PROPOSED REMEDIAL ACTION PLAN

Crystal Cleaners
State Superfund Project
Pelham (V), Westchester County
Site No. 360053
February 2016

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 above referenced site. The disposal of hazardous wastes at the site has resulted in threats to public health and the environment that would be addressed by the remedy proposed by this Proposed Remedial Action Plan (PRAP). The disposal of hazardous wastes at this site, as more fully described in Section 6 of this document, has contaminated various environmental media. The proposed remedy is intended to attain the remedial action objectives identified for this site for the protection of public health and the environment. This PRAP identifies the preferred remedy, summarizes the other alternatives considered, and discusses the reasons for the preferred remedy.

The New York State Inactive Hazardous Waste Disposal Site Remedial Program (also known as the State Superfund Program) is an enforcement program, the mission of which is to identify and characterize suspected inactive hazardous waste disposal sites and to investigate and remediate those sites found to pose a significant threat to public health and environment.

The Department has issued this document in accordance with the requirements of 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 the site-related reports and documents in the document repository identified below.

SECTION 2: CITIZEN PARTICIPATION

The Department seeks input from the community on all PRAPs. This is an opportunity for public participation in the remedy selection process. The public is encouraged to review the reports and documents, which are available at the following repository:

Pelham Village Hall
195 Sparks Avenue
Pelham, NY 10803
Phone: 914-738-2015

A public comment period has been set from:

03/01/2016 to 03/30/2016

A public meeting is scheduled for the following date:

03/22/2016 at 7:00 PM

Public meeting location:

Pelham Village Hall

At the meeting, the findings of the remedial investigation (RI) and the feasibility study (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 through 03/30/2016 to:

John Miller
NYS Department of Environmental Conservation
Division of Environmental Remediation
625 Broadway
Albany, NY 12233
john.miller@dec.ny.gov

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 the proposed remedy identified herein. 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.

Receive Site Citizen Participation Information By Email

Please note that the Department's Division of Environmental Remediation (DER) is "going paperless" relative to citizen participation information. The ultimate goal is to distribute citizen participation information about contaminated sites electronically by way of county email listservs. Information will be distributed for all sites that are being investigated and cleaned up in a particular county under the State Superfund Program, Environmental Restoration Program, Brownfield Cleanup Program, Voluntary Cleanup Program, and Resource Conservation and Recovery Act Program. We encourage the public to sign up for one or more county listservs at http://www.dec.ny.gov/chemical/61092.html

SECTION 3: SITE DESCRIPTION AND HISTORY

Location: The Crystal Cleaners Site is located at 113 Wolfs Lane in the downtown section of the

Village of Pelham, Westchester County, NY.

Site Features: The Crystal Cleaners Site is a single-story commercial building which sits on approximately 0.1 acre of land in a row of similar buildings on Wolfs Lane. The site is entirely covered by the building except for an area of concrete sidewalk in the front. Ground elevation drops several feet behind the row of commercial buildings. A larger neighboring parcel behind these buildings is owned by the Village of Pelham and is used by the Village's Department of Public Works.

Current Zoning and Land Use: The site is zoned BUS-1, which allows for commercial use. Crystal Cleaners is an active dry cleaning establishment which utilizes solvents. The surrounding area is a mix of residential and commercial properties. The nearest residential property is located approximately 200 feet to the south-west of the site.

Past Use of the Site: The site has been utilized as a dry cleaning facility for several decades.

Site Geology and Hydrogeology: Site overburden consists of a mixture of sand, gravel, silt, and clay. Groundwater is located at approximately 9 to 12 feet below ground surface and generally flows to the west - southwest. Bedrock is located approximately 12 to 14 feet below grade in the vicinity of the site but varies considerably in the surrounding area.

A site location map is attached as Figure 1.

SECTION 4: LAND USE AND PHYSICAL SETTING

The Department may consider the current, intended, and reasonably anticipated future land use of the site and its surroundings when evaluating a remedy for soil remediation. For this site, alternatives (or an alternative) that restrict(s) the use of the site to as described in Part 375-1.8(g) are/is being evaluated in addition to an alternative which would allow for unrestricted use of the site.

A comparison of the results of the investigation to the appropriate standards, criteria and guidance values (SCGs) for the identified land use and the unrestricted use SCGs for the site contaminants is included in the Tables for the media being evaluated in Exhibit A.

SECTION 5: 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:

Crystal Cleaners of Pelham Corp.

A&M Crystal Cleaners & Launderers, Inc.

Myung H. Lee

Estate of Michael Covino

113 Wolf's Lane A&M Corp.

The PRPs for the site declined to implement a remedial program 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 6: SITE CONTAMINATION

6.1: Summary of the Remedial Investigation

A Remedial Investigation (RI) has been conducted. The purpose of the RI was to define the nature and extent of any contamination resulting from previous activities at the site. The field activities and findings of the investigation are described in the RI Report.

The following general activities are conducted during an RI:

- Research of historical information,
- Geophysical survey to determine the lateral extent of wastes,
- Test pits, soil borings, and monitoring well installations,
- Sampling of waste, surface and subsurface soils, groundwater, and soil vapor,
- Sampling of surface water and sediment,
- Ecological and Human Health Exposure Assessments.

The analytical data collected on this site includes data for:

- groundwater
- soil
- soil vapor

6.1.1: Standards, Criteria, and Guidance (SCGs)

The remedy must conform to 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.

To determine whether the contaminants identified in various media are present at levels of concern, the data from the RI were compared to media-specific SCGs. The Department has developed SCGs for groundwater, surface water, sediments, and soil. The NYSDOH has developed SCGs for drinking water and soil vapor intrusion. The tables found in Exhibit A list the applicable SCGs in the footnotes. For a full listing of all SCGs see: http://www.dec.ny.gov/regulations/61794.html

6.1.2: RI Results

The data have identified contaminants of concern. A "contaminant of concern" is a hazardous waste that is sufficiently present in frequency and concentration in the environment to require evaluation for remedial action. Not all contaminants identified on the property are contaminants of concern. The nature and extent of contamination and environmental media requiring action are summarized in Exhibit A. Additionally, the RI Report contains a full discussion of the data. The contaminant(s) of concern identified at this site is/are:

tetrachloroethene (PCE)	1,2-dichloroethene
trichloroethene (TCE)	vinyl chloride

As illustrated in Exhibit A, the contaminant(s) of concern exceed the applicable SCGs for:

- groundwater
- soil
- sub-slab soil vapor

6.2: Interim Remedial Measures

An interim remedial measure (IRM) is conducted at a site when a source of contamination or exposure pathway can be effectively addressed before issuance of the Record of Decision.

The following IRM(s) has/have been completed at this site based on conditions observed during the RI.

IRM - Vapor Mitigation Systems

In 2009 and 2010, Interim Remedial Measures (IRMs) were implemented at two off-site buildings where the potential for soil vapor intrusion (SVI) was identified. A state contractor was hired to install sub-slab depressurization (SSDS) systems to mitigate vapor intrusion for these properties.

One building is a two story structure used for commercial purposes. Both floors of the structure are occupied by a restaurant. Prior to mitigation there was 20,614 micrograms per cubic meter (ug/m^3) of PCE, 100 ug/m^3 of DCE and 542 ug/m^3 of TCE in the sub-slab soil vapor. PCE was detected in the basement air at a concentration of 463 ug/m^3.

The other building is used for restricted residential purposes by the Village of Pelham as the Village Hall. Prior to mitigation 53,096 ug/m^3 of PCE, 900 ug/m^3 of DCE and 482 ug/m^3 of TCE were detected in sub-slab soil vapor. PCE was detected in the basement air at a concentration of 5.63 ug/m^3.

The SSD systems create a vacuum beneath the buildings to prevent sub-slab vapors from migrating into the indoor air of the buildings. The systems consist of numerous suction points installed into the sub-structure. Piping is routed from the extraction points to a fan which extracts vapors from beneath the building and discharges them to the ambient air. Pressure testing conducted post-installation confirmed that the systems were providing an adequate vacuum beneath the structures and operating as designed. The results of the system installations are contained in the SSDS Final Installation Reports dated June 2010 and November 2010.

