PROPOSED REMEDIAL ACTION PLAN
Former Kenwood Cleaners
Schenectady, Schenectady County New York
Site No. 447032

February 2009

Prepared by:

Division of Environmental Remediation
New York State Department of Environmental Conservation

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SECTION 1: SUMMARY AND PURPOSE OF THE PROPOSED PLAN

The New York State Department of Environmental Conservation (the Department), in consultation with the New York State Department of Health (NYSDOH), is proposing a remedy for the Former Kenwood Cleaners Site. The presence of hazardous waste has created significant threats to human health and/or the environment that are addressed by this proposed remedy. As more fully described in Sections 3 and 5 of this document, surface dumping and damaged or leaking tanks have resulted in the disposal of hazardous wastes, including volatile organic compounds. These wastes have contaminated the soil, soil vapor, and groundwater at the site, and have resulted in:

- a significant threat to human health associated with current and potential inhalation exposure to indoor air impacted by tetrachloroethene (PCE) contaminated soil vapor.

- a significant environmental threat associated with the current impacts of contaminants to the groundwater resource.

To eliminate or mitigate these threats, the Department proposes construction and operation of a dual phase extraction (DPE) system and the installation of a permeable reactive barrier (PRB) wall. The DPE system will remediate the on-site soils, soil vapor, and groundwater while the PRB will prevent additional contaminated groundwater from migrating off-site.

The proposed remedy, discussed in detail in Section 8, is intended to attain the remediation goals identified for this site in Section 6. The remedy must conform with officially promulgated standards and criteria that are directly applicable, or that are relevant and appropriate. The selection of a remedy must also take into consideration guidance, as appropriate. Standards, criteria and guidance are hereafter called SCGs.

This Proposed Remedial Action Plan (PRAP) identifies the preferred remedy, summarizes the other alternatives considered, and discusses the reasons for this preference. The Department will select a final remedy for the site only after careful consideration of all comments received during the public comment period.

The Department has issued this PRAP as a component of the Citizen Participation Plan developed pursuant to the New York State Environmental Conservation Law and Title 6 of the Official Compilation of Codes, Rules and Regulations of the State of New York (6 NYCRR) Part 375. This document is a summary of the information that can be found in greater detail in the 2007 “Remedial Investigation/Feasibility Study, Remedial Investigation (RI) Report”, the 2008 “Remedial Investigation/Feasibility Study, Feasibility Study

(FS) Report", and other relevant documents. The public is encouraged to review the project documents, which are available at the following repositories:

Schenectady County Public Library (Duane Branch)
1331 State Street
Schenectady, NY 12304
(518) 386-2242
Mon. – Sat. 12:00 pm -6:00pm
Sun. Closed

NYSDEC - Region 4
1150 North Westcott Road
Schenectady, NY 12306
Mon. - Fri. 8:30am - 4:30pm
by appointment.
Rick Georgeson
(518) 357-2075

NYSDEC - Central Office
625 Broadway
Albany, NY 12233-7016
Mon. - Fri. 8:30am - 4:30pm
by appointment.
Ian Beilby
(518) 402-9767

The Department seeks input from the community on all PRAPs. A public comment period has been set from February 9, 2009 until March 11, 2009 to provide an opportunity for public participation in the remedy selection process. A public meeting is scheduled for February 24, 2009 at the Schenectady County Public Library, Central Library at 99 Clinton St. in the McChesney Room beginning at 7:00 PM.

At the meeting, the results of the RI/FS will be presented along with a summary of the proposed remedy. After the presentation, a question-and-answer period will be held, during which verbal or written comments may be submitted on the PRAP. Written comments may also be sent to Mr. Ian Beilby, P.E. at the above address through March 11, 2009.

The Department may modify the proposed remedy or select another of the alternatives presented in this PRAP, based on new information or public comments. Therefore, the public is encouraged to review and comment on all of the alternatives identified here.

Comments will be summarized and addressed in the responsiveness summary section of the Record of Decision (ROD). The ROD is the Department's final selection of the remedy for this site.

SECTION 2: SITE LOCATION AND DESCRIPTION

The Former Kenwood Cleaners Site (Site) is located at 445 Duane Avenue in the City of Schenectady, Schenectady County and is comprised of 1.4 acres. The site is bounded by private residences to the North and East, Duane Avenue to the West and a municipally owned parking lot to the South (See Figures 1 & 2). The neighboring land uses include a mix of light industrial, commercial and residential. Interstate I-890 lies 300 ft to the southwest.

The Site geology includes a layer of surficial fill comprised of brick, concrete, glass and ash ranging from 1 to 22 feet thick. The fill overlies a discontinuous layer of sandy silt resting on a site-wide bed of low permeability clay which boring data indicates to be approximately 15 feet thick. The clay appears to be situated above a sand and silt layer overlying the shale bedrock. Only one data point is available to determine the thickness of the lower sand and silt layer which shows this stratum to be 13 feet in thickness. Bedrock is 44 feet below ground surface in the southwest corner of the Site.

There are two water bearing zones between the ground surface and bedrock. One is comprised of the fill and sandy silt layers above the low permeability clay layer (aquitard) and the other is between the aquitard and bedrock. On-site groundwater in the upper flow regime exists between 6 and 9 feet below ground surface (bgs) and travels to the southwest. The potentiometric surface of the groundwater in the lower flow regime is approximately 12 feet bgs, indicating the clay layer also acts as a confining layer. The direction of flow in the lower regime was not determined.

The site and immediately adjacent areas have experienced significant disturbance and redevelopment in the past 100 years. Recently, the Duane Avenue – Watt Street intersection and associated utilities were realigned. In addition, an 84" storm sewer is buried approximately 27 feet bgs adjacent to the Site (Figure 4). It travels roughly parallel to the Southern boundary, continues under Duane Avenue and then below I-890. Flow within the pipe proceeds in a westerly direction in the section of the sewer closest to the Site. The sewer and associated high permeability bedding material appear to influence the flow of the on-site groundwater and off-site groundwater by acting as a sink for the site. The existing on-site structure was constructed in 2004 by the current property owner. Site preparation included the excavation of concrete foundations, grading and importation of new subbase material for the concrete pad.

SECTION 3: SITE HISTORY

3.1: Operational/Disposal History

The property was the location of various commercial operations including a tuxedo rental shop and dry cleaners. The dry cleaning business is known to have operated for some period between 1950 and 1964. Some evidence exists that the business may have operated into the 1980's. While the exact method of hazardous waste disposal is unknown, it is most likely that direct release to the ground of a commonly used dry cleaning solvent, tetrachloroethene (PCE), is responsible for the volatile organic compound (VOC) contamination found on-site as well as that which is emanating off-site. It is also likely that underground fuel oil and/or gasoline spills contributed to additional VOC and semivolatile organic compound (SVOC) contamination.

3.2: Remedial History

In 2001, the Department listed the site as a Class 2 site in the Registry of Inactive Hazardous Waste Disposal Sites in New York. A Class 2 site is a site where hazardous waste presents a significant threat to the public health or the environment and action is required.

Prior to 1998, the Schenectady Industrial Development Authority (SIDA) and a private party (Worldstar Enterprises) entered the NYS Voluntary Cleanup Program (VCP) to determine whether hazardous wastes were present at the site due to the past use of the property. The 1999 investigation results indicated high levels of contamination in both soil and water. The applicants withdrew from the VCP and the Site was listed as a Class 2 site. In 2005, the site was investigated by the State to confirm the continued presence of soil and water contamination through installation of monitoring wells and collection of soil samples in approximately the same source areas as were located in 1999. The results of the investigation indicated contaminants persist in on-site soil and groundwater though some decrease in contaminant concentrations has occurred in each medium. The results from the investigation are incorporated into the remedial investigation report for the purposes of assessing the current nature and extent of contamination.

SECTION 4: ENFORCEMENT STATUS

Potentially Responsible Parties (PRPs) are those who may be legally liable for contamination at a site. This may include past or present owners and operators, waste generators, and haulers.

