



North Millsboro Bypass, US 113 to SR 24

Sussex County, DE

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Contract No. 201912701

Preliminary Stormwater Management Report

Submitted by:

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TABLE OF CONTENTS

<u>SECTION</u>	<u>PAGE</u>
I. PROJECT NARRATIVE	
A. <i>Project Description and Objectives</i>	1
Figure 1 – Overall Location Map	1
B. <i>Overall Hydrology and Points of Investigation</i>	1-7
Figure 2 – Delineation Map	2
C. <i>Soils Classification</i>	7
II. STORMWATER MANAGEMENT APPROACH	
A. <i>Analysis Methodology</i>	8
B. <i>Proposed Stormwater Management</i>	9
a. <i>Water Quality</i>	9
Table 1: BMP Reduction Summary Table	9
b. <i>Water Quantity</i>	9-10
C. <i>Conclusion</i>	10

APPENDICES

Appendix A: Background Information

GIS Desktop Materials

LOD Map

Project Level DURMM

Appendix B: POI-1

POI-1 Drainage Area Map

HydroCAD Calculations

Appendix C: POI-2

POI-2 Drainage Area Map

HydroCAD Calculations



Appendix D: POI-3

POI-3 Drainage Area Map

HydroCAD Calculations

Appendix E: POI-4, POI-5, POI-6, POI-7, & POI-8

POI Drainage Area Maps

POI-4 HydroCAD Calculations

POI-5 HydroCAD Calculations

POI-6 HydroCAD Calculations

POI-7 HydroCAD Calculations

POI-8 HydroCAD Calculations

Appendix F: POI-9, POI-10, & POI-11

POI-9 Drainage Area Maps

POI-9 HydroCAD Calculations

POI-10 HydroCAD Calculations

POI-11 HydroCAD Calculations

Appendix G: POI-12 & POI-13

POI Drainage Area Maps

POI-12 HydroCAD Calculations

POI-13 HydroCAD Calculations

Appendix H: POI-14, POI-15, & POI-16

POI Drainage Area Maps

POI-14 HydroCAD Calculations

POI-15 HydroCAD Calculations

POI-16 HydroCAD Calculations



Appendix I: POI-17, POI-18, & POI-19

POI Drainage Area Maps

POI-17 HydroCAD Calculations

POI-18 HydroCAD Calculations

POI-19 HydroCAD Calculations

Appendix J: POI-20

POI-20 Drainage Area Map

HydroCAD Calculations

Appendix K: POI-21, POI-22, & POI-23

POI Drainage Area Maps

POI-21 HydroCAD Calculations

POI-22 HydroCAD Calculations

POI-23 HydroCAD Calculations

Appendix L: POI-24, POI-25, & POI-26

POI Drainage Area Maps

POI-24 HydroCAD Calculations

POI-25 HydroCAD Calculations

POI-26 HydroCAD Calculations

Project Overview

A. Project Objectives

The purpose of this project is to improve traffic safety, capacity, and address current and future multimodal transportation needs between US 113 and SR 24 in Sussex County (~2.9 miles). This project includes a new roadway connecting US 113 to SR 24 as it crosses Millsboro Pond. Generally, the typical section of the roadway for the North Millsboro Bypass will remain as primarily open-section drainage. The existing drainage within the project limits consists of multiple areas where the flow leaves the roadway and sheet flows out into poorly defined ditches and open fields. Drainage area boundaries will be maintained to the maximum extent practicable and will include conveyance of runoff to existing ponds adjacent to the project limits.

The new proposed roadway connection between US 113 and SR 24 is proposed and accounted for in this report. Where the new roadway is proposed through open space areas, infiltration best management practices (BMPs) are proposed to achieve regulatory compliance for the project impacts of the newly constructed proposed roadway alignment. Multiple infiltration trenches are proposed along the new roadway alignment as well as multiple detention ponds located within the infield areas of the proposed interchanges.

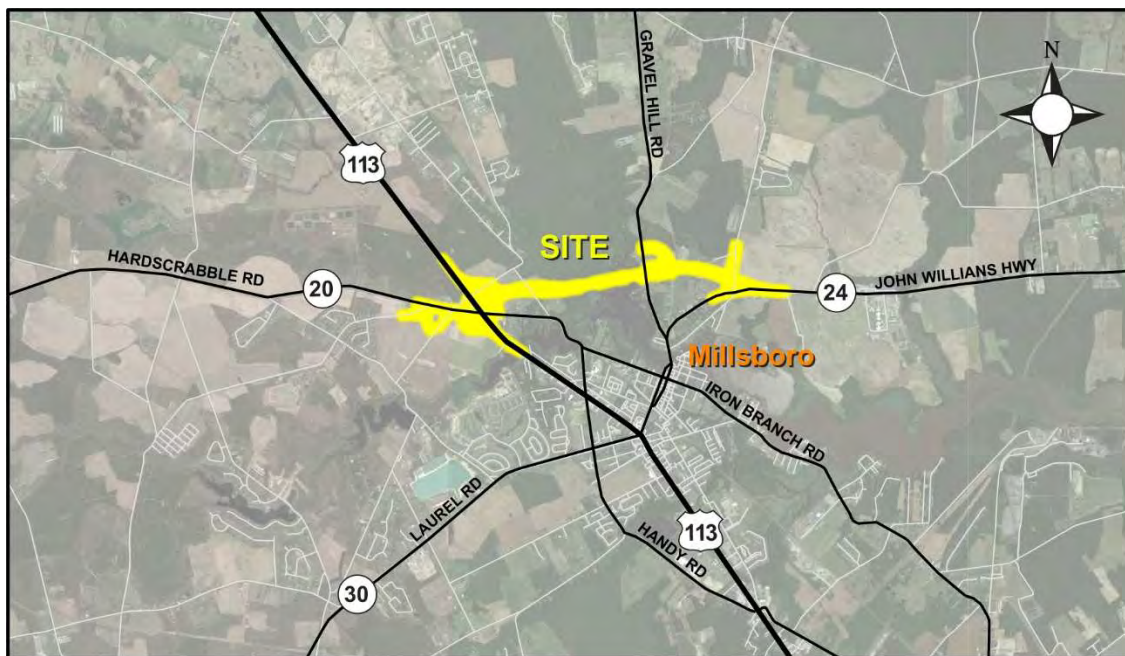


Figure 1 – Location Map

B. Overall Hydrology and Points of Investigation

Stormwater management as is detailed in this report and as constructed for this project is intended to fulfill the regulatory requirements for the entirety of the North Millsboro Bypass from US 113 to SR 24. The limits of the project lie entirely within the Indian River Bay Watershed which is part of Delaware's Inland Bays watershed. The existing drainage pattern along the length of the project site is open section draining to poorly defined ditches and open fields. The project has been broken down into two (2) major drainage areas which ultimately contribute to the greater Indian River watershed. The general line of delineation of between the two areas is SR 30 (Gravel Hill Road). Everything east of this line

flows to the east and south and directly to tidal Indian River. Everything west of this line flows directly to Millsboro Pond or Betts Pond upstream of the dams. The only exception to this rule is a small area where the Gravel Hill loop connector ramp will be constructed. Runoff in this area flows directly to Millsboro Pond and is appropriately depicted in Figure 2.

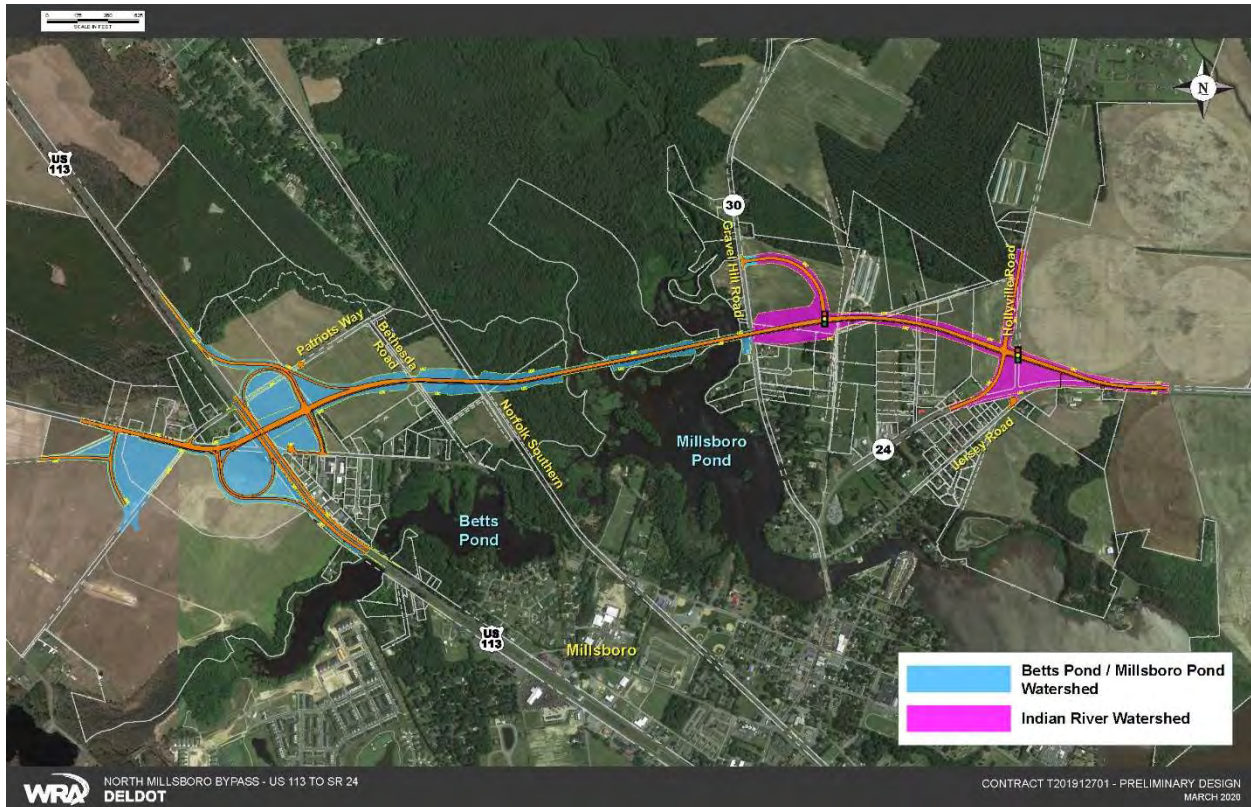


Figure 2 – Delineation between areas flowing directly to Indian River and areas flowing to Millsboro/Betts Ponds upstream of dams.

Existing drainage areas can be further broken down into four (4) areas which are defined by natural high points/lines that naturally occur at the north/south roadways intersecting the proposed bypass.

- The first drainage segment spans from Hollyville Road/Jersey Road to SR 24 (John J Williams Highway). The work in this area consists of realigning the intersection of Hollyville Road and Jersey Road and the tie in work associated with connecting the proposed bypass with the existing SR 24 roadway.
- The second major segment spans from SR 30 (Gravel Hill Road) to Jersey Road/Hollyville Road. This segment includes a connector road with Gravel Hill Road and the proposed new alignment of SR 24.
- The next major drainage segment extends from Fox Run Road/Betts Pond Road across Millsboro Pond to SR 30 (Gravel Hill Road). This ~0.8-mile segment includes 4 bridge structures spanning over Millsboro Pond as well as the Conrail railroad.
- The last segment spans from Fox Run Road/Betts Pond Road to SR 20 (Hardscrabble Road) which drains to Betts Pond. This portion of the project includes realigning Sheep Pen Road and Country

Living Road with the construction of a roundabout to provide all the necessary connections to smaller roadways. It also includes the proposed realignment of SR 24 as well as realignment of the intersection with SR 20 (Hardscrabble Road). Additionally, this segment of the project includes the construction of the grade separated portion of the North Millsboro Bypass over US 113 and loop ramps connecting to US 113 (Northbound and Southbound) and Fox Run Road/ Betts Pond Road. There are no existing stormwater BMPs along the proposed corridor. The majority of overland flow through the project area is sheet flow to open fields and the general flow direction is southerly and toward Millsboro Pond. In general, existing drainage area boundaries and flowpaths are to be maintained in the proposed condition to the greatest extent possible.

POI-1

POI-1 is located at SR 24 (John J Williams Highway), Station 1140+50, RT, and is the eastern limit of disturbance for the project. The existing drainage pattern for this area is sheet flow to shallow concentrated flow from the high point located within agricultural fields located to the north of SR 24 and eventually channelizes in a roadside ditch parallel to the roadway on the north side of SR 24 until it reaches a drainage inlet at Station 1141+00, LT. The inlet conveys runoff through an 18" RCP under SR 24 and discharges to a flat farm field south of SR 24.

Disturbance within this area includes removing the intersection of Hollyville Road and Jersey Road as well as the adjustment of SR 24 to the west. Disturbance on the west edge of the roadway includes pavement widening, and the addition of a 10-foot wide shared use sidewalk. Additionally, a proposed BMP (BMP-1) is to be built in the infield area where the existing intersection of Jersey Road and Hollyville Road exists. Drainage on the northern side of the proposed SR 24 travelway will be directed to a new pipe located at Station 1139+80 to convey flow under SR 24. The majority of runoff will be directed into the proposed BMP and eventually run along a roadside ditch parallel to SR 24 on the southern side of the road where it eventually outfalls to POI 1. The total LOD for LOI-1 is 15.31 acres.

POI-2

POI-2 is located along Hollyville Road, at Station 9020+25, LT, northwest of the proposed intersection of SR 24 and Jersey Road. The drainage area contributing to this POI extends north to the proposed tie in with the existing roadway and to the south, at the high point at the intersection with SR 24 and Jersey Road. The existing drainage area lacks a defined drainage pattern or closed drainage system.

Disturbance within this area includes the proposed realignment of Hollyville Road as well as the removal of the existing pavement. Additionally, roadside swales are proposed on either side of the new roadway, directing flow to a proposed cross pipe at Station 9020+25. Infiltration trenches are proposed at the low points of the swales, prior to discharging to POI 2. The total LOD for POI-2 is 4.46 acres.

POI-3

POI-3 is located along Jersey Road, at Station 9004+80, RT, southeast of the proposed intersection of SR 24 and Hollyville Road. The drainage area contributing to this POI extends south to the proposed tie in with the existing roadway and north to the high point at the intersection with SR 24 and Hollyville Road. The existing drainage area sheet flows off of the roadway to parallel ditches, to a closed drainage system which outfalls to the east of the intersection with Jersey Road in the existing condition.

Disturbance within this area includes the proposed realignment of Jersey Road as well as removal of existing pavement. Roadside swales are located on either side of the proposed roadway, directing flow to a proposed cross pipe at Station 9005+00 that ties into the existing drainage system. The total disturbed area for POI-3 is 5.87 acres.

POI-4 through POI-8

POI-4 through POI-8 are located in the open area extending from the intersection of SR 24 and Jersey Road/Hollyville Road to the west at approximately Station 1100+00. The existing drainage areas lack a defined drainage pattern or closed drainage system, but the area generally flows south.

Disturbance within these areas is limited to the roadway, sidewalk, and adjacent swales running parallel to the alignment. Closed system drainage is proposed to positively convey runoff from the north to the south of the proposed construction. Infiltration trenches are proposed at all low points that run adjacent to the bypass. The limits of disturbance for each of the POIs are listed below:

- POI-4 = 1.05 acres.
- POI-5 = 1.94 acres.
- POI-6 = 0.81 acres.
- POI-7 = 1.94 acres
- POI-8 = 1.82 acres

POI-9

POI-9 is located in the open space between Millsboro Pond/ SR 30 (Gravel Hill Road) and the proposed connector road extending north of the bypass. The existing area lacks a defined drainage pattern or closed drainage system, but generally the area flows south.

The area of disturbance includes the proposed bypass as well as a connector road extending from the bypass to a tie in at SR 30 NB. The drainage area also includes a portion of the infield area from the connector road. Closed system drainage is proposed to positively convey runoff from the north to the south of the proposed bypass and connector road. Also, ditches are proposed parallel to the connector road to convey flow to the discharge point at POI-9. Infiltration trenches are proposed at low points before entering proposed pipes and before discharge points. POI-9 has a total drainage area of 15.32 acres. This includes a portion of undisturbed infield area (9.58 acres) where no work is proposed and is outside the limit of disturbance (OLOD). The LOD for POI-9 is 5.74 acres.

POI-10

POI-10 is located in the open space between SR 30 (Gravel Hill Road) and the proposed connector road extending north of the proposed bypass. The existing area lacks a defined drainage pattern or closed drainage system, but the area generally flows south.

The area of disturbance includes the proposed roadway, sidewalk, and swales. The drainage area also includes a portion of the infield area created by the connector road. Closed system drainage is proposed to positively convey runoff from the north to the south of the proposed bypass. Ditches are proposed parallel to the connector road to convey flow to the discharge point at POI-10. Infiltration trenches are proposed at low points and at the inflow points of the cross pipe (Station 1092+00). POI 10 has a drainage area of 6.48 acres which includes a portion of undisturbed infield area. The undisturbed area measures 3.86 acres, and the LOD to POI-10 is 2.62.

POI-11

POI-11 is located at the intersection of SR 30 (Gravel Hill Road) and the proposed connector road coming from the bypass. The drainage area contributing to this POI is a small portion of the new connector road and adjacent swale to the north as well as a small portion of SR 30. The existing drainage pattern does not have a defined path, but generally flow is to the west of the site.

Disturbance within this area includes a small portion of the proposed connector road and adjacent swale. The swale will convey flow north of the connector road and will eventually move west. The total LOD to POI-11 is 0.55 acres.

POI-12

POI-12 is located on a piece of land within the footprint of Millsboro Pond and the drainage area covers approximately 1200 feet from east to west. The existing area lacks a defined drainage pattern or closed drainage system, but generally the area flows to the pond.

Disturbance in this area consists of the proposed bypass built on fill with sidewalk on the southern side and swales running parallel to either side of the newly proposed roadway. Additionally, a cross pipe is proposed to convey flow from the northern side to the southern side of the roadway and into Millsboro Pond. Infiltration trenches are proposed at the low points of the adjacent swales. The total LOD for POI-12 is 3.87 acres.

POI-13

POI-13 is located in an open space between Millsboro Pond and the Conrail railroad. The drainage area covers approximately 1025 feet from east to west. The existing area lacks a defined drainage pattern or closed drainage system, but generally the area flows east toward the pond.

Disturbance in this area consists of the proposed roadway built on fill with sidewalk on the southern side and swales running parallel to either side of the proposed bypass. A cross pipe is proposed to convey flow from the northern side to the southern side of the drainage area and into Millsboro Pond. Infiltration trenches are proposed at the low points of the adjacent swales. The total LOD for POI-13 is 4.93 acres.

POI-14

POI-14 is located in an open space between the Conrail railroad and Fox Run Road/Betts Pond Road. The existing area lacks a defined drainage pattern or closed drainage system, but generally the area flow south and east towards the railroad.

Disturbance in this area consists of the proposed roadway built on fill with sidewalk on the southern side and swales running parallel to either side of the proposed bypass. Infiltration trenches are proposed at the low points of the adjacent swales. The LOD for POI 14 is 4.56 acres.

POI-15 & POI-16

POI-15 and 16 are located in the open space between Fox Run Road and the proposed ramp leading from the bypass to US 113 northbound. The existing areas lack a defined drainage pattern or closed drainage system, but generally the areas flow south and east.

The area of disturbance includes the proposed roadway, adjacent sidewalks, and proposed swales. The proposed adjacent swales will carry flow from the roadway to the east toward Fox Run Road/Betts Pond Road as it does naturally in the existing conditions. The LOD for POI-15 is 1.50 acres and the LOD for POI-16 is 1.22 acres.

POI-17

POI-17 is located in the open space between Ramp D and the intersection of the bypass with Betts Pond Connector Road. The existing area lacks a defined drainage pattern or closed drainage system, but generally the area flows south to a small heavily wooded low point located south of Station 1029+00.

The area of disturbance includes the proposed bypass, adjacent sidewalks, closed drainage system (conveyance pipes), proposed swales, and BMP-17. The proposed adjacent swales will carry flow from Ramp D and a portion of the intersection with the Betts Pond Connector Road. All but 0.42 acres of the drainage area will be conveyed toward BMP-17 prior to entering POI-17. The total disturbance to the area is 7.04 acres.

POI-18

POI-18 is located in the open space between the intersection of the bypass with Betts Pond Connector Road and SR 20 (Thompsonville Road/ Betts Pond Road). The existing area lacks a defined drainage pattern or closed drainage system, but generally the area flows east of Betts Pond Connector Road at Station 4035+00.

The area of disturbance includes the proposed bypass, adjacent sidewalks, closed drainage system (conveyance pipes), and proposed swales. The proposed adjacent swales and cross pipe will convey runoff for the entirety of Betts Pond Connector Road to POI-18. The total disturbance to the area is 1.94 acres.

POI-19

POI-19 is located in the open space between Betts Pond Connector Road, US 113, and SR 20 (Thompsonville Road/Betts Pond Road). The existing area lacks a defined drainage pattern or closed drainage system, but generally the area flows south of the bypass at Station 1023+00.

The area of disturbance includes the proposed bypass, adjacent sidewalks, closed drainage system (conveyance pipes), and proposed swales. The drainage area includes a portion of the infield area formed by Ramp C which also includes Patriots Way (to be removed). The proposed adjacent swales and cross pipe will convey runoff from the north to the south following the general flow of the drainage area of the existing conditions. Infiltration trenches are proposed at the pipe inflow at Station 1024+25, LT. The total drainage area to POI-19 is 16.31 acres and the total limit of disturbance is 9.80 acres.

POI-20

POI-20 is located east of US 113 NB at Station 5027+30, RT at a small tributary named Sheep Pen Ditch. The existing drainage pattern consists of sheet flow to shallow concentrated flow to channel flow until runoff outfalls to the existing tributary.

The area of disturbance includes a portion of Ramp D, minor widening of US 113 NB, and the proposed adjacent swales. A cross pipe is proposed in the gore area between Ramp D and US 113 northbound in order to convey flow from the swale running parallel to Ramp D (western side) to the eastern side swale running to the POI. The proposed adjacent swales will convey runoff to the tributary and generally match existing drainage patterns. The total disturbed area to POI-20 is 2.43 acres.

POI-21

POI-21 is located along SR 20 (Hardscrabble Road) at Station 1004+25, LT. The existing drainage pattern consists of sheet flow to shallow concentrated flow to channel flow, and eventually pipe flow to the POI which is a flat area adjacent to SR 20.

The area of disturbance includes reconstruction of a portion of SR 20 to align with the proposed bypass as well as minor roadway widening, proposed sidewalk, and adjacent swales along SR 20. A number of driveways are affected by the proposed work and multiple cross pipes are proposed on either side of SR 20. A cross pipe is proposed at Station 1004+00 to convey flow from the southern side of SR 20 to the POI located north of the roadway, generally matching existing drainage patterns. The total LOD to POI-21 is 5.33 acres.

POI-22

POI-22 is located along Country Living Road at Station 8500+00. There is no defined existing drainage pattern but generally flows south.

The area of disturbance includes the readjustment of a portion of Country Living Road and the proposed tie in with Sheep Den Road to the east. Generally, the proposed drainage pattern consists

of sheet flow, shallow concentrated flow, and channel flow to the POI. The total LOD to POI-22 is 1.42 acres. This work is to be completed prior to the construction of the North Millsboro Bypass, so the existing and proposed modeling will match.

POI-23

POI-23 is located along Sheep Pen Road at Station 8100+00. There is no defined existing drainage pattern, but runoff generally flows southeast.

The area of disturbance includes the realignment of a portion of Country Living Road and the removal of existing pavement at the intersection of Sheep Pen Road and SR 20. Additionally, a roundabout is proposed and is to be completed prior to the construction of the bypass. The LOD to POI-23 is 6.27 acres. This work is to be completed prior to the construction of the North Millsboro Bypass, so the existing and proposed modeling will match.

POI-24

POI-24 is located along Ramp B (Station 3003+30) which connects the bypass with US 113 SB. There is no defined drainage pattern in the area, but generally runoff sheet flows to the southeast towards Betts Pond.

The area of disturbance includes a portion of Ramp B and adjacent swales. The total LOD to POI-24 is 1.09 acres.

POI-25

POI-25 is located along Ramp B (Station 3013+60, RT) which connects the bypass with US 113 SB. There is no defined drainage pattern in the area, but generally runoff sheet flows to the southeast towards Betts Pond.

The area of disturbance includes a portion of Ramp A, Ramp B, closed drainage system, and adjacent swales. This area also includes a 5.93-acre infield area that is not to be disturbed (OLOD). The total LOD to POI-25 is 8.58 acres.

POI-26

POI-26 is located along US 13 SB (Station 145+90, RT) which is located at an outfall to Betts Pond. The area has a defined drainage pattern consisting of sheet flow to shallow flow to channel/pipe flow prior to discharging to Betts Pond/POI-26.

The area of disturbance includes a portion of Ramp B, minor roadway widening, closed drainage system (including conveyance pipes), and adjacent swales. This area also includes a 1.19-acre infield area that is not to be disturbed (OLOD). The total LOD to POI-26 is 1.85 acres.

C. Soils Classification

According to the DNREC ArcGIS web application, the underlying soils in the project area are as follows:

- AsA – (A/D) – Askecksy loamy sand, 0-2% slopes
- EvB– (A) – Evesboro loamy sand, 0-5% slopes
- EvD – (A) – Evesboro loamy sand, 5-15% slopes
- FhA – (A) – Fort Mott-Henlopen complex, 0-2% slopes
- FhB– (A) – Fort Mott-Henlopen complex, 2-5% slopes
- leA – (A) – Ingleside loamy sand, 0-2% slopes
- LO – (A/D) – Longmarsh and Indiantown soils, frequently flooded
- Ma – (A/D) – Manahawkin Muck, frequently flooded
- PsA – (A) – Pepperbox-Rosedale complex, 0-2% slopes

Soils mapping from the GIS desktop materials provided at Concurrence Meeting #1, conducted on January 31st, 2020 can be found in Appendix A.

Stormwater Management Approach

Analysis Methodology

This report presents stormwater management design as outlined in the DelDOT Road Design Manual, Chapter 6 – Drainage and Stormwater Management, July 2008 and all pertinent DelDOT Standards and Specifications as presented on the DelDOT Design Resource Center. The proposed stormwater management concept is consistent with the policies set forth in the Delaware Department of Natural Resources and Environmental Control (DNREC), Delaware Sediment and Stormwater Regulations.

The following summarizes the methodologies, programs and assumptions utilized herein:

- Road Design Manual, Chapter 6 – Drainage and Stormwater Management, DelDOT, July 2008.
- Delaware Sediment and Stormwater Regulations, Delaware Department of Natural Resources and Environmental Control (DNREC), February 2019.
- Pond Code 378, Soil Conservation Service Delaware, 1996.
- Delaware Department of Transportation (2007). LiDAR elevation data for 2-foot contours. (GIS-format.)
- Sussex County Soil Survey Data (updated). Natural Resources Conservation Service, United States Department of Agriculture. Web Soil Survey. (<http://websoilsurvey.nrcs.usda.gov>) (acquired February 2009).
- Department of Natural Resources and Environmental Control (June 2019). *Delaware Urban Runoff Management Model Version 2 (DURMM V2), Delaware*
- HydroCAD Software Solutions LLC, 2020, HydroCAD 10.10-3a, [Software].
- U.S. Department of Agriculture, Natural Resources Conservation Service. (2003). *Technical Release No. 55, Urban Hydrology for Small Watersheds*, (TR-55, Version 2.1). [Software].
- U.S. Department of Agriculture, Natural Resources Conservation Service. (1992). *Technical Release No. 20, Project Formulation Hydrology*, (TR-20, Version 2.04). [Software].
- Support data are assumed to be most recent and best available data to supplement surveyed and observed field data.

Proposed Stormwater Management

Stormwater management as is detailed in this report and as constructed in this project is intended to fulfill the regulatory management required for the entirety of the proposed North Millsboro Bypass from SR 20/US 113 to SR 24. The project has been broken down into four (4) major segments. The first drainage segment spans from SR 24 (John J Williams Highway) to Hollyville Road/Jersey Road. The second major segment spans from Jersey Road/Hollyville Road to SR 30 (Gravel Hill Road). The next major drainage segment extends from SR 30 across Millsboro Pond to Fox Run Road/Betts Pond Road. The last segment spans from Fox Run Road/Betts Pond Road to SR 20 (Hardscrabble Road).

The focus of this stormwater management report is to detail the stormwater management provided within the limits of the project. The project limits are broken down into several POIs to evaluate the impacts to both stormwater quality and quantity at singular points where runoff from disturbed areas is leaving the project site. Stormwater quantity compliance is provided by proving either no increase in peak flows or no adverse impact to receiving waterways downstream of each POI.

Water Quality

Stormwater water quality compliance for North Millsboro Bypass is achieved by meeting the runoff reduction requirements set forth by DNREC for the water quality event (Rpv 1-Year storm). The general approach within the project limits is to maintain existing drainage areas to the maximum extent practicable. The overall area is very flat, so in many areas there is no defined direction of flow or drainage area boundaries. In such cases and for the sake of evaluating the project's impacts on runoff within the watershed, existing drainage areas are generally assumed to be the same as the proposed drainage area boundary. This assumption allows the impacts of the addition of impervious surface to be assessed.

A Project Level DURMM was performed to assess the overall impact of the proposed roadway construction. Those calculations and the associated mapping can be found in Appendix A along with the rest of the materials presented at Concurrence Meeting #1. The overall runoff reduction requirement for the 132.3 acre limit of disturbance is 121,176 cubic feet. This runoff reduction shortfall is offset with multiple infiltration trenches located at logical locations along the entirety of the mostly linear project limits. Logical locations for infiltration trenches are at the downstream end of on-site ditches before reaching naturally occurring low points along the project limit boundaries (POIs). In total there are fifty-six (56) separate infiltration trenches proposed throughout the twenty-six (26) POIs for the project. Table 1 shows the number of BMPs proposed per POI and the associated runoff reduction credit accrued at each POI.



Table 1: Runoff Reduction Credit per POI

POI #	BMPs Provided	RPv Runoff Reduction Credit (cf)
1	Pond 1, 1A, 1B, & 1C	19,776
2	2B, 2C, & 2D	6,839
3	N/A	0
4	4A & 4B	2,744
5	5A, 5B, 5C, & 5D	4,501
6	6A & 6B	2,222
7	7A, 7B, 7C, & 7D	3,833
8	7A, 7B, 7C, & 7D	5,837
9	9A1, 9A2, 9A3, 9A5, 9A6, 9A8, 9B, 9C, & 9E	7,362
10	10A, 10B, & 10C	4,269
11	N/A	0
12	12A1, 12A2, 12A3, 12A4, & 12E	5,706
13	13A1, 13A3, & 13A4	3,964
14	14A, 14B, & 14C	4,705
15	15	3,441
16	16	1,873
17	Pond 17	15,072
18	N/A	0
19	19A1, 19A2, 19B, & 19C	8,189
20	N/A	0
21	22B, 22C, & 22D	13,416
22	N/A	0
23	N/A	0
24	N/A	0
25	25B & 25D	9,757
26	N/A	0
Total =		123,506

Table 1 shows that a total of 123,506 cubic feet of runoff reduction credit is accrued as a result of the proposed infiltration trenches. This offsets the debit of 121,176 cubic feet produced from the construction of the North Millsboro Bypass and leaves a credit of 2,330 cubic feet.

Water Quantity

While water quality control is the primary purpose of the proposed infiltration trench BMPs for this project, water quantity control is also required. The impacts of the proposed project on peak flows for the watershed are assessed for the conveyance event (Cv 10-Year event) by performing a watershed hydrograph inflection point analysis (DNREC, Level-1 analysis). The proposed project is located hydrologically low in the watershed and so any peak flows leaving the site will occur before the upstream watershed reaches its peak flow. The hydrograph inflection point analysis proves that the peak flow leaving the affected site area is less than the overall watershed peak at the same location



and that the majority of the on-site runoff volume has passed by the point of interest before the rest of the watershed reaches its peak flow. Each POI is also evaluated to ensure that stable conveyance to an existing natural channel is provided.

The area disturbed due to construction of the North Millsboro Bypass is 132.3 acres with a time of concentration of less than 30 minutes. The overall watershed draining to Indian River at this location is ~39,500 acres with a time of concentration flow path of over 10 miles. While the full analysis has not yet been completed to compare the two hydrographs, it is highly likely that the impacts of the proposed project will not adversely impact the overall peak flow of Indian River at the point of discharge as proven through the hydrograph inflection point analysis.

Conclusion

Preliminary infiltration testing will be requested at the location of each proposed infiltration BMP and will be done in accordance with DNREC's required minimum number of tests per length of facility and BMP footprint. It is anticipated that infiltration will be feasible at most locations based on the fact that all of the infiltration trench BMPs are proposed on type A HSG soils. As currently shown the proposed infiltration trenches will offset the runoff reduction shortfall created by the construction of the North Millsboro Bypass in accordance with DNREC'S runoff reduction volume requirements for the resource protection water quality event (RPv). Any runoff volume leaving the site will contribute to the overall watershed hydrograph long before the upstream contributing area reaches its peak flow in accordance with DNREC's Level-1 hydrograph inflection point analysis for the conveyance event (Cv).



APPENDIX A

Background Information

- Project Level DURMM
 - C.A. RCN
 - LOD
 - OLOD
 - RPV
 - DURMM Report
- GIS Desktop Materials



MEMORANDUM

Date: 1/31/2020

To: Vince Davis, PE (DelDOT)

From: Kyle Romm, EIT (WRA), Hans Benford, PE (WRA)

Subject: SWM Concurrence Meeting #1

CC: Todd Oliver, PE (WRA), Mark Whiteside, PE (DelDOT)

Work Order Number: 32149-002

Contract Number: T201912701

Project: North Millsboro Bypass, US 113 to SR 24

The scope of this project consists of a new two-lane roadway with a grade separated intersection at US 113 north of Millsboro, Sussex County. This project was identified under the US 113 North/South Study and included as part of the preferred alternative described in the Millsboro-South Area Final Environmental Impact Statement (FEIS), which was approved by FHWA in October 2017. The project includes a new roadway connecting SR 24 (John J. Williams Highway) with SR 20 (Betts Pond Road/Hardscrabble Road) both above grade and at-grade as well as additional work along US 113. The new roadway measures ~2.9-miles (~15,270 ft) from its western connection with SR 20 to its eastern connection with SR 24. This includes a multi-span bridge over Millsboro Pond. This work also includes ~7,150 feet in loop ramps tying into US 113 (Dupont Blvd) and SR 30 (Gravel Hill Road) as well as reconfigurations and reconstruction of other connecting roads such as Jersey Road/Hollyville Road and Patriots Way. Additionally, a reconfiguration is proposed for Country Living Road with SR 20 (Hardscrabble Road) and Sheep Pen Road.

The project lies entirely within the Indian River Bay watershed which is a part of Delaware's Inland Bays watershed and also includes Rehoboth Bay and Little Assawoman Bay. More specifically, the entire project limits drain to Millsboro Pond as part of a 44 square mile contributing drainage area. The project does not discharge to any Tax Dich Watersheds. The majority of the existing drainage within the project limits is open system including sheet flow into poorly defined ditches and open fields. This disturbed area will decrease when the limits of mill and overlay at existing road tie-ins have been determined and as limits of MSE walls are determined and reduce the extent of fill slopes currently anticipated.

The total Limit of Disturbance (LOD) for the project as currently proposed is 132.30 acres. This includes the new proposed roadway (above grade and at grade), sidewalk, reconstructed portions of existing roadway, and reconfigurations/loop ramps connecting the new roadway to existing roads. As a result, the total impervious surface within the LOD is increased by 24.11 acres. The resultant runoff reduction shortfall for the Project Level DURMM (PLD) run is 121,176 cubic feet. This DURMM run does not account for any BMPs.

Points of Interest (POIs) have been identified as logical areas where existing drainage patterns currently leave the project limits. Twenty-Seven (27) POIs have been identified within the project limits. It is anticipated that stormwater BMPs enveloped within the infield areas of the loop ramps as well as roadside/linear stormwater BMPs (i.e. biofiltration swales) will provide sufficient runoff reduction to achieve DNREC's Stormwater Regulations for the project.

Hans Benford

DelDOT Stormwater Management Concurrence Meeting

This meeting is to assess and concur on the current and potential future stormwater management aspects of the project. This meeting should occur after the Survey Plans have been submitted and 1 month before the Preliminary Plans are completed. The DelDOT Project Manager is responsible for setting up the meeting. If the project will be in the Christina River, Dragon Run Creek, White Clay Creek, or Blackbird Creek watersheds, than the NPDES Engineer needs to be included in this meeting as well.

Required material for the designer to present electronically at the meeting:

- A. Aerial map overlaid with proposed alignment.
- B. LOD (Limit of Disturbance) delineation.
- C. On-Line Background Information. [DSSR GIS Web Application](#)
 - 1. Streams and water features
 - 2. Existing 2' contours
 - 3. Tax ditches
 - 4. Wellhead protection areas
 - 5. Aquifer recharge areas
 - 6. 2012 land use / land cover
 - 7. Hydrologic soil groups
 - 8. Wetlands
 - 9. Runoff reduction feasibility
 - 10. Depth to water table

Contract Number T201912701

Contract Name NORTH MILLSBORO BYPASS

Date 31 JAN 2020

Discussion Points:

- ✓ Narrative of the project, existing drainage patterns and structures
- ✓ Any special design criteria such as, but not limited to: Watershed Plan, TMDL Requirements, Recharge Area, Flooding/Sump Areas

MAYBE SOME LOCALIZED SPOTS
IN FARM FIELDS

Water Quality:

- ✓ LOD Concurrence

~~121,176~~ 121,176 cf

- ✓ Standard Plan or Detailed Plan
(Meeting Standard Plan criteria does not release designer from meeting drainage requirements as per Chapter 6 of the Road Design Manual)

- ✓ Infiltration Feasibility MOSTLY A-SOILS

- ✓ Potential Rpv BMPs
 - INFILTRATION TRENCHES
 - EXTENDED DETENTION FACILITIES
 - BIOSWALES

Water Quantity:

- ✓ Points of Analysis 27 POIS AT PRESENT

- ✓ Cv and Fv Approach
 - LEVEL I ANALYSIS FOR ANY AREAS GOING TO MILLSBORO & BETTS POND
 - Cv/Fv DELDOT FLOWCHART FOR THE REST

PROJECT:	North Millsboro Bypass, US 113 to SR 24 (T201912701)
DRAINAGE SUBAREA ID:	Project Level DURMM (PLD)
LOCATION (County):	Sussex
UNIT HYDROGRAPH:	DMV

**CONTRIBUTING AREA RUNOFF CURVE NUMBER
(C.A. RCN) WORKSHEET**

Curve Numbers for Hydrologic Soil Type

Cover Type	Treatment	Hydrologic Condition	Curve Numbers for Hydrologic Soil Type								
			A		B		C		D		
			Acres	RCN	Acres	RCN	Acres	RCN	Acres	RCN	
CULTIVATED AGRICULTURAL LANDS											
Fallow	Bare soil	----		77		86		91		94	
	Crop residue (CR)	poor		76		85		90		93	
Row Crops	Crop residue (CR)	good		74		83		88		90	
	Straight row (SR)	poor		72		81		88		91	
	Straight row (SR)	good		67		78		85		89	
	SR + Crop residue	poor		71		80		87		90	
	SR + Crop residue	good		64		75		82		85	
	Contoured (C)	poor		70		79		84		88	
	Contoured (C)	good		65		75		82		86	
	C + Crop residue	poor		69		78		83		87	
	C + Crop residue	good		64		74		81		85	
	Cont & terraced(C&T)	poor		66		74		80		82	
	Cont & terraced(C&T)	good		62		71		78		81	
	C&T + Crop residue	poor		65		73		79		81	
	C&T + Crop residue	good		61		70		77		80	
	Small Grain	Straight row (SR)	poor		65		76		84		88
Straight row (SR)		good		63		75		83		87	
SR + Crop residue		poor		64		75		83		86	
SR + Crop residue		good		60		72		80		84	
Contoured (C)		poor		63		74		82		85	
Contoured (C)		good		61		73		81		84	
C + Crop residue		poor		62		73		81		84	
C + Crop residue		good		60		72		80		83	
Cont & terraced(C&T)		poor		61		72		79		82	
Cont & terraced(C&T)		good		59		70		78		81	
C&T + Crop residue		poor		60		71		78		81	
C&T + Crop residue		good		58		69		77		80	
Close-seeded or broadcast legumes or rotation meadow		Straight row	poor		66		77		85		89
		Straight row	good		58		72		81		85
meadow	Contoured	poor		64		75		83		85	
	Contoured	good		55		69		78		83	
meadow	Cont & terraced	poor		63		73		80		83	
	Cont & terraced	good		51		67		76		80	

OTHER AGRICULTURAL LANDS

Pasture, grassland or range	poor		68		79		86		89
	fair		49		69		79		84
	good		39		61		74		80
Meadow -cont. grass (non grazed)	----		30		58		71		78
	poor		48		67		77		83
Brush - brush, weed, grass mix	fair		35		56		70		77
	good		30		48		65		73
	poor		57		73		82		86
Woods - grass combination	fair		43		65		76		82
	good		32		58		72		79
	poor		45		66		77		83
Woods	fair		36		60		73		79
	good		30		55		70		77
	poor		59		74		82		86
Farmsteads	----		59		74		82		86

FULLY DEVELOPED URBAN AREAS (Veg Established)

Open space (Lawns,parks etc.)	Poor condition; grass cover < 50%		68		79		86		89	
	Fair condition; grass cover 50% to 75 %		49		69		79		84	
	Good condition; grass cover > 75%		88.26	39	0.41	61		74		80
Impervious Areas	Paved parking lots, roofs, driveways		43.63	98		98		98		98
	Streets and roads									
	Paved; curbs and storm sewers		98		98		98		98	
	Paved; open ditches (w/right-of-way)		83		89		92		93	
	Gravel (w/ right-of-way)		76		85		89		91	
	Dirt (w/ right-of-way)		72		82		87		89	
Urban Districts	Avg % impervious									
	Commercial & business	85	89		92		94		95	
Industrial	72	81		88		91		93		
Residential districts by average lot size	Avg % impervious									
	1/8 acre (town houses)	65	77		85		90		92	
	1/4 acre	38	61		75		83		87	
	1/3 acre	30	57		72		81		86	
	1/2 acre	25	54		70		80		85	
	1 acre	20	51		68		79		84	
2 acre	12	46		65		77		82		

DEVELOPING URBAN AREA (No Vegetation)

Newly graded area (pervious only)		77		86		91		94
-----------------------------------	--	----	--	----	--	----	--	----

USER DEFINED

Subarea Contributing Area per Soil Type (ac)	131.89	0.41	0	0
Subarea Contributing Area (ac)	132.3			
Subarea Weighted RCN	59			

UPSTREAM CONTRIBUTING AREAS

Subarea ID	Acres	RCN
Upstream Contributing Area 1		
Upstream Contributing Area 2		
Upstream Contributing Area 3		
Upstream Contributing Area 4		

Total Contributing Area w. Upstream Areas (ac) 132

Weighted Runoff Curve Number (RCN) 59

PROJECT:	North Millsboro Bypass, US 113 to SR 24 (T201912701)
DRAINAGE SUBAREA ID:	Project Level DURMM (PLD)
LOCATION (County):	Sussex
UNIT HYDROGRAPH:	DMV

LIMIT OF DISTURBANCE (LOD) WORKSHEET

Step 1 - Subarea LOD Data

- 1.1 HSG Area Within LOD (ac)
- 1.2 Pre-Developed Woods/Meadow Within LOD (ac)
- 1.3 Pre-Developed Impervious Within LOD (ac)
- 1.4.a Post-Developed Imperviousness Within LOD, Option #1 (ac); **OR**
- 1.4.b Post-Developed Imperviousness Within LOD, Option #2 (%)

HSG A	HSG B	HSG C	HSG D
132.3			
19.51	0.02		
43.63	0.01		
33%	0%	0%	0%

Step 2 - Subarea LOD Runoff Calculations

- 2.1 RCN per HSG
- 2.2 Rpv per HSG (in.)
- 2.3 Target RCN per HSG
- 2.4 Target Runoff per HSG (in.)

58.46	0.00	0.00	0.00
0.58	0.00	0.00	0.00
46.40	0.00	0.00	0.00
0.33	0.00	0.00	0.00

- 2.5 Subarea LOD (ac)
- 2.6 Subarea Weighted RCN
- 2.7 Subarea Weighted Rpv (in.)
- 2.8 Subarea Weighted Target Runoff (in.)

132.30
58.46
0.58
0.33

Step 3 - Upstream LOD Areas (from previous DURMM Report as applicable)

- 3.1 Upstream Sub-Area ID
- 3.2 Upstream Contributing Area (ac)
- 3.3 Target Runoff for Upstream Area (in.)
- 3.4 Adjusted CN after all reductions
- 3.5 Adjusted Rpv (in.)
- 3.6 Adjusted Cv (in.)
- 3.7 Adjusted Fv (in.)

Area 1	Area 2	Area 3	Area 4

Step 4 - Rpv Calculations for Combined LOD

- 4.1 Combined LOD (ac)
- 4.2 Weighted RCN
- 4.3 Weighted Rpv (in.)
- 4.4 Weighted Target Runoff (in.)
- 4.5 Estimated Annual Runoff (in.)
- 4.6 Req'd Runoff to be Managed within LOD (in.)
- 4.7 Req'd Runoff to be Managed within LOD (%)

132.30
58.46
0.58
0.33
6.11
0.25
43%

PROJECT:	North Millsboro Bypass, US 113 to SR 24 (T201912701)
DRAINAGE SUBAREA ID:	Project Level DURMM (PLD)
LOCATION (County):	Sussex

RESOURCE PROTECTION EVENT (RPv) WORKSHEET

	BMP 1		BMP 2		BMP 3		BMP 4		BMP 5	
Type	0-No BMP	Type	--	Type	--	Type	--	Type	--	
Step 1 - Calculate Initial RPv										
1.1 Total contributing area to BMP (ac)	132.30									
1.2 Initial RCN	58.46									
1.3 RPv for Contributing Area (in.)	0.58									
1.4 Req'd RPv to be Managed for Contributing Area (in.)	0.25									
1.5 Req'd RPv to be Managed for Contributing Area (%)	43%									

Step 2 - Adjust for Retention Reduction

2.1 Retention volume provided (cu. ft.)									
2.2 Retention reduction allowance (%)	0%	N/A			N/A			N/A	
2.3 Retention reduction volume (ac-ft)	0.00	N/A			N/A			N/A	
2.4 Retention reduction volume (in.)	0.00	N/A			N/A			N/A	
2.5 Runoff volume after retention reduction (in.)	0.58	N/A			N/A			N/A	
2.6 Adjusted CN*	58.46	N/A			N/A			N/A	

Step 3 - Adjust for Annual Runoff Reduction

3.1 Annual CN (ACN)	58.46	N/A			N/A			N/A	
3.2 Annual runoff (in.)	6.11	N/A			N/A			N/A	
3.3 Proportion A/B soils in BMP footprint (%)	0%	0%			0%			0%	
3.4 Annual runoff reduction allowance (%)	0%	N/A			N/A			N/A	
3.5 Annual runoff after reduction (in.)	6.11	N/A			N/A			N/A	
3.6 Adjusted ACN	58.46	N/A			N/A			N/A	
3.7 Annual Runoff Reduction Allowance for RPv (in.)	0.00	N/A			N/A			N/A	

Step 4 - Calculate RPv with BMP Reductions

4.1 RPv Runoff Manangement Provided (cu. ft.)	0	N/A			N/A			N/A	
4.2 RPv runoff volume after all reductions (in.)	0.58	N/A			N/A			N/A	
4.3 RPv runoff volume after all reductions (cu.ft.)	279,345	N/A			N/A			N/A	
4.4 Total RPv runoff reduction (in.)	0.00	N/A			N/A			N/A	
4.5 Total RPv runoff reduction (%)	0%	N/A			N/A			N/A	
4.6 Adjusted CN after all reductions*	58.46	N/A			N/A			N/A	
4.7 Adjusted equivalent annual runoff (in.)	6.11	N/A			N/A			N/A	
4.8 RPv Compliance Met Through Runoff Reduction?	NO	N/A			N/A			N/A	
4.9 Runoff Reduction Credit, if Applicable (cu.ft)	N/A	N/A			N/A			N/A	

Step 5 - Determine Residual Volume to be Managed or Offset

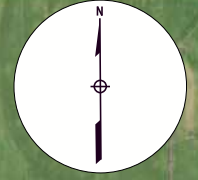
5.1 RPv Residual Volume (in.)	0.25	N/A			N/A			N/A	
5.2 RPv Residual Volume (cu.ft./ac)	916	N/A			N/A			N/A	
5.3 Residual Volume to be Managed or Offset (cu.ft.)	121,176	N/A			N/A			N/A	
5.4 RPv avg. discharge rate for 48-hr detention (cfs)	0.701	N/A			N/A			N/A	
5.5 RPv max. discharge rate for 48-hr detention (cfs)	3.506	N/A			N/A			N/A	

***NOTE: No additional runoff reduction credit can be taken for surface recharge practices once the "Adjusted CN after all reductions" (Step 4.6) reaches the equivalent CN for the native soil-cover condition of the BMP footprint itself (i.e. for Sheet Flow to Turf Filter Strip on B soils Step 4.6 cannot be below 61). If this occurs contact the DNREC – SSP for further guidance.**







US 113 TO SR 24 NORTH MILLSBORO BYPASS

CONTRACT NO. T201912701
SUSSEX COUNTY



LEGEND:

-  LIMIT OF DISTURBANCE
-  EXISTING PAVEMENT
-  EXISTING GRASS
-  POINT OF INVESTIGATION

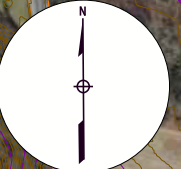


STORMWATER CONCURRENCE MEETING #1





LOD - EXISTING CONDITION

JANUARY 2020

SHEET 1 OF 8



LEGEND:

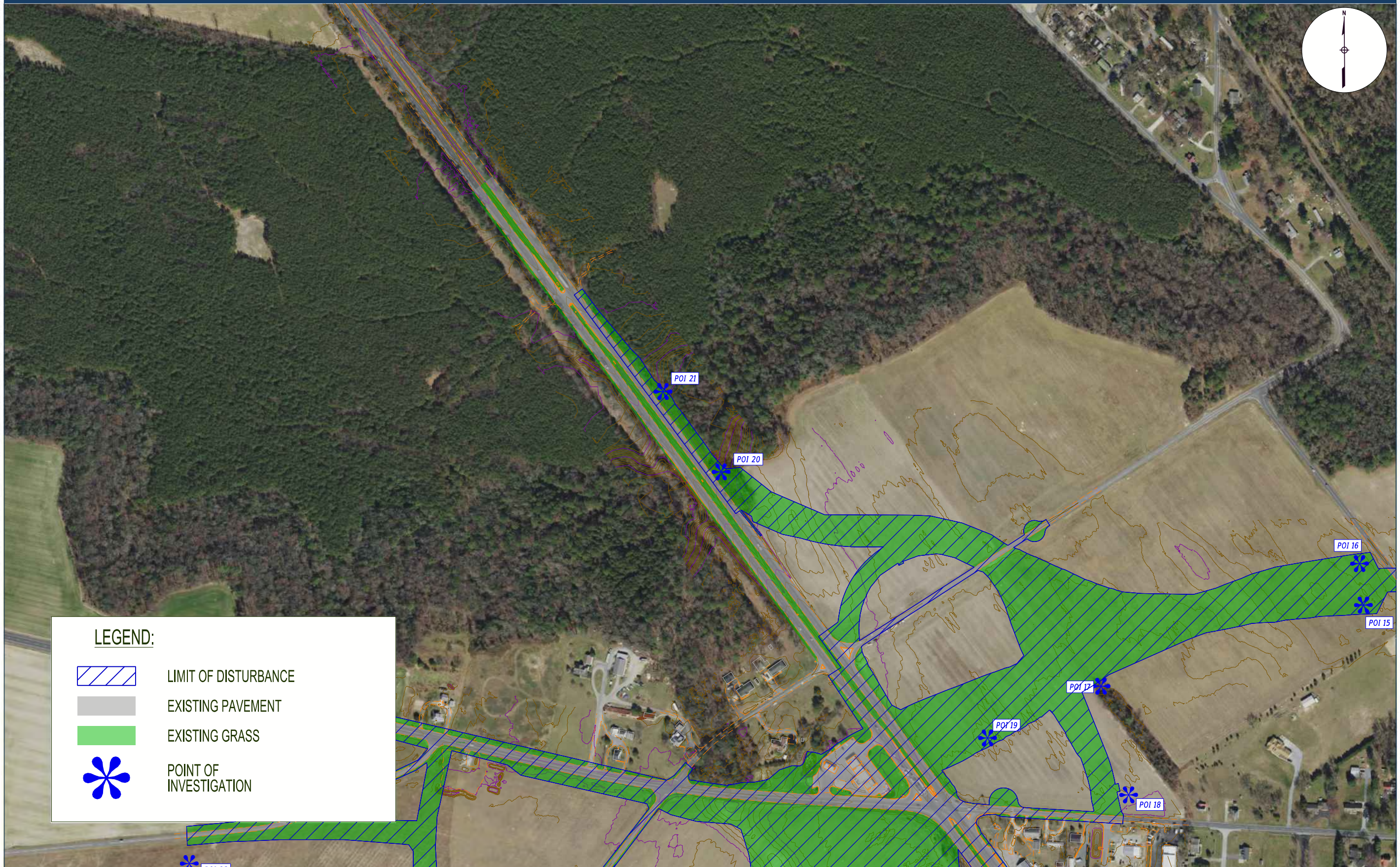
-  LIMIT OF DISTURBANCE
-  EXISTING PAVEMENT
-  EXISTING GRASS
-  POINT OF INVESTIGATION









US 113 TO SR 24 NORTH MILLSBORO BYPASS

CONTRACT NO. T201912701
SUSSEX COUNTY



LEGEND:

-  LIMIT OF DISTURBANCE
-  EXISTING PAVEMENT
-  EXISTING GRASS
-  POINT OF INVESTIGATION



STORMWATER CONCURRENCE MEETING #1

LOD - EXISTING CONDITION

JANUARY 2020





SHEET 3 OF 8

US 113 TO SR 24
NORTH MILLSBORO BYPASS

CONTRACT NO. T201912701
SUSSEX COUNTY



LEGEND:

-  LIMIT OF DISTURBANCE
-  EXISTING PAVEMENT
-  EXISTING GRASS
-  POINT OF INVESTIGATION



STORMWATER CONCURRENCE MEETING #1

LOD - EXISTING CONDITION

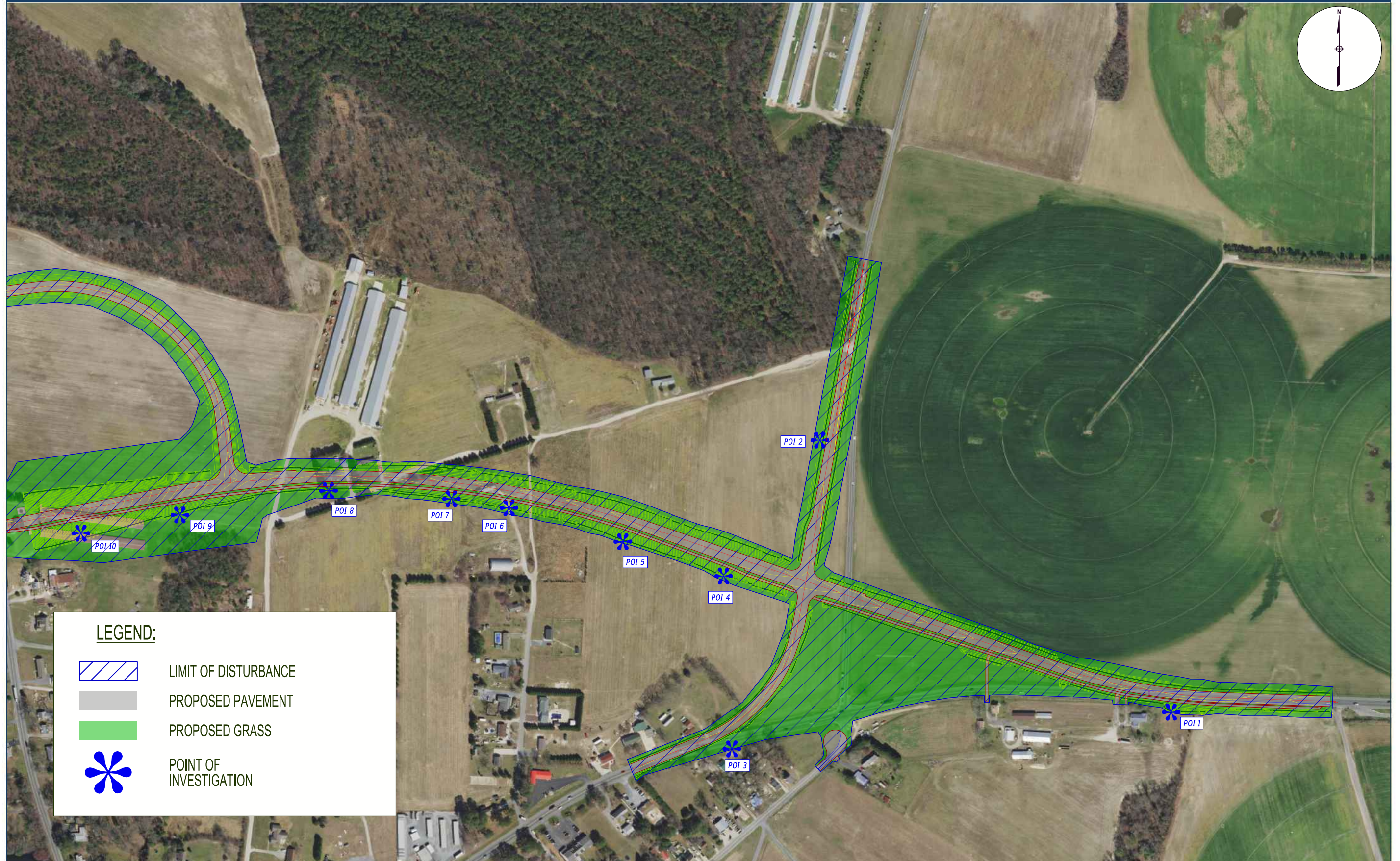
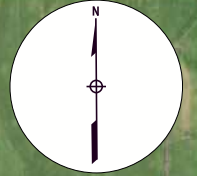
JANUARY 2020

SHEET 4 OF 8







US 113 TO SR 24 NORTH MILLSBORO BYPASS

CONTRACT NO. T201912701
SUSSEX COUNTY



LEGEND:

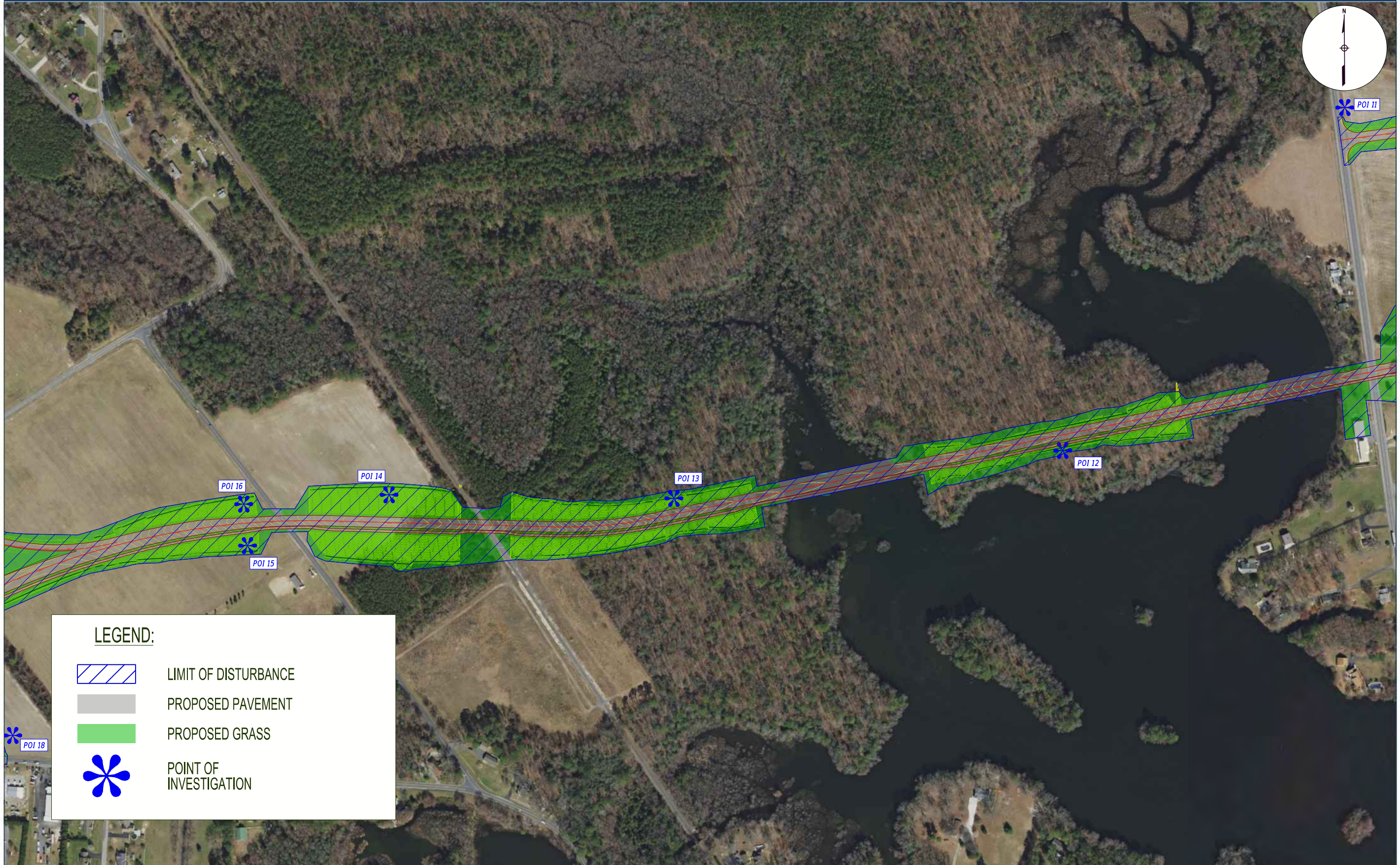
-  LIMIT OF DISTURBANCE
-  PROPOSED PAVEMENT
-  PROPOSED GRASS
-  POINT OF INVESTIGATION









US 113 TO SR 24 NORTH MILLSBORO BYPASS

CONTRACT NO. T201912701
SUSSEX COUNTY



LEGEND:

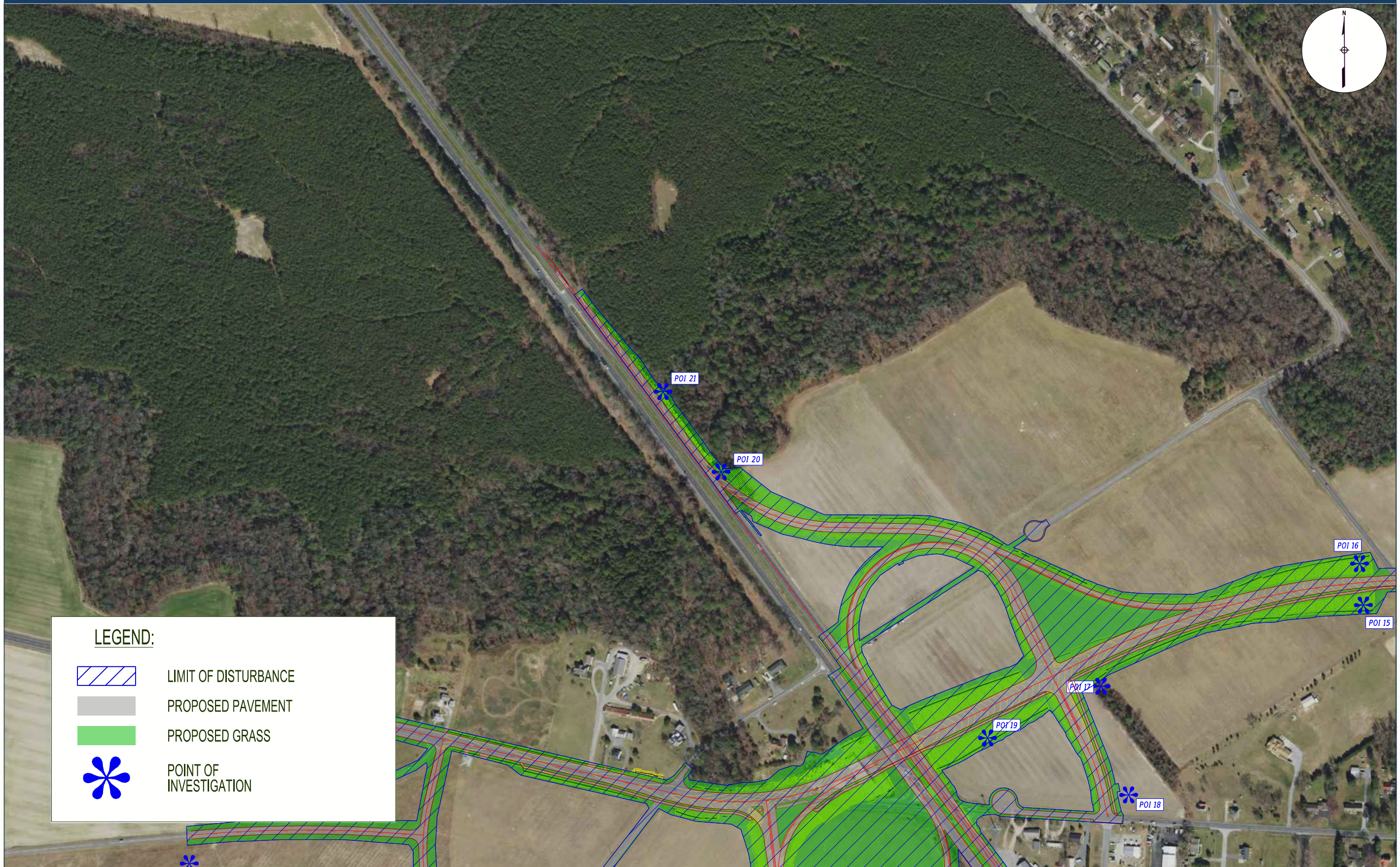
-  LIMIT OF DISTURBANCE
-  PROPOSED PAVEMENT
-  PROPOSED GRASS
-  POINT OF INVESTIGATION









US 113 TO SR 24 NORTH MILLSBORO BYPASS

CONTRACT NO. T201912701
SUSSEX COUNTY



LEGEND:

-  LIMIT OF DISTURBANCE
-  PROPOSED PAVEMENT
-  PROPOSED GRASS
-  POINT OF INVESTIGATION









US 113 TO SR 24 NORTH MILLSBORO BYPASS

CONTRACT NO. T201912701
SUSSEX COUNTY

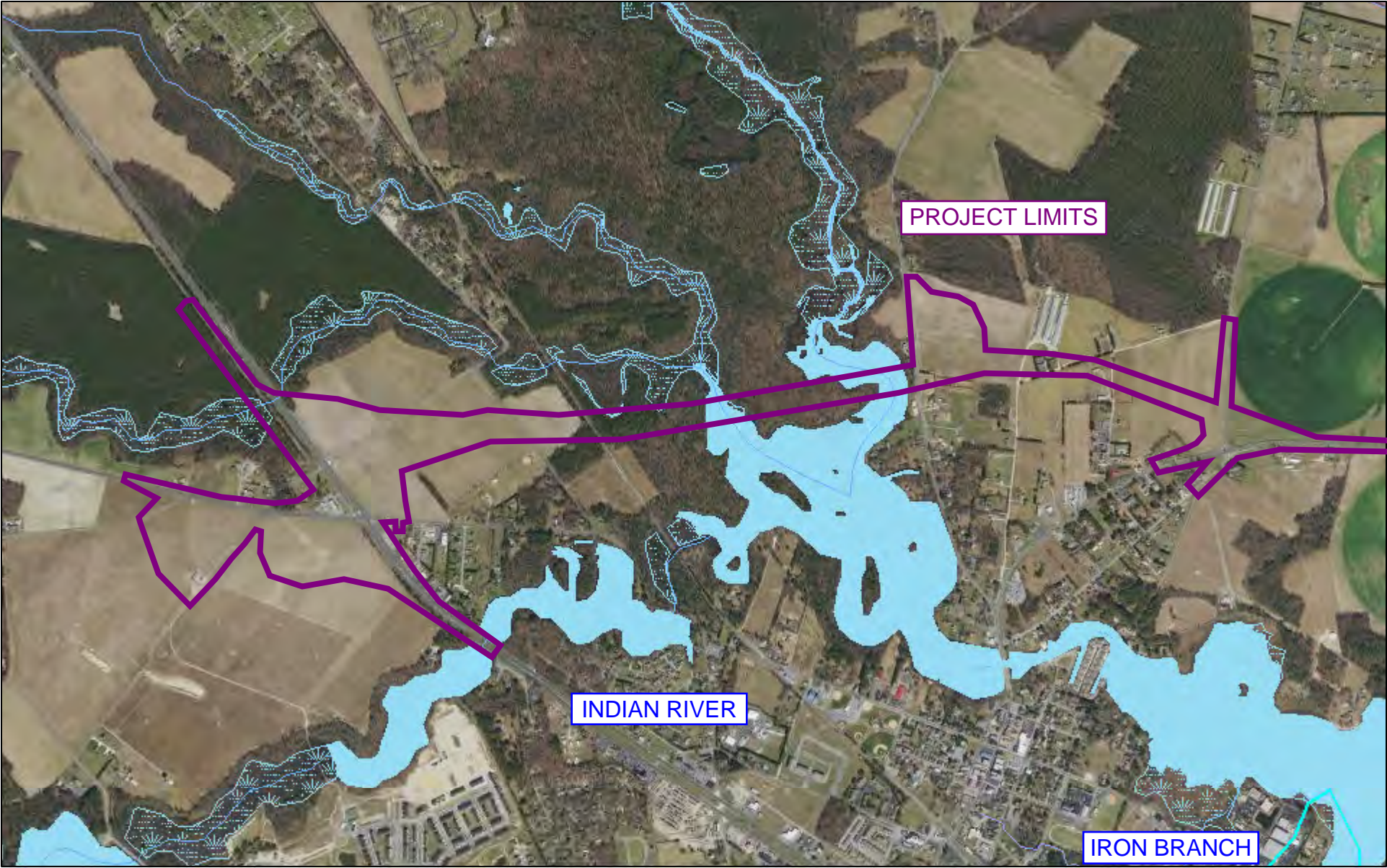


LEGEND:

-  LIMIT OF DISTURBANCE
-  PROPOSED PAVEMENT
-  PROPOSED GRASS
-  POINT OF INVESTIGATION

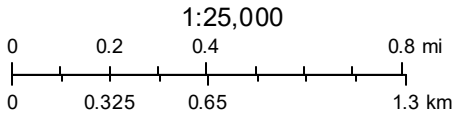


1 - Water Features



1/30/2020 4:03:03 PM

- Watersheds **WaterPolys**
- MajorRivers  Water
- FlowLine  Marsh







2 - Contours







1/30/2020 4:41:18 PM

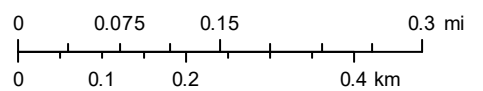
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Sussex_Co

-  Depression Index
-  Depression Intermediate
-  Normal Index
-  Normal Intermediate

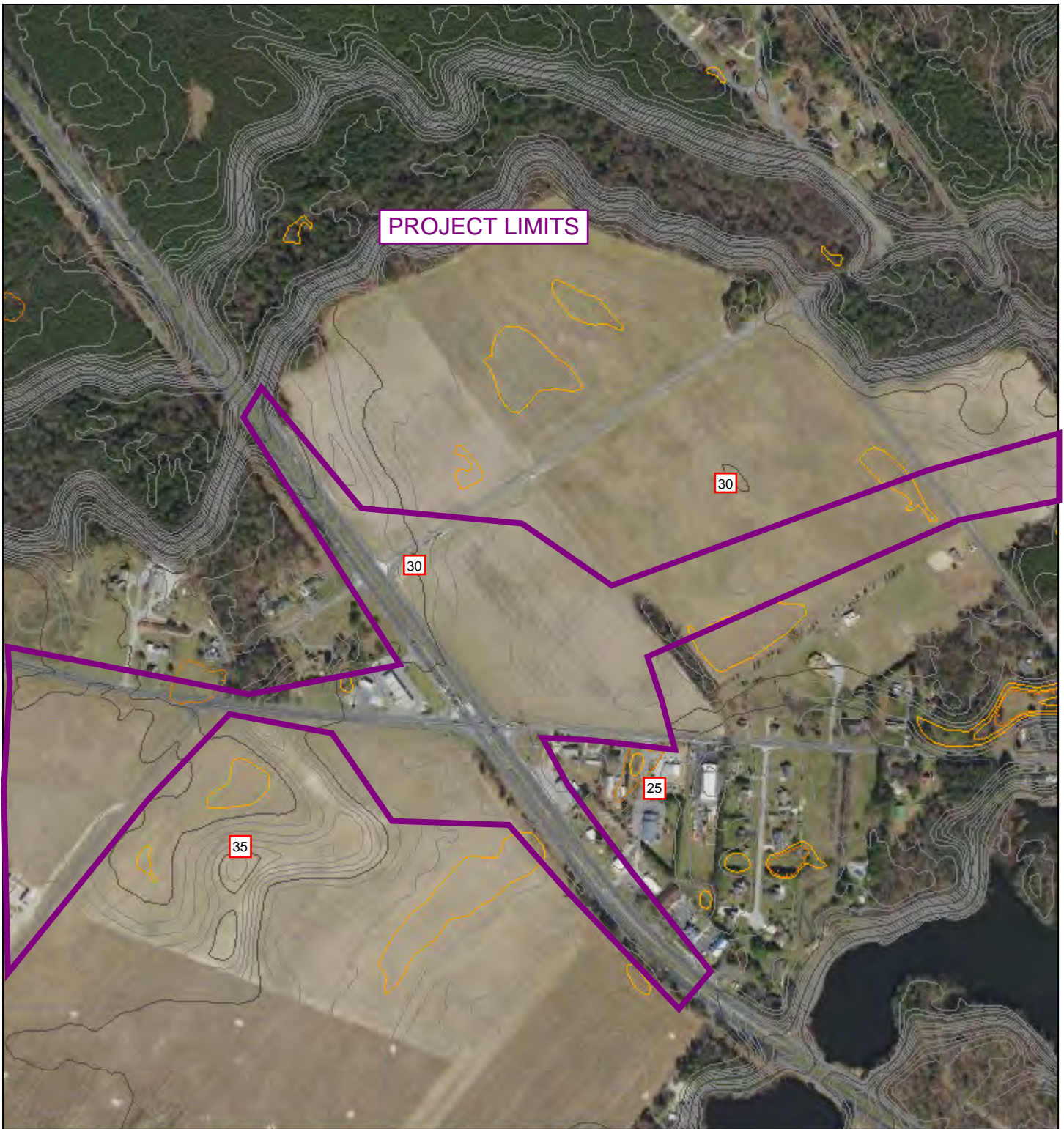
NCC_Upper

-  Depression Index
-  Depression Intermediate
-  Normal Index
-  Normal Intermediate



Delaware Geological Survey





2 - Contours







1/30/2020 4:38:44 PM

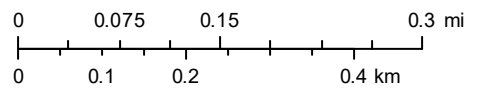
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Sussex_Co

-  Depression Index
-  Depression Intermediate
-  Normal Index
-  Normal Intermediate

NCC_Upper

-  Depression Index
-  Depression Intermediate
-  Normal Index
-  Normal Intermediate



Delaware Geological Survey





2 - Contours







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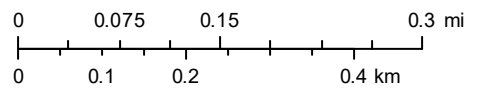
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Sussex_Co

-  Depression Index
-  Depression Intermediate
-  Normal Index
-  Normal Intermediate

NCC_Upper

-  Depression Index
-  Depression Intermediate
-  Normal Index
-  Normal Intermediate



Delaware Geological Survey





2 - Contours







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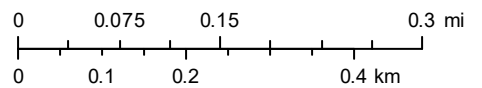
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Sussex_Co

-  Depression Index
-  Depression Intermediate
-  Normal Index
-  Normal Intermediate

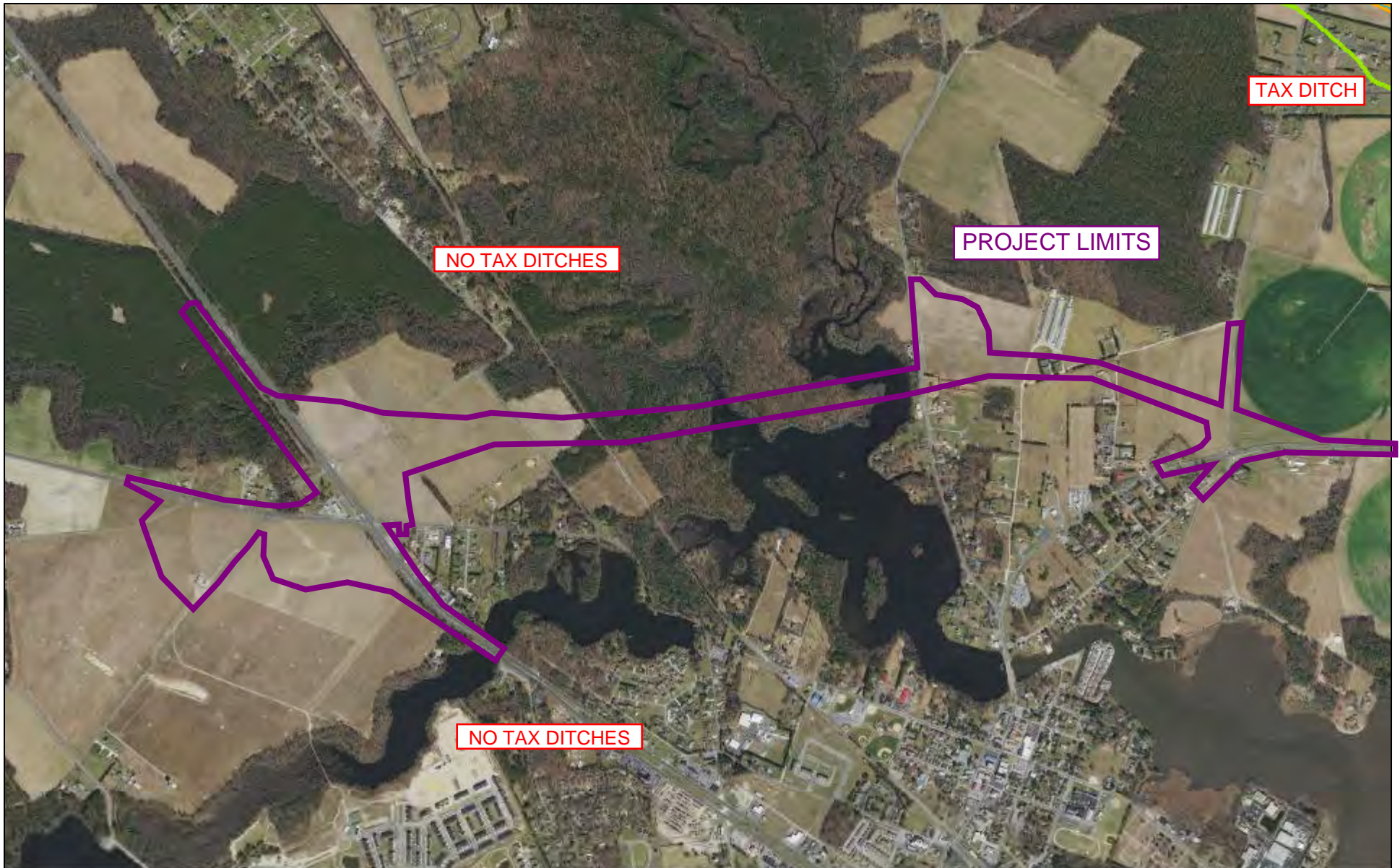
NCC_Upper

-  Depression Index
-  Depression Intermediate
-  Normal Index
-  Normal Intermediate



Delaware Geological Survey

3 - Tax Ditches

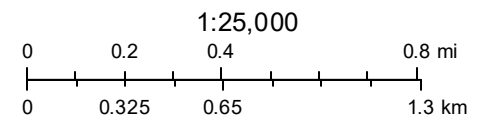


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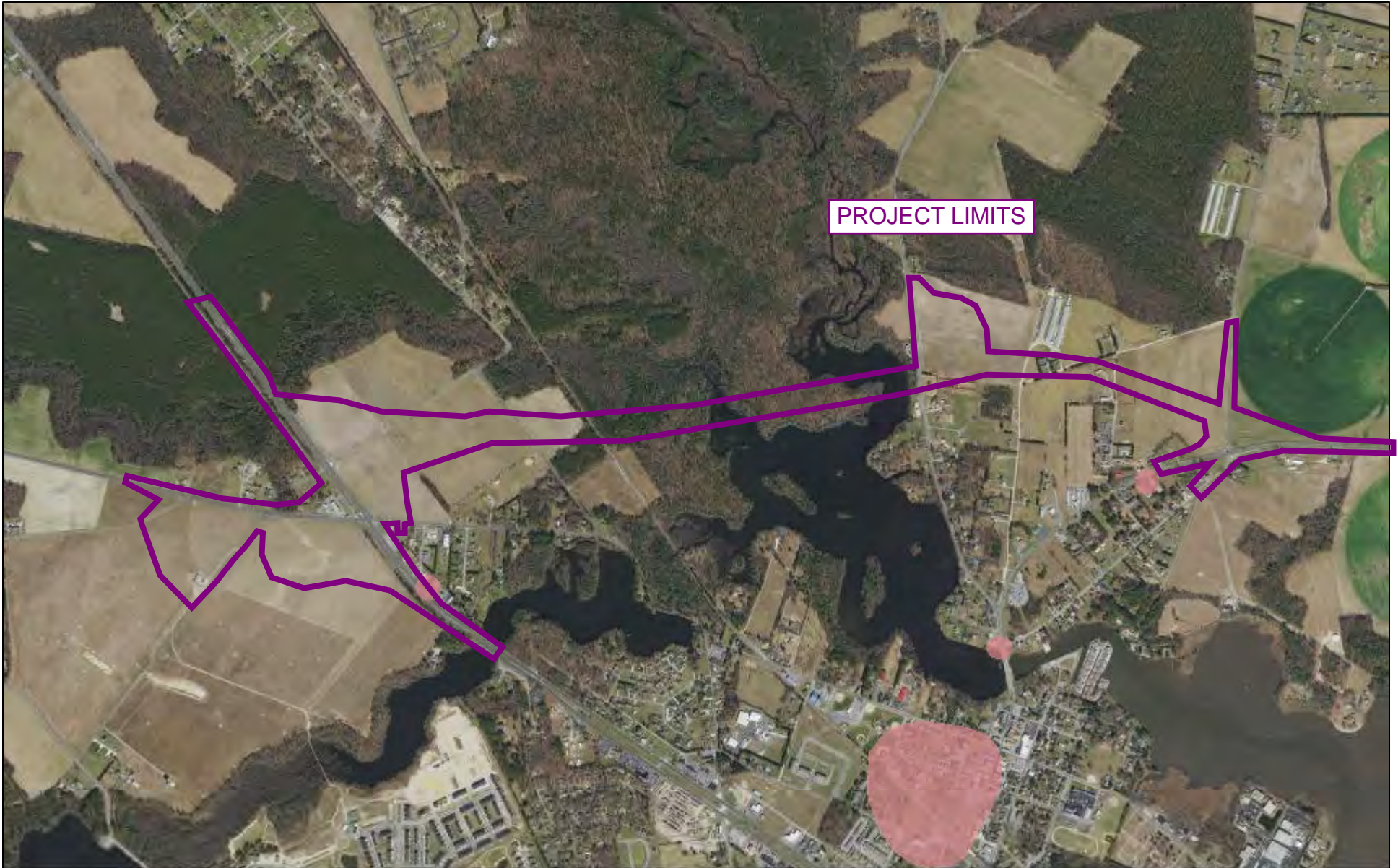
Approx. Watershed Boundary

— Tax Ditch Channel

■ Extent of Right-of-Way



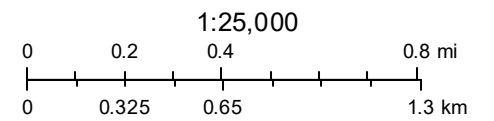
4 - Wellhead Protection Areas



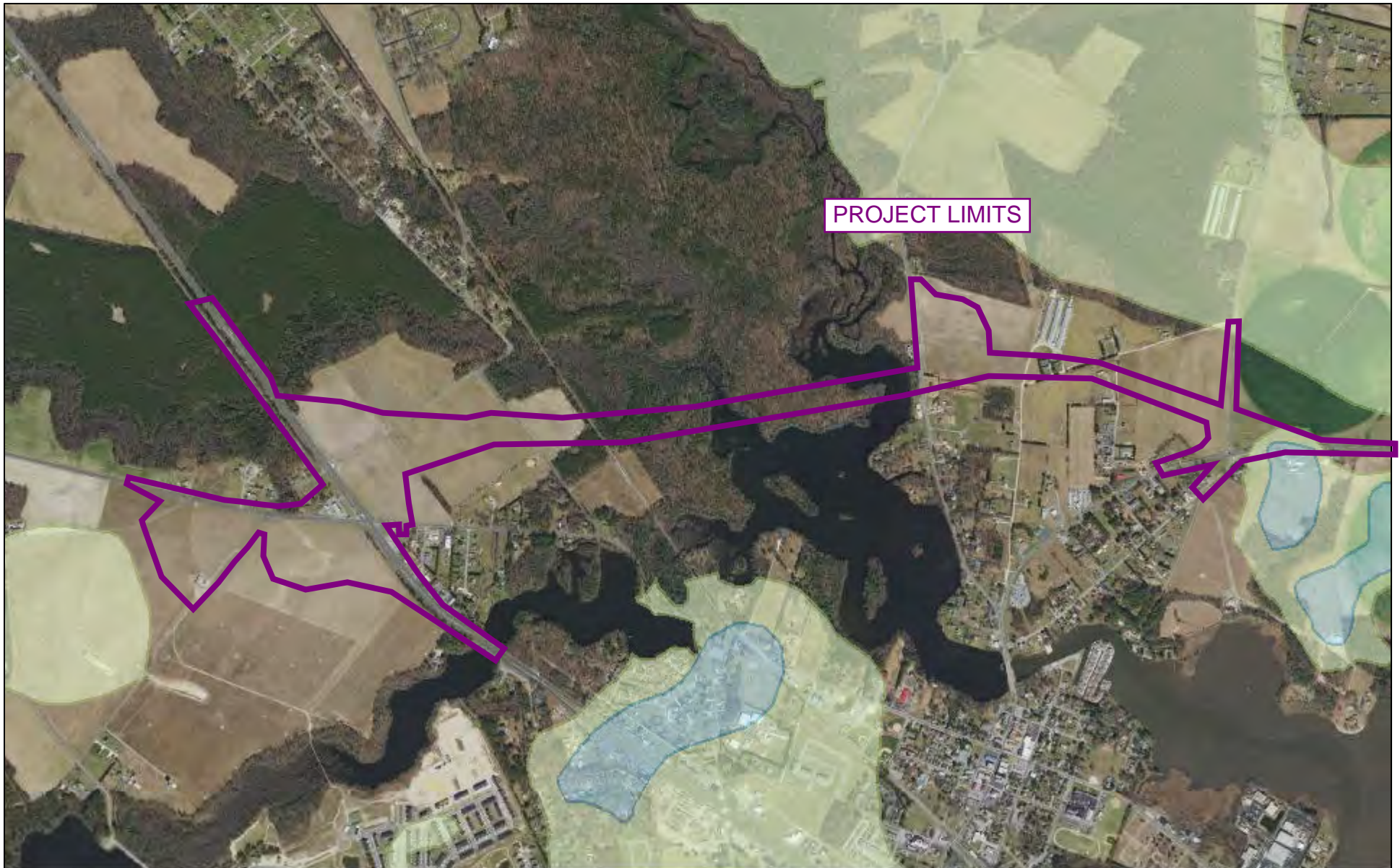
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Well Head Protection Areas

 Override 1





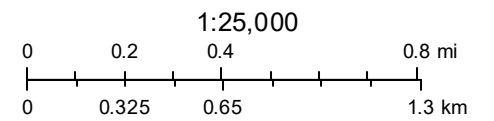
5 - Aquifer Recharge Areas



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Aquifer Recharge Areas

-  Excellent Recharge Area
-  Good Recharge Area

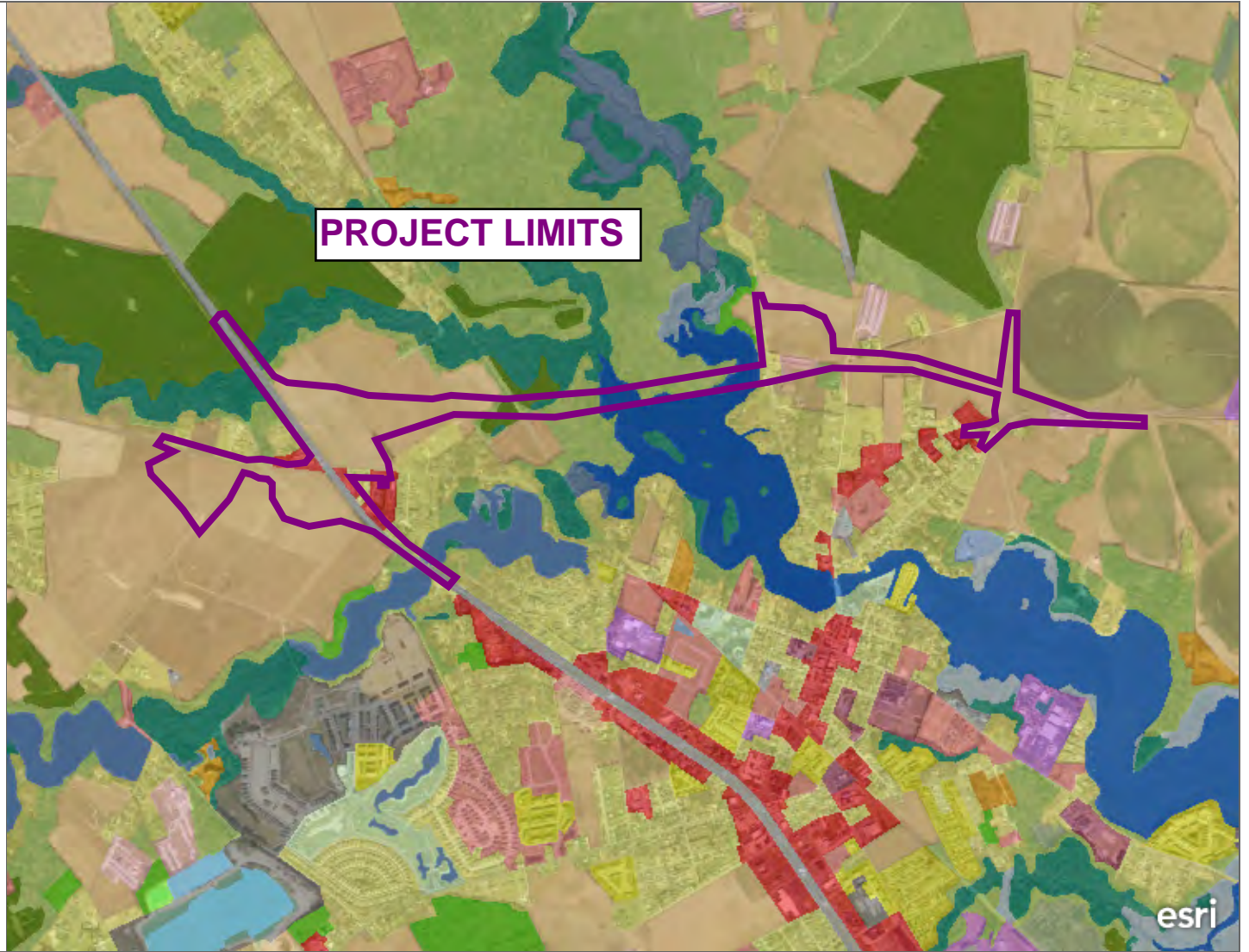


6 - 2012 Land Use/Land Cover

Delaware 2012 Land Use, Land Cover

Landuse Landcover 2012

- Mixed Residential
- Single Family Dwellings
- Multi-Family Dwellings
- Mobile Home Parks/Courts
- Commercial
- Industrial
- Transportation/Communication/Utilities
- Mixed Urban/Built-up
- Institutional/Governmental
- Recreational
- Farms, Pasture, Cropland
- Confined Animal Feeding Operations/Feedlots/Holding
- Rangeland
- Orchards/Nurseries/Horticulture
- Deciduous Forest
- Evergreen Forest
- Mixed Forest
- Shrub/Brush Rangeland
- Clear-cut
- Man-made Reservoirs and Impoundments
- Marinas/Port Facilities/Docks

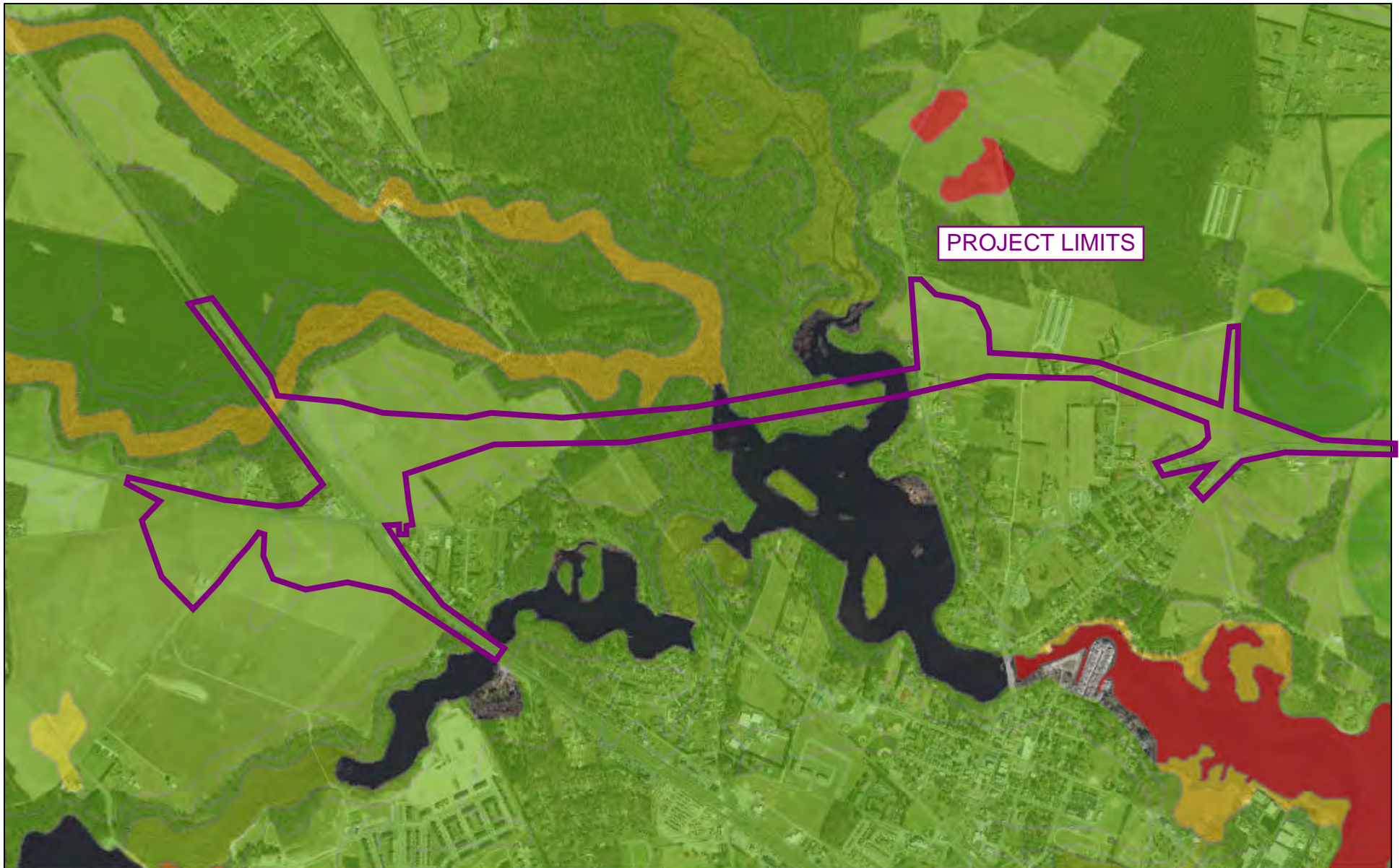


2012 Land Use Land Cover

0.4mi

State of Delaware, USDA FSA







7 - Hydrologic Soil Groups

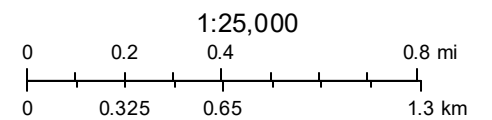


PROJECT LIMITS

1/30/2020 4:15:41 PM

Soils - Sussex County

- | | | |
|---|--|--|
|  Override 1 |  Override 3 |  Override 6 |
|  Override 2 |  Override 4 | |
| |  Override 5 | |






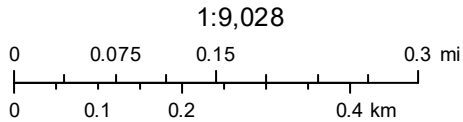
8 - Wetlands



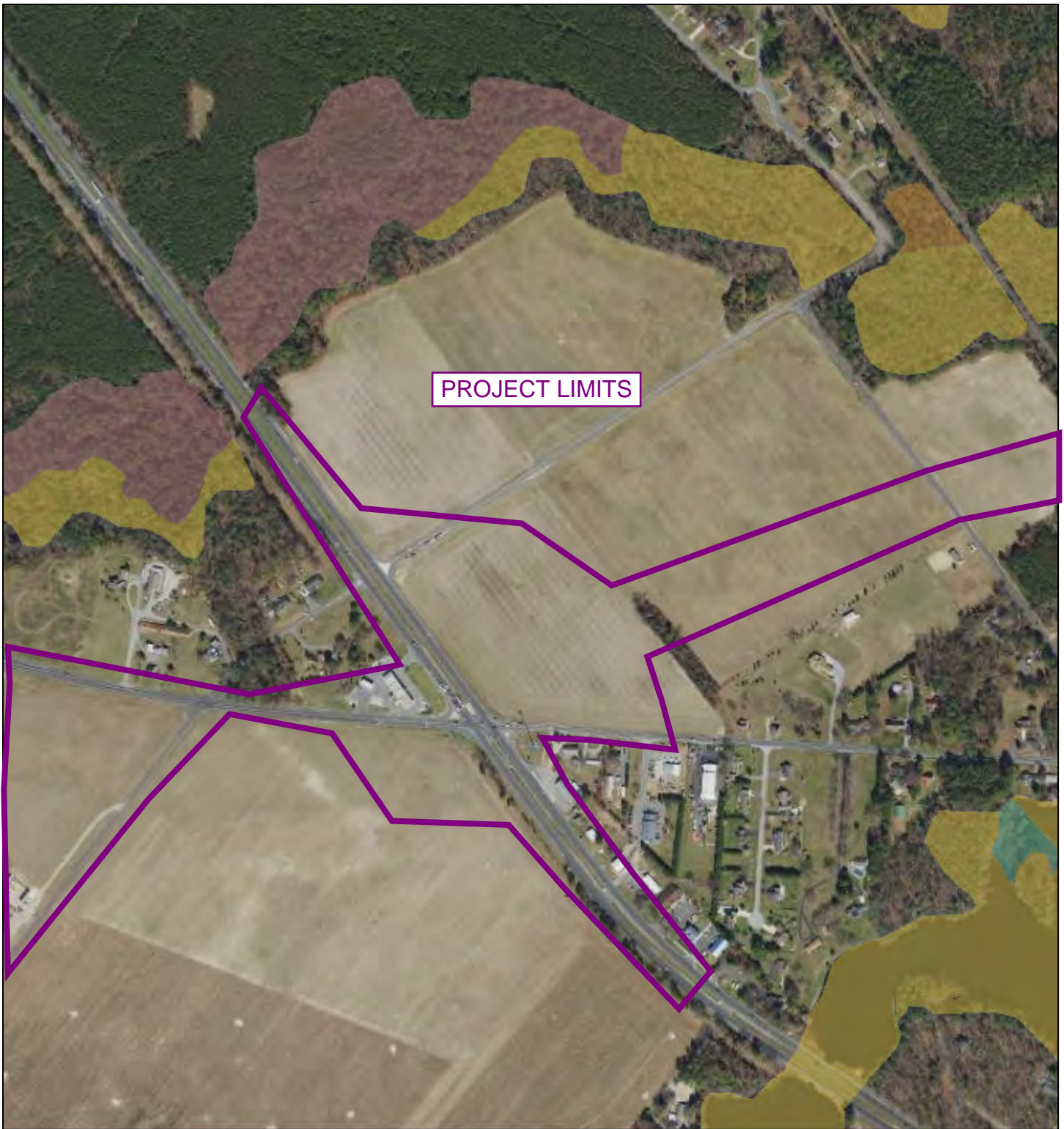
1/30/2020 4:40:56 PM

State Wetlands Mapping Project

-  Override 1
-  Override 2
-  Override 5







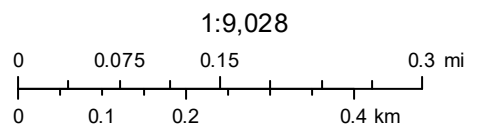
8 - Wetlands



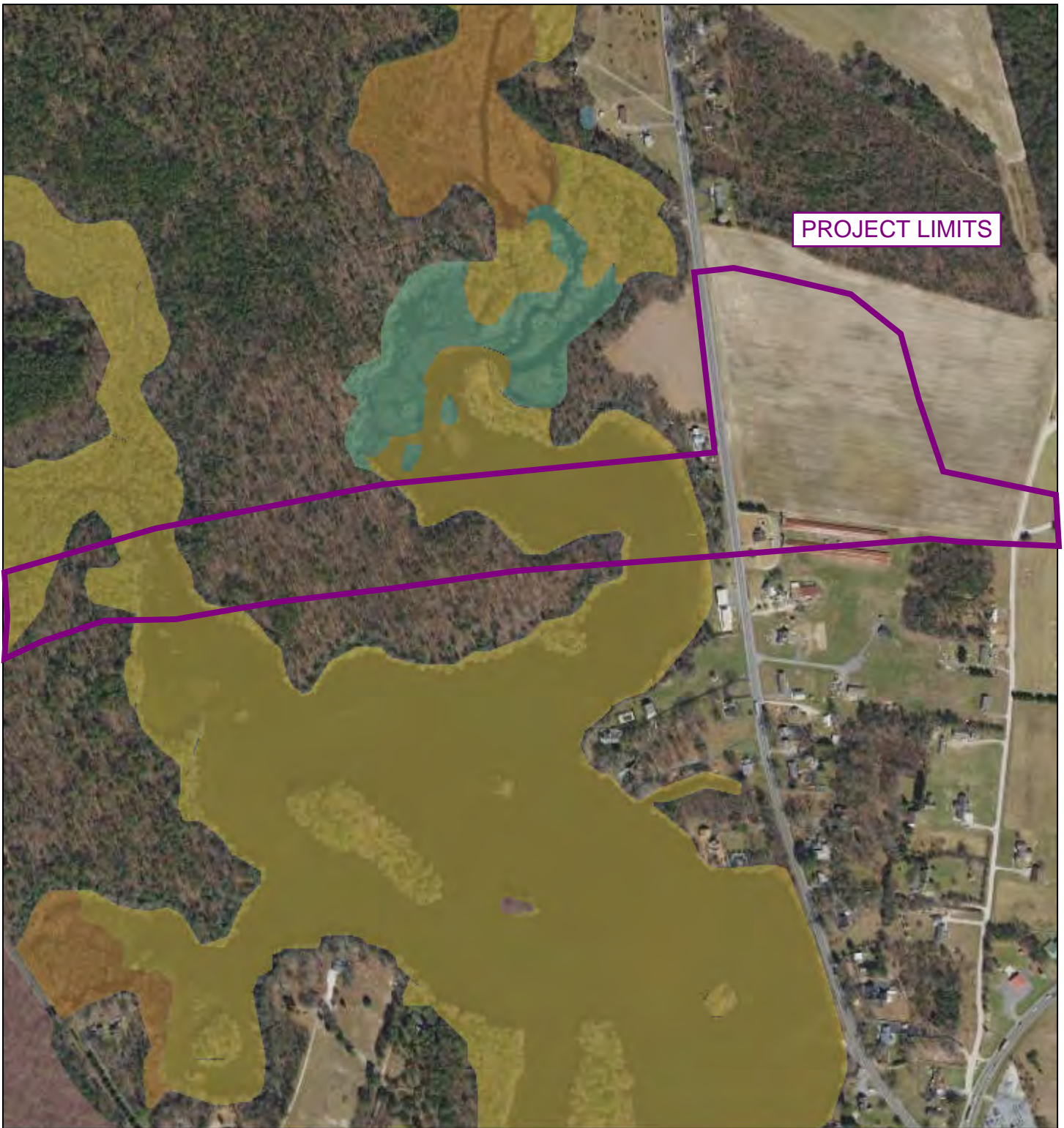
1/30/2020 4:40:05 PM

State Wetlands Mapping Project

-  Override 1
-  Override 2
-  Override 3
-  Override 4



8 - Wetlands



1/30/2020 4:37:20 PM

State Wetlands Mapping Project Override 5

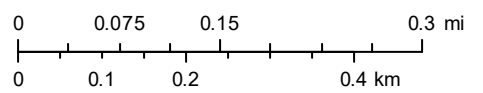
Override 1

Override 2

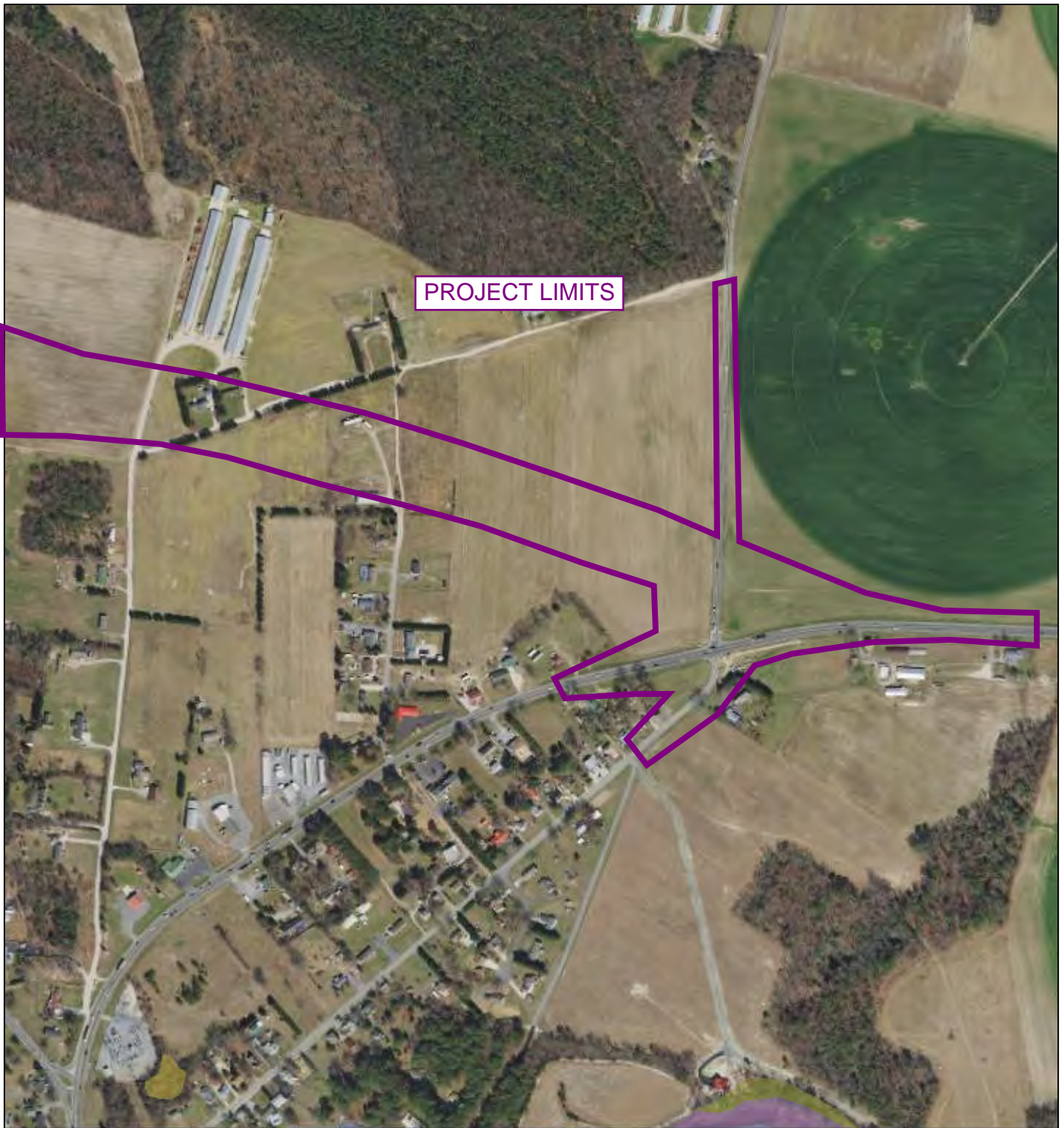
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Override 4

1:9,028







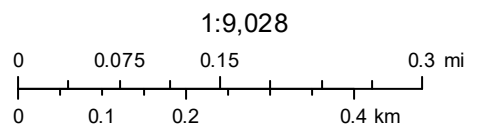
8 - Wetlands



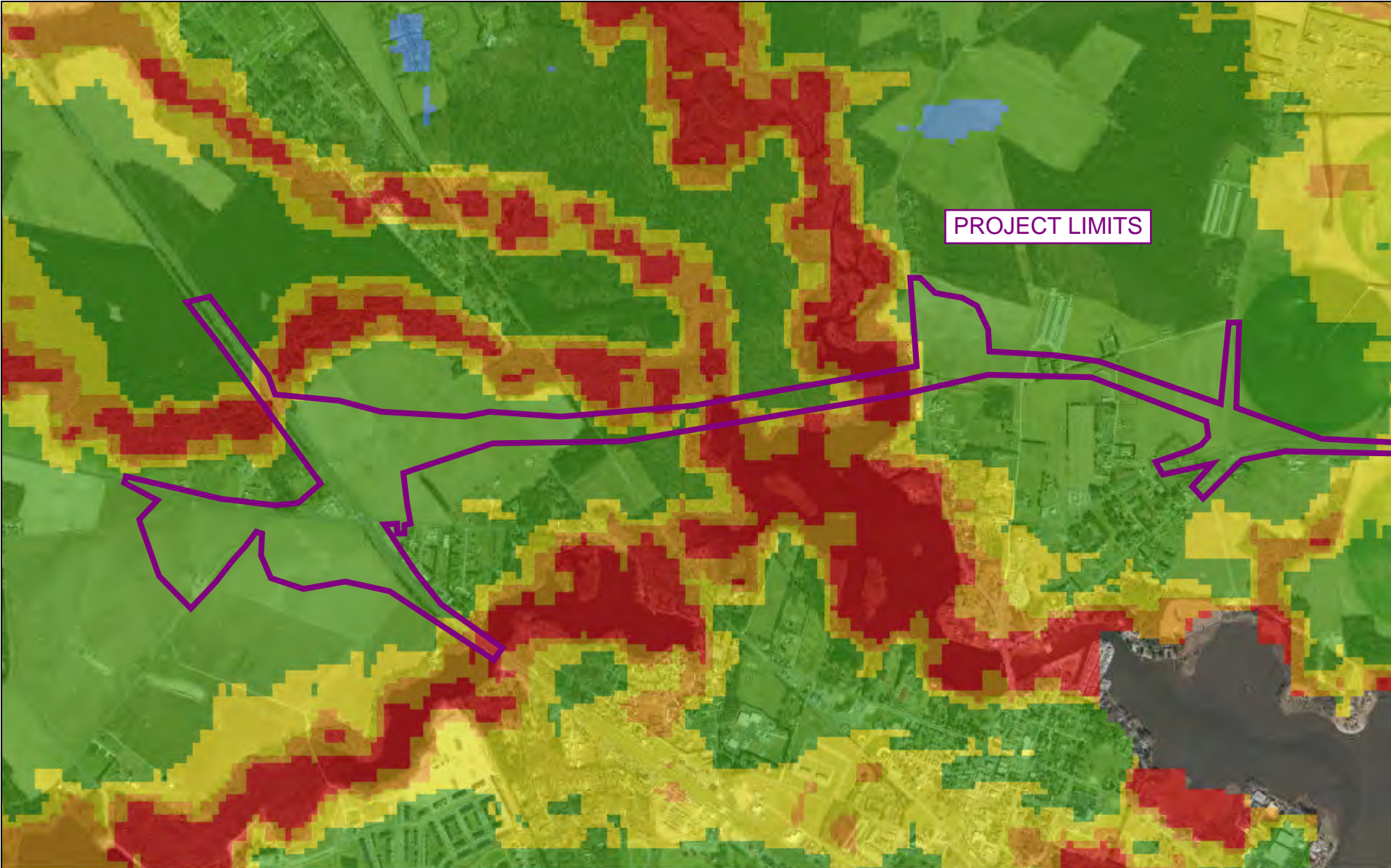
1/30/2020 4:35:44 PM

State Wetlands Mapping Project

-  Override 1
-  Override 7
-  Override 8
-  Override 9




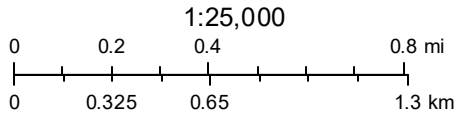
10 - Depth to Water Table



PROJECT LIMITS

1/30/2020 4:22:39 PM

- | | |
|---|---|
|  0 - 3 |  9 - 16 |
|  3 - 6 |  16 - 20 |
|  6 - 9 |  > 20 |



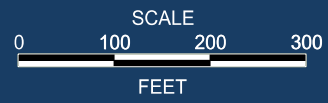
Matthew J. Martin and A. Scott Andres



APPENDIX B

POI-1

- POI-1 Drainage Area Maps
- HydroCAD Calculations






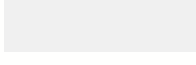



NORTH MILLSBORO BYPASS, US 113 TO SR 24

CONTRACT NO. T201912701
SUSSEX COUNTY



LEGEND

-  DRAINAGE AREA
-  Tc PATH
-  POI LOCATION
-  POI LABEL
-  OPEN SPACE
-  IMPERVIOUS
-  EXISTING CONTOURS



Summary for Subcatchment SC-1A: SC-1A

Runoff = 2.18 cfs @ 12.90 hrs, Volume= 0.427 af, Depth> 0.33"

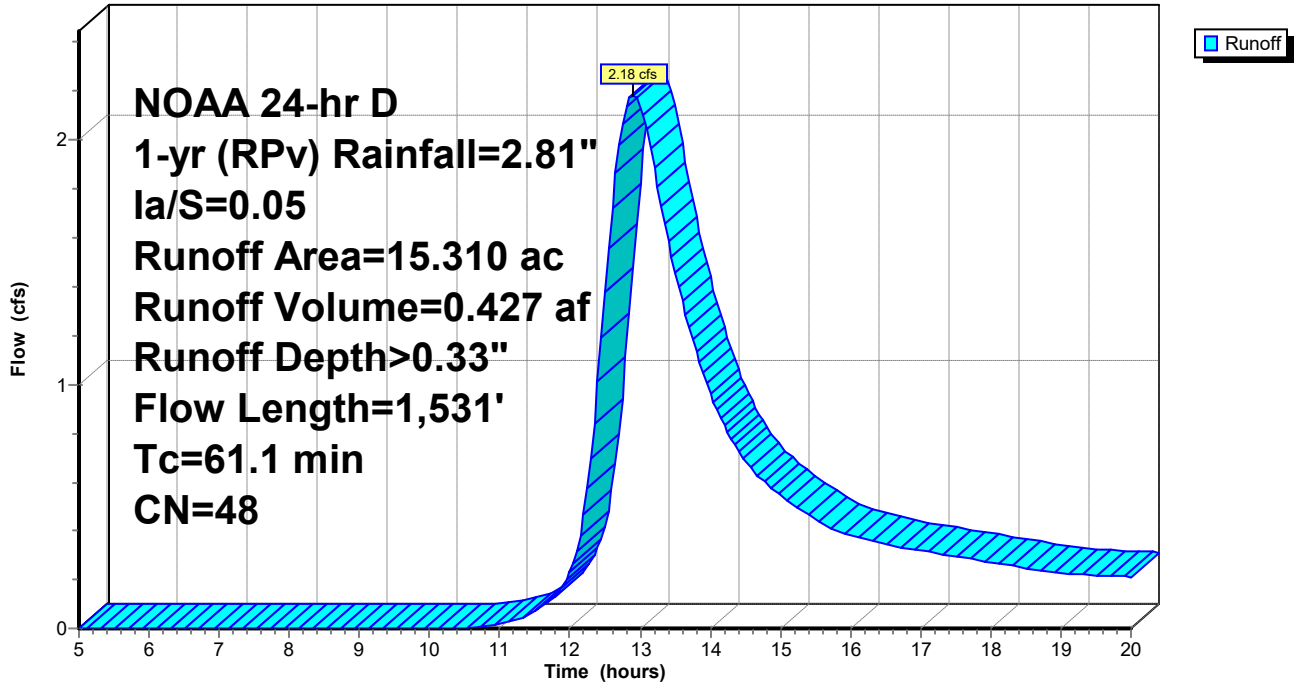
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
 NOAA 24-hr D 1-yr (RPv) Rainfall=2.81", Ia/S=0.05

Area (ac)	CN	Description
12.890	39	>75% Grass cover, Good, HSG A
2.420	98	Paved roads w/curbs & sewers, HSG A
15.310	48	Weighted Average
12.890		84.19% Pervious Area
2.420		15.81% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.0	50	0.0113	0.12		Sheet Flow, Grass: Short n= 0.150 P2= 3.30"
1.0	43	0.0113	0.74		Shallow Concentrated Flow, Short Grass Pasture Kv= 7.0 fps
2.1	125	0.0192	0.97		Shallow Concentrated Flow, Short Grass Pasture Kv= 7.0 fps
2.4	100	0.0100	0.70		Shallow Concentrated Flow, Short Grass Pasture Kv= 7.0 fps
22.4	326	0.0012	0.24		Shallow Concentrated Flow, Short Grass Pasture Kv= 7.0 fps
2.9	83	0.0047	0.48		Shallow Concentrated Flow, Short Grass Pasture Kv= 7.0 fps
21.1	425	0.0023	0.34		Shallow Concentrated Flow, Short Grass Pasture Kv= 7.0 fps
2.1	305	0.0041	2.43	30.90	Channel Flow, Area= 12.7 sf Perim= 18.9' r= 0.67' n= 0.030 Earth, grassed & winding
0.1	74	0.0340	11.87	20.98	Pipe Channel, RCP_Round 18" 18.0" Round Area= 1.8 sf Perim= 4.7' r= 0.38' n= 0.012
61.1	1,531	Total			

Subcatchment SC-1A: SC-1A

Hydrograph



Summary for Subcatchment SC-1D: SC-1D

Runoff = 0.19 cfs @ 12.27 hrs, Volume= 0.020 af, Depth> 0.20"

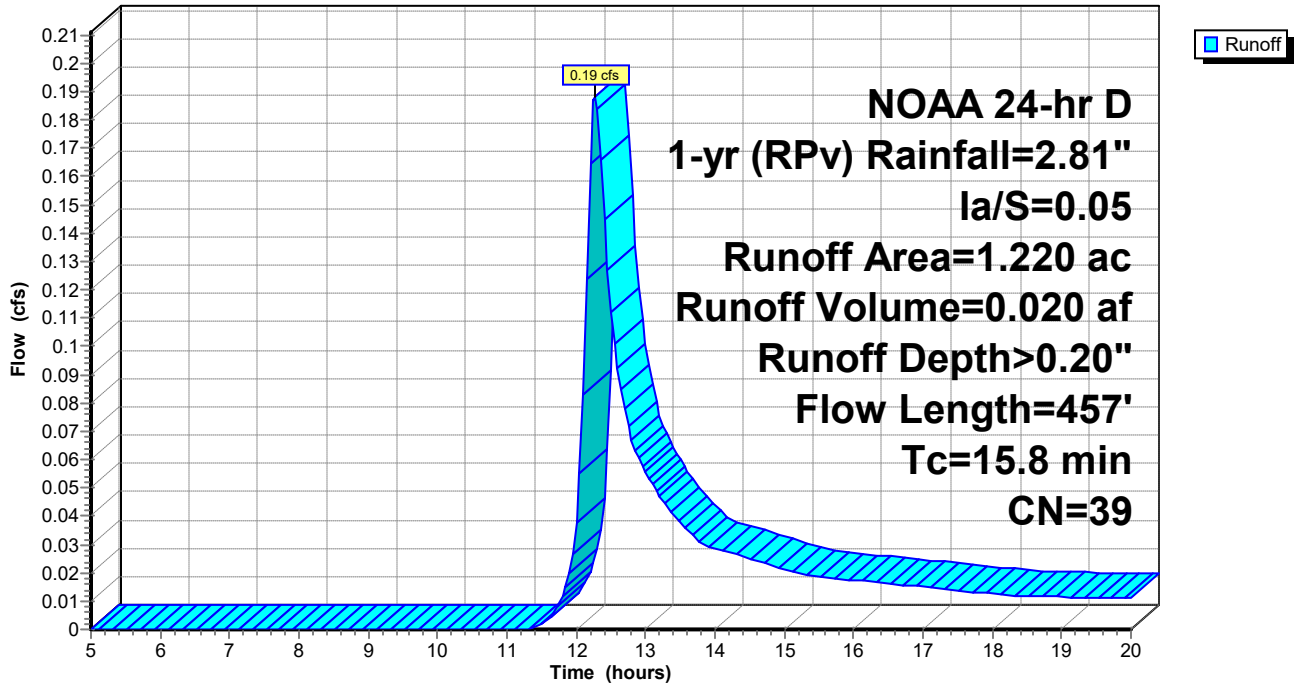
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
 NOAA 24-hr D 1-yr (RPv) Rainfall=2.81", Ia/S=0.05

Area (ac)	CN	Description
1.220	39	>75% Grass cover, Good, HSG A
1.220		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.1	61	0.0114	0.12		Sheet Flow, Grass: Short n= 0.150 P2= 3.30"
2.0	129	0.0235	1.07		Shallow Concentrated Flow, Short Grass Pasture Kv= 7.0 fps
1.3	68	0.0150	0.86		Shallow Concentrated Flow, Short Grass Pasture Kv= 7.0 fps
4.4	199	0.0115	0.75		Shallow Concentrated Flow, Short Grass Pasture Kv= 7.0 fps
15.8	457	Total			

Subcatchment SC-1D: SC-1D

Hydrograph



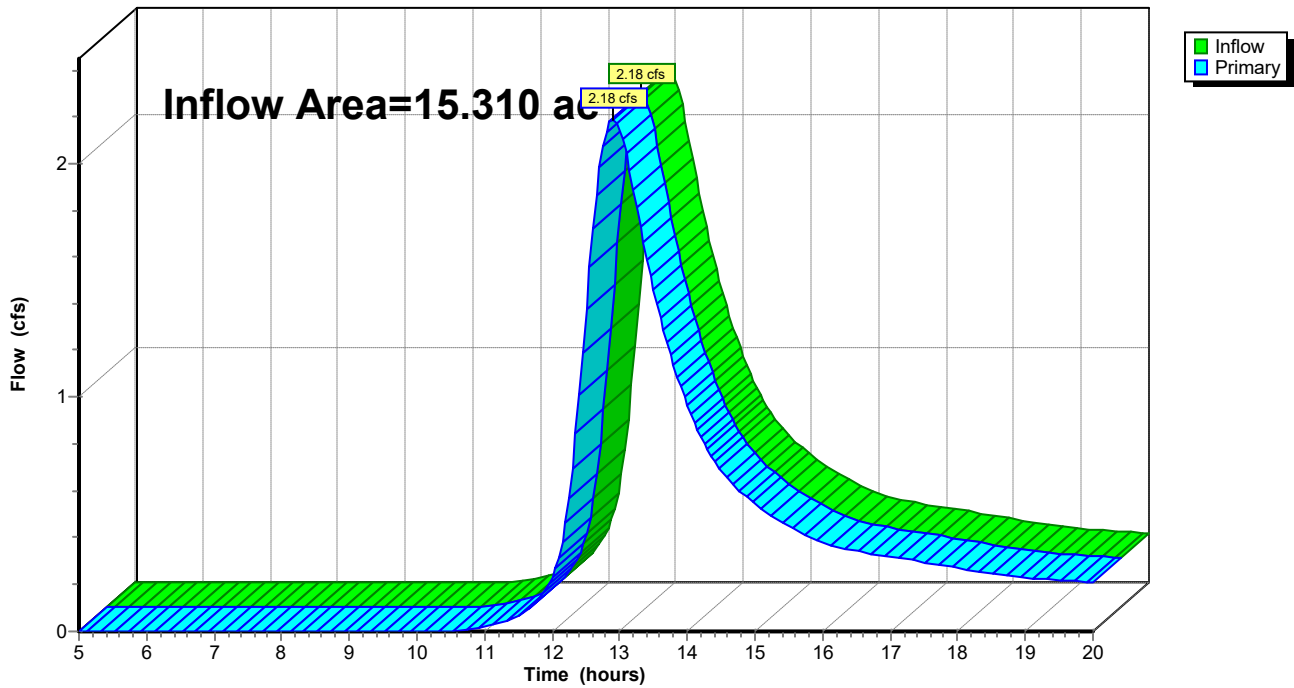
Summary for Link POI1: (new Link)

