Illinois Environmental Protection Agency

Bureau of Land • 1021 North Grand Avenue East • P.O. Box 19276 • Springfield • Illinois • 62794-9276

ILLINOIS EPA RCRA CORRECTIVE ACTION CERTIFICATION

This certification must accompany any document submitted to Illinois EPA in accordance with the corrective action requirements set forth in a facility's RCRA permit. The original and two copies of all documents submitted must be provided.

1.0 Facility Identification

Name: Equilon Enterprises LLC d/b/a/ SOPUS
County: Madison
Street Address: 900 South Central Ave
Site No. (IEPA): 1191150002
City: Roxana
Site No. (USEPA): ILD080012305

2.0 Owner Information

Name:
Mail Address:
City:
State: Zip Code:
Contact Name:
Contact Title:
Phone:

3.0 Operator Information

Name: Equilon Enterprises LLC d/b/a/ SOPUS
Mail Address: 128 East Center Street
City: Nazareth
State: PA Zip Code: 18064
Contact Name: Leroy Bealer
Contact Title: Senior Program Manager
Phone: 484-632-7955

4.0 Type of Submission (check applicable item and provide requested information, as applicable)

☐ RFI Phase I Workplan/Report
☐ RFI Phase II Workplan/Report
☐ CMP Report;
☒ Other (describe): SOPs revised based on IEPA comments

IEPA Permit Log No. B-43R
Date of Last IEPA Letter on Project: April 8, 2025
Log No. of Last IEPA Letter on Project: B-43R-CA-111
Does this submittal include groundwater information: ☐ Yes ☐ No

Date of Submittal: April 29, 2025

5.0 Description of Submittal: (briefly describe what is being submitted and its purpose)

SOP 16 (IDW Management) & SOP 44R (Soil Vapor Purging and Sampling) revised based on IEPA comments in their 4/8/2025 letter.

6.0 Documents Submitted (identify all documents in submittal, including cover letter; give dates of all documents)

Cover letter, RCRA Corrective Action Certification, Response to IEPA 4/8/25 Letter with Revised SOPs 16 and 44R.

Copy of submittal also sent directly to Gary Ko and Ali Al-Janabi of IEPA.

7.0 Certification Statement

(This statement is part of the overall certification being provided by the owner/operator, professional and laboratory in Items 7.1, 7.2 and 7.3 below). The activities described in the subject submittals have been carried out in accordance with procedures approved by Illinois EPA. I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

7.1 Owner/Operator Certification

(Must be completed for all submittals. Certification and signature requirements are set forth in 35 IAC 702.126.) All submittals pertaining to the corrective action requirements set forth in a RCRA Permit must be signed by the person designated below (or by a duly authorized representative of that person):

1. For a Corporation, by a principal executive officer of at least the level of vice president.
2. For a Partnership or Sole Proprietorship, by a general partner or the proprietor, respectively.
3. For a Governmental Entity, by either a principal executive officer or a ranking elected official.

A person is a duly authorized representative only if:

1. the authorization is made in writing by a person described above; and
2. the written authorization is provided with this submittal (a copy of a previously submitted authorization can be used).

Owner Signature: _____ Date: _____

Title: _____

Operator Signature: _____ Date: 4/28/2025

Title: **Senior Program Manager**

7.2 Professional Certification (if necessary)

Work carried out in this submittal or the regulations may also be subject to other laws governing professional services, such as the Illinois Professional Land Surveyor Act of 1989, the Professional Engineering Practice Act of 1989, the Professional Geologist Licensing Act, and the Structural Engineering Licensing Act of 1989. No one is relieved from compliance with these laws and the regulations adopted pursuant to these laws. All work that falls within the scope and definitions of these laws must be performed in compliance with them. The Illinois EPA may refer any discovered violation of these laws to the appropriate regulating authority.

Any person who knowingly makes a false, fictitious, or fraudulent material statement, orally or in writing, to the Illinois EPA commits a Class 4 felony. A second or subsequent offense after conviction is a Class 3 felony. (415 ILCS 5/44 (h))

Professional's Signature: _____ Date: 4/28/2025

Professional's Name: Wendy Pennington

Address: 100 N. Broadway, 20th Floor

City: St. Louis

State: MO Zip Code: 63102

Phone: 314-452-8929

Professional's Seal:

LICENSED PROFESSIONAL ENGINEER
WENDY M. PENNINGTON
062.064098
STATE OF ILLINOIS

For: Response to IEPA 4/8/25 Letter with Revised SOPs 16 and 44R

Date of Submission: April 29, 2025

7.3 Laboratory Certification (if necessary)

The sample collection, handling, preservation, preparation and analysis efforts for which this laboratory was responsible were carried out in accordance with procedures approved by Illinois EPA.

Name of Laboratory *NOT APPLICABLE*

_____ Date: _____

Signature of Laboratory Responsible Officer

Mailing Address of Laboratory

Address _____

City _____

State _____ Zip Code _____

_____

Name and Title of Laboratory Responsible Officer

AECOM
100 North Broadway
20th Floor
St. Louis, MO 63110
USA
aecom.com

April 29, 2025

Mr. Joshua Rhoades
Manager, Permit Section
Illinois Environmental Protection Agency
Division of Land Pollution Control
Bureau of Land
2520 West Iles Ave
Springfield, Illinois 62704

Response to IEPA 4/8/2025 Letter with Revised SOPs 16 and 44R
Equilon Enterprises LLC dba Shell Oil Products US
Roxana, Illinois
1191150002 - Madison County (ILD080012305)
Log B-43R-CA-111

Dear Mr. Rhoades:

AECOM Technical Services, Inc. (AECOM) is submitting the enclosed revised Standard Operating Procedures (SOPs) in response to the Illinois Environmental Protection Agency (IEPA) conditions in a letter dated April 8, 2025. SOPs were originally submitted, as requested by IEPA, within various reports and work plans related to the Investigation Site in Roxana, Illinois. Below, in accordance with Condition 9 of the IEPA April 8, 2025, letter, is a summary of exact changes made to the SOPs with respect to Conditions 1 through 8 of the same letter (IEPA conditions are in *italics* and AECOM responses are in **bold blue**).

