Vapor Intrusion Assessment Work Plan

(Three) Senior Housing Unit Parcels

350 South Forest Avenue
365 South Forest Avenue
370 South Forest Avenue
West Bend, Wisconsin

May 22, 2019

Prepared For:
The City of West Bend
Department of City Development
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TETRA TECH

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WDNR BRRTS #: 02-67-583306

TT Project Number: 117-1321006

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ATTACHMENT

Appendix A Vapor Pin® Installation, Extraction and Leak Testing Standard Operating Procedures

1.0 INTRODUCTION

As requested by the Wisconsin Department of Natural Resources (WDNR), in a February 20, 2019 email, a vapor intrusion assessment will be conducted at each of the three senior housing unit parcel buildings that may overlie or is located next to areas of residual chlorinated volatile organic compound (CVOC) impacts to the groundwater, which are found near or on the property. The vapor intrusion assessment will be performed to determine if the residual CVOCs impacts present a vapor intrusion risk to the indoor air quality of the buildings. The scope of work that will be performed is summarized below. This work plan is a "commissioning plan for the vapor mitigation systems installed in each of the three senior housing buildings to confirm the system's effectiveness" (WDNR email comment). DNR guidance document RR-800 is used in writing this plan. This vapor intrusion assessment work plan (VIAWP) will be approved by the WDNR prior to conducting the work.

2.0 Vapor Intrusion Assessment

An inventory of the volatile chemicals in use at each senior housing unit building will be recorded at the start of the vapor intrusion assessment to identify potential sources of indoor air impacts not associated with the residual groundwater impacts that may exist beneath and adjacent to the buildings. The locations of rooms used to store volatile chemicals will also be noted.

Three (3) sub-slab soil gas probes per building will be installed and sampled to assess the potential for the residual CVOCs impacts found in the groundwater beneath and adjacent to the building to accumulate beneath the foundation of the building. All three senior living buildings are single-story with no basements. The floor areas vary from 12,630 square feet to 13,400 square feet. Three sub-slab sample points per building, to match the vent stack locations, are presumed adequate given that an engineered vapor intrusion mitigation system was placed beneath the floor slab at each building at construction, including an impermeable vapor barrier installed over a granular layer with permeable vapor collection piping, such that a uniform vapor collection system is in place beneath the building slab which channels vapors to three vent stacks. The proposed soil gas probe locations are shown on Figures 1A and 1B. The soil gas probes will be installed in accordance with the Vapor Pin® Installation and Extraction Standard Operating Procedure (SOP) written by the vendor (Cox-Colvin & Associates, Inc.) from which the soil gas probe components will be purchased. A copy of the Vapor Pin® Installation and Extraction SOP is provided in Appendix A.

The soil gas probes will be leak-tested prior to collecting the soil gas samples in accordance with the Vapor Pin® Leak Testing via Mechanical Means SOP prepared by the vendor from which the soil gas probe components will be purchased. A copy of the SOP is included in Appendix A. The soil gas samples will be collected in 6-liter Summa canisters using calibrated flow control devices provided by the laboratory performing the analyses (Pace Analytical Services, Inc.). The flow control devices will be calibrated to deliver a flow rate of 4.167 ml/min which results in a sample collection time of 24 hours for the 6-liter Summa canister. The soil gas samples will be submitted for laboratory analysis of volatile organic compounds (VOCs) by EPA Method TO-15.

The soil gas sampling results will be compared to Vapor Risk Screening Levels (VRSLs) calculated using the non-carcinogen hazard index (1.0), excess lifetime cancer risk (1-in-100,000) and soil gas to indoor air attenuation factor (0.03) specified for residential buildings in the January 2018 Wisconsin Department of Natural Resources (WDNR) guidance document entitled, *"Addressing Vapor Intrusion at Remediation and Redevelopment Sites in Wisconsin"* (WDNR PUB-RR-800).

At the conclusion of the vapor intrusion assessment, some or all of the soil gas probes will be decommissioned in accordance with the Vapor Pin® extraction procedures described in the Vapor Pin® Installation and Extraction SOP (Appendix A). If it is determined that additional sub-slab soil gas samples should be collected or that an active sub-slab depressurization system is needed to eliminate a vapor intrusion risk, some or all of the soil gas probes may be left in place for the collection of additional soil gas samples or for pilot testing of the sub-slab depressurization system. The soil gas probes would then be decommissioned after the additional soil gas sampling event(s) and/or the pilot testing is completed.

