MOTT MACDONALD

PennEast PIPELINE

Erosion and Sediment Control Plan for Blue Mountain Interconnect

PennEast Pipeline Project

October 2019

353754-MM-EN-CO-077 RevB

Mott MacDonald
111 Wood Avenue South
Iselin NJ 08830-4112
United States of America

T +1 (800) 832 3272
F +1 (973) 376 1072
mottmac.com

One Meridian Blvd
Suite 2C01
Wyomissing, PA 19601

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Executive Summary

The Blue Mountain Interconnect site is located in Lower Towamensing Township, in Carbon County, PA (See Appendix E for location map and E&SCP drawing). The site is being developed to create a delivery point interconnection with existing UGI Central Penn Gas, Inc. pipeline from the proposed PennEast Project, a 36-inch diameter, 115-mile mainline pipeline, extending from Luzerne County, Pennsylvania, to Mercer County, New Jersey. Development of the interconnect site will include in general, the installation of a proposed 4-inch diameter pipeline, natural gas metering equipment, gravel pad, access road, fencing and post-construction stormwater management facilities.

Construction activities at the Blue Mountain Interconnect site will include erosion and sediment control measures to meet the regulatory requirements for this type of development. BMP installation and removal will proceed in accordance with the sequence approved by the Carbon County Conservation District.

1 Introduction and Overview

This Erosion and Sediment Control Plan (E&SCP) has been developed to address control of accelerated erosion and sedimentation resulting from earth disturbances associated with the construction of the proposed Blue Mountain Interconnect site. It was developed in accordance with the requirements of 25 PA Administrative Code Chapters 78 and 102, as well as the Clean Streams Law (35 P. S. §§ 691.1001), as amended, utilizing guidelines and Best Management Practice (BMP) information provided in the Erosion and Sediment Control BMP Manual. This plan complements the PennEast Post Construction Stormwater Management Plan (PCSM Plan) prepared for this project, and was planned and designed to be consistent with that Plan under PA Code §102.8. An up to date copy of this plan, and any subsequently granted variances to the E&SCP, shall be available at the project site during all stages of earth disturbance activities. This plan was prepared under the supervision of a Professional Engineer licensed in the Commonwealth of Pennsylvania, who is trained and experienced in erosion and sediment control methods and techniques applicable to the size and scope of the proposed project (see Appendix D for Standard E&S Worksheet #22 - Plan Preparer Record of Training and Experience in Erosion and Sediment Pollution Control Methods and Techniques).

2 Existing Site Conditions

The Existing Conditions Plan (Drawing 028-03-03-001), included in Appendix E, depicts all relevant existing site features, including the topography of the project site and the surrounding area, mapped soil boundaries, municipal and county boundaries, known property, easement, and right-of-way boundaries, roadways, streams, watercourses, existing structures, aerial imagery of existing ground cover, utilities, and other important features.

2.1 Soil Characteristics

The location of mapped soil types and the attributes of the soils map units crossed by the facility site are provided in Appendix A. These soil boundaries and associated information were obtained from the United States Department of Agriculture (USDA) SSURGO database. Additionally, the Natural Resource Conservation Service (USDA-NRCS) "Web Soil Survey" website (http://websoilsurvey.nrcs.usda.gov/app/HomePage.htm) was used to generate an "NRCS Custom Soils Resources Report" for this project. The methods that will be utilized to minimize impacts on soils during construction include, but are not limited to:

- Minimizing the area and duration of soil exposure
- Protecting critical areas by reducing the velocity of and control of runoff
- Installing and maintaining the erosion and sediment control measures
- Segregating and stockpiling topsoil
- Reestablishing vegetation following final grading
- Inspecting the area of disturbance and maintaining the erosion and sediment controls as necessary until final stabilization is achieved

The soil report in Appendix A contains the types, depth, slope, and limitations of the soils within the facility construction limits. Additional information in the soil report includes data on the physical characteristics of the soils, such as texture, erosion resistance, and suitability for the intended use.

2.2 Existing Land Use and Land Cover

Land use data is based on information obtained through field surveys, review of aerial photography, and USDA National Agricultural Statistics Service (NASS) Cropland Data Layer (USDA-NASS, 2014). Aerial images from 1951 depict the Blue Mountain Interconnect site and its surroundings as forested land. The proposed site location existed over the past five years as predominantly forested land accessible by Blue Mountain Drive to the west of the property.

2.3 Receiving Waters

The site drains to Aquashicola Creek, which in turn drains to the Lehigh River. The site is part of the Aquashicola Creek watershed. Chapter 93.9d from the PADEP Code indicates that Aquashicola Creek from source to Buckwha Creek is classified as "HQ-CWF", "MF". HQ-CWF indicates the stream is high quality waters with cold water fish maintenance or propagation, or both, of fish species including the family Salmonidae and additional flora and fauna which are indigenous to a cold-water habitat. MF (migratory fishes) indicates the passage, maintenance and propagation of anadromous and catadromous fishes and other fishes which move to or from flowing waters to complete their life cycle in other waters.

During construction, stormwater runoff from the disturbed area will flow through a row of compost *sock sediment traps* along the northerly side of the site for filtration before exiting the site. After construction, stormwater runoff from the proposed site will be attenuated by routing it through an infiltration basin and then discharging into a level spreader at the westerly side of the site.

2.4 Existing Riparian Forest Buffers

Riparian buffers are areas of permanent vegetation situated along any surface water(s). When this vegetation is predominantly native trees, shrubs, and forbs that are maintained in a natural state or

sustainably managed to protect and enhance water quality, it is considered a riparian forest buffer. There is a 150-foot riparian buffer surrounding two unnamed tributaries to Aquashicola Creek that are located southeast of the Blue Mountain Interconnect site. The proposed impacts within the riparian buffers are further discussed and quantified in the riparian buffer waiver request in ESCGP-3 Section 1-7. The riparian buffers are shown on the Erosion and Sediment Control Plan Drawings.

2.5 Naturally Occurring Geologic Formations

Surficial Geology:

Based on the Natural Resources Conservation Service (NRCS) Web Soil Survey, the surficial geology within the area of interest consists heavily of the Buchanan very stony loam with minor components of the Meckesville channery loam and Meckesville very stone loam. The Buchanan very stony loam is mapped as roughly 25 percent clay, 39 percent sand, and 36 percent silt. The Buchanan loam has a high rating for both the corrosion of concrete and steel.

Three borings and four test pits were performed within the area of the proposed interconnect. The soil consisted primarily of clay, silt, and sand with decomposed rock observed beginning at approximately 4 feet below existing grade.

Bedrock Geology:

Based on geological mapping through the Pennsylvania Department of Conservation and Natural Resources (PA DCNR), the proposed interconnect site lies within the Bloomsburg Formation. This formation predominantly consists of gray to red siltstone, shale, and sandstone.

United Stated Geological Survey (USGS) mapping indicates that fault lines are within the vicinity of the proposed interconnect. Although the location of the proposed interconnect falls within the approximate boundaries of the Bloomsburg Formation, it is possible that other formations or rock types could occur within the vicinity of the interconnect, due to the nature of USGS maps

Acid Producing Soils:

Based on NRCS Web Soil Survey, the existing soils have a soil reaction of acidity or alkalinity (pH levels) of approximately 4.4. Upon review of PADCNR's "Geologic Units Containing Potentially Significant Acid-Producing Sulfide Minerals" map, this interconnect site lies in a known region containing acid-producing soils. Further testing will be required to determine potential limitations and countermeasures.

Landslide Susceptibility:

"Landslide" is a general term for downslope mass movement of soil, rock, or a combination of materials on an unstable slope. Landslides can vary greatly in their rate of movement, area affected, and volume of material. The principal types of movement are falling, sliding, and flowing, but combinations of these are common. The primary cause of landslides is when colluvial (loose) soil and old landslide debris on steep slopes give way.

The geologic instabilities that cause landslides are often exacerbated by highway projects during which the earth is cut and soil is loosened. Other primary causes of landslides are rainfall or rain-on-snow events that can weaken debris on steep mountain slopes (McCormick Taylor, 2009).

It is difficult to determine the susceptibility of landslides for the interconnect site, without a proper site visit to determine the slope conditions. Readily available information does not specify the susceptibility. Decomposed rock was encountered at shallow depths within the area of the interconnect and the slope is vegetated which aids in stability. However, it has been mapped and reported that landslides occur throughout the site vicinity and a justified answer cannot be made without a slope inspection and stability analysis, if necessary.

Earthquake Probability:

Based on PA DCNR mapping, the closest earthquake epicenter is over 16 miles away and had occurred in 1961. Earthquakes have not been mapped by PA DCNR within the past 10 years within the vicinity of the interconnect.

Karst Formations and Abandon Mines:

PA DCNR mapping indicates that there is no known presence of karst formations or abandoned mines within the vicinity of the proposed interconnect.

Faults:

PA DCNR mapping indicates there are approximately three faults within the site vicinity. They range from 0.5 to 1.2 miles from the interconnect site.

3 Proposed Conditions

Earth disturbance shall be minimized to the extent practicable. Planning of the construction sequencing is required to limit the amount and duration of open trench sections, as necessary, to prevent excessive erosion or sediment flow into environmental resource areas. Approximately 1.49 acres will be disturbed at the facility site (0.99 acres for the permanent facility and 0.50 acres of temporary workspace).

Earth disturbance shall be restricted to the Limit of Disturbance (LOD) delineated on the E&SCP drawing 028-03-03-002 in Appendix E. This drawing contains the “Plan View”, which depicts the proposed facility and site features. This includes the limits of earth disturbance, the locations of the existing road, and the location of proposed BMPs.

3.1 Proposed Land Use and Land Cover

The proposed land cover will change throughout the duration of the proposed project. During the initial construction phase, much of the area will be bare earth. Upon completion of the construction, the site will be stabilized with vegetative cover, an impervious gravel pad and access road, as indicated on the Plan drawings.

3.2 Proposed Site Drainage Characteristics

A primary component of this E&SCP was the design of erosion and sediment control BMPs to minimize and control accelerated erosion and the generation of increased runoff. All proposed E&SC facilities have been designed per technical guidance provided in the Erosion and Sediment Pollution Control Program Manual (PADEP, 2012).

Proposed facilities were sized based on the maximum tributary drainage area anticipated during construction. Runoff volumes and rates for specific BMPs were calculated utilizing the methods recommended in the Manual for that type of facility. BMP sizing calculations are provided in Appendix C.

In order to produce a conservative estimate of runoff from the site, gravel is considered to be impervious, except the area restricted from vehicular traffic. These areas were designed to provide for additional infiltration volume that accounts for 40% voids space in surface gravel layer. Infiltration basin and swales were designed to meet the regulatory stormwater requirements. runoff from the site will be conveyed through vegetated swales and pipe where it will be attenuated by a subsurface infiltration basin within the site. It will be discharged overland with a level spreader towards an existing snow making pond located approximately 500 feet northwest. The location of the proposed drainage features is shown on E&SCP drawing 028-03-03-002 in Appendix E of this report.

Compost filter sock sediment traps will be installed prior to earth disturbing activities along the north side of the site, at the base of the slope, to provide filtration of any sediment laden runoff flowing from exposed soil surfaces. Two traps will also be installed on the east side of the work limits as perimeter control, as shown on E&SCP drawing 028-03-03-002 located in Appendix E.

4 Description of Erosion & Sediment Control BMP's

The erosion and sediment control BMPs for this earth disturbance activity have been planned to minimize the extent and duration of the proposed earth disturbance, to protect existing drainage features and vegetation, minimize soil compaction, and employ measures and controls that minimize the generation of increased runoff. Specific BMPs have been selected for this site to achieve these broad goals. The location of each proposed BMP is shown on E&SCP drawing 028-03-03-002.

- **Rock Construction Entrance:**

  A rock construction entrance will be installed at the facility access driveway to control sediment tracking from the construction site onto the Access Road AR-050. The proposed rock construction entrance location is shown on the E&SCP drawing 028-03-03-002. The rock construction entrance detail is presented on Drawing 028-03-04-001 (Figure 2).

- **Erosion Control Blankets:**

  Erosion control blankets shall be placed on all disturbed slopes 3H:1V and steeper and within 100 feet of waterbodies. Blankets shall be installed in accordance with the notes listed on Drawing 028-03-04-002 (Figures 23 & 24). Areas to be blanketed are indicated on the E&SCP drawing.

- **Weighted Sediment Filter Tubes:**

  Weighted sediment filter tubes are proposed to protect against sediment pollution within the proposed channels as depicted on the E&SCP drawing 028-03-03-002. The weighted sediment filter tube detail is presented on Drawing 028-03-04-001 (Figure 12A).

- **Inlet Filter Bags:**

  Inlet filter bags shall be install on all proposed inlet grates. The filter bags shall be installed according to the manufacturer's specifications, and can trap particles not passing through a No. 40 sieve. The inlet filter bag detail is presented on Drawing 028-03-04-001 (Figure 14).

- **Channels:**

  Vegetated Swale-1 and Swale-2 are designed to collect the runoff from site and offsite areas that drain towards the proposed pad.

  The locations of the channels are shown on the E&SCP drawing 028-03-03-002. Runoff and sizing calculations for Swales 1 and 2 are included in Appendix C. The vegetated channel details are presented on Drawings 028-03-04-002 as Figure 49.

- **Pumped Water Filter Bag**

  Filter bags may be used to filter water pumped from the disturbed areas at the facility site prior to discharging to surface waters. The pumped water filter bag detail is presented on Drawing 028-03-04-002 (Figure 36).

- **Compost Sock Sediment Trap**

  Compost sock sediment traps can be installed, used, and later removed with relatively little disturbance to the area. Compost sock sediment traps are proposed along the northerly and easterly edges of the LOD as a perimeter control to provide treatment for site runoff. The compost sock sediment trap detail is presented on Drawing 028-03-04-002 (Figure 18A).

4.1 Minimize Earth Disturbance

Limiting the extent and duration of earth disturbance to that which is necessary to construct the proposed facility is the most simple and effective BMP available. The LOD delineated on E&SCP Drawing 028-03-03-002 has been established to restrict construction activities to the minimum area needed to effectively and efficiently construct the proposed facilities. In addition to limiting the extents of the proposed earth disturbance, construction activities have been planned to limit the duration of earth disturbance.

Construction activities shall be sequenced to prevent, to the extent possible, excessive erosion or sediment flow into environmental resource areas.

4.2 General Erosion and Sediment Control Plan Requirements

The BMPs listed in this E&SCP shall be installed and maintained in accordance with FERC requirements, and the PADEP Erosion and Sediment Pollution Control Program Manual, March 2012. These BMPs shall be installed as shown prior to earth disturbance (including clearing and grubbing) within the drainage area of the BMP in question. Appropriate BMPs shall be provided for each stage of activity. Each BMP shall be kept functional until all earth disturbances within the drainage area are completed and a minimum vegetative cover (uniform 70% coverage of perennial vegetation over the entire disturbed area) has been achieved or other suitable permanent erosion protection has been installed.

At least 7 days prior to starting any earth disturbance activities (including clearing and grubbing), the owner and/or operator shall invite all contractors, the landowner, appropriate municipal officials, the E&S Plan preparer, the PCSM Plan preparer, the licensed professional responsible for oversight of critical stages of implementation of the post construction stormwater management plan and a representative from the local conservation district to an on-site preconstruction meeting.

