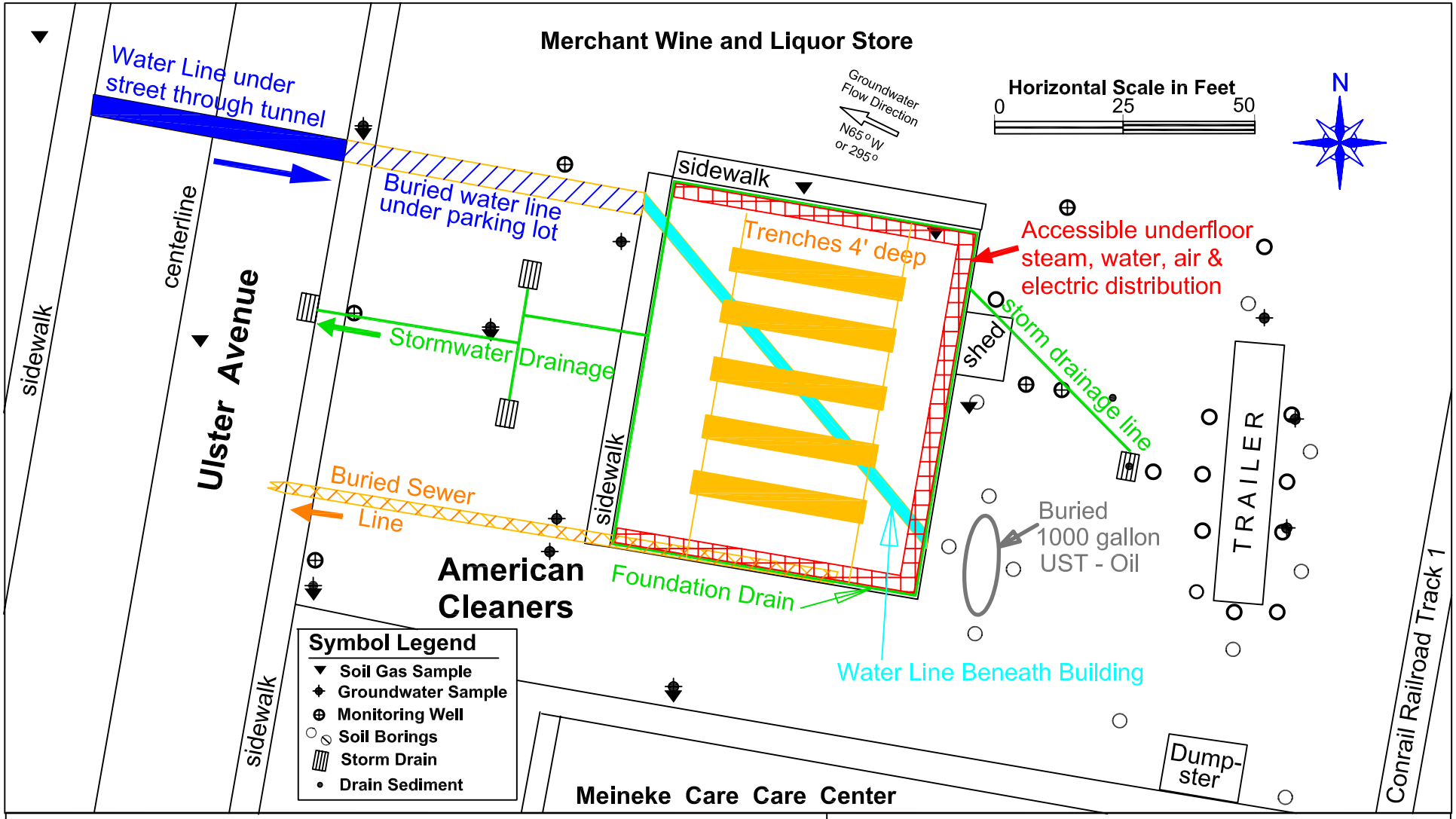


Figure 1-3. Site Plan of Building, Utilities, and Special Features Constructed for Dry-Cleaning Operations
American Cleaners Inc, 734 Ulster Avenue, Kingston, NY
NYSDEC DER VCP Site V-00601-3 December 31, 2009

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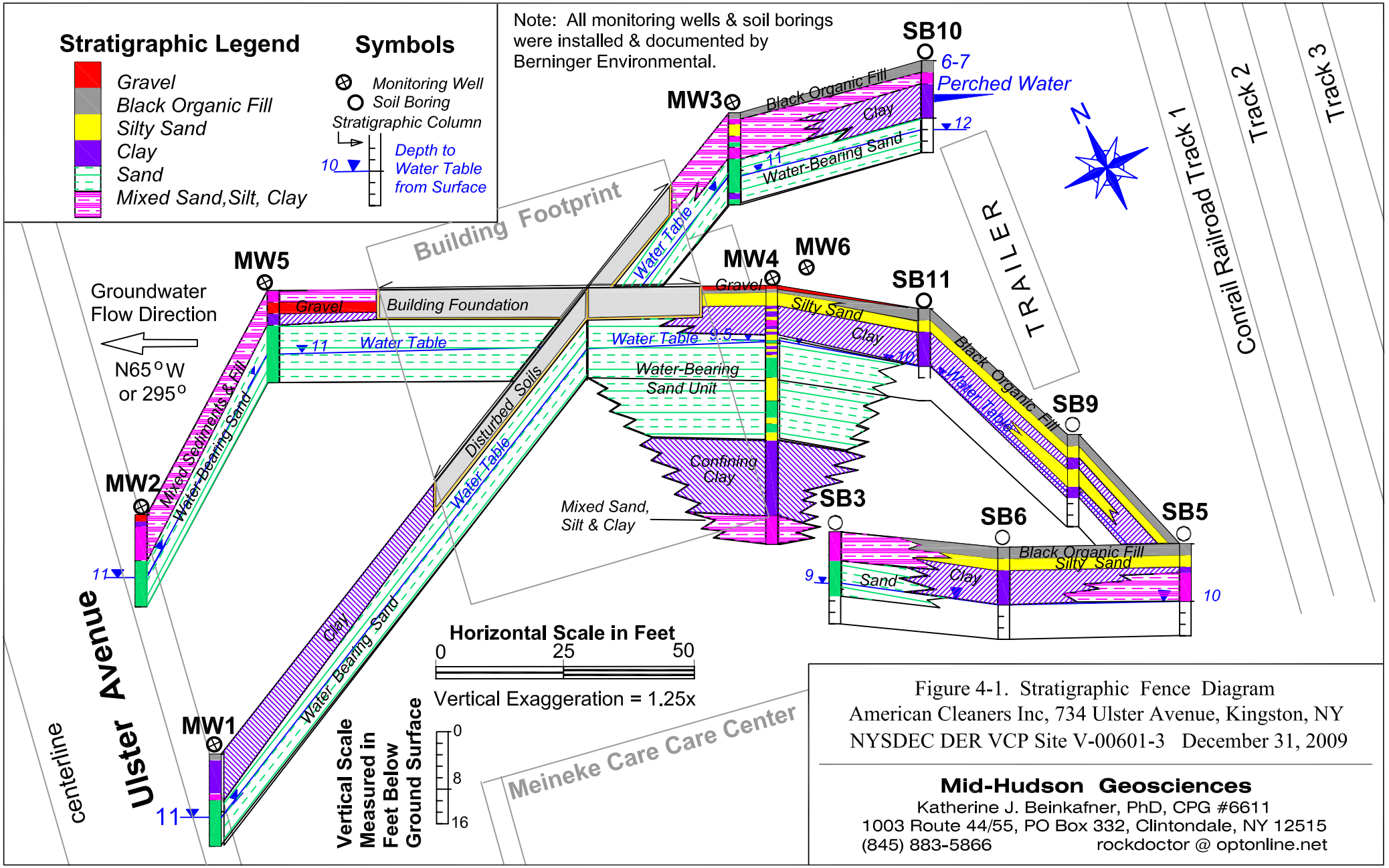

Figure 4-1. Stratigraphic Fence Diagram
American Cleaners Inc, 734 Ulster Avenue, Kingston, NY
NYSDEC DER VCP Site V-00601-3 December 31, 2009

