SITE SPECIFIC FIELD ACTIVITY PLAN FOR THE REMEDIAL INVESTIGATION / FEASIBILITY STUDY

OF

FLAMINGO CLEANERS

Flamingo Cleaners
149 North Avenue
New Rochelle, New York
(Site Code #C360078)
(WA # D006130-02)

March 2009

Prepared for:

New York State Department of Environmental Conservation
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TABLE OF CONTENTS

1.0 INTRODUCTION

The goal of this New York State Department of Environmental Conservation (NYSDEC) Work Assignment (WA) is to conduct a Remedial Investigation/Feasibility (RI/FS) at the former Flamingo Cleaners located at 149 North Avenue, New Rochelle, in Westchester County. The scope of work of the RI/FS provided in Section 2.0 of this document was developed based on the previous implemented Remedial Investigation and Interim Remedial Measures completed by owners of the property. The scope of work outlines all the necessary tasks that will be required to complete site characterization, to determine the extent that historic site activities have impacted soil, soil gas and groundwater at the site and to determine the extent, if any, of the remediation that would be required to address the impacted media.

1.1 PURPOSE AND OBJECTIVES

The purpose of this Engineering Services Standby Contract WA is to conduct a RI/FS to characterize on-site media potentially impacted by historic activities. The primary objectives of the RI/FS's scope of work are to:

- Investigate possible off-site contamination from the former Flamingo Cleaners to determine if there is surface and/or subsurface contamination. The Flamingo Cleaners previous remedial investigation on-site has revealed groundwater and soil gas contamination above NYSDEC standards and guidance values.

- Evaluate off-site soil and groundwater quality to assess if chemical concerns exist relative to NYSDEC standards and guidelines.

- Delineate the vertical and horizontal extent of contaminated soil, soil vapor and groundwater.

- Remediate soil gas pathway with a sub-slab depressurization systems as necessary.

- Determine alternative remedial options for the contamination that may be revealed off-site.

1.2 SITE DESCRIPTION AND BACKGROUND INFORMATION

The Flamingo Cleaners site is located at 149 North Avenue, in the city of New Rochelle, Westchester County, New York (see Figure 1). Flamingo Cleaners is located at the southern end of a single-story (with basements) rectangular multi-tenant commercial building. The footprint of the building along with the front sidewalk comprises the entire property that is approximately 6,000 square feet in area.

The former dry cleaning facility consisted of a ground floor, which housed the dry cleaning machine and waste storage areas within the confines of a vapor barrier room. There is also a basement area that was used to house the boiler, air compressor, vacuum unit and clothing storage. An abandoned 275-gallon PCE tank was also located in the basement of the dry cleaner along with a sump that collected overflow from the boiler expansion tank and pumps it into the sewer system.

Information from previous site investigations indicated that the earliest on-site listing for Flamingo Cleaners is 1958 (City Directory). The Flamingo Cleaners ceased on-site operations by 2004 and removed the dry-cleaning machine and all associated cleaning chemicals and wastes from the premises.

2.0 WA SCOPE OF WORK

The purpose of the 149 North Avenue RI/FS Work Assignment is to implement all the necessary tasks that will be required to complete the RI/FS. Also to determine the extent that historic site activities have impacted off-site soil, soil gas and groundwater and if any remediation is required to address the impacted media. The RI/FS will include the following tasks: preliminary activities, remedial investigation phase1, remedial investigation phase 2, and remedial alternatives and feasibility study.

2.1 PRELIMINARY ACTIVITIES

As part of the scope of work, the following field activity plans will be prepared: A project specific Field Activity Plan, site specific Heath and Safety Plan (HASP), and Quality Assurance Project Plan (QAPP).

2.2 REMEDIAL INVESTIGATION, PHASE 1

2.2.1 SOIL VAPOR

2.2.1.1 Soil Vapor Intrusion Sampling

A total of twenty-five (25) soil vapor samples (sub-slab, sub-level air, outdoor air) will be collected as part of the RI/FS. A summary of the sampling rational and their respective analyses is provided in Table 1. Each soil vapor intrusion sample will be completed and sampled in accordance to the New York State Department of Health's Guidance for Evaluating Soil Vapor Intrusion in the State of New York, October 2006. The depth of each probe that is placed beneath asphalt or concrete pavement/slabs on-site will be placed 2-3 inches below the bottom of the impervious surface. Filter glass/sand beads will be placed around the screen portion of the probe and annular space and sealed with bentonite slurry or modeling clay. Soil vapor samples will be collected in Summa canisters, and analyzed using USEPA Method TO-15. Prior to sampling, the integrity of the seal will be evaluated using a helium tracer gas. In the event that the probe fails the tightness test, the subsurface probe seal will be modified and the integrity testing repeated.

2.2.1.2 Passive soil gas sampling

Passive soil gas samplers will be implemented at the site and vicinity, in an attempt to delineate those areas of greatest contamination. A total of approximately 20 passive soil gas samplers will be completed and analyzed as part of the remedial investigation. Dependent upon the results of the passive soil gas investigation, HRP may potentially modify the proposed sampling locations of soil borings, groundwater wells, and/or indoor soil gas collection points based on the results of the passive soil gas investigation.

HRP has selected Beacon Environmental Services, Inc. to provide the passive soil gas samplers, known as a BESURE Sample Collection Kit™. The sampling and analytical procedures, which includes the field installation method of the soil gas samplers is available as Appendix A. The soil gas samplers will be analyzed for volatile organic compounds, and will include analysis for the Target Compound List by EPA method 8260B. The analytes will be reported in nanograms. The Target Compound List is available in Appendix A. The list includes all standard chlorinated hydrocarbon compounds associated with the chemical decomposition of Tetrachloroethylene, the presumed contaminate of concern at the site.