Prior to commencement of any earth disturbance activity, including clearing and grubbing, the owner and/or operator shall clearly delineate sensitive areas, riparian forest buffer boundaries, areas proposed for infiltration practices, the limits of clearing, and trees that are to be conserved within the project site. These parties shall also install appropriate barriers where equipment may not be parked, staged, operated, or located for any purpose.

E&SC measures and facilities shall be installed and operational as indicated in the construction schedule prior to any earth moving activities. See the “BMP Installation Sequence” in Section 5.0 of this E&SCP and on General Notes drawing 028-03-02-001. Control measures must be in place and operational at the beginning and end of each workday. Wherever possible, the disturbed area shall be permanently stabilized immediately after the final earthmoving has been completed. For disturbed areas that cannot be permanently stabilized, interim stabilization in the form of temporary seeding and mulching shall be implemented. Until the site is permanently stabilized, all E&SC measures shall be properly maintained by the Contractor.

Only after permanent stabilization is achieved, will the temporary E&SC measures be removed. Areas disturbed during removal of the controls must be stabilized immediately. For vegetated areas, permanent stabilization is defined as a uniform 70% perennial vegetative cover.

Minor modification to the approved E&SCP shall be noted on the E&SCP that is available at the site and initialed by the appropriate reviewing entity staff from PADEP and/or the County Conservation District.

Minor changes to the E&SCP may include adjustments to BMPs and locations within the permitted boundary to improve environmental performance, prevent potential pollution, changes in ownership or address, typographical errors, and on-site field adjustments such as the addition or deletion of BMPs, or alteration of earth disturbance activities to address unforeseen circumstances.

Major modifications to the approved E&SCP involving new or additional earth disturbance activity other than those described as minor modifications above, and/or the addition of a discharge will require prior approval by the reviewing entity and may require the submittal of a new E&SCP.

5 BMP Installation Sequence

The following is a general description of the planned sequence of BMP installation and removal. The entire construction sequence listing all steps to be taken from initial site clearing through final stabilization is included on General Notes sheet 028-03-02-001 of the Plan drawings. Refer to the Plan drawings for additional site-specific installation information. All earth disturbance activities shall proceed in accordance with the following sequence:

1. At least seven (7) days before starting any earth disturbance activities, the owner and/or operator shall notify the PADEP and Carbon County Conservation District by either telephone or certified mail of the intent to commence earth disturbance activities. Attendance at a pre-construction conference is required upon request of the PADEP.
2. At least three (3) days before starting any earth disturbance activities, all contractors involved in those activities shall notify the Pennsylvania One Call system at 1-800-242-1776 to determine the location of existing subsurface utilities.
3. Install the rock construction entrance as shown on the ESC Plan.
4. Install compost filter sock sediment traps ST-1 and ST-2 on the northerly end of the interconnect site, downslope of proposed disturbed area as shown on the ESC Plan. Compost filter sock sediment traps ST-3 and ST-4 will be installed on the easterly limits of disturbance. Engineer will inspect installation of the compost sock sediment traps prior to the start of clearing and grubbing operations.
5. Perform clearing and grubbing to those areas described in each stage of work. Remove excess topsoil from the Limits of Disturbance and stockpile off-site. The Contractor shall be responsible for ensuring that any off-site stockpile/waste areas have an E&S plan approved by the local conservation district or PADEP prior to being activated. After stripping topsoil, orange safety fencing will be installed at the perimeter of stormwater infiltration areas to prevent compaction of subgrade soils by heavy construction equipment.
6. Perform grading activities as described by proposed contours, notes, and details shown on the plan drawings. Install weighted filter tube in Swales 1 and 2 and maintain per BMP Maintenance Schedule in Section 7 of this report until the site has been stabilized. Per project specifications, additional temporary placement of compost filter sock may be necessary at the contractor's discretion, should accelerated erosion be encountered during grading activities.
7. Installation of subsurface stormwater detention system shall be coordinated with bulk filling operations. Engineer shall inspect the subgrade soils prior to installation of the geotextile fabric and stone base. Install crushed stone base and perforated HDPE piping in accordance with the project specifications. Fill the areas between the pipe runs and the edges with crushed stone. Coordinate with the Engineer for final inspection of the installed subsurface detention system before backfilling. Contractor shall inspect the compost filter sock sediment traps daily during filling operations and installation of the stormwater detention system and remove sediment when it reaches 1/3 of the height of the socks
8. The proposed 4-inch Blue Mountain Lateral pipeline will be installed to the interconnect pad area. Additional temporary placement of compost filter sock may be necessary at the Engineer’s or contractor’s discretion should accelerated erosion be encountered during trenching, pipeline placement and backing.
9. Grades will be left 1 foot below top of stormwater inlet grate elevations at IN-1, IN-2 and IN-3 to prevent silt-laden stormwater runoff from entering the subsurface piping. Inlet filter bags shall be installed on inlet grates and checked per BMP Maintenance Schedule. Install PCSM BMPs in accordance with proposed contours, notes, and details shown on the E&SCP & PCSM Plan Drawings. Once the site has been stabilized and inspected by the Engineer, grading shall be brought to final elevations.

10. Gravel shall be installed on the pad area and access road. Gravel shall be fine graded and compacted.

11. Place topsoil in areas to be vegetated. Fine grade topsoil, apply fertilizer and seed. At the completion of seeding, install erosion control blankets over seeded areas in accordance with this plan.

12. Temporary BMPs installed by contractor during grading shall remain in place until final stabilization has occurred with a minimum uniform 70% perennial vegetative cover or other permanent non-vegetative cover, with a density sufficient to resist accelerated surface erosion and subsurface characteristics sufficient to resist sliding and other movements.

13. Upon achieving site stabilization, excavate accumulated sediment in traps. Repair, regrade, reseed, and mulch any bare soil areas as needed to stabilize the surface.

14. Clean work area of any debris created during construction activities.

6 Description of Project Site Runoff

An assessment of the site's natural features was completed during the initial stage of project planning. The proposed facility has been sited to protect sensitive natural resources by avoiding these areas whenever possible. The site has also been planned and designed to maintain pre-development drainage patterns to the maximum extent practicable. A conscious effort has been made to maintain existing vegetation where possible, and limit the extents of earth disturbance to the absolute minimum area necessary to construct the proposed facility.

Under existing conditions, offsite stormwater runoff flows overland across the site away from the existing stream. During construction, silt-laden runoff will be filtered through compost filter sock sediment traps before exiting the site. Under proposed conditions, runoff from the site will be conveyed through vegetated swales and pipe where it will be attenuated by a subsurface infiltration basin within the site. It will be discharged overland with a level spreader towards an existing snow making pond located approximately 500 feet northwest.

7 Erosion & Sediment Control BMP Maintenance Plan

A maintenance program that provides for routine inspection, as well as repair and replacement as necessary, is essential to effective and efficient operation of the proposed erosion and sediment control BMPs. Implementation of the following maintenance plan is a key component in achieving the intent of this Plan and minimizing accelerated erosion and sedimentation from the proposed earth disturbance. The permittee and any co-permittees shall be responsible for implementing the following maintenance program:

7.1 Inspections

To effectively mitigate project-related impacts, the E&SCP must be properly implemented in the field. Quick and appropriate decisions in the field regarding critical issues such as stream and wetland crossings, placement of erosion controls, trench dewatering, spoil containment, and other construction related items are essential. The Contractor shall inspect all erosion and sediment BMPs after each runoff event and on a weekly basis, at a minimum. This inspection shall include a general review of the performance of all erosion and sediment control facilities, as well as an examination of each individual BMP, noting when maintenance (e.g., cleanout, repair, replacement, regrading, re-stabilizing, etc.) is required, when specific deficiencies exist, and/or signs of potential future problems are present. The progress of vegetation cover shall also be included in this inspection. All inspections shall be documented in a written report summarizing each inspection and shall include a schedule for repair of all noted deficiencies. All preventive and remedial maintenance work, including clean out, repair, regrading, reseeding and the replacement of mulch and netting must be scheduled for immediate corrective action. If any installed BMPs are identified as failing to perform as expected, corrective modifications or replacement BMPs shall be scheduled for installation.

An erosion and sediment BMP inspection log shall be maintained on site and be made available to regulatory agency officials and project personnel at the time of inspection. The log shall contain inspection dates, observed deficiencies, and remediation dates.

7.2 General Maintenance

The Contractor shall be responsible for the continuous maintenance of all measures and devices for the duration of the project, until such time the area is stabilized with a minimum uniform perennial 70% vegetative cover or other permanent non-vegetative cover with a density sufficient to resist accelerated erosion and received a written approval of Notice of Termination.

Areas devoid of vegetation shall promptly be reseeded and mulched to establish protection. Any device found to be clogged, damaged, half-full of silt, or not fully operational will be cleaned of all debris. BMPs will be repaired or replaced (as necessary) to ensure effective and efficient operation. The solid waste disposal is the responsibility of the Contractor. All necessary repairs will be made immediately after any deficiencies are observed.

7.3 Specific Maintenance

The Contractor shall be responsible for the specific maintenance activities throughout the duration of the project as follows:

7.3.1 Rock Construction Entrance

Rock Construction Entrance thickness shall be properly maintained to the specified dimensions by adding the required amount of aggregate. A stockpile of aggregate shall be maintained on site for this purpose. Aggregate shall also be added to the rock construction entrance to maintain the capacity to remove sediment from tires. In the event the entrance becomes too clogged with sediment and debris to remain effective, the rock construction entrance shall be removed and replaced.

At the end of each construction day, all sediment deposited on paved roadways shall be removed and returned immediately to the construction site upslope of appropriate BMPs. Washing the roadway or sweeping the deposits into roadway ditches, sewer, culverts, or other drainage courses is not acceptable.

If excessive amounts of sediment are being deposited on roadways, the length of the rock construction entrance shall be extended by 50-foot increments until the condition is alleviated. Alternatively, a wash rack may be installed.

7.3.2 Erosion Control Blankets

Inspect erosion control matting for good continuous contact with underlying soil throughout the entire length. Erosion control matting shall be checked for loose stapled areas and repaired as necessary.

Inspect for erosion and undermining beneath all erosion control matting. Immediately re-grade and repair any undermined or washed out areas.

Check vegetation growth during inspections. Reseed areas as necessary to ensure uniform vegetative cover.

Inspect erosion control matting for displaced, torn, or otherwise damaged matting and restore or replace within four (4) calendar days.

7.3.3 Weighted Sediment Filter Tubes

Inspect weighted sediment filter tubes weekly and after each runoff event. If repairs are needed, initiate them immediately after the inspection.

Replace any damaged sediment filter tubes. Remove sediment when accumulations reach ½ the height of the tube.

Immediately upon stabilization of each channel, the installer shall remove accumulated sediment, remove the sediment filter tube, and stabilize disturbed areas.

7.3.4 Filter Bag Inlet Protection

Inspect filter bags on a weekly basis and after each runoff event. Clean and/or replace filter bag when the bag is half full, or when flow capacity has been reduced to the point that is causes flooding or bypassing of the inlet.

Dispose of accumulated sediment in the approved manner. Rinse bags that will be reused at a location where the rinse water will enter a sediment trap or sediment basin.

Replace damaged filter bags. Needed repairs shall be initiated immediately after the inspection.

7.3.5 Channels

Channels shall be inspected to ensure that the specified design dimensions and protective linings are maintained for continuous service.

Inspect channels for channelized flow lines within the channel, unstable side slopes, wash outs, bulges, or slumps in the ditch line. Repair as necessary to correct the issue.

Damaged lining shall be repaired or replaced within 48 hours of discovery.

Channels shall be cleaned whenever total channel depth is reduced by 25% at any location and shall be maintained free of any sediment/debris blocking the normal flow of water. Sediment deposits shall be removed within 24 hours of discovery or as soon as soil conditions permit access to the channel without causing further damage. Removed sediment shall be disposed of in the manner described in this Plan.

7.3.6 Compost Sock Sediment Trap

Compost sock sediment traps shall be inspected weekly and after each runoff event. Sediment shall be removed when it reaches 1/3 of the height of the socks.

Photodegradable and biodegradable socks shall not be used for more than 1 year.

7.3.7 Pumped Water Filter Bags

A suitable means of accessing the pumped water filter bag with machinery required for disposal purposes must be provided. Filter bags shall be replaced when they become ½ full. Spare bags shall be kept available for replacement of those that have failed or become filled. It is recommended that bags be placed on straps to facilitate removal.

Filter bags shall be inspected daily for tears or breaches in the fabric and other problems. If any problem is detected, pumping shall cease immediately and not resume until the problem is corrected.

7.4 E&S Control BMP Removal

Upon completion of earth disturbance described in this plan, the rock construction entrance shall be removed and the areas stabilized in a manner similar to the remainder of the access road. All other Erosion and Sediment Control BMPs shall remain functional until implementation of the PCSM Plan. At no time shall any BMPs be removed prior to all areas tributary to them achieving permanent stabilization, except when replaced by another state-approved BMP.

After final stabilization has been achieved, temporary erosion and sediment BMPs may be removed if they are not necessary for implementation of the PCSM Plan. Areas disturbed during removal or conversion of the BMPs to PCSM BMPs must be stabilized immediately. To ensure rapid revegetation of disturbed areas, such removal\conversions are to be done only during the germinating season.

8 Recycling and Disposal of Materials

Building materials and other construction site waste must be properly managed and disposed of to reduce the potential for pollution to surface and ground waters, as per 25 PA Code § 102.4(b)(5)(xi). Building materials and waste shall be removed from the site and recycled or disposed of in accordance with PADEP Solid Waste Management Regulations per 25 PA Code 260.1 et seq., 271.1 and 287.1 et. seq. No building materials or waste shall be burned, buried, dumped, or discharged at the site. No off-site disposal area has been identified as part of this E&SCP. Construction waste shall be disposed of properly by the Contractor only at a state-approved disposal or recycling facility.

The Contractor will develop and implement procedures which will detail the proper measures for disposal and recycling of materials associated with or from the project site in accordance with PADEP regulations. Construction waste include, but are not limited to, excess soil materials, building materials, concrete wash water, and sanitary waste that could adversely impact water quality. The Contractor shall inspect the project area weekly and properly dispose of accumulated construction waste. Measures shall be planned and implemented for housekeeping, materials management, and litter control. Wherever possible, re-useable waste shall be segregated from other waste and stored separately for recycling.

The Contractor shall be responsible for submitting an E&SCP for borrow or waste areas required for completing the work. Disposal locations for excess soil/rock waste shall have appropriate BMPs implemented at the waste site. The disposal locations must be verified with the applicable state agency to show compliance with wetland and floodplain regulations. If an off-site location is used for borrow or disposal, the contractor shall be responsible for developing and implementing an adequate E&SCP for each location, and submitting it to the applicable state agency for review and approval. The Contractor shall stabilize the waste site upon completion of any stage or phase of earth disturbance activity at the waste site.