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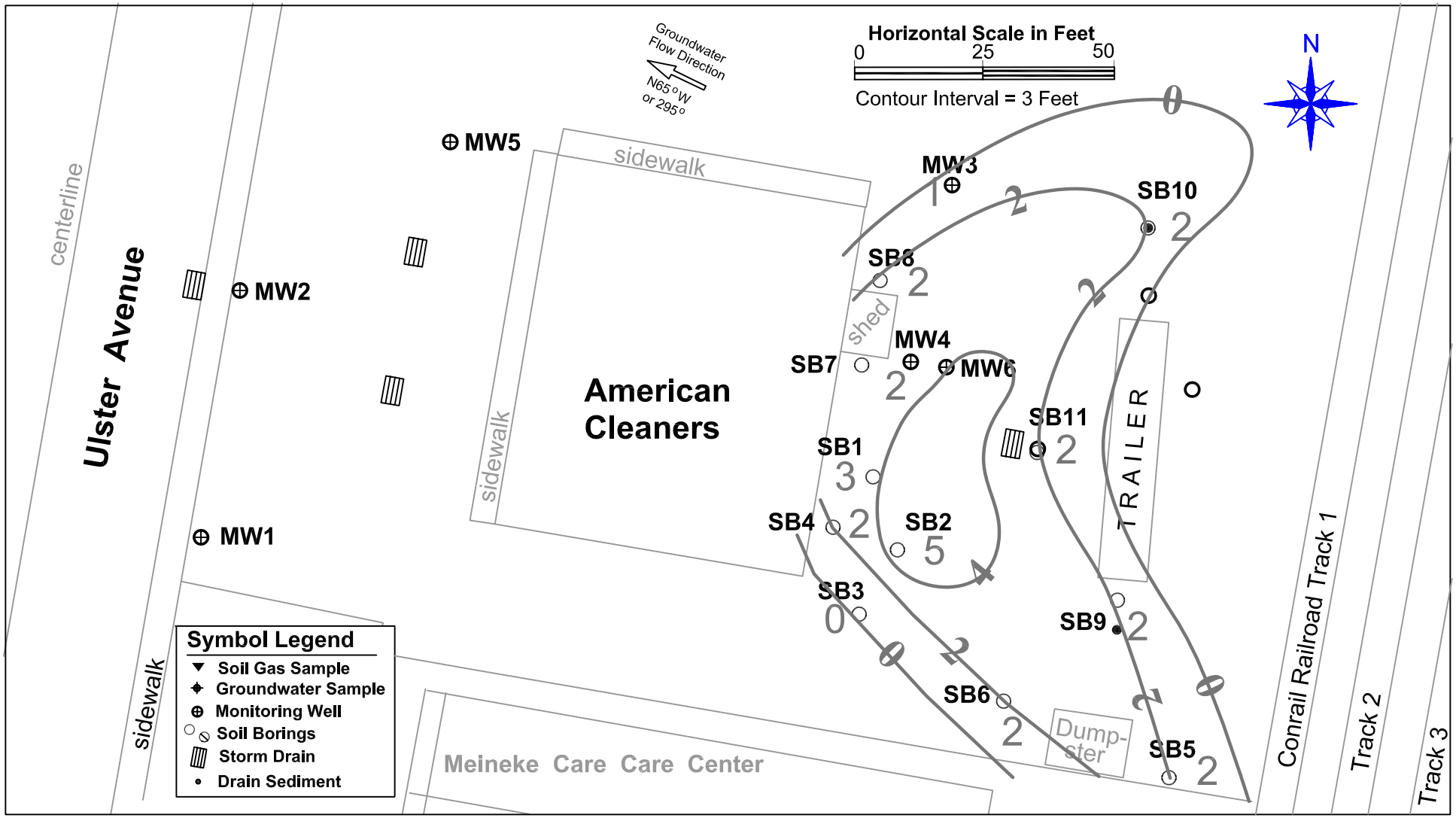

Figure 4-2. Isopachous Map of Black Organic Unit Observed in Soil Borings as Surface Deposit at Grade.
American Cleaners Inc, 734 Ulster Avenue, Kingston, NY
NYSDEC DER VCP Site V-00601-3 December 31, 2009

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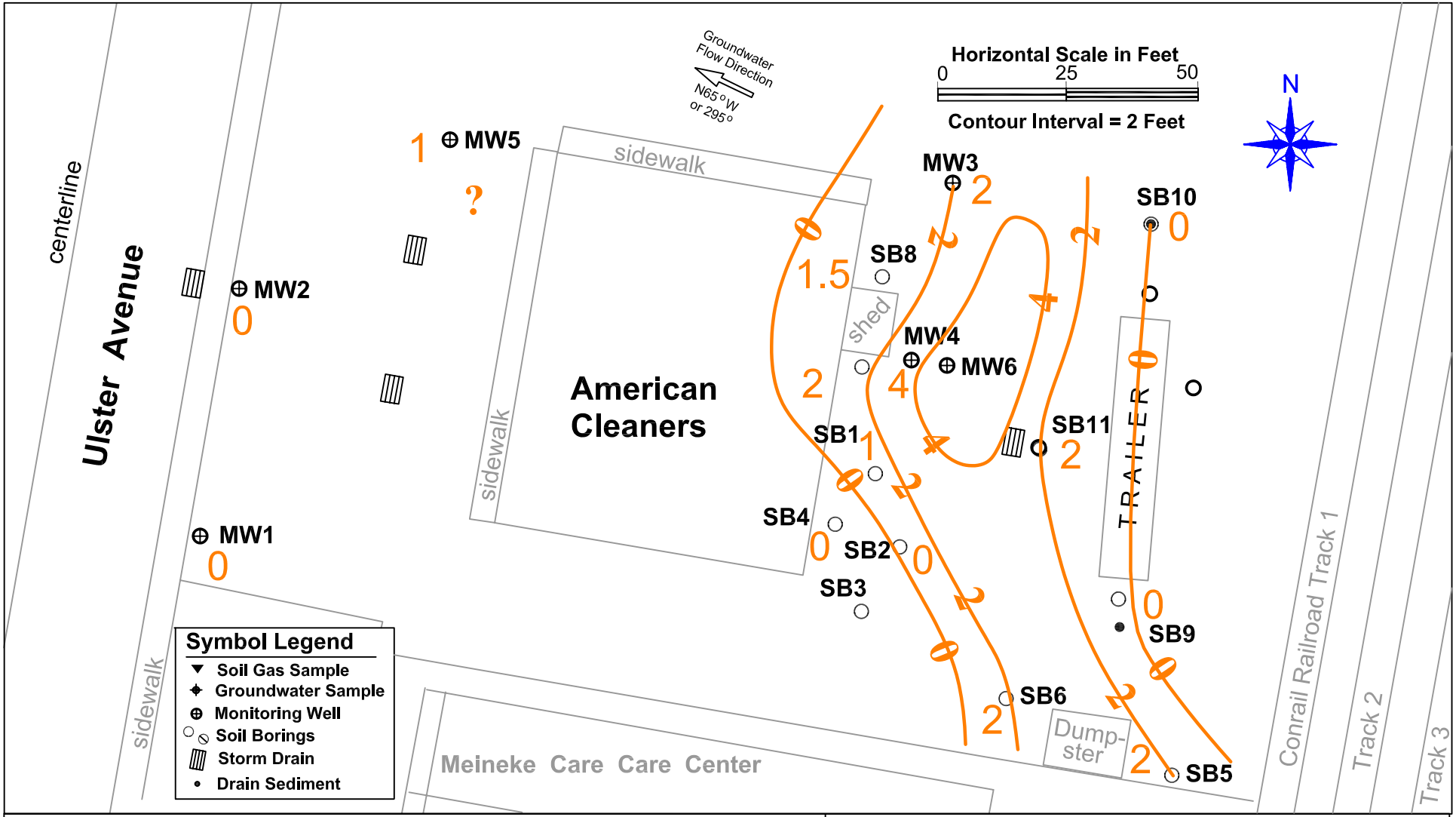

Figure 4-3. Isopachous Map of Silty Sand Unit Observed in Soil Borings below Black Organic & above Upper Clay Layer
American Cleaners Inc, 734 Ulster Avenue, Kingston, NY
NYSDEC DER VCP Site V-00601-3 December 31, 2009

