VAPOR INTERIM REMEDIAL MEASURE WORK PLAN
DUPONT POMPTON LAKES WORKS
POMPTON LAKES, NEW JERSEY

Date: June 16, 2008

Project No.: 507671
18984913

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1.0 INTRODUCTION

This Vapor Interim Remedial Measure Work Plan (VIRMWP) presents the approach for addressing the vapor pathway in off-site areas of shallow groundwater contamination for the E.I. du Pont de Nemours and Company (DuPont) Pompton Lakes Works (PLW) Site in Pompton Lakes, New Jersey. This work is a continuation of the sub-slab soil gas sampling being conducted at up to ten residences, with installation of a mitigation system (if warranted), in accordance with the *Vapor Intrusion Investigation and Remedial Action Work Plan* (VIIWP) dated June 25, 2007. Although this work plan is titled as an interim remedial measure (IRM), DuPont anticipates that the work completed will result in a final remedy.

The scope of work outlined in this VIRMWP is a continuation of the work being conducted as part of the VIIWP by offering mitigation and sampling to residents beyond the initial ten residences. As such, for ease of review and understanding, this document has been structured in a manner similar to the VIIWP previously reviewed and approved by the New Jersey Department of Environmental Protection (NJDEP) and U.S. Environmental Protection Agency (USEPA).

It is anticipated that execution of some of the work activities outlined in the VIIWP will overlap with the work outlined in this VIRMWP. Additionally, as this is a continuation of the work already being implemented as part of the VIIWP, many of the field activities outlined in this VIRMWP are the same as those outlined in the VIIWP (i.e., sub-slab sampling, system design). However, the VIIWP and VIRMWP are each considered to be stand-alone documents.

The vapor pathway work being conducted at the PLW Site is a continuation of the tiered approach initiated in 2003 and conducted as part of USEPA's Environmental Indicator (EI) CA725 determination that current human exposures are under control. Work is being conducted in accordance with the following regulatory vapor intrusion guidance documents:

- *Draft Guidance for Evaluating the Vapor Intrusion to Indoor Air Pathway from Groundwater and Soils (Subsurface Vapor Intrusion Guidance).* USEPA. November 2002; and

- *Vapor Intrusion Guidance*. NJDEP. October 2005 and updates.

Several stages of investigation have already been conducted to evaluate the potential for vapor migration from groundwater beneath the off-site area at PLW, including the current work being performed as part of the VIIWP. Based on an assessment of results to date (analytical results from sub-slab sampling), DuPont believes that proactively offering residents above the groundwater plume a protective vapor mitigation system is an appropriate IRM while additional efforts are completed to increase the knowledge of the vapor pathway above the groundwater plume.

The purpose of this work plan is to provide the procedures and methodologies needed to accomplish the objectives outlined in Section 1.5 below. The remaining sections of this document provide background information along with the rationale for the tasks to be completed.

1.1 Site Location and History

The 570-acre PLW Site is located in the boroughs of Pompton Lakes and Wanaque in Passaic County, New Jersey. Operations began in the late 1800s when the H. Julius Smith Blasting Cap Plant and the American Smokeless Powder Plant were operating on the Wanaque River and the Metallic Cap Company was operating in the Acid Brook Valley. DuPont use of the property began in 1902 with the construction and operation of the DuPont Electric Exploder Company in the Wanaque River Valley, and in 1908 with the opening of the DuPont Cap Works in Acid Brook Valley. A compilation of historical operations and past disposal practices, entitled *Operational History of the Pompton Lakes Works,* was prepared by CH2M Hill and submitted to NJDEP in 1988.

1.2 Groundwater Investigation History

A Comprehensive Groundwater Monitoring Program (CGWMP) was developed for the PLW Site in 1995. The CGWMP was based on an extensive review of all the data collected from 126 monitoring wells (36 off-site and 90 on-site). The primary constituents of concern (COCs) in groundwater, both on- and off-site, consist of ten chlorinated volatile organic compounds (VOCs). These COCs are monitored on a semi-annual basis from 33 wells, 15 on-site and 18 off-site:

- Tetrachloroethene (PCE)
- Trichloroethene (TCE)
- cis-1,2-Dichloroethene (cis-1,2-DCE)
- trans-1,2-Dichloroethene (trans-1,2-DCE)
- 1,1-Dichloroethene (1,1-DCE)
- 1,1,1-Trichloroethane (1,1,1-TCA)
- 1,1-Dichloroethane (1,1-DCA)
- 1,2-Dichloroethane (1,2-DCA)
- Vinyl chloride (VC)
- Carbon tetrachloride (carbon tet)

A chlorinated solvent plume was delineated in the alluvium in the Acid Brook Valley south plant region continuing south-southeast off-site to Pompton Lake. Classification Exception Areas (CEAs) have been established with NJDEP for the impacted groundwater areas. Annual reports are submitted to NJDEP as part of the CGWMP. Figure 1 depicts shallow monitoring well locations and the CEA boundary for the off-site shallow groundwater plume.

A groundwater IRM, specifically a groundwater pump and treat (P&T) system to prevent migration of contaminated groundwater from the Site, was implemented in August 1998. Five recovery wells extract, on average, 8 million gallons of groundwater per month from the Acid Brook Valley alluvial aquifer. Groundwater containing chlorinated VOCs is treated by air stripping, and the treated groundwater is reintroduced into the ground via subsurface infiltration beds located on-site along DuPont's southwest boundary. P&T compliance reports are submitted on a quarterly basis to NJDEP as part of the Discharge to Groundwater (DGW) permit.

1.3 Conceptual Site Model

The off-site area is a residential neighborhood south of the PLW former explosives manufacturing facility. The groundwater underlying the neighborhood is impacted by chlorinated VOCs. Concentrations vary across the shallow groundwater alluvial zone from below practical quantitation limits (PQLs) at the cross-gradient eastern and western limits up to several hundred parts per billion (ppb) total VOCs in the interior of the plume. In the off-site area, the direction of groundwater flow in the shallow zone is toward the southeast. The depth to groundwater varies seasonally and spatially from approximately 5 to 21 feet below ground surface (bgs).

The soils are a fining downward sequence of glacial till, glacial fluvial, and glacial lacustrine sands on top of Precambrian gneiss. The shallow alluvial zone (glacial till and glacial fluvial) is composed of poorly sorted coarse to medium-grained sand and gravel, and may contain layers of very coarse gravel. This shallow zone ranges from approximately 5 to 20 feet thick.

The nature and extent of groundwater contamination both on- and off-site have been extensively monitored and characterized. Since 1995, shallow groundwater concentrations have decreased by approximately an order of magnitude, and the data suggest that the off-site shallow groundwater plume is dissipating in the residential area. The P&T system is preventing further contamination from leaving the PLW Site and is furthermore flushing clean water into the edge of the off-site plume by injecting the treated water back into the aquifer.

Chlorinated VOCs volatilizing from shallow groundwater are a potential source of VOCs in soil gas and sub-slab soil gas overlying the groundwater plume. Buildings within the chlorinated VOC groundwater plume are primarily single-family homes which, based on observations to date, have basements with concrete floor slabs that are intact and lack significant cracks or other openings to the subsurface.

1.4 Summary of Recent Results

1.4.1 Sub-Slab Soil Gas

During March through May 2008, in accordance with the VIIWP, DuPont conducted sub-slab soil gas sampling at select locations in off-site areas of shallow groundwater contamination. This work focused on residences located near wells MW-128 and MW-

132 as depicted on Figures 2 and 3, respectively. Sub-slab soil gas sampling was offered to ten residents. Access was obtained and sub-slab sampling and laboratory analysis was completed at seven residences (five in the vicinity of MW-128 and two in the vicinity of MW-132). Of the remaining three, two residents denied access and one elected not to have a sub-slab sample collected at this time.

The sub-slab analytical results for the seven residences were compared to the project-specific sub-slab soil gas comparison levels outlined in Table 1. Sub-slab PCE concentrations exceeded the comparison level of 16 micrograms per cubic meter (ug/m^3) at all seven residences, while TCE concentrations exceeded the comparison level of 11 ug/m^3 at six of the seven residences. Analytical results did not exceed the comparison levels for the remaining eight COCs. In accordance with the VIIWP, installation of a protective vapor mitigation system (if feasible) is being offered to each of these residents.

1.4.2 Shallow Groundwater

During March and May 2008, groundwater sampling was conducted at select off-site monitoring wells on a voluntary basis to further characterize water quality conditions at the top of the shallow aquifer. Samples were collected via passive diffusion bags (PDBs) set at the top of the water table to assess VOC concentrations that may potentially migrate to soil gas in the overlying vadose zone. Shallow groundwater results exceeded the NJDEP and USEPA groundwater screening levels (GWSLs) for the vapor pathway for PCE and TCE at a number of the monitoring wells located southeast of the Acid Brook Valley Manufacturing Area. Figures 4 and 5 depict PCE and TCE concentrations, respectively, from the combined March/May 2008 sampling events.

1.5 Objectives and Overall Approach

The purpose of this VIRMWP is to describe the scope of work for remediation and investigation activities associated with the vapor pathway. In developing the scope of work, the CSM and data collected to date were evaluated. Based on this evaluation, PCE and TCE are the two primary COCs. The key objectives of the overall program are to:

- Proactively offer the installation of vapor mitigation systems as a protective measure at the residences located within the 1 microgram per liter (ug/L) shallow groundwater isoconcentration contour boundary (for PCE and TCE). This action provides protection to potentially affected residences while additional data on the vapor pathway is collected and evaluated.
- Collect additional data to further refine the conceptual Site model (CSM) and provide Site-specific data for technical evaluation of the soil vapor pathway. This will consist of shallow groundwater sampling, sub-slab soil gas sampling along the 1 ug/L groundwater contour boundary, and concurrent sub-slab soil gas and indoor air sampling at select residences within the potential vapor migration area.

Figure 6 depicts the area covered by this VIRMWP. Those residents located in the middle (shown in light blue) will be offered the installation of a protective vapor mitigation system and indoor air sampling. This area has been designated as the potential

vapor migration area. Sub-slab soil gas sampling will be conducted in the areas along the edges of the potential vapor migration area (shown in green) to determine potential vapor pathway conditions. This area has been designated as the expanded investigation area along the 1 ug/L groundwater contour boundary.

The tasks to be completed to meet the key objectives stated above are presented below. A detailed description of each task is included in Section 2.0.

Task 1 – Protective Vapor Mitigation Program

A protective vapor mitigation system and indoor air sampling will be offered at the residences within the potential vapor migration area (see Figure 6). Due to the complexity of this project and number of residences within this area, the implementation of this task will be based on the installation of mitigation systems on a sector basis. This allows for an orderly approach to installation by first addressing those areas where higher COC concentrations in groundwater and/or sub-slab soil gas have been detected and then proceeding to areas where lower COC concentrations have been detected. At the onset, the area closest to the PLW Site has been designated as the first sector (or Sector A) for installation of the mitigation systems and indoor air sampling (if accepted by residents).

Task 2 – Shallow Groundwater Sampling

Shallow groundwater sampling will be conducted via temporary wells located within the currently known 1 ug/l PCE/TCE groundwater contour boundary (see Figure 6). The objective of this sampling will be two-fold based on the evaluation of data: (1) prioritize the areas (or sectors) within the potential vapor migration area for installation of the systems and (2) refine the 1 ug/L PCE/TCE groundwater contour boundary and update the CSM.

Task 3 – Sub-Slab Soil Gas and Indoor Air Sampling at Select Residences

Concurrent sub-slab soil gas and indoor air sampling will be conducted at select residences within the potential migration area for the purpose of updating the current CSM and knowledge on the vapor pathway. As part of the notification activities, a survey form will be mailed to property owners to acquire information on conditions at their residences such as age of building, foundation type, and construction. This information, along with the shallow groundwater results, will be used to select approximately 50 residences (as an initial starting point) representing a cross-section of conditions across the potential vapor migration area.

Task 4 – Sub-Slab Sampling in the Expanded Investigation Area

Sub-slab soil gas sampling will be conducted at all houses within 100 feet of the 1 ug/L PCE/TCE groundwater contour boundary (see Figure 6). The objective of this sampling will be to assess whether the potential for vapor migration exists and, if warranted, will

be used to expand the potential vapor migration area boundary beyond that shown in Figure 6.

The remediation and investigation activities described herein will be implemented using a systematic, phased approach that utilizes existing information regarding concentrations of Site-related constituents in groundwater and sub-slab vapor results collected during implementation of VIIWP activities. The approach will be flexible to adapt to new analytical data or other findings. Multiple design and sampling teams will concurrently be in the field to complete installation and sampling activities in parallel to provide for the most effective and efficient response time to complete the required tasks. Remediation and sampling activities at different sectors may overlap depending on the timelines and order in which access is granted by residents.

2.0 SCOPE OF WORK

Based on the data collected and evaluated to date, DuPont is proposing a proactive plan for the area southeast of the Former Acid Brook Valley Manufacturing Area. The plan has two primary areas of implementation: (1) potential vapor migration area and (2) expanded Investigation area. The potential vapor migration area will consist of the installation of a protective vapor mitigation system, consistent with that outlined in the NJDEP-approved VIIWP, in residences which will prevent a complete vapor pathway at affected homes. The expanded investigation area will focus on the area along the 1 ug/L groundwater contour boundary where conditions may indicate the potential for vapor migration to be present and the collection of data to evaluate whether further action is warranted. Finally, data will be collected to update the current CSM (i.e., shallow groundwater sampling and sub-slab soil gas/indoor air sampling at select residences).

DuPont has planned for prompt and clear communications with the community and local officials. Communications with affected residents will include basic information related to vapor migration, current knowledge of conditions above the groundwater plume, IRM plan, and methodology of determining the order in which work will be completed across the affected area. Communications will need to remain flexible to respond to the needs of the community. At this time, it is anticipated that communications will include letters sent to residents to provide information on the program to be implemented and to schedule visits to conduct activities (sampling and design); public availability session about activities at the PLW Site, and resource(s) to answer questions from residents by telephone and meet with individual residents as needed or requested.

As a starting point, a "paper" survey of properties within the potential vapor migration area and expanded investigation area will be conducted to determine if there are any residences other than single-family/duplex structures (e.g., apartment buildings) or non-residential buildings (e.g., industrial buildings). The survey will consist of evaluating tax maps, existing figures, and aerial photographs as well as completion of survey forms by residents. This information will also be used to gain an accurate count of the number of potentially affected buildings. Additionally, information on receptors will be collected as part of the completion of the building survey during sampling.

2.1 Potential Vapor Migration Area

2.1.1 Protective Vapor Mitigation Program

A protective vapor mitigation system and indoor air sampling will be offered for residences within the potential vapor migration area. This area is currently defined by the 1 ug/L groundwater isoconcentration contour line, as interpolated from the March/May 2008 shallow groundwater analytical data. For both PCE and TCE, 1 ug/L is the NJDEP GWSL for the vapor pathway (i.e., concentration below which NJDEP does not require investigation for the vapor pathway). The NJDEP GWSL is below the USEPA GWSL for both constituents.