IEPA Condition 1

The level of personal protection equipment (PPE) must be enhanced for the nature of the work appropriate to perform the requirements written in SOP 16. Current equipment does not encompass hazards from interacting with IDW equipment such as 55-gallon drums, safety risks such as splash contamination, and airborne hazards from toxic or flammable fumes.

AECOM Response

The condition is acknowledged. The PPE list in Section 3 of SOP 16 has been revised to include various types of gloves, air monitoring equipment, spill kit, secondary containment, and fan (if applicable).

IEPA Condition 2

Under SOP 16, the Illinois EPA can accept the proposed usage of plastic sheeting for containing liquids IDW spills. However, a strong reliable secondary containment or equipment like a drum spill pallet must be provided to contain any additional hazardous splash contaminations.

AECOM Response

The condition is acknowledged. It should be noted that the items listed in Section 5 of SOP 16 were listed in no particular order and a note has been added to Section 5 stating this. The items listed in Section 5 of SOP 16 have been reordered and expanded upon for clarity.

IEPA Condition 3

The central accumulation area indicated in SOP 16 under Section 4, General Information, requires the usage of ventilation within the designated secure storage area in accordance with OSHA 1926.57 or otherwise demonstrate concentration limits not exceeding OSHA 1926.55(a).

AECOM Response

The condition is acknowledged. The Central Accumulation Area information under Section 4 of SOP 16 has been revised to provide additional information about secure storage areas, and to add information about ventilation of storage areas.

IEPA Condition 4

In SOP 16, the central accumulation area must identify any incompatible hazards derived from IDWs and specify taken steps to separate wastes during storage and transportation.

AECOM Response

The condition is acknowledged. The Central Accumulation Area information under Section 4 of SOP 16 has been revised to provide additional information about separation of incompatible wastes.

IEPA Condition 5

Under Section 4 of SOP 16, a waste sampling program must be created to enforce a consistent schedule for laboratory analysis of generator knowledge IDWs to confirm prior characterizations of a generated residual.

AECOM Response

The condition is acknowledged. A statement regarding review of laboratory analytical results was added under the Generator Knowledge category under Characterization in Section 4 of SOP 16. Statements regarding use of laboratory analytical data was also added under the Laboratory Analysis category under Characterization in Section 4 of SOP 16.

IEPA Condition 6

SOP 4, Decontamination, must be referenced in Sections 2 and 5 of SOP 16 when discussing the decontamination of expendable materials in the event of contact with hazardous waste.

AECOM Response

The condition is acknowledged. Reference to SOP 4 Decontamination has been added to Sections 2 and 5 of SOP 16.

IEPA Condition 7

A site coordinator designated to oversee the proper disposal of IDW containers shall create a plan to ensure that waste does not remain on-site for more than 90 days.

AECOM Response

The condition is acknowledged. A statement was added at the end of Section 5 IDW Handling of SOP 16 stating that the Site IDW Coordinator shall maintain a waste and container tracking system to ensure that wastes are offered for transport and disposal in a timely manner (i.e., within 90 days for hazardous wastes within the Central Accumulation Area).

IEPA Condition 8

The soil gas samples collected in accordance with SOP 44R and screened using SOP 52 (Soil Vapor Field Laboratory Screening) must include sample analysis for tracer gas used during sampling.

AECOM Response

The condition is acknowledged. The actual sampling procedure outlined with SOP 44R was not changed; however, the following revisions were made to SOP 44R to include and clarify practices already performed by the field staff:

- **Improved internal section references for clarity.**
- **Updated equipment model numbers.**
- **General updates throughout for clarity.**
- **Clarification of when and where certain readings are collected. Most readings are collected in the field at the point of sample collection by field staff. However, the TVA-2020 FID/PID instruments are large, heavy and delicate, so they are kept in the field laboratory at the field office. Tedlar® sample bag #2 from each vapor port is brought back to the field laboratory to be screened using the TVA-2020 FID/PID the same day as sample collection, in accordance with SOP 52, which is referenced in SOP 44R.**
- **Clarification of why methane is not measured in sample bag #1 unless elevated helium is observed. Helium is typically the tracer gas used during soil vapor sampling at this site. A Dielectric Technologies MGD-2002 is typically used to measure helium, and when methane is present at elevated concentrations in a vapor sample, it can bias the instrument's helium measurement high. It is not necessary to measure methane at this stage of sample collection if MGD-2002 readings do not indicate elevated helium.**

As previously requested by IEPA, below is an SOP summary table, which indicates the most recent revision date and IEPA approval date for each SOP for your reference. SOPs in **bold** below are those included within this submittal.