Mid-Hudson Geosciences
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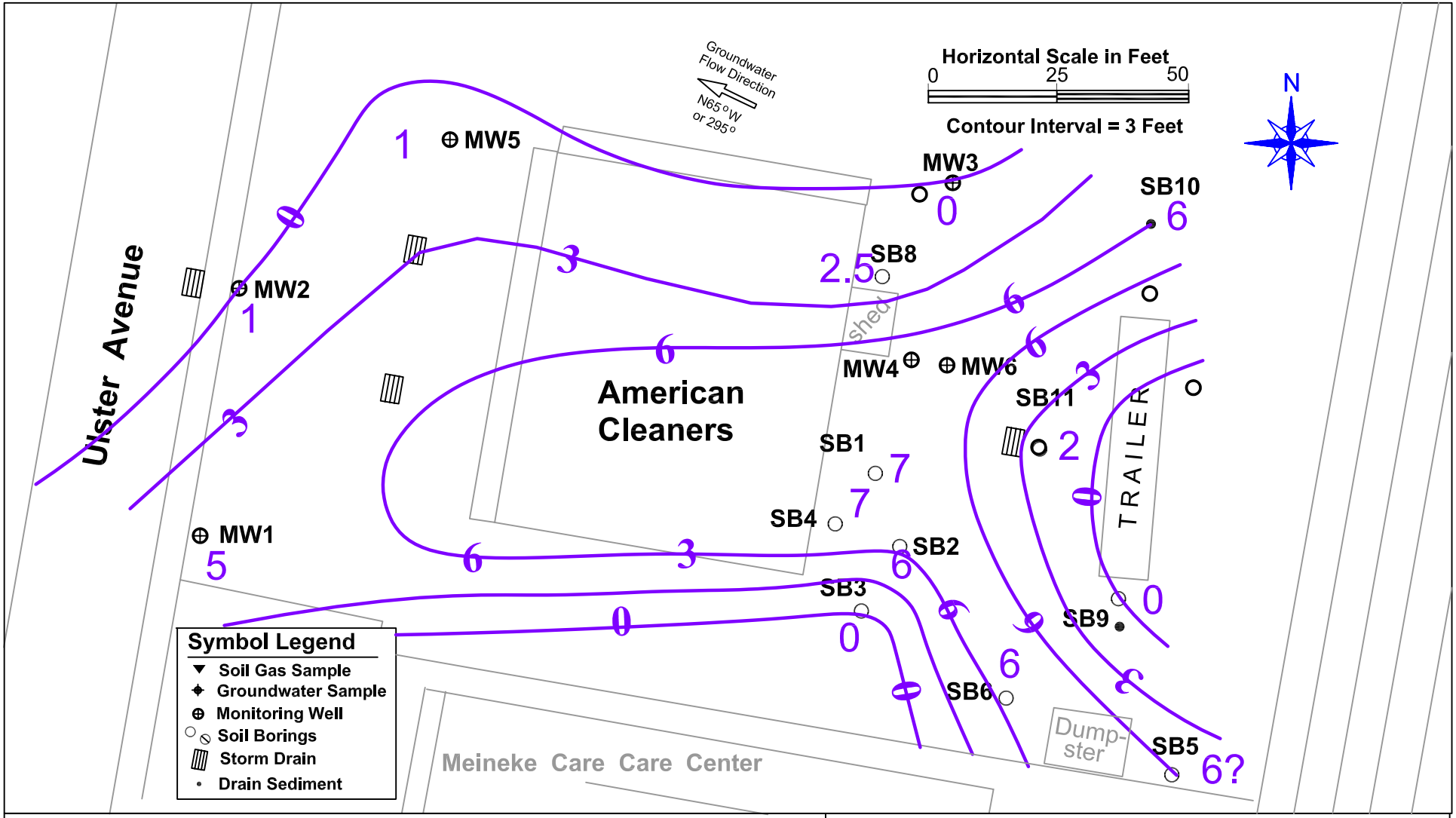

Figure 4-4. Isopachous Map of Upper Clay Layer Observed in Soil Borings under Silty Sand & Above Water-bearing Sand. American Cleaners, Inc. 734 Ulster Avenue, Kingston, NY NYSDEC DER VCP Site V-00601-3 December 13, 2009

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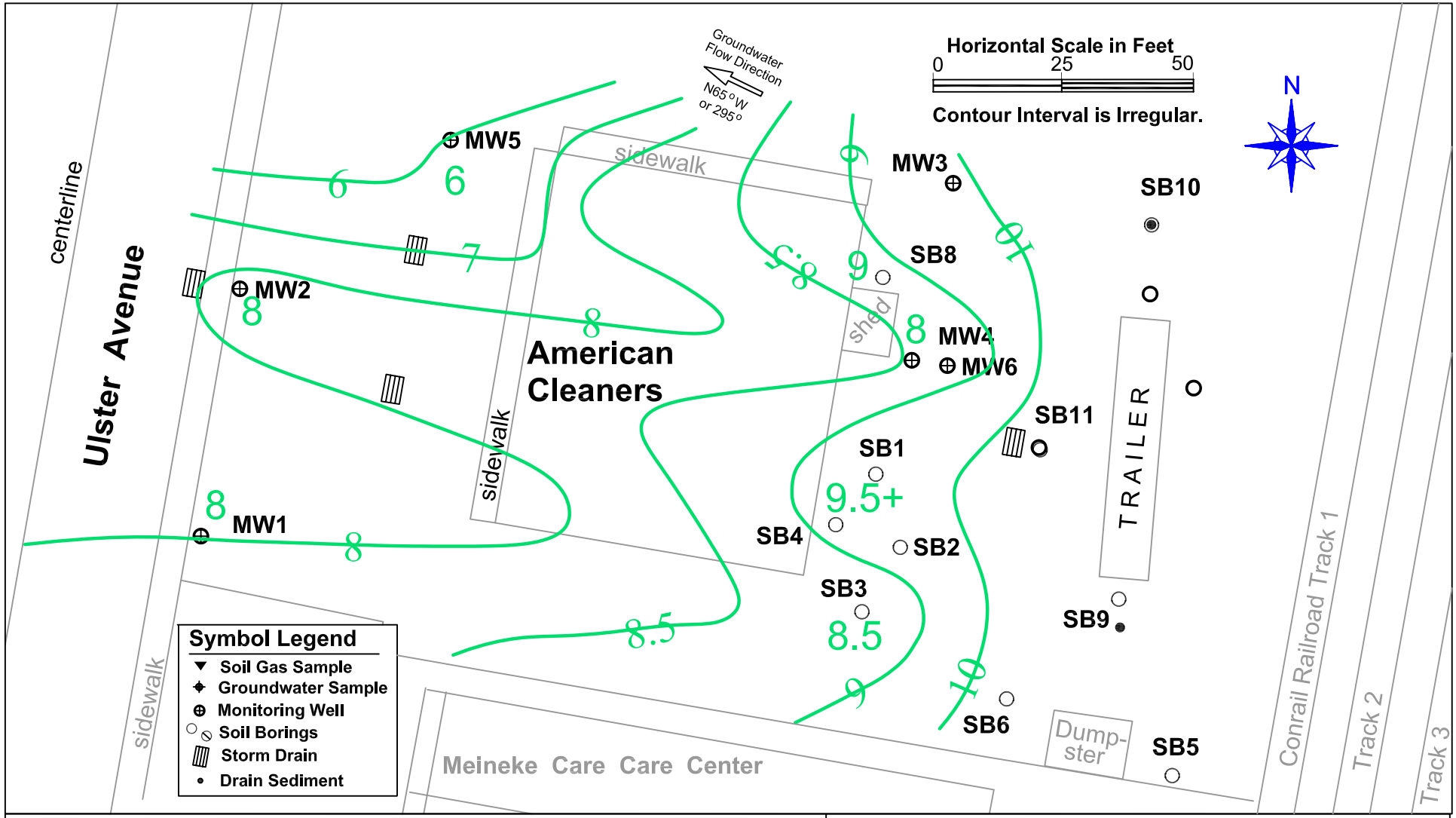

Figure 4-5. Contour Map to Depth of Upper Clay Layer/ Top of Water-Bearing Sand Unit, measured from grade.
American Cleaners, Inc. 734 Ulster Avenue, Kingston, NY
NYSDEC DER VCP V-00601-3 December 31, 2009

Mid-Hudson Geosciences
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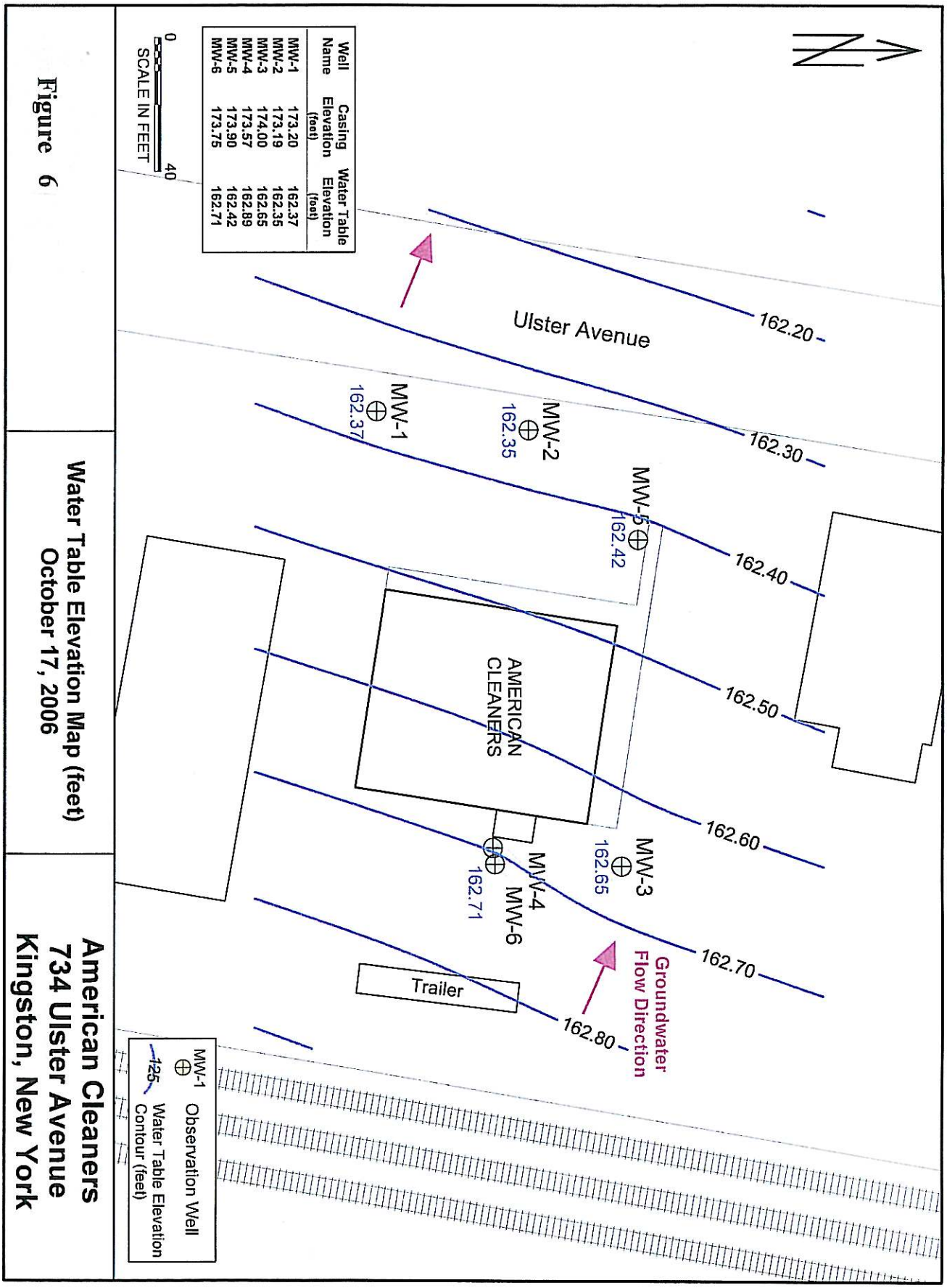
Figure 4-6. Contour Map of Water Table in Monitoring Wells Oct 17, 2006 (from Berninger, 2008)



