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**Project name:**  
PennEast Susquehanna River Crossing

**Project ref:**  
60414094

**From:**  
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**To: Sarah Binkley  
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**CC:**

# Memo

**Subject:** Sediment and Soil Sampling and Analysis

## Introduction

The planned alignment of the PennEast Pipeline Project (Project) will cross the Susquehanna River at approximately Milepost (MP) 7.0 in Luzerne County, Pennsylvania (Figure 1). The river is divided at this point by Monocanock Island, which is approximately 600 feet wide in the area of the crossing. The two river channels created by Monocanock Island are each approximately 500 feet wide. The anticipated construction will include an upriver (northern) temporary coffer dam to divert water to the opposite channel at the northern end of the island. A secondary coffer dam will be installed upriver of and directly adjacent to the trench to allow for pipeline construction to be completed in the dry. Construction will be completed in two phases, one for each side of the river channel. The width of the river in the area of the diversion dam is approximately 1,000 feet.

In preparing environmental reports for its Federal Energy Regulatory Commission (FERC) 7(c) Natural Gas Act application, PennEast learned of historical water quality impairment issues related to polychlorinated biphenyls (PCBs), mercury, and acid mine drainage (AMD) metals in the Susquehanna River.<sup>1</sup> FERC and other interested parties provided comments related to the Susquehanna River water quality impairments, and in its April 2017 Final Environmental Impact Statement (FEIS), FERC acknowledged PennEast's commitment to sample sediment for PCB concentrations prior to construction.

Sampling was performed in the spring of 2018 to preliminarily evaluate the sediment quality in the area of the crossing. Sediment samples were collected from the two river channels created by Monocanock Island, and the full width of the channel upstream of the island. Additionally, soil samples were collected from Monocanock Island. Based on the constituents identified in the FEIS as related to water quality impairment, soil and sediment samples were analyzed for PCBs, mercury, AMD metals (aluminum, iron, and manganese), and pH.

## Methodology

Samples were collected along two transects within four sections of the pipeline crossing area: Northwest Channel, Monocanock Island, Southeast Channel, and Main Channel upstream of the island (Figure 1). Sample locations were accessed using an 18-foot jet boat launched at a public boat

<sup>1</sup> PADEP. (2016). *2014 Final Pennsylvania Integrated Water Quality Monitoring and Assessment Report, Clean Water Act Section 305(b) Report and 303(d) List*. Available on-line at: <https://www.dep.pa.gov/Business/Water/CleanWater/WaterQuality/Integrated%20Water%20Quality%20Report-2016/Pages/default.aspx>. Accessed on October 24, 2018.

launch in Nesbitt Park. The field event occurred over two days, May 31, 2018 and June 12, 2018, at low flow conditions. Flow, as measured at the United States Geological Survey (USGS) Gage Station 01536500 Susquehanna River Wilkes Barre, was approximately 11,000 cubic feet per second (cfs) on May 31, 2018 and 6,000 cfs on June 12, 2018. Median daily flow based on 120 years of record is typically between 8,500 cfs and 6,500 cfs.

Sediment sampling followed U.S. Environmental Protection Agency [USEPA (2001)] guidance<sup>2</sup> for streambed sediments. Low river flow conditions allowed for instream collection of sediment (see Photo 1). At a majority of the locations, cobble was present, which precluded the use of traditional sampling equipment (e.g., ponar or hand driven core) (Photos 2 and 3). A long-handled trowel was used to collect material from the upper 0-6 inches of the stream bed and sample material was composited in a stainless steel bowl. Representative sample material was placed in the sample jar excluding cobble and excess water. Analytical samples were placed on ice in a cooler for delivery to the laboratory. Refusal was generally encountered near the surface; primarily river cobble limited advancement of sampling equipment. Two locations were unable to be sampled due to coarse substrates and swift river flows: the eastern bank sample from the Main Channel (upstream) transect (SED-005) and the mid-point location of the Southeast Channel transect (SED-013).