2.2.1.3 Sub-slab systems

Based on analytical results, an evaluation will be completed to determine the appropriate alternative (sub-slab depressurization system or soil vapor extraction) for investigation. If needed, design an active sub-slab depressurization system in accordance with Radon Mitigation Standards (EPA 402-R-93-078) and NYSDOH soil vapor intrusion guidance.

2.2.2 MONITORING WELL INSTALLATION & SAMPLING

For the purpose of evaluating groundwater quality and to obtain flow information, 4 overburden/bedrock well couplets will be installed. Bedrock wells will be open-hole, set at approximately 10 feet into competent rock with a sump installed in bentonite pellets at the bottom of bore hole (to trap DNAPL). Estimated well depth will be approximately 30 feet below ground surface. The proposed locations of each well are presented on Figure 2. These proposed locations may vary slightly based on the results from the passive soil gas analysis.

During installation, split spoon samples will be collected every five feet. Each split spoon collected will be geologically logged by the field geologist in accordance with the Unified Soil Classification System. Soil cores will be screened for organic vapors using a PID and any evidence of contamination will be noted.

Following installation, each well will be developed by pumping and surging for 2 hours or until the turbidity of the groundwater achieves a reading of 50 Nephelometric Turbidity Units (NTUs) or less. Well development will be supplemented by measurements of field parameters, including temperature, pH and specific conductance. Development will continue until the field parameters stabilize for a minimum of three consecutive readings of 10 percent variability of less.

It is anticipated that drill cuttings and purge water will be containerized in 55- gallons drums for proper disposal. All sampling equipment will be appropriately decontaminated between sampling locations.

Well Sampling

Groundwater sampling will be preformed a minimum of seven days after well development. Prior to collecting the samples, depth to groundwater will be measured. The water level data, well diameter and depth will be used to calculate the volume of water in each well. The wells will then be purged and sampled following USEPA low-flow techniques. Samples will be analyzed for VOCs and SVOCs, except one well which will be sampled for the full TCL list, metals, pesticides and PCBs. A summary of the samples to be collected and their respective analysis is presented on Table 1.

Groundwater will be monitored in the field for the presence of non-aqueous phase liquids, pH, temperature, conductivity, dissolved oxygen, turbidity, and oxidation-reduction potential. The field data will be recorded on field logs.

At total of four rounds of synoptic water level measurements will be collected over the course of a year. Two of the synoptic water level measurement rounds will be performed immediately prior to well sampling activities. Ground water flow maps will be developed as part of the summary report.

It is anticipated that purge water will be containerized in 55- gallons drums for proper disposal. All sampling equipment will be appropriately decontaminated between sampling locations.

2.2.3 FISH AND WILDLIFE IMPACT

A fish and wildlife impact assessment will be completed through Step II A.

2.2.4 SITE SURVEY

At the completion of the investigation fieldwork, a site survey will be conducted, using a hand held GPS in order to properly locate all sampling points such as monitoring wells, soil vapor intrusion samples, passive soil gas sampling points, and any other sample locations. The elevations of all monitoring well casings will be established to within an accuracy of plus or minus 0.01 feet based on the NAD 83 datum. A notch will be etched in all interior casings, or a permanent black mark, to provide a reference point for all future groundwater elevation measurements.

2.2.5 ANALYTICAL DATA QUALITY EVALUATION

As part of the 149 North Avenue RI/FS, a site specific QAPP and Field Activities Plan will be provided which will detail the data quality objectives and analytical requirements. All quality assurance protocols will be provided in the QAPP.

The selected laboratory will supply all required data deliverables (USEPA CLP deliverable format) to enable the data to be validated. The analytical data will also be transferred electronically from the laboratory to the validators to minimize the chances of errors in transcribing the data. Upon receipt of the sample data, the validation contractor will quantitatively and qualitatively validate the laboratory data. The validation of the analytical data will be performed according to the protocols and QC requirements of the analytical methods, the USEPA Contract Laboratory Program (CLP) National Functional Guidelines for Organic and Inorganic Data Review (February 1994), the USEPA Region II CLP Data Review SOP, and the reviewer's professional judgment.

2.2.6 DISPOSAL OF INVESTIGATION DERIVED WASTE

Investigation derived waste (IDW) generated (if any) from the installation of the test pits, monitoring wells and the development of monitoring wells shall be handled in accordance with NYSDEC TAGM No. 4032. Drill cuttings and spoils generated may also be disposed at a properly permitted treatment, storage, or disposal facility. Representative samples of cuttings and spoils will have to be analyzed to determine if the materials are a "hazardous waste" or a "solid waste" and to ensure proper classification, treatment, and disposal.

The Standby contractor will be responsible for supplying the equipment and materials necessary for the proper handling and storage of the IDW, such as DOT-approved 55-gallon drums, roll-off containers and/or holding tanks. All containers will be labeled and stored properly.

Drill cuttings shall be handled and disposed of in a manner that does not pose a threat to health and the environment. If off-site disposal of IDW is required, it will be disposed of or treated according to applicable local, state and federal regulations.

2.3 REMEDIAL INVESTIGATION REPORT

An Investigation Report will be prepared as part of this work assignment following completion of the field investigation. The Remedial Investigation Report will provide a description of the field activities, present data collected during field investigation, present a physical description of the site including geology and hydrogeology, and provide an analysis and interpretation of the available data in the context of existing site conditions. The report will include tabulated laboratory analytical results, site maps

and a discussion of contaminant concentrations, including a comparison to NYSDEC Standards, Criteria and Guidelines (SCGs).

