VOLUNTARY CLEANUP PROGRAM

# INTERIM REMEDIAL MEASURE
# &
# SUPPLEMENTAL INVESTIGATION
# WORK PLAN

Prepared For

Brooklyn Properties #5, LLC

188-192 Ralph Avenue

BROOKLYN, NEW YORK

Site No.: V-00669-2

Index No.: W2-0977-03-11

Submitted To

New York State Department of

Environmental Conservation

625 Broadway

Albany, New York 12233-7016

Prepared By

BERNINGER ENVIRONMENTAL, INC.

Revised June 2007

**PROFESSIONAL ENGINEER'S CERTIFICATION**

**CERTIFICATION:**

I hereby certify that I have personally reviewed this Interim Remedial Action & Investigation Work Plan (IRM IWP) developed for the subject property pursuant to the requirements of an executed Voluntary Cleanup Agreement (February 20, 2004) between the New York State Department of Environmental Conservation, Division of Environmental Remediation (DER), and Brooklyn Properties 5, LLC, the Volunteer. The site is located at 188 -192 Ralph Avenue, Brooklyn, New York 11233 (see Figures 1 and 2), fully described as NYC Tax Map Section 6, Block 1678, Lot No. 53. This work plan was prepared by Jill S. Haimson, PG, CGWP Project Manager under my supervision.

John V. Soderberg, P.E.

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Signature:

New York State P.E. License No.

Dated: April , 2007

TABLE OF CONTENTS

TABLE OF CONTENTS (cont'd)

## 1.0 INTRODUCTION

This Interim Remedial Measure & Supplemental InvestigationWork Plan (IRM SI WP) has been developed for the subject property pursuant to the requirements of an executed Voluntary Cleanup Agreement ((February 20, 2004) between the New York State Department of Environmental Conservation, Division of Environmental Remediation (DER), and Brooklyn Properties 5, LLC, the Volunteer. The site is located at 188 -192 Ralph Avenue, Brooklyn, New York 11233 (see Figures 1 and 2), fully described as NYC Tax Map Section 6, Block 1678, Lot No. 53. The site occupant and operator is Rose Tree Management Corp.

Based upon a comparison to the New York State Department of Health (NYSDOH) 2006 Soil Vapor/Indoor Air Guidance and as confirmed in the NYSDEC correspondence dated January 18, 2007, the need for mitigative measures and supplemental investigation relative to the subject site was established. Therefore, this document was prepared to provide an Interim Remedial Measures(IRM) Work Plan (inclusive of source removal and mitigation of soil vapor intrusion) and a scope for supplemental investigation to further delineate on-site and off-site environmental conditions.

This IRM SI WP contains the following: a summary of previous site data; design and specifications for the installation of an active soil venting system to address Volatile Organic Compound (VOC) contamination in soil with a combined system for active subslab vapor mitigation on-site and off-site; an evaluation of how the proposed remedy will achieve the remedial action objectives and evaluation factors set forth in 6NYCRR 375; and a supplemental scope of investigation for soil gas, soil and groundwater delineation such that a Remedial Action Plan (RAP) can be developed subsequent to the finalization of delineation of site conditions.

## 2.0 PREVIOUS VCP INVESTIGATION

A remedial site investigation was performed by Berninger Environmental Inc. (BEI) during June - July 2006 pursuant to the requirements of an executed Voluntary Cleanup Agreement that included the following at the former Fortune Cleaners property: Task 1a (Indoor Air Testing), Task 1b (Soil Gas Investigation), Task 2 (Soil Investigation), and Task 3 (Groundwater Investigation).

The primary purpose of the investigation was to delineate the lateral and vertical extent of VOC contamination (tetrachloroethene and its breakdown products) in all media that may be emanating from the subject property. Additional objectives included the development of site-specific data to allow an evaluation of the actual and potential impacts to public health and the environment; selection and design of remedial action alternatives; and identification of potential feasible cleanup technologies and presumptive remedies.

A soil gas and indoor/outdoor air quality study were performed to evaluate the potential impact of the former use of dry-cleaning chemicals on the indoor air quality of the building at the subject property, as well as the adjoining residential apartment building (196 Ralph Avenue).

Numerous volatile organic compounds (VOCs) inclusive of tetrachloroethylene (PCE) were determined to be present at elevated concentrations in the study area relative to the comparative basis established by the NYSDOH for background concentrations in outdoor or indoor air. Tetrachloroethene was present above guidelines at the basement of the management office to the north (500 $ug/m^3$); within the former dry cleaners basement (4,000 $ug/m^3$); and the basement of the residential building to the south (*190* $ug/m^3$). The outdoor ambient air sampling location in the rear yard behind the former dry cleaners reported 1,200 $ug/m^3$ of PCE (only). Lesser concentrations of PCE, were reported within the 1st floor of the former dry cleaners (88 $ug/m^3$); in the hallway of the 1st building to the north (37 $ug/m^3$); and within the 1st floor to the north in the management office (58 $ug/m^3$). The lowest indoor air concentration was reported at the 1st floor building to the south (196 Ralph Avenue) at a concentration of 4.6 $ug/m^3$ of PCE.

Other VOCs present in soil gas included elevated concentrations of numerous petroleum-related compounds (benzene; toluene; ethylbenzene; xylenes; 1,2,4-dichlorobenzene; 1,3,5-trimethylbenzene and 1,2,4-trimethylbenzene) at four sampling locations. An elevated concentration

of methylene chloride was also present at two sampling locations - the 1st floor of the former dry cleaners and within the basement of the management office.

The concentrations of VOCs in soil gas were also investigated to evaluate the potential for migration of vapors into off-site locations. The highest concentrations were reported in soil gas samples collected within the basement of the former dry cleaners. These basement soil gas concentrations were consistent with PCE concentrations in soil and groundwater data. Elevated VOCs in soil gas were also reported at the sampling location outside (to the east) of the former dry cleaners, in the sidewalk and beneath the basement of the building to the south and the management office to the north. Elevated soil gas was also detected within the rear yard to the west. Elevated concentrations of petroleum-related compounds (toluene), methylene chloride and n -Heptane were identified at several sampling locations.

The study confirmed that indoor air quality data within the basement structure of the former dry cleaners has elevated concentrations of PCE. PCE concentrations in indoor air were noted to be substantially less within the first floor of this building, as compared to the basement.

The indoor air quality data for the Management Office was less than 100 $ug/m^3$ on the first floor and the hallway areas; however, higher concentrations of PCE in indoor air were quantified in the basement. Soil gas beneath the basement floor in this area reported higher concentrations of site-related VOCs. Air testing at the 196 Ralph Avenue residential property (south) reported low PCE concentrations (4.6 $ug/m^3$) in the first floor, however, again, the air quality in the basement exhibited elevated PCE at 190 $ug/m^3$, with subsurface soil gas VOCs present at higher concentrations. The outdoor air sample collected in the rear yard, behind the former dry cleaners, also exhibited elevated PCE (1,200 $ug/m^3$ ) with a deeper, subgrade elevated soil gas concentration of 2,200 $ug/m^3$.

Therefore, as per the NYSDOH Soil Vapor/Indoor Air Guidance, the soil gas data as well as indoor air quality data developed during the VCP investigation confirmed the need for mitigative measures. Soil borings installed during the investigation confirmed the presence of PCE-impacts to soil to a vertical depth of 10+ feet bgs and possibly deeper. Groundwater sampling confirmed the presence of PCE impacts and that PCE was the dominant compound present from non-detect

to 10,000 *u*g/L in the upper groundwater zone. Significant reductions in VOC concentrations were noted with increased depth in grade (10 feet) within the groundwater aquifer.

**2.1 VCP Investigation Conclusions and Recommendations**

Based upon the soil gas, indoor air, soil and groundwater data generated during the investigation, potential exposure pathways were re-evaluated under a quantitative exposure assessment. The following conclusions were also made:

- Occupation of the area of the former dry cleaners space would be a completed exposure pathway relative to inhalation; however, same has not been occupied for a very long time and access is infeasible and securely limited.
- The indoor air quality data for the Management Office are less than the 100 *ug/m*$^3$ guideline however, due to elevated soil gas PCE concentrations in the basement and underneath the basement concrete, a completed exposure pathway, may exist in times of variations in building pressure and air flow, due to seasonal effects. As such precautions need to be undertaken to provide mitigation.
- The occupied residential property to the south had low PCE concentrations (4.6 *ug/m*$^3$) in the first floor indoor air, however, the air quality in the basement did exhibit elevated PCE above the NYSDOH guidelines of *100 ug/m*$^3$, with subsurface soil gas PCE concentrations present at high concentrations. Therefore, a completed exposure pathway, may exist in times of variations in building pressure and air flow, due to seasonal effects. This is another structure within which precautions need to be undertaken to provide mitigation.
- Elevated PCE was present in the outdoor air sample collected in the rear yard, (unidentified source) behind the former dry cleaners, with even higher concentrations present in subsurface soil gas. Although the yard area is inaccessible and is not known to be used, this area poses a risk also to be a completed exposure pathway if occupied. This area also requires mitigation.
- The investigation has revealed that the potential for soil vapor movement across Ralph Avenue exists, and all other radial directions, as well as preferential transport along site utilities and other linear features. Therefore a potential exposure pathway, due to inhalation, has now been identified to off-site residents to the east, beyond the east side of Ralph Avenue.
- Ingestion of impacted groundwater is extremely unlikely and is not considered a potential or completed exposure pathway at this time. No proximate surface water bodies are present relative to the study property. Therefore, discharge of groundwater to surface water pathway is not considered a potential or a completed exposure pathway.

