Appendix G

Site Characterization Work Plan

Note: Attachments not included

Sunoco Pipeline LP

Soil Characterization Work Plan

REDACTED Glenwood Drive, Washington Crossing, PA 18977

Upper Makefield Township
Bucks County, PA

June 4, 2025

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Attachment

Acronyms and Abbreviations

BTEX	Benzene, Toluene, Ethylbenzene, Total Xylenes
DEP	Pennsylvania Department of Environmental Protection
DOT	Pennsylvania Department of Transportation
EDB	1,2-Dibromoethane
EDC	1,2-Dichloroethane
GES	Groundwater & Environmental Services, Inc.
HASP	Health and Safety Plan
IDW	Investigation-Derived Waste
LNAPL	Light Non-Aqueous Phase Liquid
MTBE	Methyl tert-butyl ether
NAD	North American Datum
NAVD	North American Vertical Datum
NRCS	Natural Resources Conservation Service
OSHA	Occupational Safety and Health Administration
PID	Photoionization Detector
SPLP	Sunoco Pipeline LP
TOC	Top-of-Casing
TMB	Trimethylbenzene
USCS	Unified Soil Classification System
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 LP (SPLP), has prepared this *Soil Characterization Work Plan for* [REDACTED] *Glenwood Drive, Washington Crossing, PA 18977* 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 Plan is to advance at least twelve (12) soil borings in the SPLP right-of-way at [REDACTED] Glenwood Drive, Washington Crossing, PA 18977.

All activities will be performed in accordance with GES Standard Operating and Health and Safety Procedures. Proposed activities outlined in this plan will be conducted between the hours of 9:00 am and 5:00 pm, Monday through Friday. A Pennsylvania-licensed and GES-approved driller will be contracted to perform the work on-site. All work will be performed by qualified GES staff and will be approved by a Pennsylvania-licensed Professional Geologist. The following is a description of the proposed scope of work.

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 and Site investigation and remediation efforts were initiated.

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 Soil Boring Advancement

2.1 Pre-Drilling Protocol

The Pennsylvania One-Call Public Utility mark-out service (PA One-Call) will be contacted prior to performing any subsurface investigative activities at the Site to renew the mark-out of public utilities initially conducted in February 2025. 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. Therefore, a private subsurface utility survey was conducted at [REDACTED] Glenwood Drive by Rettew, Inc. (Rettew) on March 14, 2025. The locations of the private utilities identified by Rettew and the location of the proposed soil borings are depicted on **Figure 1**.

Due to the potential for shallow bedrock and the absence of utilities other than the pipeline (see **Figure 1**), the soil boring locations will not be hand cleared prior to commencement of drilling. A representative from SPLP will be on-site at all times during the investigation to mark out and located the pipeline.

2.2 Soil Boring Advancement

The general soil boring investigation scope of work is summarized as follows:

- The drilling technology will be direct-push utilizing a track-mounted drill rig.
- Soil borings will be advanced to refusal, which is expected to be within the weathered bedrock at depths between seven and eleven feet below ground surface.
- Soil borings are proposed to be advanced within the SPLP right-of-way in the area around the interim remedial excavation (**Figure 2**).
- Twelve borings are proposed at a 15-foot spacing along the perimeter of the interim remedial excavation, approximately ten feet to the north and south of the pipeline (**Figure 2**).
- During drilling activities, the GES scientist will characterize the soil according to the Unified Soil Classification System (USCS) by recording the color, composition, moisture content, and lithology on a drilling log.

- Soil cuttings will be screened with a field-calibrated photoionization detector (PID) to determine the relative presence or absence of volatile organic compounds (VOCs).
- Soil cuttings will be scanned with an ultraviolet light to screen for the presence of separate-phase petroleum products.
- Additional soil borings may be advanced based on field observations and screening results.
- Mats will be used to move drilling equipment across the grass.
- Upon completion of sampling, the borings will be abandoned by back-filling with bentonite pellets to approximately one-foot below ground surface. The bentonite pellets will be activated with potable water prior to capping the borehole with topsoil followed by grass seed.