The Remedial Investigation Report prepared as part of this assignment will also provide a data validation/usability evaluation, identification and location of contaminants, assessment of potential contaminant migration pathways, impact on human and environmental receptors/exposure assessment, conclusions regarding the significance of the findings and preliminarily evaluate clean-up options and the associated cost estimates based on future uses and redevelopment plans.

2.4 REMEDIAL ALTERNATIVES AND FEASIBILITY STUDY

The Remedial Alternatives and Feasibility Study uses the remedial investigation information to develop alternative remedies, at a minimum, for the groundwater and soil vapor mediums for the project. HRP will assist the NYSDEC with public meetings and preparation of fact sheets for the project.

TABLE

TABLE 1
149 North Avenue, New Rochelle, New York
Site Specific Field Activity Work Plan
PROPOSED SAMPLING LOCATION SUMMARY AND RATIONALE

Investigation Method	Sample Point ID	Estimated Maximum Depth Below Grade (ft)	No. of Samples Selected for Analysis	Analysis					Media	Type of Sample	Sample Point Objectives/Comments
				VOC	SVOC	TAL METALS	PCBs / Pesticides	FULL TCL			
Passive Soil Gas Sampling	PSG-01	2	1	X	--	--	--	--	Air	Composite	Determine if subsurface geologic material is degassing hazardous volatile organic compounds.
	PSG-02	2	1	X	--	--	--	--	Air	Composite	Determine if subsurface geologic material is degassing hazardous volatile organic compounds.
	PSG-03	2	1	X	--	--	--	--	Air	Composite	Determine if subsurface geologic material is degassing hazardous volatile organic compounds.
	PSG-04	2	1	X	--	--	--	--	Air	Composite	Determine if subsurface geologic material is degassing hazardous volatile organic compounds.
	PSG-05	2	1	X	--	--	--	--	Air	Composite	Determine if subsurface geologic material is degassing hazardous volatile organic compounds.
	PSG-06	2	1	X	--	--	--	--	Air	Composite	Determine if subsurface geologic material is degassing hazardous volatile organic compounds.
	PSG-07	2	1	X	--	--	--	--	Air	Composite	Determine if subsurface geologic material is degassing hazardous volatile organic compounds.
	PSG-08	2	1	X	--	--	--	--	Air	Composite	Determine if subsurface geologic material is degassing hazardous volatile organic compounds.
	PSG-09	2	1	X	--	--	--	--	Air	Composite	Determine if subsurface geologic material is degassing hazardous volatile organic compounds.
	PSG-10	2	1	X	--	--	--	--	Air	Composite	Determine if subsurface geologic material is degassing hazardous volatile organic compounds.
	PSG-11	2	1	X	--	--	--	--	Air	Composite	Determine if subsurface geologic material is degassing hazardous volatile organic compounds.
	PSG-12	2	1	X	--	--	--	--	Air	Composite	Determine if subsurface geologic material is degassing hazardous volatile organic compounds.
	PSG-13	2	1	X	--	--	--	--	Air	Composite	Determine if subsurface geologic material is degassing hazardous volatile organic compounds.
	PSG-14	2	1	X	--	--	--	--	Air	Composite	Determine if subsurface geologic material is degassing hazardous volatile organic compounds.
	PSG-15	2	1	X	--	--	--	--	Air	Composite	Determine if subsurface geologic material is degassing hazardous volatile organic compounds.

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				VOC	SVOC	TAL METALS	PCBs / Pesticides	Full TCL			
Soil Borings	SB-01s	10	1	X	X	X	X	X	Soil	Grab	Investigate soil characteristics to determine the extent of soil contamination due to the former on-site dry cleaning operations.
	SB-01d	15	1	X	X	--	--	--	Soil	Grab	Investigate soil characteristics to determine the extent of soil contamination due to the former on-site dry cleaning operations.
	SB-02s	10	1	X	X	--	--	--	Soil	Grab	Investigate soil characteristics to determine the extent of soil contamination due to the former on-site dry cleaning operations.
	SB-02d	15	1	X	X	--	--	--	Soil	Grab	Investigate soil characteristics to determine the extent of soil contamination due to the former on-site dry cleaning operations.
	SB-03s	10	1	X	X	--	--	--	Soil	Grab	Investigate soil characteristics to determine the extent of soil contamination due to the former on-site dry cleaning operations.
	SB-03d	15	1	X	X	--	--	--	Soil	Grab	Investigate soil characteristics to determine the extent of soil contamination due to the former on-site dry cleaning operations.
	SB-04s	10	1	X	X	--	--	--	Soil	Grab	Investigate soil characteristics to determine the extent of soil contamination due to the former on-site dry cleaning operations.
	SB-04d	15	1	X	X	--	--	--	Soil	Grab	Investigate soil characteristics to determine the extent of soil contamination due to the former on-site dry cleaning operations.
Bedrock Cores	RC-01	25-35	1	--	--	--	--	--	Rock	Grab	Determine if bedrock underlying the site is grossly contaminated and to assess the degree of fracturing and the competency of rock.
	RC-02	25-35	1	--	--	--	--	--	Rock	Grab	Determine if bedrock underlying the site is grossly contaminated and to assess the degree of fracturing and the competency of rock.
	RC-03	25-35	1	--	--	--	--	--	Rock	Grab	Determine if bedrock underlying the site is grossly contaminated and to assess the degree of fracturing and the competency of rock.
	RC-04	25-35	1	--	--	--	--	--	Rock	Grab	Determine if bedrock underlying the site is grossly contaminated and to assess the degree of fracturing and the competency of rock.
Groundwater Monitoring Wells	MW-01	25	1	X	X	--	--	--	Water	Grab	Determine if groundwater underlying the site is contaminated due to historical on-site activities.
	MW-02	25	1	X	X	--	--	--	Water	Grab	Determine if groundwater underlying the site is contaminated due to historical on-site activities.
	MW-03	25	1	X	X	--	--	--	Water	Grab	Determine if groundwater underlying the site is contaminated due to historical on-site activities.