Indoor air samples will be collected in proximity to the locations of the three soil gas probes shown on Figure 1A and 1B approximately one day before the soil gas probes are installed and sampled. One background outdoor air sample will also be collected from a location near each building to determine if there are other potential sources of VOCs besides what may be present in the sub-slab soil gas. The proposed location of the background outdoor air sample will be upwind of the building on the day sampling occurs. The indoor air and background air samples will be collected in 6-liter Summa canisters using calibrated flow control devices provided by the laboratory performing the analyses. The flow control devices will be calibrated for a 24-hour sampling period to match the residence time at each building. The indoor air and background outdoor air samples will be submitted for laboratory analysis of VOCs by EPA Method TO-15. The reported VOCs concentrations in the indoor air samples will be compared to the vapor action levels (VALs) for residential buildings as calculated using the method described in WDNR PUB-RR-800. The three selected sampling locations for each building are adequate based on RR-800 and the fact that an engineered vapor intrusion mitigation system was placed beneath the floor slab at each building at construction, including an impermeable vapor barrier installed over a granular layer with permeable vapor collection piping, such that a uniform vapor collection system is in place beneath the building slab which channels vapors to three vent stacks.

3.0 Reporting

The results of the indoor air testing will be reported to the WDNR project manager via telephone and email within 24 hours of receiving the analytical report from the laboratory subcontractor if a residential VAL is exceeded in one or more the indoor air samples so that the property owner can be notified of the results in a timely manner. In no residential VALs are exceeded in the indoor air samples, the WDNR project manager will be notified of the results by email message within 10 business days of receiving the final analytical report from the laboratory subcontractor. The property owner will be notified of the results of the vapor intrusion assessment in a letter within

10 business days of receiving of the final analytical report from the laboratory subcontractor if no VALs are exceeded in the indoor air samples. The letter will include copies of the laboratory analytical reports.

A report presenting the results of the soil gas and indoor air sampling activities summarized above will be prepared. The report will include the results of the leak tests performed on the soil gas probes prior to collecting the soil gas samples, conclusions and recommendations for additional investigation activities and/or vapor mitigation, if necessary. The letter report will be submitted to the WDNR via email within 60 days of receiving the analytical report(s) from the laboratory subcontractor.

