FEASIBILITY STUDY
FORMER CHARLTON CLEANERS SITE
FOREST AVENUE SHOPPERS TOWN
STATEN ISLAND, NEW YORK
VCP SITE NO. V-00252-2
INDEX NO. W3-0891-01-06

Prepared For

KIOP Forest Avenue, LP

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1.0 INTRODUCTION

The following Feasibility Study (FS) for the former Charlton Cleaners site (the Site) was completed on behalf of KIOP Forest Avenue, L.P. (KFA) by Leggette, Brashears & Graham, Inc. (LBG) in accordance with the New York State Department of Environmental Conservation (NYSDEC) and New York State Department of Health (NYSDOH) requirements. The FS is intended to satisfy the requirements of the NYSDEC as stated in a letter dated April 15, 2011, in which the NYSDEC accepted the March 2011 revised draft Remedial Investigation Report (RIR) and required the submittal of a FS as the first step in the remedial phase of the Site.

KFA is an innocent owner volunteer which entered the Site into the NYSDEC Voluntary Cleanup Program (VCP) on February 20, 2002. The former Charlton Cleaners was an approximately 2,000 square foot portion of the Rock-Landau Building in the Forest Avenue Shoppers Town (FAST) shopping center. The Site is assigned VCP Site No. V-00252-2, Index No. W3-0891-01-06. In 1997 the Site was listed in the New York State Registry of Inactive Hazardous Waste Disposal Sites as a Class "2" Site, Registry Site Code 243019.

1.1 Purpose

The purpose of the FS is to develop and evaluate options for remedial response actions and to evaluate potential remedial technologies in accordance with Title 6 of the New York State Codes, Rules and Regulations (6 NYCRR), Part 375 (Environmental Remediation Programs), Subpart 375-2 (Inactive Hazardous Waste Disposal Site Remedial Program).

1.2 Basis for Remedial Action

The Site has been classified by the Commissioner of the NYSDEC as a Class "2" site in the New York State Inactive Hazardous Waste Disposal Site Remediation Program (State Superfund Program or SSF). Thus by definition the Site "is one at which contamination constitutes a significant threat to public health or the environment" (6 NYCRR Part 375-2.7(b)(3)(ii).

Additionally, as indicated in the RIR, contamination has been detected in several Site environmental media at levels exceeding the applicable Standards, Criteria or Guidance Values (SCGs). Thus a remedial alternative is required to eliminate or mitigate all significant threats to public health and the environment.

The FS is the required remedy selection report for a site in the SSF which is listed as a Class 2 site. The FS will also satisfy the requirements of remedy selection under the Site's status in the VCP.

1.3 Goal of the Remedial Program

The goal of the remedial program (under the SSF) "is to restore that site to pre-disposal conditions, to the extent feasible. At a minimum, the remedy selected shall eliminate or mitigate all significant threats to the public health and to the environment presented by contaminants disposed at the site trough the proper application of scientific and engineering principles and in a manner not inconsistent with the national oil and hazardous substances pollution contingency plan…" (375-2.8,a)

1.4 Methodology

Remedial Action Objectives (RAOs) will be established based on existing media-specific and contaminant-specific SCGs.

RAOs are established based upon:

- applicable SCGs, considering the current, intended and reasonably anticipated future use of the Site and its surroundings;
- those contaminants exceeding applicable SCGs;
- the environmental media impacted by such contaminants;

- the extent of environmental impact;
- actual or potential human exposures; and,
- environmental impacts resulting from the contaminants.

General response actions will be identified which will:

- include an estimate of the area and volume of contaminated media to be addressed;
- include general remedial categories such as treatment, containment, excavation, extraction, disposal, institutional controls or a combination of such;
- be medium specific;
- give preference to presumptive remedies;
- consider the use of innovative technologies where applicable; and,
- identify and discuss technologies which are not appropriate for the Site due to Site-specific factors or constraints.

The general response actions will be further developed into potential remedial response actions. For response actions involving application of technology, choices will be made from either presumptive or proven remedial technologies (see DER-15) or from innovative technologies which are demonstrated to be feasible to meet the remediation requirements (375-1.8(a)(4)).

Assemble implementable and appropriate remedial responses into site wide or location specific alternatives. The alternatives will be analyzed based upon 9 factors as described in 375-1.8(f) (remedy selection):

- overall protectiveness of human health and the environment;
- conformance to applicable standards, criteria and guidance;
- long-term effectiveness and permanence;
- reduction in toxicity, mobility or volume of contamination;
- short-term impacts and effectiveness;
- implementability;
- cost-effectiveness;

- land use; and,
- community acceptance (after any public comment period).

A remedy or remedies for the Site will be recommended based on the above criteria.

1.5 Site Background

This section summarizes relevant background information relating to the Site including its physical description, history, surrounding properties and investigative history.

1.5.1 Site Description and History

As described in the VCP agreement, the Site is the former Charlton Cleaners which operated at 24 Barrett Avenue in the Forest Avenue Shoppers Town. More specifically, the VCP agreement describes the Site as an approximately 2,000 square foot portion of the Rock-Landau building in the FAST. The FAST is a shopping center comprising approximately 25 retail businesses in 5 separate buildings. The FAST shopping center is located between Forest Avenue to the south, Barrett Avenue to the northeast and Decker Avenue to the northwest. The FAST is located at 40 deg 37' 30" north latitude and 74 deg 8' 13" west longitude and is identified on the County of Richmond Tax Map as Section 5 Block 1053 Lots 130, 133, 138, 166, 176, 179, 189 and 200. The tax parcel on which the Rock-Landau building is situated is Lot 138. Figure 1 shows the FAST location on a portion of the "Arthur Kills" United States Geological Survey (USGS) 7.5-minute topographic quadrangle. The FAST building plan is shown on the figure 2 Site Plan. The Site lies at an elevation of approximately 30 feet above mean sea level and is relatively flat. Site and surrounding topography slopes very gradually downward toward the north and northeast (figure 1). The Site is zoned C4-1 commercial (zoning map 20D).

The former Charlton Cleaners facility was located in what was historically known as the Rock-Landau Building, situated in the southeast corner of the FAST and having an address of 24 Barrett Avenue. At the time of its existence, the Rock Landau building was a multi-tenant building and the Charlton Cleaners lease space occupied approximately 2,000 square feet of the approximately 17,500 square foot Rock-Landau Building. The Rock-Landau Building was a multi-tenant retail space until the redevelopment and occupation by a single

tenant. The current tenant, Michaels craft store, began occupation of the building in approximately 1995. For the sake of consistency with prior reports, the Rock Landau Building will be referred to as the Michaels building in this document.

The 17,500 square foot Michaels building is primarily constructed as a slab on grade but has a 4,150 square foot basement beneath its eastern portion, parallel to Barrett Avenue (figure 3). Records indicate that the former Charlton Cleaners leasehold space existed above the north end of this basement. The basement is primarily one large open space used as storage for retail stock for the Michaels store. Two small equipment rooms and the exterior stairwell are separated from the main basement by a block masonry fire wall and steel fire door. The eastern equipment room contains electrical panels, gas and water valves and meters and a large sump pit in the floor. The western equipment room contains several wall-mounted electrical panels.

The FAST is used for retail and commercial business and its "Contemplated Use" as described in the VCP agreement is: "Restricted Commercial; excluding day care, child care and medical care uses". The Site is almost entirely either paved with asphalt or overlain by one and two story buildings. The buildings are either constructed as slab-on-grade or are underlain by partial or full sub-grade basements.

Based on Sanborn Map review, prior to the development of the FAST property as a shopping mall in 1951, the property was a golf range. After Site development, the location of the former Charlton Cleaners was the northeast corner of the Rock-Landau Building which was once a multi-tenant building but is now occupied by one tenant (Michaels craft store). The Charlton Cleaners facility operated at the FAST from approximately 1966 to approximately 1989.

Fire insurance maps from 1917 to 1966 were inspected to determine past land uses. From 1917 to 1950 the FAST is mostly undeveloped with residential dwellings on the southeast and northwest ends. On the 1917, 1937 and 1950 Sanborn maps a surface water stream referred to as Palmer's Run crosses the future FAST property from south to northeast and continues to the east of Barrett Avenue. The 1917 map also shows a small tributary to the Palmer's Run which joins the main stream just west of the location for the future Michaels building. By 1962, the map shows that the shopping mall has been constructed (named Staten

Island Plaza Shopping Center). A dry cleaner is shown in the northeast corner of what is currently the Michaels building. A second dry cleaner (at the location of the former Paul Miller) is shown to the west-southwest of the former Charlton Cleaners location. Also, on the 1962 map the Palmer's Run is no longer evident. The NYC Sewer Department plans indicate that the stream has been "channelized" by redirecting it through a 9 foot by 5 foot concrete culvert beneath the ground. The property may have been subject to the importation of artificial fill in order to elevate the grade surface at about the same time that the Palmer's Run was routed into a subsurface culvert.

There is a current FAST tenant named Charlton Cleaners which occupies a lease space in the building north of the Michaels building. Based on an interview, the current Charlton Cleaners owners have no relation to the historic Charlton Cleaners. The current Charlton Cleaners does not use chlorinated solvents in their onsite operation but rather uses a "wet cleaning" technology.

1.5.2 Surrounding Properties

The parcels surrounding the FAST to a radius of 1,000 feet are a mixture of commercial properties and single-family residences. Along Forest Avenue to the south of the FAST are commercial parcels of a retail nature: strip malls, a real estate office, dental office, restaurant, deli, nail salon, etc. Farther to the south are single-family homes. To the west of the FAST along Decker Avenue are mostly single-family homes. A Hess gasoline filling station once stood at the current location of a Walgreens drug store, a parcel adjacent to the FAST. To the north, northwest and northeast of the FAST along Decker and Barrett Avenues and Cornell Street are single-family homes. To the east of the FAST and the Michaels building, across Barrett Avenue is another large shopping mall called the Pathmark Mall. Other than the residences to the west, north and northeast of the FAST, there are no known sensitive receptors (schools, day care, hospitals, parks, nursing homes) within 1,000 feet of the Site.

The current location and building for the Boston Market restaurant (1465 Forest Avenue) is the former location of the Paul Miller dry cleaning facility. The Paul Miller facility has its own environmental issues and has an investigative history dating back as far as Charlton Cleaners. The Paul Miller parcel is on the New York State Registry of Inactive Hazardous

Waste Disposal Sites as a Class "2" Site, Registry Site Code 243018. The Paul Miller facility appears in the city directory from 1966 to 1995. The site of the former Paul Miller facility is approximately 325 feet southwest of the former Charlton Cleaners location. The city registry also lists a Jennifer Dry Cleaners at 1458 Forest Avenue.

1.5.3 Site Investigations

A complete discussion of Site investigations is presented in the RIR and is incorporated herein by reference. The following is a brief summary of that information.

- **1994** - Apex Environmental conducted an investigation of the entire FAST property including sampling and analysis of soil and groundwater from several locations including 4 preexisting monitoring wells surrounding the Rock-Landau (Michaels) building.
- **August 1996** - EEA, Inc. working on behalf of the owner of the Paul Miller facility, conducted an environmental consisting of the drilling and installation of 5 groundwater monitor wells (2 on the Paul Miller site and 3 on the FAST).
- **October 1996** - Dvirka and Bartilucci on behalf of the NYSDEC, collected 20 soil samples and 10 groundwater samples in the vicinity of the former Carlton (Charlton) Cleaners facility
- **Summer 2000** - Lawler, Matusky & Skelly (LMS), on behalf of the NYSDEC, investigated the Paul Miller site by installing and sampling 7 piezometers and sampling three pre-existing monitor wells.
- **Fall 2000** – LBG on behalf of KIOP, conducted a subsurface investigation surrounding the Michaels building which included drilling 25 soil borings, and the installation and sampling of 8 groundwater monitoring wells.
- **Spring 2005** - Based on the 2000 results, LBG expanded the investigation by installing an additional 23 monitoring wells in clusters of 4, screened at 4 different depth intervals to 90 ft bg (feet below grade). Additional environmental media were sampled including soil vapor and outdoor air exterior to the Michaels building; soil, groundwater and vapor beneath the Michaels basement slab and indoor air within the Michaels building.

- **July 2008** - LBG supervised the installation of 20 monitoring wells in the parking lot south and hydrologically upgradient of the Michaels building. The groundwater contained dissolved chlorinated solvents which have been shown to have migrated from the Paul Miller property.
- **August 2008** - 9 permanent sub-slab vapor sampling points were installed in the floor of the Michaels building.
- **May 2009** - LBG investigated offsite soil vapor quality along Cornell Street (a residential neighborhood) to the north of the Site. Eight temporary soil vapor sample probes were installed and vapor was collected for laboratory analysis.
- **Summer 2010** – LBG investigated offsite downgradient groundwater quality through the installation and sampling of monitoring well clusters installed in the Pathmark Mall parking lot and on Cornell Street.

1.5.4 Interim Remedial Measures

In 2006-2007, the first of two Interim Remedial Measures to reduce indoor air volatile organic compound (VOC) concentrations in the Michaels building was approved and completed at the Site and included: 1) the installation of a polyethylene vapor barrier and second concrete slab on the existing floor of the Michaels building basement; 2) the installation of covers on three basement sump pits; and, 3) the installation and pilot testing of horizontal vapor extraction wells north of the Michaels building.

A second interim remedial measure (IRM) was implemented in September 2009 and included excavation of impacted soil from beneath the basement floor of the Michaels building, and the addition of a ventilation fan to the basement sump pits. This was performed in order to remediate material suspected to be impacting groundwater quality as well as to improve Michaels building indoor air quality. Eleven tons of soil was removed from the vicinity of the large basement sump pit. The activities are summarized in the November 2009 Interim Remedial Measures Report.

1.6 Site Characterization

The Site has been the subject of a series of environmental investigations beginning in approximately 1994. Investigations have been focused upon the Michaels building and its immediate surroundings, as well as areas hydraulically upgradient and downgradient (including offsite) of the former Charlton Cleaners location. Investigations have defined the environmental quality of groundwater, soil, soil vapor and indoor air through drilling, well installation, media sampling, measurements, testing, etc.

1.6.1 Geology

As determined through soil borings and excavations, the shallow lower permeability sediments (grade to approximately 20 to 30 ft bg) beneath the Site consist primarily of fine to medium sand with varying amounts of silt and gravel/cobble. At most drilling locations, a zone of difficult drilling, presumed to be a cobble layer, was encountered at between 5 and 30 ft bg. There is little or no recovery in split-spoon samples from this zone. The silty cobble zone sediments are underlain by higher permeability materials primarily consisting of fine to coarse sand with trace silt and gravel. Although there is subtle variability in the dominant grain size with depth and between locations, no confining layers were identified in any of the borings during monitor well installation activities. Terminal depth for soil borings extend to approximately 95 ft bg onsite and 130 ft bg offsite and no bedrock was encountered at any drilling locations. A conceptual geologic cross section is shown on figures 4 and 5.

1.6.2 Hydrogeology

Water-level measurements collected from monitor wells indicate the depth of the saturated zone averages approximately 6 ft bg but has been as deep as 9.5 ft bg and as shallow as 2.5 ft bg. Groundwater elevation contour maps calculated using the top of casing elevations indicate that the general groundwater flow direction beneath the Site is to the north and northeast. A groundwater elevation contour map for August 2010 is shown on figure 6. Note that this map depicts elevation contours for the water table surface and as such depict the direction of groundwater flow in the shallow saturated zone. Groundwater flow at depth was evaluated by mapping the potentiometric surface elevation as determined by water-level measurements in

wells screened below the water table. The groundwater flow directions at depth are north and northeast and correlate with the flow direction in the shallow aquifer. The water-table gradient shows some variability both across the Site and through time. Groundwater gradients varied between 0.008 ft/ft and 0.02 ft/ft. Short-term permeability slug tests on wells north of the Michaels building and screened in the lower permeability materials indicate hydraulic conductivities ranging from 1.4 feet per day to 83 feet per day. Using a porosity of 0.2, groundwater flow velocities may range between 0.07 and 4 feet per day.

The vertical component to groundwater flow was evaluated and general conclusions were that on any given date, the Site exhibited both downward and upward flow components between well pairs. There does not appear to be a dominant or Site-wide downward flow gradient. Any vertical flow component is much smaller in magnitude compared to lateral (horizontal) flow.

1.6.3 Hydrology

The Site is completely paved or covered with buildings. Some of the Site surface drainage is into catch basins and a combined sanitary/storm sewer owned and maintained by the City of New York. A portion of Site surface drainage is into catch basins that discharge into the culvertized stream referred to as Palmer's Run on historic maps. The culvert drainage system crosses the Site from the south to the northeast where it exits the Site under Barrett Avenue just north of the T-Mobile building. The former Palmer's Run stream channel may have some influence on the flow of shallow groundwater.

1.6.4 Groundwater Usage

Based on review of an EDR Geocheck report, there are no NYS or Federal public water supply wells within a 1-mile radius of the Site. The EDR report includes a search of the USGS National Water Inventory System, the EPA Public Water Systems database and the NYSDOH, New York Public Water Wells database. Water to the Site and all Staten Island is supplied by the New York City water supply system through the Richmond Tunnel.

1.6.5 Nature and Extent of Contamination

As summarized in the RIR, numerous samples have been collected from various environmental media at the Site to characterize the nature and extent of Site-related contaminants. All analytical results are reported in the RIR. Environmental media which were investigated include: groundwater, soil, soil vapor (including sub-slab vapor) and indoor air.

The primary class of contaminants found in Site media is VOCs. Further, due to the nature of the chemicals used in the onsite dry cleaning facility (Charlton Cleaners) and the adjacent offsite facility (former Paul Miller Cleaners), the majority of VOCs detected are chlorinated solvents or chlorinated volatile organic compounds (CVOCs). The former Paul Miller Cleaners is hydraulically upgradient from the Site and VOCs emanating from the Paul Miller Cleaners are believed to have migrated beneath the Site. The primary Site contaminants of concern (COCs) are tetrachloroethene (PCE) and its breakdown products trichloroethene (TCE), cis-1,2-dichloroethene (DCE) and vinyl chloride (VC). Minor detections of other VOCs, not related to dry cleaner operations, have been noted. The RIR contains a full summary of contaminant concentrations in the various Site media.

1.6.5.1 Groundwater

The Site contaminants found to exceed the applicable NYS Ground Water Quality Standards are PCE, TCE, DCE and VC. Historic groundwater quality is summarized on table 1. Halogenated VOCs have been detected at the Site up to 90 ft bg. The VOCs are in a partially degraded state as evidenced by the presence of DCE and VC in the shallow low permeable materials which extend up to 30 ft bg. Degradation of halogenated VOCs in low permeable media is common; however, the rate at which this process occurs depends on several factors (such as competing nutrients). Dispersion and diffusion are the likely dominant chemical transport mechanism in this shallow zone (i.e., slow moving and radially spreading).

Halogenated VOCs present in the deeper high permeable materials are less degraded, and have been detected at much higher concentrations than in the shallow low permeable materials. Advective flow appears to be the dominant chemical transport mechanism in this media. Chemical fingerprints and gradients in advective flow environments commonly contain few degradation constituents (reflective of aerobic conditions) with narrow and elongated high

concentration plumes. Halogenated VOCs from the upgradient Paul Miller Cleaners release appear to have substantially contributed to the impacts in these deeper high permeable materials; this is evident by the high concentration of halogenated VOCs detected in the hydraulically upgradient monitoring wells (MW-16 cluster, figure 6). These upgradient detections are only modestly lower than the concentrations typically seen in the "hot spot" at the Site (MW-6B, figure 6).

The dissolved phase plume exceeding the NYS Groundwater Quality Standards extends laterally from beneath the Michaels building in a downgradient direction (generally north and northeast). The dissolved plume at the positions of the MW-9 and MW-10 clusters only occasionally exceeds the GWQS, therefore these points mark the upgradient and onsite plume limits to the northwest. The onsite core of the Charlton plume is centered beneath the northern portion of the Michaels basement and beneath the access road between Michaels and T-Mobile (vicinity of the MW-6 cluster). PCE concentrations have generally been greatest in samples from MW-6B where historic levels have ranged from approximately 3,000 micrograms per liter (ug/l) to 12,000 ug/l. While this represents generally the peak concentrations detected at the Site, the concentrations are modestly lower than VOC detected in the hydraulically upgradient monitoring wells (MW-16 cluster).

Defining the plume boundary to the south and west of the Michaels building is complicated by the presence of a second chlorinated solvent plume which has been shown to emanate from the Paul Miller site and is migrating on to the FAST. The location at which the two plumes mingle and become one is likely to be in the vicinity of the MW-5 cluster.

Figures 7 and 8 illustrate the approximate dissolved CVOC plume boundaries which were generated using several data sets spanning the period from 2008 to 2010. The figures depict total CVOC concentrations. The Paul Miller plume extends from the southwest side of the former Paul Miller location toward the northeast. The commingled plumes exist beneath the Michaels and T-Mobile buildings and extend across Barrett Avenue and beneath the northern Pathmark Mall parking lot. Total plume length from the former Paul Miller to the distal end east of Barrett Avenue is at least 975 feet with the plume originating at the former Charlton Cleaners location extending at least 570 feet. The plume is 300-450 feet wide on the eastern side of the FAST. Offsite groundwater quality is discussed in the RIR.

The onsite vertical limit of the plume in the area immediately north and northeast of the Michaels building extends to the depth of the "D" wells (see MW-6D, MW-11D and MW-12D, table 1), screened 80 to 90 feet below grade. Other deep Site wells only occasionally contain groundwater in exceedance of TOGS

1.6.5.2 Soil

Contaminants of concern detected in soil samples are the same as those detected in groundwater: PCE, TCE, DCE and VC. Isolated low level occurrences of other VOCs, not attributable to dry cleaner chemicals are documented. These include acetone, toluene, xylenes and methylene chloride.

Soil quality is fully documented in the RIR. Soil quality inside and outside the Michaels building footprint has been documented through the collection of approximately 76 soil samples. Of all these samples, approximately 6 contained Site contaminants at levels greater than the SCGs (tables 2 and 3, figures 9 and 10). These sample locations were from below the north Michaels basement floor and below the access road between the Michaels and T-Mobile buildings. Sample depth ranged between 10 and 17 ft bg which is within the saturated zone. Compounds above the SCGs were PCE, TCE, DCE and VC. Maximum total CVOC concentrations were detected at 6.5 milligrams per kilogram (mg/kg) in a hand auger sample from below the basement floor and 200 mg/kg in a soil sample from 10 feet below grade at the location of monitoring well MW-6D.

1.6.5.3 Soil Vapor

Subsurface vapor which is further subdivided by NYSDOH convention into soil vapor (exterior to buildings) and sub-slab vapor (beneath a building foundation) has been investigated throughout the Site by the installation of both temporary and permanent vapor sampling points. While there are currently no SCGs promulgated for subsurface vapor, the relative compound concentrations are used to define areas of greatest vapor impact and are evaluated in conjunction with indoor air analyses to evaluate the need for further action.

Within the Michaels building, the concentrations of Site contaminants in sub-slab vapor are greatest beneath the northern basement floor (PCE: 610,000 micrograms per cubic meter),

the central basement floor and the northeastern corner of the slab-on-grade part of the building (PCE: 41,000 micrograms per cubic meter). The most prevalent compounds are PCE, TCE and DCE.

The concentrations of primary Site contaminants in sub-slab vapor collected from beneath the T-Mobile building are significantly less (7.3 micrograms per cubic meter) than those collected beneath the Michaels building

Offsite soil vapor is fully described in the RIR.

1.6.5.4 Indoor Air

A full discussion of indoor air quality is included in the RIR. The Michaels building indoor air has been sampled on a regular basis since 2005. Laboratory results indicate that indoor air contains the same compounds as found in the sub-slab vapor samples. The greatest total VOC levels and individual compound concentrations are found in the air within the equipment room in the basement followed by the main basement area, the upstairs loading dock (top of the stairs leading to the basement) and the main retail space. This distribution pattern appears to support the hypothesis that vapor intrusion is occurring primarily through the basement. Air migrates from the basement (with the equipment room having the highest impact) up the stairwell (subsequently impacting the upstairs loading dock area) and into the main store area (retail space). The COCs become more dilute along this path as outside air, supplied by the rooftop HVAC units, is mixed with it. It is not known whether COCs detected beneath the slab-on-grade portion of the building are significantly contributing to indoor air impact.

Review of the laboratory data for all indoor air samples (table 4) indicates that indoor air quality has improved substantially throughout late 2011 and 2012. This may be partially attributable to the installation of a ventilation fan in the basement. During the three most recent sampling dates, the NYSDOH Indoor Air Guidance Value for PCE was exceeded only in the air samples from the basement equipment room; a room not frequently occupied and only for short durations.

While chlorinated solvent contaminants are present in the Michaels indoor air, there are many compounds, not attributable to the former dry cleaner, which are of similar or greater

concentration. It is presumed that these other VOCs enter the store through several mechanisms including: 1) vapor intrusion from soil gas, 2) offgassing from cleaning products, 3) offgassing from building materials and the retail products themselves and 4) exterior air entering the building through the doors and the heating, ventilation and air conditioning (HVAC) system.

The T-Mobile building indoor air quality is substantially better than the Michaels building. PCE has never been detected at greater than 10 percent of the indoor air Guidance Value of 100 micrograms per cubic meter.

1.6.6 Contaminant Fate and Transport

In general, the fate and transport of any contaminant depends, among other factors upon the physical and chemical properties of the contaminant, the geologic and hydrogeologic characteristics of the subsurface to which it is released and the quantity and duration of release. The physical and chemical properties of chlorinated solvents include a specific gravity generally greater than 1 (in free phase), relatively low aqueous solubility, low vapor pressure and a propensity to adsorb to soil and organic matter.