TABLE 1
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Investigation Method	Sample Point ID	Estimated Maximum Depth Below Grade (ft)	No. of Samples Selected for Analysis	Analysis						Media	Type of Sample	Sample Point Objectives/Comments
				VOC	SVOC	TAL METALS	PCBs / Pesticides	Full TCL	TO-15			
Groundwater Monitoring Wells	MW-04	25	1	X	X	--	--	--	--	Water	Grab	Determine if groundwater underlying the site is contaminated due to historical on-site activities.
	MW-05	25	1	X	X	--	--	--	--	Water	Grab	Determine if groundwater underlying the site is contaminated due to historical on-site activities.
	MW-06s	15	1	X	X	X	X	X	--	Water	Grab	Determine if groundwater underlying the site is contaminated due to historical on-site activities.
	MW-06d	25	1	X	X	--	--	--	--	Water	Grab	Determine if groundwater underlying the site is contaminated due to historical on-site activities.
	MW-07s	15	1	X	X	--	--	--	--	Water	Grab	Determine if groundwater underlying the site is contaminated due to historical on-site activities.
	MW-07d	25	1	X	X	--	--	--	--	Water	Grab	Determine if groundwater underlying the site is contaminated due to historical on-site activities.
	MW-08s	15	1	X	X	--	--	--	--	Water	Grab	Determine if groundwater underlying the site is contaminated due to historical on-site activities.
	MW-08d	25	1	X	X	--	--	--	--	Water	Grab	Determine if groundwater underlying the site is contaminated due to historical on-site activities.
	MW-09s	15	1	X	X	--	--	--	--	Water	Grab	Determine if groundwater underlying the site is contaminated due to historical on-site activities.
	MW-09d	25	1	X	X	--	--	--	--	Water	Grab	Determine if groundwater underlying the site is contaminated due to historical on-site activities.
Sub-Slab Soil Vapor	SV-01	2-3 inches under asphalt or concrete	1	--	--	--	--	--	X	Air	Composite	Determine if subsurface contaminants are volatalizing in the vadose zone, yielding hazardous gases.
	SV-02	2-3 inches under asphalt or concrete	1	--	--	--	--	--	X	Air	Composite	Determine if subsurface contaminants are volatalizing in the vadose zone, yielding hazardous gases.
	SV-03	2-3 inches under asphalt or concrete	1	--	--	--	--	--	X	Air	Composite	Determine if subsurface contaminants are volatalizing in the vadose zone, yielding hazardous gases.
	SV-04	2-3 inches under asphalt or concrete	1	--	--	--	--	--	X	Air	Composite	Determine if subsurface contaminants are volatalizing in the vadose zone, yielding hazardous gases.
	SV-05	2-3 inches under asphalt or concrete	1	--	--	--	--	--	X	Air	Composite	Determine if subsurface contaminants are volatalizing in the vadose zone, yielding hazardous gases.
	SV-06	2-3 inches under asphalt or concrete	1	--	--	--	--	--	X	Air	Composite	Determine if subsurface contaminants are volatalizing in the vadose zone, yielding hazardous gases.

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				VOC	SVOC	TAL METALS	PCBs / Pesticides	Full TCL	TO-15			
Sub-Slab Soil Vapor	SV-07	2-3 inches under asphalt or concrete	1	--	--	--	--	--	X	Air	Composite	Determine if subsurface contaminants are volatalizing in the vadose zone, yielding hazardous gases.
	SV-08	2-3 inches under asphalt or concrete	1	--	--	--	--	--	X	Air	Composite	Determine if subsurface contaminants are volatalizing in the vadose zone, yielding hazardous gases.
	SV-09	2-3 inches under asphalt or concrete	1	--	--	--	--	--	X	Air	Composite	Determine if subsurface contaminants are volatalizing in the vadose zone, yielding hazardous gases.
	SV-10	2-3 inches under asphalt or concrete	1	--	--	--	--	--	X	Air	Composite	Determine if subsurface contaminants are volatalizing in the vadose zone, yielding hazardous gases.
	SV-11	2-3 inches under asphalt or concrete	1	--	--	--	--	--	X	Air	Composite	Determine if subsurface contaminants are volatalizing in the vadose zone, yielding hazardous gases.
Indoor Air (Buildings)	IA-01	NA	1	--	--	--	--	--	X	Air	Composite	Determine if subsurface contaminants are volatalizing in the vadose zone, yielding hazardous gases.
	IA-02	NA	1	--	--	--	--	--	X	Air	Composite	Determine if subsurface contaminants are volatalizing in the vadose zone, yielding hazardous gases.
	IA-03	NA	1	--	--	--	--	--	X	Air	Composite	Determine if subsurface contaminants are volatalizing in the vadose zone, yielding hazardous gases.
	IA-04	NA	1	--	--	--	--	--	X	Air	Composite	Determine if subsurface contaminants are volatalizing in the vadose zone, yielding hazardous gases.
	IA-05	NA	1	--	--	--	--	--	X	Air	Composite	Determine if subsurface contaminants are volatalizing in the vadose zone, yielding hazardous gases.
	IA-06	NA	1	--	--	--	--	--	X	Air	Composite	Determine if subsurface contaminants are volatalizing in the vadose zone, yielding hazardous gases.
	IA-07	NA	1	--	--	--	--	--	X	Air	Composite	Determine if subsurface contaminants are volatalizing in the vadose zone, yielding hazardous gases.
	IA-08	NA	1	--	--	--	--	--	X	Air	Composite	Determine if subsurface contaminants are volatalizing in the vadose zone, yielding hazardous gases.
	IA-09	NA	1	--	--	--	--	--	X	Air	Composite	Determine if subsurface contaminants are volatalizing in the vadose zone, yielding hazardous gases.
	IA-10	NA	1	--	--	--	--	--	X	Air	Composite	Determine if subsurface contaminants are volatalizing in the vadose zone, yielding hazardous gases.
	IA-11	NA	1	--	--	--	--	--	X	Air	Composite	Determine if subsurface contaminants are volatalizing in the vadose zone, yielding hazardous gases.

