

REMEDIAL WORK PLAN

FOR

**FORMER IMPERIAL CLEANERS SITE
218 LAKEVILLE ROAD
LAKE SUCCESS, NEW YORK 11020**

SITE #C130225

FEBRUARY 2019

PREPARED FOR:

**NYSDEC
DIVISION OF ENVIRONMENTAL REMEDIATION
625 BROADWAY
ALBANY, NEW YORK 12233-7020**

WALDEN ENVIRONMENTAL ENGINEERING, PLLC

Industry Leader in Environmental Engineering Consulting

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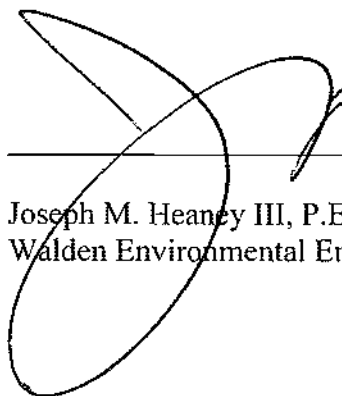
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Professional Engineer Certification

I, Joseph M. Heaney III, P.E. certify that I am currently a New York State registered professional engineer and that this *Remedial Work Plan* report, dated February 6, 2019, was prepared in accordance with all applicable statutes and regulations and in substantial conformance with the DER Technical Guidance for Site Investigation and Remediation (DER-10).

I further certify that this submittal, *Remedial Work Plan*, dated February 6, 2019, was prepared under my direction.



Joseph M. Heaney III, P.E.
Walden Environmental Engineering, PLLC

2/6/2019
Date

1 INTRODUCTION

This *Remedial Work Plan* (RWP) describes the remedial alternative to be implemented at the Former Imperial Cleaners Site, 218 Lakeville Road, Lake Success, New York (the “Site” or “Subject Property”). Walden Environmental Engineering, PLLC (Walden) has prepared this RWP on behalf of 218 Lakeville Aquisition LLC, the Owner of the Subject Property. The remedial alternative will address residual VOC contamination identified during a February 2016 soil vapor intrusion (SVI) investigation, as summarized in the *Soil Vapor Intrusion Investigation Summary Report* (Walden, May 4, 2017) submitted to the New York State Department of Environmental Conservation (NYSDEC) and the New York State Department of Health (NYSDOH). The remedial alternative detailed in this RWP will achieve the remedial action objectives for the Subject Property and will support Site closure and development of a Site Management Plan.

The Subject Property’s previous owner, 218 Lakeville Associates L.P., entered into Voluntary Cleanup Agreement (VCA) #D1-30001-01-03 with the NYSDEC, effective April 18, 2001, to address VOC contamination associated with the Former Imperial Cleaners Site. At that time, the Subject Property was assigned Voluntary Cleanup Program (VCP) Site No. V-00244-1.

When 218 Lakeville Aquisition LLC purchased the Site on July 28, 2015, the VCA was amended to reflect the change in property ownership. In April 2017, the NYSDEC notified 218 Lakeville Aquisition LLC that the Voluntary Cleanup Program was being terminated, as of March 31, 2018. Therefore, the Owner submitted a Brownfields Cleanup Program (BCP) application and supporting documentation to NYSDEC in order to complete the required remediation, site closure and post-closure management as a Volunteer participant in the BCP. NYSDEC approved the BCP application and the Former Imperial Cleaners Site was accepted into the Brownfield program and assigned Site #C130225. The Brownfield Cleanup Agreement (BCA, Index No. C130225-01-18) was fully executed by 218 Lakeville Aquisition LLC (hereinafter “Volunteer”) and the NYSDEC on February 12, 2018.

This RWP was prepared in accordance with the requirements specified in NYSDEC DER-10 (*Technical Guidance for Site Investigation and Remediation*) and includes Section 4: Alternatives Analysis (prepared in accordance with DER-10) which establishes the basis for the selected remedial alternative to achieve the remedial action objectives for the Subject Property.

2 SITE DESCRIPTION AND HISTORY

2.1 Site Description

The Subject Property location is illustrated on Figure 1. The Subject Property is a commercial center with a one-story building occupying approximately 4,250 square feet, with one active tenant (Tobacco Plaza, Ltd.) and three vacant spaces as shown on Figure 2. Residential land uses are located south and directly west of the Site. The basement of the on-site building has concrete block walls and a poured concrete floor slab. Outside the building footprint, the property is completely paved. Sanitary wastewater from the building is discharged to two on-site septic systems (shown on Figure 3) as there are no public sewers available near the Site. Note that there is a perched water table underlying the Site at approximately 30 feet below grade, a confining clay layer approximately 35 to 50 feet below grade, and the groundwater table is located approximately 150 feet below land surface. Groundwater flow at the Site varies from west to west-northwest. Six (6) new piezometers will be installed at the Site as discussed in Section 5 to obtain water quality data and to verify the current groundwater flow direction in the vicinity of the Site.

2.2 Site History and Investigations/Remediation by Previous Owner

A release of tetrachloroethylene (PCE) at the Site was first noted in 1995. The PCE contamination was suspected to originate from floor drains within the tenant space occupied by a dry cleaner (former Imperial Cleaners) at that time and from a leaching pool and dry well on the property that were associated with the former dry-cleaner operations. A site investigation followed to identify source areas and determine the extent of contaminated soil and groundwater at the Site. The site investigation and remediation work described below was conducted by 218 Lakeville Associates L.P., the previous owner of the Subject Property, as required by NYSDEC under the VCP.

Contaminated sediments were removed from the source areas (dry well, interior floor drains, and leaching pool associated with the former Imperial Cleaners operations) in 1996 and 2000 to the extent possible without undermining the structures. Post-excavation endpoint soil sampling following the source area removal actions indicated that volatile organic compounds (VOCs) remained in the subsurface at concentrations above the NYSDEC TAGM 4046 Recommended Cleanup Objectives. However, no additional materials were removed because it was determined that further excavation would threaten the integrity of the structures. 218 Lakeville Associates L.P. then installed a soil vapor extraction (SVE) system to remove VOC vapors remaining in the soil in order to address the source areas and improve soil and groundwater quality. The SVE system which consisted of eight soil vapor extraction wells began operating in 2001. A

soil, soil gas, groundwater and indoor air monitoring program was implemented to track the reductions in VOC concentrations achieved by operation of the SVE system under the VCP.

Site closure sampling (soil, soil vapor and indoor air perc badge sampling) was conducted in November 2007 – January 2008 in accordance with a NYSDEC approved work plan. The closure sampling results indicated that the SVE system had successfully reduced soil contaminant concentrations to below the NYSDEC TAGM 4046 Recommended Cleanup Objectives. Permanent shutdown of the SVE system was recommended based on the 2007-2008 closure sampling results. 218 Lakeville Associates L.P., the previous Site owner subsequently shut down the SVE system circa 2008 without approval from NYSDEC and NYSDOH. These activities occurred approximately seven (7) years before the current Owner/Volunteer purchased the site or had any involvement in the Site.

2.3 Requestor’s February 2016 Soil Vapor Intrusion Investigation

After 218 Lakeville Aquisition LLC purchased the Subject Property from 218 Lakeville Associates L.P. in July 2015, an SVI investigation was conducted to address the potential for vapor intrusion from contaminated soil vapor and potential impacts on indoor air quality at the Site and neighboring off-site properties. The SVI investigation was completed in accordance with the NYSDEC approved *Soil Vapor Intrusion Investigation Work Plan* (Work Plan; Walden, December 2015) which was developed in accordance with the guidelines set forth in NYSDEC *DER-13: Strategy for Evaluating Soil Vapor Intrusion at Remedial Sites in New York* (issued October 18, 2006) and *NYSDOH Guidance for Evaluating Soil Vapor Intrusion in the State of New York* (dated October 2006, with updates). The field work was completed in February 2016 (during the 2015-2016 heating season) and consisted of sub-slab vapor, indoor air, and outdoor air sampling and analysis.

The February 2016 SVI investigation results and conclusions are presented in the *Soil Vapor Intrusion Investigation Summary Report* (Walden, May 4, 2017) which was submitted to NYSDEC and NYSDOH. The significant SVI investigation findings are summarized as follows:

- The sub-slab sampling results revealed that vapors (mainly PCE and breakdown products TCE and cis-1,2-DCE) attributable to the historic release of VOCs at the Former Imperial Cleaners Site remain in the subsurface. The former SVE remedial system which had been installed and operated at the Site by the previous owner (218 Lakeville Associates L.P.) achieved significant reductions in VOC concentrations by 2008, leading the previous Site owner to shut down the system

without prior approval from NYSDEC and NYSDOH. The February 2016 SVI sampling results show that VOC concentrations had rebounded.

- Based on a comparison of the target compound concentrations reported for the February 2016 sub-slab and indoor air samples to the concentration ranges compared in the NYSDOH SVI decision matrices, mitigation is recommended for 218 Lakeville Road, 2 University Place and 4 University Place to address potential soil vapor intrusion impacts and prevent exposure to VOCs in indoor air.
- The NYSDOH decision matrix comparison for 220 Lakeville Road indicates that monitoring is recommended to ensure that residual VOCs do not impact indoor air at this location. [Note that the NYSDOH decision matrices were updated in May 2017 after the *Soil Vapor Intrusion Investigation Summary Report* was submitted. The updated NYSDOH decision matrix comparison recommends no further action at 220 Lakeville Road based on the PCE and TCE concentrations found during the February 2016 SVI investigation.]
- Because the owner of 216 Lakeville Road refused to grant permission for an indoor sub-slab vapor sample to be collected at this property during the February 2016 SVI investigation, 216 Lakeville Road will be included in the off-site sampling to be conducted as part of the remedy presented in this RWP as discussed further in Section 5. All future sampling at off-site properties, including 216 Lakeville Road, shall be subject to the Volunteer obtaining access and permission from the off-site property owners to enter and conduct the sampling activities.

The May 2017 SVI summary report recommended the following actions based on the SVI investigation results:

- Install sub-slab depressurization (SSD) systems at 218 Lakeville Road, 2 University Place and 4 University Place to prevent VOC vapor migration into the buildings.
 - Please note that based on the Alternatives Analysis presented in Section 4 below, the selected remedial alternative detailed in this RWP includes installation of a soil vapor extraction (SVE) remediation system and removal of contaminant sources (based on the 6 NYCRR 375-6.8(b) soil cleanup objectives based on the lower value for protection of groundwater or commercial site use), a more aggressive and protective alternative to actively

remove contaminants and control vapor migration as compared to the passive SSD approach previously considered.

- Conduct monitoring at 220 Lakeville Road during subsequent heating season(s) in accordance with the October 2006 Guidance for Evaluating Soil Vapor Intrusion in the State of New York, with updates.

These recommendations guide the development of the remedial alternative detailed in this RWP.

2.4 Exposure Assessment

The potential for exposure due to ingestion or direct contact with VOC contaminated soil is unlikely given the existing Site conditions (the Site is either covered by the building footprint or paved), the planned continued commercial use of the Subject Property, and the controls that prevent completed exposure pathways (i.e., environmental easements, Site Management Plan).

Since the Site is covered by buildings and pavement, people will not come into contact with Site-related soil and groundwater contamination unless they dig below the surface. Contaminated groundwater at the Site is not used for drinking or other purposes and the Site is served by a public water supply that obtains water from a different source not affected by this contamination. Volatile organic compounds may move into the soil vapor (air spaces within the soil), which in turn may move into buildings and affect the indoor air quality. This process, which is similar to the movement of radon gas from the subsurface into the indoor air of buildings, is referred to as soil vapor intrusion. Soil vapor intrusion sampling conducted in February 2016 identified impacts to indoor air quality. This impact was identified in one on-site building and four off-site buildings and represents a health concern. The potential exists for additional indoor air quality impacts off-site; however, insufficient information exists to fully evaluate this exposure pathway at this time.

Other pathways of potential exposure to VOCs remaining in the subsurface would occur if ground breaking activity disturbs soil on-site, releasing soil vapors, creating the possibility of exposure to contaminants due to inhalation by on-site-workers or other individuals. Such exposures can be controlled through engineering measures during construction such as the Health and Safety Plan (HASP) and Community Air Monitoring Plan (CAMP). In addition, controls will be established in the Site Management Plan (to be reviewed and approved by NYSDEC and NYSDOH) to prevent future exposure pathways. If institutional controls are required to restrict or prohibit certain uses or future development of the Site (based on the Site conditions), environmental easement(s) will be prepared and executed in accordance with the procedures established by NYSDEC.

3 REMEDIAL ACTION OBJECTIVES

Based on the February 2016 SVI investigation results and the Owner's plans to continue commercial use of the Subject Property, remedial action objectives have been developed to guide the selection of an appropriate remedial alternative for the Site and to support future development of Site closure/management plans.

The State of New York does not have any Standards, Criteria and Guidance (SCG) values for concentrations of volatile chemicals in subsurface vapors, so the sub-slab vapor concentrations cannot be compared to any regulatory threshold values. However, the sub-slab vapor concentrations factor into the decision matrices contained in the NYSDOH SVI guidance. The SVI decision matrices consider the concentrations of PCE, TCE, cis-1,2-dichloroethene (cis-1,2-DCE), and several other VOCs detected in indoor air samples and sub-slab vapor samples collected concurrently at the same location. The matrices recommend actions (monitoring and/or mitigation) intended to address soil vapor intrusion exposures based on the relationship between the sub-slab vapor and corresponding indoor air concentrations at a given sampling location.

The NYSDOH SVI decision matrix evaluation based on the February 2016 sampling results recommends mitigation to prevent potential indoor air quality impacts at 218 Lakeville Road and the residences at 2 and 4 University Place. The VOCs of concern associated with the Site are PCE, TCE and cis-1,2-DCE.

The SCG values that apply to remediation of the Subject Property are as follows:

- Contaminant concentrations in soil are subject to the NYSDEC soil cleanup objectives (SCOs) based on the lower value for protection of groundwater or commercial use (consistent with current and planned Site use and zoning) as set forth in 6 NYCRR 375-6.8(b). The Part 375 SCOs for the contaminants of concern are listed below. All exceedances of applicable Part 375 SCOs shall be evaluated and addressed.
 - PCE – 1.3 mg/kg (protection of groundwater SCO); 150 mg/kg (commercial use SCO)
 - TCE – 0.47 mg/kg (protection of groundwater SCO); 200 mg/kg (commercial use SCO)
 - Cis-1,2-DCE – 0.25 mg/kg (protection of groundwater SCO); 500 mg/kg (commercial use SCO)
- The New York State Department of Health Final Soil Vapor Intrusion Guidance (latest update May 2017) decision matrices recommend mitigation based on indoor air and sub-slab vapor concentrations as follows:

- PCE (Matrix B) - indoor air concentration 10 µg/m³ and above AND sub-slab vapor concentration 100 µg/m³ and above; OR sub-slab vapor concentration 1,000 µg/m³ and above (regardless of indoor air concentration)
- TCE (Matrix A) - indoor air concentration 1 µg/m³ and above AND sub-slab vapor concentration 6 µg/m³ and above; OR sub-slab vapor concentration 60 µg/m³ and above (regardless of indoor air concentration)
- Cis-1,2-DCE (Matrix A) - indoor air concentration 1 µg/m³ and above AND sub-slab vapor concentration 6 µg/m³ and above; OR sub-slab vapor concentration 60 µg/m³ and above (regardless of indoor air concentration)

The selected remedial alternative described in this RWP will be designed to meet the following NYSDEC generic remedial action objectives (RAOs):

- Generic RAO for Soil - Prevent ingestion/direct contact with contaminated soil.
- Generic RAO for Soil - Prevent inhalation exposure to contaminants volatilizing from soil.
- Generic RAO for Soil Vapor - Mitigate impacts to public health resulting from existing, or the potential for, soil vapor intrusion into buildings at a site.
- Generic RAO for Groundwater - Prevent ingestion of groundwater with contaminant levels exceeding drinking water standards.
- Generic RAO for Groundwater - Prevent contact with, or inhalation of volatiles, from contaminated groundwater.

After the BCA was fully executed, representatives of the Site Owner, NYSDEC and NYSDOH met on March 13, 2018 to discuss the remedial action plan. The State voiced a concern that VOC vapors may have migrated beyond the four (4) off-site properties included in the February 2016 SVI sampling. Therefore, the State requested SVI sampling at an additional seven (7) off-site properties to evaluate the potential for indoor air quality impacts due to VOC vapors from the Site. These additional off-site properties, as shown on Figure 4, will be included in the next round of SVI sampling (indoor air and sub-slab vapor) to be conducted during the 2018-2019 heating season. If the sampling results indicate impacts at any of these off-site properties, appropriate remedial measures shall be evaluated and implemented to prevent future vapor intrusion impacts. The State will evaluate all additional SVI data and will make recommendations/determinations about any additional actions based on the data.

Note that all sampling at off-site properties shall be subject to the Volunteer obtaining access and permission from the off-site property owners. NYSDOH has agreed to assist the Volunteer in pursuing access approvals, as needed.

4 ALTERNATIVES ANALYSIS

This Alternatives Analysis (AA) has been prepared in accordance with the requirements specified in NYSDEC DER-10 and establishes the basis for the selected remedial alternative to be implemented at the Subject Property.

4.1 Development & Initial Screening of Remedial Alternatives

No Further Action/Monitored Natural Attenuation (MNA)

MNA allows the biological processes already prevalent in the subsurface to naturally breakdown VOCs. A scheduled sub-slab vapor and indoor air monitoring program would be conducted to assess the effective progress of the in-situ microbial population, with focus on exposure to receptive populations. This monitoring program would be in operation during heating seasons, when risk of exposure is highest to the susceptible population.

Sub-slab Depressurization (SSD)

SSD involves installing control measures to prevent contaminated soil vapors from entering the lowest level of susceptible buildings. The SSD system design would specify individual systems consisting of fans and piping to draw vapors from beneath the building slabs at the Subject Property, 2 University Place, 4 University Place, and any additional structures identified by NYSDOH and NYSDEC as warranting mitigation. This is intended to create an adequate vacuum to control the sub-slab VOC vapors and prevent vapors from entering the buildings to avoid indoor air quality impacts. Monitoring of sub-slab vapors and indoor air during heating seasons would be performed to gauge the effectiveness of the SSD system in each building to determine if indoor air quality impacts are controlled. The SSD is not designed to be a remedial action and is only a mitigative measure. Additional engineering and institutional controls will be required to ensure potential vapor intrusion exposures are addressed.

Soil Vapor Extraction (SVE)

SVE systems extract gaseous phase contaminants from the soil pore space (in the unsaturated zone) and treat them above ground. The SVE system design would specify the locations of SVE wells and their radius of influence, or the effective area from which a system creates a vacuum to collect vapors. Pre-design phase environmental sampling of soils and SVE pilot testing would be conducted to categorize geological factors affecting the radius of influence and screen zones of SVE wells in the unsaturated zone to capture VOC vapors.

The pre-design soil sampling results shall be compared to the 6 NYCRR 375-6.8(b) soil cleanup objectives based on the lower value for protection of groundwater or commercial site use in order to evaluate the appropriate scope of on-Site source removal. If pre-design sampling of soils identifies any areas of contaminated soils, the remedy may include excavation to remove source material and reduce the overall remedial timeframe.

The on-site SVE system would remove VOCs from the unsaturated zone, encouraging the contaminants to desorb from soils and partition into the vapor phase. In addition, the SVE system would use SVE wells to create a vacuum to capture VOC vapors within the SVE wells' zone of influence in the unsaturated zone. Therefore, once the new SVE system begins operating, monitoring would be conducted to confirm the SVE system's zone of influence and verify that the SVE system controls VOC migration from the Site. Timely environmental sampling of VOCs throughout the radius of influence would be performed to determine the effectiveness of the remediation system and indicate when the system has met the remedial action objectives. The SVE alternative would also include annual monitoring of sub-slab vapors and indoor air during heating seasons to gauge the effectiveness of the SVE system in preventing indoor air quality impacts.

4.1.1 Screening Based on Protection of Public Health, Environment

No Further Action/MNA Alternative: This remedial alternative would not accelerate the treatment of contamination and would not achieve Remedial Action Objectives.

SSD Alternative: An SSD system mitigates impacts to the human health by preventing vapor phase contaminants from entering indoor spaces, achieving remedial action objectives by protecting human health. This system would not hinder the migration of subsurface contamination.

SVE Alternative: An SVE system would achieve the remedial action objectives by preventing the buildup of contaminated indoor air by creating a preferential pathway for soil vapors into SVE extraction wells, instead of cracks in foundations. This system also prevents the migration of contaminants off-site and offers the ability to treat the on-site soil to the point of achieving the SCGs.

