Appendix M.2

Surface Water Sampling and Analysis Plan

Version 1.1

May 5, 2025

UPPER MAKEFIELD RESPONSE
WASHINGTON CROSSING, PENNSYLVANIA

SURFACE WATER SAMPLING AND ANALYSIS PLAN (SW-SAP)

Version 1.1

Prepared on Behalf of:
Sunoco Pipeline LP

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May 5, 2025

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1.0 Introduction and Purpose

This Surface Water Sampling and Analysis Plan (SW-SAP) was prepared by CTEH, LLC (CTEH) on behalf of Sunoco Pipeline LP (Sunoco Pipeline) in relation to the Upper Makefield Response in Washington Crossing, Pennsylvania. A release 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 surface water monitoring and sampling include:

1. The collection of surface water samples to delineate nature and extent of potential impact related to the incident; and
2. The collection of background samples to develop a range of potential background concentrations for comparative purposes and to distinguish between incident-related and non-incident-related target analytes.

2.0 Health and Safety

CTEH sampling personnel will review and adhere to the site-specific Health and Safety Plan. Sampling and documentation activities will be conducted only 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 surface water related to jet fuel and its potential constituents and to evaluate the potential impacts to human and environmental health related to these constituents.

A strategic planning approach based on 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 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 Surface Water Monitoring and Sampling

4.1 Surface Water Monitoring Methods

Surface water monitoring will be conducted at each surface water sampling location using a Horiba multi-parameter water quality meter or equivalent. Surface water monitoring will be conducted during each sample collection event and will include the following parameters:

- Temperature (°C)
- pH (0-14 standard units)
- Conductivity (siemens/meter)
- Dissolved Oxygen (milligrams/liter)
- Turbidity (NTU)

Observations of product, sheen, and odor (or lack thereof) will be made at each surface water sampling location (e.g., visual observation of separate phase liquids, color, and clarity; character and strength of odor). Observations, along with other details about the sampling event, will be recorded electronically using a handheld data collection device and/or recorded in a log dedicated to this project. The water quality meters used will be calibrated daily and in accordance with the manufacturer's specifications.

4.2 Surface Water Sampling Methods

Surface water samples will be collected by submerging an unpreserved 500-mL amber container (uncapped) into the surface water (at a depth between 0 and 0.5 feet) and allowing water to flow directly into the container. When the container has been filled, the container will be removed from the water and decanted directly into laboratory-supplied sample containers appropriate for the intended analysis, as presented in **Table 1**. Samples will be sent under chain-of-custody to Pace Analytical (Pace) in Westborough, Massachusetts for analysis of target compounds (**Table 1**). Samples will be collected, labeled, and shipped in accordance with the Quality Assurance Project Plan (QAPP) that accompanies this SAP and the CTEH Surface Water Sampling Standard Operating Procedure (SOP) referenced therein.

Target analytes are the following volatile organic compounds (VOCs): benzene, toluene, ethylbenzene, total xylenes, m/p-xylene, o-xylene, methyl tert-butyl ether (also known as methyl tertiary butyl ether or MTBE), isopropylbenzene (also known as cumene), naphthalene, 1,3,5-trimethylbenzene, 1,2,4-trimethylbenzene, and 1,2-dichloroethane (also known as ethylene dichloride or EDC); and total petroleum hydrocarbons (TPH), reported as diesel range organics (DRO) and gasoline range organics (GRO).

In addition to water sample collection, water quality parameters will be recorded at each surface water sampling location in accordance with Section 4.1.

Table 1. Summary of Surface Water Sampling Methods

Analysis	Method[1]	Sample Container	Preservative	Hold Time
Total Petroleum Hydrocarbons (TPH) Gasoline Range Organics (GRO)	US EPA Method 8015D	2 x 40-mL HCl VOAs	HCl to pH < 2; Ice, maintained at 0-6°C	14 days
Total Petroleum Hydrocarbons (TPH) Diesel Range Organics (DRO)	US EPA Method 8015D	2 x 500-mL amber containers	Ice, maintained at 0-6°C	7 days
Volatile Organic Compounds (VOCs)[2]	US EPA Method 8260C	3 x 40-mL HCl VOAs	HCl to pH < 2; Ice, maintained at 0-6°C	14 days

[1] US EPA = United States Environmental Protection Agency

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

4.3 Location and Frequency

Surface water samples will be collected from surface water bodies both upstream and downstream of the Site. Selected locations will be easily accessible public areas of the canal and river (e.g., footpaths, bridges/road crossings). Descriptions and GPS coordinates of the locations selected for surface water sampling are provided below, and a map of the locations is provided in **Attachment B**.