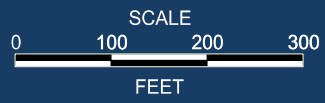
Inflow Area = 15.310 ac, 15.81% Impervious, Inflow Depth > 0.33" for 1-yr (RPv) event
Inflow = 2.18 cfs @ 12.90 hrs, Volume= 0.427 af
Primary = 2.18 cfs @ 12.90 hrs, Volume= 0.427 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Link POI1: (new Link)

Hydrograph



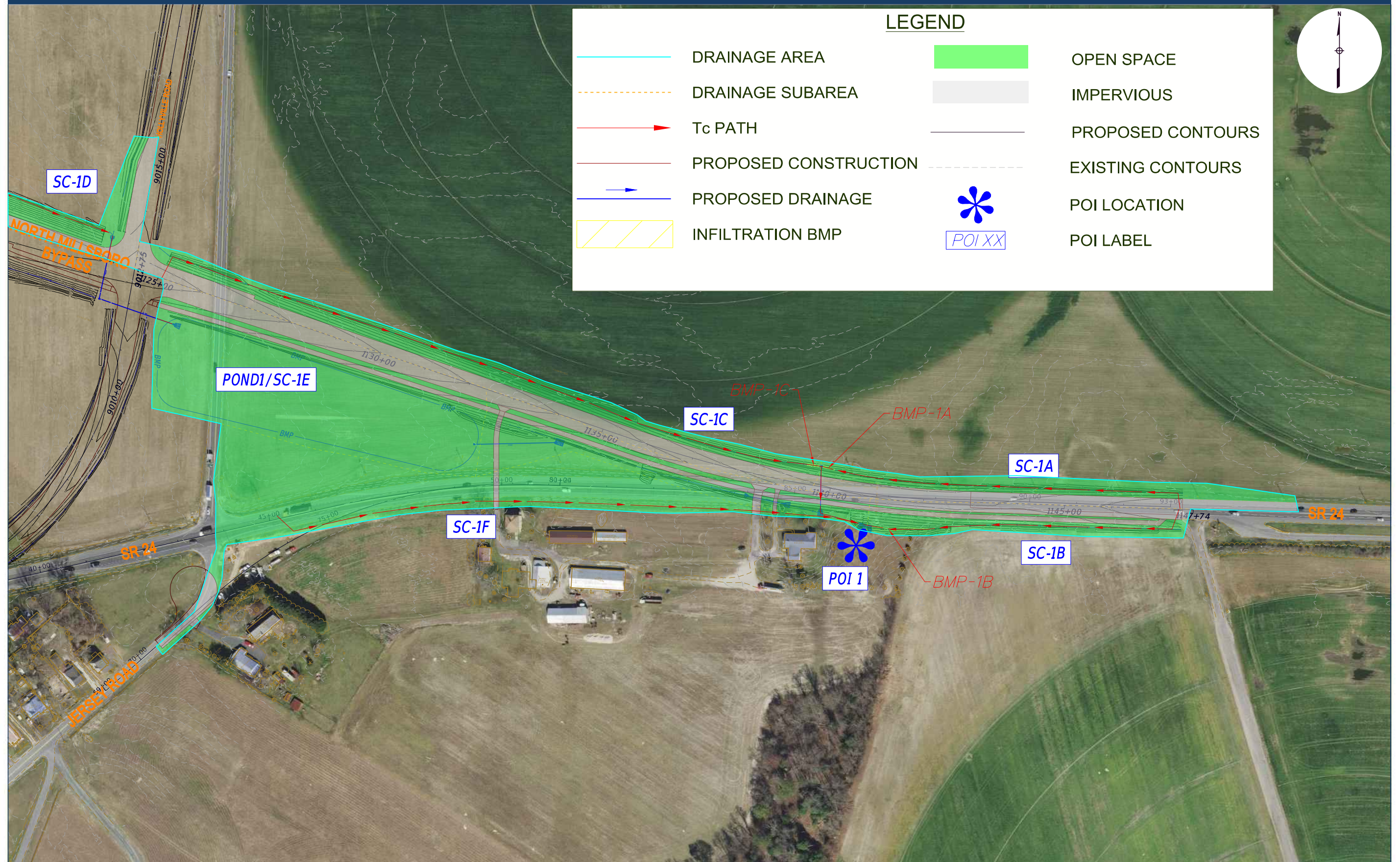


NORTH MILLSBORO BYPASS, US 113 TO SR 24

CONTRACT NO. T201912701
SUSSEX COUNTY

LEGEND

	DRAINAGE AREA		OPEN SPACE
	DRAINAGE SUBAREA		IMPERVIOUS
	T _c PATH		PROPOSED CONTOURS
	PROPOSED CONSTRUCTION		EXISTING CONTOURS
	PROPOSED DRAINAGE		POI LOCATION
	INFILTRATION BMP		POI LABEL



Summary for Subcatchment SC-1A: SC-1A

Runoff = 0.90 cfs @ 12.14 hrs, Volume= 0.064 af, Depth> 0.65"

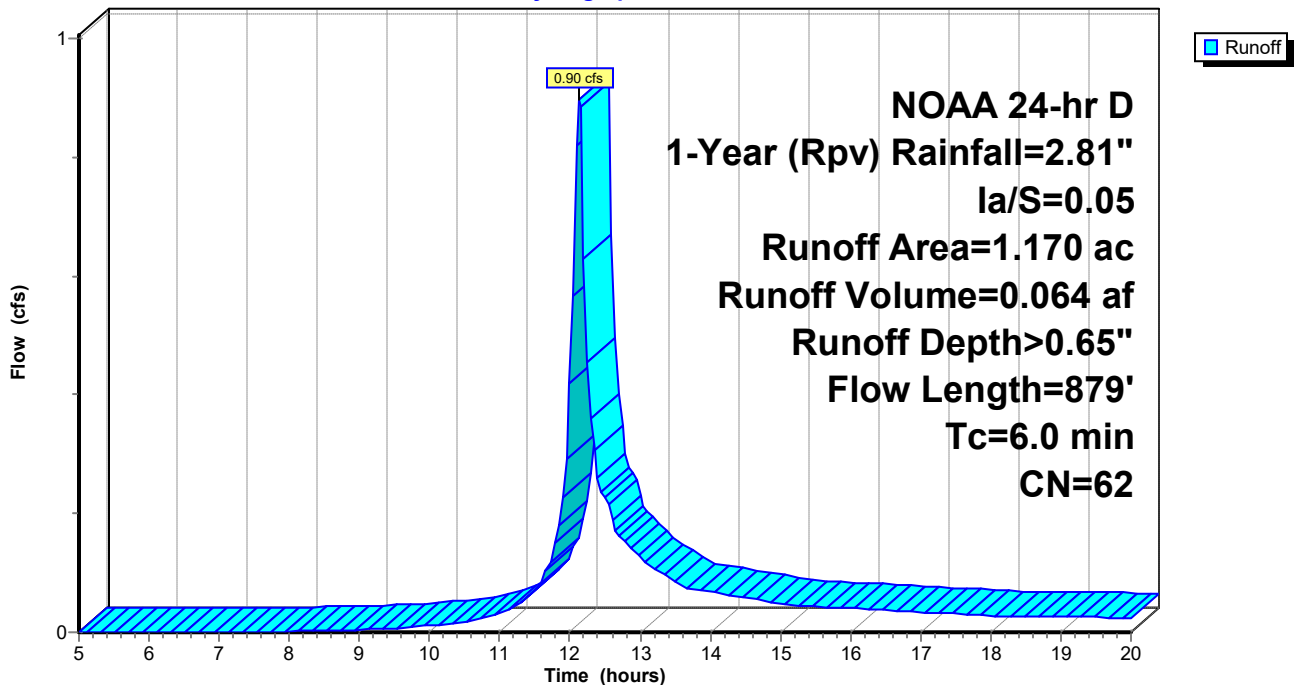
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
 NOAA 24-hr D 1-Year (Rpv) Rainfall=2.81", Ia/S=0.05

Area (ac)	CN	Description
* 0.720	39	
* 0.450	98	
1.170	62	Weighted Average
0.720		61.54% Pervious Area
0.450		38.46% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.3	21	0.0323	1.24		Sheet Flow, Smooth surfaces n= 0.011 P2= 3.30"
0.1	13	0.1570	2.77		Shallow Concentrated Flow, Short Grass Pasture Kv= 7.0 fps
4.2	762	0.0045	3.04	42.89	Channel Flow, Area= 14.1 sf Perim= 16.1' r= 0.88' n= 0.030
0.3	83	0.0050	4.55	8.05	Pipe Channel, RCP_Round 18" 18.0" Round Area= 1.8 sf Perim= 4.7' r= 0.38' n= 0.012
4.9	879	Total, Increased to minimum Tc = 6.0 min			

Subcatchment SC-1A: SC-1A

Hydrograph



Summary for Pond BMP 1A: BMP 1A

Inflow Area = 1.170 ac, 38.46% Impervious, Inflow Depth > 0.65" for 1-Year (Rpv) event
 Inflow = 0.90 cfs @ 12.14 hrs, Volume= 0.064 af
 Outflow = 0.11 cfs @ 13.21 hrs, Volume= 0.063 af, Atten= 88%, Lag= 64.6 min
 Discarded = 0.11 cfs @ 13.21 hrs, Volume= 0.063 af
 Primary = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af
 Secondary = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
 Peak Elev= 19.20' @ 13.21 hrs Surf.Area= 0.046 ac Storage= 0.022 af

Plug-Flow detention time= 82.1 min calculated for 0.063 af (99% of inflow)
 Center-of-Mass det. time= 80.7 min (890.4 - 809.7)

Volume	Invert	Avail.Storage	Storage Description
#1	18.00'	0.037 af	10.00'W x 200.00'L x 2.00'H Prismatic 0.092 af Overall x 40.0% Voids
#2	20.00'	0.131 af	10.00'W x 200.00'L x 2.00'H Prismatic Z=2.0 -Impervious
		0.168 af	Total Available Storage

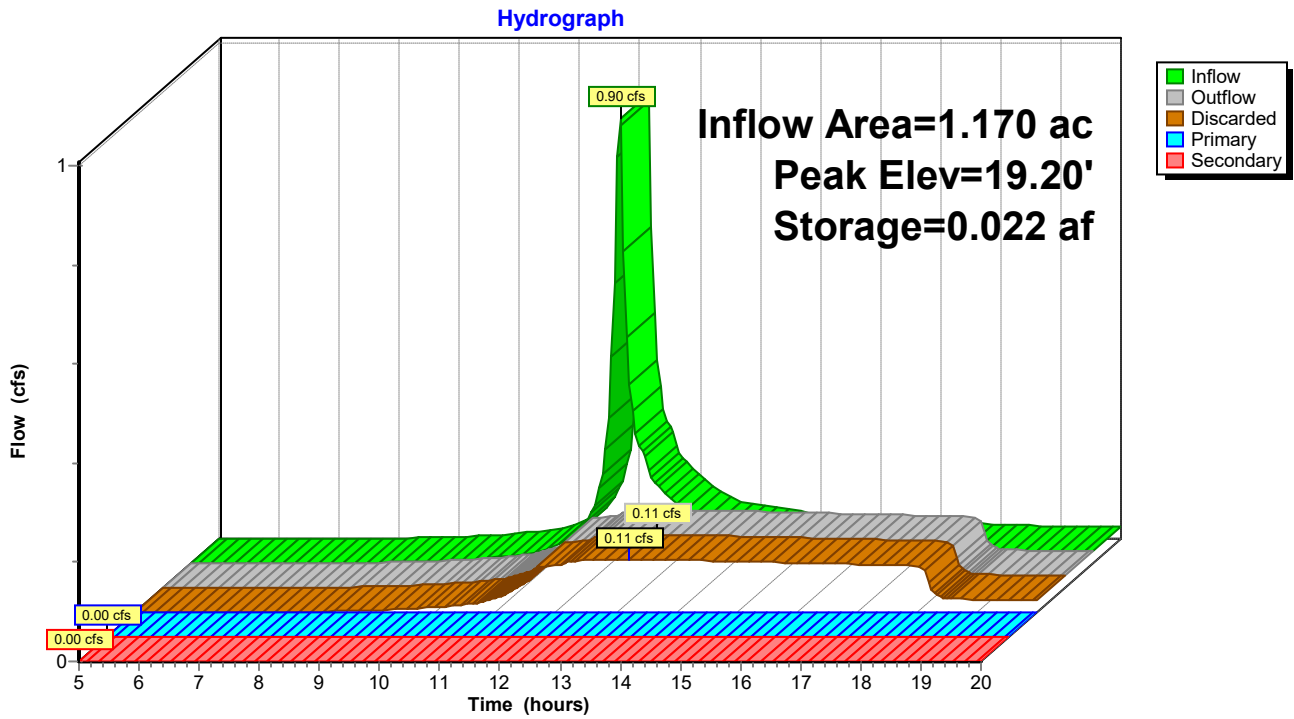
Device	Routing	Invert	Outlet Devices
#1	Discarded	18.00'	2.000 in/hr Exfiltration over Surface area Conductivity to Groundwater Elevation = 10.00'
#2	Primary	20.00'	18.0" Round Culvert L= 85.0' RCP, end-section conforming to fill, Ke= 0.500 Inlet / Outlet Invert= 20.00' / 16.00' S= 0.0471 '/ Cc= 0.900 n= 0.012, Flow Area= 1.77 sf
#3	Secondary	21.50'	18.0' long (Profile 2) Broad-Crested Rectangular Weir Head (feet) 0.49 0.98 1.48 Coef. (English) 2.90 3.26 3.44

Discarded OutFlow Max=0.11 cfs @ 13.21 hrs HW=19.20' (Free Discharge)
 ↑1=Exfiltration (Controls 0.11 cfs)

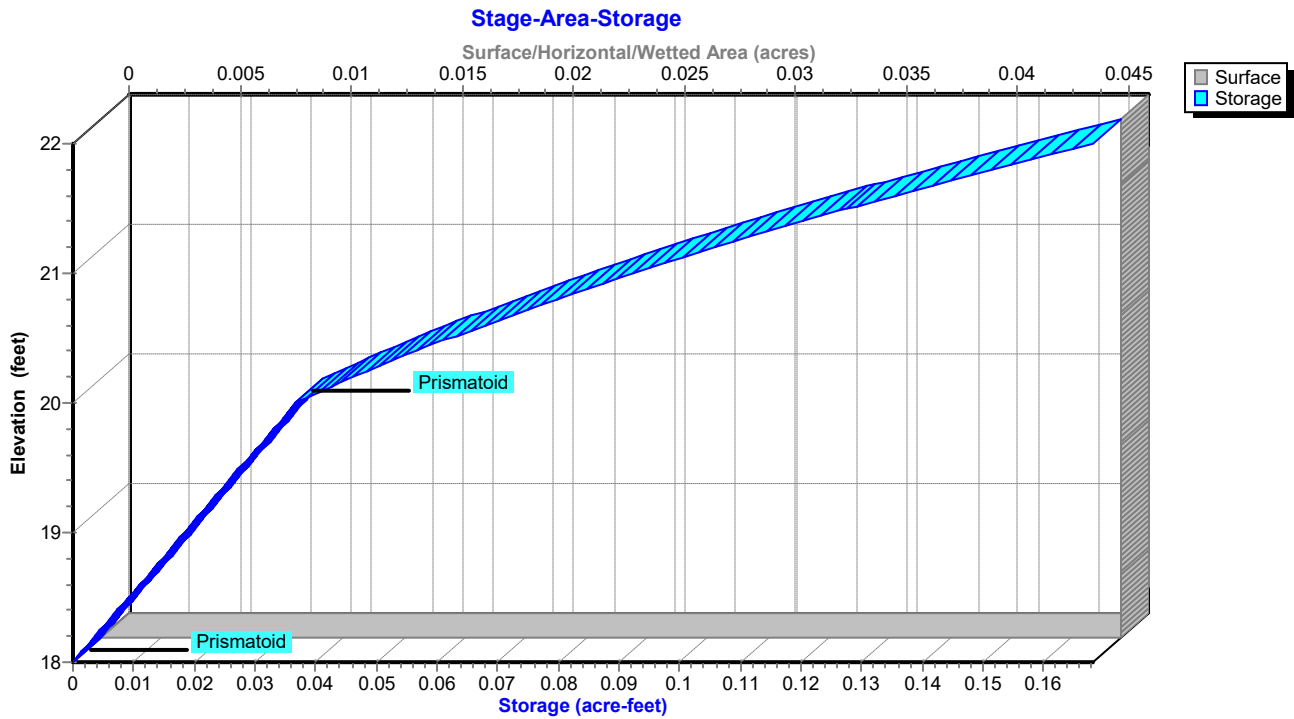
Primary OutFlow Max=0.00 cfs @ 5.00 hrs HW=18.00' (Free Discharge)
 ↑2=Culvert (Controls 0.00 cfs)

Secondary OutFlow Max=0.00 cfs @ 5.00 hrs HW=18.00' (Free Discharge)
 ↑3=Broad-Crested Rectangular Weir (Controls 0.00 cfs)

Pond BMP 1A: BMP 1A



Pond BMP 1A: BMP 1A



Summary for Subcatchment SC-1B: SC-1B

Runoff = 0.91 cfs @ 12.13 hrs, Volume= 0.064 af, Depth> 0.76"

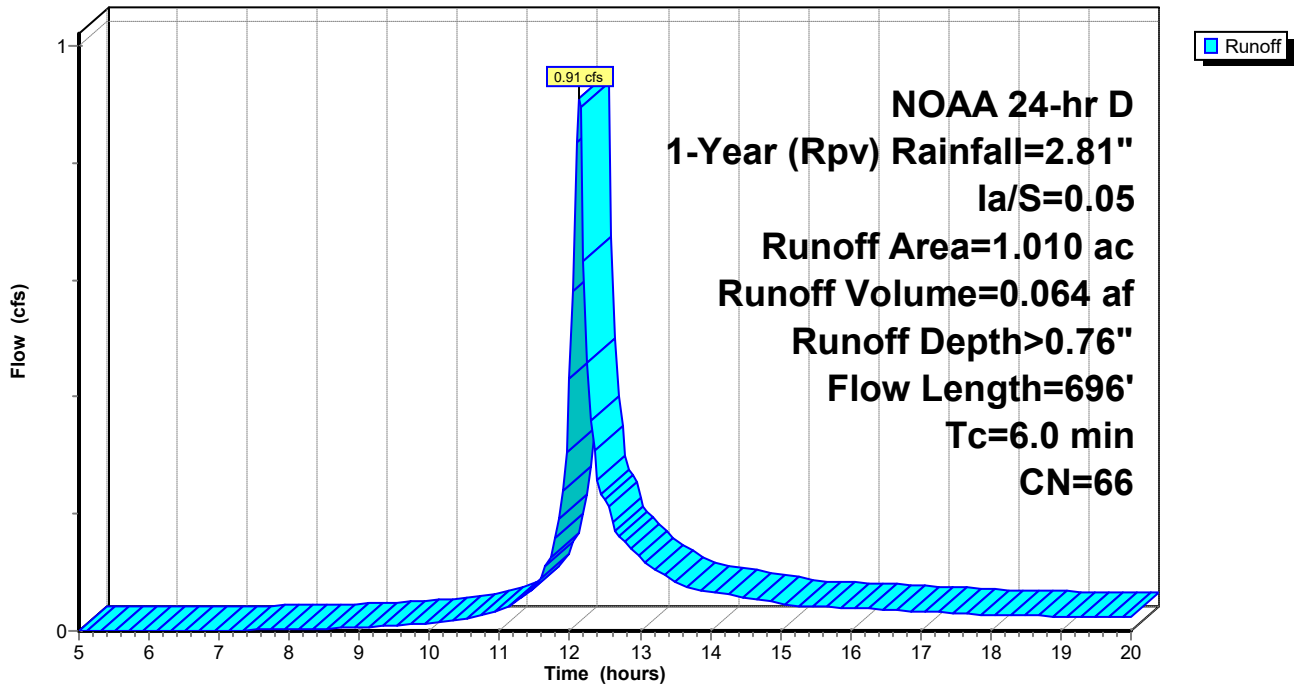
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
 NOAA 24-hr D 1-Year (Rpv) Rainfall=2.81", Ia/S=0.05

Area (ac)	CN	Description
* 0.460	98	
* 0.550	39	
1.010	66	Weighted Average
0.550		54.46% Pervious Area
0.460		45.54% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.3	23	0.0303	1.23		Sheet Flow, Smooth surfaces n= 0.011 P2= 3.30"
0.2	22	0.0835	2.02		Shallow Concentrated Flow, Short Grass Pasture Kv= 7.0 fps
3.5	651	0.0046	3.12	59.82	Channel Flow, Area= 19.2 sf Perim= 21.5' r= 0.89' n= 0.030
4.0	696	Total, Increased to minimum Tc = 6.0 min			

Subcatchment SC-1B: SC-1B

Hydrograph



Summary for Pond BMP-1B: BMP 1B

Inflow Area = 1.010 ac, 45.54% Impervious, Inflow Depth > 0.76" for 1-Year (Rpv) event
 Inflow = 0.91 cfs @ 12.13 hrs, Volume= 0.064 af
 Outflow = 0.10 cfs @ 13.27 hrs, Volume= 0.064 af, Atten= 89%, Lag= 68.0 min
 Discarded = 0.10 cfs @ 13.27 hrs, Volume= 0.064 af
 Primary = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
 Peak Elev= 16.11' @ 13.27 hrs Surf.Area= 0.037 ac Storage= 0.024 af

Plug-Flow detention time= 100.1 min calculated for 0.064 af (99% of inflow)
 Center-of-Mass det. time= 98.7 min (903.2 - 804.5)

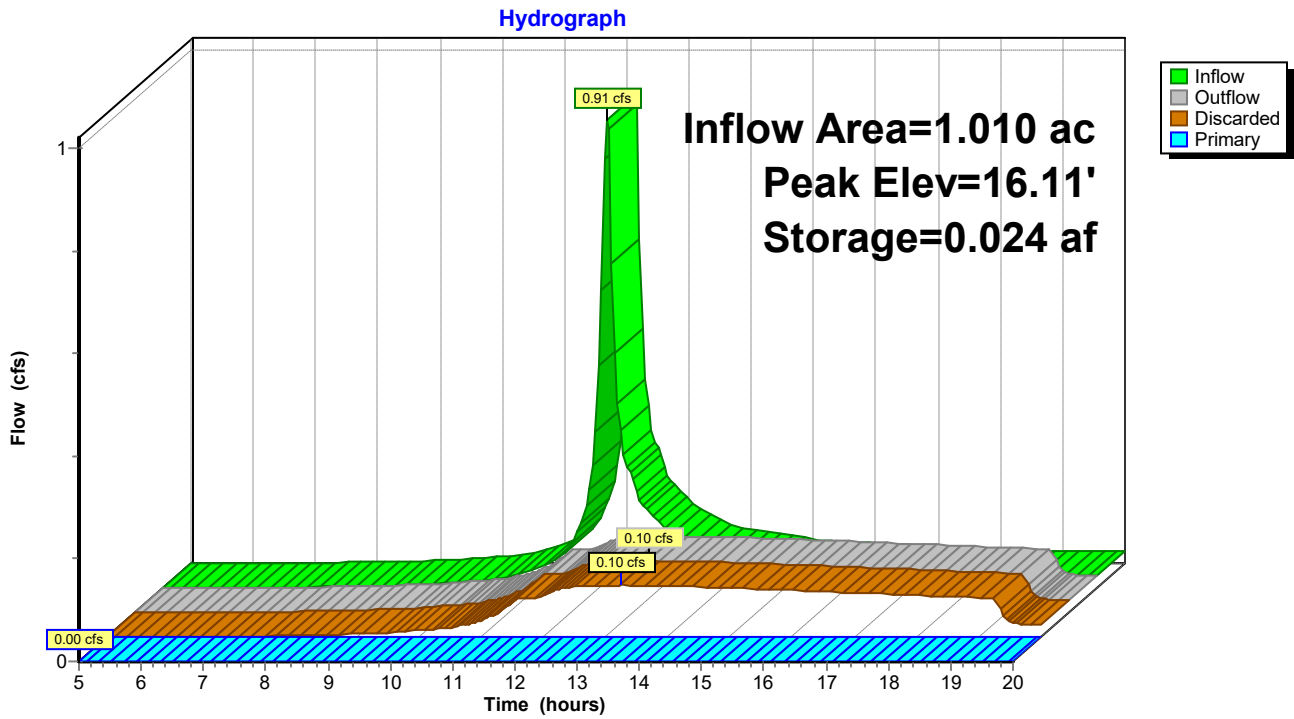
Volume	Invert	Avail.Storage	Storage Description
#1	14.50'	0.029 af	8.00'W x 200.00'L x 2.00'H Prismatic 0.073 af Overall x 40.0% Voids
#2	16.50'	0.113 af	8.00'W x 200.00'L x 2.00'H Prismatic Z=2.0 -Impervious
		0.142 af	Total Available Storage

Device	Routing	Invert	Outlet Devices
#1	Discarded	14.50'	2.000 in/hr Exfiltration over Surface area Conductivity to Groundwater Elevation = 10.00'
#2	Primary	17.75'	16.0' long (Profile 1) Broad-Crested Rectangular Weir Head (feet) 0.49 0.98 1.48 Coef. (English) 2.92 3.37 3.59

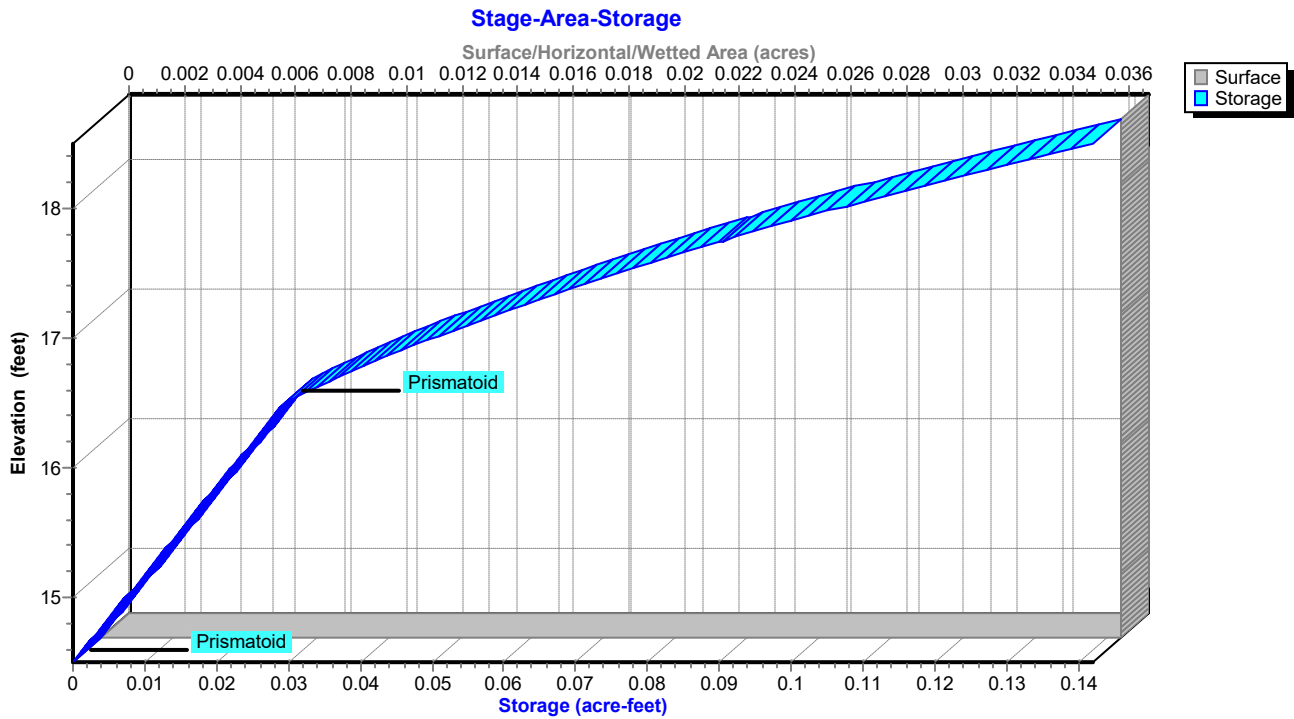
Discarded OutFlow Max=0.10 cfs @ 13.27 hrs HW=16.11' (Free Discharge)
 ↑1=Exfiltration (Controls 0.10 cfs)

Primary OutFlow Max=0.00 cfs @ 5.00 hrs HW=14.50' (Free Discharge)
 ↑2=Broad-Crested Rectangular Weir (Controls 0.00 cfs)

Pond BMP-1B: BMP 1B



Pond BMP-1B: BMP 1B



Summary for Subcatchment SC-1C: SC-1C

Runoff = 1.85 cfs @ 12.15 hrs, Volume= 0.136 af, Depth> 0.76"

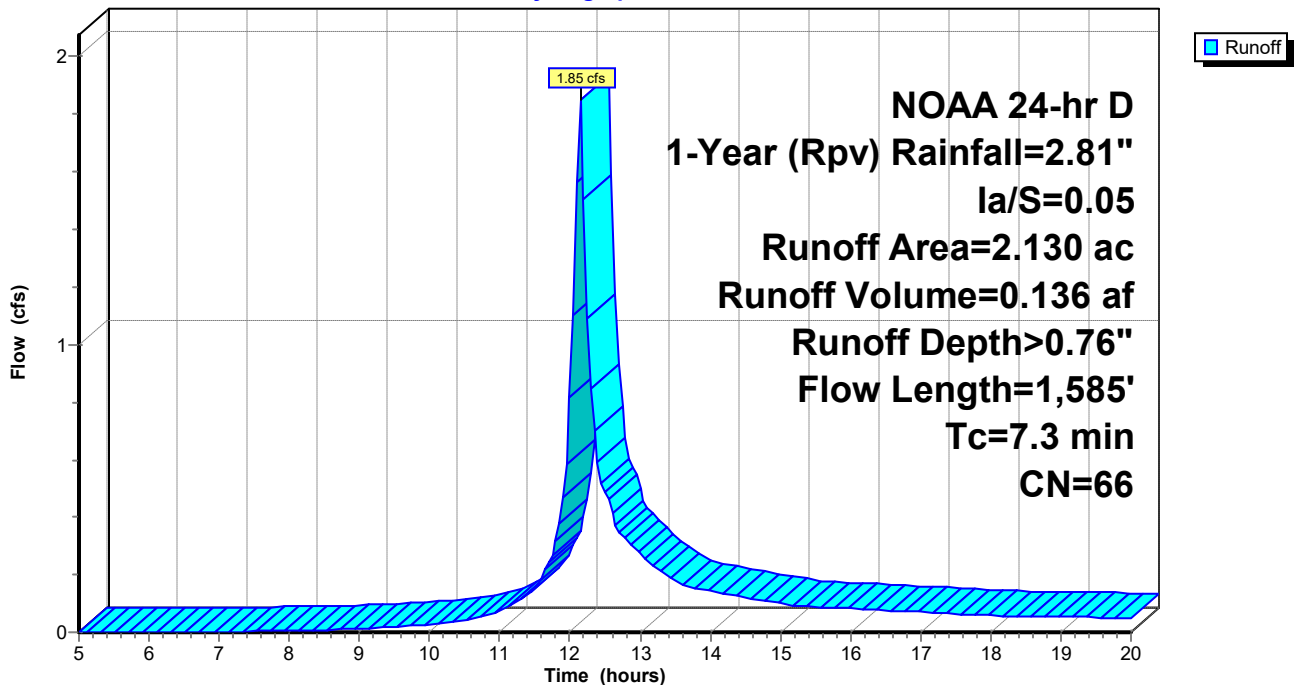
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
 NOAA 24-hr D 1-Year (Rpv) Rainfall=2.81", Ia/S=0.05

Area (ac)	CN	Description
1.160	39	>75% Grass cover, Good, HSG A
0.970	98	Paved roads w/curbs & sewers, HSG A
2.130	66	Weighted Average
1.160		54.46% Pervious Area
0.970		45.54% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.4	29	0.0324	1.32		Sheet Flow, Smooth surfaces n= 0.011 P2= 3.30"
0.1	21	0.1970	3.11		Shallow Concentrated Flow, Short Grass Pasture Kv= 7.0 fps
6.5	1,452	0.0050	3.71	75.37	Channel Flow, Area= 20.3 sf Perim= 18.6' r= 1.09' n= 0.030
0.3	83	0.0050	4.55	8.05	Pipe Channel, RCP_Round 18" 18.0" Round Area= 1.8 sf Perim= 4.7' r= 0.38' n= 0.012
7.3	1,585	Total			

Subcatchment SC-1C: SC-1C

Hydrograph



Summary for Pond BMP-1C: BMP 1C

Inflow Area = 2.130 ac, 45.54% Impervious, Inflow Depth > 0.76" for 1-Year (Rpv) event
 Inflow = 1.85 cfs @ 12.15 hrs, Volume= 0.136 af
 Outflow = 0.24 cfs @ 13.14 hrs, Volume= 0.135 af, Atten= 87%, Lag= 59.6 min
 Discarded = 0.24 cfs @ 13.14 hrs, Volume= 0.135 af
 Primary = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af
 Secondary = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
 Peak Elev= 19.10' @ 13.14 hrs Surf.Area= 0.103 ac Storage= 0.046 af

Plug-Flow detention time= 73.7 min calculated for 0.135 af (99% of inflow)
 Center-of-Mass det. time= 72.3 min (877.8 - 805.5)

Volume	Invert	Avail.Storage	Storage Description
#1	18.00'	0.083 af	10.00'W x 450.00'L x 2.00'H Prismaoid 0.207 af Overall x 40.0% Voids
#2	20.00'	0.292 af	10.00'W x 450.00'L x 2.00'H Prismaoid Z=2.0 -Impervious
		0.375 af	Total Available Storage

Device	Routing	Invert	Outlet Devices
#1	Discarded	18.00'	2.000 in/hr Exfiltration over Surface area Conductivity to Groundwater Elevation = 10.00'
#2	Primary	20.00'	18.0" Round Culvert L= 85.0' RCP, end-section conforming to fill, Ke= 0.500 Inlet / Outlet Invert= 20.00' / 16.00' S= 0.0471 '/ Cc= 0.900 n= 0.012, Flow Area= 1.77 sf
#3	Secondary	21.75'	18.0' long (Profile 2) Broad-Crested Rectangular Weir Head (feet) 0.49 0.98 1.48 Coef. (English) 2.90 3.26 3.44

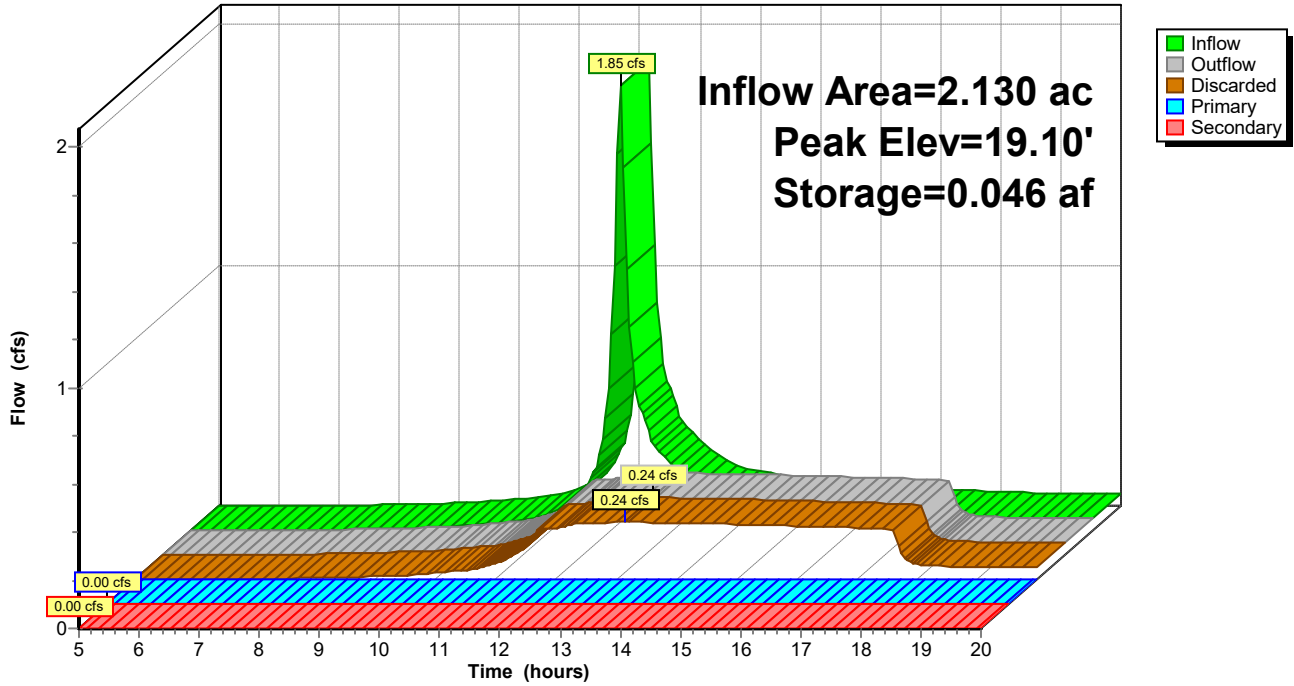
Discarded OutFlow Max=0.24 cfs @ 13.14 hrs HW=19.10' (Free Discharge)
 ↑1=Exfiltration (Controls 0.24 cfs)

Primary OutFlow Max=0.00 cfs @ 5.00 hrs HW=18.00' (Free Discharge)
 ↑2=Culvert (Controls 0.00 cfs)

Secondary OutFlow Max=0.00 cfs @ 5.00 hrs HW=18.00' (Free Discharge)
 ↑3=Broad-Crested Rectangular Weir (Controls 0.00 cfs)

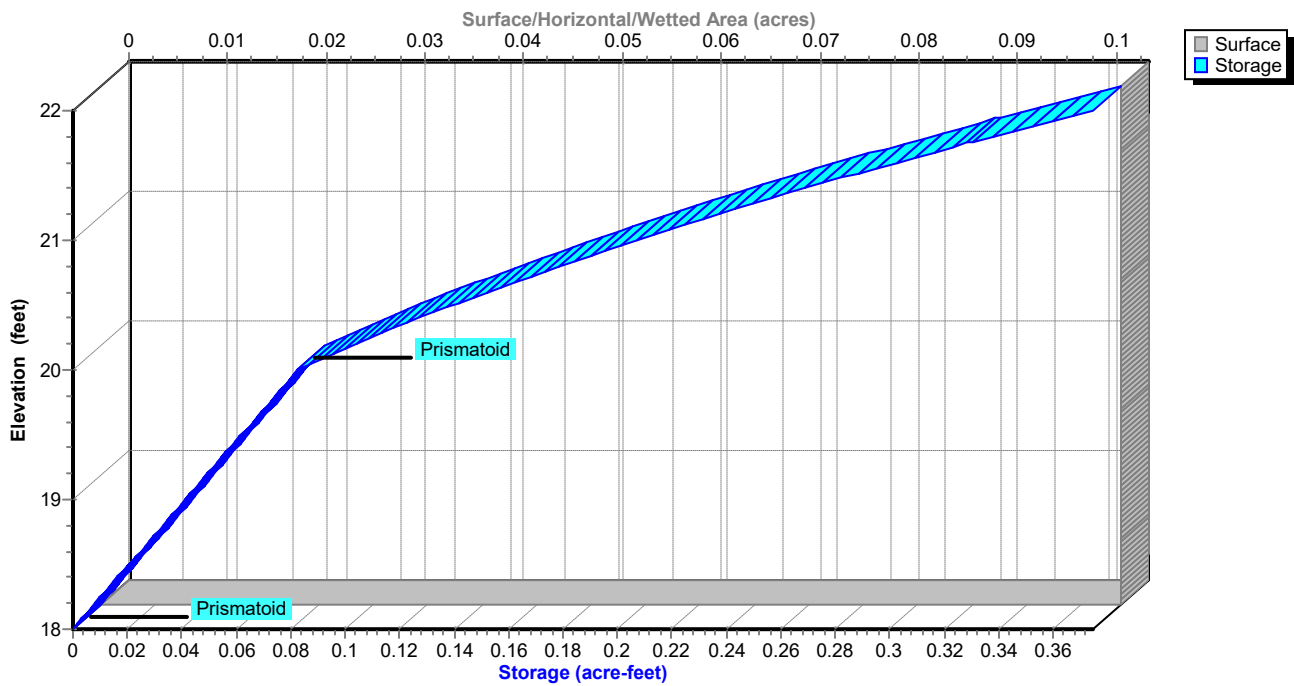
Pond BMP-1C: BMP 1C

Hydrograph



Pond BMP-1C: BMP 1C

Stage-Area-Storage



Summary for Subcatchment SC-1D: SC-1D

Runoff = 1.02 cfs @ 12.13 hrs, Volume= 0.072 af, Depth> 0.71"

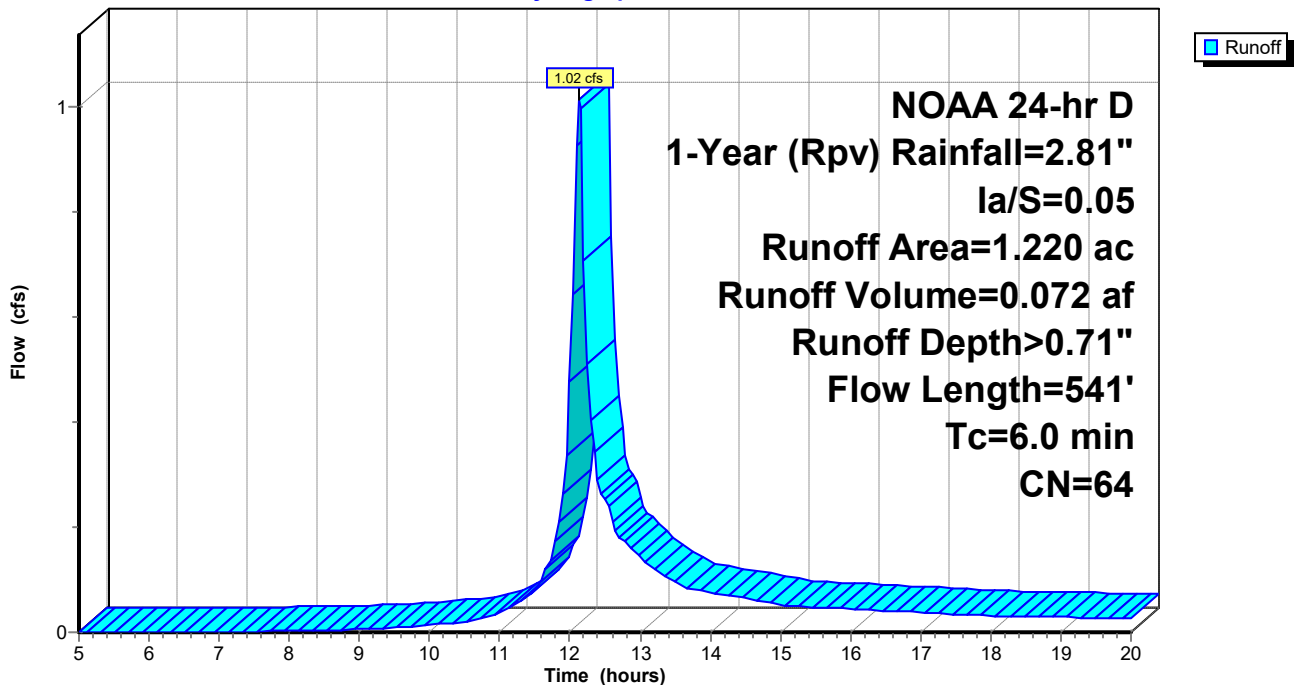
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
 NOAA 24-hr D 1-Year (Rpv) Rainfall=2.81", Ia/S=0.05

Area (ac)	CN	Description
* 0.710	39	
* 0.510	98	
1.220	64	Weighted Average
0.710		58.20% Pervious Area
0.510		41.80% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.4	26	0.0200	1.07		Sheet Flow, Smooth surfaces n= 0.011 P2= 3.30"
0.1	13	0.1580	2.78		Shallow Concentrated Flow, Short Grass Pasture Kv= 7.0 fps
1.5	206	0.0018	2.22	61.93	Channel Flow, Area= 27.9 sf Perim= 25.7' r= 1.09' n= 0.030
1.1	296	0.0050	4.55	8.05	Pipe Channel, RCP_Round 18" 18.0" Round Area= 1.8 sf Perim= 4.7' r= 0.38' n= 0.012
3.1	541	Total, Increased to minimum Tc = 6.0 min			

Subcatchment SC-1D: SC-1D

Hydrograph



Summary for Subcatchment SC-1E: SC-1E

Runoff = 1.65 cfs @ 12.14 hrs, Volume= 0.119 af, Depth> 0.36"

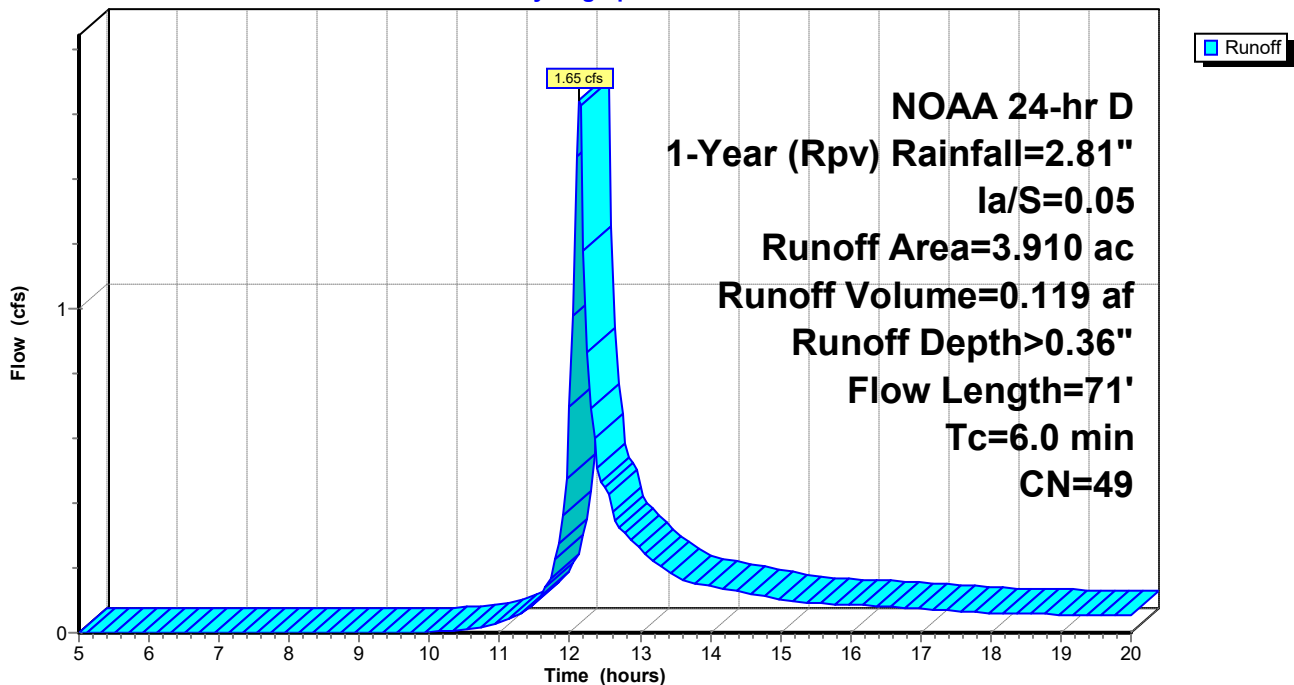
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
 NOAA 24-hr D 1-Year (Rpv) Rainfall=2.81", Ia/S=0.05

Area (ac)	CN	Description
* 0.670	98	
* 3.240	39	
3.910	49	Weighted Average
3.240		82.86% Pervious Area
0.670		17.14% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.5	35	0.0263	1.26		Sheet Flow, Smooth surfaces n= 0.011 P2= 3.30"
0.2	16	0.0393	1.39		Shallow Concentrated Flow, Short Grass Pasture Kv= 7.0 fps
0.1	10	0.0242	3.16		Shallow Concentrated Flow, Paved Kv= 20.3 fps
0.1	10	0.1580	2.78		Shallow Concentrated Flow, Short Grass Pasture Kv= 7.0 fps
0.9	71	Total, Increased to minimum Tc = 6.0 min			

Subcatchment SC-1E: SC-1E

Hydrograph



Summary for Pond POND1: BMP-1

Inflow Area = 5.130 ac, 23.00% Impervious, Inflow Depth > 0.45" for 1-Year (Rpv) event
 Inflow = 2.66 cfs @ 12.14 hrs, Volume= 0.191 af
 Outflow = 0.31 cfs @ 13.32 hrs, Volume= 0.139 af, Atten= 88%, Lag= 70.8 min
 Primary = 0.31 cfs @ 13.32 hrs, Volume= 0.139 af

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
 Peak Elev= 25.28' @ 13.32 hrs Surf.Area= 0.390 ac Storage= 0.090 af

Plug-Flow detention time= 177.1 min calculated for 0.139 af (73% of inflow)
 Center-of-Mass det. time= 106.8 min (926.5 - 819.7)

Volume	Invert	Avail.Storage	Storage Description
#1	25.00'	0.937 af	Custom Stage Data (Prismatic) Listed below (Recalc)

Elevation (feet)	Surf.Area (acres)	Inc.Store (acre-feet)	Cum.Store (acre-feet)
25.00	0.250	0.000	0.000
26.00	0.750	0.500	0.500
26.50	1.000	0.437	0.937

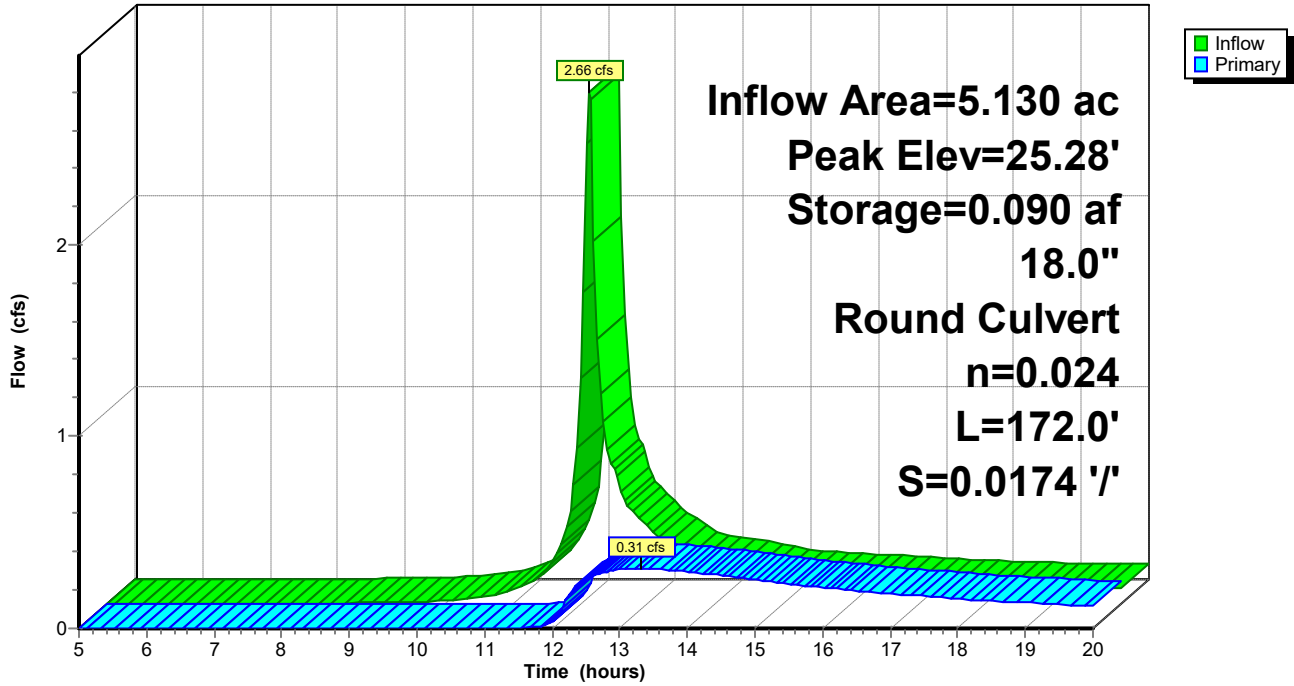
Device	Routing	Invert	Outlet Devices
#1	Primary	25.00'	18.0" Round CMP_Round 18" L= 172.0' CMP, mitered to conform to fill, Ke= 0.700 Inlet / Outlet Invert= 25.00' / 22.00' S= 0.0174 '/ Cc= 0.900 n= 0.024, Flow Area= 1.77 sf

Primary OutFlow Max=0.31 cfs @ 13.32 hrs HW=25.28' (Free Discharge)

↑1=CMP_Round 18" (Barrel Controls 0.31 cfs @ 2.09 fps)

Pond POND1: BMP-1

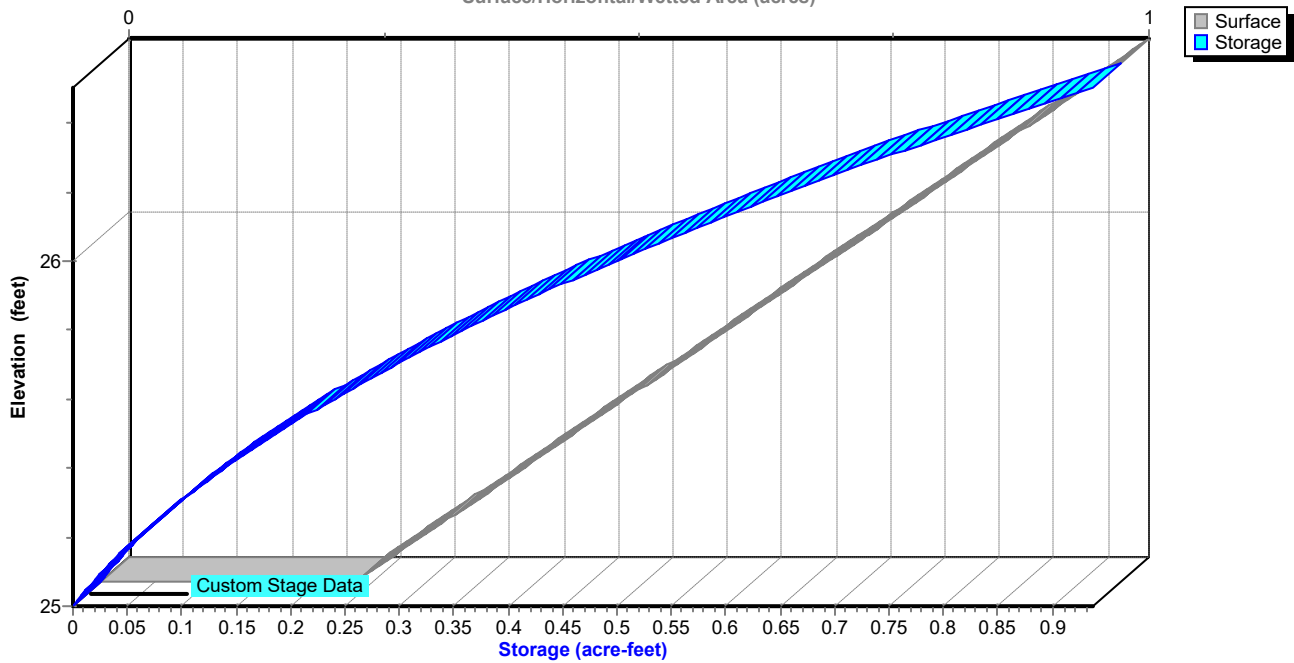
Hydrograph



Pond POND1: BMP-1

Stage-Area-Storage

Surface/Horizontal/Wetted Area (acres)



Summary for Subcatchment SC-1F: SC-1F

Runoff = 1.53 cfs @ 12.15 hrs, Volume= 0.115 af, Depth> 0.92"

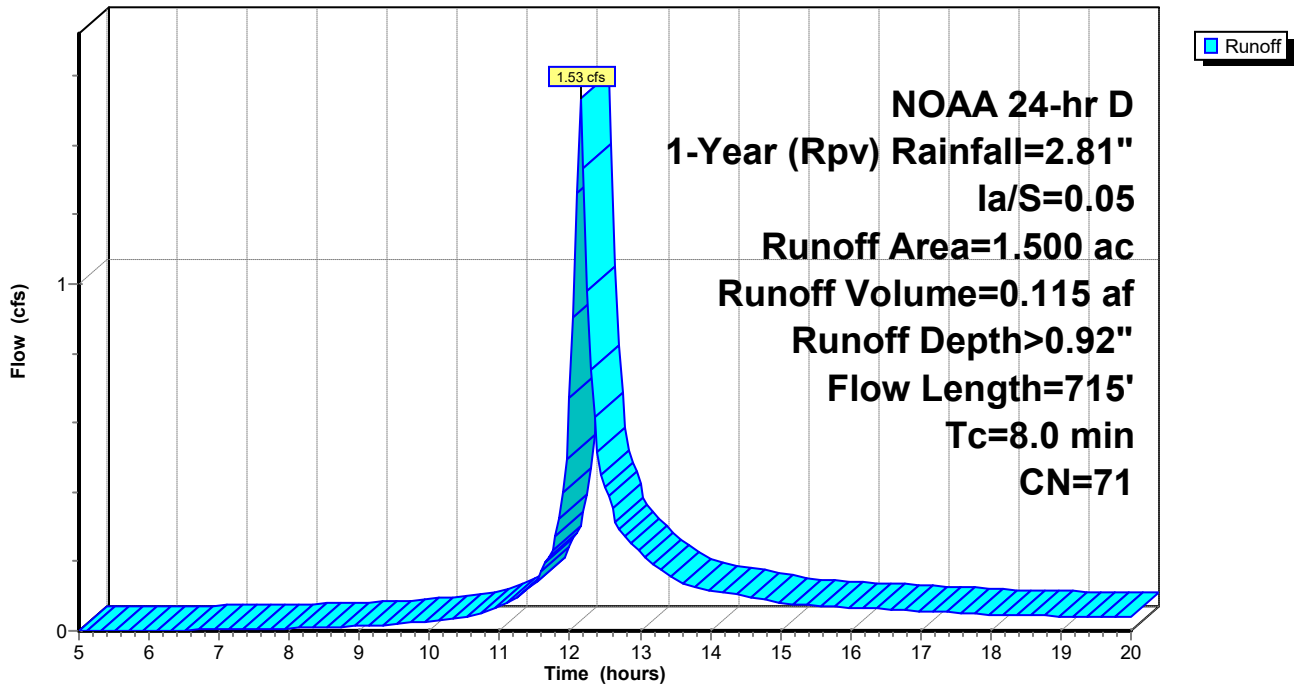
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
 NOAA 24-hr D 1-Year (Rpv) Rainfall=2.81", Ia/S=0.05

Area (ac)	CN	Description
* 0.820	98	
* 0.680	39	
1.500	71	Weighted Average
0.680		45.33% Pervious Area
0.820		54.67% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.5	50	0.0200	0.15		Sheet Flow, Grass: Short n= 0.150 P2= 3.30"
2.5	665	0.0098	4.36	66.34	Channel Flow, Area= 15.2 sf Perim= 18.1' r= 0.84' n= 0.030
8.0	715	Total			

Subcatchment SC-1F: SC-1F

Hydrograph



Summary for Subcatchment SC-1G: SC-1G

Runoff = 0.63 cfs @ 12.22 hrs, Volume= 0.060 af, Depth> 0.23"

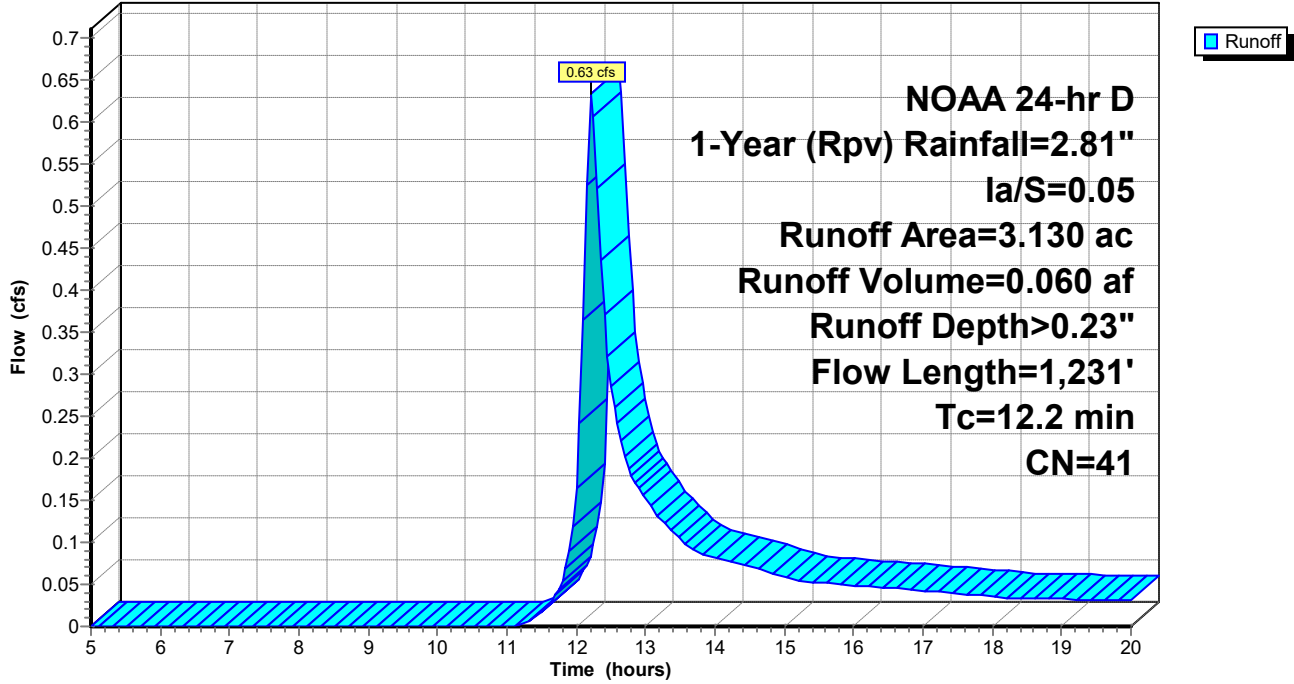
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
 NOAA 24-hr D 1-Year (Rpv) Rainfall=2.81", Ia/S=0.05

Area (ac)	CN	Description
3.010	39	>75% Grass cover, Good, HSG A
0.120	98	Paved roads w/curbs & sewers, HSG A
3.130	41	Weighted Average
3.010		96.17% Pervious Area
0.120		3.83% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.5	34	0.0095	0.10		Sheet Flow, Grass: Short n= 0.150 P2= 3.30"
0.1	13	0.0640	1.77		Shallow Concentrated Flow, Short Grass Pasture Kv= 7.0 fps
1.7	391	0.0110	3.90	48.78	Channel Flow, Area= 12.5 sf Perim= 19.2' r= 0.65' n= 0.030
0.8	126	0.0030	2.69	2.11	Pipe Channel, RCP_Round 12" 12.0" Round Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.012
3.1	457	0.0030	2.50	35.70	Channel Flow, Area= 14.3 sf Perim= 16.2' r= 0.88' n= 0.030
0.3	30	0.0050	1.74	1.36	Pipe Channel, CMP_Round 12" 12.0" Round Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.024
0.7	180	0.0173	4.10	19.29	Channel Flow, Area= 4.7 sf Perim= 9.4' r= 0.50' n= 0.030
12.2	1,231	Total			

Subcatchment SC-1G: SC-1G

Hydrograph

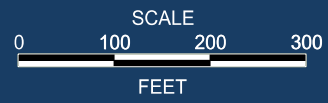




APPENDIX C

POI-2

- POI-2 Drainage Area Maps
- HydroCAD Calculations






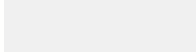



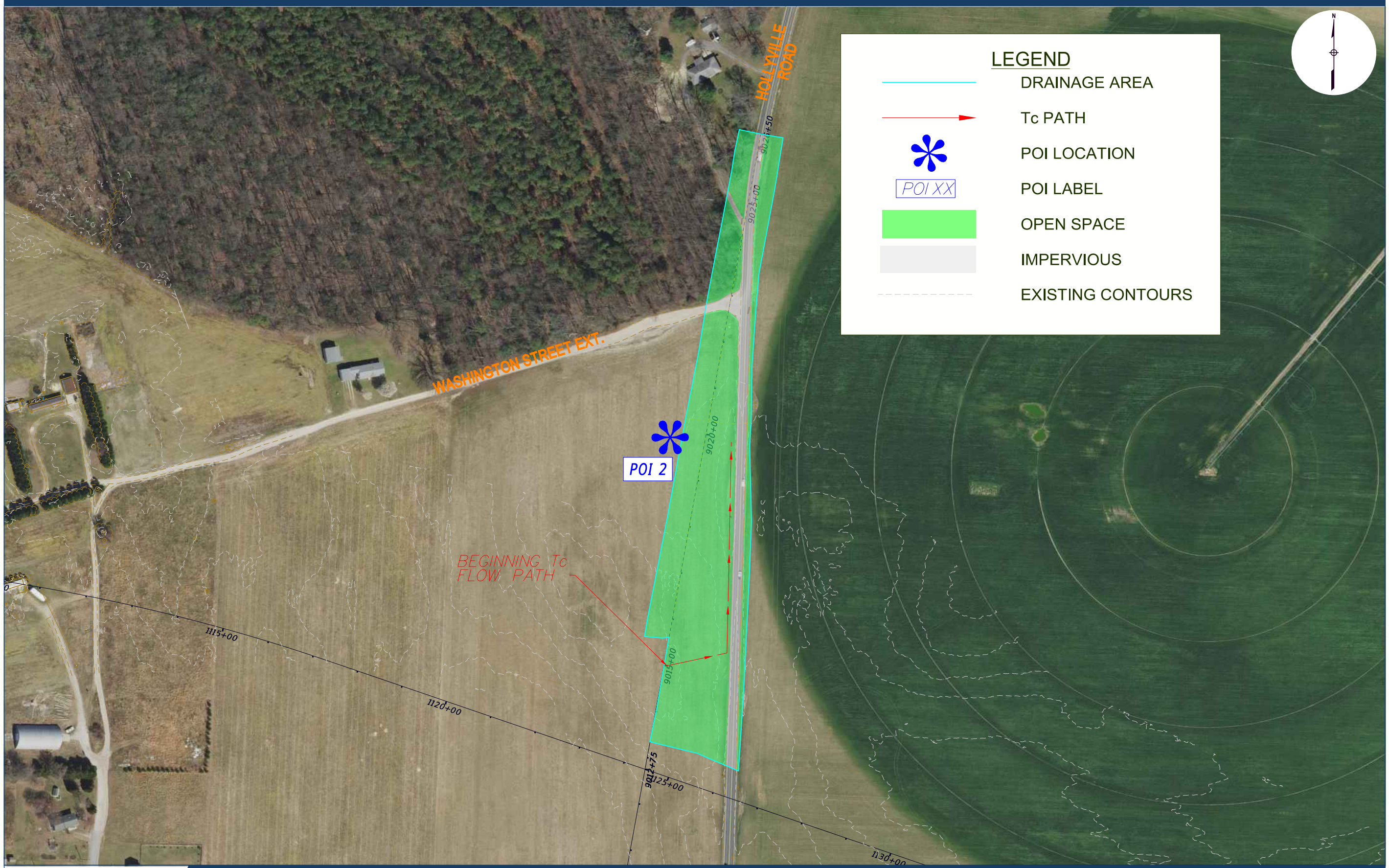
NORTH MILLSBORO BYPASS, US 113 TO SR 24

CONTRACT NO. T201912701
SUSSEX COUNTY



LEGEND

-  DRAINAGE AREA
-  Tc PATH
-  POI LOCATION
-  POI LABEL
-  OPEN SPACE
-  IMPERVIOUS
-  EXISTING CONTOURS



Summary for Subcatchment SC-2A: 2A

Runoff = 1.39 cfs @ 12.25 hrs, Volume= 0.135 af, Depth> 0.36"

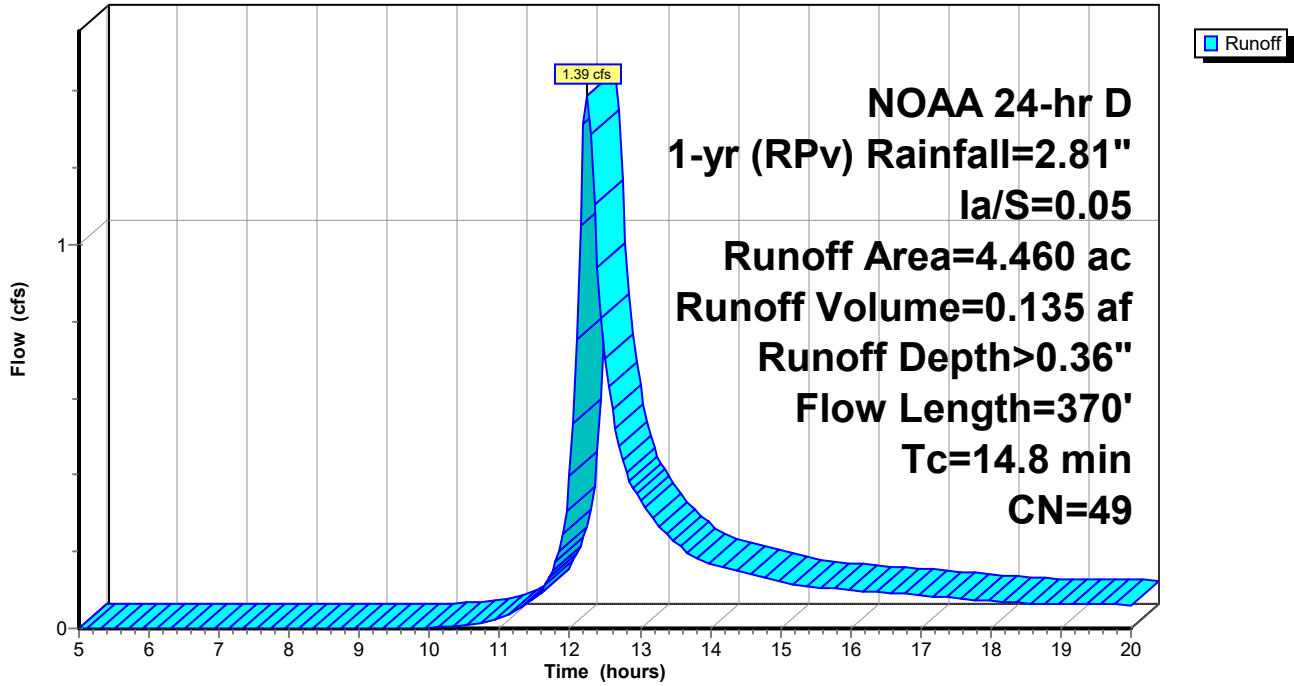
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
 NOAA 24-hr D 1-yr (RPv) Rainfall=2.81", Ia/S=0.05

Area (ac)	CN	Description
3.700	39	>75% Grass cover, Good, HSG A
0.760	98	Paved roads w/curbs & sewers, HSG A
4.460	49	Weighted Average
3.700		82.96% Pervious Area
0.760		17.04% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.4	50	0.0098	0.11		Sheet Flow, Grass: Short n= 0.150 P2= 3.30"
1.4	59	0.0098	0.69		Shallow Concentrated Flow, Short Grass Pasture Kv= 7.0 fps
1.3	68	0.0160	0.89		Shallow Concentrated Flow, Short Grass Pasture Kv= 7.0 fps
1.6	67	0.0100	0.70		Shallow Concentrated Flow, Short Grass Pasture Kv= 7.0 fps
2.3	86	0.0079	0.62		Shallow Concentrated Flow, Short Grass Pasture Kv= 7.0 fps
0.8	40	0.0150	0.86		Shallow Concentrated Flow, Short Grass Pasture Kv= 7.0 fps
14.8	370	Total			

Subcatchment SC-2A: 2A

Hydrograph



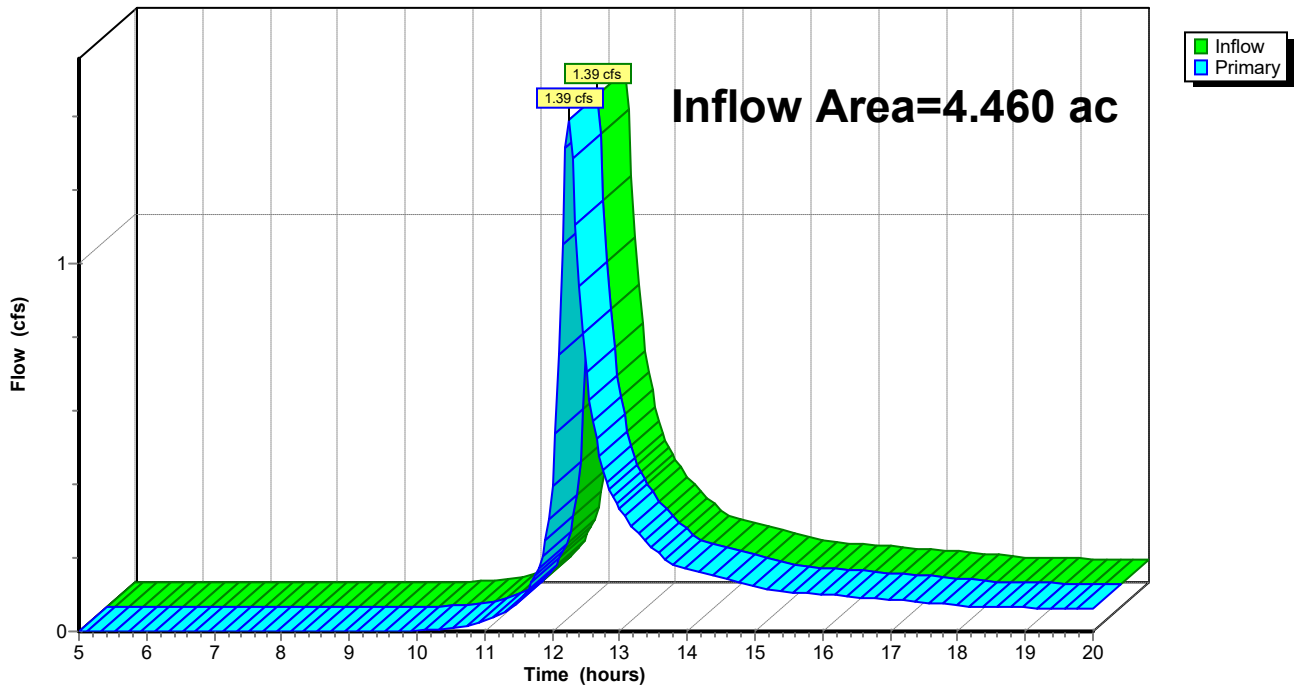
Summary for Link POI2: (new Link)

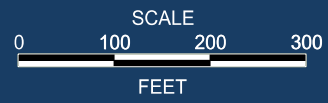
Inflow Area = 4.460 ac, 17.04% Impervious, Inflow Depth > 0.36" for 1-yr (RPv) event
Inflow = 1.39 cfs @ 12.25 hrs, Volume= 0.135 af
Primary = 1.39 cfs @ 12.25 hrs, Volume= 0.135 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Link POI2: (new Link)

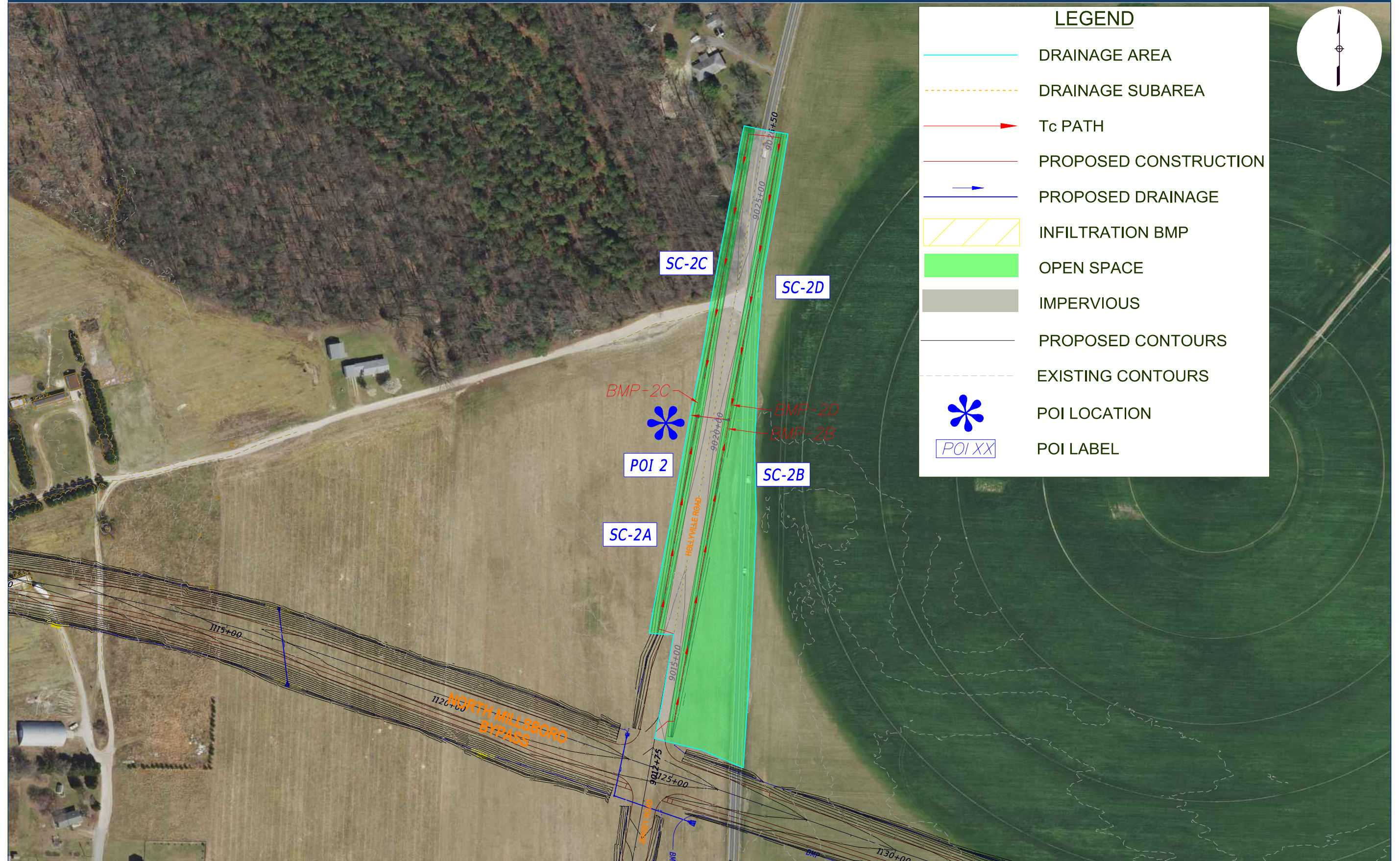
Hydrograph





NORTH MILLSBORO BYPASS, US 113 TO SR 24

CONTRACT NO. T201912701
SUSSEX COUNTY



LEGEND	
	DRAINAGE AREA
	DRAINAGE SUBAREA
	Tc PATH
	PROPOSED CONSTRUCTION
	PROPOSED DRAINAGE
	INFILTRATION BMP
	OPEN SPACE
	IMPERVIOUS
	PROPOSED CONTOURS
	EXISTING CONTOURS
	POI LOCATION
	POI LABEL



Summary for Subcatchment SC-2A: 2A

Runoff = 0.45 cfs @ 12.13 hrs, Volume= 0.032 af, Depth> 0.71"

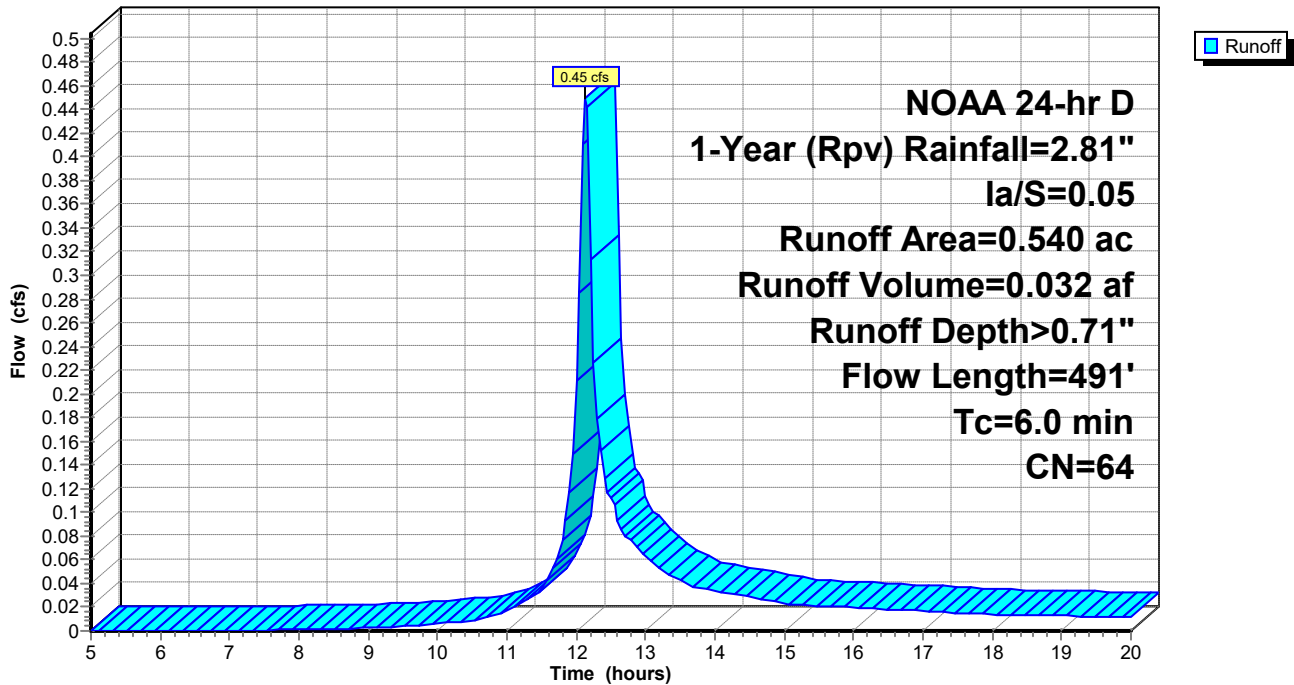
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
 NOAA 24-hr D 1-Year (Rpv) Rainfall=2.81", Ia/S=0.05

Area (ac)	CN	Description
* 0.230	98	
* 0.310	39	
0.540	64	Weighted Average
0.310		57.41% Pervious Area
0.230		42.59% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.3	22	0.0230	1.09		Sheet Flow, Smooth surfaces n= 0.011 P2= 3.30"
0.1	12	0.1670	2.86		Shallow Concentrated Flow, Short Grass Pasture Kv= 7.0 fps
2.8	457	0.0026	2.71	82.79	Channel Flow, Area= 30.6 sf Perim= 27.6' r= 1.11' n= 0.030
3.2	491	Total, Increased to minimum Tc = 6.0 min			

Subcatchment SC-2A: 2A

Hydrograph



Summary for Subcatchment SC-2B: 2B

Runoff = 0.95 cfs @ 12.14 hrs, Volume= 0.069 af, Depth> 0.35"

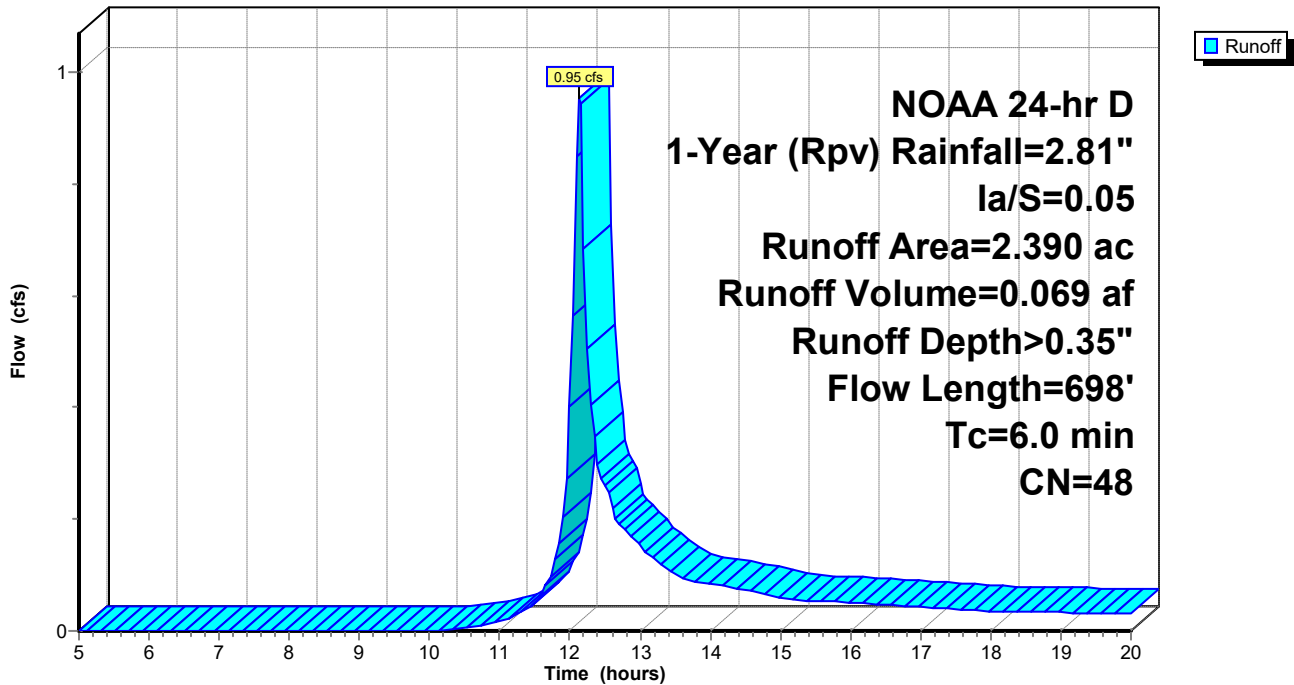
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
 NOAA 24-hr D 1-Year (Rpv) Rainfall=2.81", Ia/S=0.05

Area (ac)	CN	Description
* 0.350	98	
* 2.040	39	
2.390	48	Weighted Average
2.040		85.36% Pervious Area
0.350		14.64% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.4	32	0.0270	1.25		Sheet Flow, Smooth surfaces n= 0.011 P2= 3.30"
0.1	14	0.1470	2.68		Shallow Concentrated Flow, Short Grass Pasture Kv= 7.0 fps
3.8	652	0.0030	2.85	81.44	Channel Flow, Area= 28.6 sf Perim= 26.6' r= 1.08' n= 0.030
4.3	698	Total, Increased to minimum Tc = 6.0 min			

Subcatchment SC-2B: 2B

Hydrograph



Summary for Pond BMP-2B: BMP 2B

Inflow Area = 2.390 ac, 14.64% Impervious, Inflow Depth > 0.35" for 1-Year (Rpv) event
 Inflow = 0.95 cfs @ 12.14 hrs, Volume= 0.069 af
 Outflow = 0.10 cfs @ 13.50 hrs, Volume= 0.069 af, Atten= 89%, Lag= 81.9 min
 Discarded = 0.10 cfs @ 13.50 hrs, Volume= 0.069 af
 Primary = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af
 Secondary = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
 Peak Elev= 22.96' @ 13.50 hrs Surf.Area= 0.046 ac Storage= 0.025 af

Plug-Flow detention time= 106.3 min calculated for 0.069 af (100% of inflow)
 Center-of-Mass det. time= 105.0 min (933.8 - 828.8)

Volume	Invert	Avail.Storage	Storage Description
#1	21.60'	0.037 af	8.00'W x 250.00'L x 2.00'H Prismatic 0.092 af Overall x 40.0% Voids
#2	23.60'	0.140 af	8.00'W x 250.00'L x 2.00'H Prismatic Z=2.0
		0.177 af	Total Available Storage

Device	Routing	Invert	Outlet Devices
#1	Discarded	21.60'	2.000 in/hr Exfiltration over Surface area Conductivity to Groundwater Elevation = 10.00'
#2	Primary	23.60'	18.0" Round Culvert L= 57.0' RCP, end-section conforming to fill, Ke= 0.500 Inlet / Outlet Invert= 23.60' / 23.30' S= 0.0053 '/ Cc= 0.900 n= 0.012, Flow Area= 1.77 sf
#3	Secondary	25.50'	16.0' long (Profile 1) Broad-Crested Rectangular Weir Head (feet) 0.49 0.98 1.48 Coef. (English) 2.92 3.37 3.59

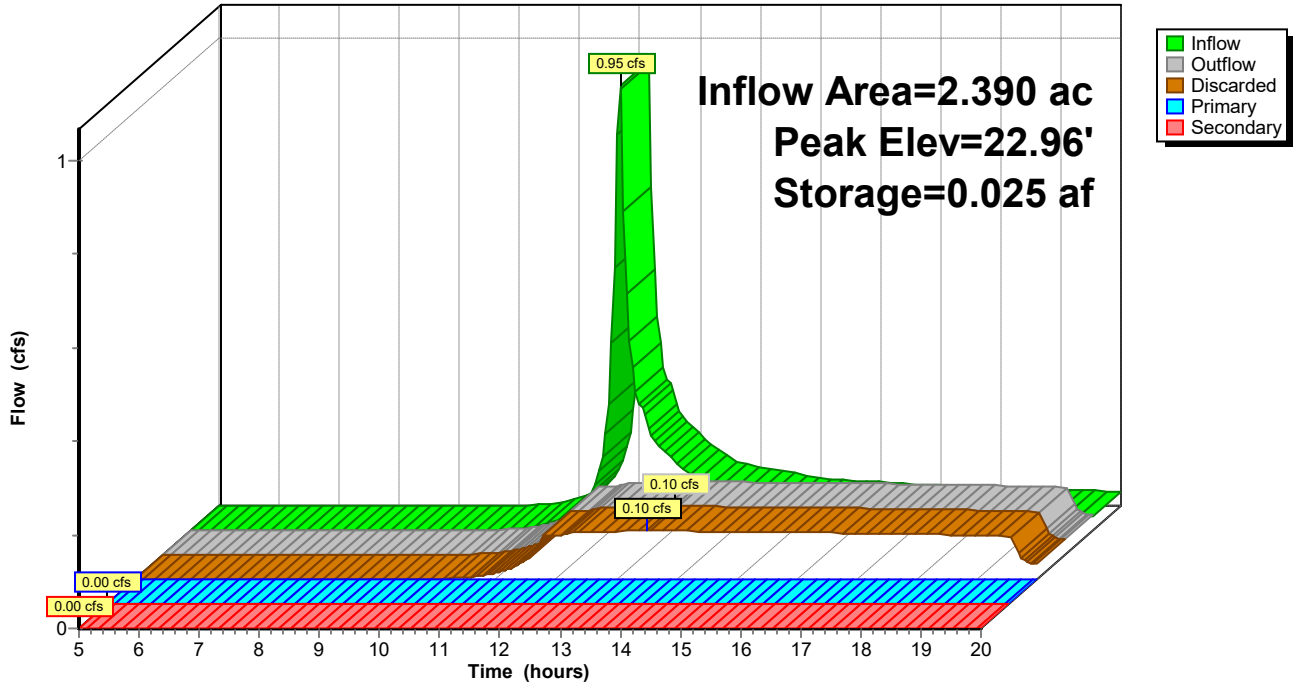
Discarded OutFlow Max=0.10 cfs @ 13.50 hrs HW=22.96' (Free Discharge)
 ↑1=Exfiltration (Controls 0.10 cfs)

Primary OutFlow Max=0.00 cfs @ 5.00 hrs HW=21.60' (Free Discharge)
 ↑2=Culvert (Controls 0.00 cfs)

Secondary OutFlow Max=0.00 cfs @ 5.00 hrs HW=21.60' (Free Discharge)
 ↑3=Broad-Crested Rectangular Weir (Controls 0.00 cfs)

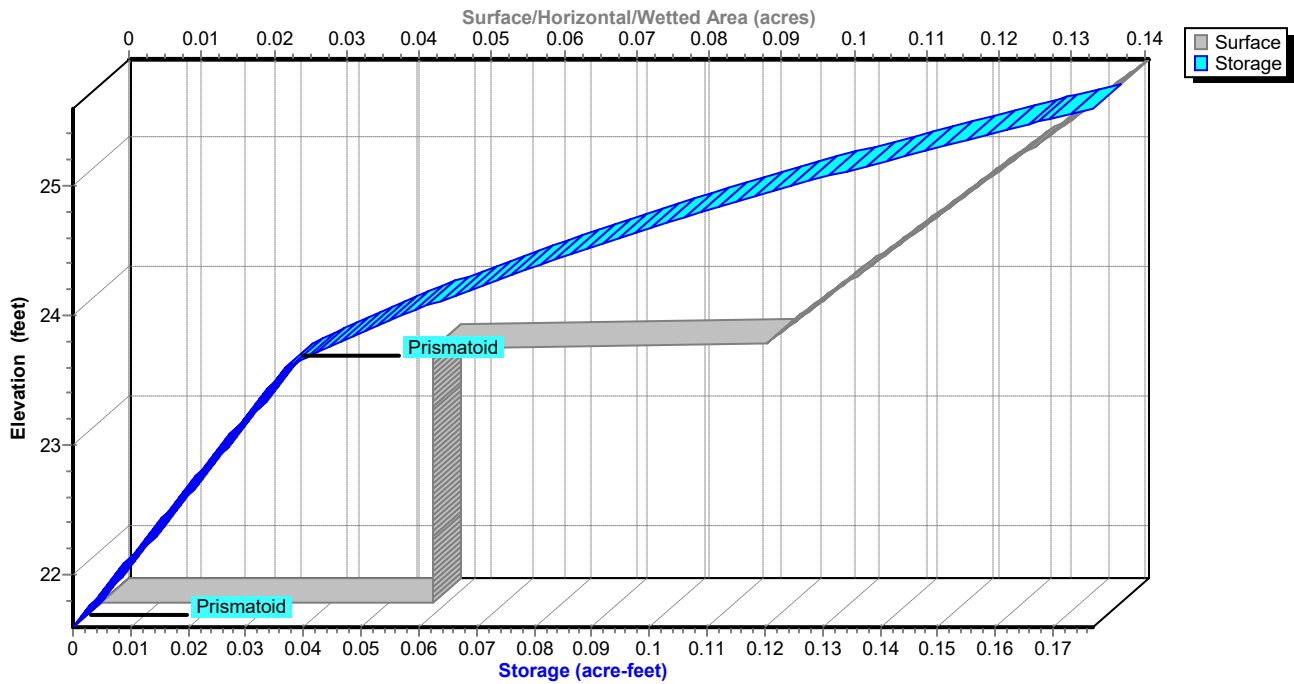
Pond BMP-2B: BMP 2B

Hydrograph



Pond BMP-2B: BMP 2B

Stage-Area-Storage



Summary for Subcatchment SC-2C: 2C

Runoff = 0.62 cfs @ 12.13 hrs, Volume= 0.044 af, Depth> 0.76"

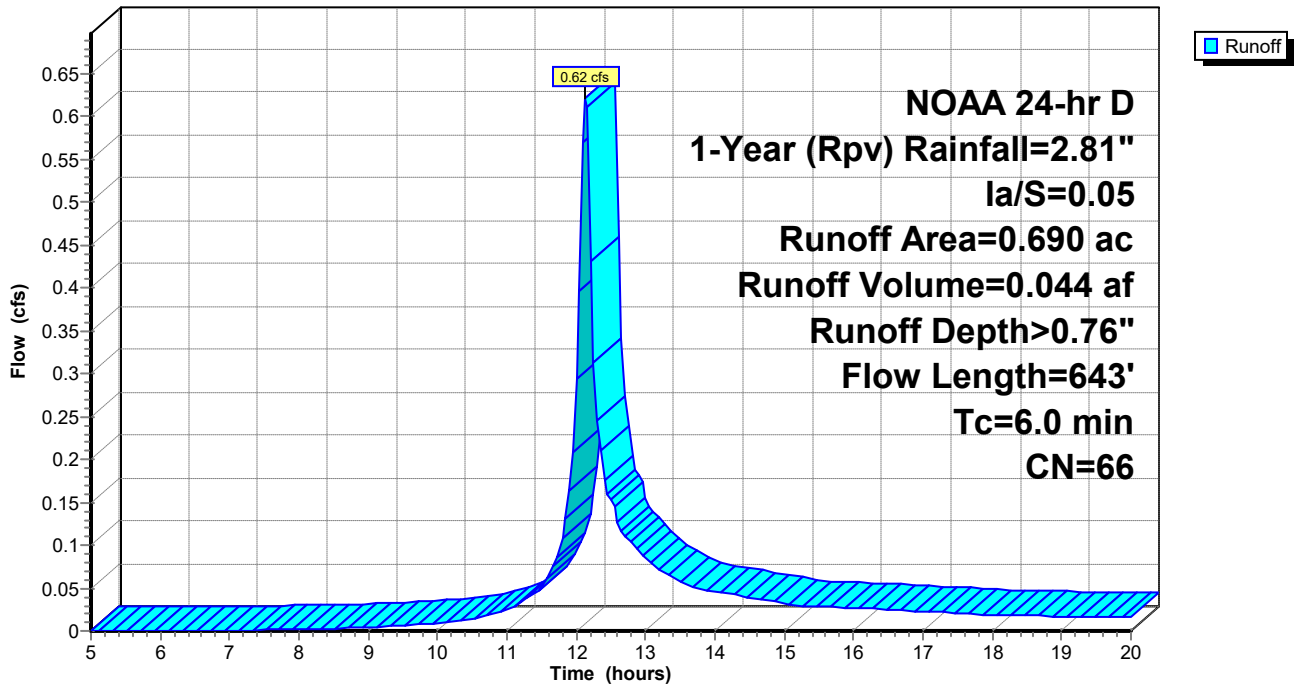
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
 NOAA 24-hr D 1-Year (Rpv) Rainfall=2.81", Ia/S=0.05

Area (ac)	CN	Description
* 0.380	39	
* 0.310	98	
0.690	66	Weighted Average
0.380		55.07% Pervious Area
0.310		44.93% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.3	21	0.0292	1.19		Sheet Flow, Smooth surfaces n= 0.011 P2= 3.30"
0.1	12	0.1650	2.84		Shallow Concentrated Flow, Short Grass Pasture Kv= 7.0 fps
4.1	610	0.0029	2.48	48.44	Channel Flow, Area= 19.5 sf Perim= 21.7' r= 0.90' n= 0.030
4.5	643	Total, Increased to minimum Tc = 6.0 min			

Subcatchment SC-2C: 2C

Hydrograph



Summary for Pond BMP-2C: BMP 2C

Inflow Area = 0.690 ac, 44.93% Impervious, Inflow Depth > 0.76" for 1-Year (Rpv) event
 Inflow = 0.62 cfs @ 12.13 hrs, Volume= 0.044 af
 Outflow = 0.06 cfs @ 13.41 hrs, Volume= 0.044 af, Atten= 90%, Lag= 76.7 min
 Discarded = 0.06 cfs @ 13.41 hrs, Volume= 0.044 af
 Secondary = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
 Peak Elev= 25.11' @ 13.41 hrs Surf.Area= 0.028 ac Storage= 0.017 af

Plug-Flow detention time= 110.9 min calculated for 0.044 af (100% of inflow)
 Center-of-Mass det. time= 109.7 min (914.3 - 804.5)

Volume	Invert	Avail.Storage	Storage Description
#1	23.60'	0.022 af	6.00'W x 200.00'L x 2.00'H Prismatic 0.055 af Overall x 40.0% Voids
#2	25.60'	0.094 af	6.00'W x 200.00'L x 2.00'H Prismatic Z=2.0 -Impervious
		0.116 af	Total Available Storage

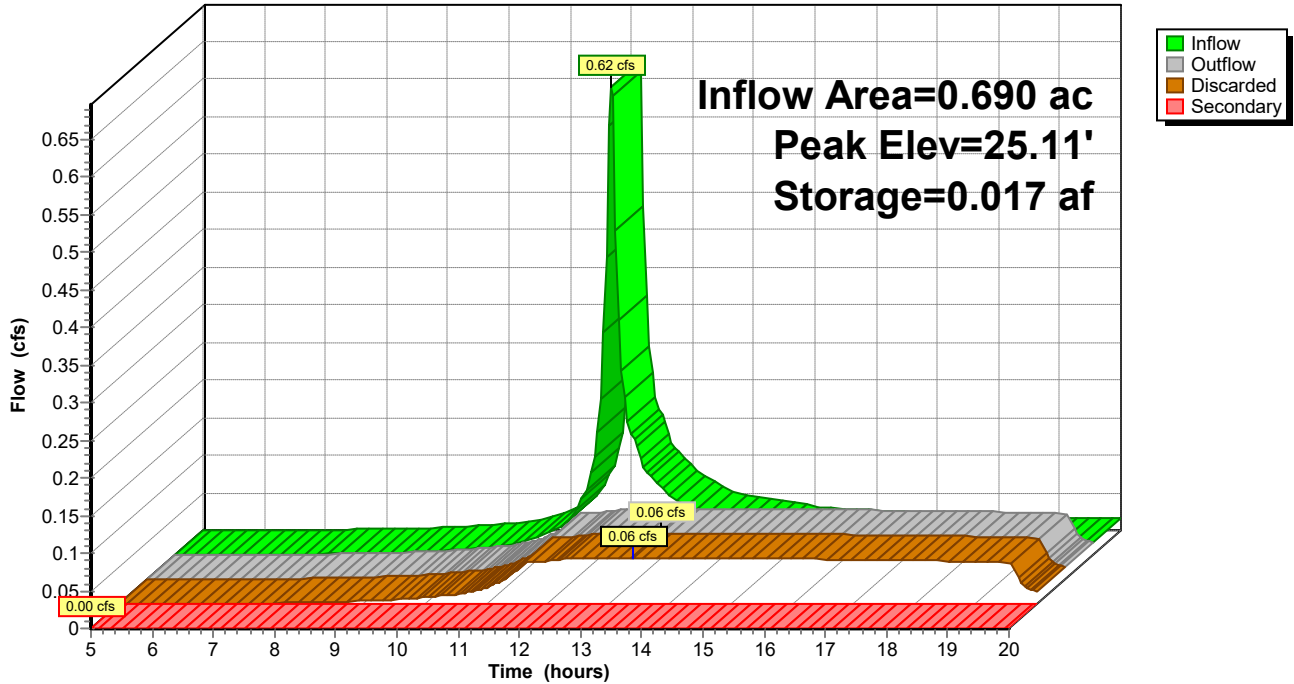
Device	Routing	Invert	Outlet Devices
#1	Discarded	23.60'	2.000 in/hr Exfiltration over Surface area Conductivity to Groundwater Elevation = 10.00'
#2	Secondary	26.75'	14.0' long (Profile 1) Broad-Crested Rectangular Weir Head (feet) 0.49 0.98 1.48 Coef. (English) 2.92 3.37 3.59

Discarded OutFlow Max=0.06 cfs @ 13.41 hrs HW=25.11' (Free Discharge)
 ↑1=Exfiltration (Controls 0.06 cfs)

Secondary OutFlow Max=0.00 cfs @ 5.00 hrs HW=23.60' (Free Discharge)
 ↑2=Broad-Crested Rectangular Weir (Controls 0.00 cfs)

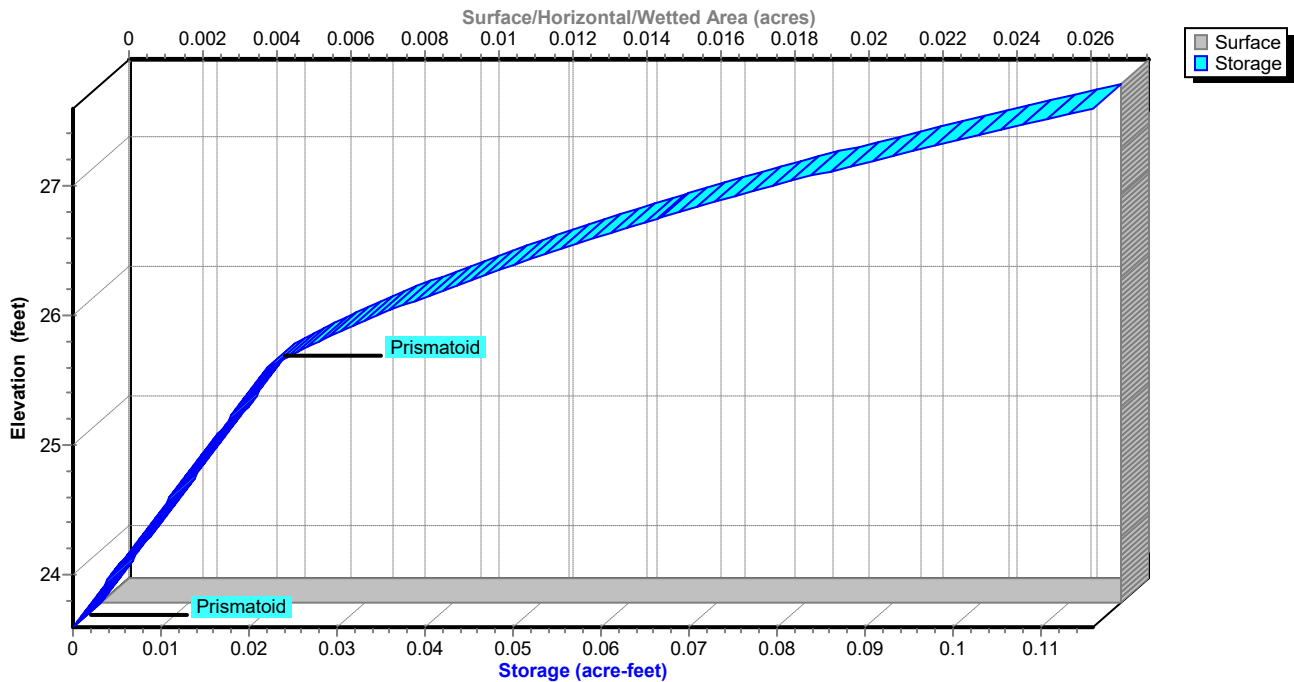
Pond BMP-2C: BMP 2C

Hydrograph



Pond BMP-2C: BMP 2C

Stage-Area-Storage



Summary for Subcatchment SC-2D: 2D

Runoff = 0.62 cfs @ 12.14 hrs, Volume= 0.044 af, Depth> 0.63"

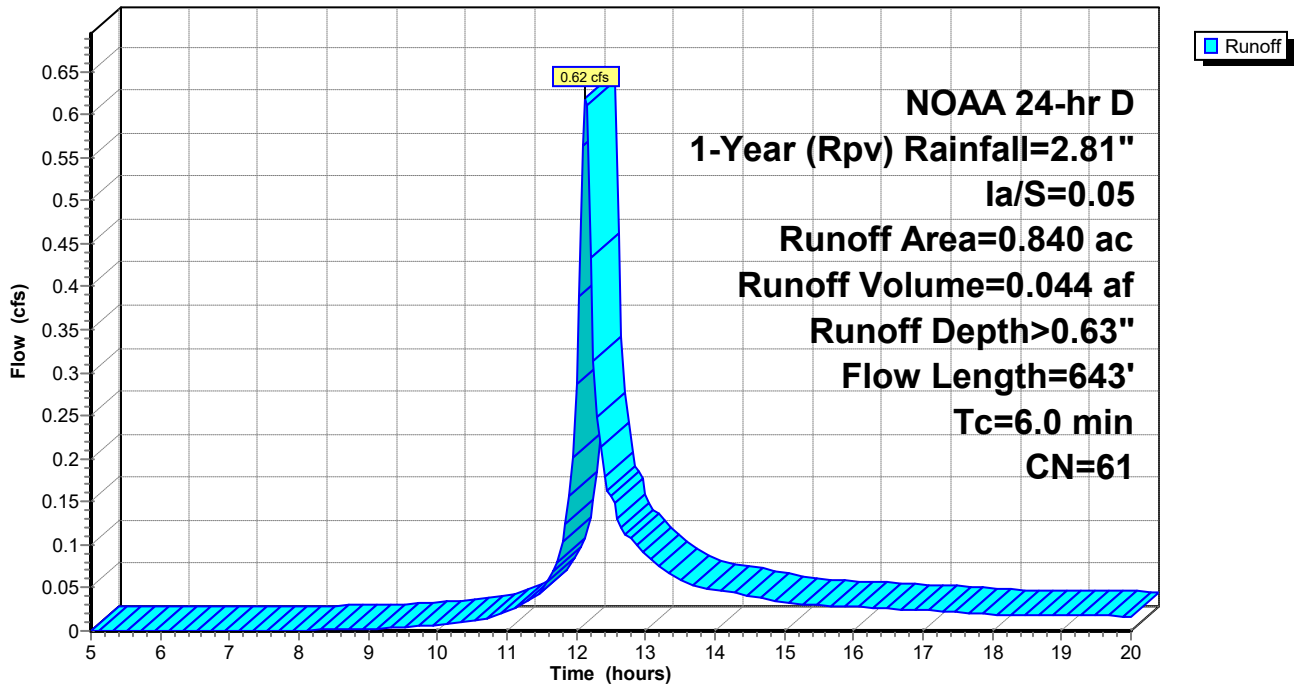
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
 NOAA 24-hr D 1-Year (Rpv) Rainfall=2.81", Ia/S=0.05

Area (ac)	CN	Description
* 0.310	98	
* 0.530	39	
0.840	61	Weighted Average
0.530		63.10% Pervious Area
0.310		36.90% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.2	11	0.0198	0.89		Sheet Flow, Smooth surfaces n= 0.011 P2= 3.30"
0.2	22	0.1070	2.29		Shallow Concentrated Flow, Short Grass Pasture Kv= 7.0 fps
4.3	610	0.0028	2.36	42.95	Channel Flow, Area= 18.2 sf Perim= 21.3' r= 0.85' n= 0.030
4.7	643	Total, Increased to minimum Tc = 6.0 min			

Subcatchment SC-2D: 2D

Hydrograph



Summary for Pond BMP-2D: (new Pond)

Inflow Area = 0.840 ac, 36.90% Impervious, Inflow Depth > 0.63" for 1-Year (Rpv) event
 Inflow = 0.62 cfs @ 12.14 hrs, Volume= 0.044 af
 Outflow = 0.06 cfs @ 13.44 hrs, Volume= 0.044 af, Atten= 90%, Lag= 78.1 min
 Discarded = 0.06 cfs @ 13.44 hrs, Volume= 0.044 af
 Primary = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af
 Secondary = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
 Peak Elev= 23.10' @ 13.44 hrs Surf.Area= 0.028 ac Storage= 0.017 af

Plug-Flow detention time= 111.2 min calculated for 0.044 af (99% of inflow)
 Center-of-Mass det. time= 109.6 min (920.6 - 811.0)

Volume	Invert	Avail.Storage	Storage Description
#1	21.60'	0.022 af	6.00'W x 200.00'L x 2.00'H Prismaoid 0.055 af Overall x 40.0% Voids
#2	23.60'	0.094 af	6.00'W x 200.00'L x 2.00'H Prismaoid Z=2.0
		0.116 af	Total Available Storage

Device	Routing	Invert	Outlet Devices
#1	Discarded	21.60'	2.000 in/hr Exfiltration over Surface area Conductivity to Groundwater Elevation = 10.00'
#2	Primary	23.60'	18.0" Round Culvert L= 57.0' RCP, end-section conforming to fill, Ke= 0.500 Inlet / Outlet Invert= 23.60' / 23.30' S= 0.0053 '/ Cc= 0.900 n= 0.012, Flow Area= 1.77 sf
#3	Secondary	25.50'	14.0' long (Profile 1) Broad-Crested Rectangular Weir Head (feet) 0.49 0.98 1.48 Coef. (English) 2.92 3.37 3.59

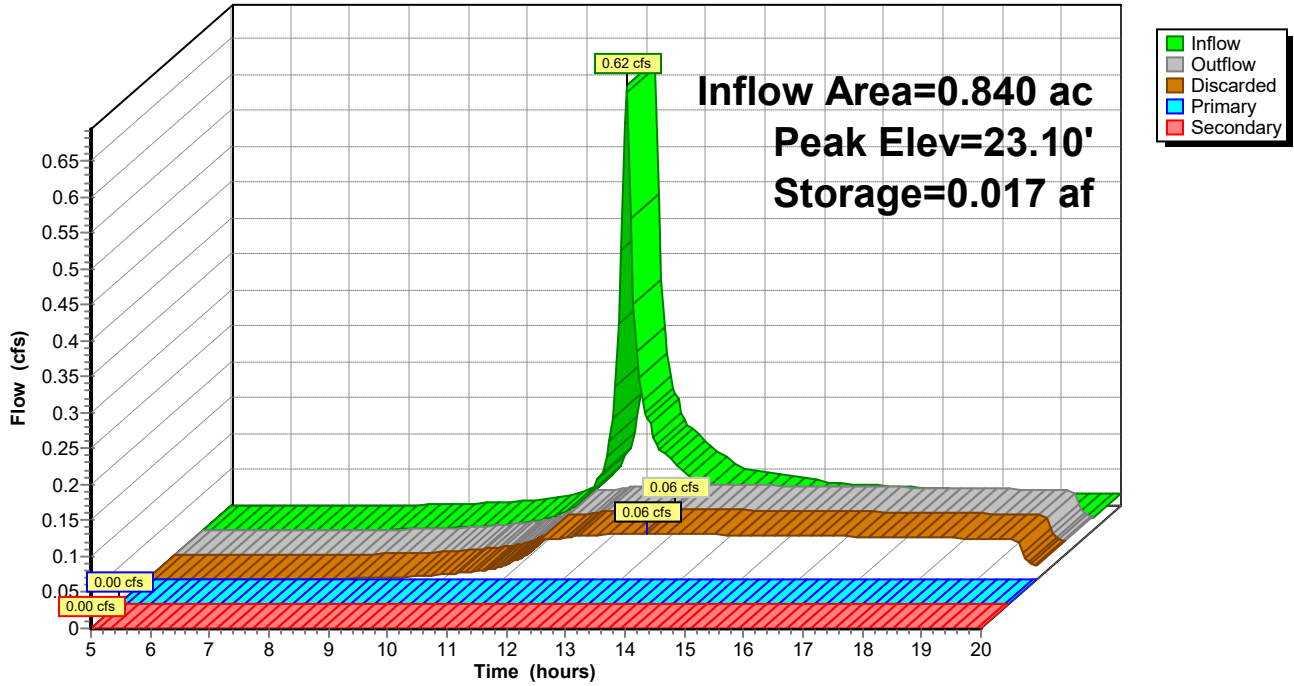
Discarded OutFlow Max=0.06 cfs @ 13.44 hrs HW=23.10' (Free Discharge)
 ↑1=Exfiltration (Controls 0.06 cfs)

Primary OutFlow Max=0.00 cfs @ 5.00 hrs HW=21.60' (Free Discharge)
 ↑2=Culvert (Controls 0.00 cfs)

Secondary OutFlow Max=0.00 cfs @ 5.00 hrs HW=21.60' (Free Discharge)
 ↑3=Broad-Crested Rectangular Weir (Controls 0.00 cfs)

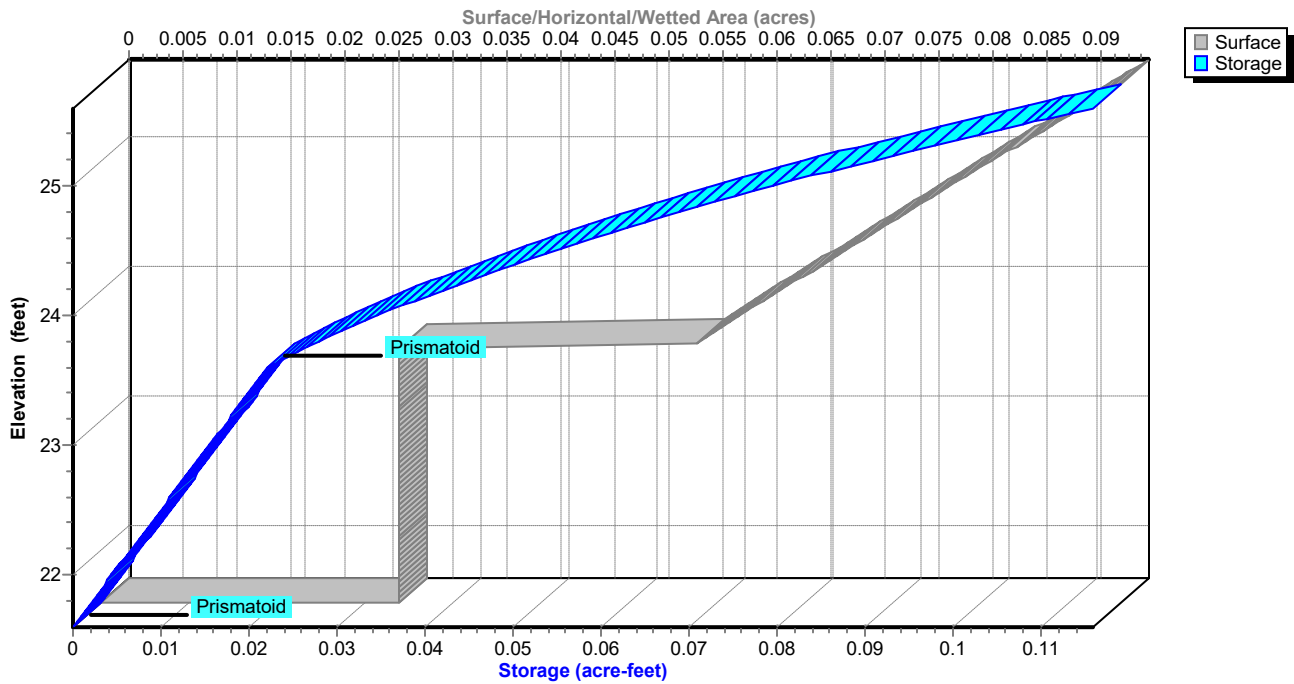
Pond BMP-2D: (new Pond)

Hydrograph



Pond BMP-2D: (new Pond)

Stage-Area-Storage

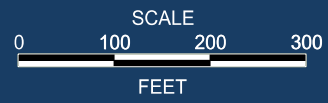




APPENDIX D

POI-3

- POI-3 Drainage Area Maps
- HydroCAD Calculations










NORTH MILLSBORO BYPASS, US 113 TO SR 24

CONTRACT NO. T201912701
SUSSEX COUNTY



LEGEND

-  DRAINAGE AREA
-  T_c PATH
-  POI LOCATION
-  POI LABEL
-  OPEN SPACE
-  IMPERVIOUS
-  EXISTING CONTOURS



STORMWATER MANAGEMENT REPORT POI-3 EXISTING

SHEET 1 OF 2
MARCH 2020

Summary for Subcatchment SC-3A: 3A

Runoff = 2.39 cfs @ 12.24 hrs, Volume= 0.226 af, Depth> 0.46"

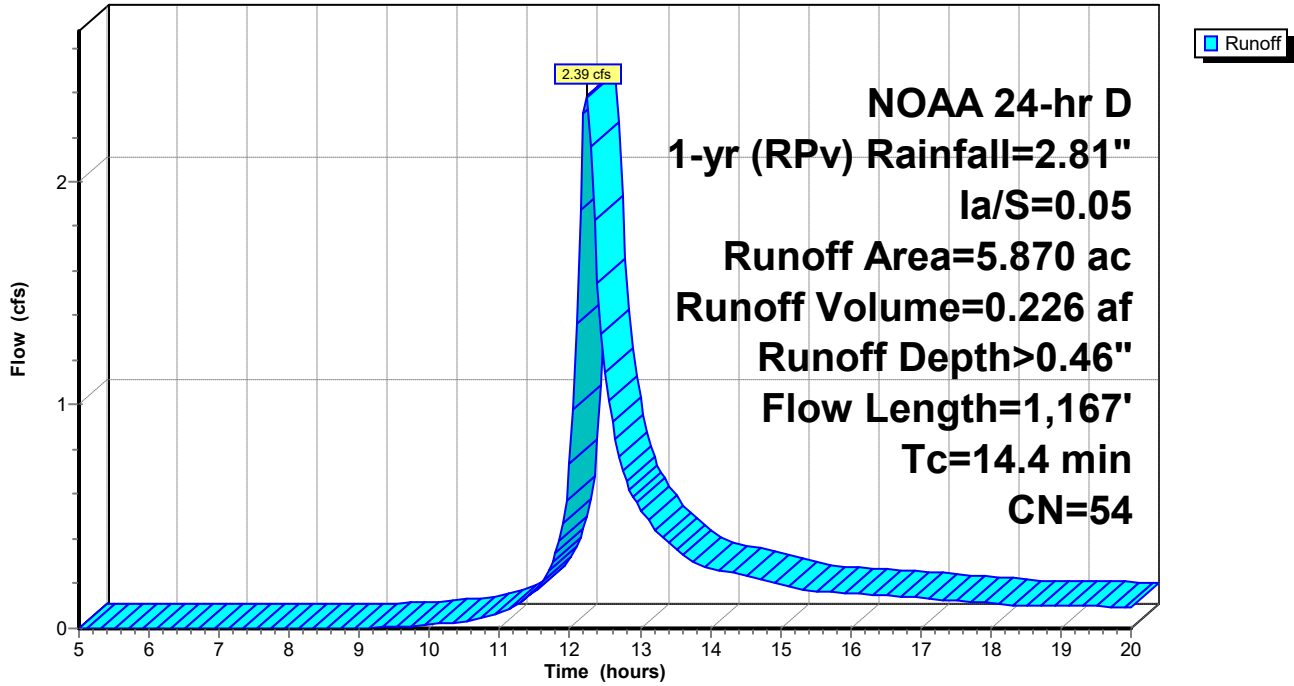
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
 NOAA 24-hr D 1-yr (RPv) Rainfall=2.81", Ia/S=0.05

Area (ac)	CN	Description
4.380	39	>75% Grass cover, Good, HSG A
1.490	98	Paved roads w/curbs & sewers, HSG A
5.870	54	Weighted Average
4.380		74.62% Pervious Area
1.490		25.38% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.2	14	0.0420	1.27		Sheet Flow, Smooth surfaces n= 0.011 P2= 3.30"
0.2	16	0.0370	1.35		Shallow Concentrated Flow, Short Grass Pasture Kv= 7.0 fps
6.7	112	0.0016	0.28		Shallow Concentrated Flow, Short Grass Pasture Kv= 7.0 fps
3.5	80	0.0029	0.38		Shallow Concentrated Flow, Short Grass Pasture Kv= 7.0 fps
0.2	19	0.0720	1.88		Shallow Concentrated Flow, Short Grass Pasture Kv= 7.0 fps
1.3	258	0.0160	3.30	12.19	Channel Flow, Area= 3.7 sf Perim= 9.7' r= 0.38' n= 0.030
0.1	26	0.0050	3.47	2.73	Pipe Channel, RCP_Round 12" 12.0" Round Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.012
0.8	190	0.0090	4.03	35.42	Channel Flow, Area= 8.8 sf Perim= 11.1' r= 0.79' n= 0.030
1.4	452	0.0066	5.23	9.24	Pipe Channel, RCP_Round 18" 18.0" Round Area= 1.8 sf Perim= 4.7' r= 0.38' n= 0.012
14.4	1,167	Total			