Chlorinated solvents released to the environment will remain a Dense Non-Aqueous Phase Liquid (DNAPL), adsorb to soil, dissolve in groundwater and volatilize to soil vapor to an extent governed by the physical properties of the particular solvent and by the subsurface characteristics. DNAPL will migrate in non-aqueous, aqueous and vapor phases through the subsurface. Non-aqueous DNAPL will migrate downward under gravity through the unsaturated and saturated zones, until confining or semi-confining layers are encountered where they will accumulate. A portion of the DNAPL will dissolve into groundwater and enter the aqueous phase where groundwater flow will transport it laterally from the release point. Solvents will volatilize from both DNAPL and from solvents dissolved in groundwater, entering the vapor phase in the soil gas. Solvents in soil gas will migrate under control of subsurface pressure and concentration gradients. Chlorinated solvents will degrade chemically and biologically from molecules of higher chlorination to lower (e.g., PCE degrades to TCE, cis-1,2-DCE and VC).

In the specific case of the former Charlton Cleaners Site, the solvents are hypothesized to have entered the subsurface either beneath the northeast corner of the Michaels building through a floor drain, floor cracks, the basement sump pit or some other means. Alternatively, they could have been released from the sanitary sewer line beneath the driveway north of the Michaels building. The basement sump pits historically discharged to this sewer. This premise is based on the distribution of contaminants in soil, groundwater and soil vapor. The lack of any vadose zone soil samples containing significant chlorinated solvent levels may indicate that the point of release was at or below the water table, especially considering that basement floor and exterior sanitary sewer are near this elevation.

The lack of any detection of free-phase DNAPL in soil samples or in monitor wells could be an indication that solvents were released in an aqueous phase. DNAPL however can be difficult to detect and has a tendency to accumulate in small globules and tendrils.

The released solvent has dissolved into Site groundwater and has traveled laterally and vertically creating a plume approximately 90-100 feet thick near the Michaels building and extending at least 570 feet to the northeast and beneath the Pathmark Mall parking lot (figures 7 and 8). It is possible that the shallow portion of the groundwater plume is influenced by a preferential pathway along the course of the buried stream culvert. This culvert runs roughly west to east across the FAST from Forest Avenue, then under Barrett Avenue and beneath the north Pathmark Mall parking lot. Because of the plume migrating onto the Site from the former Paul Miller Cleaners, it is unknown to what extent the aforementioned described plume is attributed to the historic release from the former Charlton Cleaners Site.

Solvents have also volatilized into soil vapor beneath the Michaels building and the driveway north of it. Soil vapor intrusion has been documented in the Michaels building, impacting indoor air. Based on sampling, soil vapor does not appear to have impacted the indoor air of the adjacent T-Mobile building. Offsite soil vapor quality is discussed in the RIR.

1.6.7 Qualitative Human Health Exposure Assessment

The exposure pathway or means by which an individual may be exposed to a Site contaminant consists of 5 elements: 1) a *contaminant source* either the point of release to the environment or the contaminated environmental medium; 2) a *contaminant release and transport*

mechanism which carries the contaminant from the source to points where people may be exposed; 3) a *point of exposure* where actual or potential human contact may occur; 4) a *route of exposure* or manner in which the contaminant actually enters or contacts the body; and, 5) a *receptor population* who are or may be exposed to contaminants. The exposure pathway is considered to be complete when all 5 elements are documented. A potential exposure pathway exists when any of the 5 elements is not documented.

Based on the nature of the COCs found in the Site environmental media (chlorinated solvents) and the known past uses of the Site (a commercial dry cleaner), the contaminant source is presumed to be the release of solvents to the subsurface. The exact mechanism and location of the release(s) is unknown. Through the transport mechanisms described below, the soil, groundwater and soil vapor beneath the Site and indoor air of the Michaels building has become impacted by the COCs.

The contaminant transport mechanisms at the Site include: 1) the lateral and vertical migration of contaminants along the path of groundwater flow; 2) the volatilization of solvents from soil and groundwater into soil vapor; and, 3) the migration of soil vapor under the influence of subsurface pressure gradients.

The point of exposure and route of exposure is somewhat dependent upon the particular receptor population in question. The receptor population is based both on the present use of the Site and on planned future use as communicated by the Site owners (present use and future use is as a commercial property). The first two potential receptors are an employee or patron of any of the Site businesses. These receptors may be considered together as the only difference between the two is the duration of exposure (the employee would have greater exposure duration). The only contaminated media to which an employee or patron might be exposed is indoor or outdoor air. There is no potential for an employee to be exposed to contaminated soil or soil vapor (the Site is paved) nor to contaminated groundwater (which is approximately 8 to 9 ft bg). The outdoor air exposure point can be eliminated from consideration due to the absence of COCs in the analysis of outdoor air samples collected in June 2005. The point of exposure of an employee or patron would therefore be inside the Michaels building. The route of exposure for an employee or patron would be by inhalation of indoor air.

A third potential receptor at the Site is a construction/excavation worker performing ground-intrusive activities. In the case of this receptor, there is potential to be exposed to soil vapor, soil and/or groundwater impacted by the COCs. The point of exposure to contaminated soil would be beneath or immediately north of the Michaels building. Similarly, the point of exposure to contaminated groundwater would pertain to activities which result in excavation below approximately 8 ft bg and only in the areas discussed in the section describing groundwater quality. The routes of exposure for a construction/excavation worker would be by inhalation of soil vapor or soil particulates, ingestion of soil particulates or groundwater or dermal contact with soil or groundwater.

Offsite potential receptors are discussed in the RIR. There is no known groundwater extraction point (potable, commercial, irrigation, etc.) which is a potential receptor of groundwater from the Site. There is also no known surface water receptor to which the groundwater from the Site may discharge.

2.0 IDENTIFICATION OF STANDARDS, CRITERIA AND GUIDANCE (SCGs)

In order to evaluate remedial alternatives for the Site, standards, criteria and guidance (SCGs) for various Site environmental media must be identified. Standards and criteria are cleanup standards or other substantive environmental requirements or criteria promulgated under state law. They are typically chemical specific numerical values and are risk or health based. Guidance is non-promulgated criteria or advisories and is not a legal requirement.

Soil analysis results are compared to Soil Cleanup Objectives (SCOs) identified in 6 NYCRR Part 375-6.8(a) “Unrestricted Use” to establish a baseline for comparison purposes for contaminants that have not impacted groundwater and to Part 375-6.8(b) “Protection of Groundwater” for those compounds which have been detected in both groundwater and soil.

Although groundwater at the Site and its surroundings is not currently, nor will it in the likely future, used for potable water supply, it is subject to the Class GA Groundwater Standards (best usage of Class GA waters is as a source of potable water supply). Groundwater analysis results are compared to 6 NYCRR Part 703 Groundwater Quality Standards and Guidance Values (GWQS) and Groundwater Effluent Limitations as described in

the Division of Water Technical and Operational Guidance Series 1.1.1, June 1998 (TOGS 1.1.1).

Indoor air analysis results are compared to New York State Department of Health (NYSDOH) Indoor Air Guideline values described in Guidance for Evaluating Soil Vapor Intrusion in the State of New York, October 2006.

3.0 REMEDIAL ACTION OBJECTIVES

Remedial Action Objectives (RAOs) are medium-specific objectives for the protection of public health and the environment. They are developed based on contaminant-specific SCGs to address contamination identified at the Site. Generic RAOs are to be used where possible for various media. DER-10 describes the development of site-specific RAOs in circumstances where unique Site-specific conditions warrant.

Consideration is given to the following in developing the RAOs: exceedances of applicable SCGs in various media considering the current and anticipated future use of the Site, the specific media and extent of impact, and actual or potential human exposures and environmental impact resulting from the contaminants. Based on the continued use of the property as a commercial property and the results of the environmental investigations performed at the Site, the following RAOs have been identified.

3.1 Groundwater

RAOs for Public Health Protection

- Prevent ingestion of groundwater containing contaminant concentrations exceeding drinking water standards.
- Prevent contact with, or inhalation of, volatiles emanating from contaminated groundwater.

As there are no potable water sources onsite or offsite, the groundwater depth is in excess of 5 ft bg and the Site is covered by pavement and buildings, the only risk of human ingestion of groundwater is to construction/excavation workers and to operators of a groundwater treatment system.

The volatilization of contaminants from groundwater is a documented exposure pathway and is manifested as impact to the indoor air in the Michaels building but not the T-Mobile building.

RAOs for Environmental Protection

- Prevent the discharge of contaminants to surface water.
- Remove the source of groundwater contamination.
- Restore groundwater aquifer, to the extent practicable, to background conditions.

The RAOs established for the protection of the environment from impacted groundwater include restoration of the groundwater aquifer, to the extent practicable, to background conditions, prevention of discharge of contaminants to surface waters and removal of the source of groundwater contamination.

As indicated in the RIR, the closest surface water bodies to the Site are Brooks Pond (0.8 miles east and hydraulically side gradient to the Site), and the Kill Van Kull strait (north shore of Staten Island) 1.1 miles north. There are no listed wetlands within 1 mile of the Site. Based on review of satellite images, the Palmer's Run appears to remain fully below grade (culvertized) and unexposed along its entire run downstream (northeast) from the Site. Therefore discharge of contaminants to surface waters is not a driving factor for groundwater remediation and no response action is warranted for this objective.

The source of the groundwater contamination originating at the Site has not been identified at a specific point or location within the Site. For example, with few exceptions, soil samples collected over multiple investigations did not contain chlorinated VOCs exceeding the Part 375 SCOs. No mass of adsorbed-phase contamination has been identified in vadose soils beneath the Site. The point of contaminant release to the environment is inferred to be at or beneath the footprint of the former Charlton Cleaners lease space, based on dissolved contaminant distribution. Contamination adhered to soil in the saturated zone is a potential groundwater contaminant source as it gradually enters the dissolved phase. Treatment of dissolved phase contamination in groundwater therefore, will be effective at treating any adsorbed-phase con-

tamination in the saturated zone as well. Therefore, removal of the source of groundwater contamination is addressed in the following paragraph.

The RAO for the restoration of the groundwater aquifer, to the extent practicable, to background conditions, is the primary goal of this FS and the subsequent RAWP. The dissolved phase plume originating at the Site extends from beneath the Michaels building toward the north and northeast to the eastern property line of the FAST along Barrett Avenue. The Charlton plume extends vertically from the water table, up to 90 ft bg near the north side of the Michaels building and to a lesser depth toward the north and northwest. Because of the plume migrating onto the Site from the former Paul Miller Cleaners, the precise extent of impacts attributable to the former Charlton Cleaners release is not known. As an innocent volunteer, KFA is not responsible for the remediation of the offsite plume east of Barrett Avenue and therefore there is no RAO for this portion of the plume.

The Charlton dissolved plume co-mingles with a similar plume originating at the former Paul Miller facility to the south. Existing groundwater quality and flow data suggest that these plumes comingle near the northwest corner of the Michaels building, near well clusters MW-2 and MW-5. Downgradient of this area, the plume is presumably a combination of the two individual releases. Any remediation of the Charlton plume will eventually result in the recontamination of the area by groundwater flow from the Paul Miller plume to the south. It is for this reason that the RAO is defined as restoration to "background" conditions, that background being defined as the maximum individual contaminant concentrations in groundwater at a position immediately upgradient from the zone where the two plumes meet and comingle. This background condition is not currently defined due to the absence of monitoring wells at the exact position where the plumes are thought to comingle. A work plan to install additional sentinel wells and sample groundwater in order to determine the background groundwater condition has been developed and is included as Appendix I.

3.2 Soil

RAOs for Public Health Protection

- Prevent ingestion/direct contact with contaminated soil.

- Prevent inhalation of or exposure to, contaminants volatilizing from contaminated soil.

As described under the groundwater RAOs, the Site is covered by pavement and buildings and the only risk of human ingestion or direct contact with contaminated soils is to construction/excavation workers. Similarly, while limited unsaturated soil has been identified to contain VOCs the volatilization of contaminants from soil is a potential exposure pathway to construction/excavation workers and may contribute to the indoor air contaminants in the Michaels building.

RAOs for Environmental Protection

- Prevent migration of contaminants that would result in groundwater or surface water contamination.
- Prevent impacts to biota from ingestion/direct contact with soil causing toxicity or impacts from bioaccumulation through the terrestrial food chain.

There is no evidence of contaminant migration through vadose-zone soils at the Site such as vertical or lateral mobilization of NAPL under the force of gravity. Based on the lack of contamination identified in unsaturated soils, it is presumed that the dissolved phase contamination is the result of transfer from adsorbed-phase to dissolved phase in the saturated zone. The remedial alternative(s) designed to address the groundwater RAO for environmental protection (discussed above) also will address the RAO described herein for contaminant migration impacting groundwater quality.

There is no potential pathway for biota to become exposed to or ingest contaminated soil as the Site is completely covered.

3.3 Soil Vapor/Indoor Air

RAOs for Public Health Protection

- Mitigate impacts to public health resulting from existing, or the potential for, soil vapor intrusion into buildings at the Site.

Vapor intrusion into the Michaels building is a proven pathway and has been partially mitigated through an IRM (installation of basement floor vapor barrier), proper maintenance of the building HVAC units and the installation of a ventilation fan which extracts basement indoor air directly to the atmosphere. Recent indoor air monitoring in the Michaels building has confirmed that overall VOC concentrations have decreased significantly. It is expected that reduction in dissolved VOCs in groundwater beneath the building through remedial activities will result in a reduction of soil vapor and therefore, a reduction in soil vapor intrusion.

4.0 IDENTIFICATION AND SCREENING OF REMEDIAL ALTERNATIVES

4.1 General Response Actions

As an initial step to achieve the RAOs and identify remedial alternatives, general response actions (GRAs) are identified to address impacted environmental media. The GRAs may include some combination of no further action (NFA), institutional controls (ICs), engineering controls (ECs), monitored natural attenuation (MNA), in-situ containment, in-situ treatment, removal, ex-situ treatment (onsite or offsite), or some combination. GRAs are broadly grouped into medial specific "technology types" or general categories and further divided into "technology process options" which refer to specific processes within each technology type. Potential technology types and process options are identified and screened to determine which are appropriate given Site specific conditions. Technologies retained after screening are developed into remedial alternatives. The following is a summary of technology types and process options to address the groundwater, soil and soil vapor RAOs:

Technology Type	Description	Technology Process Options
No further action	No active remedial measures implemented to address groundwater	
Institutional controls	Administrative controls to minimize contact or use of groundwater, soil	Environmental easement, deed restriction, deed notice, local permits, zoning restrictions, groundwater use restrictions, etc.
Engineering controls	Physical controls to minimize contact with groundwater, soil	Capping, site management plan
Monitored Natural Attenuation	Monitoring the extent to which groundwater contamination is degraded by microbial activity, diffusion and advection	Periodic groundwater or soil vapor/indoor air sampling and analyses
In-situ containment	Demobilization of adsorbed and dissolved contamination without extraction	Soil solidification, hydraulic control (pumping) and containment (low-permeability barrier walls), soil vapor barrier

Technology Type	Description	Technology Process Options
In-situ treatment (physical, chemical, biological)	Treatment of adsorbed and dissolved contamination without extraction	Biological treatment, chemical treatment, in-situ extraction, thermal treatment, passive/reactive treatment walls
Removal	Soil excavation, extraction of groundwater for discharge to sewer or treatment, extraction of soil vapor	Soil excavation for onsite treatment, offsite treatment or disposal, groundwater pumping, dual-phase extraction, sub-slab depressurization
Ex-situ onsite treatment	Treatment of soil, groundwater after removal	Physical or chemical treatment: biopiles, air stripping, adsorption, thermal destruction
Offsite treatment and/or disposal	Conveyance of removed soil, groundwater to offsite treatment facility	Truck transport to disposal facility, discharge to NYC sanitary sewer system

4.2 Preliminary Screening

During the preliminary screening process, a number of technology types are reviewed based on technical Implementability and effectiveness. Technical Implementability is judged based on the ability to apply the technology at the Site knowing the specific Site characterization information (layout, nature and locations of impacts, subsurface conditions, etc.). Effectiveness of a technology is judged by its ability to meet the RAOs.

4.2.1 Groundwater GRAs

Based on the discussion in Section 3.1, the groundwater RAOs which require responses are: 1) Public Health-prevention of contact and inhalation of volatiles from contaminated groundwater as it relates to construction/excavation workers, 2) Environmental Protection-remove source of groundwater contamination, and 3) Environmental Protection-restore groundwater to background conditions, to the extent practicable.

The following GRAs were identified to address the RAOs for groundwater:

- *No further action – no additional remedial measures would be performed or undertaken to address groundwater contamination.*
- *Institutional controls – administrative controls would be implemented to minimize contact with, and use of Site groundwater.* Preliminary screening identified environmental easements, deed restrictions and groundwater use restrictions as potential institutional controls to address the public health RAO.
- *Engineering controls – existing and/or new physical barriers against contact with Site groundwater would be established and maintained.* Preliminary screening identified maintenance of the existing Site cover materials (buildings,

pavement, etc.) as potential engineering controls to address the public health RAO.

- *Monitored natural attenuation – groundwater quality would be periodically monitored to evaluate the rate and extent to which Site contaminants naturally degrade due to microbial activity, advection, dispersion and dilution*. Preliminary screening identified MNA as an appropriate technology for monitoring the distal portions of the groundwater plume not directly under treatment by active remediation, as part of the protection of environment RAOs.
- *In-situ containment – hydraulically control and/or physically contain the impacted groundwater to prevent migration*. These technology process options are not considered technically feasible due to the excessive volume of groundwater which would be required to be extracted over a long time period. Also, containment with a barrier wall is not feasible due to extensive subsurface utilities and lack of a deep hydraulic aquiclude (clay layer or bedrock) into which the barrier could be keyed.
- *In-situ treatment – use biological, chemical and/or physical means to treat dissolved-phase contamination as well as compounds adsorbed to soil particles in the saturated zone*. Due to Site specific conditions, any technology process option which requires extensive above-grade infrastructure (e.g., in-situ air stripping), or which would potentially generate high soil vapor pressures (potential vapor infiltration) or extreme physical conditions (heat, electricity, etc., e.g. Fenton's Reaction) was considered technically infeasible. Also, prior sampling has shown the lack of naturally occurring microbes capable of metabolizing chlorinated ethenes (dehalococcoides) and an environment not conducive to bioremediation. Therefore evaluation of biological treatment technologies involving enhancement of an existing population was eliminated.

In-situ chemical treatment is considered to be the most Site-appropriate of the in-situ methodologies. The shallow aquifer near the Michaels building has a low natural oxidant demand (0.7 grams per kilogram permanganate and 0.35 grams per kilogram persulfate). Generally, sites with an NOD less than

20 grams per kilogram are favorable for in-situ chemical oxidation (ISCO). Therefore, ISCO through the direct application of an oxidizer (permanganate, persulfate, ozone) is retained for further evaluation. An additional physical technology, thermal remediation (electrical-resistance heating and thermal-conductive heating) was retained for secondary screening.

- *Removal and ex-situ treatment or offsite treatment and/or disposal – recover dissolved phase contaminants in groundwater by pumping. Groundwater would then be treated onsite then discharged to the New York City sewer system, discharged directly to the sewer if quality criteria are met or contained and periodically trucked from the site for offsite treatment and disposal.* This technology type was not retained for further screening for the following reasons: the high volume and long duration needed for a pump and treat system, diminishing recovery commonly exhibited by pump and treat systems, high maintenance costs, lack of space needed to set up a treatment system, high cost paid to New York City in order to discharge to a city sewer, high costs for offsite disposal.

4.2.2 Soil GRAs

Based on the discussion in Section 3.2, the soil RAOs which require responses are: 1) Public Health: prevention of ingestion/direct contact with contaminated soils as it relates to construction/excavation workers; 2) Public Health: prevent inhalation of or exposure to contaminants volatilizing from contaminated soil as it relates to construction/excavation workers. Note that RAOs for environmental protection were determined to be non-applicable as there is no evidence of contaminant migration in the unsaturated zone and there is no threat to biota. Remedial alternatives designed to address dissolved phase groundwater contamination will be equally effective at remediating adsorbed phase contaminants adhered to soil particles below the water table.

The following GRAs were identified to address the RAOs for soil:

- *No further action – no additional remedial measures would be performed or undertaken to address soil contamination.*

- *Institutional controls – administrative controls would be implemented to minimize contact with, and inhalation of volatiles from Site soil.* Preliminary screening identified environmental easements and deed restrictions as potential institutional controls to address the public health RAO. A Site Management Plan (SMP) would be an important element to identify requirements for intrusive activities (oversight, personal protective equipment, contaminant locations).
- *Engineering controls – existing and/or new physical barriers against contact with Site soil would be established and maintained.* Preliminary screening identified maintenance of the existing Site cover materials (buildings, pavement, etc.) as potential engineering controls to address the public health RAO.
- *In-situ treatment – use biological, chemical and/or physical means to treat soil contamination in the phreatic (saturate) zone.* The technology process option discussed with regard to in-situ groundwater treatment will effectively address saturated soil contamination.
- *Removal and ex-situ treatment or offsite treatment and/or disposal – recover contaminated soil by excavation. Soil would then be treated onsite or offsite.* This technology type was not retained for further screening because soil excavation is not feasible due to the active nature of the Site and the presence of Site buildings and utilities.

4.2.3 Soil Vapor/Indoor Air GRAs

Based on the discussion in Section 3.3, the soil vapor/indoor air RAO which requires response is: 1) Public Health: mitigate impacts to public health resulting from existing, or the potential for, soil vapor intrusion into buildings at the Site.

The following GRAs were identified to address the RAOs for soil vapor/indoor air:

- *No further action – no additional remedial measures would be performed or undertaken to address soil vapor/indoor air contamination.* As groundwater quality improves, it is assumed that soil vapor and indoor air quality would improve as well. However, no monitoring of conditions would be conducted.

- *Institutional controls – administrative controls would be implemented to minimize impact to public health resulting from vapor infiltration into Site buildings*. Preliminary screening identified the SMP as a mechanism to control access to the basement of the Michaels building; the area of greatest indoor air impact.
- *Engineering controls – existing and/or new physical barriers preventing soil vapor intrusion and mitigating the effects on indoor air quality*. Preliminary screening identified maintenance of the existing mitigative measures (Michaels basement vapor barrier, HVAC system maintenance, basement ventilation maintenance) as the best means of reducing vapor infiltration. The SMP would outline proper maintenance procedures. The traditional method of sub-slab depressurization as a means of preventing vapor intrusion is not technically practical at the Michaels building because the static groundwater level is at the elevation of the basement floor and therefore the sub-floor cannot be ventilated without dewatering the subsurface.
- *Monitored natural attenuation – soil vapor/indoor air quality would be periodically monitored to evaluate the rate and extent to which remediation of Site groundwater contamination results in improvement of vapor/air quality*. Preliminary screening identified MNA as an appropriate technology for monitoring the indoor air quality in the Michaels and T-Mobile buildings. Existing engineering controls have results in acceptable indoor air quality in the upstairs retail space of the Michaels building. Periodic monitoring would confirm that this condition continues and that improving groundwater quality also results in improving soil vapor/indoor air quality.
- *Removal – recover soil vapor with contaminants by passive or active sub-slab depressurization (Michaels building). Soil vapor would then be vented to the atmosphere*. This technology type is only feasible if the Michaels basement sub slab is dewatered in conjunction with depressurization. Installation of a depressurization system beneath the floor of the slab-on-grade portion of the building is feasible. However, the benefit to indoor air quality of such a system

is not known. Based on the distribution of VOCs within the building, the majority of vapor intrusion appears to be occurring in the basement.

4.3 Remedial Alternatives and Secondary Screening

Remedy selection evaluation criteria are discussed in DER-10 Section 4.2 where nine criteria are described. The first two criteria are threshold criteria and must be satisfied in order for an alternative to be further considered. The next seven criteria are primary balancing criteria used to compare the positive and negative aspects of each alternative.

1. overall protectiveness of public health and environment;
2. conformance with SCGs;
3. long-term effectiveness and permanence;
4. reduction of toxicity, mobility and volume;
5. short-term impact and effectiveness;
6. implementability;
7. cost effectiveness;
8. land use; and,
9. community acceptance (to be determined after public review).

This section describes the retained alternatives designed to address the RAOs for Site groundwater, soil and soil vapor/indoor air. The alternatives are described and evaluated with respect to the first eight criteria listed above.

4.3.1 Groundwater

As discussed in Section 3.1, the groundwater RAOs requiring remedial action are: 1) prevent ingestion of groundwater containing contaminant concentrations exceeding drinking water standards; 2) prevent contact with, or inhalation of, volatiles emanating from contaminated groundwater; and, 3) restore groundwater aquifer, to the extent practicable, to background conditions.

Four alternatives were developed for further analysis:

- **GW1** – No Further Action;

- **GW2** - Institutional Controls, Engineering Controls and Monitored Natural Attenuation;
- **GW3** - In-situ Chemical Oxidation, Monitored Attenuation and Institutional Controls, Engineering Controls; and,
- **GW4** - Electrical Resistance Heating, Monitored Attenuation and Institutional Controls, Engineering Controls.

Remedial Alternative GW1 - No Further Action

Alternative GW1 would involve NFA with respect to groundwater. The NFA alternative is developed as a baseline to which the other remedial alternatives are compared. Natural attenuation may potentially reduce the concentration and volume of contaminants over time but monitoring of Site conditions would not be part of the alternative. There is no action and no cost associated with the alternative.