- W001: Delaware Canal – upstream at Washington Crossing Road (40.289672, -74.877201)
- W002: Delaware Canal – at pipeline crossing (40.276924, -74.863002)
- W003: Delaware Canal – at mouth of unnamed creek (40.274266, -74.862588)
- W004: Delaware Canal – at mouth of Dyers Creek (40.266993, -74.858529)
- W005: Delaware River – upstream at Washington Crossing Bridge (40.294631, -74.868987)
- W006: Delaware River – at pipeline crossing/Houghs Creek (40.277512, -74.858608)

Samples collected upstream of the Site (at W001 and W005) will be used to evaluate background concentrations. Sampling locations may be added, removed, and/or revised based on a review of the preliminary results and/or changes in operational areas and/or activities.

Surface water samples will initially be collected once per week. Additional sampling may occur following observations of product, sheen, or odor on/near a water body. Surface water samples will be collected until surface water sampling results and groundwater assessment data indicate that potential impacts to surface water are adequately diminished or do not exist, or until other information indicates that the potential for impacts to surface water have been eliminated.

5.0 Screening Values

Surface water sampling results will be compared to background (upstream) concentrations and to screening values established by the Commonwealth of Pennsylvania and the United States Environmental Protection Agency (US EPA). Specifically, results will be compared to the Criteria Maximum Concentration for Fish and Aquatic Life and the Human Health Criteria, as outlined in the Water Quality Criteria for Toxic Substances established by the Commonwealth of Pennsylvania in Title 25 of the Pennsylvania Code, Chapter 93: Water Quality Standards (25 Pa. Code § 93.8c)[1]. Results will also be compared to the Biological Technical Assistance Group (BTAG) Screening Values (Freshwater Screening Benchmarks) established by US EPA Region 3[2]. The laboratory method detection limits (MDL) and reporting limits (RL) for target analytes are lower than these screening values, as outlined in the QAPP that accompanies this SAP.

If surface water sampling results indicate that concentrations of target analytes are below the background concentrations or screening values, no further action will be required, and surface water sampling will continue in accordance with Section 4.3. Exceedances of screening values do not necessarily indicate the existence of a health or ecological concern. If exceedances are observed, additional site investigation(s), including but not limited to additional sampling, may be performed.

6.0 Sample Handling Procedures

Samples will be placed in laboratory-supplied sample containers appropriate for the intended analysis, labeled, and immediately placed in a cooler on ice pending laboratory analysis. Samples will be packaged, labeled, retained on ice, and documented in an area which is free of impact and provides for secure storage. 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. Shipping or transporting of samples to the laboratory will be done within a timeframe that meets recommended holding times.

7.0 Sample Labeling

Sample containers will be clearly labeled with the following information:

- Unique sample identification;
- Sampler name or initials;
- Date sample collected;
- Time sample collected; and
- Analysis to be performed.

[1] https://www.pacodeandbulletin.gov/Display/pacode?file=/secure/pacode/data/025/chapter93/chap93toc.html
[2] https://www.epa.gov/sites/default/files/2015-09/documents/r3_btag_fw_benchmarks_07-06.pdf

8.0 Quality Assurance

Surface water sampling will be carried out in conjunction with a well-defined quality assurance (QA) program and in accordance with the QAPP that accompanies this SAP. The goal of the field QA program is to document that samples are collected without the effects of accidental cross- or systematic contamination and refers to the sampling, analysis, and data validation procedures for generating valid and defensible data. The sampling, analysis, and data validation procedures outlined in **Table 2** and the following subsections will be performed.