Subcatchment SC-3A: 3A

Hydrograph



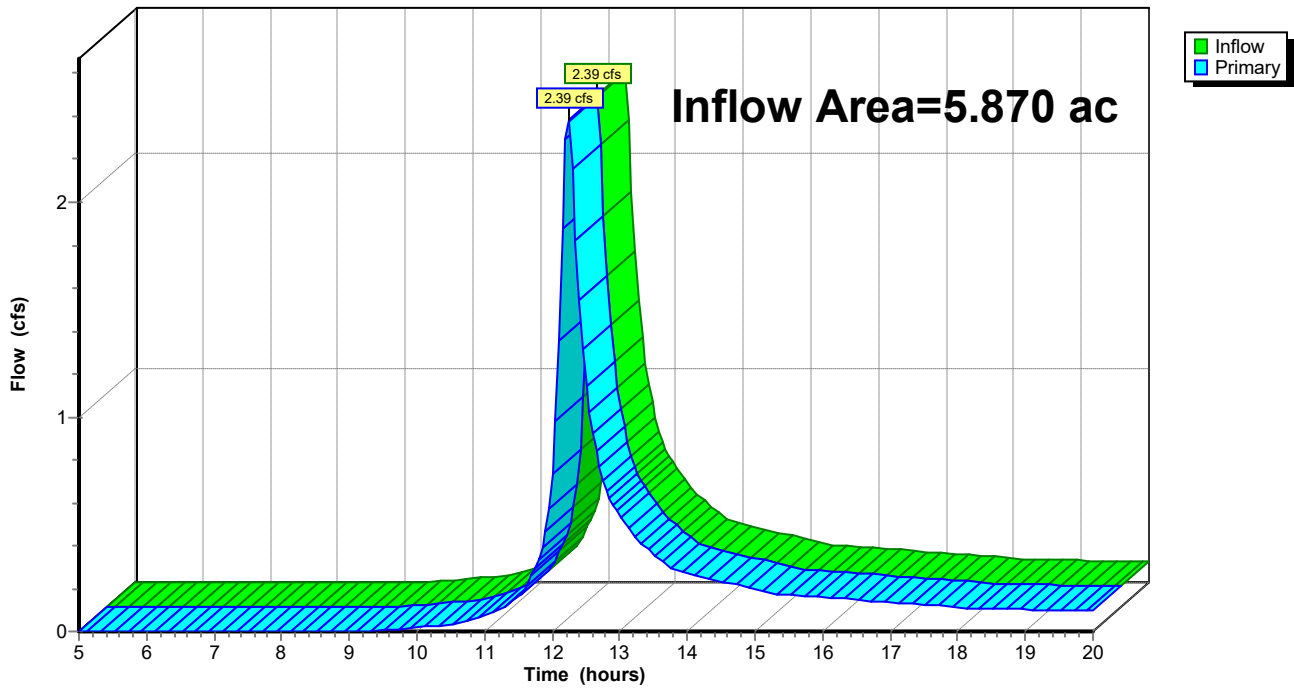
Summary for Link POI3: (new Link)

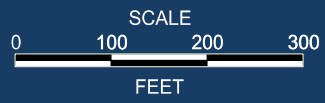
Inflow Area = 5.870 ac, 25.38% Impervious, Inflow Depth > 0.46" for 1-yr (RPv) event
Inflow = 2.39 cfs @ 12.24 hrs, Volume= 0.226 af
Primary = 2.39 cfs @ 12.24 hrs, Volume= 0.226 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Link POI3: (new Link)

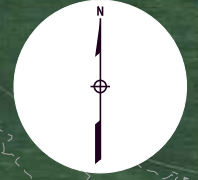
Hydrograph





NORTH MILLSBORO BYPASS, US 113 TO SR 24

CONTRACT NO. T201912701
SUSSEX COUNTY



LEGEND	
	DRAINAGE AREA
	DRAINAGE SUBAREA
	Tc PATH
	PROPOSED CONSTRUCTION
	PROPOSED DRAINAGE
	INFILTRATION BMP
	OPEN SPACE
	IMPERVIOUS
	PROPOSED CONTOURS
	EXISTING CONTOURS
	POI LOCATION
	POI LABEL



Summary for Subcatchment SC-3A: 3A

Runoff = 0.46 cfs @ 12.13 hrs, Volume= 0.032 af, Depth> 0.79"

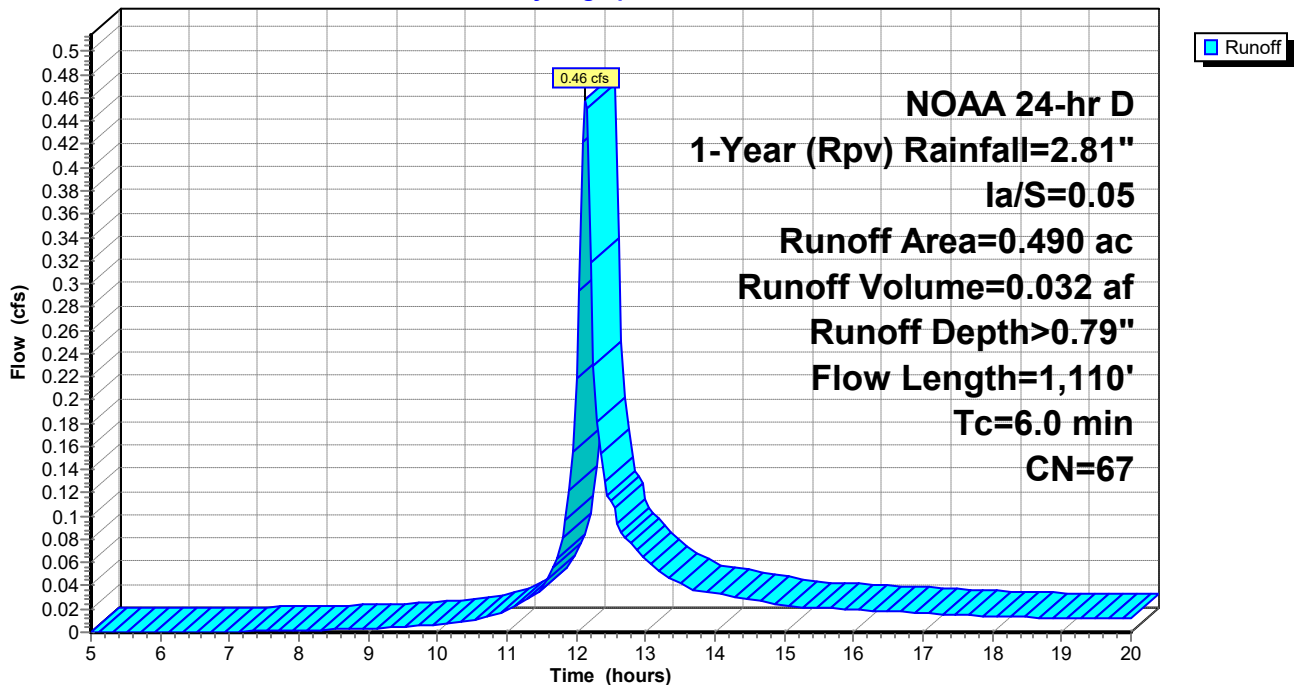
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
 NOAA 24-hr D 1-Year (Rpv) Rainfall=2.81", Ia/S=0.05

Area (ac)	CN	Description
* 0.260	39	
* 0.230	98	
0.490	67	Weighted Average
0.260		53.06% Pervious Area
0.230		46.94% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.2	410	0.0100	5.70	7.00	Pipe Channel, RCP_Round 15" 15.0" Round Area= 1.2 sf Perim= 3.9' r= 0.31' n= 0.012
0.8	225	0.0130	4.50	39.36	Trap/Vee/Rect Channel Flow, Bot.W=2.00' D=1.25' Z= 4.0 'l' Top.W=12.00' n= 0.030
1.2	475	0.0100	6.44	11.38	Pipe Channel, RCP_Round 18" 18.0" Round Area= 1.8 sf Perim= 4.7' r= 0.38' n= 0.012
3.2	1,110	Total, Increased to minimum Tc = 6.0 min			

Subcatchment SC-3A: 3A

Hydrograph



Summary for Subcatchment SC-3B: 3B

Runoff = 0.89 cfs @ 12.13 hrs, Volume= 0.063 af, Depth> 0.99"

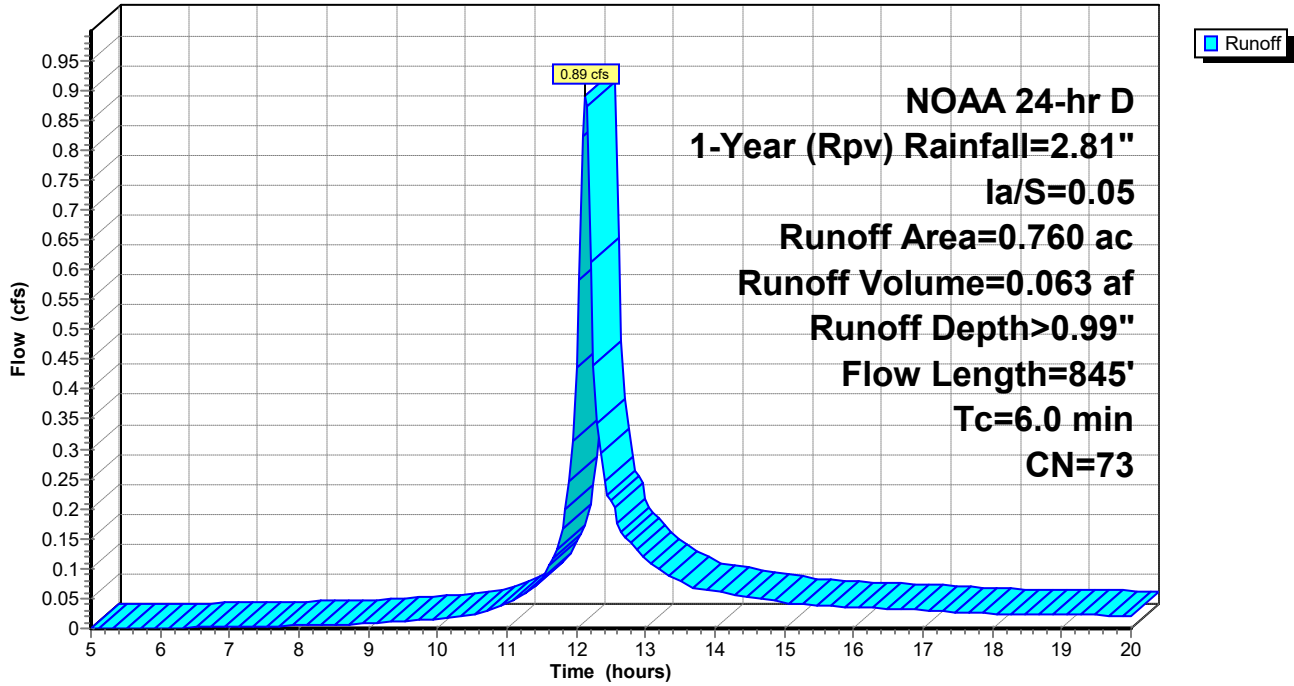
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
 NOAA 24-hr D 1-Year (Rpv) Rainfall=2.81", Ia/S=0.05

Area (ac)	CN	Description
* 0.320	39	
* 0.440	98	
0.760	73	Weighted Average
0.320		42.11% Pervious Area
0.440		57.89% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.5	32	0.0200	1.11		Sheet Flow, Smooth surfaces n= 0.011 P2= 3.30"
0.1	13	0.0500	1.57		Shallow Concentrated Flow, Short Grass Pasture Kv= 7.0 fps
1.7	400	0.0100	3.95	34.52	Trap/Vee/Rect Channel Flow, Bot.W=2.00' D=1.25' Z= 4.0 '/' Top.W=12.00' n= 0.030
1.0	400	0.0100	6.44	11.38	Pipe Channel, RCP_Round 18" 18.0" Round Area= 1.8 sf Perim= 4.7' r= 0.38' n= 0.012
3.3	845	Total, Increased to minimum Tc = 6.0 min			

Subcatchment SC-3B: 3B

Hydrograph



Summary for Subcatchment SC-3C: 3C

Runoff = 1.38 cfs @ 12.14 hrs, Volume= 0.098 af, Depth> 1.23"

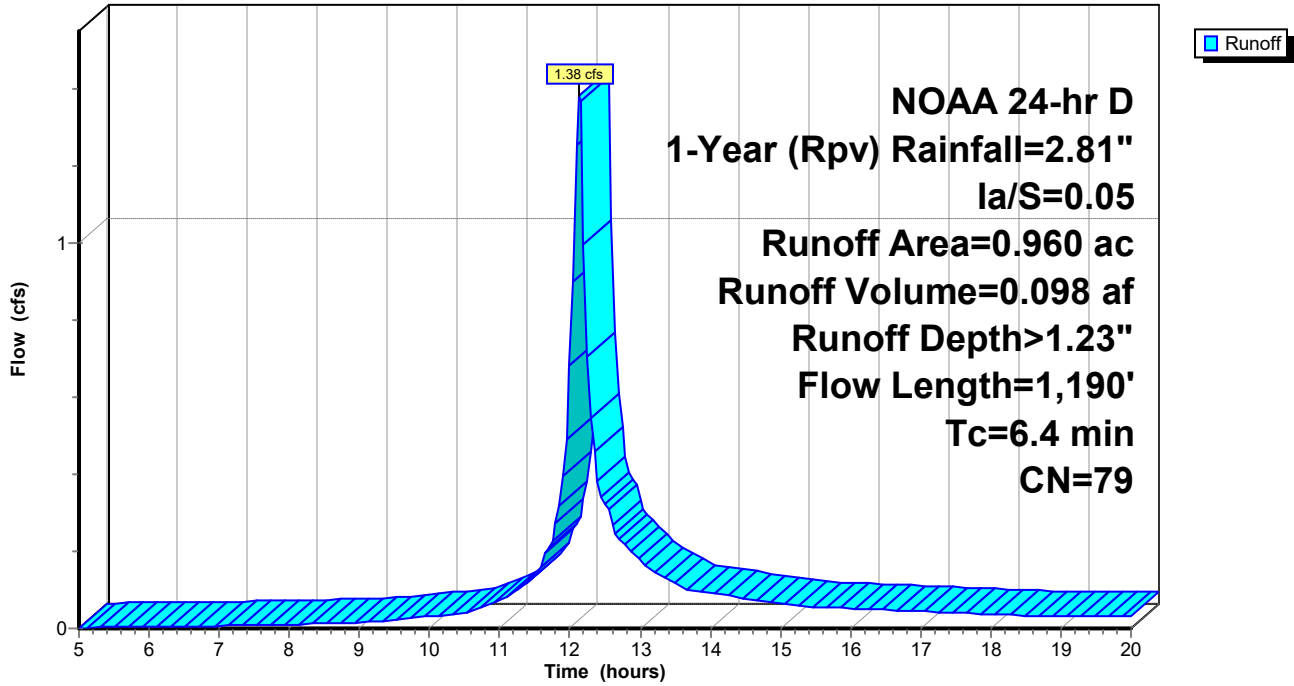
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
 NOAA 24-hr D 1-Year (Rpv) Rainfall=2.81", Ia/S=0.05

Area (ac)	CN	Description
* 0.310	39	
* 0.650	98	
0.960	79	Weighted Average
0.310		32.29% Pervious Area
0.650		67.71% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.9	70	0.0200	1.30		Sheet Flow, Smooth surfaces n= 0.011 P2= 3.30"
0.7	10	0.1200	0.22		Sheet Flow, Grass: Short n= 0.150 P2= 3.30"
3.6	635	0.0055	2.93	25.60	Trap/Vee/Rect Channel Flow, Bot.W=2.00' D=1.25' Z= 4.0 '/' Top.W=12.00' n= 0.030
1.2	475	0.0100	6.44	11.38	Pipe Channel, RCP_Round 18" 18.0" Round Area= 1.8 sf Perim= 4.7' r= 0.38' n= 0.012
6.4	1,190	Total			

Subcatchment SC-3C: 3C

Hydrograph



Summary for Subcatchment SC-3D: 3D

Runoff = 0.54 cfs @ 12.14 hrs, Volume= 0.038 af, Depth> 0.51"

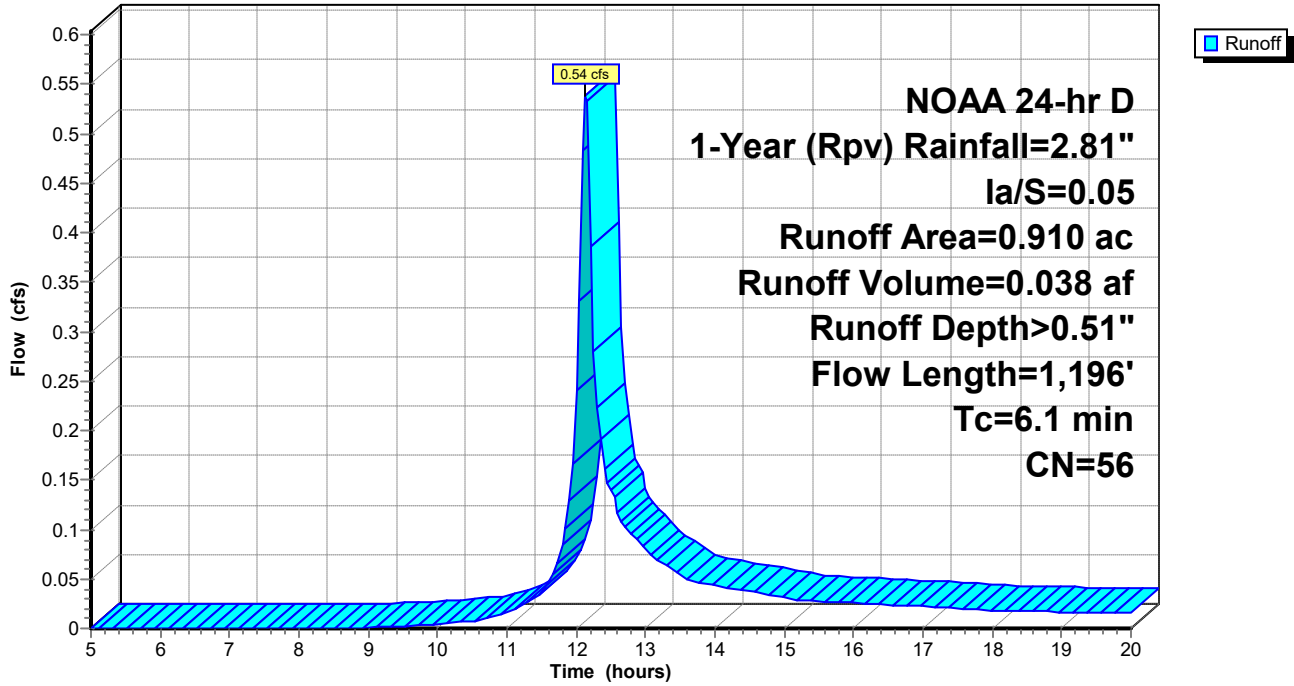
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
 NOAA 24-hr D 1-Year (Rpv) Rainfall=2.81", Ia/S=0.05

Area (ac)	CN	Description
* 0.650	39	
* 0.260	98	
0.910	56	Weighted Average
0.650		71.43% Pervious Area
0.260		28.57% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.9	70	0.0200	1.30		Sheet Flow, Smooth surfaces n= 0.011 P2= 3.30"
0.1	10	0.1200	2.42		Shallow Concentrated Flow, Short Grass Pasture Kv= 7.0 fps
4.1	716	0.0055	2.93	25.60	Trap/Vee/Rect Channel Flow, Bot.W=2.00' D=1.25' Z= 4.0 '/' Top.W=12.00' n= 0.030
1.0	400	0.0100	6.44	11.38	Pipe Channel, RCP_Round 18" 18.0" Round Area= 1.8 sf Perim= 4.7' r= 0.38' n= 0.012
6.1	1,196	Total			

Subcatchment SC-3D: 3D

Hydrograph



Summary for Subcatchment SC-3E: 3E

Runoff = 0.80 cfs @ 12.15 hrs, Volume= 0.060 af, Depth> 0.26"

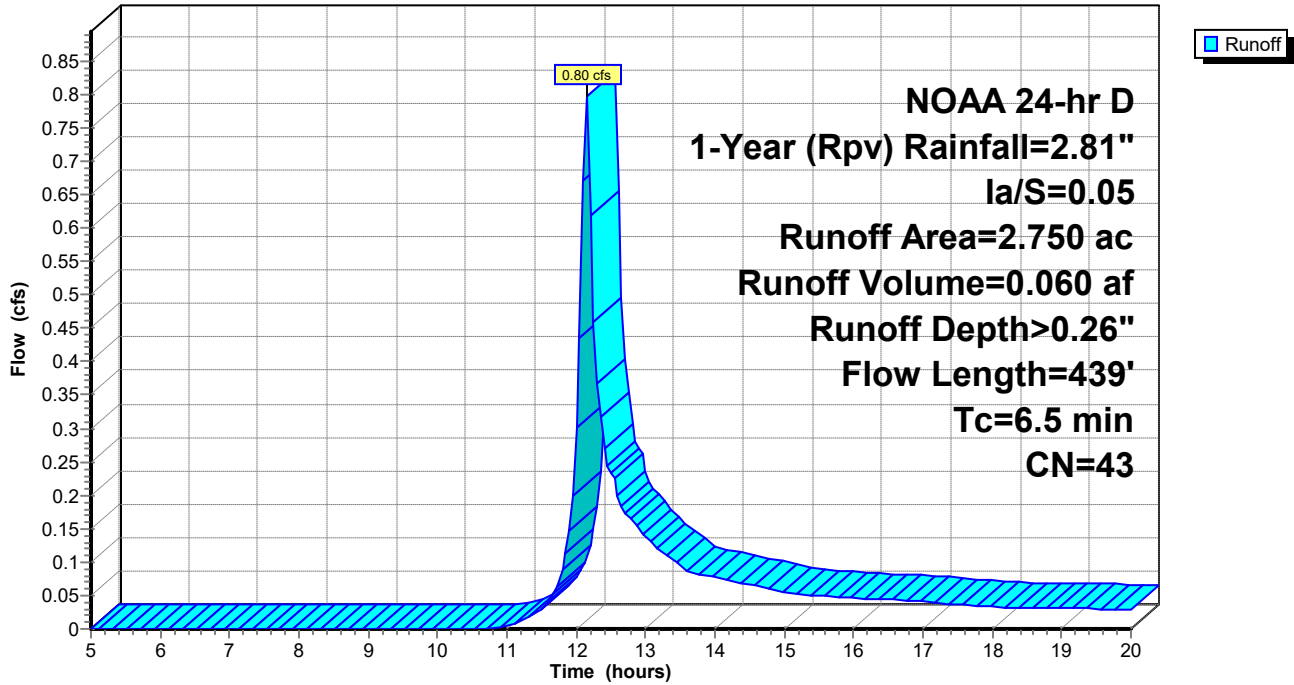
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
 NOAA 24-hr D 1-Year (Rpv) Rainfall=2.81", Ia/S=0.05

Area (ac)	CN	Description
2.580	39	>75% Grass cover, Good, HSG A
0.170	98	Paved roads w/curbs & sewers, HSG A
2.750	43	Weighted Average
2.580		93.82% Pervious Area
0.170		6.18% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.9	32	0.0110	0.11		Sheet Flow, Grass: Short n= 0.150 P2= 3.30"
0.1	10	0.1450	2.67		Shallow Concentrated Flow, Short Grass Pasture Kv= 7.0 fps
1.5	397	0.0097	4.34	77.77	Channel Flow, Area= 17.9 sf Perim= 21.3' r= 0.84' n= 0.030
6.5	439	Total			

Subcatchment SC-3E: 3E

Hydrograph

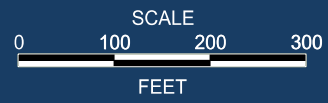




APPENDIX E

POI-4, POI-5, POI-6, POI-7 & POI-8

- POI Drainage Area Maps
- POI-4 HydroCAD Calculations
- POI-5 HydroCAD Calculations
- POI-6 HydroCAD Calculations
- POI-7 HydroCAD Calculations
- POI-8 HydroCAD Calculations






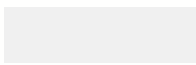



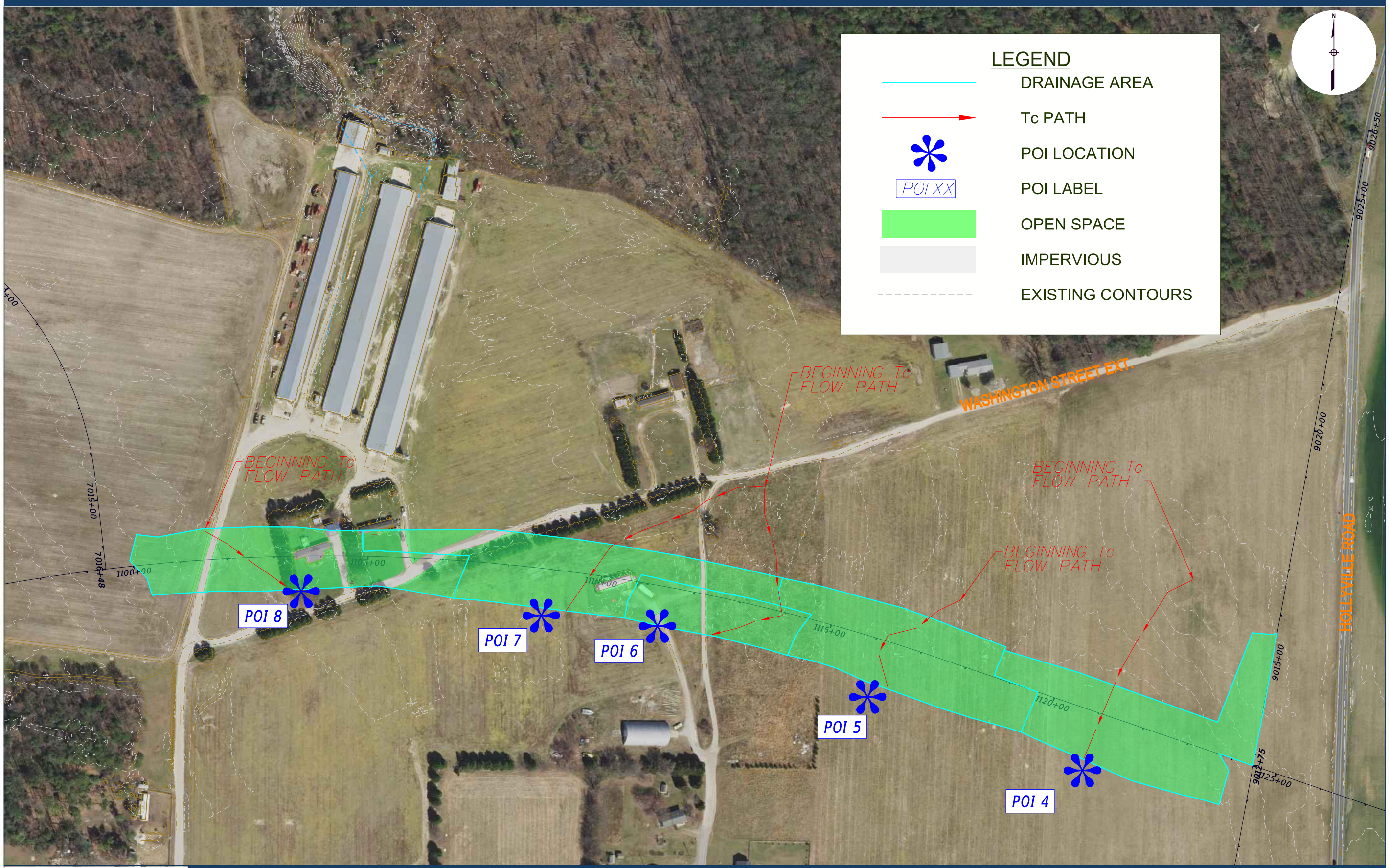
NORTH MILLSBORO BYPASS, US 113 TO SR 24

CONTRACT NO. T201912701
SUSSEX COUNTY



LEGEND

-  DRAINAGE AREA
-  Tc PATH
-  POI LOCATION
-  POI LABEL
-  OPEN SPACE
-  IMPERVIOUS
-  EXISTING CONTOURS



Summary for Subcatchment SC-4A: 4A

Runoff = 0.16 cfs @ 12.27 hrs, Volume= 0.017 af, Depth> 0.20"

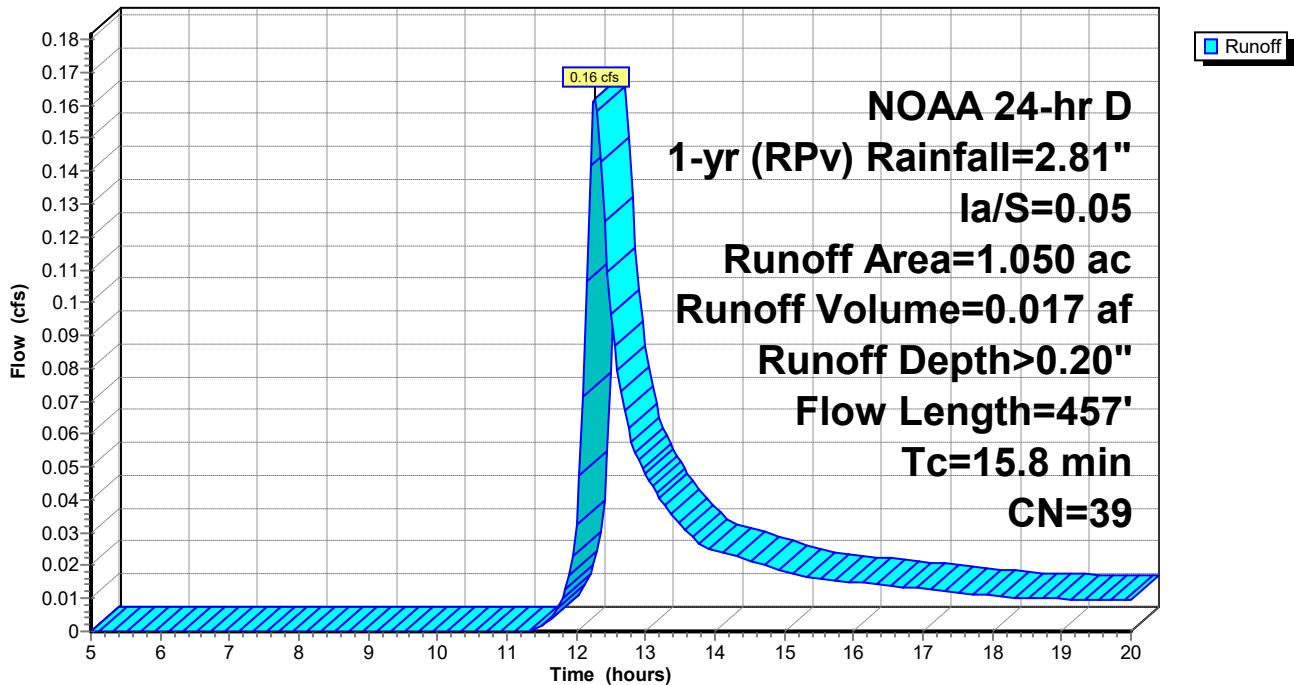
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
 NOAA 24-hr D 1-yr (RPv) Rainfall=2.81", Ia/S=0.05

Area (ac)	CN	Description
1.050	39	>75% Grass cover, Good, HSG A
1.050		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.1	61	0.0114	0.12		Sheet Flow, Grass: Short n= 0.150 P2= 3.30"
2.0	129	0.0235	1.07		Shallow Concentrated Flow, Short Grass Pasture Kv= 7.0 fps
1.3	68	0.0150	0.86		Shallow Concentrated Flow, Short Grass Pasture Kv= 7.0 fps
4.4	199	0.0115	0.75		Shallow Concentrated Flow, Short Grass Pasture Kv= 7.0 fps
15.8	457	Total			

Subcatchment SC-4A: 4A

Hydrograph



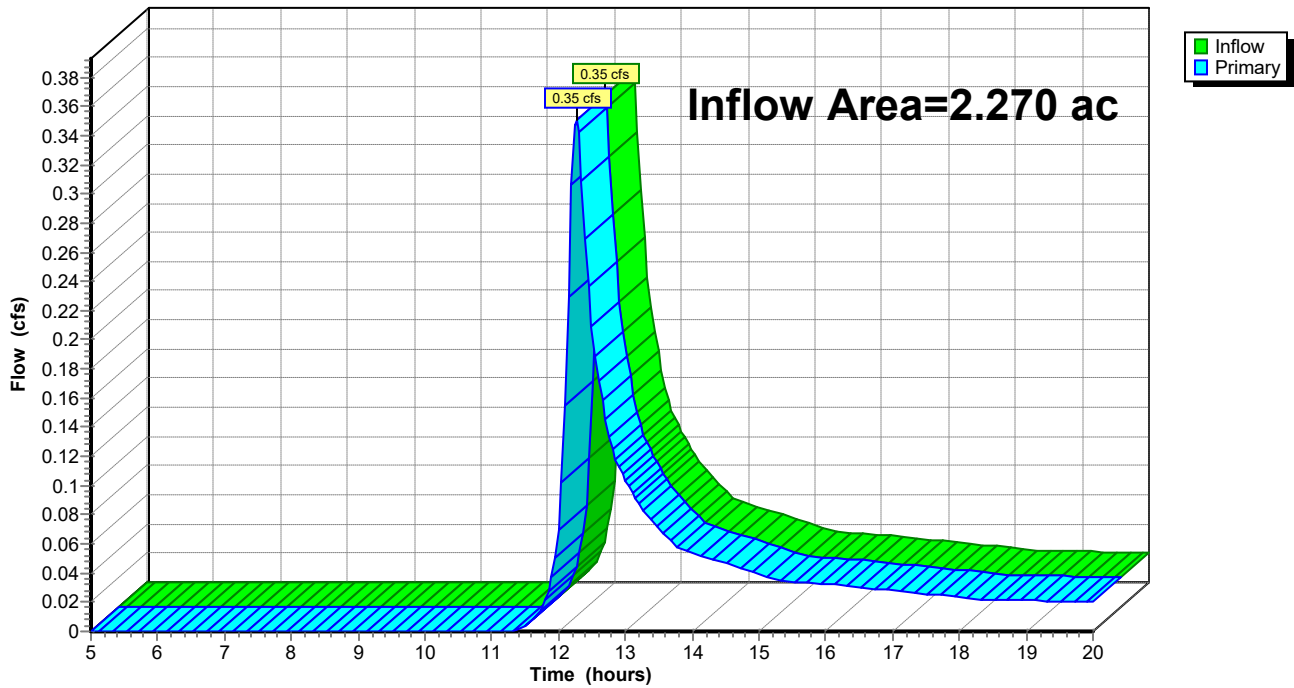
Summary for Link POI4: (new Link)

Inflow Area = 2.270 ac, 0.00% Impervious, Inflow Depth > 0.20" for 1-yr (RPv) event
Inflow = 0.35 cfs @ 12.27 hrs, Volume= 0.038 af
Primary = 0.35 cfs @ 12.27 hrs, Volume= 0.038 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Link POI4: (new Link)

Hydrograph



Summary for Subcatchment SC-5A: 5A

Runoff = 0.29 cfs @ 12.29 hrs, Volume= 0.032 af, Depth> 0.20"

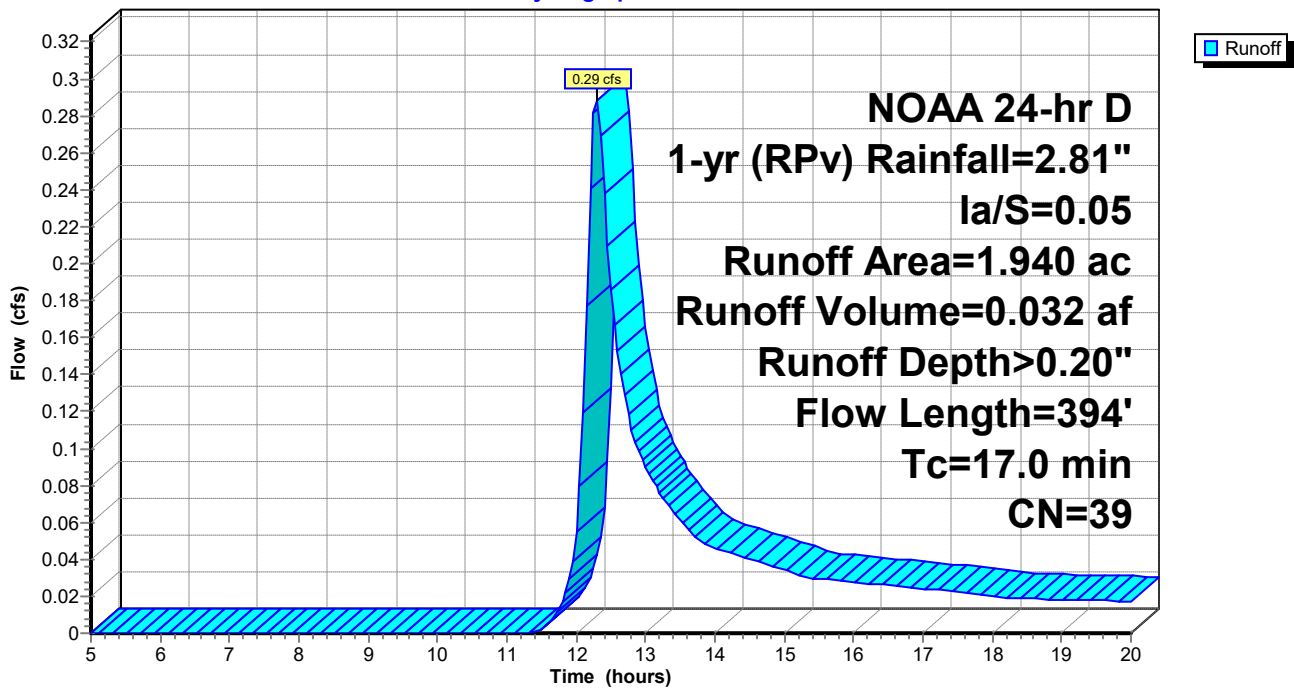
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
 NOAA 24-hr D 1-yr (RPv) Rainfall=2.81", Ia/S=0.05

Area (ac)	CN	Description
1.940	39	>75% Grass cover, Good, HSG A
1.940		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.2	50	0.0057	0.09		Sheet Flow, Grass: Short n= 0.150 P2= 3.30"
3.4	162	0.0130	0.80		Shallow Concentrated Flow, Short Grass Pasture Kv= 7.0 fps
1.2	62	0.0150	0.86		Shallow Concentrated Flow, Short Grass Pasture Kv= 7.0 fps
0.9	41	0.0120	0.77		Shallow Concentrated Flow, Short Grass Pasture Kv= 7.0 fps
2.3	79	0.0066	0.57		Shallow Concentrated Flow, Short Grass Pasture Kv= 7.0 fps
17.0	394	Total			

Subcatchment SC-5A: 5A

Hydrograph



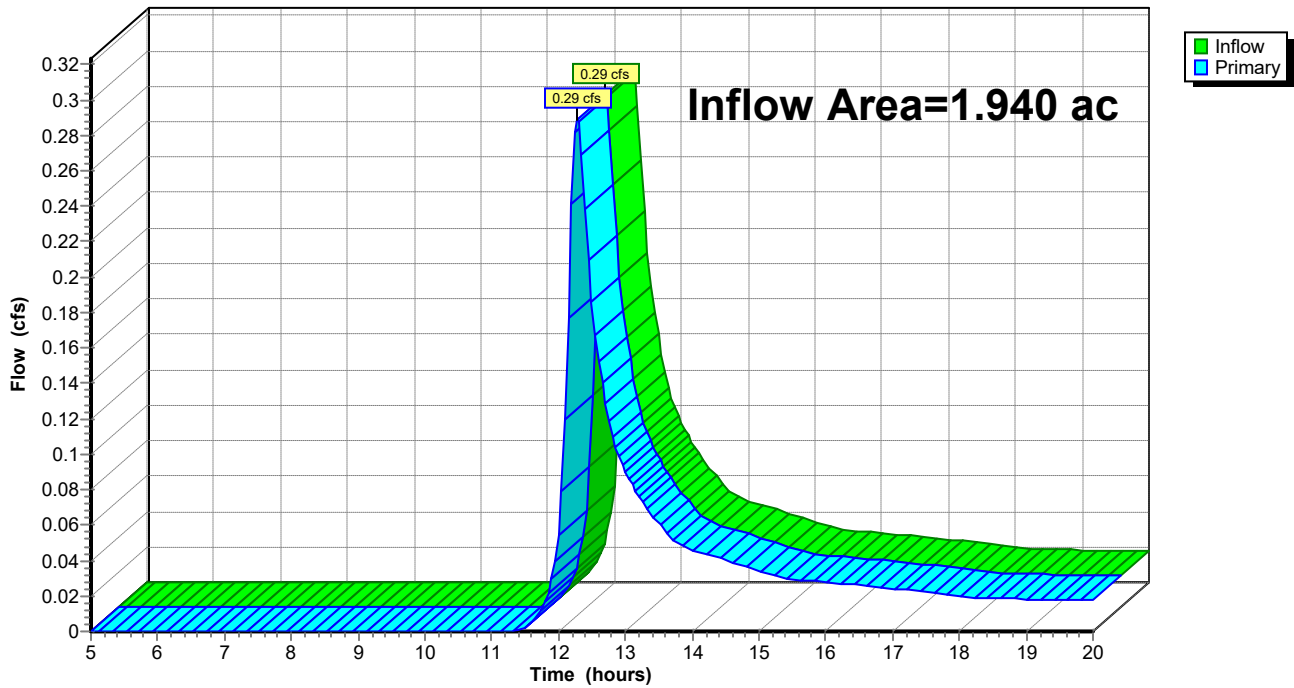
Summary for Link POI5: (new Link)

Inflow Area = 1.940 ac, 0.00% Impervious, Inflow Depth > 0.20" for 1-yr (RPv) event
Inflow = 0.29 cfs @ 12.29 hrs, Volume= 0.032 af
Primary = 0.29 cfs @ 12.29 hrs, Volume= 0.032 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Link POI5: (new Link)

Hydrograph



Summary for Subcatchment SC-6A: 6A

Runoff = 0.14 cfs @ 12.39 hrs, Volume= 0.017 af, Depth> 0.26"

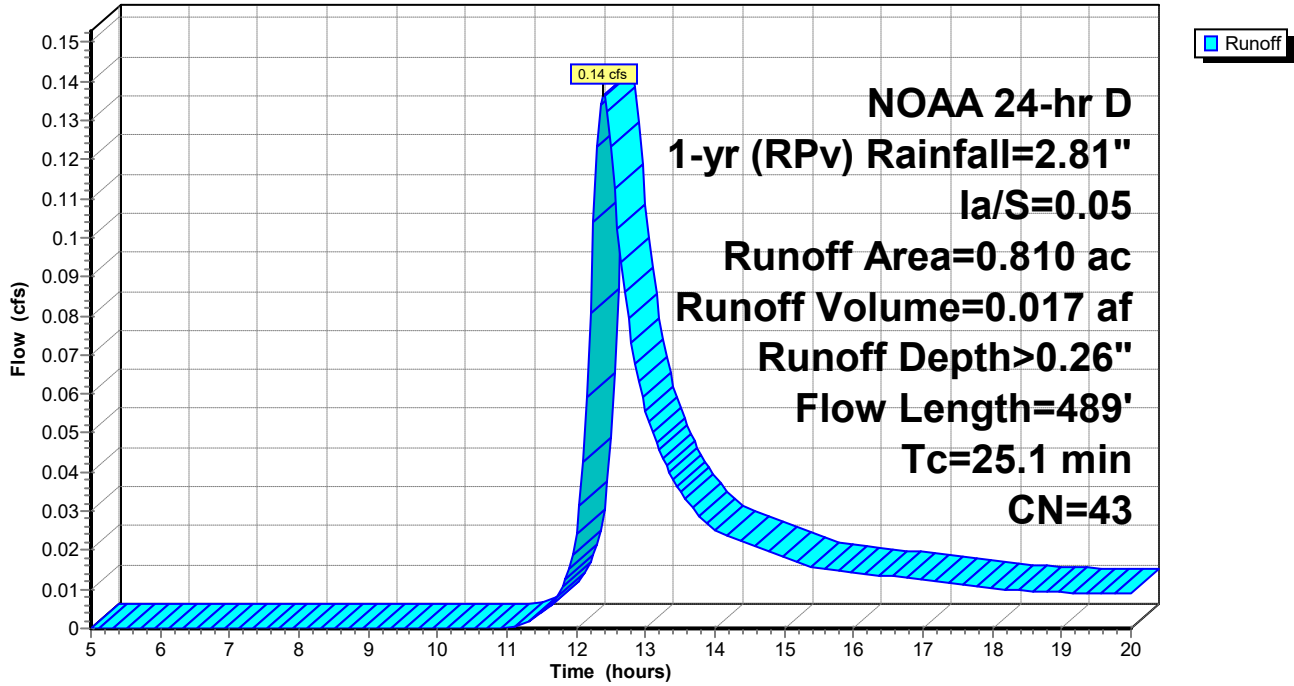
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
 NOAA 24-hr D 1-yr (RPv) Rainfall=2.81", Ia/S=0.05

Area (ac)	CN	Description
0.750	39	>75% Grass cover, Good, HSG A
0.060	98	Paved parking, HSG A
0.810	43	Weighted Average
0.750		92.59% Pervious Area
0.060		7.41% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.5	50	0.0052	0.09		Sheet Flow, Grass: Short n= 0.150 P2= 3.30"
3.1	96	0.0054	0.51		Shallow Concentrated Flow, Short Grass Pasture Kv= 7.0 fps
2.0	60	0.0051	0.50		Shallow Concentrated Flow, Short Grass Pasture Kv= 7.0 fps
5.0	67	0.0010	0.22		Shallow Concentrated Flow, Short Grass Pasture Kv= 7.0 fps
1.1	60	0.0170	0.91		Shallow Concentrated Flow, Short Grass Pasture Kv= 7.0 fps
0.6	41	0.0250	1.11		Shallow Concentrated Flow, Short Grass Pasture Kv= 7.0 fps
3.8	115	0.0051	0.50		Shallow Concentrated Flow, Short Grass Pasture Kv= 7.0 fps
25.1	489	Total			

Subcatchment SC-6A: 6A

Hydrograph



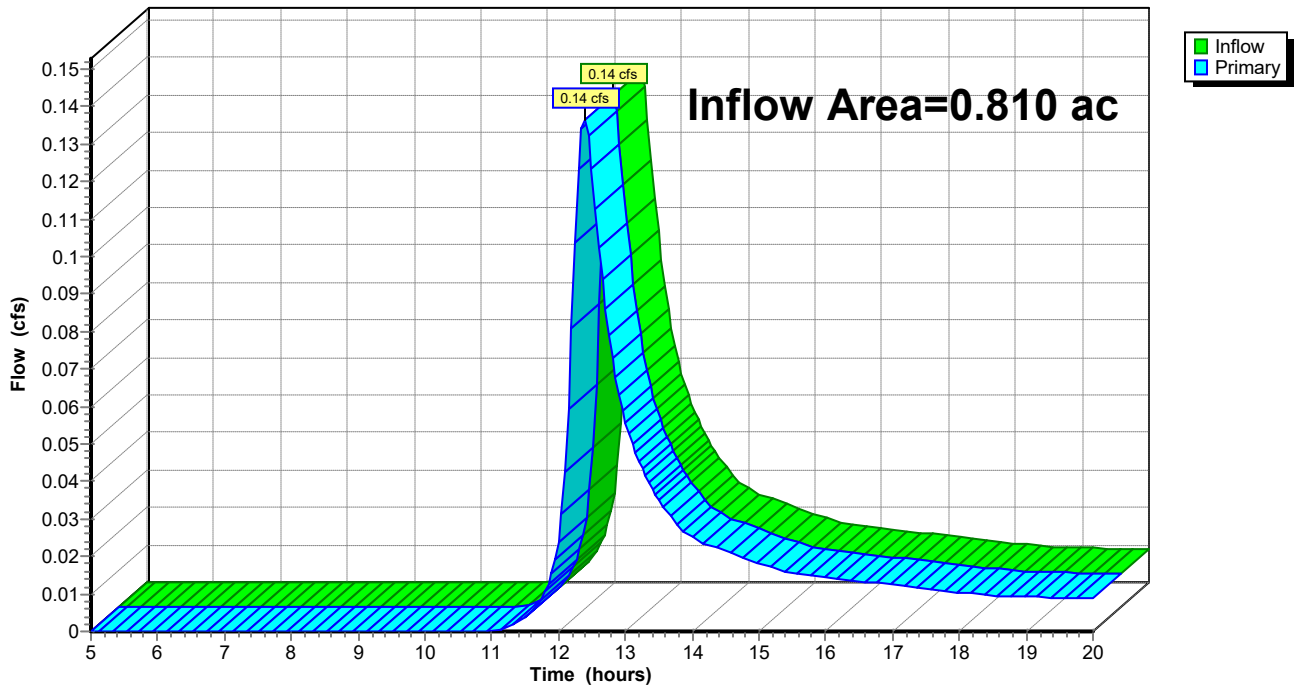
Summary for Link POI6: (new Link)

Inflow Area = 0.810 ac, 7.41% Impervious, Inflow Depth > 0.26" for 1-yr (RPv) event
Inflow = 0.14 cfs @ 12.39 hrs, Volume= 0.017 af
Primary = 0.14 cfs @ 12.39 hrs, Volume= 0.017 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Link POI6: (new Link)

Hydrograph



Summary for Subcatchment SC-7A: 7A

Runoff = 0.30 cfs @ 12.41 hrs, Volume= 0.039 af, Depth> 0.24"

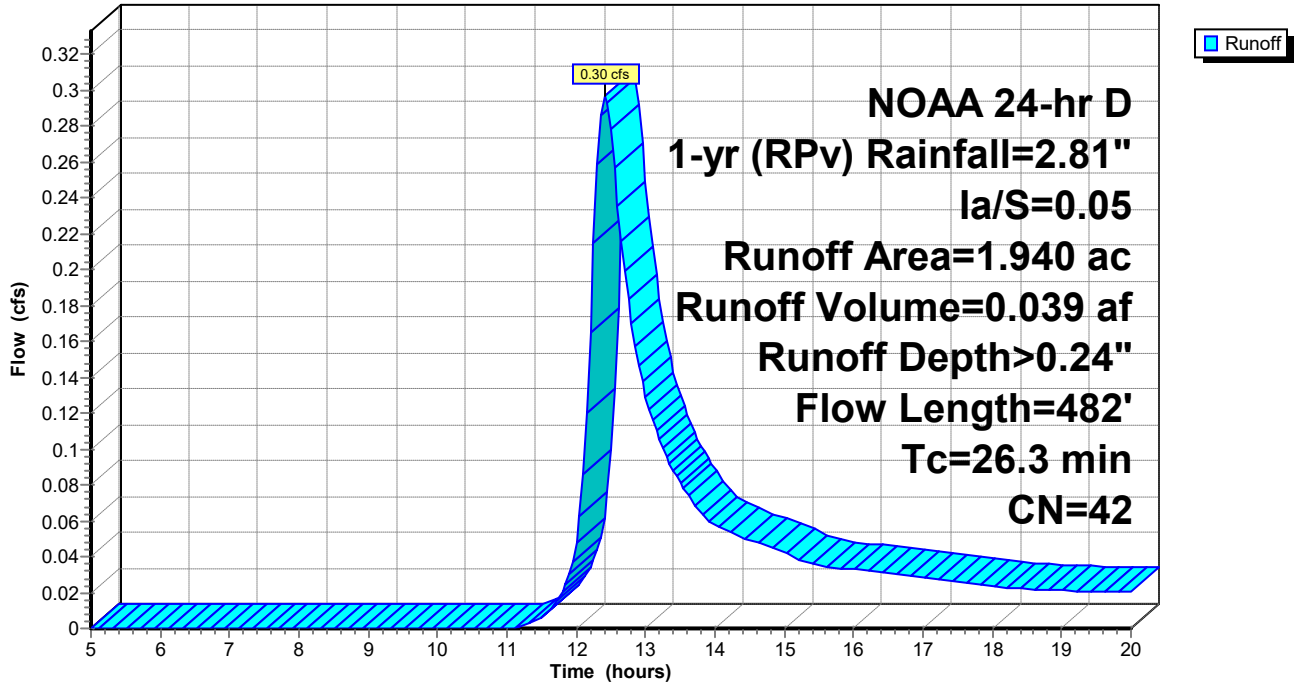
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
 NOAA 24-hr D 1-yr (RPv) Rainfall=2.81", Ia/S=0.05

Area (ac)	CN	Description
1.840	39	>75% Grass cover, Good, HSG A
0.100	98	Paved roads w/curbs & sewers, HSG A
1.940	42	Weighted Average
1.840		94.85% Pervious Area
0.100		5.15% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.3	50	0.0073	0.10		Sheet Flow, Grass: Short n= 0.150 P2= 3.30"
2.0	75	0.0079	0.62		Shallow Concentrated Flow, Short Grass Pasture Kv= 7.0 fps
0.2	32	0.0410	3.26		Shallow Concentrated Flow, Unpaved Kv= 16.1 fps
4.0	131	0.0060	0.54		Shallow Concentrated Flow, Short Grass Pasture Kv= 7.0 fps
7.8	104	0.0010	0.22		Shallow Concentrated Flow, Short Grass Pasture Kv= 7.0 fps
4.0	90	0.0028	0.37		Shallow Concentrated Flow, Short Grass Pasture Kv= 7.0 fps
26.3	482	Total			

Subcatchment SC-7A: 7A

Hydrograph



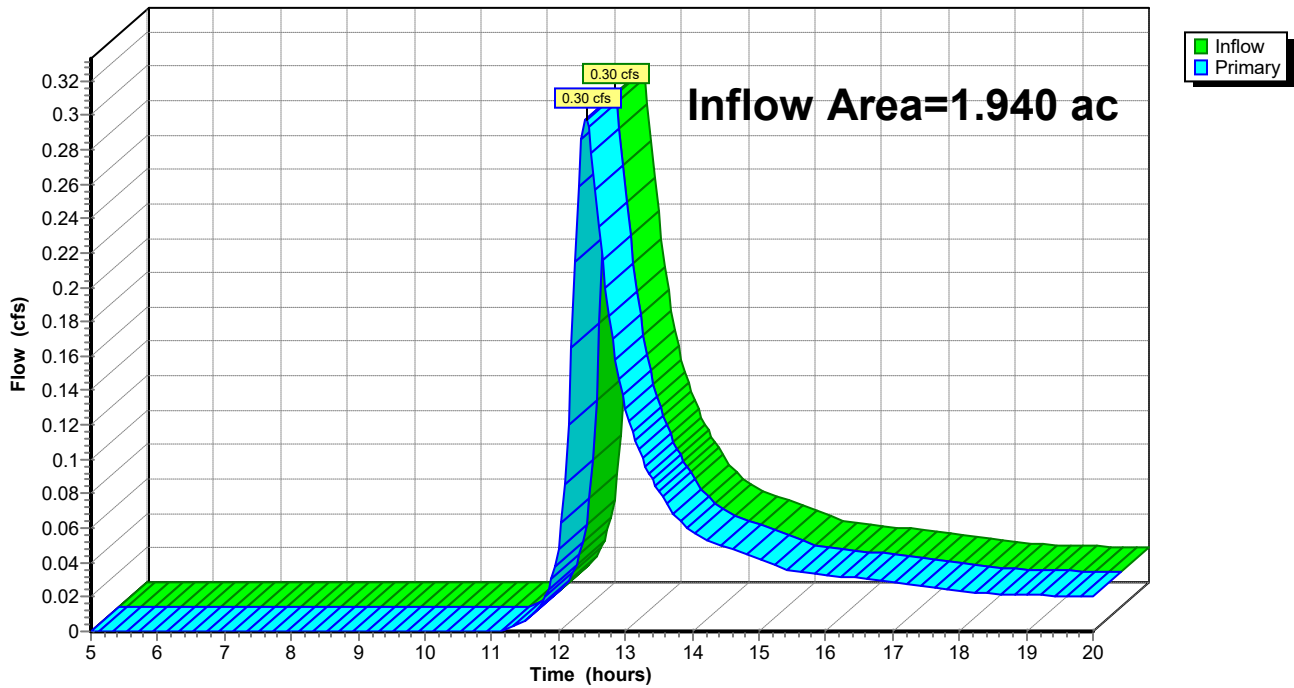
Summary for Link POI7: (new Link)

Inflow Area = 1.940 ac, 5.15% Impervious, Inflow Depth > 0.24" for 1-yr (RPv) event
Inflow = 0.30 cfs @ 12.41 hrs, Volume= 0.039 af
Primary = 0.30 cfs @ 12.41 hrs, Volume= 0.039 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Link POI7: (new Link)

Hydrograph



Summary for Subcatchment SC-8A: 8A

Runoff = 0.45 cfs @ 12.28 hrs, Volume= 0.047 af, Depth> 0.31"

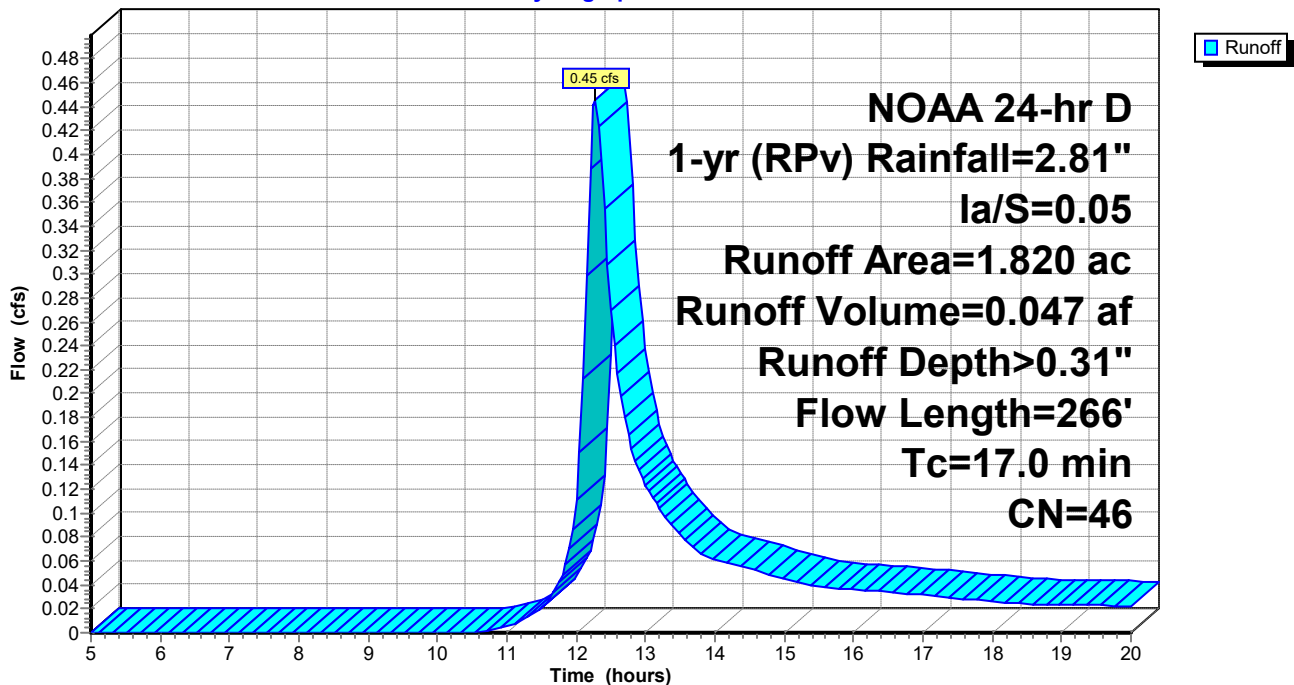
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
 NOAA 24-hr D 1-yr (RPv) Rainfall=2.81", Ia/S=0.05

Area (ac)	CN	Description
1.590	39	>75% Grass cover, Good, HSG A
0.230	98	Paved roads w/curbs & sewers, HSG A
1.820	46	Weighted Average
1.590		87.36% Pervious Area
0.230		12.64% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.1	20	0.0353	0.16		Sheet Flow, Grass: Short n= 0.150 P2= 3.30"
0.3	13	0.0010	0.64		Shallow Concentrated Flow, Paved Kv= 20.3 fps
1.2	23	0.0020	0.31		Shallow Concentrated Flow, Short Grass Pasture Kv= 7.0 fps
13.4	210	0.0014	0.26		Shallow Concentrated Flow, Short Grass Pasture Kv= 7.0 fps
17.0	266	Total			

Subcatchment SC-8A: 8A

Hydrograph



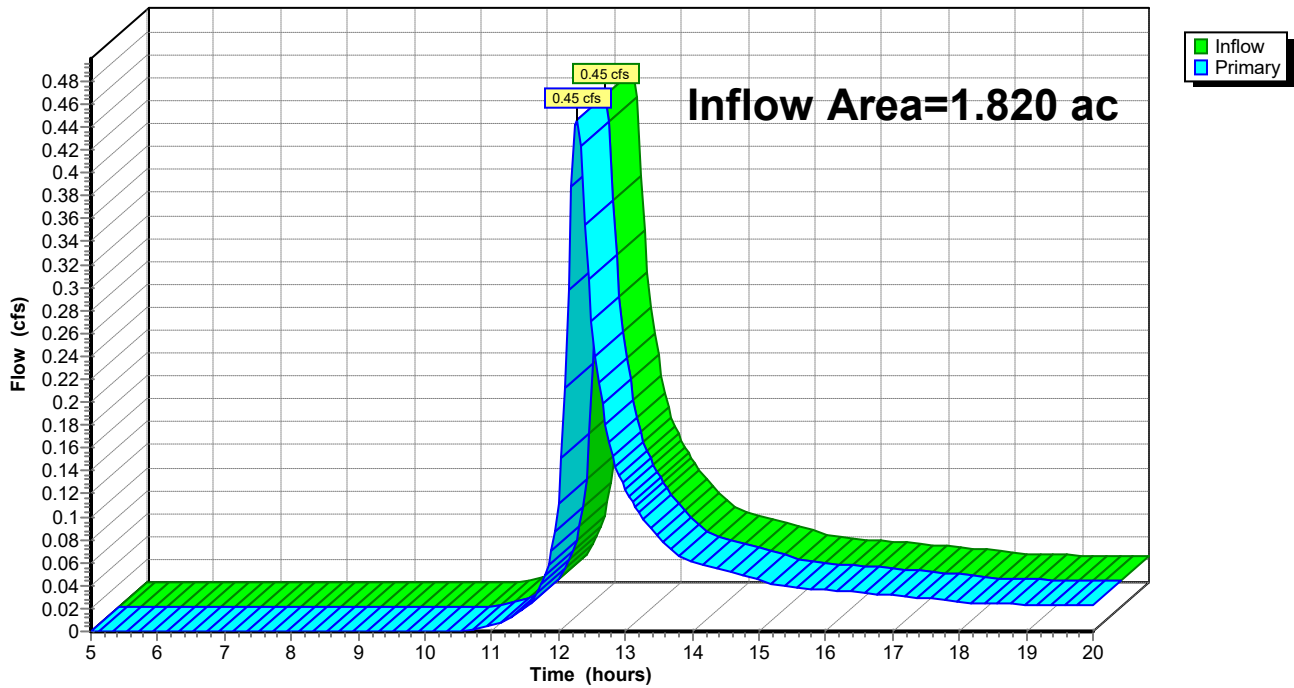
Summary for Link POI8: POI8

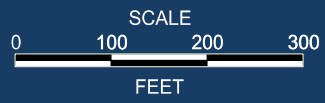
Inflow Area = 1.820 ac, 12.64% Impervious, Inflow Depth > 0.31" for 1-yr (RPv) event
Inflow = 0.45 cfs @ 12.28 hrs, Volume= 0.047 af
Primary = 0.45 cfs @ 12.28 hrs, Volume= 0.047 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Link POI8: POI8

Hydrograph





NORTH MILLSBORO BYPASS, US 113 TO SR 24

CONTRACT NO. T201912701
SUSSEX COUNTY



LEGEND	
	DRAINAGE AREA
	DRAINAGE SUBAREA
	Tc PATH
	PROPOSED CONSTRUCTION
	PROPOSED DRAINAGE
	INFILTRATION BMP
	OPEN SPACE
	IMPERVIOUS
	PROPOSED CONTOURS
	EXISTING CONTOURS
	POI LOCATION
	POI LABEL



STORMWATER MANAGEMENT REPORT POI-4, 5, 6, 7, & 8 PROPOSED

SHEET 2 OF 2
MARCH 2020

Summary for Subcatchment SC-4A: 4A

Runoff = 0.26 cfs @ 12.13 hrs, Volume= 0.018 af, Depth> 0.68"

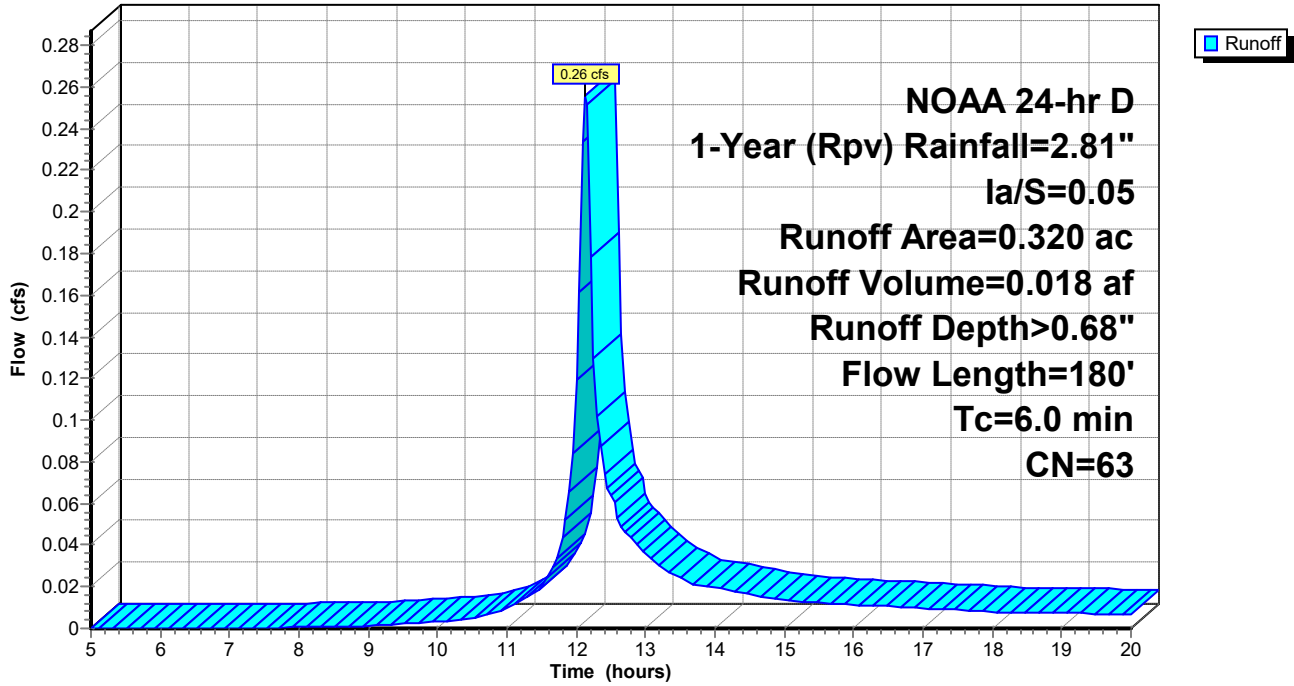
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
 NOAA 24-hr D 1-Year (Rpv) Rainfall=2.81", Ia/S=0.05

Area (ac)	CN	Description
0.190	39	>75% Grass cover, Good, HSG A
0.130	98	Paved roads w/curbs & sewers, HSG A
0.320	63	Weighted Average
0.190		59.37% Pervious Area
0.130		40.63% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.4	29	0.0269	1.23		Sheet Flow, Smooth surfaces n= 0.011 P2= 3.30"
0.1	10	0.0400	1.40		Shallow Concentrated Flow, Short Grass Pasture Kv= 7.0 fps
0.1	10	0.0200	2.87		Shallow Concentrated Flow, Paved Kv= 20.3 fps
0.2	36	0.2270	3.34		Shallow Concentrated Flow, Short Grass Pasture Kv= 7.0 fps
0.2	95	0.0165	6.62	127.06	Channel Flow, Area= 19.2 sf Perim= 18.1' r= 1.06' n= 0.030
1.0	180	Total, Increased to minimum Tc = 6.0 min			

Subcatchment SC-4A: 4A

Hydrograph



Summary for Pond BMP-4A: BMP 4A

Inflow Area = 0.320 ac, 40.63% Impervious, Inflow Depth > 0.68" for 1-Year (Rpv) event
 Inflow = 0.26 cfs @ 12.13 hrs, Volume= 0.018 af
 Outflow = 0.03 cfs @ 13.44 hrs, Volume= 0.018 af, Atten= 90%, Lag= 78.6 min
 Discarded = 0.03 cfs @ 13.44 hrs, Volume= 0.018 af
 Primary = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
 Peak Elev= 19.44' @ 13.44 hrs Surf.Area= 0.010 ac Storage= 0.007 af

Plug-Flow detention time= 120.3 min calculated for 0.018 af (98% of inflow)
 Center-of-Mass det. time= 112.5 min (921.0 - 808.4)

Volume	Invert	Avail.Storage	Storage Description
#1	17.75'	0.008 af	6.00'W x 75.00'L x 2.00'H Prismaticoid 0.021 af Overall x 40.0% Voids
#2	19.75'	0.037 af	6.00'W x 75.00'L x 2.00'H Prismaticoid Z=2.0 -Impervious
		0.045 af	Total Available Storage

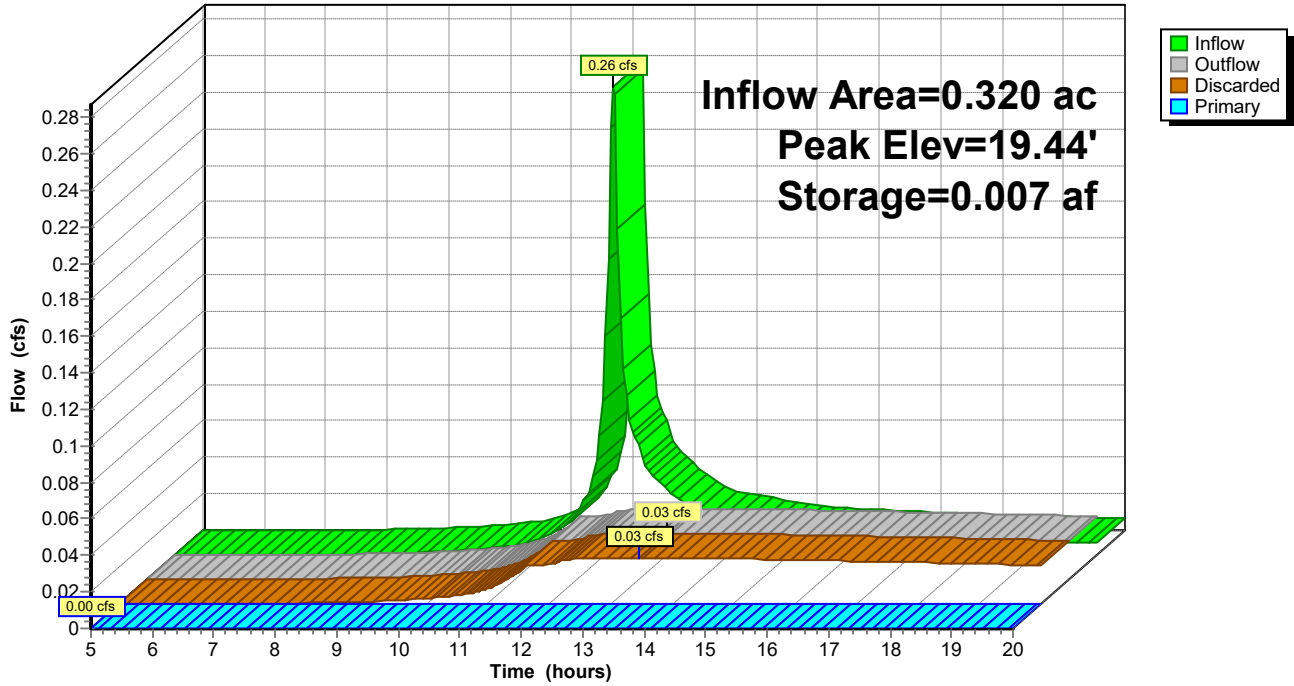
Device	Routing	Invert	Outlet Devices
#1	Discarded	17.75'	2.000 in/hr Exfiltration over Surface area Conductivity to Groundwater Elevation = 10.00'
#2	Primary	21.00'	14.0' long (Profile 1) Broad-Crested Rectangular Weir Head (feet) 0.49 0.98 1.48 Coef. (English) 2.92 3.37 3.59

Discarded OutFlow Max=0.03 cfs @ 13.44 hrs HW=19.44' (Free Discharge)
 ↑1=Exfiltration (Controls 0.03 cfs)

Primary OutFlow Max=0.00 cfs @ 5.00 hrs HW=17.75' (Free Discharge)
 ↑2=Broad-Crested Rectangular Weir (Controls 0.00 cfs)

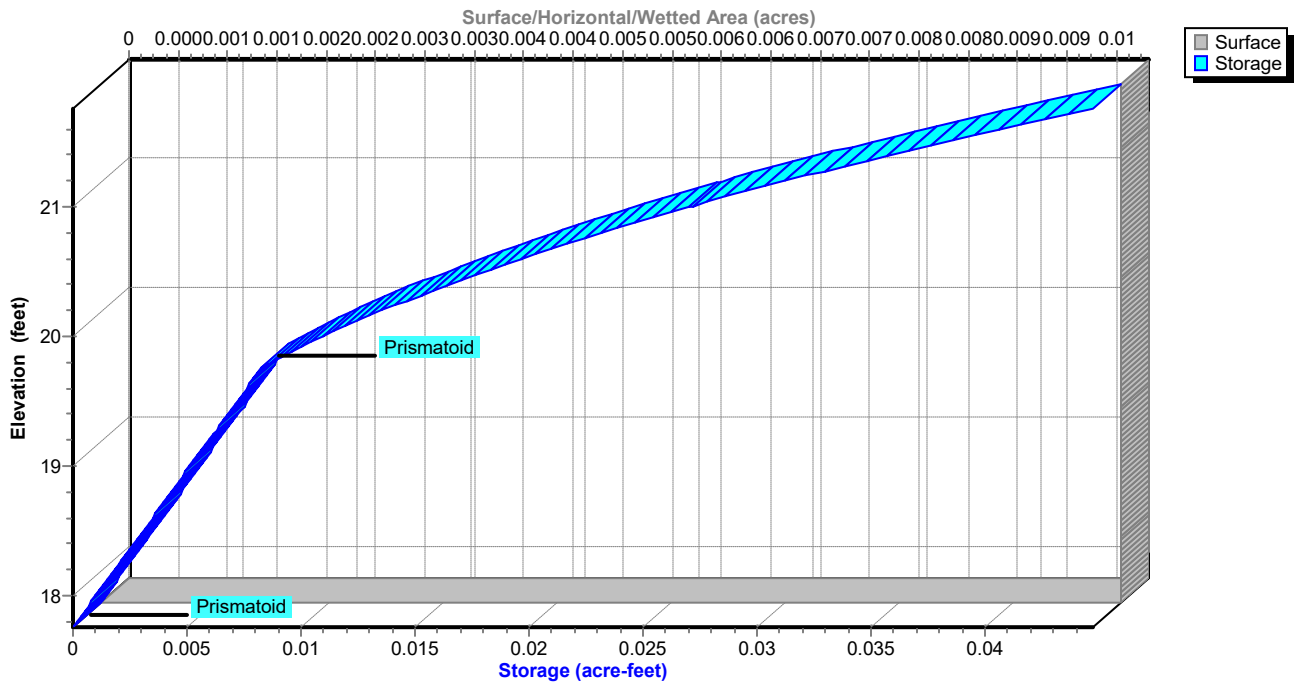
Pond BMP-4A: BMP 4A

Hydrograph



Pond BMP-4A: BMP 4A

Stage-Area-Storage



Summary for Subcatchment SC-4B: 4B

Runoff = 0.63 cfs @ 12.13 hrs, Volume= 0.045 af, Depth> 0.73"

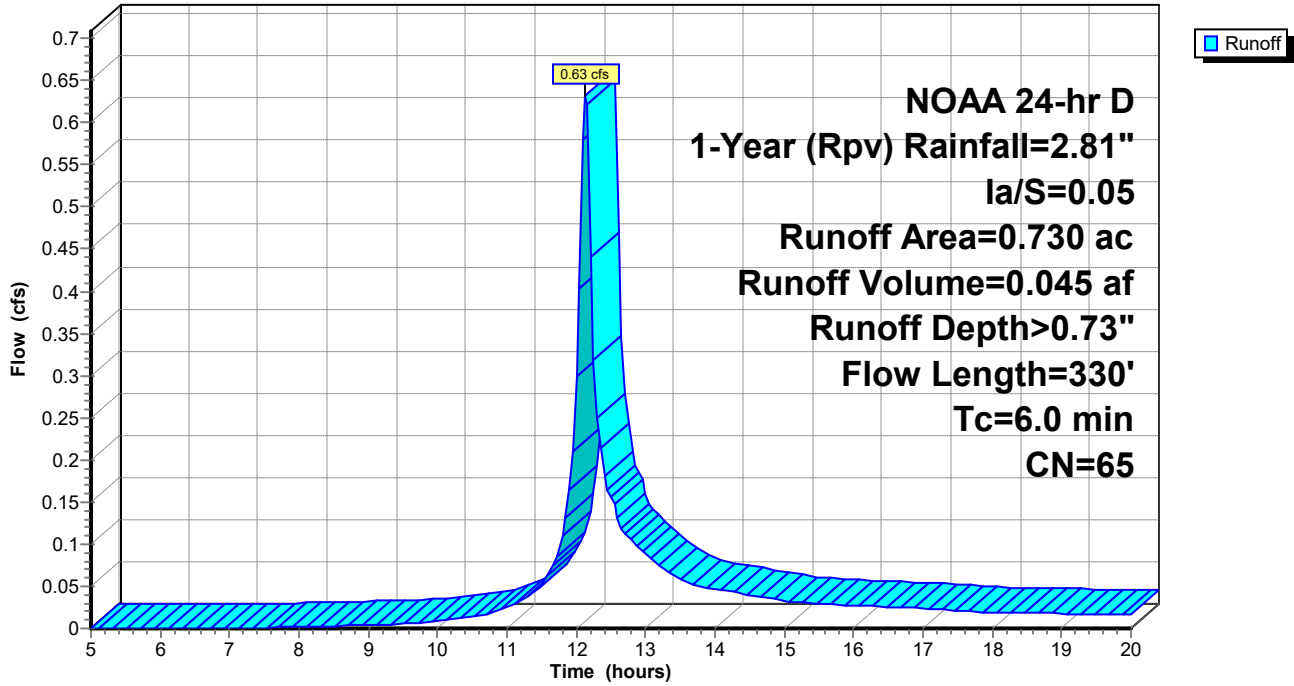
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
 NOAA 24-hr D 1-Year (Rpv) Rainfall=2.81", Ia/S=0.05

Area (ac)	CN	Description
* 0.410	39	
* 0.320	98	
0.730	65	Weighted Average
0.410		56.16% Pervious Area
0.320		43.84% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.5	43	0.0280	1.35		Sheet Flow, Smooth surfaces n= 0.011 P2= 3.30"
0.1	10	0.0400	1.40		Shallow Concentrated Flow, Short Grass Pasture Kv= 7.0 fps
0.1	10	0.0200	2.87		Shallow Concentrated Flow, Paved Kv= 20.3 fps
0.1	23	0.2120	3.22		Shallow Concentrated Flow, Short Grass Pasture Kv= 7.0 fps
0.6	244	0.0197	7.28	143.34	Channel Flow, Area= 19.7 sf Perim= 18.4' r= 1.07' n= 0.030
1.4	330	Total, Increased to minimum Tc = 6.0 min			

Subcatchment SC-4B: 4B

Hydrograph



Summary for Pond BMP-4B: BMP 4B

Inflow Area = 0.730 ac, 43.84% Impervious, Inflow Depth > 0.73" for 1-Year (Rpv) event
 Inflow = 0.63 cfs @ 12.13 hrs, Volume= 0.045 af
 Outflow = 0.08 cfs @ 13.15 hrs, Volume= 0.045 af, Atten= 88%, Lag= 61.0 min
 Discarded = 0.08 cfs @ 13.15 hrs, Volume= 0.045 af
 Primary = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
 Peak Elev= 20.60' @ 13.15 hrs Surf.Area= 0.033 ac Storage= 0.016 af

Plug-Flow detention time= 89.5 min calculated for 0.045 af (100% of inflow)
 Center-of-Mass det. time= 89.0 min (894.9 - 805.8)

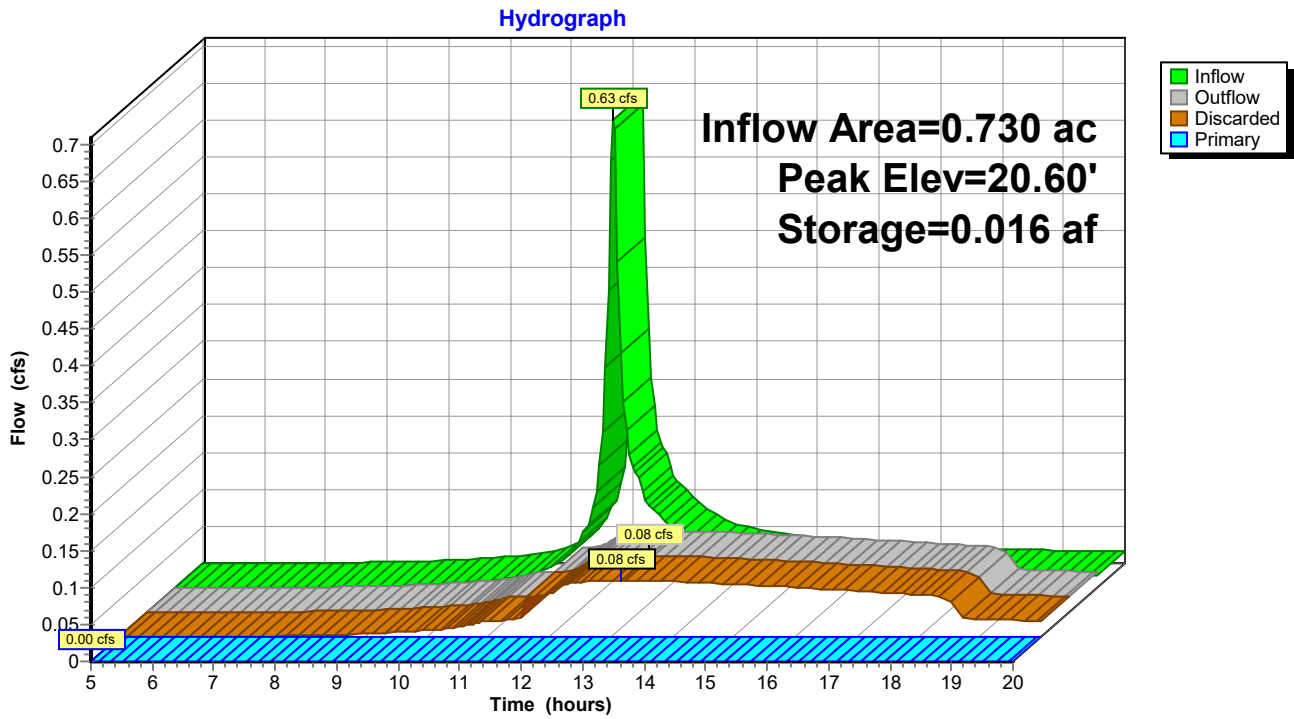
Volume	Invert	Avail.Storage	Storage Description
#1	17.75'	0.001 af	6.00'W x 75.00'L x 2.00'H Prismatic 0.021 af Overall x 4.0% Voids
#2	19.75'	0.048 af	6.00'W x 100.00'L x 2.00'H Prismatic Z=2.0
		0.049 af	Total Available Storage

Device	Routing	Invert	Outlet Devices
#1	Discarded	17.75'	2.000 in/hr Exfiltration over Surface area Conductivity to Groundwater Elevation = 10.00'
#2	Primary	21.00'	14.0' long (Profile 1) Broad-Crested Rectangular Weir Head (feet) 0.49 0.98 1.48 Coef. (English) 2.92 3.37 3.59

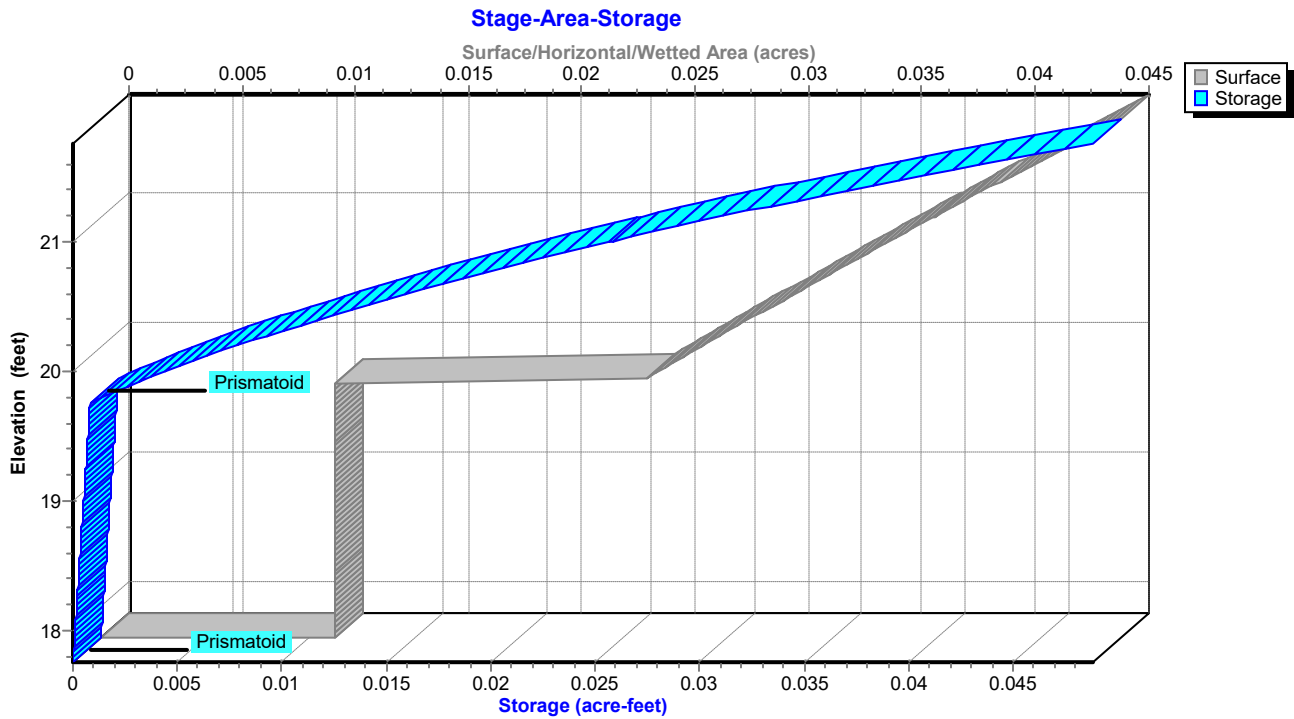
Discarded OutFlow Max=0.08 cfs @ 13.15 hrs HW=20.60' (Free Discharge)
 ↑1=Exfiltration (Controls 0.08 cfs)

Primary OutFlow Max=0.00 cfs @ 5.00 hrs HW=17.75' (Free Discharge)
 ↑2=Broad-Crested Rectangular Weir (Controls 0.00 cfs)

Pond BMP-4B: BMP 4B



Pond BMP-4B: BMP 4B



Summary for Subcatchment SC-5A: 5A

Runoff = 0.13 cfs @ 12.14 hrs, Volume= 0.009 af, Depth> 0.36"

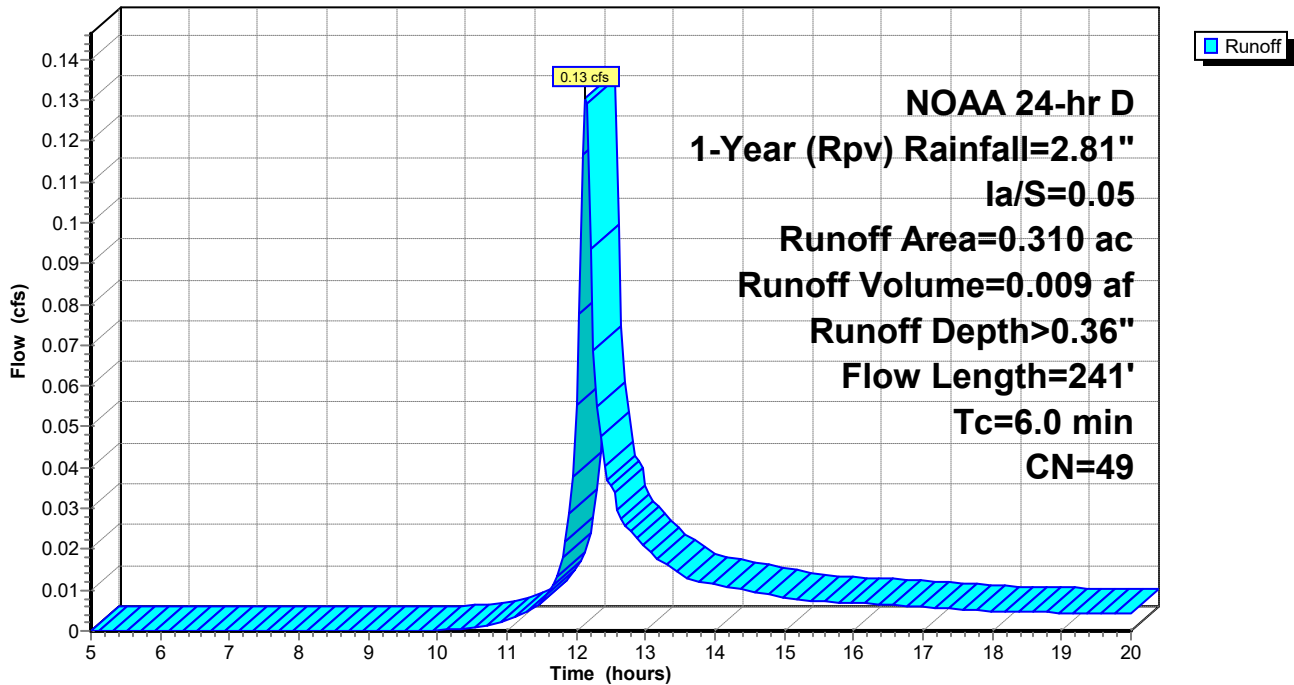
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
 NOAA 24-hr D 1-Year (Rpv) Rainfall=2.81", Ia/S=0.05

Area (ac)	CN	Description
* 0.260	39	
* 0.050	98	
0.310	49	Weighted Average
0.260		83.87% Pervious Area
0.050		16.13% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.2	11	0.0350	1.12		Sheet Flow, Smooth surfaces n= 0.011 P2= 3.30"
0.2	35	0.1950	3.09		Shallow Concentrated Flow, Short Grass Pasture Kv= 7.0 fps
0.9	195	0.0046	3.48	66.17	Channel Flow, Area= 19.0 sf Perim= 18.0' r= 1.06' n= 0.030
1.3	241	Total, Increased to minimum Tc = 6.0 min			

Subcatchment SC-5A: 5A

Hydrograph



Summary for Pond BMP-5A: BMP 5A

Inflow Area = 0.310 ac, 16.13% Impervious, Inflow Depth > 0.36" for 1-Year (Rpv) event
 Inflow = 0.13 cfs @ 12.14 hrs, Volume= 0.009 af
 Outflow = 0.07 cfs @ 12.27 hrs, Volume= 0.009 af, Atten= 50%, Lag= 7.7 min
 Discarded = 0.07 cfs @ 12.27 hrs, Volume= 0.009 af
 Primary = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af
 Secondary = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
 Peak Elev= 18.53' @ 12.27 hrs Surf.Area= 0.032 ac Storage= 0.001 af

Plug-Flow detention time= 6.7 min calculated for 0.009 af (99% of inflow)
 Center-of-Mass det. time= 5.3 min (832.6 - 827.3)

Volume	Invert	Avail.Storage	Storage Description
#1	18.45'	0.026 af	8.00'W x 175.00'L x 2.00'H Prismatic 0.064 af Overall x 40.0% Voids
#2	20.45'	0.099 af	8.00'W x 175.00'L x 2.00'H Prismatic Z=2.0
		0.125 af	Total Available Storage

Device	Routing	Invert	Outlet Devices
#1	Discarded	18.45'	2.000 in/hr Exfiltration over Surface area Conductivity to Groundwater Elevation = 10.00'
#2	Primary	20.45'	18.0" Round Culvert L= 156.0' RCP, end-section conforming to fill, Ke= 0.500 Inlet / Outlet Invert= 20.45' / 19.25' S= 0.0077 '/' Cc= 0.900 n= 0.012, Flow Area= 1.77 sf
#3	Secondary	22.00'	16.0' long (Profile 1) Broad-Crested Rectangular Weir Head (feet) 0.49 0.98 1.48 Coef. (English) 2.92 3.37 3.59

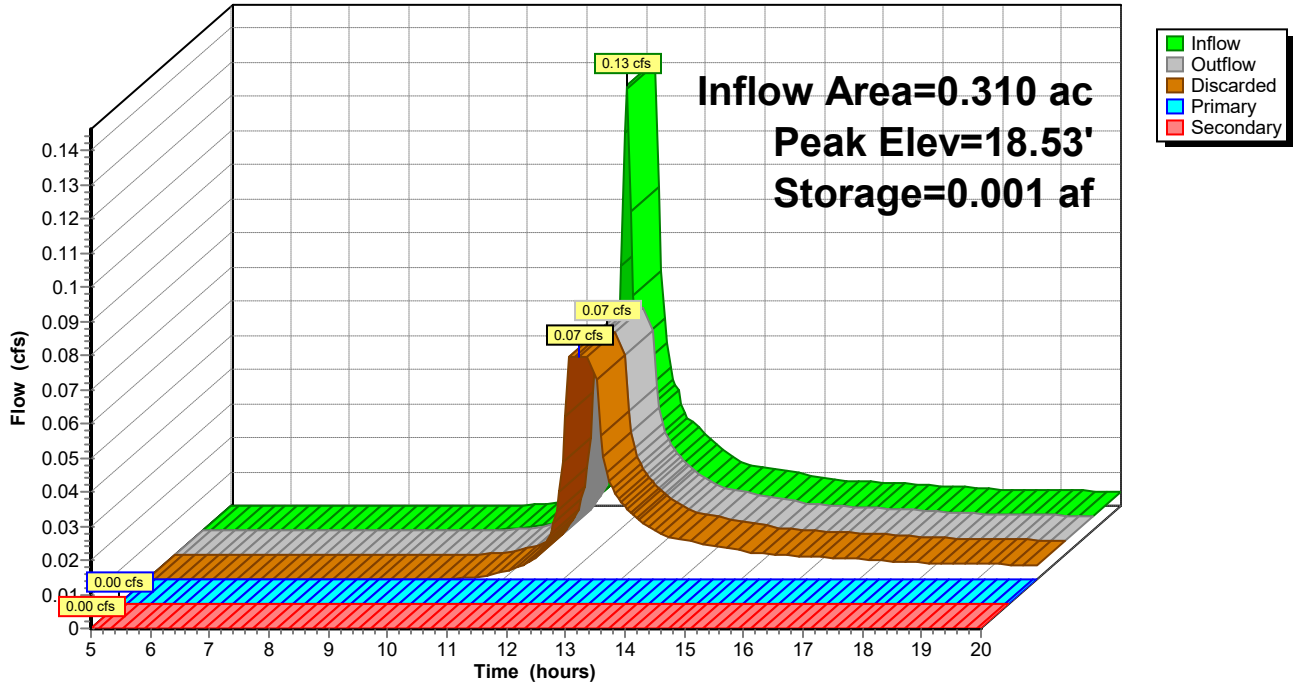
Discarded OutFlow Max=0.07 cfs @ 12.27 hrs HW=18.53' (Free Discharge)
 ↑1=Exfiltration (Controls 0.07 cfs)

Primary OutFlow Max=0.00 cfs @ 5.00 hrs HW=18.45' (Free Discharge)
 ↑2=Culvert (Controls 0.00 cfs)

Secondary OutFlow Max=0.00 cfs @ 5.00 hrs HW=18.45' (Free Discharge)
 ↑3=Broad-Crested Rectangular Weir (Controls 0.00 cfs)

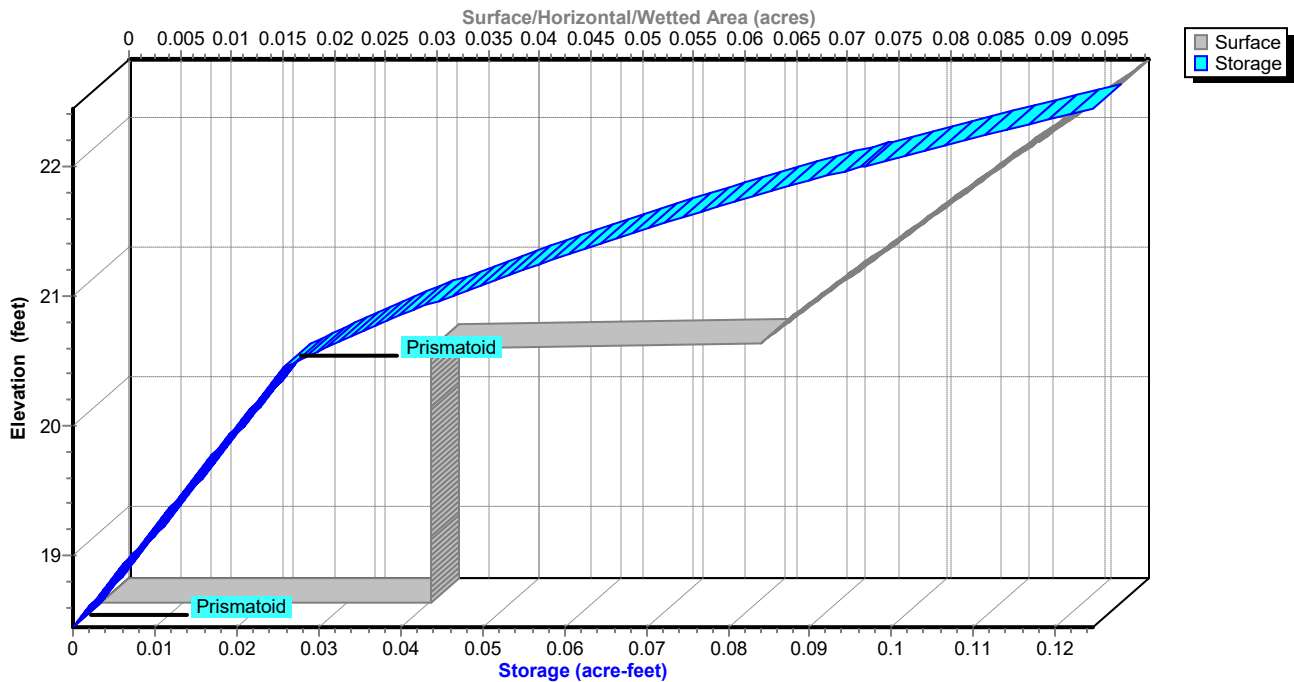
Pond BMP-5A: BMP 5A

Hydrograph



Pond BMP-5A: BMP 5A

Stage-Area-Storage



Summary for Subcatchment SC-5B: 5B

Runoff = 0.22 cfs @ 12.14 hrs, Volume= 0.016 af, Depth> 0.44"

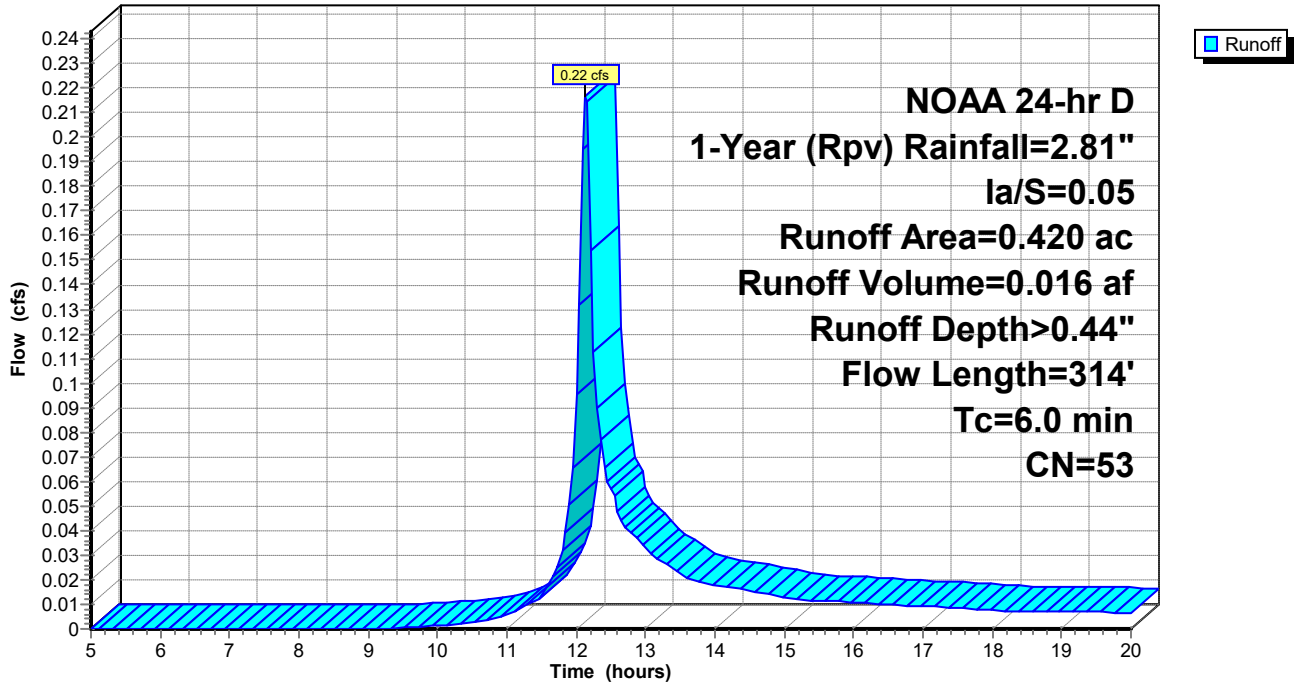
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
 NOAA 24-hr D 1-Year (Rpv) Rainfall=2.81", Ia/S=0.05

Area (ac)	CN	Description
* 0.320	39	
* 0.100	98	
0.420	53	Weighted Average
0.320		76.19% Pervious Area
0.100		23.81% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.3	18	0.0310	1.18		Sheet Flow, Smooth surfaces n= 0.011 P2= 3.30"
0.2	37	0.2200	3.28		Shallow Concentrated Flow, Short Grass Pasture Kv= 7.0 fps
1.0	259	0.0060	4.14	87.81	Channel Flow, Area= 21.2 sf Perim= 18.9' r= 1.12' n= 0.030
1.5	314	Total, Increased to minimum Tc = 6.0 min			

Subcatchment SC-5B: 5B

Hydrograph



Summary for Pond BMP-5B: BMP 5B

Inflow Area = 0.420 ac, 23.81% Impervious, Inflow Depth > 0.44" for 1-Year (Rpv) event
 Inflow = 0.22 cfs @ 12.14 hrs, Volume= 0.016 af
 Outflow = 0.04 cfs @ 12.78 hrs, Volume= 0.015 af, Atten= 82%, Lag= 38.6 min
 Discarded = 0.04 cfs @ 12.78 hrs, Volume= 0.015 af
 Primary = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af
 Secondary = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
 Peak Elev= 18.99' @ 12.78 hrs Surf.Area= 0.018 ac Storage= 0.004 af

Plug-Flow detention time= 35.0 min calculated for 0.015 af (99% of inflow)
 Center-of-Mass det. time= 33.6 min (855.2 - 821.6)

Volume	Invert	Avail.Storage	Storage Description
#1	18.45'	0.015 af	8.00'W x 100.00'L x 2.00'H Prismatic 0.037 af Overall x 40.0% Voids
#2	20.45'	0.058 af	8.00'W x 100.00'L x 2.00'H Prismatic Z=2.0
		0.072 af	Total Available Storage

Device	Routing	Invert	Outlet Devices
#1	Discarded	18.45'	2.000 in/hr Exfiltration over Surface area Conductivity to Groundwater Elevation = 10.00'
#2	Primary	20.45'	18.0" Round Culvert L= 156.0' RCP, end-section conforming to fill, Ke= 0.500 Inlet / Outlet Invert= 20.45' / 19.25' S= 0.0077 '/' Cc= 0.900 n= 0.012, Flow Area= 1.77 sf
#3	Secondary	22.00'	16.0' long (Profile 1) Broad-Crested Rectangular Weir Head (feet) 0.49 0.98 1.48 Coef. (English) 2.92 3.37 3.59

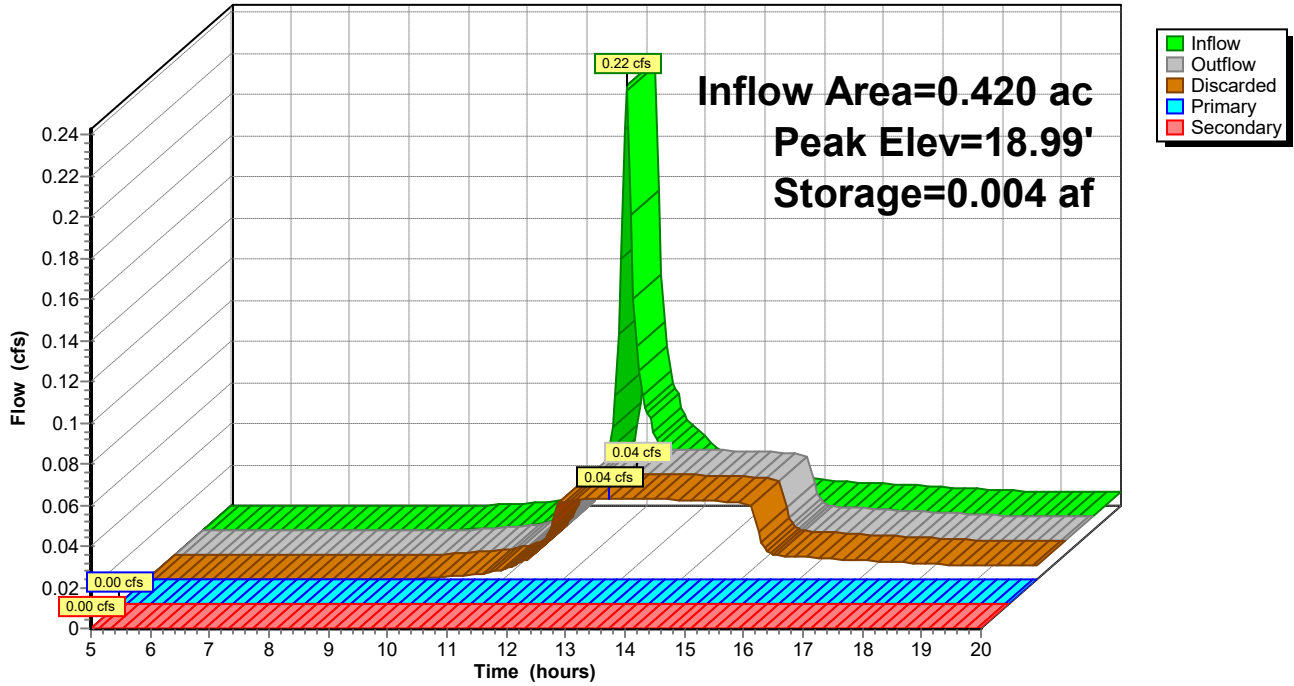
Discarded OutFlow Max=0.04 cfs @ 12.78 hrs HW=18.99' (Free Discharge)
 ↑1=Exfiltration (Controls 0.04 cfs)

Primary OutFlow Max=0.00 cfs @ 5.00 hrs HW=18.45' (Free Discharge)
 ↑2=Culvert (Controls 0.00 cfs)

Secondary OutFlow Max=0.00 cfs @ 5.00 hrs HW=18.45' (Free Discharge)
 ↑3=Broad-Crested Rectangular Weir (Controls 0.00 cfs)

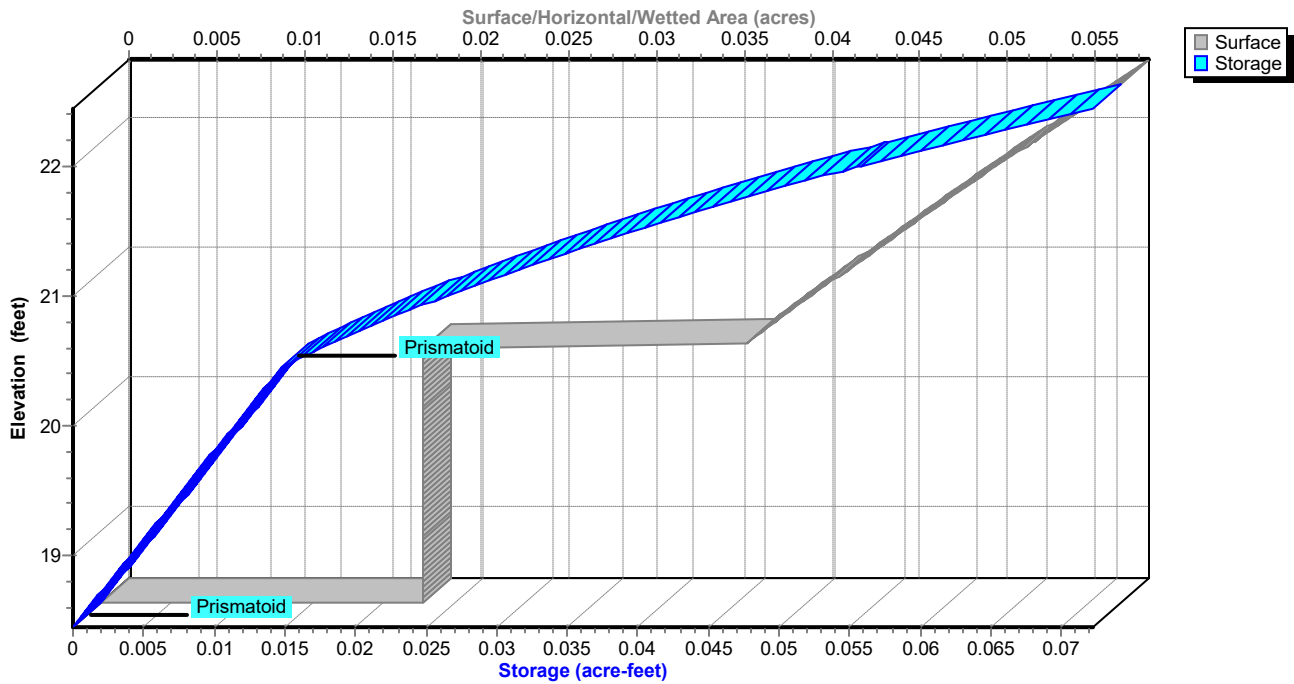
Pond BMP-5B: BMP 5B

Hydrograph



Pond BMP-5B: BMP 5B

Stage-Area-Storage



Summary for Subcatchment SC-5C: 5C

Runoff = 0.42 cfs @ 12.13 hrs, Volume= 0.030 af, Depth> 0.71"

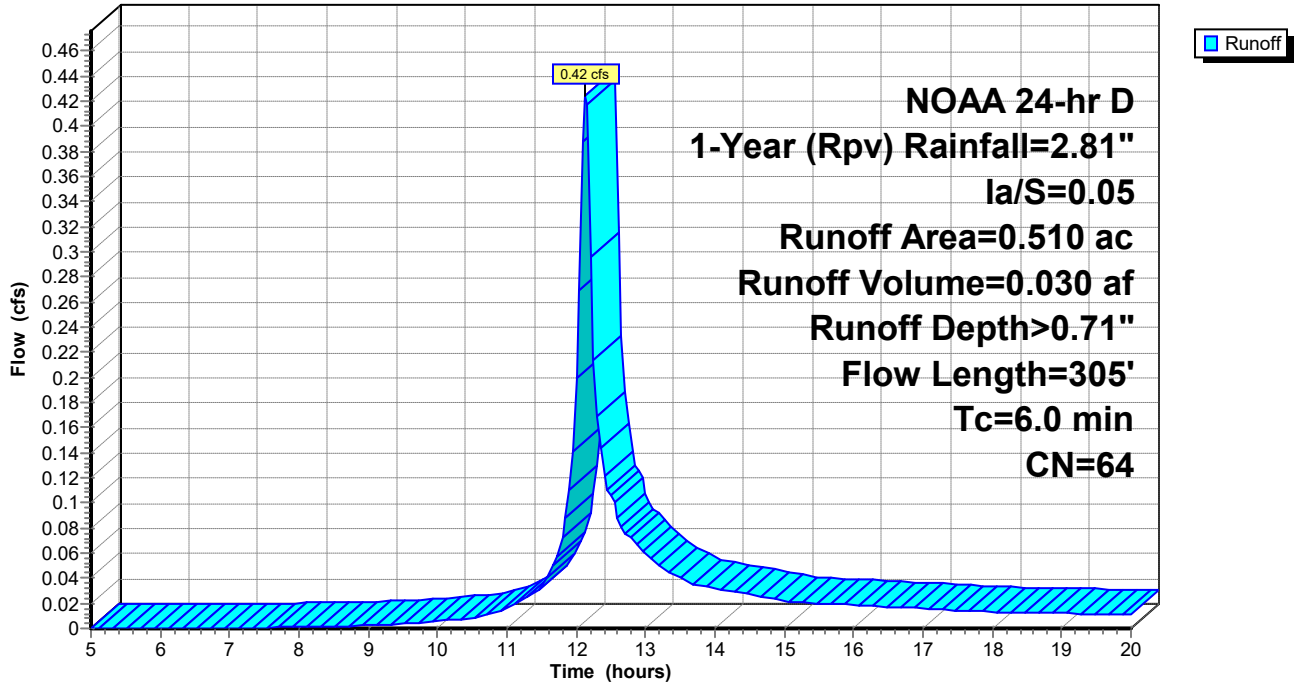
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
 NOAA 24-hr D 1-Year (Rpv) Rainfall=2.81", Ia/S=0.05

Area (ac)	CN	Description
* 0.290	39	
* 0.220	98	
0.510	64	Weighted Average
0.290		56.86% Pervious Area
0.220		43.14% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.4	35	0.0310	1.35		Sheet Flow, Smooth surfaces n= 0.011 P2= 3.30"
0.1	11	0.0400	1.40		Shallow Concentrated Flow, Short Grass Pasture Kv= 7.0 fps
0.1	10	0.0200	2.87		Shallow Concentrated Flow, Paved Kv= 20.3 fps
0.2	32	0.1810	2.98		Shallow Concentrated Flow, Short Grass Pasture Kv= 7.0 fps
0.6	217	0.0140	6.09	118.21	Channel Flow, Area= 19.4 sf Perim= 18.3' r= 1.06' n= 0.030
1.4	305	Total, Increased to minimum Tc = 6.0 min			

Subcatchment SC-5C: 5C

Hydrograph



Summary for Pond BMP-5C: BMP 5C

Inflow Area = 0.510 ac, 43.14% Impervious, Inflow Depth > 0.71" for 1-Year (Rpv) event
 Inflow = 0.42 cfs @ 12.13 hrs, Volume= 0.030 af
 Outflow = 0.04 cfs @ 13.35 hrs, Volume= 0.030 af, Atten= 89%, Lag= 73.2 min
 Discarded = 0.04 cfs @ 13.35 hrs, Volume= 0.030 af
 Primary = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
 Peak Elev= 18.77' @ 13.35 hrs Surf.Area= 0.018 ac Storage= 0.011 af

Plug-Flow detention time= 104.3 min calculated for 0.030 af (100% of inflow)
 Center-of-Mass det. time= 103.1 min (910.2 - 807.1)

Volume	Invert	Avail.Storage	Storage Description
#1	17.25'	0.015 af	8.00'W x 100.00'L x 2.00'H Prismatic 0.037 af Overall x 40.0% Voids
#2	19.25'	0.058 af	8.00'W x 100.00'L x 2.00'H Prismatic Z=2.0 -Impervious
		0.072 af	Total Available Storage

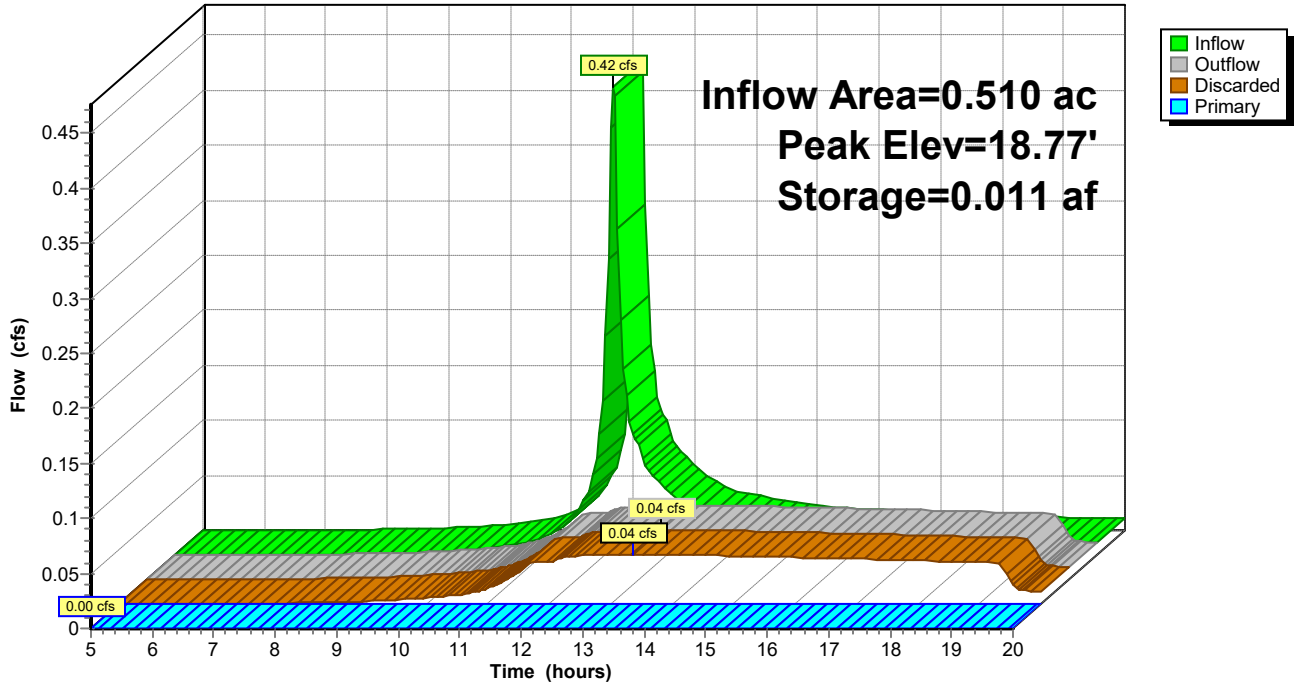
Device	Routing	Invert	Outlet Devices
#1	Discarded	17.25'	2.000 in/hr Exfiltration over Surface area Conductivity to Groundwater Elevation = 10.00'
#2	Primary	21.00'	16.0' long (Profile 1) Broad-Crested Rectangular Weir Head (feet) 0.49 0.98 1.48 Coef. (English) 2.92 3.37 3.59

Discarded OutFlow Max=0.04 cfs @ 13.35 hrs HW=18.77' (Free Discharge)
 ↑1=Exfiltration (Controls 0.04 cfs)

Primary OutFlow Max=0.00 cfs @ 5.00 hrs HW=17.25' (Free Discharge)
 ↑2=Broad-Crested Rectangular Weir (Controls 0.00 cfs)

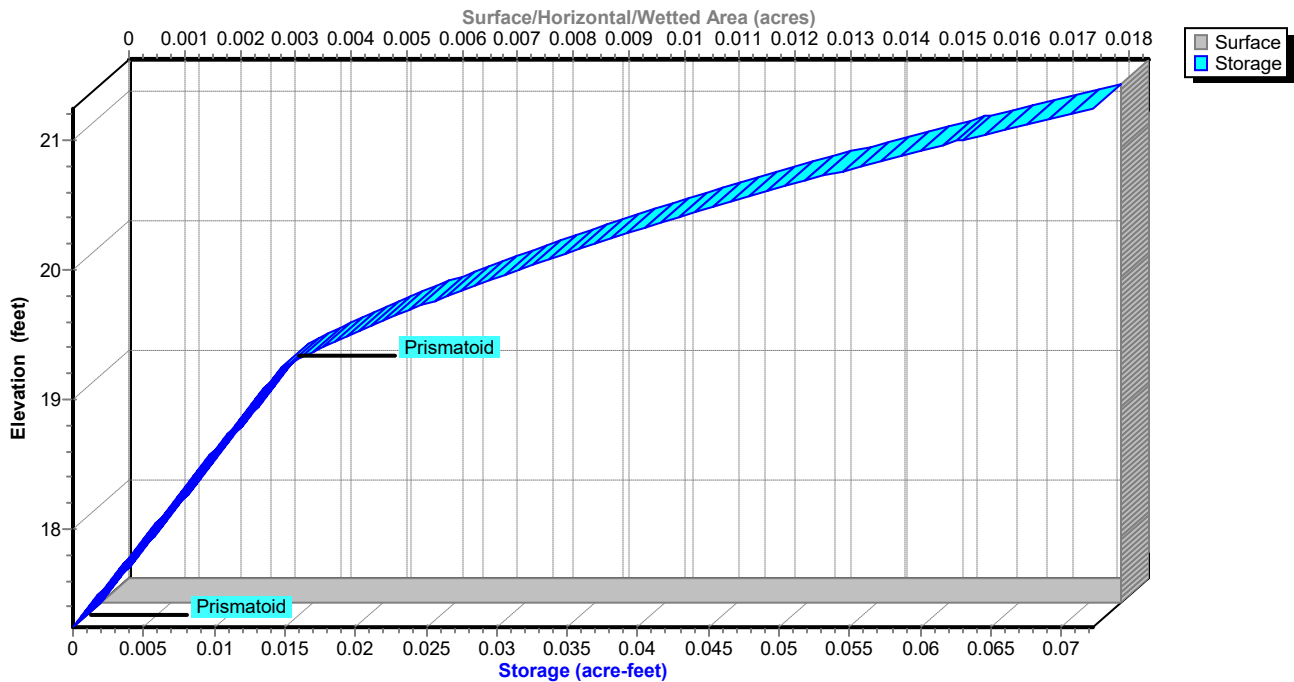
Pond BMP-5C: BMP 5C

Hydrograph



Pond BMP-5C: BMP 5C

Stage-Area-Storage



Summary for Subcatchment SC-5D: 5D

Runoff = 0.52 cfs @ 12.14 hrs, Volume= 0.037 af, Depth> 0.65"

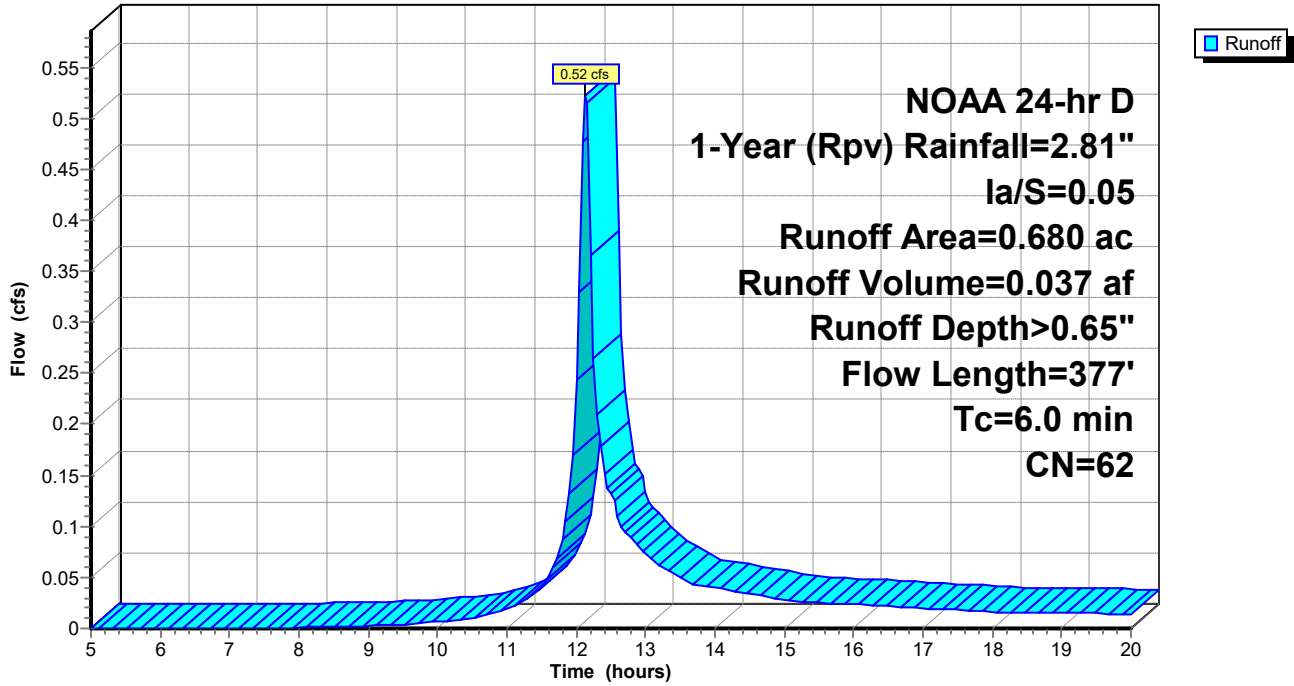
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
 NOAA 24-hr D 1-Year (Rpv) Rainfall=2.81", Ia/S=0.05