9 Thermal Impact Analysis

The proposed project was analyzed for potential thermal impacts associated with the planned activities and how potential impacts could be avoided, minimized, or mitigated. Thermal impacts resulting from activities similar to the proposed project are primarily due to the negative impacts of increased impervious area. The following opportunities for negative thermal impacts exist for projects similar to the proposed one:

- Heat transfer from impervious cover to surface runoff
- Solar heat gain in ponded surface water.
- Increased surface temperatures caused by removal of vegetation
- Reduced thermal buffering of stormwater due to reduction in site's infiltration capacity
- Increased stream temperatures due to reduced base flow caused by reduction in site's infiltration capacity

Siting of oil and gas facilities is constrained by the location of the geologic formation planned for extraction and transmission, surface restrictions such as regulatory setbacks from building and waterways, and existing property boundaries. From this perspective, the potential to limit thermal impacts by altering the location of the project is limited. Table 1 below shows the site selection criteria used for the proposed project and how they help to prevent or minimize thermal impacts to receiving waters:

Table 1: Thermal Impact Benefits of Oil and Gas Facility Selection Criteria

Siting Restrictions	Thermal Impact Benefits
Locate proposed construction activities at least 100' from all blue-line surface water features	Maintain riparian buffers and canopy cover over surface waters to the maximum extent practicable
Avoid impacts to all surface waters and wetlands to the maximum extent possible	Maintain existing hydrology and encourage natural thermal buffering
Locate proposed facilities as close as possible to existing roads	Minimize proposed impervious cover
Choose sites with minimal existing tree cover	Reduce removal of existing tree canopy

In addition to the above site selection criteria, several BMPs will be used to help mitigate negative thermal impacts from the proposed project. Minimizing the LOD to the absolute minimum area necessary to construct the necessary facilities will maintain existing vegetative cover and the infiltration capacity of undisturbed areas to the maximum extent practicable. Also, disturbed areas will be immediately re-vegetated to help cool runoff prior to discharge.

Infiltration of runoff collected in the subsurface infiltration basin is anticipated to mitigate thermal impacts from post construction stormwater. Further, it is not expected that runoff collected in the infiltration basin and discharged overland to the receiving water will be retained for more than 24 hours, thus thermal impacts of discharge from the infiltration basin are not expected. Existing shade trees are being preserved to the greatest extent possible, and no riprap and concrete channels have been proposed, to minimize the heat transfer to the runoff.

10 Anti-degradation Analysis

The site drains to Aquashicola Creek, which in turn drains to Lehigh River. The site is part of the Aquashicola Creek watershed. Chapter 93.9d of the PADEP Code indicates that Aquashicola Creek from source to Buckwha Creek is classified as “HQ-CWF”, “MF”. HQ-CWF indicates the stream is high quality waters with cold water fishes maintenance or propagation, or both, of fish species including the family Salmonidae and additional flora and fauna which are indigenous to a cold water habitat. “MF” indicates the passage, maintenance and propagation of anadromous and catadromous and other fish which move to or from flowing waters to complete their life cycle in other waters.

10.1 Non-discharge Alternatives

The project will eliminate the net change in stormwater volume, rate and quality for stormwater events up to and including the 2-year/24-hour storm. The project will use various structural and non-structural BMPs to meet the water quantity and quality requirements. The peak runoffs will be attenuated with subsurface infiltration basin. The stormwater will be routed through a series of structural and non-structural BMPs and discharged overland towards snow making pond located approximately 500 feet northwest. Therefore, the project falls into definition of nondischarge alternative as environmentally sound and cost-effective BMPs that individually or collectively eliminate the net change in stormwater volume, rate and quality for storm events up to and including the 2-year/24-hour storm when compared to the stormwater rate, volume and quality prior to the earth disturbance activities to maintain and protect the existing quality of the receiving surface waters of this Commonwealth.

10.2 Alternative Siting

Siting of pipelines and facilities is constrained by the location of leased property boundaries, regulatory setbacks, and many other factors. PennEast’s facility site selection process incorporates all of these constraints into a desktop analysis for selection of potential sites. This analysis is followed by a detailed field review of potential sites by a site staking committee. During the field review, an engineer, land agent, and biologist coordinate to conduct a facility site review and identify a pad location and proposed facility configuration that provides maximum possible protection of all identified natural resources given the site-specific constraints.

10.3 Limited Disturbed Area

The site has been designed to minimize the area of disturbance, which minimizes impervious areas. Gravel is proposed in lieu of asphalt, and areas that are not gravelled will be vegetated. The site pad will feature an area with restricted vehicular traffic designed to promote stormwater infiltration.

Given the limited site traffic (several vehicles a week), it is anticipated that gravel driving surface will have some infiltrative capacity, however, it has been considered impervious in the post construction stormwater management analysis for regulatory purposes. Certain areas of the pad have been restricted from vehicular traffic through the use of bollards, these areas will be considered pervious. The extents of the pad have been restricted to be minimum necessary for safe, effective operation of the station.

10.4 Limiting Extent and Duration of Disturbance

As described in the Construction Sequence, and throughout this E&SCP, the duration and extent of earth disturbances will be limited to the current stage of work to be completed. Temporary or permanent stabilization is to occur as soon as possible upon completion of each stage. This BMP is very effective at reducing the concentration of pollutants in stormwater runoff and reducing the impact of bare earth on runoff volume and rate.

Appendices

A. Soils Report

United States Department of Agriculture

NRCS

Natural Resources Conservation Service

A product of the National Cooperative Soil Survey, a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local participants

Custom Soil Resource Report for Carbon County, Pennsylvania

Blue Mountain Interconnect

May 14, 2018

Preface

Soil surveys contain information that affects land use planning in survey areas. They highlight soil limitations that affect various land uses and provide information about the properties of the soils in the survey areas. Soil surveys are designed for many different users, including farmers, ranchers, foresters, agronomists, urban planners, community officials, engineers, developers, builders, and home buyers. Also, conservationists, teachers, students, and specialists in recreation, waste disposal, and pollution control can use the surveys to help them understand, protect, or enhance the environment.

Various land use regulations of Federal, State, and local governments may impose special restrictions on land use or land treatment. Soil surveys identify soil properties that are used in making various land use or land treatment decisions. The information is intended to help the land users identify and reduce the effects of soil limitations on various land uses. The landowner or user is responsible for identifying and complying with existing laws and regulations.

Although soil survey information can be used for general farm, local, and wider area planning, onsite investigation is needed to supplement this information in some cases. Examples include soil quality assessments (http://www.nrcs.usda.gov/wps/portal/nrcs/main/soils/health/) and certain conservation and engineering applications. For more detailed information, contact your local USDA Service Center (https://offices.sc.egov.usda.gov/locator/app?agency=nrcs) or your NRCS State Soil Scientist (http://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/contactus/?cid=nrcs142p2_053951).

Great differences in soil properties can occur within short distances. Some soils are seasonally wet or subject to flooding. Some are too unstable to be used as a foundation for buildings or roads. Clayey or wet soils are poorly suited to use as septic tank absorption fields. A high water table makes a soil poorly suited to basements or underground installations.

The National Cooperative Soil Survey is a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local agencies. The Natural Resources Conservation Service (NRCS) has leadership for the Federal part of the National Cooperative Soil Survey.

Information about soils is updated periodically. Updated information is available through the NRCS Web Soil Survey, the site for official soil survey information.

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Contents

How Soil Surveys Are Made

Soil surveys are made to provide information about the soils and miscellaneous areas in a specific area. They include a description of the soils and miscellaneous areas and their location on the landscape and tables that show soil properties and limitations affecting various uses. Soil scientists observed the steepness, length, and shape of the slopes; the general pattern of drainage; the kinds of crops and native plants; and the kinds of bedrock. They observed and described many soil profiles. A soil profile is the sequence of natural layers, or horizons, in a soil. The profile extends from the surface down into the unconsolidated material in which the soil formed or from the surface down to bedrock. The unconsolidated material is devoid of roots and other living organisms and has not been changed by other biological activity.

Currently, soils are mapped according to the boundaries of major land resource areas (MLRAs). MLRAs are geographically associated land resource units that share common characteristics related to physiography, geology, climate, water resources, soils, biological resources, and land uses (USDA, 2006). Soil survey areas typically consist of parts of one or more MLRA.

The soils and miscellaneous areas in a survey area occur in an orderly pattern that is related to the geology, landforms, relief, climate, and natural vegetation of the area. Each kind of soil and miscellaneous area is associated with a particular kind of landform or with a segment of the landform. By observing the soils and miscellaneous areas in the survey area and relating their position to specific segments of the landform, a soil scientist develops a concept, or model, of how they were formed. Thus, during mapping, this model enables the soil scientist to predict with a considerable degree of accuracy the kind of soil or miscellaneous area at a specific location on the landscape.

Commonly, individual soils on the landscape merge into one another as their characteristics gradually change. To construct an accurate soil map, however, soil scientists must determine the boundaries between the soils. They can observe only a limited number of soil profiles. Nevertheless, these observations, supplemented by an understanding of the soil-vegetation-landscape relationship, are sufficient to verify predictions of the kinds of soil in an area and to determine the boundaries.

Soil scientists recorded the characteristics of the soil profiles that they studied. They noted soil color, texture, size and shape of soil aggregates, kind and amount of rock fragments, distribution of plant roots, reaction, and other features that enable them to identify soils. After describing the soils in the survey area and determining their properties, the soil scientists assigned the soils to taxonomic classes (units). Taxonomic classes are concepts. Each taxonomic class has a set of soil characteristics with precisely defined limits. The classes are used as a basis for comparison to classify soils systematically. Soil taxonomy, the system of taxonomic classification used in the United States, is based mainly on the kind and character of soil properties and the arrangement of horizons within the profile. After the soil

scientists classified and named the soils in the survey area, they compared the individual soils with similar soils in the same taxonomic class in other areas so that they could confirm data and assemble additional data based on experience and research.

The objective of soil mapping is not to delineate pure map unit components; the objective is to separate the landscape into landforms or landform segments that have similar use and management requirements. Each map unit is defined by a unique combination of soil components and/or miscellaneous areas in predictable proportions. Some components may be highly contrasting to the other components of the map unit. The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The delineation of such landforms and landform segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, onsite investigation is needed to define and locate the soils and miscellaneous areas.

Soil scientists make many field observations in the process of producing a soil map. The frequency of observation is dependent upon several factors, including scale of mapping, intensity of mapping, design of map units, complexity of the landscape, and experience of the soil scientist. Observations are made to test and refine the soil-landscape model and predictions and to verify the classification of the soils at specific locations. Once the soil-landscape model is refined, a significantly smaller number of measurements of individual soil properties are made and recorded. These measurements may include field measurements, such as those for color, depth to bedrock, and texture, and laboratory measurements, such as those for content of sand, silt, clay, salt, and other components. Properties of each soil typically vary from one point to another across the landscape.

Observations for map unit components are aggregated to develop ranges of characteristics for the components. The aggregated values are presented. Direct measurements do not exist for every property presented for every map unit component. Values for some properties are estimated from combinations of other properties.

While a soil survey is in progress, samples of some of the soils in the area generally are collected for laboratory analyses and for engineering tests. Soil scientists interpret the data from these analyses and tests as well as the field-observed characteristics and the soil properties to determine the expected behavior of the soils under different uses. Interpretations for all of the soils are field tested through observation of the soils in different uses and under different levels of management. Some interpretations are modified to fit local conditions, and some new interpretations are developed to meet local needs. Data are assembled from other sources, such as research information, production records, and field experience of specialists. For example, data on crop yields under defined levels of management are assembled from farm records and from field or plot experiments on the same kinds of soil.

Predictions about soil behavior are based not only on soil properties but also on such variables as climate and biological activity. Soil conditions are predictable over long periods of time, but they are not predictable from year to year. For example, soil scientists can predict with a fairly high degree of accuracy that a given soil will have a high water table within certain depths in most years, but they cannot predict that a high water table will always be at a specific level in the soil on a specific date.

After soil scientists located and identified the significant natural bodies of soil in the survey area, they drew the boundaries of these bodies on aerial photographs and

identified each as a specific map unit. Aerial photographs show trees, buildings, fields, roads, and rivers, all of which help in locating boundaries accurately.

Soil Map

The soil map section includes the soil map for the defined area of interest, a list of soil map units on the map and extent of each map unit, and cartographic symbols displayed on the map. Also presented are various metadata about data used to produce the map, and a description of each soil map unit.

Custom Soil Resource Report
Soil Map

Map Scale: 1:804 if printed on A portrait (8.5" x 11") sheet.

N

Meters
0 10 20 40 60

Feet
0 35 70 140 210

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 18N WGS84

MAP LEGEND

Area of Interest (AOI)
- Area of Interest (AOI)

Soils
- Soil Map Unit Polygons
- Soil Map Unit Lines
- Soil Map Unit Points

Special Point Features
- Blowout
- Borrow Pit
- Clay Spot
- Closed Depression
- Gravel Pit
- Gravelly Spot
- Landfill
- Lava Flow
- Marsh or swamp
- Mine or Quarry
- Miscellaneous Water
- Perennial Water
- Rock Outcrop
- Saline Spot
- Sandy Spot
- Severely Eroded Spot
- Sinkhole
- Slide or Slip
- Sodic Spot
- Spoil Area
- Stony Spot
- Very Stony Spot
- Wet Spot
- Other
- Special Line Features

Water Features
- Streams and Canals

Transportation
- Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads

Background
- Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:20,000.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Carbon County, Pennsylvania
Survey Area Data: Version 15, Oct 3, 2017

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Sep 20, 2010—Aug 28, 2016

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Map Unit Legend

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
BhD	Buchanan very stony loam, 8 to 25 percent slopes	1.2	45.5%
MbC2	Meckesville channery loam, 8 to 15 percent slopes, moderately eroded	0.7	27.1%
McD	Meckesville very stony loam, 8 to 25 percent slopes	0.7	27.4%
Totals for Area of Interest		**2.6**	**100.0%**

Map Unit Descriptions

The map units delineated on the detailed soil maps in a soil survey represent the soils or miscellaneous areas in the survey area. The map unit descriptions, along with the maps, can be used to determine the composition and properties of a unit.

A map unit delineation on a soil map represents an area dominated by one or more major kinds of soil or miscellaneous areas. A map unit is identified and named according to the taxonomic classification of the dominant soils. Within a taxonomic class there are precisely defined limits for the properties of the soils. On the landscape, however, the soils are natural phenomena, and they have the characteristic variability of all natural phenomena. Thus, the range of some observed properties may extend beyond the limits defined for a taxonomic class. Areas of soils of a single taxonomic class rarely, if ever, can be mapped without including areas of other taxonomic classes. Consequently, every map unit is made up of the soils or miscellaneous areas for which it is named and some minor components that belong to taxonomic classes other than those of the major soils.

Most minor soils have properties similar to those of the dominant soil or soils in the map unit, and thus they do not affect use and management. These are called noncontrasting, or similar, components. They may or may not be mentioned in a particular map unit description. Other minor components, however, have properties and behavioral characteristics divergent enough to affect use or to require different management. These are called contrasting, or dissimilar, components. They generally are in small areas and could not be mapped separately because of the scale used. Some small areas of strongly contrasting soils or miscellaneous areas are identified by a special symbol on the maps. If included in the database for a given area, the contrasting minor components are identified in the map unit descriptions along with some characteristics of each. A few areas of minor components may not have been observed, and consequently they are not mentioned in the descriptions, especially where the pattern was so complex that it was impractical to make enough observations to identify all the soils and miscellaneous areas on the landscape.