Table 2. Quality Control Sample Summary

QC Sample	Analytical Group	Frequency	Data Quality Indicators (DQIs)	Measurement Performance Criteria
Trip Blank (TB)[1], matrix matched	VOCs	One set of vials 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 daily	Accuracy / Bias / Contamination	Target analyte(s) detected above the RL should be compared to the associated field samples.
Field Duplicate, co-located	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], co-located	All, excluding pH	One per 20 field samples per matrix	Accuracy / Bias / Contamination / Representativeness	Accuracy and precision criteria as documented by the laboratory
Rinsate Blank[4]	All	One per 10 field samples per matrix; or one daily	Accuracy / Bias / Contamination	Target analyte(s) detected above the RL should be compared to the associated field samples.
Cooler Temperature Blank[5]	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.

[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 vial 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] In the event of reusing sampling equipment and needing to decontaminate in the field, a rinsate blank would be collected using target analyte-free water. Rinsate blanks would also be collected if the sampling equipment or sample bottles are not certified clean by the vendor or laboratory providing the equipment.

[5] 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).

8.1 Field Calibration

Instruments used in the field as part of this sampling event are anticipated to consist of multi-parameter water quality meters, GPS units, digital cameras, and handheld data collection devices such as tablets/smartphones. Equipment requiring calibration will be maintained daily in accordance with manufacturer recommendations. Operators of each piece of equipment are responsible for maintaining (including proper battery charge) and operating the equipment such that it conforms to each respective manufacturer's specifications.

8.2 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 analyte or compound detections in field 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 VOC analysis.

8.3 Field Blanks

Field blanks identify contamination in on-site sample collection and handling. Field blanks will be prepared by filling a set of sample containers filled with distilled water (provided by the laboratory) in the field. At least one field blank will be collected each day field samples are collected.

8.4 Field Duplicates

For approximately every ten samples collected in the field, one field duplicate will be collected and submitted for laboratory analyses to verify the reproducibility of the sampling methods. Field duplicates 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.

8.5 Field Split Samples

Split sampling is a technique in which multiple samples are collected from the same location at the same time and then sent to separate laboratories for analysis. Split sampling may facilitate sampling across multiple parties (e.g., stakeholders, regulatory agencies) and/or may be collected to determine accuracy of the data being reported. Field split samples may be collected at the discretion of representatives of Sunoco Pipeline and/or regulatory agencies.

8.6 Matrix Spike/Matrix Spike Duplicates

Matrix spike/matrix spike duplicates (MS/MSD) refer to field samples spiked with the analytes of interest prior to being analyzed at the laboratory to gauge the quality of analysis. Approximately one in twenty samples will be analyzed as MS/MSD samples.

8.7 Laboratory Quality Assurance

Laboratory quality control procedures will be conducted in accordance with the laboratory Standard Operating Procedures (SOP), which are referenced in the QAPP that accompanies this SAP. Deliverables will contain the supporting documentation necessary for data validation. Internal laboratory quality control checks will include method blanks, matrix spikes/matrix spike duplicates, surrogate samples, calibration standards, and laboratory control standards (LCS).

8.8 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

9.0 Decontamination Procedures

All sampling equipment (e.g., collection and/or sample containers) currently used consists of single-use items. If non-disposable sampling equipment is used, the following decontamination procedures will be undertaken. Decontamination procedures refer to the steps taken to minimize the potential for off-site contamination and cross-contamination between individual sampling locations.

Any non-disposable sampling equipment 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., Alconox or Liquinox) and distilled water. Depending on ancillary activities being conducted, the decontamination of sampling equipment will 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 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 waters will be collected in a container such as a 5-gallon bucket and transported to central collection area for disposal, in accordance with the Waste Management Plan. 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 sampling location. Previously worn nitrile gloves will be discarded in appropriate waste receptacles for personal protective equipment (PPE).

10.0 Waste Disposal

Decontamination fluids and contaminated PPE 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 accordance with the Waste Management Plan.