The potential vapor migration area is depicted in light blue on Figure 6 and includes the ten residences currently being evaluated under the VIIWP (six residences in the area of MW-128 and four in the area of MW-132). DuPont believes that this approach results in a very conservative estimated area with respect to where the vapor pathway may be complete, and the proposed action is protective of human health.

The sampling program to be conducted at those residences within the potential vapor migration area is as follows:

- Where the owner declines DuPont's offer to install a protective vapor mitigation system but accepts DuPont's offer to sample, indoor air sampling will be conducted at that residence.
- Where the owner accepts DuPont's offer to install a protective vapor mitigation system, indoor air sampling will be conducted prior to the installation of a mitigation system, if requested by the property owner.

The offer for installation of a protective vapor mitigation system will not be rescinded, even if results from sampling indicate that a system is not warranted. However, it should be noted that, based on the results, the resident might elect to not have a system installed.

Indoor air samples will be collected and analyzed in accordance with Section 4.3.

The design, installation, commissioning, and maintenance of the protective vapor mitigation systems for properties within the potential vapor migration area whose owners accept DuPont's offer to install one is further described in Section 3.0.

For residences at which a protective vapor mitigation system is installed, post-mitigation indoor air sampling in accordance with Section 4.3.

2.1.2 Shallow Groundwater Sampling

Shallow groundwater sampling is proposed at 22 temporary well locations for analysis of the COCs. Proposed locations are shown on Figure 6.

Shallow overburden temporary wells will be installed and groundwater samples collected and analyzed in accordance with Section 4.1.

Analytical results will be evaluated to (1) assess groundwater conditions as it relates to the prioritization of sectors for installation of protective vapor mitigation systems; (2) refine (potentially expand) the 1 ug/L PCE/TCE groundwater contour boundary within which residences will be offered a protective vapor mitigation system, in conjunction with the sub-slab soil gas sampling proposed in the expanded investigation area; and (3) evaluate the need for permanent monitoring wells for long-term monitoring purposes and determine their locations.

2.1.3 Sub-Slab Soil Gas and Indoor Air Sampling at Select Residences

Select residences within the potential vapor migration area will be identified for sub-slab soil gas and indoor air sampling prior to the installation of a mitigation system, with the objective being to obtain provide Site-specific data for evaluation of the soil vapor pathway and to update the current CSM. Fifty residences will initially be sampled various sectors within the potential vapor migration area to obtain a range of sampling based on the following parameters:

- Age of the house;
- Type of foundation;
- Condition of slab; and
- Concentrations in shallow groundwater.

DuPont will evaluate the sampling data set on a regular basis to update the CSM and adjust this sampling approach as warranted based on an understanding of Site conditions. To minimize inconvenience to the resident, where possible, sampling will be conducted concurrent with other activities (such as a design visit).

Sub-slab and indoor air samples will be collected and analyzed in accordance with Sections 4.2 and 4.3, respectively.

2.2 Expanded Investigation Area

Sub-slab soil gas sampling will be conducted at 100 percent of residences within 100 feet of the current 1 ug/L PCE/TCE groundwater contour boundary. This area is illustrated in green on Figure 6. The 100-foot distance from the 1 ug/L isoconcentration contour boundary was selected since USEPA's *Draft Vapor Intrusion Guidance* (2002) recommends 100 feet as an initial estimate for steady state travel distance based on diffusive vapor transport in the vadose zone, and NJDEP has also adopted this recommendation. If results of shallow groundwater sampling (Section 2.1.2) and/or sub-slab sampling indicate that the boundaries of the potential vapor migration area (Section 2.1) and/or the expanded investigation area along the 1 ug/L groundwater contour boundary needs to be expanded, DuPont will reconsider the boundaries of these areas at that time.

The sub-slab soil gas sampling methodology was approved by NJDEP in the VIIWP and is described in Section 4.2.

The determination of whether a protective vapor mitigation system will be offered for properties within the expanded investigation area will follow the decision process outlined in the NJDEP-approved VIIWP. The sub-slab soil gas data will be compared with the sub-slab soil gas comparison levels approved by NJDEP and USEPA (see Table 1).

The exceedance of a comparison level does not necessarily indicate that a health risk exists to building occupants, but rather that further evaluation of the vapor pathway is warranted. Based on the results of the sub-slab soil gas sampling and analysis, the potential follow-up actions will be based on the following decision process, as approved in the VIIWP:

- If the COCs are not detected in sub-slab soil gas above NJDEP's March 2007 *NJDEP-SRWM Low Level USEPA TO-15 Method* (NJDEP-LLTO-15-3/2007) reporting limit (0.2 parts per billion by volume [ppbv] for the majority of compounds), then no further action is necessary. This sample frequency is consistent with NJDEP's *Vapor Intrusion Guidance* (2005 and updates), since the method reporting limit is an order of magnitude below the NJDEP soil gas screening level.
- If COC concentrations in sub-slab soil gas are detected above the method reporting limit but do not exceed the comparison levels listed in Table 1, then a second round of sub-slab soil gas sampling will be conducted at the same location to confirm the results of the first round. If the results of the second round do not exceed the comparison levels, then no further action is necessary.
- If COC concentrations in sub-slab soil gas exceed the comparison levels in the first or, if applicable, second round of sampling, then installation of a protective vapor mitigation system will be offered. If the exceedences of the comparison levels are slight, or the data do not appear to be representative of Site conditions, DuPont will discuss other options with NJDEP and USEPA. Access requirements, Site-specific factors, and building characteristics will also be considered in determining whether a mitigation system is appropriate for an individual residence.

At properties within the expanded investigation area for which the sub-slab sampling results indicate that mitigation is warranted, and whose owners accept DuPont's offer, a protective vapor mitigation system will be designed, installed, commissioned, and maintained as described in Section 3.0.

For residences at which a protective vapor mitigation system is installed, post-mitigation indoor air sampling will be conducted in accordance with Section 4.3.

3.0 PROTECTIVE VAPOR MITIGATION SYSTEM

This section presents the approach to design, install, commission, and maintain the protective vapor mitigation systems in homes where the resident accepts DuPont's offer for mitigation. This approach is consistent with that outlined in the NJDEP-approved VIIWP.

3.1 System Design

DuPont anticipates installing a protective vapor mitigation system in each residence within the potential vapor migration area. The most common mitigation technique is sub-slab depressurization, which is also commonly used in radon reduction. The design criteria will be to depressurize the entire slab. DuPont will conduct design testing in order to develop a preliminary design of the mitigation system and to obtain the resident's acceptance of system details such as the fan and stack location and electrical tie-ins. Pressure field extension tests (also referred to as communication tests) will be performed to assess if sub-slab conditions are conducive to sub-slab depressurization, and if so, to determine the quantity and location of system suction points. Typically for single family residences with slab areas less than 1,500 square feet, one or two suction points will be sufficient to properly mitigate the entire slab. Results of the design testing will be documented on the *Initial Design Visit Checklist* provided in Appendix A.

In buildings with dirt floors or with concrete slabs in poor condition (i.e., major cracks), DuPont will install concrete slabs or repair slabs, as necessary, prior to design testing for the protective vapor mitigation system. Where concrete flooring is installed, DuPont may also lay perforated piping and/or a vapor barrier prior to pouring the concrete. If sub-slab conditions are not conducive to the protective vapor mitigation system and an alternative design approach is required, it will be developed during the design visit and detailed in the preliminary design. Any design approach other than the sub-slab depressurization system will be discussed with NJDEP prior to system installation.

In addition to communication testing during the design visit, DuPont will conduct an evaluation for the presence of materials suspected of containing asbestos or mold, which may potentially be disturbed during system installation. Any samples collected as part of this evaluation will be analyzed in accordance with State and Federal regulations. Backdraft tests will also be conducted on each combustion device located in the basement. The resident will be notified if any of these conditions exist. If any of these conditions pre-exist, DuPont intends to remove asbestos containing materials, in accordance with USEPA regulations, that would be disturbed during the mitigation system installation and to repair backdraft conditions prior to installation.

DuPont will generate a design drawing certified by a professional engineer. Figure 7 is an example of a typical protective vapor mitigation system design drawing. The drawing will be provided to the resident, who will sign the drawing indicating their approval of the system layout. DuPont will proceed with each installation upon receipt of the

resident-approved drawing and receipt of a building permit from the Borough of Pompton Lakes.

3.2 System Installation

Each protective vapor mitigation system suction point will be installed with a pressure gage (U-tube manometer) and an audible alarm that will alert the building occupants in the event of a system malfunction. Labels, placed on system components, will provide a telephone number of a DuPont contact that the occupant can call for questions and repairs. Slab cracks, holes, and other openings will be sealed, caulked, or covered. Floor drains that are not connected to the municipal sewer will be replaced with Dranjer-type devices that allow water to travel down the drain but do not allow vapors to migrate up the drain. Covers will be installed over the top of all sumps in order to limit potential vapor transport from the sump to indoor air.

Building and electrical permits will be obtained, as required, in accordance with local building codes. For one or two family dwellings, air permits are not required by New Jersey regulations. The need for air permits for multi-family (more than two family) dwellings will be reviewed with NJDEP.

3.3 System Commissioning

Upon installation, each system will be commissioned to document that it was installed properly, is achieving the design criteria, and is performing in accordance with defined performance specifications, discussed in this subsection. Results of the commissioning will be recorded on the *Installation and Operation Commissioning Checklist* provided in Appendix B. An as-built drawing will be prepared (modification of the design drawing) for each commissioned system, showing locations of suction points, piping, and fans on a plan view of the depressurized slab. A Remedial Action Report (see Section 6.2 for more details) consisting of the checklist and drawing will be submitted to NJDEP, along with a certification by a professional engineer licensed in New Jersey that the system has been commissioned as being effective for addressing the vapor pathway.

Each protective vapor mitigation system will be designed and commissioned to achieve a measurable differential pressure of at least 0.004 inches of water (“ wc) measured at each of four quadrants of the depressurized slab (that is, the entire slab). There may be need to verify differential pressures at more than four quadrants, particularly for slabs with internal footers or slabs that are not generally shaped as squares or rectangles. Pressure field extension testing will be conducted to confirm that depressurization is occurring in four quadrants of the slab. All combustion devices located on the slab area that pull air from within the space and exhaust it outdoors will be operating at the time of the commissioning to represent “worst-case” conditions (that is, maximum building depressurization). This approach, to measure a differential pressure of 0.004“ wc during maximum building depressurization, is a Site-specific approach to ensuring that the slab remains depressurized under all conditions. NJDEP’s *Vapor Intrusion Guidance* suggests that a slab differential pressure of 0.025 to 0.035“ wc would be sufficient to overcome most building’s depressurization but the proposed approach ensures that the systems do

overcome each individual building's depressurization, particularly when the building's depressurization is actually greater than 0.035" wc as suggested by NJDEP's guidance.

The static pressure at each suction point (u-tube manometer readings) and at the fan inlet will be recorded. These measurements will define the operating performance of each system as it achieves depressurization across the entire slab.

DuPont will describe and point out the system components to each property owner. DuPont will give property owners the *Mitigation System Instructions to Property Owners* presented in Appendix C that instructs them how to check the system and how to request non-routine maintenance if they suspect a problem with the system.

3.4 Post-Mitigation Indoor Air Sampling

DuPont will conduct post-mitigation indoor air sampling in the basement and ambient air sampling in the vicinity of each residence in which a protective vapor mitigation system is installed. The objective of the sampling is to evaluate the indoor air quality after the vapor pathway has been eliminated. Therefore, indoor air sampling will be conducted after the system is installed and commissioned. Post-remediation indoor air samples will be collected no less than one month following system commissioning.

Indoor air sampling is not a standalone means to evaluate the effectiveness of a mitigation system, since indoor and outdoor air sources will be included in the results and may bias the sampling results high. For instance, the NJDEP Indoor Air Screening Level (IASL) for both TCE and PCE is 1 ug/m^3. However, as presented in NJDEP's *Vapor Intrusion Guidance*, indoor air concentrations attributable to indoor air sources for three studies conducted in New Jersey are often greater than the screening levels, as summarized below:

	Indoor Air Concentrations (µg/m^3)[1]	
Statistic	TCE	PCE
Median	1.5 to 2.7	5.5 to 6.6
90th Percentile	5.4 to 12	19 to 36

For this reason, a multiple lines of evidence approach will be used to verify the effectiveness of the protective vapor mitigation system. In addition to evaluating the analytical data collected at a residence (post-mitigation indoor air at all residences and indoor air/sub-slab soil gas at select residences to update the CSM), DuPont will utilize the commissioning testing described in Section 3.3 to demonstrate that the entire slab is depressurized and, therefore, is capturing all or nearly all of the sub-slab vapors before they can enter the indoor air. Post-mitigation indoor air data will be compared to NJDEP's IASLs and the building survey will be reviewed for potential indoor air background sources, as outlined in Chapter 7 of NJDEP's *Vapor Intrusion Guidance*. This is consistent with the multiple line of evidence approach that NJDEP uses when

[1] NJDEP *Vapor Intrusion Guidance*, Appendix F, October 2005.

evaluating the possible impact of background sources to indoor air sampling results (as discussed in Chapter 8 of NJDEP's *Vapor Intrusion Guidance*). Other applicable sections of NJDEP's guidance to be followed during data evaluation include Subsection 6.4.1.3 and Sections 6.5 and 6.6 for methods to address background sources during sampling, and Subsection 10.3.2 for verification procedures when evaluating installed systems. The results of this sampling and data evaluation will be included in the Remedial Action Report prepared for each building where a protective vapor mitigation system is installed (Section 6.2).

Initially, 100 percent of residences that receive protective vapor mitigation systems will receive post-mitigation indoor air sampling. DuPont will evaluate the sampling data set on a regular basis. If and when the data set suggests that further sampling at a 100 percent frequency is not likely to further contribute to the evaluation (objective), DuPont will propose to NJDEP to decrease the sampling frequency. If confounding post-mitigation results are identified at a residence, DuPont will work with NJDEP and USEPA to identify the appropriate next step(s) on a case-by-case basis.

3.5 System Maintenance

DuPont will conduct the following activities to support the long-term and effective operation of the protective vapor mitigation systems:

- Routine maintenance,
- Non-routine maintenance,
- Electrical reimbursement, and
- Ongoing communication.

Routine maintenance will include regularly scheduled inspections of the protective vapor mitigation system and preventive maintenance. DuPont will inspect the systems quarterly for the first 12 months to verify the system's proper operation. If the first four quarters of inspections indicate that the systems are operating in accordance with the performance specifications, the frequency will be reduced to annual monitoring. During each inspection, the entire system will be inspected for proper installation (such as system components properly secured) and proper operation (such as system pressures). Results of each inspection will be documented on a *Mitigation System Maintenance Field Forms* as presented in Appendix D. A Monitoring and Maintenance Report, similar to NJDEP's current version of the Biennial Certification Report, will be prepared and submitted to NJDEP and USEPA to document that the protective measures are still in-place and functioning properly. The static pressure on each system suction point and fan inlet will be measured and recorded. If any static pressure deviates by more than 0.25" wc from its commissioned value, then additional investigations (such as pressure field extension testing) will be conducted to determine the affect of the change in performance. If the system needs to be modified, it will be re-commissioned (that is, depressurization will be re-verified) and documented accordingly. In addition, the basement/crawlspace floor slab

will be inspected and any new significant cracks or other openings that are observed will be sealed with caulk, or other methods as appropriate.