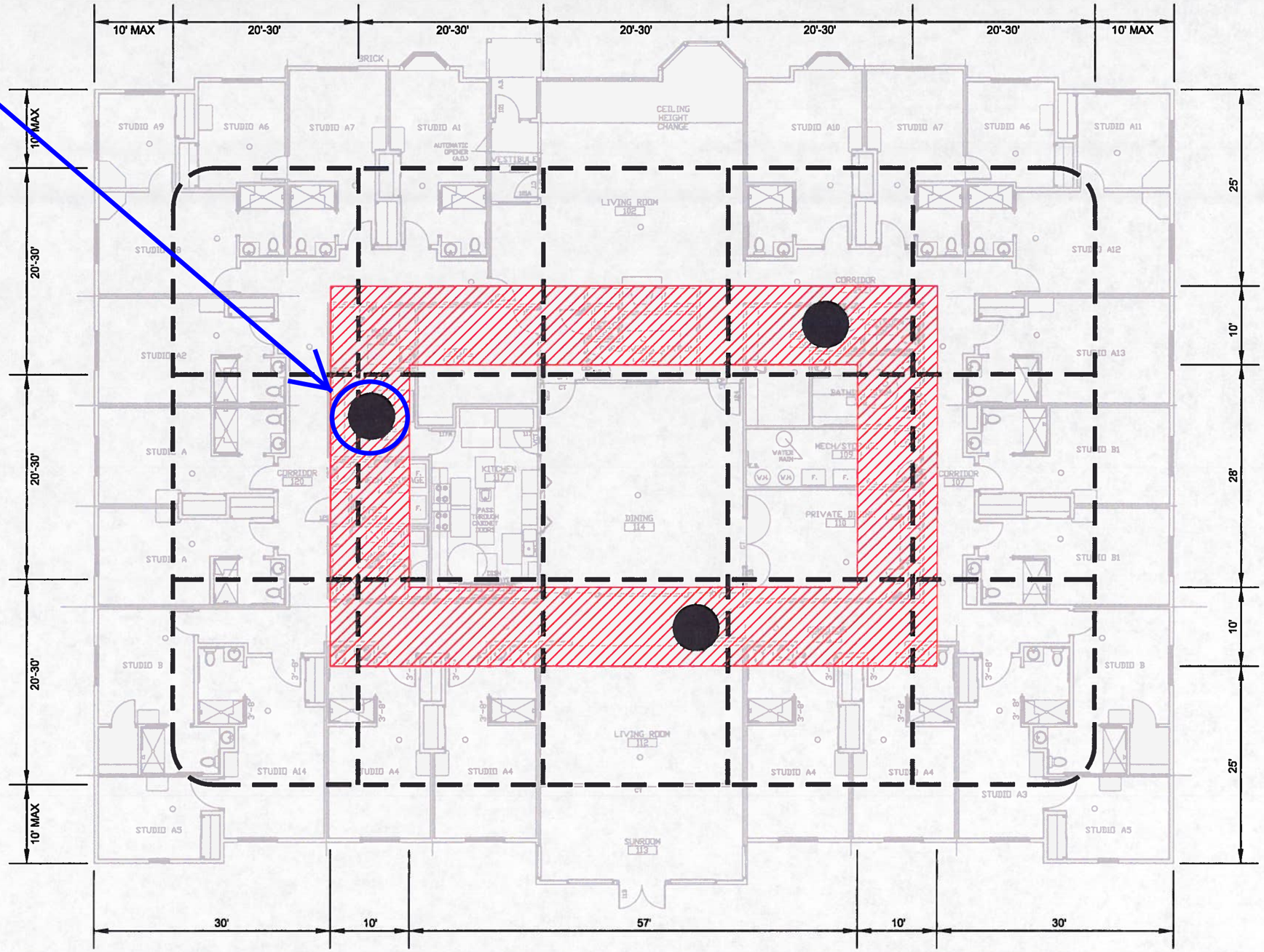
4.0 Schedule

The installation of the soil gas probes and the indoor air and soil gas sampling events for the three senior housing unit parcel buildings will be scheduled to take place within 30 days of receiving written approval or conditional approval of this work plan by the WDNR and permission for access from the current building owners. The letter report will be submitted to the WDNR within 60 days of receiving the laboratory analytical results from the last sampling event.

May 2019

Install vapor pin and set indoor air sample at 5-foot radius off of in-place vertical vent riser and avoid obstructions - typical at three vertical riser locations

Note: Plan shown is 370 South Forest Avenue; 350 South Forest Avenue is mirror image



REFERENCE: FLOOR PLAN PHASE I
DRAWING A1.1 DATED 4/26/10

EXPLANATION

- HORIZONTAL SUB SLAB VENTILATION PIPING
- RADIAL ZONE FOR VERTICAL RISERS TO ABOVE ROOF LINE
- EQUALLY SPACED: 3 VERTICALS WITHIN RADIAL ZONE