4.1.2 Screening Based on Contamination Sources Removal

No Further Action/MNA Alternative: This remedial alternative would not actively or fully remove contaminant sources and would not achieve Remedial Action Objectives.

SSD Alternative: SSD systems do not specifically address the contaminant sources or soils with elevated VOC concentrations, allowing contamination to remain underground, but preventing it from accumulating in buildings.

SVE Alternative: SVE systems encourage the release of VOCs from soil and into the vapor phase, where the contaminants are collected and treated aboveground. This remedial strategy addresses and treats the source of impaired indoor air quality, removing it from the environment below and around the building slabs. If design phase investigation reveals elevated contaminant concentrations in soil, groundwater, soil vapor or indoor air, further efforts would be determined for source removal.

4.1.3 *Screening Based on Contamination Containment*

No Further Action/MNA Alternative: This remedial alternative would not contain on-site contaminants and would not achieve Remedial Action Objectives.

SSD Alternative: The SSD remedial alternative offers no containment of subsurface PCE and its byproducts and would not create a barrier to prevent the spread of contamination in the subsurface. SSDs only offer building-by-building protection.

SVE Alternative: The radius of influence of an SVE system represents the volume of subsurface media from which all soil vapors are collected and treated by the aboveground equipment. When designing the system, the radius of influence is the most important parameter for preventing the spread of contamination. Pre-design investigation of the Subject Property and pilot tests of the SVE system would support the design of a remedial system that removes VOC mass and controls VOC vapor migration from the Site.

4.1.4 *Screening Based on Elimination of Exposure*

No Further Action/MNA Alternative: This remedial alternative would not prevent exposure to VOCs and would not achieve Remedial Action Objectives.

SSD Alternative: Engineered controls are implemented in an SSD system to prevent exposure to VOCs. The pressure gradient effectively prevents vapors from entering the building environment for which it is designed.

SVE Alternative: SVE extraction prevents exposure to contamination by diverting the path of vapors into extraction wells, where they are collected for treatment.

The vacuum created by the SVE system would prevent VOCs from migrating within the radius of influence to eliminate exposure to building occupants within the treatment zone. The SVE system would prevent VOC migration from the Site.

4.1.5 Screening Based on Treatment of Source at Exposure

No Further Action/MNA Alternative: This remedial alternative would not treat or prevent exposure to VOC vapors, and would not achieve Remedial Action Objectives.

SSD Alternative: SSD systems prevent human exposure by preventing VOC vapors from entering buildings, but do not treat contamination.

SVE Alternative: SVE systems have two forms of treatment, the collection of volatile contaminants at the wellhead and the effect of pulling fresh air into the voids that were previously filled with contaminated soil vapor, which may also enhance bio-activity.

4.1.6 Screening Based on Groundwater Protection Measures

No Further Action/MNA Alternative: This remedial alternative would not provide groundwater protection.

SSD Alternative: This strategy does not remove VOCs from the subsurface and would not actively protect local groundwater.

SVE Alternative: By actively removing VOCs from the subsurface and encouraging the volatilization and capture of the contaminants, an SVE system would reduce subsurface VOC concentrations and protect local groundwater.

4.2 Detailed Evaluation of Remedial Alternatives

Based on the remedial alternatives screening presented in Section 4.1, the No Further Action/MNA Alternative is not carried through the detailed evaluation below because it offers no protection from exposure to VOC vapors and would not achieve the remedial action objectives. Therefore, only the other two alternatives (SSD and SVE) are evaluated in detail as follows.

4.2.1 Threshold Criteria

Overall Protection of Public Health and the Environment

The SVE Alternative provides more extensive public health and environmental protection by addressing the contamination by actively removing VOCs from the subsurface, capturing VOCs on-site, eliminating off-site VOC vapor migration, and preventing soil vapors from accumulating in basements.

Ability to Reach RAOs

The SSD Alternative would achieve compliance with remedial goals for indoor air quality. The SVE Alternative goes a step further to actively remove contaminants from the subsurface and includes potential excavation of source material (if found during pre-design investigation/data collection) to comply with the 6 NYCRR 375-6.8(b) soil cleanup objectives based on the lower value for protection of groundwater or commercial site use.

SCG Compliance

Both alternatives would effectively reduce indoor air contaminant concentrations below the New York State Department of Health matrix threshold levels. The SVE Alternative presents the ability to achieve relevant soil SCGs for commercial use. The SSD Alternative would not expedite the reduction in soil contamination concentrations that would be achieved by monitored natural attenuation.

4.2.2 Balancing Criteria

Long-term Effectiveness and Permanence

Both alternatives would mitigate human exposures while the system is in operation, however the SVE Alternative would remove the contaminant source, eliminating the risk of long-term human and environmental health effects after system shutdown.

Reduction of Toxicity Mobility or Volume of Contaminant

The SVE Alternative would more effectively reduce the mobility and volume of contamination in the subsurface by capturing and removing VOCs.

Short-term Effectiveness

Both alternatives would be effective in preventing potential human exposures immediately upon system startup. While the SVE Alternative would require more time to complete the required pre-design investigation, SVE pilot study and full-scale design, the SSD Alternative would be subject to delays associated with negotiating long-term access agreements to work on off-site properties.

Implementation/Feasibility

Pilot tests must be completed to ensure proper SVE system design, so the SVE Alternative's design and implementation would be a lengthier process than would be required for SSD.

The SSD Alternative, however, has many administrative hurdles associated with access to private properties and obtaining consent to work on these properties to install, maintain and monitor the SSD systems. In addition, agreements would have to be negotiated with off-site property owners regarding payment of electrical costs for SSD systems. The SVE system would be designed so that all construction and O&M would be conducted on-site; off-site property access would only be required to conduct annual monitoring of sub-slab vapors and indoor air during the heating season. All SVE system equipment would be installed within a sound-proof treatment enclosure on-site.

Cost Effectiveness

The capital costs of implementing the SVE Alternative would be greater compared to SSD. The increased effectiveness of SVE in remediating subsurface contamination and removing VOC mass, while protecting against off-site VOC vapor migration and soil vapor intrusion make SVE a more cost-effective option.

Anticipated Future Land Use

There is no anticipated change to the land use on-site; the Site owners intend to continue the commercial use consistent with current zoning.

Community Acceptance

This criterion will be evaluated after public review of the remedy selection process. Public comments will be gathered by the State to document the community acceptance of the proposed remedial system to grant final approval for the selected strategy. Public sentiment will be evaluated in accordance with *DER 23 - Citizen Participation Handbook*.

4.3 Proposed Remedy

The SVE Alternative (with removal of soils, based on the 6 NYCRR 375-6.8(b) soil cleanup objectives based on the lower value for protection of groundwater or commercial site use) is the proposed remedy for its preferential protection of public and environmental health, contaminant source removal, on-site containment of VOCs, prevention of off-site VOC vapor migration, ability to reach RAOs and SCG compliance.

The SVE Alternative will provide significantly more benefit compared to the SSD option, which would simply prevent vapor intrusion but would not actively remove VOCs from the subsurface.

The new SVE system will be designed to capture all on-site VOC vapors and prevent off-site migration, thus eliminating the source of transient vapors which have the potential to impact off-site properties. Full-scale design and system monitoring during SVE remedial system operation will ensure that the radii of influence of the SVE wells overlap so that all vapors are managed on-site to prevent future off-site impacts. SVE will promote VOCs in the subsurface to partition to the vapor phase for capture by the SVE wells, reducing the residual VOC mass. This benefit, coupled with removing source material identified by a pre-design investigation (based on the 6 NYCRR 375-6.8(b) soil cleanup objectives based on the lower value for protection of groundwater or commercial site use), will further reduce the source of VOC vapors and expedite the time required for the SVE system to meet the remedial action objectives. Off-site properties will be protected because the VOC vapors will be captured on-site. The on-site SVE wells will create a vacuum extending under 2 University Place and 4 University Place which will address potential vapor intrusion impacts at these locations, to be confirmed through SVI sampling as described in this RWP.

If the results from SVI sampling to be conducted during the 2018-2019 heating season at the additional seven (7) off-site properties (shown on Figure 4) indicate impacts at any of these off-site properties, appropriate remedial measures shall be evaluated and implemented to prevent future vapor intrusion impacts.

5 SOIL VAPOR EXTRACTION REMEDIAL ALTERNATIVE

The components of the SVE remedial alternative are outlined below. The remainder of this RWP details how this alternative will be implemented, upon approval by NYSDEC and NYSDOH.

- Conduct Pre-Design Investigation

Soil Borings

- Drill twelve (12) borings (GB-1 through GB-12) using a Geoprobe at the locations shown on Figure 3.
- Classify soil types in the borings to support SVE system design.
- Screen soil samples at 5-foot intervals using a PID as the borings are advanced from the invert or bottom of the structures to just above the perched water interface at approximately 30 feet below grade, or to a depth where PID response returns to background if applicable.

On-site Soils/Source Evaluation

- Data collected from all twelve (12) of the borings shall be used to evaluate soils and potential sources remaining at the Site (including the leaching pool, dry wells and floor drains associated with the former dry cleaner operations).
- Based on PID screening results and sampling observations, select a minimum of two samples from each boring for laboratory analysis of VOCs using USEPA Method 5035 or equivalent.
- Compare results to NYSDEC 6 NYCRR 375-6.8(b) soil cleanup objectives based on the lower value for protection of groundwater or commercial site use.
- If area(s) of soil exceeding the 6 NYCRR 375-6.8(b) soil cleanup objectives based on the lower value for protection of groundwater or commercial site use are identified, conduct additional sampling if needed to delineate source area(s) to be excavated.

On-site Perched Water Evaluation (Including Groundwater Sampling for Emerging Contaminants)

- Collect groundwater samples from the perched zone at seven (7) on-site locations using Geoprobe sampler (GB-1, GB-2, GB-3, GB-6, GB-8, GB-9 and GB-12) (see Figure 3).
- Analyze groundwater samples from the seven (7) locations for VOCs by USEPA Method 8260.
- Analyze groundwater samples collected from locations GB-1, GB-6, GB-8 and GB-12 for PFAS and 1,4-dioxane in accordance with Groundwater Sampling for Emerging Contaminants (February 2018).

- Install seven (7) piezometers (one-inch diameter PVC) just above the clay layer at the bottom of the perched water zone (approximately 30 to 35 feet below grade) at the on-site locations shown on Figure 3 (GB-1, GB-2, GB-3, GB-6, GB-8, GB-9 and GB-12).
 - Measure water levels in each on-site piezometer to determine groundwater flow direction at the Site.
 - Compare on-site groundwater sampling results to NYSDEC Class GA groundwater quality standards. If groundwater concentrations exceed the applicable standards, evaluate all appropriate additional actions. If the pre-design sampling results indicate perched groundwater impacts associated with the Site, further appropriate investigation (e.g., additional sampling locations, deeper groundwater sampling) will be conducted in accordance with a scope of work, approved by NYSDEC and NYSDOH, designed to evaluate groundwater impacts.
- SVI Sampling During 2018-2019 Heating Season
 - Conduct SVI sampling (sub-slab and indoor air) at the properties shown on Figure 4 (including the additional 7 off-site properties discussed above).
 - SVI sampling shall be conducted during 2018-2019 heating season in accordance with the procedures described in the *Soil Vapor Intrusion Investigation Work Plan* (Work Plan; Walden, December 2015) approved by NYSDEC and NYSDOH presented in Appendix A.
 - The SVI sampling investigation results will be evaluated when designing the SVE system to determine whether action is required to address potential off-site exposures to Site-related contamination via the soil vapor intrusion pathway.
- Evaluate Condition of Former On-site SVE System Equipment
 - Evaluate the condition of the on-site SVE wells, SVE system equipment operated as part of the former SVE remedial system installed and operated by the previous owner from 2001 until circa 2008 to determine if any components are in suitable condition for re-use.
 - Dismantle and dispose of system equipment deemed unusable.
 - Properly abandon SVE remedial system wells and on-site groundwater monitoring wells that are not in suitable condition for re-use.
- Conduct SVE Pilot Test
 - Utilize an existing SVE well (if possible) or install a new SVE well in the rear parking lot.
 - If a new SVE well is installed, set well screen based on Site soil characteristics determined during pre-design investigation.

- Install four piezometers at set distances from the SVE test well to record differential subsurface pressure/vacuum measurements during the pilot test. Note that some of the six (6) new piezometers installed on-site as described above may be used to record pilot test data.
- Collect samples of extracted vapors for analysis of VOCs to determine treatment requirements.
- Evaluate SVE pilot test data and determine radius of influence and SVE well characteristics as the basis for full-scale design.
- Design Full-Scale SVE System based on Pilot Test Results
 - Perform engineering design calculations to determine SVE well depths, screen intervals, pumping rates and radius of influence.
 - SVE wells shall be placed with overlapping radii of influence to create a vacuum barrier extending beyond the Subject Property boundaries to prevent off-site migration of VOC vapors.
 - Piezometers shall be placed on-site to monitor subsurface pressures during SVE system operation.
 - Granular activated carbon units shall be specified to treat extracted soil vapors.
- Install SVE system
- SVE System Start Up
- SVE System O&M and Monitoring
 - Conduct regular monitoring (weekly or bi-weekly for the first 3 months after start-up; monthly thereafter) of the SVE system to verify effective operation.
 - Perform SVI sampling (sub-slab and indoor air) at the properties under the influence of the SVE system during the first heating season after the SVE system has been installed and operating for at least three months.
 - If the SVI results indicate no indoor air quality impacts, continue to operate the SVE system and repeat SVI sampling annually during heating seasons until the SVE system monitoring results indicate VOC concentrations in soil vapor reach asymptotic levels, at which time approval to shut down the SVE system would be requested from NYSDEC and NYSDOH.
 - If the SVI sampling results indicate potential indoor air quality impacts, evaluate the need for additional action as appropriate to prevent vapor intrusion.
- SVE System Shut Down

- Site Management Plan/Environmental Easement

6 PRE-DESIGN INVESTIGATION

Walden proposes to conduct a pre-design phase investigation at the Subject Property to support the remedial alternative design and implementation. Data from previous investigations related to the 218 Lakeville Road Site have been utilized to develop the proposed scope of work.

The contaminants of concern at the 218 Lakeville Road Site include PCE and its breakdown products, TCE and cis-1,2-DCE. For the purpose of this RWP, the goal of the pre-design investigation is to further evaluate potential remaining sources of PCE at the Site by collecting soil samples adjacent to the on-site building space, dry wells, and leaching pool associated with the former dry-cleaning operations. Interior floor drains, a dry well and a leaching pool were cleaned out to the extent possible during the on-site remedial actions completed by the previous Site owner in 1996 and 2000. However, the contaminated soil vapors found during the February 2016 sampling suggest that source materials remain on-site. Actively locating and removing residual on-site VOC source material if it can be discovered will reduce the time it takes to achieve the remedial action objectives and ultimately Site closure. Such results are the goal of the proposed pre-design investigation described below.

6.1 Soil Sampling

6.1.1 *Soil Sampling Locations*

Walden proposes to collect pre-design soil samples based on suspected sources of contamination given historic site use and previous remedial actions. Data collected from all twelve (12) of the borings shall be used to evaluate soils and potential sources remaining at the Site. Therefore, the soil sampling locations include borings drilled adjacent to the two dry wells in the rear parking lot located downgradient from the former dry cleaner space, and the leaching pool in the front of the building believed to be the historic discharge point of wastewater from the dry cleaner. Two borings are proposed on either side of each structure outside the concrete rings, one upgradient and one downgradient. In addition, one boring is proposed in the rear parking lot just outside the southernmost space which was occupied by the former Imperial Cleaners to evaluate potential VOC contamination in this area. The twelve (12) proposed sampling locations are shown on Figure 3.

While sampling of the two floor drains in the basement area is not proposed at this time due to sampling equipment access constraints, this may be revisited and one or both of the floor drains associated with the former dry cleaners space shall be sampled if accessible.

The remedial design and any source removal action shall be based on the soil data compared to the applicable 6 NYCRR 375-6.8(b) soil cleanup objectives based on the lower value for protection of groundwater or commercial site use.

6.1.2 Soil Sampling Procedure

Soil sample collection shall be conducted in accordance with DER-10 to supplement the data previously collected at the Site. The intent of the pre-design investigation soil sampling is to identify and delineate on-Site source areas for excavation, so the sampling locations shall be selected in the suspected source areas. The entire site is paved, and based on historic site use, remaining VOCs would be found in floor drains and at the bottom of dry wells and septic pools. Therefore, shallow soil sampling is not proposed because it would not yield data to support this remedial alternative. Soil samples will be collected from the depths of the suspected source material (corresponding to the bottoms of the dry wells and septic pools) down to just above the perched water interface. The samples shall be discrete, non-homogenized soils that are disturbed as little as possible during sampling to reduce volatilization and ensure that samples are as representative as possible of actual conditions. Soil samples shall be logged and screened using a PID. Soil samples shall be selected for laboratory analysis of VOCs based on field observations for visual and/or olfactory evidence of contamination and PID screening results.

The soil borings will be installed utilizing a Geoprobe[®]. Soil samples will be collected at 5-foot intervals from the depth of the bottom/invert of each structure to just above the perched water interface at approximately 30 feet below grade, or to a depth where PID response returns to background if applicable. Walden's on-site staff will qualitatively screen soil samples for VOCs utilizing a PID headspace method. A minimum of two samples from each boring will be selected for laboratory analysis of VOCs based on the PID screening results and field sampling observations (visual/olfactory), as well as other factors including proximity to suspected source areas, distinct soil types, depth with respect to the perched groundwater interface, etc. The soil sample lithology will be characterized and described to support development of the SVE system pilot test and design as discussed in Section 7. Soil boring logs will be prepared for each borehole.

6.1.3 Soil Sample Handling and Analysis

The soil samples selected for laboratory analysis will be placed in dedicated clean glassware provided by the laboratory. Following collection and labeling, all samples will be packed in iced coolers maintained at 4°C. Samples will be shipped to a NYSDOH ELAP CLP laboratory in such a manner as to avoid breakage during transportation and to

minimize the possibility of cross-contamination. The samples will be delivered to the analytical laboratory via an overnight courier under the appropriate Chain-of-Custody protocol for VOC analysis via USEPA Method 5035 or an equivalent method.

Additional sampling and analytical requirements are detailed in the QAPP (Appendix B).

6.1.4 *Evaluation of Pre-Design Soil Sampling Results*

The analytical results reported by the laboratory will be compared to the applicable NYSDEC 6 NYCRR 375-6.8(b) soil cleanup objectives based on the lower value for protection of groundwater or commercial site use. If the on-site groundwater sampling discussed below indicates VOC concentrations in groundwater exceed the NYSDEC Class GA standards, the on-site pre-design soil concentrations shall be compared to the lower of the Part 375 Commercial or Protection of Groundwater SCOs. If the data identifies any residual source areas exceeding these SCOs, additional sampling may be required to delineate source area(s) to be excavated. The source material will be disposed of at an appropriate off-site disposal facility selected on the contaminant profile.

6.2 *Groundwater Sampling*

6.2.1 *Groundwater Sampling Locations*

Perched groundwater samples will be collected at seven (7) on-site locations during the pre-design investigation. Seven (7) piezometers (one-inch diameter PVC) will be installed in Geoprobe-drilled boreholes just above the clay layer at the bottom of the perched water zone (approximately 30 to 35 feet below grade) at the on-site locations shown on Figure 3 (GB-1, GB-2, GB-3, GB-6, GB-8, GB-9 and GB-12).

6.2.2 *Groundwater Sampling Procedure*

The depth to water and depth to the bottom of each on-site piezometer will be measured to the nearest 0.01 foot using an electronic water level indicator and recorded. The water level data will be evaluated to determine the groundwater flow direction at the Site.

Groundwater samples will be collected from each on-site piezometer for analysis of VOCs by USEPA Method 8260. Groundwater samples collected from locations GB-1, GB-6, GB-8 and GB-12 will also be analyzed for PFAS and 1,4-dioxane in accordance with Groundwater Sampling for Emerging Contaminants (February 2018) and Collection of Groundwater Samples for Perfluorooctanoic Acid (PFOA) and Perfluorinated Compounds (PFCs) from Monitoring Wells Sample Protocol

6.2.3 *Groundwater Sample Handling and Analysis*

The collected groundwater samples will be placed into single-use sampling glassware provided by the laboratory. The sample containers will be labeled with the site name, the Walden job number, sample location and identification, date, time, sampler's initials, and the parameter(s) for analysis. All samples will be packed on ice in coolers maintained at 4°C prior to transport to the analytical laboratory. Samples will be shipped to the laboratory in such a manner as to avoid container breakage during transportation and to minimize the possibility of cross-contamination. The samples will be picked up by the analytical laboratory or delivered via an overnight courier under the appropriate Chain-of-Custody protocol.