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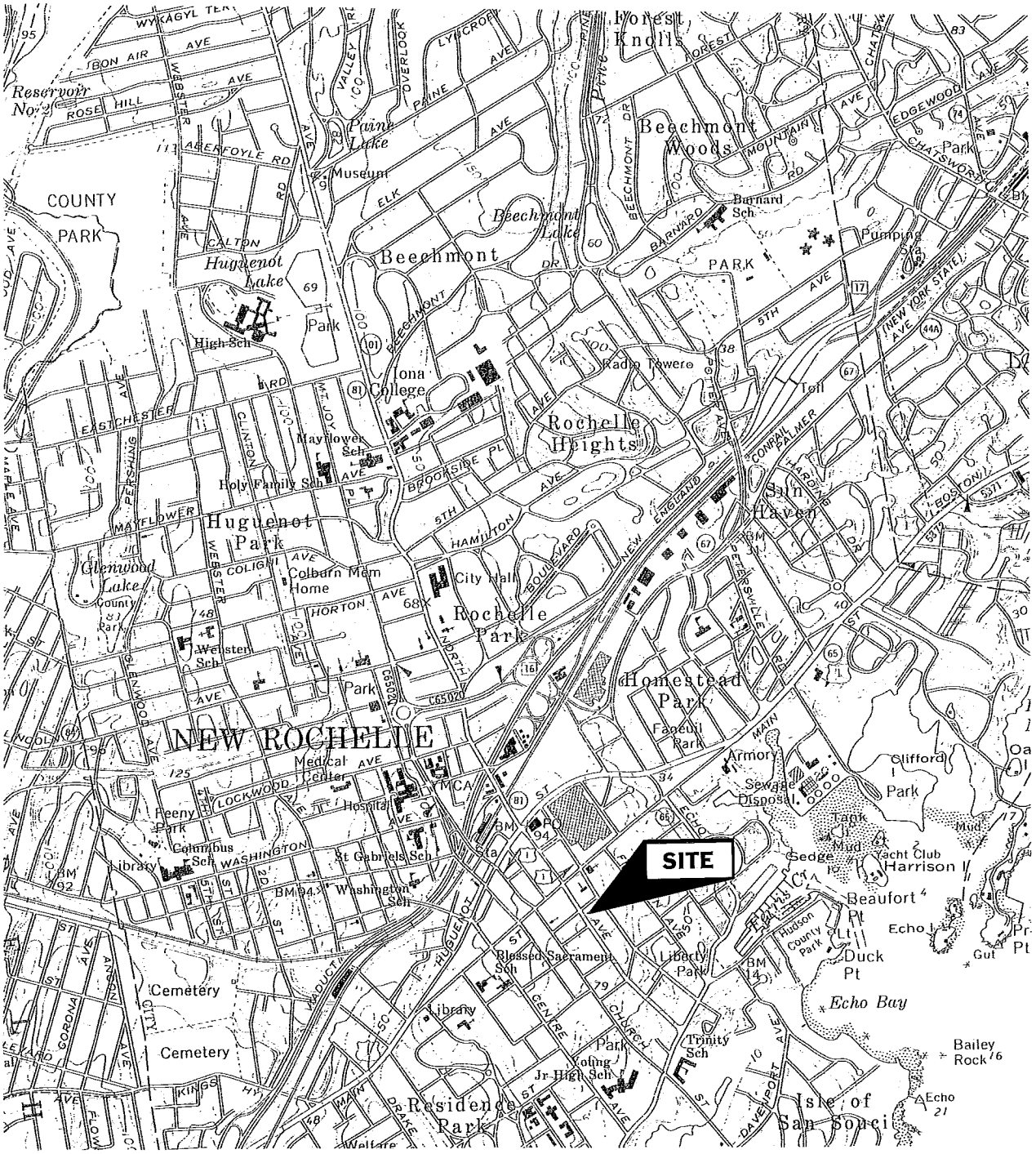
				VOC	SVOC	TAL METALS	PCBs / Pesticides	Full TCL	TO-15			
Outdoor Air (3 days of sampling)	OA-01	NA	1	--	--	--	--	--	X	Air	Composite	Determine if subsurface contaminants are volatalizing in the vadose zone, yielding hazardous gases.
	OA-02	NA	1	--	--	--	--	--	X	Air	Composite	Determine if subsurface contaminants are volatalizing in the vadose zone, yielding hazardous gases.
	OA-03	NA	1	--	--	--	--	--	X	Air	Composite	Determine if subsurface contaminants are volatalizing in the vadose zone, yielding hazardous gases.