Area (ac)	CN	Description
* 0.410	39	
* 0.270	98	
0.680	62	Weighted Average
0.410		60.29% Pervious Area
0.270		39.71% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.4	30	0.0268	1.23		Sheet Flow, Smooth surfaces n= 0.011 P2= 3.30"
0.1	10	0.0400	1.40		Shallow Concentrated Flow, Short Grass Pasture Kv= 7.0 fps
0.1	10	0.0200	2.87		Shallow Concentrated Flow, Paved Kv= 20.3 fps
0.2	34	0.2200	3.28		Shallow Concentrated Flow, Short Grass Pasture Kv= 7.0 fps
0.8	293	0.0150	6.14	109.22	Channel Flow, Area= 17.8 sf Perim= 17.5' r= 1.02' n= 0.030
1.6	377	Total, Increased to minimum Tc = 6.0 min			

Subcatchment SC-5D: 5D

Hydrograph



Summary for Pond BMP-5D: BMP 5D

Inflow Area = 0.680 ac, 39.71% Impervious, Inflow Depth > 0.65" for 1-Year (Rpv) event
 Inflow = 0.52 cfs @ 12.14 hrs, Volume= 0.037 af
 Outflow = 0.06 cfs @ 13.16 hrs, Volume= 0.037 af, Atten= 88%, Lag= 61.4 min
 Discarded = 0.06 cfs @ 13.16 hrs, Volume= 0.037 af
 Primary = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
 Peak Elev= 18.38' @ 13.16 hrs Surf.Area= 0.028 ac Storage= 0.012 af

Plug-Flow detention time= 76.5 min calculated for 0.037 af (99% of inflow)
 Center-of-Mass det. time= 75.1 min (884.8 - 809.7)

Volume	Invert	Avail.Storage	Storage Description
#1	17.25'	0.022 af	8.00'W x 150.00'L x 2.00'H Prismatic 0.055 af Overall x 40.0% Voids
#2	19.25'	0.085 af	8.00'W x 150.00'L x 2.00'H Prismatic Z=2.0
		0.107 af	Total Available Storage

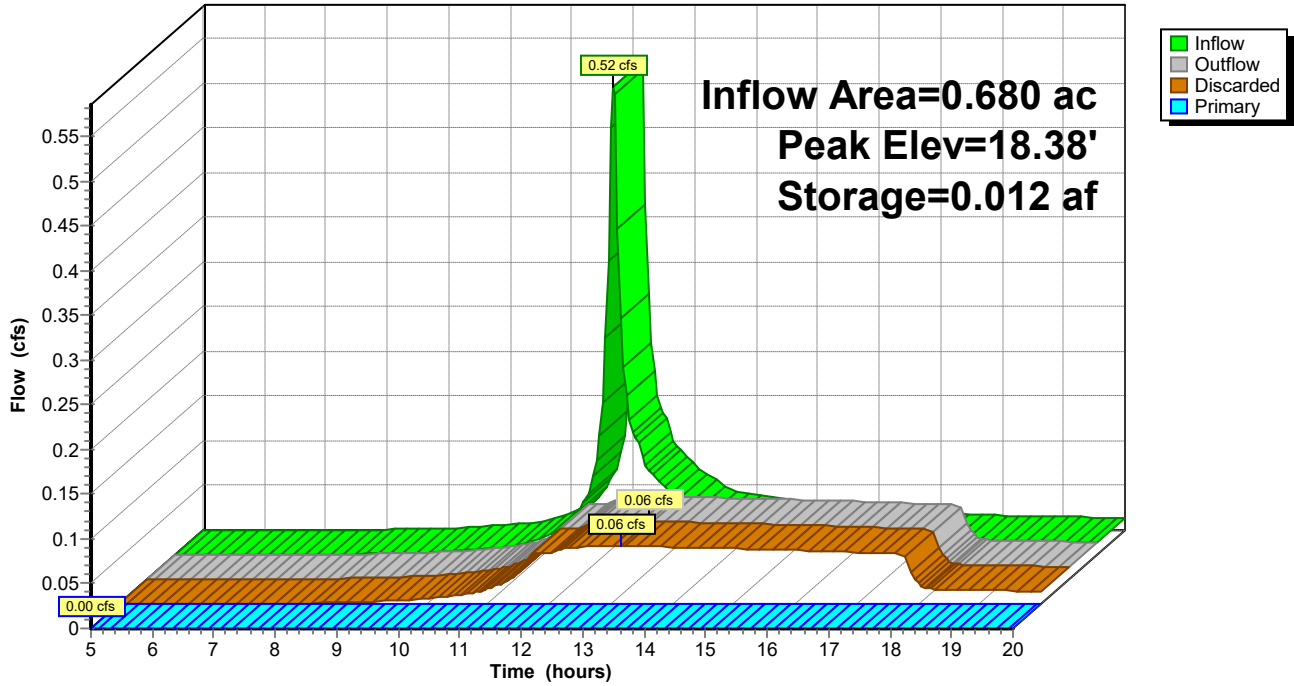
Device	Routing	Invert	Outlet Devices
#1	Discarded	17.25'	2.000 in/hr Exfiltration over Surface area Conductivity to Groundwater Elevation = 10.00'
#2	Primary	21.00'	16.0' long (Profile 1) Broad-Crested Rectangular Weir Head (feet) 0.49 0.98 1.48 Coef. (English) 2.92 3.37 3.59

Discarded OutFlow Max=0.06 cfs @ 13.16 hrs HW=18.38' (Free Discharge)
 ↑1=Exfiltration (Controls 0.06 cfs)

Primary OutFlow Max=0.00 cfs @ 5.00 hrs HW=17.25' (Free Discharge)
 ↑2=Broad-Crested Rectangular Weir (Controls 0.00 cfs)

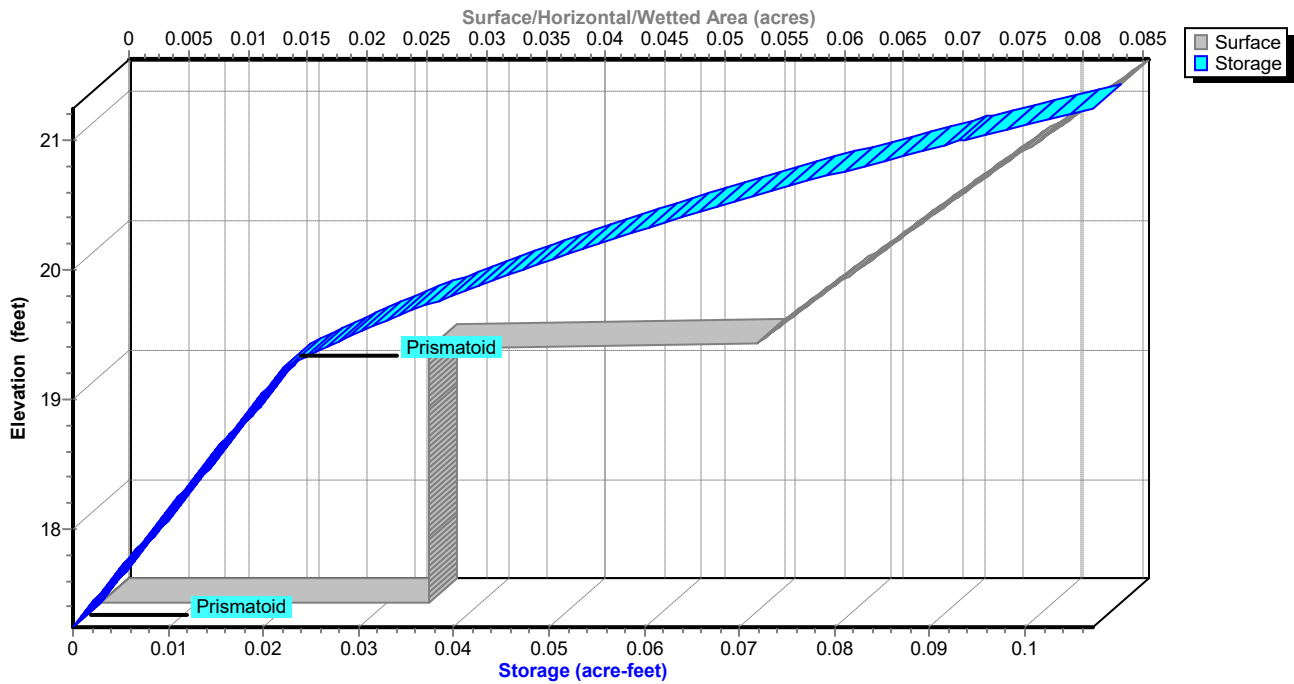
Pond BMP-5D: BMP 5D

Hydrograph



Pond BMP-5D: BMP 5D

Stage-Area-Storage



Summary for Subcatchment SC-6A: 6A

Runoff = 0.17 cfs @ 12.13 hrs, Volume= 0.012 af, Depth> 0.86"

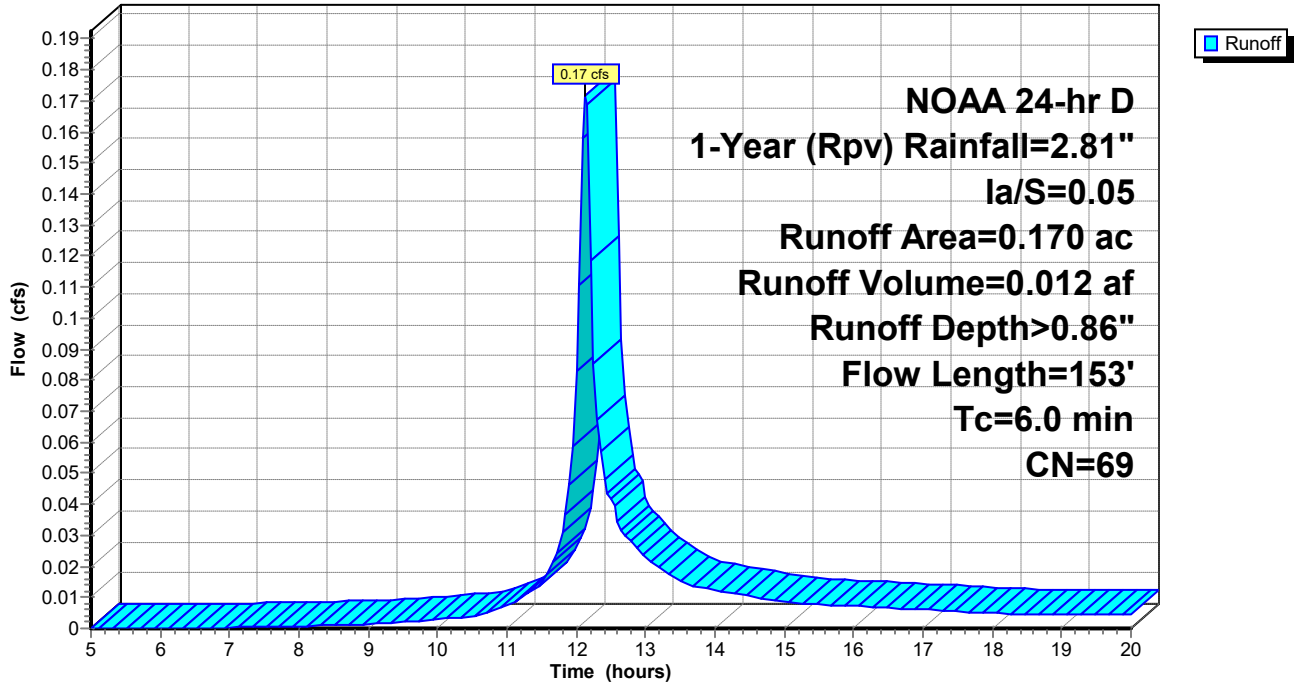
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
 NOAA 24-hr D 1-Year (Rpv) Rainfall=2.81", Ia/S=0.05

Area (ac)	CN	Description
* 0.083	39	
* 0.087	98	
0.170	69	Weighted Average
0.083		48.82% Pervious Area
0.087		51.18% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.5	38	0.0253	1.26		Sheet Flow, Smooth surfaces n= 0.011 P2= 3.30"
0.1	10	0.0400	1.40		Shallow Concentrated Flow, Short Grass Pasture Kv= 7.0 fps
0.0	10	0.0400	4.06		Shallow Concentrated Flow, Paved Kv= 20.3 fps
0.2	32	0.1840	3.00		Shallow Concentrated Flow, Short Grass Pasture Kv= 7.0 fps
0.4	63	0.0030	2.83	55.19	Channel Flow, Area= 19.5 sf Perim= 18.3' r= 1.07' n= 0.030
1.2	153	Total, Increased to minimum Tc = 6.0 min			

Subcatchment SC-6A: 6A

Hydrograph



Summary for Pond BMP-6A: BMP 6A

Inflow Area = 0.170 ac, 51.18% Impervious, Inflow Depth > 0.86" for 1-Year (Rpv) event
 Inflow = 0.17 cfs @ 12.13 hrs, Volume= 0.012 af
 Outflow = 0.02 cfs @ 13.38 hrs, Volume= 0.012 af, Atten= 90%, Lag= 74.5 min
 Discarded = 0.02 cfs @ 13.38 hrs, Volume= 0.012 af
 Primary = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
 Peak Elev= 18.84' @ 13.38 hrs Surf.Area= 0.007 ac Storage= 0.005 af

Plug-Flow detention time= 114.3 min calculated for 0.012 af (99% of inflow)
 Center-of-Mass det. time= 112.2 min (912.7 - 800.5)

Volume	Invert	Avail.Storage	Storage Description
#1	17.15'	0.006 af	6.00'W x 50.00'L x 2.00'H Prismaoid 0.014 af Overall x 40.0% Voids
#2	19.15'	0.025 af	6.00'W x 50.00'L x 2.00'H Prismaoid Z=2.0 -Impervious
		0.031 af	Total Available Storage

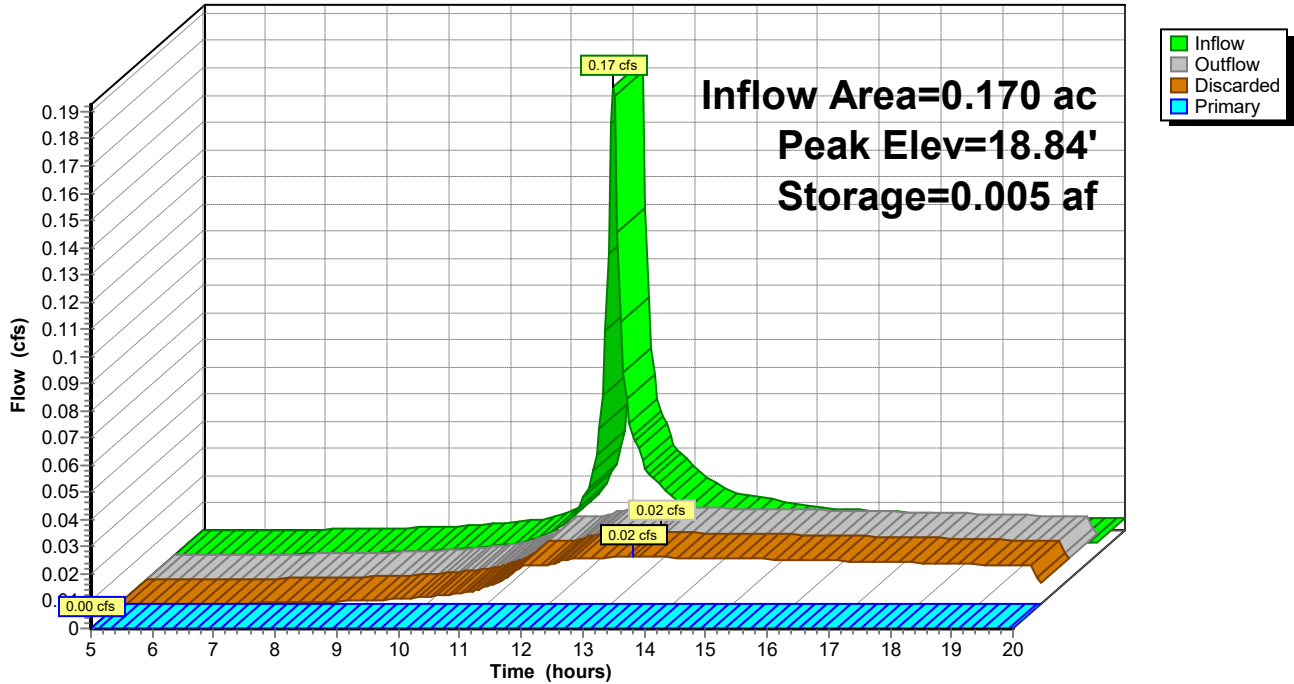
Device	Routing	Invert	Outlet Devices
#1	Discarded	17.15'	2.000 in/hr Exfiltration over Surface area Conductivity to Groundwater Elevation = 10.00'
#2	Primary	21.00'	14.0' long (Profile 1) Broad-Crested Rectangular Weir Head (feet) 0.49 0.98 1.48 Coef. (English) 2.92 3.37 3.59

Discarded OutFlow Max=0.02 cfs @ 13.38 hrs HW=18.84' (Free Discharge)
 ↑1=Exfiltration (Controls 0.02 cfs)

Primary OutFlow Max=0.00 cfs @ 5.00 hrs HW=17.15' (Free Discharge)
 ↑2=Broad-Crested Rectangular Weir (Controls 0.00 cfs)

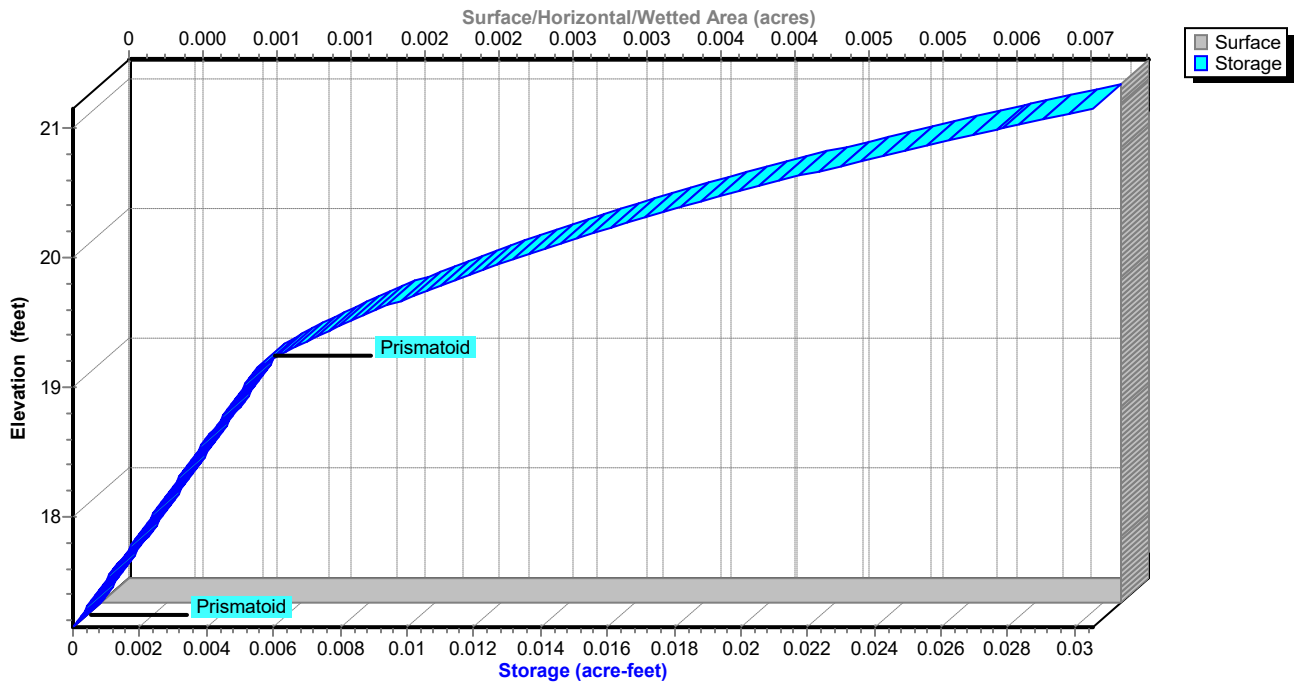
Pond BMP-6A: BMP 6A

Hydrograph



Pond BMP-6A: BMP 6A

Stage-Area-Storage



Summary for Subcatchment SC-6B: 6B

Runoff = 0.55 cfs @ 12.13 hrs, Volume= 0.039 af, Depth> 0.73"

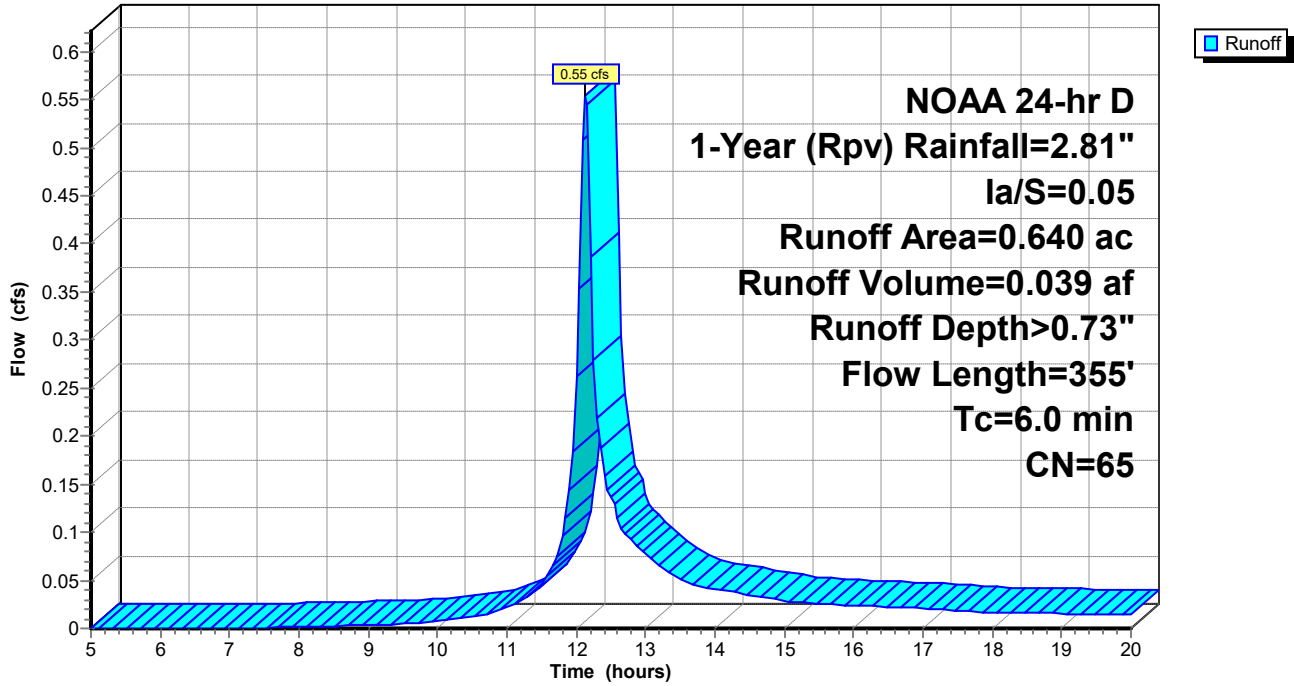
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
 NOAA 24-hr D 1-Year (Rpv) Rainfall=2.81", Ia/S=0.05

Area (ac)	CN	Description
* 0.360	39	
* 0.280	98	
0.640	65	Weighted Average
0.360		56.25% Pervious Area
0.280		43.75% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.4	36	0.0310	1.36		Sheet Flow, Smooth surfaces n= 0.011 P2= 3.30"
0.1	11	0.0400	1.40		Shallow Concentrated Flow, Short Grass Pasture Kv= 7.0 fps
0.1	10	0.0200	2.87		Shallow Concentrated Flow, Paved Kv= 20.3 fps
0.2	33	0.1830	2.99		Shallow Concentrated Flow, Short Grass Pasture Kv= 7.0 fps
0.7	265	0.0159	6.52	126.44	Channel Flow, Area= 19.4 sf Perim= 18.2' r= 1.07' n= 0.030
1.5	355	Total, Increased to minimum Tc = 6.0 min			

Subcatchment SC-6B: 6B

Hydrograph



Summary for Pond BMP-6B: BMP 6B

Inflow Area = 0.640 ac, 43.75% Impervious, Inflow Depth > 0.73" for 1-Year (Rpv) event
 Inflow = 0.55 cfs @ 12.13 hrs, Volume= 0.039 af
 Outflow = 0.07 cfs @ 13.08 hrs, Volume= 0.039 af, Atten= 87%, Lag= 56.8 min
 Discarded = 0.07 cfs @ 13.08 hrs, Volume= 0.039 af
 Primary = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
 Peak Elev= 18.19' @ 13.08 hrs Surf.Area= 0.031 ac Storage= 0.013 af

Plug-Flow detention time= 68.2 min calculated for 0.039 af (99% of inflow)
 Center-of-Mass det. time= 66.8 min (872.6 - 805.8)

Volume	Invert	Avail.Storage	Storage Description
#1	17.15'	0.025 af	6.00'W x 225.00'L x 2.00'H Prismatic 0.062 af Overall x 40.0% Voids
#2	19.15'	0.105 af	6.00'W x 225.00'L x 2.00'H Prismatic Z=2.0
		0.130 af	Total Available Storage

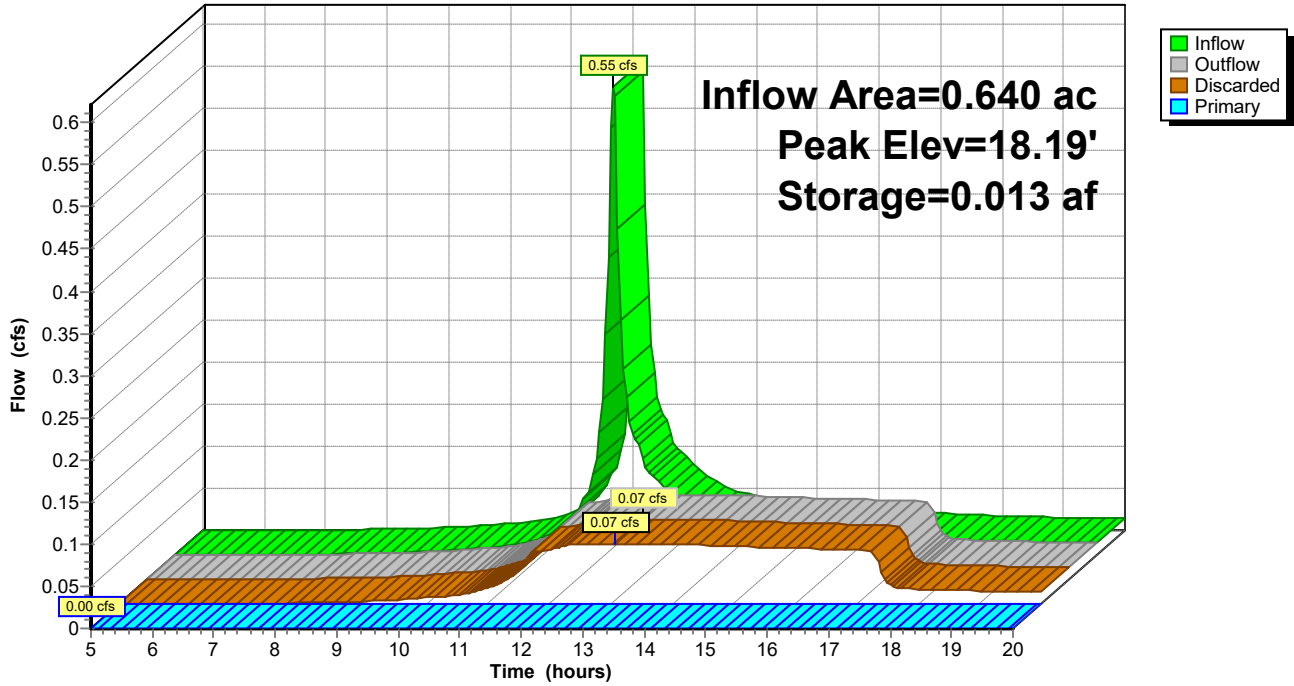
Device	Routing	Invert	Outlet Devices
#1	Discarded	17.15'	2.000 in/hr Exfiltration over Surface area Conductivity to Groundwater Elevation = 10.00'
#2	Primary	21.00'	14.0' long (Profile 1) Broad-Crested Rectangular Weir Head (feet) 0.49 0.98 1.48 Coef. (English) 2.92 3.37 3.59

Discarded OutFlow Max=0.07 cfs @ 13.08 hrs HW=18.19' (Free Discharge)
 ↑1=Exfiltration (Controls 0.07 cfs)

Primary OutFlow Max=0.00 cfs @ 5.00 hrs HW=17.15' (Free Discharge)
 ↑2=Broad-Crested Rectangular Weir (Controls 0.00 cfs)

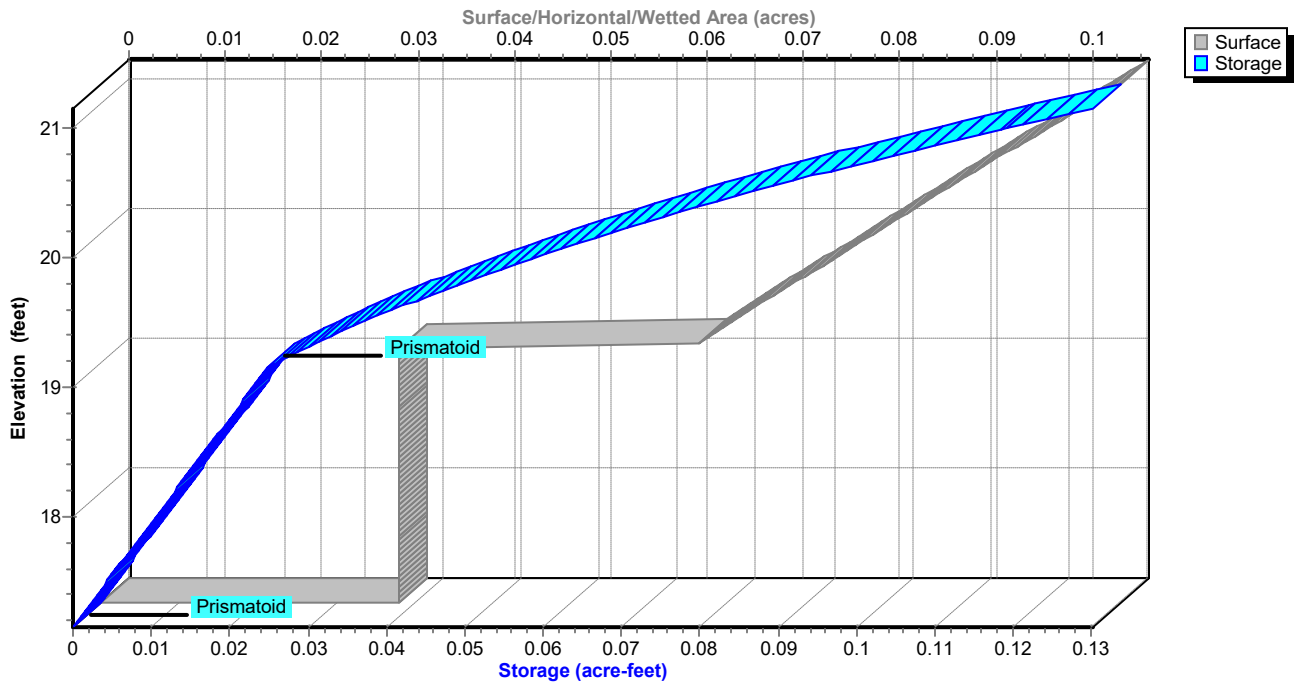
Pond BMP-6B: BMP 6B

Hydrograph



Pond BMP-6B: BMP 6B

Stage-Area-Storage



Summary for Subcatchment SC-7A: 7A

Runoff = 0.32 cfs @ 12.14 hrs, Volume= 0.023 af, Depth> 0.35"

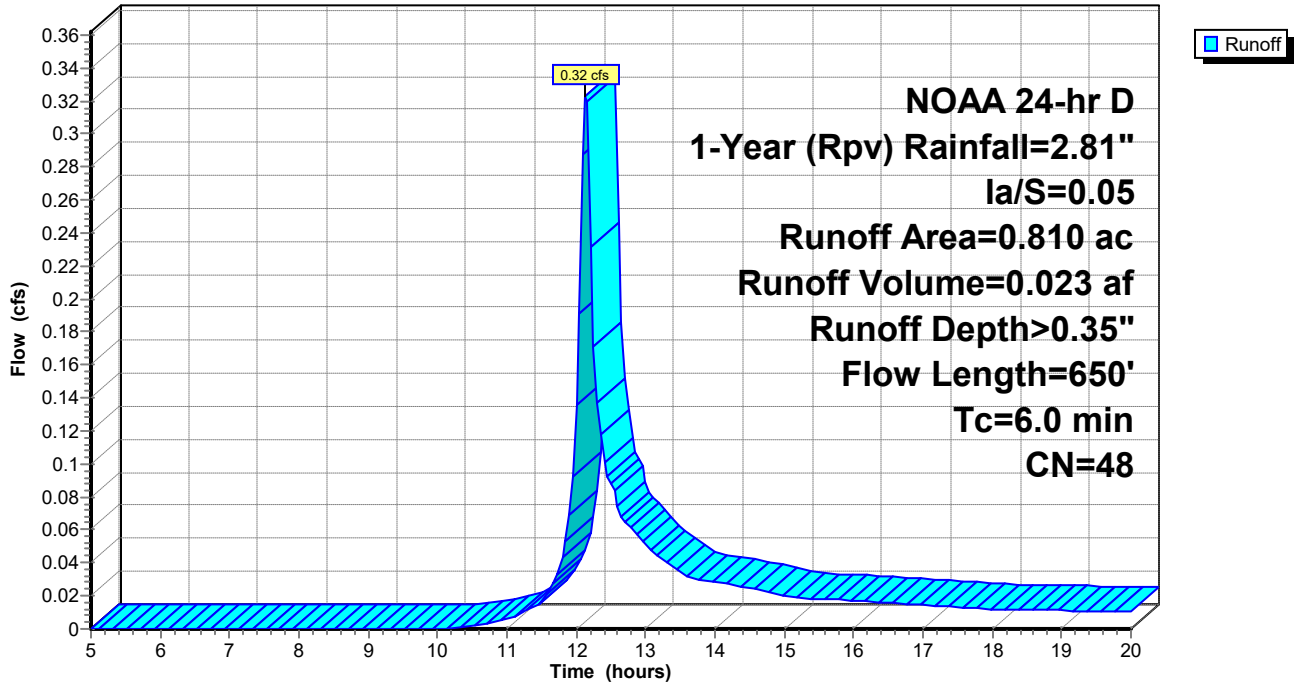
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
 NOAA 24-hr D 1-Year (Rpv) Rainfall=2.81", Ia/S=0.05

Area (ac)	CN	Description
* 0.680	39	
* 0.130	98	
0.810	48	Weighted Average
0.680		83.95% Pervious Area
0.130		16.05% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.2	11	0.0380	1.16		Sheet Flow, Smooth surfaces n= 0.011 P2= 3.30"
0.2	37	0.1790	2.96		Shallow Concentrated Flow, Short Grass Pasture Kv= 7.0 fps
1.6	602	0.0130	6.11	131.95	Channel Flow, Area= 21.6 sf Perim= 19.2' r= 1.13' n= 0.030
2.0	650	Total, Increased to minimum Tc = 6.0 min			

Subcatchment SC-7A: 7A

Hydrograph



Summary for Pond BMP-7A: BMP 7A

Inflow Area = 0.810 ac, 16.05% Impervious, Inflow Depth > 0.35" for 1-Year (Rpv) event
 Inflow = 0.32 cfs @ 12.14 hrs, Volume= 0.023 af
 Outflow = 0.05 cfs @ 13.12 hrs, Volume= 0.023 af, Atten= 86%, Lag= 58.7 min
 Discarded = 0.05 cfs @ 13.12 hrs, Volume= 0.023 af
 Primary = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af
 Secondary = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
 Peak Elev= 18.51' @ 13.12 hrs Surf.Area= 0.021 ac Storage= 0.007 af

Plug-Flow detention time= 59.9 min calculated for 0.023 af (99% of inflow)
 Center-of-Mass det. time= 58.4 min (887.2 - 828.8)

Volume	Invert	Avail.Storage	Storage Description
#1	17.65'	0.017 af	6.00'W x 150.00'L x 2.00'H Prismatoid 0.041 af Overall x 40.0% Voids
#2	19.65'	0.071 af	6.00'W x 150.00'L x 2.00'H Prismatoid Z=2.0 -Impervious
		0.087 af	Total Available Storage

Device	Routing	Invert	Outlet Devices
#1	Discarded	17.65'	2.000 in/hr Exfiltration over Surface area Conductivity to Groundwater Elevation = 10.00'
#2	Primary	19.75'	18.0" Round Culvert L= 160.0' RCP, end-section conforming to fill, Ke= 0.500 Inlet / Outlet Invert= 19.75' / 19.25' S= 0.0031 '/' Cc= 0.900 n= 0.012, Flow Area= 1.77 sf
#3	Secondary	21.00'	14.0' long (Profile 1) Broad-Crested Rectangular Weir Head (feet) 0.49 0.98 1.48 Coef. (English) 2.92 3.37 3.59

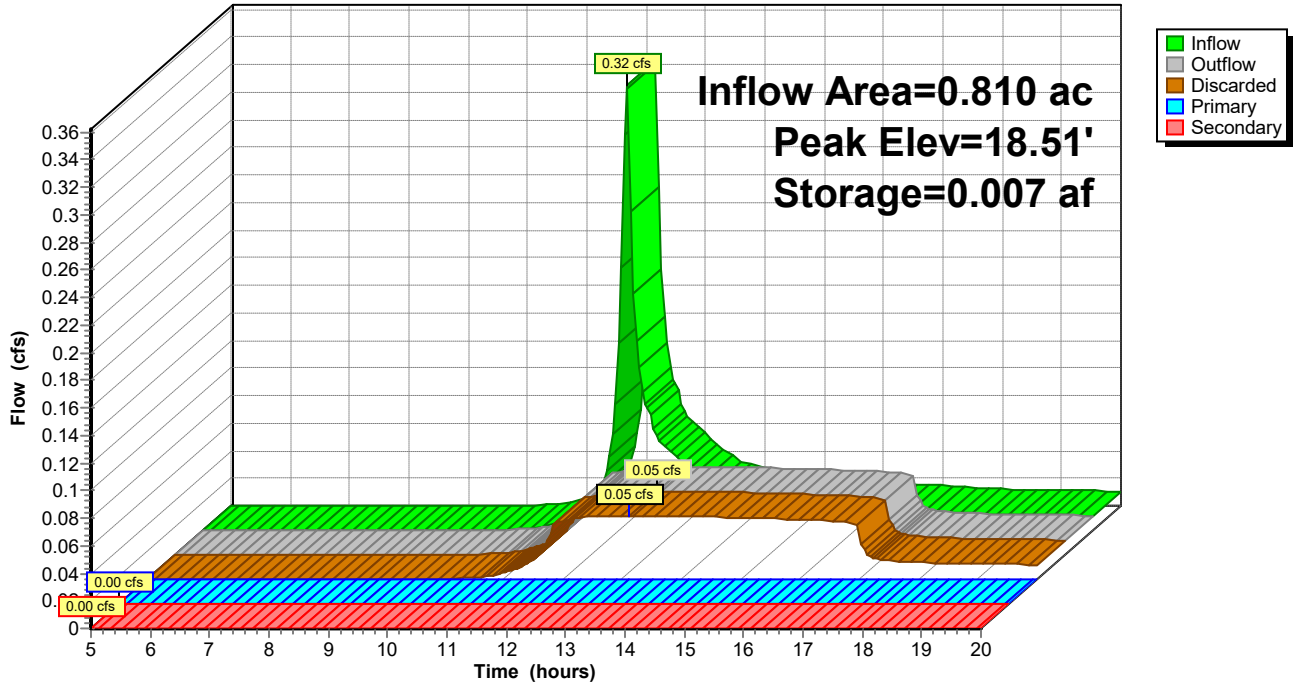
Discarded OutFlow Max=0.05 cfs @ 13.12 hrs HW=18.51' (Free Discharge)
 ↑1=Exfiltration (Controls 0.05 cfs)

Primary OutFlow Max=0.00 cfs @ 5.00 hrs HW=17.65' (Free Discharge)
 ↑2=Culvert (Controls 0.00 cfs)

Secondary OutFlow Max=0.00 cfs @ 5.00 hrs HW=17.65' (Free Discharge)
 ↑3=Broad-Crested Rectangular Weir (Controls 0.00 cfs)

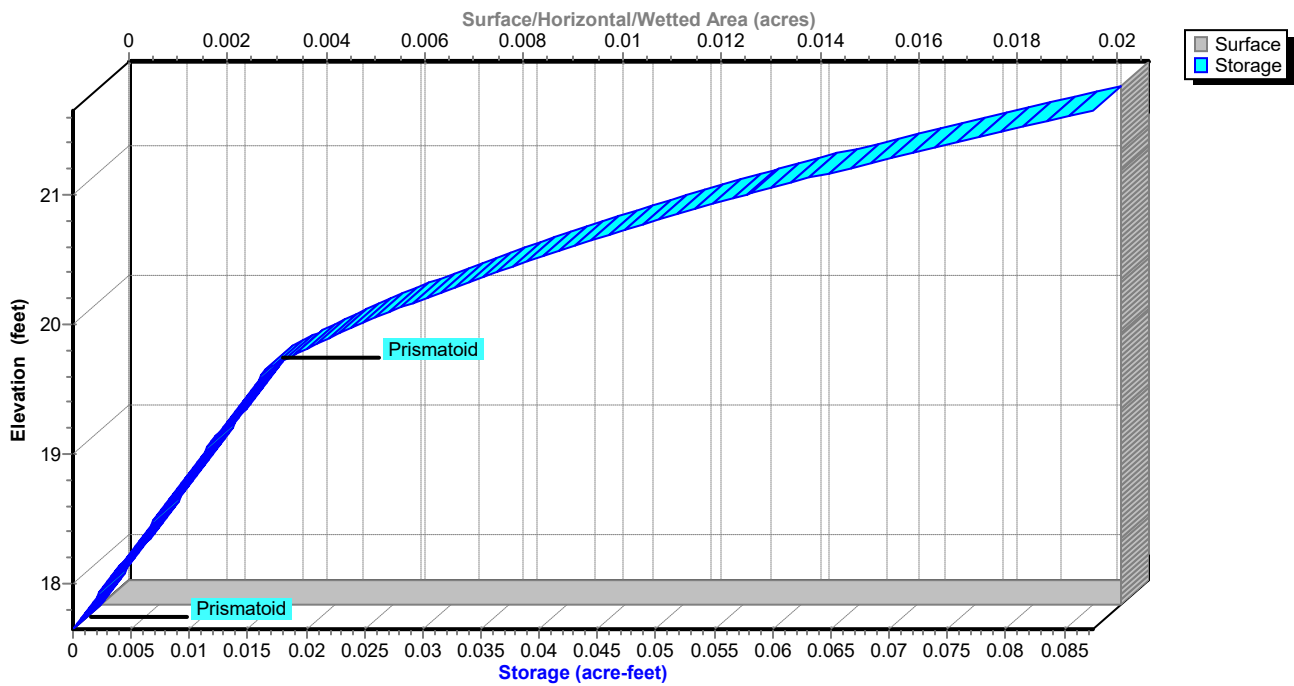
Pond BMP-7A: BMP 7A

Hydrograph



Pond BMP-7A: BMP 7A

Stage-Area-Storage



Summary for Subcatchment SC-7B: 7B

Runoff = 0.19 cfs @ 12.14 hrs, Volume= 0.013 af, Depth> 0.49"

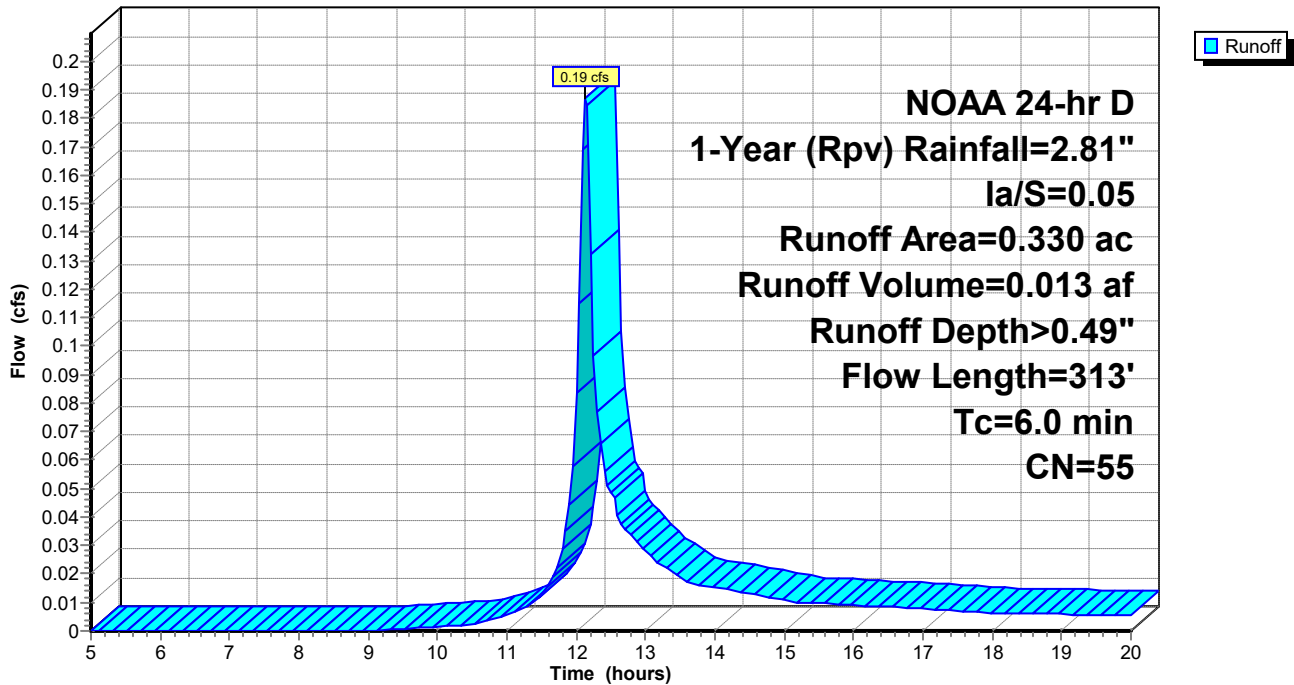
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
 NOAA 24-hr D 1-Year (Rpv) Rainfall=2.81", Ia/S=0.05

Area (ac)	CN	Description
* 0.240	39	
* 0.090	98	
0.330	55	Weighted Average
0.240		72.73% Pervious Area
0.090		27.27% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.2	11	0.0345	1.12		Sheet Flow, Smooth surfaces n= 0.011 P2= 3.30"
0.1	23	0.1870	3.03		Shallow Concentrated Flow, Short Grass Pasture Kv= 7.0 fps
2.5	279	0.0012	1.84	38.01	Channel Flow, Area= 20.7 sf Perim= 18.7' r= 1.11' n= 0.030
2.8	313	Total, Increased to minimum Tc = 6.0 min			

Subcatchment SC-7B: 7B

Hydrograph



Summary for Pond BMP-7B: BMP 7B

Inflow Area = 0.330 ac, 27.27% Impervious, Inflow Depth > 0.49" for 1-Year (Rpv) event
 Inflow = 0.19 cfs @ 12.14 hrs, Volume= 0.013 af
 Outflow = 0.03 cfs @ 12.92 hrs, Volume= 0.013 af, Atten= 84%, Lag= 46.7 min
 Discarded = 0.03 cfs @ 12.92 hrs, Volume= 0.013 af
 Primary = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
 Peak Elev= 18.33' @ 12.92 hrs Surf.Area= 0.014 ac Storage= 0.004 af

Plug-Flow detention time= 44.5 min calculated for 0.013 af (99% of inflow)
 Center-of-Mass det. time= 43.1 min (862.0 - 818.9)

Volume	Invert	Avail.Storage	Storage Description
#1	17.65'	0.011 af	6.00'W x 100.00'L x 2.00'H Prismatoid 0.028 af Overall x 40.0% Voids
#2	19.65'	0.048 af	6.00'W x 100.00'L x 2.00'H Prismatoid Z=2.0 -Impervious
		0.059 af	Total Available Storage

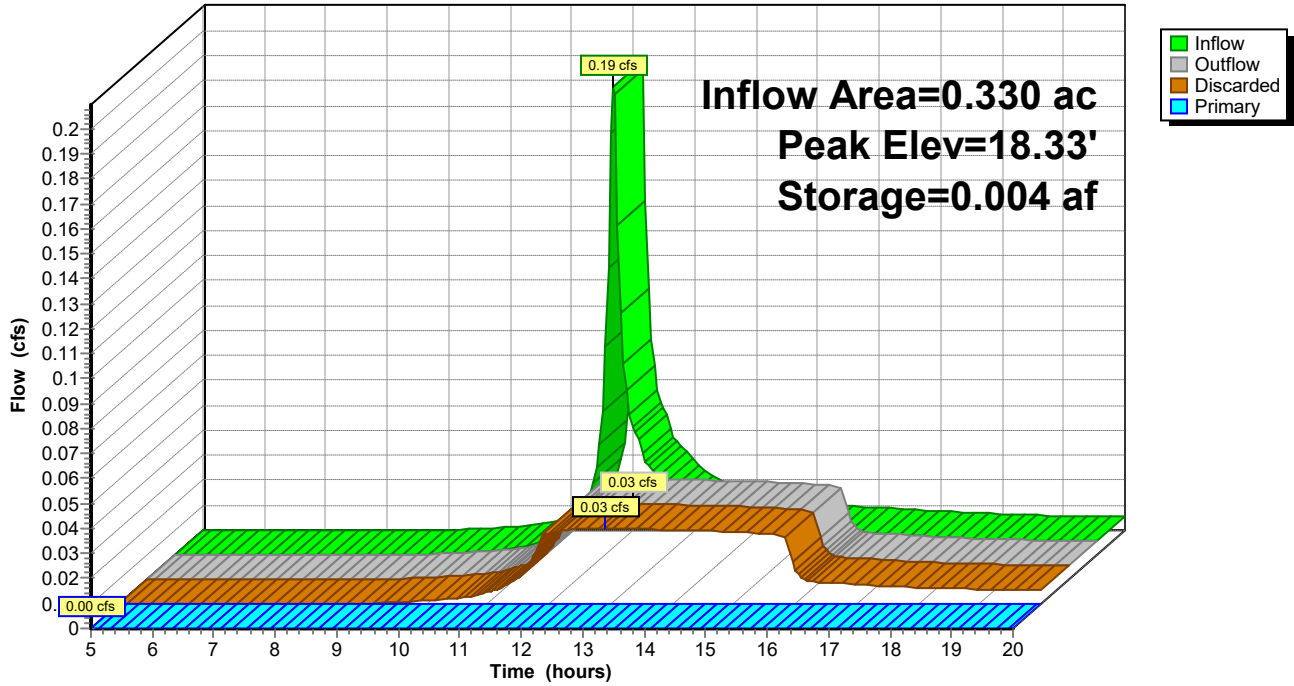
Device	Routing	Invert	Outlet Devices
#1	Discarded	17.65'	2.000 in/hr Exfiltration over Surface area Conductivity to Groundwater Elevation = 10.00'
#2	Primary	19.75'	18.0" Round Culvert L= 160.0' RCP, end-section conforming to fill, Ke= 0.500 Inlet / Outlet Invert= 19.75' / 19.25' S= 0.0031 '/' Cc= 0.900 n= 0.012, Flow Area= 1.77 sf
#3	Primary	21.00'	14.0' long (Profile 1) Broad-Crested Rectangular Weir Head (feet) 0.49 0.98 1.48 Coef. (English) 2.92 3.37 3.59

Discarded OutFlow Max=0.03 cfs @ 12.92 hrs HW=18.33' (Free Discharge)
 ↑1=Exfiltration (Controls 0.03 cfs)

Primary OutFlow Max=0.00 cfs @ 5.00 hrs HW=17.65' (Free Discharge)
 ↑2=Culvert (Controls 0.00 cfs)
 ↑3=Broad-Crested Rectangular Weir (Controls 0.00 cfs)

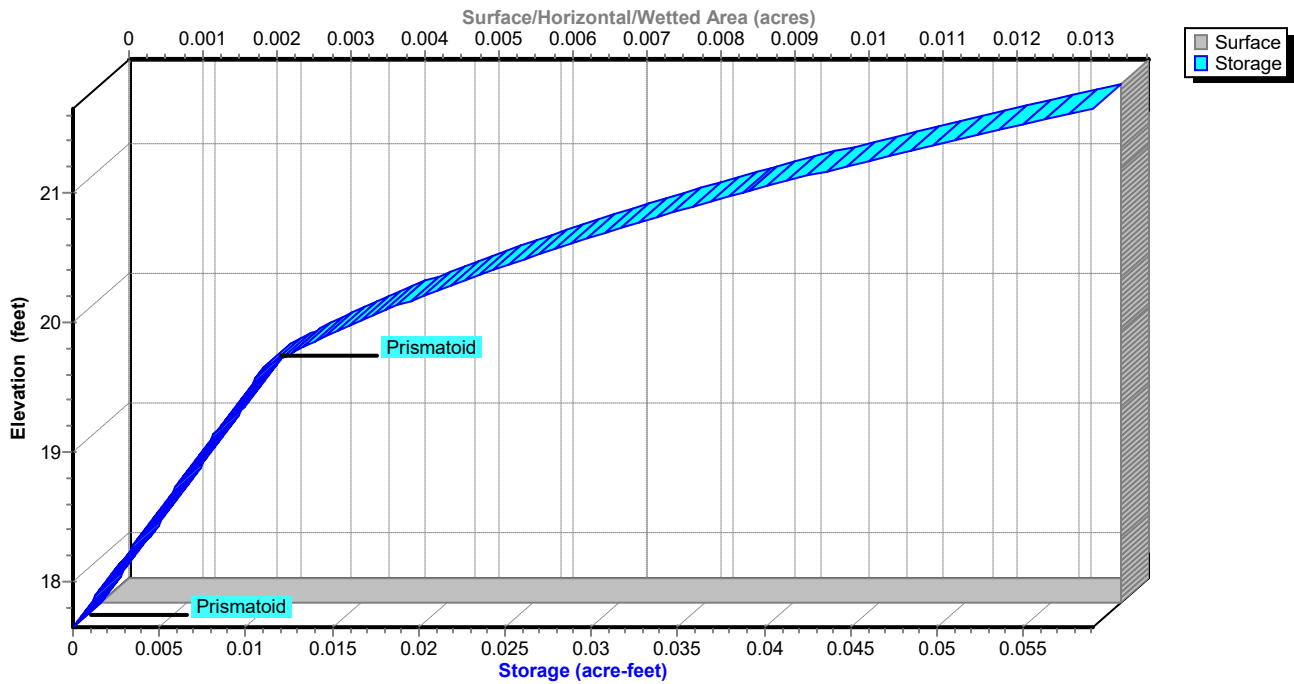
Pond BMP-7B: BMP 7B

Hydrograph



Pond BMP-7B: BMP 7B

Stage-Area-Storage



Summary for Subcatchment SC-7C: 7C

Runoff = 0.37 cfs @ 12.13 hrs, Volume= 0.026 af, Depth> 0.76"

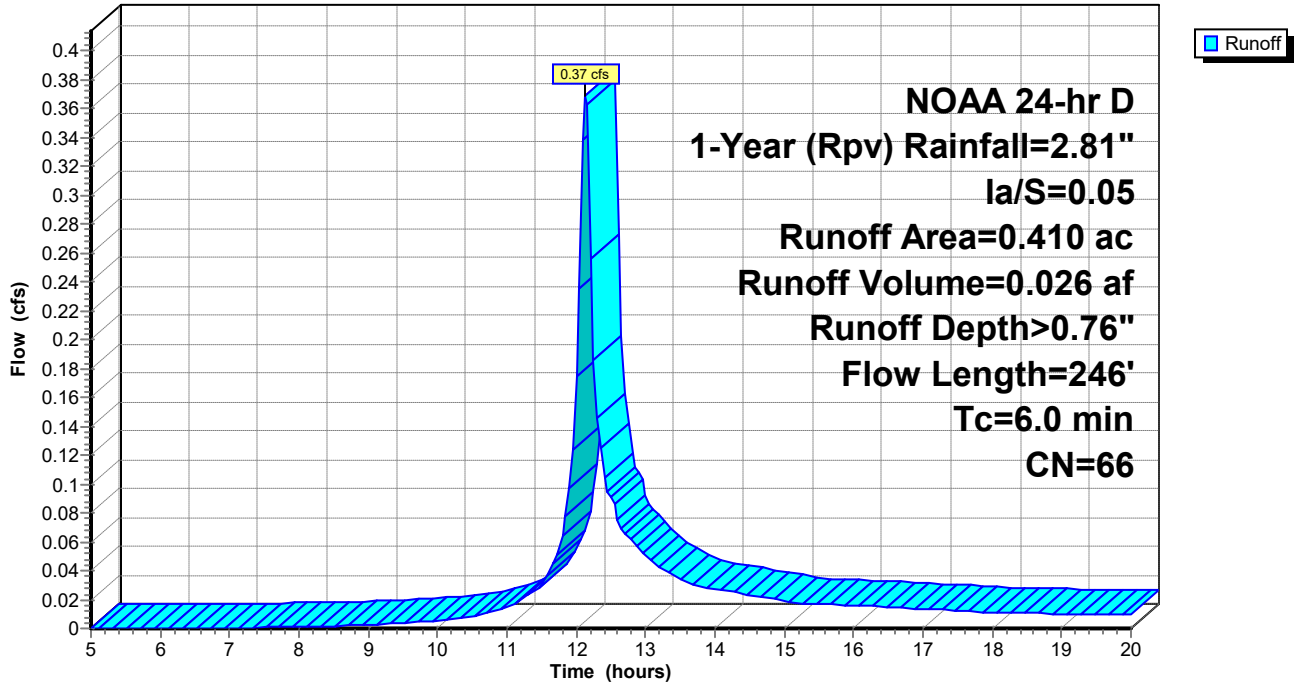
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
 NOAA 24-hr D 1-Year (Rpv) Rainfall=2.81", Ia/S=0.05

Area (ac)	CN	Description
* 0.220	39	
* 0.190	98	
0.410	66	Weighted Average
0.220		53.66% Pervious Area
0.190		46.34% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.4	35	0.0310	1.35		Sheet Flow, Smooth surfaces n= 0.011 P2= 3.30"
0.1	10	0.0400	1.40		Shallow Concentrated Flow, Short Grass Pasture Kv= 7.0 fps
0.1	10	0.0200	2.87		Shallow Concentrated Flow, Paved Kv= 20.3 fps
0.1	26	0.1850	3.01		Shallow Concentrated Flow, Short Grass Pasture Kv= 7.0 fps
0.8	165	0.0042	3.36	66.82	Channel Flow, Area= 19.9 sf Perim= 18.6' r= 1.07' n= 0.030
1.5	246	Total, Increased to minimum Tc = 6.0 min			

Subcatchment SC-7C: 7C

Hydrograph



Summary for Pond BMP-7C: BMP 7C

Inflow Area = 0.410 ac, 46.34% Impervious, Inflow Depth > 0.76" for 1-Year (Rpv) event
 Inflow = 0.37 cfs @ 12.13 hrs, Volume= 0.026 af
 Outflow = 0.04 cfs @ 13.25 hrs, Volume= 0.026 af, Atten= 89%, Lag= 67.2 min
 Discarded = 0.04 cfs @ 13.25 hrs, Volume= 0.026 af
 Primary = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
 Peak Elev= 18.61' @ 13.25 hrs Surf.Area= 0.017 ac Storage= 0.009 af

Plug-Flow detention time= 91.8 min calculated for 0.026 af (99% of inflow)
 Center-of-Mass det. time= 90.4 min (894.9 - 804.5)

Volume	Invert	Avail.Storage	Storage Description
#1	17.25'	0.014 af	6.00'W x 125.00'L x 2.00'H Prismatic 0.034 af Overall x 40.0% Voids
#2	19.25'	0.059 af	6.00'W x 125.00'L x 2.00'H Prismatic Z=2.0 -Impervious
		0.073 af	Total Available Storage

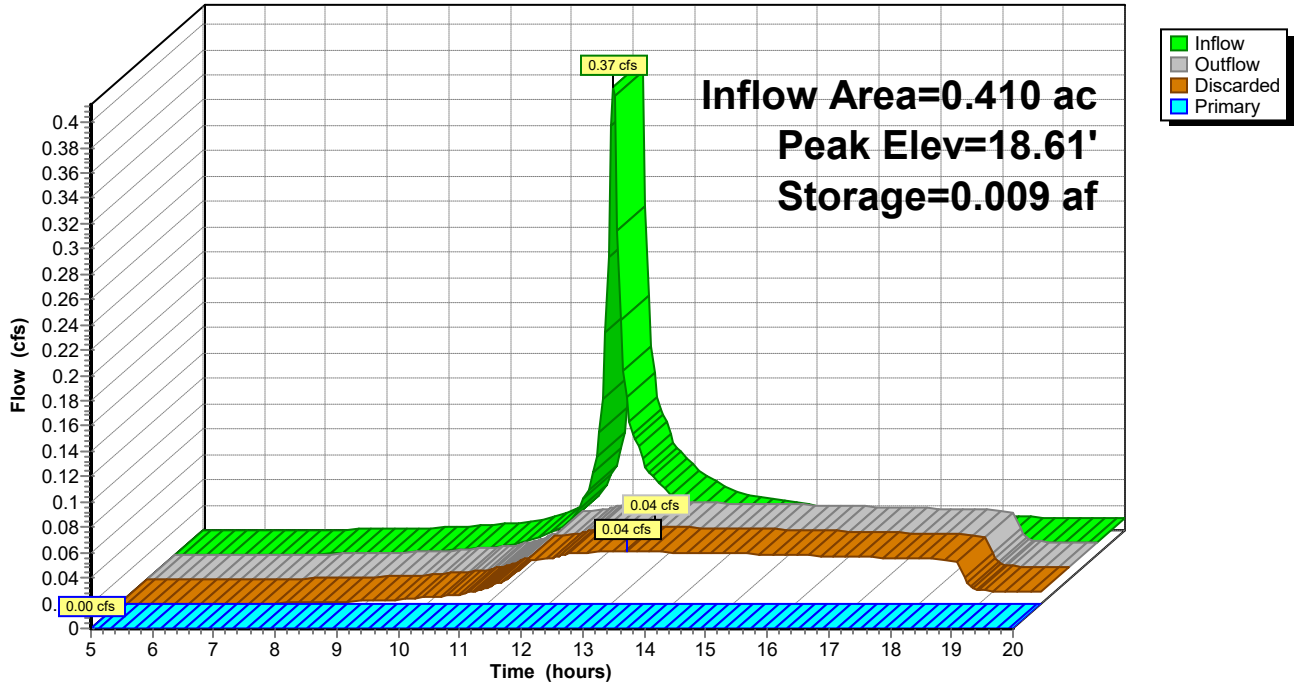
Device	Routing	Invert	Outlet Devices
#1	Discarded	17.25'	2.000 in/hr Exfiltration over Surface area Conductivity to Groundwater Elevation = 10.00'
#2	Primary	21.00'	14.0' long (Profile 1) Broad-Crested Rectangular Weir Head (feet) 0.49 0.98 1.48 Coef. (English) 2.92 3.37 3.59

Discarded OutFlow Max=0.04 cfs @ 13.25 hrs HW=18.61' (Free Discharge)
 ↑1=Exfiltration (Controls 0.04 cfs)

Primary OutFlow Max=0.00 cfs @ 5.00 hrs HW=17.25' (Free Discharge)
 ↑2=Broad-Crested Rectangular Weir (Controls 0.00 cfs)

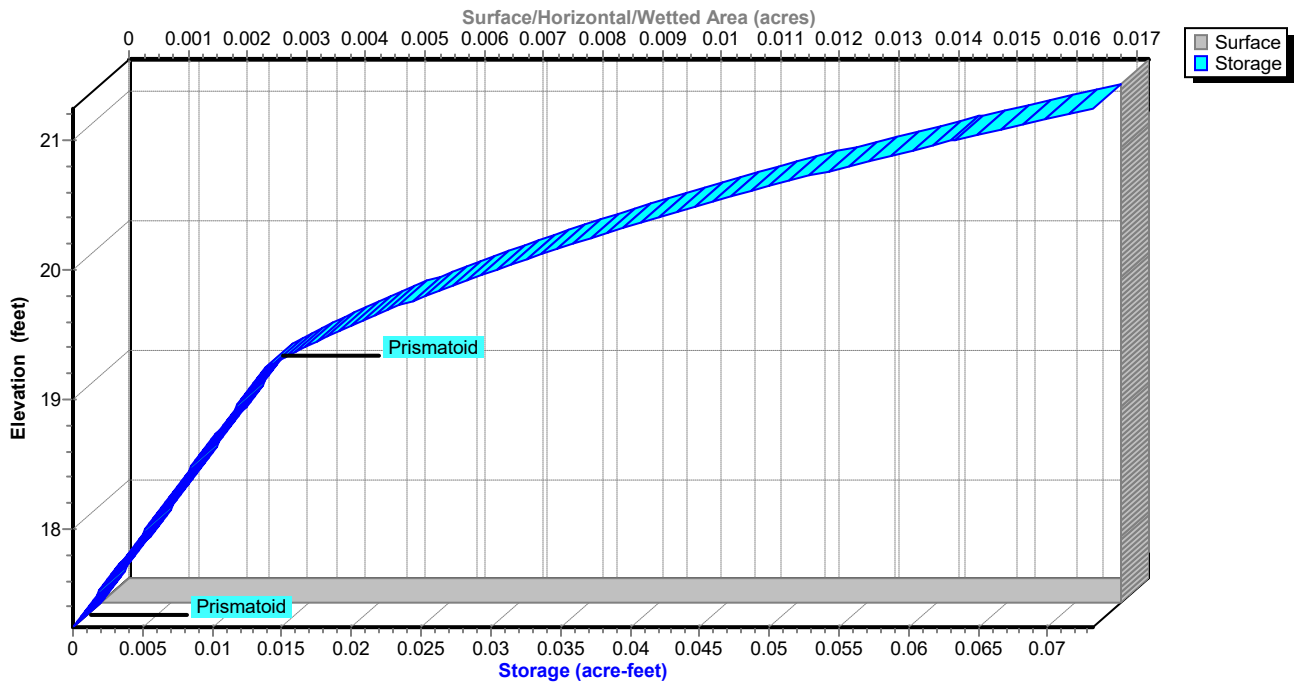
Pond BMP-7C: BMP 7C

Hydrograph



Pond BMP-7C: BMP 7C

Stage-Area-Storage



Summary for Subcatchment SC-7D: 7D

Runoff = 0.35 cfs @ 12.13 hrs, Volume= 0.025 af, Depth> 0.76"

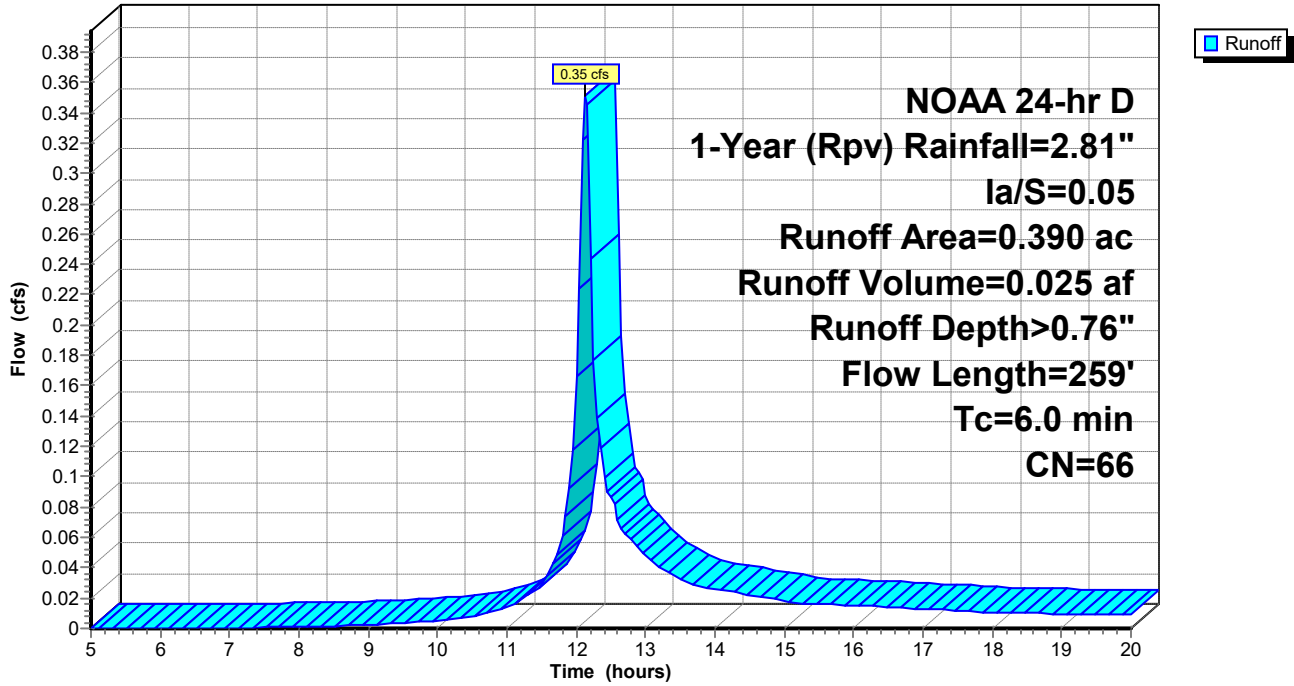
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
 NOAA 24-hr D 1-Year (Rpv) Rainfall=2.81", Ia/S=0.05

Area (ac)	CN	Description
* 0.210	39	
* 0.180	98	
0.390	66	Weighted Average
0.210		53.85% Pervious Area
0.180		46.15% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.5	38	0.0254	1.27		Sheet Flow, Smooth surfaces n= 0.011 P2= 3.30"
0.1	10	0.0394	1.39		Shallow Concentrated Flow, Short Grass Pasture Kv= 7.0 fps
0.1	10	0.0210	2.94		Shallow Concentrated Flow, Paved Kv= 20.3 fps
0.2	31	0.1840	3.00		Shallow Concentrated Flow, Short Grass Pasture Kv= 7.0 fps
0.7	170	0.0070	4.35	80.90	Channel Flow, Area= 18.6 sf Perim= 17.3' r= 1.08' n= 0.030
1.6	259	Total, Increased to minimum Tc = 6.0 min			

Subcatchment SC-7D: 7D

Hydrograph



Summary for Pond BMP-7D: BMP 7D

Inflow Area = 0.390 ac, 46.15% Impervious, Inflow Depth > 0.76" for 1-Year (Rpv) event
 Inflow = 0.35 cfs @ 12.13 hrs, Volume= 0.025 af
 Outflow = 0.05 cfs @ 13.04 hrs, Volume= 0.025 af, Atten= 87%, Lag= 54.1 min
 Discarded = 0.05 cfs @ 13.04 hrs, Volume= 0.025 af
 Primary = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
 Peak Elev= 18.21' @ 13.04 hrs Surf.Area= 0.021 ac Storage= 0.008 af

Plug-Flow detention time= 62.2 min calculated for 0.025 af (100% of inflow)
 Center-of-Mass det. time= 61.0 min (865.6 - 804.5)

Volume	Invert	Avail.Storage	Storage Description
#1	17.25'	0.017 af	6.00'W x 150.00'L x 2.00'H Prismatic 0.041 af Overall x 40.0% Voids
#2	19.25'	0.071 af	6.00'W x 150.00'L x 2.00'H Prismatic Z=2.0
		0.087 af	Total Available Storage

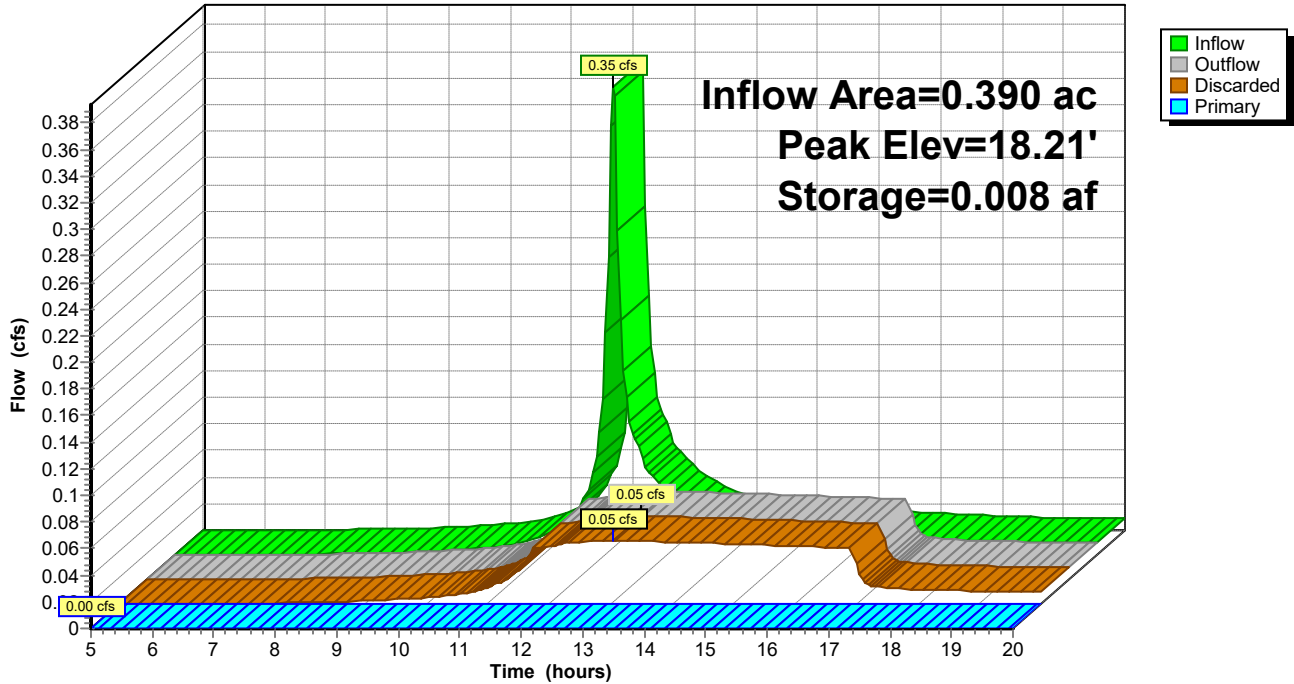
Device	Routing	Invert	Outlet Devices
#1	Discarded	17.25'	2.000 in/hr Exfiltration over Surface area Conductivity to Groundwater Elevation = 10.00'
#2	Primary	21.00'	14.0' long (Profile 1) Broad-Crested Rectangular Weir Head (feet) 0.49 0.98 1.48 Coef. (English) 2.92 3.37 3.59

Discarded OutFlow Max=0.05 cfs @ 13.04 hrs HW=18.21' (Free Discharge)
 ↑1=Exfiltration (Controls 0.05 cfs)

Primary OutFlow Max=0.00 cfs @ 5.00 hrs HW=17.25' (Free Discharge)
 ↑2=Broad-Crested Rectangular Weir (Controls 0.00 cfs)

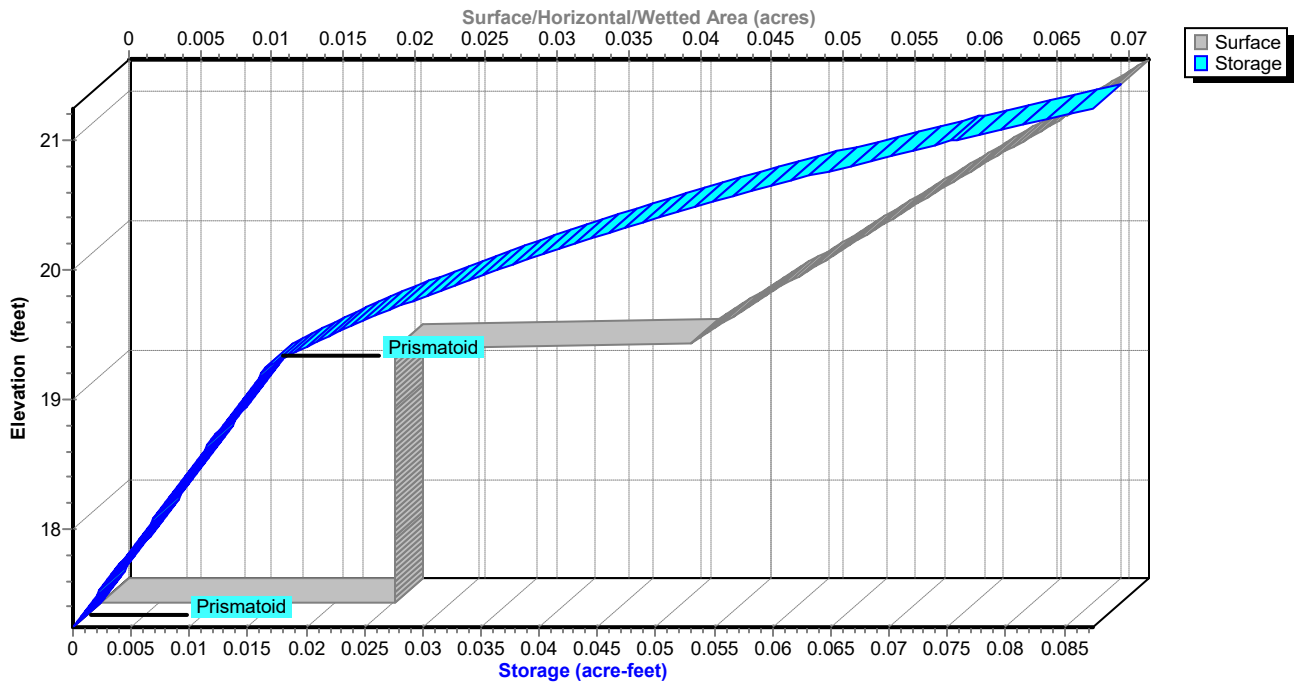
Pond BMP-7D: BMP 7D

Hydrograph



Pond BMP-7D: BMP 7D

Stage-Area-Storage



Summary for Subcatchment SC-8A: 8A

Runoff = 0.27 cfs @ 12.14 hrs, Volume= 0.019 af, Depth> 0.53"

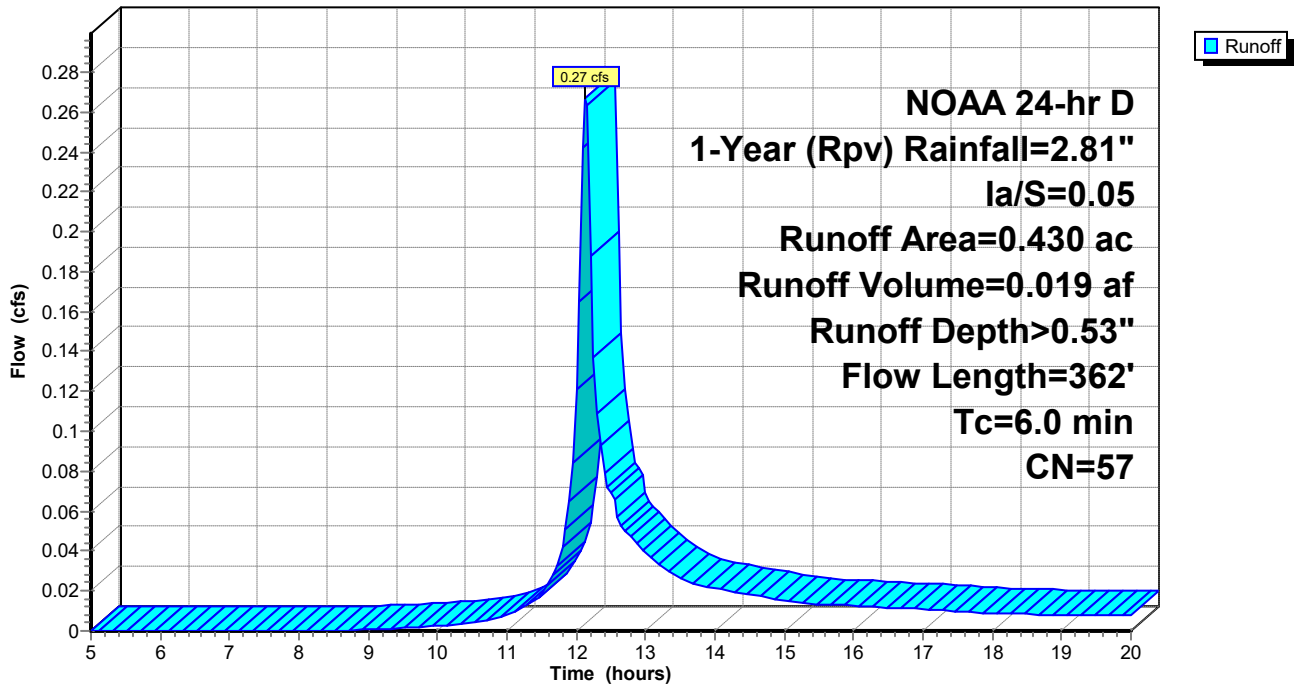
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
 NOAA 24-hr D 1-Year (Rpv) Rainfall=2.81", Ia/S=0.05

Area (ac)	CN	Description
* 0.300	39	
* 0.130	98	
0.430	57	Weighted Average
0.300		69.77% Pervious Area
0.130		30.23% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.2	17	0.0420	1.32		Sheet Flow, Smooth surfaces n= 0.011 P2= 3.30"
0.1	16	0.1670	2.86		Shallow Concentrated Flow, Short Grass Pasture Kv= 7.0 fps
1.3	329	0.0072	4.36	98.93	Channel Flow, Area= 22.7 sf Perim= 21.5' r= 1.06' n= 0.030
1.6	362	Total, Increased to minimum Tc = 6.0 min			

Subcatchment SC-8A: 8A

Hydrograph



Summary for Pond BMP-8A: BMP 8A

Inflow Area = 0.430 ac, 30.23% Impervious, Inflow Depth > 0.53" for 1-Year (Rpv) event
 Inflow = 0.27 cfs @ 12.14 hrs, Volume= 0.019 af
 Outflow = 0.03 cfs @ 13.29 hrs, Volume= 0.019 af, Atten= 88%, Lag= 69.2 min
 Discarded = 0.03 cfs @ 13.29 hrs, Volume= 0.019 af
 Primary = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af
 Secondary = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
 Peak Elev= 21.00' @ 13.29 hrs Surf.Area= 0.014 ac Storage= 0.007 af

Plug-Flow detention time= 85.7 min calculated for 0.019 af (100% of inflow)
 Center-of-Mass det. time= 84.4 min (900.7 - 816.2)

Volume	Invert	Avail.Storage	Storage Description
#1	19.80'	0.011 af	6.00'W x 100.00'L x 2.00'H Prismatoid 0.028 af Overall x 40.0% Voids
#2	21.80'	0.048 af	6.00'W x 100.00'L x 2.00'H Prismatoid Z=2.0 -Impervious
		0.059 af	Total Available Storage

Device	Routing	Invert	Outlet Devices
#1	Discarded	19.80'	2.000 in/hr Exfiltration over Surface area Conductivity to Groundwater Elevation = 10.00'
#2	Secondary	23.00'	14.0' long (Profile 1) Broad-Crested Rectangular Weir Head (feet) 0.49 0.98 1.48 Coef. (English) 2.92 3.37 3.59
#3	Primary	21.80'	18.0" Round Culvert L= 80.0' RCP, end-section conforming to fill, Ke= 0.500 Inlet / Outlet Invert= 21.80' / 20.80' S= 0.0125 '/' Cc= 0.900 n= 0.012, Flow Area= 1.77 sf

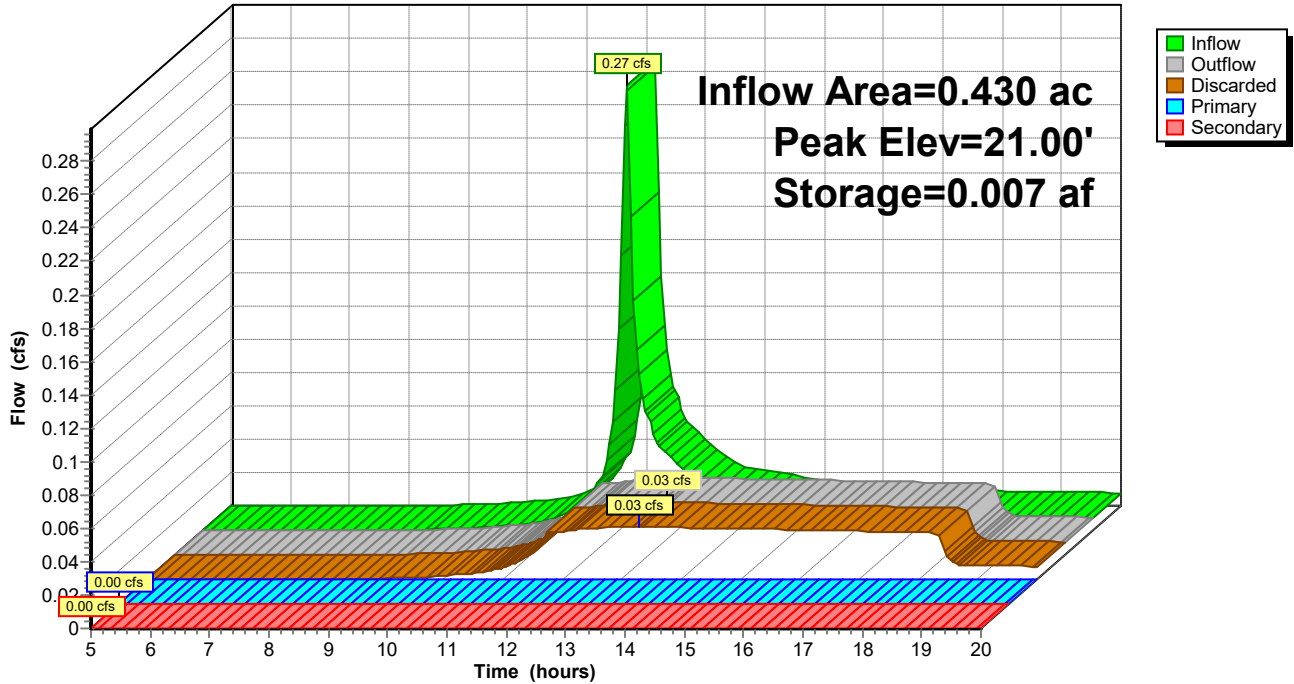
Discarded OutFlow Max=0.03 cfs @ 13.29 hrs HW=21.00' (Free Discharge)
 ↑1=Exfiltration (Controls 0.03 cfs)

Primary OutFlow Max=0.00 cfs @ 5.00 hrs HW=19.80' (Free Discharge)
 ↑3=Culvert (Controls 0.00 cfs)

Secondary OutFlow Max=0.00 cfs @ 5.00 hrs HW=19.80' (Free Discharge)
 ↑2=Broad-Crested Rectangular Weir (Controls 0.00 cfs)

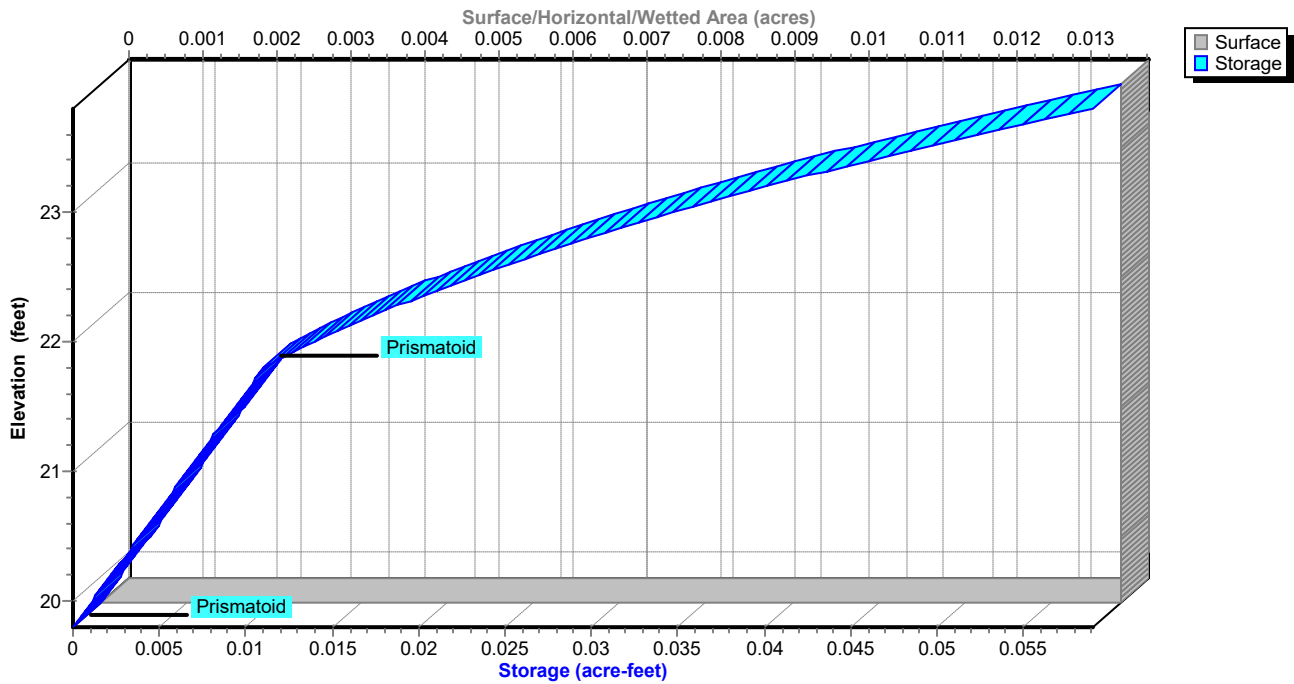
Pond BMP-8A: BMP 8A

Hydrograph



Pond BMP-8A: BMP 8A

Stage-Area-Storage



Summary for Subcatchment SC-8B: 8B

Runoff = 0.09 cfs @ 12.14 hrs, Volume= 0.007 af, Depth> 0.38"

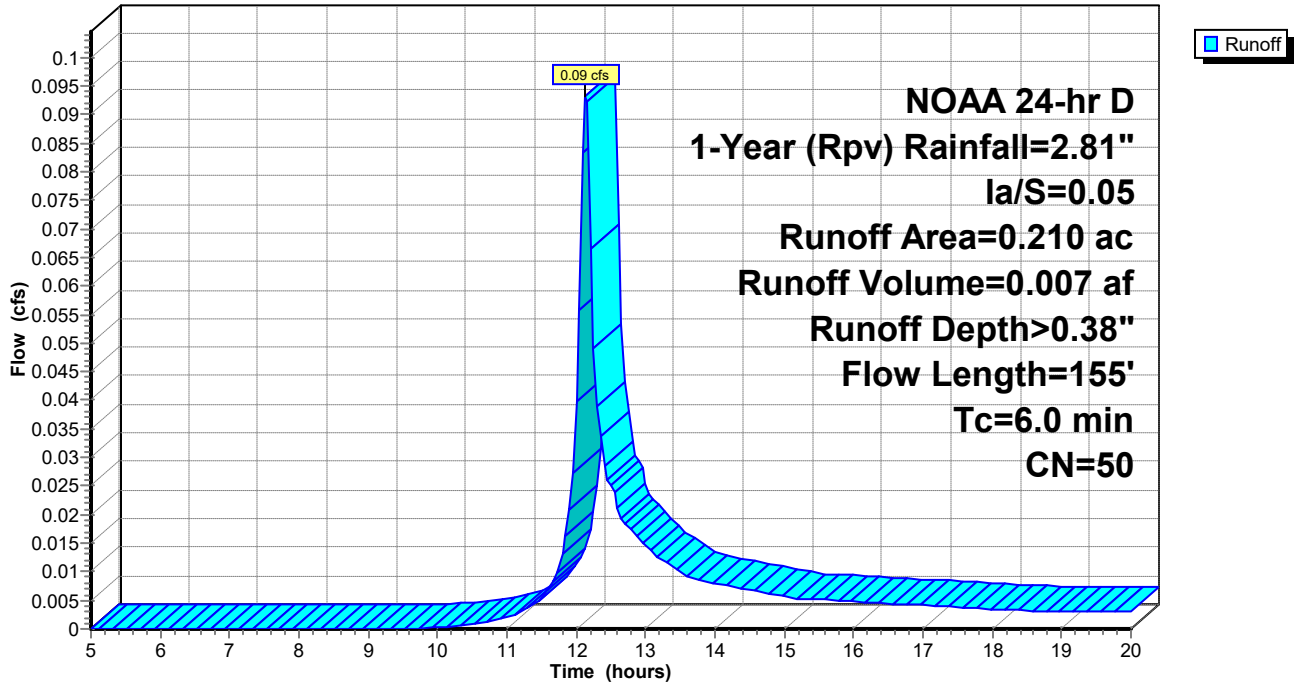
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
 NOAA 24-hr D 1-Year (Rpv) Rainfall=2.81", Ia/S=0.05

Area (ac)	CN	Description
* 0.170	39	
* 0.040	98	
0.210	50	Weighted Average
0.170		80.95% Pervious Area
0.040		19.05% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.2	11	0.0350	1.12		Sheet Flow, Smooth surfaces n= 0.011 P2= 3.30"
0.1	21	0.1170	2.39		Shallow Concentrated Flow, Short Grass Pasture Kv= 7.0 fps
1.5	123	0.0029	1.41	3.65	Channel Flow, Area= 2.6 sf Perim= 6.8' r= 0.38' n= 0.030
1.8	155	Total, Increased to minimum Tc = 6.0 min			

Subcatchment SC-8B: 8B

Hydrograph



Summary for Pond BMP-8B: BMP 8B

Inflow Area = 0.210 ac, 19.05% Impervious, Inflow Depth > 0.38" for 1-Year (Rpv) event
 Inflow = 0.09 cfs @ 12.14 hrs, Volume= 0.007 af
 Outflow = 0.01 cfs @ 12.98 hrs, Volume= 0.007 af, Atten= 84%, Lag= 50.7 min
 Discarded = 0.01 cfs @ 12.98 hrs, Volume= 0.007 af
 Primary = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af
 Secondary = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
 Peak Elev= 20.49' @ 12.98 hrs Surf.Area= 0.007 ac Storage= 0.002 af

Plug-Flow detention time= 46.5 min calculated for 0.007 af (100% of inflow)
 Center-of-Mass det. time= 45.2 min (871.0 - 825.8)

Volume	Invert	Avail.Storage	Storage Description
#1	19.80'	0.006 af	6.00'W x 50.00'L x 2.00'H Prismatic 0.014 af Overall x 40.0% Voids
#2	21.80'	0.025 af	6.00'W x 50.00'L x 2.00'H Prismatic Z=2.0
		0.031 af	Total Available Storage

Device	Routing	Invert	Outlet Devices
#1	Discarded	19.80'	2.000 in/hr Exfiltration over Surface area Conductivity to Groundwater Elevation = 10.00'
#2	Secondary	23.00'	14.0' long (Profile 1) Broad-Crested Rectangular Weir Head (feet) 0.49 0.98 1.48 Coef. (English) 2.92 3.37 3.59
#3	Primary	21.80'	18.0" Round Culvert L= 80.0' RCP, end-section conforming to fill, Ke= 0.500 Inlet / Outlet Invert= 21.80' / 20.80' S= 0.0125 '/ Cc= 0.900 n= 0.012, Flow Area= 1.77 sf

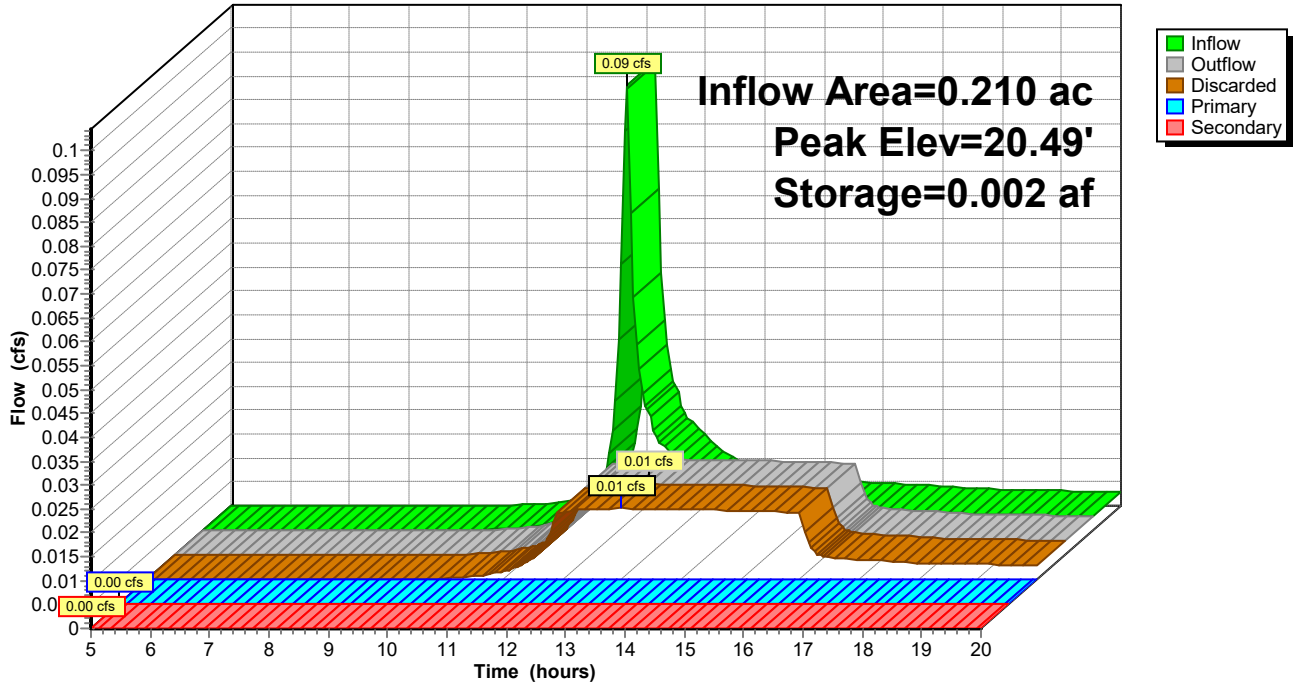
Discarded OutFlow Max=0.01 cfs @ 12.98 hrs HW=20.49' (Free Discharge)
 ↑1=Exfiltration (Controls 0.01 cfs)

Primary OutFlow Max=0.00 cfs @ 5.00 hrs HW=19.80' (Free Discharge)
 ↑3=Culvert (Controls 0.00 cfs)

Secondary OutFlow Max=0.00 cfs @ 5.00 hrs HW=19.80' (Free Discharge)
 ↑2=Broad-Crested Rectangular Weir (Controls 0.00 cfs)

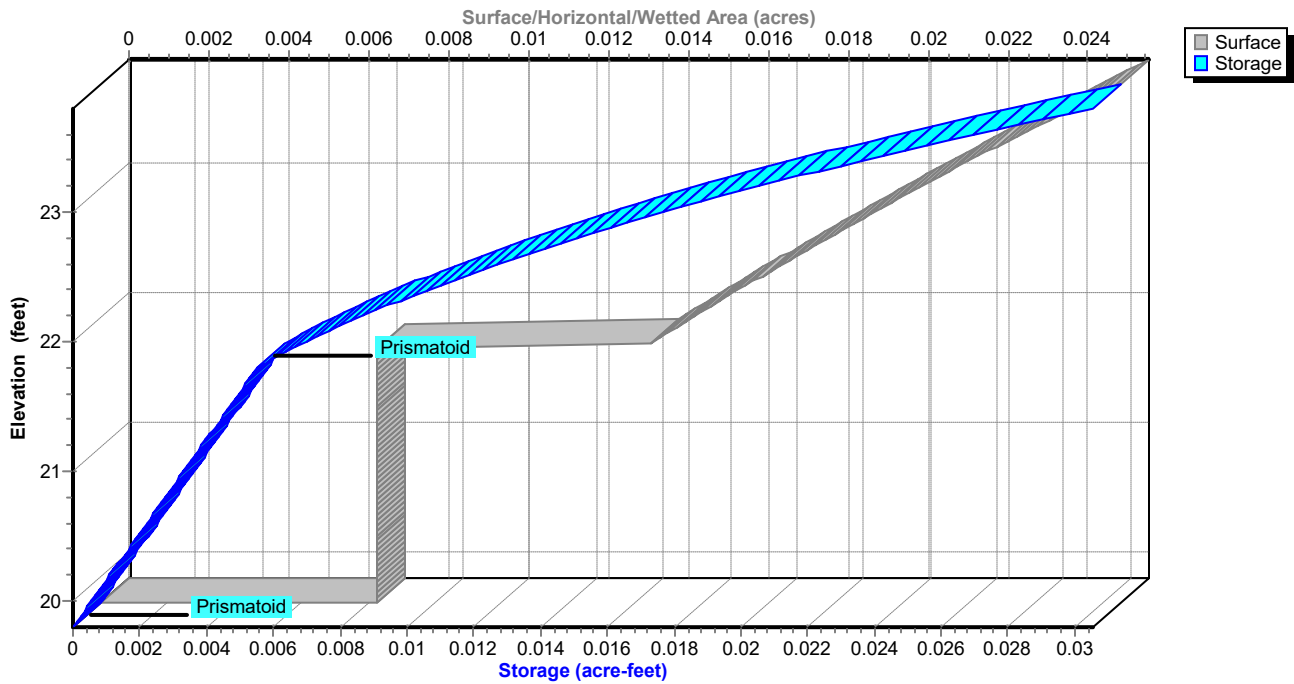
Pond BMP-8B: BMP 8B

Hydrograph



Pond BMP-8B: BMP 8B

Stage-Area-Storage



Summary for Subcatchment SC-8C: 8C

Runoff = 0.80 cfs @ 12.13 hrs, Volume= 0.056 af, Depth> 1.11"

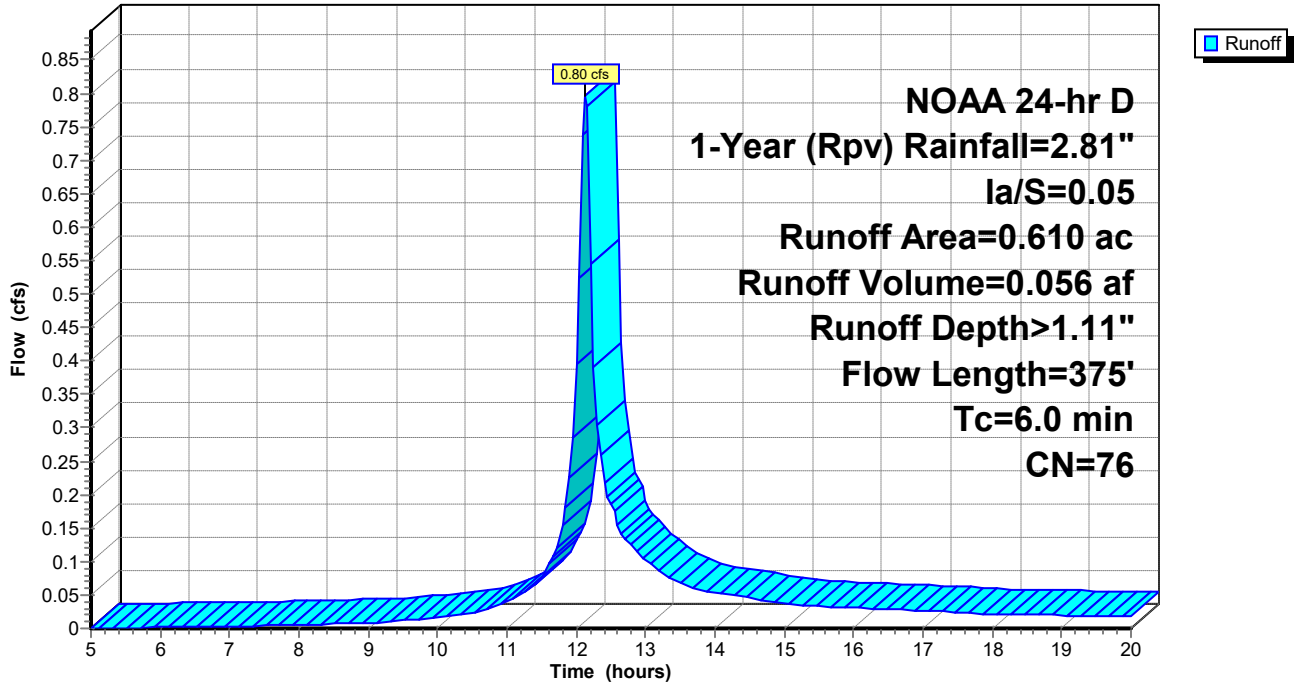
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
 NOAA 24-hr D 1-Year (Rpv) Rainfall=2.81", Ia/S=0.05

Area (ac)	CN	Description
* 0.380	98	
* 0.230	39	
0.610	76	Weighted Average
0.230		37.70% Pervious Area
0.380		62.30% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.0	86	0.0260	1.51		Sheet Flow, Smooth surfaces n= 0.011 P2= 3.30"
0.1	11	0.0410	1.42		Shallow Concentrated Flow, Short Grass Pasture Kv= 7.0 fps
0.0	9	0.0220	3.01		Shallow Concentrated Flow, Paved Kv= 20.3 fps
0.1	10	0.1590	2.79		Shallow Concentrated Flow, Short Grass Pasture Kv= 7.0 fps
1.3	259	0.0066	3.44	40.65	Channel Flow, Area= 11.8 sf Perim= 14.9' r= 0.79' n= 0.030
2.5	375	Total, Increased to minimum Tc = 6.0 min			

Subcatchment SC-8C: 8C

Hydrograph



Summary for Pond BMP-8C: BMP 8C

Inflow Area = 0.610 ac, 62.30% Impervious, Inflow Depth > 1.11" for 1-Year (Rpv) event
 Inflow = 0.80 cfs @ 12.13 hrs, Volume= 0.056 af
 Outflow = 0.09 cfs @ 13.20 hrs, Volume= 0.056 af, Atten= 89%, Lag= 64.1 min
 Discarded = 0.09 cfs @ 13.20 hrs, Volume= 0.056 af
 Primary = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
 Peak Elev= 20.19' @ 13.20 hrs Surf.Area= 0.037 ac Storage= 0.020 af

Plug-Flow detention time= 92.1 min calculated for 0.056 af (100% of inflow)
 Center-of-Mass det. time= 91.1 min (881.7 - 790.6)

Volume	Invert	Avail.Storage	Storage Description
#1	18.80'	0.029 af	8.00'W x 200.00'L x 2.00'H Prismatic 0.073 af Overall x 40.0% Voids
#2	20.80'	0.113 af	8.00'W x 200.00'L x 2.00'H Prismatic Z=2.0 -Impervious
		0.142 af	Total Available Storage

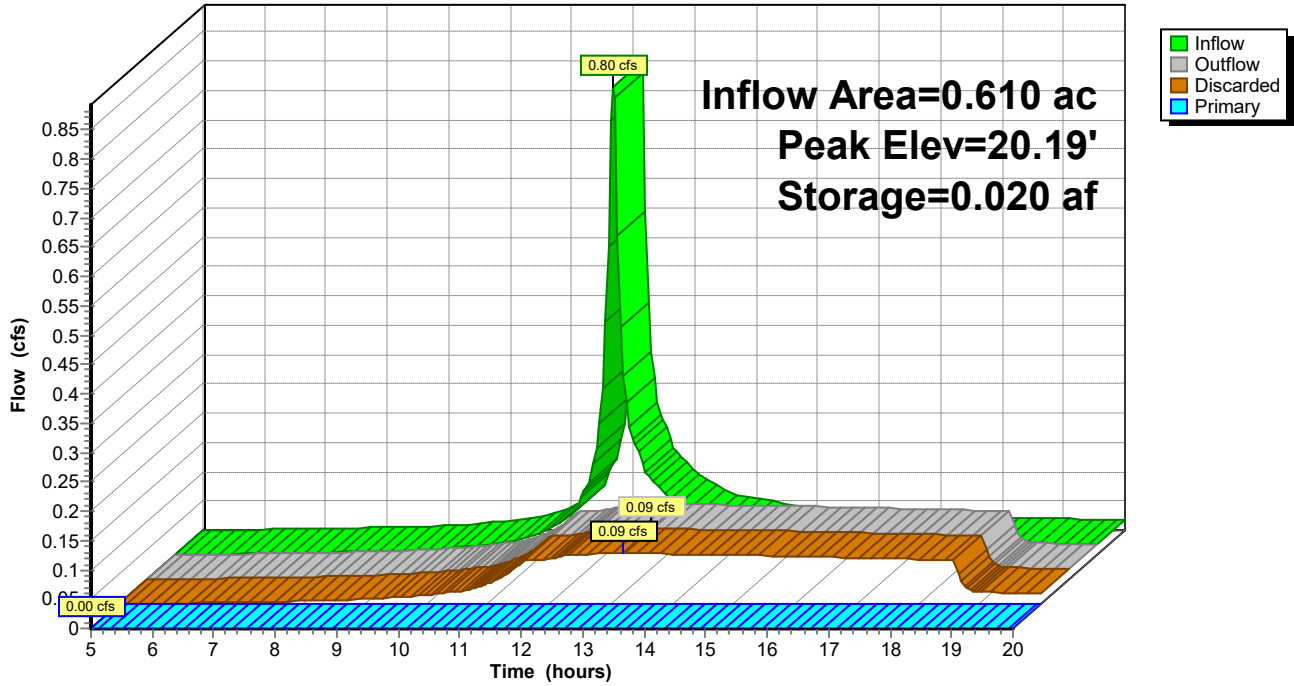
Device	Routing	Invert	Outlet Devices
#1	Discarded	18.80'	2.000 in/hr Exfiltration over Surface area Conductivity to Groundwater Elevation = 10.00'
#2	Primary	22.00'	16.0' long (Profile 1) Broad-Crested Rectangular Weir Head (feet) 0.49 0.98 1.48 Coef. (English) 2.92 3.37 3.59

Discarded OutFlow Max=0.09 cfs @ 13.20 hrs HW=20.19' (Free Discharge)
 ↑1=Exfiltration (Controls 0.09 cfs)

Primary OutFlow Max=0.00 cfs @ 5.00 hrs HW=18.80' (Free Discharge)
 ↑2=Broad-Crested Rectangular Weir (Controls 0.00 cfs)

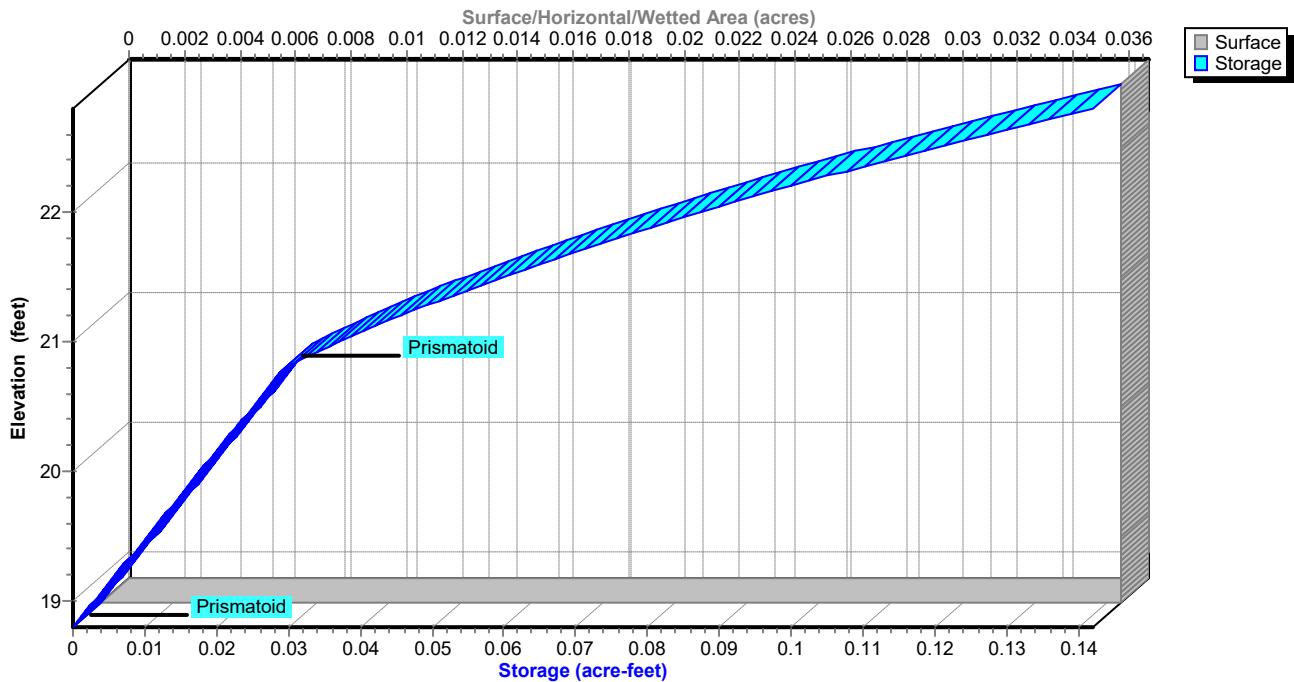
Pond BMP-8C: BMP 8C

Hydrograph



Pond BMP-8C: BMP 8C

Stage-Area-Storage



Summary for Subcatchment SC-8D: 8D

Runoff = 0.71 cfs @ 12.13 hrs, Volume= 0.050 af, Depth> 0.96"

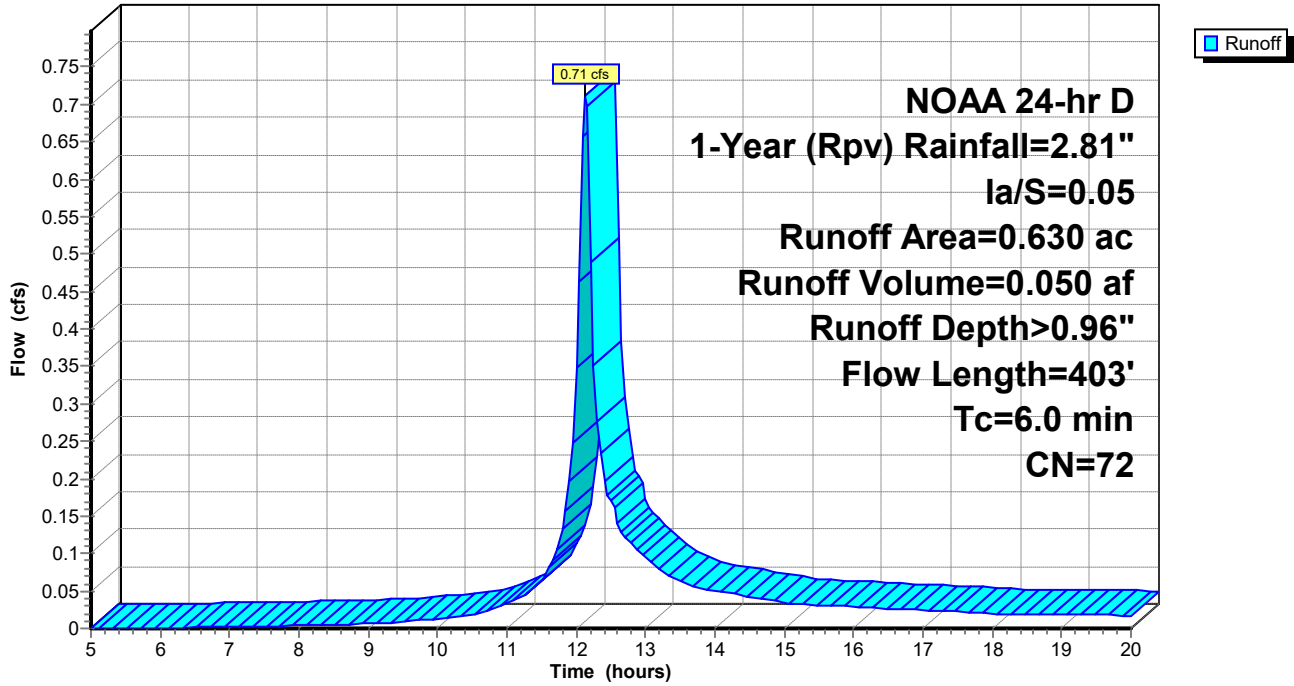
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
 NOAA 24-hr D 1-Year (Rpv) Rainfall=2.81", Ia/S=0.05

Area (ac)	CN	Description
* 0.280	39	
* 0.350	98	
0.630	72	Weighted Average
0.280		44.44% Pervious Area
0.350		55.56% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.5	37	0.0310	1.36		Sheet Flow, Smooth surfaces n= 0.011 P2= 3.30"
0.1	11	0.0390	1.38		Shallow Concentrated Flow, Short Grass Pasture Kv= 7.0 fps
0.1	10	0.0210	2.94		Shallow Concentrated Flow, Paved Kv= 20.3 fps
0.1	24	0.1930	3.08		Shallow Concentrated Flow, Short Grass Pasture Kv= 7.0 fps
1.7	321	0.0037	3.21	63.27	Channel Flow, Area= 19.7 sf Perim= 17.9' r= 1.10' n= 0.030
2.5	403	Total, Increased to minimum Tc = 6.0 min			

Subcatchment SC-8D: 8D

Hydrograph



Summary for Pond BMP-8D: BMP 8D

Inflow Area = 0.630 ac, 55.56% Impervious, Inflow Depth > 0.96" for 1-Year (Rpv) event
 Inflow = 0.71 cfs @ 12.13 hrs, Volume= 0.050 af
 Outflow = 0.08 cfs @ 13.27 hrs, Volume= 0.050 af, Atten= 89%, Lag= 68.0 min
 Discarded = 0.08 cfs @ 13.27 hrs, Volume= 0.050 af
 Primary = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
 Peak Elev= 20.24' @ 13.27 hrs Surf.Area= 0.032 ac Storage= 0.018 af

Plug-Flow detention time= 97.5 min calculated for 0.050 af (99% of inflow)
 Center-of-Mass det. time= 96.1 min (892.5 - 796.4)

Volume	Invert	Avail.Storage	Storage Description
#1	18.80'	0.026 af	8.00'W x 175.00'L x 2.00'H Prismatic 0.064 af Overall x 40.0% Voids
#2	20.80'	0.099 af	8.00'W x 175.00'L x 2.00'H Prismatic Z=2.0
		0.125 af	Total Available Storage

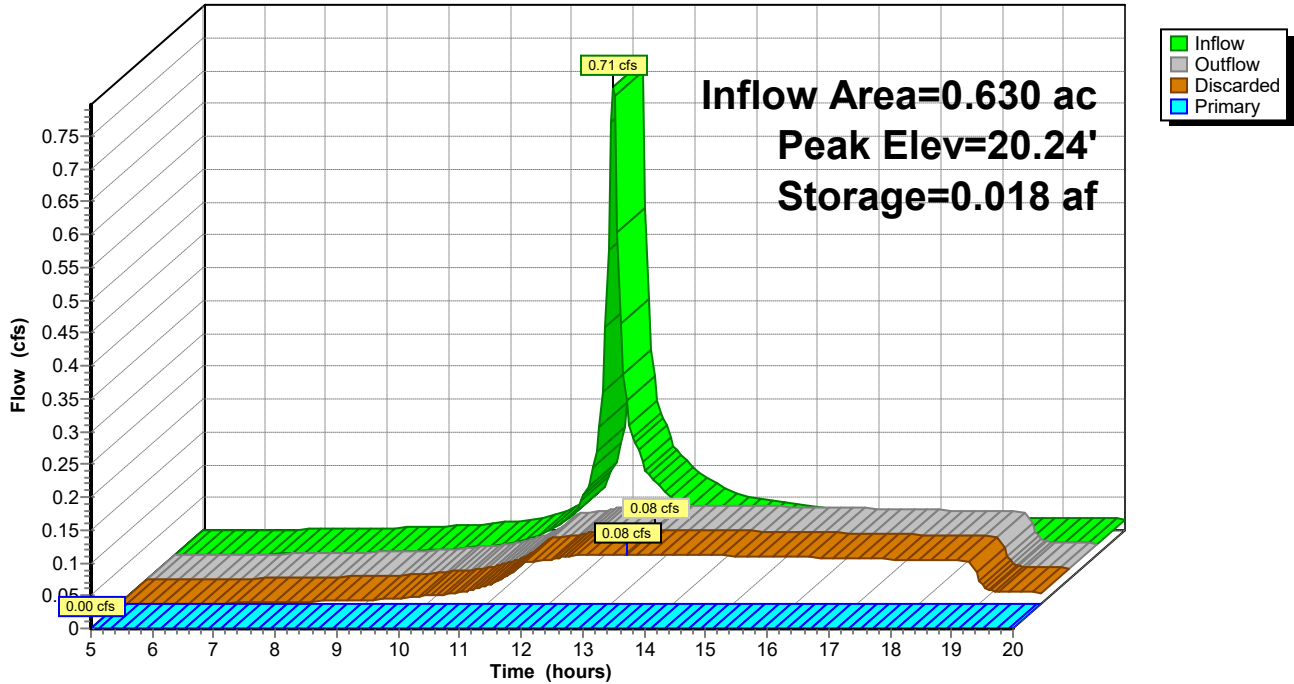
Device	Routing	Invert	Outlet Devices
#1	Discarded	18.80'	2.000 in/hr Exfiltration over Surface area Conductivity to Groundwater Elevation = 10.00'
#2	Primary	22.00'	16.0' long (Profile 1) Broad-Crested Rectangular Weir Head (feet) 0.49 0.98 1.48 Coef. (English) 2.92 3.37 3.59

Discarded OutFlow Max=0.08 cfs @ 13.27 hrs HW=20.24' (Free Discharge)
 ↑1=Exfiltration (Controls 0.08 cfs)

Primary OutFlow Max=0.00 cfs @ 5.00 hrs HW=18.80' (Free Discharge)
 ↑2=Broad-Crested Rectangular Weir (Controls 0.00 cfs)

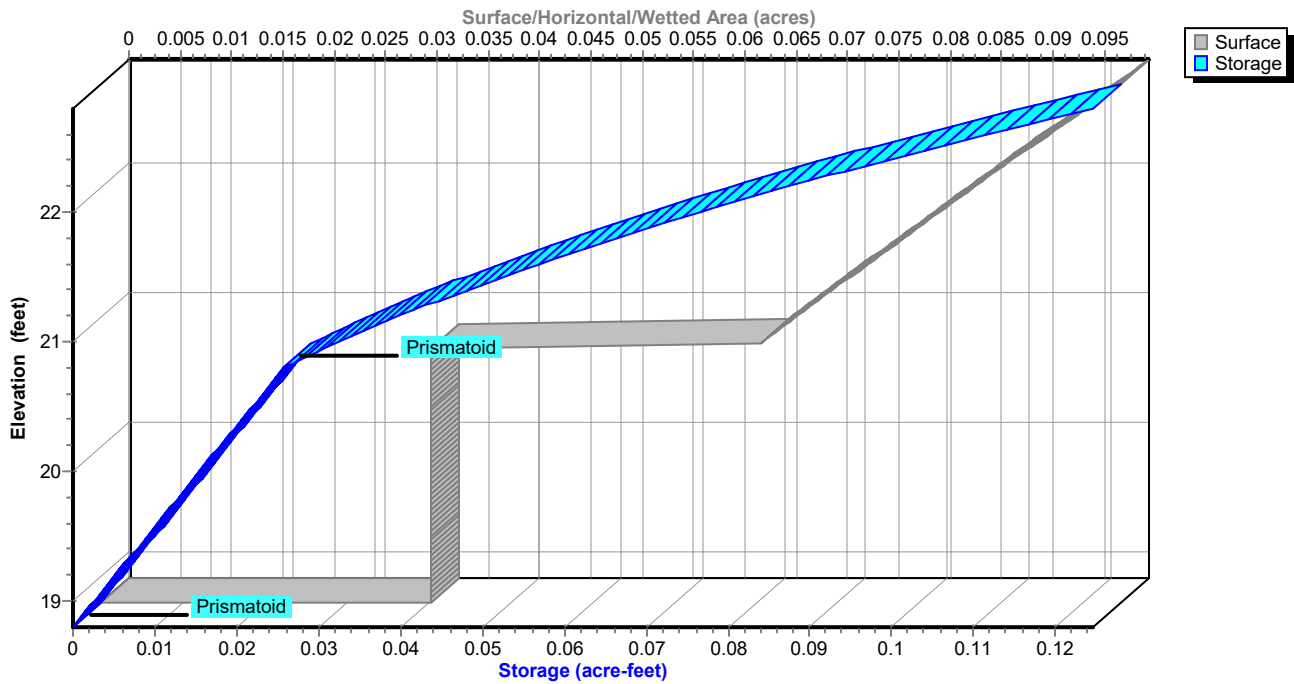
Pond BMP-8D: BMP 8D

Hydrograph



Pond BMP-8D: BMP 8D

Stage-Area-Storage








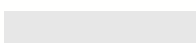



APPENDIX F

POI-9, POI-10 & POI-11

- POI Drainage Area Maps
- POI-9 HydroCAD Calculations
- POI-10 HydroCAD Calculations
- POI-11 HydroCAD Calculations