GES SOP for soil borings is included in **Attachment 1**.

2.3 Soil Sampling

Up to two soil samples from each borehole may be collected for submittal for laboratory analysis. The depths of the sampling interval will be based on observations made during the boring advancement. Samples will generally be collected at the following intervals: one soil sample will be collected from the refusal depth (i.e., soil/bedrock interface) and one soil sample will be collected from the soil boring at the interval eliciting the highest PID response or the interval identified as containing petroleum products by ultraviolet light scanning. If there are no indications of petroleum impact, only one laboratory analytical sample will be collected from the boring. The GES SOPs for soil sampling and soil screening are included in **Attachment 1**.

The soil samples will be transported under proper chain-of-custody documentation to Pace Laboratories. Soil samples will be analyzed for the PA Department of Environmental Protection (DEP) Leaded / Unleaded gasoline / Aviation Fuel parameters 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-dibromoethane (EDB), and 1,2-dichloroethane (EDC) via United States Environmental Protection Agency (USEPA) Method 8260D, and total lead USEPA Method 6010. The laboratory accreditation is provided as **Attachment 2**.

2.4 Investigation-Derived Waste Management

Construction debris and soil-cuttings generated during soil boring activities will be containerized in Pennsylvania Department of Transportation (DOT)-approved, steel 55-gallon drums for disposal in accordance with the Waste Management Plan dated February 26, 2025. All waste generated during soil boring activities will be transported off-Site for disposal at a PADEP-permitted waste facility as outlined in Waste Management Plan (**Attachment 3**).

2.5 Health, Safety, and Security

All field activities will be conducted in accordance with the site-specific Health and Safety Plan (HASP) prepared by GES for this site (**Attachment 4**). GES personnel engaged in on-Site activities will have the training necessary to perform each of the prescribed tasks. Familiarity with

the guidance documents and standards listed below is required prior to engaging in on-Site activities:

- Occupational Safety and Health Administration (OSHA) Hazardous Waste Operations and Emergency Response Standard (OSHA 29CFR1910.120)
- Occupational Safety and Health Guidance Manual for Hazardous Waste Site Activities (1985) (NIOSH/OSHA/USCG/EPA)
- Health and Safety Requirements for Employees Engaged in Field Activities (EPA Order 1440.2)

Safety measures will be implemented to manage pedestrian flow during soil boring activities, including the set-up of an orange snow fence between the work area and the property boundary. Clear and safe routes of personnel ingress and egress will be established by work zone separation, visibility, signage, barriers, training, and communication. It should be noted that all work will be contained within the boundaries of private property.

A clearly demarcated work zone will be utilized to restrict unauthorized access. The only personnel that should be in the immediate work zone near the drill rig are the drilling company and GES support personnel. Warning signs that indicate potential hazards and safety protocols, as well as emergency contact information, will be posted at prominent locations at the work zone. All other personnel near the work zone must remain at least 10 feet away from the immediate work area in the event that person does not have the property training certifications or personal protective equipment (i.e., steel toe boots, hearing protection, etc.). Crossing into the immediate work area is considered a breach of security.

Outdoor air monitoring will generally occur along the perimeter of the Property, primarily between the area where soil boring activities will occur (the work area) and neighboring residences.

Daily health, safety, and security meetings will be conducted to review training, standard operating procedures, job hazard analysis, work scopes, and hazard communication. The equipment will remain staged in the work area until drilling is complete. All equipment within the work zone will be secured overnight to prevent theft or unauthorized use.

3 References

Geyer, A.R., and J.P. Wilshusen. 1982. *Engineering Characteristics of the Rocks of Pennsylvania, Second Edition*, Pennsylvania Geologic Survey, Harrisburg, PA.

United States Department of Agriculture, Natural Resources Conservation Service. September 26, 2023. Web Soil Survey. http://websoilsurvey.nrcs.usda.gov/app/WebSoilSurvey.aspx

Verdantas. April 18, 2025. Site Characterization Work Plan.