The PRPs for the site, documented to date, include: Kenwood Cleaners though no current individual or party that owned the business could be identified. The current owner of the property is Mr. Robert Moore who pieced together the existing property by acquiring various portions of adjacent properties. He briefly relinquished the site in 1998 to Worldstar Enterprises and the SIDA under a purchase option for the purposes of the VCP investigation. Mr. Moore regained control of the property in 2002 when Worldstar and the SIDA did not undertake additional remedial actions at the site.

The PRPs declined to implement the RI/FS at the site when requested by the Department. After the remedy is selected, the PRPs will again be contacted to assume responsibility for the remedial program. If an agreement cannot be reached with the PRPs, the Department will evaluate the site for further action under the State Superfund. The PRPs are subject to legal actions by the state for recovery of all response costs the state has incurred.

SECTION 5: SITE CONTAMINATION

A remedial investigation/feasibility study (RI/FS) has been conducted to evaluate the alternatives for addressing the significant threats to human health and the environment.

5.1: Summary of the Remedial Investigation

The purpose of the RI was to define the nature and extent of any contamination resulting from previous activities at the site. The RI was conducted between January 2006 and June 2007 and culminated in RI, FS and Vapor Intrusion Study reports in 2008. The field activities and findings of the investigation are described in the RI report.

To perform the RI, samples of potentially contaminated media were collected from on-site and off-site locations by conducting soil borings, soil vapor wells, and installing groundwater monitoring wells. The media targeted at the site included subsurface and near surface soil, groundwater, and soil vapor. Once collected, the samples were analyzed for potential contaminants. Based on positive results for VOCs at levels of concern in these three media, indoor air and subslab vapor samples were also collected to determine whether VOC contamination was migrating into above ground structures through vapor intrusion.

5.1.1: Standards, Criteria, and Guidance (SCGs)

To determine whether the soil, groundwater, soil vapor, and air contain contamination at levels of concern, data from the investigation were compared to the following SCGs:

- Groundwater, drinking water, and surface water SCGs are based on the Department's "Ambient Water Quality Standards and Guidance Values" and Part 5 of the New York State Sanitary Code.

- Soil SCGs are based on the Department's Cleanup Objectives "Technical and Administrative Guidance Memorandum [TAGM] 4046; Determination of Soil Cleanup Objectives and Cleanup Levels" and on Title 6 of the New York Code of Rules and Regulations [6NYCRR] Part 375-6.

- Concentrations of VOCs in air were evaluated using the air guidelines provided in the NYSDOH guidance document titled "Guidance for Evaluating Soil Vapor Intrusion in the State of New York" dated 2006 as provided in Matrix 1: carbon tetrachloride, trichloroethene and Matrix 2: tetrachloroethene, 1,1,1-trichloroethane and *cis* 1,1-dichloroethene.

Based on the RI results, in comparison to the SCGs and potential public health and environmental exposure routes, certain media and areas of the site require remediation. These are summarized in Section 5.1.2. More complete information can be found in the RI report.

Two different soil cleanup objectives are used for comparison in the reports because Part 375 SCOs were promulgated after the 2005 investigation and Draft RI report were complete. For the purposes of this PRAP, all data have been compared to the Part 375 SCOs to determine the contaminants of concern.

5.1.2: <u>Nature and Extent of Contamination</u>

This section describes the findings of the investigation for all environmental media that were investigated.

As described in the RI report, many soil, groundwater, soil gas, and indoor air samples were collected to characterize the nature and extent of contamination. As seen in Figures 3 thru 6 and summarized in Table 1, the main categories of contaminants that exceed their SCGs are VOCs and SVOCs. For comparison purposes, where applicable, SCGs are provided for each medium.

Chemical concentrations are reported in parts per billion (ppb) for water and parts per million (ppm) for soil. Air samples are reported in micrograms per cubic meter ($\mu g/m^3$).

Figures 3 thru 6 and Table 1 summarize the degree of contamination for the contaminants of concern in groundwater, soil, and soil vapor and compare the data with the SCGs for the site. The following are the media which were investigated and a summary of the findings of the investigation.

Surface Soil

No site-related surface soil contamination of concern was identified during the RI/FS. Therefore, no remedial alternatives need to be evaluated for surface soil.

Subsurface Soil

Subsurface soil samples were collected from soil borings during the installation of groundwater monitoring wells at locations on and off-site based on previous investigation results and known subsurface conditions. Twenty-two unique samples were collected and analyzed. The depth at which each sample was collected was determined in the field based on observations and instrumentation. If no contamination was obvious, the sample was collected from the top of the watertable or the top of the clay aquitard, (the most probable depth to find the VOCs that were known to exist at the site). Eleven samples were collected from on-site borings and eleven from off-site borings. Four VOCs were found above the Unrestricted Use SCGs stated in the Part 375 SCOs, 2 of which are related to PCE. Figure 3 shows the location of PCE and related compound concentrations. Chemical compounds related to PCE are caused by its degradation in the environment and include trichloroethene (TCE), *cis* 1,2-dichloroethene (DCE), and vinyl chloride (VC).

There were on-site SVOC exceedances of Part 375 SCGs for Unrestricted Use in two locations. Four compounds were detected at concentrations exceeding SCGs. One off-site boring location, GP-12, contained concentrations of additional SVOCs above Part 375 Unrestricted SCOs. However, due to the boring's location in relation to the Site, the SVOC contamination is not related to the on-site disposal activities.

Subsurface soil contamination identified during the RI/FS will be addressed in the remedy selection process.

Groundwater

There were twenty-two groundwater monitoring wells installed to facilitate the collection of groundwater samples at the site. One of the wells was installed below the clay layer at the bedrock-overburden interface to sample the water bearing zone below the aquitard. Groundwater samples were collected from 21 of the wells which are located both on and off-site. One on-site shallow well was dry and no sample could be collected.

Measurements taken from the monitoring wells indicate that groundwater at the site flows generally in a southwesterly direction. The 84" underground sewer and/or bedding material act as a groundwater sink on the west side of Duane Avenue as indicated on Figure 4. This feature draws significant quantities of groundwater from the area and likely provides a preferential flow conduit for contaminated groundwater from the site.

Results from the analysis of on and off-site groundwater samples show PCE and its related compounds, TCE, DCE, and VC at several locations. The highest levels of contamination are found in GP-7, an on-site groundwater well immediately to the west of the building, and URS-04, an off-site well downgradient from GP-7. All four compounds are greater than groundwater standards in both locations. PCE concentrations at these two wells exist at levels (greater than 4000 parts per billion (ppb)) that indicate the presence of persistent PCE at the site. Groundwater samples collected from adjacent wells cross gradient and upgradient of GP-7 and GP-04 also showed contamination above groundwater standards but generally at concentrations one order of magnitude lower. Other wells yielding samples impacted by PCE and related compounds include GP-1 in the northeast corner of the site and GP-3, GP-8, and GP-9 on the south side of the building. The four detections are likely the result of lightly contaminated soil in the vicinity of the wells that was spread across the site from the original source of PCE contamination or represent the extent of the main plume of contaminated groundwater. A sample from the bedrock interface well, URS-10, was positive for DCE and VC at a concentrations of 15 and 180 ppb, respectively. No other PCE related compounds were detected in this sample.

As shown in the data, PCE related VOC contamination is present onsite in the groundwater and is migrating off-site in the direction of a commercial/light industrial building via the groundwater.

Groundwater contamination identified during the RI/FS will be addressed in the remedy selection process.

Soil Vapor/Sub-Slab Vapor/Air

Soil vapor, sub-slab vapor, outdoor and indoor air samples were collected during the RI. Soil vapor and indoor air samples were collected in the Spring of 2007 while sub-slab vapor and additional indoor air samples were collected during the Winter of 2007/2008. Soil vapor samples were collected to determine whether the VOCs were present in the soil vapor and if they were migrating from the site via the soil vapor. Subslab vapor (SSV) samples were collected to determine if VOCs were present under neighboring structures and whether future monitoring for VOCs or mitigation of VOCs would be necessary. Indoor air samples were collected for analysis to determine if indoor air had been impacted by contamination from the Site. The presence of soil vapor contamination is due to contaminated groundwater or soil. While soil vapor cleanup standards do not exist, there are guidelines with action levels for some VOCs including PCE and its related compounds that dictate a course of action based on the concentrations of VOCs detected.

