Appendix A

Passive Soil Gas Summary Report

Note: Attachment 1 – Laboratory Analytical Reports not included. Laboratory reports have been provided to PADEP and individual homeowners.

Sunoco Pipeline L.P.

Passive Soil Gas Summary Report

Glenwood Drive & Walker Road, Washington Crossing, PA 18977

Upper Makefield Township

Bucks County, PA

April 11, 2025

Passive Soil Gas Summary Report

Glenwood Drive and Walker Road
Washington Crossing
Upper Makefield Township
Bucks County, Pennsylvania

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Date:
April 11, 2025

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Acronyms and Abbreviations

bgs	Below Ground Surface
BTEX	Benzene, Toluene, Ethylbenzene, Total Xylenes
DEP	Pennsylvania Department of Environmental Protection
EDB	1,2-Dibromoethane
EDC	1,2-Dichloroethane
GES	Groundwater & Environmental Services, Inc.
LNAPL	Light Non-Aqueous Phase Liquid
MTBE	Methyl tert-Butyl Ether
NRCS	Natural Resources Conservation Services
PSG	Passive Soil Gas
SPLP	Sunoco Pipeline L.P.
TMB	Trimethylbenzene
USDA	United States Department of Agriculture
USEPA	United States Environmental Protection Agency
VOCs	Volatile Organic Compounds

1 General

Groundwater & Environmental Services, Inc. (GES), on behalf of Sunoco Pipeline L.P. (SPLP), has prepared this *Passive Soil Gas Summary Report* for the SPLP Site located at the Intersection of Glenwood Drive and Walker Road, Upper Makefield Township, Bucks County, Pennsylvania. The objective of this work was to use a passive soil gas (PSG) analysis technique to assist in the identification of areas where petroleum compounds may exist in the subsurface.

1.1 Site Overview

The Site is situated in a rural residential area in Upper Makefield Township, Bucks County, Pennsylvania, at geographic coordinates 40.27033, -74.87508. In January 2025, SPLP identified a release of petroleum hydrocarbons (jet fuel) from a 14-inch diameter pipeline, which was subsequently exposed for repairs. During the initial rapid response, light non-aqueous phase liquid (LNAPL) from the release was detected on groundwater prompting Site investigation and ongoing remediation efforts.

1.2 Site Geology

The Site area is underlain by the Lockatong Formation (Trl), which is a Triassic-age, dark-gray to black argillite (a fine-grained sedimentary to weakly metamorphosed rock composed of indurated clay particles cemented by silica with no cleavage), having some zones of black shale and, locally, thin layers of impure calcareous shale, with a maximum reported thickness of approximately 3,800 feet. The reference section is along the Delaware River between Point Pleasant and Lumberville, Bucks County, Pennsylvania, approximately 15 miles northwest of the Site area. Bedding in the Lockatong is moderately well-developed and flaggy and thick. Joints have a blocky pattern, and are moderately developed, closely spaced, steeply dipping, and open. It is moderately resistant to weathering and is moderately weathered to a shallow depth, with small elongate and triangular fragments resulting from rapid hydration of minerals in exposed rock, with a moderately thick overlying mantle (Geyer and Wilshusen, 1982). There are no fractures or faults mapped in the immediate Site area; there are two synclines (valley-shaped bedrock structures) mapped 5-6 miles to the west of the area.

The local area is mapped as representative of good surface drainage, with joint openings providing a secondary porosity; both weathered and unweathered rock matrices have a low primary porosity and low permeability. The average groundwater yield is 35 gallons per minute, with lithology being an important factor in well yield (Geyer and Wilshusen, 1982).