Overall protectiveness - As there is no exposure pathway for human contact with contaminated groundwater, the NFA alternative would be protective of human health (with the exception of construction/excavation workers). Natural attenuation would over time result in reduced contaminant concentrations in groundwater.

Conformance with SCGs – Natural attenuation may result in a gradual contaminant reduction but this time scale is long and the achievement of Class GA chemical-specific SCGs is unlikely.

Long-term effectiveness – Natural attenuation would continue in perpetuity while recontamination or concentration fluctuations from the upgradient plume entering the Site is a distinct possibility. There is no provision for long-term protection of construction/excavation worker.

Reduction of toxicity, mobility, volume - The reduction of contaminants in groundwater would occur only as the result of natural attenuation.

Short-term impact and effectiveness – There would be no short-term impacts or risks to the Site or community because there would be no remedial actions performed.

Implementability – The NFA alternative does not involve active remediation and thus there are no technical or administrative issues with regard to implementability.

Cost effectiveness – The NFA alternative has no costs associated with it.

Land use - The NFA alternative has no conflict with current or future anticipated land use or with the land use of nearby parcels.

Remedial Alternative GW2 – Institutional Controls, Engineering Controls and Monitored Natural Attenuation

Alternative GW2 involves the use of Institutional Controls/Engineering Controls (ICs/ECs) to address the protection of public health RAOs and MNA to address the protection of environment RAOs. In this alternative, construction/excavation workers will be protected from contact with, and inhalation of VOCs from contaminated groundwater through the use of land use restriction ICs including a deed restriction, deed notice, groundwater use restriction or some combination thereof. In combination with the ICs, an EC will be implemented consisting of an SMP designed to identify areas of impacted groundwater and identify requirements for conducting intrusive activities (oversight, personal protective equipment, soils handling, etc.).

The second aspect of the GW2 alternative would utilize MNA to document the gradual decline in contaminant concentrations due to biological degradation, and physical dilution and dispersion. Samples would be collected from select monitoring wells and analyzed for constituents of concern. Results would be presented in annual reports. For the purpose of this report, it is assumed that monitoring would continue for 15 years.

Overall protectiveness - As the only exposure pathway for human contact with contaminated groundwater is the construction/excavation worker and as the ICs/ECs would protect worker health, the GW2 alternative would be protective of human health. Natural attenuation may over time result in reduced contaminant concentrations in groundwater.

Conformance with SCGs – Natural attenuation may result in a gradual contaminant reduction but this time scale is long and the achievement of Class GA chemical-specific SCGs is unlikely.

Long-term effectiveness – As long as land use restrictions are kept in place and the SMP is instituted, the ICs/ECs possess long-term effectiveness. If Site changes (e.g., improvement in groundwater quality) warrants modification of SMP/land use restrictions, the NYSDEC would hold final approval. MNA would continue in perpetuity while recontamination or concentration fluctuations from the upgradient plume entering the Site is a distinct possibility.

Reduction of toxicity, mobility, volume – The land use restrictions and SMP would do nothing to promote reduction in toxicity, mobility or volume. The reduction of contaminants in groundwater would occur only as the result of natural attenuation.

Short-term impact and effectiveness – There would be no short-term impacts or risks to the Site or community as monitoring would be the only field work performed.

Implementability – The GW2 alternative is fully implementable.

Cost effectiveness – Costs associated with the GW2 alternative include the cost to prepare the land use restriction and SMP documents, Annual operation and maintenance (O&M) costs for the alternative include the cost to monitor and report on groundwater quality and the annual SMP certification report. The total estimated 15-year cost for this alternative is $459,000.

Land use - The GW2 alternative has no conflict with current or future anticipated land use or with the land use of nearby parcels. The land use restrictions would ensure that future land use remain protective of human health and the environment and would remain commercial. The SMP would ensure that current and future land owners maintain protective measures.

Remedial Alternative GW3 – In-Situ Chemical Oxidation, Monitored Attenuation and Institutional Controls, Engineering Controls

The GW3 alternative would involve active in-situ remedial effort focused on the core of the dissolved plume beneath and north of the Michaels building, combined with monitored attenuation of the downgradient, distal portions of the plume and monitoring of the aquifer quality on the upgradient side of the treatment area. In this alternative, the chemical oxidant (most likely sodium or potassium permanganate based on

longevity of oxidant, measured natural oxidant demand and proven track record) would be introduced into the underlying formation through direct injection. The proposed treatment volume (groundwater and saturated soil) is defined by an area of approximately 7,500 square feet including the area under the northern third of the Michaels basement and the driving lane between the Michaels and T-Mobile buildings (Appendix I, figure 1). Treatment thickness in the saturated zone begins at the water table (8 ft bg) and extends vertically to 25 ft bg (approximately 4,700 cubic yards). Groundwater monitoring would be used to measure the effectiveness of the effort. Commonly, a second oxidant application is required to "polish" the remaining contaminants after 6 to 12 months and this scenario assumes such. The existing Site conditions including a low natural oxidant demand and the ability of the formation to accept injectant are conducive to direct injection in-situ chemical oxidation (ISCO).

Portions of the Charlton plume not in direct contact with the oxidant (both below and beyond the zone of application) would be monitored for attenuation by periodic groundwater sampling and analyses. These untreated portions of the plume are expected to attenuate fairly rapidly both through advection in the deeper aquifer where groundwater flux is more rapid, and through transport of a remediated groundwater front in a downgradient direction. Due to the impact of the upgradient plume from the former Paul Miller Cleaner, the cleanup goal for completion of the remedial action would be attainment of "background" conditions or those chemical concentrations found to be migrating into the treatment area. This background flux would be monitored regularly using the sentinel well network described in Appendix I. Remediation would be declared complete when background conditions were met and sustained for an agreed upon period (for example, 4 quarters).

Alternative GW3 is similar to GW2 in that it uses ICs/ECs to address the protection of public health RAOs. In the GW3 alternative, construction/excavation workers will be protected from contact with, and inhalation of VOCs from contaminated groundwater through the use of land/groundwater use restriction ICs. An SMP will be used to identify areas of impacted groundwater and identify requirements for

conducting intrusive activities (oversight, personal protective equipment, soils handling, etc.).

Overall protectiveness - Active remediation combined with monitored attenuation would result in a rapid (2 to 3 years) attainment of background groundwater conditions in the Charlton plume core. As the only exposure pathway for human contact with contaminated groundwater is the construction/excavation worker and as the ICs/ECs would protect worker health, the GW2 alternative would be protective of human health.

Conformance with SCGs – The ISCO applications would improve groundwater quality to levels comparable to Class GA chemical-specific SCGs or background levels. Portions of the plume not directly treated would attenuate over a longer time period but stabilization at background levels should be realized in time.

Long-term effectiveness – With a continuing upgradient plume migrating into the treatment area, the long-term effectiveness is as long as it requires for the treatment area to become recontaminated. The levels of contaminants immediately upgradient of the treatment zone is not known at this time. As long as land use restrictions are kept in place and the SMP is instituted, the ICs/ECs possess long-term effectiveness. As improvement in groundwater quality is realized, modification of SMP/land use restrictions would be warranted.

Reduction of toxicity, mobility, volume – ICSO would reduce the toxicity and volume of contaminants in groundwater and in saturated soil. Mobility would not be affected because groundwater flow patterns would not be influenced.

Short-term impact and effectiveness – During implementation of the GW3 alternative, remedial workers would be potentially exposed to soil and groundwater as well as ISCO chemicals. Exposure would be minimized using a site-specific Health and Safety Plan (HASP). Air monitoring would be performed during remedial construction to protect the community. The public would be kept away from onsite remedial activities.

Implementability – The GW3 alternative is fully implementable. Application injection points can be temporary or permanent and are easily accessible on the building

exterior. Interior injection points are moderately difficult to install. Prior testing indicates that effective injection volumes and radii of influence are feasible however small scale pilot testing is warranted.

Cost effectiveness – Costs associated with the GW3 alternative include the capital cost of pilot testing, installation of ISCO injection points and ISCO materials and preparation of the land use restriction and SMP documents. Annual O&M costs for the alternative include the cost to monitor and report on groundwater quality and the annual SMP certification report. The total estimated 5-year cost for this alternative is $676,000.

Land use - The GW3 alternative has no conflict with current or future anticipated land use or with the land use of nearby parcels. There would be no Site modifications which would compromise the commercial retail property use. The land use restrictions would ensure that future land use remain protective of human health and the environment and would remain commercial. The SMP would ensure that current and future land owners maintain protective measures.

Remedial Alternative GW4 – Electrical Resistance Heating and Monitored Attenuation

Like the GW3 alternative, the GW4 alternative would involve active in-situ remediation focused on the core of the dissolved plume. In this alternative, electrical resistance heating (ERH) would volatilize the contaminants from the dissolved phase in groundwater as well as the adsorbed phase in saturated soils. Contaminants in the vapor phase are extracted from the subsurface with vapor recovery wells. Electrodes and vapor recovery wells are typically installed vertically throughout the treatment zone in a grid pattern, though they can also be installed in horizontal configurations (below buildings). Soil type and conductivity have only minor effects on electrode spacing and design efficiency. Subsurface temperatures are monitored during the remedial process. The extracted steam is condensed but contaminants remain in a vapor state. Condensate is recirculated within the treatment system and excess is discharged to the sanitary sewer. Contaminant vapor is treated (typically with activated carbon) before

discharge to the atmosphere. A health and safety plan would be developed to protect remedial construction workers as well as the public.

Several advantages of the ERH technology are that remedial goals are often achieved in a matter of months and that sites experience no contaminant rebound or rise in contaminant concentrations in the months after the alternative is closed out. All volatiles are removed without generation of degradation products. Drawbacks of this technology are a relatively high capital cost as well as high O&M costs for electrical consumption. In order to treat the area beneath the Michaels basement, electrodes and vapor recovery wells may need to be installed using directional drilling techniques and horizontal borings, again at a high cost. Adequate control of soil vapor is essential to prevent vapor intrusion and migration.

Like the GW3 alternative, the anticipated treatment zone is defined by an area of approximately 8,000 square feet (90 by 90 feet) including the area under the northern third of the Michaels basement and the driving lane between the Michaels and T-Mobile buildings. Treatment thickness in the saturated zone begins at the water table (8 ft bg) and extends vertically to 25 ft bg (approximately 5,040 cubic yards). Distal portions of the Charlton plume not treated by ERH would be monitored for attenuation by periodic groundwater sampling and analyses. There is a risk of treatment zone recontamination by the migrating Paul Miller plume as remediation would only be effective during system operation.

As complete remediation of the most severely impacted soil and groundwater is expected to require only 6 to 8 months, ICs such as deed restrictions and groundwater use limitations are considered unnecessary. A SMP will identify requirements to operate and maintain the ERH treatment system and monitoring requirements for groundwater (during remediation to judge efficacy and after, to monitor attenuation of plume margin).

Overall protectiveness – ERH would result in a rapid (6 to 8 months) attainment of background groundwater conditions in the Charlton plume core. As the only exposure pathway for human contact with contaminated groundwater is the construction/excavation worker and as the ICs/ECs would protect worker health, the

GW4 alternative would be protective of human health and environment following the conclusion of remedial efforts.

Conformance with SCGs – The ERH technology would result in rapid improvement in groundwater quality in the plume core, to levels comparable to Class GA chemical-specific SCGs or background levels. Portions of the plume not directly treated would attenuate over a longer time period but stabilization at background levels should be realized in time.

Long-term effectiveness – The GW4 alternative has long-term effectiveness. However, the complicating factor of an upgradient plume reduces the effectiveness.

Reduction of toxicity, mobility, volume – ERH would reduce the toxicity and volume of contaminants in groundwater and in saturated soil. Mobility would be reduced through the physical extraction of contaminant vapors.

Short-term impact and effectiveness – During implementation of the GW4 alternative, remedial workers would be potentially exposed to soil and groundwater. The portion of the Site under treatment would be closed to public access during installation. System infrastructure would be installed subsurface so that Site use would be restored during operation. Exposure would be minimized using a site-specific Health and Safety Plan (HASP). Access to remedial equipment would be regulated with various ECs such as fences, motion sensors, etc.

Implementability – The GW4 alternative is implementable but logistical concerns are high. Subsurface utility providers would need to approve the alternative. Directional drilling for electrode installation below the Michaels building is complicated. Construction activities would close a portion of the driveway from Barrett Avenue for an extended period.

Cost effectiveness – Costs associated with the GW4 alternative include the capital cost of design, electrode installation, system startup, system operation, trenching, waste disposal, electrical permitting, electric usage, carbon usage, and SMP documents. Annual O&M costs for the alternative include the cost to monitor and report on groundwater quality (quarterly) and the annual SMP certification report. The total estimated 2-year cost for this alternative is $2,583,000.

Land use - The GW4 alternative has no permanent conflict with current or future anticipated land use or with the land use of nearby parcels. Remedial system construction would temporarily disrupt portions of the Site. The land use restrictions are not required. The SMP would ensure proper safety and operation of the remedial system. The SMP is anticipated to be discontinued after 3 to 4 years.

4.3.2 Soil

As discussed in Section 3.2, the soil RAOs requiring remedial action are: 1) prevent ingestion/direct contact with contaminated soil; and, 2) prevent inhalation of or exposure to, contaminants volatilizing from contaminated soil. Environmental protection RAOs were determined not to require response actions because there is no evidence of contaminant migration in the unsaturated zone and no evidence of toxic impact to biota.

Two alternatives were developed for further analysis:

- **S1** – No Further Action; and,
- **S2** – Institutional Controls, Engineering Controls and Monitored Natural Attenuation.

Remedial Alternative S1 - No Further Action

Alternative S1 would involve NFA with respect to Site soils. Natural attenuation may potentially reduce the concentration and volume of contaminants adhered to soil over time as they transfer from adsorbed to dissolved phase. Monitoring of Site conditions would not be part of the alternative. There is no action and no cost associated with the alternative.

Overall protectiveness – With the exception of construction/excavation workers, there is no exposure pathway for human contact with soil. Therefore, the NFA alternative would be protective of human health. Natural attenuation may over time result in reduced contaminant concentrations in soil.

Conformance with SCGs – Natural attenuation may result in a gradual contaminant reduction in soil contamination as it diffuses into groundwater. All soil identified

to have COC at concentrations greater than SCGs was collected from below the water table.

Long-term effectiveness – Natural attenuation would continue in perpetuity while recontamination or concentration fluctuations from the upgradient plume entering the Site is a distinct possibility. There is no provision for long-term protection of construction/excavation worker.

Reduction of toxicity, mobility, volume - The reduction of toxicity and volume of contaminants in soil would occur gradually as the result of natural attenuation as constituents diffuse from adhesion to soil particles into the groundwater.

Short-term impact and effectiveness – There would be no short-term impacts or risks to the Site or community because there would be no remedial actions performed.

Implementability – The NFA alternative does not involve active remediation and thus there are no technical or administrative issues with regard to implementability.

Cost effectiveness – The NFA alternative has no costs associated with it.

Land use - The NFA alternative has no conflict with current or future anticipated land use or with the land use of nearby parcels.

Remedial Alternative S2 – Institutional Controls and Engineering Controls

Alternative S2 involves the use of ICs/ECs to address the protection of public health RAOs. This alternative is similar to GW2 in that construction/excavation workers will be protected from ingestion of, contact with, and inhalation of VOCs from contaminated soil through the use of land use restriction ICs including a deed restriction, deed notice or some combination thereof. In combination with the ICs, an EC will be implemented consisting of an SMP designed to identify areas of impacted soil and identify requirements for conducting intrusive activities (oversight, personal protective equipment, soils handling, etc.).

Overall protectiveness – The ICs/ECs of the S2 alternative would be protective of human health in that the only exposure pathway for human contact (construction/excavation worker) with contaminated soil is regulated.

Conformance with SCGs – Soil contaminant levels below the water table may naturally attenuate but this is not a goal of the S2 alternative. Therefore SCGs in soil would only be attainable over a long time period.

Long-term effectiveness – The S2 alternative is effective as long as the land use restrictions are kept in place and the SMP is instituted. Combining S2 with a groundwater remedial alternative would eventually result in soil quality improvement and elimination of the need for the land use restrictions and SMP.

Reduction of toxicity, mobility, volume – The land use restrictions and SMP would do nothing to promote reduction in soil contaminant toxicity, mobility or volume. The reduction of contaminants in soil would occur naturally or by implementation of an active groundwater remedial alternative.

Short-term impact and effectiveness – There would be no short-term impacts or risks to the Site or community.

Implementability – The S2 alternative is fully implementable.

Cost effectiveness – Costs associated with the S2 alternative include the cost to prepare the land use restriction and SMP documents. Annual O&M costs for the alternative include the annual SMP inspection and certification report. The total estimated 30-year cost for this alternative is $129,000.

Land use - The S2 alternative has no conflict with current or future anticipated land use or with the land use of nearby parcels. The land use restrictions would ensure that future land use remain protective of human health and the environment and would remain commercial. The SMP would ensure that current and future land owners maintain protective measures.

4.3.3 Soil Vapor/Indoor Air

As discussed in Section 3.3, the soil vapor/indoor air RAO requiring remedial action is: mitigate impacts to public health resulting from existing, or the potential for, soil vapor intrusion into Site buildings.

Two alternatives were developed for further analysis:

- **SV1** – No Further Action; and,

- **SV2** – Institutional Controls, Monitor and Maintain Existing Engineering Controls.

Remedial Alternative SV1 - No Further Action

Alternative SV1 would involve NFA with respect to Site soil vapor/indoor air. Assuming that an active remedial alternative is chosen to address contaminated groundwater and saturated soils (the source of soil vapor), then natural attenuation may potentially reduce the concentration and volume of soil vapor contaminants over time. Diminished soil vapor contaminant concentrations should result in an improvement in indoor air quality. Existing interim measures to improve air quality such as the basement vapor barrier, basement sump pit and ambient space ventilation fans would not be maintained. Monitoring of indoor air would not be part of the alternative. There is no action and no cost associated with the alternative.

Overall protectiveness – The protectiveness of existing measures in the Michaels building would last as long as the measures themselves. The vapor barrier for example has a lifetime that effectively could be a long as the building exists. The fans may have a useful lifetime of 5 to 10 years.

Conformance with SCGs – Natural attenuation may result in a gradual contaminant reduction in soil vapor. If an active groundwater remedial alternative is instituted, the attenuation of soil vapor would be more rapid. Indoor air guidance values for individual chemical compounds are occasionally exceeded in the basement, but rarely in the upstairs retail space. There is some question whether these guidance values are even applicable to a retail environment as they were developed with the assumption of a lifetime of continuous exposure to the chemical.

Long-term effectiveness – Natural attenuation would continue in perpetuity and the physical protective measures have finite lifetimes.

Reduction of toxicity, mobility, volume - The reduction of toxicity and volume of contaminants in soil vapor and indoor air would occur gradually as the result of natural attenuation or active remediation of groundwater. The mobility of soil vapor is under the influence of natural and artificial forces.

Short-term impact and effectiveness – There would be no short-term impacts or risks to the Site or community because there would be no remedial actions performed.

Implementability - NFA alternative does not involve active remediation and thus there are no technical or administrative issues with regard to implementability.

Cost effectiveness – The NFA alternative has no costs associated with it.

Land use - The NFA alternative has no conflict with current or future anticipated land use or with the land use of nearby parcels.

Remedial Alternative SV2 – Institutional Controls, Monitor and Maintain Existing Engineering Controls

Alternative SV2 uses a combination of ICs and ECs to mitigate impacts to public health resulting from vapor infiltration. Some combination of ICs will be developed with the guidance of the NYSDOH to control access and occupancy duration to various locations inside the Michaels building, based on indoor air quality. The primary concern would be regulating access to the basement where indoor air exhibits the greatest impact. The restrictions would be communicated to the lessee and may be incorporated into future lease agreements.

The monitoring component would involve semiannual sampling and analysis of indoor in the Michaels building combined with annual sampling of indoor air from the T-Mobile building and sub slab vapor from both buildings. Monitoring results would be communicated in annual reports.

The existing vapor mitigation controls (vapor barrier, sump and basement ventilation and HVAC maintenance) will be inspected and maintained through the use of an SMP. The continued integrity of the controls would be inspected and communicated in an annual engineering report.

Overall protectiveness – Existing controls have been shown to be protective. The SV2 alternative of ICs combined with maintenance of existing controls would be protective of human health in that they would mitigate impacts to public health from vapor intrusion.

Conformances with SCGs – Indoor air guidance values for individual chemical compounds are occasionally exceeded in the basement, but rarely in the upstairs retail space. There is some question whether these guidance values are even applicable to a retail environment as they were developed with the assumption of a lifetime of continuous exposure to the chemical.

Long-term effectiveness – The SV2 alternative is effective as long as the ICs are in place and the SMP is instituted, maintaining the vapor intrusion controls. Combining SV2 with a groundwater remedial alternative would eventually result in soil vapor improvement and elimination of the need for the ICs and SMP.

Reduction of toxicity, mobility, volume – The vapor intrusion controls do not reduce toxicity or volume. They do reduce mobility in the sense that VOCs are prevented from filling the indoor space to an equilibrium condition but rather are removed as they enter the building.

Short-term impact and effectiveness – There would be no short-term impacts or risks to the Site or community.

Implementability – The S2 alternative is fully implementable but depends on the cooperation of employees in the Michaels building to follow access guidelines.

Cost effectiveness – Costs associated with the SV2 alternative include the cost to prepare the ICs and SMP documents, monitor and report on soil vapor and indoor air quality, and annually certify the integrity of the existing engineering controls. Annual O&M costs for the alternative include the annual SMP inspection and certification report. The total estimated 5-year cost for this alternative is $244,000. Duration assumes that SV2 is combined with a groundwater alternative which would result in the improvement in indoor air to the point that mitigation is no longer necessary (assuming the former Paul Miller Cleaners plume is also remediated).

Land use - The SV2 alternative has no conflict with current or future anticipated land use or with the land use of nearby parcels. Some minor restrictions in the use of the Michaels building basement may be necessary. The SMP would ensure that current and future land owners maintain protective measures.

5.0 SELECTION OF PREFERRED REMEDIAL ALTERNATIVES

This section presents the selected remedial alternatives to address groundwater, soil and soil vapor/indoor air conditions at the Site, based on the preliminary and secondary screening.

5.1 Preferred Groundwater Remedial Alternative

Based on the screening of 4 alternatives to address impacted groundwater, alternative GW3 would achieve the ROAs of protection of human health and the environment in a cost-effective and timely manner and achieves the best balance of 8 of the 9 decision criteria (excluding community acceptance to be determined later), and thus is the preferred alternative. The alternative would address the most severely impacted groundwater while the periphery of the Charlton plume would attenuate through natural processes. Alternative GW3 will also treat contaminants adsorbed to soil below the water table, thus reducing the requirements of the soil alternative. The alternative includes a presumptive/proven technology and would not involve the removal and treatment or transport of contaminated media. It is lower in cost than the GW4 alternative, is easily implemented, and has few short term impacts to Site operation. The long term effectiveness is dependent only on the potential for the treatment area to become recontaminated by migration of groundwater from the upgradient source

5.2 Preferred Soil Remedial Alternative

Based on the screening of 2 alternatives to address impacted soil, alternative S2 is the preferred alternative. The GW3 groundwater alternative will remediate saturated soil which contains contaminants (environmental protection) and thus the S2 soil alternative only needs to achieve the RAO of minimizing the potential for construction/excavation workers to contact, ingest or inhale vapors from the soil. The SMP developed for the GW3 alternative would also incorporate requirements of the S2 alternative. The alternative is cost efficient and easily implementable. There are no short term impacts and long term effectiveness is ensured as long as the land use restrictions and SMP are in place. The need for a soil alternative would be alleviated when the GW3 alternative achieves soil cleanup objectives in the saturated zone.

5.3 Preferred Soil Vapor/Indoor Air Remedial Alternative

The preferred soil vapor/indoor air remedial alternative is SV2. The alternative would continue the existing protective measures for occupants of the Michaels building. The SMP portion of the alternative would be developed as a part of the overall SMP for groundwater and soil. Cost is relatively low and the alternative is easily implementable. Short term impacts may include restrictions on access to the basement but based on the current use of this space for storage, this should not be a major issue. In the long term, it is anticipated that the need for a soil vapor alternative would be alleviated when the GW3 alternative achieves its goals, thus eliminating the soil vapor source.

5.4 Summary

This FS has used preliminary and secondary screening tools to develop remedial response actions to address the impacts of chlorinated solvents to groundwater, soil and soil vapor/indoor air at and beneath the Site and to restore the Site to pre-disposal conditions, to the extent feasible. The remedies selected shall eliminate or mitigate all significant threats to the public health and to the environment presented by contaminants disposed at the Site.

The selected remedial response actions are a combination of remedial alternatives GW3, S2 and SV2. Institutional controls consisting of some combination of a deed restriction, a deed notice, a groundwater use restriction and restriction on access to the Michaels building basement would protect human health be regulating the potential for contact with Site contaminants. Active groundwater and saturated soil remediation in the form of in-situ chemical oxidation would be applied to the core the dissolved Charlton contaminant plume beneath the northern Michaels basement and the driveway between Michaels and T-Mobile buildings. Groundwater cleanup objectives would be background conditions determined by sentinel wells. Improvements in groundwater, soil vapor and indoor air conditions would be assessed with regular monitoring. A Site Management Plan would be developed to identify areas of groundwater and soil impact of concern to construction/excavation workers, describe proper groundwater and soil management practices and proper worker protective measures, and identify the means by which existing vapor intrusion mitigation be maintained in the Michaels building. Some costs for elements of these individual alternatives can be combined

such as ICs which regulate human contact with all 3 media and an SMP which describes access and maintenance of protective measures for all Site concerns. The total estimated 5-year cost for this combination of groundwater, soil and soil vapor alternatives is $868,000.