Soil samples from Monocanock Island were collected using USEPA (2007) sampling guidance<sup>3</sup>, which outlines procedures for surficial and subsurface soil collection. On the island, samples were collected using a hand auger to a depth of approximately six feet below ground surface (bgs), when possible (Photos 4 and 5). Analytical samples were composited at one foot intervals and placed on ice in a cooler for delivery to the laboratory. Refusal at cobble was encountered at five feet bgs at SED-009 and at 4.5 feet bgs at SED-011.

All samples were shipped to Lancaster Laboratories in Lancaster, PA for analysis of PCBs, mercury, AMD metals (aluminum, iron, and manganese), and pH. Laboratory analysis of PCBs followed Method SW-846 8082A; Method SW-846 7471A was used for mercury; AMD metals (aluminum, iron, and manganese) were analyzed using Method SW-846 6010B; and Method SW-846 9045C was used for pH. Specific AMD metals are not defined in the Project's FEIS, but are assumed to include aluminum, iron, and manganese based on discussions with Lancaster Laboratories and review of Pennsylvania Department of Environmental Protection literature [PADEP (2009)]<sup>4</sup> that identifies these three constituents, and pH.

Upon receipt of laboratory data, AECOM performed data validation following an Organic/Inorganic Level 1 review which includes validation of sample results forms, chains of custody and supporting records, laboratory receipt checklist, field Quality Control (QC) records, and method QC records and forms. The review found that the overall integrity of the data was not compromised; the results could be used as reported.

PADEP (2010)<sup>5</sup> Clean Fill concentration limits for Unregulated Fill were used for screening based on the potential disposal needs during excavation. Aluminum, iron, and pH are not regulated parameters for Clean Fill. There is no concentration limit defined for "Total PCBs;" however, concentration limits are provided for seven Aroclor mixtures. Consequently, the Clean Fill concentration limit for PCB-1232 (Aroclor) was conservatively included in this evaluation because it is the lowest Aroclor value identified by PADEP.

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<sup>2</sup> USEPA. 2001. Methods for Collection, Storage and Manipulation of Sediments for Chemical and Toxicological Analyses: Technical Manual. EPA-823-B-01-002, US Environmental Protection Agency, Office of Water, Washington, DC, 208 p.

<sup>3</sup> USEPA. 2007. Soil Sampling Operating Procedure. SESDPROC-300-R1. US Environmental Protection Agency, Science and Ecosystem Support Division, Athens, GA.

<sup>4</sup> PADEP. 2009. Final Susquehanna River Metals TMDL, Luzerne County, for Mine Drainage Affected Segments. February 19, 2009.

<sup>5</sup> PADEP. 2010. Management of Fill, Document Number 258-2182-773. Table FP-1a and b (Document Numbers 258-2182-773A and 258-2182-773B) for organics, and metals and inorganics, respectively. Available on-line at: <http://www.depgreenport.state.pa.us/elibrary/GetFolder?FolderID=4647>. Site accessed October 18, 2018.

Additionally, PADEP Statewide Health Standards<sup>6</sup> residential medium-specific concentrations (MSCs) for soils were conservatively used for comparison of the Monocanock Island soil sample concentrations. MSCs are available for seven Aroclors (PCB mixtures), but “Total PCBs” is not a regulated substance. Therefore, the lowest MSC of the seven Aroclors was used as a surrogate comparison value for “Total PCBs”.

PADEP does not have screening values or other criteria for sediment. Therefore, USEPA (2006)<sup>7</sup> Region 3 Biological Technical Assistance Group (BTAG) freshwater sediment screening criteria were used as reference for collected data. Comparing concentrations to these screening criteria is a conservative approach because the BTAG values are typically utilized for the evaluation of analyte concentrations at Superfund sites. As indicated by USEPA, these values facilitate consistency in screening level ecological risk assessment.

## Results

### Monocanock Island Soils

All detected concentrations of PCBs, aluminum, iron, manganese, and mercury in Monocanock Island soil samples were below PADEP Clean Fill concentration limits and residential soil MSCs (Table 1). pH ranged from 5.44 to 6.72.