LEGEND

-  DRAINAGE AREA
-  Tc PATH
-  POI LOCATION
-  POI LABEL
-  OPEN SPACE
-  IMPERVIOUS
-  EXISTING CONTOURS



Summary for Subcatchment SC-9A: 9A

Runoff = 1.63 cfs @ 12.54 hrs, Volume= 0.252 af, Depth> 0.20"

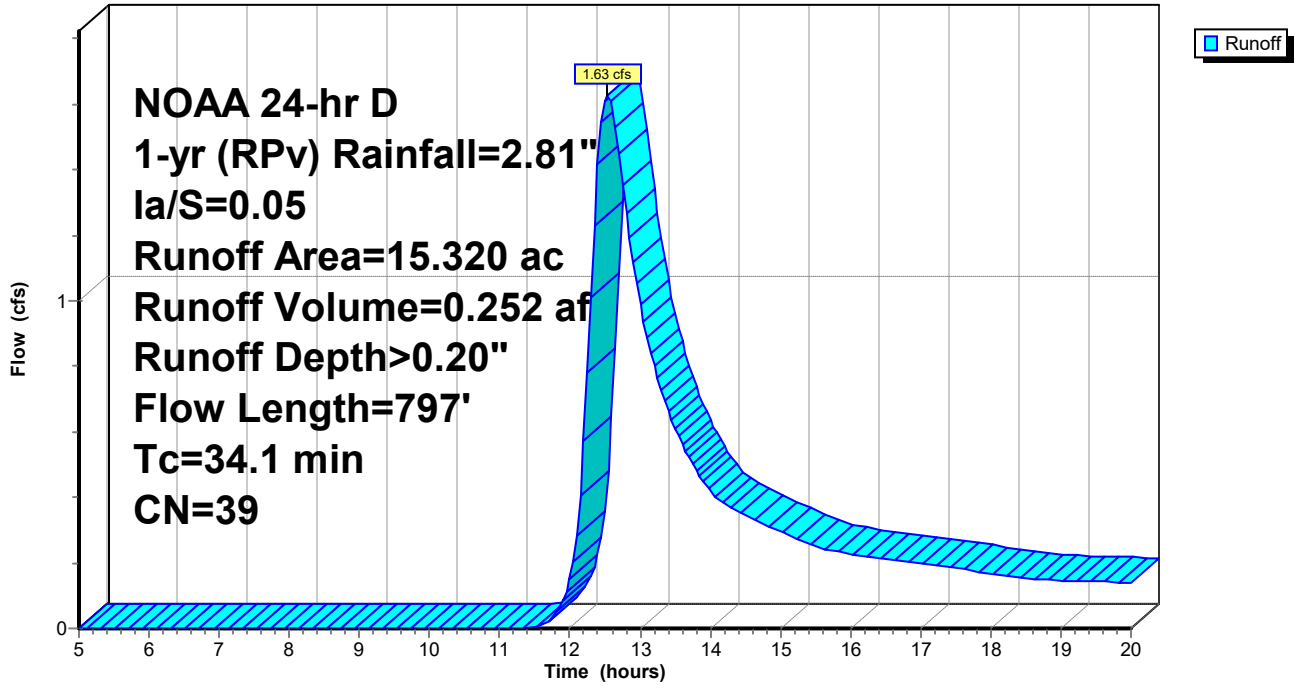
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
 NOAA 24-hr D 1-yr (RPv) Rainfall=2.81", Ia/S=0.05

Area (ac)	CN	Description
15.320	39	>75% Grass cover, Good, HSG A
15.320		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.7	45	0.0100	0.11		Sheet Flow, Grass: Short n= 0.150 P2= 3.30"
5.2	93	0.0018	0.30		Shallow Concentrated Flow, Short Grass Pasture Kv= 7.0 fps
2.8	125	0.0110	0.73		Shallow Concentrated Flow, Short Grass Pasture Kv= 7.0 fps
9.9	249	0.0036	0.42		Shallow Concentrated Flow, Short Grass Pasture Kv= 7.0 fps
3.1	124	0.0091	0.67		Shallow Concentrated Flow, Short Grass Pasture Kv= 7.0 fps
5.0	93	0.0020	0.31		Shallow Concentrated Flow, Short Grass Pasture Kv= 7.0 fps
1.4	68	0.0135	0.81		Shallow Concentrated Flow, Short Grass Pasture Kv= 7.0 fps
34.1	797	Total			

Subcatchment SC-9A: 9A

Hydrograph



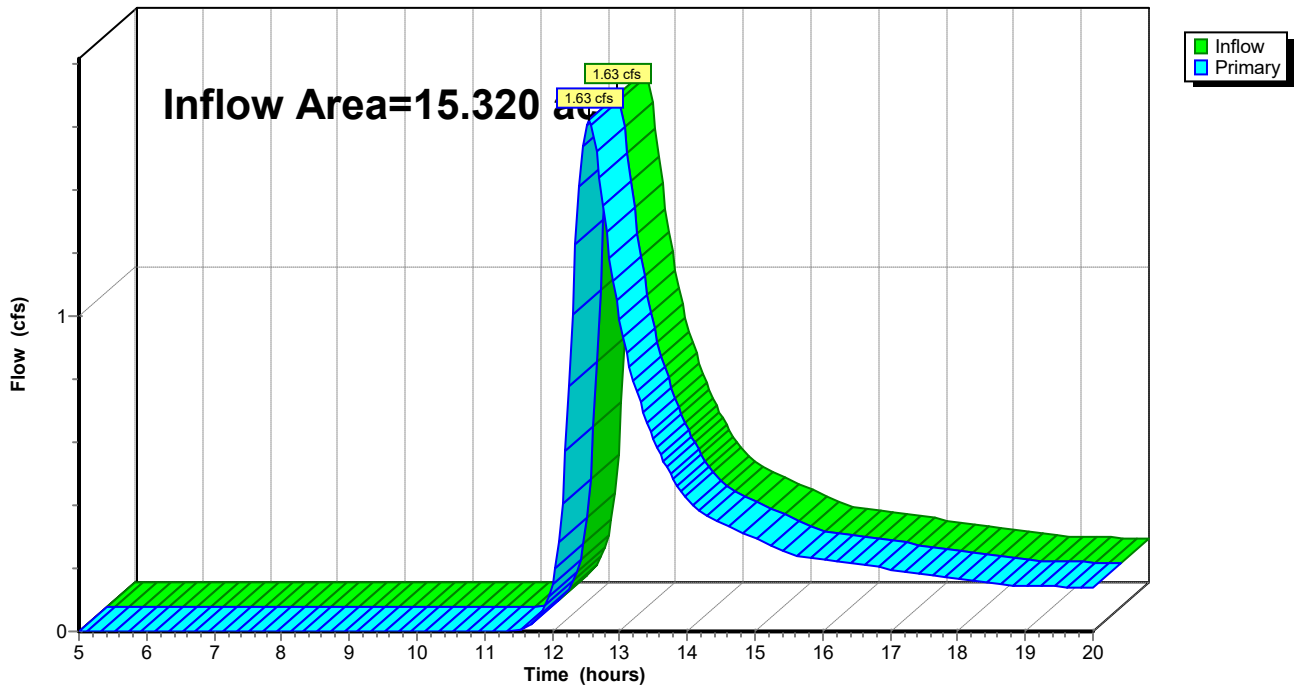
Summary for Link POI9: (new Link)

Inflow Area = 15.320 ac, 0.00% Impervious, Inflow Depth > 0.20" for 1-yr (RPv) event
Inflow = 1.63 cfs @ 12.54 hrs, Volume= 0.252 af
Primary = 1.63 cfs @ 12.54 hrs, Volume= 0.252 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Link POI9: (new Link)

Hydrograph



Summary for Subcatchment SC-10A: 10A

Runoff = 1.32 cfs @ 12.35 hrs, Volume= 0.157 af, Depth> 0.29"

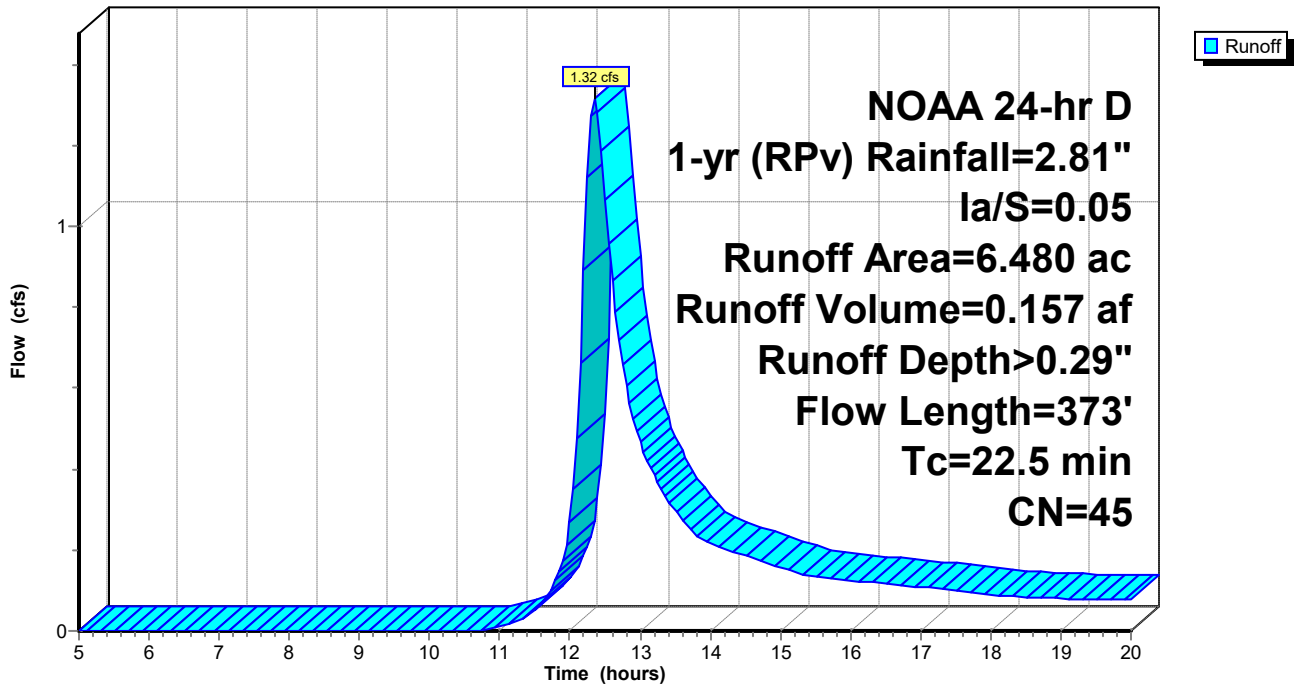
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
 NOAA 24-hr D 1-yr (RPv) Rainfall=2.81", Ia/S=0.05

Area (ac)	CN	Description
0.640	98	Paved roads w/curbs & sewers, HSG A
5.840	39	>75% Grass cover, Good, HSG A
6.480	45	Weighted Average
5.840		90.12% Pervious Area
0.640		9.88% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.8	55	0.0220	0.16		Sheet Flow, Grass: Short n= 0.150 P2= 3.30"
1.0	81	0.0370	1.35		Shallow Concentrated Flow, Short Grass Pasture Kv= 7.0 fps
15.7	237	0.0013	0.25		Shallow Concentrated Flow, Short Grass Pasture Kv= 7.0 fps
22.5	373	Total			

Subcatchment SC-10A: 10A

Hydrograph



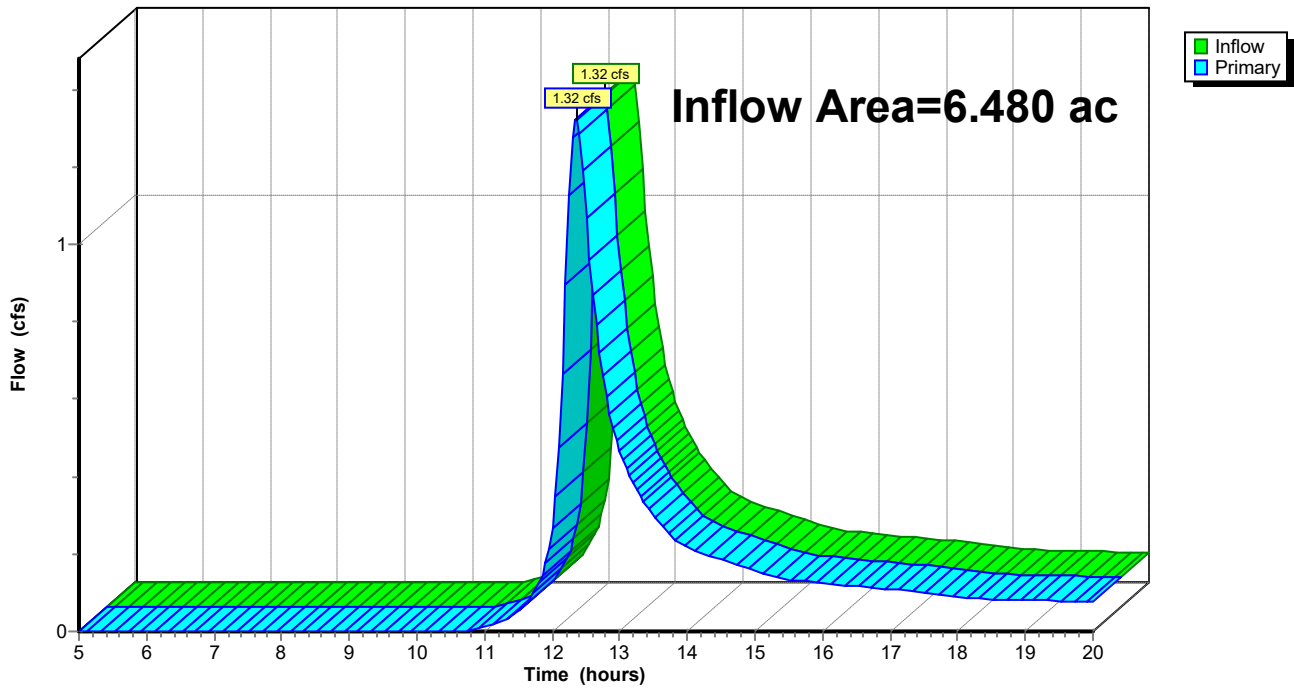
Summary for Link POI10: (new Link)

Inflow Area = 6.480 ac, 9.88% Impervious, Inflow Depth > 0.29" for 1-yr (RPv) event
Inflow = 1.32 cfs @ 12.35 hrs, Volume= 0.157 af
Primary = 1.32 cfs @ 12.35 hrs, Volume= 0.157 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Link POI10: (new Link)

Hydrograph



Summary for Subcatchment SC-11: 11

Runoff = 0.13 cfs @ 12.22 hrs, Volume= 0.013 af, Depth> 0.28"

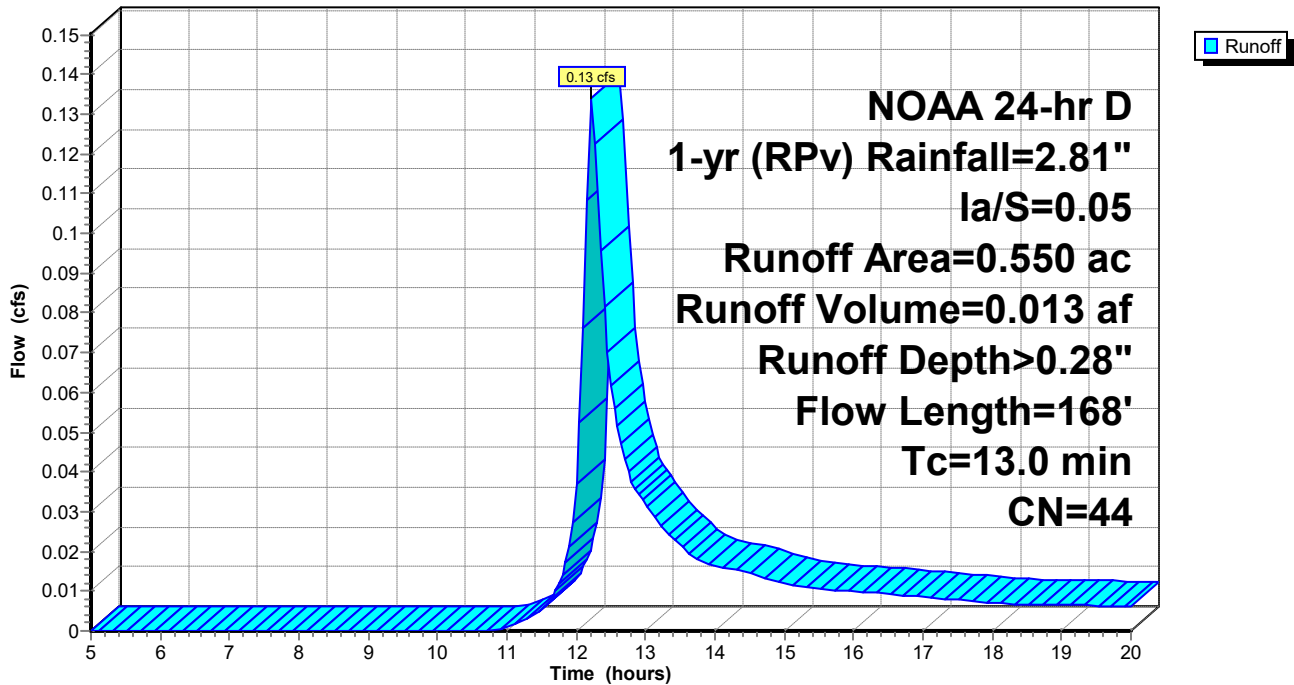
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
 NOAA 24-hr D 1-yr (RPv) Rainfall=2.81", Ia/S=0.05

Area (ac)	CN	Description
0.500	39	>75% Grass cover, Good, HSG A
0.050	98	Paved roads w/curbs & sewers, HSG A
0.550	44	Weighted Average
0.500		90.91% Pervious Area
0.050		9.09% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.2	50	0.0057	0.09		Sheet Flow, Grass: Short n= 0.150 P2= 3.30"
1.0	33	0.0057	0.53		Shallow Concentrated Flow, Short Grass Pasture Kv= 7.0 fps
2.8	85	0.0052	0.50		Shallow Concentrated Flow, Short Grass Pasture Kv= 7.0 fps
13.0	168	Total			

Subcatchment SC-11: 11

Hydrograph



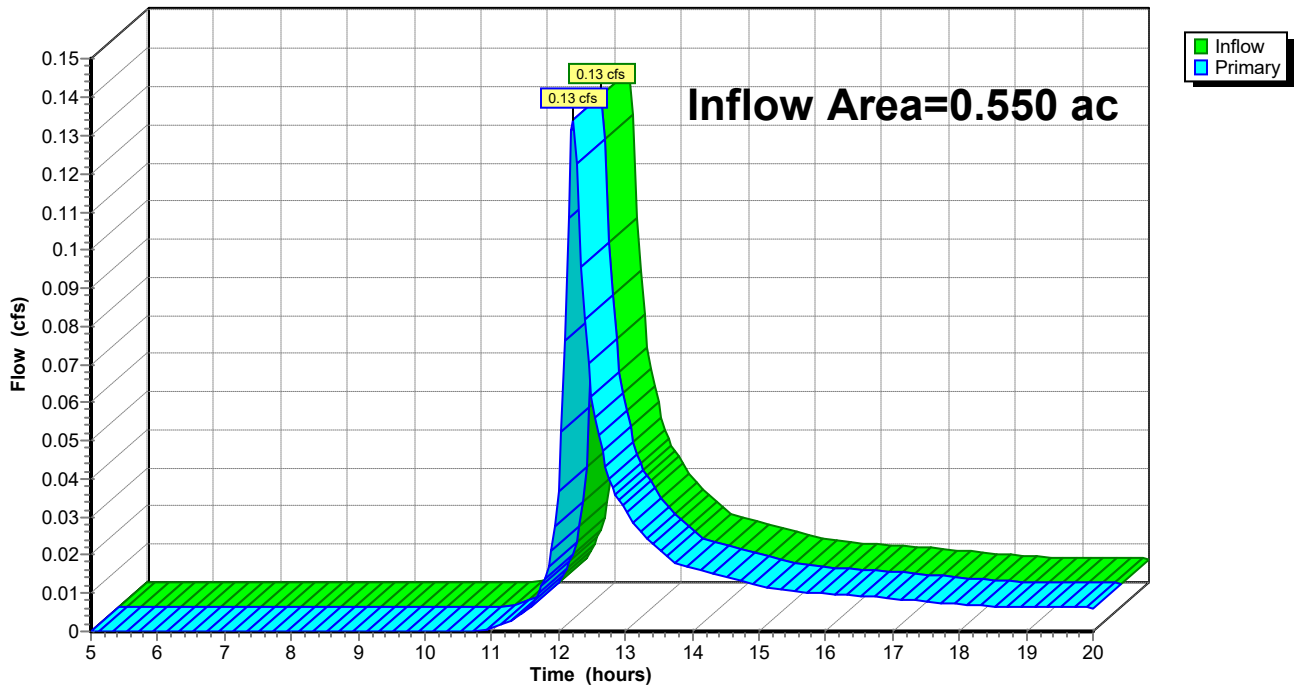
Summary for Link POI11: (new Link)

Inflow Area = 0.550 ac, 9.09% Impervious, Inflow Depth > 0.28" for 1-yr (RPv) event
Inflow = 0.13 cfs @ 12.22 hrs, Volume= 0.013 af
Primary = 0.13 cfs @ 12.22 hrs, Volume= 0.013 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Link POI11: (new Link)

Hydrograph





LEGEND

- DRAINAGE AREA
- DRAINAGE SUBAREA
- Tc PATH
- PROPOSED CONSTRUCTION
- PROPOSED DRAINAGE
- INFILTRATION BMP
- OPEN SPACE
- IMPERVIOUS
- PROPOSED CONTOURS
- EXISTING CONTOURS
- POI LOCATION
- POI LABEL

Summary for Subcatchment SC-9A1: 9A1

Runoff = 0.24 cfs @ 12.13 hrs, Volume= 0.017 af, Depth> 0.86"

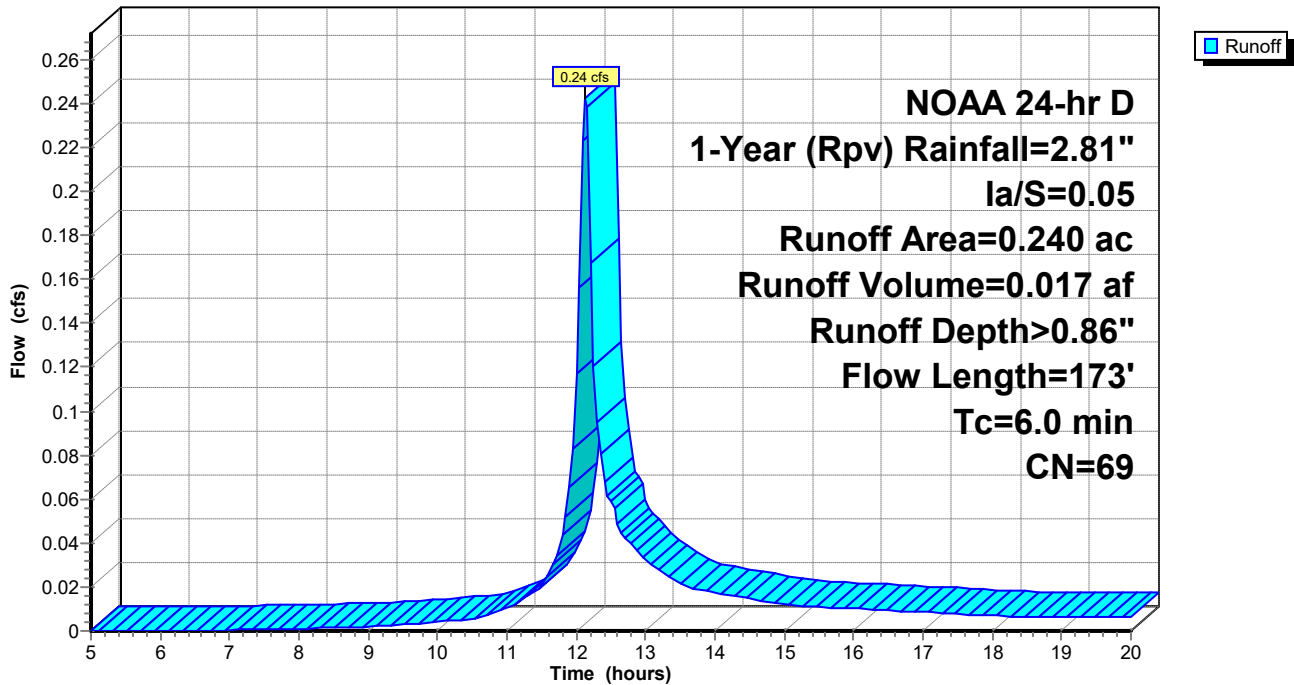
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
 NOAA 24-hr D 1-Year (Rpv) Rainfall=2.81", Ia/S=0.05

Area (ac)	CN	Description
* 0.120	39	
* 0.120	98	
0.240	69	Weighted Average
0.120		50.00% Pervious Area
0.120		50.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.4	27	0.0248	1.17		Sheet Flow, Smooth surfaces n= 0.011 P2= 3.30"
0.1	10	0.0984	2.20		Shallow Concentrated Flow, Short Grass Pasture Kv= 7.0 fps
0.4	136	0.0193	5.74	67.70	Channel Flow, Area= 11.8 sf Perim= 15.5' r= 0.76' n= 0.030
0.9	173	Total, Increased to minimum Tc = 6.0 min			

Subcatchment SC-9A1: 9A1

Hydrograph



Summary for Pond BMP-9A1: (new Pond)

Inflow Area = 0.240 ac, 50.00% Impervious, Inflow Depth > 0.86" for 1-Year (Rpv) event
 Inflow = 0.24 cfs @ 12.13 hrs, Volume= 0.017 af
 Outflow = 0.03 cfs @ 13.08 hrs, Volume= 0.017 af, Atten= 87%, Lag= 56.6 min
 Discarded = 0.03 cfs @ 13.08 hrs, Volume= 0.017 af
 Secondary = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
 Peak Elev= 21.17' @ 13.08 hrs Surf.Area= 0.014 ac Storage= 0.006 af

Plug-Flow detention time= 68.3 min calculated for 0.017 af (100% of inflow)
 Center-of-Mass det. time= 67.2 min (867.8 - 800.5)

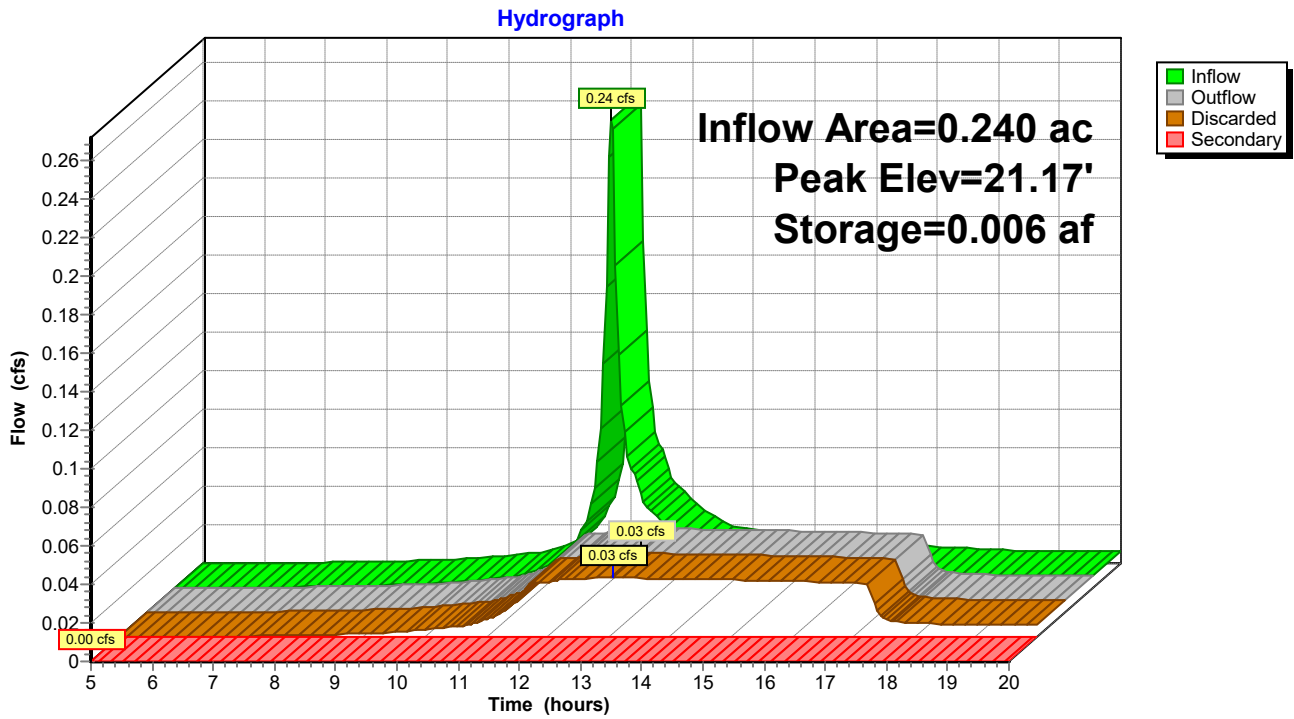
Volume	Invert	Avail.Storage	Storage Description
#1	20.15'	0.011 af	6.00'W x 100.00'L x 2.00'H Prismatic 0.028 af Overall x 40.0% Voids
#2	22.15'	0.048 af	6.00'W x 100.00'L x 2.00'H Prismatic Z=2.0
		0.059 af	Total Available Storage

Device	Routing	Invert	Outlet Devices
#1	Discarded	20.15'	2.000 in/hr Exfiltration over Surface area Conductivity to Groundwater Elevation = 10.00'
#2	Secondary	24.00'	14.0' long (Profile 1) Broad-Crested Rectangular Weir Head (feet) 0.49 0.98 1.48 Coef. (English) 2.92 3.37 3.59

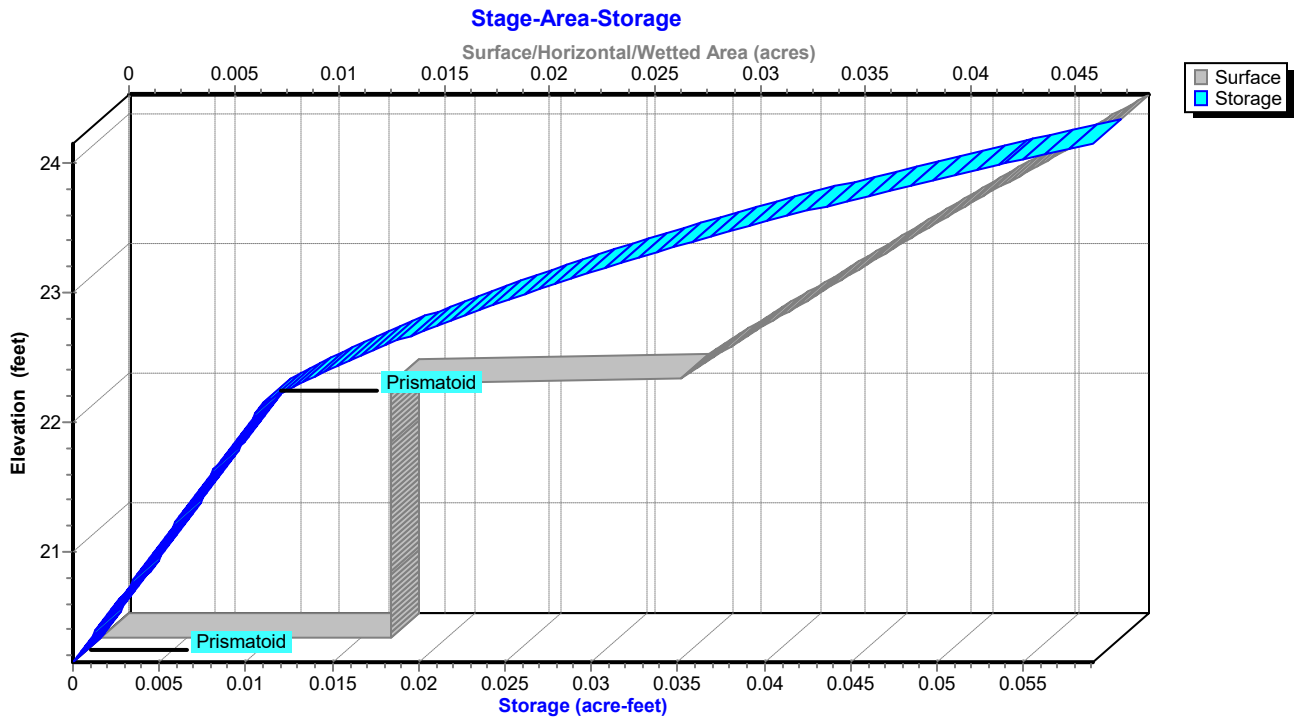
Discarded OutFlow Max=0.03 cfs @ 13.08 hrs HW=21.17' (Free Discharge)
 ↑1=Exfiltration (Controls 0.03 cfs)

Secondary OutFlow Max=0.00 cfs @ 5.00 hrs HW=20.15' (Free Discharge)
 ↑2=Broad-Crested Rectangular Weir (Controls 0.00 cfs)

Pond BMP-9A1: (new Pond)



Pond BMP-9A1: (new Pond)



Summary for Subcatchment SC-9A2: 9A2

Runoff = 0.10 cfs @ 12.14 hrs, Volume= 0.007 af, Depth> 0.49"

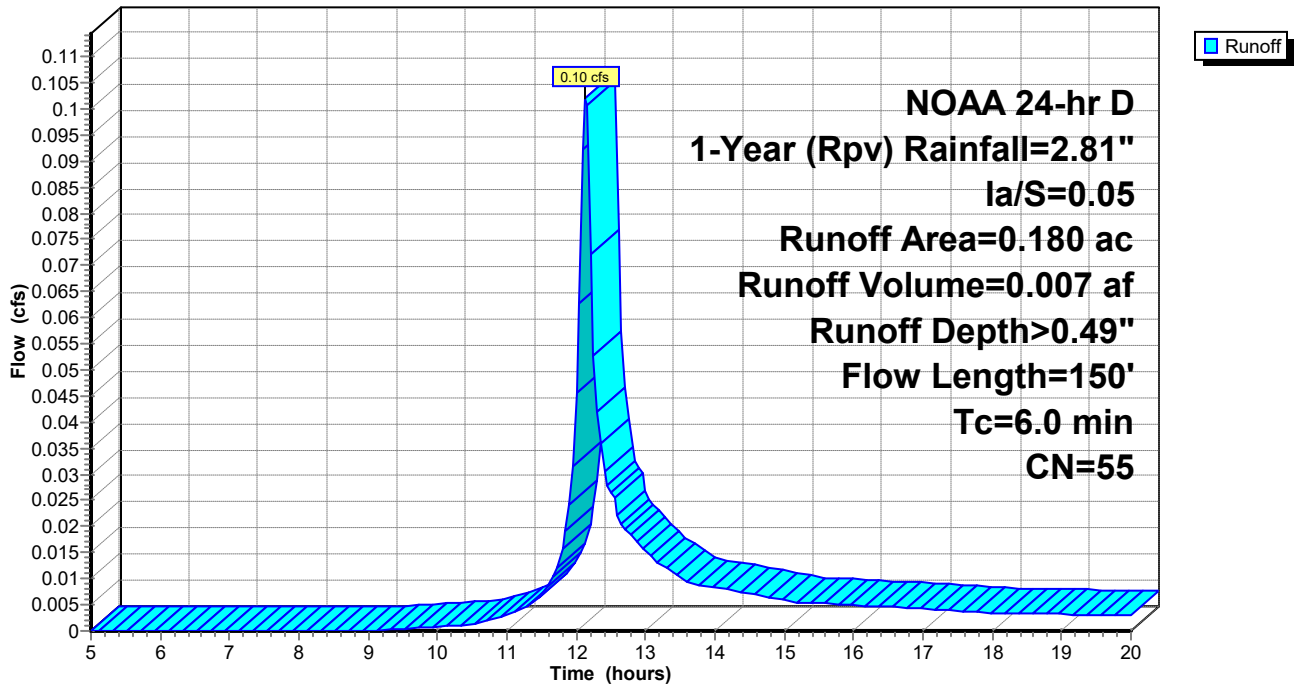
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
 NOAA 24-hr D 1-Year (Rpv) Rainfall=2.81", Ia/S=0.05

Area (ac)	CN	Description
* 0.130	39	
* 0.050	98	
0.180	55	Weighted Average
0.130		72.22% Pervious Area
0.050		27.78% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.3	18	0.0233	1.05		Sheet Flow, Smooth surfaces n= 0.011 P2= 3.30"
0.1	16	0.2140	3.24		Shallow Concentrated Flow, Short Grass Pasture Kv= 7.0 fps
0.6	116	0.0083	3.36	25.85	Channel Flow, Area= 7.7 sf Perim= 12.0' r= 0.64' n= 0.030
1.0	150	Total, Increased to minimum Tc = 6.0 min			

Subcatchment SC-9A2: 9A2

Hydrograph



Summary for Pond BMP-9A2: (new Pond)

Inflow Area = 0.180 ac, 27.78% Impervious, Inflow Depth > 0.49" for 1-Year (Rpv) event
 Inflow = 0.10 cfs @ 12.14 hrs, Volume= 0.007 af
 Outflow = 0.03 cfs @ 12.44 hrs, Volume= 0.007 af, Atten= 72%, Lag= 18.5 min
 Discarded = 0.03 cfs @ 12.44 hrs, Volume= 0.007 af
 Primary = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af
 Secondary = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
 Peak Elev= 21.05' @ 12.44 hrs Surf.Area= 0.014 ac Storage= 0.001 af

Plug-Flow detention time= 14.9 min calculated for 0.007 af (99% of inflow)
 Center-of-Mass det. time= 13.7 min (832.5 - 818.9)

Volume	Invert	Avail.Storage	Storage Description
#1	20.80'	0.011 af	6.00'W x 100.00'L x 2.00'H Prismatic 0.028 af Overall x 40.0% Voids
#2	22.80'	0.048 af	6.00'W x 100.00'L x 2.00'H Prismatic Z=2.0
		0.059 af	Total Available Storage

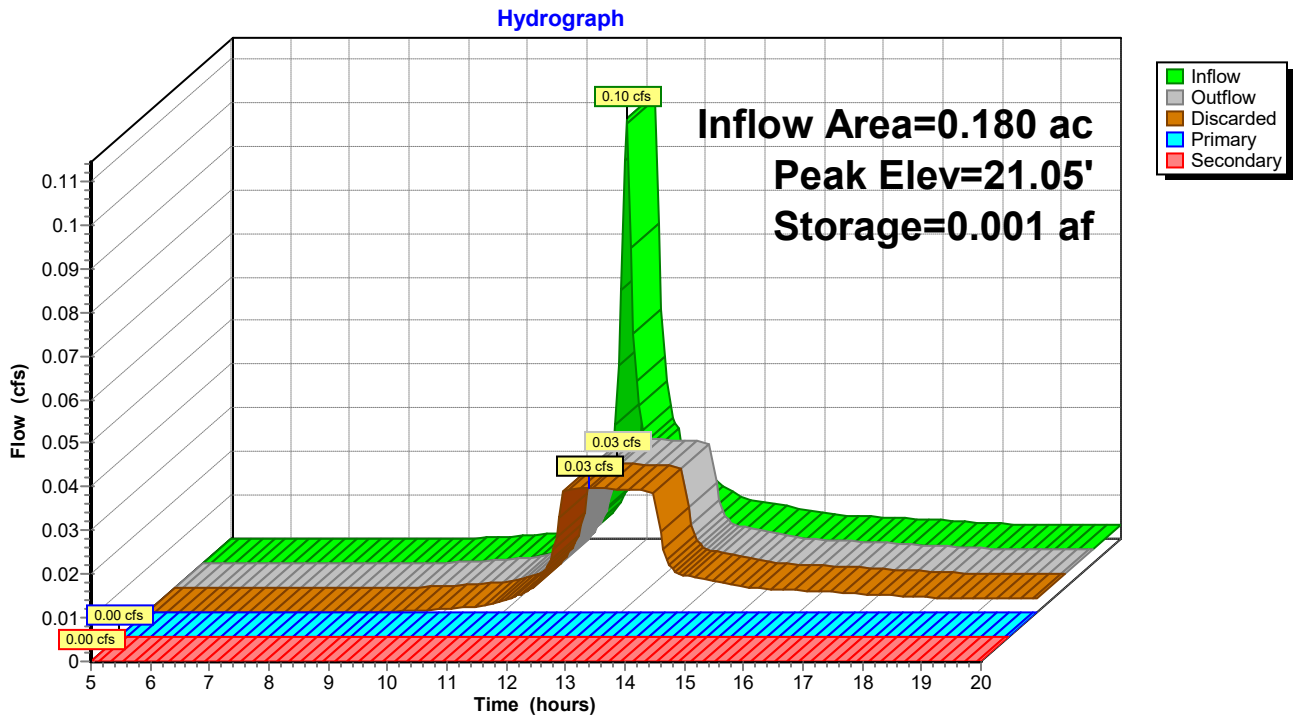
Device	Routing	Invert	Outlet Devices
#1	Discarded	20.80'	2.000 in/hr Exfiltration over Surface area Conductivity to Groundwater Elevation = 10.00'
#2	Secondary	24.00'	14.0' long (Profile 1) Broad-Crested Rectangular Weir Head (feet) 0.49 0.98 1.48 Coef. (English) 2.92 3.37 3.59
#3	Primary	22.80'	18.0" Round Culvert L= 85.0' RCP, end-section conforming to fill, Ke= 0.500 Inlet / Outlet Invert= 22.80' / 22.15' S= 0.0076 '/ Cc= 0.900 n= 0.012, Flow Area= 1.77 sf

Discarded OutFlow Max=0.03 cfs @ 12.44 hrs HW=21.05' (Free Discharge)
 ↑1=Exfiltration (Controls 0.03 cfs)

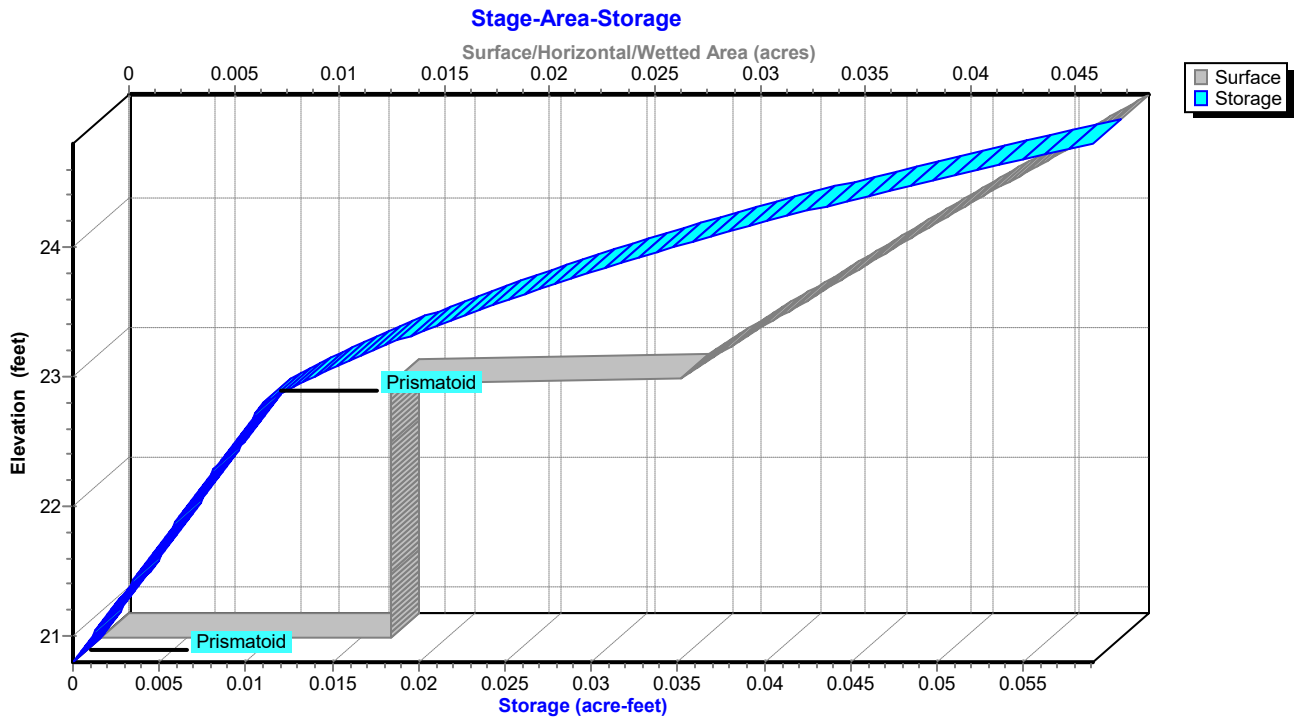
Primary OutFlow Max=0.00 cfs @ 5.00 hrs HW=20.80' (Free Discharge)
 ↑3=Culvert (Controls 0.00 cfs)

Secondary OutFlow Max=0.00 cfs @ 5.00 hrs HW=20.80' (Free Discharge)
 ↑2=Broad-Crested Rectangular Weir (Controls 0.00 cfs)

Pond BMP-9A2: (new Pond)



Pond BMP-9A2: (new Pond)



Summary for Subcatchment SC-9A3: 9A3

Runoff = 0.05 cfs @ 12.14 hrs, Volume= 0.004 af, Depth> 0.36"

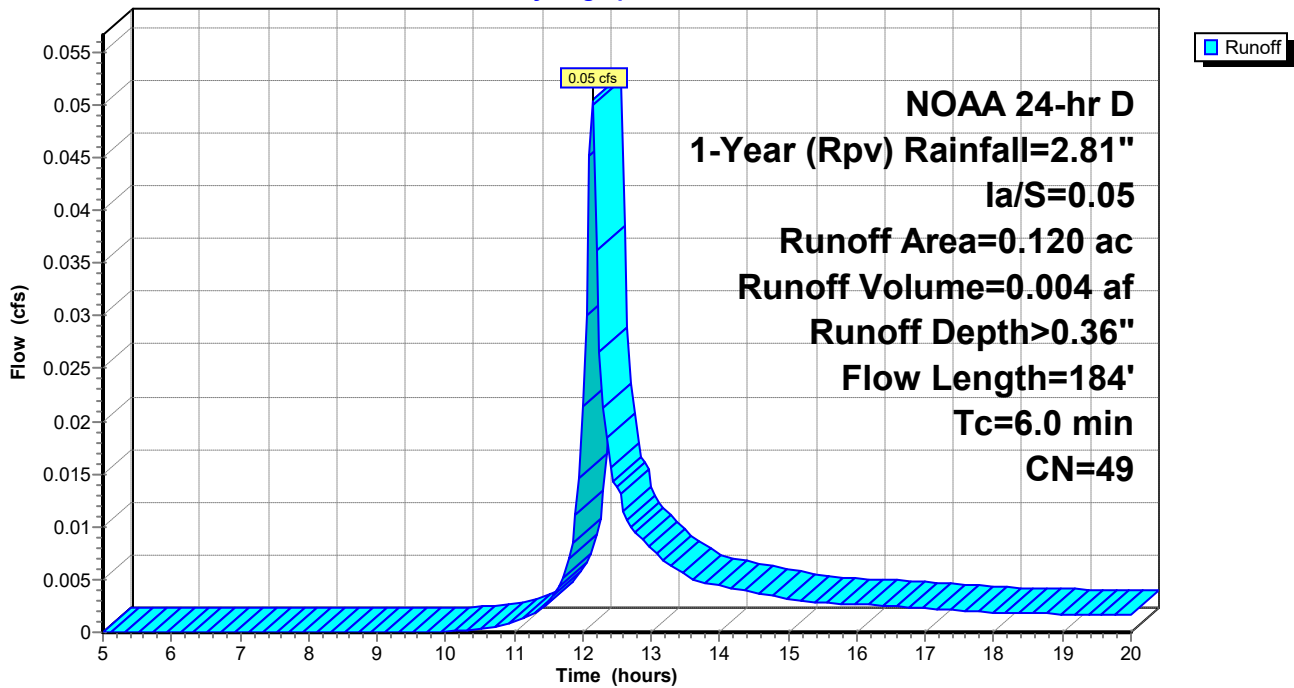
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
 NOAA 24-hr D 1-Year (Rpv) Rainfall=2.81", Ia/S=0.05

Area (ac)	CN	Description
* 0.100	39	
* 0.020	98	
0.120	49	Weighted Average
0.100		83.33% Pervious Area
0.020		16.67% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.2	11	0.0313	1.07		Sheet Flow, Smooth surfaces n= 0.011 P2= 3.30"
0.1	19	0.2230	3.31		Shallow Concentrated Flow, Short Grass Pasture Kv= 7.0 fps
0.3	79	0.0110	4.55	37.32	Channel Flow, Area= 8.2 sf Perim= 10.0' r= 0.82' n= 0.030
0.3	75	0.0050	4.55	8.05	Pipe Channel, RCP_Round 18" 18.0" Round Area= 1.8 sf Perim= 4.7' r= 0.38' n= 0.012
0.9	184	Total, Increased to minimum Tc = 6.0 min			

Subcatchment SC-9A3: 9A3

Hydrograph



Summary for Pond BMP-9A3: (new Pond)

Inflow Area = 0.120 ac, 16.67% Impervious, Inflow Depth > 0.36" for 1-Year (Rpv) event
 Inflow = 0.05 cfs @ 12.14 hrs, Volume= 0.004 af
 Outflow = 0.01 cfs @ 12.46 hrs, Volume= 0.004 af, Atten= 72%, Lag= 19.5 min
 Discarded = 0.01 cfs @ 12.46 hrs, Volume= 0.004 af
 Primary = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af
 Secondary = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
 Peak Elev= 20.39' @ 12.46 hrs Surf.Area= 0.007 ac Storage= 0.001 af

Plug-Flow detention time= 15.0 min calculated for 0.004 af (99% of inflow)
 Center-of-Mass det. time= 13.6 min (840.9 - 827.3)

Volume	Invert	Avail.Storage	Storage Description
#1	20.15'	0.006 af	6.00'W x 50.00'L x 2.00'H Prismatic 0.014 af Overall x 40.0% Voids
#2	22.15'	0.025 af	6.00'W x 50.00'L x 2.00'H Prismatic Z=2.0
		0.031 af	Total Available Storage

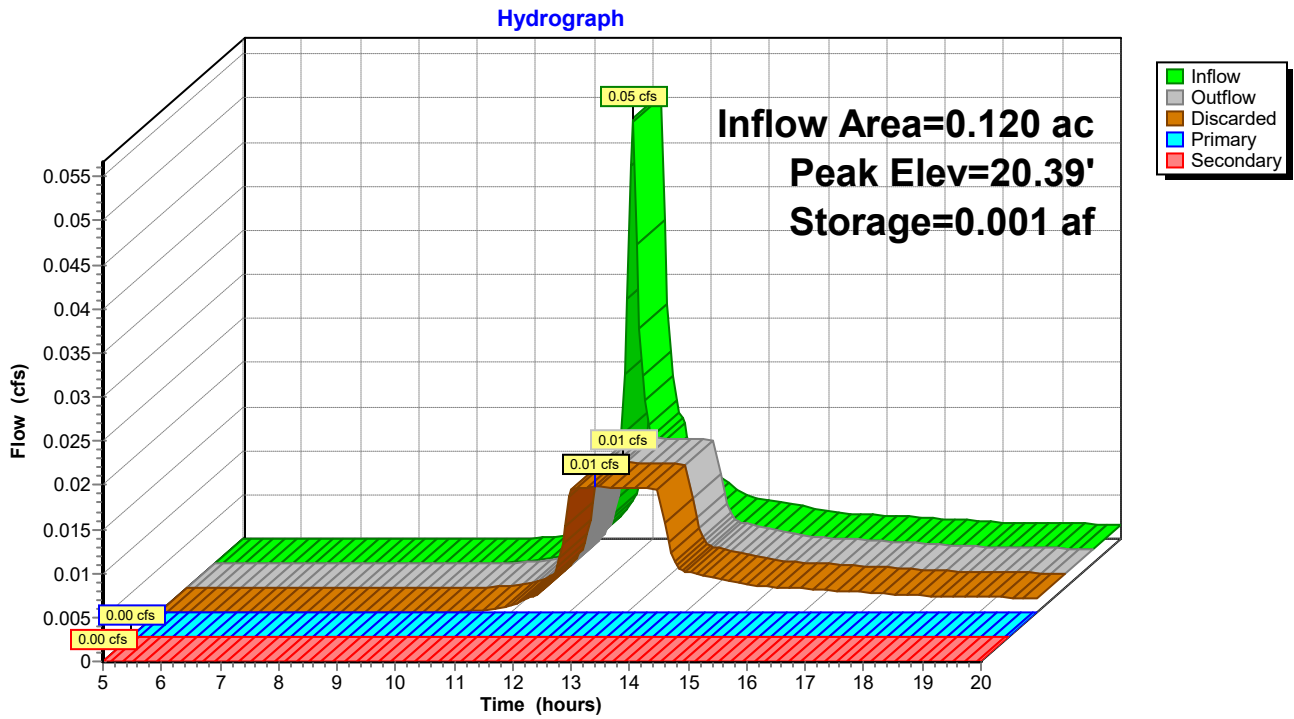
Device	Routing	Invert	Outlet Devices
#1	Discarded	20.15'	2.000 in/hr Exfiltration over Surface area Conductivity to Groundwater Elevation = 10.00'
#2	Secondary	24.00'	14.0' long (Profile 1) Broad-Crested Rectangular Weir Head (feet) 0.49 0.98 1.48 Coef. (English) 2.92 3.37 3.59
#3	Primary	22.80'	18.0" Round Culvert L= 85.0' RCP, end-section conforming to fill, Ke= 0.500 Inlet / Outlet Invert= 22.80' / 22.15' S= 0.0076 '/ Cc= 0.900 n= 0.012, Flow Area= 1.77 sf

Discarded OutFlow Max=0.01 cfs @ 12.46 hrs HW=20.39' (Free Discharge)
 ↑1=Exfiltration (Controls 0.01 cfs)

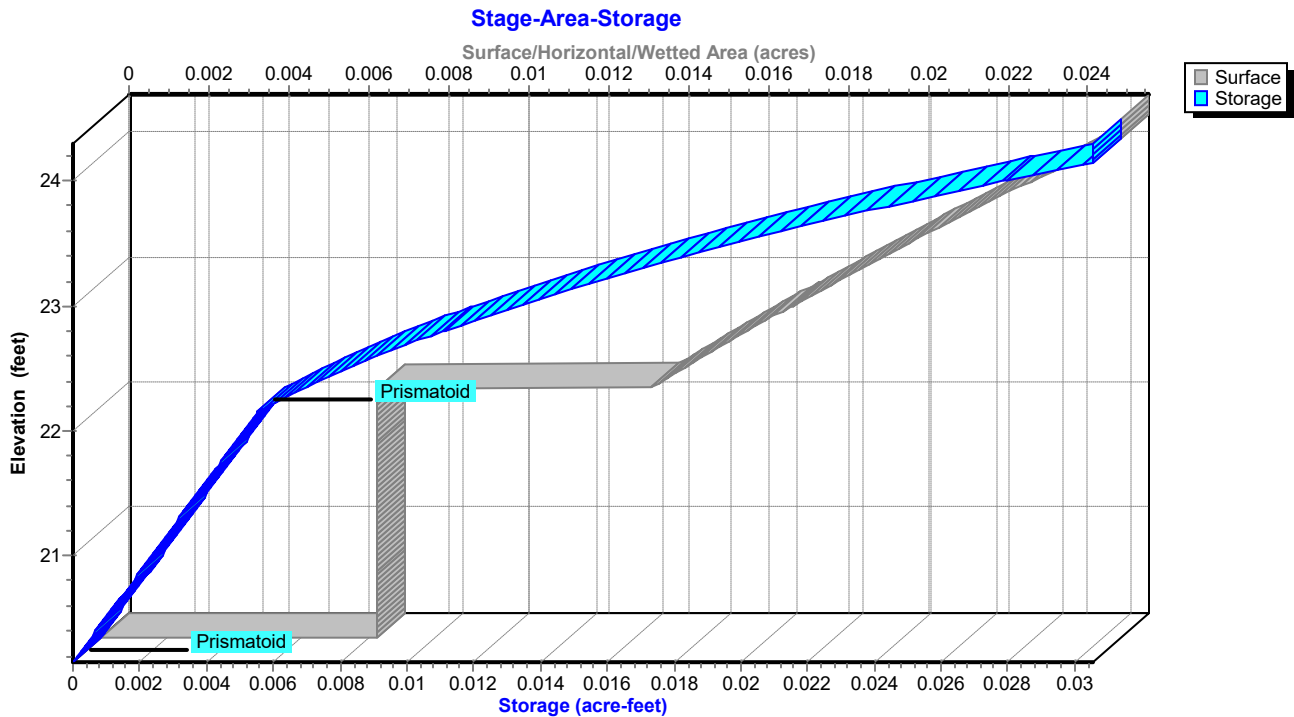
Primary OutFlow Max=0.00 cfs @ 5.00 hrs HW=20.15' (Free Discharge)
 ↑3=Culvert (Controls 0.00 cfs)

Secondary OutFlow Max=0.00 cfs @ 5.00 hrs HW=20.15' (Free Discharge)
 ↑2=Broad-Crested Rectangular Weir (Controls 0.00 cfs)

Pond BMP-9A3: (new Pond)



Pond BMP-9A3: (new Pond)



Summary for Subcatchment SC-9A4: 9A4

Runoff = 0.81 cfs @ 12.13 hrs, Volume= 0.057 af, Depth> 0.86"

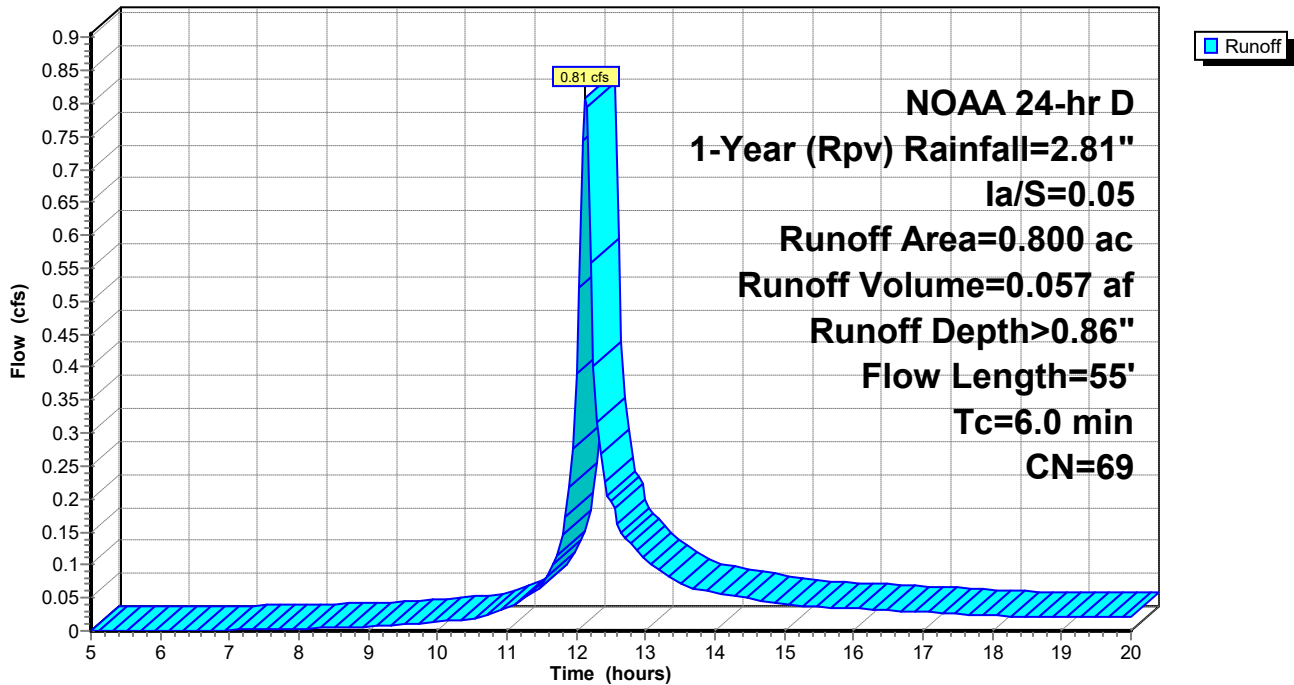
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
 NOAA 24-hr D 1-Year (Rpv) Rainfall=2.81", Ia/S=0.05

Area (ac)	CN	Description
0.390	39	>75% Grass cover, Good, HSG A
0.410	98	Paved roads w/curbs & sewers, HSG A
0.800	69	Weighted Average
0.390		48.75% Pervious Area
0.410		51.25% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.4	36	0.0462	1.59		Sheet Flow, Smooth surfaces n= 0.011 P2= 3.30"
0.1	19	0.2000	3.13		Shallow Concentrated Flow, Short Grass Pasture Kv= 7.0 fps
0.5	55	Total, Increased to minimum Tc = 6.0 min			

Subcatchment SC-9A4: 9A4

Hydrograph



Summary for Subcatchment SC-9A5: 9A5

Runoff = 0.21 cfs @ 12.14 hrs, Volume= 0.015 af, Depth> 0.42"

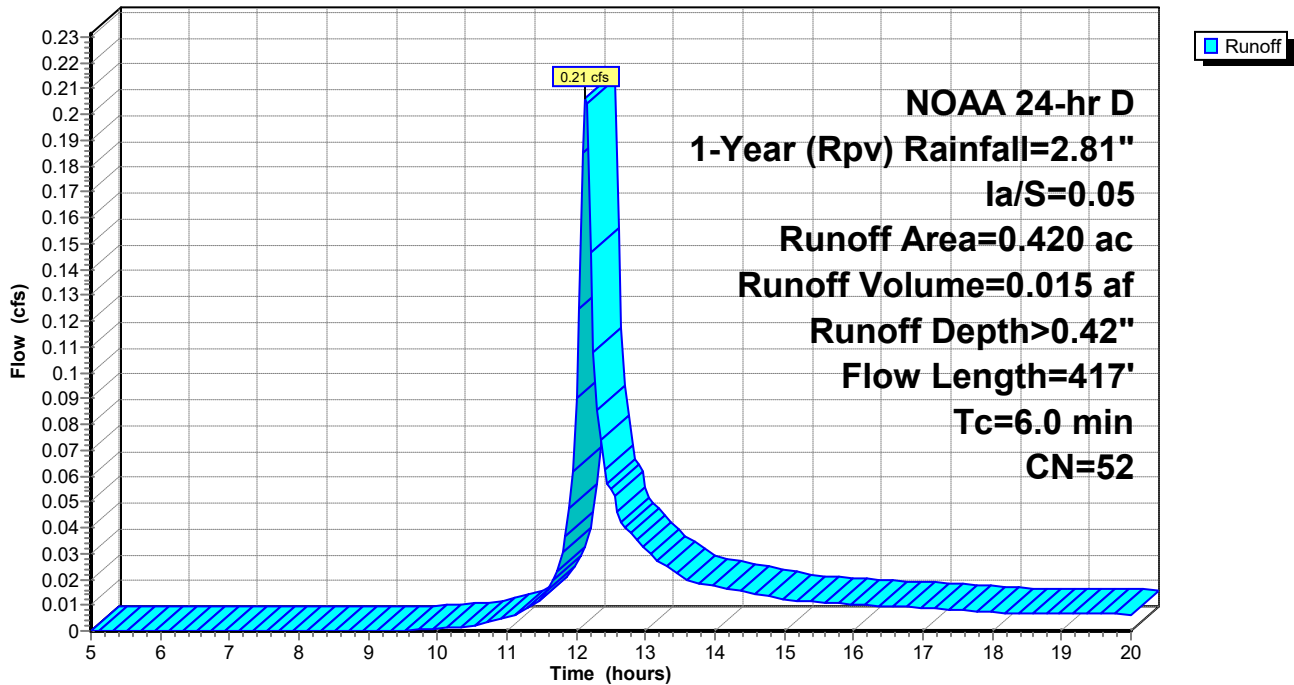
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
 NOAA 24-hr D 1-Year (Rpv) Rainfall=2.81", Ia/S=0.05

Area (ac)	CN	Description
* 0.330	39	
* 0.090	98	
0.420	52	Weighted Average
0.330		78.57% Pervious Area
0.090		21.43% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.2	10	0.0325	1.07		Sheet Flow, Smooth surfaces n= 0.011 P2= 3.30"
0.1	18	0.2210	3.29		Shallow Concentrated Flow, Short Grass Pasture Kv= 7.0 fps
1.8	389	0.0095	3.62	28.26	Channel Flow, Area= 7.8 sf Perim= 12.0' r= 0.65' n= 0.030
2.1	417	Total, Increased to minimum Tc = 6.0 min			

Subcatchment SC-9A5: 9A5

Hydrograph



Summary for Pond BMP-9A5: (new Pond)

Inflow Area = 0.420 ac, 21.43% Impervious, Inflow Depth > 0.42" for 1-Year (Rpv) event
 Inflow = 0.21 cfs @ 12.14 hrs, Volume= 0.015 af
 Outflow = 0.03 cfs @ 13.06 hrs, Volume= 0.015 af, Atten= 85%, Lag= 55.1 min
 Discarded = 0.03 cfs @ 13.06 hrs, Volume= 0.015 af
 Primary = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af
 Secondary = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
 Peak Elev= 20.00' @ 13.06 hrs Surf.Area= 0.014 ac Storage= 0.004 af

Plug-Flow detention time= 55.3 min calculated for 0.015 af (99% of inflow)
 Center-of-Mass det. time= 53.8 min (876.8 - 823.0)

Volume	Invert	Avail.Storage	Storage Description
#1	19.20'	0.011 af	6.00'W x 100.00'L x 2.00'H Prismatic 0.028 af Overall x 40.0% Voids
#2	21.20'	0.048 af	6.00'W x 100.00'L x 2.00'H Prismatic Z=2.0
		0.059 af	Total Available Storage

Device	Routing	Invert	Outlet Devices
#1	Discarded	19.20'	2.000 in/hr Exfiltration over Surface area Conductivity to Groundwater Elevation = 10.00'
#2	Secondary	23.00'	14.0' long (Profile 1) Broad-Crested Rectangular Weir Head (feet) 0.49 0.98 1.48 Coef. (English) 2.92 3.37 3.59
#3	Primary	21.20'	18.0" Round Culvert L= 61.0' RCP, end-section conforming to fill, Ke= 0.500 Inlet / Outlet Invert= 21.20' / 21.00' S= 0.0033 '/ Cc= 0.900 n= 0.012, Flow Area= 1.77 sf

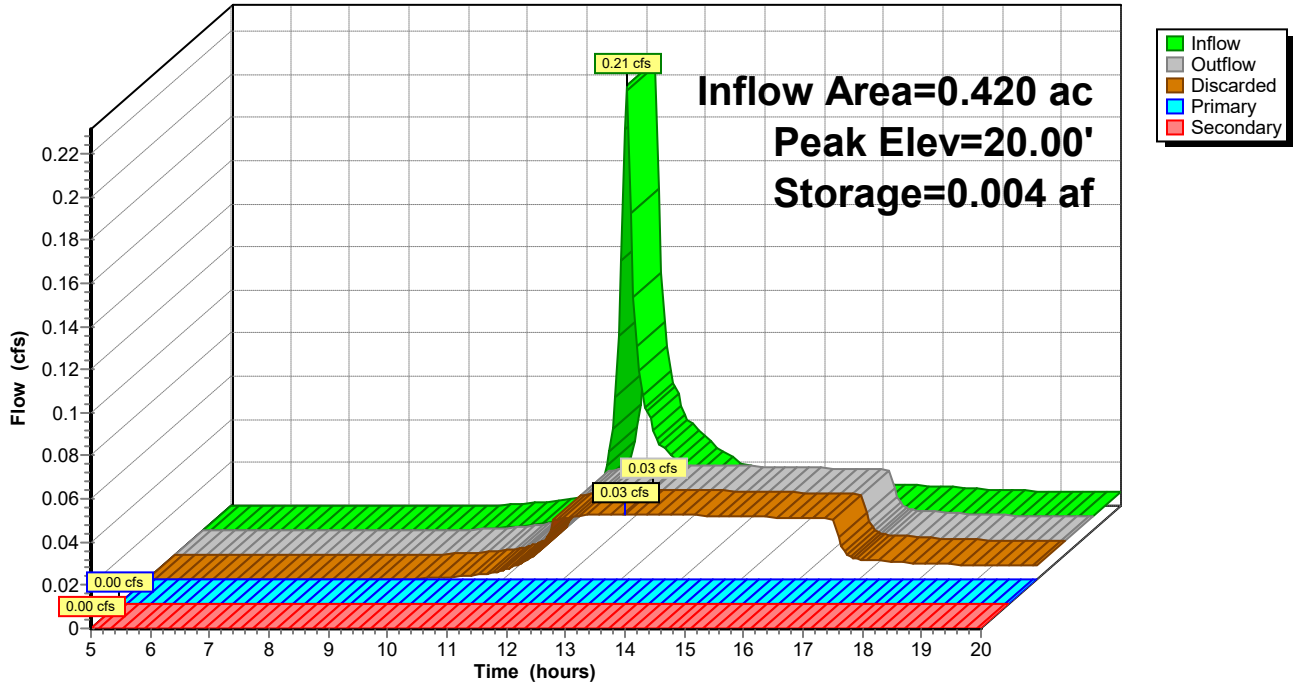
Discarded OutFlow Max=0.03 cfs @ 13.06 hrs HW=20.00' (Free Discharge)
 ↑1=Exfiltration (Controls 0.03 cfs)

Primary OutFlow Max=0.00 cfs @ 5.00 hrs HW=19.20' (Free Discharge)
 ↑3=Culvert (Controls 0.00 cfs)

Secondary OutFlow Max=0.00 cfs @ 5.00 hrs HW=19.20' (Free Discharge)
 ↑2=Broad-Crested Rectangular Weir (Controls 0.00 cfs)

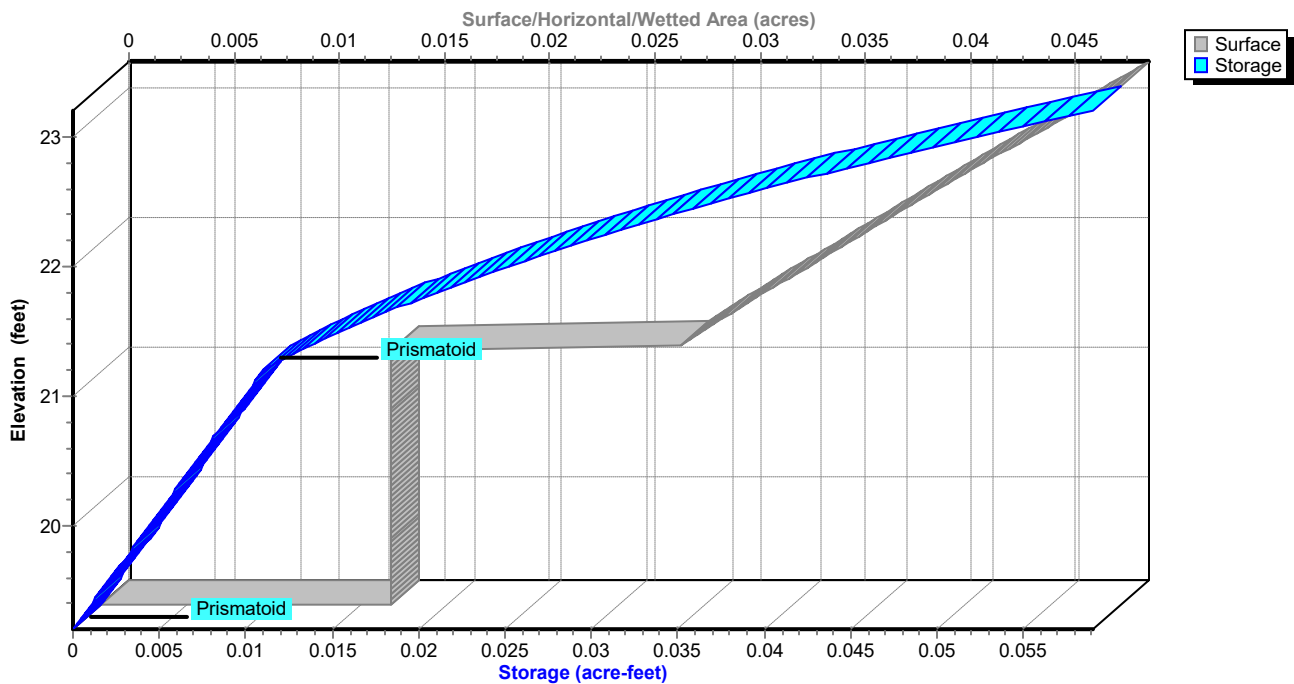
Pond BMP-9A5: (new Pond)

Hydrograph



Pond BMP-9A5: (new Pond)

Stage-Area-Storage



Summary for Subcatchment SC-9A6: 9A6

Runoff = 0.23 cfs @ 12.14 hrs, Volume= 0.016 af, Depth> 0.49"

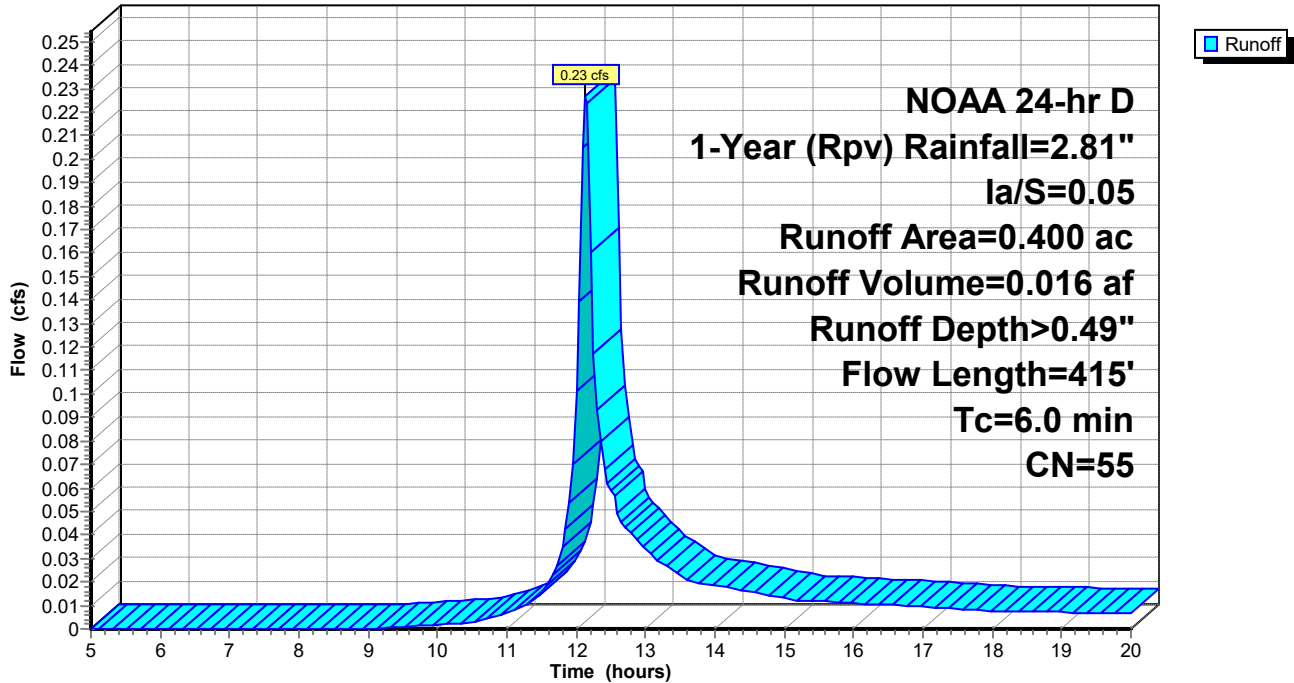
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
 NOAA 24-hr D 1-Year (Rpv) Rainfall=2.81", Ia/S=0.05

Area (ac)	CN	Description
* 0.290	39	
* 0.110	98	
0.400	55	Weighted Average
0.290		72.50% Pervious Area
0.110		27.50% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.1	9	0.0356	1.09		Sheet Flow, Smooth surfaces n= 0.011 P2= 3.30"
0.1	17	0.2030	3.15		Shallow Concentrated Flow, Short Grass Pasture Kv= 7.0 fps
1.8	389	0.0095	3.58	26.48	Channel Flow, Area= 7.4 sf Perim= 11.6' r= 0.64' n= 0.030
2.0	415	Total, Increased to minimum Tc = 6.0 min			

Subcatchment SC-9A6: 9A6

Hydrograph



Summary for Pond BMP-9A6: (new Pond)

Inflow Area = 0.400 ac, 27.50% Impervious, Inflow Depth > 0.49" for 1-Year (Rpv) event
 Inflow = 0.23 cfs @ 12.14 hrs, Volume= 0.016 af
 Outflow = 0.03 cfs @ 13.11 hrs, Volume= 0.016 af, Atten= 87%, Lag= 58.6 min
 Discarded = 0.03 cfs @ 13.11 hrs, Volume= 0.016 af
 Primary = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af
 Secondary = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
 Peak Elev= 20.13' @ 13.11 hrs Surf.Area= 0.014 ac Storage= 0.005 af

Plug-Flow detention time= 64.5 min calculated for 0.016 af (99% of inflow)
 Center-of-Mass det. time= 63.1 min (882.0 - 818.9)

Volume	Invert	Avail.Storage	Storage Description
#1	19.20'	0.011 af	6.00'W x 100.00'L x 2.00'H Prismatic 0.028 af Overall x 40.0% Voids
#2	21.20'	0.048 af	6.00'W x 100.00'L x 2.00'H Prismatic Z=2.0
		0.059 af	Total Available Storage

Device	Routing	Invert	Outlet Devices
#1	Discarded	19.20'	2.000 in/hr Exfiltration over Surface area Conductivity to Groundwater Elevation = 10.00'
#2	Secondary	23.00'	14.0' long (Profile 1) Broad-Crested Rectangular Weir Head (feet) 0.49 0.98 1.48 Coef. (English) 2.92 3.37 3.59
#3	Primary	21.20'	18.0" Round Culvert L= 61.0' RCP, end-section conforming to fill, Ke= 0.500 Inlet / Outlet Invert= 21.20' / 21.00' S= 0.0033 '/ Cc= 0.900 n= 0.012, Flow Area= 1.77 sf

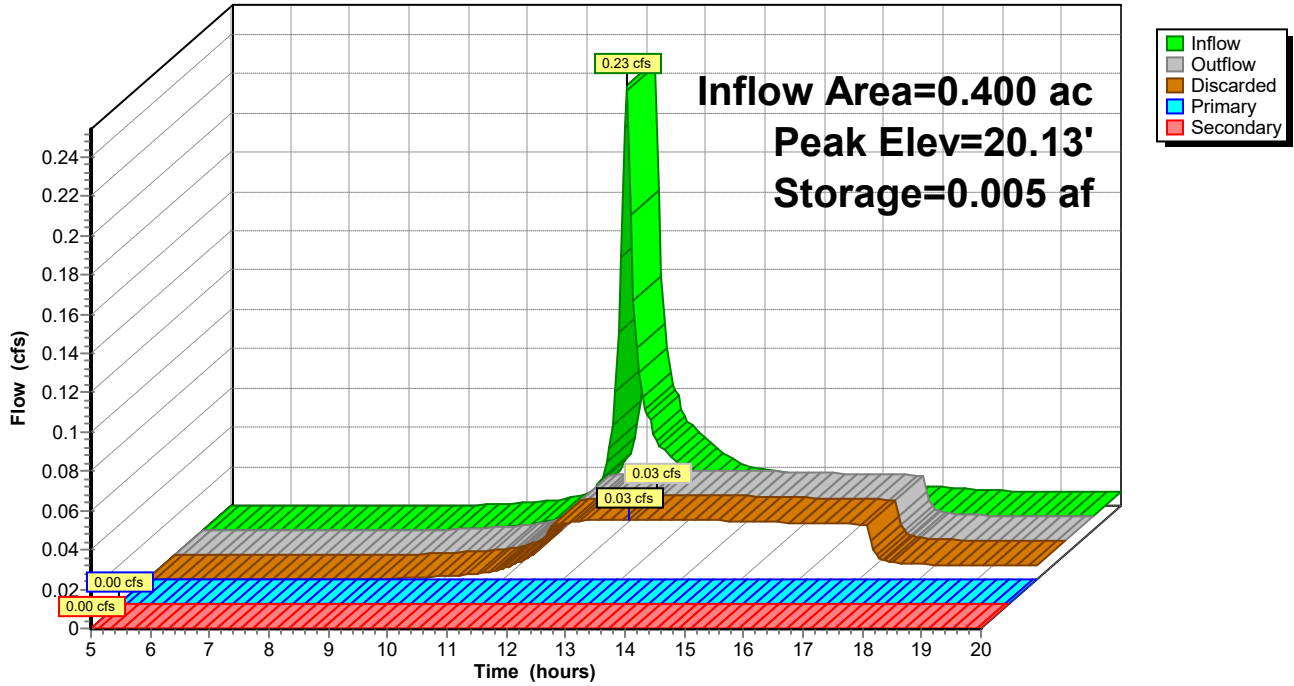
Discarded OutFlow Max=0.03 cfs @ 13.11 hrs HW=20.13' (Free Discharge)
 ↑1=Exfiltration (Controls 0.03 cfs)

Primary OutFlow Max=0.00 cfs @ 5.00 hrs HW=19.20' (Free Discharge)
 ↑3=Culvert (Controls 0.00 cfs)

Secondary OutFlow Max=0.00 cfs @ 5.00 hrs HW=19.20' (Free Discharge)
 ↑2=Broad-Crested Rectangular Weir (Controls 0.00 cfs)

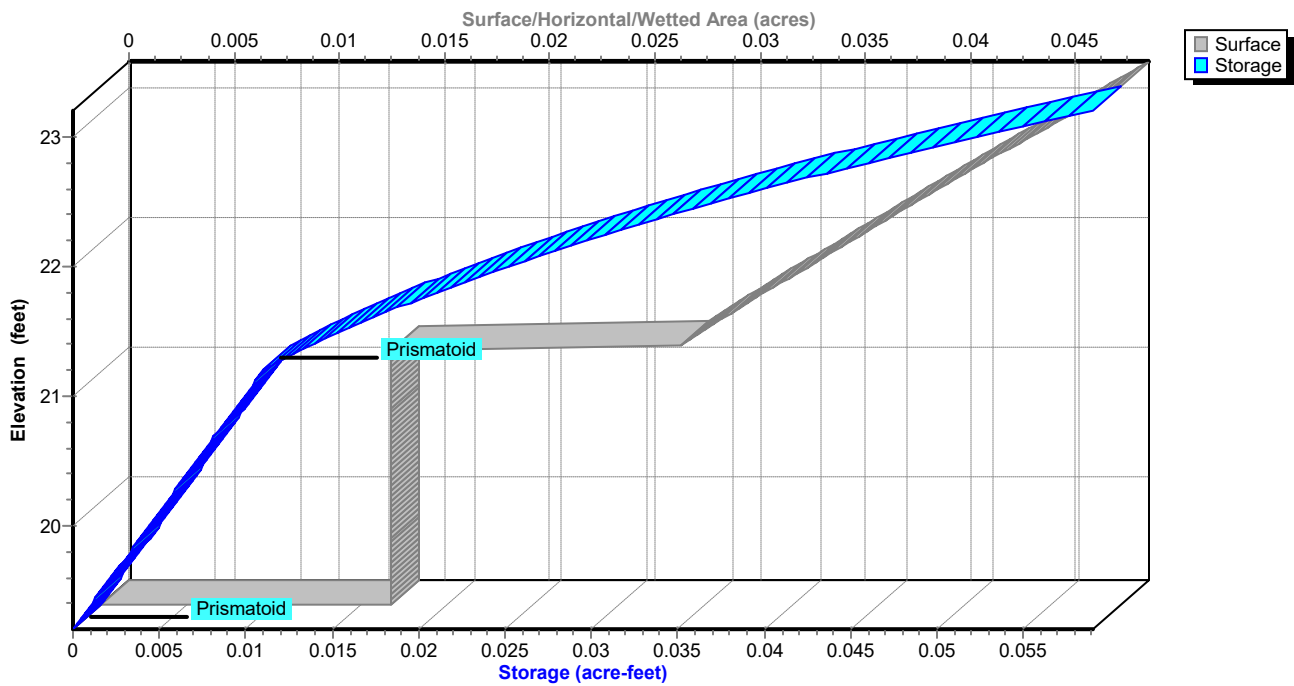
Pond BMP-9A6: (new Pond)

Hydrograph



Pond BMP-9A6: (new Pond)

Stage-Area-Storage



Summary for Subcatchment SC-9A7: 9A7

Runoff = 1.21 cfs @ 12.14 hrs, Volume= 0.086 af, Depth> 0.65"

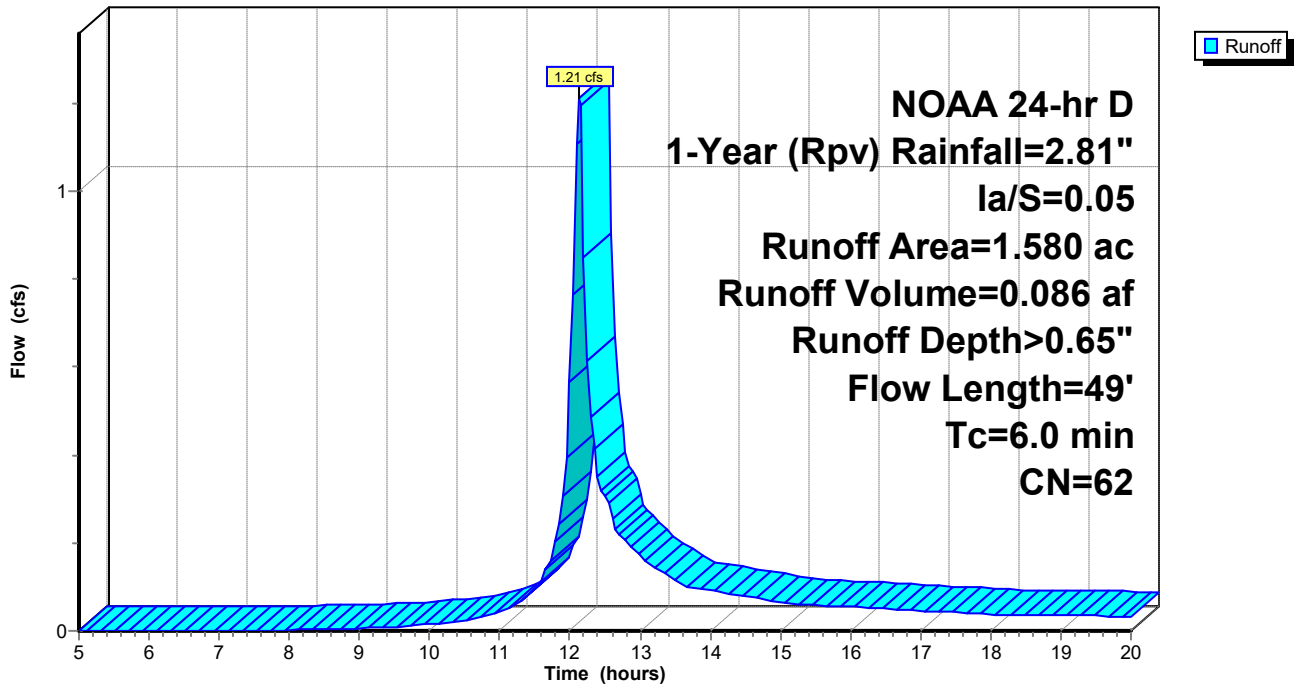
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
 NOAA 24-hr D 1-Year (Rpv) Rainfall=2.81", Ia/S=0.05

Area (ac)	CN	Description
0.960	39	>75% Grass cover, Good, HSG A
0.620	98	Paved roads w/curbs & sewers, HSG A
1.580	62	Weighted Average
0.960		60.76% Pervious Area
0.620		39.24% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.4	34	0.0466	1.58		Sheet Flow, Smooth surfaces n= 0.011 P2= 3.30"
0.1	15	0.1550	2.76		Shallow Concentrated Flow, Short Grass Pasture Kv= 7.0 fps
0.5	49	Total, Increased to minimum Tc = 6.0 min			

Subcatchment SC-9A7: 9A7

Hydrograph



Summary for Subcatchment SC-9A8: 9A5

Runoff = 0.13 cfs @ 12.14 hrs, Volume= 0.009 af, Depth> 0.44"

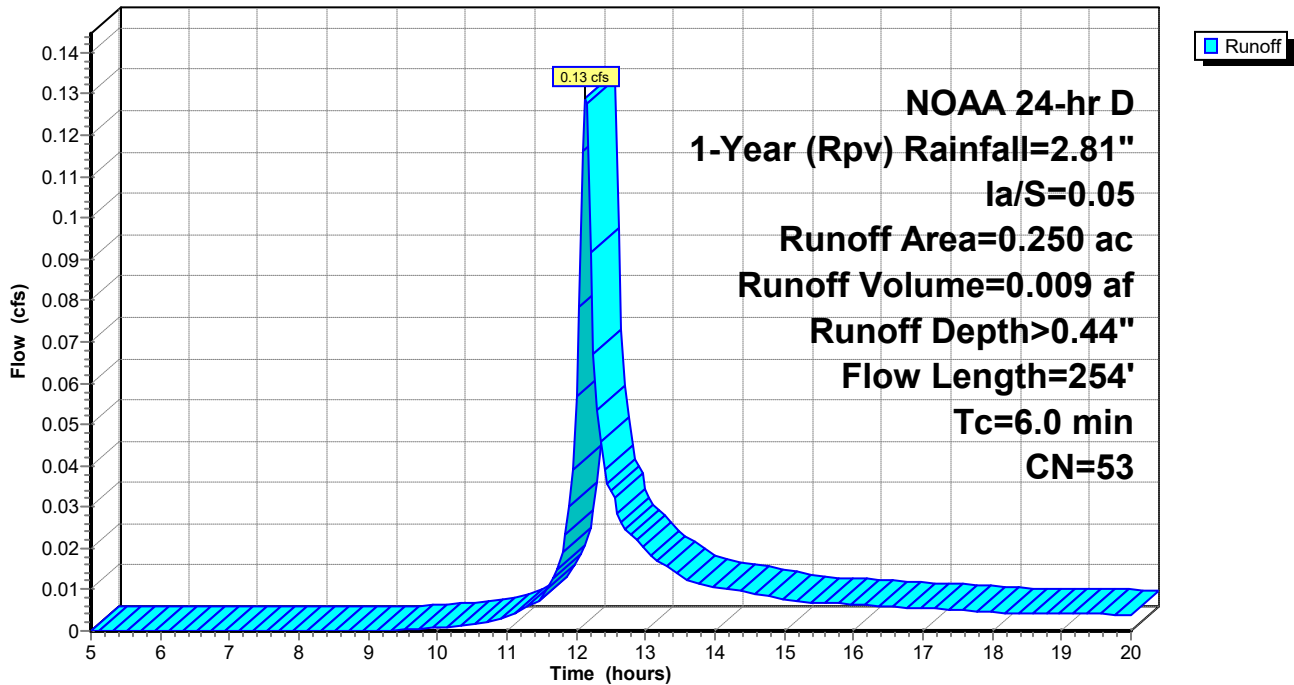
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
 NOAA 24-hr D 1-Year (Rpv) Rainfall=2.81", Ia/S=0.05

Area (ac)	CN	Description
0.190	39	>75% Grass cover, Good, HSG A
0.060	98	Paved roads w/curbs & sewers, HSG A
0.250	53	Weighted Average
0.190		76.00% Pervious Area
0.060		24.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.1	9	0.0315	1.03		Sheet Flow, Smooth surfaces n= 0.011 P2= 3.30"
0.1	18	0.1930	3.08		Shallow Concentrated Flow, Short Grass Pasture Kv= 7.0 fps
1.4	227	0.0054	2.70	19.96	Channel Flow, Area= 7.4 sf Perim= 11.6' r= 0.64' n= 0.030
1.6	254	Total, Increased to minimum Tc = 6.0 min			

Subcatchment SC-9A8: 9A5

Hydrograph



Summary for Pond BMP-9A8: (new Pond)

Inflow Area = 0.250 ac, 24.00% Impervious, Inflow Depth > 0.44" for 1-Year (Rpv) event
 Inflow = 0.13 cfs @ 12.14 hrs, Volume= 0.009 af
 Outflow = 0.03 cfs @ 12.60 hrs, Volume= 0.009 af, Atten= 78%, Lag= 27.8 min
 Discarded = 0.03 cfs @ 12.60 hrs, Volume= 0.009 af
 Primary = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af
 Secondary = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
 Peak Elev= 19.37' @ 12.60 hrs Surf.Area= 0.014 ac Storage= 0.002 af

Plug-Flow detention time= 22.8 min calculated for 0.009 af (99% of inflow)
 Center-of-Mass det. time= 21.5 min (843.0 - 821.6)

Volume	Invert	Avail.Storage	Storage Description
#1	19.00'	0.011 af	6.00'W x 100.00'L x 2.00'H Prismatic 0.028 af Overall x 40.0% Voids
#2	21.00'	0.048 af	6.00'W x 100.00'L x 2.00'H Prismatic Z=2.0
		0.059 af	Total Available Storage

Device	Routing	Invert	Outlet Devices
#1	Discarded	19.00'	2.000 in/hr Exfiltration over Surface area Conductivity to Groundwater Elevation = 10.00'
#2	Secondary	22.75'	14.0' long (Profile 1) Broad-Crested Rectangular Weir Head (feet) 0.49 0.98 1.48 Coef. (English) 2.92 3.37 3.59
#3	Primary	21.00'	18.0" Round Culvert L= 90.0' RCP, end-section conforming to fill, Ke= 0.500 Inlet / Outlet Invert= 21.00' / 20.60' S= 0.0044 '/ Cc= 0.900 n= 0.012, Flow Area= 1.77 sf

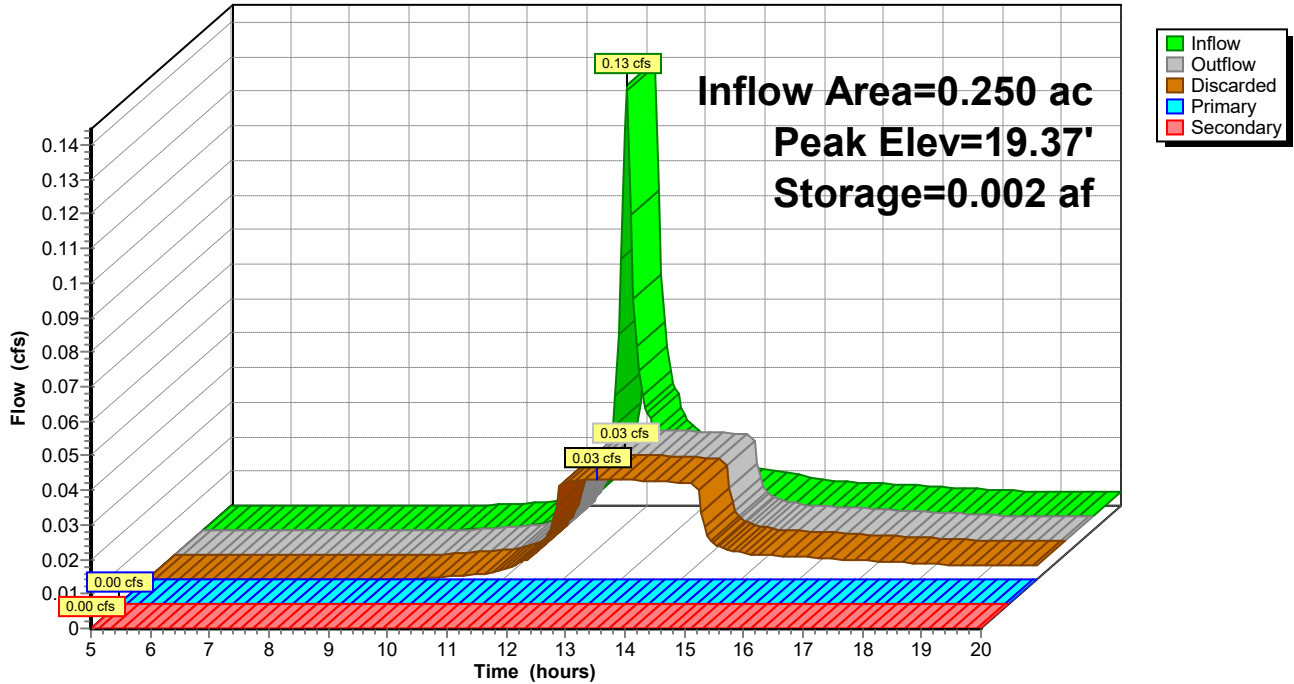
Discarded OutFlow Max=0.03 cfs @ 12.60 hrs HW=19.37' (Free Discharge)
 ↑1=Exfiltration (Controls 0.03 cfs)

Primary OutFlow Max=0.00 cfs @ 5.00 hrs HW=19.00' (Free Discharge)
 ↑3=Culvert (Controls 0.00 cfs)

Secondary OutFlow Max=0.00 cfs @ 5.00 hrs HW=19.00' (Free Discharge)
 ↑2=Broad-Crested Rectangular Weir (Controls 0.00 cfs)

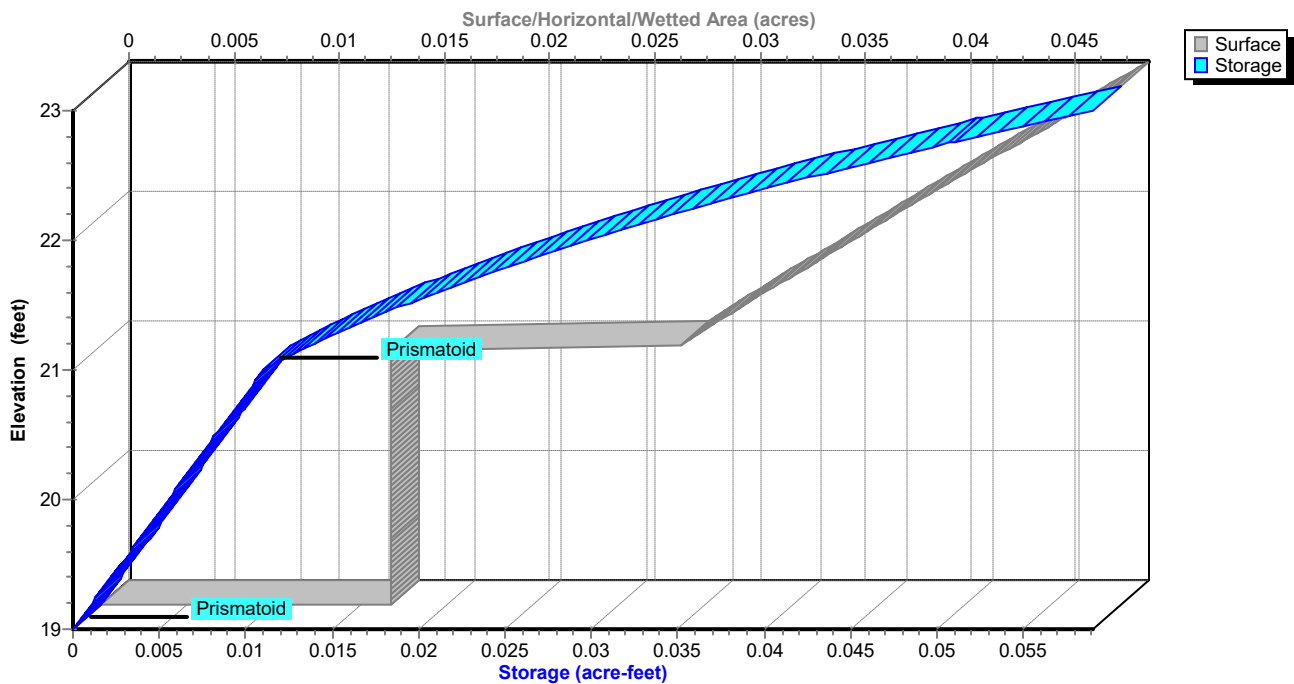
Pond BMP-9A8: (new Pond)

Hydrograph



Pond BMP-9A8: (new Pond)

Stage-Area-Storage



Summary for Subcatchment SC-9A9: 9A9

Runoff = 0.14 cfs @ 12.13 hrs, Volume= 0.010 af, Depth> 0.73"

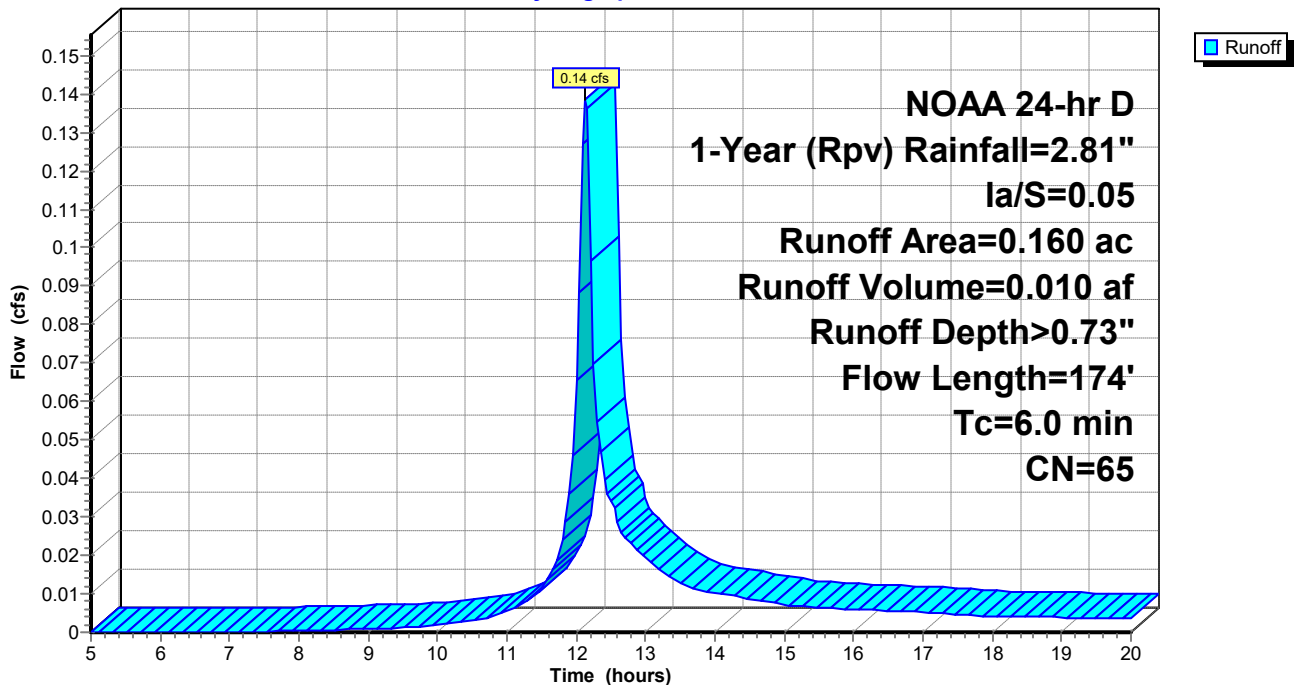
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
 NOAA 24-hr D 1-Year (Rpv) Rainfall=2.81", Ia/S=0.05

Area (ac)	CN	Description
0.090	39	>75% Grass cover, Good, HSG A
0.070	98	Paved roads w/curbs & sewers, HSG A
0.160	65	Weighted Average
0.090		56.25% Pervious Area
0.070		43.75% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.3	27	0.0480	1.53		Sheet Flow, Smooth surfaces n= 0.011 P2= 3.30"
0.1	13	0.3100	3.90		Shallow Concentrated Flow, Short Grass Pasture Kv= 7.0 fps
1.0	73	0.0010	1.19	9.66	Channel Flow, Area= 8.1 sf Perim= 12.2' r= 0.66' n= 0.030
0.2	61	0.0044	4.27	7.55	Pipe Channel, 18.0" Round Area= 1.8 sf Perim= 4.7' r= 0.38' n= 0.012
1.6	174	Total, Increased to minimum Tc = 6.0 min			

Subcatchment SC-9A9: 9A9

Hydrograph



Summary for Subcatchment SC-9B: 9B

Runoff = 0.20 cfs @ 12.14 hrs, Volume= 0.015 af, Depth> 0.33"

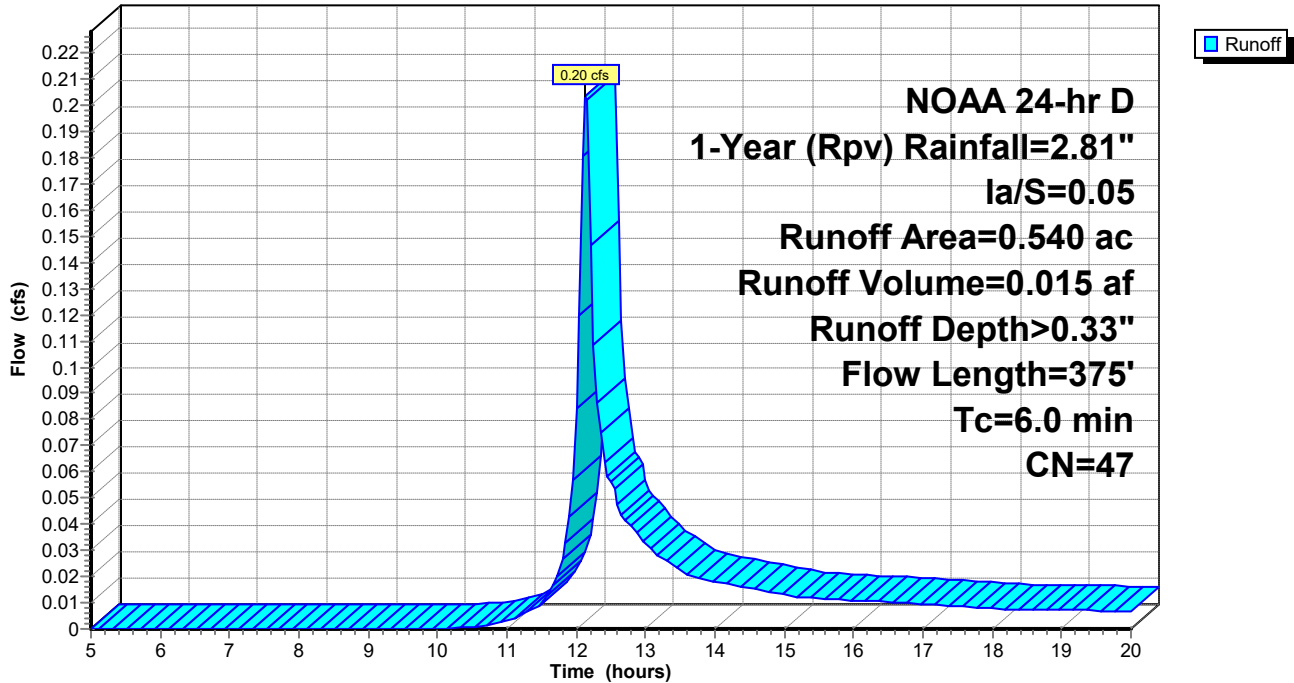
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
 NOAA 24-hr D 1-Year (Rpv) Rainfall=2.81", Ia/S=0.05

Area (ac)	CN	Description
* 0.470	39	
* 0.070	98	
0.540	47	Weighted Average
0.470		87.04% Pervious Area
0.070		12.96% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.3	19	0.0320	1.21		Sheet Flow, Smooth surfaces n= 0.011 P2= 3.30"
0.2	50	0.2810	3.71		Shallow Concentrated Flow, Short Grass Pasture Kv= 7.0 fps
1.0	306	0.0088	4.96	100.25	Channel Flow, Area= 20.2 sf Perim= 18.3' r= 1.10' n= 0.030
1.5	375	Total, Increased to minimum Tc = 6.0 min			

Subcatchment SC-9B: 9B

Hydrograph



Summary for Pond BMP-9B: (new Pond)

Inflow Area = 0.540 ac, 12.96% Impervious, Inflow Depth > 0.33" for 1-Year (Rpv) event
 Inflow = 0.20 cfs @ 12.14 hrs, Volume= 0.015 af
 Outflow = 0.03 cfs @ 13.08 hrs, Volume= 0.015 af, Atten= 85%, Lag= 56.6 min
 Discarded = 0.03 cfs @ 13.08 hrs, Volume= 0.015 af
 Primary = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
 Peak Elev= 18.74' @ 13.08 hrs Surf.Area= 0.014 ac Storage= 0.004 af

Plug-Flow detention time= 54.6 min calculated for 0.015 af (100% of inflow)
 Center-of-Mass det. time= 53.2 min (883.6 - 830.3)

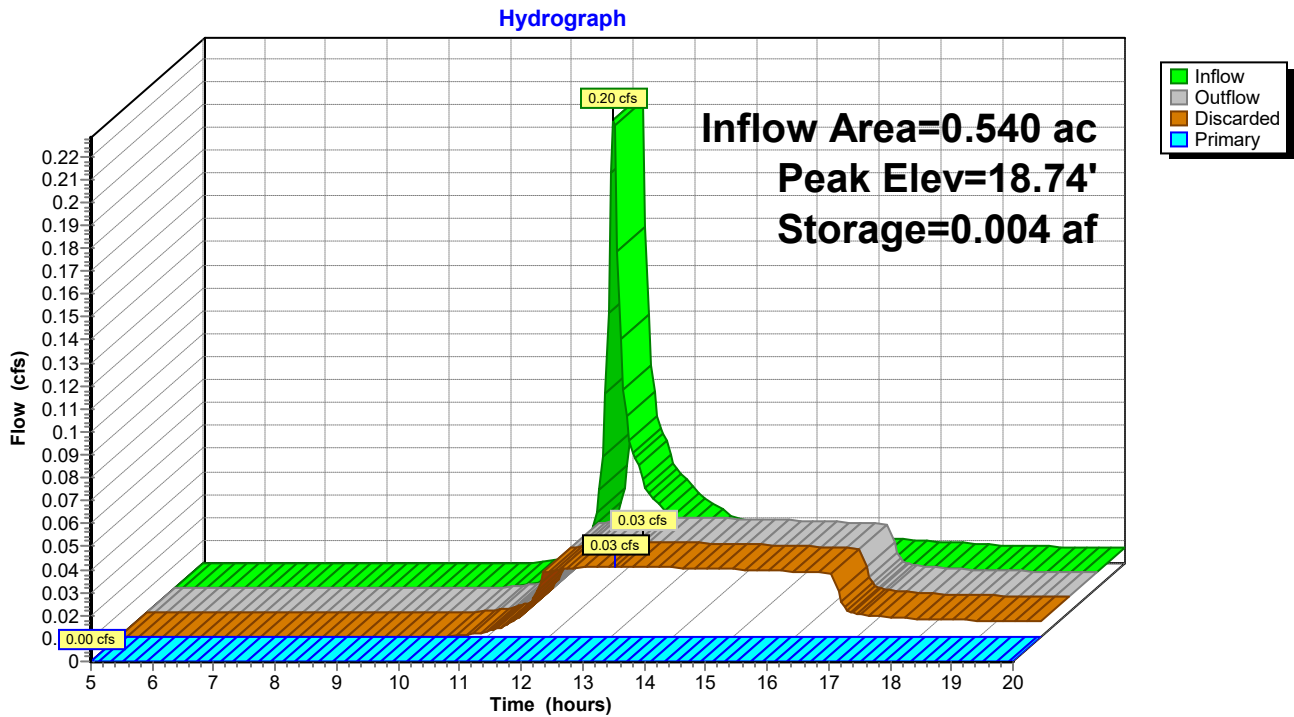
Volume	Invert	Avail.Storage	Storage Description
#1	17.95'	0.011 af	6.00'W x 100.00'L x 2.00'H Prismatic 0.028 af Overall x 40.0% Voids
#2	19.95'	0.048 af	6.00'W x 100.00'L x 2.00'H Prismatic Z=2.0
		0.059 af	Total Available Storage

Device	Routing	Invert	Outlet Devices
#1	Discarded	17.95'	2.000 in/hr Exfiltration over Surface area Conductivity to Groundwater Elevation = 10.00'
#2	Primary	21.75'	14.0' long (Profile 1) Broad-Crested Rectangular Weir Head (feet) 0.49 0.98 1.48 Coef. (English) 2.92 3.37 3.59

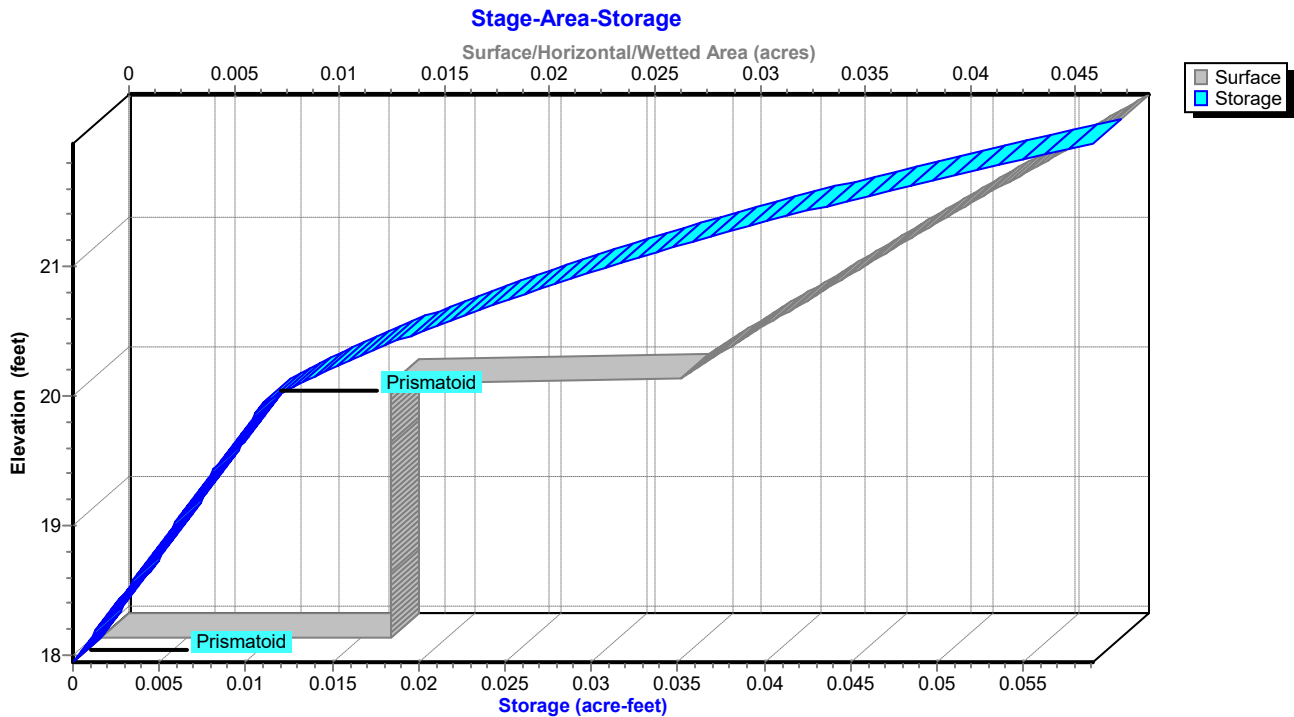
Discarded OutFlow Max=0.03 cfs @ 13.08 hrs HW=18.74' (Free Discharge)
 ↑1=Exfiltration (Controls 0.03 cfs)

Primary OutFlow Max=0.00 cfs @ 5.00 hrs HW=17.95' (Free Discharge)
 ↑2=Broad-Crested Rectangular Weir (Controls 0.00 cfs)

Pond BMP-9B: (new Pond)



Pond BMP-9B: (new Pond)



Summary for Subcatchment SC-9C: 9C

Runoff = 0.64 cfs @ 12.13 hrs, Volume= 0.045 af, Depth> 0.96"

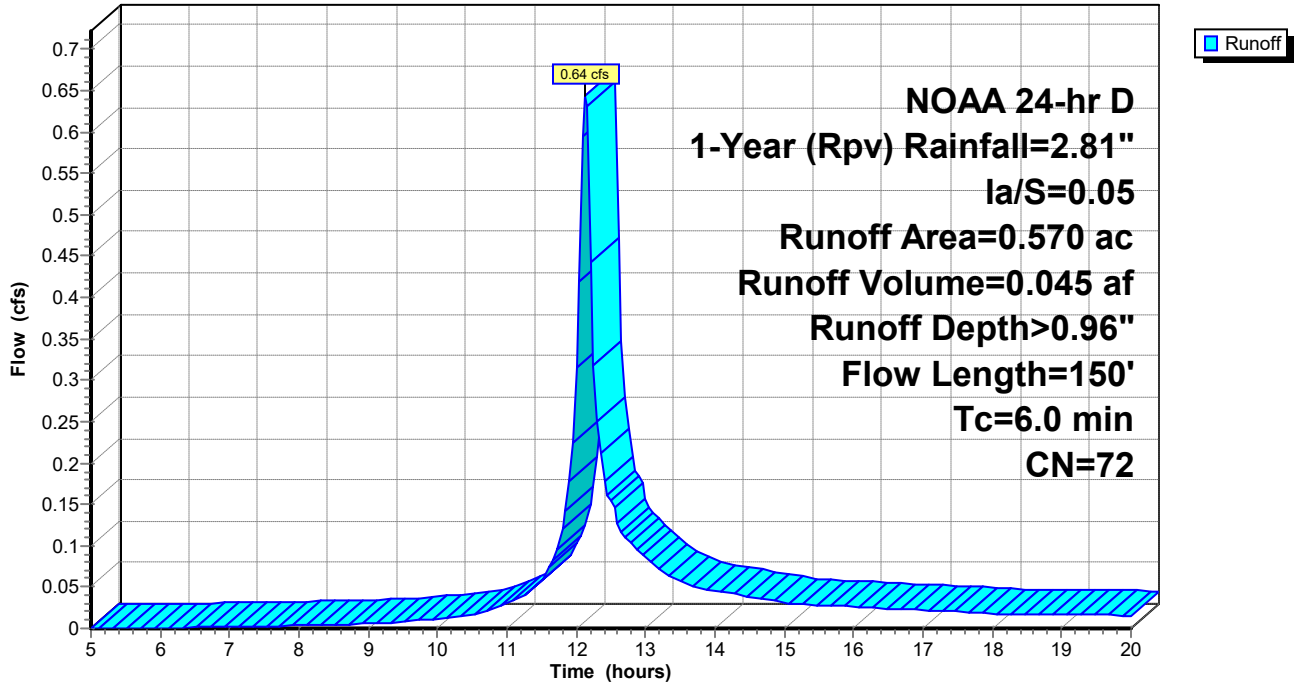
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
 NOAA 24-hr D 1-Year (Rpv) Rainfall=2.81", Ia/S=0.05

Area (ac)	CN	Description
* 0.250	39	
* 0.320	98	
0.570	72	Weighted Average
0.250		43.86% Pervious Area
0.320		56.14% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.6	54	0.0330	1.51		Sheet Flow, Smooth surfaces n= 0.011 P2= 3.30"
0.1	12	0.0410	1.42		Shallow Concentrated Flow, Short Grass Pasture Kv= 7.0 fps
0.1	10	0.0210	2.94		Shallow Concentrated Flow, Paved Kv= 20.3 fps
0.1	13	0.1720	2.90		Shallow Concentrated Flow, Short Grass Pasture Kv= 7.0 fps
0.2	61	0.0095	4.92	87.10	Channel Flow, Area= 17.7 sf Perim= 17.2' r= 1.03' n= 0.030
1.1	150	Total, Increased to minimum Tc = 6.0 min			

Subcatchment SC-9C: 9C

Hydrograph



Summary for Pond BMP-9C: (new Pond)

Inflow Area = 0.570 ac, 56.14% Impervious, Inflow Depth > 0.96" for 1-Year (Rpv) event
 Inflow = 0.64 cfs @ 12.13 hrs, Volume= 0.045 af
 Outflow = 0.07 cfs @ 13.30 hrs, Volume= 0.045 af, Atten= 90%, Lag= 70.0 min
 Discarded = 0.07 cfs @ 13.30 hrs, Volume= 0.045 af
 Primary = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
 Peak Elev= 19.29' @ 13.30 hrs Surf.Area= 0.028 ac Storage= 0.017 af

Plug-Flow detention time= 103.3 min calculated for 0.045 af (100% of inflow)
 Center-of-Mass det. time= 102.2 min (898.6 - 796.4)

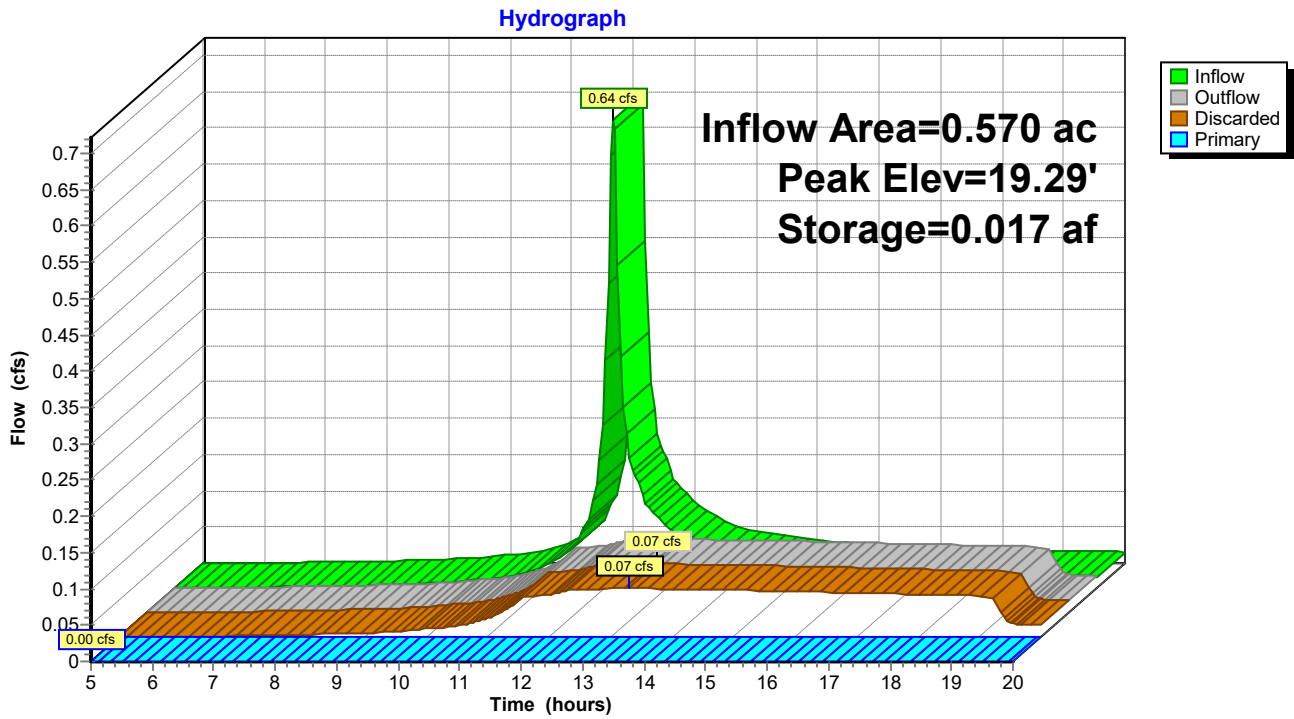
Volume	Invert	Avail.Storage	Storage Description
#1	17.75'	0.022 af	8.00'W x 150.00'L x 2.00'H Prismatic 0.055 af Overall x 40.0% Voids
#2	19.75'	0.085 af	8.00'W x 150.00'L x 2.00'H Prismatic Z=2.0
		0.107 af	Total Available Storage