AECOM

SOP No.	SOP Title	SOP Revision Date	Last Approved by IEPA
3	Calibration & Maintenance of Field Instruments	3/12/2021	3/13/23
4	Decontamination	3/12/2021	3/13/23
5	Utility Clearance Procedures	4/26/2023	3/13/23
8	Field Reporting and Documentation	3/12/2021	3/13/23
10	Well Gauging Measurements	3/12/2021	3/13/23
11	Groundwater Sampling & Well Wizard Operation	3/12/2021	3/13/23
12	Grouting Procedures	12/9/2019	3/13/23
14	Headspace Soil Screening	12/9/2019	3/13/23
16	**Investigative Derived Waste Handling**	**4/23/2025**	**NEW SOP**
17	Logging	12/9/2019	3/13/23
18	Low Flow Groundwater Purging & Sampling	3/12/2021	3/13/23
20	Well Development	3/12/2021	3/13/23
21	Monitoring Well Installation	7/24/2015	10/10/17
23	Quality Assurance Samples	3/12/2021	3/13/23
24	Soil and Groundwater Sample Identification, Packaging & Shipping	3/12/2021	3/13/23
25	Sample Containers, Preservation & Holding Times	4/26/2023	3/13/23
26	Sample Control & Custody Procedures	3/12/2021	3/13/23
28	Soil Sampling	12/9/2019	3/13/23
29	Soil Probe Operation	12/9/2019	3/13/23
42	Groundwater Profiling	12/9/2019	3/13/23
44R	**Soil Vapor Purging & Sampling**	**4/22/2025**	**3/13/23**
46	Indoor Air Sampling with Canisters	7/23/2015	10/10/17
47	Sub-slab Soil Gas Installation & Sampling with Canisters	4/4/2017	10/10/17
48	SVE Well Data Collection and Sampling	3/12/2021	3/13/23
49	SVE Effectiveness Monitoring at VMPs	3/12/2021	3/13/23
51	Vapor Sample Classification, Packaging & Shipping	3/12/2021	3/13/23
52	Soil Vapor Field Laboratory Screening	3/12/2021	3/13/23
53	Dwyer Digital Manometer	3/12/2021	3/13/23
56	LNAPL Recovery	3/12/2021	3/13/23

If you have any questions, please contact Wendy Pennington at wendy.pennington@aecom.com (314-452-8929). Copies of this submittal are being electronically sent separately directly to Gary Ko (IEPA, Springfield) and Ali Al-Janabi (IEPA, Collinsville).

Sincerely,

Wendy Pennington, PE
Project Manager, AECOM

Samuel Fisher, CHMM
Environmental Scientist, AECOM

encl: Revised SOPs 16 and 44R
RCRA Corrective Action Certification Form

cc: Gary Ko (IEPA - Springfield, IL)
Ali Al-Janabi (IEPA - Collinsville, IL)
Leroy Bealer (Shell)
Tonya Lewis (Shell)
Pierre Espejo (Shell)
Project File
Repositories (Roxana Public L brary, website)

1. Objective

This document defines general standard operating procedure for investigation derived waste (IDW) handling. These procedures, in conjunction with client requirements, and local, state and federal regulations, shall be used to ensure that any residuals generated are managed in a safe and environmentally sound manner.

A variety of IDW related activities may require unearthing, moving, lifting, over packing, or sampling drums. Such activities are inherently hazardous and require special health and safety precautions.

2. Other SOPs Referenced in this SOP

- SOP No.4 Decontamination

3. Equipment

Equipment typically used during field reporting/documentation and containerizing:

- Label(s) for IDW Container(s);
- Gloves specific for chemicals of concern (i.e., disposable latex or nitrile gloves);
- Leather work gloves for container handling;
- Goggles or face shield for potential splash hazard;
- Air monitoring equipment to monitoring breathing zone;
- Assorted tools (knife, screwdriver, crescent wrench, (15/16") socket and drive, non-sparking bung wrench, etc.)
- Drum funnel
- Plastic sheeting (if applicable)
- Spill kit
- Secondary containment (i.e., drum spill pallet)
- Fan for managing fumes in breathing zone (if applicable)

4. General Information

Prior to beginning work that will generate IDW, identify the proper containers and staging area for IDW. Also coordinate with the Site IDW Coordinator to ensure proper characterization of the IDW generated.

Potential IDW Materials include, but are not limited to, the following:

- Purged groundwater from sampling activities (purgewater)
- System water
- Soil cuttings (from drilling, vacuum excavation, trenching, etc.)
- Recovered LNAPL
- Absorbent materials
- Spent carbon
- Decontamination liquids (wash/rinse water)
- Residual solids from system cleaning/maintenance

IDW containers should be:

- Compatible with the waste to be contained
- Labeled appropriately
- In good condition and managed to prevent rupture
- Closed unless actively adding/removing material

Staging Areas where IDW may be stored are:

A. Central Accumulation Area

  - Secure storage area (storage areas are located within locked secure areas)
  - Ventilation of storage area (storage areas are located outdoors; fan can be used for additional ventilation if necessary)
  - No limit to the volume staged
  - Aisle space
  - Separation of incompatible wastes (containers will be separated and grouped based on container and hazard type)
  - 90-day storage time limit
  - Weekly inspections required

B. Satellite Accumulation Area

  - Located at or near the point of generation and under the control of the operator

- Volume less than or equal to 55-gallons

Labels

- Select proper label for the containerized material (hazardous, non-hazardous, waste material [characterization pending analytical], universal waste, flammable material, etc.)
- Date of Accumulation
- Waste Codes (if applicable)
- Container ID
- Generator information
- Material Description or Proper Shipping Name

Characterization

There are two methods in which IDW may be characterized:

- Generator Knowledge
  - The same residual has been generated by the same process before and nothing has changed in the process or the residual.
  - Laboratory analytical results from routine sampling events (typically quarterly or semi-annually) generating the recurring IDW shall be reviewed in comparison to the analytical data used to determine waste characterization. Waste characterization may be changed based on results from latest sampling event.
- Laboratory Analysis
  - Shall be used the first time a particular waste stream is generated.
  - Can be used to confirm prior characterization.
  - A sample is collected and sent to a laboratory to evaluate proper characterization or to confirm prior characterization of a generated residual.

