Central Hudson Gas & Electric Corporation

Soil Vapor Investigation Work Plan

Little Britain Road Service Center
610 Little Britain Road
New Windsor, New York

Brownfield Cleanup Program No. C336031

September 2022

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Attachment A NYSDEC Structure Sampling Questionnaire and Building Inventory

Attachment B Arcadis Technical Guidance and Information Documents

Acronyms and Abbreviations

AMSL	above mean sea level
Arcadis	Arcadis of New York, Inc.
Central Hudson/CHGE	Central Hudson Gas & Electric Corp.
ELAP	Environmental Laboratory Approval Program
in.Hg	inches of mercury
NYSDEC	New York State Department of Environmental Conservation
NYSDOH	New York State Department of Health
%	percent
PID	photoionization detector
site	Little Britain Road Service Center site, New Windsor, New York
TGI	Technical Guidance Instruction
VI	vapor intrusion
VOC	volatile organic compound
Work Plan	Soil Vapor Investigation Work Plan

1 Introduction

This Soil Vapor Investigation Work Plan (Work Plan) was prepared to support additional vapor intrusion (VI) investigations at the Central Hudson Gas & Electric Corp. (Central Hudson/CHGE) Little Britain Road Service Center site (New York State Department of Environmental Conservation [NYSDEC] Brownfield Cleanup Agreement No. C336031) located in New Windsor, New York (the "site"). This Work Plan has been prepared consistent with the following correspondence:

- April 13, 2022 NYSDEC comments on the March 2022 Remedial Investigation Data Summary Report (Arcadis of New York, Inc. [Arcadis] 2022); and
- May 16, 2022 conference call between Central Hudson, the NYSDEC, the New York State Department of Health (NYSDOH), and Arcadis.

Soil vapor sampling, conducted in 2008 and most recently in 2021 (as summarized in the Remedial Investigation Data Summary Report [Arcadis 2022]), has shown elevated levels of volatile organic compounds (VOCs) in the soil vapor at the site. CHGE installed a sub-slab depressurization system within the facility building in 2008. The sub-slab depressurization system continues operation today and is maintained by CHGE facilities staff. The purpose of the 2021 sampling was to evaluate the current levels of soil vapor concentrations at the site. Based on review of the data, and as discussed in the May 16, 2022 comment letter, the NYSDEC and NYSDOH requested a VI evaluation be conducted on three properties that abut the site: 600 Little Britain Road, 630 Little Britain Road, and 634 Little Britain Road. This Work Plan provides a proposed scope of work for conducting a VI investigation on these properties, confirming the previous 2021 sampling results at select locations, and evaluating the potential for vapor migration pathways from the site to these properties.

The remainder of this Work Plan provides relevant site background information and the specific objectives and scope of the investigation.

1.1 Site Description

The site is located at 610 Little Britain Road, New Windsor, Orange County, New York (**Figure 1**). The site encompasses approximately 9 acres with the Service Center building located near the center of the site. Access to the site is from Little Britain Road to the south. The majority of the site is fenced; three gates, one each to the north, southwest, and east of the Service Center building, provide access to the fenced area. The employee parking lot, which is located east of the Service Center building, and an open grassy field, which is located between the Service Center building and Little Britain Road, are outside of the fenced area but within the site boundary. The employee parking lot, the entrance driveway, and the areas immediately surrounding the Service Center building are paved; the remainder of the site is either gravel covered or vegetated. The City of Newburgh Lake Washington Stilling Basin is located approximately 150 feet west of the site.

1.2 Investigation Objectives

The objectives of the VI investigation are to:

- Confirm the soil vapor results at a subset of 2021 investigation locations (SVS-1, SVS-2, SVS-3, SVS-4, and SVS-9);
- Evaluate the potential presence of a soil vapor pathway from the site to the adjacent properties; and
- Evaluate potential sub-slab soil vapor and indoor air concentrations at the neighboring properties at 600, 630, and 634 Little Britain Road.

1.3 Site Geology and Hydrogeology

Overburden at the site ranges in thickness between less than 5 feet thick in the north-central portion of the site and greater than 55 feet thick along the southern boundary of the site. The overburden consists of between 3 and 15 feet of sand and gravel fill underlain by up to 50 feet of dense silty sand and gravel till along the southern property boundary. Till thickness decreases to the northwest until it is minimal or non-existent. The overburden in underlain by a bedrock consisting of the Stissing Dolostone member of the Wappinger Group. The dolostone is fine-grained, medium grey, slightly fractured, and weathered with massive bedding and calcite recrystallization along the fractures. The bedrock surface is highest (approximately 290 feet above mean sea level [AMSL]) near the northwest corner of the Service Center building and lowest south of the building, near monitoring well MW94-4B2 (approximately 241 feet AMSL). The bedrock surface also slopes downward to the northern site boundary to an elevation of approximately 268 feet AMSL.

The water table at the site is approximately 10 feet below ground surface and is located within the overburden and bedrock. Groundwater flow in the overburden and bedrock is to the north and northeast. The bedrock surface likely influences the flow direction in the overburden and causes localized mounding. Groundwater flow in the bedrock is within a complex network of fractures, and as such, flow within the bedrock can be tortuous. Downward vertical gradients are observed from the overburden to the bedrock and likely within the bedrock itself. Ultimately, all groundwater beneath the site is expected to move to the east and discharge to the Hudson River, which is located approximately 2.5 miles east of the site.

2 Scope of Investigation

The VI investigation will consist of:

- Reviewing property conditions and conducting due diligence reconnaissance (including a building inventory for indoor locations) of each the three off-site properties;
- Collecting confirmation soil vapor samples at five locations previously sampled in 2021;
- Collecting soil vapor samples at three new on-site locations adjacent to the three off-site properties being investigated for potential soil VI;
- Collecting paired sub-slab/indoor air samples at 600, 630, and 634 Little Britain Road;
- Collecting ambient air samples to evaluate the background air concentrations during sampling; and
- Preparing a VI Summary Report for submittal to the NYSDEC and NYSDOH.

Sampling will be conducted in accordance with the NYSDOH's Guidance for Evaluating Soil Vapor Intrusion in the State of New York (NYSDOH 2006, 2017). Contingent upon Work Plan approval and obtaining required off-site access, sampling will tentatively be performed during the 2022/2023 heating season. The following sections present a detailed discussion of the scope of the investigation and support activities.

2.1 Health and Safety

A site-specific Health and Safety Plan will be prepared to present the health and safety procedures, methods, and requirements that will apply to field personnel during implementation of the field work. Field activities will be conducted using Modified Level D personal protective equipment. All personnel who work in areas where they may be exposed to site contaminants will be trained as required. Health and safety procedures will be compliant with the Occupational Safety and Health Administration's Hazardous Waste Operations and Emergency Response standards, as described in 29 Code of Federal Regulations 1910.120. All VI field staff will abstain from using or having contact with fuels, solvent cleaners, aerosol sprays and avoid smoke/vapor exposure for 24 hours prior to conducting sampling activities.

2.2 Utility Clearance

Prior to installing the soil vapor points, each location will be cleared of utilities using three lines of evidence. It is assumed that the following lines may be used: building drawings, review of incoming utility lines, geophysical scan (ground penetrating radar/magnetometer), UDig-NY one-call utility locating service (formerly DigSafelyNY), and clearing using hand tools. Each location will also be visually inspected for items or conditions that would negatively affect the sample results.

2.3 Sub-Slab and Indoor Air Sampling Points

Building surveys and reconnaissance will be completed on the three adjacent properties (600, 630, and 634 Little Britain Road) prior to sampling activities on those properties. The purpose of the survey and reconnaissance will be to document information that will be used to evaluate the VI results. Field personnel will complete the NYSDEC Structure Sampling Questionnaire and Building Inventory (presented in **Attachment A**) a minimum of 72 hours prior to conducting the indoor air sampling. This will be done in conjunction with evaluating slab perforations,

obtaining information on building space use, evaluating the operating conditions of the heating/ventilation/air conditioning system, and identifying the type and location of chemical products that could influence indoor air results. A photoionization detector (PID), equipped with a 11.7 electron volt lamp, will be used to complete a real-time vapor survey to screen for the presence of detectable vapor-phase chemicals within the breathing zone and for any floor penetrations. Any products identified during the survey that could impact the results of the indoor air sampling will be removed from the area at least 24 hours prior to sampling, if possible. The Technical Guidance Instruction (TGI) document for completing the survey and reconnaissance is presented in **Attachment B**.

On the day of sampling, the sampling team will confirm and document that the building inventory did not materially change since the inventory was completed. Upon completion of the utility clearance, three temporary sub-slab vapor points will be installed as depicted on **Figure 2**. These proposed sampling locations may be changed, as necessary, based on building access and the location of utilities. The TGI document for installing and sampling sub-slab vapor points is presented in **Attachment B**. The sub-slab points (SS-1, SS-2, and SS-3; **Table 1**) will be installed using a hand-held hammer drill and a High-Efficiency Particulate Air dust collection vacuum. A ⅜-inch core hole will be advanced through the concrete slab and approximately 3 inches into the sub-slab material to create an open cavity. New Vapor-Pin® sampling points will be inserted into the concrete slab at each sample location, approximately 1 inch above the sub-slab material. Each sample point will be capped with a stainless-steel, air-tight Swagelok® fitting until tracer testing is conducted. A typical sub-slab schematic of a sub-slab point is presented on **Figure 3** for reference.

Paired building indoor air samples (IA-1, IA-2, and IA-3; **Table 1**) will be collected over the same time period (24 hours) and in the general vicinity of the sub-slab soil vapor sample points shown on **Figure 2**.

Ambient air samples (AA-1, AA-2, and AA-3; **Table 1**) will also be collected in the upwind direction at each individual building. Ambient air samples will be collected over the same time period (24 hours) as the sub-slab and indoor air samples. Indoor air and ambient air samples will be collected from an intake height of approximately 4 to 5 feet above the ground/slab. The TGI document for collecting indoor and ambient air samples is provided in **Attachment B**.

2.4 Exterior Soil Vapor Sampling Points

Upon completion of the utility clearance, eight soil vapor points (three new and five previous locations) will be installed as depicted on **Figure 2**. These proposed sampling locations may be changed, as necessary, based on site conditions and the location of utilities. The TGI document for installation and sampling of sub-slab vapor points is included in **Attachment B**.

The eight soil vapor points (SVS-1 through SVS-4, SVS-9, and SVS-11 through SVS-13; **Table 1**) will be installed using direct push methods or a hand auger. Soil descriptions will be continuously logged for grain size, density, moisture, color, and odor/contamination. In addition, a PID will be used to screen the removed soils for the presence of VOCs. The vapor point boring will be advanced to approximately 1 foot above the capillary fringe. The approximate depth to the capillary fringe will be determined based on the presence of saturated/partially saturated soil and by measuring the depth to water in nearby monitoring wells. A new, 1-foot-long, stainless-steel vapor screen will be installed at the bottom of the open cavity and connected to ¼-inch Teflon®-lined tubing to the surface. Clean #2 filter sand will be installed to 6 inches above the screen followed by 6 inches of granular bentonite. The remaining annulus will be tremie grouted to 6 inches below grade with 6 inches of hydrated granular bentonite to provide a surface seal. The sample tubing will be capped with a stainless-steel, air-tight

Swagelok® fitting until tracer testing is conducted. A typical schematic of a sub-slab point is presented on **Figure 3** for reference.

A single upgradient ambient air sample will also be collected in the upwind direction of the on-site soil vapor sampling points. All indoor air and ambient air samples will be collected from an intake height of approximately 4 to 5 feet above the ground. The TGI document for collecting indoor and ambient air samples is provided in **Attachment B**.

2.5 Tracer Testing

After installation of the sub-slab and soil vapor sampling points and prior to collecting any samples, a tracer gas test will be performed, using helium, to assess the integrity of the vapor point installations. The TGI document for conducting tracer gas testing is included in **Attachment B**. Helium will be introduced into a shroud covering the intersection of the sample tubing and the ground. The atmosphere under the shroud will consist of an initial concentration of 80 percent (%) helium or greater. After introducing the tracer gas to the shroud, three volumes (i.e., the volume of the sample probe and tube) will be purged from each sampling location at a rate not to exceed 200 milliliters per minute. The purge volume will be consistent across all the samples collected. Purge air will be tested for the helium tracer gas using real-time monitoring equipment. If the percentage of helium in the purge air is greater than 10% of the current shroud concentration, the seal will be fixed and the tracer test re-administered. Should the helium level still be greater than 10% after re-testing, the sample location should be reassessed, and a determination will be made if it is necessary to abandon the vapor point and install a new vapor point at a nearby location. Additionally, if water or significant condensation is observed in the vapor tubing, the vapor point will not be used for sample collection, and a new vapor point will be installed at a nearby location. Helium data and vapor point conditions will be noted on the sampling log.