Additional sampling and analytical requirements are detailed in the QAPP (Appendix B).

6.2.4 *Evaluation of Pre-Design Groundwater Sampling Results*

The groundwater analytical results reported by the laboratory will be compared to the applicable NYSDEC Class GA groundwater quality standards. If groundwater concentrations exceed the applicable standards, all appropriate future actions will be evaluated. If the pre-design sampling results indicate perched groundwater impacts associated with the Site, further appropriate investigation (e.g., additional sampling locations, deeper groundwater sampling) will be conducted in accordance with a scope of work, approved by NYSDEC and NYSDOH, designed to evaluate groundwater impacts.

7 SOIL VAPOR EXTRACTION PILOT STUDY

The objective of soil vapor extraction (SVE) is to induce airflow into the unsaturated zone by creating a pressure gradient by withdrawing air from specifically placed wells, or vapor extraction points. The SVE gas flow enhances vaporization of VOCs dissolved in unsaturated pore water, and desorption of VOCs from the surface of soil particles. SVE system equipment includes extraction wells, piping, treatment units, vacuum blowers, moisture separator, vapor recovery system (vapor phase granular activated carbon), and electrical controls. Vapor containing contaminants is withdrawn from the unsaturated zone and passed through a vapor recovery system before being discharged to the atmosphere. The vapor recovery system reduces the moisture of the air stream and collects VOCs by passing the air stream through a granular activated carbon (GAC) medium. The spent GAC will be disposed of off-site by a licensed private firm in compliance with all rules and regulations.

SVE pilot testing will be conducted prior to the design of the soil treatment system to determine the effectiveness and the efficiency of the proposed SVE system, its optimal extraction rate, and the radius of influence (ROI). An extraction well can create varying vacuum strengths in the vadose zone. It is assumed that once an ROI is recorded, it would be typical of subsurface conditions at the Site.

The condition of the on-site SVE wells and equipment operated as part of the former SVE remedial system installed will be evaluated to determine if any components are suitable for re-use. Any equipment deemed unusable will be dismantled and disposed of, and any SVE remedial system wells and on-site groundwater monitoring wells that are not in suitable condition for re-use will be properly abandoned.

If one of the on-site SVE wells remaining from the former SVE system is determined to be in good condition, it may be used for the pilot test. Otherwise, a new SVE well will be installed on the Subject Property in the rear parking area. The SVE well screen interval will be approximately 5 feet, and the screen zone and slot size will be determined based on the pre-design investigation findings. Four piezometers screened at depths consistent with the SVE test well depth will be installed at approximately 10 feet, 20 feet, 40 feet and 80 feet radial distance away from the SVE test well. Note that some of the six (6) new piezometers installed on-site as described above may be used to record pilot test data, depending on their location in relation to the SVE test well.

During the SVE pilot test, Walden shall record changes in soil vapor pressure (indication of vacuum effect) in the four piezometers utilizing a series of vacuum gauges. Walden shall utilize a vacuum extraction blower with fitted fresh air bypass to induce vacuum flow via the SVE well.

The SVE system shall be designed to create a barrier to capture on-site VOC vapors and prevent off-site vapor migrations. A range of air extraction flow rates will be evaluated during the SVE pilot test as determined by converting vacuum measurements recorded on a pressure gauge to scfm (flow rate) utilizing the specific pilot blower “pump curve”. The pilot study will run until the subsurface vacuums recorded in all piezometers reach steady state conditions. The SVE ROI will be estimated by plotting steady state vacuum at each piezometer versus its radial distance from the SVE well. After the pilot test is completed, Walden shall submit a letter report to NYSDEC detailing the results of the pilot test.

8 SVE REMEDIAL SYSTEM DESIGN AND IMPLEMENTATION

The SVE system to be installed at the 218 Lakeville Road Site will be designed based on the SVE pilot study results. The full-scale engineering design plans and specifications will be submitted to NYSDEC/NYSDOH for review and approval upon completion of the work described in this RWP. The plans and specifications will be sealed and certified by Joseph M. Heaney III, P.E. who is registered to practice in New York State.

8.1 SVE System Full-Scale Design

During full-scale design, the SVE extraction well parameters will be determined based on engineering design calculations, and the pre-design investigation and SVE pilot test results. The SVE pilot test extraction well's radius of influence and VOC contaminant levels measured during the pre-design investigation will be considered when determining the SVE extraction well locations, required number of SVE wells, appropriate screen intervals, slot size, and pumping rates. The SVE extraction wells will be placed near the on-site areas determined to be contaminant sources (based on the 6 NYCRR 375-6.8(b) soil cleanup objectives based on the lower value for protection of groundwater or commercial site use, to be excavated during implementation to the extent possible) and along the perimeter of the Subject Property. The SVE extraction wells will be located with overlapping radii of influence to create a barrier extending beyond the Subject Property boundaries to prevent off-site migration of VOC vapors.

The SVE wells will be screened at intervals established based on the pre-design investigation soil boring analytical results. The exact construction details (i.e., location, number, screen zones and vacuum flow rates) will be established based on an evaluation of SVE pilot well performance and the Site geology/soil type/VOC concentration data gathered during the pre-design investigation. Piezometers will be installed on-site at appropriate locations determined during design to monitor subsurface pressures during SVE system operation.

Each SVE well will be connected to PVC piping to be installed by trenching to a treatment system enclosure to be located based on full-scale design. An extraction blower will be sized based on the optimum SVE flow rate determined from the pilot study results. A vacuum blower, moisture separator, flow control gauging and valves, and granular activated carbon cylinders (sized based on flow and the VOC vapor concentrations recorded during the pilot study) will be housed within the treatment enclosure. Air discharge concentrations will be adjusted to the allowable VOC discharge concentrations as defined in NYSDEC's Toxic Ambient Air Contaminants (DAR-1). It is

anticipated that the new system can tie into the existing PSEG electric service drop which provided power to the former SVE system.

8.2 SVE System Installation and Operation

Walden will develop the engineering design plans and technical specifications for the full-scale SVE system. Bids will be obtained from qualified construction contractors for the system installation. Based on the bids received and a review of the contractor experience and references, a contractor will be selected to install the remediation system. Walden will perform contractor oversight to ensure that the SVE system components are installed in accordance with the design plans and specifications. The system will be started up once construction is completed. An operations, maintenance and monitoring program will be developed by Walden and implemented upon SVE system start-up to ensure that the remedial system performs effectively towards meeting the remedial action objectives. Post-installation sampling requirements will include both physical (pressure and radius of influence) and chemical (indoor air) sampling.

Walden will conduct regular SVE system monitoring (weekly or bi-weekly for the first 3 months after start-up; monthly thereafter) to verify effective operations and reductions in subsurface VOC concentrations.

9 SVI SAMPLING

SVI sampling (sub-slab and indoor air) shall be performed at 218 Lakeville Road and the off-site properties shown on Figure 4 during the 2018-2019 heating season. In New York State, heating systems are generally expected to be operating routinely from November 15th to March 31st. SVI sampling shall be conducted early in the 2018-2019 heating season; NYSDEC and NYSDOH shall be notified of the schedule. Note that permission must be obtained to access the off-site properties for sampling. The Volunteer may require the State's assistance to obtain permission to access certain off-site properties for sampling. NYSDEC and NYSDOH will be informed of any difficulties encountered so the State can reach out to assist in obtaining permission for the sampling.

The sampling will be conducted in accordance with the procedures briefly outlined below. Refer to additional SVI sampling details in the *Soil Vapor Intrusion Investigation Work Plan* (Walden, December 2015) presented in Appendix A and approved by NYSDEC and NYSDOH.

9.1 Pre-Sampling Inspection

A pre-sampling interior inspection will be performed to identify potential vapor intrusion pathways and to evaluate the sub-slab and indoor air sampling locations. To reduce the potential for interference and dilution effects of samples, the Site tenants and off-site property owners will be notified in advance of sampling to ensure that the occupants avoid the activities listed in the NYSDOH *Guidance for Evaluating Soil Vapor Intrusion in the State of New York, with updates* within 24 hours prior to sampling.

9.2 SVI Sampling Locations

Sub-slab and indoor air samples will be collected concurrently inside the buildings as follows:

- 218 Lakeville Road
 - Basement beneath the former Imperial Cleaners space
 - Basement beneath Tobacco Plaza (in the unfinished area on the west side of the space)
 - Two locations beneath the basement of the former delicatessen space (this basement area is divided into two sections; samples will be collected from each section)
- Lowest living space in each off-site property shown on Figure 4, provided that access is granted by the property owner for sampling

Two outdoor ambient air samples will be collected outside the 218 Lakeville Road building concurrently with the sub-slab and indoor air samples.

All SVI sampling will be conducted at the same time to achieve contemporaneous analytical results.

9.3 Sub-slab Vapor Sampling

For the properties previously sampled in February 2016, the sub-slab sampling probes installed will be used if they are still intact or replaced if needed. For the additional 7 off-site properties, new sub-slab vapor probes will be installed, at locations where the potential for ambient air infiltration from floor penetrations is minimal. The sampling probe installation procedure is as follows:

A small diameter hole (approximately one inch) will be drilled through the concrete floor slab and into sub-slab material (e.g., sand) approximately two (2) inches below the bottom of the floor slab. This will create an open cavity in the sub-slab material to prevent obstruction of probes by small pieces of gravel that may be present. Concrete and soil cuttings will be removed from the hole. Probes will be constructed as follows or by equivalent procedures in accordance with the NYSDOH SVI guidance.

Permanent Probes (218 Lakeville Road)

Permanent probes will be constructed from small-diameter threaded brass or stainless-steel tubing and connectors/fittings installed to no greater than two (2) inches into the sub-slab material. The top of the probe will be finished with a recessed brass plug flush with the surface of the concrete slab. Porous, inert backfill material (e.g., glass beads, washed #1 crushed stone, etc.) will be added to cover approximately one (1) inch of the probe tip, and the implant will be sealed to the surface with cement. For sampling purposes, a threaded fitting connected to tubing (Teflon-lined or other inert material) will be inserted into the sampling port for connection to a Summa[®] canister.

Temporary Probes (off-site properties)

Temporary probes will be constructed from inert tubing (e.g. polyethylene, stainless steel, nylon, Teflon[®], etc.). The implant will be sealed to the surface with non-VOC containing and non-shrinking products (e.g., permagum grout, melted beeswax, putty, etc.). All other installation specifics are the same as described for permanent probes.

9.4 Indoor Air Sampling

Indoor air samples will be collected concurrently with the sub-slab vapor samples, at approximately the same location as the sub-slab vapor samples to represent the lowest level occupied space. The indoor air samples will be collected at a height approximately

three (3) feet above the floor to represent the height at which occupants normally are seated, in accordance with the NYSDOH SVI guidance.

9.5 Ambient Air Sampling

Two outdoor air samples will be collected outside the building at 218 Lakeville Road concurrently with the sub-slab and indoor air samples to obtain a sample representative of ambient (background) conditions. One sample will be collected upwind of the building and one downwind. Outdoor sample locations will be selected in the field dependent upon the wind direction observed at the time of sampling, away from wind obstructions (e.g., trees or bushes), at a height of approximately three (3) to five (5) feet above the ground to represent breathing zones. The sampling locations will be sited away from potential sources of VOCs, such as automobiles, lawn mowers, oil storage tanks, gasoline stations, industrial facilities, and away from structures such as building HVAC outdoor air intakes, etc., in order to obtain representative samples.

9.6 Air Sampling Procedures

A laboratory provided and individually certified clean 6-liter Summa[®] canister will be placed adjacent to each sub-slab sampling port or at each indoor/outdoor air sampling location. Where a sub-slab vapor sample is being collected, a tee fitting will be utilized to connect the Summa[®] canister tubing (Teflon-lined or other inert material) to the sampling port tubing, and the third leg of the tee will be connected to a purge pump. Additionally, the weather conditions will be noted at the time of sampling (wind speed and direction, precipitation, outdoor temperature, barometric pressure, etc.).

Prior to and immediately after sampling at each point, a pressure gauge will be used to check each Summa[®] canister for vacuum, and the pressure will be recorded. In the case of sub-slab vapor sampling, the ground surface will be sealed in advance to prevent ambient air infiltration during purging and sample collection, and tracer gas such as helium, will be used. A regulator will be used to keep flow rates during purging and sampling below 0.2 liters per minute to minimize outdoor air infiltration during sampling.

The volume of air in each of the vapor/air sampling points (volume of sampling probe and/or tube depending on sample being secured) will be calculated, and a minimum of one to three volumes will be purged at a flow rate of 0.2 liters (or 200 ml) per minute immediately prior to sample collection. The soil gas/air samples will then be collected by opening the valve of the Summa[®] canister to draw air through the regulator to collect the sample at a rate of 0.2 liters per minute for the length of time specified above. All sub-slab vapor, indoor air and ambient air samples will be collected over a 24-hour period.

After the sampling is completed, the Summa[®] canister valve will be closed, and the pressure gauge will again be read, and the vacuum will be recorded.

9.7 Sample Analysis and Handling

The collected samples will be containerized in laboratory provided, individually certified clean Summa[®] canisters or laboratory provided single-use sampling glassware, as applicable. The sample containers will be labeled with the Site name, the Walden job number, sample location and identification, date, time, sampler's initials, and the parameter(s) for analysis. Samples will be transported to the laboratory in such a manner as to avoid container breakage during transportation and to minimize the possibility of cross-contamination. The samples will be picked up by the analytical laboratory or delivered via an overnight courier under the appropriate Chain-of-Custody protocol.

All samples will be submitted to a NYSDOH ELAP certified laboratory for VOC analysis by USEPA Method TO-15 with Category B deliverables. The analytical laboratory will achieve a minimum detection limit of 1.0 µg/m³ for all VOCs in sub-slab soil vapor samples. For the indoor and outdoor air samples, the analytical laboratory will achieve a minimum detection limit of 0.20 ug/m³ for trichloroethene (TCE), carbon tetrachloride, cis-1,2-dichloroethene, 1,1-dichloroethene, and vinyl chloride, and 1.0 ug/m³ for all other VOCs in the USEPA Method TO-15 analysis. Additional QA/QC details are described in the QAPP.

9.8 Summary Report

The laboratory analytical reports will be evaluated and compared to the NYSDOH SVI decision matrices. A summary report will be prepared and submitted to NYSDEC and NYSDOH for review.

If the SVI results indicate no indoor air quality impacts/no mitigation required per the NYSDOH SVI decision matrices, the report shall recommend continuing to operate the SVE system until the SVE system monitoring results indicate VOC concentrations in soil vapor reach asymptotic levels, at which time approval to shut down the SVE system would be requested from NYSDEC and NYSDOH.

If the NYSDOH SVI decision matrix evaluation of the SVI sampling results indicates potential indoor air quality impacts, the report shall evaluate the need for additional action as appropriate.

SVI sampling will be performed annually to evaluate vapor intrusion impacts. Note that after the first annual SVI sampling event (which will include the Subject Property and the off-site properties shown on Figure 4), individual off-site properties may, upon approval of the State, be eliminated from further sampling based on the prior year's results; likewise, additional sampling locations may be added to subsequent year sampling events based on the prior year's results.

10 REMEDIAL ALTERNATIVES IMPLEMENTATION PLANS

All proposed work will be conducted on the Subject Property; none of the work will be conducted off-site other than the SVI sampling during the heating seasons as described in Section 9. Prior to any on-site work, Walden will coordinate a private utility mark out to locate all existing utilities and buried structures to ensure they do not interfere with any portion of the pre-design investigation, SVE pilot study, of full-scale SVE system installation work.

All work associated with implementing the remedial alternative will be performed in accordance with the Quality Assurance Project Plan (QAPP), Health and Safety Plan (HASP), and Community Air Monitoring Plan (CAMP) presented in Appendices B, C and D, respectively.

Walden will be responsible for its own health and safety program; all subcontractor(s) will be required to work under acknowledgement of the Site-specific HASP or under their own HASP approved by Walden prior to commencement of the work. All Site-related work tasks will be conducted in personnel protective equipment (PPE) Level D as appropriate for the tasks to be completed.

Walden will conduct real time air monitoring during field activities to protect Site workers and the public from airborne hazards. The primary airborne hazard associated with Site work would be volatilization of PCE, TCE, and cis-1,2-DCE from contaminated media. The primary instrument utilized for this task will be a photo ionization detector (PID). The PID air monitoring will be continuous during all field activities that are ground-intrusive. If PID readings are 0.5 ppm or greater above background in the breathing zone for a period of one minute, and the source of the reading is unknown, PPE will be upgraded to Level C. The work will be halted if PID readings exceed 5 ppm above background in the breathing zone for thirty continuous seconds per the HASP and CAMP. If this were to occur, the source would be evaluated and the HASP would be reviewed.

11 SCHEDULE

Upon NYSDEC/NYSDOH approval of this RWP, Walden will proceed with scheduling the first phase of the work (the pre-design investigation). NYSDEC will be provided at least ten days' written notice prior to the start of any pre-design soil/groundwater/SVI sampling, SVE pilot study, or full-scale SVE system installation activities as described herein.

When preparing for the SVI sampling, the off-site property owners will be contacted to obtain the access needed for sampling. The field work will be scheduled to be completed during the heating season, between November 15th and March 31st. The Volunteer's representatives will begin the process of seeking permission to access off-site properties for SVI sampling upon RWP approval.

It is anticipated that full-scale SVE system installation will begin upon NYSDEC approval of the engineering plans and specifications, and subsequent contractor bidding. The 218 Lakeville Road SVE system will operate until the remedial action objectives are achieved, or monitoring data indicates that the system has reduced concentrations to the maximum extent possible, but in no case will it be discontinued until NYSDEC and NYSDOH approval is granted.

The following table outlines the tentative work phasing and time of completion:

TASK	APPROXIMATE COMPLETION TIME
RWP Approval by NYSDEC	To be Determined
Pre-Design Investigation Field Work, Data Evaluation and Reporting	Estimated 6 Weeks
SVI Investigation Site Access Coordination, Sampling, Data Evaluation and Reporting	Estimated 12 Weeks
SVE Pilot Study Implementation, Data Evaluation and Reporting	Estimated 8 Weeks
Full-Scale SVE System Design, Plans and Specifications	Estimated 12 Weeks
SVE System Construction	Estimated 8 Weeks
Issuance of Engineering Certificate/Development of O&M Plan/SVE System Startup	Estimated 6 Weeks

The above schedule depends on NYSDEC/NYSDOH review periods and does not take into account work delays related to on-site tenant and off-site property owner approvals for access to perform SVI sampling.

12 SITE MANAGEMENT PLAN AND ENVIRONMENTAL EASEMENT

Upon completion of the remedial activities described in this RWP, a Final Engineering Report will be prepared documenting the remedial actions performed at the Site per work plans approved by NYSDEC and NYSDOH. In addition, a Site Management Plan will be developed describing how any contamination remaining at the Site will be managed and establishing any engineering controls to be implemented consistent with the proposed Site use. If institutional controls are required to restrict or prohibit certain uses or future development of the Site (based on the Site conditions), environmental easement(s) will be prepared and executed in accordance with the procedures established by NYSDEC.

Reports documenting the completion of all work described in this RWP will be submitted to NYSDEC for approval as required to receive a Certificate of Completion (COC) indicating that the remedial action objectives for the BCP Site have been achieved.