0 14 28
SCALE IN FEET

S:\CAD\City of West Bend\South Lot\1321001Fig1.dwg

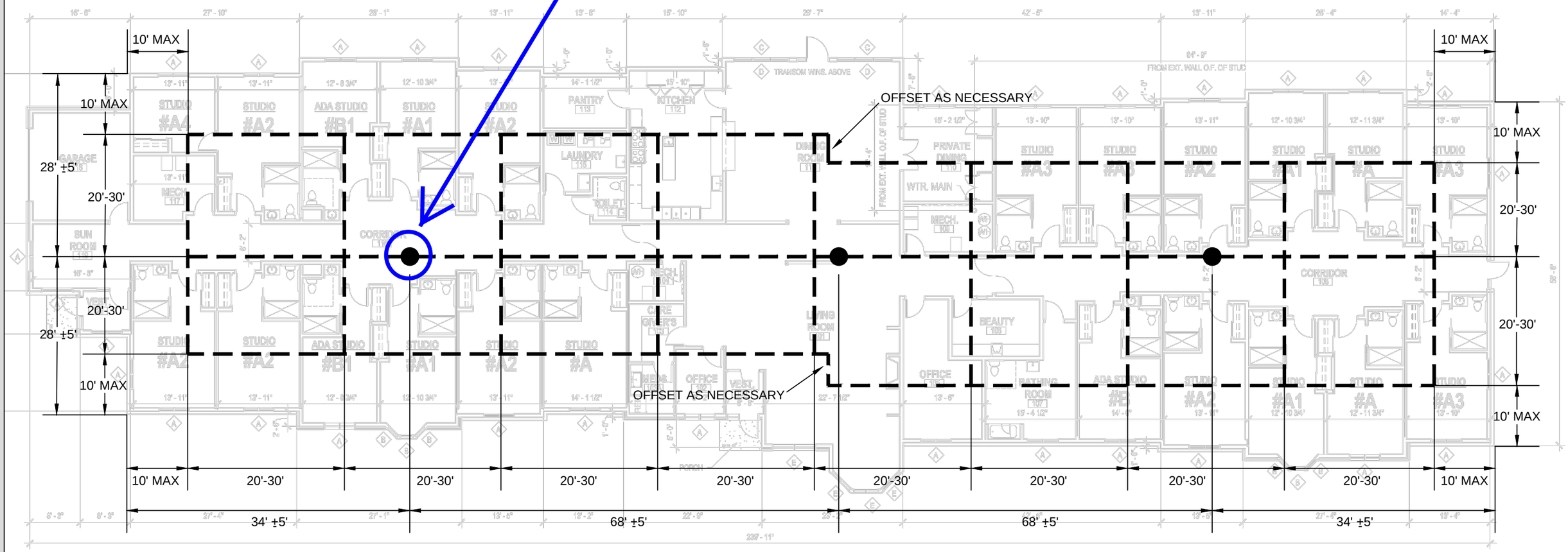
TITLE:	SUB SLAB VENTILATION PLAN FORMER GEHL PROPERTY - SOUTH LOT
LOCATION:	WEST BEND, WISCONSIN

GeoTrans, Inc. A TETRA TECH COMPANY

CHECKED	DLM	FIGURE:
DRAFTED	HJW	1A
PROJECT	117-1321001	
DATE	7/16/10	

May 2019: Install vapor pin and set indoor air sample at 5-foot radius off of in-place vertical vent riser and avoid obstructions - typical at three vertical vent locations

Plan shown is 365 South Forest Avenue



REFERENCE: FLOOR PLAN PHASE 3
DRAWING A1.0 DATED 8/28/14

EXPLANATION

HORIZONTAL SUB SLAB VENTILATION PIPING

3 VERTICALS EQUALLY SPACED ALONG LONG DIMENSION CENTERLINE

0 16 32

SCALE IN FEET

TITLE:	SUB SLAB VENTILATION PLAN FORMER GEHL PROPERTY - ASSISTED LIVING
LOCATION:	WEST BEND, WISCONSIN

TETRA TECH

CHECKED	DLM	FIGURE:
DRAFTED	HJW	1B
PROJECT	117-1321001	
DATE	9/15/14	

S:\CAD\CITY OF WEST BEND\SOUTH LOT\9-15-14\1321001FIG1.DWG

APPENDIX A

VAPOR PIN® INSTALLATION, EXTRACTION AND LEAK TESTING STANDARD OPERATING PROCEDURES

Standard Operating Procedure Installation and Extraction of the Vapor Pin®

Updated September 9, 2016

Scope:

This standard operating procedure describes the installation and extraction of the VAPOR PIN® for use in sub-slab soil-gas sampling.

Purpose:

The purpose of this procedure is to assure good quality control in field operations and uniformity between field personnel in the use of the VAPOR PIN® for the collection of sub-slab soil-gas samples or pressure readings.