2.6 Sub-Slab, Soil Vapor, Indoor Air, and Ambient Air Sampling

Sub-slab, soil vapor, indoor air, and ambient air samples will be collected following the successful passing of the helium tracer test described above. TGIs for sub-slab, soil vapor, indoor air, and ambient air sampling are provided in **Attachment B**. Paired sub-slab and indoor/ambient air samples at three off-site properties will be collected over a residential occupant period of approximately 24 hours. Consistent with the time period for samples collected in 2021, exterior soil vapor samples will be collected over an approximate 2-hour period, with the upwind ambient air sample collected for approximately 8 hours to cover the sample duration time for the exterior soil vapor samples. Samples will be collected using passive (less than -28 inches of mercury [in.Hg]) 6-liter, stainless-steel SUMMA canisters supplied from a laboratory with current Environmental Laboratory Approval Program (ELAP) certification. The canisters will be individually certified clean by the laboratory and supplied with vacuum gauges and pre-set flow controllers capable of collecting a sample at a rate not to exceed 200 milliliters per minute. Once a canister is full (i.e., -5 in.Hg remaining, as measured by an analog pressure gauge), it will be sealed and labeled with the sample identification number for the sub-slab vapor point. Each canister shipment will be sealed with chain-of-custody tape, and chain-of-custody forms will be completed in triplicate. Samples will be either shipped via overnight carrier or driven directly to the analytical laboratory on the day that collections are completed.

2.7 Decontamination and Abandonment

All down-hole drilling equipment and non-dedicated/non-disposable drilling and sampling equipment will be decontaminated prior to use at the site, in between each well location, and prior to leaving the site.

Each sampling point will be abandoned by removing the subsurface sampling equipment from the holes and patching the surface to match surrounding conditions. The area around each sampling point will be swept clean of any sampling-related debris and returned to pre-sampling conditions. All investigation-derived waste generated during the investigation, including soil/slab cuttings, excess tubing, non-dedicated sampling material, and decontamination fluids, will be containerized in new 55-gallon steel drums for characterization and offsite disposal by Central Hudson.

2.8 Survey

The locations of exterior soil vapor sampling points will be surveyed relative to the North American Vertical Datum of 1988 (NAVD 88) and North American Datum of 1983 (NAD 83) for northing and easting positions. The locations of interior sub-slab sampling locations will be photo-documented and described in the field notebook, and distances will be measured (using a measuring tape) relative to the exterior building walls.

2.9 Field Documentation

Sampling logs will be used to record outdoor plot sketches, local weather information for the sampling period, and any other pertinent observations. Each sample will be photo-documented to capture the complete sampling setup and nearby relative site features in the background, as necessary. The following information will also be recorded on the sampling log:

- Slab conditions, building layout, and on-site chemicals (NYSDEC Structure Sampling Questionnaire and Building Inventory Form – **Attachment A**);
- Sample identification number;
- Sub-slab, indoor air, soil vapor, and ambient air PID readings;
- Date and time of sample collection;
- Slab thickness and sampling depth interval;
- Field personnel;
- Sampling methods and devices;
- Number of purge volumes;
- Tracer test detections/results;
- Volume of soil vapor purged before sampling;
- Vacuum of canisters before and after sample collection;
- Apparent moisture content (dry, moist, or saturated) of the sampling zone; and
- Chain-of-custody protocols and records.

2.10 Sample Analysis

Soil vapor, indoor air, and ambient air samples will be analyzed by an ELAP-certified laboratory using United States Environmental Protection Agency Method TO-15 (Determination of VOCs in Air Collected in Specially-Prepared Canisters and Analyzed by Gas Chromatography Mass Spectrometry). Whole-air samples will be analyzed for VOCs using a quadrupole or ion-trap gas chromatograph/mass spectrometer system to provide compound reporting limits of at or below the NYSDOH guidance values. The proposed analytical compound list and associated reporting limits for each analyte is presented in **Table 2**.

2.11 Quality Assurance/Quality Control

Quality assurance/quality control measures will be implemented to minimize potential data-quality issues and facilitate obtaining high-quality data. Arcadis field personnel will avoid actions that could cause sample interference in the field, such as fueling vehicles, using permanent marking pens, and wearing freshly dry-cleaned clothing or personal fragrances. Appropriate quality assurance/quality control protocols will be followed during sample collection and laboratory analysis, including:

- Individually certified clean sample devices and containers will be employed.
- Sample holding times (30 days) and temperatures will be met and documented.
- Chain-of-custody practices will be followed.
- A single duplicate indoor air sample will be collected in a manner consistent with site samples. The duplicate sample will be collected concurrently with the parent sample using a Swagelok® “T” fitting to effectively split the sample into a separate sample canister.

2.12 Data Validation

Analytical data generated during the soil vapor investigation will be accompanied by a NYSDEC Analytical Services Protocol Category B data deliverable package(s). The data package(s) will be validated in accordance with the NYSDEC Analytical Services Protocol. The validation will include, but not be limited to, the following items:

- Adherence to specific holding times;
- Laboratory blank-detected constituents; and
- Field duplicate precision.

Pertinent field sampling records (i.e., field notes, chain-of-custody records) will be reviewed in conjunction with the laboratory deliverables for accuracy, precision, completeness, the overall quality of data, and the absence of transcription errors. The results of the data validation will be summarized in a Data Usability Summary Report for each set of TO-15 samples.

3 Schedule and Reporting

The VI investigation is tentatively scheduled to be conducted in the 2022/2023 heating season, pending NYSDEC/NYSDOH approval of this Work Plan and acquiring access to the three off-site properties. Upon completion of the fieldwork and data validation, a VI Summary Report will be prepared to include:

- A discussion of the results from the site reconnaissance, building survey, and chemical inventory;
- A summary of the completed field activities and any necessary deviations from this Work Plan;
- A comparison of the analytical results to the screening values provided in the NYSDOH guidance (NYSDOH 2006, 2017); and
- Conclusions and recommendations.

The VI Summary Report attachments will include:

- Data Usability Summary Report(s);
- Field sampling logs;
- A Structure Sampling Questionnaire and Building Inventory Form; and
- Summary data tables and figures depicting all new and 2021 remedial investigation sampling locations.

The VI Summary Report will be generated and submitted to the NYSDEC/NYSDOH following data validation and evaluation.

4 References

Arcadis. 2022. Remedial Investigation Data Summary Report, Little Britain Road Service Center, 610 Little Britain Road, New Windsor, New York. March.

NYSDOH. 2006. Guidance for Evaluating Soil Vapor Intrusion in the State of New York. October 2006, updated May 2017 (http://health.ny.gov/environmental/indoors/vapor_intrusion/update.htm).

Tables

Table 1
Soil Vapor/Indoor Air Sampling Locations

Soil Vapor Intrusion Work Plan
Central Hudson Gas Electric Corp.
Little Britain Road Service Center, New Windsor, New York

Sample Type	Sample ID	Sampling Event and Analytical
On-Site Samples		
Exterior Soil Vapor	SVS-1	2022/2023 Heating Season USEPA TO-15 VOC List
Exterior Soil Vapor	SVS-2	2022/2023 Heating Season USEPA TO-15 VOC List
Exterior Soil Vapor	SVS-3	2022/2023 Heating Season USEPA TO-15 VOC List
Exterior Soil Vapor	SVS-4	2022/2023 Heating Season USEPA TO-15 VOC List
Exterior Soil Vapor	SVS-9	2022/2023 Heating Season USEPA TO-15 VOC List
Proposed- Exterior Soil Vapor	SVS-11	2022/2023 Heating Season USEPA TO-15 VOC List
Proposed- Exterior Soil Vapor	SVS-12	2022/2023 Heating Season USEPA TO-15 VOC List
Proposed- Exterior Soil Vapor	SVS-13	2022/2023 Heating Season USEPA TO-15 VOC List
Ambient Air	AA-[Date]	2022/2023 Heating Season USEPA TO-15 VOC List
Off-Site Samples		
Proposed- Sub-Slab Soil Vapor	SS-1	2022/2023 Heating Season USEPA TO-15 VOC List
Proposed- Sub-Slab Soil Vapor	SS-2	2022/2023 Heating Season USEPA TO-15 VOC List
Proposed- Sub-Slab Soil Vapor	SS-3	2022/2023 Heating Season USEPA TO-15 VOC List
Proposed- Indoor Air	IA-1	2022/2023 Heating Season USEPA TO-15 VOC List
Proposed- Indoor Air	IA-2	2022/2023 Heating Season USEPA TO-15 VOC List
Proposed- Indoor Air	IA-3	2022/2023 Heating Season USEPA TO-15 VOC List
Proposed- Ambient Air	AA-1	2022/2023 Heating Season USEPA TO-15 VOC List
Proposed- Ambient Air	AA-2	2022/2023 Heating Season USEPA TO-15 VOC List
Proposed- Ambient Air	AA-3	2022/2023 Heating Season USEPA TO-15 VOC List

Note:
TO-15 - Method TO-15 (Determination of VOCs in Air Collected in Specially-Prepared Canisters and Analyzed by Gas Chromatography Mass Spectrometry)
USEPA - United States Environmental Protection Agency
VOC - volatile organic compound

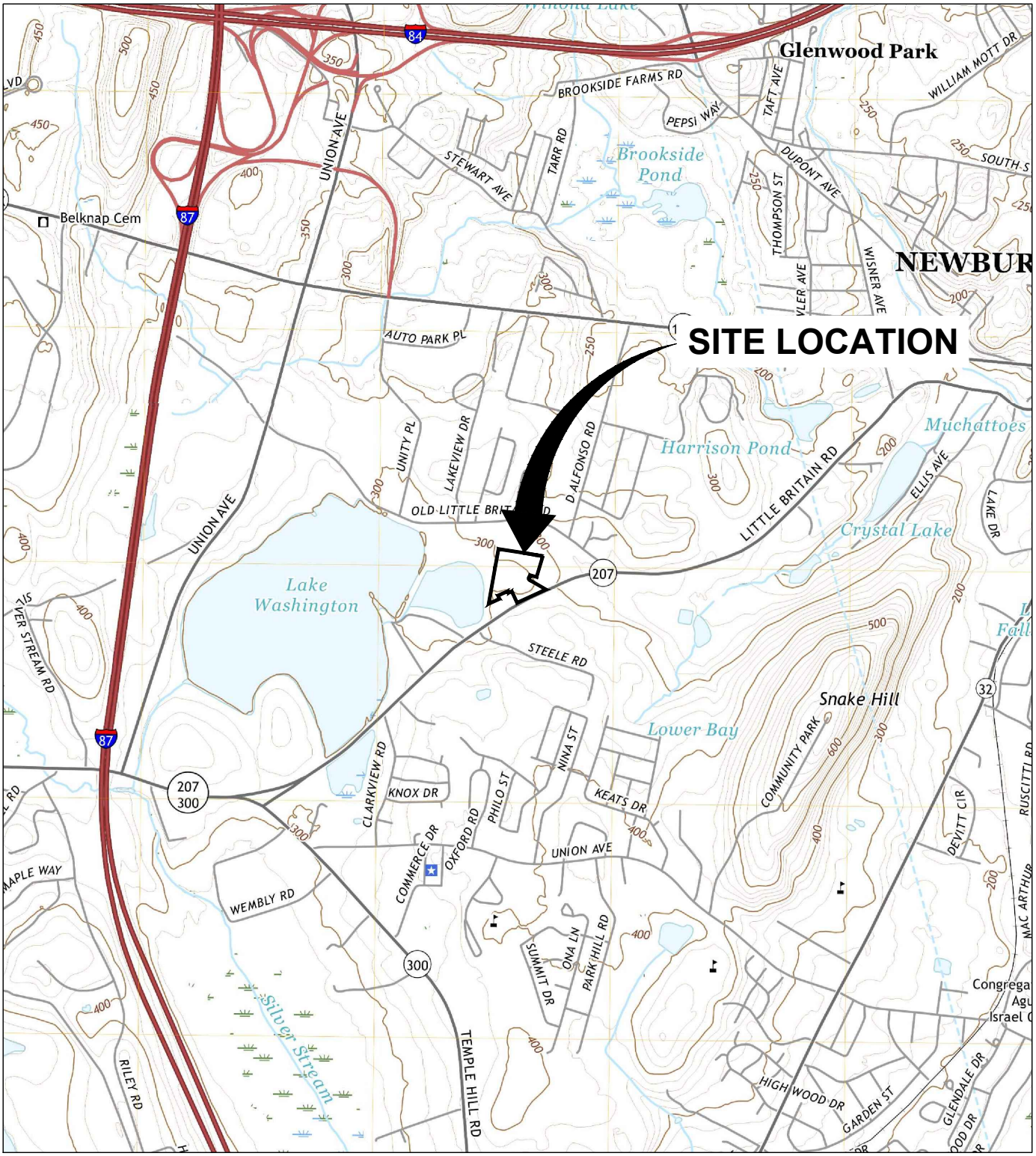
Table 2
Soil Vapor/Indoor Air Constituent List