FIGURES



Notes: Aerial photos obtained from the USGS

Creation date: 1/29/2018	Print Date: 4/10/2018
Author: MCT	Job No: IMPL0115.5

PDF: Z:\IMPL0115 (Imperial Cleaners)\IMPL0115.5 BCP Application Remedial Work Plan APRIL 2018\Figures\Figure 1 Site Location Map.pdf
 Map: Y:\IMPL0115.4\IMPL0115.5\Site Location Map.mxd


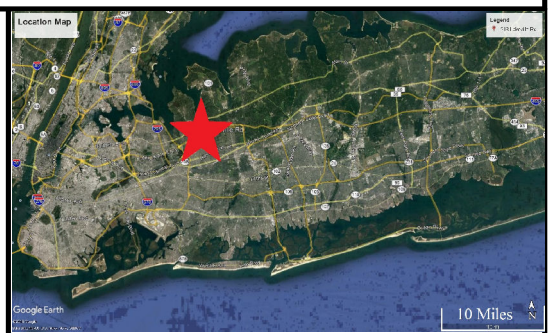

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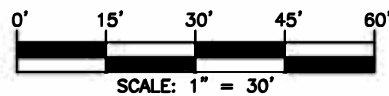
Figure 1
Site Location Map
 Former Imperial Cleaners Site
 Site No. C130225

 218 Lakeville Road
 Lake Success, NY 11020



LEGEND

- PROPERTY LINE OF BROWNFIELD SITE
- PROPERTY LINE



NOTES

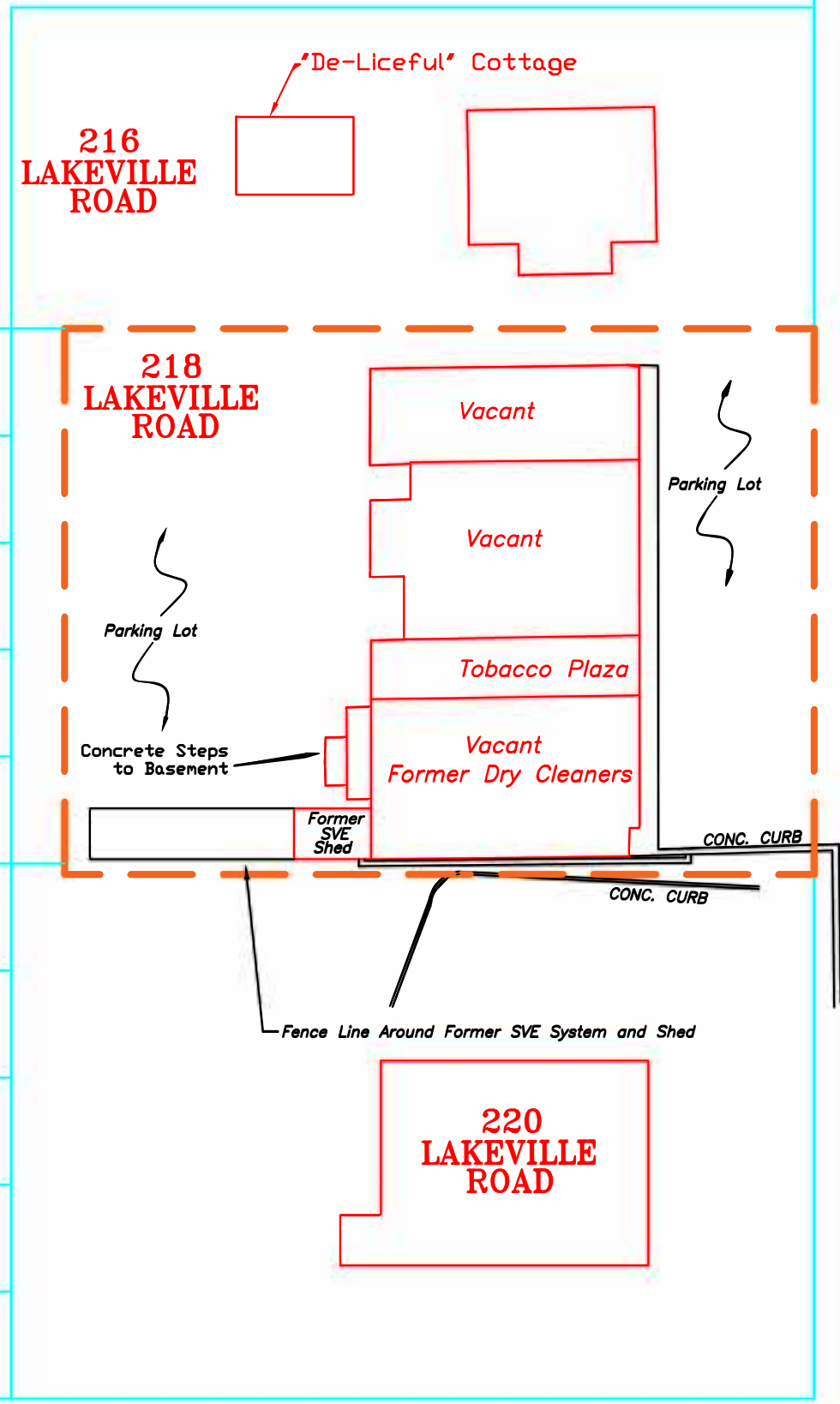
1. Site base map was derived from a property survey prepared by Welsh Engineering & Land Surveying, P.C., 343 Manville Road, Pleasantville, NY 10570, revised on 7/14/00.
2. The Welsh Engineering north area was corrected based on 1999 Nassau County GIS basemap.









UNIVERSITY PLACE

LAKEVILLE ROAD

UNIVERSITY ROAD

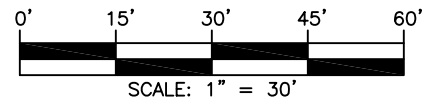


LEGEND

-  PROPERTY LINE OF BROWNFIELD SITE
-  PROPERTY LINE
- DW #1  STORMWATER DRYWELL
- LP  LEACHING POOL
- FD-1  FLOOR DRAIN
-  APPROXIMATE SANITARY SYSTEM PIPING CONNECTION

PROPOSED GEOPROBE BORING LOCATIONS (APPROXIMATE)

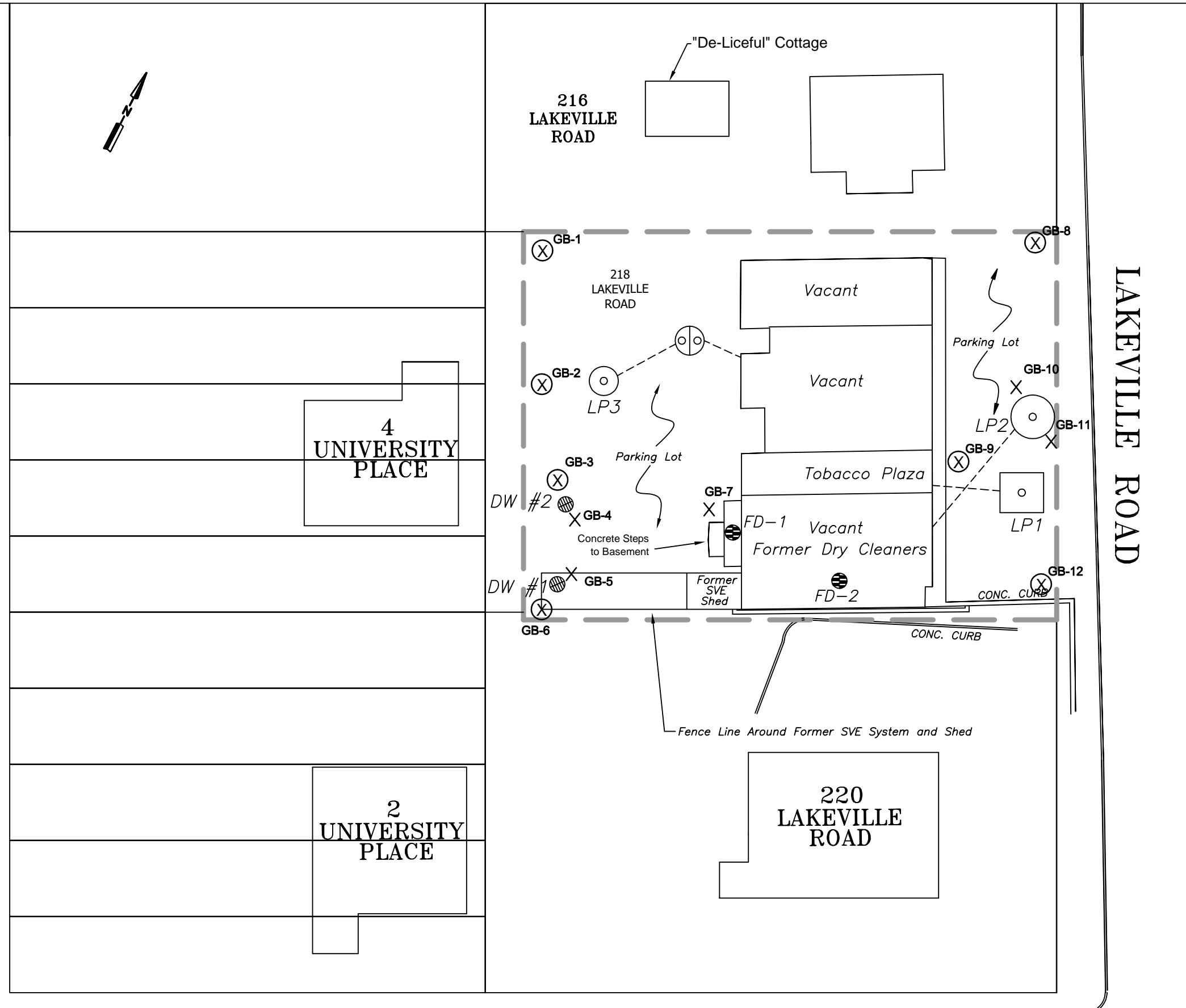
- X - SOIL SAMPLING ONLY
- (X) - SOIL AND PERCHED GROUND WATER SAMPLING



NOTES

1. Site base map was derived from a property survey prepared by Welsh Engineering & Land Surveying, P.C., 343 Manville Road, Pleasantville, NY 10570, revised on 7/14/00.
2. The Welsh Engineering north area was corrected based on 1999 Nassau County GIS basemap.
3. Piezometers shall be installed at each of the 7 groundwater sampling locations (GB-1, GB-2, GB-3, GB-6, GB-8, GB-9 and GB-12) to allow for groundwater collection and water level measurements.
4. Groundwater samples collected from each of the 7 piezometers shall be analyzed for VOC's by EPA Method 8260.
5. Groundwater samples collected from GB-1, GB-6, GB-8 and GB-12 will also be analyzed for emerging contaminants (PFAS and 1,4-dioxane).

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<p>Former Imperial Cleaners Site Site No. C130225 218 Lakeville Road Lake Success, New York 11020</p>	<p>DRAWING TITLE: PRE-DESIGN INVESTIGATION SOIL BORING LOCATIONS 218 LAKEVILLE ROAD, LAKE SUCCESS, NEW YORK</p>	<p>FIGURE 3</p>
<p>JOB NO: IMPL0115.5 DATE: February 5, 2019</p>		
<p><small>CAD FILE NAME: 2:\IMPL0115 (Imperial Cleaners)\IMPL0115.5 BCP Application\Brownfield Application\Sample Excavation.dwg</small></p>		



Notes: Aerial photos obtained from the New York State GIS Clearinghouse

Creation Date: March 9, 2018 Print Date: April 11, 2018

Author: MCT Job No: IMPL0115.4

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Figures\Figure 4 Proposed Soil Vapor Intrusion Sampling Locations.pdf






Map: Y:\IMPL0115.4\IMPL0115.4 Proposed Soil Vapor Sample Locations 11x17.mxd


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Figure 4 Proposed Soil Vapor Intrusion Sampling Locations

Former Imperial Cleaners Site
 Site No. C130225
 218 Lakeville Road
 Lake Success, New York 11020

Legend

-  Additional Offsite Sampling Location (Not Sampled Previously)
-  Onsite Drywell (Suspected Contamination Source)
-  Offsite Sampling Location (Feb. 2016)
-  Stream
-  Onsite Sampling Location (Feb. 2016)

APPENDICES

APPENDIX A

Soil Vapor Intrusion Investigation Work Plan (Walden, December 2015)

**SOIL VAPOR INTRUSION INVESTIGATION
WORK PLAN**

AT

**FORMER IMPERIAL CLEANERS SITE
218 LAKEVILLE ROAD
LAKE SUCCESS, NEW YORK 11042**

NYSDEC VCP SITE #V-00244-1

DECEMBER 2015

PREPARED FOR:

**MR. JOSEPH JONES
PROJECT MANAGER
NYSDEC
REMEDIAL BUREAU A, 11TH FLOOR
625 BROADWAY
ALBANY, NEW YORK 12233**

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**WALDEN ENVIRONMENTAL
ENGINEERING**



Sent via email to joseph.jones@dec.ny.gov

December 29, 2015
IMPL0115.2

Mr. Joseph Jones
New York State Department of Environmental Conservation
Division of Environmental Remediation
Remedial Bureau A
625 Broadway, 12th Floor
Albany, New York 12233-7015

Re: Soil Vapor Intrusion Investigation Work Plan
Former Imperial Cleaners Site
218 Lakeville Road, Lake Success, NY

Dear Mr. Jones:

Walden Environmental Engineering, PLLC (Walden) has reviewed NYSDEC's December 23, 2015 letter regarding the *Soil Vapor Intrusion Investigation Work Plan* submitted on October 22, 2015 for the above referenced Site. The Work Plan has been revised in accordance with the modifications noted in NYSDEC's letter. A copy of the revised *Soil Vapor Intrusion Investigation Work Plan* is enclosed for your review. Walden will keep you informed as access agreements are coordinated with the off-site property owners. NYSDEC will be notified at least five (5) business days before beginning sampling activities.

Please call Nora Brew or me if you have any questions.

Very truly yours,
Walden Associates

Joseph M. Heaney, III P.E.
Principal

Nora Brew
Project Manager

cc: R. Schaufeld, Esq.

Z:\IMPL0115 (Imperial Cleaners)\IMPL0115.2 - Task 2 - Sampling Work Plan\Transmittal Letter 12.29.2015.doc

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FIGURES

- 1 Site Location Map
- 2 Proposed Sampling Locations
- 3 Typical Sub-Slab Vapor Sampling Probe Schematic

APPENDICES

- APPENDIX A Health and Safety Plan (HASP)
- APPENDIX B Quality Assurance Project Plan (QAPP)
- APPENDIX C Community Air Monitoring Plan (CAMP)

1 INTRODUCTION

Walden Environmental Engineering, PLLC (Walden) has prepared this Soil Vapor Intrusion Investigation Work Plan (Work Plan) for the sampling required to support site closure and development of a site management plan for the property located at 218 Lakeville Road, Lake Success, New York (the “Site”). The Site location is illustrated on Figure 1. The Site is a commercial center with a one-story building occupying approximately 4,250 square feet, with one active tenant (Tobacco Plaza, Ltd.) and three vacant spaces as shown on Figure 2. The basement of the on-site building has concrete block walls and a poured concrete floor slab.

The Site is currently managed under the New York State Voluntary Cleanup Program (VCP) as VCP #V-00244-1 subject to New York State Department of Environmental Conservation (NYSDEC) Voluntary Cleanup Agreement #D1-0001-01-03. This agreement was amended on July 28, 2015 to reflect the change in property ownership, establishing 218 Lakeville Acquisition LLC as the site owner and remedial party.

1.1 Site History and Previous Investigations/Remediation

A release of tetrachloroethylene (PCE) at the Site was first noted in 1995. A site investigation followed to identify source areas and determine the extent of contaminated soil and groundwater at the Site (note that there is a perched water table underlying the site at approximately 30 feet below grade, while the water table is located approximately 150 feet below land surface). Contaminated sediments were removed from the source areas (dry wells, an interior floor drain and leaching pools) to the extent possible without undermining the structures. Post-excavation soil sampling results indicated that volatile organic compounds (VOCs) remained in the subsurface following the source area removal actions. A soil vapor extraction (SVE) system was installed to remove VOC vapors remaining in the soil and improve soil and groundwater quality. A soil, soil gas, groundwater and indoor air monitoring program was implemented to track the reductions in VOC concentrations achieved by operation of the SVE system. The SVE system was shut down several years ago when on-site soil sampling results indicated that the SVE system had successfully reduced soil contaminant concentrations to below the NYSDEC TAGM 4046 Recommended Cleanup Objectives. All of this site investigation and remediation work was conducted by the previous owners of the Site as required by NYSDEC and NYSDOH under the VCP.

1.2 Sampling Objectives

Representatives from NYSDEC, the new property owner and Walden met on-site on September 17, 2015 to evaluate Site conditions and discuss previous sampling investigations, potential redevelopment of the Site and the work required to achieve VCP site closure. This Work Plan presents the additional on-site and off-site sampling to be conducted in order to evaluate potential indoor air quality impacts related to soil vapor intrusion (SVI). The proposed sampling plan has been developed in accordance with the guidelines set forth in NYSDEC *DER-13: Strategy for Evaluating Soil Vapor Intrusion at Remedial Sites in New York* (issued October 18, 2006) and *NYSDOH: Final Guidance for Evaluating Soil Vapor Intrusion in the State of New York* (dated October 2006). The proposed field work includes collection of sub-slab vapor, indoor air, and outdoor air samples.

The Health and Safety Plan (HASP), Quality Assurance Project Plan (QAPP) and Community Air Monitoring Plan (CAMP) that will be implemented during the proposed sampling are provided in Appendices A, B and C, respectively.

Walden will schedule the work upon NYSDEC and NYSDOH approval of this Work Plan. The sampling will be conducted during the 2015-2016 heating season, which runs from approximately November 15, 2015 through March 31, 2016. The sampling results and site closure/management recommendations will be presented in a SVI investigation summary report for NYSDEC and NYSDOH review and approval.

2 SAMPLING PLAN ACTIVITIES

2.1 Sampling Scope and Locations

The scope of work for the SVI sampling is outlined below. The general sampling locations are shown on Figure 2; actual locations will be determined in the field. Details on the sampling locations and procedures are presented in Sections 2.2 through 2.6.

On-site Sampling

- Collect sub-slab soil vapor samples from sampling ports installed below the basement floor of the on-site building as follows:
 - One sample from beneath the former dry cleaners space
 - One sample from beneath Tobacco Plaza (in the unfinished area on the west side of the space)
 - Two samples from beneath the former delicatessen space (this basement area is divided into two sections; one sample will be collected from each section)
 - One duplicate sample from one of the four sub-slab sampling locations

The sub-slab vapor samples will be collected utilizing laboratory provided and individually certified clean Summa[®] canisters over a 24-hour period.

- Four indoor air samples and one duplicate sample will be collected from within the on-site building concurrently with the sub-slab samples. The indoor air samples will be collected utilizing laboratory provided and individually certified clean Summa[®] canisters over a 24-hour period.
- Two outdoor air samples and one duplicate will be collected outside the building concurrently with the sub-slab and indoor air samples. The outdoor air samples will be collected utilizing laboratory provided and individually certified clean Summa[®] canisters over a 24-hour period.

Off-site Sampling

- Collect sub-slab and indoor air sampling at the following off-site properties located adjacent to 218 Lakeville Road:
 - 2 University Place

- 4 University Place
- 216 Lakeville Road (“De-Liceful” rear cottage)
- 220 Lakeville Road

One sub-slab vapor sample and one indoor air sample will be collected from the basement/lowest level of each off-site property, for a total of four sub-slab samples and four indoor air samples. The off-site sampling will be conducted at the same time as the on-site sampling to achieve contemporaneous analytical results.

NYSDEC understands that it might be difficult to obtain permission to access these properties as needed to perform this sampling. 218 Lakeville Acquisition LLC will contact the four off-site property owners to request the required permission for sampling. If access is not granted by any of the off-site property owners, NYSDEC’s legal division may intercede.

2.2 Interior Inspection

If possible, a pre-sampling interior inspection will be performed to identify potential vapor intrusion pathways and to determine appropriate sub-slab and indoor air sampling locations. The Site and off-site properties will be inspected to evaluate the physical layout and to identify conditions or materials stored and/or used (especially historic or current storage or use of volatile chemicals in commercial processes and/or during building maintenance) that may affect or interfere with the proposed sampling or interpretation of the sampling results. Consideration will be given to factors such as access for installation/sampling purposes, interior uses at the Site, foundation/floor slab installation and conditions, heating/ventilation/mechanical system operation, and utility layout/breaches.

To reduce the potential for interference and dilution effects of samples, the Site tenants and off-site property owners will be notified in advance of sampling to ensure that the occupants avoid the following activities within 24 hours prior to sampling wherever possible (per NYSDOH *Final Guidance for Evaluating Soil Vapor Intrusion in the State of New York*, October 2006, p. 33):

- Opening any windows, fireplace dampers, openings or vents;
- Operating ventilation fans unless special arrangements are made;

- Smoking in the building;
- Painting;
- Using a wood stove, fireplace or other auxiliary heating equipment (e.g., kerosene heater);
- Operating or storing automobile in an attached garage;
- Allowing containers of gasoline or oil to remain within the house or garage area, except for fuel oil tanks;
- Cleaning, waxing or polishing furniture, floors or other woodwork with petroleum or oil-based products;
- Using air fresheners, scented candles or odor eliminators;
- Engaging in any hobbies that use materials containing volatile chemicals;
- Using cosmetics including hairspray, nail polish, nail polish removers, perfume/cologne, etc.;
- Lawn mowing, paving with asphalt, or snow blowing;
- Applying pesticides;
- Using building repair or maintenance products, such as caulk or roofing tar; and
- Bringing freshly dry-cleaned clothing or furnishings into the building.