Protective vapor mitigation systems are relatively simple and the only component that requires preventive maintenance is the fan, which typically has a 5-year manufacturer warranty and an expected life of at least 10 years. DuPont will monitor the failure rate of the fans and will conduct a fan replacement program as warranted.

Mitigation systems that use a mitigation technique other than the protective vapor mitigation system outlined above may require a routine maintenance frequency and procedures that are different. DuPont will propose alternative approaches for these alternative systems to NJDEP for approval.

Property owners will be given a telephone number to use at any time if they have questions or if they suspect a problem with the system. DuPont will respond to calls by owners by conducting a non-routine maintenance visit to inspect and repair, if necessary, the system. The system's "as found" and "as left" operating performance will be documented accordingly.

DuPont will reimburse the property owner (or tenants if they are the rate payer) who have an installed system for its electrical usage. Details on the electrical reimbursement program are outlined in the *Electrical Reimbursement Summary* presented in Appendix E.

DuPont will send a letter to all property owners with installed systems once each year with the purpose being to:

- Update them on the mitigation program;
- Remind them on how to check their systems and where to call if they suspect problems;
- Notify them about upcoming routine maintenance; and
- Remind them to contact DuPont if they make certain changes to the home.

Finally, DuPont will track property ownership changes for properties with installed protective vapor mitigation systems and whose previous owners have declined DuPont's offer for mitigation or have not responded to DuPont's attempts to contact them. DuPont will contact new property owners with the purpose to inform them about their system or to extend an offer to install a system.

4.0 SAMPLING METHODOLOGIES AND PROCEDURES

4.1 Shallow Groundwater

Twenty-two shallow overburden temporary wells will be installed, sampled, and abandoned per NJDEP and USEPA guidelines. In general, the temporary wells will be installed approximately 5 feet below the top of the water table. Well depths will be initially approximated from existing shallow monitoring wells in the area and associated boring logs. It is assumed that the wells will range in total depth from approximately 15 to 25 feet deep. Direct-push drilling techniques will be utilized for installation of a pre-packed well system at each location. The purpose of a pre-packed well screen will be to reduce the turbidity of the groundwater samples collected.

Groundwater samples will be analyzed for the ten COCs by a NJDEP-certified laboratory utilizing USEPA Method SW-846 8260B.

4.2 Sub-Slab Soil Gas

Consistent with the NJDEP-approved VIIWP, sub-slab soil gas samples will be collected from a 3/8-inch diameter, temporary sample point in the basement/crawlspace. Every effort will be made to locate the sample point in the center of the basement/crawlspace, but the resident will have input regarding the location to minimize impact to flooring, particularly in a finished basement. One sample will be collected from single family residences. If a residence is a duplex, one sample may be collected in the basement of each half.

The temporary sample point will be created in the concrete flooring using a 3/8-inch drill bit. The hole will be advanced to just below the concrete slab. If re-sampling events are necessary, the initial temporary sample point will be re-drilled, so re-sampling will be conducted in the same location.

The sample will be collected from tubing inserted into the temporary sample point. The annulus between the tubing and the temporary sample point will be sealed with modeling clay. The tubing will be purged of the required volume (3 times the probe and tubing volume). The sample will then be collected in batch-certified 6-liter stainless steel canister with a flow controller set by the laboratory to achieve a flow rate of less than 0.2 liters per minute and a sampling duration of approximately 24 hours. The prescribed flow rate will ensure that a representative sample is collected. The sampling duration has been increased from the sampling duration in the VIIWP (4 hours) to facilitate either combining the sampling program with design visits or when the sub-slab soil gas sample is collected currently with an indoor air sample; thus minimizing any inconvenience to the residents. Sub-slab soil gas samples collected alone (e.g., in the expanded investigation area along the 1 ug/L groundwater contour boundary) will have a sampling interval of 4 hours or less. According to NJDEP's *Vapor Intrusion Guidance* (Subsection 6.4.2.4), sub-slab soil gas sample durations up to 24 hours are acceptable. The procedures

for installing the temporary sample point, tubing, seal, purging, and sampling are outlined in the *Sub-Slab Vapor Sample Collection Procedures* attached as Appendix F.

A building survey and chemical inventory will be completed during sample collection. The presence of consumer/household products and materials and building characteristics will be documented on a *Building Survey Form* (see Appendix G), adapted from Appendix B of NJDEP's *Vapor Intrusion Guidance*. A *Sampling Form* (see Appendix H) will also be completed at each residence where a sample is collected.

The sub-slab soil gas samples will be analyzed for the ten COCs by a NJDEP-certified laboratory utilizing NJDEP-LLTO-15-3/2007. Depending on laboratory availability, DuPont may elect to analyze sub-slab samples using the current TO-15 method for those samples collected within the groundwater plume (i.e., areas where higher concentrations are expected; thus, using the low-level analytical method is not as critical to data evaluation).

4.3 Indoor Air

The same sampling methodologies and procedures will be followed for indoor air samples collected prior to and/or following the installation and commissioning of a protective vapor mitigation system. One indoor air sample will be collected in the basement (or in the first floor for buildings with slab-on-grade or in the crawlspace for crawlspace construction) of each sampled residence. Indoor air samples will be collected over a 24-hour period using individually-certified 6-liter stainless steel canisters with flow controllers. The inlet to the flow controller will be positioned between 3 and 5 feet above the floor, except in crawlspaces. The procedures for sampling are outlined in the *Indoor Air Sample Collection Procedures* presented in Appendix I. A *Building Survey Form* (see Appendix G) and *Sampling Form* (see Appendix H) will also be completed at each residence where a sample is collected.

The indoor air samples will be analyzed for the full suite of VOCs by a NJDEP-certified laboratory utilizing NJDEP-LLTO-15-3/2007.

4.4 Ambient Air

Consistent with the NJDEP-approved VIIWP, ambient (outdoor) air samples will be collected simultaneously with the indoor air samples over a 24-hour period. The sample location will be selected based on a forecast of the prevailing wind direction for the 24-hour sampling period. Due to the large number of samples being collected, the frequency of ambient air samples will be reduced from the VIIWP frequency of one ambient air sample for each indoor air sample to one ambient air sample for more than one indoor air sample, if the ambient air sample can be representative of ambient air for the residences being sampled. Since there are no known nearby outdoor sources except for vehicular traffic (no known dry cleaners or other commercial or industrial facilities), one ambient air sample can be representative of ambient air for all indoor air samples being collected at the same time (start times within approximately 4 hours of each other) and within two blocks of each other, provided that they are not separated by the main vehicular

thoroughfare through the potential vapor migration area (Colfax Avenue). Ambient air samples will not be collected near large trees.

The samples will be collected using individually-certified 6-liter stainless steel canisters with flow controllers. The inlet to the flow controller will be positioned between 3 and 5 feet above the ground surface. The procedures for sampling are outlined in the *Ambient Air Sample Collection Procedures* presented in Appendix J. A *Sampling Form* (see Appendix H) will also be completed for each sample that is collected.

The ambient air samples will be analyzed for the full suite of VOCs by a NJDEP-certified laboratory utilizing NJDEP-LLTO-15-3/2007.

5.0 SYSTEM TERMINATION

Sub-slab soil gas concentrations of the COCs (specifically PCE and TCE) are expected to diminish over time as concentrations continue to decrease in the off-site shallow groundwater plume. As soil gas concentrations diminish over time and the vapor pathway is no longer complete, the mitigation systems will no longer be needed. Consistent with the VIIWP, DuPont proposes to conduct sub-slab sampling for comparison with the applicable sub-slab soil gas screening levels available at the time of potential system termination. Samples will be collected and analyzed following the same methods described in Section 4.2, unless there is a more appropriate methodology at the time of sampling. Additionally, a port will be installed on the vent pipe of each protective vapor mitigation system as a means for potential sampling access to assess constituent concentrations in soil gas. If sub-slab concentrations do not exceed sub-slab soil gas screening levels applicable at the time of sampling, then DuPont will request approval from NJDEP to decommission the system. If approved, DuPont will offer a choice to the resident that DuPont will either remove the system or turn ownership of the system over to the resident. DuPont does not anticipate decommissioning a mitigation system without written approval from NJDEP.

6.0 REPORTING

Consistent with the VIIWP, the mitigation system verifications and investigative work will be documented in reports and submitted to NJDEP, USEPA, and the residents. DuPont will work in conjunction with NJDEP to deliver the results to the residents and respond to their questions related to the results.

6.1 Progress Reporting

Results of any sampling and/or monitoring will be submitted as quarterly IRM progress reports to NJDEP and USEPA. This will include events such as shallow groundwater sampling and sub-slab soil gas sampling in the expanded investigation area along the 1 ug/L groundwater contour boundary. DuPont will provide any data packages to NJDEP and USEPA upon receipt of final deliverables from the laboratory.

6.2 Remedial Action Reporting

Mitigation systems will be commissioned and monitored as discussed in Sections 3.3 and 3.5. A Remedial Action Report will be prepared and submitted annually for each building where a protective vapor mitigation system is installed. The Remedial Action Reports will be submitted to NJDEP and USEPA as they are completed for each residence (expected to be within 30 days of receipt of all laboratory data). Each report will contain the following types of information:

- Communication testing results and checklists;
- Design and as-built drawings;
- Building surveys (for each sampling event conducted);
- Vacuum readings for the system;
- Analytical results from all sampling conducted at the residence; and
- Certification of the report from a professional engineer.

Additionally, a Monitoring and Maintenance Report, similar to NJDEP's current version of the Biennial Certification Report, will be prepared for each residence to document that the protective measures are still in-place and functioning property. This report will discuss findings and any system modifications and re-commissioning, if applicable.

6.3 Mitigation System Termination

Consistent with the VIIWP, DuPont will notify NJDEP prior to conducting sub-slab soil gas sampling to determine the potential for mitigation system termination. The notification will detail any changes to sampling and analytical methodologies and confirm the applicable soil gas screening levels at the time of potential system termination. Results of the sub-slab soil gas sampling will be submitted to NJDEP.

6.4 Anticipated Project Schedule

6.4.1 Schedule Constraints

Due to the large number of residences and coordination with the owners regarding field activities, it is difficult to accurately assess the many issues that may arise over the course of this project and their overall effect on the project schedule. DuPont will work closely with NJDEP and USEPA so that all parties remain up-to-date during the implementation of the program. The schedule for implementation outlined in this VIRMWP will be highly dependent on a number of factors including, but not limited to:

- Number of residents within the potential vapor migration area agreeing to the installation of a protective vapor mitigation system;
- Number of residents that request indoor air sampling and want to see those results before making a decision about the installation of a protective vapor mitigation system;
- Individual resident's availability to meet with or allow DuPont to access the residence for any day and time that DuPont has available teams;
- Sub-slab sample results in the expanded investigation area along the 1 ug/L groundwater contour boundary and need for the installation of additional systems beyond the potential vapor migration area;
- Establishing access agreements and availability of residents for DuPont to enter residences on multiple occasions to complete work; and
- Possible removal of asbestos containing materials or mold found in households that may need to be disturbed during system installation.

Additionally, since there is currently only one NJDEP-certified laboratory for conducting the required analysis (NJDEP-LLTO-15-3/2007), work will be highly dependent on the number of samples that can be analyzed per day. At this time, TestAmerica Laboratories, Inc. Burlington (TAL-Burlington) of South Burlington, Vermont has two instruments for completing this work with each being able to accommodate a maximum of 20 samples per day. It is anticipated that one instrument would be dedicated to certifying canisters while the other would be used to analyze samples. To alleviate this possible schedule constraint, DuPont may elect to use the current TO-15 method for sub-slab samples as discussed in Section 4.2.

6.4.2 Near-Term Schedule

DuPont intends to divide the potential vapor migration area into sectors for the purpose of setting the order of contacting residents with DuPont's offers for sampling and/or mitigation. The initial sector(s) will be prioritized based on the existing groundwater data, which relate to the potential for vapor migration and the available sub-slab soil gas data. Areas with the higher COC concentrations in groundwater and/or sub-slab soil gas will be contacted sooner, while areas of lower COC concentrations will be contacted later. DuPont will be collecting additional groundwater samples within the potential vapor

migration area to aid in prioritization of subsequent sectors. DuPont plans to start contacting property owners before that additional groundwater sampling is complete. DuPont has selected an area within the potential vapor migration area where the highest groundwater concentrations are known at this time. Figure 8 illustrates this area, referred to as Sector A.

The sequence of activities listed below has been estimated as a guide for the near-term implementation of this project. This work is based on approval of this VIRMWP during June 2008. The "kick-off" of this program will include a letter to residents within the potential vapor migration area, a letter to residents within the expanded investigation area along the 1 ug/L groundwater contour boundary, and public availability sessions to be conducted during June 2008.

Initial 10 Properties Included in VIIWP

- June 2008 – Meet with residents to discuss sub-slab soil gas results and offer indoor air sampling and mitigation
- June 2008 – Start indoor air sampling
- July 2008– Start design, installation, and commissioning of mitigation systems

Protective Vapor Mitigation Program – Sector A

- June 2008 – Deliver notification letters to residents within potential vapor migration area (all sectors)
- July 2008 – Start individual meetings, upon request, with residents (Sector A)
- July 2008 – Start indoor air sampling, as requested by residents (Sector A)
- July 2008 – Start design, installation, and commissioning of mitigation systems (Sector A)

Shallow Groundwater Sampling within Groundwater Plume

- June 2008 – Install temporary wells and collect groundwater samples to prioritize the remainder of the potential vapor migration area and refine the 1 ug/L groundwater contour boundary
- August 2008 – Finalize remaining sectors (subsequent to Sector A) within the potential vapor migration area for prioritization purposes based on additional groundwater analytical results

Sub-Slab/Indoor Air Sampling at Select Residences to Update the CSM

- July 2008 – Deliver notification letters to select residents in potential vapor migration area identified for sampling based on paper survey results and selection criteria (Section 2.1.3.)
- August 2008 – Start individual meetings, upon request, with residents
- August 2008 – Start sub-slab soil gas and indoor air sampling

Expanded Investigation Area Along 1 ug/L Groundwater Contour Boundary

- June 2008 – Deliver notification letters to residents within expanded investigation area
- July 2008 – Start individual meetings, upon request, with residents
- July 2008 – Start sub-slab soil gas sampling

The dates listed above are target dates and will be dependent on the responsiveness from property owners and coordinating access (which could speed up or slow down the overall schedule).

6.4.3 Future-Term Schedule

At the request of NJDEP, this section presents an overall schedule for implementation and completion of this VIRMWP based on various assumptions.

Once the additional groundwater results are evaluated, the remainder of the potential vapor migration area, shown as "Future Sectors" on Figure 8, will be divided into additional sectors. Contact and meetings with residents in these new sectors will begin once the sector with the next highest priority is substantially completed (meaning, those residents who have responded and granted access have been sampled or their system design is in process).

