Appendix I.3

External Well Water Sampling and Analysis Plan

Version 1.0

March 20, 2025

UPPER MAKEFIELD RESPONSE
WASHINGTON CROSSING, PENNSYLVANIA

EXTERNAL WELL WATER SAMPLING AND ANALYSIS PLAN (SAP)

Version 1.0

Prepared on Behalf of:
Sunoco Pipeline LP

Prepared By:
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March 20, 2025

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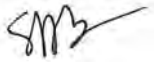
Reviewed by:	Sarah Burnett, PhD, CTEH		03/20/2025
Reviewed by:			
Approved by:			

1.0 Introduction and Purpose

This External Well Water Sampling and Analysis Plan (SAP) was prepared by CTEH, LLC (CTEH) on behalf of Sunoco Pipeline LP (Sunoco Pipeline) for external well water monitoring and sampling performed by Groundwater & Environmental Services, Inc. (GES) personnel in relation to the Upper Makefield Response in Washington Crossing, Pennsylvania. A leak from a pipeline that transports refined petroleum products, including jet fuel, was identified in January 2025. The GPS coordinates for the approximate location of the release site (hereinafter referred to as Site) are: 40.271184, -74.875953. A map of the incident location is provided in Attachment A.

The objectives of the external well water sampling are to:

1. Conduct air monitoring of external wellhead headspace as screening for volatile organic compounds (VOCs); and
2. Collect water samples from external well water to evaluate potential impacts to domestic well water related to jet fuel and its potential constituents.

2.0 Health and Safety

Field personnel will review and adhere to the site-specific Health and Safety Plan (HASP). Sampling and documentation activities will only be conducted under weather and other environmental conditions that do not create an unsafe working environment.

3.0 Data Quality Objectives

The data collected during field activities will be used to assess potential impacts to well water related to jet fuel and its potential constituents. Data will be used to primarily to evaluate potential vapor intrusion impacts to residences related to these constituents. Though well water from external wells is generally not representative of finished drinking water or indicative of human exposure, data will also be compared to health-based screening levels to evaluate potential impacts to human health related to these constituents.

A strategic planning approach based on the scientific method will be employed for data collection activities, providing a systematic procedure to ensure that the type, quantity, and quality of data used in decision-making are appropriate for the intended application. All water samples will be submitted to the analytical laboratory for a Level II data quality package. Additionally, 10% of samples will be submitted to the analytical laboratory for a Level IV data quality package.

4.0 External Well Water Monitoring and Sampling Methods

4.1 Location and Frequency

External well water samples will be collected from domestic wells within one mile of the Site by property owner request. One water monitoring/sampling event will initially be conducted per residence. Subsequent monitoring/sampling events may be conducted as requested by the property owner and/or Sunoco Pipeline personnel.

4.2 Visual Observation of External Wellhead

Prior to opening the wellhead, field personnel will photo-document the condition of the well cover. If the well is open or has no well cover, field personnel will photo-document the condition of the well and notify the project lead before proceeding to monitor/sample the well. If the external wellhead is physically inaccessible or unable to be opened at the time of sampling, field personnel will photo-document the conditions preventing sampler access and notify the project lead for potential follow up.

After monitoring/sampling has been completed and the well cover is re-secured, field personnel will again photo-document the condition of the well cover.

If the wellhead is damaged at any point during the opening, closing, and/or monitoring/sampling process, field personnel will immediately notify the project lead.

4.3 Headspace Air Monitoring

Headspace air monitoring of the external wellhead will be used as a field screening tool. The headspace of the external wellhead will be screened by slowly lifting the well cover and placing the inlet of the PID into the well headspace. The peak reading for VOCs will be recorded.

Headspace air monitoring will be conducted using a properly calibrated photoionization detector (PID) with a 10.6 electron volt (eV) lamp (e.g., RAE Systems by Honeywell MultiRAE or MiniRAE 3000+, ION Science Tiger XT; detection limit = 0.1 parts per million [ppm]).