2.3 Sub-slab Vapor Sampling

Sub-slab sample locations will be field selected based on physical access and tenant/owner approval. A total of four sub-slab locations are proposed within the basement of 218 Lakeville Road, and one location on the lowest level of each of the four off-site properties. A duplicate sub-slab sample will be collected from one of the on-site basement locations. The locations will be generally as illustrated on Figure 2. The sub-slab vapor samples will be collected from a sub-slab sampling port installed below the concrete slab using Summa[®] canisters over a 24-hour period. A schematic diagram of a typical sub-slab sampling port is presented on Figure 3.

Sub-slab vapor probes will be installed at locations where the potential for ambient air infiltration from floor penetrations is minimal. Accordingly, the interior floors will be inspected prior to installation of the sub-slab vapor probe, and any penetrations (cracks, floor drains, utility perforations, sumps, etc.) observed will be noted and recorded.

2.4 Indoor Air Sampling

Indoor air samples will be collected concurrently with the sub-slab vapor samples, at approximately the same location as the sub-slab vapor samples to represent the lowest level occupied space (Figure 2). A total of four indoor air sampling locations are proposed within the basement of 218 Lakeville Road, and one location on the lowest level of each of the four off-site properties. A duplicate indoor air sample will be collected from one of the on-site basement locations. The indoor air samples will be collected at a height approximately three (3) feet above the floor to represent the height at which occupants normally are seated, in accordance with the NYSDOH SVI guidance. The indoor air samples will be collected using Summa[®] canisters over a 24-hour period.

2.5 Ambient Air Sampling

Two outdoor air samples plus one duplicate will be collected outside the building at 218 Lakeville Road concurrently with the sub-slab and indoor air samples to obtain a sample representative of ambient (background) conditions. One sample will be collected upwind of the building and one downwind. Outdoor sample locations will be selected in the field dependent upon the wind direction observed at the time of sampling, away from wind obstructions (e.g., trees or bushes), at a height of approximately three (3) to five (5) feet above the ground to represent breathing zones. The sampling locations will be sited away from potential sources of volatile organic compounds (VOCs), such as automobiles, lawn mowers, oil storage tanks, gasoline stations, industrial facilities, and away from structures such as building HVAC outdoor air intakes, etc., in order to obtain representative samples. The outdoor air samples will be collected using Summa[®] canisters over a 24-hour period.

2.6 Air Sampling Procedures

2.6.1 Sub-slab Sampling Probe Installation

Permanent recessed sampling probes will be installed at the selected sub-slab vapor sampling locations within the basement spaces at 218 Lakeville Road. Temporary sub-slab sampling probes will be installed in the off-site properties.

These temporary probes will be sealed and the floor surface restored immediately after the samples are collected.

A small diameter hole (approximately one inch) will be drilled through the concrete floor slab and into sub-slab material (e.g., sand) approximately two (2) inches below the bottom of the floor slab. This will create an open cavity in the sub-slab material to prevent obstruction of probes by small pieces of gravel that may be present. Concrete and soil cuttings will be removed from the hole.

Sub-slab sampling probes will be constructed as follows or by equivalent procedures in accordance with the NYSDOH SVI guidance.

Permanent Probes

Permanent probes will be constructed from small-diameter threaded brass or stainless steel tubing and connectors/fittings installed to no greater than two (2) inches into the sub-slab material. The top of the probe will be finished with a recessed brass plug flush with the surface of the concrete slab. Porous, inert backfill material (e.g., glass beads, washed #1 crushed stone, etc.) will be added to cover approximately one (1) inch of the probe tip, and the implant will be sealed to the surface with cement. For sampling purposes, a threaded fitting connected to tubing (Teflon-lined or other inert material) will be inserted into the sampling port for connection to a Summa[®] canister.

Temporary Probes

Temporary probes will be constructed from inert tubing (e.g. polyethylene, stainless steel, nylon, Teflon[®], etc.). The implant will be sealed to the surface with non-VOC containing and non-shrinking products (e.g., permagum grout, melted beeswax, putty, etc.). All other installation specifics are the same as described for permanent probes.

2.6.2 Summa[®] Canister Sampling Procedures

A laboratory provided and individually certified clean 6-liter Summa[®] canister will be placed adjacent to each sub-slab sampling port or at each indoor/outdoor air sampling location. Where a sub-slab vapor sample is being collected, a tee fitting will be utilized to connect the Summa[®] canister tubing (Teflon-lined or

other inert material) to the sampling port tubing, and the third leg of the tee will be connected to a purge pump. Additionally, the weather conditions will be noted at the time of sampling (wind speed and direction, precipitation, outdoor temperature, barometric pressure, etc.).

Prior to and immediately after sampling at each point, a pressure gauge will be used to check each Summa[®] canister for vacuum, and the pressure will be recorded. In the case of sub-slab vapor sampling, the ground surface will be sealed in advance to prevent ambient air infiltration during purging and sample collection, and tracer gas such as helium, will be used. A regulator will be used to keep flow rates during purging and sampling below 0.2 liters per minute to minimize outdoor air infiltration during sampling.

The volume of air in each of the vapor/air sampling points (volume of sampling probe and/or tube depending on sample being secured) will be calculated, and a minimum of one to three volumes will be purged at a flow rate of 0.2 liters (or 200 mls) per minute immediately prior to sample collection. The soil gas/air samples will then be collected by opening the valve of the Summa[®] canister to draw air through the regulator to collect the sample at a rate of 0.2 liters per minute for the length of time specified above.

After the sampling is completed, the Summa[®] canister valve will be closed, and the pressure gauge will again be read, and the vacuum will be recorded.

2.7 Scheduling

Sub-slab vapor samples and indoor air samples are typically collected during the heating season because soil vapor intrusion is more likely to occur when a building's heating system is in operation and doors and windows are closed. In New York State, heating systems are generally expected to be operating routinely from November 15th to March 31st. During colder months, heating systems should be operating to maintain normal indoor air temperatures (i.e., 65 – 75 °F) for at least 24 hours prior to and during the scheduled sampling time.

3 SAMPLE ANALYSIS AND HANDLING

3.1 Laboratory

All samples will be submitted to a NYSDOH ELAP certified laboratory for analysis. Walden is in the process of selecting a laboratory, which will be chosen based on factors such as availability, accessibility and price. Prior to the start of work, the selected analytical laboratory shall review the attached QAPP policies and procedures and sign an acknowledgement of the same (Refer to Appendix B).

3.2 Sample Handling

All sub-slab soil vapor and air samples will be collected in accordance with the NYSDOH's *Guidance for Evaluating Soil Vapor Intrusion in the State of New York*. The collected samples will be containerized in laboratory provided, individually certified clean Summa[®] canisters or laboratory provided single-use sampling glassware, as applicable. The sample containers will be labeled with the site name, the Walden job number, sample location and identification, date, time, sampler's initials, and the parameter(s) for analysis. Samples will be transported to the laboratory in such a manner as to avoid container breakage during transportation and to minimize the possibility of cross-contamination. The samples will be picked up by the analytical laboratory or delivered via an overnight courier under the appropriate Chain-of-Custody protocol.

3.3 Soil Vapor and Air Sample Analysis

The soil vapor and air samples will be analyzed for VOCs in accordance with USEPA Method TO-15 with Category B deliverables. The analytical laboratory will achieve a minimum detection limit of 1.0 µg/m³ for all VOCs in sub-slab soil vapor samples. For the indoor and outdoor air samples, the analytical laboratory will achieve a minimum detection limit of 0.25 µg/m³ for trichloroethene (TCE) and 1.0 µg/m³ for all other VOCs in the USEPA Method TO-15 analysis.

4 QUALITY ASSURANCE/QUALITY CONTROL (QA/QC)

The proposed work may include method blanks, field blanks, trip blanks, duplicates, matrix spike/matrix spike duplicates (MS/MSD) and duplicates as necessary and specified in the QAPP (Refer to Appendix B). Any method blank, field blank or trip blank samples (properly sealed vials filled with distilled water by the laboratory) used will be carried into the field and handled and transported in the same manner as all other samples, as needed. MS/MSD and duplicate samples may be randomly collected during each sampling event, dependent upon total number of samples collected. Additional QA/QC details are described in the QAPP presented in Appendix B.

5 SUMMARY REPORT

The laboratory analytical reports will be evaluated and a summary report will be prepared presenting the SVI sampling results and recommendations for VCP site closure. Based on the results, the report will discuss whether controls are needed to prevent VOC vapors from migrating into buildings. The summary report will be submitted to NYSDEC and NYSDOH for review and approval. An appropriate site management plan will then be developed based on the sampling results and proposed site use.

6 SCHEDULE

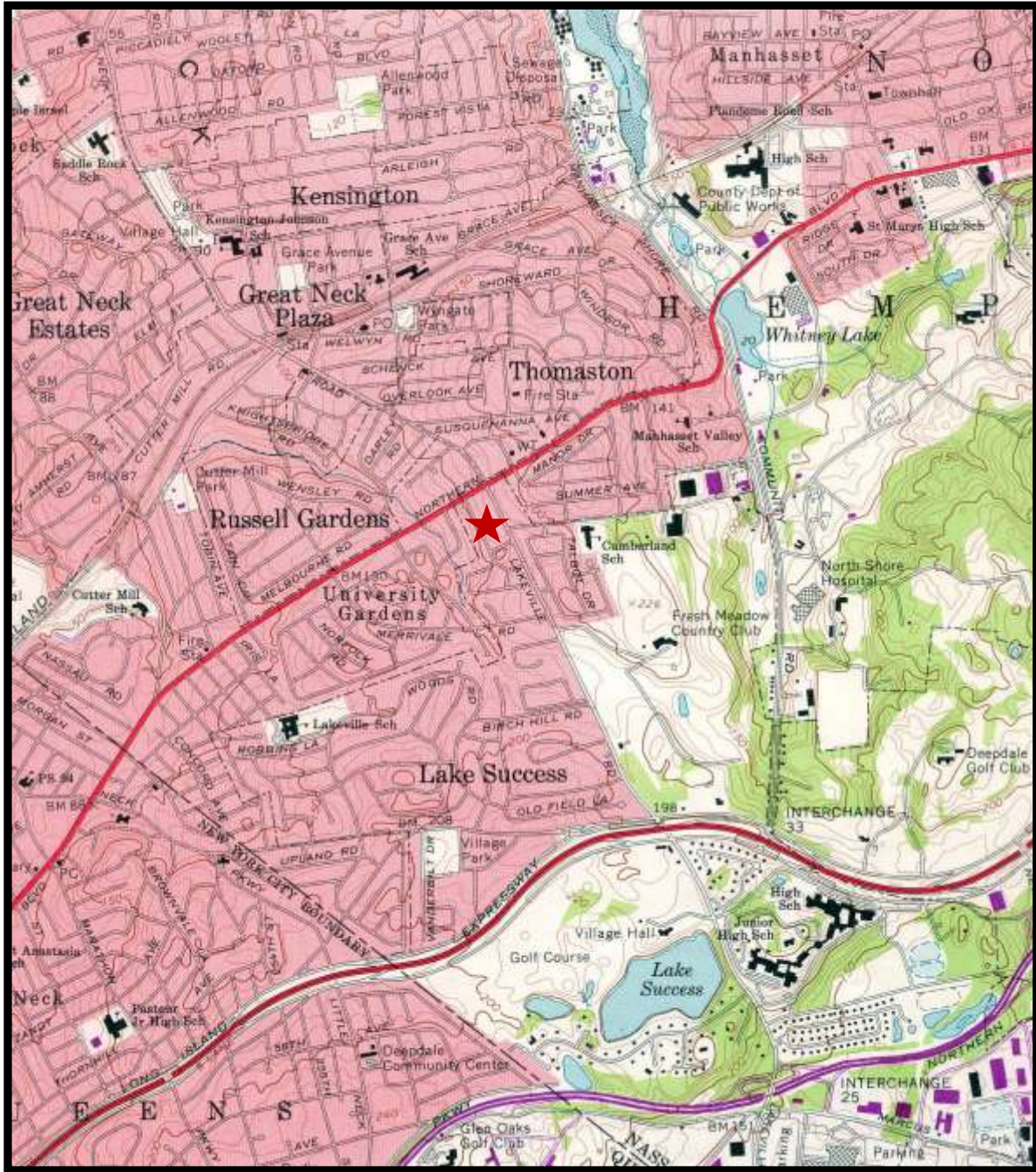
Upon NYSDEC/NYSDOH approval of this Work Plan, the off-site property owners will be contacted to obtain the access needed for sampling. The field work will be scheduled to begin as soon as possible after the November 15th start of the heating season. All sampling will be completed by March 31, 2016.

FIGURES

Former Imperial Cleaners Site
(VCP Site #V-00244-1)
218 Lakeville Road
Lake Success, New York

FIGURE 1

SITE LOCATION MAP



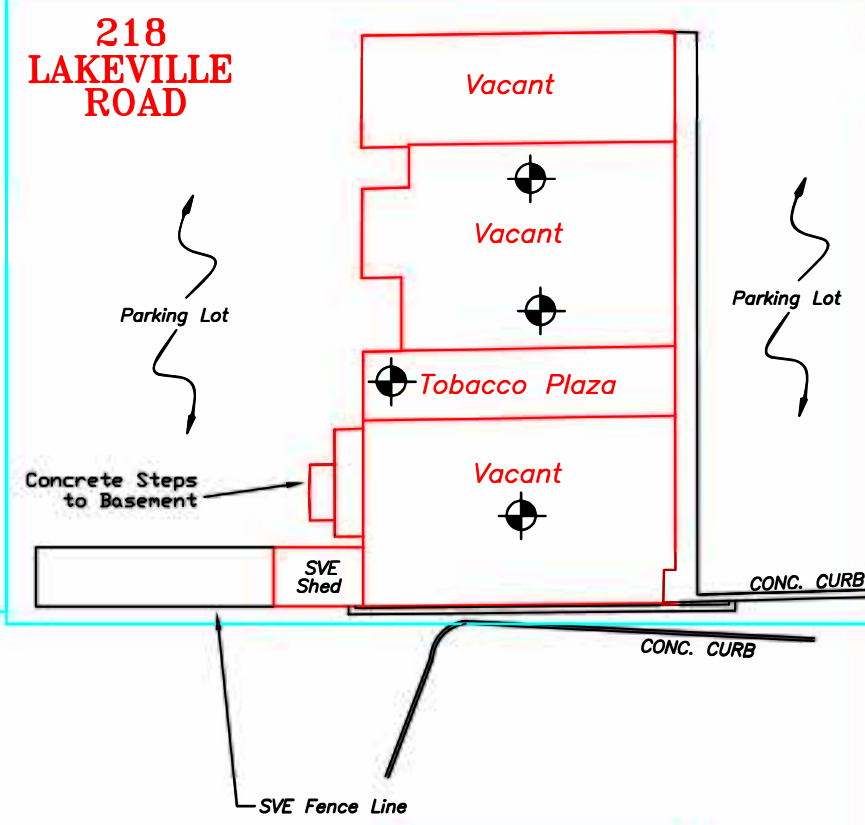
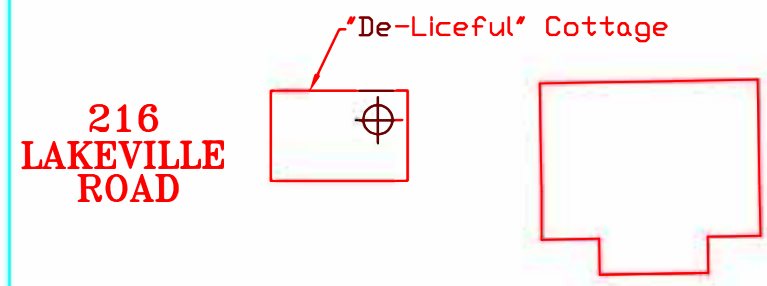
(USGS QUAD Sea Cliff, New York)

(Scale 1:24000)



UNIVERSITY PLACE

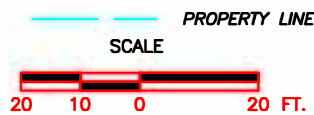
LAKEVILLE ROAD

UNIVERSITY ROAD



LEGEND

-  PROPOSED ON-SITE SUB-SLAB VAPOR AND INDOOR AIR SAMPLING LOCATION (APPROXIMATE; ACTUAL LOCATIONS TO BE DETERMINED IN FIELD)
-  PROPOSED OFF-SITE SUB-SLAB VAPOR AND INDOOR AIR SAMPLING LOCATION (APPROXIMATE; ACTUAL LOCATIONS TO BE DETERMINED IN FIELD)



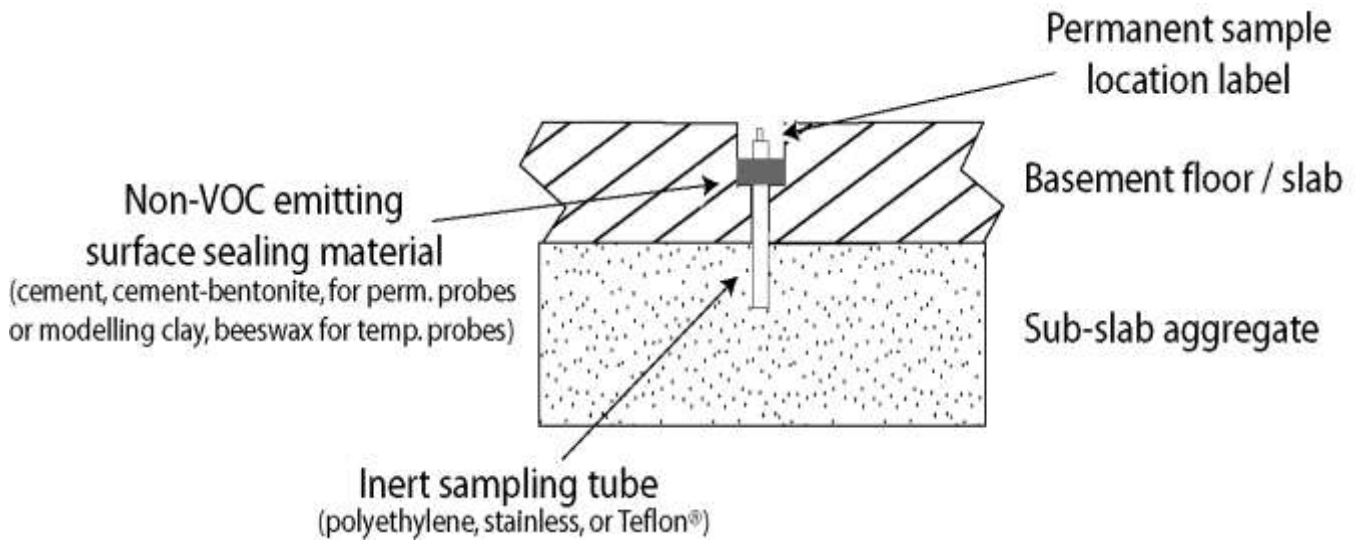
NOTES

1. Site base map was derived from a property survey prepared by Welsh Engineering & Land Surveying, P.C., 343 Manville Road, Pleasantville, NY 10570, revised on 7/14/00.
2. The Welsh Engineering north area was corrected based on 1999 Nassau County GIS basemap.

Former Imperial Cleaners Site
(VCP Site #V-00244-1)
218 Lakeville Road
Lake Success, New York

FIGURE 3

TYPICAL SUB-SLAB VAPOR SAMPLING PROBE SCHEMATIC



Source: Guidance for Evaluating Soil Vapor Intrusion in the State of New York (New York State Department of Health, October 2006), Figure 2.3 Schematic of a generic sub-slab vapor probe

APPENDIX B
Quality Assurance Project Plan (QAPP)

QUALITY ASSURANCE PROJECT PLAN

FOR

**FORMER IMPERIAL CLEANERS SITE
218 LAKEVILLE ROAD
LAKE SUCCESS, NEW YORK 11020**

SITE #C130225

FEBRUARY 2019

16 SPRING STREET
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**WALDEN ENVIRONMENTAL
ENGINEERING**

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1.0 Project Organization and Responsibilities

Walden Environmental Engineering, PLLC (Walden) maintains company policies and procedures to ensure that all sample collection and analyses meet a high degree of quality. These policies and procedures provide confidence that the resulting data provide an accurate representation of the matrix being sampled. Quality Assurance/Quality Control (QA/QC) starts with the design of the sampling program and ends with the summarized analytical data submitted in the final report. This Quality Assurance Project Plan (QAPP) describes these QA/QC policies and procedures.

The project Quality Assurance Officer (QAO) is responsible for ongoing surveillance of project activities, for ensuring conformance to this QAPP, and for evaluating the effectiveness of its requirements. The QAO has access to any personnel or subcontractors, as necessary, to resolve technical problems and take corrective action as appropriate and has the authority to recommend that work be stopped when there are factors present that may jeopardize quality. The QAO will be available to respond to immediate QA/QC problems.