As shown in Figure 5, analysis of soil vapor samples taken approximately 5 feet bgs confirm the presence of PCE both on and off-site. The highest concentrations of PCE in the soil vapor were in the same general area of the site as the highest groundwater concentrations. The on-site range of PCE concentrations included 22 micrograms per cubic meter ($\mu g/m^3$) up to 21,000 $\mu g/m^3$.

No on-site SSV samples were collected because of the modern design of the slab which incorporates a vapor barrier and its recent construction. Indoor air samples collected from the on-site building were detected for PCE at levels that indicate further monitoring or mitigation is appropriate. Off-site sub-slab vapor and indoor air samples were collected from one large commercial/industrial building on the west side of Duane Avenue as well as three residences; one to the east and two to the south. No concentrations were detected above NYSDOH air guidelines in the residences in either the sub-slab vapor or indoor air samples. Figure 6 shows the locations of sub-slab vapor and indoor air samples for the on and off-site commercial/industrial buildings. Sub-slab vapor concentrations of PCE were found at levels that warrant further monitoring or mitigation at this off-site building.

Soil vapor and indoor air contamination identified during the RI/FS will be addressed in the remedy selection process.

5.2: <u>Interim Remedial Measures</u>

An interim remedial measure (IRM) is conducted at a site when a source of contamination or exposure pathway can be effectively addressed before completion of the RI/FS.

There were no IRMs performed at this site during the RI/FS.

5.3: <u>Summary of Human Exposure Pathways</u>:

This section describes the types of human exposures that may present added health risks to persons at or around the site. A more detailed discussion of the human exposure pathways can be found in Section 6 of the RI report. An exposure pathway describes the means by which an individual may be exposed to contaminants originating from a site. An exposure pathway has five elements: [1] a contaminant source, [2] contaminant release and transport mechanisms, [3] a point of exposure, [4] a route of exposure, and [5] a receptor population.

The source of contamination is the location where contaminants were released to the environment (any waste disposal area or point of discharge). Contaminant release and transport mechanisms carry contaminants from the source to a point where people may be exposed. The exposure point is a location where actual or potential human contact with a contaminated medium may occur. The route of exposure is the manner in which a contaminant actually enters or contacts the body (e.g., ingestion, inhalation, or direct contact). The receptor population is the people who are, or may be, exposed to contaminants at a point of exposure.

An exposure pathway is complete when all five elements of an exposure pathway exist. An exposure pathway is considered a potential pathway when one or more of the elements currently does not exist, but could in the future.

Elevated levels of VOCs are present in on-site groundwater, soil, and soil vapor and have been detected in the indoor air of the on-site building. On-site workers may be exposed to VOC contaminated soil vapor through inhalation inside the on-site building. Since all remaining soil contamination at the site is covered with concrete or asphalt, the potential for contact with contaminated soil is unlikely unless engaging in on-site ground intrusive activities that may expose said individuals to contaminated soil and groundwater through dermal contact, inhalation, and ingestion. Off-site receptors may be exposed to contaminated dust generated during ground intrusive activities through inhalation, ingestion, and dermal contact. Contaminants have migrated off-site in groundwater and soil vapor. The concentrations of tetrachloroethene detected in the sub-slab samples under the nearby off-site commercial building warrant, at minimum, further monitoring. Workers and visitors may be exposed to the low levels of site-related VOCs detected in the indoor air of the off-site commercial building. Individuals engaging in off-site ground intrusive activity within the area of the contaminant plume may be exposed to contaminated groundwater through ingestion and dermal contact. Ingestion of contaminants in drinking water is unlikely as area homes and businesses are served with public water.

5.4: Summary of Environmental Assessment

This section summarizes the assessment of existing and potential future environmental impacts presented by the site. Environmental impacts include existing and potential future exposure pathways to fish and wildlife receptors, as well as damage to natural resources such as aquifers and wetlands.

Groundwater and subsurface soils at the site are contaminated with PCE and related compounds at levels exceeding the NYS guidelines and constitute a significant threat to the environment. PCE levels up to 22 parts per million (ppm) in the on-site soils and up to 7,200 ppb in the groundwater were documented in 1999. Sampling in 2005 and 2007 detected PCE and related compounds site-wide at concentrations below soil cleanup objectives for the unrestricted use scenario in subsurface soil. Groundwater concentrations of PCE were found up to 4,600 ppb at on and off-site locations downgradient of the original dry cleaner building footprint. SVOCs were detected in the subsurface soil above unrestricted use SCOs in off-site locations. Soil vapor is impacted on and off-site by PCE and related compounds. PCE was detected at 21,000 ug/m^3 on site. Off-site sub-slab vapor samples documented concentrations up to 980 ug/m^3.

Soil samples from 2005 and 2007 did not detect VOC contamination at levels of particular concern since only 2 of the sample results were greater than unrestricted use SCOs. Samples could not be collected from underneath the building for analysis of the soil in that part of the site. However, based on groundwater and soil vapor data shown on Figures 4 and 5, it has been determined that significant contamination exists under the building. The data show that groundwater flows from east to west and has very low levels of VOC contamination in the upgradient wells and high levels of VOC contamination downgradient from the building. This indicates that groundwater is flowing through an area of contaminated soil. In addition to the groundwater data, soil vapor in the immediate vicinity of the building contains high concentrations of VOC contamination. The presence of VOCs in the soil vapor in this portion of the Site also indicates a source of VOC contamination in the area. The quantity of contaminated media is estimated to be approximately 2000 cubic yards.

The surrounding area is served by municipal water and no known private wells exist in the vicinity.

Though no ecological resources exist at the site, the potential exists for contaminated groundwater originating from the site to enter the storm sewer adjacent to the site. Given the further dilution in the sewer and the volatile nature of the contamination, it is unlikely that PCE and related compounds would remain at sufficient concentrations to affect the receiving water ecosystems.

SECTION 6: SUMMARY OF THE REMEDIATION GOALS

Goals for the remedial program have been established through the remedy selection process stated in 6 NYCRR Part 375. At a minimum, the remedy selected must eliminate or mitigate all significant threats to public health and/or the environment presented by the hazardous waste disposed at the site through the proper application of scientific and engineering principles.

The remediation goals for this site are to eliminate or reduce to the extent practicable:

- Exposures of persons at or around the site to the volatile organic compounds in subsurface soil and groundwater;
- the release of contaminants from soil into groundwater that may create exceedances of groundwater quality standards; and
- the release of contaminants from subsurface soil and groundwater into indoor air through soil vapor intrusion.

Further, the remediation goals for the site include attaining to the extent practicable:

- ambient groundwater quality standards;
- sub-slab soil vapor values below applicable mitigation threshold matrix values as prescribed in the New York State Guidance for Evaluating Soil Vapor Intrusion in the State of New York; and
- soil cleanup objectives for Unrestricted Use as stated in Part 375.

SECTION 7: SUMMARY OF THE EVALUATION OF ALTERNATIVES

The selected remedy must be protective of human health and the environment, be cost-effective, comply with other statutory requirements, and utilize permanent solutions, alternative technologies or resource recovery technologies to the maximum extent practicable. Potential remedial alternatives for the Former Kenwood Cleaners Site were identified, screened and evaluated in the FS report which is available at the document repositories established for this site.

A summary of the remedial alternatives that were considered for this site is discussed below. The present worth represents the amount of money invested in the current year that would be sufficient to cover all present and future costs associated with the alternative. This enables the costs of remedial alternatives to be compared on a common basis. As a convention, a time frame of 30 years is used to evaluate present worth costs for alternatives with an indefinite duration. This does not imply that operation, maintenance, or monitoring would cease after 30 years if remediation goals are not achieved.

7.1: Description of Remedial Alternatives

The following potential remedies were considered to address the contaminated soil, groundwater, soil vapor, and indoor air at the site.

