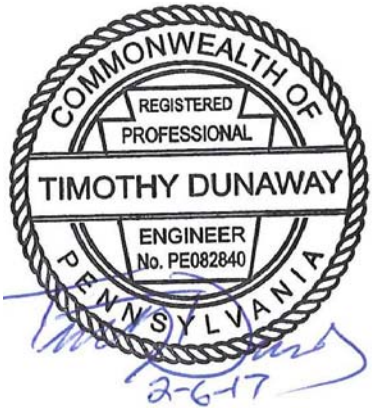
# Site Restoration and Post-Construction Stormwater Management Plan

## Pennsylvania Pipeline Project

## Mt. Union Station Expansion

February 2017

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# LIST OF ACRONYMS

| ACRONYM | MEANING |
|---|---|
| AASHTO | American Association of State Highway and Transportation Officials |
| ABACT | Antidegradation Best Available Combination of Technologies |
| ac | Acre |
| ac-ft | Acre-feet |
| BMP | Best Management Practice |
| CCE | Calcium Carbonate Equivalent |
| CFS | Compost Filter Sock |
| cfs | Cubic Feet per Second |
| CN | Curve Number |
| E&SC | Erosion and Sediment Control |
| ENV | Effective Neutralizing Value |
| HDPE | High Density Polyethylene |
| hr | Hour |
| in/hr | Inches per Hour |
| IT | Infiltration Test |

| | |
|---|---|
| lbs | Pounds |
| LOD | Limit of Disturbance |
| NRCS | Natural Resources Conservation Service |
| PADEP | Pennsylvania Department of Environmental Protection |
| PASDA | Pennsylvania Spatial Data Access |
| PCSM | Post-Construction Stormwater Management |
| PennDOT | Pennsylvania Department of Transportation |
| POI | Point of Interest |
| PPP | Pennsylvania Pipeline Project |
| SCS | Soil Conservation Service |
| sq ft | Square feet |
| sq yds | Square yards |
| SPLP | Sunoco Pipeline, L.P. |
| TSF | Trout Stock Fishes |
| Tt | Tetra Tech, Inc. |
| UNT | Unnamed tributary |
| USDA | United States Department of Agriculture |
| USGS | United States Geological Survey |
| yr | Year |

## 1.0 INTRODUCTION

Tetra Tech, Inc. (Tt) has prepared this Site Restoration and Post-Construction Stormwater Management (PCSM) Plan for Sunoco Pipeline, L.P. (SPLP) – Pennsylvania Pipeline Project (PPP). The Plan addresses post-construction stormwater management BMPs following the proposed modifications at the Mt. Union Station. The Project is located in Shirley Township, Huntingdon County, Pennsylvania. A United States Geological Survey (USGS) site location map is provided in Appendix A.

SPLP is proposing to construct the Project in Shirley Township, Huntingdon County, PA. The Project will be located adjacent to State Route 522 (Croghan Pike) at latitude 40.345°, longitude -77.866°. The Project will be connected to the PPP twenty-inch diameter transmission pipeline and will include the construction of a gravel access road, clearing and grubbing, pump station installation, and site restoration. The pump station installation will include a launcher, receiver, knock out tank, and pipe supports. The proposed Project will be constructed within a limit of disturbance (LOD) of approximately 2.83 acres.

Section 2.0 discusses the existing site and its characteristics. Section 3.0 discusses the construction sequence, site restoration practices, and the inspection and maintenance procedures. Section 4.0 discusses the proposed BMPs, the design criteria, and design process.

## 2.0 EXISTING SITE DESCRIPTION

Past and present land use of the Project area and surrounding area is meadowland. Future land use will be a maintained gravel access road and a maintained gravel pad which the pump station will sit on. The project area drains to an unnamed tributary (UNT) to Aughwick Creek. Site soils information was taken from the United States Department of Agriculture (USDA) Natural Resources Conservation Service (NRCS) Web Soil Survey. A soil map and list of existing soil types is located in Appendix B. Relevant topographic features including streams, streets, pipelines, structures, utility lines, fences, paving and other significant items along the pump station LOD are indicated on the plans, where applicable.

## 2.1 TOPOGRAPHY

The work zone is located on ground gently sloping southeast toward an UNT to Aughwick Creek and State Route 522 (Croghan Pike). Site elevations vary from approximately 609 feet (western corner of pad area) to 600 feet (eastern corner of pad area) above mean sea level based on the Pennsylvania Spatial Data Access (PASDA). The site development plans show the topography of the site and the surrounding area and can be found in Appendix G.

## 2.2 GEOLOGY AND SOILS

The soils and geologic formations surrounding the site are shown on the figures provided in Appendix B. Appendix B also provides soil descriptions and properties of the soils found at the site. In general, the following actions will be taken to counteract soil limitations:

- Pipes installed will be protected from potential corrosive soils. The pipeline(s) being installed will be either high-density polyethylene (HDPE) or coated steel.
- Prompt stabilization practices will be implemented.
- Soils will be evaluated throughout the construction process to determine whether additional measures will need to be taken to make the soil suitable for its intended use on site.
- Soil amendments will be added to site soils to promote vegetative growth.
- A wetland delineation and stream investigation has been conducted to determine the presence and location of hydric soils. No streams or wetlands have been identified within the LOD. There are streams and wetlands located on the property. To prevent sediment from leaving the site, stabilization practices will be in place and functional prior to earth disturbances, and stabilization practices will be implemented in disturbed areas as soon as practical. Geologic formations or soil conditions that may have the potential to cause pollution after earth disturbance were not observed during pre-design field activities.