The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The objective of mapping is not to delineate pure taxonomic classes but rather to separate the landscape into landforms or

landform segments that have similar use and management requirements. The delineation of such segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, however, onsite investigation is needed to define and locate the soils and miscellaneous areas.

An identifying symbol precedes the map unit name in the map unit descriptions. Each description includes general facts about the unit and gives important soil properties and qualities.

Soils that have profiles that are almost alike make up a *soil series*. Except for differences in texture of the surface layer, all the soils of a series have major horizons that are similar in composition, thickness, and arrangement.

Soils of one series can differ in texture of the surface layer, slope, stoniness, salinity, degree of erosion, and other characteristics that affect their use. On the basis of such differences, a soil series is divided into *soil phases*. Most of the areas shown on the detailed soil maps are phases of soil series. The name of a soil phase commonly indicates a feature that affects use or management. For example, Alpha silt loam, 0 to 2 percent slopes, is a phase of the Alpha series.

Some map units are made up of two or more major soils or miscellaneous areas. These map units are complexes, associations, or undifferentiated groups.

A *complex* consists of two or more soils or miscellaneous areas in such an intricate pattern or in such small areas that they cannot be shown separately on the maps. The pattern and proportion of the soils or miscellaneous areas are somewhat similar in all areas. Alpha-Beta complex, 0 to 6 percent slopes, is an example.

An *association* is made up of two or more geographically associated soils or miscellaneous areas that are shown as one unit on the maps. Because of present or anticipated uses of the map units in the survey area, it was not considered practical or necessary to map the soils or miscellaneous areas separately. The pattern and relative proportion of the soils or miscellaneous areas are somewhat similar. Alpha-Beta association, 0 to 2 percent slopes, is an example.

An *undifferentiated group* is made up of two or more soils or miscellaneous areas that could be mapped individually but are mapped as one unit because similar interpretations can be made for use and management. The pattern and proportion of the soils or miscellaneous areas in a mapped area are not uniform. An area can be made up of only one of the major soils or miscellaneous areas, or it can be made up of all of them. Alpha and Beta soils, 0 to 2 percent slopes, is an example.

Some surveys include *miscellaneous areas*. Such areas have little or no soil material and support little or no vegetation. Rock outcrop is an example.

Carbon County, Pennsylvania

BhD—Buchanan very stony loam, 8 to 25 percent slopes

Map Unit Setting

National map unit symbol: l35t
Elevation: 600 to 2,400 feet
Mean annual precipitation: 38 to 46 inches
Mean annual air temperature: 46 to 57 degrees F
Frost-free period: 140 to 170 days
Farmland classification: Not prime farmland

Map Unit Composition

Buchanan and similar soils: 95 percent
Minor components: 5 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Buchanan

Setting

Landform: Mountain slopes, valley sides
Landform position (two-dimensional): Footslope
Landform position (three-dimensional): Lower third of mountainflank, base slope
Down-slope shape: Linear, concave
Across-slope shape: Concave, linear
Parent material: Mountain slope colluvium derived from sedimentary rock

Typical profile

H1 - 0 to 5 inches: very stony loam
H2 - 5 to 25 inches: gravelly loam
H3 - 25 to 60 inches: gravelly loam

Properties and qualities

Slope: 8 to 25 percent
Percent of area covered with surface fragments: 1.6 percent
Depth to restrictive feature: 20 to 36 inches to fragipan
Natural drainage class: Moderately well drained
Runoff class: High
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to moderately high (0.06 to 0.20 in/hr)
Depth to water table: About 12 to 30 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: Low (about 3.3 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 6s
Hydrologic Soil Group: C/D
Hydric soil rating: No

Minor Components

Andover

Percent of map unit: 5 percent
Landform: Depressions

Hydric soil rating: Yes

MbC2—Meckesville channery loam, 8 to 15 percent slopes, moderately eroded

Map Unit Setting

National map unit symbol: l385
Elevation: 600 to 2,800 feet
Mean annual precipitation: 34 to 48 inches
Mean annual air temperature: 46 to 55 degrees F
Frost-free period: 130 to 190 days
Farmland classification: Farmland of statewide importance

Map Unit Composition

Meckesville and similar soils: 100 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Meckesville

Setting

Landform: Mountain valleys
Landform position (two-dimensional): Footslope
Landform position (three-dimensional): Lower third of mountainflank
Down-slope shape: Concave
Across-slope shape: Linear
Parent material: Sandstone, siltstone and shale colluvium derived from sedimentary rock

Typical profile

H1 - 0 to 9 inches: channery loam
H2 - 9 to 36 inches: gravelly loam
H3 - 36 to 60 inches: very cobbly loam

Properties and qualities

Slope: 8 to 15 percent
Depth to restrictive feature: 25 to 48 inches to fragipan
Natural drainage class: Well drained
Runoff class: Medium
Capacity of the most limiting layer to transmit water (Ksat): Moderately high (0.20 to 0.60 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: Low (about 5.0 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 3e
Hydrologic Soil Group: C
Hydric soil rating: No

McD—Meckesville very stony loam, 8 to 25 percent slopes

Map Unit Setting

National map unit symbol: l387
Elevation: 600 to 2,800 feet
Mean annual precipitation: 34 to 48 inches
Mean annual air temperature: 46 to 55 degrees F
Frost-free period: 130 to 190 days
Farmland classification: Not prime farmland

Map Unit Composition

Meckesville and similar soils: 100 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Meckesville

Setting

Landform: Mountain valleys
Landform position (two-dimensional): Footslope
Landform position (three-dimensional): Lower third of mountainflank
Down-slope shape: Concave
Across-slope shape: Linear
Parent material: Sandstone, siltstone and shale colluvium derived from sedimentary rock

Typical profile

H1 - 0 to 9 inches: very stony loam
H2 - 9 to 36 inches: gravelly loam
H3 - 36 to 60 inches: very cobbly loam

Properties and qualities

Slope: 8 to 25 percent
Percent of area covered with surface fragments: 1.6 percent
Depth to restrictive feature: 25 to 48 inches to fragipan
Natural drainage class: Well drained
Runoff class: Medium
Capacity of the most limiting layer to transmit water (Ksat): Moderately high (0.20 to 0.60 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: Low (about 5.0 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 6s
Hydrologic Soil Group: C
Hydric soil rating: No

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B. Drainage Area Maps

Point of Interest

SITE-BYP

SITE-BASIN

OFFSITE

MbC2

McD

KvF

BhD

DeF

Esri, HERE, DeLorme, MapmyIndia, © OpenStreetMap contributors, and the GIS user community, Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS

Legend

COVER

- IMP/DIRT - Impervious
- IMP/GRAVEL - Impervious
- MEAD - Meadow
- WO - Woods

- Mainline Easement
- Tc Path
- Limit of Disturbance
- Drainage Area
- Soils
- Stream
- 10ft Contours
- 2ft Contours

0 50 100 200 Feet

N W E S

BLUE MOUNTAIN INTERCONNECT EXISTING CONDITIONS DRAINAGE AREA MAP

Map Document: (P:\353754 PennEast\Stormwater\Blue Mountain Interconnect\GIS\Projects\EX_DA_Map.mxd) 28/08/2018 14:09:48 ZHI76919

Point of Interest

Infiltration Area

SITE_BYP

SITE-BASIN

OFFSITE

MbC2

McD

KvF

BhD

DeF

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Legend

COVER

- IMP/DIRT - Impervious
- IMP/GRAVEL - Impervious
- MEAD - Meadow
- WO - Woods

- Mainline Easement
- PR_Tc
- Limit of Disturbance
- Drainage Area
- Soils
- Stream
- 10ft Contours
- 2ft Contours

0 50 100 200 Feet

N W E S

BLUE MOUNTAIN INTERCONNECT PROPOSED CONDITIONS DRAINAGE AREA MAP

Map Document: (P:\353754 PennEast\Stormwater\Blue Mountain Interconnect\GIS\Projects\PR_DA_Map.mxd) 8/28/2018 2:08:32 PM zhi76919

SWALE-1
AREA = 0.13 AC
Rc = 0.36
Tc = 5 MIN

SWALE-2
AREA = 1.99 AC
Rc = 0.20
Tc = 6 MIN

MbC2
McD
KvF
DeF
BhD

Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

Legend

COVER

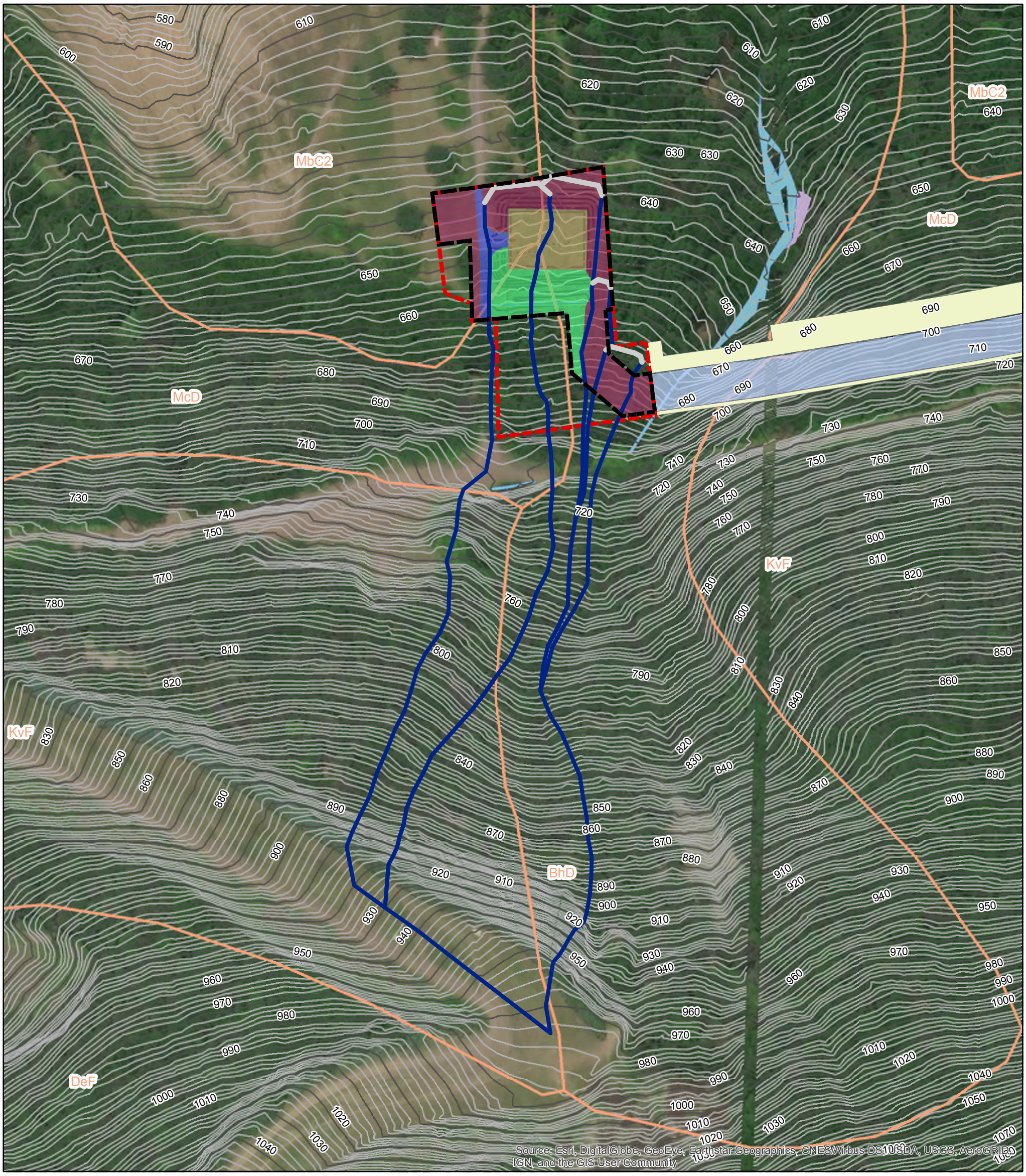
- IMP/GRAVEL - Impervious/Gravel
- MEAD - Meadow
- WO - Woods

- Swale Drainage Area
- Limit of Disturbance
- Soils
- 10ft Contours
- 2ft Contours

0 50 100 200 Feet

N W E S

BLUE MOUNTAIN INTERCONNECT
PROPOSED CONDITIONS
SWALE DRAINAGE AREA MAP



Legend

- Sediment Trap Drainage Area
- Sediment Trap

BMP

- BAS, LVL_SPR - Basin, Level Spreader
- NAT_VEG - Native Vegetation
- NAT_VEG, SWA, BAS, LVL_SPR - Native Vegetation, Basin, Level Spreader
- NONE

- Facility Permanent Easement
- Limit of Disturbance
- 2 Ft Contours
- 10 Ft Contours
- Mainline Temporary Workspace
- Mainline Easement
- Soils
- Stream

0 50 100 200 Feet

N W E S

BLUE MOUNTAIN INTERCONNECT
BMP DRAINAGE AREA MAP

Map Document: (P:\353754 PennEast\Stormwater\Blue Mountain Interconnect\GIS\Projects\SESC_BMP_DA_Map.mxd) 8/30/2018 5:50:56 PM zhi76919

C. E&SCP Design Calculations

STANDARD E&S WORKSHEET #11
Channel Design Data

PROJECT NAME: PENNEAST PIPELINE PROJECT - BLUE MOUNTAIN INTERCONNECT
LOCATION: CARBON COUNTY
PREPARED BY: MDN DATE: 10/15/18
CHECKED BY: KEK DATE: 10/15/18

CHANNEL OR CHANNEL SECTION		SWALE 1	SWALE 2
TEMPORARY OR PERMANENT?	(T OR P)	P	P
DESIGN STORM	(2, 5, OR 10 YR)	10-year	10-year
ACRES	(AC)	0.13	1.99
MULTIPLIER	(1.6, 2.25, OR 2.75) [1]	N/A (CALCULATIONS INCLUDED AT END OF APPENDIX C)	N/A (CALCULATIONS INCLUDED AT END OF APPENDIX C)
Q_r (REQUIRED CAPACITY)	(CFS)	0.3	2.6
Q (CALCULATED AT FLOW DEPTH d)	(CFS)	0.3	2.6
PROTECTIVE LINING[2]		Vegetated	Vegetated
n (MANNING'S COEFFICIENT)[2]		.035 (MOWED CONDITION)	.035 (MOWED CONDITION)
V_a (ALLOWABLE VELOCITY)	(FPS)	N/A	N/A
V (CALCUALTED AT FLOW DEPTH d)	(FPS)	0.97	2.50
τ_a (MAX ALLOWABLE SHEAR STRESS)	(LB/FT^2)	1.00	1.00
τ_d (CALC'D SHEAR STRESS AT FLOW DEPTH d)	(LB/FT^2)	0.08	0.44
CHANNEL BOTTOM WIDTH	(FT)	2.00	3.00
CHANNEL SIDE SLOPES	(H:V)	3:1	3:1
D (TOTAL DEPTH)	(FT)	1	1.5
CHANNEL TOP WIDTH @ D	(FT)	6.83	9.06
d (CALCULATED FLOW DEPTH)	(FT)	0.13	0.27
CHANNEL TOP WIDTH @ FLOW DEPTH d	(FT)	2.77	4.62
BOTTOM WIDTH: FLOW DEPTH RATIO	(12:1 MAX)	15.38	11.11
d_{50} STONE SIZE	(IN)	N/A	N/A
A (CROSS-SECTIONAL AREA)	(SQ. FT)	0.31	1.04
R (HYDRAULIC RADIUS)		0.11	0.22
S (BED SLOPE)[3]	(FT/FT)	0.01	0.03
S_C (CRITICAL SLOPE)	(FT/FT)	0.038	0.030
$.7S_c$	(FT/FT)	0.027	0.021
$1.3S_c$	(FT/FT)	0.049	0.039
STABLE FLOW?	(Y/N)	Y	Y
FREEBOARD BASED ON UNSTABLE FLOW	(FT)	N/A	N/A
FREEBOARD BASED ON STABLE FLOW	(FT)	0.68	0.74
MINIMUM REQUIRED FREEBOARD[4]	(FT)	0.50	0.50
DESIGN METHOD FOR PROTECTIVE LINING[5] PERMISSIBLE VELOCITY (V) OR SHEAR STRESS (S)		S	S

1. Use 1.6 for Temporary Channels; 2.25 for Temporary Channels in Special Protection (HQ or EV) Watersheds; 2.75 for Permanent Channels. For Rational Method, enter "N/A" and attach E&S Worksheets 9 and 10. For TR-55 enter "N/A" and attach appropriate Worksheets.
2. Adjust "n" value for changes in channel liner and flow depth. For vegetated channels, provide data for manufactured linings without vegetation and with vegetation in seperate columns.
3. Slopes may not be averaged.
4. Minimum Freeboard is 0.5 ft. or 1/4 Total Channel Depth, whichever is greater.
5. Permissible velocity lining design method is not acceptable for channels with a bed slope of 10% or greater. Shear stress lining design method is required for channels with a bed slope of 10% or greater. Shear stress lining design method may be used for any channel bed slope.