Table 1. 2018 Monocanock Island Soil Sample Results

| Analyte                      |            | Total PCBs<br>(ug/kg) | Aluminum<br>(mg/kg) | Iron<br>(mg/kg) | Manganese<br>(mg/kg) | Mercury<br>(mg/kg) | pH<br>(Std. Units) |
|------------------------------|------------|-----------------------|---------------------|-----------------|----------------------|--------------------|--------------------|
| Location                     | Depth (ft) |                       |                     |                 |                      |                    |                    |
| SED-009                      | 0.0-1.0    | 6.1                   | 7,920               | 16,600          | 483                  | 0.0248             | 6.72               |
|                              | 1.0-2.0    | 15                    | 11,900              | 23,300          | 816                  | 0.0466             | 5.95               |
|                              | 2.0-3.0    | 20                    | 14,000              | 25,600          | 907                  | 0.0577             | 6.02               |
|                              | 3.0-4.0    | 29                    | 11,800              | 22,700          | 835                  | 0.0718             | 6.28               |
|                              | 4.0-5.0    | 22                    | 12,100              | 22,700          | 884                  | 0.0675             | 6.42               |
| SED-010                      | 0.0-1.0    | 56                    | 10,400              | 20,500          | 714                  | 0.0481             | 6.44               |
|                              | 1.0-2.0    | 10                    | 9,030               | 19,000          | 496                  | 0.0680             | 6.43               |
|                              | 2.0-3.0    | 4.7                   | 9,240               | 20,600          | 476                  | 0.1000             | 5.88               |
|                              | 3.0-4.0    | N.D. (2.3)            | 8,560               | 18,000          | 448                  | 0.0801             | 5.51               |
|                              | 4.0-5.0    | N.D. (2.7)            | 11,200              | 21,500          | 508                  | 0.0556             | 5.44               |
|                              | 5.0-6.0    | N.D. (2.4)            | 8,170               | 17,500          | 393                  | 0.0195             | 5.93               |
| SED-011                      | 0.0-1.0    | 4.4                   | 6,390               | 15,500          | 517                  | 0.0213             | 6.57               |
|                              | 1.0-2.0    | 16                    | 8,110               | 18,500          | 537                  | 0.0379             | 6.40               |
|                              | 2.0-3.0    | 13                    | 11,700              | 24,400          | 813                  | 0.0601             | 6.50               |
|                              | 3.0-4.0    | 9.1                   | 8,710               | 19,600          | 389                  | 0.0974             | 6.45               |
|                              | 4.0-4.5    | 10                    | 7,190               | 18,700          | 303                  | 0.1360             | 6.64               |
| PADEP Unregulated Fill Limit |            | 500                   | -                   | -               | 31,000               | 10                 | -                  |
| PADEP Soil MSCs              |            | 4,400                 | 190,000             | 150,000         | 10,000               | 35                 | -                  |

N.D. (2.3) = “non-detect” at the method detection limit reported.

<sup>6</sup> 25 Pa. Code Chapter 250, Administration of the Land Recycling Program (Act 2 cleanup standards). Effective August 27, 2016.

<sup>7</sup> USEPA. 2006. EPA Region III BTAG Freshwater Sediment Screening Benchmarks 8/2006. Available on-line at: <https://www.epa.gov/risk/biological-technical-assistance-group-btag-screening-values>. Site accessed October 18, 2018.

## Susquehanna River Sediments

In the nine sediment samples collected from the Susquehanna River, total PCBs were not detected above the method detection limit, and mercury was only detected at very low concentrations in two surficial sediment samples (Table 2).

AMD metals were detected in all samples, but this is to be expected given that aluminum, iron, and manganese are all natural elements commonly found in soils and sediments. Six of the sediment samples had manganese concentrations greater than the highly conservative USEPA BTAG screening criterion, and all concentrations were greater than the median and 99<sup>th</sup> percentile streambed concentrations measured for the National Water-Quality Assessment Program from across the United States (1.1 mg/kg and 9.4 mg/kg, respectively).<sup>8</sup> However, they were all one to two orders of magnitude less than the PADEP Unregulated Fill limit. The iron concentrations in half the sediment samples slightly exceeded the conservative USEPA BTAG screening criterion and those samples were found throughout the survey area (Table 2). No Clean Fill concentration limit for iron is available from PADEP. Aluminum concentrations ranged from 2,100 mg/kg to 7,510 mg/kg. Neither USEPA or PADEP have screening criteria for aluminum; however, the Toxicology Profile for Aluminum states that aluminum was found in all 541 streambed sediment samples from throughout the United States analyzed for the National Water-Quality Assessment Program and that concentrations ranged from 1.4 to 14% by weight (14,000 – 140,000 mg/kg).<sup>9</sup> Therefore, aluminum concentrations in the sediment samples collected from the Susquehanna River are lower than the national range. pH ranged from 7.22 to 7.78 standard units (Table 2).