5. IDW Handling

Note that expendable materials (e.g., disposable sampling equipment such as gloves and tubing) can be decontaminated (SOP No. 4 Decontamination), if necessary, collected in trash bags, and

disposed as municipal waste. Decontamination of expendable materials may be necessary if it came into contact with hazardous waste.

The items listed below shall be considered when handling IDW, and are not listed in any particular order.

A. Always wear proper nitrile, or other specific to chemical of concern, gloves while collecting and containerizing IDW.

B. Containers holding liquids shall have strong, reliable secondary containment, (i.e., drum spill pallet).

C. Use a funnel when transferring liquid IDW into a closed-top drum.

D. Use plastic sheeting when transferring IDW into a container by dumping/pouring. The plastic sheeting will serve as an added level of precaution to catch any spillage or splashing and is in addition to any secondary containment that is present.

E. Ensure a spill kit is readily available near IDW containers.

F. When filling drums, leave open space at the top in order to accommodate expansion if freezing occurs. Leave at least 4 inches of open space.

G. Ensure containers are closed at all times, unless actively adding or removing waste.

H. Once a new container is started and labeled, take a photo of the label and send to the Site IDW Coordinator.

I. When a container is full and/or the task generating the IDW is completed, notify the Site IDW Coordinator so that proper transportation/disposal can be arranged.

   a. Transportation and disposal of IDW is performed by properly trained/licensed/permitted companies/facilities.

J. Be familiar with the Site Contingency Plan for emergencies related to IDW, and with the Site/Task Health and Safety Plan.

Site IDW Coordinator shall maintain a waste and container tracking system to ensure that wastes are offered for transportation and disposal in a timely manner (i.e., within 90 days for hazardous wastes within Central Accumulation Area).

Refer to the client requirements, and local/state/federal regulations for additional information (Title 35 Ill. Adm. Code, Parts 700-739).

1. Objective

The purpose of this Standard Operating Procedures (SOP) is to define the standard procedure SOP and necessary equipment for collection of soil vapor samples from vapor monitoring points / sampling ports using stainless steel canisters for Shell projects in Hartford and Roxana, Illinois. This SOP serves as a supplement to information which might be in a project Work Plan and is intended to be used together with other SOPs.

2. Other SOPs referenced in this SOP:

- SOP No. 4 Decontamination
- SOP No. 26 Sample Control and Custody Procedures
- SOP No. 51 Vapor Sampling Classification, Packaging and Shipping
- SOP No. 52 Soil Vapor Field Lab Screening

3. Equipment

The following equipment is typically needed:

- Field book
- Disposable nitrile gloves
- Cut resistant gloves
- Ultra-fine permanent marker
- Paper towels
- Decontamination equipment
- Soil vapor sampling field sheets and/or field computer
- Small brush or broom
- Charcoal filter
- 15 mL hand pump
- 60 mL syringe or equivalent
- Peristaltic pump with battery
- Rotameter or equivalent
- Photoionization Detector (PID) (e.g., RAE Instruments MultiRAE or equivalent)

- Flame Ionization Detector (FID) (e.g., Thermo Scientific TVA-2020 or equivalent)
- Lower Explosive Limit (LEL) meter (e.g., RAE Instruments MultiRAE or equivalent)
- Landfill gas detector (e.g., Landtec GEM-5000 or equivalent)
- Stainless steel canisters with flow controllers (supplied by the laboratory)
- 1-Liter Tedlar® bags (new or decontaminated as outlined in SOP No. 4 Decontamination) – 2 per sample
- Black trash bag for storing Tedlar® bag samples
- Bentonite grout
- Foam padding for shroud-ground seal
- Sample train assembly (configuration and parts shown on **Figure 1**)
- Vacuum gauge (0 – 30 inches Hg)
- Teflon® tubing (laboratory-grade) – 1/8" ID – ¼" OD
- Tygon® tubing (laboratory-grade) – 3/16" ID – 3/8" OD
- Tracer gas (e.g., Grade 5 helium)
- Tracer gas shroud (e.g., plastic tote)
- Tracer gas detector (e.g., Dielectric Technologies MGD-2002 or equivalent)
- Watch or timer
- Fully stocked toolbox
  - Ratchet set (**1/2, 9/16, 5/8, 3/4, 7/8, 15/16**)
    - Safety cutting tools
    - Rubber mallet
    - Wire brush
    - Pry bar
    - Wrenches (7/16, ½, 9/16, 5/8)
- Bilge pump for removing water from vaults
- Shipping supplies (e.g., UN boxes, shipping labels, hazard labels, packing tape)

4. Vapor Port Development Purging

If the port has been newly installed, the port must be developed by purging 3 volumes of the sampling assembly including 3 volumes of the sand pack. If development is not required, proceed to **Section 5** below for the appropriate sampling procedures

1. Open vapor point vault to check integrity of individual soil vapor monitoring port(s) (VMP). Each port shall have a hose barb connected to a 3-way polycarbonate stopcock (3-way) using silicone tubing. The 3-way shall be in the "off" position.
2. Connect peristaltic pump and Tygon tubing connected to the 3-way.
3. Connect charcoal filter exhaust to the discharge end of the tubing assembly.
4. Calculate Purge volume:
    - Vapor Port tubing (1/8-in diameter): 2.41 mL/foot (single volume)
    - Sample train assembly / Tygon® tubing (1/4-in diameter): 9.65 mL/foot (single volume)
    - Sand Pack: 18,765 mL (4.95 gallons – single volume – assuming 18-inch-thick sand pack)
5. Open 3-way and begin purging port at a rate no greater than 200 mL/min. Document time started.
6. Once 3 volumes are reached, stop pump and close 3-way. Document time stopped.
7. Move to next depth or replace vault cover and clean up at location.