TABLES

TABLE 1

FORMER CHARLTON CLEANER FACILITY
VOLUNTARY CLEANUP PROGRAM INDEX # W3-0891-01-06
FOREST AVENUE SHOPPERS TOWN
24 BARRETT AVENUE
STATEN ISLAND, NEW YORK

Groundwater Monitor Wells
Summary of Select Volatile Organic Compounds Detected in Ground-Water

Sample Identification	Sample Date	Compound (ug/l) [1]								
		Tetrachloroethene	Trichloroethene	1,1,1-Trichloroethane	Vinyl Chloride	4-isopropyltoluene	Acetone	cis-1,2-Dichloroethylene	1,1-Dichloroethene	2-Butanone (MEK)
MW-1	Nov-00	< 1.0	< 1.0	ND [3]	< 1.0	ND	ND	< 1.0	ND	ND
	Jul-05	1	ND	ND	ND	ND	**81**	ND	ND	ND
	Aug-06	**53**	ND	ND	ND	**120**	28	ND	ND	ND
	Dec-06	**12**	< 2.0	< 2.0	< 2.0	2.4	**25,000**	< 2.0	< 1.0	< 10.0
	Mar-07	**60**	< 2.0	< 2.0	< 2.0	< 2.0	< 10.0	< 2.0	< 1.0	**130**
	Jul-07	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 10.0	< 2.0	< 1.0	< 10.0
	Oct-07	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	11	< 2.0	< 1.0	< 10.0
	Jan-08	well paved over								
	Oct-08	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 10.0	< 2.0	< 1.0	< 10.0
	Jul-09	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 10.0	< 2.0	< 1.0	< 10.0
	Apr-10	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	16	< 2.0	< 1.0	< 10.0
MW-2A	Nov-00	< 1.0	< 1.0	ND	< 1.0	ND	ND	< 1.0	ND	ND
	Jul-05	**36**	ND	ND	ND	ND	ND	ND	ND	ND
	Aug-06	**79**	ND	ND	ND	ND	ND	ND	ND	ND
	Dec-06	**12**	< 2.0	< 2.0	< 2.0	< 2.0	< 10	< 2.0	< 1.0	< 10.0
	Mar-07	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 10.0	< 2.0	< 1.0	< 10.0
	Jul-07	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	14	< 2.0	< 1.0	< 10.0
	Oct-07	**360**	< 2.0	< 2.0	< 2.0	< 2.0	< 10.0	< 2.0	< 1.0	< 10.0
	Jan-08	**21**	< 2.0	< 2.0	< 2.0	< 2.0	< 10.0	< 2.0	< 1.0	< 10.0
	Apr-08	**76**	< 2.0	< 2.0	< 2.0	< 2.0	< 10.0	< 2.0	< 1.0	< 10.0
	Jul-08	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 10.0	< 2.0	< 1.0	< 10.0
	Oct-08	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	20	< 2.0	< 1.0	< 10.0
	Jul-09	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	10	< 2.0	< 1.0	< 10.0
	Apr-10	**26**	< 2.0	< 2.0	< 2.0	< 2.0	< 10.0	< 2.0	< 1.0	< 10.0
MW-2B	Jul-05	**2,200**	ND	ND	ND	ND	ND	ND	ND	ND
	Aug-06	**1,500**	ND	ND	ND	ND	ND	ND	ND	ND
	Dec-06	**480**	< 20	< 20	< 20	< 20	< 100	< 20	< 10	< 100.0
	Mar-07	**440**	< 2.0	< 2.0	< 2.0	< 2.0	< 10.0	< 2.0	< 1.0	< 10.0
	Jul-07	**360**	< 2.0	< 2.0	< 2.0	< 2.0	< 10.0	< 2.0	< 1.0	< 10.0
	Oct-07	**6,300**	< 20	< 20	< 20	< 20	< 100	< 20	< 10	< 100
	Jan-08	**450**	< 20	< 20	< 20	< 20	< 100	< 20	< 10	< 100
	Apr-08	**400**	< 20.0	< 20.0	< 20.0	< 20.0	< 100.0	< 20.0	< 10.0	< 100.0
	Jul-08	**9.0**	< 2.0	< 2.0	< 2.0	< 2.0	21	< 2.0	< 1.0	< 10.0
	Oct-08	**970**	< 2.0	< 2.0	< 2.0	< 2.0	< 10	< 2.0	< 1.0	< 10.0
	Jul-09	**290**	< 2.0	< 2.0	< 2.0	< 2.0	< 10	< 2.0	< 1.0	< 10.0
	Apr-10	**130**	< 2.0	< 2.0	< 2.0	< 2.0	< 10.0	< 2.0	< 1.0	< 10.0
MW-3	Nov-00	< 1.0	< 1.0	---	< 1.0	---	---	< 1.0	---	---
	Jul-05	ND	ND	ND	ND	ND	ND	ND	ND	ND
	Aug-06	ND	ND	ND	ND	ND	ND	ND	ND	ND
	Dec-06	NS	NS	NS	NS	NS	NS	NS	NS	NS
	Mar-07	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 10.0	< 2.0	< 1.0	< 10.0
	Jul-07	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	11	< 2.0	< 1.0	< 10.0
	Oct-07	**51**	< 2.0	< 2.0	< 2.0	< 2.0	< 10.0	< 2.0	< 1.0	< 10.0
	Jan-08	**12**	< 2.0	< 2.0	< 2.0	< 2.0	< 10.0	< 2.0	< 1.0	< 10.0
	Apr-08	2.1	< 2.0	< 2.0	< 2.0	< 2.0	< 10.0	< 2.0	< 1.0	< 10.0
	Jul-08	**44**	**6.3**	< 2.0	< 2.0	< 2.0	< 10.0	< 2.0	< 1.0	< 10.0
	Oct-08	**9.2**	< 2.0	< 2.0	< 2.0	< 2.0	< 10.0	< 2.0	< 1.0	< 10.0
	Jul-09	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 10.0	< 2.0	< 1.0	< 10.0
	Apr-10	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 10.0	< 2.0	< 1.0	< 10.0
MW-4	Nov-00	< 1.0	< 1.0	---	< 1.0	---	---	< 1.0	---	---
	Jul-05	17	ND	ND	ND	ND	ND	ND	ND	ND
	Aug-06	17	ND	ND	ND	ND	ND	ND	ND	ND
	Dec-06	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 10	< 2.0	< 1.0	< 10.0
	Mar-07	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 10.0	< 2.0	< 1.0	< 10.0
	Jul-07	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 10.0	< 2.0	< 1.0	< 10.0
	Oct-07	**31**	< 2.0	< 2.0	< 2.0	< 2.0	< 10.0	< 2.0	< 1.0	< 10.0
	Jan-08	**29**	< 2.0	< 2.0	< 2.0	< 2.0	< 10.0	< 2.0	< 1.0	< 10.0
	Apr-08	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 10.0	< 2.0	< 1.0	< 10.0
	Jul-08	**64**	**11**	< 2.0	< 2.0	< 2.0	< 10.0	**5.8**	< 1.0	< 10.0
	Oct-08	3.6	< 2.0	< 2.0	< 2.0	< 2.0	< 10.0	< 2.0	< 1.0	< 10.0
	Jul-09	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 10.0	< 2.0	< 1.0	< 10.0
	Apr-10	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 10.0	< 2.0	< 1.0	< 10.0
MW-5A	Nov-00	**12**	**7**	ND	**500**	ND	ND	**60**	ND	ND
	Jul-05	**30**	**13**	ND	ND	ND	ND	ND	ND	ND
	Aug-06	**36**	**15**	ND	**68**	ND	ND	**130**	ND	ND
	Dec-06	**70**	< 2.0	< 2.0	< 2.0	< 2.0	< 10	2.1	< 1.0	< 10.0
	Mar-07	**190**	**5.8**	< 2.0	**24**	< 2.0	< 10.0	**58**	< 1.0	< 10.0
	Jul-07	**260**	**9.2**	< 2.0	**30**	< 2.0	< 10.0	**75**	< 1.0	< 10.0
	Oct-07	**130**	3.9	< 2.0	**11**	< 2.0	< 10.0	**26**	< 1.0	< 10.0
	Jan-08	**170**	**42**	< 2.0	**56**	< 2.0	< 10.0	**270**	< 1.0	< 10.0
	Apr-08	**400**	**220**	< 20.0	**540**	< 20.0	< 100.0	**2,300**	< 10.0	< 100.0
	Jul-08	**430**	**270**	< 20.0	**550**	< 20.0	< 100.0	**2,000**	< 10.0	< 100.0
	Oct-08	**250**	**140**	< 20.0	**300**	< 20.0	< 100.0	**1,500**	< 10.0	< 100.0
	Jul-09	**90**	**28**	< 2.0	**69**	< 2.0	< 10.0	**240**	< 2.0	< 10.0
	Apr-10	**32**	< 2.0	< 2.0	< 2.0	< 2.0	< 10.0	**6.1**	< 1.0	< 10.0
MW-5B	Nov-00	**3,300**	< 1.0	< 1.0	**3,300**	< 1.0	< 1.0	< 1.0	< 1.0	< 10.0
	Jul-05	**2,300**	ND	ND	ND	ND	ND	ND	ND	ND
	Aug-06	**3,600**	ND	ND	ND	ND	ND	ND	ND	ND
	Dec-06	**450**	< 20	< 20	< 20	< 20	< 100	< 20	< 10	< 100.0
	Mar-07	**2,300**	< 20.0	< 20.0	< 20.0	< 20.0	< 100.0	< 20.0	< 10.0	< 100.0
	Jul-07	**1,900**	< 20.0	< 20.0	< 20.0	< 20.0	< 100.0	< 20.0	< 10.0	< 100.0
	Oct-07	**870**	< 20.0	< 20.0	< 20.0	< 20.0	< 100.0	< 20.0	< 10.0	< 100.0
	Jan-08	**1,200**	< 20.0	< 20.0	< 20.0	< 20.0	< 100.0	< 20.0	< 10.0	< 100.0
	Apr-08	**55**	< 2.0	< 2.0	< 2.0	< 2.0	< 10	< 2.0	< 1.0	< 10.0
	Jul-08	**38**	< 2.0	< 2.0	< 2.0	< 2.0	< 10	< 2.0	< 1.0	< 10.0
	Oct-08	**32**	< 2.0	< 2.0	< 2.0	< 2.0	< 10.0	< 2.0	< 1.0	< 10.0
	Jul-09	**33**	< 2.0	< 2.0	< 2.0	< 2.0	< 10.0	< 2.0	< 1.0	< 10.0
	Apr-10	**210**	< 2.0	< 2.0	< 2.0	< 2.0	< 10.0	< 2.0	< 1.0	< 10.0
MW-5C	Jul-05	**16**	ND	ND	ND	ND	ND	ND	ND	ND
	Aug-06	**38**	ND	ND	ND	ND	ND	ND	ND	ND
	Dec-06	**11**	< 2.0	< 2.0	< 2.0	< 2.0	< 10	< 2.0	< 1.0	< 10.0
	Mar-07	**11**	< 2.0	< 2.0	< 2.0	< 2.0	< 10.0	< 2.0	< 1.0	< 10.0
	Jul-07	**100**	< 2.0	< 2.0	< 2.0	< 2.0	< 10.0	< 2.0	< 1.0	< 10.0
	Oct-07	**58**	< 2.0	< 2.0	< 2.0	< 2.0	< 10.0	< 2.0	< 1.0	< 10.0
	Jan-08	**6.1**	< 2.0	< 2.0	< 2.0	< 2.0	< 10.0	< 2.0	< 1.0	< 10.0
	Apr-08	2.2	< 2.0	< 2.0	< 2.0	< 2.0	< 10	< 2.0	< 1.0	< 10.0
	Jul-08	4.9	< 2.0	< 2.0	< 2.0	< 2.0	< 10	< 2.0	< 1.0	< 10.0
	Oct-08	**6.5**	< 2.0	< 2.0	< 2.0	< 2.0	< 10.0	< 2.0	< 1.0	< 10.0
	Jul-09	**8.4**	< 2.0	< 2.0	< 2.0	< 2.0	< 10.0	2.8	< 1.0	< 10.0
	Apr-10	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 10.0	< 2.0	< 1.0	< 10.0
MW-5D	Jul-05	**260**	ND	ND	ND	ND	ND	ND	ND	ND
	Aug-06	**36**	ND	ND	ND	ND	ND	ND	ND	ND
	Dec-06	**10**	< 2.0	< 2.0	< 2.0	< 2.0	< 10	< 2.0	< 1.0	< 10.0
	Mar-07	**12**	< 2.0	< 2.0	< 2.0	< 2.0	< 10.0	< 2.0	< 1.0	< 10.0
	Jul-07	**130**	< 2.0	< 2.0	< 2.0	< 2.0	< 10.0	< 2.0	< 1.0	< 10.0
	Oct-07	**80**	< 2.0	< 2.0	< 2.0	< 2.0	< 10.0	< 2.0	< 1.0	< 10.0
	Jan-08	3.9	< 2.0	< 2.0	< 2.0	< 2.0	< 10.0	< 2.0	< 1.0	< 10.0
	Apr-08	2.9	< 2.0	< 2.0	< 2.0	< 2.0	< 10.0	< 2.0	< 1.0	< 10.0
	Jul-08	2.8	< 2.0	< 2.0	< 2.0	< 2.0	< 10.0	< 2.0	< 1.0	< 10.0
	Oct-08	**5.8**	< 2.0	< 2.0	< 2.0	< 2.0	< 10.0	< 2.0	< 1.0	< 10.0
	Jul-09	**5.8**	< 2.0	< 2.0	< 2.0	< 2.0	< 10.0	< 2.0	< 1.0	< 10.0
	Apr-10	**5.1**	< 2.0	< 2.0	< 2.0	< 2.0	< 10.0	< 2.0	< 1.0	< 10.0
TOGS 1.1.1 [4]		5	5	5	2	5	50	5	5	50

Sample Identification	Sample Date	Compound (ug/l) [1]								
		Tetrachloroethene	Trichloroethene	1,1,1-Trichloroethane	Vinyl Chloride	4-isopropyltoluene	Acetone	cis-1,2-Dichloroethylene	1,1-Dichloroethene	2-Butanone (MEK)
MW-6A	Nov-00	**2,600**	**61**	ND	**960**	ND	ND	**930**	ND	ND
	Jul-05	**160**	**22**	ND	1.7	ND	ND	ND	ND	ND
	Aug-06	**310**	2.4	ND	ND	ND	ND	**6.1**	ND	ND
	Dec-06	**810**	< 20	< 20	< 20	< 20	< 100	**42**	< 10	< 100.0
	Mar-07	**290**	< 2.0	< 2.0	< 2.0	< 2.0	< 10.0	< 2.0	< 1.0	< 10.0
	Jul-07	**2,300**	**45**	< 2.0	**3.7**	< 2.0	< 10.0	**35**	< 1.0	< 10.0
	Oct-07	**420**	**39**	< 2.0	< 2.0	< 2.0	< 10.0	**37**	< 1.0	< 10.0
	Jan-08	**600**	**6.5**	< 2.0	**7.1**	< 2.0	< 10.0	**28**	< 1.0	< 10.0
	Apr-08	**2,700**	< 20	< 20	< 20	< 20	< 100	**25**	< 10	< 100
	Jul-08	**580**	< 20	< 20	< 20	< 20	< 100	< 20	< 10	< 100
	Oct-08	**73**	< 20.0	< 20.0	< 20.0	< 20.0	< 100.0	< 20.0	< 10.0	< 100.0
	Jul-09	2.3	< 2.0	< 2.0	< 2.0	< 2.0	< 10.0	< 2.0	< 1.0	< 10.0
	Apr-10	**1,300**	**18**	< 2.0	**3.2**	< 2.0	< 10.0	**97**	< 1.0	< 10.0
MW-6B	Nov-00	**6,200**	3	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 10.0
	Jul-05	**14,000**	2	ND	ND	ND	ND	ND	ND	ND
	Aug-06	**12,000**	ND	ND	ND	ND	ND	ND	ND	ND
	Dec-06	**240**	< 20	< 20	< 20	< 20	< 100	< 20	< 10	< 100.0
	Mar-07	**5,500**	< 2.0	< 2.0	< 2.0	< 2.0	< 10.0	< 2.0	< 1.0	< 10.0
	Jul-07	**3,700**	3.7	< 2.0	< 2.0	< 2.0	< 10.0	< 2.0	< 1.0	< 10.0
	Oct-07	**3,300**	< 40	< 40	< 40	< 40	< 200	< 40	< 20	< 200
	Jan-08	**9,100**	4.3	< 2.0	< 2.0	< 2.0	< 10.0	< 2.0	< 1.0	< 10.0
	Apr-08	**13,000**	< 200	< 200	< 200	< 200	< 1000	< 200	< 100	< 1000
	Jul-08	**2,600**	< 200	< 200	< 200	< 200	< 1000	< 200	< 100	< 1000
	Oct-08	**3,000**	< 20.0	< 20.0	< 20.0	< 20.0	< 100.0	< 20.0	< 10.0	< 100.0
	Jul-09	**3,400**	< 20.0	< 20.0	< 20.0	< 20.0	< 100.0	< 20.0	< 10.0	< 100.0
	Apr-10	**12,000**	< 40	< 40	< 40	< 40	< 200	< 40	< 20	< 200
MW-6C	Jul-05	**110**	ND	ND	ND	ND	ND	ND	ND	ND
	Aug-06	**3,900**	ND	ND	ND	ND	ND	ND	ND	ND
	Dec-06	**110**	**35**	< 2.0	< 2.0	< 2.0	< 10	**77**	< 1.0	< 10.0
	Mar-07	**100**	< 2.0	< 2.0	< 2.0	< 2.0	< 10.0	< 2.0	< 1.0	< 10.0
	Jul-07	**210**	**23**	< 2.0	< 2.0	< 2.0	< 10.0	**48**	< 1.0	< 10.0
	Oct-07	**87**	**25**	< 2.0	< 2.0	< 2.0	< 10.0	**45**	< 1.0	< 10.0
	Jan-08	**250**	**10**	< 2.0	< 2.0	< 2.0	< 10.0	**13**	< 1.0	< 10.0
	Apr-08	**76**	**5.8**	< 2.0	< 2.0	< 2.0	< 10.0	**15**	< 1.0	< 10.0
	Jul-08	**120**	**16**	< 2.0	< 2.0	< 2.0	< 10.0	**110**	< 1.0	< 10.0
	Oct-08	**4,700**	< 2.0	< 2.0	< 2.0	< 2.0	< 10.0	< 2.0	< 1.0	< 10.0
	Jul-09	**120**	< 2.0	< 2.0	< 2.0	< 2.0	< 10.0	< 2.0	< 1.0	< 10.0
	Apr-10	**15**	< 2.0	< 2.0	< 2.0	< 2.0	< 10.0	< 2.0	< 1.0	< 10.0
MW-6D	Jul-05	**30**	ND	ND	ND	ND	ND	ND	ND	ND
	Aug-06	**12**	ND	ND	ND	ND	ND	ND	ND	ND
	Dec-06	**26**	< 2.0	< 2.0	< 2.0	< 2.0	< 10	**13**	< 1.0	< 10.0
	Mar-07	**9**	< 2.0	< 2.0	< 2.0	< 2.0	< 10.0	< 2.0	< 1.0	< 10.0
	Jul-07	**95**	< 2.0	< 2.0	< 2.0	< 2.0	< 10.0	3.1	< 1.0	< 10.0
	Oct-07	**7.9**	< 2.0	< 2.0	< 2.0	< 2.0	< 10.0	< 2.0	< 1.0	< 10.0
	Jan-08	**200**	2.5	< 2.0	< 2.0	< 2.0	< 10.0	**6**	< 1.0	< 10.0
	Apr-08	**48**	**11**	< 2.0	**7.4**	< 2.0	< 10.0	**120**	< 1.0	< 10.0
	Jul-08	**280**	**20**	< 2.0	**3.1**	< 2.0	< 10.0	**530**	2.6	< 10.0
	Oct-08	**5,300**	**45**	< 20.0	< 20.0	< 20.0	< 100	**230**	< 10.0	< 100
	Jul-09	**15**	< 2.0	< 2.0	< 2.0	< 2.0	< 10.0	< 2.0	< 1.0	< 10.0
	Apr-10	**7.5**	< 2.0	< 2.0	< 2.0	< 2.0	< 10.0	< 2.0	< 1.0	< 10.0
MW-7A	Nov-00	**1,500**	**81**	ND	**2,700**	ND	ND	**1,800**	ND	ND
	Jul-05	**4,300**	**93**	ND	**43**	ND	ND	**400**	1.4	ND
	Aug-06	**3,600**	**83**	ND	**82**	ND	ND	**480**	ND	ND
	Dec-06	**4,200**	**88**	< 20	**86**	< 20	< 100	**480**	< 10	< 100
	Mar-07	**4,700**	**74**	< 40.0	< 40.0	< 40.0	< 200	**320**	< 20.0	< 200
	Jul-07	**5,600**	**61**	< 4.0	**4.6**	< 2.0	< 10.0	**240**	< 2.0	< 10.0
	Oct-07	**5,000**	**93**	< 40	< 40	< 20	< 100	**390**	< 20	< 100
	Jan-08	**4,100**	**93**	< 2.0	**68**	< 2.0	< 10.0	**480**	< 1.0	< 10.0
	Apr-08	**3,200**	**61**	< 40	**46**	< 40	< 200	**360**	< 20	< 200
	Jul-08	**1,100**	**260**	< 40	**70**	< 40	< 200	**630**	< 20	< 200
	Oct-08	**880**	**110**	< 20.0	**54**	< 20.0	< 100	**620**	< 10.0	< 100
	Jul-09	**2,100**	**91**	< 20.0	**150**	< 20.0	< 100	**1,100**	< 10.0	< 100
	Apr-10	**820**	**30**	< 20	< 20	< 20	< 100	**240**	< 10	< 100
MW-7B	Nov-00	**17**	ND	ND	**5**	ND	ND	2	ND	ND
	Jul-05	**31**	ND	ND	ND	ND	ND	0.61	ND	ND
	Aug-06	ND	ND	ND	ND	ND	ND	ND	ND	ND
	Dec-06	2.6	< 2.0	< 2.0	< 2.0	< 2.0	< 10	< 2.0	< 1.0	< 10.0
	Mar-07	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 10.0	< 2.0	< 1.0	< 10.0
	Jul-07	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 10.0	< 2.0	< 1.0	< 10.0
	Oct-07	4.6	< 2.0	< 2.0	< 2.0	< 2.0	< 10.0	< 2.0	< 1.0	< 10.0
	Jan-08	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 10.0	< 2.0	< 1.0	< 10.0
	Apr-08	**22**	< 2.0	< 2.0	< 2.0	< 2.0	< 10.0	< 2.0	< 1.0	< 10.0
	Jul-08	**24**	**6.8**	< 2.0	**2.2**	< 2.0	< 10.0	**10**	< 1.0	< 10.0
	Oct-08	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 10.0	< 2.0	< 1.0	< 10.0
	Jul-09	4.5	< 2.0	< 2.0	< 2.0	< 2.0	< 10.0	2.3	< 1.0	< 10.0
	Apr-10	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 10.0	< 2.0	< 1.0	< 10.0
MW-7C	Jul-05	**17**	ND	ND	ND	ND	ND	ND	ND	ND
	Aug-06	ND	ND	ND	ND	ND	ND	ND	ND	ND
	Dec-06	**9.1**	< 2.0	< 2.0	< 2.0	< 2.0	< 10	< 2.0	< 1.0	< 10.0
	Mar-07	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 10.0	< 2.0	< 1.0	< 10.0
	Jul-07	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 10.0	< 2.0	< 1.0	< 10.0
	Oct-07	**5.2**	< 2.0	< 2.0	< 2.0	< 2.0	< 10.0	< 2.0	< 1.0	< 10.0
	Jan-08	2.4	< 2.0	< 2.0	< 2.0	< 2.0	< 10.0	< 2.0	< 1.0	< 10.0
	Apr-08	**24**	< 2.0	< 2.0	< 2.0	< 2.0	< 10.0	< 2.0	< 1.0	< 10.0
	Jul-08	**30**	**11**	< 2.0	**2.2**	< 2.0	< 10.0	**16**	< 1.0	< 10.0
	Oct-08	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 10.0	< 2.0	< 1.0	< 10.0
	Jul-09	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 10.0	< 2.0	< 1.0	< 10.0
	Apr-10	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 10.0	< 2.0	< 1.0	< 10.0
MW-7D	Jul-05	0.75	ND	ND	ND	ND	ND	ND	ND	ND
	Aug-06	ND	ND	ND	ND	ND	ND	ND	ND	ND
	Dec-06	**13**	< 2.0	< 2.0	< 2.0	< 2.0	< 10	< 2.0	< 1.0	< 10.0
	Mar-07	3	< 2.0	< 2.0	< 2.0	< 2.0	< 10.0	< 2.0	< 1.0	< 10.0
	Jul-07	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 10.0	< 2.0	< 1.0	< 10.0
	Oct-07	4.2	< 2.0	< 2.0	< 2.0	< 2.0	< 10.0	< 2.0	< 1.0	< 10.0
	Jan-08	3.6	< 2.0	< 2.0	< 2.0	< 2.0	< 10.0	< 2.0	< 1.0	< 10.0
	Apr-08	**39**	< 2.0	< 2.0	< 2.0	< 2.0	< 10.0	< 2.0	< 1.0	< 10.0
	Jul-08	**28**	**13**	< 2.0	**3.6**	< 2.0	< 10.0	**25**	< 1.0	< 10.0
	Oct-08	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 10.0	< 2.0	< 1.0	< 10.0
	Jul-09	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 10.0	< 2.0	< 1.0	< 10.0
	Apr-10	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 10.0	< 2.0	< 1.0	< 10.0
TOGS 1.1.1 [4]		5	5	5	2	5	50	5	5	50

1) - Micrograms per liter
2) - Methyl Tert Butyl Ether
3) - Not detected
4) - New York State Ground Water Quality Standards and Guidance Values
(Div. of Water Technical and Operational Guidance Series 1.1.1)
5) - Not Available

81 Exceeds TOGS

Compounds in Blue are the primary Contaminants of Concern

TABLE 1 (cont.)