Alternative 1: No Action, Long Term Monitoring

The No Action Alternative is evaluated as a procedural requirement and as a basis for comparison. It requires continued monitoring only, allowing the site to remain in an unremediated state. This alternative would leave the site in its present condition and would not provide any additional protection to human health or the environment. VOCs would continue to migrate from the site via the groundwater and soil vapor and likely migrate into on and off-site buildings via vapor intrusion. There would also continue to be potential exposures to individuals conducting future site work such as installation or repair of utilities or infrastructure. Monitoring would be performed to assess the status of the groundwater, soil vapor and indoor air.

Present Worth: *$251,000*
Capital Cost: *$0*
Annual Costs:
(Years 1-30): *$16,000*

Alternative #2: Dual Phase Extraction and Treatment, Hydraulic Containment, and Long Term Monitoring

Alternative #2 consists of three components and would remediate the source area through the installation of a dual phase extraction (DPE) system, collection and treatment of the on-site groundwater in an on-site treatment system and implementation of a long-term monitoring program to document the progress of contaminant reduction in the down gradient, off-site groundwater.

The goal of the DPE system would be to extract groundwater and soil vapor from the site by applying large negative pressure (a vacuum) around the source area located in the vicinity of the on-site structure through the installation of multiple extraction wells. The migration of soil vapor and groundwater to the wells would displace the VOCs in the soil and prevent some of the contaminated groundwater from migrating off-site, effectively constituting a hydraulic containment component to the remedial strategy. It would also serve to depressurize the pore space in the soil beneath the on-site building and prevent the accumulation of contaminants in the soil vapor below the building slab. As soil vapor and groundwater is collected, each would be directed to treatment units for the removal of contaminants and then discharged to the atmosphere and sanitary sewer respectively. Extraction and containment wells would likely be located on the south and west of the on-site building.

Monitoring would be employed downgradient and at other significant locations to determine the progress of the remediation. Groundwater, soil vapor and indoor air would be included in the monitoring program with a contingency that mitigation would be performed if determined to be necessary.

In addition to the technologies described above, institutional controls (ICs) and engineering controls (ECs) would be required at the site pending conclusive evidence that all remediation goals summarized in Section 6 have been attained due to residual contamination that would remain at the site. An environmental easement would be required that will limit the type of future development at the Site to commercial or industrial uses, prevent the exportation of soil, and restrict the use of groundwater for potable or process purposes. A site management plan (SMP) would also be required that would document the handling requirements and protocol for subsurface work at the Site to protect the health of and safety of workers. The SMP would also provide for the continued operation of the DPE system, require continued evaluation of the potential for vapor intrusion for all existing and future buildings at or adjacent to the site. The site owner would certify that he has taken no actions that may impede the remedial activities.

Estimated timeframes for implementation of Alternative #2 include 1 year for construction, 5 years of operation of the DPE system and continuation of hydraulic containment for approximately 25 additional years. Monitoring would be performed for 30 years.

Present Worth:...*$2,121,000*
Capital Cost:...*$495,000*
Annual Costs:
(Years 1-5):...*$209,000*
(Years 5-30):...*$86,000*

Alternative #3: Dual Phase Extraction and Treatment, Permeable Reactive Barrier, and Long Term Monitoring

Alternative #3 also consists of a DPE system, treatment of groundwater and soil vapor and long term monitoring. A permeable reactive barrier (PRB) replaces the hydraulic containment specified in Alternative #2 as a means of preventing contaminated groundwater from migrating off-site. The DPE system would function as described in Alternative #2. If shown to be necessary by monitoring the groundwater, the PRB would be installed in a second phase of the remediation along the south and west property boundaries to intercept the groundwater as it flows off-site. Contaminant concentration in the downgradient plume is expected to decrease by an order of magnitude in one to two years. If this trend is not observed over the first two years after implementation of the DPE, installation of the PRB would be initiated. The PRB would be keyed into the low permeability clay layer approximately 10 to 15 feet bgs and extend vertically upwards to an elevation a few feet above the watertable.

The intent of the PRB is to intercept and treat groundwater before it migrates off-site by increasing the rate that PCE degrades to its breakdown products and into potentially non-toxic constituents. The PRB is typically composed of a mixture of sand and iron filings that, once installed, requires no maintenance. Figure 7 provides a conceptual layout for the placement of the DPE and PRB in relation to the Site's boundaries and building.

Alternative #3 is an aggressive remedial approach that would target the source area under the on-site building using the DPE, collect soil vapor to minimize vapor intrusion and would prevent the existing contaminated groundwater from migrating off-site through the installation of the PRB. Based on groundwater flow rate, current off-site groundwater contamination would attenuate by an order of magnitude (less than 1 ppm) within the first two years of implementation of the proposed remedy.

The ICs and ECs identified and described in Alternative #2 would also be required for this alternative.

The estimated timeframes for implementation of this alternative include 1 year for design and construction, 5 years for operation of the DPE and monitoring for a 30 year period.

Present Worth: *$1,732,000*
Capital Cost: *$948,000*
Annual Costs:
(Years 1-5): *$139,000*
(Years 5-30): *$16,000*

Alternative #4: *In Situ* Chemical Oxidation, Hydraulic Containment, and Long Term Monitoring

Alternative #4 employs the use of a non-toxic chemical agent to accelerate the breakdown of PCE into benign compounds as well as the use of hydraulic containment and long term monitoring that would be implemented as described in Alternative #2.

In situ chemical oxidation (ISCO) is commonly used to address PCE contaminated soil and groundwater and is most effective when the contamination is located entirely in the saturated zone. The chemical agent (Fenton's Reagent and/or potassium permanganate) would be pumped into the subsurface via a series of injection wells and would dissolve in the groundwater. Once dissolved, the agent would flow and mix with the PCE and associated VOC contamination causing the destruction of the VOCs. Because ISCO relies on the flow of groundwater for effective dispersal and transport of the agent to the contaminant, it is not effective at addressing contamination in the unsaturated zone. In addition to being ineffective in the unsaturated zone, any contamination that may be in the impermeable clay layer will also be inaccessible to the agent and will not be addressed. VOCs in the soil vapor would likely decrease as the contaminants in the saturated zone are destroyed though may not be entirely eliminated as some VOCs will likely remain in the unsaturated zone.

A separate groundwater collection system would be required to extract contaminated groundwater to prevent off-site migration while the ISCO is implemented. Long term monitoring would be implemented as described in Alternative #2.

The ICs and ECs identified and described in Alternative #2 would also be required for this alternative. Continued indoor air and soil vapor monitoring would be required and future mitigation may be necessary.

The estimated timeframes for implementation of this alternative include 1 year for design and construction. Injection of the chemical agent would take place over a 5 year period while monitoring and hydraulic containment would continue for 30 years.

Present Worth: *$2,274,000*
Capital Cost: *$944,000*
Annual Costs:
(Years 1-30): *$86,000*

Alternative #5: *In Situ* Chemical Oxidation, Permeable Reactive Barrier, and Long Term Monitoring

Alternative #5 would combine the technologies described in Alternative #3 (PRB) and Alternative #4 (ISCO). The ISCO would be implemented to address the contaminant source while the PRB would prevent contaminated groundwater from migrating off-site. Each component retains its benefits and short comings described in the above alternatives.

The ICs and ECs identified and described in Alternative #2 would also be required for this alternative.

The estimated timeframes are similar to Alternatives #3 and #4: implementation of this alternative would include 1 year for design and construction, 5 years of injection of the agent and monitoring for a 30 year period.

Present Worth: *$1,459,000*
Capital Cost: *$1,208,000*
Annual Costs:
(Years 1-5): *$123,000*
(Years 5-30): *$16,000*

7.2 Evaluation of Remedial Alternatives

The criteria to which potential remedial alternatives are compared are defined in 6 NYCRR Part 375, which governs the remediation of inactive hazardous waste disposal sites in New York A detailed discussion of the evaluation criteria and comparative analysis is included in the FS report.