Post Construction Stormwater Management Facility Calculations

NOAA Atlas 14, Volume 2, Version 3
Location name: Lower Towamensing Twp, Pennsylvania, USA*
Latitude: 40.8182°, Longitude: -75.505°
Elevation: 659.54 ft**
* source: ESRI Maps
** source: USGS

POINT PRECIPITATION FREQUENCY ESTIMATES

G.M. Bonnin, D. Martin, B. Lin, T. Parzybok, M.Yekta, and D. Riley

NOAA, National Weather Service, Silver Spring, Maryland

PF_tabular | PF_graphical | Maps_&_aerials

PF tabular

PDS-based point precipitation frequency estimates with 90% confidence intervals (in inches)[1]

Duration	Average recurrence interval (years)									
	1	2	5	10	25	50	100	200	500	1000
5-min	0.318 (0.286–0.354)	0.380 (0.341–0.423)	0.453 (0.405–0.503)	0.512 (0.457–0.568)	0.590 (0.522–0.654)	0.655 (0.575–0.727)	0.724 (0.631–0.804)	0.803 (0.690–0.894)	0.911 (0.772–1.02)	1.01 (0.843–1.14)
10-min	0.504 (0.453–0.561)	0.604 (0.542–0.673)	0.720 (0.645–0.801)	0.810 (0.723–0.899)	0.930 (0.822–1.03)	1.03 (0.902–1.14)	1.13 (0.988–1.26)	1.25 (1.08–1.39)	1.42 (1.20–1.59)	1.56 (1.30–1.75)
15-min	0.627 (0.563–0.697)	0.753 (0.676–0.839)	0.903 (0.809–1.00)	1.02 (0.909–1.13)	1.17 (1.04–1.30)	1.30 (1.14–1.44)	1.43 (1.25–1.59)	1.57 (1.35–1.75)	1.78 (1.50–1.99)	1.95 (1.63–2.20)
30-min	0.852 (0.765–0.948)	1.03 (0.926–1.15)	1.27 (1.14–1.41)	1.46 (1.30–1.62)	1.72 (1.52–1.90)	1.92 (1.69–2.13)	2.15 (1.88–2.39)	2.40 (2.07–2.68)	2.77 (2.35–3.11)	3.09 (2.58–3.49)
60-min	1.06 (0.949–1.18)	1.29 (1.16–1.43)	1.62 (1.45–1.80)	1.89 (1.69–2.10)	2.27 (2.01–2.51)	2.59 (2.27–2.87)	2.95 (2.57–3.27)	3.34 (2.88–3.72)	3.94 (3.34–4.42)	4.47 (3.73–5.04)
2-hr	1.28 (1.16–1.43)	1.56 (1.40–1.73)	1.96 (1.76–2.18)	2.30 (2.06–2.55)	2.81 (2.49–3.11)	3.26 (2.88–3.61)	3.78 (3.30–4.19)	4.38 (3.78–4.87)	5.31 (4.51–5.95)	6.17 (5.16–6.96)
3-hr	1.42 (1.29–1.58)	1.72 (1.55–1.91)	2.14 (1.94–2.38)	2.50 (2.25–2.76)	3.04 (2.71–3.36)	3.52 (3.12–3.89)	4.07 (3.57–4.50)	4.71 (4.08–5.22)	5.72 (4.87–6.38)	6.63 (5.56–7.45)
6-hr	1.82 (1.65–2.02)	2.18 (1.98–2.41)	2.68 (2.43–2.97)	3.12 (2.81–3.45)	3.80 (3.39–4.19)	4.41 (3.91–4.87)	5.12 (4.48–5.66)	5.95 (5.14–6.59)	7.26 (6.17–8.10)	8.47 (7.07–9.49)
12-hr	2.25 (2.05–2.50)	2.71 (2.46–3.00)	3.36 (3.04–3.72)	3.92 (3.53–4.34)	4.81 (4.29–5.31)	5.62 (4.96–6.21)	6.56 (5.73–7.25)	7.67 (6.61–8.50)	9.44 (7.97–10.5)	11.1 (9.18–12.4)
24-hr	2.63 (2.43–2.85)	3.15 (2.92–3.42)	3.92 (3.63–4.25)	4.58 (4.23–4.96)	5.61 (5.14–6.05)	6.55 (5.96–7.03)	7.62 (6.88–8.16)	8.88 (7.94–9.47)	10.9 (9.57–11.6)	12.7 (11.0–13.5)
2-day	3.08 (2.85–3.35)	3.70 (3.43–4.02)	4.59 (4.25–4.98)	5.36 (4.94–5.80)	6.54 (5.99–7.06)	7.60 (6.91–8.19)	8.83 (7.97–9.49)	10.3 (9.16–11.0)	12.5 (11.0–13.4)	14.6 (12.7–15.6)
3-day	3.25 (3.01–3.53)	3.89 (3.61–4.24)	4.82 (4.46–5.23)	5.61 (5.18–6.07)	6.83 (6.26–7.37)	7.92 (7.22–8.53)	9.18 (8.30–9.85)	10.6 (9.53–11.4)	12.9 (11.4–13.8)	15.0 (13.1–16.0)
4-day	3.42 (3.17–3.71)	4.09 (3.80–4.45)	5.05 (4.67–5.48)	5.86 (5.42–6.35)	7.12 (6.54–7.68)	8.24 (7.52–8.87)	9.53 (8.63–10.2)	11.0 (9.89–11.8)	13.3 (11.8–14.3)	15.5 (13.5–16.5)
7-day	4.05 (3.75–4.41)	4.84 (4.47–5.28)	5.91 (5.46–6.44)	6.83 (6.30–7.43)	8.24 (7.55–8.95)	9.50 (8.65–10.3)	10.9 (9.88–11.8)	12.6 (11.3–13.5)	15.1 (13.4–16.2)	17.4 (15.2–18.7)
10-day	4.68 (4.35–5.07)	5.57 (5.18–6.04)	6.73 (6.25–7.28)	7.71 (7.13–8.33)	9.17 (8.45–9.89)	10.5 (9.59–11.3)	11.9 (10.8–12.8)	13.5 (12.2–14.5)	16.0 (14.3–17.1)	18.1 (16.1–19.4)
20-day	6.32 (5.94–6.74)	7.46 (7.01–7.96)	8.78 (8.24–9.37)	9.88 (9.25–10.5)	11.5 (10.7–12.2)	12.8 (11.9–13.7)	14.3 (13.3–15.2)	16.0 (14.7–17.0)	18.4 (16.8–19.5)	20.5 (18.6–21.7)
30-day	7.88 (7.44–8.37)	9.26 (8.74–9.83)	10.7 (10.1–11.3)	11.9 (11.2–12.6)	13.6 (12.8–14.4)	15.0 (14.0–15.9)	16.5 (15.4–17.5)	18.2 (16.9–19.2)	20.5 (18.9–21.8)	22.5 (20.7–23.9)
45-day	9.99 (9.50–10.5)	11.7 (11.1–12.3)	13.3 (12.6–14.0)	14.6 (13.8–15.4)	16.4 (15.5–17.3)	17.9 (16.9–18.9)	19.5 (18.3–20.5)	21.1 (19.8–22.3)	23.4 (21.9–24.7)	25.3 (23.6–26.8)
60-day	12.0 (11.4–12.6)	14.0 (13.3–14.7)	15.8 (15.0–16.6)	17.3 (16.4–18.2)	19.3 (18.3–20.3)	21.0 (19.8–22.0)	22.7 (21.4–23.8)	24.5 (23.0–25.7)	27.0 (25.3–28.4)	29.1 (27.1–30.6)

[1] Precipitation frequency (PF) estimates in this table are based on frequency analysis of partial duration series (PDS).

Numbers in parenthesis are PF estimates at lower and upper bounds of the 90% confidence interval. The probability that precipitation frequency estimates (for a given duration and average recurrence interval) will be greater than the upper bound (or less than the lower bound) is 5%. Estimates at upper bounds are not checked against probable maximum precipitation (PMP) estimates and may be higher than currently valid PMP values.

Please refer to NOAA Atlas 14 document for more information.

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EXISTING CONDITIONS

SITE -Tc CALCULATIONS

SHEET FLOW	
Manning's n	0.4
Flow length, ft	100
2-Yr 24-Hr rainfall, in	3.15
Land slope, %	23.00
Sheet flow time, min	**8.1**
SHALLOW CONC. FLOW	
Flow length, ft	227
Watercourse slope, %	13.83
Surface Description	unpaved
Velocity, ft/s	6.00
Sh. Conc. Flow time, min	**0.6**
TIME OF CONC., mins	**8.7**

EXISTING CONDITIONS

OFFSITE -Tc CALCULATIONS

SHEET FLOW	
Manning's n	0.24
Flow length, ft	100
2-Yr 24-Hr rainfall, in	3.15
Land slope, %	20.50
Sheet flow time, min	**5.7**
SHALLOW CONC. FLOW	
Flow length, ft	979
Watercourse slope, %	31.87
Surface Description	unpaved
Velocity, ft/s	9.11
Sh. Conc. Flow time, min	**1.8**
TIME OF CONC., mins	**7.5**

PROPOSED CONDITIONS

SITE BYPASS -Tc CALCULATIONS

SHEET FLOW	
Manning's n	0.24
Flow length, ft	100
2-Yr 24-Hr rainfall, in	3.15
Land slope, %	26.20
Sheet flow time, min	**5.1**
SHALLOW CONC. FLOW	
Flow length, ft	224
Watercourse slope, %	14.55
Surface Description	unpaved
Velocity, ft/s	6.16
Sh. Conc. Flow time, min	**0.6**
TIME OF CONC., mins	**5.7**

PROPOSED CONDITIONS

SITE TO BASIN -Tc CALCULATIONS

SHEET FLOW	
Manning's n	0.24
Flow length, ft	100
2-Yr 24-Hr rainfall, in	3.15
Land slope, %	23.00
Sheet flow time, min	**5.4**
SHALLOW CONC. FLOW	
Flow length, ft	70
Watercourse slope, %	15.71
Surface Description	unpaved
Velocity, ft/s	6.40
Sh. Conc. Flow time, min	**0.2**
CHANNEL FLOW	
Left side slope, %	33.3333
Right side slope, %	33.3333
bottom width, ft	3
channel flow depth, ft	0.70
Channel flow length, ft	98.00
channel bed slope, %	3.00
Mannings N	0.024
Accn. Due to gravity, ft/sec2	32.2
Freeboard, ft	0
H:V, left	3.00
H:V, right	3.00
bed slope, ft/ft	0.030
top width at flow depth, ft	7.20
top width including freeboard, ft	7.20
wetted area, sq. ft	3.57
wetted peri, ft	7.43
hyd. Radius, ft	0.48
velocity, ft/s	6.60
Discharge, cfs	23.56
Theta, rad	0.03
Froudes Number	1.39
Flow Type	**supercritical**
Channel flow time, mins	**0.2**

PIPE FLOW	
Pipe Diamater, in	15
Manning's N	0.012
% Slope	1
Pipe length, ft	112
diameter of pipe, d, ft	1.25
wetted area, sf =	1.23

wetted perimeter, P, ft =	3.93
R =	0.3125
Slope, ft/ft =	0.01
Full Flow Velocity, ft/s =	5.72
Full Flow Q, cfs =	7.02
Pipe flow time, mins	**0.3**
TIME OF CONC., mins	**6.1**

PROPOSED CONDITIONS

OFFSITE-Tc CALCULATIONS

SHEET FLOW	
Manning's n	0.24
Flow length, ft	100
2-Yr 24-Hr rainfall, in	3.15
Land slope, %	20.50
Sheet flow time, min	**5.7**
SHALLOW CONC. FLOW	
Flow length, ft	979
Watercourse slope, %	31.87
Surface Description	unpaved
Velocity, ft/s	9.11
Sh. Conc. Flow time, min	**1.8**
TIME OF CONC., mins	**7.5**

SWALE-1 -Tc CALCULATIONS

SHEET FLOW	
Manning's n	0.24
Flow length, ft	42
2-Yr 24-Hr rainfall, in	3.15
Land slope, %	25.95
Sheet flow time, min	**2.58**
TIME OF CONC., mins	**2.6**

SWALE-2 -Tc CALCULATIONS

SHEET FLOW	
Manning's n	0.24
Flow length, ft	100
2-Yr 24-Hr rainfall, in	3.15
Land slope, %	23.00
Sheet flow time, min	**5.41**
SHALLOW CONC. FLOW	
Flow length, ft	70
Watercourse slope, %	18.57
Surface Description	unpaved
Velocity, ft/s	6.95
Sh. Conc. Flow time, min	**0.17**
TIME OF CONC., mins	**5.6**