The primary responsibilities of the QAO are as follows:

- Monitor the correction of QC problems and alert task leaders to where similar problems might occur.
- Develop and maintain project QA files for sampling, monitoring, and field QA records.
- Participate in QA audits.
- Recommend changes to the project manager to improve the effectiveness of the project in reaching its QA objectives for field sampling and monitoring activities.
- Review proposed additions and changes to this QAPP.

The project QA will be maintained under the direction of Ms. Jessica Bluth (see attached resume), who will be assigned as the project's QAO, in accordance with this QAPP. QC for specific tasks will be the responsibility of Walden and its subcontractors, which shall be selected at the time the work is required under the direction of Ms. Bluth.

2.0 Quality Assurance Project Plan Objectives

2.1 Overview

Overall project goals are defined through the development of Data Quality Objectives (DQOs), which are qualitative and quantitative statements that specify the quality of the data required to support decisions. Data quality is measured by how well the data meet the QA/QC goals of the project. In this plan, "Quality Assurance" and "Quality Control" are defined as follows:

- Quality Assurance - The total integrated program for assuring reliability of monitoring and measurement data.
- Quality Control - The routine application of procedures for obtaining prescribed standards of performance in the monitoring and measurement process.

As stated in the Guidance for Data Quality Objectives Process (EPA QA/G-4), DQOs are derived from the outputs of each step of the DQO process that:

- Classify the study objective;
- Define the most appropriate type of data to collect;
- Determine the most appropriate conditions from which to collect the data; and
- Specify acceptable levels of decision errors that will be used as the basis for establishing the quantity and quality of data needed to support the decision (USEPA, 1994).

A non-probabilistic (judgmental) sampling approach will be used to select the specific sampling locations for the areas of concern. A judgmental sampling design consists of directed samples at specific sampling locations to confirm the existence of contamination at these chosen locations based on visual or historical information (i.e., discoloration, staining, and deterioration).

Total study error is the combination of sampling and measurement error. Total study error is directly related to decision error. These decision errors can be controlled through the use of hypothesis testing. For this sampling, the null hypothesis (baseline condition) is that the parameter of interest exceeds the cleanup levels. This decision has the smallest degree of decision error. In addition, measurement error is reduced by analyzing individual samples using more precise laboratory and sampling methods. The soil, sub-slab vapor, and indoor/outdoor air sampling will be performed with dedicated equipment and following the appropriate standard operating procedures for sample handling.

2.2 QA/QC Requirements

QA elements to be evaluated include accuracy, precision, sensitivity, representativeness and completeness. Reporting of the data must be clear, concise and comprehensive. The data generated by the analytical laboratory for this project is required to be sensitive enough to achieve detection levels low enough to meet Contract Required Quantitation Limits (CRQLs) as specified in NYSDEC Analytical Services Protocol (NYSDEC ASP) for Superfund CLP and EPA SW-846 methods performed in accordance with NYSDEC ASP protocol. The analytical results meeting the CRQLs will provide data sensitive enough to meet the objectives of the work described in the *Remedial Work Plan* (Walden, February 2019). The QC elements that are important to this project are blank contamination, instrument calibration, completeness of field data, sample-holding times, sample preservation and sample chain of custody.

2.3 Initial Instrument Calibration

Calibration curves will be developed for each of the compounds to be analyzed. Standard concentrations and a blank will be used to produce the initial curves. The development of calibration curves and initial calibration response factors must be consistent with method requirements presented in the most recent version of SW-846 and the NYSDEC's Analytical Services Protocol (ASP).

2.4 Continuing Instrument Calibration

The initial calibration curve will be verified every 12 hours by analyzing one calibration standard. The standard concentration will be the midpoint concentration of the initial calibration curve. The calibration check compound must come within 25% relative percent difference (RPD) of the average response factor obtained during initial calibration. If the RPD is greater than 25%, then corrective action must be taken as provided in the specific methodology.

2.5 Method Blanks, Field Blanks and Trip Blanks

Method blank or preparation blank is prepared from an analyze-free matrix, which includes the same reagents, internal standards and surrogate standards as the related samples. It is carried through the entire sample preparation and analytical procedure. A method blank analysis will be performed once for each 12-hour period during the analysis of samples for Volatile Organic Compounds (VOCs). The method blank will be used to demonstrate the level of laboratory background and reagent contamination that might result from the analytical process itself.

Field blanks and trip blanks will also be collected to ensure no contamination arises from sampling equipment or the transportation and handling methods.

2.6 Duplicates

Duplicate samples are two or more samples considered representative sub-samples of the same source. The samples are identically processed throughout the measurement system. For the SVI monitoring, laboratory duplicate analyses will consist of one (1) sub-slab vapor sample, one (1) indoor air sample, and one (1) outdoor air sample for every batch of field samples. For the pre-design soil investigation, one (1) duplicate sample will be collected per day of sampling. For the pre-design groundwater sampling, one (1) duplicate sample will be collected per day of sampling. Duplicate samples will be analyzed as per appropriate methodology. Duplicate analyses for Target Compound List (TCL) compounds will be associated with matrix spike and matrix spike duplicate analyses. The results of the duplicate analyses will be used to assess the precision of the measurement systems.

2.7 Surrogate Spike Analysis

Surrogate standard determinations will be performed on all samples and blanks analyzed by the analytical laboratory. All samples and blanks will be spiked with the appropriate surrogate compounds (as indicated by the methodology) before purging or extraction in order to monitor preparation and analyses of samples. Surrogate spike recoveries shall fall within the advisory limits in accordance with the SW-846 protocols for samples falling within the quantitation limits without dilution.

2.8 Matrix Spike/Matrix Spike Duplicate/Matrix Spike Blank Analysis

Matrix Spike (MS) and Matrix Spike Duplicate (MSD) analyses will be performed to evaluate the matrix effect of the sample upon the analytical methodology along with the precision of the instrument by measuring recoveries. The MS/MSD samples will be analyzed for each group of samples of a similar matrix, at a rate of one for every batch of field samples. The Relative Percent Difference (RPD) will be calculated from the difference between the MS and MSD. Matrix spike blank (MSB) analysis will be performed to indicate the appropriateness of the spiking solution(s) used for the MS/MSD.

2.9 Accuracy

Accuracy is defined as the nearness of a result or the mean (x) of a set of results to the true value. Accuracy is assessed by means of reference samples and percent recoveries. Accuracy includes both precision and recovery, and is expressed as Percent Recovery (% REC). The MS sample is used to determine the percent recovery. The matrix spike % REC is calculated by the following equation:

$$\%REC = \frac{SSR - SR}{SA}$$

where:

SSR = measurement from spiked sample

SR = measurement from un-spiked sample

SA = actual data of spike added

2.10 Precision

Precision is defined as the measurement of agreement of a set of replicate results among themselves without assumption of any prior information as to the true result. Precision is assessed by means of duplicate/replicate sample analyses. Analytical precision is expressed in terms of Relative Percent Difference (RPD) which is calculated using the following equation:

$$RPD = \frac{D_1 - D_2}{(D_1 + D_2)/2}$$

where:

RPD = Relative Percent Difference

D₁ = larger sample value

D₂ = smaller sample value (duplicate)

2.11 Sensitivity

The sensitivity objectives for this plan require that data generated by the analytical laboratory achieve detection levels low enough to meet the CRQLs as specified by SW-846 methods. The Method Detection Limits (MDL) for target compounds and target analyses will be established by the analytical laboratory to be well below the remedial objectives and submit appropriate documentation to Walden as required by the QAO.

2.12 Representativeness

Representativeness is a measure of the relationship of an individual sample taken from a particular site to the remainder of the site and the relationship of a small aliquot of the sample (i.e., the one used in the actual analysis) to the sample remaining on-site. A blind duplicate is used to accomplish this task, as well as assessing the precision of the data. The RPD between the two samples should be less than 50%. The use of standardized techniques and statistical sampling methods influences the representativeness of an aliquot of sample to the sample at the site. The representativeness of samples is assured by adherence to sampling procedures presented in this document, therefore no specific representativeness samples are to be collected.

2.13 Completeness

Completeness is a measure of the quantity of data obtained from a measurement system as compared to the amount of data expected from the measurement system. Completeness is defined as the percentage of all results that are not affected by failing QC qualifiers and should be between 90% and 100% of all analyses performed. The objective of

completeness in laboratory reporting is to provide a thorough data support package. The laboratory data package provides documentation of sample analysis and results in the form of summaries, QC data and raw analytical data. The laboratory will be required to submit data packages that follow SW-846 reporting format, which, at a minimum, will include the following components:

1. All sample chain-of custody forms.
2. The case narrative(s) presenting a discussion of any problems and/or procedural changes required during analyses. Also presented in the case narrative are sample summary forms.
3. Documentation demonstrating the laboratory's ability to attain the contract specified detection limits for all target analyses in all required matrices.
4. Tabulated target compound results and tentatively identified compounds.
5. Surrogate spike analysis results (organics).
6. Matrix spike/matrix spike duplicate results.
7. QC checks sample and standard recovery results.
8. Blank method results.
9. Internal standard area and RT summary.

2.14 Comparability

Comparability is the degree to which analytical data generated from an individual laboratory can be compared with those from another laboratory, in terms of use of standardized industry methods and equivalent instrumentation techniques. No laboratory split samples will be taken for this project.

3.0 Calibration and Maintenance Procedures of Field Equipment

Walden follows manufacturer's recommendations and guidelines with regard to field instrument calibration procedures. The calibration of each instrument will be checked prior to each day's use. The date and time of the calibration check, serial number, model number and signature of the calibrating technician will be entered into the field logbook. If the instrument readings are incorrect, the instrument will be either recalibrated by the technician or returned to the Walden's office where it will be further evaluated and/or repaired. If field instruments require major overhauls, the instruments will be returned to the appropriate manufacturer.

Preventive maintenance of field equipment is performed routinely before each sampling event and more extensive maintenance is performed based on hours of use. The Walden equipment coordinator has overall responsibility for the preventive maintenance program. However, certain maintenance programs are overseen by the project manager. Routinely, manually operated sampling equipment is checked to ensure it operates properly and that excessive wear has not occurred. If necessary, equipment is taken out of service for repair or replacement.

Soil and groundwater sampling equipment will be decontaminated with a water and alconox solution before every sample is taken. Groundwater samples to be analyzed for PFAS and 1,4-dioxane will be collected in accordance with the procedures and requirements outlined in Groundwater Sampling for Emerging Contaminants (February 2018).

4.0 Tracer Gas Monitoring for SVI Sampling

A tracer gas will be used as a quality assurance/quality control (QA/QC) measure to verify the integrity of the soil vapor probe seal. This measure will be used to determine that the soil vapor sample has not been diluted by ambient air. Plastic sheeting will be placed around the sampling probes and sealed around the edges to create an adequate surface seal to prevent outdoor air infiltration. Helium tracer gas will be introduced under the plastic sheeting through a small opening to enrich the atmosphere in the immediate vicinity of the sampling probes with the tracer gas. A portable helium monitoring device will be used to analyze a soil vapor sample for the helium tracer gas to confirm the integrity of the probe seals before vapor samples were collected in Summa[®] canisters. The helium detector will serve to purge the points of 1 to 3 volumes of air prior to sampling.

5.0 Sample Custody

5.1 Overview

The handling of samples in the field and in the laboratory will conform to the sample custody procedures presented in this section. Field custody procedures involve proper sample identification, chain-of-custody forms, packaging and shipping procedures. Laboratory custody begins with the receipt of samples by the laboratory and continues through sample storage, analysis, data reporting and data archiving. This section provides the procedures that will be followed during the course of the project to ensure proper sample custody.

5.2 Field Custody Procedures for Off-Site Laboratory

The following elements are important for maintaining the field custody of samples:

- Sample identification
- Sample labels
- Custody records
- Shipping records
- Packaging procedures

Sample labels will be attached to all sampling containers before field activities begin. Each label will contain an identifying number and each number will have a suffix that identifies the site and where the sample was collected. Approximate sampling locations will be marked on a map with a description of the sample location. The number, type of sample and sample identification will be entered into the field logbook. A chain-of-custody form will accompany the sampling containers from the laboratory into the field. Upon receipt of the samples and cooler, the sampler will sign and date the first “received” blank space. After each sample is collected and appropriately identified entries will be made on the chain-of-custody form that will include:

- Site name and address
- Samplers’ names and signatures
- Names and signatures of persons involved in chain of possession
- Sample number
- Number of containers
- Sampling station identification
- Date and time of collection
- Type of sample and the analyses requested
- Preservatives used (if any)
- Pertinent field data (if any)

After sampling has been completed, the samplers will return/ship the samples to the laboratory. The sampler will sign and date the next "relinquished" blank space. One copy of the custody form will remain with the field personnel and the remaining copies will accompany the samples to the laboratory. The samples will be shipped to the laboratory within 24 hours of collection. Samples will be received by laboratory personnel, who will assume custody of the samples and sign and date the next "received" blank.

5.3 Laboratory Custody Procedures

Upon receipt by the analytical laboratory, samples will proceed through an orderly processing sequence specifically designed to ensure continuous integrity of both the sample and its documentation.

All samples will be received by the laboratory's sample control group and will be carefully checked for label identification and completed accurate chain-of-custody records. The sample will be tracked from storage through the laboratory system until the analytical process is completed and the sample is returned to the custody of the sample control group for disposal. Generally, access to NYSDOH ELAP certified laboratories is restricted to prevent any unauthorized contact with samples, extracts, or documentation.

6.0 Sample Preparation and Analytical Procedures

Containers, preservation and holding times of environmental samples will be applied as detailed in the NYSDEC ASP. The holding time of samples for VOC analysis of air samples will be 30 days from the Verified Time of Sample Receipt (VTSR). Analyses of environmental samples will be performed by the protocol requirements of the SW-846.

A summary of analyses and related QA/QC samples would be performed on the samples collected at the site are described in the *Remedial Work Plan* (Walden, February 2019). Organic compounds will be analyzed by the following methods:

- Soil
 - TCL VOCs by USEPA Method 5035

- Groundwater
 - TCL VOCs by USEPA Method 8260
 - 1,4-dioxane via USEPA Method 8260 or Method 8270 (run in selective ion mode to achieve low level detection limits)
 - Full PFAS list (21 compounds) via USEPA Modified (Low Level) Test Method 537 or Method ISO 25101, capable of achieving two (2) parts per trillion reporting limits.

- Sub-slab Soil Vapor and Indoor/Outdoor Air Samples
 - TCL VOCs by USEPA Method TO-15

If any modifications or additions to the standard procedures are anticipated, and if any nonstandard sample preparation or analytical protocol is to be used, the modifications and the nonstandard protocol will be explicitly defined and documented. Prior approval by Walden's QAO is necessary for any nonstandard analytical or sample preparation protocol used by the laboratory.

7.0 Data Reduction, Validation, Review and Reporting

7.1 Overview

The process of data reduction, review, and reporting ensures that assessments or conclusions based on the final data accurately reflect actual site conditions. This plan presents the specific procedures, methods, and format that will be employed for data reduction, review and reporting of each measurement parameter determined in the laboratory and field. Also described in this section is the process by which all data, reports and work plans are proofed and checked for technical and numerical errors prior to final submission.

7.2 Data Reduction

Data reduction is the process by which raw analytical data generated from the laboratory instrument systems are converted into usable mass concentrations. The raw data, which may take the form of summation of areas under the curve instrument responses, or observations is processed by the laboratory and converted into concentrations expressed in micrograms per kilogram for soil samples and in micrograms per cubic meter for sub-slab vapor and air samples. The analytical laboratory will be required to follow SW-846 data reduction procedures.

Data reduction also includes the process by which raw field data is summarized into tables and graphs, from which quantitative or qualitative assessments can be derived by filter integration and evaluation. Field data that is anomalous will be thrown out to create a linear interpretation of the data that depicts a more accurate trend.

Field data obtained during sampling is summarized on appropriate field forms. This information will be used to assess field conditions at the time of sampling and is summarized and analyzed along with the chemistry data in the final report. Occasionally, the reduction of actual field data requires correcting measurement data for the measurement system's baseline value. The data will be adjusted only after the raw data has been submitted to Walden's QAO and prior to preparation of the final report.

7.3 Walden Data Review

7.3.1 Laboratory Data

The QAO or a designee under the project manager's supervision, will review each analytical data package for completeness (i.e., have all the analyses requested been performed?) and general protocol compliance, such as holding times, detection limits, spike recoveries and surrogate recoveries. The results of this review will be summarized and submitted to the independent validator with the data package. If information is found

to be missing from the data package the analytical laboratory will be contacted and requested to submit any missing information.

7.3.2 Data Usability Report

Walden's QAO will evaluate all of the analytical laboratory data according to the NYSDEC Division of Environmental Remediation (DER) Data Usability Summary Report (DUSR) guidelines to determine if the data presented by the laboratory meets the project specific criteria for data quality and use. Taking into account protocols for sampling, transport, analysis, reduction, and reporting, the QAO will use this information and his/her own experience to establish whether the results of each analysis can be used for the purpose intended. Data deficiencies, analytical protocol deviations, and quality control problems are identified and the effect on the data is evaluated. It will be determined whether the final results can be used as reported, qualified to indicate limitations, or rejected outright.

7.4 Data Validation

Data validation is the systematic process by which data quality is determined with respect to data quality criteria that are defined in project and laboratory QC programs and within the referenced analytical methods. The data validation process consists of an assessment of the acceptability or validity of project data with respect to the stated project goals and the requirements for data usability. Ideally, data validation establishes the data quality in terms of project DQOs. Data validation consists of data editing, screening, checking, auditing, certification, review and interpretation.

The purpose of data validation is to define and document analytical data quality and determine whether the laboratory data quality is sufficient for the intended use(s) of the data. An approved independent data evaluator will not review data prior to its use in reports prepared by Walden unless requested by the NYSDEC. Both the field and laboratory data will be subjected to a level of data validation commensurate with the required data quality level. If required, the data will be validated in accordance with the following document: "Functional Guidelines for Evaluating Inorganic Analyses" and the "Functional Guidelines for Evaluating Organic Analyses" (Technical Directive Document No. HQ-8410-01, USEPA). The validator will evaluate the analytical laboratory's ability to meet the DQOs provided in this QAPP. Noncompliant data will be flagged in accordance with the NYSDEC ASP and corrective action will be undertaken to rectify any problems.

7.5 Reporting

7.5.1 *Field Data Reporting*

All field real-time measurements and observations will be recorded in project logbooks or field data records. Field measurements may include temperature, wind speed and direction, and PID results, if applicable. All data will be recorded directly and legibly into field logbooks. If entries are changed, the change will not obscure the original entry and the correction will be signed. Field data records will be organized into standard formats whenever possible and retained in permanent files.

7.5.2 *Laboratory Data Reporting*

All sample data packages submitted by the analytical laboratory will be required to be reported in conformance to the SW-846 deliverable requirements as applicable to the method utilized.

7.6 Data Usage

The soil and groundwater data will be used to evaluate and determine contamination extent on the site based on the regulatory levels and project cleanup objectives. The sub-slab and indoor air sampling data will be used to monitor indoor air quality impacts.

8.0 Internal Quality Control

8.1 Overview

QC checks will be performed to ensure the collection of representative and valid data. Internal QC refers to all data compilation and contaminant measurements. QC checks will be used to monitor project activities to determine whether QA objectives are being met. All specific internal QC checks to be used are identified in this section.

8.2 Laboratory Quality Control

The analytical laboratory is required to exercise internal control in a manner consistent with the requirements of this QAPP. Control checks and internal QC audits are required by the NYSDEC ASP methods. These include reference material analysis, blank analysis, MS/MSD analysis, cleanups, instrument adjustments and calibrations, standards and internal audits. One qualified professional will proof and check all final reports for transcription and/or calculation errors. Twenty percent of all final reports will be subsequently checked again by a qualified professional. All data tables will be checked to ensure no transcription errors have occurred. Data tables will also be checked to see that any criteria cited for comparison purposes is appropriate and correctly referenced. All calculations will be checked to ensure that they will be properly presented and that resulting values are achievable. If any results cannot be duplicated the calculations will be independently checked for accuracy.

9.0 Performance and System Audits

Performance audits, when performed, will be used to monitor project activities to assure compliance with project DQOs. Walden periodically conducts internal audits of field activities. Walden's on-site project manager will routinely monitor all field activities to ensure that work is done correctly. All sampling and analytical work will be reviewed routinely by the project manager. All data sheets obtained in the field will be initialed and dated by project manager after review and acceptance of the services performed. A field audit will include monitoring and evaluation of sample collection, sample holding times, preservation techniques, field QC and equipment calibration. These audit forms will be kept on file with the Walden project manager for a period of at least one (1) year after completion of the project, then will be transferred to storage and held for an additional five (5) years.