- If a high groundwater table is encountered, water will be drained away from disturbed areas to a well vegetated area or a placed compost filter sock (CFS) prior to being discharged off the site. Water encountered during construction activities will be pumped through a pumped water filter bag to a well vegetated upland area. Saturated soils will be dried prior to being used on-site.

The site consists of **Bedington (BeB)** channery silt loam, 3 to 8 percent slopes**, Berks (BoB)** Channery silt loam, 8 to 15 percent slopes**,** and **Blairton (BkC)** silt loam, 2 to 8 percent, which are described below.

**BeB – Bedington-channery silt loam, 3 to 8 percent slopes**.

This moderately well-draining soil is located on concave hills at elevations ranging from 300 to 1,500 feet above mean sea-level. It is formed from local silty colluvium derived from shale and siltstone over acid and silty residuum weathered from shale and siltstone; colluvium derived from shale and siltstone. The typical soil profile is: 0 to 9 inches: channery silt loam **(Hydrological Soil Group B)**; 9 to 30 inches: channery silt clay loam **(Hydrological Soil Group D)**; and 30 to 38 inches: channery silt loam **(Hydrological Soil Group B)**; 38 to 42 inches: bedrock. The depth to water table is 12 to 24 inches. The restrictive feature, lithic bedrock, is encountered 20 to 40 inches below the surface. There is no frequency of flooding or ponding.

**BoB-Berks-channery silt loam, 8 to 15 percent slopes**.

This moderately well-draining soil is located on concave hills at elevations ranging from 300 to 1,500 feet above mean sea-level. It is formed from local silty colluvium derived from shale and siltstone over acid and silty residuum weathered from shale and siltstone; colluvium derived from shale and siltstone. The typical soil profile is: 0 to 9 inches: channery silt loam **(Hydrological Soil Group B)**; 9 to 30 inches: channery silt clay loam **(Hydrological Soil Group D)**; and 30 to 38 inches: channery silt loam **(Hydrological Soil Group B)**; 38 to 42 inches: bedrock. The depth to water table is 12 to 24 inches. The restrictive feature, lithic bedrock, is encountered 20 to 40 inches below the surface. There is no frequency of flooding or ponding.

**BkC – Blairton-silt loam, 2 to 8 percent slopes**.

This moderately well-draining soil is located on concave hills at elevations ranging from 300 to 1,500 feet above mean sea-level. It is formed from local silty colluvium derived from shale and siltstone over acid and silty residuum weathered from shale and siltstone; colluvium derived from shale and siltstone. The typical soil profile is: 0 to 9 inches: channery silt loam **(Hydrological Soil Group B)**; 9 to 30 inches: channery silt clay loam **(Hydrological Soil Group D)**; and 30 to 38 inches: channery silt loam **(Hydrological Soil Group B)**; 38 to 42 inches: bedrock. The depth to water table is 12 to 24 inches. The restrictive feature, lithic bedrock, is encountered 20 to 40 inches below the surface. There is no frequency of flooding or ponding.

## 2.3 SURFACE WATER HYDROLOGY

The project area surface water runoff drains to the south to an UNT to Aughwick Creek, which is designated as Trout Stock Fishes (TSF) under PA Code 25 Chapter 93.

This PCSM plan contains BMPs to maintain the designated use of the receiving waters. The locations of the receiving waters relative to the project area can be seen in Appendix A, the Site Location Map.

No streams and wetlands will be affected during construction.

## 3.0 SITE RESTORATION PRACTICES

Minimizing the LOD for the Project was taken into consideration in order to limit ground disturbance. Grounds disturbed by any of the operations necessary to complete the work for this project are to be permanently seeded, or if specified, sodded, unless occupied by structures, paved, graveled, or designated as a permanent access road. Disturbed areas will be seeded and mulched as soon as practical once final grades are achieved. If seeding cannot be completed within a four (4) day period due to weather conditions, the disturbed area will be mulched with straw at the rate of three (3) tons per acre. This straw will be anchored using a method described in Section 3.4. An infiltration trench will be installed as a post construction stormwater BMP to mitigate the permanent stormwater impacts of construction.

## 3.1 CONSTRUCTION SEQUENCE

A construction sequence is provided below for installing post construction stormwater BMPs. The construction sequence is intended to provide a course of action to conform to the applicable regulatory agency requirements for restoration and post-construction stormwater management of the site. Necessary steps for proper and complete execution of work pertaining to this plan, whether specifically mentioned or not, are to be performed by the contractor. The contractor will comply with all requirements listed in this section and the Pennsylvania Stormwater Best Management Practices Manual. The contractor may be required to alter controls based on the effectiveness of controls or differing conditions encountered in the field. If the contractor plans on deviating from the methods and controls in this PCSM Plan, they must get approval from the county conservation district and PADEP before any actions commence.