Approximately 400 residents will be offered sampling and/or mitigation. The length of time it takes to substantially complete each sector will depend on the factors presented above in Section 6.4.1. If none of the constraints listed in Section 6.4.1 are incurred, installation of all the systems will be completed by December 31, 2009. However, it should be noted that if the constraints listed in Section 6.4.1 are encountered at a significant number of residences, then the substantial completion of system installations could take between one and two years longer.

TABLES

Table 1
Sub-Slab Soil Gas Comparison Levels[1]
DuPont Pompton Lakes Works
Pompton Lakes, New Jersey

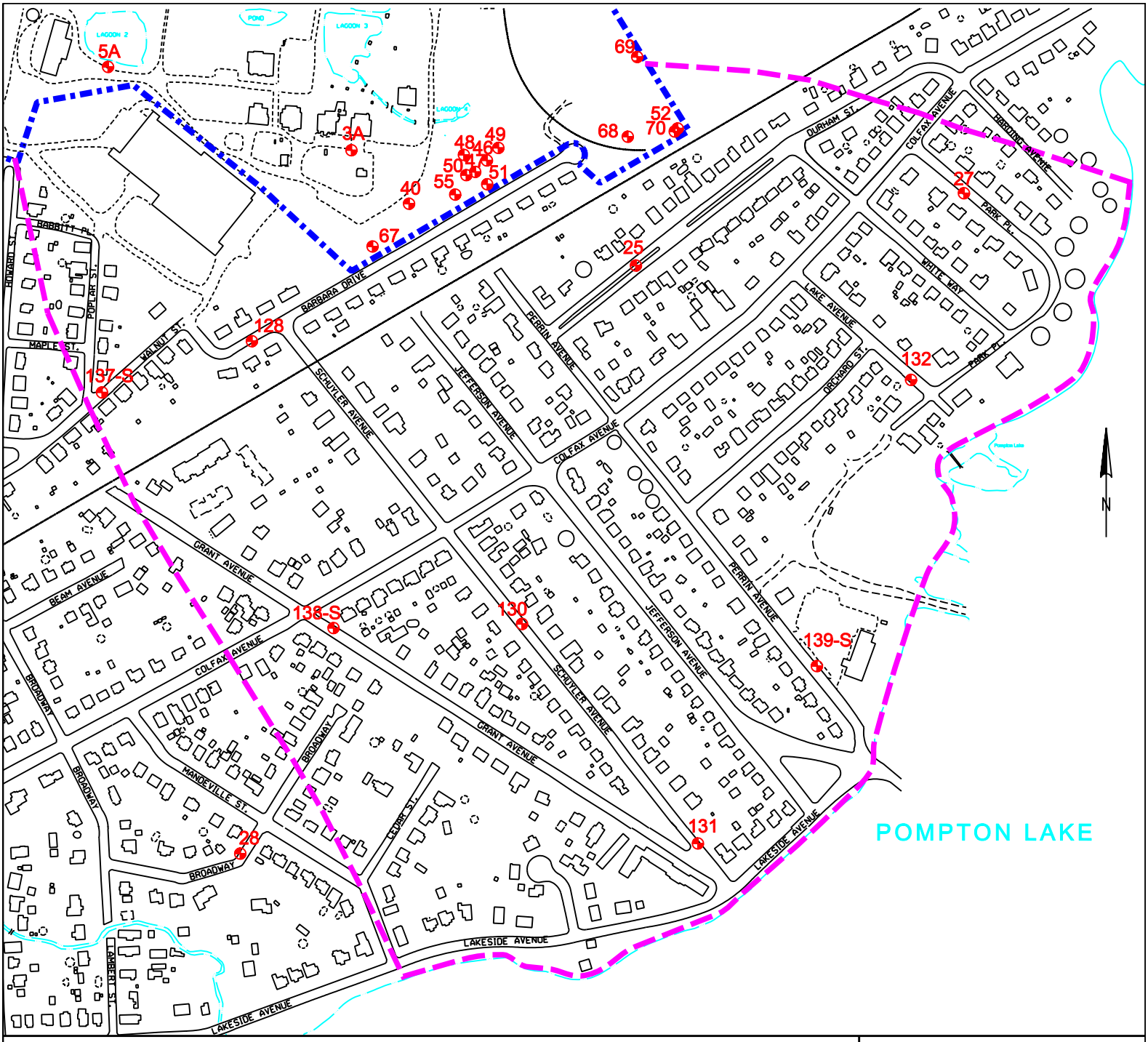
Constituents of Concern	Sub-Slab Soil Gas (ppbv)	Sub-Slab Soil Gas (µg/m^3)
PCE[2]	2	16
TCE[2]	2	11
cis-1,2-DCE[3]	88	350
trans-1,2-DCE[3]	180	700
1,1-DCE[3]	500	2,000
1,1,1-TCA[3]	4,000	22,000
1,1-DCA[3]	1,200	5,000
1,2-DCA[2]	2	8
VC[2]	2	5
Carbon Tet[2]	2	13

(1) It is important to note that guidance on the evaluation of the vapor intrusion pathway continues to be developed. As discussed in the NJDEP's 2005 VIG, the USEPA draft Subsurface Vapor Intrusion Guidance uses a shallow soil gas-to-indoor air attenuation factor of 0.1 based on the information available in the USEPA Vapor Intrusion Database when the 2002 USEPA guidance was drafted. USEPA's current reevaluation of the database, which includes additional empirical data, suggests that a reduced attenuation factor may be more appropriate in the development of shallow/sub-slab soil screening levels (NJDEP 2005; USEPA 2005, 2006, 2007, 2008). Based on more recent information, the NJDEP selected an attenuation factor of 0.02 in the development of its health-based soil gas screening levels. Since the USEPA 2002 draft guidance has not yet been updated, DuPont proposes to use the USEPA screening levels for five constituents as indicated in the table, because they are more conservative (lower) than the current NJDEP screening levels, recognizing that the NJDEP screening levels are based on more recent information and that the state of the science continues to advance.

(2) NJDEP anticipated residential screening levels for soil gas (NJDEP, 2007).

(3) USEPA draft generic screening level for shallow soil gas (USEPA, 2002).

FIGURES



LEGEND

SCALE: 1-inch = 425-feet

OPEN WATERS
PLANT BOUNDARY
RIVER AND CREEK
ROADS

RAIL ROAD LINES
CEA BOUNDARY
Shallow Well

MAPPER: M.E. Vetter
DATE: June 9, 2008
DRAWING: Fig1-VI_wells.dgn

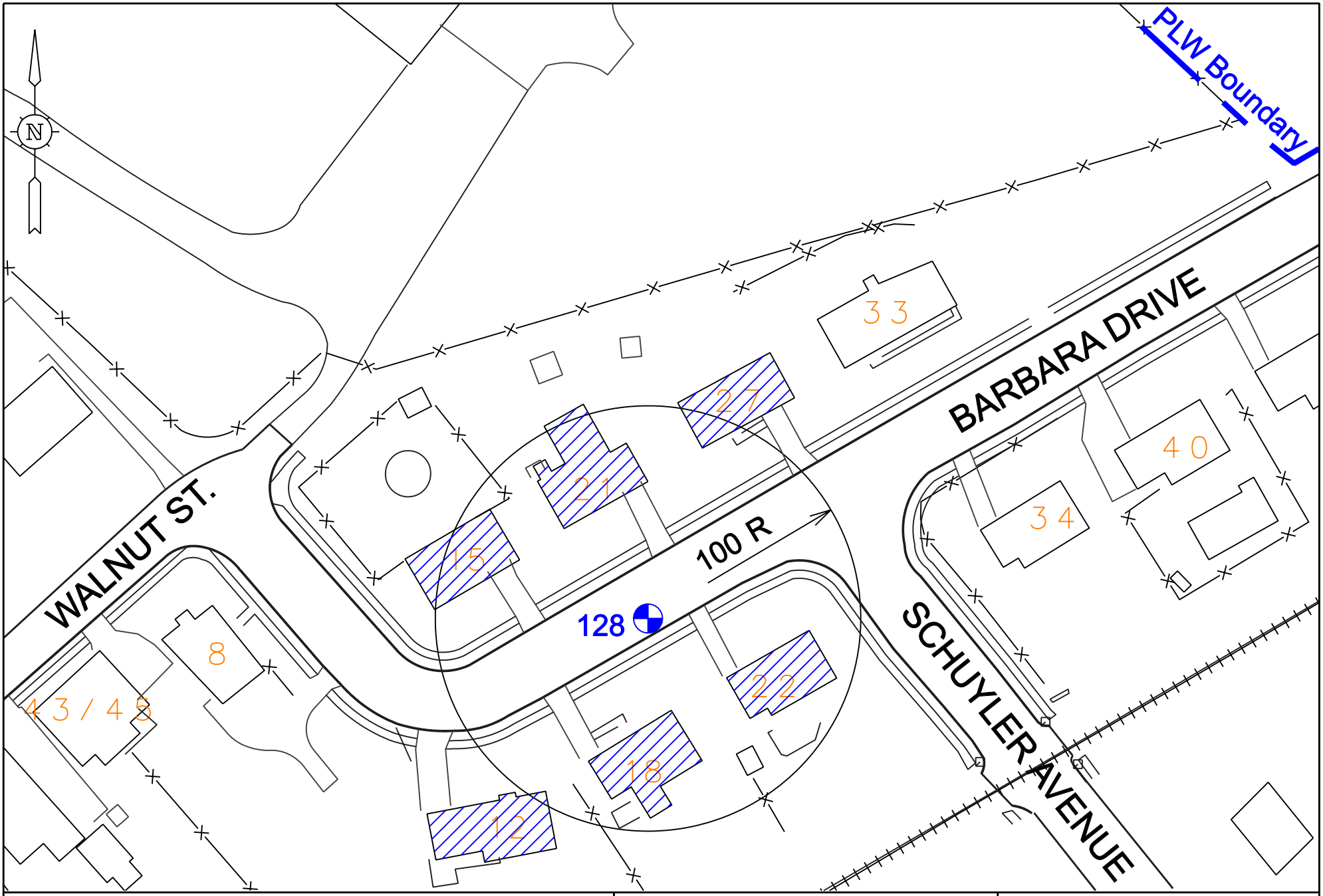
OFF-SITE SHALLOW WELL LOCATIONS and CEA BOUNDARY

DUPONT POMPTON LAKES WORKS
POMPTON LAKES, NEW JERSEY

CORPORATE REMEDIATION GROUP
An Alliance Between DuPont and URS Diamond

2000 Cannonball Road
Pompton Lakes, New Jersey

FIGURE 1



LEGEND:

0' 60'

SCALE: 1-inch = 60-feet

MAPPER: M.E. Vetter
DATE: June 9, 2008
DRAWING: Fig2_MW128-subslab.dgn

Shallow Well
Fence
Road
Paved Surface
Railroad

Sub-Slab Sampling Locations

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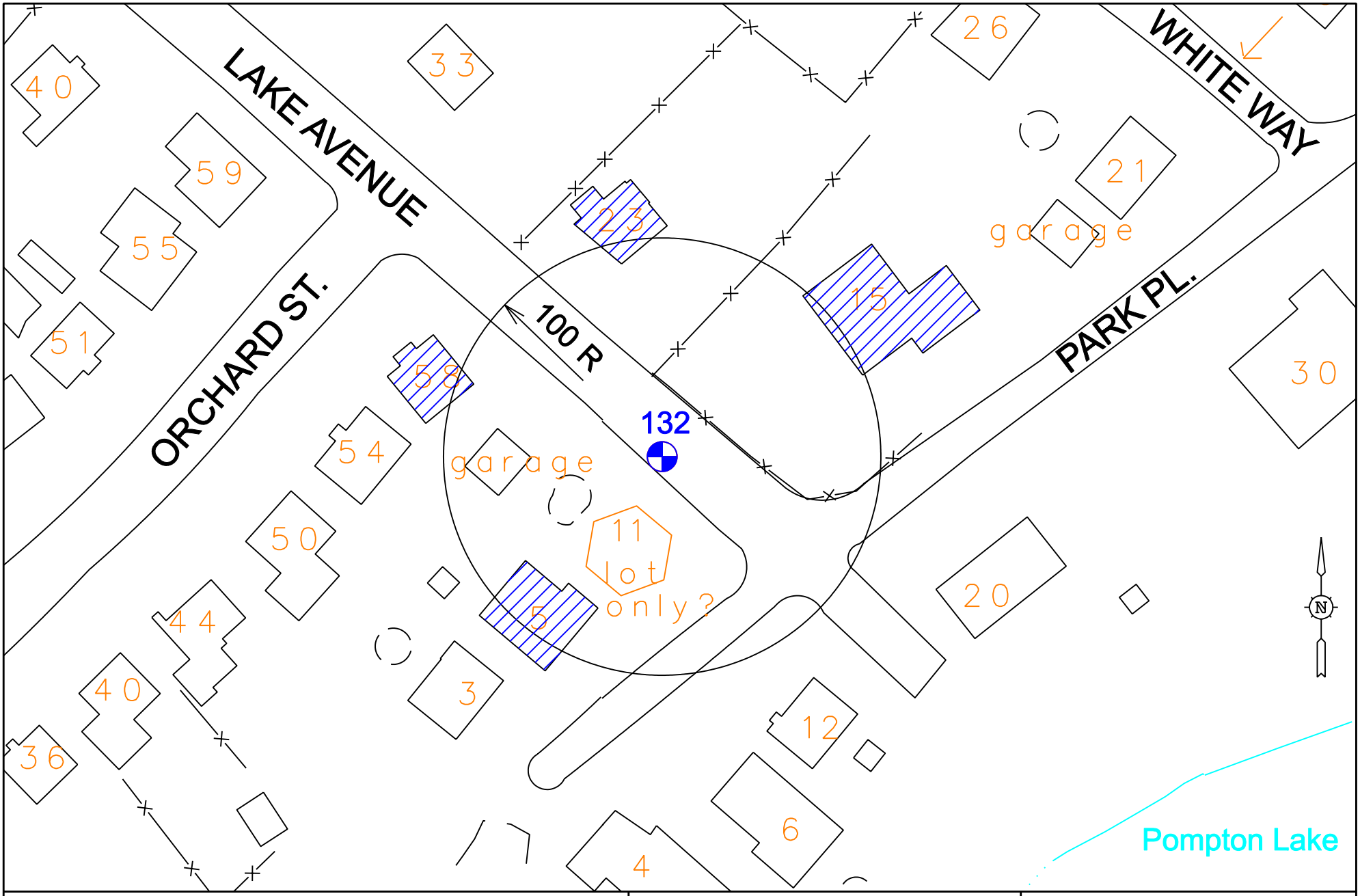
Pompton Lakes, New Jersey

WELL 128 VICINITY MAP AND SUB-SLAB SAMPLING LOCATIONS

DUPONT POMPTON LAKES WORKS
POMPTON LAKES, NEW JERSEY

FIGURE 2



LEGEND:

0' 60'