Equipment Needed:

- Assembled VAPOR PIN® [VAPOR PIN® and silicone sleeve(Figure 1)]; Because of sharp edges, gloves are recommended for sleeve installation;
- Hammer drill;
- 5/8-inch (16mm) diameter hammer bit (hole **must** be 5/8-inch (16mm) diameter to ensure seal. It is recommended that you use the drill guide). (Hilti™ TE-YX 5/8" x 22" (400 mm) #00206514 or equivalent);
- 1½-inch (38mm) diameter hammer bit (Hilti™ TE-YX 1½" x 23" #00293032 or equivalent) for flush mount applications;
- ¾-inch (19mm) diameter bottle brush;
- Wet/Dry vacuum with HEPA filter (optional);
- VAPOR PIN® installation/extraction tool;
- Dead blow hammer;
- VAPOR PIN® flush mount cover, if desired;
- VAPOR PIN® drilling guide, if desired;
- VAPOR PIN® protective cap; and
- VOC-free hole patching material (hydraulic cement) and putty knife or trowel for repairing the hole following the extraction of the VAPOR PIN®.

Figure 1. Assembled VAPOR PIN®

Installation Procedure:

1) Check for buried obstacles (pipes, electrical lines, etc.) prior to proceeding.

2) Set up wet/dry vacuum to collect drill cuttings.

3) If a flush mount installation is required, drill a 1½-inch (38mm) diameter hole at least 1¾-inches (45mm) into the slab. Use of a VAPOR PIN® drilling guide is recommended.

4) Drill a 5/8-inch (16mm) diameter hole through the slab and approximately 1-inch (25mm) into the underlying soil to form a void. Hole **must** be 5/8-inch (16mm) in diameter to ensure seal. It is recommended that you use the drill guide.

VAPOR PIN® protected under US Patent # 8,220,347 B2, US 9,291,531 B2 and other patents pending

5) Remove the drill bit, brush the hole with the bottle brush, and remove the loose cuttings with the vacuum.

6) Place the lower end of VAPOR PIN® assembly into the drilled hole. Place the small hole located in the handle of the installation/extraction tool over the vapor pin to protect the barb fitting, and tap the vapor pin into place using a dead blow hammer (Figure 2). Make sure the installation/extraction tool is aligned parallel to the vapor pin to avoid damaging the barb fitting.

Figure 2. Installing the VAPOR PIN®

During installation, the silicone sleeve will form a slight bulge between the slab and the VAPOR PIN® shoulder. Place the protective cap on VAPOR PIN® to prevent vapor loss prior to sampling (Figure 3).

Figure 3. Installed VAPOR PIN®

7) For flush mount installations, cover the vapor pin with a flush mount cover, using either the plastic cover or the optional stainless-steel Secure Cover (Figure 4).

Figure 4. Secure Cover Installed

8) Allow 20 minutes or more (consult applicable guidance for your situation) for the sub-slab soil-gas conditions to re-equilibrate prior to sampling.

9) Remove protective cap and connect sample tubing to the barb fitting of the VAPOR PIN®. This connection can be made using a short piece of Tygon™ tubing to join the VAPOR PIN® with the Nylaflow tubing (Figure 5). Put the

Nylaflow tubing as close to the VAPOR PIN® as possible to minimize contact between soil gas and Tygon™ tubing.

Figure 5. VAPOR PIN® sample connection

10) Conduct leak tests in accordance with applicable guidance. If the method of leak testing is not specified, an alternative can be the use of a water dam and vacuum pump, as described in SOP Leak Testing the VAPOR PIN® via Mechanical Means (Figure 6). For flush-mount installations, distilled water can be poured directly into the 1 1/2 inch (38mm) hole.

Figure 6. Water dam used for leak detection

11) Collect sub-slab soil gas sample or pressure reading. When finished, replace the protective cap and flush mount cover until the next event. If the sampling is complete, extract the VAPOR PIN®.

Extraction Procedure:

1) Remove the protective cap, and thread the installation/extraction tool onto the barrel of the VAPOR PIN® (Figure 7). Turn the tool clockwise continuously, don't stop turning, the VAPOR PIN® will feed into the bottom of the installation/extraction tool and will extract from the hole like a wine cork, DO NOT PULL.

2) Fill the void with hydraulic cement and smooth with a trowel or putty knife.

Figure 7. Removing the VAPOR PIN®

- Prior to reuse, remove the silicone sleeve and protective cap and discard. Decontaminate the VAPOR PIN® in a hot water and Alconox® wash, then heat in an oven to a temperature of 265° F (130° C) for 15 to 30 minutes. For both steps, **STAINLESS – ½ hour, BRASS 8 minutes**

3) Replacement parts and supplies are available online.