A pre-construction meeting is required prior to the start of any construction activity. The Pennsylvania Department of Environmental Protection (PADEP) or applicable county conservation district, contractors, the landowner, appropriate municipal officials, and the plan preparer must be invited to this meeting at least 7 days prior to construction commencement. All construction activities shall be discussed in this meeting including, but not limited to, the PCSM features and any deviations the contractor has planned. A licensed professional shall oversee all installation and testing procedures for the berms, infiltration trenches, and all associated piping and inlets, as they are critical stages of the BMP installation.

Install post construction BMPs after completion and stabilization of the Project to prevent sediment accumulation in the BMPs.

**Minimize Total Disturbed Area**

1. All construction shall take place within the designated limits of disturbance as shown on the plans.
2. Maintain soil stockpiles in the areas designated on the plans.
3. The existing compressor station gravel pad shall be used for equipment and material storage to minimize the limits of disturbance and soil compaction.

4. Within the limits of disturbance, contractors are to minimize land disturbance to the maximum extent. Repeated travel is restricted to travel lanes and travel through areas are limited to those necessary to complete the work.

5. Surface roughing is the practice of providing a rough soil surface with horizontal depressions for the purpose of reducing runoff velocity, increasing infiltration, aiding the establishment of vegetation, and reducing erosion. During the preparation for seeding on slopes 3H:1V or steeper, unless a stable rock face is provided, surface roughening is to be conducted by tracking the slopes by running tracked equipment (with blades up) across the surface as to leave grooves parallel to the contour. Any area where stone and/or timber mats are used for temporary stabilization, soil will be decompacted through multiple passes using tracked equipment. The tracking method can be used elsewhere to aid in the decompaction of soils as deemed necessary to facilitate successful restoration. The tracking method can be used on the subsoil before topsoil replacement and/or on the topsoil prior to seeding. In agricultural areas, severely compacted areas are to be plowed with a harrow, paraplow, paratill or other equipment before subsoil replacement. Vehicular traffic is to be restricted from areas that are ready to be seeded. The level of soil compaction will vary greatly across the project and the decompaction measures to be implemented will be considered on case-by-case basis and evaluated through testing (e.g., penetrometer) and discussions between Spread Managers and Environmental Inspectors.

**Re-Vegetate Disturbed Areas**

1. Apply permanent seeding as described in Section 3.2

**Infiltration Trench**

1. Permanent filters should not be installed until the site is stabilized. Excessive sediment generated during construction can clog the filter and prevent or reduce the anticipated post-construction water quality benefits. Stabilize all contributing areas before runoff enters filters.

2. Structures shall be installed in accordance with the manufacturers' or design engineers guidance.

3. The excavation for the infiltration trench shall be excavated from the sides without entering the trench in such a manner as to avoid compaction of the subbase.

4. A layer of non-woven-geotextile fabric shall be placed in the excavation.

5. Place gravel/stone in minimum 6 inch lifts and lightly spread with equipment bucket until stone is level and does not settle. Place underdrain pipes in gravel during placement.

6. Wrap and secure nonwoven geotextile to prevent gravel/stone from clogging with sediments.

7. Saturate filter media and allow media to drain to properly settle and distribute.

**Stormwater Inlets, Piping and Outlets**

1. Excessive sediment generated during construction can clog the inlets, outlets, and piping and prevent or reduce the anticipated post-construction water quality benefits. Stabilize all contributing areas before

runoff enters structures. If inlets require installation prior to site stabilization, the inlet shall be protected with sand bags or other means necessary to prevent sediment laden runoff from entering.

2. Excavate trenches for stormwater inlets, piping, and outlets. Take care to ensure slope stability during excavation in order to avoid slope failure.

3. Place underlying gravel, stone, or clean fill per the construction details provided on the PCSM plan sheets. Lightly compact the underlying media.

4. Place stormwater structure on top of the lightly compacted underlying media.

5. Cover the inlets, outlets, and piping per the construction details provided in the PCSM plan sheets.

**Berm**

1. Lightly scarify the soil in the area of the proposed berm before delivering soil to site.

2. Bring in fill material to make up the majority of the berm. Soil shall be added and compacted according to design specifications. The slope and shape of the berm shall be graded out as soil is added.

3. Complete final grading of berm after the top layer of soil is added. Tamp soil down lightly and smooths sides of the berm.

4. Plant berm with permanent grass seed mix.

5. Mulch planted and disturbed areas with compost mulch to prevent erosion while plants become established.

### 3.2 PERMANENT SEEDING

Site preparation and establishment of permanent cover will be conducted according to the following guidelines:

1. Install needed surface water control measures.

2. Hydroseed or follow Steps 3 through 6 below.

3. Perform all cultural operations at right angles to the slope.

4. Determine agricultural lime application rates by field pH testing. Perform testing at a rate of 1 test per acre (minimum). In the absence of testing, apply at 6 tons per acre.

5. Apply dry 10-20-20 formulation of fertilizer at the rate of 678 pounds (lbs) per acre or at a rate determined by field testing.