Device	Routing	Invert	Outlet Devices
#1	Discarded	17.75'	2.000 in/hr Exfiltration over Surface area Conductivity to Groundwater Elevation = 10.00'
#2	Primary	21.50'	16.0' long (Profile 1) Broad-Crested Rectangular Weir Head (feet) 0.49 0.98 1.48 Coef. (English) 2.92 3.37 3.59

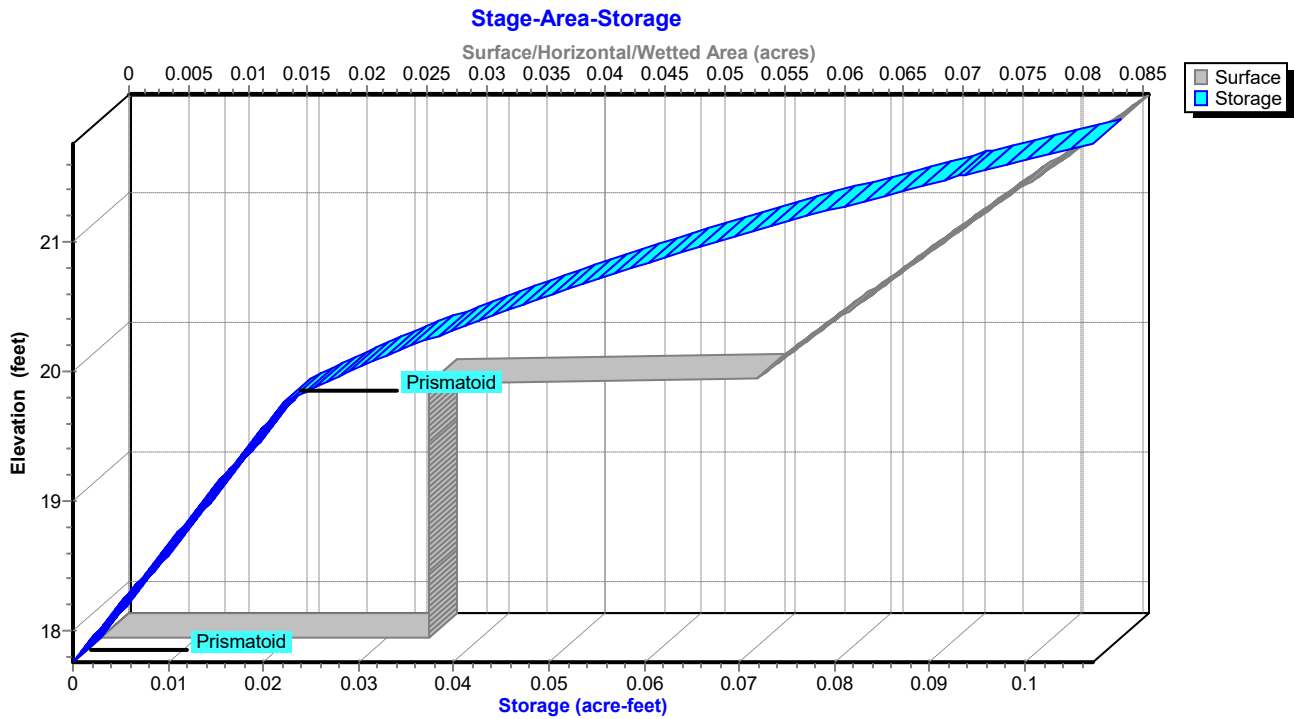
Discarded OutFlow Max=0.07 cfs @ 13.30 hrs HW=19.29' (Free Discharge)
 ↑1=Exfiltration (Controls 0.07 cfs)

Primary OutFlow Max=0.00 cfs @ 5.00 hrs HW=17.75' (Free Discharge)
 ↑2=Broad-Crested Rectangular Weir (Controls 0.00 cfs)

Pond BMP-9C: (new Pond)



Pond BMP-9C: (new Pond)



Summary for Subcatchment SC-9D: 9D

Runoff = 0.80 cfs @ 12.81 hrs, Volume= 0.153 af, Depth> 0.19"

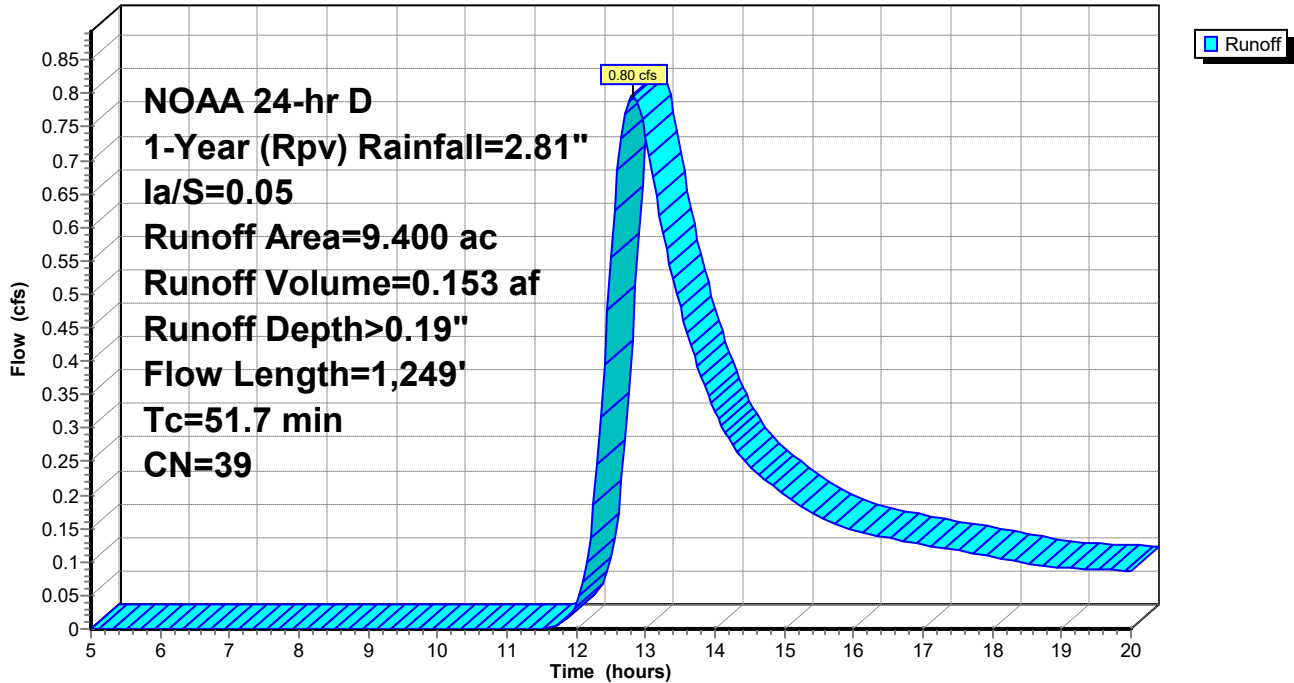
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
 NOAA 24-hr D 1-Year (Rpv) Rainfall=2.81", Ia/S=0.05

Area (ac)	CN	Description
* 9.400	39	
9.400		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
17.7	50	0.0011	0.05		Sheet Flow, Grass: Short n= 0.150 P2= 3.30"
33.2	985	0.0050	0.49		Shallow Concentrated Flow, Short Grass Pasture Kv= 7.0 fps
0.6	130	0.0100	3.90	12.25	Pipe Channel, CMP_Round 24" 24.0" Round Area= 3.1 sf Perim= 6.3' r= 0.50' n= 0.024
0.2	84	0.0180	7.05	141.68	Channel Flow, Area= 20.1 sf Perim= 18.4' r= 1.09' n= 0.030
51.7	1,249	Total			

Subcatchment SC-9D: 9D

Hydrograph



Summary for Subcatchment SC-9E: 9E

Runoff = 0.56 cfs @ 12.13 hrs, Volume= 0.040 af, Depth> 0.73"

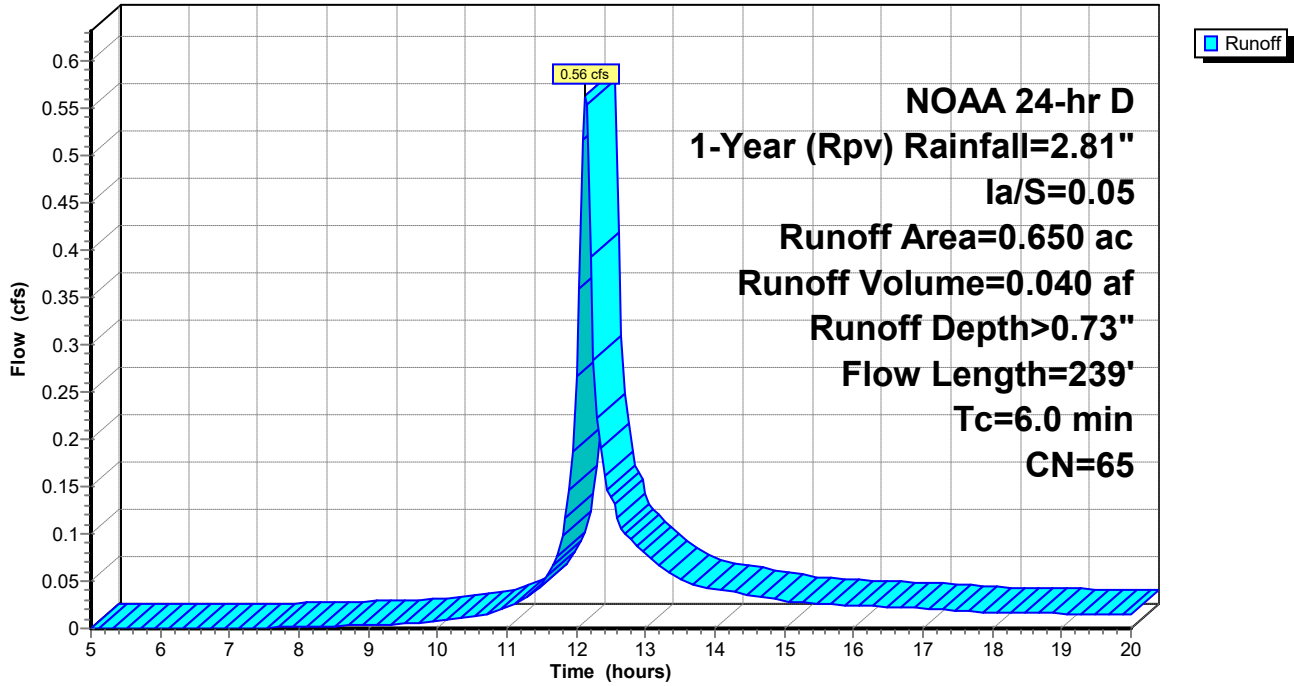
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
 NOAA 24-hr D 1-Year (Rpv) Rainfall=2.81", Ia/S=0.05

Area (ac)	CN	Description
* 0.360	39	
* 0.290	98	
0.650	65	Weighted Average
0.360		55.38% Pervious Area
0.290		44.62% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.6	57	0.0370	1.60		Sheet Flow, Smooth surfaces n= 0.011 P2= 3.30"
0.2	18	0.0440	1.47		Shallow Concentrated Flow, Short Grass Pasture Kv= 7.0 fps
0.1	18	0.0340	3.74		Shallow Concentrated Flow, Paved Kv= 20.3 fps
0.2	46	0.2760	3.68		Shallow Concentrated Flow, Short Grass Pasture Kv= 7.0 fps
0.5	100	0.0044	3.63	84.16	Channel Flow, Area= 23.2 sf Perim= 20.0' r= 1.16' n= 0.030
1.6	239	Total, Increased to minimum Tc = 6.0 min			

Subcatchment SC-9E: 9E

Hydrograph



Summary for Pond BMP-9E: (new Pond)

Inflow Area = 0.650 ac, 44.62% Impervious, Inflow Depth > 0.73" for 1-Year (Rpv) event
 Inflow = 0.56 cfs @ 12.13 hrs, Volume= 0.040 af
 Outflow = 0.06 cfs @ 13.27 hrs, Volume= 0.040 af, Atten= 89%, Lag= 68.0 min
 Discarded = 0.06 cfs @ 13.27 hrs, Volume= 0.040 af
 Primary = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
 Peak Elev= 21.24' @ 13.27 hrs Surf.Area= 0.028 ac Storage= 0.014 af

Plug-Flow detention time= 90.0 min calculated for 0.040 af (100% of inflow)
 Center-of-Mass det. time= 88.8 min (894.7 - 805.8)

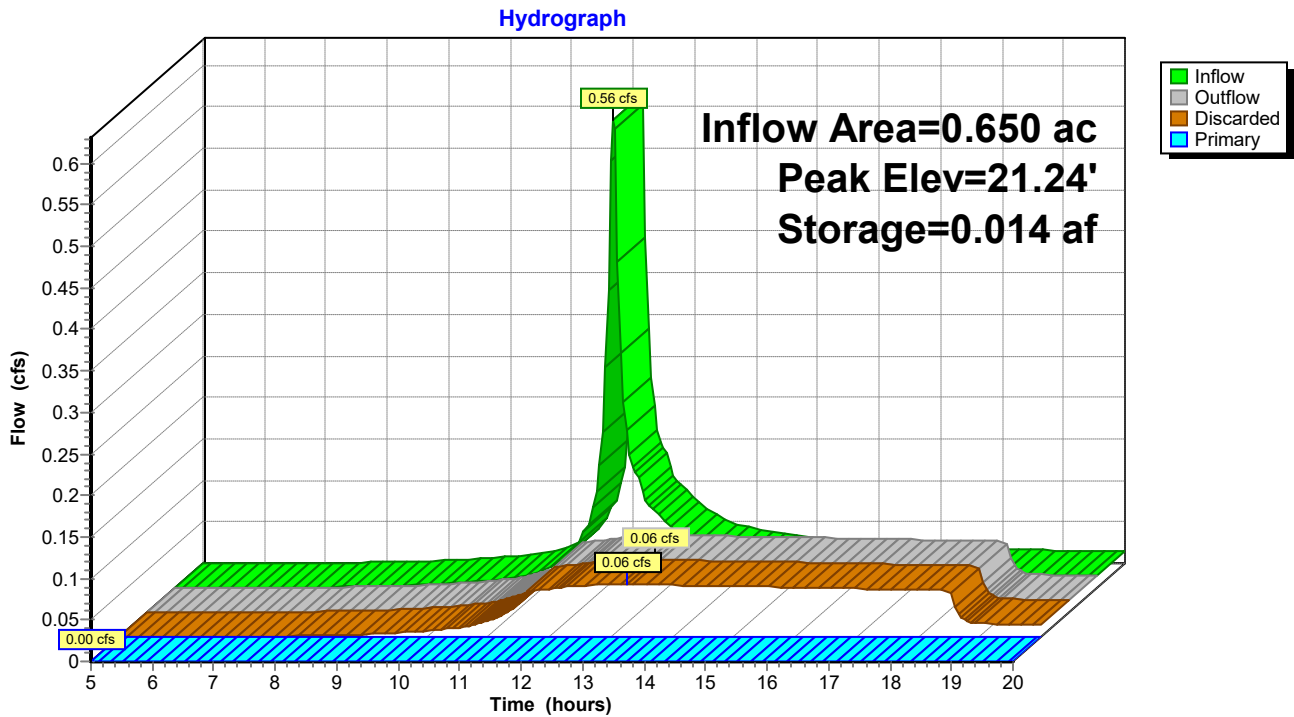
Volume	Invert	Avail.Storage	Storage Description
#1	19.95'	0.022 af	8.00'W x 150.00'L x 2.00'H Prismatic 0.055 af Overall x 40.0% Voids
#2	21.95'	0.085 af	8.00'W x 150.00'L x 2.00'H Prismatic Z=2.0
		0.107 af	Total Available Storage

Device	Routing	Invert	Outlet Devices
#1	Discarded	19.95'	2.000 in/hr Exfiltration over Surface area Conductivity to Groundwater Elevation = 10.00'
#2	Primary	23.50'	16.0' long (Profile 1) Broad-Crested Rectangular Weir Head (feet) 0.49 0.98 1.48 Coef. (English) 2.92 3.37 3.59

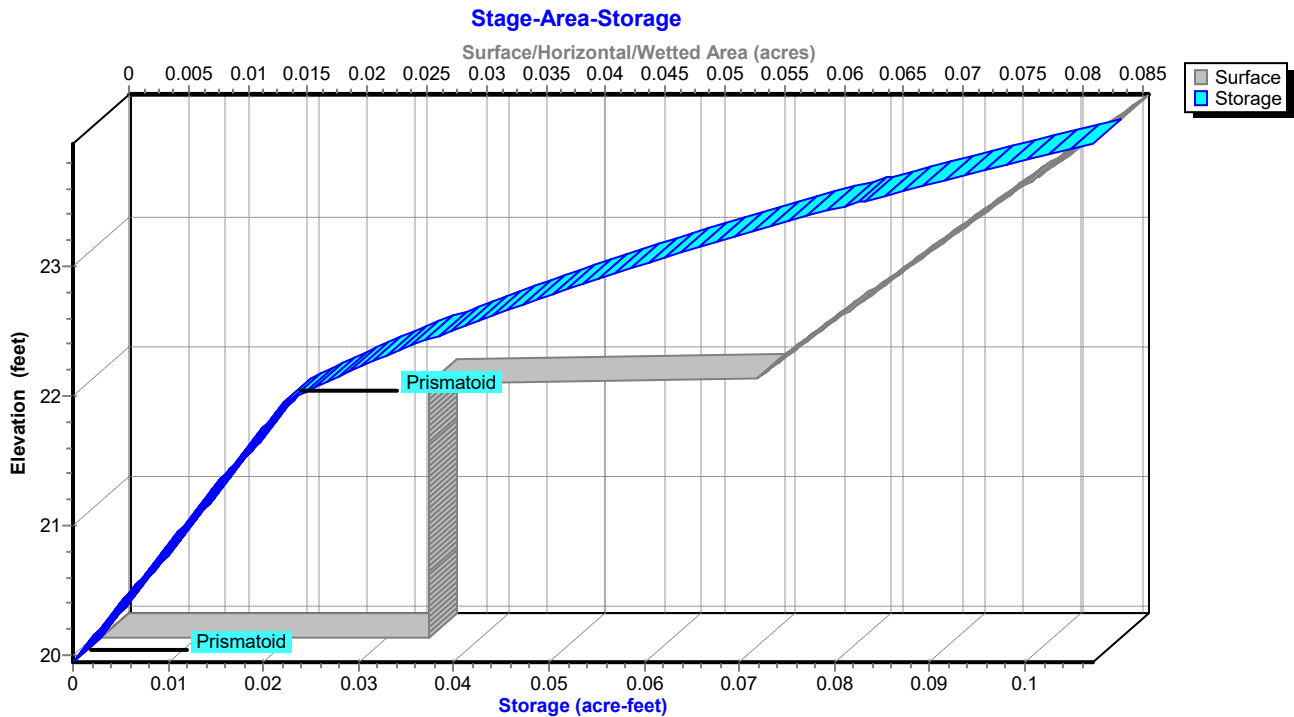
Discarded OutFlow Max=0.06 cfs @ 13.27 hrs HW=21.24' (Free Discharge)
 ↑1=Exfiltration (Controls 0.06 cfs)

Primary OutFlow Max=0.00 cfs @ 5.00 hrs HW=19.95' (Free Discharge)
 ↑2=Broad-Crested Rectangular Weir (Controls 0.00 cfs)

Pond BMP-9E: (new Pond)



Pond BMP-9E: (new Pond)



Summary for Subcatchment SC-10A: 10A

Runoff = 0.40 cfs @ 12.14 hrs, Volume= 0.029 af, Depth> 0.40"

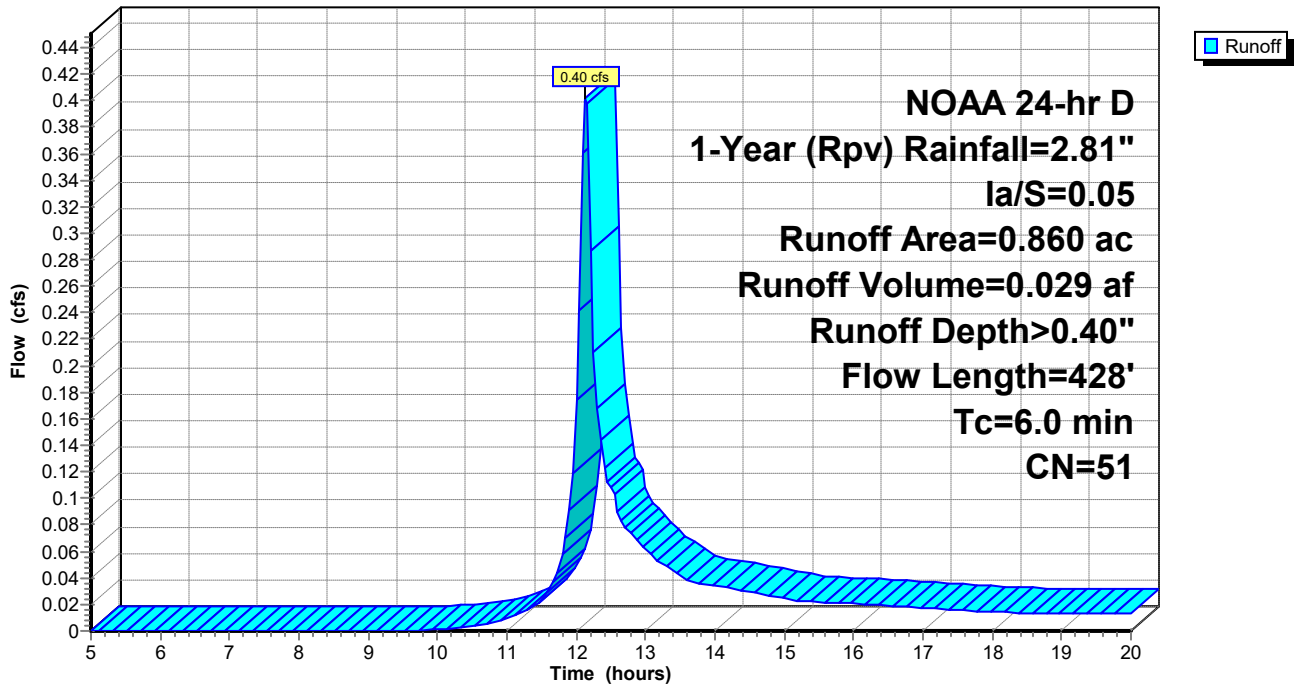
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
 NOAA 24-hr D 1-Year (Rpv) Rainfall=2.81", Ia/S=0.05

Area (ac)	CN	Description
* 0.180	98	
* 0.680	39	
0.860	51	Weighted Average
0.680		79.07% Pervious Area
0.180		20.93% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.3	21	0.0320	1.23		Sheet Flow, Smooth surfaces n= 0.011 P2= 3.30"
0.2	52	0.2820	3.72		Shallow Concentrated Flow, Short Grass Pasture Kv= 7.0 fps
1.9	355	0.0032	3.06	64.54	Channel Flow, Area= 21.1 sf Perim= 18.5' r= 1.14' n= 0.030
2.4	428	Total, Increased to minimum Tc = 6.0 min			

Subcatchment SC-10A: 10A

Hydrograph



Summary for Pond BMP-10A: BMP 10A

Inflow Area = 0.860 ac, 20.93% Impervious, Inflow Depth > 0.40" for 1-Year (Rpv) event
 Inflow = 0.40 cfs @ 12.14 hrs, Volume= 0.029 af
 Outflow = 0.04 cfs @ 13.47 hrs, Volume= 0.029 af, Atten= 89%, Lag= 80.0 min
 Discarded = 0.04 cfs @ 13.47 hrs, Volume= 0.029 af
 Primary = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af
 Secondary = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
 Peak Elev= 19.94' @ 13.47 hrs Surf.Area= 0.018 ac Storage= 0.011 af

Plug-Flow detention time= 107.4 min calculated for 0.029 af (100% of inflow)
 Center-of-Mass det. time= 106.0 min (930.4 - 824.4)

Volume	Invert	Avail.Storage	Storage Description
#1	18.50'	0.015 af	8.00'W x 100.00'L x 2.00'H Prismatic 0.037 af Overall x 40.0% Voids
#2	20.50'	0.058 af	8.00'W x 100.00'L x 2.00'H Prismatic Z=2.0 -Impervious
		0.072 af	Total Available Storage

Device	Routing	Invert	Outlet Devices
#1	Discarded	18.50'	2.000 in/hr Exfiltration over Surface area Conductivity to Groundwater Elevation = 10.00'
#2	Primary	20.50'	24.0" Round Culvert L= 228.0' CMP, end-section conforming to fill, Ke= 0.500 Inlet / Outlet Invert= 20.50' / 19.75' S= 0.0033 '/ Cc= 0.900 n= 0.024, Flow Area= 3.14 sf
#3	Secondary	22.00'	16.0' long (Profile 1) Broad-Crested Rectangular Weir Head (feet) 0.49 0.98 1.48 Coef. (English) 2.92 3.37 3.59

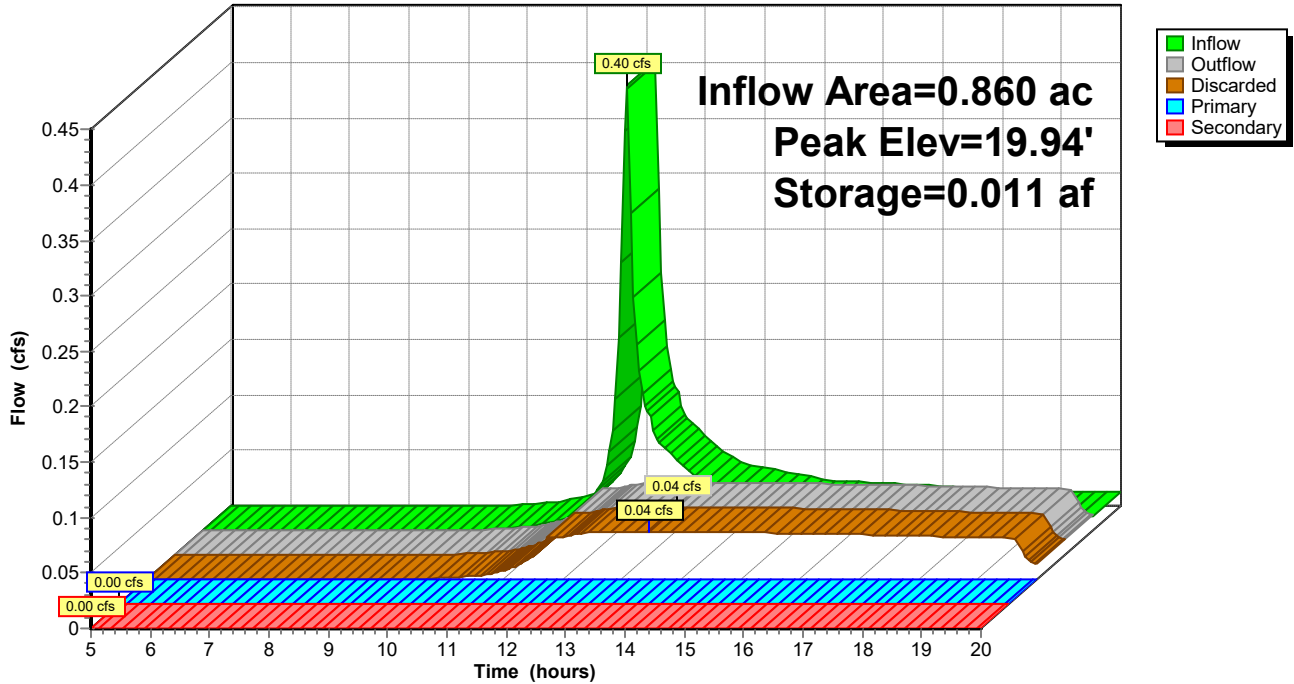
Discarded OutFlow Max=0.04 cfs @ 13.47 hrs HW=19.94' (Free Discharge)
 ↑1=Exfiltration (Controls 0.04 cfs)

Primary OutFlow Max=0.00 cfs @ 5.00 hrs HW=18.50' (Free Discharge)
 ↑2=Culvert (Controls 0.00 cfs)

Secondary OutFlow Max=0.00 cfs @ 5.00 hrs HW=18.50' (Free Discharge)
 ↑3=Broad-Crested Rectangular Weir (Controls 0.00 cfs)

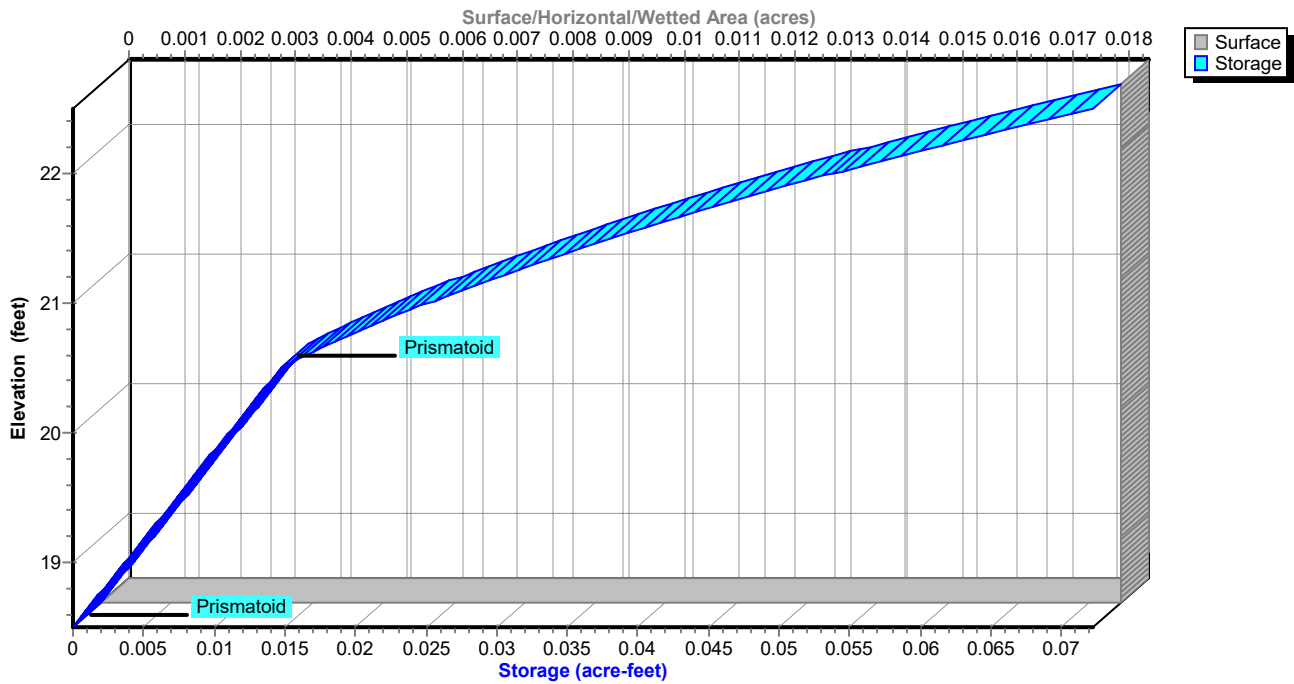
Pond BMP-10A: BMP 10A

Hydrograph



Pond BMP-10A: BMP 10A

Stage-Area-Storage



Summary for Subcatchment SC-10B: 10B

Runoff = 0.48 cfs @ 12.13 hrs, Volume= 0.034 af, Depth> 0.79"

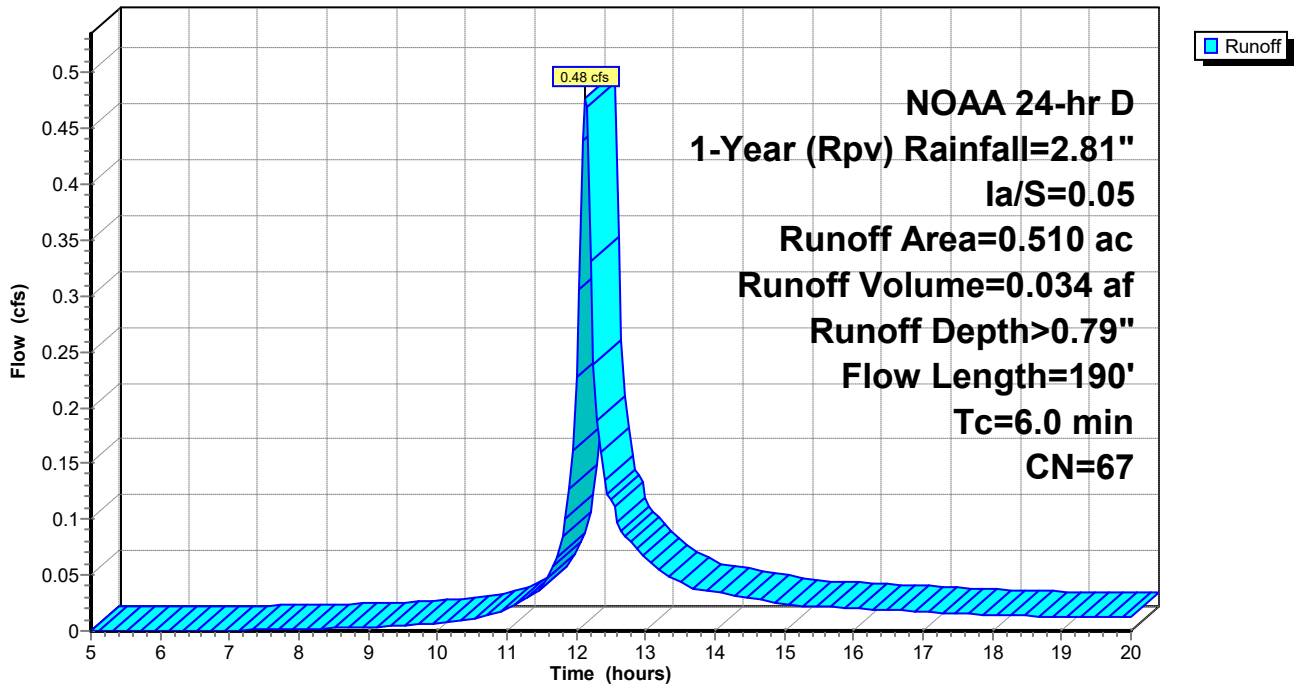
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
 NOAA 24-hr D 1-Year (Rpv) Rainfall=2.81", Ia/S=0.05

Area (ac)	CN	Description
0.240	98	Paved roads w/curbs & sewers, HSG A
0.270	39	>75% Grass cover, Good, HSG A
0.510	67	Weighted Average
0.270		52.94% Pervious Area
0.240		47.06% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.3	23	0.0325	1.26		Sheet Flow, Smooth surfaces n= 0.011 P2= 3.30"
0.4	92	0.3000	3.83		Shallow Concentrated Flow, Short Grass Pasture Kv= 7.0 fps
0.2	75	0.0155	6.39	121.47	Channel Flow, Area= 19.0 sf Perim= 18.0' r= 1.06' n= 0.030
0.9	190	Total, Increased to minimum Tc = 6.0 min			

Subcatchment SC-10B: 10B

Hydrograph



Summary for Pond BMP-10B: BMP 10B

Inflow Area = 0.510 ac, 47.06% Impervious, Inflow Depth > 0.79" for 1-Year (Rpv) event
 Inflow = 0.48 cfs @ 12.13 hrs, Volume= 0.034 af
 Outflow = 0.04 cfs @ 13.47 hrs, Volume= 0.032 af, Atten= 91%, Lag= 80.2 min
 Discarded = 0.04 cfs @ 13.47 hrs, Volume= 0.032 af
 Primary = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af
 Secondary = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
 Peak Elev= 20.31' @ 13.47 hrs Surf.Area= 0.018 ac Storage= 0.013 af

Plug-Flow detention time= 130.7 min calculated for 0.032 af (95% of inflow)
 Center-of-Mass det. time= 113.2 min (916.4 - 803.2)

Volume	Invert	Avail.Storage	Storage Description
#1	18.50'	0.015 af	8.00'W x 100.00'L x 2.00'H Prismatoid 0.037 af Overall x 40.0% Voids
#2	20.50'	0.058 af	8.00'W x 100.00'L x 2.00'H Prismatoid Z=2.0
		0.072 af	Total Available Storage

Device	Routing	Invert	Outlet Devices
#1	Discarded	18.50'	2.000 in/hr Exfiltration over Surface area Conductivity to Groundwater Elevation = 10.00'
#2	Primary	20.50'	24.0" Round Culvert L= 228.0' CMP, end-section conforming to fill, Ke= 0.500 Inlet / Outlet Invert= 20.50' / 19.75' S= 0.0033 '/ Cc= 0.900 n= 0.024, Flow Area= 3.14 sf
#3	Secondary	22.00'	16.0' long (Profile 1) Broad-Crested Rectangular Weir Head (feet) 0.49 0.98 1.48 Coef. (English) 2.92 3.37 3.59

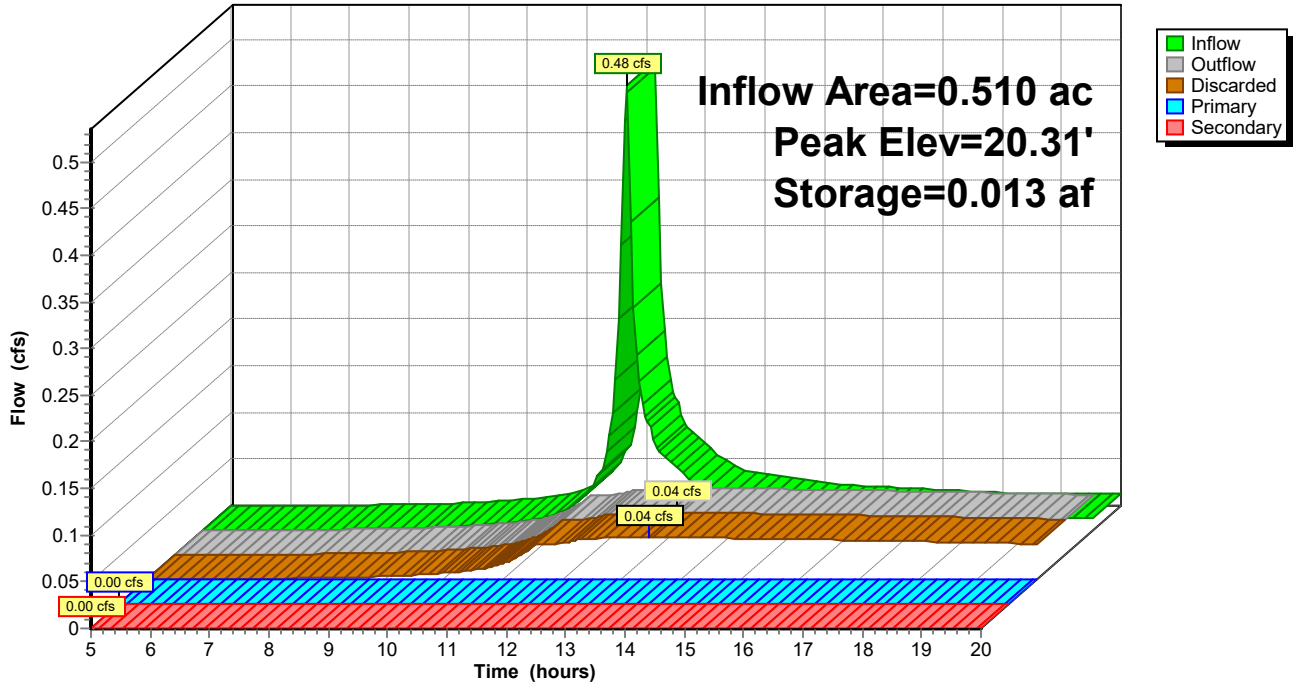
Discarded OutFlow Max=0.04 cfs @ 13.47 hrs HW=20.31' (Free Discharge)
 ↑1=Exfiltration (Controls 0.04 cfs)

Primary OutFlow Max=0.00 cfs @ 5.00 hrs HW=18.50' (Free Discharge)
 ↑2=Culvert (Controls 0.00 cfs)

Secondary OutFlow Max=0.00 cfs @ 5.00 hrs HW=18.50' (Free Discharge)
 ↑3=Broad-Crested Rectangular Weir (Controls 0.00 cfs)

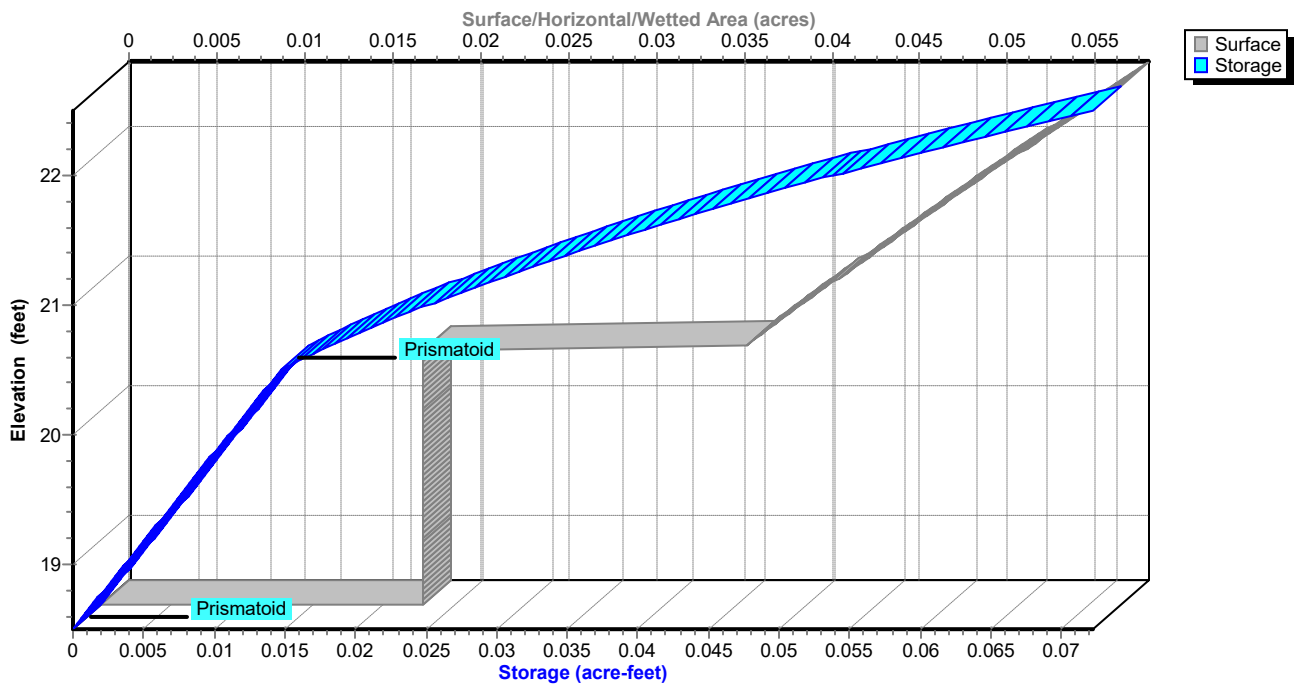
Pond BMP-10B: BMP 10B

Hydrograph



Pond BMP-10B: BMP 10B

Stage-Area-Storage



Summary for Subcatchment SC-10C: 10C

Runoff = 0.48 cfs @ 12.14 hrs, Volume= 0.034 af, Depth> 0.51"

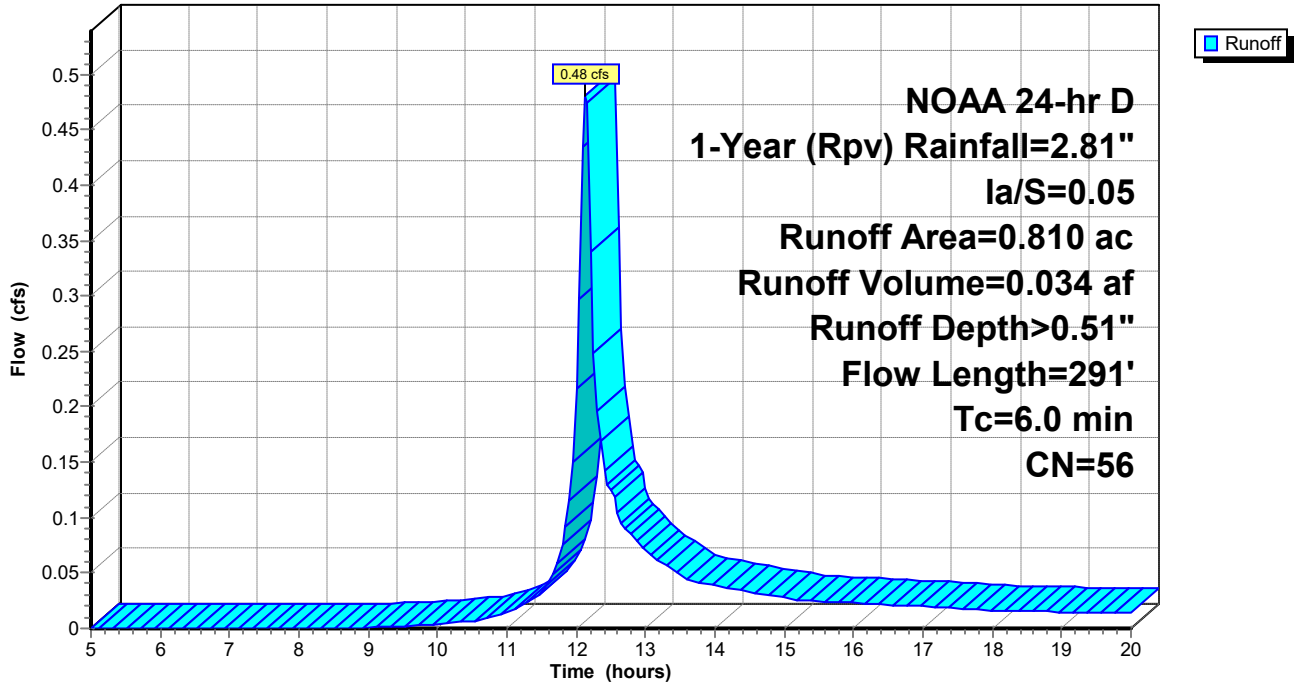
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
 NOAA 24-hr D 1-Year (Rpv) Rainfall=2.81", Ia/S=0.05

Area (ac)	CN	Description
* 0.240	98	
* 0.570	39	
0.810	56	Weighted Average
0.570		70.37% Pervious Area
0.240		29.63% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.5	46	0.0380	1.55		Sheet Flow, Smooth surfaces n= 0.011 P2= 3.30"
0.2	15	0.0470	1.52		Shallow Concentrated Flow, Short Grass Pasture Kv= 7.0 fps
0.1	14	0.0330	3.69		Shallow Concentrated Flow, Paved Kv= 20.3 fps
0.2	50	0.2900	3.77		Shallow Concentrated Flow, Short Grass Pasture Kv= 7.0 fps
0.7	166	0.0059	3.88	69.78	Channel Flow, Area= 18.0 sf Perim= 17.5' r= 1.03' n= 0.030
1.7	291	Total, Increased to minimum Tc = 6.0 min			

Subcatchment SC-10C: 10C

Hydrograph



Summary for Pond BMP-10C: BMP 10

Inflow Area = 0.810 ac, 29.63% Impervious, Inflow Depth > 0.51" for 1-Year (Rpv) event
 Inflow = 0.48 cfs @ 12.14 hrs, Volume= 0.034 af
 Outflow = 0.05 cfs @ 13.34 hrs, Volume= 0.034 af, Atten= 89%, Lag= 72.0 min
 Discarded = 0.05 cfs @ 13.34 hrs, Volume= 0.034 af
 Primary = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
 Peak Elev= 18.57' @ 13.34 hrs Surf.Area= 0.023 ac Storage= 0.012 af

Plug-Flow detention time= 93.4 min calculated for 0.034 af (99% of inflow)
 Center-of-Mass det. time= 91.9 min (909.4 - 817.5)

Volume	Invert	Avail.Storage	Storage Description
#1	17.25'	0.018 af	8.00'W x 125.00'L x 2.00'H Prismatic 0.046 af Overall x 40.0% Voids
#2	19.25'	0.071 af	8.00'W x 125.00'L x 2.00'H Prismatic Z=2.0
		0.090 af	Total Available Storage

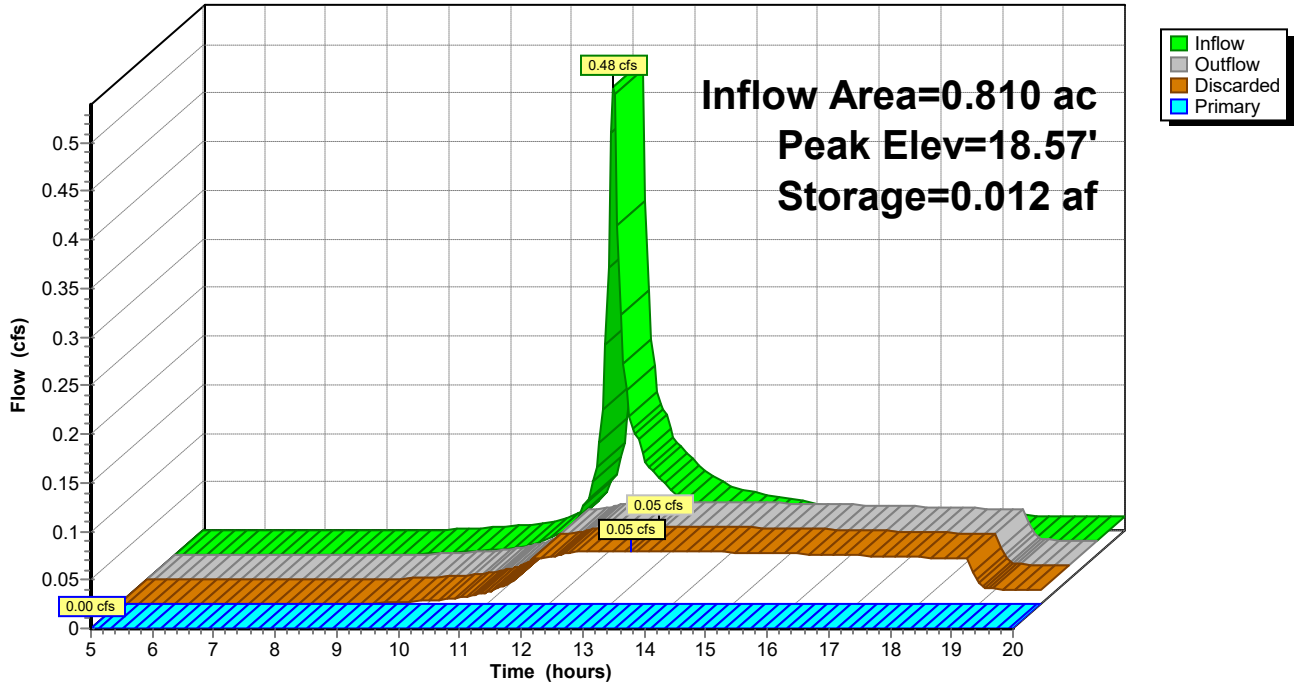
Device	Routing	Invert	Outlet Devices
#1	Discarded	17.25'	2.000 in/hr Exfiltration over Surface area Conductivity to Groundwater Elevation = 10.00'
#2	Primary	21.00'	16.0' long (Profile 1) Broad-Crested Rectangular Weir Head (feet) 0.49 0.98 1.48 Coef. (English) 2.92 3.37 3.59

Discarded OutFlow Max=0.05 cfs @ 13.34 hrs HW=18.57' (Free Discharge)
 ↑1=Exfiltration (Controls 0.05 cfs)

Primary OutFlow Max=0.00 cfs @ 5.00 hrs HW=17.25' (Free Discharge)
 ↑2=Broad-Crested Rectangular Weir (Controls 0.00 cfs)

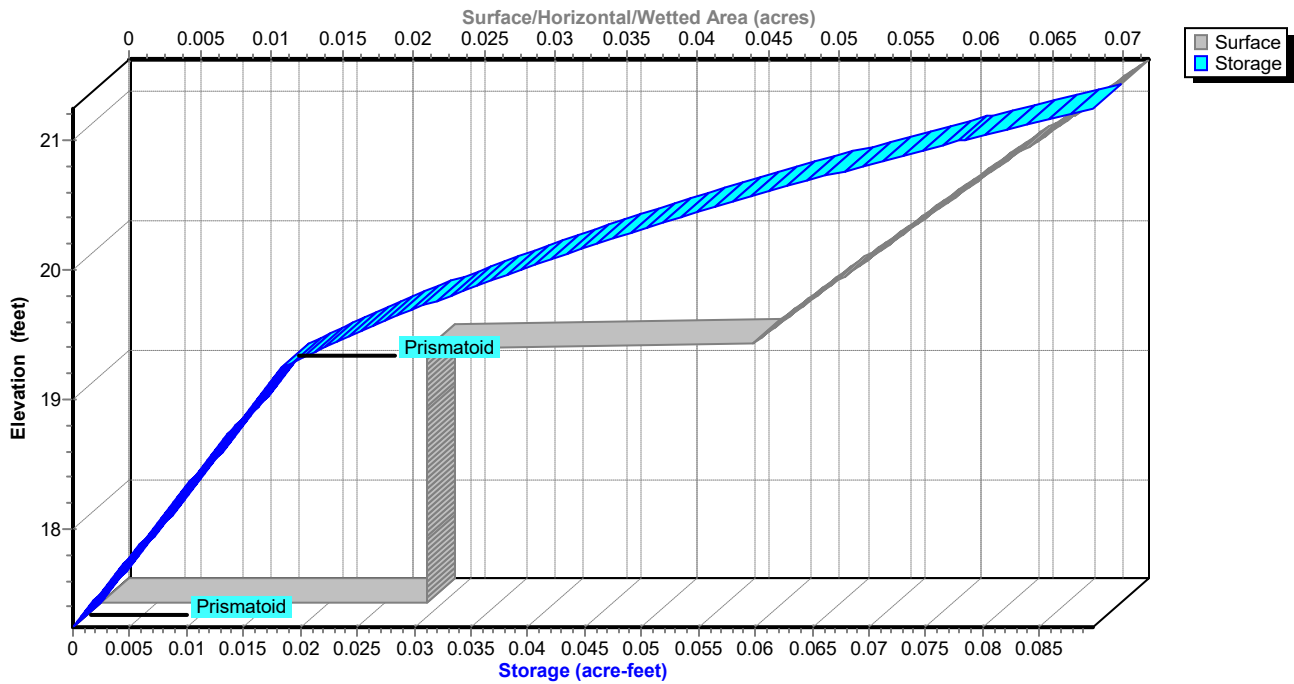
Pond BMP-10C: BMP 10

Hydrograph



Pond BMP-10C: BMP 10

Stage-Area-Storage



Summary for Subcatchment SC-10D: 10D

Runoff = 0.29 cfs @ 12.14 hrs, Volume= 0.021 af, Depth> 0.40"

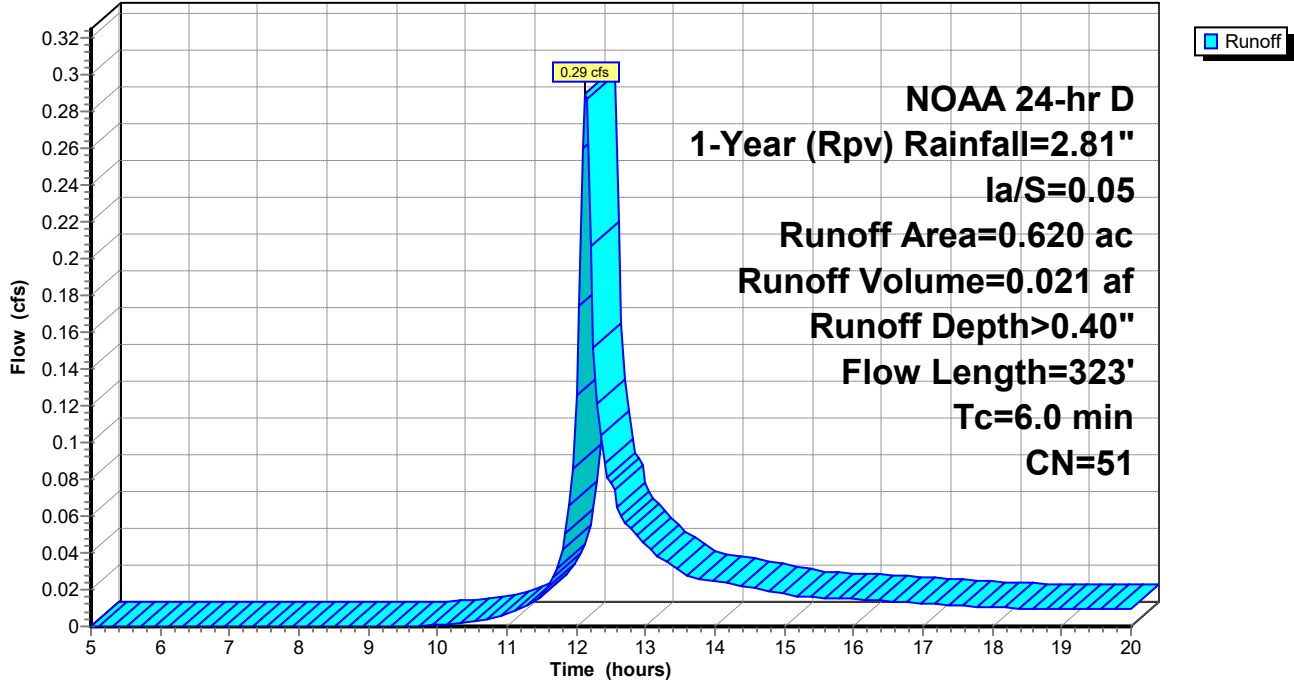
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
 NOAA 24-hr D 1-Year (Rpv) Rainfall=2.81", Ia/S=0.05

Area (ac)	CN	Description
0.130	98	Paved roads w/curbs & sewers, HSG A
0.490	39	>75% Grass cover, Good, HSG A
0.620	51	Weighted Average
0.490		79.03% Pervious Area
0.130		20.97% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.3	25	0.0329	1.29		Sheet Flow, Smooth surfaces n= 0.011 P2= 3.30"
0.1	5	0.0426	1.44		Shallow Concentrated Flow, Short Grass Pasture Kv= 7.0 fps
0.1	10	0.0260	3.27		Shallow Concentrated Flow, Paved Kv= 20.3 fps
0.4	92	0.2960	3.81		Shallow Concentrated Flow, Short Grass Pasture Kv= 7.0 fps
0.4	191	0.0197	7.64	173.46	Channel Flow, Area= 22.7 sf Perim= 19.7' r= 1.15' n= 0.030
1.3	323	Total, Increased to minimum Tc = 6.0 min			

Subcatchment SC-10D: 10D

Hydrograph



Summary for Subcatchment SC-10E: 10E

Runoff = 0.54 cfs @ 12.32 hrs, Volume= 0.064 af, Depth> 0.20"

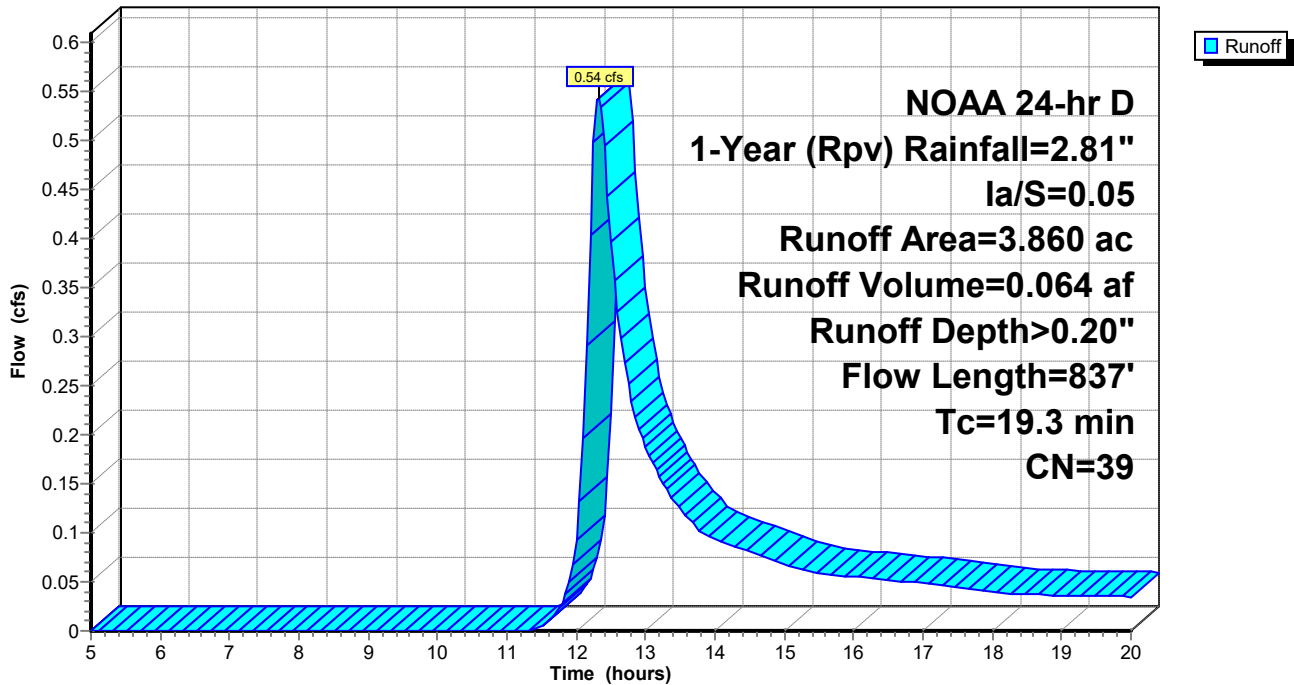
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
 NOAA 24-hr D 1-Year (Rpv) Rainfall=2.81", Ia/S=0.05

Area (ac)	CN	Description
* 3.860	39	
3.860		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.0	50	0.0110	0.12		Sheet Flow, Grass: Short n= 0.150 P2= 3.30"
10.9	559	0.0150	0.86		Shallow Concentrated Flow, Short Grass Pasture Kv= 7.0 fps
1.4	228	0.0050	2.76	8.66	Pipe Channel, CMP_Round 24" 24.0" Round Area= 3.1 sf Perim= 6.3' r= 0.50' n= 0.024
19.3	837	Total			

Subcatchment SC-10E: 10E

Hydrograph



Summary for Subcatchment SC-11: 11

Runoff = 0.59 cfs @ 12.13 hrs, Volume= 0.042 af, Depth> 0.96"

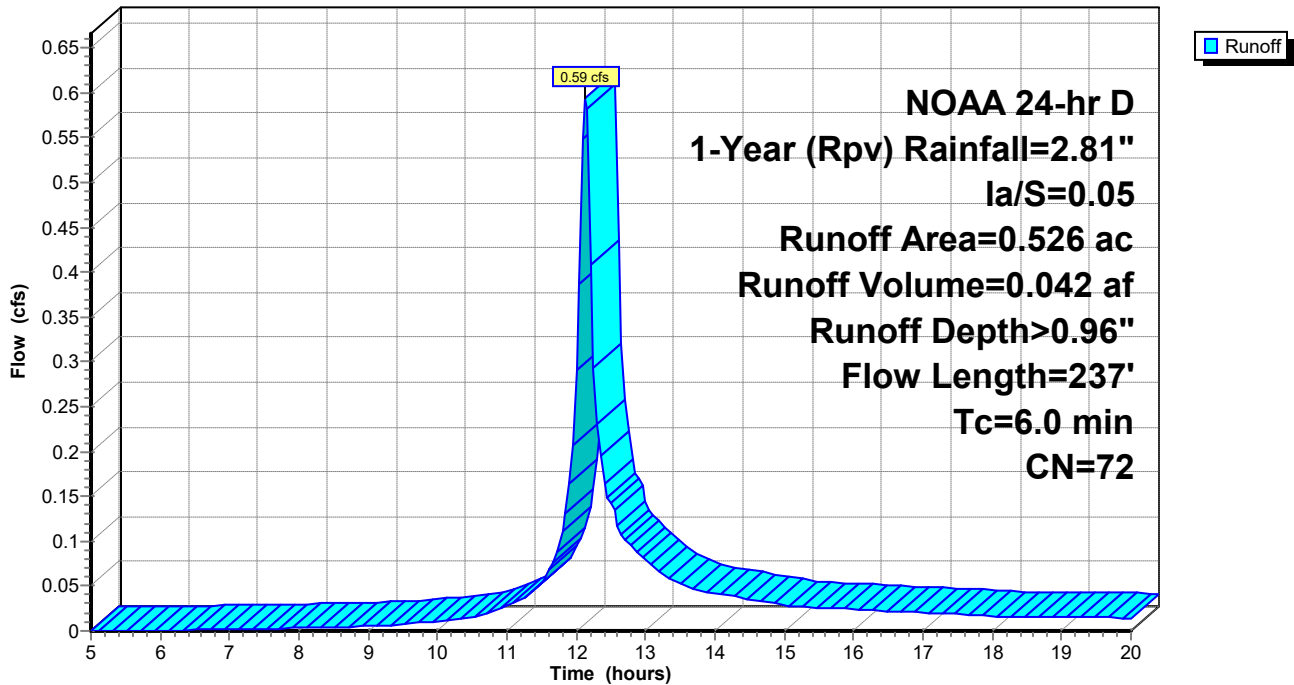
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
 NOAA 24-hr D 1-Year (Rpv) Rainfall=2.81", Ia/S=0.05

Area (ac)	CN	Description
* 0.236	39	
* 0.290	98	
0.526	72	Weighted Average
0.236		44.87% Pervious Area
0.290		55.13% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.3	21	0.0280	1.17		Sheet Flow, Smooth surfaces n= 0.011 P2= 3.30"
0.1	8	0.0570	1.67		Shallow Concentrated Flow, Short Grass Pasture Kv= 7.0 fps
1.0	208	0.0090	3.43	35.35	Channel Flow, Area= 10.3 sf Perim= 16.5' r= 0.62' n= 0.030
1.4	237	Total, Increased to minimum Tc = 6.0 min			

Subcatchment SC-11: 11

Hydrograph





APPENDIX G

POI-12 & POI-13






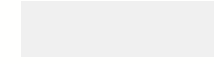

- POI Drainage Area Maps
- POI-12 HydroCAD Calculations
- POI-13 HydroCAD Calculations

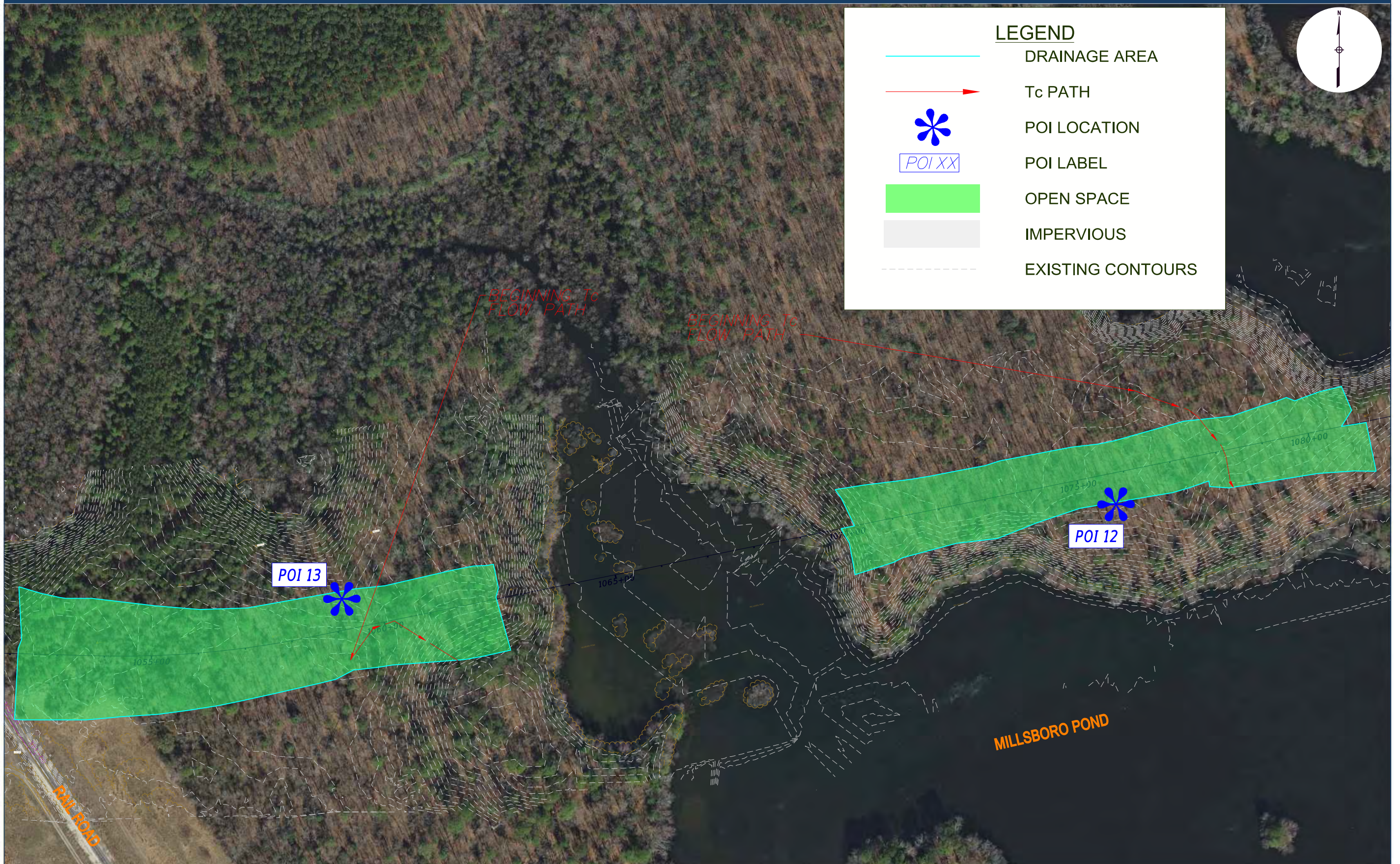


NORTH MILLSBORO BYPASS, US 113 TO SR 24

CONTRACT NO. T201912701
SUSSEX COUNTY

LEGEND

-  DRAINAGE AREA
-  Tc PATH
-  POI LOCATION
-  POI LABEL
-  OPEN SPACE
-  IMPERVIOUS
-  EXISTING CONTOURS



Summary for Subcatchment SC-12A: SC-12A

Runoff = 0.59 cfs @ 12.27 hrs, Volume= 0.064 af, Depth> 0.20"

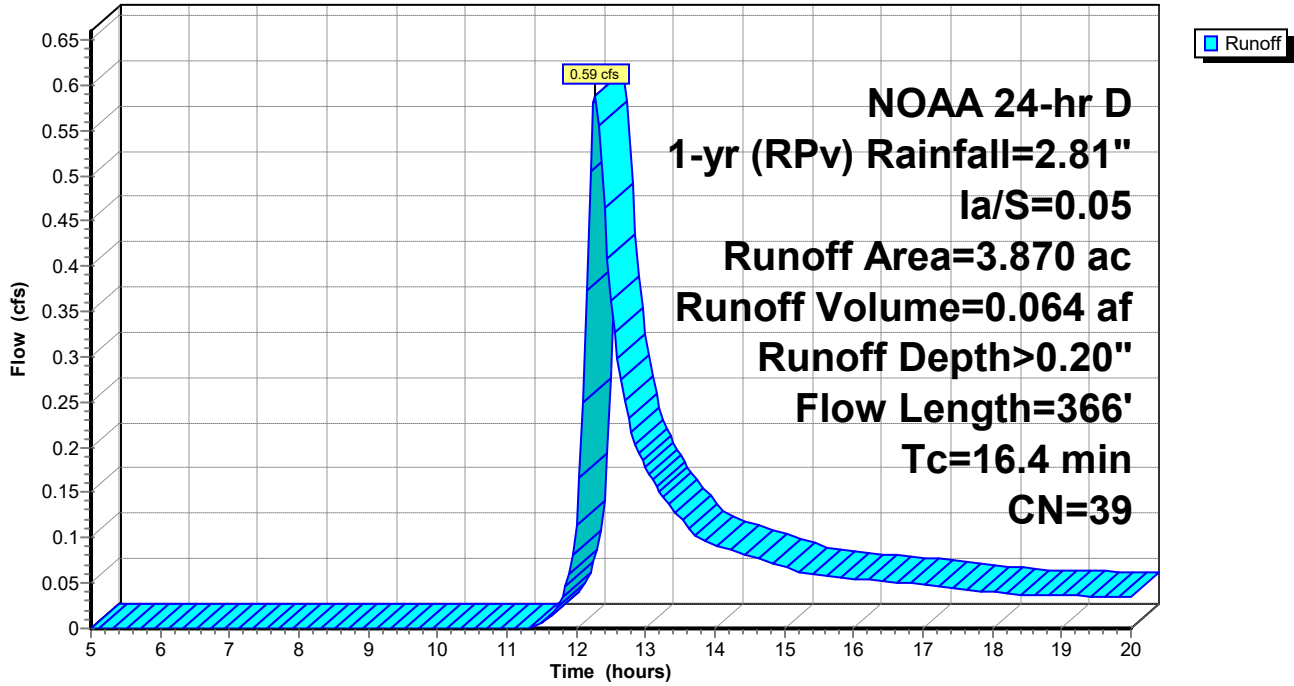
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
 NOAA 24-hr D 1-yr (RPv) Rainfall=2.81", Ia/S=0.05

Area (ac)	CN	Description
3.870	39	>75% Grass cover, Good, HSG A
3.870		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.4	50	0.0041	0.08		Sheet Flow, Grass: Short n= 0.150 P2= 3.30"
2.5	67	0.0041	0.45		Shallow Concentrated Flow, Short Grass Pasture Kv= 7.0 fps
0.4	26	0.0287	1.19		Shallow Concentrated Flow, Short Grass Pasture Kv= 7.0 fps
0.8	51	0.0237	1.08		Shallow Concentrated Flow, Short Grass Pasture Kv= 7.0 fps
0.3	25	0.0420	1.43		Shallow Concentrated Flow, Short Grass Pasture Kv= 7.0 fps
0.6	56	0.0526	1.61		Shallow Concentrated Flow, Short Grass Pasture Kv= 7.0 fps
1.4	91	0.0252	1.11		Shallow Concentrated Flow, Short Grass Pasture Kv= 7.0 fps
16.4	366	Total			

Subcatchment SC-12A: SC-12A

Hydrograph



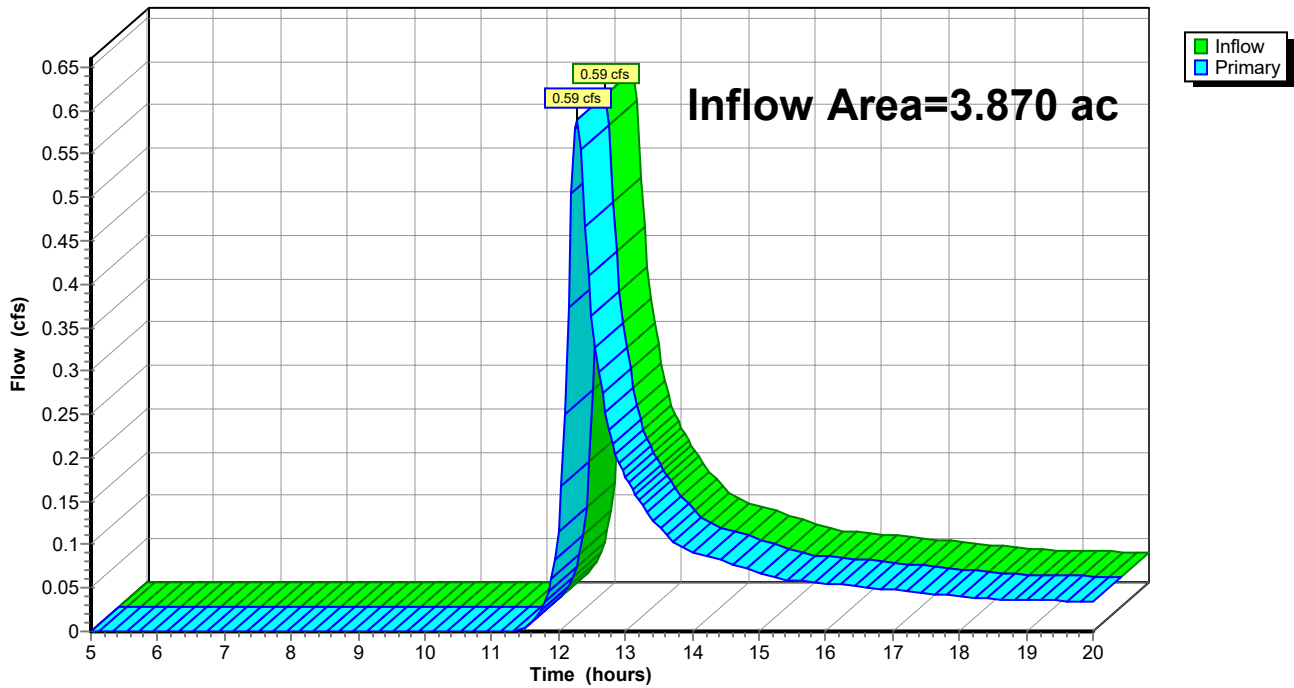
Summary for Link POI12: LOI12

Inflow Area = 3.870 ac, 0.00% Impervious, Inflow Depth > 0.20" for 1-yr (RPv) event
Inflow = 0.59 cfs @ 12.27 hrs, Volume= 0.064 af
Primary = 0.59 cfs @ 12.27 hrs, Volume= 0.064 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

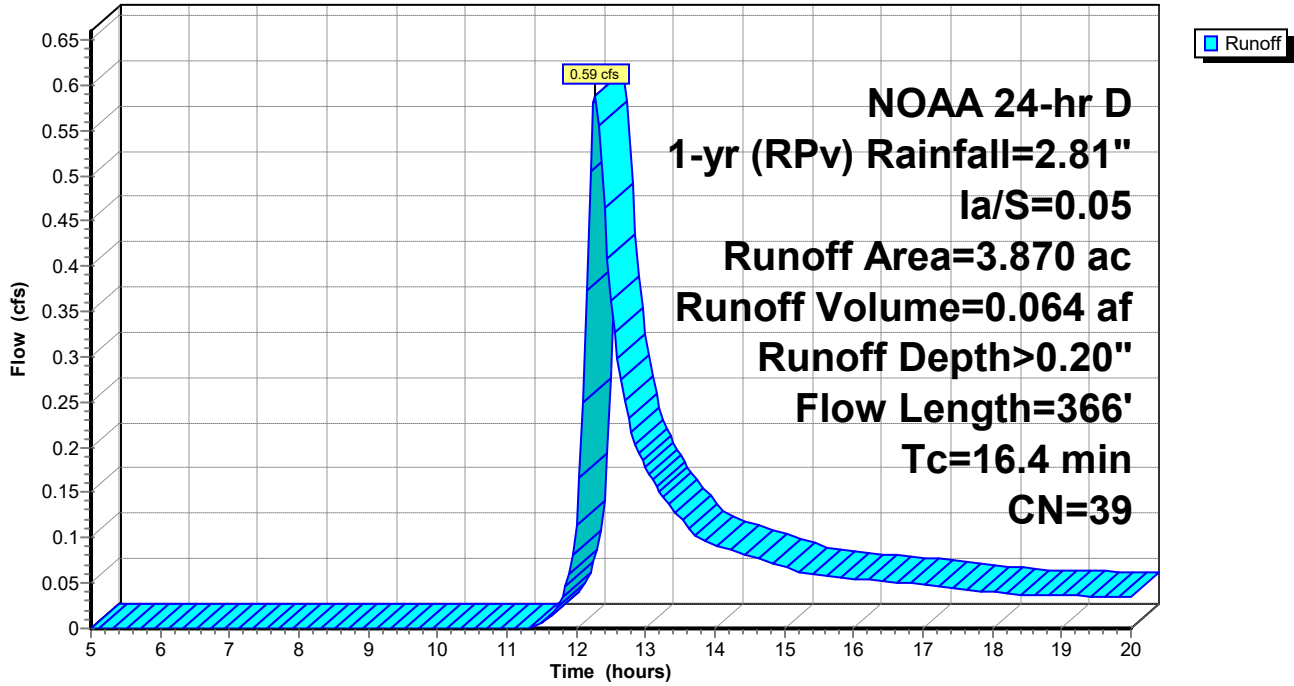
Link POI12: LOI12

Hydrograph



Subcatchment SC-12A: SC-12A

Hydrograph



Summary for Subcatchment SC-13A: SC-13A

Runoff = 0.92 cfs @ 12.19 hrs, Volume= 0.082 af, Depth> 0.20"

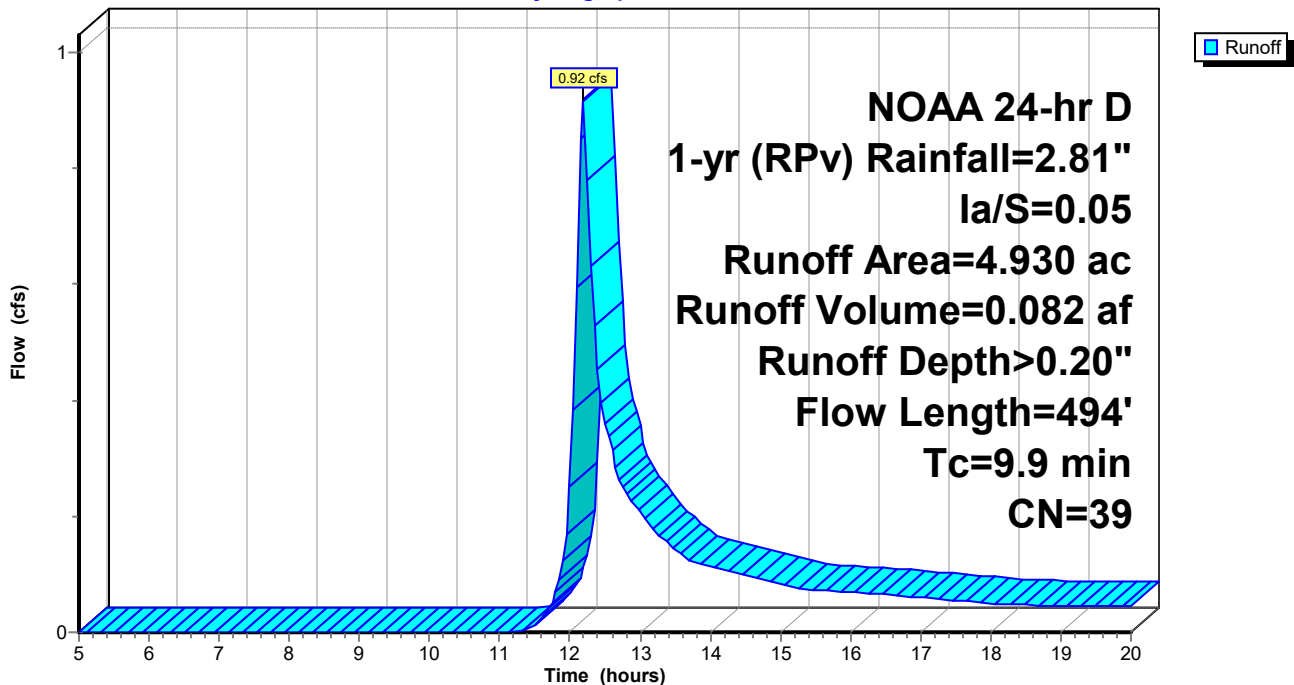
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
 NOAA 24-hr D 1-yr (RPv) Rainfall=2.81", Ia/S=0.05

Area (ac)	CN	Description
4.930	39	>75% Grass cover, Good, HSG A
4.930		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.4	50	0.0358	0.19		Sheet Flow, Grass: Short n= 0.150 P2= 3.30"
0.4	34	0.0358	1.32		Shallow Concentrated Flow, Short Grass Pasture Kv= 7.0 fps
0.9	47	0.0141	0.83		Shallow Concentrated Flow, Short Grass Pasture Kv= 7.0 fps
1.8	205	0.0760	1.93		Shallow Concentrated Flow, Short Grass Pasture Kv= 7.0 fps
1.4	72	0.0143	0.84		Shallow Concentrated Flow, Short Grass Pasture Kv= 7.0 fps
1.0	86	0.0430	1.45		Shallow Concentrated Flow, Short Grass Pasture Kv= 7.0 fps
9.9	494	Total			

Subcatchment SC-13A: SC-13A

Hydrograph



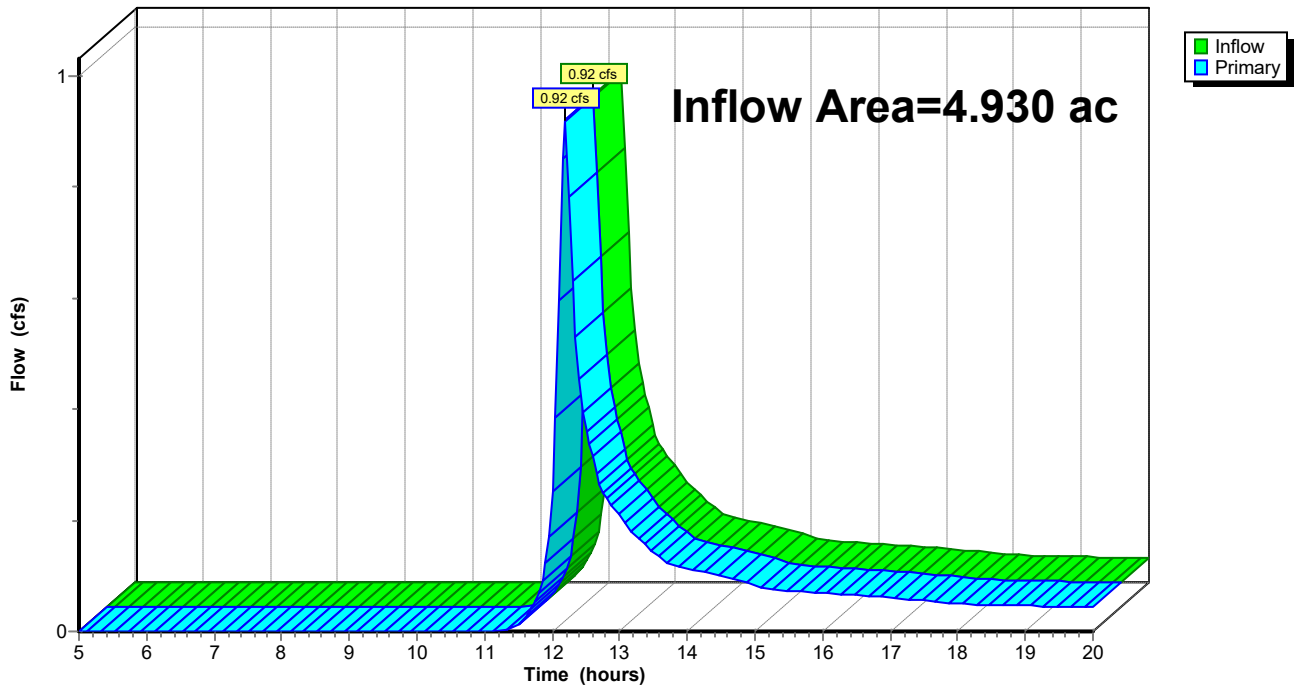
Summary for Link POI13: LOI13

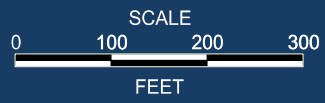
Inflow Area = 4.930 ac, 0.00% Impervious, Inflow Depth > 0.20" for 1-yr (RPv) event
Inflow = 0.92 cfs @ 12.19 hrs, Volume= 0.082 af
Primary = 0.92 cfs @ 12.19 hrs, Volume= 0.082 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Link POI13: LOI13

Hydrograph





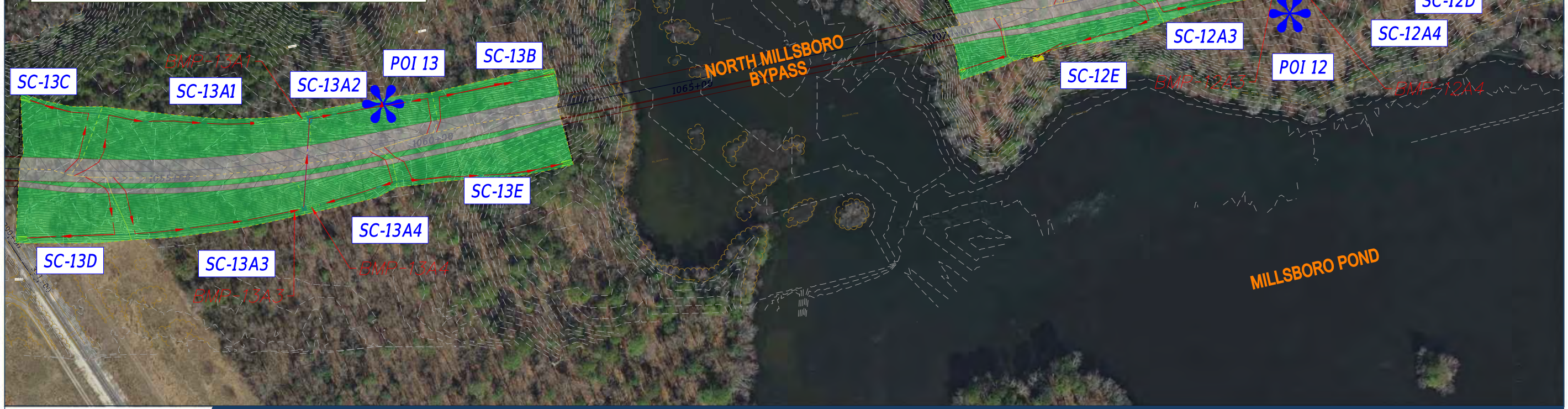
NORTH MILLSBORO BYPASS, US 113 TO SR 24

CONTRACT NO. T201912701
SUSSEX COUNTY



LEGEND

- DRAINAGE AREA
- - - DRAINAGE SUBAREA
- Tc PATH
- PROPOSED CONSTRUCTION
- PROPOSED DRAINAGE
- INFILTRATION BMP
- OPEN SPACE
- IMPERVIOUS
- PROPOSED CONTOURS
- - - EXISTING CONTOURS
- ✻ POI LOCATION
- POI XX POI LABEL



Summary for Subcatchment SC-12A1: SC-12A

Runoff = 0.43 cfs @ 12.14 hrs, Volume= 0.030 af, Depth> 0.55"

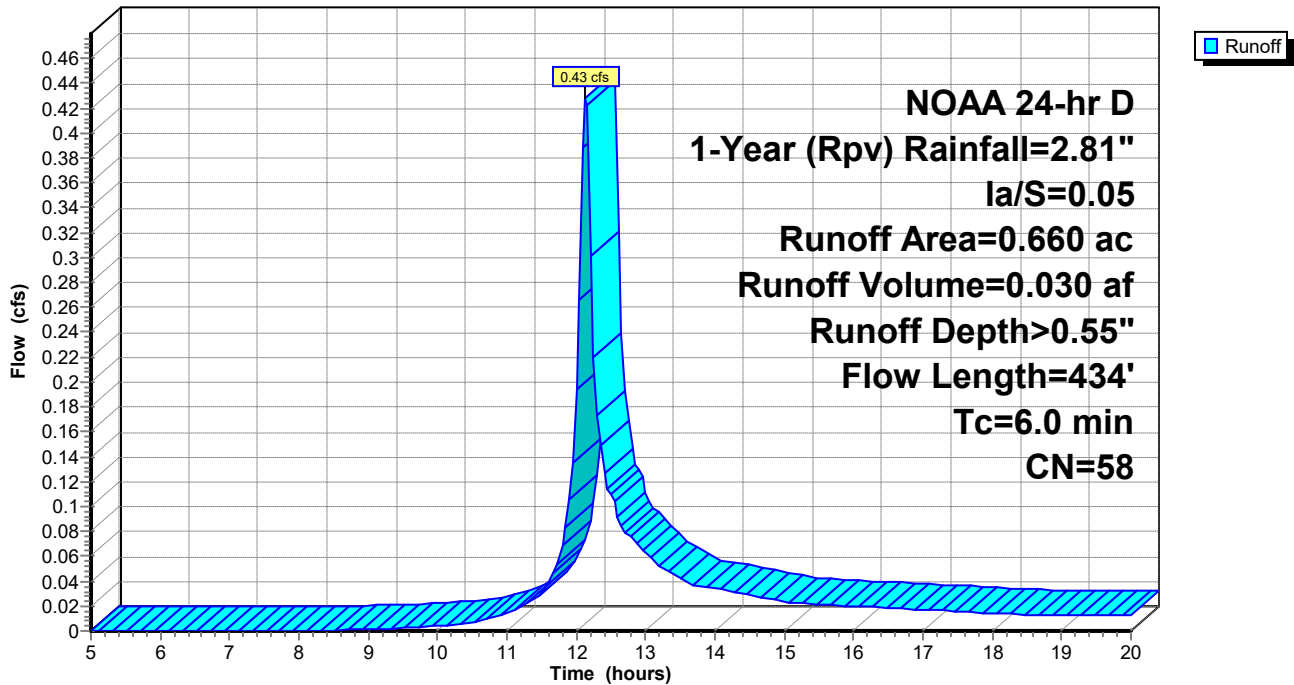
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
 NOAA 24-hr D 1-Year (Rpv) Rainfall=2.81", Ia/S=0.05

Area (ac)	CN	Description
0.450	39	>75% Grass cover, Good, HSG A
0.210	98	Paved roads w/curbs & sewers, HSG A
0.660	58	Weighted Average
0.450		68.18% Pervious Area
0.210		31.82% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.3	21	0.0295	1.19		Sheet Flow, Smooth surfaces n= 0.011 P2= 3.30"
1.0	15	0.1390	0.26		Sheet Flow, Grass: Short n= 0.150 P2= 3.30"
2.2	398	0.0036	3.07	64.48	Channel Flow, Area= 21.0 sf Perim= 20.0' r= 1.05' n= 0.030
3.5	434	Total, Increased to minimum Tc = 6.0 min			

Subcatchment SC-12A1: SC-12A

Hydrograph



Summary for Pond BMP-12A1: (new Pond)

Inflow Area = 0.660 ac, 31.82% Impervious, Inflow Depth > 0.55" for 1-Year (Rpv) event
 Inflow = 0.43 cfs @ 12.14 hrs, Volume= 0.030 af
 Outflow = 0.05 cfs @ 13.33 hrs, Volume= 0.030 af, Atten= 89%, Lag= 71.8 min
 Discarded = 0.05 cfs @ 13.33 hrs, Volume= 0.030 af
 Primary = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af
 Secondary = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
 Peak Elev= 19.86' @ 13.33 hrs Surf.Area= 0.021 ac Storage= 0.011 af

Plug-Flow detention time= 93.6 min calculated for 0.030 af (99% of inflow)
 Center-of-Mass det. time= 92.1 min (907.0 - 814.9)

Volume	Invert	Avail.Storage	Storage Description
#1	18.55'	0.017 af	6.00'W x 150.00'L x 2.00'H Prismaoid 0.041 af Overall x 40.0% Voids
#2	20.55'	0.071 af	6.00'W x 150.00'L x 2.00'H Prismaoid Z=2.0 -Impervious
		0.087 af	Total Available Storage

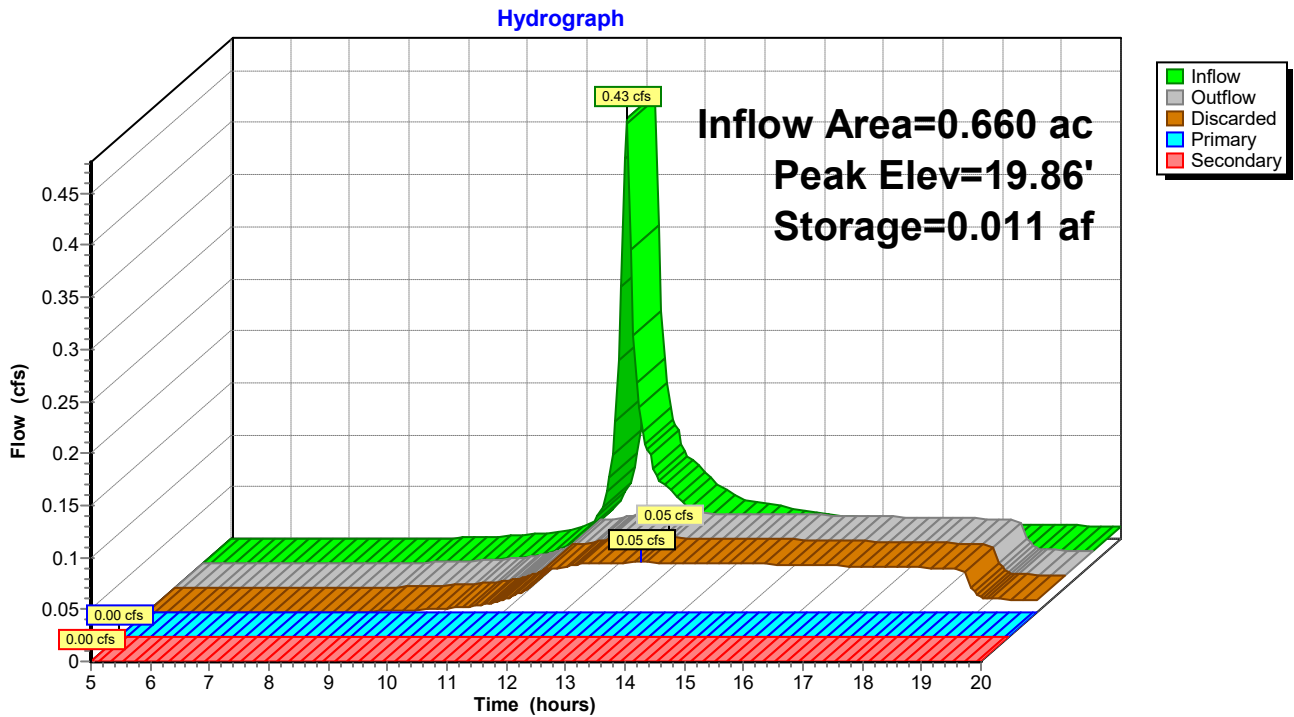
Device	Routing	Invert	Outlet Devices
#1	Discarded	18.55'	2.000 in/hr Exfiltration over Surface area Conductivity to Groundwater Elevation = 10.00'
#2	Primary	20.55'	18.0" Round Culvert L= 85.0' RCP, end-section conforming to fill, Ke= 0.500 Inlet / Outlet Invert= 20.55' / 19.90' S= 0.0076 '/' Cc= 0.900 n= 0.012, Flow Area= 1.77 sf
#3	Secondary	22.35'	14.0' long (Profile 1) Broad-Crested Rectangular Weir Head (feet) 0.49 0.98 1.48 Coef. (English) 2.92 3.37 3.59

Discarded OutFlow Max=0.05 cfs @ 13.33 hrs HW=19.86' (Free Discharge)
 ↑1=Exfiltration (Controls 0.05 cfs)

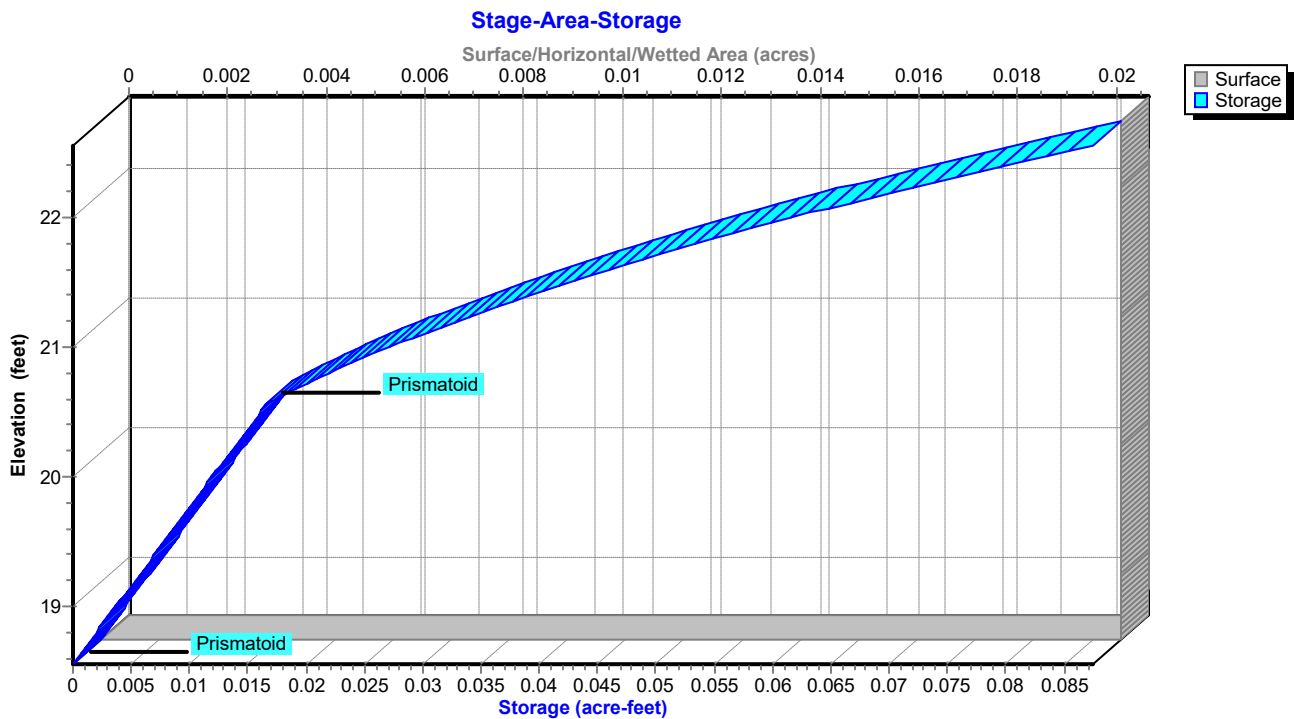
Primary OutFlow Max=0.00 cfs @ 5.00 hrs HW=18.55' (Free Discharge)
 ↑2=Culvert (Controls 0.00 cfs)

Secondary OutFlow Max=0.00 cfs @ 5.00 hrs HW=18.55' (Free Discharge)
 ↑3=Broad-Crested Rectangular Weir (Controls 0.00 cfs)

Pond BMP-12A1: (new Pond)



Pond BMP-12A1: (new Pond)



Summary for Subcatchment SC-12A2: SC-12A

Runoff = 0.25 cfs @ 12.14 hrs, Volume= 0.018 af, Depth> 0.55"

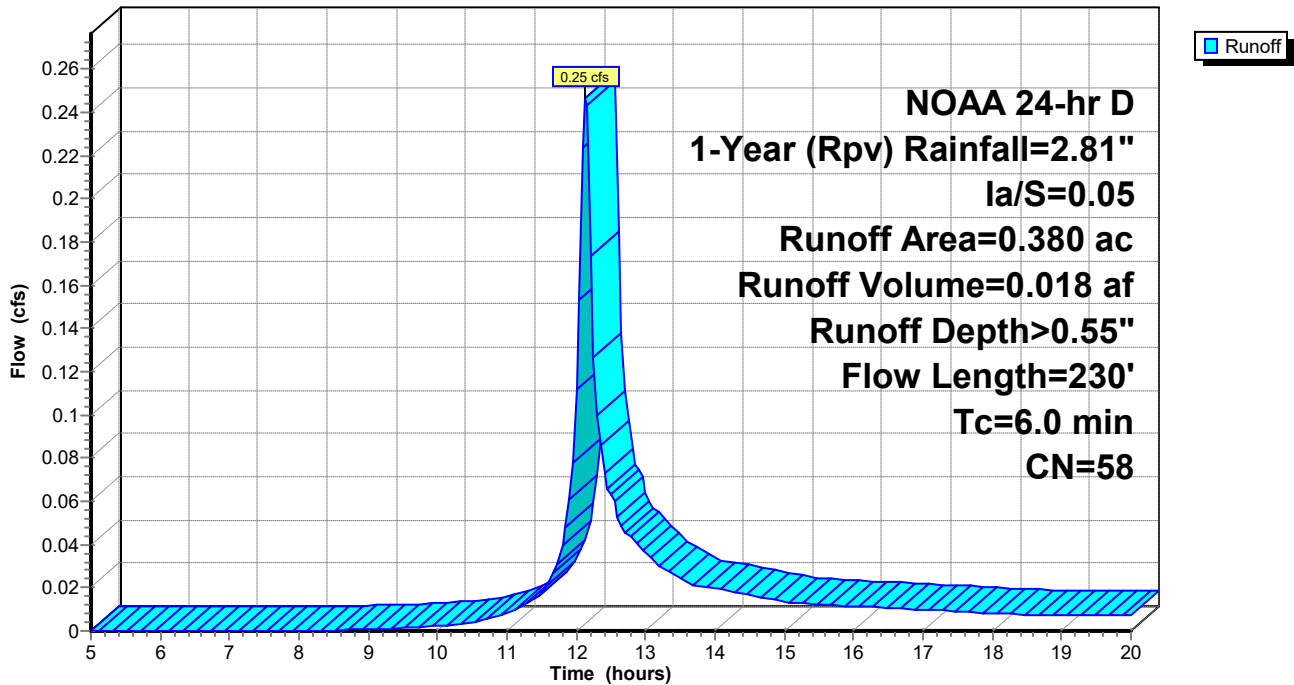
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
 NOAA 24-hr D 1-Year (Rpv) Rainfall=2.81", Ia/S=0.05

Area (ac)	CN	Description
0.260	39	>75% Grass cover, Good, HSG A
0.120	98	Paved roads w/curbs & sewers, HSG A
0.380	58	Weighted Average
0.260		68.42% Pervious Area
0.120		31.58% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.4	32	0.0327	1.35		Sheet Flow, Smooth surfaces n= 0.011 P2= 3.30"
0.1	15	0.1400	2.62		Shallow Concentrated Flow, Short Grass Pasture Kv= 7.0 fps
0.7	183	0.0102	4.54	70.44	Channel Flow, Area= 15.5 sf Perim= 17.9' r= 0.87' n= 0.030
1.2	230	Total, Increased to minimum Tc = 6.0 min			

Subcatchment SC-12A2: SC-12A

Hydrograph



Summary for Pond BMP-12A2: (new Pond)

Inflow Area = 0.380 ac, 31.58% Impervious, Inflow Depth > 0.55" for 1-Year (Rpv) event
 Inflow = 0.25 cfs @ 12.14 hrs, Volume= 0.018 af
 Outflow = 0.04 cfs @ 12.75 hrs, Volume= 0.017 af, Atten= 82%, Lag= 36.6 min
 Discarded = 0.04 cfs @ 12.75 hrs, Volume= 0.017 af
 Primary = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af
 Secondary = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
 Peak Elev= 19.10' @ 12.75 hrs Surf.Area= 0.021 ac Storage= 0.005 af

Plug-Flow detention time= 34.9 min calculated for 0.017 af (100% of inflow)
 Center-of-Mass det. time= 33.7 min (848.6 - 814.9)

Volume	Invert	Avail.Storage	Storage Description
#1	18.55'	0.017 af	6.00'W x 150.00'L x 2.00'H Prismaoid 0.041 af Overall x 40.0% Voids
#2	20.55'	0.071 af	6.00'W x 150.00'L x 2.00'H Prismaoid Z=2.0 -Impervious
		0.087 af	Total Available Storage

Device	Routing	Invert	Outlet Devices
#1	Discarded	18.55'	2.000 in/hr Exfiltration over Surface area Conductivity to Groundwater Elevation = 10.00'
#2	Primary	20.55'	18.0" Round Culvert L= 85.0' RCP, end-section conforming to fill, Ke= 0.500 Inlet / Outlet Invert= 20.55' / 19.90' S= 0.0076 '/' Cc= 0.900 n= 0.012, Flow Area= 1.77 sf
#3	Secondary	22.35'	14.0' long (Profile 1) Broad-Crested Rectangular Weir Head (feet) 0.49 0.98 1.48 Coef. (English) 2.92 3.37 3.59

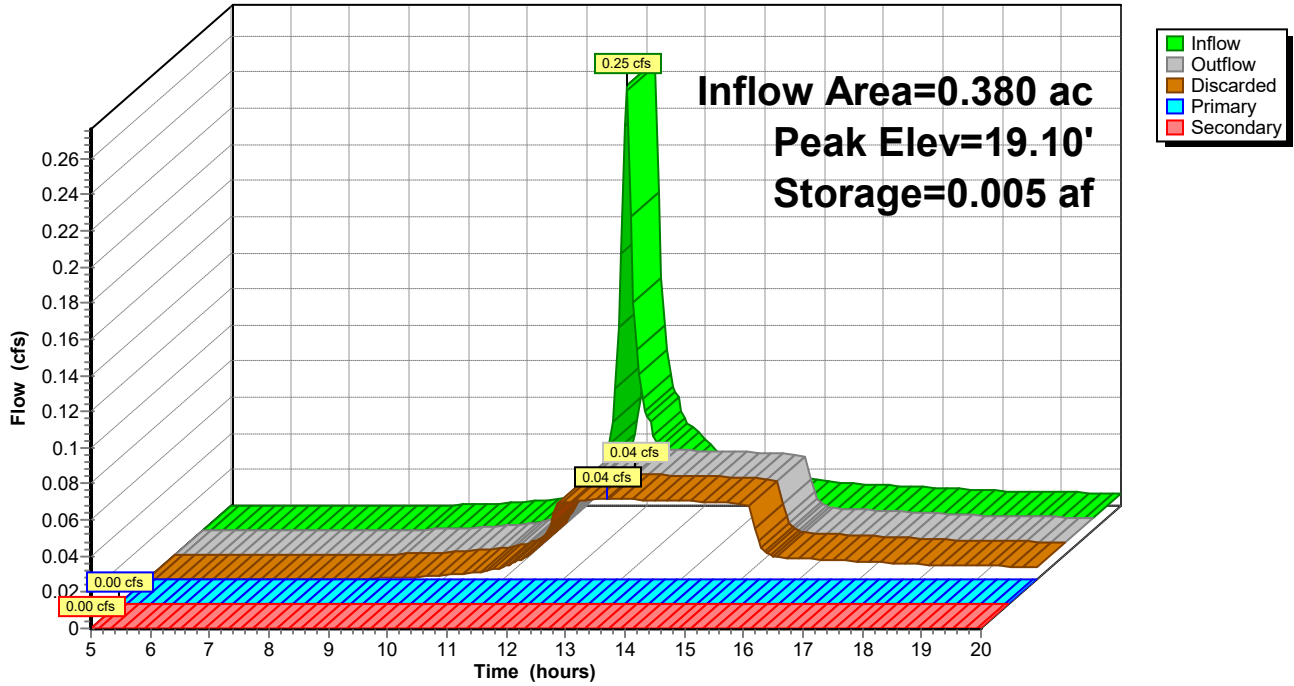
Discarded OutFlow Max=0.04 cfs @ 12.75 hrs HW=19.10' (Free Discharge)
 ↑1=Exfiltration (Controls 0.04 cfs)

Primary OutFlow Max=0.00 cfs @ 5.00 hrs HW=18.55' (Free Discharge)
 ↑2=Culvert (Controls 0.00 cfs)

Secondary OutFlow Max=0.00 cfs @ 5.00 hrs HW=18.55' (Free Discharge)
 ↑3=Broad-Crested Rectangular Weir (Controls 0.00 cfs)

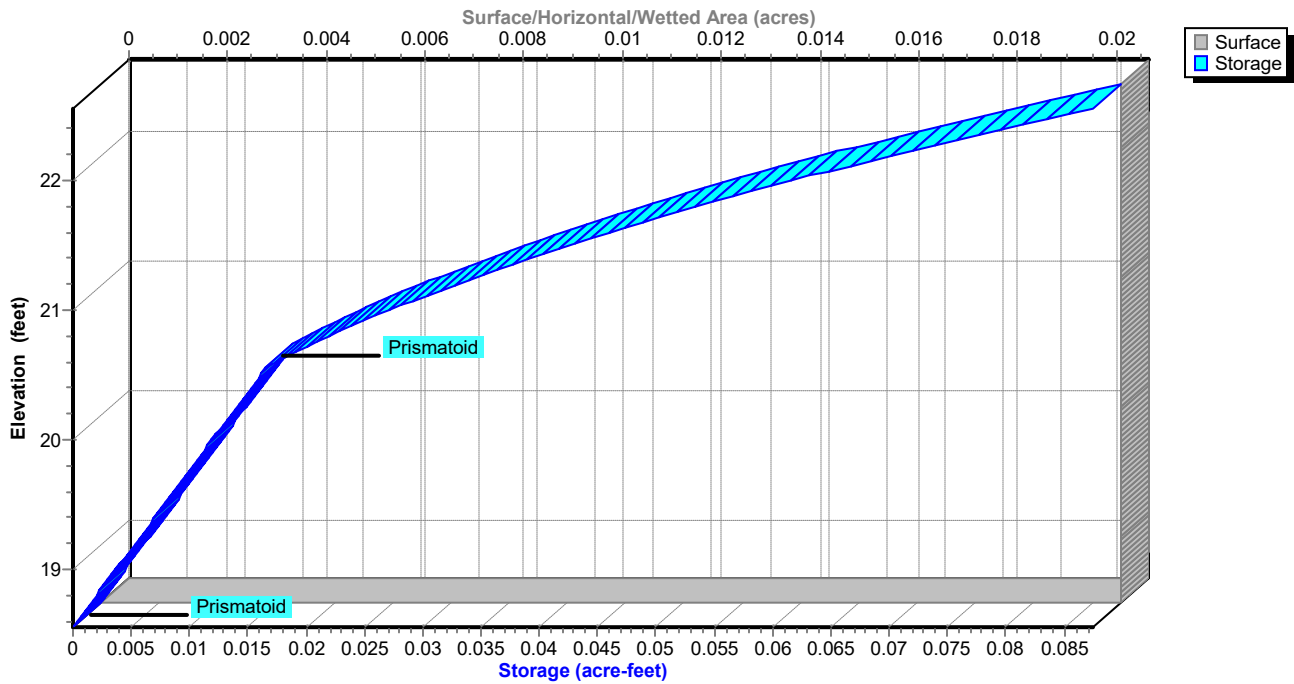
Pond BMP-12A2: (new Pond)

Hydrograph



Pond BMP-12A2: (new Pond)

Stage-Area-Storage



Summary for Subcatchment SC-12A3: SC-12A

Runoff = 0.36 cfs @ 12.13 hrs, Volume= 0.026 af, Depth> 0.99"

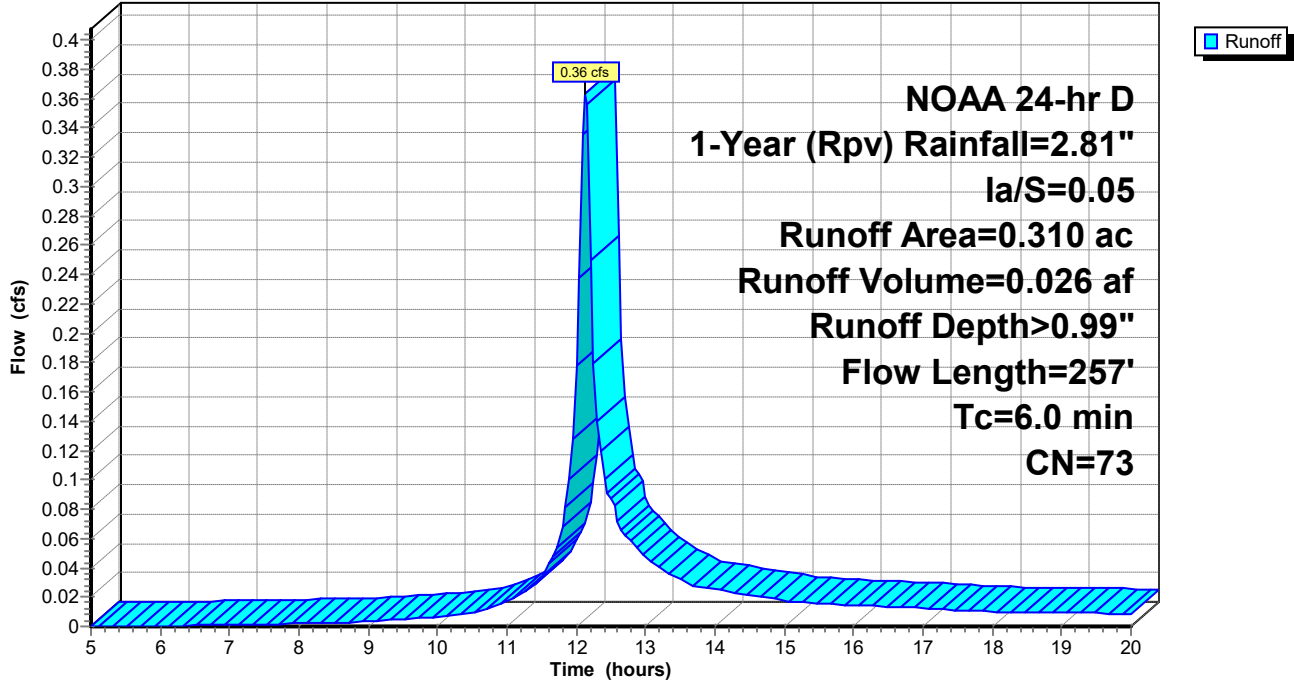
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
 NOAA 24-hr D 1-Year (Rpv) Rainfall=2.81", Ia/S=0.05

Area (ac)	CN	Description
0.130	39	>75% Grass cover, Good, HSG A
0.180	98	Paved roads w/curbs & sewers, HSG A
0.310	73	Weighted Average
0.130		41.94% Pervious Area
0.180		58.06% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.3	23	0.0291	1.21		Sheet Flow, Smooth surfaces n= 0.011 P2= 3.30"
0.1	10	0.0400	1.40		Shallow Concentrated Flow, Short Grass Pasture Kv= 7.0 fps
0.1	11	0.0266	3.31		Shallow Concentrated Flow, Paved Kv= 20.3 fps
0.1	11	0.1460	2.67		Shallow Concentrated Flow, Short Grass Pasture Kv= 7.0 fps
1.4	202	0.0050	2.43	10.92	Channel Flow, Area= 4.5 sf Perim= 7.8' r= 0.58' n= 0.030
2.0	257	Total, Increased to minimum Tc = 6.0 min			

Subcatchment SC-12A3: SC-12A

Hydrograph



Summary for Pond BMP-12A3: (new Pond)

Inflow Area = 0.310 ac, 58.06% Impervious, Inflow Depth > 0.99" for 1-Year (Rpv) event
 Inflow = 0.36 cfs @ 12.13 hrs, Volume= 0.026 af
 Outflow = 0.05 cfs @ 13.03 hrs, Volume= 0.026 af, Atten= 87%, Lag= 53.5 min
 Discarded = 0.05 cfs @ 13.03 hrs, Volume= 0.026 af
 Secondary = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
 Peak Elev= 18.91' @ 13.03 hrs Surf.Area= 0.021 ac Storage= 0.008 af

Plug-Flow detention time= 64.8 min calculated for 0.026 af (100% of inflow)
 Center-of-Mass det. time= 63.7 min (858.6 - 795.0)

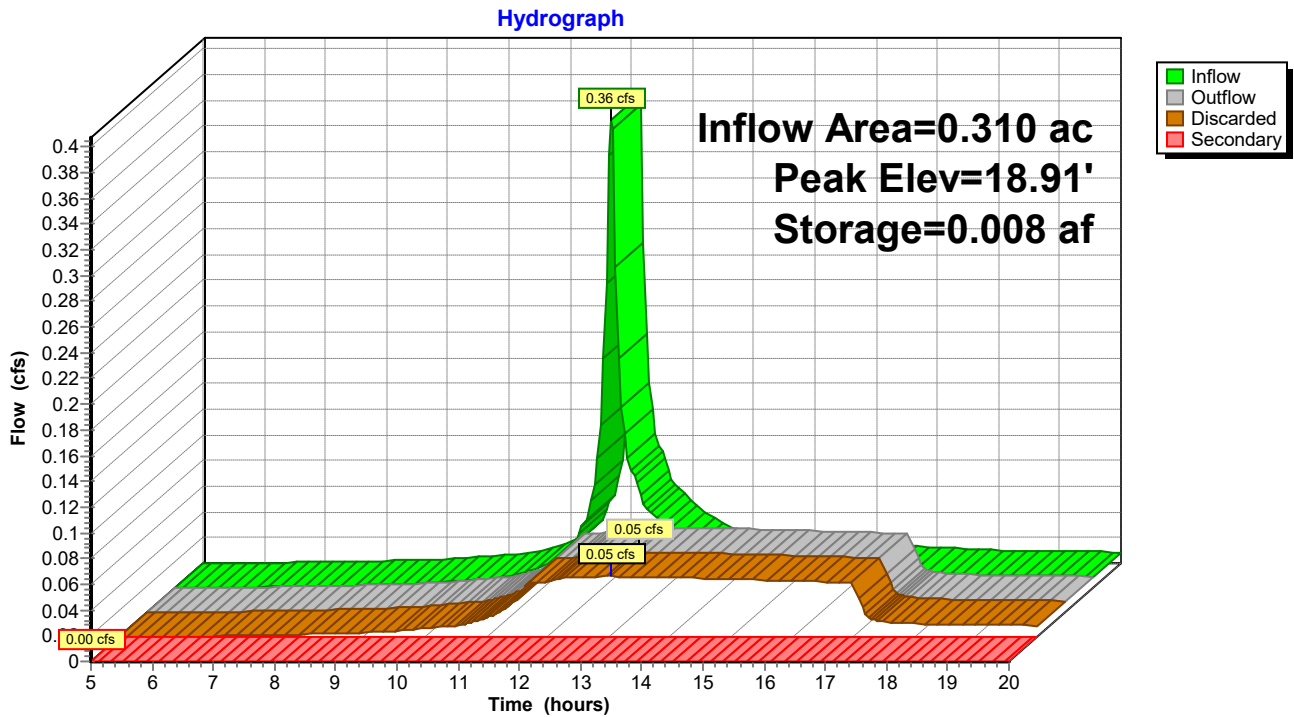
Volume	Invert	Avail.Storage	Storage Description
#1	17.90'	0.017 af	6.00'W x 150.00'L x 2.00'H Prismatoid 0.041 af Overall x 40.0% Voids
#2	19.90'	0.071 af	6.00'W x 150.00'L x 2.00'H Prismatoid Z=2.0 -Impervious
		0.087 af	Total Available Storage

Device	Routing	Invert	Outlet Devices
#1	Discarded	17.90'	2.000 in/hr Exfiltration over Surface area Conductivity to Groundwater Elevation = 10.00'
#2	Secondary	21.75'	14.0' long (Profile 1) Broad-Crested Rectangular Weir Head (feet) 0.49 0.98 1.48 Coef. (English) 2.92 3.37 3.59

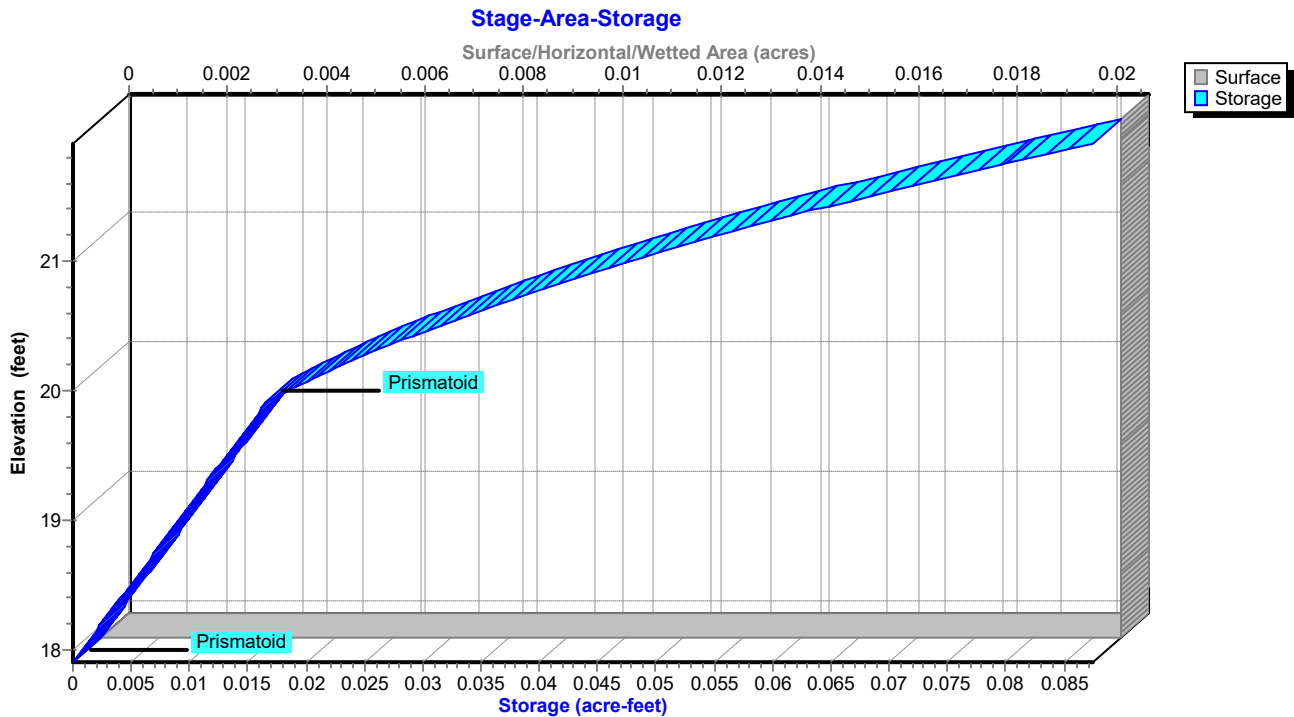
Discarded OutFlow Max=0.05 cfs @ 13.03 hrs HW=18.91' (Free Discharge)
 ↑1=Exfiltration (Controls 0.05 cfs)