Based upon the data developed during the Voluntary Investigation, BEI has identified supplemental investigatory data needs, required compliance activities and/or the need for remediation as follows:

- Soils within the basement structure need to be remediated in accordance with applicable regulations. Due to the elevated concentrations, and the presence of elevated soil gas at the study site, these actions should be performed under an Interim Remedial Measure (IRM) to allow for the expeditious removal of soil impacts.
- Immediate mitigation activities should be performed relative to the presence of elevated soil gas. These activities should include, but not be limited to the following: evaluation of the integrity of the building's foundation and air flow, with the sealing of holes or cracks, etc. increased air exchange through the use of active venting (soil venting) from the installation of a sub-slab depressurization system, etc.
- Supplemental soil gas, soil and groundwater sampling should be performed at adjoining properties to further define the lateral and vertical extent of impacts.
- Monitoring wells or piezometers should be installed to provide site specific groundwater flow direction.
- Implementation of any pilot studies or feasibility studies to allow for the design of appropriate remedial measures for impacted media.

## 3.0 PROPOSED SOIL AND SOIL GAS MITIGATION PROGRAM (INTERIM REMEDIAL MEASURE)

Based upon the data developed during the Voluntary Investigation, BEI has identified required compliance activities and recommended the following:

- Soils within the basement structure need to be remediated in accordance with applicable regulations. Due to the elevated concentrations of VOCs in soils and the presence of elevated VOCs in soil gas at the study site, these actions should be performed under an Interim Remedial Measure (IRM) to allow for the expeditious removal of soil impacts.

In order to address soil and soil vapor impacts within the basement of the former Fortune Dry Cleaners portion of the subject property, a Soil Vapor Extraction (SVE) system is proposed for installation. This SVE system will be used to both remediate VOCs in unsaturated soils within the basement structure, as well as to control and mitigate the migration of soil vapor on-site and off-site. At this time, the lateral and vertical extent of VOCs in soil includes the majority of the footprint of the basement of the former dry cleaners. Supplemental investigation will be performed in order to confirm the lateral extent of any soil contamination that may extend exterior to the basement footprint, if any. In addition to the SVE system, other mitigative measures such as engineering controls (coincident sub-slab depressurization of the basement floor for on-site and off-site vapor recovery, installation of a vapor barrier and concrete cap, etc.) will be employed as part of the overall remedy specified as the IRM.

### 3.1 Installation of SVE System

*3.1.1. Basement of Former Dry Cleaners*

In order to address soil and soil vapor impacts within the basement of the former Fortune Dry Cleaners portion of the subject property, it has been determined that a SVE system is the most feasible means of providing mitigation for both medias of concern. Due to the extremely limited accessibility for drilling equipment within the basement, the SVE system to be installed within the basement of the former dry cleaners using a remote Geoprobe drilling system. Due to equipment constraints, out of necessity the SVE wells have to be constructed as one-inch diameter SVE wells. Preliminary design criteria indicates that three SVE wells will likely suffice to address VOCs in

soils and provide sufficient vacuum to create a sub slab depressurization and mitigation of soil vapor movement away from the basement. This preliminary design is based upon site conditions noted during prior observations of site soils; it is predicted that each SVE will have a minimum radius of influence (ROI) of approximately eight (8) feet.

The wells are proposed to be constructed with twenty-five (25) feet of one-inch Schedule 40 PVC well screen with the terminus of the screen set at twenty-seven (27) feet below the exposed soil dirt floor of the basement. The bottom of the well screen will be five (5) feet above the encountered water table (previously measured at 32 feet below the basement floor). The upper two feet of the SVE well will be constructed of solid one-inch diameter riser pipe. Figure 5 depicts the proposed locations of the SVE wells.

The native soils were observed during the previous site investigation to be highly permeable sands which will allow air to flow easily into the well. An in-line sample port and airflow gauge will be installed at a working height of approximately 4 feet above each SVE well head. The SVE piping will be extended to the blower unit, which will also be located within the basement of the former dry cleaners. The PVC piping will be connected to the blower intake using flexible ductwork. Flexible ductwork will also connect the blower outlet or exhaust to a two-inch diameter air stack. The air stack will extend to a height of approximately ten (10) feet above the highest roofline (management office) allowing venting to the atmosphere, where it is anticipated that the soil gas (air) effluent will undergo sufficient levels of dilution. Testing of effluent soil gas will be conducted during project start up. The effluent from the proposed SVE system will be treated to comply with the NYS-DEC Guidelines for the Control of Toxic Ambient Air Contaminants (Air Guide 1).

Based on the other SVE systems installed in similar areas of Brooklyn, BEI proposes using a Rotron explosion-proof blower or equivalent to create the vacuum for the SVE system. The blower will not require an enclosure. The blower unit will be wired to an existing electric sub-panel and operated by a control box located within the basement of the former dry cleaners. An alarm or system fault light will be installed at a visible area within the first floor to indicate times that the system becomes inoperable due to equipment malfunction or power outages. A pressure gauge will also be included as a supplemental warning device of system malfunction or failure.

*3.1.2 Basement of Rose Tree Management*

As the basement of the Rose Tree Management is virtually inaccessible to drilling equipment necessary to install SVE wells to significant depths (e.g., beyond seven feet below the concrete floor), BEI will hand-install two (2) shallow SVE wells within this area. These wells will be installed utilizing manually-operated equipment and will consist of one-inch diameter PVC well screen constructed of five (5) feet of well screen with the bottom of the screen set at seven (7) feet below the concrete surface. The upper two feet of the SVE wells will be constructed of solid one-inch diameter PVC piping. The proposed locations of the SVE wells in the basement of the Rose Tree Management office are also depicted on Figure 5.

Consistent with the wells installed within the basement of the former dry cleaners, 1-inch connectors will be used to connect with piping into the basement of the former dry cleaners. An in-line sample port and airflow gauge will also be installed at a working height of approximately 4 feet above each SVE well head. The SVE piping will be extended to the blower unit and to the rest of the SVE system.

## 3.2 Mitigation of Soil Vapor Migration Pathways

Typical soil vapor migration pathways include entrance into a building through cracks or perforations in the slab or walls, and through openings around sump pumps or where pipes and electrical wires go through the foundation. The vapor movement is primarily a result of a difference between interior and exterior pressures. As established in the NYSDOH Vapor Intrusion Guidance, the basic requirements that must be established with respect to a soil vapor mitigation program are as follows:

- Methods of mitigation;
- Installation and design of mitigation system;
- Post-mitigation testing;
- Operation, maintenance and monitoring of mitigation systems;
- Termination of mitigation system operations; and
- Annual certification.

### *3.2.1 Methods of Mitigation*

*Sealing of Infiltration Points within the Basement of the Former Dry Cleaners*

The most effective mitigation methods for soil vapors include a combination of sealing any infiltration points and actively manipulating the pressure differential between the building's interior and exterior. The installation of an active SVE system will accomplish the pressure differential creating a sub-slab depressurization system to draw the vapors back toward the points of vacuum, then to the system for exterior venting or treatment as necessary.

*Sealing of Infiltration Points within the Basement of the Rose Tree Management Office*

The interior basement area of the management office identified as requiring mitigation will be further inspected as to the integrity and condition of the poured concrete floor and any utility or other perforation or penetrations into the subgrade surface. Although sealing is not a reliable mitigation technique on its own, it can significantly improve the effectiveness of a soil vapor extraction system since it limits the flow of subsurface vapors into the building. All joints, cracks and other penetrations of the basement floor of the management office, as well as the interior basement wall separating the management office basement and the former dry cleaners will be sealed with materials that prevent air leakage.

## 3.3 Vapor Barrier

Subsequent to the installation of the SVE wells within the basement of the former dry cleaners, a 10-mil polyethylene sheeting vapor barrier will be installed encompassing the entire foot print of the basement. The vapor barrier surfaces surrounding the SVE wells will be sealed utilizing a bentonite grout material to avoid potential short circuiting of the vapor barrier via these penetrations. After the successful installation of the vapor barrier, a four-inch thick concrete surface will be installed atop the vapor barrier to restore an impermeable cap at grade in the basement of the former dry cleaners.

## 3.4 Post-installation Testing

### *3.5.1 Indoor Air Quality*

Routine airflow and concentration sampling of the SVE system will occur on a monthly basis. BEI staff will go to the site to collect airflow and bulk air concentration data. Airflow calculations for the SVE System will be generated using inline airflow rates and VOC concentration data collected near each of the SVE wells. In order to collect air concentration measurements, the SVE system will be temporarily shut down to eliminate the vacuum on the system piping. Within 20 seconds of system shut-down, total VOC measurements will be measured with a Photoionization detector (PID) via a sample port installed in the solid PVC piping. Once air concentration measurements have been recorded, the system will be returned to normal operation.

BEI will perform a follow-up round of indoor air quality (IAQ) sampling to determine the effectiveness of the SVE. IAQ sampling will be performed to replicate the June/July 2006[1] interior sampling performed by BEI summarized in Section 2.0. As typically required, the indoor air sampling will be performed during the heating season.

BEI will adhere to the same sampling methods and quality control guidelines previously approved and employed. Indoor air samples from within commercially occupied space will be collected over an eight (8) hour sampling interval and indoor air samples from within residentially occupied space will be collected over a 24 hour sampling interval. Two confirmatory IAQ samples are proposed (one in each of the two basements of the subject property) for collection subsequent to (within two weeks) the completion of system installation and start-up. Generally, no continued indoor air quality monitoring is required if the system has been installed properly and is maintaining a vacuum beneath the entire slab. Two ambient air samples, collected directly exterior (front and rear) of the building, will be collected concurrently with any indoor air sampling.

### 3.5.2 *Soil Vapor Sampling*

Concurrent with the installation of the SVE wells, BEI will install a series of six permanent soil

[1] And proposed additional sampling discussed below.

vapor sampling probes. Three of the permanent probes will be installed within the sidewalk adjacent to the east of the subject property, one will be installed within the basement of the management office, one will be installed within the private courtyard to the west of the former dry cleaners (proximate to the SG-7 sample location) and the remaining permanent soil vapor probe will be installed within the basement of the adjoining residential apartment building (proximate to the SG-6 sample location). Pressure extension testing (via the use of pressure gauge responses) will be performed at these six locations as part of the initial pilot test and system start-up to demonstrate that the SVE system is adequately depressurizing the former dry cleaner slab and Rose Tree Management building. If deemed necessary during the field efforts, additional vapor points may be added to further delineate site conditions. These permanent soil vapor sampling probes will be constructed consistent with the NYSDOH Vapor Intrusion Guidance, with the exception of variable depths at sampling locations, that may be required to minimize possible sampling discrepancies.