FIGURES



HRP
Engineering P.C.
ENVIRONMENTAL/
CIVIL ENGINEERING &
HYDROGEOLOGY

Scale: 1"=2000'

USGS TOPO QUAD:
MOUNT VERNON

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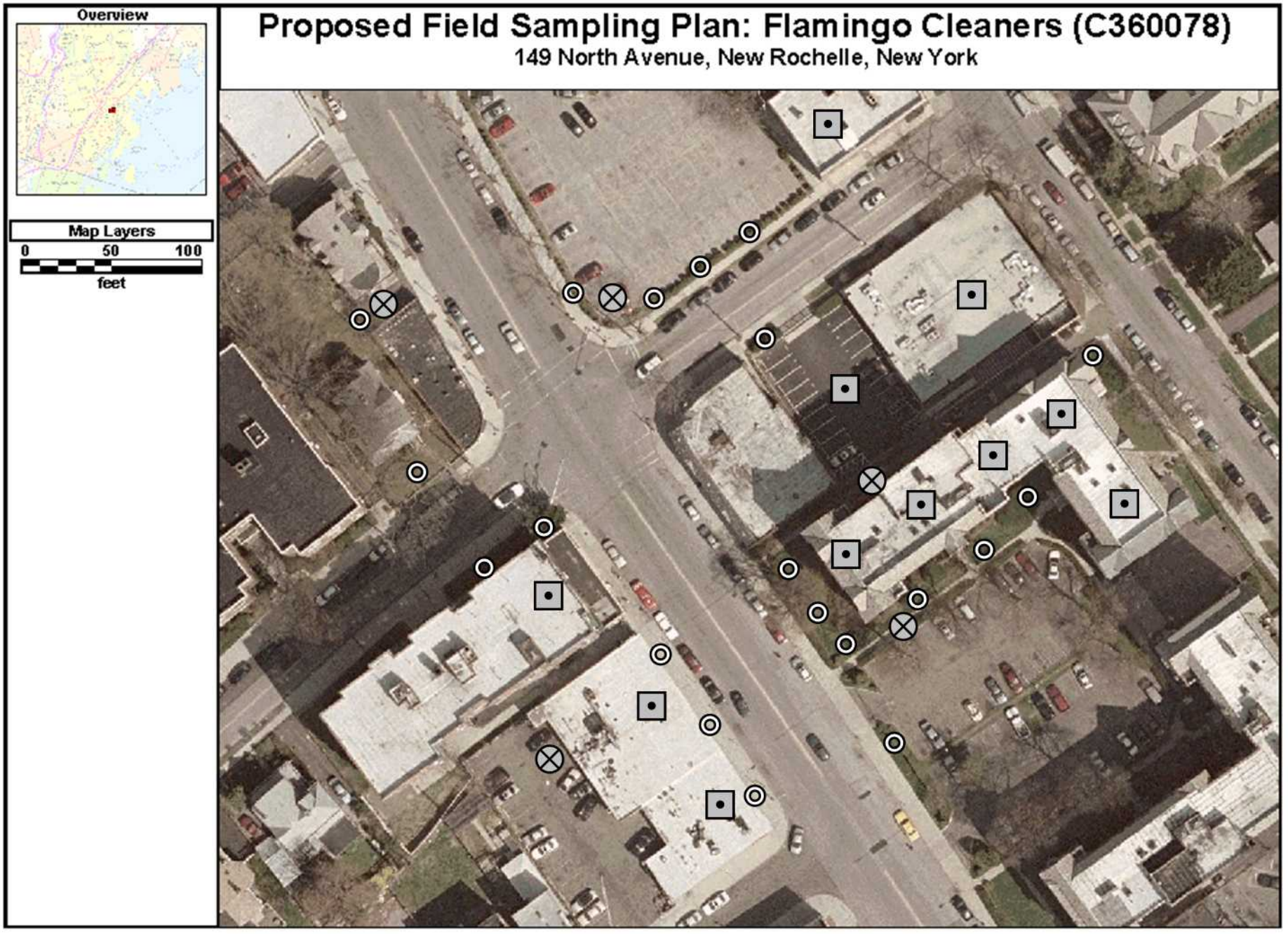
FIGURE 1 – SITE LOCATION
Flamingo Cleaners
149 North Avenue
New Rochelle, New York
D006130-02

Proposed Field Sampling Plan: Flamingo Cleaners (C360078)

149 North Avenue, New Rochelle, New York



HRP Associates, Inc.
Environmental/Civil Engineering & Hydrogeology

Map Key

- Soil Vapor Intrusion Sampling Location
- Groundwater Monitoring Well Couplets
- Passive Soil Gas Sampling Locations

APPENDIX A

BEACON ENVIRONMENTAL SERVICES, INC.
PASSIVE SOIL GAS SAMPLING AND ANALYTICAL SERVICES

PROPOSAL FOR SOIL-GAS SAMPLING AND ANALYTICAL SERVICES
149 North Avenue
New Rochelle, NY

Background

Beacon Environmental Services, Inc. (BEACON), a small business concern (NAICS 541380), has been invited by HRP Associates, Inc. to provide a Proposal and Cost Estimate for soil-gas services at the 149 North Avenue Site in New Rochelle, NY. The Proposal and Cost Estimate are based on information provided to BEACON by HRP Associates, Inc.

