Supply Header Project

Erosion and Sediment Control General Permit (ESCGP-2)

Registration

Prepared by:

ERM

March 2017

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DOMINION TRANSMISSION, INC.

SUPPLY HEADER PROJECT

SECTION 1 – EROSION AND SEDIMENT CONTROL GENERAL PERMIT REGISTRATION

- Notice of Intent Application Form
- Notice of Intent Checklist
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- Greene County Conservation District Project Review Application

pennsylvania
DEPARTMENT OF ENVIRONMENTAL PROTECTION

COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF ENVIRONMENTAL PROTECTION
OFFICE OF WATER MANAGEMENT
OFFICE OF OIL AND GAS MANAGEMENT

OFFICIAL USE ONLY
ID #
Date Received

NOTICE OF INTENT (NOI) FOR COVERAGE UNDER THE EROSION AND SEDIMENT CONTROL GENERAL PERMIT (ESCGP-2) FOR EARTH DISTURBANCE ASSOCIATED WITH OIL AND GAS EXPLORATION, PRODUCTION, PROCESSING, OR TREATMENT OPERATIONS OR TRANSMISSION FACILITIES

READ THE INSTRUCTIONS PROVIDED IN THIS PERMIT APPLICATION PACKAGE BEFORE COMPLETING THIS FORM.

PLEASE PRINT OR TYPE INFORMATION IN BLACK OR BLUE INK.

SECTION A. APPLICANT INFORMATION

APPLICATION TYPE NEW ☒ RENEWAL ☐ MAJOR MODIFICATIONS ☐ EXPEDITED ☐ PHASED ☐

Applicant's Last Name (If applicable) Hartz	First Name Leslie	MI	Phone (804) 771-4468 FAX	
Organization Name or Registered Fictitious Name Dominion Transmission, Inc.			Phone FAX	
Mailing Address 707 W. Main Street	City Richmond		State VA	ZIP + 4 23219
Email Address leslie.hartz@dom.com				
Co-Applicant's Last Name (If applicable)	First Name	MI	Phone FAX	
Organization Name or Registered Fictitious Name			Phone FAX	
Mailing Address	City		State	ZIP + 4
Email Address				

SECTION B. SITE INFORMATION

Site Name Supply Header Project		
Site Location Crayne Compressor Station		
Site Location – City Waynesburg	State PA	ZIP+4 15370

Detailed Written Directions to Site

Follow I-376 W and I-79 S to US-19 S in Washington Township. Take exit 19 from I-79 S toward PA-221/Jefferson/Ruff Creek. Turn left onto US-19 S and then left onto PA-221 S for three miles. Turn right onto Kennel Road/TRS 569 and continue to follow Kennel Road for 1.8 miles. Continue onto Poverty Run Road and the Crayne Compressor Station is located at the western intersection of Jefferson Road (SR 188) and Poverty Run Road.

County	Municipality	City	Boro	Twp.
Greene	Franklin/Morgan	☐	☐	☒

SECTION C. PROJECT INFORMATION

1. Total Project Area/Project Site (Ac):	16.5	Total Disturbed Area (Ac):	5.6

2. Project Name Supply Header Project

3. Project Type (Check all that apply)

☐ Oil/Gas Well ☐ Transmission Facility ☐ Gathering Facility ☐ Processing Facility ☐ Treatment Facility
☐ Centralized Fresh Water Impoundment ☐ Centralized Wastewater Impoundment ☐ Water Pipeline
☐ Ground/Surface Water Withdrawal Site ☒ Other

If Oil/Gas well, is the well conventional or unconventional? ☐ Conventional ☐ Unconventional

Project Description

Addition of one new gas-driven turbine which will provide 7,700 horsepower of additional compression. The modifications will include expansion to the existing compressor building within the existing chain-link security fenced-in site. Equipment at the station will include gas filter/separators, gas coolers, inlet air filters, exhaust silencers, tanks, blowdown silencers, heaters, and auxiliary generators. Workspace outside the existing fenceline will be required for construction activities such as welding, coating, and storing construction materials. Following construction, these areas will be restored to pre-construction conditions.

Additional information is available in Attachment 2.

4. Please provide the latitude and longitude coordinates for the center of the project. The coordinates should be in degrees, minutes seconds (DD MM SS.SS) and North American Datum 1983. For linear projects provide the project's termini.

Latitude 39 degrees 55 minutes 08.8 seconds Longitude -80 degrees 07 minutes 19.2 seconds

Latitude _____ degrees _____ minutes _____ seconds Longitude _____ degrees _____ minutes _____ seconds

Horizontal Collection Method: ☒ GPS ☐ Interpolated from U.S.G.S. Topographic Map ☐ DEP's eMAP

5. U.S.G.S. 7.5 min. Quad Map Name Mather (Include a copy of the project area on the 7.5 min quad map)

6. Will the project be conducted as a phased permit project? ☐ Yes ☒ No
If Yes, Include Master Site Plan Estimated Timetable for Phased Projects. ☐ Additional sheet(s) attached.

Phase No. or Name	Description	Total Area	Disturbed Area	Start Date	End Date

7. List existing and previous land use for a minimum of the previous 5 years. Industrial and open land

8. Other Pollutants: Will the stormwater discharge contain pollutional substances other than sediment? ☐ Yes ☒ No
If yes, explain and provide any available quantitative data.

9. Will fuels, chemicals, solvents, other hazardous waste or materials be used or stored on site during earth disturbance activities?
Yes ☒ No ☐ **(If yes, a PPC Plan must be maintained on site during earth disturbance.)**

10. Does the project have the potential to discharge to siltation-impaired waters?
Yes ☐ No ☒ **(If yes, show how the project will not result in a net change in volume, rate or water quality. See section G below.)**

11. Has the project site been investigated to identify naturally occurring geologic formations or soil types that may cause pollution when disturbed?

Yes ☒ No ☐

Have naturally occurring geologic formations or soil types that may cause pollution when disturbed been identified?

Yes ☒ No ☐ **(If yes, BMPs to avoid or minimize the potential pollution must be utilized.)**

12. Has the project site been analyzed to determine potential thermal impacts to surface waters of the Commonwealth?

Yes ☒ No ☐

Have potential thermal impacts to surface water of the Commonwealth from earth disturbance activity been identified?

Yes ☒ No ☐ **(If yes, BMPs to avoid, minimize or mitigated the thermal pollution must be utilized.)**

13. Have the E&S Plan and PCSM/SR Plan been planned, designed and implemented to be consistent?

Yes ☒ No ☐

14. Have existing and/or proposed Riparian Forest Buffers been identified?

Yes ☐ N/A ☒ **(If not, they must be shown on the plans.)**

15. Is a riparian buffer waiver being requested?

Yes ☐ No ☒

If yes, the applicant requesting a waiver must submit a written request that demonstrates that reasonable alternatives will meet the requirements of 25 Pa. Code § 102.14 and to demonstrate that any existing riparian buffer will remain undisturbed to the extent practicable.

16. Have antidegradation implementation requirements for special protection waters been addressed?

Yes ☐ No ☐ **(If no, antidegradation requirements must be included in the plan.)** N/A ☒

17. Has the seasonal high groundwater level been identified at all excavation locations for pits and impoundments other than those which will contain top-hole water, fresh water and uncontaminated drill cuttings?

Yes ☐ No ☐ N/A ☒ **(If no, be advised that a 20-inch separation between the seasonal high groundwater and the bottom of all pits and impoundments containing pollutional substances is required.)**

18. Receiving Water/Watershed Name

Ruff Creek/Tenmile Creek Watershed

Chapter 93, Designated Use and Existing Use Stream Classification

☐ High Quality ☐ Exceptional Value
☒ Other WWF

☐ Siltation-impaired

Secondary Receiving Water N/A

Name of Municipal or Private Separate Storm Sewer Operator

N/A

19. Is an Expedited Review being requested? Yes ☐ No ☒

If yes, be advised that the Expedited Review is not available for all projects. Refer to the "Expedited Review Process" Item 8, Page 17 of the ESCGP-2 Instructions to determine if your project is eligible.

SECTION D. EROSION AND SEDIMENT CONTROL PLAN BMPS

See the attached Instructions on how to complete this section.

Erosion and Sediment Control Plan BMPs should be designed to minimize accelerated erosion and sedimentation through limiting the extent and duration of earth disturbance, protection of existing drainage and vegetation, limiting soil compaction and controlling the generation of increased runoff. The Department recommends the use of the Erosion and Sediment Control BMP Manual to achieve this goal. The E&S Plan must meet the requirements of Pa. Code § 102.4(b) and submitted with the NOI.

1. E & S Plan

The E & S Plan must satisfy at least one of subparagraph A or B below.

Provide a brief summary of proposed BMPs and their performance to manage E & S for the project. If E & S BMPs and their application do not follow the guidelines referenced in the Pa. Erosion and Sediment Pollution Control Program Manual, provide documentation to demonstrate performance equivalent to, or better than, the BMPs in the Manual.

The plan is designed to provide guidelines, best management practices, and typical techniques for the installation and implementation of soil erosion and sediment control measures while permitting adequate flexibility to use the most appropriate best management practice measures based on site-specific conditions. The intent is to provide general information on the pipeline construction process and sequence, and to describe specific measures that will be employed during and following construction to minimize impacts to the environment. Specific BMPs are outlined in the ESCP and PCSM attached with the NOI.

A. ☒ E & S plan is designed using BMPs in the Pennsylvania Erosion & Sedimentation Pollution Control Manual (ESPC) (Technical Guidance #3632134-008/March 2012)

OR

B. ☐ E & S plan is designed using an alternative BMP or design standard

2. Riparian Buffer Information

A. Will you be protecting, converting or establishing a riparian buffer or a riparian forest buffer as a part of this project?

Protect ☐ Yes ☒ No Convert ☐ Yes ☒ No Establish ☐ Yes ☒ No

B. Will you be protecting, converting or establishing a voluntary riparian forest buffer as part of this project?

☐ Yes ☒ No

C. Are you proposing to conduct oil and gas activities for which site reclamation or restoration is required as part of the Chapter 78 permit authorization in a high quality or exceptional value watershed that is currently attaining its designated use and within 150 ft of a perennial or intermittent river, stream or creek or lake, pond or reservoir?

☐ Yes ☒ No If yes, provide a demonstration that any existing riparian buffer is undisturbed to the extent practicable.

D. If the regulations require a riparian buffer or riparian forest buffer and you are not providing one, list the waiver provisions in the Chapter 102 regulations, Section 102.14(d)(2)(i)-(vi), that you are requesting and provide additional documentation to demonstrate reasonable alternatives for compliance with 102.14 requirements and to demonstrate that any existing reparian buffer will remain undisturbed to the extent practicable.

N/A

Note: If the proposed activity protects, converts or establishes a riparian or riparian forest buffer a Buffer Management Plan is required in the PCSM Plan.

3. Thermal Impacts Analysis

Please explain how thermal impacts associated with this project were avoided, minimized, or mitigated.

Avoid impacts to all surface waters and wetlands to the maximum extent possible to maintain existing hydrology and encourage natural thermal buffering; locate proposed facilities as close as possible to existing facilities to minimize proposed impervious cover; choose areas with minimal existing tree cover to reduce removal of existing tree canopy; immediately revegetate disturbed areas to help cool runoff prior to discharge.

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 one being proposed:

- 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; and
- Increased stream temperatures due to reduced base flow caused by reduction in site's infiltration capacity.

Siting of the proposed facilities was limited by the location of the existing facilities and pipelines which they will service, 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. The Project has implemented the following Site Layout Criteria to help prevent or minimize thermal impacts to receiving waters: avoid impacts to surface waters and wetlands to the maximum extent possible; locate proposed facilities as close as possible to existing facilities; and choose areas with minimal existing tree cover.

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 and the limit of tree clearing to the minimum area necessary to construct the proposed facilities will preserve existing vegetative cover and maintain the infiltration and evapotranspiration capacity of undisturbed areas to the maximum extent practicable. Also, disturbed areas will be immediately revegetated to help cool runoff prior to discharge.

SECTION E. SITE RESTORATION (SR) PLAN BMPS

See the attached Instructions on how to complete this section.

If this section is not applicable to your project, please indicate by checking this box: N/A ☐

For earth disturbance projects involving oil and gas activities authorized by Chapter 78 (well pads) or pipelines and other similar utility infrastructure provide the information outlined below. If your project includes both oil and gas activities authorized by Chapter 78 (well pads) or pipelines and other similar utility infrastructure and other activities requiring Post Construction Stormwater Management, provide the information outlined in this Section as well as Section F.

Site Restoration BMPs should be designed to use natural measures to eliminate pollution, infiltrate runoff, not require extensive construction/maintenance activity, promote pollutant reduction, and preserve the integrity of stream channels. The Department recommends the use of PA Stormwater BMP manual to achieve this goal. The SR Plan must meet the requirements of Pa Code § 102.8(n) and be submitted with the NOI.

1. **Site Restoration Plan Information** – The Site Restoration Plan should be designed to maximize volume reduction technologies, eliminate (where possible) or minimize point source discharges to surface waters, preserve the integrity of stream channels, and protect the physical, biological and chemical qualities of the receiving surface water.

Design standards applied to develop the Site Restoration Plan. Check those that apply.

☐ Act 167 Plan – The attached SR Plan is consistent with an applicable approved Act 167 Plan.

Complete the following for all approved Act 167 Stormwater Management Plans. (Use additional sheets if necessary)

Act 167 Plan Name	Date Adopted	
		Consistency Letter Included ☐
____________	____________	Verification Report Included ☐

***NOTE:** A consistency letter is not required if a verification report is provided. Please see NOI Instructions.* The Site Restoration Plan must satisfy either sub paragraph A, B, **<u>or</u>** C below. Check those that apply.

A. ☐ Act 167 Plan approvals on or after January 2005 - The attached PCSM Plan, in its entirety, is consistent with all requirements pertaining to rate, volume, and water quality from an Act 167 Stormwater Management Plan approved by DEP on or after January 2005. Letter A must be checked if a current, DEP approved Act 167 plan exists.

B. ☒ The PCSM meets the standard design criteria from the PA Stormwater BMP Manual. For projects involving oil and gas activities authorized by a permit issued under Chapter 78 (well pads) or pipelines and other similar utility infrastructure, post construction stormwater management requirements are met for all areas that are restored to preconstruction conditions or to a condition of meadow in good condition or better.

C. ☐ Alternative Design Standard – The attached PCSM Plan was developed using approaches other than 102.8(g)(2). Demonstrate/explain in the space provided below how this standard will be either more protective than what is required in 102.8(g)(2) or will maintain and protect existing water quality and existing and designated uses.

2. Riparian Buffer Information

A. Will you be protecting, converting or establishing a riparian buffer or a riparian forest buffer as part of this activity?
Protect ☐ Yes ☒ No Convert ☐ Yes ☒ No Establish ☐ Yes ☒ No

B. Will you be protecting, converting or establishing a voluntary riparian forest buffer as part of this activity?
☐ Yes ☒ No

C. Are you proposing to conduct oil and gas activities for which site reclamation or restoration is required under a permit issued under the auhtority of the 2012 Oil and Gas Act and Chapter 78 in a high quality or exceptional value watershed that is currently attaining its designated use and within 150 ft of a perennial or intermittent river, stream or creek or lake, pond or reservoir?

☐ Yes ☒ No If yes, provide a demonstration that any existing riparian buffer is undisturbed to the extent practicable.

D. If the regulations require a riparian buffer or riparian forest buffer and you are **not** providing one, list below the waiver provisions in the Chapter 102 regulations, Section 102.14(d)(i)-(vi), that you are requesting and provide additional documentation to demonstrate reasonable alternatives for compliance with 102.14 requirements and to demonstrate that any existing reparian buffer will remain undisturbed to the extent practicable.
N/A

Note: If the proposed activity protects, converts or establishes a riparian or riparian forest buffer a Buffer Management Plan is required in the PCSM Plan.

3. SUMMARY TABLE FOR SUPPORTING CALCULATION AND MEASUREMENT DATA
See Attachment D in the Instructions on how to Complete This Section

This section does not need to be completed for areas of projects involving oil and gas activities authorized by Chapter 78 (well pads) or pipelines and other similar utility infrastructure which will be restored to meadow in good condition or better or existing conditions.

Watershed Name: See Appendix C of Section 5.0

Design storm frequency 2-yr / 24-hr Rainfall amount 2.39 inches	Pre-construction	Post Construction	Net Change
Impervious area (acres)	0.901	0.970	0.069
Volume of stormwater runoff (acre-feet) without planned stormwater BMPs	1.642	1.650	0.008
Volume of stormwater runoff (acre-feet) with planned stormwater BMPs		0.558	0.009

Stormwater discharge rate for the design frequency storm	Pre-construction	Post Construction	Net Change
1) 2-Year/24-Hour	4.32	4.37	0.05
2) 10-Year/24-Hour	9.42	9.63	0.21
3) 50-year/24-Hour	16.01	16.43	0.42
4) 100-year/24-Hour	20.42	21.10	1.32

4. SUMMARY DESCRIPTION OF SITE RESTORATION BMPs

In the lists below, check the BMPs identified in the Post Construction Stormwater Management Plan. The primary function(s) of the BMP listed in the functions column (infiltration/recharge; detention/retention; water quality). Additional functions may be added if applicable to that BMP. List the stormwater volume and area of runoff to be treated by each BMP type when calculations are required. If any BMP in the Site Restoration Plan is not listed below, describe it in the space provided after "Other".

BMP	Function(s)	Volume of stormwater treated	Acres treated
Site Restoration ☒ Restore Site to Meadow in Good Condition or Better, or Existing Conditions	Infiltration/Recharge Detention/WQ Treatment	0.558 af	5.6 acres (Note: All disturbed areas will be restored to their pre-existing conditions: either gravel or vegetative condition.)
Bio-infiltration areas ☐ Infiltration Trench ☐ Infiltration Bed ☐ Infiltrated Basin	Infiltration/Recharge	____ ____ ____	____ ____ ____
Natural Area Conservation ☐ Streamside Buffer Zone ☐ Wetland Buffer Zone ☐ Sensitive Area Buffer Zone ☒ Pre-Construction Drainage Pattern Intact	Infiltration/Recharge	____ ____ ____ ____	____ ____ ____ ____
Stormwater Retention ☐ Constructed Wetlands ☐ Wet Ponds ☐ Retention Basin	Detention/Retention	____ ____ ____	____ ____ ____
Sediment and Pollutant Removal ☐ Vegetated Filter Strips ☐ Detention Basins	Water Quality Treatment	____ ____	____ ____
Access Road Design ☐ Road Crowning ☐ Ditches ☐ Turnouts ☐ Culverts ☐ Roadside Vegetated Filter Strips	Infiltration/Recharge	____ ____ ____ ____ ____	____ ____ ____ ____ ____

Stormwater Energy Dissipaters	Infiltration/Recharge		
☐ Level Spreaders ☐ Riprap Aprons ☐ Upslope Diversions ☐ ______		____ ____ ____ ____	____ ____ ____ ____

5. Off-site Discharge Analysis.

Does the activity propose any off-site discharges to areas other than surface waters? ☐ Yes ☒ No

If yes, it is the applicant's responsibility to ensure that they have legal authority for any off-site discharge.

The Applicant must provide a demonstration in both the E&S and Site Restoration Plans that the discharge will not cause erosion, damage, or a nuisance to off-site properties.

The Applicant shall 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. The Applicant is responsible for developing and implementing an adequate E&SCP(s) and submitting the Plan(s) to the PADEP for review and approval. The Contractor shall immediately stabilize the waste site upon completion of any stage or phase of earth disturbance activity at the waste site.

6. Thermal Impact Analysis.

Explain how thermal impacts associated with this project were avoided, minimized, or mitigated.

Avoid impacts to all surface waters and wetlands to the maximum extent possible to maintain existing hydrology and encourage natural thermal buffering; locate proposed facilities as close as possible to existing facilities to minimize proposed impervious cover; choose areas with minimal existing tree cover to reduce removal of existing tree canopy; immediately revegetate disturbed areas to help cool runoff prior to discharge.

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 one being proposed:

- 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; and
- Increased stream temperatures due to reduced base flow caused by reduction in site's infiltration capacity.

Siting of the proposed facilities was limited by the location of the existing facilities and pipelines which they will service, 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. The Project has implemented the following Site Layout Criteria to help prevent or minimize thermal impacts to receiving waters: avoid impacts to surface waters and wetlands to the maximum extent possible; locate proposed facilities as close as possible to existing facilities; and choose areas with minimal existing tree cover.

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 and the limit of tree clearing to the minimum area necessary to construct the proposed facilities will preserve existing vegetative cover and maintain the infiltration and evapotranspiration capacity of undisturbed areas to the maximum extent practicable. Also, disturbed areas will be immediately revegetated to help cool runoff prior to discharge.

SECTION F. POST CONSTRUCTION STORMWATER MANAGEMENT (PCSM) PLAN BMPS

See the attached Instructions on how to complete this section.

If this section is not applicable to your project, please indicate by checking this box: N/A ☐

For earth disturbance projects requiring post construction stormwater management, provide the information outlined below. If your project includes both oil and gas activities authorized under a well permit issued under the 2012 Oil and Gas Act and Chapter 78 (well pads) or pipelines and other similar utility infrastructure and other activities requiring Post Construction Stormwater Management, provide the information outlined in this Section as well as Section E.

Post Construction Stormwater Management BMPs should be designed to use natural measures to eliminate pollution, infiltrate runoff, not require extensive construction/maintenance activity, promote pollutant reduction, and preserve the integrity of stream channels. The Department recommends the use of PA Stormwater BMP manual to achieve this goal. If PCSM BMPS and their application do not follow the guidelines referenced in the PA Stormwater BMP Manual, provide documentation to demonstrate performance equivalent to, or better than, the BMPs in the Manual.

1. **Post Construction Stormwater Management Plan Information** – The Post Construction Stormwater Management Plan must meet the requirements in 25 Pa. Code §102.8 and should be designed to maximize volume reduction technologies, eliminate (where possible) or minimize point source discharges to surface waters, preserve the integrity of stream channels, and protect the physical, biological and chemical qualities of the receiving surface water.

   Design standards applied to develop the Post Construction Stormwater Management Plan. Check those that apply.

   ☐ Act 167 Plan – The attached PCSM Plan is consistent with an applicable approved Act 167 Plan.

   Complete the following for all approved Act 167 Stormwater Management Plans. (Use additional sheets if necessary)

Act 167 Plan Name	Date Adopted	
		Consistency Letter Included ☐
____________	____________	Verification Report Included ☐

   NOTE: A consistency letter is not required if a verification report is provided. Please see NOI Instructions.

   The PCSM Plan must satisfy either subparagraph A, B, **or** C below. Check those that apply. If a current, DEP approved Act 167 Plan exists, letter A must be checked.

   A. ☐ Act 167 Plan approvals on or after January 2005 - The attached PCSM Plan, in its entirety, is consistent with all requirements pertaining to rate, volume, and water quality from an Act 167 Stormwater Management Plan approved by DEP on or after January 2005.

   B. ☒ The PCSM meets the standard design criteria from 102.8(g)(2) and (3) the PA Stormwater BMP Manual. [Note: PCSM plans have to meet both the volume and rate requirements in the regulations, which are provided in these 2 sections].

   C. ☐ Alternative Design Standard – The attached PCSM Plan was developed using alternative approaches as provided in 102.8(g)(2)(iv) and 102.(g)(3)(iii). Demonstrate/explain in the space provided below how this standard will be either more protective than what is required in 102.8(g)(2) and 102.8(g)(3) or will maintain and protect existing water quality and existing and designated uses.

2. **Riparian Buffer Information**

   A. Will you be protecting, converting or establishing a riparian buffer or a riparian forest buffer as part of this activity?
   Protect ☐ Yes ☒ No Convert ☐ Yes ☒ No Establish ☐ Yes ☒ No

   B. Will you be protecting, converting or establishing a voluntary riparian forest buffer as part of this activity?
   ☐ Yes ☒ No

   C. Are you proposing to conduct oil and gas activities for which site reclamation or restoration is is required under a well permit issued under the authority of the 2012 Oil and Gas Act and Chapter 78 and in a high quality or exceptional value watershed that is currently attaining its designated use and within 150 ft of a perennial or intermittent river, stream or creek or lake, pond or reservoir?

   ☐ Yes ☒ No If yes, provide a demonstration that any existing riparian buffer is undisturbed to the extent practicable.

   D. If the regulations require a riparian buffer or riparian forest buffer and you are not providing one, list below the waiver provisions in the Chapter 102 regulations, Section 102.14(d)(i)-(vi), that you are requesting and provide additional documentation to demonstrate reasonable alternatives for compliance with 102.14 requirements and to demonstrate that any existing reparian buffer will remain undisturbed to the extent practicable.
   N/A

   Note: If the proposed activity protects, converts or establishes a riparian or riparian forest buffer a Buffer Management Plan is required in the PCSM Plan.

3. SUMMARY TABLE FOR SUPPORTING CALCULATION AND MEASUREMENT DATA See Attachment D in the Instructions on how to Complete This Section			
Watershed Name: See Appendix C of Section 5.0			
Design storm frequency 2-yr / 24-hr Rainfall amount 2.38 inches	Pre-construction	Post Construction	Net Change
Impervious area (acres)	0.901	0.970	0.069
Volume of stormwater runoff (acre-feet) without planned stormwater BMPs	1.642	1.650	0.008
Volume of stormwater runoff (acre-feet) with planned stormwater BMPs	[redacted]	0.558	0.009
Stormwater discharge rate for the design frequency storm			
1) 2-Year/24-Hour	4.32	4.37	0.05
2) 10-Year/24-Hour	9.42	9.63	0.21
3) 50-year/24-Hour	16.01	16.43	0.42
4) 100-year/24-Hour	20.42	21.10	1.32

4. SUMMARY DESCRIPTION OF POST CONSTRUCTION STORMWATER BMPs

In the lists below, check the BMPs identified in the Post Construction Stormwater Management Plan. The primary function(s) of the BMP listed in the functions column (infiltration/recharge; detention/retention; water quality). Additional functions may be added if applicable to that BMP. List the stormwater volume and area of runoff to be treated by each BMP type when calculations are required. If any BMP in the Site Restoration Plan is not listed below, describe it in the space provided after "Other".

BMP	Function(s)	Volume of stormwater treated	Acres treated
Bio-infiltration areas ☐ Infiltration Trench ☐ Infiltration Bed ☐ Infiltrated Basin	Infiltration/Recharge	____ ____ ____	____ ____ ____
Natural Area Conservation ☐ Streamside Buffer Zone ☐ Wetland Buffer Zone ☐ Sensitive Area Buffer Zone ☒ Pre-Construction Drainage Pattern Intact	Infiltration/Recharge	____ ____ ____ 0.558 af	____ ____ ____ 5.6 acres (Note: All disturbed areas will be restored to their pre-existing conditions: either gravel or vegetative condition.)
Stormwater Retention ☐ Constructed Wetlands ☐ Wet Ponds ☐ Retention Basin	Detention/Retention	____ ____ ____	____ ____ ____
Sediment and Pollutant Removal ☐ Vegetated Filter Strips ☐ Compost Filter Sock	Water Quality Treatment	____ ____	____ ____

☐ Detention Basins		____	____
Access Road Design ☐ Road Crowning ☐ Ditches ☐ Turnouts ☐ Culverts ☐ Roadside Vegetated Filter Strips	Infiltration/Recharge	____ ____ ____ ____ ____	____ ____ ____ ____ ____
Stormwater Energy Dissipaters ☐ Level Spreaders ☐ Riprap Aprons ☐ Upslope Diversions ☐ ______________	Infiltration/Recharge	____ ____ ____ ____	____ ____ ____ ____

5. Off-site Discharge Analysis.

Does the activity propose any off-site discharges to areas other than surface waters? ☐ Yes ☒ No

If yes, it is the applicant's responsibility to ensure that they have legal authority for any off-site discharge.

The Applicant must provide a demonstration in both the E&S and PCSM Plans that the discharge will not cause erosion, damage, or nuisance to off-site properties.

The Applicant shall 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. The Applicant is responsible for developing and implementing an adequate E&SCP(s) and submitting the Plan(s) to the PADEP for review and approval. The Contractor shall immediately stabilize the waste site upon completion of any stage or phase of earth disturbance activity at the waste site.

6. Thermal Impact Analysis.

Explain how thermal impacts associated with this project were avoided, minimized, or mitigated.

Avoid impacts to all surface waters and wetlands to the maximum extent possible to maintain existing hydrology and encourage natural thermal buffering; locate proposed facilities as close as possible to existing facilities to minimize proposed impervious cover; choose areas with minimal existing tree cover to reduce removal of existing tree canopy; immediately revegetate disturbed areas to help cool runoff prior to discharge.

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 one being proposed:

- 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; and
- Increased stream temperatures due to reduced base flow caused by reduction in site's infiltration capacity.

Siting of the proposed facilities was limited by the location of the existing facilities and pipelines which they will service, 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. The Project has implemented the following Site Layout Criteria to help prevent or minimize thermal impacts to receiving waters: avoid impacts to surface waters and wetlands to the maximum extent possible; locate proposed facilities as close as possible to existing facilities; and choose areas with minimal existing tree cover.

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 and the limit of tree clearing to the minimum area necessary to construct the proposed facilities will preserve existing vegetative cover and maintain the infiltration and evapotranspiration capacity of undisturbed areas to the maximum extent practicable. Also, disturbed areas will be immediately revegetated to help cool runoff prior to discharge.

7. **Critical PCSM Plan stages.**

Identify and list critical stages of implementation of the PCSM Plan for which a licensed professional or designee shall be present on site.

N/A

SECTION G. ANTIDEGRADATION ANALYSIS			
This section must be completed where earth disturbance activities will be conducted in special protection or siltation-impaired watersheds.			
Part 1 NONDISCHARGE ALTERNATIVES EVALUATION			
The applicant must consider and describe any and all nondischarge alternatives for the entire project area which are environmentally sound and will: • Minimize accelerated erosion and sedimentation during the earth disturbance activity • Achieve no net change from pre-development to post-development volume, rate and concentration of pollutants in water quality			
E & S Plan	***Official Use Only***	**PCSM/Site Restoration Plan**	***Official Use Only***
Check off the environmentally sound nondischarge Best Management Practices (BMPs) listed below to be used prior to, during, and after earth disturbance activities that have been incorporated into your E & S Plan based on your site analysis. For non-discharge BMPs not checked, provide an explanation of why they were not utilized. Also for BMPs checked, provide an explanation of why they were utilized. (Provide your analysis and attach additional sheets if necessary)		Check off the environmentally sound nondischarge Best Management Practices (BMPs) listed below to be used after construction that have been incorporated into your PCSM/SR Plan based on your site analysis. For non-discharge BMPs not checked, provide an explanation of why they were not utilized. Also for BMPs checked, provide an explanation of why they were utilized. (Provide your analysis and attach additional sheets if necessary)	
Nondischarge BMPs ☐ Alternative Siting ☐ Alternative location ☐ Alternative configuration ☐ Alternative location of discharge ☒ Limited Disturbed Area ☒ Limiting Extent & Duration of Disturbance (Phasing, Sequencing) ☐ Riparian Buffers (150 ft. min.) ☐ Riparian Forest Buffer (150 ft. min.) ☐ Other ____		**Nondischarge BMPs** ☐ Alternative Siting ☐ Alternative location ☐ Alternative configuration ☐ Alternative location of discharge ☐ Low Impact Development (LID / BSD) ☐ Riparian Buffers (150 ft. min.) ☐ Riparian Forest Buffer (150 ft. min.) ☐ Infiltration ☐ Water Reuse ☐ Other ____	
Will the non-discharge alternative BMPs eliminate the net change in rate, volume and quality during and after construction? ☒ Yes ☐ No If yes, antidegradation analysis is complete. If no, proceed to Part 2.			

PART 2 ANTIDEGRADATION BEST AVAILABLE COMBINATION OF TECHNOLOGIES (ABACT)			
If the net change in stormwater discharge from or after construction is not fully managed by nondischarge BMPs, the applicant must utilize ABACT BMPs to manage the difference. The Applicant must specify whether the discharge will occur during construction, post-construction or both, and identify the technologies that will be used to ensure that the discharge will be a non-degrading discharge. ABACT BMPs include but are not limited to:			
E & S Plan	***Official Use Only***	**PCSM/Site Restoration Plan**	***Official Use Only***
☐ **Treatment BMPs:** ☐ Sediment basin with skimmer ☐ Sediment basin ratio of 4:1 or greater (flow length to basin width) ☐ Sediment basin with 4-7 day detention ☐ Flocculants ☐ Compost Filter Socks ☐ Compost Filter Sock Sediment Basin ☐ RCE w/ Wash Rack ☐ **Land disposal:** ☐ Vegetated filters ☐ Riparian buffers <150ft. ☐ Riparian Forest Buffer <150ft. ☐ Immediate stabilization ☐ **Pollution prevention:** ☒ PPC Plans ☐ Street sweeping ☐ Channels, collectors and diversions lined with permanent vegetation, rock, geotextile or other non-erosive materials ☐ **Stormwater reuse technologies:** ☐ Sediment basin water for dust control ☐ Sediment basin water for irrigation ☒ **Other** All disturbed areas will be restored to their pre-existing conditions: either gravel or vegetative condition.		☐ **Treatment BMPs:** ☐ Infiltration Practices ☐ Wet ponds ☐ Created wetland treatment systems ☐ Vegetated swales ☐ Manufactured devices ☐ Bio-retention/infiltration ☐ Green Roofs ☐ **Land disposal:** ☐ Vegetated filters ☐ Riparian Buffers <150ft. ☐ Riparian Forest Buffer <150ft. ☐ Disconnection of roof drainage ☐ Bio-retention/bio-infiltration ☐ **Pollution prevention:** ☐ Street sweeping ☐ Nutrient, pesticide, herbicide or other chemical application plan alternatives ☒ PPC Plans ☐ Non-structural Practices ☐ Restoration BMPs ☐ **Stormwater reuse technologies:** ☐ Divert rainwater into impoundment ☐ Underground storage ☐ Spray/Drip Irrigation ☒ **Other** All disturbed areas will be restored to their pre-existing conditions: either gravel or vegetative condition.	

SECTION H. COMPLIANCE REVIEW

Is the applicant in violation of any existing permit, regulation, order, or schedule of compliance issued by the Department within the last 5 years?

☒ Yes ☐ No

If yes, provide the permit number or facility name, a brief description of the violation, the compliance schedule (including dates and steps to achieve compliance) and the current compliance status. (Attach additional information on a separate sheets, when necessary)

*** See attached Compliance History**

SECTION I. CERTIFICATION BY PERSON PREPARING APPLICATION

I do hereby certify to the best of my knowledge, information, and belief, that the Erosion and Sediment Control and PCSM/Site Restoration Plans are true and correct, represent actual field conditions, and are in accordance with the 25 Pa. Code Chapters 78 and 102 of the Department's rules and regulations. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment.

Print Name J. Lawrence Hosmer	Signature	Professional Seal COMMONWEALTH OF PENNSYLVANIA REGISTERED PROFESSIONAL J. LAWRENCE HOSMER ENGINEER 025926-E 03.30.17
Company Environmental Resources Management, Inc.		
Address 180 Admiral Cochrane Drive, Suite 400, Annapolis, Maryland 21401		
Phone (410) 266-0006		
Most Recent DEP Training Attended	Location ______ Date ______	
e-Mail Address larry.hosmer@erm.com		

EXPEDITED REVIEW PROCESS

In addition to the certification required above applicants using the expedited permit review process must attach an E&S and PCSM/Site Restoration Plans developed and sealed by a licensed professional engineer, surveyor or professional geologist. The plans shall contain the following certification:

I do hereby certify to the best of my knowledge, information, and belief, that the E & S Control and SR/PCSM BMPs are true and correct, represent actual field conditions and are in accordance with the 25 Pa. Code Chapters 78 and 102 of the Department's rules and regulations. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment.

SECTION J. APPLICANT CERTIFICATION

Applicant Certification. I certify under penalty of law that this document and all attachments were prepared by me or under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gathered and evaluated the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. The responsible official's signature also verifies that the activity is eligible to participate in the permit, and that the applicant agrees to abide by the terms and conditions of the permit. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

Anne E. Bomar, SVP Pipeline Services & Optimization
Print Name and Title of Applicant

Anne E Bomar
Signature of Applicant

31 March 2017
Date Application Signed

______
Print Name and Title of Co-Applicant (if applicable)

______
Signature of Co-Applicant

______
Date Application Signed

Notarization

Sworn to and subscribed to before me this 31st day of March, 20 17

Angela B. Fitzgerald
Notary Public

AFFIX SEAL

ANGELA B FITZGERALD
NOTARY PUBLIC
REG # 7022016
MY COMMISSION EXPIRES 03/31/2018
COMMONWEALTH OF VIRGINIA

Commonwealth of Pennsylvania

County of ______

My Commission expires 3/31/18

SECTION K. CONTACT FOR ADDITIONAL INFORMATION				
Contact's Last Name Gangle	First Name Richard	MI	Phone (804) 273-2814 FAX	
Mailing Address 5000 Dominion Blvd.	City Glen Allen		State VA	ZIP + 4 23060
e-Mail Address Richard.B.Gangle@dom.com				

pennsylvania
DEPARTMENT OF ENVIRONMENTAL PROTECTION

COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF ENVIRONMENTAL PROTECTION
OFFICE OF WATER MANAGEMENT
OFFICE OF OIL AND GAS MANAGEMENT

NOTICE OF INTENT (NOI) ADMINISTRATIVE COMPLETENESS CHECKLIST EROSION AND SEDIMENT CONTROL GENERAL PERMIT (ESCGP-2) FOR EARTH DISTURBANCE ASSOCIATED WITH OIL AND GAS EXPLORATION, PRODUCTION, PROCESSING, OR TREATMENT OPERATIONS OR TRANSMISSION FACILITIES

Please check the following list to make sure that you have included all the required information. Place a check mark in the column provided for all items completed and/or provided. Failure to provide all of the requested information will delay the processing of the application, may preclude the use of the Expedited Review, and may result in the application being placed ON HOLD with NO ACTION, or being considered withdrawn and the application file closed.

THIS CHECKLIST MUST BE COMPLETED AND ENCLOSED WITH YOUR GENERAL PERMIT NOI

✓CHECKLIST FOR EROSION AND SEDIMENT CONTROL GENERAL PERMIT NOI

☒ NEW NOI ☐ RENEWAL ☐ SUBSEQUENT PHASE ☐ MAJOR MODIFICATION

If a Renewal, Subsequent Phase or Revision, identify ESCGP-2 Permit Authorization # __________

Minor revisions are not required to be submitted to the regional office for review.

	APPLICANT Dominion Transmission, Inc. PROJECT and PHASE NAME Supply Header Project (If applicable)			Applicant Check ✓ if Included	Official Use Only
1.	Fully completed, properly signed and notarized Notice of Intent form (1 original and 2 copies). (Not required for subsequent phases)			☒	☐
2.	Complete **Erosion and Sediment Control (E&S) Plans.** (1 original and 2 copies) NOTE: Identify Locations as Drawings (D), Narrative (N). (Identify Not Applicable as "N/A") The E & S Plan must contain, at a minimum, the following:			☒	☐
	a. Topographic Features Existing topographic features of the project site and immediate surrounding area. Include the project area outlined on an 8 ½" x 11" photocopy of the U.S.G.S. topo map area. The map must include the name of the appropriate 1:24,000 scale U.S.G.S. 7.5 minute series quadrangle map where the project is located.	Location: D	Page: Sec 4, App A	☒	☐
	b. Soil Characteristics Types, depth, slope, locations and limitations of the soils including methods for resolution of all soil limitations.	Location: N	Page: Sec 4 p2; App B	☒	☐
	c. Earth Disturbance Activity The characteristics of the earth disturbance activity, including the past, present and proposed land uses and proposed alteration to the project site.	Location: N	Page: Sec 4 p2-3	☒	☐
	d. Project Site Runoff The Volume and rate of runoff from the project site and its upstream watershed area.	Location: N	Page: Sec 4 p4-5	☒	☐
	e. Surface Water Classification The Location of all surface waters of this Commonwealth which may receive runoff within or from the project site including their classification under Chapter 93 and status as siltation-impaired water.	Location: N	Page: Sec 4 p4-5	☒	☐
	f. BMP Description Narrative A narrative description of the location and type of perimeter and onsite BMPs used before, during, and after the earth disturbance activity.	Location: N	Page: Sec 4 p17-19	☒	☐

	g. BMP Installation Sequence Narrative A sequence of BMP installation and removal in relation to the scheduling of earth disturbance activities, prior to, during and after earth disturbance activities that ensures proper functioning of BMPs.	Location: N	Page: Sec 4 p19-20	☒	☐
	h. Supporting Calculations and Measurements.	Location: D	Page: Sec 4 App E	☒	☐
	i. Plan Drawings.	Location: D	Page: Sec 4 App A	☒	☐
	j. Maintenance Program A maintenance program which provides for the operation and maintenance of BMPs and the inspection of BMPs on a weekly basis and after each stormwater event, including the repair or replacement of BMPs to ensure effective and efficient operation. The program must provide for completion of a written report documenting each inspection and all BMP repair, or replacement and maintenance activities.	Location: N	Page: Sec 4 p20-25	☒	☐
	k. Material Recycling and Disposal Procedures which ensure that the proper measures for the recycling or disposal of materials associated with or from the project site will be undertaken in accordance with this title.	Location: N	Page: Sec 4 p25	☒	☐
	l. Soil Conditions and Geologic Formations Identification of naturally occurring geologic formations or soil conditions that may have the potential to cause pollution during earth disturbance activities and include BMPs to avoid or minimize potential pollution and its impacts from the formations.	Location: N	Page: Sec 4 p25-27	☒	☐
	m. Thermal Impacts Identification of potential thermal impacts to surface waters of this Commonwealth from the earth disturbance activity including BMPs to avoid, minimize or mitigate potential pollution from thermal impacts.	Location: N	Page: Sec 4 p27-28	☒	☐
	n. E&S Plan and PCSM/SR Plan Consistency The E&S Plan shall be planned, designed and implemented to be consistent with the PCSM Plan under § 102.8. Unless otherwise approved by the Department, the E&S Plan must be separate from the PCSM Plan and labeled "E&S" or "Erosion and Sediment Control Plan" and be the final plan for construction.	Location: N	Page: Sec 4 p28	☒	☐
	o. Riparian Forest Buffers Identification of existing and proposed riparian forest buffers (When required).	Location: N/A	Page: N/A	☒	☐
	p. Antidegradation Requirements Satisfy antidegradation implementation requirements for special protection water and siltation-impaired waters including evaluation of nondischarge alternatives and ABACT.	Location: N	Page: Sec 4 p29	☒	☐
3.	**Permit NOI Filing Fees** of $500 to the appropriate Clean Water Fund plus $100/Acre of earth disturbance payable to the Commonwealth of PA Clean Water Fund ($500 filing fee not required for subsequent phases).	Location: N	Page: NOI	☒	☐

4.	**Municipal Notification:** (3 copies) Not required for subsequence phases.			☒	☐
	a. Act 14 Municipal Notifications to the local municipality and county governments that specify that the application is for Erosion and Sediment Control General Permit for Earth Disturbance Associated with Oil and Gas Activities. A "sample" notification letter is provided as Attachment C of the instructions. **Proof or Receipt** of municipal notifications: copies of certified mail receipts, proof of deliver from a commercial carrier or acknowledgment letters from the local municipality and county government	Location: N	Page: Sec 7	☒	☐
	b. Cultural Resource Notice: for permitted activities on lands of the Allegheny National Forest (ANF) are to be coordinated with the appropriate ANF Ranger.				
5.	**Pennsylvania Natural Heritage Program (PNHP).** Include PNDI receipt and other information depending on the permit application option. (3 copies)	Location: N	Page: Sec 6	☒	☐
6.	**Complete PCSM/SR Plans.** (1 Original, 2 copies) NOTE: Identify location(s) as Drawing (D), Narrative (N). (Identify Not Applicable as "N/A".) The PCSM/SR Plan must contain, at a minimum, the following:			☒	☐
	a. Topographic Features The existing topographic features of the project site and immediate surrounding area.	Location: D	Page: Sec 5 App A	☒	☐
	b. Soil Characteristics The types, depth, slope, locations and limitations of the soils and geologic formations.	Location: N	Page: Sec 5 p3	☒	☐
	c. Earth Disturbance Activity Characterization The characteristics of the project site, including the past, present and proposed land uses and the proposed alteration of the project site.	Location: N	Page: Sec 5 p3 and p5	☒	☐
	d. Net Change in Volume and Rate of Runoff An identification of the net change in volume and rate of stormwater from preconstruction hydrology to post construction hydrology for the entire project site and each drainage area.	Location: N/D	Page: Sec 5 p10-13; App C	☒	☐
	e. Surface Water Classification An identification and location of surface waters of this Commonwealth, which may receive runoff within or from the project site and their classification under Chapter 93.	Location: N	Page: Sec 5 p3-4	☒	☐
	f. BMP Description Narrative A written description of the location and type of PCSM/Site Restoration BMPs including construction details for permanent stormwater BMPs including permanent stabilization specifications and locations.	Location: N/D	Page: Sect 5 p7-10; App A	☒	☐
	g. BMP Installation Sequence Narrative A sequence of PCSM/Site Restoration BMP implementation or installation in relation to earth disturbance activities of the project site and a schedule of inspections for critical stages of PCSM/Site Restoration BMP installation.	Location: N/D	Page: Sect 5 p10; App A	☒	☐
	h. Supporting calculations.	Location: D	Page: Sec 5 App C	☒	☐

	i. Plan Drawings.	Location: D	Page: Sec 5 App A	☒	☐
	j. Long Term Operation and Maintenance Schedule A Long term operation and maintenance schedule, which provides for inspection of PCSM/Site Restoration BMPs, including the repair, replacement or other routine maintenance of the PCSM/Site Restoration BMPs to ensure proper function and operation. The program must provide for completion of a written report documenting each inspection and all BMP repair and maintenance activities and how access to the PCSM/Site Restoration BMPs will be provided.	Location: N	Page: Sec 5 p13-14	☒	☒
	k. Material Recycling and Disposal Procedures which ensure that the proper measures for recycling or disposal of materials associated with or from the PCSM/Site Restoration BMPs are in accordance with Department laws, regulations and requirements.	Location: N	Page: Sec 5 p14	☒	☐
	l. Geologic Formations and Soil Conditions An identification of naturally occurring geologic formations or soil conditions that may have the potential to cause pollution after earth disturbance activities are completed and PCSM/Site Restoration BMPs are operational and development of a management plan to avoid or minimize potential pollution and its impacts.	Location: N	Page: Sec 5 p4-6	☒	☐
	m. Thermal Impacts An Identification of potential thermal impacts from post construction stormwater to surface water of this Commonwealth including BMPs to avoid, minimize or mitigate potential thermal pollution from thermal impacts.	Location: N	Page: Sec 5 p15	☒	☐
	n. Riparian Forest Buffer Management Plan A riparian forest buffer management plan when required under § 102.14.	Location: N/A	Page: N/A	☐	☐
	o. Antidegradation Requirements A demonstration of compliance with antidegradation implementation requirements including evaluation of nondischarge alternatives and ABACT for where activities will be conducted in special protection waters or siltation impaired waters.	Location: N	Page: Sec 5 p16	☒	☐
7.	**PCSM Plan Stormwater Analysis** Do the regulated activities require site restoration or reclamation? If Yes, skip to Item 8. If No, provide the following information:		☒ Yes ☐ No	☐	☐
	a. Site Characterization and Assessment Predevelopment site characterization and assessment of soil and geology including infiltration and geotechnical studies that identify location and depths of test sites and methods used (If applicable).	Location: N/A	Page: N/A	☐	☐

	b. Volume Reduction and Water Quality Requirements Analysis demonstrating that the PCSM BMPs will meet the volume reduction and water quality requirement specified in an applicable Department approved and current Act 167 stormwater management watershed plan; **or** manage the net change for storms up to and including the 2-year/24-hour storm event when compared to preconstruction runoff volume and water quality (If applicable).	Location: N/A	Page: N/A	☐	☐
	c. Rate Requirements Analyses demonstrating that the PCSM BMPs will meet the rate requirements specified in an applicable Department approved and current Act 167 stormwater management watershed plan; **or** manage the net change in peak rate for the 2-, 10-, 50-, and 100-year/24-hour storm event in a manner not to exceed preconstruction rates (If applicable).	Location: N/A	Page: N/A	☐	☐
	d. Calculation Methodologies Identification of the methodologies for calculating total runoff volume and peak rate of runoff and provide supporting documentation and calculations (If applicable).	Location: N/A	Page: N/A	☐	☐
	e. Construction Techniques Identification of construction techniques or special consideration to address soil and geologic limitations (If applicable).	Location: N/A	Page: N/A	☐	☐
	f. Antidegradation Requirements Demonstration of compliance with antidegradation implementation requirements including evaluation of nondischarge alternatives and ABACT for where activities will be conducted in special protection waters or siltation impaired waters.	Location: N/A	Page: N/A	☐	☐
8.	**Expedited Review Process** Is any part of your project located in or drain into a Special Protection watershed? ☐ Yes ☒ No Is the area surrounding an oil or natural gas wellhead that is subject to earth disturbance and that is used or planned for use for drilling, production or plugging of the well including associated support activities constructed on or in a flood plain? ☐ Yes ☒ No Is any earth disturbance located on land known to be contaminated? ☐ Yes ☒ No Is your project a transmission project? ☒ Yes ☐ No If yes, to any of the above questions your project is not eligible for Expedited Review. If your project is **not** a transmission protect complete items 8a and 8b. Is an expedited review being requested? ☐ Yes ☒ No If yes, all of the following items must be completed:			☐	☐
	a. E&S and PCSM/Site Restoration Plan drawings and narrative sealed by licensed professional.			☐	☐
	b. Licensed professional prepared, sealed, and certified Application/NOI.			☐	☐
	c. Licensed professional listed location and date of DEP training attended in application/NOI.			☐	☐

9.	**Phased Projects** Is the activity being conducted as a phased project? ☐ Yes ☒ No If yes, all of the following must be completed:	☐	☐
	a. Initial Phase - Is the master plan included? ☐ Yes ☐ No		
	b. Subsequent Phase(s) – Is(are) the subsequent phase(s) identified in the master plan? ☐ Yes ☐ No		
10.	**Preparedness, Prevention and Contingency (PPC) Plan** Will fuels, chemicals, solvents, other hazardous materials be used or stored on site during earth disturbance activities? ☒ Yes ☐ No If yes, a PPC Plan must be maintained on the site during earth disturbance.	☐	☐
11.	**Subsequent Phase Certification for Expedited Reviews** Is the activity being conducted as a phased project? ☐ Yes ☒ No Is an expedited review being requested for subsequent phase? ☐ Yes ☒ No If yes, all of the following must be completed:	☐	☐
	I do hereby certify to the best of my knowledge, information, and belief, that the Erosion and Sediment Control and PCSM/Site Restoration Plan are true and correct, represent actual field conditions and are in accordance with the 25 Pa. Code Chapters 78 and 102 of the Department's rules and regulations. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment.		
	Signature	Professional Seal	
	Company		
	Address		
	Phone		
	Most Recent DEP Training Attended Location _______ Date __________		
	e-Mail Address		
	EXPEDITED REVIEW PROCESS In addition to the certification required above, applicants using the expedited permit review process must attach an E&S and PCSM/Site Restoration Plan developed and sealed by a licensed professional engineer, landscape architect, surveyor or professional geologist. The plans shall contain the following certification: ***I do hereby certify to the best of my knowledge, information, and belief, that the Erosion and Sediment Control and PCSM/Site Restoration Plan and Post Construction BMPs are true and correct, represent actual field conditions and are in accordance with the 25 Pa. Code Chapters 78 and 102 of the Department's rules and regulations. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment.***		
12.	**Permit Renewal** Is a permit renewal being requested? ☐ Yes ☒ No If yes, all of the following must be completed:	☐	☐
	a. Administratively complete, signed, and notarized Notice of Intent Form, including Items 1-8. (1 signed original and 2 copies of the NOI/application)	☐	☐
	b. Permit filing fee of $500 payable to the appropriate clean water fund plus $100/Acre of earth disturbance payable to the Commonwealth of PA Clean Water Fund.	☐	☐

FACILITY NAME	DATE	DESCRIPTION OF NONCOMPLIANCE	ACTION TAKEN/ COMPLIANCE SCHEDULE	RESOLUTION/ CURRENT COMPLIANCE STATUS
South Oakford Station	2007 - 2012	Potential historical deviation. Compliance summary page indicated incorrect emission units (lb/hr instead of tons/year) in Semi-annual and Annual Compliance reports.	Contacted PADEP regarding this issue. Department has indicated that a single letter with revised sheets should be sent to revise the submittals. Letter submitted.	In compliance.
Harrison Station	2012	NPDES - Stormwater from permitted pond used for testing of possible leak of natural gas at a station valve. After test completed water discharged through filter bag to the ground.	Notified PADEP and trained employees on proper discharge process.	In compliance.
Punxsutawney Station	1/9/12	Malodor off of property boundary.	Reported to PADEP same day (within 24 hours); contacted neighbor to obtain additional information.	In compliance.
Punxsutawney Station	1/10/12	Malodor off of property boundary.	Reported to PADEP same day (within 24 hours)	In compliance.
Punxsutawney Station	1/10/12-3/12/12	Neighbor reported numerous instances of malodor off of property boundary.	Reported to PADEP same day (within 24 hours) of report from neighbor.	In compliance.
Crayne Station	1/16/12	Malfunction - ESD of Station	ESD was activated due to a faulty hand valve. Valve was leaking pilot air and pressure went down to the point that the ESD was activated. PADEP notified. Investigated cause and replaced hand valve and put back into service.	In compliance.
Ardell Station	2/1/12	Failed NOx ppm at 15% Oxygen	Failed Test Protocol being implemented. Replaced fuel injectors and re-tested.	In compliance.
Beaver Station	2/28/12	NOV - Underground pipe failure resulted in loss of about 1800 gallons of 50% ethylene glycol. Glycol migrated to a water spring	Isolate system, contain spring water for commercial disposal. Reported to PADEP.	In compliance.
South Bend Station	2/29/12	NPDES - Flow was not taken as required at outfall 001 due to flow meter broken	replaced meter; noted on DMR	In compliance.
Leidy Station	3/5/12	NPDES - Exceeded the monthly average and daily maximum for copper at the API Separator	A new filter system has been installed in the WWTP to remove metals prior to Outfall 101 discharge; noted on DMR	In compliance.
TL591	3/7/12	Consent Assessment of Civil Penalty - Directional drilling for pipeline under I-70 caused inadvertent return in stream. Not reported to PADEP as a spill.	Lead EI removed from Project due to not following requirements. Shut down operations, contain and recover drilling fluids, install turbidity curtain in stream.	Paid $5,500 fine. In compliance.
Charleroi Propane Terminal	3/12/12	Malodor off of property boundary.	Operators called to scene and investigated and eventually stopped leak. On the 12 Scott Kingston met with neighbors to review odor issue and indicate our commitment to resolve. Also called in to PADEP at 10:46 A.M. (within 24 hour window of complaint)	In compliance.
Charleroi Propane Terminal	3/13/12	Malodor off of property boundary.	Scott Kingston met with neighbors to review odor issue and again indicate our commitment to resolve. Believe this was residual from initial odor incident.	In compliance.
Charleroi Propane Terminal	3/14/12	Malodor off of property boundary. Noticed odor outside of facility.	DRS met with neighbors to review odor issue and again indicate our commitment to resolve. Discussed with Operations who found a small leak and repaired it.	In compliance.
Charleroi Propane Terminal	3/15/12	Malodor off of property boundary. Odor still noticeable inside of office in the AM.	DRS met with neighbors to review odor issue. Investigation indicated that odor may be coming in from furnace and hot water tank inlet air lines.	In compliance.
Charleroi Propane Terminal	3/19/12	Malodor off of property boundary. PADEP called us reporting an anonymous report of malodors.	DRS met with neighbors to review odor issue. Reported to Operations for resolution.	In compliance.

FACILITY NAME	DATE	DESCRIPTION OF NONCOMPLIANCE	ACTION TAKEN/ COMPLIANCE SCHEDULE	RESOLUTION/ CURRENT COMPLIANCE STATUS
Beaver Station	3/23/12	Overfilled frac tank causing a glycol spill.	Changed manifold to pump to a different tank. Reported to PADEP	In compliance.
TL591 SR221	3/23/12	NPDES -Exceeded the holding time for dissolved oxygen samples	Purchase DO meter for on site testing; noted on DMR	In compliance.
Ardell Station	3/27/12	ESD of Unit 1	Review indicated Analog control card failed. Card was replaced and unit re-stared at 5:20 P.M. Reported to PADEP (Roger Jordan) at 3:15 P.M. on 3/27/12 (voice mail). Follow up call to Roger Jordan at 9:00 A.M. to indicate cause and resolution. Roger indicated no concern regarding this Malfunction. Information filed.	In compliance.
TL591 SR221	3/30/12	NPDES -Exceeded the holding time for dissolved oxygen samples	Purchase DO meter for on site testing; noted on DMR	In compliance.
TL591 I 76	3/31/12	NPDES -Exceeded the holding time for dissolved oxygen samples	Purchase DO meter for on site testing; noted on DMR	In compliance.
Leidy Station	4/5/12	NPDES - Exceeded the monthly average for copper at the API Separator	Replace the media in the metals filter at the WWTP and change the metal parameters to the WWTP discharge; noted on DMR	In compliance.
Beaver Station	4/12/12	Failed CO - 18.3 lbs/hr limit, result = 18.99 lbs/hr.	Took away 1/2 inch of air manifold pressure.	In compliance.
Leidy Station	5/1/12	NPDES - Three permit exceptions; average and maximum copper and average aluminum	Facility personnel were trained by Glenn Bishop on clean sampling techniques, equipment was purchased to conduct clean sampling, and a comprehensive sampling program on incoming water, process water, stormwater and soil is planned for the July - August timeframe; reported to PADEP.	In compliance.
South Oakford Station	5/7/12	NPDES - Discharge sample exceeded permit limits	Reported to PADEP.	In compliance.
TL492 EXT 5	5/23/12	NOV - Contractor was conducting ROW cleanup activities and illegally disposed of residual waste on a private property	Meeting on site with PADEP and Greene Co. Soil Conservation District. Site remediated.	In compliance.
TL-591	6/21/12	Contractor conducted pipeline crossing of Brush Creek using a wet-trench crossing method. The permitted construction method with PADEP, USACE and FERC was for a dry (dam/pump) crossing method	Reported to PADEP.	In compliance.
TL590	7/5/12	NPDES -TL-590 ruptured during hydrotest, and released approx. 55,000 gallons of clean water to an unnamed tributary of Dunkard Fork in Greene County, PA. Water was released through the rupture and was therefore not sampled prior to release.	Notified PADEP and Greene County SCD via telephone on 7/5/2012 and followed up with letter on 7/9/2012. Met with inspectors from PADEP and Greene SCD. No release of sediment was observed in the stream or the larger Dunkard Fork approx 1 mile downstream from release. Pipeline was excavated, replaced and the stream banks restored.	In compliance.
TL590	7/11/12	NPDES - 4 permit exceptions: Exceed TSS holding time limit and improperly preserve the oil and grease samples from the hydrostatic test discharge sampling.	Additional training provided for sampling personnel. Reported to PADEP.	In compliance.

FACILITY NAME	DATE	DESCRIPTION OF NONCOMPLIANCE	ACTION TAKEN/ COMPLIANCE SCHEDULE	RESOLUTION/ CURRENT COMPLIANCE STATUS
South Bend Station	7/24/12	ESD of Station	Brief power loss resulted in the start-up of emergency generator and then shutdown of the generator when power was restored. During re-boot of system there was an analog input failure causing the ESD. PADEP notified. Updated control logic and placed facility back into operation.	In compliance.
TL591	7/24/12	NPDES - 2 permit exceptions exceed TSS limit and total iron limit	Reported to PADEP.	In compliance.
South Oakford Station	7/27/12	NOV - Wastewater excursions 1st Half 2012	Entire septic tank and nitrifying filter system was pumped down and cleaned / reworked June & July 2012; letter response to NOV with documentation submitted to PA DEP on 4/5/2013	In compliance.
Leidy Station	8/23/12	NPDES - laboratory error suggesting permit limitation exceedence.	Reported to PADEP. Revised DMR accordingly.	In compliance.
South Bend Station	9/11/12	Failed NOx	Failed Test protocol being implemented. Called PADEP to report failed test at 2:35 P.M. same day.	In compliance.
Leidy Station	9/13/12	Gas leak on engine 8 resulting in fire and blow-down of engines.	Reported to PADEP within 24 hours. Blew down all engines (except 9 it was already down). Isolate and address issue and re-start equipment.	In compliance.
DTI - PA	9/18/12	NOV for failure to disclose enforcement actions within the last 5 years. Waste Transportation Safety Act Section 6204 (e)	Resubmitted application 10/24 with updated enforcement action list.	In compliance.
Leidy Station	9/24/12	NPDES - One exception of daily average permit limits for copper at outfall 001	Reported to PADEP.	In compliance.
Ardell Station	9/25/12	Failed NOx	Failed Test protocol being implemented. Called PADEP to report failed test at 2:17 P.M. same day.	In compliance.
Finnefrock Station	10/15/12	Inlet gas temperature and pressure drop across the control devise (C202) were not being recorded.	The Department was notified of the non-compliance issue on February 6, 2013 and the issue was addressed on February 7, 2013.	In compliance.
Finnefrock Station	10/15/12	Inlet gas temperature and pressure drop across the control devise (C202) were not recorded on a continuous basis during the stack test.	The Department was notified of the non-compliance issue on February 6, 2013 and the issue was addressed on February 7, 2013. A re-test was scheduled and completed on 2/21/13, preliminary results indicate a passing test.	In compliance.
Leidy Station	10/28/12 (5-day letter sent 10/18/12)	NPDES - NOV for the diversion of wastewater around treatment	Repairs made to pipelines; completed on 10/26/12 and 12/11/12. To ensure proper wastewater flow paths are maintained, periodic dry weather evaluations (e.g. checks for dry weather flow in the stormwater drain lines) will be conducted.	In compliance.
Finnefrock Station	10/30/12	During the course of an abnormal operating condition, AOC-919, 1.5 gallons of oil was emitted through the ESD of Finnefrock and sprayed onto a site puddle and left a sheen on the mud roadway.	The oil was discovered on the morning of 10/30/12 and it was immediately contained with spill sorbent pads and the mud was containerized. Notification was made to PADEP and the National Response Center as it was unclear whether or not oil migrated from the site from the pictures.	In compliance.
Finnefrock Station	10/30/12	Blow-down of Station; Aux gen did not operate after initial operation during power failure. Loss of air pressure and station ESD was activated.	Reported to PADEP. Cleanup completed.	In compliance.

FACILITY NAME	DATE	DESCRIPTION OF NONCOMPLIANCE	ACTION TAKEN/ COMPLIANCE SCHEDULE	RESOLUTION/ CURRENT COMPLIANCE STATUS
Oakford Station	11/7/12	Stained gravel and soil was noted outside the fence line near the front entrance. It is not clear where the source of the petroleum that stained the soil came from and the quantity is not known. It was estimated for reporting purposes to be less than 20 gallons.	Impacted soil excavated and placed into drums. The soil is awaiting characterization. Post-excavation samples were collected for TPH-DRO and GRO, per the PADEP instructions.	In compliance.
Punxsutawney Station	11/14/12	Failed NOx	Failed Test protocol being implemented. Called PADEP to report failed test at 4:20 P.M. same day.	In compliance.
South Bend Station	11/14/12	NPDES permit, TSS exceedence for instantaneous max and monthly average due to backwash procedural error.	Reported within 24 hours by M. Ballantine and a 5-day written notification was submitted to the DEP regional office. No further action required.	In compliance.
Punxsutawney Station	11/15/12	Failed VOC	Failed portable test for VOC – Engine 3 tested at 2.9 lb/hr and exceeding limit of 2.61 lb/hr.	In compliance.
Leidy Station	11/30/12	Missed portable test.	Reported in Compliance report as a potential deviation.	In compliance.
Sabinsville Station	11/30/12	Relief Valve Blow-down.	Shut facility down to stop blow-down. Removed, cleaned / repaired relief valve and placed facility back into service. Reported to PADEP.	In compliance.
South Bend Station	12/3/12	NPDES - TSS exceedence for instantaneous max and monthly average.	Reported within 24 hours by M. Ballantine and a 5-day written notification was submitted to the DEP regional office. No further action required.	In compliance.
Oakford Station	12/4/12	Failed NOx	Replaced PCC checks, balanced engine	In compliance.
Oakford Station	12/7/12	Failed VOC	Adjusted A/F ratio, balanced unit	In compliance.
Oakford Station	12/7/12	NPDES - invalid sample due to temperature	Reported to PADEP.	In compliance.
Oakford Station	12/10/12	Failed VOC	Replaced fuel valve, adjusted A/F ratio, balanced unit	In compliance.
Finnefrock Station	12/11/12	Auxiliary Generator started up without installation of a Non-Resettable Hours meter.	The Department was notified of the non-compliance issue on February 6, 2013. Dominion obtained and installed a separate stand alone, non-resettable hour meter on February 13, 2013.	In compliance.
Leidy Station	12/28/12	NPDES - Discharge exceeded permit limits	Reported to PADEP. Permit modified.	In compliance.
Charleroi Propane Terminal	1/9/2013, 1/11/2013	Malodor complaint	Repaired leak. Reported to PADEP.	In compliance.
South Bend Station	1/13/13	RCRA-Exempt Pipeline Fluid Release to Soil	Excavation, repair of line, and soil removal to clean soil determined by PID meter. Ryan Environmental hired by Supply Chain to complete soil removal work. Line repair completed 1/14/2013. Telephone notification made to PA DEP SW Region 24-hour release notification contact on 1/13/2013. 10-day initial written report submitted to PA DEP SW Solid Waste on 1/23/2013.	In compliance.
Tioga Station	1/16/13	NPDES - pH test method used by Tioga for wastewater monitoring not approved for wastewater per NPDES program rules 40 CFR 136	Training specific to Tioga wastewater monitoring including proper pH meter calibration and documentation was conducted on 1/23/2013. Reported to PADEP.	In compliance.
Oakford Station	1/23/13	Failed NOx (18.5 lb/hr vs. 16.53 lb/hr limit)	Replaced fuel valve P2R, lifter P4L and balanced engine	In compliance.

FACILITY NAME	DATE	DESCRIPTION OF NONCOMPLIANCE	ACTION TAKEN/ COMPLIANCE SCHEDULE	RESOLUTION/ CURRENT COMPLIANCE STATUS
Oakford Station	1/27/13	RCRA-Exempt Pipeline Fluid Release to Soil	Operators locked out affected drip lines, spill material and snow was shoveled up from frozen ground and drummed, spill area was covered with plastic to protect from expected rain, nearby storm drain was blocked, station mobilizing resources for repair 1/28&29, will collect soil in roll-off boxes for characterization. Telephone notification made to PA DEP SW Region 24-hour release notification contact on 1/27/2013. 10-day initial written report submitted to PA DEP SW Solid Waste on 2/6.	In compliance.
Charleroi Propane Terminal	2/13/13	Malodor complaint	Deodorant was placed by operator.	In compliance.
Centre Station	2/13/2013 - Issue confirmed and addressed 6/12/13	Failed to maintain a record of weekly malodor and visible emission inspections.	Reported to PADEP.	In compliance.
North Summit Storage Pool	2/18/13	RCRA-Exempt Production Fluid (brine) release to soil inside containment	Isolated the R-6 tanks, brought in vacuum truck to remove free liquid in earthen containment dike, also pumped down tanks to allow repair to piping. Protective telephone notification made to PA DEP SW Region 24-hour release notification contact on 2/18/2013. Decision to report was based on volume of release which exceeds threshold for contained release in the North Summit Storage Pool PPC Plan and 2012 DRAFT PA Act 13 brine release reporting guidance; no follow-up from PA DEP, DTI follow-up written report submitted on 4/2/2013.	In compliance.
Oakford Station	3/5/13	Distillate Release to concrete and gravel surfaces.	Source stopped by Operations. Concrete surfaces cleaned with pads and mats. Contractor called to perform emergency response excavation of impacted gravel. Spill reported on 3/5/2013 at 10:15 to the PADEP, Paul Minor. Follow-up written report to DEP submitted 3/19/2013.	In compliance.
Sabinsville Station	3/19/13	Failed test, subsequently determined to be invalid due to low load testing.	The first turbine test was determined to be invalid and a re-test was scheduled for April 16, 2013. The Department (Andrea Ryder) was contacted on March 25, 2013 and informed of the invalid test and schedule to re-test. With the approval of the Department, DTI proceeded with the re-test of the turbine.	In compliance.
Sabinsville Station	3/19/13	Failed stack test (CO and formaldehyde), subsequently determined to be invalid due to low load testing.	Retested unit at full load and passed.	In compliance.
Leidy Station	3/28/13 (for Feb 2013)	NPDES - TSS excursion	Resin beds were replaced 2/25, TSS sample collected 3/5 was < 5 mg/l	In compliance.

FACILITY NAME	DATE	DESCRIPTION OF NONCOMPLIANCE	ACTION TAKEN/ COMPLIANCE SCHEDULE	RESOLUTION/ CURRENT COMPLIANCE STATUS
Tioga Station	4/1/13	Hydraulic oil release to soil	Spill was immediately contained and cleaned up. Valve was repaired by Shafer valve repairman. Soil impacted by hydraulic oil is drummed and ready for disposal. Courtesy call to Tom Mcnerney PADEP. Since oil was immediately cleaned up, PADEP indicated no follow-up report required.	In compliance.
Big Run Station	4/17/13	Failed test for grams/hr NOx on engine 2 but passed on lb/hr NOx.	Implemented failed test protocol. Replaced #1 and #4 PCC chambers	In compliance.
Beaver Station	6/11/13 proposed - settled 8/23/13	Dec 2011 ethylene glycol incident where groundwater contaminated by underground leak of ethylene glycol from engine lines emerged in spring on the property creating a release to surface water. Proposed civil penalty from PA DEP for unauthorized discharge to water self-reported by Dominion on 12/21/2011.	Stopped source of release, contained release, remediated groundwater at Beaver Station and replaced underground ethylene glycol piping that failed with above ground piping	Paid $192,000 fine. In compliance
Oakford Station	6/25/13	Pipeline fluid release to surface gravel	Operators locked out affected drip lines, gravel chips with spill material were shoveled up and drummed, area was backfilled with clean gravel chips, all completed by 7 am. Verbal report to PA DEP SW Regional office made by Paul Dickens at 9:15 am on 6/15. 10-day report submitted on 7/2.	In compliance.
Punxsutawney Station	6/30/13	Late portable test	Called PADEP and reported issue. Added recurring semi-annual portable test task into ECTS. Scheduled a make-up test for the second half of 2013	In compliance.
Ardell Station	6/30/13	Late portable test	Called PADEP and reported issue. Added recurring semi-annual portable test task into ECTS. Scheduled a make-up test for the second half of 2013	In compliance.
Finnefrock Station and Tioga Expansion Project	7/14/13	Pipeline fluid release to surface gravel	All gravel and soil impacted by the spilled pipeline fluids was collected immediately and notification was made to the ECC at the same time. In the future, if a separator vessel needs to be taken offline, it will either be plugged or have sufficient containment to collect any and all fluids within the vessel. Verbal report to PA DEP NC Regional Office, to Mr. Randy Farmerie, by Sharon Burke at 8:00 am on 7/15. Written report submitted 7/29.	In compliance.

FACILITY NAME	DATE	DESCRIPTION OF NONCOMPLIANCE	ACTION TAKEN/ COMPLIANCE SCHEDULE	RESOLUTION/ CURRENT COMPLIANCE STATUS
Tioga Expansion: TL610 Ext. 1	7/15/13	Spill of drilling mud to surface	Mud was vacuumed up as much as possible, Pit dug deeper and berm height extended. A straw bale barrier was placed in roadway ditch to prevent mud from reaching culvert and eventually Pine Creek. Reported to PADEP around 1600 on July 15,2013. Site visit by John Erich (Manager Environmental Emergency Response). There was some mud that entered wetland W15 but was minimal and did not appear to create any issues. Mr. Erich commented that he was happy to see how effective our response was and that we were correct to block any flow along the road ditch to prevent any spill into Pine Creek. On Tuesday July 16, 2013 Mr. Randy Farmerie of PADEP North Central Office paid a visit to the site as a follow up to John Erich's visit.	In compliance.
Harrison Station	9/5/13	Spill of produced fluids due to tank overfill	The exterior of the tank was cleaned; Ryan Environmental / Waste Management was onsite for drip cutting and vacuumed and cleaned the secondary containment of the tank and all impacted gravel and soil was staged on tarps and then later transferred to a roll off container. The previously approved waste disposal request submitted for the produced fluid was updated and emailed to supply chain. The tank alarm setting has been set at 75% capacity rather than 90% capacity and waste disposal requests for the tank contents will be inputted more frequently and scheduled promptly by supply chain. Reported to PADEP.	In compliance.
Punxsutawney Station	11/19/13	Failed test for NOx ppm on the turbine (ID 137)	Tuned turbine and replaced blocking rings in turbine combustion section to adjust air to fuel ratio.	In compliance.
Central PA G&P	11/27/13	Notice of Violation for alleged failure to register PA Act 9 emergency response information for unconventional wells in the PA Oil and Gas Reporting Electronic (OGRE) web-based system by 8/15/2013 deadline. NOV was received by GES on 12/5/2013.	Central G&P Operations Staff entered missing Act 9 emergency response information for unconventional wells in the PA OGRE system on 12/6/2013. Other new Act 9 requirements were completed during 2nd Qtr 2013.	In compliance.
Charleroi Propane Terminal	12/1/13	odor complaint	Homeowner called and complained of a mild to strong odor. Operations investigated the site and found no issues. Likely a small spill and not an on-going issue. Reported to PADEP.	In compliance.
Harrison Station	12/16/13	Reporting - left emergency generator off the ZZZZ Initial Notification	Submitted notification of generator	In compliance.

FACILITY NAME	DATE	DESCRIPTION OF NONCOMPLIANCE	ACTION TAKEN/ COMPLIANCE SCHEDULE	RESOLUTION/ CURRENT COMPLIANCE STATUS
Sabinsville Station-Transmission Lay down Area - LN 50 Gate 85 Capital Project Drip	12/23/13	Contained release to gravel and soil of pipeline solids and sludge mixed with rain water	Sabinsville Transmission and Station personnel cleaned up spill materials and affected gravel & soil, then wrapped drip to cover any openings to prevent any further rain or snow fall from entering drip. Generated 5 drums of spill cleanup material. Ryan Environmental returned to site on 12/24 and completed proper cleaning of solids and fluids in the drip. The material removed from the drip was drummed generating 13 additional drums. Total of 18 drums of spill response and drip cleaning waste were generated from this incident. Samples were collected on 12/23 for characterization. Reported to PADEP.	In compliance.
Steinmiller Tap	1/9/14	Sediment in waterbody; PADEP inspection with violations identified dated 01/09/2014; formal NOV dated 01/22/2014 for failure to maintain E&S Controls	Instructed contractor to de-water excavation through filter bag and monitor discharge to ensure it does not become sediment laden and enter any wetland or waterbody.	In compliance.
Tioga Station	1/15/14	NPDES - pH excursion	Reported to PADEP.	In compliance.
Punxsutawney Station	2/6/14	High Opacity	Reported to PADEP.	In compliance.
North Summit Storage Pool Area / Well UW-119	2/8/14	Brine Spill; NOV dated 2/12/2014	The spill was contained and Weavertown was called to cleanup the spill.	In compliance.
Sabinsville Station	3/28/14	Failed to submit Leak Detection Reports since the Plan Approval was issued in 2009.	Submitted report of all past Leak Detection Inspections	In compliance.
Boom Station	3/31/14	Five year ESD test released a fine mist of oil and water which sprayed onto soil, gravel, station structures, fencing material, and a perimeter ditch.	Impacted soil/gravel was excavated and disposed. Booms were placed in the perimeter ditch and in the receiving stream. Contaminated structures and piping were wiped down. Reported to PADEP.	In compliance.
North Summit Storage Pool Area / Well UW-107	4/23/14	Brine Spill due to failed pipe connection; NOV dated 4/28/2014.	Drain valves from containment dikes were evaluated and plugged.	In compliance.
South Oakford Station	5/7/14	Recordkeeping - Some required daily records of fuel consumption were not collected every day for the auxiliary generator or the glycol dehydration system.	Reported to PADEP.	In compliance.
Ardell Station	6/4/14	Release - Unexpected slug of pipeline fluids entered the compressor and discharged through blow down stack during unit shutdown.	The contaminated material was cleaned up and drummed. Reported to PADEP.	In compliance.
Leidy Station	7/1/14	Discovered that the annual boiler inspection report had not been submitted for the inspection conducted in October 2013	Report submitted. Reported to PADEP.	In compliance.
Finnefrock Station	7/30/14	The 4Q 2013 and 1Q 2014 PEM Reports did not include a Certificate of Accuracy from the Responsible Official.	Disclosed this oversight to PADEP in the 2Q 2014 report.	In compliance.
Crayne Station	10/1/14	Excess Emission	Reported to PADEP.	In compliance.
Beaver Station	11/11/14	Reporting -Discovered Boiler MACT initial Notification for new 3.0 MMBtu/hr was not submitted	Notification submitted to USEPA/PADEP 11/11/2014.	In compliance.

FACILITY NAME	DATE	DESCRIPTION OF NONCOMPLIANCE	ACTION TAKEN/ COMPLIANCE SCHEDULE	RESOLUTION/ CURRENT COMPLIANCE STATUS
Crayne Station	12/10/14	Station ESD at 9:45 am, 1018.78 MCF gas released	ESD handle was closed as soon as the issue was identified. Pilot relay on F gate was leaking and it was rebuilt and reinstalled. Reported to PADEP.	In compliance.
Oakford Station	1/22/15	CO exceedence	Catalyst Replaced. Reported to PADEP.	In compliance.
Crayne Station	1/27-28/15	PM Exceedence	Invalid Test - incorrect equipment used. Reported to PADEP.	In compliance.
PA Unconventional Production Wells	4/1/15	NOV - Failure to file unconventional well production reports for January 2015 by the statutory deadline.	Reports filed.	In compliance.
Longwall Cumberland Panel 64 (TL-342/TL-492)	4/10/15 - 4/13/15 NOV dated 4/21/15	NOV - Compliant from local land owner that discharge from Dominion's TL-342/TL-492 long wall project was putting sediment into his pond. Project open excavation filled with rainwater, overflowed into stream and caused a slip which moved outside of the limits of disturbance.	Emergency corrective action plan developed and submitted to Green County Conservation District and PADEP. Landslide material was excavated and staged to dry out.	In compliance.
PA Unconventional Production Wells	4/17/15	NOV - Failure to file unconventional well production reports for February 2015 by the statutory deadline.	Reports filed.	In compliance.
Sharon Storage Pool Well N-249-S	4/30/15 NOV dated 5/4/15	NOV - Failure to operate and construct the well to ensure the integrity of the well is maintained and health, safety, environment, and property are protected.	Well was killed with fresh water and cast iron bridge plug set.	In compliance.
Leidy Station	4/30/15	NPDES - Bypass of treatment	Area excavated, gasket/seal of pipe into vault repaired. Reported to PADEP.	In compliance.
LN-50/Gaines Township, Tioga County, PA	7/22/15	Spill - Release of hydrostatic test water into Lick Run causing turbidity.	Reported to PADEP.	In compliance.
LN50 Pipeline Replacement (Sections 3&4)	7/22/15	NOV - Water was released from a pressure-relief valve on the pipeline that was installed as part of the hydrotest set-up. Water needed to be transferred from the pipe, and the release occurred.`	A sample was obtained from the hydrotest water storage tank for chemical characterization of the release. No potential for contamination (hazardous or petroleum) determined in soil or water, so no cleanup required. Lick Run returned to clear flow several hours after incident occurred. Reported to PADEP.	In compliance.
Leidy Station	8/11/15	NPDES - Exceedence of daily maximum for Oil & Grease	Three additional samples were collected during the month of August 2015 for purposes of calculating the monthly average. All other results were BDL (detection limit of 4.8 mg/l). Reported to PADEP.	In compliance.
Finnefrock Station	12/17/15	NOV issued to DTI for Finnefrock emissions exceedence due to not installing cold ambient fuel control logic on Turbine 110 when installed in 2012. COA: Final Signed Order signed by DTI 3/10/2016. Failure to construct and operate new equipment in accordance with the air permit.	Significant permit amendment submitted to PADEP on 3/24/2016 to correct permit limits. Civil Penalty paid 3/10/2016	In compliance.
South Bend Station	1/1/16	DMR was submitted late	Report was submitted	In compliance.

FACILITY NAME	DATE	DESCRIPTION OF NONCOMPLIANCE	ACTION TAKEN/ COMPLIANCE SCHEDULE	RESOLUTION/ CURRENT COMPLIANCE STATUS
Leidy Station	2/22/16	Spill of distillate/water	The valve was closed and locked. Contractor was immediately called to mobilize to the site for clean up. Contaminated debris (soil/gravel) was collected and placed in lined roll-off containers, sampled and characterized for off-site disposal. Reported to PADEP.	In compliance.
Cherry Tree Station	4/3/16	Spill - Aprx. 20 gallons of pipeline fluids was released as a mist from the ESD stack.	Valve was manually shut, pads used to absorb visible liquids. Contractor wiped structures, grass, etc. Reported to PADEP.	In compliance.
PA G&P Well No. WN-1562	9/13/2016	NOV - failure to stop the verticle movement of gas in the wellbore. PADEP detected 100% LEL in the vent on this plugged well and believe the plug has failed to prevent the vertical movement of gas.	DTI will be re-plugging well.	Unchanged
Finnefrock	9/19/2016	NOV - Failure to conduct stack testing. TV renewal issued 6/11/2013 required stack testing to be completed on engines 1-6 between 6/11/2014-6/11/2015.	Testing was completed 6/2013 on routine 5 year schedule instead of during timeframe required by permit.	NOV closed via issuance of Closure memo 11/16/16
Greenlick Station	9/29/16	Little Greenlick Engine 2 (P106) on September 29, 2016 showed initial NOx readings of 7.19 lb/hr which is higher than the Title V limit of 6.35 lb/hr.	Unit shutdown (except for tuning and validation of repairs). Maintenance and engine tuning performed. Follow-up stack testing to confirm compliance with the Title V limit and PA RACT II completed on December 6, 2016. Little Greenlick Engine 2 emissions on December 6, 2016 were below all Title V permit limits and complied with NOx limits.	In compliance
Leidy Station	1/1/17	Gas release on 8/12/16 due to operator error. Gas release 9/12/2016 due to impropert setting. PA RACT II VOC Compliance Demonstration not bet by 1/1/2017	8/12/2016 Closed valve, ensured valve proper operation, and provided additional training. 9/12/2016 Relief valve immediately reset and placed back in service. Per notification submitted to PADEP 12/30/2016, Engines 1 and 5 are shut down and will only operate for reasons of maintenance, troubleshooting, and testing. Engines 1&5 will be tested in April 2017.	Unchanged

Greene County Conservation District
22 West High Street, Suite 204
Waynesburg, PA 15370
Phone: 724-852-5278
Fax: 724-852-5341

For Office Use Only	
GCCD#	Fees/Inv#
Date Rec'd	ESCGP#
NPDES#	GP#
GP#	GP#

Project Information		Applicant Information	Preparer Information
Name:Supply Header Project		Company: Dominion Transmission, Inc.	Company: Environmental Resources Management, Inc.
Location: Crayne Compressor Station		Contact: Leslie Hartz	Contact: Steve Holden
		Address: 707 W. Main St.	Address: 15 Park Row West, Suite 104
Municipality: Waynesburg		Richmond, VA 23219	Providence, RI 02903
Total Acres:	5.56 ac	Phone: 804-771-4468	Phone: 410-278-4308
Disturbed Acres:	5.56 ac	E-Mail: leslie.hartz@dom.com	E-Mail: steve.holden.@erm.com

Additional Project Details	
Receiving Streams & Ch. 93 Designation	
Ruff Creek	WWF
GPS Coordinates	
39°55'0.08", -80°07'19.2"	
Does the site balance? If not, where are the off site waste and borrow areas?	
N/A	
# of Impacts Paid for:	5.56 ac
Total # of Impacts :	5.56 ac
SLLA required?	N/A
Anticipated Start Date	
February 2018	
On-Site Contact[2]	
Name:	
Phone:	

GCCD Payments

Disturbed Acreage Fee	Check #	Amount: $1100.00
Elective Acceleration Fee	**Check #**	**Amount: N/A**

GCCD Clean Water Fund Payments

General NPDES or ESCGP	Check#	Amount: $500.00
Individual NPDES	**Check#**	**Amount: N/A**

105 GCCD Clean Water Fund Payments

105 Permit Fee	Check#	Amount: N/A

Commonwealth of PA Clean Water Fund Payment

$100/disturbed acre fee	Check#	Amount: $600.00

By signing below I am acknowledging that I have reviewed and addressed the current GCCD Fee Schedule and Policy.

Anne E Boman
Signature

31 March 2017 Date

DOMINION TRANSMISSION, INC.

SUPPLY HEADER PROJECT

SECTION 2 – PROJECT DESCRIPTION

- Greene County Project Description

Project Description

Dominion Transmission, Inc. (DTI) is proposing to construct and operate approximately 37.5 miles of pipeline loop and modify existing compression facilities in Pennsylvania and West Virginia. This project, referred to as the Supply Header Project (Project), will enable DTI to provide firm transportation service to various customers, including Atlantic Coast Pipeline, LLC, which is proposing to construct the Atlantic Coast Pipeline in West Virginia, Virginia, and North Carolina. DTI has hired Environmental Resources Management, Inc. (ERM) as the primary environmental consultant for the Project. ERM is assisting DTI with construction planning, environmental surveys, and acquisition of environmental permits and certifications necessary for the Project. The overall project is being reviewed and authorized through the Federal Energy Regulatory Commission (FERC), Docket No. CP15-555-000.

The Pennsylvania segment of the Project includes 3.9 miles of 30-inch diameter natural gas pipeline loop (TL-636) adjacent to DTI's existing LN-25 pipeline in Westmoreland County and modifications at DTI's existing JB Tonkin and Crayne Compressor Stations in Westmoreland and Greene Counties, respectively. The Project will utilize temporary contractor yards in Salem Township, Westmoreland County.

In Greene County, modifications at the Crayne Compressor Station will include the addition of one new gas-driven turbine that will provide 7,700 horsepower of additional compression. The modifications will include expansion to the existing compressor building within the existing chain-link security fenced-in site. Equipment at the station will include gas coolers, inlet air filters, exhaust silencers, blowdown silencers, heaters, and auxiliary generators. Workspace outside the existing fence line will be required for construction activities such as welding, coating, and storing construction materials. Following construction, these areas will be restored to pre-construction conditions. There are no wetlands and/or waterbodies present within the construction workspace; therefore, no wetland or waterbody impacts are associated with the Crayne Compressor Station. This Erosion and Sediment Control General Permit (ESCGP-2) is only for the impacts within Greene County. DTI anticipates that construction in Pennsylvania will be complete and placed in service by fall 2019.

Field Reconnaissance

ERM conducted a wetland and waterbody delineation of the proposed Project area. The onsite wetland delineation was conducted utilizing procedures described in the 1987 U.S. Army Corps of Engineers Wetland Delineation Manual and the 2012 Regional Supplement to the U.S. Army Corps of Engineers Wetland Delineation Manual: Eastern Mountains and Piedmont Region. Other waters were assessed utilizing the definitions in 33 Code of Federal Regulations 328.3. Impact assessments to potential waters of the U.S., including wetlands, were evaluated within the proposed Project construction work area. Under these procedures, no wetlands or waterbodies are located within the footprint of the proposed construction area within or around the Crayne Compressor Station.

Pennsylvania Natural Diversity Index

An on-line Pennsylvania Natural Diversity Inventory (PNDI) query of the project area was conducted on July 2, 2014, May 6, 2015, and March 16, 2017. The review for the Crayne Compressor Station study area indicated potential impacts for two listed species: puttyroot orchid (*Aplectrum hyemale*) and three-ridge mussel (*Amblema plicata*). A copy of the PNDI Project Environmental Review Receipt is provided in Section 9. Regulatory consultations were conducted as a result:

1. Consultation with the Pennsylvania Department of Conservation and Natural Resources (PDCNR) was initiated on May 1, 2015. An updated PNDI was performed on May 6, 2015 to ensure coverage after the recent changes related to the northern long-eared bat. Updated results were provided to the PDCNR on May 13, 2015. PDCNR responded May 29, 2015 and determined that no impact to species of special concern is anticipated.

2. Consultation with the PFBC was initiated on May 1, 2015. An updated PNDI was performed on May 6, 2015 to ensure coverage after the recent changes related to the northern long-eared bat. Updated results were provided to the PFBC on May 13, 2015. PFBC responded on May 18, 2015 and determined that no impact to species of special concern, including the three-ridge mussel, is anticipated provided that strict erosion and sedimentation control measures are employed, no toxic or harmful chemicals are released into the waterway, and chemical storage tanks are located at least 100 feet away from waterways.

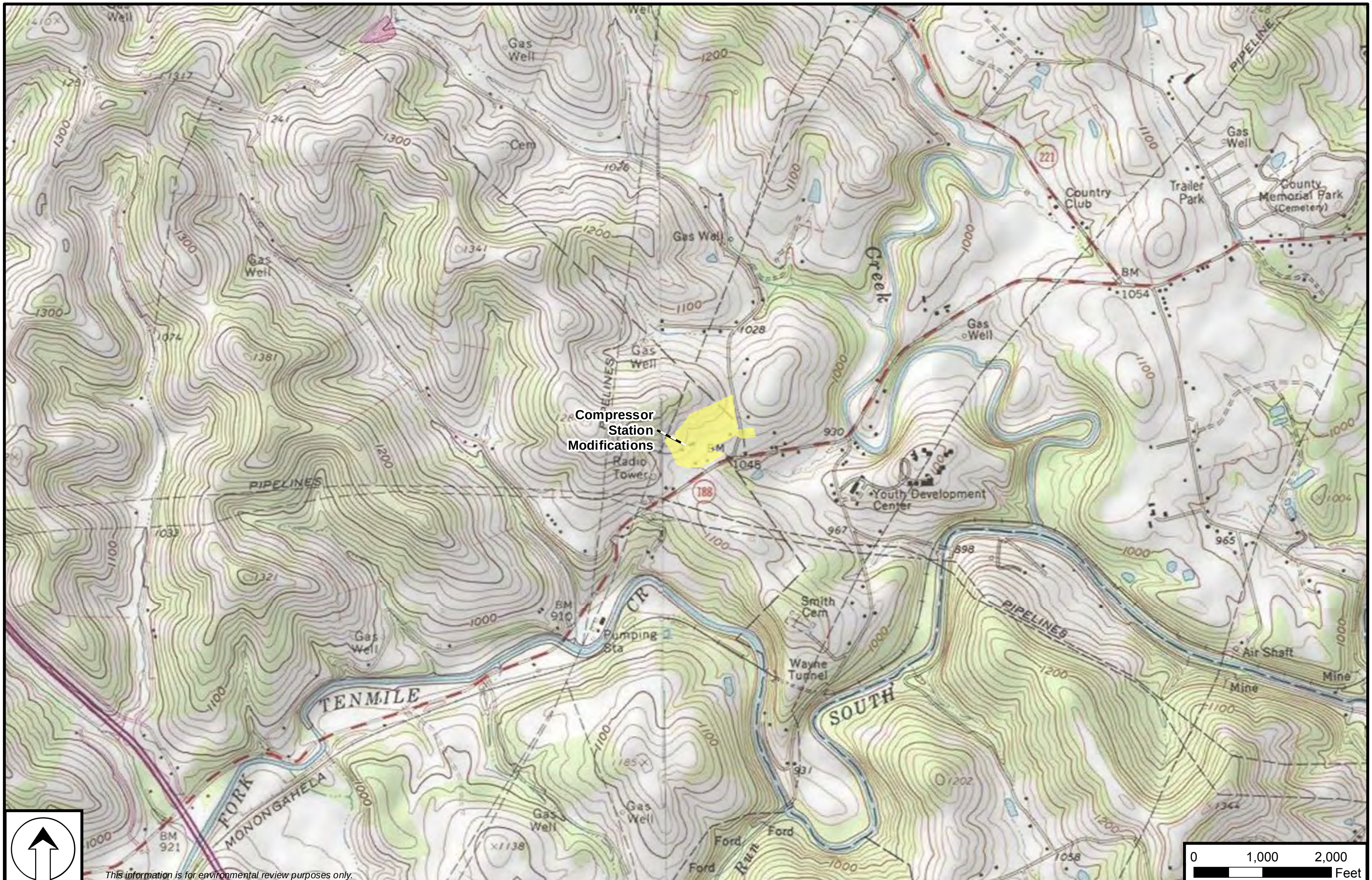
3. Consultation with the Pennsylvania Game Commission (PGC) was initiated on May 1, 2015. An updated PNDI was performed on May 6, 2015 to ensure coverage after the recent changes related to the northern long-eared bat. Updated results were provided to the PGC on May 13, 2015. PGC responded on May 14, 2015 and determined that no impact to species of special concern is anticipated.

ERM updated the PNDI results for the Project on March 16, 2017 due to the FWS listing the rusty patched bumble bee as endangered under the Endangered Species Act on January 10, 2017 and to reflect the modifications to the Crayne Compressor Station site layout in Greene County. The PNDI results indicated there were no know impacts for the Project. DTI will periodically rerun these searches as the Project progresses to ensure that the most up-to-date information is available.

DOMINION TRANSMISSION, INC.

SUPPLY HEADER PROJECT

SECTION 3 – PROJECT OVERVIEW MAP



PA
WV

Dominion

Crayne Compressor Station Modifications

Supply Header Project

Overview Maps

Greene Co., Pennsylvania

ERM

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DOMINION TRANSMISSION, INC.

SUPPLY HEADER PROJECT

SECTION 4 – EROSION AND SEDIMENT CONTROL PLAN (ESCP)

Erosion and Sediment Control Plan

Dominion Transmission, Inc.
Supply Header Project
Franklin and Morgan Townships,
Greene County, Pennsylvania

March 31, 2017

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LIST OF DEFINITIONS

ABACT	anti-degradation best available combination of technology
BMP	best management practice
CFR	Code of Federal Regulations
Company	Dominion Transmission, Inc.
DTI	Dominion Transmission, Inc.
E&S	erosion and sediment control
E&SCP	Erosion and Sediment Control Plan
ECP	Environmental Construction Permitting Department
EI	Environmental Inspector
EPA	U.S. Environmental Protection Agency
ERM	Environmental Resources Management, Inc.
ESCGP-2	Erosion and Sediment Control General Permit
FERC Plan	FERC's Upland Erosion Control, Revegetation, and Maintenance Plan
FERC Procedures	FERC's Wetland and Waterbody Construction and Mitigation Procedures
FERC	Federal Energy Regulatory Commission
LOD	limit of disturbance
NPDES	National Pollutant Discharge Elimination System
NRCS	Natural Resources Conservation Service
P.S.	Pennsylvania Statutes
PA ESC Manual	Pennsylvania Department of Environmental Protection's Erosion and Sediment Pollution Control Program Manual, 2012
Pa. Code	Pennsylvania Code
PADEP	Pennsylvania Department of Environmental Protection
PaGEODE	Pennsylvania Geologic Data Exploration web-mapping application
PPC Plan	Preparedness, Prevention, and Contingency Plan
Project	Supply Header Project
SCS	Soil Conservation Service
SPCC	Spill Prevention, Control, and Countermeasure
SR/PCSM Plan	Site Restoration/Post-Construction Stormwater Management Plan
SSURGO database	Soil Survey Geographic database
TR-55	Technical Release 55
USDA	U.S. Department of Agriculture
USGS	U.S. Geological Survey

1.0 INTRODUCTION

Dominion Transmission, Inc. (DTI or Company) is proposing to construct and operate the Supply Header Project (Project) in Franklin and Morgan Townships, Greene County, Pennsylvania. This submittal addresses only the portions of the Project located in Greene County. A general location map, and a U.S. Geological Survey (USGS) quadrangle map showing the exact location and extents of the proposed Project, is included on the cover of the Erosion and Sediment Control Plan (E&SCP) drawings included in Appendix A.

This E&SCP has been developed to address control of accelerated erosion and sedimentation resulting from earth disturbance associated with the proposed Project. The plan consists of this written narrative and the attached appendices including plan drawings and design calculations. The content of this plan is organized in the same order as the "Standard E&S Control Plan Technical Review Checklist" provided in the Pennsylvania Department of Environmental Protection's (PADEP) Erosion and Sediment Pollution Control Program Manual 2012 (PA ESC Manual). This Plan was developed in accordance with the requirements of the Federal Energy Regulatory Commission (FERC), the U.S. Army Corps of Engineers, the U.S. Fish and Wildlife Service, the U.S. Department of Agriculture (USDA), Natural Resources Conservation Service (NRCS), Title 25 Pennsylvania Code (Pa. Code) Chapters 78 and 102, as well as the Clean Streams Law (Title 35 Pennsylvania Statutes [P.S.] Section 691.1001), as amended, utilizing guidelines and best management practices (BMP) information provided in the PA ESC Manual. An up-to-date copy of this E&SCP (including this narrative and all appendices) shall be maintained and available at the Project site during all stages of earth disturbance activity.

The figures provided in Appendix A of this plan illustrate the minimum requirements of BMPs for design and utilization of construction workspace areas, access roads, and erosion controls, as well as construction methods for special use areas.

The goal of the E&SCP is to preserve the integrity of environmentally sensitive areas and to maintain existing water quality by:

- minimizing the extent and duration of disturbance;
- diverting runoff to stabilized areas;
- installing temporary and permanent erosion control measures; and
- establishing an effective inspection and maintenance program.

If conflicts or differences occur between project-specific conditions of appropriate federal and state agencies and the BMPs described in this E&SCP, the contractor shall consult with the DTI Environmental Construction Permitting Department (ECP) representative or ECP Lead. The more stringent or site-specific requirement is typically applicable unless otherwise approved by the permitting agency and approved by the ECP Lead. With the exception of minor variations from the typical figures that may be required due to site-specific conditions designed to achieve an equivalent or greater degree of environmental protection, any deviations from the construction drawings or changes in the design of control measures as set forth in this E&SCP must be approved by the appropriate permitting agency and DTI's ECP Lead prior to implementation. Measures and practices identified within this plan are to be implemented during construction unless otherwise specified by project-specific permit conditions approved by the appropriate agency(ies).

This plan was prepared by Environmental Resources Management, Inc. (ERM) personnel, under the direct supervision of a Pennsylvania licensed Professional Engineer trained and experienced in E&S methods and techniques applicable to the size and scope of the proposed Project.

DTI shall perform the required environmental field surveys and acquire the necessary environmental permits, clearances, and authorizations prior to the start of construction of the Project. DTI shall notify the appropriate federal, state, and local agencies prior to, during, and/or subsequent to the construction of the Project.

2.0 EXISTING TOPOGRAPHY AND FEATURES

The E&SCP drawings included in Appendix A contain existing site features. The existing features include the topography of the Project site and the surrounding area, mapped soil boundaries, known property, roadways, streams, watercourses, existing structures, existing ground cover (including tree lines and other significant vegetative features), and identifiable underground utilities.

3.0 SOIL CHARACTERISTICS

The location of mapped soil types are shown on the E&SCP drawings. These soil boundaries and associated information were obtained from the USDA Soil Survey Geographic (SSURGO) database. In addition to this soil mapping data, the 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 soil report is included in Appendix B and contains the types, depth, slope, and limitations of the soils within the Project area. Additional information in the soil report includes data on the physical characteristics of the soils, such as their texture, resistance to erosion, and suitability for the intended use. The limitation of soils pertaining to earthmoving projects, and the means to address the identified soils limitations are included on the E&SCP drawings.

4.0 EARTH DISTURBANCE AND LAND USES

4.1 PROJECT DESCRIPTION

DTI is proposing to construct and operate approximately 37.5 miles of pipeline loop and modify existing compression facilities in Pennsylvania and West Virginia. The Project will enable DTI to provide firm transportation service to various customers, including Atlantic Coast Pipeline, LLC, which is proposing to construct the Atlantic Coast Pipeline in West Virginia, Virginia, and North Carolina. DTI has hired ERM as the primary environmental consultant for the Project. ERM is assisting DTI with construction planning, environmental surveys, and acquisition of environmental permits necessary for the Project. The overall project is being reviewed and authorized through FERC.

The Pennsylvania segment of the Project in Greene County includes modifications at DTI's existing Crayne Compressor Station.

In Greene County, modifications at the Crayne Compressor Station will include the addition of one new gas-driven turbine that will provide 7,700 horsepower of additional compression. The modifications will include expansion to the existing compressor building within the existing chain-link security fenced-in site. Equipment at the station will include gas coolers, inlet air filters, exhaust silencers, blowdown silencers, heaters, and auxiliary generators. Workspace outside the existing fence line will be required for construction activities such as welding, coating, and storing construction materials. Following construction, these areas will be restored to pre-construction conditions.

The total proposed area of disturbance resulting from installation of the proposed facilities and associated workspaces is 5.6 acres within the 16.5 acres limit of construction footprint including the Crayne Compressor Station and temporary staging areas. Earth disturbance will be restricted to the limit of disturbance (LOD) delineated on the E&SCP drawings. These drawings depict all proposed facilities and site features as well as the boundary of the area to be covered by the Erosion and Sediment Control General Permit (ESCGP-2) (Project Boundary) within Greene County. This includes the proposed topography, areas of cuts and fills, the limits of earth disturbance, the locations of proposed roads, the locations of existing and proposed structures, and the locations of proposed BMPs. The E&SCP drawings also include road profiles and cross sections of areas with significant cuts and fills.

4.2 LAND USE AND LAND COVER

The proposed Project is located on private land and the current land use is oil- and gas-related industrial activity. Prior to the existing industrial development, the land use was rural residential. The existing land cover within the permit boundary is a mixture of impervious roof and asphalt, gravel surface, and meadow. The Project does not cross any federally owned lands, as demonstrated on Figure 4.2-1. The proposed land cover will remain the same with more impervious roof, asphalt, and gravel surface.

The approximate construction area at the Crayne Compressor Station is 16.5 acres. The only permanent change in proposed conditions at the Crayne Compressor Station is a small building addition within an existing compacted gravel area, with an addition of 0.069 acre of impervious area and a total of 5.56 acres of disturbance within the compressor station and temporary staging areas. Of the approximate 5.56 acres of disturbance, Staging Area A is approximately 1.52 acres; Staging Area B is 0.26 acre; Upper Yard C is 1.12 acres; Staging Area D is 0.50 acre; Staging Area E is 0.80 acre; and the Compressor Station Workspace is 1.36 acres as identified on the E&S drawings in Appendix A.

5.0 RUNOFF FROM PROJECT AND UPSTREAM WATERSHED

The proposed earth disturbance was analyzed for the impact it will have on downstream receiving watercourses. This analysis included calculation of the runoff volume and peak rate of runoff for each of the design storms in existing and proposed conditions. Preconstruction stormwater runoff calculations were completed for the Crayne Compressor Station using Technical Release 55 (TR-55) because construction of the station upgrade will result in an increase in impervious surface area. Post-construction stormwater calculations will be completed when the updated permanent impervious surface is determined. A summary of the preconstruction stormwater runoff from the site and from the upstream drainage area is shown in the Notice of Intent. Detailed calculations, standard TR-55 worksheets, and print-outs from

WinTR-55 will be shown in the Site Restoration/Post-Construction Stormwater Management Plan (SR/PCSM Plan) Section 5 of the ESCGP-2 application package.

5.1 HYDROLOGIC ANALYSIS METHODS

Hydrology calculations were performed to determine existing conditions and analyze the impacts of the proposed facilities. The NRCS Rainfall-Runoff methodology was used to produce rainfall-runoff response estimates for the Project's drainage areas. Further details and analysis are included in the PCSM/SR Plan, Section 5.0 of this permit.

5.2 RUNOFF VOLUME AND PEAK RATE

The impacts of the proposed Project on runoff volume and peak flow rate were analyzed utilizing the methods described in the previous section. The calculations used to determine the 2-year volume and peak flow rate are consistent with the methodology described in the PADEP's Pennsylvania Stormwater Best Management Practices Manual (2006). A summary of the analysis results for each drainage area are depicted in the Summary Tables contained in the Notice of Intent form and detailed analysis results are included in the SR/PCSM Plan. Peak flow rate calculations associated with the design of the existing detention pond to receive runoff from the previously improved areas at the Crayne Compressor Station and peak flow rate calculations for the proposed compressor station improvements are included in the SR/PCSM Plan.

6.0 LOCATION AND CLASSIFICATION OF SURFACE WATERS

ERM conducted a wetland and waterbody delineation of the proposed Project area. The Wetland and Watercourse Report is included in Appendix C. The on-site wetland delineation was conducted using the procedures described in the 1987 U.S. Army Corps of Engineers Wetland Delineation Manual and the 2012 Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Eastern Mountains and Piedmont Region. Other waters were assessed using the definitions in Title 33 Code of Federal Regulations (CFR) Part 328.3. Impact assessments to potential waters of the United States, including wetlands, were evaluated within the proposed Project construction work area. No wetlands or waterbodies are located within the footprint of the proposed construction area in Greene County. Therefore, stream and wetland crossing BMPs are not applicable to the proposed Project. There are no U.S. Environmental Protection Agency (EPA) Section 303(d) impaired streams within the Project area. A stormwater detention pond is located south of the Project area northwest of Jefferson Road and east of the Crayne Compressor Station entrance. The detention pond/discharge location mitigates stormwater for the facility and will remain functioning during construction and operations. There are two culverts directing water to the stormwater detention pond. DTI will install super silt fencing upgradient of the stormwater detention pond to reduce the potential of sedimentation. This stormwater detention pond is not within the permit boundaries and will not be crossed by the Project.

The Project is located within Tenmile Creek watershed according to the PADEP Pennsylvania State Water Plan. There are no applicable Act 167 Stormwater Management plans within the Project area. The Project site contains two different receiving waters to Ruff Creek. Ruff Creek has a Pa. Code, Title 25, Chapter 93 designated water use of Warm Water Fishes, but is not defined in the Pa. Code as a special protection water. An unnamed tributary to Ruff Creek is the receiving water for the Project area. The receiving waters are not listed as Pennsylvania Fish and Boat Commission (PFBC) “Approved Trout Waters” or “Wild Trout Waters.” According to the 2014 Pennsylvania Integrated Water Quality Monitoring and Assessment Report, the receiving waters for the Project are not listed as siltation impaired in Category 4 or Category 5.

Potential stormwater runoff impacts to water quality will be managed through the implementation of the BMPs outlined for erosion and sediment control throughout this E&SCP.

7.0 CONSTRUCTION TECHNIQUES FOR NATURAL GAS FACILITIES

7.1 ESTIMATED START AND COMPLETION DATES FOR THE PROJECT

Subject to receipt of the required permits and regulatory approvals, DTI anticipates that the proposed modifications to the Crayne Compressor Station will commence in the spring of 2018. DTI anticipates that the proposed modifications to the Crayne Compressor Station will be complete and in service by fall of 2019.

7.2 TYPICAL WORKSPACE REQUIREMENTS

Compressor station construction workspace requirements are a function of equipment size, topography, geological rock formations, location of construction, road crossings, and existing soil conditions encountered during construction. All workspace locations for a given Project will be shown on the construction drawings.

Minor field realignments and workspace shifts are only allowed if construction activities remain within the environmental field survey area, comply with project-specific environmental permits and do not affect sensitive resource areas within the permitted LOD.

7.3 ACCESS ROADS AND ACCESS POINTS

DTI anticipates using existing access roads for the modifications at the compressor station. The following conditions apply to the use of access roads:

1. Maintain safe and accessible conditions at all road crossings and access points during construction and restoration.

2. Minimize the use of tracked equipment on public roadways and in accordance with the requirements of the managing agency. Remove soil or gravel spilled or tracked onto roadways daily or more frequently as necessary to maintain safe road conditions. Repair damages to roadway surfaces, shoulders, and bar ditches.

3. Construction entrances will have stone access entrance and exit drives and parking areas to reduce the tracking of sediment onto public or private roads. Maintain access roads in a stable manner to prevent impacts to areas outside of the LOD, including impacts on adjacent and/or nearby sensitive resource areas.

4. During construction and restoration activities, access to the construction workspace is limited to the use of existing access roads identified on the construction drawings. Access to the construction workspaces will utilize existing roads and access will be avoided in wetlands.

7.4 OFF-LOD DISTURBANCE

All construction activities, including staging areas and spoil storage areas, are restricted to the construction LOD identified on the construction drawings, except for activities in limited, non-wetland and non-riparian areas that are allowed by the FERC Plan and Procedures and are located within the Pennsylvania Chapter 102 permit boundary. Use of these limited areas is subject to land management agency approval and compliance with all applicable survey, permit, and reporting requirements. In some cases, federal, state, and local permits and authorizations may require additional approvals.

7.5 SUPPLY HEADER PROJECT CONSTRUCTION SEQUENCE

This section provides an overview of the equipment and operations necessary, describes potential impacts that may occur from each operation, and identifies the measures that will be implemented to control these potential impacts. This section discusses in detail the erosion and sediment control techniques that typically apply to each construction activity including clearing and grading. LOD restoration is the final step in the typical construction sequence.

At least 7 days prior to starting any earth disturbance activities, DTI will invite all contractors, appropriate municipal officials, the E&S plan preparer, the PCSM plan preparer, and a representative from the Greene County Conservation District to an on-site preconstruction meeting. Upon installation or stabilization of all perimeter sediment control BMPs and at least 3 days prior to proceeding with the bulk earth disturbance activities, the permittee or co-permittee shall provide notification to the Department or authorized conservation district. At least 3 days prior to starting any earth disturbance activities, or expanding into an area previously unmarked, the Contractor will notify the Pennsylvania One Call (Dial 8-1-1) for the location of existing underground utilities. All earth disturbance activities shall proceed in accordance with the sequence provided on the plan drawings. Deviation from that sequence must be approved by the Greene County Conservation District or by the Department prior to implementation. Each step of the sequence shall be completed before proceeding to the next step, except where noted.

Site Preparation

1. Survey and flag the construction workspace and mark environmentally sensitive areas.

2. Install rock construction entrances.

3. Conduct initial clearing, limited to that necessary to install temporary sediment barriers.

4. Install all perimeter BMPs prior to any bulk earthmoving activity.

5. Conduct progressive clearing with installation of temporary sediment barriers and temporary equipment bridges keeping pace with clearing.

6. Modify access roads by grading and installing stone where needed.

7. Grade the workspace, and segregate topsoil where necessary.

7.6 CLEARING AND FLAGGING

Clearing operations include the removal of vegetation within the LOD. Various clearing methods are employed depending on tree size, contour of the land, and the ability of the ground to support clearing equipment. Vegetation clearing can be accomplished either by hand or by cutting equipment. The following procedures will be standard practice during clearing.

1. Prior to beginning the removal of vegetation:

    a. the limits of clearing will be established and visibly marked before clearing;

    b. signs and highly visible flagging will also be used to mark the boundaries of sensitive resource areas, including waterbodies and wetlands, and/or areas with special requirements along the construction work area, in accordance with the construction drawings;

    c. flagging or marking shall be maintained throughout construction; and

    d. trees to be protected as directed will be clearly marked, if applicable.

2. All construction activities and ground disturbance will be confined to within the permitted LOD shown on the construction drawings.

3. All brush and trees will be felled into the construction LOD to minimize damage to trees and structures adjacent to the LOD. Trees that inadvertently fall beyond the edge of the LOD will be immediately moved onto the LOD and disturbed areas will be immediately stabilized.

4. Trees will be chipped and removed or cut then stacked at the edge of the LOD or removed. Trees may be burned depending on local and state restrictions and applicable permits.

5. Brush and limbs may be disposed of in one or more of the following ways depending on local restrictions and applicable permits.

    a. stockpiled/windrowed along the edge of the workspace;

    b. burned – if burning of brush is elected and approved by DTI, the contractor will first obtain a burn permit from the local Fire Marshall or Fire Department with jurisdiction in Pennsylvania and abide by all site-specific requirements of the permit. The Environmental Inspector (EI) will receive a copy of the burn permit and determine where, if any, requirements conflict with other permits or requirements of the Project;

c. chipped, spread across the workspace in upland areas in accordance with federal and/or state requirements, and plowed in at the discretion of the Construction Site Supervisor or EI (excess material must be removed);

d. used as part of erosion control mix material; or

e. hauled off site to a DTI-approved disposal facility.

6. Existing surface drainage patterns shall not be altered by the placement of timber or brush piles at the edge of the construction workspace.

7.7 TEMPORARY SEDIMENT BARRIERS

Sediment barriers, which are temporary sediment controls intended to minimize the flow and deposition of sediment beyond approved workspaces or into sensitive resource areas, shall be installed following vegetation clearing operations. They may be constructed of materials such as super silt fence, compacted earth, or other appropriate materials (see Appendix A).

1. Install temporary sediment barriers at the base of slopes greater than 5 percent where the base of the slope is less than 50 feet from a road crossing, waterbody, and/or wetland.

2. Inspect temporary sediment barriers daily in areas of active construction to ensure proper functioning and maintenance. In other areas with no construction or equipment operation, sediment barriers will be inspected and maintained on a weekly basis throughout construction, and within 24 hours following runoff events. Remove accumulated sediments when sediment reaches half the aboveground height of the fence.

3. Sediment removed from erosion controls will be disposed by adding to existing on-site soil stockpiles and stabilizing, or will be reused on site within the construction LOD and outside of any wetlands, streams, or riparian areas.

4. Maintain all temporary sediment barriers in place until permanent revegetation measures are successful or the upland areas adjacent to wetlands, waterbodies, or roads are stabilized.

5. Remove temporary sediment barriers from an area when replaced by permanent erosion or sediment control measures or when the area has been successfully restored to uniform 70 percent perennial vegetation.

7.8 WIND EROSION CONTROL

The following temporary sediment controls are intended to minimize the surface and air movement of dust during land disturbing and constructing activities:

1. In areas with little or no construction traffic, a vegetative stabilized surface will reduce the dust emissions.

2. Mulch is not to be used in areas designated for heavy traffic. Binders or tackifiers should be used to stake organic mulches.

3. Tillage should be used only in an emergency situation before wind erosion begins, plowing on the windward side of the site with chisel-type plows spaced approximately 12 inches apart.

4. The site should be sprinkled with water until the surface is wet and repeated as needed.

5. Use of spray-on adhesives may be used on mineral soils only.

6. Use crushed stone or course gravel to stabilize roads and other areas during construction.

7. Use a board fence, wind fence, or sediment fence to control air currents and blowing soil. Place barriers perpendicular to prevailing air currents at intervals of about 15 times the barrier height.

8. Calcium chloride may be applied by a mechanical spreader as loose, dry granules or flakes at a rate that keeps the surface moist but not so high as to cause water pollution or plant damage.

9. Permanent vegetation can be used to help reduce soil and air movement.

7.9 GRADING

The construction LOD will be graded as needed to provide a level workspace for safe operation of heavy equipment used in workspace construction. The following procedures will be standard practice during grading: topsoil segregation, tree stump removal and disposal, rock management, and temporary stabilization as needed. These procedures are discussed in more detail in subsequent sections.

7.9.1 Topsoil Segregation

During construction, topsoil and subsoil will be disturbed by grading of the LOD and by heavy equipment moving throughout the LOD. Implementation of proper topsoil segregation is intended to mitigate these construction impacts and promote or facilitate post-construction revegetation success.

Topsoil segregation methods will be used in all areas at the land managing agency’s request, as applicable to these site activities. Either the “ditch plus spoil side” or the “full right-of-way” segregation method will be used.

1. Graded areas shall be scarified or otherwise loosened to a depth of 3 to 5 inches to permit bonding of the topsoil to the surface areas and to provide a roughened surface to prevent topsoil from sliding down slope.

2. Prevent the mixing of topsoil with subsoil by stripping topsoil from either the full work area or from the subsoil storage area (“ditch plus spoil side” method).

3. Segregate at least 12 inches of topsoil in deep soils with more than 12 inches of topsoil. In soils with less than 12 inches of topsoil, make every effort to segregate the entire topsoil layer.

4. Maintain separation of salvaged topsoil and subsoil throughout all construction activities.

5. Never use topsoil for improving or maintaining roads or as a fill material.

6. Topsoil shall be uniformly distributed across the disturbed area to a minimum depth of 4 to 8 inches—2 inches on fill outslopes. Spreading shall be done in such a manner that sodding or seeding can proceed with a minimum of additional preparation or tillage. Irregularities in the surface resulting from topsoil placement shall be corrected in order to prevent formation of depressions.

7. Topsoil shall not be placed while the topsoil or subsoil is in a frozen or muddy condition, when the subsoil is excessively wet, or in a condition that may otherwise be detrimental to proper grading and seedbed preparation. Compacted soils shall be scarified 6 to 12 inches along contour wherever possible prior to seeding.

8. Stabilize topsoil piles and minimize loss due to wind and water erosion with use of sediment barriers, mulch, temporary seeding, or functional equivalents, where necessary.

9. Cessation of activity for at least 4 days or more requires temporary stabilization. Immediate stabilization is required as soon as any graded area reaches final grade.

7.9.2 Rock Management

Rock will be used, removed, or disposed of in one of the following ways, as applicable, to the proposed site activities:

a. rock excavated from the LOD may be used to backfill LOD areas only to the top of the existing bedrock profile (rock that is not returned to the LOD shall be considered construction material or waste, unless approved for use as mulch or for some other use on the construction work areas by the land managing agency);

b. windrowed will not block natural drainages;

c. removed and disposed of at a DTI-approved disposal facility within the LOD; or

d. if removed to a DTI-approved disposal site not within the LOD, an approved E&SCP with the county conservation district is required.

NOTE: Form FP-001 – Certification of Clean Fill must be completed if fill material is brought onto the Project site, provided in Appendix D.

If removed to a DTI-approved disposal site not within the limits of disturbance, an approved E&SCP with the county conservation district is required.

7.9.3 Temporary Stabilization

Temporary stabilization will be conducted as needed for graded areas, spoil piles, and other disturbed land during construction with temporary seed and mulch as indicated below. The recommended soil amendment application rates and recommended seed mixtures are listed in Table 7.9.3-1.

Table 7.9.3-1: Recommended Seed Mixtures

Mixture Number	Species	Seeding Rate (pounds/acre) – Pure Live Seed	
		Most Sites	Adverse Sites
3	Birdsfoot trefoil, plus	6	10
	Tall fescue	30	35

Seeding rates are adapted from Table 11.4 of the PA ESC Manual. For birdsfoot trefoil, the empire variety will be used. For slopes greater than 3H:1V, the contractor will add perennial rye at 20 pounds per acre. For planting outside March 1 to October 15, the contractor will use winter oats at 90 pounds per acre and winter rye at 56 pounds per acre.

Table 7.9.3-2 lists the soil amendment application rates, which are adapted from Table 11.2 of the PA ESC Manual.

Table 7.9.3-2: Soil Amendment Application Rate Equivalents

Soil Amendment	Temporary Seeding Application Rate			
	Per Acre	Per 1,000 sq. ft.	Per 1,000 sq. yd.	Notes
Agricultural lime	1 tons	40 lb	410 lb.	Typically not required for topsoil stockpiles
10-10-20 fertilizer	500 lb.	12.5 lb.	100 lb.	Typically not required for topsoil stockpiles

7.10 LIMIT OF DISTURBANCE RESTORATION AND FINAL CLEANUP

Restoration of the LOD will begin after construction activities have been completed. Restoration measures include the re-establishment of final grades and drainage patterns as well as the installation of permanent erosion and sediment control devices to minimize post-construction erosion. Property shall be restored as close to its preconstruction condition as practical.

1. The contractor shall make every reasonable effort to complete final cleanup of an area (including final grading, topsoil replacement and installation of permanent erosion control structures) within 20 days after backfilling in that area. If seasonal or other weather conditions prevent compliance with these timeframes, continue to inspect and maintain temporary erosion and sediment controls (i.e., sediment barriers and mulch) until conditions allow completion of cleanup.

2. As soon as slopes, channels, ditches, and other disturbed areas reach final grade, they must be stabilized. The disturbed LOD will be seeded as soon as possible and within no more than 6 working days of final grading, weather and soil conditions permitting.

3. Grade the LOD to preconstruction contours, with the exception of the installation of any permanent measures required herein.
4. Spread segregated topsoil back across the graded LOD to its original profile.
5. Remove excess rock from at least the top 12 inches of soil in areas to return to meadow or better condition. The size, density, and distribution of rock on the construction workspace shall be similar to adjacent areas not disturbed by construction. The land managing agency may approve other provisions in writing.
6. A travel lane may be left open temporarily to allow access by construction traffic if the temporary erosion and sediment control structures are installed, regularly inspected, and maintained. When access is no longer required, the travel lane must be removed and the LOD restored.
7. Remove all construction debris (e.g., skids, trash, etc.) from all construction work areas unless the land managing agency approves leaving material on site for beneficial reuse, stabilization, or habitat restoration. Grade or till the LOD to leave the soil in the proper condition for planting.
8. Cessation of activity for at least 4 days or more requires temporary stabilization. Immediate stabilization is required as soon as any graded area reaches final grade.

7.10.1 Permanent Erosion Control

7.10.1.1 Erosion Control Fabric/Blankets

Erosion control fabric or blankets are used during restoration to decrease stormwater velocity and stabilize soil until vegetation becomes established. Install erosion control fabric or blankets where necessary or as recommended by the EI and according to manufacturer's specifications. Evaluate flow conditions to determine if erosion control fabric is suitable as an effective vegetation stabilization technique on waterbody banks. Erosion control fabric/blankets will be installed in accordance with the PA ESC Manual.

7.10.2 Revegetation and Seeding

Permanent seed mixes will be the same as those outlined in Section 7.9.3 of this E&SCP. Seeding will be conducted using the following requirements:

1. Fertilize and add soil pH modifiers in accordance with Table 7.10.2-1 Incorporate recommended soil pH modifier and fertilizer into the top 2 inches of soil as soon as practicable after application.

Table 7.10.2-1: Soil Amendment Application Rate Equivalents

Soil Amendment	Permanent Seeding Application Rate			
	Per Acre	Per 1,000 sq. ft.	Per 1,000 sq. yd.	Notes
Agricultural lime	6 tons	240 lb	2,480 lb.	Or as per soil test; may not be required in agricultural fields
10-10-20 fertilizer	1,000 lb.	25 lb.	210 lb.	Or as per soil test; may not be required in agricultural fields

2. Seed all disturbed areas within 6 working days of final grading, weather and soil conditions permitting.
3. Prepare seedbed in disturbed areas to a depth of 3 to 4 inches to provide a firm seedbed. When hydroseeding, scarify the seedbed to facilitate lodging and germination of seed.
4. Seeding is required in all disturbed areas in accordance with the seed mixes and rates, as described in Table 7.9.3-1 and Table 7.10.2-1, respectively, except in upland areas where a land management agency may request alternative seed mixes, however, seeding is not required in cultivated croplands.
5. Perform seeding of permanent vegetation within the recommended seeding dates, as outlined on the E&S drawings. If seeding cannot be done in a timely manner, use appropriate temporary erosion control measures and perform seeding of permanent vegetation at the beginning of the next recommended seeding season. Dormant seeding or temporary seeding of annual species may also be used, if necessary, to establish cover, as approved by the EI. Mulch in accordance with Section 7.10.3.
6. Use seed within 12 months of seed testing.
7. Treat legume seed with an inoculant specific to the species using the manufacturer's recommended rate of inoculant appropriate for the seeding method (broadcast, drill, or hydroseeding).
8. Uniformly apply and cover seed in accordance with the appropriate seed mix, as outlined on the E&S drawings, in the absence of any recommendations from the local soil conservation authorities or land managing agency.
9. Cessation of activity for at least 4 days or more requires temporary stabilization. Immediate stabilization is required as soon as any graded area reaches final grade.

7.10.3 Mulch

Mulch is intended to stabilize the soil surface and shall consist of weed-free straw, wood fiber hydromulch, or some functional equivalent in compliance with the PA ESC Manual and as approved by the EI and Chief Inspector. General mulch application rates are provided in Table 7.10.3-1, but may increase pending agency consultations. The mulch application rates, which are derived from the PA ESC Manual, will be applied to the proposed site activities.

Table 7.10.3-1: Mulch Application Rates

Mulch Type	Tons per Acre	Pounds per 1000 sq. ft.	Pounds per 1000 sq. yd.	Notes
Straw	3	140	1240	Either wheat or oat straw, free of weeds, not chopped or finely broken.
Hay	3	140	1240	Timothy, mixed clover and timothy, or other native forage grasses.
Wood Chips	4–6	185–275	1650–2500	May prevent germination of grasses and legumes.
Hydromulch	1	47	415	Shredded paper hydromulch should not be used on slopes steeper than 5 percent. Wood fiber hydromulch may be applied on steeper slopes provided a tackifier is used. The application rate for any hydromulch should be 2,000 pounds per acre at a minimum.

1. In general, to ensure that the seed will remain in place through germination and growth, seedlings must be mulched. Straw and hay mulch will be anchored or tackified immediately after application to prevent being windblown. A tractor-drawn implement may be used to “crimp” the straw or hay into the soil. Crimping of hay or straw by running over it with tracked machinery is not recommended. This method will be limited to slopes no steeper than 3H:1V. Mulch on slopes of 8 percent or steeper will be held in place with netting. All seeded areas should be mulched or covered with erosion control blanketing to minimize the potential for failure to establish an adequate vegetative cover. An area which is to be stabilized by vegetation will not exceed 15,000 square feet prior to reaching final grade without being seeded and mulched.

2. Mulch all disturbed upland areas (except cultivated cropland) before seeding if:

    a. Final cleanup, including final grading and installation of permanent erosion control measures, is not completed in an area within 20 days after the area is backfilled;

    b. Construction or restoration activity is interrupted for an extended period, such as when seeding cannot be completed due to seeding period restrictions;

    c. When final grade is achieved during non-germinating months, the area should be mulched until the beginning of the next planting season.

3. NOTE: When mulching before seeding, increase mulch applications on all slopes within 100 feet of waterbodies and wetlands to a rate of 3 tons/acre of straw or equivalent.

4. Apply mulch on all slopes (except in cultivated cropland) concurrent with or immediately after seeding, where necessary, to stabilize the soil surface and to reduce wind and water erosion. Spread mulch uniformly over the workspace as specified in the table above.

5. Ensure that mulch is anchored to minimize loss by wind and water. Anchoring may be achieved by wet soil conditions, when approved by the EI, mechanical means, or use of liquid mulch binders.

6. When anchoring with liquid mulch binders, use rates recommended by the manufacturer. Do not use liquid mulch binders within 100 feet of wetlands and waterbodies, except where the product is certified environmentally non-toxic by the appropriate state or federal agency or independent standards-setting organization.

7. Install erosion control fabric or blankets in accordance with the E&SCP.

7.10.4 Frozen Conditions and Winter Construction

Winter weather may not provide suitable conditions for soil handling or restoration of disturbed areas. In the event that the construction occurs too late in the year for cleanup activities to adequately proceed or if construction is planned to occur during winter weather conditions, DTI will develop a project-specific Winter Construction Plan that addresses:

- Winter construction procedures (e.g., snow handling and removal, access road maintenance, soil handling under saturated or frozen conditions, topsoil stripping);

- Stabilization and monitoring procedures if ground conditions will delay restoration until the following spring (e.g., mulching and erosion controls, inspection and reporting, stormwater control during spring thaw conditions); and

- Final restoration procedures (e.g., subsidence and compaction repair, topsoil replacement, seeding).

Section 7(c) and prior notice projects are required to file the Winter Construction Plan for review and written approval by the FERC. (The requirement to file a plan does not apply to projects constructed under the automatic authorization provisions in the FERC's regulations).

7.11 OTHER CONTROLS

7.11.1 Vehicles

All equipment will be refueled with extreme care under continual surveillance and away from the identified water resources within the vicinity of the Project site. On-site mobile fuel tanks shall be located in the staging areas with double walls to provide containment without the additional structure on the truck or trailer. Fueling vehicles shall only take place within the staging areas unless otherwise approved by an EI. A DTI representative and EI must be present if refueling occurs within a restricted refueling area, and refueling must be approved by the EI. If any fuel is spilled, the fuel-impacted soil material and fuel residue shall be cleaned up and disposed of properly. Fuel dispensers shall be locked during non-construction hours. Spills will be reported to the PADEP as per the requirements of the Preparedness, Prevention, and Contingency (PPC) Plan.

All equipment will be maintained in good operating condition and inspected regularly for leaks. Routine scheduled maintenance and identified necessary maintenance shall only take place within the staging areas unless equipment is not able to be moved to staging areas for unplanned, emergency repairs. In the event of planned major maintenance, the vehicle should be transported off site for service. Any liquids leaked during maintenance shall be cleaned up and disposed of properly.

Repairs shall only be made outside of the staging area if equipment requires emergency repairs on site (e.g., unexpected hydraulic hose rupture or similar) and cannot be moved to the staging area without the potential to have additional impacts. As soon as equipment can be safely moved, the equipment shall be moved to staging areas for continued maintenance. The EI shall be notified of all necessary emergency repairs prior to them occurring. Proper containers and/or disposable sorbent materials shall be placed under the equipment to collect drips and leaked liquids. Impacted soils and spilled material shall be properly cleaned up, contained, and disposed of properly.

Vehicle washing shall be performed off site. No vehicle washing will occur on site, except in the case of field maintenance.

All equipment operating on site will have sufficient spill containment equipment on board to provide for prompt cleanup in the event of a release. All equipment will also carry tools necessary to stop leaks and, if possible, make repairs.

7.11.2 Staging Areas

Staging areas should be maintained on site throughout the construction activities. The staging areas should be used as a place to store equipment, construction materials, waste, and additional construction-related material. The staging areas shall be in an area away from concentrated stormwater drainage paths. The contractor is responsible for storing and securing all tools, materials, and waste.

7.11.3 Washout Area

A washout area for excess concrete and cleaning of concrete delivery vehicles shall be constructed near areas where concrete pours will occur. Concrete wash water or green concrete shall be managed to minimize the potential for this material to reach identified water and wetland resources.

The washout area shall be installed in an upland area away from potential wetlands and streams. It shall be above grade, with a minimum width of 10 feet. The base and sides of the washout area shall be covered with a plastic sheeting at least 10 mils thick without any holes or tears. The wash area shall be inspected for any leaks, holes, and tears in the plastic on a daily basis. If the washout area gets to 75 percent capacity, the area should be cleaned out. Once all concrete mixing activities are completed, the concrete waste area should be allowed to harden, be broken up, and then disposed of properly.

8.0 BEST MANGEMENT PRACTICES USED FOR EARTH DISTURBANCE ACTIVITY

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, maximize protection of 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 in order to achieve these broad goals. The location of each proposed BMP is shown on the E&SCP drawings in Appendix A.

Each planned erosion and sediment control BMP is specified for implementation to address a specific aspect of the proposed earth disturbance. The various BMPs were chosen based on their effectiveness for the planned use. Erosion and sediment control will primarily be achieved through the use of temporary and permanent water bars. Where necessary, upstream diversion berms will be used to direct clean upslope runoff away from the proposed earth disturbance. Primary downslope perimeter control will be achieved by installing super silt fence. Additional perimeter controls (i.e., additional super silt fence) may be necessary at the contractor's discretion should unexpected erosion be encountered during grading activities. Erosion control blankets will be installed within 50 feet of streams and 100 feet of wetlands.

A rock construction entrance will be used to control sediment tracking from the construction site at all ingress/egress points. Site access roads and pads will be stabilized with an aggregate (e.g., rock, stone, and/or gravel) surface as soon as possible during construction. This will greatly reduce the opportunity for erosion and sedimentation from these heavily trafficked areas. Additional BMPs include planned soil stockpile locations with appropriate perimeter controls, temporary seeding of inactive stockpiles, seeding and mulching all proposed vegetated areas immediately upon reaching design elevations, and erosion control matting of all slopes 3H:1V or steeper. Stormwater runoff associated with the Crayne Compressor Station modifications will be managed by the existing detention pond.

8.1 MINIMIZE EARTH DISTURBANCE

Limiting the extent and duration of earth disturbance to that necessary to construct the proposed facility is the simplest and most effective BMP available. The LOD depicted on the E&SCP drawings has been established to restrict construction activities to the minimum area needed to effectively and efficiently construct the proposed facility. The Project was designed to restrict earth disturbance to within the existing property boundary with no newly developed land added to the Project and minimal impervious surface added to the site. In addition to limiting the extent of the proposed earth disturbance, construction activities have been planned to limit the duration of earth disturbance.

The proposed Project will involve two primary stages of activity: 1) construction and 2) site restoration. The majority of earth disturbance will occur in the first stage of the Project, with a much smaller earth disturbance occurring during site restoration in the final stage of the Project. The contractor shall make every reasonable effort to complete final cleanup of an area within 20 days, pending seasonal and weather restrictions. The entire site, where applicable, will be stabilized through the use of permanent or temporary stabilization techniques as described in this Plan. Limiting the duration of this critical stage of the Project is one of the most effective BMPs.

8.2 GENERAL EROSION AND SEDIMENT CONTROL PLAN REQUIREMENTS

The BMPs listed in this plan shall be installed and maintained in accordance with the PA ESC Manual. 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 percent 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, appropriate municipal officials, the Greene County Conservation District, the E&SCP preparer, the SR/PCSM Plan preparer, and a representative from the applicable PADEP regional office to an on-site preconstruction meeting. PA One Call will be notified at least 3 days prior to earth disturbance activities.

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.

Erosion and sediment control measures shall be installed and operational as indicated in the construction schedule prior to any earthmoving activities. See the “BMP Installation Sequence” in this plan and on the E&SCP drawings. Control measures must be in place and operational at the end of each workday. Where it is possible, the disturbed area will be permanently stabilized immediately after the final earthmoving has been completed. For disturbed areas not able to be permanently stabilized, interim stabilization in the form of temporary seeding and mulching will be implemented. Until the site is permanently stabilized, all E&S measures must be maintained properly by the contractor.

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

Minor modification to the approved E&SCP shall be noted on the plan that is available at the site and initialed by the appropriate PADEP or Greene County Conservation District staff. Minor changes to the plan may include adjustments to BMPs and locations within the permitted boundary to improve environmental performance, prevent potential pollution, change 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 plan.

9.0 SEQUENCE OF EROSION AND SEDIMENT CONTROL BEST MANAGEMENT PRACTICE INSTALLATION

This sequence of BMP installation is intended to provide a general course of action during Project construction to conform to applicable regulatory agency requirements for temporary and permanent erosion and sediment control installation. It shall be the responsibility of the contractor to comply with the conservation district and any other applicable local, state, and federal regulations including but not limited to, the manner, direction, location, and condition of the waste disposal site. Any necessary tasks for proper and complete execution of work pertaining to this plan, whether specifically mentioned or not, are to be performed by the contractor. The contractor shall comply with the requirements listed in this section. The contractor may be required to alter controls based on effectiveness of controls or differing site conditions encountered.

The following is a general narrative 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 the cover of the E&SCP drawings. Refer to the E&SCP drawings for additional site-specific installation information (see Appendix A).

The first BMP to be installed at the site will be the rock construction entrance. Immediately following installation of the rock construction entrances, any planned upslope diversions and all perimeter controls (e.g., super silt fence, etc.) will be placed prior to any major earth disturbance (including clearing and grubbing). Specific function BMPs such as sediment traps, channels, culverts, or outlet protection will be installed at the appropriate time as construction progresses. All planned erosion and sediment control BMPs shall be in place and functional before any earth disturbance occurs within the drainage area for the planned BMP. Unless specifically stated otherwise in this plan, all BMPs will remain in place until the SR/PCSM Plan has been implemented and final stabilization has been achieved.

9.1 TEMPORARY EROSION AND SEDIMENT CONTROL BEST MANAGEMENT PRACTICE REMOVAL

Upon completion of earth disturbance as described in this E&SCP, the rock construction entrance shall be removed and to the area will be stabilized in a manner similar to the remainder of the access road. All other erosion and sediment control BMPs shall remain functional and in place until permanent stabilization is achieved and the Conservation District approves removal. Permanent stabilization is defined as a minimum uniform, perennial 70% vegetative cover or other permanent non-vegetative cover with a density sufficient to resist accelerated erosion. In no cases, except when replaced by another BMP approved by the PADEP or Conservation District, shall any erosion and sediment control BMPs be removed prior to all areas with the potential to be impacted by runoff achieving permanent stabilization.

After final stabilization has been achieved, temporary erosion and sediment control BMPs may be removed if they are not necessary for implementation of the SR/PCSM Plan. Any E&S BMPs that are to remain as SR/PCSM BMPs must be modified where necessary to meet the requirements of the permanent facility. Areas disturbed during removal or conversion of the BMPs to SR/PCSM BMPs must be stabilized immediately.

10.0 SUPPORTING CALCULATIONS

A primary component of this E&SCP was the design of erosion and sediment control BMPs to minimize and control accelerated erosion and minimize the generation of increased runoff. All proposed erosion and sediment control BMPs have been designed per design guidance provided in the PA ESC Manual. Erosion and sediment control design calculation worksheets showing the design information for all proposed erosion and sediment control BMPs are included in the supporting calculations provided in Appendix E of this Plan.

11.0 PLAN DRAWINGS

A complete set of E&SCP drawings is included in Appendix A of this plan. These drawings depict the existing and proposed conditions relevant to the proposed Project, including but not limited to existing and proposed topography, pertinent existing features, proposed site facilities, and proposed E&SCP information.

The E&SCP drawings include all information necessary for a contractor to correctly install, operate, and maintain the proposed erosion and sediment control BMPs. Proposed E&SCP information includes the proposed LOD, the proposed permit boundary, proposed erosion and sediment control BMPs, construction sequence, plan notes, construction details, seeding, mulching and soil amendment specifications, and maintenance instructions.

12.0 MAINTENANCE PROGRAM

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 E&SCP and minimizing accelerated erosion and sedimentation from the proposed earth disturbance. The permittee and shall be responsible for implementing the following maintenance program.

12.1 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 placement of erosion controls, spoil containment, and other construction-related items are essential.

To ensure that the E&SCP is properly implemented, at least one EI will be designated by DTI for each construction spread during active construction or restoration activities. The EI is responsible for verifying environmental compliance on the construction spread, and performing the duties that are outlined in Section 12.1.1.

Per PADEP requirement, the contractor shall inspect all erosion and sediment control BMPs after each runoff event and on a weekly basis, at a minimum, and record observations in the PADEP Visual Site Inspection Form, provided as Appendix F. This inspection shall include a general review of the performance of all of the erosion and sediment control facilities as well as an examination of each individual BMP, noting when maintenance (e.g., cleanout, repair, replacement, regrading, restabilizing) 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, replacement, regrading, reseeding, remulching, and renetting 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 control BMP inspection log shall be maintained on site and be made available to regulatory agency officials at the time of inspection. The log shall contain inspection dates, observed deficiencies, and remediation dates. The SR/PCSM Plan, inspection reports, and monitoring records shall be available for review and inspection by PADEP or the conservation district.

12.1.1 Role and Responsibility of the Environmental Inspector

EIs will have the authority to stop activities that violate the environmental conditions of the FERC's Orders (if applicable), stipulations of other environmental permits or approvals as well as order appropriate corrective action.

The EI will have peer status with all other activity inspectors and will report directly to the Chief Inspector who has overall authority on the construction spread or Project.

At least one EI having knowledge of the wetland and waterbody conditions in the Project area is required for each construction spread. The number and experience of EIs assigned to each construction spread shall be appropriate for the length of the construction spread and the number/significance of resources affected. On Section 7(c) and other large construction projects, the person designated as the EI will typically be a dedicated role for each construction spread. On small construction activities carried out under this E&SCP, the EI role may be carried out by the Chief Inspector or another designated and properly trained Company Inspector on site, at the discretion of the Company. In such instances, the Company may employ additional periodic oversight of the EI(s) by an environmental specialist.

At a minimum, the EI shall be responsible for:

1. Inspecting construction activities for compliance with the requirements of this E&SCP, the construction drawings, the environmental conditions of the FERC's Orders (if applicable), proposed mitigation measures, and other federal or state and local (if applicable) environmental permits and approvals;
2. Identifying, documenting, and overseeing corrective actions, as necessary to bring an activity back into compliance;

3. Verifying that the limits of authorized construction work areas and locations of access roads are visibly marked before clearing, and maintained throughout construction;
4. Verifying the location of signs and highly visible flagging marking the boundaries of sensitive resource areas, including waterbodies and wetlands, or areas with special requirements along the construction work area;
5. Identifying erosion/sediment control and soil stabilization needs in all areas;
6. Advising the Chief Inspector when environmental conditions (such as wet weather, severe storm events or frozen soils) make it advisable to restrict or delay construction activities to avoid topsoil mixing or excessive compaction;
7. Ensuring restoration of contours and topsoil;
8. Ensuring that the appropriate erosion and sediment control and stabilization needs are implemented in all areas, including ensuring that erosion and sediment controls are properly installed and maintained daily to prevent sediment flow into sensitive resource areas (e.g., wetlands, waterbodies, cultural resource sites, sensitive species habitats) and onto roads, and determining the need for additional erosion control devices;
9. Inspecting and ensuring the maintenance of temporary erosion and sediment control measures at least:
    a. On a daily basis in areas of active construction or equipment operation;
    b. On a weekly basis in areas with no construction or equipment operation; and
    c. Within 24 hours of each stormwater event (runoff from precipitation, snowmelt, surface runoff and drainage, as defined by Pennsylvania Chapter 102 Regulations), including rainfall events resulting in 0.5 inches or more.
10. Ensuring the repair of all ineffective temporary erosion and sediment control measures within 24 hours of identification, or as soon as conditions allow if compliance with this time frame would result in greater environmental impacts;
11. Documenting inspection on the PADEP Visual Site Inspection Report in Appendix F;
12. Identifying areas that should be given special attention to ensure stabilization and restoration after the construction phase;
13. Ensuring proper seed mixes, rates and restoration methods are used, and obtaining documentation;
14. Ensuring that the contractor implements and complies with DTI's PPC Plan, DTI's *Waste Management Plan*, and other Company environmental documents and standard operating procedures;
15. Verifying that locations for any disposal of excess construction materials for beneficial reuse comply with this E&SCP and any applicable permits/clearances; and

16. Keeping records of compliance with the environmental conditions of the FERC's Orders and the mitigation measures proposed by DTI in the application submitted to FERC (if applicable), and other federal or state environmental permits during active construction and restoration. Records should include photo documentation.

12.1.2 Environmental Training for Construction

Prior to the start of construction, DTI will conduct environmental and field training for company and contractor personnel. The training program will be focused on the PA ESC Manual, the FERC's Plan and Procedures*;* this E&SCP; applicable permit conditions and other applicable construction, restoration, and mitigation plans as identified. DTI will provide large-group training sessions before each work crew commences construction with follow-up training for groups of newly assigned personnel.

Environmental training will be given to both DTI personnel and contractor personnel whose activities have the potential to impact the environment during workspace and compressor station construction and modifications. All construction personnel will go through an environmental training program. The level of training will be commensurate with the type of duties of the personnel. At the discretion of DTI, environmental training for personnel may also be required on projects where it is not required by FERC.

Training will be given prior to the start of construction and throughout the construction process, as needed, and will cover the following issues:

- Specifics of this E&SCP and other DTI plans;
- Job or activity specific permit requirements;
- DTI policies and commitments;
- Cultural resource procedures and restrictions;
- Threatened and endangered species procedures and restrictions; and
- Any other pertinent information related to the job.

In addition to the EI, all other construction personnel are expected to play an important role in maintaining strict compliance with all permit conditions, and to promptly report any conditions that are perceived as having the potential to threaten environmental protection to the appropriate inspector during construction.

Contractors will provide spill prevention and response training to their work crews as well as educate work crews on how to conduct daily inspections of erosion and sediment control BMPs. The training program will be designed to improve awareness of potential hazards, pollution control laws, and proper operation and maintenance or equipment. Contractors will train all employees who handle fuels and other regulated substances to prevent spills and to quickly and effectively contain and clean up spills that may occur in accordance with applicable regulations. Contractors will also train all employees on the methods by which to inspect, properly install, and repair erosion and sediment control structures, as well as response procedures to implement in the event an erosion and sediment control structure fails. Copies of blank training records are included as Appendix G.

12.2 GENERAL MAINTENANCE

The applicant shall be responsible for the continuous maintenance of all erosion and sediment control measures and devices for the duration of the Project until which time the area is stabilized with a minimum uniform perennial 70 percent vegetative cover or other permanent non-vegetative cover with a density sufficient to resist accelerated erosion, and the contractor has received written approval of Notice of Termination.

Areas void of vegetation shall promptly be reseeded and mulched to establish protection. Accumulated sediment will be removed when it reaches half the aboveground height of the sediment barrier. BMPs will be repaired or replaced (as necessary) to ensure effective and efficient operation. Solid waste disposal is the responsibility of the contractor. The contractor is responsible for proper trash disposal, recycling of materials, proper materials handling, and spill prevention and cleanup to reduce the potential for construction site wastes to be mobilized by stormwater runoff and conveyed to surface waters. Under no circumstances may BMPs be used for temporary storage of demolition materials or construction wastes. All necessary repairs will be made immediately after any deficiencies have been observed.

12.3 SPECIFIC MAINTENANCE

The contractor shall be responsible for the specific maintenance activities throughout the duration of the Project. Specific maintenance activities for individual BMPs are identified on the E&SCP drawings in Appendix A.

12.3.1 Seeding and Mulching Maintenance

Inspect seeded and mulched areas for evidence of erosion; immediately repair and reseed areas disturbed by erosion or slope movement. Identify vegetated areas in need of additional erosion control measures until permanent vegetative cover is established.

Inspect seeded and mulched areas for displaced mulch cover and uneven vegetative growth. For displaced mulch, replace mulch at original application rate or greater. Reseed bare areas at original seed application rates.

12.3.2 Rock Construction Entrance Maintenance

Rock construction entrance thickness shall be constantly maintained to the specified dimensions by adding rock. A stockpile shall be maintained on site for this purpose. All sediment deposited on paved roadways shall be removed and returned to the construction site immediately. If excessive amounts of sediment are being deposited on the adjacent roadway(s), extend the length of the corresponding rock construction entrance by 50 foot increments until the condition is alleviated or. Washing the roadway or sweeping the deposits into roadway ditches, sewers, culverts, or other drainage courses is not acceptable.

13.0 RECYCLING AND DISPOSAL PROCEDURES

Building materials and other construction site wastes must be properly managed and disposed of to reduce potential for pollution to surface and ground waters as per 25 Pa. Code § 102.4(b)(5)(xi). All building materials and wastes shall be removed from the site and recycled or disposed of in accordance with the PADEP's Solid Waste Management Regulations at 25 Pa. Code 260.1 et seq., 271.1 and 287.1 et. seq. No building materials, wastes, or unused building materials shall be burned, buried, dumped, or discharged at the site. No off-site disposal area has been identified as part of this plan. Construction waste will be disposed of properly by the contractor at a facility approved by PADEPand DTI or recycled.

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

The contractor shall be responsible for submitting an E&SCP for any borrow or waste areas required to complete the work. Disposal locations for excess soil/rock waste will implement appropriate BMPs. The disposal locations must be verified with the PADEP to show compliance with wetland and floodplain regulations. If an off-site location is used for borrow or disposal, the contractor is responsible for developing and implementing an adequate E&SCP and submitting the plan(s) to the PADEP for review and approval. The contractor must immediately stabilize the waste site upon completion of any stage or phase of earth disturbance activity at the waste site.

14.0 GEOLOGIC FORMATIONS OR SOIL CONDITIONS WITH POTENTIAL TO CAUSE POLLUTION

General Geology

The bedrock unit beneath the Crayne Compressor Station is comprised of the Waynesburg Formation, which consists of cyclic sequences of sandstone, shale, limestone, and coal. The formation ranges in thickness from 80 to 210 feet within Greene County, increasing in thickness from northwest to the south.

Regionally, the water table varies based on topographic setting and water-bearing zone head. The water levels in valleys and upland areas are shallow and become deeper with increasing elevation to hilltops. The depth to water varies with rock type, physiography, and precipitation. The median well depth in the Waynesburg Formation is 84 feet below ground surface, with a range from 8 to 393 feet below ground surface. The median reported yield for wells in the Waynesburg Formation is 3.8 gallons per minute, with a range of 0.2 to 40.0 gallons per minute. The median specific capacity for wells in the Waynesburg Formation is 0.40 gallons per minute per foot, with a range of 0.01 to 4.4 gallons per minute per foot.

Surficial Geology

According to the Mather, Pennsylvania USGS 7.5 Minute Quadrangle Map, the Crayne Compressor Station site is approximately 1,000 to 1,120 feet above mean sea level near the township of Waynesburg. The topography consists of very hilly with narrow hilltops and steep-sloped narrow valleys, which have been modified by fluvial erosion and periglacial mass wasting. Detailed NRCS soil reports are included in Appendix B.

Landslide Susceptibility

The USGS Preliminary Landslide Overview Map of the Conterminous United States indicates the proposed area is in an area of high landslide incidence. This hazard can be further mitigated by implementing proper sloping and drainage controls. DTI is implementing a comprehensive Geohazards Analysis Program to assess potential geohazards, including slope failures at aboveground facility sites. There are no slopes greater than 30 percent in the defined Project area within Greene County, Pennsylvania.

Earthquake Probability

According to the Pennsylvania Geologic Data Exploration web-mapping application (PaGEODE) online services, the nearest earthquake to the JB Tonkin Compressor Station occurred in 1965, at magnitude 3.3. The largest known earthquake to occur in Pennsylvania, the Pymatuning Earthquake, had an epicenter in Jamestown, approximately 110 miles north of the Crayne Compressor Station. The Pymatuning Earthquake had a magnitude of 5.2, causing light property damage.

The USGS maintains a database containing information on surface and subsurface faults and folds in the United States that are believed to be sources of earthquakes of greater than 6.0 magnitude during the past 1.6 million years.

Potential Geologic Hazards

According to the available coal resource information, there has been no underground mining at the proposed site area, however, mined areas surround the site from the northwest to the east of the site with the closest evidence of mining just over 2,000 feet to the east near Ruff Creek. There does not appear to be any abandoned or reclaimed strip mining or mine tailings piles, based on the USGS 7.5 Minute Quadrangle Map. Although there has not been any mining at the site-specific location, the proposed well pad is close to areas of bedrock with potentially acid-producing sulfide minerals. The Little Washington Coal, which marks the base of the Waynesburg Formation upper member, can range in depth from 5 to 50 feet below ground surface. Cut and fill operations may extend near or directly above this relatively thin seam, and as such, acidic drainage could be a potential hazard. Acidic drainage would adversely affect ecological receptors in any stream receiving such discharges from the site.

The primary mitigation of this potential geologic hazard will be avoidance. The maximum depth of excavation for the proposed Project is 12 feet below existing grade, with the majority of the proposed earthmoving activities occurring at much shallower depths. At these relatively shallow depths, it is not likely that the proposed construction activities will encounter the noted bedrock with potentially significant acid-producing sulfide minerals. Nonetheless, if the coal layers or rocks with acid producing minerals are encountered during construction activities, it would be a small amount.

In the event that bedrock with potentially significant acid-producing sulfide minerals is encountered during excavation for the proposed facility, the following mitigation measures are to be followed:

- Material with the potential to provide significant acid-producing sulfide minerals encountered during pad construction is not to be used as fill material on-site. This material shall be exported off site and disposed in a proper manner.
- Material with the potential to provide significant acid-producing sulfide minerals exposed during pad construction is to be addressed through site specific analysis and design of appropriate mitigation measures. Possible mitigation measures for small quantities could be blending the materials with acid-neutralizing materials, such as limestone; covering the material with soil or glacial till and layering with lime or limestone.

15.0 THERMAL IMPACTS TO SURFACE WATERS

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 one being proposed:

- 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; and
- Increased stream temperatures due to reduced base flow caused by reduction in site's infiltration capacity.

Siting of the proposed facilities was limited by the location of the existing facilities and pipelines which they will service, 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. However, Table 15.0-1 shows several site layout criteria that were used for the proposed Project and how they help prevent or minimize thermal impacts to receiving waters.

Table 15.0-1: Thermal Impact Benefits of Site Layout Criteria

Site Layout Criteria	Thermal Impact Benefits
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 facilities	Minimize proposed impervious cover
Choose areas with minimal existing tree cover	Reduce removal of existing tree canopy

In addition to the above site selection criteria, several BMPs mitigate thermal impacts from the proposed Project. Minimizing the LOD and the limit of tree clearing to the minimum area necessary to construct the proposed facilities will preserve existing vegetative cover and maintain the infiltration and evapotranspiration capacity of undisturbed areas to the maximum extent practicable. Also, disturbed areas will be immediately revegetated to help cool runoff prior to discharge.

16.0 EROSION AND SEDIMENT CONTROL PLAN CONSISTENCY WITH THE POST-CONSTRUCTION STORMWATER MANAGEMENT PLAN

A SR/PCSM Plan has been developed for this Project to maximize replication of the natural hydrologic cycle, protect the structural integrity of receiving waters, and protect and maintain existing and designated uses of the Commonwealth waters. It was developed in accordance with the requirements of 25 Pa. Code § 102, as well as the Clean Streams Law (35 P.S. § 691.1001), as amended, utilizing guidelines and BMP information provided in the Pennsylvania Stormwater Best Management Practices Manual.

This E&SCP was planned and designed to support the management of stormwater for erosion and sediment control during earth disturbance activities in a manner that is compatible with the proposed SR/PCSM Plan. This plan complements the SR/PCSM Plan and is consistent with Pa. Code § 102.8. Post-construction condition monitoring, maintenance, and reporting will be discussed in the SR/PCSM Plan narrative in Section 5 of the ESCGP-2 application package.

17.0 RIPARIAN BUFFERS

17.1 EXISTING RIPARIAN BUFFERS

Riparian buffers are an area 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. The proposed Project activities at the Crayne Compressor Station do not directly affect wetlands or waterbodies, as determined by field surveys. No existing riparian buffers were identified within the proposed Project area.

17.2 PROPOSED RIPARIAN BUFFERS

This Project is not located in a special protection watershed (Exceptional Value or High Quality) and does not propose earth disturbance within 150 feet of a perennial or intermittent river, stream, or creek, or lake, pond or reservoir. As such, according to Pa. Code § 102.14(a), mandatory riparian buffers are not required for this Project.