10.0 Analytical Corrective Action

10.1 Laboratory Corrective Action

Corrective actions will be implemented if unsatisfactory performance and/or system audit results indicate that problems exist. Corrective action may also be implemented if the result of a data assessment or internal QC check warrants such action.

11.0 Analytical Methods/Quality Assurance Summary Table

Parameter	Information
Matrix Type	Soil
Number of Samples to be Collected	Twelve (12) borings, minimum two (2) samples per boring
Number of Field Blanks	1 per day of sampling
Number of Trip Blanks	1 per trip
Analytical Parameters	VOCs
Analytical Methods	USEPA Method 5035
Number of Matrix Spike Samples and Matrix Spike Duplicate to be Collected	To be determined after consultation with selected laboratory
Number and Type of Duplicate Samples to be Collected	1 per day of sampling
Sample Preservation	None
Sample Container Volume and Type	per USEPA Method 5035
Sample Holding Time	per USEPA Method 5035
Parameter	Information
Matrix Type	Groundwater
Number of Samples to be Collected	Seven (7) [four (4) for emerging contaminants]
Number of Field Blanks	1 per day of sampling
Number of Trip Blanks	1 per trip
Analytical Parameters	VOCs
Analytical Methods	USEPA Method 8260, USEPA Modified (Low Level) Test Method 537 or Method ISO 25101
Number of Matrix Spike Samples and Matrix Spike Duplicate to be Collected	To be determined after consultation with selected laboratory
Number and Type of Duplicate Samples to be Collected	1 per day of sampling
Sample Preservation	None
Sample Container Volume and Type	per USEPA Method 5035
Sample Holding Time	per USEPA Method 5035
Parameter	Information
Matrix Type	Sub-Slab Soil Vapor
Number of Samples to be Collected	Approx. 11 Sub-Slab Samples
Number of Field Blanks	1 per sampling event
Number of Trip Blanks	1 per trip
Analytical Parameters	VOCs
Analytical Methods	USEPA Method TO-15
Number of Matrix Spike Samples and Matrix Spike Duplicate to be Collected	To be determined after consultation with selected laboratory
Number and Type of Duplicate Samples to be Collected	1 per day of sampling

Sample Preservation	None
Sample Container Volume and Type	per USEPA Method TO-15
Sample Holding Time	per USEPA Method TO-15

Parameter	Information
Matrix Type	Indoor Air
Number of Samples to be Collected	Approx. 11 Indoor Air Samples
Number of Field Blanks	1 per sampling event
Number of Trip Blanks	1 per trip
Analytical Parameters	VOCs
Analytical Methods	USEPA Method TO-15
Number of Matrix Spike Samples and Matrix Spike Duplicate to be Collected	To be determined after consultation with selected laboratory
Number and Type of Duplicate Samples to be Collected	1 per day of sampling
Sample Preservation	None
Sample Container Volume and Type	per USEPA Method TO-15
Sample Holding Time	per USEPA Method TO-15

QUALITY ASSURANCE OFFICER RESUME

APPENDIX C
Health and Safety Plan (HASP)

HEALTH AND SAFETY PLAN

FOR

**FORMER IMPERIAL CLEANERS SITE
218 LAKEVILLE ROAD
LAKE SUCCESS, NEW YORK 11020**

SITE #C130225

FEBRUARY 2019

16 SPRING STREET
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PHONE: (516) 624-7200
FAX: (516) 624-3219
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**WALDEN ENVIRONMENTAL
ENGINEERING**

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- Appendix IV: Chemical Hazard Information
- Appendix V: Hospital Route and Emergency Numbers

1.0 Statement of Commitment to Worker Health and Safety

Walden Environmental Engineering, PLLC (Walden) employees may be exposed to risks from site-related hazardous conditions while performing field activities at the Former Imperial Cleaners Site located at 218 Lakeville Road, Lake Success, NY. Walden's policy is to minimize the possibility of work-related injury through aware and qualified supervision, health and safety training, medical monitoring and the use of appropriate Personal Protective Equipment (PPE). Walden has established a guidance program to implement this corporate policy in a manner that protects personnel to the maximum reasonable extent.

This site-specific Health and Safety Plan (HASP) applies to all Walden personnel, owners' representatives, subcontractors, and the New York State Department of Environmental Conservation (NYSDEC) personnel and/or its representatives on the job site where operations involve actual or potential physical and chemical hazards that have been identified by Walden or others. This HASP is also intended to inform and guide all personnel (Walden employees and/or owner representatives and/or NYSDEC representatives and/or subcontractors) entering the exclusion zone, ensuring that each person sign and acknowledge the site hazards on the acknowledgement form provided in Appendix I. Walden and/or the owner's subcontractors are retained as independent contractors and, as such, are responsible for ensuring the safety of their employees.

Walden may require that on-site personnel take certain precautions in accordance with this HASP, and Walden may request that others protect their personnel in a manner that they deem necessary or sufficient.

2.0 General

2.1 Site Information

Owner Name: 218 Lakeville Acquisition LLC
Location: 218 Lakeville Road, Lake Success, New York
Walden Job #: IMPL0115

2.2 Project Personnel

Primary Consultant: Walden Environmental Engineering, PLLC
16 Spring Street, Oyster Bay, New York
(516) 624-7200 (phone)
(516) 624-3219 (fax)

On-Site Safety Coordinator: Jessica Bluth

On-Site Health and Safety Officer: Jessica Bluth

2.3 Project Description

The Former Imperial Cleaners site is located at 218 Lakeville Road, immediately south of Northern Boulevard (New York State Route 25A) and west of Lakeville Road in Lake Success, New York (RWP Figure 1). The one-story commercial building on-site has one active tenant (Tobacco Plaza) and three vacant tenant spaces. A release of tetrachloroethylene (PCE) at the 218 Lakeville Road Site was first noted in 1995. A site investigation followed to identify source areas and determine the extent of contaminated soil and groundwater at the Site (note that there is a perched water table underlying the site at approximately 30 feet below grade). Contaminated sediments were removed from the source areas (dry wells and leaching pools) to the extent possible without undermining the structures. Post-excavation soil sampling results indicated that volatile organic compounds (VOCs) remained in the subsurface following the source area removal actions. A soil vapor extraction (SVE) system was installed to remove VOC vapors remaining in the soil and improve soil and groundwater quality. A soil, soil gas, groundwater and indoor air monitoring program was implemented to track the reductions in VOC concentrations achieved by operation of the SVE system. The SVE system was shut down several years ago when on-site soil sampling results indicated that the SVE system had successfully reduced soil contaminant concentrations to below the NYSDEC TAGM 4046 Recommended Cleanup Objectives. All of this site investigation and remediation work was conducted by the previous owners of the Site as required by NYSDEC and NYSDOH under the Voluntary Cleanup Program (VCP).

Sub-slab vapor sampling and indoor/outdoor air sampling was performed under the VCP. Walden was retained by 218 Lakeville Acquisition LLC to perform this work in accordance with NYSDEC and NYSDOH requirements.

Further on-site soil and groundwater sampling for VOC sampling and geological characterization shall be performed by Walden in accordance with NYSDEC and NYSDOH requirements. In addition, a SVE pilot test will be conducted, and an SVE remedial system will be installed and operated on-site. Sub-slab vapor and indoor/outdoor air sampling will be performed to evaluate soil vapor intrusion and indoor air quality impacts.

2.4 Training

All site-related workers entering the exclusion zone must be trained in accordance with 29 CFR 1910.120 E3 and E4, and all others must have at least 29 CFR 1910.120 E3.

Documentation of Walden personnel training is maintained on files and each Walden employee will have copies of his/her applicable 40-Hour OSHA Training, 8-Hour Refresher and Supervision Training Certificates on-site (maintained by the job health and safety officer or designee).

Each subcontractor working on the job must provide the site safety officer with training documentation for its personnel.

2.5 Affidavit

All Walden personnel and subcontractors who enter site-related exclusion zones must sign the attached Safety Plan Acknowledgment form (**Appendix I**). Walden personnel and site-related subcontractors must also read and comply with Walden's generic HASP.

2.6 Alternative Work Practices

Underground utilities must be identified before commencing any subsurface work. Blowers may be employed to reduce and disperse any releases of toxic gases. If items proposed within the work plan are modified based on changes in field conditions, they would be evaluated and an addendum would be prepared to cover these alternative work practices.

3.0 Hazardous Substances

Hazardous substances are defined as the suspected or known hazardous substances stored, within any media (contaminated), etc.

In soil and sub-slab soil vapor: The Volatile Organic Compounds (VOCs) Tetrachloroethylene (PCE), Trichloroethylene (TCE) and cis-1,2 Dichloroethylene have been identified in soil and sub-slab soil vapor at the Site.

3.1 Hazard Assessment

Defined as toxic effects, including Threshold Limit Values (TLVs), Immediately Dangerous to Life or Health's (IDLHs), reactivity, stability, flammability and operational hazards with sampling, decontaminating, etc.

The major route of exposure to potential contaminants will be respiratory; however, dermal exposure may also be possible. Inhalation of vapors and contaminated dusts would provide the mechanism for respiratory exposure. Skin contact with soils and groundwater would result in dermal exposure. PCE is the compound of highest concern. The program will use engineering controls and Personal Protective Equipment (PPE) to reduce the amount of potential exposure. Continuous air monitoring and personal protection devices will serve to prevent exposure to chemicals.

All field personnel, except for the equipment operator, must remain away from the equipment while work is taking place. All field personnel, including the operator, must wear steel-toe boots. All persons unrelated to the project must remain outside the exclusion zone while work is taking place. If persons other than Walden personnel or associated contractors have business in the exclusion area, they must remain at a safe distance away from Walden personnel during slab drilling activities and as determined by the site health and safety officer.

During typical work activities, surfaces can be expected to become uneven and slippery, causing unsure footing and requiring additional care by personnel engaged in operations. Additional site hazards are presented by the possibility of airborne and waterborne transport of hazardous materials and the presence of contaminated materials and equipment. Other site hazards include those that exist on all sites where construction type

operations take place, e.g., dangers from falling equipment, cuts, abrasions, and contusions.

4.0 Site Work Zones

Site work zones are defined as the designated exclusion zone, contaminant reduction zone and support zone. These work zones will be determined based on the degree of danger present. To the extent possible, the support and contaminant reduction zones will be established outside of the exclusion zone.

4.1 Support Zone

The support zone will be located outside of the exclusion zone. Personnel allowed in this area include all site personnel, visitors and representatives of regulatory agencies and observers. No particular training or PPE equipment are needed in the support zone/clean area.

4.2 Contaminant Reduction Zone

The contaminant reduction zone will be located between the support zone and the designated exclusion zone. In this area authorized personnel will don protective equipment, as needed in the exclusion zone. When exiting the contaminant reduction zone, personnel will remove contaminated PPE.

4.3 Exclusion Zone

The exclusion zone is in the immediate work area and that adjacent area as defined by the safety coordinator. Attempts will be made so that equipment and site activities taking place in the exclusion zone are situated so that personnel are upwind of sources. Fans or blowers will be used, if necessary, to disperse gases released during site-related activities.

4.4 Task Specific Level of Protection

See Table 1 for levels of personal protective equipment (PPE) requirements.

4.5 Communications

In the event that Level C respiratory protection is used, hand signals will be developed for communication. At this point, all proposed site-related work would be conducted in Level D PPE.

TABLE 1

PERSONAL PROTECTIVE EQUIPMENT REQUIREMENTS

LOCATION	LEVEL OF PROTECTION/TASKS	DESCRIPTION
Support Zone	D	Steel toe boots and work clothes
Exclusion Zone and Contamination Reduction Zone	To be determined by the site safety officer based on contamination present D (modified) C	Steel toe boots, nitrile or latex gloves, hard hat, safety glasses Full face respirator fitted with organic vapor cartridge and Level D

5.0 Site Access

In the event of an emergency, the project personnel and subcontractors should assemble at the predetermined assembly area, designated by the site safety officer.

The predetermined assembly area for this site or task is the southwestern corner of the parking lot behind 218 Lakeville Road. The project manager or on-site health and safety officer may relocate this area, if necessary.

6.0 Monitoring Procedures

Monitoring will be conducted at the Site to identify contaminants and contaminant concentrations in all media as follows:

Direct reading instruments will be used in active work areas in order to enable rapid field decisions regarding levels of respiratory protection, as well as indicate the need for increased monitoring frequency at the edge of the exclusion zone.

A Photo Ionization Detector (PID), which will be calibrated daily and adjusted to give maximum sensitivity to the contaminants of concern, will be used to monitor the air on a continuous basis while soil vapor and air sampling activities are performed.

6.1 Task Specific Air Monitoring Action Levels

See Table 2 for air monitoring action levels.

TABLE 2

AIR MONITORING ACTION LEVELS

INSTRUMENT	HAZARD MONITORED	INSTRUMENT READING	ACTION REQUIRED
PID	Organic Vapors	5 ppm or greater above background in the breathing zone for 1 minute and the source of the reading is unknown.	PPE will be upgraded to Level C.

7.0 Decontamination and Disposal

Decontamination procedures apply to all contaminated personnel, surfaces, materials, instruments, equipment, etc. PPE will be removed prior to removing any respiratory protection. All personnel will thoroughly wash their hands and face before leaving the site. Subsurface tools will be steam-cleaned or washed with Alconox detergent and water, then followed by a deionized water rinse and/or air-drying.

Disposal procedures also apply to all contaminated equipment, supplies, disposable items and wash water. Any PPE will be bagged and contained in a drum designated for PPE disposal. All decontamination water and materials will also be drummed and disposed of off-site.

8.0 Emergency Procedures

Free and clear egress from the work areas shall be provided. Preparatory meetings will be held to ensure that procedures for reporting and responding to emergency incidents are compatible with emergency response of local, state, and federal agencies. The emergency response plan will be rehearsed prior to start-up of site activities.

8.1 Personnel Exposure

In event of personnel exposure (skin contact, inhalation, ingestion, specific procedures for specific chemicals):

- Skin Contact: Wash with soap and water.
- Inhalation: Remove to fresh air, monitor for ABCs (Airway, Breathing and Circulation).
- Ingestion: Call Poison Control Center and monitor ABCs.
- Eye Exposure: Repeated eye flush, monitor ABCs and transport to hospital.

8.2 Personnel Injury

In the event of personnel injury:

Check ABCs (Airway, Breathing and Circulation). Perform first aid, if required. Contact local ambulance if professional help is needed.

8.3 Potential or Actual Fire or Explosion

In event of potential or actual fire or explosion:

If a fire or explosion occurs leave the site and contact the appropriate emergency team (i.e. fire or police).

8.4 Environmental Accident

In event of environmental accident (spread of contamination outside site):

Stop spread of chemical as best as possible and notify Walden, NYSDEC, associated contractors and Nassau County Health Department at first opportunity.

8.5 Emergency Services

Emergency Medical Facility: North Shore University Hospital

Location: 300 Community Drive
Manhasset, NY 11030

Telephone: (516) 562-0100

Directions to hospital from site (Refer to Appendix V): Make left onto Lakeville Road and head north to Northern Boulevard (Route 25A). Make right onto Northern Boulevard heading east. Take Northern Boulevard 0.7 miles and turn right onto Community Drive heading south. Continue 0.3 miles on Community Drive and arrive at North Shore University Hospital (300 Community Drive, Manhasset, NY).

Ambulance Service: 911

Fire Department: 911

Police Department: 911

North Shore University

Hospital (Non-emergency): (516) 562-0100

National Response Center: (800) 424-8802

Poison Control Center (800) 222-1222

NYSDEC Spill Hotline (800) 457-7362

APPENDICES

Appendix I: Site Safety Plan Acknowledgement Form

I have read and understand the procedures set forth in this Health and Safety Plan for the Former Imperial Cleaners Site, 218 Lakeville Road, Lake Success, NY.

Printed Name	Signature	Representing	Date
_____	_____	_____	_____
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Appendix II: Heat Stress

Heart rate (HR) should be monitored by the radial pulse for 30 seconds as soon as possible in the resting period. If at the beginning of the rest period a worker's radial pulse is measured and his heart rate exceeds 100 beats per minute, the worker's next work period should be reduced by 33%. Therefore, if the original work period was one hour, the following work cycle should be reduced to 40 minutes.

Heat Stroke is a true medical emergency. First aid should be directed toward immediate measures to cool the body quickly, as well as seeing that the victim receives medical attention as soon as possible.

Prior to medical treatment, remove as much clothing as possible and proceed to cool the victim's body, taking care not to overchill the victim once his temperature falls below 102⁰F. One of the following cooling measures should be taken:

- a) Sponge the bare skin with cool water;
- b) Apply cold packs continuously;
- c) Wrap the victim in a sheet soaked with water;
- d) Immerse the victim in a tub of cold water, while closely monitoring the victim's level of consciousness.

Prior to site activity, the Site Safety Officer may make arrangements for heat stress monitoring (i.e., monitoring heart rate, body temperature and body water loss) during actual site work if conditions warrant these measures. In addition, the Site Safety Officer would want to ensure that the team members have been acclimatized to the particular environmental conditions and that personnel are aware of the signs and symptoms of heat sickness and have been adequately trained in first aid procedures. As Site Safety Officer, one should also make sure that sufficient personnel are on-site, so as to rotate work assignments, schedule work during hours of reduced temperatures, and ensure personnel do not consume alcoholic or caffeinated beverages but rather drink moderate levels of an electrolyte solution and eat well prior to commencing site work.

Workers may experience a condition of heat rash. Allow workers to rest and relieve the itching associated with heat rash rather than return to work too soon. Itching workers may not follow stringent decon procedures or scratch where it itches on-site and risk cross contamination.

Keeping the skin clean and dry will reduce the incidence of heat rash. This can be accomplished by wearing cotton garments (or other materials that absorb perspiration) underneath protective clothing. Upon removing the protective clothing, the worker should wash and dry his skin thoroughly.

The sense of thirst is not an adequate regulator of water replacement during heat exposure. Therefore, as a general rule, the amount of water administered should replace the amount of water lost, and it should be administered at regular intervals throughout the day. For every ½ pound of water loss, 8 ounces of water should be ingested. Water should be replaced by drinking 2 to 4 ounce servings during every rest period. A recommended alternative to water is an electrolyte drink diluted 50/50 with water.

Although there is no specific test given during a baseline physical that would identify a person's intolerance to heat, there are physical factors and personal habits which may indicate possible intolerance to heat, such as whether or not an individual smokes, one's dietary habits, body weight, as well as predisposing physical conditions such as high blood pressure, heart conditions, diabetes, or one's medication, that may influence an individual's ability to tolerate excessive heat.

Heat cramps are caused by profuse perspiration with inadequate fluid intake and salt replacement. Heat cramps most often afflict people in good physical condition who overwork in conditions of high temperature and humidity. Heat cramps usually come on suddenly during vigorous activity. Untreated, heat cramps may progress directly to heat exhaustion or heat stroke. First aid treatment: remove victim to a cool place and give sips of salted water (1 teaspoon of salt to 1 quart of water) - 4 ounces every 15 minutes over a period of one hour. A commercial preparation, e.g., Gatorade, may be used if diluted 50/50 with water.

Salted water or solution should mitigate the cramps. Manual pressure should not be applied to the cramped muscles.

Required Frequency of Heat Stress Monitoring for workers in Impermeable Clothing

Adjusted ⁽²⁾ Temperature (⁰ F)	Work Time Allowed Before Monitoring Break (min.)
90 or above	15
87.5-90	30
82.5-87.5	60
77.5-82.5	90
72.5-77.5	120

(1) Adapted from Eastern Research Group and National Institute for Occupational Safety and Health, Occupational Safety and Health Guidance Manual for Super Activities. September 26, 1984, pp. 8-75.

(2) Calculate the adjusted air temperature (Ta adj) by using this equation:

$$Ta \text{ adj } ^0F = Ta ^0F + (13 \times \% \text{ sunshine})$$

Measure air temperature (Ta) with a standard thermometer, with the bulb shielded from radiant heat. Then estimate percent sunshine (100 percent sunshine = no cloud cover and a sharp, distinct shadow; 0 percent sunshine = no shadows).

Heat Stress Signs and Symptoms

Heat Stress Indicator	When to Measure	If Exceeds . . .	Action
Heart rate (pulse)	Beginning of rest period	110 beats per minute	Shorten next work period by 33%
Oral temperature	Beginning of rest period	99 ⁰ F (after thermometer is under tongue for 3 minutes) or	Shorten next work period by 33%
		100.6 ⁰ F or greater	Prohibit work in impermeable clothing and shorten next work period by 33%
Body weight	1. Before workday begins (a.m.) 2. After workday ends (p.m.)	Decreases more than 5%	Increase fluid intake

Appendix III: Cold Stress (Hypothermia)

Cold stress is a function of cold, wetness and wind. A worker's susceptibility to cold stress can vary according to his/her physical fitness, degree of acclimatization to cold weather, age and diet.