Table 2. 2018 Susquehanna River Sediment Sample Results

| Analyte                  |         | Depth (ft) | Total PCBs<br>(ug/kg) | Aluminum<br>(mg/kg) | Iron<br>(mg/kg) | Manganese<br>(mg/kg) | Mercury<br>(mg/kg) | pH<br>(Std. Units) |
|--------------------------|---------|------------|-----------------------|---------------------|-----------------|----------------------|--------------------|--------------------|
| Location                 |         |            |                       |                     |                 |                      |                    |                    |
| Main Channel<br>Upstream | SED-001 | 0.0-0.5    | N.D. (3.9)            | 3,320               | 8,630           | 3,150                | N.D. (0.0116)      | 7.32               |
|                          | SED-002 | 0.0-0.5    | N.D. (4.0)            | 4,550               | 24,000          | 548                  | N.D. (0.0118)      | 7.22               |
|                          |         | 0.5-1.0    | N.D. (4.0)            | 2,770               | 10,300          | 321                  | N.D. (0.0119)      | 7.28               |
|                          | SED-003 | 0.0-0.5    | N.D. (3.8)            | 5,880               | 20,700          | 585                  | N.D. (0.0115)      | 7.66               |
|                          | SED-004 | 0.0-0.5    | N.D. (3.8)            | 4,470               | 12,800          | 439                  | N.D. (0.0110)      | 7.57               |
| Northwest<br>Channel     | SED-006 | 0.0-0.5    | N.D. (3.9)            | 6,280               | 19,200          | 517                  | N.D. (0.0109)      | 7.44               |
|                          | SED-007 | 0.0-0.5    | N.D. (3.4)            | 3,910               | 20,900          | 362                  | N.D. (0.0099)      | 7.33               |
|                          | SED-008 | 0.0-0.5    | N.D. (4.1)            | 4,370               | 16,100          | 516                  | 0.0124             | 7.27               |
| Southeast<br>Channel     | SED-012 | 0.0-0.5    | N.D. (3.7)            | 2,100               | 26,000          | 376                  | N.D. (0.0115)      | 7.78               |
|                          | SED-014 | 0.0-0.5    | N.D. (4.0)            | 7,510               | 25,700          | 1,570                | 0.0155             | 7.24               |
| PADEP Unregulated Fill   |         |            | 500                   | -                   | -               | 31,000               | 10                 | -                  |
| USEPA Region 3 BTAG      |         |            | 59.8                  | -                   | 20,000          | 460                  | 0.18               | -                  |

N.D. (3.9) = “non-detect” at the method detection limit reported.

SED-005 and SED-013 were unable to be sampled due to coarse substrates and swift river flows.

<sup>8</sup> EPA 2003a. Health effects support document for manganese. U.S. Environmental Protection Agency. EPA822R03003. [http://www.epa.gov/safewater/ccl/pdfs/reg\\_determine1/support\\_cc1\\_magnese\\_healtheffects.pdf](http://www.epa.gov/safewater/ccl/pdfs/reg_determine1/support_cc1_magnese_healtheffects.pdf). April 07, 2008. As cited in: Agency for Toxic Substances and Disease Registry (ATSDR). 2012. Toxicological profile for Manganese. Atlanta, GA: U.S. Department of Health and Human Services, Public Health Service.

<sup>9</sup> Rice K.C. 1999. Trace-element concentrations in streambed sediment across the conterminous United States. Environ Sci Technol 33(15):2499-2504. As cited in: Agency for Toxic Substances and Disease Registry (ATSDR). 2008. Toxicological profile for Aluminum. Atlanta, GA: U.S. Department of Health and Human Services, Public Health Service.