18.0 ANTIDEGRADATION

There are no streams or high quality or exceptional value watersheds within the Project area. Post-construction condition peak discharge is less compared to preconstruction discharge rates. With the lessened peak discharge and limited thermal impacts, there will be no degradation post-construction condition. To reduce impacts to water quality from stormwater runoff associated with Project activities, the following anti-degradation best available combination of technology (ABACT) nondischarge alternative standards will be applied to this Project, as necessary, in addition to the BMPs outlined throughout the E&SCP:

- Access to the site has been limited to the use of construction entrances that were designed to use existing roads and avoid stream and wetland crossings.

- Upon completion or temporary cessation of earth disturbance activities, disturbed areas will be stabilized; soil stabilizers and blanketing will be used as necessary. Disturbed areas will be revegetated in accordance with DTI's post-construction management plan.

These BMPs, in conjunction with the additional BMPs outlined in the E&SCP, serve to minimize or eliminate increased stormwater discharges to all waters of the Commonwealth of Pennsylvania.

19.0 SPILL PREVENTION AND RESPONSE

19.1 SPILL PREVENTION, CONTROL AND COUNTERMEASURE PLAN AND PREPAREDNESS, PREVENTION AND CONTINGENCY PLAN

DTI has prepared a PPC Plan and a copy of the PPC Plan will be maintained at the Project site.

The purpose of the PPC plan is to reduce the probability and risk of a potential spill or release of oil or hazardous materials during construction-related activities. The objectives of these plans are to identify and address:

- The type and quantity of material handled, stored, or used on site during construction;
- Measures to be taken for spill preparedness and prevention;
- Emergency response procedures;
- Spill incident reporting/notification procedures; and
- Local emergency response team arrangements.

An SPCC Plan (Spill Prevention, Control and Countermeasure Plan) is, in general terms, required if a facility has an aggregate aboveground storage capacity of oil greater than 1,320 gallons. DTI does not intend to store more than the permitted threshold.

DTI will provide an SPCC Plan if more than the above threshold is stored on-site. The SPCC Plan will be made available to the Contractor and appropriate agencies, if necessary.

19.2 SPILL PREVENTION AND RESPONSE PROCEDURES

Potential spills may occur anywhere within the LOD, but specifically in areas where refueling, equipment maintenance, and chemical storage is occurring. When refueling or maintaining equipment, proper buffer areas must be maintained at streams, wetlands, and other water conveyance channels.

DTI will report any noncompliance that may endanger health or the environment to the appropriate contact in Table 19.0-1 immediately after becoming aware of the circumstances. If a spill occurs, the federal and state agencies listed in Table 19.0-1 shall be contacted.

Table 19.0-1: Spill Response Notification Contacts

Agency	Telephone Number
PADEP Southwest Regional Office	412-442-4000
PADEP Dept. of Field Operation	717-787-5028
Pennsylvania Emergency Management Agency	717-651-2001
EPA Region III Hotline	215-814-9016
Federal National Response Center	800-424-8802
U.S. Coast Guard National Response Center	800-424-8802
Pennsylvania Fish and Boat Commission	814-445-8974
Chemical Transportation Emergency Center	800-424-9300
Regional Poison Information Center	800-222-1222

Owners and operators must provide written notification to the appropriate regional office and to the local municipality with 15 days of the reportable release. DTI's Environmental Incident Report form should be submitted in accordance with the above-listed requirements. For spills not deemed reportable, it is strongly recommended that that facts concerning the incident be documented and a record maintained for 1 year.

DOMINION TRANSMISSION, INC.

SUPPLY HEADER PROJECT

SECTION 4 – EROSION AND SEDIMENT CONTROL PLAN (ESCP)

APPENDIX A – ESCP DRAWINGS

GENERAL NOTES:

1. COORDINATE SYSTEM USED FOR MAPPING AND TOPOGRAPHY - UTM WITH NAD83 DATUM, ZONE 17, US SURVEY FOOT, CENTRAL MERIDAN 81° W.
2. CONTOURS AND TOPOGRAPHIC FEATURES WERE DERIVED FROM LIDAR DATA AND GPS SUB-METER GROUND SURVEY PERFORMED BY GAI CONSULTANTS, INC FROM 11-03-2014 THRU 11-07-2014.
3. IMAGERY TAKEN FROM GOOGLE EARTH.
4. THE PROPERTY LINES SHOWN ARE BASED ON GIS & TAX ASSESSMENT RECORDS (PROVIDED BY OTHERS). GAI CONSULTANTS MAKE NO GUARANTEE EITHER EXPRESSED OR IMPLIED AS TO THE ACCURACY OF THE RECORDS AS SHOWN ON THESE DRAWINGS.
5. THIS PLAN SET CONTAINS ALL INFORMATION FOR THE EROSION AND SEDIMENT CONTROL PLAN (E&S PLAN) AND POST-CONSTRUCTION STORMWATER MANAGEMENT PLAN (PCSM PLAN) REQUIRED FOR THE PERMIT AS SPECIFIED ABOVE. THIS IS A PERMIT DOCUMENT ONLY. ADDITIONAL PLANS AND DOCUMENTATION ARE REQUIRED FOR CONSTRUCTION OF THE PROPOSED DEVELOPMENT.

REFERENCE (ALL SHEETS):

1. SOILS INFORMATION FROM UNITED STATES DEPARTMENT OF AGRICULTURE, NATURAL RESOURCES CONSERVATION SERVICE WEB SOIL SURVEY (CURRENT).

CONSTRUCTION SEQUENCE:

1. ALL EARTH DISTURBANCE ACTIVITIES SHALL PROCEED IN ACCORDANCE WITH THE FOLLOWING GENERAL CONSTRUCTION SEQUENCE. CONSTRUCTION ACTIVITIES MAY BE PERFORMED CONCURRENTLY, OR ON PARALLEL PATHS WHERE APPROPRIATE, PROVIDED THAT THE APPROPRIATE EROSION ANO SEDIMENT CONTROL BMPS HAVE BEEN IMPLEMENTED.
2. AT LEAST SEVEN (7) DAYS BEFORE STARTING ANY EARTH DISTURBANCE ACTIVITIES, THE OWNER AND/OR OPERATOR SHALL NOTIFY THE GREEN 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 CONSERVATION DISTRICT.
3. AT LEAST THREE (3) DAYS BEFORE STARTING ANY EARTH DISTURBANCE ACTIVITIES, ALL CONTRACTORS INVOLVED IN THOSE ACTIVITIES SHALL NOTIFY THE PENNSYLVANIA ONE CALL SYSTEM INCORPORATED AT 1-800-242-1776 FOR THE LOCATION OF EXISTING UNDERGROUND UTILITIES.
4. INSTALL ROCK CONSTRUCTION ENTRANCES AT EACH LOCATION SHOWN ON THE PLANS.
5. INSTALL TEMPORARY PERIMETER CONTROL BMPS (SUPER SILT FENCE) AT ALL LOCATIONS SHOWN ON THE PLANS. LIMIT CLEARING AND EARTH DISTURBANCE TO THAT ABSOLUTELY NECESSARY TO PROPERLY INSTALL THE PROPOSED BMPS.

POST CONSTRUCTION STORMWATER MANAGEMENT

1. UPON COMPLETION OF CONSTRUCTION ACTIVITIES AT THE PROPOSED PIPEYARD, RESTORE THE ENTIRE SITE TO PRE-EXISTING CONDITIONS AS DETAILED BY THE PCSM PLAN.
2. ANY TEMPORARY MEASURES (SUCH AS COMPOST FILTER SOCK, COLLECTION CHANNEL, RIPRAP APRONS, ETC.) INSTALLED BY CONTRACTOR, SHALL REMAIN IN PLACE UNTIL FINAL STABILIZATION HAS 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.

Dominion[SM]

DOMINION TRANSMISSION, INC.
445 W. MAIN STREET, CLARKSBURG, WV 26301

LEGEND

— — —	PROPERTY LINE
—X—X—X—X—X—	FENCE
— LOD — LOD — LOD —	LIMITS OF DISTURBANCE
— LOC —	LIMITS OF CONSTRUCTION
— SSF — SSF — SSF —	SUPER SILT FENCE
———	SOIL BOUNDARY
———	SOIL CLASSIFICATION
	WETLAND
	TREE/BRUSH LINE
	EXISTING CULVERT
— — — — —	EXISTING CONTOUR LINE
	CLEAN WATER DIVERSION SWALE

CRAYNE STATION (PENNSYLVANIA) DRAWING INDEX

SHEET NO.	REV.	SHEET TITLE
1		COVER SHEET
2		EXISTING CONDITIONS
3		EROSION AND SEDIMENT CONTROL PLAN
4		DETAILS AND NOTES

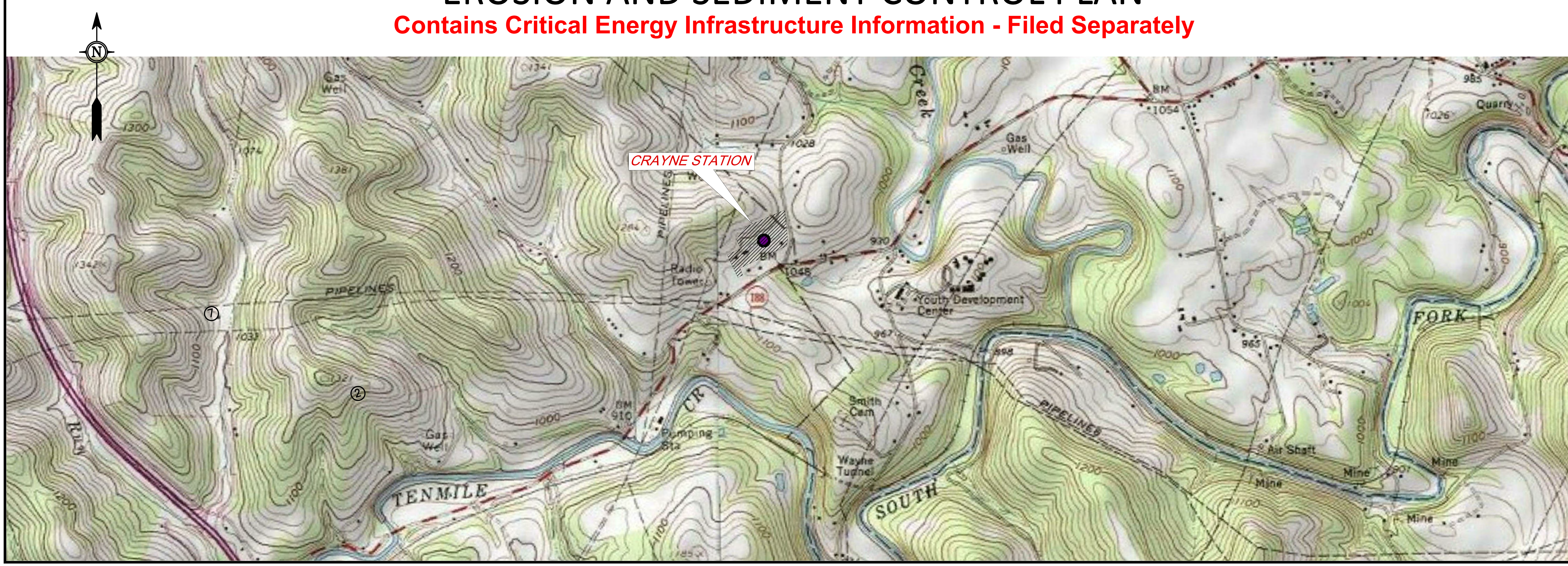
CALL BEFORE YOU DIG!
PENNSYLVANIA LAW REQUIRES 3 WORKING DAYS NOTICE FOR CONSTRUCTION PHASE AND 10 WORKING DAYS IN DESIGN STAGE – STOP CALL
Pennsylvania One Call System, Inc.

1-800-242-1776

PENNSYLVANIA ACT 287 OF 1974, AS AMENDED BY PA ACT 181 OF 2006, REQUIRES NOTIFICATION OF EXCAVATORS, DESIGNERS, OR ANY PERSON PREPARING TO DISTURB THE EARTH'S SURFACE ANYWHERE IN THE COMMONWEALTH, CALL PENNSYLVANIA ONE CALL SYSTEM, INC. AT 1-800-242-1776 BEFORE ANY DISTURBANCE.

PA SUPPLY HEADER PROJECT - PROPOSED ADDITION TO EXISTING CRAYNE COMPRESSOR STATION & CONTRACTOR STAGING AREAS
EROSION AND SEDIMENT CONTROL PLAN

Contains Critical Energy Infrastructure Information - Filed Separately



REVISIONS

NO.	DATE	DWN.	CHKD.	APPVD.	DESCRIPTION

COMMONWEALTH OF PENNSYLVANIA REGISTERED PROFESSIONAL J. LAWRENCE HOSMER ENGINEER 025926-E
03.31.2017

PA SUPPLY HEADER PROJECT – PROPOSED ADDITION TO EXISTING CRAYNE COMPRESSOR STATION
FRANKLIN BOROUGH, GREENE COUNTY, PENNSYLVANIA
DOMINION TRANSMISSION, INC.
445 WEST MAIN STREET
CLARKSBURG, WV 26301

SCALE:	AS SHOWN
DATE:	03/27/17
DRAWN:	P.L.S.
CHECKED:	M.A.P.
APPROVED:	S.L.

COVER SHEET

PROJECT NO./DASH NO.	C141330-01
TASK NO. 005	SUB TASK NO. 00
GROUP ID D	DRAWING NO.
SHEET	1

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STANDARD GENERAL E&S PLAN NOTES

1. ALL EARTH DISTURBANCES, INCLUDING CLEARING AND GRUBBING AS WELL AS CUTS AND FILLS SHALL BE DONE IN ACCORDANCE WITH THE APPROVED E&S PLAN. A COPY OF THE APPROVED DRAWINGS (STAMPED, SIGNED AND DATED BY THE REVIEWING AGENCY) MUST BE AVAILABLE AT THE PROJECT SITE AT ALL TIMES. THE REVIEWING AGENCY SHALL BE NOTIFIED OF ANY CHANGES TO THE APPROVED PLAN PRIOR TO IMPLEMENTATION OF THOSE CHANGES. THE REVIEWING AGENCY MAY REQUIRE A WRITTEN SUBMITTAL OF THOSE CHANGES FOR REVIEW AND APPROVAL AT ITS DISCRETION.

2. 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 PCSM PLAN, AND A REPRESENTATIVE FROM THE LOCAL CONSERVATION DISTRICT TO AN ON-SITE PRECONSTRUCTION MEETING.

3. AT LEAST 3 DAYS PRIOR TO STARTING ANY EARTH DISTURBANCE ACTIVITIES, OR EXPANDING INTO AN AREA PREVIOUSLY UNMARKED, THE PENNSYLVANIA ONE CALL SYSTEM INC. SHALL BE NOTIFIED AT 1-800-242-1776 FOR THE LOCATION OF EXISTING UNDERGROUND UTILITIES.

4. ALL EARTH DISTURBANCE ACTIVITIES SHALL PROCEED IN ACCORDANCE WITH THE SEQUENCE PROVIDED ON THE PLAN DRAWINGS. DEVIATION FROM THAT SEQUENCE MUST BE APPROVED IN WRITING FROM THE LOCAL CONSERVATION DISTRICT OR BY THE DEPARTMENT PRIOR TO IMPLEMENTATION.

5. AREAS TO BE FILLED ARE TO BE CLEARED, GRUBBED, AND STRIPPED OF TOPSOIL TO REMOVE TREES, VEGETATION, ROOTS AND OTHER OBJECTIONABLE MATERIAL.

6. CLEARING, GRUBBING, AND TOPSOIL STRIPPING SHALL BE LIMITED TO THOSE AREAS DESCRIBED IN EACH STAGE OF THE CONSTRUCTION SEQUENCE. GENERAL SITE CLEARING, GRUBBING AND TOPSOIL STRIPPING MAY NOT COMMENCE IN ANY STAGE OR PHASE OF THE PROJECT UNTIL THE E&S BMPS SPECIFIED BY THE BMP SEQUENCE FOR THAT STAGE OR PHASE HAVE BEEN INSTALLED AND ARE FUNCTIONING AS DESCRIBED IN THIS E&S PLAN.

7. AT NO TIME SHALL CONSTRUCTION VEHICLES BE ALLOWED TO ENTER AREAS OUTSIDE THE LIMIT OF DISTURBANCE BOUNDARIES SHOWN ON THE PLAN MAPS. THESE AREAS MUST BE CLEARLY MARKED AND FENCED OFF BEFORE CLEARING AND GRUBBING OPERATIONS BEGIN.

8. TOPSOIL REQUIRED FOR THE ESTABLISHMENT OF VEGETATION SHALL BE STOCKPILED WITH THE LIMITS OF DISTURBANCE SHOWN ON THE PLAN MAP(S) IN THE AMOUNT NECESSARY TO COMPLETE THE FINISH GRADING OF ALL EXPOSED AREAS THAT ARE TO BE STABILIZED BY VEGETATION. EACH STOCKPILE SHALL BE PROTECTED AND THE STOCKPILE HEIGHTS SHALL NOT EXCEED 35 FEET. STOCKPILE SLOPES SHALL BE 2H:1V OR FLATTER.

9. IMMEDIATELY UPON DISCOVERING UNFORESEEN CIRCUMSTANCES POSING THE POTENTIAL FOR ACCELERATED EROSION AND/OR SEDIMENT POLLUTION, THE OPERATOR SHALL IMPLEMENT APPROPRIATE BEST MANAGEMENT PRACTICES TO MINIMIZE THE POTENTIAL FOR EROSION AND SEDIMENT POLLUTION AND NOTIFY THE LOCAL CONSERVATION DISTRICT AND/OR THE REGIONAL OFFICE OF THE DEPARTMENT.

10. ALL BUILDING MATERIALS AND WASTES SHALL BE REMOVED FROM THE SITE AND RECYCLED OR DISPOSED OF IN ACCORDANCE WITH THE DEPARTMENT'S SOLID WASTE MANAGEMENT REGULATIONS AT 25 PA. CODE 260.1 ET SEQ., 271.1, AND 287.1 ET. SEQ. NO BUILDING MATERIALS OR WASTES OR UNUSED BUILDING MATERIALS SHALL BE BURNED, BURIED, DUMPED, OR DISCHARGED AT THE SITE.

11. ALL OFF-SITE WASTE AND BORROW AREAS MUST HAVE AN E&S PLAN APPROVED BY THE LOCAL CONSERVATION DISTRICT OR THE DEPARTMENT FULLY IMPLEMENTED PRIOR TO BEING ACTIVATED.

12. THE CONTRACTOR IS RESPONSIBLE FOR ENSURING THAT ANY MATERIAL BROUGHT ON SITE IS CLEAN FILL. FORM FP-001 MUST BE RETAINED BY THE PROPERTY OWNER FOR ANY FILL MATERIAL AFFECTED BY A SPILL OR RELEASE OF A REGULATED SUBSTANCE BUT QUALIFYING AS CLEAN FILL DUE TO ANALYTICAL TESTING.

13. ALL PUMPING OF WATER FROM ANY WORK AREA SHALL BE DONE ACCORDING TO THE PROCEDURE DESCRIBED IN THIS PLAN, OVER UNDISTURBED VEGETATED AREAS.

14. NOT APPLICABLE.

15. UNTIL THE SITE IS STABILIZED, ALL EROSION AND SEDIMENT BMPS SHALL BE MAINTAINED PROPERLY. MAINTENANCE SHALL INCLUDE INSPECTIONS OF ALL EROSION AND SEDIMENT BMPS AFTER EACH RUNOFF EVENT AND ON A WEEKLY BASIS. ALL PREVENTATIVE AND REMEDIAL MAINTENANCE WORK, INCLUDING CLEAN OUT, REPAIR, REPLACEMENT, REGRADING, RESEEDING, REMULCHING AND RENETTING MUST BE PERFORMED IMMEDIATELY. IF THE E&S BMPS FAIL TO PERFORM AS EXPECTED, REPLACEMENT BMPS, OR MODIFICATIONS OF THOSE INSTALLED WILL BE REQUIRED.

16. A LOG SHOWING DATES THAT E&S BMPS WERE INSPECTED AS WELL AS ANY DEFICIENCIES FOUND AND THE DATE THEY WERE CORRECTED SHALL BE MAINTAINED ON THE SITE AND BE MADE AVAILABLE TO REGULATORY AGENCY OFFICIALS AT THE TIME OF INSPECTION.

17. SEDIMENT TRACKED ONTO ANY PUBLIC ROADWAY OR SIDEWALK SHALL BE RETURNED TO THE CONSTRUCTION SITE BY THE END OF EACH WORK DAY AND DISPOSED IN THE MANNER DESCRIBED IN THIS PLAN. IN NO CASE SHALL THE SEDIMENT BE WASHED, SHOVELED, OR SWEPT INTO ANY ROADSIDE DITCH, STORM SEWER, OR SURFACE WATER.

18. ALL SEDIMENT REMOVED FROM BMPS SHALL BE DISPOSED OF IN THE MANNER DESCRIBED ON THE PLAN DRAWINGS.

19. AREAS WHICH ARE TO BE TOPSOILED SHALL BE SCARIFIED TO A MINIMUM DEPTH OF 3 TO 5 INCHES -- 6 TO 12 INCHES ON COMPACTED SOILS -- PRIOR TO PLACEMENT OF TOPSOIL. AREAS TO BE VEGETATED SHALL HAVE A MINIMUM 4 INCHES OF TOPSOIL IN PLACE PRIOR TO SEEDING AND MULCHING. FILL OUTSLOPES SHALL HAVE A MINIMUM OF 2 INCHES OF TOPSOIL.

20. ALL FILLS SHALL BE COMPACTED AS REQUIRED TO REDUCE EROSION, SLIPPAGE, SETTLEMENT, SUBSIDENCE OR OTHER RELATED PROBLEMS. FILL INTENDED TO SUPPORT BUILDINGS, STRUCTURES AND CONDUITS, ETC. SHALL BE COMPACTED IN ACCORDANCE WITH LOCAL REQUIREMENTS OR CODES.

21. ALL EARTHEN FILLS SHALL BE PLACED IN COMPACTED LAYERS NOT TO EXCEED 9 INCHES IN THICKNESS.

22. FILL MATERIALS SHALL BE FREE OF FROZEN PARTICLES, BRUSH, ROOTS, SOD, OR OTHER FOREIGN OR OBJECTIONABLE MATERIALS THAT WOULD INTERFERE WITH OR PREVENT CONSTRUCTION OF SATISFACTORY FILLS.

23. FROZEN MATERIALS OR SOFT, MUCKY, OR HIGHLY COMPRESSIBLE MATERIALS SHALL NOT BE INCORPORATED INTO FILLS.

24. FILL SHALL NOT BE PLACED ON SATURATED OR FROZEN SURFACES.

25. SEEPS OR SPRINGS ENCOUNTERED DURING CONSTRUCTION SHALL BE HANDLED IN ACCORDANCE WITH THE STANDARD AND SPECIFICATION FOR SUBSURFACE DRAIN OR OTHER APPROVED METHOD.

26. ALL GRADED AREAS SHALL BE PERMANENTLY STABILIZED IMMEDIATELY UPON REACHING FINISHED GRADE. CUT SLOPES IN COMPETENT BEDROCK AND ROCK FILLS NEED NOT BE VEGETATED. SEEDED AREAS WITHIN 50 FEET OF A SURFACE WATER, OR AS OTHERWISE SHOWN ON THE PLAN DRAWINGS, SHALL BE BLANKETED ACCORDING TO THE STANDARDS OF THIS PLAN.

27. IMMEDIATELY AFTER EARTH DISTURBANCE ACTIVITIES CEASE IN ANY AREA OR SUBAREA OF THE PROJECT, THE OPERATOR SHALL STABILIZE ALL DISTURBED AREAS. DURING NON-GERMINATING MONTHS, MULCH OR PROTECTIVE BLANKETING SHALL BE APPLIED AS DESCRIBED IN THE PLAN. AREAS NOT AT FINISHED GRADE, WHICH WILL BE REACTIVATED WITHIN 1 YEAR, MAY BE STABILIZED IN ACCORDANCE WITH THE TEMPORARY STABILIZATION SPECIFICATIONS. THOSE AREAS WHICH WILL NOT BE REACTIVATED WITHIN 1 YEAR SHALL BE STABILIZED IN ACCORDANCE WITH THE PERMANENT STABILIZATION SPECIFICATIONS.

28. PERMANENT STABILIZATION IS DEFINED AS A MINIMUM UNIFORM, PERENNIAL 70% VEGETATIVE COVER OR OTHER PERMANENT NON-VEGETATIVE COVER WITH A DENSITY SUFFICIENT TO RESIST ACCELERATED EROSION. CUT AND FILL SLOPES SHALL BE CAPABLE OF RESISTING FAILURE DUE TO SLUMPING, SLIDING, OR OTHER MOVEMENTS.

29. E&S BMPS SHALL REMAIN FUNCTIONAL AS SUCH UNTIL ALL AREAS TRIBUTARY TO THEM ARE PERMANENTLY STABILIZED OR UNTIL THEY ARE REPLACED BY ANOTHER BMP APPROVED BY THE LOCAL CONSERVATION DISTRICT OR THE DEPARTMENT.

30. UPON COMPLETION OF ALL EARTH DISTURBANCE ACTIVITIES AND PERMANENT STABILIZATION OF ALL DISTURBED AREAS, THE OWNER AND/OR OPERATOR SHALL CONTACT THE LOCAL CONSERVATION DISTRICT FOR AN INSPECTION PRIOR TO REMOVAL/CONVERSION OF THE E&S BMPS.

31. AFTER FINAL SITE STABILIZATION HAS BEEN ACHIEVED, TEMPORARY EROSION AND SEDIMENT BMPS MUST BE REMOVED OR CONVERTED TO PERMANENT POST CONSTRUCTION STORMWATER MANAGEMENT BMPS. AREAS DISTURBED DURING REMOVAL OR CONVERSION OF THE BMPS SHALL BE STABILIZED IMMEDIATELY. IN ORDER TO ENSURE RAPID REVEGETATION OF DISTURBED AREAS, SUCH REMOVAL/CONVERSIONS ARE TO BE DONE ONLY DURING THE GERMINATING SEASON.

32. UPON COMPLETION OF ALL EARTH DISTURBANCE ACTIVITIES AND PERMANENT STABILIZATION OF ALL DISTURBED AREAS, THE OWNER AND/OR OPERATOR SHALL CONTACT THE LOCAL CONSERVATION DISTRICT TO SCHEDULE A FINAL INSPECTION.

33. FAILURE TO CORRECTLY INSTALL E&S BMPS, FAILURE TO PREVENT SEDIMENT-LADEN RUNOFF FROM LEAVING THE CONSTRUCTION SITE, OR FAILURE TO TAKE IMMEDIATE CORRECTIVE ACTION TO RESOLVE FAILURE OF E&S BMPS MAY RESULT IN ADMINISTRATIVE, CIVIL, AND/OR CRIMINAL PENALTIES BEING INSTITUTED BY THE DEPARTMENT AS DEFINED IN SECTION 602 OF THE PENNSYLVANIA CLEAN STREAMS LAW. THE CLEAN STREAMS LAW PROVIDES FOR UP TO $10,000 PER DAY IN CIVIL PENALTIES, UP TO $10,000 IN SUMMARY CRIMINAL PENALTIES, AND UP TO $25,000 IN MISDEMEANOR CRIMINAL PENALTIES FOR EACH VIOLATION.

CONSTRUCTION SEQUENCE NOTES

THIS SECTION PROVIDES AN OVERVIEW OF THE EQUIPMENT AND OPERATIONS NECESSARY, DESCRIBES POTENTIAL IMPACTS THAT MAY OCCUR FROM EACH OPERATION, AND IDENTIFIES THE MEASURES THAT WILL BE IMPLEMENTED TO CONTROL THESE POTENTIAL IMPACTS. THIS SECTION DISCUSSES IN DETAIL THE EROSION AND SEDIMENT CONTROL TECHNIQUES THAT TYPICALLY APPLY TO EACH CONSTRUCTION ACTIVITY INCLUDING CLEARING, GRADING, TRENCHING, LOWERING-IN OF PIPE, AND BACKFILLING. ROW RESTORATION IS THE FINAL STEP IN THE TYPICAL CONSTRUCTION SEQUENCE.

PENNSYLVANIA ONE CALL (DIAL 8-1-1) WILL BE CONTACTED PRIOR TO START OF WORK. PRIOR TO STARTING ANY EARTH DISTURBANCE ACTIVITIES, APPROPRIATE PROJECT AND AGENCY PERSONNEL SHALL BE INVITED TO A PRECONSTRUCTION MEETING.

SITE PREPARATION

- SURVEY AND FLAG THE CONSTRUCTION RIGHT-OF-WAY AND MARK ENVIRONMENTALLY SENSITIVE AREAS;
- INSTALL ROCK ACCESS PADS;
- CONDUCT INITIAL CLEARING, LIMITED TO THAT NECESSARY TO INSTALL TEMPORARY SEDIMENT BARRIERS;
- INSTALL ALL PERIMETER BMPS PRIOR TO ANY BULK EARTH-MOVING ACTIVITY;
- CONDUCT PROGRESSIVE CLEARING WITH INSTALLATION OF TEMPORARY SEDIMENT BARRIERS AND TEMPORARY EQUIPMENT BRIDGES KEEPING PACE WITH CLEARING;
- MODIFY ACCESS ROADS BY GRADING AND INSTALLING STONE WHERE NEEDED;
- GRADE THE RIGHT-OF-WAY, AND SEGREGATE TOPSOIL WHERE NECESSARY; AND

1.0 CLEARING & FLAGGING

CLEARING OPERATIONS INCLUDE THE REMOVAL OF VEGETATION WITHIN THE CONSTRUCTION AREA. VARIOUS CLEARING METHODS ARE EMPLOYED DEPENDING ON TREE SIZE, CONTOUR OF THE LAND, AND THE ABILITY OF THE GROUND TO SUPPORT CLEARING EQUIPMENT. VEGETATIVE CLEARING CAN BE ACCOMPLISHED EITHER BY HAND OR BY CUTTING EQUIPMENT. THE FOLLOWING PROCEDURES WILL BE STANDARD PRACTICE DURING CLEARING:

1. PRIOR TO BEGINNING THE REMOVAL OF VEGETATION,
   a. THE LIMITS OF CLEARING WILL BE ESTABLISHED AND VISIBLY MARKED BEFORE CLEARING;
   b. SIGNS AND HIGHLY VISIBLE FLAGGING WILL ALSO BE USED TO MARK THE BOUNDARIES OF SENSITIVE RESOURCE AREAS, INCLUDING WATERBODIES AND WETLANDS, AND/OR AREAS WITH SPECIAL REQUIREMENTS ALONG THE CONSTRUCTION WORK AREA, IN ACCORDANCE WITH THE CONSTRUCTION DRAWINGS;
   c. FLAGGING OR MARKING SHALL BE MAINTAINED THROUGHOUT CONSTRUCTION; AND
   d. TREES TO BE PROTECTED PER LANDOWNER REQUESTS OR AS OTHERWISE DIRECTED WILL BE CLEARLY MARKED.
2. ALL CONSTRUCTION ACTIVITIES AND GROUND DISTURBANCE WILL BE CONFINED TO WITHIN THE CONSTRUCTION AREA SHOWN ON THE CONSTRUCTION DRAWINGS;
3. ALL BRUSH AND TREES WILL BE FELLED INTO THE CONSTRUCTION AREA TO MINIMIZE DAMAGE TO TREES AND STRUCTURES ADJACENT TO THE CONSTRUCTION AREA. TREES THAT INADVERTENTLY FALL BEYOND THE EDGE OF THE CONSTRUCTION AREA WILL BE IMMEDIATELY MOVED ONTO THE CONSTRUCTION AREA AND DISTURBED AREAS WILL BE IMMEDIATELY STABILIZED, PER LANDOWNER APPROVAL;
4. TREES WILL BE CHIPPED AND REMOVED OR CUT INTO LENGTHS IDENTIFIED BY THE LANDOWNER AND THEN STACKED AT THE EDGE OF THE CONSTRUCTION AREA OR REMOVED. TREES MAY BE BURNED DEPENDING ON LOCAL AND STATE RESTRICTIONS, APPLICABLE PERMITS, CONSTRUCTION LINE LIST STIPULATIONS, AND LANDOWNER AGREEMENTS;
5. BRUSH AND LIMBS MAY BE DISPOSED OF IN ONE OR MORE OF THE FOLLOWING WAYS DEPENDING ON LOCAL RESTRICTIONS, APPLICABLE PERMITS, CONSTRUCTION LINE LIST STIPULATIONS, AND LANDOWNER AGREEMENTS:
   a. STOCKPILED ALONG THE EDGE OF THE CONSTRUCTION AREA;
   b. BURNED;
   c. CHIPPED, SPREAD ACROSS THE CONSTRUCTION AREA IN UPLAND AREAS, AND PLOWED IN AT THE DISCRETION OF THE CHIEF INSPECTOR OR EI (EXCESS MATERIAL MUST BE REMOVED);
   d. USED AS PART OF EROSION CONTROL MIX MATERIAL; OR
   e. HAULED OFF SITE TO A DTI-APPROVED LOCATION.
6. EXISTING SURFACE DRAINAGE PATTERNS SHALL NOT BE ALTERED BY THE PLACEMENT OF TIMBER OR BRUSH PILES AT THE EDGE OF THE CONSTRUCTION ROW.

2.0 GRADING

THE CONSTRUCTION AREA WILL BE GRADED AS NEEDED TO PROVIDE A LEVEL WORKSPACE FOR SAFE OPERATION OF HEAVY EQUIPMENT USED IN THE LAY-DOWN AREA. THE FOLLOWING PROCEDURES WILL BE STANDARD PRACTICE DURING GRADING:

2.1 TOPSOIL SEGREGATION

DURING CONSTRUCTION, TOPSOIL AND SUBSOIL WILL BE DISTURBED BY GRADING OF THE RIGHT-OF-WAY, TRENCH EXCAVATION, AND BY HEAVY EQUIPMENT MOVING ALONG THE RIGHT-OF-WAY. IMPLEMENTATION OF PROPER TOPSOIL SEGREGATION IS INTENDED TO MITIGATE THESE CONSTRUCTION IMPACTS AND PROMOTE OR FACILITATE POST-CONSTRUCTION REVEGETATION SUCCESS.

TOPSOIL SEGREGATION METHODS WILL BE USED IN ALL RESIDENTIAL AREAS (EXCEPT WHERE THE TOPSOIL IS BEING REPLACED), WETLANDS (EXCEPT AREAS WHERE STANDING WATER IS PRESENT OR SOILS ARE SATURATED), CULTIVATED OR ROTATED CROPLANDS, MANAGED PASTURES, HAYFIELDS, AND OTHER AREAS AT THE LANDOWNER'S OR LAND MANAGING AGENCY'S REQUEST. EITHER THE "DITCH PLUS SPOIL SIDE" OR THE "FULL RIGHT-OF-WAY" SEGREGATION METHOD WILL BE USED.

a. PREVENT THE MIXING OF TOPSOIL WITH SUBSOIL BY STRIPPING TOPSOIL FROM EITHER THE FULL WORK AREA OR FROM THE TRENCH AND SUBSOIL STORAGE AREA ("DITCH PLUS SPOIL SIDE" METHOD).
b. SEGREGATE AT LEAST 12 INCHES OF TOPSOIL IN DEEP SOILS WITH MORE THAN 12 INCHES OF TOPSOIL. IN SOILS WITH LESS THAN 12 INCHES OF TOPSOIL, MAKE EVERY EFFORT TO SEGREGATE THE ENTIRE TOPSOIL LAYER.
c. WITHIN WETLANDS, SEGREGATE THE TOP 12 INCHES OF TOPSOIL WITHIN THE TRENCHLINE, EXCEPT IN AREAS WHERE STANDING WATER IS PRESENT OR SOILS ARE SATURATED.
d. IN RESIDENTIAL AREAS, IMPORTATION OF TOPSOIL (I.E. TOPSOIL REPLACEMENT) IS AN ACCEPTABLE ALTERNATIVE TO TOPSOIL SEGREGATION, IF APPROVED BY THE LANDOWNER AND CHIEF INSPECTOR.
e. MAINTAIN SEPARATION OF SALVAGED TOPSOIL AND SUBSOIL THROUGHOUT ALL CONSTRUCTION ACTIVITIES.
f. LEAVE GAPS IN THE TOPSOIL PILES AND SPOIL PILES FOR THE INSTALLATION OF TEMPORARY SLOPE BREAKERS TO ALLOW WATER TO BE DIVERTED OFF THE CONSTRUCTION ROW.
g. NEVER USE TOPSOIL FOR PADDING THE PIPE, CONSTRUCTING TEMPORARY SLOPE BREAKERS, TRENCH BREAKERS OR TRENCH PLUGS, IMPROVING OR MAINTAINING ROADS, OR AS A FILL MATERIAL.
h. STABILIZE TOPSOIL PILES AND MINIMIZE LOSS DUE TO WIND AND WATER EROSION WITH USE OF SEDIMENT BARRIERS, MULCH, TEMPORARY SEEDING, OR FUNCTIONAL EQUIVALENTS, WHERE NECESSARY.

2.2 TREE STUMP REMOVAL AND DISPOSAL

a. REMOVE TREE STUMPS IN UPLAND AREAS ALONG THE ENTIRE WIDTH OF THE PERMANENT ROW TO ALLOW ADEQUATE CLEARANCE FOR THE SAFE OPERATION OF VEHICLES AND EQUIPMENT. STUMPS WITHIN THE TEMPORARY ROW WILL BE REMOVED OR GROUND BELOW THE SURFACE IN ACCORDANCE WITH DTI CONSTRUCTION SPECIFICATIONS TO ALLOW THE SAFE PASSAGE OF EQUIPMENT, AS DETERMINED BY THE CHIEF INSPECTOR OR EI.
b. IN WETLANDS, LIMIT PULLING OF TREE STUMPS AND GRADING ACTIVITIES TO DIRECTLY OVER THE TRENCHLINE.
c. DISPOSE OF STUMPS BY ONE OF THE FOLLOWING METHODS WITH THE APPROVAL OF THE CHIEF INSPECTOR AND THE LANDOWNER AND IN ACCORDANCE WITH REGULATORY REQUIREMENTS:

2.3 ROCK MANAGEMENT

ROCK, INCLUDING BLAST ROCK, WILL BE USED, REMOVED OR DISPOSED OF IN ONE OF THE FOLLOWING WAYS:

a. ROCK EXCAVATED FROM THE TRENCH MAY BE USED TO BACKFILL THE TRENCH ONLY TO THE TOP OF THE EXISTING BEDROCK PROFILE. (ROCK THAT IS NOT RETURNED TO THE TRENCH SHALL BE CONSIDERED CONSTRUCTION MATERIAL OR WASTE, UNLESS APPROVED FOR USE AS MULCH OR FOR SOME OTHER USE ON THE CONSTRUCTION WORK AREAS BY THE LAND OWNER OR LAND MANAGING AGENCY.);
b. WINDROWED PER WRITTEN LANDOWNER AGREEMENT WITH DTI;
c. REMOVED AND DISPOSED OF AT A DTI -APPROVED LANDFILL;
d. USED AS RIPRAP FOR STREAMBANK STABILIZATION AS ALLOWED BY APPLICABLE REGULATORY AGENCY(IES) AND PROVIDED THE ROCK IS UNCONTAMINATED AND FREE OF SOIL AND OTHER DEBRIS; OR
e. IF REMOVED TO A DTI -APPROVED DISPOSAL SITE NOT WITHIN THE LIMITS OF DISTURBANCE, AN APPROVED E&SCP WITH THE COUNTY CONSERVATION DISTRICT IS REQUIRED.

2.4 TEMPORARY STABILIZATION

TEMPORARY STABILIZATION WILL BE CONDUCTED AS NEEDED FOR GRADED AREAS, SPOIL PILES AND OTHER DISTURBED LAND DURING CONSTRUCTION. STABILIZE WITH TEMPORARY SEED AND MULCH AS INDICATED. THE RECOMMENDED SOIL AMENDMENT APPLICATION RATES AND RECOMMENDED SEED MIXTURES ARE AS SHOWN ON THE DETAIL SHEET.

SEEDING RATES ARE ADAPTED FROM TABLE 11.4 OF PA ESC MANUAL. FOR BIRDSFOOT TREFOIL USE EMPIRE VARIETY. FOR SLOPES >3H:1V, ADD PERENNIAL RYE AT 20 LB/ACRE. FOR PLANTING OUTSIDE MARCH 1 - OCTOBER 15, USE WINTER OATES AT 90 LB/ACRE AND WINTER RYE AT 56 LB/ACRE. FOR AGRICULTURAL OR PRIVATE LANDS, CONTRACTOR WILL USE MIXTURES ABOVE UNLESS OTHERWISE SPECIFIED BY LANDOWNER. PLS IS THE PRODUCT OF THE PERCENTAGE OF PURE SEED TIMES PERCENTAGE GERMINATION DIVIDED BY 100. FOR EXAMPLE, TO SECURE THE ACTUAL PLANTING RATE FOR SWITCHGRASS, DIVIDE 12 POUNDS PLS SHOWN ON THE SEED TAG. THUS, IF THE PLS CONTENT OF A GIVEN SEED LOT IS 35%, DIVIDE 12 PLS BY 0.35 TO OBTAIN 34.3 POUNDS OF SEED REQUIRED TO PLANT ONE ACRE. ALL MIXTURES IN THIS TABLE ARE SHOWN IN TERMS OF PLS AS SHOWN ON DETAIL SHEET..

SOIL AMENDMENT APPLICATION RATES ARE ADAPTED FROM TABLE 11.2 OF PA ESC MANUAL. FOR AGRICULTURAL OR PRIVATE LANDS, CONTRACTOR WILL USE RATES ABOVE UNLESS OTHERWISE SPECIFIED BY LANDOWNER.

3.0 TEMPORARY SLOPE BREAKERS

TEMPORARY SLOPE BREAKERS ARE TEMPORARY EROSION CONTROL MEASURES INTENDED TO REDUCE RUNOFF VELOCITY AND DIVERT WATER OFF THE CONSTRUCTION ROW. TEMPORARY SLOPE BREAKERS MAY BE CONSTRUCTED OF MATERIALS SUCH AS COMPACTED SOIL, SILT FENCE, STAKED STRAW BALES, OR SAND BAGS. SEGREGATED TOPSOIL MAY NOT BE USED FOR CONSTRUCTING TEMPORARY SLOPE BREAKERS. IF PERMITTED BY REGULATORY AGENCY(IES), HAY BALES MAY BE USED IN LIEU OF STRAW BALES EXCEPT FOR MULCHING. IF HAY BALES ARE USED, THE CONTRACTOR IS RESPONSIBLE FOR THEIR REMOVAL AND DTI -APPROVED DISPOSAL.

1. INSTALL TEMPORARY SLOPE BREAKERS ON ALL DISTURBED AREAS AS NECESSARY FOLLOWING GRADING OPERATIONS (FIGURE EC-7) TO AVOID EXCESSIVE EROSION. UNLESS OTHERWISE SPECIFIED BY PERMIT CONDITIONS, TEMPORARY SLOPE BREAKERS MUST BE INSTALLED ON SLOPES GREATER THAN 5% AT THE RECOMMENDED SPACING INTERVAL INDICATED ON DETAIL SHEET (CLOSER SPACING SHOULD BE USED IF NECESSARY):
2. DIRECT THE OUTFALL OF EACH SLOPE BREAKER TO A STABLE, WELL VEGETATED AREA OR CONSTRUCT AN ENERGY-DISSIPATING DEVICE (SILT FENCE, STAKED STRAW BALES, EROSION CONTROL FABRIC) AT THE END OF THE SLOPE BREAKER.
3. POSITION THE OUTFALL OF EACH TEMPORARY SLOPE BREAKER TO PREVENT SEDIMENT DISCHARGE INTO WETLANDS, WATERBODIES, OR OTHER SENSITIVE RESOURCE AREAS.
4. INSTALL TEMPORARY SLOPE BREAKERS ACROSS THE ENTIRE CONSTRUCTION ROW ALONG SLOPES GREATER THAN 5 % WHERE THE BASE OF THE SLOPE IS LESS THAN 50 FEET FROM WATERBODY, WETLAND, AND ROAD CROSSINGS.
5. INSPECT TEMPORARY SLOPE BREAKERS DAILY IN AREAS OF ACTIVE CONSTRUCTION TO INSURE PROPER FUNCTIONING AND MAINTENANCE. IN OTHER AREAS, THE SLOPE BREAKERS WILL BE INSPECTED AND MAINTAINED ON A WEEKLY BASIS THROUGHOUT CONSTRUCTION, AND WITHIN 24 HOURS FOLLOWING CONSTRUCTION. REPAIRS SHOULD BE MADE WITHIN 24 HOURS OF IDENTIFICATION, IF POSSIBLE.
6. REMOVE TEMPORARY MEASURES WHEN REPLACED BY PERMANENT MEASURES OR WHEN PERMANENT STABILIZATION IS ACHIEVED (UNIFORM 70% PERENNIAL VEGETATIVE COVER).

4.0 TRENCH & SITE DEWATERING

DEWATERING MAY BE PERIODICALLY CONDUCTED TO REMOVE ACCUMULATED GROUNDWATER OR PRECIPITATION FROM THE CONSTRUCTION AREA, THE NEED FOR WITHIN THE TRENCHLINE. THE NEED FOR EROSION CONTROLS AS WELL AS THE TYPE OF CONTROL USED WILL VARY DEPENDING ON THE TYPE AND AMOUNT OF SEDIMENT WITHIN THE WATER, AND VOLUME AND RATE OF DISCHARGE.

1. CONDUCT DEWATERING IN SUCH A MANNER THAT DOES NOT CAUSE EROSION AND DOES NOT RESULT IN SILT-LADEN WATER FLOWING INTO ANY WATERBODY OR WETLAND.
2. ELEVATE AND SCREEN THE INTAKE OF EACH HOSE USED TO WITHDRAW THE WATER FROM THE TRENCH TO MINIMIZE PUMPING OF DEPOSITED SEDIMENTS.
3. WATER MAY BE DISCHARGED INTO AREAS WHERE ADEQUATE VEGETATION IS PRESENT ADJACENT TO THE CONSTRUCTION ROW TO FUNCTION AS A FILTER MEDIUM.
4. WHERE VEGETATION IS ABSENT OR IN THE VICINITY OF WATERBODY / WETLAND AREAS, WATER WILL BE PUMPED INTO A DISCHARGE STRUCTURE THAT ACCOMMODATES THE ANTICIPATED DISCHARGE VOLUMES AS WELL AS TYPE AND AMOUNT OF SEDIMENT WITHIN THE WATER BEING DISCHARGED, INCLUDING
   a. A FILTER BAG, OR
   b. A STRUCTURE COMPOSED OF SEDIMENT BARRIERS

   A STRUCTURE THAT IS MORE TYPICALLY USED FOR DISCHARGES OF HYDROSTATIC TEST WATER, MAY BE NECESSARY FOR LARGE VOLUMES OF WATER.
5. WHEN USING FILTER BAGS, SECURE THE DISCHARGE HOSE TO THE BAG WITH A CLAMP.
6. REMOVE DEWATERING STRUCTURES AS SOON AS PRACTICABLE AFTER THE COMPLETION OF DEWATERING ACTIVITIES.

RESTORATION & FINAL CLEANUP

RESTORATION WILL BEGIN AFTER CONSTRUCTION ACTIVITIES HAVE BEEN COMPLETED. RESTORATION MEASURES INCLUDE THE RE-ESTABLISHMENT OF FINAL GRADES AND DRAINAGE PATTERNS. PROPERTY SHALL BE RESTORED AS CLOSE TO ITS PRECONSTRUCTION CONDITION AS PRACTICAL UNLESS OTHERWISE SPECIFIED BY THE LANDOWNER.

1. THE CONTRACTOR SHALL MAKE EVERY REASONABLE EFFORT TO COMPLETE FINAL CLEANUP OF AN AREA (INCLUDING FINAL GRADING, TOPSOIL REPLACEMENT AND INSTALLATION OF PERMANENT EROSION CONTROL STRUCTURES) WITHIN 20 DAYS. IF SEASONAL OR OTHER WEATHER CONDITIONS PREVENT COMPLIANCE WITH THESE TIMEFRAMES, CONTINUE TO INSPECT AND MAINTAIN TEMPORARY EROSION AND SEDIMENT CONTROLS (I.E. TEMPORARY SLOPE BREAKERS, SEDIMENT BARRIERS, AND MULCH) UNTIL CONDITIONS ALLOW COMPLETION OF CLEANUP.
2. GRADE ALL DISTURBED AREAS TO THE PRE-CONSTRUCTION CONTOURS, WITH THE EXCEPTION OF THE INSTALLATION OF ANY PERMANENT MEASURES REQUIRED HEREIN.
3. SPREAD SEGREGATED TOPSOIL BACK ACROSS THE GRADED ROW TO ITS ORIGINAL PROFILE.
4. REMOVE EXCESS ROCK FROM AT LEAST THE TOP 12 INCHES OF SOIL IN ALL CULTIVATED OR ROTATED CROPLAND, MANAGED PASTURES, HAYFIELDS, RESIDENTIAL AREAS, AS WELL AS OTHER AREAS AT THE LANDOWNER'S REQUEST. THE SIZE, DENSITY, AND DISTRIBUTION OF ROCK ON THE CONSTRUCTION ROW SHALL BE SIMILAR TO ADJACENT AREAS NOT DISTURBED BY CONSTRUCTION. THE LANDOWNER OR LAND MANAGING AGENCY MAY APPROVE OTHER PROVISIONS IN WRITING.
5. A TRAVEL LANE MAY BE LEFT OPEN TEMPORARILY TO ALLOW ACCESS BY CONSTRUCTION TRAFFIC IF THE TEMPORARY EROSION AND SEDIMENT CONTROL STRUCTURES ARE INSTALLED, REGULARLY INSPECTED AND MAINTAINED. WHEN ACCESS IS NO LONGER REQUIRED, THE TRAVEL LANE MUST BE REMOVED AND THE ROW RESTORED.
6. REMOVE ALL CONSTRUCTION DEBRIS (USED FILTER BAGS, SKIDS, TRASH, ETC.) FROM ALL CONSTRUCTION WORK AREAS UNLESS THE LANDOWNER OR LAND MANAGING AGENCY APPROVES LEAVING MATERIAL ONSITE FOR BENEFICIAL REUSE, STABILIZATION, OR HABITAT RESTORATION. GRADE OR TILL THE AREA TO LEAVE THE SOIL IN THE PROPER CONDITION FOR PLANTING.

5.0 REVEGETATION AND SEEDING

PERMANENT SEED MIXES AND RATES WILL BE THE SAME AS THOSE OUTLINED IN THE TEMPORARY STABILIZATION SECTION ABOVE.

6.0 MULCH

MULCH IS INTENDED TO STABILIZE THE SOIL SURFACE AND SHALL CONSIST OF WEED-FREE STRAW, WOOD FIBER HYDROMULCH, EROSION CONTROL FABRIC OR SOME FUNCTIONAL EQUIVALENT AS APPROVED BY THE EI AND CHIEF INSPECTOR.

RECOMMENDED SEED MIXTURES

MIXTURE NUMBER	SPECIES	SEEDING RATE PER ACRE	
		MOST SITES	ADVERSE SITES
3	BIRDSFOOT, PLUS	6 LB.	10 LB.
	TALL FESCUE	30 LB.	35 LB.

TABLE 11.1
Cubic Yards of Topsoil Required for Application to Various Depths

Depth (in)	Per 1,000 Square Feet	Per Acre
1	3.1	134
2	6.2	268
3	9.3	403
4	12.4	537
5	15.5	672
6	18.6	806
7	21.7	940
8	24.8	1,074

Adapted from VA DSWC

TABLE 11.2
Soil Amendment Application Rate Equivalents

Soil Amendment	Permanent Seeding Application Rate			Notes
	Per Acre	Per 1,000 sq. ft.	Per 1,000 sq. yd.	
Agricultural lime	6 tons	240 lb.	2,480 lb.	Or as per soil test; may not be required in agricultural fields
10-10-20 fertilizer	1,000 lb.	25 lb.	210 lb.	Or as per soil test; may not be required in agricultural fields
	Temporary Seeding Application Rate			
Agricultural lime	1 ton	40 lb.	410 lb.	Typically not required for topsoil stockpiles
10-10-10 fertilizer	500 lb.	12.5 lb.	100 lb.	Typically not required for topsoil stockpiles

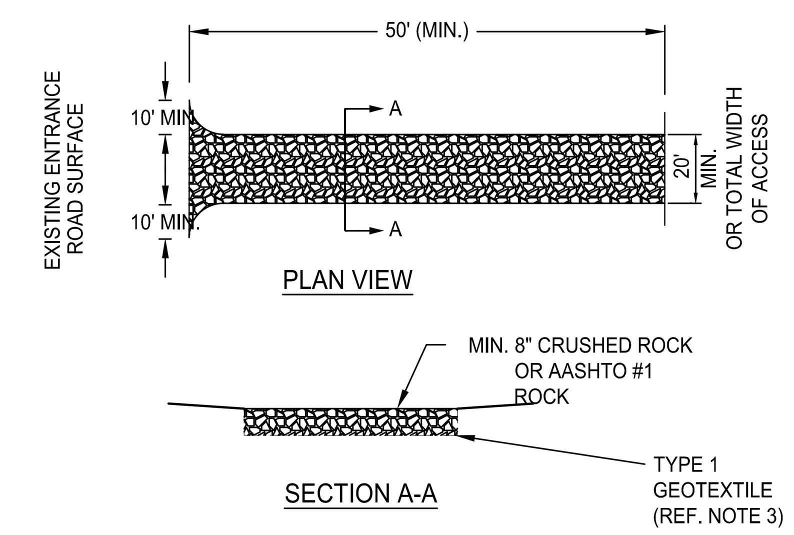
Adapted from Penn State, "Erosion Control and Conservation Plantings on Noncropland"

NOTE: A compost blanket which meets the standards of this chapter may be substituted for the soil amendments shown in Table 11.2.

TABLE 11.6
Mulch Application Rates

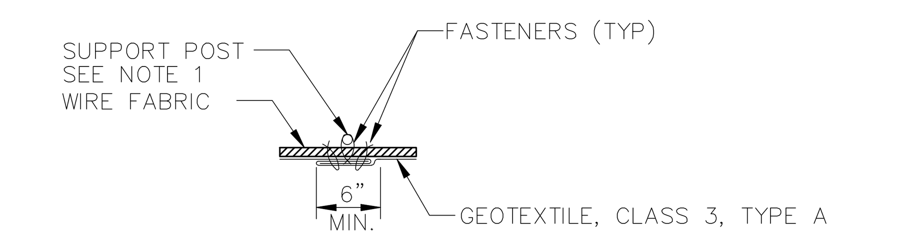
Mulch Type	Application Rate (Min.)			Notes
	Per Acre	Per 1,000 sq. ft.	Per 1,000 sq. yd.	
Straw	3 tons	140 lb.	1,240 lb.	Either wheat or oat straw, free of weeds, not chopped or finely broken
Hay	3 tons	140 lb.	1,240 lb.	Timothy, mixed clover and timothy or other native forage grasses
Wood Chips	4 - 6 tons	185 - 275 lb.	1,650 - 2,500 lb.	May prevent germination of grasses and legumes
Hydromulch	1 ton	47 lb.	415	See limitations above

NOTES:
1. SHREDDED PAPER HYDROMULCH SHOULD NOT BE USED ON SLOPES STEEPER THAN 5%. WOOD FIBER HYDROMULCH MAY BE APPLIED ON STEEPER SLOPES PROVIDED TACKIFIER IS USED. THE APPLICATION RATE FOR ANY HYDROMULCH SHOULD BE 2,000 LB./ACRE AT MINIMUM.

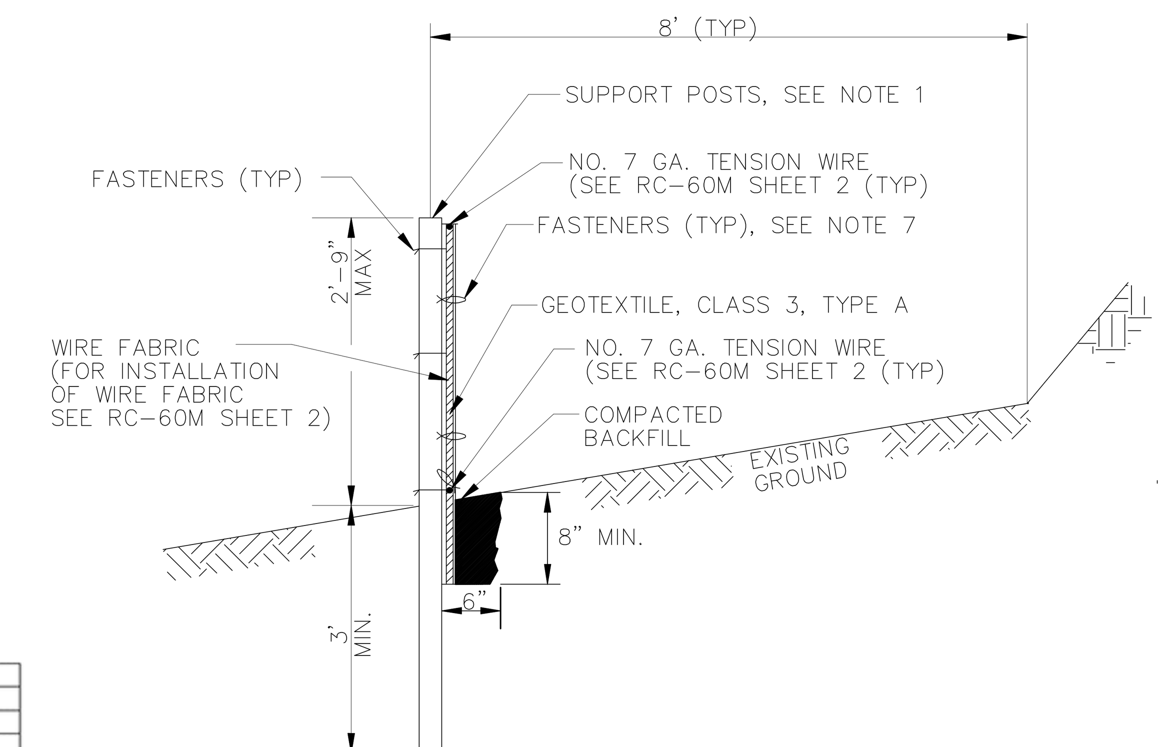


NOTES:
1. ROCK CONSTRUCTION ENTRANCE THICKNESS SHALL BE CONSTANTLY MAINTAINED TO THE SPECIFIED DIMENSIONS BY ADDING ROCK. A STOCKPILE SHALL BE MAINTAINED ON-SITE FOR THIS PURPOSE.
2. AT THE END OF EACH CONSTRUCTION DAY, ALL SEDIMENT DEPOSITED ON PAVED ROADWAYS SHALL BE REMOVED AND RETURNED TO THE CONSTRUCTION SITE.
3. TYPE 1 GEOTEXTILE SHALL CONFORM TO REQUIREMENTS IN AASHTO M-288 FOR SEPARATION FABRICS AND CLASS 3 REQUIREMENTS.
4. A PENNDOT HIGHWAY OCCUPANCY PERMIT IS REQUIRED FOR STATE ROUTE CROSSINGS. A TOWNSHIP ROAD OCCUPANCY/DRIVEWAY PERMIT IS REQUIRED FOR A DRIVEWAY OR CONSTRUCTION ENTRANCE ONTO A TOWNSHIP ROAD. A FLAGMAN SHALL BE UTILIZED WHERE SIGHT DISTANCE IS MINIMAL.

ROCK CONSTRUCTION ENTRANCE DETAIL
N.T.S.



GEOTEXTILE OVERLAP DETAIL



NOTES:
1. SPACE POSTS AT 10 FEET MAXIMUM. USE 2.5 INCH DIAMETER GALVANIZED STEEL OR ALUMINUM POSTS.
2. EXTEND GEOTEXTILE AND WIRE FABRIC 8 INCH MINIMUM INTO EXCAVATED TRENCH.
3. PLACE HEAVY DUTY SILT BARRIER FENCE ON LEVEL GRADE. EXTEND BOTH ENDS OF THE FENCE AT LEASE 8 FEET UPSLOPE AT 45 DEGREES TO THE MAIN FENCE ALIGNMENT.
4. REMOVE SEDIMENT DEPOSITS WHEN SEDIMENT ACCUMULATION IS ONE HALF THE ABOVE GROUND HEIGHT OF THE SILT FENCE.
5. ADHERE TO THE MANUFACTURERS RECOMMENDATIONS RELATIVE TO THE REQUIRED GEOTEXTILE REPLACEMENT DUE TO WEATHERING.
6. REPLACE UNDERCUT AND OVERTOPPED FENCE WITH A ROCK FILTER OUTLET. ROCK FILTER OUTLETS SHOULD BE INSTALLED ALONG THE SILT BARRIER FENCE AT POINTS OF FREQUENT FAILURES AND WHERE REQUIRED BY THE EROSION AND SEDIMENT POLLUTION CONTROL PLAN.
7. SPACE GEOTEXTILE TO WIRE FABRIC FASTENERS AT 24 INCH MAXIMUM CENTER TO CENTER.

SUPER SILT FENCE DETAIL
N.T.S.

NO.	DATE	DWN.	CHKD.	APPVD.	DESCRIPTION

REVISIONS

PA SUPPLY HEADER PROJECT – PROPOSED ADDITION TO EXISTING CRAYNE COMPRESSOR STATION
FRANKLIN BOROUGH, GREENE COUNTY, PENNSYLVANIA

DOMINION TRANSMISSION, INC.
445 WEST MAIN STREET
CLARKSBURG, WV 26301

SCALE:	AS SHOWN
DATE:	03/27/17
DRAWN:	P.L.S.
CHECKED:	M.A.P.
APPROVED:	S.L.

EROSION AND SEDIMENT CONTROL DETAILS & NOTES

PROJECT NO./DASH NO.	
C141330-01	
TASK NO.	SUB TASK NO.
005	00
GROUP ID	DRAWING NO.
D	
SHEET	4

DOMINION TRANSMISSION, INC.

SUPPLY HEADER PROJECT

SECTION 4 – EROSION AND SEDIMENT CONTROL PLAN (ESCP)

APPENDIX B – SOIL 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 Greene and Washington Counties, Pennsylvania

Crayne Compressor Station

July 20, 2015

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 (http://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.

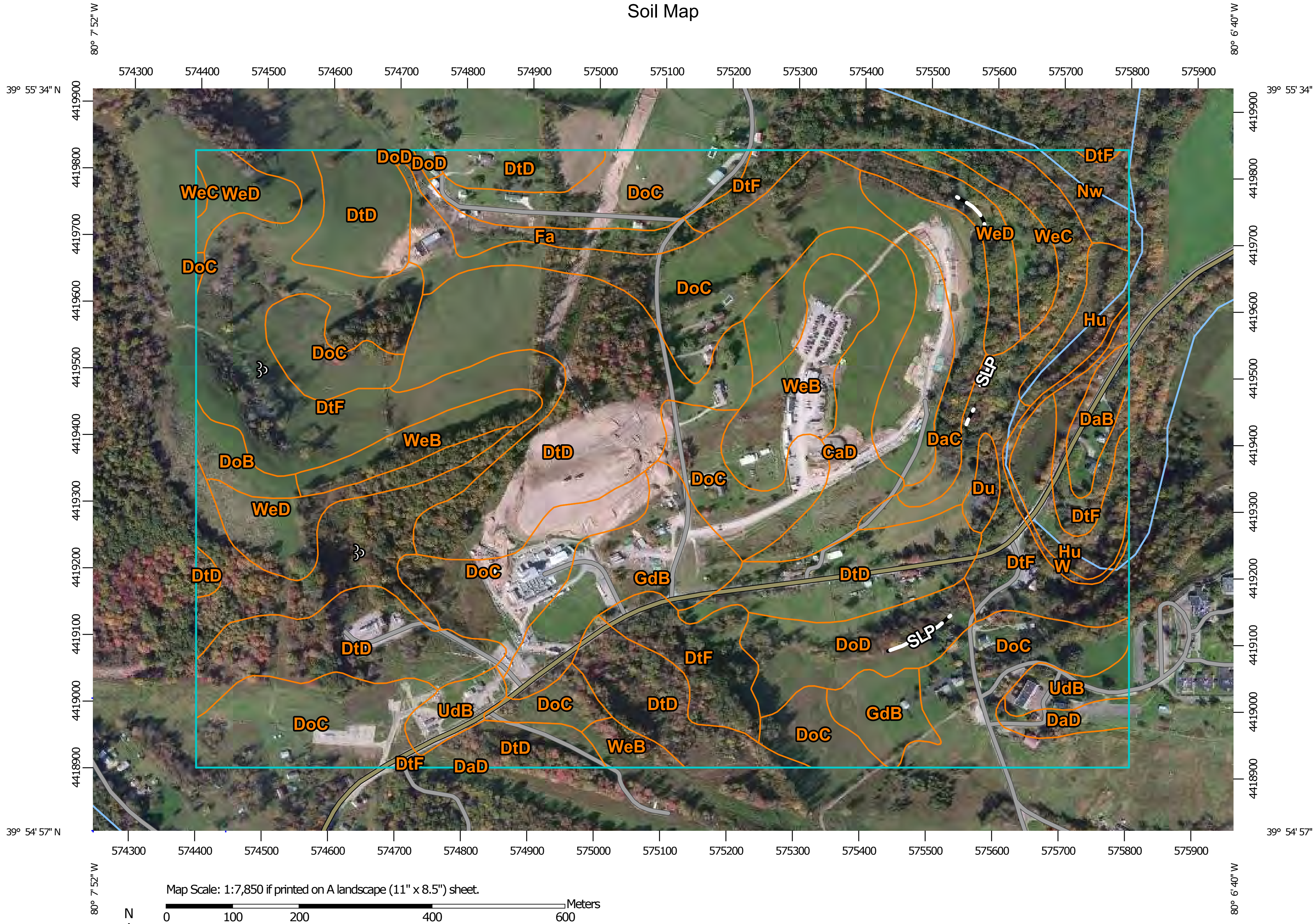
Predictions about soil behavior are based not only on soil properties but also on such variables as climate and biological activity. Soil conditions are predictable over long periods of time, but they are not predictable from year to year. For example, soil scientists can predict with a fairly high degree 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: 1:7,850 if printed on A landscape (11" x 8.5") sheet.

N

Meters: 0, 100, 200, 400, 600

Feet: 0, 350, 700, 1400, 2100

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 17N 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 1:15,800.

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: http://websoilsurvey.nrcs.usda.gov
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: Greene and Washington Counties, Pennsylvania
Survey Area Data: Version 7, Sep 19, 2014

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

Date(s) aerial images were photographed: Oct 8, 2011—Oct 25, 2011

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

Greene and Washington Counties, Pennsylvania (PA611)			
Map Unit Symbol	**Map Unit Name**	**Acres in AOI**	**Percent of AOI**
CaD	Culleoka channery silt loam, 15 to 25 percent slopes	12.8	4.0%
DaB	Dekalb channery loam, 3 to 8 percent slopes	2.8	0.9%
DaC	Dekalb channery loam, 8 to 15 percent slopes	7.4	2.3%
DaD	Dekalb channery loam, 15 to 25 percent slopes	1.9	0.6%
DoB	Dormont silt loam, 3 to 8 percent slopes	2.4	0.8%
DoC	Dormont silt loam, 8 to 15 percent slopes	81.5	25.2%
DoD	Dormont silt loam, 15 to 25 percent slopes	9.0	2.8%
DtD	Dormont-Culleoka complex, 15 to 25 percent slopes	70.3	21.8%
DtF	Dormont-Culleoka complex, 25 to 50 percent slopes	63.4	19.6%
Du	Dumps, mine	1.3	0.4%
Fa	Fluvaquents, loamy	3.8	1.2%
GdB	Glenford silt loam, 3 to 8 percent slopes	14.7	4.5%
Hu	Huntington silt loam	8.7	2.7%
Nw	Newark silt loam	3.4	1.1%
UdB	Udorthents, smoothed, gently sloping	5.1	1.6%
W	Water	1.6	0.5%
WeB	Weikert-Culleoka complex, 3 to 8 percent slopes	15.1	4.7%
WeC	Weikert-Culleoka complex, 8 to 15 percent slopes	3.9	1.2%
WeD	Weikert-Culleoka complex, 15 to 25 percent slopes	13.9	4.3%
Totals for Area of Interest		**322.9**	**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.

Greene and Washington Counties, Pennsylvania

CaD—Culleoka channery silt loam, 15 to 25 percent slopes

Map Unit Setting

National map unit symbol: 2s5gp
Elevation: 720 to 1,610 feet
Mean annual precipitation: 37 to 48 inches
Mean annual air temperature: 49 to 53 degrees F
Frost-free period: 173 to 206 days
Farmland classification: Not prime farmland

Map Unit Composition

Culleoka and similar soils: 80 percent
Minor components: 20 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Culleoka

Setting

Landform: Hills
Landform position (two-dimensional): Backslope, shoulder, summit
Landform position (three-dimensional): Interfluve
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Fine-loamy residuum weathered from sandstone and shale

Typical profile

Ap - 0 to 10 inches: channery silt loam
Bt - 10 to 19 inches: channery silt loam
BC - 19 to 26 inches: very channery silt loam
C - 26 to 31 inches: very channery silt loam
R - 31 to 41 inches: bedrock

Properties and qualities

Slope: 15 to 25 percent
Depth to restrictive feature: 24 to 40 inches to lithic bedrock
Natural drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Very low to high (0.00 to 2.00 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 3.5 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 4e
Hydrologic Soil Group: B

Minor Components

Dormont

Percent of map unit: 15 percent
Landform: Hills
Landform position (two-dimensional): Backslope, summit, shoulder

Landform position (three-dimensional): Side slope, interfluve
Down-slope shape: Linear
Across-slope shape: Convex, linear

Lowell
Percent of map unit: 5 percent
Landform: Hills
Landform position (two-dimensional): Summit, backslope, shoulder
Landform position (three-dimensional): Side slope, interfluve
Down-slope shape: Convex
Across-slope shape: Linear, convex

DaB—Dekalb channery loam, 3 to 8 percent slopes

Map Unit Composition
Dekalb and similar soils: 100 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Dekalb

Typical profile
H1 - 0 to 7 inches: channery loam
H2 - 7 to 21 inches: very channery sandy loam
H3 - 21 to 25 inches: extremely channery loamy sand
H4 - 25 to 29 inches: bedrock

Properties and qualities
Slope: 3 to 8 percent
Depth to restrictive feature: 20 to 40 inches to lithic bedrock
Natural drainage class: Well drained
Runoff class: Very low
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.57 to 5.95 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: Very low (about 2.3 inches)

Interpretive groups
Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 2e
Hydrologic Soil Group: A

DaC—Dekalb channery loam, 8 to 15 percent slopes

Map Unit Composition
Dekalb and similar soils: 100 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Dekalb

Typical profile

H1 - 0 to 7 inches: channery loam
H2 - 7 to 21 inches: very channery sandy loam
H3 - 21 to 25 inches: extremely channery loamy sand
H4 - 25 to 29 inches: bedrock

Properties and qualities

Slope: 8 to 15 percent
Depth to restrictive feature: 20 to 40 inches to lithic bedrock
Natural drainage class: Well drained
Runoff class: Very low
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.57 to 5.95 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: Very low (about 2.3 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 3e
Hydrologic Soil Group: A

DaD—Dekalb channery loam, 15 to 25 percent slopes

Map Unit Setting

National map unit symbol: l64l
Mean annual precipitation: 36 to 50 inches
Mean annual air temperature: 46 to 57 degrees F
Frost-free period: 120 to 200 days
Farmland classification: Not prime farmland

Map Unit Composition

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

Description of Dekalb

Setting

Landform: Hills
Landform position (two-dimensional): Backslope, summit
Landform position (three-dimensional): Upper third of mountainflank, mountaintop
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Residuum weathered from sandstone and shale

Typical profile

H1 - 0 to 7 inches: channery loam
H2 - 7 to 21 inches: very channery sandy loam
H3 - 21 to 25 inches: extremely channery loamy sand
H4 - 25 to 29 inches: bedrock

Properties and qualities

Slope: 15 to 25 percent
Depth to restrictive feature: 20 to 40 inches to lithic bedrock
Natural drainage class: Well drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.57 to 5.95 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: Very low (about 2.3 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 4e
Hydrologic Soil Group: A

DoB—Dormont silt loam, 3 to 8 percent slopes

Map Unit Setting

National map unit symbol: 2s5gj
Elevation: 800 to 1,540 feet
Mean annual precipitation: 37 to 47 inches
Mean annual air temperature: 48 to 52 degrees F
Frost-free period: 173 to 197 days
Farmland classification: All areas are prime farmland

Map Unit Composition

Dormont and similar soils: 75 percent
Minor components: 25 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Dormont

Setting

Landform: Hills
Landform position (two-dimensional): Backslope, summit, shoulder
Landform position (three-dimensional): Side slope, interfluve
Down-slope shape: Linear
Across-slope shape: Concave, linear
Parent material: Fine-loamy residuum weathered from limestone, sandstone, and shale

Typical profile

Ap - 0 to 11 inches: silt loam
Bt1 - 11 to 21 inches: silt loam
Bt2 - 21 to 31 inches: silty clay loam
Bt3 - 31 to 46 inches: channery silty clay loam
Bt4 - 46 to 62 inches: channery silty clay loam
BC - 62 to 75 inches: channery silty clay loam

Properties and qualities

Slope: 3 to 8 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Moderately well drained
Capacity of the most limiting layer to transmit water (Ksat): Low to moderately high (0.01 to 0.66 in/hr)
Depth to water table: About 24 to 44 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: Moderate (about 8.7 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 2e
Hydrologic Soil Group: D

Minor Components

Culleoka

Percent of map unit: 10 percent
Landform: Hills
Landform position (two-dimensional): Backslope, shoulder, summit
Landform position (three-dimensional): Interfluve
Down-slope shape: Convex
Across-slope shape: Convex

Lowell

Percent of map unit: 10 percent
Landform: Hills
Landform position (two-dimensional): Summit, backslope, shoulder
Landform position (three-dimensional): Side slope, interfluve
Down-slope shape: Convex
Across-slope shape: Linear, convex

Guernsey

Percent of map unit: 5 percent
Landform: Hillslopes
Landform position (two-dimensional): Summit, backslope
Landform position (three-dimensional): Side slope, interfluve
Down-slope shape: Concave, linear
Across-slope shape: Concave

DoC—Dormont silt loam, 8 to 15 percent slopes

Map Unit Setting

National map unit symbol: 2s5gh
Elevation: 800 to 1,540 feet
Mean annual precipitation: 37 to 47 inches
Mean annual air temperature: 48 to 52 degrees F
Frost-free period: 173 to 197 days

Farmland classification: Farmland of statewide importance

Map Unit Composition

Dormont and similar soils: 70 percent
Minor components: 30 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Dormont

Setting

Landform: Hills
Landform position (two-dimensional): Backslope, summit, shoulder
Landform position (three-dimensional): Side slope, interfluve
Down-slope shape: Linear
Across-slope shape: Concave, linear
Parent material: Fine-loamy residuum weathered from limestone, sandstone, and shale

Typical profile

Ap - 0 to 11 inches: silt loam
Bt1 - 11 to 21 inches: silt loam
Bt2 - 21 to 31 inches: silty clay loam
Bt3 - 31 to 46 inches: channery silty clay loam
Bt4 - 46 to 62 inches: channery silty clay loam
BC - 62 to 75 inches: channery silty clay loam

Properties and qualities

Slope: 8 to 15 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Moderately well drained
Capacity of the most limiting layer to transmit water (Ksat): Low to moderately high (0.01 to 0.66 in/hr)
Depth to water table: About 24 to 44 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: Moderate (about 8.7 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 3e
Hydrologic Soil Group: D

Minor Components

Culleoka

Percent of map unit: 15 percent
Landform: Hills
Landform position (two-dimensional): Backslope, shoulder, summit
Landform position (three-dimensional): Interfluve
Down-slope shape: Convex
Across-slope shape: Convex

Lowell

Percent of map unit: 10 percent
Landform: Hills
Landform position (two-dimensional): Summit, backslope, shoulder
Landform position (three-dimensional): Side slope, interfluve

Down-slope shape: Convex
Across-slope shape: Linear, convex

Guernsey

Percent of map unit: 5 percent
Landform: Hillslopes
Landform position (two-dimensional): Summit, backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Concave, linear
Across-slope shape: Concave

DoD—Dormont silt loam, 15 to 25 percent slopes

Map Unit Setting

National map unit symbol: 2s5gk
Elevation: 800 to 1,540 feet
Mean annual precipitation: 36 to 50 inches
Mean annual air temperature: 46 to 57 degrees F
Frost-free period: 120 to 200 days
Farmland classification: Not prime farmland

Map Unit Composition

Dormont and similar soils: 75 percent
Minor components: 25 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Dormont

Setting

Landform: Hills
Landform position (two-dimensional): Backslope, summit, shoulder
Landform position (three-dimensional): Side slope, interfluve
Down-slope shape: Linear
Across-slope shape: Concave, linear
Parent material: Fine-loamy residuum weathered from limestone, sandstone, and shale

Typical profile

Ap - 0 to 11 inches: silt loam
Bt1 - 11 to 21 inches: silt loam
Bt2 - 21 to 31 inches: silty clay loam
Bt3 - 31 to 46 inches: channery silty clay loam
Bt4 - 46 to 62 inches: channery silty clay loam
BC - 62 to 75 inches: channery silty clay loam

Properties and qualities

Slope: 15 to 25 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Moderately well drained
Capacity of the most limiting layer to transmit water (Ksat): Low to moderately high (0.01 to 0.66 in/hr)

Depth to water table: About 24 to 44 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: Moderate (about 8.7 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 4e
Hydrologic Soil Group: D

Minor Components

Culleoka

Percent of map unit: 10 percent
Landform: Hills
Landform position (two-dimensional): Backslope, shoulder, summit
Landform position (three-dimensional): Interfluve
Down-slope shape: Convex
Across-slope shape: Convex

Guernsey

Percent of map unit: 5 percent
Landform: Hillslopes
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Concave, linear
Across-slope shape: Concave

Lowell

Percent of map unit: 5 percent
Landform: Hills
Landform position (two-dimensional): Summit, backslope, shoulder
Landform position (three-dimensional): Side slope, interfluve
Down-slope shape: Convex
Across-slope shape: Linear, convex

Fluvaquents

Percent of map unit: 5 percent
Landform: Flood plains
Landform position (two-dimensional): Toeslope
Landform position (three-dimensional): Rise
Down-slope shape: Linear
Across-slope shape: Linear

DtD—Dormont-Culleoka complex, 15 to 25 percent slopes

Map Unit Setting

National map unit symbol: 2s5gy
Elevation: 200 to 1,300 feet
Mean annual precipitation: 32 to 48 inches
Mean annual air temperature: 48 to 55 degrees F

Frost-free period: 120 to 200 days
Farmland classification: Not prime farmland

Map Unit Composition

Dormont and similar soils: 45 percent
Culleoka and similar soils: 37 percent
Thorndale and similar soils: 3 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Dormont

Setting

Landform: Hills
Landform position (two-dimensional): Shoulder, backslope
Landform position (three-dimensional): Nose slope, side slope, head slope
Down-slope shape: Linear
Across-slope shape: Linear, concave
Parent material: Fine-loamy residuum weathered from limestone, sandstone, and shale

Typical profile

Ap - 0 to 11 inches: silt loam
Bt1 - 11 to 21 inches: silt loam
Bt2 - 21 to 31 inches: silty clay loam
Bt3 - 31 to 46 inches: channery silty clay loam
Bt4 - 46 to 62 inches: channery silty clay loam
BC - 62 to 75 inches: channery silty clay loam

Properties and qualities

Slope: 15 to 25 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Moderately well drained
Capacity of the most limiting layer to transmit water (Ksat): Low to moderately high (0.01 to 0.66 in/hr)
Depth to water table: About 24 to 44 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: Moderate (about 8.7 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 4e
Hydrologic Soil Group: D

Description of Culleoka

Setting

Landform: Hills
Landform position (two-dimensional): Shoulder, backslope
Landform position (three-dimensional): Side slope, nose slope, head slope
Down-slope shape: Convex
Across-slope shape: Convex, linear
Parent material: Fine-loamy residuum weathered from sandstone and shale

Typical profile

Ap - 0 to 10 inches: channery silt loam

Bt - 10 to 19 inches: channery silt loam
BC - 19 to 26 inches: very channery silt loam
C - 26 to 31 inches: very channery silt loam
R - 31 to 41 inches: bedrock

Properties and qualities

Slope: 15 to 25 percent
Depth to restrictive feature: 24 to 40 inches to lithic bedrock
Natural drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Very low to high (0.00 to 2.00 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 3.5 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 4e
Hydrologic Soil Group: B

Description of Thorndale

Setting

Landform: Depressions, drainageways
Landform position (two-dimensional): Footslope
Landform position (three-dimensional): Head slope, base slope
Down-slope shape: Concave
Across-slope shape: Concave
Parent material: Fine-silty colluvium derived from limestone, sandstone, and shale

Typical profile

Ap - 0 to 8 inches: silt loam
Btg - 8 to 26 inches: silty clay loam
Bgx - 26 to 41 inches: silty clay loam
C - 41 to 65 inches: silt loam

Properties and qualities

Slope: 3 to 8 percent
Depth to restrictive feature: 20 to 36 inches to fragipan; 65 to 99 inches to lithic bedrock
Natural drainage class: Poorly drained
Runoff class: Very 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 0 to 6 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: Low (about 4.1 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 4w
Hydrologic Soil Group: C/D

Minor Components

Lowell

Percent of map unit: 10 percent
Landform: Hills
Landform position (two-dimensional): Backslope, shoulder
Landform position (three-dimensional): Side slope, head slope, nose slope
Down-slope shape: Convex
Across-slope shape: Linear, convex

Guernsey

Percent of map unit: 5 percent
Landform: Hillslopes
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Concave, linear
Across-slope shape: Concave

DtF—Dormont-Culleoka complex, 25 to 50 percent slopes

Map Unit Setting

National map unit symbol: 2s5gz
Elevation: 800 to 1,300 feet
Mean annual precipitation: 36 to 50 inches
Mean annual air temperature: 46 to 57 degrees F
Frost-free period: 120 to 200 days
Farmland classification: Not prime farmland

Map Unit Composition

Dormont and similar soils: 50 percent
Culleoka and similar soils: 35 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Dormont

Setting

Landform: Hills
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Side slope, head slope, nose slope
Down-slope shape: Linear
Across-slope shape: Linear, concave
Parent material: Fine-loamy residuum weathered from limestone, sandstone, and shale

Typical profile

Ap - 0 to 11 inches: silt loam

Bt1 - 11 to 21 inches: silt loam
Bt2 - 21 to 31 inches: silty clay loam
Bt3 - 31 to 46 inches: channery silty clay loam
Bt4 - 46 to 62 inches: channery silty clay loam
BC - 62 to 75 inches: channery silty clay loam

Properties and qualities

Slope: 25 to 50 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Moderately well drained
Capacity of the most limiting layer to transmit water (Ksat): Low to moderately high (0.01 to 0.66 in/hr)
Depth to water table: About 24 to 44 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: Moderate (about 8.7 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7e
Hydrologic Soil Group: D

Description of Culleoka

Setting

Landform: Hills
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Side slope, nose slope, head slope
Down-slope shape: Convex, linear
Across-slope shape: Convex, linear
Parent material: Fine-loamy residuum weathered from sandstone and shale

Typical profile

Ap - 0 to 10 inches: channery silt loam
Bt - 10 to 19 inches: channery silt loam
BC - 19 to 26 inches: very channery silt loam
C - 26 to 31 inches: very channery silt loam
R - 31 to 41 inches: bedrock

Properties and qualities

Slope: 25 to 50 percent
Depth to restrictive feature: 24 to 40 inches to lithic bedrock
Natural drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Very low to high (0.00 to 2.00 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 3.5 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7e
Hydrologic Soil Group: B

Minor Components

Fluvaquents

Percent of map unit: 5 percent
Landform: Flood plains
Landform position (two-dimensional): Toeslope
Landform position (three-dimensional): Rise
Down-slope shape: Linear
Across-slope shape: Linear

Lowell

Percent of map unit: 5 percent
Landform: Hills
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Side slope, head slope, nose slope
Down-slope shape: Convex, linear
Across-slope shape: Linear, convex

Guernsey

Percent of map unit: 5 percent
Landform: Hills
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Concave, linear
Across-slope shape: Concave

Du—Dumps, mine

Map Unit Setting

National map unit symbol: l64v
Elevation: 1,000 to 1,500 feet
Mean annual precipitation: 36 to 46 inches
Mean annual air temperature: 41 to 62 degrees F
Frost-free period: 130 to 170 days
Farmland classification: Not prime farmland

Map Unit Composition

Mine dump: 99 percent
Minor components: 1 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Mine Dump

Setting

Parent material: Coal waste and rock residuum weathered from sedimentary rock

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 8s

Minor Components

Wet spots

Percent of map unit: 1 percent
Landform: Depressions

Fa—Fluvaquents, loamy

Map Unit Setting

National map unit symbol: l64w
Elevation: 700 to 1,100 feet
Mean annual precipitation: 36 to 50 inches
Mean annual air temperature: 41 to 62 degrees F
Frost-free period: 120 to 200 days
Farmland classification: Not prime farmland

Map Unit Composition

Fluvaquents and similar soils: 85 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Fluvaquents

Setting

Landform: Flood plains
Landform position (two-dimensional): Toeslope
Landform position (three-dimensional): Rise
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Alluvium

Typical profile

H1 - 0 to 6 inches: silt loam
H2 - 6 to 42 inches: silt loam
H3 - 42 to 60 inches: loam

Properties and qualities

Slope: 0 to 3 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Poorly drained
Runoff class: Very high
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.60 to 2.00 in/hr)
Depth to water table: About 0 to 12 inches
Frequency of flooding: Frequent
Frequency of ponding: None
Available water storage in profile: Moderate (about 6.1 inches)

Interpretive groups

Land capability classification (irrigated): None specified

Land capability classification (nonirrigated): 4w
Hydrologic Soil Group: B/D

Minor Components

Melvin
Percent of map unit: 5 percent
Landform: Flood plains
Down-slope shape: Concave
Across-slope shape: Concave

Huntington
Percent of map unit: 5 percent
Landform: Flood plains
Down-slope shape: Linear
Across-slope shape: Linear

Newark
Percent of map unit: 5 percent
Landform: Flood plains
Down-slope shape: Linear
Across-slope shape: Linear

GdB—Glenford silt loam, 3 to 8 percent slopes

Map Unit Setting
National map unit symbol: 2s5h4
Elevation: 540 to 1,320 feet
Mean annual precipitation: 38 to 44 inches
Mean annual air temperature: 49 to 54 degrees F
Frost-free period: 130 to 204 days
Farmland classification: All areas are prime farmland

Map Unit Composition
Glenford and similar soils: 85 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Glenford

Setting
Landform: Terraces
Landform position (two-dimensional): Toeslope
Landform position (three-dimensional): Tread
Down-slope shape: Convex, linear
Across-slope shape: Linear, convex
Parent material: Silty lacustrine deposits

Typical profile
Ap - 0 to 10 inches: silt loam
Bt1 - 10 to 18 inches: silt loam

Bt2 - 18 to 34 inches: silt loam
BC - 34 to 50 inches: silty clay loam
C - 50 to 80 inches: silty clay loam

Properties and qualities
Slope: 3 to 8 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Moderately well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to moderately high (0.01 to 0.28 in/hr)
Depth to water table: About 15 to 24 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum in profile: 15 percent
Available water storage in profile: Very high (about 12.3 inches)

Interpretive groups
Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 2e
Hydrologic Soil Group: C/D

Minor Components

Fitchville
Percent of map unit: 10 percent
Landform: Terraces
Landform position (two-dimensional): Toeslope
Landform position (three-dimensional): Tread
Down-slope shape: Linear, concave
Across-slope shape: Linear, concave

Sebring
Percent of map unit: 5 percent
Landform: Terraces
Landform position (two-dimensional): Toeslope
Landform position (three-dimensional): Tread
Down-slope shape: Concave
Across-slope shape: Concave, linear

Hu—Huntington silt loam

Map Unit Setting
National map unit symbol: l653
Elevation: 660 to 1,470 feet
Mean annual precipitation: 36 to 50 inches
Mean annual air temperature: 46 to 57 degrees F
Frost-free period: 120 to 201 days
Farmland classification: All areas are prime farmland

Map Unit Composition
Huntington and similar soils: 90 percent

Minor components: 10 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Huntington

Setting

Landform: Flood plains
Down-slope shape: Linear
Across-slope shape: Linear

Typical profile

H1 - 0 to 20 inches: silt loam
H2 - 20 to 48 inches: silt loam
H3 - 48 to 60 inches: sandy loam

Properties and qualities

Slope: 0 to 3 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Well drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.60 to 2.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: Occasional
Frequency of ponding: None
Available water storage in profile: High (about 11.1 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 1
Hydrologic Soil Group: B

Minor Components

Melvin

Percent of map unit: 10 percent
Landform: Flood plains
Landform position (two-dimensional): Toeslope
Landform position (three-dimensional): Dip
Down-slope shape: Concave
Across-slope shape: Concave

Nw—Newark silt loam

Map Unit Setting

National map unit symbol: l657
Elevation: 660 to 1,500 feet
Mean annual precipitation: 36 to 50 inches
Mean annual air temperature: 41 to 62 degrees F
Frost-free period: 120 to 201 days
Farmland classification: Farmland of statewide importance

Map Unit Composition

Newark and similar soils: 85 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Newark

Setting

Landform: Flood plains
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Mixed alluvium derived from limestone, sandstone, and shale

Typical profile

H1 - 0 to 9 inches: silt loam
H2 - 9 to 34 inches: silt loam
H3 - 34 to 60 inches: silt loam

Properties and qualities

Slope: 0 to 2 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Somewhat poorly drained
Runoff class: Very high
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.60 to 2.00 in/hr)
Depth to water table: About 6 to 18 inches
Frequency of flooding: Frequent
Frequency of ponding: None
Available water storage in profile: High (about 11.9 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 2w
Hydrologic Soil Group: B/D

Minor Components

Brinkerton

Percent of map unit: 5 percent
Landform: Depressions
Down-slope shape: Concave
Across-slope shape: Concave

Melvin

Percent of map unit: 5 percent
Landform: Flood plains
Landform position (two-dimensional): Toeslope
Landform position (three-dimensional): Dip
Down-slope shape: Concave
Across-slope shape: Concave

Clarksburg

Percent of map unit: 5 percent
Landform: Hillslopes
Landform position (two-dimensional): Toeslope, footslope
Landform position (three-dimensional): Base slope, head slope
Down-slope shape: Concave

Across-slope shape: Linear

UdB—Udorthents, smoothed, gently sloping

Map Unit Setting

National map unit symbol: l659
Elevation: 1,000 to 1,500 feet
Mean annual precipitation: 36 to 50 inches
Mean annual air temperature: 41 to 62 degrees F
Frost-free period: 120 to 200 days
Farmland classification: Not prime farmland

Map Unit Composition

Udorthents and similar soils: 99 percent
Minor components: 1 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Udorthents

Setting

Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Man made and altered materials from mixed rock types

Typical profile

H1 - 0 to 6 inches: very channery silt loam
H2 - 6 to 60 inches: very channery silt loam

Properties and qualities

Slope: 0 to 8 percent
Depth to restrictive feature: 40 to 72 inches to lithic bedrock
Natural drainage class: Well drained
Runoff class: Very low
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to high (0.06 to 6.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: Very low (about 2.9 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 4s
Hydrologic Soil Group: A

Minor Components

Wet spots

Percent of map unit: 1 percent
Landform: Depressions

W—Water

Map Unit Setting

National map unit symbol: l65j
Mean annual precipitation: 36 to 50 inches
Mean annual air temperature: 46 to 59 degrees F
Frost-free period: 120 to 214 days
Farmland classification: Not prime farmland

Map Unit Composition

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

Description of Water

Setting

Parent material: Rivers streams ponds

Properties and qualities

Runoff class: Negligible
Frequency of ponding: Frequent

WeB—Weikert-Culleoka complex, 3 to 8 percent slopes

Map Unit Setting

National map unit symbol: l65k
Elevation: 500 to 1,600 feet
Mean annual precipitation: 36 to 50 inches
Mean annual air temperature: 41 to 62 degrees F
Frost-free period: 120 to 200 days
Farmland classification: Farmland of statewide importance

Map Unit Composition

Weikert and similar soils: 65 percent
Culleoka and similar soils: 35 percent
Minor components: 10 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Weikert

Setting

Landform: Hillslopes
Landform position (two-dimensional): Summit
Landform position (three-dimensional): Interfluve
Down-slope shape: Convex, linear

Across-slope shape: Linear, convex
Parent material: Residuum weathered from siltstone

Typical profile
H1 - 0 to 7 inches: channery silt loam
H2 - 7 to 19 inches: extremely channery silt loam
H3 - 19 to 23 inches: bedrock

Properties and qualities
Slope: 3 to 8 percent
Depth to restrictive feature: 10 to 20 inches to lithic bedrock
Natural drainage class: Somewhat excessively drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.60 to 6.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: Very low (about 1.5 inches)

Interpretive groups
Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 3e
Hydrologic Soil Group: D

Description of Culleoka

Setting
Landform: Hills
Landform position (two-dimensional): Backslope, shoulder, summit
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Residuum weathered from nonacid siltstone, fine-grained sandstone, and shale

Typical profile
Ap - 0 to 10 inches: channery silt loam
Bt - 10 to 26 inches: channery silt loam
C - 26 to 31 inches: very channery silt loam

Properties and qualities
Slope: 3 to 8 percent
Depth to restrictive feature: 20 to 40 inches to lithic bedrock
Natural drainage class: Well drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.60 to 6.00 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 4.8 inches)

Interpretive groups
Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 2e
Hydrologic Soil Group: B

Minor Components

Dormont

Percent of map unit: 5 percent
Landform: Hills
Landform position (two-dimensional): Backslope, summit, shoulder
Landform position (three-dimensional): Interfluve
Down-slope shape: Linear, convex
Across-slope shape: Convex

Brooke

Percent of map unit: 5 percent
Landform: Hills
Landform position (two-dimensional): Summit
Landform position (three-dimensional): Interfluve
Down-slope shape: Linear
Across-slope shape: Convex

WeC—Weikert-Culleoka complex, 8 to 15 percent slopes

Map Unit Setting

National map unit symbol: l65l
Elevation: 500 to 1,600 feet
Mean annual precipitation: 36 to 50 inches
Mean annual air temperature: 41 to 62 degrees F
Frost-free period: 120 to 200 days
Farmland classification: Not prime farmland

Map Unit Composition

Weikert and similar soils: 50 percent
Culleoka and similar soils: 40 percent
Minor components: 10 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Weikert

Setting

Landform: Hillslopes
Landform position (two-dimensional): Summit
Landform position (three-dimensional): Interfluve
Down-slope shape: Convex, linear
Across-slope shape: Linear, convex
Parent material: Residuum weathered from siltstone

Typical profile

H1 - 0 to 7 inches: channery silt loam
H2 - 7 to 19 inches: extremely channery silt loam
H3 - 19 to 23 inches: bedrock

Properties and qualities

Slope: 8 to 15 percent
Depth to restrictive feature: 10 to 20 inches to lithic bedrock
Natural drainage class: Somewhat excessively drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.60 to 6.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: Very low (about 1.5 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 4e
Hydrologic Soil Group: D

Description of Culleoka

Setting

Landform: Hillslopes
Landform position (two-dimensional): Backslope, shoulder, summit
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Residuum weathered from nonacid siltstone, fine-grained sandstone, and shale

Typical profile

Ap - 0 to 10 inches: channery silt loam
Bt - 10 to 26 inches: channery silt loam
C - 26 to 31 inches: very channery silt loam

Properties and qualities

Slope: 8 to 15 percent
Depth to restrictive feature: 20 to 40 inches to lithic bedrock
Natural drainage class: Well drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.60 to 6.00 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 4.8 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 3e
Hydrologic Soil Group: B

Minor Components

Brooke

Percent of map unit: 5 percent
Landform: Hills
Landform position (two-dimensional): Summit
Landform position (three-dimensional): Side slope
Down-slope shape: Linear

Across-slope shape: Convex

Dormont

Percent of map unit: 5 percent
Landform: Hillslopes
Landform position (two-dimensional): Backslope, summit, shoulder
Landform position (three-dimensional): Head slope, side slope
Down-slope shape: Linear, concave
Across-slope shape: Convex

WeD—Weikert-Culleoka complex, 15 to 25 percent slopes

Map Unit Setting

National map unit symbol: l65m
Elevation: 500 to 1,600 feet
Mean annual precipitation: 36 to 50 inches
Mean annual air temperature: 41 to 62 degrees F
Frost-free period: 120 to 200 days
Farmland classification: Not prime farmland

Map Unit Composition

Weikert and similar soils: 50 percent
Culleoka and similar soils: 40 percent
Minor components: 10 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Weikert

Setting

Landform: Hillslopes
Landform position (two-dimensional): Summit
Landform position (three-dimensional): Interfluve
Down-slope shape: Convex, linear
Across-slope shape: Linear, convex
Parent material: Residuum weathered from siltstone

Typical profile

H1 - 0 to 7 inches: channery silt loam
H2 - 7 to 19 inches: extremely channery silt loam
H3 - 19 to 23 inches: bedrock

Properties and qualities

Slope: 15 to 25 percent
Depth to restrictive feature: 10 to 20 inches to lithic bedrock
Natural drainage class: Somewhat excessively drained
Runoff class: Medium
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.60 to 6.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None

Frequency of ponding: None
Available water storage in profile: Very low (about 1.5 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 6e
Hydrologic Soil Group: D

Description of Culleoka

Setting

Landform: Hillslopes
Landform position (two-dimensional): Backslope, shoulder
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Residuum weathered from nonacid siltstone, fine-grained sandstone, and shale

Typical profile

Ap - 0 to 10 inches: channery silt loam
Bt - 10 to 26 inches: channery silt loam
C - 26 to 31 inches: very channery silt loam

Properties and qualities

Slope: 15 to 25 percent
Depth to restrictive feature: 20 to 40 inches to lithic bedrock
Natural drainage class: Well drained
Runoff class: Medium
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.60 to 6.00 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 4.8 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 6e
Hydrologic Soil Group: B

Minor Components

Brooke

Percent of map unit: 5 percent
Landform: Hills
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Linear
Across-slope shape: Convex

Dormont

Percent of map unit: 5 percent
Landform: Hills
Landform position (two-dimensional): Backslope, shoulder
Landform position (three-dimensional): Side slope, nose slope, head slope
Down-slope shape: Linear
Across-slope shape: Concave, linear

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DOMINION TRANSMISSION, INC.

SUPPLY HEADER PROJECT

SECTION 4 – EROSION AND SEDIMENT CONTROL PLAN (ESCP)

APPENDIX C – WETLAND AND WATERCOURSE REPORT

Supply Header Project

Wetland and Waterbody Survey Report 1

Prepared by:

ERM

November 2016

Supply Header Project
Wetland and Waterbody Survey Report 1

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ACRONYMS

ACP	Atlantic Coast Project
CFR	Code of Federal Regulations
COE	U.S. Army Corps of Engineers
D&D	Duncan & Duncan West, LLC
DTI	Dominion Transmission, Inc.
EPA	Environmental Protection Agency
ERM	Environmental Resources Management
FAC	Facultative Plants
FACU	Facultative Upland Plants
FACW	Facultative Wetland Plants
GPS	Global Positioning System
NHD	National Hydrography Dataset
NRCS	Natural Resource Conservation Service
NWI	National Wetland Inventory
NWPL	National Wetland Plant List
OBL	Obligate Plants
OHWM	Ordinary High Water Mark
PEM	Palustrine System Emergent Wetland Class
PFO	Palustrine System Forested Wetland Class
PSS	Palustrine System Scrub-Shrub Wetland Class
SHP	Supply Header Project
TOB	top of bank
UPL	Uplands Plants
USDA	U.S. Department of Agriculture
USFWS	U.S. Fish and Wildlife Service
USGS	U.S. Geological Survey

1.0 INTRODUCTION

Environmental Resources Management (ERM), on behalf of Dominion Transmission, Inc. (DTI), conducted wetland and waterbody surveys for the proposed Supply Header Project (SHP). Surveys were completed by contracted staff from Duncan & Duncan WEST, LLC (D&D) and ERM staff. This report presents results of the wetland and waterbody field surveys that were completed in Pennsylvania for the SHP. The survey area consists of a 300-foot-wide corridor approximately 3.9 miles in Pennsylvania and associated aboveground facilities (Figure 1). The survey corridor includes areas within the U.S. Army Corps of Engineers (COE) Pittsburgh District. This report will only include information regarding delineated resources within Commonwealth of Pennsylvania.

Wetland and waterbody surveys were conducted along the proposed mainline TL-636, JB Tonkin Compressor Station, Crayne Compressor Station, and all associated access roads, contractor yards, and impoundment areas. Westmoreland County in Pennsylvania was surveyed for TL-636 and JB Tonkin Compressor Station. Greene County in Pennsylvania was surveyed for Crayne Compressor Station. The field surveys were conducted from October 2014 to July 2015 and in September 2015 along the proposed pipeline routes. This report will specifically include the wetlands and waterbodies delineated within Pennsylvania. This report serves as the wetland and waterbody report to be submitted to the Federal Energy Regulatory Commission.

This report provides an assessment of wetlands, rivers, streams, open waterbodies (e.g., ponds), and seep points documented within the survey corridor based on qualified wetland biologists' best professional judgment and interpretation of the *U.S. Army Corps of Engineers 1987 Wetlands Delineation Manual* (COE, 1987)*, the Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Eastern Mountains and Piedmont Region (Version 2.0)* (COE, 2010), the *COE Regulatory Guidance Letter regarding Ordinary High Water Mark Identification* (COE, 2005), and other applicable COE guidance documents and regulations. The report also documents observations made at "non-water points" where desktop data indicated a wetland or waterbody may be present but upon field inspection requisite wetland parameters or discernable evidence of waterbody morphological characteristics were not present. The wetland and waterbody delineation report identifies delineated resources regulated under the 1972 Clean Water Act as Waters of the United States and under PA Code Title 25 Environmental Protection - Chapter 105 Dam Safety and Water Management as Regulated Waters of this Commonwealth at the proposed SHP area. Please refer to figures within the Chapter 105 Water Obstruction and Encroachment Permit application for relevant location information for the wetlands and waterbodies documented in the report. Specifically, Section 7 includes alignment sheets with aerial photography maps each with illustrated wetlands and waterbodies delineated during field surveys.

Figure 1 – Supply Header Project Map

2.0 METHODS

Prior to conducting field surveys, a review of high resolution aerial photographic resources and other desktop data (e.g., National Wetland Inventory, soils maps, USGS maps) was conducted prior to field surveys. These resources were used both prior to and during field surveys to identify potential wetland or waterbody areas that may be present within the survey corridor.

Field surveys for the proposed pipeline were conducted within a 300-foot-wide survey corridor and proposed access roads were conducted within a 50-foot-wide survey corridor. The survey area was evaluated to determine the presence of water features including wetlands, waterbodies (streams and open waterbodies), non-tidal ditches, and seep points. Data were also collected to document a lack of water features where desktop data indicated water features may be present; these are referred to as non-water points.

Accessible tracts within the survey corridor were evaluated to determine the presence or absence of water features, including wetlands, waterbodies (streams and open waterbodies), seep points, and non-water points. Specific naming conventions were followed during field surveys in order to catalog each feature type collected. Tables 2-1 and 2-2 describe the unique naming conventions for these features.

TABLE 2-1

Supply Header Project
Wetland, Waterbody, Seep, and Non-Water Point Feature Naming Protocol

Water Feature Type	Polygon/Line	County	Field Crew Letter	Feature Number	Special Designation
Wetland	w (wetland)	county code	crew letter (e.g., a, b, c)	001, 002, 003, …	f, e, s (PFO, PEM, PSS wetlands)
Waterbody	s (stream) o (open waterbody)	county code	crew letter (e.g., a, b, c)	001, 002, 003, …	p, i, e (change in stream morphology to perennial, intermittent, or ephemeral)
Non-tidal Ditch	d (ditch)	county code	crew letter (e.g., a, b, c)	001, 002, 003, …	
Seep	p (seep)	county code	crew letter (e.g., a, b, c)	001, 002, 003, …	
Non-Water Point	no (non-water)	county code	crew letter (e.g., a, b, c)	001, 002, 003, …	

2.1 DESKTOP REVIEW

Several sources of information were used to complete a “desktop” review of survey areas for potential wetlands and waterbodies prior to conducting field surveys. Biologists utilized high resolution aerial photography, U.S. Fish and Wildlife Service (USFWS) National Wetlands Inventory (NWI) data, U.S. Department of Agriculture oil Survey Geographical Database, the USGS National Hydrography Dataset (NHD), and USGS Topographic Maps. The evaluation prior to field survey allowed crews to identify areas of high probability for wetlands or waterbodies in planning and preparation for field survey.

Table 2-2

Supply Header Project
Survey Corridor County Codes

Facility Type/State	County	County Code
TL-636/JB Tonkin Compressor Station		
Pennsylvania	Westmoreland	wm

2.2 FIELD SURVEY

The field surveys for the SHP were conducted by D&D from October 2014 to July 2015 and by ERM in September 2015. Wetland boundaries, waterbody thalweg or banks, data collection points, open waterbody boundaries, seep points, and non-water points were surveyed using a Trimble® 6000 series GeoXH model global positioning system (GPS) unit. The field data collection settings within the GPS units used available satellites to capture location data. Note that while the GPS data collected during survey provides reasonably accurate spatial information regarding the wetlands, open waterbodies, seep points, and non-water points delineated, typically one-meter accuracy with sufficient satellite reception, it does not constitute the same accuracy as a professional land survey.

2.2.1 Wetlands

The delineation of wetlands was conducted using the method described in the 1987 Manual, along with either of the Regional Supplements. The wetland boundaries were delineated using the routine onsite determination method described in the Regional Supplements and utilizing *the National Wetland Plant List: 2014 (NWPL)* (Lichvar et al., 2012; Federal Register, 2012) for determination of plant indicator status, and the *Classification of Wetlands and Deepwater Habitats of the United States* (Cowardin, 1979) to classify wetlands. According to the COE 1987 Wetland Manual, three criteria or parameters are considered during a wetland delineation, and for a plant community to be considered a wetland it must have: a predominance of hydrophytic vegetation, indications of wetland hydrology, and the presence of hydric soils under normal circumstances (i.e., where naturally problematic conditions or disturbances are absent). Wetland data sheets were completed at sample points within each wetland community type (i.e., Cowardin classification) making up the wetland or wetland complex, along with a minimum of one corresponding upland community sample point.

2.2.1.1 Hydrophytic Vegetation

The 1987 Manual and NWPL defines the wetland indicator status of plants as follows:

- Obligate Wetland Plants (OBL): almost always occur in wetlands (estimated probability >99 percent) in wetlands under natural conditions. With few exceptions, these plants (herbaceous or woody) are found in standing water or seasonally saturated soils (14 or more consecutive days) near the surface. These plants are of four types: submerged, floating, floating-leaved, and emergent.
- Facultative Wetland Plants (FACW): usually occur in wetlands (estimated probability >67 percent to 99 percent), but may occur in non-wetlands. These

plants predominantly occur with hydric soils, often in geomorphic settings where water saturates the soils or floods the soil surface at least seasonally.

- Facultative Plants (FAC): occur in wetlands and uplands (estimated probability 33 percent to 99 percent within wetlands). These plants can grow in hydric, mesic, or xeric habitats. The occurrence of these plants in different habitats represents responses to a variety of environmental variables other than just hydrology, such as shade tolerance, soil pH and elevation. They have a wide tolerance of soil moisture conditions.
- Facultative Upland Plants (FACU): usually occur in uplands, but many occur in wetlands (estimated probability 1 percent to <33 percent in wetlands). These plants predominantly occur on drier or more mesic sites in geomorphic settings where water rarely saturates the soils or floods the soil surface seasonally.
- Upland Plants (UPL): almost never occur in wetlands (estimated probability <1 percent). These plants occupy mesic to xeric upland habitats. They almost never occur in standing water or saturated soils. Typical growth forms include herbaceous, shrubs, woody vines, and trees.

Dominant vegetation was assessed for each stratum present (tree, sapling/shrub, woody vine, and herbaceous) at a sample point location. In most cases, plant dominance was determined using the COE "50/20 Rule" in which species from each stratum that individually or collectively make up more than 50 percent of the total cover in each stratum, plus any other species that account for at least 20 percent of the total cover in the stratum are determined to be dominant species. The hydrophytic vegetation criterion is met when greater than 50 percent of the dominant plant species are classified as OBL, FACW, or FAC. Vegetation information was recorded on the appropriate COE data forms.

2.2.1.2 Wetland Hydrology

Hydrology is influenced by many variables, including: seasonal and long-term rainfall patterns, local geology, topography, soil type, local water table conditions, and drainage. According to the 1987 Manual and Regional Supplements, wetland hydrology is present if 14 or more consecutive days of inundation or water saturation within 12 inches of the soil surface occurs during the growing season at a minimum frequency of 5 years in 10.

Indicators of wetland hydrology provide evidence that a site has a persistent wetland hydrologic regime. The Regional Supplements both provide a list of hydrology indicators that include primary and secondary indicators, which are grouped as:

- Observation of Surface Water or Saturated Soils
- Evidence of Recent Inundation
- Evidence of Current and Recent Soil Saturation
- Evidence of Other Site Conditions or Data

One primary indicator or two secondary indicators are required to confirm that wetland hydrology is present or occurs at some time during the growing season. Field observations of hydrology were made at each vegetation community sample point. Examples of key indicators observed include presence of water above the ground surface, high water table within the hole dug for soil observations, saturated soil in the upper portion of the soil profile, water-stained leaves, drainage patterns as evidence of water presence, and the geomorphic position of the vegetation community and sample point location. Hydrology information was recorded on the appropriate COE data sheets.

2.2.1.3 Hydric Soils

The 1987 Manual defines hydric soils as soils that are saturated, flooded or ponded long enough during the growing season to develop anaerobic conditions in the upper part.

Hydric soils are characterized by specific morphological characteristics developed in the soil profile over time due to reduction of iron, manganese, and sulfur under saturated and anaerobic conditions (U.S. Department of Agriculture [USDA] Natural Resource Conservation Service [NRCS], 2010). The hydric soil indicators described in the Regional Supplements are a subset of hydric soil indicators described in *Field Indicators of Hydric Soils in the United States, Version 7.0 (2010)*. The *Munsell Book of Soil Color Charts (2014)* was utilized to determine soil matrix and mottle colors (redoximorphic features) and record soil profile descriptions. The soils were observed and documented at representative sample point locations in both wetland communities and adjacent upland communities to help establish the wetland boundary. Soil profile descriptions were recorded on the appropriate COE data sheets.

2.2.1.4 Cowardin Classification

The Cowardin Classification was developed in 1979 to classify a variety of wetland habitats. The Cowardin Classification divides wetlands into five systems, including: Marine, Estuarine, Riverine, Lacustrine, and Palustrine. These represent the five major landscape settings. The classification system further divides wetland communities into systems and classes. The 2014 and 2015 surveys were conducted in inland wetlands, and descriptions of the common Cowardin Classification community types are described in the bullets below.

- Palustrine System Emergent Wetland Class (PEM): A PEM wetland is defined as a non-tidal wetland characterized by erect, rooted, hydrophytic herbaceous species. These wetland habitats are often dominated by perennial plants, where the vegetation is present for the majority of the growing season (Cowardin, 1979).
- Palustrine Forested Wetland Class (PFO): A PFO wetland is defined as a non-tidal wetland characterized by dominant woody vegetation that is greater than 20 feet tall, with an understory of small trees and shrubs, as well as an herbaceous layer (Cowardin, 1979).
- Palustrine System Scrub-Shrub Wetland Class (PSS): A PSS wetland is defined as a non-tidal wetland consisting of woody vegetation that is less than 20 feet tall, including shrubs, young trees, and stunted trees or shrubs (Cowardin, 1979).

Each wetland delineated was assigned a Cowardin class. For wetland complexes, or wetlands that are comprised of more than one wetland plant community (i.e., Cowardin class) a sample point was established and observations recorded to document each community. Unique wetland IDs and separate polygons were established based on the wetland community present within the complex. The field crews in 2014 and 2015 collected wetland information for PEM, PFO, and PSS wetlands.

2.2.2 Waterbodies

Waterbodies documented during field survey were categorized as 1) linear or flowing waterbodies such as streams and rivers, and assigned a unique ID starting with an "s" or 2) non-flowing open waterbodies such as ponds and lakes which were assigned a unique ID starting with an "o". Linear or flowing waterbodies were identified as landscape features with a channel that include a bed and a bank in a concave landscape position where water flow has resulted in a feature that possesses an ordinary high water mark (OHWM). Based on evidence of flow regime at the time of survey linear waterbodies were attributed a flow regime, according to the definitions provided by the COE for the Nationwide Permit Program in Code of Federal Regulations (CFR) 33 Part 330 (Federal Register, 1993). Similarly non-flowing, open waterbody features were assigned a Cowardin hydrology regime based on observations recorded at the time of survey. Definitions of these flow regimes and hydrology regimes are included below.

2.2.2.1 Regime Classification

Water regime classification is defined by its flow duration. The following regime classifications are described below as defined by the CFR 33 Part 330 ruling:

- Perennial Stream: A perennial stream has flowing water year round during a typical year. The water table is located above the stream bed for most of the year, and groundwater is the primary source of water for stream flow. Runoff from rainfall is a supplemental source of water for stream flow.
- Intermittent Stream: An intermittent stream has flowing water during most times of the year, when groundwater provides water for stream flow. During dry periods, intermittent streams may not have flowing water, and runoff from rainfall is a supplemental source of water for stream flow.
- Ephemeral Stream: An ephemeral stream has flowing water only during and for a short duration after precipitation events. Ephemeral stream beds are located above the water table year round, therefore, groundwater is not a source of water for the stream. Runoff from rainfall is the primary source of water for stream flow.

Non-flowing or open waterbodies were documented based on the evidence of inundation/saturation at the time of surveys, utilizing one of four categories based on the USFWS's *Classification of Wetlands and Deepwater Habitats of the United States* (Cowardin, 1979) including the following:

- Non-flowing: Water covers the land surface throughout the year in all years.
- Semi-Non-flowing: Surface water persists throughout the growing season in most years. When surface water is absent, the water table is usually at or very near the land surface

- Seasonally flooded: Surface water is present for extended periods especially early in the growing season, but is absent by the end of the season in most years. When surface water is absent, the water table is often near the land surface.
- Temporarily flooded: Surface water is present for brief periods during the growing season, but the water table usually lies well below the soil surface for most of the season.

2.2.3 Non-tidal Ditches

Field crews documented ditches that had an OHWM, bed and bank, and/or were connected to waters of the United States. Additionally, the ditches documented by the field review contained one or more of the following characteristics, in accordance with Draft Guidance provided by the Environmental Protection Agency (EPA, 2015):

- Standing or flowing water
- A link to two or more waters of the United States.
- Drain wetlands or waterbodies that can be linked to waters of the United States.
- Excavated within waters of the United States.
- A relocated, channelized, and/or straightened tributary

Ditches that exhibited wetland characteristics were classified as wetlands if they met the criteria specified in the Manual or applicable Regional Supplement.

2.2.4 Seep Points

Seep points are defined as small areas where groundwater saturates the soil surface on steep slopes or along sidehill cuts or banks. Seeps do not meet the definition of either a waterbody, due to lack of OHWM, top of bank (TOB), or a wetland, lacking the three wetland parameters (hydrology, vegetation, soils). One example of where a seep point would likely be found would be a road cut. Seep points were reviewed and documented on a case-by-case basis by wetland biologists. Where seep points were observed a GPS data point was taken along with corresponding photos of the area.

2.2.5 Non-Water Points

Non-water points were collected to document areas mapped as NWI polygons or NHD lines that did not meet the required criteria of wetlands or waterbodies (i.e., upland habitat). Observations were recorded, photographs were taken, and a GPS point was recorded at each non-water point to document that wetland biologists visited the point and determined that a wetland or waterbody was not present. COE wetland delineation forms were used to record information for non-water points located within NWI wetlands polygons. Documentation of non-water points provides a record to demonstrate that areas mapped as NWI and NHD, or areas with an aerial photography signature indicative of wetland conditions, which from a desktop may be assumed to be aquatic, were visited by wetland biologists and determined to lack the requisite indicators of a wetland or waterbody.

3.0 RESULTS AND FINDINGS

The following sections present the results of water resources survey from October 2014 through July 2015 and in September 2015 on the SHP, including wetlands, waterbodies, seep points, and non-water points that were documented on accessible tracts within the SHP survey corridor. The workspace for Greene and Westmoreland Counties were surveyed to identify water resources; however, there were no water resources present in the Crayne Compressor Station workspace in Greene County, Pennsylvania. Therefore, the report only includes resources identified during the surveys in Westmoreland County, Pennsylvania. **Please note that only features, datasheets, and photos documenting water resources within the Commonwealth of Pennsylvania are included in this package.**

3.1 WETLANDS

A total of 12 wetlands have been documented within the survey corridor along the proposed pipeline route in Westmoreland County, Pennsylvania during the field season. A table listing the delineated wetlands is located in Table 3.1-1. Table 3.1-1 includes the state, county, unique project wetland ID, Cowardin classification, approximate milepost, latitude, and longitude. Datasheets and photo pages for each wetland and upland sample point are provided in Appendix A.

3.2 WATERBODIES

A total of 18 waterbodies have been documented within the survey corridor along the proposed pipeline route in Westmoreland County, Pennsylvania during the field season. A table listing delineated waterbodies is located in Table 3.2-1. Table 3.2-1 includes the state, county, unique project waterbody ID, USGS waterbody name, hydrologic regime, field estimated OHWM width (ft.), and field estimated bank-to-bank width (feet), approximate milepost, latitude, and longitude. Datasheets and photo pages for each waterbody sample point are provided in Appendix B.

3.3 NON-TIDAL DITCHES

No ditches were documented within the survey corridor along the proposed pipeline route.

3.4 SEEP POINTS

No seep points were documented within the survey corridor along the proposed pipeline route.

3.5 NON-WATER POINTS

No non-water points were documented within the survey corridor along the proposed pipeline route.

TABLE 3.1-1

Supply Header Project
Wetland Inventory

Facility/State/County/ Approximate Milepost	Unique ID	Cowardin Classification	Latitude	Longitude
TL-636/JB Tonkin Compressor Station				
Pennsylvania				
Westmoreland				
N/A	wwmh005e	PEM	40.4623523262295	-79.6405387816610
N/A	wwmc001e	PEM	40.4248188478790	-79.5852955813219
0.2	wwmh012f	PFO	40.4253265676696	-79.5937998332657
0.6	wwmh001f	PFO	40.4294960198917	-79.6006394801935
0.7	wwmh001f	PFO	40.4296412578112	-79.6007430355412
1.2	wwmh002e	PEM	40.4330644395070	-79.6092591167805
1.3	wwmh002e	PEM	40.4341094348971	-79.6106072005217
1.9	wwmh007e	PEM	40.4408612173111	-79.6192503762113
2.6	wwmh003f	PFO	40.4478566206251	-79.6279818503258
2.9	wwmh008e	PEM	40.4504207257220	-79.6311135129026
2.9	wwmh009e	PEM	40.4510617698231	-79.6316585447007
3.2	wwmh010f	PFO	40.4532326030784	-79.6344216791762
3.6	wwmh011f	PFO	40.4594885736349	-79.6385750988932
3.8	wwmh006e	PEM	40.4609615939800	-79.6393562606762

TABLE 3.2-1

Supply Header Project
Waterbody Inventory

Facility/State/ County/ Approximate Milepost	Unique ID	USGS Name	Hydrologic Regime	OHWM Width (feet)	Bank to Bank Width (feet)	Latitude	Longitude
TL-636/ JB Tonkin Compressor Station							
Pennsylvania							
Westmoreland							
0.2	swmh002	UNT to Turtle Creek	Perennial	5	7	40.4256194295263	-79.5938036878563
0.2	swmh001	UNT to Turtle Creek	Perennial	3	6	40.4246553849002	-79.5978463239672
0.5	swmh001	UNT to Turtle Creek	Perennial	3	6	40.4239428950187	-79.6016011497773
0.7	swmh003	UNT to Turtle Creek	Perennial	3	5	40.4296380136157	-79.6006253571047
1.2	swmh004	UNT to Kemerer Hollow	Perennial	4	8	40.4339717856692	-79.6105601276734
1.4	swmh005	Kemerer Hollow	Perennial	4	8	40.4346663145257	-79.6117141834835
1.7	swmh012	UNT to Kemerer Hollow	Perennial	1	10	40.4376884466757	-79.6162735163807
1.9	swmh013	UNT to Kemerer Hollow	Perennial	5	10	40.4408025125325	-79.6190444035428
2.5	swmh006	UNT to Steels Run	Perennial	4	8	40.4464247413319	-79.6262876179098
2.6	swmh007	Steels Run	Perennial	6	10	40.4480418510385	-79.6277784475133
2.6	owmh001	Unnamed pond	Perennial	na	na	40.4478735936819	-79.6276178052457
2.7	swmh008	UNT to Steels Run	Perennial	2	3	40.4488460016674	-79.6286836208999
2.9	swmh014	UNT to Steels Run	Perennial	4	8	40.4529233917312	-79.6339882048317
2.9	owmh002	Unnamed pond	Perennial	na	na	40.4510793541902	-79.6324995561128
3.3	swmh016	UNT to Steel's Run	Intermittent	2	4	40.4557676297418	-79.6350443216715
3.6	swmh015	UNT to Haymakers Run	Perennial	5	8	40.4593731937649	-79.6385927916215
3.8	swmh011	UNT to Haymakers Run	Perennial	3	8	40.4613229149341	-79.639525114389
N/A	swmh010	Haymakers Run	Perennial	9	15	40.4625279998542	-79.6393433785753
N/A	smwh009	UNT to Haymakers Run	Perennial	4	20	40.4625887449162	-79.639446227021

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SUPPLY HEADER PROJECT ENVIRONMENTAL SURVEY

Wetland and Waterbody Delineation Report

APPENDIX A

Wetland Datasheets and Photo Pages

[Note: Wetland Datasheets from Westmoreland County are included in the ESCGP-2 Application for Westmoreland County. No wetlands were delineated in Greene County.]

DOMINION TRANSMISSION, INC.

SUPPLY HEADER PROJECT

SECTION 4 – EROSION AND SEDIMENT CONTROL PLAN (ESCP)

APPENDIX D – CLEAN FILL CERTIFICATION

COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF ENVIRONMENTAL PROTECTION
BUREAU OF WASTE MANAGEMENT

pennsylvania
DEPARTMENT OF ENVIRONMENTAL PROTECTION

FORM FP-001 - CERTIFICATION OF CLEAN FILL

Prior to completing this form and signing this certification, please review the entire Management of Fill policy (#258-2182-773), including the certification requirements. Please note that historic fill, as defined in the Management of Fill policy, may meet the definition of clean fill if the material is limited to uncontaminated soil, rock, stone, dredged material, used asphalt, and brick, block or concrete from construction and demolition activities that is separate from other waste and recognizable as such.

Instructions: Sections 1 and 2 of this form must be completed by the person making the determination of clean fill at the site of origin. Section 3 must be completed by the person using the material as clean fill. Both the person determining clean fill and the user of the clean fill are responsible for maintaining copies of this completed form on site for a period of five (5) years for Department inspection.

Section 1: Person Determining Clean Fill

Name (Print): ______________________ Title: ______________________ Date: __________

Company Name: ____

Street Address: ____________________ City: ______________ State: _____ Zip Code: __________

Telephone Number: ____________________ E-mail Address: ______________________________

Clean Fill Material originated on the following property:

Site Name: ____

Street Address: ____________________ City: ______________ State: _____ Zip Code: __________

Section 2: Site Characterization

Check the following that applies:

☐ **A. IF the site of origin for the fill material has undergone or is undergoing cleanup or remediation pursuant to a local state or federal regulatory program that requires site characterization, provide the following information along with a copy of the entire site characterization and laboratory analysis for the material to be used as clean fill.**

Name of local, state, or federal agency: ______________________________

Identification number assigned to the project: ______________________________

Name of the local, state, or federal contact person: ______________________________

Telephone Number: ____________________ E-mail Address: ______________________________

Name of the Laboratory that conducted the analysis: ______________________________

Laboratory Accreditation Number: ______________________________

☐ **B. IF the material proposed to be used as clean fill has otherwise been subject to analytical testing or other procedure identified in the definition of "environmental due diligence" contained in the Management of Fill policy, provide or attach the following:**

Copies of **ALL** lab analytical testing performed as part of environmental due diligence (see Management of Fill policy, #258-2182-773).

Name of the Laboratory that conducted the analysis: ______________________________

Laboratory Accreditation Number: ______________________________

☐ **C. IF the proposed material to be used as clean fill was subject to environmental due diligence procedures as defined in the Management of Fill policy other than those listed in A and B, describe those procedures.**

____

____

I, the undersigned, certify under penalty of law (18 Pa. C.S.A. §4904) that the information provided in Sections 1 and 2 of this form is true and correct to the best of my knowledge, information and belief.

Signature: ____

Section 3: Person Receiving or Placing Clean Fill

Name and address of person completing this form:

Name (Print): ________________________________ Date: ____________________

Mailing Address: ________________ City: ______________ State: _____ Zip Code: ______

Telephone Number: __________________ E-mail Address: __________________________

Fill material that has been determined to be clean fill will be placed on the following property solely for property improvement or construction purposes:

Property Address: ________________ City: __________ State: _____ Zip Code: ________

Current Owner of Property: ____

Telephone Number: _________________ E-mail Address: __________________________

The quantity of clean fill to be placed on the property is:

☐ <3,000 cubic yards ☐ 3,000 cubic yards to 20,000 cubic yards ☐ >20,000 cubic yards

I, the undersigned, certify under penalty of law (18 Pa. C.S.A. §4904) that the information provided is true and correct to the best of my knowledge, information and belief.

Signature: ____

* * * * *

Prior to placement of the clean fill, the owner of the property receiving fill material shall provide a copy of this completed form and attachments to the DEP Regional Office serving the county in which the receiving site is located. If a property receives fill from multiple sources, a separate Form FP-001 is required for each source.

DOMINION TRANSMISSION, INC.

SUPPLY HEADER PROJECT

SECTION 4 – EROSION AND SEDIMENT CONTROL PLAN (ESCP)

APPENDIX E – ESCP DESIGN CALCULATIONS

Plant Area

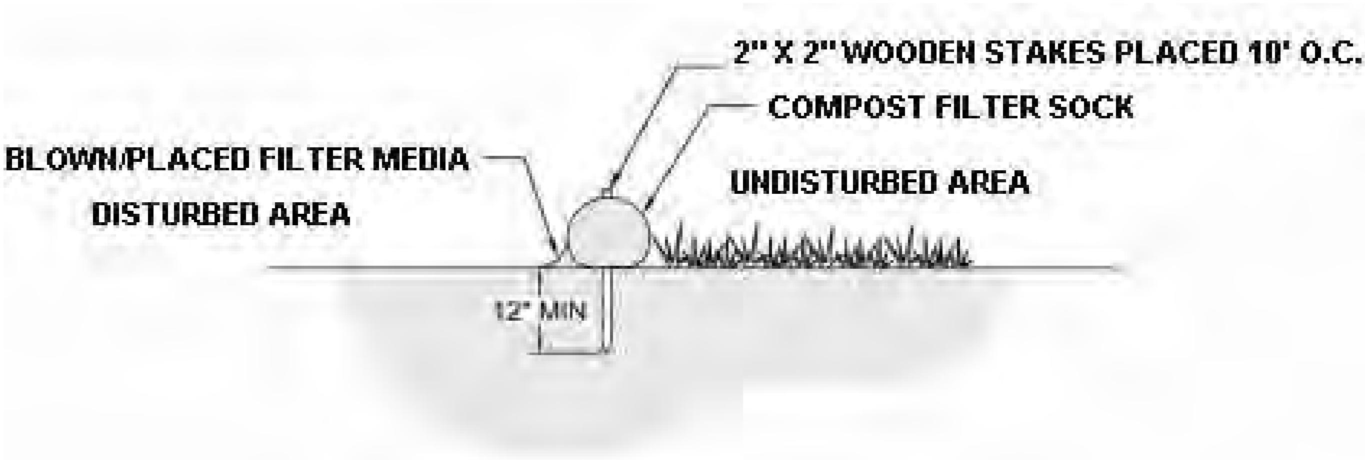
Barrier #	Slope Length (ft)	Slope %	Barrier Size	Barrier Length (ft)
1.01	175.78	0.13	SSF	

Top Elev	Bottom Elev
1128	1105

Type (SF or CFS)
SF

STANDARD E&S WORKSHEET #1
Compost Filter Socks

PROJECT NAME: Crayne Compressor Station
LOCATION: Greene County, PA
PREPARED BY: Mike Pettit DATE: 10/27/2016
CHECKED BY: DATE:



SOCK NO.	Dia. In.	LOCATION	SLOPE PERCENT	SLOPE LENGTH ABOVE BARRIER (FT)
1.01	18	Plant Area	0.13	175.78

STANDARD E&S WORKSHEET # 21
Temporary and Permanent Vegetative Stabilization Specifications

PROJECT NAME: Crayne Compressor Station
LOCATION: Greene County, PA
PREPARED BY: Mike Pettit DATE: 1/12/2017
CHECKED BY: DATE:

SPECIFICATIONS: The Department recommends the use of the Penn State publication, "Erosion Control and Conservation Plantings on Noncropland," as the standard to use for the selection of species, seed specifications, mixtures, liming and fertilizing, time of seeding, and seeding methods. Specifications for these items may also be obtained from PennDOT's Publication # 408, Section 804 or by contacting the applicable county conservation district. Upon selection of a reference, that reference should be used to provide all specifications for seeding, mulching, and soil amendments. The following specification will be used for this project:

(TEMPORARY)

*SPECIES:	Annual Ryegrass	
% PURE LIVE SEED:	90	%
APPLICATION RATE:	5	LB./ACRE
FERTILIZER TYPE:	10-10-20	(X-X-X)
FERTILIZER APPL. RATE:	1,000	LB./ACRE
LIMING RATE:	2	T./ACRE
MULCH TYPE:	Straw	
MULCHING RATE:	3	T./ACRE

(PERMANENT)

TOPSOIL PLACEMENT DEPTH:	3	IN.
*SPECIES:	Tall Fescue	
% PURE LIVE SEED:	90	%
APPLICATION RATE	79	LB./ACRE
FERTILIZER TYPE:	10-10-20	(X-X-X)
FERTILIZER APPL. RATE:	1,000	LB./ACRE
LIMING RATE:	2	T./ACRE
MULCH TYPE:	Straw	
MULCHING RATE:	3	T./ACRE
ANCHOR MATERIAL:	Tracked in with Dozer	
ANCHORING METHOD:	Tracked in with Dozer	
RATE OF ANCHOR MATERIAL APPL.:	-	LB./ACRE
SEEDING SEASON DATES:	August 16 and Later	

(PERMANENT - STEEP SLOPE)

TOPSOIL PLACEMENT DEPTH:	0	IN.
*SPECIES:	Tall Fescue	
% PURE LIVE SEED:	90	%
APPLICATION RATE:	79	LB./ACRE
FERTILIZER TYPE:	10-10-20	(X-X-X)
FERTILIZER APPL. RATE:	1,000	LB./ACRE
LIMING RATE:	2	T./ACRE
MULCH TYPE:	Straw	
MULCHING RATE:	3	T./ACRE
ANCHOR MATERIAL:	Hydromulch	
ANCHORING METHOD:	Spray from Hydroseeder	
RATE OF ANCHOR MATERIAL APPL.:	3	LB./ACRE
SEEDING SEASON DATES:	August 16 or Later	

*If more than one species is used, indicate application rate for each species.

Note: This worksheet should be added to the plan drawings.

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: Larry Hosmer, P.E.

FORMAL EDUCATION:

Name of College or Technical Institute: Lehigh University
Curriculum or Program: Geotechnical Engineering
Dates of Attendance: **From:** 1966 **To:** 1970
Degree Received Bachelors of Civil/Geotechnical Engineering

OTHER TRAINING:

Name of Training: Masters of Civil/Geotechnical Engineering
Presented By: University of Illinois
Date: 1972

EMPLOYMENT HISTORY:

Current Employer: Environmental Resources Management
Telephone: 410-972-0252

Former Employer: ____________
Telephone: ____________

RECENT E&S PLANS PREPARED:

Name of Project: ____________ ____________ ____________
County: ____________ ____________ ____________
Municipality: ____________ ____________ ____________
Permit Number: ____________ ____________ ____________
Approving Agency: ____________ ____________ ____________

DOMINION TRANSMISSION, INC.

SUPPLY HEADER PROJECT

SECTION 4 – EROSION AND SEDIMENT CONTROL PLAN (ESCP)

APPENDIX F – PADEP VISUAL SITE INSPECTION FORM

3150-FM-BWEW0083 2/2012

pennsylvania
DEPARTMENT OF ENVIRONMENTAL PROTECTION

COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF ENVIRONMENTAL PROTECTION
BUREAU OF WATERWAYS ENGINEERING AND WETLANDS

VISUAL SITE INSPECTION REPORT

Note: It is a condition of National Pollutant Discharge Elimination System and Erosion and Sediment permits that a maintenance program be conducted to provide for the operation and maintenance of all BMPs to be inspected on a weekly basis and after each stormwater event. Please list in the space provided comments to note if repairs or replacement are needed or have been made for BMPs as a result of the inspection. Failure to conduct the required inspection may result in permit suspension or the imposition of civil penalties. If supplemental monitoring is required as part of a permit condition this form may be used to meet those monitoring requirements.

Project Site Name: ______________________ Date: __________ Inspection #: ________

Time: ______________ Weather: ______________________________

Permit #: ____________________ Photos Taken: Yes ☐ No ☐

Inspector/Title: ______________________________

Municipality(s): ______________________________

County(s): ______________________________

Inspection Type (check one): Weekly ☐ Stormwater Event ☐

		Y	N
1.	Are the approved (Stamped) E & S plan and PCSM plan present on site?	☐	☐
2.	Are there activities occurring outside of the limits of disturbance shown on the plan drawings? (If yes, notify conservation district and explain.)	☐	☐

____

____

3.	Is Construction Sequence being followed? (If No, notify conservation district and explain.)	☐	☐

____

____

4. E & S BMPs (List BMPs and note if installed and maintained as per the plan.)

	Y	N			
________	☐	☐	________	☐	☐
________	☐	☐	________	☐	☐
________	☐	☐	________	☐	☐
________	☐	☐	________	☐	☐
________	☐	☐	________	☐	☐
________	☐	☐	________	☐	☐
________	☐	☐	________	☐	☐
________	☐	☐	________	☐	☐

Were repairs/maintenance/replacement BMPs necessary (if so, describe): ______________

____

____

____

		Y	N
5.	**Site Conditions**		
	Sediment Discharge is occurring to waters or wetlands from earth disturbance activity?	☐	☐
	Stabilization of inactive disturbed areas, stockpiles, or at final grade? (exceeding 4 days inactive)	☐	☐
	Are slopes 3:1 and greater stabilized with appropriate BMPs?	☐	☐
6.	**PCSM BMPs**		
	Are areas intended for PCSM BMPs being protected from compaction?	☐	☐

PCSM BMPs (List BMPs and note if installed and maintained as per the plan.)

	Y	N		Y	N
______	☐	☐	______	☐	☐
______	☐	☐	______	☐	☐
______	☐	☐	______	☐	☐
______	☐	☐	______	☐	☐
______	☐	☐	______	☐	☐
______	☐	☐	______	☐	☐
______	☐	☐	______	☐	☐
______	☐	☐	______	☐	☐

Were repairs/maintenance/replacement BMPs necessary (if so, describe): ______

______

______

______

7. **Department/Conservation District has been notified within 24 hours of non-compliance, including discharge to waters or wetlands?** ☐ ☐

8. **Identify all remedial measures that have been taken or will be taken on this site.**

______

______

______

______

Inspector’s Signature: ______ Date: ______

Company Name: ______

Attach additional sheets for comments/repairs/remedial measures if necessary.

DOMINION TRANSMISSION, INC.

SUPPLY HEADER PROJECT

SECTION 4 – EROSION AND SEDIMENT CONTROL PLAN (ESCP)

APPENDIX G – TRAINING RECORDS

Training Record
Storm Water, Sediment, and Erosion Control Training

Project Name: ______________________________

Instructor's Name: ______________________________

Location: ______________________________

Date: ______________________________

Length: ______________________________

Topics:

- ☐ Erosion Control BMPs
- ☐ Sediment Control BMPs
- ☐ Non-Storm Water BMPs
- ☐ Emergency Procedures
- ☐ Good Housekeeping BMPs
- ☐ SWPPP Provisions
- ☐ Conducting Inspections
- ☐ Turbidity Monitoring
- ☐ Other (Specify): ______________________________

Attendee Roster: (attach additional pages as necessary)

Name of Attendee	Company/Agency

Inspector's Signature: ______________________________

Title: ______________________________

DOMINION TRANSMISSION, INC.

SUPPLY HEADER PROJECT

SECTION 5 – POST-CONSTRUCTION STORMWATER MANAGEMENT PLAN/SITE RESTORATION (PCSM/SR) PLAN

Site Restoration/Post-Construction Stormwater Management Plan

Dominion Transmission, Inc.
Supply Header Project
Franklin and Morgan Townships,
Greene County, Pennsylvania

March 31, 2017

Submitted By: Dominion Transmission, Inc.
5000 Dominion Boulevard
Glen Allen, VA 23060
(804) 335-4923

Prepared By: Environmental Resources Management, Inc.
15 Park Row West
Suite 104
Providence, RI 02903
(401) 278-4308

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LIST OF DEFINITIONS

BMP	best management practice
DTI	Dominion Transmission, Inc.
E&SCP	Erosion and Sediment Control Plan
EPA	U.S. Environmental Protection Agency
ERM	Environmental Resources Management, Inc.
ESCGP-2	Erosion and Sediment Control General Permit
LOD	limit of disturbance
NRCS	Natural Resources Conservation Service
NOT	Notice of Termination
NRCS	Natural Resources Conservation Service
PADEP	Pennsylvania Department of Environmental Protection
Pa. Code	Pennsylvania Code
PA ESC Manual	Pennsylvania Department of Environmental Protection's Erosion and Sediment Pollution Control Program Manual, 2012
PaGEODE	Pennsylvania Geologic Data Exploration web-mapping application
Project	Supply Header Project
SCS	Soil Conservation Service
SR/PCSM Plan	Site Restoration/Post-Construction Stormwater Management Plan
SSURGO database	Soil Survey Geographic database
TR-20	Technical Release 20
TR-55	Technical Release 55
USDA	U.S. Department of Agriculture
USGS	U.S. Geological Survey

This Site Restoration/Post-Construction Stormwater Management Plan (SR/PCSM Plan) has been developed to maximize replication of the natural hydrologic cycle, protect the structural integrity of receiving waters, and to protect and maintain existing and designated uses of the Commonwealth waters. The Plan consists of this written narrative and the attached appendices including plan drawings and design calculations. It was developed to be in accordance with the requirements of Title 25 Pennsylvania Code (Pa. Code) Chapter 102, as well as the Clean Streams Law (Title 35 Pennsylvania Statutes [P.S.] Section 691.1001), as amended, utilizing guidelines and best management practices (BMP) information provided in the Department of Environmental Protection's Erosion and Sediment Pollution Control Program Manual, 2012 (PA ECS Manual). This SR/PCSM Plan complements the Erosion and Sediment Control Plan (E&SCP) prepared for this Project and was planned and designed to be consistent with the E&SCP under Pa. Code § 102.4(b). An up-to-date copy of this SR/PCSM Plan (including this narrative and appendices) shall be maintained and available at the Project site during all stages of earth disturbance activity.

This plan was prepared by Environmental Resources Management, Inc. (ERM) personnel, under the direct supervision of a Pennsylvania licensed Professional Engineer trained and experienced in stormwater management design methods and techniques applicable to the size and scope of the proposed Project. The plan has been designed to minimize the threat to human health, safety and the environment to the greatest extent practicable. Staff involved in preparation of this SR/PCSM Plan have attended a Pennsylvania Department of Environmental Protection (PADEP)-sponsored oil and gas industry training class for erosion and sediment control and stormwater management for oil and gas activities.

1.0 PROJECT OVERVIEW

Dominion Transmission, Inc. (DTI) is proposing to construct and operate approximately 37.5 miles of pipeline loop and modify existing compression facilities in Pennsylvania and West Virginia. This project, referred to as the Supply Header Project (Project), will enable DTI to provide firm transportation service to various customers, including Atlantic Coast Pipeline, LLC, which is proposing to construct the Atlantic Coast Pipeline in West Virginia, Virginia, and North Carolina. DTI has hired ERM as the primary environmental consultant for the Project. ERM is assisting DTI with construction planning, environmental surveys, and acquisition of environmental permits and certifications necessary for the Project. The overall project is being reviewed and authorized through the Federal Energy Regulatory Commission (FERC), Docket No. CP15-555-000.

The Pennsylvania segment of the Project includes 3.9 miles of 30-inch diameter natural gas pipeline loop (TL-636) adjacent to DTI's existing LN-25 pipeline in Westmoreland County and modifications at DTI's existing JB Tonkin and Crayne Compressor Stations in Westmoreland and Greene Counties, respectively. The Project will utilize temporary contractor yards in Salem Township, Westmoreland County.

In Greene County, modifications at the Crayne Compressor Station will include the addition of one new gas-driven turbine which will provide 7,700 horsepower of additional compression. The modifications will include expansion to the existing compressor building within the existing chain-link security fenced-in site. Equipment at the station will include gas coolers, inlet air filters, exhaust silencers, blowdown silencers, heaters, and auxiliary generators. Workspace outside the existing fenceline will be required for construction activities such as welding, coating, and storing construction materials. Following construction, these areas will be restored to pre-construction conditions. There are no wetlands and/or waterbodies present within the construction workspace; therefore, no wetland or waterbody impacts are associated with the Crayne Compressor Station. This Erosion and Sediment Control General Permit (ESCGP-2) is only for the impacts within Greene County.

In addition, DTI will install valves and pig launcher/receiver facilities at each end of the pipeline loop. The valves, which will allow DTI to segment the pipelines for safety, operations, and maintenance purposes, will be installed below grade with aboveground valve operators, risers, blowdown valves, and crossover piping connected on each side of the valve. The pig launchers/receivers will be used to run pipeline inspection tools, called pigs, through the pipeline system. DTI anticipates that construction in Pennsylvania will be complete and placed in service by fall 2019.

The Project location is shown on the U.S. Geological Survey (USGS) Quad included in Section 3 of ESCGP-2 permit application package. In addition, this SR/PCSM includes drawings that show the location and limit of construction activities described above in Appendix A. Access to the sites will be via existing and proposed access roads from Jefferson Road (State Route 188) and Kennel Road. The proposed construction activities are expected to disturb approximately 6.0 acres. All construction activities will occur within the limit of disturbance (LOD) delineated on the Project plans.

2.0 EXISTING CONDITIONS

The E&SCP drawings included in the Appendix A of the E&SCP and the SR/PCSM drawings in Appendix A of this plan depict the relevant existing site features. The existing features include 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, existing ground cover (including tree lines and other significant vegetative features), utilities, and other important features.

As shown in Appendix A of the E&SCP, the Crayne Compressor Station currently has multiple existing E&SCP permits opened (Appalachian Gateway, Tioga Area Expansion, and Natrium to Market Projects). Therefore, as part of this ESCGP-2 permit application, the Project will transfer the existing permitted areas from their respective projects to this Project.

In addition, Appendix B includes the stormwater calculations for the most recent previous project, the Natrium to Market Project. Therefore, the preconstruction conditions are considered to be represented by the post-construction conditions of the Natrium to Market Project, which includes an existing stormwater management system with detention ponds, swales, and reaches at the Crayne Compressor Station.

2.1 SOIL CHARACTERISTICS

The location of mapped soil types are shown on the SR/PCSM Plan drawings in Appendix A. These soil boundaries and associated information were obtained from the U.S. Department of Agriculture (USDA) Soil Survey Geographic (SSURGO) database. In addition to this soil mapping data, the USDA, Natural Resources Conservation Service (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 NRCS Custom Soils Resources Report is included in Appendix B of the E&SCP and contains the types, depth, slope, and limitations of the soils within the Project area. Additional information in the soil report includes data on the physical characteristics of the soils, such as their texture, resistance to erosion and suitability for the intended use. The limitation of soils pertaining to earthmoving projects, and the means to address the identified soils limitations are included on the plan drawings.

2.2 EXISTING LAND USE AND LAND COVER

The E&SCP Plan drawings included in Appendix A of the E&SCP and the SR/PCSM drawings in Appendix A of this plan contain existing site features. The existing features include 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, existing ground cover (including tree lines and other significant vegetative features), utilities, and other important features.

The proposed Project is located on private land and the current land use is oil- and gas-related industrial activity. Prior to the existing industrial development, the land use was rural residential. The existing land cover within the permit boundary is a mixture of impervious roof and asphalt, gravel surface, and meadow. The proposed land cover will remain the same with more impervious roof, asphalt, and gravel surface.

The only permanent change in proposed conditions at the Crayne Compressor Station is a small building addition within an existing compacted gravel area, with an addition of 0.069 acre of impervious area. Of the approximate 5.56 acres of disturbance, Staging Area A is approximately 1.52 acres; Staging Area B is 0.26 acre; Upper Yard C is 1.12 acres; Staging Area D is 0.50 acre; Staging Area E is 0.80 acre; and the Compressor Station Workspace is 1.36 acre. The LOD is approximately 16.5 acres.

2.3 RECEIVING WATERS

ERM completed a wetland and watercourse investigation of the Project area as shown on the E&SCP drawings and the SR/PCSM drawings of this plan. No wetlands or waterbodies are located within the footprint of the proposed construction area. There are no U.S. Environmental Protection Agency (EPA) Section 303(d) impaired streams within the Project area. A stormwater detention pond is located south of the Project area northwest of Jefferson Road and east of the Crayne Compressor Station entrance. The detention pond/discharge location mitigates stormwater for the facility and will remain functioning during construction and operations. There are two culverts directing water to the stormwater detention pond. The Crayne Compressor Station is currently active and the proposed disturbed areas were previously disturbed within other E&SCP permitted projects.

The Project is located within Tenmile Creek watershed according to the PADEP Pennsylvania State Water Plan. There are no applicable Act 167 Stormwater Management plans within the Project area. The Project site contains two different receiving waters to Ruff Creek. Ruff Creek has a Pa. Code, Title 25, Chapter 93 designated water use of Warm Water Fishes, but is not defined in the Pa. Code as a special protection water. An unnamed tributary to Ruff Creek is the receiving water for the Project area. The receiving waters are not listed as Pennsylvania Fish and Boat Commission (PFBC) "Approved Trout Waters" or "Wild Trout Waters." According to the 2014 Pennsylvania Integrated Water Quality Monitoring and Assessment Report, the receiving waters for the Project are not listed as siltation impaired in Category 4 or Category 5.

According to the 2014 Pennsylvania Integrated Water Quality Monitoring and Assessment Report, the receiving waters for the Project are not listed as siltation impaired in Category 4 or Category 5.

2.4 EXISTING RIPARIAN BUFFERS

Riparian buffers are an area 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. ERM completed an investigation of the Project area to identify existing riparian forest buffers. No existing riparian buffers were identified within the proposed Project area.

2.5 NATURALLY OCCURRING GEOLOGIC FORMATIONS

General Geology

The bedrock unit beneath the Crayne Compressor Station is comprised of the Waynesburg Formation, which consists of cyclic sequences of sandstone, shale, limestone, and coal. The formation ranges in thickness from 80 to 210 feet within Greene County, increasing in thickness from northwest to the south.

Regionally, the water table varies based on topographic setting and water-bearing zone head. The water levels in valleys and upland areas are shallow and become deeper with increasing elevation to hilltops. The depth to water varies with rock type, physiography, and precipitation. According to USGS, the median well depth in the Waynesburg Formation is 84 feet below ground surface, with a range from 8 to 393 feet below ground surface. The median reported yield for wells in the Waynesburg Formation is 3.8 gallons per minute, with a range of 0.2 to 40.0 gallons per minute. The median specific capacity for wells in the Waynesburg Formation is 0.40 gallons per minute per foot, with a range of 0.01 to 4.4 gallons per minute per foot.

Surficial Geology

According to the Mather, Pennsylvania USGS 7.5 Minute Quadrangle Map, the proposed Crayne Compressor Station site is approximately 1,000 to 1,120 feet above mean sea level near the town of Waynesburg. The topography consists of very hilly with narrow hilltops and steep-sloped narrow valleys that have been modified by fluvial erosion and periglacial mass wasting. A complete soil report for the Project is available in Appendix B of the E&SCP.

Landslide Susceptibility

The USGS Preliminary Landslide Overview Map of the Conterminous United States, 2014, indicates the proposed area is in an area of high landslide incidence. This hazard can be further mitigated by implementing proper sloping and drainage controls. DTI is implementing a comprehensive Geohazards Analysis Program to assess potential geohazards, including slope failures at the aboveground facility site. There are no slopes greater than 30 percent in the defined Project area within Greene County, Pennsylvania.

Earthquake Probability

According to the Pennsylvania Data Exploration web-mapping application (PaGEODE) online services, the nearest earthquake to the Crayne Compressor Station occurred in 1965, at magnitude 3.3. The largest known earthquake to occur in Pennsylvania, the Pymatuning Earthquake, had an epicenter in Jamestown, approximately 110 miles north of the Crayne Compressor Station. The Pymatuning Earthquake had a magnitude of 5.2, causing light property damage.

The USGS maintains a database containing information on surface and subsurface faults and folds in the United States that are believed to be sources of earthquakes of greater than 6.0 magnitude during the past 1.6 million years. The Crayne Compressor Station is not located on any of the surface or subsurface faults identified in the USGS database.

Potential Geologic Hazards

According to the available coal resource information, there has been no underground mining at the proposed site area; however, mined areas are located near the site, with the closest active mine approximately 2.5 miles east of the site. Although there has not been any mining at the site-specific location, three plugged and abandoned oil and gas wells were previously located within the Crayne Compressor Station footprint. There are no karst features within the area of the Crayne Compressor Station.

The primary mitigation of potential geologic hazards will be avoidance. The maximum depth of excavation for the proposed Project is 12 feet below existing grade, with the majority of the proposed earthmoving activities occurring at much shallower depths. At these relatively shallow depths, it is possible that the proposed construction activities will encounter the noted bedrock with acid-producing sulfide minerals. If coal layers or rocks with acid-producing minerals are encountered during construction activities, it would be a small amount.

While the Waynesburg Formation is not typically associated with acid-producing sulfide minerals, coal mining activities have been and are currently active in the general vicinity of the Project. In the event that bedrock with potentially significant acid-producing sulfide minerals is encountered during excavation for the proposed facility, the following mitigation measures are to be followed:

- Material with the potential to provide significant acid-producing sulfide minerals encountered during pad construction is not to be used as fill material on site. This material shall be exported off site and disposed of in the proper manner.

- Material with the potential to provide significant acid-producing sulfide minerals exposed during pad construction is to be addressed through site-specific analysis and design of appropriate mitigation measures. Possible mitigation measures for small quantities could be blending the materials with acid-neutralizing materials, such as limestone; covering the material with soil or glacial till and layering with lime or limestone.

3.0 PROPOSED CONDITIONS

The proposed land use is utility right-of-way, access roads, storage, compressor stations and related equipment to be used for compression, measurement and regulation. Earth disturbance will be restricted to the approximate 16.5-acre LOD delineated on the E&SCP drawings and SR/PCSM drawings. The total proposed area of disturbance resulting from installation of the proposed facilities is 5.6 acres, including the proposed topography; areas of cuts and fills; the limits of earth disturbance; and the locations of proposed access roads, existing and proposed structures, and proposed BMPs.

The only change in proposed conditions is a small building addition (less than 60 by 50 feet in plan dimensions) within an existing compacted gravel surface area located at the Crayne Compressor Station. Other disturbed areas will be within a pipe laydown area on the opposite side of the compressor station. This area will only be used temporarily and will be restored to its preconstruction conditions (cover, grade, slope, etc.).

3.1 PROPOSED LAND USE AND LAND COVER

The proposed land cover will only change minimally in the area of the small building addition. This less than 0.069-acre building addition will change the composite curve number slightly because the pre-construction condition included this 0.069 acre as a curve number of 89 (gravel) and the post-construction condition includes the area as a curve number of 98 (building roof). Therefore, the post-construction composite curve number for the Post-DA-1 Detained 2 sub-catchment (the name of the drainage area within which the proposed improvements are located) is 82 compared to 81 for the pre-construction condition. The temporary Project area will be restored to pre-construction conditions that are generally consistent with a land cover of meadow or its hydrologic equivalent.

3.2 PROPOSED SITE DRAINAGE CHARACTERISTICS

An assessment of the Project site's existing features was completed at the initial stage of Project planning. The site has 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 extent of earth disturbance to the area necessary to construct the proposed facilities. Where possible, site drainage will be directed to previously established drainage features. Specifically, runoff associated with the area of proposed permanent improvements at the Crayne Compressor Station will continue to be managed by the existing detention pond. The location of the proposed drainage features is shown on the SR/PCSM Plan drawings in Appendix A.

3.3 PROPOSED RIPARIAN BUFFER

This Project is not located in a special protection watershed (Exceptional Value or High Quality) and does not propose earth disturbance within 150 feet of a perennial or intermittent river, stream, or creek, or lake, pond, or reservoir. As such, according to Pa. Code § 102.14(a), mandatory riparian buffers are not required for this Project.

4.0 DESCRIPTION OF EROSION AND SEDIMENT CONTROL BEST MANAGEMENT PRACTICES

The erosion and sediment control BMPs for the Project have been planned to minimize the extent and duration of the proposed earth disturbance, maximize protection of existing features, minimize soil compaction, and employ measures and controls that minimize the generation of increased runoff. Specific BMPs have been selected for this site in order to achieve these broad goals. The location of each proposed BMP is shown on the E&SCP drawings in Appendix A of the E&SCP and are discussed further in the E&SCP in section 4.0 of this application.