6. Work in lime and fertilizer to a depth of 4 inches using suitable equipment.

7. Seed Mixture - The seed mixture will be:

| TABLE 1: PENNSYLVANIA DEPARTMENT OF TRANSPORTATION (PENNDOT) FORMULA W | | | | | | | |
|---|---|---|---|---|---|---|---|
| **SCIENTIFIC NAME** | **COMMON NAME** | **REQUIRED VARIETIES** | **% BY WEIGHT** | **MINIMUM % PURITY** | **MINIMUM % GERMINATION** | **MAX % WEED** | **SEEDING RATE (POUNDS/1000 SQUARE FEET, LBS/1000 SQ FT)** |
| Festuca Arundinacea | Tall Fesuce | Festuca arundinacea var. Kentucy 31 | 70 | 98 | 85 | 0.15 | 7.5 |
| Lotus Corniculatus | Birdsfoot Trefoil Mixture | A combination of varieties (Viking, Empire, Norcen, Dawn, Leo, Bull, Maitland) with no one variety exceeding 50% of the total Trefoil component. | 20 | 98 | 80(1) | 0.10 | 2.0 |
| Agrostis Alba | Redtop | Agrostis alba | 10 | 92 | 80 | 0.15 | 1.0 |

(1) Recommended 10% hardseed and 70% normal sprouts.

8. If not hydroseeding, apply mulch.

Notes:

1. *Spread seeds where indicated and at the rates specified in Table 1, or as otherwise indicated.*
2. *Spread seeds within April 1 to June 15 or August 16 to September 15.*
3. *Extend seeding dates where project conditions warrant. Apply full treatment or apply only 50% of the permanent seeding and soil supplements and apply the remaining 50% within the next seeding dates, as directed in writing.*
4. *Use tillage and soil supplements before permanent seeding on topsoiled areas, where temporary seeding or mulching has been applied.*
    a. *On topsoiled areas, 1:3 (3:1) and flatter, loosen the surface to a depth of at least 50 millimeters (2 inches) by disking, harrowing, or other acceptable methods until the tillage is satisfactory. On untopsoiled areas, 1:3 (3:1) and flatter, till only as directed. Also, till or scarify areas if the surface is glazed or crusted.*
    b. *Correct surface irregularities by filling depressions and leveling rough or uneven areas. Remove metal objects, stones larger than 50 millimeters (2 inches) in any dimension, and other debris or objects deemed detrimental to maintenance operations.*
5. *Inoculate leguminous seed, such as Birdsfoot Trefoil, with proper cultures, according to the manufacturer's directions.*
6. *At the rates specified in Table 1, sow seeds uniformly on the prepared areas by the helicopter, hydraulic placement, broadcasting, drilling, or hand seeding methods. Inspect seeding equipment and adjust the equipment, if required, to ensure the specified application rates. Periodically perform a check on the rate and uniformity of application, as directed. Prior to seed application of each designated seed formula, thoroughly clean-out seed tank by rinsing with clean water to prevent contamination from one seed formula to the next. Repeat rinsing cycle until tank is clean. Collect all non-applied seed derived from each clean-out event and remove as waste from the project.*

7. *After seeding, roll topsoiled areas that are to be mowed. Use a roller with a mass (weight) not more than 100 kilograms/meter (65 pounds per foot). If soil is wet or frozen, roll only when directed.*
8. *Apply herbicides as directed, to areas that are to be mowed and where weed growth is prominent. The Representative will designate existing plants or groups of plants to be saved within these areas before herbicide application. If directed, more than one application may be required to control undesirable growth. Apply material with application personnel certified by the Department of Agriculture and with equipment specified in Section 108.05(c).*
9. *Final acceptance of seeding and soil supplement materials and installation are subject to the results of official sampling and testing as specified before use and installation and the resultant establishment of the specified vegetation. Remove non-approved materials from the project.*
    a. *Reseed rejected areas with additional applications of the specified seed and soil supplement materials. Redress soil surfaces when directed. Perform reapplication of seed and soil supplements within the next applicable seeding date if necessary or as directed. When directed, reseed areas damaged by herbicide applications and mowing operations. NOTE: Reseeded areas will also require the application of appropriate mulch as specified in Section 805.*
    b. *Seeded areas may be rejected based on the lack of actual grass seedling establishment exhibited in the area for the specified seed formula.*
        i. *Table 1 formula seeded areas that exhibit less than 70% surface area coverage with the specified germinated grass seedlings after 90 days of growth may be rejected upon visual inspection. The seed germination and growth period is determined from the date of the seeding operation for the area when these operations are performed within the specified seeding dates.*
        ii. *Special seed formula planted areas (seed mixtures not indicated in Table 1) may be rejected based on the lack of the specified seed germination and growth of less than 11 seedlings/square meter (9 seedlings/square yard) after 120 days of growth determined by visual inspection. The seed germination and growth period is determined from the date of the seeding operation of the area when these operations are performed within the specified seeding dates.*
        iii. *Seeded areas exhibiting soil surface erosion rills or gullies deeper than 250 millimeters (1 inch) may be rejected upon visual inspection. Redress and reseed designated eroded areas with specified materials and application rates as directed.*

**Liming Rates**

Minimum 6 tons per acre at 100% effective neutralizing value (% ENV), unless the soil test determines that a lesser amount is needed. To determine the actual amount of regular lime to apply, divide the amount called for by the soil test by the % ENV for the product used. For example, if 6 tons per acre is needed and the ENV for the lime used is 88%, divide 6 by 0.88 resulting in 6.8 tons needing to be applied. For dolomitic lime, which has a significant amount of magnesium in it, divide the amount called for by the soil test by the % calcium carbonate equivalent (% CCE) listed for the product instead of the % ENV. The % CCE may be above 100% which accounts for the fact that magnesium has a greater effect per pound than the calcium in regular lime. Note: When a soil test requires more than 8,000 pounds of lime per acre, the lime must be mixed into the top 6 inches of soil.