Soil Vapor Intrusion Work Plan
Central Hudson Gas Electric Corp.
Little Britain Road Service Center, New Windsor, New York

Compound List	Units	Reporting Limit
USEPA TO-15 VOC LIST		
1,1,1-Trichloroethane	ug/m3	2.2 U
1,1-Dichloroethane	ug/m3	3.2 U
1,1-Dichloroethene	ug/m3	0.63 U
1,2,4-Trimethylbenzene	ug/m3	3.9 U
1,3,5-Trimethylbenzene	ug/m3	3.9 U
2,2,4-Trimethylpentane	ug/m3	3.7 U
2-Butanone	ug/m3	2.4 U
4-Ethyltoluene	ug/m3	3.9 U
Acetone	ug/m3	1.9 U
Benzene	ug/m3	2.6 U
Bromodichloromethane	ug/m3	2.7 U
Carbon Disulfide	ug/m3	2.5 U
Chloroform	ug/m3	2.8 U
Chloromethane	ug/m3	1.7 U
cis-1,2-Dichloroethene	ug/m3	0.63 U
Cyclohexane	ug/m3	2.8 U
Dichlorodifluoromethane	ug/m3	4.0 U
Ethanol	ug/m3	2.9 U
Ethyl acetate	ug/m3	3.6 U
Ethylbenzene	ug/m3	3.5 U
Isopropyl alcohol	ug/m3	2.0 U
m,p-Xylene	ug/m3	3.5 U
Methylene Chloride	ug/m3	2.8 U
n-Hexane	ug/m3	2.8 U
o-Xylene	ug/m3	3.5 U
Propylene	ug/m3	3.4 U
Tertiary butyl alcohol	ug/m3	2.4 U
Tetrachloroethene	ug/m3	1.1 U
Tetrahydrofuran	ug/m3	2.4 U
Toluene	ug/m3	3.0 U
trans-1,2-Dichloroethene	ug/m3	3.2 U
Trichloroethene	ug/m3	0.86 U
Trichlorofluoromethane	ug/m3	2.2 U
Vinyl Chloride	ug/m3	0.41 U
Xylenes (total)	ug/m3	3.5 U

Notes:
ug/m3 - micrograms per meter cubed
TO-15 - Method TO-15 (Determination of VOCs in Air Collected in Specially-Prepared Canisters and Analyzed by Gas Chromatography Mass Spectrometry)
U - The contaminant was not detected at a concentration greater than the detection limit.
USEPA - United States Environmental Protection Agency
VOC - volatile organic compound

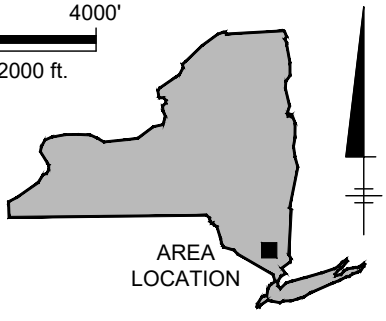
Figures



REFERENCE: BASE MAP USGS 7.5. MIN. TOPO. QUAD., CORNWALL-ON-HUDSON, NY, 2019 AND NEWBURGH, 2019, NY.

0 2000' 4000'

Approximate Scale: 1 in. = 2000 ft.



CENTRAL HUDSON GAS & ELECTRIC CORPORATION
LITTLE BRITAIN ROAD SERVICE CENTER
NEW WINDSOR, NEW YORK
SOIL VAPOR INVESTIGATION WORK PLAN

SITE LOCATION MAP

ARCADIS

FIGURE
1

IMAGES:
NY_Cornwall-on-Hudson_20190916_TM_geo.tif
NY_Newburgh_20190923_TM_geo.tif

C:\Users\lposenauer\ACCDocs\Arcadis\AUS-CENTRAL HUDSON GAS & ELECTRIC-LITTLE BRITAIN ROAD-NEW BRITAIN New York\Project Files\2022\01-In Progress\01-DWG\SVIWP-F01-USGS SLM.dwg LAYOUT: 1 SAVED: 7/26/2022 1:47 PM ACADVER: 24.0S (LMS TECH) PAGESETUP: C-PA-PDF
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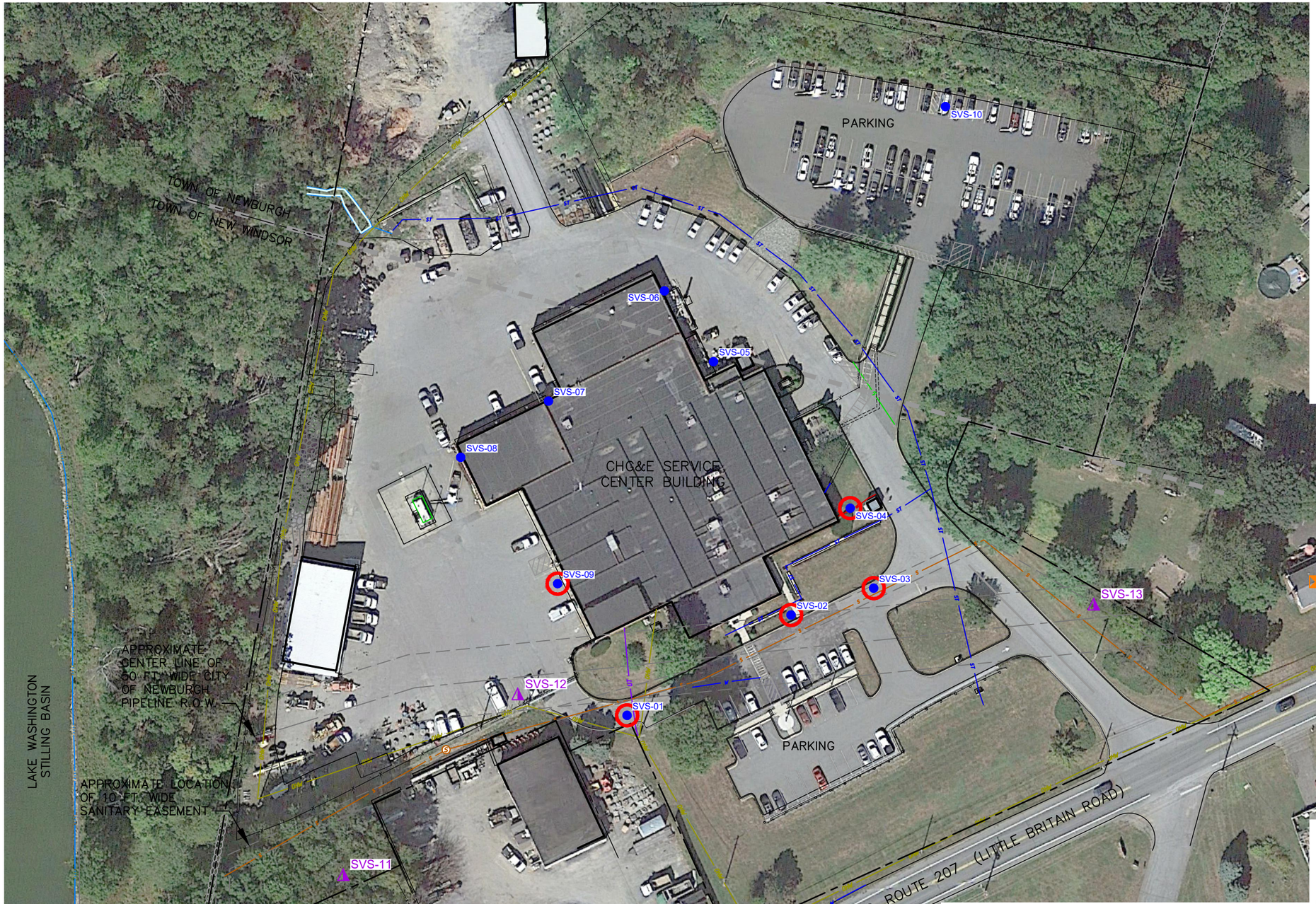

LEGEND:

- PROPOSED PAIRED INDOOR AIR AND SUB-SLAB SAMPLE LOCATION
- PROPOSED SOIL VAPOR SAMPLE LOCATION
- 2021 SOIL VAPOR SAMPLING LOCATION TO BE RE-SAMPLED
- SOIL VAPOR SAMPLING LOCATIONS
- SITE PROPERTY LINE
- ADJACENT PROPERTY LINE
- PROPERTY EASEMENT
- FENCE
- STONE WALL
- WATER COURSE
- OHW — OVERHEAD WIRES
- UE — UNDERGROUND ELECTRIC LINE
- UT — UNDERGROUND COMMUNICATIONS LINE
- S — UNDERGROUND SEWER LINE
- ST — EXISTING UNDERGROUND STORM LINE

0 80' 160'

GRAPHIC SCALE

NOTES:

1. BASE MAP PREPARED FROM SURVEY PERFORMED BY CHAZEN ENGINEERING, LAND SURVEYING & LANDSCAPE ARCHITECTURE, CO., D.P.C., DATED 09/14/2017 TITLED: MAP OF ENVIRONMENTAL EASEMENT SURVEY PREPARED FOR CENTRAL HUDSON GAS AND ELECTRIC CORP., AT A SCALE OF 1"=50'.
2. ALL UTILITY LOCATIONS ARE APPROXIMATE.
3. ALL INVESTIGATION LOCATIONS ARE APPROXIMATE.
4. GOOGLE AERIAL IMAGE DATED 9/18/2019 DOWNLOADED ON 10/26/2021.

CENTRAL HUDSON GAS & ELECTRIC CORPORATION
LITTLE BRITAIN ROAD SERVICE CENTER
NEW WINDSOR, NEW YORK
SOIL VAPOR INVESTIGATION WORK PLAN

SOIL VAPOR AND INDOOR AIR SAMPLING LOCATIONS

ARCADIS

FIGURE 2

C:\Users\posenauer\ACCDocs\Arcadis\AUS-CENTRAL HUDSON GAS & ELECTRIC-LITTLE BRITAIN ROAD-NEW BRITAIN New York\Project Files\2022\01-In Progress\01-DWG\SV\WP-F02-SOIL VAPOR.dwg LAYOUT: SV DATA SAVED: 9/28/2022 3:41 PM ACADVER: 24.2S (LMS TECH) PAGESETUP:
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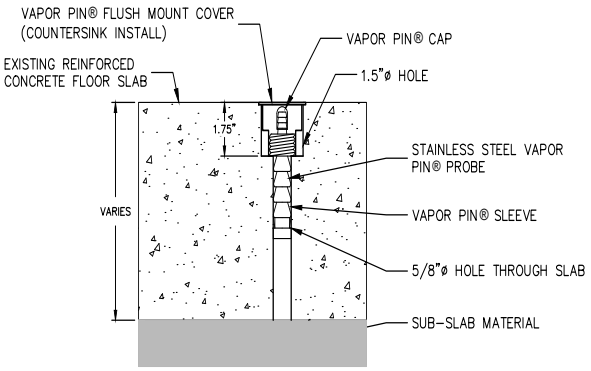
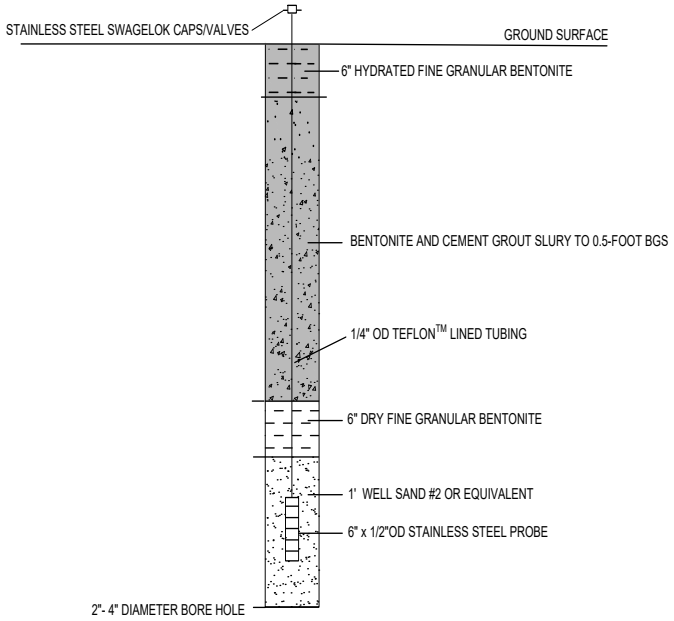