4.4 Visual Observation and Documentation of Odors

Regardless of whether VOCs are detected in the headspace of the external wellhead, an aliquot of water will be drawn from the well for observation (as accessible) using approved materials (i.e., single-use bailer and/or peristaltic pump with single-use tubing). Observations of product and/or odor, or lack thereof, will be made (e.g., visual observation of separate phase liquids, color, and clarity; character and strength of odor). Observations will be recorded in the field form, along with other details about the residence and sampling event (Attachment B). If observations of product and/or odor indicate the presence of product

in a well, additional site investigation(s), including but not limited to additional sampling and/or manual removal of product, may be performed.

The aliquot of drawn well water will be disposed of in a manner consistent with regulatory guidelines and requirements. If a wellhead is inaccessible or the well column is blocked, field personnel will document the reason and report the finding to the project lead for potential follow up.

4.5 Sampling Methodology and Analysis

A HydraSleeve or equivalent no-purge groundwater sampling device will be used to collect water samples without disturbing the water column. Prior to deployment, field personnel will calculate the proper depth based on well construction details and attach the HydraSleeve to a weighted line with clear depth markings. Once lowered to the target sampling depth, the HydraSleeve will be activated with a quick upward pull, allowing water to flow through the check valve and fill the sampling sleeve. After retrieval to the surface, field personnel will transfer the collected water sample to laboratory-provided containers. If a HydraSleeve is unavailable or not a feasible sampling method due to site conditions (e.g., condition, depth, and size of the well), other no-purge sampling devices may be used, including but not limited to a bailer or peristaltic pump with disposable tubing. The sampling device and details will be documented.

Target analytes were selected based on analytical requirements for water testing related to refined petroleum products, including jet fuel, as outlined in the Short List of Petroleum Products in the Land Recycling Program Technical Guidance Manual established by the Pennsylvania Department of Environmental Protection (PA DEP). Target analytes are the following VOCs: benzene, toluene, ethylbenzene, total xylenes, isopropylbenzene, methyl tert-butyl ether (also known as methyl tertiary butyl ether or MTBE), naphthalene, 1,2,4-trimethylbenzene, 1,3,5-trimethylbenzene, and 1,2-dichloroethane (also known as ethylene dichloride or EDC); 1,2-dibromoethane (also known as ethylene dibromide or EDB); and lead (dissolved).

Water samples will be collected in laboratory-supplied sample containers and submitted to Pace Analytical in Westborough, Massachusetts for analysis of target analytes, as outlined in **Table 1**.

Pace Analytical in Westborough, Massachusetts is accredited for analysis of the target VOCs in drinking water via US EPA Method 524.2 and is accredited for analysis of EDB in drinking water via US EPA Method 504.1. The Westborough laboratory is not accredited for analysis of lead in drinking water; therefore, the Westborough laboratory will send the water sample collected for lead analysis to Pace Analytical in Mansfield, Massachusetts, and the sample will be analyzed for lead by the Mansfield laboratory, which is accredited for analysis of lead in drinking water via US EPA Method 200.8.

Table 1. Summary of Analytical Methods

Analysis	Method	Sample Container	Preservative	Hold Time
Volatile Organic Compounds[1]	US EPA Method 524.2	3 x 40-mL VOAs, preservative: hydrochloric acid (HCl)[2]	HCl to pH < 2; Ice, maintained at 0-6°C	14 days
1,2-Dibromoethane (EDB)	US EPA Method 504.1	2 x 40-mL VOAs, preservative: sodium thiosulfate ($Na_2S_2O_3$)	$Na_2S_2O_3$ to pH < 2; Ice, maintained at 0-6°C	14 days
Lead	US EPA Method 200.8	1 x 250-mL poly, preservative: nitric acid (HNO_3)	HNO_3 to pH < 2; Ice, maintained at 0-6°C	180 days

[1] Benzene, toluene, ethylbenzene, total xylenes, isopropylbenzene, methyl tert-butyl ether (MTBE), naphthalene, 1,2,4-trimethylbenzene, 1,3,5-trimethylbenzene, and 1,2-dichloroethane (EDC)

[2] If the water source has recently been chlorinated, the water sample collected for VOCs analysis will be collected using 2 x 40-mL VOAs, preservative: ascorbic acid ($C_6H_8O_6$) with HCl added to the water sample in the field to pH < 2, per guidance provided by Pace Analytical.