American Cleaners Inc, Kingston, NY: NYSDEC DER VCP Site V-00601-3, Dec 13, 2009
Included here in Remedial Investigation Report Prepared by Mid-Hudson Geosciences

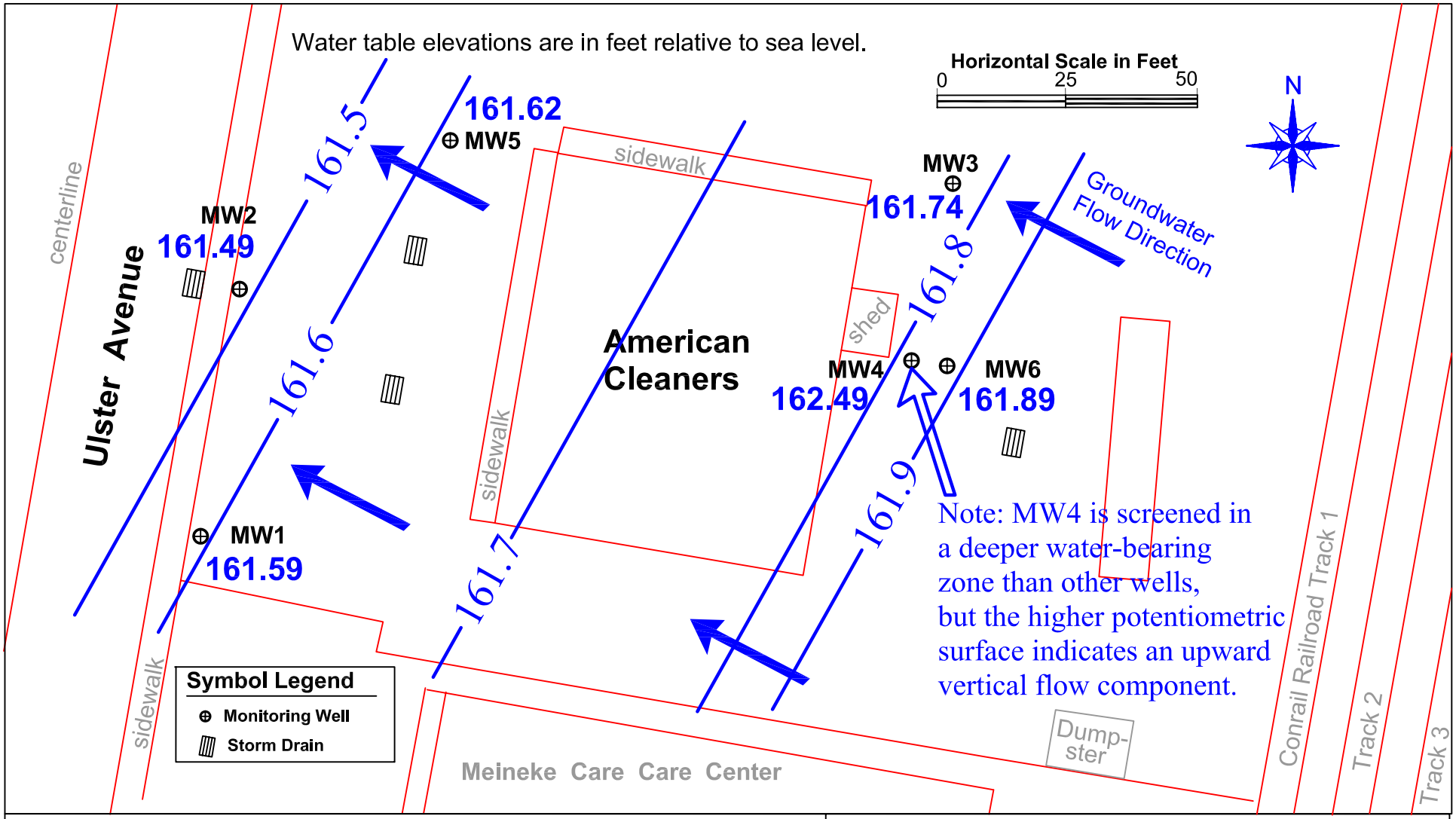


Figure 4-7. Contour Map of Water Table in Monitoring Wells, Measured on December 9, 2009.
American Cleaners, Inc. 734 Ulster Avenue, Kingston, NY
NYSDEC DER VCP Site V-00601-3 December 31, 2009

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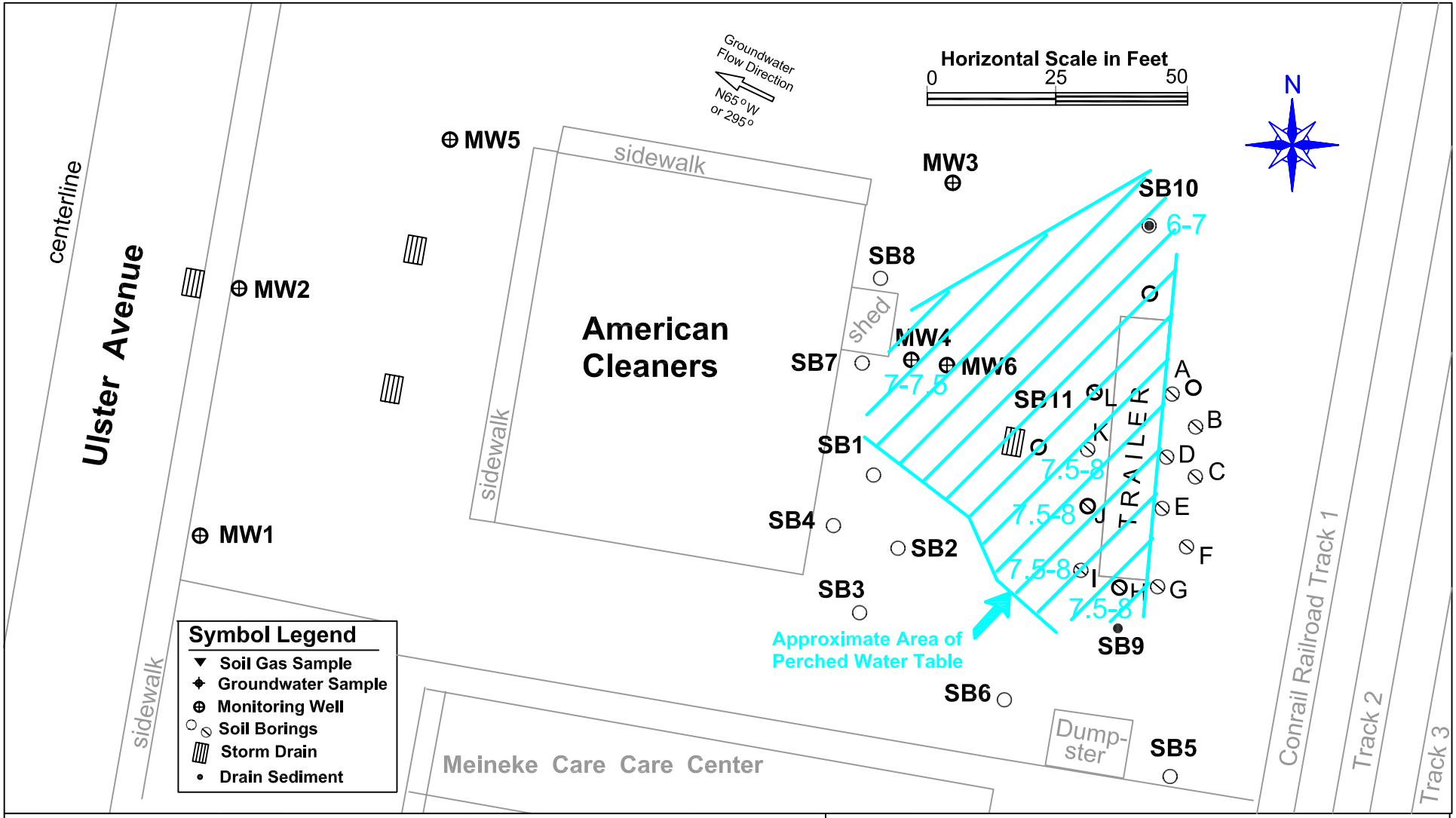