5.0 DESCRIPTION OF STORMWATER MANAGEMENT BEST MANAGEMENT PRACTICES

The stormwater management BMPs for this Project have been planned to minimize the extent of the proposed earth disturbance, maximize protection of existing drainage features and vegetation, minimize soil compaction, and employ measures and controls that minimize the generation of increased stormwater runoff. Specific BMPs have been selected for this site in order to achieve these broad goals. The location of each proposed stormwater management BMP is shown on the SR/PCSM Plan drawings in Appendix A. Each planned stormwater management BMP is specified for implementation to address a specific aspect of the proposed development. The various BMPs were chosen based on their effectiveness for the planned use and the feasibility of implementation at the Project site.

Stormwater management site planning techniques were used throughout the site design process to preserve natural systems and hydrologic functions to the maximum extent possible through the use of non-structural BMPs. These self-crediting BMPs (i.e., BMPs that minimize or avoid increases in runoff volume or peak discharge) were utilized to the extent possible to prevent stormwater generation and reduce the overall impact of the proposed facilities on stormwater runoff. Non-structural BMPs used on the site are discussed in detail in Section 5.1.

Stormwater runoff associated with the Crayne Compressor Station modifications will be managed by the existing detention pond. Stormwater runoff calculations associated with the design of the existing detention pond are included in Appendix B. Structural BMPs used on the site are discussed in detail in Section 5.2.

5.1 NON-STRUCTURAL BEST MANAGEMENT PRACTICES

Stormwater management site planning techniques were used throughout the site design process to preserve natural systems and hydrologic functions to the maximum extent possible through the use of non-structural BMPs. These self-crediting BMPs were utilized to the extent possible to prevent stormwater generation and reduce the overall impact of the proposed facilities on stormwater runoff. Non-structural BMPs are also employed to minimize impacts on water quality, specifically in controlling nitrate. The non-structural BMPs are described in the following sections.

5.1.1 Protect Sensitive/Special Value Features

To minimize the stormwater impacts of the proposed site features and facilities, the site design was planned to avoid encroachment upon, disturbance of, and alteration to natural features that provide valuable stormwater functions or are very sensitive to stormwater impacts. The site planning process involved early identification of floodplains, wetlands, natural flow pathways/drainage ways, steep slopes, and historic and natural resources and avoidance of these features to the maximum extent possible. The stormwater functions of this BMP include very high volume reduction, recharge, peak rate control, and water quality.

5.1.2 Protect/Utilize Natural Flow Pathways

The site's natural drainage features were identified early in the design process so these valuable features could be protected and utilized as part of the overall stormwater management system. Existing drainage areas and natural flow paths were identified, preserved, and incorporated into the site design to the extent possible. This design technique helps to reduce the impact of the proposed facilities by maintaining the established hydrologic patterns of the site. The stormwater functions of this BMP include low to medium volume reduction, low recharge, and medium to high peak rate control and medium water quality.

5.1.3 Minimize Total Disturbed Area

Minimizing the total disturbed area to the area absolutely necessary to construct the proposed facilities is a simple and effective BMP. The LOD delineated on the plan drawings has been established to restrict construction activities to the minimum area needed to effectively and efficiently construct the proposed facilities and maximize conservation of existing site vegetation. The stormwater functions of this BMP include high volume reduction, recharge, peak rate control, and water quality. The construction activities at the Crayne Compressor Station and pipe laydown area will be located within already developed areas.

5.1.4 Revegetate Disturbed Areas

Vegetative stabilization of disturbed areas is a central component of the SR/PCSM Plan. The seed mixtures specified for the site were selected to mimic natural meadows and provide sufficient stabilization while not requiring significant chemical maintenance by fertilizers, herbicides, and pesticides. The stormwater functions of this BMP include low to medium volume reduction, recharge and peak rate control and medium very high water quality. Where applicable, the site will be restored to meadow or better condition.

5.1.5 Disconnect Impervious Area

Where feasible, runoff from impervious surfaces is directed across vegetated areas or to vegetated channels, where possible. This practice reduces runoff volume and peak discharge, as well as improves water quality by slowing runoff, allowing for filtration, and providing opportunity for infiltration and evapotranspiration. The stormwater functions of this BMP include high volume reduction, recharge, peak rate control, and water quality.

5.2 STRUCTURAL BEST MANAGEMENT PRACTICES

Because the existing stormwater management system was sized larger than required, the small increase in stormwater runoff will be easily handled under the existing stormwater management system constructed during the Natrium to Market Project. The oversized detention basins limit the peak discharge off site and, therefore, no additional structural BMPs are needed besides soil amendment post-construction. Construction details and placement locations of each BMP are included in the SR/PCSM drawings in Appendix A. Stormwater runoff calculations associated with the design of the existing detention pond to receive runoff from the area to be improved at the Crayne Compressor Station are included in Appendix B.

5.2.1 Existing Detention Pond

The existing detention pond is proposed as the primary peak rate stormwater management facility. This will provide temporary storage of runoff and function hydraulically to attenuate stormwater runoff peak flow rates. A secondary benefit includes volume reduction achieved through initial saturation of the soil mantle and evaporation during detention. The stormwater functions of this BMP include low volume reduction, no recharge, high peak rate control, and low water quality. The minor increase in runoff peak flow and volume associated with the building addition will be managed by the existing detention pond. Calculations for the detention pond are included in Appendix C.

5.2.2 Soil Amendment

Soil amendment and restoration is the process of improving disturbed soils and low organic soils by restoring soil porosity and/or adding a soil amendment, such as compost, for the purpose of reestablishing the soil's long-term capacity for infiltration and pollution removal. Soil amendment will be utilized at the Crayne Compressor Station and will be used to infiltrate increased post-construction runoff. Calculations for soil amendment are included in Appendix C.

6.0 BEST MANAGEMENT PRACTICE INSTALLATION SEQUENCE

The following is a general narrative description of the planned sequence of BMP installation and removal. The entire construction sequence listing the steps to be taken from initial site clearing through final stabilization is included on the cover of the SR/PCSM Plan drawings. Refer to the SR/PCSM Plan drawings for additional site-specific installation information.

Upon completion of the earth disturbance as described in the E&SCP, all E&S BMPs will be removed and this area will be stabilized. All other temporary erosion and sediment control BMPs necessary for implementation of the SR/PCSM Plan shall remain functional through execution of the plan. In no cases, except when replaced by another BMP approved by the PADEP or conservation district, shall any erosion and sediment control BMPs be removed prior to all areas tributary to them achieving permanent stabilization. After final stabilization has been achieved, temporary erosion and sediment control BMPs may be removed if they are not necessary for implementation of the SR/PCSM Plan.

Upon initiation of the site restoration/post-construction stormwater management phase Areas to be restored shall be graded to approximate original contour as shown on the SR/PCSM Plan drawings and planted with the proposed permanent vegetation seed mix.

Areas disturbed during removal or conversion of any temporary erosion and sediment control BMPs to SR/PCSM BMPs must be stabilized immediately. In order to ensure rapid revegetation of disturbed areas, such removal\conversions should be done only during the germinating season. When final stabilization has been achieved after implementation of the SR/PCSM Plan, the remaining temporary erosion and sediment BMPs may be removed. Areas disturbed during removal of the temporary erosion and sediment control BMPs must be stabilized immediately.

7.0 STORMWATER RUNOFF ANALYSIS

The following section presents calculations associated with control of peak stormwater discharge rates and management of runoff volume. These calculations pertain to the Crayne Compressor Station as shown in the SR/PCSM Plan drawings. The proposed staging/laydown areas will be restored to the approximate original contour and land cover, therefore no stormwater management calculations have been completed for this portion of the Project.

The stormwater analysis performed for this Project was completed in a manner to be consistent with the design standards contained in the Pennsylvania Stormwater BMP Manual (2006). The following is a general description of the methods used to complete the stormwater analysis and a summary of the results. Stormwater runoff calculations associated with the design of the existing detention pond to receive runoff from the area to be improved at the Crayne Compressor

Station are included in Appendix A. Stormwater runoff calculations for the proposed compressor station improvements are included in Appendix C.

7.1 HYDROLOGIC ANALYSIS METHODS

The precipitation data used for the hydrologic analysis was obtained from the Point Precipitation Frequency Estimates from National Oceanic and Atmospheric Administration Atlas 14. The data was obtained for a geographic coordinate near the proposed Project. A rainfall depth of 2.39 inches was used for this analysis. This is the value for the 90 percent confidence interval of the 2-year, 24-hour duration storm obtained from National Oceanic and Atmospheric Administration Atlas 14. The Soil Conservation Service (SCS) 24-hour duration distribution was used to interpolate incremental precipitation values for the computation time interval and time period specified.

Time	1 year	2 year	5 year	10 year	25 year	50 year	100 year
24 hr	2.01	2.39	2.92	3.35	3.95	4.44	4.96

Hydrology calculations were performed to determine existing conditions and analyze the impacts of the proposed facilities. The NRCS Rainfall-Runoff methodology was used to produce rainfall-runoff response estimates for the Project’s drainage areas. This methodology utilizes the Curve Number Runoff Method of generating runoff depths in conjunction with the SCS Unit Hydrograph Method to estimate runoff hydrographs and peak runoff rates. These methods are described in the National Engineering Handbook, Part 630 Hydrology, 1997, and Urban Hydrology for Small Watersheds, Technical Release 55 (TR-55). HydroCAD Stormwater Modeling System, Version 8, developed by HydroCAD Software Solutions LLC, was used to model the existing and proposed hydrology in order to calculate peak runoff flows. This software computes SCS runoff hydrographs by convoluting a rainfall hyetograph through a unit hydrograph. This method is also used in SCS TR-20.

Time of concentration values were calculated using the velocity method, also referred to as the segmental method, as described in the National Engineering Handbook and TR-55. When channel routing was deemed necessary, hydrographs were routed through proposed channels using the Modified Att-Kin routing method as described in TR-20. As mentioned above, the SCS unit hydrograph technique was used to transform precipitation excess to subbasin outflow.

7.2 DRAINAGE AREAS AND CURVE NUMBER RUNOFF METHOD ASSUMPTIONS

The site is part of a set of drainage areas that were determined by analyzing pre-development and post-development flow paths within the watershed. Drainage maps that illustrate drainage area boundaries, time of concentration calculation flow paths, existing contours, and proposed features are provided in Appendix D. Data provided on the drainage maps was used to complete runoff volume calculations and peak flow calculations as discussed herein. The drainage areas were split into subareas based on the BMPs they are tributary to and their existing and proposed land cover complex for use in the stormwater analysis.

7.3 PEAK FLOW CALCULATIONS

Peak stormwater runoff flow rates were analyzed for the 1-year, 2-year, 5-year, 10-year, 25-year, 50-year and 100-year (24-hour duration) design storms. These design storms were analyzed to be consistent with the recommendations of the PA Stormwater BMP Manual (2006). The analysis was performed using HydroCAD software to model the existing and proposed conditions using the methodologies described previously in this section. Drainage area runoff hydrographs were routed through the proposed stormwater management facilities to determine the impact of these facilities on anticipated future stormwater runoff volumes and peak flow rates. Peak flow calculations associated with the design of the existing detention pond to receive runoff from the area to be improved at the Crayne Compressor Station are included in Appendix B. Peak flow rate calculations for the proposed compressor station improvements are included in Appendix C.

Table 7.3-1 below displays the peak discharge results for the different design storms for the three time periods modeled:

- NTM[1] Pre – the pre-developed conditions of the site prior to the compressor station being constructed;
- NTM Post/SHP Pre – the post-developed condition of the site following the construction of the Natrium to Market Project, but prior to the construction of the Project; and
- SHP Post – the proposed conditions of the site following the construction of the Project.

Table 7.3-1: Peak Discharge (cubic feet per second)

Time Period	1-Year	2-Year	5-Year	10-Year	25-Year	50-Year	100-Year
NTM Pre	3.050	6.020	11.16	15.93	23.25	29.66	36.79
NTM Post/SHP Pre	2.730	4.320	6.93	9.42	12.97	16.01	20.42
SHP Post	2.770	4.370	7.12	9.63	13.19	16.43	21.1

As shown in the table above, the peak discharge for the proposed Project is significantly less for all storm events in comparison to the pre-developed condition of the Crayne Compressor Station site. With the Project building addition, there will be a slight increase to the peak discharge for all storm events, most notable within the larger storm events. However, the existing stormwater management infrastructure is able to handle the additional peak discharge (resultant of the additional impervious area) based on the stormwater calculation results presented above. Therefore, although the peak discharge does increase relative to the NTM Post/SHP Pre condition based on the additional impervious area, the existing stormwater management system remains sufficient to handle the peak discharge.

[1] Natrium to Market Project

7.4 RUNOFF VOLUME CALCULATIONS

Runoff volume calculations were completed for the Crayne Compressor Station. The 2-year storm event runoff volumes were calculated for each land cover/hydrologic soil group combination in each drainage area. These runoff volumes were added to determine the total runoff volume for each drainage area. This was calculated using a custom worksheet similar to "Worksheet 4" contained in the PA Stormwater BMP Manual (2006). Runoff volume was calculated for each type of land cover and hydrologic soil group. The summary tables contained in Appendix C summarize the difference in 2-year design storm runoff volume between existing conditions and the proposed conditions for each drainage area.

8.0 STORMWATER MANAGEMENT BEST MANAGEMENT PRACTICE MAINTENANCE

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 stormwater BMPs. Implementation of the following maintenance plan is a key component in achieving the intent of this SR/PCSM Plan and minimizing negative impacts of stormwater runoff from the proposed facilities. The permittee and any co-permittees shall be responsible for long-term operation and maintenance of the stormwater BMPs unless a different person is identified in the Notice of Termination and has agreed to long-term operation and maintenance of the stormwater BMPs.

8.1 INSPECTIONS

The responsible party (as identified in the previous paragraph) shall inspect all stormwater BMPs semi-annually. This inspection shall include a general review of the performance of all stormwater management 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 inspections shall be documented in a written report summarizing each inspection and shall include a schedule for repair of noted deficiencies. Any required preventive and remedial maintenance work, including cleanout, repair, replacement, regrading, or reseeding, must be scheduled for immediate corrective action. If any installed stormwater BMPs are identified as failing to perform as expected, corrective modifications or replacement BMPs shall be scheduled for installation. The PCSM Inspection Form is available in Appendix E.

8.2 GENERAL MAINTENANCE

The Owner, or a designated representative, shall be responsible for general operation and maintenance of stormwater management BMPs for the life of the facility. General maintenance shall include preventive and remedial maintenance work, including cleanout, repair, replacement, regrading, or reseeding.

Areas void 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 shall be cleaned of debris. BMPs will be repaired or replaced (as necessary) to ensure effective and efficient operation. The disposal of any solid waste is the responsibility of the party performing the maintenance and shall be conducted in accordance with the Recycling/Disposal of Materials procedures identified in this plan. Necessary repairs will be made immediately after any deficiencies have been observed.

8.3 SPECIFIC MAINTENANCE

The Owner, or a designated representative, shall be responsible for the following specific maintenance activities throughout the life of the facilities. Existing stormwater management infrastructure, including the existing detention pond, shall continue to be maintained in accordance with the maintenance requirements set forth within the original design documents for these facilities.

8.3.1 Seeding and Mulching Maintenance

Inspect seeded and mulched area for evidence of erosion, immediately repair and reseed areas disturbed by erosion or slope movement. Identify vegetated areas in need of additional erosion control measures until permanent vegetative cover is established.

Inspect seeded and mulched areas for displaced mulch cover and uneven vegetative growth. For displaced mulch, replace mulch at the original application rate or greater. Reseed bare areas at original seed application rates.

9.0 RECYCLING/DISPOSAL OF MATERIALS

Building materials and other construction site wastes shall 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). All building materials and wastes shall be removed from the site and recycled or disposed of in accordance with the PADEP's Solid Waste Management Regulations at 25 Pa. Code 260.1 et seq., 271.1 and 287.1 et. Seq. No building materials or wastes or unused building materials shall be burned, buried, dumped, or discharged at the site. No off-site disposal area has been identified as part of this plan. Construction waste will be disposed of properly by the contractor at a PADEP-approved facility or recycled.

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

The contractor shall be responsible for submitting an E&SCP for any borrow or waste areas required to complete the work. Appropriate BMPs will be implemented at disposal locations for excess soil/rock waste. The disposal locations shall be verified with the PADEP to show compliance with wetland and floodplain regulations. If an off-site location is used for borrow or disposal, the contractor is responsible for developing and implementing an adequate E&SCP(s) and submitting the plan(s) to the PADEP for review and approval. The contractor shall immediately stabilize the waste site upon completion of any stage or phase of earth disturbance activity at the waste site.

10.0 THERMAL IMPACTS 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 one being proposed:

- 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; and
- Increased stream temperatures due to reduced base flow caused by reduction in site's infiltration capacity.

Siting of the proposed facilities was limited by the location of the existing facilities and pipelines which they will service, 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. However, Table 10.0-1 below shows several site layout criteria that were used for the proposed Project and how they help prevent or minimize thermal impacts to receiving waters.

Table 10.0-1: Thermal Impact Benefits of Site Layout Criteria

Site Layout Criteria	Thermal Impact Benefits
Avoid impacts to 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 facilities	Minimize proposed impervious cover
Choose areas 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 minimum area necessary to construct the proposed facilities will preserve existing vegetative cover and maintain the infiltration and evapotranspiration capacity of undisturbed areas to the maximum extent practicable. Also, disturbed areas will be immediately revegetated to help cool runoff prior to discharge.

11.0 ANTIDEGRADATION ANALYSIS

There are no streams within the Project area and the Project is not located in a HQ/EV watershed. Post-construction peak discharge is less compared to preconstruction discharge rates. With the lessened peak discharge and limited thermal impacts, there will be no degradation post-construction. To reduce impacts to water quality from stormwater runoff associated with Project activities, the following anti-degradation best available combination of technology nondischarge alternative standards will be applied to this Project, as necessary, in addition to the BMPs outlined throughout the E&SCP:

- Access to the site has been limited to the use of construction entrances that were designed to use existing roads and avoid stream and wetland crossings.

- Upon completion or within 4 days of temporary cessation of earth disturbance activities, disturbed areas will be stabilized; soil stabilizers and blanketing will be used as necessary. Disturbed areas will be revegetated in accordance with DTI's post-construction management plan or installed with additional gravel and compacted in place.

These BMPs, in conjunction with the additional BMPs outlined in the E&SCP, serve to minimize or eliminate increased stormwater discharges to waters of the Commonwealth of Pennsylvania.

DOMINION TRANSMISSION, INC.

SUPPLY HEADER PROJECT

SECTION 5 – POST-CONSTRUCTION STORMWATER MANAGEMENT PLAN/SITE RESTORATION (PCSM/SR) PLAN

APPENDIX A – PCSM/SR PLAN DRAWINGS

GENERAL NOTES:

1. COORDINATE SYSTEM USED FOR MAPPING AND TOPOGRAPHY - UTM WITH NAD83 DATUM, ZONE 17, US SURVEY FOOT, CENTRAL MERIDAN 81° W.
2. CONTOURS AND TOPOGRAPHIC FEATURES WERE DERIVED FROM LIDAR DATA AND GPS SUB-METER GROUND SURVEY PERFORMED BY GAI CONSULTANTS, INC FROM 11-03-2014 THRU 11-07-2014.
3. IMAGERY TAKEN FROM GOOGLE EARTH.
4. THE PROPERTY LINES SHOWN ARE BASED ON GIS & TAX ASSESSMENT RECORDS (PROVIDED BY OTHERS). GAI CONSULTANTS MAKE NO GUARANTEE EITHER EXPRESSED OR IMPLIED AS TO THE ACCURACY OF THE RECORDS AS SHOWN ON THESE DRAWINGS.
5. THIS PLAN SET CONTAINS ALL INFORMATION FOR THE EROSION AND SEDIMENT CONTROL PLAN (E&S PLAN) AND POST-CONSTRUCTION STORMWATER MANAGEMENT PLAN (PCSM PLAN) REQUIRED FOR THE PERMIT AS SPECIFIED ABOVE. THIS IS A PERMIT DOCUMENT ONLY. ADDITIONAL PLANS AND DOCUMENTATION ARE REQUIRED FOR CONSTRUCTION OF THE PROPOSED DEVELOPMENT.

REFERENCE (ALL SHEETS):

1. SOILS INFORMATION FROM UNITED STATES DEPARTMENT OF AGRICULTURE, NATURAL RESOURCES CONSERVATION SERVICE WEB SOIL SURVEY (CURRENT).

CONSTRUCTION SEQUENCE:

1. ALL EARTH DISTURBANCE ACTIVITIES SHALL PROCEED IN ACCORDANCE WITH THE FOLLOWING GENERAL CONSTRUCTION SEQUENCE. CONSTRUCTION ACTIVITIES MAY BE PERFORMED CONCURRENTLY, OR ON PARALLEL PATHS WHERE APPROPRIATE, PROVIDED THAT THE APPROPRIATE EROSION ANO SEDIMENT CONTROL BMPS HAVE BEEN IMPLEMENTED.
2. AT LEAST SEVEN (7) DAYS BEFORE STARTING ANY EARTH DISTURBANCE ACTIVITIES, THE OWNER AND/OR OPERATOR SHALL NOTIFY THE GREEN 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 CONSERVATION DISTRICT.
3. AT LEAST THREE (3) DAYS BEFORE STARTING ANY EARTH DISTURBANCE ACTIVITIES, ALL CONTRACTORS INVOLVED IN THOSE ACTIVITIES SHALL NOTIFY THE PENNSYLVANIA ONE CALL SYSTEM INCORPORATED AT 1-800-242-1776 FOR THE LOCATION OF EXISTING UNDERGROUND UTILITIES.
4. INSTALL ROCK CONSTRUCTION ENTRANCES AT EACH LOCATION SHOWN ON THE PLANS.
5. INSTALL TEMPORARY PERIMETER CONTROL BMPS (SUPER SILT FENCE) AT ALL LOCATIONS SHOWN ON THE PLANS. LIMIT CLEARING AND EARTH DISTURBANCE TO THAT ABSOLUTELY NECESSARY TO PROPERLY INSTALL THE PROPOSED BMPS.

POST CONSTRUCTION STORMWATER MANAGEMENT

1. UPON COMPLETION OF CONSTRUCTION ACTIVITIES AT THE PROPOSED PIPEYARD, RESTORE THE ENTIRE SITE TO PRE-EXISTING CONDITIONS AS DETAILED BY THE PCSM PLAN.
2. ANY TEMPORARY MEASURES (SUCH AS COMPOST FILTER SOCK, COLLECTION CHANNEL, RIPRAP APRONS, ETC.) INSTALLED BY CONTRACTOR, SHALL REMAIN IN PLACE UNTIL FINAL STABILIZATION HAS 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.

Dominion[SM]

DOMINION TRANSMISSION, INC.
445 W. MAIN STREET, CLARKSBURG, WV 26301

LEGEND

— — —	PROPERTY LINE
—X—X—X—	FENCE
— LOD — LOD —	LIMITS OF DISTURBANCE
— LOC —	LIMITS OF CONSTRUCTION
— SSF — SSF —	SUPER SILT FENCE
———	SOIL BOUNDARY
———	SOIL CLASSIFICATION
	WETLAND
	TREE/BRUSH LINE
	EXISTING CULVERT
— — —	EXISTING CONTOUR LINE
	CLEAN WATER DIVERSION SWALE

CRAYNE STATION (PENNSYLVANIA) DRAWING INDEX

SHEET NO.	REV.	SHEET TITLE
1		COVER SHEET
2		EXISTING CONDITIONS
3		POST CONSTRUCTION STORMWATER MANAGEMENT PLAN
4		DETAILS AND NOTES

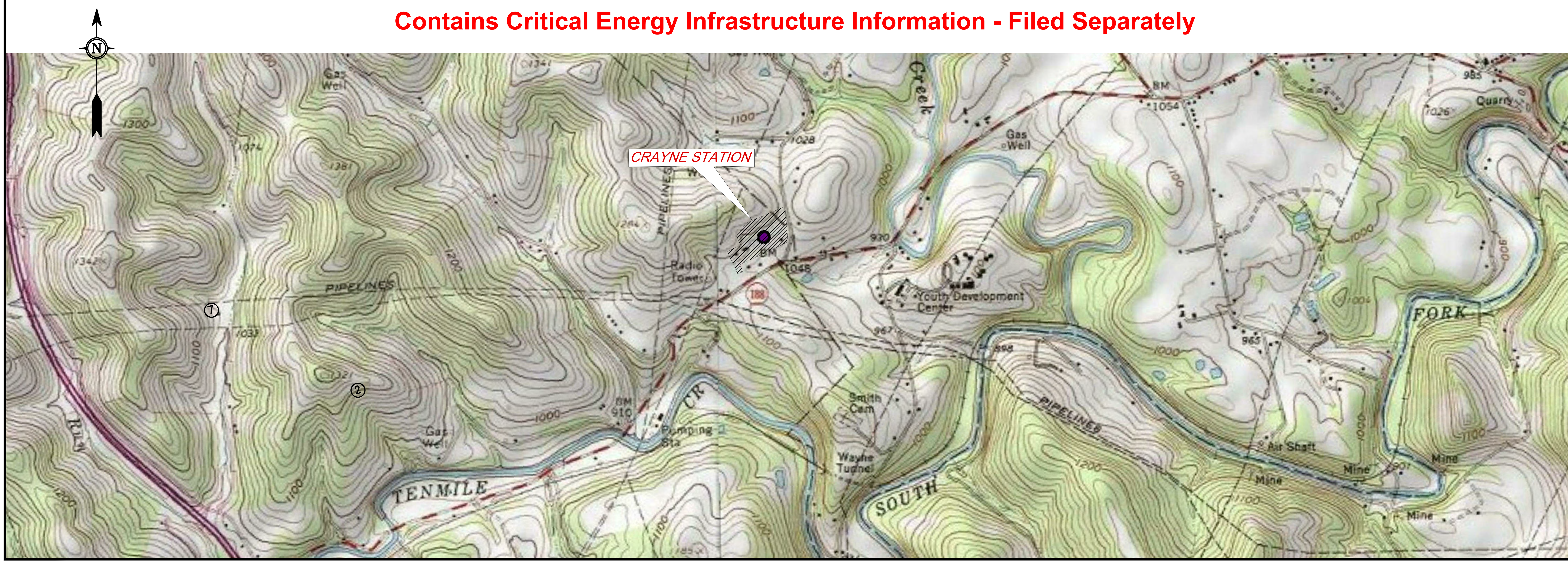
CALL BEFORE YOU DIG!
PENNSYLVANIA LAW REQUIRES 3 WORKING DAYS NOTICE FOR CONSTRUCTION PHASE AND 10 WORKING DAYS IN DESIGN STAGE – STOP CALL
Pennsylvania One Call System, Inc.

1-800-242-1776

PENNSYLVANIA ACT 287 OF 1974, AS AMENDED BY PA ACT 181 OF 2006, REQUIRES NOTIFICATION OF EXCAVATORS, DESIGNERS, OR ANY PERSON PREPARING TO DISTURB THE EARTH'S SURFACE ANYWHERE IN THE COMMONWEALTH, CALL PENNSYLVANIA ONE CALL SYSTEM, INC. AT 1–800–242–1776 BEFORE ANY DISTURBANCE.

PA SUPPLY HEADER PROJECT - PROPOSED ADDITION TO EXISTING CRAYNE COMPRESSOR STATION & CONTRACTOR STAGING AREAS
POST CONSTRUCTION STORMWATER MANAGEMENT PLAN AND SITE RESTORATION

Contains Critical Energy Infrastructure Information - Filed Separately



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PA SUPPLY HEADER PROJECT – PROPOSED ADDITION TO EXISTING CRAYNE COMPRESSOR STATION
FRANKLIN BOROUGH, GREENE COUNTY, PENNSYLVANIA
DOMINION TRANSMISSION, INC.
445 WEST MAIN STREET
CLARKSBURG, WV 26301

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DOMINION TRANSMISSION, INC.

SUPPLY HEADER PROJECT

SECTION 5 – POST-CONSTRUCTION STORMWATER MANAGEMENT PLAN/SITE RESTORATION (PCSM/SR) PLAN

APPENDIX B – PREVIOUS STORMWATER DESIGN AND RUNOFF CALCULATIONS

Post-Construction Stormwater Management Plan

Dominion Transmission, Inc.
Natrium to Market Project
Franklin and Morgan Townships,
Greene County, Pennsylvania

October 24, 2013

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POST-CONSTRUCTION STORMWATER MANAGEMENT (PCSM) PLAN NARRATIVE

This Post-Construction Stormwater Management Plan (PCSM Plan) has been developed to maximize replication of the natural hydrologic cycle, protect the structural integrity of receiving waters, and to protect and maintain existing and designated uses of the Commonwealth waters. The Plan consists of this written narrative and the attached appendices including plan drawings and design calculations. It was developed to be in accordance with the requirements of 025 PA Administrative Code Chapters 78 and 102, as well as the Clean Streams Law (35 P. S. §§ 691.1001), as amended, utilizing guidelines and BMP information provided in the Pennsylvania Stormwater Best Management Practices Manual. This PCSM Plan complements the E&S Plan prepared for this project and was planned and designed to be consistent with the E&S Plan under PA Code § 102.4(b). An up to date copy of this PCSM Plan (including this narrative and all appendices) shall be maintained and available at the project site during all stages of earth disturbance activity.

This Plan was prepared by URS personnel, under the direct supervision of a Pennsylvania licensed Professional Engineer trained and experienced in stormwater management design methods and techniques applicable to the size and scope of the proposed project. The Plan has been designed to minimize the threat to human health, safety and the environment to the greatest extent practicable. The supervising Professional Engineer has attended a DEP sponsored Oil & Gas industry training class for erosion and sediment control and stormwater management for oil and gas activities.

1.0 PROJECT OVERVIEW

The proposed Project includes proposed facilities in three distinct geographic locations which are all located in close proximity to Dominion Transmission Inc.'s (DTI) existing Crayne Compressor Station. The proposed facilities are grouped by geographic location as follows: 1) Crayne Station expansion, 2) Crayne II M&R Upgrade, and 3) a Proposed Pipeyard on an adjacent parcel. The following activities will be occurring at each of these facilities:

- Crayne Station: DTI proposes to install a new gas turbine/compressor package and auxiliary equipment at its existing Crayne Compressor Station (CS). The compression facilities will be housed in a new building on property owned by DTI at the Crayne CS. The main function of the new unit will be to compress gas from transmission pipeline TL-590 into pipeline TL-591. Existing stormwater management facilities are proposed to be removed and replaced with new stormwater facilities.
- Crayne II M&R Upgrade: DTI proposes to upgrade the Measurement and Regulation (M&R) facilities at this location in order to deliver gas to Texas Eastern Transmission, LP from DTI's existing TL-591 pipeline. These activities will not involve any earth disturbance.
- Proposed Pipeyard: DTI proposes to construct approximately three (3) acres of temporary work space on an adjacent parcel. This area will be used for storing materials, staging construction activities, and vehicle parking during construction and will be restored to existing conditions prior to completion of the project.

The project location is shown on the U.S. Geological Survey Quad (Figure 1) included in Section 1.3 of the ESCGP-2 permit application package. This figure shows the location and limit of construction activities described above. The total Project Area is approximately 29.1 acres. Access to the sites will be via existing and proposed access roads from Jefferson Road (State Route 188) and Kennel Road. The proposed construction activities are expected to disturb approximately 24.9 acres. All construction activities will occur within the limit of disturbance delineated on the project plans.

2.0 EXISTING CONDITIONS

The E&S Plan drawings included in the appendix of the E&S Plan contain an “Existing Conditions Plan” which depicts all relevant existing site features. The existing features include 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, existing ground cover (including tree lines and other significant vegetative features), utilities, and other important features.

2.1 Soil Characteristics

The location of mapped soil types are shown on the PCSM Plan drawings. These soil boundaries and associated information were obtained from the United States Department of Agriculture (USDA) SSURGO database. In addition to this soil mapping data, the USDA, 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 NRCS Custom Soils Resources Report is included in Appendix B of the E&S Plan and contains the types, depth, slope and limitations of the soils within the project area. Additional information in the soil report includes data on the physical characteristics of the sols, such as their texture, resistance to erosion and suitability for the intended use. The limitation of soils pertaining to earthmoving projects, and the means to address the identified soils limitations are included on the Plan drawings.

2.2 Existing Land Use and Land Cover

The E&S Plan drawings included in the appendix of the E&S Plan contain an “Existing Conditions Plan” which depicts all relevant existing site features. The existing features include 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, existing ground cover (including tree lines and other significant vegetative features), utilities, and other important features.

2.3 Receiving Waters

URS Corporation completed a wetland and watercourse investigation of the project area. The boundary of this site investigation, and all environmental resources identified during this investigation are shown on the “Existing Conditions Plan” in the E&S Plan drawings. A full report containing the findings of this investigation is included in Appendix B.

The project site is tributary to two different receiving waters. The Crayne Compressor Station, Crayne II M&R Upgrades, and a portion of the Temporary Workspace access road are all tributary to an Unnamed Tributary to Ruff Creek. This stream has a PA Code, Title 25, Chapter 93 designated protected water use of Warm Water Fishes (WWF). The remainder of the Temporary Workspace is tributary directly to Ruff Creek, which also has a PA Code, Title 25, Chapter 93 designated protected water use of Warm Water Fishes (WWF). This is not a special protection water. Neither of the receiving waters are Pennsylvania Fish and Boat Commission (PFBC) “Approved Trout Waters” or PFBC “Wild Trout Waters”.

According to the 2012 Pennsylvania Integrated Water Quality Monitoring and Assessment Report, the receiving waters for this project are not listed as siltation impaired in Category 4 or Category 5.

2.4 Existing Riparian Buffers

Riparian buffers are an area 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. URS Corporation completed an investigation of the project area to identify existing riparian forest buffers. No existing riparian buffers were identified within the proposed project area.

2.5 Naturally Occurring Geologic Formations

General Geology:

Bedrock unit along the proposed well pad is the Waynesburg Formation (Socolow, 1980, Wagner and others, 1975). The Waynesburg Formation, which is approximately 140 to 245 feet thick in Greene County, consists of 3 members (lower, middle, upper) and is mostly comprised of a succession of cyclic sequences of sandstone, shale, limestone, and coal, with the bottom of the Waynesburg Coal marking the base of the formation.

Regionally, the water table varies based on topographic setting and water-bearing zone head. The water levels in valleys and upland are shallow and become deeper with increasing elevation to hilltops. The depth to water varies with rock type, physiography, and precipitation; median depth to water ranges from 6-38 feet bgs. Average reported well yield within the Waynesburg Formation is 3.8 gal/min. The water in this formation is characteristically hard with some high iron and manganese content. The pH content is within acceptable range with exception to mined areas where the pH is lower and exhibits high concentrations of sulfate, iron, manganese, and dissolved solids. Based on local well data, well yields range from 0.2 to 40 gal/min.

Surficial Geology:

According to the Mather, Pennsylvania USGS 7.5 Minute Quadrangle Map, the Crayne Station well pad is proposed approximately 1,030 feet to 1,100 feet above mean sea level (amsl) in the Waynesburg Hills Section of the Appalachian Plateaus Physiographic Province (Sevon, 2000). The topography consists of very hilly with narrow hilltops and steep-sloped narrow valleys which have been modified by fluvial erosion and periglacial mass wasting.

According to the Soil Survey of the proposed area (USDA NRCS, 1989), the proposed well pad site crosses over the following types of soils:

- Dormont-Culleoka silt loams (DtD), 15-25% slopes
- Dormont-Culleoka silt loams (DtF), 25-50% slopes
- Dormont silt loam (DoC), 8-15% slopes
- Glenford silt loam(GdB), 3-8% slopes
- Weikert-Culleoka complex (WeB), 3 to 8% slopes

These soils are part of the Dormont-Culleoka association consisting of moderately well to well drained, deep and moderately deep, gently sloping to very steep soils along hilltops, ridges, benches and hillsides.

Landslide Susceptibility:

The proposed well pad site is located over an area varying in elevation from 11,030 feet to 1,100 feet amsl. This also translates to a varying degree of sloping from near flat to moderate sloping. As such, geologic hazards, such as excessive runoff and mass wasting may be present. The USGS Preliminary Landslide Overview Map of the Conterminous United States (USGS, 2011), indicates the proposed area is in an area of high landslide incidence. This hazard can be further mitigated implementing proper sloping and drainage controls. There is no karst features within the area of the proposed well pad site.

Earthquake Probability:

The proposed well pad site is situated between two structural folds with the Waynesburg Syncline approximately 3.5 miles to the northwest, and the Bellevernon Anticline approximately 1.5 miles to the southeast (Faill, 2011, Wagner and others, 2975). Basement rock is approximately 7,200 meters below sea level and dips to the southeast (Alexander and others, 2005). A non-seismic fault, striking northeast-southwest, is mapped approximately 6 kilometers west of the proposed site and dips to the southeast. Based on seismic hazard mapping, the proposed well pad site is located in an area of very low percent gravity (g), approximately 0.02 to 0.04 g. No events have been documented within the proposed well pad area or within Greene County.

Potential Geologic Hazards:

According to the available coal resource information, there has been no underground mining at the proposed site area, however, mined areas surround the site from the northwest to the east of the site with the closest evidence of mining just over 2,000 feet to the east near Ruff Creek. There doesn't appear to be any abandoned or reclaimed strip mining or mine tailings piles, based on the USGS 7.5 Minute Quadrangle Map. Although there hasn't been any mining at the site specific location, the proposed well pad is close to areas of bedrock with potentially acid-producing sulfide minerals (Pennsylvania Geological Survey, 2005). The Little

Washington Coal, which marks the base of the Waynesburg Formation upper member, can range in depth from 5-50 feet bgs. Cut and fill operations may extend near or directly above this relatively thin seam, and as such, acidic drainage could be a potential hazard. Acidic drainage would adversely affect ecological receptors in any stream receiving such discharges from the site.

The primary mitigation of this potential geologic hazard will be avoidance. The maximum depth of excavation for the proposed project is 12 feet below existing grade, with the majority of the proposed earth moving activities occurring at much shallower depths. At these relatively shallow depths, it is likely that the proposed construction activities will encounter the noted bedrock with potentially significant acid-producing sulfide minerals. If the coal layers or rocks with acid producing minerals are encountered during construction activities, it would be a small amount.

In the event that bedrock with potentially significant acid-producing sulfide minerals is encountered during excavation for the proposed facility, the following mitigation measures are to be followed:

- Material with the potential to provide significant acid-producing sulfide minerals encountered during pad construction is not to be used as fill material on-site. This material shall be exported off-site and disposed of in the proper manner.
- Material with the potential to provide significant acid-producing sulfide minerals exposed during pad construction is to be addressed through site specific analysis and design of appropriate mitigation measures. Possible mitigation measures for small quantities could be blending the materials with acid-neutralizing materials, such as limestone; covering the material with soil or glacial till and layering with lime or limestone.

3.0 PROPOSED CONDITIONS

The proposed land use is stabilized pads and access roads to be used for compression, measurement, and regulation. The total proposed area of disturbance resulting from installation of the proposed facilities is 24.9 acres. Earth disturbance will be restricted to the LOD delineated on the E&S Plan drawings. These drawings contain a “Proposed Conditions Plan” which depicts all proposed facilities and site features. This includes the proposed topography, areas of cuts and fills, the limits of earth disturbance, the locations of proposed roads, the location of existing and proposed structures and the location of proposed BMPs. This drawing sheet also depicts all applicable distance requirements (setbacks) contained in the Oil and Gas Act of 2012 (i.e. Act 13 of 2012), and the boundary of the area to be covered by the Erosion and Sediment Control General Permit (Project Boundary). The E&S Plan drawings also include road profiles and cross sections of areas with significant cuts and fills.

The Crayne M&R Station, located immediately north of the proposed Crayne Station expansion is currently in the final stages of construction. These facilities have existing sediment traps in place as part of the Erosion and Sediment Control Plan for that earth disturbance. These E&S BMPs are permitted to be replaced by permanent stormwater management facilities upon completion of construction. Construction of the Crayne M&R Station will be complete prior to initiation of construction for this project. As part of this project, the existing sediment traps will be removed and replaced with a newly designed Forebay and Stormwater Management Basin. The stormwater management design for the proposed facilities will work in conjunction with these new stormwater management BMPs to manage stormwater runoff for the whole site. In order to design the post-construction stormwater management facilities appropriately, the pre-development analysis for this project is based off existing condtions prior to construction of the Crayne M&R Station. The Post-Construction analysis includes the facilities installed for the Crayne M&R Station and all facilities proposed as part of this Natrium to Market Project.

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 stage of the project, much of the area will be bare earth. Once the oil and gas processing facilities are constructed the site will be stabilized with vegetative cover and impervious gravel cover as indicated on the E&S Plan drawings. Upon completion of construction, the temporary workspace facilities will be fully restored to approximate original conditions and land cover.

3.2 Proposed Site Drainage Characteristics

An assessment of the project site's natural features was completed at the initial stage of project planning. The proposed facilities have 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 area necessary to construct the proposed facilities. Where possible, site drainage will be directed to previously established drainage features. When not possible, concentrated site runoff will be dispersed through the use of level spreaders. The location of the proposed drainage features is shown on the PCSM Plan drawings.

3.3 Proposed Riparian Buffers

This project is not located in a special protection watershed (Exceptional Value or High Quality) and does not propose earth disturbance within 150 feet of a perennial or intermittent river, stream, or creek, or lake, pond or reservoir. As such, according to PA Code § 102.14(a), mandatory riparian buffers are not required for this project.

4.0 DESCRIPTION OF STORMWATER MANAGEMENT BMPs

The stormwater management best management practices (BMPs) for this project have been planned to minimize the extent of the proposed earth disturbance, maximize protection of existing drainage features and vegetation, minimize soil compaction, and employ measures and controls that minimize the generation of increased stormwater runoff. Specific BMPs have been selected for this site in order to achieve these broad goals. The location of each proposed stormwater management BMP is shown on the PCSM Plan drawings. Each planned stormwater management BMP is specified for implementation to address a specific aspect of the proposed development. The various BMPs were chosen based on their effectiveness for the planned use and the feasibility of implementation at the project site.

Stormwater management site planning techniques were used throughout the site design process to preserve natural systems and hydrologic functions to the maximum extent possible through the use of non-structural BMPs. These self-crediting BMPs were utilized to the extent possible to prevent stormwater generation and reduce the overall impact of the proposed facilities on stormwater runoff. Non-structural BMPs used on the site are discussed in greater detail in Section 4.1.

Stormwater conveyance along the access roads will be managed by aggregate stabilized channels. The channels will convey runoff to culverts with outlets stabilized with riprap aprons. Stormwater runoff will be managed by one water quality forebay and two stormwater management basins. Infiltration testing at the site indicated that infiltration is not possible at this site. Therefore, the Water Quality Forebay is designed to detain the increase in the 2-year design storm volume and treat this volume by filtration through an amended soil mix.

4.1 Non-Structural BMPs

4.1.1 Protect Sensitive and Special Value Features

To minimize the stormwater impacts of the proposed features, the site design was planned to avoid encroachment upon, disturbance of, and alteration to natural features which provide valuable stormwater functions or are very sensitive to stormwater impacts. As described in the E&S Plan narrative, the site planning process involved early processes to identify floodplains, wetlands, natural flow pathways/drainage ways, steep slopes, and historic and natural resources and avoid these features to the maximum extent possible. The stormwater functions of this BMP include very high volume reduction, recharge, peak rate control and water quality.

4.1.2 Protect/Utilize Natural Flow Pathways

The site's natural drainage features were identified early in the design process so these valuable features could be protected and utilized as part of the overall stormwater management system. Existing drainage areas and natural flow paths were identified, preserved, and incorporate into the site design to the extent possible. This design technique helps to reduce the impact of the proposed facilities by maintaining the established hydrologic patterns of the site. The stormwater functions of this BMP include low to medium volume reduction, low recharge and medium to high peak rate control and medium water quality.

4.1.3 Minimize Total Disturbed Area

Minimizing the total disturbed area to the area absolutely necessary to construct the proposed facility is a simple and effective BMP. The LOD delineated on the Plan drawings has been established to restrict construction activities to the minimum area needed to effectively and efficiently construct the proposed facilities and maximize conservation of existing site vegetation. The stormwater functions of this BMP include high volume reduction, recharge, peak rate control and water quality.

4.1.4 Re-Vegetate and Re-Forest Disturbed Areas

Vegetative stabilization of disturbed areas is a central component of the stormwater management plan. The seed mixtures specified for the site were selected to mimic natural meadows and provide sufficient stabilization while not requiring significant chemical maintenance by fertilizers, herbicides and pesticides. The stormwater functions of this BMP include low to medium volume reduction, recharge and peak rate control and medium very high water quality.

4.1.5 Disconnect Impervious Area

Where feasible, runoff from impervious surfaces such as access roads and pads is directed across vegetated areas or to vegetated channels. This practice reduces runoff volume and peak discharge, as well as improves water quality by slowing runoff, allowing for filtration, and providing opportunity for infiltration and evapotranspiration. The stormwater functions of this BMP include high volume reduction, recharge, peak rate control and water quality.

4.2 Structural BMPs

4.2.1 Level Spreaders

Level spreaders are measures to reduce the erosive energy of concentrated flow by distributing runoff as sheet flow to stabilized vegetative surfaces. By diffusing flow, level spreaders promote infiltration and improve water quality by evenly distributing flows over a stabilized vegetated surface. The stormwater functions of this BMP include low volume reduction, low recharge, low peak rate control, and low water quality.

4.2.2 Dry Detention Basins

Dry detention basins are proposed as the primary peak rate stormwater management facility. These earthen structures provided temporary storage of runoff and function hydraulically to attenuate stormwater runoff peaks. Some volume reduction is achieved through initial saturation of the soil mantle and some evaporation takes place during detention, however these benefits are not included in the design of the facilities. The stormwater functions of this BMP include low volume reduction, no recharge, high peak rate control, and low water quality.

4.2.3 Water Quality Forebay

A water quality forebay is proposed as the primary volume control stormwater management facility. The forebay is located immediately upstream of Basin 1 and will provide upstream pretreatment by allowing sediment to settle out prior to entering the dry detention basin. The forebay is vegetated to improve filtering of runoff, to reduce runoff velocity, and to stabilize soils against erosion. The forebay is designed to provide water quality treatment storage to capture the increase in the 2-year runoff volume. This volume will be retained and filtered through an amended soil mix prior to discharging through an underdrain system. This type of forebay functions similar to a constructed filter. The stormwater functions of this BMP include high volume reduction, low recharge, medium peak rate control, and high water quality.

5.0 BMP INSTALLATION SEQUENCE

The following is a general narrative 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 the cover of the PCSM Plan drawings. Refer to the PCSM Plan drawings for additional site-specific installation information.

Upon completion of the earth disturbance as described in this E&S Plan, the rock construction entrances are to be removed and these areas will be stabilized in a manner similar to the remainder of the access roads. All other temporary E&S BMPs necessary for implementation of the PCSM Plan shall remain functional through execution of the Plan. In no cases, except when replaced by another BMP approved by the Department, shall any E&S BMPs be removed prior to all areas tributary to them achieving permanent stabilization. After final stabilization has been achieved, temporary E&S BMPs may be removed if they are not necessary for implementation of the PCSM Plan.

Upon initiation of the post-construction stormwater management phase, install all proposed temporary E&S BMPs shown on the PCSM Plan drawing. Convert Sediment Trap 1 to Stormwater Management Basin 2 and install Permanent Level Spreader 3. Remove temporary watertight covers from all stormwater management basin outlet orifices and ensure outlet structures are configured as shown on the PCSM Plans. Areas to be restored, including the entire proposed pipeyard, shall be graded to approximate original contour as shown on the PCSM Plan drawings and planted with the proposed permanent vegetation seed mix.

Areas disturbed during removal or conversion of any temporary E&S BMPs to PCSM BMPs must be stabilized immediately. In order to ensure rapid revegetation of disturbed areas, such removal\conversions should be done only during the germinating season. When final stabilization has been achieved after implementation of the PCSM Plan, all remaining temporary erosion and sediment BMPs may be removed. Areas disturbed during removal of the temporary E&S BMPs must be stabilized immediately.

6.0 NET CHANGE IN VOLUME AND RATE OF RUNOFF

The following section presents calculations associated with control of peak stormwater discharge rates and management of runoff volume. These calculations pertain to the Crayne Station portion of the project as shown on Sheet 13 the PCSM Plan drawings. The proposed pipeyard will be restored to the approximate original contour and land cover, therefore no stormwater management calculations have been completed for this portion of the project.

The stormwater analysis performed for this project was completed in a manner to be consistent with the design standards contained in the PA Stormwater BMP Manual (2006). A design standard consistency report is provided in Appendix A. The following is a general description of the methods used to complete the stormwater analysis and a summary of the results.

6.1 Hydrologic Analysis Methods

The precipitation data used for the hydrologic analysis was obtained from the Point Precipitation Frequency Estimates from NOAA Atlas 14. The data was obtained for a geographic coordinate near the proposed project. A rainfall depth of 2.39 inches was used for this analysis. This is the value for the 90% confidence interval of the 2-year, 24-hour duration storm obtained from NOAA Atlas 14. The Soil Conservation Service (SCS) 24-hour duration distribution was used to interpolate incremental precipitation values for the computation time interval and time period specified. Complete NOAA Atlas 14 rainfall data is included in Appendix D.

Hydrology calculations were performed to determine existing conditions and analyze the impacts of the proposed facilities. The United States Department of Agriculture, Natural Resource Conservation Service (NRCS) Rainfall-Runoff methodology was used to produce rainfall-runoff response estimates for the projects drainage areas. This methodology utilizes the Curve Number Runoff Method of generating runoff depths in conjunction with the SCS Unit Hydrograph Method to estimate runoff hydrographs and peak runoff rates. These methods are described in the National Engineering Handbook, Part 630 Hydrology (NRCS, 1997) and Urban Hydrology for Small Watersheds, TR-55 (NRCS, 1986). This Autodesk's Hydraflow Hydrographs Extension software was used to model the existing and proposed hydrology in order to calculate peak runoff flows. This software computes SCS runoff hydrographs by convoluting a rainfall hyetograph through a unit hydrograph. This method is also used in SCS TR-20.

Time of concentration values were calculated using the velocity method, also referred to as the segmental method, as described in the National Engineering Handbook and TR-55. When channel routing was deemed necessary, hydrographs were routed through proposed channels using the Modified Att-Kin routing method as described in TR-20. As mentioned above, the SCS unit hydrograph technique was used to transform precipitation excess to subbasin outflow.

6.2 Drainage Areas and Curve Number Runoff Method Assumptions

The site is part of a single drainage areas that were determined by analyzing pre-development and post development flow paths within the watershed. Drainage maps that illustrate drainage area boundaries, time of concentration calculation flow paths, existing contours, and proposed features are provided in Appendix D. Data provided on the drainage maps was used to complete runoff volume calculations and peak flow calculations as discussed herein. The drainage areas were split into subareas based on the BMPs they are tributary to and their existing and proposed land cover complex for use in the stormwater analysis.

6.3 Peak Flow Calculations

Peak stormwater runoff flow rates were analyzed for the 1-year, 2-year, 5-year, 10-year, 25-year, 50-year, and 100-year (24-hour duration) design storms. These design storms were analyzed to be consistent with the recommendations of the PA Stormwater BMP Manual. The analysis was performed using Autodesk's Hydraflow Hydrographs Extension software to model the existing and proposed conditions using the methodologies described previously in this section. Drainage area runoff hydrographs were routed through the proposed stormwater management facilities to determine the impact of these facilities on anticipated future stormwater runoff.

A single report was generated for the entire site from Hydraflow Hydrographs. The first page of the report illustrates the watershed model schematic including pre-development areas, post-undetained areas, post-detained areas, routing to storm water management facilities, and combined post development hydrographs. Peak flow rates from each of the post-development drainage areas are equal to, or less than, the pre-development rates for each of the design storms. The following tables show a summary of the calculated peak flow rates for each drainage area. These values correspond to the values found in the Hydraflow Hydrographs Report included in Appendix D.

Drainage Area	1-Year	2-Year	5-Year	10-Year	25-Year	50-Year	100-Year
Drainage Area 1 (cfs)							
Pre Development	3.16	6.23	11.6	16.59	24.21	30.85	38.22
Post Development	0.00	4.56	7.58	10.08	14.77	18.56	23.58
Change (Post/Pre)	-3.16	-1.67	-4.02	-6.51	-9.44	-12.29	-14.64

Table 1-1. Peak Flow Summary for Drainage Area 1

6.4 Runoff Volume Calculations

The 2-year storm event runoff volumes were calculated for each land cover / hydrologic soil group combination in each drainage area. These runoff volumes were added to determine the total runoff volume for each drainage area. This was calculated using a custom worksheet similar to "Worksheet 4" contained in the PA Stormwater BMP Manual (2006). Runoff volume was calculated for each type of land cover and hydrologic soil group. The summary tables contained in the NOI summarize the difference in 2-year design storm runoff volume between existing conditions and the proposed conditions for each drainage area.

To ensure that the net change in runoff volume for the 2-year storm event will be manage, the same methodology was used to calculate the runoff volume tributary to the water quality forebay in Drainage Area 1. This "capture volume" was calculated using a custom worksheet similar to "Worksheet 4". This worksheet is included with the stormwater management design calculations in Appendix D.

Infiltration testing was completed by S&ME, Inc. to determine the ability of onsite soils to support infiltration. Infiltration testing resulted in the conclusion that silty clay soils at the site are unsuitable for infiltration of stormwater runoff. The full Infiltration Testing report is contained in Appendix E. The captured water quality volume will be filtered and treated by the amended soil mix due to the inability of this site to support infiltration. The amended soil mix is specified to provide a minimum infiltration rate of 2.0 in/hr.

7.0 STORMWATER MANAGEMENT BMP MAINTENANCE PROGRAM

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 stormwater BMPs. Implementation of the following maintenance plan is a key component in achieving the intent of this PCSM Plan and minimizing negative impacts of stormwater runoff from the proposed facilities. The permittee and any co-permittees shall be responsible for long-term operation and maintenance of the stormwater BMPs unless a different person is identified in the Notice of Termination and has agreed to long-term operation and maintenance of the stormwater BMPs.

7.1 Inspections

The responsible party (as identified in the previous paragraph) shall inspect all stormwater BMPs semi-annually. This inspection shall include a general review of the performance of all of the stormwater management facilities as well as an examination of each individual BMP noting when maintenance (e.g., cleanout, repair, replacement, regrading, restabilizing, etc.) is required, when specific deficiencies exist, and/or signs of potential future problems are present. 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, replacement, regrading, or reseeding, must be scheduled for immediate corrective action. If any installed stormwater BMPs are identified as failing to perform as expected, corrective modifications or replacement BMPs shall be scheduled for installation.

7.2 General Maintenance

The Owner, or a designated representative, shall be responsible for general operation and maintenance of stormwater management BMPs for the life of the facility. General maintenance shall include all preventive and remedial maintenance work, including clean out, repair, replacement, regrading, or reseeding.

Vegetation void areas shall promptly be reseeded and mulched to establish protection. Any device found to be clogged, damaged, half-full of silt or not fully operational shall be cleaned of all debris. BMPs will be repaired or replaced (as necessary) to ensure effective and efficient operation. The disposal of any solid waste is the responsibility of the party performing the maintenance and shall be conducted in accordance with the Recycling/Disposal of Materials procedures identified in this Plan. All necessary repairs will be made immediately after any deficiencies have been observed.

7.3 Specific Maintenance

The Owner, or a designated representative, shall be responsible for the following specific maintenance activities throughout the life of the facility:

7.3.1 Roadside Ditch and Channel Maintenance

Channels shall be inspected to ensure that the specified design dimensions and protective linings are maintained at all times. Also 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 problem.

Maintenance should include ensuring design capacity of the channel is maintained and maintaining a dense, healthy vegetated cover. Maintenance activities should include periodic mowing, weed control, reseeding of bare areas, and clearing of debris and blockages.

7.3.2 Culvert Maintenance

Inspect culvert for flow obstructions, scour at the inlet and outlet, and damage to the culvert.

Flow obstructions shall be removed immediately; suitable inlet and/or outlet protection should be provided where scour is observed; and, damaged culverts shall be repaired, or replaced immediately.

7.3.3 Riprap Apron Maintenance

Inspect riprap on back side of aprons at pipe discharges for scour around the pipe. The specified stone depth shall be maintained at all times. Replace displaced riprap within the apron immediately.

Riprap apron shall be maintained free of sediment deposits and other debris. When present, remove sediment and debris to the extent possible. In the event the apron becomes too clogged with sediment and debris to remain effective, the apron shall be removed and replaced.

7.3.4 Level Spreader Maintenance

Level spreaders shall be inspected to ensure that the specified design dimensions and protective linings are maintained at all times. Repair any damaged linings as necessary.

Inspect level spreader discharges to ensure channelized flow does not develop and level grading is maintained.

Level spreader shall be maintained free of sediment deposits and other debris. When present, remove sediment and debris to the extent possible. In the event the level spreader becomes too clogged with sediment and debris to remain effective, the level spreader shall be removed and replaced.

Inspect areas downstream of level spreader discharge for adequate vegetative cover and evidence of accelerated erosion. When downstream erosion is identified, redirect flow away from the affected area until repairs can be completed and the area is stabilized. Stabilize the area immediately and identify appropriate level spreader design modifications as necessary.

7.3.5 Seeding and Mulching Maintenance

Inspect seeded and mulched area for evidence of erosion, Immediately repair and re-seed areas disturbed by erosion or slope movement. Identify vegetated areas in need of additional erosion control measures until permanent vegetative cover is established.

Inspect seeded and mulched area for displaced mulch cover and uneven vegetative growth. For displaced mulch, replace mulch at original application rate or greater. Reseed bare areas at original seed application rates.

7.3.6 Dry Detention Basin Maintenance

Inspect embankments and any structural components, such as inlet or outlet structures, for proper functionality and immediately complete any necessary repairs.

Inspect all basin structures expected to trap debris and sediment for clogging and excessive debris at least four times per year, and after every significant storm event.

Inspect the basin for excessive accumulations of sediment. Remove excessive sediment deposits when the basin is completely dry. Immediately stabilize and revegetate areas disturbed during removal of sediment.

Inspect vegetated areas annually for erosion and unwanted growth of exotic/invasive species.

Mow and/or trim vegetation as necessary to sustain the system and remove all plant detritus from the basin.

7.3.7 Water Quality Forebay Maintenance

Inspect embankments and any structural components, such as inlet or outlet structures, for proper functionality and immediately complete any necessary repairs.

Inspect the basin for excessive accumulations of sediment. Remove excessive sediment deposits when the basin is completely dry. Immediately stabilize and revegetate areas disturbed during removal of sediment.

Inspect vegetated areas annually for erosion and unwanted growth of exotic/invasive species.

Mow and/or trim vegetation as necessary to sustain the system and remove all plant detritus from the basin.

8.0 RECYCLING/DISPOSAL OF MATERIALS

Building materials and other construction site wastes must be properly managed and disposed of to reduce potential for pollution to surface and ground waters as per 25 PA Code § 102.4(b)(5)(xi). All building materials and wastes shall be removed from the site and recycled or disposed of in accordance with PADEP's Solid

Waste Management Regulations at 25 Pa. Code 260.1 et seq., 271.1 and 287.1 et. Seq. No building materials or wastes or unused building materials shall be burned, buried, dumped, or discharged at the site. No off-site disposal area has been identified as part of this Plan. Construction waste will be disposed of properly by the Contractor at a PADEP-approved facility or recycled.

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 wastes include, but are not limited to, excess soil materials, building materials, concrete wash water, and sanitary wastes, that could adversely impact water quality. The Contractor will inspect the project area weekly and properly dispose of all construction wastes. Measures will be planned and implemented for housekeeping materials management and litter control. Wherever possible, re-useable wastes will be segregated from other waste and stored separately for recycling.

The Contractor shall be responsible for submitting an E&S Control Plan for any borrow or waste areas required to complete the work. Disposal locations for excess soil/rock waste will implement appropriate BMPs. The disposal locations must be verified with the PADEP to show compliance with wetland and floodplain regulations. If an off-site location is used for borrow or disposal, the contractor is responsible for developing and implementing an adequate E&S Control Plan(s) and submitting the Plan(s) to the PADEP for review and approval. The Contractor must immediately stabilize the waste site upon completion of any stage or phase of earth disturbance activity at the waste site.

9.0 THERMAL IMPACTS 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 one being proposed:

- 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 the proposed oil and gas facilities was limited by the location of the existing facilities and pipelines which they will service. , 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. However, Table 1 below shows several site layout criteria that were used for the proposed project and how they help prevent or minimize thermal impacts to receiving waters:

Site Layout Criteria	Thermal Impact Benefits
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 facilities	Minimize proposed impervious cover
Choose areas with minimal existing tree cover	Reduce removal of existing tree canopy

Table 1. Thermal Impact Benefits of Site Layout Criteria

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 and the limit of tree clearing to the minimum area necessary to construct the proposed facilities will preserve existing vegetative cover and maintain the infiltration and evapotranspiration capacity of undisturbed areas to the maximum extent practicable. Also, disturbed areas will be immediately re-vegetated to help cool runoff prior to discharge.

Where feasible, level spreaders have been utilized to encourage infiltration and promote groundwater recharge of stormwater runoff therefore, directing less overland flow to the receiving stream. Direct discharges of stormwater runoff to surface waters will be avoided. Runoff discharges will instead be directed across vegetated areas which will provide opportunity for increased infiltration and promote groundwater recharge which both promote natural thermal buffering.

10.0 ANTIDEGRADATION ANALYSIS

As identified in Section 2.3 of this narrative, none of the receiving surface waters for this project are classified as High Quality or Exceptional Value under PA Code, Title 25, Chapter 93 or as siltation impaired waters identified in the 2012 Pennsylvania Integrated Water Quality Monitoring and Assessment Report. As such, this project is in compliance with PADEP's antidegradation requirements as defined in 25 PA Code §102.8(h).

APPENDIX A

DESIGN STANDARD CONSISTENCY REPORT

STORMWATER DESIGN CONSISTENCY VERIFICATION REPORT

FOR

PENNSYLVANIA STORMWATER BEST MANAGEMENT PRACTICES MANUAL

The proposed project is located within a watershed and municipality that is not covered by a DEP approved and current (from 2005 or later) Act 167 Plan. In the absence of an approved and current Act 167 Plan, the Site Restoration Plan and/or Post Construction Stormwater Management Plan for this project is consistent with the standard design criteria from the *Pennsylvania Stormwater Best Management Practices Manual* (BMP Manual). The Erosion and Sediment Control Plan, Site Restoration Plan, and/or Post Construction Stormwater Management Plan (SR/PCSM Plan) for this project were prepared by URS personnel, under the direct supervision of a Pennsylvania licensed Professional Engineer trained and experienced in E&S control methods and techniques and stormwater management design methods and techniques.

1.0 SUMMARY OF STORMWATER RECOMMENDATIONS IN THE BMP MANUAL

The BMP Manual emphasizes effective site planning as the preferred method of managing stormwater runoff. It also provides examples of BMPs that can be used to further avoid and minimize flooding and water resource problems. The BMP Manual recommends three site control guidelines to manage stormwater runoff in a manner consistent with the Pennsylvania Comprehensive Stormwater Management Policy: 1) Volume control guidelines, 2) Peak rate control guidelines, and 3) Water quality control guidelines.

1.1 Volume Control Guidelines

The BMP Manual identifies a volume control guideline as essential to mitigate the consequences of increased runoff. The recommended volume controls from the BMP Manual include:

1. Control Guideline 1:

   Do not increase the post-development total runoff volume for al storms equal to or less than the 2-year/24-hour event.

   Existing (pre-development) non-forested pervious areas must be considered meadow (good condition) or its equivalent.

   Twenty (20) percent of existing impervious area, when present, shall be considered meadow (good condition) in the model for existing conditions for redevelopment.

2. Control Guideline 2:

   Permanent removal of a portion of the runoff volume generated from the total runoff flow. Stormwater facilities shall be sized to capture at least the first two inches (2”) of runoff from all contributing impervious surfaces.

   At least the first one inch (1.0”) of runoff from new impervious surfaces shall be permanently removed from the runoff flow – i.e. it shall not be released into the surface Water of the Commonwealth. Removal options include reuse, evaporation, transpiration, and infiltration.

   Wherever possible, infiltration facilities should be designed to accommodate infriltation of the entire permanently removed runoff; however, in all cases at lease the first one-half inche (0.5”) of the permanently removed runoff should be infiltrated.

Control Guideline 1 is applicable to any size project. Control Guideline 2 is restricted to projects one acre or less that do not require design of stormwater storage facilities.

1.2 Peak Rate Control Guideline

The BMP Manual identifies peak rate control for large storms, up to the 100-year event, as essential to protect against immediate downstream erosion and flooding. The recommended control guidelines for peak rate control are:

1. Do not increase the peak rate of discharge for the 1-year through 100-year events (at a minimum).
2. Provide additional peak rate control as required by applicable and approved Act 167 plans.

1.3 Water Quality Control Guidelines

The recommended control guideline for total water quality control is:

Achieve an 85 percent reduction in post-development particulate associated pollutant load (as represented by Total Suspended Solids), an 85 percent reduction in post-development total phosphorus load, and a 50 percent reduction in post-development solute loads (as represented by NO3-N), all based on post-development land use.

This is a set of performance-based goals. It does not represent specific effluent limitations, but presents composite efficiency expectations that can be used to select appropriate BMPs.

2.0 STORMWATER CALCULATIONS

The stormwater management design calculations completed for this project are included in the appendix of the SR/PCSM Plan. These calculations were completed using methods that are consistent with the BMP Manual and demonstrate that this SR/PCSM Plan is consistent with the stormwater runoff peak rate, volume, and water quality controls recommended in the BMP Manual. The applicable worksheets referenced in the BMP Manual are included in the design calculations.

3.0 VERIFICATION OF BMP MANUAL DESIGN CONSISTENCY

The Site Restoration Plan and/or Post Construction Stormwater Management Plan for this project was developed to be consistent with the components of the BMP Manual summarized above. Specifically, Table 2 below shows the methods that have implemented on this project to meet the recommended control guidelines from the manual.

Technical Standard	Method of Compliance with Technical Standard
Volume Controls	• Removal of the increase in 2-year runoff volume
Peak Rate Controls	• Removal of the increase in 2-year runoff volume • Detention of peak rate increases to calculated pre-development peak rates or lower
Water Quality Controls	• Minimize Total Disturbed Area • Landscape Restoration • Protect Sensitive / Special Value Features • (See Worksheet 10)

Table 2. Methods Utilized to Achieve Consistency with the PA Stormwater BMP Manual

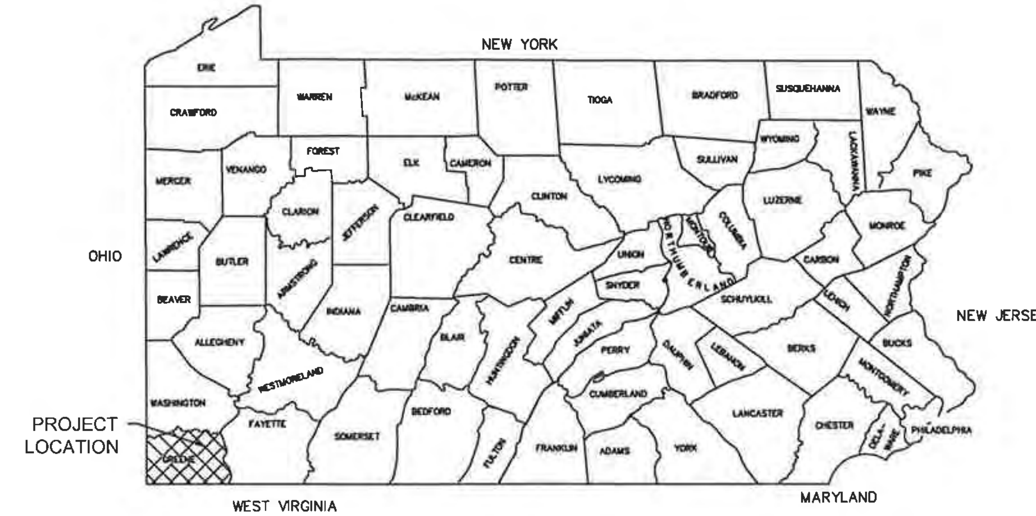
This Design Consistency Verification Report has been prepared under the direct supervision of a Pennsylvania licensed Professional Engineer as part of the SR/PCSM Plan developed for this project. As an appendix to the Plan, this consistency report is considered part of the Plan. The supervising Professional Engineer has sealed the cover of the SR/PCSM Plan.

APPENDIX B

PCSM PLAN DRAWINGS

NATRIUM TO MARKET PROJECT

FRANKLIN & MORGAN TOWNSHIPS
GREENE COUNTY, PA
EROSION & SEDIMENT CONTROL AND PCSM PLAN DRAWINGS
OCTOBER 2013



N
COUNTY MAP
N.T.S.

GENERAL NOTES:

1. THIS PLAN SET CONTAINS ALL INFORMATION FOR THE EROSION AND SEDIMENT CONTROL PLAN (E&S PLAN) AND POST-CONSTRUCTION STORMWATER MANAGEMENT PLAN (PCSM PLAN) REQUIRED FOR THE PERMIT AS SPECIFIED ABOVE THIS IS A PERMIT DOCUMENT ONLY ADDITIONAL PLANS AND DOCUMENTATION ARE REQUIRED FOR CONSTRUCTION OF THE PROPOSED DEVELOPMENT
2. FULL SIZE SHEETS OF THIS PLAN SET MAY BE PRINTED OUT ON 22"x34" SHEETS ALL SCALES PRINTED OUT ON 11"x17" SHEETS ARE SCALED BY 1/2 (E G , 1"=100' IS EQUIVALENT TO 1"=200' WHEN THESE PLAN SETS ARE PRINTED ON 11"x17")

REFERENCE (ALL SHEETS):

1. SOILS INFORMATION FROM UNITED STATES DEPARTMENT OF AGRICULTURE, NATURAL RESOURCES CONSERVATION SERVICE WEB SOIL SURVEY (CURRENT)
2. LIDAR TOPOGRAPHIC DATA AND BACKGROUND IMAGERY OBTAINED FROM PENNSYLVANIA SPATIAL DATA ACCESS (PASDA) WEB SITE (HTTP: //WWW PASDA PSU EDU/)
3. SITE TOPOGRAPHIC AND FEATURE SURVEY FOR PROPOSED PIPEYARD PERFORMED BY URS ON OCTOBER 3, 2013 URS SURVEY DATA IS SUPPLEMENTED BY ADDITIONAL TOPOGRAPHIC AND FEATURE INFORMATION PROVIDED BY DOMINION TRANSMISSION INC
4. PROPERTY BOUNDARY INFORMATION OBTAINED FROM GREENE COUNTY TAX PARCEL DATA
5. WETLAND AND STREAM INFORMATION OBTAINED FROM NATIONAL WETLAND INVENTORY DATA AND FIELD OBSERVATIONS PERFORMED BY URS ON SEPTEMBER 5, 2013 REFER TO THE URS WETLAND & WATERCOURSE DELINEATION REPORT FOR ADDITIONAL INFORMATION.
6. HORIZONTAL DATUM IS NAD83 VERTICAL DATUM IS NAVD1988
7. ALL NORTHING AND EASTING COORDINATES SHOWN IN PENNSYLVANIA STATE PLANE SOUTH NAD83

CONSTRUCTION SEQUENCE:

ALL EARTH DISTURBANCE ACTIVITIES SHALL PROCEED IN ACCORDANCE WITH THE FOLLOWING GENERAL CONSTRUCTION SEQUENCE CONSTRUCTION ACTIVITIES MAY BE PERFORMED CONCURRENTLY, OR ON PARALLEL PATHS WHERE APPROPRIATE, PROVIDED THAT THE APPROPRIATE EROSION AND SEDIMENT CONTROL BMPS HAVE BEEN IMPLEMENTED.

1. AT LEAST SEVEN (7) DAYS BEFORE STARTING ANY EARTH DISTURBANCE ACTIVITIES, THE OWNER AND/OR OPERATOR SHALL NOTIFY THE GREEN 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 CONSERVATION DISTRICT
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 INCORPORATED AT 1-800-242-1776 FOR THE LOCATION OF EXISTING UNDERGROUND UTILITIES
3. INSTALL ROCK CONSTRUCTION ENTRANCES AT EACH LOCATION SHOWN ON THE PLANS
4. INSTALL HIGH VISIBILITY BARRIER FENCE AROUND THE PERIMETER OF "WETLAND, W-KHG-286 (PEM)" AND ALONG THE LIMIT OF DISTURBANCE ALONG "UNT TO RUFF CREEK, S-KHG-196 (INT)" AS SHOWN ON THE PLANS
5. INSTALL TEMPORARY PERIMETER CONTROL BMPS (COMPOST FILTER SOCK) AT ALL LOCATIONS SHOWN ON THE PLANS LIMIT CLEARING AND EARTH DISTURBANCE TO THAT ABSOLUTELY NECESSARY TO PROPERLY INSTALL THE PROPOSED BMPS

PROPOSED PIPEYARD CONSTRUCTION

1. INSTALL TEMPORARY STREAM CROSSING (CULVERT 8 AND ASSOCIATED CLEAN ROCK FILL) IN ACCORDANCE WITH ALL GENERAL PERMIT CONDITIONS
2. INSTALL UPSLOPE DIVERSION BERMS AND ASSOCIATED TEMPORARY LEVEL SPREADERS
3. REMOVE TOPSOIL FROM THE FOOTPRINT OF THE PROPOSED SEDIMENT TRAPS AND STOCKPILE IN THE LOCATION(S) SHOWN ON THE PLANS APPLY TEMPORARY SEED AND MULCH TO THE TOPSOIL STOCKPILE UPON COMPLETION OF THIS ACTIVITY.
4. INSTALL COLLECTION CHANNELS 11B, 12B, 13B AND 14B, AND SEDIMENT TRAPS 2 AND 3 UPON COMPLETION, IMMEDIATELY STABILIZE ALL CONSTRUCTED FACILITIES
5. REMOVE TOPSOIL FROM THE FOOTPRINT OF EACH STAGE OF WORK AS WORK PROGRESSES AND STOCKPILE IN THE LOCATION(S) SHOWN ON THE PLANS APPLY TEMPORARY SEED AND MULCH TO THE TOPSOIL STOCKPILE UPON COMPLETION OF THIS ACTIVITY
6. PERFORM GENERAL GRADING ACTIVITIES FOR THE TEMPORARY ACCESS ROAD, TEMPORARY PAD 1, TEMPORARY PAD 2, AND TEMPORARY PAD 3 AS DETAILED BY PROPOSED GRADING, NOTES, AND DETAILS SHOWN ON THE EROSION AND SEDIMENT CONTROL PLAN DRAWINGS INSTALL COLLECTION CHANNELS AND CULVERTS AS WORK PROGRESSES ADDITIONAL TEMPORARY PLACEMENT OF COMPOST FILTER SOCK MAY BE NECESSARY AT THE CONTRACTOR'S DISCRETION SHOULD ACCELERATED EROSION BE ENCOUNTERED DURING GRADING ACTIVITIES
7. IMMEDIATELY UPON ACHIEVING DESIGN ELEVATIONS, STABILIZE PROPOSED FACILITIES WITH AGGREGATE OR TEMPORARY SEED AND MULCH AS APPROPRIATE

CRAYNE STATION CONSTRUCTION

1. INSTALL SEDIMENT TRAP 1 AND COLLECTION CHANNELS 4 AND 5 INSTALL THE OUTLET PIPE AND OUTLET STRUCTURE FOR STORMWATER MANAGEMENT BASIN 2 AS SEDIMENT TRAP 1 IS BEING CONSTRUCTED INSTALL TEMPORARY WATER TIGHT COVERS OVER ALL PERMANENT OUTLET STRUCTURE ORIFICES UPON COMPLETION, IMMEDIATELY STABILIZE ALL CONSTRUCTED FACILITIES
2. REMOVE TOPSOIL FROM THE FOOTPRINT OF THE PROPOSED FOREBAY AND STORMWATER MANAGEMENT BASIN 1 AND STOCKPILE IN THE LOCATION(S) SHOWN ON THE PLANS APPLY TEMPORARY SEED AND MULCH TO THE TOPSOIL STOCKPILE UPON COMPLETION OF THIS ACTIVITY
3. INSTALL THE PROPOSED FOREBAY, STORMWATER MANAGEMENT BASIN 1, PERMANENT LEVEL SPREADER 1 AND ALL RELATED PERMANENT STORMWATER FACILITIES UPON COMPLETION, IMMEDIATELY STABILIZE ALL DISTURBED AREAS AS DETAILED BY THE PLANS, NOTES, AND CONSTRUCTION DETAILS
4. REMOVE EXISTING SEDIMENT TRAPS, INSTALL COLLECTION CHANNELS 2 AND 3, MODIFY EXISTING PIPES AS NECESSARY AND INSTALL RIPRAP APRONS 1 AND 2
5. PERFORM GENERAL GRADING ACTIVITIES FOR THE PERMANENT ACCESS ROADS AND COMPRESSOR STATION EXPANSION AS DETAILED BY PROPOSED GRADING, NOTES, AND DETAILS SHOWN ON THE EROSION AND SEDIMENT CONTROL PLAN DRAWINGS
6. INSTALL COLLECTION CHANNELS, CULVERTS, AND ROAD SUBGRADE AGGREGATE AS WORK PROGRESSES ADDITIONAL TEMPORARY PLACEMENT OF COMPOST FILTER SOCK MAY BE NECESSARY AT THE CONTRACTOR'S DISCRETION SHOULD ACCELERATED EROSION BE ENCOUNTERED DURING GRADING ACTIVITIES
7. INSTALL ALL PROPOSED FACILITIES AND BUILDINGS AS SHOWN ON PLANS BY OTHERS
8. UPON INSTALLATION OF ALL PERMANENT FACILITIES, INSTALL AGGREGATE SURFACE STABILIZATION
9. REMOVE ROCK CONSTRUCTION ENTRANCES AND PAVE PERMANENT ACCESS ROADS AS SHOWN ON THE PLANS
10. PLACE TOPSOIL IN ALL AREAS TO BE VEGETATED
11. APPLY PERMANENT SEED AND MULCH TO ALL DISTURBED AREAS TO BE VEGETATED AS SHOWN ON THE PLANS

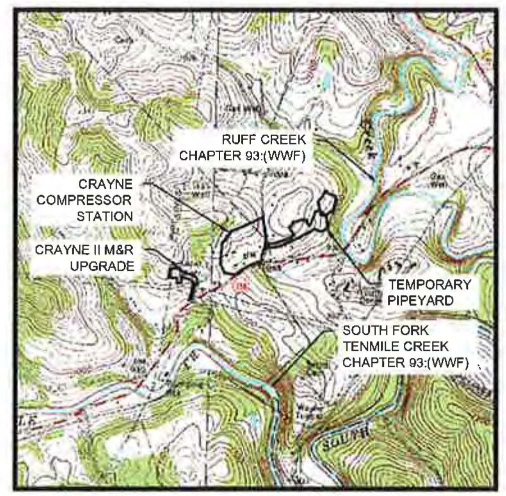
POST CONSTRUCTION STORMWATER MANAGEMENT

1. UPON COMPLETION OF CONSTRUCTION ACTIVITIES AT THE PROPOSED PIPEYARD, RESTORE THE ENTIRE SITE TO PRE-EXISTING CONDITIONS AS DETAILED BY THE PCSM PLAN.
2. ANY TEMPORARY MEASURES (SUCH AS COMPOST FILTER SOCK, COLLECTION CHANNEL, RIPRAP APRONS, ETC) INSTALLED BY CONTRACTOR DURING GRADING, SHALL REMAIN IN PLACE UNTIL FINAL STABILIZATION HAS 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
3. ONCE THE CRAYNE STATION SITE IS PERMANENTLY STABILIZED, CONVERT SEDIMENT TRAP 1 TO PERMANENT STORMWATER MANAGEMENT BASIN 2, INSTALL PERMANENT LEVEL SPREADER 3, AND ALL PCSM BMP'S DETAILED BY PROPOSED GRADING, NOTES, AND DETAILS SHOWN ON THE EROSION AND SEDIMENT CONTROL PLAN DRAWINGS AND POST-CONSTRUCTION STORMWATER MANAGEMENT PLAN DRAWINGS RETURN TOPSOIL TO DISTURBED AREAS AND APPLY PERMANENT SEED AND MULCH.

APPLICANT:

Dominion

5000 DOMINION BOULEVARD
GLEN ALLEN, VA 23060
PHONE: (804) 335-4923
FAX: (804) 373-2964



N
LOCATION MAP
SCALE 1" =2000'
USGS QUAD: WAYNESBURG, PA

PREPARED BY:

URS

FOSTER PLAZA 6
681 ANDERSEN DRIVE
SUITE 400
PITTSBURGH, PA 15220
PHONE: (412) 503-4700
FAX: (412) 503-4701

SHEET	DESCRIPTION	NO.
	EROSION & SEDIMENT CONTROL PLAN	
SHEET	DESCRIPTION	NO.
1	COVER SHEET	1
2	CRAYNE STATION AND CRAYE II M&R UPGRADE - EXISTING CONDITIONS	2
3	PROPOSED PIPEYARD - EXISTING CONDITIONS	3
4	CRAYNE STATION - PROPOSED CONDITIONS	4
5-6	PROPOSED PIPEYARD - PROPOSED CONDITIONS	5-6
7	PROPOSED PIPEYARD - ACCESS ROAD PROFILE	7
8-12	NOTES & DETAILS	8-12
	PCSM PLAN	
SHEET	DESCRIPTION	NO.
13	CRAYNE STATION - PCSM PLAN	13
14-15	PROPOSED PIPEYARD - PCSM PLAN	14-15
16-17	NOTES & DETAILS	16-17

ENGINEER S CERTIFICATION

I DO HEREBY CERTIFY TO THE BEST OF MY KNOWLEDGE, INFORMATION AND BELIEF, THAT THE EROSION AND SEDIMENT CONTROL PLAN AND POST CONSTRUCTION STORMWATER MANAGEMENT PLAN ARE TRUE AND CORRECT, REPRESENT ACTUAL FIELD CONDITIONS AND ARE IN ACCORDANCE WITH THE 25 PA CODE CHAPTERS 78 AND 102 OF THE DEPARTMENT'S RULES AND REGULATIONS I AM AWARE THAT THERE ARE SIGNIFICANT PENALTIES FOR SUBMISSION OF FALSE INFORMATION, INCLUDING THE POSSIBILITY OF FINE AND IMPRISONMENT

COMMONWEALTH OF PENNSYLVANIA
REGISTERED PROFESSIONAL
ADAM B. ZANISER
ENGINEER
PE076016

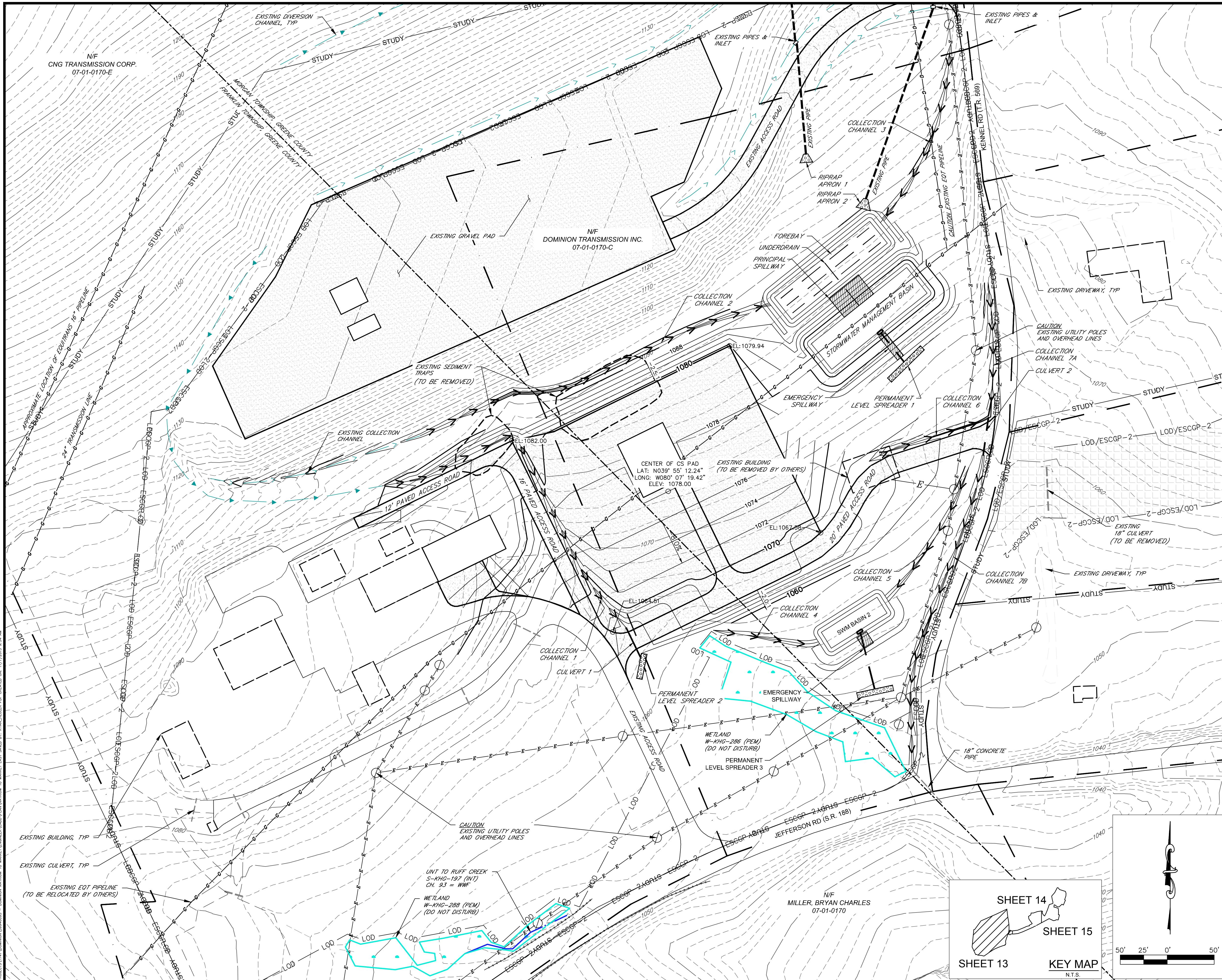
10-24-13

NOT ALL UTILITIES ARE SHOWN

THE LOCATION OF ALL UTILITIES (ABOVE OR BELOW GROUND) SHOWN ON THESE DRAWINGS ARE APPROXIMATE & WERE OBTAINED FROM USGS TOPO MAPS AND/OR UTILITY OWNERS URS CORP DOES NOT GUARANTEE THAT LOCATION SHOWN ON THE DRAWINGS ARE CORRECT IT SHALL BE THE RESPONSIBILITY OF THE CONTRACTOR TO DETERMINE LOCATIONS OF EXISTING UTILITIES (ABOVE OR BELOW GROUND) & TO NOTIFY THE RESPECTIVE UTILITY OWNERS BEFORE BEGINNING CONSTRUCTION

CALL BEFORE YOU DIG!
PENNSYLVANIA LAW REQUIRES
3 WORKING DAYS NOTICE FOR
CONSTRUCTION PHASE AND 10 WORKING DAYS IN DESIGN STAGE - STOP CALL
PENNSYLVANIA ONE CALL SYSTEM INC
1-800-242-1776

DESIGN ONE CALL SERIAL NO : 20133100598 - FRANKLIN TWP
20133100599 - MORGAN TWP



LEGEND:

EXISTING:

- 1490 — MAJOR CONTOUR (10' INTERVAL)
- MINOR CONTOUR (2' INTERVAL)
- PROPERTY LINE
- EDGE OF ROADWAY
- EXISTING FENCE LINE
- EXISTING ELECTRIC UTILITY
- EXISTING GAS LINE
- EXISTING CULVERT
- TREE / BRUSH LINE
- STREAM
- DELINEATED WETLAND AREA
- OPEN-ENDED WETLAND
- PLUGGED WELL
- MoB2 — SOIL CLASSIFICATION
- SOIL BOUNDARY

PROPOSED:

- STUDY — RESOURCE STUDY AREA
- ESCGP-2 — PROJECT / ESCGP-2 BOUNDARY
- LOD — LIMIT OF DISTURBANCE
- WELL PAD / TANK PAD
- RIPRAP APRON
- PERMANENT COLLECTION CHANNEL
- SOIL CEMENT W/ GRAVEL SURFACE
- COMPOST FILTER SOCK
- STOCKPILE AREA
- CULVERT
- TEMPORARY COLLECTION CHANNEL
- ROCK CONSTRUCTION ENTRANCE
- GRAVEL SURFACE

REVISIONS		
DATE	DESCRIPTION	APPROVED

PREPARED FOR:
DTI
5000 DOMINION BOULEVARD
GLEN ALLEN, VA 23060
PHONE: (804) 335-4923
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PREPARED BY:
URS
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PHONE: (412) 503-4700
FAX: (412) 503-4701

POST CONSTRUCTION STORMWATER MANAGEMENT PLAN
NATRIUM TO MARKET PROJECT
FRANKLIN TOWNSHIP & MORGAN TOWNSHIP
GREENE COUNTY, PENNSYLVANIA

HORIZONTAL SCALE: AS SHOWN

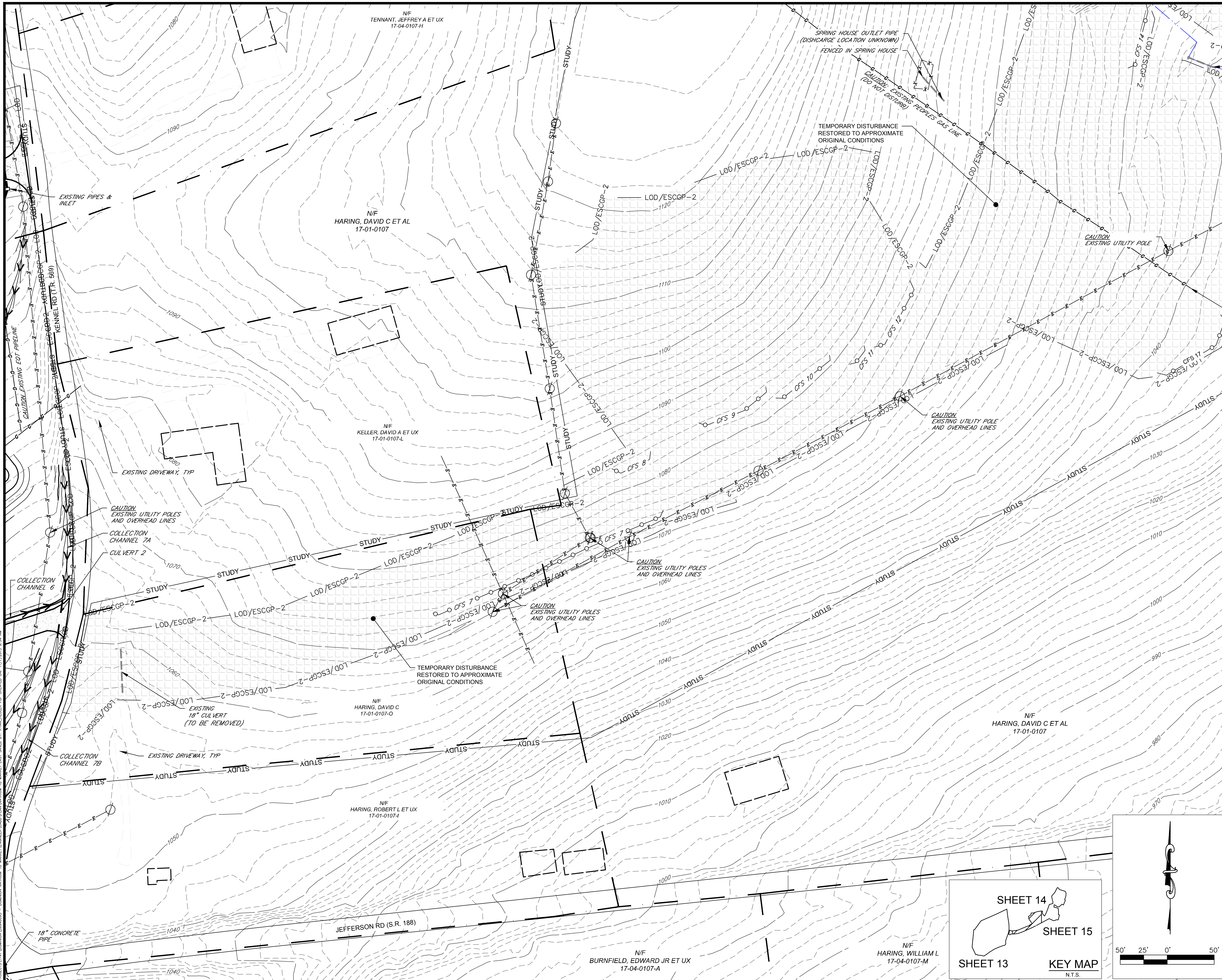
DRAWN BY:	RFH	10/22/2013
DETAIL CK:	ARZ	10/23/2013
ITR:	BDN	10/28/2013

URS PROJECT NO.: 39940093.42000

SHEET: 13

DRAWING DESC.: CRAYNE STATION PCSM PLAN

SHEET NO. 13 OF 17 REV.: 0



LEGEND:

EXISTING:

- 1490 — MAJOR CONTOUR (10' INTERVAL)
- MINOR CONTOUR (2' INTERVAL)
- PROPERTY LINE
- EDGE OF ROADWAY
- EXISTING FENCE LINE
- EXISTING ELECTRIC UTILITY
- EXISTING GAS LINE
- EXISTING CULVERT
- TREE / BRUSH LINE
- STREAM
- DELINEATED WETLAND AREA
- OPEN-ENDED WETLAND
- PLUGGED WELL
- MoB2 — SOIL CLASSIFICATION
- SOIL BOUNDARY

PROPOSED:

- STUDY — RESOURCE STUDY AREA
- ESCGP-2 — PROJECT / ESCGP-2 BOUNDARY
- LOD — LIMIT OF DISTURBANCE
- WELL PAD / TANK PAD
- RIPRAP APRON
- PERMANENT COLLECTION CHANNEL
- SOIL CEMENT W/ GRAVEL SURFACE
- COMPOST FILTER SOCK
- STOCKPILE AREA
- CULVERT
- TEMPORARY COLLECTION CHANNEL
- ROCK CONSTRUCTION ENTRANCE
- GRAVEL SURFACE

REVISIONS

DATE	DESCRIPTION	APPROVED

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POST CONSTRUCTION STORMWATER MANAGEMENT PLAN
NATRIUM TO MARKET PROJECT
FRANKLIN TOWNSHIP & MORGAN TOWNSHIP
GREENE COUNTY, PENNSYLVANIA

HORIZONTAL SCALE: AS SHOWN

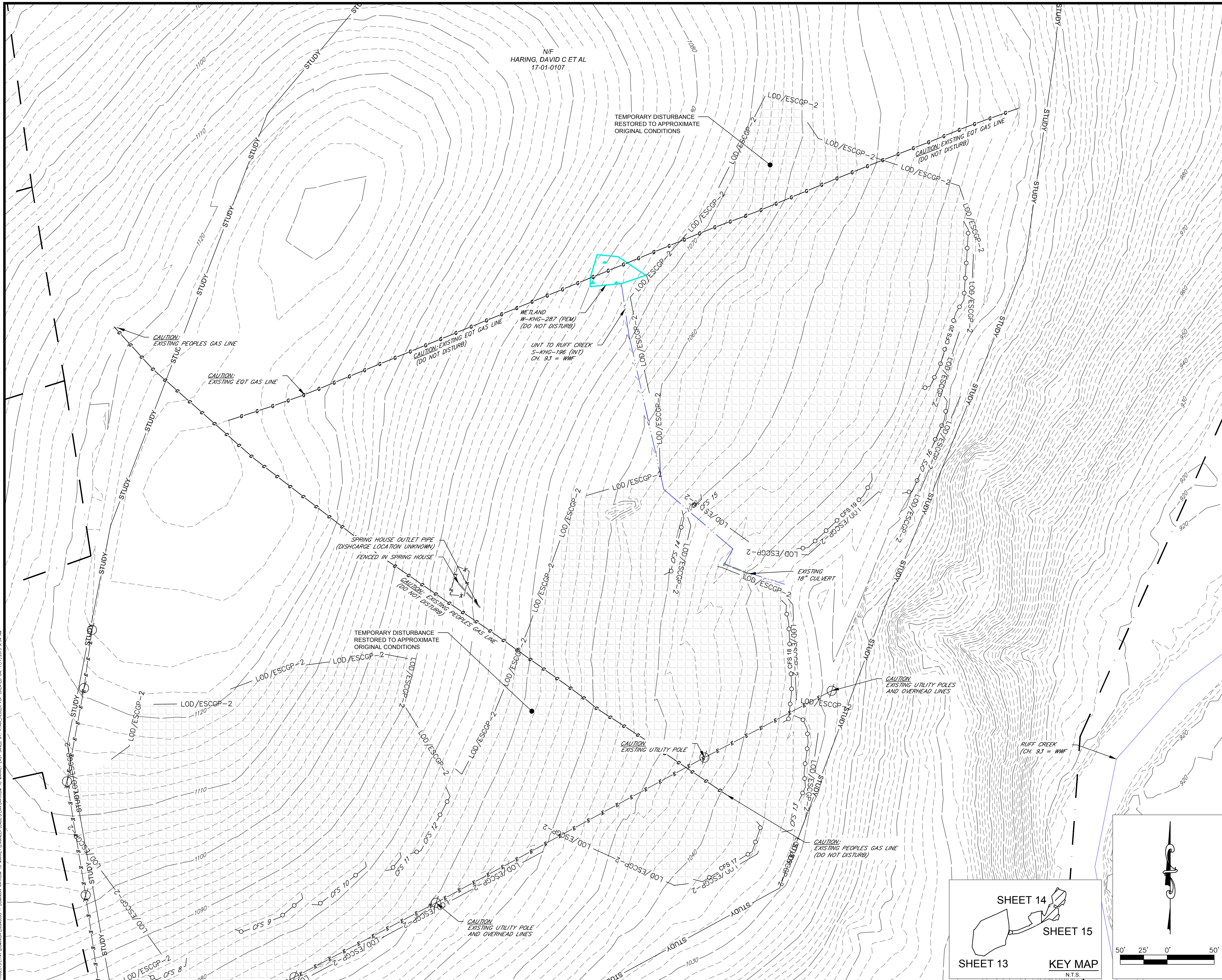
DRAWN BY:	RFH	10/22/2013
DETAIL CK:	ARZ	10/23/2013
ITR:	BDN	10/28/2013

URS PROJECT NO.: 39940093.42000

SHEET: 14

DRAWING DESC.: PROPOSED PIPEYARD PCSM PLAN

SHEET NO. 14 OF 17 REV.: 0



LEGEND:

EXISTING:		PROPOSED:	
1490	MAJOR CONTOUR (10' INTERVAL)	STUDY	RESOURCE STUDY AREA
	MINOR CONTOUR (2' INTERVAL)	ESCGP-2	PROJECT / ESCGP-2 BOUNDARY
	PROPERTY LINE	LOD	LIMIT OF DISTURBANCE
	EDGE OF ROADWAY		
—X—X—X—	EXISTING FENCE LINE		
—E—E—E—	EXISTING ELECTRIC UTILITY		WELL PAD / TANK PAD
—G—G—	EXISTING GAS LINE		RIPRAP APRON
	EXISTING CULVERT		PERMANENT COLLECTION CHANNEL
	TREE / BRUSH LINE		SOIL CEMENT W/ GRAVEL SURFACE
	STREAM		COMPOST FILTER SOCK
	DELINEATED WETLAND AREA		STOCKPILE AREA
	OPEN-ENDED WETLAND		CULVERT
W	PLUGGED WELL		TEMPORARY COLLECTION CHANNEL
MoB2	SOIL CLASSIFICATION		ROCK CONSTRUCTION ENTRANCE
	SOIL BOUNDARY		GRAVEL SURFACE

REVISIONS		
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POST CONSTRUCTION STORMWATER MANAGEMENT PLAN
NATRIUM TO MARKET PROJECT
FRANKLIN TOWNSHIP & MORGAN TOWNSHIP
GREENE COUNTY, PENNSYLVANIA

HORIZONTAL SCALE: AS SHOWN		
DRAWN BY:	RFH	10/22/2013
DETAIL CK:	ARZ	10/23/2013
ITR:	BDN	10/28/2013

URS PROJECT NO.: 39940093.42000

SHEET: 15

DRAWING DESC.: PROPOSED PIPEYARD PCSM PLAN

SHEET NO. 15 OF 17 REV.: 0

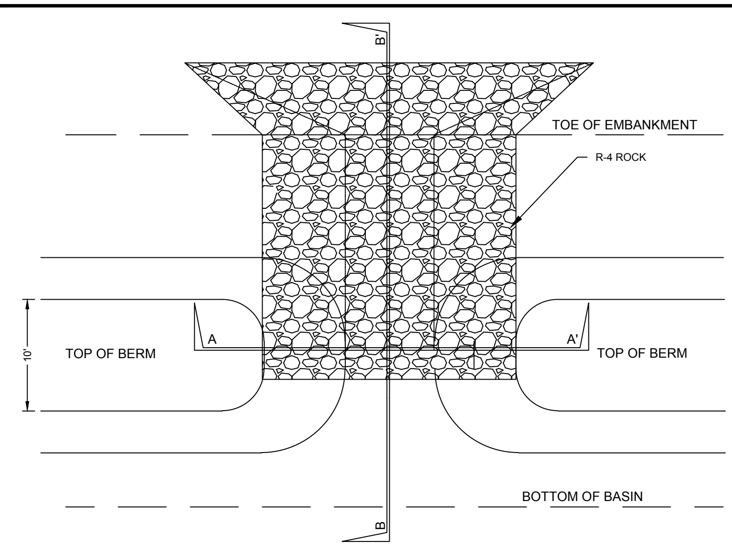
GENERAL MAINTENANCE NOTES FOR POST CONSTRUCTION

1. UPON PERMANENT STABILIZATION OF THE EARTH DISTURBANCE ACTIVITY UNDER # 102.22 (A)(2) (RELATING TO PERMANENT STABILIZATION), AND INSTALLATION OF BMPS IN ACCORDANCE WITH AN APPROVED PLAN PREPARED AND IMPLEMENTED IN ACCORDANCE WITH ## 102.4 AND 102.8 (RELATING TO EROSION AND SEDIMENT CONTROL REQUIREMENTS; AND PCSM REQUIREMENTS), THE PERMITTEE OR CO-PERMITTEE SHALL SUBMIT A NOTICE OF TERMINATION TO THE DEP.
2. PERMANENT STABILIZATION IS DEFINED AS A MINIMUM UNIFORM, PERENNIAL 70% VEGETATIVE COVER OR OTHER PERMANENT NON-VEGETATIVE COVER WITH A DENSITY SUFFICIENT TO RESIST ACCELERATED EROSION. CUT AND FILL SLOPES SHALL BE CAPABLE OF RESISTING FAILURE DUE TO SLUMPING, SLIDING, OR OTHER MOVEMENTS.
3. PERMITEE OR A DESIGNATED REPRESENTATIVE WILL BE RESPONSIBLE FOR LONG-TERM OPERATION AND MAINTENANCE OF THE PCSM BMPS IN ACCORDANCE WITH # 102.8(M) AND WILL BE ABLE TO PROVIDE PROOF OF COMPLIANCE WITH # 102.8(M)(2).
4. UNTIL THE PERMITTEE OR CO-PERMITTEE HAS RECEIVED WRITTEN APPROVAL OF A NOTICE OF TERMINATION, THE PERMITTEE OR CO-PERMITTEE WILL REMAIN RESPONSIBLE FOR COMPLIANCE WITH THE PERMIT TERMS AND CONDITIONS INCLUDING LONG-TERM OPERATION AND MAINTENANCE OF ALL PCSM BMPS ON THE PROJECT SITE AND IS RESPONSIBLE FOR VIOLATIONS OCCURRING ON THE PROJECT SITE. THE DEP WILL CONDUCT A FINAL INSPECTION AND APPROVE OR DENY THE NOTICE OF TERMINATION WITHIN 30 DAYS.
5. THE PCSM PLAN, INSPECTION REPORTS AND MONITORING RECORDS SHALL BE AVAILABLE FOR REVIEW AND INSPECTION BY THE DEP.
6. A LICENSED PROFESSIONAL OR A DESIGNEE SHALL BE PRESENT ONSITE AND BE RESPONSIBLE DURING CRITICAL STAGES OF IMPLEMENTATION OF THE APPROVED PCSM PLAN. THE CRITICAL STAGES MAY INCLUDE THE INSTALLATION OF UNDERGROUND TREATMENT OR STORAGE BMPS, STRUCTURALLY ENGINEERED BMPS, OR OTHER BMPS AS DEEMED APPROPRIATE BY THE DEP. WITH THIS SPECIFIC PROJECT, THERE ARE CURRENTLY NO IDENTIFIED CRITICAL STAGES WITH THE PROPOSED BMPS.
7. THE PERMITTEE SHALL INCLUDE WITH THE NOTICE OF TERMINATION "RECORD DRAWINGS" WITH A FINAL CERTIFICATION STATEMENT FROM A LICENSED PROFESSIONAL, WHICH READS AS FOLLOWS:

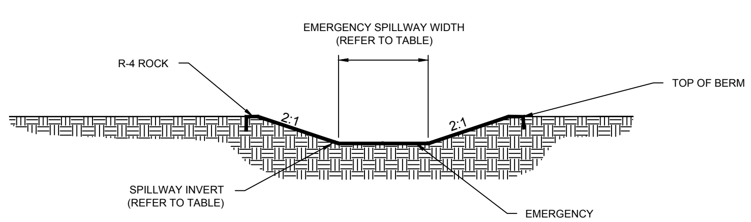
   "I (NAME) DO HEREBY CERTIFY PURSUANT TO THE PENALTIES OF 18 PA.C.S.A #4904 TO THE BEST OF MY KNOWLEDGE, INFORMATION AND BELIEF, THAT THE ACCOMPANYING RECORD DRAWINGS ACCURATELY REFLECT THE AS-BUILT CONDITIONS, ARE TRUE AND CORRECT, AND ARE CONFORMANCE WITH CHAPTER 102 OF THE RULES AND REGULATIONS OF THE DEPARTMENT OF ENVIRONMENTAL PROTECTION AND THAT THE PROJECT SITE WAS CONSTRUCTED IN ACCORDANCE WITH THE APPROVED PCSM PLAN, ALL APPROVED PLAN CHANGES AND ACCEPTED CONSTRUCTION PRACTICES."
8. THE PERMITTEE SHALL RETAIN A COPY OF THE RECORD DRAWINGS AS A PART OF THE APPROVED PCSM PLAN.
9. THE PERMITTEE SHALL PROVIDE A COPY OF THE RECORD DRAWINGS AS A PART OF THE APPROVED PCSM PLAN TO ANY DESIGNATED REPRESENTATIVE IDENTIFIED IN THIS SECTION (OR OTHERWISE DESIGNATED) AS BEING RESPONSIBLE FOR THE LONG-TERM OPERATION AND MAINTENANCE OF THE PCSM BMPS.
10. THE PERMITTEE OR CO-PERMITTEE SHALL BE RESPONSIBLE FOR LONG-TERM OPERATION AND MAINTENANCE OF PCSM BMPS UNLESS A DIFFERENT PERSON IS IDENTIFIED IN THE NOTICE OF TERMINATION AND HAS AGREED TO LONG-TERM OPERATION AND MAINTENANCE OF THE PCSM BMPS.
11. FOR ANY PROPERTY CONTAINING A PCSM BMP, THE PERMITTEE OR CO-PERMITTEE SHALL RECORD AN INSTRUMENT WITH THE RECORDER OF DEEDS WHICH WILL ASSURE DISCLOSURE OF THE PCSM BMP AND THE RELATED OBLIGATIONS IN THE ORDINARY COURSE OF A TITLE SEARCH OF THE SUBJECT PROPERTY. THE RECORDED INSTRUMENT MUST IDENTIFY THE PCSM BMP, PROVIDE FOR NECESSARY ACCESS RELATED TO LONG-TERM OPERATION AND MAINTENANCE FOR THE PCSM BMPS AND PROVIDE NOTICE THAT THE RESPONSIBILITY FOR LONG-TERM OPERATION AND MAINTENANCE IS A COVENANT THAT RUNS WITH THE LAND THAT IS BINDING UPON AND ENFORCEABLE BY SUBSEQUENT GRANTEES, AND PROVIDE PROOF OF FILING WITH THE NOTICE OF TERMINATION UNDER # 102.7(B)(5)(RELATING TO PERMIT TERMINATION).
12. CONSTRUCTED FACILITIES SHOULD BE INSPECTED SEMI-ANNUALLY. CHANNEL, RAINGARDENS, LEVEL SPREADERS, DETENTION PONDS, AND OTHER STORMWATER FACILITIES SHOULD BE MAINTAINED TO ORIGINAL DESIGN DIMENSIONS AND GROUND COVER. EXCESSIVE SEDIMENT ACCUMULATIONS SHOULD BE REMOVED AND DISPOSED IN WELL VEGETATED AREAS AWAY FROM WATERBODIES IN ACCORDANCE WITH EROSION AND SEDIMENTATION CONTROL PRACTICE AS SET FORTH IN 25 PA CODE CHAPTER 102. UNSTABLE FLOWS CORRECTED WHERE POSSIBLE. ANY SOIL DISTURBED BY MAINTENANCE ACTIVITIES SHOULD BE SEEDED AND MULCHED IMMEDIATELY OR OTHERWISE STABILIZED IN ACCORDANCE WITH THESE PLANS.

LEVEL SPREADER MAINENANCE SCHEDULE

1. MONITORING SHALL OCCUR FOR 2 YEARS ON A QUARTERLY BASIS AND SEMI-ANNUALLY THEREAFTER.
2. INSPECTIONS SHOULD ALSO BE MADE FOLLOWING RAINFALL EVENTS EXCEEDING 1 INCH.



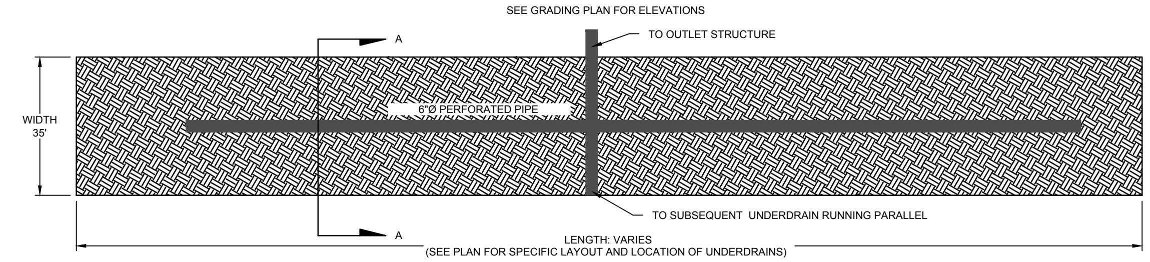
PLAN VIEW

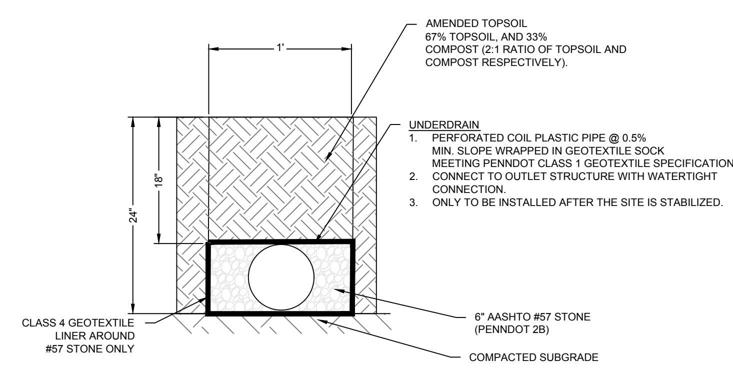


SECTION A-A

EMERGENCY SPILLWAY & OUTLET STRUCTURE

N.T.S.

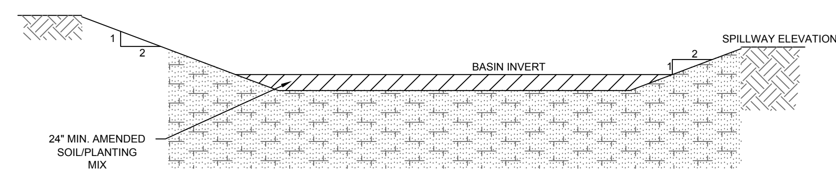




SECTION A-A

NOTES:

1. CONTRACTOR SHALL VERIFY THAT THE AMENDED SOIL PROVIDES AN INFILTRATION RATE OF 2.0 IN/HR OR GREATER.
2. WHERE LAYERS OF FILL THAT VARY IN GRADATION ARE ADJACENT TO EACH OTHER, A FILTER FABRIC BARRIER SHOULD BE USED TO PREVENT MIGRATION OF FINES. (i.e. WHERE A FINER GRAINED SELECT FILL IS PLACED ON TOP OF, OR BELOW, AN OPEN-GRADED STONE FILL.)
3. AMENDED SOIL MIX SHALL CONSIST OF 33% ORGANIC MATTER (COMPOST) AND 67% SOIL BASE (TOPSOIL). SOIL SHALL HAVE A CLAY CONTENT OF LESS THAN 10% AND BE FREE OF TOXIC SUBSTANCES.
4. CONSTRUCT ONLY AFTER UPSTREAM AREAS HAVE BEEN STABILIZED OR DIVERT RUNOFF DURING CONSTRUCTION.
5. EXCAVATE TO PROPOSED INVERT ELEVATION AND SCARIFY EXISTING SOILS, DO NOT COMPACT IN-SITU SOILS.
6. BACKFILL WITH AMENDED SOIL, LIGHT HAND TAMPING IS ACCEPTABLE. OVERFILL AS REQUIRED TO ACCOUNT FOR SETTLEMENT.
7. UPON COMPLETION, SEED AND MULCH THE INVERT USING THE DETENTION BASIN FLOOR SEED MIXTURE: ERNMX-122 (FACW WETLAND MEADOW MIX) AT 1/2 POUND PER 1,000 SQUARE FEET ERNMX - 131 (OBL WETLAND MIX) AT 1/2 POUND PER 1,000 SQUARE FEET.



PROFILE

UNDERDRAIN DETAIL

N.T.S.

BASIN DETAIL

N.T.S.

AMENDED SOIL PARAMETERS			
SOIL TEXTURE	IDEAL BULK DENSITIES g/cm^3	BULK DENSITIES THAT MAY AFFECT ROOT GROWTH g/cm^3	BULK DENSITIES THAT RESTRICT ROOT GROWTH g/cm^3
SANDS, LOAMY SANDS	< 1.60	1.69	1.80
SANDY LOAMS, LOAMS	< 1.40	1.63	1.80
SANDY CLAY LOAMS, LOAMS, CLAY LOAMS	< 1.40	1.60	1.75
SILT, SILT LOAMS	< 1.30	1.60	1.75
SILT LOAMS, SILTY CLAY LOAMS	< 1.10	1.55	1.65
SANDY CLAYS, SILTY CLAYS, SOME CLAY LOAMS (35-45% CLAY)	< 1.10	1.49	1.58
CLAYS (> 45% CLAY)	< 1.10	1.39	1.47

AMENDMENT & SITE RESTORATION OPTIONS

ALL RESTORED AREA TO BE RECLAIMED USING EITHER OPTION 1 OR 2 LISTED UNDER AMENDMENT & SITE RESTORATION OPTIONS SEE BELOW

1. TREATING COMPACTION BY SOIL RESTORATION
   A. SOIL AMENDMENT MEDIA USUALLY CONSISTS OF COMPOST, BUT CAN INCLUDE MULCH, MANURES, SAND, AND MANUFACTURED MICROBIAL SOLUTIONS.
   B. COMPOST SHOULD BE ADDED AT A RATE OF 2:1 (SOIL:COMPOST). IF A PROPRIETARY PRODUCT IS USED, THE MANUFACTURE'S INSTRUCTIONS SHOULD BE FOLLOWED IN TERMS OF MIXING AND APPLICATION RATE.
   C. SOIL RESTORATION SHOULD NOT BE USED ON SLOPES GREATER THAN 30%. IN THESE AREAS, DEEP-ROOTED VEGETATION CAN BE USED TO INCREASE STABILITY.
   D. SOIL RESTORATION SHOULD NOT TAKE PLACE WITHIN THE DRIP LINE OF A TREE TO AVOID DAMAGING THE ROOT SYSTEM.
   E. ON-SITE SOILS WITH AN ORGANIC CONTENT OF AT LEAST 5 PERCENT CAN BE PROPERLY STOCKPILED (TO MAINTAIN ORGANIC CONTENT) AND REUSED.
   F. PROCEDURE: ROTOTILL, OR RIP THE SUBGRADE, REMOVE ROCKS, DISTRIBUTE THE COMPOST, SPREAD THE NUTRIENTS, ROTOTILL AGAIN.
   G. ADD 6 INCHES COMPOST/AMENDMENT AND TILL UP TO 8 INCHES FOR MINOR COMPACTION.
   H. ADD 10 INCHES COMPOST/AMENDMENT AND TILL UP TO 20 INCHES FOR MAJOR COMPACTION.
2. TREATING COMPACTION BY RIPPING/SUBSOILING/TILLING/SCARIFICATION
   A. SUBSOILING IS ONLY EFFECTIVE WHEN PERFORMED ON DRY SOILS.
   B. RIPPING, SUBSOILING, OR SCARIFICATION OF THE SUBSOIL SHOULD BE PERFORMED WHERE SUBSOIL HAS BECOME COMPACTED BY EQUIPMENT OPERATION, DRIED OUT AND CRUSTED, OR WHERE NECESSARY TO OBLITERATE EROSION RILLS.
   C. RIPPING (SUBSOILING) SHOULD BE PERFORMED USING A SOLID-SHANK RIPPER AND TO A DEPTH OF 20 INCHES, (8 INCHES FOR MINOR COMPACTION).
   D. SHOULD BE PERFORMED BEFORE COMPOST IS PLACED AND AFTER ANY EXCAVATION IS COMPLETED.
   E. SUBSOILING SHOULD NOT BE PERFORMED WITHIN THE DRIP LINE OF ANY EXISTING TREES, OVER UNDERGROUND UTILITY INSTALLATIONS WITHIN 30 INCHES OF THE SURFACE, WHERE TRENCHING/DRAINAGE LINES ARE INSTALLED, WHERE COMPACTION IS BY DESIGN.

REVISIONS		
DATE	DESCRIPTION	APPROVED

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GREENE COUNTY, PENNSYLVANIA

HORIZONTAL SCALE: AS SHOWN		
DRAWN BY:	RFH	10/22/2013
DETAIL CK:	ARZ	10/23/2013
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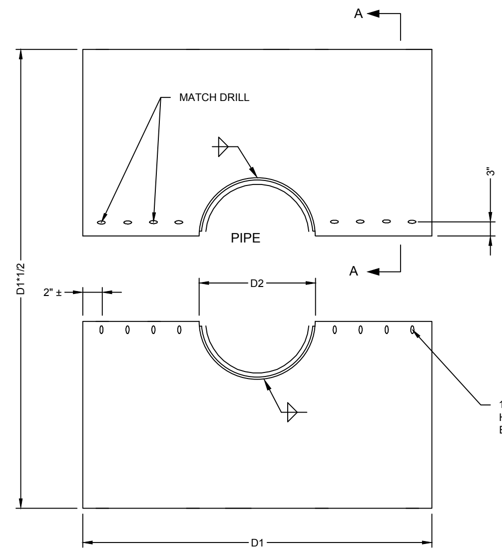
URS PROJECT NO.: 39940093.42000

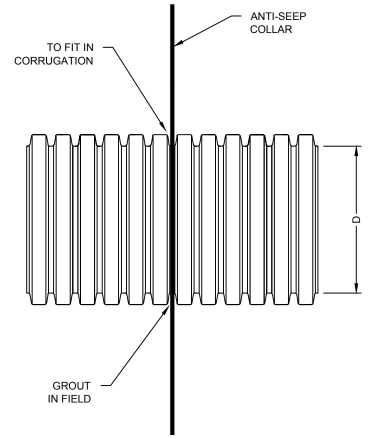
SHEET: 16

DRAWING DESC.: NOTES & DETAILS

SHEET NO. 16 OF 17 REV.: 0



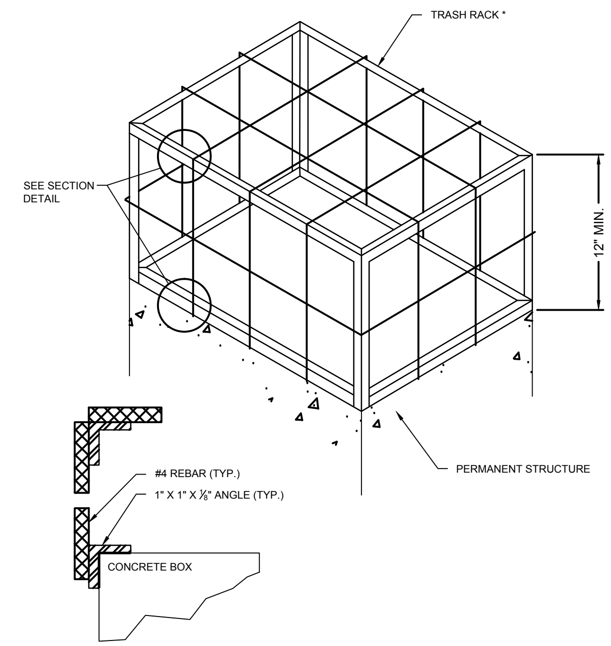
TYPICAL TWO-PIECE DIAPHRAGM



BASIN NO.	NUMBER OF COLLARS	D1 (FEET)	D2 (FEET)
1	1	4.1	4.1
2	1	3.9	3.9

HDPE ANTI-SEEP COLLAR

N.T.S.



SECTION DETAIL

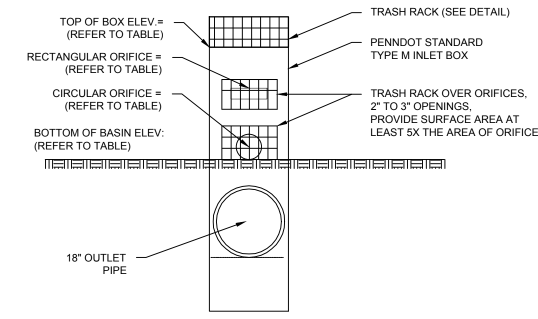
* TRASH RACK COMPOSED OF 1 IN. X 1 IN. X 1/8 IN. L (TYP.) AND #4 BARS (TYP.) WELDED TO THE ANGLES AND AT EACH INTERSECTION OF THE BARS; #4 BARS SPACED AT HALF THE DIAMETER OF THE BARREL MAX.

NOTES:

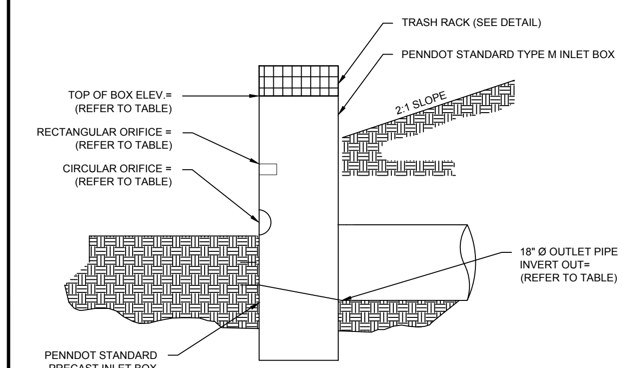
BOX SHALL BE BOLTED, STRAPPED, OR OTHERWISE SECURED TO THE PERMANENT RISER. ALL JOINTS SHALL BE WATER TIGHT. CLOGGED OR DAMAGED SPILLWAYS SHALL BE REPAIRED IMMEDIATELY. TRASH AND OTHER DEBRIS SHALL BE REMOVED FROM THE BASIN AND RISER.

TRASH RACK FOR PERMANENT STRUCTURE

N.T.S.



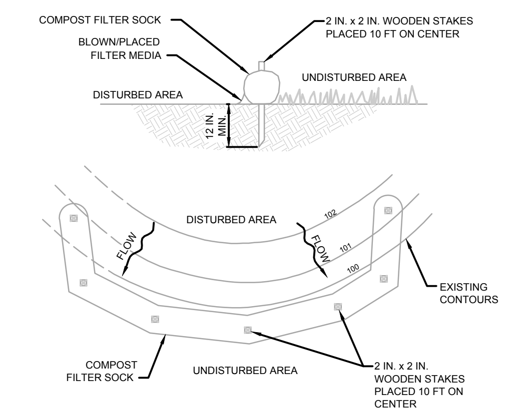
FRONT SECTION ELEVATION



SIDE SECTION ELEVATION

BASIN OUTLET STRUCTURE

N.T.S.



COMPOST FILTER SOCK SIZES	
BARRIER NO.	MINIMUM TYPE BARRIER ALLOWED
17-20	18" C.F.S.

C.F.S. = COMPOST FILTER SOCK

NOTES:

SOCK FABRIC SHALL MEET STANDARDS OF TABLE 4.1 OF THE PA DEP EROSION CONTROL MANUAL. COMPOST SHALL MEET THE STANDARDS OF TABLE 4.2 OF THE PA DEP EROSION CONTROL MANUAL.

COMPOST FILTER SOCK SHALL BE PLACED AT EXISTING LEVEL GRADE. BOTH ENDS OF THE BARRIER SHALL BE EXTENDED AT LEAST 8 FEET UP SLOPE AT 45 DEGREES TO THE MAIN BARRIER ALIGNMENT. MAXIMUM SLOPE LENGTH ABOVE ANY BARRIER SHALL NOT EXCEED THAT SPECIFIED FOR THE SIZE OF THE SOCK AND THE SLOPE OF ITS TRIBUTARY AREA.

TRAFFIC SHALL NOT BE PERMITTED TO CROSS COMPOST FILTER SOCKS.

ACCUMULATED SEDIMENT SHALL BE REMOVED WHEN IT REACHES 1/2 THE ABOVE GROUND HEIGHT OF THE BARRIER AND DISPOSED IN THE MANNER DESCRIBED ELSEWHERE IN THE PLAN.

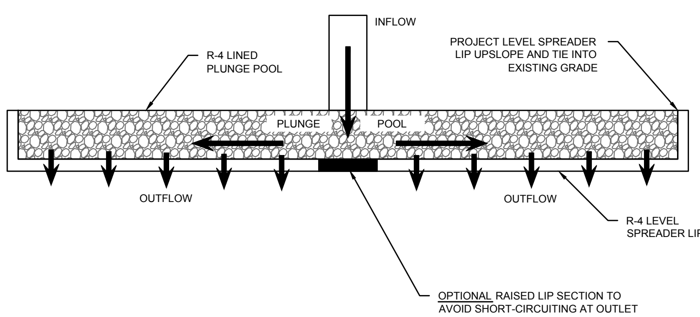
COMPOST FILTER SOCKS SHALL BE INSPECTED WEEKLY AND AFTER EACH RUNOFF EVENT. DAMAGED SOCKS SHALL BE REPAIRED ACCORDING TO MANUFACTURER'S SPECIFICATIONS OR REPLACED WITHIN 24 HOURS OF INSPECTION.

BIODEGRADABLE COMPOST FILTER SOCKS SHALL BE REPLACED AFTER 6 MONTHS; PHOTODEGRADABLE SOCKS AFTER 1 YEAR. POLYPROPYLENE SOCKS SHALL BE REPLACED ACCORDING TO MANUFACTURER'S RECOMMENDATIONS.

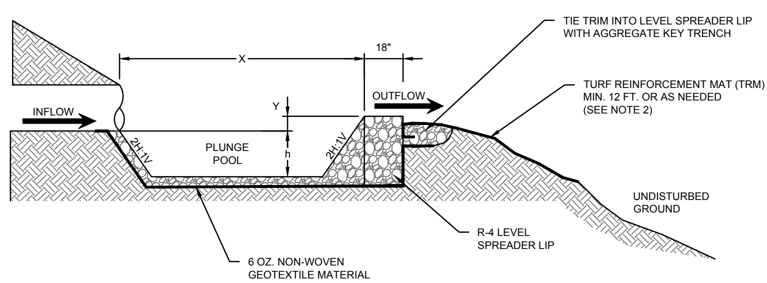
UPON STABILIZATION OF THE AREA TRIBUTARY TO THE SOCK, STAKES SHALL BE REMOVED. THE SOCK MAY BE LEFT IN PLACE AND VEGETATED OR REMOVED. IN THE LATTER CASE, THE MESH SHALL BE CUT OPEN AND THE MULCH SPREAD AS A SOIL SUPPLEMENT.

STANDARD CONSTRUCTION DETAIL #4-1
COMPOST FILTER SOCK

NOT TO SCALE



PLAN VIEW



PROFILE VIEW

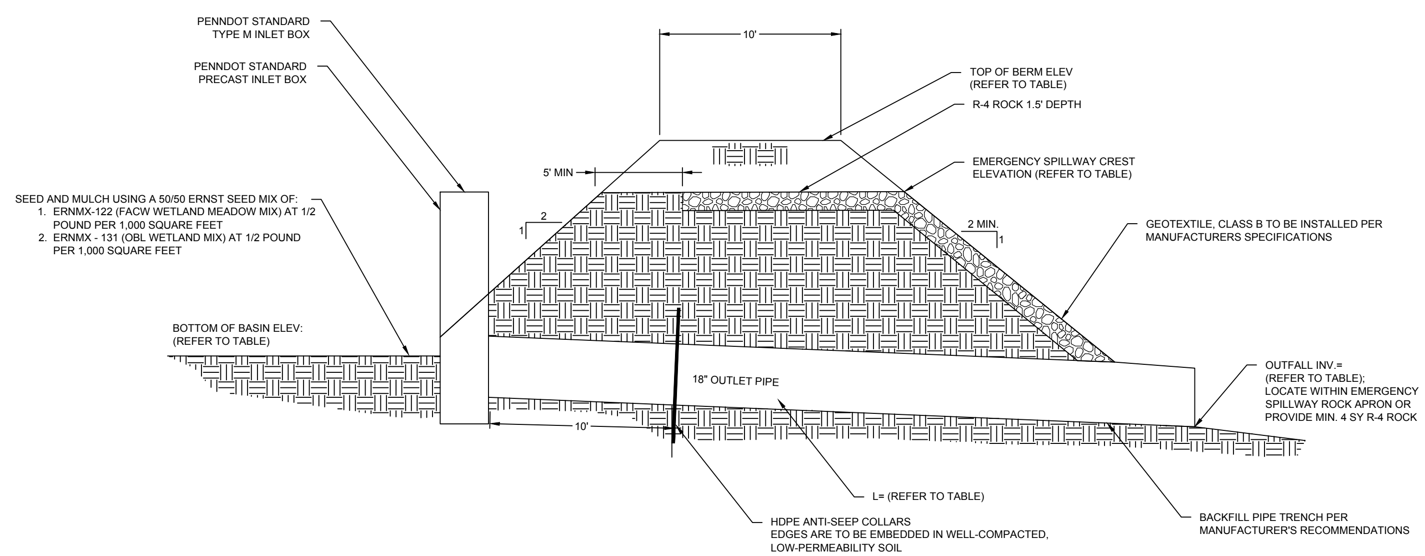
LEVEL SPREADER ID	LEVEL SPREADER LENGTH, L(FT)	PLUNGE POOL LENGTH, X (FT)	PLUNGE POOL HEIGHT, h (FT)	VERTICAL SEPERATION Y(FT)
1	49	6	1.5	0.75
2	27	6	1.5	0.75
3	39	6	1.5	0.75

NOTES:

1. UNDERLYING SOILS TO REMAIN UNDISTURBED, COMPACTED AND PROTECTED FROM HEAVY EQUIPMENT TO PRESERVE INFILTRATION CAPACITY.
2. LEVEL SPREADER TO BE INSTALLED COMPLETELY LEVEL ALONG THE EXISTING CONTOUR WITH A SMOOTH TRANSITION BETWEEN THE LEVEL SPREADER AND THE EXISTING GRADE. THE IDEAL ELEVATION OF THE LEVEL SPREADER LIP IS 3 INCHES ABOVE THE EXISTING GRADE.
3. THE MINIMUM WIDTH OF 12' OF TURF REINFORCEMENT MAT (TRM) IS TO BE INSTALLED IMMEDIATELY DOWNSLOPE OF THE LEVEL SPREADER LIP. CONTRACTOR TO INSTALL ADDITIONAL TRM AS NECESSARY BASED ON EXISTING SITE CONDITIONS TO ADEQUATELY STABILIZE THE DOWNSLOPE AREA.

PERMANENT LEVEL SPREADER

N.T.S.



SECTION B-B'

EMERGENCY SPILLWAY & OUTLET STRUCTURE

N.T.S.

BASIN NO.	TOP OF BERM ELEVATION	EMERGENCY SPILLWAY ELEVATION	EMERGENCY SPILLWAY WIDTH (LF)	BASIN BOTTOM ELEVATION	18" OUTLET PIPE INV.	OUTFALL INV. ELEVATION	OUTLET BARREL (LF)	TOP OF RISER ELEVATION	CIRC. ORIFICE INV. ELEVATION	CIRC. ORIFICE DIAMETER (IN)	REC. ORIFICE INV. ELEVATION	REC. ORIFICE DIMENSIONS (IN)
1	1080.0	1078.5	8.0	1076.0	1074.5	1072.5	40	1078.0	1076.0	6	1077.0	6 X 12
2	1056.0	1054.5	12.0	1052.0	1050.5	1049.0	62	1054.0	1052.0	6	1053.0	6 X 6

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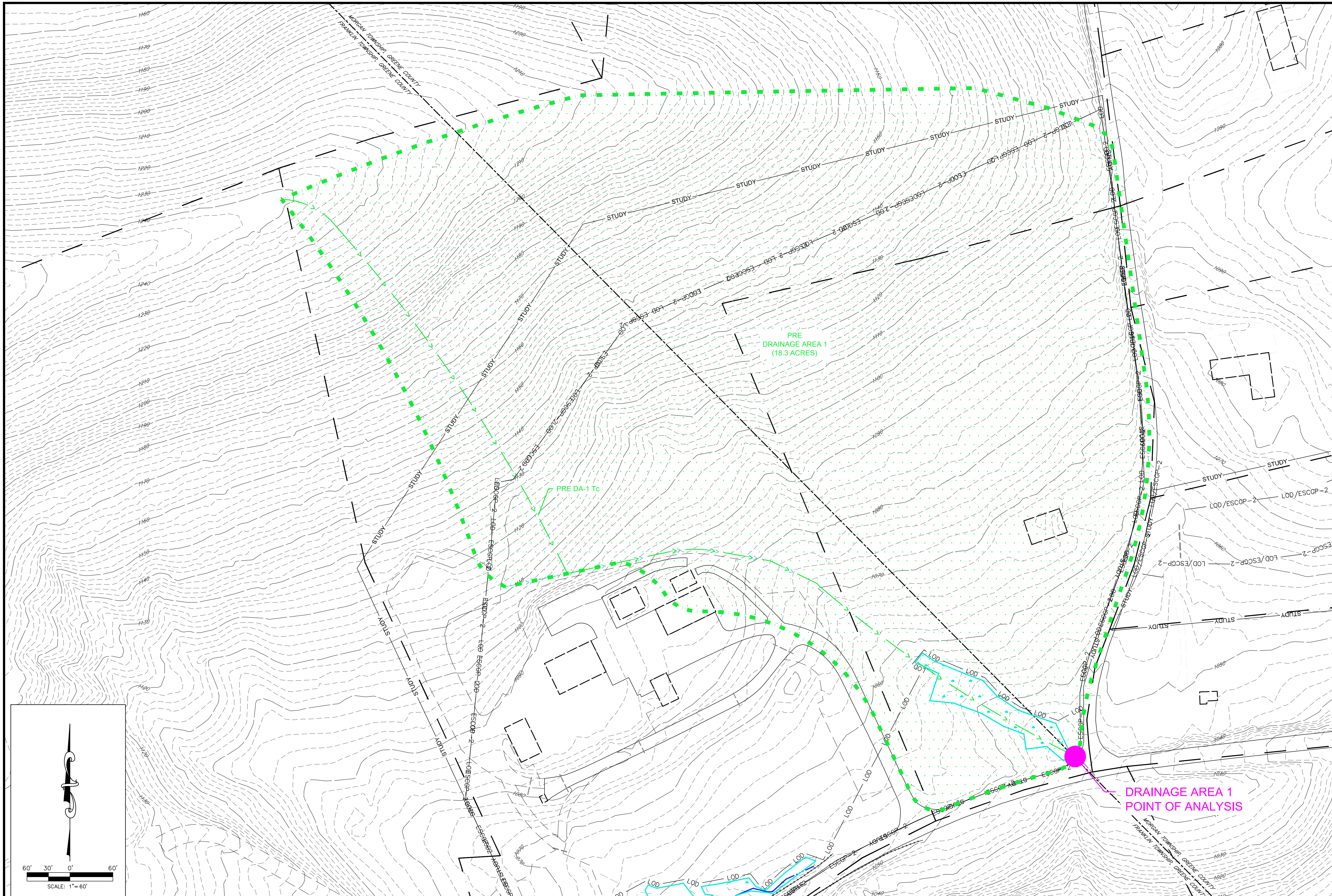
SHEET: 17

DRAWING DESC.: NOTES & DETAILS

SHEET NO. 17OF 17 REV.: 0

APPENDIX C

DRAINAGE AREA MAPS



URS
FOSTER PLAZA 6
681 ANDERSEN DRIVE
SUITE 400
PITTSBURGH, PA 15220

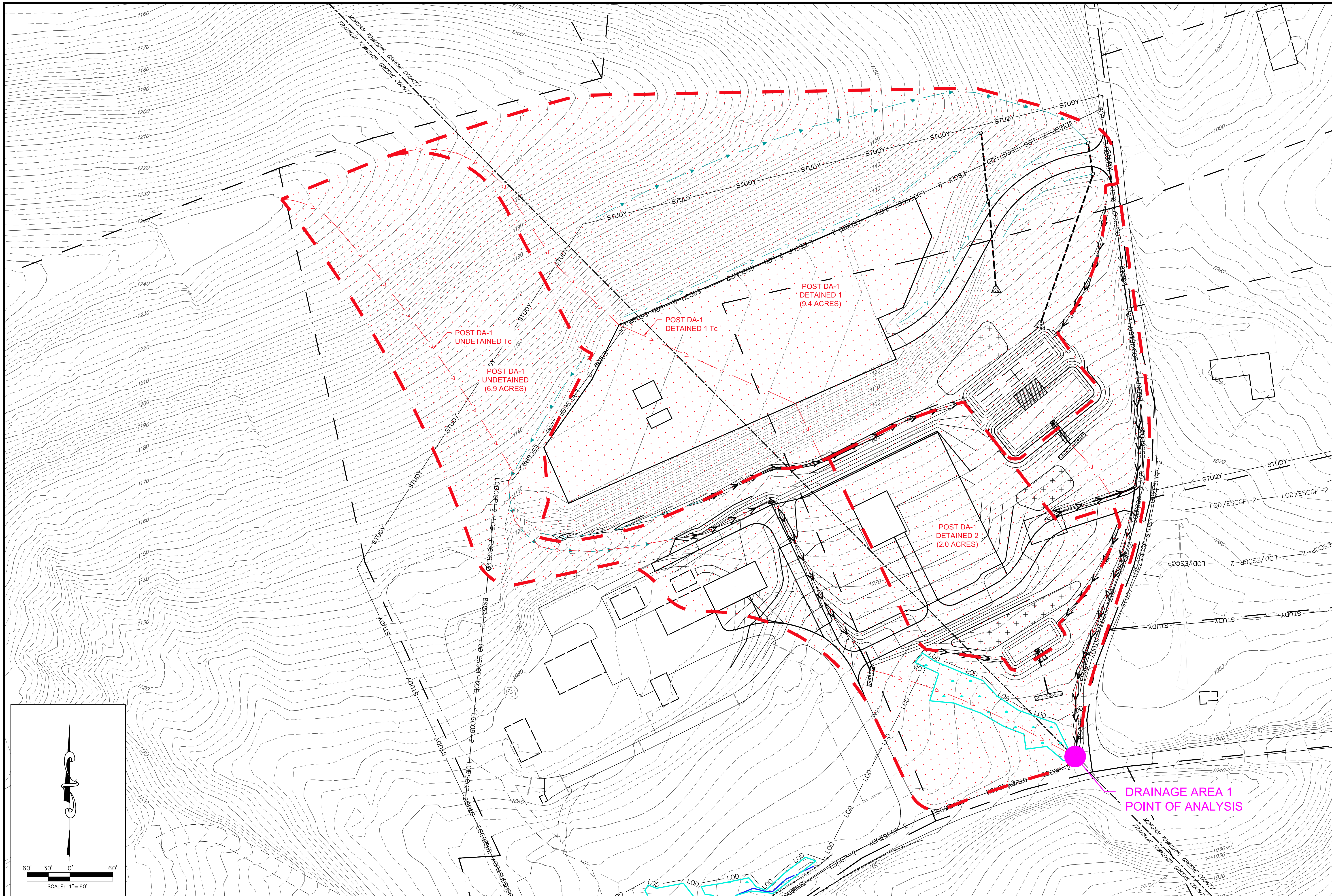
DTI - NATRIUM TO MARKET PROJECT
FRANKLIN & MORGAN TOWNSHIPS, GREENE COUNTY, PA
DRAINAGE PLAN

PRE-DEVELOPMENT DRAINAGE MAP

REVISIONS

DATE	DESCRIPTION	APPROVED

HORZ. SCALE:	AS SHOWN
DRAWN BY:	RFH
DRAFTING CK:	ARZ
ENGINEERING CK:	ARZ
CONSTRUCTION CK:	-
ENVIRONMENTAL CK:	-
DATE:	OCTOBER 2013
URS PROJECT NO.:	39940093
DRAWING NO.:	PRE-DRN
SHEET 1 OF 2	REV. 0



URS
FOSTER PLAZA 6
681 ANDERSEN DRIVE
SUITE 400
PITTSBURGH, PA 15220

DTI - NATRIUM TO MARKET PROJECT
FRANKLIN & MORGAN TOWNSHIPS, GREENE COUNTY, PA
DRAINAGE PLAN

POST-DEVELOPMENT DRAINAGE MAP

REVISIONS		
DATE	DESCRIPTION	APPROVED

HORZ. SCALE:	AS SHOWN
DRAWN BY:	RFH
DRAFTING CK:	ARZ
ENGINEERING CK:	ARZ
CONSTRUCTION CK:	
ENVIRONMENTAL CK:	
DATE: OCTOBER 2013	
URS PROJECT NO.: 39940093	
DRAWING NO.: POST-DRN	
SHEET 2 OF 2	REV. 0

APPENDIX D

STORMWATER DESIGN CALCULATIONS

URS

PROJECT NAME: Natrium to Market
LOCATION: Franklin & Morgan Twps, Greene County
PREPARED BY: RFH DATE: 9/11/2013

STORMWATER MANAGEMENT WORKSHEET #1

General Site Information

WATERSHED INFORMATION:

Is this project located in a:

Special Protection (HQ or EV) watershed? NO

Siltation Impaired watershed? NO

Municipal Separate Storm Sewer System (MS4)? NO

Watershed with an Act 167 Stormwater Management Plan approved by PADEP after Jan. 2005? NO

Act 167 SWM release rate district? NO

If yes, what are the release rates for each design storm?