5.0 Sample Handling and Documentation

5.1 Sampling Handling

Water samples will be collected in laboratory-supplied sample containers appropriate for the intended analysis, packaged, labeled, and immediately placed in a cooler and retained on ice pending laboratory analysis. Custody seals will be placed on each sample-containing cooler, and chain-of-custody procedures will be maintained from the time of sample collection until arrival at the laboratory to protect sample integrity. Samples will be shipped or otherwise transported to the laboratory within a timeframe that meets recommended holding times.

5.2 Sample Labeling

Sample containers will be clearly labeled with the following information:

- Unique sample identification;
- Sample matrix;
- Sampler name or initials;
- Date and time of sample collection;
- Analysis to be performed; and
- Bottle and preservative type.

Labeling may include quality assurance (QA) sample designations (e.g., for matrix spike/matrix spike duplicate [MS/MSD] samples or field duplicate samples).

5.3 Sample Documentation

Field sampling activities will be documented in field notebooks using indelible ink, including sample locations, collection methods, field observations, and any deviations from the sampling plan. CTEH mainly uses electronic records, but in the event hardcopy data will be maintained by the originator for inclusion

in the project file. Photographic documentation will supplement written records by capturing sampling locations, site conditions, and any unusual circumstances that may affect sample interpretation.

6.0 Quality Assurance

Field activities, including water sampling, will be carried out in conjunction with a well-defined field quality assurance (QA) program and in accordance with the Quality Assurance Project Plan (QAPP) that accompanies this SAP. The field QA program refers to the sampling, analysis, and data validation procedures that will be performed for generating valid and defensible data, including to document that samples are collected without accidental cross- or systematic contamination. The types of quality control (QC) samples that will be collected are outlined in **Table 2**.

Table 2. Summary of Quality Control Samples

QC Sample	Analytical Group	Frequency	Data Quality Indicators (DQIs)	Measurement Performance Criteria*
Trip Blank (TB), matrix matched[1]	VOCs	One per cooler	Accuracy / Bias / Contamination	Target analyte(s) detected in the associated field samples must have concentrations < 1/2 the LOQ
Field Blank (FB)[2]	All	One per 10 field samples per matrix; at least one per day	Accuracy / Bias / Contamination	Any detections of target analytes above the laboratory reporting limits should be compared to any field samples associated with that field blank.
Field Duplicate	All	One per 10 field samples per matrix	Precision / Representativeness	If both the original and duplicate results are ≥ 5× LOQ, the RPD is recommended to be ≤ 30% for aqueous samples. If either the original or duplicate results are < 5× LOQ, the difference should be ≤ the LOQ for aqueous samples.
Matrix Spike/ Matrix Spike Duplicate (MS/MSD)[3]	All, excluding pH	One per 20 field samples per matrix	Accuracy / Bias / Contamination / Representativeness	Accuracy and precision criteria as documented by the laboratory
Cooler Temperature Blank[4]	Temperature only	One per cooler	Representativeness	Upon arrival at the laboratory, samples may not exceed 6°C, and aqueous samples may not be frozen. For samples received the same day of collection, evidence of cooling must be present. During laboratory storage, samples must be maintained at a temperature between 0°C and 6°C. Samples must not be frozen, with the exception of water-preserved VOC samples, which must be frozen within 48 hours of collection.

* LOQ = Limit of Quantitation, RPD = relative percent difference

[1] TBs will be included in bottle shipments from the laboratory. Aqueous TBs will be prepared using VOC-free water in a 40-mL preserved VOA with no headspace. At the sampling site, a TB will be packed in each cooler containing VOC samples and shipped to the laboratory with the site samples and required documentation (e.g., chain-of-custody form).

[2] Water used for FBs will be target analyte-free water provided by the laboratory. At the sampling site, when ready to collect a FB, the FB water provided by the laboratory will be opened, along with a corresponding empty bottle also provided by the laboratory. The FB water will be poured into the empty (receiving) sample bottle, the cap will be closed, and this filled bottle will be labeled as the FB. The FB will be packed and shipped to the laboratory with the site samples and required documentation (e.g., chain-of-custody form).