6.3: Summary of Environmental Assessment

This section summarizes the assessment of existing and potential future environmental impacts presented by the site. Environmental impacts may include existing and potential future exposure pathways to fish and wildlife receptors, wetlands, groundwater resources, and surface water.

Based upon the resources and pathways identified and the toxicity of the contaminants of ecological concern at this site, a Fish and Wildlife Resources Impact Analysis (FWRIA) was deemed not necessary for OU 01.

Nature and Extent of Contamination:
The Site Characterization identified the contaminants of concern at the site as tetrachloroethene (PCE) and three associated breakdown products: trichloroethene (TCE), cis-1,2 dichloroethene (DCE) and vinyl chloride. These all fall under the category of volatile organic compounds (VOCs). Sampling for other contaminants was conducted, including metals and semivolatile organic compounds (SVOCs) did not identify significant contamination, so subsequent investigation work focused on VOCs.

VOC contamination has been documented in both overburden and bedrock groundwater. There has also been contamination observed in soil and soil vapor at concentrations which exceed standards, criteria, or guidance (SCGs).

Groundwater - Contaminants were observed in both the overburden and bedrock aquifers. The plume originates in the vicinity of the dry cleaner building and flows to the southwest away from the site. PCE, TCE, DCE and vinyl chloride were detected in groundwater at maximum concentrations of 1400 parts per billion (ppb), 620 ppb, 1900 ppb and 170 ppb, respectively. The SCG for PCE, TCE and DCE is 5 ppb and for vinyl chloride is 1 ppb.

Soil - Contamination was observed in soil samples collected adjacent to the rear of the dry cleaner building. Samples were collected from the depth where the highest PID reading was observed which was generally the three to five foot interval. PCE was present in the soil samples at a maximum of 17 parts per million (ppm). Note that there were no surface soil samples collected as all soil near the site is covered by buildings and or pavement.

Soil Vapor, Sub-Slab Vapor, and Indoor Air – Samples were collected at eleven off-site buildings in total. Mitigation was recommended for four of the eleven off-site buildings due to the potential for indoor air impacts as a result of soil vapor intrusion. Two of the four buildings received sub-slab depressurization systems. The owners of the two remaining buildings did not respond to the offers to install sub-slab depressurization systems. Both of these structures are residential properties. One of them had concentrations of PCE, TCE and DCE detected at concentrations of 9,800, 560 and 2,500 micrograms per cubic meter (ug/m3) in sub-slab vapor, respectively. The other building had PCE, TCE and DCE detected at concentrations of 8,300, 370 and 1,500 ug/m3, respectively. There were no detections in indoor air at any of the buildings. No further actions were needed at the remaining seven off-site buildings.

6.4: Summary of Human Exposure Pathways

This human exposure assessment identifies ways in which people may be exposed to site-related contaminants. Chemicals can enter the body through three major pathways (breathing, touching or swallowing). This is referred to as *exposure.*

The site is covered by buildings and pavement so exposure to potentially contaminated soils by the general public is not expected unless excavation occurs on the site. Public water serves the area and there are no known users of well water in the vicinity so exposure to site-related contamination via drinking water is not expected. The potential exists for site-related volatile contaminants to enter nearby homes and businesses through soil vapor intrusion and for exposure to building occupants. The soil vapor intrusion pathway is being investigated.

6.5: Summary of the Remediation Objectives

The objectives for the remedial program have been established through the remedy selection process stated in 6 NYCRR Part 375. The goal for the remedial program is to restore the site to pre-disposal conditions to the extent feasible. At a minimum, the remedy shall eliminate or mitigate all significant threats to public health and the environment presented by the contamination identified at the site through the proper application of scientific and engineering principles.

The remedial action objectives for this site are:

Groundwater

RAOs for Public Health Protection

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

RAOs for Environmental Protection

- Restore ground water aquifer to pre-disposal/pre-release conditions, to the extent practicable.
- Remove the source of ground or surface water contamination.

Soil

RAOs for Public Health Protection

- Prevent ingestion/direct contact with contaminated soil.
- Prevent inhalation of or exposure from contaminants volatilizing from contaminants in soil.

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.

Soil Vapor

RAOs for Public Health Protection

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

SECTION 7: SUMMARY OF THE PROPOSED REMEDY

To be selected, the 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. The remedy must also attain the remedial action objectives identified for the site, which are presented in Section 6.5. Potential remedial alternatives for the Site were identified, screened and evaluated in the FS report.

A summary of the remedial alternatives that were considered for this site is presented in Exhibit B. Cost information is presented in the form of present worth, which 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. A summary of the Remedial Alternatives Costs is included as Exhibit C.

The basis for the Department's proposed remedy is set forth at Exhibit D.

The proposed remedy is referred to as the Soil Removal and Enhanced Bioremediation of Groundwater remedy.

The estimated present worth cost to implement the remedy is $1,554,000. The cost to construct the remedy is estimated to be $804,000 and the estimated average annual cost is $25,000.

The elements of the proposed remedy, as shown on Figures 6 and 7, are as follows:

1. Remedial Design

A remedial design program will be implemented to provide the details necessary for the construction, operation, optimization, maintenance, and monitoring of the remedial program. Green remediation principles and techniques will be implemented to the extent feasible in the design, implementation, and site management of the remedy as per DER-31. The major green remediation components are as follows;

- Considering the environmental impacts of treatment technologies and remedy stewardship over the long term;
- Reducing direct and indirect greenhouse gases and other emissions;
- Increasing energy efficiency and minimizing use of non-renewable energy;
- Conserving and efficiently managing resources and materials;
- Reducing waste, increasing recycling and increasing reuse of materials which would otherwise be considered a waste;
- Maximizing habitat value and creating habitat when possible;
- Fostering green and healthy communities and working landscapes which balance ecological, economic and social goals; and
- Integrating the remedy with the end use where possible and encouraging green and sustainable re-development.

2. Excavation

Excavation and disposal of off-site contaminant source areas, including:
- grossly contaminated soil, as defined in 6 NYCRR Part 375-1.2(u);
- soils exceeding the protection of groundwater soil cleanup objectives (PGWSCOs), as defined by 6 NYCRR Part 375-6.8 for those contaminants found in site groundwater above standards; and
- soils that may create a nuisance condition, as defined in Commissioner Policy CP-51 Section G.

The excavation area is approximately 770 square feet. It is estimated that up to 400 cubic yards of contaminated soil will be removed. The volume will be more precisely determined during design. The soil will be treated prior to disposal, if necessary. Soil which does not exceed the excavation criteria or the protection of groundwater SCOs for any constituent may be used anywhere beneath the cover system, including below the water table, to backfill the excavation or re-grade the site.

Clean fill meeting the requirements of 6 NYCRR Part 375-6.7(d) will be brought in to replace the excavated soil or complete the backfilling of the excavation and establish the designed grades at the site. The site will be re-graded to accommodate installation of a cover system as described in remedy element 3.

3. Cover System

A site cover currently exists consisting of the existing buildings and pavement at the, there is currently no exposed surface soil. A site cover will be maintained as a component of any future

site development, to allow for the commercial use of the site, which will consist either of the structures such as buildings, pavement, sidewalks comprising the site development or a soil cover in areas where the upper one foot of exposed surface soil will exceed the applicable soil cleanup objectives (SCOs). Where the soil cover is required it will be a minimum of one foot of soil, meeting the SCOs for cover material as set forth in 6 NYCRR Part 375-6.7(d) for commercial use. The soil cover will be placed over a demarcation layer, with the upper six inches of the soil of sufficient quality to maintain a vegetation layer. Any fill material brought to the site will meet the requirements for the identified site use as set forth in 6 NYCRR Part 375-6.7(d).

4. In-Situ Enhanced Bioremediation Using Activated Carbon Injection

In-situ enhanced biodegradation will be employed to treat contaminants in groundwater near the source and at downgradient locations. The biological breakdown of contaminants through anaerobic reductive dechlorination will be enhanced by the addition of colloidal activated carbon injections. The carbon adsorbs to the contamination and promotes the growth of bacteria which further stimulates biological breakdown of contaminants. The material can be delivered through injection wells or be added directly through open excavation. The treatment area is approximately 4200 square feet in size and it is expected that approximately 4,000 pounds of material will be required to treat the contamination.