The following procedures will be included in the permanent construction protocol:

a. Implants will be installed utilizing a combination of direct-push (Geoprobe) and manually-operated equipment to attain the desired depth;
b. Porous, inert backfill material (e.g., coarse sand and gravel, well screen sand, etc.) will be used to create a sampling zone 1 to 2 feet in length;
c. Implants will be fitted with inert polyethylene tubing 1/4-inch diameter of food grade quality to the surface;
d. Soil vapor probes will be sealed above the sampling zone with a bentonite slurry for a minimum distance of 3 feet to prevent air infiltration and the remainder of the borehole backfilled with clean material; and
e. The permanent soil vapor probes will be finished with bolt-down manholes affixed with interior gaskets to minimize interferences and to prevent accidental damage.

The three permanent soil vapor probes to be located within the sidewalk will be set at depths of 14 feet bgs, the permanent probe within the private courtyard will be installed to a depth of six feet bgs (due to limited access) and the probe within the basement of the residential apartment building will be installed to a depth of six feet bgs.

These permanent soil vapor probes will monitor the effectiveness of the SVE system and will be sampled as part of the proposed supplemental investigation. These probes are proposed to be

sampled on a bi-annual basis as part of monitoring activities associated with the SVE. Prior to initial start-up of the SVE system, soil gas samples will be collected from each of the six permanent probes in order to establish baseline soil vapor conditions. The six permanent soil vapor probes will be used as part of the pilot test in addition to the wells themselves to confirm ROI and depressurization.

To obtain representative samples and to minimize possible discrepancies, soil vapor samples will be collected in the following manner at all permanent vapor point locations:

a. At a minimum 24 hours after the installation of permanent probes, one to three implant volumes (i.e., the volume of the sample probe and tube) will be purged prior to collecting the samples;

b. Flow rates for both purging and collecting will not exceed 0.2 liters per minute to minimize outdoor air infiltration during sampling;

c. Samples will be collected, using conventional sampling methods, utilizing a 6-liter summa cannister which:

   i. Meets the objectives of the sampling

   ii. Is consistent with the sampling and analytical methods (e.g., low flow rate; EPA Method TO-15), and

   iii. Is certified clean by the laboratory.

d. A tracer gas (e.g., helium) will be used when collecting soil vapor samples to verify that adequate sampling techniques are being implemented (i.e., to verify infiltration of outdoor air is not occurring)

When soil vapor samples are collected, the following actions will be taken to document local conditions during sampling that may influence interpretation of the results:

a. Uses of volatile chemicals during normal operations of proximate facilities will be identified;

b. Outdoor plot sketches will be drawn that include the site, area streets, neighboring commercial or industrial facilities (with estimated distance to the site), outdoor air sampling locations (if applicable) and compass orientation (north);

c. Weather conditions (e.g., precipitation and outdoor temperature) will be noted for the 24 to 48 hours prior to sampling; and

d. Any pertinent observations will be recorded, such as odors and readings from field instrumentation.

The field sampling team will maintain a sample log sheet for each sampling location summarizing the following:

a. sample identification,

b. date and time of sample collection,

c. sampling depth,

d. identity of samplers,

e. sampling methods and devices,

f. purge volumes,

g. volume of soil vapor extracted,

h. the vacuum before and after samples were collected,

i. apparent moisture content (dry, moist, saturated, etc.) of the sampling zone,

j. subsequent to sample collection, a real time measurement utilizing a photoionization detector will be made and recorded, and

k. chain of custody protocols and records used to track samples from sampling point to analysis.

BEI will generate a database to store all data acquired during monitoring. Semi-annual reports to the Department will include routine airflow and VOC concentration data collected during each monitoring event. Reports will also detail any system repairs or alterations that occurred between sampling events. Results from the IAQ sampling event will be submitted to the Department under separate cover.

### 3.5 Operation, Maintenance and Monitoring of SVE System

When mitigation systems are implemented at a site, the operation, maintenance and monitoring (OM&M) protocols for the systems are typically set forth in a site-specific OM&M plan. Routine maintenance will commence within 18 months after the system becomes operational, and will likely be required every 12 to 18 months thereafter. Based upon a demonstration of the systems reliability, a petition to alter the frequency may be submitted for the States review. During routine maintenance, the following activities will be conducted:

a. A visual inspection of the complete system (e.g., vent fan, piping, warning device, labeling on systems, etc.);

b. Identification and repair of leaks; and

c. Inspection of the exhaust or discharge point to verify no air intakes have been located nearby.

As necessary, preventive maintenance (e.g., replacing vent fans), repairs and/or adjustments will be made to the system to ensure its continued effectiveness at mitigating exposures related to soil vapor intrusion. The need for preventive maintenance will depend upon the life expectancy and warranty for the specific part, as well as visual observations over time. The need for repairs and/or adjustments will depend upon the results of a specific activity compared to that obtained when system operations were initiated. If significant changes are made to the system or when the systems performance is unacceptable, the system may need to be redesigned and restarted.

Operation and maintenance of the SVE will also be performed by BEI on a monthly basis. Monthly inspections will consist of observation and documentation of system component operations and conditions. The monthly reporting will include a narrative that describes all activities performed on site for the reporting period inclusive of copies of the laboratory data for all sample analyses performed during that month. BEI will establish a point of contact with the property manager in the event that the system becomes inoperable ("system fault condition"). If a major repair requires the system to be offline for longer than a 24-hour period, the representative of the owner will contact the NYSDEC to discuss the problem and offer a schedule for repair.

In addition to the routine OM&M activities described here, the building's owner and tenants will be given information packages that explain the systems operation, maintenance and monitoring. Therefore, at any time during the systems operation, the building's owner or tenants may check that the system is operating properly.

### 3.6 Termination of SVE Operations

The SVE will not be turned off without prior approval from the State, except in emergency situations. The SVE will remain operational until it is no longer needed to address current or potential exposures related to soil vapor intrusion. Termination of the mitigation system will comply with the procedures discussed in the NYSDOH guidance and with NYSDEC and NYSDOH concurrence. A petition for the termination of the SVE operation would be based upon the following:

a. Residual subsurface sources of contamination, if any, of VOCs in subsurface vapors have been remediated based upon an evaluation of appropriate post-remedial sampling results;

b. Residual contamination, if any, in subsurface vapors is not expected to affect indoor air quality significantly based upon indoor air, outdoor air and sub-slab vapor sampling results;

c. Residual contamination, if any, in subsurface vapors is not expected to affect indoor air

quality significantly when the SVE is turned off based upon indoor air, outdoor air and sub-slab vapor sampling results at representative structures: and

d. There is no "rebound" effect that requires additional mitigation efforts observed when the SVE system is turned off for prolonged periods of time. This determination is based upon indoor air, outdoor air and sub-slab vapor sampling from the building over a time period, which will depend upon site-specific conditions.

BEI will work with the property owner to make such a determination if any one of the above conditions has been satisfied and both the NYSDEC and NYSDOH will be petitioned on this matter for concurrence prior to system termination.

### 3.7 Annual certification

SVEs are considered engineering controls. Therefore, depending upon the remedial program, submission of an annual certification to the State is required. This certification will be prepared and submitted by a professional engineer or environmental professional acceptable to the State and affirm that the engineering controls are in place, are performing properly and remain effective. This requirement will remain in effect until the State provides notification, in writing, that this certification is no longer needed.

### 3.8 Schedule of Implementation

Upon approval, the installation of the SVE system will be completed within 45 days. The vapor barrier and concrete surface replacement within the basement of the former dry cleaners will be completed prior to the start-up of SVE completion.

## 4.0 EVALUATION OF PROPOSED IRM

### 4.1 Evaluation of Remedial Alternatives

The criteria to which potential remedial alternatives are compared are defined in 6 NYCRR Part 375 Section 1.10, which governs the remediation of environmental restoration projects in New York State. The first two evaluation criteria are termed "threshold criteria" and must be satisfied in order for an alternative to be considered for selection as follows:

1. Protection of Human Health and the Environment. This criterion is an overall evaluation of the remedial alternative's ability to protect public health and the environment. The installation of engineering controls such as a SVE has been recognized for a long time as the foremost means of achieving protection of public health, relative to sub-slab vapor migration and to address residual soil contamination. Significant research on the successfulness of SVE and other types of sub slab depressurization has been performed as a result of the mitigation of radon. The majority of technology regarding the installation of SVE and/or SSDS systems to mitigate volatile organic compounds is an outgrowth of radon research and VOCs. Furthermore, this technology is specifically recommended for use as per the *Draft Guidance for Evaluating Soil Vapor Intrusion in the State of New York (NYSDOH, February 2005) and the Radon Mitigation Standards (USEPA 402-R-03-078).*

2. Compliance with New York State Standards, Criteria and Guidance (SCGs). Compliance with SCGs addresses whether a remedy will meet environmental laws, regulations and other standards and criteria. In addition, this criterion includes the consideration of guidance which the NYSDEC has determined to be applicable on a case-specific basis. The installation and operation of a SVE fully complies with the New York State SCGs relative to VOC vapor migration as it will serve to mitigate or remove the potential for current and/or future potential exposure pathways. The remainder of the criteria set forth in Part 375 are five "primary balancing criteria" and are used to compare the positive and negative aspects of the remedial strategy.

3. Short-term Effectiveness. This criterion relates to the potential short-term adverse impacts of the remedial action upon the community, the workers and the environment during the construction

and/or implementation of the SVE. As the SVE system and associated permanent soil vapor probes will be installed within several days and community air monitoring will be conducted to ensure the protection of on-site workers, no short-term adverse impacts were identified relative to the workers, community or the environment.