Figure 4-8. Map of Perched Water Table Depth and Extent Observed in Soil Borings at depth below grade (feet).
American Cleaners, Inc. 734 Ulster Avenue, Kingston, NY
NYSDEC DER VCP Site V-00601-3 December 31, 2009

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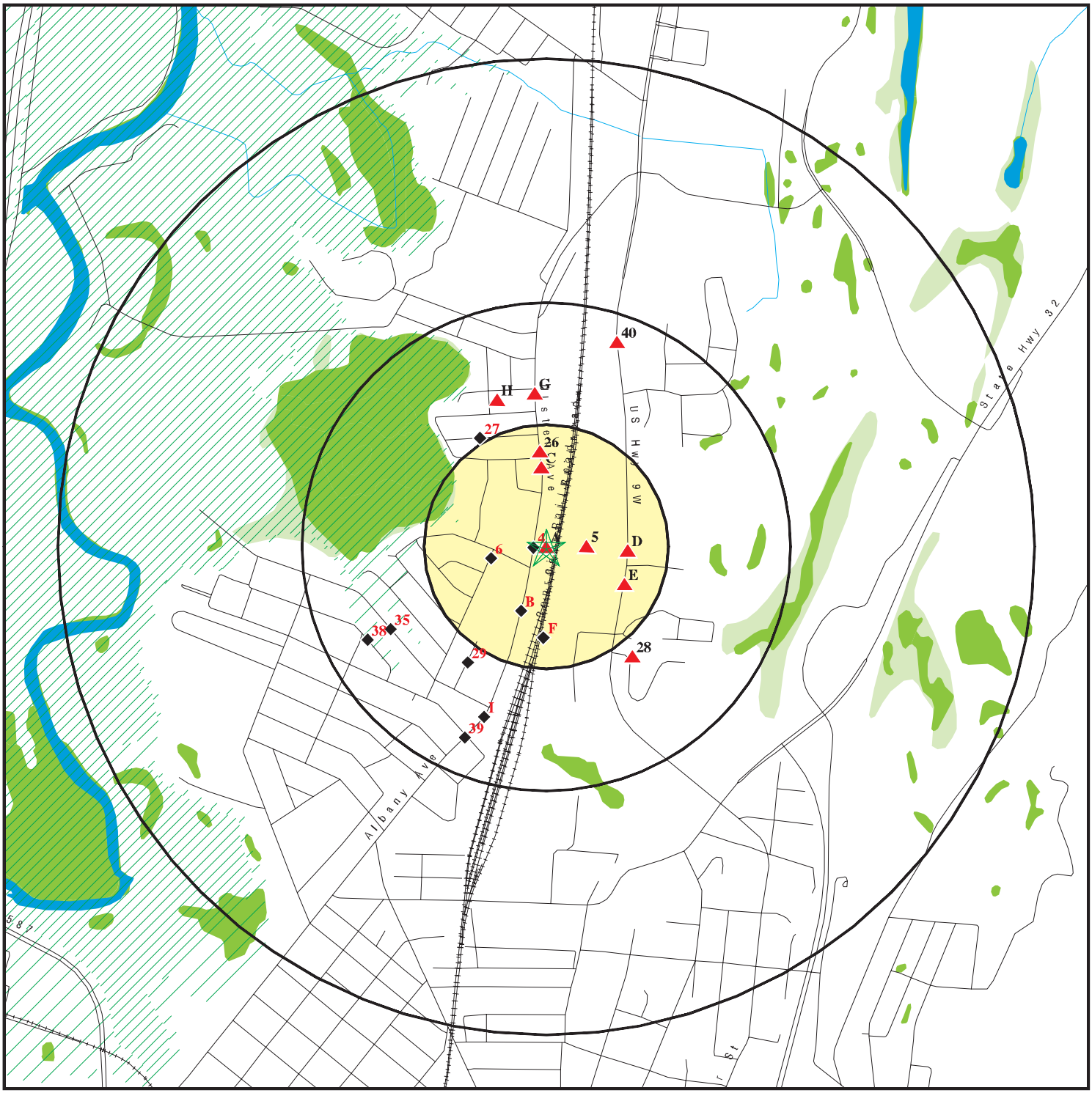
OVERVIEW MAP - 2520754.6s



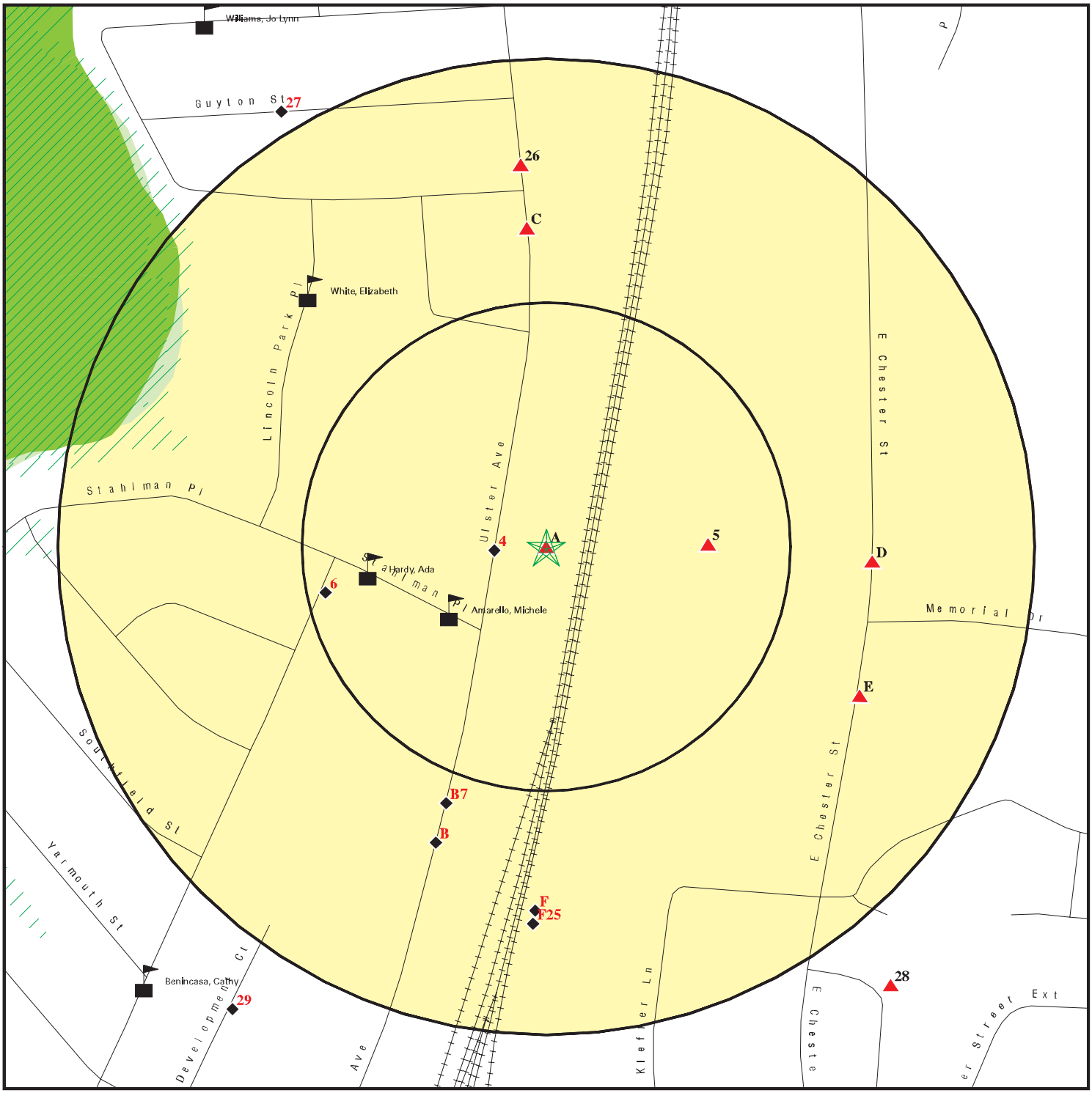
- Target Property
- Sites at elevations higher than or equal to the target property
- Sites at elevations lower than the target property
- Manufactured Gas Plants
- National Priority List Sites
- Dept. Defense Sites
- Indian Reservations BIA
- Oil & Gas pipelines
- 100-year flood zone
- 500-year flood zone
- National Wetland Inventory
- State Wetlands

Figure 4-9 Overview Map from EDR Environmental Database Search

This report includes Interactive Map Layers to display and/or hide map information. The legend includes only those icons for the default map view.