5. Vapor Mitigation

Sub slab depressurization systems (SSDS) were offered to property owners of four off-site buildings in 2010 and 2012. SSD systems were subsequently installed in two of the four buildings where recommended. The owners of the two remaining buildings have not responded to offers to install SSD systems. Should the owners request to have SSD systems installed in the future, the NYSDEC, in consultation with the NYSDOH, shall determine if mitigation such as SSD systems or other actions are still appropriate.

6. Engineering and Institutional Controls

Imposition of an institutional control in the form of an environmental easement and a Site Management Plan, as described below, will be required.

Institutional Control

Imposition of an institutional control in the form of an environmental easement for the controlled property which will:

- require the site owner to complete and submit to the Department a periodic certification of institutional and engineering controls in accordance with Part 375-1.8 (h)(3);
- allow the use and development of the controlled property for commercial use as defined by Part 375-1.8(g), although land use is subject to local zoning laws;
- restrict the use of groundwater as a source of potable or process water, without necessary water quality treatment as determined by the NYSDOH or County DOH; and

- require compliance with the Department approved Site Management Plan.

Site Management Plan

A Site Management Plan is required, which includes the following:

1. an Institutional and Engineering Control Plan that identifies all use restrictions and engineering controls for the site and details the steps and media-specific requirements necessary to ensure the following institutional and/or engineering controls remain in place and effective:

Institutional Controls: The Environmental Easement discussed in Paragraph 5 above.

Engineering Controls: The soil cover discussed in Paragraph 3.

This plan includes, but may not be limited to:

- an Excavation Plan which details the provisions for management of future excavations in areas of remaining contamination;
- a provision for further investigation and remediation should large scale redevelopment occur, if any of the on-site building is demolished, or if the subsurface is otherwise made accessible. The nature and extent of contamination in areas where access was previously limited or unavailable will be immediately and thoroughly investigated pursuant to a plan approved by the Department. Based on the investigation results and the Department's determination of the need for a remedy, a Remedial Action Work Plan (RAWP) will be developed for the final remedy for the site, including removal and/or treatment of any source areas to the extent feasible. Citizen Participation Plan (CPP) activities will continue through this process. Any necessary remediation will be completed prior to, or in association with, redevelopment. This includes the two story on-site building;

- a description of the provisions of the environmental easement including any land use, and/or groundwater use restrictions;
- a provision for evaluation of the potential for soil vapor intrusion for any future buildings developed on the site, or for the current building if site-related COCs are no longer used, including a provision for implementing actions recommended to address exposures related to soil vapor intrusion;
- provisions for the management and inspection of the identified engineering controls;
- maintaining site access controls and Department notification; and
- the steps necessary for the periodic reviews and certification of the institutional and/or engineering controls.

2. a Monitoring Plan to assess the performance and effectiveness of the remedy. The plan includes, but may not be limited to:

- monitoring of groundwater and soil vapor to assess the performance and effectiveness of the remedy;
- a schedule of monitoring and frequency of submittals to the Department;

- monitoring for vapor intrusion for any occupied existing or future buildings developed on the site, as may be required by the Institutional and Engineering Control Plan discussed above.

3. an Operation and Maintenance (O&M) Plan to ensure continued operation, maintenance, optimization, monitoring, inspection, and reporting of any mechanical or physical components of the remedy. The plan includes, but is not limited to:

- procedures for operating and maintaining the remedy;
- compliance monitoring of treatment systems to ensure proper O&M as well as providing the data for any necessary permit or permit equivalent reporting;
- maintaining site access controls and Department notification; and
- providing the Department access to the site and O&M records

Exhibit A

Nature and Extent of Contamination

This section describes the findings of the Remedial Investigation for all environmental media that were evaluated. As described in Section 6.1, samples were collected from various environmental media to characterize the nature and extent of contamination.

For each medium, a table summarizes the findings of the investigation. The tables present the range of contamination found at the site in the media and compares the data with the applicable SCGs for the site. The contaminants of concern at the site are volatile organic compounds (VOCs). For comparison purposes, the SCGs are provided for each medium that allows for unrestricted use. For soil, the Restricted Use SCGs identified in Section 6.1.1 are also presented.

Waste/Source Areas

As described in the Remedial Investigation (RI) report, waste/source materials were present near the site. These contaminants have impacted groundwater, soil and soil vapor near the site.

Wastes are defined in 6 NYCRR Part 375-1.2(aw) and include solid, industrial and/or hazardous wastes. Source areas are defined in 6 NYCRR Part 375(au). Source areas are areas of concern at a site where substantial quantities of contaminants are found which can migrate and release significant levels of contaminants to another environmental medium. Wastes and source areas identified near the site include an area of contaminated soil approximately 30 feet from the backdoor of the dry cleaner in the vicinity of the dumpster area. Figure 6 shows the general location of the source area for the primary contaminants of concern. It should be noted that disposal apparently took place very close to the southern boundary of the Crystal Cleaners property, and consequently high levels of soil contamination extend beyond, onto neighboring properties. It is also possible that some disposal activities may have introduced PCE wastes into the subsurface directly beneath the former Crystal Cleaners building itself.

Soil contaminants include PCE and its breakdown products TCE, cis-1,2 DCE and vinyl chloride, which are contaminants related to the chlorinated solvents that are associated with the past and current use of the site. Data collected in the investigation supports that significant quantities of hazardous wastes were disposed in this area at some time in the past, which resulted in the current soil contamination and groundwater contaminant plume.

The waste/source areas identified will be addressed in the remedy selection process.

Groundwater

The groundwater plume migrates to the south as seen in Figure 7 and the plume extends approximately 1000 feet from the site. Groundwater samples were collected from 24 locations during the RI to determine the nature and extent of contamination in the groundwater. Nine of the samples were collected from overburden monitoring wells. Six samples were collected from new and existing bedrock wells. Also, an additional nine samples were collected from temporary overburden sampling points to delineate off-site impacts in areas where conventional drilling would be more difficult.

As shown in Table 1, several samples exceeded the SCGs for the contaminants of concern. Contamination was detected above SCGs in both the overburden and bedrock groundwater. Figure 3 depicts the contaminants detected in the overburden groundwater wells. Figure 4 illustrates the bedrock well contamination.

Table # 1 – Groundwater Data

Detected Constituents	Concentration Range Detected (ppb)[a]	SCG[b] (ppb)	Frequency Exceeding SCG
VOCs			
Tetrachloroethene	ND – 1400	5	16 of 24
Trichloroethene	ND - 620	5	12 of 24
Vinyl Chloride	ND – 170	5	2 of 24
Cis 1,2 Dichloroethene	ND - 1900	5	14 of 24

a - ppb: parts per billion, which is equivalent to micrograms per liter, ug/L, in water.
b- SCG: Standard Criteria or Guidance - Ambient Water Quality Standards and Guidance Values (TOGs 1.1.1), 6 NYCRR Part 703, Surface water and Groundwater Quality Standards, and Part 5 of the New York State Sanitary Code (10 NYCRR Part 5).

Based on the findings of the RI, the past disposal of hazardous waste has resulted in the contamination of groundwater. The site contaminants that are considered to be the primary contaminants of concern which will drive the remediation of groundwater to be addressed by the remedy selection process are: tetrachloroethene (PCE) and its breakdown products trichlorothene (TCE), Cis 1,2 Dichlorothene and Vinyl Chloride.

Soil

Subsurface soil samples were collected at the site during the RI. A total of 15 soil borings were advanced. Ten borings were advanced off-site in the source area as shown in Figure 5. Samples were collected off-site because the site is predominantly covered by the building. An additional five soil samples were collected from temporary monitoring wells while investigating the off-site plume. Soil samples were collected in five foot intervals and screened using a photoionization detector. One sample was collected from each boring. In general the samples were collected from where there was stained soil or where the PID readings were above background. The highest PID readings in the vicinity of the source were typically found at the 3 to 5 foot depth interval, where most of the samples were collected. Note that there were no surface soil samples collected as the site is covered by buildings and or pavement and the suspected source area is covered by an asphalt parking area.