4. Long-term Effectiveness and Permanence. This criterion is used to evaluate the long-term effectiveness of the remedial alternative after implementation. The following items are evaluated: 1) the magnitude of the remaining risks, 2) the adequacy of the engineering and/or institutional controls intended to limit the risk, and 3) the reliability of these controls. As the SVE system has been selected to address VOC contamination, the magnitude of remaining environmental risks will continue to decrease. The adequacy of the SVE (properly installed, operated, monitored and maintained) to remediate VOCs in soil, to create sub-slab depressurization for the control of sub slab vapors, in addition to its reliability over time, are both considered to be excellent, due to the long-term track record established.

5. Reduction of Toxicity, Mobility or Volume. The ability of the remedial alternative to permanently and/or significantly reduce the toxicity, mobility or volume of the wastes is required to be evaluated. The SVE is specifically designed to limit the mobility of the sub-slab soil gas from infiltrating through the slab. Furthermore, as there will be pressure changes, soil gas will be routed exterior to the building, ultimately resulting in reduced volume over time. Monitoring and ongoing maintenance of the system provides the ability to measure changes in concentrations.

6. Implementability. The technical and administrative feasibility of implementing the remedial alternative must be considered. Again, as SVE system is a widely used application for VOC-contaminated soil and soil gas mitigation, implementability of the construction of this system is considered to be excellent.

7. Cost-Effectivness. Capital costs and operation, maintenance and monitoring costs are also part of the evaluation criteria. The construction of an SVE is considered to be extremely cost-effective relative to the impracticality of removing soil under the building, Furthermore, it can be installed into existing structures (retrofit) without requiring widespread, difficult and costly building reconstruction.

8. Community Acceptance - As the installation of an SVE system will generally not result in activities noticeable or that will significantly affect the surrounding community, and as an SVE is generally considered to be a widely accepted presumptive remedy, community acceptance should be high.

Therefore, the installation of an SVE at the subject property satisfies the threshold criteria and provides an excellent balance relative to the remainder of the criteria cited in Part 375. The installation of an SVE will achieve the remediation goals for the site by addressing any current completed exposure pathways and future potential exposure pathways, relative to sub slab vapor migration.

## 5.0 SUPPLEMENTAL INVESTIGATION

The objective of this work plan is to provide a scope for supplemental sampling and analysis of indoor air samples, soil gas, subsurface soils and groundwater to determine the horizontal and vertical extent of contamination of PCE and its breakdown products to the satisfaction of the DER.

### 5.1 Potential Environmental Concerns

Continued environmental concerns identified at the subject property are the potential for impacted soils to be present outside the footprint of the basement of the former dry cleaners and indoor air quality concerns due to on and off-site soil gas migration. The delineation of lateral and vertical groundwater impacts is required in addition to the confirmation of groundwater flow direction. This supplemental field investigation will require off-site access permits to allow sampling within right-of-ways (ROWS), sidewalks, etc. to perform the required sample collection.

### 5.2 Scope of Supplemental Investigation

As per NYSDEC and NYSDOH requirements, supplemental remedial investigation activities need to include, but are not limited to the following:

- Installation of monitoring wells to provide site specific groundwater flow direction, and to allow for collection of additional groundwater samples to delineate the groundwater plume;
- Supplemental soil vapor, soil and groundwater sampling to further define the lateral and vertical extent of contamination; and
- Additional soil vapor intrusion investigation in the surrounding neighborhood in all directions from the source area. Associated outdoor air sample locations will include re-sampling at location OA- 1 and at least one additional outdoor ambient air sample.
- Drill cuttings and purge water from the well installation and soil borings will be containerized, characterized and disposed off-site properly in accordance with all applicable state and local regulations.

Off-site sampling locations are expected within the NYC right-of-way which will require securing access agreements and other permits.

**Task 1 - Piezometer Installation/Groundwater Flow Calculation & Sampling**

Purpose: To determine the direction of groundwater flow and other aquifer characteristics beneath the site, five (5) small diameter piezometers are proposed for installation. The installation of the piezometers is necessary to determine localized groundwater flow direction. This will enable an accurate and site-specific calculation of the direction and velocity of groundwater flow at the subject property.

Specifications: With a Geoprobe truck-mounted and/or mobile drilling system, BEI will install the five (5) groundwater piezometers. Depth to groundwater was measured at a depth of 39+ feet below exterior grade surface (bgs). The final depth of each well will be approximately 45 feet+, dependent upon the exact depth to groundwater. Well construction will consist of 10 feet of 1-inch diameter, schedule 40, 0.020 inch slotted well screen, set approximately five feet above and five feet below the water table. 1 inch diameter, schedule 40, flush joint threaded riser pipe will finish the well to grade. A 5-inch cast iron manhole and cover will be cemented in place to complete the installation. If wells are drilled in potential source areas, drill cuttings will be containerized on-site in a 55-gallon drum until sampling and disposal arrangements are completed. If wells are drilled at exterior locations, then drill cuttings will be screened and soils reused on-site if feasible and agreeable by the NYSDEC.

Upon completion of the wells, the location and casing elevations will be determined by a surveyor to an arbitrary datum. Depth to groundwater will be measured from each well to the nearest 0.01 foot using a sonic interface probe. The collected data will be used to generate a groundwater gradient map depicting the direction of groundwater flow. Figure 6 indicates the location of the proposed piezometers. The actual location of each well will be determined based on site constraints or field analytical data. Four of the five piezometers will also be sampled to provide supplemental groundwater data (see Figure 6). The sampling of piezometers and other supplemental groundwater sampling locations are discussed in Task 3.

**Task 2 - Soil Vapor Intrusion Investigation with Indoor/Outdoor Air Testing**

Supplemental soil vapor intrusion investigation is required in the surrounding neighborhood and in all directions from the source area. Combined with this supplemental investigation is the

requirement for the re-sampling of outdoor air sample location OA- 1 and one additional outdoor ambient air sample, designated at the front of the former dry cleaners.

Specifications: As indicated in Figure 6, a manually advanced Geoprobe equipped with a Post-Run Tubing System (PRT) will be used to collect soil gas samples from within the basement structure of the management office (at one location further to the north of SG-5), along MacDonough Street, and at the neighboring residential properties to the west and south (one additional location to the south of SG-6) at depths equivalent to beneath the concrete foundation walls (estimated six feet below the respective basement floors). This depth was selected to make a representation of soil gas conditions below the bottom of building foundations or footings.

In addition, soil gas samples will be collected from within the private courtyard to the west of the SG-7 sample location at a depth comparable with the SG-7 sample depth (6 feet bgs). Soil gas samples will also be collected from within the western sidewalk along Ralph Avenue, to the north and east of the Rose Tree management office, to the east of the former dry cleaners and to the east and south of the adjoining residential building. One additional soil gas sample will be collected from within the eastern sidewalk along Ralph Avenue. Sampling depths of soil gas samples collected from within sidewalks will be selected as representative of depths below the footings of adjoining buildings. The required depth and exact locations of samples will be verified with the NYSDEC during field activities.

All soil gas samples will be collected in accordance with the October 2006, New York State Health Department (NYSDOH) "Guidance for Evaluating Soil Vapor Intrusion in the State of New York" protocols and the previously approved VCP investigation work plan.

**Task 3 - Soil Investigation**

It has not been established whether soil contamination is limited to the basement of the former dry-cleaning facility. Additional subsurface soil sampling will be performed to the north, west, east and south of the source area to determine the lateral extent of contamination off-site, if any.

Specifications: A Geoprobe direct push sampling rig (or manually-operated equivalent) will be used for the collection of soil samples. A two or four foot long soil sampling tool will be attached to the drive rods for the collection of continuous undisturbed soil samples. The sample will be protected in a PVC liner that prevents the loss of VOCs prior to field analysis. Each sample will

be opened and logged to document subsurface conditions including soil types and description of non-soil materials, field instrument measurements and depth to groundwater, when encountered. There will be additional documentation, if present, of soil mottling, presence of odor, vapors and soil discoloration. A portion of each sample will be placed in a resealable plastic bag and screened for total volatile organic compounds by a MiniRae 2000 Photoionizer detector (PID) or equivalent.

The sample with the highest field measurement recorded at each boring or the deepest sample collected from a non-detection location will be appropriately containerized at the time of its collection and immediately maintained in an ice packed cooler. Upon completion of each day's sample collection, these samples will be transported under strict chain-of-custody to an NYSDOH-ELAP certified laboratory for Target Compound List (TCL) VOC analysis by EPA Method 8260 and Tentatively Identified Compounds (TICs) Purgeable Organics by GC/MS. The borings will be abandoned by sand and bentonite grout to grade

**Task 4 - Groundwater Investigation**

Groundwater samples will be collected at four of the piezometer locations and/or at temporary monitoring wells installed using a Geoprobe direct push sampling rig at the locations shown on Figure 6. Using the groundwater flow direction determined subsequent to the installation of piezometers, up to four soil borings will be extended to groundwater as temporary groundwater monitoring wells. Sampling will be performed at multiple depths vertically to define the VOC contamination in groundwater.

Specifications: Groundwater sampling at the piezometers (wells) will include the following: the well will be opened, and depth to water measured. The bottom of the well will be tagged in order to accurately determine the standing column of water. This volume will be considered to be one purge volume. Prior to sampling, the well will be purged a minimum of three purge volumes using a dedicated new bailer. A field hydrogeologist will supervise the well purging/sampling and recorded procedures, quantities and characteristics of water removed in the dedicated bound field notebook. Field sampling parameters such as temperature, pH, specific conductance and turbidity will be measured to ensure representative sampling. Samples will be collected when sufficient

purge volume had been removed and pH, temperature and conductivity stabilized within 10% on successive well volumes. Purge waters will be discharged upgradient, proximate to the well location if no suspect conditions are noted, with NYSDEC permission.

For groundwater sampling at temporary monitoring wells, the Geoprobe rig will be equipped with a mill-slotted well point sampling tool or equivalent. Groundwater samples will be collected at the water table (approximately 39+ feet bgs) and will continue vertically to one deeper interval (49+ foot bgs). At the locations downgradient to known interior source areas, the groundwater sampling program will continue two deeper intervals - 59+ feet bgs and 69 feet bgs. Upon completion, the borings will be abandoned by sand and bentonite grout to grade.