Objective

Collection of passive soil-gas (PSG) samples from the shallow subsurface will provide data on the identity and relative concentrations of targeted volatile organic compounds (VOCs) which may be present, without generating waste from soil cuttings. This data will be used to identify source areas of contamination and to delineate the lateral extent of the contaminants.

Survey Design

HRP Associates, Inc. will determine actual sampling locations. At HRP Associates, Inc.'s option, BEACON will assist in the development of the sampling plan.

Sampling Procedures

A small, easy-to-carry BESURE Sample Collection Kit™ containing sufficient equipment to collect at least 20 field samples will be provided to HRP Associates, Inc. personnel for collection of soil-gas samples following the protocols of BEACON's passive method. BEACON will ship the Field Kits via FedEx® overnight delivery within two (2) business days following notice to proceed.

To install a PSG Sampler, a 3/4" diameter hole is made to a depth of four inches using a hammer and a metal stake provided in the Kit. When applicable, a hammer drill, slide hammer, or other comparable equipment can be used to create a 1/2" diameter hole to a two- to three-foot depth. In either case, the PSG Sampler (which contains ***two sets of hydrophobic adsorbent cartridges***) is installed in the top four inches of the hole. For locations covered by asphalt or concrete surfacing, a 1 1/4" to 1 1/2" diameter hole is drilled through the surfacing to the underlying soils, and the hole is sleeved with a sanitized metal pipe provided in the Kit. After the Sampler is installed inside the metal pipe, the hole is patched with an aluminum foil plug and a thin concrete patch to protect the sampler. The samplers are exposed to subsurface gas for approximately three to 10 days. Following the exposure period, the Samplers are retrieved and shipped to BEACON's laboratory for analysis. A trip blank, which will remain with the other PSG samples during preparation, shipment, and storage, will be included with each batch of up to 40 field samples.

BEACON provides in the BESURE Sample Collection Kit™ pre-cleaned metal sleeves when sampling through impermeable surfacing to protect the Samplers. These sleeves prevent any horizontal migration of vapors in the more porous substrate from influencing the soil-gas samplers. The metal sleeves are advanced below the substrate and tapped into the underlying soils so that the Samplers will only be adsorbing compounds in soil gas that is moving vertically through the soils beneath, and not in the vapors that may be migrating laterally through the more porous substrate. Other soil-gas vendors simply create a hole 2 to 3 feet deep, and leave their samplers unprotected to the horizontal migration of vapors in the substrate. This easy-to-perform but important procedure of using the metal sleeves is critical to an accurate and reliable soil gas survey (see **Attachment 1**).

Note: The adsorbent cartridges used by BEACON are hydrophobic, which allows the samplers to be effective even in water-saturated conditions. Extensive empirical evidence, which is supported by a government study, has proven that hydrophobic adsorbents work perfectly well in high moisture conditions and should not be encased by a hydrophobic membrane.[1] The use of surrogates and internal standards by BEACON during the analysis of samples verifies that moisture is not a problem during the analysis of the samples. Therefore, water does not adversely impact adsorption of compounds in the field or the analysis of the samplers at the laboratory. An analytical method that does not use internal standards or surrogates during the analysis of each sample cannot provide proof of performance that the system was functioning properly for each sample.

A two-person team can install approximately 50 to 100 samplers per day depending on the number of sample locations that are covered with asphalt, concrete, or gravel surfacing. For retrieval of the Samplers, one person can retrieve approximately 50 samplers per day and patch the holes through the surfacing. It is anticipated that one day will be required to install the samplers and one day will be required for retrieval.

Figure 1 — Installation of Samplers with BESURE Sample Collection Kit™

1 The Marines Project: A Laboratory Study of Diffusive Sampling/Thermal Desorption/Mass Spectrometry Techniques for Monitoring Personal Exposure to Toxic Industrial Chemicals, April 2002, Warren Hendricks, Methods Developments Team, Industrial Hygiene Chemistry Division, OSHA Salt Lake Technical Center, Salt Lake City, UT 84115-1802.

Sample Custody Procedures

A chain-of-custody accompanies the field samples at all times from the time the samples are collected until final analysis. Field kits are shipped with tug-tight custody seals to ensure that samplers are not tampered with during transport. Once samples are received at BEACON's laboratory, the sample custodian receives the samples and logs the samples into the laboratory's Sample Receipt Log per BEACON's *Quality Assurance Program Plan for the Analysis of Soil-Gas Samples*.

BEACON's laboratory is maintained in a safe and secure manner at all times. The facility is locked when not occupied and is monitored for fire and unauthorized access. BEACON personnel escort all visitors at all times while inside the facility.

Analytical Procedures

Soil gas samples will be analyzed by BEACON using gas chromatography/mass spectrometry (GC/MS) instrumentation, following modified EPA Method 8260B procedures. Samples will be analyzed for those compounds on the attached list, including Total Petroleum Hydrocarbons (TPH). The laboratory will perform an ***initial five-point calibration***. In addition, a BFB tune is performed daily and a method blank is run following the daily calibration. ***Internal standards and surrogates*** are included with each sample analysis. The laboratory's reported quantitation level (RQL) for each of the targeted compounds is 25 nanograms (ng) and the RQL for TPH is 2,500 ng; however, the actual detection limits are even lower. Other specific analytes may be targeted, if requested prior to analysis. Two sets of adsorbent cartridges are included in each Sampler for duplicate or confirmatory analysis. At HRP Associates, Inc.'s option, BEACON will analyze ***field sample duplicates*** from selected sample locations identified on the chain-of-custody.