Table 2 contains the results of the soil sampling.

Table # 2- Soil Data

Detected Constituents	Concentration Range Detected (ppm)[a]	Unrestricted SCG[b] (ppm)	Frequency Exceeding Unrestricted SCG	Restricted Use SCG[c] (ppm)	Frequency Exceeding Restricted SCG
VOCs					

Detected Constituents	Concentration Range Detected (ppm)[a]	Unrestricted SCG[b] (ppm)	Frequency Exceeding Unrestricted SCG	Restricted Use SCG[c] (ppm)	Frequency Exceeding Restricted SCG
Tetrachloroethene	ND - 17	1.3	6 of 15	1.3	6 of 15

a - ppm: parts per million, which is equivalent to milligrams per kilogram, mg/kg, in soil;
b - SCG: Part 375-6.8(a), Unrestricted Soil Cleanup Objectives.
c - SCG: Part 375-6.8(b), Restricted Use Soil Cleanup Objectives for the Protection of Groundwater.

The contaminant of concern, PCE, was detected above SCGs in six of the soil samples that were collected.

Based on the findings of the Remedial Investigation, the past disposal of hazardous waste has resulted in the contamination of soil. The site contaminant identified in soil which is considered to be the primary contaminant of concern, to be addressed by the remedy selection process, is PCE.

Soil Vapor

The evaluation of the potential for soil vapor intrusion resulting from the presence of site related soil or groundwater contamination was evaluated by the collection of sub-slab soil vapor and indoor air samples at nearby structures. On the site, there were no soil vapor intrusion samples collected since the site consists of only the dry cleaning structure and the drycleaner is still in business and continues to use the COCs.

Due to their locations relative to the site's groundwater plume, several off-site buildings were identified for soil vapor intrusion sampling. Seventeen notices were sent to surrounding residences and businesses requesting permission to sample the buildings. Samples were collected from eleven properties that granted access to perform the sampling. The purpose of the sampling was to assess the potential for soil vapor intrusion at each location. In general, one sub-slab sample and one indoor air sample were collected from each structure. An ambient air sample was also collected during each event. Based upon the results of the samples that were collected, it appears that the soil vapor contamination follows the groundwater plume closely with limited migration to the east or west.

Soil vapor contamination was identified at four off-site buildings during the RI. Site related contaminants in sub-slab vapor was identified at levels that warranted mitigation for two commercial buildings located adjacent to the site, and two residential buildings located along the path of the groundwater plume to the south of the site.

Soil vapor intrusion impacts identified during the RI were addressed at the two commercial buildings during the IRMs described in Section 6.2 through the installation of sub-slab depressurization systems. However, the owners of the two residential buildings to the south of the site declined the installation of the recommended SSDS.

Exhibit B

Description of Remedial Alternatives

The following alternatives were considered based on the remedial action objectives (see Section 6.5) to address the contaminated media identified at the site as described in Exhibit A.

Alternative 1: No Further Action

The No Further Action Alternative recognizes the remediation of the site completed by the IRM(s) described in Section 6.2. This alternative leaves the site in its present condition and does not provide any additional protection of the environment.

Present Worth: *$0*
Capital Cost: *$0*
Annual Costs: *$0*

Alternative 2: Restoration to Pre-Disposal or Unrestricted Conditions

This alternative achieves all of the SCGs discussed in Section 6.1.1 and Exhibit A and soil meets the unrestricted soil cleanup objectives (SCOs) listed in Part 375-6.8(a). This alternative calls for the excavation, removal and disposal of contaminated soil above unrestricted SCOs. Alternative 2 also includes in-situ treatment of the groundwater plume where PCE is greater than 50 parts per billion (ppb). Alternative 2 utilizes in-situ chemical oxidation (ISCO) injections to treat the contamination in groundwater for both the bedrock and overburden plume. Alternative 2 calls for multiple rounds of ISCO injections until groundwater quality standards are achieved. Quarterly groundwater monitoring is estimated for five years and a short term Site Management Plan would be necessary until groundwater standards are met.

Present Worth: *$10,408,000*
Capital Cost: *$9,483,000*
Annual Costs: *$31,000*

Alternative 3: Soil Removal and Monitored Natural Attenuation (MNA) of Groundwater

This alternative calls for the removal of the contaminated soil in the source area near the former dry cleaner. Approximately 400 cubic yards of contaminated soil (roughly 40 dump truck loads) would be excavated and transported off site for proper treatment and disposal. Post-excavation soil samples would be collected to ensure that removal is complete, and the area would then be restored to its previous grade using clean soil materials from an off-site source.

No active groundwater treatment would be conducted. With the source of contamination removed, groundwater contaminant levels would be expected to decline over time, as a result of biological decay processes. The decay process would be monitored, with all of the current monitoring wells sampled periodically. Samples would be

analyzed for PCE and all of its breakdown products, and for other chemical indicators of biological decay. It is assumed that this sampling would be conducted annually for the first five years following source removal, and conducted every five years thereafter.

Alternative 3 also utilizes institutional controls (ICs) to provide additional protection. The ICs include groundwater use and land use restrictions to prevent contact with contaminated groundwater. A Site Management Plan (SMP) will be needed to specify the details of the ICs, and provide for the management of remaining contamination and monitoring activities for the site.

Present Worth: *$993,000*
Capital Cost: *$423,000*
Annual Costs (30 years): *$19,000*

Alternative 4: Soil Removal and Enhanced Bioremediation of Groundwater

This alternative builds on the soil removal specified in Alternative 3, and also provides for accelerated biological treatment of contaminated groundwater.

Following excavation of the source area, enhanced in-situ bioremediation will be employed to treat PCE and related contaminants in groundwater. Emulsified activated carbon would be injected into the remaining overburden soils to encourage and hasten the bacterial decay of contaminants. The treatment would be applied over an area of approximately 7000 square feet, where groundwater contaminant concentrations exceed 500 ppb. It is estimated that approximately 110 injection points would be required, spaced approximately 7 feet apart. A single round of injections is anticipated, but could be repeated if the first round fails to meet cleanup objectives.

Institutional controls would be required similar to those involved in Alternative 3. However, it is anticipated that groundwater monitoring and use controls could be discontinued sooner, since the more aggressive treatment of contaminated groundwater is expected to degrade the plume more quickly than the natural attenuation approach called for in Alternative 3. Continuation of ICs would be determined based on the results of the groundwater monitoring program.

An SMP is also necessary for the groundwater monitoring program.

Present Worth: *$1,554,000*
Capital Cost: *$804,000*
Annual Costs: *$25,000*

Alternative 5: Soil Removal and In-Situ Chemical Oxidation of Groundwater

This alternative builds on Alternatives 3 and 4 by combining source removal with an alternative groundwater treatment technology based on direct chemical destruction of the contaminants.

Following excavation of the source area as described in the Alternatives above, in-situ chemical oxidation (ISCO) would be implemented to destroy remaining contaminants in groundwater. Chemical oxidants would be injected into the remaining overburden soils to react with the contaminants and destroy them in place. It is estimated that 24 injection points will be required, spaced approximately 15 feet apart. Two rounds of chemical injection are

anticipated, although injections could be repeated if the initial effort falls short of treatment objectives. The specific oxidant to be employed would be determined during remedial design.

Institutional controls would be required similar to those involved in Alternatives 3 and 4. However, it is anticipated that groundwater monitoring and use controls could be discontinued sooner, since the more aggressive treatment of contaminated groundwater is expected to degrade the plume more quickly than the natural attenuation approach called for in Alternative 3. Continuation of ICs would be determined based on the results of the groundwater monitoring program.

An SMP is also necessary for the groundwater monitoring program.