TABLE 5.2
Runoff Coefficients for the Rational Equation*

LAND USE	A Soils[1]			B Soils[1]			C Soils[1]			D Soils[1]		
	< 2%	2 - 6%	>6%	< 2%	2 - 6%	>6%	< 2%	2 - 6%	>6%	< 2%	2 - 6%	>6%
Cultivated land	0.08	0.13	0.16	0.11	0.15	0.21	0.14	0.19	0.26	0.18	0.23	0.31
Pasture	0.12	0.20	0.30	0.18	0.28	0.37	0.24	0.34	0.44	0.30	0.40	0.50
Meadow	0.10	0.16	0.25	0.14	0.22	0.30	0.20	0.28	0.36	0.24	0.30	0.40
Forest	0.05	0.08	0.11	0.08	0.11	0.14	0.10	0.13	0.16	0.12	0.16	0.20
Residential lot size 1/8 acre	0.25	0.28	0.31	0.27	0.30	0.35	0.30	0.33	0.38	0.33	0.36	0.42
Residential lot size 1/4 acre	0.22	0.26	0.29	0.24	0.29	0.33	0.27	0.31	0.36	0.30	0.34	0.40
Residential lot size 1/3 acre	0.19	0.23	0.26	0.22	0.26	0.30	0.25	0.29	0.34	0.28	0.32	0.39
Residential lot size 1/2 acre	0.16	0.20	0.24	0.19	0.23	0.28	0.22	0.27	0.32	0.26	0.30	0.37
Residential lot size 1 acre	0.14	0.19	0.22	0.17	0.21	0.26	0.20	0.25	0.31	0.24	0.29	0.35
Industrial	0.67	0.68	0.68	0.68	0.68	0.69	0.68	0.68	0.69	0.69	0.69	0.70
Commercial	0.71	0.71	0.72	0.71	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72
Streets	0.70	0.71	0.72	0.71	0.72	0.74	0.72	0.73	0.76	0.73	0.75	0.78
Open Space	0.05	0.10	0.14	0.08	0.13	0.19	0.12	0.17	0.24	0.15	0.21	0.28
Parking	0.85	0.86	0.87	0.85	0.86	0.87	0.85	0.86	0.87	0.85	0.86	0.87
Construction Sites - Bare packed soil, smooth	0.30	0.35	.040	0.35	.040	0.45	0.40	0.45	0.50	0.50	0.55	0.60
Construction Sites - Bare packed soil, rough	.020	0.25	0.30	0.25	0.30	0.35	0.30	0.35	0.40	0.40	0.45	0.50

Source: PADEP Erosion and Sediment Pollution Control Program Manual, March 2012

PENNEAST-BLUE MOUNTAIN INTERCONNECT

PROPOSED CONDITIONS RUNOFF COEFFICIENT CALCULATIONS FOR PROPOSED SWALES

***Note: Rational C Coefficients adopted from PA Erosion and Sediment Pollution Control Program Manual, Mar 2012, Table 5.2**

DA	Land Use	Soils	HSG	Area	Area (Acres)	C	C*A	RC
SWALE1	MEAD	Bhd	C/D	2011	0.046	0.36	0.017	0.36
SWALE1	MEAD	MbC2	C	1221	0.028	0.36	0.010	0.36
SWALE1	MEAD	McD	C	2546	0.058	0.36	0.021	0.36
SWALE1 Total					**0.133**		**0.048**	**0.36**
SWALE2	IMP	Bhd	C/D	59	0.001	0.87	0.001	0.87
SWALE2	IMP	McD	C	2077	0.048	0.87	0.041	0.87
SWALE2	MEAD	Bhd	C/D	3814	0.088	0.36	0.032	0.36
SWALE2	MEAD	DeF	A	4489	0.103	0.11	0.011	0.11
SWALE2	MEAD	McD	C	16431	0.377	0.36	0.136	0.36
SWALE2	WOODS	BhD	C/D	10736	0.246	0.16	0.039	0.16
SWALE2	WOODS	KvF	A	41426	0.951	0.11	0.105	0.11
SWALE2	WOODS	McD	C	7730	0.177	0.16	0.028	0.16
SWALE2 Total					**1.992**		**0.394**	**0.20**
Grand Total					**2.124**		**0.442**	**0.21**

The "RC" value is an area averaged runoff coefficient value (arithmetic mean) calculated as:

$$RC = \frac{\sum_{i=1}^{n} C_i \, x \, Area_i}{\sum_{i=1}^{n} Area_i}$$

PENNEAST-BLUE MOUNTAIN INTERCONNECT

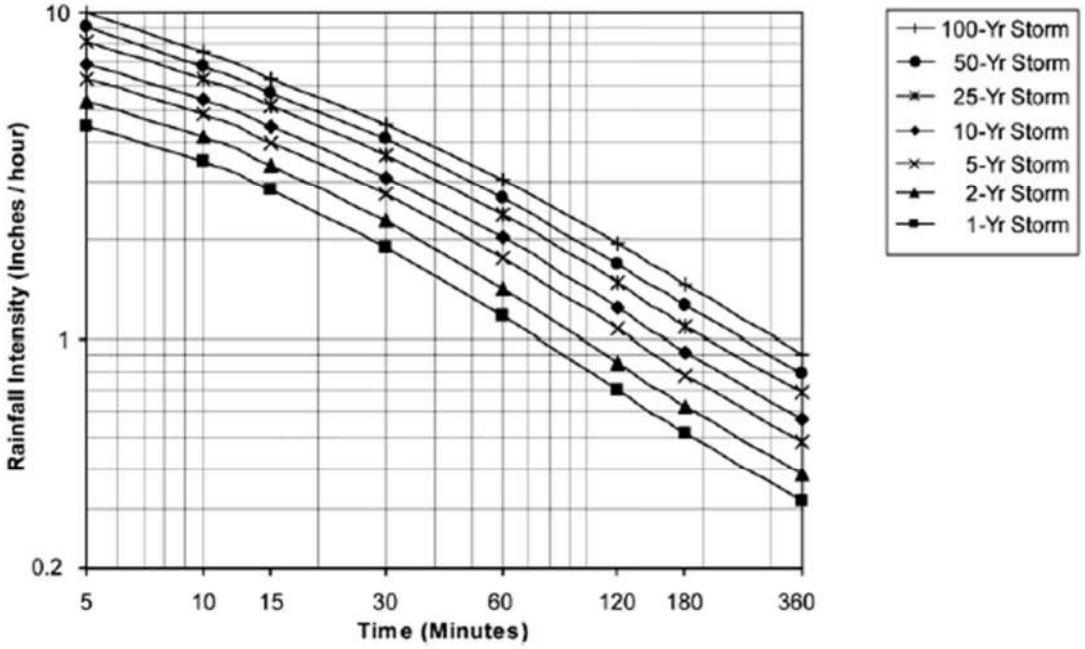
RATIONAL METHOD PEAK FLOW CALCULATIONS FOR PROPOSED SWALES

Return Period (Yrs) 10

Time of Concentration (Min) 5 **(Unless otherwise noted below)**

DA	Area (Acres)	RC	Tc (mins)	Rainfall Intensity (in/hr)	Q (cfs)
SWALE1	0.133	0.36	5.0	6.9	0.3
SWALE2	1.992	0.20	5.6	6.6	2.6

Rainfall Intensity for 1-year through 100-year Storms for Region 5



Adapted from Appendix A of PennDOT Publication 584 (2008 Edition)

PENNEAST-BLUE MOUNTAIN INTERCONNECT

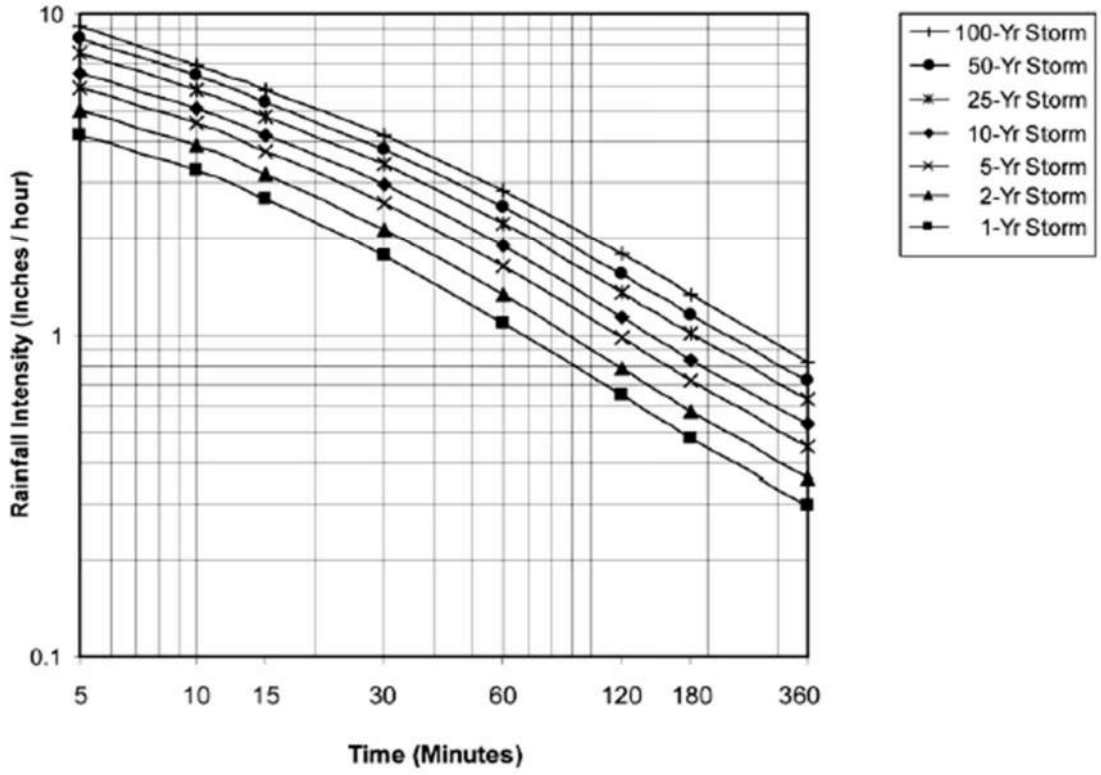
RATIONAL METHOD PEAK FLOW CALCULATIONS FOR PROPOSED SWALES

Return Period (Yrs) 100

Time of Concentration (Min) 5 **(Unless otherwise noted below)**

DA	Area (Acres)	RC	Tc (mins)	Rainfall Intensity (in/hr)	Q (cfs)
SWALE1	0.133	0.36	5.0	9.2	0.4
SWALE2	1.992	0.20	5.6	8.5	3.3

Rainfall Intensity for 1-year through 100-year Storms for Region 4



Adapted from Appendix A of PennDOT Publication 584 (2008 Edition)

PENNEAST-BLUE MOUNTAIN INTERCONNECT

PROPOSED CONDITIONS RUNOFF COEFFICIENT CALCULATIONS FOR PROPOSED INLETS

***Note: Rational C Coefficients adopted from PA Erosion and Sediment Pollution Control Program Manual, Mar 2012, Table 5.2**

DA	Land Use	Soils	HSG	Area	Area (Acres)	C	C*A	RC
INLET1	IMP	Bhd	C/D	1606	0.037	0.87	0.032	0.87
INLET1	IMP	McD	C	3989	0.092	0.87	0.080	0.87
INLET1	MEAD	Bhd	C/D	711	0.016	0.36	0.006	0.36
INLET1	MEAD	MbC2	C	932	0.021	0.36	0.008	0.36
INLET1	MEAD	McD	C	8268	0.190	0.36	0.068	0.36
INLET1 Total					**0.356**		**0.194**	**0.54**
INLET2	IMP	Bhd	C/D	2832	0.065	0.87	0.057	0.87
INLET2	IMP	MbC2	C	859	0.020	0.87	0.017	0.87
INLET2	IMP	McD	C	927	0.021	0.87	0.019	0.87
INLET2 Total					**0.106**		**0.092**	**0.87**
INLET3	MEAD	Bhd	C/D	6176	0.142	0.36	0.051	0.36
INLET3	MEAD	MbC2	C	1434	0.033	0.36	0.012	0.36
INLET3	MEAD	McD	C	474	0.011	0.36	0.004	0.36
INLET3 Total					**0.186**		**0.067**	**0.36**
Grand Total					**0.648**		**0.353**	**0.54**

The "RC" value is an area averaged runoff coefficient value (arithmetic mean) calculated as:

$$RC = \frac{\sum_{i=1}^{n} C_i \, x \, Area_i}{\sum_{i=1}^{n} Area_i}$$

PENNEAST-BLUE MOUNTAIN INTERCONNECT

RATIONAL METHOD PEAK FLOW CALCULATIONS FOR PROPOSED INLETS

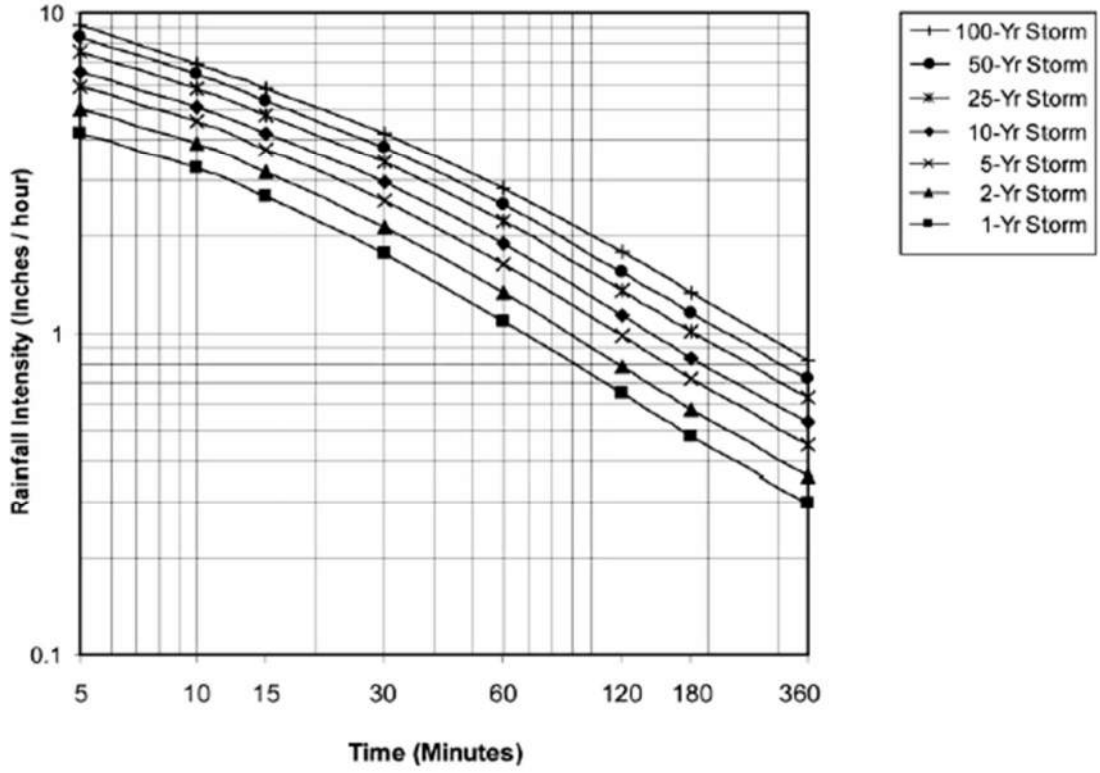
Return Period (Yrs) 10

Time of Concentration (Min) 5 **(Unless otherwise noted below)**

DA	Area (Acres)	RC	Tc (mins)	Rainfall Intensity (in/hr)	Q (cfs)
INLET1	0.356	0.54	5.6	6.3	1.2
INLET2	0.106	0.87	5.0	6.9	0.6
INLET3	0.186	0.36	5.0	6.9	0.5