**Fertilization Rates**

Prepare areas for seeding by uniformly applying supplements. Document bulk delivery. Blend the initial soil supplements into the soil at least 50 millimeters (2 inches), on topsoiled areas, by raking, disking, harrowing, or other acceptable methods. Blend the supplements into the soil during tillage operations. Apply slow-release nitrogen fertilizer to the surface of Formula W seeded areas before project completion. Apply soil supplements as shown in the following table, unless otherwise indicated:

| Permanent Seeding Application Rate | | | | |
|---|---|---|---|---|
| **Soil Amendment** | **Per Acre** | **Per 1,000 square feet (sq ft)** | **Per 1,000 square yards (sq yds)** | **Notes** |
| Agricultural Lime | 3872 lbs | 89 lbs | 800 lbs | or as per soil test; may not be required in agricultural fields |
| 10-20-20 Fertilizer | 678 lbs | 16 lbs | 140 lbs | |
| 38-0-0 Ureaform Fertilizer, OR | 242 lbs | 6 lbs | 50 lbs | |
| 32-0-0 to 38-0-0 Sulfur Coated Urea Fertilizer, OR | 286 lbs | 7 lbs | 59 lbs | |
| 31-0-0 IBDU Fertilizer | 295 lbs | 7 lbs | 61 lbs | |

### 3.3 TEMPORARY SEEDING

Temporary grass cover will be established in the following areas:

- Where vegetative filters must be established below filter bags, a minimum distance of 10 feet will be seeded down slope of the trap outlet. Seed mixture for temporary cover will consist of 100-percent annual ryegrass. Seed will be applied at the rate of 40 lbs per acre or as recommended by a local recognized seed supplier and approved by the owner's representative. Prior to seeding, apply 1 ton of agricultural grade limestone per acre plus 10-10-10 fertilizer at the rate of 500 lbs per acre and work into soil.
- Where soil stockpiles are to be exposed for a period greater than four (4) days, the stockpile shall be seeded.

| Temporary Seeding Application Rate | | | | |
|---|---|---|---|---|
| **Soil Amendment** | **Per Acre** | **Per 1,000 sq ft** | **Per 1,000 sq yd** | **Notes** |
| Agricultural Lime | 1 ton | 40 lbs | 410 lbs | Typically not required for topsoil stockpiles |
| 10-10-10 Fertilizer | 500 lbs | 12.5 lbs | 100 lbs | Typically not required for topsoil stockpiles |

### 3.4 MULCHING

The purpose of mulch is to reduce runoff and erosion, prevent surface compaction or crusting, conserve moisture, aid in establishing plant cover, and control weeds. Mulch will be applied on any area subject to erosion, or which has unfavorable conditions for plant establishment and growth. The practice will be used alone or in conjunction with other structural and vegetative conservation practices, such as waterways, ponds,

sedimentation traps or critical area planting. On sediment producing areas where the period of exposure is less than 2 months, mulch materials will be applied according to the following guidelines:

- Apply straw mulch at the rate of 3 tons per acre. Chemically treated or salted straw is not acceptable as mulch.

    - Anchor straw mulch immediately after application by at least one of the following methods.

    A. "Crimp" straw mulch into the soil using tractor drawn equipment (straight bladed coulter or similar). This method is limited to slopes no steeper than 3:1. Operate machinery on the contour. Crimping of hay or straw by running it over with tracked machinery is not recommended.

    B. Uniformly apply asphalt, either emulsified or cut-back, containing no solvents or other diluting agents toxic to plant or animal life, at the rate of 31 gallons per 1,000 square feet.

    C. Use synthetic binders (chemical binders) as recommended by the manufacturer to anchor mulch provided sufficient documentation is provided to show that it is non-toxic to native plant and animal species.

    D. Staple lightweight plastic, fiber, or paper nets over the mulch according to the manufacturer's recommendations.

Mulched areas will be checked periodically and after each runoff event (e.g. rain, snowmelt, etc.) for damage until the desired purpose of the mulching is achieved. Damaged portions of the mulch or tie-down material will be repaired upon discovery.

### 3.5 MATERIAL RECYCLING AND DISPOSAL

The operator will remove from the site, recycle, or dispose of all building materials and wastes in accordance with PADEP's solid waste management regulations at 25 PA Code 260.1 et seq., 271.1 et seq., and 287.1 et seq. The operator will first characterize the waste materials as municipal, residual or hazardous waste. Before the waste material is hauled away, the material will be stored and labeled in accordance with the applicable management procedures, if any, under the Solid Waste Management Act regulations. The operator will then hire a licensed and insured waste hauler to transport the waste material to a properly permitted waste disposal facility. The contractor will not illegally bury, dump, or discharge building material or wastes at the site. Excess material brought into the site areas to facilitate construction access will be completely removed prior to rough grading and final surface stabilization. Expected construction wastes will consist of packaging material and sediment cleaned from BMPs. Sediment removed from BMPs will either be spread in a protected area within the LOD, to dry and then recycled as fill material or disposed of off-site. Off-site spoil and/or borrow sites greater than one acre must be operated under an E&SC Plan approved by the County Conservation District.