Present Worth: *$2,075,000*
Capital Cost: *$1,235,000*
Annual Costs: *$28,000*

Exhibit C

Remedial Alternative Costs

Remedial Alternative	Capital Cost ($)	Annual Costs ($)	Total Present Worth ($)
Alternative 1	0	0	0
Alternative 2	9,483,000	31,000	10,408,000
Alternative 3	423,000	19,000	993,000
Alternative 4	804,000	25,000	1,554,000
Alternative 5	1,235,000	28,000	2,075,000

Exhibit D

SUMMARY OF THE PROPOSED REMEDY

The Department is proposing Alternative 4, **Soil Removal and Enhanced Bioremediation of Groundwater** as the remedy for this site. Alternative 4 would achieve the remediation goals for the site by removing the source of the contamination in soil and significantly reducing the concentration of contaminants in the groundwater through in-situ treatment. The elements of this remedy are described in Section 7. The proposed remedy is depicted in Figures 6 and 7.

Basis for Selection

The proposed remedy is based on the results of the RI and the evaluation of alternatives. The criteria to which potential remedial alternatives are compared are defined in 6 NYCRR Part 375. 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.

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.

Alternative 1 (No Further Action) does not provide any protection to public health and the environment and thus will not be evaluated further.

The proposed remedy, Alternative 4 would satisfy this criterion by removing the contaminated soils that are the source of the groundwater contamination plume and thereby addressing the most significant threat to public health and the environment. Alternative 4 also treats the groundwater providing further health and environmental protection by reducing the potential for soil vapor intrusion at nearby structures from the overburden groundwater plume. Alternative 2, by removing all contaminated soil and treating groundwater, meets the threshold criteria with a high degree of certainty. Alternatives 3 and 5 also comply with this criterion because they would remove the source of the contamination.

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.

All of the retained Alternatives, 2 through 5, comply with SCGs, but do so to different degrees over different time scales. Alternative 4 complies with SCGs to the extent practicable. It addresses the source area of contamination in soil by excavation and removal to meet soil SCOs in the off-site source area. Alternative 4 also will help reduce the levels of contamination in groundwater to meet groundwater standards in the overburden groundwater plume over time. Alternative 2 complies with this criterion to the highest degree of certainty by removing all soil above SCOs and treating groundwater contamination to levels to reach groundwater quality standards. Alternative 3 would comply with SCGs over a longer time period, but would rely on natural decay and dilution processes which could take many years to be fully effective. Alternative 5 offers a level of SCG compliance comparable with Alternative 4, by using a different approach to destroying groundwater contaminants and would extend the treatment from the overburden downward into the bedrock aquifer.

The next six "primary balancing criteria" are used to compare the positive and negative aspects of each of the remedial strategies.

3. 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.

Alternative 2 provides the most long-term effectiveness and permanence since it will remove all of the soil contamination. Alternative 2 also provides extensive groundwater treatment for both the overburden and bedrock groundwater thus limiting the long term potential for soil vapor intrusion and groundwater use restrictions. Alternatives 3, 4 and 5 all provide a high degree of long term effectiveness with regards to soil by removing most of the contaminated soil. Alternatives 4 and 5 also provide additional long term effectiveness for groundwater by treating the areas of highest contamination within the groundwater plume, although to a lesser degree of effectiveness than Alternative 2. Alternatives 3, 4 and 5 are all expected to have groundwater use restrictions, but the restrictions for Alternative 4 and 5 are expected to be shorter in duration due to their additional groundwater treatment. Soil vapor intrusion potential would also be lower for Alternatives 4 and 5 as compared to Alternative 3, but not as low as Alternative 2.

4. 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.

Alternative 2 provides the most reduction in toxicity, mobility and volume as it removes all of the soil contamination near the site. Alternative 2 also treats the greatest volume of groundwater thus, reducing the most toxicity and mobility for both the bedrock and overburden groundwater plumes.

Alternatives 3, 4 and 5 reduce the toxicity, mobility and volume of soil contamination by excavating and removing the off-site source material and disposing at an approved location. Alternative 4 and 5 provide additional reduction of toxicity, mobility and volume of contamination by treating the areas of highest groundwater contamination in the overburden groundwater plume.

5. Short-term Impacts and 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.

Alternatives 2 through 5 all have short-term impacts associated with their activities. Each alternative consists of intrusive ground activities to excavate contaminated soil, which may temporarily disrupt the activities of the local Department of Public Works (DPW) and the surrounding residential and commercial properties. Such disruptions can be minimized with careful coordination with surrounding landowners during the remedial design. A community air monitoring plan (CAMP) and health and safety plan (HASP) would be necessary during remediation activities for each of the Alternatives. However, Alternative 2 would have much greater short term impact due to the additional excavation and intense short term in-situ injection program. The time to perform the active remedy is approximately 6 months. Alternatives 3, 4, and 5 would all have much less short term impact due to the more limited source area removal and the intermittent injection schedule over a smaller area. The time to perform these remedies would be from 2 to 3 months. Alternative 2 is expected to achieve remedial objectives the fastest for the remediation of both soil and groundwater. Alternatives 3, 4 and 5 all achieve remedial objectives

for soil at an acceptable effectiveness in the short term. In addition, Alternatives 4 and 5 are expected to provide for short-term effectiveness in the groundwater because they actively treat the overburden plume whereas Alternative 3 does not.

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.

Alternatives 2, 3, 4 and 5 are all technologically implementable with available methods, equipment, material and services. Alternative 2 would be the most difficult to implement because of the challenges associated with the depth of soil removal and with excavating below the water table. Alternative 2 also must deal with the challenges of treating bedrock groundwater contamination. In situ treatment of bedrock groundwater has proven difficult to accomplish at other sites, due to the complex pattern of bedrock fractures along which the injected fluid would need to move.

Alternative 3, 4 and 5 are all equally implementable in terms of soil remediation. The excavation activities for these remedies are more implementable than Alternative 2 because excavation below the water table will not be necessary to remove the bulk of the contaminated soil. The groundwater treatment proposed in Alternatives 4 and 5 is readily implementable. Potential administrative challenges exist for each remedy as portions of the DPW yard would need to be shut down during the excavation activities. In addition there may be additional administrative challenges for Alternative 2 regarding access, because groundwater treatment would be required on off-site residential properties.

7. Cost-Effectiveness. 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 of the alternatives vary significantly. Although Alternative 3 has the lowest present worth cost, the remedy would not actively address the contamination in groundwater. Since Alternative 2 requires the largest volume of soil to be handled and calls for additional bedrock groundwater treatment, it would have the highest present worth cost of all the alternatives. The costs associated with Alternatives 4 and 5 are much less expensive than Alternative 2, yet the remedies would provide similar overall levels of protection for human health and the environment. The total present worth cost of Alternatives 4 is lower than Alternative 5 primarily because it is anticipated to have a lower initial capital cost due to only one injection event anticipated. The annual monitoring and maintenance costs are similar for the remedies with Alternative 2 expected to have the shortest maintenance period and Alternative 3 the longest.

8. Land Use. When cleanup to pre-disposal conditions is determined to be infeasible, the Department may consider the current, intended, and reasonable anticipated future land use of the site and its surroundings in the selection of the soil remedy.

The anticipated use of the site is commercial and the dry cleaner and surrounding buildings are all actively occupied. Thus, Alternative 3 is the least desirable remedy because soil vapor intrusion concerns will remain for the foreseeable future since the alternative does not actively address groundwater contamination. Alternatives 2, 4 and 5 are more desirable because they not only remove contaminated soil but also treat groundwater thereby

helping to address soil vapor intrusion issues. All of the alternatives require some degree of site management. Alternative 2 is expected to require the least amount of site management with Alternative 4 and 5 needing moderate site management activities. Alternative 3 requires the most site management because it is anticipated that to result in the most remaining contamination that would need to be monitored.

The final criterion, Community Acceptance, 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.

9. Community Acceptance. Concerns of the community regarding the investigation, the evaluation of alternatives, 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.

Alternative 4 is being proposed because, as described above, it satisfies the threshold criteria and provides the best balance of the balancing criterion.