Secondary OutFlow Max=0.00 cfs @ 5.00 hrs HW=17.90' (Free Discharge)
 ↑2=Broad-Crested Rectangular Weir (Controls 0.00 cfs)

Pond BMP-12A3: (new Pond)



Pond BMP-12A3: (new Pond)



Summary for Subcatchment SC-12A4: SC-12A

Runoff = 0.36 cfs @ 12.13 hrs, Volume= 0.026 af, Depth> 0.99"

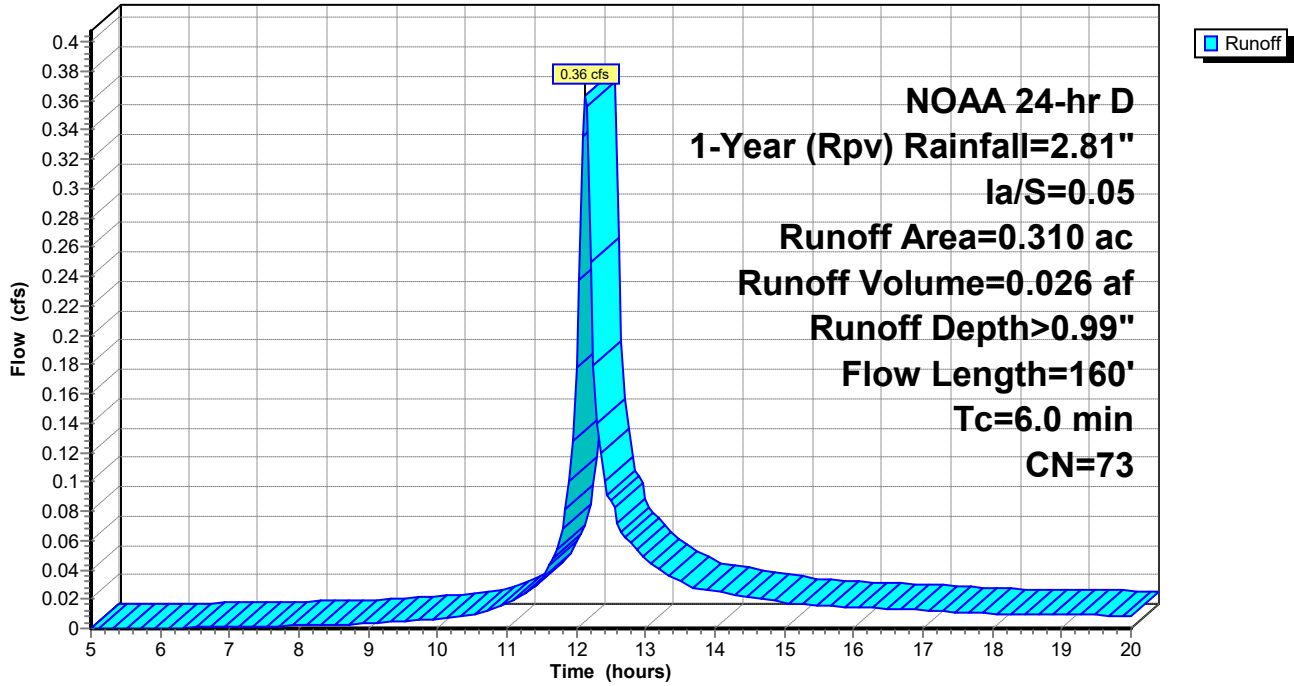
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
 NOAA 24-hr D 1-Year (Rpv) Rainfall=2.81", Ia/S=0.05

Area (ac)	CN	Description
0.130	39	>75% Grass cover, Good, HSG A
0.180	98	Paved roads w/curbs & sewers, HSG A
0.310	73	Weighted Average
0.130		41.94% Pervious Area
0.180		58.06% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.3	23	0.0310	1.24		Sheet Flow, Smooth surfaces n= 0.011 P2= 3.30"
0.1	10	0.0410	1.42		Shallow Concentrated Flow, Short Grass Pasture Kv= 7.0 fps
0.1	10	0.0217	2.99		Shallow Concentrated Flow, Paved Kv= 20.3 fps
0.1	11	0.1560	2.76		Shallow Concentrated Flow, Short Grass Pasture Kv= 7.0 fps
0.7	106	0.0055	2.55	11.46	Channel Flow, Area= 4.5 sf Perim= 7.8' r= 0.58' n= 0.030
1.3	160	Total, Increased to minimum Tc = 6.0 min			

Subcatchment SC-12A4: SC-12A

Hydrograph



Summary for Pond BMP-12A4: (new Pond)

Inflow Area = 0.310 ac, 58.06% Impervious, Inflow Depth > 0.99" for 1-Year (Rpv) event
 Inflow = 0.36 cfs @ 12.13 hrs, Volume= 0.026 af
 Outflow = 0.05 cfs @ 13.03 hrs, Volume= 0.026 af, Atten= 87%, Lag= 53.5 min
 Discarded = 0.05 cfs @ 13.03 hrs, Volume= 0.026 af
 Secondary = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
 Peak Elev= 18.91' @ 13.03 hrs Surf.Area= 0.021 ac Storage= 0.008 af

Plug-Flow detention time= 64.8 min calculated for 0.026 af (100% of inflow)
 Center-of-Mass det. time= 63.7 min (858.6 - 795.0)

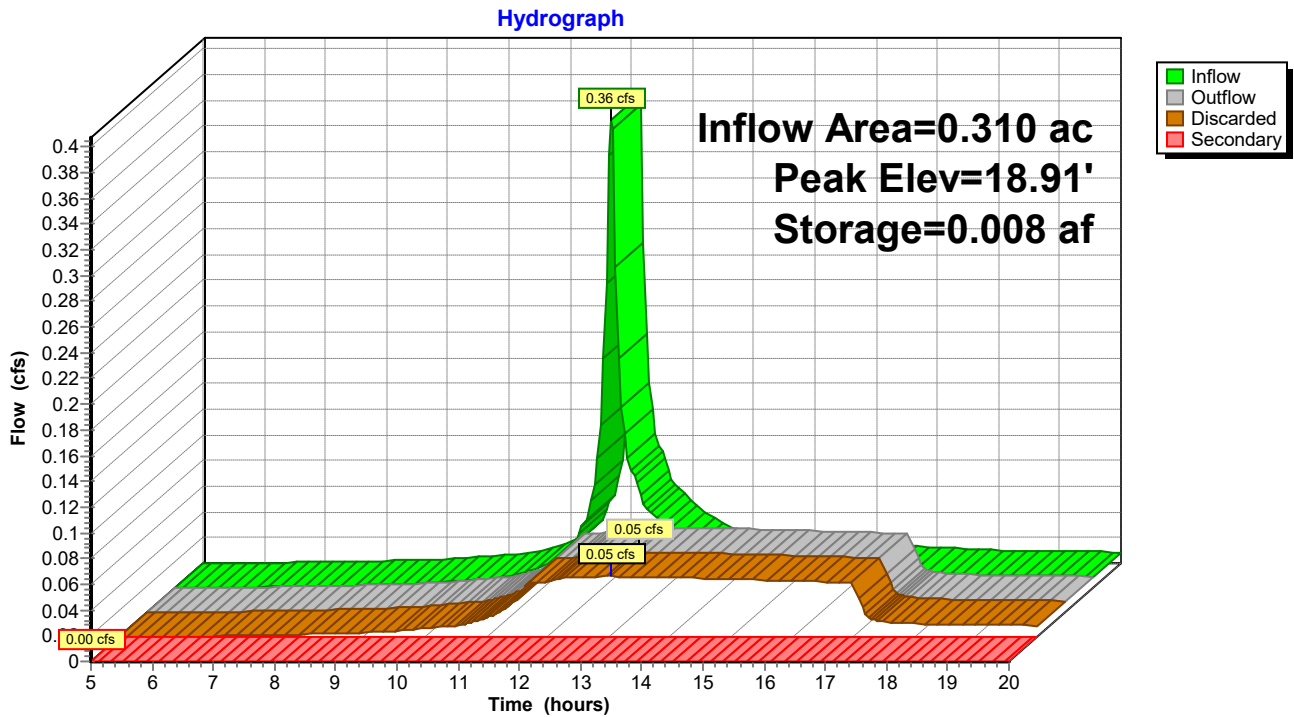
Volume	Invert	Avail.Storage	Storage Description
#1	17.90'	0.017 af	6.00'W x 150.00'L x 2.00'H Prismatoid 0.041 af Overall x 40.0% Voids
#2	19.90'	0.071 af	6.00'W x 150.00'L x 2.00'H Prismatoid Z=2.0 -Impervious
		0.087 af	Total Available Storage

Device	Routing	Invert	Outlet Devices
#1	Discarded	17.90'	2.000 in/hr Exfiltration over Surface area Conductivity to Groundwater Elevation = 10.00'
#2	Secondary	21.75'	14.0' long (Profile 1) Broad-Crested Rectangular Weir Head (feet) 0.49 0.98 1.48 Coef. (English) 2.92 3.37 3.59

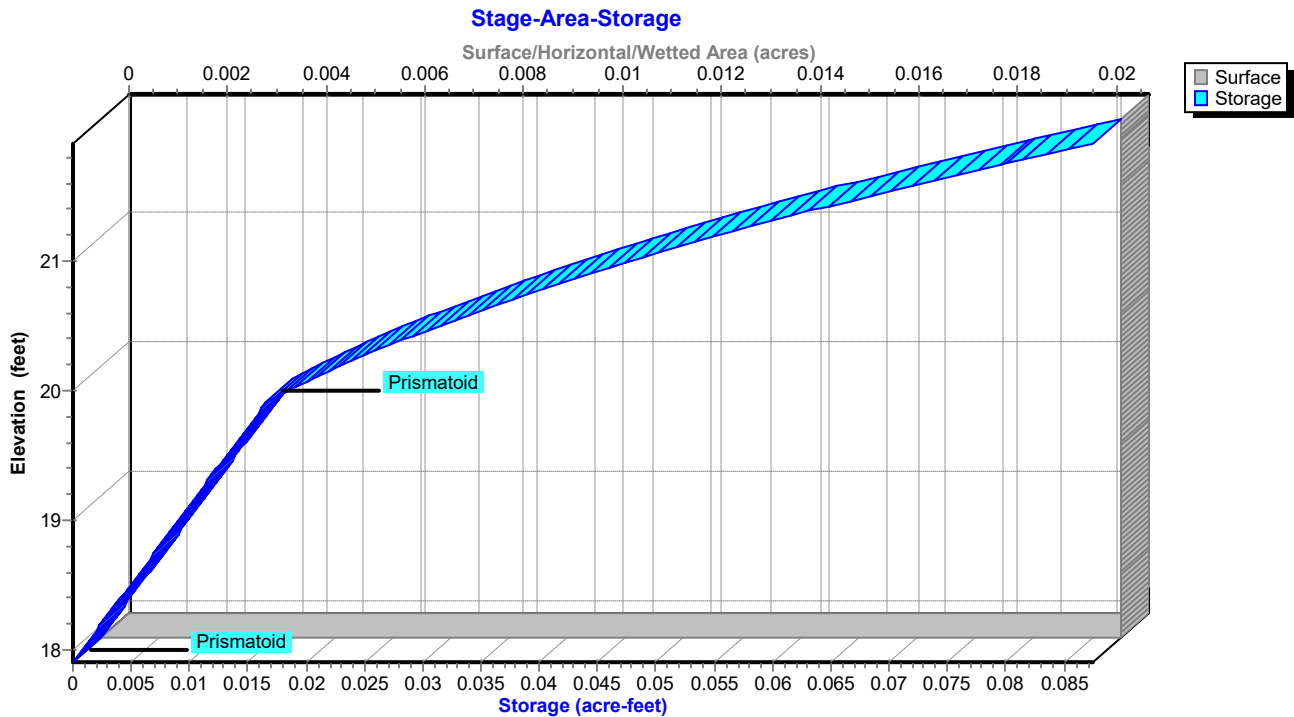
Discarded OutFlow Max=0.05 cfs @ 13.03 hrs HW=18.91' (Free Discharge)
 ↑1=Exfiltration (Controls 0.05 cfs)

Secondary OutFlow Max=0.00 cfs @ 5.00 hrs HW=17.90' (Free Discharge)
 ↑2=Broad-Crested Rectangular Weir (Controls 0.00 cfs)

Pond BMP-12A4: (new Pond)



Pond BMP-12A4: (new Pond)



Summary for Subcatchment SC-12B: SC-12B

Runoff = 0.19 cfs @ 12.14 hrs, Volume= 0.014 af, Depth> 0.44"

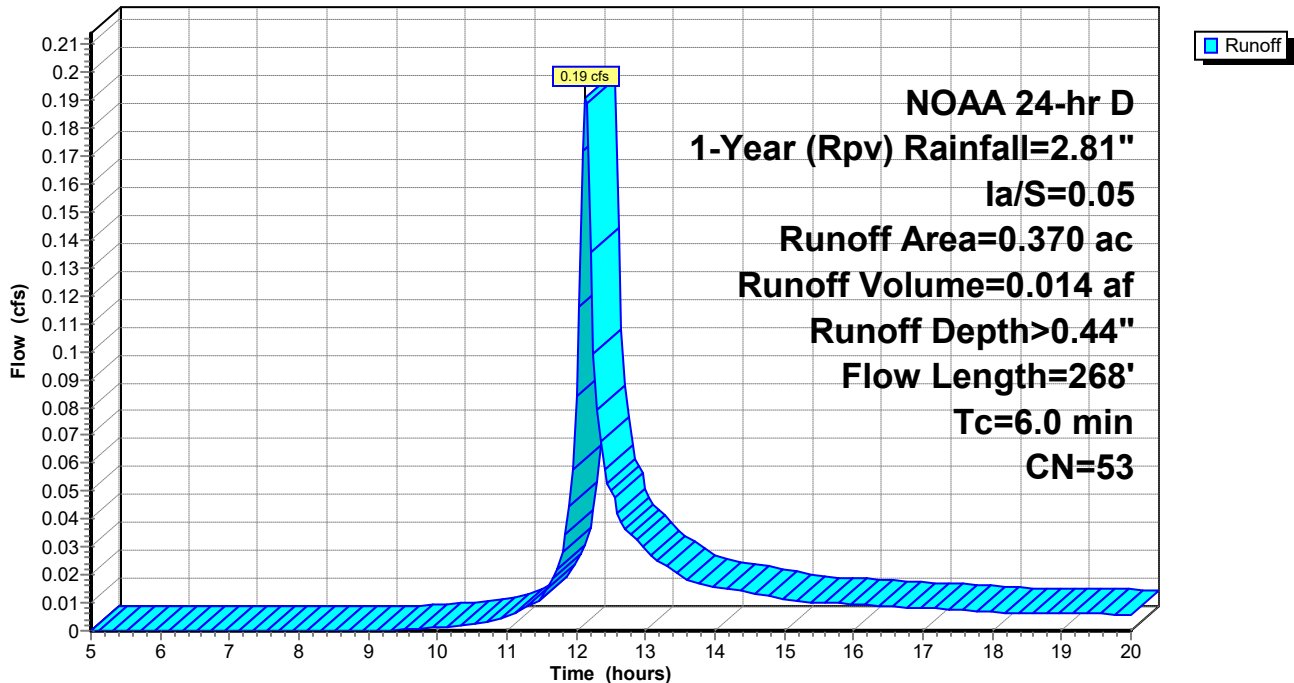
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
 NOAA 24-hr D 1-Year (Rpv) Rainfall=2.81", Ia/S=0.05

Area (ac)	CN	Description
0.280	39	>75% Grass cover, Good, HSG A
* 0.090	98	
0.370	53	Weighted Average
0.280		75.68% Pervious Area
0.090		24.32% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.3	23	0.0290	1.21		Sheet Flow, Smooth surfaces n= 0.011 P2= 3.30"
1.0	15	0.1450	0.26		Sheet Flow, Grass: Short n= 0.150 P2= 3.30"
0.2	75	0.0470	5.37	37.58	Channel Flow, Area= 7.0 sf Perim= 19.8' r= 0.35' n= 0.030
0.5	155	0.0100	5.56	136.23	Channel Flow, Area= 24.5 sf Perim= 20.6' r= 1.19' n= 0.030
2.0	268	Total, Increased to minimum Tc = 6.0 min			

Subcatchment SC-12B: SC-12B

Hydrograph



Summary for Subcatchment SC-12C: SC-12C

Runoff = 0.23 cfs @ 12.14 hrs, Volume= 0.016 af, Depth> 0.46"

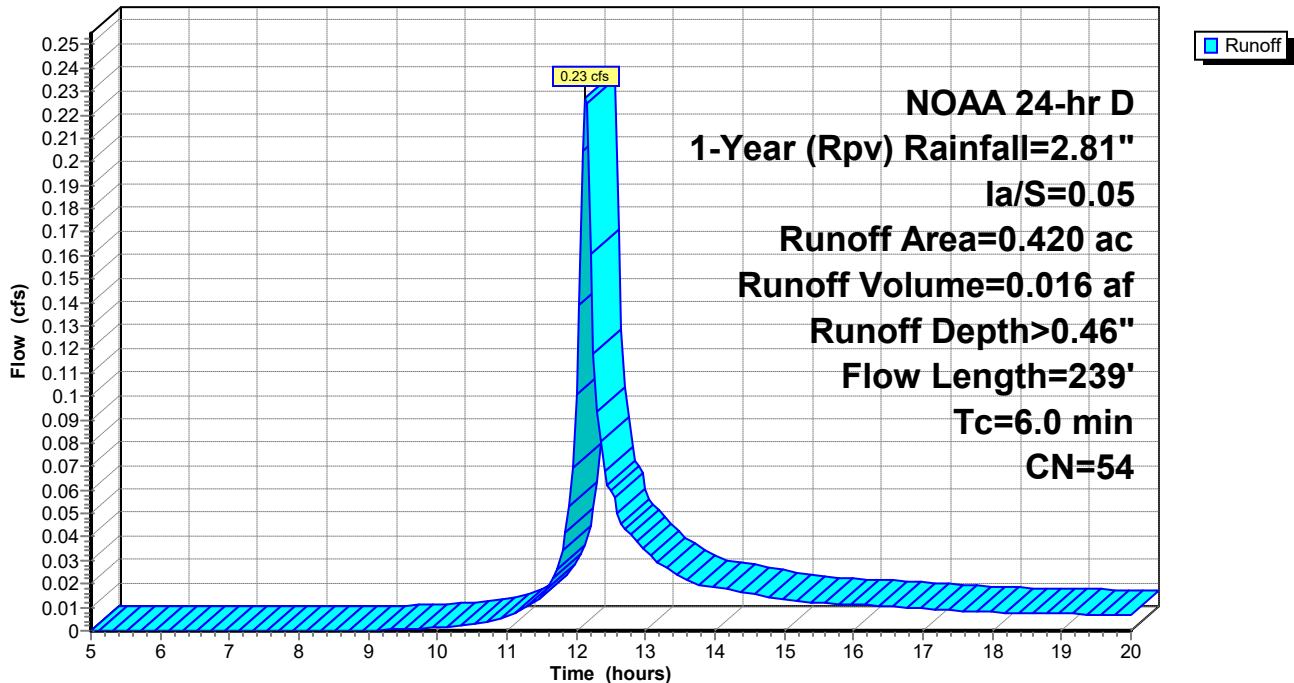
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
 NOAA 24-hr D 1-Year (Rpv) Rainfall=2.81", Ia/S=0.05

Area (ac)	CN	Description
0.310	39	>75% Grass cover, Good, HSG A
* 0.110	98	
0.420	54	Weighted Average
0.310		73.81% Pervious Area
0.110		26.19% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.4	29	0.0330	1.33		Sheet Flow, Smooth surfaces n= 0.011 P2= 3.30"
1.2	22	0.1900	0.31		Sheet Flow, Grass: Short n= 0.150 P2= 3.30"
0.2	88	0.0110	6.00	157.75	Channel Flow, Area= 26.3 sf Perim= 21.2' r= 1.24' n= 0.030
0.2	100	0.0190	7.89	185.53	Channel Flow, Area= 23.5 sf Perim= 18.9' r= 1.24' n= 0.030
2.0	239	Total, Increased to minimum Tc = 6.0 min			

Subcatchment SC-12C: SC-12C

Hydrograph



Summary for Subcatchment SC-12D: SC-12D

Runoff = 0.47 cfs @ 12.14 hrs, Volume= 0.034 af, Depth> 0.60"

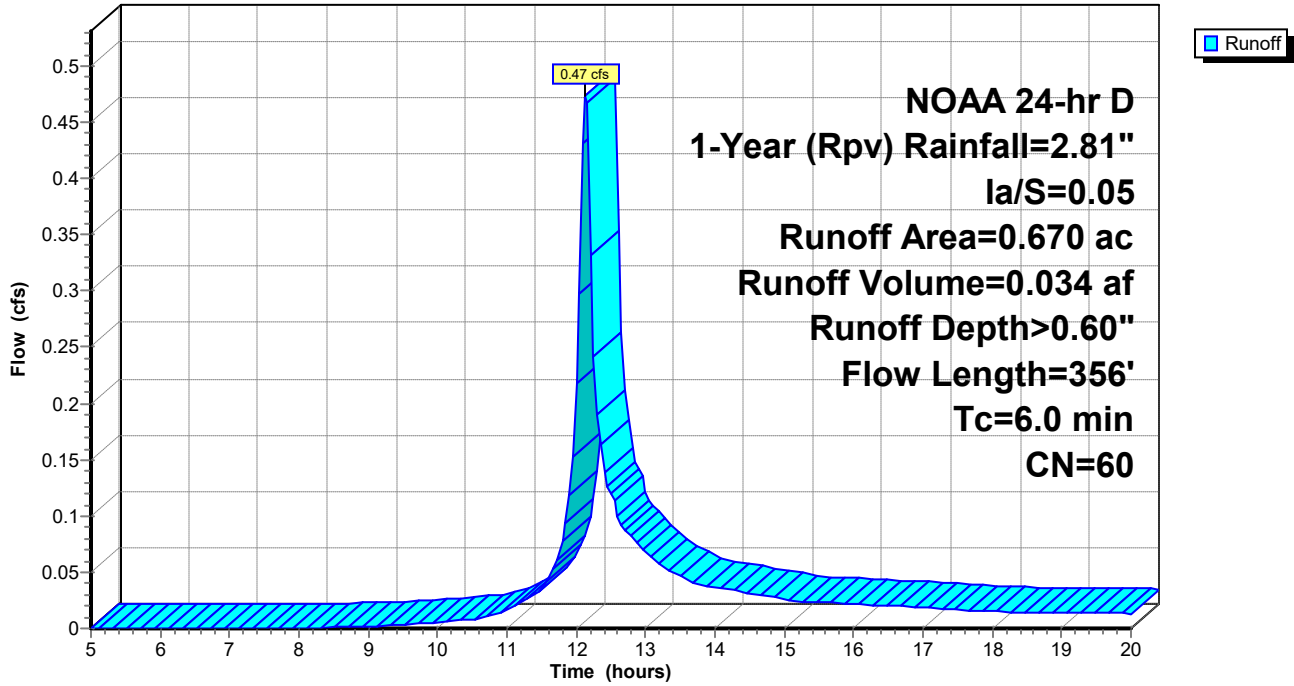
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
 NOAA 24-hr D 1-Year (Rpv) Rainfall=2.81", Ia/S=0.05

Area (ac)	CN	Description
* 0.240	98	
* 0.430	39	
0.670	60	Weighted Average
0.430		64.18% Pervious Area
0.240		35.82% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.3	25	0.0320	1.28		Sheet Flow, Smooth surfaces n= 0.011 P2= 3.30"
1.6	11	0.0230	0.12		Sheet Flow, Grass: Short n= 0.150 P2= 3.30"
0.2	11	0.0230	0.95		Sheet Flow, Smooth surfaces n= 0.011 P2= 3.30"
1.0	16	0.1670	0.28		Sheet Flow, Grass: Short n= 0.150 P2= 3.30"
1.2	293	0.0065	3.99	69.49	Channel Flow, Area= 17.4 sf Perim= 17.4' r= 1.00' n= 0.030
4.3	356	Total, Increased to minimum Tc = 6.0 min			

Subcatchment SC-12D: SC-12D

Hydrograph



Summary for Subcatchment SC-12E: SC-12E

Runoff = 0.42 cfs @ 12.14 hrs, Volume= 0.029 af, Depth> 0.65"

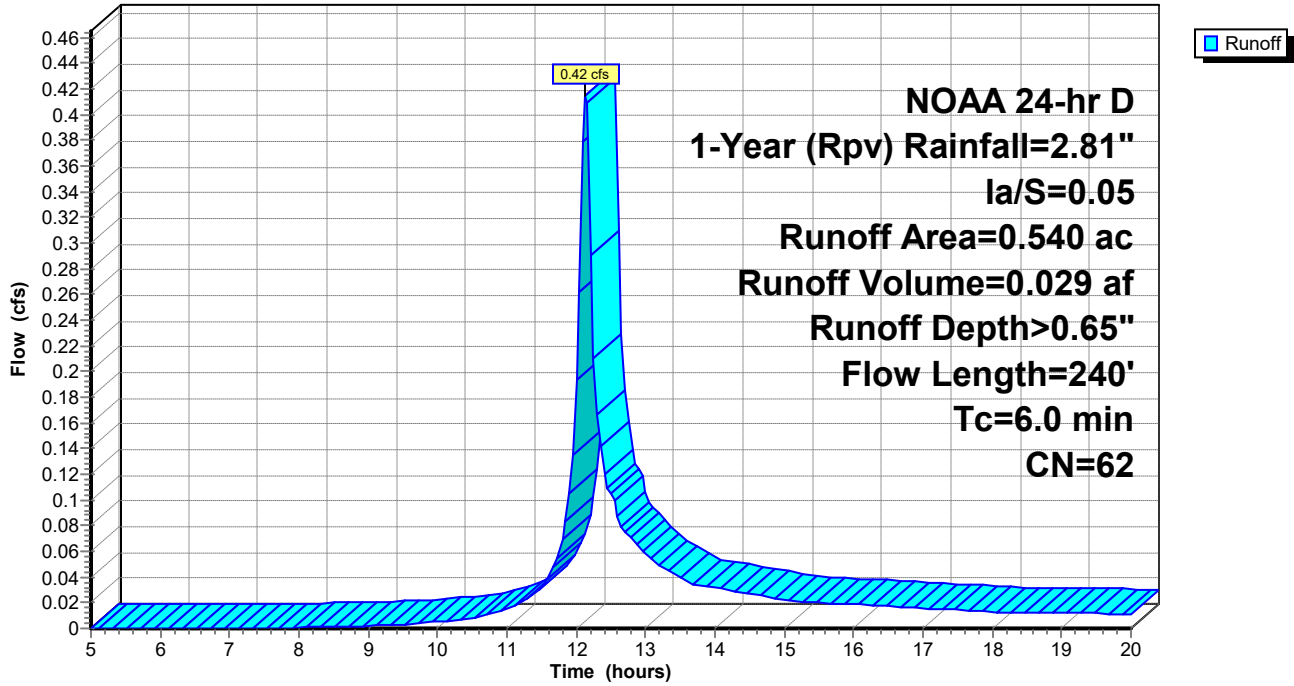
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
 NOAA 24-hr D 1-Year (Rpv) Rainfall=2.81", Ia/S=0.05

Area (ac)	CN	Description
* 0.210	98	
* 0.330	39	
0.540	62	Weighted Average
0.330		61.11% Pervious Area
0.210		38.89% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.4	30	0.0240	1.18		Sheet Flow, n= 0.011 P2= 3.30"
1.5	13	0.0340	0.14		Sheet Flow, Grass: Short n= 0.150 P2= 3.30"
0.2	12	0.0190	0.90		Sheet Flow, Smooth surfaces n= 0.011 P2= 3.30"
1.1	21	0.1860	0.31		Sheet Flow, Grass: Short n= 0.150 P2= 3.30"
0.2	164	0.0650	15.63	150.07	Channel Flow, Area= 9.6 sf Perim= 11.1' r= 0.86' n= 0.022
3.4	240	Total, Increased to minimum Tc = 6.0 min			

Subcatchment SC-12E: SC-12E

Hydrograph



Summary for Pond BMP-12E: (new Pond)

Inflow Area = 0.540 ac, 38.89% Impervious, Inflow Depth > 0.65" for 1-Year (Rpv) event
 Inflow = 0.42 cfs @ 12.14 hrs, Volume= 0.029 af
 Outflow = 0.06 cfs @ 13.05 hrs, Volume= 0.029 af, Atten= 86%, Lag= 55.0 min
 Discarded = 0.06 cfs @ 13.05 hrs, Volume= 0.029 af
 Primary = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
 Peak Elev= 13.65' @ 13.05 hrs Surf.Area= 0.014 ac Storage= 0.010 af

Plug-Flow detention time= 82.4 min calculated for 0.029 af (100% of inflow)
 Center-of-Mass det. time= 81.2 min (890.9 - 809.7)

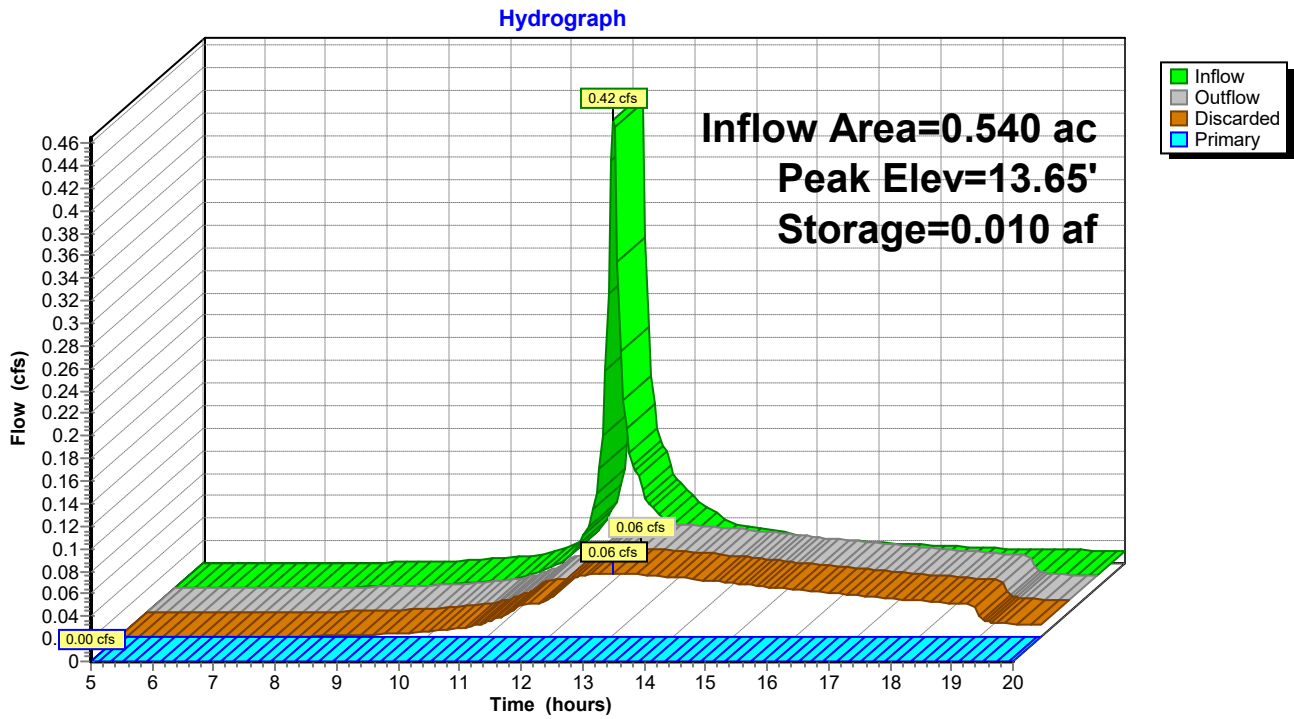
Volume	Invert	Avail.Storage	Storage Description
#1	11.80'	0.011 af	6.00'W x 100.00'L x 2.00'H Prismatic 0.028 af Overall x 40.0% Voids
#2	13.80'	0.048 af	6.00'W x 100.00'L x 2.00'H Prismatic Z=2.0
		0.059 af	Total Available Storage

Device	Routing	Invert	Outlet Devices
#1	Discarded	11.80'	2.000 in/hr Exfiltration over Surface area Conductivity to Groundwater Elevation = 10.00'
#2	Primary	15.65'	14.0' long (Profile 1) Broad-Crested Rectangular Weir Head (feet) 0.49 0.98 1.48 Coef. (English) 2.92 3.37 3.59

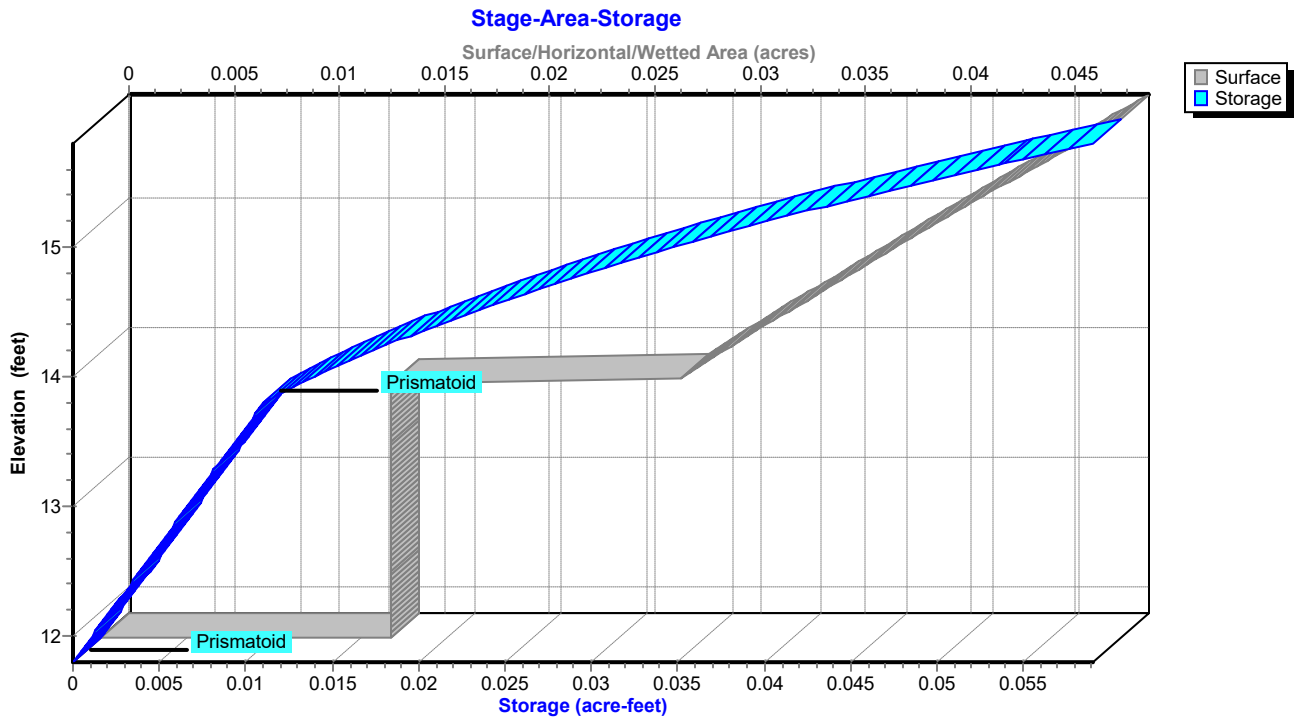
Discarded OutFlow Max=0.06 cfs @ 13.05 hrs HW=13.65' (Free Discharge)
 ↑1=Exfiltration (Controls 0.06 cfs)

Primary OutFlow Max=0.00 cfs @ 5.00 hrs HW=11.80' (Free Discharge)
 ↑2=Broad-Crested Rectangular Weir (Controls 0.00 cfs)

Pond BMP-12E: (new Pond)



Pond BMP-12E: (new Pond)



Summary for Subcatchment SC-12F: SC-12F

Runoff = 0.15 cfs @ 12.14 hrs, Volume= 0.011 af, Depth> 0.60"

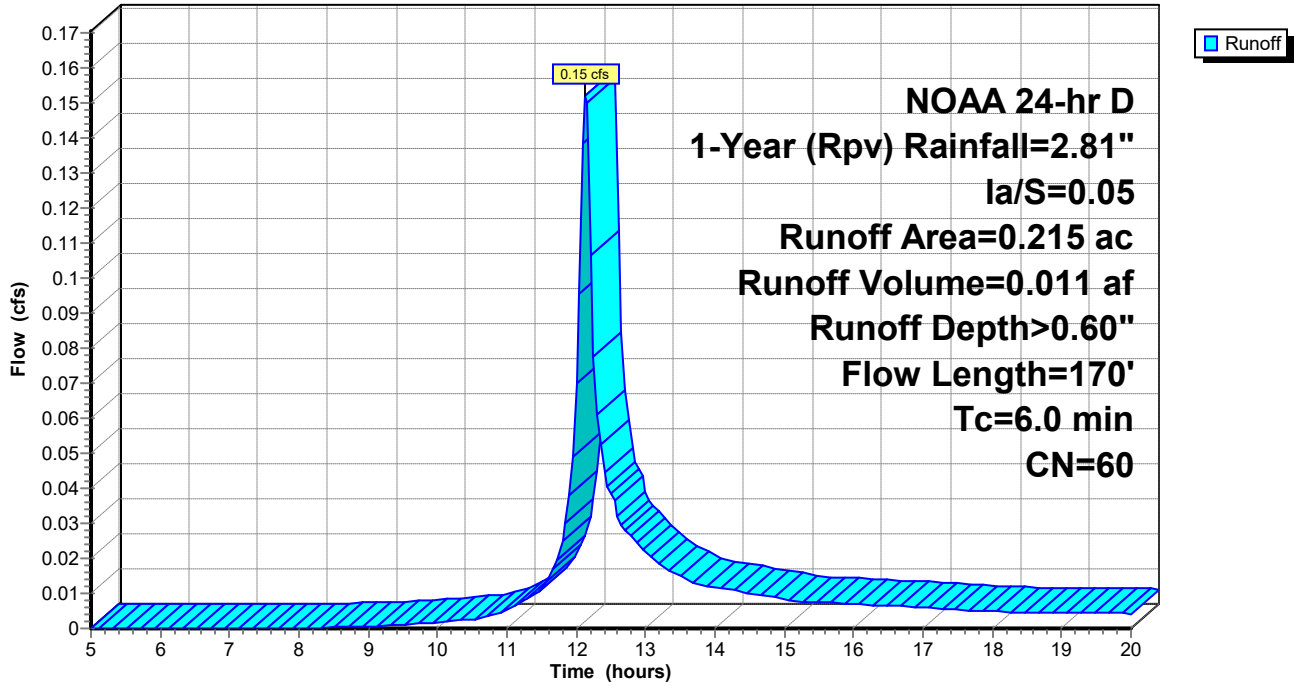
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
 NOAA 24-hr D 1-Year (Rpv) Rainfall=2.81", Ia/S=0.05

Area (ac)	CN	Description
* 0.075	98	
* 0.140	39	
0.215	60	Weighted Average
0.140		65.12% Pervious Area
0.075		34.88% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.3	24	0.0290	1.22		Sheet Flow, Smooth surfaces n= 0.011 P2= 3.30"
1.1	8	0.0320	0.13		Sheet Flow, Grass: Short n= 0.150 P2= 3.30"
0.1	10	0.0690	1.45		Sheet Flow, Smooth surfaces n= 0.011 P2= 3.30"
1.8	36	0.1800	0.34		Sheet Flow, Grass: Short n= 0.150 P2= 3.30"
0.2	92	0.0560	9.50	131.16	Channel Flow, Area= 13.8 sf Perim= 18.9' r= 0.73' n= 0.030
3.5	170	Total, Increased to minimum Tc = 6.0 min			

Subcatchment SC-12F: SC-12F

Hydrograph



Summary for Subcatchment SC-13A1: SC-13A

Runoff = 0.70 cfs @ 12.14 hrs, Volume= 0.050 af, Depth> 0.55"

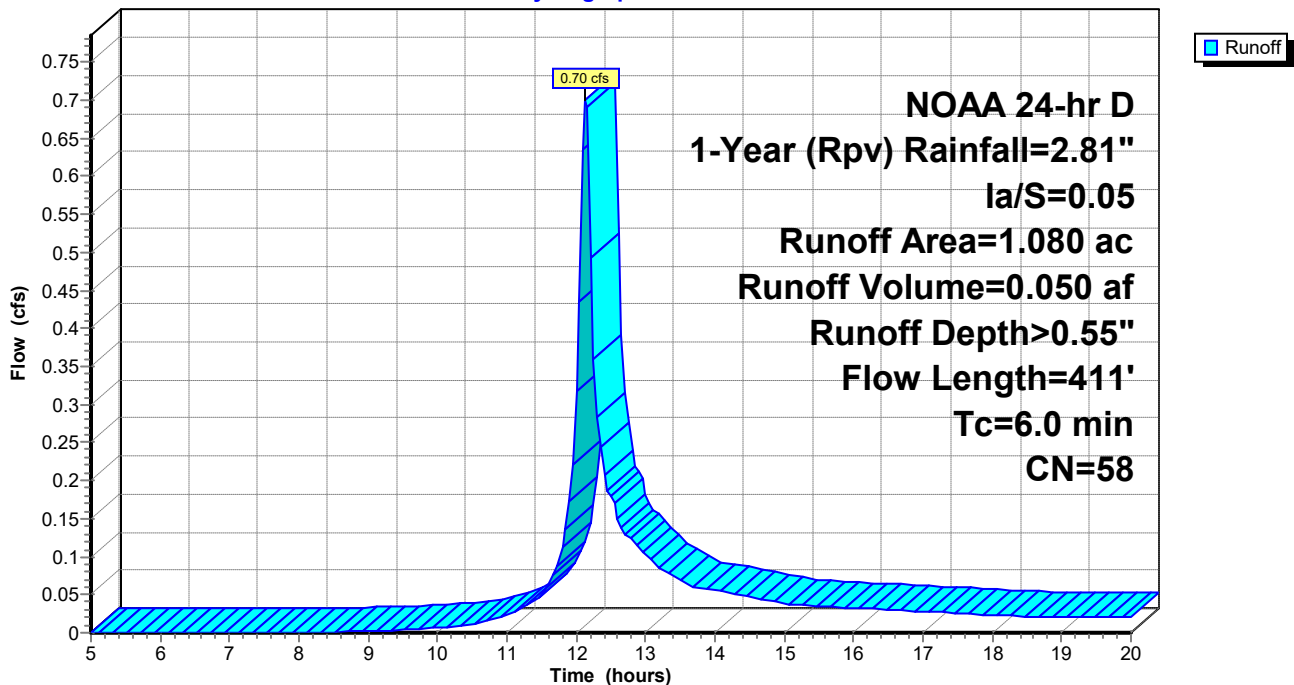
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
 NOAA 24-hr D 1-Year (Rpv) Rainfall=2.81", Ia/S=0.05

Area (ac)	CN	Description
* 0.340	98	
* 0.740	39	
1.080	58	Weighted Average
0.740		68.52% Pervious Area
0.340		31.48% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.6	50	0.0342	1.51		Sheet Flow, Smooth surfaces n= 0.011 P2= 3.30"
0.1	15	0.1830	2.99		Shallow Concentrated Flow, Short Grass Pasture Kv= 7.0 fps
0.3	71	0.3220	3.97		Shallow Concentrated Flow, Short Grass Pasture Kv= 7.0 fps
0.6	275	0.0260	7.99	136.58	Channel Flow, Area= 17.1 sf Perim= 17.1' r= 1.00' n= 0.030
1.6	411	Total, Increased to minimum Tc = 6.0 min			

Subcatchment SC-13A1: SC-13A

Hydrograph



Summary for Pond BMP-13A1: (new Pond)

Inflow Area = 1.080 ac, 31.48% Impervious, Inflow Depth > 0.55" for 1-Year (Rpv) event
 Inflow = 0.70 cfs @ 12.14 hrs, Volume= 0.050 af
 Outflow = 0.08 cfs @ 13.26 hrs, Volume= 0.050 af, Atten= 88%, Lag= 67.5 min
 Discarded = 0.08 cfs @ 13.26 hrs, Volume= 0.050 af
 Primary = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
 Peak Elev= 21.12' @ 13.26 hrs Surf.Area= 0.037 ac Storage= 0.017 af

Plug-Flow detention time= 83.3 min calculated for 0.049 af (99% of inflow)
 Center-of-Mass det. time= 81.8 min (896.7 - 814.9)

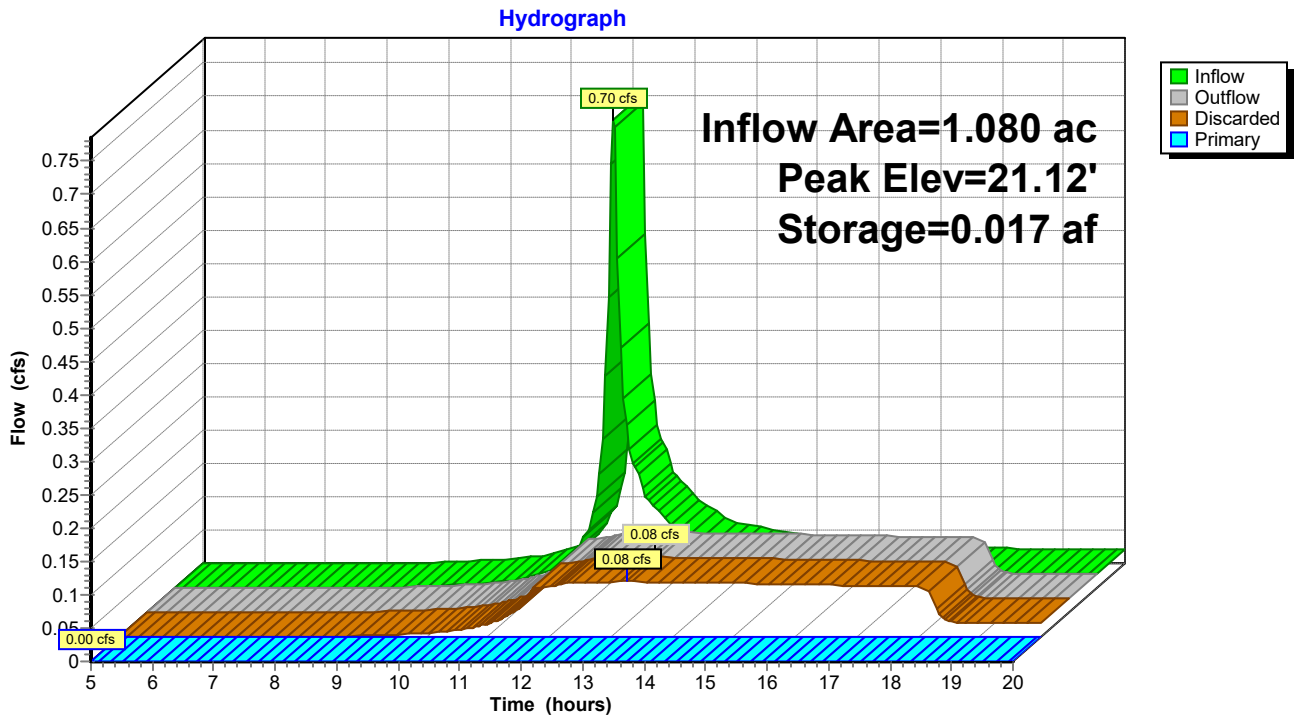
Volume	Invert	Avail.Storage	Storage Description
#1	19.95'	0.029 af	8.00'W x 200.00'L x 2.00'H Prismatic 0.073 af Overall x 40.0% Voids
#2	21.95'	0.113 af	8.00'W x 200.00'L x 2.00'H Prismatic Z=2.0
		0.142 af	Total Available Storage

Device	Routing	Invert	Outlet Devices
#1	Discarded	19.95'	2.000 in/hr Exfiltration over Surface area Conductivity to Groundwater Elevation = 10.00'
#2	Primary	23.65'	16.0' long (Profile 1) Broad-Crested Rectangular Weir Head (feet) 0.49 0.98 1.48 Coef. (English) 2.92 3.37 3.59

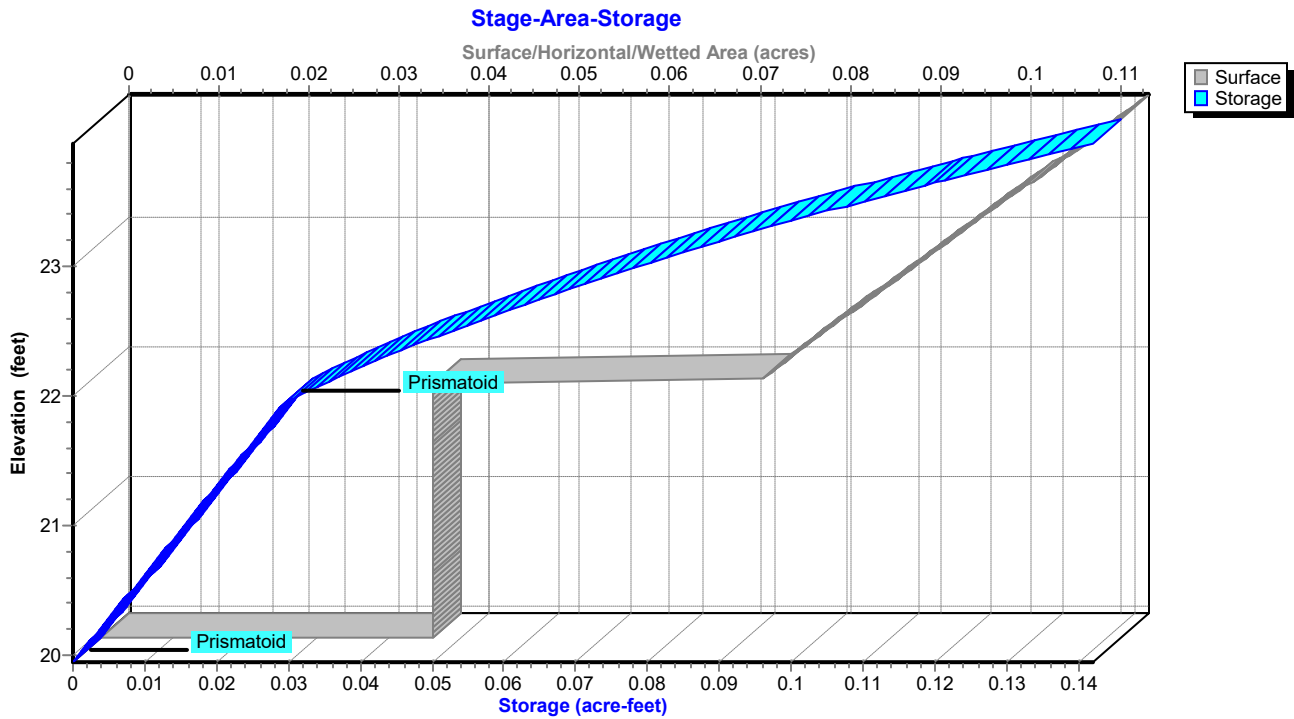
Discarded OutFlow Max=0.08 cfs @ 13.26 hrs HW=21.12' (Free Discharge)
 ↑1=Exfiltration (Controls 0.08 cfs)

Primary OutFlow Max=0.00 cfs @ 5.00 hrs HW=19.95' (Free Discharge)
 ↑2=Broad-Crested Rectangular Weir (Controls 0.00 cfs)

Pond BMP-13A1: (new Pond)



Pond BMP-13A1: (new Pond)



Summary for Subcatchment SC-13A2: SC-13A

Runoff = 0.34 cfs @ 12.14 hrs, Volume= 0.024 af, Depth> 0.58"

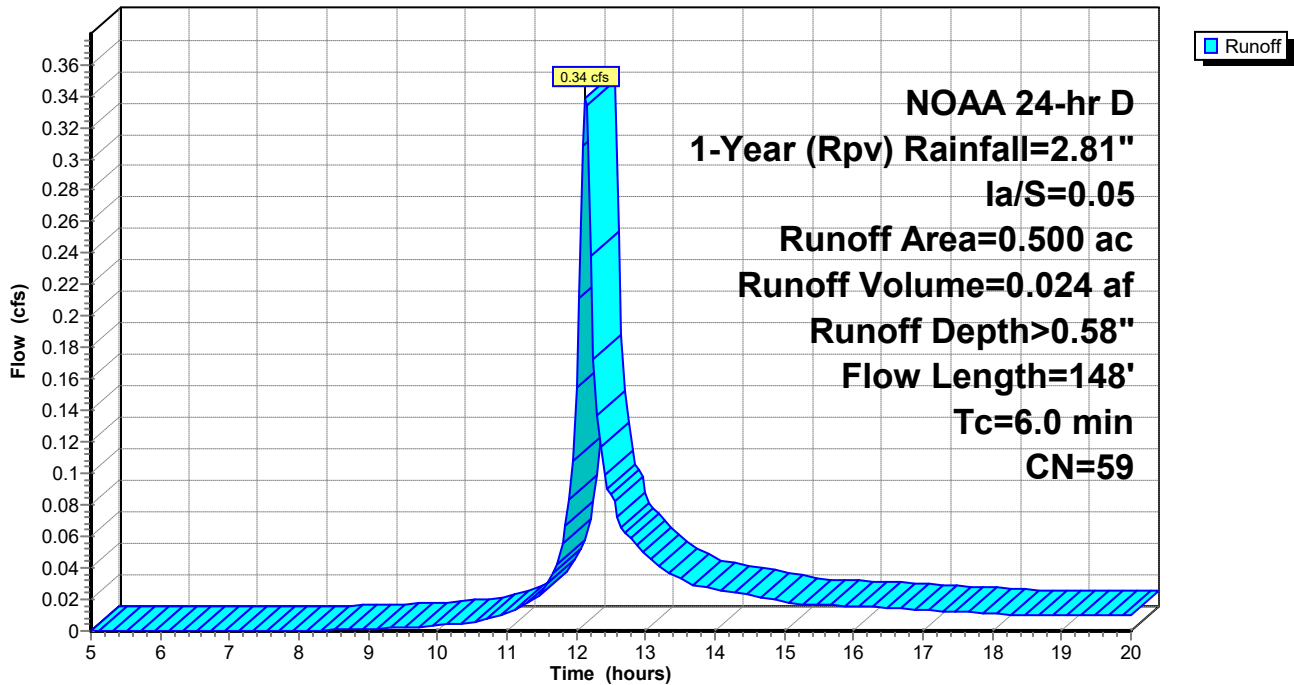
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
 NOAA 24-hr D 1-Year (Rpv) Rainfall=2.81", Ia/S=0.05

Area (ac)	CN	Description
* 0.170	98	
* 0.330	39	
0.500	59	Weighted Average
0.330		66.00% Pervious Area
0.170		34.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.3	25	0.0332	1.30		Sheet Flow, Smooth surfaces n= 0.011 P2= 3.30"
0.2	43	0.2270	3.34		Shallow Concentrated Flow, Short Grass Pasture Kv= 7.0 fps
0.3	80	0.0098	4.90	83.85	Channel Flow, Area= 17.1 sf Perim= 17.1' r= 1.00' n= 0.030
0.8	148	Total, Increased to minimum Tc = 6.0 min			

Subcatchment SC-13A2: SC-13A

Hydrograph



Summary for Subcatchment SC-13A3: SC-13A

Runoff = 0.36 cfs @ 12.14 hrs, Volume= 0.026 af, Depth> 0.38"

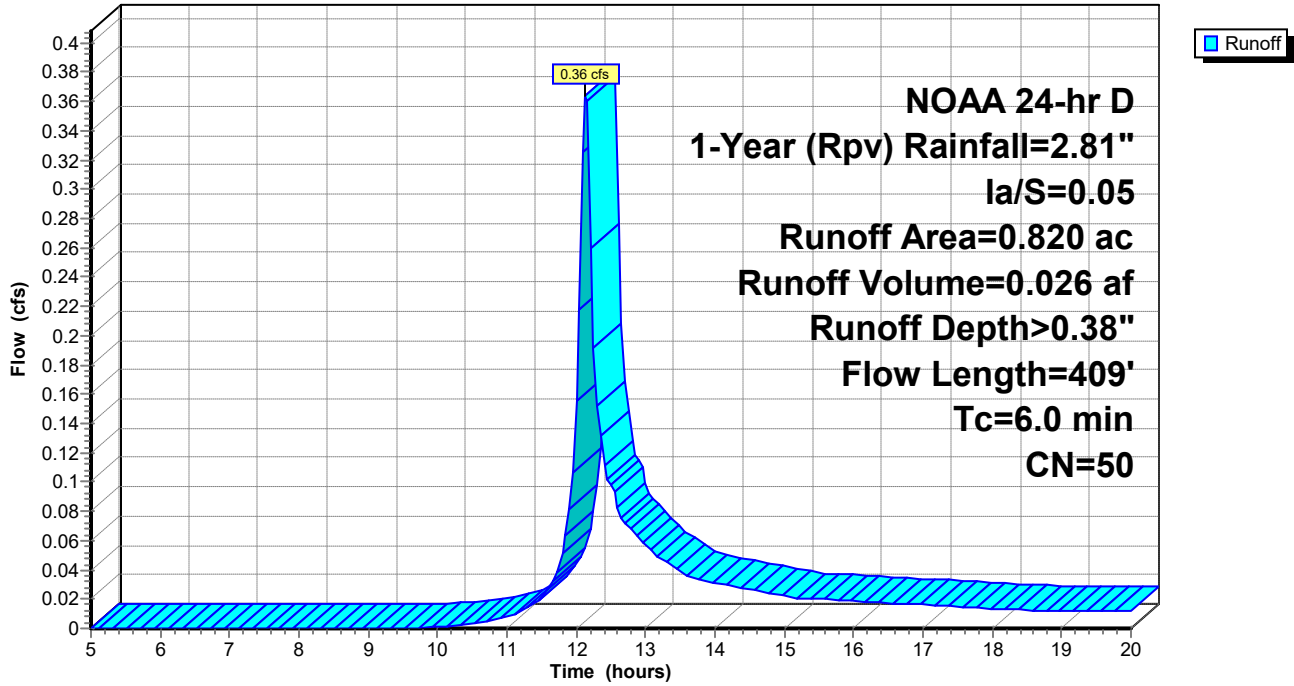
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
 NOAA 24-hr D 1-Year (Rpv) Rainfall=2.81", Ia/S=0.05

Area (ac)	CN	Description
0.670	39	>75% Grass cover, Good, HSG A
0.150	98	Paved roads w/curbs & sewers, HSG A
0.820	50	Weighted Average
0.670		81.71% Pervious Area
0.150		18.29% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.2	13	0.0434	1.27		Sheet Flow, Smooth surfaces n= 0.011 P2= 3.30"
0.1	13	0.0460	1.50		Shallow Concentrated Flow, Short Grass Pasture Kv= 7.0 fps
0.1	12	0.0280	3.40		Shallow Concentrated Flow, Paved Kv= 20.3 fps
0.3	77	0.3000	3.83		Shallow Concentrated Flow, Short Grass Pasture Kv= 7.0 fps
1.2	294	0.0050	4.03	87.39	Channel Flow, Area= 21.7 sf Perim= 17.6' r= 1.23' n= 0.030
1.9	409	Total, Increased to minimum Tc = 6.0 min			

Subcatchment SC-13A3: SC-13A

Hydrograph



Summary for Pond BMP-13A3: (new Pond)

Inflow Area = 0.820 ac, 18.29% Impervious, Inflow Depth > 0.38" for 1-Year (Rpv) event
 Inflow = 0.36 cfs @ 12.14 hrs, Volume= 0.026 af
 Outflow = 0.06 cfs @ 12.97 hrs, Volume= 0.026 af, Atten= 84%, Lag= 49.7 min
 Discarded = 0.06 cfs @ 12.97 hrs, Volume= 0.026 af
 Primary = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
 Peak Elev= 21.61' @ 12.97 hrs Surf.Area= 0.028 ac Storage= 0.007 af

Plug-Flow detention time= 45.0 min calculated for 0.026 af (99% of inflow)
 Center-of-Mass det. time= 43.5 min (869.4 - 825.8)

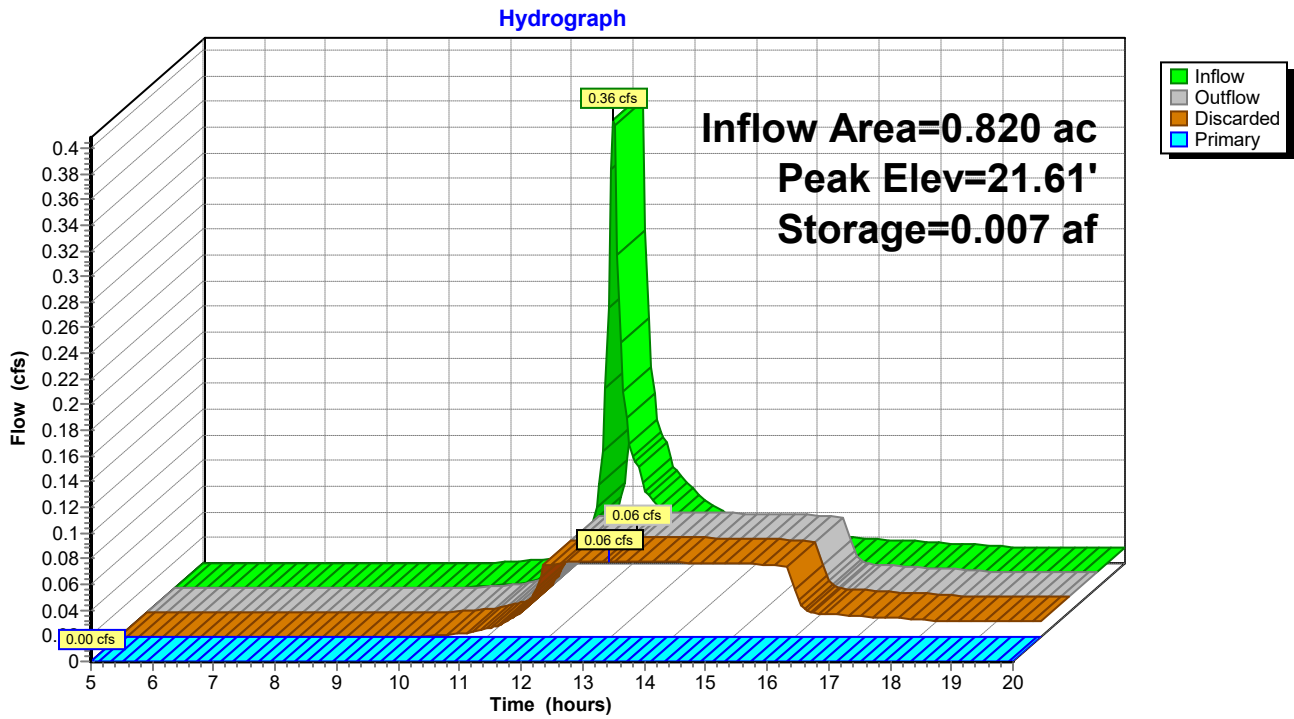
Volume	Invert	Avail.Storage	Storage Description
#1	20.95'	0.022 af	8.00'W x 150.00'L x 2.00'H Prismatic 0.055 af Overall x 40.0% Voids
#2	22.95'	0.085 af	8.00'W x 150.00'L x 2.00'H Prismatic Z=2.0
		0.107 af	Total Available Storage

Device	Routing	Invert	Outlet Devices
#1	Discarded	20.95'	2.000 in/hr Exfiltration over Surface area Conductivity to Groundwater Elevation = 10.00'
#2	Primary	24.00'	16.0' long (Profile 1) Broad-Crested Rectangular Weir Head (feet) 0.49 0.98 1.48 Coef. (English) 2.92 3.37 3.59
#3	Primary	22.95'	18.0" Round Culvert L= 303.0' RCP, end-section conforming to fill, Ke= 0.500 Inlet / Outlet Invert= 22.95' / 21.95' S= 0.0033 '/ Cc= 0.900 n= 0.012, Flow Area= 1.77 sf

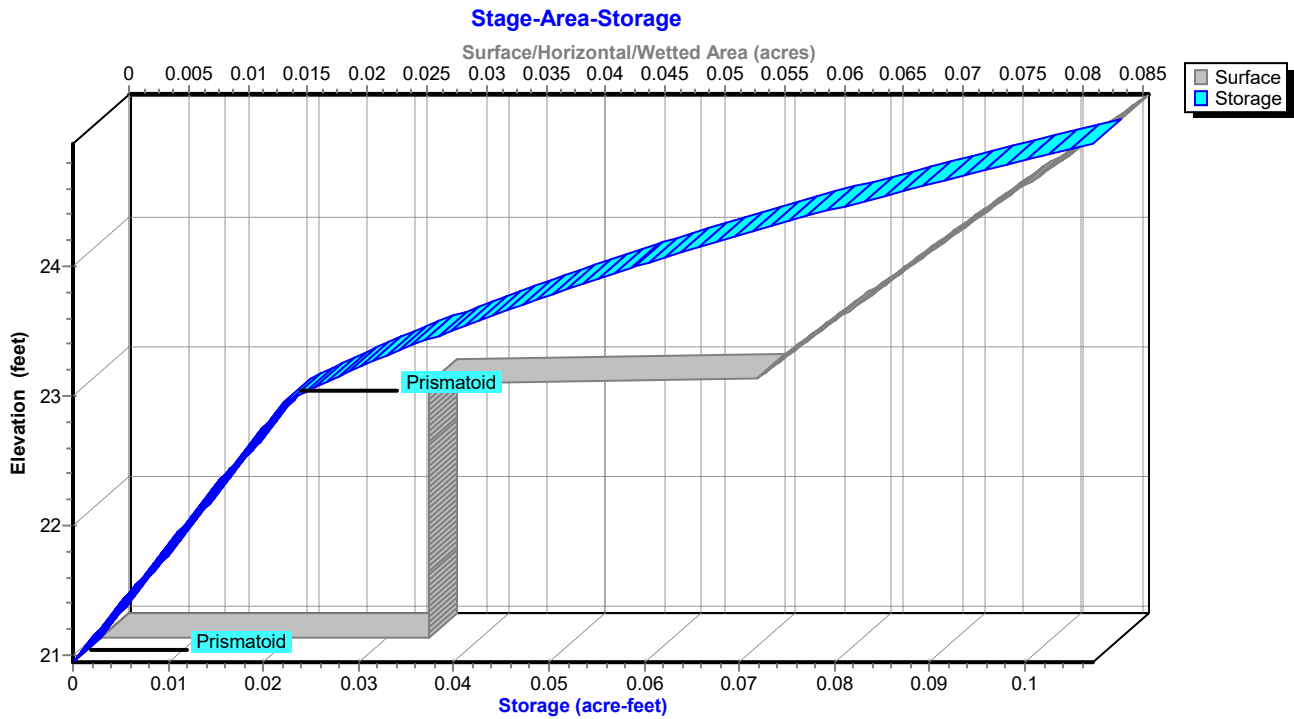
Discarded OutFlow Max=0.06 cfs @ 12.97 hrs HW=21.61' (Free Discharge)
 ↑1=Exfiltration (Controls 0.06 cfs)

Primary OutFlow Max=0.00 cfs @ 5.00 hrs HW=20.95' (Free Discharge)
 ↑2=Broad-Crested Rectangular Weir (Controls 0.00 cfs)
 ↓3=Culvert (Controls 0.00 cfs)

Pond BMP-13A3: (new Pond)



Pond BMP-13A3: (new Pond)



Summary for Subcatchment SC-13A4: SC-13A

Runoff = 0.21 cfs @ 12.14 hrs, Volume= 0.015 af, Depth> 0.46"

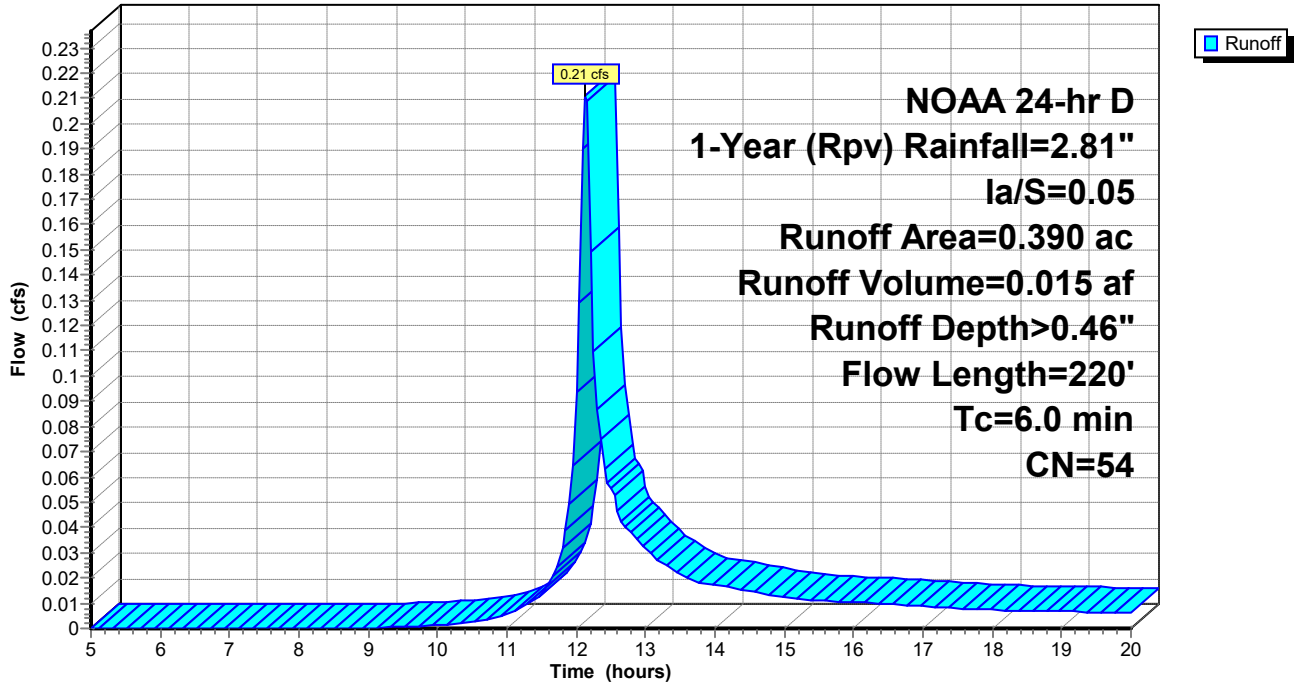
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
 NOAA 24-hr D 1-Year (Rpv) Rainfall=2.81", Ia/S=0.05

Area (ac)	CN	Description
0.290	39	>75% Grass cover, Good, HSG A
0.100	98	Paved roads w/curbs & sewers, HSG A
0.390	54	Weighted Average
0.290		74.36% Pervious Area
0.100		25.64% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.2	18	0.0430	1.35		Sheet Flow, Smooth surfaces n= 0.011 P2= 3.30"
0.2	15	0.0460	1.50		Shallow Concentrated Flow, Short Grass Pasture Kv= 7.0 fps
0.1	10	0.0240	3.14		Shallow Concentrated Flow, Paved Kv= 20.3 fps
0.2	36	0.2260	3.33		Shallow Concentrated Flow, Short Grass Pasture Kv= 7.0 fps
0.8	141	0.0033	2.90	50.77	Channel Flow, Area= 17.5 sf Perim= 17.0' r= 1.03' n= 0.030
1.5	220	Total, Increased to minimum Tc = 6.0 min			

Subcatchment SC-13A4: SC-13A

Hydrograph



Summary for Pond BMP-13A4: (new Pond)

Inflow Area = 0.390 ac, 25.64% Impervious, Inflow Depth > 0.46" for 1-Year (Rpv) event
 Inflow = 0.21 cfs @ 12.14 hrs, Volume= 0.015 af
 Outflow = 0.06 cfs @ 12.47 hrs, Volume= 0.015 af, Atten= 73%, Lag= 20.1 min
 Discarded = 0.06 cfs @ 12.47 hrs, Volume= 0.015 af
 Primary = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
 Peak Elev= 21.21' @ 12.47 hrs Surf.Area= 0.028 ac Storage= 0.003 af

Plug-Flow detention time= 15.9 min calculated for 0.015 af (99% of inflow)
 Center-of-Mass det. time= 14.6 min (834.8 - 820.2)

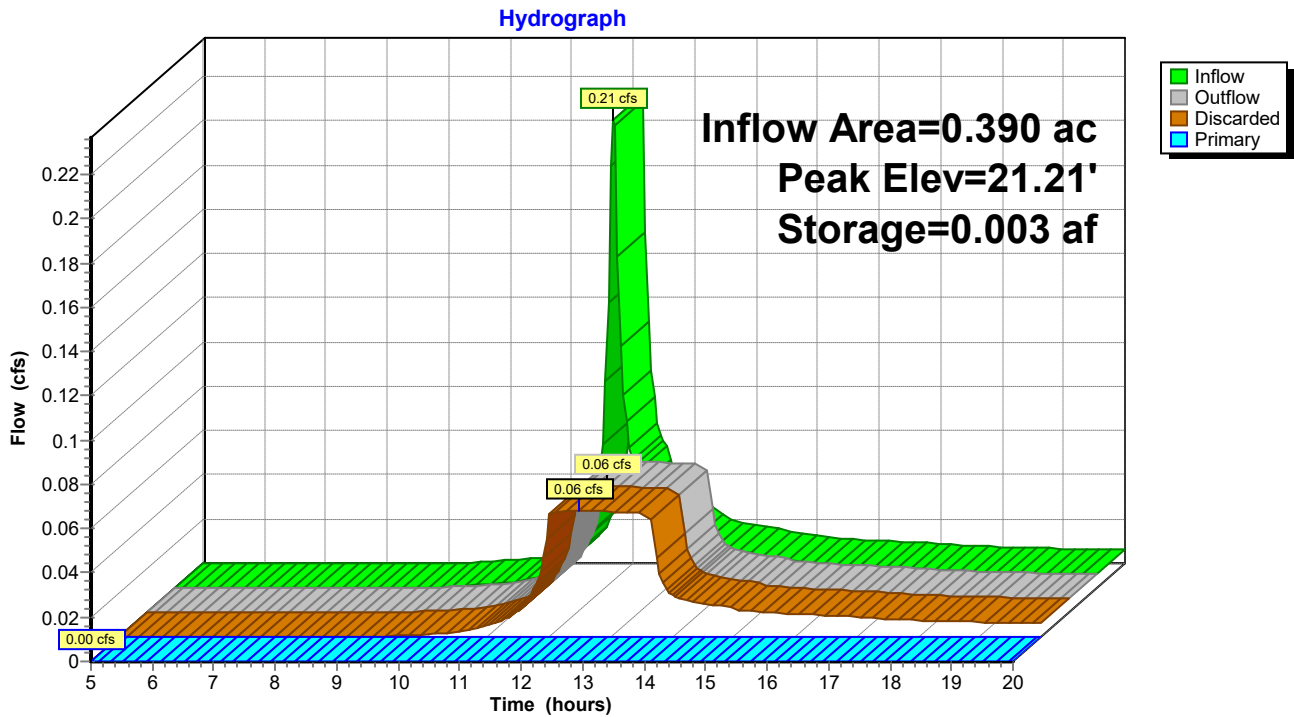
Volume	Invert	Avail.Storage	Storage Description
#1	20.95'	0.022 af	8.00'W x 150.00'L x 2.00'H Prismatic 0.055 af Overall x 40.0% Voids
#2	22.95'	0.085 af	8.00'W x 150.00'L x 2.00'H Prismatic Z=2.0
		0.107 af	Total Available Storage

Device	Routing	Invert	Outlet Devices
#1	Discarded	20.95'	2.000 in/hr Exfiltration over Surface area Conductivity to Groundwater Elevation = 10.00'
#2	Primary	24.00'	16.0' long (Profile 1) Broad-Crested Rectangular Weir Head (feet) 0.49 0.98 1.48 Coef. (English) 2.92 3.37 3.59
#3	Primary	22.95'	18.0" Round Culvert L= 303.0' RCP, end-section conforming to fill, Ke= 0.500 Inlet / Outlet Invert= 22.95' / 21.95' S= 0.0033 '/ Cc= 0.900 n= 0.012, Flow Area= 1.77 sf

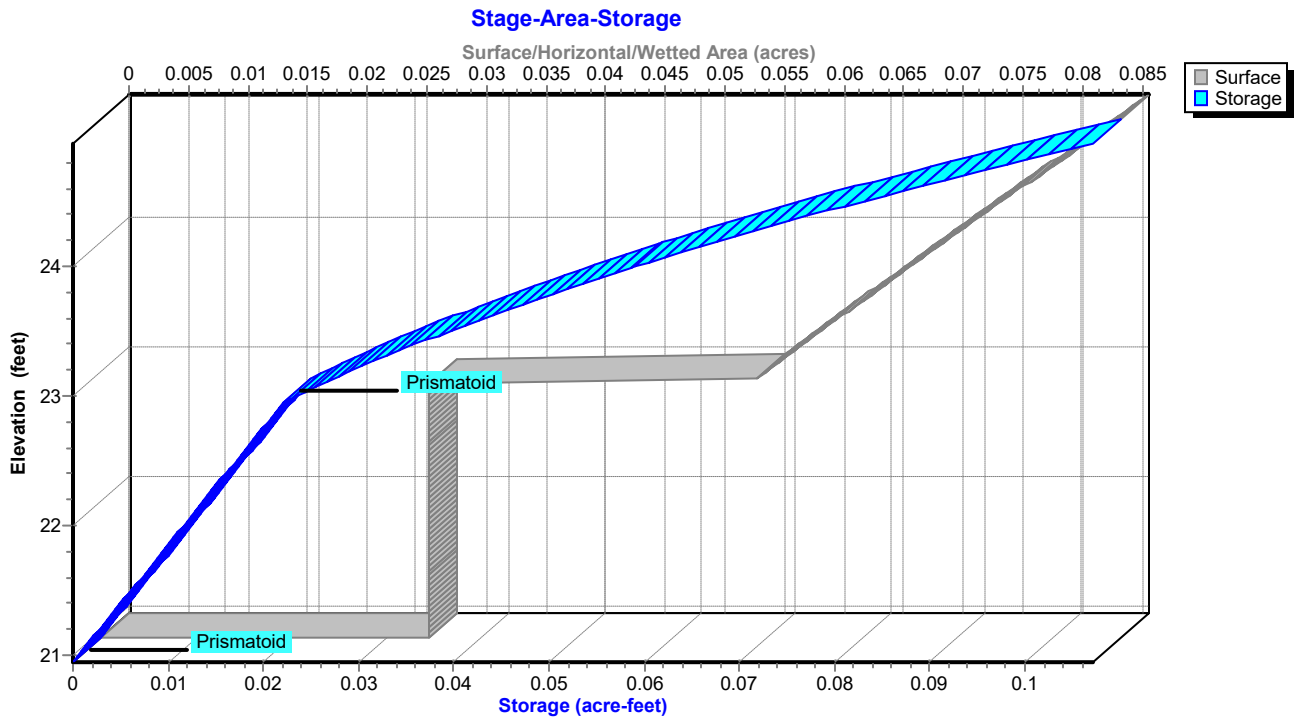
Discarded OutFlow Max=0.06 cfs @ 12.47 hrs HW=21.21' (Free Discharge)
 ↑1=Exfiltration (Controls 0.06 cfs)

Primary OutFlow Max=0.00 cfs @ 5.00 hrs HW=20.95' (Free Discharge)
 ↑2=Broad-Crested Rectangular Weir (Controls 0.00 cfs)
 ↓3=Culvert (Controls 0.00 cfs)

Pond BMP-13A4: (new Pond)



Pond BMP-13A4: (new Pond)



Summary for Subcatchment SC-13B: SC-13B

Runoff = 0.25 cfs @ 12.14 hrs, Volume= 0.018 af, Depth> 0.51"

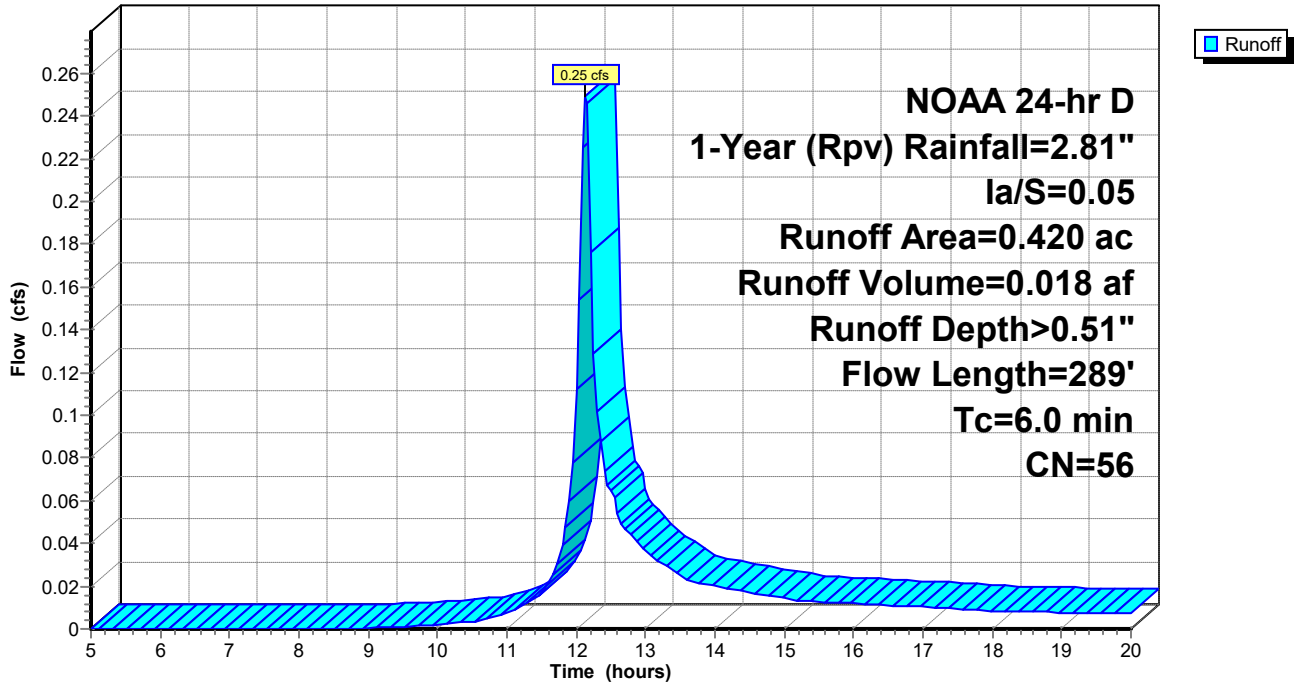
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
 NOAA 24-hr D 1-Year (Rpv) Rainfall=2.81", Ia/S=0.05

Area (ac)	CN	Description
* 0.300	39	
* 0.120	98	
0.420	56	Weighted Average
0.300		71.43% Pervious Area
0.120		28.57% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.3	25	0.0320	1.28		Sheet Flow, Smooth surfaces n= 0.011 P2= 3.30"
1.9	43	0.2230	0.38		Sheet Flow, Grass: Short n= 0.150 P2= 3.30"
0.8	221	0.0078	4.70	114.28	Channel Flow, Area= 24.3 sf Perim= 21.8' r= 1.11' n= 0.030
3.0	289	Total, Increased to minimum Tc = 6.0 min			

Subcatchment SC-13B: SC-13B

Hydrograph



Summary for Subcatchment SC-13C: SC-13C

Runoff = 0.15 cfs @ 12.14 hrs, Volume= 0.011 af, Depth> 0.35"

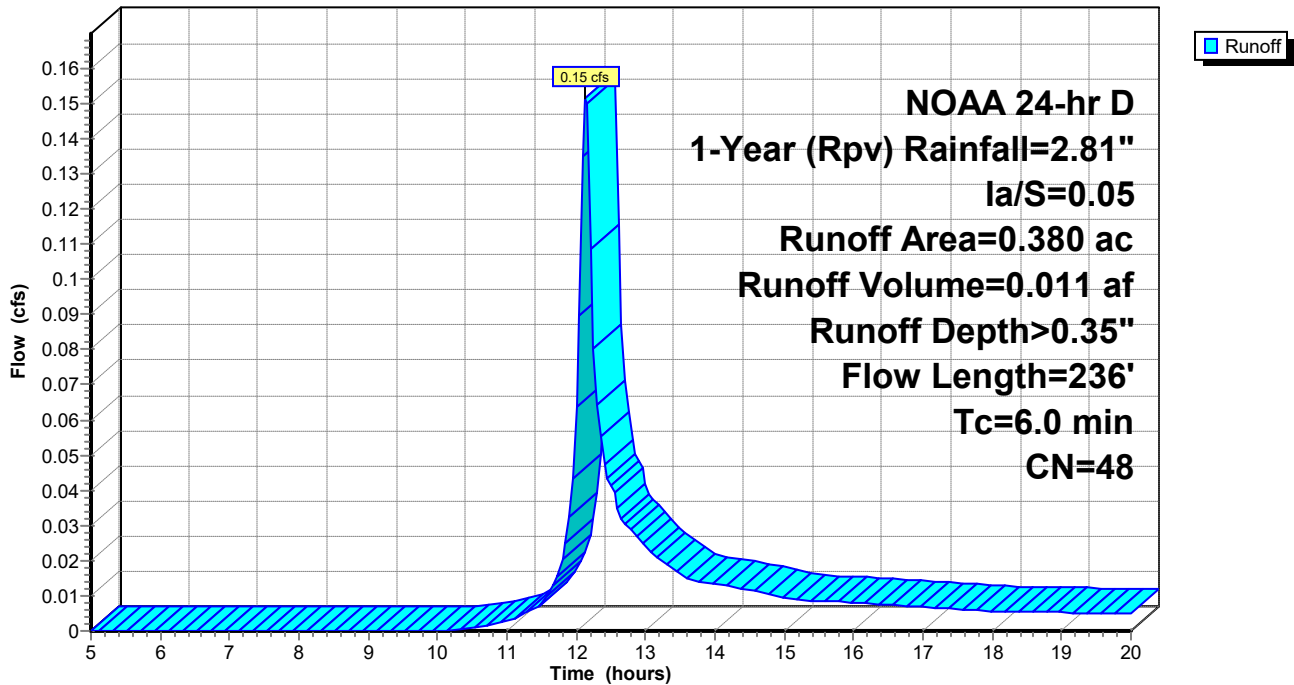
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
 NOAA 24-hr D 1-Year (Rpv) Rainfall=2.81", Ia/S=0.05

Area (ac)	CN	Description
* 0.320	39	
* 0.060	98	
0.380	48	Weighted Average
0.320		84.21% Pervious Area
0.060		15.79% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.4	35	0.0330	1.38		Sheet Flow, Smooth surfaces n= 0.011 P2= 3.30"
2.9	88	0.3020	0.50		Sheet Flow, Grass: Short n= 0.150 P2= 3.30"
0.2	113	0.0420	10.26	186.81	Channel Flow, Area= 18.2 sf Perim= 17.9' r= 1.02' n= 0.030
3.5	236	Total, Increased to minimum Tc = 6.0 min			

Subcatchment SC-13C: SC-13C

Hydrograph



Summary for Subcatchment SC-13D: SC-13D

Runoff = 0.24 cfs @ 12.14 hrs, Volume= 0.017 af, Depth> 0.36"

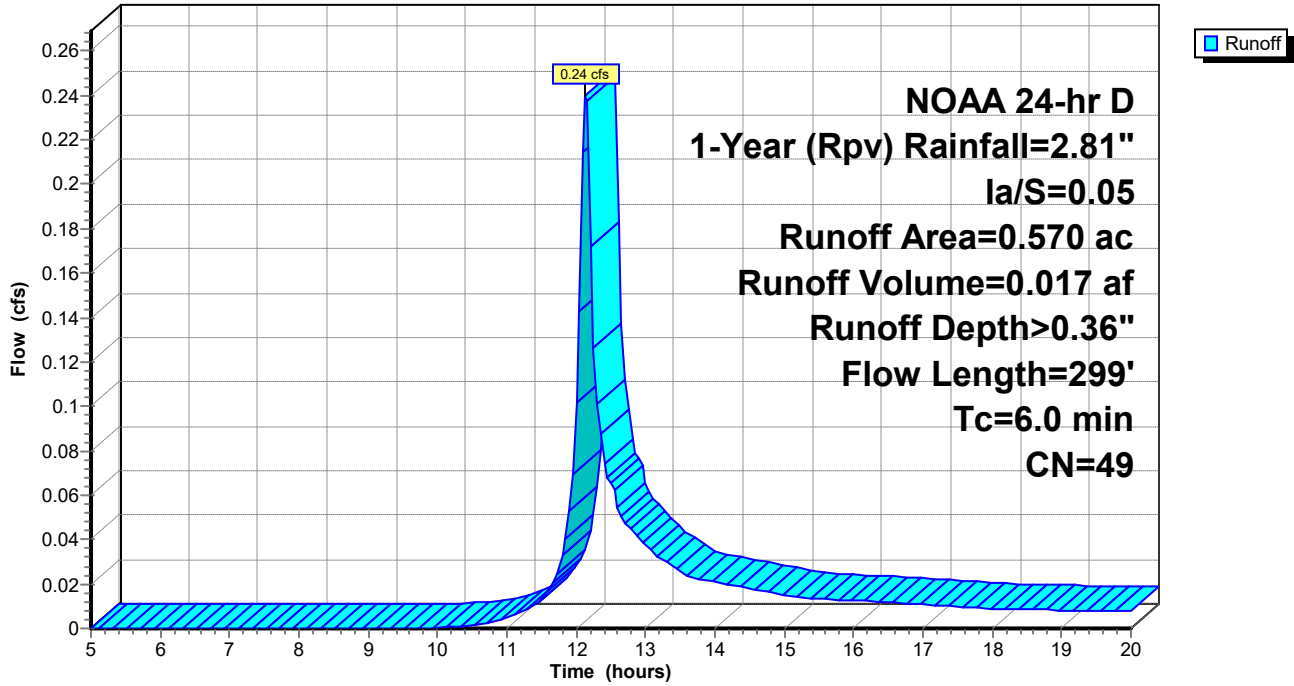
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
 NOAA 24-hr D 1-Year (Rpv) Rainfall=2.81", Ia/S=0.05

Area (ac)	CN	Description
* 0.470	39	
* 0.100	98	
0.570	49	Weighted Average
0.470		82.46% Pervious Area
0.100		17.54% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.3	21	0.0410	1.36		Sheet Flow, Smooth surfaces n= 0.011 P2= 3.30"
2.1	21	0.0410	0.17		Sheet Flow, Grass: Short n= 0.150 P2= 3.30"
0.2	12	0.0310	1.09		Sheet Flow, Smooth surfaces n= 0.011 P2= 3.30"
2.7	79	0.3020	0.49		Sheet Flow, Grass: Short n= 0.150 P2= 3.30"
0.6	166	0.0076	4.83	112.95	Channel Flow, Area= 23.4 sf Perim= 19.8' r= 1.18' n= 0.030
5.9	299	Total, Increased to minimum Tc = 6.0 min			

Subcatchment SC-13D: SC-13D

Hydrograph



Summary for Subcatchment SC-13E: SC-13E

Runoff = 0.48 cfs @ 12.14 hrs, Volume= 0.034 af, Depth> 0.53"

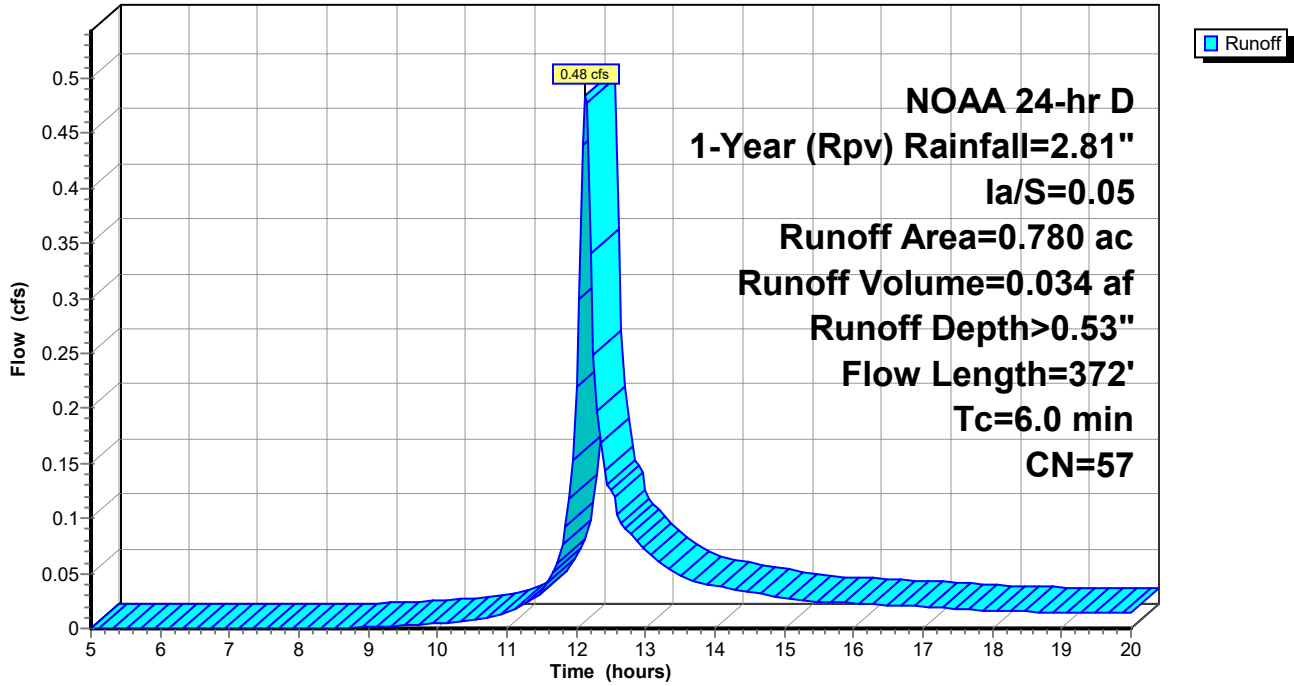
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
 NOAA 24-hr D 1-Year (Rpv) Rainfall=2.81", Ia/S=0.05

Area (ac)	CN	Description
* 0.240	98	
* 0.540	39	
0.780	57	Weighted Average
0.540		69.23% Pervious Area
0.240		30.77% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.2	17	0.0390	1.28		Sheet Flow, Smooth surfaces n= 0.011 P2= 3.30"
1.3	12	0.0470	0.16		Sheet Flow, Grass: Short n= 0.150 P2= 3.30"
0.2	17	0.0320	1.18		Sheet Flow, Smooth surfaces n= 0.011 P2= 3.30"
1.8	40	0.2200	0.38		Sheet Flow, Grass: Short n= 0.150 P2= 3.30"
0.2	90	0.0380	9.16	145.69	Channel Flow, Area= 15.9 sf Perim= 17.2' r= 0.92' n= 0.030 Earth, grassed & winding
0.5	196	0.0880	6.85	28.76	Channel Flow, Area= 4.2 sf Perim= 13.2' r= 0.32' n= 0.030
4.2	372	Total, Increased to minimum Tc = 6.0 min			

Subcatchment SC-13E: SC-13E

Hydrograph

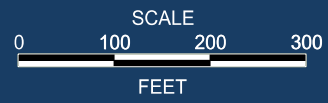




APPENDIX H

POI-14, POI-15 & POI-16

- POI Drainage Area Maps
- POI-14 HydroCAD Calculations
- POI-15 HydroCAD Calculations
- POI-16 HydroCAD Calculations






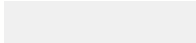



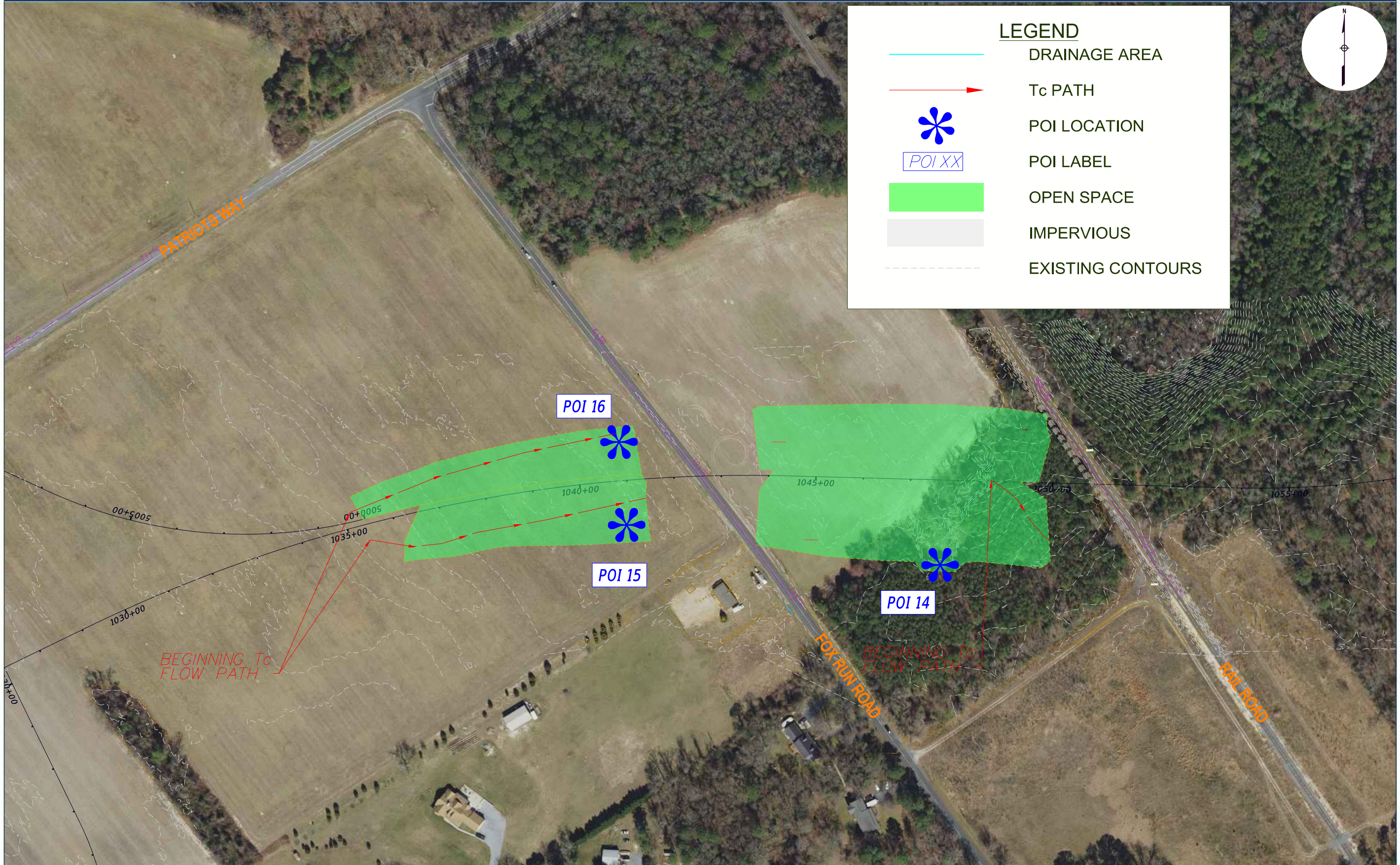
NORTH MILLSBORO BYPASS, US 113 TO SR 24

CONTRACT NO. T201912701
SUSSEX COUNTY



LEGEND

-  DRAINAGE AREA
-  Tc PATH
-  POI LOCATION
-  POI LABEL
-  OPEN SPACE
-  IMPERVIOUS
-  EXISTING CONTOURS



Summary for Subcatchment SC-14A: SC-14A

Runoff = 0.94 cfs @ 12.16 hrs, Volume= 0.076 af, Depth> 0.20"

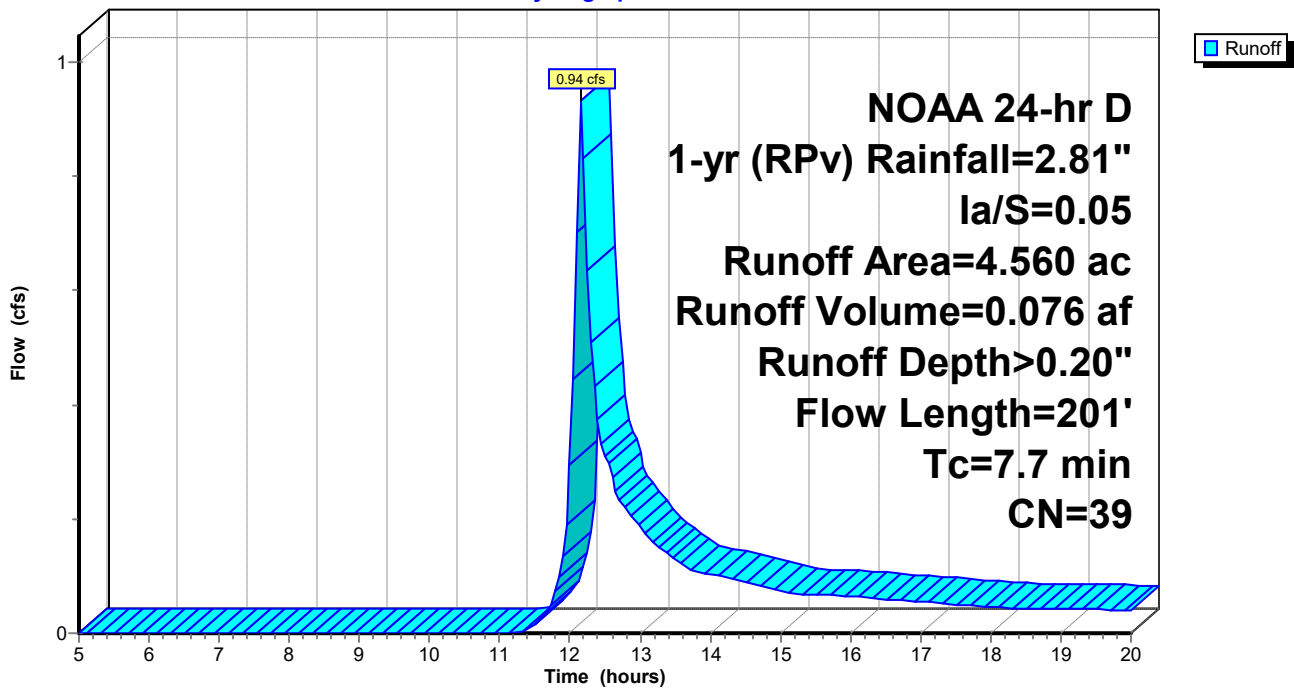
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
 NOAA 24-hr D 1-yr (RPv) Rainfall=2.81", Ia/S=0.05

Area (ac)	CN	Description
4.560	39	>75% Grass cover, Good, HSG A
4.560		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.1	23	0.0459	0.18		Sheet Flow, Grass: Short n= 0.150 P2= 3.30"
2.7	30	0.0429	0.18		Sheet Flow, Grass: Short n= 0.150 P2= 3.30"
0.9	68	0.0360	1.33		Shallow Concentrated Flow, Short Grass Pasture Kv= 7.0 fps
1.4	48	0.0071	0.59		Shallow Concentrated Flow, Short Grass Pasture Kv= 7.0 fps
0.6	32	0.0170	0.91		Shallow Concentrated Flow, Short Grass Pasture Kv= 7.0 fps
7.7	201	Total			

Subcatchment SC-14A: SC-14A

Hydrograph



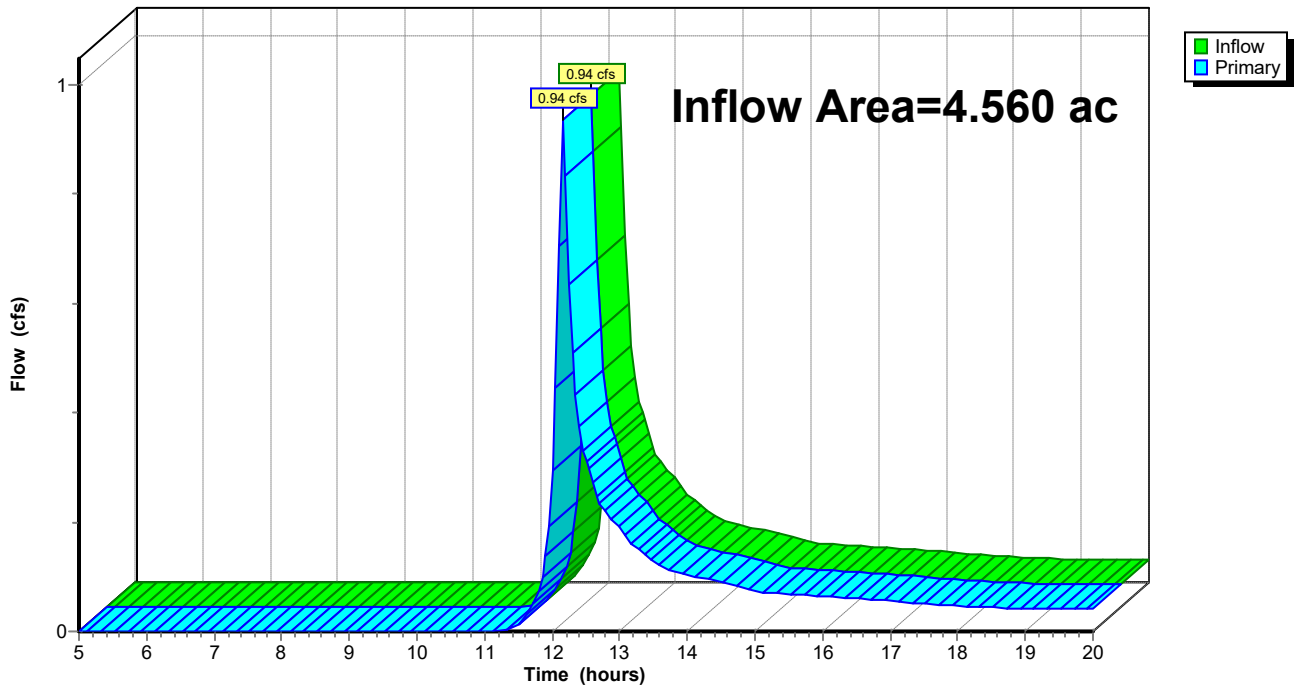
Summary for Link POI14: (new Link)

Inflow Area = 4.560 ac, 0.00% Impervious, Inflow Depth > 0.20" for 1-yr (RPv) event
Inflow = 0.94 cfs @ 12.16 hrs, Volume= 0.076 af
Primary = 0.94 cfs @ 12.16 hrs, Volume= 0.076 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Link POI14: (new Link)

Hydrograph



Summary for Subcatchment SC-15: SC-15

Runoff = 0.18 cfs @ 12.43 hrs, Volume= 0.025 af, Depth> 0.20"

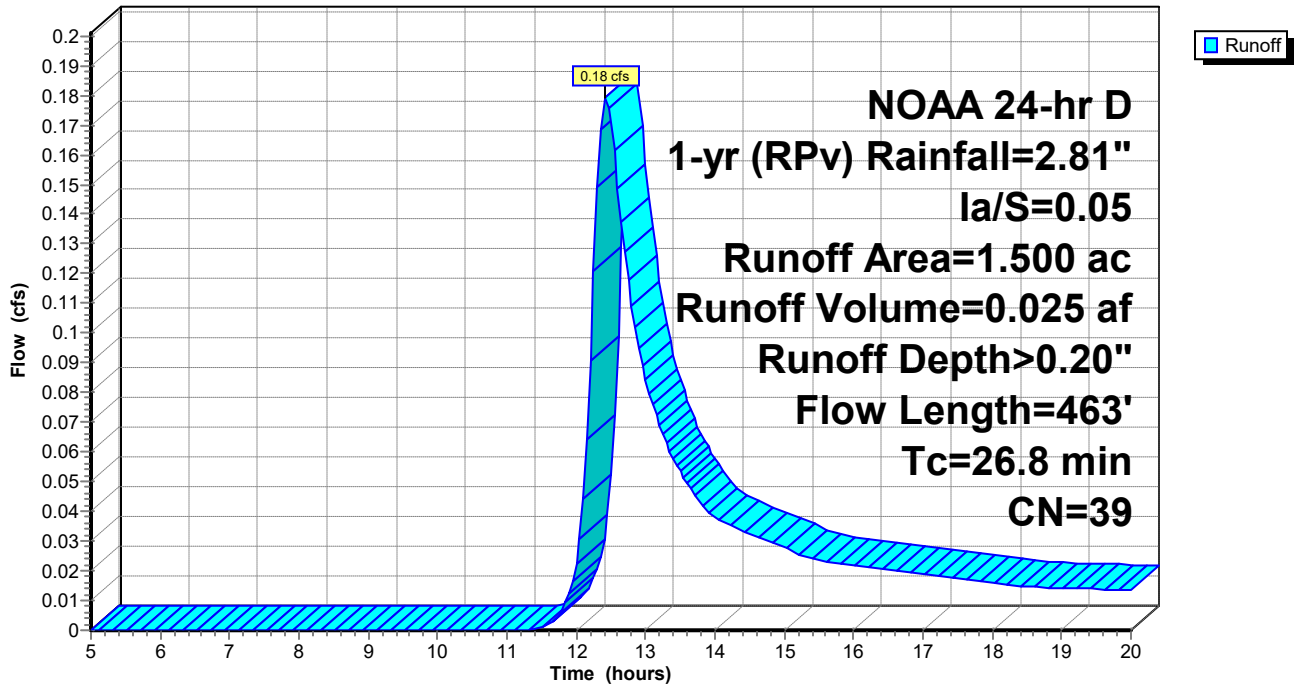
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
 NOAA 24-hr D 1-yr (RPv) Rainfall=2.81", Ia/S=0.05

Area (ac)	CN	Description
1.500	39	>75% Grass cover, Good, HSG A
1.500		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.8	50	0.0048	0.08		Sheet Flow, Grass: Short n= 0.150 P2= 3.30"
3.8	111	0.0048	0.48		Shallow Concentrated Flow, Short Grass Pasture Kv= 7.0 fps
3.5	73	0.0024	0.34		Shallow Concentrated Flow, Short Grass Pasture Kv= 7.0 fps
6.9	91	0.0010	0.22		Shallow Concentrated Flow, Short Grass Pasture Kv= 7.0 fps
1.4	71	0.0140	0.83		Shallow Concentrated Flow, Short Grass Pasture Kv= 7.0 fps
1.4	67	0.0134	0.81		Shallow Concentrated Flow, Short Grass Pasture Kv= 7.0 fps
26.8	463	Total			

Subcatchment SC-15: SC-15

Hydrograph



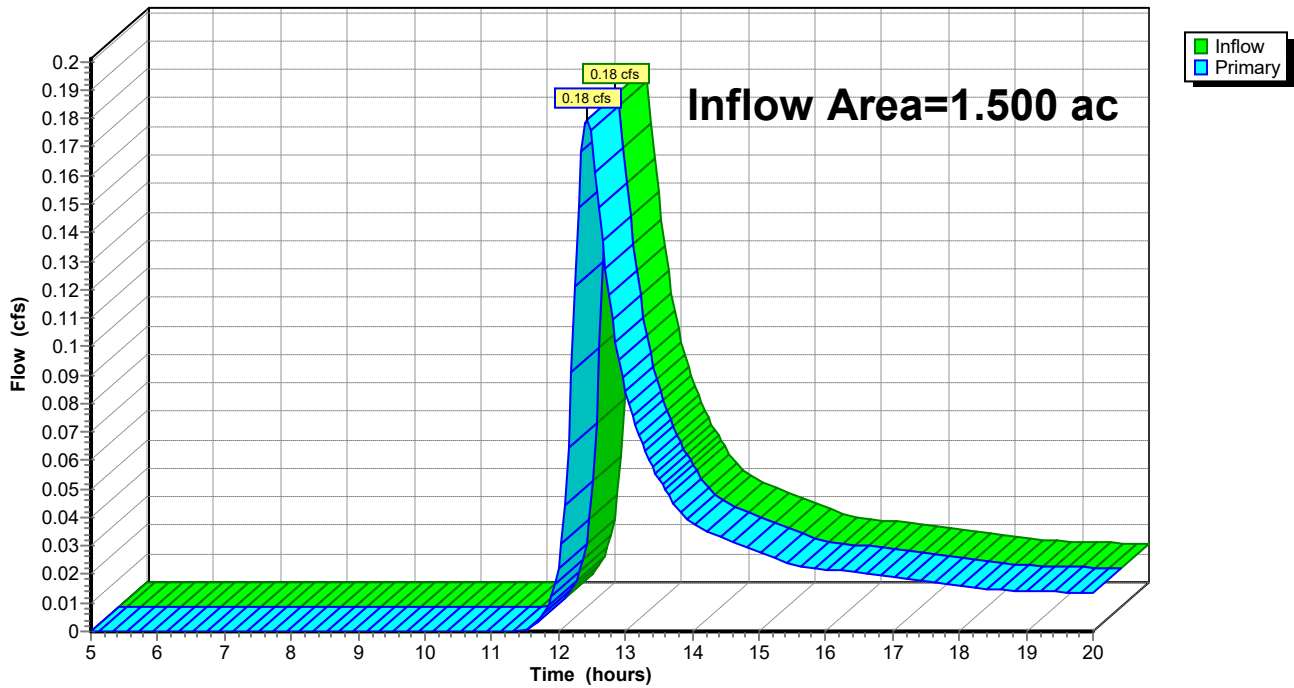
Summary for Link POI15: (new Link)

Inflow Area = 1.500 ac, 0.00% Impervious, Inflow Depth > 0.20" for 1-yr (RPv) event
Inflow = 0.18 cfs @ 12.43 hrs, Volume= 0.025 af
Primary = 0.18 cfs @ 12.43 hrs, Volume= 0.025 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Link POI15: (new Link)

Hydrograph



Summary for Subcatchment SC-16: SC-16

Runoff = 0.12 cfs @ 12.61 hrs, Volume= 0.020 af, Depth> 0.20"

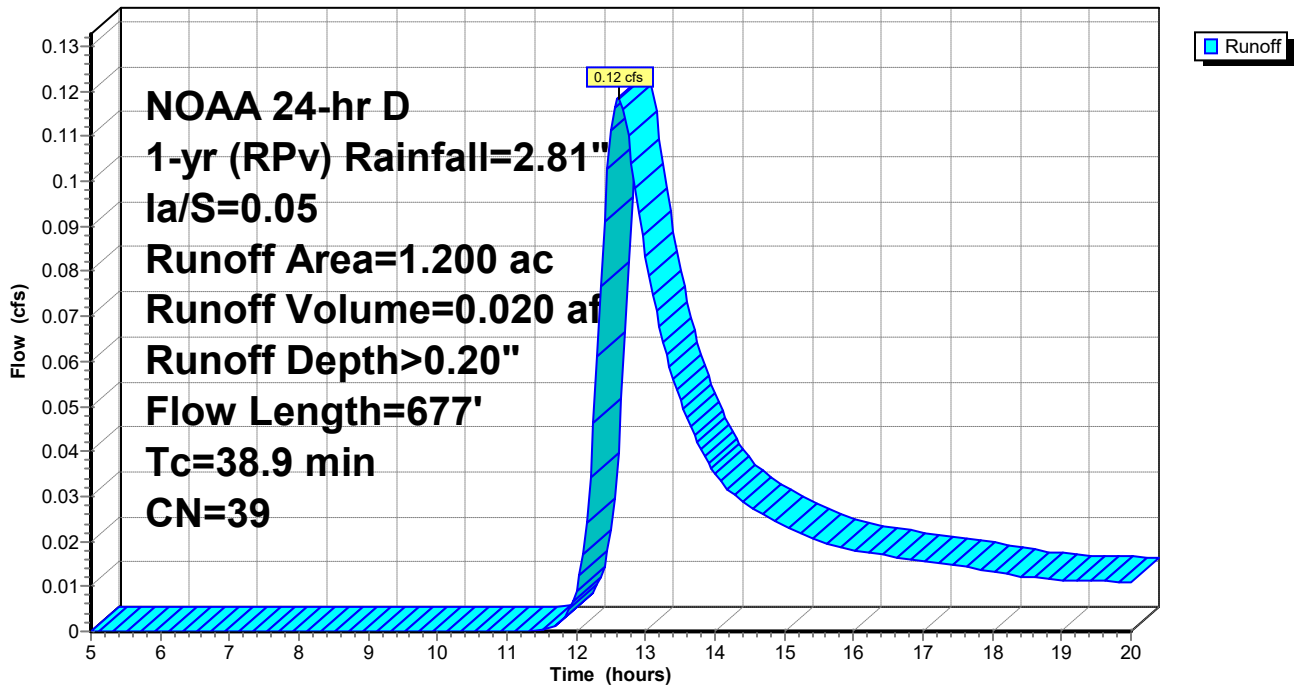
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
 NOAA 24-hr D 1-yr (RPv) Rainfall=2.81", Ia/S=0.05

Area (ac)	CN	Description
1.200	39	>75% Grass cover, Good, HSG A
1.200		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.8	50	0.0048	0.08		Sheet Flow, Grass: Short n= 0.150 P2= 3.30"
3.8	111	0.0048	0.48		Shallow Concentrated Flow, Short Grass Pasture Kv= 7.0 fps
4.4	199	0.0117	0.76		Shallow Concentrated Flow, Short Grass Pasture Kv= 7.0 fps
20.9	317	0.0013	0.25		Shallow Concentrated Flow, Short Grass Pasture Kv= 7.0 fps
38.9	677	Total			

Subcatchment SC-16: SC-16

Hydrograph



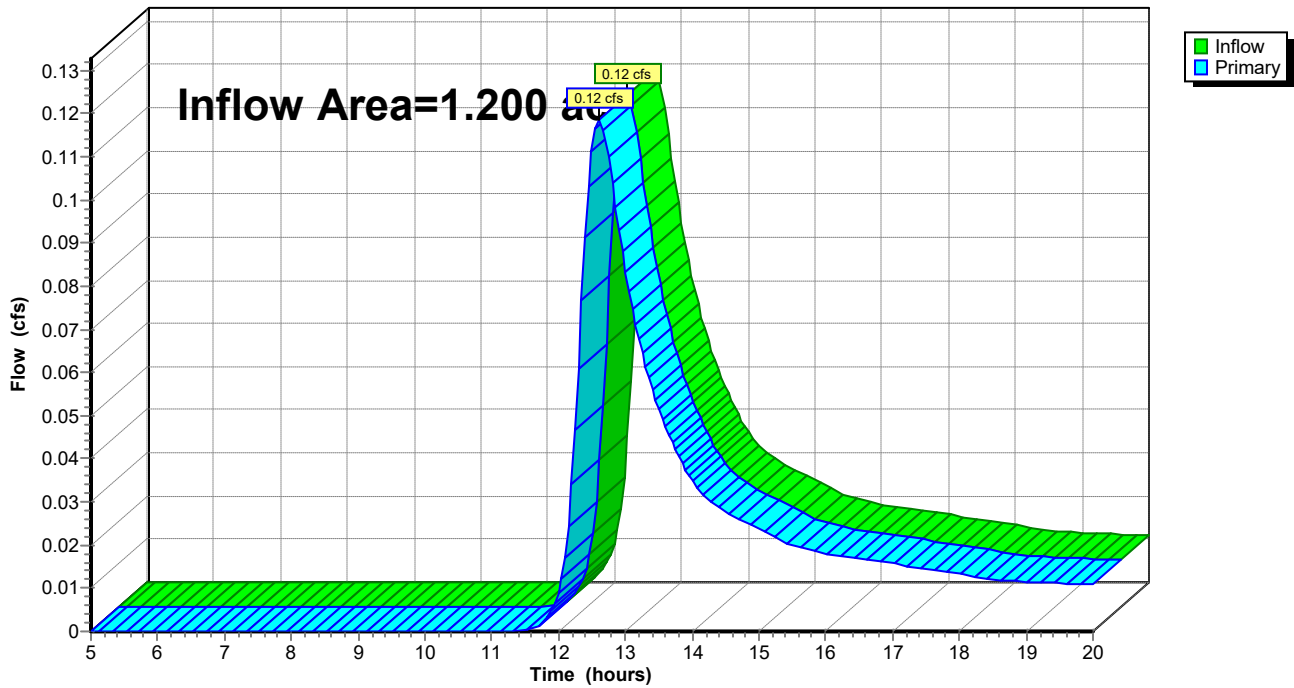
Summary for Link POI16: (new Link)

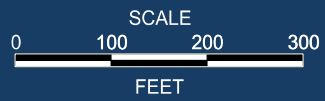
Inflow Area = 1.200 ac, 0.00% Impervious, Inflow Depth > 0.20" for 1-yr (RPv) event
Inflow = 0.12 cfs @ 12.61 hrs, Volume= 0.020 af
Primary = 0.12 cfs @ 12.61 hrs, Volume= 0.020 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Link POI16: (new Link)

Hydrograph





NORTH MILLSBORO BYPASS, US 113 TO SR 24

CONTRACT NO. T201912701
SUSSEX COUNTY



LEGEND

- DRAINAGE AREA
- DRAINAGE SUBAREA
- Tc PATH
- PROPOSED CONSTRUCTION
- PROPOSED DRAINAGE
- INFILTRATION BMP
- OPEN SPACE
- IMPERVIOUS
- PROPOSED CONTOURS
- EXISTING CONTOURS
- POI LOCATION
- POI LABEL



Summary for Subcatchment SC-14A: SC-14A

Runoff = 0.38 cfs @ 12.14 hrs, Volume= 0.028 af, Depth> 0.31"

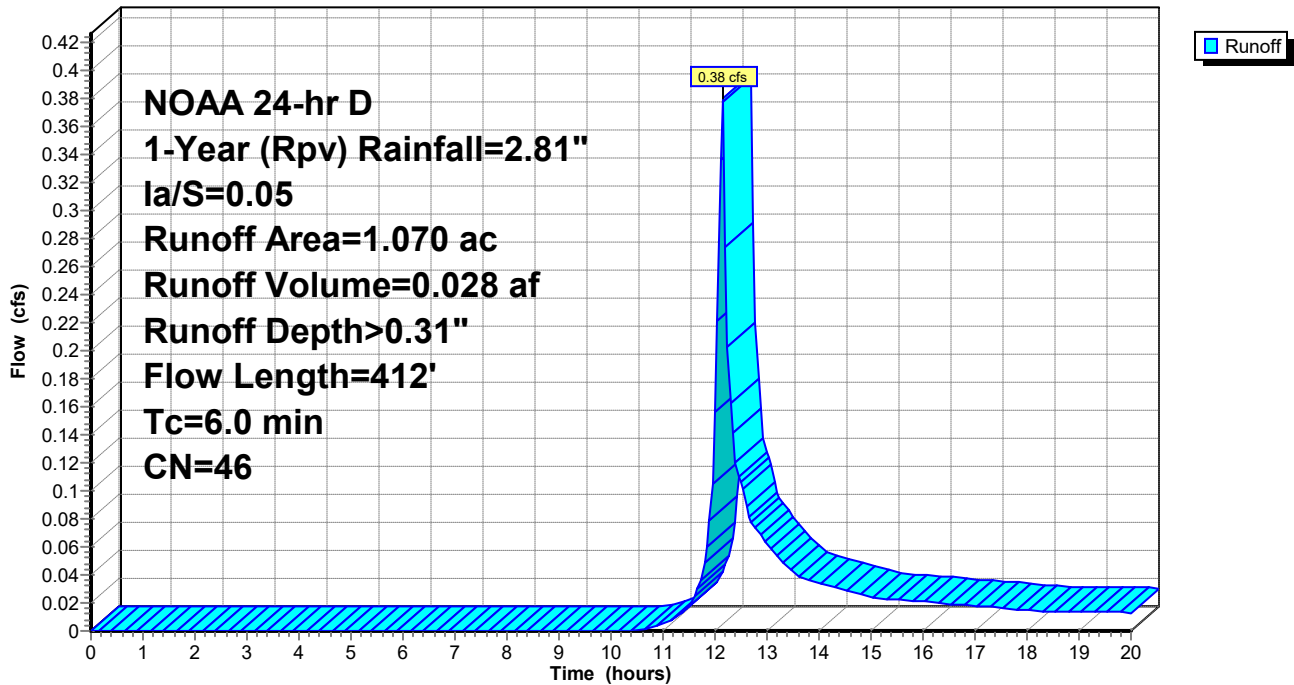
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-20.00 hrs, dt= 0.05 hrs
 NOAA 24-hr D 1-Year (Rpv) Rainfall=2.81", Ia/S=0.05