Prevention

Institute the following steps to prevent overexposure of workers to cold:

1. Maintain body core temperature at 96.8⁰F or above by encouraging workers to drink warm liquids during breaks (preferably not coffee) and wear several layers of clothing. Wool is recommended since it can keep the body warm even when the wool is wet.
2. Avoid frostbite by adequately covering hands, feet, and other extremities. Clothing such as insulated gloves or mittens, earmuffs, and hat liners should be worn. To prevent contact frostbite (from touching metal and cold surfaces below 20⁰F) workers should wear anti-contact gloves. Tool handles and control bars should be covered with insulating material.
3. Adjust work schedules if necessary, providing adequate rest periods. When feasible, rotate personnel and perform work during the warmer hours of the day.
4. Provide a heated enclosure for workers close to their work area. Workers should remove their outer layer(s) of clothing while in the shelter to allow sweat to evaporate.
5. In the event that wind barriers are constructed around an intrusive operation (such as drilling), the enclosure must be properly vented to prevent the build-up of toxic or explosive gases or vapors. Care must be taken to keep any heat source away from flammable substances.
6. Using a wind chill chart such as the one attached, obtain the equivalent chill temperature (ECT) based on actual wind speed and temperature. Refer to the ECT when setting up work warm-up schedules, planning appropriate clothing, etc. Workers should use warming shelters at regular intervals at or below an ECT or 20⁰F. For exposed skin, continuous exposure should not be permitted at or below an ECT of -35 ⁰F.

7. Workers who become immersed in water or whose clothing becomes wet (from perspiration, rain, etc.) must immediately be provided a change of dry clothing whenever the air temperature is 25.6⁰F or below.
8. Maintain an optimal level of worker fitness by encouraging regular exercise, proper diet, etc. If possible, acclimatize workers to site conditions for several days before work begins.

Monitoring

Personnel should be aware of the symptoms of cold stress. If the following symptoms of systemic hypothermia are noticed in any worker, he/she should immediately go the warm shelter:

- Heavy, uncontrollable shivering;
- Excessive fatigue or drowsiness;
- Loss of coordination;
- Difficulty in speaking;
- Frostbite (see below).

Frostbite is the generic term for local injury resulting from cold. The stages of frostbite and their symptoms are as follows:

- Frostbite or incipient frostbite: sudden blanching or whitening of the skin.
- Superficial frostbite: waxy or white skin which is firm to the touch (tissue underneath is still resilient).
- Deep frostbite: tissues are cold, pale and solid.

Wind-chill Chart

Wind Speed (mph)	Actual thermometer Reading (^o F)									
	50	40	30	20	10	0	-10	-20	-30	-40
	Equivalent Temperature (^o F)									
calm	50	40	30	20	10	0	-10	-20	-30	-40
5	48	37	27	16	6	-5	-15	-26	-36	-47
10	40	28	16	4	-9	-21	-33	-46	-58	-70
15	36	22	9	-5	-18	-36	-45	-58	-72	-85
20	32	18	4	-10	-25	-39	-53	-67	-82	-96
25	30	16	0	-15	-29	-44	-59	-74	-88	-104
30	28	13	-2	-18	-33	-48	-63	-79	-94	-109
35	27	11	-4	-20	-35	-49	-67	-82	-98	-113
40	26	10	-6	-21	-37	-53	-69	-85	-100	-116
>40 (Little added effect)	Little Danger (for properly clothed person)				Increasing Danger (Danger from freezing of exposed flesh)			Great Danger		

Appendix IV: Chemical Hazards

TETRACHLOROETHENE or PERCHLOROETHENE (PCE)

Introduction

Tetrachloroethylene is a man-made substance widely used for dry cleaning fabrics and textiles and for metal-degreasing operations. It is also used as a starting material (building block) for the production of other man-made chemicals. Other names that may be used for tetrachloroethylene include perchloroethylene, perc, PCE, perclene, and perchlor. Although tetrachloroethylene is a liquid at room temperature, some of the liquid can be expected to evaporate into the air producing an ether-like odor; evaporation increases as temperature increases.

Exposure Pathways

Humans can be exposed to tetrachloroethylene from environmental, consumer product, and occupational sources. Common environmental levels of tetrachloroethylene (often called background levels) are usually several thousand times lower than levels found in some workplaces. Background levels found in the air we breathe and in the food and water we consume probably result from evaporation from industrial or dry-cleaning operations or from releases from areas where chemical wastes are stored. Tetrachloroethylene has been found in at least 330 of the 1117 National Priorities List (NPL) hazardous waste sites.

In general, tetrachloroethylene levels in air are higher in urban and industrialized areas than in more rural or remote areas. Higher-than-background concentrations of tetrachloroethylene have occasionally been measured in air close to chemical waste sites and in water taken from nearby wells.

Exposure to tetrachloroethylene may also occur from some consumer products. Products that may contain tetrachloroethylene include auto brake noise-reducers and cleaners, suede protectors, water repellants, silicone lubricants, belt lubricants and dressings, specialized aerosol cleaners, ignition wire driers, fabric finishers, spot removers, adhesives and wood cleaners. Although uncommon, small amounts of tetrachloroethylene have been found in food.

The levels of tetrachloroethylene in air in dry-cleaning shops, textile and chemical processing operations and degreasing operations can result in exposures that are much higher than those found in the outside environment. Levels of tetrachloroethylene in the workplace are usually measured in parts of tetrachloroethylene per million parts of air (ppm), while common environmental levels are usually measured in parts per billion (ppb) or parts per trillion (ppt).

Metabolism

Because tetrachloroethylene evaporates quickly, the most common exposure to tetrachloroethylene comes from breathing air containing it. This is certainly true for individuals who work with the chemical, but it is probably also true for those who live in industrial and commercial areas where large amounts of the compound are used or disposed of.

Tetrachloroethylene may also enter the body through drinking contaminated water or eating contaminated food. Because tetrachloroethylene does not pass through the skin to any

significant extent, entry into the body by this path is of minimal concern, although skin irritation may result from repeated or prolonged contact with the undiluted liquid. Scientific reports indicate that tetrachloroethylene is present (and may in fact be concentrated) in the breast milk of mothers who have been exposed to the chemical.

Health Effects

In high concentrations in air, particularly in closed, poorly ventilated areas, single exposures to tetrachloroethylene can cause central nervous system (CNS) effects leading to dizziness, headache, sleepiness, confusion, nausea, difficulty in speaking and walking and possibly unconsciousness and death. As might be expected, these symptoms occur almost entirely in work (or hobby) environments. The potential long-term health effects that might occur in humans from breathing lower levels of tetrachloroethylene than those that produce CNS effects or from ingesting very low levels of the chemical found in some water supplies have not been identified. The effects of exposing infants to tetrachloroethylene through breast milk are unknown.

Animal studies, conducted with amounts much higher than typical environmental levels, have shown that tetrachloroethylene can cause liver and kidney damage, liver and kidney cancers and leukemia. Developmental effects in fetuses have been observed but only at tetrachloroethylene exposure levels that also produce toxicity in the maternal animal.

The U.S. Department of Health and Human Services has determined that tetrachloroethylene may reasonably be anticipated to be a carcinogen. Based on evidence from animal studies, tetrachloroethylene is thought to be capable of causing cancer in humans. It should be emphasized, however, that currently available information is not sufficient to determine whether tetrachloroethylene causes cancer in humans.

Short-term exposures to air containing more than 100 ppm of tetrachloroethylene have produced harmful effects in both humans and animals and more prolonged exposures to approximately 9 ppm caused harmful liver effects in mice. It should be pointed out that some of the highest environmental levels of tetrachloroethylene ever recorded (at waste disposal sites, for example) were still 150 times smaller than the concentrations shown to produce symptoms of toxicity in animals after repeated exposure. Drinking (or eating) the equivalent of approximately 60 to 80 mg (less than a spoonful) of undiluted tetrachloroethylene per kg; of body weight (1 kg = 2.2 pounds) has produced effects similar to drinking alcohol. Tetrachloroethylene was used in the past as a medicine to eliminate worms in humans, but safer and more effective drugs are now available. More prolonged exposures in animals have produced harm to the liver at doses of approximately 100 mg/kg/day. These levels of exposure are more than 1,000 times higher than would be expected even if humans ingested the most contaminated drinking water ever reported.

Cancer: From data in animals, EPA has estimated that if people breathe air containing 1 ppm tetrachloroethylene all day every day for 70 years, there would be an added risk of 66 additional cases of cancer in a population of 10,000 people (or 65,500 additional cases in a population of 10,000,000) over the number of cases that would be observed in a population not exposed to tetrachloroethylene. If people consume 1.0 mg tetrachloroethylene/kg/day in food and water every day for 70 years, there would be at the most a risk of 510 additional cases of cancer in a

population of 10,000, or 5 10,000 additional cases in a population of 10,000,000. It should be noted that these risk values are plausible upper-limit estimates. Actual risk levels are unlikely to be higher and may be lower.

Regulations

The government has made recommendations to limit the exposure of the general public to tetrachloroethylene in drinking water and the exposure of workers to tetrachloroethylene in the workplace.

The Environmental Protection Agency (EPA) has developed the following health advisories to describe concentrations of tetrachloroethylene in drinking water at which no adverse effects are anticipated to occur: 2.0 milligrams per liter of water (mg/L) for short-term exposure of children, 1.4 mg/L for longer term exposure of children, and 5.0 mg/L for long-term exposure of adults. In addition, a drinking water equivalent level (DWEL) of 0.5 mg/L has been established.

The Occupational Safety and Health Administration (OSHA) has a legally enforceable exposure limit of 25 ppm tetrachloroethylene in air for an 8-hour workday, 40-hour workweek based on non-cancer health considerations. The National Institute for Occupational Safety and Health (NIOSH) has classified tetrachloroethylene as a potential occupational carcinogen and recommends that workplace exposure be limited to the lowest possible level.

perchloroethylene. (tetrachloroethylene). CAS: 127-18-4. C12C:CC12.

Properties:

Colorless liquid, ether-like odor, extremely stable, resists hydrolysis, d 1.625 (20/20C), bp 121C, fp -22AC,

bulk d 13.46 lb/gal (26C), refr index 1.5029 (25C), flash p none. Miscible with alcohol, ether, and oils; insoluble in water.

Non-flammable.

Derivation:

- (1) By chlorination of hydrocarbons and pyrolysis of the carbon tetrachloride also formed,
- (2) from acetylene and chlorine via trichloroethylene.

Method of purification: Distillation.

Grade: Purified, technical, USP, as tetrachloroethylene, spectrophotometric.

Hazard: Irritant to eyes and skin. TLV: 50 ppm in air.

Use: Dry-cleaning solvent, vapor -degreasing solvent, drying agent for metals and certain other solids, vermifuge, heat transfer medium, manufacture of fluorocarbons.

APPENDIX V
HOSPITAL ROUTE
AND EMERGENCY NUMBERS

Emergency Telephone Numbers

Nassau County Police Department	911
Nassau County Fire Department	911
Emergency Medical System	911
North Shore University Hospital	(516) 562-0100
National Response Center	(800) 424-8802
Poison Control Center	(800) 222-1222
NYSDEC Spill Hotline	(800) 457-7362

Hospital Information

North Shore University Hospital is able to treat chemical exposures and has an emergency room. The address is: 300 Community Drive, Manhasset, New York.

HOSPITAL ROUTE – TAKE LAKEVILLE ROAD NORTH TO NORTHERN BOULEVARD. TURN RIGHT TO TAKE NORTHERN BOULEVARD 0.7 MILES EAST TO COMMUNITY DRIVE. TURN RIGHT – HOSPITAL IS 0.3 MILES SOUTH ON LEFT OF COMMUNITY DRIVE.

APPENDIX D
Community Air Monitoring Plan (CAMP)

APPENDIX D

New York State Department of Health Generic Community Air Monitoring Plan

The following discussion is taken from NYSDEC's DER-10 Technical Guidance for Site Investigation and Remediation Appendix 1A (May 2010).

A Community Air Monitoring Plan (CAMP) requires real-time monitoring for volatile organic compounds (VOCs) and particulates (i.e., dust) at the downwind perimeter of each designated work area when certain activities are in progress at contaminated sites. The CAMP is not intended for use in establishing action levels for worker respiratory protection. Rather, its intent is to provide a measure of protection for the downwind community (i.e., off-site receptors including residences and businesses and on-site workers not directly involved with the subject work activities) from potential airborne contaminant releases as a direct result of investigative and remedial work activities. The action levels specified herein require increased monitoring, corrective actions to abate emissions, and/or work shutdown. Additionally, the CAMP helps to confirm that work activities did not spread contamination off-site through the air.

The generic CAMP presented below will be sufficient to cover many, if not most, sites. Specific requirements should be reviewed for each situation in consultation with NYSDOH to ensure proper applicability. In some cases, a separate site-specific CAMP or supplement may be required. Depending upon the nature of contamination, chemical-specific monitoring with appropriately-sensitive methods may be required. Depending upon the proximity of potentially exposed individuals, more stringent monitoring or response levels than those presented below may be required. Special requirements will be necessary for work within 20 feet of potentially exposed individuals or structures and for indoor work with co-located residences or facilities. These requirements should be determined in consultation with NYSDOH.

Reliance on the CAMP should not preclude simple, common-sense measures to keep VOCs, dust, and odors at a minimum around the work areas.

Community Air Monitoring Plan

Depending upon the nature of known or potential contaminants at each site, real-time air monitoring for volatile organic compounds (VOCs) and/or particulate levels at the perimeter of the exclusion zone or work area will be necessary. Most sites will involve VOC and particulate monitoring; sites known to be contaminated with heavy metals alone may only require particulate monitoring. If radiological contamination is a concern, additional monitoring requirements may be necessary per consultation with appropriate NYSDEC/NYSDOH staff.

Periodic monitoring for VOCs will be required during non-intrusive activities such as the collection of soil and sediment samples or the collection of groundwater samples from existing monitoring wells. “Periodic” monitoring during sample collection might reasonably consist of taking a reading upon arrival at a sample location, monitoring while opening a well cap or overturning soil, monitoring during well baling/purging, and taking a reading prior to leaving a sample location. In some instances, depending upon the proximity of potentially exposed individuals, continuous monitoring may be required during sampling activities. Examples of such situations include groundwater sampling at wells on the curb of a busy urban street, in the midst of a public park, or adjacent to a school or residence.

Continuous monitoring will be required for all ground intrusive activities and during the demolition of contaminated or potentially contaminated structures. Ground intrusive activities include, but are not limited to, soil/waste excavation and handling, test pitting or trenching, and the installation of soil borings or monitoring wells.

If ground intrusive activities will include work inside a building or within 20 feet of a receptor (occupied building, place where people could be, etc.), then the following applies:

Special Requirements for Work Within 20 Feet of Potentially Exposed Individuals or Structures

When work areas are within 20 feet of potentially exposed populations or occupied structures, the continuous monitoring locations for VOCs and particulates must reflect the nearest potentially exposed individuals and the location of ventilation system intakes for nearby structures. The use of engineering controls such as vapor/dust barriers, temporary negative pressure enclosures, or special ventilation devices

should be considered to prevent exposures related to work activities and to control dust and odors. Consideration should be given to implementing the planned activities when potentially exposed populations are at a minimum, such as weekends or evening hours, in non-residential settings.

If total VOC concentrations opposite the walls of occupied structures or next to intake vents exceed 1 ppm, monitoring should occur within the occupied structure(s). Depending upon the nature of contamination, chemical-specific colorimetric tubes of sufficient sensitivity may be necessary for comparing the exposure point concentrations with appropriate pre-determined response levels (response actions should also be pre-determined). Background readings in the occupied spaces must be taken prior to commencement of the planned work. Any unusual background readings should be discussed with NYSDOH prior to commencement of the work.

If total particulate concentrations opposite the walls of occupied structures or next to intake vents exceed 150 mcg/m³, work activities should be suspended until controls are implemented and are successful in reducing the total particulate concentration to 150 mcg/m³ or less at the monitoring point.

Depending on the nature of contamination and remedial activities, other parameters (e.g., explosivity, oxygen, hydrogen sulfide, carbon monoxide) may also need to be monitored. Response levels and actions should be pre-determined, as necessary, for each site.

Special Requirements for Indoor Work Within Co-Located Residences or Facilities

Unless a self-contained, negative-pressure enclosure with proper emission controls will encompass the work area, all individuals not directly involved with the planned work must be absent from the room in which the work will occur. Monitoring requirements shall be as stated above under “Special Requirements for Work Within 20 Feet of Potentially Exposed Individuals or Structures” except that in this instance “nearby/occupied structures” would be adjacent occupied rooms. Additionally, the location of all exhaust vents in the room and their discharge points, as well as potential vapor pathways (openings, conduits, etc.) relative to adjoining rooms, should be understood and the monitoring locations established accordingly. In these situations, it is strongly recommended that exhaust fans or other engineering controls be used to create negative air pressure within the work area during remedial activities.

Additionally, it is strongly recommended that the planned work be implemented during hours (e.g., weekends or evenings) when building occupancy is at a minimum.

VOC Monitoring, Response Levels, and Actions

Volatile organic compounds (VOCs) must be monitored at the downwind perimeter of the immediate work area (i.e., the exclusion zone) on a continuous basis or as otherwise specified. Upwind concentrations should be measured at the start of each workday and periodically thereafter to establish background conditions. The monitoring work should be performed using equipment appropriate to measure the types of contaminants known or suspected to be present. The equipment should be calibrated at least daily for the contaminant(s) of concern or for an appropriate surrogate. The equipment should be capable of calculating 15-minute running average concentrations, which will be compared to the levels specified below.

- If the ambient air concentration of total organic vapors at the downwind perimeter of the work area or exclusion zone exceeds 5 parts per million (ppm) above background for the 15-minute average, work activities must be temporarily halted and monitoring continued. If the total organic vapor level readily decreases (per instantaneous readings) below 5 ppm over background, work activities can resume with continued monitoring.
- If total organic vapor levels at the downwind perimeter of the work area or exclusion zone persist at levels in excess of 5 ppm over background but less than 25 ppm, work activities must be halted, the source of vapors identified, corrective actions taken to abate emissions, and monitoring continued. After these steps, work activities can resume provided that the total organic vapor level 200 feet downwind of the exclusion zone or half the distance to the nearest potential receptor or residential/commercial structure, whichever is less - but in no case less than 20 feet, is below 5 ppm over background for the 15-minute average.
- If the organic vapor level is above 25 ppm at the perimeter of the work area, activities must be shutdown.

All 15-minute readings must be recorded and be available for State (DEC and DOH) personnel to review. Instantaneous readings, if any, used for decision purposes should also be recorded.

Particulate Monitoring, Response Levels, and Actions

Particulate concentrations should be monitored continuously at the upwind and downwind perimeters of the exclusion zone at temporary particulate monitoring stations. The particulate monitoring should be performed using real-time monitoring equipment capable of measuring particulate matter less than 10 micrometers in size (PM-10) and capable of integrating over a period of 15 minutes (or less) for comparison to the airborne particulate action level. The equipment must be equipped with an audible alarm to indicate exceedance of the action level. In addition, fugitive dust migration should be visually assessed during all work activities.

- If the downwind PM-10 particulate level is 100 micrograms per cubic meter (mcg/m³) greater than background (upwind perimeter) for the 15-minute period or if airborne dust is observed leaving the work area, then dust suppression techniques must be employed. Work may continue with dust suppression techniques provided that downwind PM-10 particulate levels do not exceed 150 mcg/m³ above the upwind level and provided that no visible dust is migrating from the work area.
- If, after implementation of dust suppression techniques, downwind PM-10 particulate levels are greater than 150 mcg/m³ above the upwind level, work must be stopped and a re-evaluation of activities initiated. Work can resume provided that dust suppression measures and other controls are successful in reducing the downwind PM-10 particulate concentration to within 150 mcg/m³ of the upwind level and in preventing visible dust migration.

All readings must be recorded and be available for State (DEC and DOH) personnel to review.

Summary

As noted above, air monitoring activities for the Former Imperial Cleaners Site (218 Lakeville Road) site activities described in the *Remedial Work Plan* (Walden, February 2019) will be appropriate for the soil sampling, groundwater sampling, SVI sampling, SVE pilot testing, SVE remedial system installation or any other ground intrusive activities (such as drilling, test pits, excavation, soil pile staging, etc.), and periodic sub-slab vapor, indoor and outdoor air sampling to be conducted. Therefore, the CAMP will encompass periodic VOC monitoring using a PID and dust monitoring as appropriate.