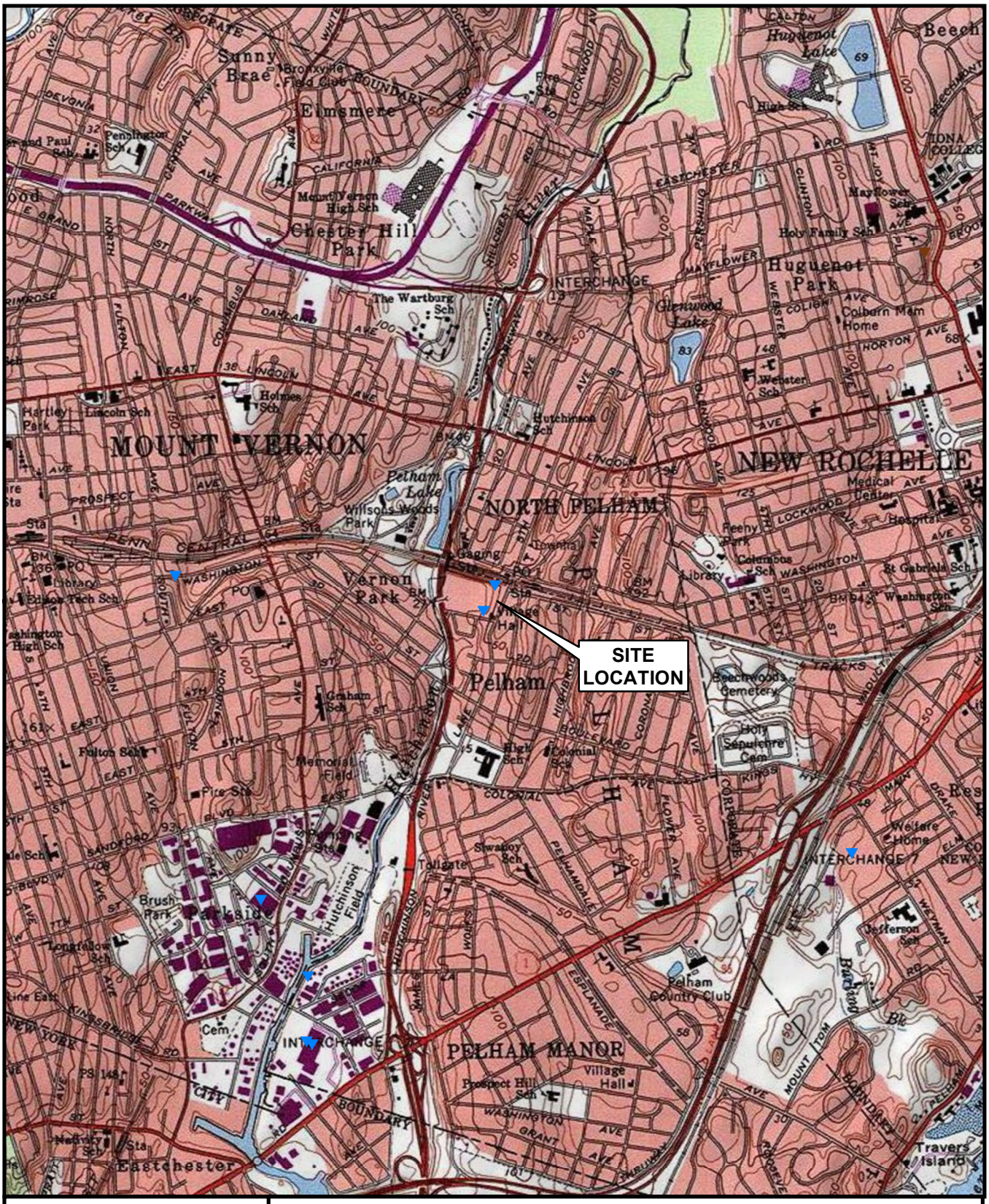


Figure 1

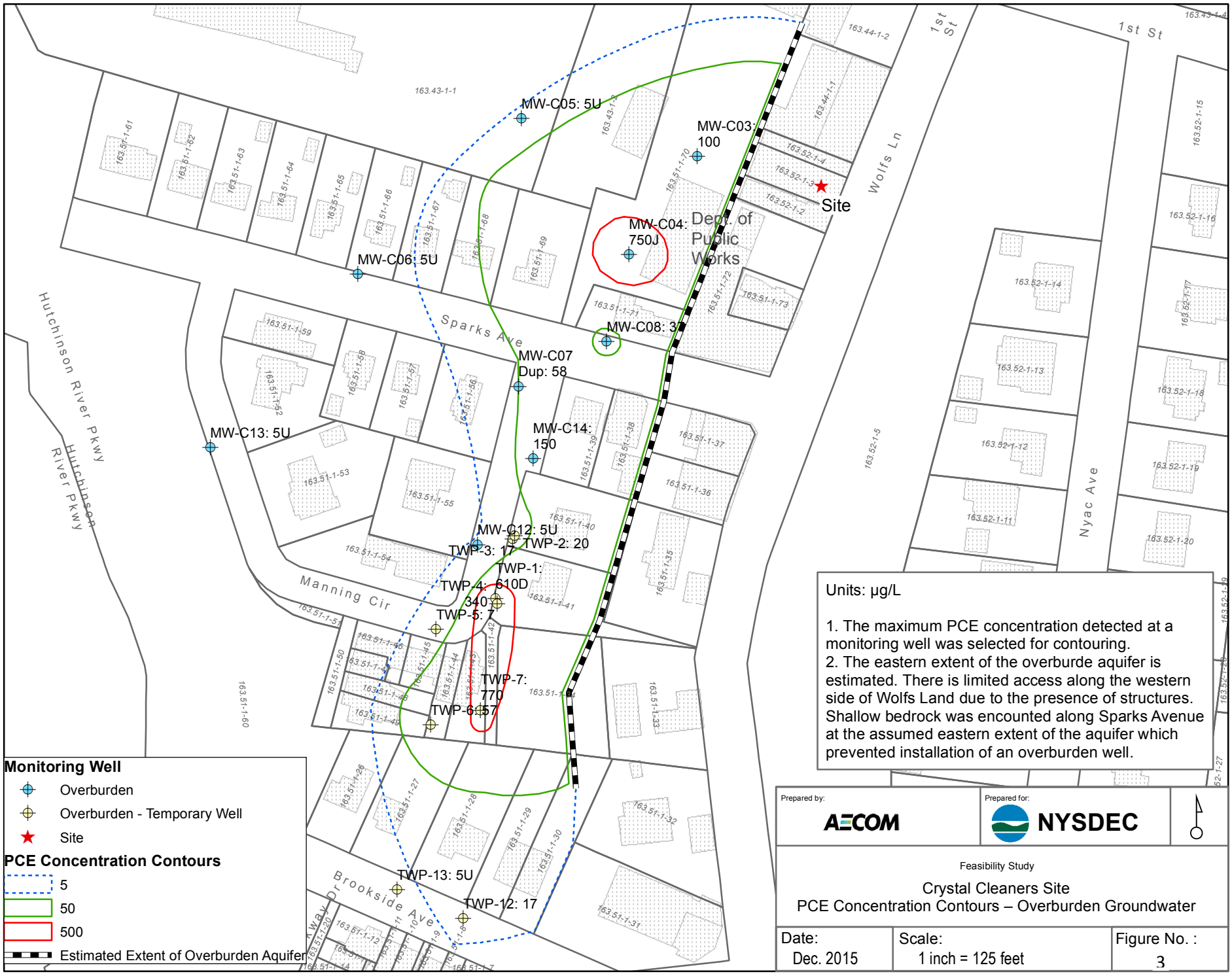
Site Location Map

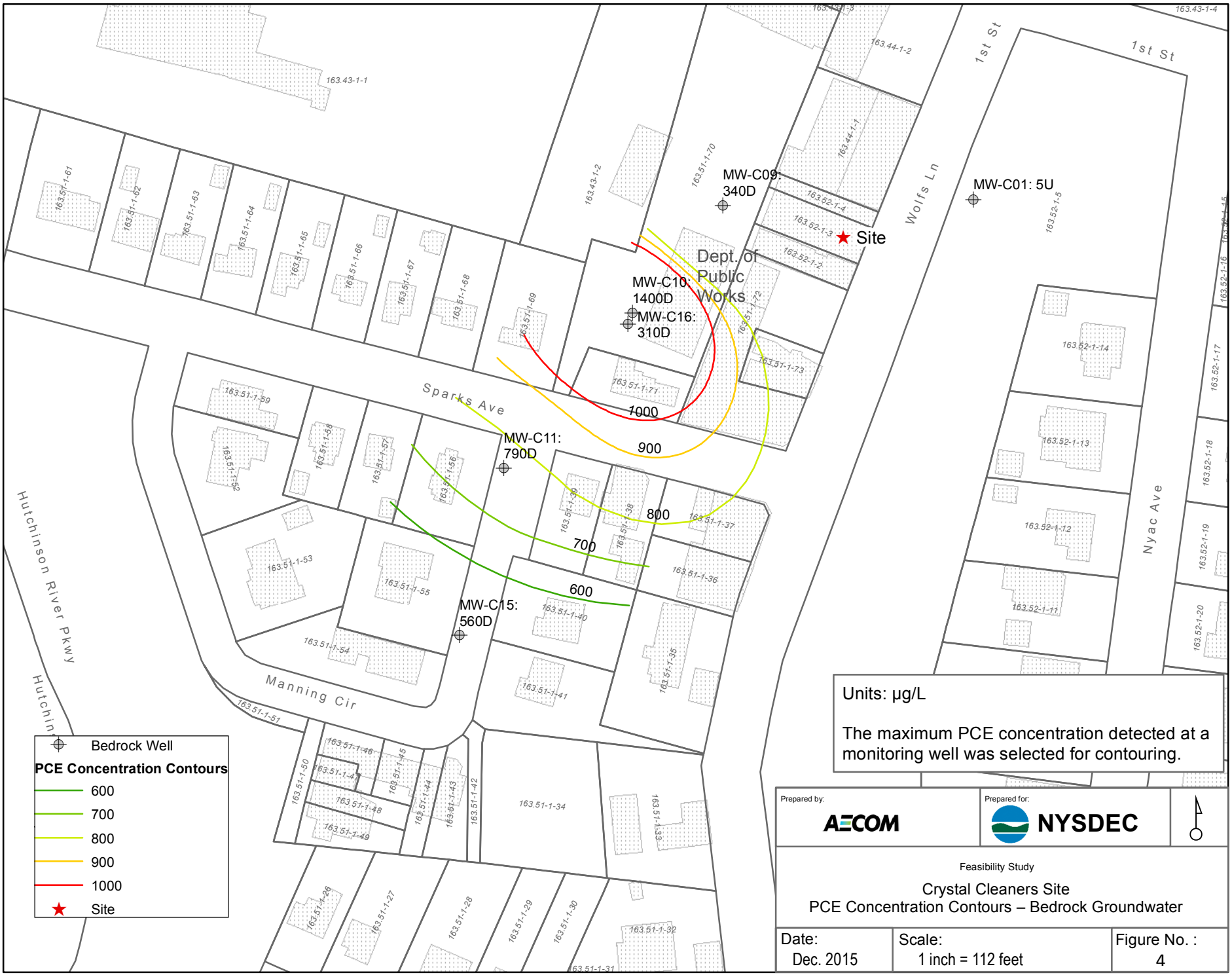
Crystal Cleaners Site
Village of Pelham
Westchester County
Site No. 360053