DESIGN STORM RAINFALL DEPTHS:

**24-hour Rainfall Depths obtained from NOAA's National Weather Service Precipitation Frequency Data Server.*

Return Period	Depth	Unit
1-yr	2.0	inches
2-yr	2.4	inches
5-yr	2.9	inches
10-yr	3.4	inches
25-yr	4.0	inches
50-yr	4.4	inches
100-yr	5.0	inches

SOILS DATA:

**Soil data obtained from USDA - NRCS Soil Survey Geographic (SSURGO) database*

Map Unit	Soil Type	Slope	HSG
DoC	Dormont Silt Loam	8-15%	C
DtD	Dormont -Culleoka Silt Loam	15-25%	C
DtF	Dormont-Culleoka Silt Loam	25-150%	C
GdB	Glenford Silt Loam	3-8%	C

NOAA Atlas 14, Volume 2, Version 3
Location name: Waynesburg, Pennsylvania, US*
Coordinates: 39.9194, -80.1214
Elevation: 1046ft*
* source: Google Maps

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	0.313 (0.283–0.348)	0.373 (0.338–0.414)	0.451 (0.407–0.499)	0.510 (0.460–0.564)	0.586 (0.527–0.647)	0.644 (0.576–0.709)	0.699 (0.622–0.769)	0.755 (0.670–0.830)	0.829 (0.732–0.910)	0.883 (0.776–0.969)
10-min	0.487 (0.439–0.540)	0.583 (0.527–0.646)	0.701 (0.633–0.776)	0.787 (0.710–0.871)	0.896 (0.806–0.989)	0.976 (0.873–1.08)	1.05 (0.937–1.16)	1.13 (1.00–1.24)	1.22 (1.08–1.34)	1.29 (1.13–1.41)
15-min	0.597 (0.539–0.662)	0.713 (0.644–0.790)	0.861 (0.778–0.953)	0.968 (0.873–1.07)	1.11 (0.995–1.22)	1.21 (1.08–1.33)	1.31 (1.16–1.44)	1.40 (1.24–1.54)	1.52 (1.34–1.67)	1.61 (1.41–1.76)
30-min	0.790 (0.713–0.876)	0.954 (0.862–1.06)	1.18 (1.07–1.31)	1.35 (1.21–1.49)	1.56 (1.41–1.73)	1.73 (1.55–1.90)	1.89 (1.68–2.08)	2.05 (1.82–2.25)	2.25 (1.99–2.47)	2.41 (2.12–2.64)
60-min	0.964 (0.870–1.07)	1.17 (1.06–1.30)	1.48 (1.34–1.64)	1.71 (1.54–1.89)	2.03 (1.82–2.24)	2.28 (2.04–2.51)	2.52 (2.25–2.78)	2.78 (2.46–3.05)	3.12 (2.75–3.42)	3.38 (2.97–3.71)
2-hr	1.11 (1.01–1.23)	1.35 (1.22–1.50)	1.70 (1.54–1.88)	1.97 (1.78–2.17)	2.34 (2.10–2.57)	2.63 (2.36–2.90)	2.94 (2.62–3.22)	3.25 (2.88–3.55)	3.67 (3.23–4.01)	4.00 (3.50–4.36)
3-hr	1.19 (1.08–1.31)	1.43 (1.30–1.59)	1.80 (1.63–1.98)	2.09 (1.89–2.30)	2.48 (2.24–2.73)	2.80 (2.52–3.08)	3.14 (2.80–3.43)	3.48 (3.09–3.80)	3.95 (3.48–4.30)	4.33 (3.79–4.70)
6-hr	1.42 (1.30–1.56)	1.71 (1.56–1.88)	2.12 (1.94–2.33)	2.46 (2.25–2.70)	2.94 (2.67–3.21)	3.32 (3.00–3.62)	3.73 (3.35–4.04)	4.15 (3.71–4.49)	4.74 (4.20–5.12)	5.22 (4.58–5.61)
12-hr	1.68 (1.55–1.84)	2.00 (1.84–2.19)	2.47 (2.26–2.69)	2.85 (2.60–3.10)	3.39 (3.09–3.67)	3.84 (3.48–4.15)	4.31 (3.88–4.65)	4.81 (4.31–5.16)	5.52 (4.89–5.90)	6.08 (5.35–6.49)
24-hr	2.01 (1.88–2.16)	2.39 (2.24–2.57)	2.92 (2.73–3.13)	3.35 (3.12–3.58)	3.95 (3.67–4.22)	4.44 (4.12–4.74)	4.96 (4.58–5.27)	5.49 (5.05–5.83)	6.24 (5.71–6.61)	6.84 (6.22–7.23)
2-day	2.36 (2.21–2.53)	2.80 (2.63–3.01)	3.39 (3.17–3.63)	3.85 (3.61–4.13)	4.51 (4.21–4.82)	5.03 (4.68–5.37)	5.57 (5.17–5.94)	6.13 (5.67–6.52)	6.89 (6.34–7.32)	7.49 (6.86–7.95)
3-day	2.53 (2.38–2.71)	3.00 (2.82–3.21)	3.61 (3.39–3.85)	4.09 (3.84–4.36)	4.76 (4.45–5.07)	5.29 (4.94–5.63)	5.84 (5.43–6.20)	6.39 (5.93–6.78)	7.15 (6.60–7.58)	7.75 (7.11–8.21)
4-day	2.71 (2.55–2.88)	3.21 (3.02–3.42)	3.83 (3.60–4.07)	4.32 (4.06–4.59)	5.01 (4.69–5.32)	5.55 (5.19–5.88)	6.10 (5.69–6.46)	6.66 (6.19–7.05)	7.41 (6.86–7.84)	8.00 (7.37–8.47)
7-day	3.24 (3.07–3.42)	3.82 (3.62–4.04)	4.50 (4.26–4.75)	5.03 (4.76–5.31)	5.75 (5.43–6.07)	6.31 (5.95–6.65)	6.87 (6.45–7.23)	7.43 (6.96–7.81)	8.16 (7.62–8.58)	8.71 (8.10–9.15)
10-day	3.74 (3.55–3.94)	4.40 (4.18–4.64)	5.13 (4.86–5.41)	5.70 (5.40–6.01)	6.46 (6.11–6.81)	7.04 (6.65–7.42)	7.62 (7.17–8.02)	8.19 (7.69–8.61)	8.92 (8.35–9.38)	9.46 (8.84–9.95)
20-day	5.26 (5.00–5.53)	6.16 (5.86–6.48)	7.09 (6.74–7.45)	7.80 (7.42–8.20)	8.74 (8.30–9.18)	9.44 (8.95–9.91)	10.1 (9.58–10.6)	10.8 (10.2–11.3)	11.6 (10.9–12.2)	12.2 (11.5–12.8)
30-day	6.61 (6.30–6.93)	7.71 (7.36–8.10)	8.79 (8.37–9.23)	9.61 (9.16–10.1)	10.7 (10.2–11.2)	11.5 (10.9–12.0)	12.2 (11.6–12.8)	12.9 (12.3–13.6)	13.9 (13.1–14.5)	14.5 (13.7–15.2)
45-day	8.45 (8.08–8.83)	9.84 (9.41–10.3)	11.1 (10.6–11.6)	12.0 (11.5–12.6)	13.2 (12.6–13.8)	14.1 (13.4–14.7)	14.9 (14.2–15.5)	15.6 (14.9–16.3)	16.5 (15.7–17.3)	17.1 (16.3–17.9)
60-day	10.2 (9.75–10.6)	11.8 (11.3–12.3)	13.2 (12.6–13.8)	14.2 (13.6–14.8)	15.5 (14.9–16.2)	16.4 (15.7–17.1)	17.3 (16.5–18.0)	18.1 (17.3–18.8)	19.0 (18.1–19.8)	19.6 (18.7–20.5)

[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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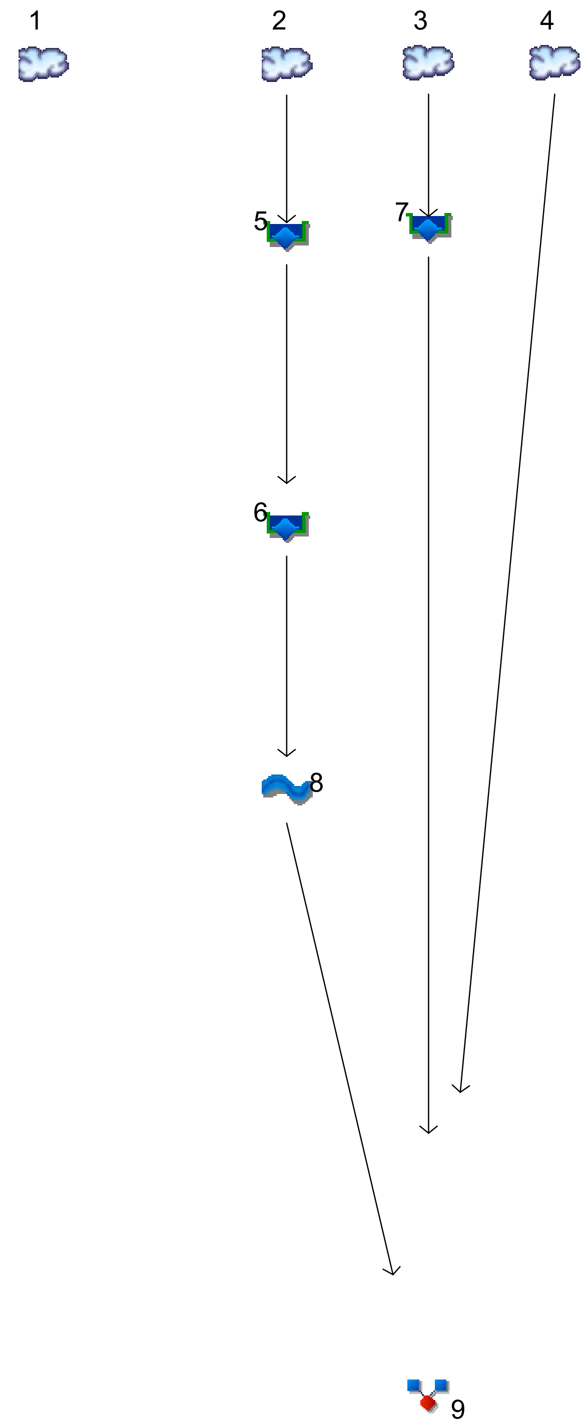
PF graphical

Watershed Model Schematic

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2012 by Autodesk, Inc. v9



Legend

Hyd.	Origin	Description
1	SCS Runoff	Pre DA-1
2	SCS Runoff	Post DA-1 Detained 1
3	SCS Runoff	Post DA-1 Detained 2
4	SCS Runoff	Post DA-1 Undetained
5	Reservoir	Forebay Outflow
6	Reservoir	Basin 1 Outflow
7	Reservoir	Basin 2 Outflow
8	Reach	Basin 1 Reach
9	Combine	Post DA-1

Hydrograph Return Period Recap

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2012 by Autodesk, Inc. v9

Hyd. No.	Hydrograph type (origin)	Inflow hyd(s)	Peak Outflow (cfs)								Hydrograph Description
			1-yr	2-yr	3-yr	5-yr	10-yr	25-yr	50-yr	100-yr	
1	SCS Runoff	------	3.156	6.227	-------	11.60	16.59	24.21	30.85	38.22	Pre DA-1
2	SCS Runoff	------	3.270	5.374	-------	8.714	11.66	16.04	19.80	23.92	Post DA-1 Detained 1
3	SCS Runoff	------	2.245	3.216	-------	4.668	5.903	7.678	9.157	10.75	Post DA-1 Detained 2
4	SCS Runoff	------	2.124	3.597	-------	5.972	8.083	11.23	13.94	16.92	Post DA-1 Undetained
5	Reservoir	2	0.000	0.206	-------	0.992	4.740	12.59	18.40	23.58	Forebay Outflow
6	Reservoir	5	0.000	0.155	-------	0.499	0.906	2.693	6.542	13.11	Basin 1 Outflow
7	Reservoir	3	0.713	1.020	-------	1.717	2.304	6.049	8.304	10.31	Basin 2 Outflow
8	Reach	6	0.000	0.155	-------	0.499	0.906	2.692	6.496	13.05	Basin 1 Reach
9	Combine	4, 7, 8	0.000	4.556	-------	7.583	10.08	14.77	18.56	23.58	Post DA-1

Hydrograph Summary Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2012 by Autodesk, Inc. v9

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to Peak (min)	Hyd. volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (cuft)	Hydrograph Description
1	SCS Runoff	6.227	1	731	29,055	------	------	------	Pre DA-1
2	SCS Runoff	5.374	1	729	21,461	------	------	------	Post DA-1 Detained 1
3	SCS Runoff	3.216	1	718	6,475	------	------	------	Post DA-1 Detained 2
4	SCS Runoff	3.597	1	730	14,711	------	------	------	Post DA-1 Undetained
5	Reservoir	0.206	1	1140	3,775	2	1085.51	17,856	Forebay Outflow
6	Reservoir	0.155	1	1381	3,728	5	1076.24	1,161	Basin 1 Outflow
7	Reservoir	1.020	1	725	6,463	3	1053.19	1,929	Basin 2 Outflow
8	Reach	0.155	1	1383	3,517	6	------	------	Basin 1 Reach
9	Combine	4.556	1	729	24,691	4, 7, 8	------	------	Post DA-1

Hydrograph Report

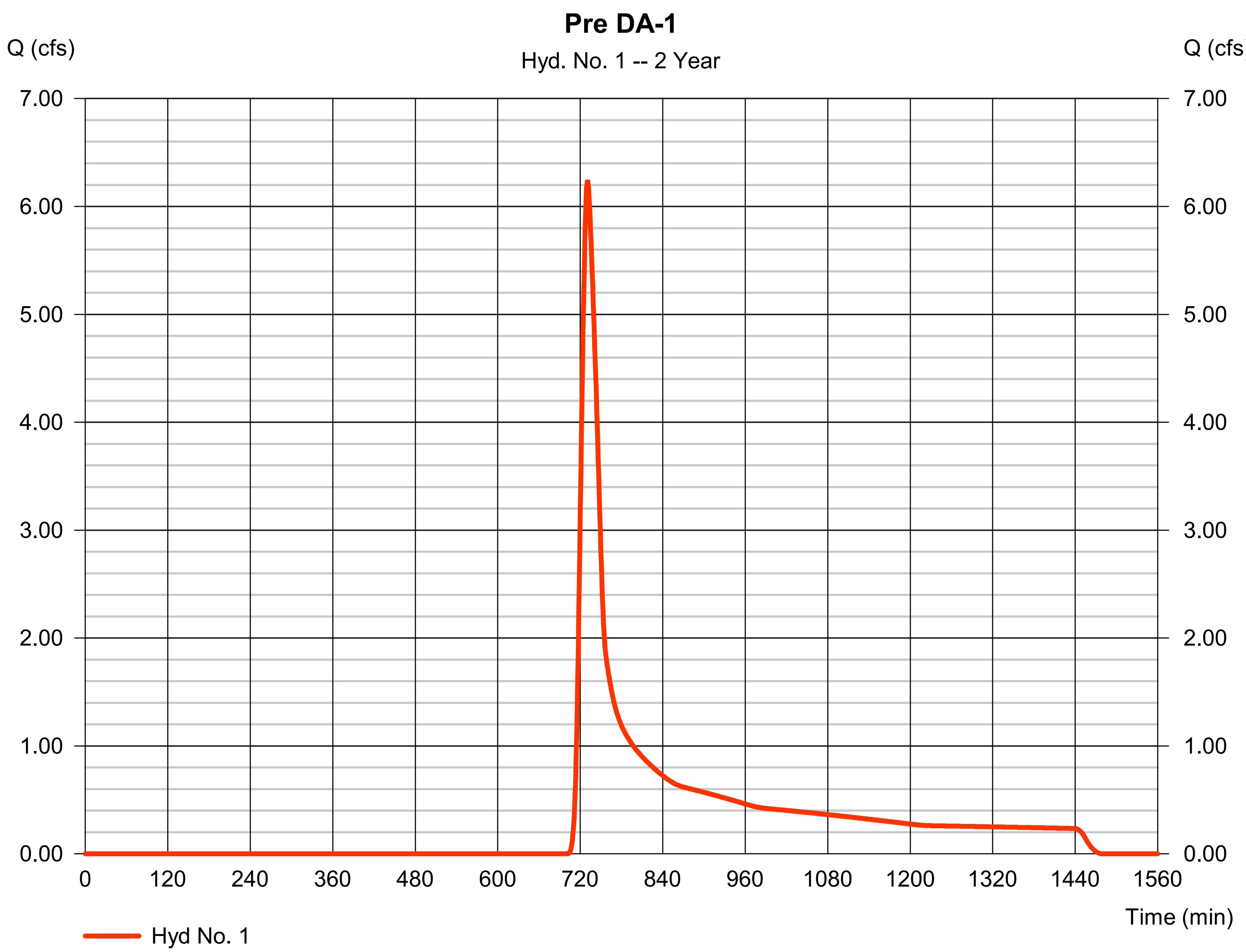
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2012 by Autodesk, Inc. v9 — Tuesday, 00 22, 2013

Hyd. No. 1

Pre DA-1

Hydrograph type	= SCS Runoff	Peak discharge	= 6.227 cfs
Storm frequency	= 2 yrs	Time to peak	= 731 min
Time interval	= 1 min	Hyd. volume	= 29,055 cuft
Drainage area	= 18.300 ac	Curve number	= 71*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 24.60 min
Total precip.	= 2.39 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

* Composite (Area/CN) = [(0.200 x 98) + (0.200 x 89) + (11.200 x 71) + (6.700 x 70)] / 18.300



TR55 Tc Worksheet

Hyd. No. 1

Pre DA-1

Description		A		B		C		Totals
Sheet Flow								
Manning's n-value	=	0.800		0.011		0.011		
Flow length (ft)	=	100.0		0.0		0.0		
Two-year 24-hr precip. (in)	=	2.39		2.39		0.00		
Land slope (%)	=	12.00		0.00		0.00		
Travel Time (min)	**=**	**21.13**	**+**	**0.00**	**+**	**0.00**	**=**	**21.13**
Shallow Concentrated Flow								
Flow length (ft)	=	573.00		429.00		0.00		
Watercourse slope (%)	=	22.00		6.00		0.00		
Surface description	=	Unpaved		Unpaved		Paved		
Average velocity (ft/s)	=7.57			3.95		0.00		
Travel Time (min)	**=**	**1.26**	**+**	**1.81**	**+**	**0.00**	**=**	**3.07**
Channel Flow								
X sectional flow area (sqft)	=	12.00		0.00		0.00		
Wetted perimeter (ft)	=	10.90		0.00		0.00		
Channel slope (%)	=	8.70		0.00		0.00		
Manning's n-value	=	0.033		0.015		0.015		
Velocity (ft/s)	=14.20							
				0.00				
						0.00		
Flow length (ft)	({0})367.0			0.0		0.0		
Travel Time (min)	**=**	**0.43**	**+**	**0.00**	**+**	**0.00**	**=**	**0.43**
Total Travel Time, Tc								**24.60 min**

Hydrograph Report

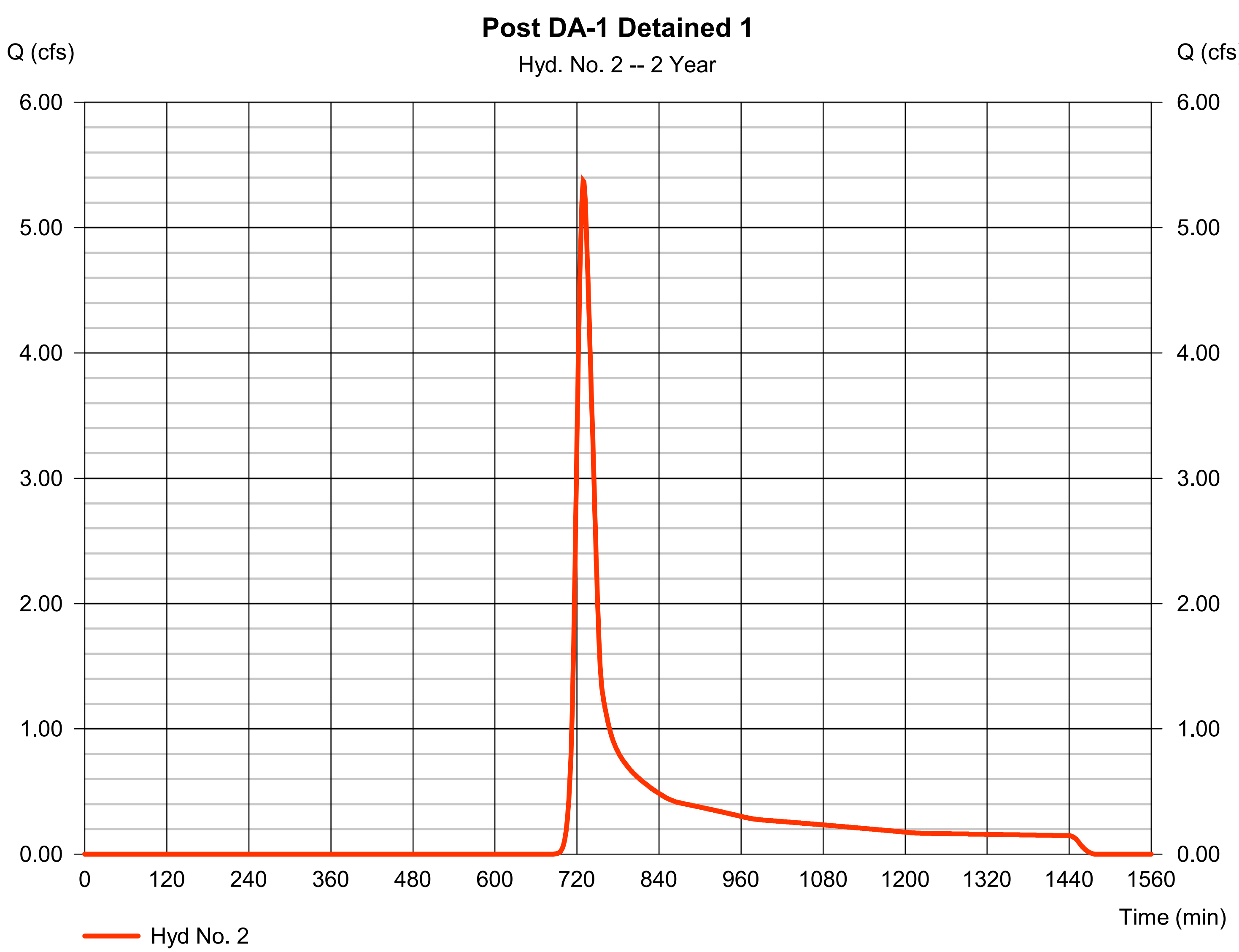
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2012 by Autodesk, Inc. v9 — Tuesday, 00 22, 2013

Hyd. No. 2

Post DA-1 Detained 1

Hydrograph type	= SCS Runoff	Peak discharge	= 5.374 cfs
Storm frequency	= 2 yrs	Time to peak	= 729 min
Time interval	= 1 min	Hyd. volume	= 21,461 cuft
Drainage area	= 9.400 ac	Curve number	= 76*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 23.90 min
Total precip.	= 2.39 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

* Composite (Area/CN) = [(0.200 x 98) + (2.300 x 89) + (6.000 x 71) + (0.900 x 70)] / 9.400



TR55 Tc Worksheet

Hyd. No. 2

Post DA-1 Detained 1

Description		A		B		C		Totals
Sheet Flow								
Manning's n-value	=	0.800		0.011		0.011		
Flow length (ft)	=	100.0		0.0		0.0		
Two-year 24-hr precip. (in)	=	2.39		0.00		0.00		
Land slope (%)	=	12.00		0.00		0.00		
Travel Time (min)	**=**	**21.13**	**+**	**0.00**	**+**	**0.00**	**=**	**21.13**
Shallow Concentrated Flow								
Flow length (ft)	=	332.00		270.00		88.00		
Watercourse slope (%)	=	26.00		3.00		38.00		
Surface description	=	Unpaved		Paved		Unpaved		
Average velocity (ft/s)		=8.23		3.52		9.95		
Travel Time (min)	**=**	**0.67**	**+**	**1.28**	**+**	**0.15**	**=**	**2.10**
Channel Flow								
X sectional flow area (sqft)	=	12.00		0.00		0.00		
Wetted perimeter (ft)	=	10.90		0.00		0.00		
Channel slope (%)	=	1.40		0.00		0.00		
Manning's n-value	=	0.033		0.015		0.015		
Velocity (ft/s)		=5.70						
				0.00				
						0.00		
Flow length (ft)		({0})222.0		0.0		0.0		
Travel Time (min)	**=**	**0.65**	**+**	**0.00**	**+**	**0.00**	**=**	**0.65**

Total Travel Time, Tc .... 23.90 min

Hydrograph Report

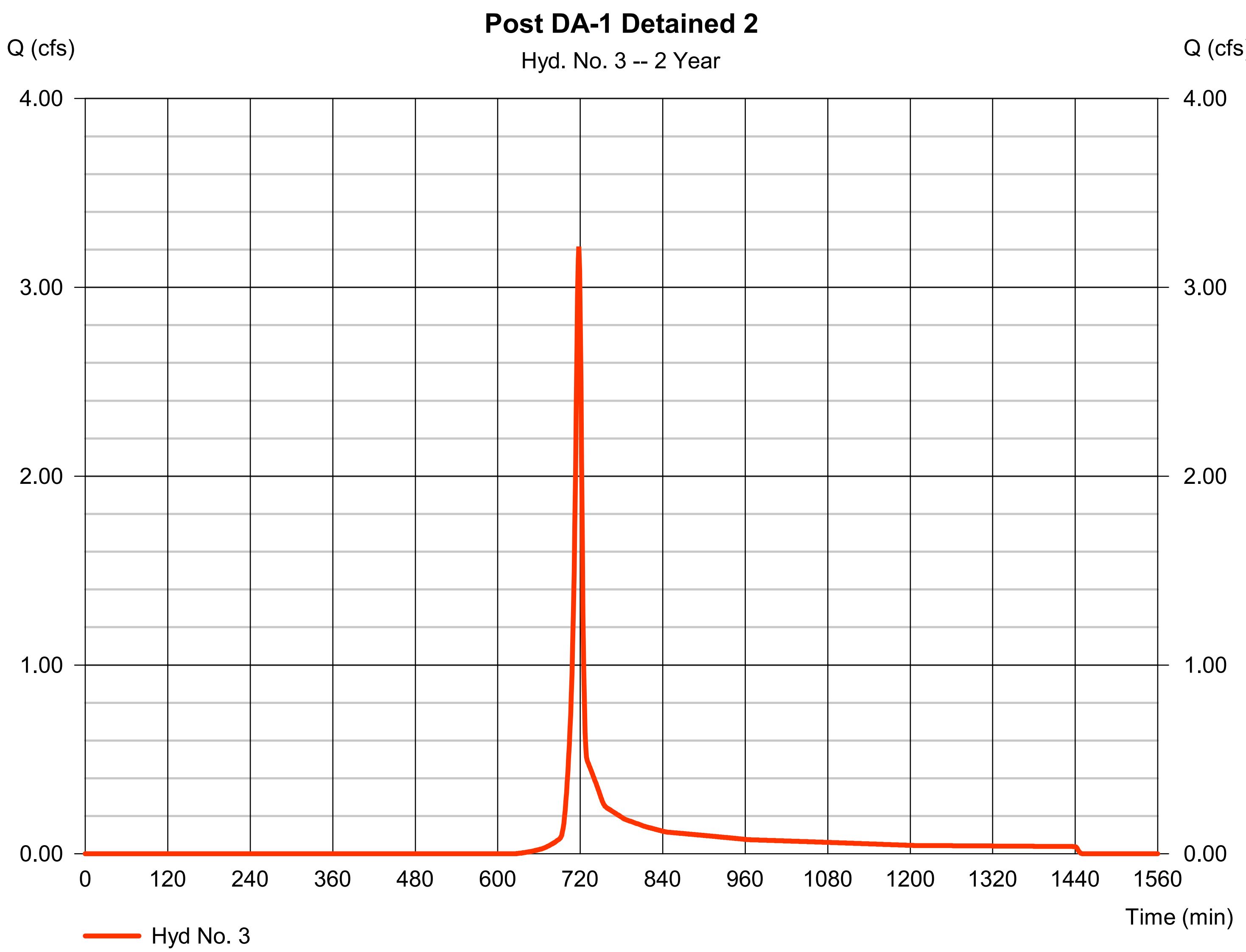
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2012 by Autodesk, Inc. v9 — Tuesday, 00 22, 2013

Hyd. No. 3

Post DA-1 Detained 2

Hydrograph type	= SCS Runoff	Peak discharge	= 3.216 cfs
Storm frequency	= 2 yrs	Time to peak	= 718 min
Time interval	= 1 min	Hyd. volume	= 6,475 cuft
Drainage area	= 2.000 ac	Curve number	= 81*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 5.00 min
Total precip.	= 2.39 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

* Composite (Area/CN) = [(0.300 x 98) + (0.700 x 89) + (1.000 x 71)] / 2.000



Hydrograph Report

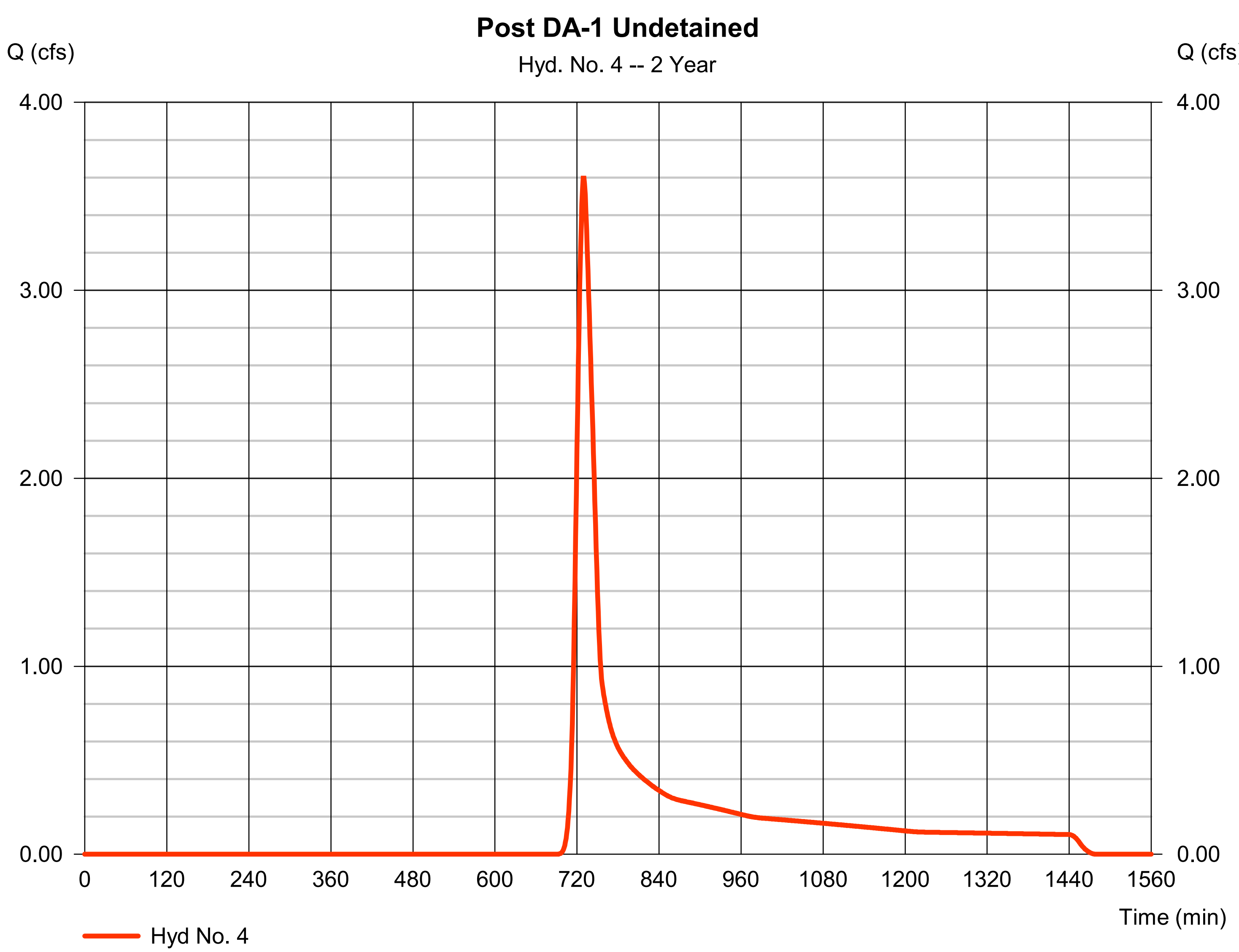
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2012 by Autodesk, Inc. v9 Tuesday, 00 22, 2013

Hyd. No. 4

Post DA-1 Undetained

Hydrograph type	= SCS Runoff	Peak discharge	= 3.597 cfs
Storm frequency	= 2 yrs	Time to peak	= 730 min
Time interval	= 1 min	Hyd. volume	= 14,711 cuft
Drainage area	= 6.900 ac	Curve number	= 75*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 24.20 min
Total precip.	= 2.39 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

* Composite (Area/CN) = [(0.400 x 98) + (0.900 x 89) + (4.100 x 71) + (1.500 x 70)] / 6.900



TR55 Tc Worksheet

Hyd. No. 4

Post DA-1 Undetained

Description		A		B		C		Totals
Sheet Flow								
Manning's n-value	=	0.800		0.011		0.011		
Flow length (ft)	=	100.0		0.0		0.0		
Two-year 24-hr precip. (in)	=	2.39		0.00		0.00		
Land slope (%)	=	12.00		0.00		0.00		
Travel Time (min)	**=**	**21.13**	**+**	**0.00**	**+**	**0.00**	**=**	**21.13**
Shallow Concentrated Flow								
Flow length (ft)	=	412.00		312.00		0.00		
Watercourse slope (%)	=	23.00		5.80		0.00		
Surface description	=	Unpaved		Unpaved		Paved		
Average velocity (ft/s)	=	7.74		3.89		0.00		
Travel Time (min)	**=**	**0.89**	**+**	**1.34**	**+**	**0.00**	**=**	**2.23**
Channel Flow								
X sectional flow area (sqft)	=	12.00		0.00		0.00		
Wetted perimeter (ft)	=	10.90		0.00		0.00		
Channel slope (%)	=	9.60		0.00		0.00		
Manning's n-value	=	0.033		0.015		0.015		
Velocity (ft/s)	=	14.92		0.00		0.00		
Flow length (ft)		({0})732.0		0.0		0.0		
Travel Time (min)	**=**	**0.82**	**+**	**0.00**	**+**	**0.00**	**=**	**0.82**

Total Travel Time, Tc .... **24.20 min**

Hydrograph Report

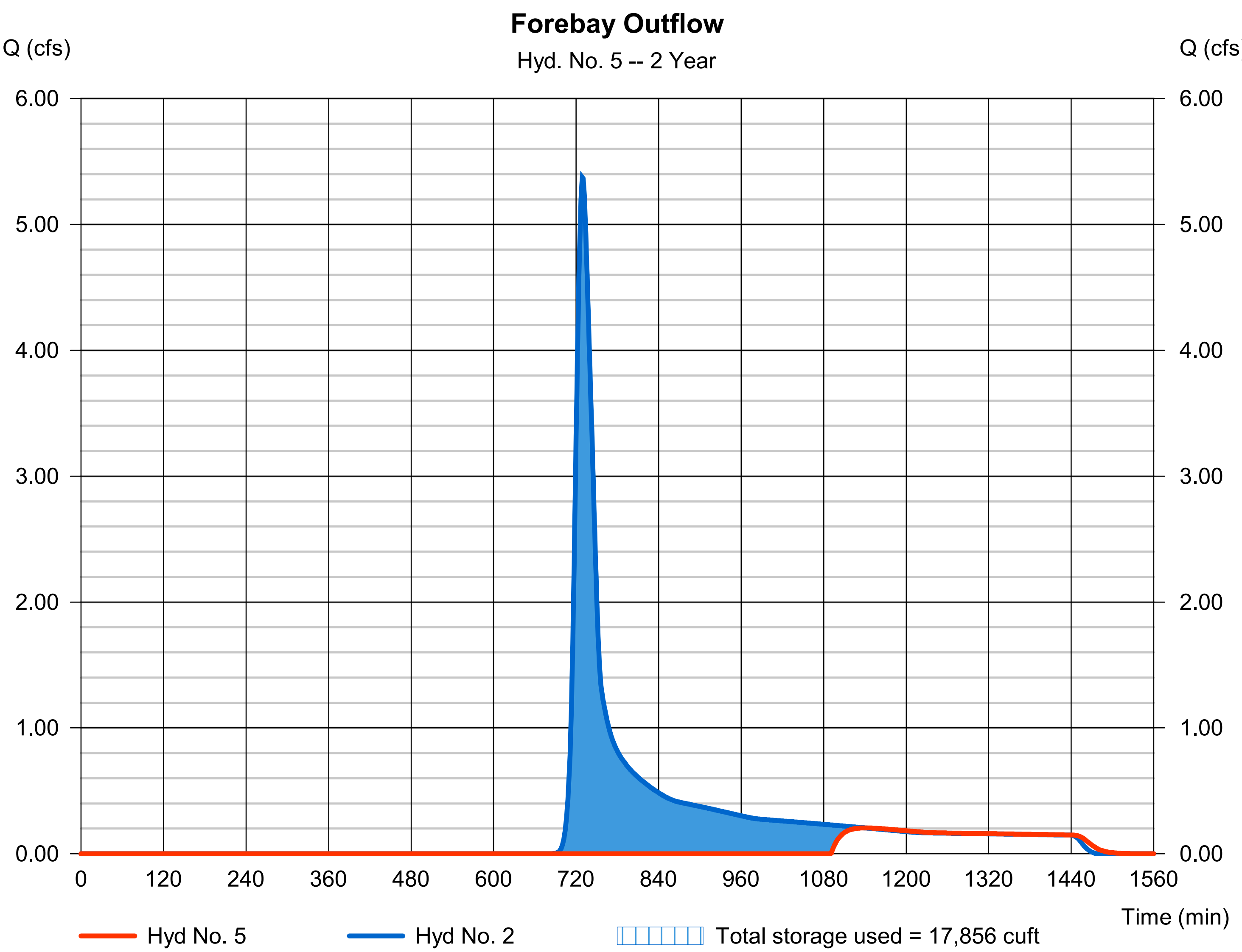
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2012 by Autodesk, Inc. v9 Tuesday, 00 22, 2013

Hyd. No. 5

Forebay Outflow

Hydrograph type	= Reservoir	Peak discharge	= 0.206 cfs
Storm frequency	= 2 yrs	Time to peak	= 1140 min
Time interval	= 1 min	Hyd. volume	= 3,775 cuft
Inflow hyd. No.	= 2 - Post DA-1 Detained 1	Max. Elevation	= 1085.51 ft
Reservoir name	= Forebay	Max. Storage	= 17,856 cuft

Storage Indication method used.



Pond Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2012 by Autodesk, Inc. v9 Tuesday, 00 22, 2013

Pond No. 1 - Forebay

Pond Data

Trapezoid -Bottom L x W = 130.0 x 30.0 ft, Side slope = 2.00:1, Bottom elev. = 1082.00 ft, Depth = 4.00 ft

Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (cuft)	Total storage (cuft)
0.00	1082.00	3,900	0	0
0.40	1082.40	4,159	1,612	1,612
0.80	1082.80	4,422	1,716	3,328
1.20	1083.20	4,691	1,822	5,150
1.60	1083.60	4,965	1,931	7,081
2.00	1084.00	5,244	2,042	9,123
2.40	1084.40	5,528	2,154	11,277
2.80	1084.80	5,817	2,269	13,546
3.20	1085.20	6,112	2,386	15,932
3.60	1085.60	6,411	2,504	18,436
4.00	1086.00	6,716	2,625	21,061

Culvert / Orifice Structures

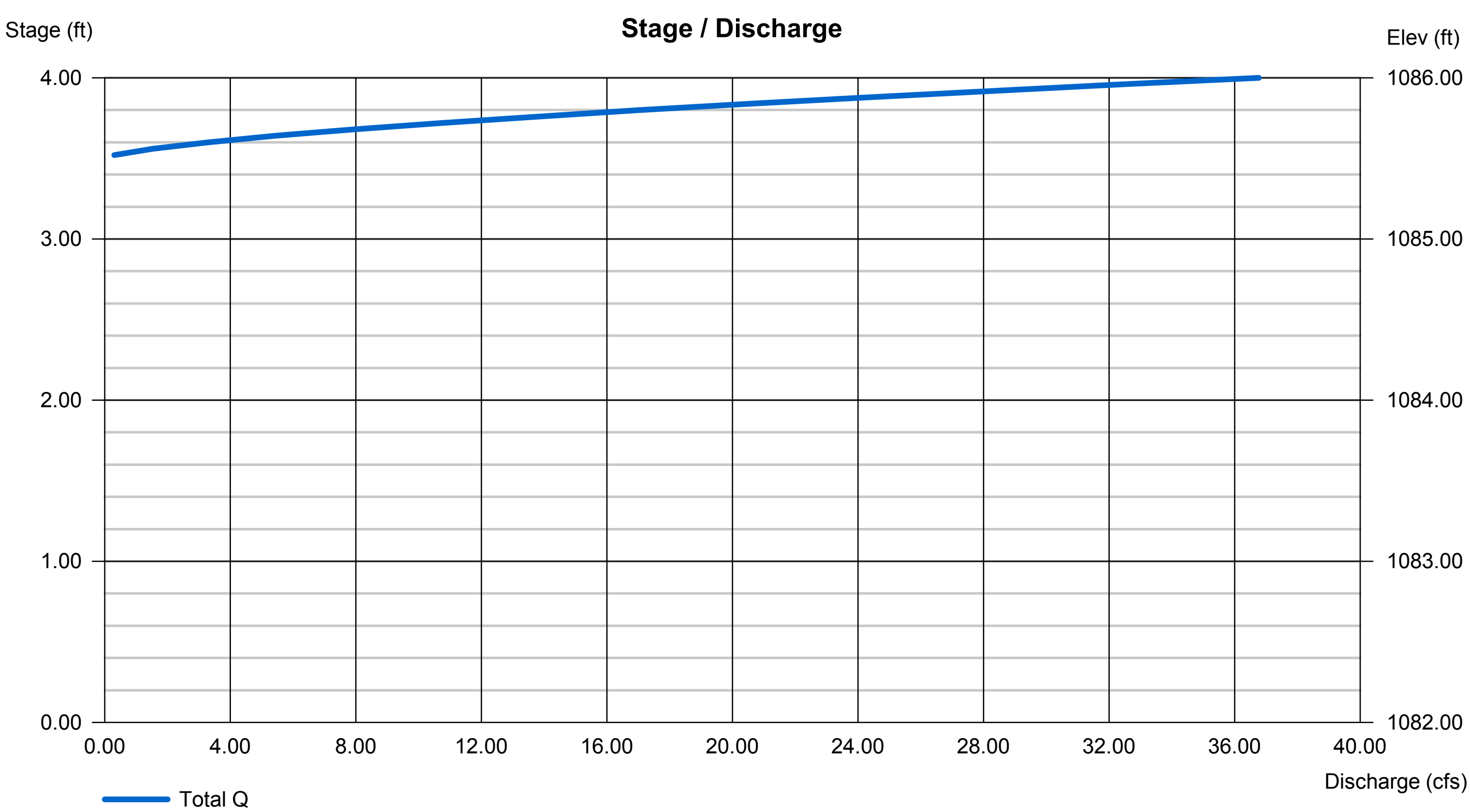
	[A]	[B]	[C]	[PrfRsr]
Rise (in)	= 0.00	0.00	0.00	0.00
Span (in)	= 0.00	0.00	0.00	0.00
No. Barrels	= 0	0	0	0
Invert El. (ft)	= 0.00	0.00	0.00	0.00
Length (ft)	= 0.00	0.00	0.00	0.00
Slope (%)	= 0.00	0.00	0.00	n/a
N-Value	= .013	.013	.013	n/a
Orifice Coeff.	= 0.60	0.60	0.60	0.60
Multi-Stage	= n/a	No	No	No

Weir Structures

	[A]	[B]	[C]	[D]
Crest Len (ft)	= 40.00	0.00	0.00	0.00
Crest El. (ft)	= 1085.50	0.00	0.00	0.00
Weir Coeff.	= 2.60	3.33	3.33	3.33
Weir Type	= Broad	---	---	---
Multi-Stage	= No	No	No	No

Exfil.(in/hr) = 0.000 (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).



Hydrograph Report

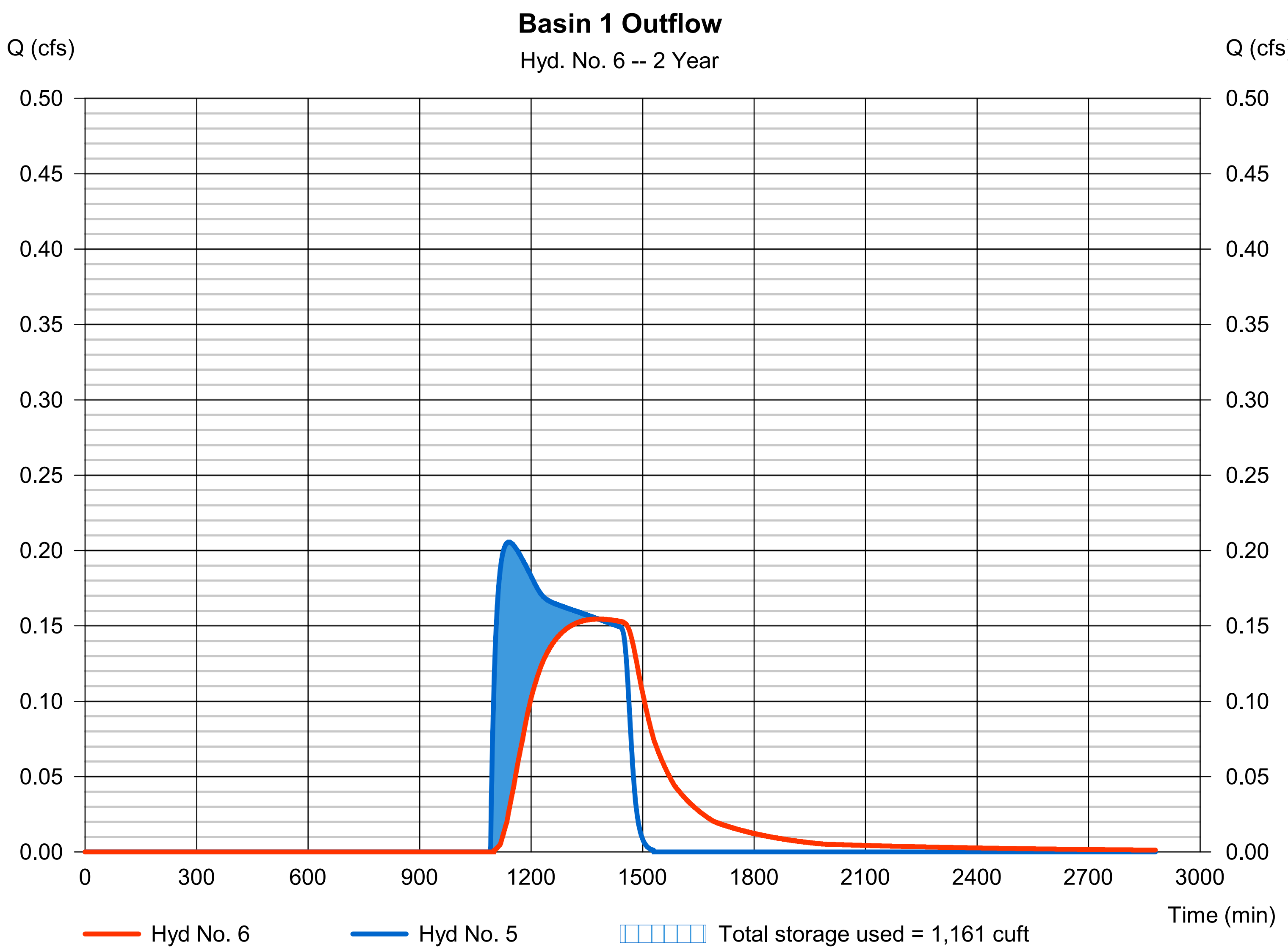
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2012 by Autodesk, Inc. v9 Tuesday, 00 22, 2013

Hyd. No. 6

Basin 1 Outflow

Hydrograph type	= Reservoir	Peak discharge	= 0.155 cfs
Storm frequency	= 2 yrs	Time to peak	= 1381 min
Time interval	= 1 min	Hyd. volume	= 3,728 cuft
Inflow hyd. No.	= 5 - Forebay Outflow	Max. Elevation	= 1076.24 ft
Reservoir name	= Basin 1	Max. Storage	= 1,161 cuft

Storage Indication method used.



Pond Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2012 by Autodesk, Inc. v9 — Tuesday, 00 22, 2013

Pond No. 2 - Basin 1

Pond Data

Trapezoid -Bottom L x W = 130.0 x 35.0 ft, Side slope = 5.00:1, Bottom elev. = 1076.00 ft, Depth = 4.00 ft

Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (cuft)	Total storage (cuft)
0.00	1076.00	4,550	0	0
0.40	1076.40	5,226	1,954	1,954
0.80	1076.80	5,934	2,231	4,185
1.20	1077.20	6,674	2,521	6,706
1.60	1077.60	7,446	2,823	9,529
2.00	1078.00	8,250	3,138	12,667
2.40	1078.40	9,086	3,466	16,133
2.80	1078.80	9,954	3,807	19,940
3.20	1079.20	10,854	4,161	24,100
3.60	1079.60	11,786	4,527	28,627
4.00	1080.00	12,750	4,906	33,533

Culvert / Orifice Structures

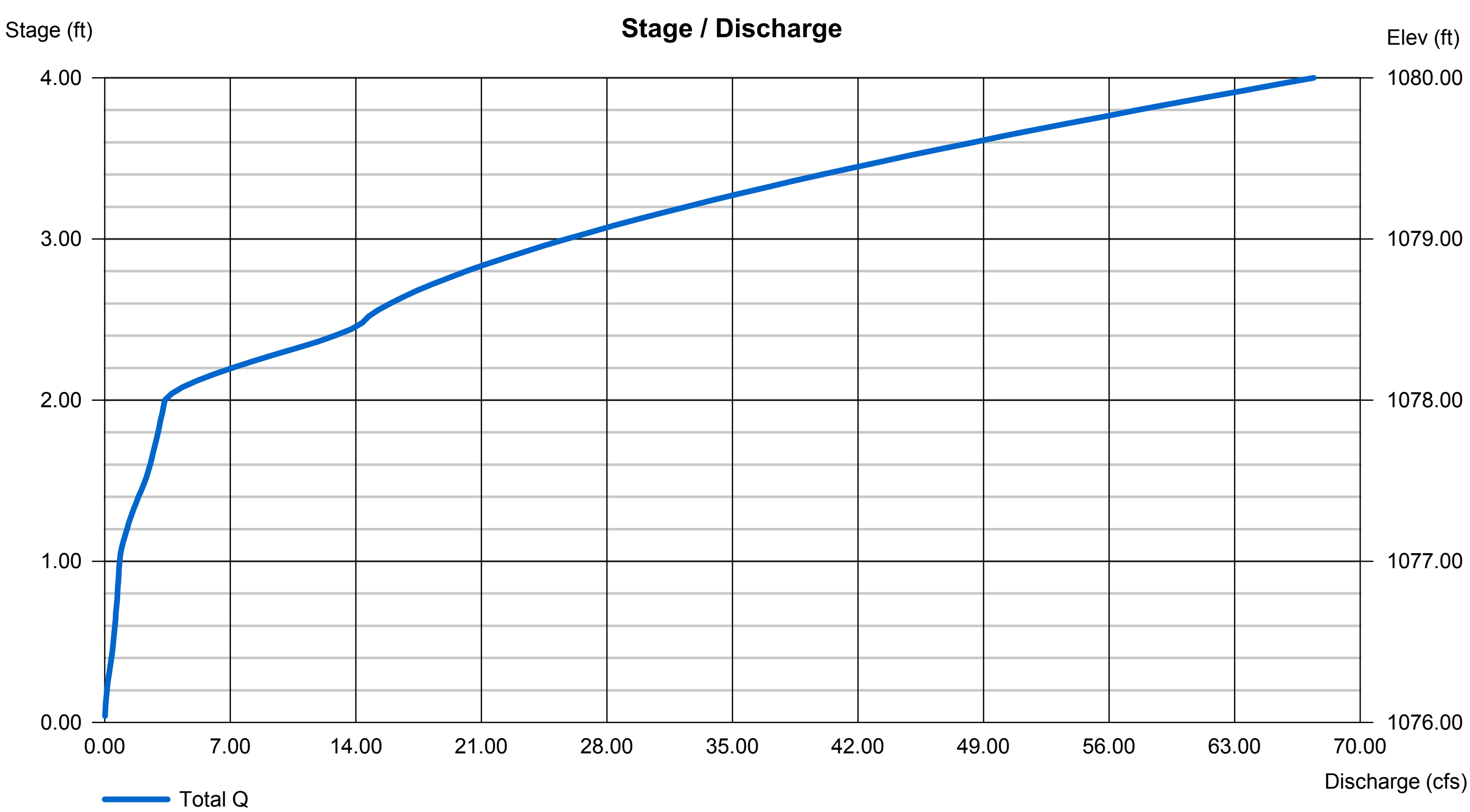
	[A]	[B]	[C]	[PrfRsr]
Rise (in)	= 18.00	6.00	6.00	0.00
Span (in)	= 18.00	6.00	12.00	0.00
No. Barrels	= 1	1	1	0
Invert El. (ft)	= 1074.50	1076.00	1077.00	0.00
Length (ft)	= 40.00	0.50	0.50	0.00
Slope (%)	= 5.00	0.00	0.00	n/a
N-Value	= .013	.013	.013	n/a
Orifice Coeff.	= 0.60	0.60	0.60	0.60
Multi-Stage	= n/a	Yes	Yes	No

Weir Structures

	[A]	[B]	[C]	[D]
Crest Len (ft)	= 11.50	8.00	0.00	0.00
Crest El. (ft)	= 1078.00	1078.50	0.00	0.00
Weir Coeff.	= 3.33	3.33	3.33	3.33
Weir Type	= 1	Broad	---	---
Multi-Stage	= Yes	No	No	No

Exfil.(in/hr) = 0.000 (by Contour)
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).



Hydrograph Report

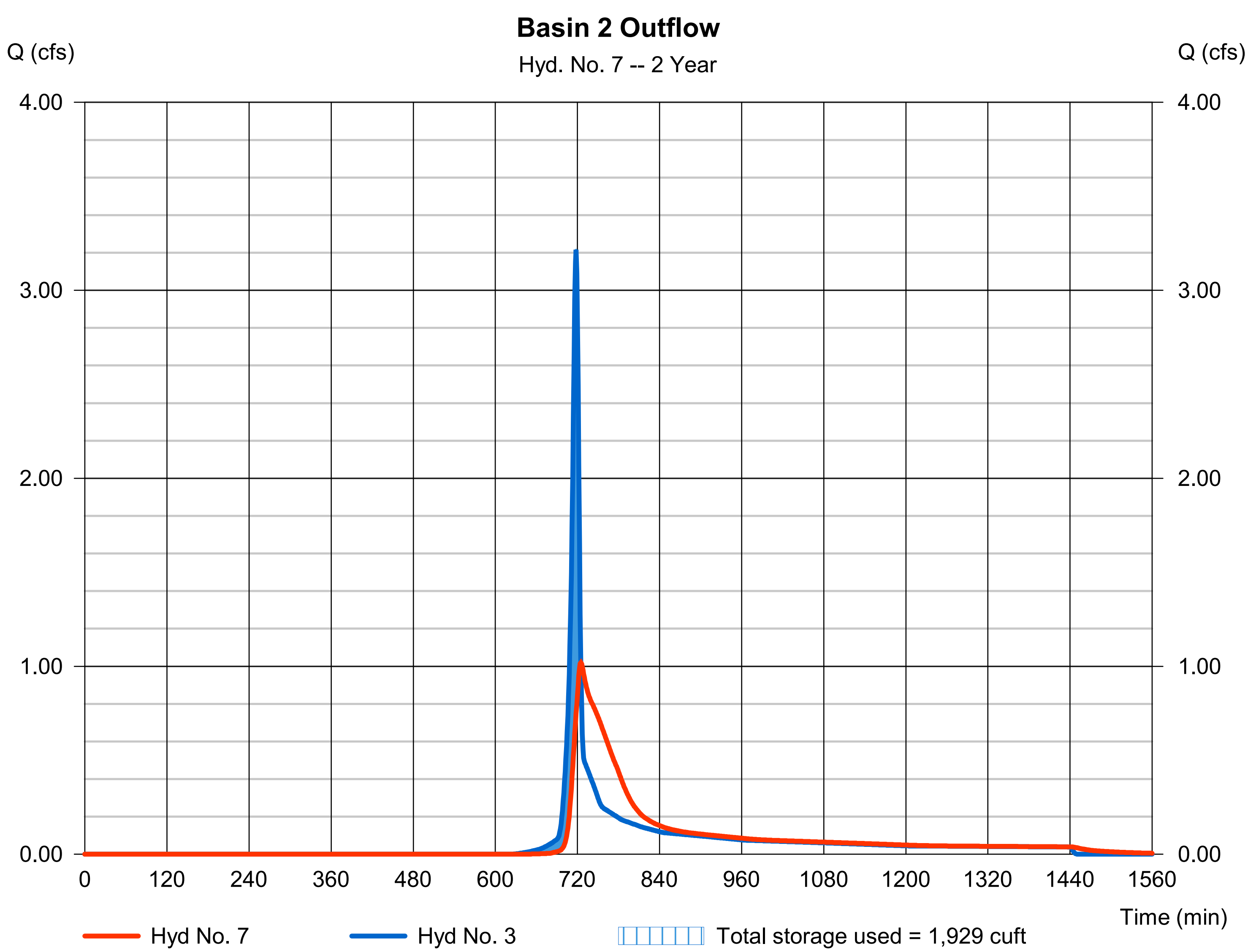
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2012 by Autodesk, Inc. v9 Tuesday, 00 22, 2013

Hyd. No. 7

Basin 2 Outflow

Hydrograph type	= Reservoir	Peak discharge	= 1.020 cfs
Storm frequency	= 2 yrs	Time to peak	= 725 min
Time interval	= 1 min	Hyd. volume	= 6,463 cuft
Inflow hyd. No.	= 3 - Post DA-1 Detained 2	Max. Elevation	= 1053.19 ft
Reservoir name	= Basin 2	Max. Storage	= 1,929 cuft

Storage Indication method used.



Pond Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2012 by Autodesk, Inc. v9 Tuesday, 00 22, 2013

Pond No. 3 - Basin 2

Pond Data

Trapezoid -Bottom L x W = 70.0 x 20.0 ft, Side slope = 2.00:1, Bottom elev. = 1052.00 ft, Depth = 4.00 ft

Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (cuft)	Total storage (cuft)
0.00	1052.00	1,400	0	0
0.40	1052.40	1,547	589	589
0.80	1052.80	1,698	649	1,238
1.20	1053.20	1,855	710	1,948
1.60	1053.60	2,017	774	2,723
2.00	1054.00	2,184	840	3,563
2.40	1054.40	2,356	908	4,471
2.80	1054.80	2,533	978	5,448
3.20	1055.20	2,716	1,050	6,498
3.60	1055.60	2,903	1,124	7,622
4.00	1056.00	3,096	1,200	8,821

Culvert / Orifice Structures

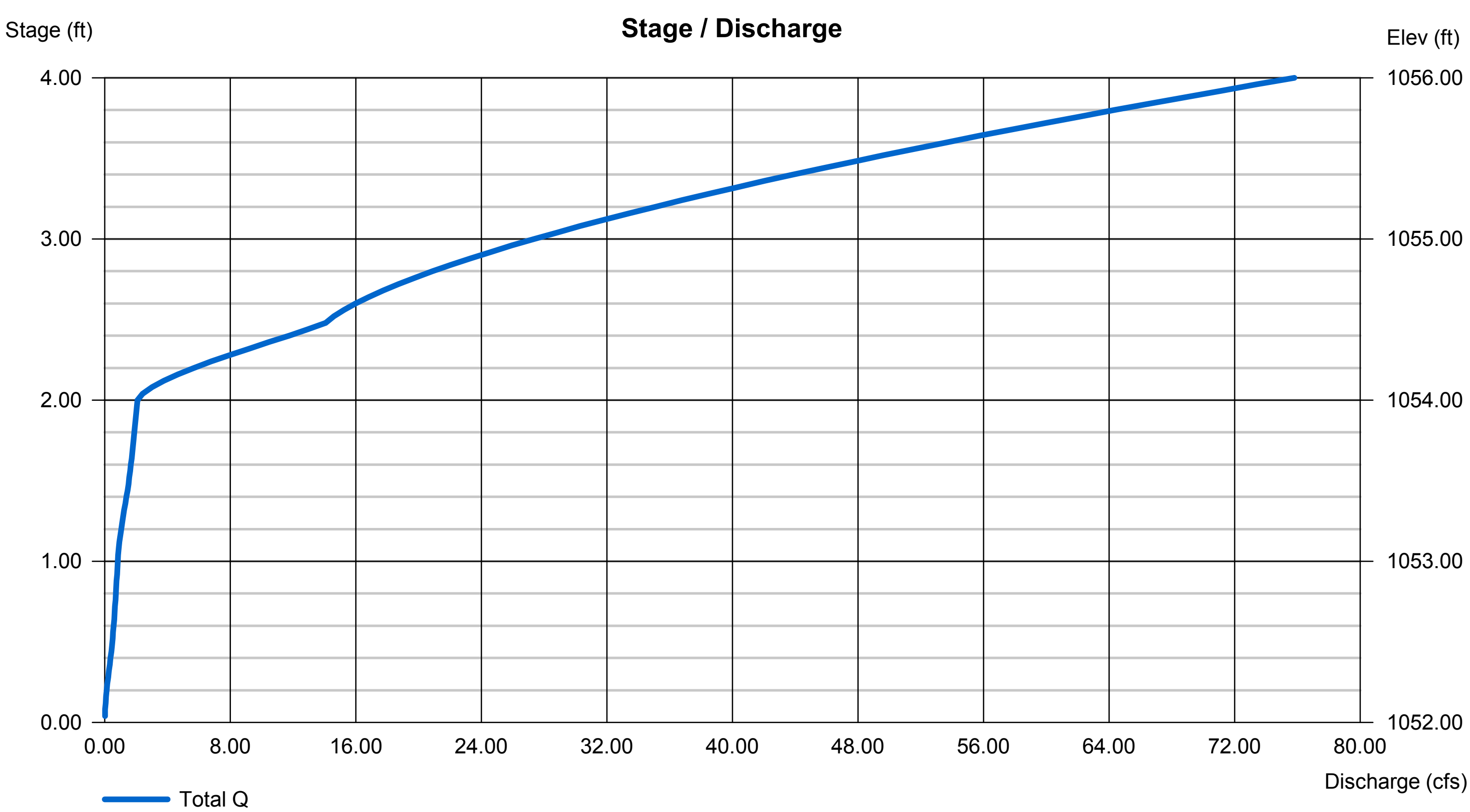
	[A]	[B]	[C]	[PrfRsr]
Rise (in)	= 18.00	6.00	6.00	0.00
Span (in)	= 18.00	6.00	6.00	0.00
No. Barrels	= 1	1	1	0
Invert El. (ft)	= 1050.50	1052.00	1053.00	0.00
Length (ft)	= 62.00	0.50	0.50	0.00
Slope (%)	= 2.40	0.00	0.00	n/a
N-Value	= .013	.013	.013	n/a
Orifice Coeff.	= 0.60	0.60	0.60	0.60
Multi-Stage	= n/a	Yes	Yes	No

Weir Structures

	[A]	[B]	[C]	[D]
Crest Len (ft)	= 11.50	12.00	0.00	0.00
Crest El. (ft)	= 1054.00	1054.50	0.00	0.00
Weir Coeff.	= 3.33	2.60	3.33	3.33
Weir Type	= 1	Broad	---	---
Multi-Stage	= Yes	No	No	No

Exfil.(in/hr) = 0.000 (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).



Hydrograph Report

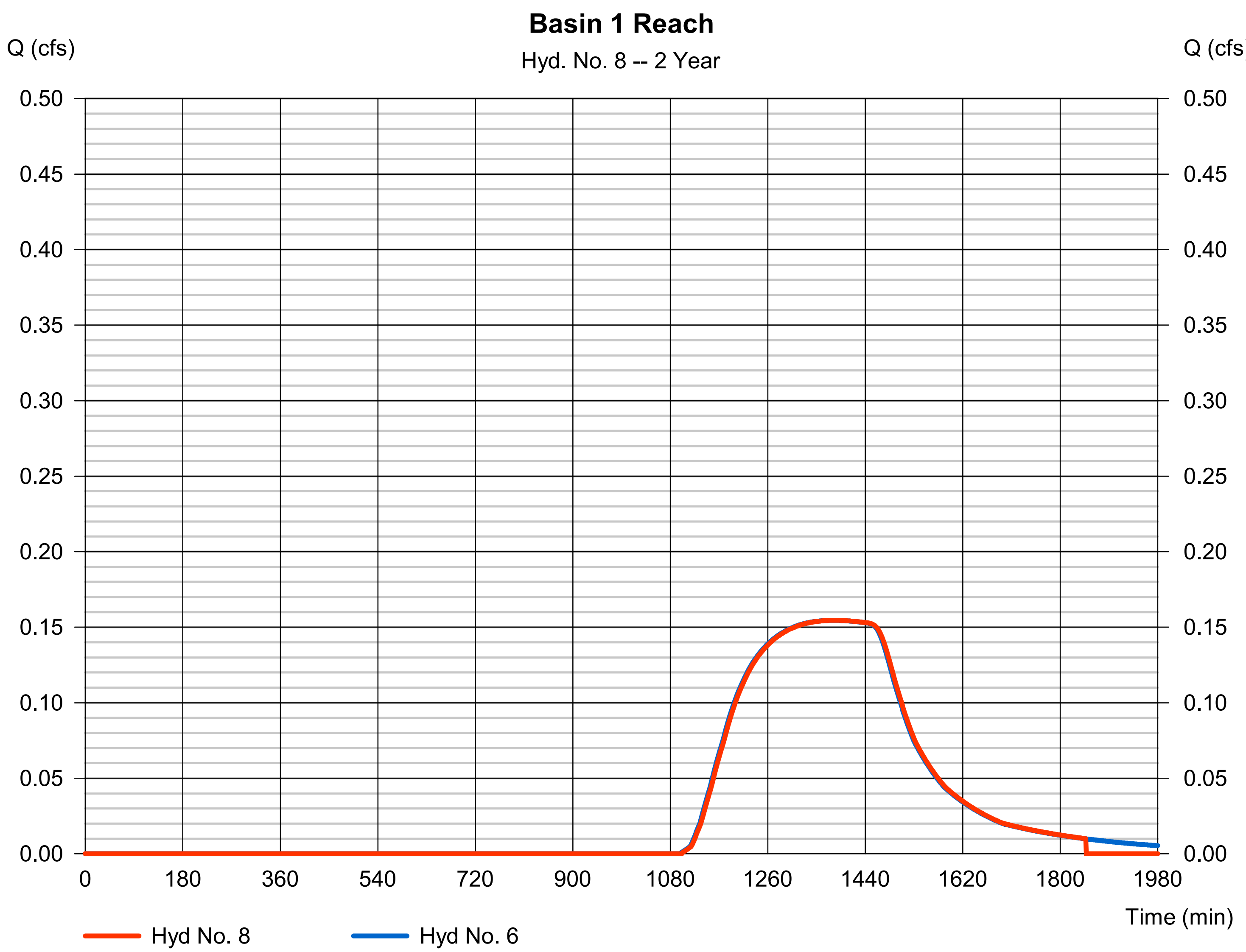
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2012 by Autodesk, Inc. v9 Tuesday, 00 22, 2013

Hyd. No. 8

Basin 1 Reach

Hydrograph type	= Reach	Peak discharge	= 0.155 cfs
Storm frequency	= 2 yrs	Time to peak	= 1383 min
Time interval	= 1 min	Hyd. volume	= 3,517 cuft
Inflow hyd. No.	= 6 - Basin 1 Outflow	Section type	= Trapezoidal
Reach length	= 400.0 ft	Channel slope	= 4.0 %
Manning's n	= 0.033	Bottom width	= 2.0 ft
Side slope	= 2.0:1	Max. depth	= 2.0 ft
Rating curve x	= 5.687	Rating curve m	= 1.156
Ave. velocity	= 3.50 ft/s	Routing coeff.	= 0.4652

Modified Att-Kin routing method used.



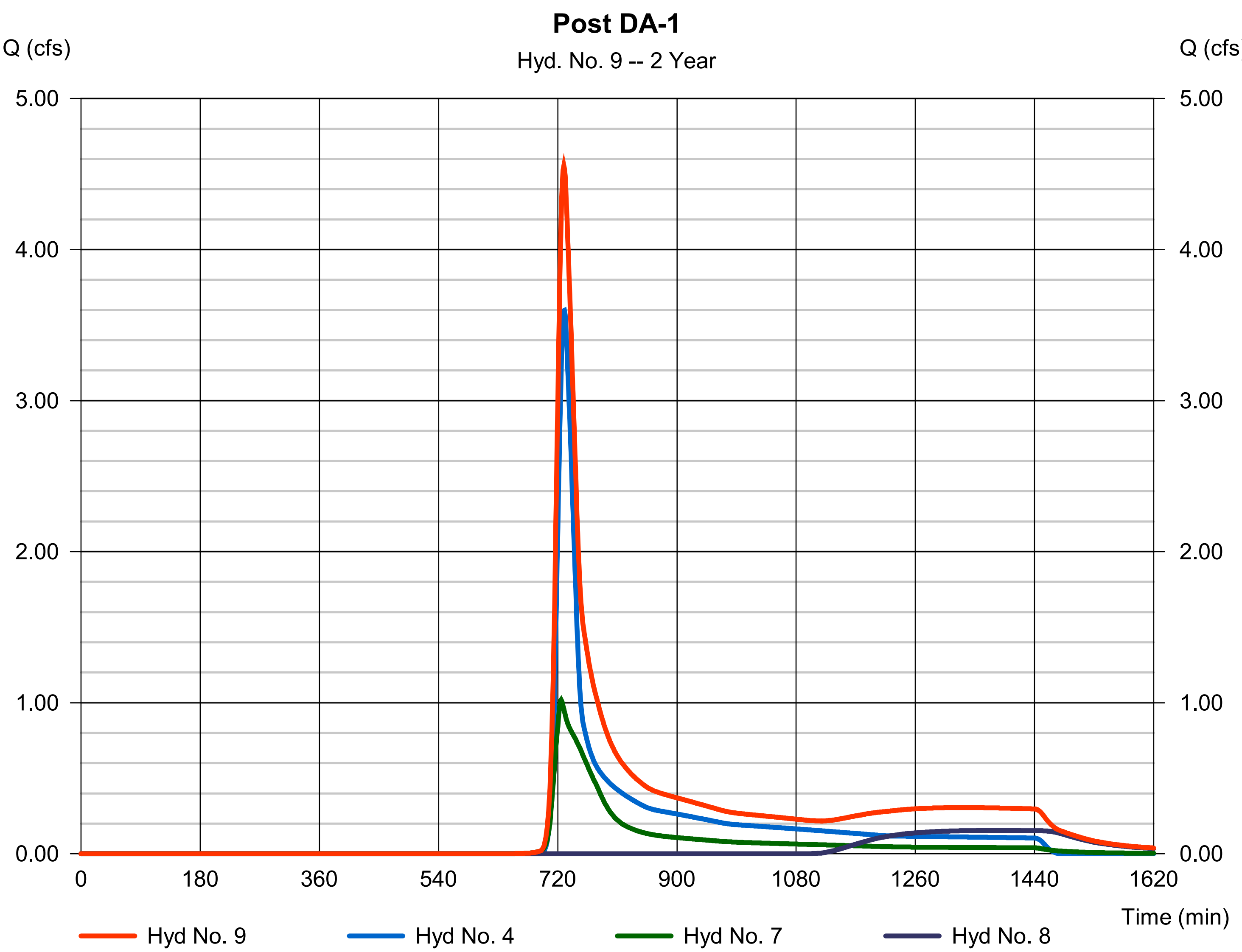
Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2012 by Autodesk, Inc. v9 Tuesday, 00 22, 2013

Hyd. No. 9

Post DA-1

Hydrograph type	= Combine	Peak discharge	= 4.556 cfs
Storm frequency	= 2 yrs	Time to peak	= 729 min
Time interval	= 1 min	Hyd. volume	= 24,691 cuft
Inflow hyds.	= 4, 7, 8	Contrib. drain. area	= 6.900 ac



Hydrograph Summary Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2012 by Autodesk, Inc. v9

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to Peak (min)	Hyd. volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (cuft)	Hydrograph Description
1	SCS Runoff	11.60	1	730	47,485	------	------	------	Pre DA-1
2	SCS Runoff	8.714	1	729	32,810	------	------	------	Post DA-1 Detained 1
3	SCS Runoff	4.668	1	718	9,376	------	------	------	Post DA-1 Detained 2
4	SCS Runoff	5.972	1	729	22,764	------	------	------	Post DA-1 Undetained
5	Reservoir	0.992	1	796	15,124	2	1085.54	18,075	Forebay Outflow
6	Reservoir	0.499	1	922	15,076	5	1076.53	2,674	Basin 1 Outflow
7	Reservoir	1.717	1	724	9,365	3	1053.65	2,828	Basin 2 Outflow
8	Reach	0.499	1	924	14,866	6	------	------	Basin 1 Reach
9	Combine	7.583	1	729	46,995	4, 7, 8	------	------	Post DA-1

PCSM Model.gpw	Return Period: 5 Year	Tuesday, 00 22, 2013

Hydrograph Summary Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2012 by Autodesk, Inc. v9

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to Peak (min)	Hyd. volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (cuft)	Hydrograph Description
1	SCS Runoff	16.59	1	729	64,411	------	------	------	Pre DA-1
2	SCS Runoff	11.66	1	729	42,910	------	------	------	Post DA-1 Detained 1
3	SCS Runoff	5.903	1	718	11,889	------	------	------	Post DA-1 Detained 2
4	SCS Runoff	8.083	1	729	29,974	------	------	------	Post DA-1 Undetained
5	Reservoir	4.740	1	748	25,225	2	1085.63	18,613	Forebay Outflow
6	Reservoir	0.906	1	838	25,175	5	1077.06	5,834	Basin 1 Outflow
7	Reservoir	2.304	1	724	11,877	3	1054.03	3,625	Basin 2 Outflow
8	Reach	0.906	1	840	24,967	6	------	------	Basin 1 Reach
9	Combine	10.08	1	729	66,818	4, 7, 8	------	------	Post DA-1

Hydrograph Summary Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2012 by Autodesk, Inc. v9

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to Peak (min)	Hyd. volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (cuft)	Hydrograph Description
1	SCS Runoff	24.21	1	729	90,347	------	------	------	Pre DA-1
2	SCS Runoff	16.04	1	729	58,019	------	------	------	Post DA-1 Detained 1
3	SCS Runoff	7.678	1	718	15,569	------	------	------	Post DA-1 Detained 2
4	SCS Runoff	11.23	1	729	40,808	------	------	------	Post DA-1 Undetained
5	Reservoir	12.59	1	737	40,333	2	1085.75	19,383	Forebay Outflow
6	Reservoir	2.693	1	765	40,283	5	1077.67	10,099	Basin 1 Outflow
7	Reservoir	6.049	1	721	15,558	3	1054.22	4,048	Basin 2 Outflow
8	Reach	2.692	1	767	40,075	6	------	------	Basin 1 Reach
9	Combine	14.77	1	722	96,441	4, 7, 8	------	------	Post DA-1

Hydrograph Summary Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2012 by Autodesk, Inc. v9

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to Peak (min)	Hyd. volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (cuft)	Hydrograph Description
1	SCS Runoff	30.85	1	729	113,135	------	------	------	Pre DA-1
2	SCS Runoff	19.80	1	728	71,043	------	------	------	Post DA-1 Detained 1
3	SCS Runoff	9.157	1	718	18,689	------	------	------	Post DA-1 Detained 2
4	SCS Runoff	13.94	1	728	50,181	------	------	------	Post DA-1 Undetained
5	Reservoir	18.40	1	732	53,357	2	1085.82	19,845	Forebay Outflow
6	Reservoir	6.542	1	751	53,306	5	1078.18	14,216	Basin 1 Outflow
7	Reservoir	8.304	1	719	18,678	3	1054.30	4,222	Basin 2 Outflow
8	Reach	6.496	1	753	53,099	6	------	------	Basin 1 Reach
9	Combine	18.56	1	721	121,958	4, 7, 8	------	------	Post DA-1

PCSM Model.gpw	Return Period: 50 Year	Tuesday, 00 22, 2013

Hydrograph Summary Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2012 by Autodesk, Inc. v9

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to Peak (min)	Hyd. volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (cuft)	Hydrograph Description
1	SCS Runoff	38.22	1	729	138,591	------	------	------	Pre DA-1
2	SCS Runoff	23.92	1	728	85,394	------	------	------	Post DA-1 Detained 1
3	SCS Runoff	10.75	1	718	22,086	------	------	------	Post DA-1 Detained 2
4	SCS Runoff	16.92	1	728	60,535	------	------	------	Post DA-1 Undetained
5	Reservoir	23.58	1	730	67,708	2	1085.87	20,217	Forebay Outflow
6	Reservoir	13.11	1	744	67,655	5	1078.41	16,251	Basin 1 Outflow
7	Reservoir	10.31	1	719	22,075	3	1054.36	4,369	Basin 2 Outflow
8	Reach	13.05	1	745	67,450	6	------	------	Basin 1 Reach
9	Combine	23.58	1	742	150,061	4, 7, 8	------	------	Post DA-1

URS

PROJECT NAME:	Natrium to Market		
LOCATION:	Franklin & Morgan Twps, Greene County		
PREPARED BY:	RFH	DATE:	10/11/2013
CHECKED BY:	ARZ	DATE:	10/15/2013

STORMWATER MANAGEMENT WORKSHEET #1

Change In Runoff Volume for the 2-Year Storm Event (BMP Manual Worksheet 4)

Drainage Area ID: DA-1
Drainage Area: 18.30 (acres)
2-Year Rainfall: 2.39 inches *(From NOAA Atlas 14)*

Total Site Area: 18.30 acres
Protected Site Area: 0.00 acres
Stormwater Management Area: 18.30 acres

Existing Conditions:

Land Use	Soil Type (HSG)	Area (sf)	Area (acres)	CN	S	Ia (0.2*S)	Q Runoff[1] (in)	Runoff Volume[2] (ft^3)
Woods (good)	C	291,852	6.70	70	4.2857	0.8571	0.40	9,821
Meadow	C	487,872	11.20	71	4.0845	0.8169	0.44	17,783
Gravel	C	8,712	0.20	89	1.2360	0.2472	1.36	987
Impervious	C	8,712	0.20	98	0.2041	0.0408	2.16	1,569
TOTAL:		**797,148**	**18.30**					**30,160**

Developed Conditions:

Land Use	Soil Type (HSG)	Area (sf)	Area (acres)	CN	S	Ia (0.2*S)	Q Runoff[1] (in)	Runoff Volume[2] (ft^3)
Woods (good)	C	104,544	2.40	70	4.2857	0.8571	0.40	3,518
Meadow	C	483,516	11.10	71	4.0845	0.8169	0.44	17,624
Gravel	C	169,884	3.90	89	1.2360	0.2472	1.36	19,239
Impervious	C	39,204	0.90	98	0.2041	0.0408	2.16	7,061
TOTAL:		**797,148**	**18.30**					**47,442**

2-Year Volume Increase (ft^3): 17,282

2-Year Volume Increase = Developed Conditions Runoff Volume - Existing Conditions Runoff Volume

= 47,442 - 30,160 = 17,282 ft^3

1. Runoff (in) = $Q = (P - I_a)^2 / [(P - I_a) + S]$; when $P > I_a$ *(OR)* Runoff (in) = $Q = 0$; when $P \leq I_a$

Where, P = 2-Year Rainfall (in)
S = (1000 / CN) - 10
I_a = (0.2 x S)

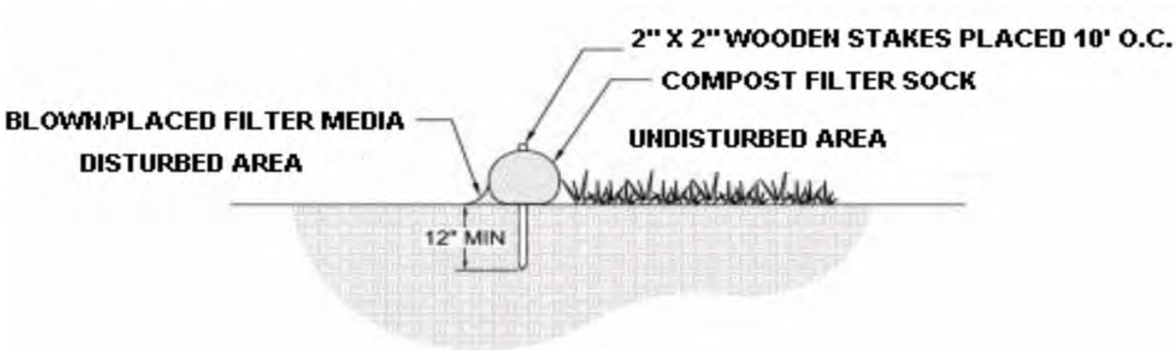
2. Runoff Volume (CF) = Q x Area x 1/12
Q = Runoff (in)
Area = Land use area (sq. ft)

Note: Runoff Volume must be calculated for EACH land use type/condition and HSG. The use of a weighted CN value is not acceptable.

STANDARD E&S WORKSHEET #1

Compost Filter Socks

PROJECT NAME: Natrium to Market
LOCATION: Franklin & Morgan Twps, Greene County
PREPARED BY: RFH DATE: 10/11/2013
CHECKED BY: ARZ DATE: 10/15/2013



SOCK NO.	DIA. (in)	LOCATION	SLOPE (%) [1]	SLOPE LENGTH ABOVE BARRIER (FT) [2]
CFS-17	18	Below CC-14B	10.0%	230
CFS-18	18	Below CC-15B	11.0%	220
CFS-19	18	Below CC-16B	13.0%	230
CFS-20	18	Below CC-17B	11.0%	240

[1] Maximum land slope within the drainage area tributary to the compost filter sock.
[2] Longest slope length within the drainage area tributary to the compost filter sock.

PROJECT NAME:	Natrium to Market		
LOCATION:	Franklin & Morgan Twps, Greene County		
PREPARED BY:	RFH	DATE:	10/11/2013
CHECKED BY:	ARZ	DATE:	10/15/2013

STORMWATER MANAGEMENT WORKSHEET #4

PERMANENT CHANNEL DESIGN DATA

CHANNEL OR CHANNEL SECTION		CC-1 (min)	CC-1 (max)	CC-2 (min)	CC-2 (max)	CC-3 (min)	CC-3 (max)
TEMPORARY OR PERMANENT		P	P	P	P	P	P
DESIGN STORM		10	10	10	10	10	10
ACRES	(AC)	2.6	2.6	3.8	3.8	0.5	0.5
MULTIPLIER		2.75	2.75	2.75	2.75	2.75	2.75
Q_r (REQUIRED CAPACITY) [1]	**(CFS)**	**7.2**	**7.2**	**10.5**	**10.5**	**1.4**	**1.4**
Q (AT FLOW DEPTH d)	**(CFS)**	**7.3**	**7.4**	**10.6**	**10.6**	**1.5**	**1.5**
PROTECTIVE LINING [2]		R-3	R-3	R-3	R-3	R-3	R-3
n (MANNING'S COEFFICIENT) [2]		0.038	0.041	0.036	0.040	0.043	0.043
Va (ALLOWABLE VELOCITY)	(FPS)	6.5	6.5	6.5	6.5	6.5	6.5
V (AT FLOW DEPTH d)	(FPS)	2.99	5.36	2.92	6.31	2.66	3.28
t_a (MAX ALLOWABLE SHEAR STRESS)	(LB/FT^2)	1.00	1.00	1.00	1.00	1.00	1.00
t_d (SHEAR STRESS AT FLOW DEPTH d)	(LB/FT^2)	0.82	3.21	0.70	4.15	1.32	2.10
CHANNEL BOTTOM WIDTH	(FT)	1.0	1.0	1.0	1.0	0.0	0.0
CHANNEL SIDE SLOPES	(H:V)	2	2	2	2	2	2
D (TOTAL DEPTH)	(FT)	2.00	2.00	2.00	2.00	2.00	2.00
CHANNEL TOP WIDTH @ D	(FT)	9.00	9.00	9.00	9.00	8.00	8.00
d (CALCULATED FLOW DEPTH)	(FT)	**0.88**	**0.62**	**1.12**	**0.70**	**0.53**	**0.48**
CHANNEL TOP WIDTH @ FLOW DEPTH d	(FT)	4.5	3.5	5.5	3.8	2.1	1.9
BOTTOM WIDTH:DEPTH RATIO	(12:1 MAX)	1	2	1	1	0	0
d_{50} STONE SIZE	(IN)	3	3	3	3	3	3
A (CROSS-SECTIONAL AREA ABOVE LINING)	(SQ. FT)	2.43	1.39	3.63	1.68	0.56	0.46
R (HYDRAULIC RADIUS ABOVE LINING)		0.49	0.37	0.60	0.41	0.24	0.21
FLOW AREA WITHIN ROCK LINING (40% VOIDS) [6]	(SQ. FT)	0.00	0.00	0.00	0.00	0.00	0.00
TOTAL PROVIDED FLOW AREA [6]	(SQ. FT)	2.43	1.39	3.63	1.68	0.56	0.46
S (BED SLOPE) [3]	(FT/FT)	0.015	0.083	0.010	0.095	0.040	0.070
S_c (CRITICAL SLOPE)	(FT/FT)	0.029	0.037	0.025	0.034	0.048	0.050
$0.7\ S_c$		0.020	0.026	0.017	0.024	0.034	0.035
$1.3\ S_c$		0.038	0.048	0.032	0.044	0.062	0.065
STABLE FLOW? (Y/N)	(Y/N)	Y	Y	Y	Y	N	Y
FREEBOARD BASED ON UNSTABLE FLOW	(FT)	0.20	0.25	0.25	0.33	0.11	0.12
FREEBOARD BASED ON STABLE FLOW	(FT)	0.22	0.16	0.28	0.18	0.13	0.12
MINIMUM REQUIRED FREEBOARD (FT) [4]	(FT)	0.5	0.5	0.5	0.5	0.5	0.5
FREEBOARD (AT FLOW DEPTH d) (FT)	(FT)	1.12	1.38	0.88	1.30	1.47	1.52
DESIGN METHOD FOR PROTECTIVE LINING [5]	PERMISSIBLE	V	V	V	V	V	V

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. Manning's "n" values are adjusted for changes in channel liner and flow depth. For vegetated channels, all temporary channel calculations assume unvegetated condition.
3. Slopes may not be averaged
4. Minumum 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.
6. Per the PADEP E&S Control Manual, a 40% void space was accounted for in the riprap on channel bottoms (not side slopes) for gradients ≥ 0.10%.

URS

PROJECT NAME:	Natrium to Market		
LOCATION:	Franklin & Morgan Twps, Greene County		
PREPARED BY:	RFH	DATE:	10/11/2013
CHECKED BY:	ARZ	DATE:	10/15/2013

STORMWATER MANAGEMENT WORKSHEET #4
PERMANENT CHANNEL DESIGN DATA

CHANNEL OR CHANNEL SECTION		CC-4 (min)	CC-4 (max)	CC-5 (min)	CC-5 (max)	CC-6 (min)	CC-6 (max)
TEMPORARY OR PERMANENT		P	P	P	P	P	P
DESIGN STORM		10	10	10	10	10	10
ACRES	(AC)	0.8	0.8	0.7	0.7	0.5	0.5
MULTIPLIER		2.75	2.75	2.75	2.75	2.75	2.75
Q_r (REQUIRED CAPACITY) [1]	(CFS)	**2.2**	**2.2**	**1.9**	**1.9**	**2.4**	**2.4**
Q (AT FLOW DEPTH d)	(CFS)	**2.2**	**2.3**	**2.0**	**2.0**	**2.5**	**2.5**
PROTECTIVE LINING [2]		R-3	R-3	R-3	R-3	R-3	R-3
n (MANNING'S COEFFICIENT) [2]		0.040	0.040	0.039	0.041	0.038	0.042
Va (ALLOWABLE VELOCITY)	(FPS)	6.5	6.5	6.5	6.5	6.5	6.5
V (AT FLOW DEPTH d)	(FPS)	2.16	2.61	1.81	2.63	1.52	3.61
t_a (MAX ALLOWABLE SHEAR STRESS)	(LB/FT^2)	1.00	1.00	1.00	1.00	1.00	1.00
t_d (SHEAR STRESS AT FLOW DEPTH d)	(LB/FT^2)	0.67	1.05	0.46	1.14	0.28	2.21
CHANNEL BOTTOM WIDTH	(FT)	0.0	0.0	0.0	0.0	0.0	0.0
CHANNEL SIDE SLOPES	(H:V)	2	2	2	2	2	2
D (TOTAL DEPTH)	(FT)	2.00	2.00	2.00	2.00	2.00	2.00
CHANNEL TOP WIDTH @ D	(FT)	8.00	8.00	8.00	8.00	8.00	8.00
d (CALCULATED FLOW DEPTH)	(FT)	**0.72**	**0.67**	**0.74**	**0.61**	**0.90**	**0.59**
CHANNEL TOP WIDTH @ FLOW DEPTH d	(FT)	2.9	2.7	3.0	2.4	3.6	2.4
BOTTOM WIDTH:DEPTH RATIO	(12:1 MAX)	0	0	0	0	0	0
d_{50} STONE SIZE	(IN)	3	3	3	3	3	3
A (CROSS-SECTIONAL AREA ABOVE LINING)	(SQ. FT)	1.04	0.90	1.10	0.74	1.62	0.70
R (HYDRAULIC RADIUS ABOVE LINING)		0.32	0.30	0.33	0.27	0.40	0.26
FLOW AREA WITHIN ROCK LINING (40% VOIDS) [6]	(SQ. FT)	0.00	0.00	0.00	0.00	0.00	0.00
TOTAL PROVIDED FLOW AREA [6]	(SQ. FT)	1.04	0.90	1.10	0.74	1.62	0.70
S (BED SLOPE) [3]	(FT/FT)	0.015	0.025	0.010	0.030	0.005	0.060
S_c (CRITICAL SLOPE)	(FT/FT)	0.037	0.039	0.036	0.043	0.031	0.044
0.7 S_c		0.026	0.028	0.025	0.030	0.022	0.031
1.3 S_c		0.048	0.051	0.047	0.055	0.041	0.057
STABLE FLOW? (Y/N)	(Y/N)	Y	Y	Y	N	Y	Y
FREEBOARD BASED ON UNSTABLE FLOW	(FT)	0.12	0.13	0.10	0.12	0.10	0.16
FREEBOARD BASED ON STABLE FLOW	(FT)	0.18	0.17	0.19	0.15	0.23	0.15
MINIMUM REQUIRED FREEBOARD (FT) [4]	(FT)	0.5	0.5	0.5	0.5	0.5	0.5
FREEBOARD (AT FLOW DEPTH d) (FT)	(FT)	1.28	1.33	1.26	1.39	1.10	1.41
DESIGN METHOD FOR PROTECTIVE LINING [5]	PERMISSIBLE	V	V	V	V	V	V

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. Manning's "n" values are adjusted for changes in channel liner and flow depth. For vegetated channels, all temporary channel calculations assume unvegetated condition.
3. Slopes may not be averaged
4. Minumum 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.
6. Per the PADEP E&S Control Manual, a 40% void space was accounted for in the riprap on channel bottoms (not side slopes) for gradients ≥ 0.10%.

URS

PROJECT NAME:	Natrium to Market
LOCATION:	Franklin & Morgan Twps, Greene County
PREPARED BY:	RFH	DATE: 10/11/2013
CHECKED BY:	ARZ	DATE: 10/15/2013

STORMWATER MANAGEMENT WORKSHEET #4
PERMANENT CHANNEL DESIGN DATA

CHANNEL OR CHANNEL SECTION		CC-7A (min)	CC-7A (max)	CC-7B (min)	CC-7B (max)		
TEMPORARY OR PERMANENT		P	P	P	P		
DESIGN STORM		10	10	10	10		
ACRES	(AC)	0.5	0.5	1.4	1.4		
MULTIPLIER		2.75	2.75	2.75	2.75		
Q_r (REQUIRED CAPACITY) [1]	(CFS)	**1.4**	**1.4**	**4.9**	**4.9**		
Q (AT FLOW DEPTH d)	(CFS)	**1.5**	**1.5**	**5.0**	**5.0**		
PROTECTIVE LINING [2]		R-3	R-3	R-3	R-3		
n (MANNING'S COEFFICIENT) [2]		0.043	0.043	0.041	0.042		
Va (ALLOWABLE VELOCITY)	(FPS)	6.5	6.5	6.5	6.5		
V (AT FLOW DEPTH d)	(FPS)	2.54	3.08	3.53	4.20		
t_a (MAX ALLOWABLE SHEAR STRESS)	(LB/FT^2)	1.00	1.00	1.00	1.00		
t_d (SHEAR STRESS AT FLOW DEPTH d)	(LB/FT^2)	1.18	1.83	1.38	2.10		
CHANNEL BOTTOM WIDTH	(FT)	0.0	0.0	1.0	1.0		
CHANNEL SIDE SLOPES	(H:V)	2	2	2	2		
D (TOTAL DEPTH)	(FT)	2.00	2.00	2.00	2.00		
CHANNEL TOP WIDTH @ D	(FT)	8.00	8.00	9.00	9.00		
d (CALCULATED FLOW DEPTH)	(FT)	**0.54**	**0.49**	**0.63**	**0.56**		
CHANNEL TOP WIDTH @ FLOW DEPTH d	(FT)	2.2	2.0	3.5	3.2		
BOTTOM WIDTH:DEPTH RATIO	(12:1 MAX)	0	0	2	2		
d_{50} STONE SIZE	(IN)	3	3	3	3		
A (CROSS-SECTIONAL AREA ABOVE LINING)	(SQ. FT)	0.58	0.48	1.42	1.19		
R (HYDRAULIC RADIUS ABOVE LINING)		0.24	0.22	0.37	0.34		
FLOW AREA WITHIN ROCK LINING (40% VOIDS) [6]	(SQ. FT)	0.00	0.00	0.00	0.00		
TOTAL PROVIDED FLOW AREA [6]	(SQ. FT)	0.58	0.48	1.42	1.19		
S (BED SLOPE) [3]	(FT/FT)	0.035	0.060	0.035	0.060		
S_c (CRITICAL SLOPE)	(FT/FT)	0.047	0.050	0.037	0.040		
0.7 S_c		0.033	0.035	0.026	0.028		
1.3 S_c		0.061	0.065	0.048	0.052		
STABLE FLOW? (Y/N)	(Y/N)	N	N	N	Y		
FREEBOARD BASED ON UNSTABLE FLOW	(FT)	0.10	0.11	0.17	0.18		
FREEBOARD BASED ON STABLE FLOW	(FT)	0.14	0.12	0.16	0.14		
MINIMUM REQUIRED FREEBOARD (FT) [4]	(FT)	0.5	0.5	0.5	0.5		
FREEBOARD (AT FLOW DEPTH d) (FT)	(FT)	1.46	1.51	1.37	1.44		
DESIGN METHOD FOR PROTECTIVE LINING [5]	PERMISSIBLE	V	V	V	V		

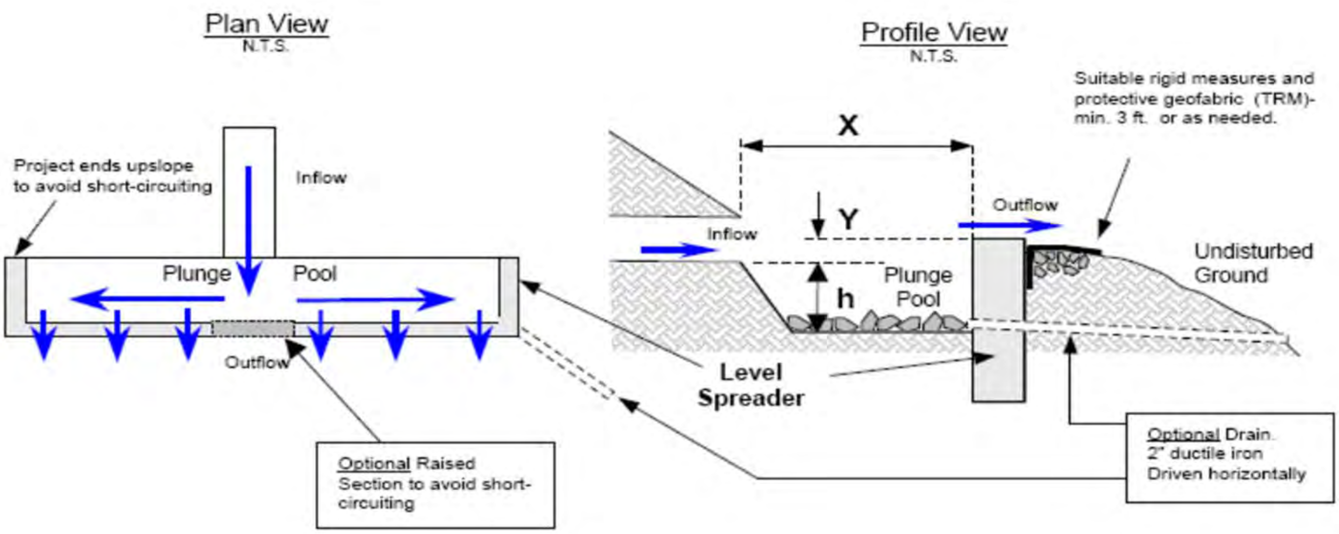
1. Use 1.6 for Temporary Channels; 2.25 for Temporary Channels in Special Protection (HQ or EV) Watersheds; 2.75 for Permanent Channels. For Rational Method, enter "N/A" and attach E&S Worksheets 9 and 10. For TR-55, enter "N/A" and attach appropriate Worksheets.
2. Manning's "n" values are adjusted for changes in channel liner and flow depth. For vegetated channels, all temporary channel calculations assume unvegetated condition.
3. Slopes may not be averaged
4. Minumum 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.
6. Per the PADEP E&S Control Manual, a 40% void space was accounted for in the riprap on channel bottoms (not side slopes) for gradients ≥ 0.10%.

URS

PROJECT NAME: Natrium to Market
LOCATION: Franklin & Morgan Twps, Greene County
PREPARED BY: RFH DATE: 10/11/2013
CHECKED BY: ARZ DATE: 10/15/2012

STORMWATER MANAGEMENT WORKSHEET #5

Permanent Level Spreader Design



LEVEL SPREADER ID	DRAINAGE AREA [1] (AC)	DESIGN FLOW [2] Q_{100} (CFS)	INFLOW DEPTH [3] (FT)	DOWN SLOPE GROUND COVER	LEVEL SPREADER LENGTH, L (FT)	PLUNGE POOL LENGTH, X (FT)	PLUNGE POOL DEPTH, h (FT)	VERTICAL SEPARATION, Y (FT)
LS-1	9.4	13.1	1.5	Grass/Thicket	49	6	1.5	0.75
LS-2	4.5	7.2	1.5	Grass/Thicket	27	6	1.5	0.75
LS-3	2.0	10.3	1.5	Grass/Thicket	39	6	1.5	0.75

[1] Drainage area to a single level spreaders should be limited to 5 acres or less.

[2] Permanent level spreaders should be designed to safely diffuse flows up to the 100-year design storm.

[3] Inflow Depth:

Pipe discharges, inflow depth = Inside diameter of the pipe

Channel discharges, inflow depth = 100-year channel flow depth

STORMWATER MANAGEMENT DESIGN CALCULATIONS

PROJECT NAME: Natrium to Market

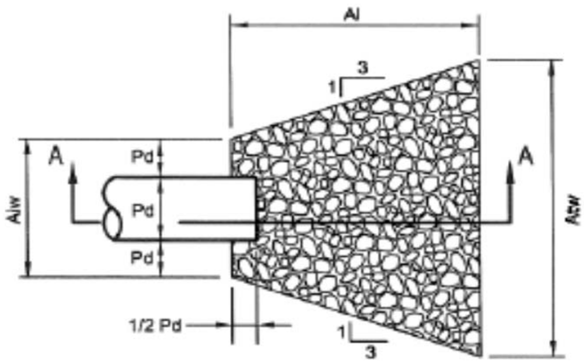
LOCATION: Franklin & Morgan Twps, Greene County

PREPARED BY: RFH DATE: 10/11/2013

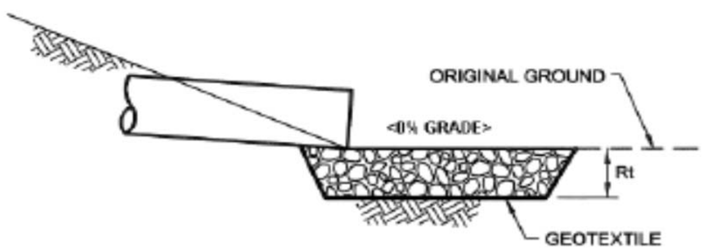
CHECKED BY: ARZ DATE: 10/15/2013

STORMWATER MANAGEMENT WORKSHEET #6

Riprap Apron Outlet Protection



PLAN VIEW



SECTION A - A

APRON NO.	PIPE DIA. D_0 (in)	TAIL WATER COND. (MAX OR MIN)	MAN. "n" FOR PIPE	PIPE SLOPE (FT/FT)	Q [2] (CFS)	V [1] (FPS)	RIPRAP SIZE	Rt (in)	Al [3] (FT)	Aiw (FT)	Atw (FT)
A-1	18	MIN	0.013	0.006	9.5	5.4	R-3	9	9	4.5	13.5
A-2	18	MIN	0.013	0.008	11.3	6.4	R-3	9	11	4.5	15.5

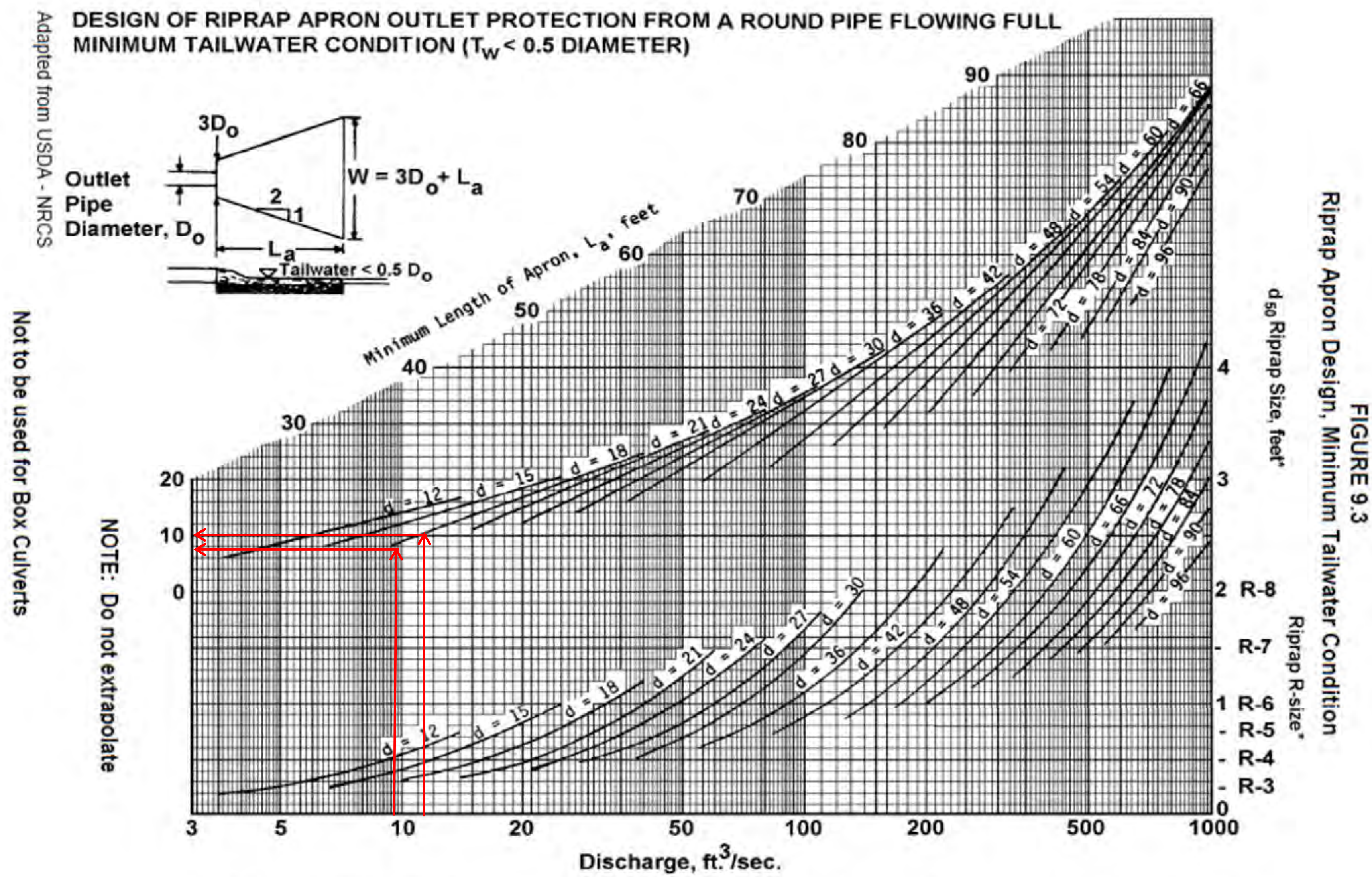
[1] The anticipated velocity (V) should not exceed the maximum permissible shown in Table 6.6 for the proposed riprap protection.

- Adjust velocity for less than full pipe flow using Figure 9.1
- Use Manning's equation to calculate velocity for pipe slopes > 0.05 ft/ft.

** Velocity obtained from Hydraflow Culvert Report (Velocity Dn).

[2] Design flow converted to a theoretical "pipe flowing full" using the continuity equation (Q = VA) using the calculated velocity.

[3] Determine apron length using Figure 9.3 for minimum tailwater condition and Figure 9.4 for maximum tailwater condition



* For discharge velocities exceeding Maximum Allowable for Riprap indicated, increase d_{50} stone size and/or provide velocity reduction device.

URS

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STORMWATER MANAGEMENT WORKSHEET #7

Underdrain System Design

Minimum Required Flow Check to Empty in 72 Hours		
Volume Stored in the Resevoir (ft^3)		17856
Minimum Required Flow (cfs)		0.069

Soil Infiltration Rate (in/hr)	2	(TYP. range in table below)
Volume Depth in Resevoir (ft)	3.5	
Volume Stored at above depth (ft^3)	17856	
Slope of Volume vs Depth curve	5102	
Depth of Underdrain Below Pond Invert (ft) (1' Min)	1	(Use Depth at Pond Edge)
Height of Underdrain (ft) (2' Min)	2	
Underdrain Ditch Width (ft) (1' Min)	1	
Total Underdrain Length (ft)	425	
Filtration Area (ft^2)	2125	
Total Infiltration (cfs) (@ Volume Increase Depth)	0.15	(0.1 cfs Max)
Total Infiltration (cfs) (@ No Pond Depth)	0.03	

Soil Type		Infiltration Rate (in/hr)
Silty Sand		2.2 - 3.6

(Silty Sand ~ Amended Mixture in Detail)

Das, Braja M. (2006). Principles of Geotechnical Engineering. Thomson Learning.
Hausmann, Manfred R. (1990). Engineering Principles of Ground Modification. Mc-Graw Hill, Inc.
Sharma, Hari D and Krishna R Reddy (2004). Geoenvironmental Engineering. John Wiley & Sons, Inc.

Percent Depth	Ponding Depth (ft)	Infiltration (cfs)	Volume Remaining (ft^3)	Approx. Time (s) (259200 Max)	
100%	3.5	0.148	17,856	Approx. Estimate	Conservative
90%	3.15	0.136	16,070	12,590	13,121
80%	2.8	0.125	14,285	26,288	27,450
70%	2.45	0.113	12,499	41,309	43,232
60%	2.1	0.102	10,714	57,935	60,797
50%	1.75	0.090	8,928	76,550	80,597
40%	1.4	0.079	7,142	97,696	103,285
30%	1.05	0.067	5,357	122,168	129,846
20%	0.7	0.056	3,571	151,208	161,875
10%	0.35	0.044	1,786	186,913	202,209
0%	0	0.033	0	233,254	256,659
	Total Time (hrs)=	64.793	71.294	Drains well before 72 hours	

PROJECT NAME:	Natrium to Market		
LOCATION:	Franklin & Morgan Twps, Greene County		
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STORMWATER MANAGEMENT WORKSHEET #9

Anti-Seep Collar Design

Facility: **Basin 1**

1). Determine the length of pipe in the saturated zone (Ls).

$$L_S = y(z+4)[1+\frac{PipeSlope}{0.25-PipeSlope}]$$

Where:

L_s = Length of pipe in saturated zone (ft)

y = Distance from upstream invert of principal spillway riser to top of dewatering volume

z = horizontal component of upstream embankment slope (ft)

Dewatering Zone WSEL:	1078.00		y =	3.50	ft
Upstream Invert:	1074.50		z =	2	ft
Downstream Invert:	1072.50		Pipe Slope:	0.050	ft/ft
Pipe Length:	40.00	ft/ft			

L_s = 26.25 ft

2). Determine the required increase in flow path.

For a permanent basin, a minimum of 15% should be provided.

$$L_F = 1.15 * L_s$$

L_F = 30.19 ft

3). Choose the number of collars to be used and determine the minimum collar projection (Vmin).

$$V_{min} = \frac{L_F - L_S}{2 * N}$$

Where:

V_{min} = Minimum collar projection from pipe (ft)

N = Number of anti-seep collars

N = 1

V_{min} = 2.0 ft

URS

PROJECT NAME:	Natrium to Market		
LOCATION:	Franklin & Morgan Twps, Greene County		
PREPARED BY:	RFH	DATE:	10/11/2013
CHECKED BY:	ARZ	DATE:	10/15/2013

STORMWATER MANAGEMENT WORKSHEET #9

Anti-Seep Collar Design

Facility: Basin 2

1). Determine the length of pipe in the saturated zone (Ls).

$$L_S = y(z+4)[1+\frac{PipeSlope}{0.25-PipeSlope}]$$

Where:

L_s = Length of pipe in saturated zone (ft)

y = Distance from upstream invert of principal spillway riser to top of dewatering volume

z = horizontal component of upstream embankment slope (ft)

Dewatering Zone WSEL:	1054.00		y =	3.50	ft
Upstream Invert:	1050.50		z =	2	ft
Downstream Invert:	1049.00		Pipe Slope:	0.024	ft/ft
Pipe Length:	62.00	ft/ft			

L_s = 23.25 ft

2). Determine the required increase in flow path.

For a permanent basin, a minimum of 15% should be provided.

$$L_F = 1.15 * L_s$$

L_F = 26.74 ft

3). Choose the number of collars to be used and determine the minimum collar projection (Vmin).

$$V_{\min} = \frac{L_F - L_S}{2 * N}$$

Where:

V_{min} = Minimum collar projection from pipe (ft)

N = Number of anti-seep collars

N = 1

V_{min} = 1.7 ft

URS

PROJECT NAME:	Natrium to Market		
LOCATION:	Franklin & Morgan Twps, Greene County		
PREPARED BY:	RFH	DATE:	10/11/2013
CHECKED BY:	ARZ	DATE:	10/15/2013

STORMWATER MANAGEMENT WORKSHEET #10

Captured Runoff Volme for 2-Year Storm Event

Drainage Area ID: **DA-1 Detained 1**

Drainage Area: **9.40** (acres)

2-Year Rainfall: **2.39** **inches** *(From NOAA Atlas 14)*

Developed Conditions:

Land Use	Soil Type (HSG)	Area (sf)	Area (acres)	CN	S	Ia (0.2*S)	Q Runoff[1] (in)	Runoff Volume[2] (ft^3)
Woods (good)	C	39,204	0.90	70	4.2857	0.8571	0.40	1,319
Meadow	C	261,360	6.00	71	4.0845	0.8169	0.44	9,527
Gravel	C	100,188	2.30	89	1.2360	0.2472	1.36	11,346
Impervious	C	8,712	0.20	98	0.2041	0.0408	2.16	1,569
TOTAL:		**409,464**	**9.40**					**23,761**

2-Year Storm Capture Volume (ft^3):	**23,761**

1. Runoff (in) = $Q = (P - I_a)^2 / [(P - I_a) + S]$; when $P > I_a$ *(OR)* Runoff (in) = $Q = 0$; when $P \leq I_a$

   Where, P = 2-Year Rainfall (in)

   S = (1000 / CN) - 10

   I_a = (0.2 x S)

2. Runoff Volume (CF) = Q x Area x 1/12

   Q = Runoff (in)

   Area = Land use area (sq. ft)

Note: Runoff Volume must be calculated for EACH land use type/condition and HSG.
The use of a weighted CN value for volume calculations is not acceptable.

APPENDIX E

INFILTRATION TESTING REPORT

Test Pit Location Map Contains Critical Energy Infrastructure Information - Filed Separately

June 21, 2013
1171-13-049A

Chris Fager, E.I.T.
Basic Systems, Inc.
9255 Cadiz Road
Cambridge, Ohio 43725

Re: Results of Field Infiltration Testing
Crayne Compressor Station
Waynesburg, Greene County, Pennsylvania

Mr. Fager:

In accordance with our proposal for modification of scope/fee dated May 17, 2013, which was authorized by Basic Systems, Inc. on May 21, 2013, S&ME, Inc. (S&ME) is pleased to submit a summary letter containing the results of our field infiltration testing for the Crayne Compressor Station in Waynesburg, Pennsylvania. A description of the test procedure and test results is herewith submitted.

INTRODUCTION

S&ME previously performed a subsurface investigation for the proposed compressor station expansion and submitted our results in a report dated June 6, 2013. S&ME understands that an infiltration basin is proposed as part of the planned compressor station expansion. A test location plan was provided by the infiltration designer (URS) on May 15, 2013, consisting of two (2) test locations with a requested test elevation of El. 56 (not referenced to MSL). A copy of this test location plan is attached for reference.

S&ME performed the infiltration testing in general accordance with Appendix D.1 of the Maryland Stormwater Manual, as referenced in the Pennsylvania Stormwater Best Management Practices Manual (Appendix C).

FIELD WORK

Field Work

S&ME was on site on June 17 and 18, 2013, and performed two (2) infiltration tests at the requested depths of 5 feet and 14 feet below ground surface in test holes T-1 and T-2, respectively. Test locations were selected by URS and field located by Dominion prior to S&ME arriving on site.

The test holes were advanced to the planned depth by an all-terrain-vehicle-mounted drill rig using a 3¼-inch inside-diameter (I.D.) continuous flight auger. No soil sampling was performed; however, S&ME's field personnel observed the auger cuttings to assess stratum characteristics. Upon the completion of drilling, the test holes were checked for the presence of groundwater, and solid 5-inch diameter casing was installed in the borehole. Clean water was then added to the test holes to allow for soaking overnight.

S&ME returned to the site the following day and performed four (4) infiltration tests at each test location. Each test consisted of adjusting the water level to a specified depth within the casing, and then measuring the drop in water level over a 60 minute period. Water was added to the test hole, if necessary, between subsequent tests. Upon completion of the field testing, the casing was removed and the test holes were backfilled with cuttings.

FINDINGS

Groundwater Observations

Groundwater was not encountered in either of the test holes during drilling. Upon completion of drilling, each test hole was noted as being “dry,” that is to say no measurable amount of water had collected in the test hole prior to the addition of water for testing.

Results of Infiltration Testing

Based on field observations of the auger cuttings, test hole T-1 encountered approximately 3 feet of cohesive (silty clay) soil and terminated in bedrock described as soft shale interbedded with sandstone. Similarly, approximately 6 feet of cohesive (silty clay) soil was encountered in test hole T-2 overlying shale and sandstone bedrock. Test hole T-2 terminated in medium-hard to hard sandstone. The silty clay soils encountered over the bedrock were noted as containing varying amounts of sand and possible gravel.

During the field infiltration testing, no measureable amount of water drop was observed during any of the tests. Since four (4) tests were performed successively in each test hole without measureable infiltration, and each test had a duration of one hour, the infiltration rate at the locations and depths of T-1 and T-2 are considered to be less than 0.25 inches per hour. In addition, no drop in water level was noted during the overnight soaking period.

FINAL CONSIDERATIONS

The analyses and conclusions presented in this report are based on project information provided by Basic Systems. The contents of this report are also based on the subsurface conditions as they existed at the time of our field investigation, and further on the assumption that the exploratory borings are representative of actual subsurface conditions throughout the area investigated. It should be noted that actual subsurface conditions between and beyond the borings might differ from those encountered at the boring locations. If subsurface conditions are encountered during construction that vary from those discussed in this report, S&ME should be notified immediately so that we may evaluate the effects, if any, on design and construction.

We appreciate having been given the opportunity to provide services for you on this project. Please do not hesitate to contact our office if you have any questions concerning this submittal.

Respectfully,

S&ME, Inc.
Columbus, Ohio

Christopher J. Nye, P.E.
Project Engineer

Bethanie L. Meek, P.E.
Senior Engineer

Enclosures: Infiltration Test Location Plan
Submitted: 1 copy via email to cfager@bsicos.com

DOMINION TRANSMISSION, INC.

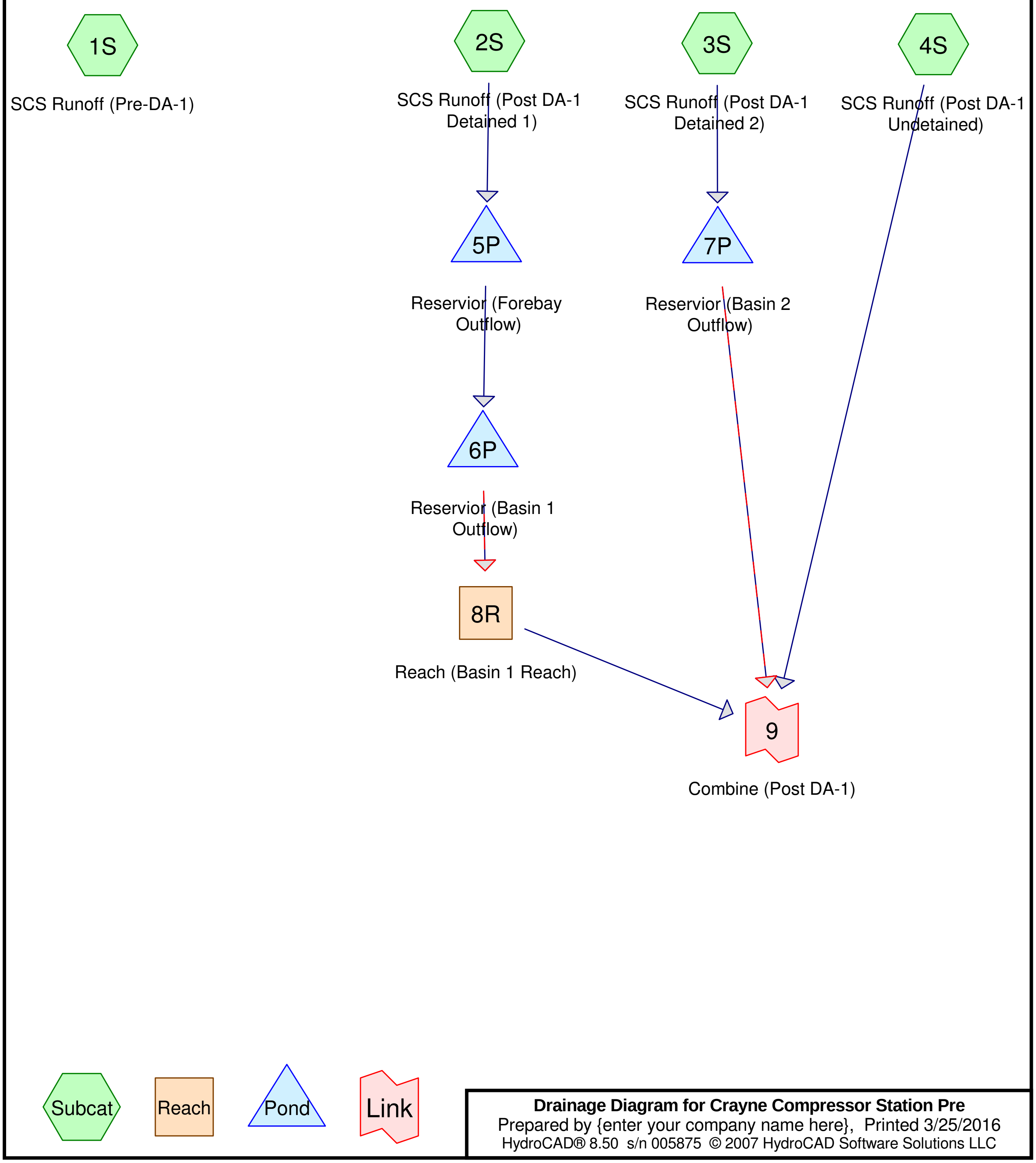
SUPPLY HEADER PROJECT

SECTION 5 – POST-CONSTRUCTION STORMWATER MANAGEMENT PLAN/SITE RESTORATION (PCSM/SR) PLAN

APPENDIX C – STORMWATER RUNOFF CALCULATIONS

Summary of Peak Discharge
Dominion Transmission, INC
Greene County, PA

Project	Hydro. No.	Hydrograph type (origin)	Inflow hyd(s)	Peak Outflow (cfs) 1-yr (2.01 in)	2-yr (2.39 in)	3-yr	5-yr (2.92 in)	10-yr (3.35 in)	25-yr (3.95 in)	50-yr (4.44 in)	100-yr (4.96 in)	Hydrograph Description
Natruim to Market	1	SCS Runoff	-	3.050	6.020	-	11.16	15.93	23.25	29.66	36.79	Pre DA-1
	2	SCS Runoff	-	3.210	5.270	-	8.54	11.44	15.75	19.43	23.47	Post DA-1 Detained 1
	3	SCS Runoff	-	2.240	3.200	-	4.65	5.88	7.66	9.14	10.73	Post DA-1 Detained 2
	4	SCS Runoff	-	2.080	3.510	-	5.82	7.89	10.98	13.63	16.55	Post DA-1 Undetained
	5	Reservior	2	0.000	0.210	-	1.01	4.030	11.47	17.59	22.91	Forebay Outflow
	6	Reservior	5	0.000	0.150	-	0.5	0.92	2.67	5.61	10.06	Basin 1 Outflow
	7	Reservior	3	0.700	1.510	-	3.8	5.32	7.19	8.6	8.9	Basin 2 Outflow
	8	Reach	6	0.000	0.150	-	0.5	0.92	2.67	5.57	10.05	Basin 1 Reach
	9	Combine	4, 7, 8	2.730	4.320	-	6.93	9.42	12.97	16.01	20.42	Post DA-1
Supply Header (current model)	1	SCS Runoff	-	3.050	6.020	-	11.16	15.93	23.25	29.66	36.79	Pre DA-1
	2	SCS Runoff	-	3.210	5.270	-	8.54	11.44	15.75	19.43	23.47	Post DA-1 Detained 1
	3	SCS Runoff	-	2.410	3.410	-	4.89	6.14	7.93	9.43	11.03	Post DA-1 Detained 2
	4	SCS Runoff	-	2.080	3.510	-	5.82	7.89	10.98	13.63	16.55	Post DA-1 Undetained
	5	Reservior	2	0.000	0.210	-	1.01	4.020	11.47	17.59	22.91	Forebay Outflow
	6	Reservior	5	0.000	0.150	-	0.5	0.92	2.67	5.61	10.06	Basin 1 Outflow
	7	Reservior	3	0.740	1.910	-	4.14	5.61	7.46	8.64	8.98	Basin 2 Outflow
	8	Reach	6	0.000	0.150	-	0.5	0.92	2.67	5.57	10.05	Basin 1 Reach
	9	Combine	4, 7, 8	2.770	4.370	-	7.12	9.63	13.19	16.43	21.1	Post DA-1



Drainage Diagram for Crayne Compressor Station Pre
Prepared by {enter your company name here}, Printed 3/25/2016
HydroCAD® 8.50 s/n 005875 © 2007 HydroCAD Software Solutions LLC

Area Listing (all nodes)

Area (acres)	CN	Description (subcatchment-numbers)
9.100	70	(1S,2S,4S)
22.300	71	(1S,2S,3S,4S)
4.100	89	(1S,2S,3S,4S)
1.100	98	(1S,2S,3S,4S)
36.600		**TOTAL AREA**

Soil Listing (all nodes)

Area (acres)	Soil Goup	Subcatchment Numbers
0.000	HSG A	
0.000	HSG B	
0.000	HSG C	
0.000	HSG D	
36.600	Other	1S, 2S, 3S, 4S
36.600		**TOTAL AREA**

Time span=0.00-26.00 hrs, dt=0.02 hrs, 1301 points
Runoff by SCS TR-20 method, UH=SCS
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 1S: SCS Runoff (Pre-DA-1) Runoff Area=18.300 ac 1.09% Impervious Runoff Depth=0.27"
Flow Length=1,469' Tc=24.6 min CN=71 Runoff=3.05 cfs 0.411 af

Subcatchment 2S: SCS Runoff (Post DA-1 Runoff Area=9.400 ac 2.13% Impervious Runoff Depth=0.42"
Flow Length=1,012' Tc=23.9 min CN=76 Runoff=3.21 cfs 0.328 af

Subcatchment 3S: SCS Runoff (Post DA-1 Runoff Area=2.000 ac 15.00% Impervious Runoff Depth=0.61"
Tc=5.0 min CN=81 Runoff=2.24 cfs 0.102 af

Subcatchment 4S: SCS Runoff (Post DA-1 Runoff Area=6.900 ac 5.80% Impervious Runoff Depth=0.39"
Flow Length=1,556' Tc=24.1 min CN=75 Runoff=2.08 cfs 0.222 af

Reach 8R: Reach (Basin 1 Reach) Avg. Depth=0.00' Max Vel=0.00 fps Inflow=0.00 cfs 0.000 af
n=0.033 L=400.0' S=0.0400 '/' Capacity=114.92 cfs Outflow=0.00 cfs 0.000 af

Pond 5P: Reservior (Forebay Outflow) Peak Elev=1,084.93' Storage=0.328 af Inflow=3.21 cfs 0.328 af
Outflow=0.00 cfs 0.000 af

Pond 6P: Reservior (Basin 1 Outflow) Peak Elev=1,076.00' Storage=0.000 af Inflow=0.00 cfs 0.000 af
Primary=0.00 cfs 0.000 af Secondary=0.00 cfs 0.000 af Outflow=0.00 cfs 0.000 af

Pond 7P: Reservior (Basin 2 Outflow) Peak Elev=1,052.79' Storage=0.028 af Inflow=2.24 cfs 0.102 af
Primary=0.70 cfs 0.101 af Secondary=0.00 cfs 0.000 af Outflow=0.70 cfs 0.101 af

Link 9: Combine (Post DA-1) Inflow=2.73 cfs 0.323 af
Primary=2.73 cfs 0.323 af

Total Runoff Area = 36.600 ac Runoff Volume = 1.063 af Average Runoff Depth = 0.35"
96.99% Pervious = 35.500 ac 3.01% Impervious = 1.100 ac

Summary for Subcatchment 1S: SCS Runoff (Pre-DA-1)

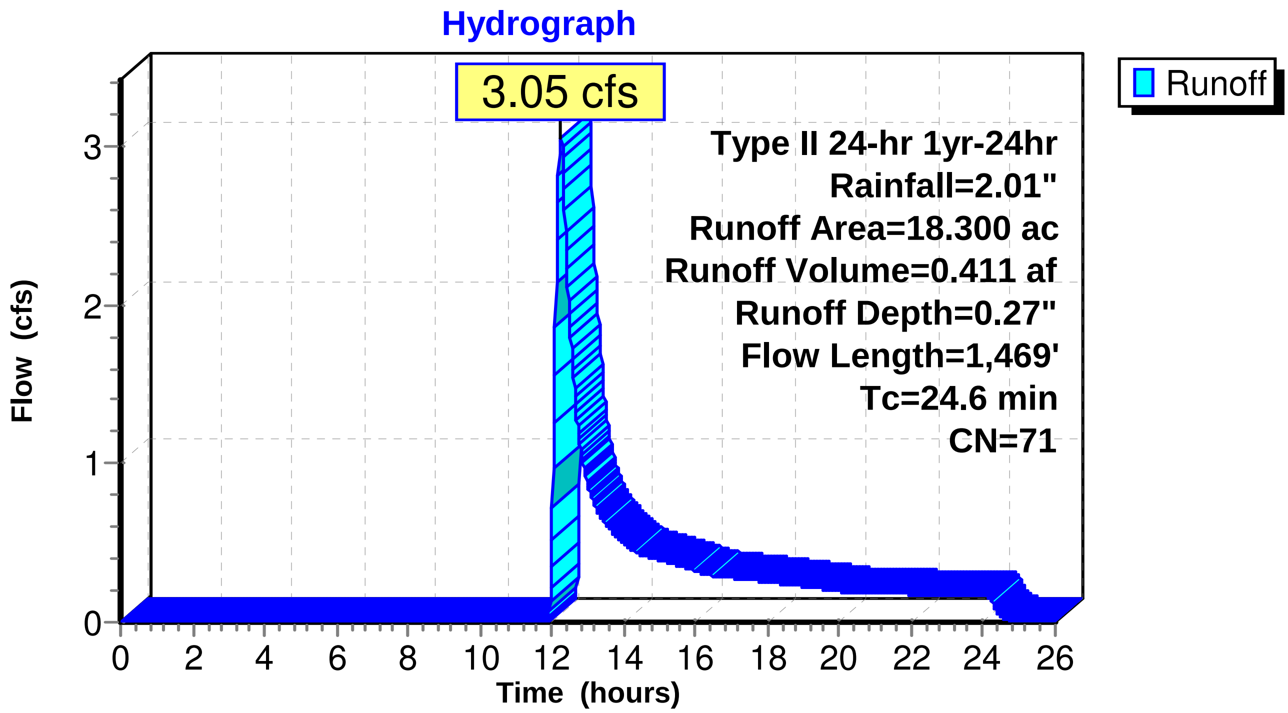
Runoff = 3.05 cfs @ 12.25 hrs, Volume= 0.411 af, Depth= 0.27"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-26.00 hrs, dt= 0.02 hrs
Type II 24-hr 1yr-24hr Rainfall=2.01"

	Area (ac)	CN	Description
*	0.200	98	
*	0.200	89	
*	11.200	71	
*	6.700	70	
	18.300	71	Weighted Average
	18.100		Pervious Area
	0.200		Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
21.1	100	0.1200	0.08		**Sheet Flow, Sheet Flow** n= 0.800 P2= 2.39"
1.3	573	0.2200	7.55		**Shallow Concentrated Flow, Shallow Concentrated Flow A** Unpaved Kv= 16.1 fps
1.8	429	0.0600	3.94		**Shallow Concentrated Flow, Shallow Concentrated Flow B** Unpaved Kv= 16.1 fps
0.4	367	0.0870	14.16	169.93	**Channel Flow, Channel Flow** Area= 12.0 sf Perim= 10.9' r= 1.10' n= 0.033
24.6	1,469	Total			

Subcatchment 1S: SCS Runoff (Pre-DA-1)



Summary for Subcatchment 2S: SCS Runoff (Post DA-1 Detained 1)

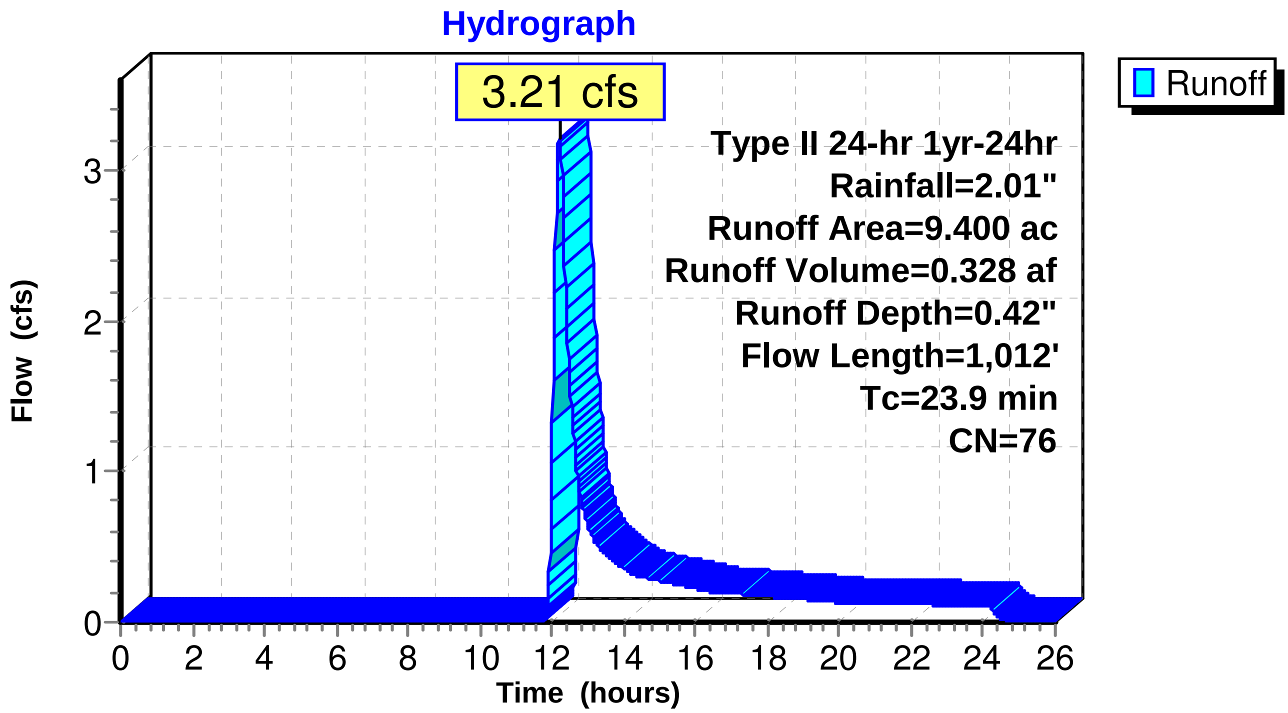
Runoff = 3.21 cfs @ 12.21 hrs, Volume= 0.328 af, Depth= 0.42"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-26.00 hrs, dt= 0.02 hrs
Type II 24-hr 1yr-24hr Rainfall=2.01"

	Area (ac)	CN	Description
*	0.200	98	
*	2.300	89	
*	6.000	71	
*	0.900	70	
	9.400	76	Weighted Average
	9.200		Pervious Area
	0.200		Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
21.1	100	0.1200	0.08		**Sheet Flow, Sheet Flow** n= 0.800 P2= 2.39"
0.7	332	0.2600	8.21		**Shallow Concentrated Flow, Shallow Concentrated Flow A** Unpaved Kv= 16.1 fps
1.3	270	0.0300	3.52		**Shallow Concentrated Flow, Shallow Concentrated Flow B** Paved Kv= 20.3 fps
0.1	88	0.3800	9.92		**Shallow Concentrated Flow, Shallow Concentrated Flow C** Unpaved Kv= 16.1 fps
0.7	222	0.0140	5.68	68.17	**Channel Flow, Channel Flow** Area= 12.0 sf Perim= 10.9' r= 1.10' n= 0.033
23.9	1,012	Total			

Subcatchment 2S: SCS Runoff (Post DA-1 Detained 1)



Summary for Subcatchment 3S: SCS Runoff (Post DA-1 Detained 2)

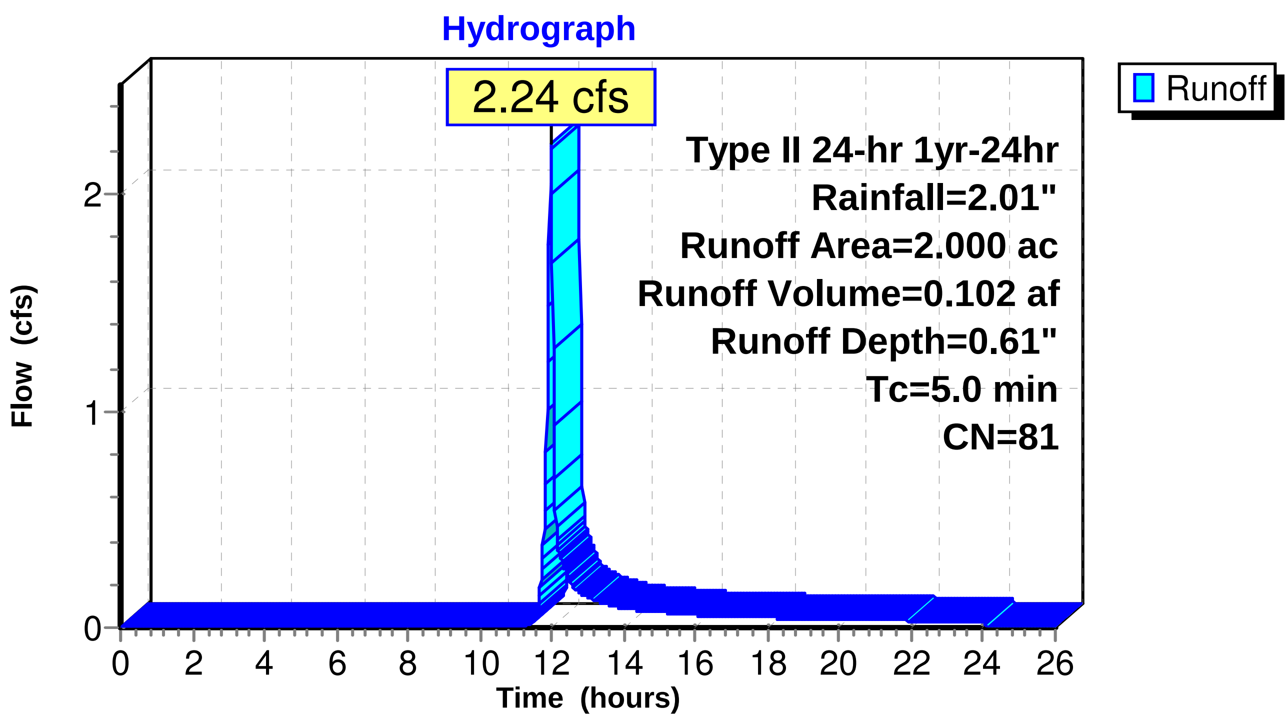
Runoff = 2.24 cfs @ 11.97 hrs, Volume= 0.102 af, Depth= 0.61"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-26.00 hrs, dt= 0.02 hrs
Type II 24-hr 1yr-24hr Rainfall=2.01"

	Area (ac)	CN	Description
*	0.300	98	
*	0.700	89	
*	1.000	71	
	2.000	81	Weighted Average
	1.700		Pervious Area
	0.300		Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry, User**

Subcatchment 3S: SCS Runoff (Post DA-1 Detained 2)



Summary for Subcatchment 4S: SCS Runoff (Post DA-1 Undetained)

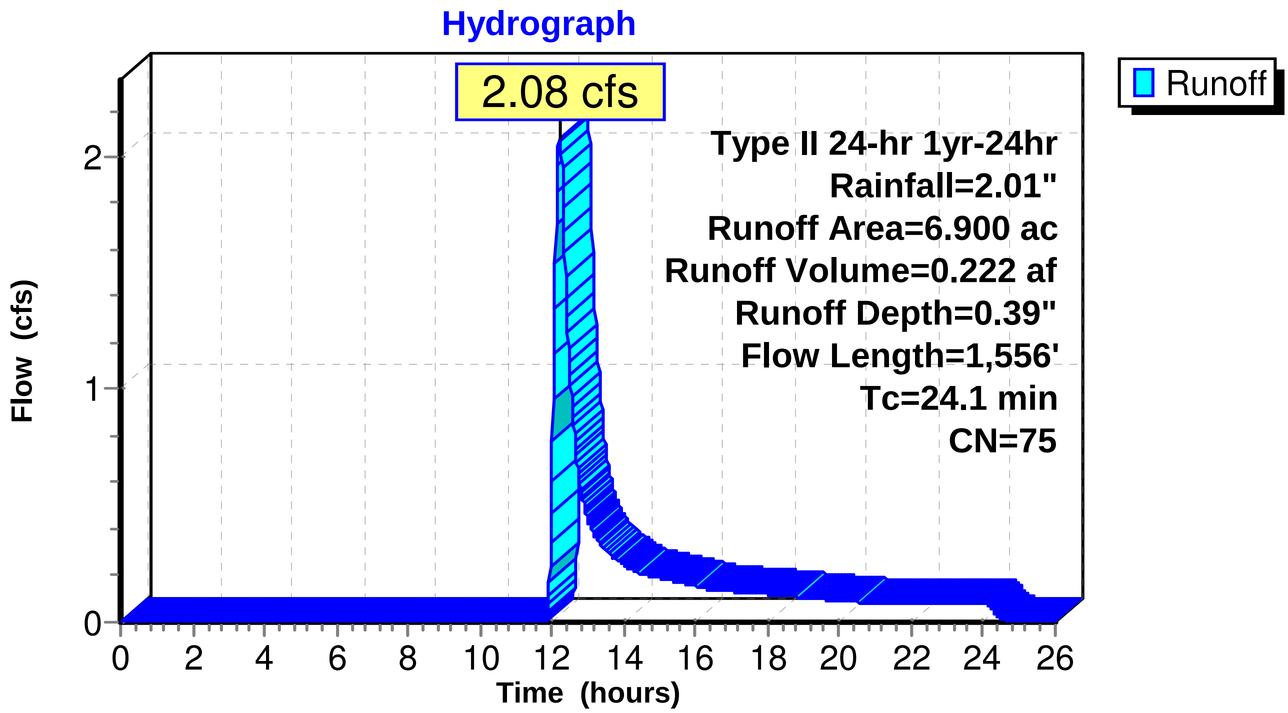
Runoff = 2.08 cfs @ 12.22 hrs, Volume= 0.222 af, Depth= 0.39"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-26.00 hrs, dt= 0.02 hrs
Type II 24-hr 1yr-24hr Rainfall=2.01"

	Area (ac)	CN	Description
*	0.400	98	
*	0.900	89	
*	4.100	71	
*	1.500	70	
	6.900	75	Weighted Average
	6.500		Pervious Area
	0.400		Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
21.1	100	0.1200	0.08		**Sheet Flow, Sheet Flow** n= 0.800 P2= 2.39"
0.9	412	0.2300	7.72		**Shallow Concentrated Flow, Shallow Concentrated Flow A** Unpaved Kv= 16.1 fps
1.3	312	0.0580	3.88		**Shallow Concentrated Flow, Shallow Concentrated Flow B** Unpaved Kv= 16.1 fps
0.8	732	0.0960	14.88	178.51	**Channel Flow, Channel Flow** Area= 12.0 sf Perim= 10.9' r= 1.10' n= 0.033
24.1	1,556	Total			

Subcatchment 4S: SCS Runoff (Post DA-1 Undetained)



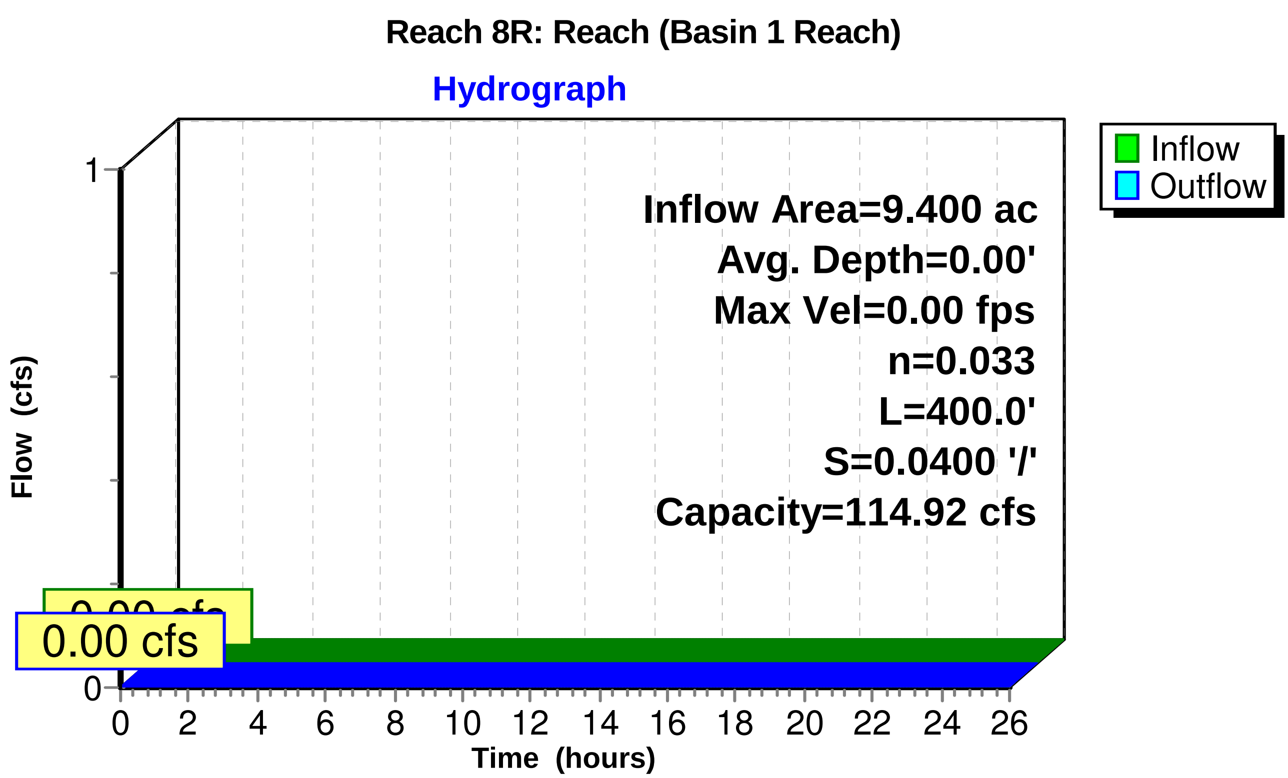
Summary for Reach 8R: Reach (Basin 1 Reach)

Inflow Area = 9.400 ac, 2.13% Impervious, Inflow Depth = 0.00" for 1yr-24hr event
Inflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-26.00 hrs, dt= 0.02 hrs
Max. Velocity= 0.00 fps, Min. Travel Time= 0.0 min
Avg. Velocity = 0.00 fps, Avg. Travel Time= 0.0 min

Peak Storage= 0 cf @ 0.00 hrs, Average Depth at Peak Storage= 0.00'
Bank-Full Depth= 2.00', Capacity at Bank-Full= 114.92 cfs

2.00' x 2.00' deep channel, n= 0.033
Side Slope Z-value= 2.0 '/' Top Width= 10.00'
Length= 400.0' Slope= 0.0400 '/'
Inlet Invert= 1,072.00', Outlet Invert= 1,056.00'



Summary for Pond 5P: Reservior (Forebay Outflow)

Inflow Area = 9.400 ac, 2.13% Impervious, Inflow Depth = 0.42" for 1yr-24hr event
Inflow = 3.21 cfs @ 12.21 hrs, Volume= 0.328 af
Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Atten= 100%, Lag= 0.0 min
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

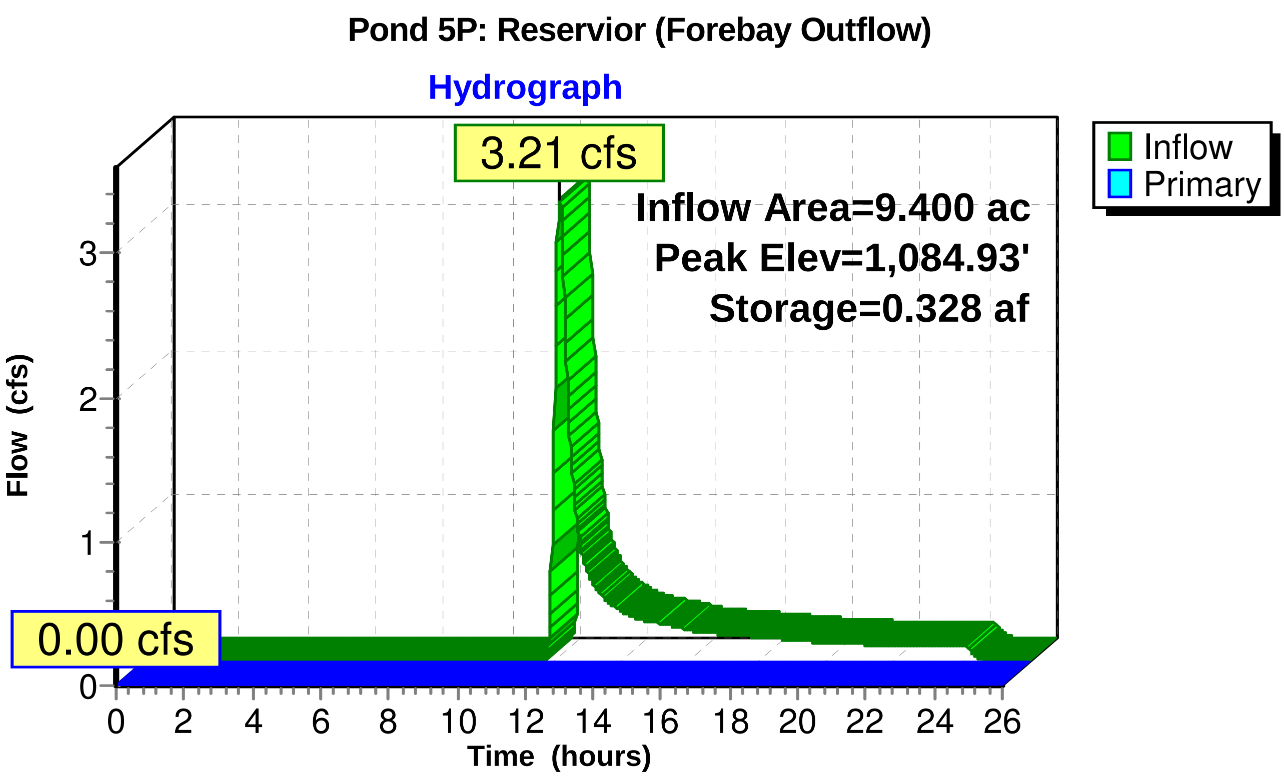
Routing by Stor-Ind method, Time Span= 0.00-26.00 hrs, dt= 0.02 hrs
Peak Elev= 1,084.93' @ 25.36 hrs Surf.Area= 0.136 ac Storage= 0.328 af

Plug-Flow detention time= (not calculated: initial storage excedes outflow)
Center-of-Mass det. time= (not calculated: no outflow)

Volume	Invert	Avail.Storage	Storage Description
#1	1,082.00'	0.484 af	**30.00'W x 130.00'L x 4.00'H Trapezoid Z=2.0**

Device	Routing	Invert	Outlet Devices
#1	Primary	1,085.50'	**40.0' long Broad-Crested Rectangular Weir** Head (feet) 1,085.50 Coef. (English) 2.60

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=1,082.00' (Free Discharge)
└─**1=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)



Summary for Pond 6P: Reservior (Basin 1 Outflow)

Inflow Area = 9.400 ac, 2.13% Impervious, Inflow Depth = 0.00" for 1yr-24hr event
Inflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Atten= 0%, Lag= 0.0 min
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 0.00-26.00 hrs, dt= 0.02 hrs
Peak Elev= 1,076.00' @ 0.00 hrs Surf.Area= 0.104 ac Storage= 0.000 af

Plug-Flow detention time= (not calculated: initial storage excedes outflow)
Center-of-Mass det. time= (not calculated: no inflow)

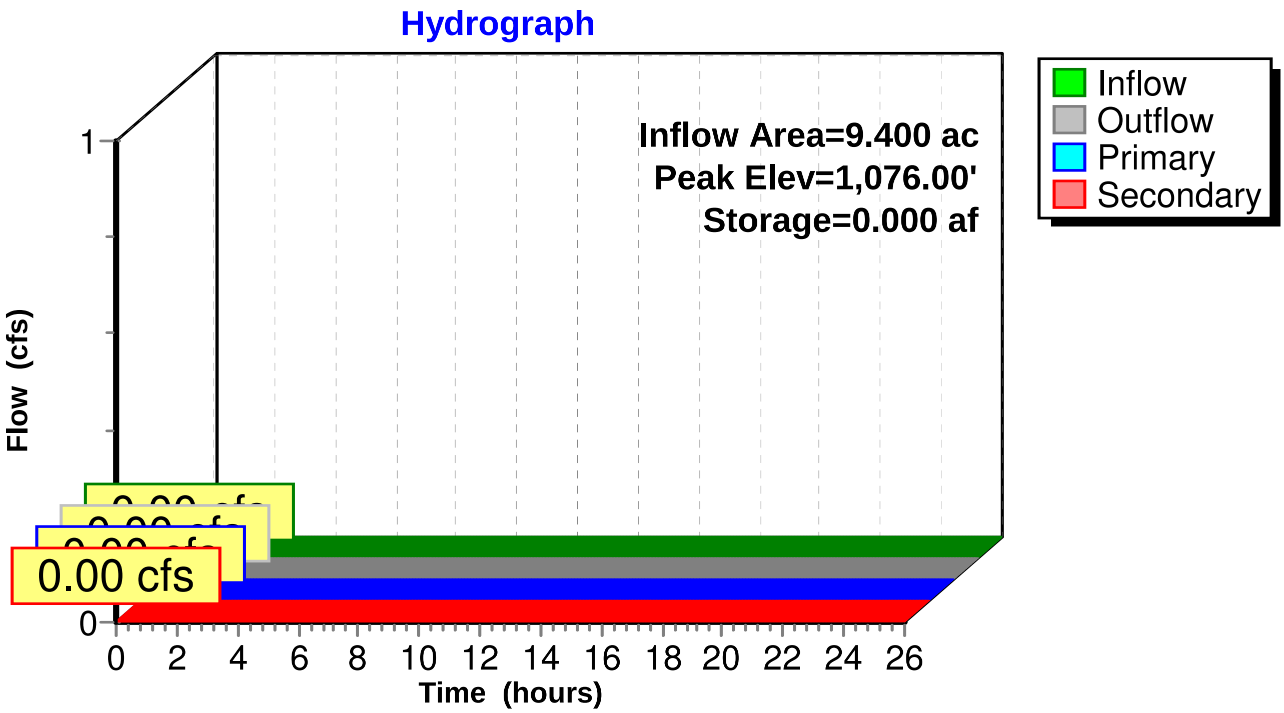
Volume	Invert	Avail.Storage	Storage Description
#1	1,076.00'	0.770 af	**35.00'W x 130.00'L x 4.00'H Trapezoid Z=5.0**

Device	Routing	Invert	Outlet Devices
#1	Device 4	1,076.00'	**6.0" Vert. Orifice/Grate** C= 0.600
#2	Device 4	1,077.00'	**1.00' W x 0.50' H Vert. Orifice/Grate** C= 0.600
#3	Device 4	1,078.00'	**11.5' long Sharp-Crested Rectangular Weir** 2 End Contraction(s)
#4	Primary	1,074.50'	**18.0" x 40.0' long Culvert** Ke= 0.500 Outlet Invert= 1,072.50' S= 0.0500 '/' Cc= 0.600 n= 0.013
#5	Secondary	1,078.50'	**8.0' long Broad-Crested Rectangular Weir** Head (feet) 1,078.50 Coef. (English) 3.33

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=1,076.00' (Free Discharge)
└─**4=Culvert** (Passes 0.00 cfs of 4.91 cfs potential flow)
  ├─**1=Orifice/Grate** (Controls 0.00 cfs)
  ├─**2=Orifice/Grate** (Controls 0.00 cfs)
  └─**3=Sharp-Crested Rectangular Weir** (Controls 0.00 cfs)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=1,076.00' (Free Discharge)
└─**5=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond 6P: Reservior (Basin 1 Outflow)



Summary for Pond 7P: Reservior (Basin 2 Outflow)

Inflow Area = 2.000 ac, 15.00% Impervious, Inflow Depth = 0.61" for 1yr-24hr event
Inflow = 2.24 cfs @ 11.97 hrs, Volume= 0.102 af
Outflow = 0.70 cfs @ 12.08 hrs, Volume= 0.101 af, Atten= 69%, Lag= 6.8 min
Primary = 0.70 cfs @ 12.08 hrs, Volume= 0.101 af
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 0.00-26.00 hrs, dt= 0.02 hrs
Peak Elev= 1,052.79' @ 12.08 hrs Surf.Area= 0.039 ac Storage= 0.028 af

Plug-Flow detention time= 42.3 min calculated for 0.101 af (99% of inflow)
Center-of-Mass det. time= 36.7 min (898.5 - 861.8)

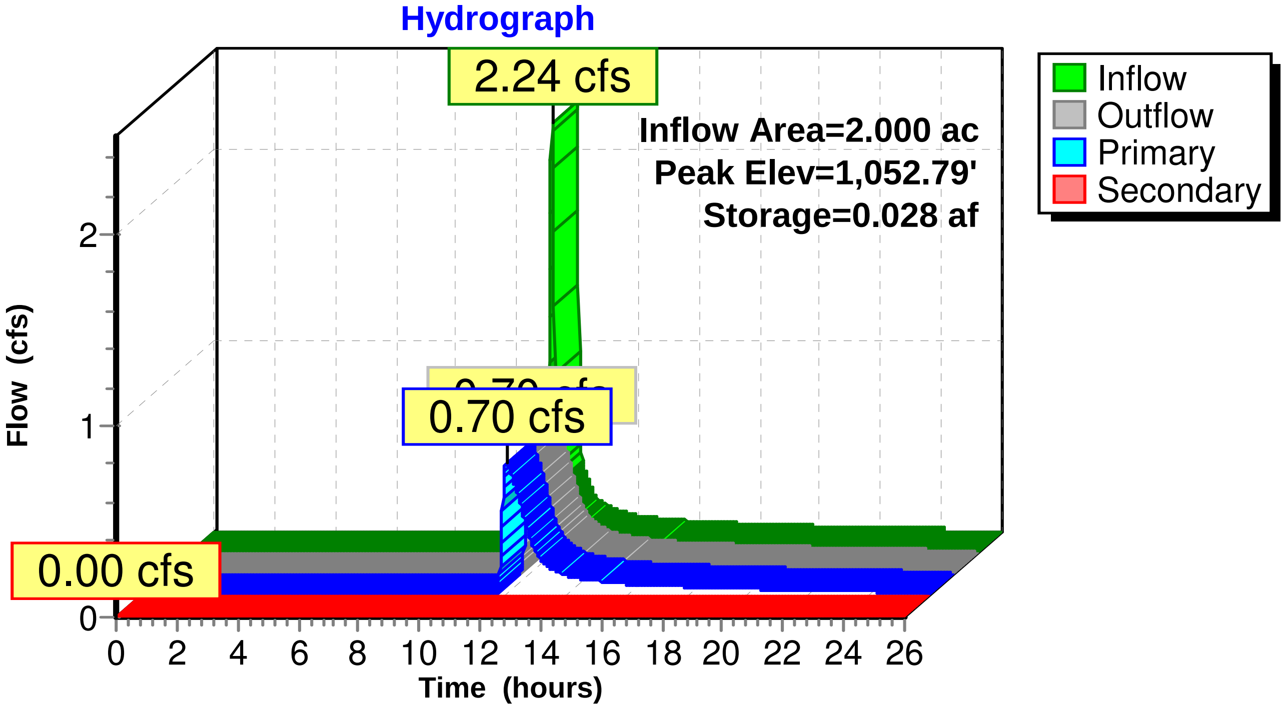
Volume	Invert	Avail.Storage	Storage Description
#1	1,052.00'	0.203 af	**20.00'W x 70.00'L x 4.00'H Trapezoid Z=2.0**

Device	Routing	Invert	Outlet Devices
#1	Device 4	1,052.00'	**6.0" Vert. Orifice/Grate** C= 0.600
#2	Device 4	1,053.00'	**6.00' W x 6.00' H Vert. Orifice/Grate** C= 0.600
#3	Device 4	1,054.00'	**11.5' long Sharp-Crested Rectangular Weir** 2 End Contraction(s)
#4	Primary	1,050.50'	**18.0" x 62.0' long Culvert** Ke= 0.500 Outlet Invert= 1,049.01' S= 0.0240 '/' Cc= 0.600 n= 0.013
#5	Secondary	1,054.50'	**12.0' long Broad-Crested Rectangular Weir** Head (feet) 1,054.50 Coef. (English) 2.60

Primary OutFlow Max=0.70 cfs @ 12.08 hrs HW=1,052.79' (Free Discharge)
└─**4=Culvert** (Passes 0.70 cfs of 7.04 cfs potential flow)
  ├─**1=Orifice/Grate** (Orifice Controls 0.70 cfs @ 3.54 fps)
  ├─**2=Orifice/Grate** (Controls 0.00 cfs)
  └─**3=Sharp-Crested Rectangular Weir** (Controls 0.00 cfs)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=1,052.00' (Free Discharge)
└─**5=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond 7P: Reservior (Basin 2 Outflow)

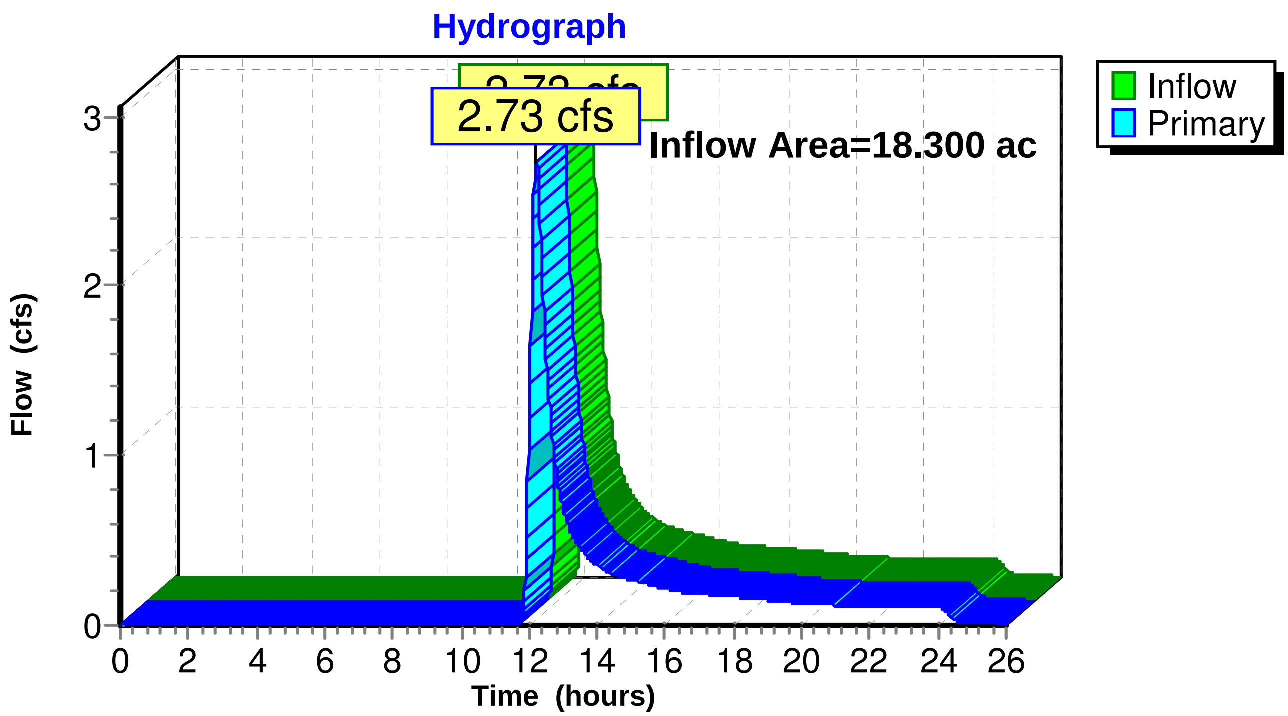


Summary for Link 9: Combine (Post DA-1)

Inflow Area =	18.300 ac,	4.92% Impervious, Inflow Depth > 0.21"	for 1yr-24hr event
Inflow =	2.73 cfs @	12.21 hrs, Volume=	0.323 af
Primary =	2.73 cfs @	12.21 hrs, Volume=	0.323 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-26.00 hrs, dt= 0.02 hrs

Link 9: Combine (Post DA-1)



Time span=0.00-26.00 hrs, dt=0.02 hrs, 1301 points
Runoff by SCS TR-20 method, UH=SCS
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 1S: SCS Runoff (Pre-DA-1) Runoff Area=18.300 ac 1.09% Impervious Runoff Depth=0.44"
Flow Length=1,469' Tc=24.6 min CN=71 Runoff=6.02 cfs 0.667 af

Subcatchment 2S: SCS Runoff (Post DA-1 Runoff Area=9.400 ac 2.13% Impervious Runoff Depth=0.63"
Flow Length=1,012' Tc=23.9 min CN=76 Runoff=5.27 cfs 0.493 af

Subcatchment 3S: SCS Runoff (Post DA-1 Runoff Area=2.000 ac 15.00% Impervious Runoff Depth=0.86"
Tc=5.0 min CN=81 Runoff=3.20 cfs 0.144 af