## Mitigation Measures

PennEast evaluated route and construction method alternatives for the proposed Susquehanna River crossing. The route was selected to avoid extensive development, flood projects, other critical infrastructure, and to maximize use of previously-disturbed land and open space. Due to historical mining operations and geotechnical conditions, a trenchless crossing was deemed to be infeasible at the proposed crossing location. A dry, open-cut crossing that utilizes diversion dams and cofferdams was determined to be the most practicable alternative, and has therefore been incorporated in the Project design.

As described in the Introduction, construction of the Susquehanna River crossing will occur in two phases, one for each river channel north and south of Monocanock Island. A temporary diversion dam will be installed at the upstream tip of Monocanock Island in the northern channel, and cofferdams will be installed at the edge of workspace in the northern channel. Within the dewatered workspace, the trench will be excavated from the northern river bank to Monocanock Island, the pipeline will be installed, the trench will be backfilled, and the pre-construction river bed and bank contours will be restored to the extent practicable. After restoration is complete, the cofferdams and diversion dam will be removed, restoring flow to the northern channel. The process will be repeated in the southern channel, and a tie-in weld will occur within the trench on the island before the trench is backfilled.

The dry crossing method using coffer dams minimizes suspension of sediments in the water column during construction. By utilizing this dry crossing technique, stream flow can be temporarily diverted, effectively isolating the workspace from the stream, which greatly reduces sedimentation. Stream flow would be restored once the crossing is complete and the stream bed and banks are restored, thereby minimizing suspension of any sediment during construction.

In the event that contamination (including that from historical mining activities) is encountered during construction, PennEast would implement the protocols in its Unanticipated Discovery of Contamination Plan, which was provided to the FERC for its review of the Project's 7(c) application. If contaminated soils are encountered during construction, all personnel would stop work, leave the contaminated area, and notify the chief inspector on-site. Additional notifications would then be made, including outside agencies if required. PennEast would transport excavated soil to designated soil staging areas, characterize the soils for waste disposal, and manage soils in accordance with state and federal regulations. FERC has reviewed this plan and concluded that implementation of these plans would provide adequate environmental protection during pipeline construction and operation. PennEast will update the Unanticipated Discovery of Contamination Plan, which will include identification of responsible personnel, and will submit it to FERC for final review and written approval prior to construction.

## Conclusions

Based on the results of the preliminary sediment and soil analyses conducted for the proposed Susquehanna River crossing, AECOM does not anticipate that PennEast will encounter contaminated sediments or contaminated soil at the proposed crossing during Project construction. Sampling occurred in the upper six inches of the river bed and at intervals down to 6 feet bgs on Monocanock Island, which is where contaminated sediment/soil would likely be found through deposition events (i.e. flooding). It is unlikely that contamination would be present below the sampling depths, as river channel geometry and substrate generally inhibit deposition.

By implementing the dual cofferdam and dry crossing technique, the workspace will be isolated from river flows which will minimize sediment resuspension within the river. Spoil excavated from the trench will be temporarily stored within the isolated workspace while the pre-fabricated pipeline segment is installed. The stockpiled native spoil will be used to backfill the trench. If additional fill must be brought in to restore the stream crossing, PennEast would use clean gravel or native cobbles for the upper 12

inches of the trench backfill. If contamination is identified during construction, or if any spoil must be removed from the site, it would be stockpiled in uplands, characterized for waste disposal, and managed in accordance with state and federal regulations.

## Photographs

Photo 1. Low Flow Conditions (SED-004, Looking Downstream of the Southern Main Channel)



Photo 2. Typical Cobble Shoreline (SED-001, Looking Downstream of the Northwest Channel)