The first two evaluation criteria are termed “threshold criteria” and must be satisfied in order for an alternative to be considered for selection.

1. Protection of Human Health and the Environment. This criterion is an overall evaluation of each alternative's ability to protect public health and the environment.

2. Compliance with New York State Standards, Criteria, and Guidance (SCGs). Compliance with SCGs addresses whether a remedy will meet environmental laws, regulations, and other standards and criteria. In addition, this criterion includes the consideration of guidance which the Department has determined to be applicable on a case-specific basis.

The next five “primary balancing criteria” are used to compare the positive and negative aspects of each of the remedial strategies.

3. Short-term Effectiveness. The potential short-term adverse impacts of the remedial action upon the community, the workers, and the environment during the construction and/or implementation are evaluated. The length of time needed to achieve the remedial objectives is also estimated and compared against the other alternatives.

4. Long-term Effectiveness and Permanence. This criterion evaluates the long-term effectiveness of the remedial alternatives after implementation. If wastes or treated residuals remain on-site after the selected

remedy has been implemented, the following items are evaluated: 1) the magnitude of the remaining risks, 2) the adequacy of the engineering and/or institutional controls intended to limit the risk, and 3) the reliability of these controls.

5. Reduction of Toxicity, Mobility or Volume. Preference is given to alternatives that permanently and significantly reduce the toxicity, mobility or volume of the wastes at the site.

6. Implementability. The technical and administrative feasibility of implementing each alternative are evaluated. Technical feasibility includes the difficulties associated with the construction of the remedy and the ability to monitor its effectiveness. For administrative feasibility, the availability of the necessary personnel and materials is evaluated along with potential difficulties in obtaining specific operating approvals, access for construction, institutional controls, and so forth.

7. Cost-Effectivness. Capital costs and annual operation, maintenance, and monitoring costs are estimated for each alternative and compared on a present worth basis. Although cost-effectiveness is the last balancing criterion evaluated, where two or more alternatives have met the requirements of the other criteria, it can be used as the basis for the final decision. The costs for each alternative are presented in Table 3.

This final criterion is considered a "modifying criterion" and is taken into account after evaluating those above. It is evaluated after public comments on the Proposed Remedial Action Plan have been received.

8. Community Acceptance - Concerns of the community regarding the RI/FS reports and the PRAP are evaluated. A responsiveness summary will be prepared that describes public comments received and the manner in which the Department will address the concerns raised. If the selected remedy differs significantly from the proposed remedy, notices to the public will be issued describing the differences and reasons for the changes.

SECTION 8: SUMMARY OF THE PROPOSED REMEDY

The Department is proposing Alternative #3, Dual Phase Extraction and Treatment, Permeable Reactive Barrier, and Long Term Monitoring as the remedy for this site. The elements of this remedy are described at the end of this section.

The proposed remedy is based on the results of the RI and the evaluation of alternatives presented in the FS.

Alternative #3 Dual Phase Extraction and Treatment, Permeable Reactive Barrier, and Long Term Monitoring is being proposed because, as described below, it satisfies the threshold criteria and provides the best balance of the primary balancing criteria described in Section 7.2. It would achieve the remediation goals for the site by removing the PCE and related VOC contamination from the soil, groundwater and soil vapor and it would prevent contaminated groundwater not collected by the DPE extraction wells from migrating off-site towards other structures. Attaining these two goals will also prevent further migration of soil vapor and minimize impacts to indoor air. Given the difficulties of reaching the source of the PCE underneath the on-site building, DPE provides the best option of removing the contaminated soil vapor and contaminants in the soil in the unsaturated zone to address the most significant threat to public health and obtaining compliance with SCGs applicable to the Site. Alternative #2 would also mitigate the threat posed by soil vapor because it contains the DPE component as well. Alternatives #4 and #5 do not address the soil vapor directly and rely on *in situ* treatment of the soil and groundwater before any decrease in the contaminant concentrations would occur. Therefore, they would not provide the same level of short term protection of human heath and the environment. Alternative #1 does not meet threshold criteria and is not discussed further.

Alternatives #3 and #5 include installation of a PRB to address the off-site migration of contaminated groundwater. This would have a rapid effect on the off-site contaminant concentrations in groundwater. Neither Alternative #2 nor #4 include the PRB but rely on hydraulic containment to prevent additional groundwater from migrating off-site. This approach would be less effective at addressing the off-site groundwater contamination to achieve SCGs and, therefore, would be less protective in the near term.

Alternatives #2 thru #5 are likely to cause short term inconvenience to the commercial tenants and owner of the on-site building due to the location on the property where work must be performed. Alternatives #3 and #5 would be more disruptive than #2 and #4 because of the construction of the PRB though the other alternatives include the installation of wells and piping in the building's parking area and may not be significantly less obtrusive. As mentioned above in the context of addressing the threat posed to human health, Alternatives #2 and #3 would be the most effective in quickly decreasing the VOC concentrations in soil vapor.

Addressing the source of the contamination would provide the greatest long-term effectiveness. The descriptions of each alternative provided in Section 7 indicate that DPE would be more effective than ISCO at addressing the source because it would treat contamination in both saturated and unsaturated zones and is capable of reaching the contamination below the building footprint. Alternatives #2 and #3 would provide better long-term effectiveness because they include DPE.

Alternatives #2 thru #5 attempt to reduce the toxicity, mobility, and volume of the on-site hazardous waste through combinations of hydraulic containment, collection and above ground treatment or *in situ* remediation. Technologies that more completely treat the source will be more effective at permanently reducing the mobility and volume because of the contaminants inherent ability to migrate through the soil vapor and into structures. Alternatives #2 and #3 would be more effective at reducing the mobility of the VOCs through soil vapor and groundwater because of the DPE component that removes soil vapor and groundwater from the site for treatment. Alternative components that have been included to address contaminated groundwater migrating off-site include hydraulic containment with above ground treatment and the PRB. The PRB would be more effective at permanently reducing toxicity of the contamination and would likely be more effective at decreasing the mobility and volume of contaminants in the groundwater because it will contact all groundwater from the clay aquitard to the top of the watertable equally while a reliance on hydraulic containment may allow some contamination to migrate due to uncertain radii of influence. Alternatives #3 and #5 include the use of a PRB making those alternatives preferable. Alternative #3 combines the DPE system and PRB which makes it the most effective at reducing toxicity, mobility, and volume.

All alternatives discussed in Section 7 are technically implementable. Alternatives #2 and #3 will likely require more area on the property than #4 and #5 because of the DPE system. Alternatives #3 and #5 may require the development of alternate access to the building because the construction of the PRB would take place across the parking and delivery entrance.

Estimated costs for Alternatives #2 thru #5 vary by about 55% between the least and most expensive with the most expensive component being the hydraulic containment to prevent contaminated groundwater from migrating off-site. Alternative #4 is the most expensive while its technology (ISCO) is likely to be less effective at decreasing the contaminant mass as Alternatives #2 and #3. Alternative #2 utilizes DPE (more effective than ISCO) and hydraulic containment (less effective than a PRB) and is nearly as expensive as Alternative #4. Alternative #3 provides the most effective remedy at a cost only slightly more than the least expensive remedy proposed that addresses the contamination.

The estimated present worth cost to implement the remedy is $1,732,000. The cost to construct the remedy is estimated to be $948,000 and the estimated average annual costs for the first 5 years is $139,000 and $16,000 per year for the following 25 years.

The elements of the proposed remedy are as follows:

1. A remedial design program would be implemented to provide the details necessary for the construction, operation, maintenance, and monitoring of the remedial program.

2. Construction and operation of a dual phase extraction system to treat on-site soil and groundwater by collecting soil vapor and groundwater and conveying the contaminated media to treatment units.

3. Construction of a permeable reactive barrier along the south and west property boundaries to treat contaminated groundwater migrating off-site.