## 3.6 THERMAL IMPACTS

Potential pollution to surface waters from thermal impacts will be minimized by minimizing clearing and retaining existing vegetation where possible during construction. Following construction, permanent seeding will occur as soon as practicable to facilitate vegetative growth. All post-construction water storage will be underground, thus minimizing the opportunity for increase in water temperature. Additionally, all other proposed BMPs allow for stormwater runoff to flow consistently, thus reducing the opportunity for the temperature to rise in the stormwater.

## 3.7 RIPARIAN FOREST BUFFERS

Existing riparian forest buffers do not exist within the Project area.

## 3.8 INSPECTION AND MAINTENANCE PROCEDURES

Seeded areas will be inspected weekly and after each runoff event for bare spots, washouts, and healthy growth. Necessary repairs will be made immediately. Mulched areas will be checked periodically and after severe storms for damage until the desired purpose of the mulching is achieved. Damaged portions of the mulch or tie-down material will be repaired upon discovery.

All sedimentation control measures will remain in place until the disturbed areas are stabilized and a uniform 70-percent perennial vegetative cover is established. Any area not achieving a 70-percent vegetative cover will be reseeded and mulched within 24 hours of detection. The following inspection and maintenance practices will be used to maintain PCSM BMPs on site:

- PCSM BMPs will be in place and inspected according to the schedule below. PCSM BMPs will also be inspected after each runoff event. The Contractor will immediately repair any deficiencies.
- Maintenance and inspection of PCSM BMPs will conform to PADEP Chapter 102 and 105 rules and regulations.
- A licensed professional shall oversee all installation and testing procedures for the Infiltration Trench and Berm.

If BMPs are found to be inoperative or ineffective during an inspection, PADEP should be contacted within 24 hours, followed by submission of a written noncompliance report to PADEP within 5 days of the initial contact.

**Long-Term Maintenance**

The owner will maintain the stormwater management facilities for this site. Maintenance of the stormwater management facilities includes, but is not limited to, the following:

1. The proposed stormwater BMPs will be inspected and maintained by the property owner in accordance with the approved operation and maintenance program.

2. The stormwater BMPs are fixtures that can be altered or removed only after approval by PADEP.

3. Vegetation should be inspected around the site during all regular inspections. Vegetation outside of the fence and equipment pad shall be mowed sparingly to maintain a meadow condition. Bare spots shall be re-seeded and mulched to maintain full vegetated cover. Invasive plants shall be removed manually or by mowing.

4. Berm:

    - Inspections to be done annually and within 48 hours after every major storm event (> 1 inch rainfall depth)
    - Maintain turf grass and other vegetation by mowing and re-mulching
    - The crest of the berm may be used as access for heavy equipment when necessary to limit disturbance.
    - Routinely remove accumulated trash and debris.
    - Remove invasive plants as needed.
    - Inspect for signs of flow channelization; restore level gradient immediately after deficiencies are observed.

5. Infiltration Trench:

    - Inspect Infiltration Trenches and associated inlets and piping at least two times per year and within 48 hours after every major storm event (> 1 inch rainfall depth). Inspection considerations include:
        - Inspect cleanouts – any water left in a surface filter after the design drain down time indicates the filter is not optimally functioning.
        - Remove trash and debris as necessary.
        - Catch basins and inlets should be cleaned of sediment when accumulation is more than 6 inches.
        - The vegetation along the surface of the Infiltration Trench should be maintained in good condition, and any bare spots revegetated as soon as possible.
        - Vehicles should not be parked or driven on a vegetated Infiltration Trench, and care should be taken to avoid excessive compaction by mowers.

**Long-Term Operation and Maintenance Schedule**

| PCSM BMP | Inspections | Repairs | Reconstruction | BMP Life Expectancy |
|---|---|---|---|---|
| Infiltration Trench | 1 hr Quarterly @ $70/hr | Replace 10% of filter media: $2,200 | 1-2 weeks Cost: $100,000 | 20-30 years |
| Berm | 1 hr Quarterly @ $70/hr | Replacing 10% of vegetation Time: 1 day Cost: $800 | Time: 1-2 days Cost: $2,200 | 20-30 years |

1. *Sunoco Pipeline L.P. is the owner/operator of the Houston Injection Station and is responsible for the long term maintenance of the site PCSM BMPs. SPLP can be contacted at: 610-670-3200*

## 3.9 ANTIDEGRADATION REQUIREMENTS

Post-construction stormwater management BMPs associated with the Mt. Union Pump Station Expansion Activities will drain to receiving waters that are classified as Trout Stock Fishes (TSF) with a designated use of attaining. Therefore, a PCSM anti-degradation analysis and anti-degradation BMPs are not required.

# 4.0 POST-CONSTRUCTION STORMWATER MANAGEMENT ANALYSIS

## 4.1 DESIGN BASIS

This plan has been prepared to comply Chapter 102.8(g)(2) and Chapter 102.8(g)(3).