5. Vapor Port Sampling – With Tracer Gas Shroud

1. When conducting soil vapor purging and sampling, no soil vapor sampling should take place within 48 hrs after a rainfall event of ½ inch or greater and in standing or ponded water areas. Additionally, soil vapor samples should be collected from a depth of at least 3 ft below the ground surface or building foundation, but above the capillary fringe soil layer located 14.75 in (37.5 cm) above the top of groundwater, when conducting soil vapor purging and sampling. Set up at VMP. Turn off vehicle. If vehicle will be left running per health and safety procedures, prevent sample and sample media from being exposed to vehicle exhaust.
2. Open vapor point vault to check integrity of individual VMP(s). Each port shall have a hose barb fitting connected to a 3-way valve using silicone tubing. The 3-way shall be in the "off" position.
3. Perform stainless steel canister vacuum check, per the steps listed in **Section 6** of this SOP.

4. Remove hose barb fitting from port and set up the sample assembly using the configuration shown in **Figure 3**. The flow controller (one for each stainless-steel canister provided by the laboratory) shall be connected to the stainless-steel canister inlet. Do not re-use flow controllers between samples. Flow controllers can be set to different rates as specified by the project work plan, depending on size of container to be filled. For a 1-Liter stainless steel canister, approximately 5 minutes is a standard collection time (~167 ml/min). Flow rate should not exceed 200 mL/min.
5. Perform sample train leak check, per the steps listed in **Section 6** of this SOP.
6. Calculate Purge volume:
    - Vapor Port tubing (1/8-in diameter): 2.41 mL/foot (single volume)
    - Sample train assembly (1/4-in diameter): 9.65 mL/foot (single volume)
7. Purge the three volumes from the vapor monitoring port purge using the 60 mL syringe. If pullback is observed on the 60 mL syringe and the purge cannot be completed, the VMP screen may be saturated with water and will not yield a representative sample. If this happens, do not sample the VMP. Similarly, if water or light non-aqueous phase liquid (LNAPL) is observed in the syringe during the purge, do not sample the VMP. Record purge results in field computer and on sample sheets.
8. Remove the 3-way and connect the sample train to the VMP using Swagelok® fittings.
9. Open Port Valve and Valve #1. Use 60 mL syringe to purge 30 mL (approximately three times the volume of the sample train assembly).
10. Close Valve #1.
11. Place an enclosure shroud over the VMP and assembled sample train as shown in **Figure 3**. The shroud shall have openings for:
    - Introduction of tracer gas;
    - Pressure relief to the atmosphere and access of a tracer gas monitoring device;
    - Tygon tubing to connect to the peristaltic pump for Valve #1

    The shroud shall have sufficient glove access to open or close all valves within. As shown in **Figure 3**, the shroud must also be sealed to the ground with hydrated bentonite (or equivalent) or foam padding.
12. Introduce tracer gas into the shroud at a known rate until the atmosphere within the shroud contains a sufficient quantity (typically 20% to 50%) of tracer gas.

13. Connect peristaltic pump to Valve #1 using Tygon tubing, open Valve #1, and collect sample bag #1. The sample bag shall be filled at a rate no greater than 200 mL/min.
14. Close Valve #1.
15. While personnel are in the field at the point of sample collection, measure tracer gas in Tedlar® sample bag #1 using tracer gas detector. If readings from tracer gas detector are >10% of the concentration of the tracer gas in the shroud, screen sample bag #1 using a landfill gas detector to obtain a direct methane reading[1] while at the point of sample collection. See **Section 6, Tracer Gas Check** for detailed acceptance criteria.
16. Open stainless-steel canister valve completely and record the time in field computer or on sample sheets.
17. Allow the canister to fill until the vacuum gauge reads between -5 and -10 inches Hg; however, an ideal sample shall have approximately -5 inches Hg remaining after sampling is complete. When ambient temperatures are below freezing, close canister valve when the vacuum gauge reading is -8 inches Hg[2]. For a 1-Liter canister, filling shall take approximately 5 minutes but may require more or less time depending on formation materials.[3] If the vacuum gauge reading drops below -5 inches Hg before approximately 5 minutes, close the stainless-steel canister valve completely. Record the time in the field computer and on sample sheets. Record the concentration of tracer gas within the shroud after closing the canister valve.
18. Connect peristaltic pump to tubing connected to Valve #1 and open Valve #1 to collect sample bag #2. The sample bag shall be filled at a rate no greater than 200 mL/min.
19. Break seal on the shroud and disconnect flow controller, stainless steel canister, and used tubing from sample assembly.

[1]Helium is typically the tracer gas used. A Dielectric Technologies MGD-2002 is typically used to measure helium, and when methane is present at elevated concentrations in a vapor sample, it can bias the instrument's helium measurement high. It is not necessary to measure methane at this stage of sample collection if elevated helium is not observed with the MGD-2002.