FORMER CHARLTON CLEANER FACILITY
VOLUNTARY CLEANUP PROGRAM INDEX # W3-0891-01-06
FOREST AVENUE SHOPPERS TOWN
24 BARRETT AVENUE
STATEN ISLAND, NEW YORK

Groundwater Monitor Wells
Summary of Select Volatile Organic Compounds Detected in Ground-Water

Sample Identification	Sample Date	Compound (ug/l) [1]								
		Tetrachloroethene	Trichloroethene	1,1,1-Trichloroethane	Vinyl Chloride	4-isopropyltoluene	Acetone	cis-1,2-Dichloroethylene	1,1-Dichloroethene	2-Butanone (MEK)
MW-8A	Nov-00	**120**	**11**	ND	**37**	ND	ND	**74**	ND	ND
	Jul-05	**1,700**	**51**	ND	ND	ND	ND	**200**	0.91	ND
	Aug-06	**940**	**30**	ND	ND	ND	ND	**120**	ND	ND
	Dec-06	**890**	**27**	<20	<20	<20	<100	**110**	<10	<100.0
	Mar-07	**1,200**	**36**	<20.0	<20.0	<20.0	<100.0	**140**	<10.0	<100.0
	Jul-07	**1,400**	**36**	<20.0	<20.0	<20.0	<100.0	**140**	<10.0	<100.0
	Oct-07	**950**	**32**	<20.0	<20.0	<20.0	<100.0	**120**	<10.0	<100.0
	Jan-08	**740**	**29**	<20.0	<20.0	<20.0	<100.0	**91**	<10.0	<100.0
	Apr-08	**550**	<20.0	<20.0	<20.0	<20.0	<100.0	**83**	<10.0	<100.0
	Jul-08	**160**	**13**	<2.0	<2.0	<2.0	11	**48**	<1.0	<10.0
	Oct-08	**460**	**42**	<2.0	**9.4**	<2.0	<10.0	**120**	<1.0	<10.0
	Jul-09	**170**	**8.0**	<2.0	<2.0	<2.0	<10.0	**30**	<1.0	<10.0
	Apr-10	**210**	**15**	<2.0	<2.0	<2.0	<10.0	**91**	<1.0	<10.0
MW-8B	Nov-00	**26**	1	ND	ND	ND	ND	3	ND	ND
	Jul-05	**7.9**	ND	ND	ND	ND	ND	ND	ND	ND
	Aug-06	**28**	ND	ND	ND	ND	ND	ND	ND	ND
	Dec-06	**50**	<2.0	<2.0	<2.0	<2.0	<10	<2.0	<1.0	<10.0
	Mar-07	<2.0	<2.0	<2.0	<2.0	<2.0	<10.0	<2.0	<1.0	<10.0
	Jul-07	<2.0	<2.0	<2.0	<2.0	<2.0	<10.0	<2.0	<1.0	<10.0
	Oct-07	<2.0	<2.0	<2.0	<2.0	<2.0	<10.0	<2.0	<1.0	<10.0
	Jan-08	<2.0	<2.0	<2.0	<2.0	<2.0	<10.0	<2.0	<1.0	<10.0
	Apr-08	<2.0	<2.0	<2.0	<2.0	<2.0	<10.0	<2.0	<1.0	<10.0
	Jul-08	<2.0	<2.0	<2.0	<2.0	<2.0	21	<2.0	<1.0	<10.0
	Oct-08	**10**	<2.0	<2.0	<2.0	<2.0	<10.0	<2.0	<1.0	<10.0
	Jul-09	<2.0	<2.0	<2.0	<2.0	<2.0	<10.0	<2.0	<1.0	<10.0
	Apr-10	<2.0	<2.0	<2.0	<2.0	<2.0	<10.0	<2.0	<1.0	<10.0
MW-8C	Jul-05	4.7	ND	ND	ND	ND	ND	ND	ND	ND
	Aug-06	**37**	ND	ND	ND	ND	ND	ND	ND	ND
	Dec-06	<2.0	<2.0	<2.0	<2.0	<2.0	<10	<2.0	<1.0	ND
	Mar-07	<2.0	<2.0	<2.0	<2.0	<2.0	<10.0	<2.0	<1.0	<10.0
	Jul-07	<2.0	<2.0	<2.0	<2.0	<2.0	<10.0	<2.0	<1.0	<10.0
	Oct-07	<2.0	<2.0	<2.0	<2.0	<2.0	<10.0	<2.0	<1.0	<10.0
	Jan-08	<2.0	<2.0	<2.0	<2.0	<2.0	<10.0	<2.0	<1.0	<10.0
	Apr-08	<2.0	<2.0	<2.0	<2.0	<2.0	<10.0	<2.0	<1.0	<10.0
	Jul-08	<2.0	<2.0	<2.0	<2.0	<2.0	<10.0	<2.0	<1.0	<10.0
	Oct-08	4.4	<2.0	<2.0	<2.0	<2.0	<10.0	<2.0	<1.0	<10.0
	Jul-09	<2.0	<2.0	<2.0	<2.0	<2.0	<10.0	<2.0	<1.0	<10.0
	Apr-10	<2.0	<2.0	<2.0	<2.0	<2.0	<10.0	<2.0	<1.0	<10.0
MW-8D	Jul-05	3.7	ND	ND	ND	ND	ND	ND	ND	<10.0
	Aug-06	**45**	ND	ND	ND	ND	ND	**22**	ND	<10.0
	Dec-06	<2.0	<2.0	<2.0	<2.0	<2.0	<10	<2.0	<1.0	<10.0
	Mar-07	<2.0	<2.0	<2.0	<2.0	<2.0	<10.0	<2.0	<1.0	<10.0
	Jul-07	<2.0	<2.0	<2.0	<2.0	<2.0	<10.0	<2.0	<1.0	<10.0
	Oct-07	<2.0	<2.0	<2.0	<2.0	<2.0	<10.0	<2.0	<1.0	<10.0
	Jan-08	<2.0	<2.0	<2.0	<2.0	<2.0	<10.0	<2.0	<1.0	<10.0
	Apr-08	<2.0	<2.0	<2.0	<2.0	<2.0	<10.0	<2.0	<1.0	<10.0
	Jul-08	<2.0	<2.0	<2.0	<2.0	<2.0	11	<2.0	<1.0	<10.0
	Oct-08	**10**	<2.0	<2.0	<2.0	<2.0	<10.0	<2.0	<1.0	<10.0
	Jul-09	<2.0	<2.0	<2.0	<2.0	<2.0	<10.0	<2.0	<1.0	<10.0
	Apr-10	<2.0	<2.0	<2.0	<2.0	<2.0	<10.0	<2.0	<1.0	<10.0
MW-9A	Jul-05	0.8	ND	ND	0.98	ND	3	1.6	ND	NM
	Aug-06	**8**	ND	ND	**18**	ND	ND	ND	ND	NM
	Dec-06	**6.1**	<2.0	<2.0	**24**	<2.0	<10	**44**	<1.0	NM
	Mar-07	<2.0	<2.0	<2.0	**24**	<2.0	<10.0	**41**	<1.0	<10.0
	Jul-07	<2.0	<2.0	<2.0	**17**	<2.0	<10.0	**26**	<1.0	<10.0
	Oct-07	**96**	<2.0	<2.0	**7.8**	<2.0	<10.0	**7.4**	<1.0	<10.0
	Jan-08	<2.0	<2.0	<2.0	**13**	<20.	<10.0	**25**	<1.0	<10.0
	Apr-08	<2.0	<2.0	<2.0	**3.0**	<2.0	<10.0	<2.0	<1.0	<10.0
	Jul-08	<2.0	<2.0	<2.0	<2.0	<2.0	<10.0	<2.0	<1.0	<10.0
	Oct-08	2.3	<2.0	<2.0	<2.0	<2.0	<10.0	<2.0	<1.0	<10.0
	Jul-09	<2.0	<2.0	<2.0	**4.7**	<2.0	<10.0	**13**	<1.0	<10.0
	Apr-10	<2.0	<2.0	<2.0	**13**	<2.0	<10.0	**38**	<1.0	<10.0
MW-9B	Jul-05	ND	ND	ND	ND	ND	ND	ND	ND	ND
	Aug-06	3.1	ND	ND	ND	ND	ND	ND	ND	ND
	Dec-06	**6.4**	<2.0	<2.0	<2.0	<2.0	<10	**2.8**	<1.0	<10.0
	Mar-07	<2.0	<2.0	2.4	<2.0	<2.0	<10.0	<2.0	<1.0	<10.0
	Jul-07	<2.0	<2.0	2.4	<2.0	<2.0	<10.0	<2.0	<1.0	<10.0
	Oct-07	**79**	<2.0	2.2	<2.0	<2.0	<10.0	<2.0	<1.0	<10.0
	Jan-08	<2.0	<2.0	2.6	<2.0	<2.0	<10.0	<2.0	<1.0	<10.0
	Apr-08	<2.0	<2.0	2.6	<2.0	<2.0	<10.0	<2.0	<1.0	<10.0
	Jul-08	<2.0	<2.0	<2.0	<2.0	<2.0	<10.0	<2.0	<1.0	<10.0
	Oct-08	<2.0	<2.0	<2.0	<2.0	<2.0	<10.0	<2.0	<1.0	<10.0
	Jul-09	<2.0	<2.0	2.3	<2.0	<2.0	<10.0	<2.0	<1.0	<10.0
	Apr-10	<2.0	<2.0	<2.0	<2.0	<2.0	<10.0	<2.0	<1.0	<10.0
MW-9C	Jul-05	ND	ND	1.5	ND	ND	ND	ND	ND	ND
	Aug-06	4.1	ND	ND	ND	ND	ND	ND	ND	ND
	Dec-06	**5.6**	<2.0	<2.0	<2.0	<2.0	<10	<2.0	<1.0	<10.0
	Mar-07	<2.0	<2.0	2.2	<2.0	<2.0	<10.0	<2.0	<1.0	<10.0
	Jul-07	<2.0	<2.0	3.0	<2.0	<2.0	<10.0	<2.0	<1.0	<10.0
	Oct-07	**110**	2.2	3.6	<2.0	<2.0	<10.0	<2.0	<1.0	<10.0
	Jan-08	<2.0	<2.0	<2.0	<2.0	<2.0	<10.0	<2.0	<1.0	<10.0
	Apr-08	<2.0	<2.0	2.6	<2.0	<2.0	<10.0	<2.0	<1.0	<10.0
	Jul-08	<2.0	<2.0	<2.0	<2.0	<2.0	<10.0	<2.0	<1.0	<10.0
	Oct-08	<2.0	<2.0	<2.0	<2.0	<2.0	<10.0	<2.0	<1.0	<10.0
	Jul-09	<2.0	<2.0	2.3	<2.0	<2.0	<10.0	<2.0	<1.0	<10.0
	Apr-10	<2.0	<2.0	2.5	<2.0	<2.0	<10.0	<2.0	<1.0	<10.0
MW-9D	Jul-05	ND	ND	ND	ND	ND	ND	ND	ND	ND
	Aug-06	**5.5**	ND	ND	ND	ND	ND	ND	ND	ND
	Dec-06	**10**	<2.0	<2.0	<2.0	<2.0	<10	<2.0	<1.0	<10.0
	Mar-07	<2.0	<2.0	<2.0	<2.0	<2.0	<10.0	<2.0	<1.0	<10.0
	Jul-07	<2.0	<2.0	<2.0	<2.0	<2.0	<10.0	<2.0	<1.0	<10.0
	Oct-07	**57**	<2.0	<2.0	<2.0	<2.0	<10.0	<2.0	<1.0	<10.0
	Jan-08	<2.0	<2.0	<2.0	<2.0	<2.0	<10.0	<2.0	<1.0	<10.0
	Apr-08	<2.0	<2.0	2.6	<2.0	<2.0	<10.0	<2.0	<1.0	<10.0
	Jul-08	<2.0	<2.0	<2.0	<2.0	<2.0	<10.0	<2.0	<1.0	<10.0
	Oct-08	<2.0	<2.0	<2.0	<2.0	<2.0	<10.0	<2.0	<1.0	<10.0
	Jul-09	<2.0	<2.0	<2.0	<2.0	<2.0	<10.0	<2.0	<1.0	<10.0
	Apr-10	<2.0	<2.0	<2.0	<2.0	<2.0	<10.0	<2.0	<1.0	<10.0
MW-10A	Jul-05	ND	ND	ND	ND	0.9	ND	ND	ND	ND
	Aug-06	ND	ND	ND	ND	ND	ND	ND	ND	ND
	Dec-06	<2.0	<2.0	<2.0	<2.0	<2.0	<10	<2.0	<1.0	<10.0
	Mar-07	<2.0	<2.0	<2.0	<2.0	<2.0	<10.0	<2.0	<1.0	<10.0
	Jul-07	<20.0	<20.0	<20.0	<20.0	<20.0	<100.0	<20.0	<10.0	<100.0
	Oct-07	**25**	<2.0	<2.0	<2.0	<2.0	<10.0	<2.0	<1.0	<10.0
	Jan-08	**13**	<2.0	<2.0	<2.0	<2.0	<10.0	<2.0	<1.0	<10.0
	Apr-08	<2.0	<2.0	<2.0	<2.0	<2.0	<10.0	<2.0	<1.0	<10.0
	Jul-08	**85**	<2.0	<2.0	<2.0	<2.0	<10.0	<2.0	<1.0	<10.0
	Oct-08	<2.0	<2.0	<2.0	<2.0	<2.0	<10.0	<2.0	<1.0	<10.0
	Jul-09	<2.0	<2.0	<2.0	<2.0	<2.0	<10.0	<2.0	<1.0	<10.0
	Apr-10	<2.0	<2.0	<2.0	<2.0	<2.0	<10.0	<2.0	<1.0	<10.0
MW-10B	Jul-05	ND	ND	ND	ND	ND	ND	ND	ND	ND
	Aug-06	ND	ND	ND	ND	ND	ND	ND	ND	ND
	Dec-06	<2.0	<2.0	<2.0	<2.0	<2.0	<10	<2.0	<1.0	<10.0
	Mar-07	<2.0	<2.0	<2.0	<2.0	<2.0	<10.0	<2.0	<1.0	<10.0
	Jul-07	NS	NS	NS	NS	NS	NS	NS	NS	NS
	Oct-07	NS	NS	NS	NS	NS	NS	NS	NS	NS
	Jan-08	**12**	<2.0	<2.0	<2.0	<2.0	<10.0	<2.0	<1.0	<10.0
	Apr-08	<2.0	<2.0	<2.0	<2.0	<2.0	<10.0	<2.0	<1.0	<10.0
	Jul-08	NS	NS	NS	NS	NS	NS	NS	NS	NS
	Oct-08	NS	NS	NS	NS	NS	NS	NS	NS	NS
	Jul-09	<2.0	<2.0	<2.0	<2.0	<2.0	<10.0	<2.0	<1.0	<10.0
	Apr-10	NS	NS	NS	NS	NS	NS	NS	NS	NS
TOGS 1.1.1 [4]		5	5	5	2	5	50	5	5	50

Sample Identification	Sample Date	Compound (ug/l) [1]								
		Tetrachloroethene	Trichloroethene	1,1,1-Trichloroethane	Vinyl Chloride	4-isopropyltoluene	Acetone	cis-1,2-Dichloroethylene	1,1-Dichloroethene	2-Butanone (MEK)
MW-10C	Jul-05	ND	ND	ND	ND	ND	ND	ND	ND	ND
	Aug-06	ND	ND	ND	ND	ND	ND	ND	ND	ND
	Dec-06	<2.0	<2.0	<2.0	<2.0	<2.0	<10	<2.0	<1.0	<10.0
	Mar-07	<2.0	<2.0	<2.0	<2.0	<2.0	<10.0	<2.0	<1.0	<10.0
	Jul-07	NS	NS	NS	NS	NS	NS	NS	NS	NS
	Oct-07	NS	NS	NS	NS	NS	NS	NS	NS	NS
	Jan-08	**15**	<2.0	<2.0	<2.0	<2.0	<10.0	<2.0	<1.0	<10.0
	Apr-08	<2.0	<2.0	<2.0	<2.0	<2.0	<10.0	<2.0	<1.0	<10.0
	Jul-08	NS	NS	NS	NS	NS	NS	NS	NS	NS
	Oct-08	NS	NS	NS	NS	NS	NS	NS	NS	NS
	Jul-09	<2.0	<2.0	<2.0	<2.0	<2.0	<10.0	<2.0	<1.0	<10.0
	Apr-10	NS	NS	NS	NS	NS	NS	NS	NS	NS
MW-10D	Jul-05	ND	ND	ND	ND	ND	ND	ND	ND	ND
	Aug-06	ND	ND	ND	ND	ND	ND	ND	ND	ND
	Dec-06	<2.0	<2.0	<2.0	<2.0	<2.0	<10	<2.0	<1.0	<10.0
	Mar-07	<2.0	<2.0	<2.0	<2.0	<2.0	<10.0	<2.0	<1.0	<10.0
	Jul-07	NS	NS	NS	NS	NS	NS	NS	NS	NS
	Oct-07	NS	NS	NS	NS	NS	NS	NS	NS	NS
	Jan-08	**20**	<2.0	<2.0	<2.0	<2.0	<10.0	<2.0	<1.0	<10.0
	Apr-08	<2.0	<2.0	<2.0	<2.0	<2.0	<10.0	<2.0	<1.0	<10.0
	Jul-08	NS	NS	NS	NS	NS	NS	NS	NS	NS
	Oct-08	NS	NS	NS	NS	NS	NS	NS	NS	NS
	Jul-09	<2.0	<2.0	<2.0	<2.0	<2.0	<10.0	<2.0	<1.0	<10.0
	Apr-10	NS	NS	NS	NS	NS	NS	NS	NS	NS
MW-11C	Jul-05	**10**	ND	ND	ND	ND	ND	ND	ND	ND
	Aug-06	ND	ND	ND	ND	ND	ND	ND	ND	ND
	Dec-06	**7.3**	<2.0	<2.0	<2.0	<2.0	<10	<2.0	<1.0	<10.0
	Mar-07	**95**	<2.0	<2.0	<2.0	<2.0	<10.0	<2.0	<1.0	<10.0
	Jul-07	**89**	<2.0	<2.0	<2.0	<2.0	<10.0	<2.0	<1.0	<10.0
	Oct-07	**9.5**	<2.0	<2.0	<2.0	<2.0	<10.0	<2.0	<1.0	<10.0
	Jan-08	**26**	<2.0	<2.0	<2.0	<2.0	<10.0	<2.0	<1.0	<10.0
	Apr-08	3.2	<2.0	<2.0	<2.0	<2.0	<10.0	<2.0	<1.0	<10.0
	Jul-08	**93**	<2.0	<2.0	<2.0	<2.0	<10.0	<2.0	<1.0	<10.0
	Oct-08	**5.3**	<2.0	<2.0	<2.0	<2.0	<10.0	<2.0	<1.0	<10.0
	Jul-09	<2.0	<2.0	<2.0	<2.0	<2.0	<10.0	<2.0	<1.0	<10.0
	Apr-10	2	<2.0	<2.0	<2.0	<2.0	<10.0	<2.0	<1.0	<10.0
MW-11D	Jul-05	**17**	ND	ND	ND	ND	ND	ND	ND	ND
	Aug-06	**20**	ND	ND	ND	ND	ND	ND	ND	ND
	Dec-06	**49**	<2.0	<2.0	<2.0	<2.0	<10	<2.0	<1.0	<10.0
	Mar-07	**140**	2.2	<2.0	<2.0	<2.0	<10.0	2.6	<1.0	<10.0
	Jul-07	**130**	<2.0	<2.0	<2.0	<2.0	<10.0	<2.0	<1.0	<10.0
	Oct-07	**16**	<2.0	<2.0	<2.0	<2.0	<10.0	<2.0	<1.0	<10.0
	Jan-08	**44**	<2.0	<2.0	<2.0	<2.0	<10.0	<2.0	<1.0	<10.0
	Apr-08	**10**	<2.0	<2.0	<2.0	<2.0	<10.0	<2.0	<1.0	<10.0
	Jul-08	**81**	<2.0	<2.0	<2.0	<2.0	15	<2.0	<1.0	<10.0
	Oct-08	4.4	<2.0	<2.0	<2.0	<2.0	<10.0	<2.0	<1.0	<10.0
	Jul-09	<2.0	<2.0	<2.0	<2.0	<2.0	<10.0	<2.0	<1.0	<10.0
	Apr-10	<2.0	<2.0	<2.0	<2.0	<2.0	<10.0	<2.0	<1.0	<10.0
MW-12C	Jul-05	**8,200**	ND	ND	ND	ND	ND	ND	ND	ND
	Aug-06	**250**	ND	ND	ND	ND	ND	ND	ND	ND
	Dec-06	**1,600**	3.1	<2.0	<2.0	<2.0	<10	**9.7**	<1.0	<10.0
	Mar-07	**1,100**	<20.0	<20.0	<20.0	<20.0	<100.0	<20.0	<10.0	<100.0
	Jul-07	**1,100**	<2.0	<2.0	<2.0	<2.0	<10.0	<2.0	<1.0	<10.0
	Oct-07	**70**	<2.0	<2.0	<2.0	<2.0	<10.0	<2.0	<1.0	<10.0
	Jan-08	**650**	<2.0	<2.0	<2.0	<2.0	<10.0	<2.0	<1.0	<10.0
	Apr-08	**41**	<2.0	<2.0	<2.0	<2.0	<10.0	<2.0	<1.0	<10.0
	Jul-08	**500**	2.0	<2.0	<2.0	<2.0	<10.0	3.1	<1.0	<10.0
	Oct-08	**180**	<20.0	<20.0	<20.0	<20.0	<100.0	<20.0	<10.0	<100.0
	Jul-09	**41**	<2.0	<2.0	<2.0	<2.0	<10.0	<2.0	<1.0	<10.0
	Apr-10	**300**	<2.0	<2.0	<2.0	<2.0	<10.0	<2.0	<1.0	<10.0
MW-12D	Jul-05	**54**	0.74	ND	ND	ND	ND	0.75	ND	ND
	Aug-06	**160**	ND	ND	ND	ND	ND	**9.6**	ND	ND
	Dec-06	**32**	<20	<20	<20	<20	<100	**14**	<10	<100.0
	Mar-07	**110**	<2.0	<2.0	<2.0	<2.0	<10.0	**15**	<1.0	<10.0
	Jul-07	**250**	<2.0	<2.0	<2.0	<2.0	<10.0	<2.0	<1.0	<10.0
	Oct-07	**24**	<2.0	<2.0	<2.0	<2.0	<10.0	<2.0	<1.0	<10.0
	Jan-08	**23**	<2.0	<2.0	<2.0	<2.0	<10.0	<2.0	<1.0	<10.0
	Apr-08	**16**	<2.0	<2.0	<2.0	<2.0	<10.0	<2.0	<1.0	<10.0
	Jul-08	**130**	<2.0	<2.0	<2.0	<2.0	<10.0	2.2	<1.0	<10.0
	Oct-08	**25**	<2.0	<2.0	<2.0	<2.0	<10.0	2.4	<1.0	<10.0
	Jul-09	**32**	<2.0	<2.0	<2.0	<2.0	<10.0	<2.0	<1.0	<10.0
	Apr-10	**16**	<2.0	<2.0	<2.0	<2.0	<10.0	<2.0	<1.0	<10.0
MW-13A	Aug-06	ND	ND	ND	ND	ND	ND	ND	ND	ND
	Dec-06	<2.0	<2.0	<2.0	<2.0	<2.0	<10	<2.0	<1.0	<10.0
	Mar-07	<2.0	<2.0	<2.0	<2.0	<2.0	<10.0	<2.0	<1.0	<10.0
	Jul-07	NS	NS	NS	NS	NS	NS	NS	NS	NS
	Oct-07	NS	NS	NS	NS	NS	NS	NS	NS	NS
	Jan-08	<2.0	<2.0	<2.0	<2.0	<2.0	<10.0	<2.0	<1.0	<10.0
	Apr-08	NS	NS	NS	NS	NS	NS	NS	NS	NS
	Jul-08	NS	NS	NS	NS	NS	NS	NS	NS	NS
	Oct-08	NS	NS	NS	NS	NS	NS	NS	NS	NS
	Jul-09	<2.0	<2.0	<2.0	<2.0	<2.0	<10.0	<2.0	<1.0	<10.0
	Apr-10	NS	NS	NS	NS	NS	NS	NS	NS	NS
MW-13B	Aug-06	ND	ND	ND	ND	ND	ND	ND	ND	ND
	Dec-06	<2.0	<2.0	<2.0	<2.0	<2.0	<10	<2.0	<1.0	<10.0
	Mar-07	<2.0	<2.0	<2.0	<2.0	<2.0	<10.0	<2.0	<1.0	<10.0
	Jul-07	NS	NS	NS	NS	NS	NS	NS	NS	NS
	Oct-07	NS	NS	NS	NS	NS	NS	NS	NS	NS
	Jan-08	<2.0	<2.0	<2.0	<2.0	<2.0	<10.0	<2.0	<1.0	<10.0
	Apr-08	NS	NS	NS	NS	NS	NS	NS	NS	NS
	Jul-08	NS	NS	NS	NS	NS	NS	NS	NS	NS
	Oct-08	NS	NS	NS	NS	NS	NS	NS	NS	NS
	Jul-09	<2.0	<2.0	<2.0	<2.0	<2.0	<10.0	<2.0	<1.0	<10.0
	Apr-10	NS	NS	NS	NS	NS	NS	NS	NS	NS
GES MW-4	Aug-06	ND	ND	ND	**7.6**	ND	ND	4.4	ND	ND
	Dec-06	**23**	<2.0	<2.0	**4.4**	<2.0	<10	2.7	<1.0	<10.0
	Mar-07	<2.0	<2.0	<2.0	**6.2**	<2.0	<10.0	4.1	<1.0	<10.0
	Jul-07	<2.0	<2.0	<2.0	<2.0	<2.0	<10.0	<2.0	<1.0	<10.0
	Oct-07	<2.0	<2.0	<2.0	**15**	<2.0	<10.0	**6.8**	<1.0	<10.0
	Jan-08	<2.0	<2.0	<2.0	**5.4**	<2.0	<10.0	**5.1**	<1.0	<10.0
	Apr-08	**33**	<2.0	<2.0	**6.6**	<2.0	<10.0	**6.9**	<1.0	<10.0
	Jul-08	<2.0	<2.0	<2.0	**4.8**	<2.0	<10.0	**8.9**	<1.0	<10.0
	Oct-08	<2.0	<2.0	<2.0	<2.0	<2.0	<10.0	**9.5**	<1.0	<10.0
	Jul-09	<2.0	<2.0	<2.0	<2.0	<2.0	<10.0	<2.0	<1.0	<10.0
	Apr-10	<2.0	<2.0	<2.0	<2.0	<2.0	<10.0	<2.0	<1.0	<10.0
MW-14A	Jul-08	**190**	2.8	<2.0	<2.0	<2.0	<10.0	**9.9**	<1.0	<10.0
MW-14B		**330**	**5.6**	<2.0	<2.0	<2.0	<10.0	**28**	<1.0	<10.0
MW-14C		**370**	**6.8**	<2.0	<2.0	<2.0	<10.0	**21**	<1.0	<10.0
MW-14D		**450**	2.6	<2.0	<2.0	<2.0	<10.0	**9.6**	<1.0	<10.0
MW-14E		**200**	2.9	<2.0	<2.0	<2.0	<10.0	**8.6**	<1.0	<10.0
MW-15A	Jul-08	**29**	<2.0	<2.0	<2.0	<2.0	<10.0	**11**	<1.0	<10.0
MW-15B		**35**	2.5	<2.0	<2.0	<2.0	<10.0	**19**	<1.0	<10.0
MW-15C		**43**	2.8	<2.0	<2.0	<2.0	<10.0	**22**	<1.0	<10.0
MW-15D		**36**	<2.0	<2.0	<2.0	<2.0	<10.0	**7.7**	<1.0	<10.0
MW-15E		2.5	<2.0	<2.0	<2.0	<2.0	<10.0	<2.0	<1.0	<10.0
MW-16A	Jul-08	**840**	4.7	<2.0	<2.0	<2.0	<10.0	4.7	<1.0	<10.0
MW-16B		**3,400**	**15**	<2.0	<2.0	<2.0	<10.0	**22**	<1.0	<10.0
MW-16C		**6,200**	**20**	<2.0	<2.0	<2.0	<10.0	**35**	<1.0	<10.0
MW-16D		**170**	<2.0	<2.0	<2.0	<2.0	<10.0	2.4	<1.0	<10.0
MW-16E		**56**	<2.0	<2.0	<2.0	<2.0	<10.0	<2.0	<1.0	<10.0
MW-17A	Jul-08	**210**	<20	<20	<20	<20	<100	**41**	<10	<100
MW-17B		**350**	<20	<20	<20	<20	<100	<20	<10	<100
MW-17C		**330**	**7.1**	<2.0	<2.0	<2.0	<10.0	**49**	<1.0	<10.0
MW-17D		**340**	4.7	<2.0	<2.0	<2.0	<10.0	**36**	<1.0	<10.0
MW-17E		**290**	<2.0	<2.0	<2.0	<2.0	<10.0	<2.0	<1.0	<10.0
TOGS 1.1.1 [4]		5	5	5	2	5	50	5	5	50