SITE NAME: American Cleaners Kingston	CLIENT: Mid-Hudson Geosciences
ADDRESS: Ulster Avenue Kingston NY 12401	CONTACT: Kathy Beinkafner INQUIRY #: 2520754.6s
LAT/LONG: 41.9493 / 73.9940	DATE: June 17, 2009 10:10 am

DETAIL MAP - 2520754.6s



- Target Property
- Sites at elevations higher than or equal to the target property
- Sites at elevations lower than the target property
- Manufactured Gas Plants
- Sensitive Receptors
- National Priority List Sites
- Dept. Defense Sites
- Indian Reservations BIA
- Oil & Gas pipelines
- 100-year flood zone
- 500-year flood zone
- National Wetland Inventory
- State Wetlands

Figure 4-10. EDR Detailed Map from Environmental Database Search

This report includes Interactive Map Layers to display and/or hide map information. The legend includes only those icons for the default map view.

SITE NAME: American Cleaners Kingston	CLIENT: Mid-Hudson Geosciences
ADDRESS: Ulster Avenue Kingston NY 12401	CONTACT: Kathy Beinkafner INQUIRY #: 2520754.6s
LAT/LONG: 41.9493 / 73.9940	DATE: June 17, 2009 10:11 am

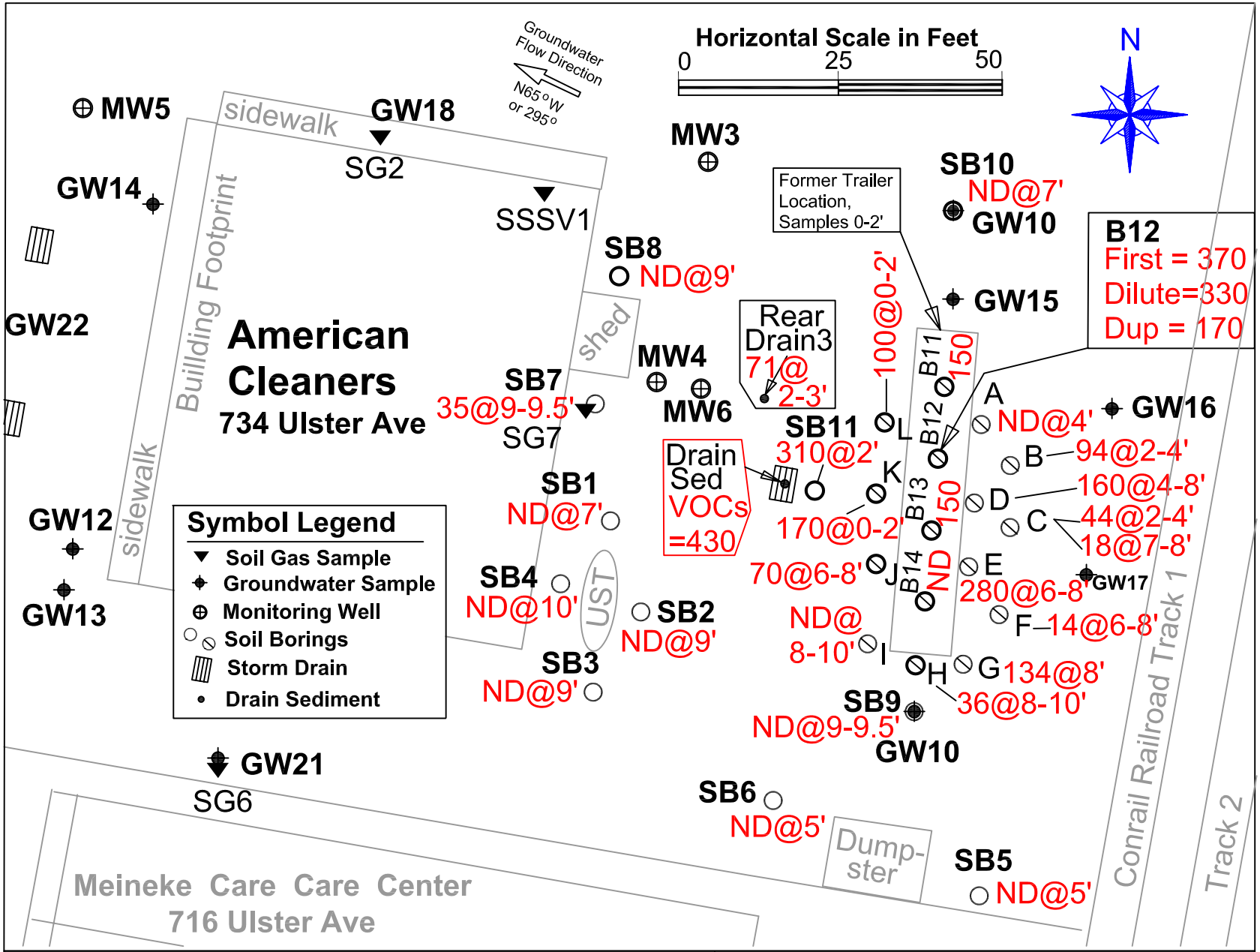


Figure 5-1. Map of PCE Concentrations (ug/kg) Detected in Soil Samples at all depths as shown.
American Cleaners Inc, 734 Ulster Avenue, Kingston, NY
NYSDEC DER VCP Site V-00601-3 December 31, 2009

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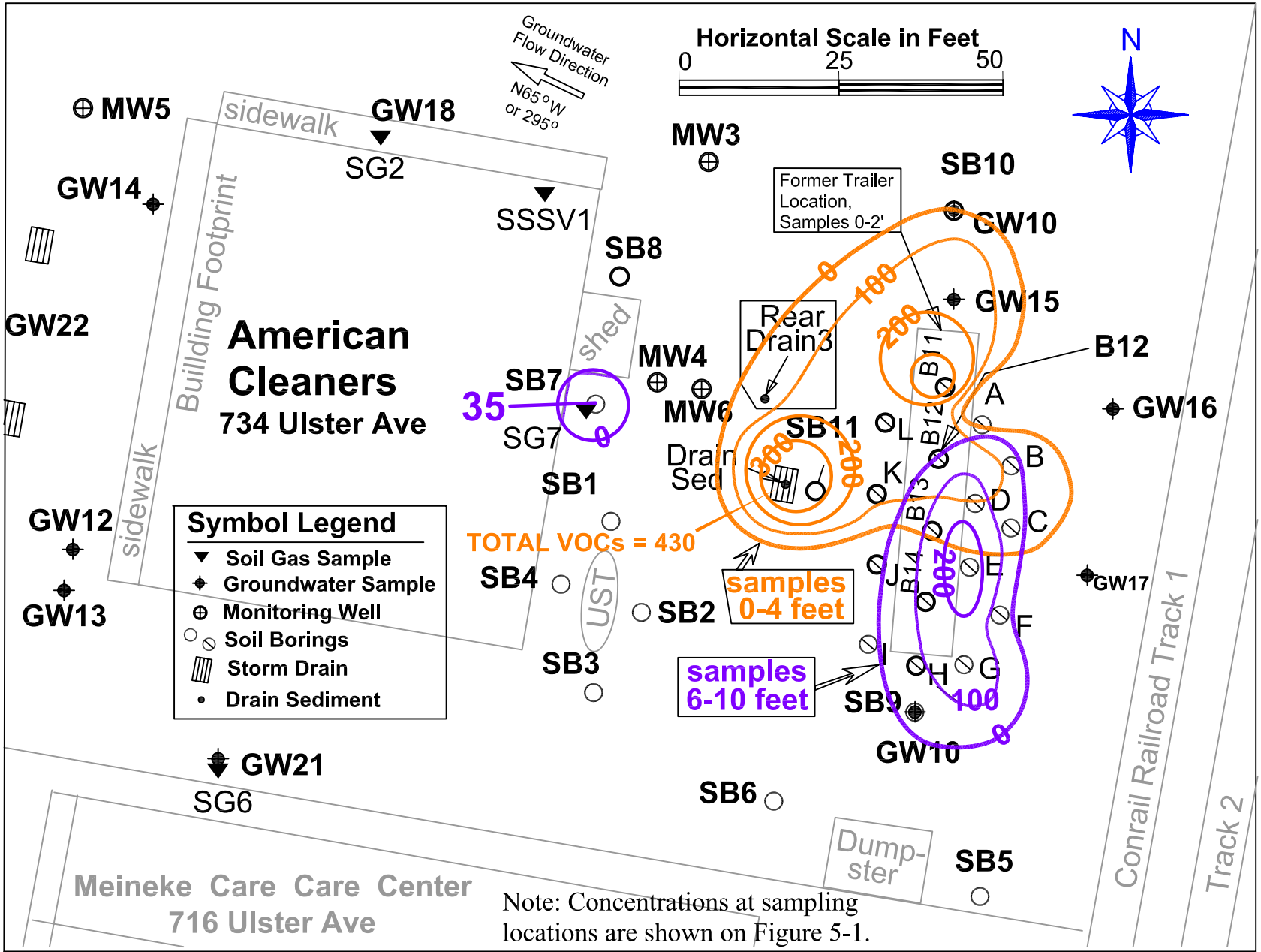