Upon completion of each day's sample collection, these samples will be transported under strict chain-of-custody to an NYSDOH-ELAP certified laboratory for Target Compound List (TCL) VOC analysis by EPA Method 8260 and Tentatively Identified Compounds (TICs) Purgeable Organics by GC/MS.

## 6.0 QUALITY ASSURANCE/QUALITY CONTROL

Quality Assurance/Quality Control procedures specified in the previously approved remedial investigation work plan (Section 6) will be used for any sampling specified in the IRM.

## 7.0 HEALTHY AND SAFETY PLAN

The Health and Safety Plan included in the previously approved remedial investigation work plan (Section 7) will be used for all activities to be conducted under the IRM and/or supplemental investigation.

## 8.0 PROJECT SCHEDULE AND REPORTING

Within 30 days of the approval of the Interim Remedial Measure and Supplemental Investigation, BEI will begin to mobilize for the performance of the above referenced tasks; dependent upon achieving successful off-site access. Each of the individual tasks will take approximately one-to-two weeks to perform; laboratory analysis of data associated with same is anticipated to take approximately 45-60 days inclusive of data useability review.

Separate interim report deliverables will be provided for the IRM activities and the Supplemental Investigation. Reporting requirements have been established for the implementation of the IRM and soil gas mitigation program and have been detailed in Section 3.0. The findings of the supplemental investigation will be added to the prior VCP Report to provide an all inclusive VCP investigation report document. This report will be generated within 60 days of receipt of all validated data. Only the ELAP-approved validated laboratory data will be used to make remedial conclusions. When the VCP Investigation is considered complete by the NYSDEC and the NYSDOH, a Remedial Action Plan (RAP) will be prepared upon NYSDEC request.

# FIGURES

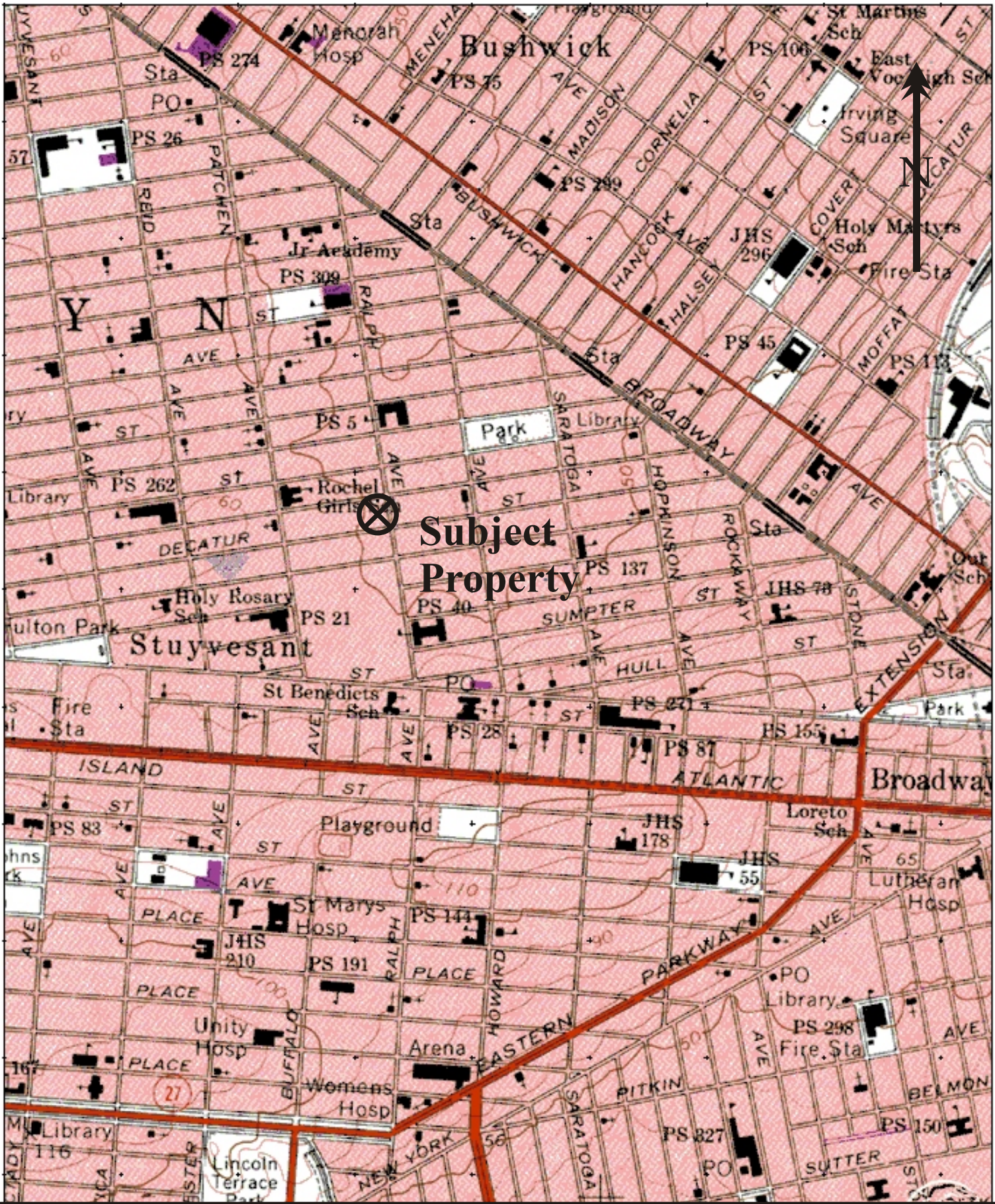
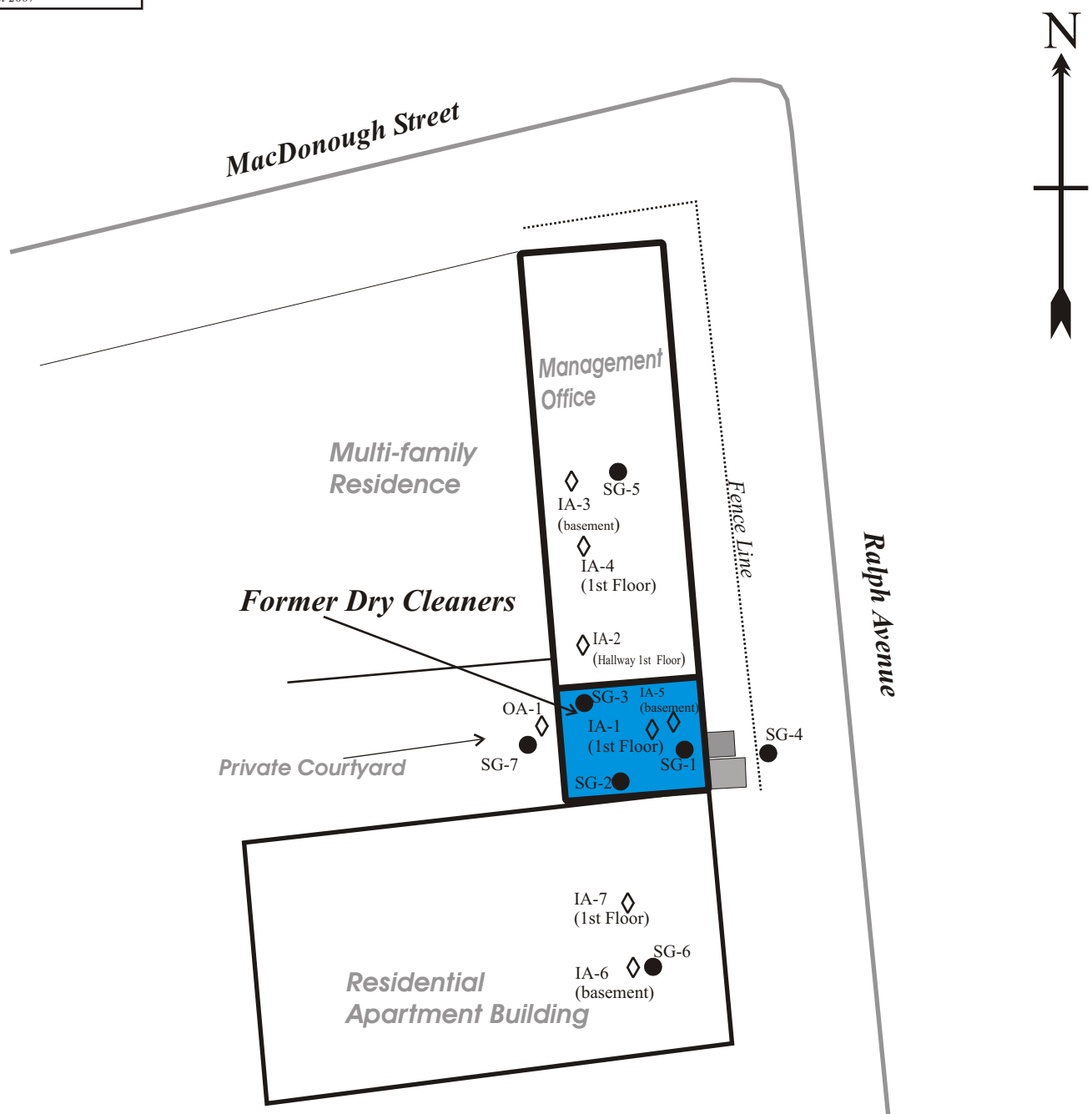



**Figure 1 - Site Location**

**188-192 Ralph Avenue**
**Brooklyn, New York**
**Site No. V-00669-2**
**Index No.: W2-0977-03-11**

BEi BERNINGER ENVIRONMENTAL INC.
*groundwater consultants and geologists*
90-B Knickerbocker Avenue Phone # (631) 589-6521
Bohemia, New York 11716 Fax #(631) 589-6528