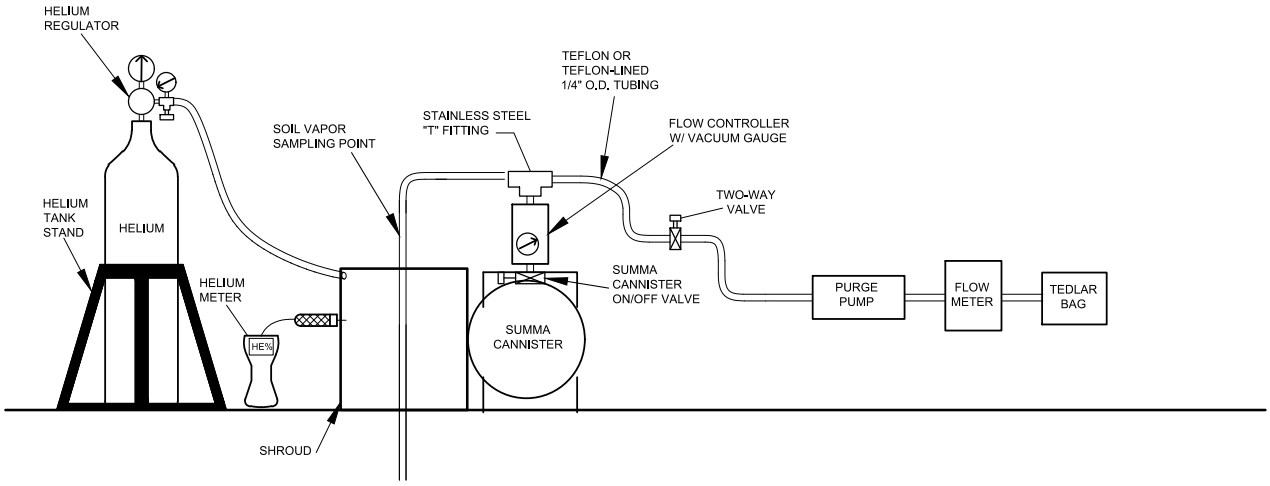
SUB-SLAB VAPOR SAMPLING POINT

NOT TO SCALE



TEMPORARY SOIL VAPOR SAMPLING POINT

NOT TO SCALE



SOIL VAPOR SAMPLING TRAIN

NOT TO SCALE

CENTRAL HUDSON GAS & ELECTRIC CORPORATION
LITTLE BRITAIN ROAD SERVICE CENTER
NEW WINDSOR, NEW YORK
SOIL VAPOR INVESTIGATION WORK PLAN

SOIL VAPOR SAMPLING DESIGN

ARCADIS

FIGURE
3

Attachment A

NYSDEC Structure Sampling & Building Questionnaire

Structure Sampling Questionnaire and Building Inventory

New York State Department of Environmental Conservation

Site Name: _____ Site Code: _____ Operable Unit: _____

Building Code: _____ Building Name: _____

Address: _____ Apt/Suite No: _____

City: _____ State: _____ Zip: _____ County: _____

Contact Information

Preparer's Name: _____ Phone No: _____

Preparer's Affiliation: _____ Company Code: _____

Purpose of Investigation: _____ Date of Inspection: _____

Contact Name: _____ Affiliation: _____

Phone No: _____ Alt. Phone No: _____ Email: _____

Number of Occupants (total): _____ Number of Children: _____

☐ Occupant Interviewed? ☐ Owner Occupied? ☐ Owner Interviewed?

Owner Name (if different): _____ Owner Phone: _____

Owner Mailing Address: _____

Building Details

Bldg Type (Res/Com/Ind/Mixed): _____ Bldg Size (S/M/L): _____

If Commercial or Industrial Facility, Select Operations:

If Residential Select Structure Type:

Number of Floors: _____ Approx. Year Construction: _____ ☐ Building Insulated? ☐ Attached Garage?

Describe Overall Building 'Tightness' and Airflows(e.g., results of smoke tests):

Foundation Description

Foundation Type: _____ Foundation Depth (bgs): _____ Unit: FEET

Foundation Floor Material: _____

Foundation Wall Material: _____

Foundation Floor Thickness: _____

Foundation Wall Thickness: _____ Unit: INCHES

☐ Floor penetrations? Describe Floor Penetrations: _____

☐ Wall penetrations? Describe Wall Penetrations: _____

Basement is: _____ Basement is: _____ ☐ Sumps/Drains? Water In Sump?: _____

Describe Foundation Condition (cracks, seepage, etc.) : _____

☐ Radon Mitigation System Installed? ☐ VOC Mitigation System Installed? ☐ Mitigation System On?

Heating/Cooling/Ventilation Systems

Heating System: _____ Heat Fuel Type: _____ ☐ Central A/C Present?

Vented Appliances

Water Heater Fuel Type: _____ Clothes Dryer Fuel Type: _____

Water Htr Vent Location: _____ Dryer Vent Location: _____

Structure Sampling Questionnaire and Building Inventory

New York State Department of Environmental Conservation

PRODUCT INVENTORY

Building Name: _____ Bldg Code: _____ Date: _____

Bldg Address: _____ Apt/Suite No: _____

Bldg City/State/Zip: _____

Make and Model of PID: _____ Date of Calibration: _____

Location	Product Name/Description	Size (oz)	Condition *	Chemical Ingredients	PID Reading	COC Y/N?
						☐
						☐
						☐
						☐
						☐
						☐
						☐
						☐
						☐
						☐
						☐
						☐
						☐
						☐
						☐
						☐
						☐
						☐

* Describe the condition of the product containers as **Unopened (UO)**, **Used (U)**, or **Deteriorated (D)**

** Photographs of the **front and back** of product containers can replace the handwritten list of chemical ingredients. However, the photographs must be of good quality and ingredient labels must be legible.

Product Inventory Complete? ☐ Were there any elevated PID readings taken on site? ☐ ☐ Products with COC?

Structure Sampling Questionnaire and Building Inventory

New York State Department of Environmental Conservation

Site Name: _____ Site Code: _____ Operable Unit: _____

Building Code: _____ Building Name: _____

Address: _____ Apt/Suite No: _____

City: _____ State: _____ Zip: _____ County: _____

Factors Affecting Indoor Air Quailty

Frequency Basement/Lowest Level is Occupied?: _____ Floor Material: _____

☐ Inhabited? ☐ HVAC System On? ☐ Bathroom Exhaust Fan? ☐ Kitchen Exhaust Fan?

Alternate Heat Source: _____ ☐ Is there smoking in the building?

☐ Air Fresheners? Description/Location of Air Freshener: _____

☐ Cleaning Products Used Recently?: Description of Cleaning Products: _____

☐ Cosmetic Products Used Recently?: Description of Cosmetic Products: _____

☐ New Carpet or Furniture? Location of New Carpet/Furniture: _____

☐ Recent Dry Cleaning? Location of Recently Dry Cleaned Fabrics: _____

☐ Recent Painting/Staining? Location of New Painting: _____

☐ Solvent or Chemical Odors? Describe Odors (if any): _____

☐ Do Any Occupants Use Solvents At Work? If So, List Solvents Used: _____

☐ Recent Pesticide/Rodenticide? Description of Last Use: _____

Describe Any Household Activities (chemical use,/storage, unvented appliances, hobbies, etc.) That May Affect Indoor Air Quality:

☐ Any Prior Testing For Radon? If So, When?: _____

☐ Any Prior Testing For VOCs? If So, When?: _____

Sampling Conditions

Weather Conditions: _____ Outdoor Temperature: _____ °F

Current Building Use: _____ Barometric Pressure: _____ in(hg)

Product Inventory Complete? _____ ☐ Building Questionnaire Completed?

Structure Sampling Questionnaire and Building Inventory

New York State Department of Environmental Conservation

Building Code: _____ Address: _____

Sampling Information

Sampler Name(s): _____ Sampler Company Code: _____

Sample Collection Date: _____ Date Samples Sent To Lab: _____

Sample Chain of Custody Number: _____ Outdoor Air Sample Location ID: _____

SUMMA Canister Information

Sample ID:					
Location Code:					
Location Type:					
Canister ID:					
Regulator ID:					
Matrix:					
Sampling Method:					

Sampling Area Info

Slab Thickness (inches):					
Sub-Slab Material:					
Sub-Slab Moisture:					
Seal Type:					
Seal Adequate?:	☐	☐	☐	☐	☐

Sample Times and Vacuum Readings

Sample Start Date/Time:					
Vacuum Gauge Start:					
Sample End Date/Time:					
Vacuum Gauge End:					
Sample Duration (hrs):					
Vacuum Gauge Unit:					

Sample QA/QC Readings

Vapor Port Purge:	☐	☐	☐	☐	☐
Purge PID Reading:					
Purge PID Unit:					
Tracer Test Pass:	☐	☐	☐	☐	☐

Sample start and end times should be entered using the following format: MM/DD/YYYY HH:MM

Structure Sampling Questionnaire and Building Inventory

New York State Department of Environmental Conservation

LOWEST BUILDING LEVEL LAYOUT SKETCH

Please click the box with the blue border below to upload a sketch of the lowest building level . The sketch should be in a standard image format (.jpg, .png, .tiff)

Clear Image

Design Sketch

Design Sketch Guidelines and Recommended Symbology

- Identify and label the locations of all sub-slab, indoor air, and outdoor air samples on the layout sketch.
- Measure the distance of all sample locations from identifiable features, and include on the layout sketch.
- Identify room use (bedroom, living room, den, kitchen, etc.) on the layout sket
- Identify the locations of the following features on the layout sketch, using the appropriate symbols:

B or **F**	Boiler or Furnace	o	Other floor or wall penetrations (label appropriately)
HW	Hot Water Heater	**xxxxxxx**	Perimeter Drains (draw inside or outside outer walls as appropriate)
FP	Fireplaces	**######**	Areas of broken-up concrete
WS	Wood Stoves	● SS-1	Location & label of sub-slab samples
W/D	Washer / Dryer	● IA-1	Location & label of indoor air samples
S	Sumps	● OA-1	Location & label of outdoor air samples
@	Floor Drains	● PFET-1	Location and label of any pressure field test holes.

Structure Sampling Questionnaire and Building Inventory

New York State Department of Environmental Conservation

FIRST FLOOR BUILDING LAYOUT SKETCH

Please click the box with the blue border below to upload a sketch of the first floor of the building.
The sketch should be in a standard image format (.jpg, .png, .tiff)

Clear Image

Design Sketch

Design Sketch Guidelines and Recommended Symbology

- Identify and label the locations of all sub-slab, indoor air, and outdoor air samples on the layout sketch.
- Measure the distance of all sample locations from identifiable features, and include on the layout sketch.
- Identify room use (bedroom, living room, den, kitchen, etc.) on the layout sket
- Identify the locations of the following features on the layout sketch, using the appropriate symbols:

B or **F**	Boiler or Furnace	o	Other floor or wall penetrations (label appropriately)
HW	Hot Water Heater	**xxxxxxx**	Perimeter Drains (draw inside or outside outer walls as appropriate)
FP	Fireplaces	**######**	Areas of broken-up concrete
WS	Wood Stoves	● SS-1	Location & label of sub-slab samples
W/D	Washer / Dryer	● IA-1	Location & label of indoor air samples
S	Sumps	● OA-1	Location & label of outdoor air samples
@	Floor Drains	● PFET-1	Location and label of any pressure field test holes.