Photo 3. Representative Sediment Sample

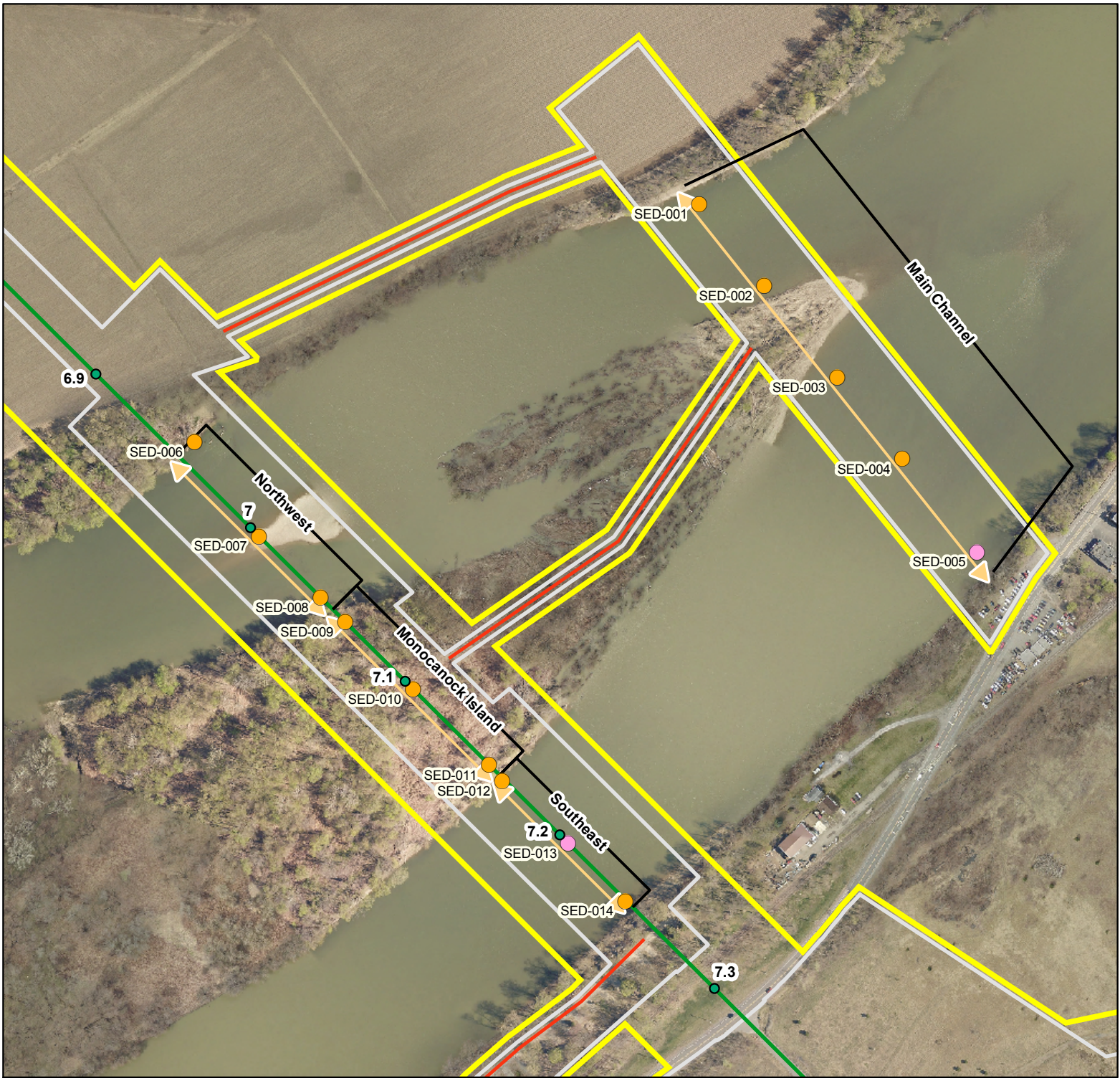


Photo 4. Monocanock Island Sampling (SED-010)



Photo 5. Representative Soil Sample

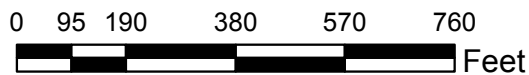




**Legend**

- Milepost
- Centerline
- Access Road Centerline
- Construction Limits
- Study Area
- 2018 Sampling Locations
- Unable to be Sampled
- ⇄ Sampling Transect

Reference:  
PennEast Aerial Imagery 2015



**Figure 1: 2018  
Sampling Locations  
Susquehanna River Crossing**

Wyoming Borough and Jenkins Township,  
Luzerne County, Pennsylvania