[3] Known quantities of the method analytes are added to this preserved field sample in the laboratory. The MS is processed and analyzed exactly like a sample to determine whether the sample matrix contributes bias to the analytical results. The background concentrations of the analytes in the sample matrix must be determined in a separate sample extraction, and the measured values in the MS must be corrected for background concentrations.

[4] Samples requiring thermal preservation must be placed on ice upon collection. If no temperature blank is provided, a representative sample container from each cooler will be used to measure the temperature (with an infrared thermometer).

6.1 Field Calibration

Instruments used in the field as part of this sampling program will consist of PIDs and handheld data collection devices such as tablets/smartphones. PID instruments will be maintained and calibrated daily in accordance with manufacturer recommendations and instructions. Operators of each instrument are responsible for maintaining (including proper battery charge) and operating the equipment such that it conforms to manufacturer specifications.

6.2 Trip Blanks

Trip blanks identify contamination in on-site sample handling and transportation. They are prepared by the laboratory and travel with samples to and from the laboratory to ensure that any detections of target analytes in investigative samples are not a result of contamination during the handling or sampling process prior to analysis. One trip blank will be placed in each sample-containing cooler prior to transport to the laboratory for analysis of VOCs.

6.3 Field Blanks

Field blanks identify contamination in on-site sample collection and handling. Field blanks will be prepared by filling a complete set of empty sample containers with distilled water (provided by the laboratory). One field blank will be prepared per approximately 10 samples, and at least one field blank will be collected on each day field samples are collected.

6.4 Field Duplicate Samples

For approximately every ten samples collected in the field, one field duplicate sample will be collected and submitted for laboratory analysis to verify the reproducibility of the sampling methods. Field duplicate samples will be collected at the same time and location as the parent sample and will be submitted as a separate sample to the laboratory for analysis consistent with the proscribed analyses.

6.5 Matrix Spike/Matrix Spike Duplicate Samples

Matrix spike/matrix spike duplicate (MS/MSD) samples refer to field samples spiked at the laboratory with the target analytes prior to analysis to assess method performance and any effects of matrix interference. Approximately one in twenty samples will be analyzed as MS/MSD samples.

6.6 Field Split Samples

Split sampling is a technique in which multiple samples are collected from the same location at the same time and sent to separate laboratories for analysis. Split sampling may facilitate sampling across multiple parties (e.g., stakeholders, regulatory agencies) and/or may be conducted to verify the accuracy of the

data being reported. Field split samples may be collected as requested by Sunoco Pipeline personnel. If split samples are collected with sampling teams associated with another group(s), sampling will be conducted in accordance with the Sampling and Analysis Plan (SAP) for Well Water Split Sampling.

6.7 Laboratory Quality Assurance

Laboratory QC procedures will be conducted in a manner consistent with relevant state and federal regulatory guidance. Deliverables will contain the supporting documentation necessary for data validation. Internal laboratory QC checks will include method blanks, matrix spike/matrix spike duplicate samples, surrogate samples, calibration standards, and laboratory control standards (LCS).

6.8 Data Verification/Validation

Third-party data verification/validation will be performed by Environmental Standards, Inc. Data verification/validation will include, at a minimum, sample holding times, accuracy, precision, contamination of field-generated or laboratory method blanks, and surrogate compound recovery. Accuracy will be determined by evaluating LCS and MS recovery. Precision will be determined by evaluating laboratory and field duplicate samples.

Level II data verification will be performed on 100% of the samples. Additionally, Level IV data validation will be performed on approximately 10% of the samples. The components of data verification/validation are summarized in **Table 3**.

Table 3. Summary of Data Verification/Validation Levels

Data Verification/ Validation Level	Definition
Level I	Sample data reporting only
Level II	Complete QC, including data blanks, spikes, duplicates (including matrix spike duplicates), laboratory control samples, relative percent difference (RPD), and percent recovery
Level III	Items listed in Level II plus QC limits and QA batch cross-reference table
Level IV	Items listed in Levels II and III, including sample raw data and chromatograms