1) - Micrograms per liter
2) - Methyl Tert Butyl Ether
3) - Not detected
4) - New York State Ground Water Quality Standards and Guidance Values
(Div. of Water Technical and Operational Guidance Series 1.1.1)
5) - Not Available

81 Exceeds TOGS

Compounds in Blue are the primary Contaminants of Concern

TABLE 2

VOLUNTARY CLEANUP PROGRAM INDEX # W3-0891-01-06
KIMCO REALTY CORPORATION
FOREST AVENUE SHOPPING CENTER
STATEN ISLAND, NEW YORK

Monitor Wells
Summary of Volatile Organic Compounds Detected in Soil Samples
May 2005

Sample Location	Sample Depth (ft bg) [1]	Concentration (ug/kg) [2]												
		Tetrachloroethene	Trichloroethene	Ethylbenzene	Total Xylenes	1,2,4-Trimethylbenzene	1,3,5-Trimethylbenzene	4-Isopropyltoluene	Naphthalene	Acetone	2-Butanone	n-Butylbenzene	2-Chloroethyl vinyl ether	sec-Butylbenzene
MW-2B	0 to 5	ND [3]	ND	ND	14.2	127	38.4	ND	61.2	ND	ND	14.3	22.1	ND
	43 to 45	18.4	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
MW-5D	0 to 5	16.4	ND	ND	15.1	180	69.6	15.8	83.2	ND	ND	ND	ND	ND
	38 to 40	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
MW-6D	10 to 12	200,000	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
	15 to 17	120,000	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
MW-7D	29 to 31	91.3	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
	33 to 35	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
MW-8D	5 to 7	19	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
	7 to 9	14.5	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
MW-9B	5 to 7	ND	ND	ND	ND	26.8	ND	ND	47.2	19.1	ND	ND	ND	ND
MW-9C	5 to 7	ND	ND	ND	ND	136	45.2	ND	50.1	64.7	18.1	15.1	ND	ND
MW-10D	15 to 17	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	187	ND	286
	17 to 19	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
MW-11D	0 to 5	ND	ND	ND	59.9	360	161	37.2	216	ND	ND	ND	ND	ND
	30 to 32	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
MW-12D	0 to 5	26.8	ND	ND	ND	ND	77.2	ND	ND	ND	ND	ND	ND	ND
	25 to 27	50.9	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Part 375, Unrestricted Use [4]		**1,300**	**470**	**1,000**	**260 (mixed)**	**3,600**	**8,400**	**NL [5]**	**12,000**	**50**	**120**	**12,000**	**NL**	**11,000**
Part 375, Restricted Use, Protection of Groundwater [4]		**1,300**	**470**	**1,000**	**1,600 (mixed)**	**3,600**	**8,400**	**NL [5]**	**12,000**	**50**	**120**	**12,000**	**NL**	**11,000**

1) - Feet below grade
2) - Micrograms per kilogram
3) - Not Detected
4) - New York State Codes, Rules and Regulations, Chapter IV, Part 375: Environmental Remediation Programs, Subpart 375-6 Remedial Program Soil Cleanup Objectives, Dec. 14, 2006
5) - Not Listed

200,000 Exceeds Part 375

TABLE 3

FORMER CHARLTON CLEANERS FACILITY
VOLUNTARY CLEANUP PROGRAM INDEX # W3-0891-01-06
FOREST AVENUE SHOPPERS TOWN
STATEN ISLAND, NEW YORK

Hand Augers Locations
Summary of Volatile Organic Compounds Detected in Soil Samples
Collected From Beneath Michaels Basement Floor Slab
September 2000 & June 2005

Sample Location	Sample Depth (ft bg) [1]	Concentration (ug/kg) [2]				
		Tetrachloroethene	Trichloroethene	cis-1,2-Dichloroethene	Acetone	Vinyl Chloride
HA-1 (2000)	1	5,000	860	390	NA	250
HA-2 (2000)	4 to 5	45	< 5.0	< 5.0	NA	< 5.0
HA-1 (2005)	2 to 3	ND [3]	ND	ND	13.3	ND
HA-2 (2005)	2 to 3	945	23.5	55.4	ND	ND
HA-3	2 to 3	266	20.5	25.8	ND	ND
HA-4	2 to 3	ND	ND	ND	ND	ND
HA-5	2 to 3	ND	ND	ND	ND	ND
HA-6	2 to 3	ND	ND	ND	ND	ND
Part 375, Unrestricted Use [4]		**1,300**	**470**	**250**	**50**	**20**
Part 375, Restricted Use, Protection of Groundwater [4]		**1,300**	**470**	**250**	**50**	**20**

1) - Feet below grade
2) - Micrograms per kilogram
3) - Not Detected
4) - New York State Codes, Rules and Regulations, Chapter IV, Part 375: Environmental Remediation Programs, Subpart 375-6 Remedial Program Soil Cleanup Objectives, Dec. 14, 2006

5,000 xceeds Part 375

TABLE 4

FORMER CHARLTON CLEANER FACILITY
VOLUNTARY CLEANUP PROGRAM INDEX # W3-0891-01-06
FOREST AVENUE SHOPPERS TOWN
24 BARRETT AVENUE
STATEN ISLAND, NEW YORK

Historic Summary of Indoor Air Quality Samples
Select Chlorinated Compounds Found on the NYSDOH Decision Matrices
EPA Method TO-15 with Selected Ion Monitoring
(All concentrations expressed in micrograms per cubic meter)

Basement Fan Installation

Compound	Michaels Basement Equipment Room																	NYSDOH Air Guidance Value	Building Assessment and Survey Evaluation - 90th Percentile, EPA 2001
	June-05	September-05	October-05	October-06	December-06	June-07	August-07	August-07	August-07	October-07	August-08	March-09	August-09	March-10	March-11	August-11	March-12	September-12	
1,1,1-Trichloroethane	NS	ND	ND	ND	ND	ND	NA	NA	N	NA	ND	<1.4	<2.8	<7	<14 / <0.0294 SIM	<0.37	<0.37	<0.067	NE	20.6
1,1-Dichloroethene	NS	ND	ND	ND	ND	ND	NA	NA	N	NA	0.102 J SIM	<1.0	<2.4	<5.1	<6.9 / .323 SIM	<0.27	<0.27	<0.040	NE	<1.4
1,2-Dichloroethane	NS	13	5	ND	ND	ND	NA	NA	N	NA	26	<1.0	29	2.6	<7.4 / 0.988 SIM	10	2.6	5.3	NE	<0.9
cis-1,2-Dichloroethene	NS	190	190	43.0	71	24	7.4	<0.20	6.6	1.7	18, 23.1 SIM	170	85	91	88 / 80.8 SIM	11	30	8.8	NE	<1.9
Tetrachloroethene	NS	**2,600**	**1,700**	**1,200**	**1,600**	**750**	55	<0.20	48	18	**200, 201 SIM**	**450**	**580**	**720**	**780 / 553 SIM**	**190**	**110 E**	70	**100**	15.9
Trichloroethene	NS	**34**	**19**	**11**	**24 J, 55.9 SIM**	**6.6**	0.7	<0.20	**17**	0.62	**5.3 J**, 2.47 SIM	**16**	**14**	**11**	**13J / 15 SIM**	**2**	**4**	1.1	**5**	4.2
Vinyl Chloride	NS	17	17	3.2	14.3 SIM	ND	NA	NA	N	NA	ND	16	7.3	3.8	9.4J / 6.21 SIM	0.26	0.97	<0.042	NE	<1.9

Compound	Michaels Main Basement																	NYSDOH Air Guidance Value	Building Assessment and Survey Evaluation - 90th Percentile, EPA 2001
	June-05	September-05	October-05	October-06	December-06	June-07	August-07	August-07	August-07	October-07	August-08	March-09	August-09	March-10	March-11	August-11	March-12	September-12	
1,1,1-Trichloroethane	ND	ND	ND	ND	ND	ND	NA	NA	NA	NA	ND	<0.89	<5.18	<4.9	<14 / 0.222 J SIM	<0.37	<0.37	<0.067	NE	20.6
1,1-Dichloroethene	0.9	ND	ND	ND	ND	ND	NA	NA	NA	NA	0.0689 J SIM	<0.65	<3.78	<3.5	<6.9 / 0.645 SIM	<0.27	<0.27	<0.040	NE	<1.4
1,2-Dichloroethane	4	21	15	1.4 J	ND	1.9 J	NA	NA	NA	NA	46	0.72	37	8.3	<7.4 / 4.45 SIM	10	3.3	4.7	NE	<0.9
cis-1,2-Dichloroethene	230	120	170	7.5	25	ND	<0.20	<0.20	<0.20	<0.20	4.3, 5.70 SIM	97	<3.78	44	180 / 128 SIM	0.32	1.2	<0.046	NE	<1.9
Tetrachloroethene	**4,000**	**1,200**	**1,600**	**150**	**660**	55	1.4	0.74	1.5	0.63	68, 68.0 SIM	**310**	**170**	**510**	**1,400 / 879 SIM**	**13**	**34**	2.9	**100**	15.9
Trichloroethene	**42**	**20**	**23**	2.7 J	**7.4, 7.52 SIM**	1.6 J	<0.20	<0.20	**14**	0.31	1.8 J, 0.936 SIM	**9.7**	<5.11	**6.5**	**21 / 87 SIM**	**<0.18**	**<0.18**	<0.044	**5**	4.2
Vinyl Chloride	21	2	21	0.74 J	2.3 SIM	ND	NA	NA	NA	NA	ND, <0.0230 SIM	8.7	<2.43	<2.3	15 / 51.7 SIM	0.17	<0.35	<0.042	NE	<1.9

NYSDOH - New York State Department of Health
NE - Not Established
ND - Not Detected
NL - Not Listed
NA - Not Analyzed

NS - Not Sampled
J - indicates an estimated value
SIM - Selected Ion Monitoring
2,600 exceeds the NYSDOH indoor-air guidance values

TABLE 4, cont.

FORMER CHARLTON CLEANER FACILITY
VOLUNTARY CLEANUP PROGRAM INDEX # W3-0891-01-06
FOREST AVENUE SHOPPERS TOWN
24 BARRETT AVENUE
STATEN ISLAND, NEW YORK

Historic Summary of Indoor Air Quality Samples
Select Chlorinated Compounds Found on the NYSDOH Decision Matrices
EPA Method TO-15 with Selected Ion Monitoring
(All concentrations expressed in micrograms per cubic meter)

Basement Fan Installation

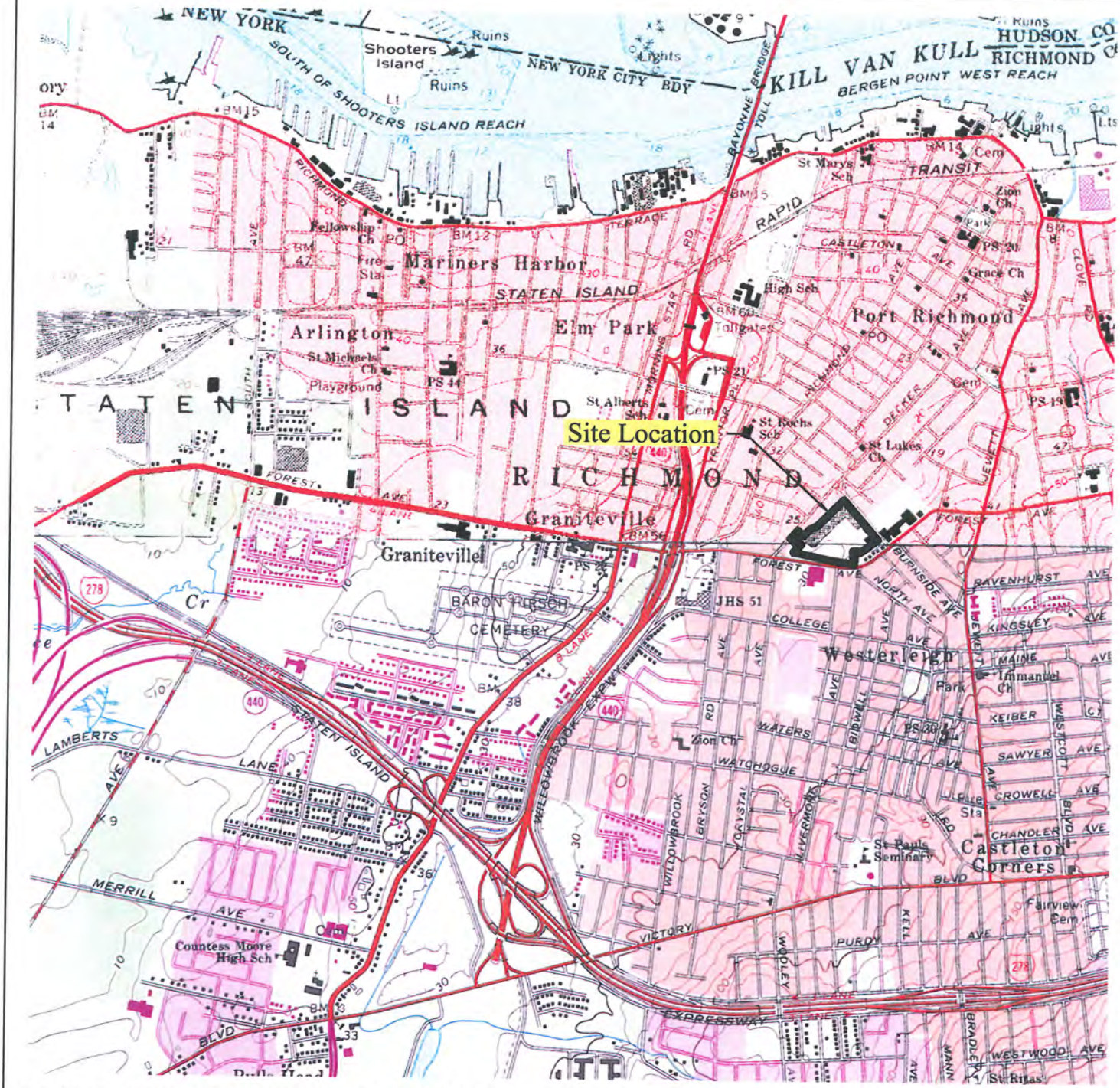
Compound	Michaels Main Store Area													Michaels Main Store, NE Corner							NYSDOH Air Guidance Value	Building Assessment and Survey Evaluation - 90th Percentile, EPA 2001
	September-05	October-05	October-06	December-06	June-07	August-08	March-09	August-09	March-10	March-11	August-11	March-12	September-12	March-09	August-09	March-10	March-11	August-11	March-12	September-12		
1,1,1-Trichloroethane	ND	ND	ND	ND	ND	ND	<0.88	<4.76	<5.1	<7.2 / <0.0294 SIM	<0.37	<0.37	<0.067	<0.88	<5.48	<4.9	<7.2 / <0.0294 SIM	<0.37	<0.37	<0.067	NE	20.6
1,1-Dichloroethene	ND	ND	ND	ND	ND	ND	<0.64	<3.47	<3.7	<3.4 / <0.0508 SIM	<0.27	<0.27	<0.040	<0.64	<4	<3.5	<3.4 / <0.0508 SIM	<0.27	<0.27	<0.040	NE	<1.4
1,2-Dichloroethane	8	4	ND	1.2 J	1.9 J	35	2.0	33	5.5	5.6 / 6.42 SIM	13	3.6	<0.52	2.0	<4.08	5.3	4.1 J / 4.78 SIM	12	3.6	5.7	NE	<0.9
cis-1,2-Dichloroethene	7	6	ND	3.7 J	ND	1.75, 1.75 SIM	16	<3.47	5.7	32 / 21.2 SIM	<0.27	0.67	<0.046	15	300	5.9	30 / 19.2 SIM	<0.27	0.86	<0.046	NE	<1.9
Tetrachloroethene	90	74	6.0 J	90	2.3 J	19, 24.5 SIM	68	30	81	**250 / 164 SIM**	7.7	12	1.3	66	<6.83	80	**230 / 171 SIM**	9.2	17	1.7	**100**	15.9
Trichloroethene	2		ND	1.77 SIM	ND	0.469, 0.469 SIM	1.9	<4.7	<5.1	<6.6 / 4.15 SIM	<0.18	<0.18	<0.044	1.9	<5.41	<4.8	<6.6 / 3.88 SIM	<0.18	<0.18	<0.044	**5**	4.2
Vinyl Chloride	ND	0.8	ND	0.358 SIM	ND	ND, <0.0230 SIM	1.8	<2.24	<2.4	<4.3 / 2.18 SIM	0.17	<0.35	<0.042	1.4	<2.57	<2.3	<4.3 / 2.08 SIM	<0.17	<0.35	<0.042	NE	<1.9

Compound	Michaels Upstairs Loading Dock													T-Mobile Building					NYSDOH Air Guidance Value	Building Assessment and Survey Evaluation - 90th Percentile, EPA 2001
	September-05	October-05	October-06	December-06	June-07	August-08	March-09	August-09	March-10	March-11	August-11	March-12	September-12	June-05	October-06	December-06	August-08	Post August-08		
1,1,1-Trichloroethane	ND	ND	ND	ND	ND	ND	<0.88	<4.9	<5.4	<7.2 / <0.0294 SIM	<0.37	NS	<0.067	ND	ND	ND	ND	NOT SAMPLED	NE	20.6
1,1-Dichloroethene	ND	ND	ND	ND	ND	ND	<0.64	<3.58	<3.9	<3.4 / 0.202 SIM	<0.27	NS	<0.040	ND	ND	ND	ND		NE	<1.4
1,2-Dichloroethane	6	1	ND	1.3 J	1.2 J	36	1.2	31	5.1	<3.7 / 4.08 SIM	9.7	NS	5.7	ND	ND	ND	ND		NE	<0.9
cis-1,2-Dichloroethene	22	3	ND	4.7	ND	1.4 J, 3.02 SIM	47	10	14	58	<0.27	NS	<0.046	ND	ND	ND	ND		NE	<1.9
Tetrachloroethene	**320**	32	17.0	**120**	28	26, 35.8 SIM	**170**	90	**160**	**460 / 345 SIM**	8.7	NS	1.7	1	10.0	4.8 J, 2.65 SIM	0.909, 0.909 SIM		**100**	15.9
Trichloroethene	4	ND	ND	1.5 J, 2.15 SIM	**6.8**	1.2 J, 0.588 SIM	**5.1**	<4.83	<5.3	**7.1 J / 6.89 SIM**	<0.18	NS	<0.044	ND	ND	0.215 J	7.2 J		**5**	4.2
Vinyl Chloride	2	ND	ND	0.435 SIM	ND	ND, <0.0230 SIM	4.1	<2.3	<2.5	5.6 J / 3.61 SIM	0.17	NS	<0.042	ND	ND	ND	ND, <0.0230 SIM		NE	<1.9

NYSDOH - New York State Department of Health
NE - Not Established
ND - Not Detected
NL - Not Listed
NA - Not Analyzed

NS - Not Sampled
J - indicates an estimated value
SIM - Selected Ion Monitoring
250 exceeds the NYSDOH indoor-air guidance values

FIGURES



SOURCE: USGS TOPOGRAPHIC QUADRANGLES ELIZABETH AND ARTHUR KILL, NEW YORK–NEW JERSEY (PHOTOREVISED 1981).