4. Imposition of an institutional control in the form of an environmental easement that would require (a) limiting the use and development of the property to commercial use, which would also permit industrial use; (b) compliance with the approved site management plan; (c) restrict the use of soil excavated from the site for any off-site applications pending sampling and analysis to document conformance with applicable SCGs. and (d) restricting the use of groundwater as a source of potable or process water, without necessary water quality treatment as determined by NYSDOH;

5. Development of a site management plan which would include the following institutional and engineering controls: (a) Excavated soil would be tested, properly handled to protect the health and safety of workers and the nearby community, and would be properly managed in a manner acceptable to the Department; (b) continued evaluation of the potential for vapor intrusion for any buildings developed on the site, including provision for mitigation of any impacts identified; (c) monitoring of groundwater and soil vapor, and potential for vapor intrusion on-site and at the off-site industrial building; (d) identification of any use restrictions on the site; and (e) provisions for the continued proper operation and maintenance of the components of the remedy.

6. The property owner would provide a periodic certification of institutional and engineering controls, prepared and submitted by a professional engineer or such other expert acceptable to the Department, until the Department notifies the property owner in writing that this certification is no longer needed. This submittal would: (a) contain certification that the institutional controls and engineering controls put in place are still in place and are either unchanged from the previous certification or are compliant with Department-approved modifications; (b) allow the Department access to the site; and (c) state that nothing has occurred that would impair the ability of the control to protect public health or the environment, or constitute a violation or failure to comply with the site management plan unless otherwise approved by the Department.

7. The operation of the components of the remedy would continue until the remedial objectives have been achieved, or until the Department determines that continued operation is technically impracticable or not feasible.

Since the remedy results in untreated hazardous waste remaining at the site, a long-term monitoring program would be instituted. Groundwater and soil vapor samples would be collected at frequencies to be determined in the Remedial Design process that would indicate the effectiveness of the remedial technologies and treatment system. Once remedial goals have been attained, samples would be collected and analyzed to document continued conformance with the specified goals. This program would allow the effectiveness of the DPE and PRB to be monitored and would be a component of the long-term management for the site.

TABLE 1
Nature and Extent of Contamination
May 2005 – February 2007

SUBSURFACE SOIL	Contaminants of Concern	Concentration Range Detected (ppm)[a]	SCG[b] (ppm)[a]	Frequency of Exceeding SCG
Semivolatile Organic Compounds (SVOCs)	Benzo(a)anthracene	0.041-8.0	1.0	1 of 22
	Benzo(a)pyrene	0.047-6.0	1.0	1 of 22
	Benzo(b)flouranthene	0.210-6.9	1.0	2 of 22
	Benzo(k)flouranthene	0.110-3.6	1.0	1 of 22
	Dibenz(a,h)anthracene	0.072-1.3	0.33	1 of 22
	Chrysene	0.160-8.6	1.0	2 of 22
	Indeno(1,2,3-cd)pyrene	0.100-4.1	0.5	1 of 22
Volatile Organic Compounds (VOCs)	1,2,4-Trimethylbenzene	0.002-4.1	3.6	1 of 22
	Acetone	0.006-.08	0.05	3 of 22
	1,2-Dichlorethene(cis)	0.004-0.71	0.25	1 of 22
	Vinyl chloride	0.051	0.02	1 of 22

TABLE 1
Nature and Extent of Contamination
May 2005 – February 2007

GROUNDWATER	Contaminants of Concern	Concentration Range Detected (ppb)[a]	SCG[b] (ppb)[a]	Frequency of Exceeding SCG
Volatile Organic Compounds (VOCs)	1,2,4-Trimethylbenzene	26	5	1 of 8
	1,2-Dichlorethene(cis)	1-920	5	11 of 29
	1,3,5-Trimethylbenzene	10	5	1 of 8
	Tetrachloroethene	2-4600	5	11 of 29
	Trichloroethene	1-405	5	6 of 29
	Vinyl Chloride	1-180	2	8 of 29

[a] ppb = parts per billion, which is equivalent to micrograms per liter, ug/L, in water;
ppm = parts per million, which is equivalent to milligrams per kilogram, mg/kg, in soil;
ug/m^3 = micrograms per cubic meter

[b] SCG = standards, criteria, and guidance values;
Groundwater, drinking water, and surface water SCGs are based on the Department's "Ambient Water Quality Standards and Guidance Values" and Part 5 of the New York State Sanitary Code.
Subsurface Soil SCGs are based on Title 6 of the New York Code of Rules and Regulations [6NYCRR] Part 375 Unrestricted Use Soil Cleanup Objectives [SCOs], Table 375-6.8(a).

[c] LEL = Lowest Effects Level and SEL = Severe Effects Level. A sediment is considered to be contaminated if either of these criteria is exceeded. If both criteria are exceeded, the sediment is severely impacted. If only the LEL is exceeded, the impact is considered to be moderate.

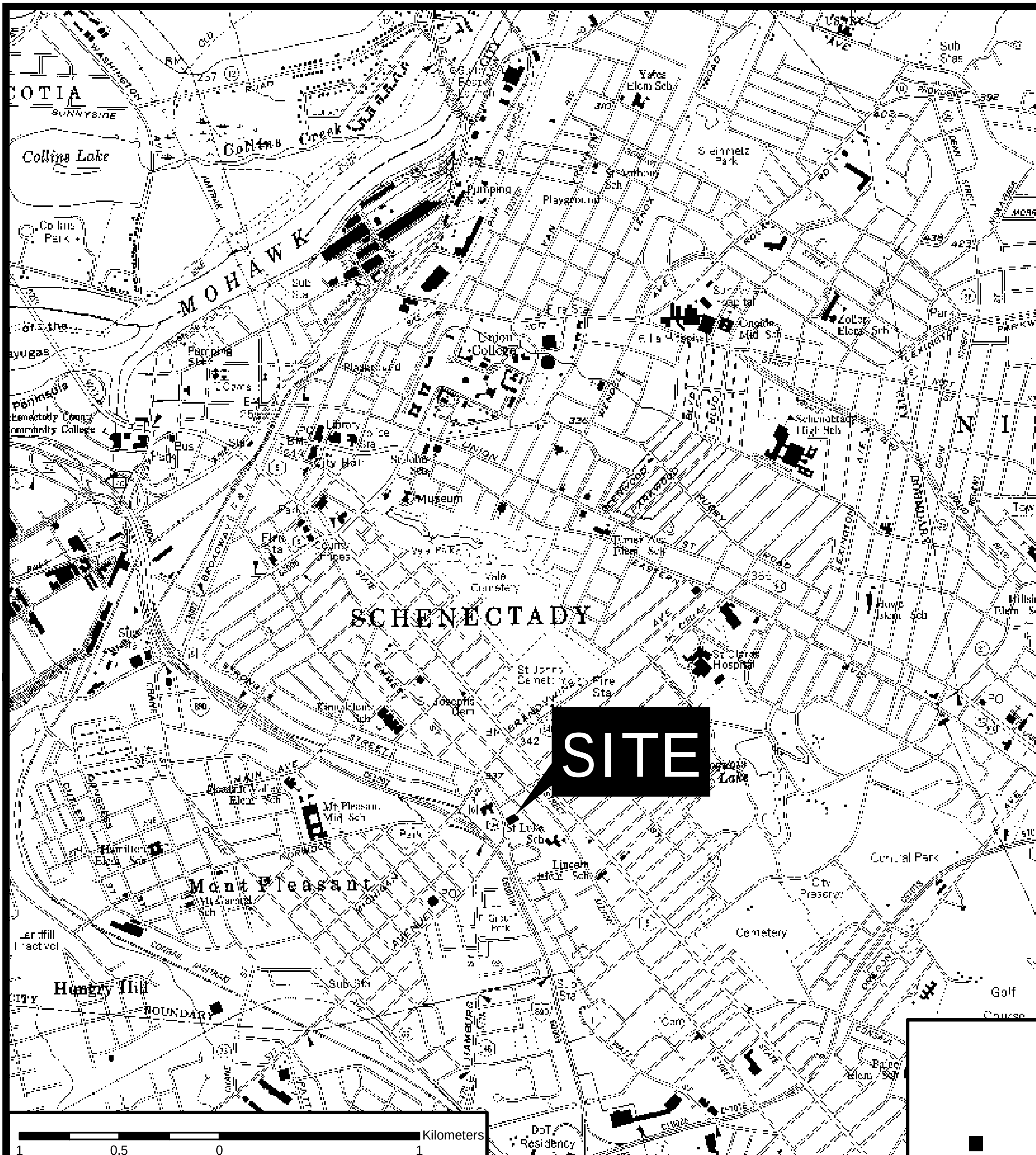
[c] ER-L = EffectRange - Low and ER-M = Effect Range - Moderate. A sediment is considered to be contaminated if either of these criteria is exceeded. If both criteria are exceeded, the sediment is severely impacted. If only the ER-L is exceeded, the impact is considered to be moderate.