**Notes:**

◊ - Indoor Air/Outdoor Air Sampling Locations

● - Soil Gas Sampling Locations

**Scale**

**0 ft.** — **40 ft.**

**Figure 2 - Soil Gas and Indoor Air Sampling Locations - June through July 2006**

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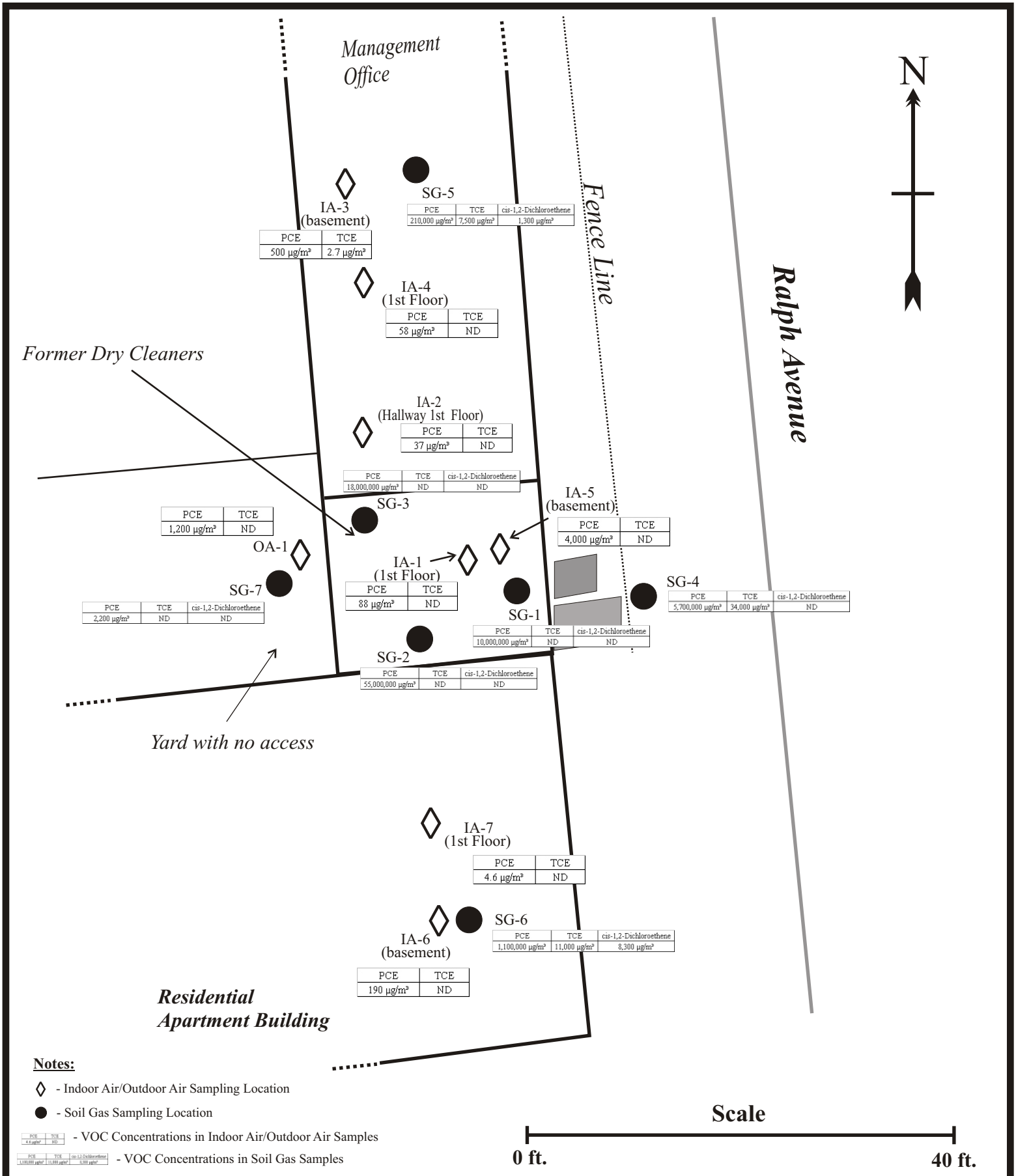


**Figure 3 - VOCs Detected in Soil Gas and Indoor Air**

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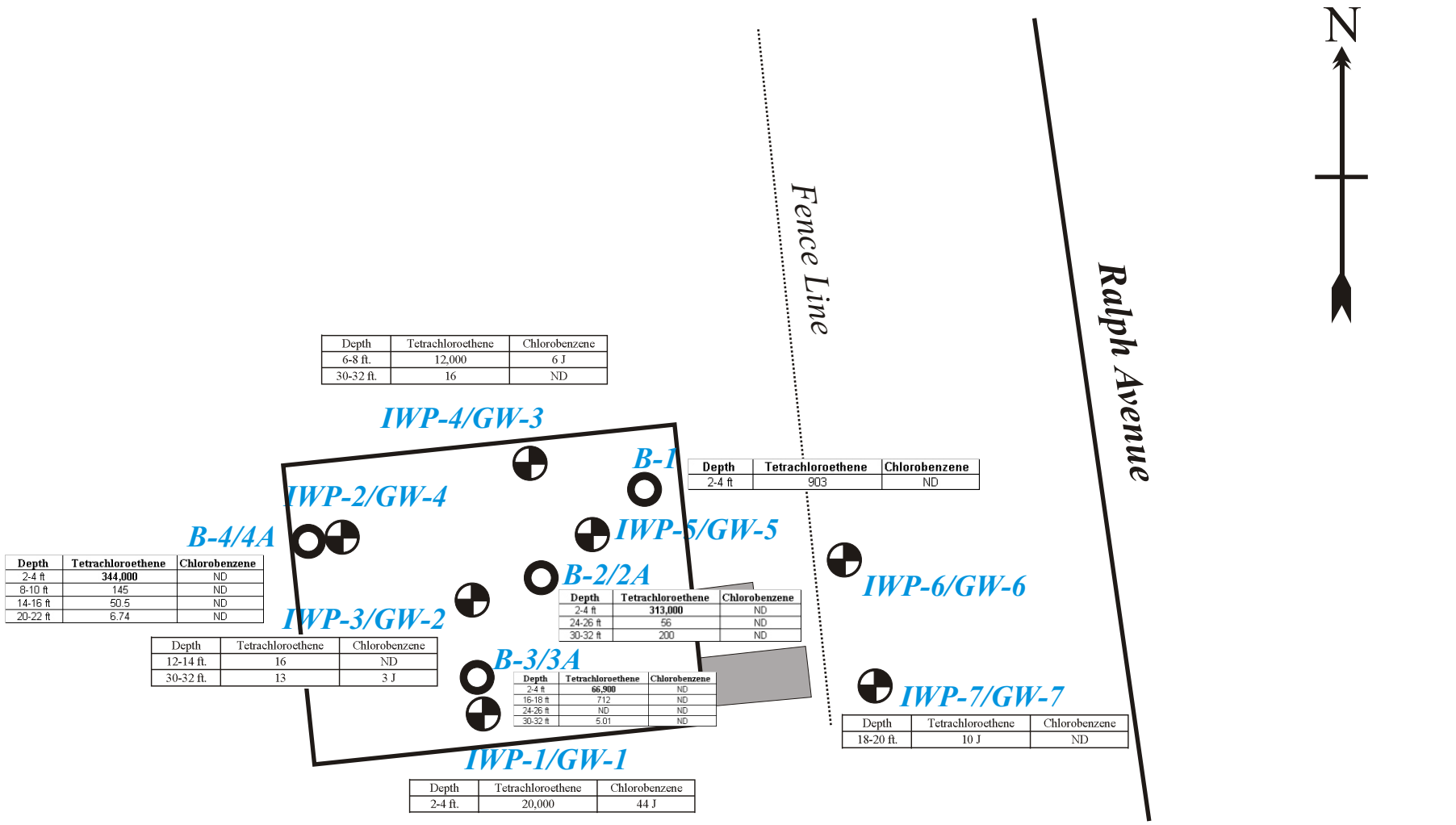


**Figure 4 - VOCs Detected in Soil Samples Collected in Prior Investigations and During IWP Activities July 2006**

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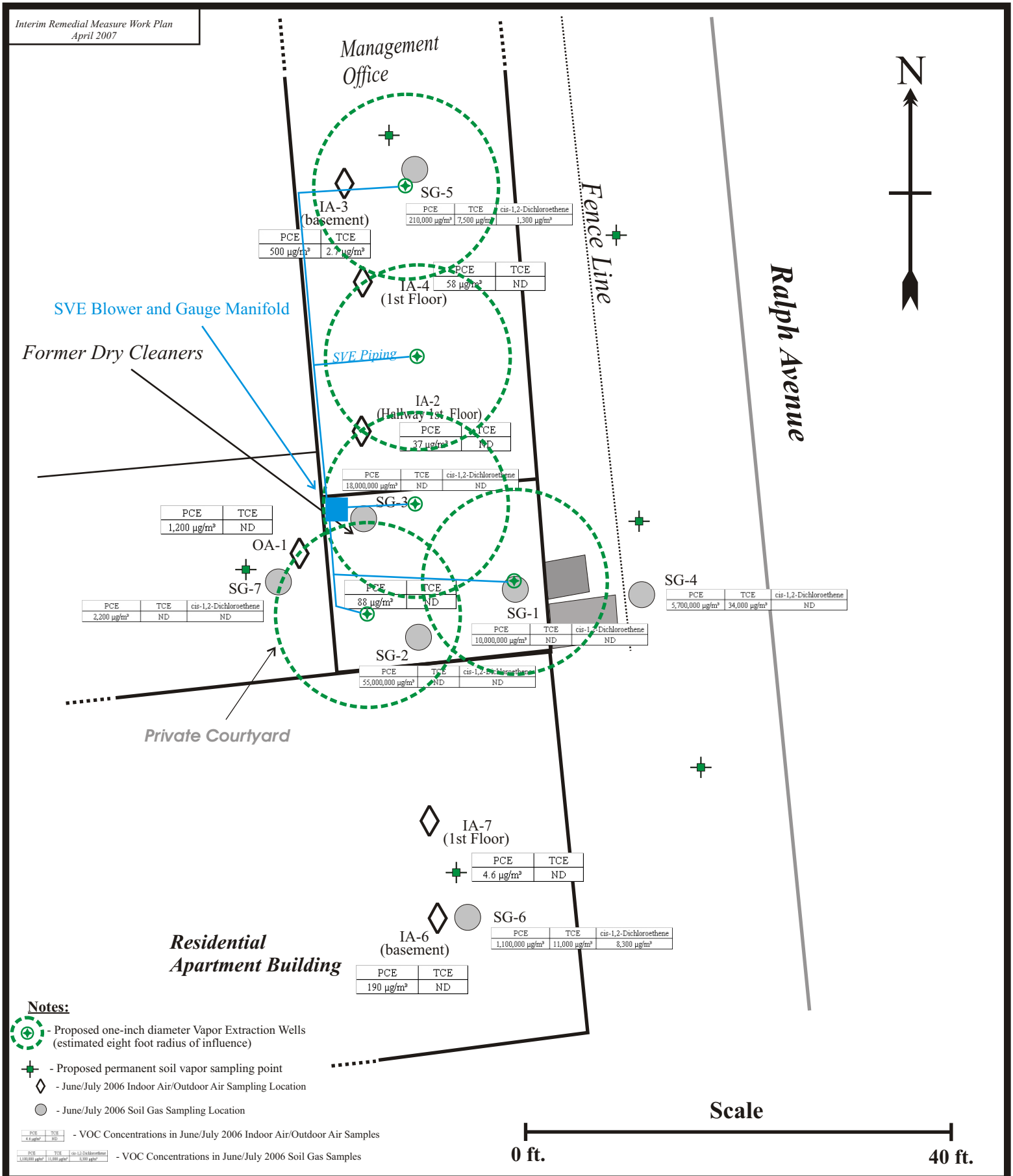