TOTAL FLOW FOR INLET2	ADD
INLET1	1.2
INLET2	0.6
TOTAL	**1.9**

Rainfall Intensity for 1-year through 100-year Storms for Region 4



Adapted from Appendix A of PennDOT Publication 584 (2008 Edition)

PENNEAST-BLUE MOUNTAIN INTERCONNECT

RATIONAL METHOD PEAK FLOW CALCULATIONS FOR PROPOSED INLETS

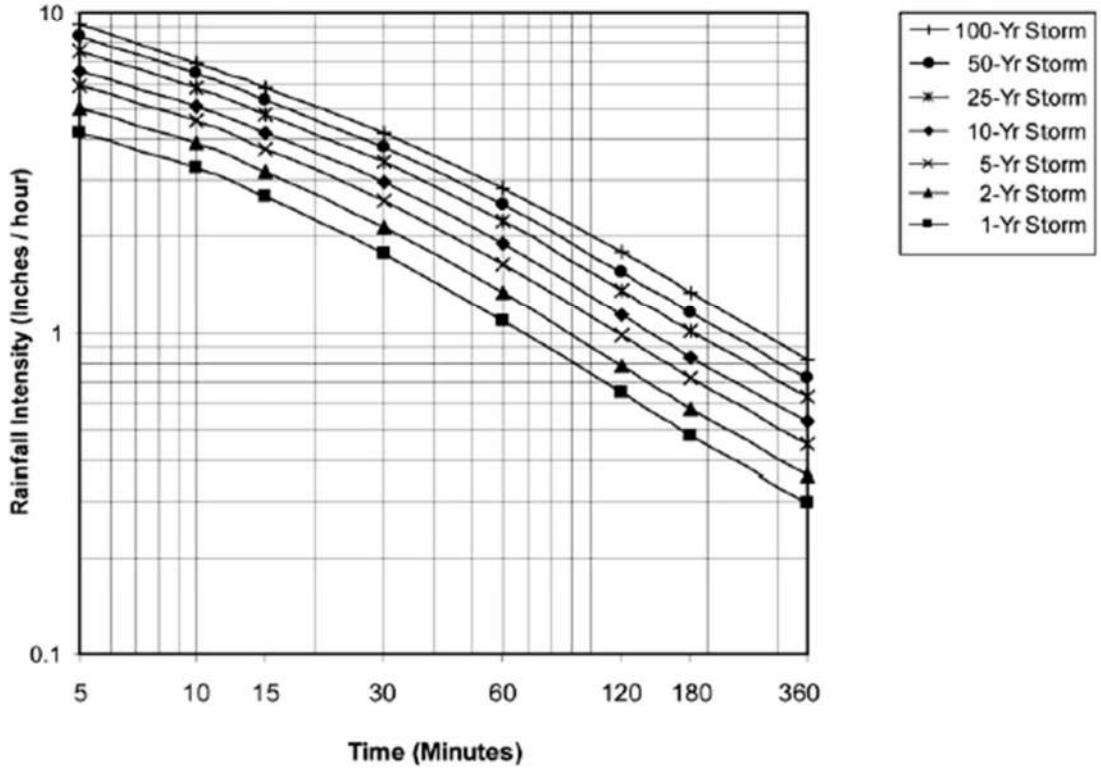
Return Period (Yrs) 100

Time of Concentration (Min) 5 **(Unless otherwise noted below)**

DA	Area (Acres)	RC	Tc (mins)	Rainfall Intensity (in/hr)	Q (cfs)
INLET1	0.356	0.54	5.6	8.9	1.7
INLET2	0.106	0.87	5.0	9.2	0.8
INLET3	0.186	0.36	5.0	9.2	0.6

TOTAL FLOW FOR INLET2	ADD
INLET1	1.7
INLET2	0.8
TOTAL	**2.6**

Rainfall Intensity for 1-year through 100-year Storms for Region 4



Adapted from Appendix A of PennDOT Publication 584 (2008 Edition)

PENNEAST-BLUE MOUNTAIN INTERCONNECT
PROPOSED DRAINAGE PIPES CAPACITY ANALYSIS

Pipe ID	P#1	100-Year Swale-2 Flow
Upstream Str	IN-1	
Downstream Str	IN-2	
peak Discharge, cfs	3.3	
Pipe Diamater, in	15.00	
Manning's N	0.011	
% Slope	2.00	
diameter of pipe, d, ft	1.25	
wetted area, sf =	1.23	
wetted perimeter, P, ft =	3.93	
R =	0.31	
Slope, ft/ft =	0.02	
Full Flow Velocity, ft/s =	**8.82**	
Full Flow Q, cfs =	**10.83**	**Capacity Ok**

Pipe ID	P#2	100-Year Swale-1 and Swale-2 Flow
Upstream Str	IN-2	
Downstream Str	MH-1	
peak Discharge, cfs	3.7	
Pipe Diamater, in	15.00	
Manning's N	0.011	
% Slope	1.00	
diameter of pipe, d, ft	1.25	
wetted area, sf =	1.23	
wetted perimeter, P, ft =	3.93	
R =	0.31	
Slope, ft/ft =	0.01	
Full Flow Velocity, ft/s =	**6.24**	
Full Flow Q, cfs =	**7.65**	**Capacity Ok**

Pipe ID	P#3	
Upstream Str	MH-1	
Downstream Str	BASIN	
peak Discharge, cfs	3.7	100-Year Swale-1 and Swale-2 Flow
Pipe Diamater, in	15.00	
Manning's N	0.011	
% Slope	1.00	
diameter of pipe, d, ft	1.25	
wetted area, sf =	1.23	
wetted perimeter, P, ft =	3.93	
R =	0.31	
Slope, ft/ft =	0.01	
Full Flow Velocity, ft/s =	**6.24**	
Full Flow Q, cfs =	**7.65**	**Capacity Ok**

Pipe ID	P#5,6	
Upstream Str		
Downstream Str		
peak Discharge, cfs	7.26	100-Year Basin Discharge
Pipe Diamater, in	15.00	
Manning's N	0.011	
% Slope	2.25	
diameter of pipe, d, ft	1.25	
wetted area, sf =	1.23	
wetted perimeter, P, ft =	3.93	
R =	0.31	
Slope, ft/ft =	0.0225	
Full Flow Velocity, ft/s =	**9.36**	
Full Flow Q, cfs =	**11.48**	**Capacity Ok**

PENNEAST-BLUE MOUNTAIN INTERCONNECT
LEVEL SPREADER

From Pennsylvania Stormwater Best Management Manual Chapter 6.8.1 Design Consideration 7

Conventional level spreaders designed to diffuse all flow rates should be sized based on the following:

For grass or thick ground cover vegetation:

a) 13 linear feet of level spreader for every 1 cfs flow
b) Slopes of 8% or less from level spreader to toe of slope

For forested areas with little or no ground cover vegetation:

a) 100 linear feet of level spreader for every 1 cfs flow
b) Slopes of 6% or less from level spreader to toe of slope

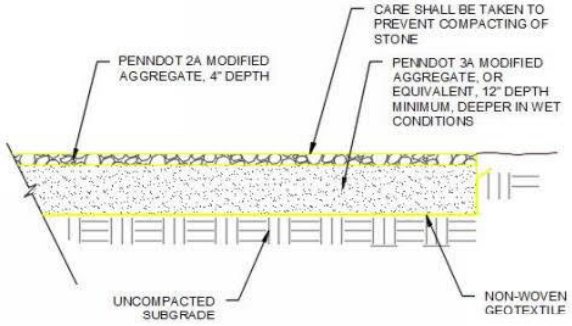
Level Spreader ID	LS-1	
Level Spreader Discharge Type	Subsurface	
10-YR Peak Discharge, cfs	1.61	10-Year Basin Discharge from Model Hydrograph 12
DS Ground Cover	Grass	
Crest Elev.	639.75	
Design Criteria cfs/lf	13.0	
Calculated Crest Length, ft	21	
Design Crest Length, ft	**30**	
Weir Coefficient	3.33	Use sharp crested value to calculate higher velocity
Weir Head (H)	0.06	to be conservative.
Flow Area	1.91	
Velocity	0.84	
Velocity Non-Erosive	YES	

In accordance with Pennsylvania Stormwater Best Management Practices Manual - Chapter 6.8.1

AT SURFACE INFILTRATION AREA VOLUME AND DRAW DOWN TIME

Infiltration Area, sq ft	2,285
Voids Ratio	40%
Area Depth, in	12
Effective Area Depth, in	4.8
Calculated Volume, cu ft	914

Infitration Rate, in/hr	2.63
Drain Time, hr	1.83

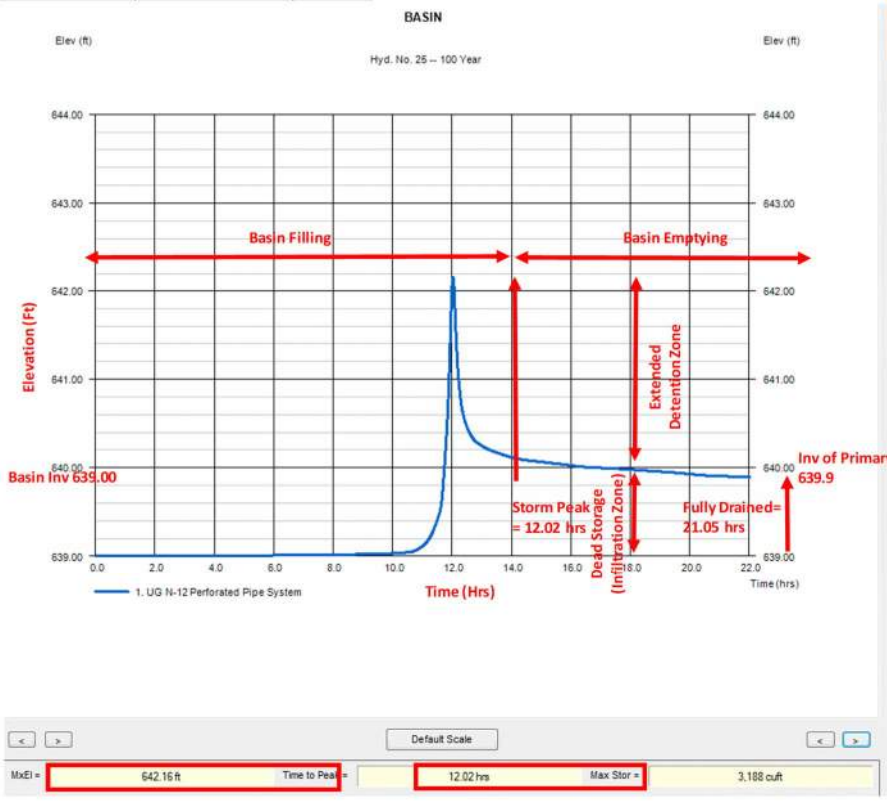


PAD INFILTRATION AREA
CROSS SECTION DETAIL
(COMPACTION TO BE MINIMIZED)
N.T.S.

BASIN DEWATERING TIME CALCULATIONS

BASIN NAME	UG-BASIN	
BASIN BARREL DIA., FT	3	
BMTP-6, IN/HR	6	
BMTP-4, IN/HR	4.5	
AVERAGE, IN/HR	5.25	
FOS	**2.00**	**BASIN FLOOD TEST HAS SAFETY FACTOR BUILT IN*
DESIGN RATE, IN/HR	**2.63**	
INFILTRATION OF STORAGE VOLUME BELOW PRIMARY ORIFICE		
BASIN INV. EL., FT	639.00	
BASIN PIPE INV. EL., FT	639.50	
BASIN FULL ELEV., FT	642.16	*100-YEAR EVENT*
BASIN DEPTH, FT	3.50	
100-YEAR DEWATERING DEPTH, FT	3.16	
ROCK BED DEPTH, FT	0.50	
POROSITY, %	40	
ROCK BED DEPTH ADJUSTED FOR POROSITY, FT	0.20	
ADJUSTED 100-YEAR DEWATERING DEPTH, FT	2.86	
TOP OF DEAD STORAGE EL., FT	639.90	
DELTA STORAGE DEPTH, IN	7.20	
DRAIN TIME (1)	**2.74**	*DRAIN TIME FOR DEAD STORAGE BELOW PRIMARY ORIFICE*

INFILTRATION OF STORAGE VOLUME ABOVE PRIMARY ORIFICE (THROUGH OUTLET STR)



Time (hrs)	Elev (ft)
20.72	639.91
20.73	639.91
20.75	639.91
20.77	639.91
20.78	639.91
20.80	639.91
20.82	639.91
20.83	639.91
20.85	639.91
20.87	639.91
20.88	639.91
20.90	639.91
20.92	639.91
20.93	639.91
20.95	639.91
20.97	639.91
20.98	639.91
21.00	639.91
21.02	639.91
21.03	639.90
21.05	639.90
21.07	639.90
21.08	639.90
21.10	639.90
21.12	639.90
21.13	639.90
21.15	639.90
21.17	639.90

DRAIN TIME (2)	**9.03**	*DRAIN TIME FROM 100-YEAR STORM PEAK TO DEAD STORAGE ELEVATION*
TOTAL DRAIN TIME	**11.77**	

Basin Infiltration Volume Table

Pond No. 1 - UG N-12 Perforated Pipe System

Pond Data

UG Chambers -Invert elev. = 639.50 ft, Rise x Span = 3.00 x 3.00 ft, Barrel Len = 65.00 ft, No. Barrels = 4, Slope = 0.00%, Headers = Yes
Encasement -Invert elev. = 639.00 ft, Width = 5.25 ft, Height = 4.50 ft, Voids = 40.00%

Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (cuft)	Total storage (cuft)
0.00	639.00	n/a	0	0
0.45	639.45	n/a	285	285
0.90	639.90	n/a	387	673
1.35	640.35	n/a	483	1,155
1.80	640.80	n/a	519	1,674
2.25	641.25	n/a	529	2,203
2.70	641.70	n/a	516	2,720
3.15	642.15	n/a	476	3,196
3.60	642.60	n/a	369	3,565
4.05	643.05	n/a	285	3,850
4.50	643.50	n/a	285	4,135

Culvert / Orifice Structures

	[A]	[B]	[C]	[PrfRsr]
Rise (in)	= 18.00	10.00	0.00	0.00
Span (in)	= 18.00	9.00	0.00	0.00
No. Barrels	= 1	1	0	0
Invert El. (ft)	= 639.00	639.90	0.00	0.00
Length (ft)	= 65.00	0.00	0.00	0.00
Slope (%)	= 1.00	0.00	0.00	n/a
N-Value	= .013	.013	.013	n/a
Orifice Coeff.	= 0.60	0.60	0.60	0.60
Multi-Stage	= n/a	Yes	No	No

Weir Structures

	[A]	[B]	[C]	[D]
Crest Len (ft)	= 4.00	0.75	0.00	0.00
Crest El. (ft)	= 642.33	640.90	0.00	0.00
Weir Coeff.	= 3.33	3.33	3.33	3.33
Weir Type	= Rect	Rect	---	---
Multi-Stage	= No	Yes	No	No

Exfil.(in/hr) = 2.930 (by Wet area)
TW Elev. (ft) = 0.00

Note: Culvert/Orifice outflows are analyzed under inlet (ic) and outlet (oc) control. Weir risers checked for orifice conditions (ic) and submergence (s).