Structure Sampling Questionnaire and Building Inventory

New York State Department of Environmental Conservation

OUTDOOR PLOT LAYOUT SKETCH

Please click the box with the blue border below to upload a sketch of the outdoor plot of the building as well as the surrounding area. The sketch should be in a standard image format (.jpg, .png, .tiff)

Clear Image

Design Sketch

Design Sketch Guidelines and Recommended Symbology

- Identify and label the locations of all sub-slab, indoor air, and outdoor air samples on the layout sketch.
- Measure the distance of all sample locations from identifiable features, and include on the layout sketch.
- Identify room use (bedroom, living room, den, kitchen, etc.) on the layout sket
- Identify the locations of the following features on the layout sketch, using the appropriate symbols:

B or **F**	Boiler or Furnace	o	Other floor or wall penetrations (label appropriately)
HW	Hot Water Heater	**xxxxxxx**	Perimeter Drains (draw inside or outside outer walls as appropriate)
FP	Fireplaces	**######**	Areas of broken-up concrete
WS	Wood Stoves	● SS-1	Location & label of sub-slab samples
W/D	Washer / Dryer	● IA-1	Location & label of indoor air samples
S	Sumps	● OA-1	Location & label of outdoor air samples
@	Floor Drains	● PFET-1	Location and label of any pressure field test holes.

Attachment B

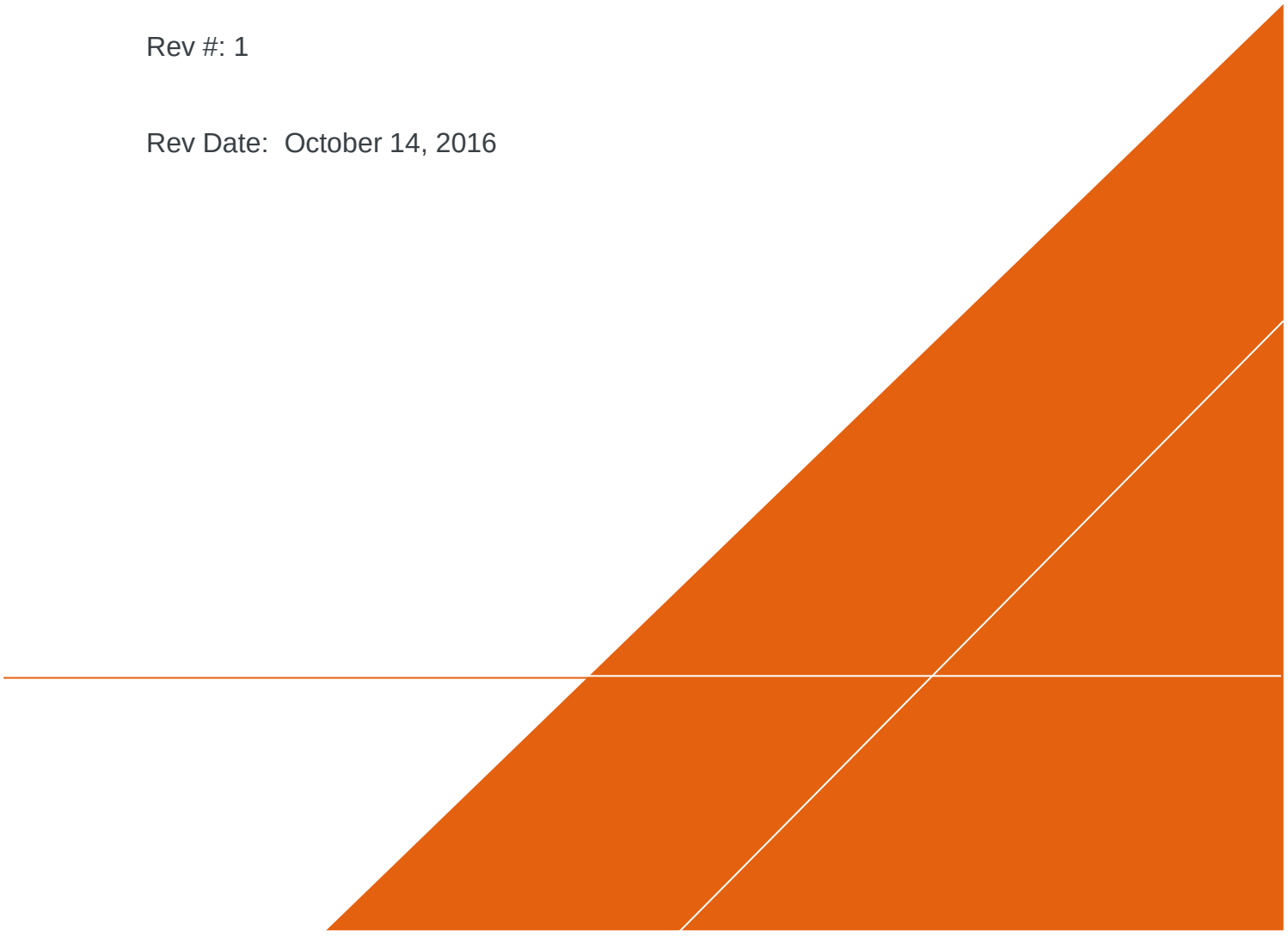
Arcadis Technical Guidance and Information Documents

ARCADIS Design & Consultancy for natural and built assets

TGI - ADMINISTERING HELIUM TRACER GAS LEAK TEST

Rev #: 1

Rev Date: October 14, 2016



APPROVAL SIGNATURES

Prepared by:  Date: 10/14/2016

Eric Cathcart

Reviewed by:  Date: 10/14/2016

Mitch Wacksman

I. INTRODUCTION

This Technical Guidance Instruction (TGI) document describes the procedures to conduct a building survey prior to indoor air sampling.

This document describes general and/or specific procedures, methods, actions, steps, and considerations to be used and observed by Arcadis staff when performing work, tasks, or actions under the scope and relevancy of this document. This document may describe expectations, requirements, guidance, recommendations, and/or instructions pertinent to the service, work task, or activity it covers.

It is the responsibility of the Arcadis Certified Project Manager (CPM) to provide this document to the persons conducting services that fall under the scope and purpose of this procedure, instruction, and/or guidance. The Arcadis CPM will also ensure that the persons conducting the work falling under this document are appropriately trained and familiar with its content. The persons conducting the work under this document are required to meet the minimum competency requirements outlined herein, and inquire to the CPM regarding any questions, misunderstanding, or discrepancy related to the work under this document.

This document is not considered to be all inclusive nor does it apply to all projects. It is the CPM's responsibility to determine the proper scope and personnel required for each project. There may be project- and/or client- and/or state-specific requirements that may be more or less stringent than what is described herein. The CPM is responsible for informing Arcadis and/or Subcontractor personnel of omissions and/or deviations from this document that may be required for the project. In turn, project staff are required to inform the CPM if or when there is a deviation or omission from work performed as compared to what is described herein.

In following this document to execute the scope of work for a project, it may be necessary for staff to make professional judgment decisions to meet the project's scope of work based upon site conditions, staffing expertise, regulation-specific requirements, health and safety concerns, etc. Staff are required to consult with the CPM when or if a deviation or omission from this document is required that has not already been previously approved by the CPM. Upon approval by the CPM, the staff can perform the deviation or omission as confirmed by the CPM.

II. SCOPE AND APPLICATION

When collecting subsurface vapor samples as part of a vapor intrusion evaluation, a tracer gas serves as a quality assurance/quality control method to verify the integrity of the vapor port seal and the numerous connections comprising the sample train. Without the use of a tracer, verification that a soil vapor sample has not been diluted by ambient or indoor air is difficult.

This Technical Guidance Instruction (TGI) focuses on using helium as a tracer gas. It should be noted that a field helium meter could register a false positive if methane is present in the subsurface. In this case an alternative method should be employed (i.e., water dam test), The protocol for using a tracer gas includes the following basic steps: (1) enrich the atmosphere in the immediate vicinity of the sample port where ambient air could enter the sampling train during sampling with the tracer gas; and (2) measure a vapor sample from the sample tubing for the presence of elevated concentrations (> 10%) of the tracer. A plastic pail, bucket, garbage can or

even a plastic bag can serve as a shroud to keep the tracer gas in contact with the port during the testing.

There are two basic approaches to testing for the tracer gas:

1. Include the tracer gas in the list of target analytes reported by the laboratory; and/or

2. Use a portable monitoring device to analyze a sample of soil vapor for the tracer prior to sampling for the compounds of concern. (Note that tracer gas samples can be collected via syringe, Tedlar bag, etc. They need not be collected in SUMMA® canisters or mini-cans.)

This TGI focuses on monitoring helium using a portable sampling device, although helium can also be analyzed by the laboratory along with other volatile organic compounds (VOCs). Real-time tracer sampling allows the investigator to confirm the integrity of the port seals prior to formal sample collection.

During the initial stages of a subsurface vapor sampling program, tracer gas samples should be collected at each of the sampling points. If the results of the initial samples indicate that the port seals are adequate, the Project Manager can consider reducing the number of locations at which tracer gas samples are used in future monitoring rounds. At a minimum, at least 10% of the subsequent samples should be supported with tracer gas analyses. When using permanent soil vapor points as part of a long-term monitoring program, the port should be tested prior to the first sampling event. Tracer gas testing of subsequent sampling events may often be reduced or eliminated unless conditions have changed at the site. Soil gas port integrity should certainly be rechecked with Tracer gas if land clearing/grading activities, freeze thaw cycles, or soil desiccation may have occurred. Points should also be rechecked if more than 2 years have elapsed since the last check of that port.

III. PERSONNEL QUALIFICATIONS

Arcadis field sampling personnel will have current health and safety training, including 40-hour HAZWOPER training, site supervisor training, site-specific training, first aid, and cardiopulmonary resuscitation (CPR), as needed. Arcadis field sampling personnel will be competent in the relevant procedures and possess the required skills and experience necessary to successfully complete the desired field work. Arcadis personnel responsible for directing tracer gas testing must have previous experience conducting similar tests without direct supervision.

IV. EQUIPMENT LIST

The equipment required to conduct a helium tracer gas test is presented below:

- Appropriate PPE for site (as required by the Health and Safety Plan)
- Helium (laboratory grade)
- Regulator for helium tank
- Shroud (plastic bucket, garbage can, plastic bag, etc)

- The size of the shroud should be sufficient to fit over the sample port. It is worth noting that using the smallest shroud possible will minimize the volume of helium needed; this may be important when projects require a large number of helium tracer tests.
- The shroud will need to have three small holes in it. These holes will include one on the top (to accommodate the sample tubing), and two on the side (one for the helium detector probe, and one for the helium line).
- The shroud should ideally enclose the sample port and as much as possible of the sampling train.

- Helium detector capable of measuring from 1 - 100% (Dielectric MGD-2002, Mark Model 9522, or equivalent)
- Tedlar bag
- Seal material for shroud (rubber gasket, VOC-free modeling clay, bentonite, etc) to keep helium levels in shroud high in windy conditions. Although the sealing material is not in direct contact with the sample if leakage does not occur, sealing materials with high levels of VOC emissions should be avoided, since they could contaminate a sample if a leak occurs.
- Sample logs
- Field notebook

V. CAUTIONS

Helium is an asphyxiant! Be cautious with its use indoors! Never release large volumes of helium within a closed room!

Field sampling equipment must be carefully handled to minimize the potential for injury and the spread of hazardous substances. All sampling personnel should review the appropriate health and safety plan (HASP) and job safety analysis (JSA) prior to beginning work to be aware of all potential hazards associated with the job site and the specific task. Field staff should review the attachment on safely handling compressed gas cylinders prior to commencing field work.

Compressed gas cylinders should be handled with caution; see attachment on the use and storage of compressed gasses before beginning field work.

Care should be taken not to pressurize the shroud while introducing helium. If the shroud is completely air tight and the helium is introduced quickly, the shroud can be over-pressurized and helium can be pushed into the ground. Provide a relief valve or small gap where the helium can escape.

Because minor leakage around the port seal should not materially affect the usability of the soil vapor sampling results, the mere presence of the tracer gas in the sample should not be a cause for alarm. Consequently, portable field monitoring devices with detection limits in the low ppm range are more than adequate for screening samples for the tracer. If high concentrations (> 10%) of tracer gas are observed in a sample, the port seal should be enhanced and fittings within the sampling train should be should be checked and/or tightened to reduce the infiltration of ambient air

and the tracer test re-administered. If the problem cannot be rectified, a new sample point should be installed or an alternate sampling train used.