BEACON provides the highest level of accuracy and quality assurance and quality control (QA/QC) procedures for the analysis of soil gas samples in the industry. The table below summarizes these analytical procedures.

Description	Included
Analysis by thermal desorption-gas chromatography/mass spectrometry (TD-GC/MS) following modified EPA Method 8260B	√
Analytical results based on 5-point initial calibration (10, 25, 50, 100, and 250 nanograms)	√
Internal standards and surrogates included with each run (100 nanograms per compound)	√
BFB tunes (5 to 50 nanograms through GC, per method)	√
Continuing calibration checks (50 nanograms per compound)	√
Method blanks	√

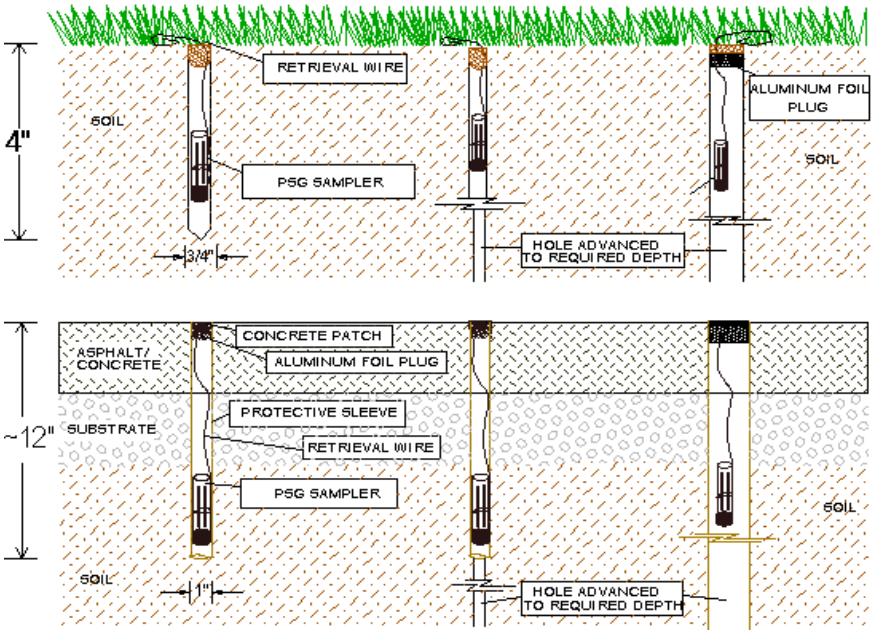
Attachment 1

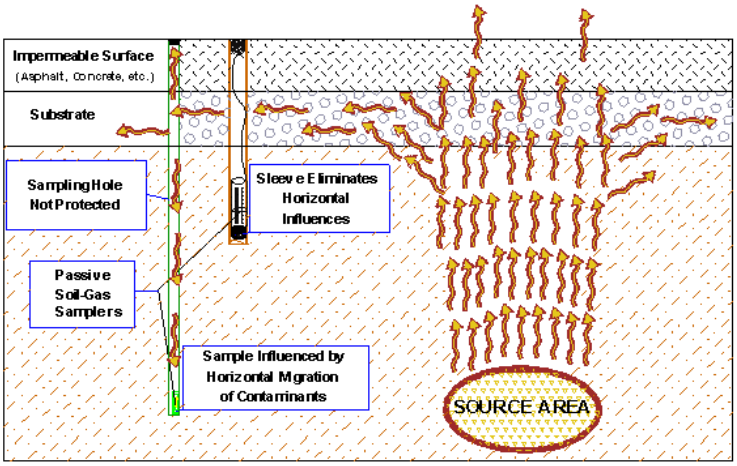
EFFECTIVE PASSIVE SOIL-GAS SAMPLING PROCEDURES

PSG Samplers need only be **installed to a 4-inch depth** because of the sensitivity of the method. However, the method is extremely versatile and installation procedures can be adapted to meet project objectives or client requirements.

When a PSG Sampler is installed in the ground, the top of the hole is completely sealed by collapsing the soils above the Sampler or patching the drilled hole through the surfacing. Other vendors use a permeable cork to plug their installation hole, which allows subsurface gases to escape before the adsorbent captures the organic compounds (reducing sensitivity) *and* permits vapors from above the surface, as well as surface water, to enter the hole (false positives). BEACON's PSG Samplers are not susceptible to these influences because they are effectively sealed in the subsurface.

As mentioned above, BEACON's Samplers are versatile and for some projects a higher sensitivity is required because contaminants are present at low concentrations or soils are fairly impermeable. In these situations, the sampling hole is advanced to a greater depth using a hammer drill, slide hammer, or direct push equipment. *Because the soil vapors that enter the hole will migrate upwards in this newly created preferential pathway, it is not necessary to push the Sampler to the bottom of the hole.* Therefore, the Sampler can still be installed in the upper 4-inches of the hole





Samplers installed through an impermeable surface are sleeved in pre-cleaned protective metal sleeves (provided by BEACON). These sleeves prevent any horizontal migration of vapors in the more porous substrate from influencing the soil-gas Samplers. As the accompanying diagram shows, the metal sleeves are advanced below the substrate and tapped into the underlying soils so that the Samplers will only be adsorbing compounds in soil gas that are moving vertically through the soils beneath, and not in the vapors that may be migrating laterally through the more porous substrate. Other soil-gas vendors simply create a hole 2 to 3 feet deep, and leave their samplers unprotected to the horizontal migration of vapors in the substrate. This easy-to-perform but important procedure is yet another reason why BEACON's method has achieved the reputation as being the most accurate and reliable soil gas technology available.

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