Table 2
Remedial Alternative Costs

Remedial Alternative	Capital Cost ($)	Annual Costs ($)	Total Present Worth ($)
Alternative #1: No Action/Long Term Monitoring		0-30 yrs: 16,000	251,000
Alternative #2: Dual Phase Extraction, Hydraulic Containment and Long Term Monitoring	495,000	0-5 yrs: 209,000 6-30 yrs: 86,000	2,121,000
Alternative #3: Dual Phase Extraction, Permeable Reactive Barrier and Long Term Monitoring	948,000	0-5 yrs: 139,000 6-30 yrs: 16,000	1,732,000
Alternative #4: Chemical Oxidation, Hydraulic Containment and Long Term Monitoring	944,000	0-30 yrs: 86,000	2,274,000
Alternative #5: Chemical Oxidation, Permeable Reactive Barrier and Long Term Monitoring	1,208,000	0-5 yrs: 123,000 6-30 yrs: 16,000	1,459,000

Table 3
Alternative Component Comparison

Alternative Components	Proposed Alternatives	1	2	3	4	5
No Action		X				
Longterm Monitoring		X	X	X	X	X
Dual Phase Extraction			X	X		
Hydraulic Containment			X		X	
Above Ground Treatment System			X	X	X	
Permeable Reactive Barrier				X		X
In situ Chemical Oxidation					X	X



SITE LOCATION

Former Kenwood Cleaners Site

4-47-032

Figure 1

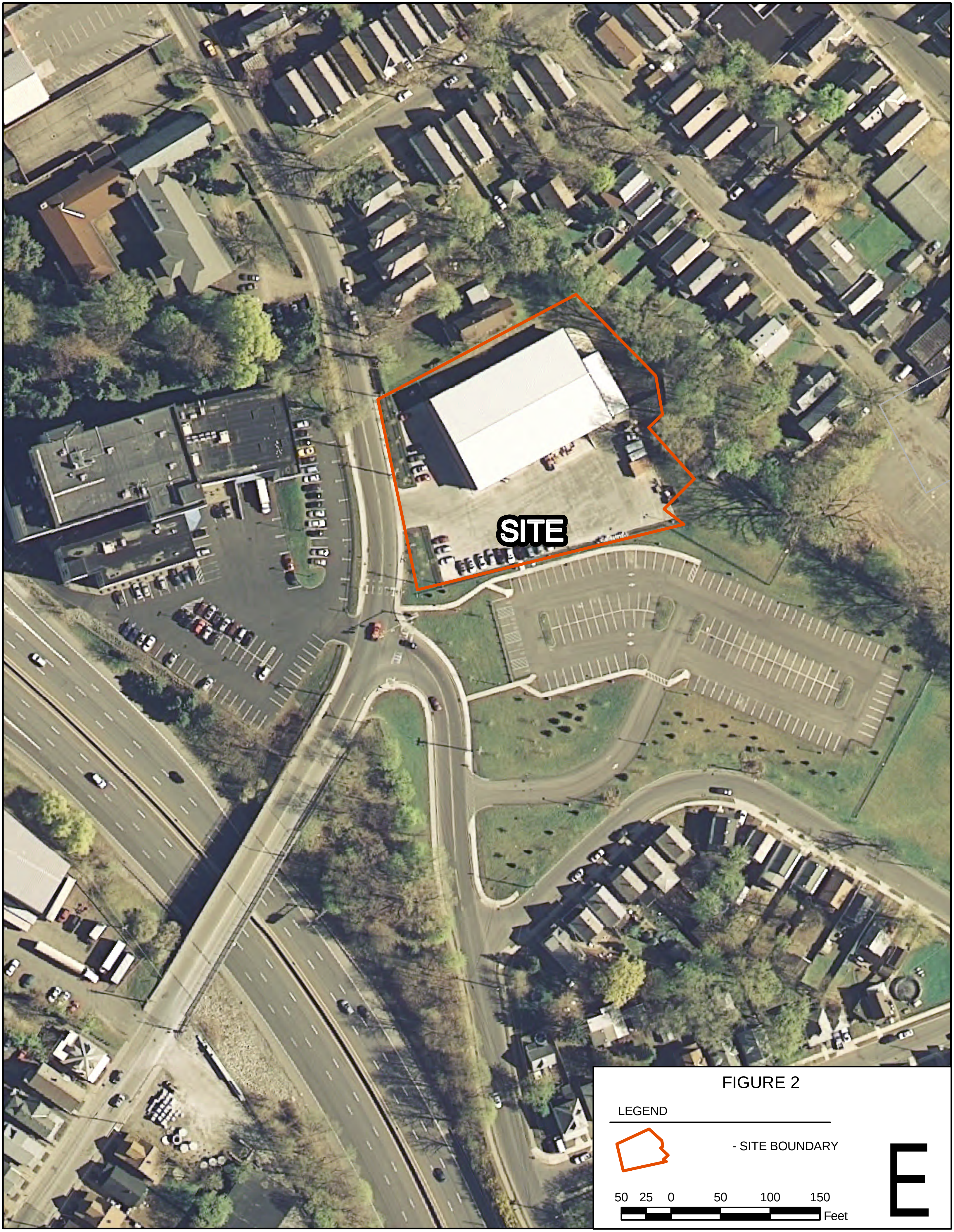
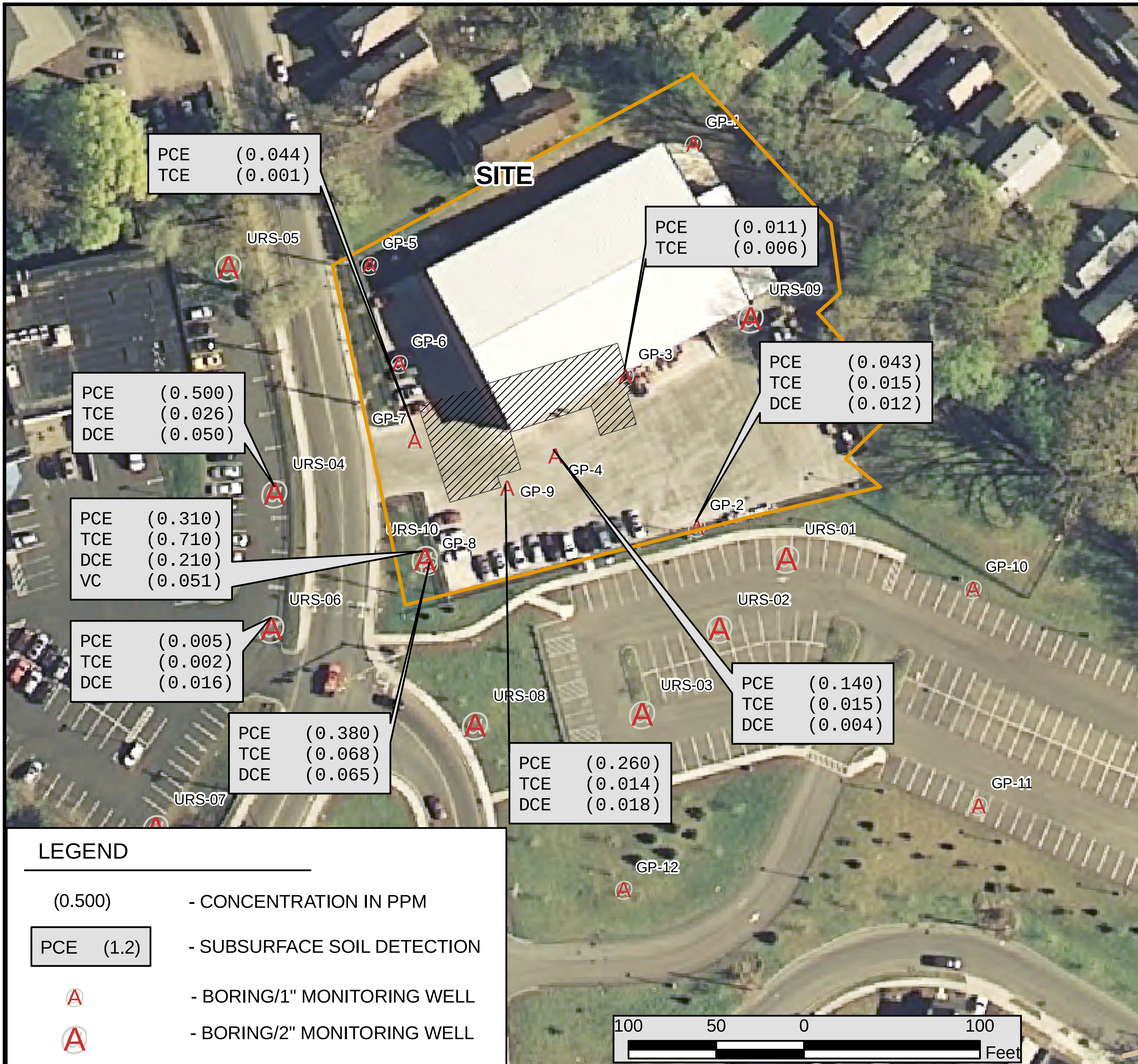