According to the September 26, 2023, United States Department of Agriculture (USDA) Natural Resources Conservation Service (NRCS) soil survey report, the Site area lies within the Uxb Urban land (65%) - Penn (25%) - other (10%) soil complex. This complex is described as having 0-8% slope, elevation of 200-1000 feet, and mean annual precipitation 36-55 inches. The depth to bedrock is 10 to 100 inches, and the available water supply in the upper 0-60 inches is described as low to very low. The soil is derived from a parent material ranging from artificially

covered areas to residuum weathered from shale and siltstone, is well-drained with very low runoff, and has a depth to water table of more than 80 inches.

2 Passive Soil Gas Methodology and Installation

2.1 Methodology

Soil gas screening has been used for decades in the environmental industry to identify subsurface areas where chemicals of concern may exist. The theory behind soil gas screening is well-established, as volatile organic compounds (VOCs) will readily partition from a liquid phase (i.e., gasoline or groundwater) and migrate vertically upward through the unsaturated soil profile to the atmosphere. Shallow soil gas screening can reliably detect the presence of VOCs directly beneath the locations investigated. From the PSG detections, figures can be developed to present the areal extent, or footprint, of the VOC constituents at a moment in time.

GES contracted Beacon Environmental (Beacon) of Forest Hill, Maryland, to provide the PSG collector devices and to perform laboratory analyses from the collectors subsequent to their deployment. Beacon is a fully accredited laboratory and their patented soil gas collection apparatus is designed to capture VOCs and provide for compound-specific chemical identification at low levels, which is an advantage over other rapid soil gas screening approaches.

2.2 One Call

The Pennsylvania One-Call Public Utility mark-out service (PA One-Call) was contacted prior to performing any subsurface investigative activities at the Site. The PA One-Call service identified the locations of the subsurface public utilities (electric, natural gas, water, telephone, etc.), but not the private utilities for which they are not responsible.

2.3 Installation, Sampling and Analysis

A total of 46 PSG collectors were installed within the investigation area (**Figure 1**). Based upon access to various properties and valid One Call Legal Dig dates, the collectors were deployed on February 25, 2025, February 28, 2025, March 3, 2025, March 6, 2025, and March 7, 2025 and were retrieved on March 7 and March 14, 2025. Specifics regarding the placement of the PSG collectors during the February and March 2025 event are provided below:

- The 46 PSG collectors were installed along five (5) North-South lines transecting Spencer Road and Walker Road between the north and south sides of Glenwood Drive, with 8-10 PSG collectors installed along each line (**Figure 1**).
- An additional PSG collector, PSG-A, was installed in the root cellar of 122 Walker Road.

The temperatures during the timeframe of absorption (from February 25, 2025 through March 7, 2025; March 3, 2025 through March 14, 2025) ranged from 24°F to 50°F with an avg. temp. of 36°F. The area received approximately 2 inches of rainfall during this period.

A hammer drill was used to advance each PSG screening location as a boring to a total depth of approximately 30 inches below ground surface (bgs) to promote air flow from the underlying zone.

A small-diameter (approximately one-inch) metallic tubing sheath protecting an open glass vial containing a proprietary adsorbent media was placed into each boring to a depth of approximately 30-inches and was then covered with native soil and left undisturbed for approximately one week.

After the one-week deployment period, each PSG collector was retrieved, sealed, and returned to Beacon for analysis. Beacon's procedures for deployment and collection of the PSG capture devices were strictly followed by GES personnel. All samples were given unique identification numbers, marked with a small flag during deployment, and their exact GPS coordinates were logged by GES field personnel. The PSG samples were submitted under proper chain-of-custody documentation to Beacon to be analyzed for the PA Department of Environmental Protection (DEP) Leaded / Unleaded gasoline / Aviation Fuel parameters (VOCs only): benzene, toluene, ethylbenzene, and total xylenes (BTEX), methyl tert-butyl ether (MTBE), isopropylbenzene, naphthalene, 1,2,4-trimethylbenzene (TMB), 1,3,5-TMB, 1,2-dichloroethane (EDC), and 1,2-dibromoethane (EDB) via EPA Method TO-17.