[2]Sample will undergo thermal expansion (some loss of vacuum) when moved from a cold outdoor setting to a warmer indoor setting. By closing the canister valve at -8 inches Hg, the sample will be able to undergo thermal expansion without reaching 0 inches Hg. The larger the difference between outdoor and indoor temperatures, the greater the loss of vacuum.

[3]Other sized canisters will take different amounts of time to sufficiently fill.

20. While personnel are still in the field at the point of sample collection, screen sample bag #2 for CO_2, CH_4, LEL, and oxygen (O_2) with a landfill gas detector, and for tracer gas concentration with the tracer gas detector. See **Section 6, Tracer Gas Check** for detailed acceptance criteria. Record readings in field computer or on field sheets. Retain Tedlar® sample bag #2 for screening with PID and FID at field lab, to be performed same day as sample collection. Tedlar® sample screening at the field lab shall be performed in accordance with SOP No. 52 Soil Vapor Field Lab Screening.
21. Perform stainless steel canister vacuum check, per the steps listed in **Section 6** of this SOP.
22. Disconnect the sample train from the VMP and reconnect the 3-way.
23. Move to next depth or replace vault cover and clean up at location.
24. Decontaminate any non-designated equipment (e.g., sample assembly) following procedures listed in **Section 7**.

6. Quality Control

Quality control procedures have been developed to verify equipment integrity, sample quality, and sample repeatability.

In addition to the procedures listed below, the following items are also of concern:

- Care shall be taken to keep all sampling equipment, especially the stainless-steel canisters, safe from damage.
- No samples are to be collected in an area where vehicle or other equipment exhaust is being discharged. Do not place samples or sample media directly on asphalt, gravel, or other ground surfaces.

Field Duplicates

A field duplicate shall be collected for 10% of the samples collected.

Field duplicates are collected by using a sample assembly with an additional 3-way union. A stainless-steel canister with a flow controller is attached to each of the 3-way unions on the assembly. For sampling, both stainless steel canister valves shall be opened and closed simultaneously. Use the procedure described above to collect samples.

Stainless Steel Canister Vacuum Check

The stainless-steel canister vacuum check shall be performed for 100% of the stainless-steel canisters.

Prior to Sampling

1. Remove brass cap from stainless steel canister. Brass cap will not be present if canister is configured with quick connect fitting.
2. Attach the vacuum gauge provided by the laboratory to the stainless-steel canister inlet.
3. Open valve one-half turn, then close valve.
4. Record reading on the canister tag. If the canister does not show a vacuum or shows a vacuum of less than -26 inches Hg, then:
    - Label the canister tag with "Insufficient vacuum – No Sample";
    - Set canister aside for return to the laboratory;
    - Record canister ID number to share with task manager and lab coordinator; and
    - Contact task manager and lab coordinator if number of canister failures affect field work.
5. Make sure valve is closed tight, but not overtight.
6. Remove the vacuum gauge.
7. If not immediately using the stainless-steel canister for sample, place and tighten brass cap on stainless steel canister (not applicable if canister is configured with quick connect fitting).

After Sampling

1. Attach the vacuum gauge provided by the laboratory to the stainless-steel canister inlet.
2. Open valve one-half turn, then close valve after one second. Gently tap vacuum gauge with finger if needle appears to be stuck.
3. Record reading. There shall still be a vacuum in the stainless-steel canister. The final vacuum on the canister shall be between -10 inches of Hg to -2 inches of Hg. If the final vacuum does not fall within this range, contact the task manager immediately to determine the value of using another stainless-steel canister to recollect the sample.
4. Make sure valve is closed tight, but not overtight.
5. Remove the vacuum gauge.
6. Place and tighten brass cap on stainless steel canister (not applicable if canister is configured with quick connect fitting).

Sample Train Vacuum Leak Check

The sample train leak check shall be performed for 100% of the samples collected.

1. Assemble the sampling apparatus as shown in **Figure 1**.
2. Keep the stainless-steel canister closed, and Valve #1 in the "open" position.
3. Attach the 15 mL hand pump to sample train at Valve #1.
4. Withdraw air from the sampling apparatus until a vacuum between 20 and 25 inches Hg is achieved. Close Valve #1. Use flow controller's built-in vacuum gauge to observe the induced vacuum for at least five minutes. If the flow controller's vacuum gauge does not function properly, notify the task manager.
5. If the change in vacuum over five minutes is equal to or less than 0.5 inches Hg, the system leak rate is acceptable.
6. If the change in vacuum over five minutes is greater than 0.5 inches Hg, check, tighten or replace the fittings and connections and repeat the leak check.

Tracer Gas Check

Soil vapor samples shall be collected using a tracer gas, as per the project work plan or activity plan.

1. Tracer gas shall be introduced near the VMP to test the integrity of the probe seal and the above ground connections.
2. Collect the soil vapor sample per procedures in **Section 5**.
3. If the tracer gas detector reading in a sample is ≤10% of the concentration of the tracer gas in the shroud:
    - Prior to stainless steel canister sampling: continue with sample collection.
    - Following stainless steel canister sampling: the sample is acceptable.
4. If the tracer gas detector reading in the sample is >10% of the concentration of the tracer gas in the shroud:
    - Prior to stainless steel canister sampling: obtain methane reading using landfill gas detector.
        - If methane reading ≥2%, continue with sample collection.
        - If methane reading ≤2%, stop sample collection. Check fittings and valves before restarting sample collection.
    - Following stainless steel canister sampling: obtain methane reading using landfill gas detector.