Subcatchment 4S: SCS Runoff (Post DA-1 Runoff Area=6.900 ac 5.80% Impervious Runoff Depth=0.59"
Flow Length=1,556' Tc=24.1 min CN=75 Runoff=3.51 cfs 0.338 af

Reach 8R: Reach (Basin 1 Reach) Avg. Depth=0.06' Max Vel=1.28 fps Inflow=0.15 cfs 0.070 af
n=0.033 L=400.0' S=0.0400 '/' Capacity=114.92 cfs Outflow=0.15 cfs 0.069 af

Pond 5P: Reservior (Forebay Outflow) Peak Elev=1,085.51' Storage=0.411 af Inflow=5.27 cfs 0.493 af
Outflow=0.21 cfs 0.084 af

Pond 6P: Reservior (Basin 1 Outflow) Peak Elev=1,076.24' Storage=0.026 af Inflow=0.21 cfs 0.084 af
Primary=0.15 cfs 0.070 af Secondary=0.00 cfs 0.000 af Outflow=0.15 cfs 0.070 af

Pond 7P: Reservior (Basin 2 Outflow) Peak Elev=1,053.10' Storage=0.041 af Inflow=3.20 cfs 0.144 af
Primary=1.51 cfs 0.143 af Secondary=0.00 cfs 0.000 af Outflow=1.51 cfs 0.143 af

Link 9: Combine (Post DA-1) Inflow=4.32 cfs 0.549 af
Primary=4.32 cfs 0.549 af

Total Runoff Area = 36.600 ac Runoff Volume = 1.642 af Average Runoff Depth = 0.54"
96.99% Pervious = 35.500 ac 3.01% Impervious = 1.100 ac

Summary for Subcatchment 1S: SCS Runoff (Pre-DA-1)

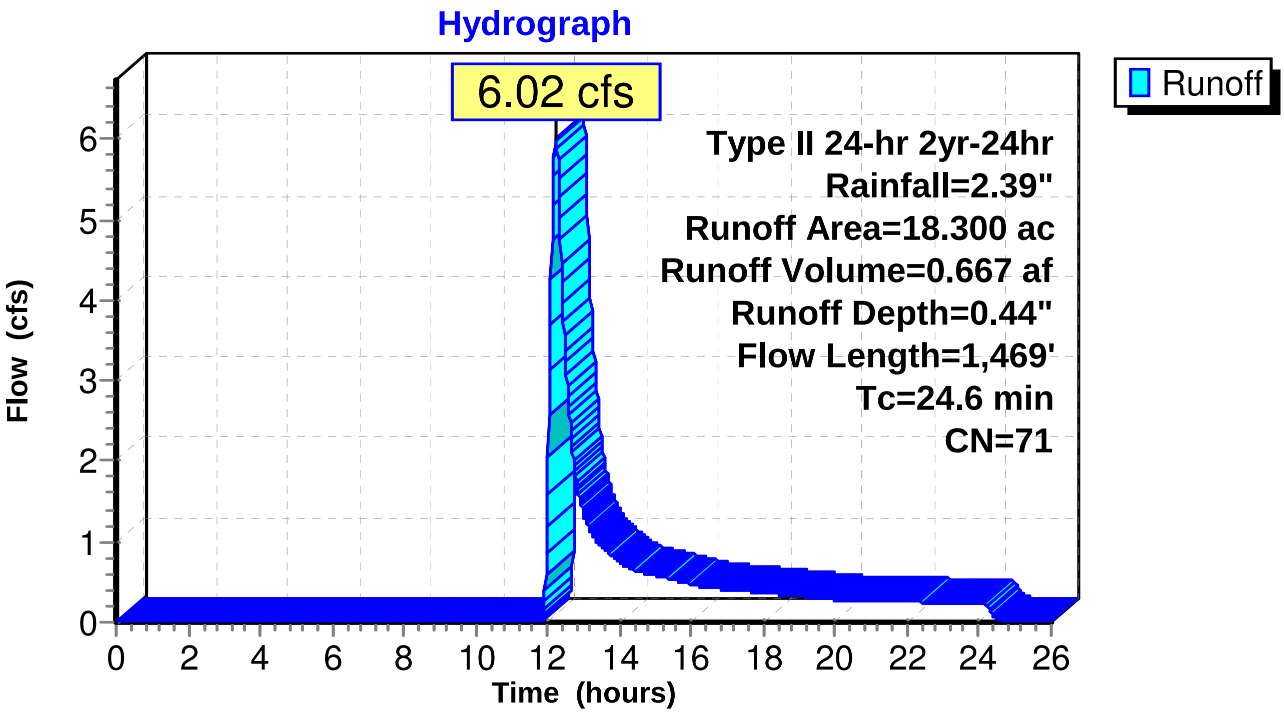
Runoff = 6.02 cfs @ 12.22 hrs, Volume= 0.667 af, Depth= 0.44"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-26.00 hrs, dt= 0.02 hrs
Type II 24-hr 2yr-24hr Rainfall=2.39"

	Area (ac)	CN	Description
*	0.200	98	
*	0.200	89	
*	11.200	71	
*	6.700	70	
	18.300	71	Weighted Average
	18.100		Pervious Area
	0.200		Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
21.1	100	0.1200	0.08		**Sheet Flow, Sheet Flow** n= 0.800 P2= 2.39"
1.3	573	0.2200	7.55		**Shallow Concentrated Flow, Shallow Concentrated Flow A** Unpaved Kv= 16.1 fps
1.8	429	0.0600	3.94		**Shallow Concentrated Flow, Shallow Concentrated Flow B** Unpaved Kv= 16.1 fps
0.4	367	0.0870	14.16	169.93	**Channel Flow, Channel Flow** Area= 12.0 sf Perim= 10.9' r= 1.10' n= 0.033
24.6	1,469	Total			

Subcatchment 1S: SCS Runoff (Pre-DA-1)



Summary for Subcatchment 2S: SCS Runoff (Post DA-1 Detained 1)

Runoff = 5.27 cfs @ 12.20 hrs, Volume= 0.493 af, Depth= 0.63"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-26.00 hrs, dt= 0.02 hrs
Type II 24-hr 2yr-24hr Rainfall=2.39"

	Area (ac)	CN	Description
*	0.200	98	
*	2.300	89	
*	6.000	71	
*	0.900	70	
	9.400	76	Weighted Average
	9.200		Pervious Area
	0.200		Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
21.1	100	0.1200	0.08		**Sheet Flow, Sheet Flow** n= 0.800 P2= 2.39"
0.7	332	0.2600	8.21		**Shallow Concentrated Flow, Shallow Concentrated Flow A** Unpaved Kv= 16.1 fps
1.3	270	0.0300	3.52		**Shallow Concentrated Flow, Shallow Concentrated Flow B** Paved Kv= 20.3 fps
0.1	88	0.3800	9.92		**Shallow Concentrated Flow, Shallow Concentrated Flow C** Unpaved Kv= 16.1 fps
0.7	222	0.0140	5.68	68.17	**Channel Flow, Channel Flow** Area= 12.0 sf Perim= 10.9' r= 1.10' n= 0.033
23.9	1,012	Total			

Crayne Compressor Station Pre
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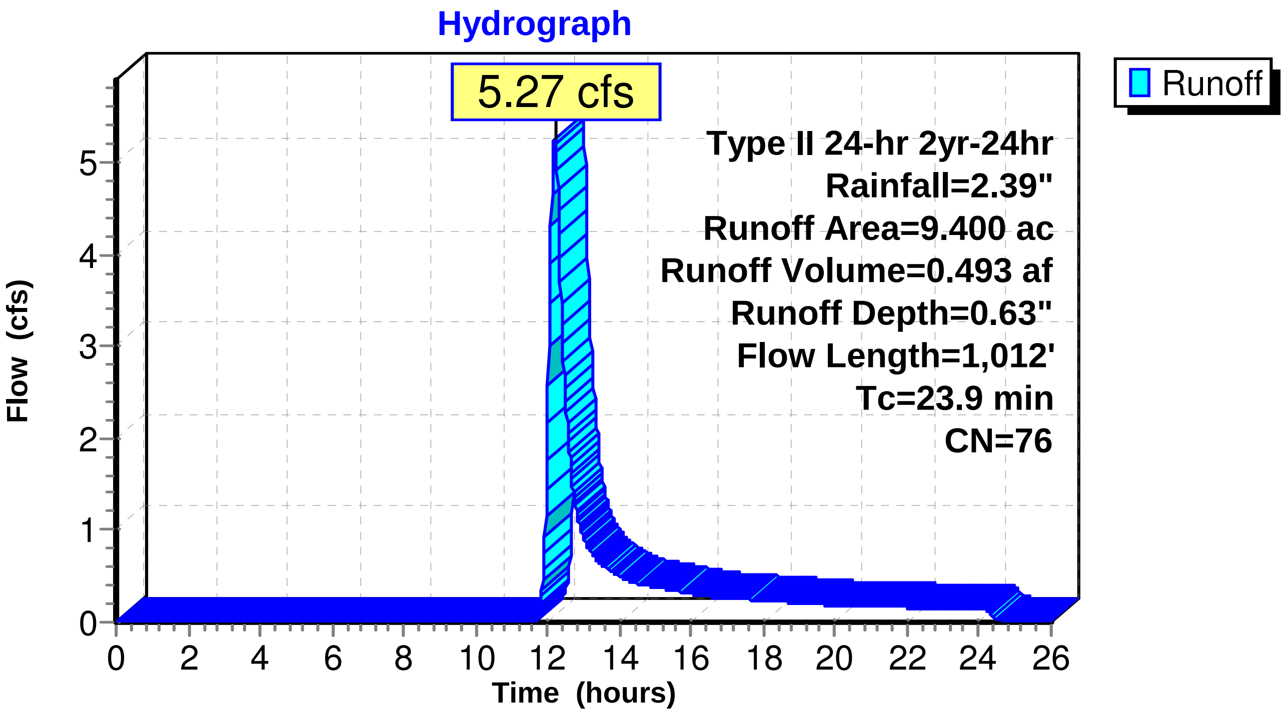
Subcatchment 2S: SCS Runoff (Post DA-1 Detained 1)



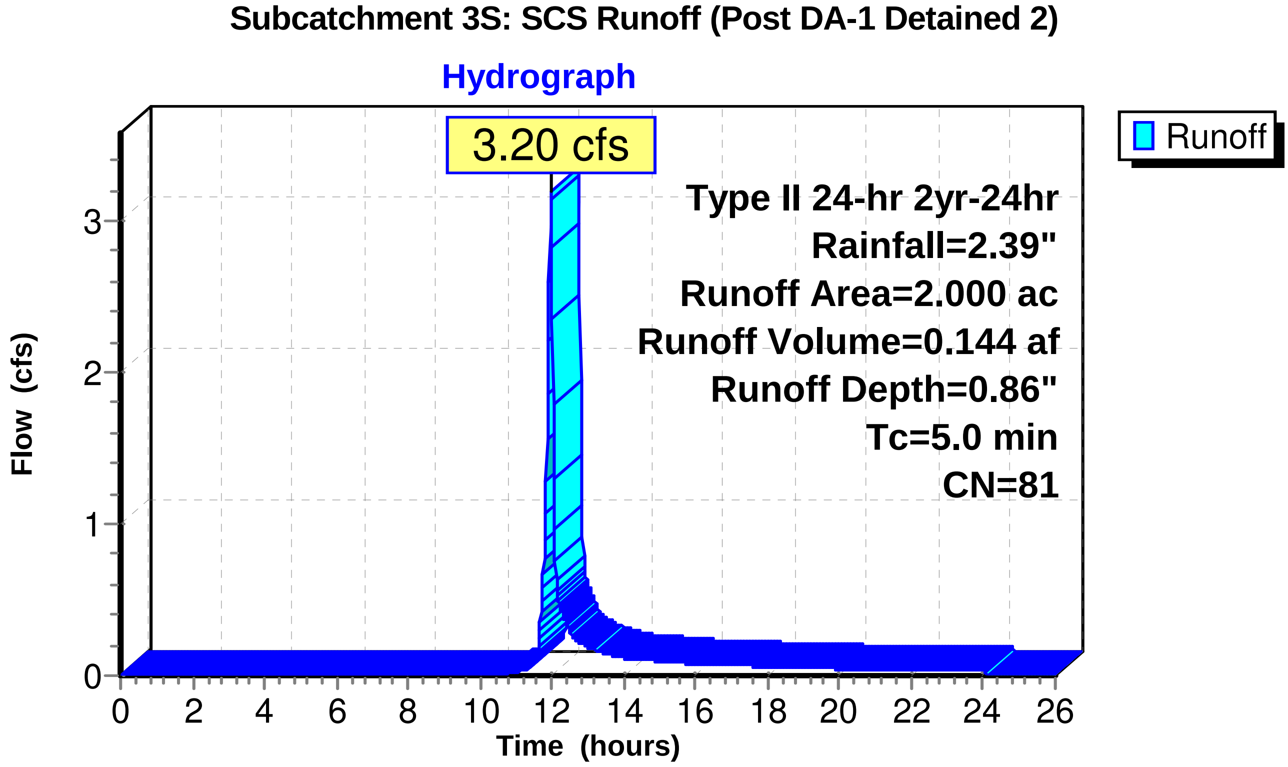
Summary for Subcatchment 3S: SCS Runoff (Post DA-1 Detained 2)

Runoff = 3.20 cfs @ 11.97 hrs, Volume= 0.144 af, Depth= 0.86"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-26.00 hrs, dt= 0.02 hrs
Type II 24-hr 2yr-24hr Rainfall=2.39"

	Area (ac)	CN	Description
*	0.300	98	
*	0.700	89	
*	1.000	71	
	2.000	81	Weighted Average
	1.700		Pervious Area
	0.300		Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry, User**



Summary for Subcatchment 4S: SCS Runoff (Post DA-1 Undetained)

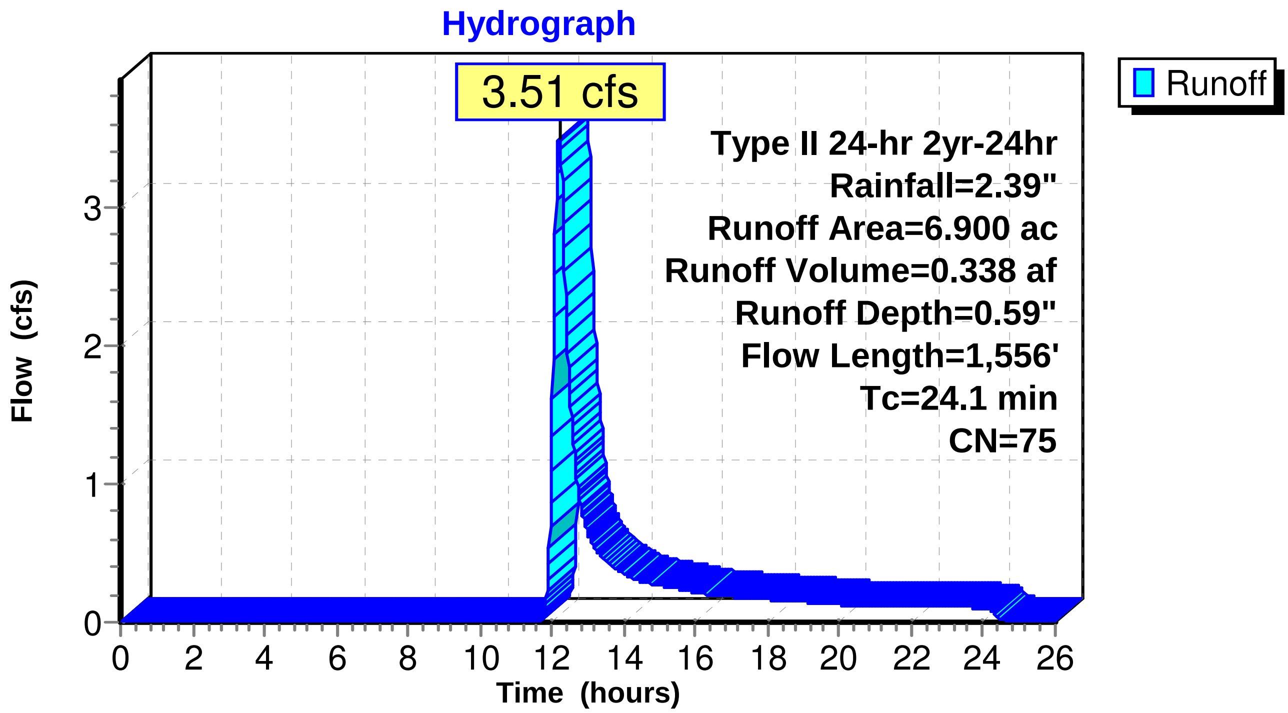
Runoff = 3.51 cfs @ 12.20 hrs, Volume= 0.338 af, Depth= 0.59"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-26.00 hrs, dt= 0.02 hrs
Type II 24-hr 2yr-24hr Rainfall=2.39"

	Area (ac)	CN	Description
*	0.400	98	
*	0.900	89	
*	4.100	71	
*	1.500	70	
	6.900	75	Weighted Average
	6.500		Pervious Area
	0.400		Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
21.1	100	0.1200	0.08		**Sheet Flow, Sheet Flow** n= 0.800 P2= 2.39"
0.9	412	0.2300	7.72		**Shallow Concentrated Flow, Shallow Concentrated Flow A** Unpaved Kv= 16.1 fps
1.3	312	0.0580	3.88		**Shallow Concentrated Flow, Shallow Concentrated Flow B** Unpaved Kv= 16.1 fps
0.8	732	0.0960	14.88	178.51	**Channel Flow, Channel Flow** Area= 12.0 sf Perim= 10.9' r= 1.10' n= 0.033
24.1	1,556	Total			

Subcatchment 4S: SCS Runoff (Post DA-1 Undetained)



Summary for Reach 8R: Reach (Basin 1 Reach)

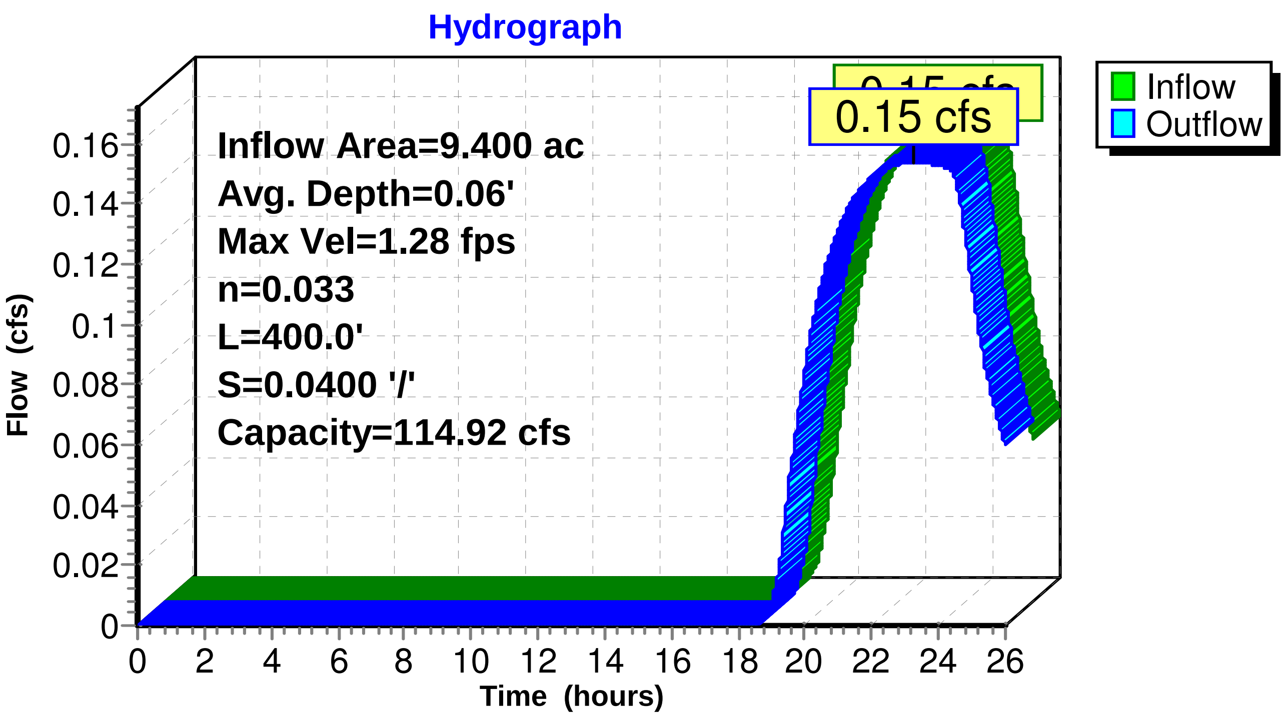
Inflow Area = 9.400 ac, 2.13% Impervious, Inflow Depth > 0.09" for 2yr-24hr event
Inflow = 0.15 cfs @ 23.13 hrs, Volume= 0.070 af
Outflow = 0.15 cfs @ 23.28 hrs, Volume= 0.069 af, Atten= 0%, Lag= 8.8 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-26.00 hrs, dt= 0.02 hrs
Max. Velocity= 1.28 fps, Min. Travel Time= 5.2 min
Avg. Velocity = 1.12 fps, Avg. Travel Time= 6.0 min

Peak Storage= 48 cf @ 23.19 hrs, Average Depth at Peak Storage= 0.06'
Bank-Full Depth= 2.00', Capacity at Bank-Full= 114.92 cfs

2.00' x 2.00' deep channel, n= 0.033
Side Slope Z-value= 2.0 '/' Top Width= 10.00'
Length= 400.0' Slope= 0.0400 '/'
Inlet Invert= 1,072.00', Outlet Invert= 1,056.00'

Reach 8R: Reach (Basin 1 Reach)



Summary for Pond 5P: Reservior (Forebay Outflow)

Inflow Area =	9.400 ac, 2.13% Impervious, Inflow Depth = 0.63"	for 2yr-24hr event
Inflow =	5.27 cfs @ 12.20 hrs, Volume=	0.493 af
Outflow =	0.21 cfs @ 18.89 hrs, Volume=	0.084 af, Atten= 96%, Lag= 402.0 min
Primary =	0.21 cfs @ 18.89 hrs, Volume=	0.084 af

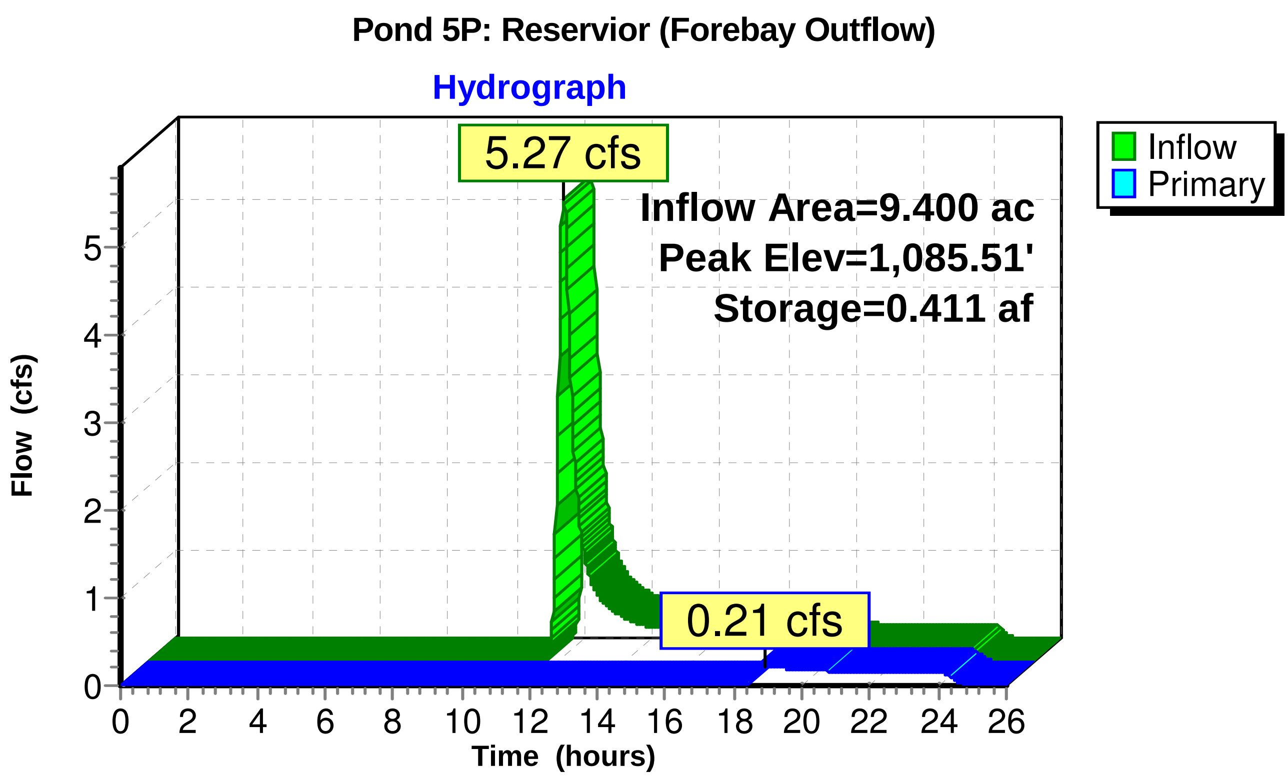
Routing by Stor-Ind method, Time Span= 0.00-26.00 hrs, dt= 0.02 hrs
Peak Elev= 1,085.51' @ 18.89 hrs Surf.Area= 0.146 ac Storage= 0.411 af

Plug-Flow detention time= 553.4 min calculated for 0.084 af (17% of inflow)
Center-of-Mass det. time= 390.0 min (1,278.2 - 888.2)

Volume	Invert	Avail.Storage	Storage Description
#1	1,082.00'	0.484 af	**30.00'W x 130.00'L x 4.00'H Trapezoid Z=2.0**

Device	Routing	Invert	Outlet Devices
#1	Primary	1,085.50'	**40.0' long Broad-Crested Rectangular Weir** Head (feet) 1,085.50 Coef. (English) 2.60

Primary OutFlow Max=0.18 cfs @ 18.89 hrs HW=1,085.51' (Free Discharge)
└─**1=Broad-Crested Rectangular Weir** (Weir Controls 0.18 cfs @ 0.31 fps)



Summary for Pond 6P: Reservior (Basin 1 Outflow)

Inflow Area =	9.400 ac,	2.13% Impervious,	Inflow Depth = 0.11"	for 2yr-24hr event
Inflow =	0.21 cfs @	18.89 hrs, Volume=	0.084 af	
Outflow =	0.15 cfs @	23.13 hrs, Volume=	0.070 af,	Atten= 27%, Lag= 254.2 min
Primary =	0.15 cfs @	23.13 hrs, Volume=	0.070 af	
Secondary =	0.00 cfs @	0.00 hrs, Volume=	0.000 af	

Routing by Stor-Ind method, Time Span= 0.00-26.00 hrs, dt= 0.02 hrs
Peak Elev= 1,076.24' @ 23.13 hrs Surf.Area= 0.114 ac Storage= 0.026 af

Plug-Flow detention time= 110.0 min calculated for 0.070 af (83% of inflow)
Center-of-Mass det. time= 77.5 min (1,355.7 - 1,278.2)

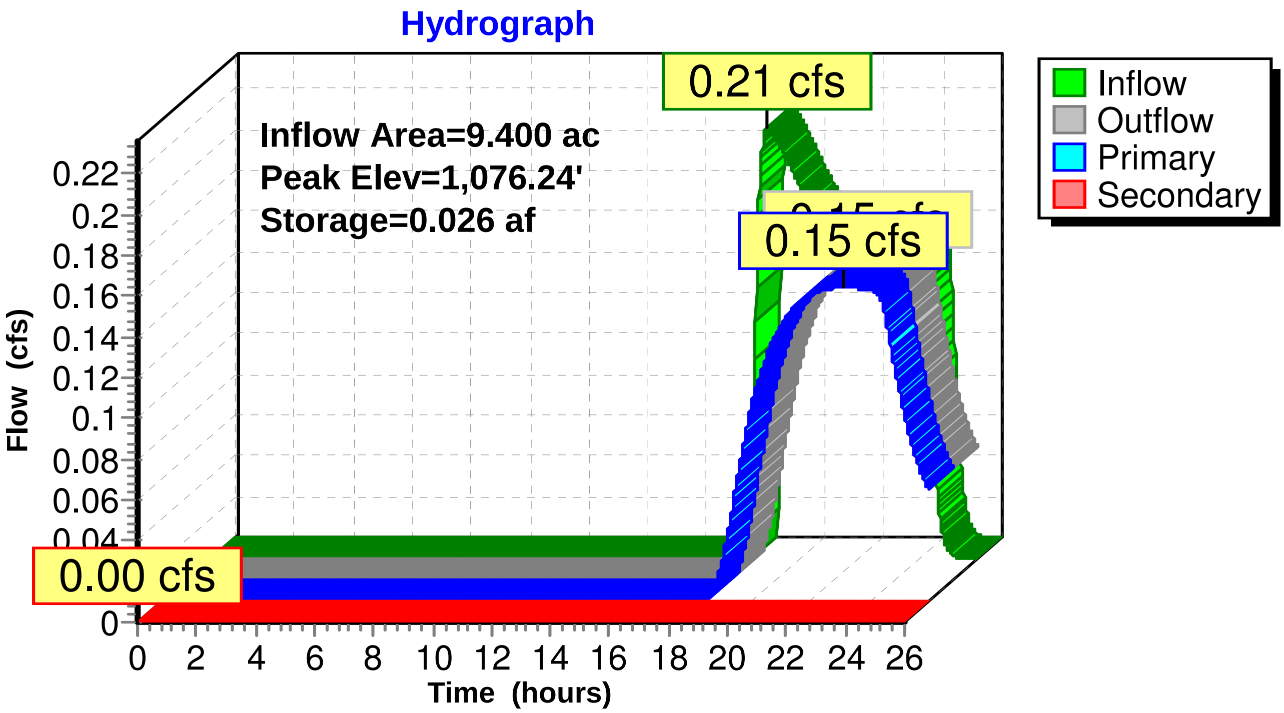
Volume	Invert	Avail.Storage	Storage Description
#1	1,076.00'	0.770 af	**35.00'W x 130.00'L x 4.00'H Trapezoid Z=5.0**

Device	Routing	Invert	Outlet Devices
#1	Device 4	1,076.00'	**6.0" Vert. Orifice/Grate** C= 0.600
#2	Device 4	1,077.00'	**1.00' W x 0.50' H Vert. Orifice/Grate** C= 0.600
#3	Device 4	1,078.00'	**11.5' long Sharp-Crested Rectangular Weir** 2 End Contraction(s)
#4	Primary	1,074.50'	**18.0" x 40.0' long Culvert** Ke= 0.500 Outlet Invert= 1,072.50' S= 0.0500 '/' Cc= 0.600 n= 0.013
#5	Secondary	1,078.50'	**8.0' long Broad-Crested Rectangular Weir** Head (feet) 1,078.50 Coef. (English) 3.33

Primary OutFlow Max=0.15 cfs @ 23.13 hrs HW=1,076.24' (Free Discharge)
└─**4=Culvert** (Passes 0.15 cfs of 5.64 cfs potential flow)
  ├─**1=Orifice/Grate** (Orifice Controls 0.15 cfs @ 1.66 fps)
  ├─**2=Orifice/Grate** (Controls 0.00 cfs)
  └─**3=Sharp-Crested Rectangular Weir** (Controls 0.00 cfs)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=1,076.00' (Free Discharge)
└─**5=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond 6P: Reservior (Basin 1 Outflow)



Summary for Pond 7P: Reservior (Basin 2 Outflow)

Inflow Area = 2.000 ac, 15.00% Impervious, Inflow Depth = 0.86" for 2yr-24hr event
Inflow = 3.20 cfs @ 11.97 hrs, Volume= 0.144 af
Outflow = 1.51 cfs @ 12.05 hrs, Volume= 0.143 af, Atten= 53%, Lag= 5.2 min
Primary = 1.51 cfs @ 12.05 hrs, Volume= 0.143 af
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 0.00-26.00 hrs, dt= 0.02 hrs
Peak Elev= 1,053.10' @ 12.05 hrs Surf.Area= 0.042 ac Storage= 0.041 af

Plug-Flow detention time= 38.3 min calculated for 0.143 af (99% of inflow)
Center-of-Mass det. time= 33.8 min (884.8 - 851.0)

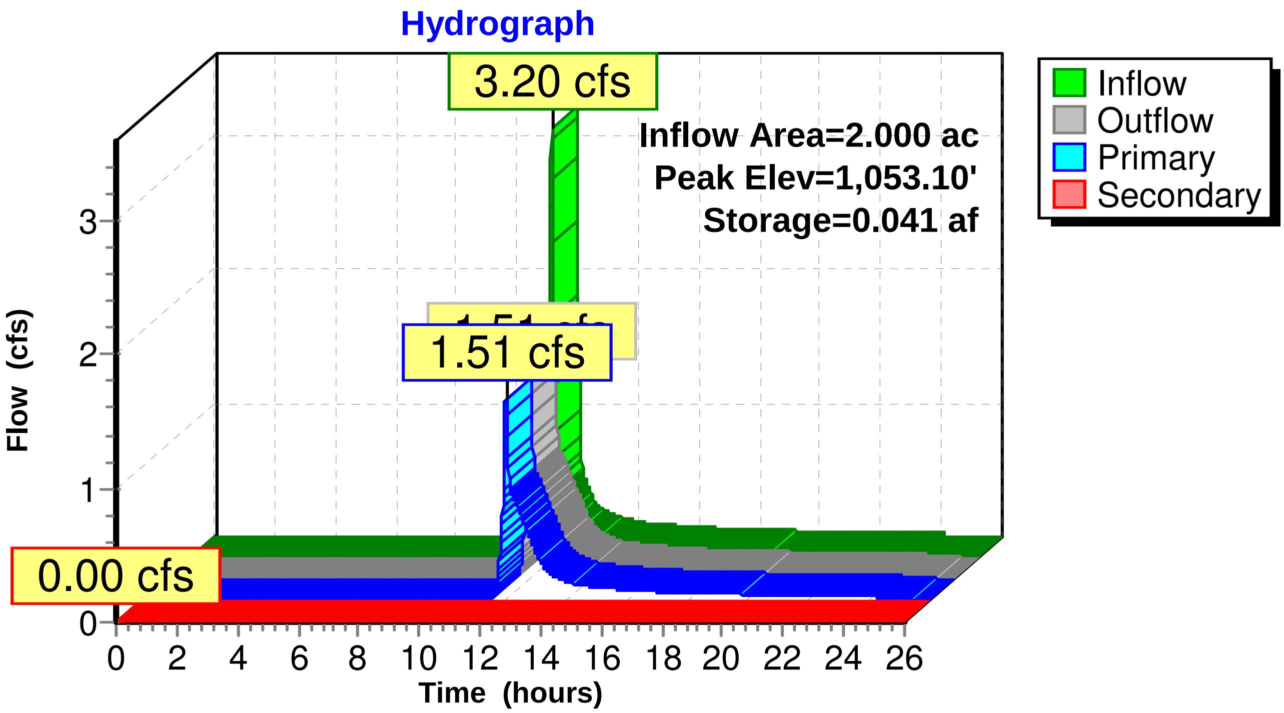
Volume	Invert	Avail.Storage	Storage Description
#1	1,052.00'	0.203 af	**20.00'W x 70.00'L x 4.00'H Trapezoid Z=2.0**

Device	Routing	Invert	Outlet Devices
#1	Device 4	1,052.00'	**6.0" Vert. Orifice/Grate** C= 0.600
#2	Device 4	1,053.00'	**6.00' W x 6.00' H Vert. Orifice/Grate** C= 0.600
#3	Device 4	1,054.00'	**11.5' long Sharp-Crested Rectangular Weir** 2 End Contraction(s)
#4	Primary	1,050.50'	**18.0" x 62.0' long Culvert** Ke= 0.500 Outlet Invert= 1,049.01' S= 0.0240 '/' Cc= 0.600 n= 0.013
#5	Secondary	1,054.50'	**12.0' long Broad-Crested Rectangular Weir** Head (feet) 1,054.50 Coef. (English) 2.60

Primary OutFlow Max=1.47 cfs @ 12.05 hrs HW=1,053.10' (Free Discharge)
└─**4=Culvert** (Passes 1.47 cfs of 7.71 cfs potential flow)
  ├─**1=Orifice/Grate** (Orifice Controls 0.87 cfs @ 4.44 fps)
  ├─**2=Orifice/Grate** (Orifice Controls 0.60 cfs @ 1.01 fps)
  └─**3=Sharp-Crested Rectangular Weir** (Controls 0.00 cfs)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=1,052.00' (Free Discharge)
└─**5=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

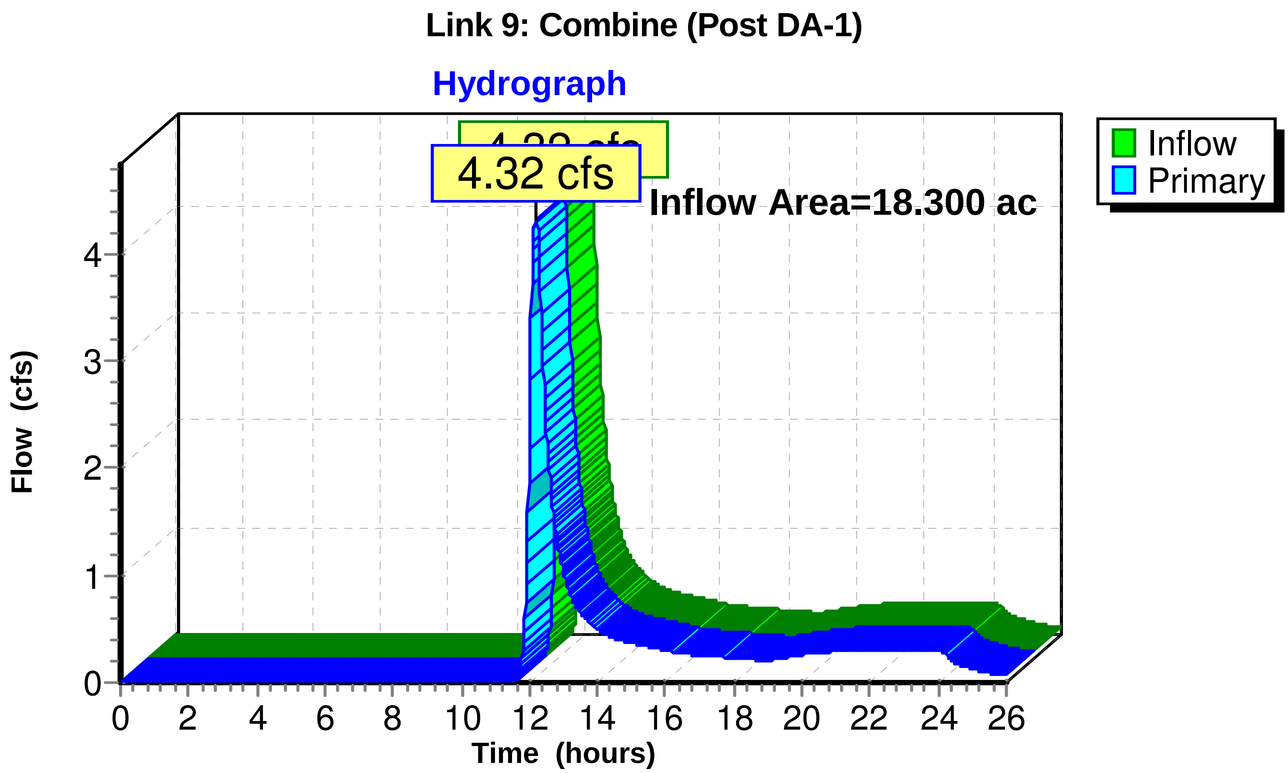
Pond 7P: Reservior (Basin 2 Outflow)



Summary for Link 9: Combine (Post DA-1)

Inflow Area = 18.300 ac, 4.92% Impervious, Inflow Depth > 0.36" for 2yr-24hr event
Inflow = 4.32 cfs @ 12.19 hrs, Volume= 0.549 af
Primary = 4.32 cfs @ 12.19 hrs, Volume= 0.549 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-26.00 hrs, dt= 0.02 hrs



Time span=0.00-26.00 hrs, dt=0.02 hrs, 1301 points
Runoff by SCS TR-20 method, UH=SCS
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 1S: SCS Runoff (Pre-DA-1) Runoff Area=18.300 ac 1.09% Impervious Runoff Depth=0.71"
Flow Length=1,469' Tc=24.6 min CN=71 Runoff=11.16 cfs 1.090 af

Subcatchment 2S: SCS Runoff (Post DA-1 Runoff Area=9.400 ac 2.13% Impervious Runoff Depth=0.96"
Flow Length=1,012' Tc=23.9 min CN=76 Runoff=8.54 cfs 0.753 af

Subcatchment 3S: SCS Runoff (Post DA-1 Runoff Area=2.000 ac 15.00% Impervious Runoff Depth=1.25"
Tc=5.0 min CN=81 Runoff=4.65 cfs 0.209 af

Subcatchment 4S: SCS Runoff (Post DA-1 Runoff Area=6.900 ac 5.80% Impervious Runoff Depth=0.91"
Flow Length=1,556' Tc=24.1 min CN=75 Runoff=5.82 cfs 0.523 af

Reach 8R: Reach (Basin 1 Reach) Avg. Depth=0.11' Max Vel=1.97 fps Inflow=0.50 cfs 0.328 af
n=0.033 L=400.0' S=0.0400 '/' Capacity=114.92 cfs Outflow=0.50 cfs 0.327 af

Pond 5P: Reservior (Forebay Outflow) Peak Elev=1,085.54' Storage=0.415 af Inflow=8.54 cfs 0.753 af
Outflow=1.01 cfs 0.345 af

Pond 6P: Reservior (Basin 1 Outflow) Peak Elev=1,076.53' Storage=0.061 af Inflow=1.01 cfs 0.345 af
Primary=0.50 cfs 0.328 af Secondary=0.00 cfs 0.000 af Outflow=0.50 cfs 0.328 af

Pond 7P: Reservior (Basin 2 Outflow) Peak Elev=1,053.28' Storage=0.048 af Inflow=4.65 cfs 0.209 af
Primary=3.80 cfs 0.207 af Secondary=0.00 cfs 0.000 af Outflow=3.80 cfs 0.207 af

Link 9: Combine (Post DA-1) Inflow=6.93 cfs 1.057 af
Primary=6.93 cfs 1.057 af

Total Runoff Area = 36.600 ac Runoff Volume = 2.575 af Average Runoff Depth = 0.84"
96.99% Pervious = 35.500 ac 3.01% Impervious = 1.100 ac

Summary for Subcatchment 1S: SCS Runoff (Pre-DA-1)

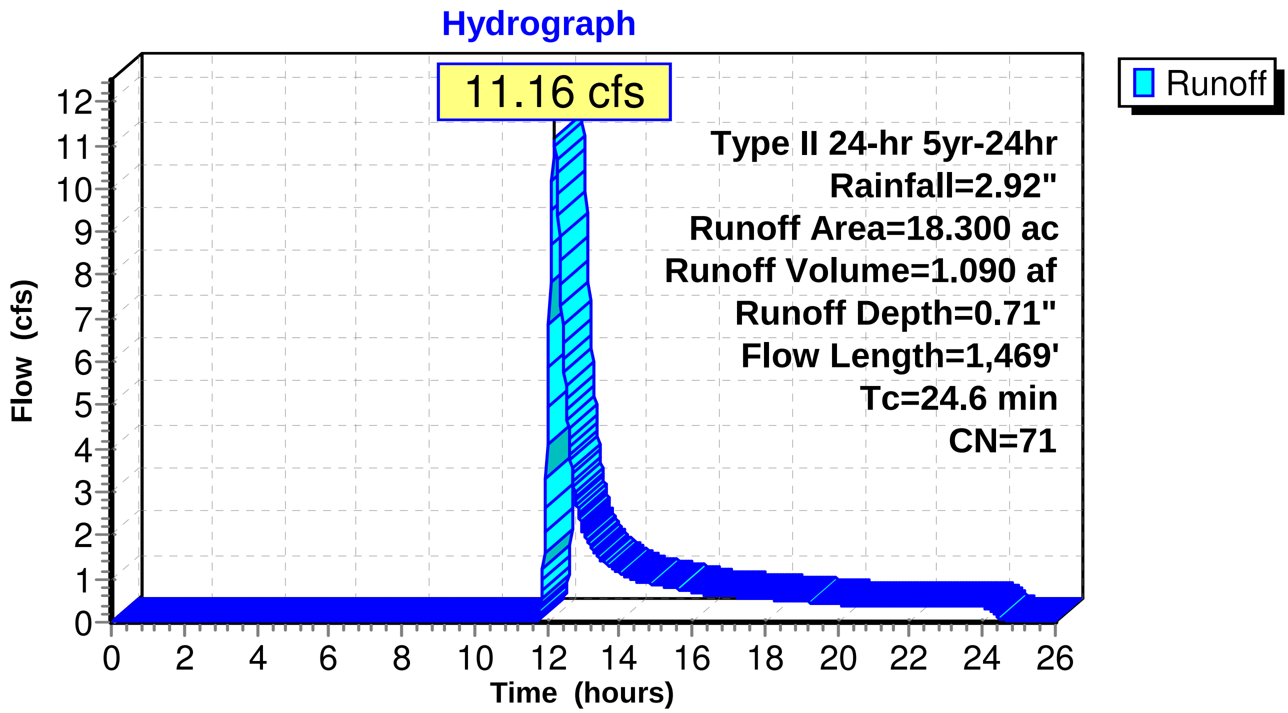
Runoff = 11.16 cfs @ 12.21 hrs, Volume= 1.090 af, Depth= 0.71"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-26.00 hrs, dt= 0.02 hrs
Type II 24-hr 5yr-24hr Rainfall=2.92"

	Area (ac)	CN	Description
*	0.200	98	
*	0.200	89	
*	11.200	71	
*	6.700	70	
	18.300	71	Weighted Average
	18.100		Pervious Area
	0.200		Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
21.1	100	0.1200	0.08		**Sheet Flow, Sheet Flow** n= 0.800 P2= 2.39"
1.3	573	0.2200	7.55		**Shallow Concentrated Flow, Shallow Concentrated Flow A** Unpaved Kv= 16.1 fps
1.8	429	0.0600	3.94		**Shallow Concentrated Flow, Shallow Concentrated Flow B** Unpaved Kv= 16.1 fps
0.4	367	0.0870	14.16	169.93	**Channel Flow, Channel Flow** Area= 12.0 sf Perim= 10.9' r= 1.10' n= 0.033
24.6	1,469	Total			

Subcatchment 1S: SCS Runoff (Pre-DA-1)



Summary for Subcatchment 2S: SCS Runoff (Post DA-1 Detained 1)

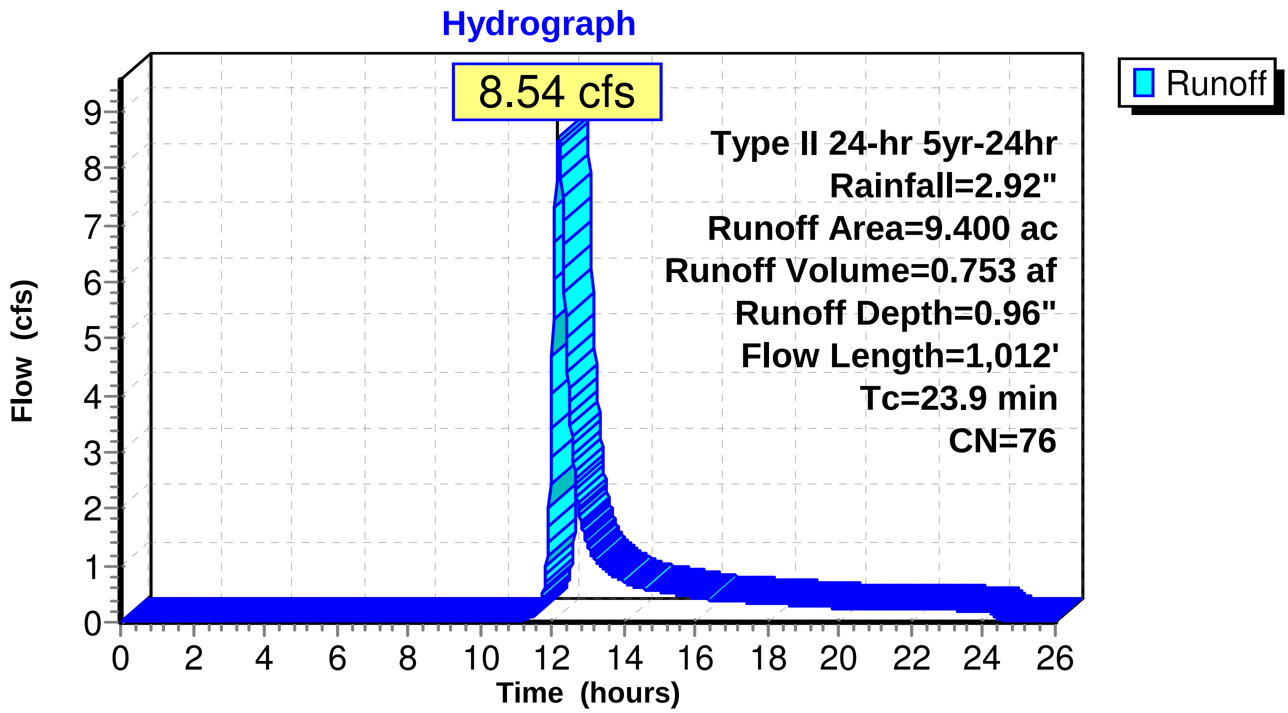
Runoff = 8.54 cfs @ 12.19 hrs, Volume= 0.753 af, Depth= 0.96"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-26.00 hrs, dt= 0.02 hrs
Type II 24-hr 5yr-24hr Rainfall=2.92"

	Area (ac)	CN	Description
*	0.200	98	
*	2.300	89	
*	6.000	71	
*	0.900	70	
	9.400	76	Weighted Average
	9.200		Pervious Area
	0.200		Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
21.1	100	0.1200	0.08		**Sheet Flow, Sheet Flow** n= 0.800 P2= 2.39"
0.7	332	0.2600	8.21		**Shallow Concentrated Flow, Shallow Concentrated Flow A** Unpaved Kv= 16.1 fps
1.3	270	0.0300	3.52		**Shallow Concentrated Flow, Shallow Concentrated Flow B** Paved Kv= 20.3 fps
0.1	88	0.3800	9.92		**Shallow Concentrated Flow, Shallow Concentrated Flow C** Unpaved Kv= 16.1 fps
0.7	222	0.0140	5.68	68.17	**Channel Flow, Channel Flow** Area= 12.0 sf Perim= 10.9' r= 1.10' n= 0.033
23.9	1,012	Total			

Subcatchment 2S: SCS Runoff (Post DA-1 Detained 1)



Summary for Subcatchment 3S: SCS Runoff (Post DA-1 Detained 2)

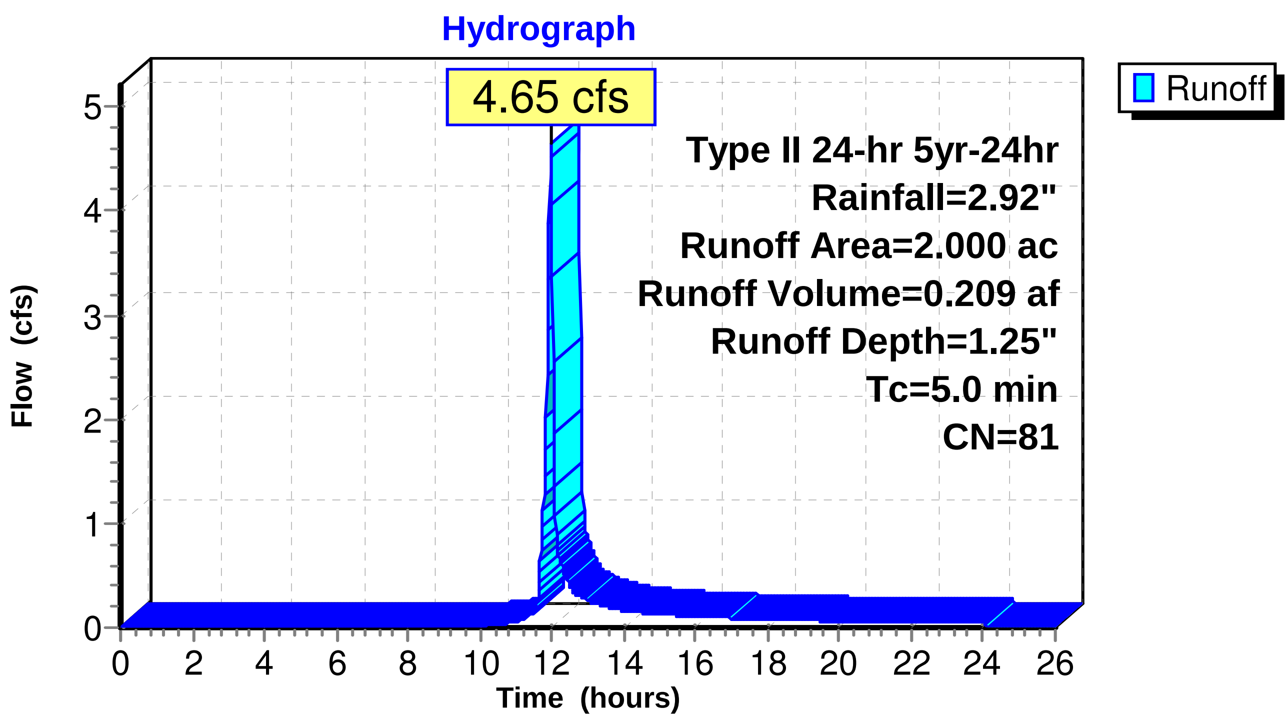
Runoff = 4.65 cfs @ 11.96 hrs, Volume= 0.209 af, Depth= 1.25"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-26.00 hrs, dt= 0.02 hrs
Type II 24-hr 5yr-24hr Rainfall=2.92"

	Area (ac)	CN	Description
*	0.300	98	
*	0.700	89	
*	1.000	71	
	2.000	81	Weighted Average
	1.700		Pervious Area
	0.300		Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry, User**

Subcatchment 3S: SCS Runoff (Post DA-1 Detained 2)



Summary for Subcatchment 4S: SCS Runoff (Post DA-1 Undetained)

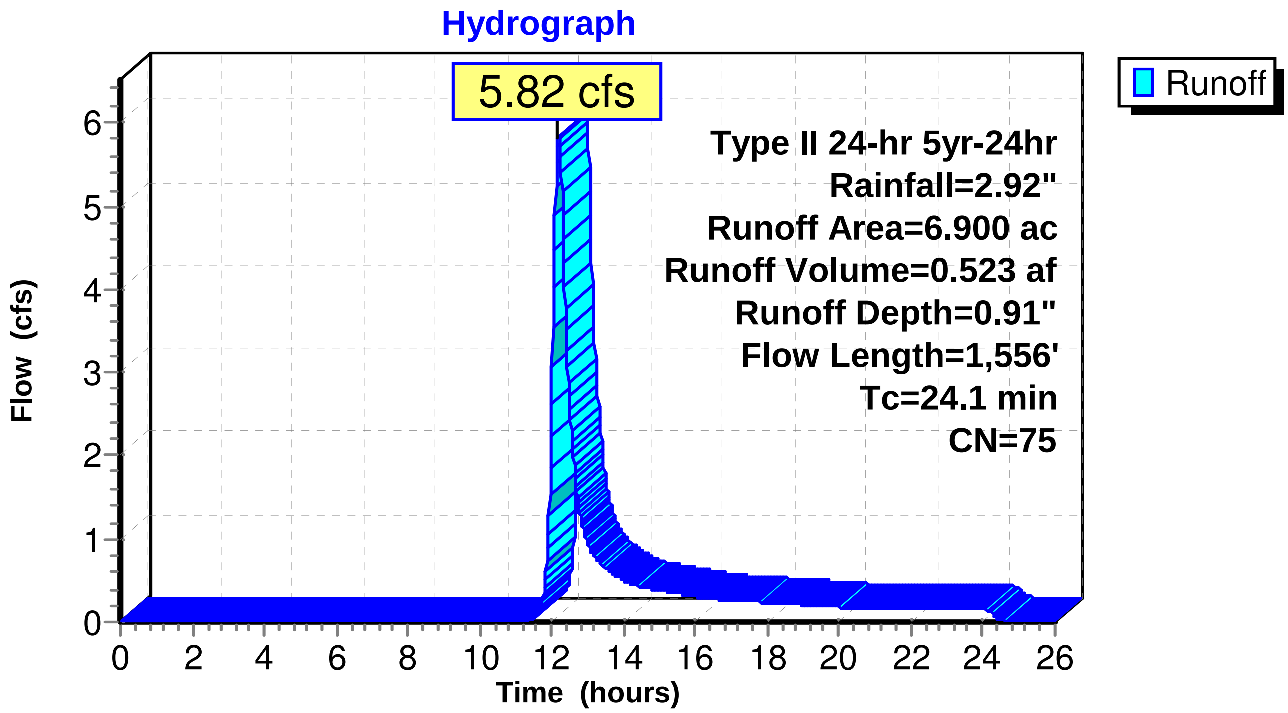
Runoff = 5.82 cfs @ 12.19 hrs, Volume= 0.523 af, Depth= 0.91"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-26.00 hrs, dt= 0.02 hrs
Type II 24-hr 5yr-24hr Rainfall=2.92"

	Area (ac)	CN	Description
*	0.400	98	
*	0.900	89	
*	4.100	71	
*	1.500	70	
	6.900	75	Weighted Average
	6.500		Pervious Area
	0.400		Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
21.1	100	0.1200	0.08		**Sheet Flow, Sheet Flow** n= 0.800 P2= 2.39"
0.9	412	0.2300	7.72		**Shallow Concentrated Flow, Shallow Concentrated Flow A** Unpaved Kv= 16.1 fps
1.3	312	0.0580	3.88		**Shallow Concentrated Flow, Shallow Concentrated Flow B** Unpaved Kv= 16.1 fps
0.8	732	0.0960	14.88	178.51	**Channel Flow, Channel Flow** Area= 12.0 sf Perim= 10.9' r= 1.10' n= 0.033
24.1	1,556	Total			

Subcatchment 4S: SCS Runoff (Post DA-1 Undetained)



Summary for Reach 8R: Reach (Basin 1 Reach)

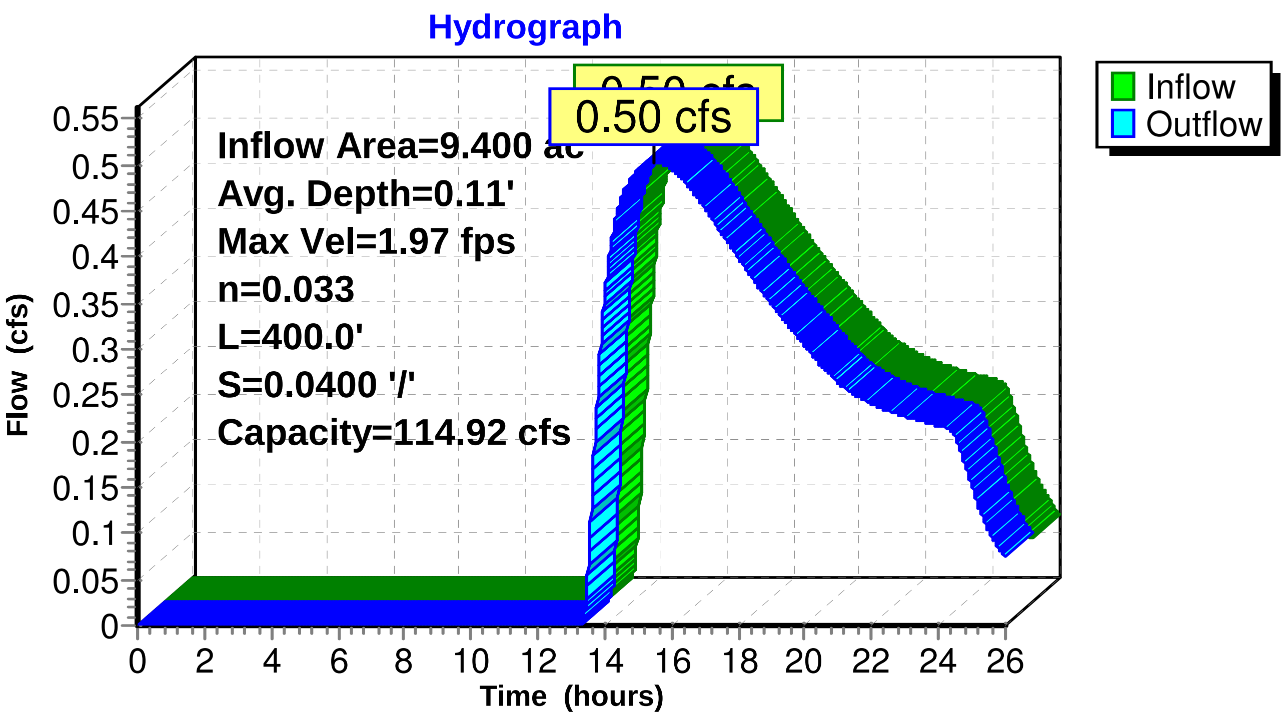
Inflow Area = 9.400 ac, 2.13% Impervious, Inflow Depth > 0.42" for 5yr-24hr event
Inflow = 0.50 cfs @ 15.42 hrs, Volume= 0.328 af
Outflow = 0.50 cfs @ 15.51 hrs, Volume= 0.327 af, Atten= 0%, Lag= 5.7 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-26.00 hrs, dt= 0.02 hrs
Max. Velocity= 1.97 fps, Min. Travel Time= 3.4 min
Avg. Velocity = 1.61 fps, Avg. Travel Time= 4.1 min

Peak Storage= 102 cf @ 15.46 hrs, Average Depth at Peak Storage= 0.11'
Bank-Full Depth= 2.00', Capacity at Bank-Full= 114.92 cfs

2.00' x 2.00' deep channel, n= 0.033
Side Slope Z-value= 2.0 '/' Top Width= 10.00'
Length= 400.0' Slope= 0.0400 '/'
Inlet Invert= 1,072.00', Outlet Invert= 1,056.00'

Reach 8R: Reach (Basin 1 Reach)



Summary for Pond 5P: Reservior (Forebay Outflow)

Inflow Area = 9.400 ac, 2.13% Impervious, Inflow Depth = 0.96" for 5yr-24hr event
Inflow = 8.54 cfs @ 12.19 hrs, Volume= 0.753 af
Outflow = 1.01 cfs @ 13.33 hrs, Volume= 0.345 af, Atten= 88%, Lag= 68.6 min
Primary = 1.01 cfs @ 13.33 hrs, Volume= 0.345 af

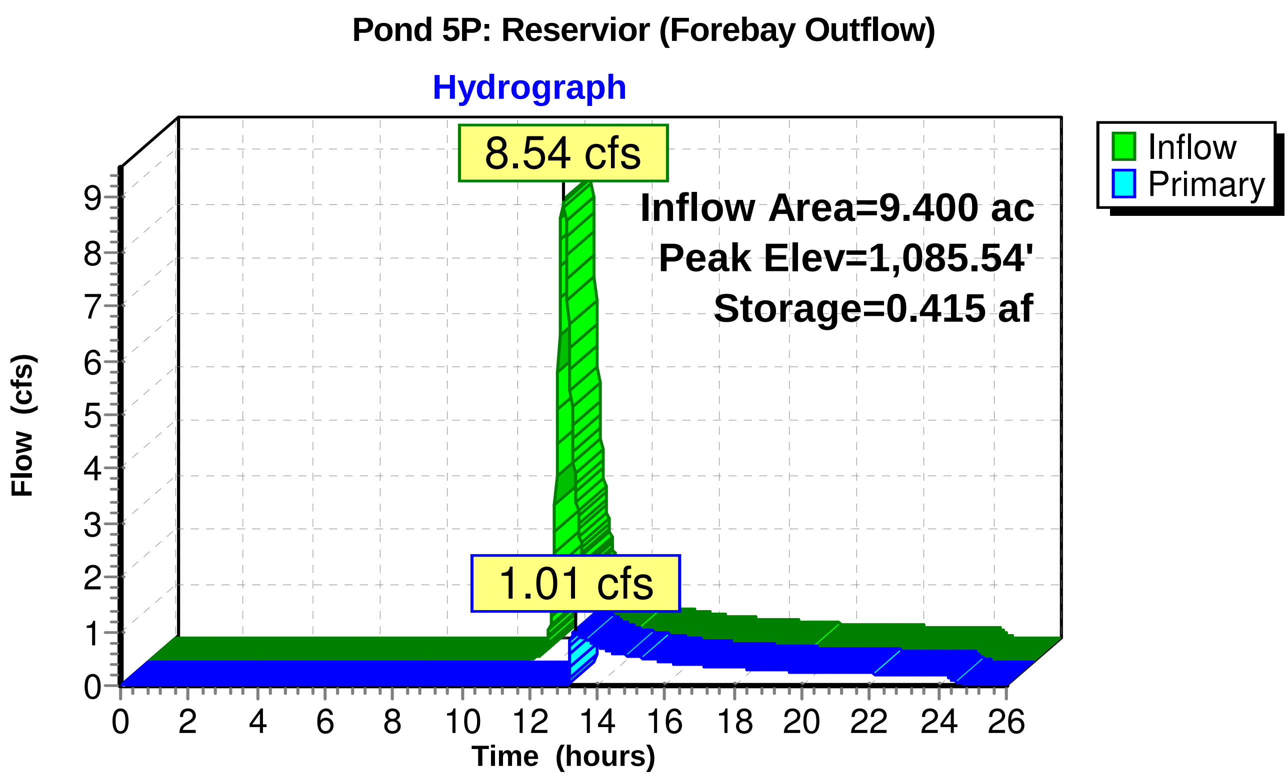
Routing by Stor-Ind method, Time Span= 0.00-26.00 hrs, dt= 0.02 hrs
Peak Elev= 1,085.54' @ 13.33 hrs Surf.Area= 0.146 ac Storage= 0.415 af

Plug-Flow detention time= 306.5 min calculated for 0.344 af (46% of inflow)
Center-of-Mass det. time= 166.0 min (1,040.4 - 874.4)

Volume	Invert	Avail.Storage	Storage Description
#1	1,082.00'	0.484 af	**30.00'W x 130.00'L x 4.00'H Trapezoid Z=2.0**

Device	Routing	Invert	Outlet Devices
#1	Primary	1,085.50'	**40.0' long Broad-Crested Rectangular Weir** Head (feet) 1,085.50 Coef. (English) 2.60

Primary OutFlow Max=0.93 cfs @ 13.33 hrs HW=1,085.54' (Free Discharge)
└─**1=Broad-Crested Rectangular Weir** (Weir Controls 0.93 cfs @ 0.54 fps)



Summary for Pond 6P: Reservior (Basin 1 Outflow)

Inflow Area =	9.400 ac,	2.13% Impervious,	Inflow Depth = 0.44"	for 5yr-24hr event
Inflow =	1.01 cfs @	13.33 hrs,	Volume=	0.345 af
Outflow =	0.50 cfs @	15.42 hrs,	Volume=	0.328 af, Atten= 50%, Lag= 125.4 min
Primary =	0.50 cfs @	15.42 hrs,	Volume=	0.328 af
Secondary =	0.00 cfs @	0.00 hrs,	Volume=	0.000 af

Routing by Stor-Ind method, Time Span= 0.00-26.00 hrs, dt= 0.02 hrs
Peak Elev= 1,076.53' @ 15.42 hrs Surf.Area= 0.125 ac Storage= 0.061 af

Plug-Flow detention time= 89.2 min calculated for 0.328 af (95% of inflow)
Center-of-Mass det. time= 69.3 min (1,109.7 - 1,040.4)

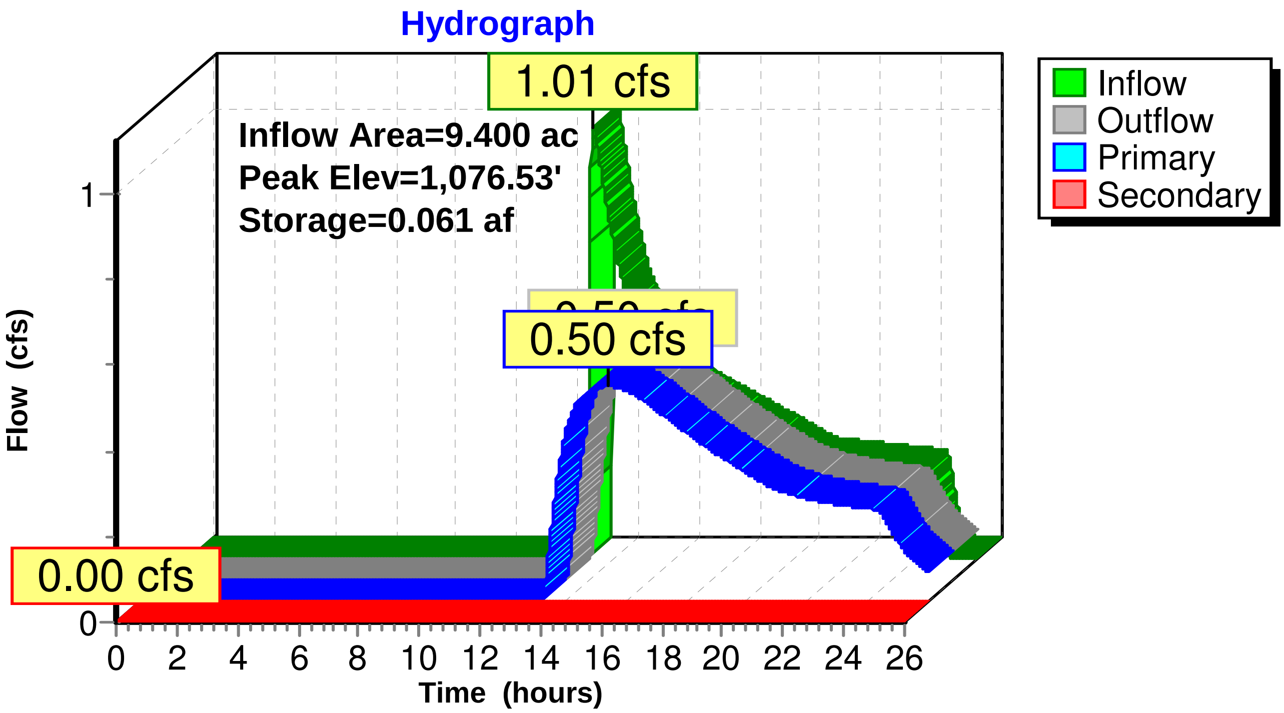
Volume	Invert	Avail.Storage	Storage Description
#1	1,076.00'	0.770 af	**35.00'W x 130.00'L x 4.00'H Trapezoid Z=5.0**

Device	Routing	Invert	Outlet Devices
#1	Device 4	1,076.00'	**6.0" Vert. Orifice/Grate** C= 0.600
#2	Device 4	1,077.00'	**1.00' W x 0.50' H Vert. Orifice/Grate** C= 0.600
#3	Device 4	1,078.00'	**11.5' long Sharp-Crested Rectangular Weir** 2 End Contraction(s)
#4	Primary	1,074.50'	**18.0" x 40.0' long Culvert** Ke= 0.500 Outlet Invert= 1,072.50' S= 0.0500 '/' Cc= 0.600 n= 0.013
#5	Secondary	1,078.50'	**8.0' long Broad-Crested Rectangular Weir** Head (feet) 1,078.50 Coef. (English) 3.33

Primary OutFlow Max=0.50 cfs @ 15.42 hrs HW=1,076.53' (Free Discharge)
└─**4=Culvert** (Passes 0.50 cfs of 6.42 cfs potential flow)
  ├─**1=Orifice/Grate** (Orifice Controls 0.50 cfs @ 2.56 fps)
  ├─**2=Orifice/Grate** (Controls 0.00 cfs)
  └─**3=Sharp-Crested Rectangular Weir** (Controls 0.00 cfs)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=1,076.00' (Free Discharge)
└─**5=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond 6P: Reservior (Basin 1 Outflow)



Summary for Pond 7P: Reservior (Basin 2 Outflow)

Inflow Area = 2.000 ac, 15.00% Impervious, Inflow Depth = 1.25" for 5yr-24hr event
Inflow = 4.65 cfs @ 11.96 hrs, Volume= 0.209 af
Outflow = 3.80 cfs @ 12.01 hrs, Volume= 0.207 af, Atten= 18%, Lag= 2.7 min
Primary = 3.80 cfs @ 12.01 hrs, Volume= 0.207 af
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 0.00-26.00 hrs, dt= 0.02 hrs
Peak Elev= 1,053.28' @ 12.01 hrs Surf.Area= 0.043 ac Storage= 0.048 af

Plug-Flow detention time= 32.2 min calculated for 0.207 af (99% of inflow)
Center-of-Mass det. time= 28.8 min (868.7 - 840.0)

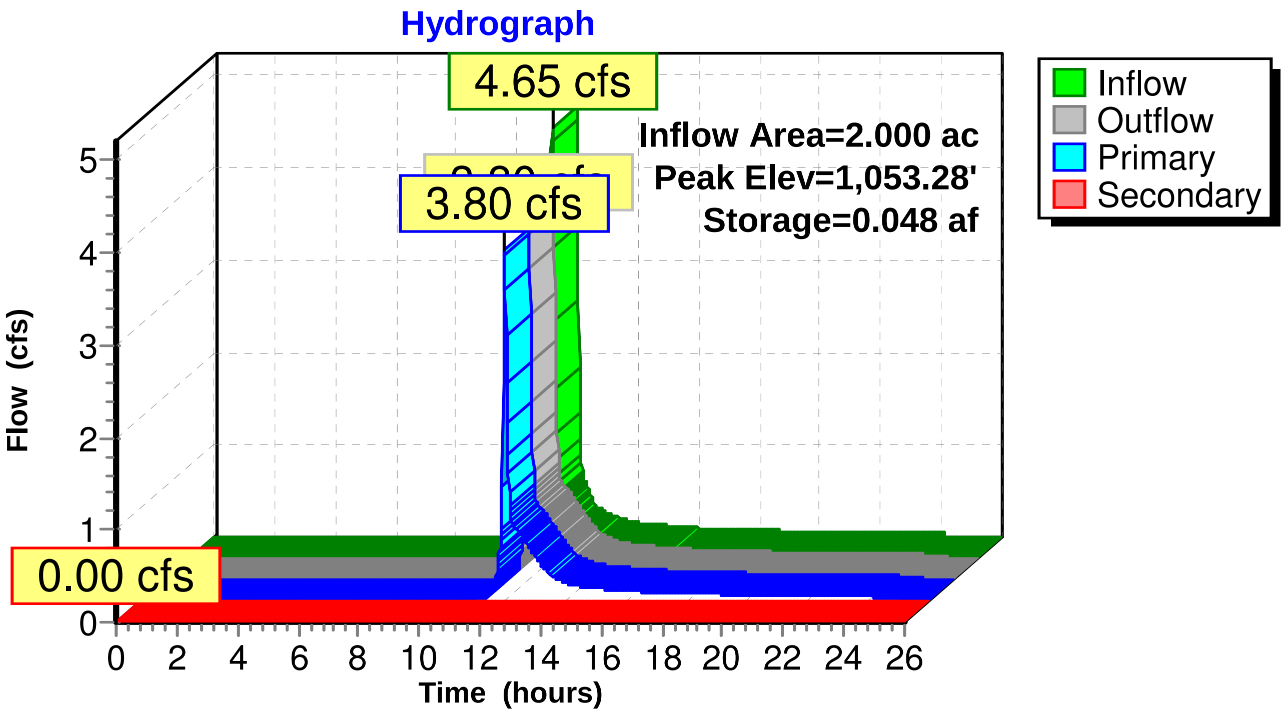
Volume	Invert	Avail.Storage	Storage Description
#1	1,052.00'	0.203 af	**20.00'W x 70.00'L x 4.00'H Trapezoid Z=2.0**

Device	Routing	Invert	Outlet Devices
#1	Device 4	1,052.00'	**6.0" Vert. Orifice/Grate** C= 0.600
#2	Device 4	1,053.00'	**6.00' W x 6.00' H Vert. Orifice/Grate** C= 0.600
#3	Device 4	1,054.00'	**11.5' long Sharp-Crested Rectangular Weir** 2 End Contraction(s)
#4	Primary	1,050.50'	**18.0" x 62.0' long Culvert** Ke= 0.500 Outlet Invert= 1,049.01' S= 0.0240 '/' Cc= 0.600 n= 0.013
#5	Secondary	1,054.50'	**12.0' long Broad-Crested Rectangular Weir** Head (feet) 1,054.50 Coef. (English) 2.60

Primary OutFlow Max=3.73 cfs @ 12.01 hrs HW=1,053.27' (Free Discharge)
4=Culvert (Passes 3.73 cfs of 8.07 cfs potential flow)
1=Orifice/Grate (Orifice Controls 0.96 cfs @ 4.87 fps)
2=Orifice/Grate (Orifice Controls 2.77 cfs @ 1.68 fps)
3=Sharp-Crested Rectangular Weir (Controls 0.00 cfs)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=1,052.00' (Free Discharge)
5=Broad-Crested Rectangular Weir (Controls 0.00 cfs)

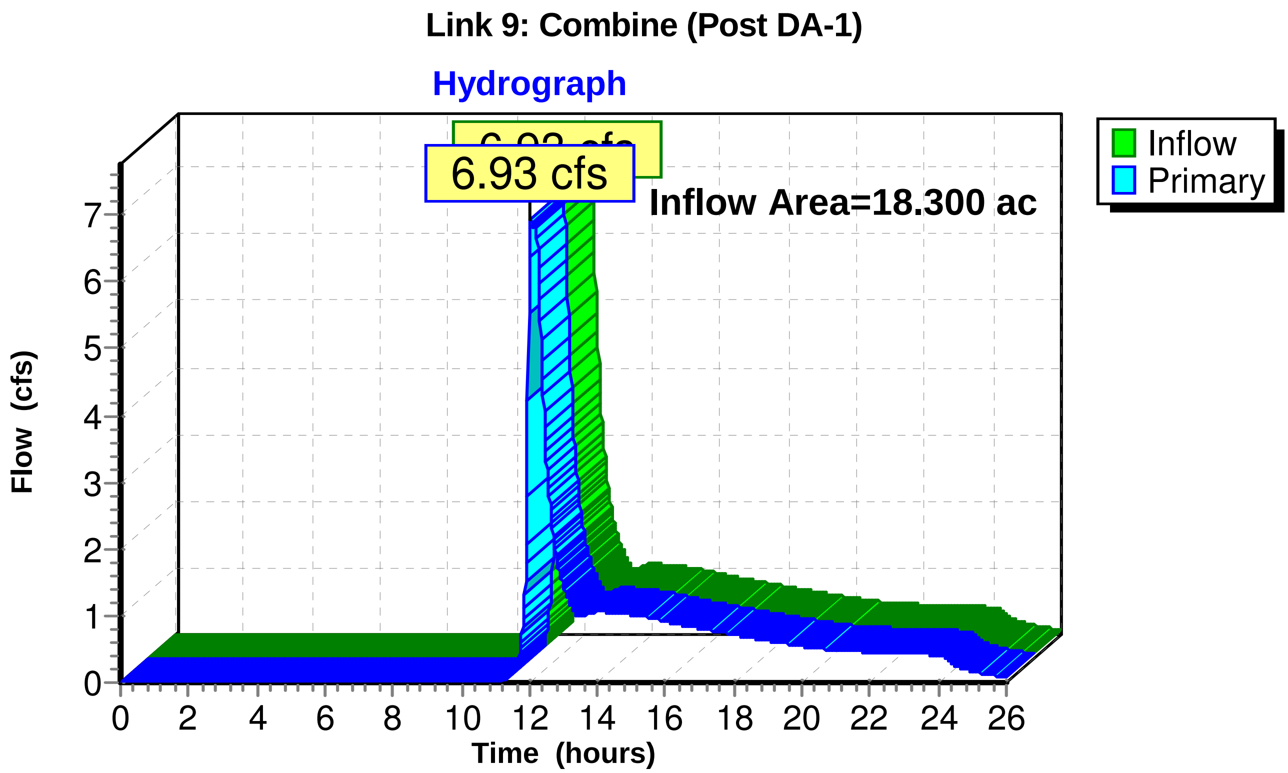
Pond 7P: Reservior (Basin 2 Outflow)



Summary for Link 9: Combine (Post DA-1)

Inflow Area =	18.300 ac,	4.92% Impervious, Inflow Depth >	0.69"	for 5yr-24hr event
Inflow =	6.93 cfs @	12.05 hrs, Volume=	1.057 af	
Primary =	6.93 cfs @	12.05 hrs, Volume=	1.057 af,	Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-26.00 hrs, dt= 0.02 hrs



Time span=0.00-26.00 hrs, dt=0.02 hrs, 1301 points
Runoff by SCS TR-20 method, UH=SCS
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 1S: SCS Runoff (Pre-DA-1) Runoff Area=18.300 ac 1.09% Impervious Runoff Depth=0.97"
Flow Length=1,469' Tc=24.6 min CN=71 Runoff=15.93 cfs 1.479 af

Subcatchment 2S: SCS Runoff (Post DA-1 Runoff Area=9.400 ac 2.13% Impervious Runoff Depth=1.26"
Flow Length=1,012' Tc=23.9 min CN=76 Runoff=11.44 cfs 0.985 af

Subcatchment 3S: SCS Runoff (Post DA-1 Runoff Area=2.000 ac 15.00% Impervious Runoff Depth=1.59"
Tc=5.0 min CN=81 Runoff=5.88 cfs 0.265 af

Subcatchment 4S: SCS Runoff (Post DA-1 Runoff Area=6.900 ac 5.80% Impervious Runoff Depth=1.20"
Flow Length=1,556' Tc=24.1 min CN=75 Runoff=7.89 cfs 0.688 af

Reach 8R: Reach (Basin 1 Reach) Avg. Depth=0.16' Max Vel=2.42 fps Inflow=0.92 cfs 0.559 af
n=0.033 L=400.0' S=0.0400 '/' Capacity=114.92 cfs Outflow=0.92 cfs 0.558 af

Pond 5P: Reservior (Forebay Outflow) Peak Elev=1,085.61' Storage=0.425 af Inflow=11.44 cfs 0.985 af
Outflow=4.02 cfs 0.576 af

Pond 6P: Reservior (Basin 1 Outflow) Peak Elev=1,077.07' Storage=0.135 af Inflow=4.02 cfs 0.576 af
Primary=0.92 cfs 0.559 af Secondary=0.00 cfs 0.000 af Outflow=0.92 cfs 0.559 af

Pond 7P: Reservior (Basin 2 Outflow) Peak Elev=1,053.37' Storage=0.052 af Inflow=5.88 cfs 0.265 af
Primary=5.32 cfs 0.263 af Secondary=0.00 cfs 0.000 af Outflow=5.32 cfs 0.263 af

Link 9: Combine (Post DA-1) Inflow=9.42 cfs 1.509 af
Primary=9.42 cfs 1.509 af

Total Runoff Area = 36.600 ac Runoff Volume = 3.417 af Average Runoff Depth = 1.12"
96.99% Pervious = 35.500 ac 3.01% Impervious = 1.100 ac

Summary for Subcatchment 1S: SCS Runoff (Pre-DA-1)

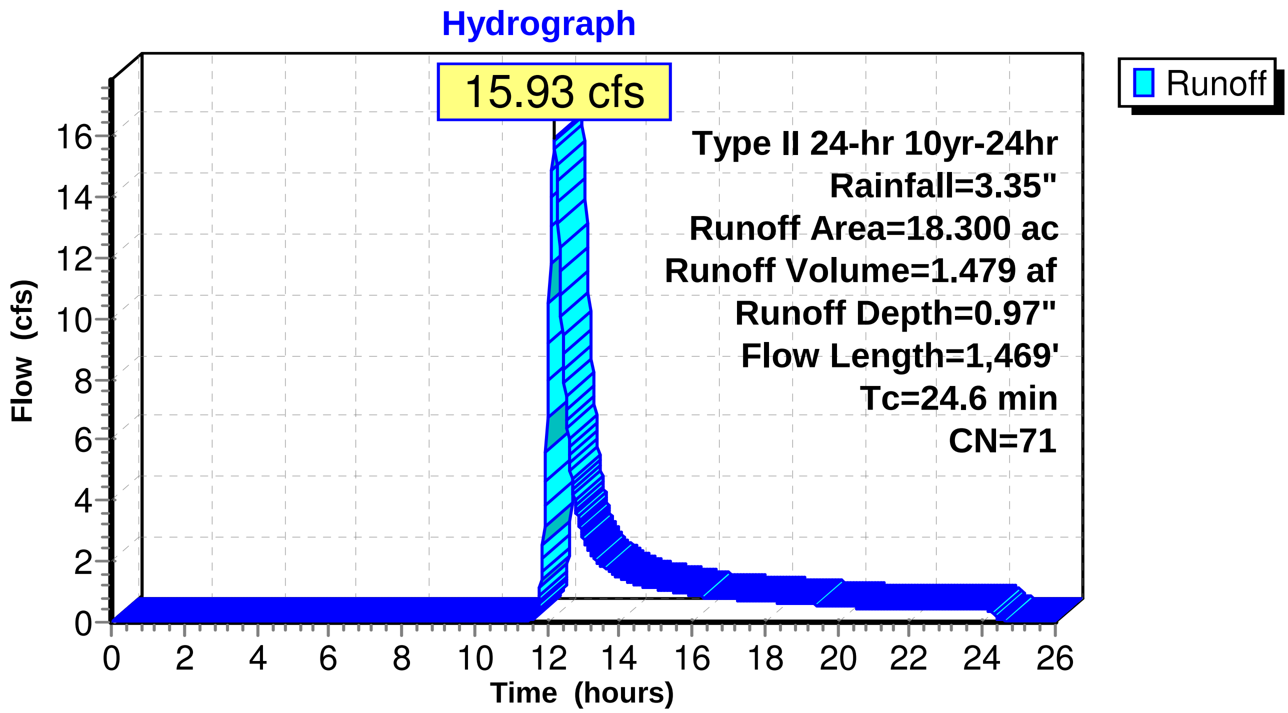
Runoff = 15.93 cfs @ 12.20 hrs, Volume= 1.479 af, Depth= 0.97"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-26.00 hrs, dt= 0.02 hrs
Type II 24-hr 10yr-24hr Rainfall=3.35"

	Area (ac)	CN	Description
*	0.200	98	
*	0.200	89	
*	11.200	71	
*	6.700	70	
	18.300	71	Weighted Average
	18.100		Pervious Area
	0.200		Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
21.1	100	0.1200	0.08		**Sheet Flow, Sheet Flow** n= 0.800 P2= 2.39"
1.3	573	0.2200	7.55		**Shallow Concentrated Flow, Shallow Concentrated Flow A** Unpaved Kv= 16.1 fps
1.8	429	0.0600	3.94		**Shallow Concentrated Flow, Shallow Concentrated Flow B** Unpaved Kv= 16.1 fps
0.4	367	0.0870	14.16	169.93	**Channel Flow, Channel Flow** Area= 12.0 sf Perim= 10.9' r= 1.10' n= 0.033
24.6	1,469	Total			

Subcatchment 1S: SCS Runoff (Pre-DA-1)



Summary for Subcatchment 2S: SCS Runoff (Post DA-1 Detained 1)

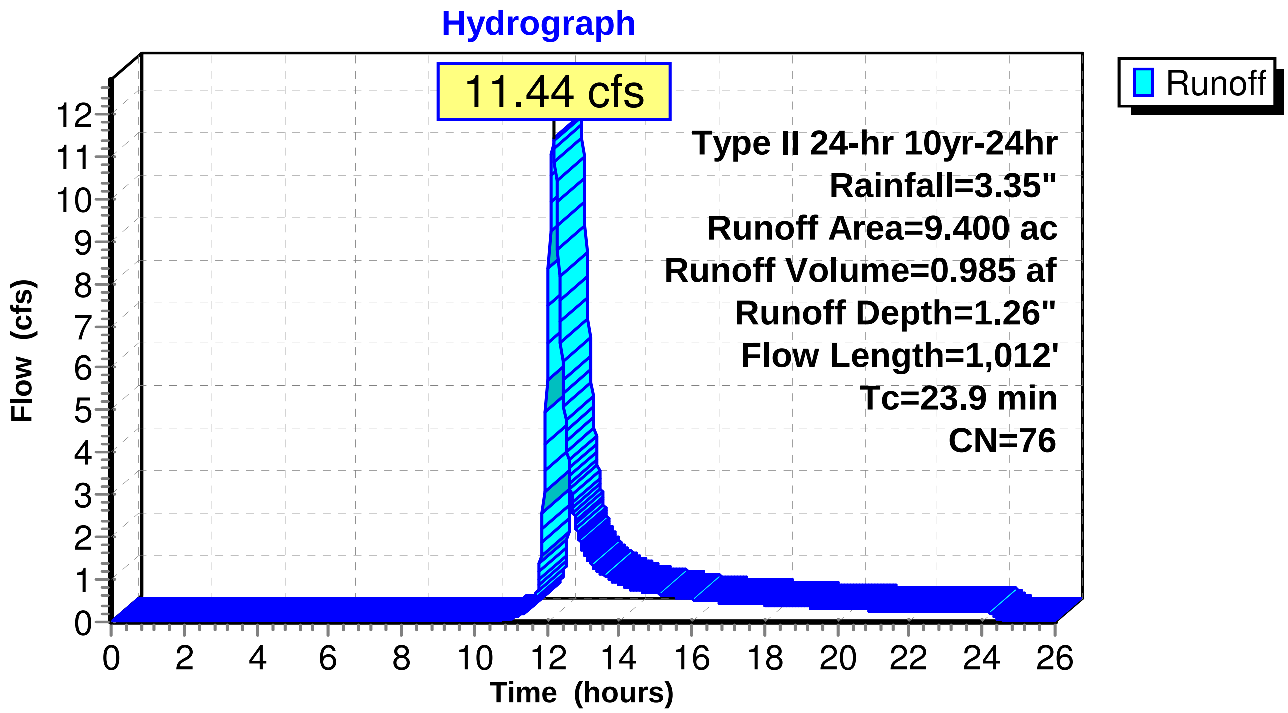
Runoff = 11.44 cfs @ 12.18 hrs, Volume= 0.985 af, Depth= 1.26"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-26.00 hrs, dt= 0.02 hrs
Type II 24-hr 10yr-24hr Rainfall=3.35"

	Area (ac)	CN	Description
*	0.200	98	
*	2.300	89	
*	6.000	71	
*	0.900	70	
	9.400	76	Weighted Average
	9.200		Pervious Area
	0.200		Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
21.1	100	0.1200	0.08		**Sheet Flow, Sheet Flow** n= 0.800 P2= 2.39"
0.7	332	0.2600	8.21		**Shallow Concentrated Flow, Shallow Concentrated Flow A** Unpaved Kv= 16.1 fps
1.3	270	0.0300	3.52		**Shallow Concentrated Flow, Shallow Concentrated Flow B** Paved Kv= 20.3 fps
0.1	88	0.3800	9.92		**Shallow Concentrated Flow, Shallow Concentrated Flow C** Unpaved Kv= 16.1 fps
0.7	222	0.0140	5.68	68.17	**Channel Flow, Channel Flow** Area= 12.0 sf Perim= 10.9' r= 1.10' n= 0.033
23.9	1,012	Total			

Subcatchment 2S: SCS Runoff (Post DA-1 Detained 1)



Summary for Subcatchment 3S: SCS Runoff (Post DA-1 Detained 2)

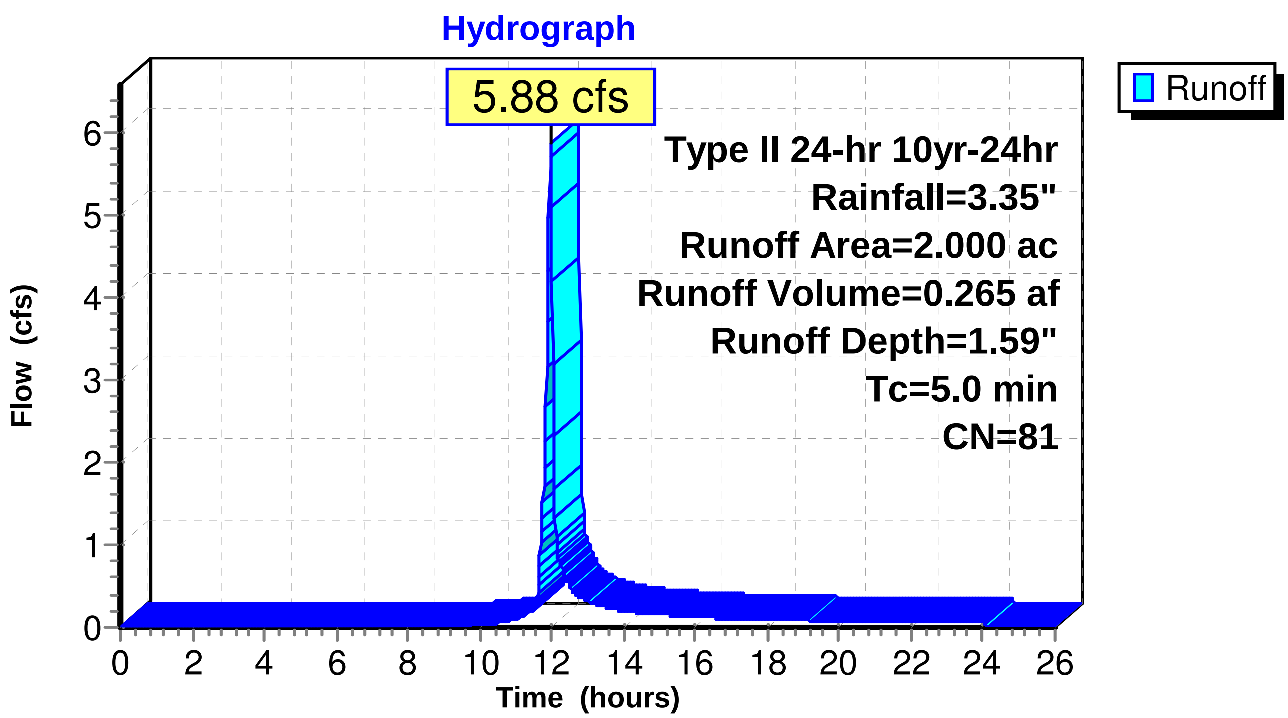
Runoff = 5.88 cfs @ 11.96 hrs, Volume= 0.265 af, Depth= 1.59"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-26.00 hrs, dt= 0.02 hrs
Type II 24-hr 10yr-24hr Rainfall=3.35"

	Area (ac)	CN	Description
*	0.300	98	
*	0.700	89	
*	1.000	71	
	2.000	81	Weighted Average
	1.700		Pervious Area
	0.300		Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry, User**

Subcatchment 3S: SCS Runoff (Post DA-1 Detained 2)



Summary for Subcatchment 4S: SCS Runoff (Post DA-1 Undetained)

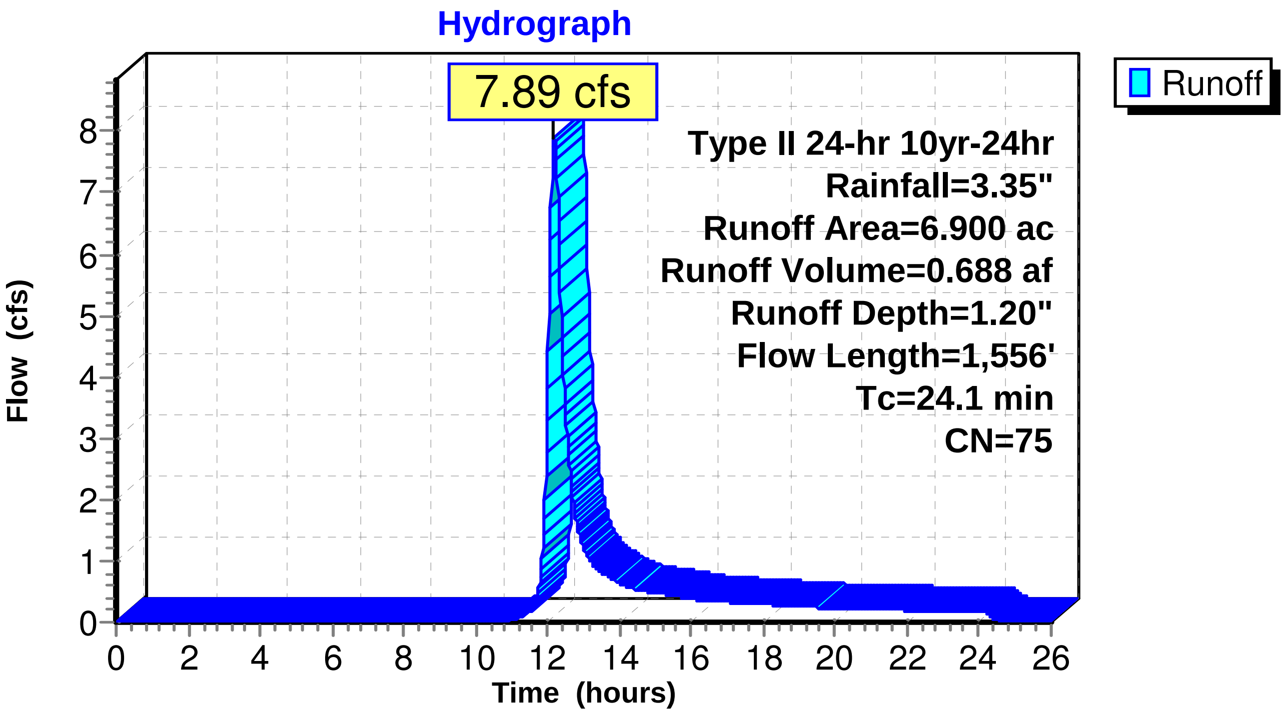
Runoff = 7.89 cfs @ 12.19 hrs, Volume= 0.688 af, Depth= 1.20"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-26.00 hrs, dt= 0.02 hrs
Type II 24-hr 10yr-24hr Rainfall=3.35"

	Area (ac)	CN	Description
*	0.400	98	
*	0.900	89	
*	4.100	71	
*	1.500	70	
	6.900	75	Weighted Average
	6.500		Pervious Area
	0.400		Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
21.1	100	0.1200	0.08		**Sheet Flow, Sheet Flow** n= 0.800 P2= 2.39"
0.9	412	0.2300	7.72		**Shallow Concentrated Flow, Shallow Concentrated Flow A** Unpaved Kv= 16.1 fps
1.3	312	0.0580	3.88		**Shallow Concentrated Flow, Shallow Concentrated Flow B** Unpaved Kv= 16.1 fps
0.8	732	0.0960	14.88	178.51	**Channel Flow, Channel Flow** Area= 12.0 sf Perim= 10.9' r= 1.10' n= 0.033
24.1	1,556	Total			

Subcatchment 4S: SCS Runoff (Post DA-1 Undetained)



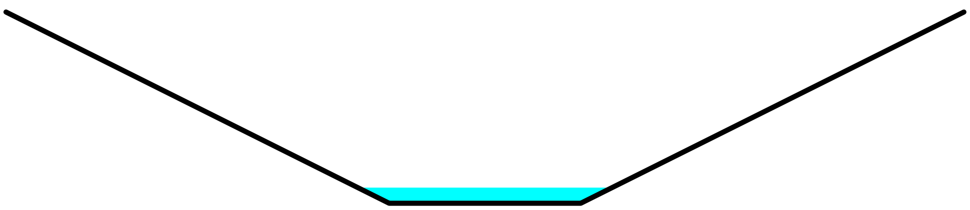
Summary for Reach 8R: Reach (Basin 1 Reach)

Inflow Area = 9.400 ac, 2.13% Impervious, Inflow Depth > 0.71" for 10yr-24hr event
Inflow = 0.92 cfs @ 14.01 hrs, Volume= 0.559 af
Outflow = 0.92 cfs @ 14.08 hrs, Volume= 0.558 af, Atten= 0%, Lag= 4.6 min

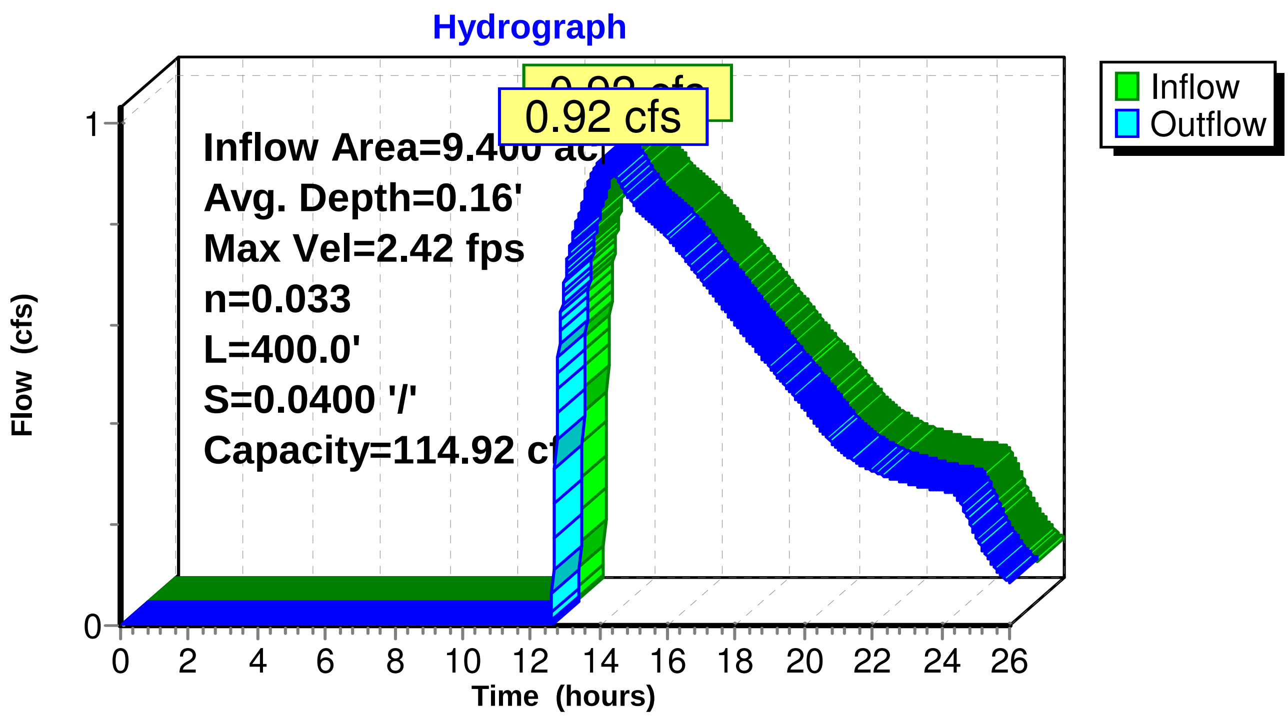
Routing by Stor-Ind+Trans method, Time Span= 0.00-26.00 hrs, dt= 0.02 hrs
Max. Velocity= 2.42 fps, Min. Travel Time= 2.8 min
Avg. Velocity = 1.89 fps, Avg. Travel Time= 3.5 min

Peak Storage= 152 cf @ 14.04 hrs, Average Depth at Peak Storage= 0.16'
Bank-Full Depth= 2.00', Capacity at Bank-Full= 114.92 cfs

2.00' x 2.00' deep channel, n= 0.033
Side Slope Z-value= 2.0 '/' Top Width= 10.00'
Length= 400.0' Slope= 0.0400 '/'
Inlet Invert= 1,072.00', Outlet Invert= 1,056.00'



Reach 8R: Reach (Basin 1 Reach)



Summary for Pond 5P: Reservior (Forebay Outflow)

Inflow Area = 9.400 ac, 2.13% Impervious, Inflow Depth = 1.26" for 10yr-24hr event
Inflow = 11.44 cfs @ 12.18 hrs, Volume= 0.985 af
Outflow = 4.02 cfs @ 12.56 hrs, Volume= 0.576 af, Atten= 65%, Lag= 22.9 min
Primary = 4.02 cfs @ 12.56 hrs, Volume= 0.576 af

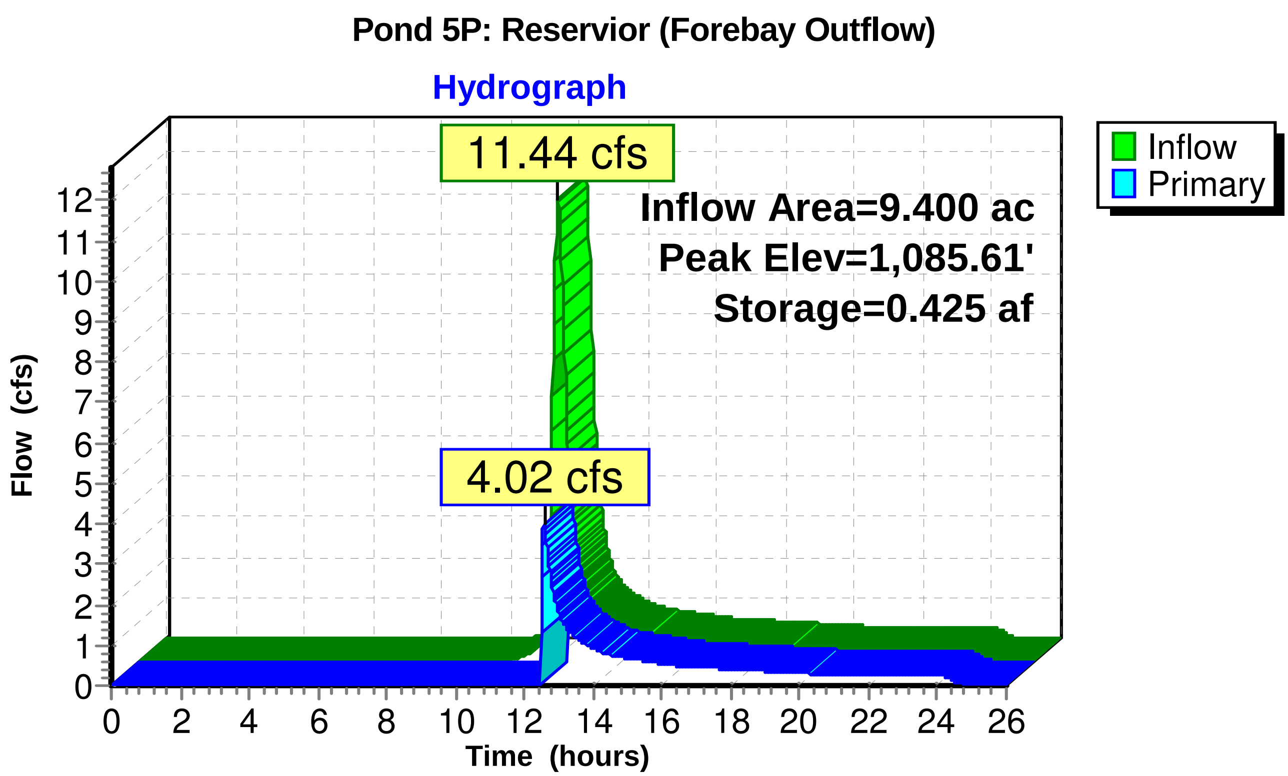
Routing by Stor-Ind method, Time Span= 0.00-26.00 hrs, dt= 0.02 hrs
Peak Elev= 1,085.61' @ 12.56 hrs Surf.Area= 0.147 ac Storage= 0.425 af

Plug-Flow detention time= 228.7 min calculated for 0.576 af (58% of inflow)
Center-of-Mass det. time= 102.7 min (968.8 - 866.2)

Volume	Invert	Avail.Storage	Storage Description
#1	1,082.00'	0.484 af	**30.00'W x 130.00'L x 4.00'H Trapezoid Z=2.0**

Device	Routing	Invert	Outlet Devices
#1	Primary	1,085.50'	**40.0' long Broad-Crested Rectangular Weir** Head (feet) 1,085.50 Coef. (English) 2.60

Primary OutFlow Max=3.97 cfs @ 12.56 hrs HW=1,085.61' (Free Discharge)
└**1=Broad-Crested Rectangular Weir** (Weir Controls 3.97 cfs @ 0.88 fps)



Summary for Pond 6P: Reservior (Basin 1 Outflow)

Inflow Area = 9.400 ac, 2.13% Impervious, Inflow Depth = 0.74" for 10yr-24hr event
Inflow = 4.02 cfs @ 12.56 hrs, Volume= 0.576 af
Outflow = 0.92 cfs @ 14.01 hrs, Volume= 0.559 af, Atten= 77%, Lag= 86.5 min
Primary = 0.92 cfs @ 14.01 hrs, Volume= 0.559 af
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 0.00-26.00 hrs, dt= 0.02 hrs
Peak Elev= 1,077.07' @ 14.01 hrs Surf.Area= 0.148 ac Storage= 0.135 af

Plug-Flow detention time= 96.7 min calculated for 0.559 af (97% of inflow)
Center-of-Mass det. time= 81.6 min (1,050.4 - 968.8)

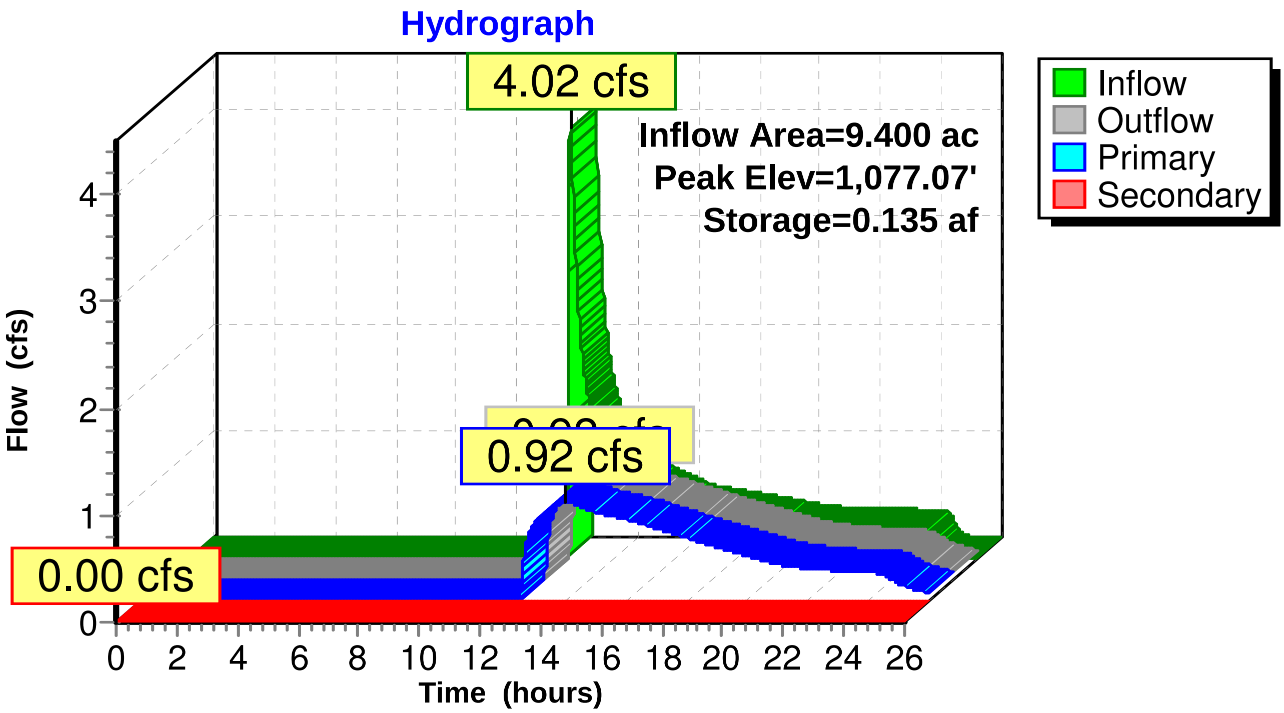
Volume	Invert	Avail.Storage	Storage Description
#1	1,076.00'	0.770 af	**35.00'W x 130.00'L x 4.00'H Trapezoid Z=5.0**

Device	Routing	Invert	Outlet Devices
#1	Device 4	1,076.00'	**6.0" Vert. Orifice/Grate** C= 0.600
#2	Device 4	1,077.00'	**1.00' W x 0.50' H Vert. Orifice/Grate** C= 0.600
#3	Device 4	1,078.00'	**11.5' long Sharp-Crested Rectangular Weir** 2 End Contraction(s)
#4	Primary	1,074.50'	**18.0" x 40.0' long Culvert** Ke= 0.500 Outlet Invert= 1,072.50' S= 0.0500 '/' Cc= 0.600 n= 0.013
#5	Secondary	1,078.50'	**8.0' long Broad-Crested Rectangular Weir** Head (feet) 1,078.50 Coef. (English) 3.33

Primary OutFlow Max=0.92 cfs @ 14.01 hrs HW=1,077.07' (Free Discharge)
└─**4=Culvert** (Passes 0.92 cfs of 7.66 cfs potential flow)
  ├─**1=Orifice/Grate** (Orifice Controls 0.86 cfs @ 4.36 fps)
  ├─**2=Orifice/Grate** (Orifice Controls 0.06 cfs @ 0.86 fps)
  └─**3=Sharp-Crested Rectangular Weir** (Controls 0.00 cfs)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=1,076.00' (Free Discharge)
└─**5=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond 6P: Reservior (Basin 1 Outflow)



Summary for Pond 7P: Reservior (Basin 2 Outflow)

Inflow Area = 2.000 ac, 15.00% Impervious, Inflow Depth = 1.59" for 10yr-24hr event
Inflow = 5.88 cfs @ 11.96 hrs, Volume= 0.265 af
Outflow = 5.32 cfs @ 11.99 hrs, Volume= 0.263 af, Atten= 10%, Lag= 1.9 min
Primary = 5.32 cfs @ 11.99 hrs, Volume= 0.263 af
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 0.00-26.00 hrs, dt= 0.02 hrs
Peak Elev= 1,053.37' @ 11.99 hrs Surf.Area= 0.044 ac Storage= 0.052 af

Plug-Flow detention time= 29.0 min calculated for 0.263 af (100% of inflow)
Center-of-Mass det. time= 26.1 min (859.2 - 833.1)

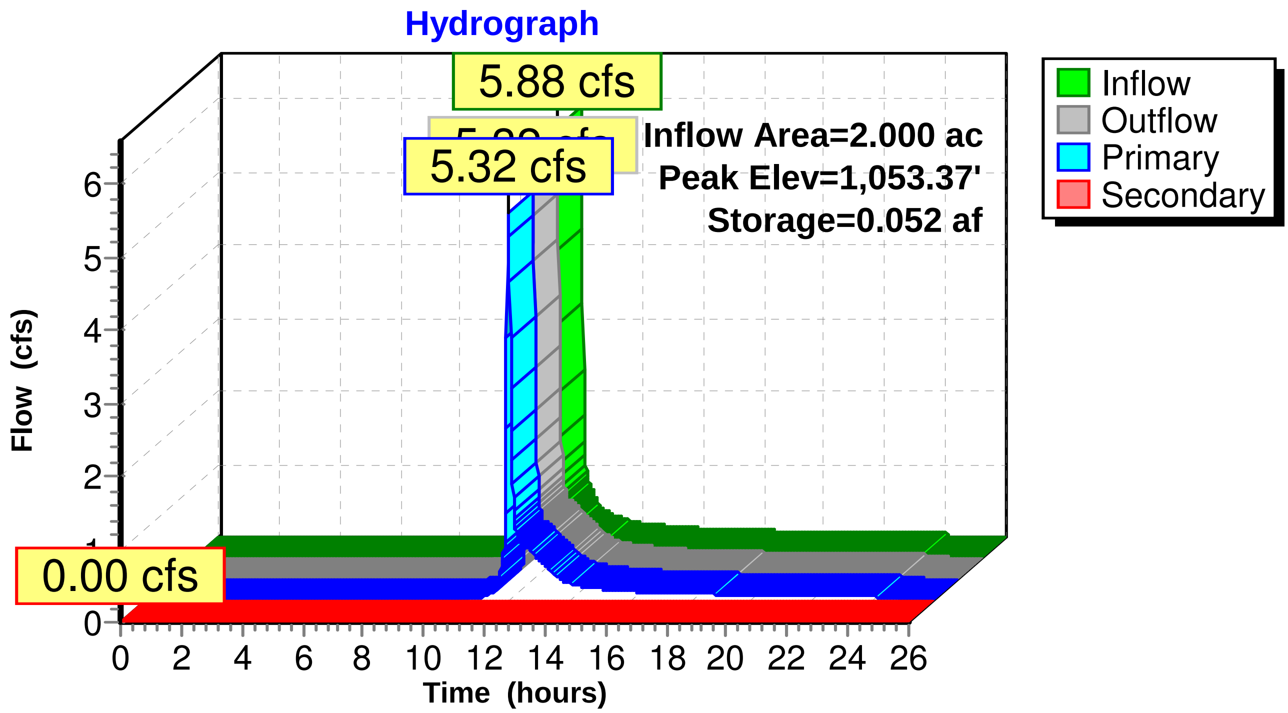
Volume	Invert	Avail.Storage	Storage Description
#1	1,052.00'	0.203 af	**20.00'W x 70.00'L x 4.00'H Trapezoid Z=2.0**

Device	Routing	Invert	Outlet Devices
#1	Device 4	1,052.00'	**6.0" Vert. Orifice/Grate** C= 0.600
#2	Device 4	1,053.00'	**6.00' W x 6.00' H Vert. Orifice/Grate** C= 0.600
#3	Device 4	1,054.00'	**11.5' long Sharp-Crested Rectangular Weir** 2 End Contraction(s)
#4	Primary	1,050.50'	**18.0" x 62.0' long Culvert** Ke= 0.500 Outlet Invert= 1,049.01' S= 0.0240 '/' Cc= 0.600 n= 0.013
#5	Secondary	1,054.50'	**12.0' long Broad-Crested Rectangular Weir** Head (feet) 1,054.50 Coef. (English) 2.60

Primary OutFlow Max=5.27 cfs @ 11.99 hrs HW=1,053.37' (Free Discharge)
└─**4=Culvert** (Passes 5.27 cfs of 8.25 cfs potential flow)
  ├─**1=Orifice/Grate** (Orifice Controls 1.00 cfs @ 5.09 fps)
  ├─**2=Orifice/Grate** (Orifice Controls 4.27 cfs @ 1.94 fps)
  └─**3=Sharp-Crested Rectangular Weir** (Controls 0.00 cfs)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=1,052.00' (Free Discharge)
└─**5=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

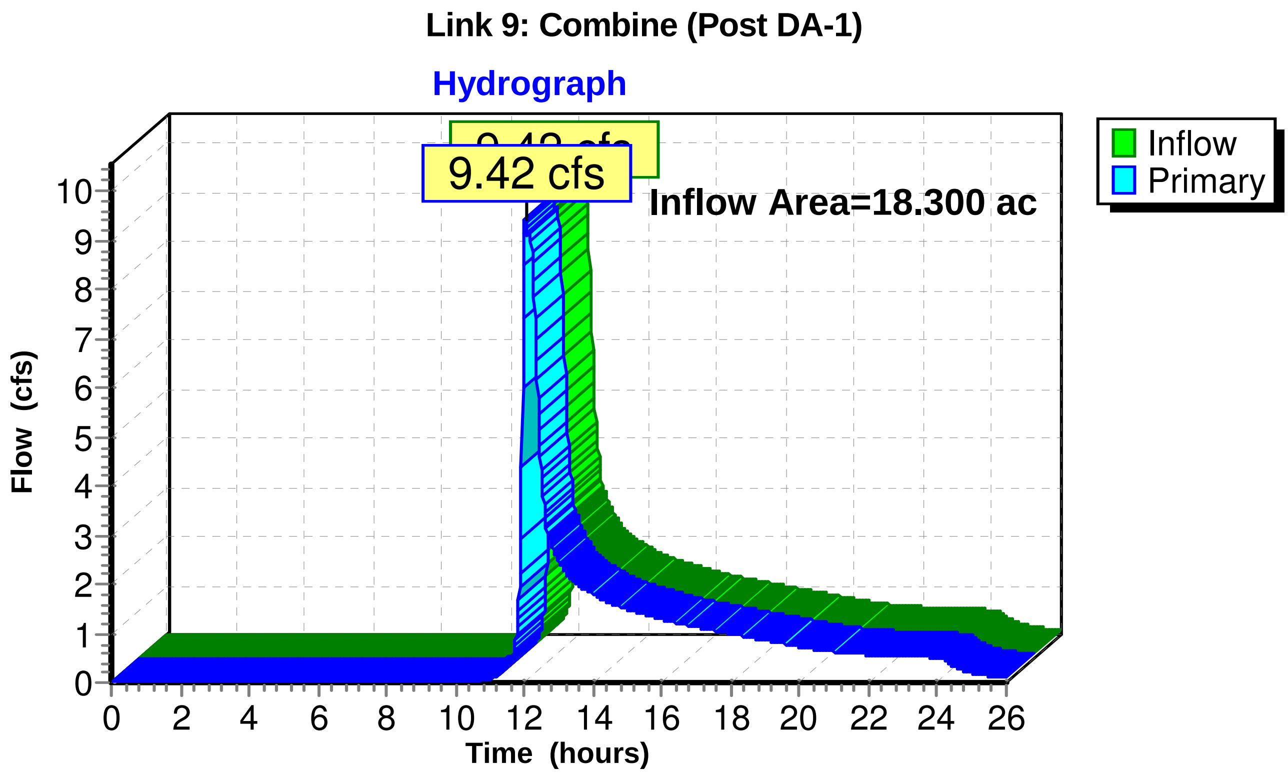
Pond 7P: Reservior (Basin 2 Outflow)



Summary for Link 9: Combine (Post DA-1)

Inflow Area = 18.300 ac, 4.92% Impervious, Inflow Depth > 0.99" for 10yr-24hr event
Inflow = 9.42 cfs @ 12.03 hrs, Volume= 1.509 af
Primary = 9.42 cfs @ 12.03 hrs, Volume= 1.509 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-26.00 hrs, dt= 0.02 hrs



Time span=0.00-26.00 hrs, dt=0.02 hrs, 1301 points
Runoff by SCS TR-20 method, UH=SCS
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 1S: SCS Runoff (Pre-DA-1) Runoff Area=18.300 ac 1.09% Impervious Runoff Depth=1.36"
Flow Length=1,469' Tc=24.6 min CN=71 Runoff=23.25 cfs 2.074 af

Subcatchment 2S: SCS Runoff (Post DA-1 Runoff Area=9.400 ac 2.13% Impervious Runoff Depth=1.70"
Flow Length=1,012' Tc=23.9 min CN=76 Runoff=15.75 cfs 1.332 af

Subcatchment 3S: SCS Runoff (Post DA-1 Runoff Area=2.000 ac 15.00% Impervious Runoff Depth=2.08"
Tc=5.0 min CN=81 Runoff=7.66 cfs 0.347 af

Subcatchment 4S: SCS Runoff (Post DA-1 Runoff Area=6.900 ac 5.80% Impervious Runoff Depth=1.63"
Flow Length=1,556' Tc=24.1 min CN=75 Runoff=10.98 cfs 0.937 af

Reach 8R: Reach (Basin 1 Reach) Avg. Depth=0.30' Max Vel=3.42 fps Inflow=2.67 cfs 0.904 af
n=0.033 L=400.0' S=0.0400 '/' Capacity=114.92 cfs Outflow=2.67 cfs 0.903 af

Pond 5P: Reservior (Forebay Outflow) Peak Elev=1,085.73' Storage=0.442 af Inflow=15.75 cfs 1.332 af
Outflow=11.47 cfs 0.923 af

Pond 6P: Reservior (Basin 1 Outflow) Peak Elev=1,077.67' Storage=0.231 af Inflow=11.47 cfs 0.923 af
Primary=2.67 cfs 0.904 af Secondary=0.00 cfs 0.000 af Outflow=2.67 cfs 0.904 af

Pond 7P: Reservior (Basin 2 Outflow) Peak Elev=1,053.47' Storage=0.056 af Inflow=7.66 cfs 0.347 af
Primary=7.19 cfs 0.345 af Secondary=0.00 cfs 0.000 af Outflow=7.19 cfs 0.345 af

Link 9: Combine (Post DA-1) Inflow=12.97 cfs 2.185 af
Primary=12.97 cfs 2.185 af

Total Runoff Area = 36.600 ac Runoff Volume = 4.689 af Average Runoff Depth = 1.54"
96.99% Pervious = 35.500 ac 3.01% Impervious = 1.100 ac

Summary for Subcatchment 1S: SCS Runoff (Pre-DA-1)

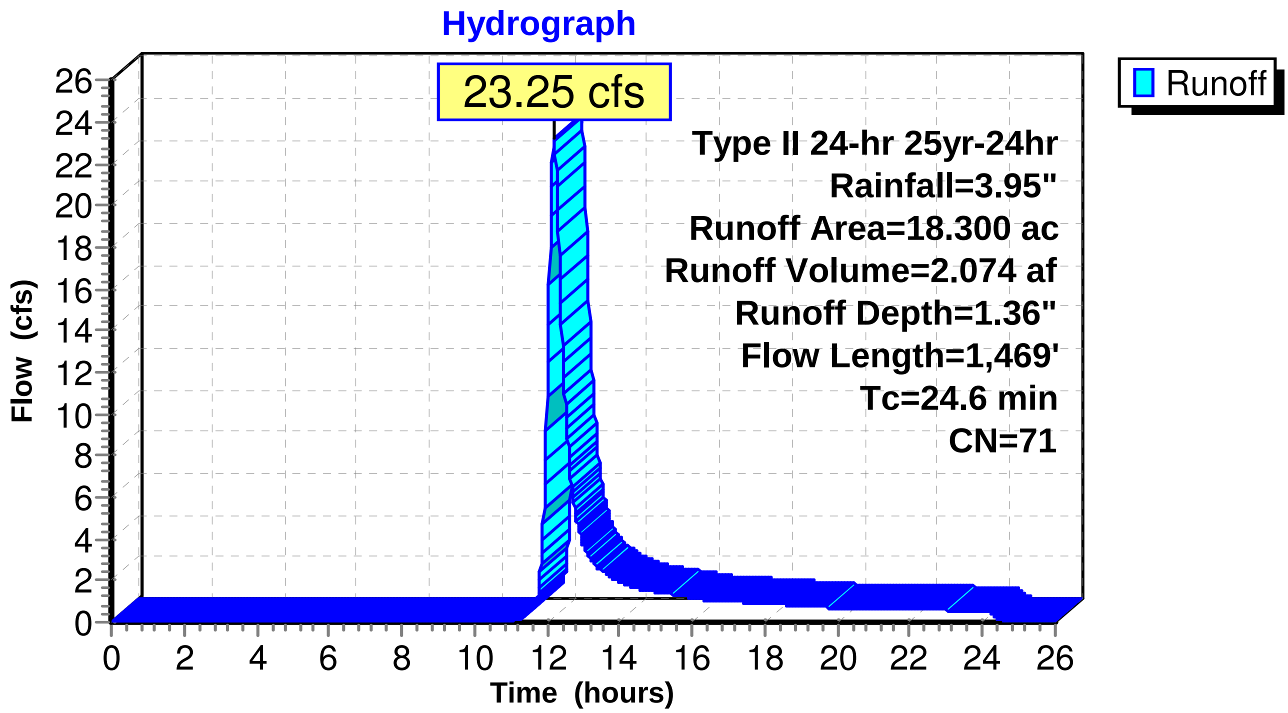
Runoff = 23.25 cfs @ 12.19 hrs, Volume= 2.074 af, Depth= 1.36"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-26.00 hrs, dt= 0.02 hrs
Type II 24-hr 25yr-24hr Rainfall=3.95"

	Area (ac)	CN	Description
*	0.200	98	
*	0.200	89	
*	11.200	71	
*	6.700	70	
	18.300	71	Weighted Average
	18.100		Pervious Area
	0.200		Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
21.1	100	0.1200	0.08		**Sheet Flow, Sheet Flow** n= 0.800 P2= 2.39"
1.3	573	0.2200	7.55		**Shallow Concentrated Flow, Shallow Concentrated Flow A** Unpaved Kv= 16.1 fps
1.8	429	0.0600	3.94		**Shallow Concentrated Flow, Shallow Concentrated Flow B** Unpaved Kv= 16.1 fps
0.4	367	0.0870	14.16	169.93	**Channel Flow, Channel Flow** Area= 12.0 sf Perim= 10.9' r= 1.10' n= 0.033
24.6	1,469	Total			

Subcatchment 1S: SCS Runoff (Pre-DA-1)



Summary for Subcatchment 2S: SCS Runoff (Post DA-1 Detained 1)

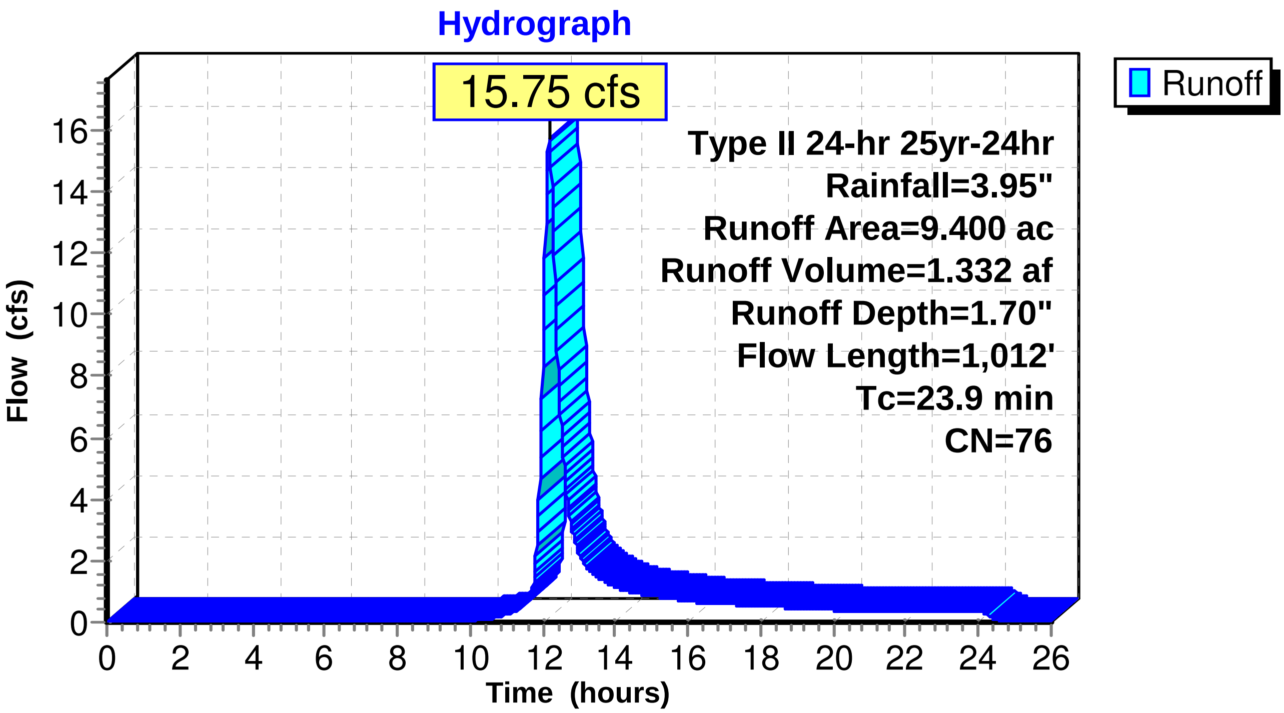
Runoff = 15.75 cfs @ 12.18 hrs, Volume= 1.332 af, Depth= 1.70"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-26.00 hrs, dt= 0.02 hrs
Type II 24-hr 25yr-24hr Rainfall=3.95"

	Area (ac)	CN	Description
*	0.200	98	
*	2.300	89	
*	6.000	71	
*	0.900	70	
	9.400	76	Weighted Average
	9.200		Pervious Area
	0.200		Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
21.1	100	0.1200	0.08		**Sheet Flow, Sheet Flow** n= 0.800 P2= 2.39"
0.7	332	0.2600	8.21		**Shallow Concentrated Flow, Shallow Concentrated Flow A** Unpaved Kv= 16.1 fps
1.3	270	0.0300	3.52		**Shallow Concentrated Flow, Shallow Concentrated Flow B** Paved Kv= 20.3 fps
0.1	88	0.3800	9.92		**Shallow Concentrated Flow, Shallow Concentrated Flow C** Unpaved Kv= 16.1 fps
0.7	222	0.0140	5.68	68.17	**Channel Flow, Channel Flow** Area= 12.0 sf Perim= 10.9' r= 1.10' n= 0.033
23.9	1,012	Total			

Subcatchment 2S: SCS Runoff (Post DA-1 Detained 1)



Summary for Subcatchment 3S: SCS Runoff (Post DA-1 Detained 2)

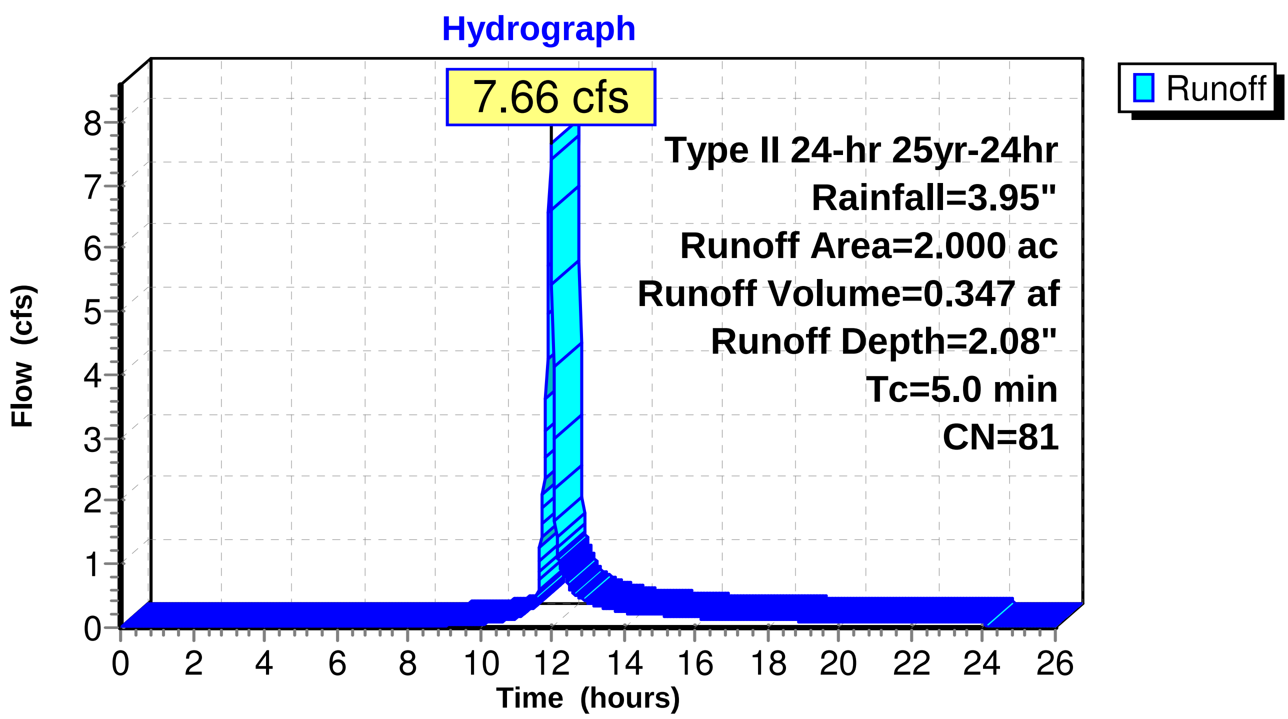
Runoff = 7.66 cfs @ 11.96 hrs, Volume= 0.347 af, Depth= 2.08"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-26.00 hrs, dt= 0.02 hrs
Type II 24-hr 25yr-24hr Rainfall=3.95"

	Area (ac)	CN	Description
*	0.300	98	
*	0.700	89	
*	1.000	71	
	2.000	81	Weighted Average
	1.700		Pervious Area
	0.300		Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry, User**

Subcatchment 3S: SCS Runoff (Post DA-1 Detained 2)



Summary for Subcatchment 4S: SCS Runoff (Post DA-1 Undetained)

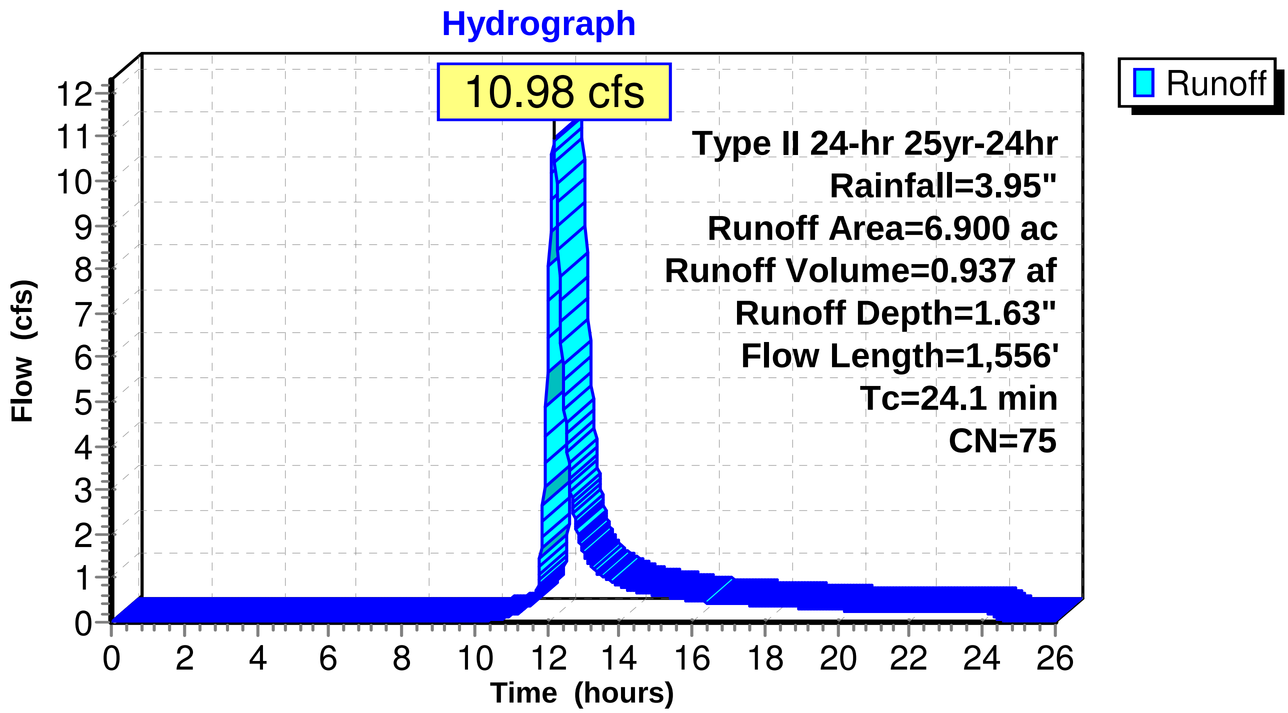
Runoff = 10.98 cfs @ 12.18 hrs, Volume= 0.937 af, Depth= 1.63"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-26.00 hrs, dt= 0.02 hrs
Type II 24-hr 25yr-24hr Rainfall=3.95"

	Area (ac)	CN	Description
*	0.400	98	
*	0.900	89	
*	4.100	71	
*	1.500	70	
	6.900	75	Weighted Average
	6.500		Pervious Area
	0.400		Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
21.1	100	0.1200	0.08		**Sheet Flow, Sheet Flow** n= 0.800 P2= 2.39"
0.9	412	0.2300	7.72		**Shallow Concentrated Flow, Shallow Concentrated Flow A** Unpaved Kv= 16.1 fps
1.3	312	0.0580	3.88		**Shallow Concentrated Flow, Shallow Concentrated Flow B** Unpaved Kv= 16.1 fps
0.8	732	0.0960	14.88	178.51	**Channel Flow, Channel Flow** Area= 12.0 sf Perim= 10.9' r= 1.10' n= 0.033
24.1	1,556	Total			

Subcatchment 4S: SCS Runoff (Post DA-1 Undetained)



Summary for Reach 8R: Reach (Basin 1 Reach)

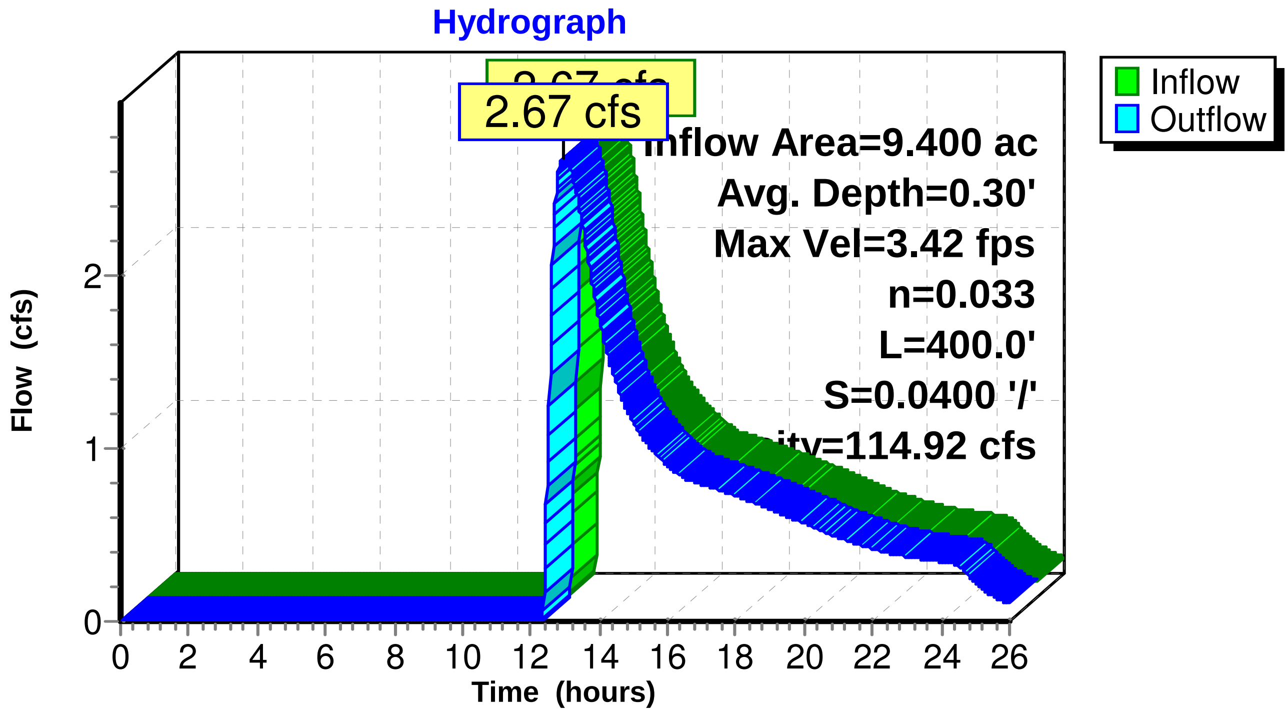
Inflow Area = 9.400 ac, 2.13% Impervious, Inflow Depth > 1.15" for 25yr-24hr event
Inflow = 2.67 cfs @ 12.92 hrs, Volume= 0.904 af
Outflow = 2.67 cfs @ 12.97 hrs, Volume= 0.903 af, Atten= 0%, Lag= 3.4 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-26.00 hrs, dt= 0.02 hrs
Max. Velocity= 3.42 fps, Min. Travel Time= 2.0 min
Avg. Velocity = 2.16 fps, Avg. Travel Time= 3.1 min

Peak Storage= 312 cf @ 12.94 hrs, Average Depth at Peak Storage= 0.30'
Bank-Full Depth= 2.00', Capacity at Bank-Full= 114.92 cfs

2.00' x 2.00' deep channel, n= 0.033
Side Slope Z-value= 2.0 '/' Top Width= 10.00'
Length= 400.0' Slope= 0.0400 '/'
Inlet Invert= 1,072.00', Outlet Invert= 1,056.00'

Reach 8R: Reach (Basin 1 Reach)



Summary for Pond 5P: Reservior (Forebay Outflow)

Inflow Area =	9.400 ac,	2.13% Impervious,	Inflow Depth = 1.70"	for 25yr-24hr event	
Inflow =	15.75 cfs @	12.18 hrs,	Volume=	1.332 af	
Outflow =	11.47 cfs @	12.33 hrs,	Volume=	0.923 af,	Atten= 27%, Lag= 9.2 min
Primary =	11.47 cfs @	12.33 hrs,	Volume=	0.923 af	

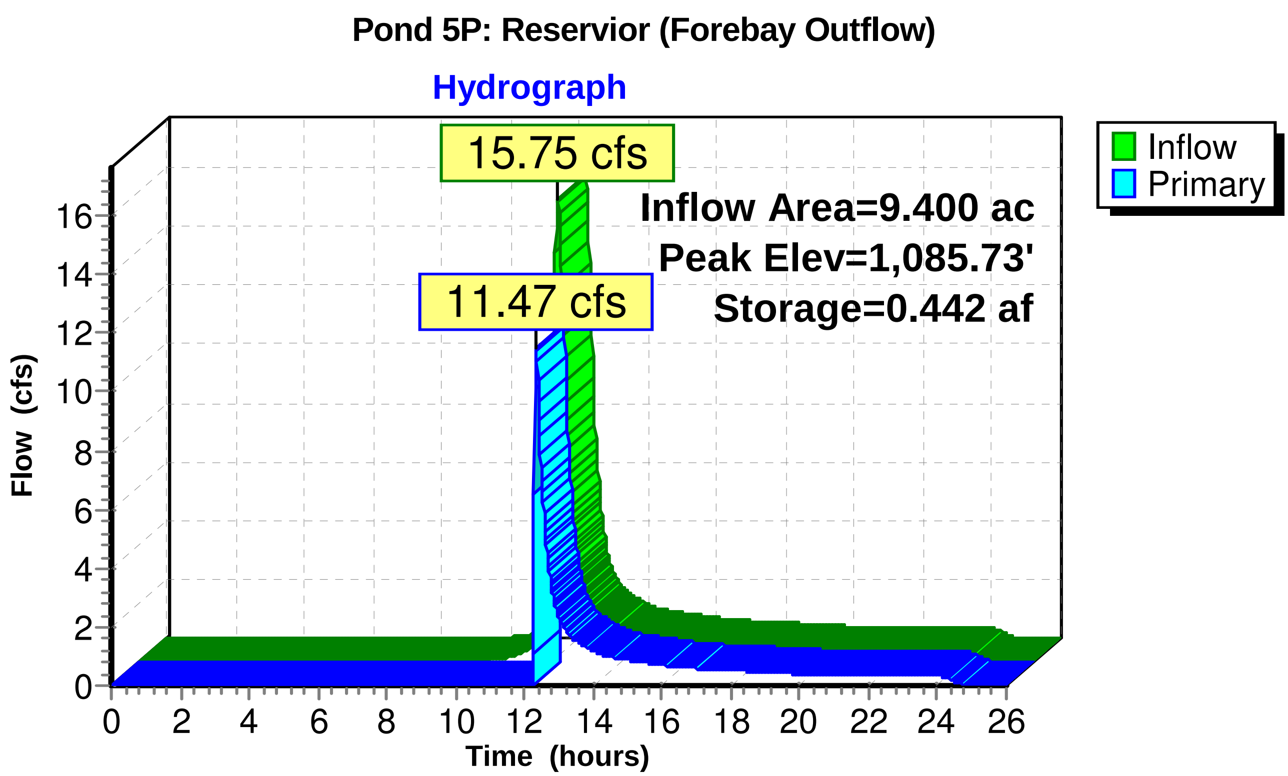
Routing by Stor-Ind method, Time Span= 0.00-26.00 hrs, dt= 0.02 hrs
Peak Elev= 1,085.73' @ 12.33 hrs Surf.Area= 0.149 ac Storage= 0.442 af

Plug-Flow detention time= 173.9 min calculated for 0.923 af (69% of inflow)
Center-of-Mass det. time= 65.0 min (922.2 - 857.3)

Volume	Invert	Avail.Storage	Storage Description
#1	1,082.00'	0.484 af	**30.00'W x 130.00'L x 4.00'H Trapezoid Z=2.0**

Device	Routing	Invert	Outlet Devices
#1	Primary	1,085.50'	**40.0' long Broad-Crested Rectangular Weir** Head (feet) 1,085.50 Coef. (English) 2.60

Primary OutFlow Max=11.39 cfs @ 12.33 hrs HW=1,085.73' (Free Discharge)
└─**1=Broad-Crested Rectangular Weir** (Weir Controls 11.39 cfs @ 1.24 fps)



Summary for Pond 6P: Reservior (Basin 1 Outflow)

Inflow Area = 9.400 ac, 2.13% Impervious, Inflow Depth = 1.18" for 25yr-24hr event
Inflow = 11.47 cfs @ 12.33 hrs, Volume= 0.923 af
Outflow = 2.67 cfs @ 12.92 hrs, Volume= 0.904 af, Atten= 77%, Lag= 35.0 min
Primary = 2.67 cfs @ 12.92 hrs, Volume= 0.904 af
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 0.00-26.00 hrs, dt= 0.02 hrs
Peak Elev= 1,077.67' @ 12.92 hrs Surf.Area= 0.174 ac Storage= 0.231 af

Plug-Flow detention time= 84.4 min calculated for 0.904 af (98% of inflow)
Center-of-Mass det. time= 73.0 min (995.3 - 922.2)

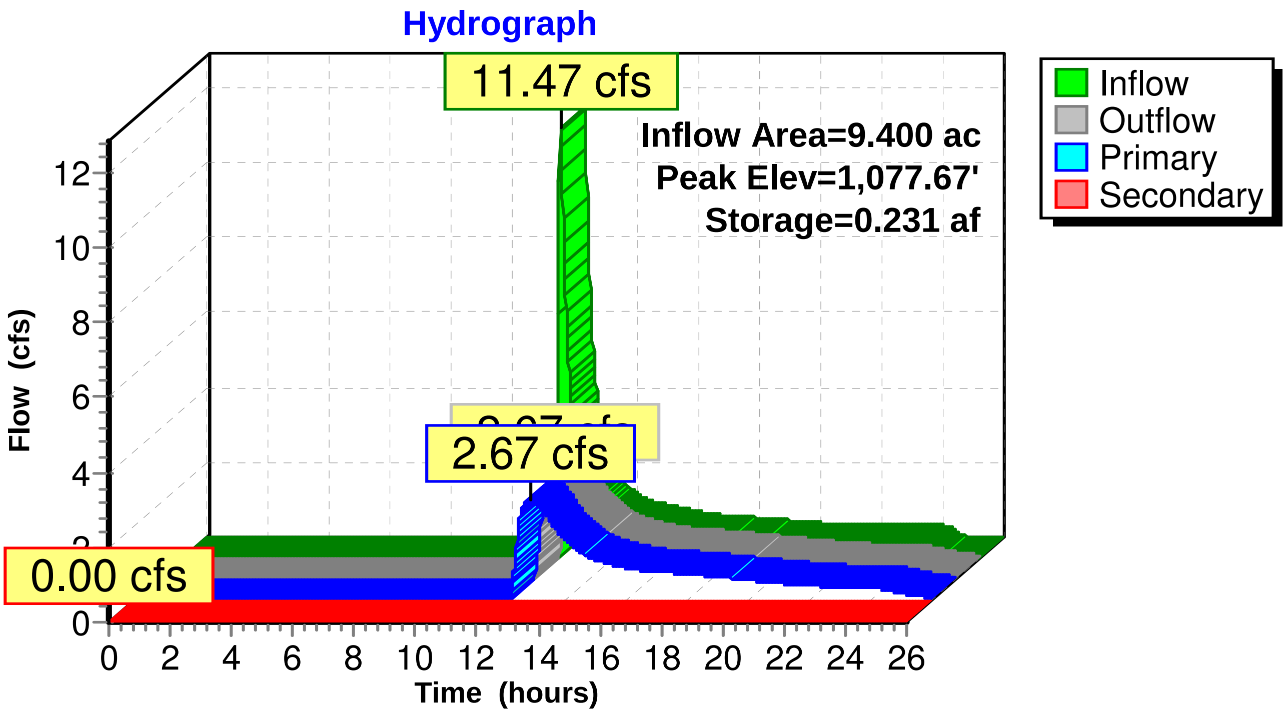
Volume	Invert	Avail.Storage	Storage Description
#1	1,076.00'	0.770 af	**35.00'W x 130.00'L x 4.00'H Trapezoid Z=5.0**

Device	Routing	Invert	Outlet Devices
#1	Device 4	1,076.00'	**6.0" Vert. Orifice/Grate** C= 0.600
#2	Device 4	1,077.00'	**1.00' W x 0.50' H Vert. Orifice/Grate** C= 0.600
#3	Device 4	1,078.00'	**11.5' long Sharp-Crested Rectangular Weir** 2 End Contraction(s)
#4	Primary	1,074.50'	**18.0" x 40.0' long Culvert** Ke= 0.500 Outlet Invert= 1,072.50' S= 0.0500 '/' Cc= 0.600 n= 0.013
#5	Secondary	1,078.50'	**8.0' long Broad-Crested Rectangular Weir** Head (feet) 1,078.50 Coef. (English) 3.33

Primary OutFlow Max=2.67 cfs @ 12.92 hrs HW=1,077.67' (Free Discharge)
└─**4=Culvert** (Passes 2.67 cfs of 8.83 cfs potential flow)
  ├─**1=Orifice/Grate** (Orifice Controls 1.13 cfs @ 5.74 fps)
  ├─**2=Orifice/Grate** (Orifice Controls 1.54 cfs @ 3.08 fps)
  └─**3=Sharp-Crested Rectangular Weir** (Controls 0.00 cfs)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=1,076.00' (Free Discharge)
└─**5=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond 6P: Reservior (Basin 1 Outflow)



Summary for Pond 7P: Reservior (Basin 2 Outflow)

Inflow Area =	2.000 ac, 15.00% Impervious, Inflow Depth = 2.08"	for 25yr-24hr event	
Inflow =	7.66 cfs @ 11.96 hrs, Volume=	0.347 af	
Outflow =	7.19 cfs @ 11.99 hrs, Volume=	0.345 af,	Atten= 6%, Lag= 1.5 min
Primary =	7.19 cfs @ 11.99 hrs, Volume=	0.345 af	
Secondary =	0.00 cfs @ 0.00 hrs, Volume=	0.000 af	