QUADRANGLE LOCATION

0 2000

SCALE IN FEET

FORMER CHARLTON CLEANERS FACILITY
VCP # W3-0891-01-06
FOREST AVENUE SHOPPERS TOWN
24 BARRETT AVENUE
STATEN ISLAND NEW YORK

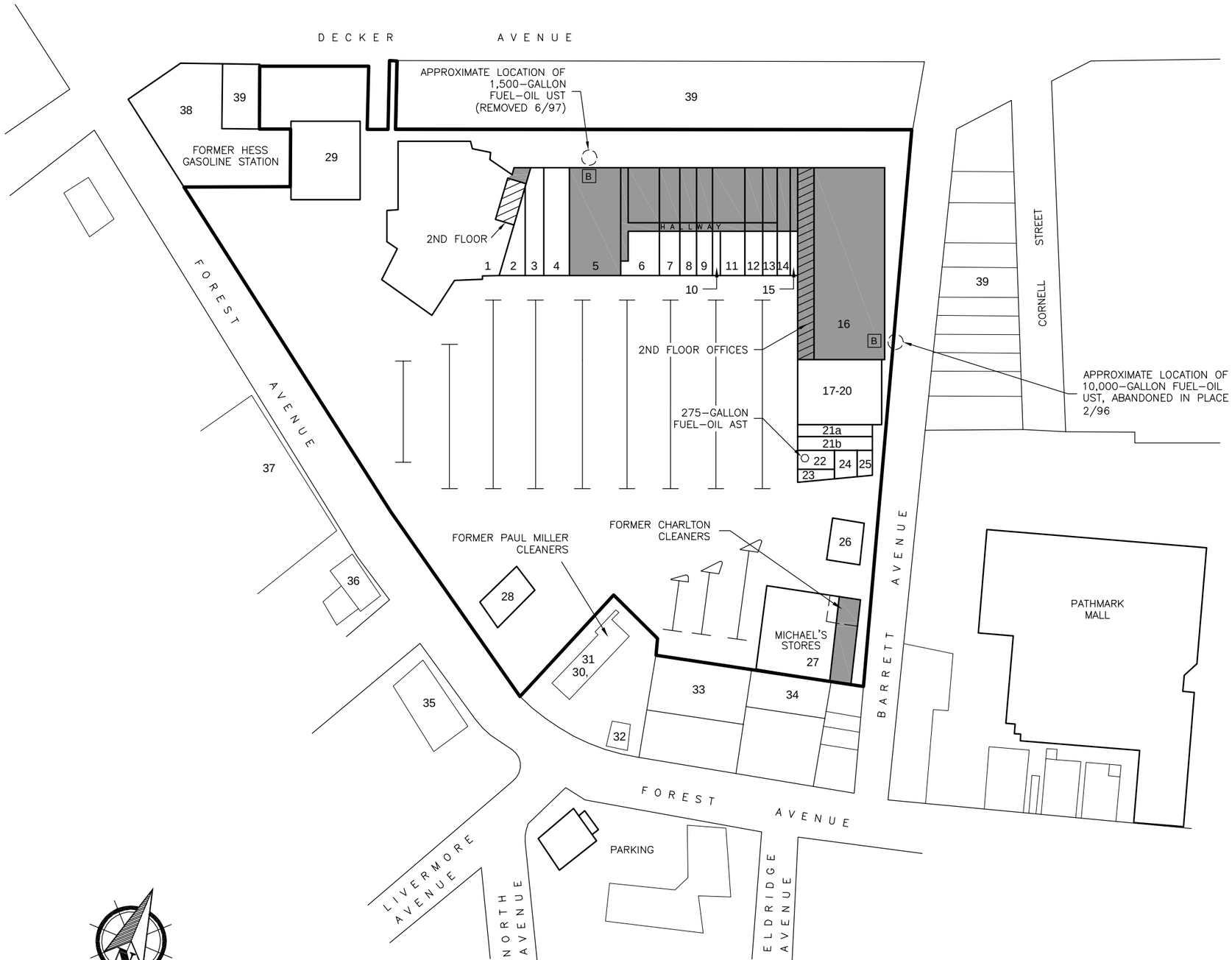
SITE LOCATION MAP

DATE	REVISED

PREPARED BY:

LEGGETTE, BRASHEARS & GRAHAM, INC.
Professional Groundwater and Environmental Engineering Services
110 Corporate Park Drive
Suite 112
White Plains, NY 10604
(914) 694-5711

DRAWN:	RAC	CHECKED:	PW	DATE:	09/14/10	FIGURE:	1



LEGEND

1	VACANT (FORMER NATIONAL WHOLESALE LIQUIDATORS)	24	G.J.'S UNISEX
2	RAINBOW APPAREL	25	PLAZA DELI
3	VACANT	26	T-MOBILE
4	AVENUE	27	MICHAEL'S STORES
5	PARTY CITY	28	NORTHFIELD BANK
6	KID'S PLACE (NEW)	29	CVS
7	KID'S PLACE (FORMER)	30	FORMER PAUL MILLER DRY CLEANING FACILITY
8	SLEEPY'S	31	BOSTON MARKET
9	EMPIRE SZECHUAN	32	KFC
10	TOP LINE NAILS	33	LIQUOR STORE
11	PAY HALF	34	MISCELLANEOUS
12	DANICE $10 STORES	35	WEST COAST VIDEO
13	D&G STORES	36	BANK
14	PAYLESS SHOES	37	RICKELS HOME CENTER
15	SNEAKER ZONE	38	WALGREENS (FORMER HESS GASOLINE STATION)
16	TJ MAXX	39	RESIDENTIAL
17-20	HIBACHI GRILL		SITE BOUNDARY BOUNDARY
21a	LABELLA PIZZA	B	BOILER
21b	PETLAND DISCOUNTS		BASEMENTS
22	J.H. CHARLTON CLEANERS		
23	SPECS FOR LESS		

0 150

APPROXIMATE SCALE IN FEET

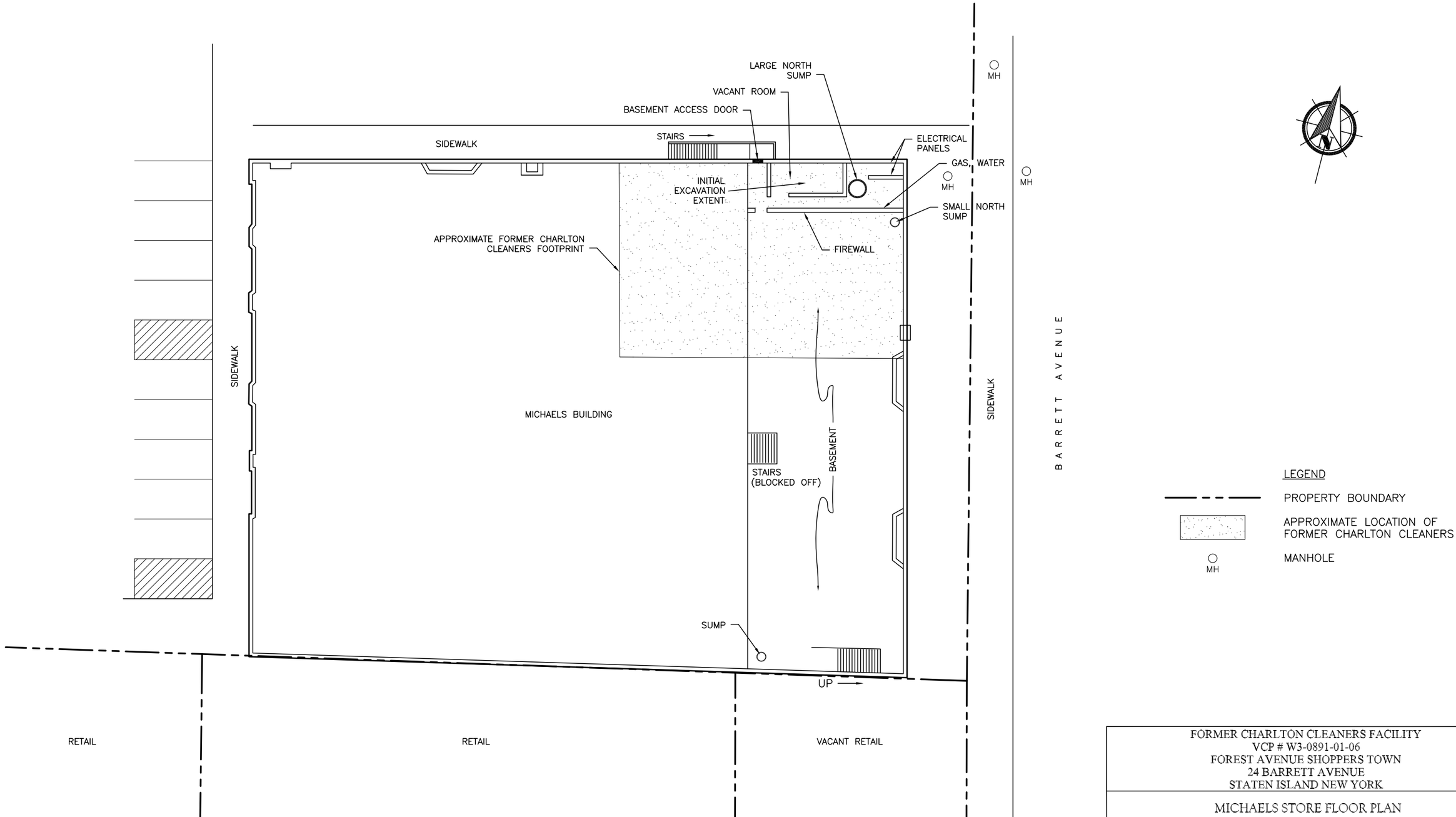
FORMER CHARLTON CLEANERS FACILITY
VCP#W3-0891-01-06
FOREST AVENUE SHOPPERS TOWN
24 BARRETT AVENUE
STATEN ISLAND NEW YORK

FOREST AVENUE SHOPPERS TOWN SITE PLAN

DATE	REVISED

PREPARED BY:
LEGGETTE, BRASHEARS & GRAHAM, INC.
Professional Groundwater and Environmental Engineering Services
110 Corporate Park Drive
Suite 112
White Plains, NY 10604
(914) 694-5711

DRAWN: MRV | CHECKED: PW | DATE: 02/14/12 | FIGURE: 2



FORMER CHARLTON CLEANERS FACILITY
VCP # W3-0891-01-06
FOREST AVENUE SHOPPERS TOWN
24 BARRETT AVENUE
STATEN ISLAND NEW YORK

MICHAELS STORE FLOOR PLAN

DATE	REVISED

PREPARED BY:
LEGGETTE, BRASHEARS & GRAHAM, INC.
Professional Groundwater and Environmental Engineering Services
110 Corporate Park Drive
Suite 112
White Plains, NY 10604
(914) 694-5711

DRAWN:	RAC	CHECKED:	PW	DATE:	09/14/10	FIGURE:	3

A'

MW-10A
MW-10C
MW-10B
MW-10D

ONE STORY
BRICK BUILDING

GRATED VAULTS

BARRETTE AVENUE

EXISTING CHARLTON
CLEANERS

MW-9A
MW-9D
MW-9C
MW-9B

MW-7D
MW-8C
MW-8B
MW-7B
MW-7A
MW-8D
MW-8A
MW-7C
MW-11C
MW-11D

FYE

MW-17
MW-15
MW-5D
MW-5C
MW-6B
MW-6C
MW-6A
MW-12C
MW-12D
MW-5A
MW-6D
MW-2B
MW-2A
GESMW-4
MW-5B

EQUIPMENT ROOM
SUMP
MW-3

MW-14
MW-16
MICHAELS
STORE

LOCATION OF FORMER
CHARLTON CLEANERS

MW-1
SUMP
MICHAELS BASEMENT
MW-4

LOCATION OF FORMER
PAUL MILLER CLEANERS

MASONRY BUILDINGS

MW-13B
MW-13A

Parking Lot

A

FOREST AVENUE

0 60
SCALE IN FEET

LEGEND

MW-2A MONITOR WELL LOCATION – Installed Prior to 2000

MW-5A MONITOR WELL LOCATION – Installed by LBG in 2000

MW-9C MONITOR WELL LOCATION – Installed by LBG in 2005

MW-14 MONITOR WELL LOCATION – Installed by LBG in 2008

FORMER CHARLTON CLEANERS FACILITY
VCP # W3-0891-01-06
FOREST AVENUE SHOPPERS TOWN
24 BARRETT AVENUE
STATEN ISLAND NEW YORK

SITE PLAN ILLUSTRATING TREND OF CROSS-SECTION (FIGURE 7)

DATE	REVISED

PREPARED BY:
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DRAWN:	MTM	CHECKED:	PW	DATE:	08/01/08	FIGURE:	4

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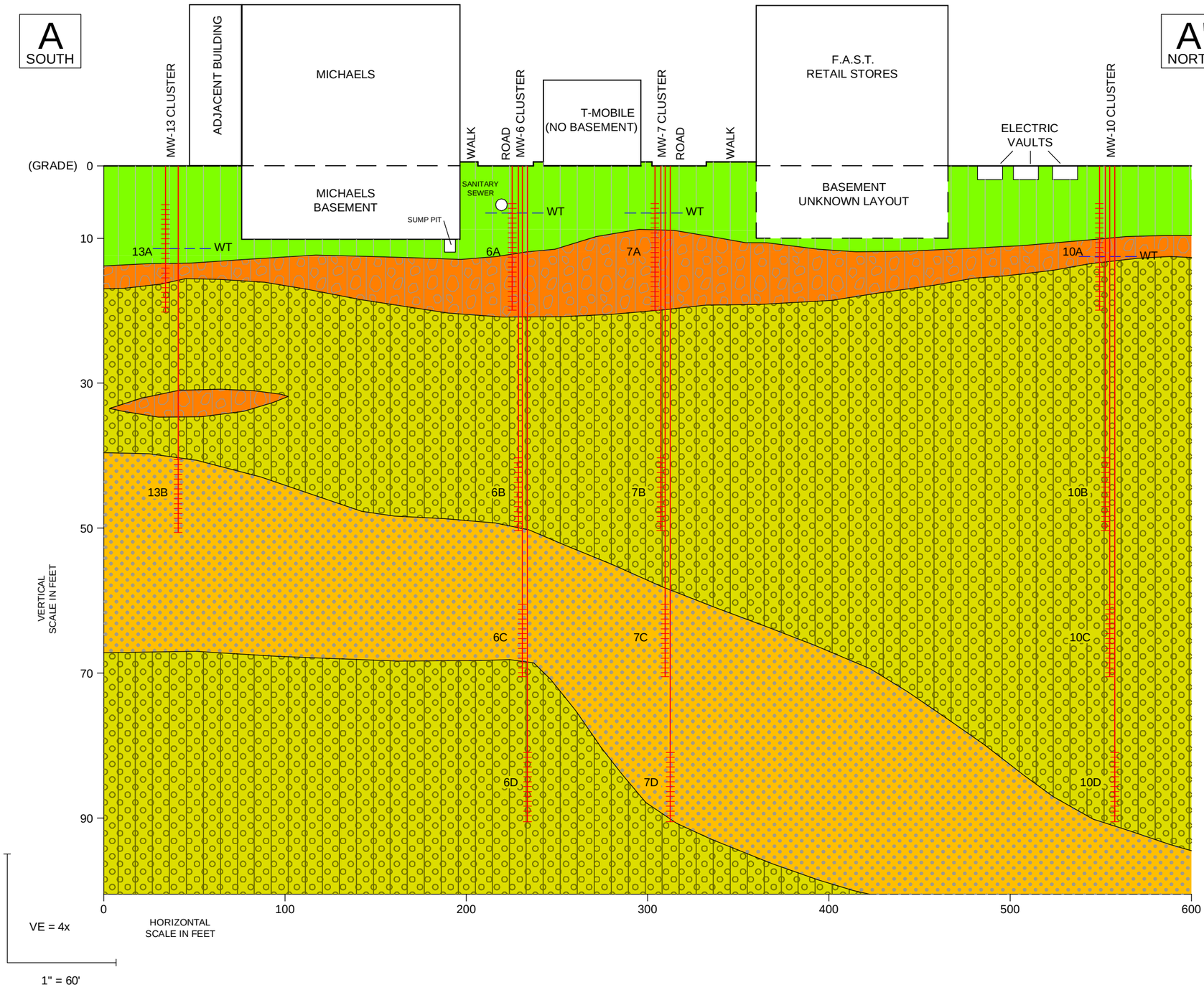

KEY

- SILIT AND FINE SAND
- PRESUMED COBBLE LAYER, HEAVY DRILLING, NO SAMPLE RECOVERY, HIGH BLOW COUNT
- SAND, FINE TO MEDIUM AND SILT
- SAND, FINE TO COARSE, TRACE TO SOME SILT

NOTE: FIGURE DOES NOT ILLUSTRATE LAND SURFACE CHANGE ACROSS CROSS-SECTION.

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FOREST AVENUE SHOPPERS TOWN
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STATEN ISLAND NEW YORK

SIMPLIFIED GEOLOGIC CROSS-SECTION

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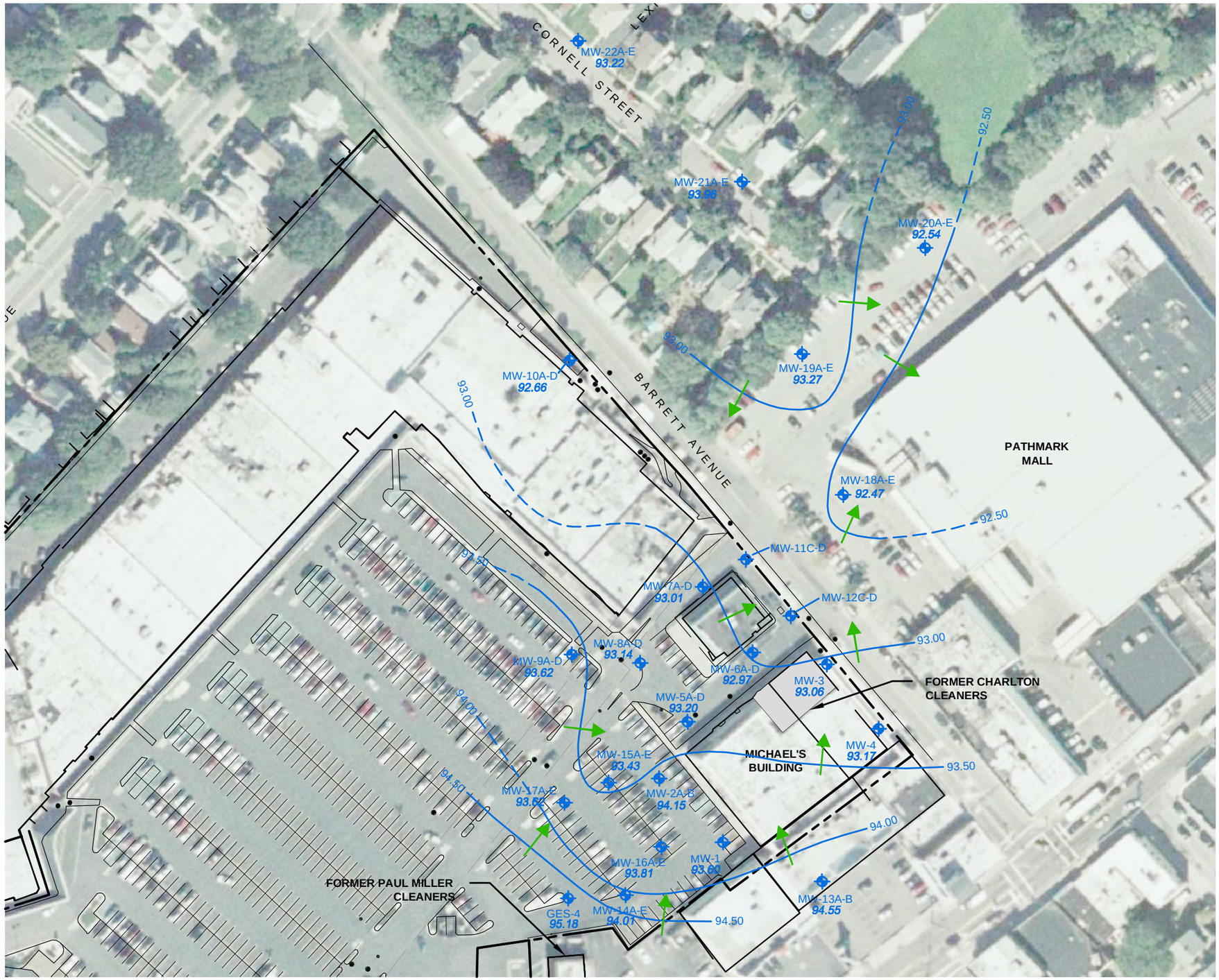

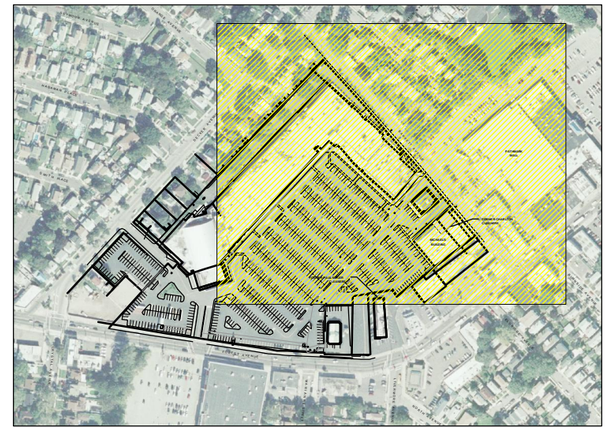

KEY MAP
SCALE: 1" = 500'

LEGEND

- PROPERTY BOUNDARY
- MW-2A-B 94.15 — DEEP MONITOR WELL LOCATION
- GROUNDWATER ELEVATION IN FEET
- 92.50 — GROUNDWATER ELEVATION CONTOUR LINE (DASHED WHERE INFERRED)
- GROUNDWATER FLOW DIRECTION

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FOREST AVENUE SHOPPERS TOWN
24 BARRETT AVENUE
STATEN ISLAND NEW YORK

SHALLOW GROUNDWATER ELEVATION CONTOUR MAP
AUGUST 2010

DATE	REVISED

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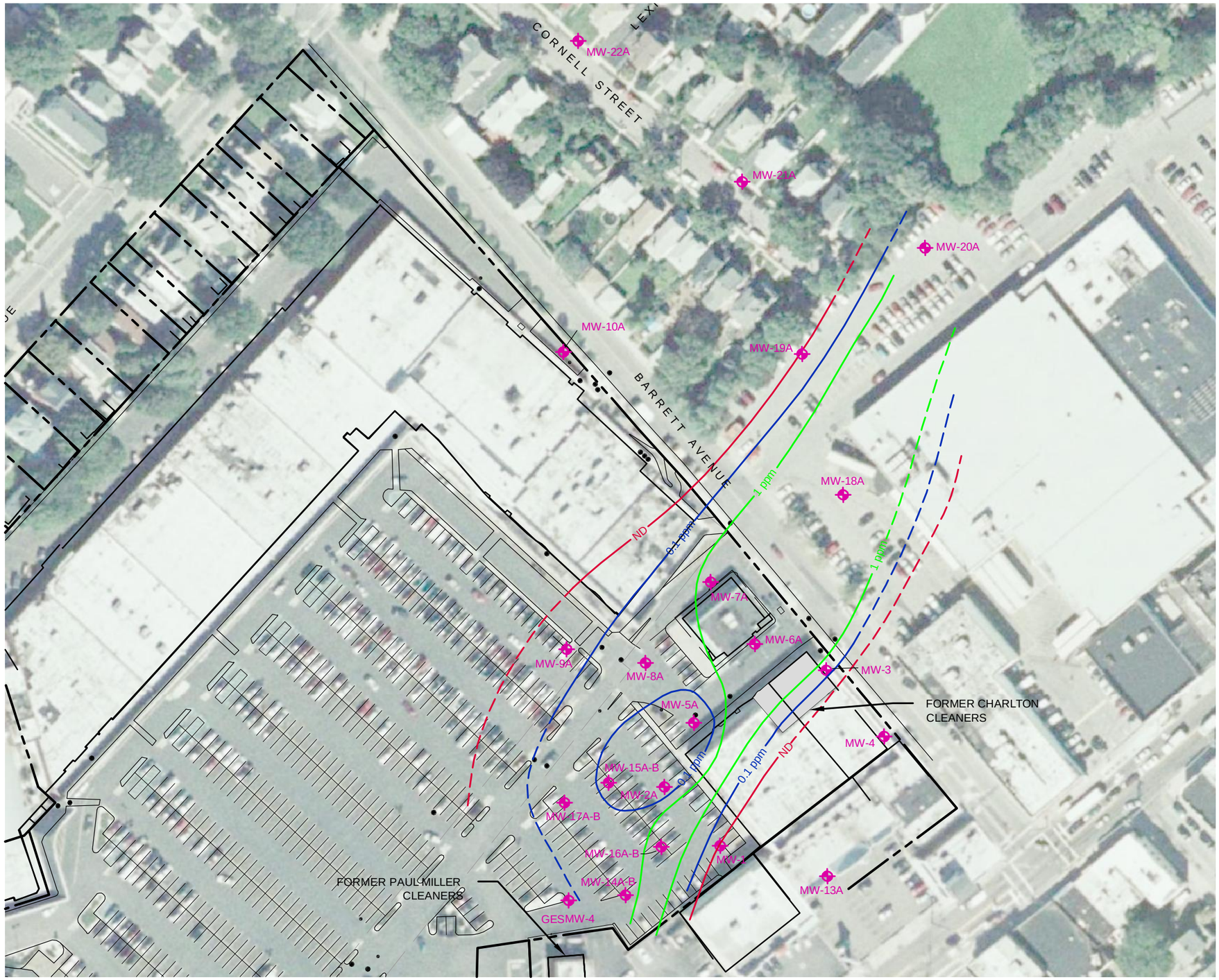

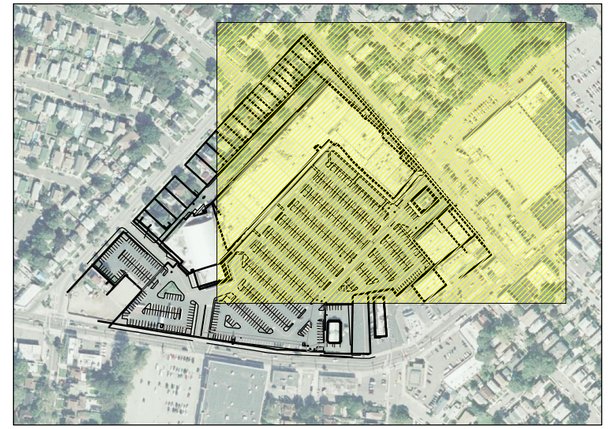

KEY MAP
SCALE: 1" = 500'

LEGEND

- PROPERTY BOUNDARY
- MW-1 — SHALLOW MONITOR WELL LOCATION
- ND — CONCENTRATION OF HALOGENATED VOCs (DASHED WHERE INFERRED)
- 0.1 ppm
- 1 ppm

NOTES:

1. PEAK HALOGENATED VOCs INCLUDE COMBINATION OF TETRACHLOROETHYLENE, TRICHLOROETHENE, (CIS) 1, 2-DICHLOROETHENE AND VINYL CHLORIDE.
2. LBG WAS NOT PROVIDED WITH SURVEY DATA FROM STATE CONTRACTOR BEFORE COMPLETION OF THIS FIGURE.
3. ISOCONCENTRATION DELINEATED USING MOST RECENT GROUNDWATER QUALITY DATA FROM SAMPLING POINTS SHOWN. PEAK CONCENTRATON FROM WELL CLUSTERS USED IN CONSTRUCTION OF THE FIGURE.