FIGURE 2



New York State
Department of Environmental Conservation

Division of
Environmental Remediation

Former Kenwood Cleaners

DEC Site No.: E4-47-032

FIGURE 3

Subsurface Soil Tetrachloroethene & Related Compound Detections

Map Details

Created in ArcMap 9.2
Date of Last Revision: 11.24.2008

8

North American Datum 1983
UTM Zone 18

Department of Environmental Conservation

Division of Environmental Remediation

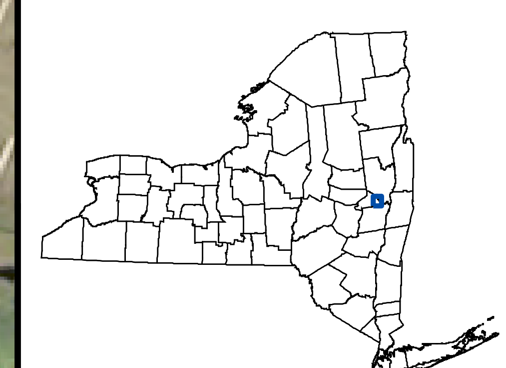
1

FIGURE 4

Former Kenwood Cleaners - February 2007

Groundwater: Elevation & Tetrachloroethene Related Contamination

0 25 50 100 Feet



New York State
Department of Environmental Conservation

Division of
Environmental Remediation

Former Kenwood Cleaners

DEC Site No.: 4-47-032

FIGURE 5

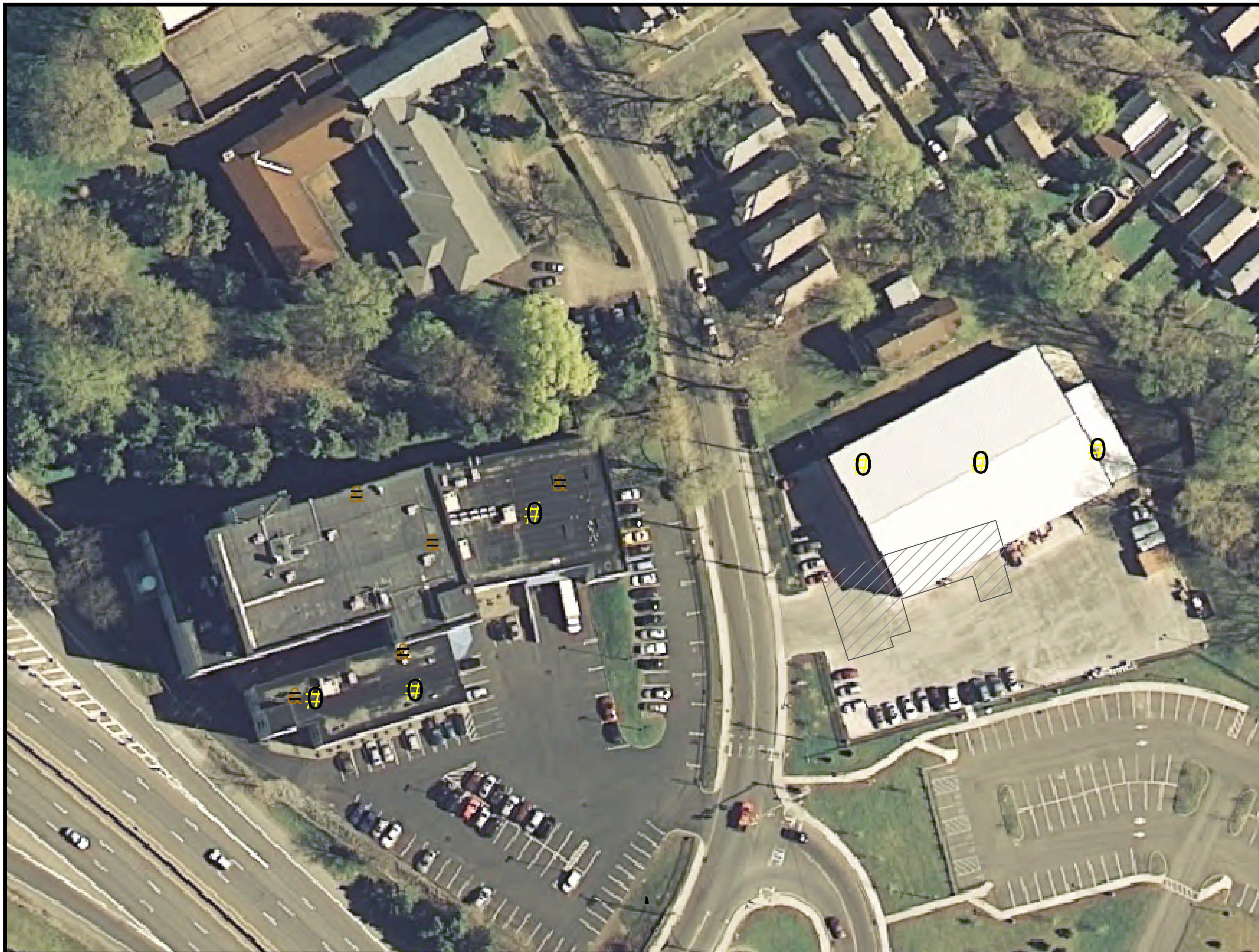
Soil Vapor: Tetrachloroethene
(Spring 2007)

Map Details

Created in ArcMap 9.2
Date of Last Revision: 11.24.2008

8

North American Datum 1983
UTM Zone 18



LEGEND

Indoor Air Sample Location

Sub-Slab Vapor Sample Location

100 50 0 100 200 Feet

New York State
Department of Environmental
Conservation

Division of
Environmental Remediation

Former Kenwood
Cleaners

DEC Site No.: 4-47-032

FIGURE 6

Sub-Slab Vapor & Indoor Air Sample Locations

(Winter 2008)

Map Details

Created in ArcMap 9.2
Date of Last
Revision: 11.24.2008

North American Datum 1983
UTM Zone 18

J:\11174747.00000\DB\GIS\Alternative3.mxd 1/30/2008

URS

FORMER KENWOOD CLEANERS SITE
CONCEPTUAL LAYOUT FOR ALTERNATIVE 3
DUAL PHASE EXTRACTION WITH PERMEABLE REACTIVE BARRIER

FIGURE 7