Routing by Stor-Ind method, Time Span= 0.00-26.00 hrs, dt= 0.02 hrs
Peak Elev= 1,053.47' @ 11.99 hrs Surf.Area= 0.045 ac Storage= 0.056 af

Plug-Flow detention time= 25.9 min calculated for 0.345 af (100% of inflow)
Center-of-Mass det. time= 23.5 min (848.8 - 825.4)

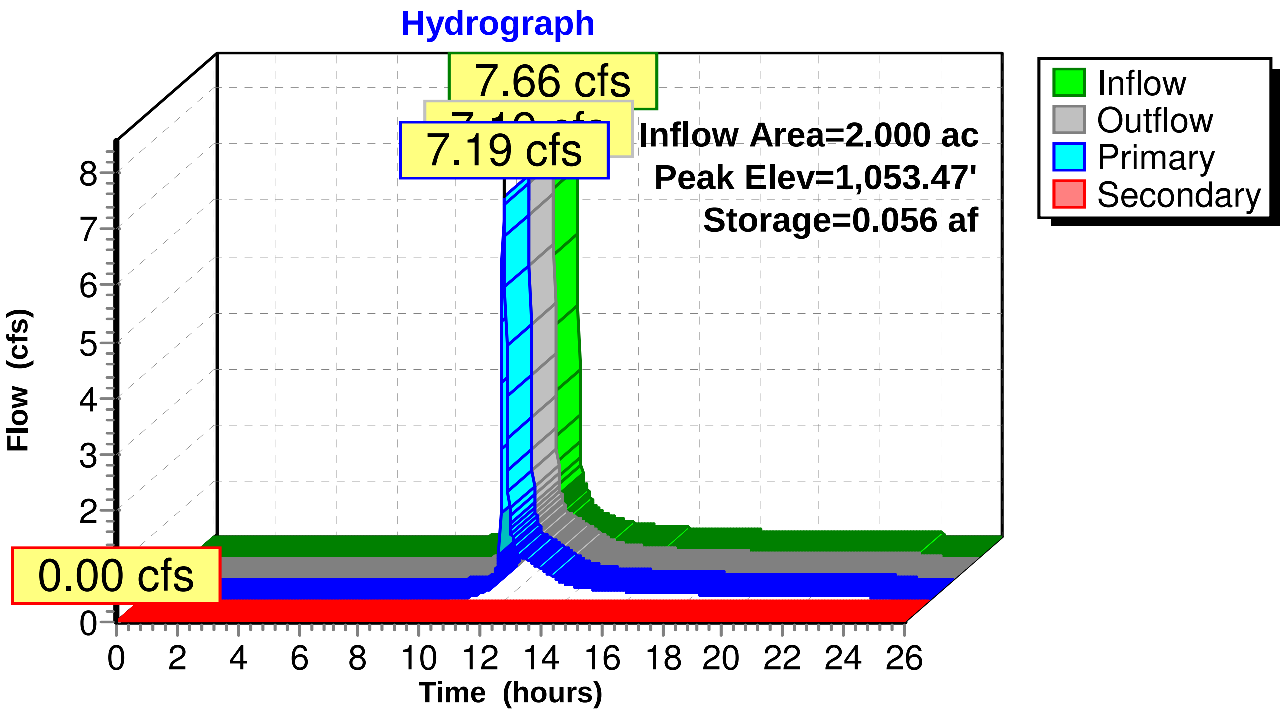
Volume	Invert	Avail.Storage	Storage Description
#1	1,052.00'	0.203 af	**20.00'W x 70.00'L x 4.00'H Trapezoid Z=2.0**

Device	Routing	Invert	Outlet Devices
#1	Device 4	1,052.00'	**6.0" Vert. Orifice/Grate** C= 0.600
#2	Device 4	1,053.00'	**6.00' W x 6.00' H Vert. Orifice/Grate** C= 0.600
#3	Device 4	1,054.00'	**11.5' long Sharp-Crested Rectangular Weir** 2 End Contraction(s)
#4	Primary	1,050.50'	**18.0" x 62.0' long Culvert** Ke= 0.500 Outlet Invert= 1,049.01' S= 0.0240 '/' Cc= 0.600 n= 0.013
#5	Secondary	1,054.50'	**12.0' long Broad-Crested Rectangular Weir** Head (feet) 1,054.50 Coef. (English) 2.60

Primary OutFlow Max=7.14 cfs @ 11.99 hrs HW=1,053.46' (Free Discharge)
└─**4=Culvert** (Passes 7.14 cfs of 8.44 cfs potential flow)
  ├─**1=Orifice/Grate** (Orifice Controls 1.04 cfs @ 5.31 fps)
  ├─**2=Orifice/Grate** (Orifice Controls 6.09 cfs @ 2.19 fps)
  └─**3=Sharp-Crested Rectangular Weir** (Controls 0.00 cfs)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=1,052.00' (Free Discharge)
└─**5=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

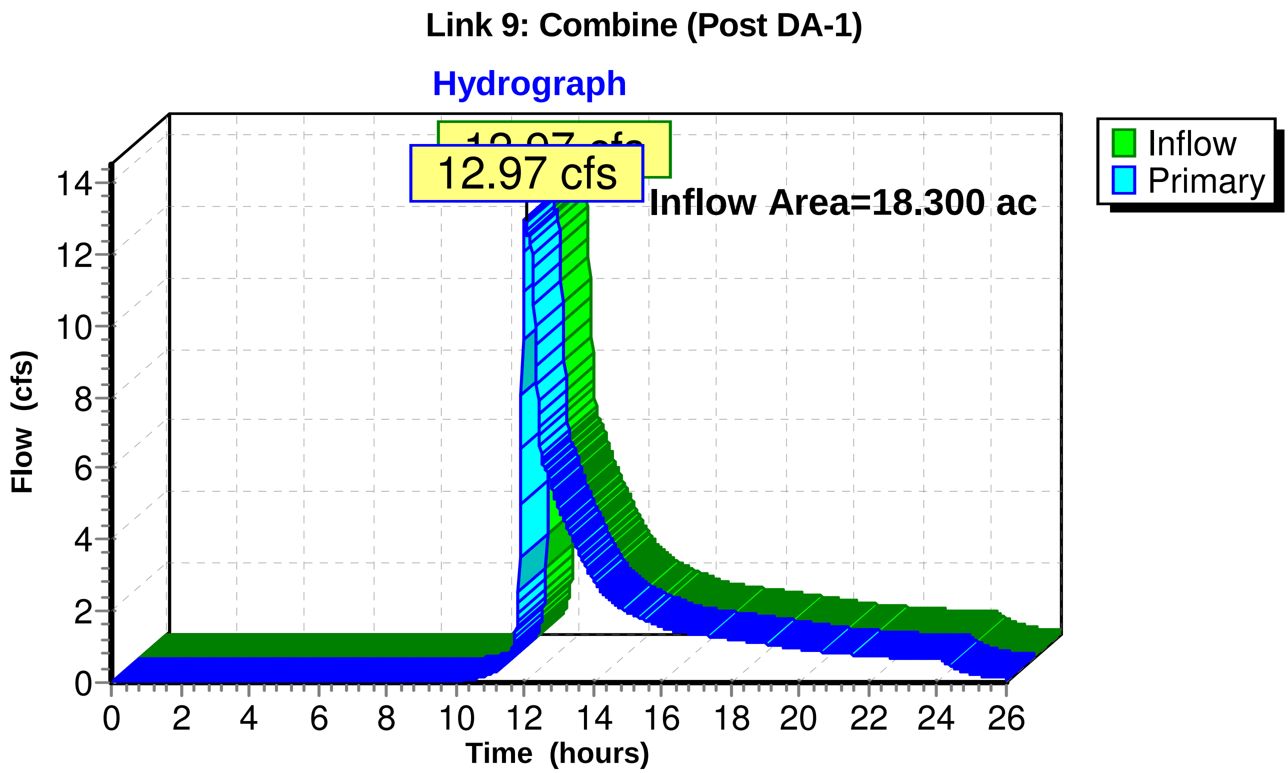
Pond 7P: Reservior (Basin 2 Outflow)



Summary for Link 9: Combine (Post DA-1)

Inflow Area = 18.300 ac, 4.92% Impervious, Inflow Depth > 1.43" for 25yr-24hr event
Inflow = 12.97 cfs @ 12.02 hrs, Volume= 2.185 af
Primary = 12.97 cfs @ 12.02 hrs, Volume= 2.185 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-26.00 hrs, dt= 0.02 hrs



Time span=0.00-26.00 hrs, dt=0.02 hrs, 1301 points
Runoff by SCS TR-20 method, UH=SCS
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 1S: SCS Runoff (Pre-DA-1) Runoff Area=18.300 ac 1.09% Impervious Runoff Depth=1.70"
Flow Length=1,469' Tc=24.6 min CN=71 Runoff=29.66 cfs 2.597 af

Subcatchment 2S: SCS Runoff (Post DA-1 Runoff Area=9.400 ac 2.13% Impervious Runoff Depth=2.08"
Flow Length=1,012' Tc=23.9 min CN=76 Runoff=19.43 cfs 1.631 af

Subcatchment 3S: SCS Runoff (Post DA-1 Runoff Area=2.000 ac 15.00% Impervious Runoff Depth=2.50"
Tc=5.0 min CN=81 Runoff=9.14 cfs 0.416 af

Subcatchment 4S: SCS Runoff (Post DA-1 Runoff Area=6.900 ac 5.80% Impervious Runoff Depth=2.00"
Flow Length=1,556' Tc=24.1 min CN=75 Runoff=13.63 cfs 1.152 af

Reach 8R: Reach (Basin 1 Reach) Avg. Depth=0.45' Max Vel=4.26 fps Inflow=5.61 cfs 1.201 af
n=0.033 L=400.0' S=0.0400 '/' Capacity=114.92 cfs Outflow=5.57 cfs 1.200 af

Pond 5P: Reservior (Forebay Outflow) Peak Elev=1,085.81' Storage=0.454 af Inflow=19.43 cfs 1.631 af
Outflow=17.59 cfs 1.222 af

Pond 6P: Reservior (Basin 1 Outflow) Peak Elev=1,078.14' Storage=0.318 af Inflow=17.59 cfs 1.222 af
Primary=5.61 cfs 1.201 af Secondary=0.00 cfs 0.000 af Outflow=5.61 cfs 1.201 af

Pond 7P: Reservior (Basin 2 Outflow) Peak Elev=1,053.54' Storage=0.060 af Inflow=9.14 cfs 0.416 af
Primary=8.60 cfs 0.415 af Secondary=0.00 cfs 0.000 af Outflow=8.60 cfs 0.415 af

Link 9: Combine (Post DA-1) Inflow=16.01 cfs 2.767 af
Primary=16.01 cfs 2.767 af

Total Runoff Area = 36.600 ac Runoff Volume = 5.796 af Average Runoff Depth = 1.90"
96.99% Pervious = 35.500 ac 3.01% Impervious = 1.100 ac

Summary for Subcatchment 1S: SCS Runoff (Pre-DA-1)

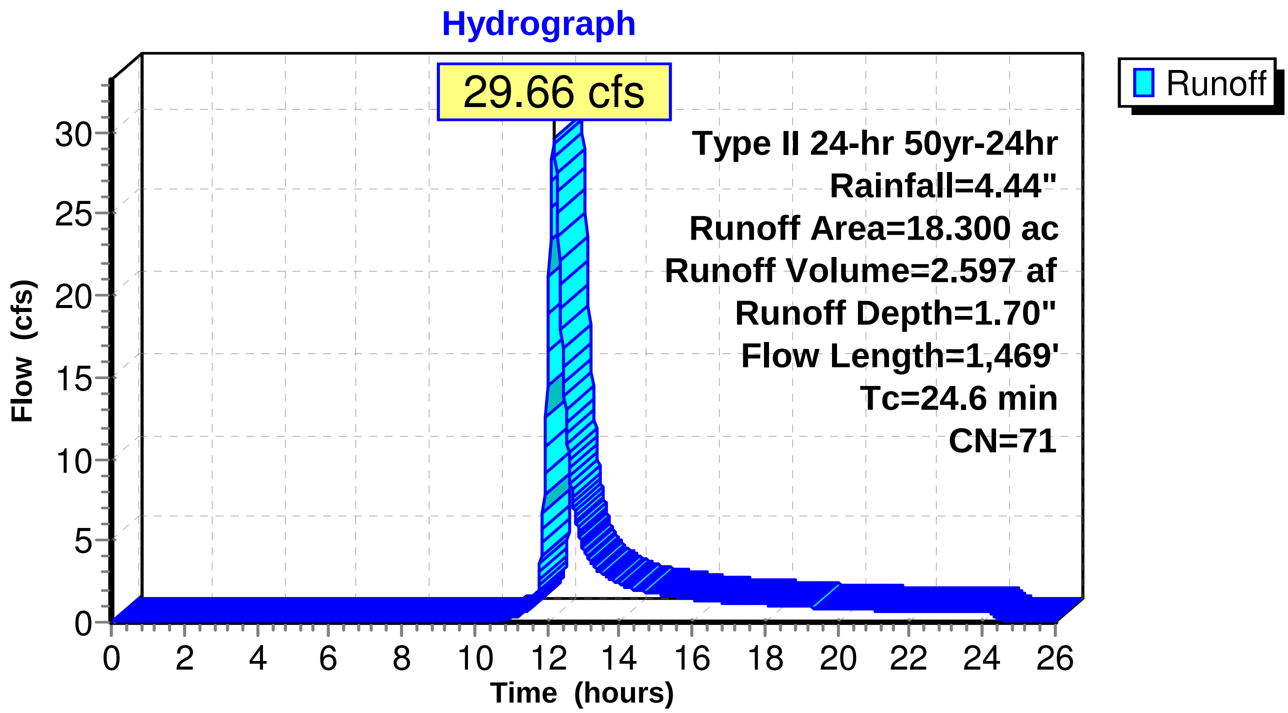
Runoff = 29.66 cfs @ 12.19 hrs, Volume= 2.597 af, Depth= 1.70"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-26.00 hrs, dt= 0.02 hrs
Type II 24-hr 50yr-24hr Rainfall=4.44"

	Area (ac)	CN	Description
*	0.200	98	
*	0.200	89	
*	11.200	71	
*	6.700	70	
	18.300	71	Weighted Average
	18.100		Pervious Area
	0.200		Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
21.1	100	0.1200	0.08		**Sheet Flow, Sheet Flow** n= 0.800 P2= 2.39"
1.3	573	0.2200	7.55		**Shallow Concentrated Flow, Shallow Concentrated Flow A** Unpaved Kv= 16.1 fps
1.8	429	0.0600	3.94		**Shallow Concentrated Flow, Shallow Concentrated Flow B** Unpaved Kv= 16.1 fps
0.4	367	0.0870	14.16	169.93	**Channel Flow, Channel Flow** Area= 12.0 sf Perim= 10.9' r= 1.10' n= 0.033
24.6	1,469	Total			

Subcatchment 1S: SCS Runoff (Pre-DA-1)



Summary for Subcatchment 2S: SCS Runoff (Post DA-1 Detained 1)

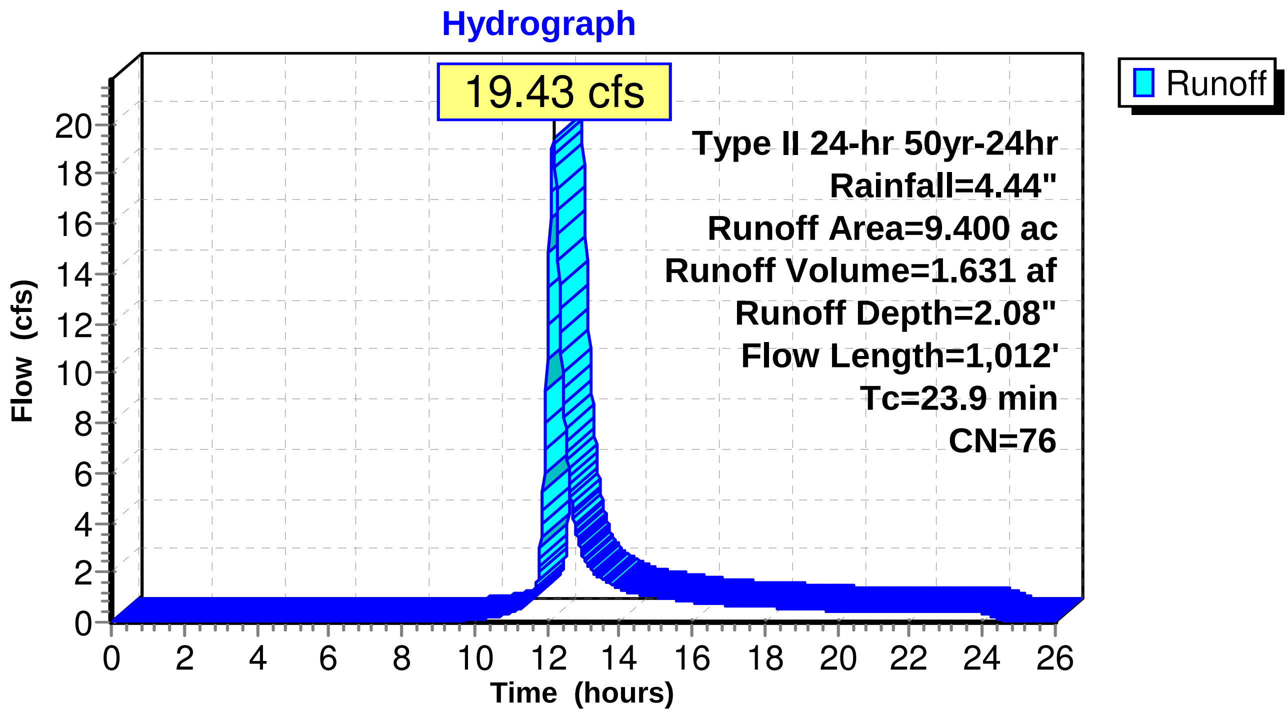
Runoff = 19.43 cfs @ 12.18 hrs, Volume= 1.631 af, Depth= 2.08"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-26.00 hrs, dt= 0.02 hrs
Type II 24-hr 50yr-24hr Rainfall=4.44"

	Area (ac)	CN	Description
*	0.200	98	
*	2.300	89	
*	6.000	71	
*	0.900	70	
	9.400	76	Weighted Average
	9.200		Pervious Area
	0.200		Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
21.1	100	0.1200	0.08		**Sheet Flow, Sheet Flow** n= 0.800 P2= 2.39"
0.7	332	0.2600	8.21		**Shallow Concentrated Flow, Shallow Concentrated Flow A** Unpaved Kv= 16.1 fps
1.3	270	0.0300	3.52		**Shallow Concentrated Flow, Shallow Concentrated Flow B** Paved Kv= 20.3 fps
0.1	88	0.3800	9.92		**Shallow Concentrated Flow, Shallow Concentrated Flow C** Unpaved Kv= 16.1 fps
0.7	222	0.0140	5.68	68.17	**Channel Flow, Channel Flow** Area= 12.0 sf Perim= 10.9' r= 1.10' n= 0.033
23.9	1,012	Total			

Subcatchment 2S: SCS Runoff (Post DA-1 Detained 1)



Summary for Subcatchment 3S: SCS Runoff (Post DA-1 Detained 2)

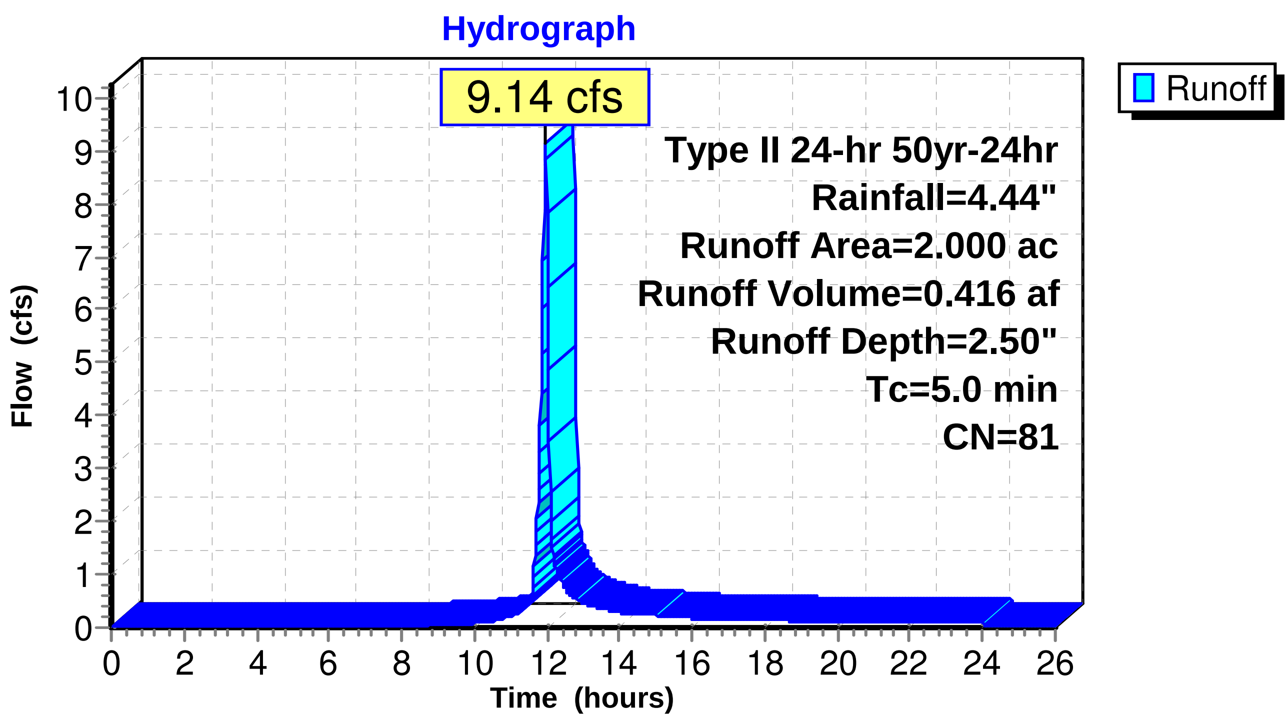
Runoff = 9.14 cfs @ 11.96 hrs, Volume= 0.416 af, Depth= 2.50"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-26.00 hrs, dt= 0.02 hrs
Type II 24-hr 50yr-24hr Rainfall=4.44"

	Area (ac)	CN	Description
*	0.300	98	
*	0.700	89	
*	1.000	71	
	2.000	81	Weighted Average
	1.700		Pervious Area
	0.300		Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry, User**

Subcatchment 3S: SCS Runoff (Post DA-1 Detained 2)



Summary for Subcatchment 4S: SCS Runoff (Post DA-1 Undetained)

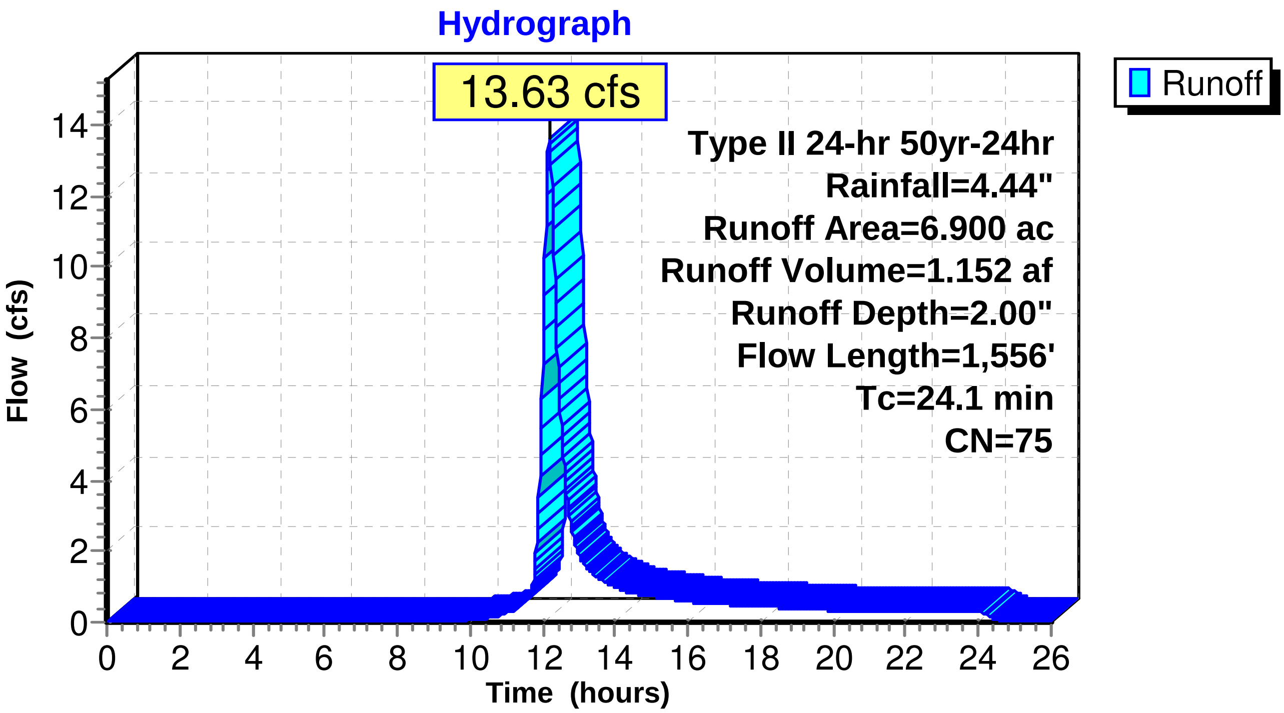
Runoff = 13.63 cfs @ 12.18 hrs, Volume= 1.152 af, Depth= 2.00"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-26.00 hrs, dt= 0.02 hrs
Type II 24-hr 50yr-24hr Rainfall=4.44"

	Area (ac)	CN	Description
*	0.400	98	
*	0.900	89	
*	4.100	71	
*	1.500	70	
	6.900	75	Weighted Average
	6.500		Pervious Area
	0.400		Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
21.1	100	0.1200	0.08		**Sheet Flow, Sheet Flow** n= 0.800 P2= 2.39"
0.9	412	0.2300	7.72		**Shallow Concentrated Flow, Shallow Concentrated Flow A** Unpaved Kv= 16.1 fps
1.3	312	0.0580	3.88		**Shallow Concentrated Flow, Shallow Concentrated Flow B** Unpaved Kv= 16.1 fps
0.8	732	0.0960	14.88	178.51	**Channel Flow, Channel Flow** Area= 12.0 sf Perim= 10.9' r= 1.10' n= 0.033
24.1	1,556	Total			

Subcatchment 4S: SCS Runoff (Post DA-1 Undetained)



Summary for Reach 8R: Reach (Basin 1 Reach)

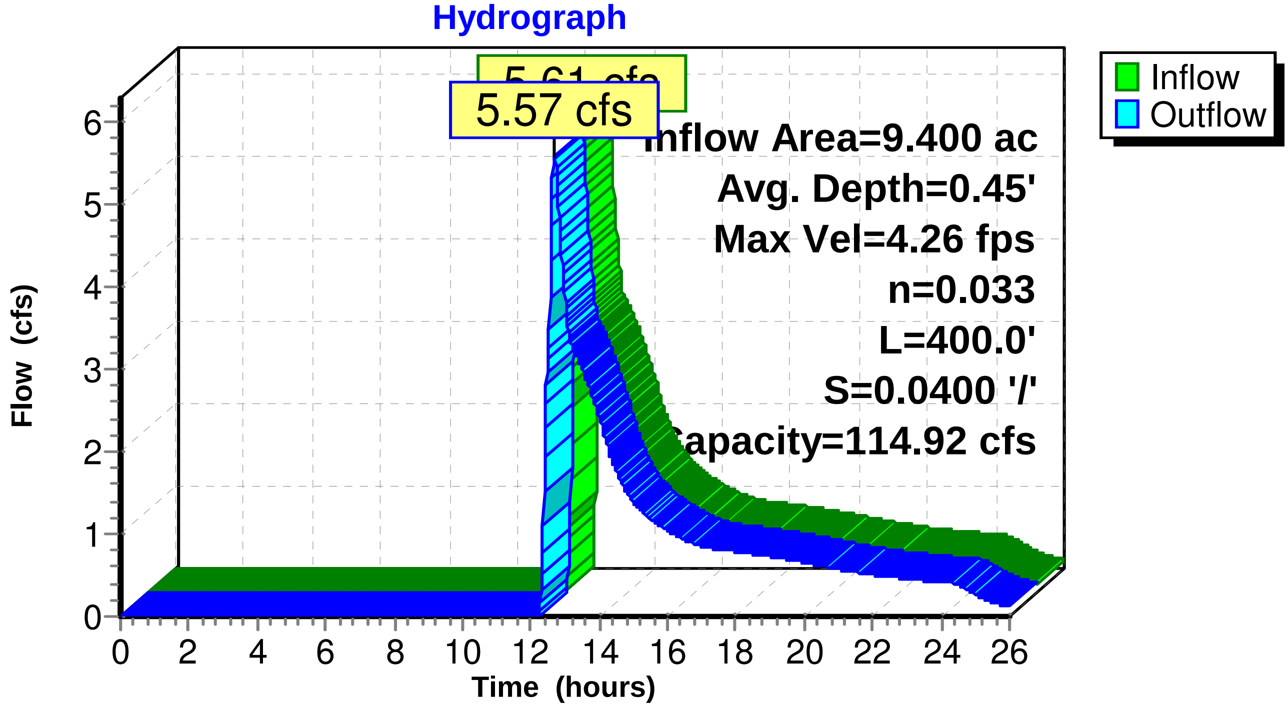
Inflow Area = 9.400 ac, 2.13% Impervious, Inflow Depth > 1.53" for 50yr-24hr event
Inflow = 5.61 cfs @ 12.65 hrs, Volume= 1.201 af
Outflow = 5.57 cfs @ 12.69 hrs, Volume= 1.200 af, Atten= 1%, Lag= 2.9 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-26.00 hrs, dt= 0.02 hrs
Max. Velocity= 4.26 fps, Min. Travel Time= 1.6 min
Avg. Velocity = 2.33 fps, Avg. Travel Time= 2.9 min

Peak Storage= 523 cf @ 12.67 hrs, Average Depth at Peak Storage= 0.45'
Bank-Full Depth= 2.00', Capacity at Bank-Full= 114.92 cfs

2.00' x 2.00' deep channel, n= 0.033
Side Slope Z-value= 2.0 '/' Top Width= 10.00'
Length= 400.0' Slope= 0.0400 '/'
Inlet Invert= 1,072.00', Outlet Invert= 1,056.00'

Reach 8R: Reach (Basin 1 Reach)



Summary for Pond 5P: Reservior (Forebay Outflow)

Inflow Area = 9.400 ac, 2.13% Impervious, Inflow Depth = 2.08" for 50yr-24hr event
Inflow = 19.43 cfs @ 12.18 hrs, Volume= 1.631 af
Outflow = 17.59 cfs @ 12.26 hrs, Volume= 1.222 af, Atten= 10%, Lag= 5.0 min
Primary = 17.59 cfs @ 12.26 hrs, Volume= 1.222 af

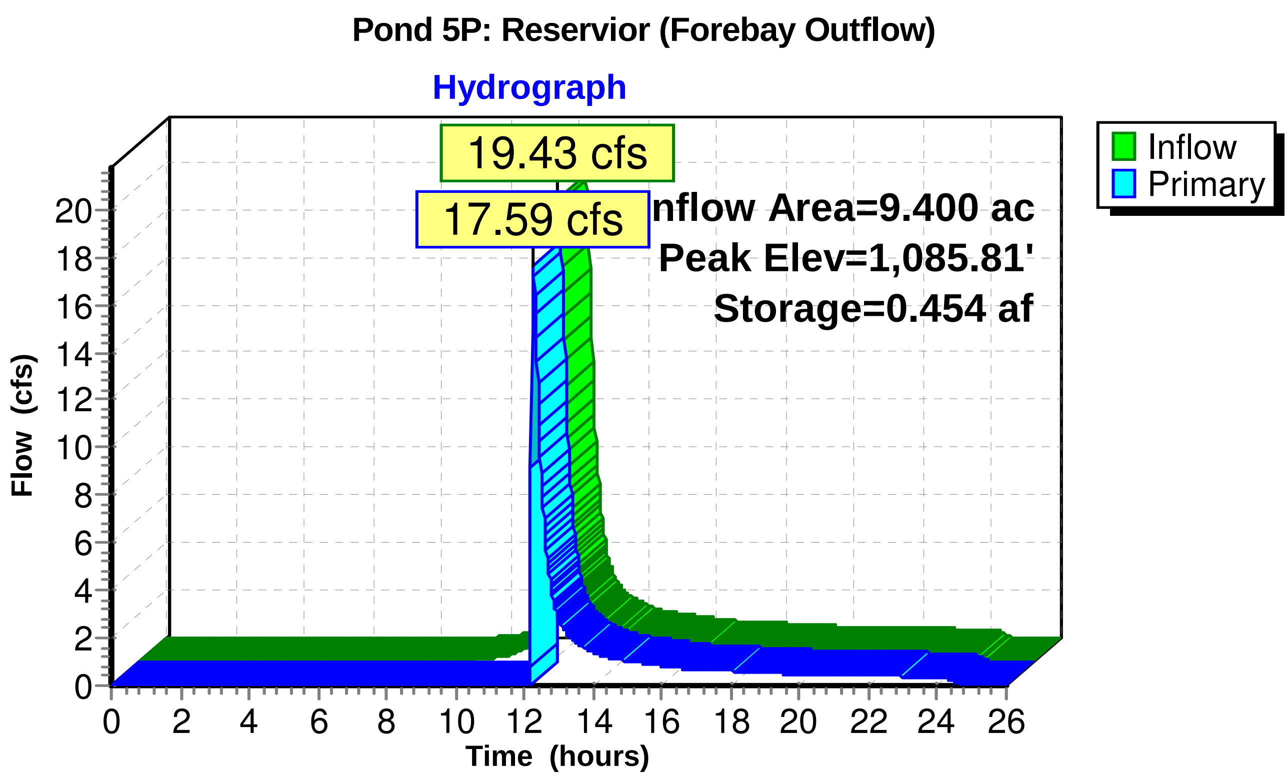
Routing by Stor-Ind method, Time Span= 0.00-26.00 hrs, dt= 0.02 hrs
Peak Elev= 1,085.81' @ 12.26 hrs Surf.Area= 0.151 ac Storage= 0.454 af

Plug-Flow detention time= 146.5 min calculated for 1.221 af (75% of inflow)
Center-of-Mass det. time= 50.0 min (901.4 - 851.4)

Volume	Invert	Avail.Storage	Storage Description
#1	1,082.00'	0.484 af	**30.00'W x 130.00'L x 4.00'H Trapezoid Z=2.0**

Device	Routing	Invert	Outlet Devices
#1	Primary	1,085.50'	**40.0' long Broad-Crested Rectangular Weir** Head (feet) 1,085.50 Coef. (English) 2.60

Primary OutFlow Max=17.57 cfs @ 12.26 hrs HW=1,085.81' (Free Discharge)
└─**1=Broad-Crested Rectangular Weir** (Weir Controls 17.57 cfs @ 1.44 fps)



Summary for Pond 6P: Reservior (Basin 1 Outflow)

Inflow Area = 9.400 ac, 2.13% Impervious, Inflow Depth = 1.56" for 50yr-24hr event
Inflow = 17.59 cfs @ 12.26 hrs, Volume= 1.222 af
Outflow = 5.61 cfs @ 12.65 hrs, Volume= 1.201 af, Atten= 68%, Lag= 23.2 min
Primary = 5.61 cfs @ 12.65 hrs, Volume= 1.201 af
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 0.00-26.00 hrs, dt= 0.02 hrs
Peak Elev= 1,078.14' @ 12.65 hrs Surf.Area= 0.196 ac Storage= 0.318 af

Plug-Flow detention time= 76.8 min calculated for 1.200 af (98% of inflow)
Center-of-Mass det. time= 67.2 min (968.6 - 901.4)

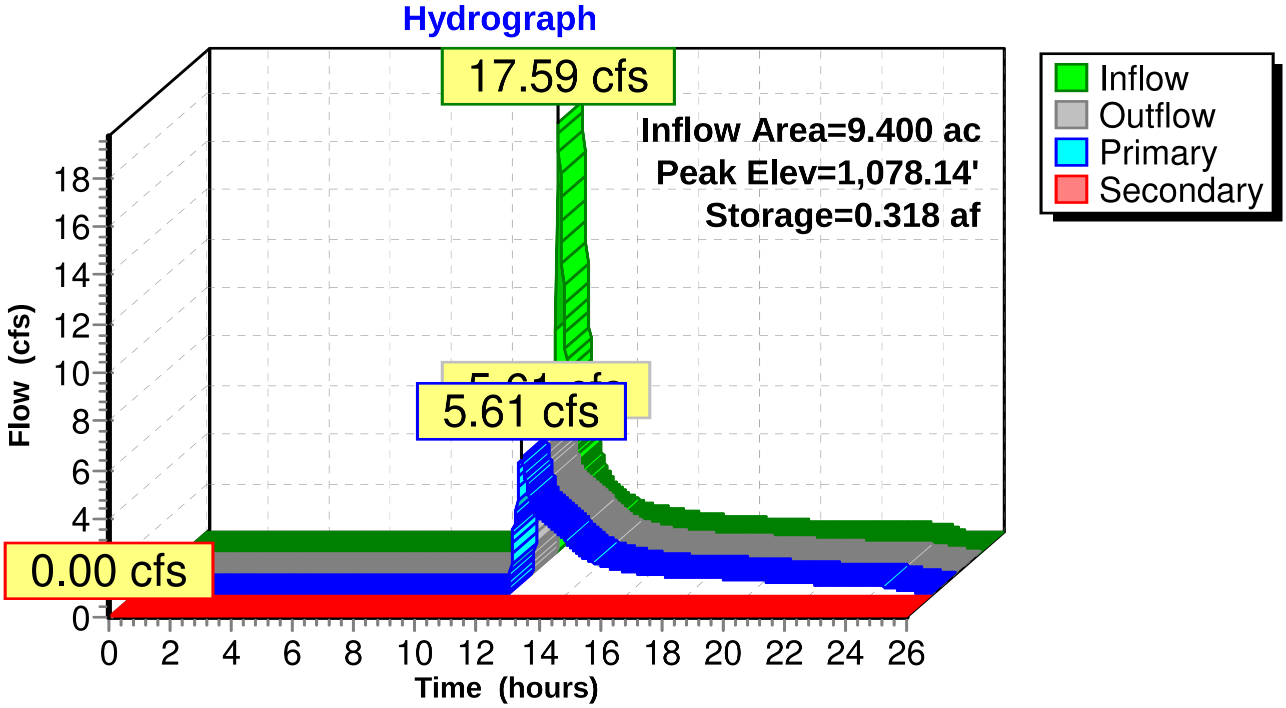
Volume	Invert	Avail.Storage	Storage Description
#1	1,076.00'	0.770 af	**35.00'W x 130.00'L x 4.00'H Trapezoid Z=5.0**

Device	Routing	Invert	Outlet Devices
#1	Device 4	1,076.00'	**6.0" Vert. Orifice/Grate** C= 0.600
#2	Device 4	1,077.00'	**1.00' W x 0.50' H Vert. Orifice/Grate** C= 0.600
#3	Device 4	1,078.00'	**11.5' long Sharp-Crested Rectangular Weir** 2 End Contraction(s)
#4	Primary	1,074.50'	**18.0" x 40.0' long Culvert** Ke= 0.500 Outlet Invert= 1,072.50' S= 0.0500 '/' Cc= 0.600 n= 0.013
#5	Secondary	1,078.50'	**8.0' long Broad-Crested Rectangular Weir** Head (feet) 1,078.50 Coef. (English) 3.33

Primary OutFlow Max=5.59 cfs @ 12.65 hrs HW=1,078.14' (Free Discharge)
└─**4=Culvert** (Passes 5.59 cfs of 9.65 cfs potential flow)
  ├─**1=Orifice/Grate** (Orifice Controls 1.30 cfs @ 6.62 fps)
  ├─**2=Orifice/Grate** (Orifice Controls 2.27 cfs @ 4.53 fps)
  └─**3=Sharp-Crested Rectangular Weir** (Weir Controls 2.02 cfs @ 1.23 fps)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=1,076.00' (Free Discharge)
└─**5=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond 6P: Reservior (Basin 1 Outflow)



Summary for Pond 7P: Reservior (Basin 2 Outflow)

Inflow Area = 2.000 ac, 15.00% Impervious, Inflow Depth = 2.50" for 50yr-24hr event
Inflow = 9.14 cfs @ 11.96 hrs, Volume= 0.416 af
Outflow = 8.60 cfs @ 11.99 hrs, Volume= 0.415 af, Atten= 6%, Lag= 1.5 min
Primary = 8.60 cfs @ 11.99 hrs, Volume= 0.415 af
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 0.00-26.00 hrs, dt= 0.02 hrs
Peak Elev= 1,053.54' @ 11.98 hrs Surf.Area= 0.046 ac Storage= 0.060 af

Plug-Flow detention time= 23.9 min calculated for 0.414 af (100% of inflow)
Center-of-Mass det. time= 21.9 min (842.1 - 820.2)

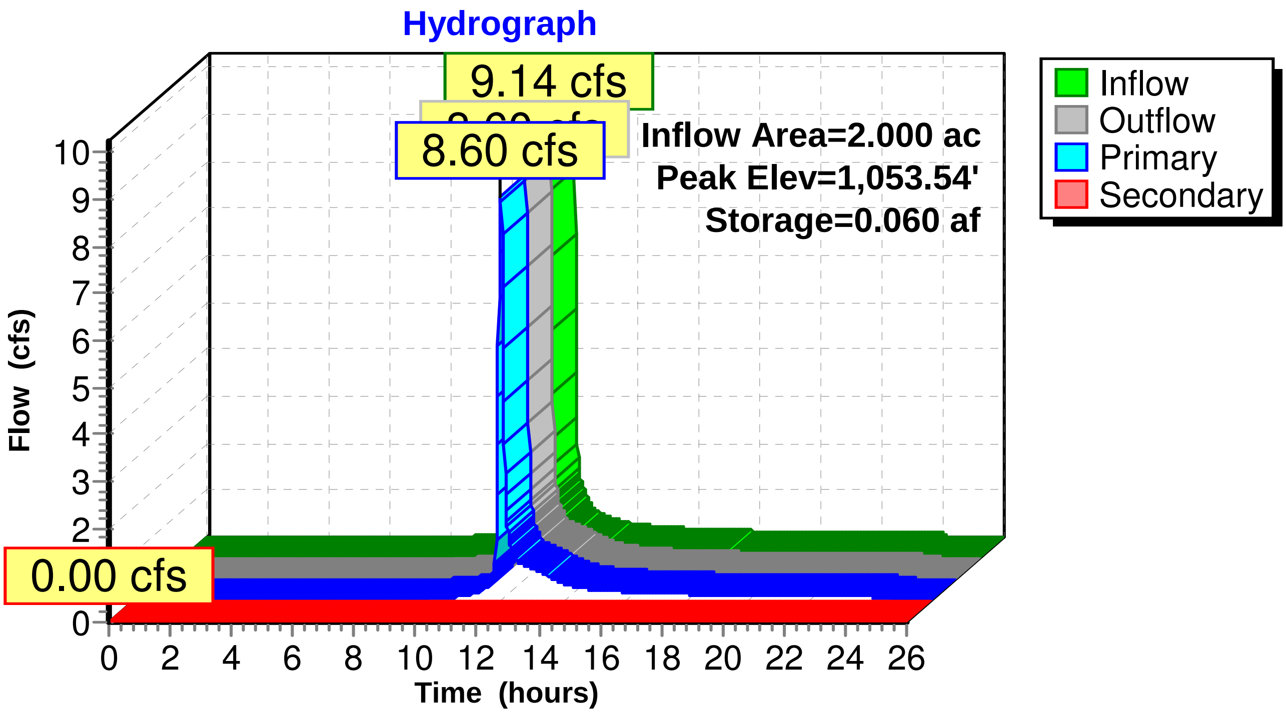
Volume	Invert	Avail.Storage	Storage Description
#1	1,052.00'	0.203 af	**20.00'W x 70.00'L x 4.00'H Trapezoid Z=2.0**

Device	Routing	Invert	Outlet Devices
#1	Device 4	1,052.00'	**6.0" Vert. Orifice/Grate** C= 0.600
#2	Device 4	1,053.00'	**6.00' W x 6.00' H Vert. Orifice/Grate** C= 0.600
#3	Device 4	1,054.00'	**11.5' long Sharp-Crested Rectangular Weir** 2 End Contraction(s)
#4	Primary	1,050.50'	**18.0" x 62.0' long Culvert** Ke= 0.500 Outlet Invert= 1,049.01' S= 0.0240 '/' Cc= 0.600 n= 0.013
#5	Secondary	1,054.50'	**12.0' long Broad-Crested Rectangular Weir** Head (feet) 1,054.50 Coef. (English) 2.60

Primary OutFlow Max=8.58 cfs @ 11.99 hrs HW=1,053.54' (Free Discharge)
└─**4=Culvert** (Inlet Controls 8.58 cfs @ 4.86 fps)
  ├─**1=Orifice/Grate** (Passes < 1.07 cfs potential flow)
  ├─**2=Orifice/Grate** (Passes < 7.63 cfs potential flow)
  └─**3=Sharp-Crested Rectangular Weir** (Controls 0.00 cfs)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=1,052.00' (Free Discharge)
└─**5=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

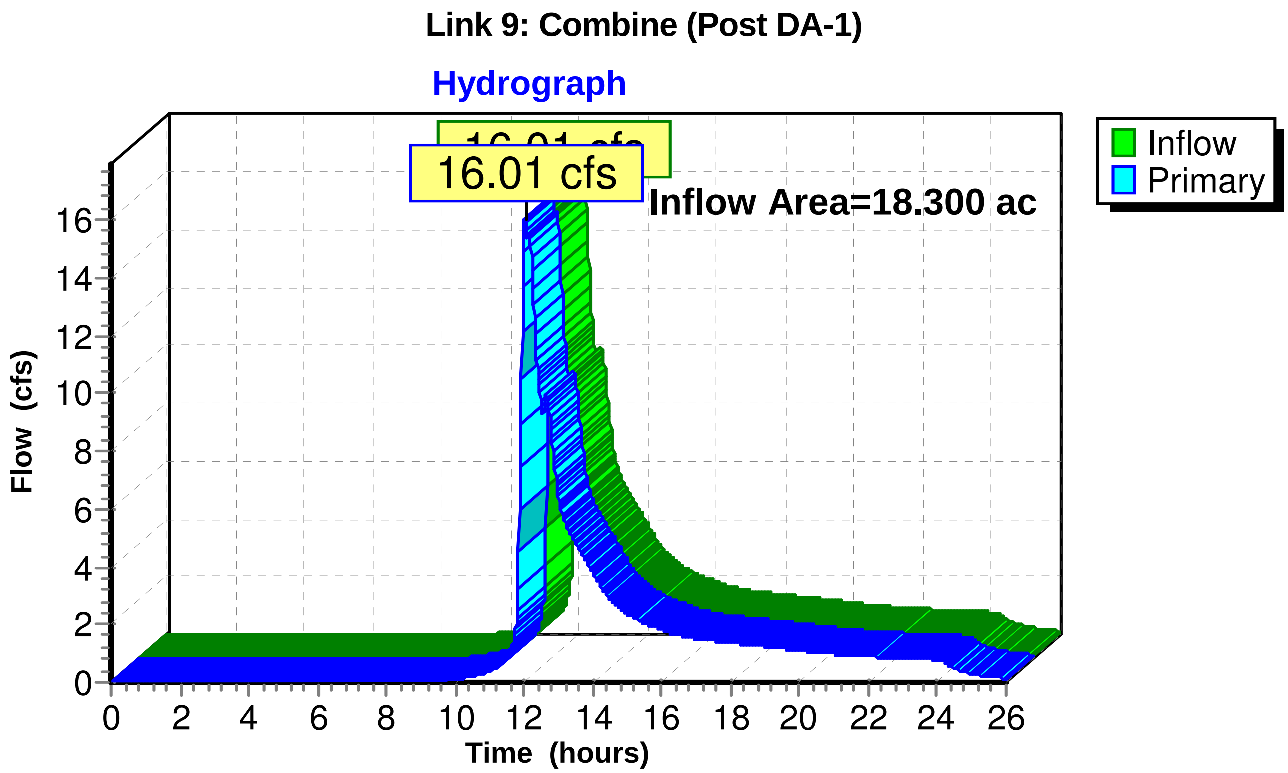
Pond 7P: Reservior (Basin 2 Outflow)



Summary for Link 9: Combine (Post DA-1)

Inflow Area =	18.300 ac,	4.92% Impervious,	Inflow Depth > 1.81"	for 50yr-24hr event
Inflow =	16.01 cfs @	12.02 hrs, Volume=	2.767 af	
Primary =	16.01 cfs @	12.02 hrs, Volume=	2.767 af,	Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-26.00 hrs, dt= 0.02 hrs



Time span=0.00-26.00 hrs, dt=0.02 hrs, 1301 points
Runoff by SCS TR-20 method, UH=SCS
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 1S: SCS Runoff (Pre-DA-1) Runoff Area=18.300 ac 1.09% Impervious Runoff Depth=2.09"
Flow Length=1,469' Tc=24.6 min CN=71 Runoff=36.79 cfs 3.182 af

Subcatchment 2S: SCS Runoff (Post DA-1 Runoff Area=9.400 ac 2.13% Impervious Runoff Depth=2.50"
Flow Length=1,012' Tc=23.9 min CN=76 Runoff=23.47 cfs 1.960 af

Subcatchment 3S: SCS Runoff (Post DA-1 Runoff Area=2.000 ac 15.00% Impervious Runoff Depth=2.95"
Tc=5.0 min CN=81 Runoff=10.73 cfs 0.492 af

Subcatchment 4S: SCS Runoff (Post DA-1 Runoff Area=6.900 ac 5.80% Impervious Runoff Depth=2.42"
Flow Length=1,556' Tc=24.1 min CN=75 Runoff=16.55 cfs 1.390 af

Reach 8R: Reach (Basin 1 Reach) Avg. Depth=0.62' Max Vel=5.04 fps Inflow=10.06 cfs 1.528 af
n=0.033 L=400.0' S=0.0400 '/' Capacity=114.92 cfs Outflow=10.05 cfs 1.527 af

Pond 5P: Reservior (Forebay Outflow) Peak Elev=1,085.86' Storage=0.463 af Inflow=23.47 cfs 1.960 af
Outflow=22.91 cfs 1.552 af

Pond 6P: Reservior (Basin 1 Outflow) Peak Elev=1,078.39' Storage=0.369 af Inflow=22.91 cfs 1.552 af
Primary=10.06 cfs 1.528 af Secondary=0.00 cfs 0.000 af Outflow=10.06 cfs 1.528 af

Pond 7P: Reservior (Basin 2 Outflow) Peak Elev=1,053.71' Storage=0.068 af Inflow=10.73 cfs 0.492 af
Primary=8.90 cfs 0.490 af Secondary=0.00 cfs 0.000 af Outflow=8.90 cfs 0.490 af

Link 9: Combine (Post DA-1) Inflow=20.42 cfs 3.407 af
Primary=20.42 cfs 3.407 af

Total Runoff Area = 36.600 ac Runoff Volume = 7.023 af Average Runoff Depth = 2.30"
96.99% Pervious = 35.500 ac 3.01% Impervious = 1.100 ac

Summary for Subcatchment 1S: SCS Runoff (Pre-DA-1)

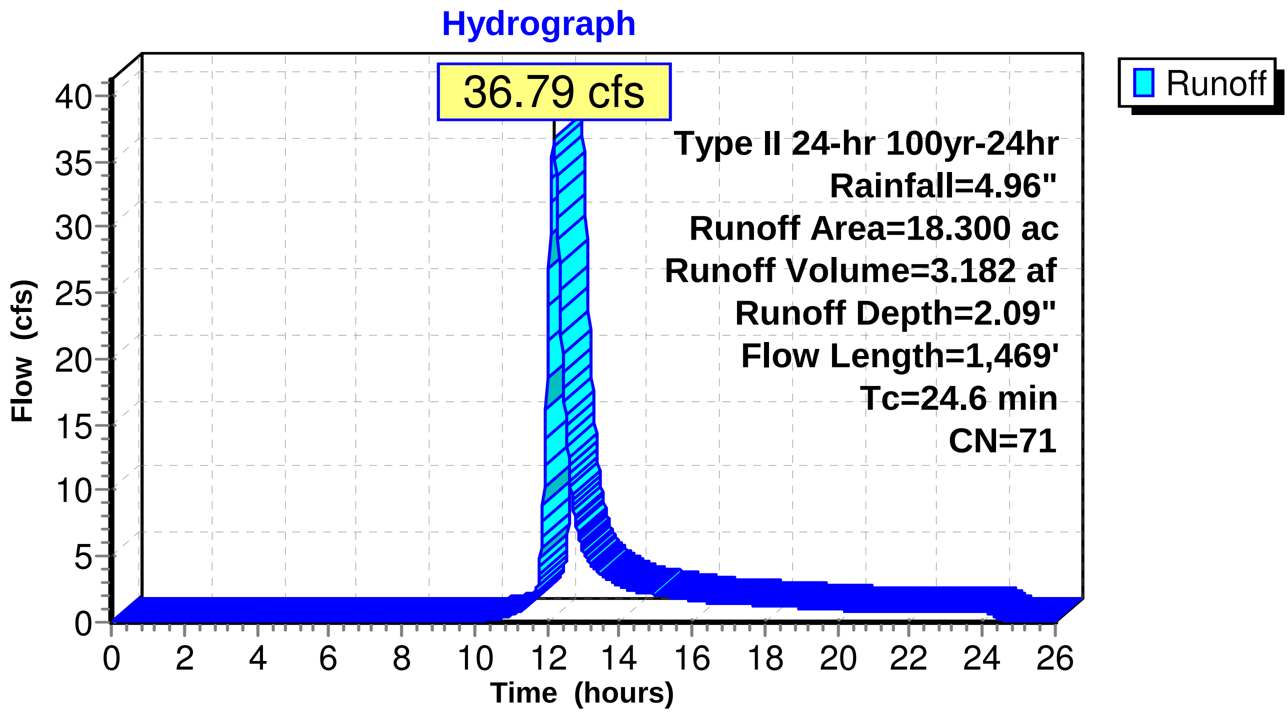
Runoff = 36.79 cfs @ 12.19 hrs, Volume= 3.182 af, Depth= 2.09"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-26.00 hrs, dt= 0.02 hrs
Type II 24-hr 100yr-24hr Rainfall=4.96"

	Area (ac)	CN	Description
*	0.200	98	
*	0.200	89	
*	11.200	71	
*	6.700	70	
	18.300	71	Weighted Average
	18.100		Pervious Area
	0.200		Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
21.1	100	0.1200	0.08		**Sheet Flow, Sheet Flow** n= 0.800 P2= 2.39"
1.3	573	0.2200	7.55		**Shallow Concentrated Flow, Shallow Concentrated Flow A** Unpaved Kv= 16.1 fps
1.8	429	0.0600	3.94		**Shallow Concentrated Flow, Shallow Concentrated Flow B** Unpaved Kv= 16.1 fps
0.4	367	0.0870	14.16	169.93	**Channel Flow, Channel Flow** Area= 12.0 sf Perim= 10.9' r= 1.10' n= 0.033
24.6	1,469	Total			

Subcatchment 1S: SCS Runoff (Pre-DA-1)



Summary for Subcatchment 2S: SCS Runoff (Post DA-1 Detained 1)

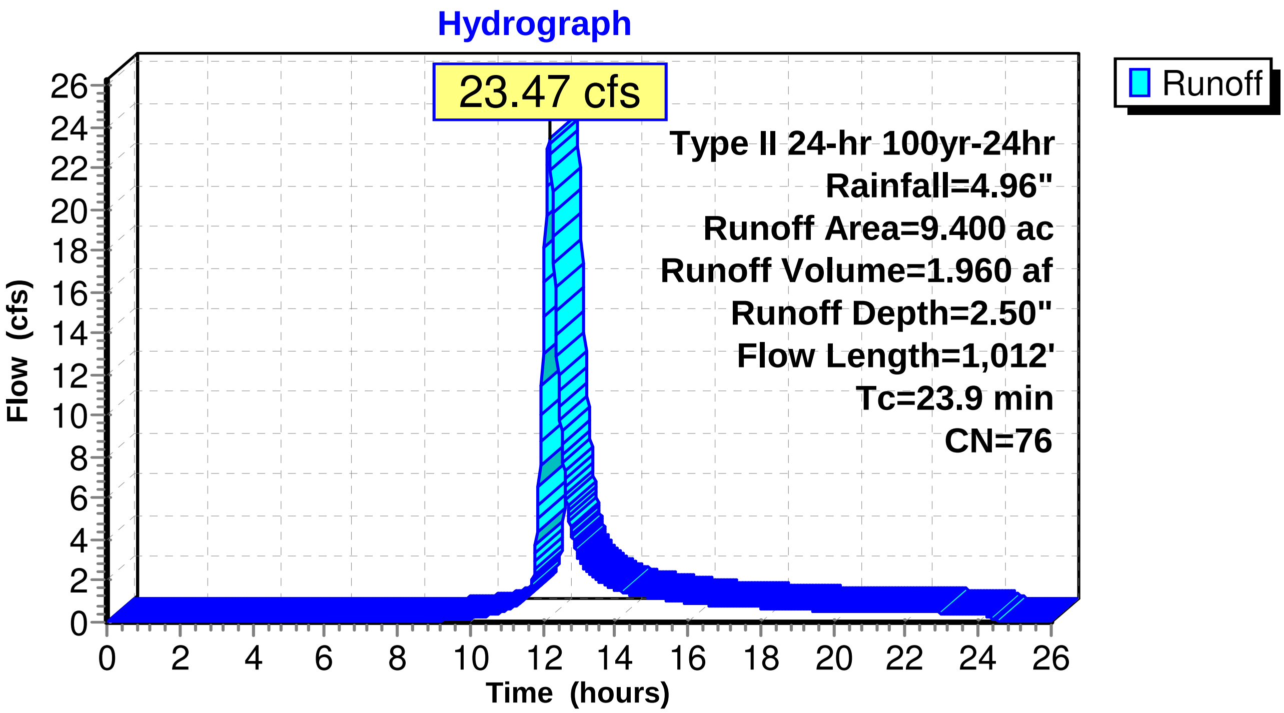
Runoff = 23.47 cfs @ 12.18 hrs, Volume= 1.960 af, Depth= 2.50"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-26.00 hrs, dt= 0.02 hrs
Type II 24-hr 100yr-24hr Rainfall=4.96"

	Area (ac)	CN	Description
*	0.200	98	
*	2.300	89	
*	6.000	71	
*	0.900	70	
	9.400	76	Weighted Average
	9.200		Pervious Area
	0.200		Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
21.1	100	0.1200	0.08		**Sheet Flow, Sheet Flow** n= 0.800 P2= 2.39"
0.7	332	0.2600	8.21		**Shallow Concentrated Flow, Shallow Concentrated Flow A** Unpaved Kv= 16.1 fps
1.3	270	0.0300	3.52		**Shallow Concentrated Flow, Shallow Concentrated Flow B** Paved Kv= 20.3 fps
0.1	88	0.3800	9.92		**Shallow Concentrated Flow, Shallow Concentrated Flow C** Unpaved Kv= 16.1 fps
0.7	222	0.0140	5.68	68.17	**Channel Flow, Channel Flow** Area= 12.0 sf Perim= 10.9' r= 1.10' n= 0.033
23.9	1,012	Total			

Subcatchment 2S: SCS Runoff (Post DA-1 Detained 1)



Summary for Subcatchment 3S: SCS Runoff (Post DA-1 Detained 2)

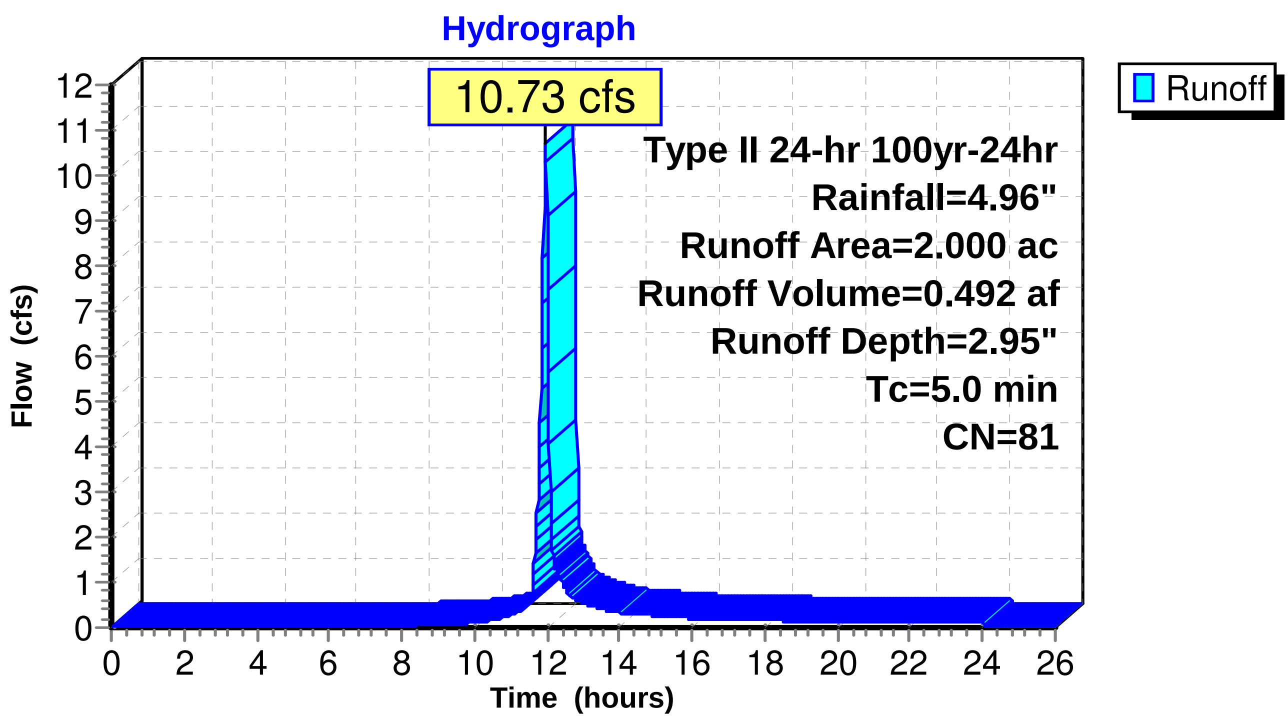
Runoff = 10.73 cfs @ 11.96 hrs, Volume= 0.492 af, Depth= 2.95"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-26.00 hrs, dt= 0.02 hrs
Type II 24-hr 100yr-24hr Rainfall=4.96"

	Area (ac)	CN	Description
*	0.300	98	
*	0.700	89	
*	1.000	71	
	2.000	81	Weighted Average
	1.700		Pervious Area
	0.300		Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry, User**

Subcatchment 3S: SCS Runoff (Post DA-1 Detained 2)



Summary for Subcatchment 4S: SCS Runoff (Post DA-1 Undetained)

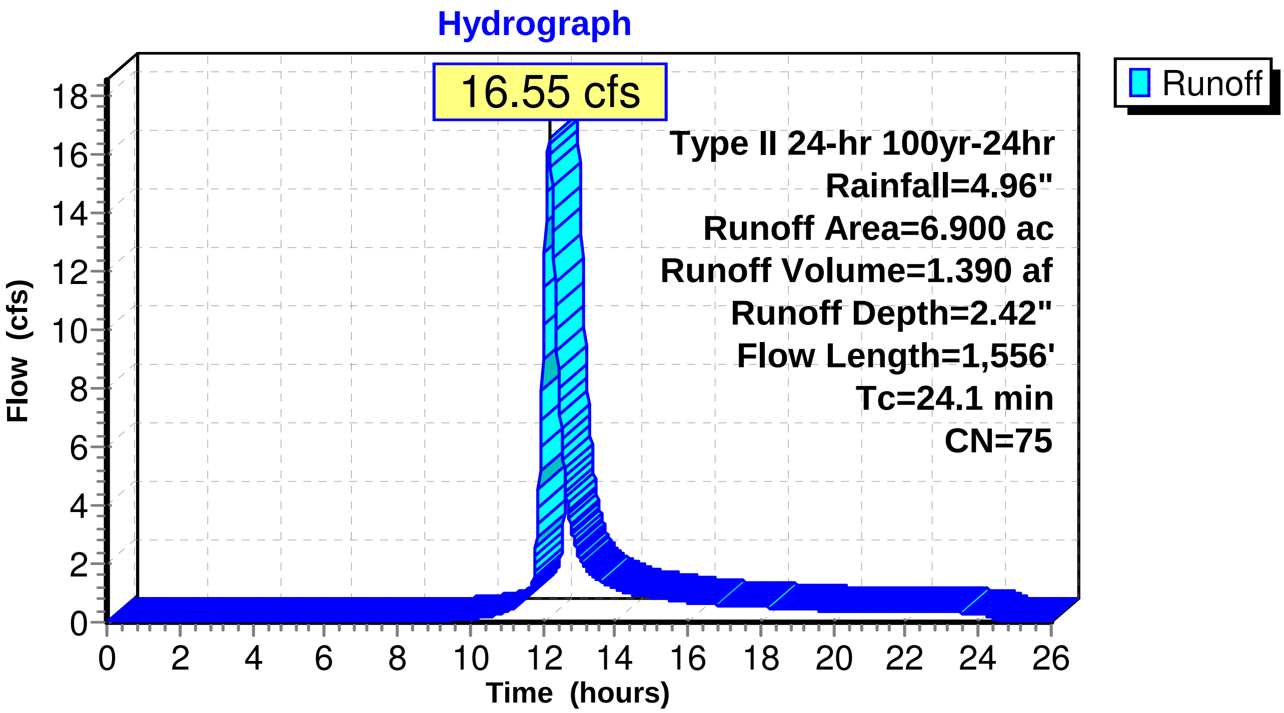
Runoff = 16.55 cfs @ 12.18 hrs, Volume= 1.390 af, Depth= 2.42"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-26.00 hrs, dt= 0.02 hrs
Type II 24-hr 100yr-24hr Rainfall=4.96"

	Area (ac)	CN	Description
*	0.400	98	
*	0.900	89	
*	4.100	71	
*	1.500	70	
	6.900	75	Weighted Average
	6.500		Pervious Area
	0.400		Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
21.1	100	0.1200	0.08		**Sheet Flow, Sheet Flow** n= 0.800 P2= 2.39"
0.9	412	0.2300	7.72		**Shallow Concentrated Flow, Shallow Concentrated Flow A** Unpaved Kv= 16.1 fps
1.3	312	0.0580	3.88		**Shallow Concentrated Flow, Shallow Concentrated Flow B** Unpaved Kv= 16.1 fps
0.8	732	0.0960	14.88	178.51	**Channel Flow, Channel Flow** Area= 12.0 sf Perim= 10.9' r= 1.10' n= 0.033
24.1	1,556	Total			

Subcatchment 4S: SCS Runoff (Post DA-1 Undetained)



Summary for Reach 8R: Reach (Basin 1 Reach)

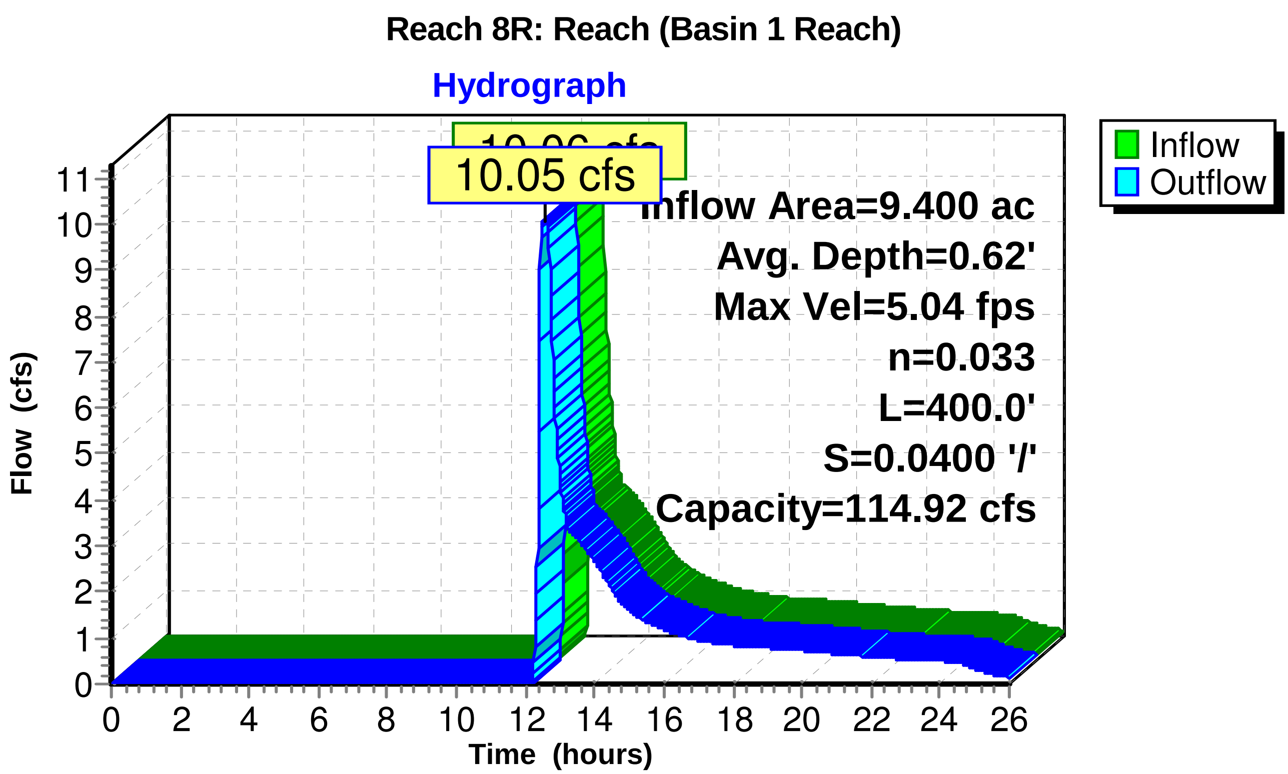
[79] Warning: Submerged Pond 6P Primary device # 4 OUTLET by 0.12'

Inflow Area = 9.400 ac, 2.13% Impervious, Inflow Depth > 1.95" for 100yr-24hr event
Inflow = 10.06 cfs @ 12.50 hrs, Volume= 1.528 af
Outflow = 10.05 cfs @ 12.54 hrs, Volume= 1.527 af, Atten= 0%, Lag= 2.4 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-26.00 hrs, dt= 0.02 hrs
Max. Velocity= 5.04 fps, Min. Travel Time= 1.3 min
Avg. Velocity = 2.46 fps, Avg. Travel Time= 2.7 min

Peak Storage= 797 cf @ 12.52 hrs, Average Depth at Peak Storage= 0.62'
Bank-Full Depth= 2.00', Capacity at Bank-Full= 114.92 cfs

2.00' x 2.00' deep channel, n= 0.033
Side Slope Z-value= 2.0 '/' Top Width= 10.00'
Length= 400.0' Slope= 0.0400 '/'
Inlet Invert= 1,072.00', Outlet Invert= 1,056.00'



Summary for Pond 5P: Reservior (Forebay Outflow)

Inflow Area =	9.400 ac,	2.13% Impervious,	Inflow Depth = 2.50"	for 100yr-24hr event
Inflow =	23.47 cfs @	12.18 hrs, Volume=	1.960 af	
Outflow =	22.91 cfs @	12.21 hrs, Volume=	1.552 af, Atten= 2%, Lag= 2.3 min	
Primary =	22.91 cfs @	12.21 hrs, Volume=	1.552 af	

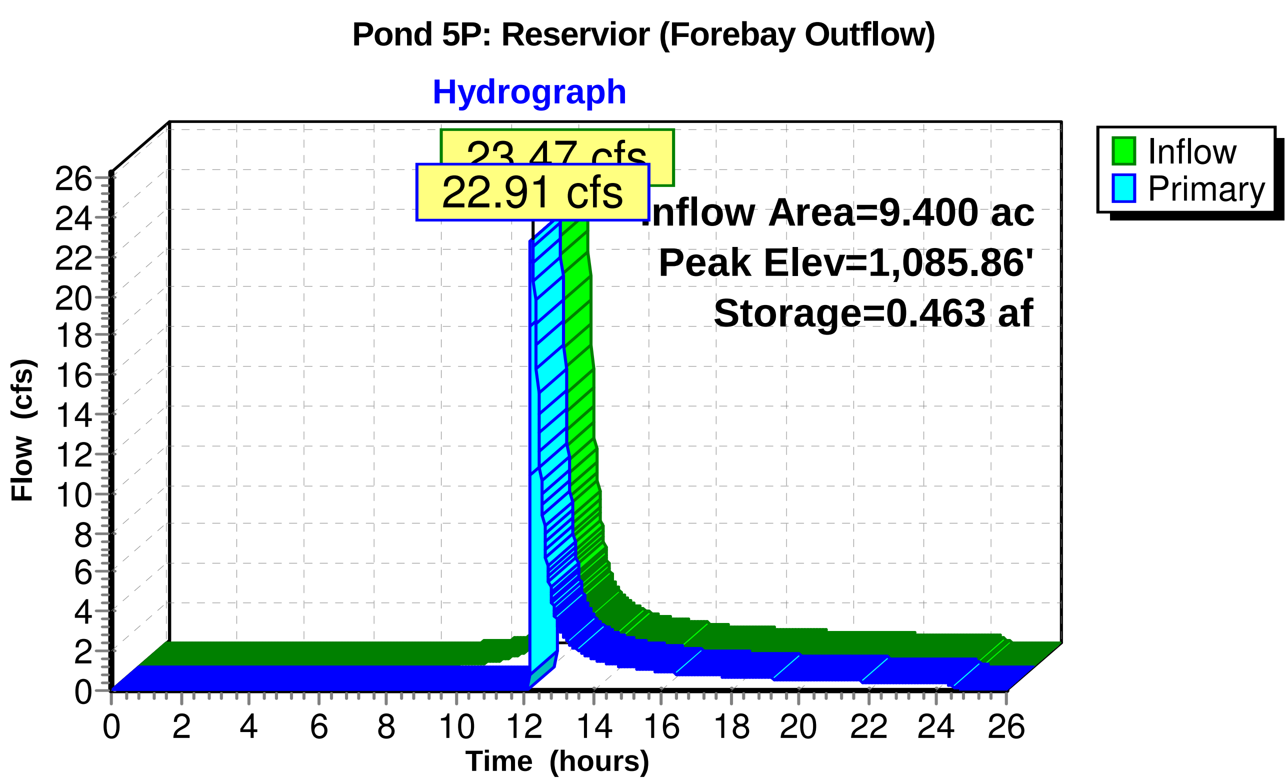
Routing by Stor-Ind method, Time Span= 0.00-26.00 hrs, dt= 0.02 hrs
Peak Elev= 1,085.86' @ 12.21 hrs Surf.Area= 0.152 ac Storage= 0.463 af

Plug-Flow detention time= 126.6 min calculated for 1.551 af (79% of inflow)
Center-of-Mass det. time= 40.6 min (886.7 - 846.1)

Volume	Invert	Avail.Storage	Storage Description
#1	1,082.00'	0.484 af	**30.00'W x 130.00'L x 4.00'H Trapezoid Z=2.0**

Device	Routing	Invert	Outlet Devices
#1	Primary	1,085.50'	**40.0' long Broad-Crested Rectangular Weir** Head (feet) 1,085.50 Coef. (English) 2.60

Primary OutFlow Max=22.83 cfs @ 12.21 hrs HW=1,085.86' (Free Discharge)
└**1=Broad-Crested Rectangular Weir** (Weir Controls 22.83 cfs @ 1.57 fps)



Summary for Pond 6P: Reservior (Basin 1 Outflow)

Inflow Area = 9.400 ac, 2.13% Impervious, Inflow Depth = 1.98" for 100yr-24hr event
Inflow = 22.91 cfs @ 12.21 hrs, Volume= 1.552 af
Outflow = 10.06 cfs @ 12.50 hrs, Volume= 1.528 af, Atten= 56%, Lag= 17.2 min
Primary = 10.06 cfs @ 12.50 hrs, Volume= 1.528 af
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 0.00-26.00 hrs, dt= 0.02 hrs
Peak Elev= 1,078.39' @ 12.50 hrs Surf.Area= 0.208 ac Storage= 0.369 af

Plug-Flow detention time= 68.0 min calculated for 1.528 af (98% of inflow)
Center-of-Mass det. time= 59.3 min (946.0 - 886.7)

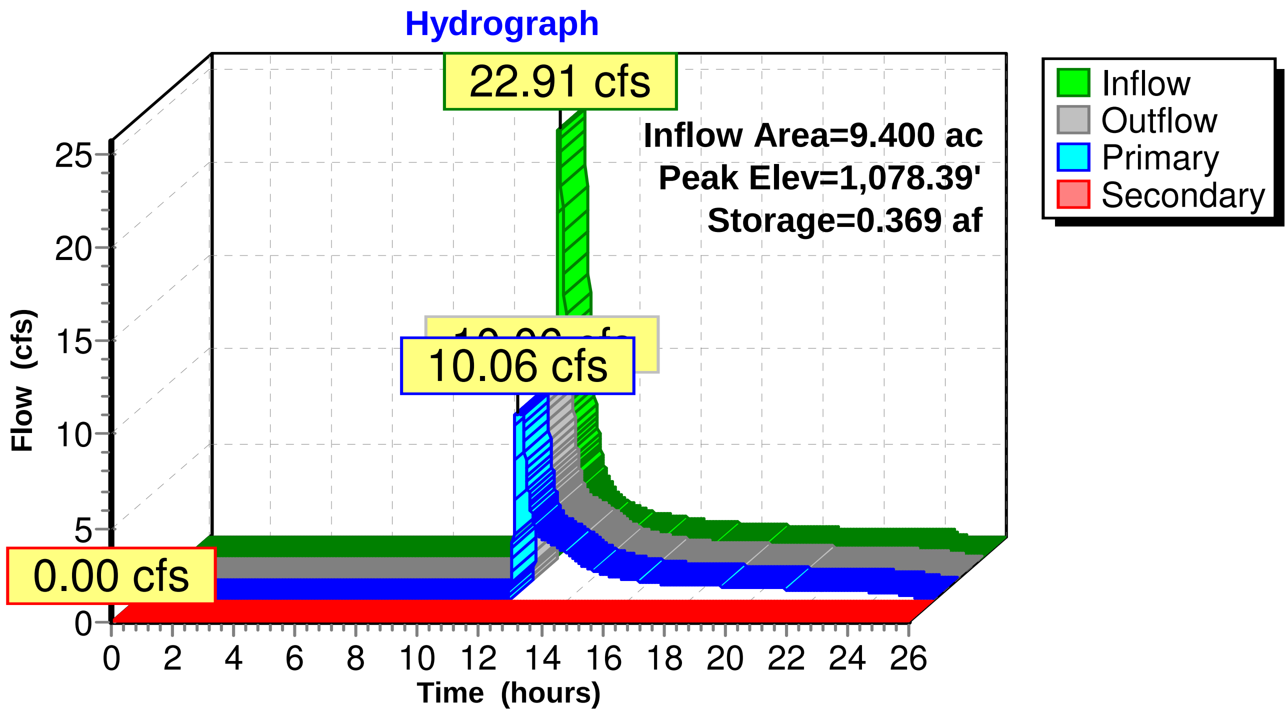
Volume	Invert	Avail.Storage	Storage Description
#1	1,076.00'	0.770 af	**35.00'W x 130.00'L x 4.00'H Trapezoid Z=5.0**

Device	Routing	Invert	Outlet Devices
#1	Device 4	1,076.00'	**6.0" Vert. Orifice/Grate** C= 0.600
#2	Device 4	1,077.00'	**1.00' W x 0.50' H Vert. Orifice/Grate** C= 0.600
#3	Device 4	1,078.00'	**11.5' long Sharp-Crested Rectangular Weir** 2 End Contraction(s)
#4	Primary	1,074.50'	**18.0" x 40.0' long Culvert** Ke= 0.500
			Outlet Invert= 1,072.50' S= 0.0500 '/' Cc= 0.600 n= 0.013
#5	Secondary	1,078.50'	**8.0' long Broad-Crested Rectangular Weir**
			Head (feet) 1,078.50
			Coef. (English) 3.33

Primary OutFlow Max=10.06 cfs @ 12.50 hrs HW=1,078.39' (Free Discharge)
└─**4=Culvert** (Inlet Controls 10.06 cfs @ 5.69 fps)
  ├─**1=Orifice/Grate** (Passes < 1.38 cfs potential flow)
  ├─**2=Orifice/Grate** (Passes < 2.57 cfs potential flow)
  └─**3=Sharp-Crested Rectangular Weir** (Passes < 9.23 cfs potential flow)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=1,076.00' (Free Discharge)
└─**5=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond 6P: Reservior (Basin 1 Outflow)



Summary for Pond 7P: Reservior (Basin 2 Outflow)

Inflow Area = 2.000 ac, 15.00% Impervious, Inflow Depth = 2.95" for 100yr-24hr event
Inflow = 10.73 cfs @ 11.96 hrs, Volume= 0.492 af
Outflow = 8.90 cfs @ 12.00 hrs, Volume= 0.490 af, Atten= 17%, Lag= 2.5 min
Primary = 8.90 cfs @ 12.00 hrs, Volume= 0.490 af
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 0.00-26.00 hrs, dt= 0.02 hrs
Peak Elev= 1,053.71' @ 12.00 hrs Surf.Area= 0.047 ac Storage= 0.068 af

Plug-Flow detention time= 22.5 min calculated for 0.490 af (100% of inflow)
Center-of-Mass det. time= 20.7 min (836.1 - 815.4)

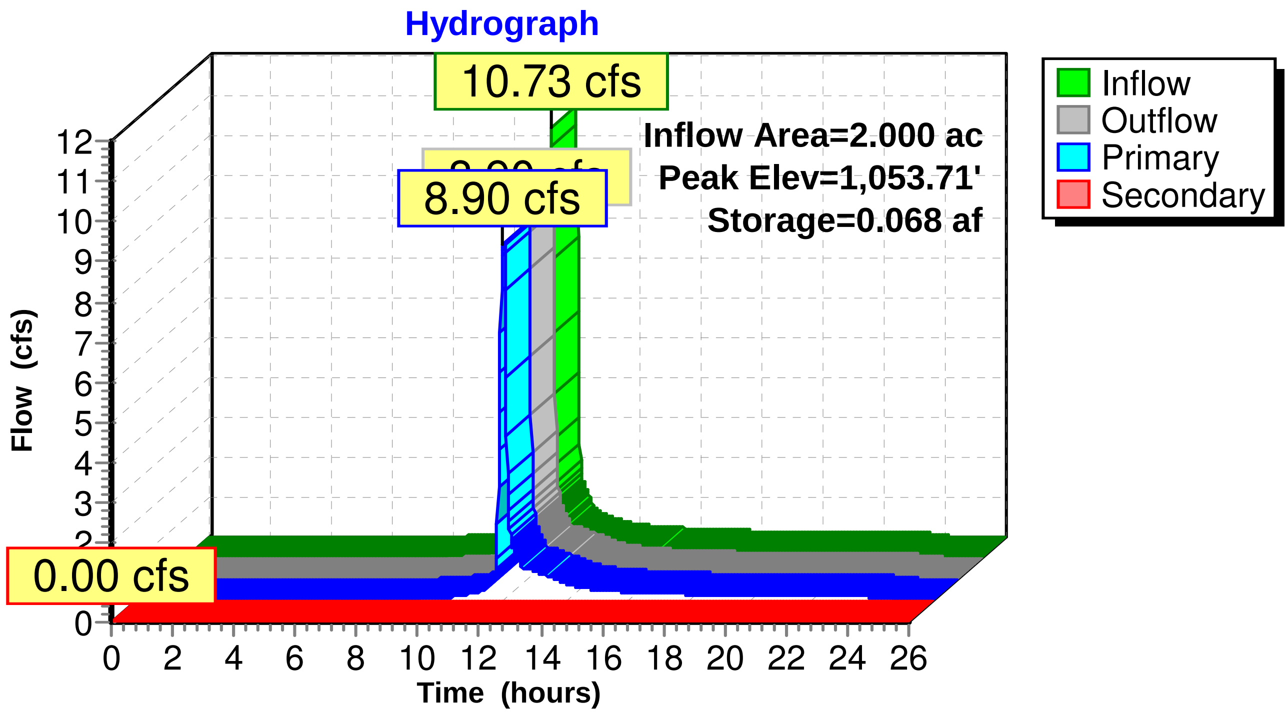
Volume	Invert	Avail.Storage	Storage Description
#1	1,052.00'	0.203 af	**20.00'W x 70.00'L x 4.00'H Trapezoid Z=2.0**

Device	Routing	Invert	Outlet Devices
#1	Device 4	1,052.00'	**6.0" Vert. Orifice/Grate** C= 0.600
#2	Device 4	1,053.00'	**6.00' W x 6.00' H Vert. Orifice/Grate** C= 0.600
#3	Device 4	1,054.00'	**11.5' long Sharp-Crested Rectangular Weir** 2 End Contraction(s)
#4	Primary	1,050.50'	**18.0" x 62.0' long Culvert** Ke= 0.500 Outlet Invert= 1,049.01' S= 0.0240 '/' Cc= 0.600 n= 0.013
#5	Secondary	1,054.50'	**12.0' long Broad-Crested Rectangular Weir** Head (feet) 1,054.50 Coef. (English) 2.60

Primary OutFlow Max=8.90 cfs @ 12.00 hrs HW=1,053.71' (Free Discharge)
└─**4=Culvert** (Inlet Controls 8.90 cfs @ 5.04 fps)
  ├─**1=Orifice/Grate** (Passes < 1.14 cfs potential flow)
  ├─**2=Orifice/Grate** (Passes < 11.57 cfs potential flow)
  └─**3=Sharp-Crested Rectangular Weir** (Controls 0.00 cfs)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=1,052.00' (Free Discharge)
└─**5=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond 7P: Reservior (Basin 2 Outflow)

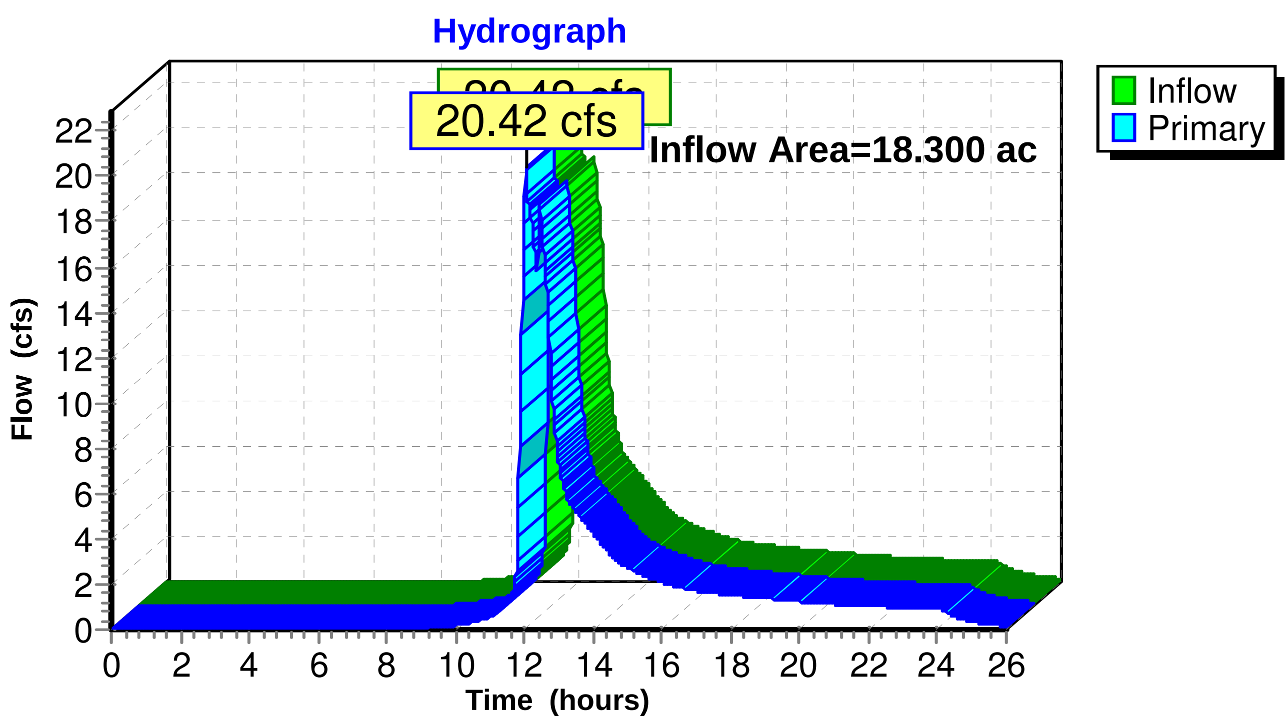


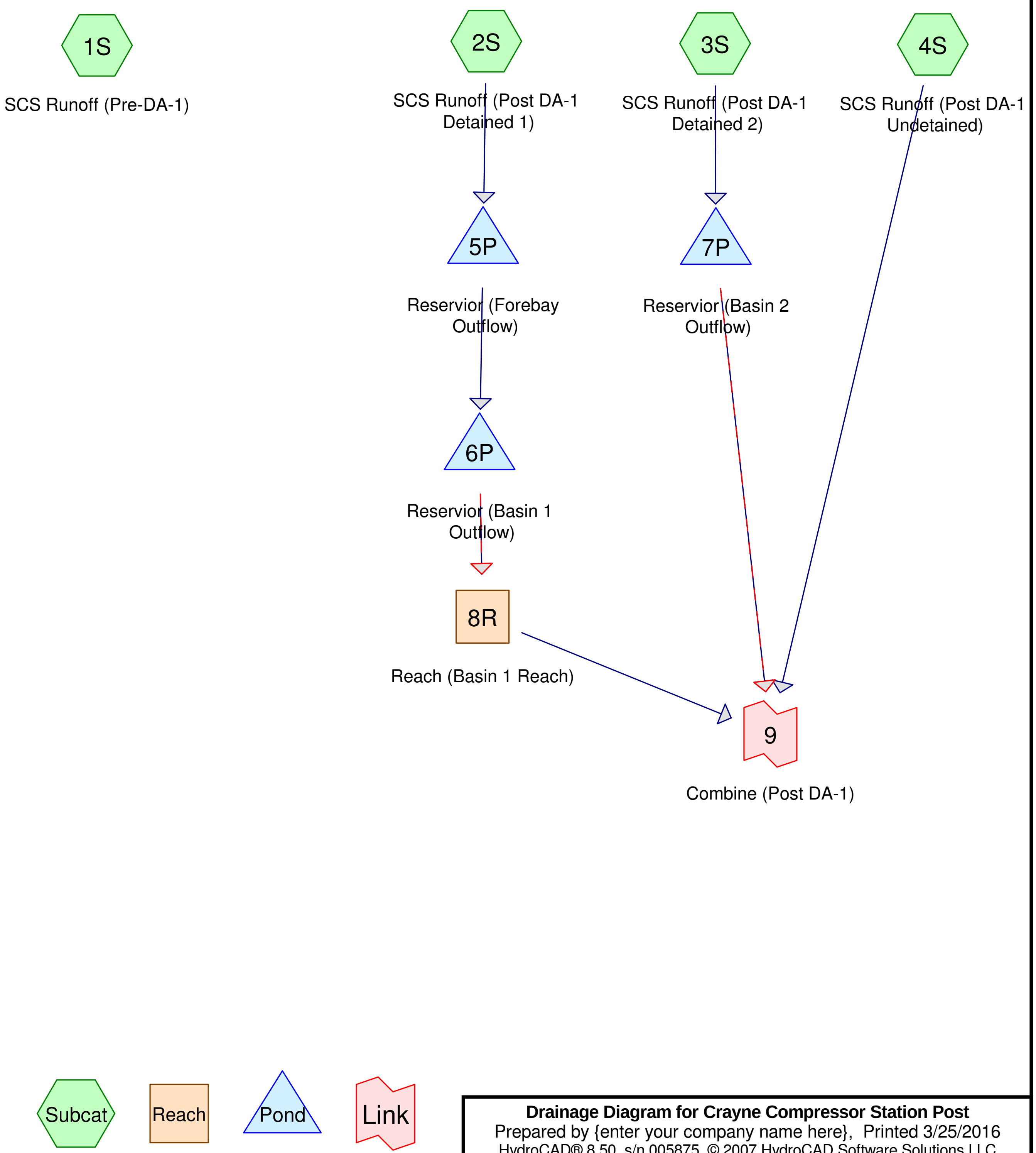
Summary for Link 9: Combine (Post DA-1)

Inflow Area = 18.300 ac, 4.92% Impervious, Inflow Depth > 2.23" for 100yr-24hr event
Inflow = 20.42 cfs @ 12.05 hrs, Volume= 3.407 af
Primary = 20.42 cfs @ 12.05 hrs, Volume= 3.407 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-26.00 hrs, dt= 0.02 hrs

Link 9: Combine (Post DA-1)





Drainage Diagram for Crayne Compressor Station Post
Prepared by {enter your company name here}, Printed 3/25/2016

Area Listing (all nodes)

Area (acres)	CN	Description (subcatchment-numbers)
9.100	70	(1S,2S,4S)
22.300	71	(1S,2S,3S,4S)
4.031	89	(1S,2S,3S,4S)
1.169	98	(1S,2S,3S,4S)
36.600		**TOTAL AREA**

Soil Listing (all nodes)

Area (acres)	Soil Goup	Subcatchment Numbers
0.000	HSG A	
0.000	HSG B	
0.000	HSG C	
0.000	HSG D	
36.600	Other	1S, 2S, 3S, 4S
36.600		**TOTAL AREA**

Time span=0.00-26.00 hrs, dt=0.02 hrs, 1301 points
Runoff by SCS TR-20 method, UH=SCS
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 1S: SCS Runoff (Pre-DA-1) Runoff Area=18.300 ac 1.09% Impervious Runoff Depth=0.27"
Flow Length=1,469' Tc=24.6 min CN=71 Runoff=3.05 cfs 0.411 af

Subcatchment 2S: SCS Runoff (Post DA-1 Runoff Area=9.400 ac 2.13% Impervious Runoff Depth=0.42"
Flow Length=1,012' Tc=23.9 min CN=76 Runoff=3.21 cfs 0.328 af

Subcatchment 3S: SCS Runoff (Post DA-1 Runoff Area=2.000 ac 18.45% Impervious Runoff Depth=0.66"
Tc=5.0 min CN=82 Runoff=2.41 cfs 0.109 af

Subcatchment 4S: SCS Runoff (Post DA-1 Runoff Area=6.900 ac 5.80% Impervious Runoff Depth=0.39"
Flow Length=1,556' Tc=24.1 min CN=75 Runoff=2.08 cfs 0.222 af

Reach 8R: Reach (Basin 1 Reach) Avg. Depth=0.00' Max Vel=0.00 fps Inflow=0.00 cfs 0.000 af
n=0.033 L=400.0' S=0.0400 '/' Capacity=114.92 cfs Outflow=0.00 cfs 0.000 af

Pond 5P: Reservior (Forebay Outflow) Peak Elev=1,084.93' Storage=0.328 af Inflow=3.21 cfs 0.328 af
Outflow=0.00 cfs 0.000 af

Pond 6P: Reservior (Basin 1 Outflow) Peak Elev=1,076.00' Storage=0.000 af Inflow=0.00 cfs 0.000 af
Primary=0.00 cfs 0.000 af Secondary=0.00 cfs 0.000 af Outflow=0.00 cfs 0.000 af

Pond 7P: Reservior (Basin 2 Outflow) Peak Elev=1,052.87' Storage=0.031 af Inflow=2.41 cfs 0.109 af
Primary=0.74 cfs 0.108 af Secondary=0.00 cfs 0.000 af Outflow=0.74 cfs 0.108 af

Link 9: Combine (Post DA-1) Inflow=2.77 cfs 0.330 af
Primary=2.77 cfs 0.330 af

Total Runoff Area = 36.600 ac Runoff Volume = 1.071 af Average Runoff Depth = 0.35"
96.81% Pervious = 35.431 ac 3.19% Impervious = 1.169 ac

Summary for Subcatchment 1S: SCS Runoff (Pre-DA-1)

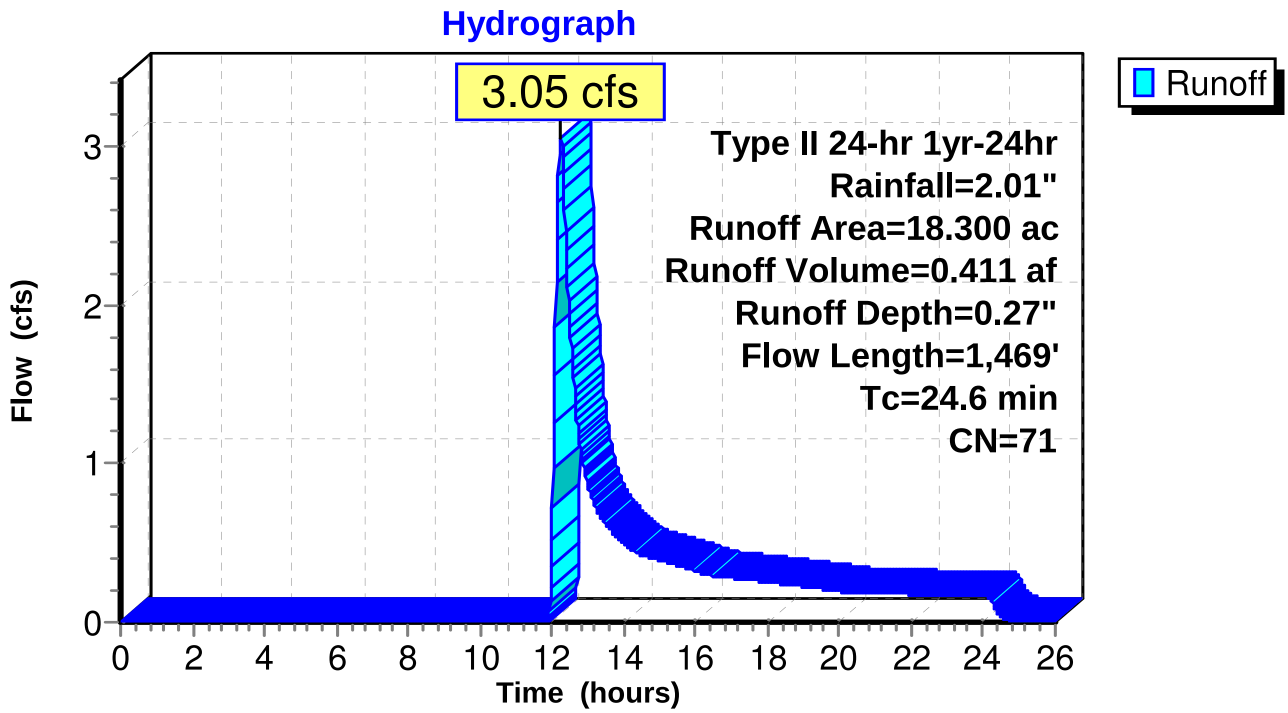
Runoff = 3.05 cfs @ 12.25 hrs, Volume= 0.411 af, Depth= 0.27"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-26.00 hrs, dt= 0.02 hrs
Type II 24-hr 1yr-24hr Rainfall=2.01"

	Area (ac)	CN	Description
*	0.200	98	
*	0.200	89	
*	11.200	71	
*	6.700	70	
	18.300	71	Weighted Average
	18.100		Pervious Area
	0.200		Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
21.1	100	0.1200	0.08		**Sheet Flow, Sheet Flow** n= 0.800 P2= 2.39"
1.3	573	0.2200	7.55		**Shallow Concentrated Flow, Shallow Concentrated Flow A** Unpaved Kv= 16.1 fps
1.8	429	0.0600	3.94		**Shallow Concentrated Flow, Shallow Concentrated Flow B** Unpaved Kv= 16.1 fps
0.4	367	0.0870	14.16	169.93	**Channel Flow, Channel Flow** Area= 12.0 sf Perim= 10.9' r= 1.10' n= 0.033
24.6	1,469	Total			

Subcatchment 1S: SCS Runoff (Pre-DA-1)



Summary for Subcatchment 2S: SCS Runoff (Post DA-1 Detained 1)

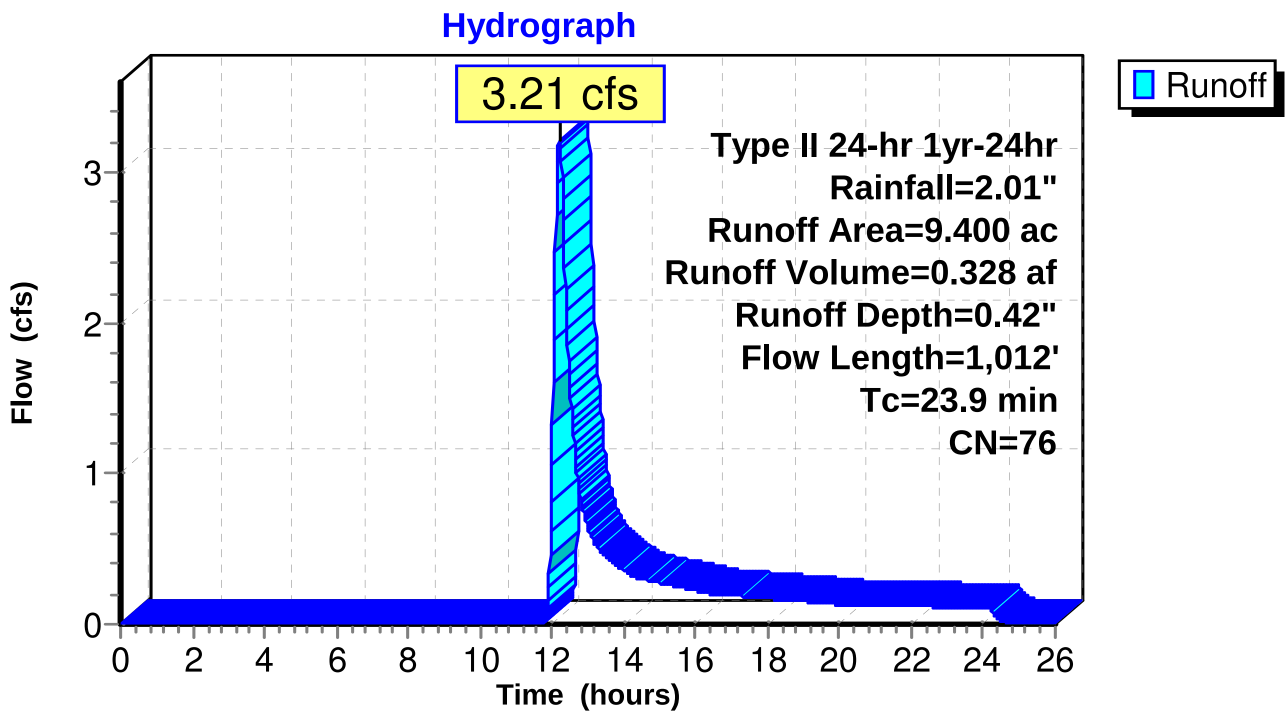
Runoff = 3.21 cfs @ 12.21 hrs, Volume= 0.328 af, Depth= 0.42"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-26.00 hrs, dt= 0.02 hrs
Type II 24-hr 1yr-24hr Rainfall=2.01"

	Area (ac)	CN	Description
*	0.200	98	
*	2.300	89	
*	6.000	71	
*	0.900	70	
	9.400	76	Weighted Average
	9.200		Pervious Area
	0.200		Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
21.1	100	0.1200	0.08		**Sheet Flow, Sheet Flow** n= 0.800 P2= 2.39"
0.7	332	0.2600	8.21		**Shallow Concentrated Flow, Shallow Concentrated Flow A** Unpaved Kv= 16.1 fps
1.3	270	0.0300	3.52		**Shallow Concentrated Flow, Shallow Concentrated Flow B** Paved Kv= 20.3 fps
0.1	88	0.3800	9.92		**Shallow Concentrated Flow, Shallow Concentrated Flow C** Unpaved Kv= 16.1 fps
0.7	222	0.0140	5.68	68.17	**Channel Flow, Channel Flow** Area= 12.0 sf Perim= 10.9' r= 1.10' n= 0.033
23.9	1,012	Total			

Subcatchment 2S: SCS Runoff (Post DA-1 Detained 1)



Summary for Subcatchment 3S: SCS Runoff (Post DA-1 Detained 2)

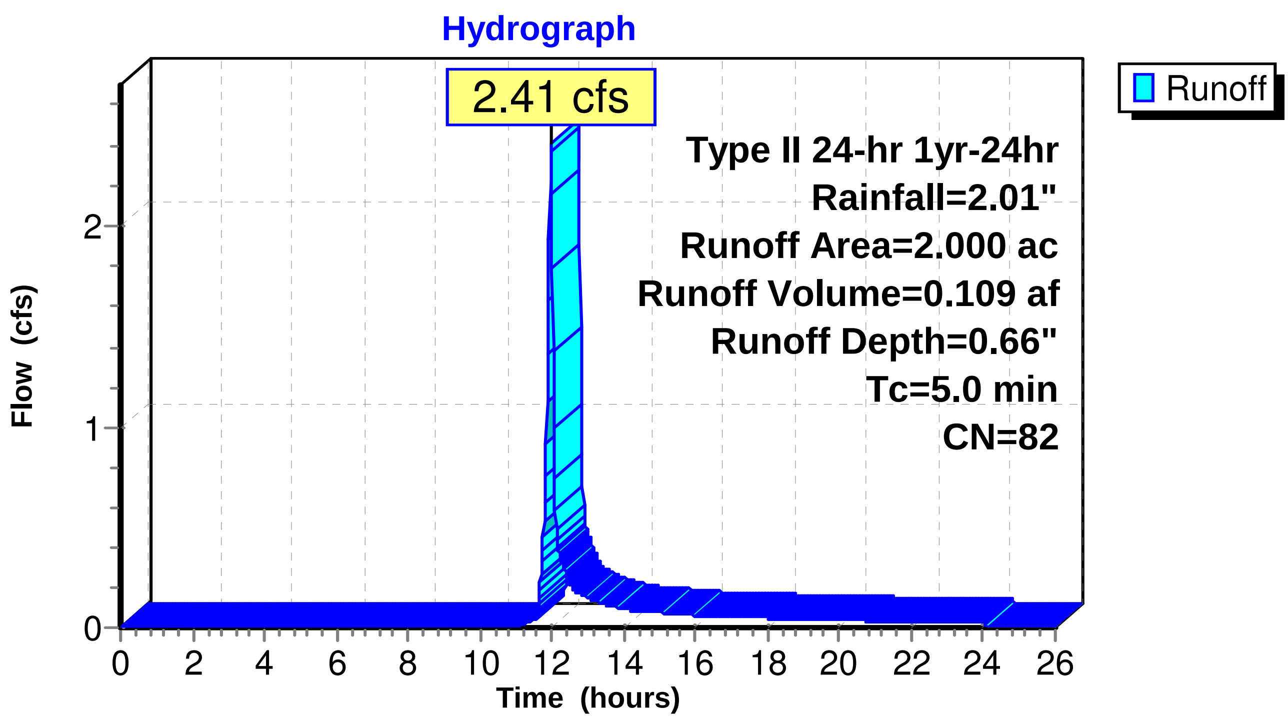
Runoff = 2.41 cfs @ 11.97 hrs, Volume= 0.109 af, Depth= 0.66"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-26.00 hrs, dt= 0.02 hrs
Type II 24-hr 1yr-24hr Rainfall=2.01"

	Area (ac)	CN	Description
*	0.369	98	
*	0.631	89	
*	1.000	71	
	2.000	82	Weighted Average
	1.631		Pervious Area
	0.369		Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry, User**

Subcatchment 3S: SCS Runoff (Post DA-1 Detained 2)



Summary for Subcatchment 4S: SCS Runoff (Post DA-1 Undetained)

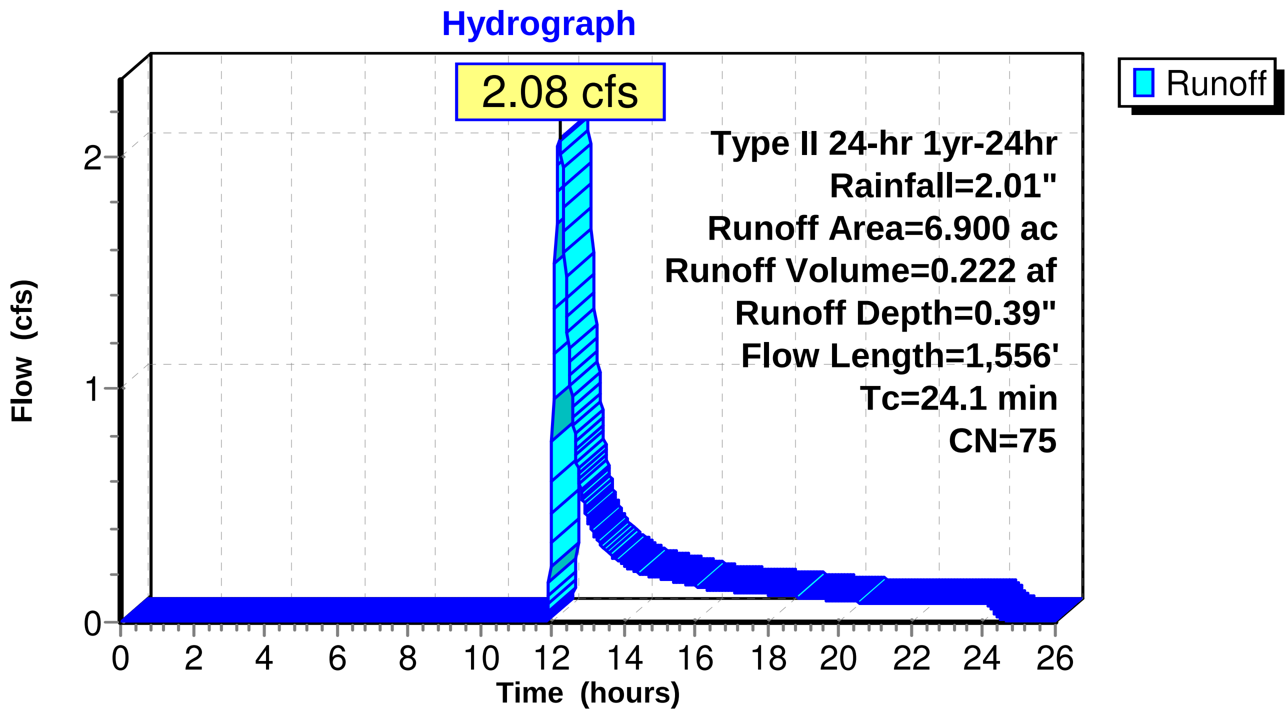
Runoff = 2.08 cfs @ 12.22 hrs, Volume= 0.222 af, Depth= 0.39"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-26.00 hrs, dt= 0.02 hrs
Type II 24-hr 1yr-24hr Rainfall=2.01"

	Area (ac)	CN	Description
*	0.400	98	
*	0.900	89	
*	4.100	71	
*	1.500	70	
	6.900	75	Weighted Average
	6.500		Pervious Area
	0.400		Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
21.1	100	0.1200	0.08		**Sheet Flow, Sheet Flow** n= 0.800 P2= 2.39"
0.9	412	0.2300	7.72		**Shallow Concentrated Flow, Shallow Concentrated Flow A** Unpaved Kv= 16.1 fps
1.3	312	0.0580	3.88		**Shallow Concentrated Flow, Shallow Concentrated Flow B** Unpaved Kv= 16.1 fps
0.8	732	0.0960	14.88	178.51	**Channel Flow, Channel Flow** Area= 12.0 sf Perim= 10.9' r= 1.10' n= 0.033
24.1	1,556	Total			

Subcatchment 4S: SCS Runoff (Post DA-1 Undetained)



Summary for Reach 8R: Reach (Basin 1 Reach)

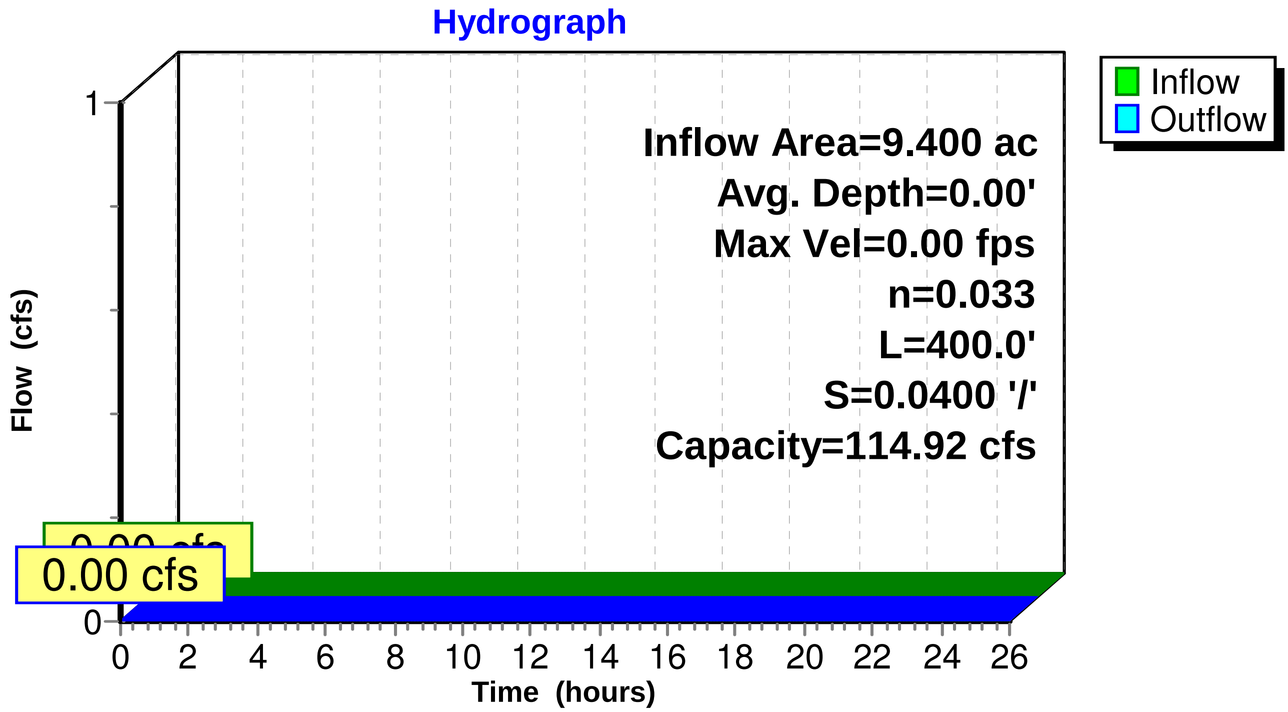
Inflow Area = 9.400 ac, 2.13% Impervious, Inflow Depth = 0.00" for 1yr-24hr event
Inflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-26.00 hrs, dt= 0.02 hrs
Max. Velocity= 0.00 fps, Min. Travel Time= 0.0 min
Avg. Velocity = 0.00 fps, Avg. Travel Time= 0.0 min

Peak Storage= 0 cf @ 0.00 hrs, Average Depth at Peak Storage= 0.00'
Bank-Full Depth= 2.00', Capacity at Bank-Full= 114.92 cfs

2.00' x 2.00' deep channel, n= 0.033
Side Slope Z-value= 2.0 '/' Top Width= 10.00'
Length= 400.0' Slope= 0.0400 '/'
Inlet Invert= 1,072.00', Outlet Invert= 1,056.00'

Reach 8R: Reach (Basin 1 Reach)



Summary for Pond 5P: Reservior (Forebay Outflow)

Inflow Area =	9.400 ac,	2.13% Impervious,	Inflow Depth =	0.42"	for 1yr-24hr event
Inflow =	3.21 cfs @	12.21 hrs,	Volume=	0.328 af	
Outflow =	0.00 cfs @	0.00 hrs,	Volume=	0.000 af,	Atten= 100%, Lag= 0.0 min
Primary =	0.00 cfs @	0.00 hrs,	Volume=	0.000 af	

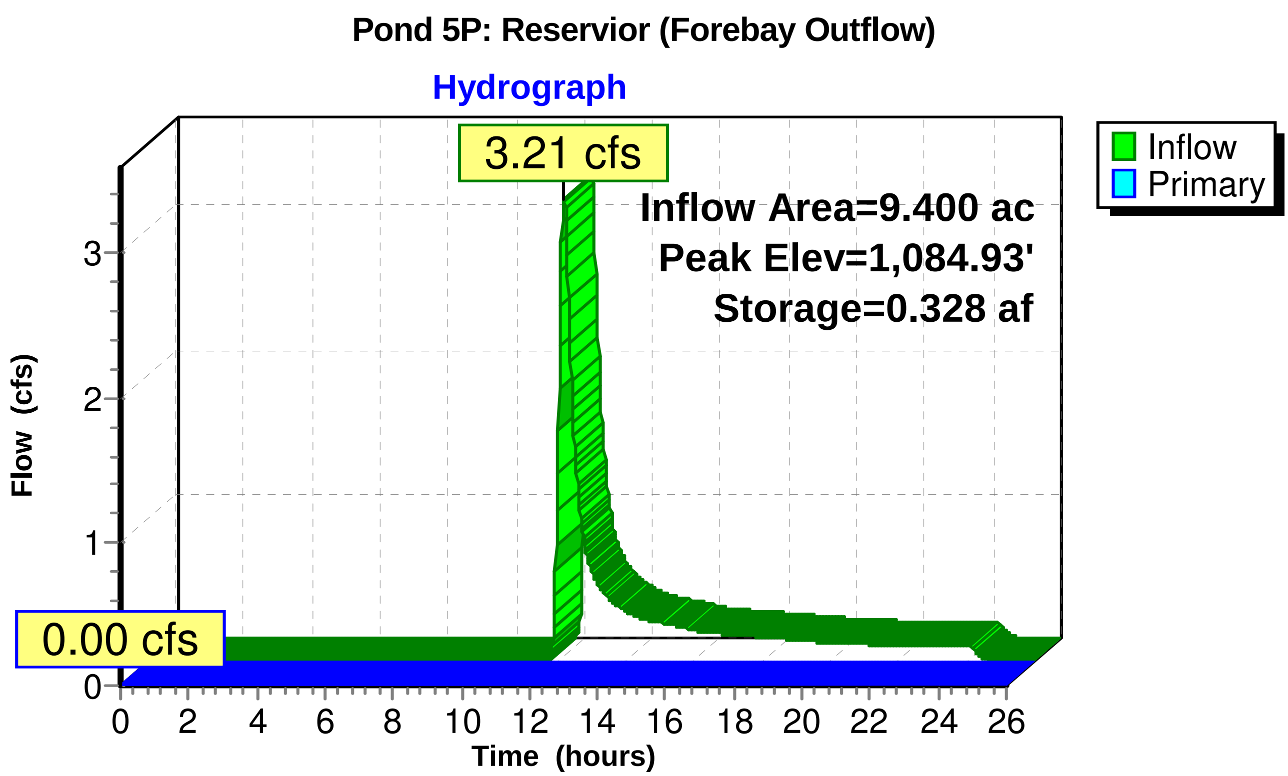
Routing by Stor-Ind method, Time Span= 0.00-26.00 hrs, dt= 0.02 hrs
Peak Elev= 1,084.93' @ 25.36 hrs Surf.Area= 0.136 ac Storage= 0.328 af

Plug-Flow detention time= (not calculated: initial storage excedes outflow)
Center-of-Mass det. time= (not calculated: no outflow)

Volume	Invert	Avail.Storage	Storage Description
#1	1,082.00'	0.484 af	**30.00'W x 130.00'L x 4.00'H Trapezoid Z=2.0**

Device	Routing	Invert	Outlet Devices
#1	Primary	1,085.50'	**40.0' long Broad-Crested Rectangular Weir** Head (feet) 1,085.50 Coef. (English) 2.60

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=1,082.00' (Free Discharge)
└─**1=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)



Summary for Pond 6P: Reservior (Basin 1 Outflow)

Inflow Area = 9.400 ac, 2.13% Impervious, Inflow Depth = 0.00" for 1yr-24hr event
Inflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Atten= 0%, Lag= 0.0 min
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 0.00-26.00 hrs, dt= 0.02 hrs
Peak Elev= 1,076.00' @ 0.00 hrs Surf.Area= 0.104 ac Storage= 0.000 af

Plug-Flow detention time= (not calculated: initial storage excedes outflow)
Center-of-Mass det. time= (not calculated: no inflow)

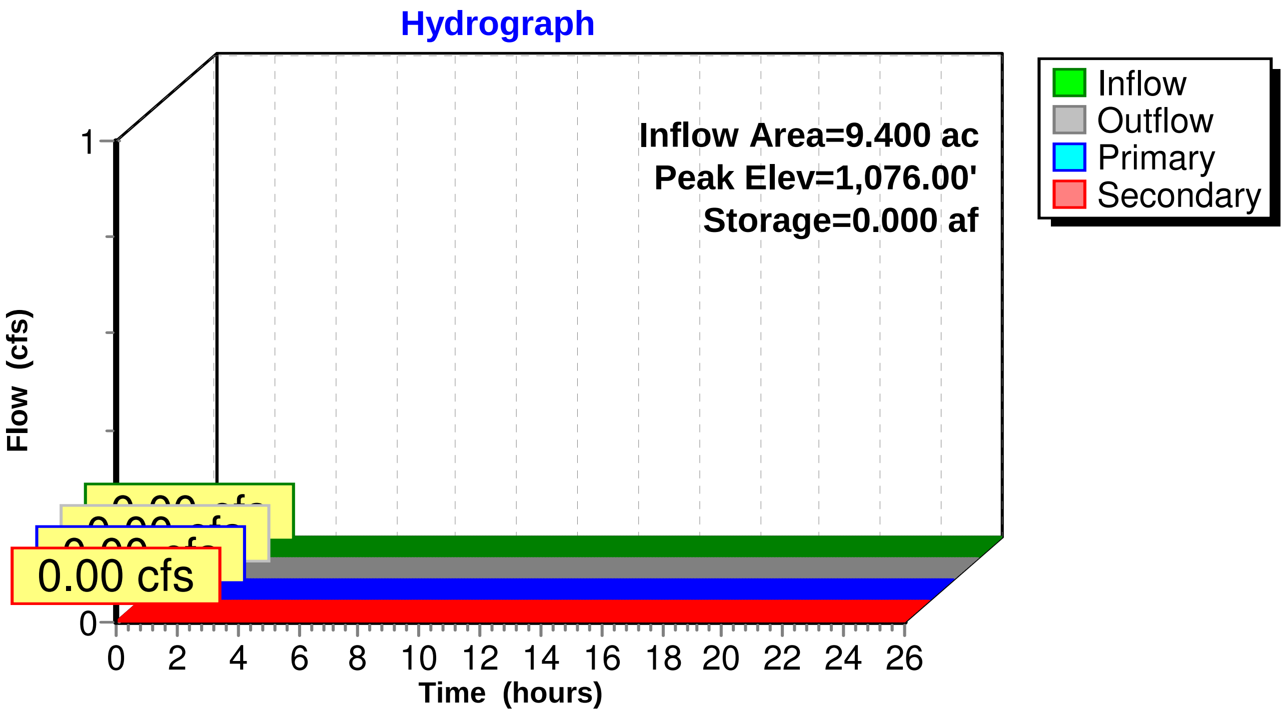
Volume	Invert	Avail.Storage	Storage Description
#1	1,076.00'	0.770 af	**35.00'W x 130.00'L x 4.00'H Trapezoid Z=5.0**

Device	Routing	Invert	Outlet Devices
#1	Device 4	1,076.00'	**6.0" Vert. Orifice/Grate** C= 0.600
#2	Device 4	1,077.00'	**1.00' W x 0.50' H Vert. Orifice/Grate** C= 0.600
#3	Device 4	1,078.00'	**11.5' long Sharp-Crested Rectangular Weir** 2 End Contraction(s)
#4	Primary	1,074.50'	**18.0" x 40.0' long Culvert** Ke= 0.500 Outlet Invert= 1,072.50' S= 0.0500 '/' Cc= 0.600 n= 0.013
#5	Secondary	1,078.50'	**8.0' long Broad-Crested Rectangular Weir** Head (feet) 1,078.50 Coef. (English) 3.33

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=1,076.00' (Free Discharge)
└─**4=Culvert** (Passes 0.00 cfs of 4.91 cfs potential flow)
  ├─**1=Orifice/Grate** (Controls 0.00 cfs)
  ├─**2=Orifice/Grate** (Controls 0.00 cfs)
  └─**3=Sharp-Crested Rectangular Weir** (Controls 0.00 cfs)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=1,076.00' (Free Discharge)
└─**5=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond 6P: Reservior (Basin 1 Outflow)



Summary for Pond 7P: Reservior (Basin 2 Outflow)

Inflow Area = 2.000 ac, 18.45% Impervious, Inflow Depth = 0.66" for 1yr-24hr event
Inflow = 2.41 cfs @ 11.97 hrs, Volume= 0.109 af
Outflow = 0.74 cfs @ 12.08 hrs, Volume= 0.108 af, Atten= 69%, Lag= 6.9 min
Primary = 0.74 cfs @ 12.08 hrs, Volume= 0.108 af
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 0.00-26.00 hrs, dt= 0.02 hrs
Peak Elev= 1,052.87' @ 12.08 hrs Surf.Area= 0.040 ac Storage= 0.031 af

Plug-Flow detention time= 41.6 min calculated for 0.108 af (99% of inflow)
Center-of-Mass det. time= 36.3 min (893.7 - 857.5)

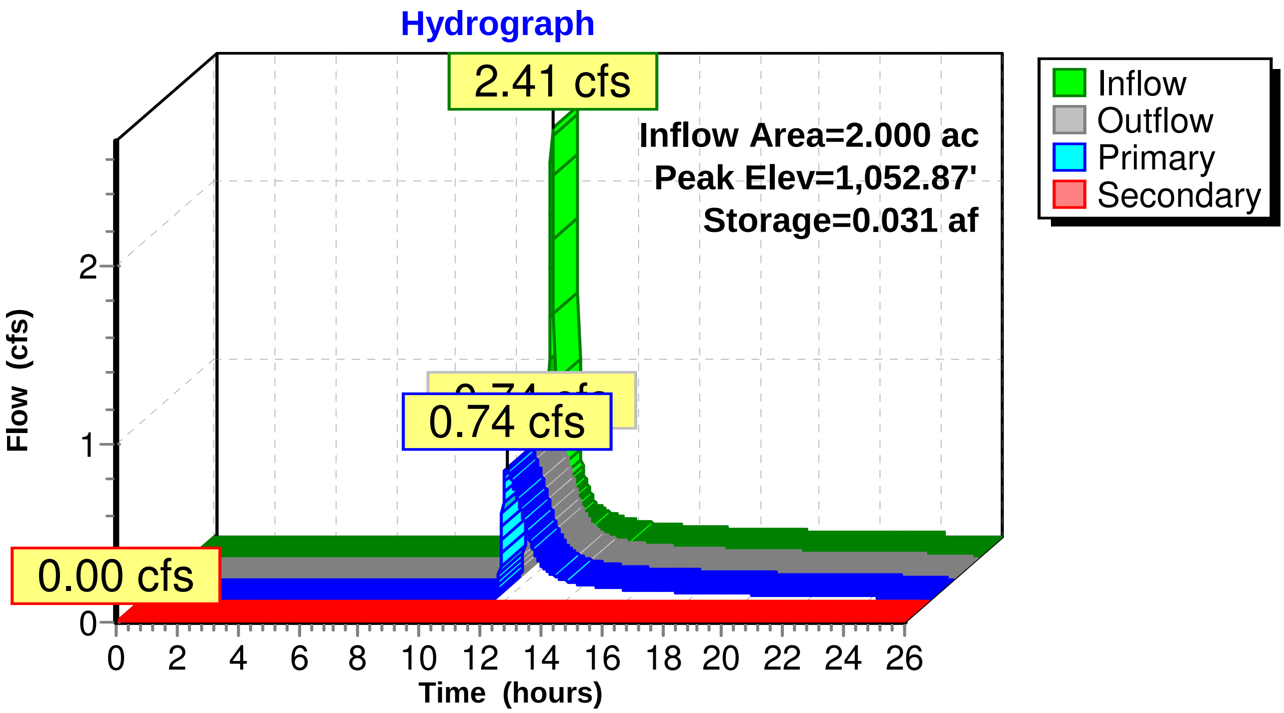
Volume	Invert	Avail.Storage	Storage Description
#1	1,052.00'	0.203 af	**20.00'W x 70.00'L x 4.00'H Trapezoid Z=2.0**

Device	Routing	Invert	Outlet Devices
#1	Device 4	1,052.00'	**6.0" Vert. Orifice/Grate** C= 0.600
#2	Device 4	1,053.00'	**6.00' W x 6.00' H Vert. Orifice/Grate** C= 0.600
#3	Device 4	1,054.00'	**11.5' long Sharp-Crested Rectangular Weir** 2 End Contraction(s)
#4	Primary	1,050.50'	**18.0" x 62.0' long Culvert** Ke= 0.500 Outlet Invert= 1,049.01' S= 0.0240 '/' Cc= 0.600 n= 0.013
#5	Secondary	1,054.50'	**12.0' long Broad-Crested Rectangular Weir** Head (feet) 1,054.50 Coef. (English) 2.60

Primary OutFlow Max=0.74 cfs @ 12.08 hrs HW=1,052.87' (Free Discharge)
└─**4=Culvert** (Passes 0.74 cfs of 7.21 cfs potential flow)
  ├─**1=Orifice/Grate** (Orifice Controls 0.74 cfs @ 3.78 fps)
  ├─**2=Orifice/Grate** (Controls 0.00 cfs)
  └─**3=Sharp-Crested Rectangular Weir** (Controls 0.00 cfs)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=1,052.00' (Free Discharge)
└─**5=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond 7P: Reservior (Basin 2 Outflow)

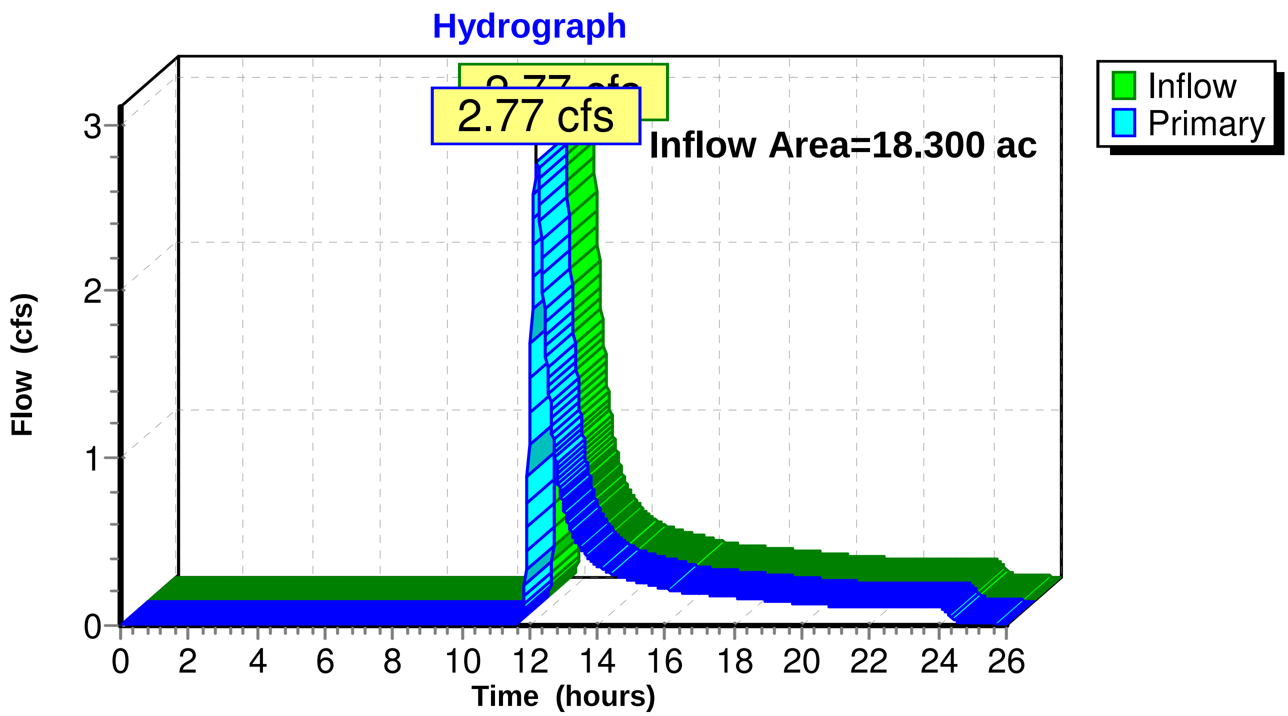


Summary for Link 9: Combine (Post DA-1)

Inflow Area = 18.300 ac, 5.30% Impervious, Inflow Depth > 0.22" for 1yr-24hr event
Inflow = 2.77 cfs @ 12.21 hrs, Volume= 0.330 af
Primary = 2.77 cfs @ 12.21 hrs, Volume= 0.330 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-26.00 hrs, dt= 0.02 hrs

Link 9: Combine (Post DA-1)



Time span=0.00-26.00 hrs, dt=0.02 hrs, 1301 points
Runoff by SCS TR-20 method, UH=SCS
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 1S: SCS Runoff (Pre-DA-1) Runoff Area=18.300 ac 1.09% Impervious Runoff Depth=0.44"
Flow Length=1,469' Tc=24.6 min CN=71 Runoff=6.02 cfs 0.667 af

Subcatchment 2S: SCS Runoff (Post DA-1 Runoff Area=9.400 ac 2.13% Impervious Runoff Depth=0.63"
Flow Length=1,012' Tc=23.9 min CN=76 Runoff=5.27 cfs 0.493 af

Subcatchment 3S: SCS Runoff (Post DA-1 Runoff Area=2.000 ac 18.45% Impervious Runoff Depth=0.92"
Tc=5.0 min CN=82 Runoff=3.41 cfs 0.153 af

Subcatchment 4S: SCS Runoff (Post DA-1 Runoff Area=6.900 ac 5.80% Impervious Runoff Depth=0.59"
Flow Length=1,556' Tc=24.1 min CN=75 Runoff=3.51 cfs 0.338 af

Reach 8R: Reach (Basin 1 Reach) Avg. Depth=0.06' Max Vel=1.28 fps Inflow=0.15 cfs 0.070 af
n=0.033 L=400.0' S=0.0400 '/' Capacity=114.92 cfs Outflow=0.15 cfs 0.069 af

Pond 5P: Reservior (Forebay Outflow) Peak Elev=1,085.51' Storage=0.411 af Inflow=5.27 cfs 0.493 af
Outflow=0.21 cfs 0.084 af

Pond 6P: Reservior (Basin 1 Outflow) Peak Elev=1,076.24' Storage=0.026 af Inflow=0.21 cfs 0.084 af
Primary=0.15 cfs 0.070 af Secondary=0.00 cfs 0.000 af Outflow=0.15 cfs 0.070 af

Pond 7P: Reservior (Basin 2 Outflow) Peak Elev=1,053.14' Storage=0.042 af Inflow=3.41 cfs 0.153 af
Primary=1.91 cfs 0.152 af Secondary=0.00 cfs 0.000 af Outflow=1.91 cfs 0.152 af

Link 9: Combine (Post DA-1) Inflow=4.37 cfs 0.558 af
Primary=4.37 cfs 0.558 af

Total Runoff Area = 36.600 ac Runoff Volume = 1.650 af Average Runoff Depth = 0.54"
96.81% Pervious = 35.431 ac 3.19% Impervious = 1.169 ac

Summary for Subcatchment 1S: SCS Runoff (Pre-DA-1)

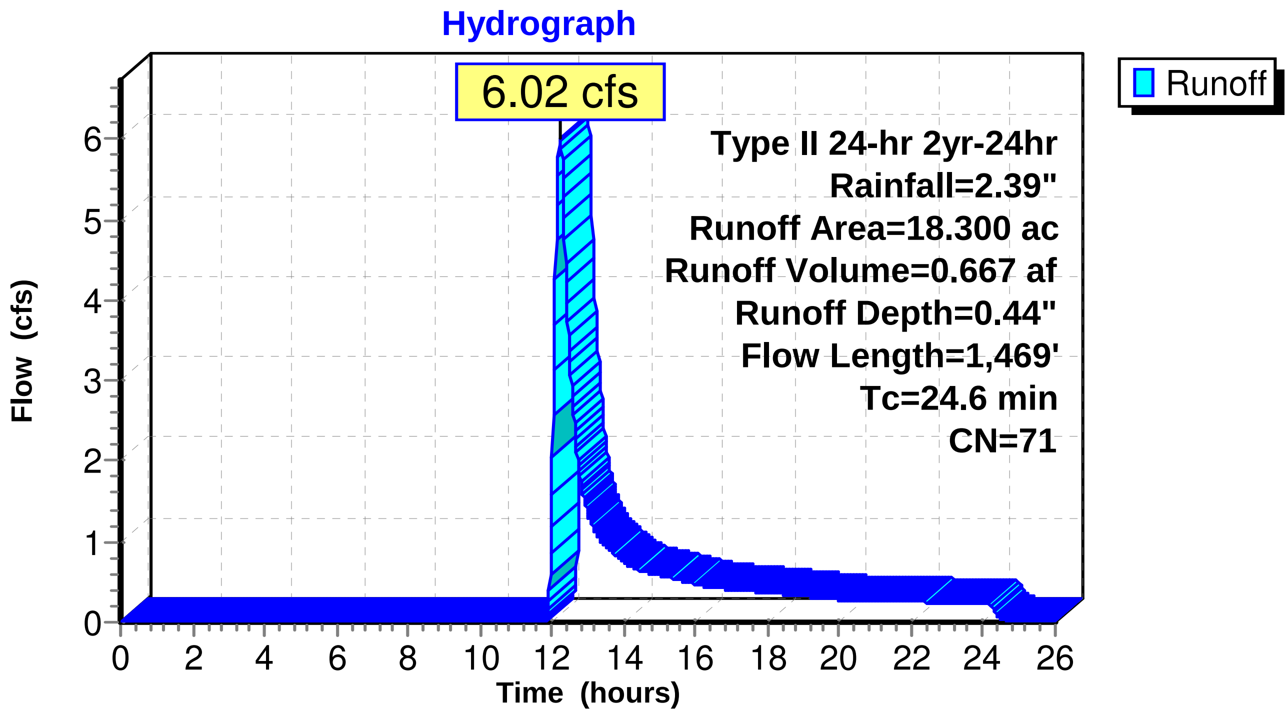
Runoff = 6.02 cfs @ 12.22 hrs, Volume= 0.667 af, Depth= 0.44"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-26.00 hrs, dt= 0.02 hrs
Type II 24-hr 2yr-24hr Rainfall=2.39"

	Area (ac)	CN	Description
*	0.200	98	
*	0.200	89	
*	11.200	71	
*	6.700	70	
	18.300	71	Weighted Average
	18.100		Pervious Area
	0.200		Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
21.1	100	0.1200	0.08		**Sheet Flow, Sheet Flow** n= 0.800 P2= 2.39"
1.3	573	0.2200	7.55		**Shallow Concentrated Flow, Shallow Concentrated Flow A** Unpaved Kv= 16.1 fps
1.8	429	0.0600	3.94		**Shallow Concentrated Flow, Shallow Concentrated Flow B** Unpaved Kv= 16.1 fps
0.4	367	0.0870	14.16	169.93	**Channel Flow, Channel Flow** Area= 12.0 sf Perim= 10.9' r= 1.10' n= 0.033
24.6	1,469	Total			

Subcatchment 1S: SCS Runoff (Pre-DA-1)



Summary for Subcatchment 2S: SCS Runoff (Post DA-1 Detained 1)

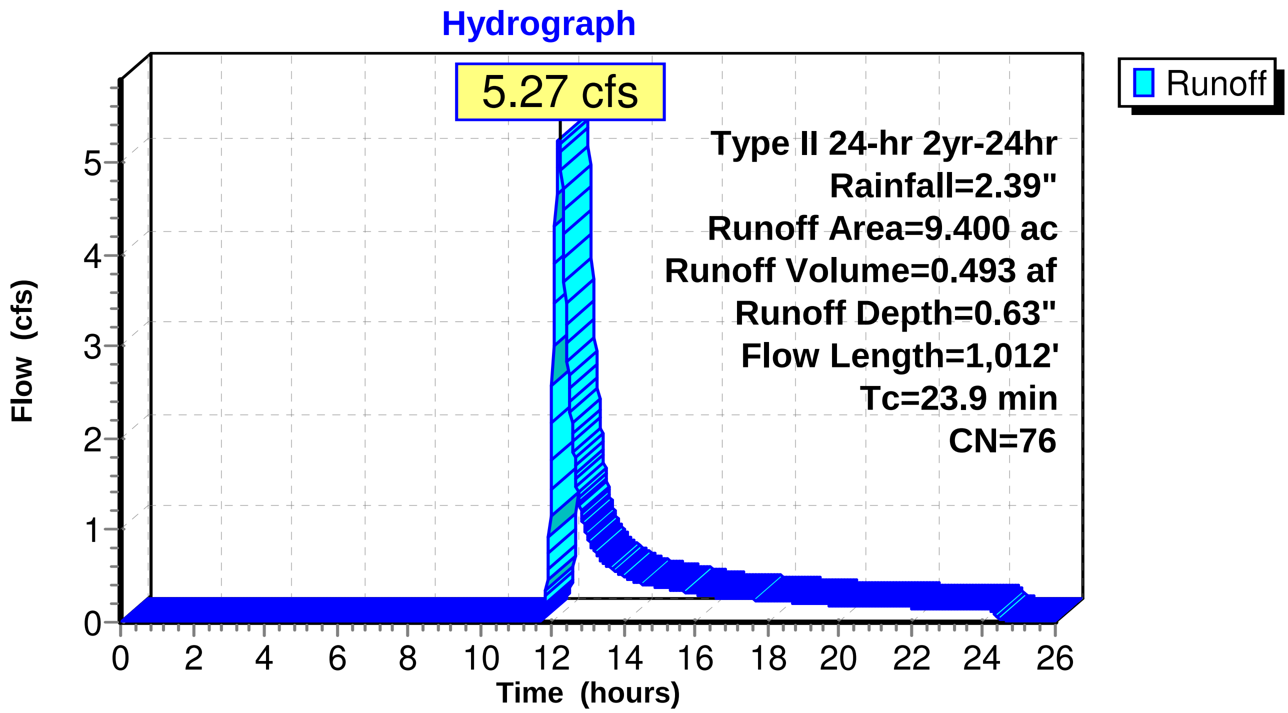
Runoff = 5.27 cfs @ 12.20 hrs, Volume= 0.493 af, Depth= 0.63"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-26.00 hrs, dt= 0.02 hrs
Type II 24-hr 2yr-24hr Rainfall=2.39"

	Area (ac)	CN	Description
*	0.200	98	
*	2.300	89	
*	6.000	71	
*	0.900	70	
	9.400	76	Weighted Average
	9.200		Pervious Area
	0.200		Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
21.1	100	0.1200	0.08		**Sheet Flow, Sheet Flow** n= 0.800 P2= 2.39"
0.7	332	0.2600	8.21		**Shallow Concentrated Flow, Shallow Concentrated Flow A** Unpaved Kv= 16.1 fps
1.3	270	0.0300	3.52		**Shallow Concentrated Flow, Shallow Concentrated Flow B** Paved Kv= 20.3 fps
0.1	88	0.3800	9.92		**Shallow Concentrated Flow, Shallow Concentrated Flow C** Unpaved Kv= 16.1 fps
0.7	222	0.0140	5.68	68.17	**Channel Flow, Channel Flow** Area= 12.0 sf Perim= 10.9' r= 1.10' n= 0.033
23.9	1,012	Total			

Subcatchment 2S: SCS Runoff (Post DA-1 Detained 1)



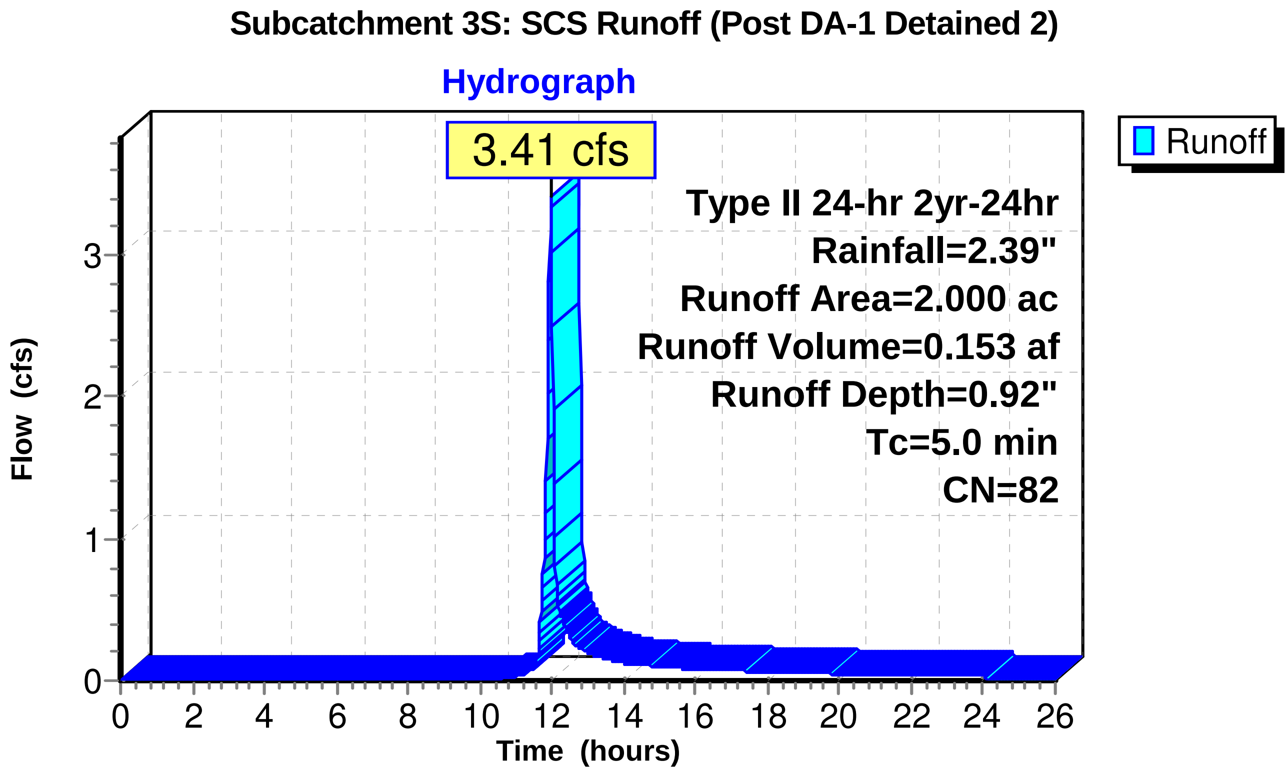
Summary for Subcatchment 3S: SCS Runoff (Post DA-1 Detained 2)

Runoff = 3.41 cfs @ 11.97 hrs, Volume= 0.153 af, Depth= 0.92"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-26.00 hrs, dt= 0.02 hrs
Type II 24-hr 2yr-24hr Rainfall=2.39"

	Area (ac)	CN	Description
*	0.369	98	
*	0.631	89	
*	1.000	71	
	2.000	82	Weighted Average
	1.631		Pervious Area
	0.369		Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry, User**



Summary for Subcatchment 4S: SCS Runoff (Post DA-1 Undetained)

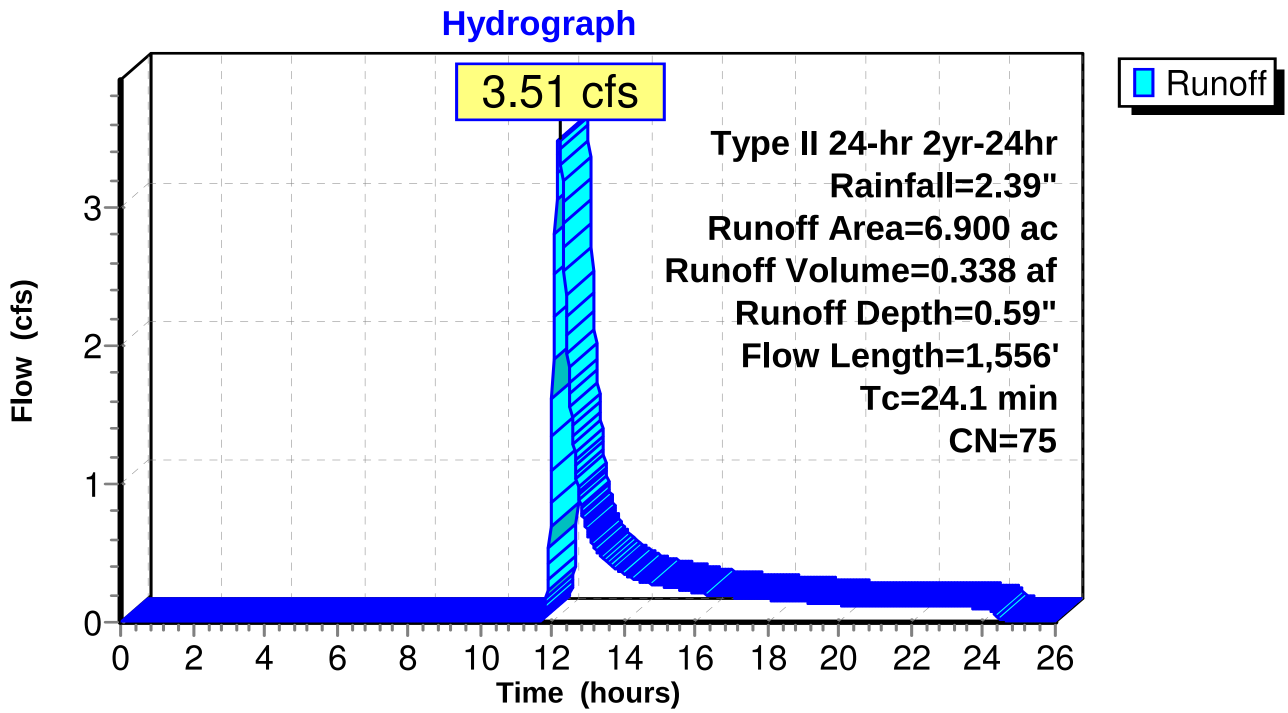
Runoff = 3.51 cfs @ 12.20 hrs, Volume= 0.338 af, Depth= 0.59"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-26.00 hrs, dt= 0.02 hrs
Type II 24-hr 2yr-24hr Rainfall=2.39"

	Area (ac)	CN	Description
*	0.400	98	
*	0.900	89	
*	4.100	71	
*	1.500	70	
	6.900	75	Weighted Average
	6.500		Pervious Area
	0.400		Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
21.1	100	0.1200	0.08		**Sheet Flow, Sheet Flow** n= 0.800 P2= 2.39"
0.9	412	0.2300	7.72		**Shallow Concentrated Flow, Shallow Concentrated Flow A** Unpaved Kv= 16.1 fps
1.3	312	0.0580	3.88		**Shallow Concentrated Flow, Shallow Concentrated Flow B** Unpaved Kv= 16.1 fps
0.8	732	0.0960	14.88	178.51	**Channel Flow, Channel Flow** Area= 12.0 sf Perim= 10.9' r= 1.10' n= 0.033
24.1	1,556	Total			

Subcatchment 4S: SCS Runoff (Post DA-1 Undetained)



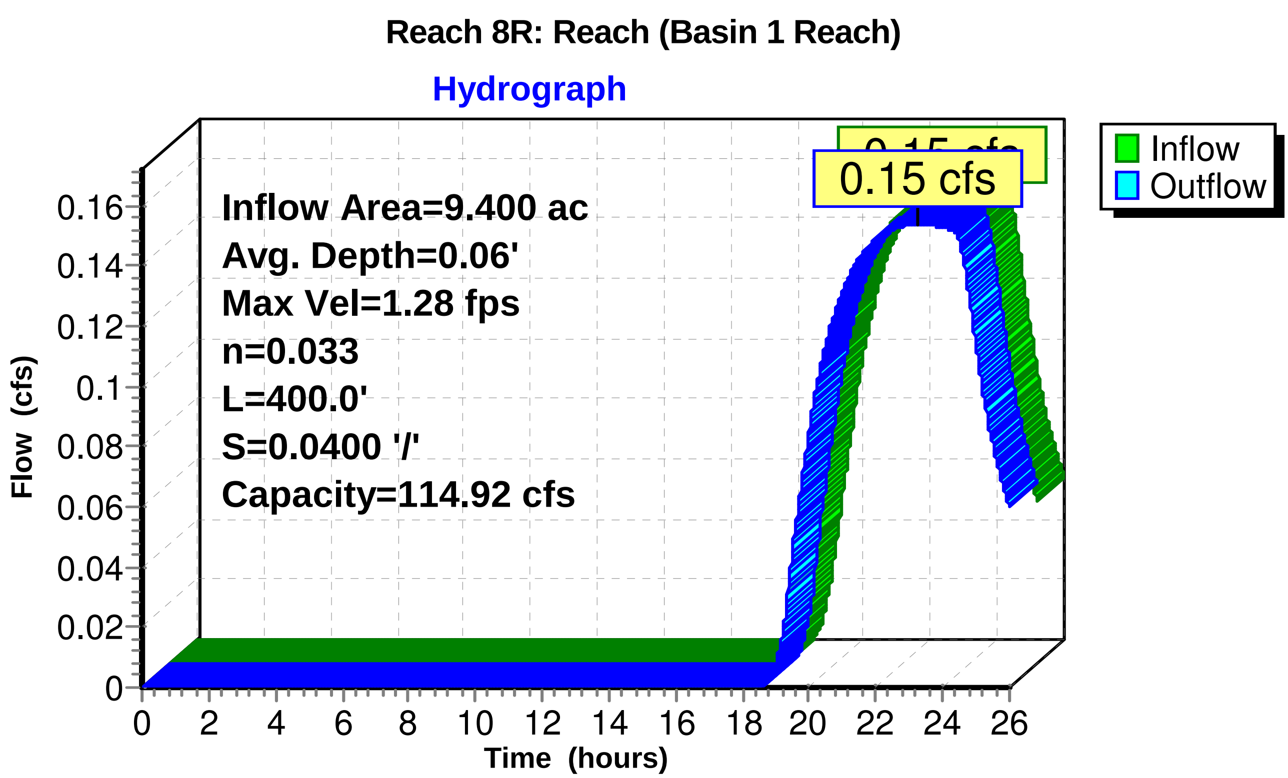
Summary for Reach 8R: Reach (Basin 1 Reach)