0 100
APPROXIMATE SCALE IN FEET

FORMER CHARLTON CLEANERS FACILITY
VCP # W3-0891-01-06
FOREST AVENUE SHOPPERS TOWN
24 BARRETT AVENUE
STATEN ISLAND NEW YORK

ISOCONCENTRATION OF PEAK TOTAL HALOGENATED VOLATILE ORGANIC COMPOUNDS IN SHALLOW AQUIFER (LESS THAN 30 FEET BELOW GRADE)

DATE	REVISED

PREPARED BY:
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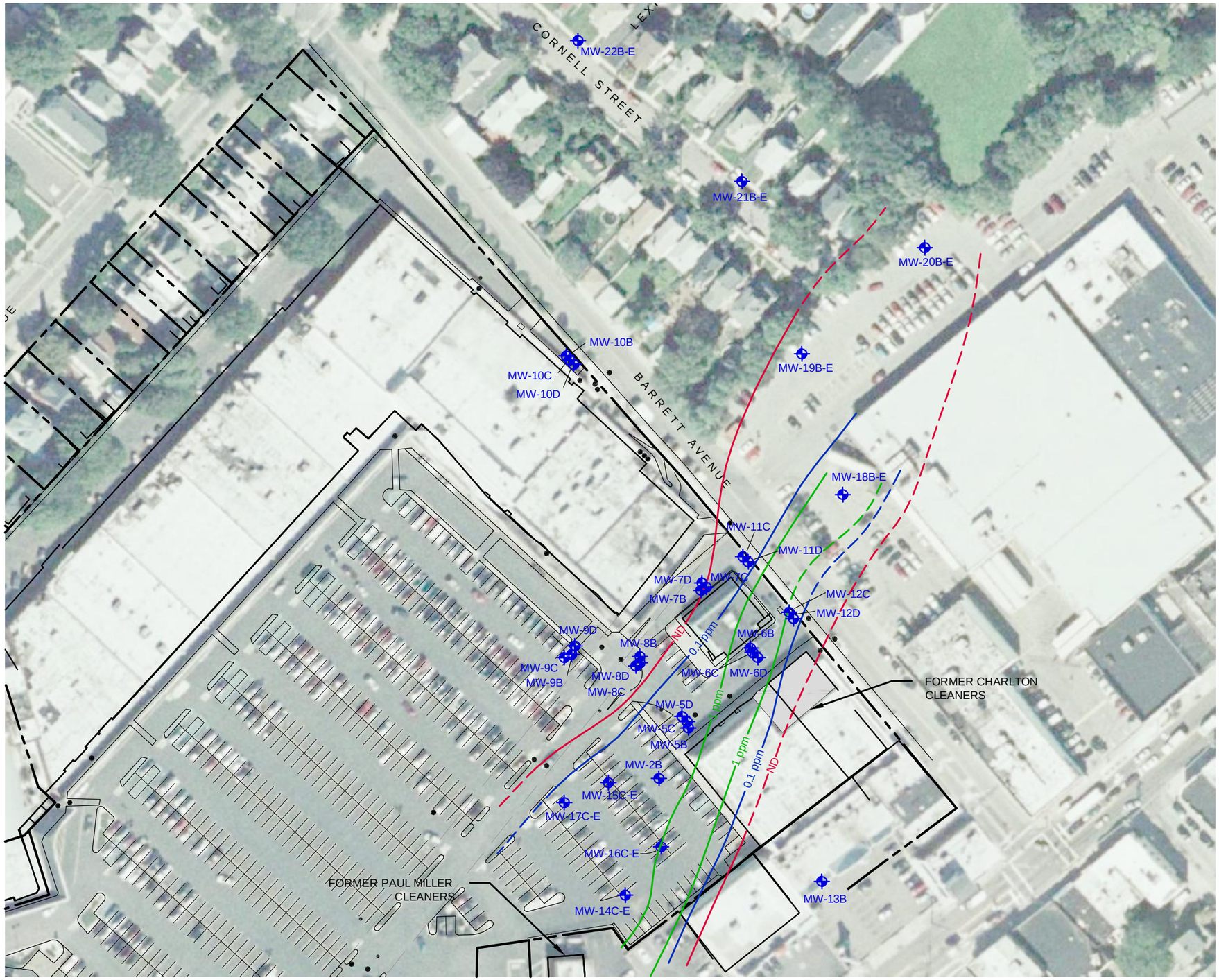

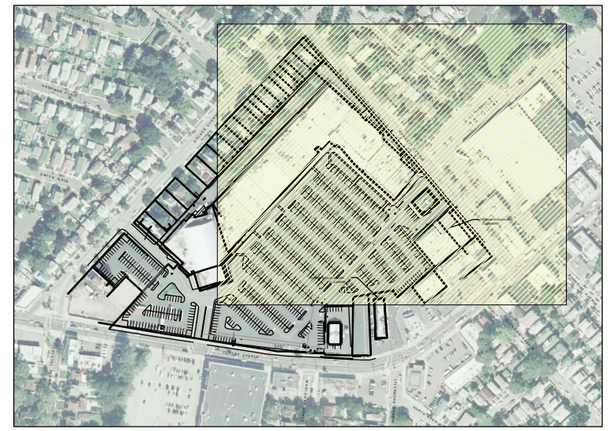

KEY MAP
SCALE: 1" = 500'

LEGEND

- PROPERTY BOUNDARY
- MW-1 — DEEP MONITOR WELL LOCATION
- ND / 0.1 ppm / 1 ppm — CONCENTRATION OF HALOGENATED VOCs (DASHED WHERE INFERRED)

NOTES:

1. PEAK HALOGENATED VOCs INCLUDE COMBINATION OF TETRACHLOROETHYLENE, TRICHLOROETHENE, (CIS) 1, 2-DICHLOROETHENE AND VINYL CHLORIDE.
2. LBG WAS NOT PROVIDED WITH SURVEY DATA FROM STATE CONTRACTOR BEFORE COMPLETION OF THIS FIGURE.
3. ISOCONCENTRATION DELINEATED USING MOST RECENT GROUNDWATER QUALITY DATA FROM SAMPLING POINTS SHOWN. PEAK CONCENTRATON FROM WELL CLUSTERS USED IN CONSTRUCTION OF THE FIGURE.

FORMER CHARLTON CLEANERS FACILITY
VCP # W3-0891-01-06
FOREST AVENUE SHOPPERS TOWN
24 BARRETT AVENUE
STATEN ISLAND NEW YORK

ISOCONCENTRATION OF PEAK TOTAL HALOGENATED VOLATILE ORGANIC COMPOUNDS IN DEEPER AQUIFER (GREATER THAN 30 FEET BELOW GRADE)

DATE	REVISED

PREPARED BY:
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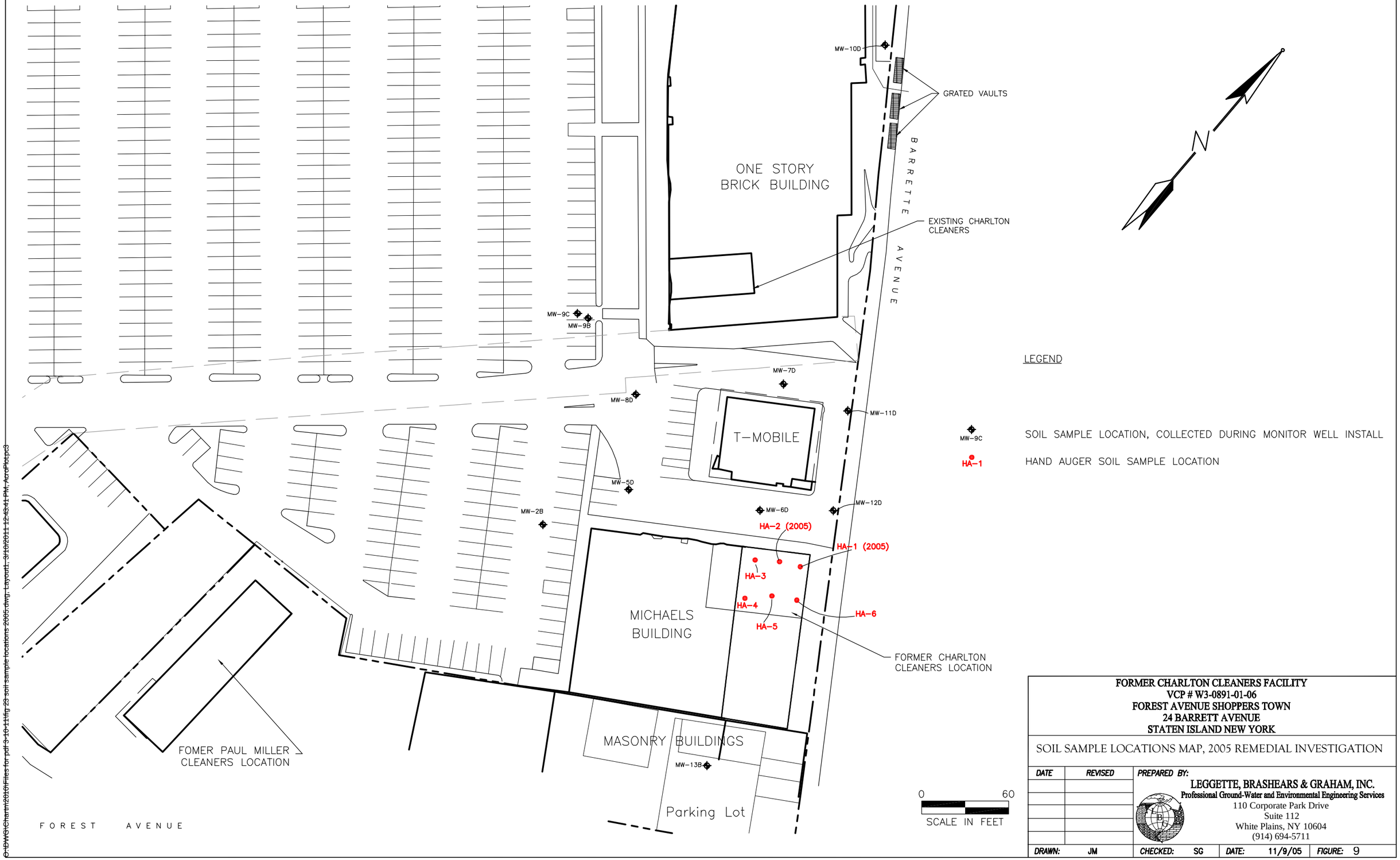

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STATEN ISLAND NEW YORK

SOIL SAMPLE LOCATIONS MAP, 2005 REMEDIAL INVESTIGATION

DATE	REVISED

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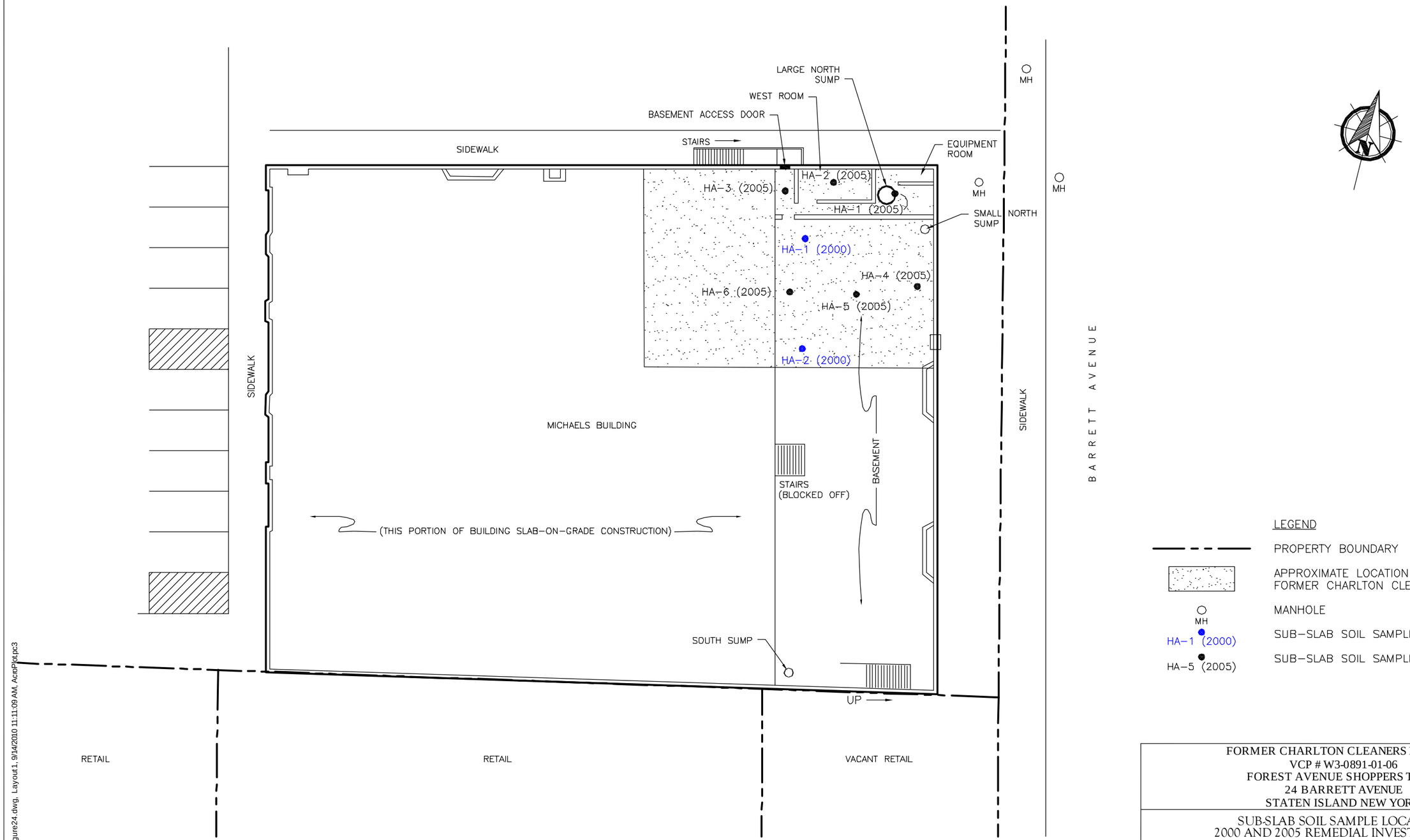

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SUB-SLAB SOIL SAMPLE LOCATIONS
2000 AND 2005 REMEDIAL INVESTIGATIONS

DATE	REVISED

PREPARED BY:
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APPENDIX I

WORKPLAN TO DETERMINE BACKGROUND GROUNDWATER CLEANUP OBJECTIVES

WORK PLAN TO DETERMINE BACKGROUND GROUNDWATER CLEANUP OBJECTIVES FORMER CHARLTON CLEANERS SITE FOREST AVENUE SHOPPERS TOWN STATEN ISLAND, NEW YORK

Prepared For

KIOP Forest Avenue, LP

November 2012

LEGGETTE, BRASHEARS & GRAHAM, INC.
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TABLE OF CONTENTS

WORK PLAN TO DETERMINE BACKGROUND GROUNDWATER CLEANUP OBJECTIVES FORMER CHARLTON CLEANERS SITE FOREST AVENUE SHOPPERS TOWN STATEN ISLAND, NEW YORK

INTRODUCTION

Leggette, Brashears & Graham, Inc. (LBG), on behalf of Kimco Income Operating Properties Forest Avenue, L.P. (KIOP), has developed this Work Plan to Determine Background Groundwater Cleanup Objectives (work plan) at the Former Charlton Cleaners Site (VCP # W3-0891-01-06) located in Staten Island, New York. This work plan is developed in conjunction with the Feasibility Study (FS) for the same Site. The purpose of the work plan is to describe the methods by which groundwater quality in the area of the Site immediately upgradient of the proposed remedial treatment area, will be determined. These background groundwater contaminant levels will be used as end goals to define the attainment of the groundwater remedial objectives for the Site. Typically, the cleanup goals for groundwater in New York State are the Ambient Water Quality Standards and Guidance Values (AWQS). The AWQS are quite low in concentration; on the order of 5 ug/l (micrograms per liter) for most chlorinated volatile organic compounds (VOCs).

Groundwater elevation data indicate that the former Paul Miller Dry Cleaner site lies hydrologically upgradient of the Michaels building and of the planned groundwater remedial treatment area for the Site. The 2012 Draft Remedial Investigation Report for the former Paul Miller Cleaners, as well as data from Charlton wells, indicate that the dissolved chlorinated solvent plume from Paul Miller has migrated northward from that site and under the FAST parking lot west of the Michaels building. The concern is that any remedial effort undertaken by KIOP to clean the groundwater downgradient of the former Charlton site will eventually result in recontamination by further migration of the Paul Miller plume. Therefore, the background levels must be determined in order for the FS to define the remedial goals.

SAMPLE EXISTING MONITORING WELLS

A monitoring well network exists in the parking lot between the Michaels building and the Boston Market building (the former Paul Miller site) and consists of wells installed by both KIOP and the NYSDEC (in conjunction with the Paul Miller investigation). The KIOP wells were sampled only on one date in 2008 and the NYSDEC wells on only two dates (2008 and 2012). The first phase of determining the background remedial goals is to sample a select number of wells in the upgradient area. At the same time, it will be advantageous to sample several of the wells within the anticipated treatment area as these wells were last sampled in the spring of 2010 and these additional data will be incorporated into the remedial design.

INSTALLATION OF SENTINEL WELLS

The existing upgradient well network does not contain wells at locations suitable for monitoring groundwater quality in the area where it flows into the proposed treatment zone. The second phase for determining background groundwater concentrations will involve the installation of a transect of new monitoring wells, located at positions which based on existing data, will bisect the Paul Miller plume near the anticipated treatment area.

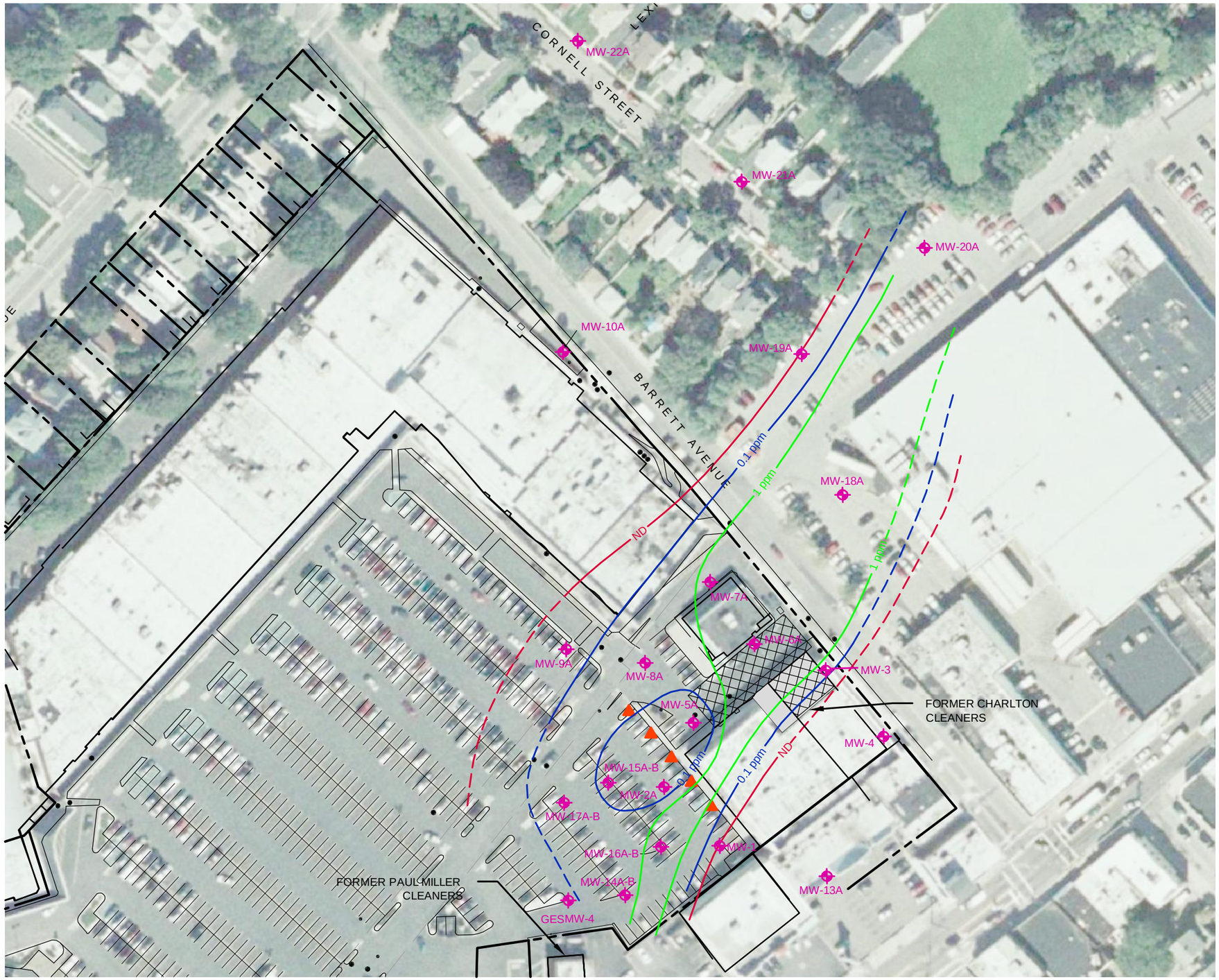
A total of 5 nested sentinel wells will be installed either with a direct-push or hollow-stem auger drilling rig (figure 1). Each well nest will contain 3 microwells (0.75 or 1 inch in diameter) with 10-foot screen length. The 3 microwells will be installed inside the hollow drill rods or augers once the full target depth is reached. Filter sand will be placed around each well screen and a bentonite seal will separate each screen interval. The vertical position of each screen will be determined in the field based on examination of soil cores, but will be located approximately at: 6 to 16 ft bg (feet below grade), 20 to 30 ft bg and 34 to 44 ft bg. Well screens will be adjusted to correlate with the positions of any low-permeability sedimentary layers. The vertical interval monitored by each well nest will span the zone from the water table to approximately 44 ft bg.

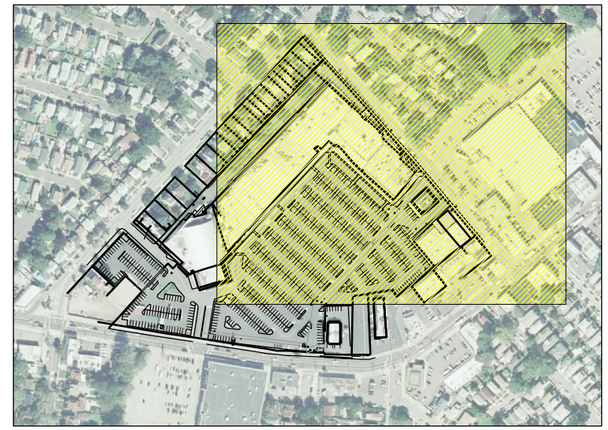
The sentinel wells will be spaced 30 feet apart from each other along a line parallel to the front of the Michaels building and extending from the building entrance north to the driving

lane in front of the T-Mobile building (figure 1). The position and elevation of all wells would be measured by a licensed surveyor.

GROUNDWATER SAMPLING AND BACKGROUND DETERMINATION

Groundwater from each of the sentinel wells will be sampled approximately one week after installation. Groundwater samples will be analyzed for chlorinated solvents. Laboratory results will be used to create a 3-dimensional conceptual model of the contaminant distribution entering the treatment zone. The remedial goals for determining that the Charlton plume has been adequately remediated will be compound specific and will be the greater of either the TOGS AWQS or the maximum individual compound concentrations as determined by sentinel well monitoring. Periodic sampling of sentinel wells would determine the temporal fluctuations in background concentrations.





KEY MAP
SCALE: 1" = 500'

LEGEND

- PROPERTY BOUNDARY
- MW-1 — SHALLOW MONITOR WELL LOCATION
- PROPOSED MONITORING WELL NEST, EACH CONSISTING OF 3 MICROWELLS SCREENED 6 TO 16, 20 TO 30 AND 34 TO 44 FEET BELOW GRADE
- PROPOSED ~7,500 SQUARE FOOT TREATMENT AREA
- ND / 0.1 ppm / 1 ppm — CONCENTRATION OF HALOGENATED VOCs (DASHED WHERE INFERRED)

NOTES:

1. PEAK HALOGENATED VOCs INCLUDE COMBINATION OF TETRACHLOROETHYLENE, TRICHLOROETHENE, (CIS) 1, 2-DICHLOROETHENE AND VINYL CHLORIDE.
2. ISOCONCENTRATION DELINEATED USING MOST RECENT GROUNDWATER QUALITY DATA FROM SAMPLING POINTS SHOWN. PEAK CONCENTRATION FROM WELL CLUSTERS USED IN CONSTRUCTION OF THE FIGURE.

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24 BARRETT AVENUE
STATEN ISLAND NEW YORK

PROPOSED WELL NEST LOCATIONS FOR DETERMINATION AND MONITORING GROUNDWATER BACKGROUND CONCENTRATIONS

DATE	REVISED

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DRAWN:	MRV	CHECKED:	PW	DATE:	12/07/12	FIGURE:	1

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