7.0 Decontamination and Waste Disposal

7.1 Decontamination

Decontamination procedures refer to the steps taken to minimize the potential for off-site contamination and cross-contamination between individual sampling locations. Prior to collecting a sample, any non-disposable sampling equipment such as buckets or stainless-steel hand trowels which come into contact with sampling media will be decontaminated using a bristled brush and a solution comprised of a laboratory-grade, non-phosphate detergent (e.g., Liquinox) and distilled water. Depending on ancillary

activities being conducted, the decontamination of sampling equipment may be conducted over poly sheeting at the sample location or in a nearby designated area. The sampling equipment to be decontaminated will first be placed in a container with detergent solution and thoroughly washed using a bristled brush. The items will then be rinsed at least three times with clean distilled water. Following the initial rinsing, the item will be visually inspected prior to a final rinsing. Rinse water will be collected in a container such as a 5-gallon bucket and transported to central collection area for proper disposal. Containers will be closed with a lid during transport to avoid splashing and loss of rinse water. Decontaminated items will be wrapped in clean aluminum foil for transit to the next sampling location.

Nitrile gloves will be worn by sampling personnel and changed between activities at each discrete sample collection location. Previously worn nitrile gloves will be discarded in appropriate waste receptacles for personal protective equipment (PPE).

7.2 Waste Disposal

Decontamination fluids, used PPE, and drawn well water will be containerized and collected at the designated on-site waste staging area. All waste produced on-site will be managed and disposed of in a manner consistent with regulatory guidelines and requirements.

8.0 Data Analysis

Validated water sampling results will be used to evaluate the potential impacts to well water related to jet fuel and its potential constituents. Data will be used to primarily to evaluate potential vapor intrusion impacts to residences. Though well water from external wells is generally not representative of finished drinking water or indicative of human exposure, data will also be compared to health-based screening levels to evaluate potential impacts to human health.

External well water sampling results will be reviewed for the presence/absence of target analytes and, if a target analyte is detected, the concentration of that analyte will be compared to relevant screening levels, as outlined in Section 8.1. Background concentrations of target analytes may be determined by evaluating the results of external well water samples collected at domestic wells located upgradient or cross-gradient of the incident site, or by obtaining publicly available data to determine historic background concentrations.

Prior to data validation, preliminary water sampling results issued by the laboratory will be provided to Sunoco Pipeline personnel, who will share the results verbally and in writing with individual property owners. Sharing preliminary sampling results will enable property owners to receive their external well water sampling results in a timelier manner, rather than waiting for data validation to be completed before sharing water sampling results. If any issues with data quality are identified during data validation, Sunoco Pipeline personnel will notify the individual property owner.

8.1 Screening Levels

To evaluate potential vapor intrusion impacts to residences, sampling results will be compared to the Groundwater Statewide health standard vapor intrusion screening values (SV_{GW}) established by the PA DEP. Specifically, sampling results will be compared to the Residential SV_{GW}s. If water sampling results indicate that concentrations of target analytes are below their respective SV_{GW}s, no further action will be required with respect to vapor intrusion. If water sampling results indicate that concentrations of target analytes are above their respective SV_{GW}s, additional site and/or vapor intrusion investigation(s), including but not limited to indoor air sampling, may be performed.

Though well water from external wells is generally not representative of finished drinking water or indicative of human exposure, sampling results will also be compared to health-based screening levels to evaluate potential impacts to human health related to these constituents. Specifically, sampling results will be compared to the Statewide health standard Medium-Specific Concentrations (MSCs) for Organic and Inorganic Regulated Substances in Groundwater, as established by the State of Pennsylvania in Title 25 of the Pennsylvania Code, Chapter 250: Administration of Land Recycling Program (25 Pa. Code § 250.2). If water sampling results indicate that concentrations of target analytes are below their respective MSCs, no further action will be required. If water sampling results indicate that concentrations of target analytes are above their respective MSCs, additional site investigation(s), including but not limited to additional sampling, may be performed.