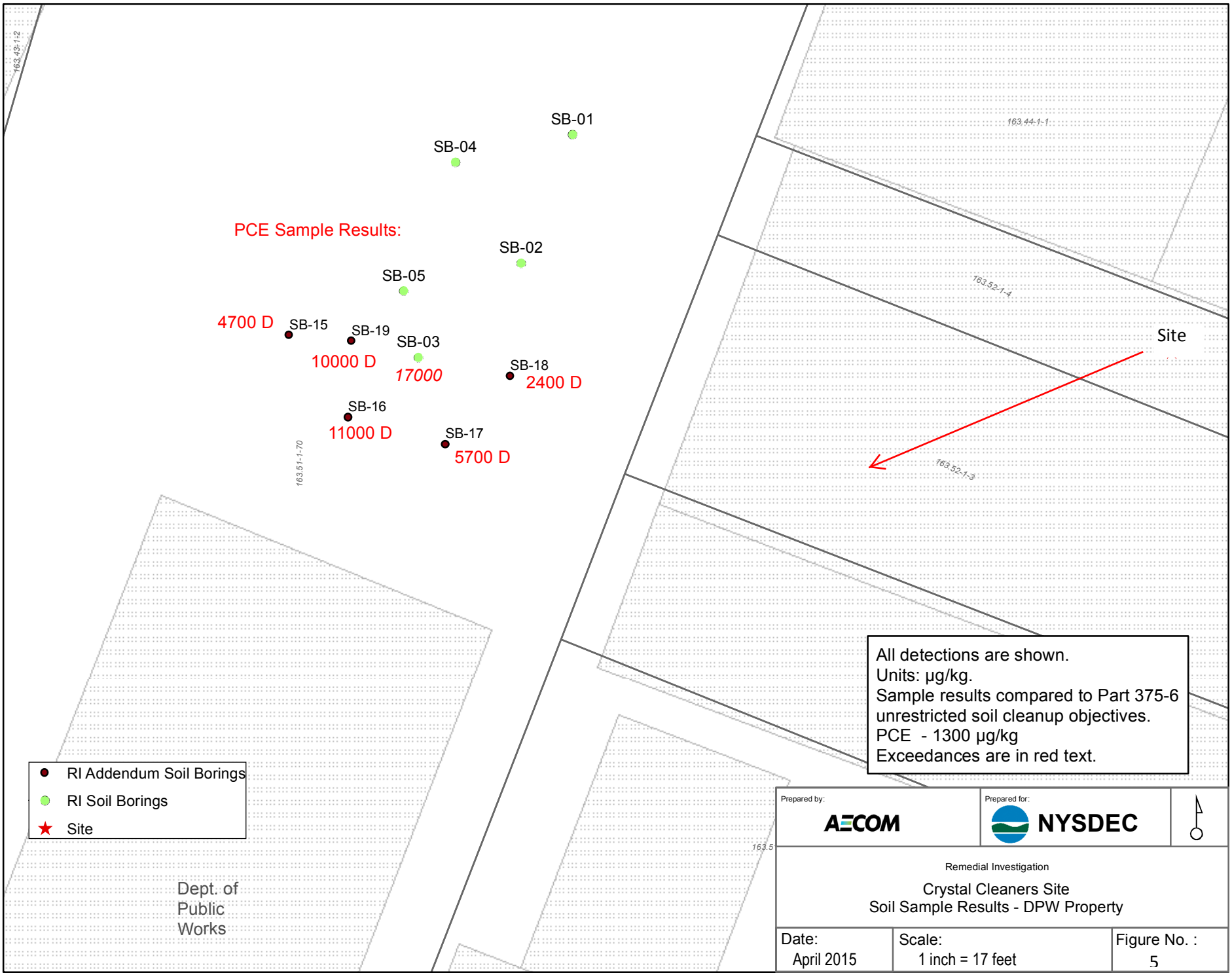
DEPARTMENT OF ENVIRONMENTAL CONSERVATION • NEW YORK STATE •

Crystal Cleaners Site Property Boundary

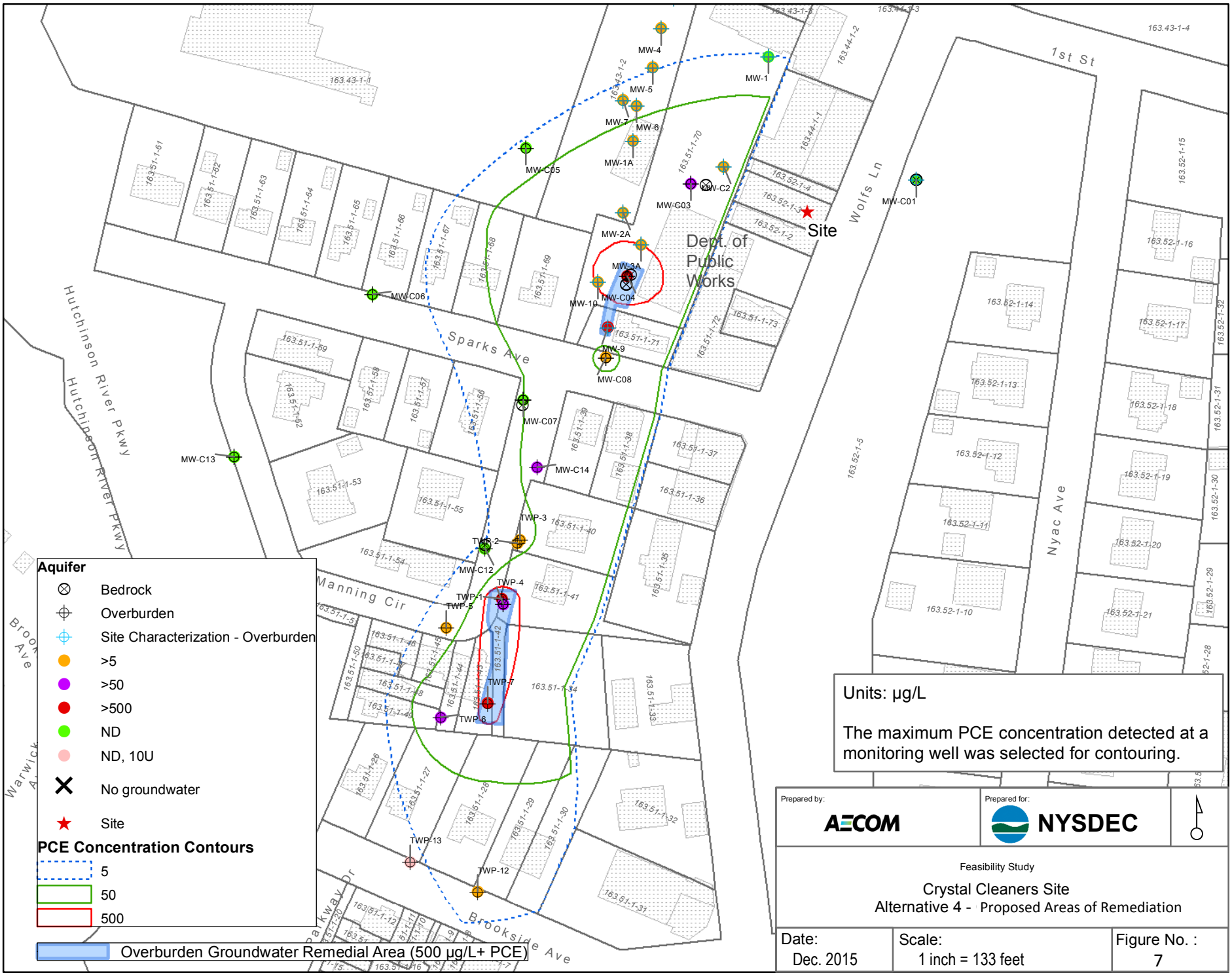
PRAP Figure 2


MW-C05: 5U
MW-C03: 100
Site
MW-C04: 750J
Dept. of Public Works
MW-C06: 5U
MW-C08: 37
MW-C07 Dup: 58
MW-C13: 5U
MW-C14: 150
MW-C12: 5U
TWP-3: 17
TWP-2: 20
TWP-1: 610D
TWP-4: 340
TWP-5: 7
TWP-7: 770
TWP-6: 57
TWP-13: 5U
TWP-12: 17
Sparks Ave
Manning Cir
Brookside Ave
Wolfs Ln
1st St
Nyac Ave
Hutchinson River Pkwy
Units: µg/L
1. The maximum PCE concentration detected at a monitoring well was selected for contouring.
2. The eastern extent of the overburde aquifer is estimated. There is limited access along the western side of Wolfs Land due to the presence of structures. Shallow bedrock was encounted along Sparks Avenue at the assumed eastern extent of the aquifer which prevented installation of an overburden well.
Monitoring Well
Overburden
Overburden - Temporary Well
Site
PCE Concentration Contours
5
50
500
Estimated Extent of Overburden Aquifer
Prepared by:
AECOM
Prepared for:
NYSDEC
Feasibility Study
Crystal Cleaners Site
PCE Concentration Contours – Overburden Groundwater
Date:
Dec. 2015
Scale:
1 inch = 125 feet
Figure No. :
3


MW-C09: 340D
MW-C01: 5U
Site
Dept. of Public Works
MW-C10: 1400D
MW-C16: 310D
MW-C11: 790D
MW-C15: 560D
1000
900
800
700
600
Sparks Ave
Wolfs Ln
1st St
1st St
Nyac Ave
Manning Cir
Hutchinson River Pkwy
Bedrock Well
PCE Concentration Contours
600
700
800
900
1000
Site
Units: µg/L
The maximum PCE concentration detected at a monitoring well was selected for contouring.
Prepared by:
AECOM
Prepared for:
NYSDEC
Feasibility Study
Crystal Cleaners Site
PCE Concentration Contours – Bedrock Groundwater
Date:
Dec. 2015
Scale:
1 inch = 112 feet
Figure No. :
4


SB-01
SB-04
PCE Sample Results:
SB-02
SB-05
4700 D
SB-15
SB-19
SB-03
10000 D
17000
SB-18
2400 D
SB-16
11000 D
SB-17
5700 D
Site