VI. PROCEDURE

The helium tracer test can be conducted when using temporary or permanent sampling points and inside or outside a facility. A visual of an example helium tracer gas test equipment set up in included as Figure 1.

1. Attach Teflon or nylon (Nylaflow) sample tubing to the sample point. This can be accomplished utilizing a number of different methods depending on the sample install (i.e., Swage-Lok or comparable fittings).
2. Place the shroud over the sample point and tubing.
3. Pull the tubing through hole in top of shroud. Seal opening at top of shroud with VOC free modeling clay.
4. Place weight on top of shroud to help maintain a good seal with the ground.
5. Insert helium tubing and helium detector probe into side of shroud. Seal both with modeling clay to prevent leaks.
6. Fill shroud with helium. Fill shroud slowly, allowing atmospheric air to escape either by leaving a gap where the shroud meets the ground surface or by providing a release value on the side of the shroud. Do not pressurize the shroud!
7. Use the helium detector to monitor helium concentration within the shroud from the lowest hole drilled in the shroud (bottom of the shroud nearest where the sample tubing intersects the ground). Helium should be added until the environment inside the shroud has > 40% helium.
8. Purge the sample point through the sample tubing into a Tedlar bag using a syringe equipped with a three-way leur lock valve. The purge rate should at least match the sample collection rate but not exceed 100 ml/min. Test the air in the Tedlar bag for helium using portable helium detector. If the point is free of leaks there should be very low helium in the purge air from the soil. The natural concentration of helium in the atmosphere is 0.00052% by volume and there are few if any natural sources of helium to soil gas.
9. If > 10% of the amount of helium present in the shroud is noted in purge air, rectify issues with the seal at the sample port and repeat the testing procedure. If the seal cannot be fixed, reinstall sample point.
10. Monitor and record helium level in shroud before, during and after tracer test.
11. Monitor and record helium level in purge exhaust.
12. At successful completion of tracer test and sample point purging, the soil vapor sample can be collected (if the helium shroud must be removed prior to sample collection be mindful not disturb the sample tubing and any established seals.

VII. WASTE MANAGEMENT

No specific waste management procedures are required.

VIII. DATA RECORDING AND MANAGEMENT

Measurements will be recorded on the sample logs at the time of measurement with notations of the project name, sample date, sample start and finish time, sample location, and the helium concentrations in both the shroud and the purge air before, during, and after tracer testing. Any problems encountered should also be recorded in the field notes.

IX. QUALITY ASSURANCE

Conduct quality assurance as required by the project-specific work plan and/or Quality Assurance Project Plan (QAPP).

ATTACHMENT: Compressed Gases – Use and Storage

In general, a compressed gas is any material contained under pressure that is dissolved or liquefied by compression or refrigeration. Compressed gas cylinders should be handled as high- energy sources and therefore as potential explosives and projectiles. Prudent safety practices should be followed when handling compressed gases since they expose workers to both chemical and physical hazards.

Handling

- Safety glasses with side shields (or safety goggles) and other appropriate personal protective equipment should be worn when working with compressed gases.
- Cylinders should be marked with a label that clearly identifies the contents.
- All cylinders should be checked for damage prior to use. Do not repair damaged cylinders or valves. Damaged or defective cylinders, valves, etc., should be taken out of use immediately and returned to the manufacturer/distributor for repair.
- All gas cylinders (full or empty) should be rigidly secured to a substantial structure at 2/3 height. Only two cylinders per restraint are allowed in the laboratory and only soldered link chains or belts with buckles are acceptable. Cylinder stands are also acceptable but not preferred.
- Handcarts shall be used when moving gas cylinders. Cylinders must be chained to the carts.
- All cylinders must be fitted with safety valve covers before they are moved.
- Only three-wheeled or four-wheeled carts should be used to move cylinders.
- A pressure-regulating device shall be used at all times to control the flow of gas from the cylinder.
- The main cylinder valve shall be the only means by which gas flow is to be shut off. The correct position for the main valve is all the way on or all the way off.
- Cylinder valves should never be lubricated, modified, forced, or tampered with.
- After connecting a cylinder, check for leaks at connections. Periodically check for leaks while the cylinder is in use.
- Regulators and valves should be tightened firmly with the proper size wrench. Do not use adjustable wrenches or pliers because they may damage the nuts.
- Cylinders should not be placed near heat or where they can become part of an electrical circuit.
- Cylinders should not be exposed to temperatures above 50 °C (122 °F). Some rupture devices on cylinders will release at about 65 °C (149 °F). Some small cylinders, such as

lecture bottles, are not fitted with rupture devices and may explode if exposed to high temperatures.

- Rapid release of a compressed gas should be avoided because it will cause an unsecured gas hose to whip dangerously and also may build up enough static charge to ignite a flammable gas.
- Appropriate regulators should be used on each gas cylinder. Threads and the configuration of valve outlets are different for each family of gases to avoid improper use. Adaptors and homemade modifications are prohibited.
- Cylinders should never be bled completely empty. Leave a slight pressure to keep contaminants out.

Storage

- When not in use, cylinders should be stored with their main valve closed and the valve safety cap in place.
- Cylinders must be stored upright and not on their side. All cylinders should be secured.
- Cylinders awaiting use should be stored according to their hazard classes.
- Cylinders should not be located where objects may strike or fall on them.
- Cylinders should not be stored in damp areas or near salt, corrosive chemicals, chemical vapors, heat, or direct sunlight. Cylinders stored outside should be protected from the weather.

Special Precautions

Flammable Gases

- No more than two cylinders should be manifolded together; however, several instruments or outlets are permitted for a single cylinder.
- Valves on flammable gas cylinders should be shut off when the laboratory is unattended and no experimental process is in progress.
- Flames involving a highly flammable gas should not be extinguished until the source of the gas has been safely shut off; otherwise it can reignite causing an explosion.

Acetylene Gas Cylinders

- Acetylene cylinders must always be stored upright. They contain acetone, which can discharge instead of or along with acetylene. Do not use an acetylene cylinder that has been stored or handled in a nonupright position until it has remained in an upright position for at least 30 minutes.
- A flame arrestor must protect the outlet line of an acetylene cylinder.

- Compatible tubing should be used to transport gaseous acetylene. Some tubing like copper forms explosive acetylides.

Lecture Bottles

- All lecture bottles should be marked with a label that clearly identifies the contents.
- Lecture bottles should be stored according to their hazard classes.
- Lecture bottles that contain toxic gases should be stored in a ventilated cabinet.
- Lecture bottles should be stored in a secure place to eliminate them from rolling or falling.
- Lecture bottles should not be stored near corrosives, heat, direct sunlight, or in damp areas.
- To avoid costly disposal fees, lecture bottles should only be purchased from suppliers that will accept returned bottles (full or empty). Contact the supplier before purchasing lecture bottles to ensure that they have a return policy.
- Lecture bottles should be dated upon initial use. It is advised that bottles be sent back to the supplier after one year to avoid accumulation of old bottles.

ARCADIS Design & Consultancy for natural and built assets

TGI - BUILDING SURVEYING PRIOR TO VAPOR INTRUSION INDOOR AIR SAMPLING

Rev. #: 1

Rev Date: August 16, 2016

SOP VERSION CONTROL

Revision No	Revision Date	Page No(s)	Description	Reviewed by
1	8/19/2016	All	Update Rev 0	Margaret Bartee Mitch Wacksman

APPROVAL SIGNATURES

Prepared by: _____ Date: 8/19/2016

Margaret Bartee

Reviewed by: _____ Date: 8/19/2016

Mitch Wacksman

I. SCOPE AND APPLICATION

This Technical Guidance Instruction (TGI) document describes the procedures to conduct a building survey prior to indoor air sampling.

II. PERSONNEL QUALIFICATIONS

Arcadis field sampling personnel will have current health and safety training, including 40-hour HAZWOPER training, site supervisor training, site-specific training, first aid, and cardiopulmonary resuscitation (CPR), as needed. Arcadis field sampling personnel will be competent in the relevant procedures and possess the required skills and experience necessary to successfully complete the desired field work. Arcadis personnel responsible for directing indoor air and/or ambient air sample collection activities must have previous indoor air sampling experience and be able to complete the field work without direct supervision.

III. EQUIPMENT LIST

The equipment required for conducting a building survey is presented below:

- Building survey form specific to jurisdiction, or using one of the attached forms. If the building survey form does not include sufficient space for documenting the chemical product inventory, bring additional pages (attached) to complete the chemical product inventory.
- Photoionization detector (PID) capable of readings in the parts per billion by volume (ppbv) range (e.g., ppbRae)
- Nitrile gloves

IV. HEALTH AND SAFETY CONSIDERATIONS

All survey personnel should review the appropriate health and safety plan (HASP) and job safety analysis (JSA) prior to beginning work to be aware of all potential hazards associated with the job site and the specific task.

V. PROCEDURE

Using the appropriate building survey form, document site information; building construction, usage, and layout; and chemical products present in the building prior to conducting indoor air sampling. The building survey form should be jurisdiction-specific, or use one of the generic Arcadis forms for either a commercial or residential building included in Attachment A.

- Complete the portions of the form provide site and property information. This information may be completed in advance of the building survey.
- If property contact is available, review building construction, layout, usage, and occupancy information with property contact. If no property contact is available, complete these portions of the form based on observations during the building survey.
- Document observed products or materials that may potentially produce or emit volatile organic compounds (VOCs) on the building survey form, or if sufficient space is unavailable, on separate pages. Record brand name, product name, and product identification number; take a reading with the PID to

evaluate potential off-gassing; and take a photograph of each product or material documented. Use nitrile gloves, as needed, to handle chemical products. If the building is owned and/or occupied by a commercial/industrial occupant, ask the property contact whether a copy of the chemical product inventory could be provided for confirmatory purposes.

- Items or materials that contain contaminants of concern and/or exhibit elevated PID readings shall be considered probable sources of VOCs. Request approval of the owner or occupant to have these items removed to a structure not attached to the target structure at least 48 hours prior to sampling, if possible.
- Note the buildings current condition, particularly the floor slab. Pay attention for any penetrations or perforations in the floor that could act as preferential pathways. These include floor cracks, floor drains, utility penetrations, and sumps.
- Set a date and time with the owner or occupant to return to conduct sampling.

VI. WASTE MANAGEMENT

No specific waste management procedures are required.

VII. DATA RECORDING AND MANAGEMENT

Notes taken during the initial building survey will be recorded on the building survey form. A copy of the building survey form will be transmitted to the Task Manager or Project Manager.

VIII. QUALITY ASSURANCE

Conduct quality assurance as required by the project-specific work plan and/or Quality Assurance Project Plan (QAPP).

ARCADIS Design & Consultancy for natural and built assets

TGI - INDOOR OR AMBIENT AIR SAMPLING AND ANALYSIS VIA USEPA METHOD TO-15

Rev #: 1

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SOP VERSION CONTROL

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1	8/19/2016	All	Updated Rev0	Mitch Wacksman

APPROVAL SIGNATURES

Prepared by: _____ Date: 8/19/2016

Margaret Bartee

Reviewed by: _____ Date: 8/19/2016

Mitch Wacksman

I. INTRODUCTION

This Technical Guidance Instruction (TGI) document describes the procedures to conduct a building survey prior to indoor air sampling.

This document describes general and/or specific procedures, methods, actions, steps, and considerations to be used and observed by Arcadis staff when performing work, tasks, or actions under the scope and relevancy of this document. This document may describe expectations, requirements, guidance, recommendations, and/or instructions pertinent to the service, work task, or activity it covers.

It is the responsibility of the Arcadis Certified Project Manager (CPM) to provide this document to the persons conducting services that fall under the scope and purpose of this procedure, instruction, and/or guidance. The Arcadis CPM will also ensure that the persons conducting the work falling under this document are appropriately trained and familiar with its content. The persons conducting the work under this document are required to meet the minimum competency requirements outlined herein, and inquire to the CPM regarding any questions, misunderstanding, or discrepancy related to the work under this document.

This document is not considered to be all inclusive nor does it apply to all projects. It is the CPM's responsibility to determine the proper scope and personnel required for each project. There may be project- and/or client- and/or state-specific requirements that may be more or less stringent than what is described herein. The CPM is responsible for informing Arcadis and/or Subcontractor personnel of omissions and/or deviations from this document that may be required for the project. In turn, project staff are required to inform the CPM if or when there is a deviation or omission from work performed as compared to what is described herein.

