Proposed PSG Collector Map

Sunoco Pipeline
Upper Makefield Township,
Washington Crossing, PA

Drawn **J.B.**
Designed **C.M.**
Approved **X.X.**

Date **2/14/25**
Figure **X.X.**

Scale In Feet (Approximate)
0 200

Groundwater & Environmental Services, Inc.

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Use of Passive Soil Gas for Identifying Fuel in the Subsurface

Feb 2025

GES proposes to use a passive soil gas analysis technique to assist in the identification of areas where petroleum compounds may exist in the subsurface. This is a semi-quantitative screening technique that involves the shallow (approx. 18-inch deep) burial of a passive soil gas collector capsule. This collector is installed using hand tools (typically a hammer drill) and left in place for one week. Subsurface organic vapor moving through soils will collect on the absorber material. The collectors are retrieved after approximately one week and returned to the laboratory for analysis.

The lab analysis is capable of low-level detection of volatile organics and can be used to map the presence of underlying fuel or fuel components. This technique relies upon natural soil gas transport and can be hampered by atmospheric conditions that will limit or preclude soil gas transport such as sustained freezing conditions or excessive precipitation. In those cases, it may be necessary to leave the passive collectors in place for a longer duration to allow for adequate vapor flux.

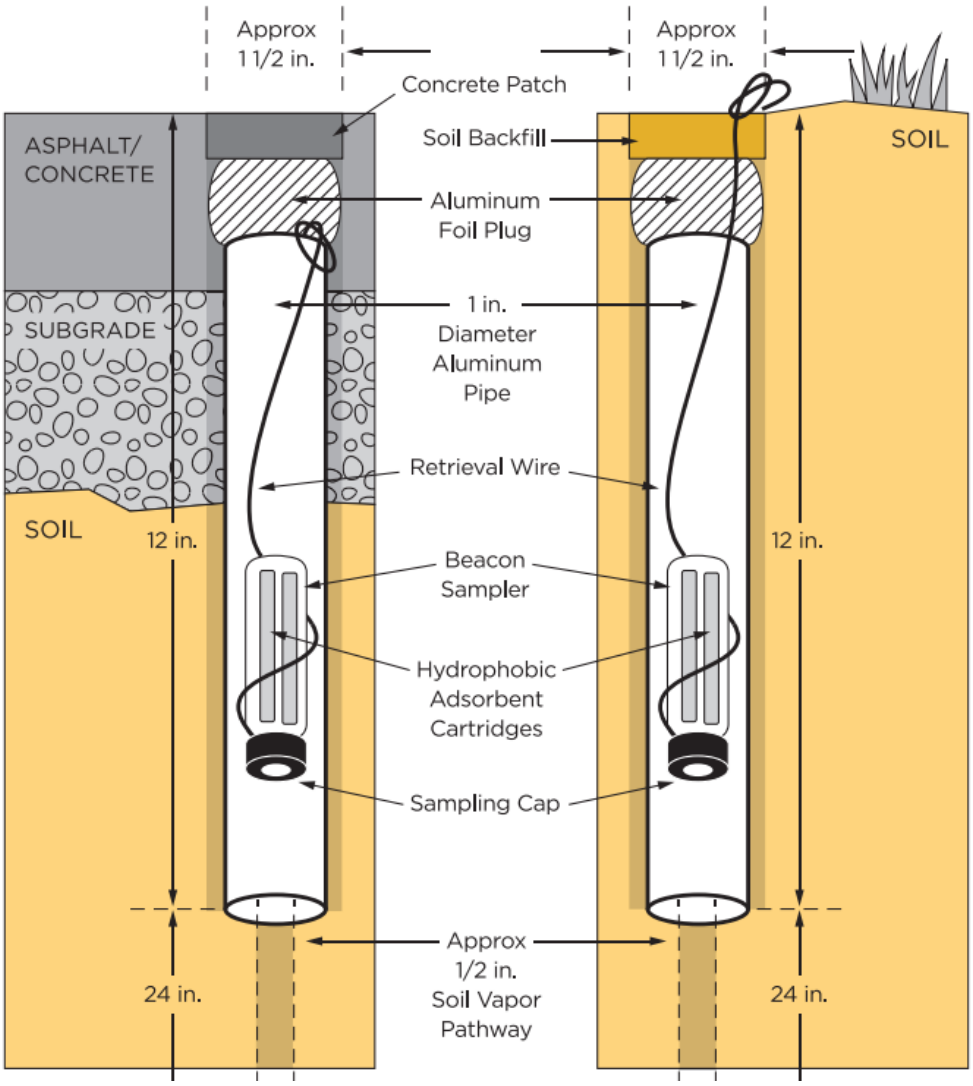
GES proposes to use Beacon Environmental (Beacon) of Forest Hill, Maryland to provide the passive soil gas (PSG) collector devices and to perform laboratory analyses from the collectors after their retrieval (www.beacon-usa.com). Beacon is a fully accredited laboratory and their patented soil gas collection apparatus is designed to capture volatile organic compounds and provide for compound-specific chemical identification at low levels, which is an advantage over other rapid screening approaches. This investigative technique can be completed using hand tools – allowing for ease of access and low-impact to areas of interest.