Stage / Storage / Discharge Table

Stage ft	Storage cuft	Elevation ft	Clv A cfs	Clv B cfs	Clv C cfs	PrfRsr cfs	Wr A cfs	Wr B cfs	Wr C cfs	Wr D cfs	Exfil cfs	User cfs	Total cfs
0.00	0	639.00	0.00	0.00	---	---	0.00	0.00	---	---	0.000	---	0.000
0.05	29	639.04	0.00	0.00	---	---	0.00	0.00	---	---	0.102	---	0.102
0.09	57	639.09	0.00	0.00	---	---	0.00	0.00	---	---	0.103	---	0.103
0.14	86	639.13	0.00	0.00	---	---	0.00	0.00	---	---	0.105	---	0.105
0.18	114	639.18	0.00	0.00	---	---	0.00	0.00	---	---	0.107	---	0.107
0.22	143	639.22	0.00	0.00	---	---	0.00	0.00	---	---	0.109	---	0.109
0.27	171	639.27	0.00	0.00	---	---	0.00	0.00	---	---	0.110	---	0.110
0.31	200	639.31	0.00	0.00	---	---	0.00	0.00	---	---	0.112	---	0.112
0.36	228	639.36	0.00	0.00	---	---	0.00	0.00	---	---	0.114	---	0.114
0.40	257	639.40	0.00	0.00	---	---	0.00	0.00	---	---	0.115	---	0.115
0.45	285	639.45	0.00	0.00	---	---	0.00	0.00	---	---	0.117	---	0.117
0.50	324	639.49	0.00	0.00	---	---	0.00	0.00	---	---	0.119	---	0.119
0.54	363	639.54	0.00	0.00	---	---	0.00	0.00	---	---	0.121	---	0.121
0.58	402	639.59	0.00	0.00	---	---	0.00	0.00	---	---	0.122	---	0.122
0.63	440	639.63	0.00	0.00	---	---	0.00	0.00	---	---	0.124	---	0.124
0.68	479	639.67	0.00	0.00	---	---	0.00	0.00	---	---	0.126	---	0.126
0.72	518	639.72	0.00	0.00	---	---	0.00	0.00	---	---	0.127	---	0.127
0.76	556	639.76	0.00	0.00	---	---	0.00	0.00	---	---	0.129	---	0.129
0.81	595	639.81	0.00	0.00	---	---	0.00	0.00	---	---	0.131	---	0.131
0.86	634	639.85	0.00	0.00	---	---	0.00	0.00	---	---	0.133	---	0.133
0.90	673	639.90	0.00	0.00			0.00	0.00	---	---	0.134	---	0.134
0.94	721	639.95	0.03 ic	0.02 ic			0.00	0.00	---	---	0.136	---	0.160
0.99	769	639.99	0.07 ic	0.07 ic			0.00	0.00	---	---	0.138	---	0.207
1.03	817	640.03	0.13 ic	0.13 ic			0.00	0.00	---	---	0.140	---	0.266
1.08	866	640.08	0.20 ic	0.19 ic			0.00	0.00	---	---	0.141	---	0.336
1.13	914	640.12	0.27 ic	0.27 ic			0.00	0.00	---	---	0.143	---	0.415
1.17	962	640.17	0.36 ic	0.36 ic			0.00	0.00	---	---	0.145	---	0.503
1.22	1,010	640.21	0.46 ic	0.45 ic			0.00	0.00	---	---	0.146	---	0.598
1.26	1,059	640.26	0.55 ic	0.55 ic			0.00	0.00	---	---	0.148	---	0.699
1.30	1,107	640.30	0.66 ic	0.66 ic			0.00	0.00	---	---	0.150	---	0.808
1.35	1,155	640.35	0.77 ic	0.77 ic	---	---	0.00	0.00	---	---	0.152	---	0.922
1.39	1,207	640.40	0.89 ic	0.89 ic	---	---	0.00	0.00	---	---	0.153	---	1.042

Primary Orifice Invert=639.9

Storage Volume = 673 cuft

Continues on next page...

UG N-12 Perforated Pipe System

Stage / Storage / Discharge Table

Stage ft	Storage cuft	Elevation ft	Clv A cfs	Clv B cfs	Clv C cfs	PrfRsr cfs	Wr A cfs	Wr B cfs	Wr C cfs	Wr D cfs	Exfil cfs	User cfs	Total cfs
1.44	1,259	640.44	1.02 ic	1.01 ic	---	---	0.00	0.00	---	---	0.155	---	1.168
1.49	1,311	640.48	1.16 ic	1.14 ic	---	---	0.00	0.00	---	---	0.157	---	1.299
1.53	1,363	640.53	1.31 ic	1.28 ic	---	---	0.00	0.00	---	---	0.158	---	1.435
1.58	1,415	640.57	1.42 ic	1.42 ic	---	---	0.00	0.00	---	---	0.160	---	1.576
1.62	1,467	640.62	1.59 ic	1.56 ic	---	---	0.00	0.00	---	---	0.162	---	1.721
1.66	1,518	640.66	1.71 ic	1.71 ic	---	---	0.00	0.00	---	---	0.164	---	1.872
1.71	1,570	640.71	1.90 ic	1.86 ic	---	---	0.00	0.00	---	---	0.165	---	2.026
1.75	1,622	640.75	2.03 ic	1.99 ic	---	---	0.00	0.00	---	---	0.167	---	2.159
1.80	1,674	640.80	2.10 ic	2.09 ic	---	---	0.00	0.00	---	---	0.169	---	2.261
1.85	1,727	640.84	2.23 ic	2.19 ic	---	---	0.00	0.00	---	---	0.170	---	2.358
1.89	1,780	640.89	2.30 ic	2.28 ic	---	---	0.00	0.00	---	---	0.172	---	2.451
1.93	1,833	640.93	2.38 ic	2.37 ic	---	---	0.00	0.02	---	---	0.174	---	2.556
1.98	1,886	640.98	2.51 ic	2.45 ic	---	---	0.00	0.06	---	---	0.176	---	2.683
2.03	1,939	641.02	2.66 ic	2.53 ic	---	---	0.00	0.11	---	---	0.177	---	2.820
2.07	1,992	641.07	2.80 ic	2.61 ic	---	---	0.00	0.17	---	---	0.179	---	2.966
2.12	2,044	641.11	2.95 ic	2.69 ic	---	---	0.00	0.25	---	---	0.181	---	3.118
2.16	2,097	641.16	3.11 ic	2.76 ic	---	---	0.00	0.33	---	---	0.182	---	3.276
2.20	2,150	641.20	3.26 ic	2.84 ic	---	---	0.00	0.42	---	---	0.184	---	3.440
2.25	2,203	641.25	3.42 ic	2.91 ic	---	---	0.00	0.52	---	---	0.186	---	3.610
2.30	2,255	641.29	3.64 ic	2.98 ic	---	---	0.00	0.62	---	---	0.188	---	3.784
2.34	2,306	641.34	3.80 ic	3.04 ic	---	---	0.00	0.73	---	---	0.189	---	3.962
2.38	2,358	641.38	3.96 ic	3.11 ic	---	---	0.00	0.84	---	---	0.191	---	4.145
2.43	2,410	641.43	4.19 ic	3.18 ic	---	---	0.00	0.96	---	---	0.193	---	4.331
2.47	2,461	641.47	4.34 ic	3.24 ic	---	---	0.00	1.09	---	---	0.194	---	4.522
2.52	2,513	641.52	4.57 ic	3.30 ic	---	---	0.00	1.22	---	---	0.196	---	4.716
2.57	2,565	641.56	4.72 ic	3.36 ic	---	---	0.00	1.35	---	---	0.198	---	4.914
2.61	2,616	641.61	4.94 ic	3.42 ic	---	---	0.00	1.49	---	---	0.200	---	5.115
2.66	2,668	641.65	5.16 ic	3.48 ic	---	---	0.00	1.64	---	---	0.201	---	5.320
2.70	2,720	641.70	5.37 ic	3.54 ic	---	---	0.00	1.79	---	---	0.203	---	5.529
2.74	2,767	641.74	5.57 ic	3.60 ic	---	---	0.00	1.94	---	---	0.205	---	5.741
2.79	2,815	641.79	5.76 ic	3.65 ic	---	---	0.00	2.10	---	---	0.206	---	5.956
2.84	2,862	641.84	6.00 ic	3.71 ic	---	---	0.00	2.26	---	---	0.208	---	6.174
2.88	2,910	641.88	6.19 ic	3.76 ic	---	---	0.00	2.42	---	---	0.210	---	6.395
2.92	2,958	641.92	6.43 ic	3.82 ic	---	---	0.00	2.59	---	---	0.212	---	6.619
2.97	3,005	641.97	6.61 ic	3.84 ic	---	---	0.00	2.76	---	---	0.213	---	6.816
3.02	3,053	642.01	6.81 ic	3.85 ic	---	---	0.00	2.94	---	---	0.215	---	7.006
3.06	3,100	642.06	6.98 ic	3.86 ic	---	---	0.00	3.12	---	---	0.217	---	7.199
3.11	3,148	642.10	7.09 oc	3.79 ic	---	---	0.00	3.30	---	---	0.218	---	7.311
3.15	3,196	642.15	7.29 oc	3.80 ic	---	---	0.00	3.49	---	---	0.220	---	7.509
3.19	3,233	642.20	7.49 oc	3.81 ic	---	---	0.00	3.68	---	---	0.222	---	7.708
3.24	3,269	642.24	7.69 oc	3.81 ic	---	---	0.00	3.87	---	---	0.224	---	7.909
3.29	3,306	642.28	7.89 oc	3.82 ic	---	---	0.00	4.07	---	---	0.225	---	8.111
3.33	3,343	642.33	8.09 oc	3.82 ic	---	---	0.00	4.27	---	---	0.227	---	8.315
3.38	3,380	642.37	8.29 oc	3.82 ic	---	---	0.13	4.47	---	---	0.229	---	8.648
3.42	3,417	642.42	8.50 oc	3.82 ic	---	---	0.36	4.68	---	---	0.230	---	9.087
3.47	3,454	642.46	8.70 oc	3.82 ic	---	---	0.66	4.89	---	---	0.232	---	9.596
3.51	3,491	642.51	8.91 oc	3.81 ic	---	---	1.02	5.10 s	---	---	0.234	---	10.16
3.56	3,528	642.55	9.11 oc	3.81 ic	---	---	1.42	5.30 s	---	---	0.236	---	10.77
3.60	3,565	642.60	9.31 oc	3.80 ic	---	---	1.87	5.50 s	---	---	0.237	---	11.41
3.64	3,593	642.65	9.50 oc	3.80 ic	---	---	2.35	5.70 s	---	---	0.239	---	12.09
3.69	3,622	642.69	9.69 oc	3.80 ic	---	---	2.88	5.89 s	---	---	0.241	---	12.81
3.73	3,650	642.73	9.88 oc	3.79 ic	---	---	3.43	6.09 s	---	---	0.242	---	13.55
3.78	3,679	642.78	10.06 oc	3.79 ic	---	---	4.02	6.28 s	---	---	0.244	---	14.33
3.83	3,707	642.82	10.25 oc	3.78 ic	---	---	4.64	6.47 s	---	---	0.246	---	15.13
3.87	3,736	642.87	10.43 oc	3.77 ic	---	---	5.28	6.66 s	---	---	0.248	---	15.96
3.92	3,764	642.91	10.61 oc	3.77 ic	---	---	5.96	6.84 s	---	---	0.249	---	16.82
3.96	3,793	642.96	10.79 oc	3.76 ic	---	---	6.66	7.03 s	---	---	0.251	---	17.70
4.01	3,821	643.00	10.97 oc	3.75 ic	---	---	7.38	7.22 s	---	---	0.253	---	18.60
4.05	3,850	643.05	11.15 oc	3.74 ic	---	---	8.14	7.40 s	---	---	0.254	---	19.54
4.09	3,879	643.09	11.32 oc	3.74 ic	---	---	8.91	7.58 s	---	---	0.256	---	20.49
4.14	3,907	643.14	11.49 oc	3.73 ic	---	---	9.71	7.77 s	---	---	0.258	---	21.46
4.18	3,936	643.18	11.66 oc	3.72 ic	---	---	10.53	7.95 s	---	---	0.260	---	22.45
4.23	3,964	643.23	11.83 oc	3.71 ic	---	---	11.37	8.13 s	---	---	0.261	---	23.47
4.28	3,993	643.27	12.00 oc	3.70 ic	---	---	12.23	8.31 s	---	---	0.263	---	24.50
4.32	4,021	643.32	12.17 oc	3.69 ic	---	---	13.12	8.48 s	---	---	0.265	---	25.55
4.37	4,050	643.36	12.33 oc	3.67 ic	---	---	14.02	8.66 s	---	---	0.266	---	26.62
4.41	4,078	643.41	12.50 oc	3.66 ic	---	---	14.95	8.83 s	---	---	0.268	---	27.71
4.46	4,107	643.45	12.66 oc	3.65 ic	---	---	15.89	9.01 s	---	---	0.270	---	28.82
4.50	4,135	643.50	12.82 oc	3.64 ic	---	---	16.86	9.18 s	---	---	0.272	---	29.95

...End

D. Standard E&S Worksheet #22

STANDARD E&S WORKSHEET # 22
PLAN PREPARER RECORD OF TRAINING AND EXPERIENCE IN EROSION AND SEDIMENT POLLUTION CONTROL METHODS AND TECHNIQUES

NAME OF PLAN PREPARER: MICHAEL DENICHILO

FORMAL EDUCATION:

Name of College or Technical Institute: VILLANOVA UNIVERSITY

Curriculum or Program: CIVIL AND ENVIRONMENTAL ENGINEERING (BS)
WATER RESOURCES AND ENVIRONMENTAL ENGINEERING (MS)

Dates of Attendance: **From:** 2004 / 2009 **To:** 2008 / 2011

Degree Received BACHELOR OF SCIENCE / MASTER OF SCIENCE

OTHER TRAINING:

Name of Training:	FEDERAL ENERGY REGULATORY COMMISSION (FERC) - ENVIRONMENTAL REVIEW AND COMPLIANCE FOR NATURAL GAS FACILITIES	GAS TECHNOLOGY INSTITUTE (GTI) - TRANSMISSION PIPELINE DESIGN & CONSTRUCTION PRACTICES
Presented By:	DAVID HANOBIC / DANNY LAFFOON / MAGGIE SUTER / LARRY BROWN / TIM DRAKE / JENNIFER LEE / MIKE TIMPSON / JANELLE RIELAND / JOE HOLLER	GUS / BILL
Date:	MARCH 7-9, 2017	NOVEMBER 6-10, 2017

EMPLOYMENT HISTORY:

Current Employer: MOTT MACDONALD

Telephone: (973) 379-3400

Former Employer: N/A

Telephone: N/A

RECENT E&S PLANS PREPARED:

Name of Project:	Rahway River Pipe Replacement	Rivervale to Market Project	
County:	Union County, NJ	Bergen County, NJ	
Municipality:	Linden	Carlstadt, River Vale, Emerson & Paramus	
Permit Number:	2017-2960	18-1148	
Approving Agency:	Somerset-Union Soil Conservation District	Bergen County Soil Conservation District	

E. E&SCP Drawings

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