The site's pre-development and post-development drainage characteristics were modeled in accordance with local and state requirements. The hydrology calculations were performed utilizing the U.S. Soil Conservation Service (SCS) TR-55 Urban Hydrology for Small Watersheds. The 1, 2, 10, 25, 50, and 100-year, 24-hour storm events have been analyzed for pre- and post-developed conditions. The rainfall depths for each storm event are 2.4, 2.8, 4.1, 5.0, 5.7, and 6.5 inches, respectively, and follow the SCS 24-hour Type II rainfall distribution. Rainfall depths were taken from the Township of Shirley Stormwater Management Plan. The soils in the analyzed drainage areas include Blairton silt loam. This soil type has a HSG rating of C/D according to the NRCS Web Soil Survey. The CN for C/D soils was calculated by assuming half C soils and half D soils for each type of land cover. Bentley PondPack V8i was used to perform the hydrology analysis. The pre-development watershed maps are located in Appendix C. The post-development watershed maps are located in Appendix D. The PondPack report and Flowmaster calculations are located in Appendix E.

The stormwater BMPs have been designed for the Project to comply with the stormwater quality and quantity management requirements. The watershed calculations were performed using Bentley PondPack V8i. The BMP has also been designed meet state stormwater quality and quantity management requirements. Calculation worksheets from Chapter 8 of the Pennsylvania Stormwater Best Management Practices Manual were used to ensure compliance with state requirements. The completed worksheets are located in Appendix F. On Worksheet #4, the LOD of 2.83 acres is identified as the total site area/managed site area. The proposed impervious area within the LOD is 0.63 acres. This area is identified on Worksheet #4 as the drainage area, which is also the area controlled with the proposed BMP. The 2.20 acre managed area outside of the 0.63 acre controlled drainage area will be restored to pre-development conditions after construction. Therefore, runoff from this area is not changed between the pre-development and post-development condition and including it in the analysis would have no effect on the 2-year volume increase calculation shown on Worksheet #4.

## 4.2 HYDROLOGY

Pre-development and post-development runoff results were calculated using the previously described design basis. The pre-development and post-development watersheds have a single point of interest (POI) that encompass the developed pad area. The full post-development area is directed to the BMP. Table 4.1 provides a summary of the pre-development and post-development hydrology and associated peak flow discharge rates without BMP controls. Table 4.2 provides a summary of the pre-development and post-development hydrograph volumes without BMP controls.

**Table 4.1: Pre-Development and Post-Development Hydrology**

| | | | | Peak Flow (cubic feet per second, cfs) | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | **Drainage Area (acre, ac)** | **Tc (hour, hr)** | **Curve Number (CN)** | **1-year, yr** | **2-yr** | **10-yr** | **25-yr** | **50-yr** | **100-yr** |
| Pre-Development | 0.632 | 0.083 | 60.07 | 0.05 | 0.18 | 0.70 | 1.16 | 1.60 | 2.13 |
| Post-Development | 0.632 | 0.083 | 98.00 | 1.87 | 2.26 | 3.34 | 4.00 | 4.60 | 5.26 |

**Table 4.2: Pre-Development and Post-Development Hydrograph Volumes**

| | Hydrograph Volume (acre feet, ac-ft) | | | | | |
|---|---|---|---|---|---|---|
| | **1-yr** | **2-yr** | **10-yr** | **25-yr** | **50-yr** | **100-yr** |
| Pre-Development | 0.007 | 0.015 | 0.043 | 0.067 | 0.090 | 0..119 |
| Post-Development | 0.112 | 0.137 | 0.203 | 0.248 | 0.286 | 0.329 |

Maps for the pre-development and post-development watersheds are located in Appendix C and Appendix D, respectively.

### 4.3 BMP DESIGN

The infiltration trench consists of a 3.5-foot deep flat gravel bed surrounded by filter fabric. A 1 foot high berm is constructed downslope of the gravel pad area to retain surface runoff. The berm directs runoff into two drop inlets that connect to four, 280-foot long lengths of perforated High Density Polyethylene (HDPE) pipe that run the length of the infiltration trench. The drop inlets are also connected to a manhole with an interior weir that controls discharge from the infiltration trench during larger storm events. The BMP design details are shown in Appendix G.

The PondPack report of the storm routing for the BMP is provided in Appendix E. The cumulative storage volume for the BMP is shown in Table 4.3. The routing summary for the BMP is summarized in Table 4.4.

**Table 4.3: BMP Cumulative Storage Volume**

| Elevation of Water in System[1] | Cumulative Pipe Storage[2] | Cumulative Pipe and Gravel Storage[3] | Total System Cumulative Storage[4] | Total System Cumulative Storage |
|---|---|---|---|---|
| (Feet) | (Cubic Feet) | (Cubic Feet) | (Cubic Feet) | (Acre Feet) |
| 0.0 | 0.00 | 0.00 | 0.00 | 0.000 |
| 0.5 | 0.00 | 1.00 | 1120.00 | 0.026 |
| 1.0 | 0.61 | 2.37 | 2652.74 | 0.061 |
| 1.5 | 1.57 | 3.94 | 4415.58 | 0.101 |
| 2.0 | 2.53 | 5.52 | 6178.41 | 0.142 |
| 2.5 | 3.14 | 6.88 | 7711.16 | 0.177 |
| 3.0 | 3.14 | 7.88 | 8831.16 | 0.203 |
| 3.5 | 3.14 | 8.88 | 9951.16 | 0.228 |

1. BMP bottom elevation 0.0 corresponds to elevation 601.00 AMSL on the plan.
2. Storage per foot of length of a 24" pipe set at invert elevation 0.5.
3. Storage per foot of length of a 24" pipe set at invert elevation 0.5 plus surrounding gravel set in a 5 foot wide trench with 40% pore space [pipe storage + 40% * ((5ft * depth) – pipe storage)]
4. Total System Cumulative Storage = Cumulative Pipe and Gravel Storage * 1120 feet of pipe length.