SCALE: 1-inch = 60-feet

MAPPER: M.E. Vetter
DATE: May 22, 2008
DRAWING: Fig3_MW132-subslab.dgn

Shallow Well

Fence

Road

58 Sub-Slab Sampling Locations

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WELL 132 VICINITY MAP AND
SUB-SLAB SAMPLING LOCATIONS

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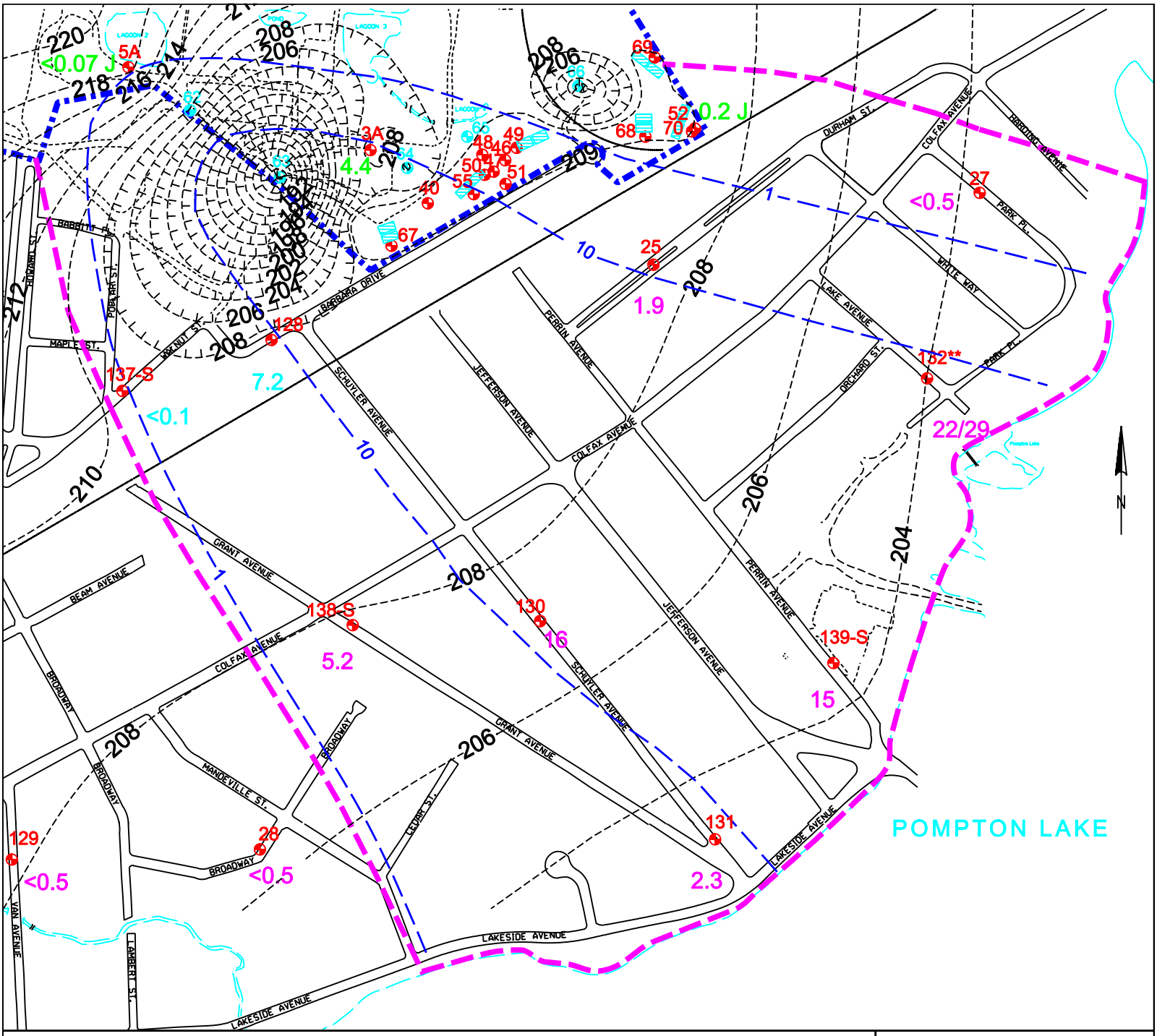
POMPTON LAKES, NEW JERSEY

FIGURE 3



LEGEND

SCALE: 1-inch = 425-feet

OPEN WATERS
PLANT BOUNDARY
RIVER AND CREEK
ROADS
RAIL ROAD LINES
CEA BOUNDARY

PCE Isoconcentration Contour Line
Groundwater Elevation Contour Line
Feb 19, 2008
Groundwater Infiltration Bed
Recovery Well
Shallow Well
1.9 PCE (ug/L) Mar 6, 2008
1.9 PCE (ug/L) May 7, 2008
1.9 PCE (ug/L) Nov 28-29, 2007

MAPPER: M.E. Vetter
DATE: June 9, 2008
DRAWING: Fig4-PCE_Mar-May08.dgn

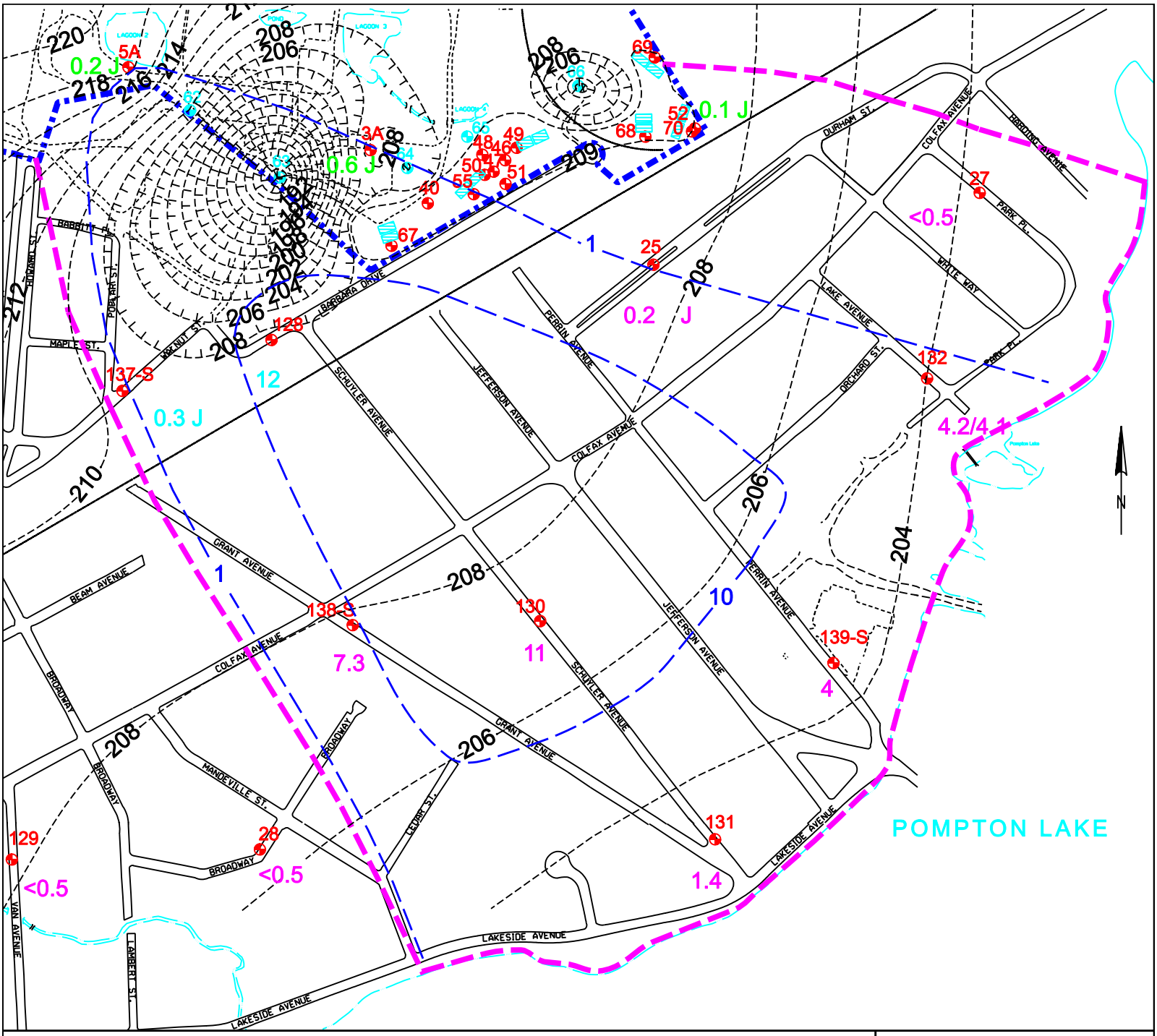
PCE Shallow Groundwater Results and Isoconcentration Contours (March/May 2008)

DUPONT POMPTON LAKES WORKS
POMPTON LAKES, NEW JERSEY

CORPORATE REMEDIATION GROUP
An Alliance Between DuPont and URS Diamond

2000 Cannonball Road
Pompton Lakes, New Jersey

FIGURE 4



LEGEND

SCALE: 1-inch = 425-feet

OPEN WATERS
PLANT BOUNDARY
RIVER AND CREEK
ROADS

RAIL ROAD LINES
CEA BOUNDARY

TCE Isoconcentration Contour Line
Groundwater Elevation Contour Line
Feb 19, 2008
Groundwater Infiltration Bed
Recovery Well
Shallow Well

7.3 TCE (ug/L) Mar 6, 2008
7.3 TCE (ug/L) May 7, 2008
7.3 TCE (ug/L) Nov 28-29, 2007

MAPPER: M.E. Vetter
DATE: June 9, 2008
DRAWING: Fig5-TCE_Mar-May08.dgn

TCE Shallow Groundwater Results
and Isoconcentration Contours
(March/May 2008)

DUPONT POMPTON LAKES WORKS
POMPTON LAKES, NEW JERSEY

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DuPont and URS Diamond

2000 Cannonball Road
Pompton Lakes, New Jersey

FIGURE 5

Jun 10, 2008 - 1:52pm

POTENTIAL VAPOR MIGRATION AREA AND EXPANDED INVESTIGATION AREA

LEGEND

- PROPERTY BOUNDARY
- 1 ug/L GROUNDWATER CONTOUR BOUNDARY (COMBINED PCE/TCE)
- POTENTIAL VAPOR MIGRATION AREA
- EXPANDED INVESTIGATION AREA
- TEMPORARY WELL LOCATION (WELL ID)
- MONITORING WELL (WELL ID)

1"=200' 200 0 200 400

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An Alliance between DuPont and URS Diamond

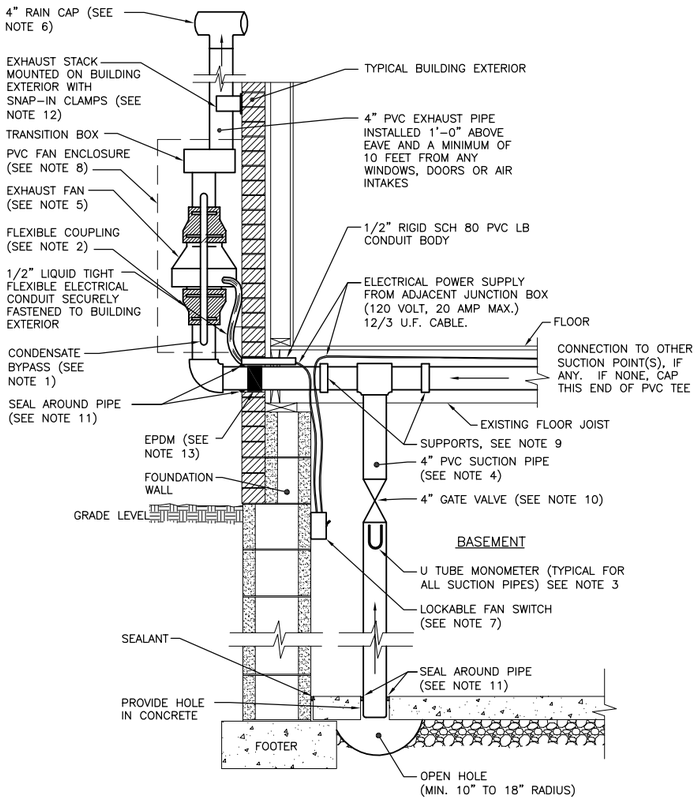
2000 Cannonball Road
Pompton Lakes, New Jersey 07442

Figure 6

SCALE	DESIGNED BY	DRAWN BY	CAD DRAWING NO
1-In=200-ft	-	-	Fig6_rev3_w aerial.dwg
DATE	CHECKED	APPROVED	PROJECT NO
5/20/08	-	-	7026

DUPONT POMPTON LAKES WORKS
Pompton Lakes, New Jersey

I:\Projects\11576 DuPont\41104 Vapor Investigation\DWG\Figure 6_rev8.dwg

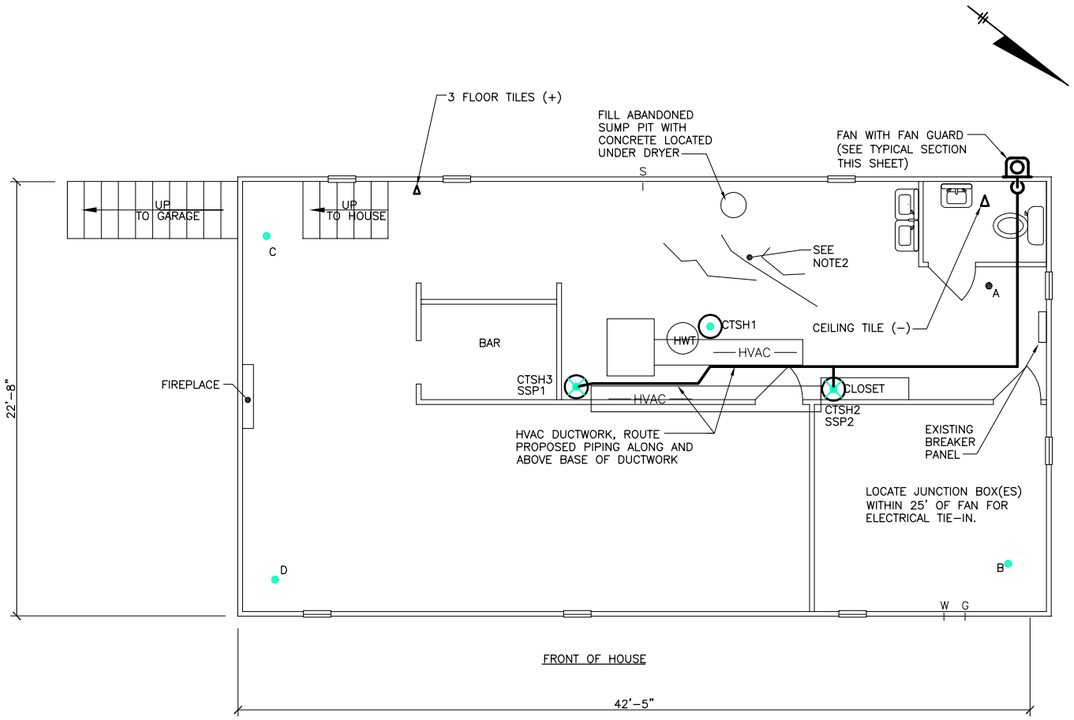


TYPICAL SECTION

NOT TO SCALE

SECTION NOTES:

1. RCI #FG–43 FAN GUARD KIT (CONDENSATE BYPASS) OR EQUAL. (1–REQUIRED)
2. RCI #B–106–44 FLEXIBLE PVC COUPLING WITH STAINLESS STEEL CLAMPS OR EQUAL, (4.0"x6.0", 2–REQUIRED).
3. RCI #MU–93 MANOMETER OR EQUAL, INSTALL AT 5'–0" ABOVE THE FLOOR IN THE SUCTION PIPE RISER. (2–REQUIRED)
4. PVC PIPE IS DUAL RATED DWV/SCH. 40 WITH DWV FITTINGS. ALL PIPING SHALL BE INSTALLED WITH CLEAR LOW VOLATILE ORGANIC COMPOUND (VOC) GLUE AND PRIMER (IPS OR HERCULES).
5. FANTECH HP–220 FAN OR EQUAL. FAN IS DIRECT WIRED FROM A DEDICATED 115–120 VAC–20 AMP MAX. SUPPLY. THE FAN DRAWS A MAXIMUM OF 1.3 AMPS AND 152 WATTS MAXIMUM. TEST LOAD CIRCUIT PRIOR TO INSTALLATION OF FAN. FAN TO BE MOUNTED 4'–0" ABOVE EXISTING GRADE. (1–REQUIRED)
6. RCI RAIN CAP #RC40–4 OR EQUAL. (1–REQUIRED)
7. PROVIDE MOTOR RATED WEATHER PROOF SWITCH, 2 HP MAX., 1 PHASE, 2 POLE LEVITON CAT. #MS302 WITH LOCKABLE COVER PLATE CAT. #N1302 OR EQUAL. PROVIDE STEEL SINGLE GANG DEVICE BOX. ALL WORK SHALL BE IN ACCORDANCE WITH THE NATIONAL ELECTRIC AND LOCAL CODES. (1–REQUIRED)
8. RCI #WFH89 FAN ENCLOSURE OR EQUAL (INCLUDING BASE PLATE, TRANSITION BOX, AND WHITE HOUSING). (1–REQUIRED)
9. CONTRACTOR SHALL SECURE EQUIPMENT AND PIPING TO MINIMIZE ANY MOVEMENT. HORIZONTAL PIPE RUNS SHALL BE SUPPORTED EVERY 6 FEET WITH "J" HOOKS (RCI #HT–4), STRAPS OR EQUAL AND SHALL BE SLOPED TOWARD THE SUCTION HOLE IN FLOOR.
10. VALTERRA BLADEX VALVE #6401 OR EQUAL. (2–REQUIRED)
11. GEOCEL 3300 POLYURETHANE SEALANT AROUND PIPE OPENING.
12. RCI #SIC–04 SNAP–IN CLAMPS OR EQUAL MOUNTED TO THE EXTERIOR WALL.
13. WRAP PIPE WITH A 6" WIDE PIECE OF EPDM WHERE PIPE COMES INTO CONTACT WITH THE BOX AND SILL OF THE BUILDING.



BASEMENT FLOOR PLAN

SCALE: 1/4" = 1'–0"

BASEMENT AREA – 962 SQ. FT.

PLAN NOTES:

1. DIMENSIONS AND INSTALLATION LOCATIONS SHOWN ON FIGURE ARE APPROXIMATE AND SHALL BE FIELD VERIFIED BY CONTRACTOR.
2. CONTRACTOR SHALL GROUT AND/OR CAULK ALL MAJOR CRACKS AND OPENINGS IN FLOOR OR WALLS THAT WOULD IMPAIR VENTILATION SYSTEM PERFORMANCE.
3. CONTRACTOR SHALL VERIFY ELECTRICAL TIE–IN LOCATION.
4. ALL WORK TO BE IN ACCORDANCE WITH ESTABLISHED RADON MITIGATION STANDARDS AS ESTABLISHED BY THE U.S. ENVIRONMENTAL PROTECTION AGENCY AND THE ASTM STANDARD PRACTICE (E 2121–03) FOR INSTALLING RADON MITIGATION SYSTEMS IN EXISTING LOW–RISE RESIDENTIAL BUILDINGS.

LEGEND

- S — SEWER
- G — NATURAL GAS
- W — WATER
- E — ELECTRICAL
- HVAC — HVAC DUCT
- G — PIPE/DUCT DOWN
- O — PIPE/DUCT UP
- EXISTING WALL
- WINDOW
- DOOR
- STAIRWAY
- (HWT) HOT WATER TANK
- FURNACE
- J — JUNCTION BOX
- S — FAN SWITCH
- CIRCUIT BREAKER PANEL
- SUMP PUMP
- FD — FLOOR DRAIN (FD)
- COMMUNICATION TEST SUCTION HOLE (CTSH)
- COMMUNICATION TEST SUCTION HOLE AND SYSTEM SUCTION POINT
- SYSTEM SUCTION POINT (SSP)
- COMMUNICATION TEST POINT
- PROPOSED EXHAUST RISER PIPE
- PROPOSED EXHAUST PIPE
- ASBESTOS SAMPLE RESULT (+/–)

COMMUNICATION TEST RESULTS

	DESIGN	AS–BUILT
TEST POINT LOCATION	SUB–SLAB VACUUM READING (INCHES WATER)	SUB–SLAB VACUUM READING (INCHES WATER)
CTSH#1–A	–0.003	
1–B	–0.002	
1–C	0.000	
1–D	0.000	
CTSH#2–A	–0.090	
2–B	–0.035	
2–C	–0.005	
2–D	–0.006	
CTSH#3–A	–0.006	
3–C	–0.013	
3–D	–0.037	

PROPERTY OWNER SIGNATURE APPROVING LAYOUT: _____ DATE: _____

IN CHARGE OF MAD
DESIGNED BY EMA CHECKED BY MJD
DRAWN BY DJF

1/4"=1'–0" 2 0 2 4 6 8 10

NO.	DATE	REVISION	INIT.

O'BRIEN & GERE

DUPONT PLW SITE
POMPTON LAKES, NEW JERSEY

(Property Address)
EXAMPLE SUB–SLAB DEPRESSURIZATION SYSTEM DESIGN

FILE NO. 3686.41104.001
DATE JUNE 2008

7

I:\Projects\11576 DuPont\41104 Vapor Investigation\DWG\Figure 7.dwg Jun 10, 2008 - 1:27pm

Jun 13, 2008 - 10:57am

MITIGATION SECTORS

LEGEND

- PROPERTY BOUNDARY
- 1 ug/L GROUNDWATER CONTOUR BOUNDARY (COMBINED PCE/TCE)
- MITIGATION SECTOR "A"
- FUTURE SECTORS
- EXPANDED INVESTIGATION AREA
- TEMPORARY WELL LOCATION (WELL ID)
- MONITORING WELL (WELL ID)

1"=200' 200 0 200 400

CORPORATE REMEDIATION GROUP
An Alliance between DuPont and URS Diamond

2000 Cannonball Road
Pompton Lakes, New Jersey 07442

Figure 8

SCALE	DESIGNED BY	DRAWN BY	CAD DRAWING NO
1-In=200-ft	-	-	Fig8_rev3_w aerial.dwg
DATE	CHECKED	APPROVED	PROJECT NO
5/20/08	-	-	7026

DUPONT POMPTON LAKES WORKS
Pompton Lakes, New Jersey

I:\Projects\11576 DuPont\41104 Vapor Investigation\DWG\Figure 8_rev1.dwg

APPENDICES

Appendix A

Initial Design Visit Checklist

O'BRIEN & GERE

Initial Design Visit Checklist

Structure Address: _____ **Date of Design Visit:** _____

Structure ID #: _____

Design Team: _____

Diagnostic Communication Test Results

Test Point Location	Sub-slab Pressure - Vacuum Off ("Hg.)	Sub-slab Pressure - Vacuum On ("Hg.)	Sub-slab Pressure Differential ("Hg.)

Initial Backdraft Test Checklist

Was an initial backdraft test performed? ☐ Yes ☐ No

On what combustion appliances was a backdraft test performed? ☐ Hot Water Heater ☐ Furnace / Boiler ☐ Dryer

Other: _____

Is there is an existing backdraft on any appliance? ☐ Yes ☐ No
(If yes, explain)

_____

Were winter conditions simulated during tests? ☐ Yes ☐ No
(Doors/windows closed, heating appliances running)

Was there precipitation during the previous 24 hours? ☐ Yes ☐ No

What is the apparent wind speed? ☐ Calm ☐ Light ☐ Strong

Documentation Checklist

Were digital photographs taken of existing conditions? ☐ Yes ☐ No

Is there visual pre-existing structure damage? ☐ Yes ☐ No

Was the site cleaned-up and left as found? ☐ Yes ☐ No

Comments:

_____

_____

_____

_____

O'BRIEN & GERE

Subcontractor Checklist

Structure Address: _____ **Date of Design Visit:** _____

Structure ID #: _____

Design Team: _____

Check Yes or No if the following are potential asbestos containing materials were observed during the design visit and may be disturbed during design or installation.

	Yes	No
Floor tiles	☐	☐
Ceiling tiles	☐	☐
Carpet mastic	☐	☐
Transite siding	☐	☐
Pipe and duct insulation in basement	☐	☐
Insulation on interior walls	☐	☐
Vapor barrier under siding	☐	☐
Roofing materials	☐	☐
Plaster ceiling	☐	☐
Plaster/"stucco walls"	☐	☐
Sheetrock	☐	☐
Sheetrock spackle	☐	☐

Other sources of potential ACM:

_____

_____

Is there evidence of possible mold? Where? ☐ Yes ☐ No

_____

_____

Will the installation require a licensed asbestos abatement contractor? ☐ Yes ☐ No

Will the installation require a licensed electrical contractor? ☐ Yes ☐ No

Is roofing required? ☐ Yes ☐ No

Is new concrete required? ☐ Yes ☐ No

Quantities of potential ACM to be removed for installation:

_____

_____

_____

Results of asbestos/mold analysis and comments:

_____

_____

Appendix B

Installation and Operation Commissioning Checklist

O'BRIEN & GERE

Installation and Operation Commissioning Checklist

Structure Address: _____ **Date of Commissioning Visit:** _____

Structure ID #: _____

Commissioning Team: _____

System Performance Data

Fan Inlet Static Pressure (vacuum)

Fan System	1	2	3	4	5
Fan Model					
U-Tube Reading ("w.g)					

Is each fan mounted securely? ☐ Yes ☐ No

SSP Static Pressure (vacuum)

SSP#	Static Pressure ("w.g.)	Fan System

Final Communication Test Results

Communication test point						
Manometer reading ("w.g.)						
Distance to closest SSP (ft.)						

Communication test point						
Manometer reading ("w.g.)						
Distance to closest SSP (ft.)						

Were all fans in operation during final communication test? ☐ Yes ☐ No

Were all valves locked prior to final communication test? ☐ Yes ☐ No ☐ NA

Was the pressure reading at each test point • -0.004"wc? ☐ Yes ☐ No

Were winter conditions simulated during test? ☐ Yes ☐ No

Was there precipitation during the previous 24 hours? ☐ Yes ☐ No

What was the apparent wind speed? ☐ Calm ☐ Light ☐ Strong

Accessible Crawlspace Performance Inspection

Was each membrane joint and perimeter smoke tested and found to be sealed? ☐ Yes ☐ No ☐ NA

Inaccessible Crawlspace Data ☐ NA

	Crawlspace 1	Crawlspace 2	Crawlspace 3	Crawlspace 4
SSP#				
Crawlspace volume (ft^3)				
Suction pipe diameter (in.)				
Measured velocity (fpm)				
Flow rate out of crawlspace (cfm)				
Number of air exchanges				
Meets criteria (Yes/No)				

Backdraft Test Results

Was commissioning backdraft test performed? ☐ Yes ☐ No

On what combustion appliances was a backdraft test performed? ☐ Hot Water Heater ☐ Furnace / Boiler ☐ Dryer

Other: _____

Is there is a backdraft on any appliance? ☐ Yes ☐ No

(If yes, explain)*

_____

_____

*If backdraft exists, please notify the property owner.

Owner was notified on: (date) _____

Electrical System Installation Inspection

Are all electrical connections secure? ☐ Yes ☐ No

Are all switches locked on? ☐ Yes ☐ No

Electric meter # _____

Pipe System Performance

Are all pipe runs properly supported? ☐ Yes ☐ No

Were 10% of all pipe joints smoke tested?	☐ Yes	☐ No	
Are manometers installed at each suction point?	☐ Yes	☐ No	
Are audible alarms installed and working at each suction point?	☐ Yes	☐ No	

Slab/Wall Repair Performance

Was each identified slab/wall crack repair smoke tested?	☐ Yes	☐ No	☐ NA

Labeling Inspection

Are the appropriate labels applied in the proper locations?	☐ Yes	☐ No

System Design

Are all vent pipe exhausts installed:	☐ Yes	☐ No
Above the eave of the roof?	☐ Yes	☐ No
At least 10 ft above ground level?	☐ Yes	☐ No
At least 10 ft away from any adjoining or adjacent buildings, or structure opening or HVAC intake?	☐ Yes	☐ No

Documentation

Were digital photographs taken of post-installation conditions?	☐ Yes	☐ No

Comments:

Appendix C

Mitigation System Instructions to Property Owners


1


2


3


4

Protective Vapor Mitigation System

DuPont Pompton Lakes Works

Building Modification

The system installed at your property is specifically designed in consideration of the building conditions and the heating, ventilating, and air conditioning (HVAC) systems present in the building at the time the design was developed. If you plan to make modifications to the buildings or the HVAC system, please call the contact number (back page) so a representative can evaluate whether the modifications you plan will affect the performance of the protective vapor mitigation system (System). Some of the types of modifications you may wish to contact us about would include the replacement of (or major modification to) the heating or cooling system, any building additions, or the installation of a whole house fan. This, of course, is not an exhaustive list and you should feel free to contact us on any modifications you make to your property that may affect the System.

System Components

The System installed in your building is designed to operate 24 hours a day, 7 days a week, all year round. The following typical system components control operations or confirm that operations are normal:

1. *Fan* — Fan(s) model installed is one of the following Fantech manufacturer's models: HP220, GP501, HS 2000, or HS 5000. [Installer, please circle the model installed]
2. *Switch* — This is a simple On / Off switch that is installed close to the fan and is "locked" in the On position with a plastic tie-wrap.
3. *Valves* — For Systems with two or more suction points, balancing valves are installed on each suction point pipe and pinned into specific positions to balance airflow and pressures beneath your structure. These valves should not be adjusted by the homeowner.
4. *Manometer* — This is a plastic U-shaped tube, containing a red dyed oil. It is mounted in a visible location on the pipe at each system suction point. The red oil is an indicator of operational status.
   a. If the oil in the manometer has unequal or different readings, such as 2" and –1", the system is operating.
   b. If the oil in the manometer is level on both sides of the U, the system is not operating, and you contact us immediately.