9.0 Records Management

Records management refers to the procedures for generating, controlling, and archiving project-specific records and records of field activities. Project records, particularly those that are anticipated to be used as evidentiary data, directly support current or ongoing technical studies and activities, and provide historical evidence needed for later reviews and analyses, will be legible, identifiable, retrievable, and protected against damage, deterioration, and loss on a centralized electronic database. Handwritten records will be written in indelible ink. Records may include, but are not limited to, the following: bound field notebooks on pre-numbered pages, sample collection forms, personnel qualification and training forms, sample location maps, equipment maintenance and calibration forms, chain-of-custody forms, maps and drawings, transportation and disposal documents, reports issued as a result of the work, procedures used, correspondences, and any deviations from the procedural records. Documentation errors will be corrected by drawing a single line through the error so that it remains legible and writing the correction adjacent to the error; the change will be initialed by the responsible individual, along with the date of change.

Attachment A: Site Location Map

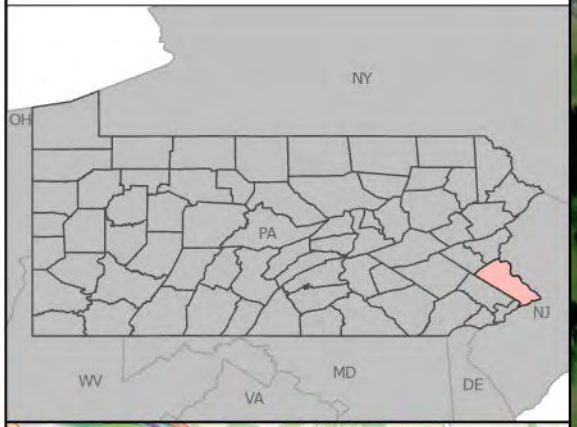