Figure 5-2. Isopleth Map of PCE Concentrations (ug/kg) Detected in Soil Samples at two different depth intervals. American Cleaners Inc, 734 Ulster Avenue, Kingston, NY NYSDEC DER VCP Site V-00601-3 **December 31, 2009**

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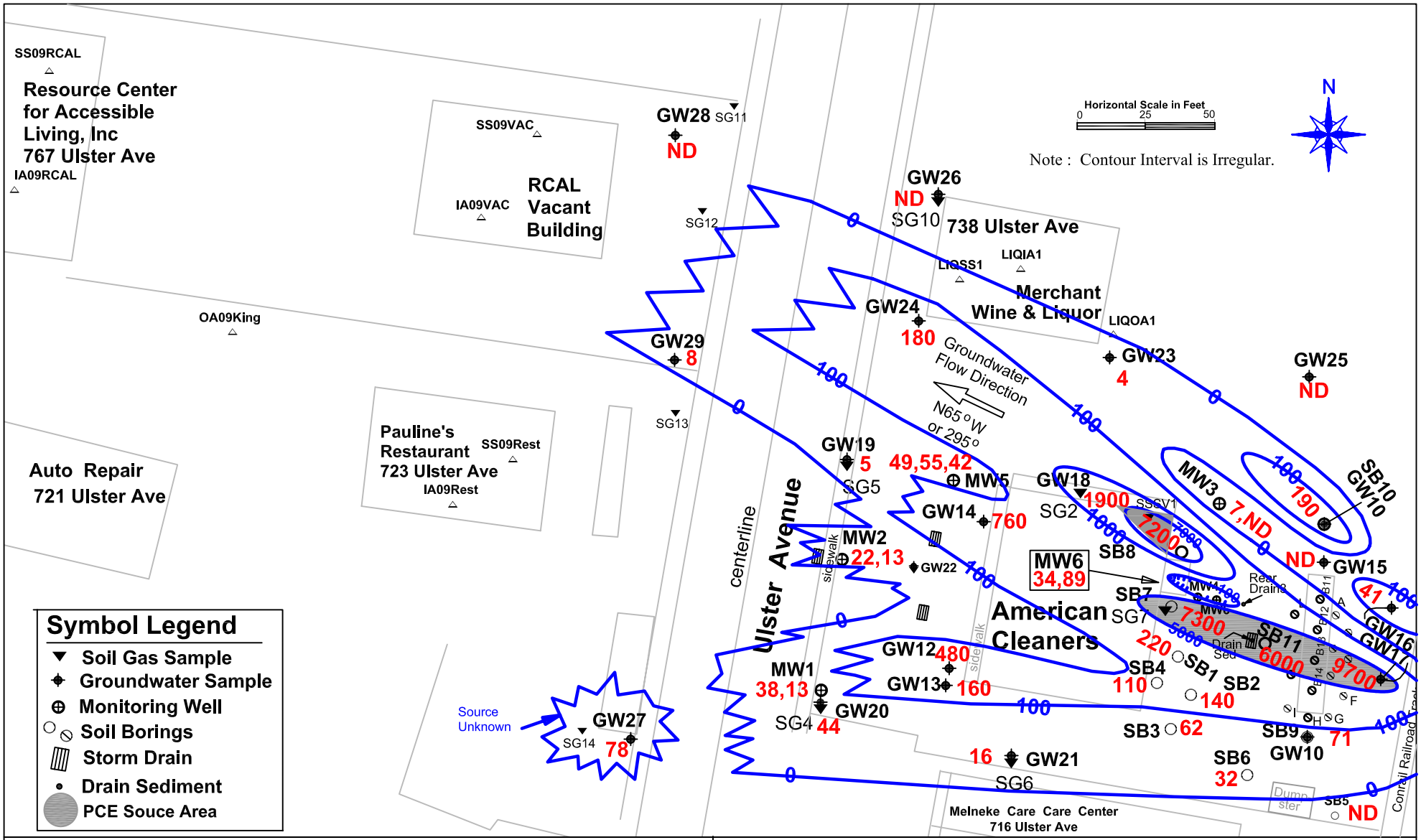

Figure 5-3. Isopleth Map and PCE Concentrations (ug/L) Detectd in Groundwater between 9.5 and 16 feet below ground surface.
American Cleaners Inc, 734 Ulster Avenue, Kingston, NY
NYSDEC DER VCP Site V-00601-3 December 31, 2009

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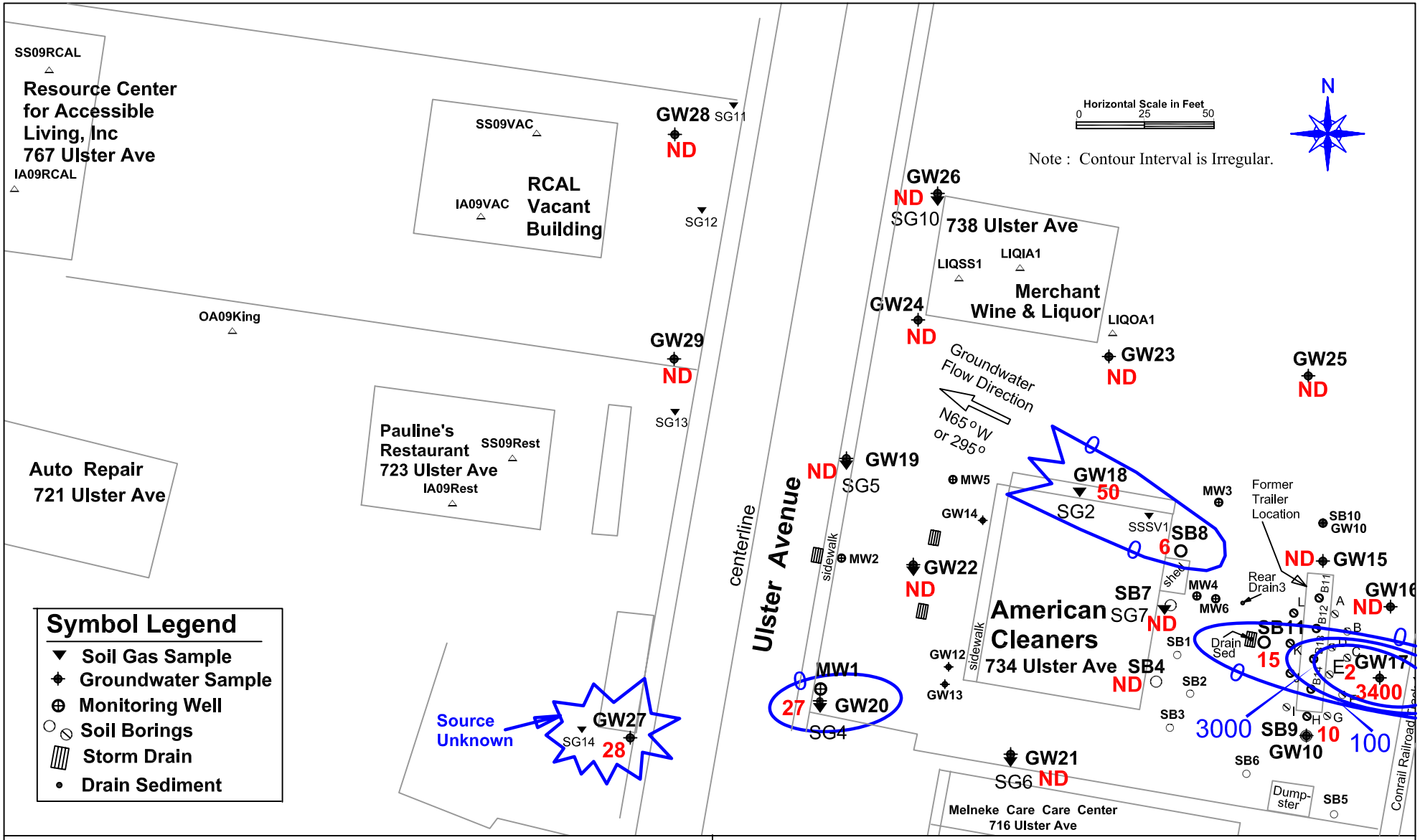

Figure 5-4. Isopleth Map and PCE Concentrations (ug/L Detected in Groundwater between 19.5 and 25 feet below ground surface.
American Cleaners Inc, 734 Ulster Avenue, Kingston, NY
NYSDEC DER VCP Site V-00601-3 December 31, 2009