11.0 Data Analysis

Validated surface water sampling results will be used to evaluate potential impacts to surface water related to jet fuel and its potential constituents. Surface water sampling results will be compared to background concentrations and to the screening values outlined in Section 5.0. Background concentrations of target analytes may be determined by evaluating the results of water samples collected upgradient, cross-gradient, or upstream of the Site or by obtaining publicly available data to determine historic background concentrations. The results of laboratory analyses will be provided to Sunoco Pipeline personnel.

12.0 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

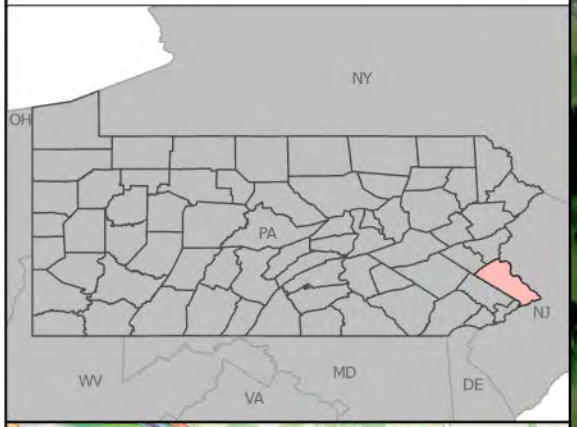
CTEH®

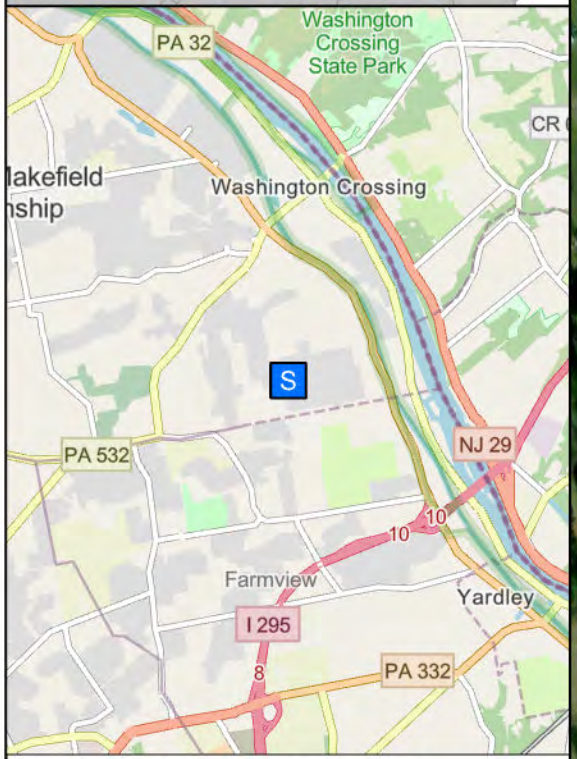
Upper Makefield Response

Incident Location

Washington Crossing, PA | Bucks County

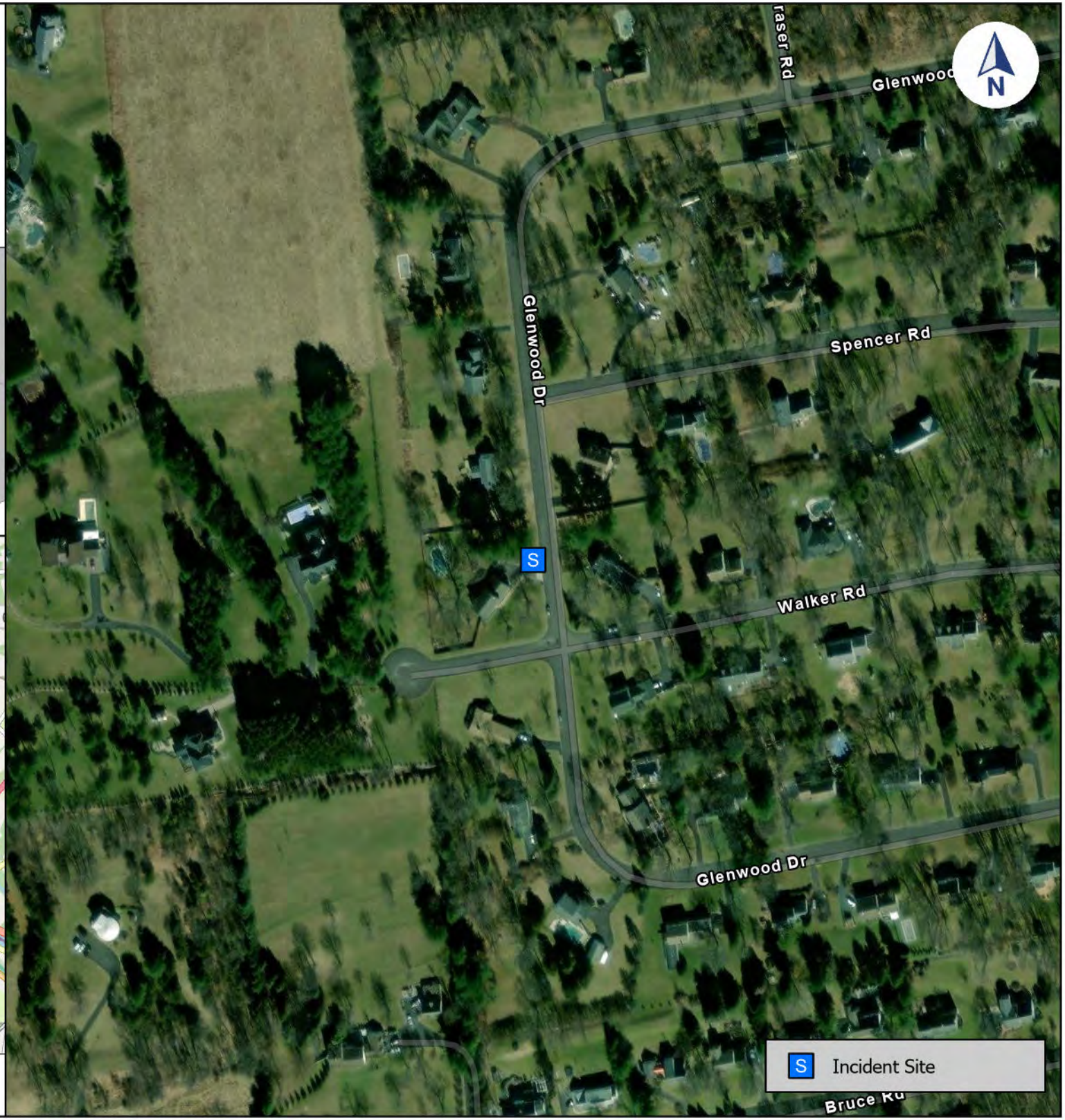