CTEH®

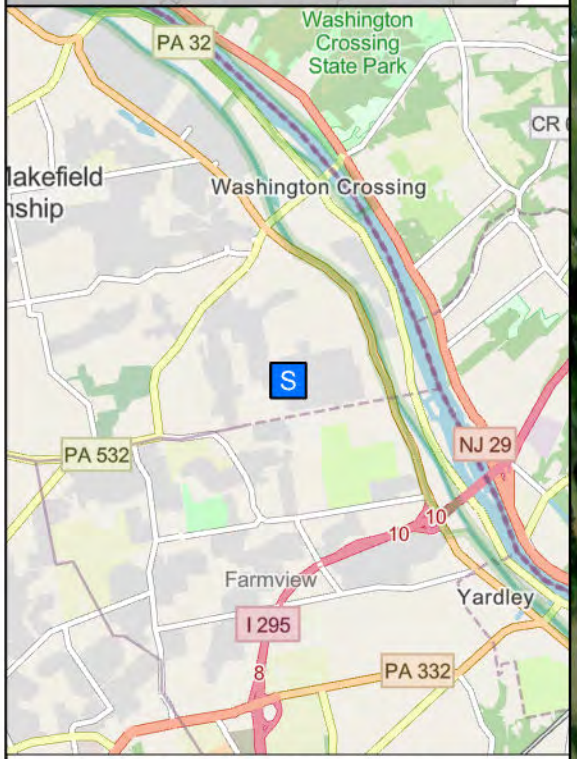
Upper Makefield Response

Incident Location

Washington Crossing, PA | Bucks County

PROJ-051861





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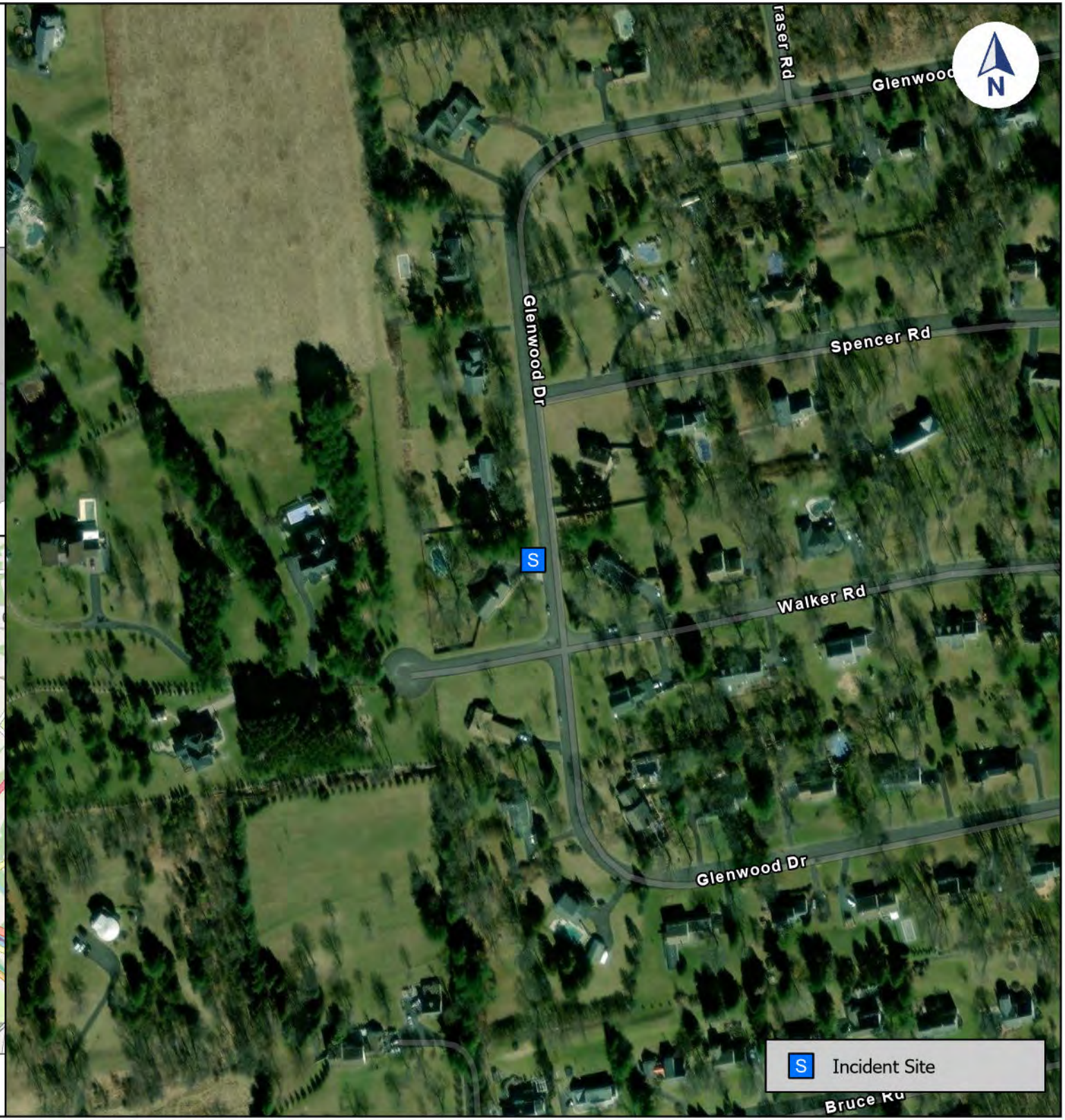

Attachment B: GES Field Form

Potable Well Sampling Field Form

SPL - Washington Crossing

Potable Well Sampling

Date: _____ **Sampler:** _____

Sampling Notes

PROPERTY LOCATION	
PURGE START TIME	
PURGE STOP TIME	
PURGE LOCATION	
SAMPLE TIME	
SAMPLE LOCATION (i.e., kitchen sink, spigot, POET)	
PID Readng at Sample Location (ppm)	
PID Readng at Wellhead (ppm)	
Lat / Long Coordinates of Well	
Location of well (i.e., front yard)	
WELL DEPTH (ft)	
PUMP DEPTH (ft)	
Casing Depth (ft)	
Property Owners Name	
Heating Source (If heating oil last fill up date/gallons)	
PROPERTY NOTES (including treatment such as reverse osmosis, water softener, filter, etc.)	

Notes:
UK = Unknown

Additional Observations/Notes:
All dissolved lead samples were Field Filtered at time of collection

Management of Change

Change from v1.0 to v1.1

Summary of Changes:

	NAME/ORGANIZATION	SIGNATURE	DATE SIGNED
Prepared by:			
Reviewed by:			
Approved by:			
Approved by:			

Change from v1.1 to v1.2

Summary of Changes:

	NAME/ORGANIZATION	SIGNATURE	DATE SIGNED
Prepared by:			
Reviewed by:			
Approved by:			
Approved by:			