In following this document to execute the scope of work for a project, it may be necessary for staff to make professional judgment decisions to meet the project's scope of work based upon site conditions, staffing expertise, regulation-specific requirements, health and safety concerns, etc. Staff are required to consult with the CPM when or if a deviation or omission from this document is required that has not already been previously approved by the CPM. Upon approval by the CPM, the staff can perform the deviation or omission as confirmed by the CPM.

II. SCOPE AND APPLICATION

This Technical Guidance Instruction (TGI) document describes the procedures to collect indoor air or ambient air samples in passivated stainless steel canisters (e.g., SUMMA®) for the analysis of volatile organic compounds (VOCs) using United States Environmental Protection Agency (USEPA) Method TO-15 (TO-15).

III. PERSONNEL QUALIFICATIONS

Arcadis field sampling personnel will have current health and safety training, including 40-hour HAZWOPER training, site supervisor training, site-specific training, first aid, and cardiopulmonary resuscitation (CPR), as needed. Arcadis field sampling personnel will be competent in the relevant procedures and possess the required skills and experience necessary to successfully complete the

desired field work. Arcadis personnel responsible for directing indoor air and/or ambient air sample collection activities must have previous indoor air sampling experience and be able to complete the field work without direct supervision.

IV. EQUIPMENT LIST

The equipment required for indoor air sample collection is presented below:

- 6-liter, stainless steel passivated canisters (e.g., SUMMA®). Request one canister for each sampling location, plus duplicate canisters per project-specific requirements. If feasible, order extra canisters at a rate of 10 to 20% of the total number of sampling canisters (including duplicates).
- Flow controllers with in-line particulate filters and vacuum gauges. Flow controllers are pre-calibrated by the laboratory to the sampling duration [e.g., 8 hours] specified by the project team). Vacuum gauges are also generally supplied by the laboratory.
- Open-end wrench. Typical canister caps require 9/16-inch wrenches.
- Chain-of-custody (COC) form.
- Sample collection log (attached).
- Box, chair, tripod, or similar to hold canister above the ground surface at approximate breathing height (3-5 feet).
- Camera (optional, if photography is permitted at sampling locations).
- Hand-held weather meter (optional)

For abnormal situations (i.e., sumps, crawlspaces with no access, where canisters must be hidden, etc.), Teflon tubing may be used to collect an air sample. In these situations, ¼-inch Swagelok fittings (including nut, front sleeve, and back sleeve) or other methods may be appropriate to affix tubing to canister.

V. CAUTIONS

Care must be taken to minimize the potential for introducing interferences during the sampling event. As such, keep canisters away from heavy pedestrian traffic areas (e.g., main entranceways, walkways), if possible. Sampling personnel should not handle hazardous substances (such as gasoline), permanent marking pens (sharpies), wear/apply fragrances, or smoke cigarettes before and/or during the sampling event.

Specify sample collection duration with the laboratory when ordering equipment, and confirm with the laboratory upon equipment receipt. Sample integrity can be compromised if sample collection is extended to the point that the canister reaches atmospheric pressure. Sample integrity is maintained if sample collection is terminated prior to the target sample duration and a measurable vacuum (e.g., 5 inches Hg) remains in the canister when sample collection is terminated.

VI. HEALTH AND SAFETY CONSIDERATIONS

All sampling personnel should review the appropriate health and safety plan (HASP) and job safety analysis (JSA) prior to beginning work to be aware of all potential hazards associated with the job site and the specific task.

VII. PROCEDURE

Preparation of Passivated Canister and Collection of Sample

1. Record the following information on the sampling form (use a hand-held weather meter, contact the local airport or other suitable information source [e.g., weatherunderground.com] to obtain the following information):
    - ambient temperature
    - barometric pressure
    - wind speed
    - relative humidity
    - significant recent precipitation
    - snow/ice cover
2. For indoor air sampling, note whether the heating, ventilation, and air conditioning (HVAC) system is operational and record settings.
3. Choose the sampling location in accordance with the project sampling plan. If a breathing zone sample is required, place the canister on a box, chair, tripod, or other similar stand to locate the canister orifice 3 to 5 feet above the ground or floor surface. The canister may be affixed to wall/ceiling support with nylon rope or placed on a stable surface. In general, areas near windows, doors, air supply vents, and/or other potential sources of “drafts” shall be avoided.
4. Record canister serial number and flow controller number on the sampling log and COC form. Assign sample identification (ID), and record on canister ID tag, sample collection log (Attachment A), and COC form.
5. Remove the brass dust cap from the canister with the wrench. Attach the flow controller and vacuum gauge to the canister with the wrench. Tighten with fingers first, then gently with the wrench (roughly a quarter turn). Use caution not to over tighten fittings.
6. Open the canister valve to initiate sample collection. Record the date and local time (24-hour basis) of valve opening on the sample collection log and COC form. Collection of duplicate samples will include collecting two samples side by side at the same time.
7. Check the initial canister pressure using the vacuum gauge. Record the initial pressure in the canister on the sample log and COC form. The initial pressure reading should be evaluated with respect to project-specific and jurisdictional requirements. If the initial pressure registers less

than -25 inches of Hg, then the canister is not appropriate for use, and another canister should be used.

8. Photograph the canister and surrounding area, if photography is permitted at sampling locations.
9. If feasible, check the canister approximately half-way through the sample duration and note progress on sample logs.

Termination of Sample Collection

1. Arrive at the sampling location at least 1 to 2 hours prior to the end of the sampling interval (e.g., 6 hours following sample initiation for an 8-hour sampling duration).
2. Stop collecting the sample by turning the valve on the canister when the canister pressure reaches approximately -5 inches of Hg or when the desired sample time has elapsed, whichever comes first. Leaving some vacuum in the canister provides a way to evaluate whether the canister leaks before it reaches the laboratory.
3. Record the final canister pressure. Record the date and local time (24-hour basis) of valve closing on the sample collection log and COC form.
4. Remove the flow controller from the canister, re-install brass cap on canister fitting, and tighten with the wrench.
5. Package the canister and flow controller in accordance with Department of Transportation regulations available on the Transportation Health and Safety's Team Site on the Source for return shipment to the laboratory. The canister does not require preservation with ice or refrigeration during shipment.
6. Complete the forms and sample labels provided by the laboratory as directed (e.g., affix card with string).
7. Complete COC form; copy, photograph, or scan a version for the project file (if possible); and place the form in the shipping container. Close the shipping container and affix the custody seal to the container closure. Transmit canisters via courier delivery service (e.g., Federal Express or UPS) to laboratory for analysis.

VIII. WASTE MANAGEMENT

No specific waste management procedures are required.

IX. DATA RECORDING AND MANAGEMENT

Notes will be recorded on the sampling log form (attached), with notations of project name, sample date, sample time, and sample location (e.g., description and GPS coordinates if available) sample start and finish times, canister serial number, flow controller number, initial vacuum reading, and final vacuum reading. Sampling logs and COC records will be transmitted to the Task Manager or Project Manager and stored in the project file consistent with client and project requirements.

X. QUALITY ASSURANCE

Conduct quality assurance as required by the project-specific work plan and/or Quality Assurance Project Plan (QAPP).

ARCADIS Design & Consultancy for natural and built assets

TGI - SUB-SLAB SOIL VAPOR OR SOIL VAPOR SAMPLING USING WHOLE AIR CANISTERS ANALYZED VIA USEPA METHOD TO-15

Rev #: 1

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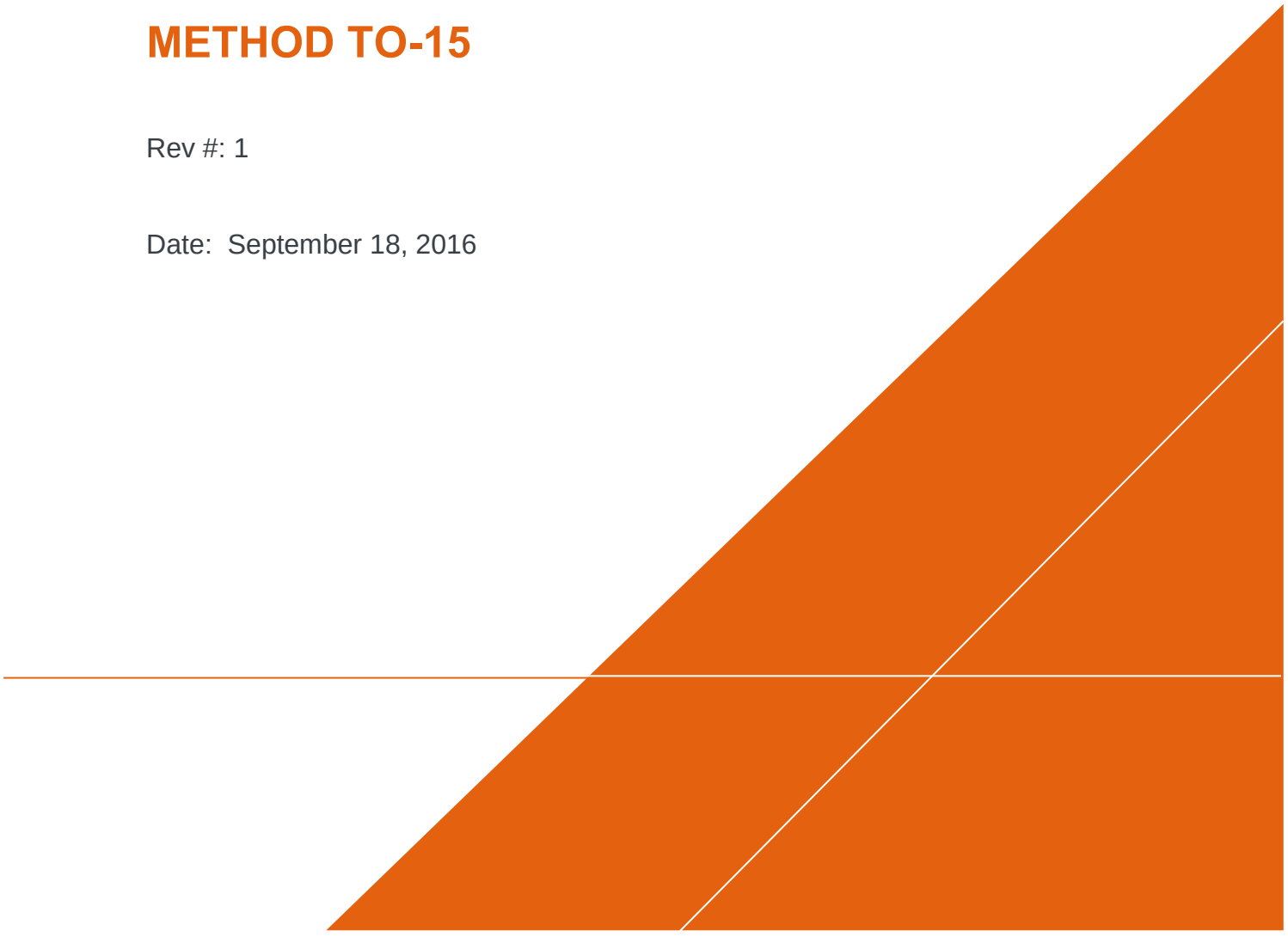

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APPROVAL SIGNATURES

Prepared by:  Date: 9/18/2016

Eric Cathcart

Reviewed by:  Date: 9/18/2016

Mitch Wacksman (Technical Expert)

I. INTRODUCTION

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II. SCOPE AND APPLICATION

This document describes the procedures for collecting exterior soil vapor or sub-slab soil vapor (herein referred to as "soil vapor") samples using whole air canisters for the analysis of volatile organic compounds (VOCs) by United States Environmental Protection Agency (USEPA) Method TO-15 (TO-15). This document assumes a sample port – either sub-slab or exterior soil vapor – has already been installed. This document covers the above ground assembly and sampling methods.

Method TO-15 uses a 1-liter 3-liter or 6-liter SUMMA® passivated stainless steel canister to collect a whole-air sample. The whole-air sample is then analyzed for VOCs using a quadrupole or ion-trap gas chromatograph/mass spectrometer (GS/MS) system to provide typical compound detection limits of 0.5 parts per billion volume (ppbv).

The following sections list the necessary equipment and detailed instructions for collecting soil vapor samples for VOC analysis.