Inflow Area =	9.400 ac,	2.13% Impervious,	Inflow Depth >	0.09"	for 2yr-24hr event
Inflow =	0.15 cfs @	23.13 hrs,	Volume=	0.070 af	
Outflow =	0.15 cfs @	23.28 hrs,	Volume=	0.069 af,	Atten= 0%, Lag= 8.8 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-26.00 hrs, dt= 0.02 hrs
Max. Velocity= 1.28 fps, Min. Travel Time= 5.2 min
Avg. Velocity = 1.12 fps, Avg. Travel Time= 6.0 min

Peak Storage= 48 cf @ 23.19 hrs, Average Depth at Peak Storage= 0.06'
Bank-Full Depth= 2.00', Capacity at Bank-Full= 114.92 cfs

2.00' x 2.00' deep channel, n= 0.033
Side Slope Z-value= 2.0 '/' Top Width= 10.00'
Length= 400.0' Slope= 0.0400 '/'
Inlet Invert= 1,072.00', Outlet Invert= 1,056.00'



Summary for Pond 5P: Reservior (Forebay Outflow)

Inflow Area = 9.400 ac, 2.13% Impervious, Inflow Depth = 0.63" for 2yr-24hr event
Inflow = 5.27 cfs @ 12.20 hrs, Volume= 0.493 af
Outflow = 0.21 cfs @ 18.89 hrs, Volume= 0.084 af, Atten= 96%, Lag= 402.0 min
Primary = 0.21 cfs @ 18.89 hrs, Volume= 0.084 af

Routing by Stor-Ind method, Time Span= 0.00-26.00 hrs, dt= 0.02 hrs
Peak Elev= 1,085.51' @ 18.89 hrs Surf.Area= 0.146 ac Storage= 0.411 af

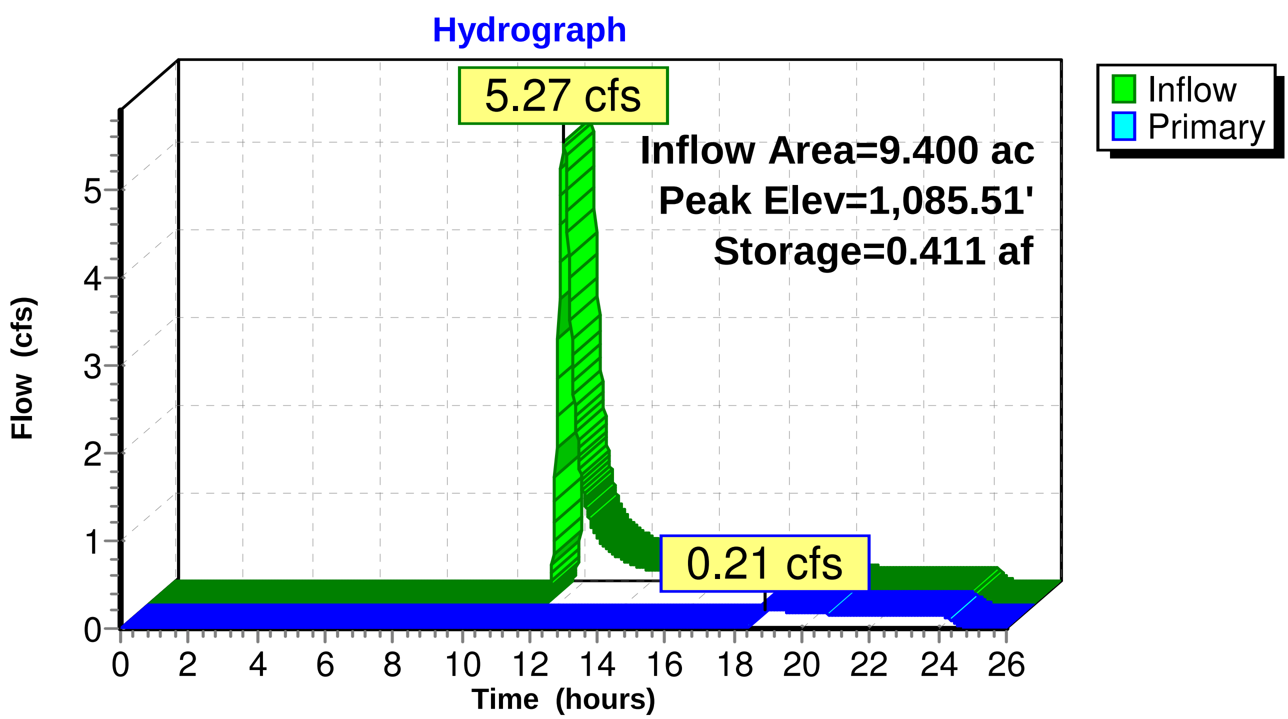
Plug-Flow detention time= 553.4 min calculated for 0.084 af (17% of inflow)
Center-of-Mass det. time= 390.0 min (1,278.2 - 888.2)

Volume	Invert	Avail.Storage	Storage Description
#1	1,082.00'	0.484 af	**30.00'W x 130.00'L x 4.00'H Trapezoid Z=2.0**

Device	Routing	Invert	Outlet Devices
#1	Primary	1,085.50'	**40.0' long Broad-Crested Rectangular Weir** Head (feet) 1,085.50 Coef. (English) 2.60

Primary OutFlow Max=0.18 cfs @ 18.89 hrs HW=1,085.51' (Free Discharge)
└─**1=Broad-Crested Rectangular Weir** (Weir Controls 0.18 cfs @ 0.31 fps)

Pond 5P: Reservior (Forebay Outflow)



Summary for Pond 6P: Reservior (Basin 1 Outflow)

Inflow Area = 9.400 ac, 2.13% Impervious, Inflow Depth = 0.11" for 2yr-24hr event
Inflow = 0.21 cfs @ 18.89 hrs, Volume= 0.084 af
Outflow = 0.15 cfs @ 23.13 hrs, Volume= 0.070 af, Atten= 27%, Lag= 254.2 min
Primary = 0.15 cfs @ 23.13 hrs, Volume= 0.070 af
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 0.00-26.00 hrs, dt= 0.02 hrs
Peak Elev= 1,076.24' @ 23.13 hrs Surf.Area= 0.114 ac Storage= 0.026 af

Plug-Flow detention time= 110.0 min calculated for 0.070 af (83% of inflow)
Center-of-Mass det. time= 77.5 min (1,355.7 - 1,278.2)

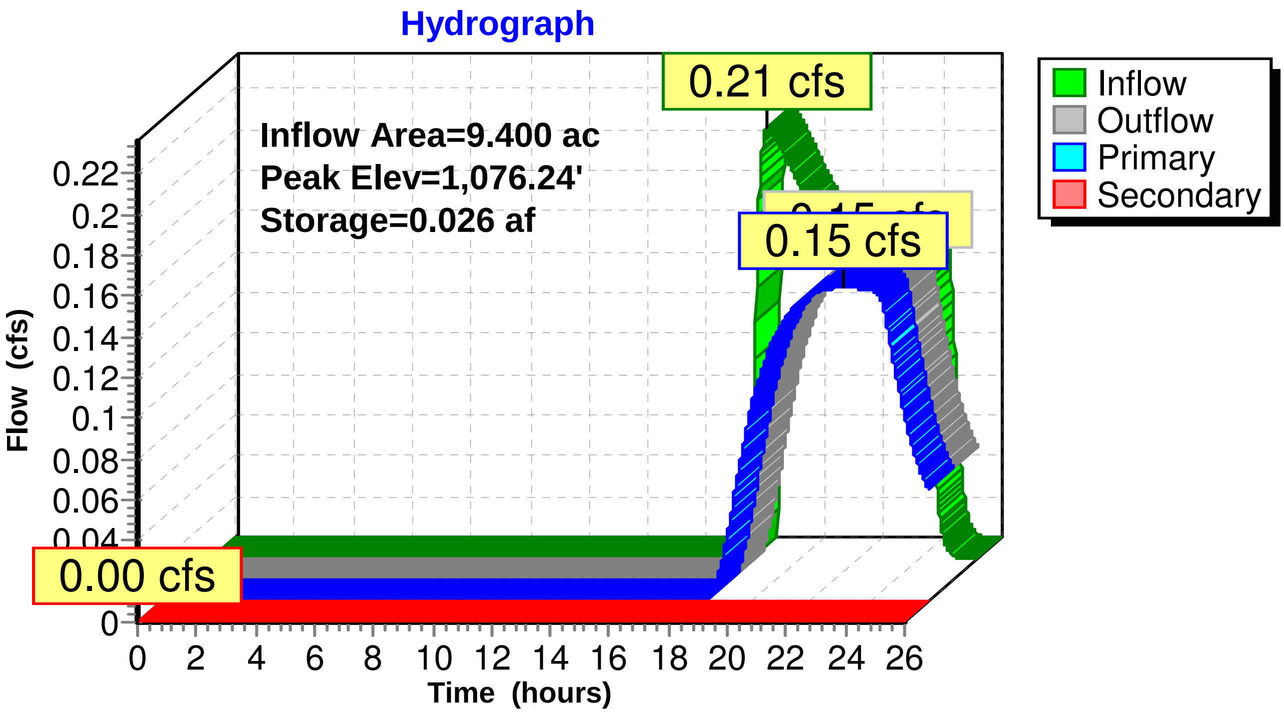
Volume	Invert	Avail.Storage	Storage Description
#1	1,076.00'	0.770 af	**35.00'W x 130.00'L x 4.00'H Trapezoid Z=5.0**

Device	Routing	Invert	Outlet Devices
#1	Device 4	1,076.00'	**6.0" Vert. Orifice/Grate** C= 0.600
#2	Device 4	1,077.00'	**1.00' W x 0.50' H Vert. Orifice/Grate** C= 0.600
#3	Device 4	1,078.00'	**11.5' long Sharp-Crested Rectangular Weir** 2 End Contraction(s)
#4	Primary	1,074.50'	**18.0" x 40.0' long Culvert** Ke= 0.500 Outlet Invert= 1,072.50' S= 0.0500 '/' Cc= 0.600 n= 0.013
#5	Secondary	1,078.50'	**8.0' long Broad-Crested Rectangular Weir** Head (feet) 1,078.50 Coef. (English) 3.33

Primary OutFlow Max=0.15 cfs @ 23.13 hrs HW=1,076.24' (Free Discharge)
└─**4=Culvert** (Passes 0.15 cfs of 5.64 cfs potential flow)
  ├─**1=Orifice/Grate** (Orifice Controls 0.15 cfs @ 1.66 fps)
  ├─**2=Orifice/Grate** (Controls 0.00 cfs)
  └─**3=Sharp-Crested Rectangular Weir** (Controls 0.00 cfs)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=1,076.00' (Free Discharge)
└─**5=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond 6P: Reservior (Basin 1 Outflow)



Summary for Pond 7P: Reservior (Basin 2 Outflow)

Inflow Area = 2.000 ac, 18.45% Impervious, Inflow Depth = 0.92" for 2yr-24hr event
Inflow = 3.41 cfs @ 11.97 hrs, Volume= 0.153 af
Outflow = 1.91 cfs @ 12.04 hrs, Volume= 0.152 af, Atten= 44%, Lag= 4.6 min
Primary = 1.91 cfs @ 12.04 hrs, Volume= 0.152 af
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 0.00-26.00 hrs, dt= 0.02 hrs
Peak Elev= 1,053.14' @ 12.04 hrs Surf.Area= 0.042 ac Storage= 0.042 af

Plug-Flow detention time= 37.1 min calculated for 0.152 af (99% of inflow)
Center-of-Mass det. time= 32.9 min (880.1 - 847.2)

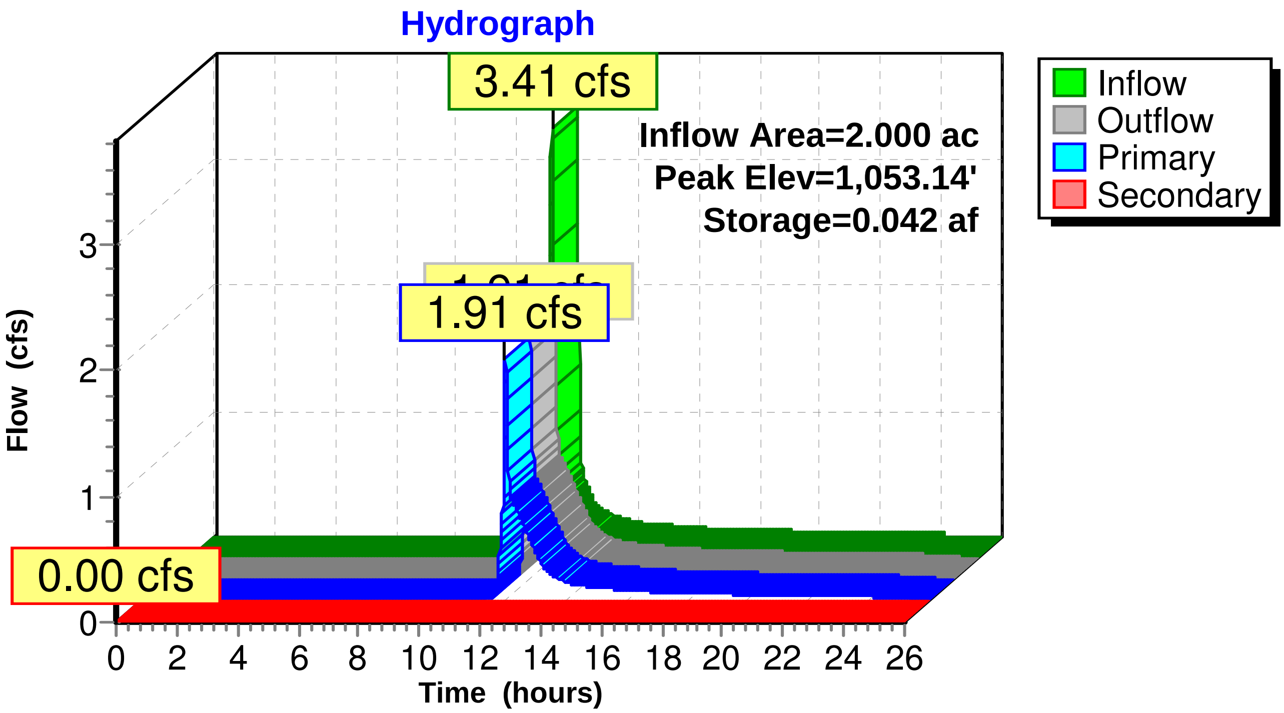
Volume	Invert	Avail.Storage	Storage Description
#1	1,052.00'	0.203 af	**20.00'W x 70.00'L x 4.00'H Trapezoid Z=2.0**

Device	Routing	Invert	Outlet Devices
#1	Device 4	1,052.00'	**6.0" Vert. Orifice/Grate** C= 0.600
#2	Device 4	1,053.00'	**6.00' W x 6.00' H Vert. Orifice/Grate** C= 0.600
#3	Device 4	1,054.00'	**11.5' long Sharp-Crested Rectangular Weir** 2 End Contraction(s)
#4	Primary	1,050.50'	**18.0" x 62.0' long Culvert** Ke= 0.500 Outlet Invert= 1,049.01' S= 0.0240 '/' Cc= 0.600 n= 0.013
#5	Secondary	1,054.50'	**12.0' long Broad-Crested Rectangular Weir** Head (feet) 1,054.50 Coef. (English) 2.60

Primary OutFlow Max=1.88 cfs @ 12.04 hrs HW=1,053.14' (Free Discharge)
└─**4=Culvert** (Passes 1.88 cfs of 7.79 cfs potential flow)
  ├─**1=Orifice/Grate** (Orifice Controls 0.89 cfs @ 4.54 fps)
  ├─**2=Orifice/Grate** (Orifice Controls 0.99 cfs @ 1.19 fps)
  └─**3=Sharp-Crested Rectangular Weir** (Controls 0.00 cfs)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=1,052.00' (Free Discharge)
└─**5=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond 7P: Reservior (Basin 2 Outflow)

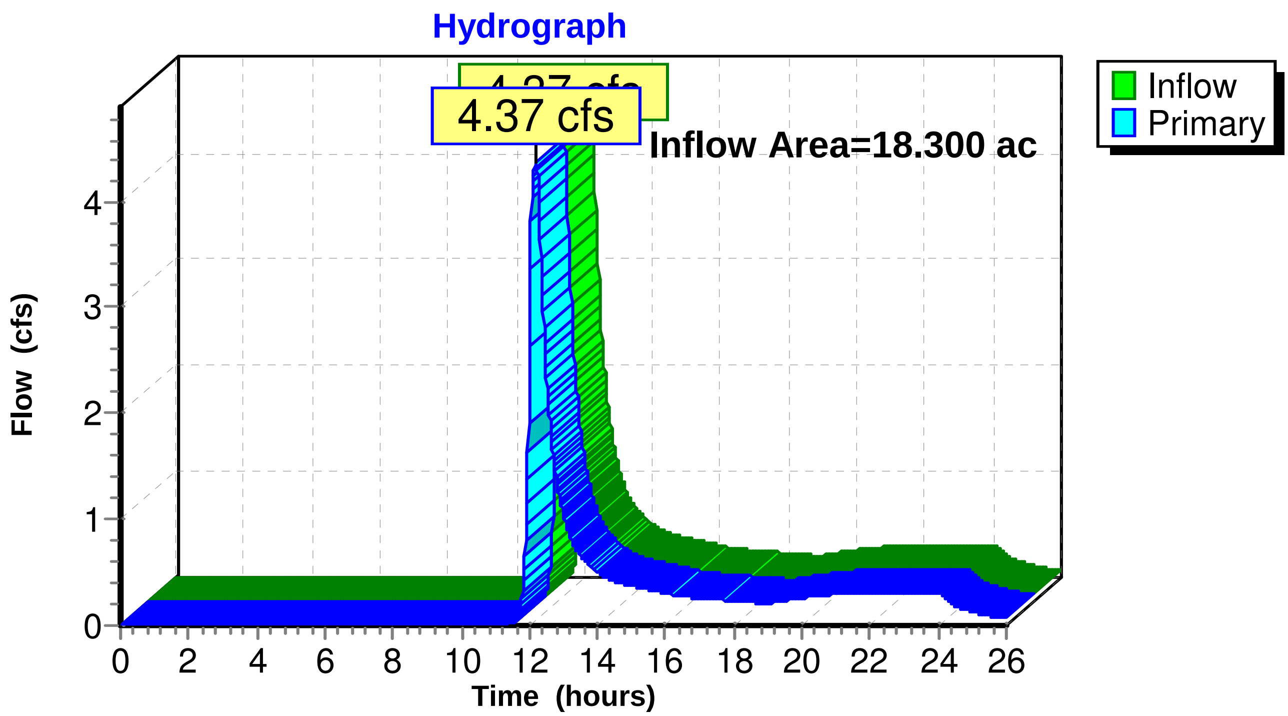


Summary for Link 9: Combine (Post DA-1)

Inflow Area =	18.300 ac,	5.30% Impervious,	Inflow Depth > 0.37"	for 2yr-24hr event	
Inflow =	4.37 cfs @	12.18 hrs,	Volume=	0.558 af	
Primary =	4.37 cfs @	12.18 hrs,	Volume=	0.558 af,	Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-26.00 hrs, dt= 0.02 hrs

Link 9: Combine (Post DA-1)



Time span=0.00-26.00 hrs, dt=0.02 hrs, 1301 points
Runoff by SCS TR-20 method, UH=SCS
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 1S: SCS Runoff (Pre-DA-1) Runoff Area=18.300 ac 1.09% Impervious Runoff Depth=0.71"
Flow Length=1,469' Tc=24.6 min CN=71 Runoff=11.16 cfs 1.090 af

Subcatchment 2S: SCS Runoff (Post DA-1 Runoff Area=9.400 ac 2.13% Impervious Runoff Depth=0.96"
Flow Length=1,012' Tc=23.9 min CN=76 Runoff=8.54 cfs 0.753 af

Subcatchment 3S: SCS Runoff (Post DA-1 Runoff Area=2.000 ac 18.45% Impervious Runoff Depth=1.32"
Tc=5.0 min CN=82 Runoff=4.89 cfs 0.219 af

Subcatchment 4S: SCS Runoff (Post DA-1 Runoff Area=6.900 ac 5.80% Impervious Runoff Depth=0.91"
Flow Length=1,556' Tc=24.1 min CN=75 Runoff=5.82 cfs 0.523 af

Reach 8R: Reach (Basin 1 Reach) Avg. Depth=0.11' Max Vel=1.97 fps Inflow=0.50 cfs 0.328 af
n=0.033 L=400.0' S=0.0400 '/' Capacity=114.92 cfs Outflow=0.50 cfs 0.327 af

Pond 5P: Reservior (Forebay Outflow) Peak Elev=1,085.54' Storage=0.415 af Inflow=8.54 cfs 0.753 af
Outflow=1.01 cfs 0.345 af

Pond 6P: Reservior (Basin 1 Outflow) Peak Elev=1,076.53' Storage=0.061 af Inflow=1.01 cfs 0.345 af
Primary=0.50 cfs 0.328 af Secondary=0.00 cfs 0.000 af Outflow=0.50 cfs 0.328 af

Pond 7P: Reservior (Basin 2 Outflow) Peak Elev=1,053.30' Storage=0.049 af Inflow=4.89 cfs 0.219 af
Primary=4.14 cfs 0.218 af Secondary=0.00 cfs 0.000 af Outflow=4.14 cfs 0.218 af

Link 9: Combine (Post DA-1) Inflow=7.12 cfs 1.068 af
Primary=7.12 cfs 1.068 af

Total Runoff Area = 36.600 ac Runoff Volume = 2.585 af Average Runoff Depth = 0.85"
96.81% Pervious = 35.431 ac 3.19% Impervious = 1.169 ac

Summary for Subcatchment 1S: SCS Runoff (Pre-DA-1)

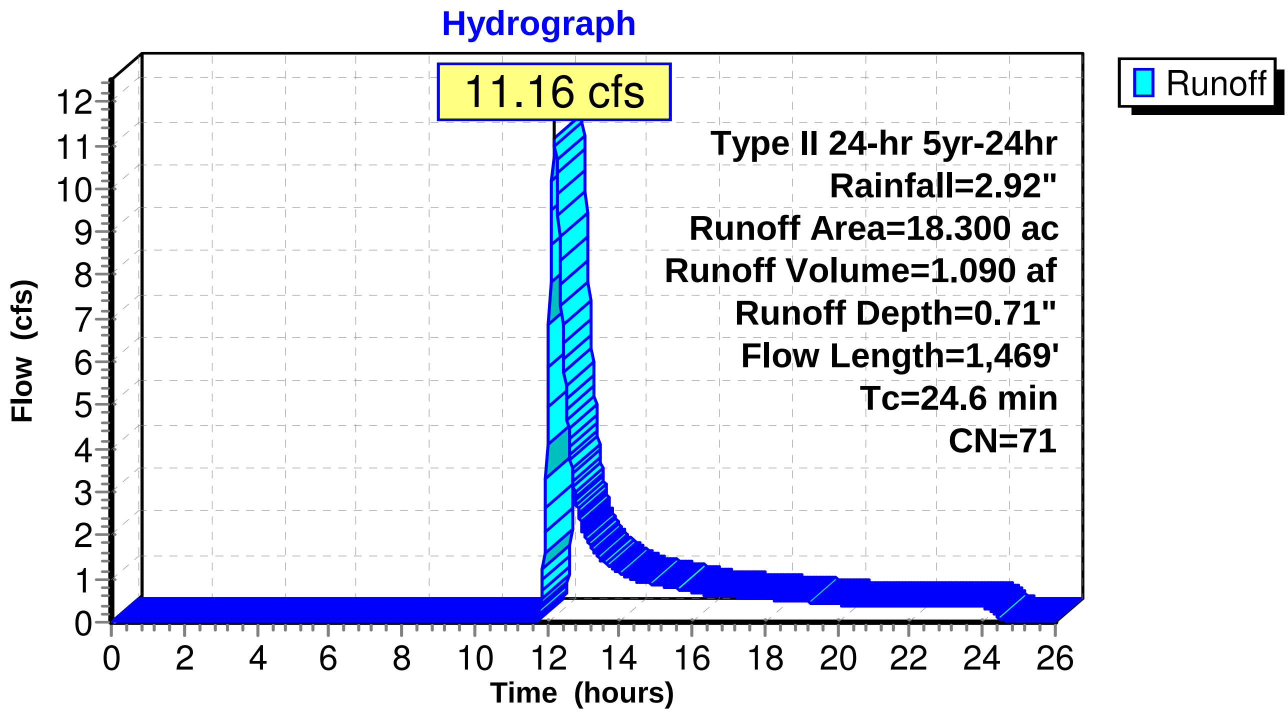
Runoff = 11.16 cfs @ 12.21 hrs, Volume= 1.090 af, Depth= 0.71"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-26.00 hrs, dt= 0.02 hrs
Type II 24-hr 5yr-24hr Rainfall=2.92"

	Area (ac)	CN	Description
*	0.200	98	
*	0.200	89	
*	11.200	71	
*	6.700	70	
	18.300	71	Weighted Average
	18.100		Pervious Area
	0.200		Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
21.1	100	0.1200	0.08		**Sheet Flow, Sheet Flow** n= 0.800 P2= 2.39"
1.3	573	0.2200	7.55		**Shallow Concentrated Flow, Shallow Concentrated Flow A** Unpaved Kv= 16.1 fps
1.8	429	0.0600	3.94		**Shallow Concentrated Flow, Shallow Concentrated Flow B** Unpaved Kv= 16.1 fps
0.4	367	0.0870	14.16	169.93	**Channel Flow, Channel Flow** Area= 12.0 sf Perim= 10.9' r= 1.10' n= 0.033
24.6	1,469	Total			

Subcatchment 1S: SCS Runoff (Pre-DA-1)



Summary for Subcatchment 2S: SCS Runoff (Post DA-1 Detained 1)

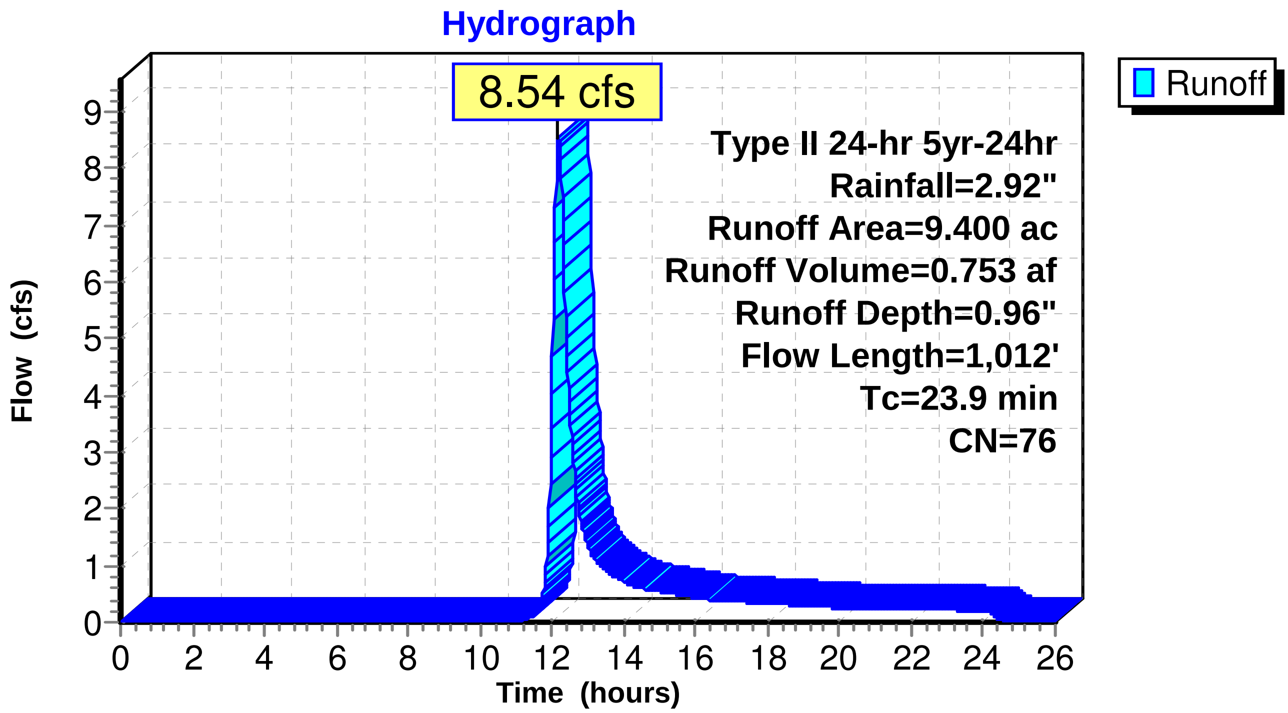
Runoff = 8.54 cfs @ 12.19 hrs, Volume= 0.753 af, Depth= 0.96"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-26.00 hrs, dt= 0.02 hrs
Type II 24-hr 5yr-24hr Rainfall=2.92"

	Area (ac)	CN	Description
*	0.200	98	
*	2.300	89	
*	6.000	71	
*	0.900	70	
	9.400	76	Weighted Average
	9.200		Pervious Area
	0.200		Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
21.1	100	0.1200	0.08		**Sheet Flow, Sheet Flow** n= 0.800 P2= 2.39"
0.7	332	0.2600	8.21		**Shallow Concentrated Flow, Shallow Concentrated Flow A** Unpaved Kv= 16.1 fps
1.3	270	0.0300	3.52		**Shallow Concentrated Flow, Shallow Concentrated Flow B** Paved Kv= 20.3 fps
0.1	88	0.3800	9.92		**Shallow Concentrated Flow, Shallow Concentrated Flow C** Unpaved Kv= 16.1 fps
0.7	222	0.0140	5.68	68.17	**Channel Flow, Channel Flow** Area= 12.0 sf Perim= 10.9' r= 1.10' n= 0.033
23.9	1,012	Total			

Subcatchment 2S: SCS Runoff (Post DA-1 Detained 1)



Summary for Subcatchment 3S: SCS Runoff (Post DA-1 Detained 2)

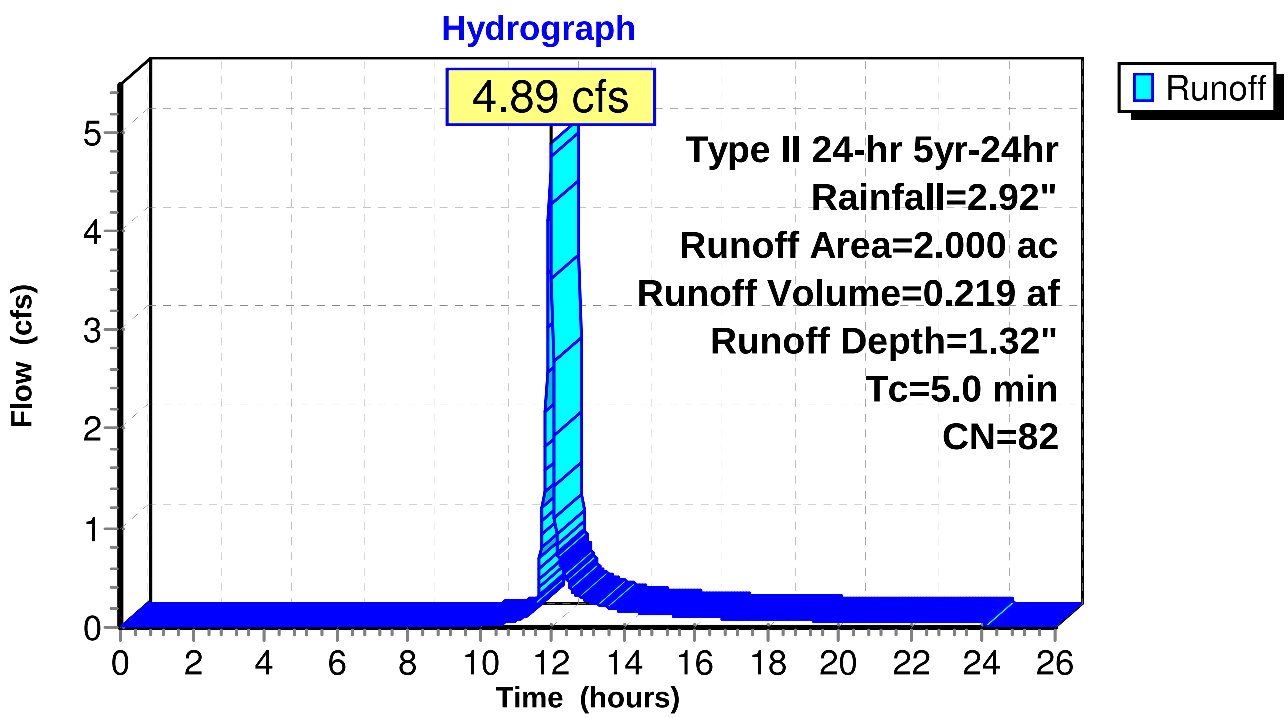
Runoff = 4.89 cfs @ 11.96 hrs, Volume= 0.219 af, Depth= 1.32"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-26.00 hrs, dt= 0.02 hrs
Type II 24-hr 5yr-24hr Rainfall=2.92"

	Area (ac)	CN	Description
*	0.369	98	
*	0.631	89	
*	1.000	71	
	2.000	82	Weighted Average
	1.631		Pervious Area
	0.369		Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry, User**

Subcatchment 3S: SCS Runoff (Post DA-1 Detained 2)



Summary for Subcatchment 4S: SCS Runoff (Post DA-1 Undetained)

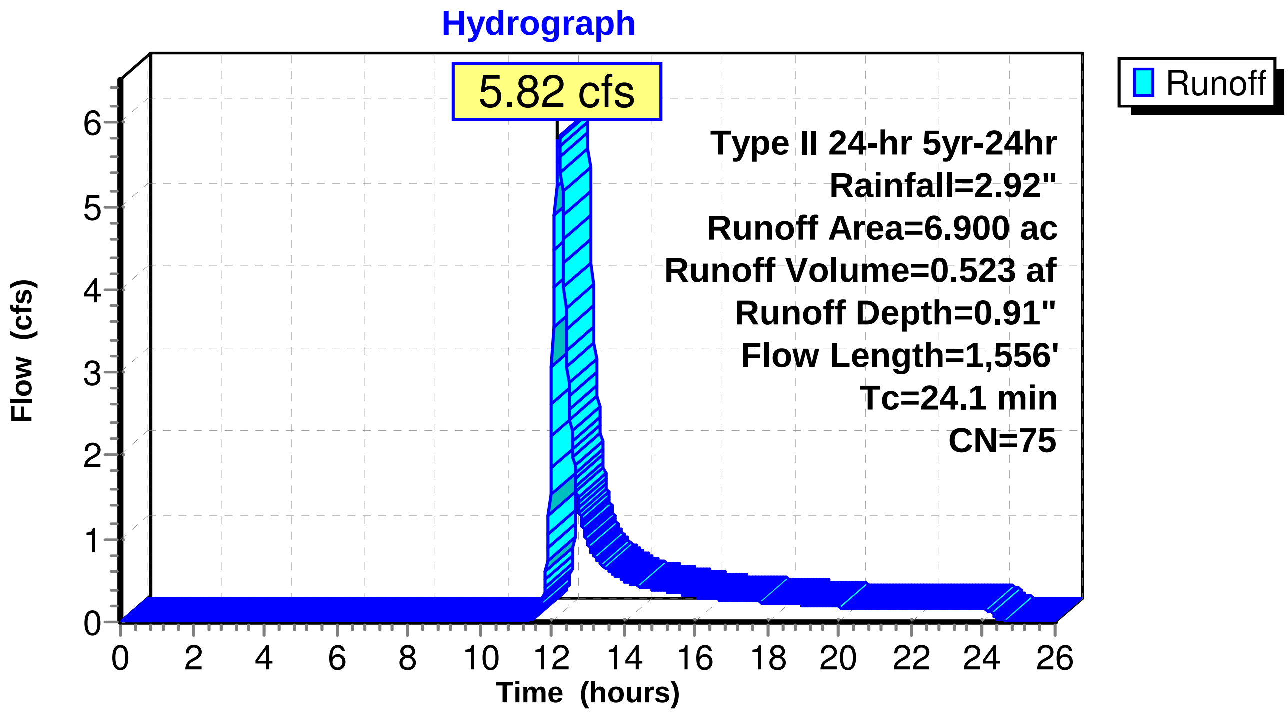
Runoff = 5.82 cfs @ 12.19 hrs, Volume= 0.523 af, Depth= 0.91"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-26.00 hrs, dt= 0.02 hrs
Type II 24-hr 5yr-24hr Rainfall=2.92"

	Area (ac)	CN	Description
*	0.400	98	
*	0.900	89	
*	4.100	71	
*	1.500	70	
	6.900	75	Weighted Average
	6.500		Pervious Area
	0.400		Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
21.1	100	0.1200	0.08		**Sheet Flow, Sheet Flow** n= 0.800 P2= 2.39"
0.9	412	0.2300	7.72		**Shallow Concentrated Flow, Shallow Concentrated Flow A** Unpaved Kv= 16.1 fps
1.3	312	0.0580	3.88		**Shallow Concentrated Flow, Shallow Concentrated Flow B** Unpaved Kv= 16.1 fps
0.8	732	0.0960	14.88	178.51	**Channel Flow, Channel Flow** Area= 12.0 sf Perim= 10.9' r= 1.10' n= 0.033
24.1	1,556	Total			

Subcatchment 4S: SCS Runoff (Post DA-1 Undetained)



Summary for Reach 8R: Reach (Basin 1 Reach)

Inflow Area = 9.400 ac, 2.13% Impervious, Inflow Depth > 0.42" for 5yr-24hr event
Inflow = 0.50 cfs @ 15.42 hrs, Volume= 0.328 af
Outflow = 0.50 cfs @ 15.51 hrs, Volume= 0.327 af, Atten= 0%, Lag= 5.7 min

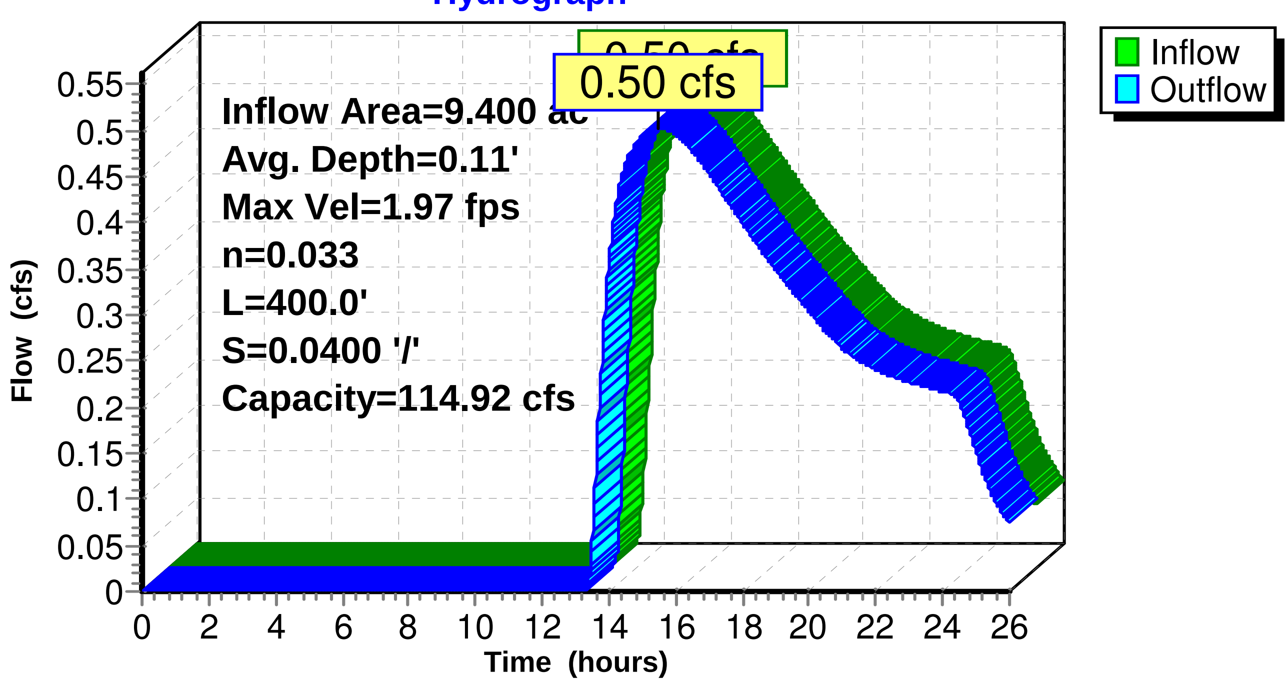
Routing by Stor-Ind+Trans method, Time Span= 0.00-26.00 hrs, dt= 0.02 hrs
Max. Velocity= 1.97 fps, Min. Travel Time= 3.4 min
Avg. Velocity = 1.61 fps, Avg. Travel Time= 4.1 min

Peak Storage= 102 cf @ 15.46 hrs, Average Depth at Peak Storage= 0.11'
Bank-Full Depth= 2.00', Capacity at Bank-Full= 114.92 cfs

2.00' x 2.00' deep channel, n= 0.033
Side Slope Z-value= 2.0 '/' Top Width= 10.00'
Length= 400.0' Slope= 0.0400 '/'
Inlet Invert= 1,072.00', Outlet Invert= 1,056.00'

Reach 8R: Reach (Basin 1 Reach)

Hydrograph



Summary for Pond 5P: Reservior (Forebay Outflow)

Inflow Area =	9.400 ac,	2.13% Impervious,	Inflow Depth = 0.96"	for 5yr-24hr event
Inflow =	8.54 cfs @	12.19 hrs, Volume=	0.753 af	
Outflow =	1.01 cfs @	13.33 hrs, Volume=	0.345 af,	Atten= 88%, Lag= 68.6 min
Primary =	1.01 cfs @	13.33 hrs, Volume=	0.345 af	

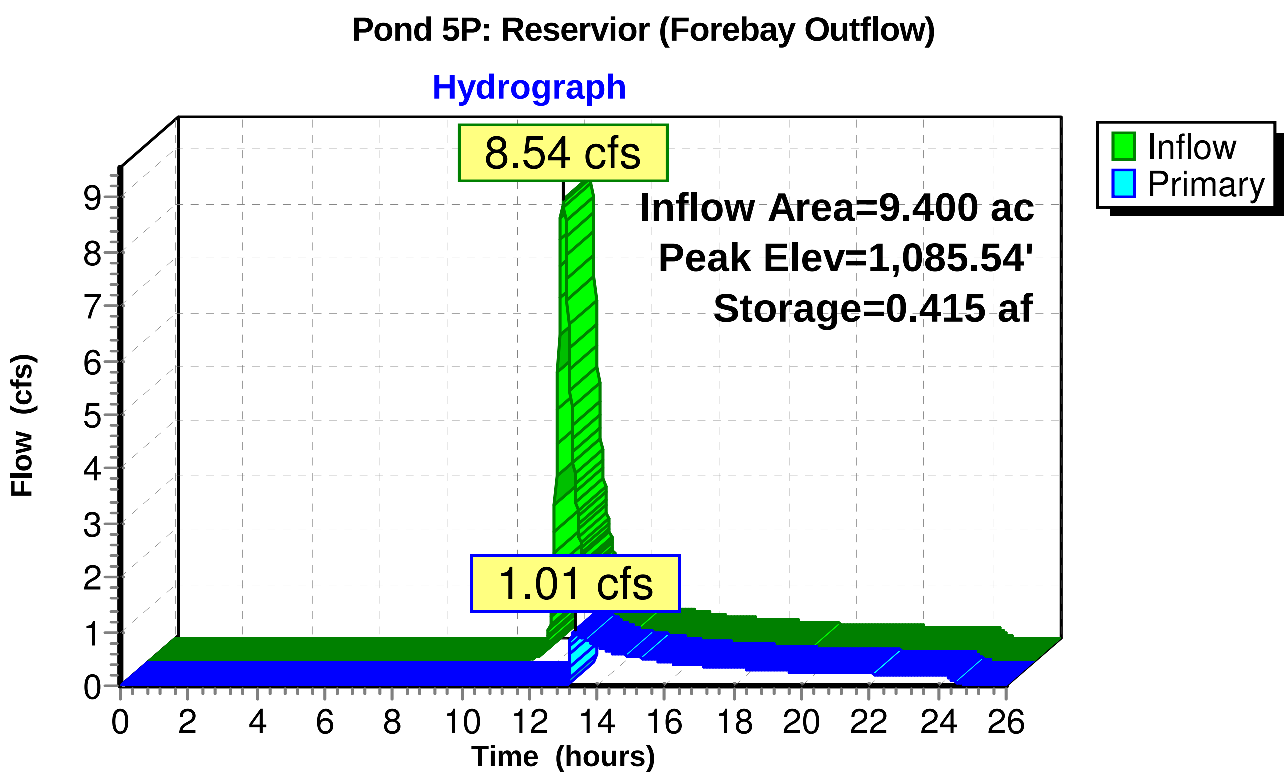
Routing by Stor-Ind method, Time Span= 0.00-26.00 hrs, dt= 0.02 hrs
Peak Elev= 1,085.54' @ 13.33 hrs Surf.Area= 0.146 ac Storage= 0.415 af

Plug-Flow detention time= 306.5 min calculated for 0.344 af (46% of inflow)
Center-of-Mass det. time= 166.0 min (1,040.4 - 874.4)

Volume	Invert	Avail.Storage	Storage Description
#1	1,082.00'	0.484 af	**30.00'W x 130.00'L x 4.00'H Trapezoid Z=2.0**

Device	Routing	Invert	Outlet Devices
#1	Primary	1,085.50'	**40.0' long Broad-Crested Rectangular Weir** Head (feet) 1,085.50 Coef. (English) 2.60

Primary OutFlow Max=0.93 cfs @ 13.33 hrs HW=1,085.54' (Free Discharge)
└─**1=Broad-Crested Rectangular Weir** (Weir Controls 0.93 cfs @ 0.54 fps)



Summary for Pond 6P: Reservior (Basin 1 Outflow)

Inflow Area = 9.400 ac, 2.13% Impervious, Inflow Depth = 0.44" for 5yr-24hr event
Inflow = 1.01 cfs @ 13.33 hrs, Volume= 0.345 af
Outflow = 0.50 cfs @ 15.42 hrs, Volume= 0.328 af, Atten= 50%, Lag= 125.4 min
Primary = 0.50 cfs @ 15.42 hrs, Volume= 0.328 af
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 0.00-26.00 hrs, dt= 0.02 hrs
Peak Elev= 1,076.53' @ 15.42 hrs Surf.Area= 0.125 ac Storage= 0.061 af

Plug-Flow detention time= 89.2 min calculated for 0.328 af (95% of inflow)
Center-of-Mass det. time= 69.3 min (1,109.7 - 1,040.4)

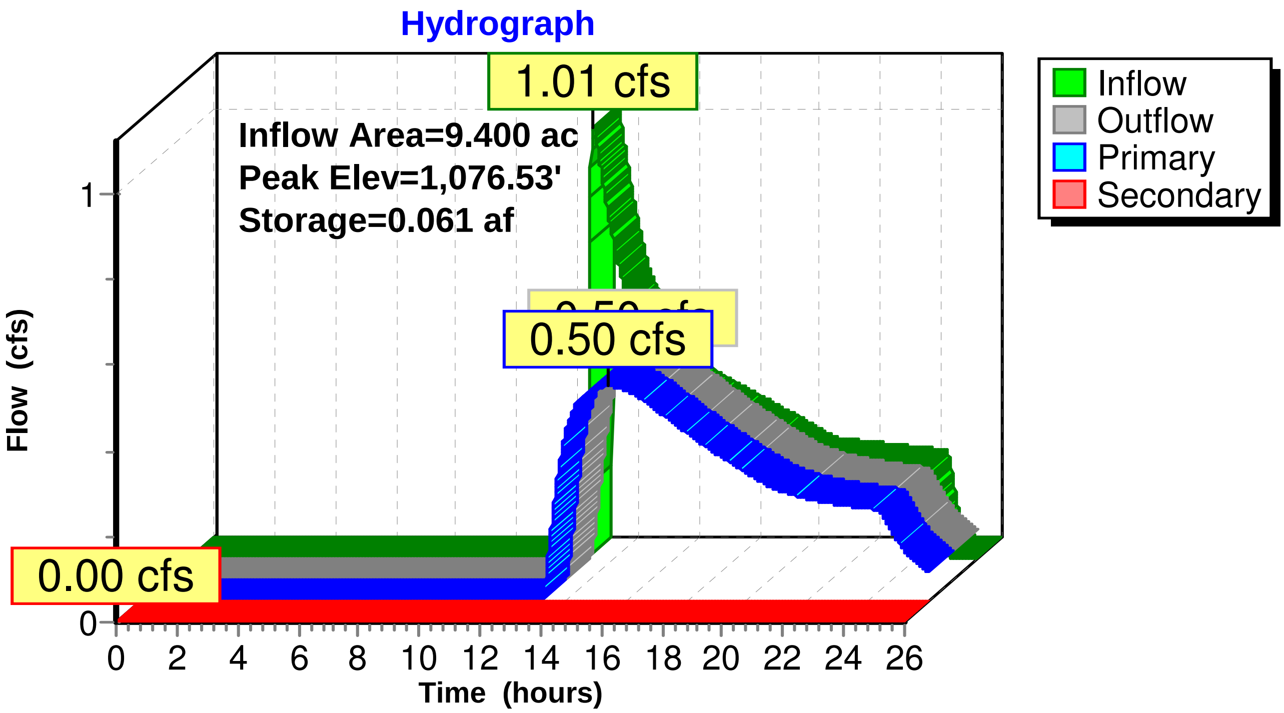
Volume	Invert	Avail.Storage	Storage Description
#1	1,076.00'	0.770 af	**35.00'W x 130.00'L x 4.00'H Trapezoid Z=5.0**

Device	Routing	Invert	Outlet Devices
#1	Device 4	1,076.00'	**6.0" Vert. Orifice/Grate** C= 0.600
#2	Device 4	1,077.00'	**1.00' W x 0.50' H Vert. Orifice/Grate** C= 0.600
#3	Device 4	1,078.00'	**11.5' long Sharp-Crested Rectangular Weir** 2 End Contraction(s)
#4	Primary	1,074.50'	**18.0" x 40.0' long Culvert** Ke= 0.500 Outlet Invert= 1,072.50' S= 0.0500 '/' Cc= 0.600 n= 0.013
#5	Secondary	1,078.50'	**8.0' long Broad-Crested Rectangular Weir** Head (feet) 1,078.50 Coef. (English) 3.33

Primary OutFlow Max=0.50 cfs @ 15.42 hrs HW=1,076.53' (Free Discharge)
└─**4=Culvert** (Passes 0.50 cfs of 6.42 cfs potential flow)
  ├─**1=Orifice/Grate** (Orifice Controls 0.50 cfs @ 2.56 fps)
  ├─**2=Orifice/Grate** (Controls 0.00 cfs)
  └─**3=Sharp-Crested Rectangular Weir** (Controls 0.00 cfs)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=1,076.00' (Free Discharge)
└─**5=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond 6P: Reservior (Basin 1 Outflow)



Summary for Pond 7P: Reservior (Basin 2 Outflow)

Inflow Area = 2.000 ac, 18.45% Impervious, Inflow Depth = 1.32" for 5yr-24hr event
Inflow = 4.89 cfs @ 11.96 hrs, Volume= 0.219 af
Outflow = 4.14 cfs @ 12.00 hrs, Volume= 0.218 af, Atten= 15%, Lag= 2.5 min
Primary = 4.14 cfs @ 12.00 hrs, Volume= 0.218 af
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 0.00-26.00 hrs, dt= 0.02 hrs
Peak Elev= 1,053.30' @ 12.00 hrs Surf.Area= 0.043 ac Storage= 0.049 af

Plug-Flow detention time= 31.6 min calculated for 0.218 af (99% of inflow)
Center-of-Mass det. time= 28.2 min (864.8 - 836.6)

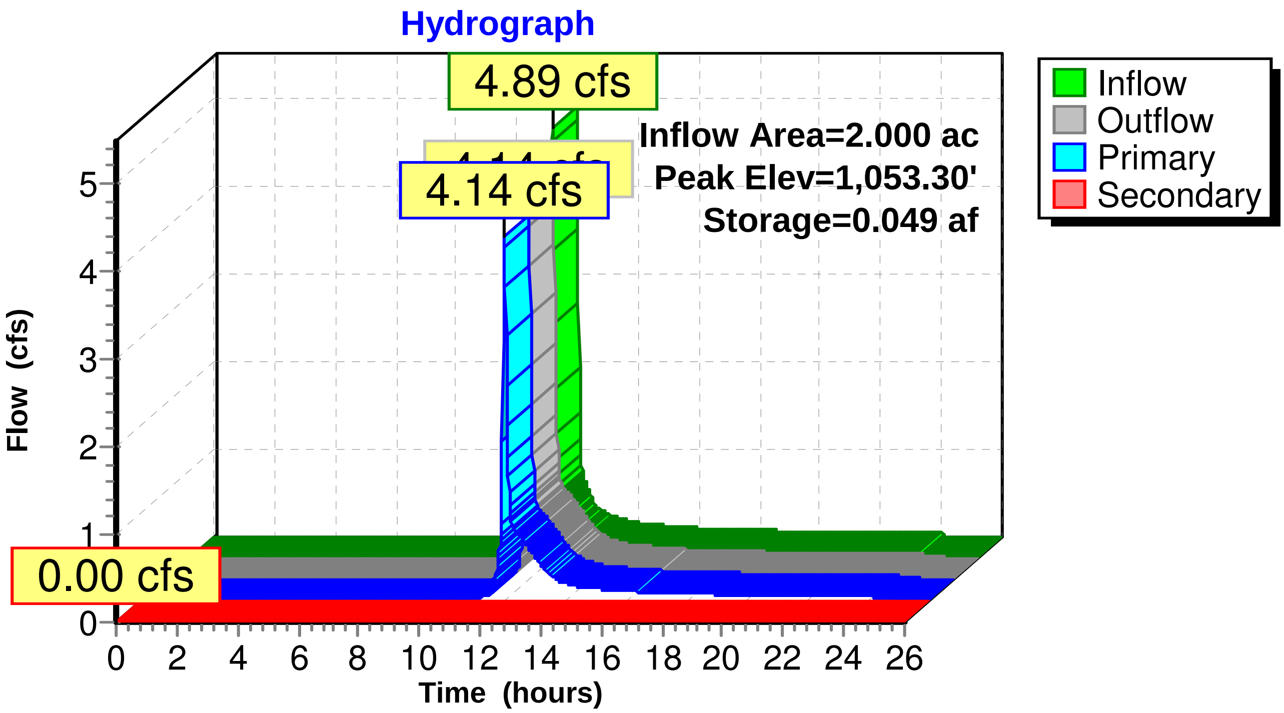
Volume	Invert	Avail.Storage	Storage Description
#1	1,052.00'	0.203 af	**20.00'W x 70.00'L x 4.00'H Trapezoid Z=2.0**

Device	Routing	Invert	Outlet Devices
#1	Device 4	1,052.00'	**6.0" Vert. Orifice/Grate** C= 0.600
#2	Device 4	1,053.00'	**6.00' W x 6.00' H Vert. Orifice/Grate** C= 0.600
#3	Device 4	1,054.00'	**11.5' long Sharp-Crested Rectangular Weir** 2 End Contraction(s)
#4	Primary	1,050.50'	**18.0" x 62.0' long Culvert** Ke= 0.500 Outlet Invert= 1,049.01' S= 0.0240 '/' Cc= 0.600 n= 0.013
#5	Secondary	1,054.50'	**12.0' long Broad-Crested Rectangular Weir** Head (feet) 1,054.50 Coef. (English) 2.60

Primary OutFlow Max=4.08 cfs @ 12.00 hrs HW=1,053.30' (Free Discharge)
└─**4=Culvert** (Passes 4.08 cfs of 8.12 cfs potential flow)
  ├─**1=Orifice/Grate** (Orifice Controls 0.97 cfs @ 4.93 fps)
  ├─**2=Orifice/Grate** (Orifice Controls 3.11 cfs @ 1.75 fps)
  └─**3=Sharp-Crested Rectangular Weir** (Controls 0.00 cfs)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=1,052.00' (Free Discharge)
└─**5=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

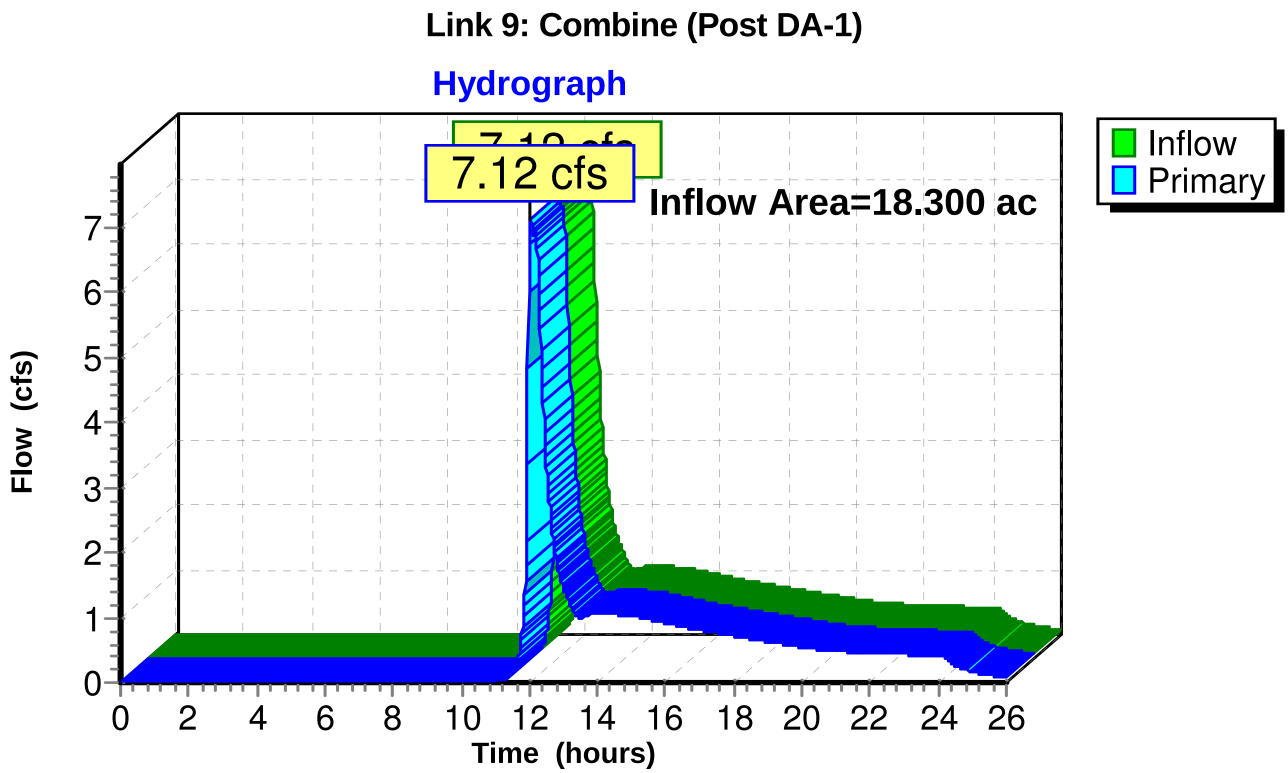
Pond 7P: Reservior (Basin 2 Outflow)



Summary for Link 9: Combine (Post DA-1)

Inflow Area =	18.300 ac,	5.30% Impervious,	Inflow Depth > 0.70"	for 5yr-24hr event
Inflow =	7.12 cfs @	12.04 hrs, Volume=	1.068 af	
Primary =	7.12 cfs @	12.04 hrs, Volume=	1.068 af,	Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-26.00 hrs, dt= 0.02 hrs



Time span=0.00-26.00 hrs, dt=0.02 hrs, 1301 points
Runoff by SCS TR-20 method, UH=SCS
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 1S: SCS Runoff (Pre-DA-1) Runoff Area=18.300 ac 1.09% Impervious Runoff Depth=0.97"
Flow Length=1,469' Tc=24.6 min CN=71 Runoff=15.93 cfs 1.479 af

Subcatchment 2S: SCS Runoff (Post DA-1 Runoff Area=9.400 ac 2.13% Impervious Runoff Depth=1.26"
Flow Length=1,012' Tc=23.9 min CN=76 Runoff=11.44 cfs 0.985 af

Subcatchment 3S: SCS Runoff (Post DA-1 Runoff Area=2.000 ac 18.45% Impervious Runoff Depth=1.66"
Tc=5.0 min CN=82 Runoff=6.14 cfs 0.277 af

Subcatchment 4S: SCS Runoff (Post DA-1 Runoff Area=6.900 ac 5.80% Impervious Runoff Depth=1.20"
Flow Length=1,556' Tc=24.1 min CN=75 Runoff=7.89 cfs 0.688 af

Reach 8R: Reach (Basin 1 Reach) Avg. Depth=0.16' Max Vel=2.42 fps Inflow=0.92 cfs 0.559 af
n=0.033 L=400.0' S=0.0400 '/' Capacity=114.92 cfs Outflow=0.92 cfs 0.558 af

Pond 5P: Reservior (Forebay Outflow) Peak Elev=1,085.61' Storage=0.425 af Inflow=11.44 cfs 0.985 af
Outflow=4.02 cfs 0.576 af

Pond 6P: Reservior (Basin 1 Outflow) Peak Elev=1,077.07' Storage=0.135 af Inflow=4.02 cfs 0.576 af
Primary=0.92 cfs 0.559 af Secondary=0.00 cfs 0.000 af Outflow=0.92 cfs 0.559 af

Pond 7P: Reservior (Basin 2 Outflow) Peak Elev=1,053.38' Storage=0.053 af Inflow=6.14 cfs 0.277 af
Primary=5.61 cfs 0.275 af Secondary=0.00 cfs 0.000 af Outflow=5.61 cfs 0.275 af

Link 9: Combine (Post DA-1) Inflow=9.63 cfs 1.521 af
Primary=9.63 cfs 1.521 af

Total Runoff Area = 36.600 ac Runoff Volume = 3.428 af Average Runoff Depth = 1.12"
96.81% Pervious = 35.431 ac 3.19% Impervious = 1.169 ac

Summary for Subcatchment 1S: SCS Runoff (Pre-DA-1)

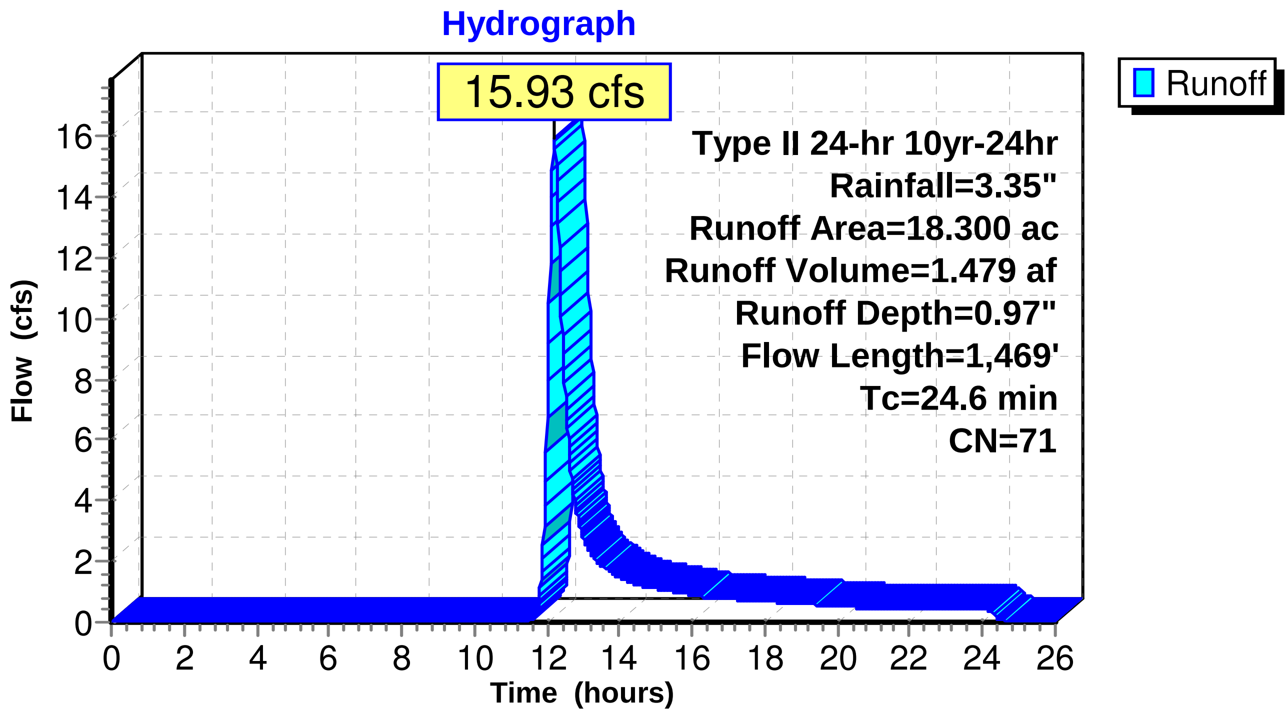
Runoff = 15.93 cfs @ 12.20 hrs, Volume= 1.479 af, Depth= 0.97"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-26.00 hrs, dt= 0.02 hrs
Type II 24-hr 10yr-24hr Rainfall=3.35"

	Area (ac)	CN	Description
*	0.200	98	
*	0.200	89	
*	11.200	71	
*	6.700	70	
	18.300	71	Weighted Average
	18.100		Pervious Area
	0.200		Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
21.1	100	0.1200	0.08		**Sheet Flow, Sheet Flow** n= 0.800 P2= 2.39"
1.3	573	0.2200	7.55		**Shallow Concentrated Flow, Shallow Concentrated Flow A** Unpaved Kv= 16.1 fps
1.8	429	0.0600	3.94		**Shallow Concentrated Flow, Shallow Concentrated Flow B** Unpaved Kv= 16.1 fps
0.4	367	0.0870	14.16	169.93	**Channel Flow, Channel Flow** Area= 12.0 sf Perim= 10.9' r= 1.10' n= 0.033
24.6	1,469	Total			

Subcatchment 1S: SCS Runoff (Pre-DA-1)



Summary for Subcatchment 2S: SCS Runoff (Post DA-1 Detained 1)

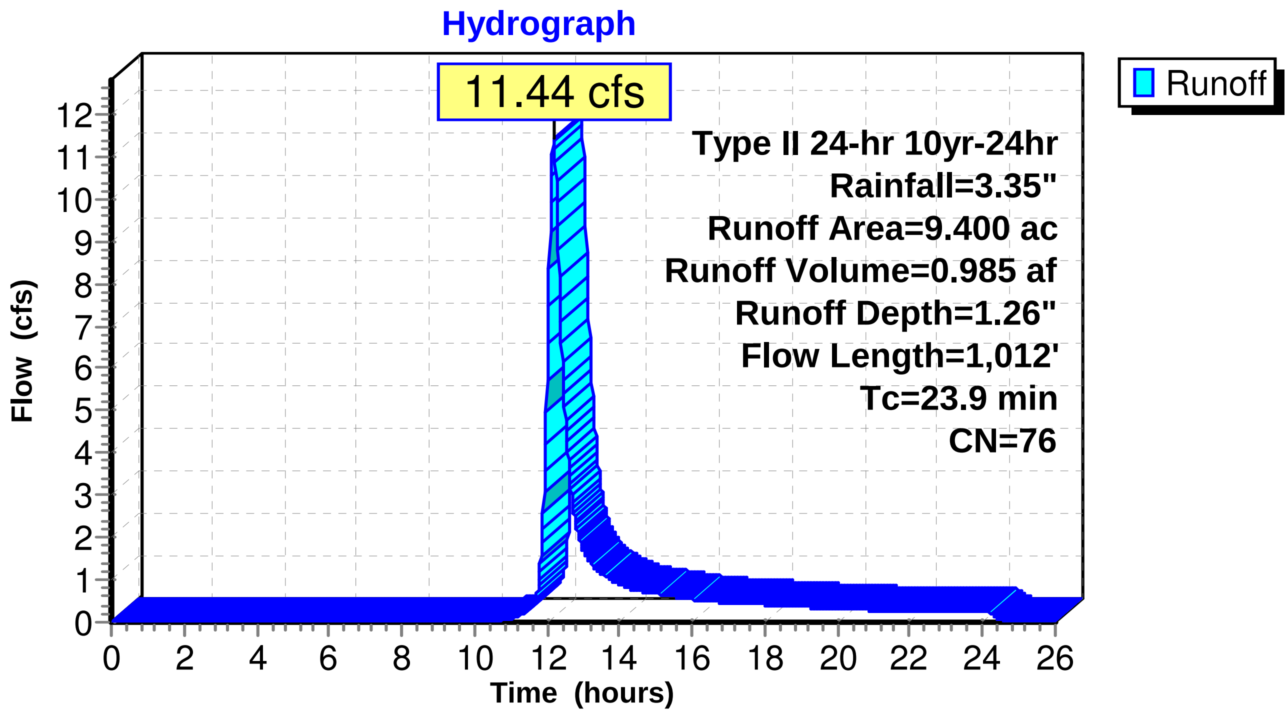
Runoff = 11.44 cfs @ 12.18 hrs, Volume= 0.985 af, Depth= 1.26"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-26.00 hrs, dt= 0.02 hrs
Type II 24-hr 10yr-24hr Rainfall=3.35"

	Area (ac)	CN	Description
*	0.200	98	
*	2.300	89	
*	6.000	71	
*	0.900	70	
	9.400	76	Weighted Average
	9.200		Pervious Area
	0.200		Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
21.1	100	0.1200	0.08		**Sheet Flow, Sheet Flow** n= 0.800 P2= 2.39"
0.7	332	0.2600	8.21		**Shallow Concentrated Flow, Shallow Concentrated Flow A** Unpaved Kv= 16.1 fps
1.3	270	0.0300	3.52		**Shallow Concentrated Flow, Shallow Concentrated Flow B** Paved Kv= 20.3 fps
0.1	88	0.3800	9.92		**Shallow Concentrated Flow, Shallow Concentrated Flow C** Unpaved Kv= 16.1 fps
0.7	222	0.0140	5.68	68.17	**Channel Flow, Channel Flow** Area= 12.0 sf Perim= 10.9' r= 1.10' n= 0.033
23.9	1,012	Total			

Subcatchment 2S: SCS Runoff (Post DA-1 Detained 1)



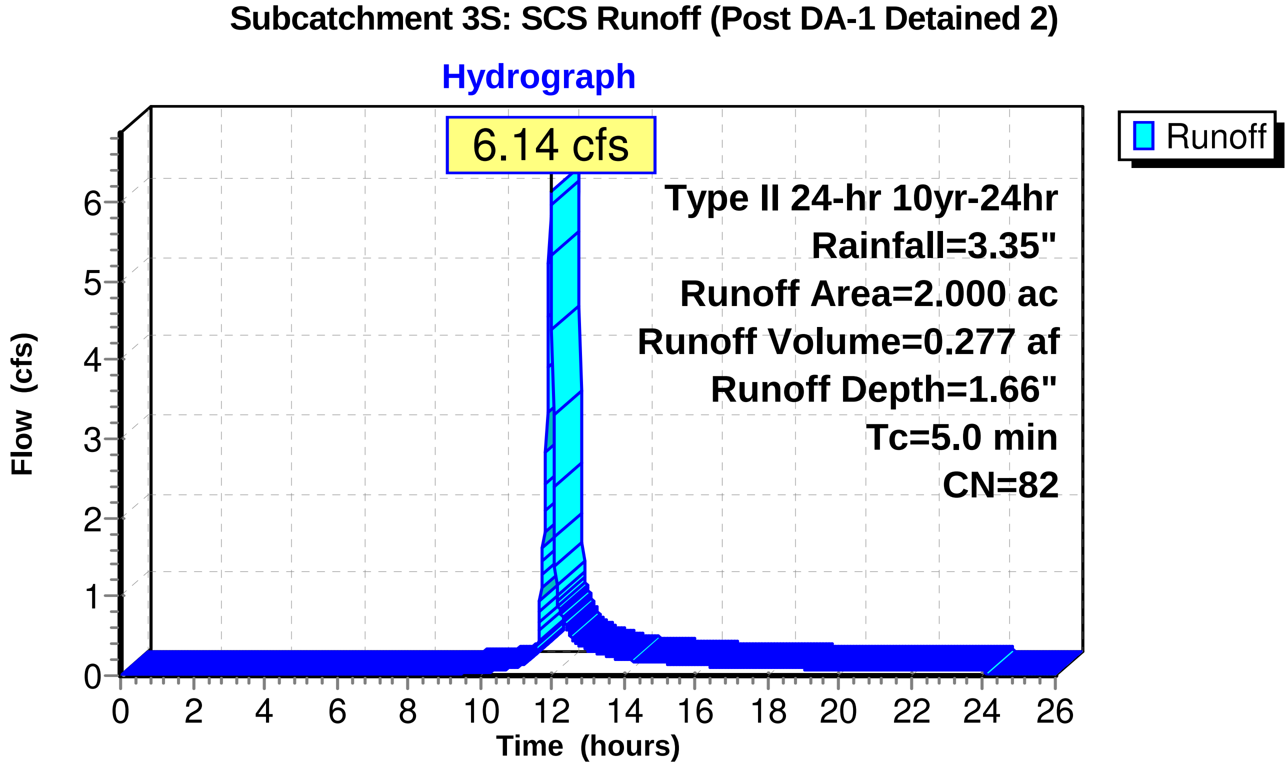
Summary for Subcatchment 3S: SCS Runoff (Post DA-1 Detained 2)

Runoff = 6.14 cfs @ 11.96 hrs, Volume= 0.277 af, Depth= 1.66"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-26.00 hrs, dt= 0.02 hrs
Type II 24-hr 10yr-24hr Rainfall=3.35"

	Area (ac)	CN	Description
*	0.369	98	
*	0.631	89	
*	1.000	71	
	2.000	82	Weighted Average
	1.631		Pervious Area
	0.369		Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry, User**



Summary for Subcatchment 4S: SCS Runoff (Post DA-1 Undetained)

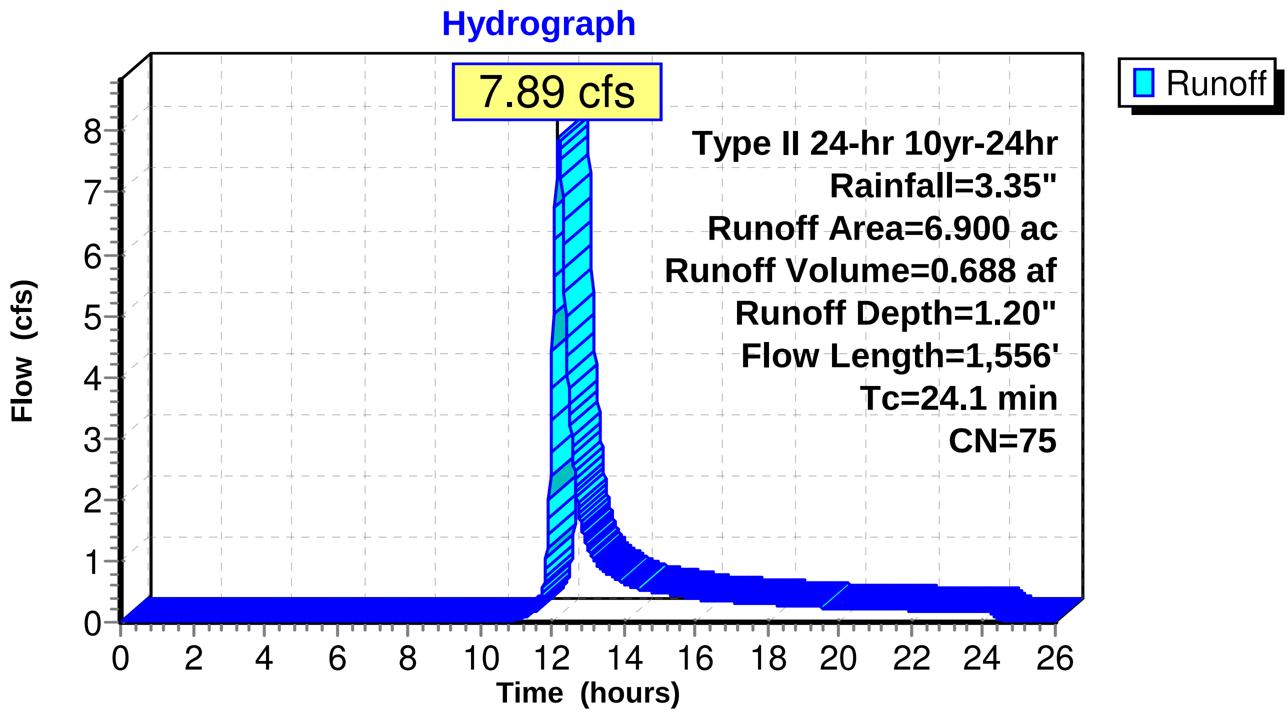
Runoff = 7.89 cfs @ 12.19 hrs, Volume= 0.688 af, Depth= 1.20"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-26.00 hrs, dt= 0.02 hrs
Type II 24-hr 10yr-24hr Rainfall=3.35"

	Area (ac)	CN	Description
*	0.400	98	
*	0.900	89	
*	4.100	71	
*	1.500	70	
	6.900	75	Weighted Average
	6.500		Pervious Area
	0.400		Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
21.1	100	0.1200	0.08		**Sheet Flow, Sheet Flow** n= 0.800 P2= 2.39"
0.9	412	0.2300	7.72		**Shallow Concentrated Flow, Shallow Concentrated Flow A** Unpaved Kv= 16.1 fps
1.3	312	0.0580	3.88		**Shallow Concentrated Flow, Shallow Concentrated Flow B** Unpaved Kv= 16.1 fps
0.8	732	0.0960	14.88	178.51	**Channel Flow, Channel Flow** Area= 12.0 sf Perim= 10.9' r= 1.10' n= 0.033
24.1	1,556	Total			

Subcatchment 4S: SCS Runoff (Post DA-1 Undetained)



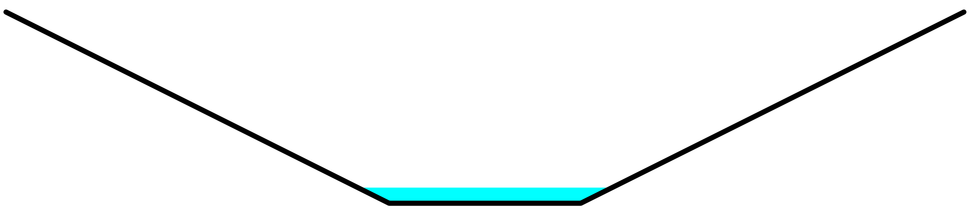
Summary for Reach 8R: Reach (Basin 1 Reach)

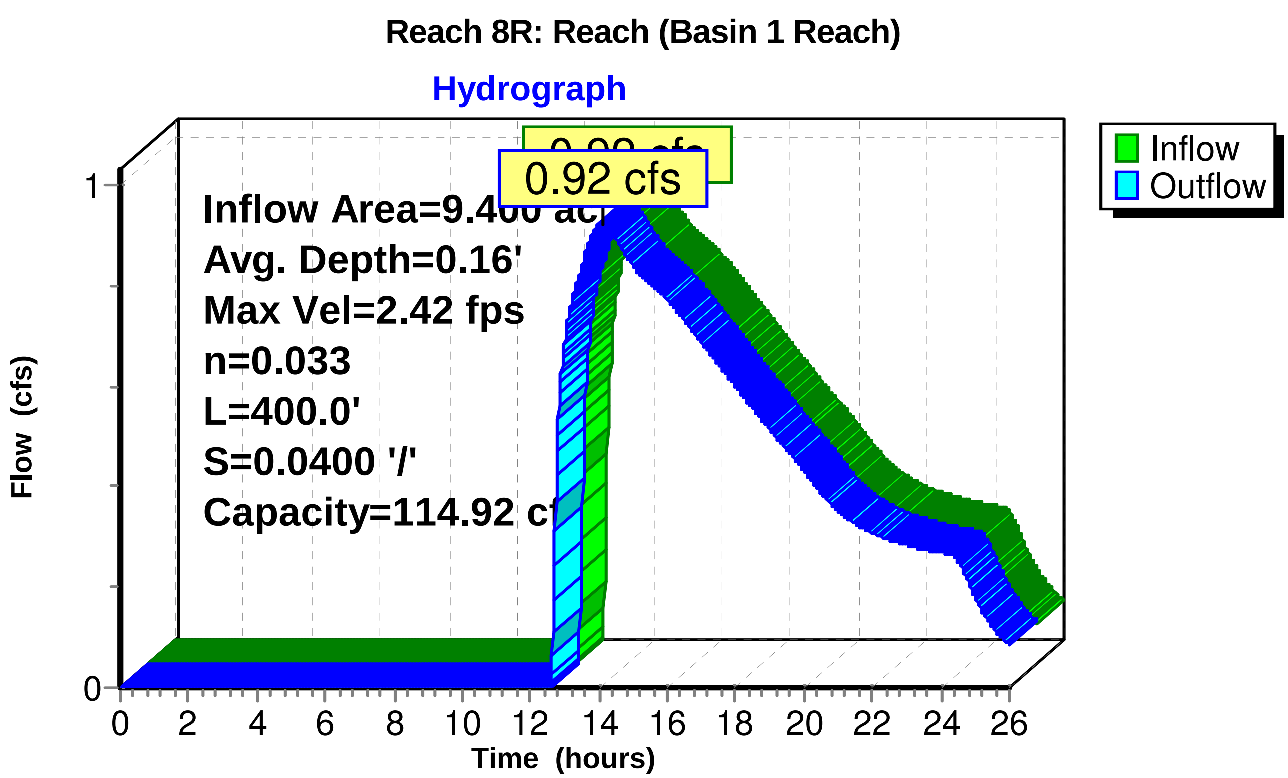
Inflow Area = 9.400 ac, 2.13% Impervious, Inflow Depth > 0.71" for 10yr-24hr event
Inflow = 0.92 cfs @ 14.01 hrs, Volume= 0.559 af
Outflow = 0.92 cfs @ 14.08 hrs, Volume= 0.558 af, Atten= 0%, Lag= 4.6 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-26.00 hrs, dt= 0.02 hrs
Max. Velocity= 2.42 fps, Min. Travel Time= 2.8 min
Avg. Velocity = 1.89 fps, Avg. Travel Time= 3.5 min

Peak Storage= 152 cf @ 14.04 hrs, Average Depth at Peak Storage= 0.16'
Bank-Full Depth= 2.00', Capacity at Bank-Full= 114.92 cfs

2.00' x 2.00' deep channel, n= 0.033
Side Slope Z-value= 2.0 '/' Top Width= 10.00'
Length= 400.0' Slope= 0.0400 '/'
Inlet Invert= 1,072.00', Outlet Invert= 1,056.00'





Summary for Pond 5P: Reservior (Forebay Outflow)

Inflow Area =	9.400 ac,	2.13% Impervious, Inflow Depth = 1.26"	for 10yr-24hr event	
Inflow =	11.44 cfs @	12.18 hrs, Volume=	0.985 af	
Outflow =	4.02 cfs @	12.56 hrs, Volume=	0.576 af,	Atten= 65%, Lag= 22.9 min
Primary =	4.02 cfs @	12.56 hrs, Volume=	0.576 af	

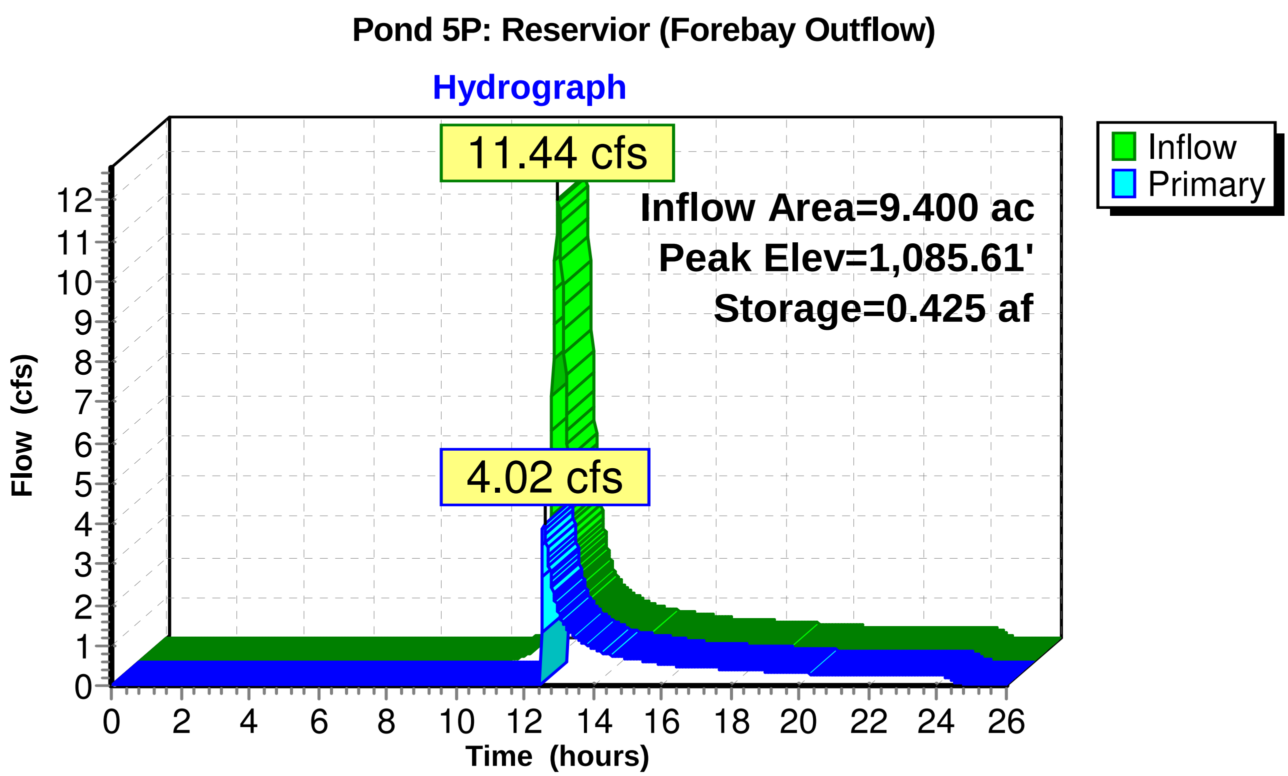
Routing by Stor-Ind method, Time Span= 0.00-26.00 hrs, dt= 0.02 hrs
Peak Elev= 1,085.61' @ 12.56 hrs Surf.Area= 0.147 ac Storage= 0.425 af

Plug-Flow detention time= 228.7 min calculated for 0.576 af (58% of inflow)
Center-of-Mass det. time= 102.7 min (968.8 - 866.2)

Volume	Invert	Avail.Storage	Storage Description
#1	1,082.00'	0.484 af	**30.00'W x 130.00'L x 4.00'H Trapezoid Z=2.0**

Device	Routing	Invert	Outlet Devices
#1	Primary	1,085.50'	**40.0' long Broad-Crested Rectangular Weir** Head (feet) 1,085.50 Coef. (English) 2.60

Primary OutFlow Max=3.97 cfs @ 12.56 hrs HW=1,085.61' (Free Discharge)
└**1=Broad-Crested Rectangular Weir** (Weir Controls 3.97 cfs @ 0.88 fps)



Summary for Pond 6P: Reservior (Basin 1 Outflow)

Inflow Area = 9.400 ac, 2.13% Impervious, Inflow Depth = 0.74" for 10yr-24hr event
Inflow = 4.02 cfs @ 12.56 hrs, Volume= 0.576 af
Outflow = 0.92 cfs @ 14.01 hrs, Volume= 0.559 af, Atten= 77%, Lag= 86.5 min
Primary = 0.92 cfs @ 14.01 hrs, Volume= 0.559 af
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 0.00-26.00 hrs, dt= 0.02 hrs
Peak Elev= 1,077.07' @ 14.01 hrs Surf.Area= 0.148 ac Storage= 0.135 af

Plug-Flow detention time= 96.7 min calculated for 0.559 af (97% of inflow)
Center-of-Mass det. time= 81.6 min (1,050.4 - 968.8)

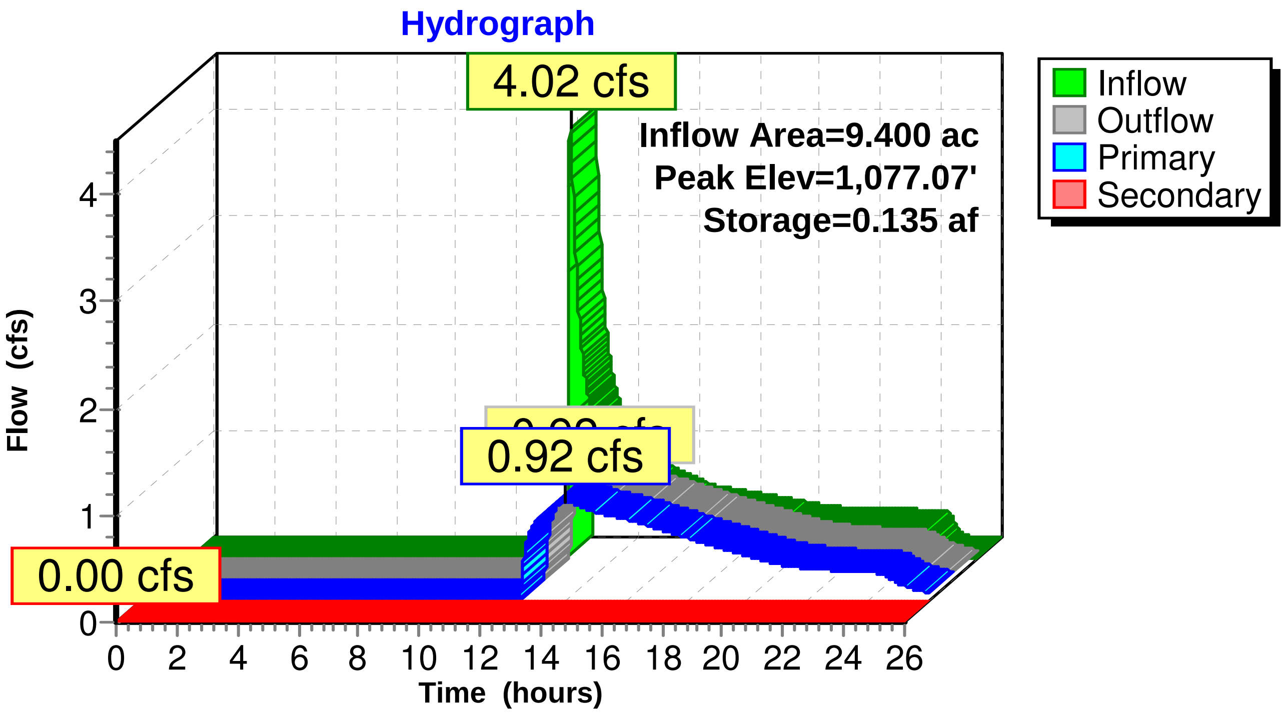
Volume	Invert	Avail.Storage	Storage Description
#1	1,076.00'	0.770 af	**35.00'W x 130.00'L x 4.00'H Trapezoid Z=5.0**

Device	Routing	Invert	Outlet Devices
#1	Device 4	1,076.00'	**6.0" Vert. Orifice/Grate** C= 0.600
#2	Device 4	1,077.00'	**1.00' W x 0.50' H Vert. Orifice/Grate** C= 0.600
#3	Device 4	1,078.00'	**11.5' long Sharp-Crested Rectangular Weir** 2 End Contraction(s)
#4	Primary	1,074.50'	**18.0" x 40.0' long Culvert** Ke= 0.500 Outlet Invert= 1,072.50' S= 0.0500 '/' Cc= 0.600 n= 0.013
#5	Secondary	1,078.50'	**8.0' long Broad-Crested Rectangular Weir** Head (feet) 1,078.50 Coef. (English) 3.33

Primary OutFlow Max=0.92 cfs @ 14.01 hrs HW=1,077.07' (Free Discharge)
└─**4=Culvert** (Passes 0.92 cfs of 7.66 cfs potential flow)
  ├─**1=Orifice/Grate** (Orifice Controls 0.86 cfs @ 4.36 fps)
  ├─**2=Orifice/Grate** (Orifice Controls 0.06 cfs @ 0.86 fps)
  └─**3=Sharp-Crested Rectangular Weir** (Controls 0.00 cfs)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=1,076.00' (Free Discharge)
└─**5=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond 6P: Reservior (Basin 1 Outflow)



Summary for Pond 7P: Reservior (Basin 2 Outflow)

Inflow Area = 2.000 ac, 18.45% Impervious, Inflow Depth = 1.66" for 10yr-24hr event
Inflow = 6.14 cfs @ 11.96 hrs, Volume= 0.277 af
Outflow = 5.61 cfs @ 11.99 hrs, Volume= 0.275 af, Atten= 9%, Lag= 1.8 min
Primary = 5.61 cfs @ 11.99 hrs, Volume= 0.275 af
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 0.00-26.00 hrs, dt= 0.02 hrs
Peak Elev= 1,053.38' @ 11.99 hrs Surf.Area= 0.044 ac Storage= 0.053 af

Plug-Flow detention time= 28.4 min calculated for 0.275 af (99% of inflow)
Center-of-Mass det. time= 25.6 min (855.6 - 829.9)

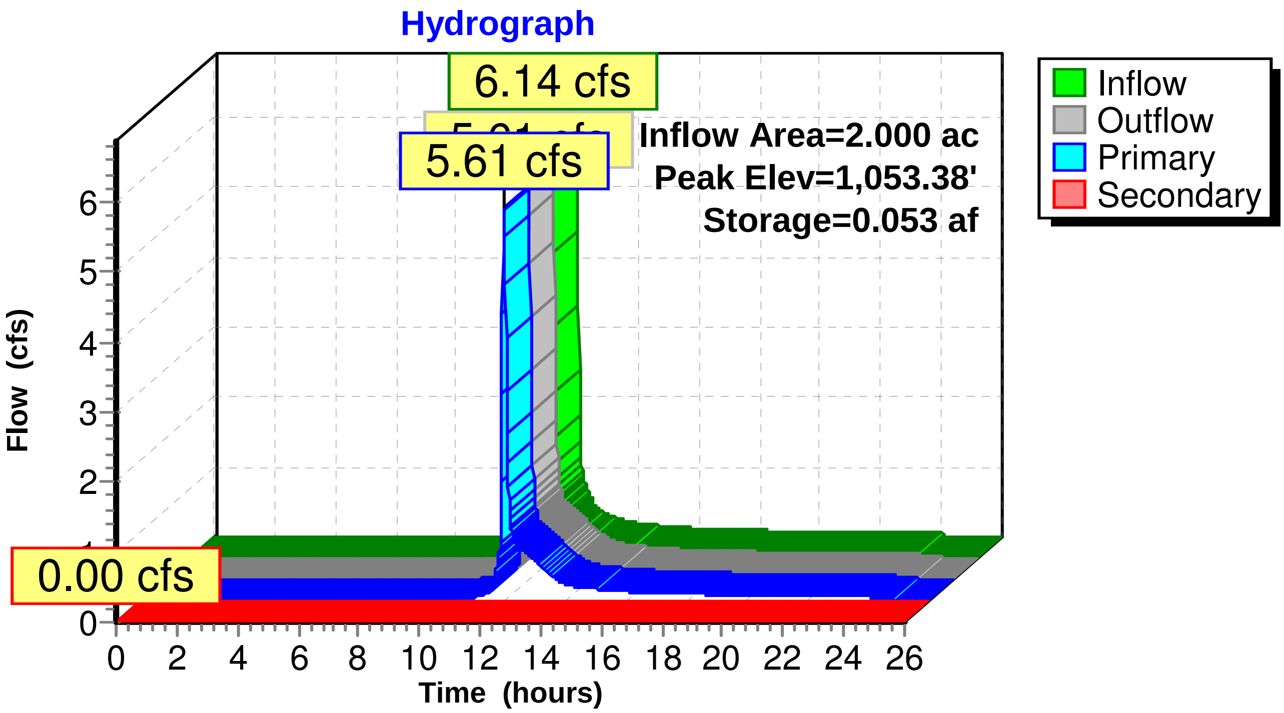
Volume	Invert	Avail.Storage	Storage Description
#1	1,052.00'	0.203 af	**20.00'W x 70.00'L x 4.00'H Trapezoid Z=2.0**

Device	Routing	Invert	Outlet Devices
#1	Device 4	1,052.00'	**6.0" Vert. Orifice/Grate** C= 0.600
#2	Device 4	1,053.00'	**6.00' W x 6.00' H Vert. Orifice/Grate** C= 0.600
#3	Device 4	1,054.00'	**11.5' long Sharp-Crested Rectangular Weir** 2 End Contraction(s)
#4	Primary	1,050.50'	**18.0" x 62.0' long Culvert** Ke= 0.500 Outlet Invert= 1,049.01' S= 0.0240 '/' Cc= 0.600 n= 0.013
#5	Secondary	1,054.50'	**12.0' long Broad-Crested Rectangular Weir** Head (feet) 1,054.50 Coef. (English) 2.60

Primary OutFlow Max=5.55 cfs @ 11.99 hrs HW=1,053.38' (Free Discharge)
└─**4=Culvert** (Passes 5.55 cfs of 8.28 cfs potential flow)
  ├─**1=Orifice/Grate** (Orifice Controls 1.01 cfs @ 5.12 fps)
  ├─**2=Orifice/Grate** (Orifice Controls 4.54 cfs @ 1.98 fps)
  └─**3=Sharp-Crested Rectangular Weir** (Controls 0.00 cfs)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=1,052.00' (Free Discharge)
└─**5=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond 7P: Reservior (Basin 2 Outflow)

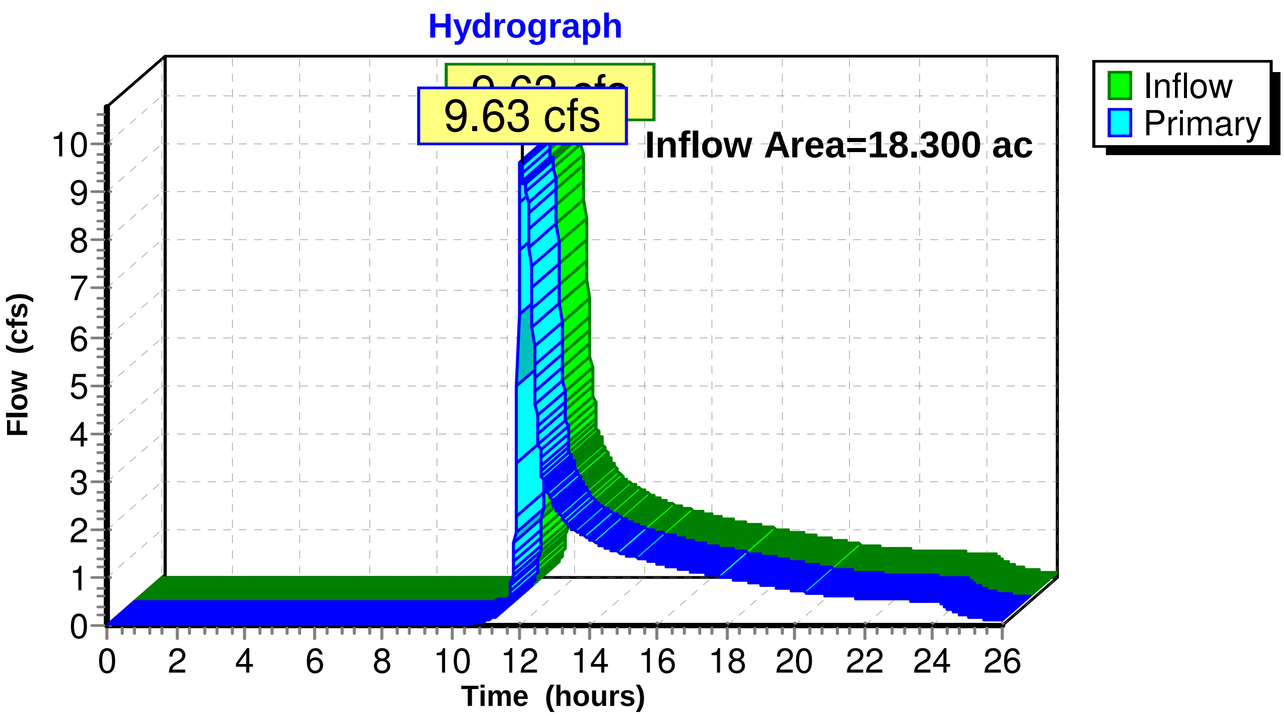


Summary for Link 9: Combine (Post DA-1)

Inflow Area = 18.300 ac, 5.30% Impervious, Inflow Depth > 1.00" for 10yr-24hr event
Inflow = 9.63 cfs @ 12.03 hrs, Volume= 1.521 af
Primary = 9.63 cfs @ 12.03 hrs, Volume= 1.521 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-26.00 hrs, dt= 0.02 hrs

Link 9: Combine (Post DA-1)



Time span=0.00-26.00 hrs, dt=0.02 hrs, 1301 points
Runoff by SCS TR-20 method, UH=SCS
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 1S: SCS Runoff (Pre-DA-1) Runoff Area=18.300 ac 1.09% Impervious Runoff Depth=1.36"
Flow Length=1,469' Tc=24.6 min CN=71 Runoff=23.25 cfs 2.074 af

Subcatchment 2S: SCS Runoff (Post DA-1 Runoff Area=9.400 ac 2.13% Impervious Runoff Depth=1.70"
Flow Length=1,012' Tc=23.9 min CN=76 Runoff=15.75 cfs 1.332 af

Subcatchment 3S: SCS Runoff (Post DA-1 Runoff Area=2.000 ac 18.45% Impervious Runoff Depth=2.16"
Tc=5.0 min CN=82 Runoff=7.93 cfs 0.360 af

Subcatchment 4S: SCS Runoff (Post DA-1 Runoff Area=6.900 ac 5.80% Impervious Runoff Depth=1.63"
Flow Length=1,556' Tc=24.1 min CN=75 Runoff=10.98 cfs 0.937 af

Reach 8R: Reach (Basin 1 Reach) Avg. Depth=0.30' Max Vel=3.42 fps Inflow=2.67 cfs 0.904 af
n=0.033 L=400.0' S=0.0400 '/' Capacity=114.92 cfs Outflow=2.67 cfs 0.903 af

Pond 5P: Reservior (Forebay Outflow) Peak Elev=1,085.73' Storage=0.442 af Inflow=15.75 cfs 1.332 af
Outflow=11.47 cfs 0.923 af

Pond 6P: Reservior (Basin 1 Outflow) Peak Elev=1,077.67' Storage=0.231 af Inflow=11.47 cfs 0.923 af
Primary=2.67 cfs 0.904 af Secondary=0.00 cfs 0.000 af Outflow=2.67 cfs 0.904 af

Pond 7P: Reservior (Basin 2 Outflow) Peak Elev=1,053.48' Storage=0.057 af Inflow=7.93 cfs 0.360 af
Primary=7.46 cfs 0.359 af Secondary=0.00 cfs 0.000 af Outflow=7.46 cfs 0.359 af

Link 9: Combine (Post DA-1) Inflow=13.19 cfs 2.198 af
Primary=13.19 cfs 2.198 af

Total Runoff Area = 36.600 ac Runoff Volume = 4.703 af Average Runoff Depth = 1.54"
96.81% Pervious = 35.431 ac 3.19% Impervious = 1.169 ac

Summary for Subcatchment 1S: SCS Runoff (Pre-DA-1)

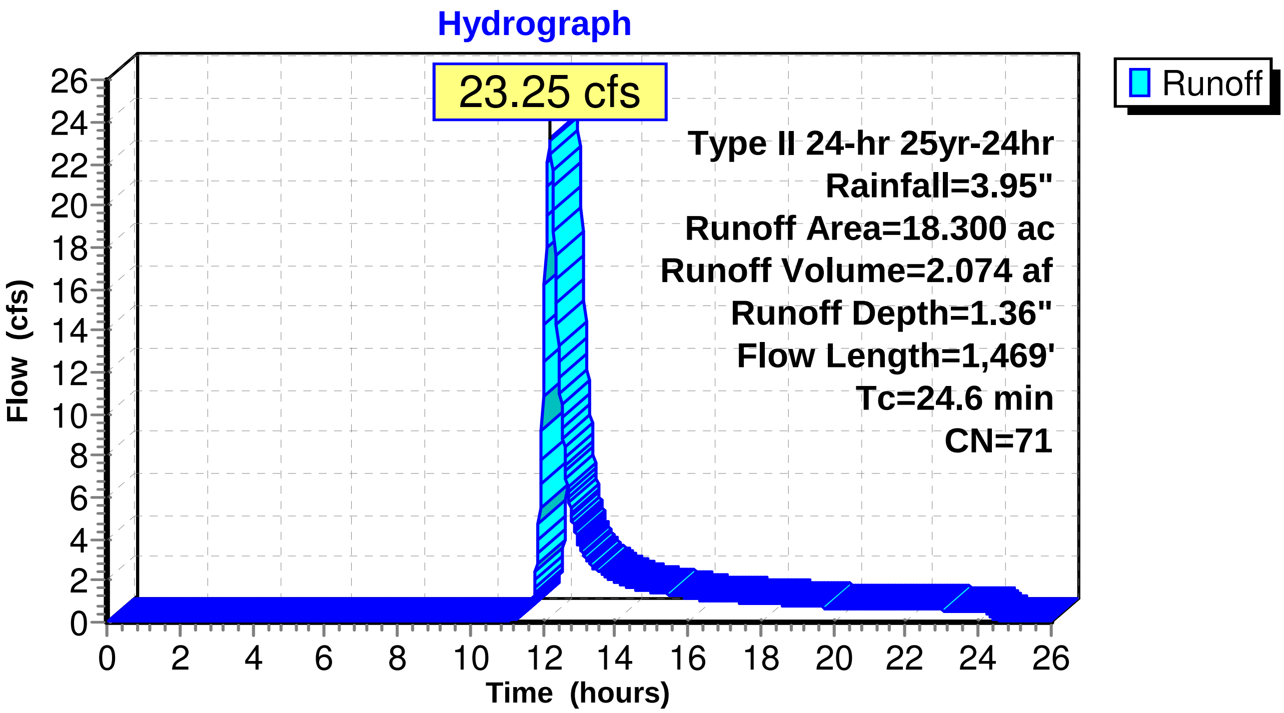
Runoff = 23.25 cfs @ 12.19 hrs, Volume= 2.074 af, Depth= 1.36"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-26.00 hrs, dt= 0.02 hrs
Type II 24-hr 25yr-24hr Rainfall=3.95"

	Area (ac)	CN	Description
*	0.200	98	
*	0.200	89	
*	11.200	71	
*	6.700	70	
	18.300	71	Weighted Average
	18.100		Pervious Area
	0.200		Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
21.1	100	0.1200	0.08		**Sheet Flow, Sheet Flow** n= 0.800 P2= 2.39"
1.3	573	0.2200	7.55		**Shallow Concentrated Flow, Shallow Concentrated Flow A** Unpaved Kv= 16.1 fps
1.8	429	0.0600	3.94		**Shallow Concentrated Flow, Shallow Concentrated Flow B** Unpaved Kv= 16.1 fps
0.4	367	0.0870	14.16	169.93	**Channel Flow, Channel Flow** Area= 12.0 sf Perim= 10.9' r= 1.10' n= 0.033
24.6	1,469	Total			

Subcatchment 1S: SCS Runoff (Pre-DA-1)



Summary for Subcatchment 2S: SCS Runoff (Post DA-1 Detained 1)

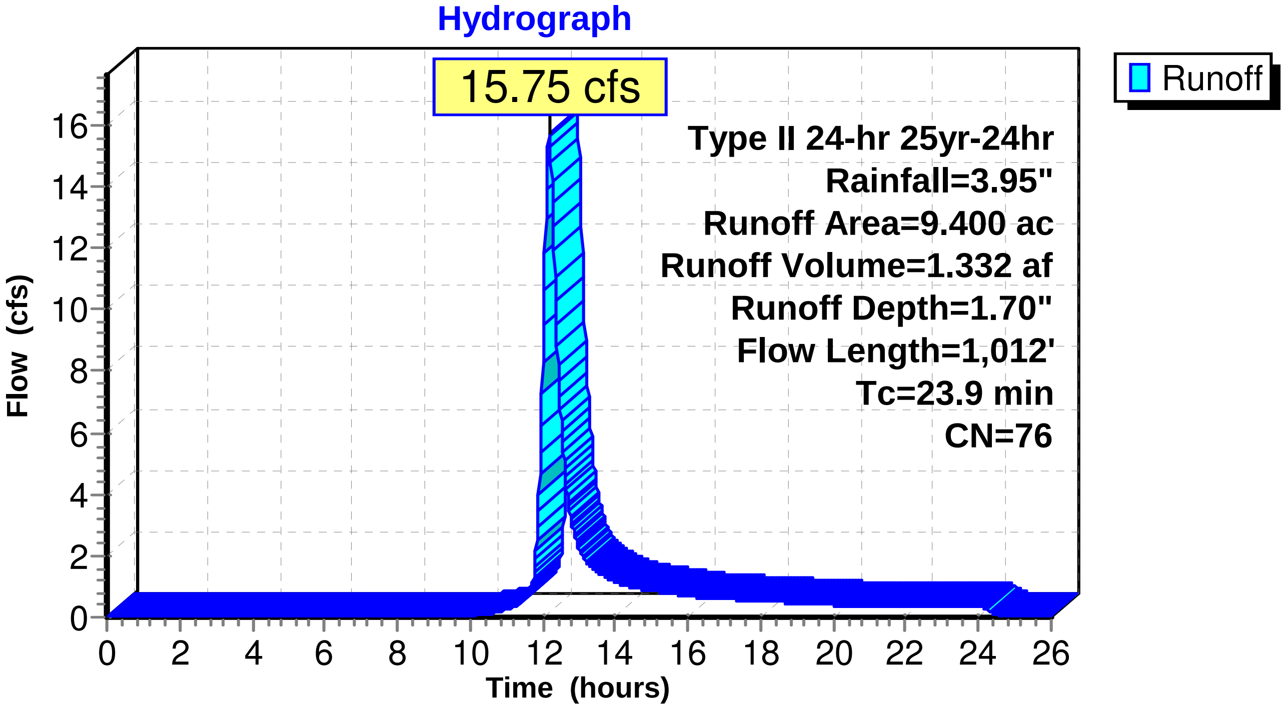
Runoff = 15.75 cfs @ 12.18 hrs, Volume= 1.332 af, Depth= 1.70"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-26.00 hrs, dt= 0.02 hrs
Type II 24-hr 25yr-24hr Rainfall=3.95"

	Area (ac)	CN	Description
*	0.200	98	
*	2.300	89	
*	6.000	71	
*	0.900	70	
	9.400	76	Weighted Average
	9.200		Pervious Area
	0.200		Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
21.1	100	0.1200	0.08		**Sheet Flow, Sheet Flow** n= 0.800 P2= 2.39"
0.7	332	0.2600	8.21		**Shallow Concentrated Flow, Shallow Concentrated Flow A** Unpaved Kv= 16.1 fps
1.3	270	0.0300	3.52		**Shallow Concentrated Flow, Shallow Concentrated Flow B** Paved Kv= 20.3 fps
0.1	88	0.3800	9.92		**Shallow Concentrated Flow, Shallow Concentrated Flow C** Unpaved Kv= 16.1 fps
0.7	222	0.0140	5.68	68.17	**Channel Flow, Channel Flow** Area= 12.0 sf Perim= 10.9' r= 1.10' n= 0.033
23.9	1,012	Total			

Subcatchment 2S: SCS Runoff (Post DA-1 Detained 1)



Summary for Subcatchment 3S: SCS Runoff (Post DA-1 Detained 2)

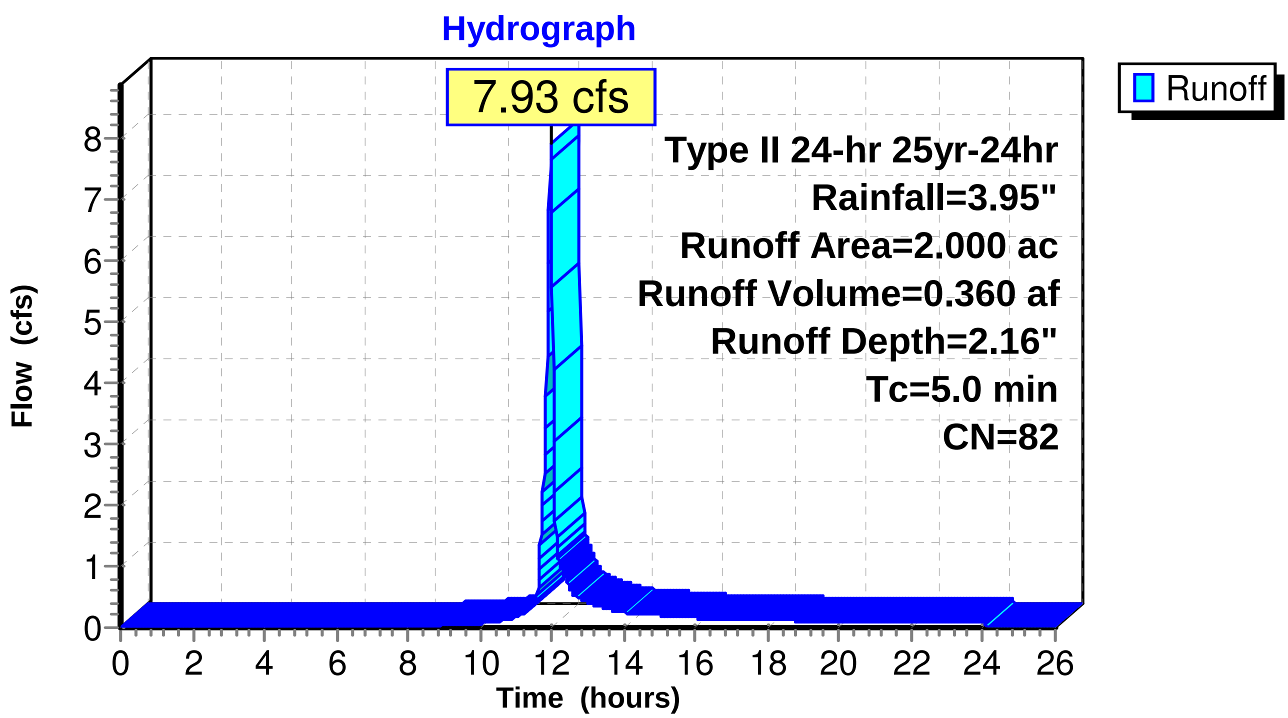
Runoff = 7.93 cfs @ 11.96 hrs, Volume= 0.360 af, Depth= 2.16"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-26.00 hrs, dt= 0.02 hrs
Type II 24-hr 25yr-24hr Rainfall=3.95"

	Area (ac)	CN	Description
*	0.369	98	
*	0.631	89	
*	1.000	71	
	2.000	82	Weighted Average
	1.631		Pervious Area
	0.369		Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry, User**

Subcatchment 3S: SCS Runoff (Post DA-1 Detained 2)



Summary for Subcatchment 4S: SCS Runoff (Post DA-1 Undetained)

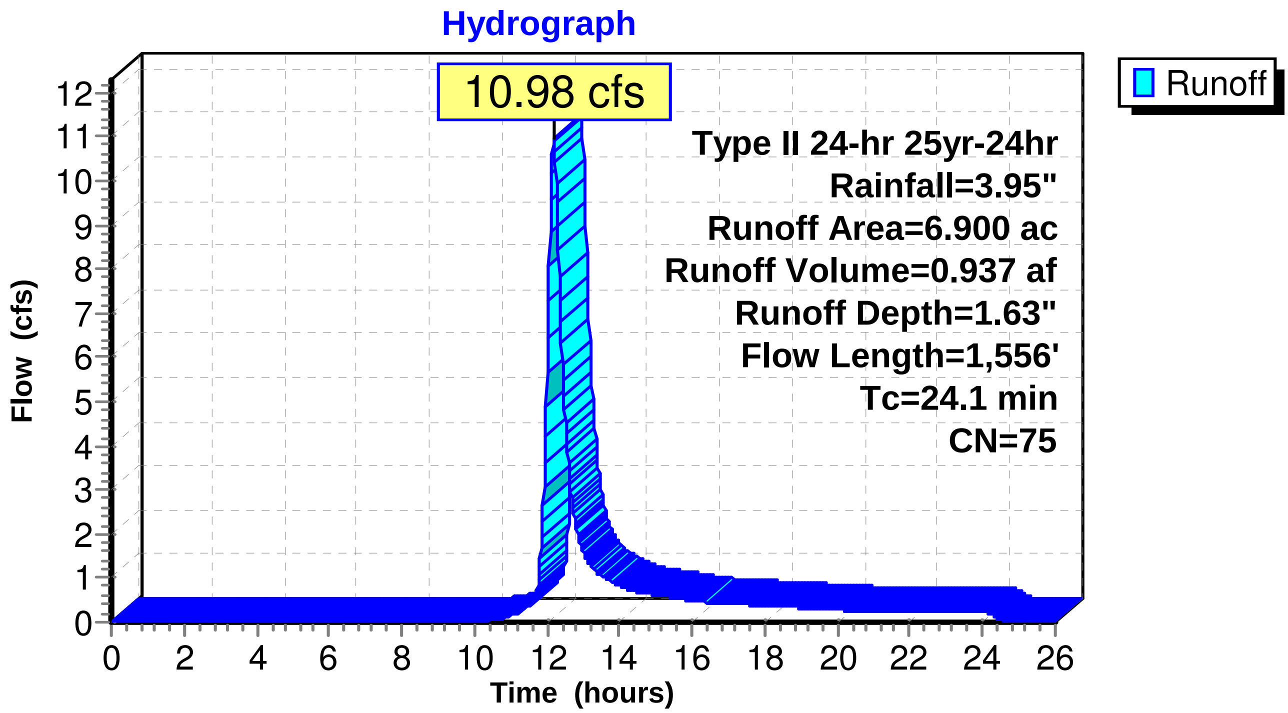
Runoff = 10.98 cfs @ 12.18 hrs, Volume= 0.937 af, Depth= 1.63"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-26.00 hrs, dt= 0.02 hrs
Type II 24-hr 25yr-24hr Rainfall=3.95"

	Area (ac)	CN	Description
*	0.400	98	
*	0.900	89	
*	4.100	71	
*	1.500	70	
	6.900	75	Weighted Average
	6.500		Pervious Area
	0.400		Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
21.1	100	0.1200	0.08		**Sheet Flow, Sheet Flow** n= 0.800 P2= 2.39"
0.9	412	0.2300	7.72		**Shallow Concentrated Flow, Shallow Concentrated Flow A** Unpaved Kv= 16.1 fps
1.3	312	0.0580	3.88		**Shallow Concentrated Flow, Shallow Concentrated Flow B** Unpaved Kv= 16.1 fps
0.8	732	0.0960	14.88	178.51	**Channel Flow, Channel Flow** Area= 12.0 sf Perim= 10.9' r= 1.10' n= 0.033
24.1	1,556	Total			

Subcatchment 4S: SCS Runoff (Post DA-1 Undetained)



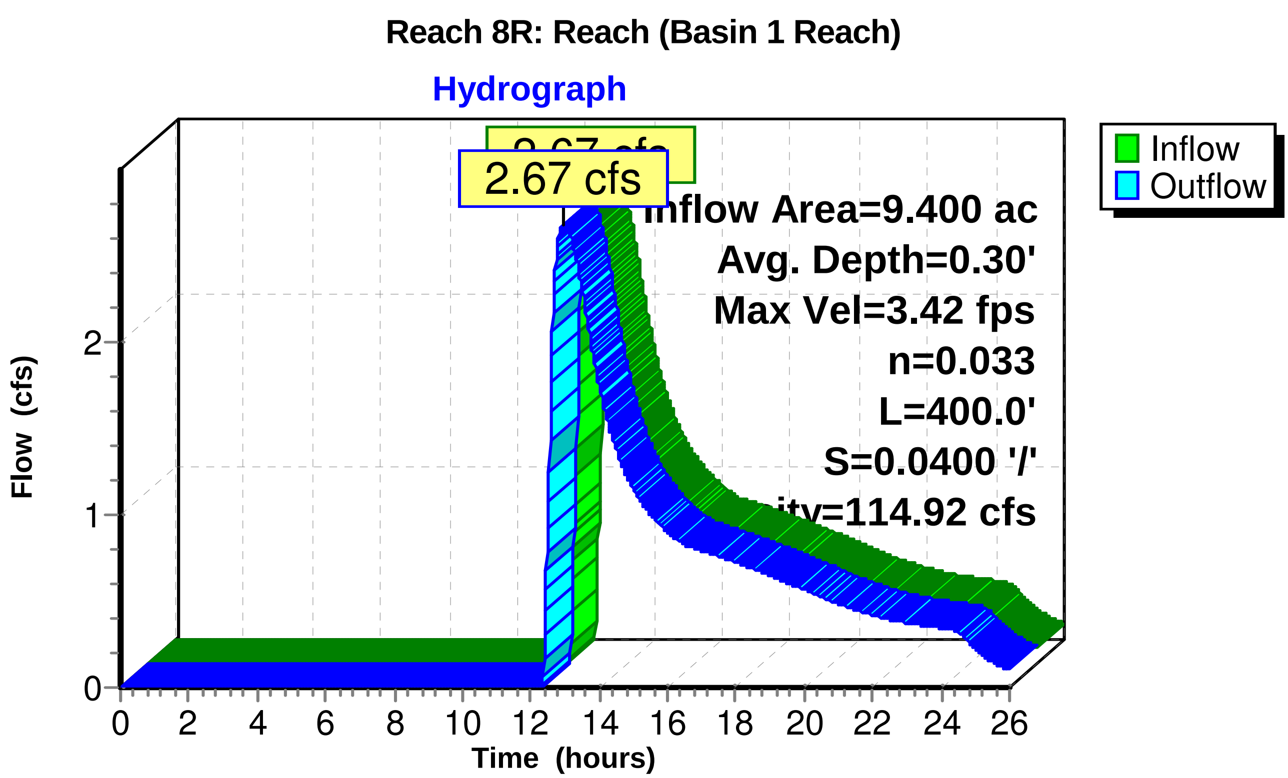
Summary for Reach 8R: Reach (Basin 1 Reach)

Inflow Area = 9.400 ac, 2.13% Impervious, Inflow Depth > 1.15" for 25yr-24hr event
Inflow = 2.67 cfs @ 12.92 hrs, Volume= 0.904 af
Outflow = 2.67 cfs @ 12.97 hrs, Volume= 0.903 af, Atten= 0%, Lag= 3.4 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-26.00 hrs, dt= 0.02 hrs
Max. Velocity= 3.42 fps, Min. Travel Time= 2.0 min
Avg. Velocity = 2.16 fps, Avg. Travel Time= 3.1 min

Peak Storage= 312 cf @ 12.94 hrs, Average Depth at Peak Storage= 0.30'
Bank-Full Depth= 2.00', Capacity at Bank-Full= 114.92 cfs

2.00' x 2.00' deep channel, n= 0.033
Side Slope Z-value= 2.0 '/' Top Width= 10.00'
Length= 400.0' Slope= 0.0400 '/'
Inlet Invert= 1,072.00', Outlet Invert= 1,056.00'



Summary for Pond 5P: Reservior (Forebay Outflow)

Inflow Area = 9.400 ac, 2.13% Impervious, Inflow Depth = 1.70" for 25yr-24hr event
Inflow = 15.75 cfs @ 12.18 hrs, Volume= 1.332 af
Outflow = 11.47 cfs @ 12.33 hrs, Volume= 0.923 af, Atten= 27%, Lag= 9.2 min
Primary = 11.47 cfs @ 12.33 hrs, Volume= 0.923 af

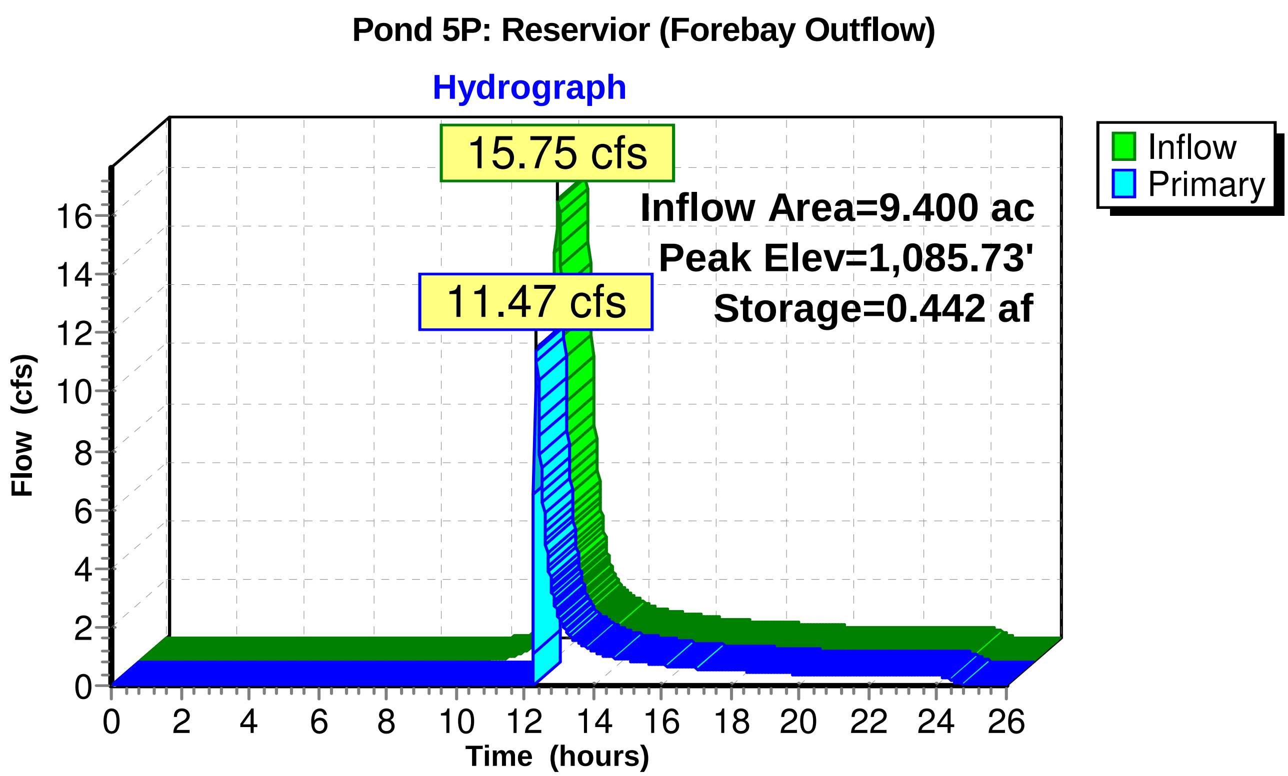
Routing by Stor-Ind method, Time Span= 0.00-26.00 hrs, dt= 0.02 hrs
Peak Elev= 1,085.73' @ 12.33 hrs Surf.Area= 0.149 ac Storage= 0.442 af

Plug-Flow detention time= 173.9 min calculated for 0.923 af (69% of inflow)
Center-of-Mass det. time= 65.0 min (922.2 - 857.3)

Volume	Invert	Avail.Storage	Storage Description
#1	1,082.00'	0.484 af	**30.00'W x 130.00'L x 4.00'H Trapezoid Z=2.0**

Device	Routing	Invert	Outlet Devices
#1	Primary	1,085.50'	**40.0' long Broad-Crested Rectangular Weir** Head (feet) 1,085.50 Coef. (English) 2.60

Primary OutFlow Max=11.39 cfs @ 12.33 hrs HW=1,085.73' (Free Discharge)
└─**1=Broad-Crested Rectangular Weir** (Weir Controls 11.39 cfs @ 1.24 fps)



Summary for Pond 6P: Reservior (Basin 1 Outflow)

Inflow Area = 9.400 ac, 2.13% Impervious, Inflow Depth = 1.18" for 25yr-24hr event
Inflow = 11.47 cfs @ 12.33 hrs, Volume= 0.923 af
Outflow = 2.67 cfs @ 12.92 hrs, Volume= 0.904 af, Atten= 77%, Lag= 35.0 min
Primary = 2.67 cfs @ 12.92 hrs, Volume= 0.904 af
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 0.00-26.00 hrs, dt= 0.02 hrs
Peak Elev= 1,077.67' @ 12.92 hrs Surf.Area= 0.174 ac Storage= 0.231 af

Plug-Flow detention time= 84.4 min calculated for 0.904 af (98% of inflow)
Center-of-Mass det. time= 73.0 min (995.3 - 922.2)

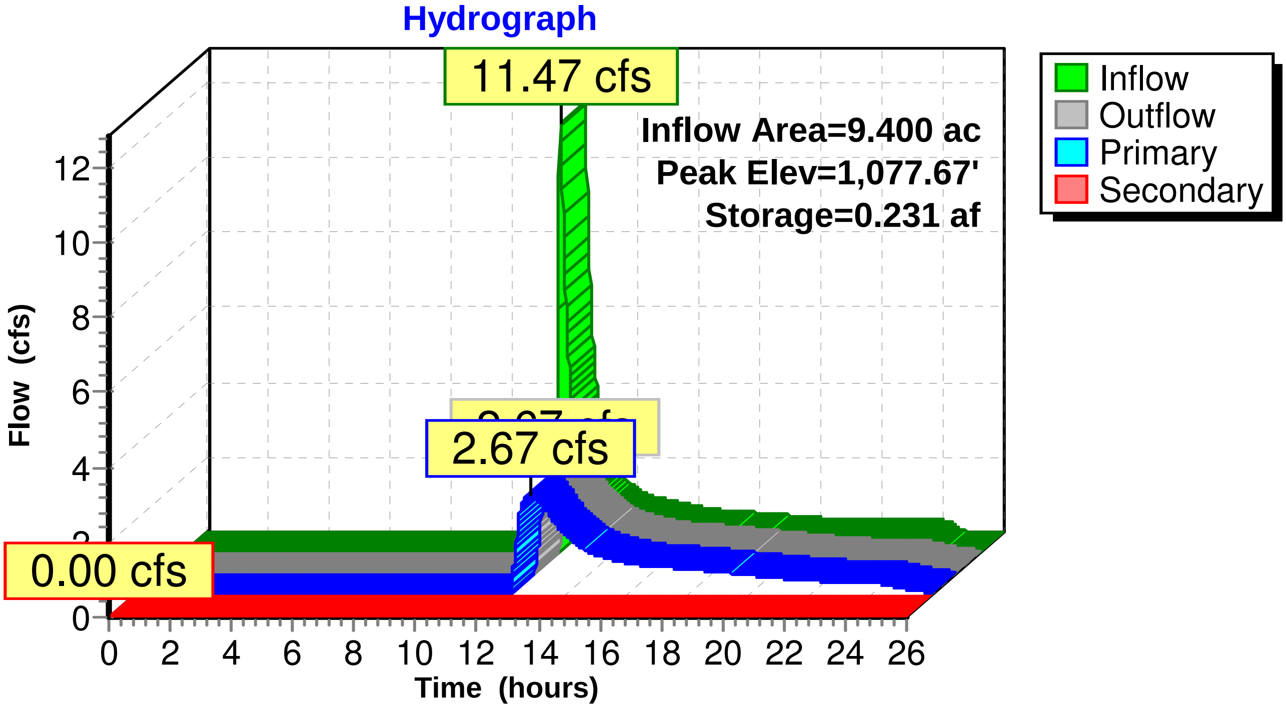
Volume	Invert	Avail.Storage	Storage Description
#1	1,076.00'	0.770 af	**35.00'W x 130.00'L x 4.00'H Trapezoid Z=5.0**

Device	Routing	Invert	Outlet Devices
#1	Device 4	1,076.00'	**6.0" Vert. Orifice/Grate** C= 0.600
#2	Device 4	1,077.00'	**1.00' W x 0.50' H Vert. Orifice/Grate** C= 0.600
#3	Device 4	1,078.00'	**11.5' long Sharp-Crested Rectangular Weir** 2 End Contraction(s)
#4	Primary	1,074.50'	**18.0" x 40.0' long Culvert** Ke= 0.500 Outlet Invert= 1,072.50' S= 0.0500 '/' Cc= 0.600 n= 0.013
#5	Secondary	1,078.50'	**8.0' long Broad-Crested Rectangular Weir** Head (feet) 1,078.50 Coef. (English) 3.33

Primary OutFlow Max=2.67 cfs @ 12.92 hrs HW=1,077.67' (Free Discharge)
└─**4=Culvert** (Passes 2.67 cfs of 8.83 cfs potential flow)
  ├─**1=Orifice/Grate** (Orifice Controls 1.13 cfs @ 5.74 fps)
  ├─**2=Orifice/Grate** (Orifice Controls 1.54 cfs @ 3.08 fps)
  └─**3=Sharp-Crested Rectangular Weir** (Controls 0.00 cfs)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=1,076.00' (Free Discharge)
└─**5=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond 6P: Reservior (Basin 1 Outflow)



Summary for Pond 7P: Reservior (Basin 2 Outflow)

Inflow Area = 2.000 ac, 18.45% Impervious, Inflow Depth = 2.16" for 25yr-24hr event
Inflow = 7.93 cfs @ 11.96 hrs, Volume= 0.360 af
Outflow = 7.46 cfs @ 11.99 hrs, Volume= 0.359 af, Atten= 6%, Lag= 1.5 min
Primary = 7.46 cfs @ 11.99 hrs, Volume= 0.359 af
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 0.00-26.00 hrs, dt= 0.02 hrs
Peak Elev= 1,053.48' @ 11.99 hrs Surf.Area= 0.045 ac Storage= 0.057 af

Plug-Flow detention time= 25.4 min calculated for 0.358 af (100% of inflow)
Center-of-Mass det. time= 23.2 min (845.6 - 822.4)

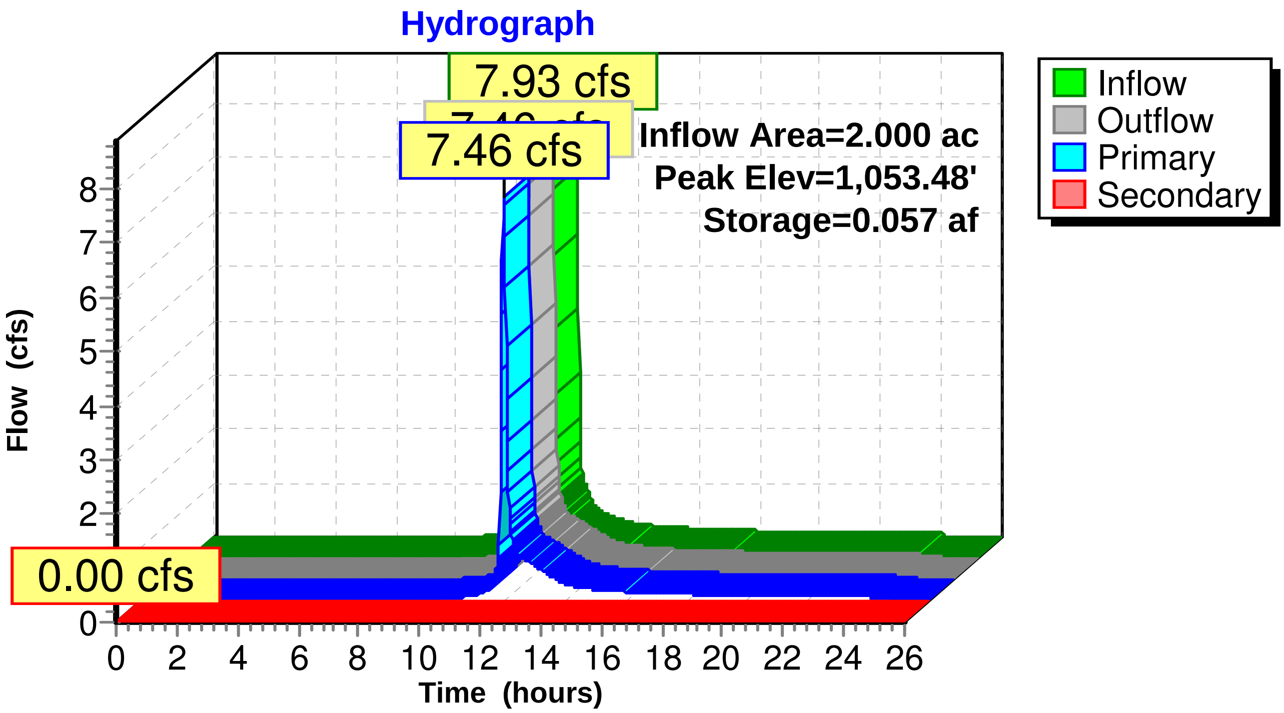
Volume	Invert	Avail.Storage	Storage Description
#1	1,052.00'	0.203 af	**20.00'W x 70.00'L x 4.00'H Trapezoid Z=2.0**

Device	Routing	Invert	Outlet Devices
#1	Device 4	1,052.00'	**6.0" Vert. Orifice/Grate** C= 0.600
#2	Device 4	1,053.00'	**6.00' W x 6.00' H Vert. Orifice/Grate** C= 0.600
#3	Device 4	1,054.00'	**11.5' long Sharp-Crested Rectangular Weir** 2 End Contraction(s)
#4	Primary	1,050.50'	**18.0" x 62.0' long Culvert** Ke= 0.500 Outlet Invert= 1,049.01' S= 0.0240 '/' Cc= 0.600 n= 0.013
#5	Secondary	1,054.50'	**12.0' long Broad-Crested Rectangular Weir** Head (feet) 1,054.50 Coef. (English) 2.60

Primary OutFlow Max=7.42 cfs @ 11.99 hrs HW=1,053.48' (Free Discharge)
└─**4=Culvert** (Passes 7.42 cfs of 8.47 cfs potential flow)
  ├─**1=Orifice/Grate** (Orifice Controls 1.05 cfs @ 5.34 fps)
  ├─**2=Orifice/Grate** (Orifice Controls 6.38 cfs @ 2.22 fps)
  └─**3=Sharp-Crested Rectangular Weir** (Controls 0.00 cfs)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=1,052.00' (Free Discharge)
└─**5=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

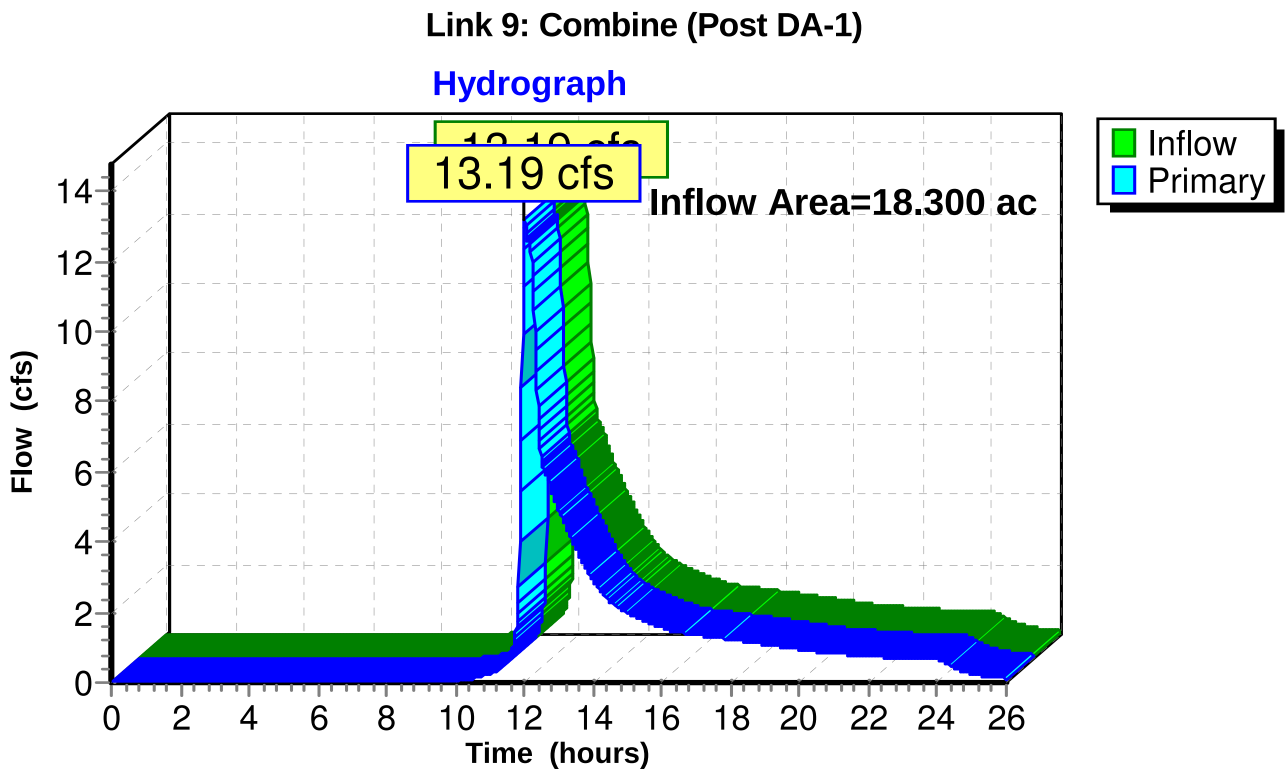
Pond 7P: Reservior (Basin 2 Outflow)



Summary for Link 9: Combine (Post DA-1)

Inflow Area = 18.300 ac, 5.30% Impervious, Inflow Depth > 1.44" for 25yr-24hr event
Inflow = 13.19 cfs @ 12.02 hrs, Volume= 2.198 af
Primary = 13.19 cfs @ 12.02 hrs, Volume= 2.198 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-26.00 hrs, dt= 0.02 hrs



Time span=0.00-26.00 hrs, dt=0.02 hrs, 1301 points
Runoff by SCS TR-20 method, UH=SCS
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 1S: SCS Runoff (Pre-DA-1) Runoff Area=18.300 ac 1.09% Impervious Runoff Depth=1.70"
Flow Length=1,469' Tc=24.6 min CN=71 Runoff=29.66 cfs 2.597 af

Subcatchment 2S: SCS Runoff (Post DA-1 Runoff Area=9.400 ac 2.13% Impervious Runoff Depth=2.08"
Flow Length=1,012' Tc=23.9 min CN=76 Runoff=19.43 cfs 1.631 af

Subcatchment 3S: SCS Runoff (Post DA-1 Runoff Area=2.000 ac 18.45% Impervious Runoff Depth=2.58"
Tc=5.0 min CN=82 Runoff=9.43 cfs 0.431 af

Subcatchment 4S: SCS Runoff (Post DA-1 Runoff Area=6.900 ac 5.80% Impervious Runoff Depth=2.00"
Flow Length=1,556' Tc=24.1 min CN=75 Runoff=13.63 cfs 1.152 af

Reach 8R: Reach (Basin 1 Reach) Avg. Depth=0.45' Max Vel=4.26 fps Inflow=5.61 cfs 1.201 af
n=0.033 L=400.0' S=0.0400 '/' Capacity=114.92 cfs Outflow=5.57 cfs 1.200 af

Pond 5P: Reservior (Forebay Outflow) Peak Elev=1,085.81' Storage=0.454 af Inflow=19.43 cfs 1.631 af
Outflow=17.59 cfs 1.222 af

Pond 6P: Reservior (Basin 1 Outflow) Peak Elev=1,078.14' Storage=0.318 af Inflow=17.59 cfs 1.222 af
Primary=5.61 cfs 1.201 af Secondary=0.00 cfs 0.000 af Outflow=5.61 cfs 1.201 af

Pond 7P: Reservior (Basin 2 Outflow) Peak Elev=1,053.56' Storage=0.061 af Inflow=9.43 cfs 0.431 af
Primary=8.64 cfs 0.429 af Secondary=0.00 cfs 0.000 af Outflow=8.64 cfs 0.429 af

Link 9: Combine (Post DA-1) Inflow=16.43 cfs 2.781 af
Primary=16.43 cfs 2.781 af

Total Runoff Area = 36.600 ac Runoff Volume = 5.811 af Average Runoff Depth = 1.91"
96.81% Pervious = 35.431 ac 3.19% Impervious = 1.169 ac

Summary for Subcatchment 1S: SCS Runoff (Pre-DA-1)

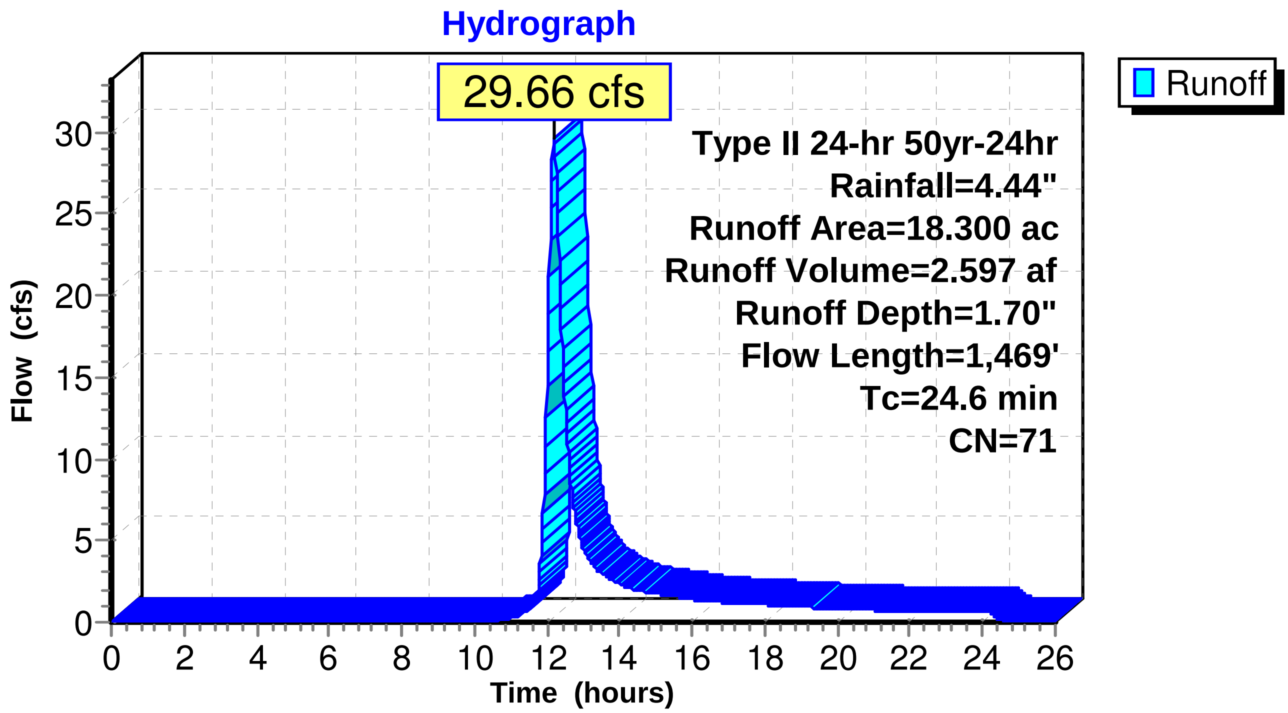
Runoff = 29.66 cfs @ 12.19 hrs, Volume= 2.597 af, Depth= 1.70"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-26.00 hrs, dt= 0.02 hrs
Type II 24-hr 50yr-24hr Rainfall=4.44"

	Area (ac)	CN	Description
*	0.200	98	
*	0.200	89	
*	11.200	71	
*	6.700	70	
	18.300	71	Weighted Average
	18.100		Pervious Area
	0.200		Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
21.1	100	0.1200	0.08		**Sheet Flow, Sheet Flow** n= 0.800 P2= 2.39"
1.3	573	0.2200	7.55		**Shallow Concentrated Flow, Shallow Concentrated Flow A** Unpaved Kv= 16.1 fps
1.8	429	0.0600	3.94		**Shallow Concentrated Flow, Shallow Concentrated Flow B** Unpaved Kv= 16.1 fps
0.4	367	0.0870	14.16	169.93	**Channel Flow, Channel Flow** Area= 12.0 sf Perim= 10.9' r= 1.10' n= 0.033
24.6	1,469	Total			

Subcatchment 1S: SCS Runoff (Pre-DA-1)



Summary for Subcatchment 2S: SCS Runoff (Post DA-1 Detained 1)

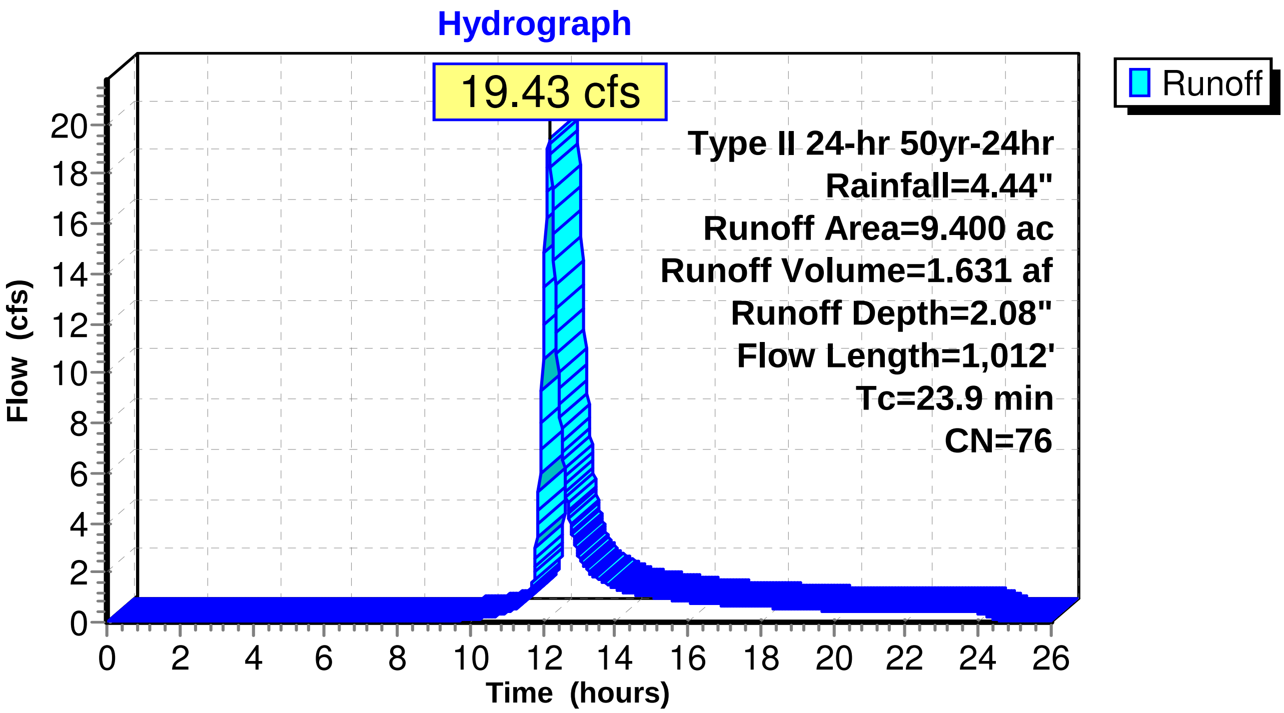
Runoff = 19.43 cfs @ 12.18 hrs, Volume= 1.631 af, Depth= 2.08"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-26.00 hrs, dt= 0.02 hrs
Type II 24-hr 50yr-24hr Rainfall=4.44"

	Area (ac)	CN	Description
*	0.200	98	
*	2.300	89	
*	6.000	71	
*	0.900	70	
	9.400	76	Weighted Average
	9.200		Pervious Area
	0.200		Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
21.1	100	0.1200	0.08		**Sheet Flow, Sheet Flow** n= 0.800 P2= 2.39"
0.7	332	0.2600	8.21		**Shallow Concentrated Flow, Shallow Concentrated Flow A** Unpaved Kv= 16.1 fps
1.3	270	0.0300	3.52		**Shallow Concentrated Flow, Shallow Concentrated Flow B** Paved Kv= 20.3 fps
0.1	88	0.3800	9.92		**Shallow Concentrated Flow, Shallow Concentrated Flow C** Unpaved Kv= 16.1 fps
0.7	222	0.0140	5.68	68.17	**Channel Flow, Channel Flow** Area= 12.0 sf Perim= 10.9' r= 1.10' n= 0.033
23.9	1,012	Total			

Subcatchment 2S: SCS Runoff (Post DA-1 Detained 1)



Summary for Subcatchment 3S: SCS Runoff (Post DA-1 Detained 2)

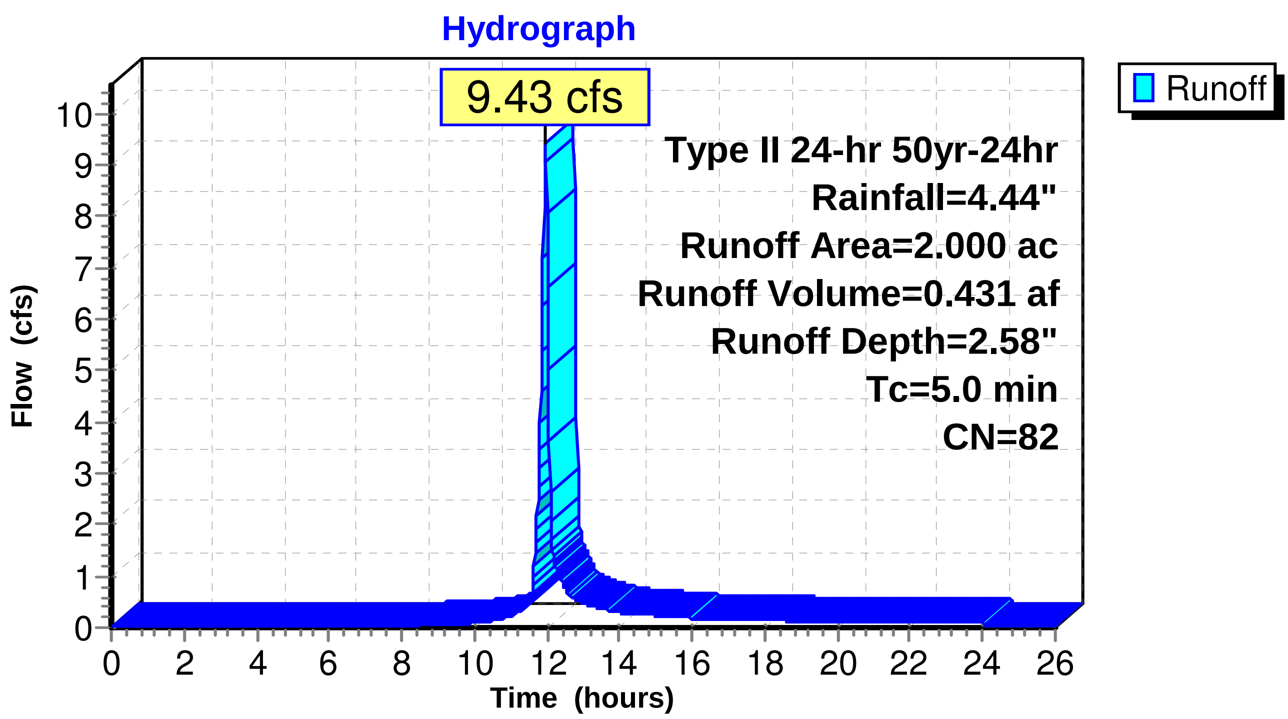
Runoff = 9.43 cfs @ 11.96 hrs, Volume= 0.431 af, Depth= 2.58"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-26.00 hrs, dt= 0.02 hrs
Type II 24-hr 50yr-24hr Rainfall=4.44"