Figures

REDACTED

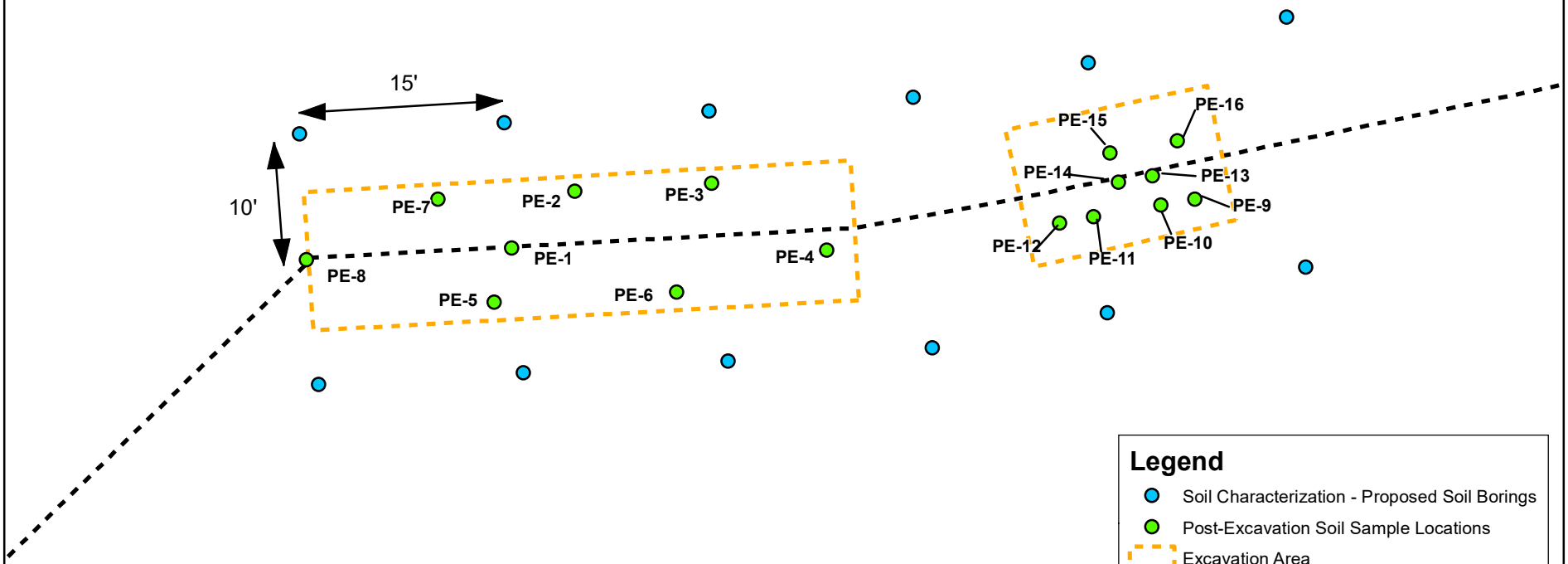
Figure 1: Subsurface Utility Survey Results

REDACTED Glenwood Drive
Washington Crossing, PA
Upper Makefield Township
Bucks County, PA

RETTEW SM

RETTEW Field Services, Inc.
5031 Richard Lane, Suite 111, Mechanicsburg, PA 17055
Phone (717) 697-3551

SURVEY DATE:	3/14/2025
PROJECT No:	0963003386
REVIEWED BY:	DEM
DRAWN BY:	SHC
DATE:	03/18/2025
FIGURE No:	1 of 1



Legend

- Soil Characterization - Proposed Soil Borings
- Post-Excavation Soil Sample Locations
- Excavation Area
- Approximate 14-Inch Pipeline

Notes:
Post-Excavation Soil Sample Locations and Excavation Area boundaries were provided by Groundwater & Environmental Services, Inc.
The figure is not drawn to scale.

verdantas

April 2025

Twin Oaks - Newark 14"-Diameter Pipeline-
LNAPL Incident: Site Characterization Work Plan

Figure 2 - Proposed Soil Boring Location

Upper Makefield Township
Bucks County, Pennsylvania

Figure
2

Produced Using Esri's ArcGIS Software
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