2.4 Results

The DEP Sub-Slab Soil Gas Residential SHS VI Screening Values are the screening criteria for the site. None of the target concentrations were detected above the applicable screening values. However, it is important to note that the samples were not collected under a slab foundation of any residence. The samples were collected in areas that are highly permeable (i.e., grassy areas). There are no existing criteria under the Act 2 Technical Guidance Manual for screening values for passive soil gas. However, among the various screening values, the most suitable criteria were applied.

- Benzene was detected in one sample (PSG-11, located at REDACTE Walker Road) at a concentration of 3.63 micrograms per liter (µg/m^3), which is below the applicable screening value of 120 µg/m^3. It should be noted that this location was near the property's septic tank and may have been from the off-gas of the septic system.
- Toluene was detected in various sample locations at concentrations ranging from 5.2 µg/m^3 to 28.5 µg/m^3, which is below the applicable screening value of 200,000 µg/m^3. Toluene detections are plotted on **Figure 2** and **Figure 3**.

These findings show that the concentrations are more prevalent closer to the release point (REDACTE Glenwood Drive). However, overall, these detected concentrations are generally very low level and do not indicate a significant source area below the properties that were investigated.

Figures

REDACTED

REDACTED

Passive Soil Gas Test Location Map

Sunoco Pipeline
Upper Makefield Township,
Washington Crossing, PA

rawn
.B.
esigned
C.M.
pproved
G.J.R.

Date
4/1/25
Figure
1

Scale In Feet (Approximate)

0 200

Groundwater & Environmental Services, Inc.

N:\Blacksburg\Projects\Energy Transfer\WashingtonCrossing\GIS\WashingtonCrossingER.aprx - Scale 1:2,400 - 4/1/2025 12:48 PM - jbarnard - NAD 1983 StatePlane Pennsylvania South FIPS 3702 Feet - Layout -PSG_OverallMap

REDACTED

BEACON ENVIRONMENTAL
526 Underwood Lane, Bel Air, MD 21014 USA
www.Beacon-USA.com 1-410-838-8780
Beacon Project No. 8452, March 2025

REDACTED

Figure 12
Passive Soil-Gas Survey
Sample Locations

SPLP
Washington Crossing, PA

REDACTED

BEACON ENVIRONMENTAL
526 Underwood Lane, Bel Air, MD 21014 USA
www.Beacon-USA.com 1-410-838-8780
Beacon Project No. 8452, March 2025