	Area (ac)	CN	Description
*	0.369	98	
*	0.631	89	
*	1.000	71	
	2.000	82	Weighted Average
	1.631		Pervious Area
	0.369		Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry, User**

Subcatchment 3S: SCS Runoff (Post DA-1 Detained 2)



Summary for Subcatchment 4S: SCS Runoff (Post DA-1 Undetained)

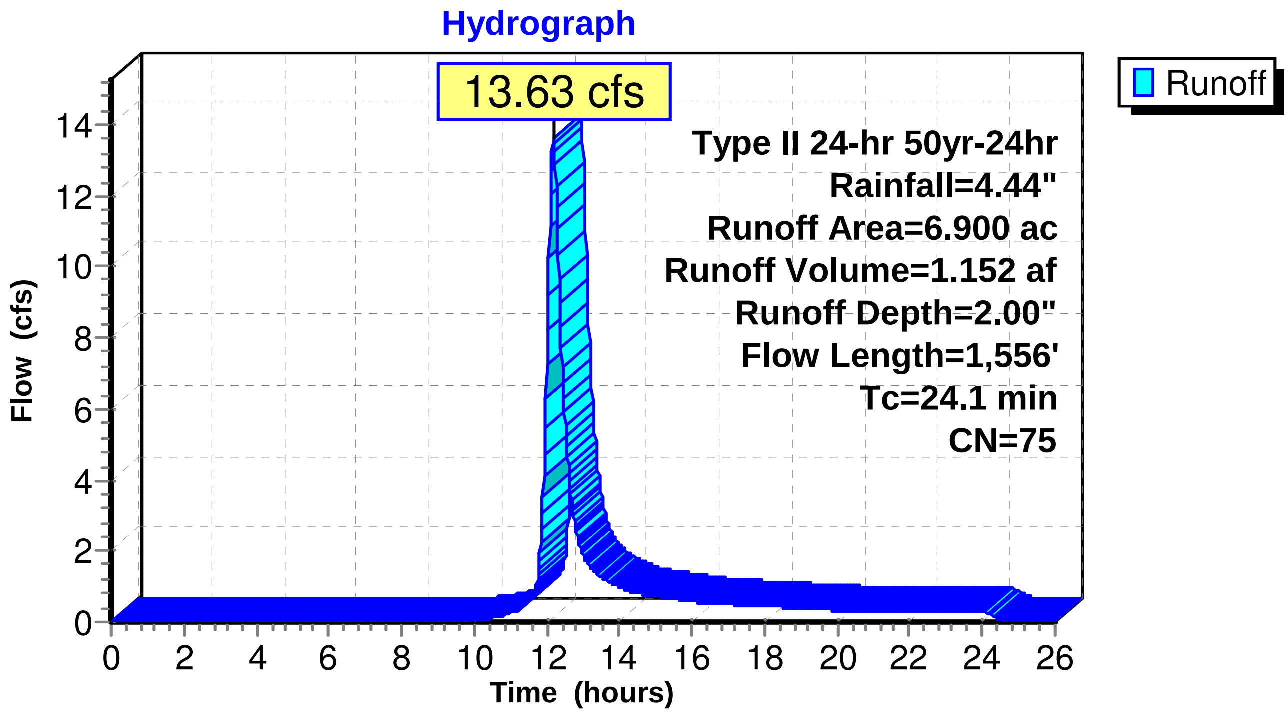
Runoff = 13.63 cfs @ 12.18 hrs, Volume= 1.152 af, Depth= 2.00"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-26.00 hrs, dt= 0.02 hrs
Type II 24-hr 50yr-24hr Rainfall=4.44"

	Area (ac)	CN	Description
*	0.400	98	
*	0.900	89	
*	4.100	71	
*	1.500	70	
	6.900	75	Weighted Average
	6.500		Pervious Area
	0.400		Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
21.1	100	0.1200	0.08		**Sheet Flow, Sheet Flow** n= 0.800 P2= 2.39"
0.9	412	0.2300	7.72		**Shallow Concentrated Flow, Shallow Concentrated Flow A** Unpaved Kv= 16.1 fps
1.3	312	0.0580	3.88		**Shallow Concentrated Flow, Shallow Concentrated Flow B** Unpaved Kv= 16.1 fps
0.8	732	0.0960	14.88	178.51	**Channel Flow, Channel Flow** Area= 12.0 sf Perim= 10.9' r= 1.10' n= 0.033
24.1	1,556	Total			

Subcatchment 4S: SCS Runoff (Post DA-1 Undetained)



Summary for Reach 8R: Reach (Basin 1 Reach)

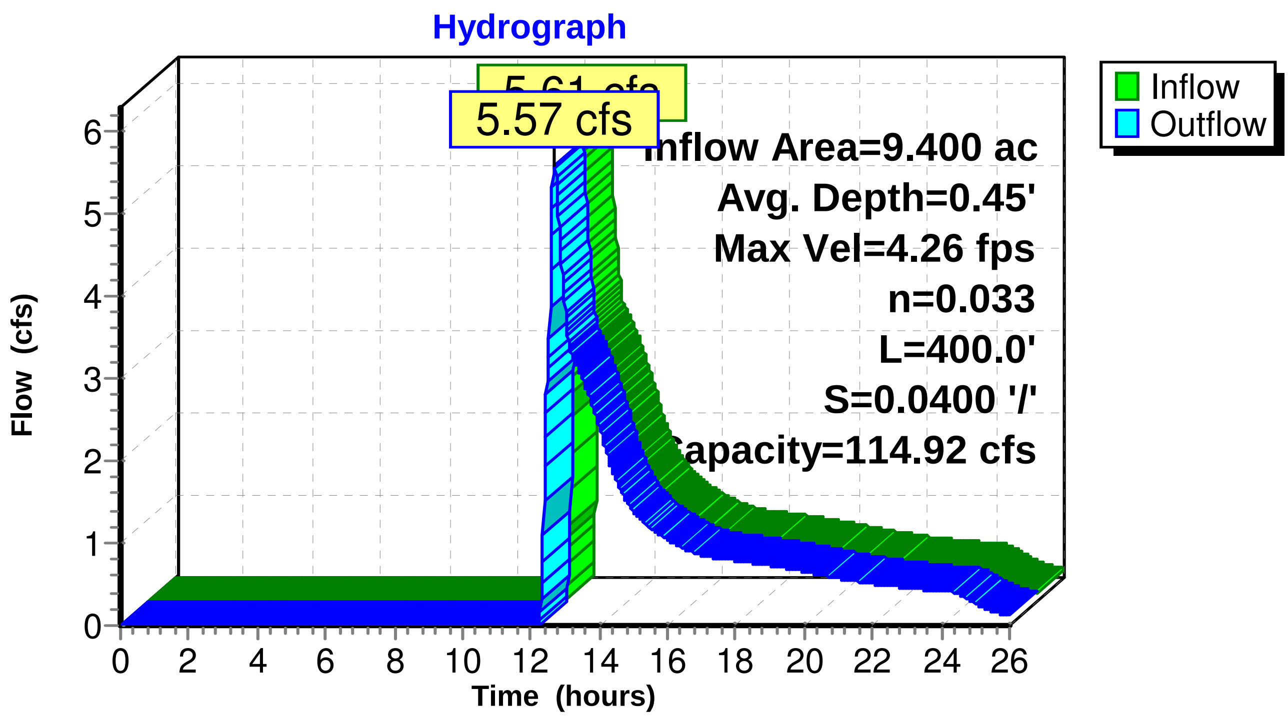
Inflow Area = 9.400 ac, 2.13% Impervious, Inflow Depth > 1.53" for 50yr-24hr event
Inflow = 5.61 cfs @ 12.65 hrs, Volume= 1.201 af
Outflow = 5.57 cfs @ 12.69 hrs, Volume= 1.200 af, Atten= 1%, Lag= 2.9 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-26.00 hrs, dt= 0.02 hrs
Max. Velocity= 4.26 fps, Min. Travel Time= 1.6 min
Avg. Velocity = 2.33 fps, Avg. Travel Time= 2.9 min

Peak Storage= 523 cf @ 12.67 hrs, Average Depth at Peak Storage= 0.45'
Bank-Full Depth= 2.00', Capacity at Bank-Full= 114.92 cfs

2.00' x 2.00' deep channel, n= 0.033
Side Slope Z-value= 2.0 '/' Top Width= 10.00'
Length= 400.0' Slope= 0.0400 '/'
Inlet Invert= 1,072.00', Outlet Invert= 1,056.00'

Reach 8R: Reach (Basin 1 Reach)



Summary for Pond 5P: Reservior (Forebay Outflow)

Inflow Area = 9.400 ac, 2.13% Impervious, Inflow Depth = 2.08" for 50yr-24hr event
Inflow = 19.43 cfs @ 12.18 hrs, Volume= 1.631 af
Outflow = 17.59 cfs @ 12.26 hrs, Volume= 1.222 af, Atten= 10%, Lag= 5.0 min
Primary = 17.59 cfs @ 12.26 hrs, Volume= 1.222 af

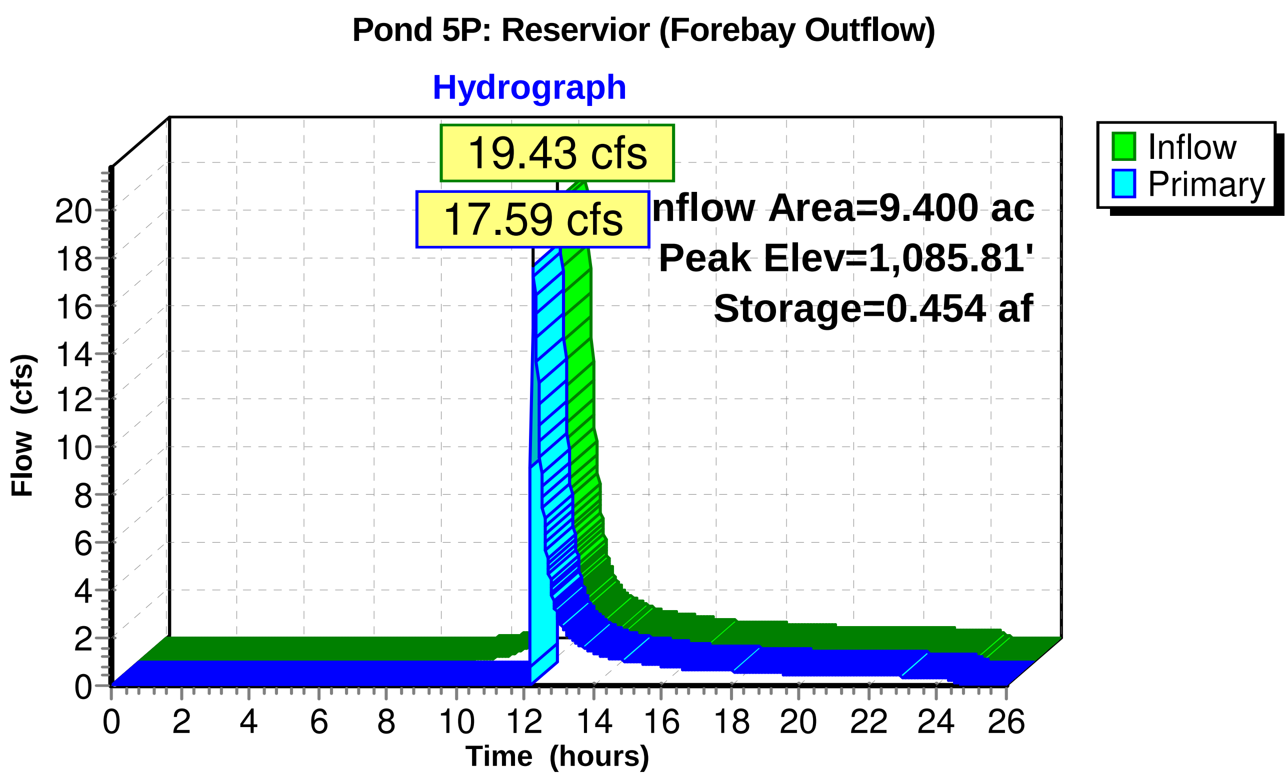
Routing by Stor-Ind method, Time Span= 0.00-26.00 hrs, dt= 0.02 hrs
Peak Elev= 1,085.81' @ 12.26 hrs Surf.Area= 0.151 ac Storage= 0.454 af

Plug-Flow detention time= 146.5 min calculated for 1.221 af (75% of inflow)
Center-of-Mass det. time= 50.0 min (901.4 - 851.4)

Volume	Invert	Avail.Storage	Storage Description
#1	1,082.00'	0.484 af	**30.00'W x 130.00'L x 4.00'H Trapezoid Z=2.0**

Device	Routing	Invert	Outlet Devices
#1	Primary	1,085.50'	**40.0' long Broad-Crested Rectangular Weir** Head (feet) 1,085.50 Coef. (English) 2.60

Primary OutFlow Max=17.57 cfs @ 12.26 hrs HW=1,085.81' (Free Discharge)
└─**1=Broad-Crested Rectangular Weir** (Weir Controls 17.57 cfs @ 1.44 fps)



Summary for Pond 6P: Reservior (Basin 1 Outflow)

Inflow Area =	9.400 ac,	2.13% Impervious,	Inflow Depth = 1.56"	for 50yr-24hr event
Inflow =	17.59 cfs @	12.26 hrs,	Volume=	1.222 af
Outflow =	5.61 cfs @	12.65 hrs,	Volume=	1.201 af, Atten= 68%, Lag= 23.2 min
Primary =	5.61 cfs @	12.65 hrs,	Volume=	1.201 af
Secondary =	0.00 cfs @	0.00 hrs,	Volume=	0.000 af

Routing by Stor-Ind method, Time Span= 0.00-26.00 hrs, dt= 0.02 hrs
Peak Elev= 1,078.14' @ 12.65 hrs Surf.Area= 0.196 ac Storage= 0.318 af

Plug-Flow detention time= 76.8 min calculated for 1.200 af (98% of inflow)
Center-of-Mass det. time= 67.2 min (968.6 - 901.4)

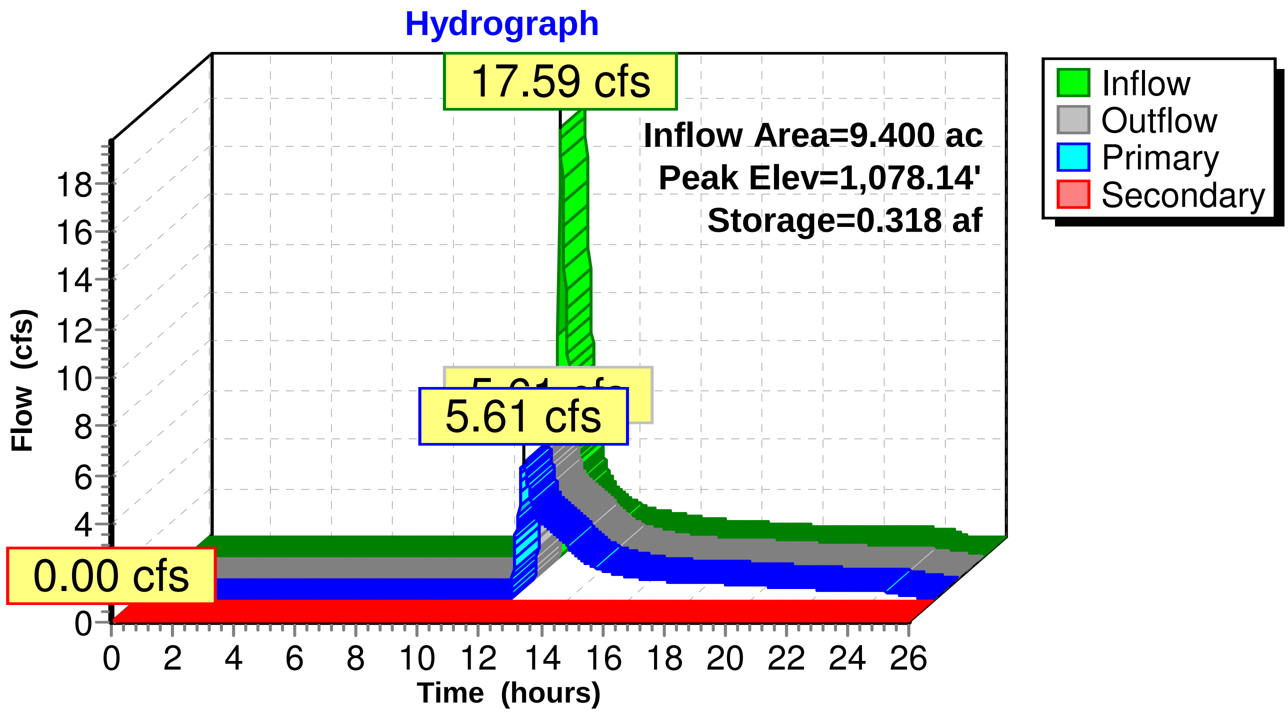
Volume	Invert	Avail.Storage	Storage Description
#1	1,076.00'	0.770 af	**35.00'W x 130.00'L x 4.00'H Trapezoid Z=5.0**

Device	Routing	Invert	Outlet Devices
#1	Device 4	1,076.00'	**6.0" Vert. Orifice/Grate** C= 0.600
#2	Device 4	1,077.00'	**1.00' W x 0.50' H Vert. Orifice/Grate** C= 0.600
#3	Device 4	1,078.00'	**11.5' long Sharp-Crested Rectangular Weir** 2 End Contraction(s)
#4	Primary	1,074.50'	**18.0" x 40.0' long Culvert** Ke= 0.500 Outlet Invert= 1,072.50' S= 0.0500 '/' Cc= 0.600 n= 0.013
#5	Secondary	1,078.50'	**8.0' long Broad-Crested Rectangular Weir** Head (feet) 1,078.50 Coef. (English) 3.33

Primary OutFlow Max=5.59 cfs @ 12.65 hrs HW=1,078.14' (Free Discharge)
└─**4=Culvert** (Passes 5.59 cfs of 9.65 cfs potential flow)
  ├─**1=Orifice/Grate** (Orifice Controls 1.30 cfs @ 6.62 fps)
  ├─**2=Orifice/Grate** (Orifice Controls 2.27 cfs @ 4.53 fps)
  └─**3=Sharp-Crested Rectangular Weir** (Weir Controls 2.02 cfs @ 1.23 fps)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=1,076.00' (Free Discharge)
└─**5=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond 6P: Reservior (Basin 1 Outflow)



Summary for Pond 7P: Reservior (Basin 2 Outflow)

Inflow Area = 2.000 ac, 18.45% Impervious, Inflow Depth = 2.58" for 50yr-24hr event
Inflow = 9.43 cfs @ 11.96 hrs, Volume= 0.431 af
Outflow = 8.64 cfs @ 11.99 hrs, Volume= 0.429 af, Atten= 8%, Lag= 1.7 min
Primary = 8.64 cfs @ 11.99 hrs, Volume= 0.429 af
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 0.00-26.00 hrs, dt= 0.02 hrs
Peak Elev= 1,053.56' @ 11.99 hrs Surf.Area= 0.046 ac Storage= 0.061 af

Plug-Flow detention time= 23.7 min calculated for 0.429 af (100% of inflow)
Center-of-Mass det. time= 21.7 min (839.0 - 817.3)

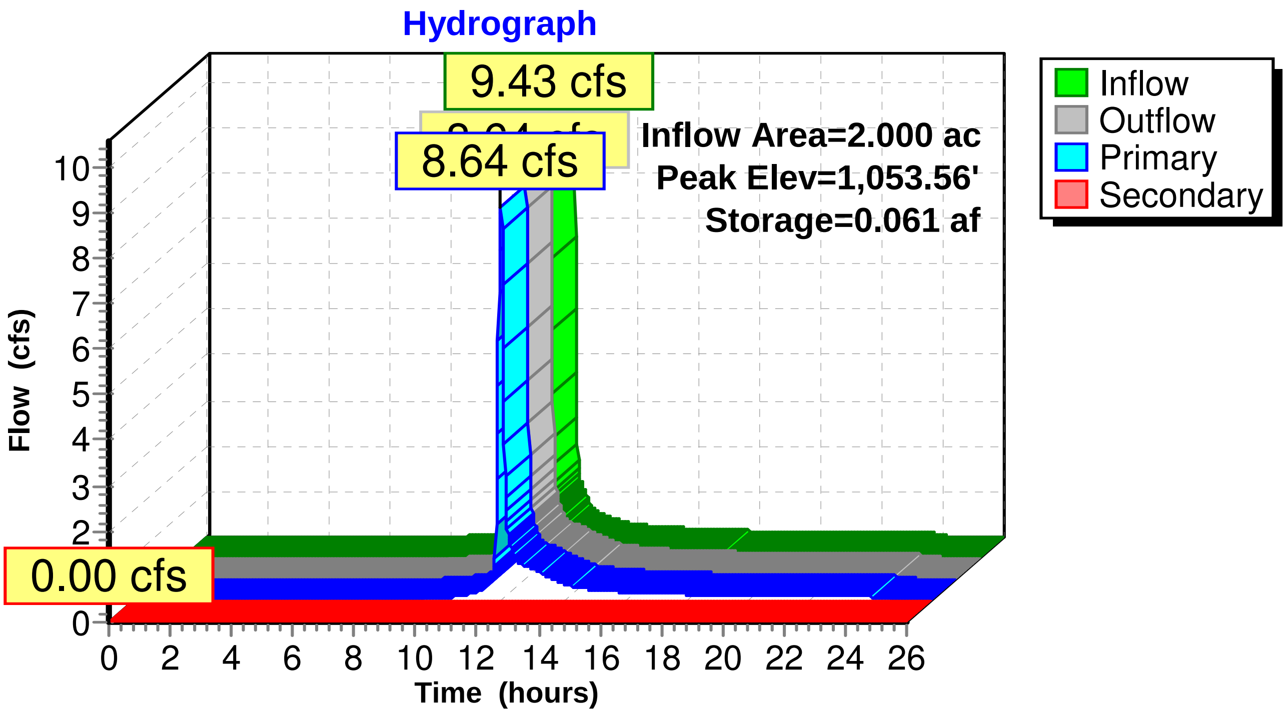
Volume	Invert	Avail.Storage	Storage Description
#1	1,052.00'	0.203 af	**20.00'W x 70.00'L x 4.00'H Trapezoid Z=2.0**

Device	Routing	Invert	Outlet Devices
#1	Device 4	1,052.00'	**6.0" Vert. Orifice/Grate** C= 0.600
#2	Device 4	1,053.00'	**6.00' W x 6.00' H Vert. Orifice/Grate** C= 0.600
#3	Device 4	1,054.00'	**11.5' long Sharp-Crested Rectangular Weir** 2 End Contraction(s)
#4	Primary	1,050.50'	**18.0" x 62.0' long Culvert** Ke= 0.500 Outlet Invert= 1,049.01' S= 0.0240 '/' Cc= 0.600 n= 0.013
#5	Secondary	1,054.50'	**12.0' long Broad-Crested Rectangular Weir** Head (feet) 1,054.50 Coef. (English) 2.60

Primary OutFlow Max=8.62 cfs @ 11.99 hrs HW=1,053.56' (Free Discharge)
└─**4=Culvert** (Inlet Controls 8.62 cfs @ 4.88 fps)
  ├─**1=Orifice/Grate** (Passes < 1.08 cfs potential flow)
  ├─**2=Orifice/Grate** (Passes < 8.06 cfs potential flow)
  └─**3=Sharp-Crested Rectangular Weir** (Controls 0.00 cfs)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=1,052.00' (Free Discharge)
└─**5=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond 7P: Reservior (Basin 2 Outflow)

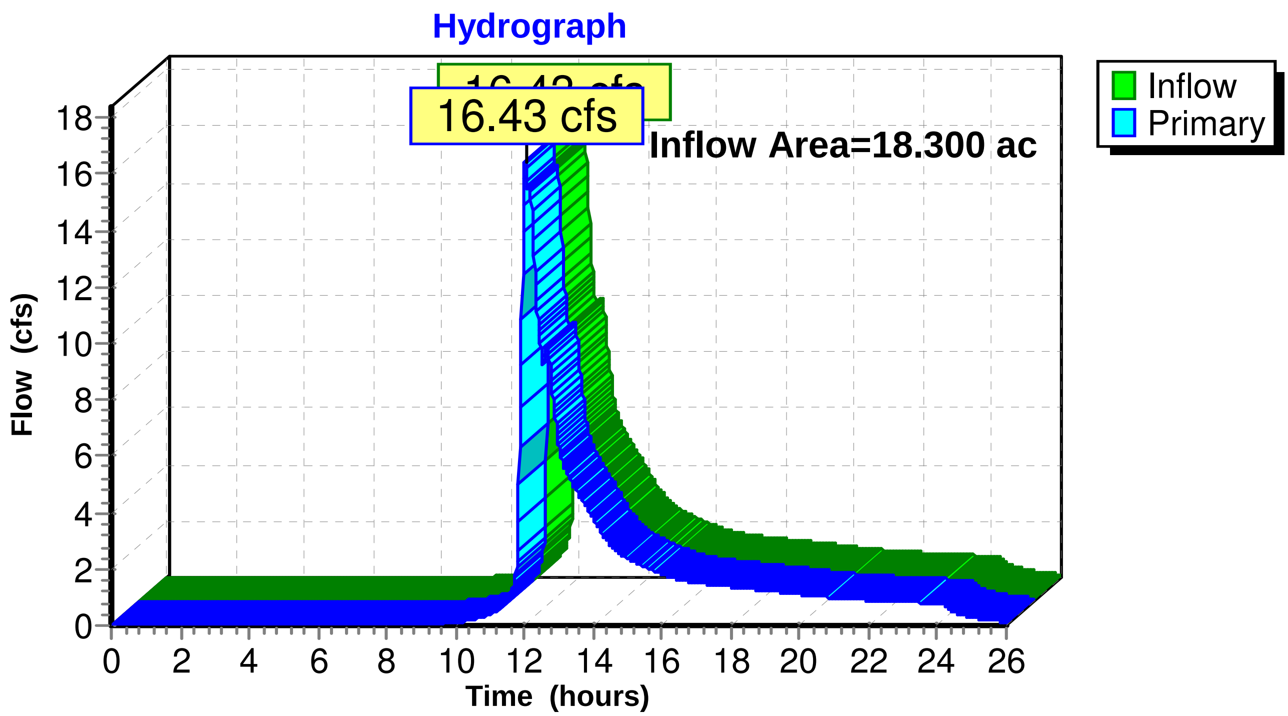


Summary for Link 9: Combine (Post DA-1)

Inflow Area =	18.300 ac,	5.30% Impervious,	Inflow Depth > 1.82"	for 50yr-24hr event	
Inflow =	16.43 cfs @	12.02 hrs,	Volume=	2.781 af	
Primary =	16.43 cfs @	12.02 hrs,	Volume=	2.781 af,	Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-26.00 hrs, dt= 0.02 hrs

Link 9: Combine (Post DA-1)



Time span=0.00-26.00 hrs, dt=0.02 hrs, 1301 points
Runoff by SCS TR-20 method, UH=SCS
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 1S: SCS Runoff (Pre-DA-1) Runoff Area=18.300 ac 1.09% Impervious Runoff Depth=2.09"
Flow Length=1,469' Tc=24.6 min CN=71 Runoff=36.79 cfs 3.182 af

Subcatchment 2S: SCS Runoff (Post DA-1 Runoff Area=9.400 ac 2.13% Impervious Runoff Depth=2.50"
Flow Length=1,012' Tc=23.9 min CN=76 Runoff=23.47 cfs 1.960 af

Subcatchment 3S: SCS Runoff (Post DA-1 Runoff Area=2.000 ac 18.45% Impervious Runoff Depth=3.04"
Tc=5.0 min CN=82 Runoff=11.03 cfs 0.507 af

Subcatchment 4S: SCS Runoff (Post DA-1 Runoff Area=6.900 ac 5.80% Impervious Runoff Depth=2.42"
Flow Length=1,556' Tc=24.1 min CN=75 Runoff=16.55 cfs 1.390 af

Reach 8R: Reach (Basin 1 Reach) Avg. Depth=0.62' Max Vel=5.04 fps Inflow=10.06 cfs 1.528 af
n=0.033 L=400.0' S=0.0400 '/' Capacity=114.92 cfs Outflow=10.05 cfs 1.527 af

Pond 5P: Reservior (Forebay Outflow) Peak Elev=1,085.86' Storage=0.463 af Inflow=23.47 cfs 1.960 af
Outflow=22.91 cfs 1.552 af

Pond 6P: Reservior (Basin 1 Outflow) Peak Elev=1,078.39' Storage=0.369 af Inflow=22.91 cfs 1.552 af
Primary=10.06 cfs 1.528 af Secondary=0.00 cfs 0.000 af Outflow=10.06 cfs 1.528 af

Pond 7P: Reservior (Basin 2 Outflow) Peak Elev=1,053.76' Storage=0.070 af Inflow=11.03 cfs 0.507 af
Primary=8.98 cfs 0.506 af Secondary=0.00 cfs 0.000 af Outflow=8.98 cfs 0.506 af

Link 9: Combine (Post DA-1) Inflow=21.10 cfs 3.422 af
Primary=21.10 cfs 3.422 af

Total Runoff Area = 36.600 ac Runoff Volume = 7.039 af Average Runoff Depth = 2.31"
96.81% Pervious = 35.431 ac 3.19% Impervious = 1.169 ac

Summary for Subcatchment 1S: SCS Runoff (Pre-DA-1)

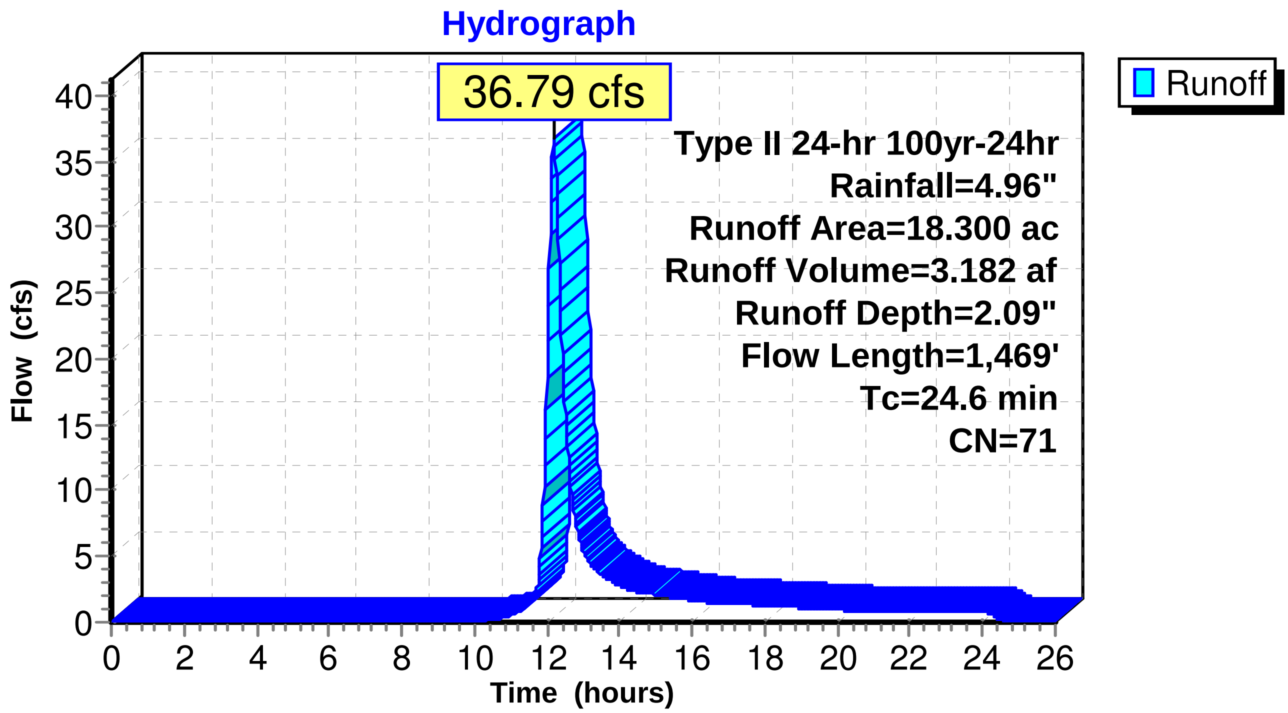
Runoff = 36.79 cfs @ 12.19 hrs, Volume= 3.182 af, Depth= 2.09"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-26.00 hrs, dt= 0.02 hrs
Type II 24-hr 100yr-24hr Rainfall=4.96"

	Area (ac)	CN	Description
*	0.200	98	
*	0.200	89	
*	11.200	71	
*	6.700	70	
	18.300	71	Weighted Average
	18.100		Pervious Area
	0.200		Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
21.1	100	0.1200	0.08		**Sheet Flow, Sheet Flow** n= 0.800 P2= 2.39"
1.3	573	0.2200	7.55		**Shallow Concentrated Flow, Shallow Concentrated Flow A** Unpaved Kv= 16.1 fps
1.8	429	0.0600	3.94		**Shallow Concentrated Flow, Shallow Concentrated Flow B** Unpaved Kv= 16.1 fps
0.4	367	0.0870	14.16	169.93	**Channel Flow, Channel Flow** Area= 12.0 sf Perim= 10.9' r= 1.10' n= 0.033
24.6	1,469	Total			

Subcatchment 1S: SCS Runoff (Pre-DA-1)



Summary for Subcatchment 2S: SCS Runoff (Post DA-1 Detained 1)

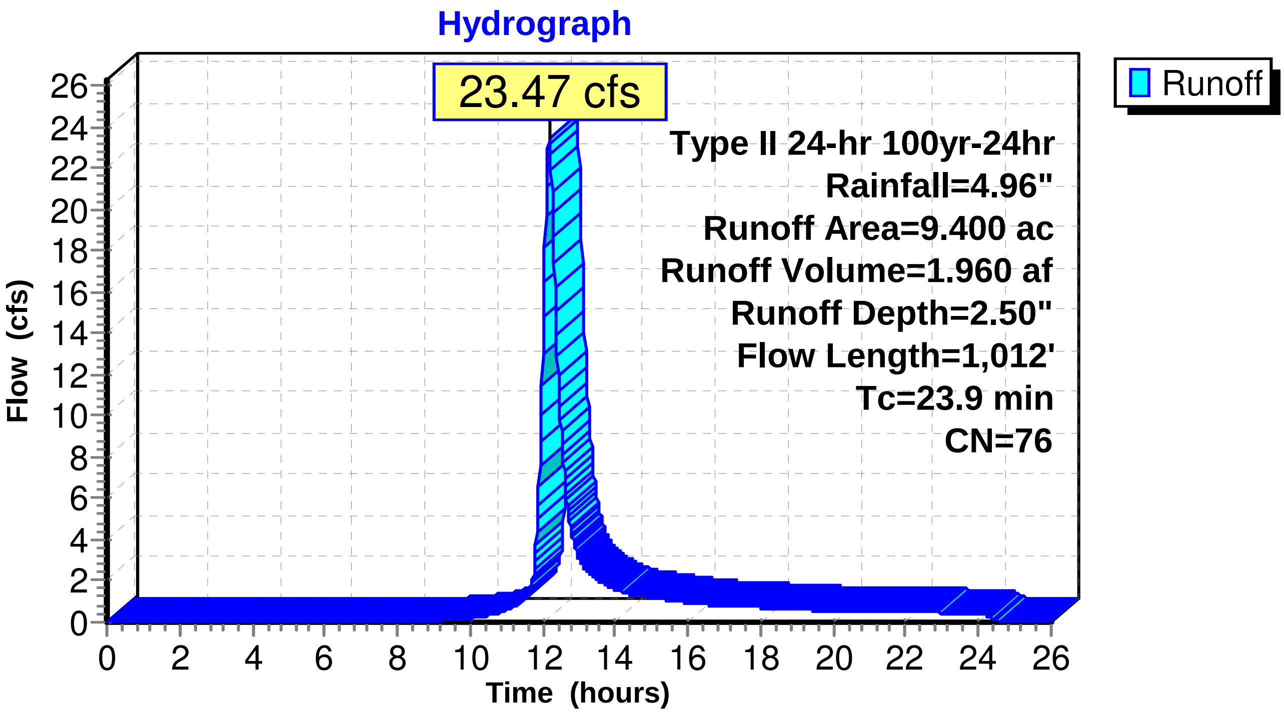
Runoff = 23.47 cfs @ 12.18 hrs, Volume= 1.960 af, Depth= 2.50"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-26.00 hrs, dt= 0.02 hrs
Type II 24-hr 100yr-24hr Rainfall=4.96"

	Area (ac)	CN	Description
*	0.200	98	
*	2.300	89	
*	6.000	71	
*	0.900	70	
	9.400	76	Weighted Average
	9.200		Pervious Area
	0.200		Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
21.1	100	0.1200	0.08		**Sheet Flow, Sheet Flow** n= 0.800 P2= 2.39"
0.7	332	0.2600	8.21		**Shallow Concentrated Flow, Shallow Concentrated Flow A** Unpaved Kv= 16.1 fps
1.3	270	0.0300	3.52		**Shallow Concentrated Flow, Shallow Concentrated Flow B** Paved Kv= 20.3 fps
0.1	88	0.3800	9.92		**Shallow Concentrated Flow, Shallow Concentrated Flow C** Unpaved Kv= 16.1 fps
0.7	222	0.0140	5.68	68.17	**Channel Flow, Channel Flow** Area= 12.0 sf Perim= 10.9' r= 1.10' n= 0.033
23.9	1,012	Total			

Subcatchment 2S: SCS Runoff (Post DA-1 Detained 1)



Summary for Subcatchment 3S: SCS Runoff (Post DA-1 Detained 2)

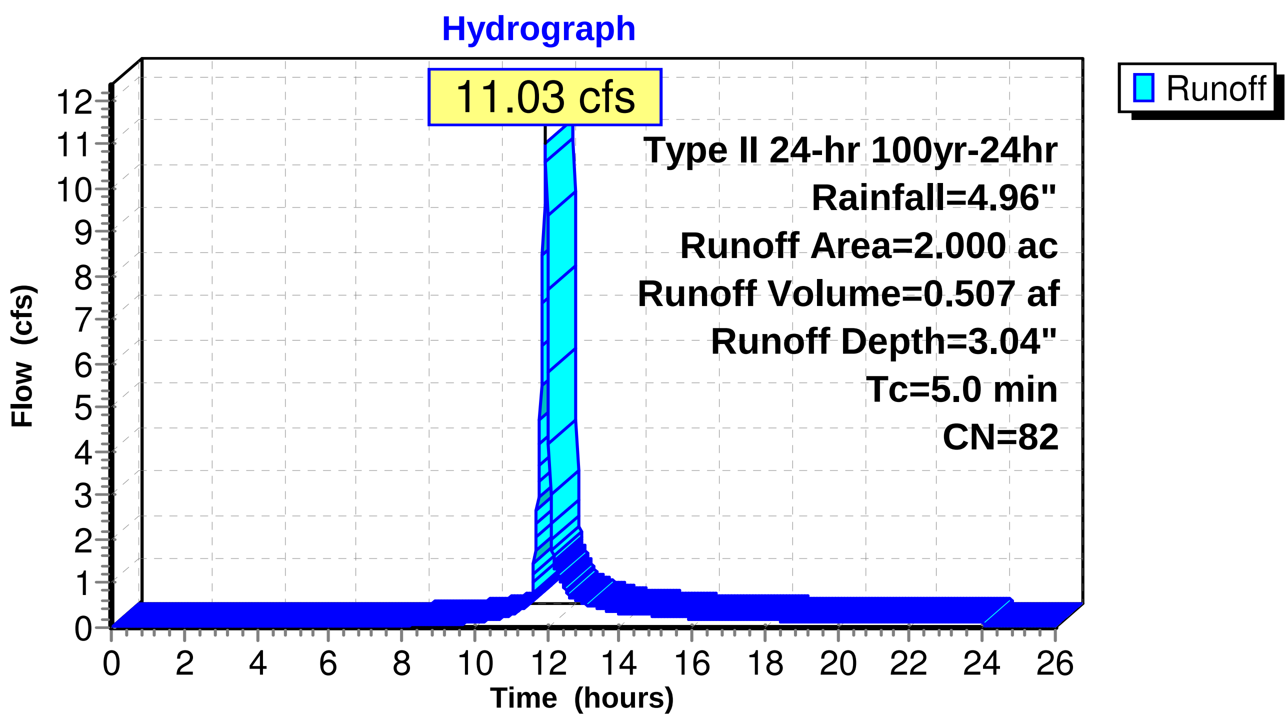
Runoff = 11.03 cfs @ 11.96 hrs, Volume= 0.507 af, Depth= 3.04"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-26.00 hrs, dt= 0.02 hrs
Type II 24-hr 100yr-24hr Rainfall=4.96"

	Area (ac)	CN	Description
*	0.369	98	
*	0.631	89	
*	1.000	71	
	2.000	82	Weighted Average
	1.631		Pervious Area
	0.369		Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry, User**

Subcatchment 3S: SCS Runoff (Post DA-1 Detained 2)



Summary for Subcatchment 4S: SCS Runoff (Post DA-1 Undetained)

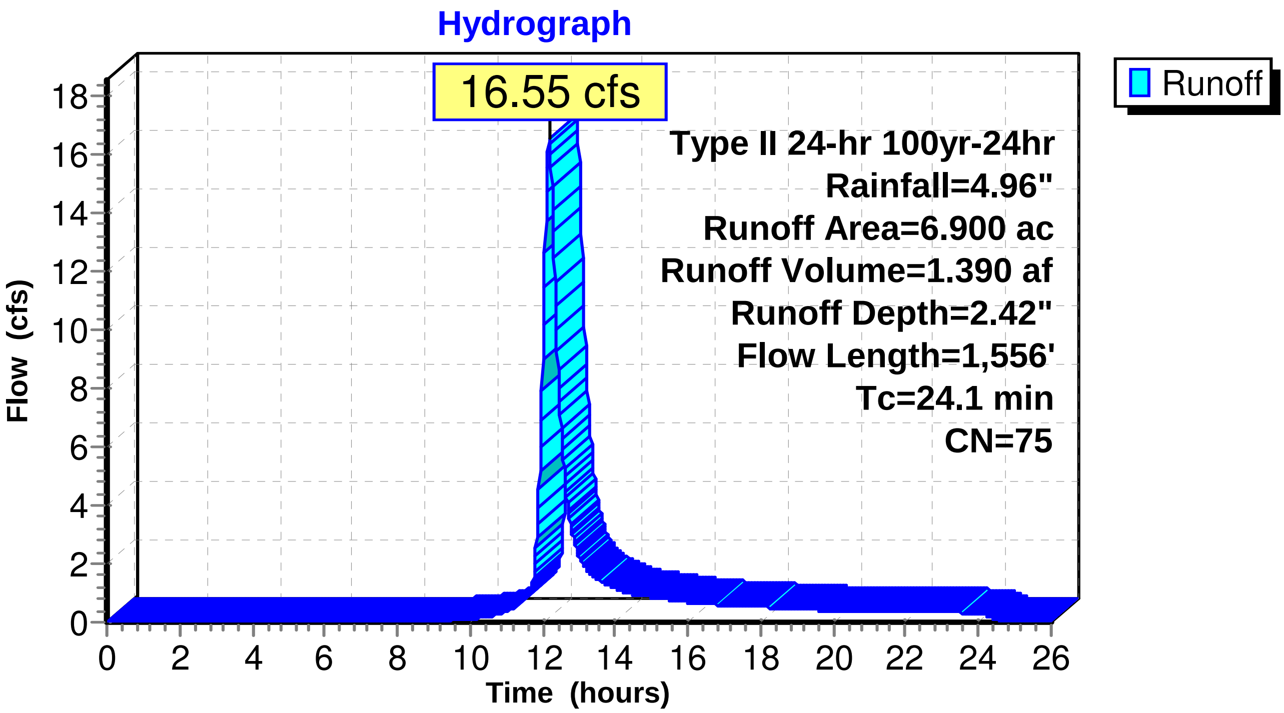
Runoff = 16.55 cfs @ 12.18 hrs, Volume= 1.390 af, Depth= 2.42"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-26.00 hrs, dt= 0.02 hrs
Type II 24-hr 100yr-24hr Rainfall=4.96"

	Area (ac)	CN	Description
*	0.400	98	
*	0.900	89	
*	4.100	71	
*	1.500	70	
	6.900	75	Weighted Average
	6.500		Pervious Area
	0.400		Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
21.1	100	0.1200	0.08		**Sheet Flow, Sheet Flow** n= 0.800 P2= 2.39"
0.9	412	0.2300	7.72		**Shallow Concentrated Flow, Shallow Concentrated Flow A** Unpaved Kv= 16.1 fps
1.3	312	0.0580	3.88		**Shallow Concentrated Flow, Shallow Concentrated Flow B** Unpaved Kv= 16.1 fps
0.8	732	0.0960	14.88	178.51	**Channel Flow, Channel Flow** Area= 12.0 sf Perim= 10.9' r= 1.10' n= 0.033
24.1	1,556	Total			

Subcatchment 4S: SCS Runoff (Post DA-1 Undetained)



Summary for Reach 8R: Reach (Basin 1 Reach)

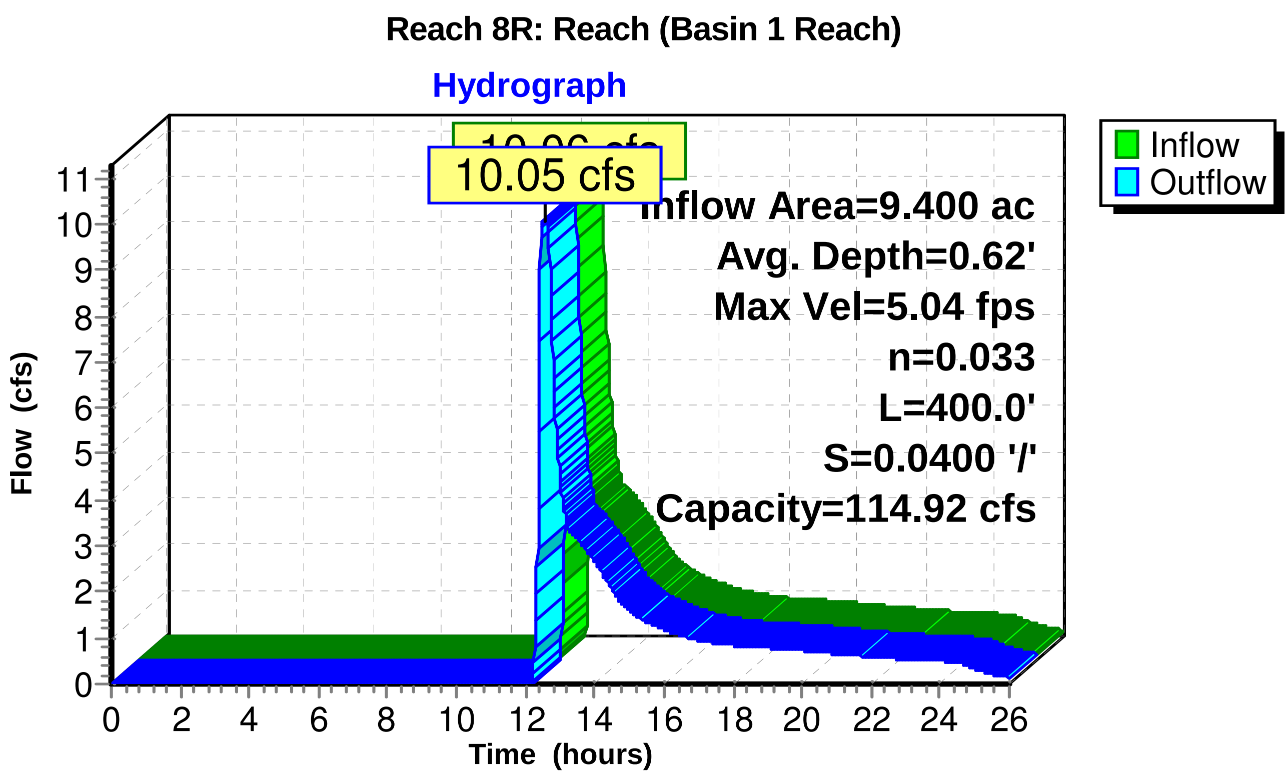
[79] Warning: Submerged Pond 6P Primary device # 4 OUTLET by 0.12'

Inflow Area = 9.400 ac, 2.13% Impervious, Inflow Depth > 1.95" for 100yr-24hr event
Inflow = 10.06 cfs @ 12.50 hrs, Volume= 1.528 af
Outflow = 10.05 cfs @ 12.54 hrs, Volume= 1.527 af, Atten= 0%, Lag= 2.4 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-26.00 hrs, dt= 0.02 hrs
Max. Velocity= 5.04 fps, Min. Travel Time= 1.3 min
Avg. Velocity = 2.46 fps, Avg. Travel Time= 2.7 min

Peak Storage= 797 cf @ 12.52 hrs, Average Depth at Peak Storage= 0.62'
Bank-Full Depth= 2.00', Capacity at Bank-Full= 114.92 cfs

2.00' x 2.00' deep channel, n= 0.033
Side Slope Z-value= 2.0 '/' Top Width= 10.00'
Length= 400.0' Slope= 0.0400 '/'
Inlet Invert= 1,072.00', Outlet Invert= 1,056.00'



Summary for Pond 5P: Reservior (Forebay Outflow)

Inflow Area =	9.400 ac,	2.13% Impervious,	Inflow Depth = 2.50"	for 100yr-24hr event	
Inflow =	23.47 cfs @	12.18 hrs,	Volume=	1.960 af	
Outflow =	22.91 cfs @	12.21 hrs,	Volume=	1.552 af,	Atten= 2%, Lag= 2.3 min
Primary =	22.91 cfs @	12.21 hrs,	Volume=	1.552 af	

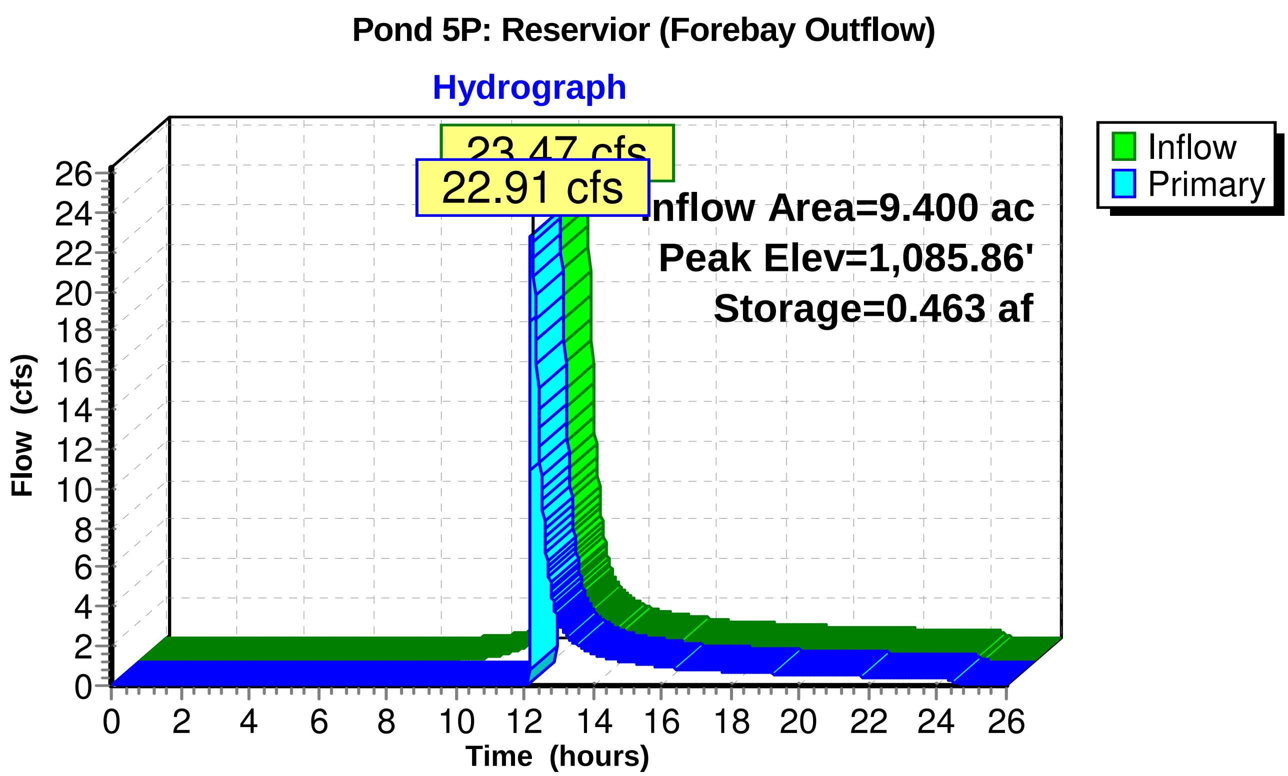
Routing by Stor-Ind method, Time Span= 0.00-26.00 hrs, dt= 0.02 hrs
Peak Elev= 1,085.86' @ 12.21 hrs Surf.Area= 0.152 ac Storage= 0.463 af

Plug-Flow detention time= 126.6 min calculated for 1.551 af (79% of inflow)
Center-of-Mass det. time= 40.6 min (886.7 - 846.1)

Volume	Invert	Avail.Storage	Storage Description
#1	1,082.00'	0.484 af	**30.00'W x 130.00'L x 4.00'H Trapezoid Z=2.0**

Device	Routing	Invert	Outlet Devices
#1	Primary	1,085.50'	**40.0' long Broad-Crested Rectangular Weir** Head (feet) 1,085.50 Coef. (English) 2.60

Primary OutFlow Max=22.83 cfs @ 12.21 hrs HW=1,085.86' (Free Discharge)
└─**1=Broad-Crested Rectangular Weir** (Weir Controls 22.83 cfs @ 1.57 fps)



Summary for Pond 6P: Reservior (Basin 1 Outflow)

Inflow Area = 9.400 ac, 2.13% Impervious, Inflow Depth = 1.98" for 100yr-24hr event
Inflow = 22.91 cfs @ 12.21 hrs, Volume= 1.552 af
Outflow = 10.06 cfs @ 12.50 hrs, Volume= 1.528 af, Atten= 56%, Lag= 17.2 min
Primary = 10.06 cfs @ 12.50 hrs, Volume= 1.528 af
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 0.00-26.00 hrs, dt= 0.02 hrs
Peak Elev= 1,078.39' @ 12.50 hrs Surf.Area= 0.208 ac Storage= 0.369 af

Plug-Flow detention time= 68.0 min calculated for 1.528 af (98% of inflow)
Center-of-Mass det. time= 59.3 min (946.0 - 886.7)

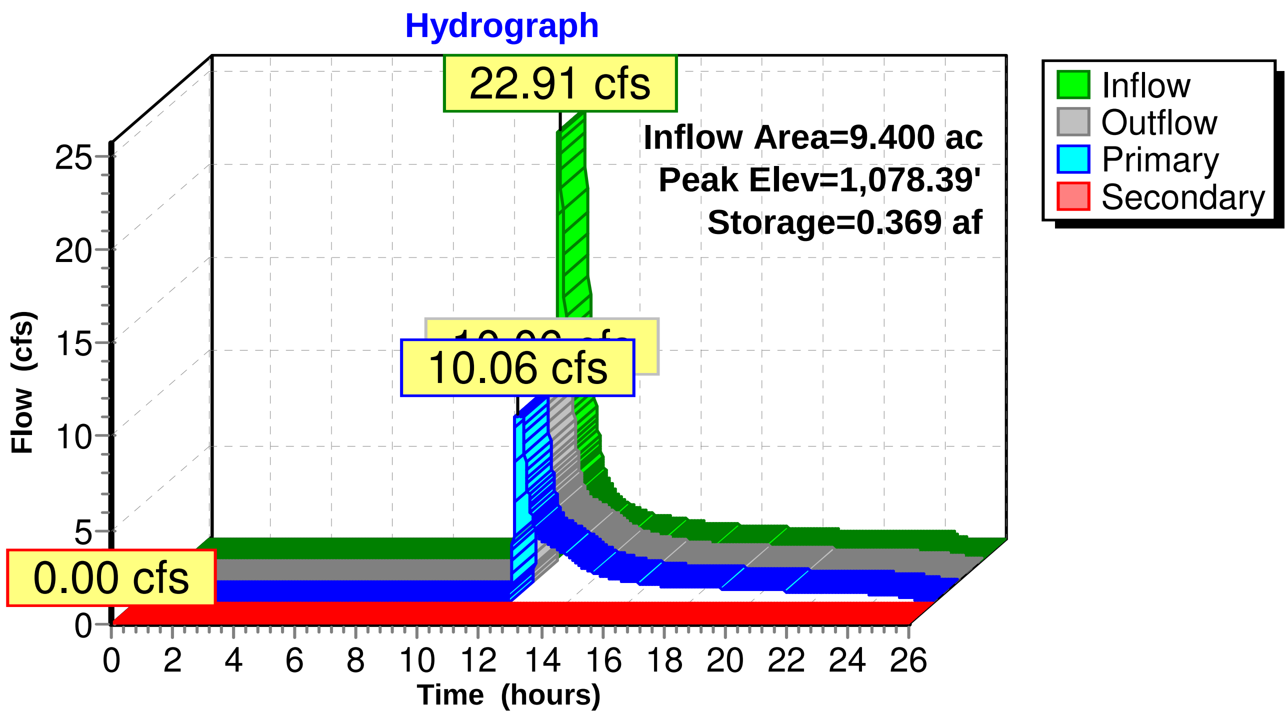
Volume	Invert	Avail.Storage	Storage Description
#1	1,076.00'	0.770 af	**35.00'W x 130.00'L x 4.00'H Trapezoid Z=5.0**

Device	Routing	Invert	Outlet Devices
#1	Device 4	1,076.00'	**6.0" Vert. Orifice/Grate** C= 0.600
#2	Device 4	1,077.00'	**1.00' W x 0.50' H Vert. Orifice/Grate** C= 0.600
#3	Device 4	1,078.00'	**11.5' long Sharp-Crested Rectangular Weir** 2 End Contraction(s)
#4	Primary	1,074.50'	**18.0" x 40.0' long Culvert** Ke= 0.500 Outlet Invert= 1,072.50' S= 0.0500 '/' Cc= 0.600 n= 0.013
#5	Secondary	1,078.50'	**8.0' long Broad-Crested Rectangular Weir** Head (feet) 1,078.50 Coef. (English) 3.33

Primary OutFlow Max=10.06 cfs @ 12.50 hrs HW=1,078.39' (Free Discharge)
└─**4=Culvert** (Inlet Controls 10.06 cfs @ 5.69 fps)
  ├─**1=Orifice/Grate** (Passes < 1.38 cfs potential flow)
  ├─**2=Orifice/Grate** (Passes < 2.57 cfs potential flow)
  └─**3=Sharp-Crested Rectangular Weir** (Passes < 9.23 cfs potential flow)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=1,076.00' (Free Discharge)
└─**5=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond 6P: Reservior (Basin 1 Outflow)



Summary for Pond 7P: Reservior (Basin 2 Outflow)

Inflow Area = 2.000 ac, 18.45% Impervious, Inflow Depth = 3.04" for 100yr-24hr event
Inflow = 11.03 cfs @ 11.96 hrs, Volume= 0.507 af
Outflow = 8.98 cfs @ 12.00 hrs, Volume= 0.506 af, Atten= 19%, Lag= 2.7 min
Primary = 8.98 cfs @ 12.00 hrs, Volume= 0.506 af
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 0.00-26.00 hrs, dt= 0.02 hrs
Peak Elev= 1,053.76' @ 12.00 hrs Surf.Area= 0.048 ac Storage= 0.070 af

Plug-Flow detention time= 22.4 min calculated for 0.506 af (100% of inflow)
Center-of-Mass det. time= 20.6 min (833.2 - 812.6)

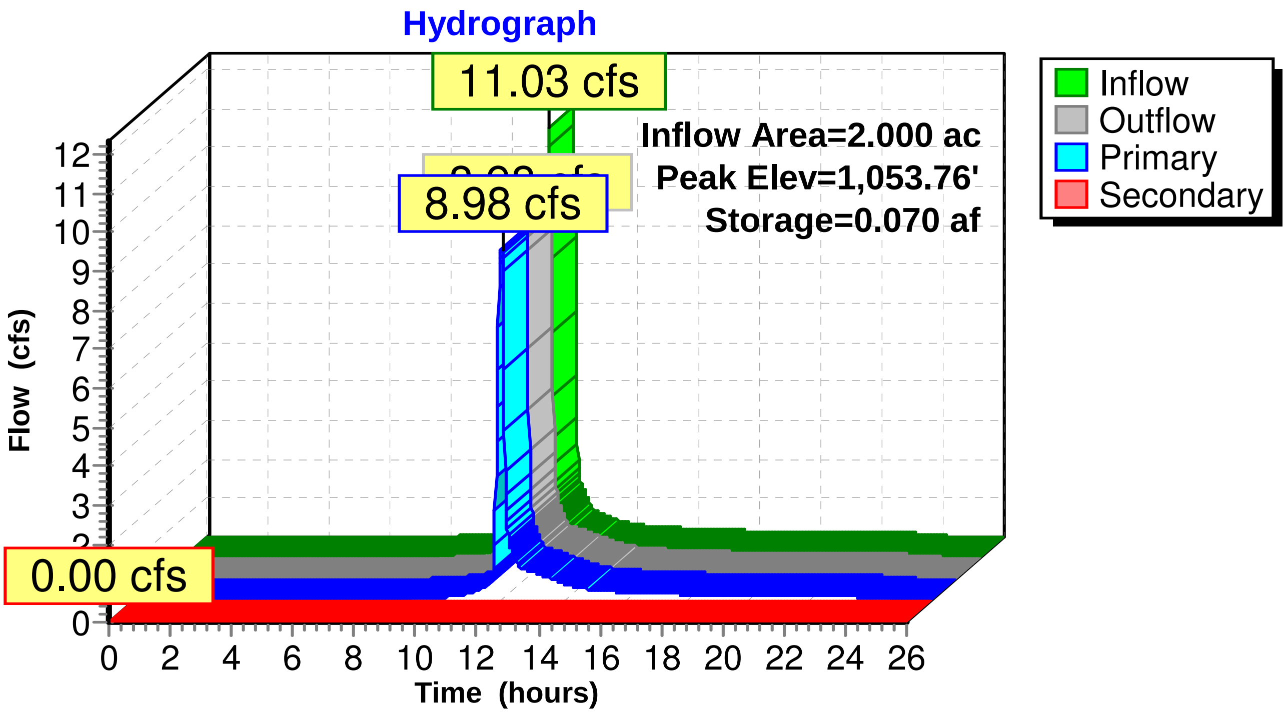
Volume	Invert	Avail.Storage	Storage Description
#1	1,052.00'	0.203 af	**20.00'W x 70.00'L x 4.00'H Trapezoid Z=2.0**

Device	Routing	Invert	Outlet Devices
#1	Device 4	1,052.00'	**6.0" Vert. Orifice/Grate** C= 0.600
#2	Device 4	1,053.00'	**6.00' W x 6.00' H Vert. Orifice/Grate** C= 0.600
#3	Device 4	1,054.00'	**11.5' long Sharp-Crested Rectangular Weir** 2 End Contraction(s)
#4	Primary	1,050.50'	**18.0" x 62.0' long Culvert** Ke= 0.500 Outlet Invert= 1,049.01' S= 0.0240 '/' Cc= 0.600 n= 0.013
#5	Secondary	1,054.50'	**12.0' long Broad-Crested Rectangular Weir** Head (feet) 1,054.50 Coef. (English) 2.60

Primary OutFlow Max=8.97 cfs @ 12.00 hrs HW=1,053.75' (Free Discharge)
└─**4=Culvert** (Inlet Controls 8.97 cfs @ 5.08 fps)
  ├─**1=Orifice/Grate** (Passes < 1.16 cfs potential flow)
  ├─**2=Orifice/Grate** (Passes < 12.56 cfs potential flow)
  └─**3=Sharp-Crested Rectangular Weir** (Controls 0.00 cfs)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=1,052.00' (Free Discharge)
└─**5=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond 7P: Reservior (Basin 2 Outflow)

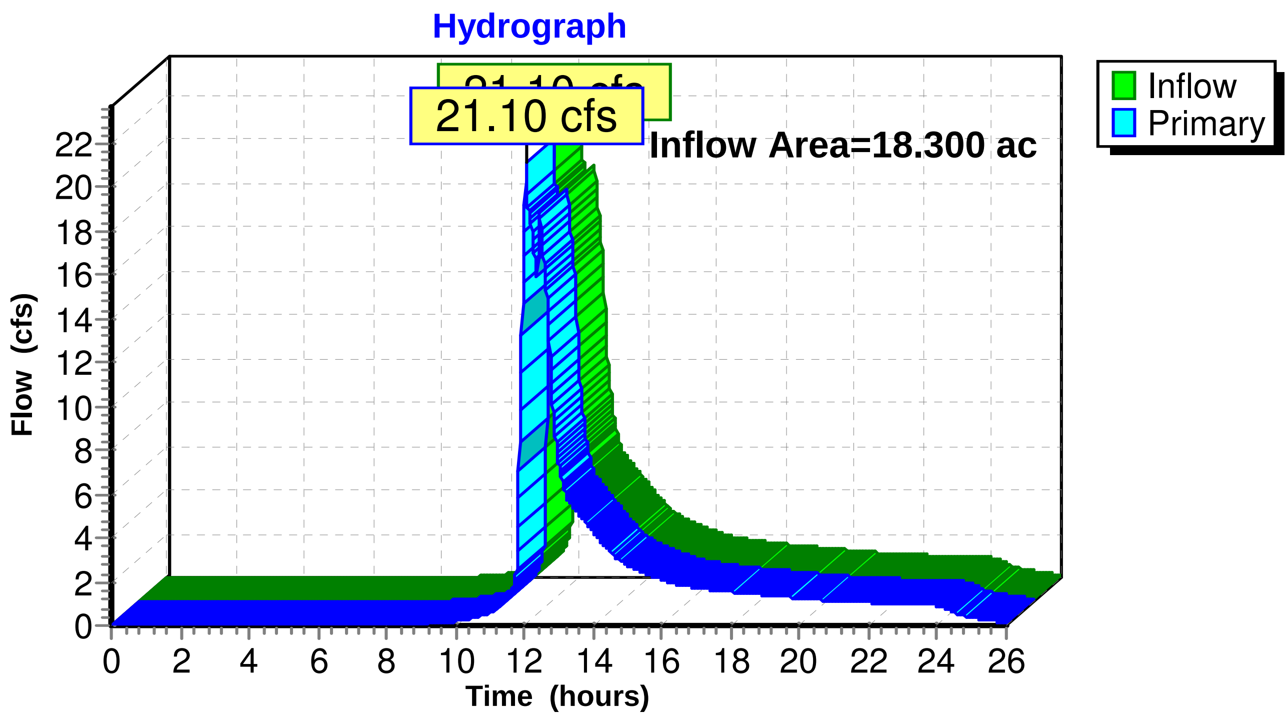


Summary for Link 9: Combine (Post DA-1)

Inflow Area =	18.300 ac,	5.30% Impervious, Inflow Depth > 2.24"	for 100yr-24hr event	
Inflow =	21.10 cfs @	12.06 hrs, Volume=	3.422 af	
Primary =	21.10 cfs @	12.06 hrs, Volume=	3.422 af,	Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-26.00 hrs, dt= 0.02 hrs

Link 9: Combine (Post DA-1)

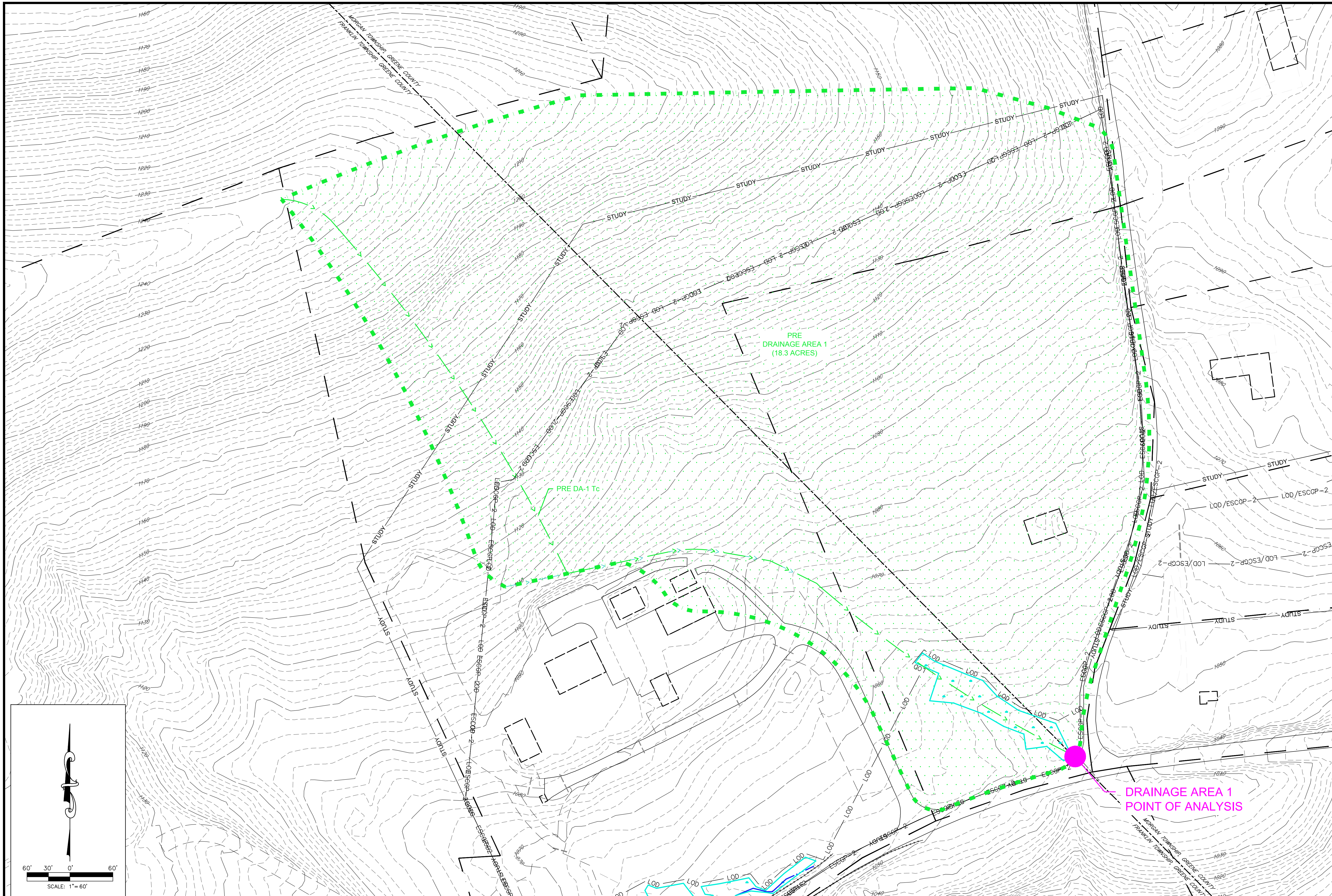


DOMINION TRANSMISSION, INC.

SUPPLY HEADER PROJECT

SECTION 5 – POST-CONSTRUCTION STORMWATER MANAGEMENT PLAN/SITE RESTORATION (PCSM/SR) PLAN

APPENDIX D – DRAINAGE AREA MAPS



URS
FOSTER PLAZA 6
681 ANDERSEN DRIVE
SUITE 400
PITTSBURGH, PA 15220

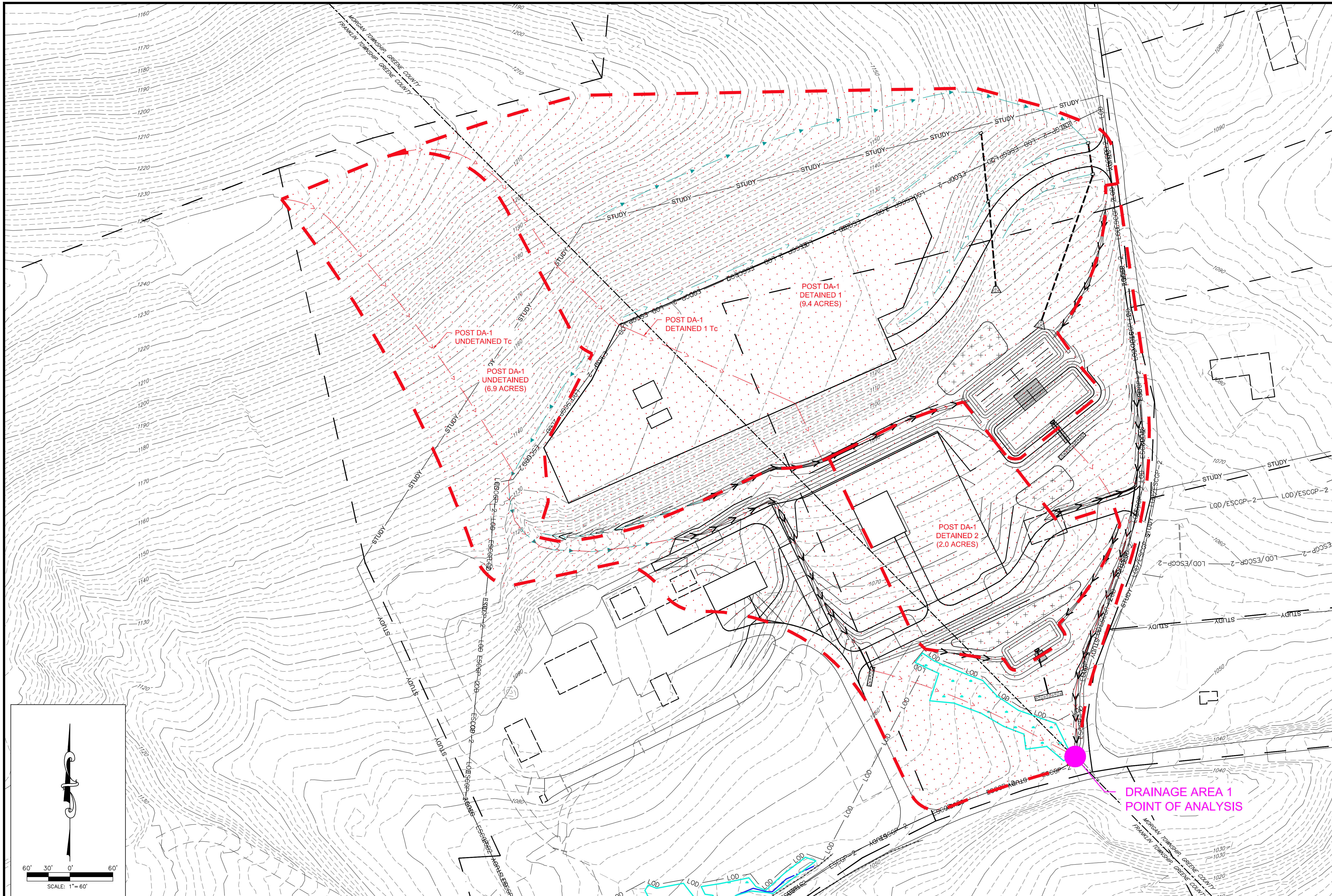
DTI - NATRIUM TO MARKET PROJECT
FRANKLIN & MORGAN TOWNSHIPS, GREENE COUNTY, PA
DRAINAGE PLAN

PRE-DEVELOPMENT DRAINAGE MAP

REVISIONS

DATE	DESCRIPTION	APPROVED

HORZ. SCALE:	AS SHOWN
DRAWN BY:	RFH
DRAFTING CK:	ARZ
ENGINEERING CK:	ARZ
CONSTRUCTION CK:	-
ENVIRONMENTAL CK:	-
DATE:	OCTOBER 2013
URS PROJECT NO.:	39940093
DRAWING NO.:	PRE-DRN
SHEET 1 OF 2	REV. 0



URS
FOSTER PLAZA 6
681 ANDERSEN DRIVE
SUITE 400
PITTSBURGH, PA 15220

DTI - NATRIUM TO MARKET PROJECT
FRANKLIN & MORGAN TOWNSHIPS, GREENE COUNTY, PA
DRAINAGE PLAN

POST-DEVELOPMENT DRAINAGE MAP

REVISIONS		
DATE	DESCRIPTION	APPROVED

HORZ. SCALE:	AS SHOWN
DRAWN BY:	RFH
DRAFTING CK:	ARZ
ENGINEERING CK:	ARZ
CONSTRUCTION CK:	
ENVIRONMENTAL CK:	
DATE:	OCTOBER 2013
URS PROJECT NO.:	39940093
DRAWING NO.:	POST-DRN
SHEET 2 OF 2	REV. 0

DOMINION TRANSMISSION, INC.

SUPPLY HEADER PROJECT

SECTION 5 – POST-CONSTRUCTION STORMWATER MANAGEMENT PLAN/SITE RESTORATION (PCSM/SR) PLAN

APPENDIX E – PCSM INSPECTION FORM

Environmental Construction Permitting
FIELD REVIEW FORM: Post-construction Evaluation

This form will be completed by the ECP Field Reviewer to assess the status of project areas following in-service & final cleanup.

Company Name: **Dominion Transmission, Inc.**	Time & Date of Field Review:
Project Name & Location: **Supply Header Project, Greene County, PA**	Name of ECP Field Reviewer:
EP Database Project ID:	ECP Project Lead:
Facility Description: Location of Inspection (MP, Line No.): Type of Inspection: Weather Conditions: **NOTE TODAY'S WEATHER AND ANY OTHER WEATHER OBSERVATIONS HERE.**	
Future Follow-up Inspection Recommended: **(Yes / No)** Immediate response needed for repairs or work recommendations: **(Yes / No – if yes identify Item Nos. from tables below)**	

Section 1: Narrative

	Yes	No
1. Are the approved (Stamped) E&S Plan and PCSM Plan present on site?		
2. Site Conditions		
a. Sediment discharge is occurring to waters or wetlands from earth disturbance activity?		
b. Stabilization of disturbed areas or stockpiles at final grade?		
c. Are slopes 3:1 and greater reaching final stabilization?		
3. Are there areas observed where restoration is limited by soil compaction?		
4. PCSM BMPs (List and note if maintained as per the plan)		

If yes, describe: ____________________

6. Department/Conservation District has been notified within 24 hours of non-compliance, including discharge to waters or wetlands?
7. Identify any additional measures/actions to be taken on site: ____________________

---- Part A: EROSION / SOIL CONDITIONS

Item No.	Compliance Review Item and Comment	Work / Repair Needed? (Yes/No)
1)	Silt fence - erosion control devices [Identify location and amount of all silt fence left in place for permanent restoration measures following completion of final grade and seeding].	

2)	Compaction of topsoil?	
3)	Rock distribution (if applicable) within actively cultivated or rotated cropland and pastures, hay fields, and residential areas.	
4)	Confirm topographic contours are maintained by permanent erosion control measures (no gullies, erosion, subsidence, etc.).	
5)	Confirm contours restored to preconstruction conditions (compare to adjacent undisturbed off-ROW areas).	
6)	Construction debris removed from all construction work areas (unless the approved otherwise)?	
7)	Are additional permanent measures necessary to prevent erosion and migration of sediment?	

---- Part B: VEGETATION

Item No.	Compliance Review Item and Comment	Work / Repair Needed? (Yes/No)
8)	Provide the current status of reseeding/revegetation (germination or growth of seeded areas within construction work spaces):	
9)	Density and cover of restored areas compared to adjacent undisturbed areas:	
10)	Weed invasion issues (including reed canary grass):	
11)	Identify any areas which have achieved final stabilization, include recommendations for removal of temporary erosion control devices; including silt fence:	

---- Part C: Wetland

Item No.	Compliance Review Item and Comment	Work / Repair Needed? (Yes/No)
12)	**Wetlands: Inspect adjacent wetlands**	
13)	Confirm BMPs around wetland are in place and functioning.	
14)	Problem areas at wetlands: Identify and describe each problem area, including weed invasion issues (such as reed canary grass) within wetlands adjacent to project area.	

---- Part D: OTHER RECOMMENDATIONS

Item No.	Compliance Review Item and Comment	Work / Repair Needed? (Yes/No)
20)	List any additional problem areas not identified above, including any actions to be taken to maintain compliance with Company plans or environmental permits and regulations, including those referenced in the Environmental Clearance Memo for this project:	
21)	Landowner issues (Identify the issue, who was contacted and where/when the notice occurred):	

Additional Comments/Observations/Notes:

I certify that the information contained in this report is true, accurate and complete. In addition, I agree that I am qualified to complete this inspection and report in accordance with the following stipulations:
"I am knowledgeable in the principles and practice of erosion and sediment controls. I also possess the skills to assess conditions at the construction site that could impact storm water quality, as well as, assess the effectiveness of any sediment and erosion control measures selected to control the quality of storm water discharges from the construction activity."

Signature of ECP Field Reviewer	Title & Company	Date of Inspection

Fax or e-mail this completed form and associated photo log to ECP lead for Dominion Transmission, Inc.

DOMINION TRANSMISSION, INC.

SUPPLY HEADER PROJECT

SECTION 6 – PENNSYLVANIA NATURAL DIVERISTY INVENTORY (PNDI) RESULTS

Pennsylvania Natural Diversity Inventory (PNDI Results)

March 16, 2017

1. PROJECT INFORMATION

Project Name: **Supply Header Project - Greene County**
Date of Review: **3/16/2017 09:51:39 AM**
Project Category: **Energy Storage, Production, and Transfer, Energy Transfer, Other**
Project Area: **15.09 acres**
County(s): **Greene**
Township/Municipality(s): **FRANKLIN; MORGAN**
ZIP Code: **15370**
Quadrangle Name(s): **MATHER**
Watersheds HUC 8: **Lower Monongahela**
Watersheds HUC 12: **Ruff Creek; Smith Creek-South Fork Tenmile Creek**
Decimal Degrees: **39.920050, -80.122421**
Degrees Minutes Seconds: **39° 55' 12.1802" N, 80° 7' 20.7167" W**

2. SEARCH RESULTS

Agency	Results	Response
PA Game Commission	No Known Impact	No Further Review Required
PA Department of Conservation and Natural Resources	No Known Impact	No Further Review Required
PA Fish and Boat Commission	No Known Impact	No Further Review Required
U.S. Fish and Wildlife Service	No Known Impact	No Further Review Required

As summarized above, Pennsylvania Natural Diversity Inventory (PNDI) records indicate no known impacts to threatened and endangered species and/or special concern species and resources within the project area. Therefore, based on the information you provided, no further coordination is required with the jurisdictional agencies. This response does not reflect potential agency concerns regarding impacts to other ecological resources, such as wetlands.

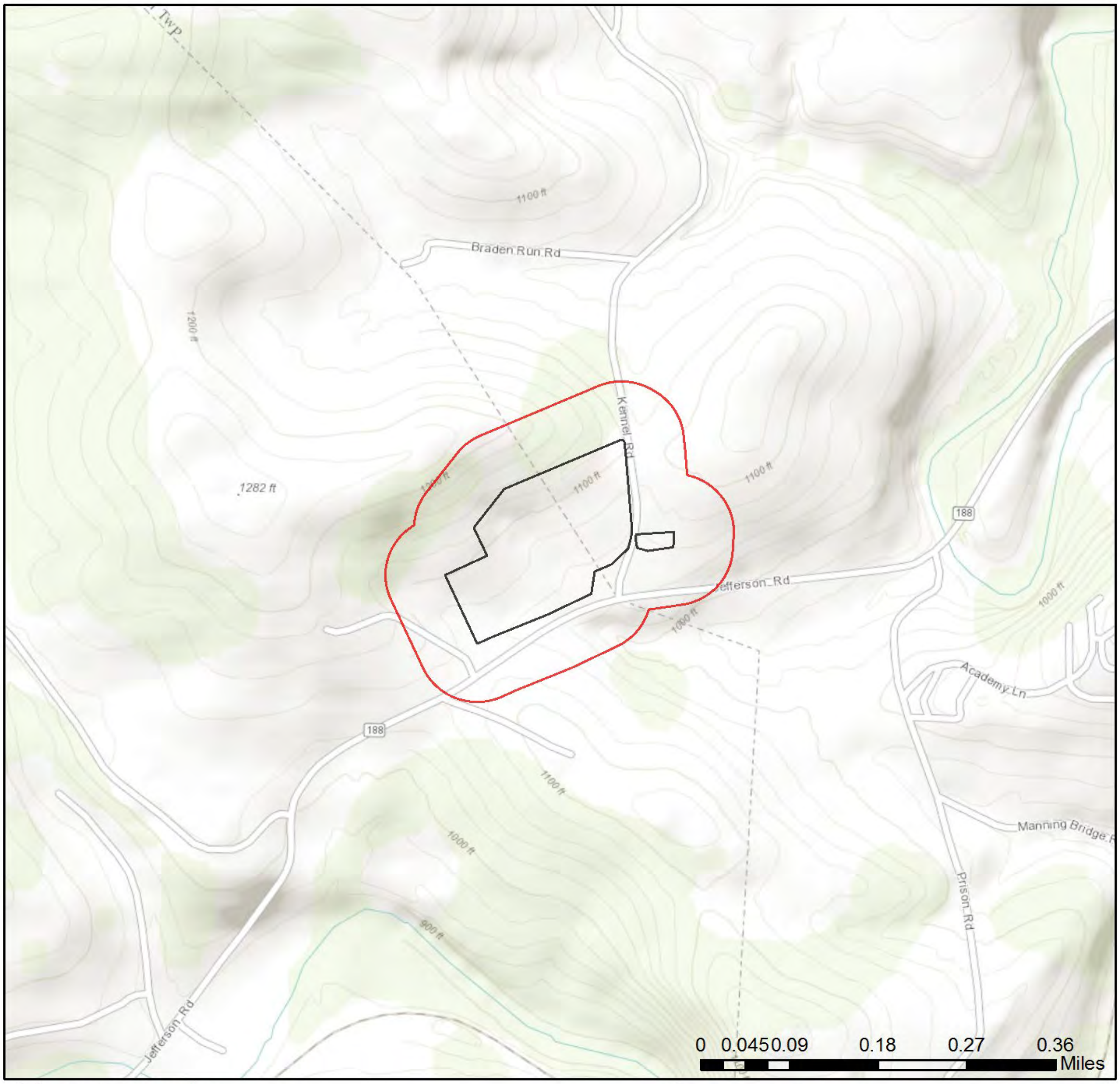
Supply Header Project - Greene County

Project Boundary

Buffered Project Boundary

Service Layer Credits: Sources: Esri, HERE, DeLorme, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), swisstopo, MapmyIndia, © OpenStreetMap contributors, and the GIS User Community
Esri, HERE, DeLorme, MapmyIndia, © OpenStreetMap contributors, and the GIS user

Supply Header Project - Greene County



Project Boundary

Buffered Project Boundary

Service Layer Credits: Sources: Esri, HERE, DeLorme, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), swisstopo, MapmyIndia, © OpenStreetMap contributors, and the GIS User Community

3. AGENCY COMMENTS

Regardless of whether a DEP permit is necessary for this proposed project, any potential impacts to threatened and endangered species and/or special concern species and resources must be resolved with the appropriate jurisdictional agency. In some cases, a permit or authorization from the jurisdictional agency may be needed if adverse impacts to these species and habitats cannot be avoided.

These agency determinations and responses are **valid for two years** (from the date of the review), and are based on the project information that was provided, including the exact project location; the project type, description, and features; and any responses to questions that were generated during this search. If any of the following change: 1) project location, 2) project size or configuration, 3) project type, or 4) responses to the questions that were asked during the online review, the results of this review are not valid, and the review must be searched again via the PNDI Environmental Review Tool and resubmitted to the jurisdictional agencies. The PNDI tool is a primary screening tool, and a desktop review may reveal more or fewer impacts than what is listed on this PNDI receipt. The jursidictional agencies **strongly advise against** conducting surveys for the species listed on the receipt prior to consultation with the agencies.

PA Game Commission
RESPONSE:

No Impact is anticipated to threatened and endangered species and/or special concern species and resources.

PA Department of Conservation and Natural Resources
RESPONSE:

No Impact is anticipated to threatened and endangered species and/or special concern species and resources.

PA Fish and Boat Commission
RESPONSE:

No Impact is anticipated to threatened and endangered species and/or special concern species and resources.

U.S. Fish and Wildlife Service
RESPONSE:

No impacts to **federally** listed or proposed species are anticipated. Therefore, no further consultation/coordination under the Endangered Species Act (87 Stat. 884, as amended; 16 U.S.C. 1531 et seq. is required. Because no take of federally listed species is anticipated, none is authorized. This response does not reflect potential Fish and Wildlife Service concerns under the Fish and Wildlife Coordination Act or other authorities.

4. DEP INFORMATION

The Pa Department of Environmental Protection (DEP) requires that a signed copy of this receipt, along with any required documentation from jurisdictional agencies concerning resolution of potential impacts, be submitted with applications for permits requiring PNDI review. Two review options are available to permit applicants for handling PNDI coordination in conjunction with DEP's permit review process involving either T&E Species or species of special concern. Under sequential review, the permit applicant performs a PNDI screening and completes all coordination with the appropriate jurisdictional agencies prior to submitting the permit application. The applicant will include with its application, both a PNDI receipt and/or a clearance letter from the jurisdictional agency if the PNDI Receipt shows a Potential Impact to a species or the applicant chooses to obtain letters directly from the jurisdictional agencies. Under concurrent review, DEP, where feasible, will allow technical review of the permit to occur concurrently with the T&E species consultation with the jurisdictional agency. The applicant must still supply a copy of the PNDI Receipt with its permit application. The PNDI Receipt should also be submitted to the appropriate agency according to directions on the PNDI Receipt. The applicant and the jurisdictional agency will work together to resolve the potential impact(s). See the DEP PNDI policy at https://conservationexplorer.dcnr.pa.gov/content/resources.

5. ADDITIONAL INFORMATION

The PNDI environmental review website is a preliminary screening tool. There are often delays in updating species status classifications. Because the proposed status represents the best available information regarding the conservation status of the species, state jurisdictional agency staff give the proposed statuses at least the same consideration as the current legal status. If surveys or further information reveal that a threatened and endangered and/or special concern species and resources exist in your project area, contact the appropriate jurisdictional agency/agencies immediately to identify and resolve any impacts.

For a list of species known to occur in the county where your project is located, please see the species lists by county found on the PA Natural Heritage Program (PNHP) home page (www.naturalheritage.state.pa.us). Also note that the PNDI Environmental Review Tool only contains information about species occurrences that have actually been reported to the PNHP.

6. AGENCY CONTACT INFORMATION

PA Department of Conservation and Natural Resources
Bureau of Forestry, Ecological Services Section
400 Market Street, PO Box 8552
Harrisburg, PA 17105-8552
Email: RA-HeritageReview@pa.gov
Fax:(717) 772-0271

U.S. Fish and Wildlife Service
Pennsylvania Field Office
Endangered Species Section
110 Radnor Rd; Suite 101
State College, PA 16801
NO Faxes Please

PA Fish and Boat Commission
Division of Environmental Services
450 Robinson Lane, Bellefonte, PA 16823
Email: RA-FBPACENOTIFY@pa.gov

PA Game Commission
Bureau of Wildlife Habitat Management
Division of Environmental Planning and Habitat Protection
2001 Elmerton Avenue, Harrisburg, PA 17110-9797
Email: RA-PGC_PNDI@pa.gov
NO Faxes Please

7. PROJECT CONTACT INFORMATION

Name: Steve Holden
Company/Business Name: Environmental Resources Management, Inc.
Address: 15 Park Row W #104,
City, State, Zip: Providence, RI 02903
Phone:(401)278-4308 Fax:( )
Email: steve.holden@erm.com

8. CERTIFICATION

I certify that ALL of the project information contained in this receipt (including project location, project size/configuration, project type, answers to questions) is true, accurate and complete. In addition, if the project type, location, size or configuration changes, or if the answers to any questions that were asked during this online review change, I agree to re-do the online environmental review.

[signature] 03/17/2017
applicant/project proponent signature date

Initial PNDI Results

May 1, 2015

1. PROJECT INFORMATION

Project Name: **Crayne CS**
Date of review: **3/20/2015 11:18:59 AM**
Project Category: **Energy Storage, Production, and Transfer,Energy Transfer,Pipeline (e.g., gas, oil) -- NEW (construction of new line in a new location)**
Project Area: **54.9** acres
County: **Greene** Township/Municipality: **Franklin,Morgan**
Quadrangle Name: **MATHER** ~ ZIP Code: **15370**
Decimal Degrees: **39.919861 N, -80.122330 W**
Degrees Minutes Seconds: **39° 55' 11.5" N, -80° 7' 20.4" W**

2. SEARCH RESULTS

Agency	Results	Response
PA Game Commission	No Known Impact	No Further Review Required
PA Department of Conservation and Natural Resources	**Potential Impact**	**FURTHER REVIEW IS REQUIRED, See Agency Response**
PA Fish and Boat Commission	**Potential Impact**	**FURTHER REVIEW IS REQUIRED, See Agency Response**
U.S. Fish and Wildlife Service	No Known Impact	No Further Review Required

As summarized above, Pennsylvania Natural Diversity Inventory (PNDI) records indicate there may be potential impacts to threatened and endangered and/or special concern species and resources within the project area. If the response above indicates "No Further Review Required" no additional communication with the respective agency is required. If the response is "Further Review Required" or "See Agency Response," refer to the appropriate agency comments below. Please see the DEP Information Section of this receipt if a PA Department of Environmental Protection Permit is required.

RESPONSE TO QUESTION(S) ASKED

Q1: "Will the entire project area (including any discharge), plus a 300 feet buffer around the project area, all occur in or on an existing building, parking lot, driveway, road, road shoulder, street, runway, paved area, railroad bed, maintained (periodically mown) lawn, crop agriculture field or maintained orchard?"
Your answer is: **3. Unknown**

3. AGENCY COMMENTS

Regardless of whether a DEP permit is necessary for this proposed project, any potential impacts to threatened and endangered species and/or special concern species and resources must be resolved with the appropriate jurisdictional agency. In some cases, a permit or authorization from the jurisdictional agency may be needed if adverse impacts to these species and habitats cannot be avoided.

These agency determinations and responses are **valid for two years** (from the date of the review), and are based on the project information that was provided, including the exact project location; the project type, description, and features; and any responses to questions that were generated during this search. If any of the following change: 1) project location, 2) project size or configuration, 3) project type, or 4) responses to the questions that were asked during the online review, the results of this review are not valid, and the review must be searched again via the PNDI Environmental Review Tool and resubmitted to the jurisdictional agencies. The PNDI tool is a primary screening tool, and a desktop review may reveal more or fewer impacts than what is listed on this PNDI receipt. The jursidictional agencies **strongly advise against** conducting surveys for the species listed on the receipt prior to consultation with the agencies.

PA Game Commission

RESPONSE: No Impact is anticipated to threatened and endangered species and/or special concern species and resources.

PA Department of Conservation and Natural Resources

RESPONSE: Further review of this project is necessary to resolve the potential impacts(s). Please send project information to this agency for review (see WHAT TO SEND).

DCNR Species: (Note: The PNDI tool is a primary screening tool, and a desktop review may reveal more or fewer species than what is listed below. After desktop review, if a botanical survey is required by DCNR, we recommend the DCNR Botanical Survey Protocols, available here: http://www.gis.dcnr.state.pa.us/hgis-er/PNDI_DCNR.aspx.)
Scientific Name: Aplectrum hyemale
Common Name: Puttyroot
Current Status: Special Concern Species*
Proposed Status: Special Concern Species*

Scientific Name: Sensitive Species**
Common Name:
Current Status: Special Concern Species*
Proposed Status: Special Concern Species*

PA Fish and Boat Commission

RESPONSE: Further review of this project is necessary to resolve the potential impacts(s). Please send project information to this agency for review (see WHAT TO SEND).

PFBC Species: (Note: The PNDI tool is a primary screening tool, and a desktop review may reveal more or fewer species than what is listed below.)
Scientific Name: Amblema plicata
Common Name: Three-ridge
Current Status: Special Concern Species*

U.S. Fish and Wildlife Service

RESPONSE: No impacts to **federally** listed or proposed species are anticipated. Therefore, no further consultation/coordination under the Endangered Species Act (87 Stat. 884, as amended; 16 U.S.C. 1531 *et seq.* is required. Because no take of federally listed species is anticipated, none is authorized. This response does not reflect potential Fish and Wildlife Service concerns under the Fish and Wildlife Coordination Act or other authorities.

* Special Concern Species or Resource - Plant or animal species classified as rare, tentatively undetermined or candidate as well as other taxa of conservation concern, significant natural communities, special concern populations (plants or animals) and unique geologic features.
** Sensitive Species - Species identified by the jurisdictinal agency as collectible, having economic value, or being susceptible to decline as a result of visitation.

WHAT TO SEND TO JURISDICTIONAL AGENCIES

If project information was requested by one or more of the agencies above, send the following information to the agency(s) seeking this information (see AGENCY CONTACT INFORMATION).

Check-list of *Minimum* Materials to be submitted:

____**SIGNED** copy of this Project Environmental Review Receipt
____Project narrative with a description of the overall project, the work to be performed, current physical characteristics of the site and acreage to be impacted.
____Project location information (name of USGS Quadrangle, Township/Municipality, and County)
____USGS 7.5-minute Quadrangle with project boundary clearly indicated, and quad name on the map

The inclusion of the following information may expedite the review process.
____A basic site plan(particularly showing the relationship of the project to the physical features such as wetlands, streams, ponds, rock outcrops, etc.)
____Color photos keyed to the basic site plan (i.e. showing on the site plan where and in what direction each photo was taken and the date of the photos)
____Information about the presence and location of wetlands in the project area, and how this was determined (e.g., by a qualified wetlands biologist), if wetlands are present in the project area, provide project plans showing

the location of all project features, as well as wetlands and streams

4. DEP INFORMATION

The Pa Department of Environmental Protection (DEP) requires that a signed copy of this receipt, along with any required documentation from jurisdictional agencies concerning resolution of potential impacts, be submitted with applications for permits requiring PNDI review. For cases where a "Potential Impact" to threatened and endangered species has been identified before the application has been submitted to DEP, the application should not be submitted until the impact has been resolved. For cases where "Potential Impact" to special concern species and resources has been identified before the application has been submitted, the application should be submitted to DEP along with the PNDI receipt. The PNDI Receipt should also be submitted to the appropriate agency according to directions on the PNDI Receipt. DEP and the jurisdictional agency will work together to resolve the potential impact(s). See the DEP PNDI policy at http://www.naturalheritage.state.pa.us.

5. ADDITIONAL INFORMATION

The PNDI environmental review website is a **preliminary** screening tool. There are often delays in updating species status classifications. Because the proposed status represents the best available information regarding the conservation status of the species, state jurisdictional agency staff give the proposed statuses at least the same consideration as the current legal status. If surveys or further information reveal that a threatened and endangered and/or special concern species and resources exist in your project area, contact the appropriate jurisdictional agency/agencies immediately to identify and resolve any impacts.

For a list of species known to occur in the county where your project is located, please see the species lists by county found on the PA Natural Heritage Program (PNHP) home page (www.naturalheritage.state.pa.us). Also note that the PNDI Environmental Review Tool only contains information about species occurrences that have actually been reported to the PNHP.

6. AGENCY CONTACT INFORMATION

PA Department of Conservation and Natural Resources

Bureau of Forestry, Ecological Services Section
400 Market Street, PO Box 8552, Harrisburg, PA. 17105-8552
Fax:(717) 772-0271

U.S. Fish and Wildlife Service

Pennsylvania Field Office
110 Radnor Rd; Suite 101, State College, PA 16801
NO Faxes Please.

PA Fish and Boat Commission

Division of Environmental Services
450 Robinson Lane, Bellefonte, PA. 16823-7437
NO Faxes Please

PA Game Commission

Bureau of Wildlife Habitat Management
Division of Environmental Planning and Habitat Protection
2001 Elmerton Avenue, Harrisburg, PA. 17110-9797
Fax:(717) 787-6957

7. PROJECT CONTACT INFORMATION

Name: Steve Holden
Company/Business Name: Natural Resource Group, LLC
Address: One Financial Plaza, Suite 1515
City, State, Zip: Providence, RI 02903
Phone:(401) 278-4308 Fax:(401) 278-4310
Email: Steve.holden@NRG-LLC.Com

8. CERTIFICATION

I certify that ALL of the project information contained in this receipt (including project location, project size/configuration, project type, answers to questions) is true, accurate and complete. In addition, if the project type, location, size or configuration changes, or if the answers to any questions that were asked during this online review change, I agree to re-do the online environmental review.

applicant/project proponent signature date 3/16/15

Dominion Resources Services, Inc.
5000 Dominion Boulevard,
Glen Allen, VA 23060

May 1, 2015

Mike Dimatteo
Pennsylvania Game Commission
Bureau of Wildlife Habitat Management
Division of Environmental Planning and Habitat Protection
2001 Elmerton Avenue
Harrisburg, PA 17110-9797

Re: <u>Dominion Transmission, Inc., Supply Header Project</u>
<u>Greene and Westmoreland Counties, Pennsylvania</u>

Dear Mr. Dimatteo:

Dominion Transmission, Inc. (DTI) is proposing to construct and operate approximately 36.7 miles of pipeline loop and modify existing compression facilities in Pennsylvania and West Virginia. This project, referred to as the Supply Header Project (Project), will enable DTI to provide firm transportation service to various customers, including Atlantic Coast Pipeline, LLC, which is proposing to construct the Atlantic Coast Pipeline. DTI has hired Natural Resource Group, LLC (NRG) as the primary environmental consultant for the Project. NRG is assisting DTI with construction planning, environmental surveys, and acquisition of environmental permits necessary for the Project.

The Pennsylvania segment of the Project includes 3.9 miles of 30-inch diameter natural gas pipeline loop (TL-636) adjacent to DTI's existing LN-25 pipeline in Westmoreland County and modifications at DTI's existing JB Tonkin and Crayne Compressor Stations in Westmoreland and Greene Counties, respectively.

Attached are the results of PNDI reviews we recently ran on the Project facilities. The reviews indicated that there are no potential impacts anticipated with special concern species or resources in the areas crossed by the pipeline and JB Tonkin Compressor Station. We intend to periodically rerun these searches as the Project progresses to ensure that we have captured the most up-to-date information. The review for the Crayne Compressor Station study area showed that there are potential impacts for two listed species: puttyroot orchid (*Aplectrum hyemale*) and three-ridge mussel (*Amblema plicata*). However, no results were listed under the Pennsylvania Game Commission. We believe no additional action is required by the Pennsylvania Game Commission.

We have sent a copy of these results to the Pennsylvania Department of Conservation and Natural Resources and Pennsylvania Fish and Boat Commission to obtain additional information about potential impacts on puttyroot orchid and three-ridge mussels, respectively. We are also

consulting with the U.S. Fish and Wildlife Service to assess potential Project impacts on federally listed threatened and endangered species.
The typical construction right-of-way for the TL-636 loop will be 100 feet wide in non-agricultural upland areas and 125 feet wide in agricultural areas, where full width topsoil segregation will be implemented. The width of the construction right-of-way will be reduced to 75 feet in wetlands. In addition to the construction right-of-way, additional temporary workspace will be required to stage construction activities and store equipment, materials, and spoil at wetland, waterbody, and road crossings. Following construction, a 50-foot-wide permanent easement will be maintained for operation of the pipeline.

Modifications at the JB Tonkin Compressor Station will include the addition of two new gas-driven turbines which will provide a combined 26,000 horsepower of additional compression. The modifications will include one new compressor building and expansion to the existing auxiliary building within the existing chain-link security fenced-in site. Equipment at the station will include gas filter/separators, gas coolers, inlet air filters, exhaust silencers, tanks, blowdown silencers, heaters, and auxiliary generators. Workspace outside the existing fenceline will be required for construction activities such as welding, coating, and storing construction materials, as well as, activities associated with existing pipeline interconnects. Following construction, these areas will be restored to pre-construction conditions with the exception of valves and other aboveground facilities that will be installed at the pipeline interconnects.

Modifications at the Crayne Compressor Station will include the addition of one new gas-driven turbine which will provide 7,700 horsepower of additional compression. The modifications will include expansion to the existing compressor building within the existing chain-link security fenced-in site. Equipment at the station will include gas filter/separators, gas coolers, inlet air filters, exhaust silencers, tanks, blowdown silencers, heaters, and auxiliary generators. Workspace outside the existing fenceline will be required for construction activities such as welding, coating, and storing construction materials. Following construction these areas will be restored to pre-construction conditions.

In addition, DTI will install valves and pig launcher/receiver facilities at each end of the pipeline loop. The valves, which will allow DTI to segment the pipelines for safety, operations, and maintenance purposes, will be installed below grade with aboveground valve operators, risers, blowdown valves, and crossover piping connected on each side of the valve. The pig launchers/receivers will be used to run pipeline inspection tools, called pigs, through the pipeline system.

The attached maps identify the areas being reviewed for the Project. DTI is currently evaluating the workspace that will be required for construction of the proposed facilities. The finalized workspace will likely be significantly smaller than the study area represented in the attached maps. Shapefiles for the proposed pipeline route and study areas are being e-mailed to you concurrent with this letter by Steve Holden of NRG. Please note that DTI is providing this information in confidence to facilitate early planning and routing. We request that these items are respected as confidential commercial information, not for distribution outside of your agency.

We appreciate your assistance with this review. Please contact Mr. William A. Scarpinato at (804) 273-3019 or William.A.Scarpinato@dom.com, if there are questions or concerns. Please direct written responses to:

William A. Scarpinato
Dominion Resources Services, Inc.
5000 Dominion Boulevard
Glen Allen, Virginia 23060

Sincerely,

Robert M. Bisha

Robert M. Bisha
Director, Environmental Business Support

Enclosures: Project Mapping
PNDI Review Results

cc: William Scarpinato

Dominion Resources Services, Inc.
5000 Dominion Boulevard,
Glen Allen, VA 23060

Dominion

May 1, 2015

Gary Smith
Pennsylvania Fish and Boat Commission
Division of Environmental Services, Natural Gas Section
236 Lake Road
Somerset, PA 15501

Re: **<u>Dominion Transmission, Inc., Supply Header Project</u>**
<u>Greene and Westmoreland Counties, Pennsylvania</u>

Dear Mr. Smith:

Dominion Transmission, Inc. (DTI) is proposing to construct and operate approximately 36.7 miles of pipeline loop and modify existing compression facilities in Pennsylvania and West Virginia. This project, referred to as the Supply Header Project (Project), will enable DTI to provide firm transportation service to various customers, including Atlantic Coast Pipeline, LLC, which is proposing to construct the Atlantic Coast Pipeline. DTI has hired Natural Resource Group, LLC (NRG) as the primary environmental consultant for the Project. NRG is assisting DTI with construction planning, environmental surveys, and acquisition of environmental permits necessary for the Project.

The Pennsylvania segment of the Project includes 3.9 miles of 30-inch diameter natural gas pipeline loop (TL-636) adjacent to DTI's existing LN-25 pipeline in Westmoreland County and modifications at DTI's existing JB Tonkin and Crayne Compressor Stations in Westmoreland and Greene Counties, respectively.

Attached are the results of PNDI reviews we recently ran on the Project facilities. The reviews indicated that there are no potential impacts anticipated with special concern species or resources in the areas crossed by the pipeline and JB Tonkin Compressor Station. We intend to periodically rerun these searches as the Project progresses to ensure that we have captured the most up-to-date information. The review for the Crayne Compressor Station study area showed that there are potential impacts for two listed species: puttyroot orchid (*Aplectrum hyemale*) and three-ridge mussel (*Amblema plicata*). The purpose of this letter is to transmit the attached PNDI review results and request additional information about potential impacts on three-ridge mussel within the Crayne Compressor Station study area. More information regarding the areas of disturbance related to the project is included below for your consideration.

We have sent a copy of these results to the Pennsylvania Department of Conservation and Natural Resources to obtain additional information about potential impacts on puttyroot orchid. We are also consulting with the U.S. Fish and Wildlife Service to assess potential Project impacts on federally listed threatened and endangered species.

The typical construction right-of-way for the TL-636 loop will be 100 feet wide in non-agricultural upland areas and 125 feet wide in agricultural areas, where full width topsoil segregation will be implemented. The width of the construction right-of-way will be reduced to 75 feet in wetlands. In addition to the construction right-of-way, additional temporary workspace will be required to stage construction activities and store equipment, materials, and spoil at wetland, waterbody, and road crossings. Following construction, a 50-foot-wide permanent easement will be maintained for operation of the pipeline.

Modifications at the JB Tonkin Compressor Station will include the addition of two new gas-driven turbines which will provide a combined 26,000 horsepower of additional compression. The modifications will include one new compressor building and expansion to the existing auxiliary building within the existing chain-link security fenced-in site. Equipment at the station will include gas filter/separators, gas coolers, inlet air filters, exhaust silencers, tanks, blowdown silencers, heaters, and auxiliary generators. Workspace outside the existing fenceline will be required for construction activities such as welding, coating, and storing construction materials, as well as, activities associated with existing pipeline interconnects. Following construction, these areas will be restored to pre-construction conditions with the exception of valves and other aboveground facilities that will be installed at the pipeline interconnects.

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The attached maps identify the areas being reviewed for the Project. DTI is currently evaluating the workspace that will be required for construction of the proposed facilities. The finalized workspace will likely be significantly smaller than the study area represented in the attached maps. Shapefiles for the proposed pipeline route and study areas are being e-mailed to you concurrent with this letter by Steve Holden of NRG. Please note that DTI is providing this information in confidence to facilitate early planning and routing. We request that these items are respected as confidential commercial information, not for distribution outside of your agency.

We appreciate your assistance with this review. Please contact Mr. William A. Scarpinato at (804) 273-3019 or William.A.Scarpinato@dom.com, if there are questions or concerns. Please direct written responses to:

William A. Scarpinato
Dominion Resources Services, Inc.
5000 Dominion Boulevard
Glen Allen, Virginia 23060

Sincerely,

Robert M. Bisha

Robert M. Bisha
Director, Environmental Business Support

Enclosures: Project Mapping
PNDI Review Results

cc: William Scarpinato

Dominion Resources Services, Inc.
5000 Dominion Boulevard,
Glen Allen, VA 23060

Dominion

May 1, 2015

Jason Ryndock
Pennsylvania Department of Conservation and Natural Resources
Bureau of Forestry, Ecological Services Section
Natural Heritage Program
P.O. Box 8552
Harrisburg, PA 17105-8552

**Re: Dominion Transmission, Inc., Supply Header Project
Greene and Westmoreland Counties, Pennsylvania**

Dear Mr. Ryndock:

Dominion Transmission, Inc. (DTI) is proposing to construct and operate approximately 36.7 miles of pipeline loop and modify existing compression facilities in Pennsylvania and West Virginia. This project, referred to as the Supply Header Project (Project), will enable DTI to provide firm transportation service to various customers, including Atlantic Coast Pipeline, LLC, which is proposing to construct the Atlantic Coast Pipeline. DTI has hired Natural Resource Group, LLC (NRG) as the primary environmental consultant for the Project. NRG is assisting DTI with construction planning, environmental surveys, and acquisition of environmental permits necessary for the Project.

The Pennsylvania segment of the Project includes 3.9 miles of 30-inch diameter natural gas pipeline loop (TL-636) adjacent to DTI's existing LN-25 pipeline in Westmoreland County and modifications at DTI's existing JB Tonkin and Crayne Compressor Stations in Westmoreland and Greene Counties, respectively.

Attached are the results of PNDI reviews we recently ran on the Project facilities. The reviews indicated that there are no potential impacts anticipated with special concern species or resources in the areas crossed by the pipeline and JB Tonkin Compressor Station. We intend to periodically rerun these searches as the Project progresses to ensure that we have captured the most up-to-date information. The review for the Crayne Compressor Station study area showed that there are potential impacts for two listed species: puttyroot orchid (*Aplectrum hyemale*) and three-ridge mussel (*Amblema plicata*). The purpose of this letter is to transmit the attached PNDI review results and request additional information about potential impacts on puttyroot orchid within the Crayne Compressor Station study area. More information regarding the areas of disturbance related to the project is included below for your consideration.

We have sent a copy of these results to the Pennsylvania Fish and Boat Commission to obtain additional information about potential impacts on three-ridge mussels. We are also consulting with the U.S. Fish and Wildlife Service to assess potential Project impacts on federally listed threatened and endangered species.

The typical construction right-of-way for the TL-636 loop will be 100 feet wide in non-agricultural upland areas and 125 feet wide in agricultural areas, where full width topsoil segregation will be implemented. The width of the construction right-of-way will be reduced to 75 feet in wetlands. In addition to the construction right-of-way, additional temporary workspace will be required to stage construction activities and store equipment, materials, and spoil at wetland, waterbody, and road crossings. Following construction, a 50-foot-wide permanent easement will be maintained for operation of the pipeline.

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The attached maps identify the areas being reviewed for the Project. DTI is currently evaluating the workspace that will be required for construction of the proposed facilities. The finalized workspace will likely be significantly smaller than the study area represented in the attached maps. Shapefiles for the proposed pipeline route and study areas are being e-mailed to you concurrent with this letter by Steve Holden of NRG. Please note that DTI is providing this information in confidence to facilitate early planning and routing. We request that these items are respected as confidential commercial information, not for distribution outside of your agency.

We appreciate your assistance with this review. Please contact Mr. William A. Scarpinato at (804) 273-3019 or William.A.Scarpinato@dom.com, if there are questions or concerns. Please direct written responses to:

William A. Scarpinato
Dominion Resources Services, Inc.
5000 Dominion Boulevard
Glen Allen, Virginia 23060

Sincerely,

Robert M. Bisha

Robert M. Bisha
Director, Environmental Business Support

Enclosures: Project Mapping
PNDI Review Results

cc: William Scarpinato

Updated PNDI Results

May 6, 2015

Steve Holden

From: Steve Holden
Sent: Wednesday, May 13, 2015 12:23 PM
To: 'garys@pa.gov'; 'mdimatteo@pa.gov'; 'c-jryndock@pa.gov'
Subject: RE: Dominion Supply Header Project
Attachments: SHP_PNDI Results_Signed_5-06-2015.pdf; SHP_Crayne_Study_Area.prj; SHP_Crayne_Study_Area.sbn; SHP_Crayne_Study_Area.sbx; SHP_Crayne_Study_Area.shp; SHP_Crayne_Study_Area.shx; SHP_Crayne_Study_Area.CPG; SHP_Crayne_Study_Area.dbf; SHP_TL_636_Study_Area.CPG; SHP_TL_636 _Study_Area.dbf; SHP_TL_636_Study_Area.prj; SHP_TL_636_Study_Area.sbn; SHP_TL_636 _Study_Area.sbx; SHP_TL_636_Study_Area.shp; SHP_TL_636_Study_Area.shp.xml; SHP_TL_636_Study_Area.shx; SHP_TL_636_Centerline.CPG; SHP_TL_636_Centerline.dbf; SHP_TL_636_Centerline.prj; SHP_TL_636_Centerline.sbn; SHP_TL_636_Centerline.sbx; SHP_TL_636_Centerline.shp; SHP_TL_636_Centerline.shx

As a follow-up to the letters sent to you on May 1, 2015 by Dominion Transmission, Inc., please find the attached shapefiles for the study areas along the proposed pipeline route and at the two compressor station modification sites.

Also attached are the results of a PNDI review we reran on May 6th to ensure coverage after the recent changes related to the northern long-eared bat.

Please let me know if you have any questions.

Thank you,
Steve

NATURAL RESOURCE GROUP
an ERM Group company

Steve Holden, CPSS; CPESC
steve.holden@nrg-llc.com
(401) 278-4308 Direct
(401) 528-7299 Cell
(401) 278-4310 Fax

1. PROJECT INFORMATION

Project Name: **Crayne CS**
Date of review: **5/6/2015 1:23:55 PM**
Project Category: **Energy Storage, Production, and Transfer,Energy Transfer,Pipeline (e.g., gas, oil) -- NEW (construction of new line in a new location)**
Project Area: **51.5** acres
County: **Greene** Township/Municipality: **Morgan,Franklin**
Quadrangle Name: **MATHER** ~ ZIP Code: **15370**
Decimal Degrees: **39.922066 N, -80.120624 W**
Degrees Minutes Seconds: **39° 55' 19.4" N, -80° 7' 14.2" W**

2. SEARCH RESULTS

Agency	Results	Response
PA Game Commission	No Known Impact	No Further Review Required
PA Department of Conservation and Natural Resources	**Potential Impact**	**FURTHER REVIEW IS REQUIRED, See Agency Response**
PA Fish and Boat Commission	**Potential Impact**	**FURTHER REVIEW IS REQUIRED, See Agency Response**
U.S. Fish and Wildlife Service	No Known Impact	No Further Review Required

As summarized above, Pennsylvania Natural Diversity Inventory (PNDI) records indicate there may be potential impacts to threatened and endangered and/or special concern species and resources within the project area. If the response above indicates "No Further Review Required" no additional communication with the respective agency is required. If the response is "Further Review Required" or "See Agency Response," refer to the appropriate agency comments below. Please see the DEP Information Section of this receipt if a PA Department of Environmental Protection Permit is required.

RESPONSE TO QUESTION(S) ASKED

Q1: "Will the entire project area (including any discharge), plus a 300 feet buffer around the project area, all occur in or on an existing building, parking lot, driveway, road, road shoulder, street, runway, paved area, railroad bed, maintained (periodically mown) lawn, crop agriculture field or maintained orchard?"
Your answer is: **3. Unknown**

3. AGENCY COMMENTS

Regardless of whether a DEP permit is necessary for this proposed project, any potential impacts to threatened and endangered species and/or special concern species and resources must be resolved with the appropriate jurisdictional agency. In some cases, a permit or authorization from the jurisdictional agency may be needed if adverse impacts to these species and habitats cannot be avoided.

These agency determinations and responses are **valid for two years** (from the date of the review), and are based on the project information that was provided, including the exact project location; the project type, description, and features; and any responses to questions that were generated during this search. If any of the following change: 1) project location, 2) project size or configuration, 3) project type, or 4) responses to the questions that were asked during the online review, the results of this review are not valid, and the review must be searched again via the PNDI Environmental Review Tool and resubmitted to the jurisdictional agencies. The PNDI tool is a primary screening tool, and a desktop review may reveal more or fewer impacts than what is listed on this PNDI receipt. The jursidictional agencies **strongly advise against** conducting surveys for the species listed on the receipt prior to consultation with the agencies.

PA Game Commission

RESPONSE: No Impact is anticipated to threatened and endangered species and/or special concern species and resources.

PA Department of Conservation and Natural Resources

RESPONSE: Further review of this project is necessary to resolve the potential impacts(s). Please send project information to this agency for review (see WHAT TO SEND).

DCNR Species: (Note: The PNDI tool is a primary screening tool, and a desktop review may reveal more or fewer species than what is listed below. After desktop review, if a botanical survey is required by DCNR, we recommend the DCNR Botanical Survey Protocols, available here: http://www.gis.dcnr.state.pa.us/hgis-er/PNDI_DCNR.aspx.)
Scientific Name: Aplectrum hyemale
Common Name: Puttyroot
Current Status: Special Concern Species*
Proposed Status: Special Concern Species*

Scientific Name: Sensitive Species**
Common Name:
Current Status: Special Concern Species*
Proposed Status: Special Concern Species*

PA Fish and Boat Commission

RESPONSE: Further review of this project is necessary to resolve the potential impacts(s). Please send project information to this agency for review (see WHAT TO SEND).

PFBC Species: (Note: The PNDI tool is a primary screening tool, and a desktop review may reveal more or fewer species than what is listed below.)
Scientific Name: Amblema plicata
Common Name: Three-ridge
Current Status: Special Concern Species*

U.S. Fish and Wildlife Service

RESPONSE: No impacts to **federally** listed or proposed species are anticipated. Therefore, no further consultation/coordination under the Endangered Species Act (87 Stat. 884, as amended; 16 U.S.C. 1531 *et seq.* is required. Because no take of federally listed species is anticipated, none is authorized. This response does not reflect potential Fish and Wildlife Service concerns under the Fish and Wildlife Coordination Act or other authorities.

* Special Concern Species or Resource - Plant or animal species classified as rare, tentatively undetermined or candidate as well as other taxa of conservation concern, significant natural communities, special concern populations (plants or animals) and unique geologic features.
** Sensitive Species - Species identified by the jurisdictinal agency as collectible, having economic value, or being susceptible to decline as a result of visitation.

WHAT TO SEND TO JURISDICTIONAL AGENCIES

If project information was requested by one or more of the agencies above, send the following information to the agency(s) seeking this information (see AGENCY CONTACT INFORMATION).

Check-list of *Minimum* Materials to be submitted:

____**SIGNED** copy of this Project Environmental Review Receipt
____Project narrative with a description of the overall project, the work to be performed, current physical characteristics of the site and acreage to be impacted.
____Project location information (name of USGS Quadrangle, Township/Municipality, and County)
____USGS 7.5-minute Quadrangle with project boundary clearly indicated, and quad name on the map

The inclusion of the following information may expedite the review process.
____A basic site plan(particularly showing the relationship of the project to the physical features such as wetlands, streams, ponds, rock outcrops, etc.)
____Color photos keyed to the basic site plan (i.e. showing on the site plan where and in what direction each photo was taken and the date of the photos)
____Information about the presence and location of wetlands in the project area, and how this was determined (e.g., by a qualified wetlands biologist), if wetlands are present in the project area, provide project plans showing

the location of all project features, as well as wetlands and streams

4. DEP INFORMATION

The Pa Department of Environmental Protection (DEP) requires that a signed copy of this receipt, along with any required documentation from jurisdictional agencies concerning resolution of potential impacts, be submitted with applications for permits requiring PNDI review. For cases where a "Potential Impact" to threatened and endangered species has been identified before the application has been submitted to DEP, the application should not be submitted until the impact has been resolved. For cases where "Potential Impact" to special concern species and resources has been identified before the application has been submitted, the application should be submitted to DEP along with the PNDI receipt. The PNDI Receipt should also be submitted to the appropriate agency according to directions on the PNDI Receipt. DEP and the jurisdictional agency will work together to resolve the potential impact(s). See the DEP PNDI policy at http://www.naturalheritage.state.pa.us.

5. ADDITIONAL INFORMATION

The PNDI environmental review website is a **preliminary** screening tool. There are often delays in updating species status classifications. Because the proposed status represents the best available information regarding the conservation status of the species, state jurisdictional agency staff give the proposed statuses at least the same consideration as the current legal status. If surveys or further information reveal that a threatened and endangered and/or special concern species and resources exist in your project area, contact the appropriate jurisdictional agency/agencies immediately to identify and resolve any impacts.

For a list of species known to occur in the county where your project is located, please see the species lists by county found on the PA Natural Heritage Program (PNHP) home page (www.naturalheritage.state.pa.us). Also note that the PNDI Environmental Review Tool only contains information about species occurrences that have actually been reported to the PNHP.

6. AGENCY CONTACT INFORMATION

PA Department of Conservation and Natural Resources

Bureau of Forestry, Ecological Services Section
400 Market Street, PO Box 8552, Harrisburg, PA. 17105-8552
Fax:(717) 772-0271

U.S. Fish and Wildlife Service

Pennsylvania Field Office
110 Radnor Rd; Suite 101, State College, PA 16801
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PA Fish and Boat Commission

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450 Robinson Lane, Bellefonte, PA. 16823-7437
NO Faxes Please

PA Game Commission

Bureau of Wildlife Habitat Management
Division of Environmental Planning and Habitat Protection
2001 Elmerton Avenue, Harrisburg, PA. 17110-9797
Fax:(717) 787-6957

7. PROJECT CONTACT INFORMATION

Name: Steve Holden
Company/Business Name: Natural Resource Group, LLC
Address: One Financial Plaza, Suite 1515
City, State, Zip: Providence, RI 02903
Phone:(401) 278-4308 Fax:(401) 278-4310
Email: Steve.holden@NRG-LLC.com

8. CERTIFICATION

I certify that ALL of the project information contained in this receipt (including project location, project size/configuration, project type, answers to questions) is true, accurate and complete. In addition, if the project type, location, size or configuration changes, or if the answers to any questions that were asked during this online review change, I agree to re-do the online environmental review.

_______________________ 5/06/15
applicant/project proponent signature date

Pennsylvania Game Commission Response

May 14, 2015

Steve Holden

From: Taucher, John <jotaucher@pa.gov>
Sent: Thursday, May 14, 2015 8:07 AM
To: Steve Holden
Subject: RE: Dominion Supply Header Project

Mr. Holden,

Thank you for submitting this information. Please note that if the PNDI receipt states no further review is required by the PGC, then you do not need to coordinate with this agency. Rather the PNDI receipt will be your "clearance" letter.

Thanks,

John Taucher
Pennsylvania Game Commission
Bureau of Wildlife Habitat Management
Division of Environmental Planning & Habitat Protection
2001 Elmerton Avenue
Harrisburg, PA 17110
717-787-4250 ext. 3632
Fax 717-787-6957

From: Steve Holden [mailto:steve.holden@nrg-llc.com]
Sent: Wednesday, May 13, 2015 12:24 PM
To: Smith, Gary (Fish & Boat); DiMatteo, Michael R; Ryndock, Jason
Subject: RE: Dominion Supply Header Project

As a follow-up to the letters sent to you on May 1, 2015 by Dominion Transmission, Inc., please find the attached shapefiles for the study areas along the proposed pipeline route and at the two compressor station modification sites.

Also attached are the results of a PNDI review we reran on May 6th to ensure coverage after the recent changes related to the northern long-eared bat.

Please let me know if you have any questions.

Thank you,
Steve

NATURAL RESOURCE GROUP
an ERM Group company

Steve Holden, CPSS; CPESC
steve.holden@nrg-llc.com
(401) 278-4308 Direct
(401) 528-7299 Cell
(401) 278-4310 Fax

Pennsylvania Fish and Boat Commission Response

May 08, 2015

Division of Environmental Services
Natural Gas Section
450 Robinson Lane
Bellefonte, PA 16823

May 18, 2015

IN REPLY REFER TO
SIR# 44286

Dominion Resources Services, Inc.
William Scarpinato
5000 Dominion Blvd.
Glen Allen, Virginia 23060

RE: Species Impact Review (SIR) – Rare, Candidate, Threatened and Endangered Species
PNDI Search No. 20150506502190
Crayne Compressor Station Modification - Supply Header Project
GREENE County: Franklin Township, Morgan Township

Dear William Scarpinato:

This responds to your inquiry about a Pennsylvania Natural Diversity Inventory (PNDI) Internet Database search "potential conflict" or a threatened and endangered species impact review. These projects are screened for potential conflicts with rare, candidate, threatened or endangered species under Pennsylvania Fish & Boat Commission jurisdiction (fish, reptiles, amphibians, aquatic invertebrates only) using the Pennsylvania Natural Diversity Inventory (PNDI) database and our own files. These species of special concern are listed under the Endangered Species Act of 1973, the Wild Resource Conservation Act, and the Pennsylvania Fish & Boat Code (Chapter 75), or the Wildlife Code.

Freshwater Mussels

Rare or protected freshwater mussel species are known from the vicinity of the project area. These rare and protected freshwater mussel species are known from the waterway near the project site. No erosion or sediment should be allowed to enter into the waterway (e.g., strict E&S control measures need to be employed). No release of toxic or harmful chemicals should be discharged into the waterway. We therefore recommend that all chemical storage including fuel storage tanks for equipment re-fueling be located at least 100 feet away from waterways. Provided that these recommendations are followed, as well as best management practices and an approved strict erosion/sedimentation control plan is maintained, then I do not anticipate the proposed activity to have any significant adverse impacts to the freshwater mussel species of concern.

This response represents the most up-to-date summary of the PNDI data and our files and is valid for two (2) years from the date of this letter. An absence of recorded species information does not necessarily imply species absence. Our data files and the PNDI system are continuously being updated with species occurrence information. Should project plans change or additional information on listed or proposed species become available, this determination may be reconsidered, and consultation shall be re-initiated.

If you have any questions regarding this review, please contact Gary Smith at 814-279-3080 and refer to the SIR # 44286. Thank you for your cooperation and attention to this important matter of species conservation and habitat protection.

Sincerely,

Heather Smiles

Heather A. Smiles, Chief
Natural Gas Section

HAS/GAS/dn

Pennsylvania Department of Conservation and Natural Resources Response

May 29, 2015

pennsylvania
DEPARTMENT OF CONSERVATION
AND NATURAL RESOURCES

BUREAU OF FORESTRY

May 29, 2015 **PNDI Number: 20150506502190**

Steve Holden
Natural Resource Group, LLC
One Financial Plaza, Suite 1515
Providence, RI 02903
Email: steve.holden@nrg-llc.com (hard copy will not follow)

Re: Dominion Transmission, Inc., Supply Header Project – Crayne Compressor Station
Franklin and Morgan Townships, Greene County, PA

Dear Mr. Holden,

Thank you for the submission of the Pennsylvania Natural Diversity Inventory (PNDI) Environmental Review Receipt Number 20150506502190 for review (formerly PNDI 20150320490888). PA Department of Conservation and Natural Resources screened this project for potential impacts to species and resources under DCNR's responsibility, which includes plants, terrestrial invertebrates, natural communities, and geologic features only.

No Impact Anticipated

PNDI records indicate species or resources under DCNR's jurisdiction are located in the vicinity of the project. However, based on the information you submitted concerning the nature of the project, the immediate location, and our detailed resource information, DCNR has determined that no impact is likely. No further coordination with our agency is needed for this project.

This response represents the most up-to-date review of the PNDI data files and is valid for two (2) years only. If project plans change or more information on listed or proposed species becomes available, our determination may be reconsidered. Should the proposed work continue beyond the period covered by this letter, please resubmit the project to this agency as an "Update" (including an updated PNDI receipt, project narrative and accurate map). As a reminder, this finding applies to potential impacts under DCNR's jurisdiction only. Visit the PNHP website for directions on contacting the Commonwealth's other resource agencies for environmental review.

Should you have any questions or concerns, please contact Jason Ryndock, Ecological Information Specialist, by phone (717-705-2822) or via email (c-jryndock@pa.gov).

Sincerely

Greg Podniesinski

Greg Podniesinski, Section Chief
Natural Heritage Section

DOMINION TRANSMISSION, INC.

SUPPLY HEADER PROJECT

SECTION 7 –ACT 14 LETTERS

Dominion Resources Services, Inc.
5000 Dominion Boulevard,
Glen Allen, VA 23060

Dominion

April 27, 2016

Planning Commission
Department of Economic Development for Greene County
49 South Washington Street
Waynesburg, PA 15370

Re: Dominion Transmission, Inc., Supply Header Project
PADEP Chapter 105 GP-5, 7, 8 and ESCGP-2 Act 14 Notification
Greene and Westmoreland Counties, Pennsylvania
CERTIFIED MAIL – RETURN RECEIPT REQUESTED

Dear Commissioners:

The purpose of this notice is to inform you that Dominion Transmission, Inc. (DTI) proposes to submit updated permit applications to the Pennsylvania Department of Environmental Protection (DEP) for the Supply Header Project (SHP). This letter provides project notification in accordance with the provisions of Act 14, 97 P.S. § 510-5. The letter serves as an update to the Act 14 Notification Letter dated September 8, 2015.

Acts 67 and 68 of 2000, which amended the Municipalities Planning Code to direct state agencies to consider comprehensive plans and zoning ordinances when reviewing applications for permitting of facilities or infrastructure, specify that state agencies may rely upon comprehensive plans and zoning ordinances under certain conditions as described in Sections 619.2 and 1105 of the Municipalities Planning Code.

Permit Application Type:

Chapter 105 General Permits for Utility Line Crossings (GP-5), Minor Road Crossings (GP-7), Temporary Road Crossings (GP-8), and Erosion and Sediment Control General Permit (ESCGP-2).

Applicant Contact:

William Scarpinato
Dominion Environmental Services
5000 Dominion Boulevard
Glen Allen, Virginia 23060
(804) 273-3019
william.a.scarpinato@dom.com

Project Location:

JB Tonkin Compressor Station, Murrysville, Westmoreland County
3.9 miles of pipeline through Murrysville, Westmoreland County
Crayne Compressor Station, Franklin Township, Greene County

Project Description:

The SHP includes 36.5 miles of pipeline loop and modify existing compression facilities in Pennsylvania and West Virginia. The Pennsylvania segment of the Project includes:

- 3.9 miles of 30-inch diameter natural gas pipeline loop adjacent to DTI's existing pipeline in Westmoreland County.
- Modifications at DTI's existing JB Tonkin and Crayne Compressor Stations in Westmoreland and Greene Counties, respectively.

The Project will enable DTI to provide firm transportation service to various customers, including Atlantic Coast Pipeline, LLC, which is proposing to construct the Atlantic Coast Pipeline.

Enclosed is a U.S. Geological Survey topographic map showing the SHP location in Westmoreland and Green Counties, Pennsylvania. SHP invites you to comment on the land use aspects of this project; please be specific and focus on the relationship to zoning ordinances. If you wish to submit comments to DEP, you must respond within 30 days of this letter. If there are no land use comments received by the end of the comment period, DEP will assume that there are no substantive land use conflicts and proceed with the normal application review process.

If you have any questions or concerns, please contact William A. Scarpinato at (804) 273-3019 or by email at William.A.Scarpinato@dom.com.

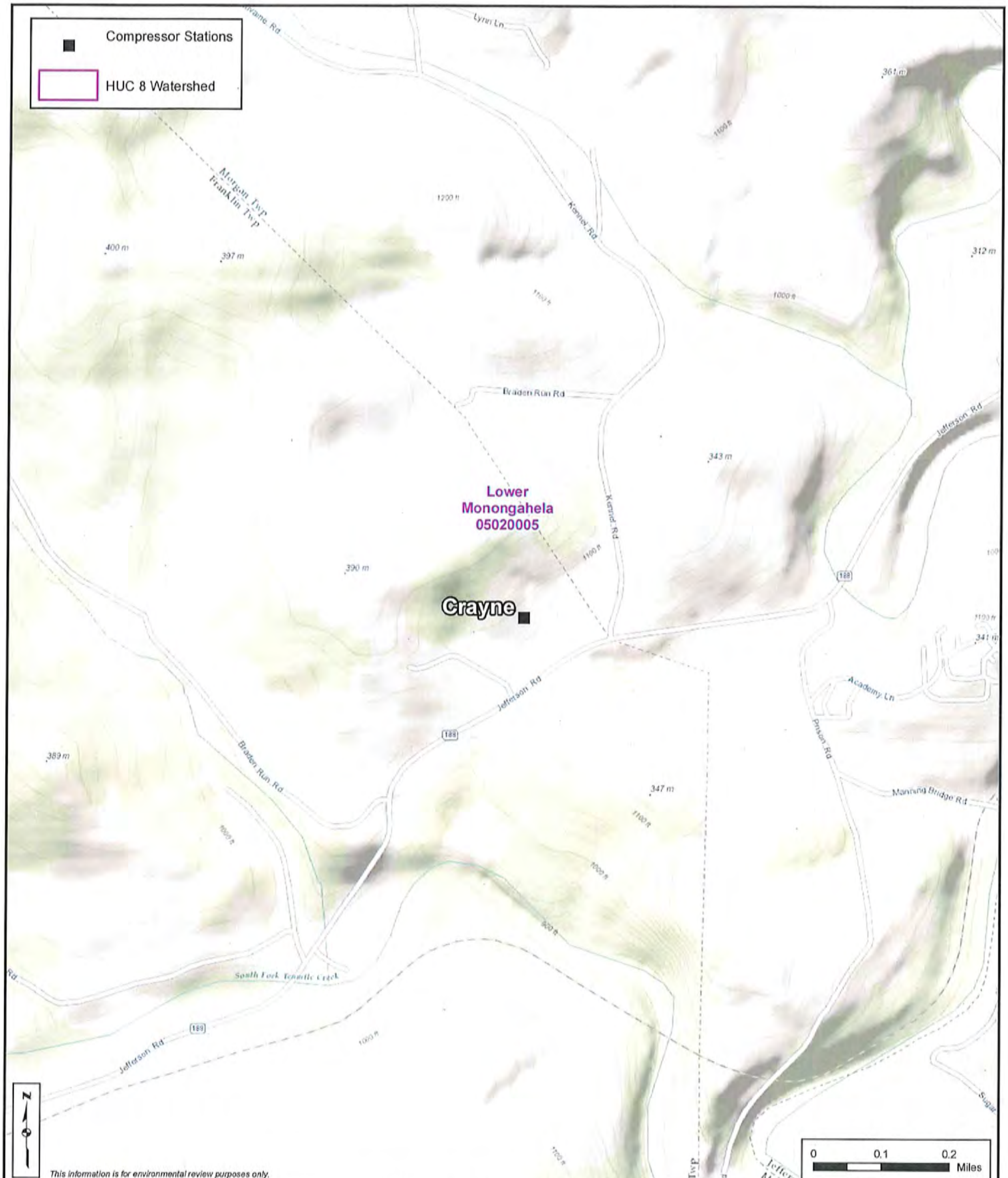
Sincerely,

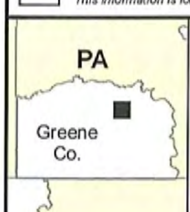
Robert M. Bisha

Robert M. Bisha
Technical Advisor, Supply Header Project

Enclosures: U.S. Geological Survey Topographic Map

cc: William A. Scarpinato





Supply Header Project

General Location Map

Dominion

NATURAL RESOURCE GROUP

an ERM Group company

SENDER: COMPLETE THIS SECTION

- Complete items 1, 2, and 3.
- Print your name and address on the reverse so that we can return the card to you.
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1. Article Addressed to:

Planning Commission
Department of Economic Development for Greene County
49 South Washington Street
Waynesburg, PA 15370

9590 9402 1587 5362 9574 73

2. Article Number (Transfer from service label)
7016 0340 0000 7419 5256

COMPLETE THIS SECTION ON DELIVERY

A. Signature
X Mary Jane Kent
☒ Agent
☐ Addressee

B. Received by (Printed Name)
MARY JANE KENT

C. Date of Delivery
5/2/16

D. Is delivery address different from item 1? ☐ Yes
If YES, enter delivery address below: ☐ No

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PS Form 3811, July 2015 PSN 7530-02-000-9053

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☐ Adult Signature Required $ $0.00	
☐ Adult Signature Restricted Delivery $	
Postage $ $0.47	
Total Postage and Fees $ $6.47	04/27/2016

Sent To
Greene County Planning Commission
Street and Apt. No., or PO Box No.
49 South Washington Street
City, State, ZIP+4®
Waynesburg, PA 15370

PS Form 3800, April 2015 PSN 7530-02-000-9047 See Reverse for Instructions

Dominion Resources Services, Inc.
5000 Dominion Boulevard.
Glen Allen, VA 23060

Dominion

April 27, 2016

Franklin Township Supervisors
Franklin Township Municipal Building
568 Rolling Meadows Road
Waynesburg, PA 15370

Re: Dominion Transmission, Inc., Supply Header Project
PADEP Chapter 105 GP-5, 7, 8 and ESCGP-2 Act 14 Notification
Greene and Westmoreland Counties, Pennsylvania
CERTIFIED MAIL – RETURN RECEIPT REQUESTED

Dear Supervisors:

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Permit Application Type:

Chapter 105 General Permits for Utility Line Crossings (GP-5), Minor Road Crossings (GP-7), Temporary Road Crossings (GP-8), and Erosion and Sediment Control General Permit (ESCGP-2).

Applicant Contact:

William Scarpinato
Dominion Environmental Services
5000 Dominion Boulevard
Glen Allen, Virginia 23060
(804) 273-3019
william.a.scarpinato@dom.com

Project Location:

JB Tonkin Compressor Station, Murrysville, Westmoreland County
3.9 miles of pipeline through Murrysville, Westmoreland County
Crayne Compressor Station, Franklin Township, Greene County

Project Description:

The SHP includes 36.5 miles of pipeline loop and modify existing compression facilities in Pennsylvania and West Virginia. The Pennsylvania segment of the Project includes:

- 3.9 miles of 30-inch diameter natural gas pipeline loop adjacent to DTI's existing pipeline in Westmoreland County.
- Modifications at DTI's existing JB Tonkin and Crayne Compressor Stations in Westmoreland and Greene Counties, respectively.

The Project will enable DTI to provide firm transportation service to various customers, including Atlantic Coast Pipeline, LLC, which is proposing to construct the Atlantic Coast Pipeline.

Enclosed is a U.S. Geological Survey topographic map showing the SHP location in Westmoreland and Green Counties, Pennsylvania. SHP invites you to comment on the land use aspects of this project; please be specific and focus on the relationship to zoning ordinances. If you wish to submit comments to DEP, you must respond within 30 days of this letter. If there are no land use comments received by the end of the comment period, DEP will assume that there are no substantive land use conflicts and proceed with the normal application review process.

If you have any questions or concerns, please contact William A. Scarpinato at (804) 273-3019 or by email at William.A.Scarpinato@dom.com.

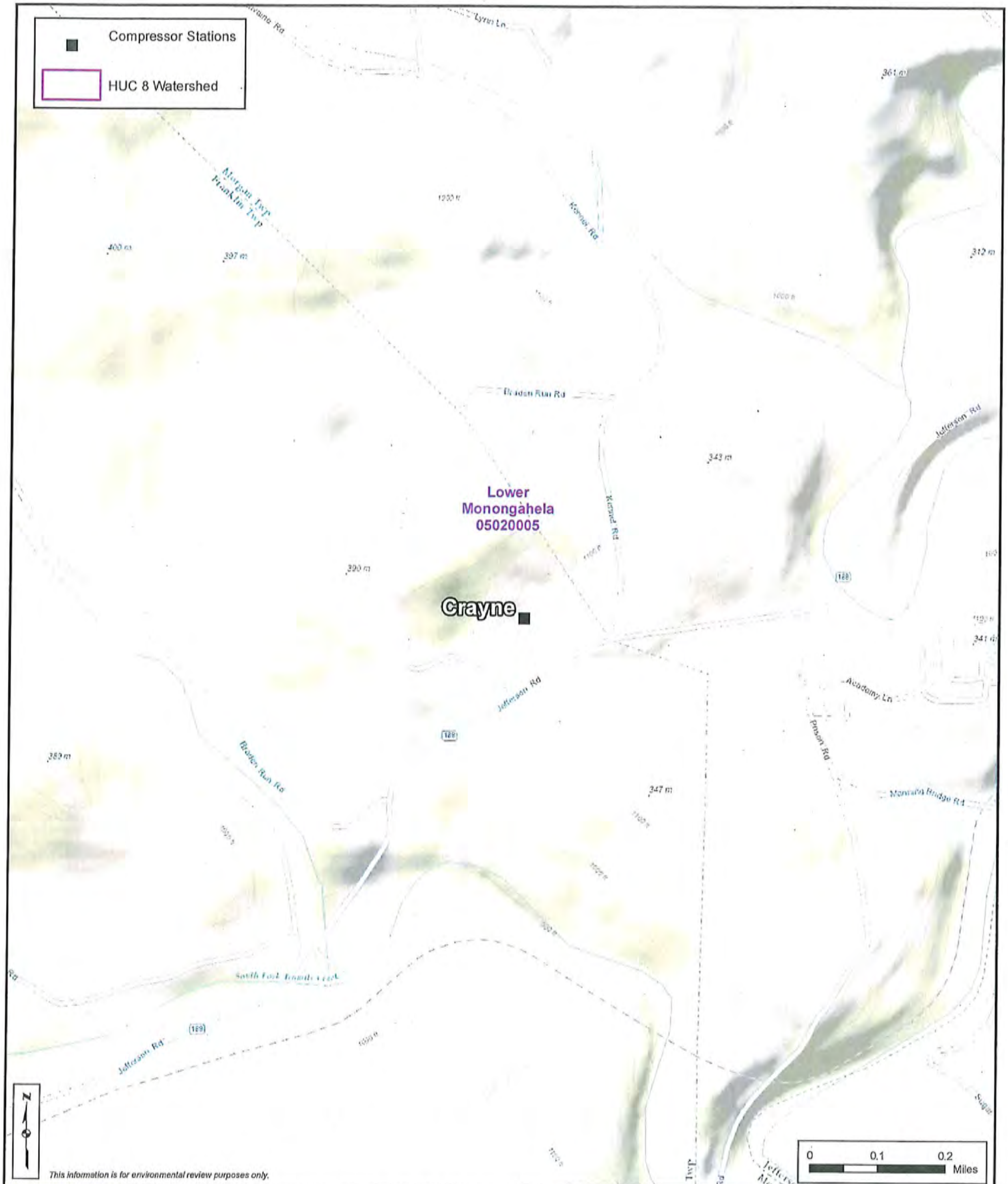
Sincerely,

Robert M. Bisha

Robert M. Bisha
Technical Advisor, Supply Header Project

Enclosures: U.S. Geological Survey Topographic Map

cc: William A. Scarpinato



Supply Header Project

General Location Map

Dominion

Natural Resource Group
an ERM Group company

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Article Addressed to:

Franklin Township Supervisors
Franklin Township Municipal Building
568 Rolling Meadows Road
Waynesburg, PA 15370

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Article Number *(Transfer from service label)*
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☐ Agent
☐ Addressee

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S Form 3811, July 2015 PSN 7530-02-000-9053 Domestic Return Receipt

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Total Postage and Fees $6.47

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City, State, ZIP+4® Waynesburg, PA 15370

PS Form 3800, April 2015 PSN 7530-02-000-9047 See Reverse for Instructions

Dominion Resources Services, Inc.
5000 Dominion Boulevard,
Glen Allen, VA 23060

Dominion

February 3, 2017

Morgan Township Board of Supervisors
Township Municipal Building
1019 Third Street Extension
P.O. Box 3
Mather, PA 15346

Re: Dominion Transmission, Inc., Supply Header Project
PADEP Chapter 105 GP-5, 7, 8 and ESCGP-2 Act 14 Notification
Greene and Westmoreland Counties, Pennsylvania
CERTIFIED MAIL – RETURN RECEIPT REQUESTED

Dear Supervisors:

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Permit Application Type:

Chapter 105 General Permits for Utility Line Crossings (GP-5), Minor Road Crossings (GP-7), Temporary Road Crossings (GP-8), and Erosion and Sediment Control General Permit (ESCGP-2).

Applicant Contact:

Richard Gangle
Dominion Environmental Services
5000 Dominion Boulevard
Glen Allen, Virginia 23060
(804) 273-2814
richard.b.gangle@dom.com

Project Location:

JB Tonkin Compressor Station, Murrysville, Westmoreland County
Temporary Contractor Yard, Salem Township, Westmoreland County
3.9 miles of pipeline through Murrysville, Westmoreland County
Crayne Compressor Station, Franklin & Morgan Townships, Greene County

Project Description:

The SHP includes 37.5 miles of pipeline loop and modification to existing compression facilities in Pennsylvania and West Virginia. The Pennsylvania segment of the Project includes:

- 3.9 miles of 30-inch diameter natural gas pipeline loop adjacent to DTI's existing pipeline in Westmoreland County.
- Modifications at DTI's existing JB Tonkin and Crayne Compressor Stations in Westmoreland and Greene Counties, respectively.
- Access roads and temporary contractor yards in Westmoreland and Greene Counties.

The Project will enable DTI to provide firm transportation service to various customers, including Atlantic Coast Pipeline, LLC, which is proposing to construct the Atlantic Coast Pipeline in West Virginia, Virginia, and North Carolina.

Enclosed is a U.S. Geological Survey topographic map showing the SHP location in Westmoreland and Green Counties, Pennsylvania. SHP invites you to comment on the land use aspects of this project; please be specific and focus on the relationship to zoning ordinances. If you wish to submit comments to DEP, you must respond within 30 days of this letter. If there are no land use comments received by the end of that period, DEP will assume that there are no substantive land use conflicts and proceed with the normal application review process.

If you have any questions or concerns, please contact Richard B. Gangle at (804) 273-2814 or by email at Richard.B.Gangle @dom.com.

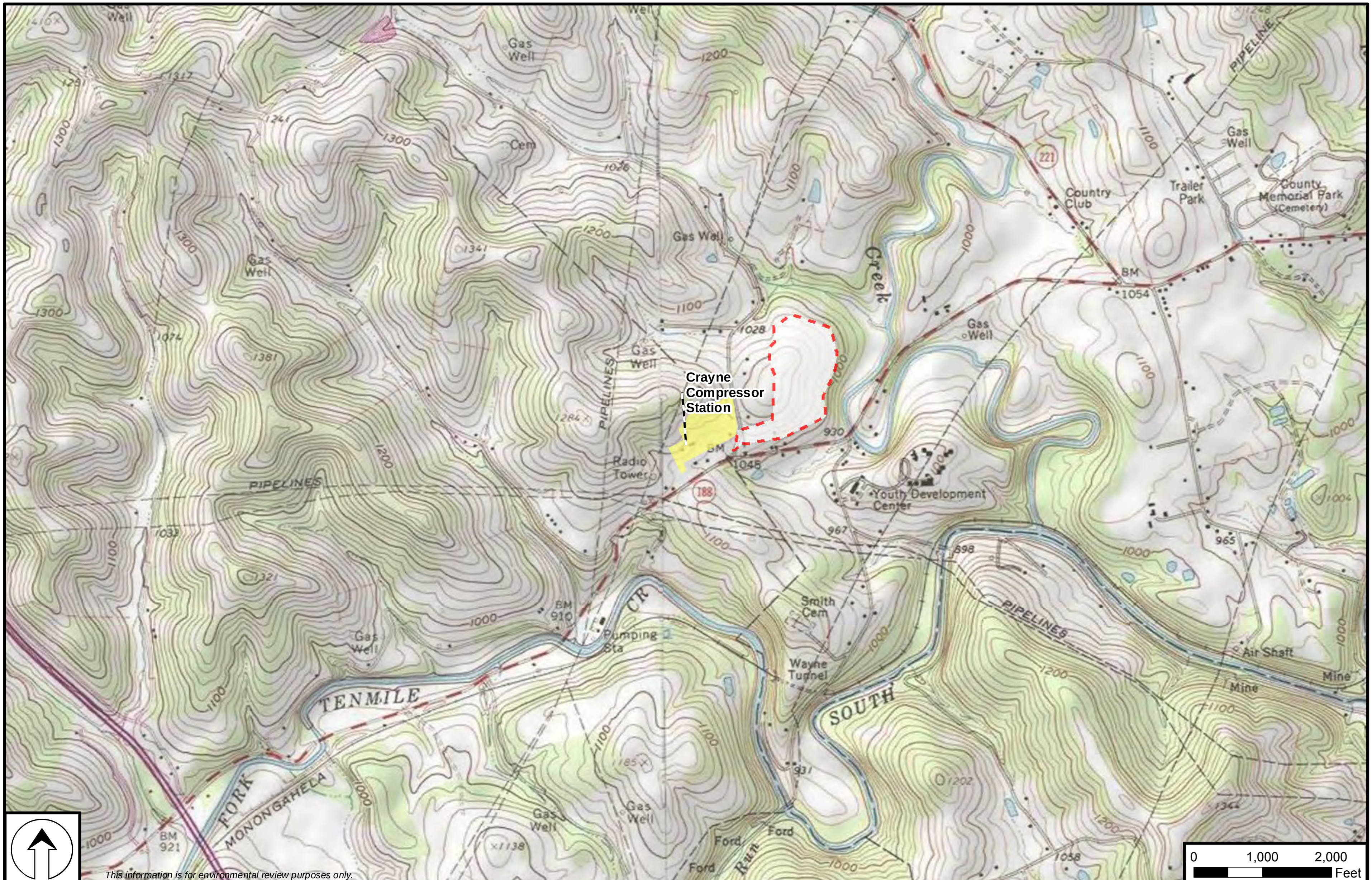
Sincerely,

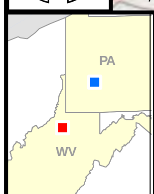
Robert M. Bisha

Robert M. Bisha
Technical Advisor, Supply Header Project

Enclosures: U.S. Geological Survey Topographic Map

cc: Richard B. Gangle





Supply Header Project

General Location Map

Greene Co., Pennsylvania

Dominion

ERM

FILE: M:\Clients\D-F\DOM\Supply_Header_ArcGIS\Resource_Reports\RREP_01\Figures_DRS_SHP_RR01_Sheets_Topos_Let.mxd, REVISED: 01/28/2017, SCALE: 1:24,000

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02/03/2017

Sent To: Morgan Twp Board of Supervisor
Street and Apt. No., or PO Box No.: 1019 Third Street Extension; PO Box 3
City, State, ZIP+4®: Mather PA 15346

PS Form 3800, April 2015 PSN 7530-02-000-9047 — See Reverse for Instructions

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1. Article Addressed to:

Morgan Township
Board of Supervisors
Township Municipal Bldg
1019 Third Street Extension
P.O. Box 3
Mather, PA 15346

9590 9402 1633 6053 9760 47

2. Article Number (Transfer from service label)

7016 0750 0000 4348 4780

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X Kelda Litten
☐ Agent
☐ Addressee

B. Received by *(Printed Name)*
KELDA LITTEN

C. Date of Delivery

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If YES, enter delivery address below: ☐ No

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- ☐ Return Receipt for Merchandise
- ☐ Signature Confirmation™
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PS Form 3811, July 2015 PSN 7530-02-000-9053 — Domestic Return Receipt