**Figure 5 - Proposed Soil Vapor Extraction Wells and Permanent Soil Vapor Monitoring Implants Eight Foot ROI**

**188-192 Ralph Avenue**
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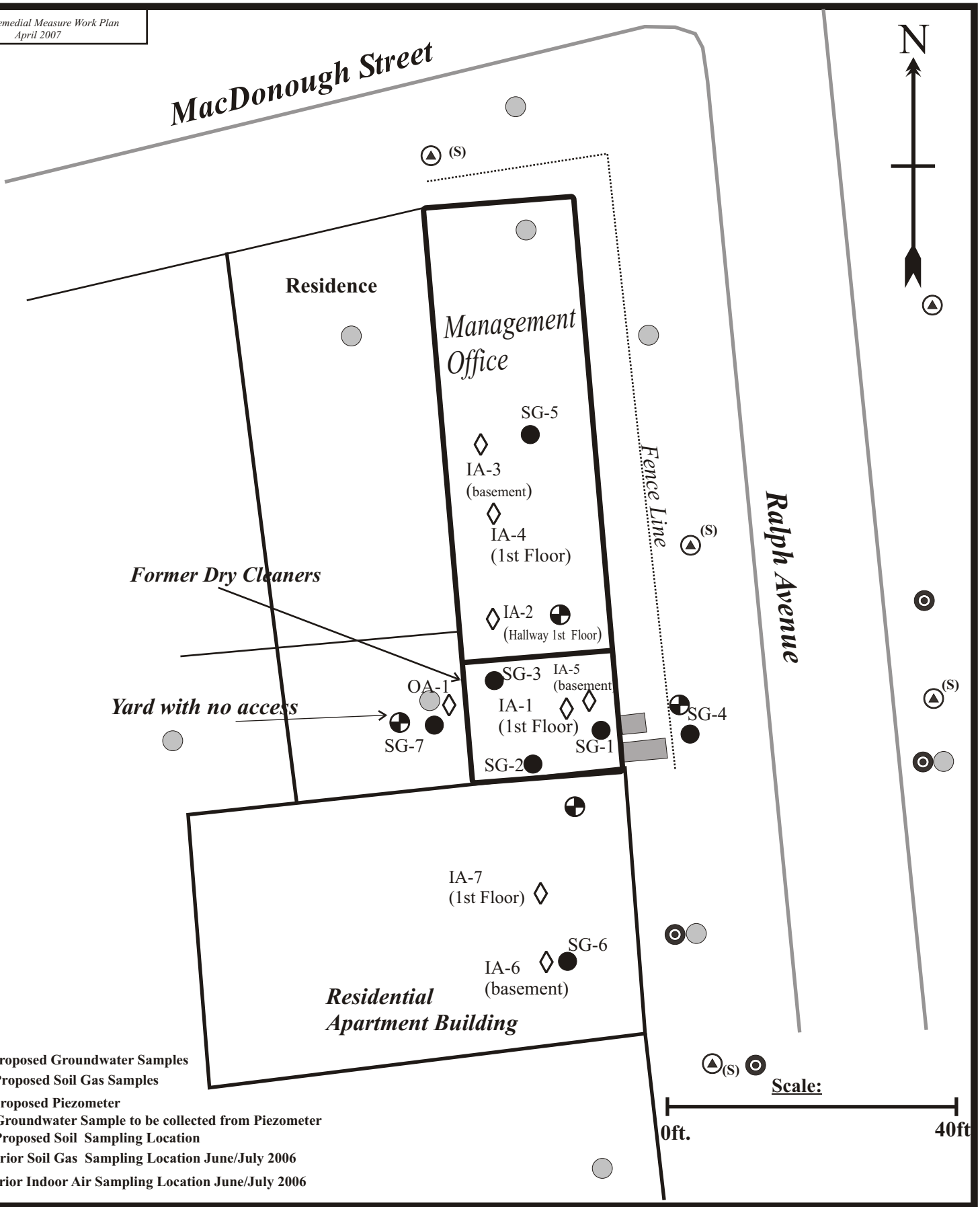


**Figure 6 - Proposed Piezometer, Soil Gas, Soil and Groundwater Sampling Locations**

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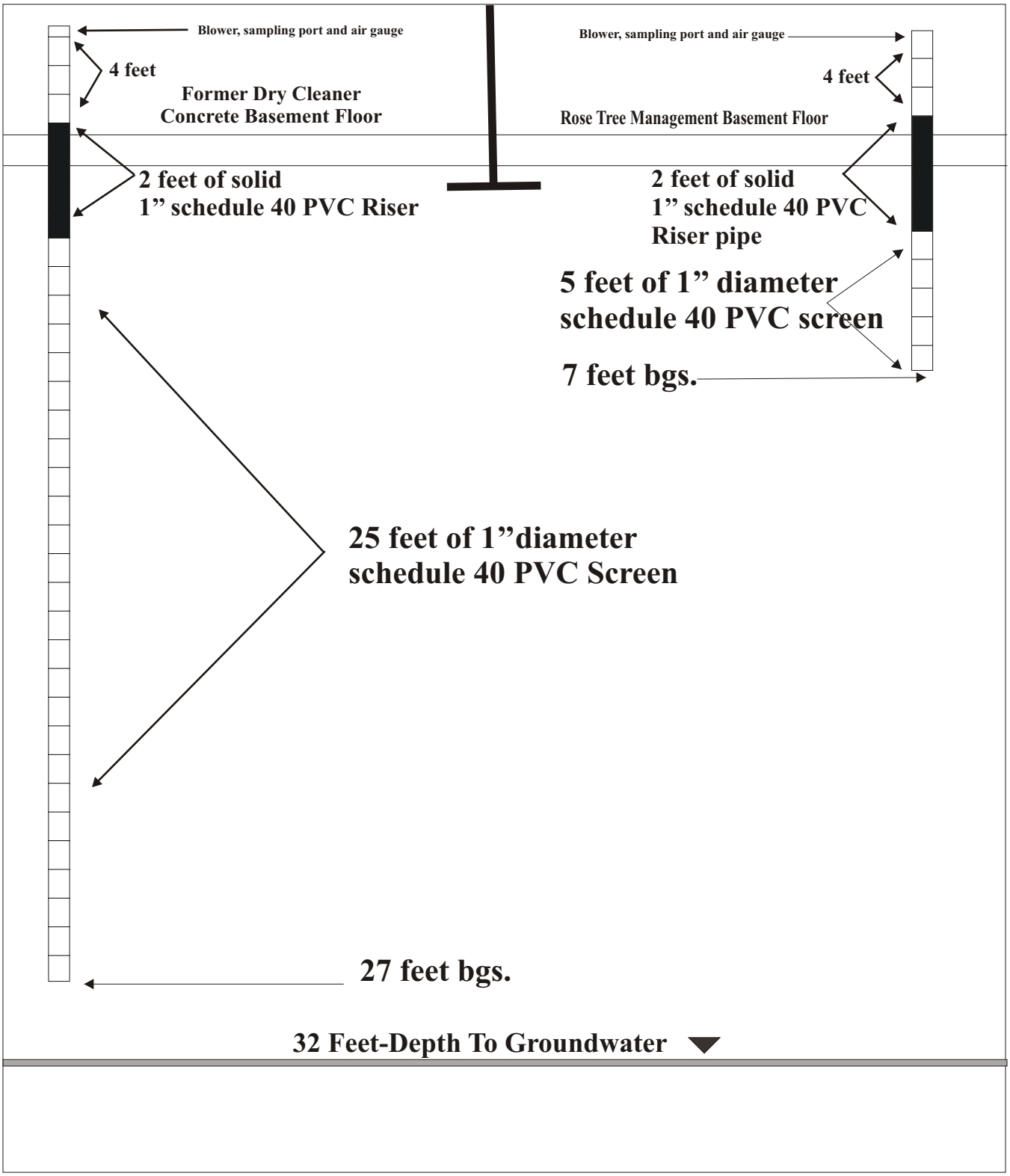


**Figure 1- Typical SVE Wells**

**188-192 Ralph Avenue**
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# APPENDIX A

**Specification Sheet for Rotron EN454**

# EN 454
# Explosion-Proof Regenerative Blower

## FEATURES

- Manufactured in the USA
- Maximum flow: 127 SCFM
- Maximum pressure: 65″ WG
- Maximum vacuum: 59″ WG
- Standard motor: 1.5 HP
- Blower construction — cast aluminum housing, cover, impeller & manifold; cast iron flanges
- UL & CSA approved motors for Class I, Group D atmospheres
- Sealed blower assembly
- Quiet operation within OSHA standards