REDACTED

Figure 23
Passive Soil-Gas Survey
Toluene

SPLP
Washington Crossing, PA

Table

Table 1

Soil-Vapor Analytical Data Summary

Property	Sample ID	Installation Depth	Sample (Retrieval) Date	Benzene	Toluene	Ethylbenzene	m,p-Xylenes	o-Xylenes	Total Xylenes	MTBE	Isopropyl benzene	Naphthalene	1,2,4-Trimethyl-benzene	1,3,5-Trimethyl-benzene	1,2-Dichloroethane	1,2-Dibromoethane (EDB)
				($\mu g/m^3$)	($\mu g/m^3$)	($\mu g/m^3$)	($\mu g/m^3$)	($\mu g/m^3$)	($\mu g/m^3$)	($\mu g/m^3$)	($\mu g/m^3$)	($\mu g/m^3$)	($\mu g/m^3$)	($\mu g/m^3$)	($\mu g/m^3$)	($\mu g/m3$)
DEP Residential Sub-Slab Soil Gas SHS VI Screening Values (SV_{ss})				**120**	**200,000**	**370**	**-**	**-**	**4,000**	**3,600**	**16,000**	**28**	**2,400**	**2,400**	**36**	**1.6**
REDACTED	1	30 inches	3/7/2025	<3.33	<4.41	<2.07	<2.00	<2.00	<4.00	<3.53	<2.12	<0.882	<2.12	<2.12	<1.26	*<1.81*
	2	30 inches	3/7/2025	<3.32	<4.40	<2.07	<2.00	<2.00	<4.00	<3.52	<2.12	<0.881	<2.12	<2.12	<1.26	*<1.81*
	3	30 inches	3/7/2025	<3.32	<4.40	<2.07	<2.00	<2.00	<4.00	<3.52	<2.12	<0.880	<2.12	<2.12	<1.26	*<1.81*
	4	30 inches	3/7/2025	<3.32	<4.40	<2.07	<2.00	<2.00	<4.00	<3.52	<2.12	<0.880	<2.12	<2.12	<1.26	*<1.80*
	5	30 inches	3/7/2025	<3.34	<4.43	<2.08	<2.01	<2.01	<4.02	<3.54	<2.13	<0.885	<2.13	<2.13	<1.26	*<1.82*
	6	30 inches	3/7/2025	<3.34	<4.42	<2.08	<2.01	<2.01	<4.02	<3.54	<2.13	<0.884	<2.13	<2.13	<1.26	*<1.81*
	7	30 inches	3/7/2025	<3.33	<4.41	<2.07	<2.00	<2.00	<4.00	<3.53	<2.12	<0.882	<2.12	<2.12	<1.26	*<1.81*
	8	30 inches	3/7/2025	<3.33	<4.41	<2.08	<2.00	<2.00	<4.00	<3.53	<2.13	<0.882	<2.13	<2.13	<1.26	*<1.81*
	9	30 inches	3/7/2025	<3.32	<4.40	<2.07	<2.00	<2.00	<4.00	<3.52	<2.12	<0.880	<2.12	<2.12	<1.26	*<1.81*
	10	30 inches	3/7/2025	<3.32	<4.40	<2.07	<2.00	<2.00	<4.00	<3.52	<2.12	<0.879	<2.12	<2.12	<1.26	*<1.80*
	11	30 inches	3/7/2025	3.63	<4.39	<2.07	<2.00	<2.00	<4.00	<3.51	<2.12	<0.879	<2.12	<2.12	<1.26	*<1.80*
	12	30 inches	3/7/2025	<3.32	<4.39	<2.07	<2.00	<2.00	<4.00	<3.51	<2.12	<0.879	<2.12	<2.12	<1.26	*<1.80*
	13	30 inches	3/7/2025	<3.31	<4.39	<2.07	<2.00	<2.00	<4.00	<3.51	<2.12	<0.878	<2.12	<2.12	<1.25	*<1.80*
	A	30 inches	3/7/2025	*<3.33*	<4.41	<2.07	<2.00	<2.00	<4.00	<3.53	<2.12	<0.882	<2.12	<2.12	<1.26	*<1.81*
	14	30 inches	3/7/2025	<3.33	<4.42	<2.08	<2.01	<2.01	<4.02	<3.53	<2.13	<0.883	<2.13	<2.13	<1.26	*<1.81*
	15	30 inches	3/7/2025	<3.31	28.5	<2.06	<1.99	<1.99	<3.98	<3.51	<2.11	<0.877	<2.11	<2.11	<1.25	*<1.80*