The installation can be done in less than 30 minutes per collector and nothing is left above-ground except a small flag to mark the location. A plug of soil is placed over the collector upon deployment and we will leave a small flag in place to ensure efficient recovery. A GPS unit is typically employed to record the exact location of each collector in the event that the flag marker becomes misplaced.

This technique provides “screening level” results that can guide more intensive investigation efforts such as well drilling. No evidence of the work should be visible after the collectors are removed. GES has used this technique successfully in Pennsylvania and elsewhere to assist with environmental investigations. Beacon has been involved in hundreds of environmental investigations using passive soil gas methods and is a leader in this practice.

A schematic of the passive collector deployment is shown below:

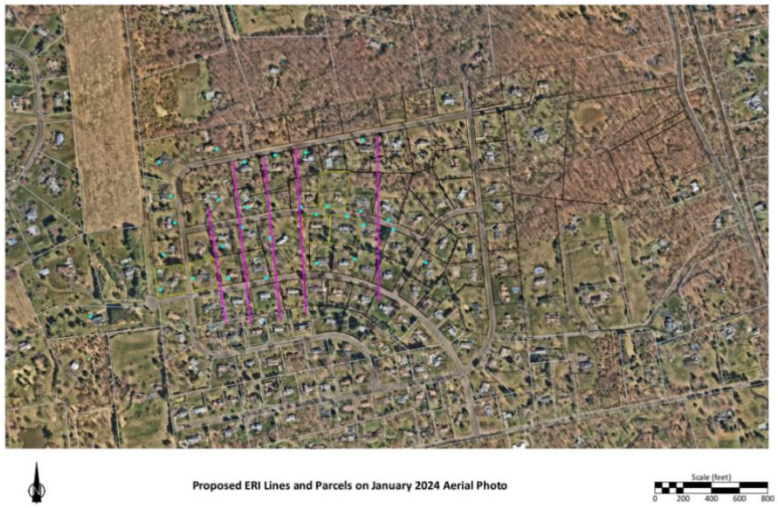
Figure 3 – Beacon PSG Sampler Installation



Photos showing the installation and retrieval of passive soil gas collectors in a hilly, wooded location are shown below:

Electrical Resistivity Imaging Workplan for Washington Crossing

RETTEW proposes to conduct an electrical resistivity imaging (ERI) survey along five (5) profiles (see figure left), each between ~ 900 and 1,100 feet in length, to map the locations of fractures (electrically conductive) and potential petroleum product (electrically resistive) beneath the Washington Crossing neighborhood. Identification of these features will facilitate the planned installation of monitoring and product recovery wells throughout the impacted area.



ERI surveys involve laying out a long cable (between 550 and 1,100 feet) with thin (1/4") steel-spike electrodes spaced 10 feet apart along the cable and inserted 4" - 6" into the ground, and collecting resistivity readings using a SuperSting resistivity meter (see photo left). This procedure does not involve any hazardous or even perceptible electrical or electromagnetic fields. The currents involved are measured in milliAmps.

RETTEW can complete approximately one profile of this length per day. Where cables cross roadways, RETTEW will position the cables beneath high-visibility yellow cable protectors over which vehicles can drive slowly. In addition, traffic control or "Slow Down" signage will be installed adjacent to the cable protectors.

Limited foot traffic, and ¼"-diameter spike insertion points at 10-foot intervals will be the only temporary impact along each of the profiles. RETTEW can slightly modify the profile routes depending upon residential property approval.