  - If methane reading ≥2%, the results may be biased high by methane. Call task manager to discuss.
  - If methane reading <2%, sample likely compromised; do not use sample. Call task manager to inform of need for re-sample.

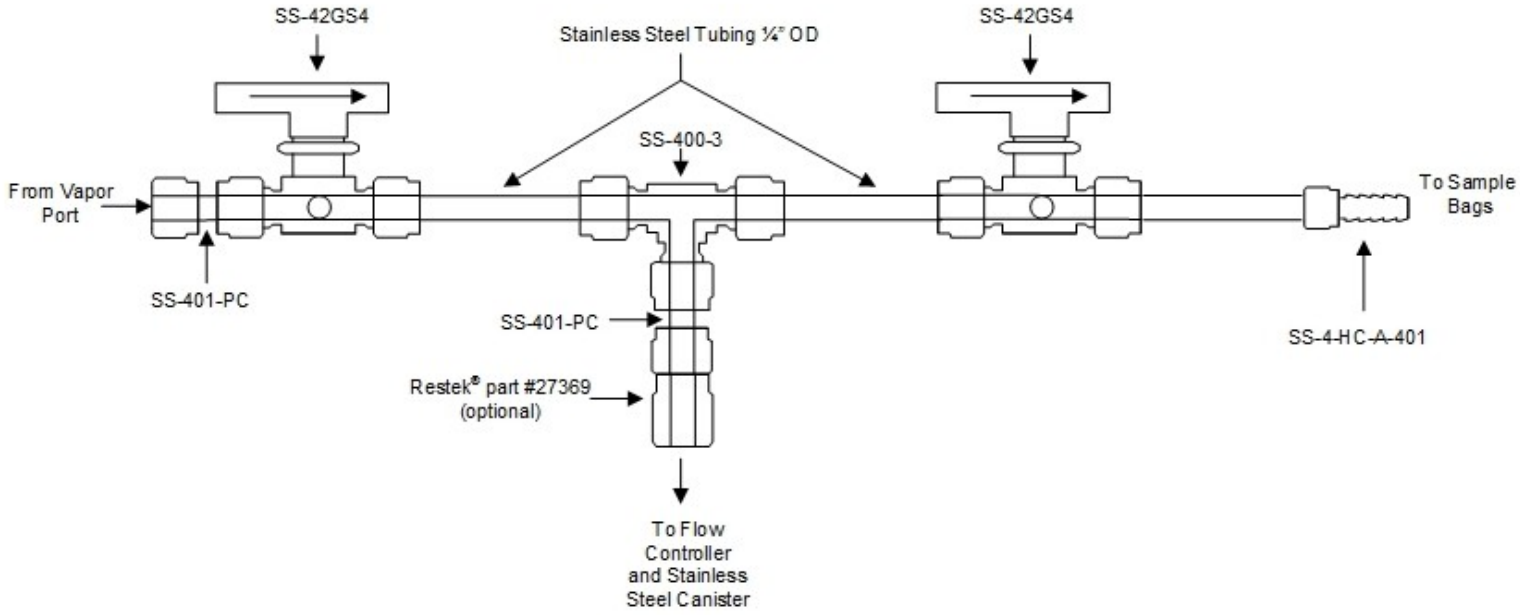
- If a sample is found to be compromised, 2 additional attempts (3 attempts total) shall be made to collect a sample.
  - With each additional attempt, check stainless-steel tubing and fittings for holes and loose connections, and place an additional layer of bentonite seal in the interior of the well vault.
  - After 3 attempts, if a successful sample has not been collected, the VMP shall not be sampled for that quarter.

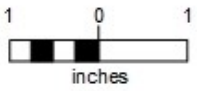
7. Decontamination

- Non-designated stainless-steel assemblies shall be thoroughly decontaminated by purging with at least half a liter of air (e.g., with hand pump or peristaltic pump).
- If a stainless-steel assembly comes into contact with groundwater, it shall be decontaminated using a Liquinox® detergent wash followed by a distilled water rinse. Discuss with task manager before re-using the assembly.
- If a stainless-steel assembly comes into contact with LNAPL, immediately call task manager and segregate the contaminated components from other sample media.
- Multiple stainless-steel assemblies shall be available to sample crews to allow for equipment to be cleaned and dried sufficiently before being reused.
- Tedlar® bags may be decontaminated if it meets the criteria listed in SOP No. 4 Decontamination.

8. Shipping

- Sample information shall be recorded on a chain of custody for the laboratory following procedures outlined in SOP No. 26 Sample Control and Custody Procedures.
- Samples shall be shipped to the laboratory following DOT regulations. If there is the possibility that samples may be classified as hazardous, samples must be shipped as such. For procedures, see SOP No. 51 Vapor Sampling Classification, Packaging and Shipping, and check with one of the office hazardous shipping personnel.