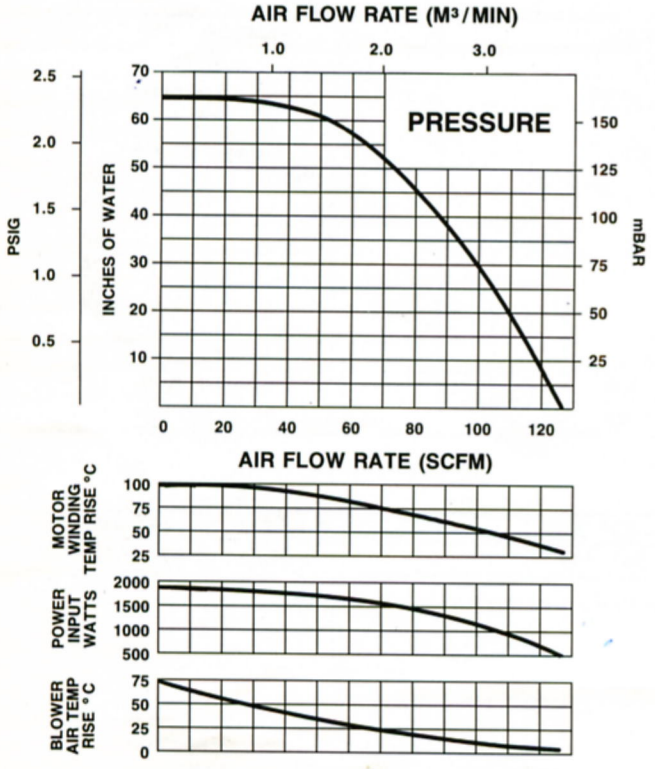
## OPTIONS

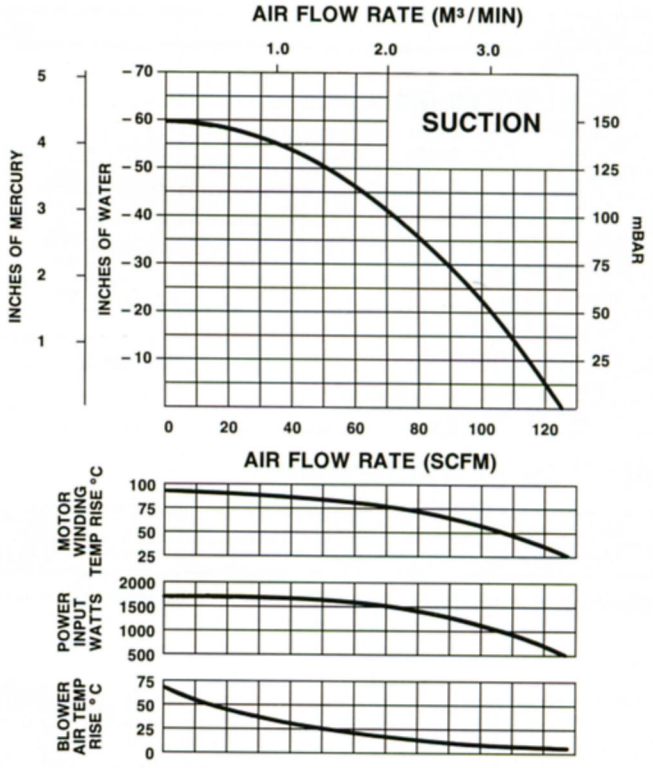
- TEFC motors
- 50 Hz motors
- International voltages
- Other HP motors
- Corrosion resistant surface treatments
- Remote drive (motorless) models

## ACCESSORIES

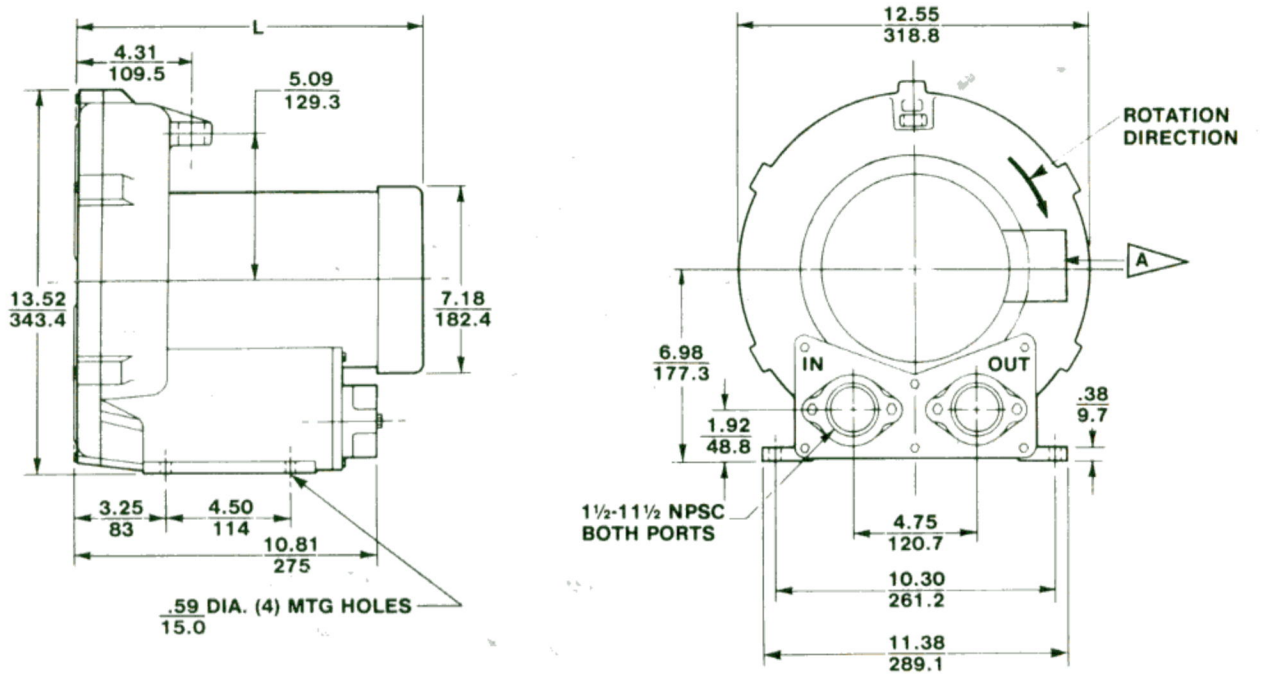
- Moisture separators
- Explosion-proof motor starters
- Inline & inlet filters
- Vacuum & pressure gauges
- Relief valves
- External mufflers

## BLOWER PERFORMANCE AT STANDARD CONDITIONS



# EN 454
# Explosion-Proof Regenerative Blower




DIMENSIONS: IN / MM
TOLERANCES: .XX ± .06 / 1.5
(UNLESS OTHERWISE NOTED)

A 0.75" NPT CONDUIT CONNECTION AT 12 O'CLOCK POSITION

## SPECIFICATIONS

| MODEL | EN454W58L | | EN454W72L | |
|---|---|---|---|---|
| Part No. | 038175 | | 038176 | |
| Motor Enclosure Type | Explosion-proof | | Explosion-proof | |
| Horsepower | 1.5 | | 1.5 | |
| Phase — Frequency | Single — 60 Hz | | Three - 60 Hz | |
| Voltage | 115 | 208-230 | 230 | 460 |
| Motor Nameplate Amps | 17.7 | 9.35-8.85 | 4.5 | 2.25 |
| Maximum Blower Amps[1] | 19.4 | 9.7-9.0 | 4.8 | 2.4 |
| Inrush Amps | 96 | 48 | 32 | 16 |
| Starter Size | 1 | 0 | 00 | 00 |
| Service Factor | 1.0 | | 1.0 | |
| Thermal Protection | Pilot Duty | | Pilot Duty | |
| Bearing Type | Sealed, Ball | | Sealed, Ball | |
| Shipping Weight | 84 lb (38 kg) | | 78 lb (36 kg) | |

## BLOWER LIMITATIONS

| | | |
|---|---|---|
| Min. Flow @ Max. Suction | 0 SCFM @ −59" WG | 0 SCFM @ −59" WG |
| Min. Flow @ Max. Pressure | 0 SCFM @ 65" WG | 0 SCFM @ 65" WG |

[1]Corresponds to the performance point at which the blower and/or motor temperature rise reaches the limit of the thermal protection in the motor.

**Specifications subject to change without notice. Please contact factory for specification updates.**

# TABLES

**Table 1 -**
**Summary of Operation, Monitoring & Maintenance requirements**
**for Soil Vapor Extraction System**

| Sampling Media | Frequency |
|---|---|
| Pilot Pressure Testing of six soil vapor sampling probes and SVE wells - extension pressure testing, Radius of Influence (ROI) and vapor concentration of VOCs for individual and effluent. | Once prior to system start-up |
| Sampling of six vapor probes sampled for TCL VOCs TO-15. | Baseline sampling and on a Bi-annual basis |
| After start-up: routine airflow and concentration sampling of the SVE system - pressure gauge. | Monthly with Monthly Report |
| Two confirmatory IAQ samples (one in each of the two basements of the subject property) within two weeks of system installation and start-up. Two ambient air samples, collected directly exterior (front and rear) of the building will also be collected concurrently. | Within two weeks of system installation and start-up. |
| Monitoring of SVE influent and effluent - PID and Lab analysis. | Monthly with data |
| Indoor Air Quality (IAQ) sampling (replicate the prior June/July 2006 event). | Heating Season 2007 |
| Database with monthly monitoring data will include routine airflow and VOC concentration data collected during each monitoring event. Reports will also detail any system repairs or alterations that occurred between sampling events. | Semi-annual reports |
| Operation and maintenance of the SVE, as needed. | Monthly basis |
| Annual certification to the State | Annually |
| Routine Maintenance of SVE system | 18 months from start-up. Every 12 to 18 months thereafter. |
| System shut down - soil and groundwater sampling | when applicable |