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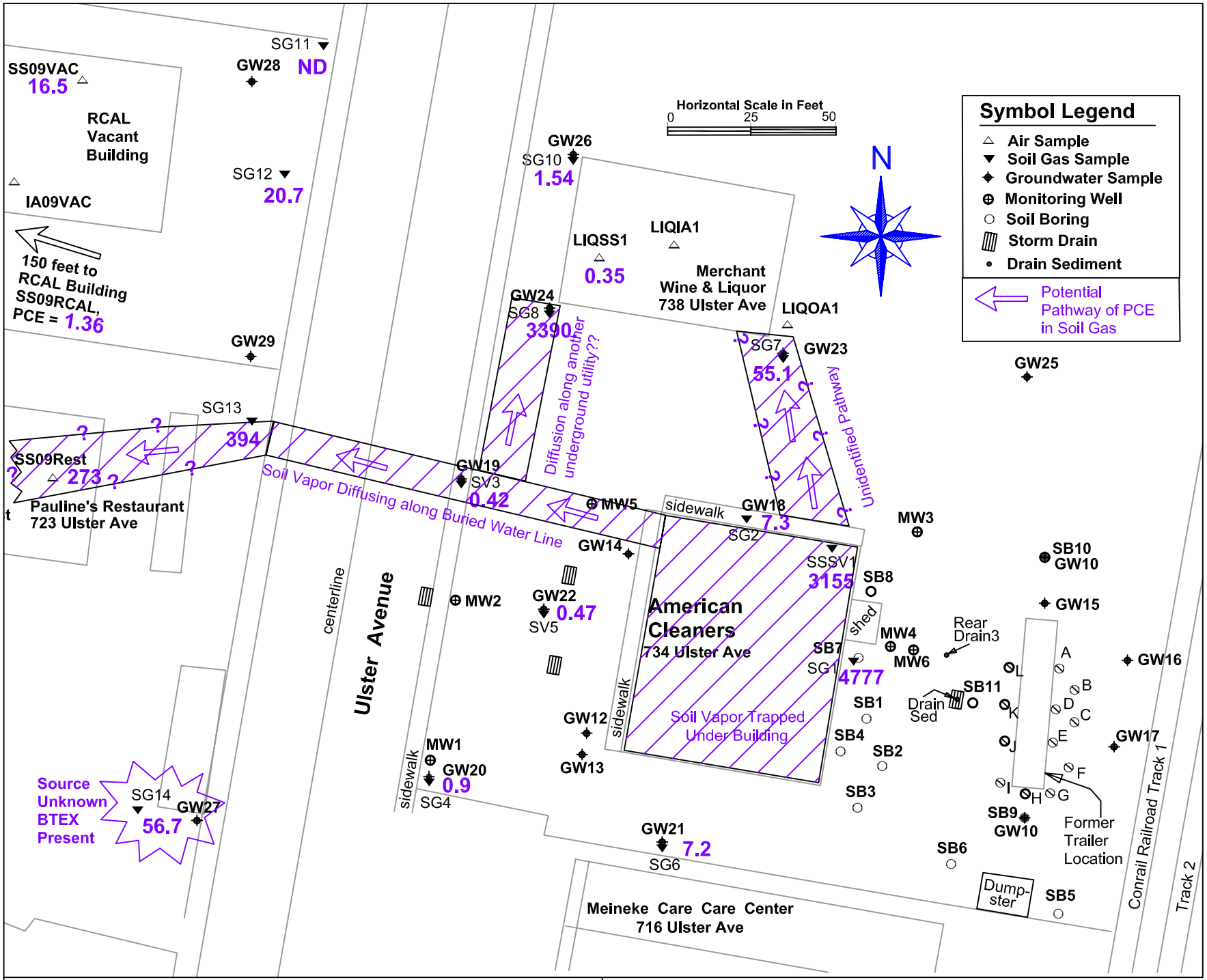

Figure 5-5. Map of PCE Concentrations (ppbv) Detected in Soil Gas and Subslab Air Samples.
American Cleaners Inc, 734 Ulster Avenue, Kingston, NY
NYSDEC DER VCP Site V-00601-3 December 31,2009

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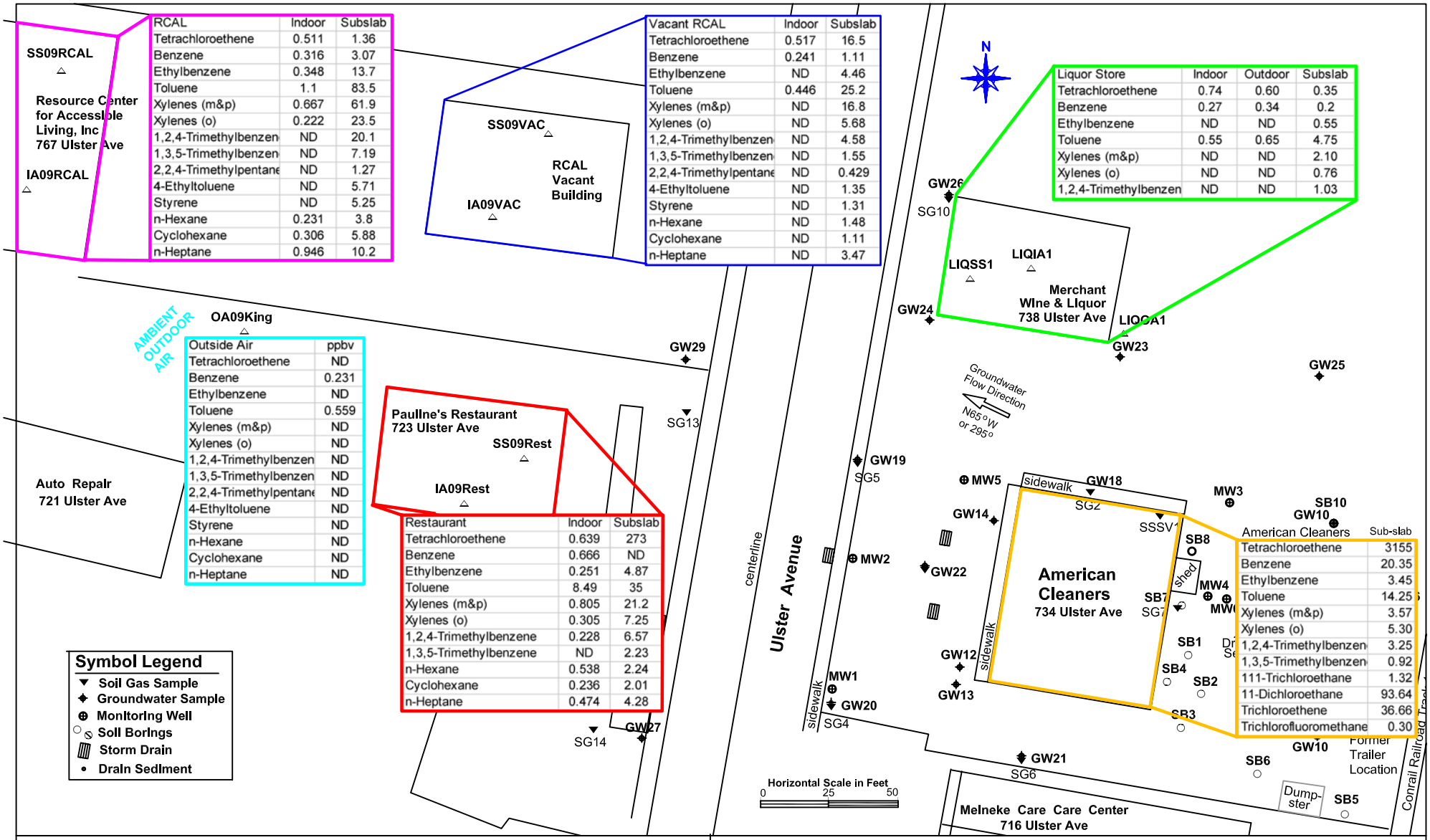

Figure 5-6. Map of PCE & Other VOC Concentrations (ppbv) in Air Samples from Subslab, Indoor and Outdoor Locations on & off site.
American Cleaners, Inc. 734 Ulster Avenue, Kingston, NY
NYSDEC DER VCP Site V-00601-3, December 31, 2009

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APPENDICES

[only available on magnetic media]

A Monitoring Well Construction Diagram and Soil Boring Logs
B EDR Environmental Database Search within 0.5 miles of American Cleaners Kingston
C Analytical Laboratory Reports
D Berninger Table of Soil Gas Results for Samples VVVS1 and SG1 (Unknown Dates)
E Data Usability Summary Reports

Voluntary Cleanup Program

Remedial Investigation Report At American Cleaners Kingston

734 Ulster Avenue
Kingston, NY
Site No: V-00601-3
Index No: W3-0952-03-03

For Submittal to
New York State Department of Environmental Conservation
Division of Environmental Remediation
625 Broadway
Albany, NY 12233-7016

December 31, 2009

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