	16	30 inches	3/7/2025	<3.31	11.2	<2.07	<2.00	<2.00	<4.00	<3.51	<2.12	<0.878	<2.12	<2.12	<1.25	*<1.80*
	17	30 inches	3/7/2025	<4.76	<6.30	<2.96	<2.86	<2.86	<5.72	<5.04	<3.04	<1.26	<3.04	<3.04	<1.80	*<2.58*
	18	30 inches	3/7/2025	<4.75	<6.29	<2.96	<2.86	<2.86	<5.72	<5.03	<3.03	<1.26	<3.03	<3.03	<1.80	*<2.58*
	19	30 inches	3/14/2025	<2.96	<3.92	<1.84	<1.78	<1.78	<3.56	<3.13	<1.89	<0.783	<1.89	<1.89	<1.12	*<1.61*
	20	30 inches	3/14/2025	<2.97	8.69	<1.85	<1.79	<1.79	<3.58	<3.15	<1.90	<0.787	<1.90	<1.90	<1.12	*<1.61*
	21	30 inches	3/14/2025	<2.97	<3.94	<1.85	<1.79	<1.79	<3.58	<3.15	<1.90	<0.787	<1.90	<1.90	<1.12	*<1.61*
	22	30 inches	3/14/2025	<2.97	<3.94	<1.85	<1.79	<1.79	<3.58	<3.15	<1.90	<0.787	<1.90	<1.90	<1.12	*<1.62*
	23	30 inches	3/14/2025	<2.97	<3.94	<1.85	<1.79	<1.79	<3.58	<3.15	<1.90	<0.787	<1.90	<1.90	<1.12	*<1.62*
	24	30 inches	3/14/2025	<2.97	<3.94	<1.85	<1.79	<1.79	<3.58	<3.15	<1.90	<0.788	<1.90	<1.90	<1.13	*<1.62*
	25	30 inches	3/14/2025	<2.97	<3.94	<1.85	<1.79	<1.79	<3.58	<3.15	<1.90	<0.788	<1.90	<1.90	<1.13	*<1.62*
	26	30 inches	3/14/2025	<2.98	8.66	<1.86	<1.79	<1.79	<3.58	<3.15	<1.90	<0.788	<1.90	<1.90	<1.13	*<1.62*
	27	30 inches	3/14/2025	<2.98	<3.95	<1.86	<1.79	<1.79	<3.58	<3.16	<1.90	<0.790	<1.90	<1.90	<1.13	*<1.62*
	28	30 inches	3/14/2025	<2.98	<3.95	<1.86	<1.80	<1.80	<3.60	<3.16	<1.90	<0.790	<1.90	<1.90	<1.13	*<1.62*
	29	30 inches	3/14/2025	<3.01	5.20	<1.87	<1.81	<1.81	<3.62	<3.19	<1.92	<0.797	<1.92	<1.92	<1.14	*<1.63*
	30	30 inches	3/14/2025	<2.97	<3.94	<1.85	<1.79	<1.79	<3.58	<3.15	<1.90	<0.788	<1.90	<1.90	<1.13	*<1.62*
	31	30 inches	3/14/2025	<2.97	15.9	<1.85	<1.79	<1.79	<3.58	<3.15	<1.90	<0.788	<1.90	<1.90	<1.13	*<1.62*
	32	30 inches	3/14/2025	<4.06	8.96	<2.53	<2.45	<2.45	<5.90	<4.30	<2.59	<1.08	<2.59	<2.59	<1.54	*<2.21*
	33	30 inches	3/14/2025	<4.06	6.00	<2.53	<2.45	<2.45	<5.90	<4.31	<2.60	<1.08	<2.60	<2.60	<1.54	*<2.21*
	34	30 inches	3/14/2025	<4.13	<5.47	<2.57	<2.49	<2.49	<4.98	<4.38	<2.64	<1.09	<2.64	<2.64	<1.56	*<2.24*
	35	30 inches	3/14/2025	<4.13	25.1	<2.57	<2.49	<2.49	<4.98	<4.38	<2.64	<1.09	<2.64	<2.64	<1.56	*<2.24*
	36	30 inches	3/14/2025	<4.13	27.5	<2.57	<2.49	<2.49	<4.98	<4.38	<2.64	<1.09	<2.64	<2.64	<1.56	*<2.24*
	37	30 inches	3/14/2025	<4.08	<5.41	<2.55	<2.46	<2.46	<5.92	<4.33	<2.61	<1.08	<2.61	<2.61	<1.55	*<2.22*
	38	30 inches	3/14/2025	<4.09	<5.42	<2.55	<2.46	<2.46	<5.92	<4.33	<2.61	<1.08	<2.61	<2.61	<1.55	*<2.22*