DUPONT®

Self - Inspections

1. We ask that you conduct regular inspections of the system to identify damage to the fan or pipe components, and to check the oil level in the manometer. If you find damage to any system component or if the oil level is level on both sides of the U-shaped tube, call the contact number below so a representative can come and inspect the system. This contact number is also shown on the label affixed to the piping.
2. Some buildings have one or more floor drain seals installed (trade name: Dranjer). If your floor drain seal appears to be clogged, it is likely due to debris on your floor that tried to drain through the drain seal. You can unclog it yourself. To do so, simply unscrew the unit, remove it from the mounting flange and clean it by rinsing out dust, dirt, or debris. The components should slide easily after cleaning. Reinstall the drain and re-secure the screws. If there is known damage or the drain does not have screws, call the contact number below or on the affixed labels.

Support Services

1. *Routine Maintenance* — During the first 12 months of operation, DuPont will schedule a routine maintenance visit every three months. During this visit, System performance and components will be inspected, and any issues will be corrected. Routine maintenance visits will usually take less than one hour, unless issues need to be corrected.
2. *On-Going Communication* — DuPont will maintain contact with you through an annual letter that will remind you how to routinely check for proper operation of the System and any updates on the routine maintenance schedule.

Electrical Reimbursement

Near the beginning of July of each year, DuPont will send a reimbursement check to cover the electrical expenses associated with the system for the upcoming year. Reimbursement amount will be based on the fan's maximum rated electrical draw and on the highest residential supply cost ($/kilowatt-hour) posted by New Jersey Central Power & Light's on June 1 of each year.

Contact

For maintenance service and general information,
please contact **DuPont** at**:**
(973) 492-7733.

Appendix D

Mitigation System Maintenance Field Forms

O'BRIEN & GERE

System Inspection Field Form

STRUCTURE REVIEW

Routine or Non-Routine (circle one)

Address: _____ **Tracking Number:** _____

Have the following items changed since the last visit?

	Yes	No
Building Foot Print		
Basement/Slab Occupancy		
Heating / Ventilating Systems		
Basement Finish		
Crawlspaces		
Drains, Sumps, Floor Cracks		
Wall Penetrations, Cracks		
Appliances (in basement)		
Ownership		
Siding		
Owner		

If Yes, write new owner name contact information below

Date of Ownership Change _____

Owner Name _____

Telephone No. _____

If any of these items have changed, a redesign may be required. Contact the maintenance supervisor for field review.

Comments

_____

_____

_____

_____

_____

Performed by: _____ **Date:** _____

O'BRIEN & GERE

System Inspection Field Form

FAN AND ELECTRICAL

Routine or Non-Routine (circle one)

Address: _____ **Tracking Number:** _____

Electric Meter Number

Prior visit: _____

Current visit: _____

Equipment Documentation

As Found		Fan Inlet (in H2O)	
Fan Model	**SSP#**	**Prior**	**Current**

As Left		Fan Inlet (in H2O)	
Fan Model	**SSP#**	**Prior**	**Current**

Fan System Recommissioning	**As Found**	**As Left**
Remove each fan cover?		
Each fan mounted securely?		
Coupling connections secure?		
Each fan runs when switch is in the ON position?		
Each fan shuts down when the switch is in the OFF position?		
Is excessive noise heard when fan is running?		
Each fan induces suction when running?		
Switch is locked in the ON position?		

Electrical Check

Romex connections secure?		
Each junction box closed?		
Conduit properly supported?		
Each fan starts when switch is ON position?		
Are appliances affected by fan operation?		
Each fan stops when switch is in OFF position?		

Labeling Inspection

Labels applied?		
Correct labels applied in proper location?		

Comments

Performed By: _____ **Date:** _____

O'BRIEN & GERE

System Inspection Field Form

PIPING, SLAB AND WALL

Routine or Non-Routine (circle one)

Address: _____ **Tracking Number:** _____

Piping Check	As Found	As Left
Glue is evident?		
System suction points are sealed?		
Each component is installed?		
Piping system is properly supported?		
Valves and manometers installed at proper locations?		
Excessive noise is heard in piping joints?		
Smoke test piping modifications and 10% of old joints?		
Did smoke enter joints?		
If Yes: Was joint sealed?		
Did smoke enter sealed joint?		
Slab Check		
Smoke each identified slab crack, repair, or modification?		
Did smoke enter?		
If Yes: Was area sealed with approved sealant?		
Did smoke enter sealed area?		
Checked/cleaned Dranjer(s)?		
Smoke Dranjer(s)?		
Wall Check		
Smoke each visible wall crack?		
Movement is observed at wall cracks?		
If yes: Crack was sealed with approved sealant?		
Smoke enters sealed crack?		
Smoke open course of top wall?		
Smoke enters top course?		
If yes: Open block sealed with approved sealant?		
Smoke enters open block tops?		

Comments

_____

_____

_____

_____

_____

Performed by: _____ **Date:** _____

O'BRIEN & GERE

System Inspection Field Form

CRAWLSPACE DATA

Routine or Non-Routine (circle one)

Address: _____ **Tracking Number:** _____

Inaccessible Crawlspace

As Found*	Crawlspace 1	Crawlspace 2	Crawlspace 3	Crawlspace 4
SSP#				
Crawlspace Volume	cf.	cf.	cf.	cf.
Suction Pipe Diameter	in.	in.	in.	in.
Measured Velocity	fpm	fpm	fpm	fpm
Flowrate	cfm	cfm	cfm	cfm
Number of Air Exchanges	hr^{-1}	hr^{-1}	hr^{-1}	hr^{-1}
Meets Criteria (Y/N)				

Velocity measured with Airflow Model TA45 hotwire anemometer

As Left*	Crawlspace 1	Crawlspace 2	Crawlspace 3	Crawlspace 4
SSP#				
Crawlspace Volume	cf.	cf.	cf.	cf.
Suction Pipe Diameter	in.	in.	in.	in.
Measured Velocity	fpm	fpm	fpm	fpm
Flowrate	cfm	cfm	cfm	cfm
Number of Air Exchanges	hr^{-1}	hr^{-1}	hr^{-1}	hr^{-1}
Meets Criteria (Y/N)				

Velocity measured with Airflow Model TA45 hotwire anemometer

Accessible Crawlspace

As Found*	Crawlspace 1	Crawlspace 2	Crawlspace 3	Crawlspace 4
SSP#				
Smoke test each membrane				
Smoke entered seam				
Manometer reading >0.1"				

As Left*	Crawlspace 1	Crawlspace 2	Crawlspace 3	Crawlspace 4
SSP#				
Smoke test each membrane				
Smoke entered seam				
Manometer reading >0.1"				

Comments

* As-Found conditions = before corrective action.
* As-Left conditions = after corrective action.

Baseboard Heater Preventive Maintenance (if present)

	Yes	No
Inspected and cleaned heater unit		
Verified thermostat set points		
Tested low temp alarm		

Performed by: _____ **Date:** _____

O'BRIEN & GERE

Re-Commissioning Field Form

TEST DATA AND BACKDRAFT

Routine or Non-Routine (circle one)

Address: _____ **Tracking Number:** _____

Manometer Reading at Fan Inlet

Prior visit: _____

As found: _____

As left: _____

Manometer Reading at SSPs

SSP#	1	2	3	4	5	6	7	8
Manometer Reading (Prior)								
Manometer Reading (As Found)								
Manometer Reading (As Left)								

Valves and Manometers are installed in proper location? _____

Communication Test

As Found*	Point 1	Point 2	Point 3	Point 4	Point 5	Point 6	Point 7	Point 8
Test point Identifier								
Micromanometer Reading								
Distance to Closest SSP (ft)								
Smoke Test								

As Left*	Point 1	Point 2	Point 3	Point 4	Point 5	Point 6	Point 7	Point 8
Test point Identifier								
Micromanometer Reading								
Distance to Closest SSP (ft)								
Smoke Test								

	As Found	**As Left**
All fans in operation?	_____	_____
Winter conditions simulated?	_____	_____
Each test point tested?	_____	_____
Each test point sealed after testing?	_____	_____
Vacuum >-0.004 observed at each test point?	_____	_____
Smoke entered each test point?	_____	_____
All valves set prior to re-commissioning comm. test?	_____	_____

Backdraft Test

		As Found	As Left
Windows closed?			
Venting appliances on?			
Doors closed?			
Combustion sources on?			
Backdraft			
	Hot water heater		
	Furnace/Boiler		
	Fireplace		
	Dryer		

Owner notified of existing backdraft condition? _____

Was a previous backdraft condition present during any previous visit? _____

Redline Drawing

	As Left
Piping redlines complete?	
Each switch and electrical tie in are identified?	
Cracks/penetrations are identified?	
As-built notes are complete?	
New ventilation devices identified?	

Comments

_____

_____

_____

_____

_____

_____

* As-Found conditions = before corrective action.
* As-Left conditions = after corrective action.

Performed by: _____ **Date:** _____

Appendix E

Electrical Reimbursement Summary

Electrical Reimbursement Summary for Installed Sub-Slab Depressurization Systems

Pompton Lakes, New Jersey

Overview

DuPont commits to reimburse property owners (or tenants if they are the rate payers) for the electrical cost of operating the installed sub-slab depressurization system. DuPont will issue one reimbursement check each year to property owners/tenants with installed systems. The check will be issued within two months after system startup and annually thereafter on or about July 1 of each operating year to cover the electrical cost of the period from June 1 (one month prior to the check date) to May 31 (11 months after the check date). This time period was selected because electrical rates are updated by Jersey Central Power &Light (JCP&L) in June of each year. The following describes how the reimbursement amount is calculated.

Calculation of Reimbursement Amount

The reimbursement amount will be calculated using the maximum power rating (kilowatts (KW)) of the fan(s) installed and the highest residential supply price of electricity (dollars per kilowatt-hour ($/KWH))[1].

The equation for estimating your reimbursement amount is as follows:

Reimbursement ($) = *Fan Maximum Power Rating (KW) x*
Highest Residential Supply Price of Electricity ($/KWH) x
Fan Operating Hours (8,760 hours for full non-leap year or 8,784 hours for full leap year)

Example Scenario 1:

(1) The maximum rated power of the fan installed for your system is rated at 150 watts (or 0.15 KW).
(2) The highest residential supply price of electricity is $0.168482/KWH as of June 1, 2008.

Therefore,

Reimbursement ($) = *0.15 KW x $0.168482/KWH x 8,760 hours*

= *$221.38* *[to cover electrical costs from June 1, 2008 to May 31, 2009]*

Under this example scenario, you would receive a check, on or about July 1, 2008, from DuPont in the amount of $221.38. This is a hypothetical example and does not reflect the actual amount of electrical reimbursement that you will receive.

[1] This is the cost that JCP&L charges to supply electricity to residents in the Borough of Pompton Lakes. For the current price of electricity, please refer to the following link: https://www.firstenergycorp.com/Residential_and_Business/Customer_Choice/New_Jersey/Price_To_Compare.html

Electrical Reimbursement Summary for Installed Sub-Slab Depressurization Systems
Pompton Lakes, New Jersey

Electricity Price Increase
In the event that the price of electricity increases during the operating year after the reimbursement check has been issued, DuPont will reimburse the increased cost of electricity in the following operating year.

The equation for estimating the increased cost of electricity to be reimbursed is as follows:

Increased Cost ($) = *Fan Maximum Power Rating (KW) x [New Supply Price of Electricity - Previous Supply Price of Electricity] ($/KWH) x Fan Operating Hours Since Price Increase*

Example Scenario 2:
For the same 150-watt fan, the price of electricity as-supplied increased by 15% to $0.193754/KWH on April 1, 2009.

Therefore, in the next year's check due on July 1, 2009 to cover the following operating year (June 1, 2009 through May 31, 2010), DuPont will reimburse the increased cost as follows:

Increased Cost ($) = *0.15 KW x ($0.193754/KWH - $0.168482/KWH) x 1,464 hours*

= *$5.55* *[to cover increased electricity price from April 1, 2009 to May 31, 2009]*

Annual Reimbursement ($) = *0.15 KW x $0.193754/KWH x 8,760 hours*

= *$254.59* *[to cover electrical costs from June 1, 2009 to May 31, 2010]*

Under this scenario, you would receive a check, on or about July 1, 2009, from DuPont in the amount of $260.14 ($5.55 + $254.59). This is a hypothetical example and does not reflect the actual amount of electrical reimbursement that you will receive.

Appendix F

Sub-Slab Vapor Sample Collection Procedures

APPENDIX F

SUB-SLAB VAPOR SAMPLE COLLECTION PROCEDURES

This set of procedures outlines the general steps to collect sub-slab vapor samples. The site-specific Sampling and Analysis Work Plan should be consulted for proposed sample locations, sample depths, and sampling duration.

Sub-Slab Vapor Probe Installation

Temporary sampling probes will be installed using the following procedures:

- Sampling personnel must avoid activities immediately before and during the sampling that may contaminate the sample (e.g., using markers, fueling vehicles, etc.).

- If appropriate, record weather information (temperature, barometric pressure, rainfall, wind speed, and wind direction) at the beginning of the sampling event. Record substantial changes to these conditions that may have occurred over the past 24 to 48 hours and that do occur during the course of sampling. The information may be measured with on-site equipment or obtained from a reliable source of local measurements (e.g., a local airport).

- Identify sampling location(s) on a floor plan that also identifies any slab breeches (e.g., utility penetrations, sumps, drains, and cracks) and locations of HVAC equipment.

- Insert a section of food-grade (inert) Teflon® or other appropriate tubing through a 3/8-inch (approx.) hole drilled through the slab. If necessary, advance the drill bit 2 to 3 inches into the sub-slab material to create an open cavity. Use the bit to measure the slab thickness.

- Install the tubing inlet to the specified sampling depth at or near the bottom of the slab.

- Seal the annular space between the hole and tubing using 100% beeswax or another inert, non-shrinking sealing compound such as permagum®.

Sub-Slab Vapor Sample Collection

Sub-slab vapor samples will be collected by following the steps outlined below.

- Purge the tubing using a vacuum pump or gas-tight syringe (~60 cc). Calculate the volume of air (volume = $\pi r^2 h$) in the tubing and purge three tubing volumes prior to sample collection at a rate no greater than 0.2 liter per minute (lpm).

- Use an evacuated Summa® passivated (or equivalent) canister to collect the sub-slab vapor sample. The canister will be provided by the laboratory, along with a flow controller equipped with an in-line particulate filter and a vacuum gauge. The flow controller will be pre-calibrated by the laboratory for the desired flow rate or duration of sample collection, as defined in the site-specific work plan. The sampling flow rate should always be less than 0.2 lpm. The canisters will be batch certified as clean by the laboratory.

- Remove the protective brass plug from canister. Connect the pre-calibrated flow controller to the canister.

- Record the identification numbers for the canister and flow controller. Record the initial canister pressure on the vacuum gauge (check equipment-specific instructions for taking this measurement). A canister with a significantly different pressure than originally recorded by the testing laboratory should not be used for sampling. Record these numbers and values on the chain-of-custody form for each sample.

- Connect the tubing from the sub-slab vapor sampling probe to the flow controller.

- Completely open the valve on the canister. Record the time that the valve is opened (beginning of sampling) and the canister pressure on the vacuum gauge.