All detections are shown.
Units: µg/kg.
Sample results compared to Part 375-6 unrestricted soil cleanup objectives.
PCE - 1300 µg/kg
Exceedances are in red text.
RI Addendum Soil Borings
RI Soil Borings
Site
Dept. of Public Works
Prepared by:
AECOM
Prepared for:
NYSDEC
Remedial Investigation
Crystal Cleaners Site
Soil Sample Results - DPW Property
Date:
April 2015
Scale:
1 inch = 17 feet
Figure No. :
5


163.43-1-1
163.43-1-2
163.44-1-1
163.52-1-4
163.52-1-3
163.52-1-2
163.51-1-70
163.51-1-69
163.51-1-72
Dumpsters, Concrete Pad, Utility Runs
Concrete Pad, Equipment
Dept. of Public Works
Site
SB-1 5.2U
SB-4 5.4U
SB-2 4.8J
SB-5 93
SB-15 4700
SB-19 10000
SB-3 17000
SB-18 2400
SB-16 1000
SB-17 5700
SB-9 5.6U
PCE concentrations are listed.
Units: µg/kg.
Sample results compared to Part 375-6 unrestricted soil cleanup objectives.
PCE - 1300 µg/kg
Exceedances are in red text.
Soil Borings
Overburden - Temporary Well Borings
Site
Soil Removal Area
Structure
Lots
Prepared by:
AECOM
Prepared for:
NYSDEC
Feasibility Study
Proposed Crystal Cleaners Site Soil Removal Area
Date: Feb. 2015
Scale: 1 inch = 32 feet
Figure No. : 6


MW-4
MW-5
MW-7
MW-6
MW-1A
MW-1
MW-C05
MW-C2
MW-C03
MW-C01
Site
MW-2A
MW-3A
MW-C04
MW-10
MW-9
MW-C08
MW-C06
MW-C07
MW-C13
MW-C14
TWP-3
TWP-2
MW-C12
TWP-4
TWP-1
TWP-5
TWP-7
TWP-6
TWP-13
TWP-12
Dept. of Public Works
Sparks Ave
Hutchinson River Pkwy
Hutchinson River Pkwy
Manning Cir
Brookside Ave
Parkway Dr
Wolfs Ln
1st St
Nyac Ave
Aquifer
Bedrock
Overburden
Site Characterization - Overburden
>5
>50
>500
ND
ND, 10U
No groundwater
Site
PCE Concentration Contours
5
50
500
Overburden Groundwater Remedial Area (500 µg/L+ PCE)
Units: µg/L
The maximum PCE concentration detected at a monitoring well was selected for contouring.
Prepared by:
AECOM
Prepared for:
NYSDEC
Feasibility Study
Crystal Cleaners Site
Alternative 4 - Proposed Areas of Remediation
Date:
Dec. 2015
Scale:
1 inch = 133 feet
Figure No. :
7