Table 1

Soil-Vapor Analytical Data Summary

Property	Sample ID	Installation Depth	Sample (Retrieval) Date	Benzene	Toluene	Ethylbenzene	m,p-Xylenes	o-Xylenes	Total Xylenes	MTBE	Isopropyl benzene	Naphthalene	1,2,4-Trimethyl-benzene	1,3,5-Trimethyl-benzene	1,2-Dichloroethane	1,2-Dibromoethane (EDB)
				(µg/m^3)	(µg/m^3)	(µg/m^3)	(µg/m^3)	(µg/m^3)	(µg/m^3)	(µg/m^3)	(µg/m^3)	(µg/m^3)	(µg/m^3)	(µg/m^3)	(µg/m^3)	(µg/m3)
DEP Residential Sub-Slab Soil Gas SHS VI Screening Values (SV_{ss})				**120**	**200,000**	**370**	**-**	**-**	**4,000**	**3,600**	**16,000**	**28**	**2,400**	**2,400**	**36**	**1.6**
REDACTED	39	30 inches	3/14/2025	<4.13	18.0	<2.57	<2.49	<2.49	<5.98	<4.38	<2.64	<1.09	<2.64	<2.64	<1.56	*<2.24*
	40	30 inches	3/14/2025	<4.13	12.8	<2.57	<2.49	<2.49	<5.98	<4.38	<2.64	<1.09	<2.64	<2.64	<1.56	*<2.24*
	41	30 inches	3/14/2025	<4.13	13.6	<2.57	<2.49	<2.49	<5.98	<4.38	<2.64	<1.09	<2.64	<2.64	<1.56	*<2.24*
	42	30 inches	3/14/2025	<4.80	18.2	<2.99	<2.89	<2.89	<5.78	<5.08	<3.06	<1.27	<3.06	<3.06	<1.82	<2.61
	43	30 inches	3/14/2025	<4.81	<6.37	<3.00	<2.89	<2.89	<5.78	<5.09	<3.07	<1.27	<3.07	<3.07	<1.82	<2.61
	44	30 inches	3/14/2025	<4.81	6.73	<3.00	<2.90	<2.90	<5.80	<5.10	<3.07	<1.28	<3.07	<3.07	<1.82	<2.62
	45	30 inches	3/14/2025	<4.76	12.6	<2.97	<2.86	<2.86	<5.72	<5.04	<3.04	<1.26	<3.04	<3.04	<1.80	*<2.59*
	46	30 inches	3/14/2025	<4.76	20.5	<2.97	<2.86	<2.86	<5.72	<5.04	<3.04	<1.26	<3.04	<3.04	<1.80	*<2.59*

DEP = Pennsylvania Department of Environmental Protection
VI = Vapor Intrusion
MTBE = Methyl tertiary butyl ether
mg/m^3 = Milligrams per cubic meter
J = Estimated value >= the Laboratory Detection Limit (MDL or DL) and < the Limit of Quantitation (LOQ or RL)
MDL = Method Detection Limit
DL = Detection Limit
LOQ = Limit of Quantitation
RL = Reporting Limit
NA = Not Analyzed
ND = Not detected (# is the method detection limit)
Note = Samples were analyzed via TO-15 by Eurofins Lancaster Laboratories Environmental (ELLE)
SHS = Statewide Health Standard (DEP Technical Guidance Manual, 2021)
Note = Selection of SHS is based on attainment of SHS in soil and groundwater
Bold Values indicate an exceedance of the DEP Residential Sub-Slab Soil Gas SHS VI Screening Value
Shaded Values indicate an exceedance of the DEP Residential Indoor Air SHS VI Screening Value
Italics indicates the Limit of Quantitation (reporting limit) exceeds an applicable Screening Value

Attachment 1 – Laboratory Analytical Results

Not included