PROJ-051861





Updated At: 2/15/2025 4:18 PM

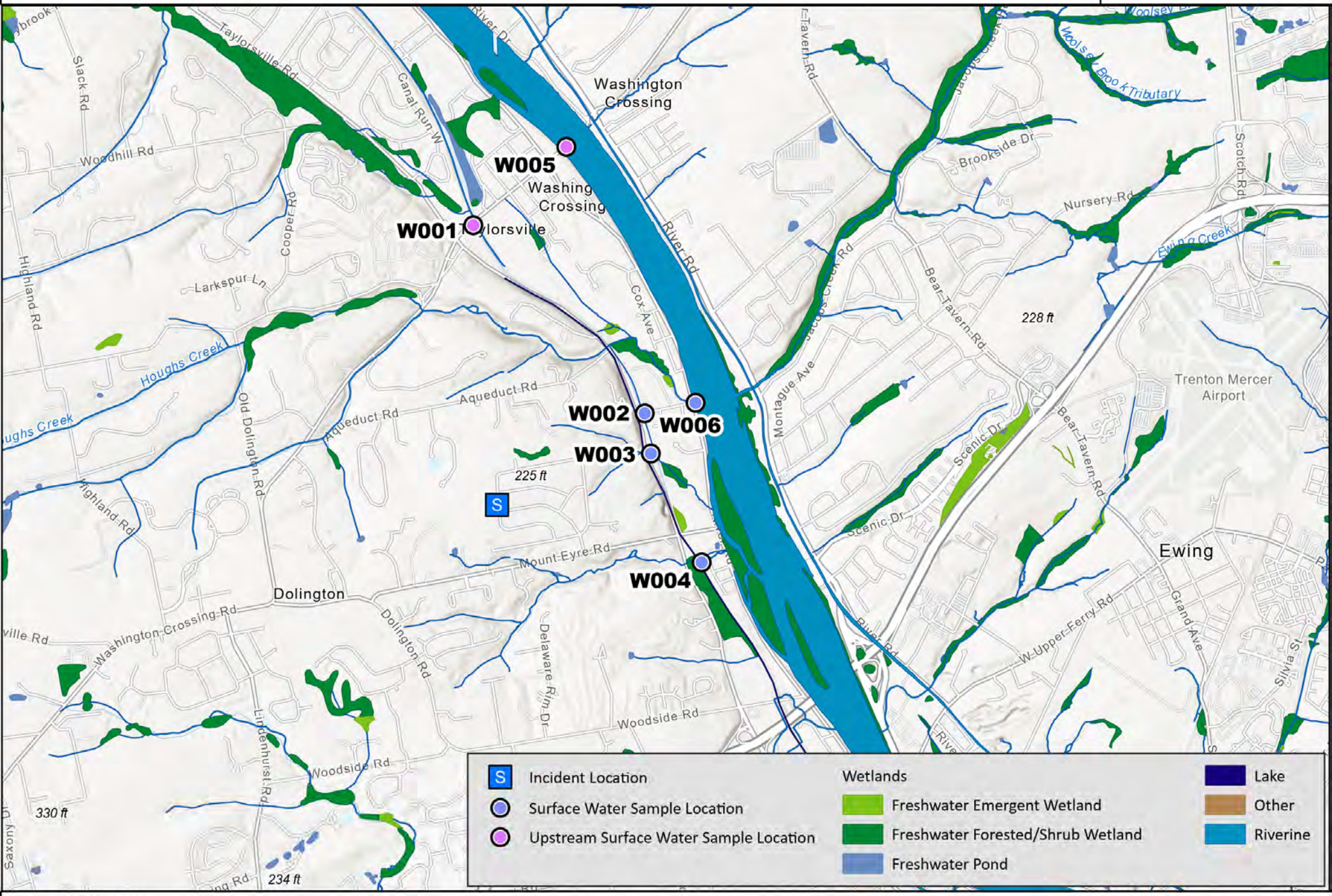
Projection: NAD 1983 2011 StatePlane Pennsylvania South FIPS 3702 Ft US



Attachment B: Map of Surface Water Sampling Locations

CTEH® **Surface Water Sampling Locations**
Upper Makefield Response

Project: PROJ-051861
Client: Sunoco Pipeline LP
City: Washington Crossing, PA
County: Bucks



Datum: NAD 1983 2011
Projection: NAD 1983 2011 StatePlane Pennsylvania South FIPS 3702

0 5,000 10,000 Feet

Updated at 2024-11-04 12:45

Management of Change

Change from Version 1.0 to 1.1			
Summary of Changes: Updated document throughout to reflect change from "Energy Transfer LP" to "Sunoco Pipeline LP"; language and formatting revisions throughout; Table 1 updated, including hold time for DRO; Section 4.2 updated to include additional detail about sample collection methodology; Section 4.3 updated to add GPS coordinates to the list of sampling locations, remove the need to sample after rain events, and clarify that groundwater and/or other data streams will be used to determine the need for continued surface water sampling; Section 5.0 updated to add comparison to Water Quality Criteria established by the Commonwealth of Pennsylvania and state that detection limits are lower than screening values; Section 8.0 updated to reference QAPP and add Measurement Performance Criteria for field and rinsate blanks (Table 2); language in Sections 8.3 and 8.4 updated; Section 8.7 updated to reference laboratory SOPs; Section 9.0 updated to clarify decontamination procedures; Section 10.0 updated to reference Waste Management Plan; language in Section 11.0 updated; title page and page footers updated for version control of Version 1.0 to Version 1.1			
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