**Table 4.4: BMP Routing Summary**

| Storm Event (years) | Peak BMP Inflow (cfs) | Routed Peak BMP Outflow (cfs) | Maximum Storage Volume (ac-ft) | Water Surface Elevation (feet) |
|---|---|---|---|---|
| 1 | 1.87 | 0.00 | 0.112 | 602.64 |
| 2 | 2.26 | 0.00 | 0.137 | 602.94 |
| 10 | 3.31 | 0.12 | 0.151 | 603.13 |
| 25 | 4.00 | 0.33 | 0.166 | 603.35 |
| 50 | 4.60 | 0.57 | 0.184 | 603.64 |
| 100 | 5.26 | 0.85 | 0.206 | 604.06 |

## 4.4 INFILTRATION AREA

The BMP is designed to provide infiltration for volume control. PondPack allows for infiltration information to be included in the BMP design and it can be used to calculate the volumes removed by the BMPs through infiltration. Infiltration testing was performed according to the Pennsylvania Stormwater Best Management

Practices Manual to determine the infiltration rates to use in the calculations. Infiltration test results are located in Appendix B. Infiltration rates were determined as follows:

The BMP is located at infiltration test (IT) points IT-A and IT-B. The previous infiltration test results at IT-1 and IT-2 were invalid due to incorrect location and depth. The infiltration rate at IT-A was measured to be 3.34 inches per hour (in/hr). The infiltration rate at IT-B was measured to be 1.66 in/hr. The geometric mean of IT-A and IT-B is 2.4 in/hr. With a safety factor of 3 applied, the infiltration rate used is 0.8 in/hr (0.0667 ft/hr). The method for entering the infiltration rate into PondPack is as a volumetric rate. Therefore the volumetric rate was determined as follows:

Surface area of BMP = 5,600 $ft^2$

The dewatering time (t) in hours is:

t = d / k

d = depth of water below dewatering orifice (ft) = 2

k = infiltration rate (ft/hr) = 0.0667

t = 2 ft / 0.0667 ft/hr = 30 hours

Groundwater was not encountered in the test pits that were dug during infiltration testing. If groundwater is encountered during construction of the BMP, the certifying engineer should be consulted to determine what measures, if any, need to be taken to ensure that groundwater will not interfere with proper functioning of the BMP.

### 4.5 STORMWATER MANAGEMENT

Stormwater quality management for the project will comply with Township ordinances and state regulations through the implementation of erosion and sediment controls during construction and implementation and maintenance of post construction stormwater management (PCSM) controls after construction. Stormwater quality is achieved with the proposed BMP design, which is in accordance with the Pennsylvania Stormwater Best Management Practices Manual.

Table 4.5 shows how the design criterion for peak discharge rate and volume reduction is achieved for this project. The post development flow is less than the pre-development peak flow for each design storm event. For the 1- and 2-year storm events, the post development hydrograph volume is less than the pre-development hydrograph volume.

**Table 4.5: POI-1 Peak Discharge Rate Reduction Summary**

| Storm Event (years) | Total Pre-Development Peak Flow (cfs) | Total Post-Development Peak Flow (cfs) | Total Peak Flow Rate Difference (cfs) | Total Pre-Development Hydrograph Volume (ac-ft) | Total Post-Development Hydrograph Volume (ac-ft) | Total Hydrograph Volume Difference (ac-ft) |
|---|---|---|---|---|---|---|
| 1 | 0.05 | 0.00 | -0.05 | 0.007 | 0.000 | -0.007 |
| 2 | 0.18 | 0.00 | -0.18 | **0.015** | **0.000** | **-0.015** |
| 10 | 0.70 | 0.12 | -0.58 | 0.043 | 0.059 | 0.016 |
| 25 | 1.16 | 0.33 | -0.83 | 0.067 | 0.103 | 0.036 |
| 50 | 1.60 | 0.57 | -1.03 | 0.009 | 0.141 | 0.132 |
| 100 | 2.13 | 0.85 | -1.28 | 0.119 | 0.183 | 0.064 |

1. The total post development peak flow is the routed flow of all post-development watersheds to POI-1

## 5.0 REFERENCES

Erosion and Sediment Pollution Control Program Manual, Commonwealth of Pennsylvania, Department of Environmental Protection, Office of Water Management, March 2012.

Pennsylvania Stormwater Best Management Practices Manual Draft, Document Number 363-0300-002, Pennsylvania Department of Environmental Protection, Bureau of Watershed Management, December 2006.

Soil Survey of Huntingdon County, Pennsylvania, United States Department of Agriculture, Soil Conservation Service.