- Photograph the canister and the area surrounding the canister.

- Monitor the vacuum pressure in the canister routinely during sampling, when practical (sometimes the canister will sample over a 24-hour period and routine monitoring is not practical).

- Complete the building survey and chemical inventory form.

- Stop sample collection after the scheduled duration of sample collected, but when the canister still has a minimum amount of vacuum remaining. Check with the laboratory supplying the canister and flow controller for the ideal final vacuum pressure. Typically, the minimum vacuum is between 2 and 5 inches of mercury, but not zero. If there is no vacuum remaining, the sample will be rejected and collected again in a new canister. Note that it is not critical that sub-slab soil gas sampling be terminated with some residual vacuum in the canisters provided that the sampler is periodically monitoring the pressure on the vacuum gauge during sample collection. Under these circumstances, the canister would not be automatically rejected. If the sample is longer than 4 hours (collected concurrent with indoor and ambient air samples), monitoring is unlikely and a residual vacuum is required.

- Record the final vacuum pressure and close the canister valve. Record the date and time that sample collection was stopped.

- Remove the flow controller from the canister and replace the protective brass plug.

- Attach labels/tags (sample name, time/date of sampling, etc.) to the canister as directed by the laboratory.

- Place the canister and other laboratory-supplied equipment in the packaging provided by the laboratory.

- Enter the information required for each sample on the chain-of-custody form, making sure to include the identification numbers for the canister and flow controller, and the initial and final canister pressures on the vacuum gauge.

- Include the required copies of the chain-of-custody form in the shipping packaging, as directed by the laboratory. The field crew will retain a copy of the chain-of-custody for the project file.

- Deliver or ship the samples to the laboratory within one business day of sample collection and via overnight delivery (when shipping).

- For temporary probes, remove the probe and seal the slab hole with cement. Repair flooring, if any.

Appendix G

Building Survey Form

BUILDING SURVEY FORM

Preparer's name: _____ Date: _____

Preparer's affiliation: _____ Phone #: _____

Site Name: _____ Case #: _____

Part I - Occupants

Building Address: _____

Property Contact: _____ Owner / Renter / other: _____

Contact's Phone: home ( )_____ work ( )_____ cell ( )_____

# of Building occupants: Children under age 13 _____ Children age 13-18 _____ Adults _____

Part II – Building Characteristics

Building type: residential / multi-family residential / office / strip mall / commercial / industrial

Describe building: _____ Year constructed: _____

Sensitive population: day care / nursing home / hospital / school / other (specify): _____

Number of floors below grade: _____ (full basement / crawl space / slab on grade)

Number of floors at or above grade: _____

Depth of basement below grade surface: _____ ft. Basement size: _____ ft^2

Basement floor construction: concrete / dirt / floating / stone / other (specify): _____

Condition of floor (cracks, water stains, etc.): _____

Foundation walls: poured concrete / cinder blocks / stone / other (specify) _____

Basement sump present? *Yes / No* Sump pump? *Yes / No* Water in sump? *Yes / No*

Type of heating system (circle all that apply):

hot air circulation	hot air radiation	wood	steam radiation
heat pump	hot water radiation	kerosene heater	electric baseboard

other (specify): _____

Type of ventilation system (circle all that apply):

central air conditioning	mechanical fans	bathroom ventilation fans
individual air conditioning units	kitchen range hood fan	outside air intake

other (specify): _____

Type of fuel utilized (circle all that apply):

Natural gas / electric / fuel oil / wood / coal / solar / kerosene

Are the basement walls or floor sealed with waterproof paint or epoxy coatings? *Yes / No*

Is there a whole house fan? *Yes / No*

Septic system? *Yes / Yes (but not used) / No*

Irrigation/private well? *Yes / Yes (but not used) / No*

BUILDING SURVEY FORM

Preparer's name: _____ Date: _____

Preparer's affiliation: _____ Phone #: _____

Site Name: _____ Case #: _____

Type of ground cover outside of building: grass / concrete / asphalt / other (specify) _____

Existing subsurface depressurization (radon) system in place? *Yes / No active / passive*

Sub-slab vapor/moisture barrier in place? *Yes / No*

Type of barrier: _____

Part III - Outside Contaminant Sources

NJDEP contaminated site (1000-ft. radius): _____

Other stationary sources nearby (gas stations, emission stacks, etc.): _____

Heavy vehicular traffic nearby (or other mobile sources): _____

Part IV – Indoor Contaminant Sources

Identify all potential indoor sources found in the building (including attached garages), the location of the source (floor and room), and whether the item was removed from the building 48 hours prior to indoor air sampling event. Any ventilation implemented after removal of the items should be completed at least 24 hours prior to the commencement of the indoor air sampling event.

Potential Sources	**Location(s)**
Gasoline storage cans	
Gas-powered equipment	
Kerosene storage cans	
Paints / thinners / strippers	
Cleaning solvents	
Oven cleaners	
Carpet / upholstery cleaners	
Other house cleaning products	
Moth balls	
Polishes / waxes	
Insecticides	
Furniture / floor polish	
Nail polish / polish remover	
Hairspray	
Cologne / perfume	
Air fresheners	
Fuel tank (inside building)	
Wood stove or fireplace	
New furniture / upholstery	
New carpeting / flooring	
Hobbies - glues, paints, etc.	

BUILDING SURVEY FORM

Preparer's name: _____ Date: _____

Preparer's affiliation: _____ Phone #: _____

Site Name: _____ Case #: _____

Part V – Miscellaneous Items

Do any occupants of the building smoke? *Yes / No* How often? _____

Last time someone smoked in the building? _____ hours */ days ago*

Does the building have an attached garage directly connected to living space? *Yes / No*

If so, is a car usually parked in the garage? *Yes / No*

Are gas-powered equipment or cans of gasoline/fuels stored in the garage? *Yes / No*

Do the occupants of the building have their clothes dry cleaned? *Yes / No*

If yes, how often? weekly / monthly / 3-4 times a year

Do any of the occupants use solvents in work? *Yes / No*

If yes, what types of solvents are used? _____

If yes, are their clothes washed at work? *Yes / No*

Have any pesticides/herbicides been applied around the building or in the yard? *Yes* / No

If so, when and which chemicals? _____

Has there ever been a fire in the building? *Yes / No* If yes, when? _____

Has painting or staining been done in the building in the last 6 months? *Yes / No*

If yes, when _____ and where? _____

Comments:

_____

_____

_____

_____

_____

_____

_____

Appendix H

Sampling Form

SAMPLING FORM

Preparer's name: _____ Date: _____

Preparer's affiliation: _____ Phone #: _____

Site Name: _____ Case #: _____

Part I - Occupants

Building Address: _____

Property Contact: _____ Owner / Renter / other: _____

Contact's Phone: home _____ work _____ cell _____

# of Building occupants: Children under age 13 _____ Children age 13-18 _____ Adults _____

(See Building Survey Form for Parts I1 through V.)

Part VI – Sampling Information

Sample Technician: _____ Phone number: _____

Sample Source: Indoor Air / Sub-Slab / Near Slab Soil Gas / Exterior Soil Gas

Sampler Type: Tedlar bag / Sorbent / Stainless Steel Canister / Other (specify): _____

Analytical Method: TO-15 / TO-17 / other: _____ Cert. Laboratory: _____

Sample locations (floor, room):

Field ID # _____ - _____ Field ID # _____ - _____

Field ID # _____ - _____ Field ID # _____ - _____

Provide Drawing of Sample Location(s) in Building

SAMPLING FORM

Preparer's name: _____ Date: _____

Preparer's affiliation: _____ Phone #: _____

Site Name: _____ Case #: _____

Part VII - Meteorological Conditions

Was there significant precipitation within 12 hours prior to (or during) the sampling event? *Yes / No*

Describe the general weather conditions: _____

_____

_____

_____

Part VIII – General Observations

Provide any information that may be pertinent to the sampling event and may assist in the data interpretation process. : _____

_____

_____

_____

Appendix I

Indoor Air Sample Collection Procedures

APPENDIX I
INDOOR AIR SAMPLE COLLECTION PROCEDURES

This set of procedures outlines the general steps to collect indoor air samples. The site-specific Sampling and Analysis Work Plan should be consulted for proposed sampling locations and other indoor air requirements (inventory, etc.).

Indoor air samples will be collected by following the steps outlined below:

- Sampling personnel must avoid activities immediately before and during the sampling that may contaminate the sample (e.g., using markers, fueling vehicles, etc.).

- Record weather information (temperature, barometric pressure, relative humidity, wind speed, and wind direction) and indoor temperature and humidity at the beginning of the sampling event. Record substantial changes to these conditions that may have occurred over the past 24 to 48 hours and that do occur during the course of sampling. The information may be measured with on-site equipment or obtained from a reliable source of local measurements (e.g., a local airport).

- Identify sampling location(s) on a floor plan that also identifies locations of HVAC equipment, chemical storage areas, garages, doorways, stairways, sumps, drains, utility perforations, north direction, and separate footing sections

- Use an evacuated Summa® passivated (or equivalent) stainless-steel canister to collect the outdoor air sample. The canister will be provided by the laboratory, along with a flow controller equipped with an in-line particulate filter and a vacuum gauge. The flow controller will be pre-calibrated by the laboratory for the desired flow rate or duration of sample collection, as defined in the site-specific work plan. The sampling flow rate should always be less than 0.2 lpm. The canisters will be individually certified as clean by the laboratory.

- Place the canister at the sampling location. The sample should be collected from breathing height (e.g., 3 to 5 feet above ground). Either mount the canister on a stable platform or attach

a length of inert tubing to the flow controller inlet and support it such that the sample inlet will be at the proper height.

- Remove the protective brass plug from canister. Connect the pre-calibrated flow controller to the canister.

- Record the identification numbers for the canister and flow controller. Record the initial canister pressure on the vacuum gauge (check equipment-specific instructions for taking this measurement). A canister with a significantly different pressure than originally recorded by the testing laboratory should not be used for sampling. Record these numbers and values on the chain-of custody form for each sample.

- Completely open the valve on the vacuum pressure in the canister. Record the time that the valve was opened (beginning of sampling) and the canister pressure on the vacuum gauge.

- Photograph the canister and the area surrounding the canister.

- Monitor the vacuum pressure in the canister routinely during sampling, when practical (sometimes the canister will sample over a 24-hour period and routine monitoring is not practical). During monitoring, note the vacuum pressure on the gauge.

- Complete the building survey and chemical inventory form.

- Stop sample collection after the scheduled duration of sample collection, but make sure that the canister still has a minimum amount of vacuum remaining. Check with the laboratory supplying the canister and flow controller for the ideal final vacuum pressure. Typically, the minimum vacuum is between 2 and 5 inches of mercury, but not zero. If there is no vacuum remaining, the sample will be rejected and collected again in a new canister.

- Record the final vacuum pressure and close the canister valves. Record the date and time that sample collection was stopped.

- Remove the flow controller from the canister and replace the protective brass plug.

- Attach labels/tags (sample name, time/date of sampling, etc.) to the canister as directed by the laboratory.

- Place the canister and other laboratory-supplied equipment in the packaging provided by the laboratory.

- Enter the information required for each sample on the chain-of-custody form, making sure to include the identification numbers for the canister and flow controller, and the initial and final canister pressures on the vacuum gauge.

- Include the required copies of the chain-of-custody form in the shipping packaging, as directed by the laboratory. The field crew will retain a copy of the chain-of-custody for the project file.

- Deliver or ship the samples to the laboratory within one business day of sample collection and via overnight delivery (when shipping).

Appendix J

Ambient Air Sample Collection Procedures

APPENDIX J
AMBIENT AIR SAMPLE COLLECTION PROCEDURES

This set of procedures outlines the general steps to collect ambient air samples. The site-specific Sampling and Analysis Work Plan should be consulted for proposed sample locations and sampling duration.

The following procedures will be followed for the collection of ambient air samples:

- Sampling personnel must avoid activities immediately before and during the sampling that may contaminate the sample (e.g., using markers, fueling vehicles, etc.).

- Select a location upwind of the building or other area that is being evaluated. If possible, select a location upwind or near the HVAC air intake for the building being sampled.

- Record weather information (i.e., temperature, barometric pressure, relative humidity, wind speed, and wind direction) at the beginning of the sampling event. Record substantial changes to these conditions that may occur during the course of sampling. The information may be measured with on-site equipment or obtained from a reliable source of local measurements (e.g., a local airport).

- Use an evacuated Summa® passivated (or equivalent) stainless-steel canister to collect the ambient air sample. The canister will be provided by the laboratory, along with a flow controller equipped with an in-line particulate filter and a vacuum gauge. The flow controller will be pre-calibrated by the laboratory for the desired flow rate or duration of sample collection, as defined in the site-specific work plan. The sampling flow rate should always be less than 0.2 lpm. The canisters will be individually certified as clean by the laboratory.

- Place the canister at the sampling location. If the sample should be collected from breathing height (e.g., 3 to 5 feet above ground), then mount the canister on a stable platform such that the sample inlet will be at the proper height.

- Remove the protective brass plug from canister. Connect the pre-calibrated flow controller to the canister.

- Record the identification numbers for the canister and flow controller. Record the initial canister pressure on the vacuum gauge (check equipment-specific instructions for taking this measurement). A canister with a significantly different pressure than originally recorded by the testing laboratory should not be used for sampling. Record these numbers and values on the chain-of custody form for each sample.

- Completely open the valve on the vacuum pressure in the canister. Record the time that the valve was opened (beginning of sampling) and the canister pressure on the vacuum gauge.

- Photograph the canister and the area surrounding the canister.

- Document on a field form an outdoor plot sketch that indicates the building being sampled, streets, sampling location, location of potential outdoor air sources, north direction and paved areas. Also record pertinent observations such as odors, readings from field instrumentation, and significant activities in the vicinity that result in air emissions.

- Monitor the vacuum pressure in the canister routinely during sampling, when practical (sometimes the canister will sample over a 24-hour period and routine monitoring is not practical). During monitoring, note the vacuum pressure on the gauge.

- Stop sample collection after the scheduled duration of sample collection but make sure that the canister still has a minimum amount of vacuum remaining. Check with the laboratory supplying the canister and flow controller for the ideal final vacuum pressure. Typically, the minimum vacuum is between 2 and 5 inches of mercury, but not zero. If there is no vacuum remaining, the sample will be rejected and collected again in a new canister.

- Record the final vacuum pressure and close the canister valves. Record the date and time that sample collection was stopped.

- Remove the flow controller from the canister and replace the protective brass plug.

- Attach labels/tags (sample name, time/date of sampling, etc.) to the canister as directed by the laboratory.

- Place the canister and other laboratory-supplied equipment in the packaging provided by the laboratory.

- Enter the information required for each sample on the chain-of-custody form, making sure to include the identification numbers for the canister and flow controller, and the initial and final canister pressures on the vacuum gauge.

- Include the required copies of the chain-of-custody form in the shipping packaging, as directed by the laboratory. The field crew will retain a copy of the chain-of-custody for the project file.

- Deliver or ship the samples to the laboratory within one business day of sample collection and via overnight delivery (when shipping).