III. PERSONNEL QUALIFICATIONS

Arcadis field sampling personnel will have current health and safety training, including 40-hour HAZWOPER training, site supervisor training, site-specific training, first-aid, and cardiopulmonary resuscitation (CPR), as needed. Arcadis field sampling personnel will be well versed in the relevant technical guidance instructions (TGIs) and possess the required skills and experience necessary to successfully complete the desired field work. Arcadis personnel responsible for leading soil vapor sample collection activities must have previous soil vapor sampling experience.

IV. EQUIPMENT LIST

The equipment required for soil vapor sample collection is presented below:

- 1,3, or 6 – liter stainless steel SUMMA® canisters (order at least one extra, if feasible) (batch certified canisters or individual certified canisters as required by the project);
- Flow controllers with in-line particulate filters and vacuum gauges; flow controllers are pre-calibrated to specified sample duration (e.g.,5-, 10, or 30- minutes) or flow rate (e.g., < 200 milliliters per minute [mL/min]); confirm with the laboratory that the flow controller comes with an in-line particulate filter and pressure gauge (order at least one extra, if feasible);
- 1/4-inch OD tubing (Teflon®, or similar);
- Extra 1/4-inch Swagelok front and back compression sleeves
- Decontaminated stainless steel Swagelok or comparable “T” fitting and ball or needle valve for isolation of purge leg of sample train;
- Stainless steel duplicate “T” fitting provided by the laboratory (if collecting duplicate [i.e., split] samples);
- 60-mL syringe equipped with a three-way leur lock valve;
- Appropriate equipment and materials for quality assurance testing as laid out in the respective quality assurance TGIs (i.e., helium leak testing, water dam testing, methane testing);
- Appropriate-sized open-end wrench (typically 9/16-inch and ½”);
- Tedlar® bag to collect purge air for venting outside a structure if working inside;
- Portable weather meter, if appropriate;

- Chain-of-custody (COC) form;
- Sample collection log (attached);
- Nitrile gloves;
- Work gloves; and
- Field notebook

V. CAUTIONS

The following cautions and field tips should be reviewed and considered prior to installing or collecting a soil vapor sample.

- Sampling personnel should not handle hazardous substances (such as gasoline), permanent marking pens (sharpies), wear/apply fragrances, or smoke cigarettes/cigars before and/or during the sampling event.
- Ensure that the flow controller is pre-calibrated to the proper sample collection duration (confirm with laboratory). Sample integrity can be compromised if sample collection is extended to the point that the canister reaches atmospheric pressure. Sample integrity is maintained if sample collection is terminated prior to the target duration and a measurable vacuum (e.g., 3 -7 – inches Hg) remains in the canister when sample collection is terminated.
- The integrity of the sample train will be tested in accordance with the project specific requirements. These procedures are contained in their own TGI documents and include helium leak testing, water dam testing, and methane screening.
- It is important to record the canister pressure, start and stop times, and sample identification on a proper field sampling form. You should observe and record the time/pressure at the start, and then again one or two hours after starting the sample collection. It is a good practice to lightly tap the pressure gauge with your finger before reading it to make sure it is not stuck. If the canister is running correctly for a 24-hour period, the vacuum will have decreased slightly after one or two hours (for example from 29 inches to 27 inches). Consult your project manager, risk assessor or air sampling expert by phone if the SUMMA canister does not appear to be working properly.
- Ensure that there is still measurable vacuum in the SUMMA® after sampling. Sometimes the gauges sent from labs have offset errors, or they stick.
- When sampling carefully consider elevation. If your site is over 2,000’ above sea level or the difference in elevation between your site and your lab is more than 2,000’ then pressure effects will be significant. If you take your samples at a high elevation they will contain less air for a given ending pressure reading. High elevation samples analyzed at low elevation

will result in more dilution at the lab, which could affect reporting limits. Conversely low elevation samples when received at high elevation may appear to not have much vacuum left in them. http://www.uigi.com/Atmos_pressure.html.

- If possible, have equipment shipped a two to three days before the scheduled start of the sampling event so that all materials can be checked. Order replacements if needed.

- Requesting extra canisters and flow controllers from the laboratory should also be considered to ensure that you have enough equipment on site in case of an equipment failure.

- Check the seal around the soil vapor sampling port by using a tracer gas (e.g., helium) or other method established in the appropriate guidance document. See TGI library and project specific instructions for appropriate TGIs.

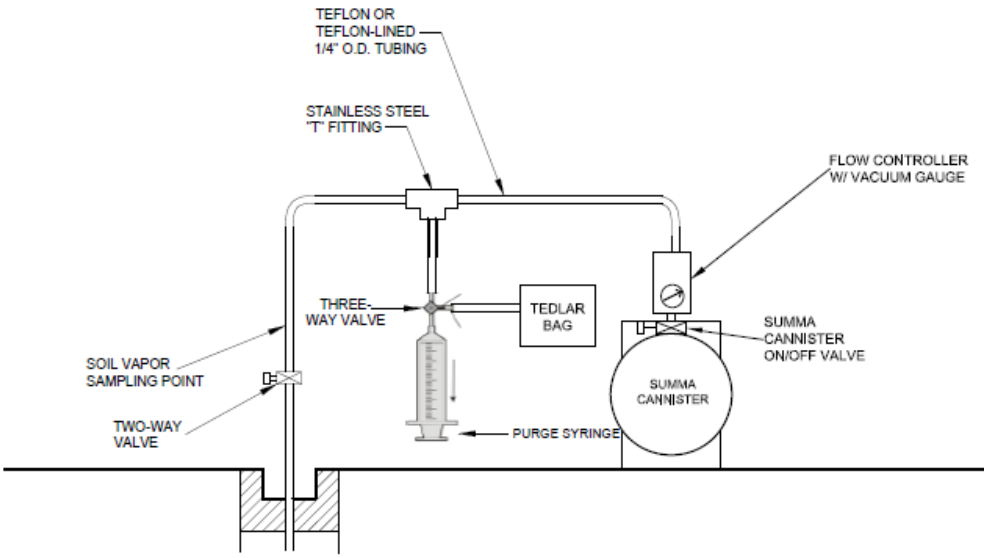
VI. HEALTH AND SAFETY CONSIDERATIONS

All sampling personnel should review the appropriate health and safety plan (HASP) and job safety analysis (JSA) prior to beginning work to be aware of all potential hazards associated with the job site and the specific task. Field sampling must be carefully performed to minimize the potential for injury and the spread of hazardous substances.

VII. SOIL VAPOR SAMPLE COLLECTION

Sample Train Assembly

The following procedures should be used to collect a soil vapor sample using a whole air canister (i.e., SUMMA canister). These methods can be used for both exterior soil vapor samples and interior sub-slab soil vapor samples collected from both permanent or temporary sample points installations. A schematic of the suggested sample train set up is included below



1. Assemble the sample train by removing the cap from the SUMMA canister and connecting the flow controller with in-line particulate filter and vacuum gauge. The flow controller attaches directly to the canister and dictates the sample duration. This piece will come preset from the laboratory.

2. Attach the canister and flow controller assembly to a stainless steel T-fitting using a short length of 1/4-inch OD Teflon tubing. This T-fitting adds a leg to the sample train that will be used to purge “dead” air from the sample train in order to collect a more representative sample.

3. Connect the purge syringe with three-way valve to one of the free ends of the T-fitting using a length of Teflon sample tubing, Swagelok compression fittings and silicon tubing.

4. Attach the Swagelok two-way valve to the remaining free end of the T-fitting using a short length of ¼-inch OD Teflon tubing. The two-way valve will be immediately adjacent to the sample point in the train assembly. This valve is used to isolate the sample train from the sample point prior to sampling in order to test the sample train’s integrity.

5. When collecting duplicate or other quality assurance/quality control (QA/QC) samples as required by applicable regulations and guidance, couple two SUMMA canisters using stainless steel Swagelok duplicate sample T-fitting supplied by the laboratory. Attach flow controller with in-line particulate filter and vacuum gauge to duplicate sample T-fitting provided by the laboratory.

6. Attach the terminal end of the two-way Swagelok valve to the sample port as appropriate. This may be done using the options below:

a. Use a section of silicon tube to connect the Teflon sample tubing to the barbed fitting of a Vapor Pin™ port.

b. Use Swagelok compression fittings to connect Teflon tubing to sampling port. Teflon tape should never be used on Swagelok compression fitting connections.

c. Wrap the Teflon tubing with Teflon tape to seal around the slab then use VOC free clay to further seal around the slab if using temporary points.

Sample Documentation

1. Record on the sample log and COC form the flow controller number with the appropriate SUMMA® canister number.

2. Record the following information on the sample log, if appropriate (contact the local airport or other suitable information source [e.g., site-specific measurements, weatherunderground.com] to obtain the information):

   a. wind speed and direction;

   b. ambient temperature;

   c. barometric pressure; and

   d. relative humidity.

3. Take a photograph of the SUMMA® canister and surrounding area.

Sample Collection

1. Perform a leak-down-test by closing the two-way valve to the sample port. Open the three-way valve to the syringe and pull a vacuum. Quickly close the three-way valve and record the pressure indicated on the gauge connected to the canister. If there are no leaks in the system this vacuum should be held. If vacuum holds proceed with sample collection; if not attempt to rectify the situation by tightening fittings.

2. Open the two-way valve and purge the soil vapor sampling port and tubing with the portable sampling pump. Purge approximately three volumes of air from the soil vapor sampling port and sampling line using a flow rate of 200 mL/min. Purge volume is calculated by the following equation “purge volume = 3 x Pi x inner radius of tubing^2 x length of tubing. Purge air will be collected into a Tedlar bag to provide that VOCs are not released into interior spaces. Perform quality control method tests concurrently, as appropriate

3. Close the three-way valve to the syringe in order to isolate this leg of the sample train.

4. Open the SUMMA® canister valve to initiate sample collection. Record on the sample log (attached) the time sampling began and the canister pressure.

   If the initial vacuum pressure registers less than -25 inches of Hg, then the SUMMA® canister is not appropriate for use and another canister should be used.

5. Check the SUMMA canister approximately half way through the sample duration and note progress on sample logs.

Termination of Sample Collection

1. Arrive at the SUMMA® canister prior to the end of sample collection.

2. Record the final vacuum pressure. Stop collecting the sample by closing the SUMMA® canister valves. The canister should have a minimum amount of vacuum (approximately 5 inches of Hg or slightly greater).

3. Record the date and local time (24-hour basis) of valve closing on the sample collection log and COC form.

4. Disconnect sample tubing from the sample port; replace any coverings or abandon as appropriate to mitigate tripping hazards.

5. Remove the particulate filter and flow controller from the SUMMA® canister, re-install the brass plug on the canister fitting, and tighten with the appropriate wrench.

6. Package the canister and flow controller per Department of Transportation regulations for return shipment to the laboratory. These regulations can be found at the Transportation Safety Program's Team Site on the Source. The SUMMA® canister does not require preservation with ice or refrigeration during shipment.

7. Complete the appropriate forms and sample labels as directed by the laboratory (e.g., affix card with a string).

8. Complete the COC form and place the requisite copies in a shipping container. Close the shipping container and affix a custody seal to the container closure. Ship the container to the laboratory via overnight carrier (e.g., Federal Express) for analysis.

VIII. WASTE MANAGEMENT

No specific waste management procedures are required.

IX. DATA RECORDING AND MANAGEMENT

Measurements will be recorded on the sample log at the time of measurement with notations of the project name, sample date, sample start and finish time, sample location (e.g., GPS

coordinates, distance from permanent structure [e.g., two walls, corner of room]), canister serial number, flow controller serial number, initial vacuum reading, and final pressure reading. Field sampling logs and COC records will be transmitted to the Project Manager.

X. QUALITY ASSURANCE

Duplicate samples should be collected in the field as a quality assurance step per project requirements. Generally, duplicates are taken from 10% of samples, but project specific requirements should take precedence.

XI. REFERENCES

DiGiulio et. al. 2003. Draft Standard Operating Procedure (SOP) for Installation of Sub-Slab Vapor Probes and Sampling Using EPA TO-15 to Support Vapor Intrusion Investigations. http://www.cdphe.state.co.us/hm/indoorair.pdf (Attachment C)

Di Giulio et. Al. 2006. Assessment of Vapor intrusion in Homes Near the Raymark Superfund Site Using Basement and Sub-Slab Air Samples. USEPA. EPA/600/R-05/147.

New York State Department of Health (NYSDOH). 2005. DRAFT “Guidance for Evaluating Soil Vapor Intrusion in the State of New York” February 23, 2005.

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