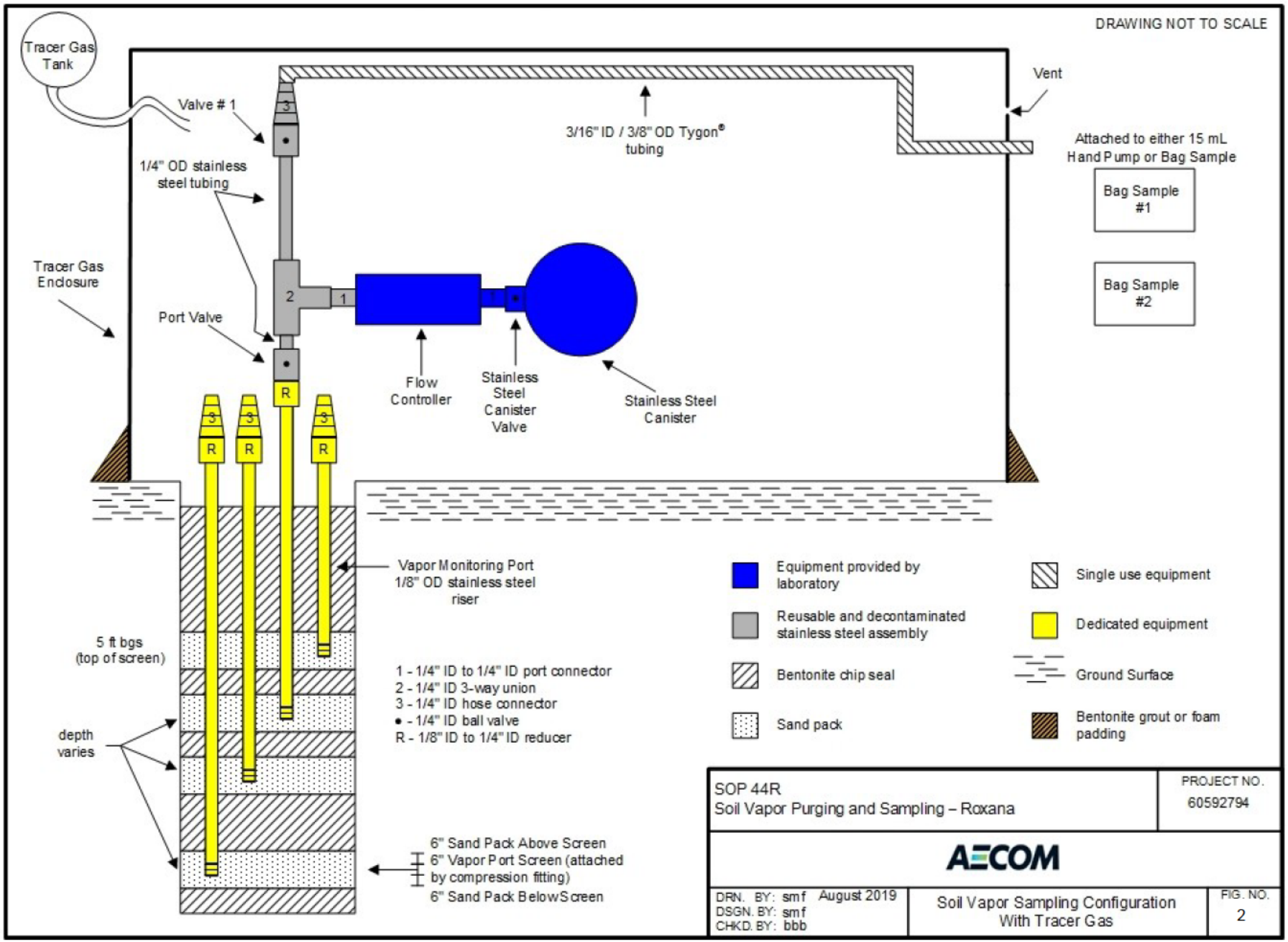




Notes:
1) All components listed with Swagelok® part numbers (if applicable).
2) All components made by Swagelok® unless otherwise noted.
3) Assembly shown for standard sample.
4) Duplicate assembly includes an additional 3-way union between the two shown.
5) All fittings shown are compression fittings with SS-400-Set ferules and SS-402-1 nuts.
6) Restek® part #27369 is a female quick connect fitting that may be used to connect sampling assembly to flow controller when flow controller is outfitted with accompanying Restek® part #27373 (male quick connect fitting).

Source: https://swagelok.com/products.aspx; Accessed June 13, 2019.
Source: https://www.restek.com/catalog/view/53581; Accessed June 13, 2019.

SOP 44R Soil Vapor Purging and Sampling – Roxana	PROJECT NO. 60592794
AECOM	
DRN. BY: smf August 2019 DSGN. BY: smf CHKD. BY: bbb	Soil Vapor Sampling Assembly FIG. NO. 1


DRAWING NOT TO SCALE
Tracer Gas Tank
Valve # 1
1/4" OD stainless steel tubing
3/16" ID / 3/8" OD Tygon® tubing
Vent
Attached to either 15 mL Hand Pump or Bag Sample
Bag Sample #1
Bag Sample #2
Tracer Gas Enclosure
Port Valve
Flow Controller
Stainless Steel Canister Valve
Stainless Steel Canister
Vapor Monitoring Port 1/8" OD stainless steel riser
5 ft bgs (top of screen)
depth varies
1 - 1/4" ID to 1/4" ID port connector
2 - 1/4" ID 3-way union
3 - 1/4" ID hose connector
• - 1/4" ID ball valve
R - 1/8" ID to 1/4" ID reducer
6" Sand Pack Above Screen
6" Vapor Port Screen (attached by compression fitting)
6" Sand Pack Below Screen
Equipment provided by laboratory
Reusable and decontaminated stainless steel assembly
Bentonite chip seal
Sand pack
Single use equipment
Dedicated equipment
Ground Surface
Bentonite grout or foam padding
SOP 44R
Soil Vapor Purging and Sampling – Roxana
PROJECT NO.
60592794
AECOM
DRN. BY: smf August 2019
DSGN. BY: smf
CHKD. BY: bbb
Soil Vapor Sampling Configuration With Tracer Gas
FIG. NO.
2