Standard Operating Procedure
Leak Testing VAPOR PIN®
Via Mechanical Means

Updated March 29, 2016

Scope:

The operating procedure describes the methodology to test a VAPOR PIN® or equivalent sub-slab sampling device and sample train for leakage of indoor air. Mechanical leak testing is generally simpler and less costly than testing with tracer gases such as helium, but relevant state, program, or other guidance documents should be consulted to determine if a specific type of leak test is needed.

Purpose:

The purpose of this procedure is to ensure that indoor air does not leak past the VAPOR PIN® or associated tubing and hardware, and dilute the sub-slab soil gas sample with indoor air.

Equipment Needed:

- VAPOR PIN®;
- 3 stopcocks
- 2 Tee fittings
- Vacuum pump or peristaltic pump
- Photo-Ionization Detector (PID) or other pump for purging soil gas
- Sample container
- Vacuum gauge
- 0.25-inch Outer Diameter sample tubing (Nylaflow LM shown)
- Tubing or fittings to connect sample tubing to equipment (Tygon™ R-3803 tubing shown)
- Distilled Water

For stick-up configuration only:

- Play-Doh or VOC-free modeling clay
- 2-inch diameter plastic pipe couple;

Procedure:

1) Drill a 5/8" diameter hole in the concrete slab and install the VAPOR PIN® as per the Standard Operating Procedure (SOP). For a flush-mount installation, drill the 1-1/2" diameter hole first, and follow the SOP Use of the VAPOR PIN® Drilling Guide and Secure Cover. Testing evacuated ("Summa") canisters and regulators in accordance with ASTM standard D7663-11 or Restek Corporation's A Guide to Whole Air Canister Sampling prior to starting field work eliminates most risk of leakage when sampling with the VAPOR PIN®. Leave the canister closed until leak testing is completed.

2) Install the VAPOR PIN® as described in the SOP Installation and Extraction of the VAPOR PIN®.

3) Clean the slab within a 2-inch radius of the VAPOR PIN® to remove all dust. Avoid wetting the concrete or wait until the concrete is dry before proceeding, and avoid cleaning with VOC-containing substances. A whisk broom or shop vacuum is recommended. Remaining dust can be picked up with a scrap of clay.

VAPOR PIN® protected under US Patent # 8,220,347 B2

4) For a flush-mount installation, water is poured directly into the 1-1/2" depression without the PVC couple or modeling clay-proceed to the next step. For a stick-up installation, roll a 1-inch diameter ball of clay between your palms to form a "snake" approximately 7 inches long and press it against the end of the 2" pipe couple. Push the couple against the slab to form a seal between the pipe and the concrete. Notice that water soluble clays such as Play-Doh may absorb enough water to be unsuitable for tests lasting more than one hour.

5) Assemble the sample train as shown in Figure 1. Notice that the figure shows Photo-Ionization Detector (PID) at the end of the sample train, which should be replaced with the hand-held vacuum pump next to it, or a peristaltic pump, during shut-in testing. The shut-in test is conducted by closing stopcock 1, opening stopcocks 2 and 3, and imposing a vacuum of 15" mercury equivalent (in Hg) with the vacuum pump or peristaltic pump. Close stopcock 3, and observe the vacuum gauge for one to five minutes to verify that pressure in the sample train increases no more than 0.5 in Hg. Tighten or replace leaking components, if needed. The compression fitting connecting sample tubing to the sample canister is a common leak point.

6) Attach the peristaltic pump or PID and pour enough distilled water into the pipe couple or flush-mount depression to immerse the tubing connection to the VAPOR PIN®.

7) Open all stopcocks and purge and sample the sample point as required by the data quality objectives. Water level might drop slightly due to absorption into the concrete, but if there is a sudden drop in water level, the appearance of water in sample tubing, or other indication of water entering the sub-slab, remove the distilled water from the couple or depression, and reposition the VAPOR PIN® to stop the leakage before resuming the leak test and sampling.

8) If long-term sampling is conducted (e.g. 8-hour or 24-hour), the vacuum gauge, stopcock 3, PID and pumps can be removed immediately after closing stopcock 2, for use at subsequent sample locations.

Figure 1. Example of Sub-Slab Sampling and Leak-Test Setup