Area (ac)	CN	Description
0.950	39	>75% Grass cover, Good, HSG A
0.120	98	Paved roads w/curbs & sewers, HSG A
1.070	46	Weighted Average
0.950		88.79% Pervious Area
0.120		11.21% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.3	24	0.0352	1.32		Sheet Flow , Smooth surfaces n= 0.011 P2= 3.30"
3.5	109	0.3100	0.53		Sheet Flow , Grass: Short n= 0.150 P2= 3.30"
1.5	279	0.0040	3.07	57.68	Channel Flow , Area= 18.8 sf Perim= 19.4' r= 0.97' n= 0.030
5.3	412	Total, Increased to minimum Tc = 6.0 min			

Subcatchment SC-14A: SC-14A

Hydrograph



Summary for Pond BMP-14A: (new Pond)

Inflow Area = 1.070 ac, 11.21% Impervious, Inflow Depth > 0.31" for 1-Year (Rpv) event
 Inflow = 0.38 cfs @ 12.14 hrs, Volume= 0.028 af
 Outflow = 0.05 cfs @ 13.41 hrs, Volume= 0.028 af, Atten= 88%, Lag= 76.1 min
 Discarded = 0.05 cfs @ 13.41 hrs, Volume= 0.028 af
 Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 0.00-20.00 hrs, dt= 0.05 hrs
 Peak Elev= 22.84' @ 13.41 hrs Surf.Area= 0.021 ac Storage= 0.009 af

Plug-Flow detention time= 87.6 min calculated for 0.028 af (99% of inflow)
 Center-of-Mass det. time= 86.0 min (917.9 - 831.9)

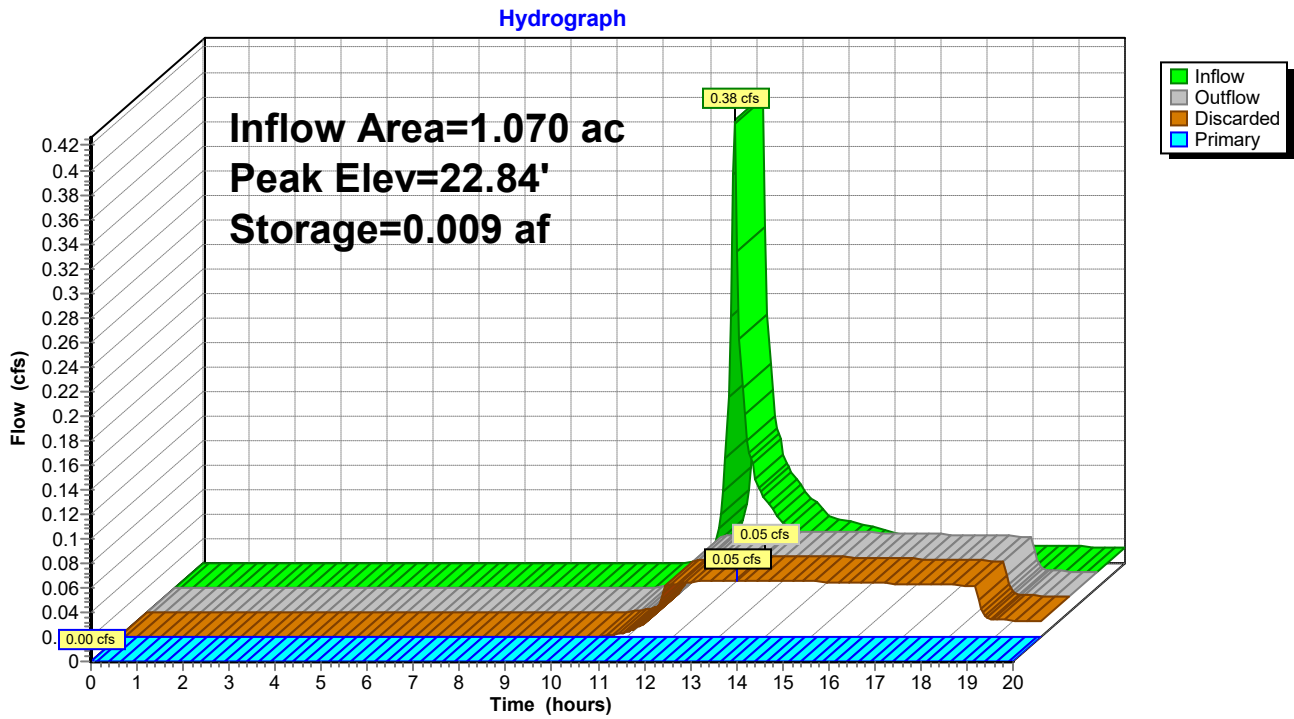
Volume	Invert	Avail.Storage	Storage Description
#1	21.70'	0.017 af	6.00'W x 150.00'L x 2.00'H Prismaticoid 0.041 af Overall x 40.0% Voids
#2	23.70'	0.071 af	6.00'W x 150.00'L x 2.00'H Prismaticoid Z=2.0
		0.087 af	Total Available Storage

Device	Routing	Invert	Outlet Devices
#1	Discarded	21.70'	2.000 in/hr Exfiltration over Surface area Conductivity to Groundwater Elevation = 10.00'
#2	Primary	25.25'	14.0' long (Profile 1) Broad-Crested Rectangular Weir Head (feet) 0.49 0.98 1.48 Coef. (English) 2.92 3.37 3.59

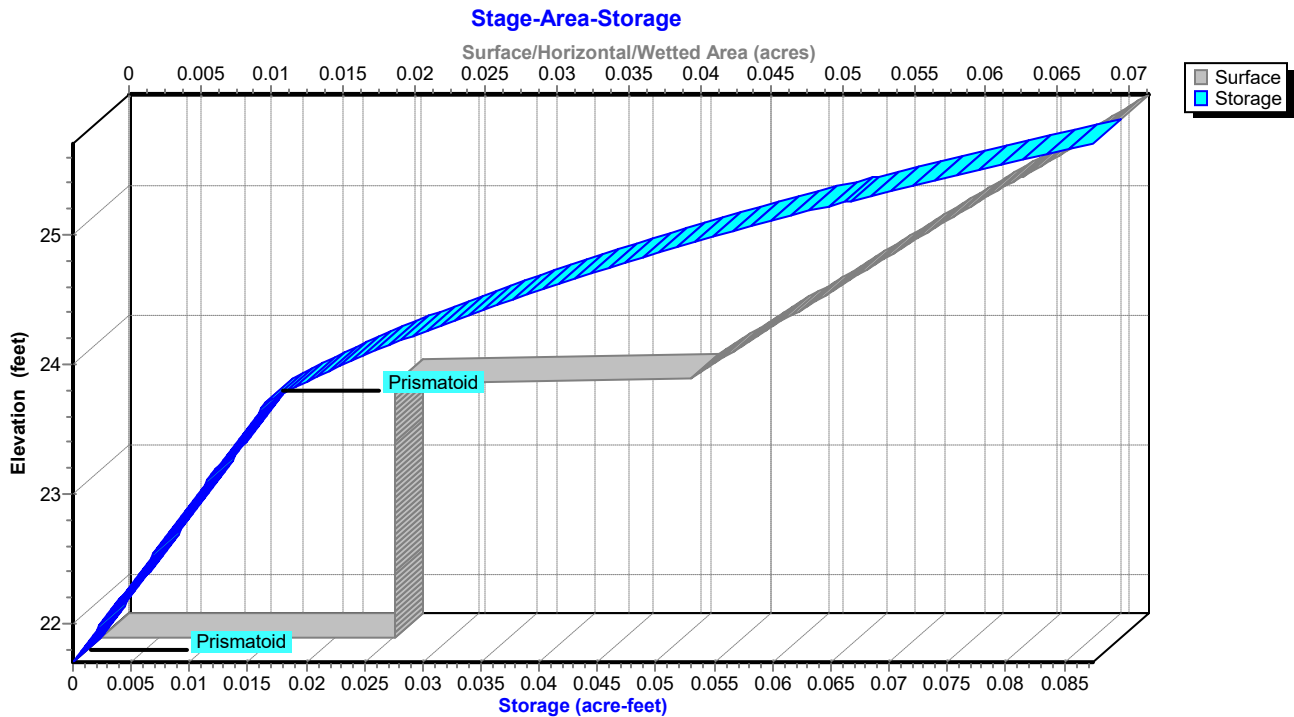
Discarded OutFlow Max=0.05 cfs @ 13.41 hrs HW=22.84' (Free Discharge)
 ↑1=Exfiltration (Controls 0.05 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=21.70' (Free Discharge)
 ↑2=Broad-Crested Rectangular Weir (Controls 0.00 cfs)

Pond BMP-14A: (new Pond)



Pond BMP-14A: (new Pond)



Summary for Subcatchment SC-14B: SC-14B

Runoff = 0.40 cfs @ 12.14 hrs, Volume= 0.029 af, Depth> 0.33"

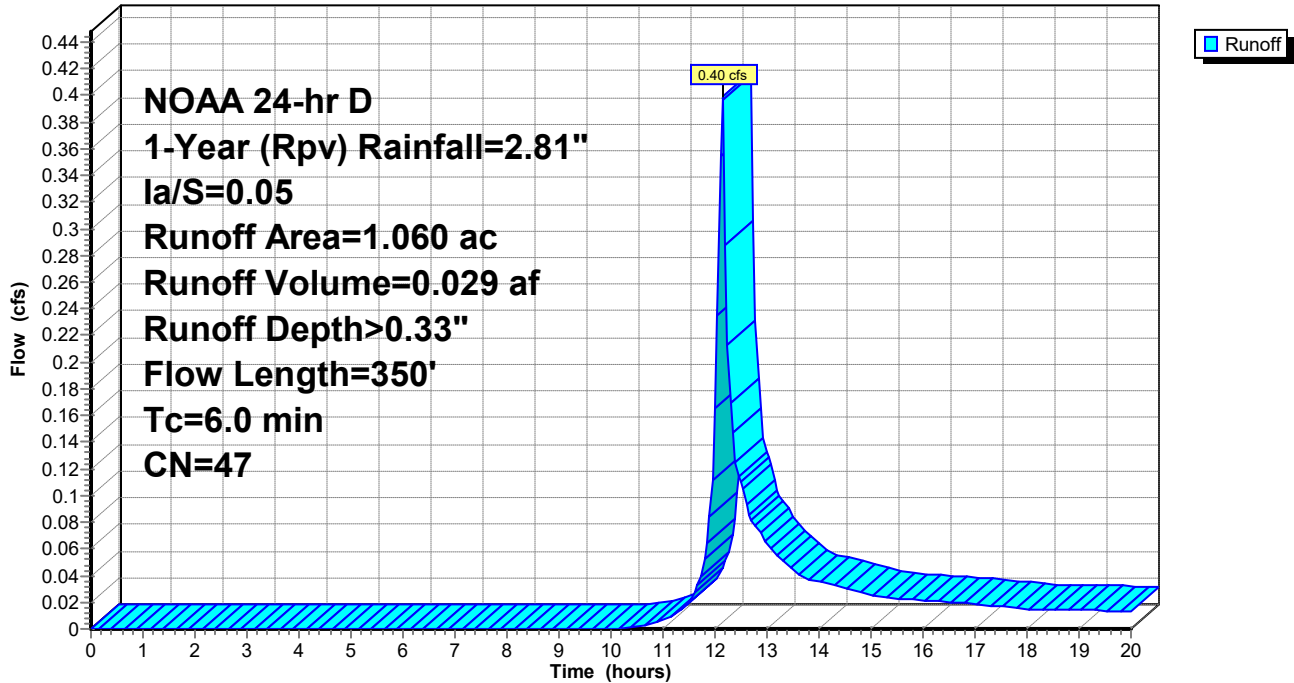
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-20.00 hrs, dt= 0.05 hrs
 NOAA 24-hr D 1-Year (Rpv) Rainfall=2.81", Ia/S=0.05

Area (ac)	CN	Description
0.140	98	Paved roads w/curbs & sewers, HSG A
0.920	39	>75% Grass cover, Good, HSG A
1.060	47	Weighted Average
0.920		86.79% Pervious Area
0.140		13.21% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.4	30	0.0303	1.30		Sheet Flow, Smooth surfaces n= 0.011 P2= 3.30"
0.5	112	0.3070	3.88		Shallow Concentrated Flow, Short Grass Pasture Kv= 7.0 fps
0.5	208	0.0190	7.42	163.35	Channel Flow, Area= 22.0 sf Perim= 19.4' r= 1.13' n= 0.030
1.4	350	Total, Increased to minimum Tc = 6.0 min			

Subcatchment SC-14B: SC-14B

Hydrograph



Summary for Pond BMP-14B: (new Pond)

Inflow Area = 1.060 ac, 13.21% Impervious, Inflow Depth > 0.33" for 1-Year (Rpv) event
 Inflow = 0.40 cfs @ 12.14 hrs, Volume= 0.029 af
 Outflow = 0.05 cfs @ 13.44 hrs, Volume= 0.029 af, Atten= 88%, Lag= 78.4 min
 Discarded = 0.05 cfs @ 13.44 hrs, Volume= 0.029 af
 Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 0.00-20.00 hrs, dt= 0.05 hrs
 Peak Elev= 22.93' @ 13.44 hrs Surf.Area= 0.021 ac Storage= 0.010 af

Plug-Flow detention time= 94.9 min calculated for 0.029 af (99% of inflow)
 Center-of-Mass det. time= 93.3 min (923.6 - 830.3)

Volume	Invert	Avail.Storage	Storage Description
#1	21.70'	0.017 af	6.00'W x 150.00'L x 2.00'H Prismatic 0.041 af Overall x 40.0% Voids
#2	23.70'	0.071 af	6.00'W x 150.00'L x 2.00'H Prismatic Z=2.0
		0.087 af	Total Available Storage

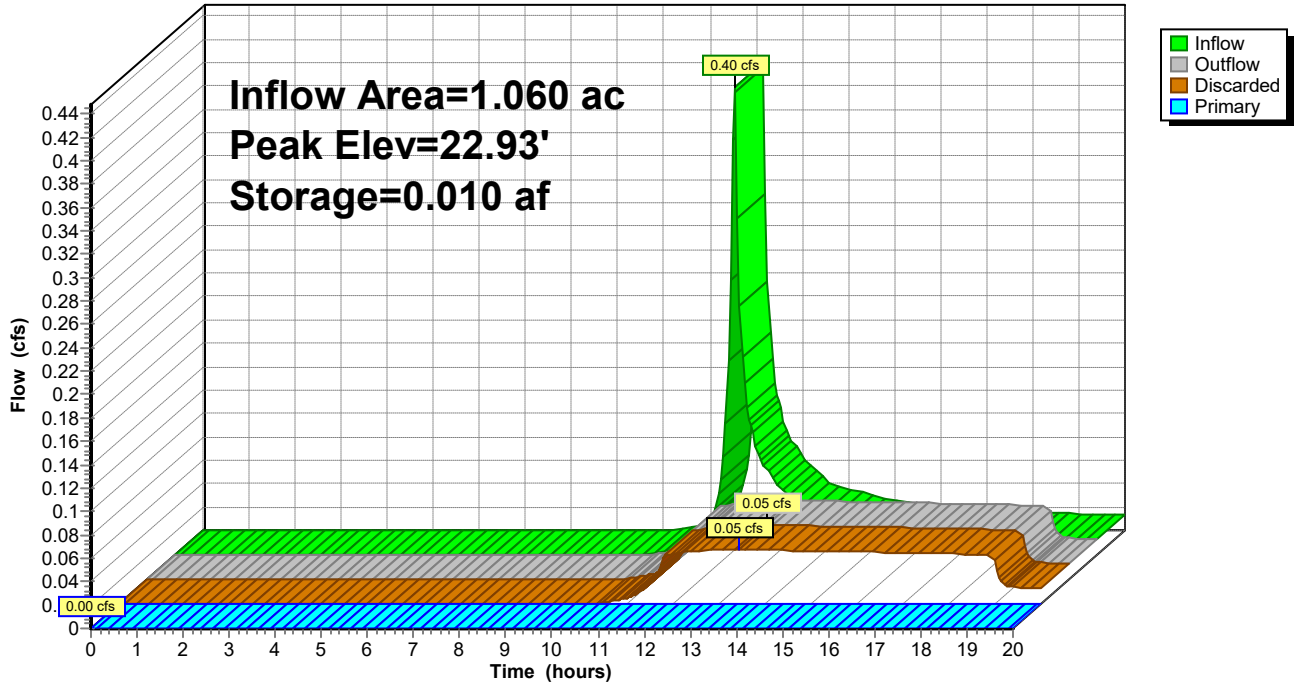
Device	Routing	Invert	Outlet Devices
#1	Discarded	21.70'	2.000 in/hr Exfiltration over Surface area Conductivity to Groundwater Elevation = 10.00'
#2	Primary	25.25'	14.0' long (Profile 1) Broad-Crested Rectangular Weir Head (feet) 0.49 0.98 1.48 Coef. (English) 2.92 3.37 3.59

Discarded OutFlow Max=0.05 cfs @ 13.44 hrs HW=22.93' (Free Discharge)
 ↑1=Exfiltration (Controls 0.05 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=21.70' (Free Discharge)
 ↑2=Broad-Crested Rectangular Weir (Controls 0.00 cfs)

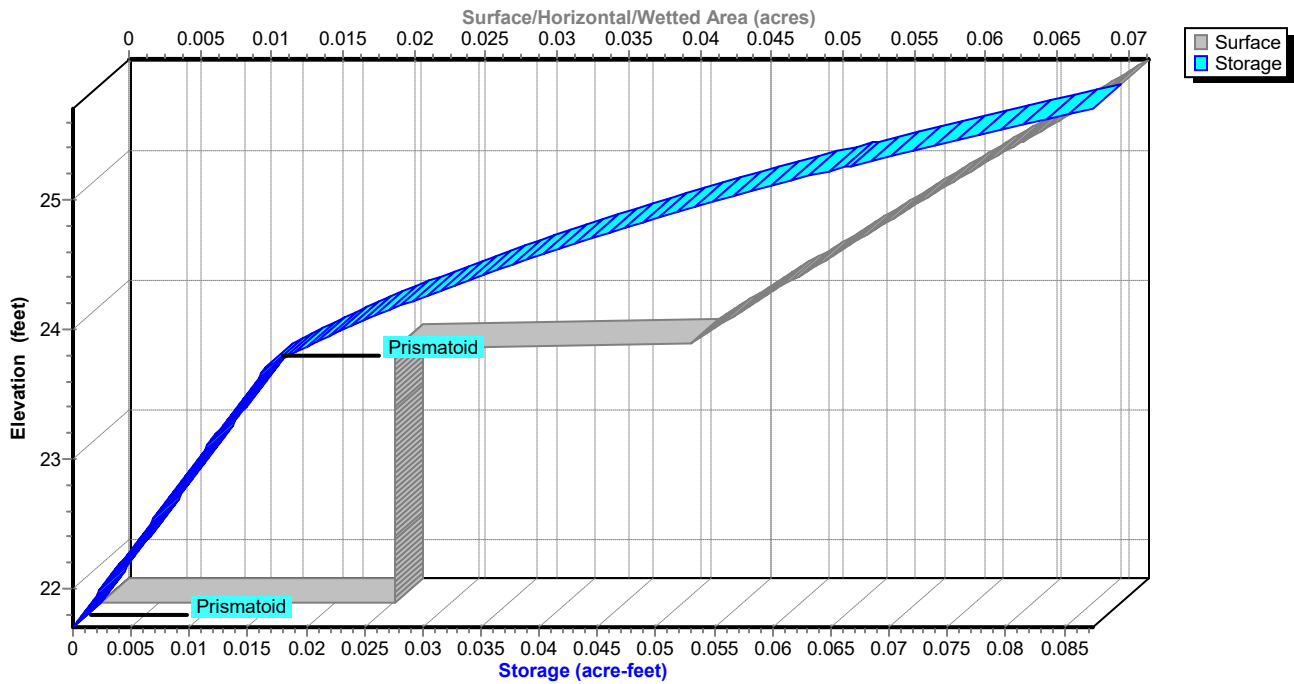
Pond BMP-14B: (new Pond)

Hydrograph



Pond BMP-14B: (new Pond)

Stage-Area-Storage



Summary for Subcatchment SC-14C: 14A

Runoff = 0.70 cfs @ 12.14 hrs, Volume= 0.050 af, Depth> 0.40"

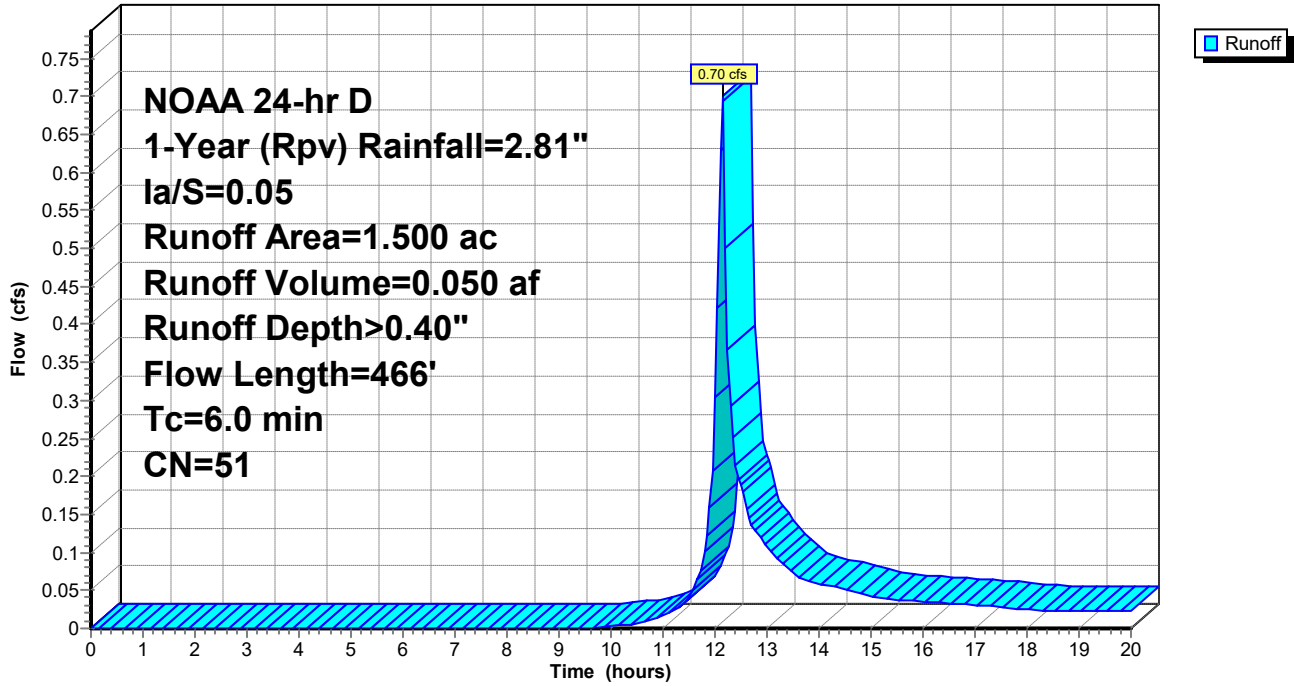
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-20.00 hrs, dt= 0.05 hrs
 NOAA 24-hr D 1-Year (Rpv) Rainfall=2.81", Ia/S=0.05

Area (ac)	CN	Description
1.200	39	>75% Grass cover, Good, HSG A
0.300	98	Paved roads w/curbs & sewers, HSG A
1.500	51	Weighted Average
1.200		80.00% Pervious Area
0.300		20.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.4	43	0.0450	1.63		Sheet Flow, Smooth surfaces n= 0.011 P2= 3.30"
0.1	6	0.0480	1.53		Shallow Concentrated Flow, Short Grass Pasture Kv= 7.0 fps
0.0	12	0.0420	4.16		Shallow Concentrated Flow, Paved Kv= 20.3 fps
0.4	102	0.3090	3.89		Shallow Concentrated Flow, Short Grass Pasture Kv= 7.0 fps
1.1	303	0.0075	4.60	92.04	Channel Flow, Area= 20.0 sf Perim= 18.0' r= 1.11' n= 0.030
2.0	466	Total, Increased to minimum Tc = 6.0 min			

Subcatchment SC-14C: 14A

Hydrograph



Summary for Pond BMP-14C: (new Pond)

Inflow Area = 1.500 ac, 20.00% Impervious, Inflow Depth > 0.40" for 1-Year (Rpv) event
 Inflow = 0.70 cfs @ 12.14 hrs, Volume= 0.050 af
 Outflow = 0.08 cfs @ 13.37 hrs, Volume= 0.050 af, Atten= 88%, Lag= 74.0 min
 Discarded = 0.08 cfs @ 13.37 hrs, Volume= 0.050 af
 Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 0.00-20.00 hrs, dt= 0.05 hrs
 Peak Elev= 22.89' @ 13.37 hrs Surf.Area= 0.037 ac Storage= 0.017 af

Plug-Flow detention time= 89.2 min calculated for 0.050 af (100% of inflow)
 Center-of-Mass det. time= 87.9 min (912.2 - 824.4)

Volume	Invert	Avail.Storage	Storage Description
#1	21.70'	0.029 af	8.00'W x 200.00'L x 2.00'H Prismatic 0.073 af Overall x 40.0% Voids
#2	23.70'	0.113 af	8.00'W x 200.00'L x 2.00'H Prismatic Z=2.0
		0.142 af	Total Available Storage

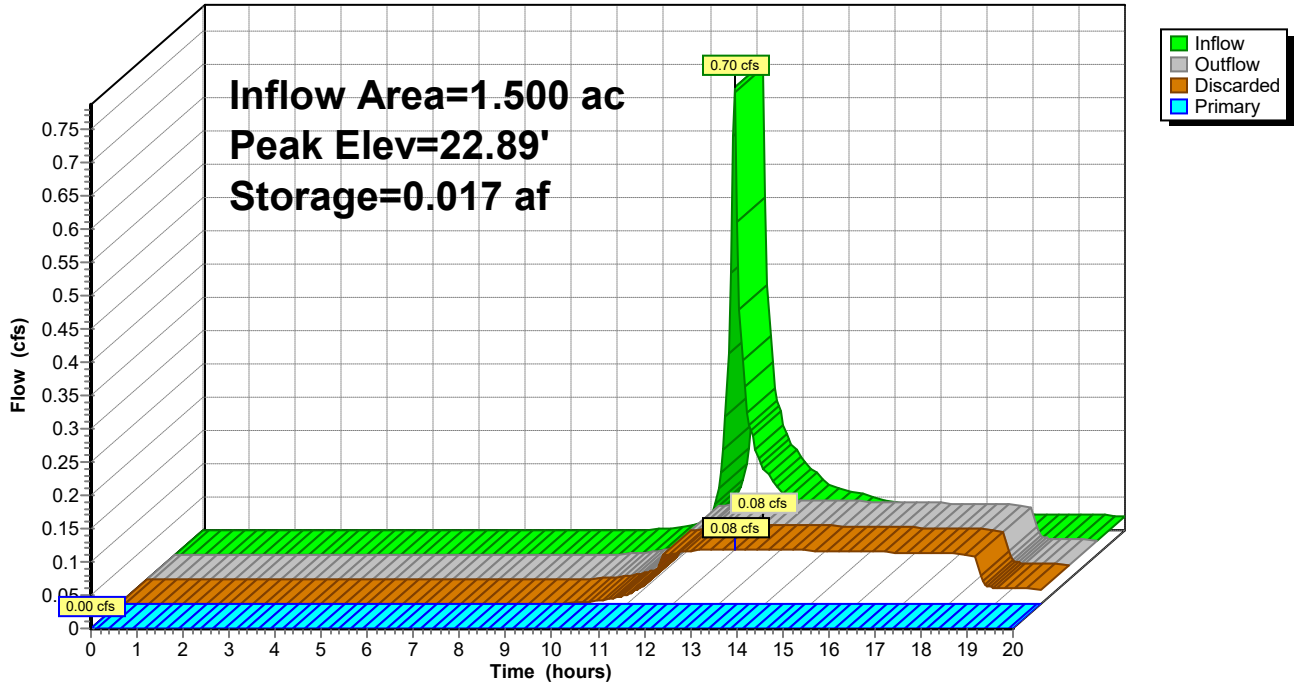
Device	Routing	Invert	Outlet Devices
#1	Discarded	21.70'	2.000 in/hr Exfiltration over Surface area Conductivity to Groundwater Elevation = 10.00'
#2	Primary	25.25'	16.0' long (Profile 1) Broad-Crested Rectangular Weir Head (feet) 0.49 0.98 1.48 Coef. (English) 2.92 3.37 3.59

Discarded OutFlow Max=0.08 cfs @ 13.37 hrs HW=22.89' (Free Discharge)
 ↑1=Exfiltration (Controls 0.08 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=21.70' (Free Discharge)
 ↑2=Broad-Crested Rectangular Weir (Controls 0.00 cfs)

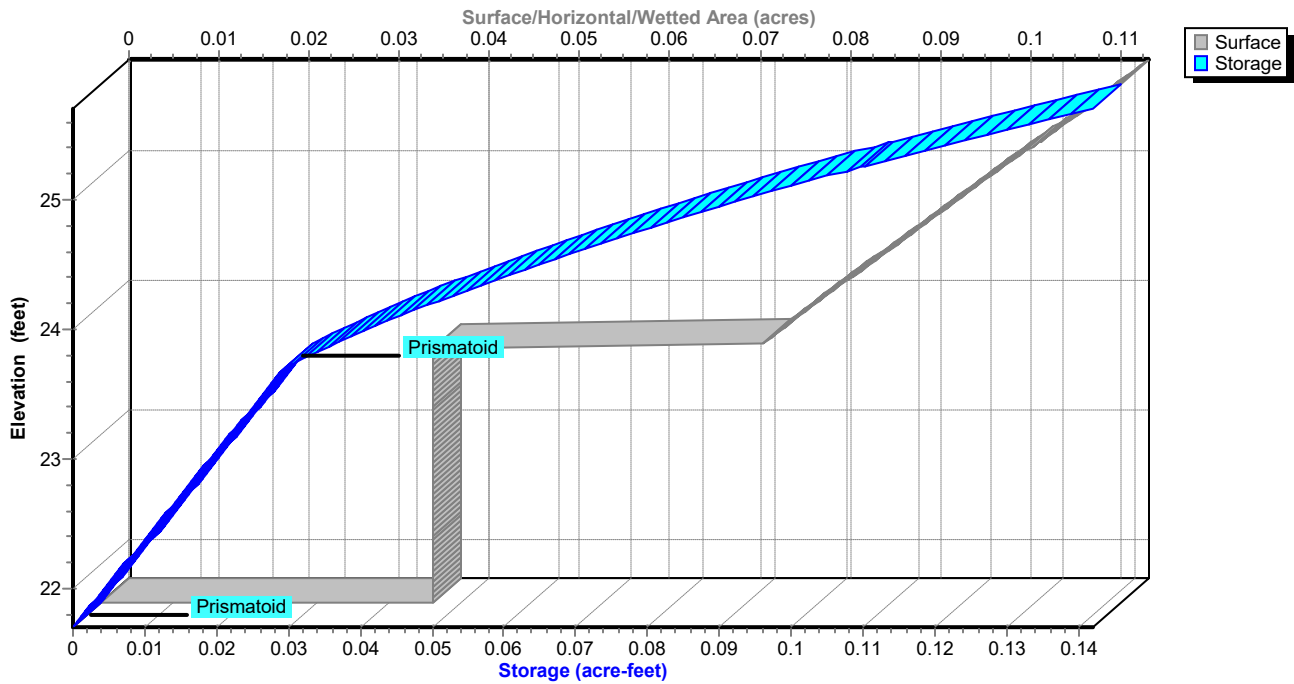
Pond BMP-14C: (new Pond)

Hydrograph



Pond BMP-14C: (new Pond)

Stage-Area-Storage



Summary for Subcatchment SC-14D: (new Subcat)

Runoff = 0.13 cfs @ 12.14 hrs, Volume= 0.009 af, Depth> 0.35"

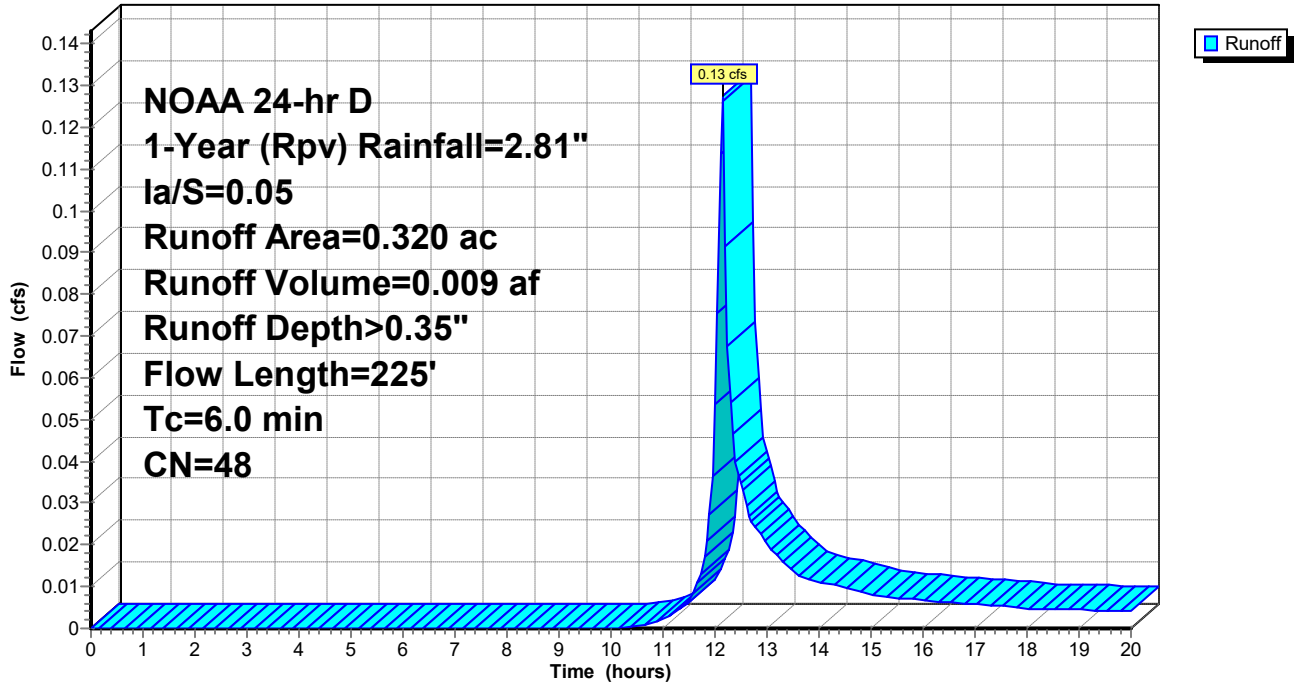
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-20.00 hrs, dt= 0.05 hrs
 NOAA 24-hr D 1-Year (Rpv) Rainfall=2.81", Ia/S=0.05

Area (ac)	CN	Description
0.050	98	Paved roads w/curbs & sewers, HSG A
0.270	39	>75% Grass cover, Good, HSG A
0.320	48	Weighted Average
0.270		84.38% Pervious Area
0.050		15.63% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.3	25	0.0300	1.25		Sheet Flow, Smooth surfaces n= 0.011 P2= 3.30"
0.1	11	0.0404	1.41		Shallow Concentrated Flow, Short Grass Pasture Kv= 7.0 fps
0.1	11	0.0228	3.07		Shallow Concentrated Flow, Paved Kv= 20.3 fps
0.5	121	0.3110	3.90		Shallow Concentrated Flow, Short Grass Pasture Kv= 7.0 fps
0.3	57	0.0044	3.56	78.34	Channel Flow, Area= 22.0 sf Perim= 19.5' r= 1.13' n= 0.030
1.3	225	Total, Increased to minimum Tc = 6.0 min			

Subcatchment SC-14D: (new Subcat)

Hydrograph



Summary for Subcatchment SC-14E: 14E

Runoff = 0.26 cfs @ 12.14 hrs, Volume= 0.019 af, Depth> 0.36"

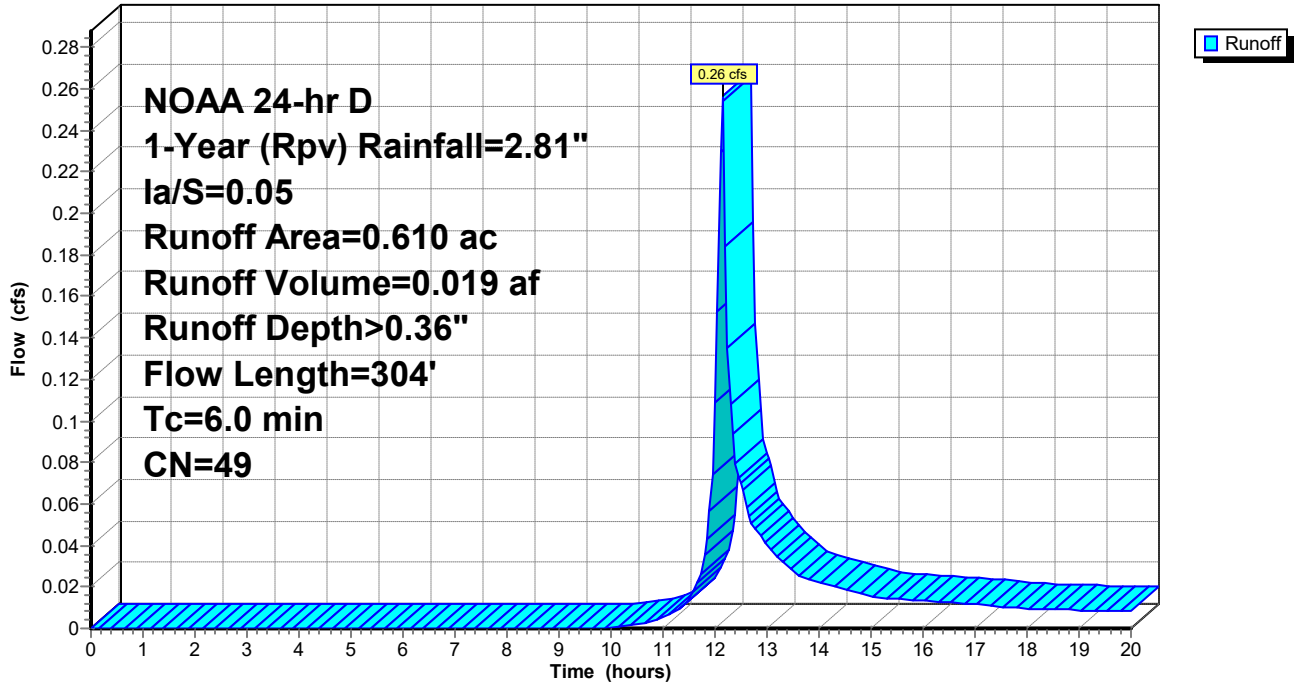
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-20.00 hrs, dt= 0.05 hrs
 NOAA 24-hr D 1-Year (Rpv) Rainfall=2.81", Ia/S=0.05

Area (ac)	CN	Description
0.510	39	>75% Grass cover, Good, HSG A
0.100	98	Paved roads w/curbs & sewers, HSG A
0.610	49	Weighted Average
0.510		83.61% Pervious Area
0.100		16.39% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.3	26	0.0310	1.27		Sheet Flow, Smooth surfaces n= 0.011 P2= 3.30"
0.1	12	0.0400	1.40		Shallow Concentrated Flow, Short Grass Pasture Kv= 7.0 fps
0.1	10	0.0220	3.01		Shallow Concentrated Flow, Paved Kv= 20.3 fps
0.5	119	0.3140	3.92		Shallow Concentrated Flow, Short Grass Pasture Kv= 7.0 fps
0.5	137	0.0090	4.97	92.91	Channel Flow, Area= 18.7 sf Perim= 17.2' r= 1.09' n= 0.030
1.5	304	Total, Increased to minimum Tc = 6.0 min			

Subcatchment SC-14E: 14E

Hydrograph



Summary for Subcatchment SC-15: SC-15

Runoff = 1.11 cfs @ 12.14 hrs, Volume= 0.078 af, Depth> 0.63"

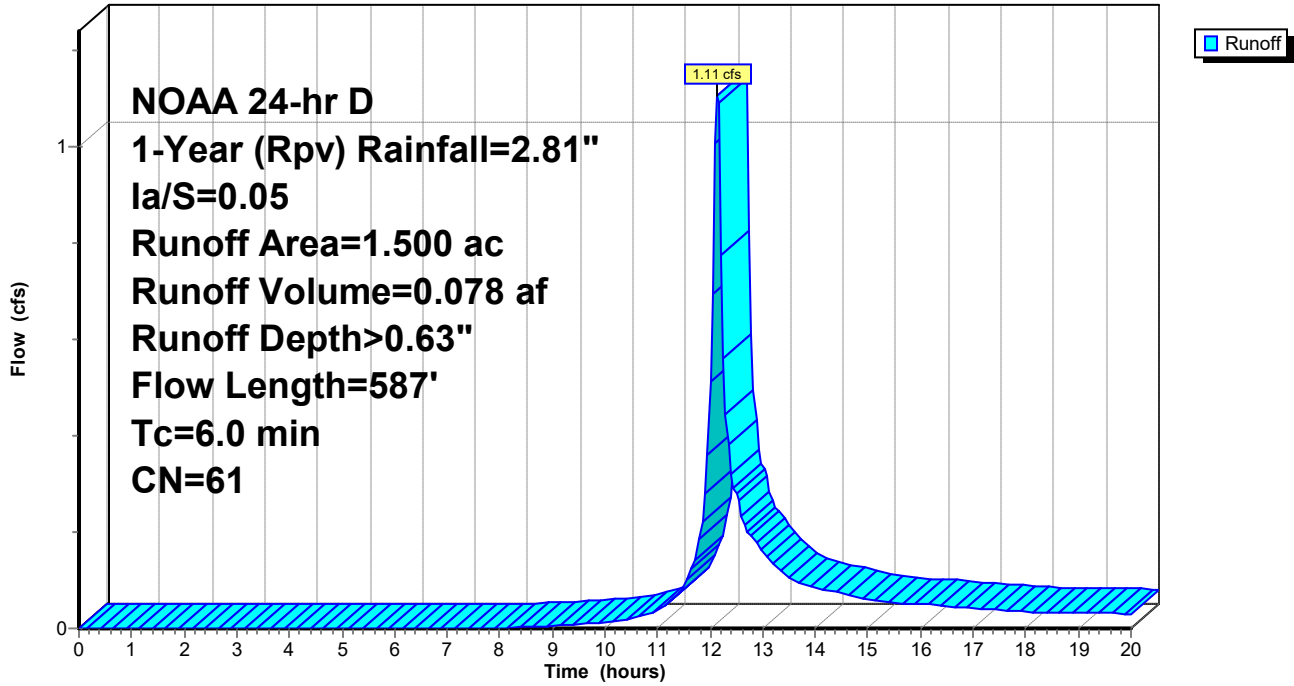
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-20.00 hrs, dt= 0.05 hrs
 NOAA 24-hr D 1-Year (Rpv) Rainfall=2.81", Ia/S=0.05

Area (ac)	CN	Description
* 0.550	98	
* 0.950	39	
1.500	61	Weighted Average
0.950		63.33% Pervious Area
0.550		36.67% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.5	54	0.0448	1.71		Sheet Flow, Smooth surfaces n= 0.011 P2= 3.30"
1.2	12	0.0500	0.16		Sheet Flow, Grass: Short n= 0.150 P2= 3.30"
0.2	10	0.0225	0.92		Sheet Flow, Smooth surfaces n= 0.011 P2= 3.30"
1.6	36	0.2190	0.37		Sheet Flow, Grass: Short n= 0.150 P2= 3.30"
2.5	475	0.0037	3.23	65.54	Channel Flow, Area= 20.3 sf Perim= 18.3' r= 1.11' n= 0.030
6.0	587	Total			

Subcatchment SC-15: SC-15

Hydrograph



Summary for Pond BMP-15: (new Pond)

Inflow Area = 1.500 ac, 36.67% Impervious, Inflow Depth > 0.63" for 1-Year (Rpv) event
 Inflow = 1.11 cfs @ 12.14 hrs, Volume= 0.078 af
 Outflow = 0.13 cfs @ 13.27 hrs, Volume= 0.078 af, Atten= 89%, Lag= 68.3 min
 Discarded = 0.13 cfs @ 13.27 hrs, Volume= 0.078 af
 Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 0.00-20.00 hrs, dt= 0.05 hrs
 Peak Elev= 24.19' @ 13.27 hrs Surf.Area= 0.057 ac Storage= 0.027 af

Plug-Flow detention time= 86.0 min calculated for 0.078 af (100% of inflow)
 Center-of-Mass det. time= 84.8 min (895.8 - 811.0)

Volume	Invert	Avail.Storage	Storage Description
#1	23.00'	0.046 af	10.00'W x 250.00'L x 2.00'H Prismatic 0.115 af Overall x 40.0% Voids
#2	25.00'	0.164 af	10.00'W x 250.00'L x 2.00'H Prismatic Z=2.0
		0.209 af	Total Available Storage

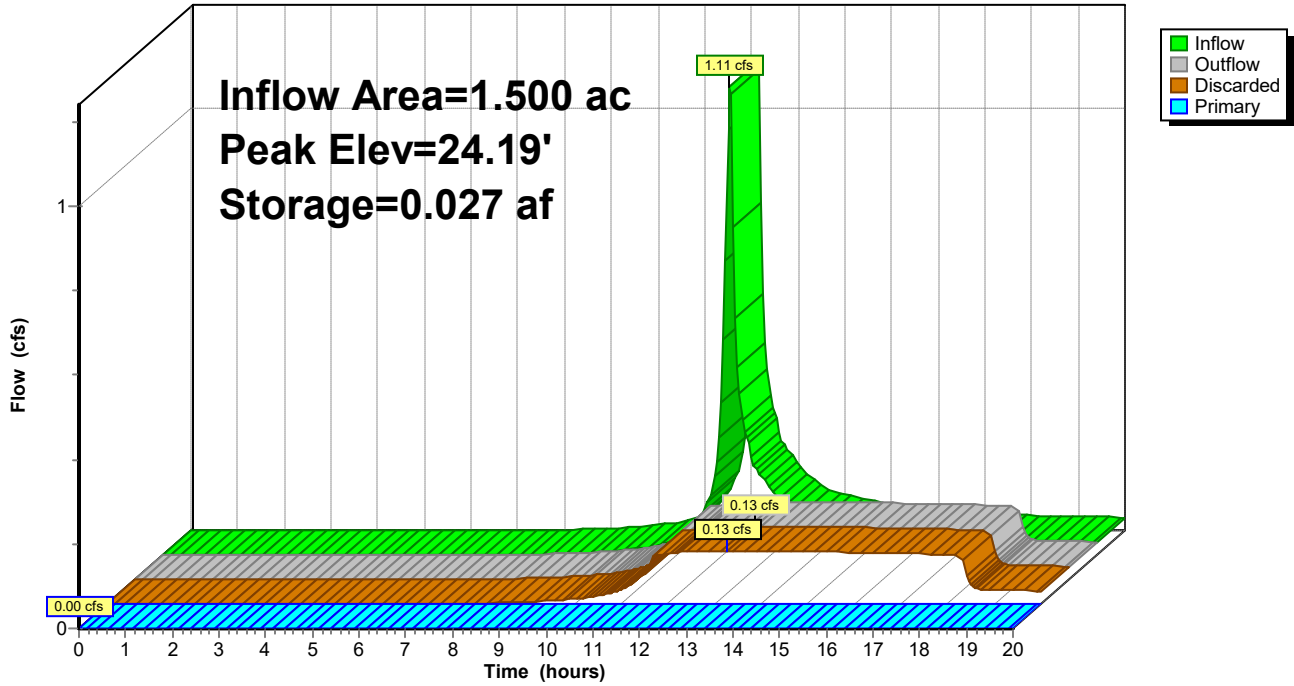
Device	Routing	Invert	Outlet Devices
#1	Discarded	23.00'	2.000 in/hr Exfiltration over Surface area Conductivity to Groundwater Elevation = 10.00'
#2	Primary	26.75'	18.0' long (Profile 1) Broad-Crested Rectangular Weir Head (feet) 0.49 0.98 1.48 Coef. (English) 2.92 3.37 3.59

Discarded OutFlow Max=0.13 cfs @ 13.27 hrs HW=24.19' (Free Discharge)
 ↑1=Exfiltration (Controls 0.13 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=23.00' (Free Discharge)
 ↑2=Broad-Crested Rectangular Weir (Controls 0.00 cfs)

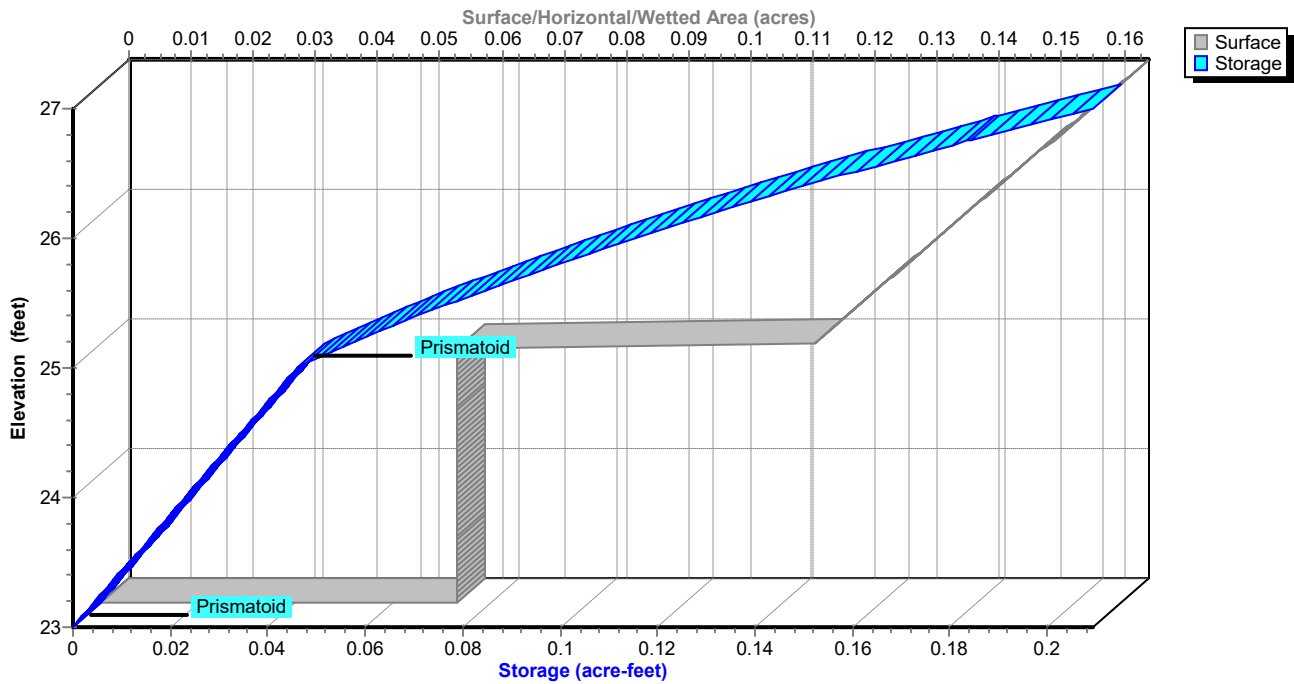
Pond BMP-15: (new Pond)

Hydrograph



Pond BMP-15: (new Pond)

Stage-Area-Storage



Summary for Subcatchment SC-16: SC-16

Runoff = 0.59 cfs @ 12.14 hrs, Volume= 0.042 af, Depth> 0.42"

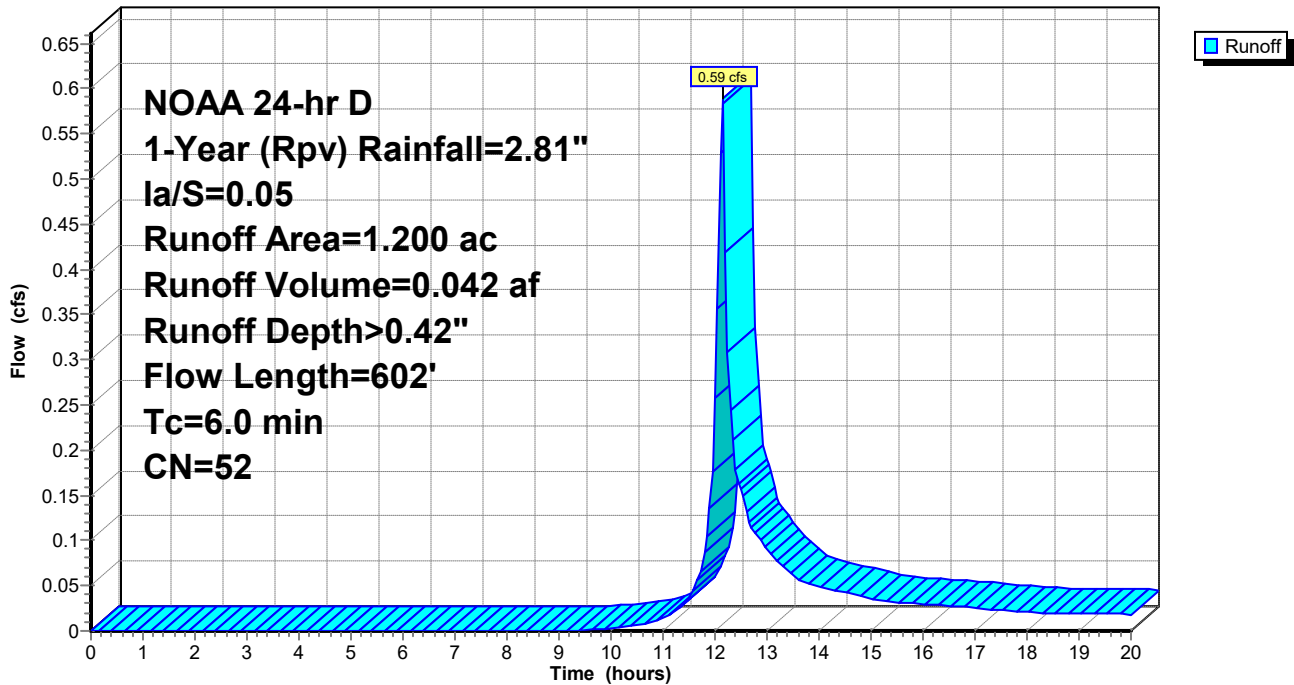
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-20.00 hrs, dt= 0.05 hrs
 NOAA 24-hr D 1-Year (Rpv) Rainfall=2.81", Ia/S=0.05

Area (ac)	CN	Description
* 0.940	39	
* 0.260	98	
1.200	52	Weighted Average
0.940		78.33% Pervious Area
0.260		21.67% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.4	29	0.0340	1.35		Sheet Flow, Smooth surfaces n= 0.011 P2= 3.30"
1.7	35	0.2000	0.35		Sheet Flow, Grass: Short n= 0.150 P2= 3.30"
1.8	538	0.0090	4.98	96.08	Channel Flow, Area= 19.3 sf Perim= 17.7' r= 1.09' n= 0.030
3.9	602	Total, Increased to minimum Tc = 6.0 min			

Subcatchment SC-16: SC-16

Hydrograph



Summary for Pond BMP-16: (new Pond)

Inflow Area = 1.200 ac, 21.67% Impervious, Inflow Depth > 0.42" for 1-Year (Rpv) event
 Inflow = 0.59 cfs @ 12.14 hrs, Volume= 0.042 af
 Outflow = 0.12 cfs @ 12.66 hrs, Volume= 0.042 af, Atten= 80%, Lag= 31.4 min
 Discarded = 0.12 cfs @ 12.66 hrs, Volume= 0.042 af
 Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 0.00-20.00 hrs, dt= 0.05 hrs
 Peak Elev= 22.93' @ 12.66 hrs Surf.Area= 0.057 ac Storage= 0.010 af

Plug-Flow detention time= 27.7 min calculated for 0.042 af (100% of inflow)
 Center-of-Mass det. time= 26.4 min (849.3 - 823.0)

Volume	Invert	Avail.Storage	Storage Description
#1	22.50'	0.046 af	10.00'W x 250.00'L x 2.00'H Prismatic 0.115 af Overall x 40.0% Voids
#2	24.50'	0.164 af	10.00'W x 250.00'L x 2.00'H Prismatic Z=2.0
		0.209 af	Total Available Storage

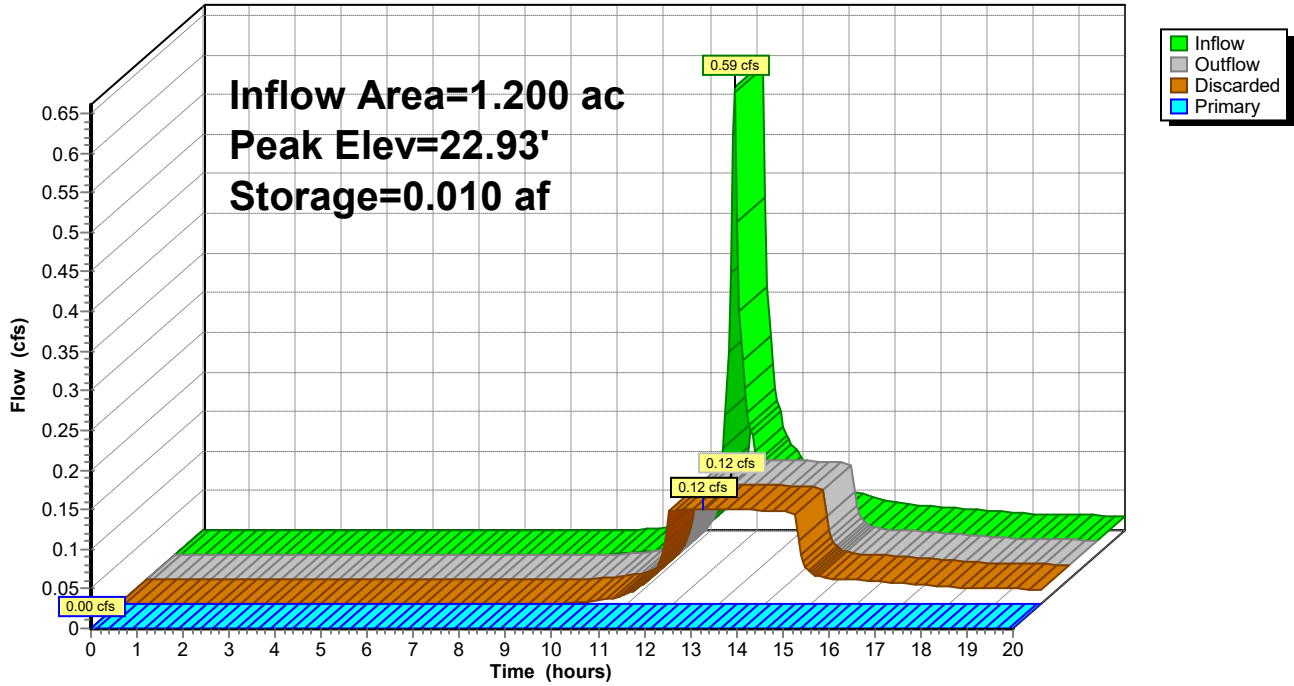
Device	Routing	Invert	Outlet Devices
#1	Discarded	22.50'	2.000 in/hr Exfiltration over Surface area Conductivity to Groundwater Elevation = 10.00'
#2	Primary	26.25'	18.0' long (Profile 1) Broad-Crested Rectangular Weir Head (feet) 0.49 0.98 1.48 Coef. (English) 2.92 3.37 3.59

Discarded OutFlow Max=0.12 cfs @ 12.66 hrs HW=22.93' (Free Discharge)
 ↑1=Exfiltration (Controls 0.12 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=22.50' (Free Discharge)
 ↑2=Broad-Crested Rectangular Weir (Controls 0.00 cfs)

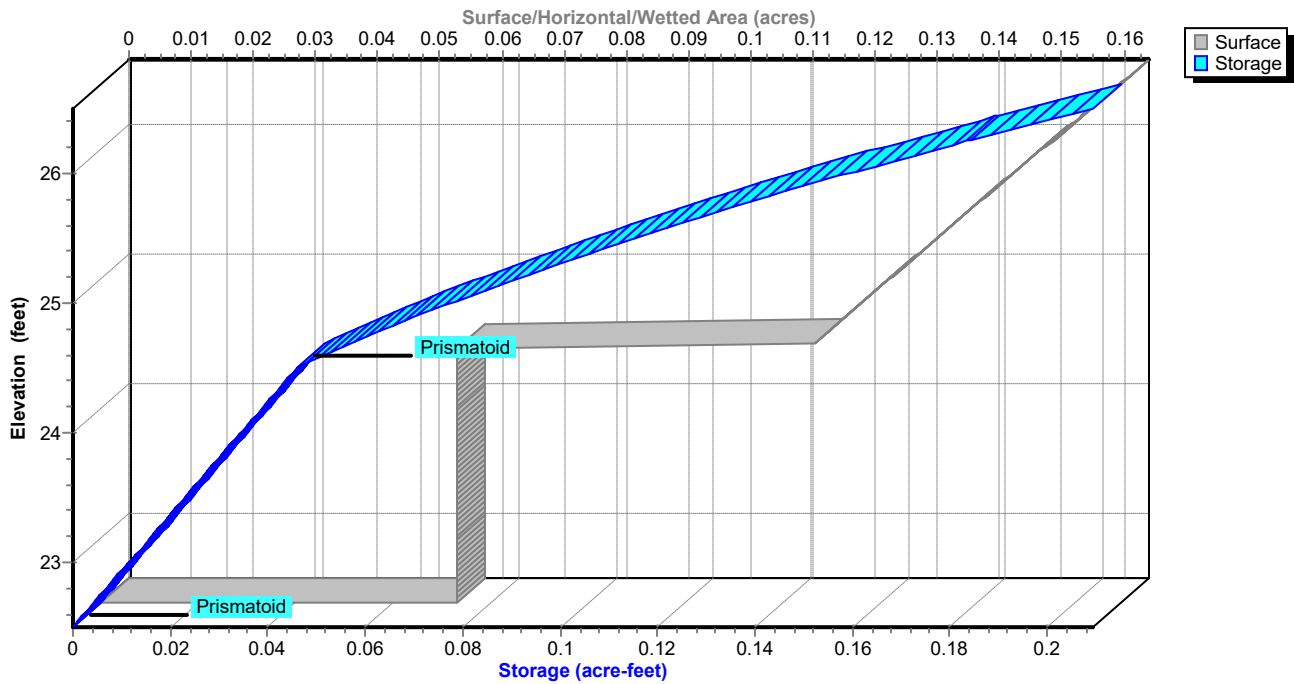
Pond BMP-16: (new Pond)

Hydrograph



Pond BMP-16: (new Pond)

Stage-Area-Storage

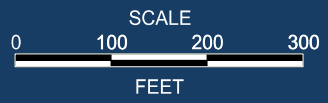




APPENDIX I

POI-17, POI-18 & POI-19

- POI Drainage Area Maps
- POI-17 HydroCAD Calculations
- POI-18 HydroCAD Calculations
- POI-19 HydroCAD Calculations






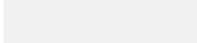



NORTH MILLSBORO BYPASS, US 113 TO SR 24

CONTRACT NO. T201912701
SUSSEX COUNTY



LEGEND

-  DRAINAGE AREA
-  Tc PATH
-  POI LOCATION
-  POI LABEL
-  OPEN SPACE
-  IMPERVIOUS
-  EXISTING CONTOURS



Summary for Subcatchment SC-17A: SC-17A

Runoff = 0.83 cfs @ 12.44 hrs, Volume= 0.116 af, Depth> 0.20"

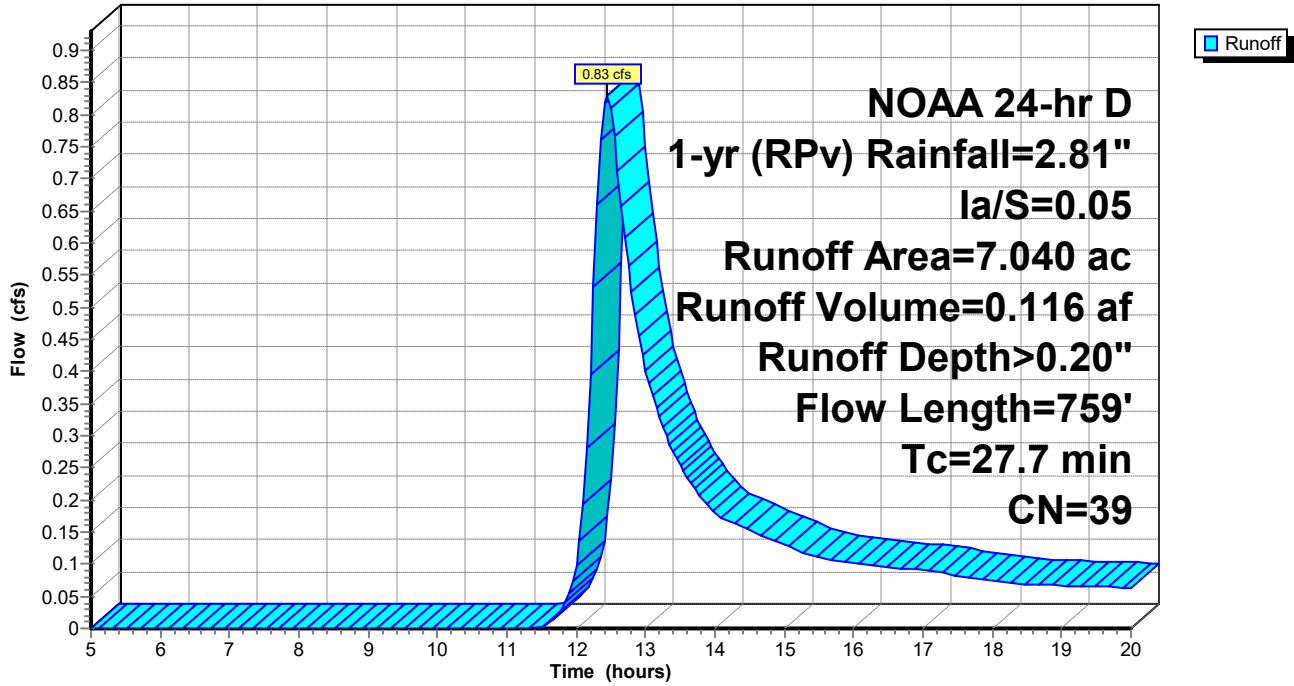
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
 NOAA 24-hr D 1-yr (RPv) Rainfall=2.81", Ia/S=0.05

Area (ac)	CN	Description
7.020	39	>75% Grass cover, Good, HSG A
0.020	98	Paved roads w/curbs & sewers, HSG A
7.040	39	Weighted Average
7.020		99.72% Pervious Area
0.020		0.28% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.4	50	0.0140	0.13		Sheet Flow, Grass: Short n= 0.150 P2= 3.30"
2.4	117	0.0140	0.83		Shallow Concentrated Flow, Short Grass Pasture Kv= 7.0 fps
3.1	114	0.0075	0.61		Shallow Concentrated Flow, Short Grass Pasture Kv= 7.0 fps
7.5	195	0.0038	0.43		Shallow Concentrated Flow, Short Grass Pasture Kv= 7.0 fps
6.1	184	0.0051	0.50		Shallow Concentrated Flow, Short Grass Pasture Kv= 7.0 fps
2.2	99	0.0113	0.74		Shallow Concentrated Flow, Short Grass Pasture Kv= 7.0 fps
27.7	759	Total			

Subcatchment SC-17A: SC-17A

Hydrograph



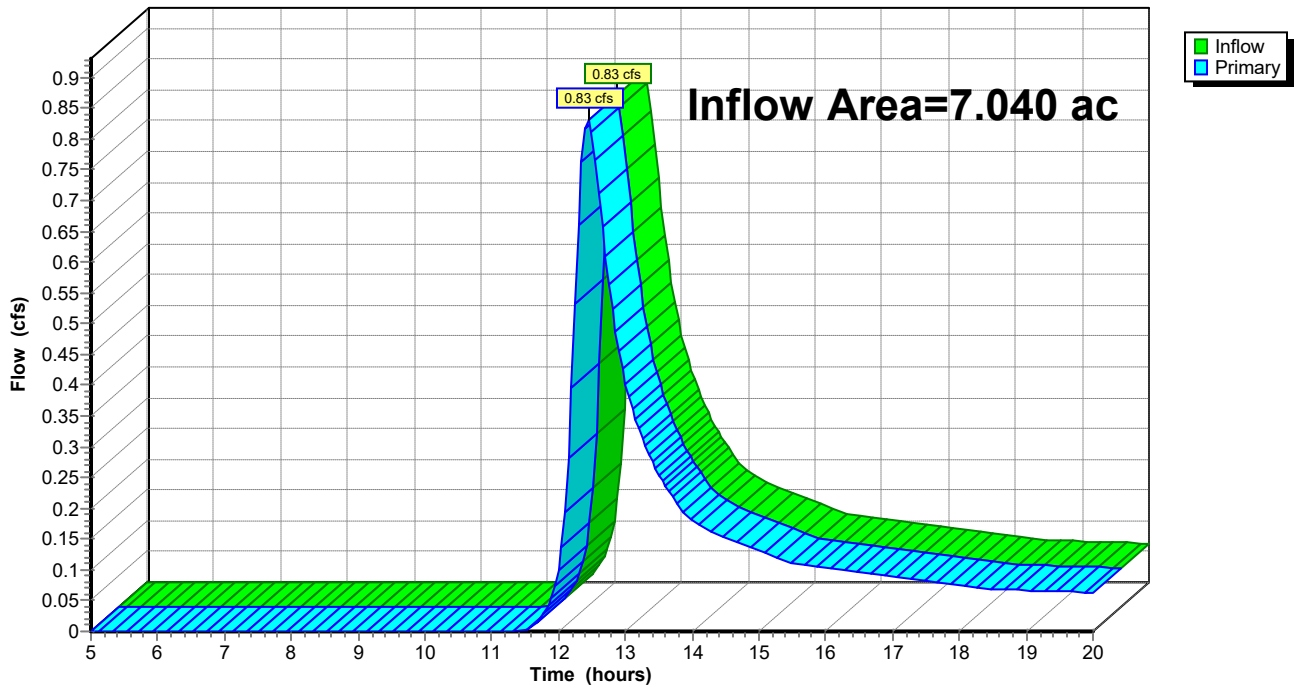
Summary for Link POI17: (new Link)

Inflow Area = 7.040 ac, 0.28% Impervious, Inflow Depth > 0.20" for 1-yr (RPv) event
Inflow = 0.83 cfs @ 12.44 hrs, Volume= 0.116 af
Primary = 0.83 cfs @ 12.44 hrs, Volume= 0.116 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Link POI17: (new Link)

Hydrograph



Summary for Subcatchment SC-18A: SC-18A

Runoff = 0.44 cfs @ 12.40 hrs, Volume= 0.056 af, Depth> 0.29"

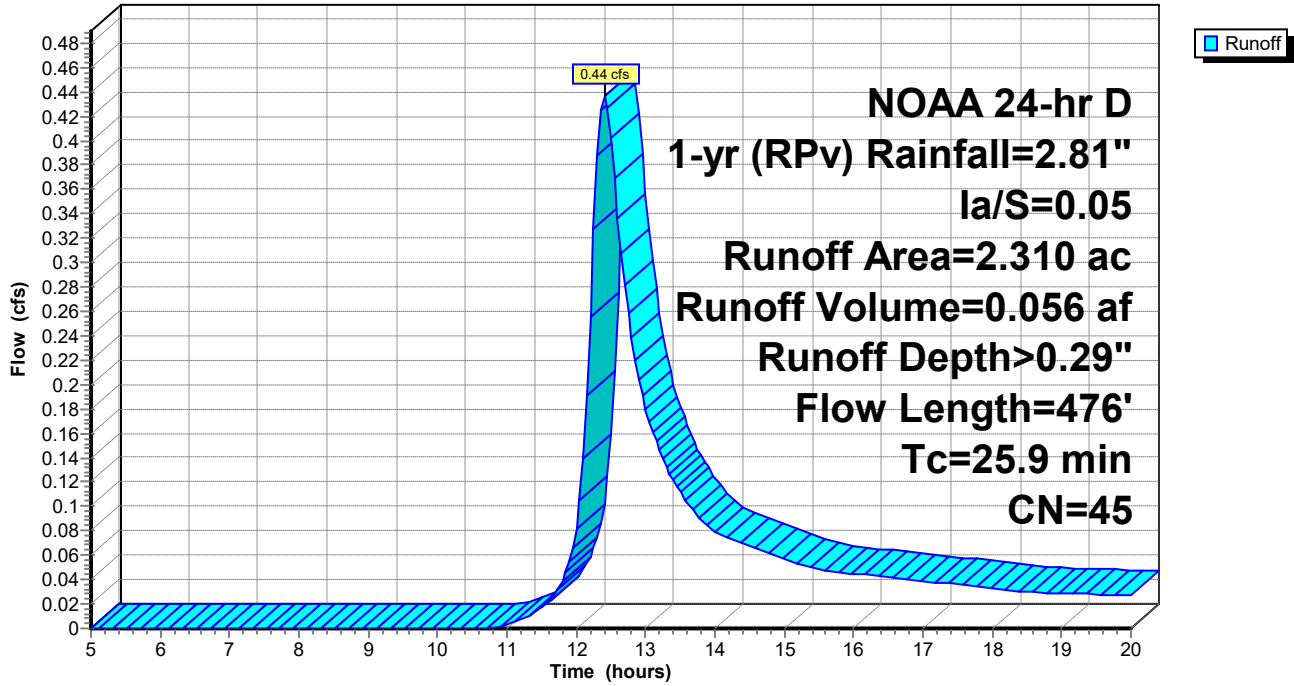
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
 NOAA 24-hr D 1-yr (RPv) Rainfall=2.81", Ia/S=0.05

Area (ac)	CN	Description
2.080	39	>75% Grass cover, Good, HSG A
0.230	98	Paved roads w/curbs & sewers, HSG A
2.310	45	Weighted Average
2.080		90.04% Pervious Area
0.230		9.96% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.4	50	0.0053	0.09		Sheet Flow, Grass: Short n= 0.150 P2= 3.30"
0.7	20	0.0053	0.51		Shallow Concentrated Flow, Short Grass Pasture Kv= 7.0 fps
1.3	61	0.0129	0.80		Shallow Concentrated Flow, Short Grass Pasture Kv= 7.0 fps
1.6	38	0.0034	0.41		Shallow Concentrated Flow, Short Grass Pasture Kv= 7.0 fps
8.4	154	0.0019	0.31		Shallow Concentrated Flow, Short Grass Pasture Kv= 7.0 fps
4.5	153	0.0066	0.57		Shallow Concentrated Flow, Short Grass Pasture Kv= 7.0 fps
25.9	476	Total			

Subcatchment SC-18A: SC-18A

Hydrograph



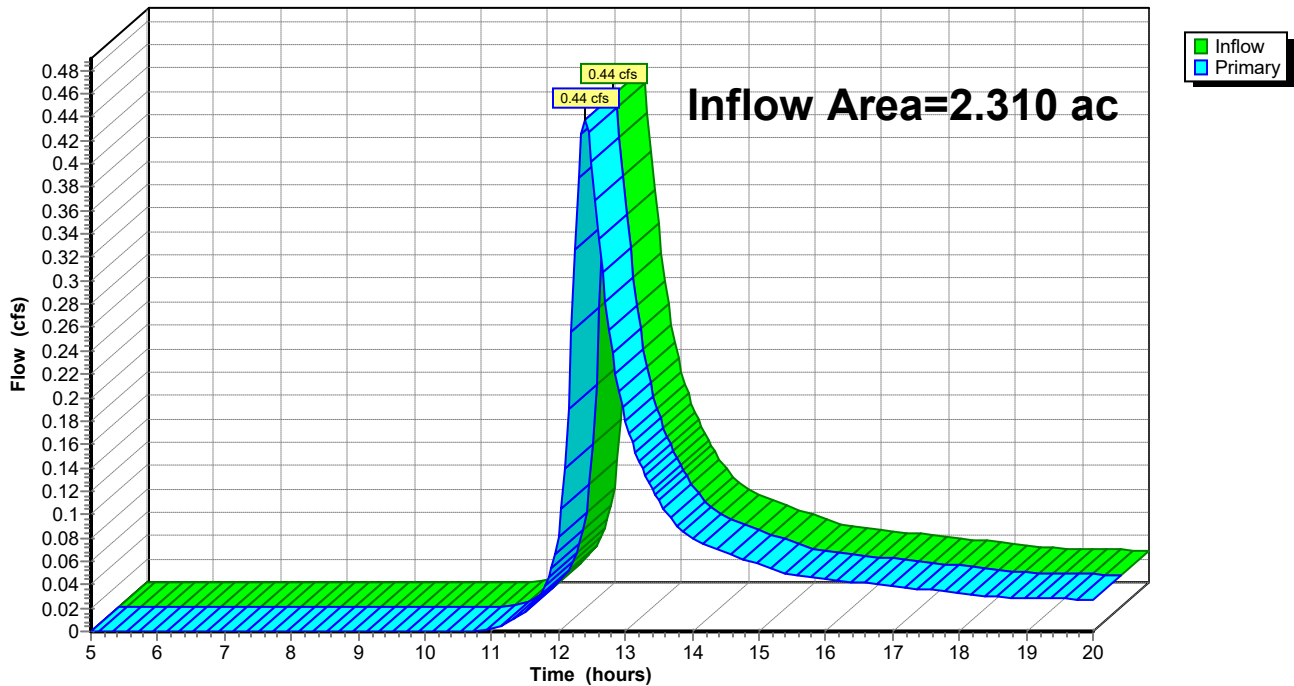
Summary for Link POI18: (new Link)

Inflow Area = 2.310 ac, 9.96% Impervious, Inflow Depth > 0.29" for 1-yr (RPv) event
Inflow = 0.44 cfs @ 12.40 hrs, Volume= 0.056 af
Primary = 0.44 cfs @ 12.40 hrs, Volume= 0.056 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Link POI18: (new Link)

Hydrograph



Summary for Subcatchment SC-19: 19

Runoff = 1.40 cfs @ 13.25 hrs, Volume= 0.329 af, Depth> 0.23"

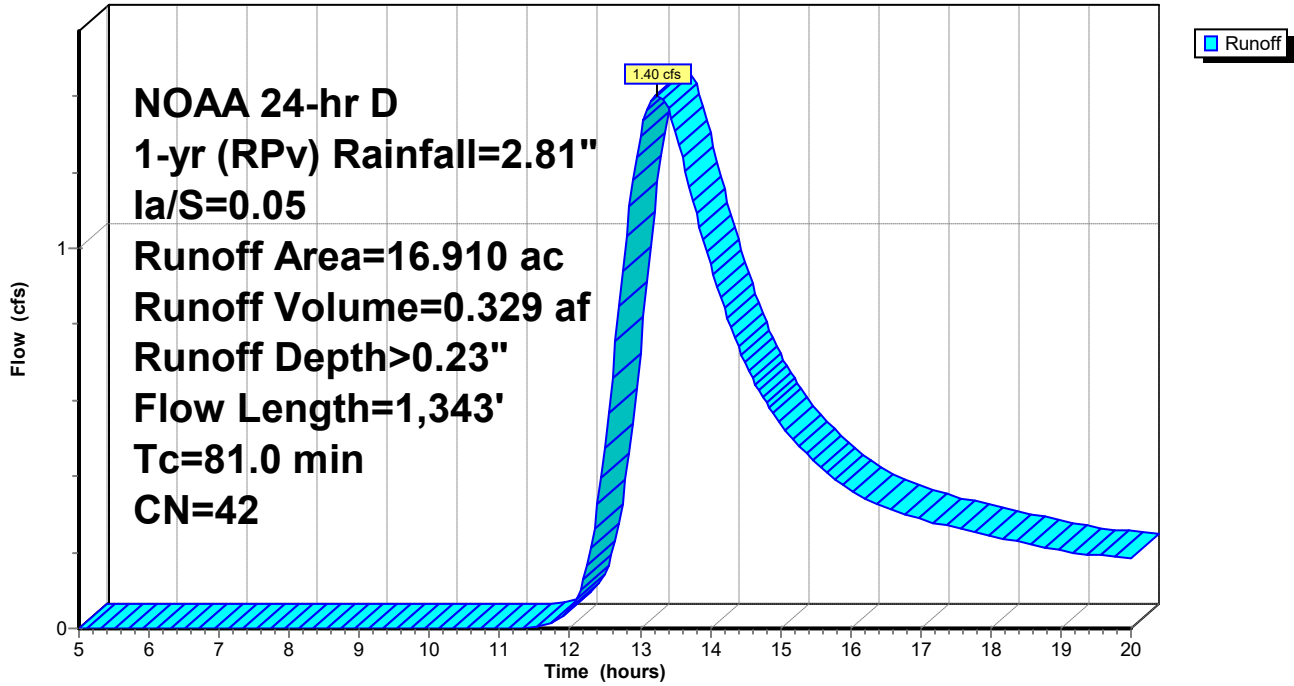
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
 NOAA 24-hr D 1-yr (RPv) Rainfall=2.81", Ia/S=0.05

Area (ac)	CN	Description
0.940	98	Paved roads w/curbs & sewers, HSG A
15.970	39	>75% Grass cover, Good, HSG A
16.910	42	Weighted Average
15.970		94.44% Pervious Area
0.940		5.56% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.1	50	0.0242	0.16		Sheet Flow, Grass: Short n= 0.150 P2= 3.30"
10.5	122	0.0242	0.19		Sheet Flow, Grass: Short n= 0.150 P2= 3.30"
1.5	68	0.0110	0.73		Shallow Concentrated Flow, Short Grass Pasture Kv= 7.0 fps
9.4	125	0.0010	0.22		Shallow Concentrated Flow, Short Grass Pasture Kv= 7.0 fps
9.0	193	0.0026	0.36		Shallow Concentrated Flow, Short Grass Pasture Kv= 7.0 fps
20.1	447	0.0028	0.37		Shallow Concentrated Flow, Short Grass Pasture Kv= 7.0 fps
25.4	338	0.0010	0.22		Shallow Concentrated Flow, Short Grass Pasture Kv= 7.0 fps
81.0	1,343	Total			

Subcatchment SC-19: 19

Hydrograph



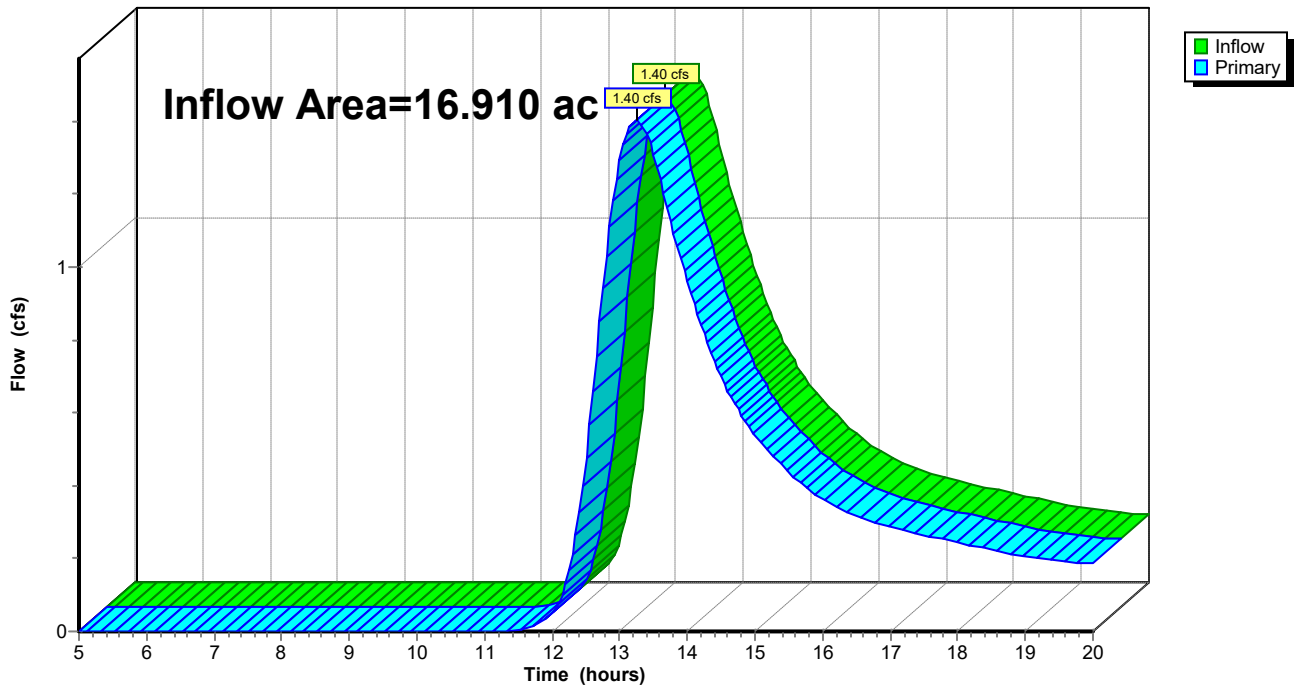
Summary for Link POI19: (new Link)

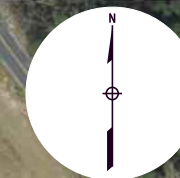
Inflow Area = 16.910 ac, 5.56% Impervious, Inflow Depth > 0.23" for 1-yr (RPv) event
Inflow = 1.40 cfs @ 13.25 hrs, Volume= 0.329 af
Primary = 1.40 cfs @ 13.25 hrs, Volume= 0.329 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs







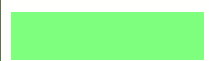
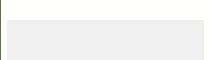




Link POI19: (new Link)

Hydrograph





LEGEND

-  DRAINAGE AREA
-  DRAINAGE SUBAREA
-  Tc PATH
-  PROPOSED CONSTRUCTION
-  PROPOSED DRAINAGE
-  INFILTRATION BMP
-  OPEN SPACE
-  IMPERVIOUS
-  PROPOSED CONTOURS
-  EXISTING CONTOURS
-  POI LOCATION
-  POI LABEL

Summary for Subcatchment SC-17A: SC-17A

Runoff = 0.87 cfs @ 12.14 hrs, Volume= 0.062 af, Depth> 0.63"

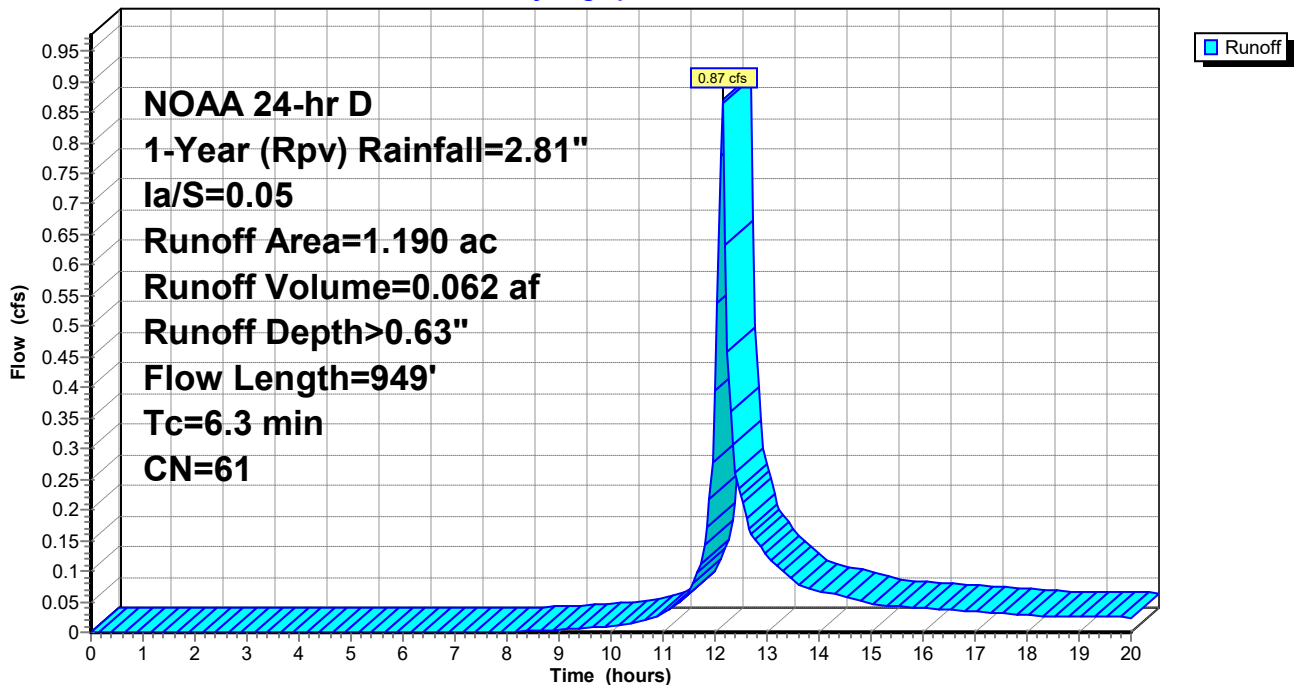
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-20.00 hrs, dt= 0.05 hrs
 NOAA 24-hr D 1-Year (Rpv) Rainfall=2.81", Ia/S=0.05

Area (ac)	CN	Description
* 0.740	39	
* 0.450	98	
1.190	61	Weighted Average
0.740		62.18% Pervious Area
0.450		37.82% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.6	49	0.0310	1.44		Sheet Flow, Smooth surfaces n= 0.011 P2= 3.30"
1.0	17	0.1540	0.27		Sheet Flow, Grass: Short n= 0.150 P2= 3.30"
4.0	766	0.0084	3.22	19.66	Channel Flow, Area= 6.1 sf Perim= 10.2' r= 0.60' n= 0.030
0.7	117	0.0085	2.97	5.25	Pipe Channel, 18.0" Round Area= 1.8 sf Perim= 4.7' r= 0.38' n= 0.024
6.3	949	Total			

Subcatchment SC-17A: SC-17A

Hydrograph



Summary for Subcatchment SC-17B: SC-17B

Runoff = 0.59 cfs @ 12.13 hrs, Volume= 0.041 af, Depth> 0.76"

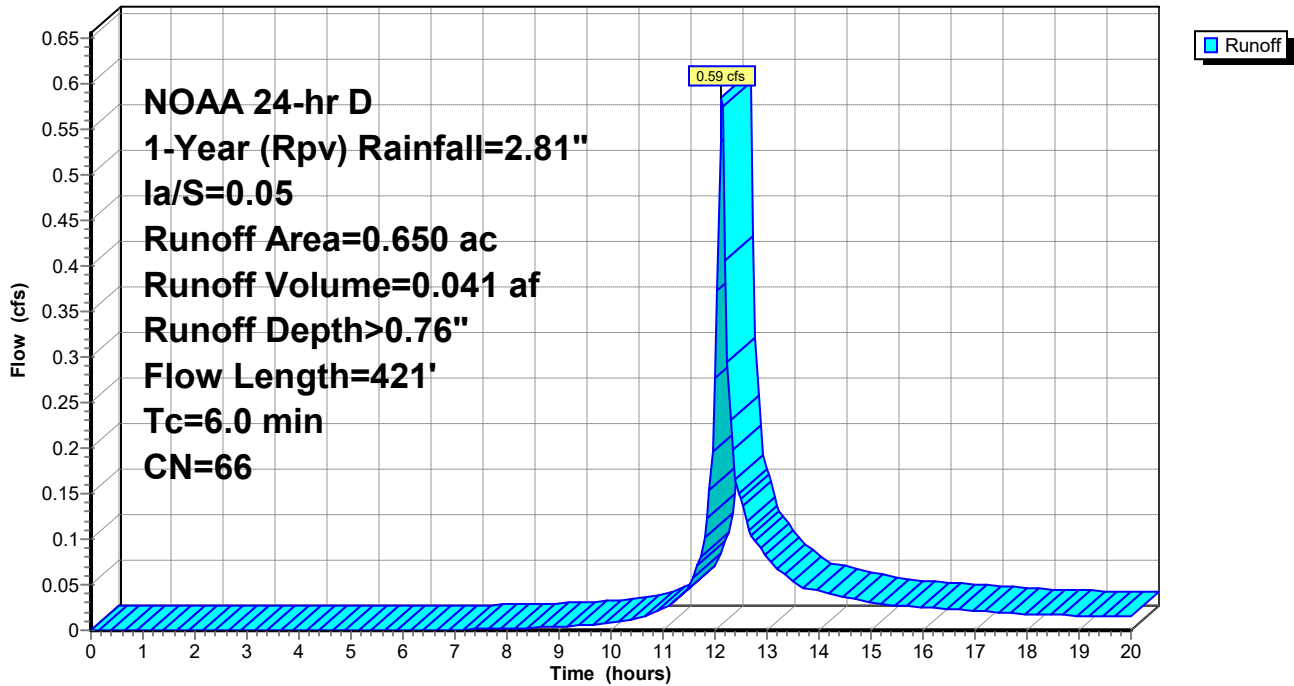
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-20.00 hrs, dt= 0.05 hrs
 NOAA 24-hr D 1-Year (Rpv) Rainfall=2.81", Ia/S=0.05

Area (ac)	CN	Description
* 0.350	39	
* 0.300	98	
0.650	66	Weighted Average
0.350		53.85% Pervious Area
0.300		46.15% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.3	27	0.0470	1.51		Sheet Flow, Smooth surfaces n= 0.011 P2= 3.30"
1.0	19	0.1900	0.30		Sheet Flow, Grass: Short n= 0.150 P2= 3.30"
0.6	243	0.0190	6.89	160.47	Channel Flow, Area= 23.3 sf Perim= 23.0' r= 1.01' n= 0.030
1.0	132	0.0050	2.28	4.02	Pipe Channel, 18.0" Round Area= 1.8 sf Perim= 4.7' r= 0.38' n= 0.024
2.9	421	Total, Increased to minimum Tc = 6.0 min			

Subcatchment SC-17B: SC-17B

Hydrograph



Summary for Subcatchment SC-17C: SC-17C

Runoff = 1.99 cfs @ 12.13 hrs, Volume= 0.140 af, Depth> 1.11"

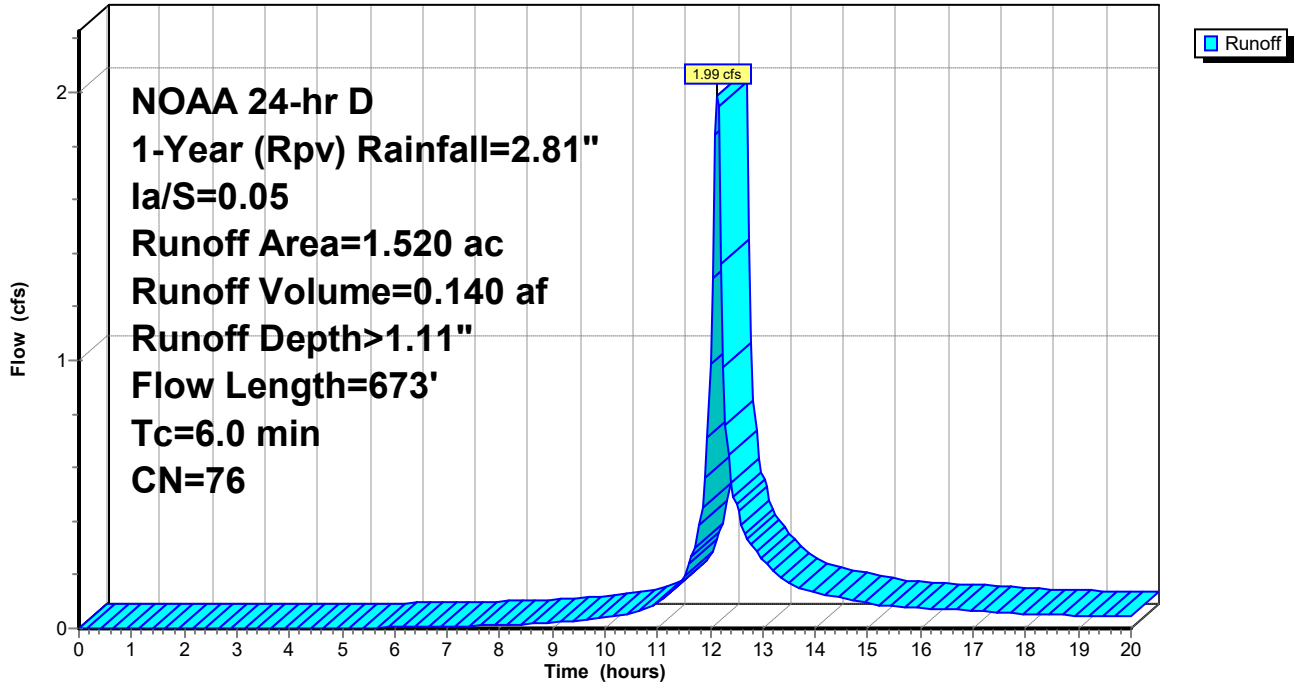
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-20.00 hrs, dt= 0.05 hrs
 NOAA 24-hr D 1-Year (Rpv) Rainfall=2.81", Ia/S=0.05

Area (ac)	CN	Description
* 0.950	98	
* 0.570	39	
1.520	76	Weighted Average
0.570		37.50% Pervious Area
0.950		62.50% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.7	73	0.0440	1.80		Sheet Flow, Smooth surfaces n= 0.011 P2= 3.30"
1.5	15	0.0490	0.17		Sheet Flow, Grass: Short n= 0.150 P2= 3.30"
0.2	14	0.0354	1.18		Sheet Flow, Smooth surfaces n= 0.011 P2= 3.30"
1.5	29	0.1870	0.33		Sheet Flow, Grass: Short n= 0.150 P2= 3.30"
1.1	450	0.0190	7.03	132.82	Channel Flow, Area= 18.9 sf Perim= 18.1' r= 1.04' n= 0.030
0.7	92	0.0050	2.28	4.02	Pipe Channel, 18.0" Round Area= 1.8 sf Perim= 4.7' r= 0.38' n= 0.024
5.7	673	Total, Increased to minimum Tc = 6.0 min			

Subcatchment SC-17C: SC-17C

Hydrograph



Summary for Subcatchment SC-17D: SC-17D

Runoff = 0.46 cfs @ 12.13 hrs, Volume= 0.032 af, Depth> 0.92"

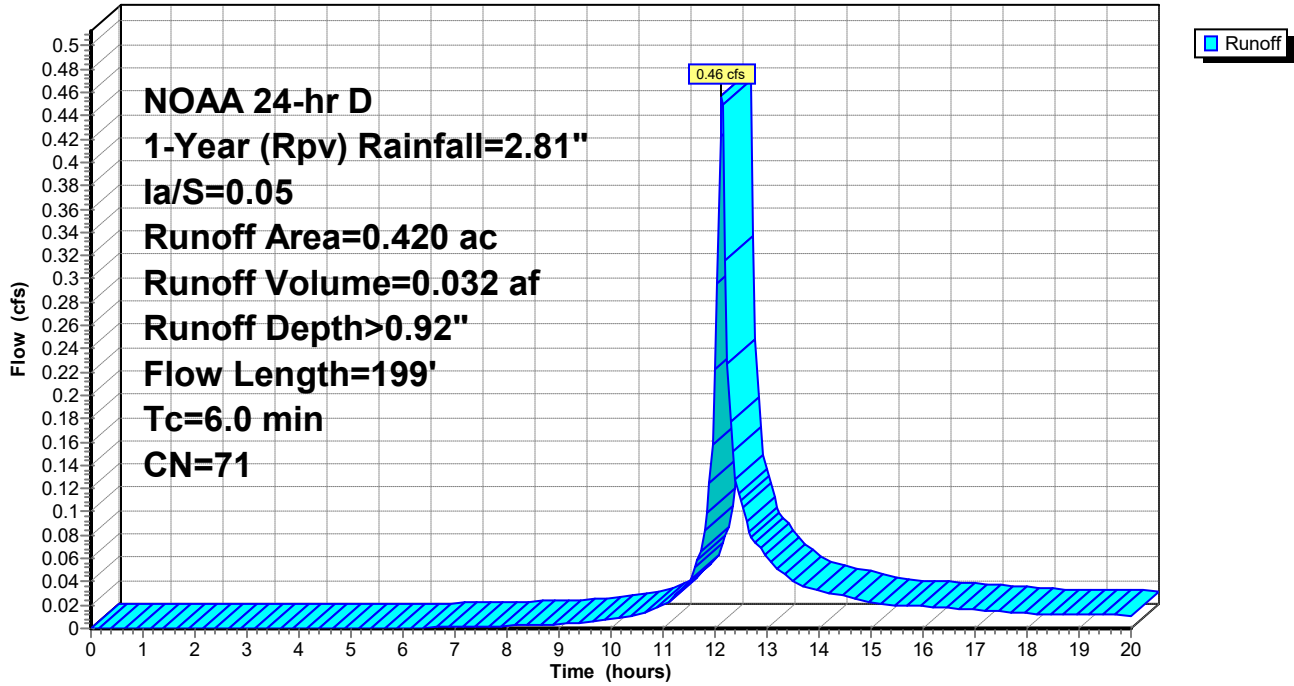
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-20.00 hrs, dt= 0.05 hrs
 NOAA 24-hr D 1-Year (Rpv) Rainfall=2.81", Ia/S=0.05

Area (ac)	CN	Description
* 0.230	98	
* 0.190	39	
0.420	71	Weighted Average
0.190		45.24% Pervious Area
0.230		54.76% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.8	72	0.0310	1.56		Sheet Flow, Smooth surfaces n= 0.011 P2= 3.30"
1.4	14	0.0500	0.17		Sheet Flow, Grass: Short n= 0.150 P2= 3.30"
0.2	14	0.0340	1.17		Sheet Flow, Smooth surfaces n= 0.011 P2= 3.30"
1.1	20	0.2000	0.31		Sheet Flow, Grass: Short n= 0.150 P2= 3.30"
0.8	79	0.0010	1.68	33.92	Channel Flow, Area= 20.2 sf Perim= 18.2' r= 1.11' n= 0.030
4.3	199	Total, Increased to minimum Tc = 6.0 min			

Subcatchment SC-17D: SC-17D

Hydrograph



Summary for Subcatchment SC-17E: SC-17E

Runoff = 1.37 cfs @ 12.14 hrs, Volume= 0.099 af, Depth> 0.36"

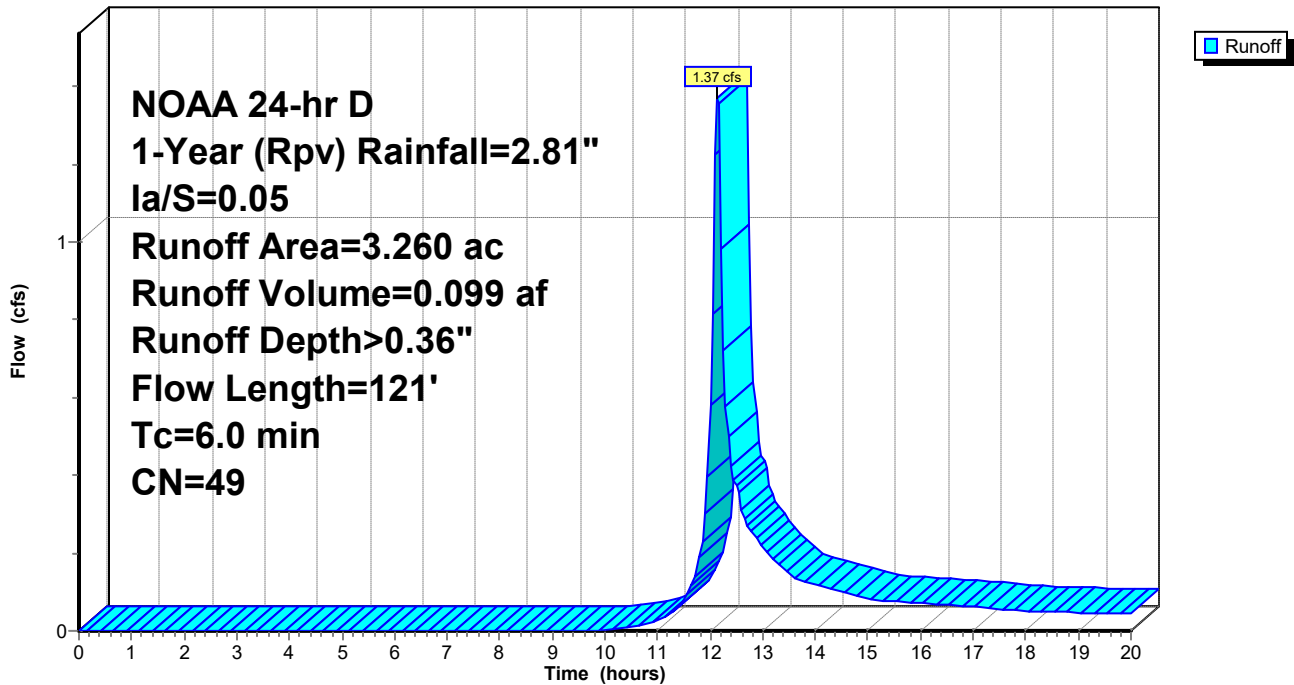
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-20.00 hrs, dt= 0.05 hrs
 NOAA 24-hr D 1-Year (Rpv) Rainfall=2.81", Ia/S=0.05

Area (ac)	CN	Description
* 2.680	39	
* 0.580	98	
3.260	49	Weighted Average
2.680		82.21% Pervious Area
0.580		17.79% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.9	90	0.0330	1.67		Sheet Flow, Smooth surfaces n= 0.011 P2= 3.30"
1.7	31	0.1500	0.31		Sheet Flow, Grass: Short n= 0.150 P2= 3.30"
2.6	121	Total, Increased to minimum Tc = 6.0 min			

Subcatchment SC-17E: SC-17E

Hydrograph



Summary for Pond POND17: POND17

Inflow Area = 6.620 ac, 34.44% Impervious, Inflow Depth > 0.62" for 1-Year (Rpv) event
 Inflow = 4.82 cfs @ 12.14 hrs, Volume= 0.343 af
 Outflow = 0.23 cfs @ 15.51 hrs, Volume= 0.137 af, Atten= 95%, Lag= 202.7 min
 Primary = 0.23 cfs @ 15.51 hrs, Volume= 0.137 af
 Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 0.00-20.00 hrs, dt= 0.05 hrs
 Peak Elev= 26.32' @ 15.51 hrs Surf.Area= 0.938 ac Storage= 0.225 af

Plug-Flow detention time= 267.7 min calculated for 0.137 af (40% of inflow)
 Center-of-Mass det. time= 164.1 min (970.7 - 806.6)

Volume	Invert	Avail.Storage	Storage Description		
#1	26.00'	3.093 af	Custom Stage Data (Conic) Listed below (Recalc)		
Elevation (feet)	Surf.Area (acres)	Inc.Store (acre-feet)	Cum.Store (acre-feet)	Wet.Area (acres)	
26.00	0.500	0.000	0.000	0.500	
26.50	1.250	0.423	0.423	1.250	
27.00	1.830	0.765	1.189	1.830	
28.00	1.980	1.905	3.093	1.982	

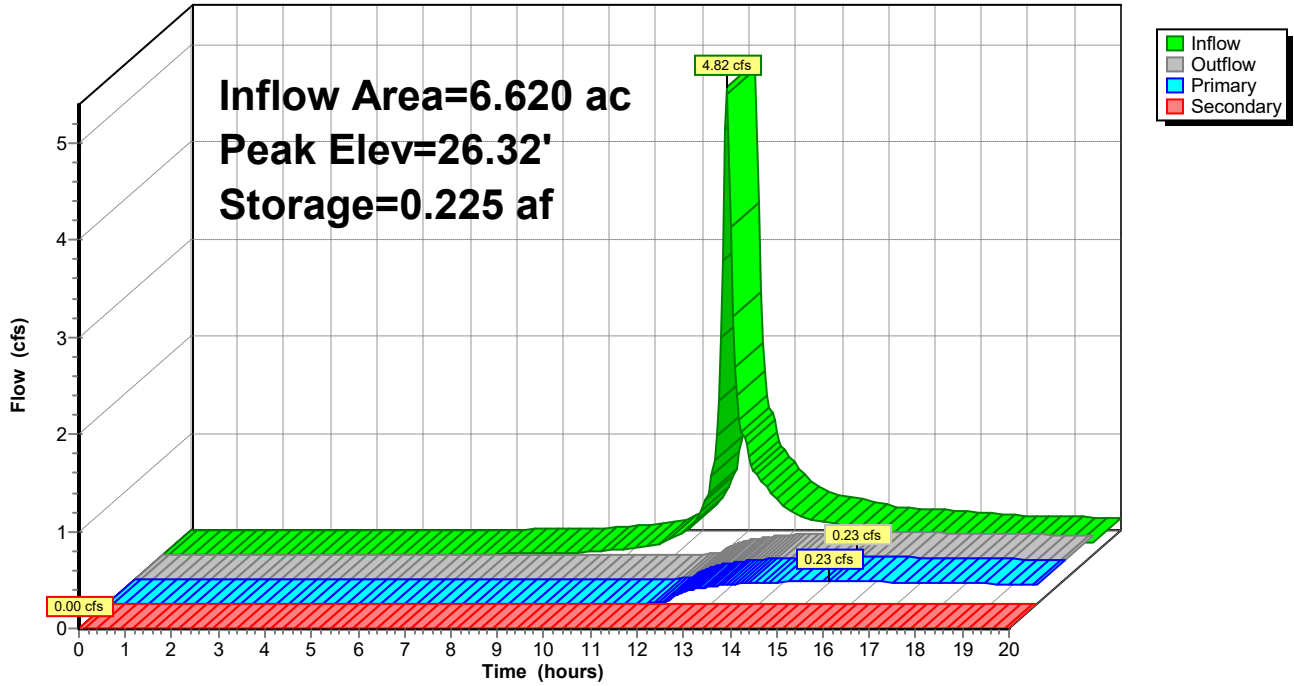
Device	Routing	Invert	Outlet Devices	
#1	Primary	26.00'	24.0" Round CMP_Round 24" L= 144.0' CMP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 26.00' / 25.50' S= 0.0035 '/' Cc= 0.900 n= 0.024, Flow Area= 3.14 sf	
#2	Secondary	26.65'	6.0" Vert. Orifice/Grate C= 0.600 Limited to weir flow at low heads	
#3	Secondary	27.75'	34.0" x 18.0" Horiz. Orifice/Grate C= 0.600 Limited to weir flow at low heads	

Primary OutFlow Max=0.23 cfs @ 15.51 hrs HW=26.32' (Free Discharge)
 ↑1=CMP_Round 24" (Barrel Controls 0.23 cfs @ 1.08 fps)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=26.00' (Free Discharge)
 ↑2=Orifice/Grate (Controls 0.00 cfs)
 ↑3=Orifice/Grate (Controls 0.00 cfs)

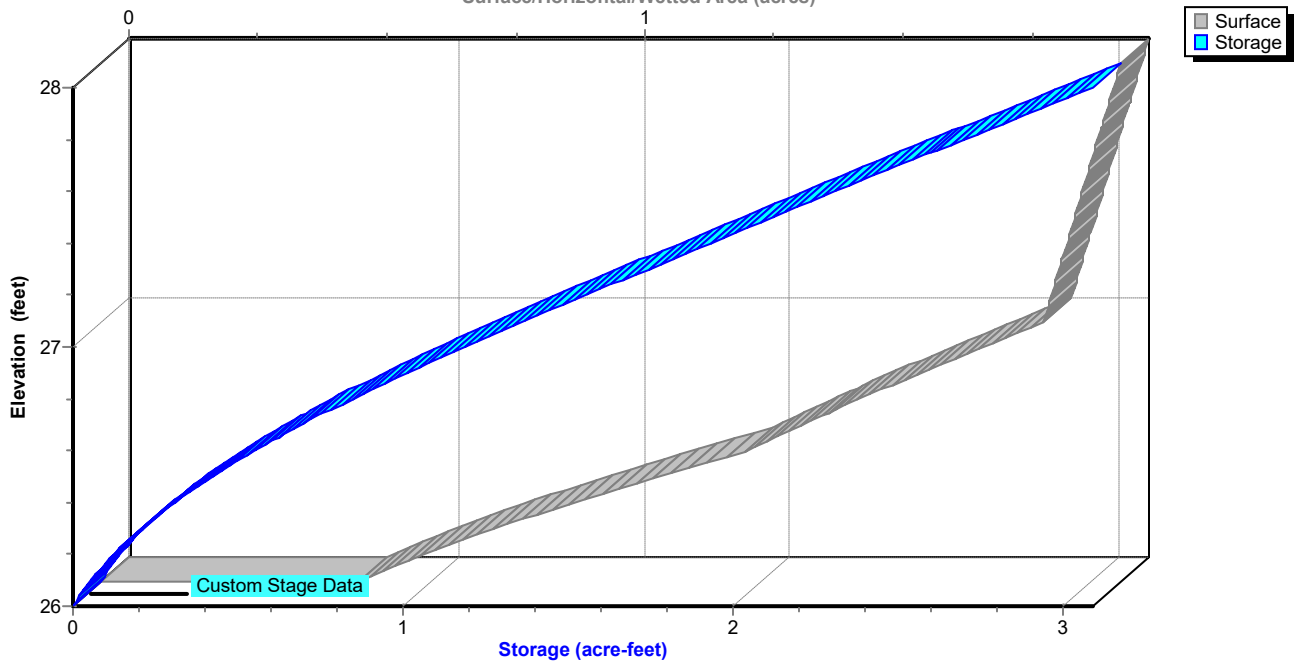
Pond POND17: POND17

Hydrograph



Pond POND17: POND17

Stage-Area-Storage
Surface/Horizontal/Wetted Area (acres)



Summary for Subcatchment SC-18A: SC-18A

Runoff = 1.55 cfs @ 12.14 hrs, Volume= 0.110 af, Depth> 0.99"

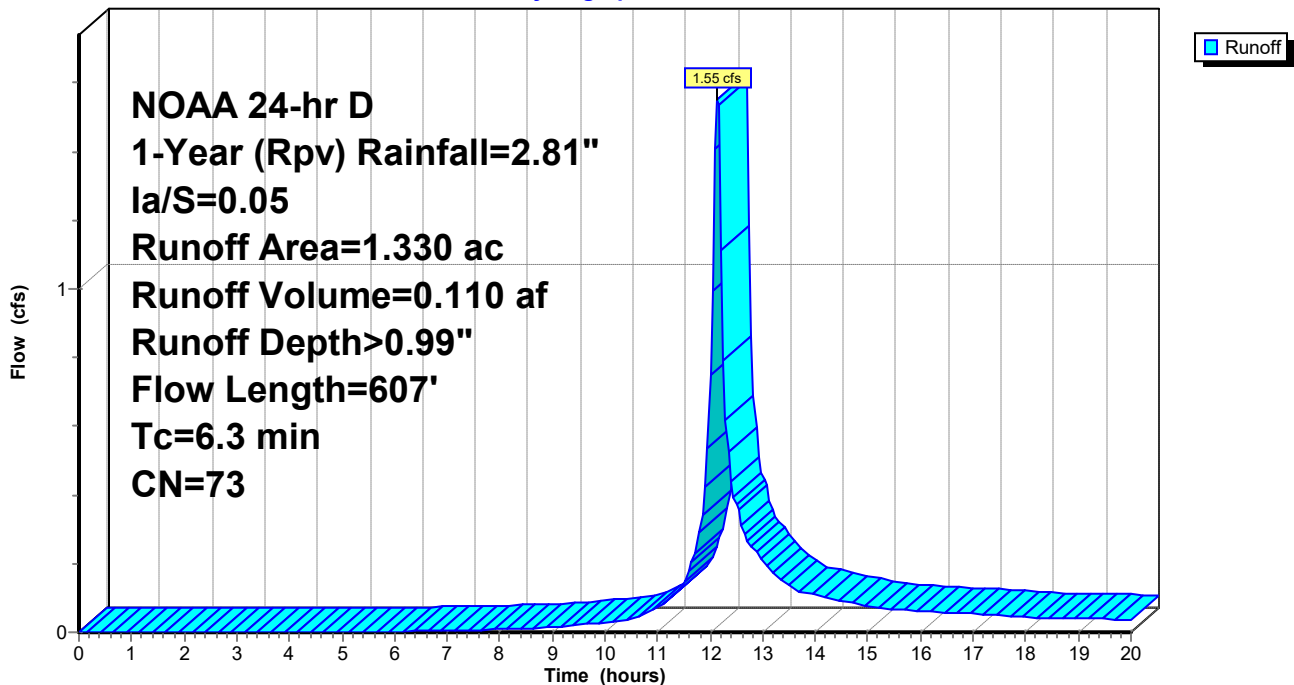
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-20.00 hrs, dt= 0.05 hrs
 NOAA 24-hr D 1-Year (Rpv) Rainfall=2.81", Ia/S=0.05

Area (ac)	CN	Description
0.570	39	>75% Grass cover, Good, HSG A
0.760	98	Paved roads w/curbs & sewers, HSG A
1.330	73	Weighted Average
0.570		42.86% Pervious Area
0.760		57.14% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.4	41	0.0400	1.54		Sheet Flow , Smooth surfaces n= 0.011 P2= 3.30"
0.8	19	0.3300	0.38		Sheet Flow , Grass: Short n= 0.150 P2= 3.30"
4.5	459	0.0023	1.69	10.14	Channel Flow , Area= 6.0 sf Perim= 10.0' r= 0.60' n= 0.030
0.6	88	0.0050	2.28	4.02	Pipe Channel , 18.0" Round Area= 1.8 sf Perim= 4.7' r= 0.38' n= 0.024
6.3	607	Total			

Subcatchment SC-18A: SC-18A

Hydrograph



Summary for Subcatchment SC-18B: SC-18B

Runoff = 0.75 cfs @ 12.14 hrs, Volume= 0.053 af, Depth> 0.65"

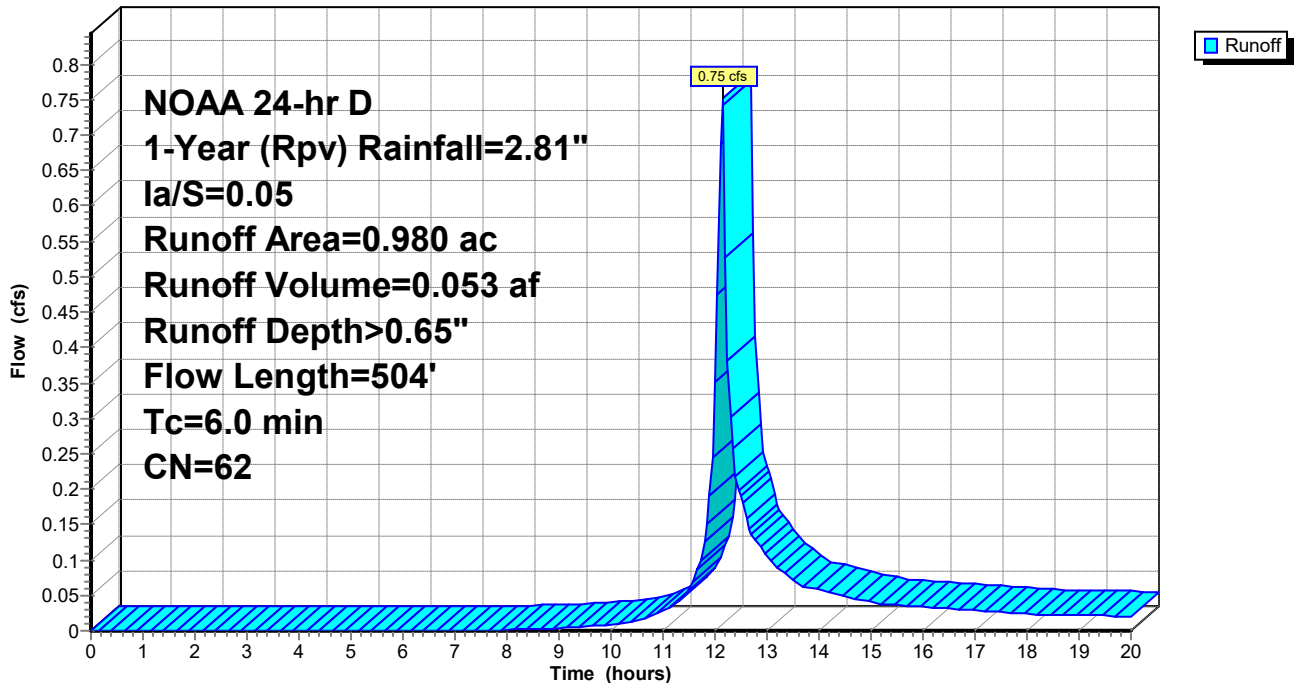
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-20.00 hrs, dt= 0.05 hrs
 NOAA 24-hr D 1-Year (Rpv) Rainfall=2.81", Ia/S=0.05

Area (ac)	CN	Description
0.390	98	Paved roads w/curbs & sewers, HSG A
0.590	39	>75% Grass cover, Good, HSG A
0.980	62	Weighted Average
0.590		60.20% Pervious Area
0.390		39.80% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.4	37	0.0440	1.57		Sheet Flow, Smooth surfaces n= 0.011 P2= 3.30"
0.1	15	0.2200	2.49		Sheet Flow, Smooth surfaces n= 0.011 P2= 3.30"
1.3	22	0.1500	0.29		Sheet Flow, Grass: Short n= 0.150 P2= 3.30"
1.8	430	0.0120	3.88	24.47	Channel Flow, Area= 6.3 sf Perim= 10.4' r= 0.61' n= 0.030
3.6	504	Total, Increased to minimum Tc = 6.0 min			

Subcatchment SC-18B: SC-18B

Hydrograph



Summary for Subcatchment SC-19A1: 19A

Runoff = 0.57 cfs @ 12.14 hrs, Volume= 0.041 af, Depth> 0.35"

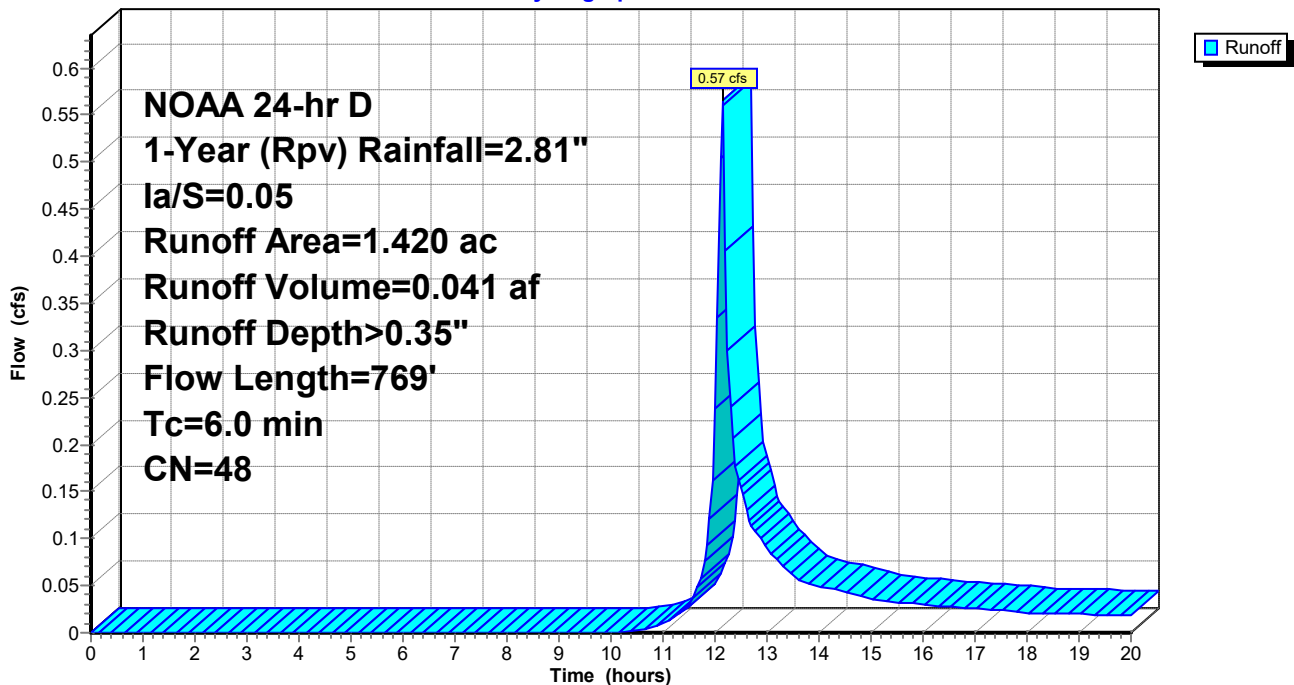
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-20.00 hrs, dt= 0.05 hrs
 NOAA 24-hr D 1-Year (Rpv) Rainfall=2.81", Ia/S=0.05

Area (ac)	CN	Description
1.210	39	>75% Grass cover, Good, HSG A
0.210	98	Paved roads w/curbs & sewers, HSG A
1.420	48	Weighted Average
1.210		85.21% Pervious Area
0.210		14.79% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.4	26	0.0180	1.02		Sheet Flow, Smooth surfaces n= 0.011 P2= 3.30"
0.1	30	0.0795	5.72		Shallow Concentrated Flow, Paved Kv= 20.3 fps
3.8	476	0.0020	2.10	42.31	Channel Flow, Area= 20.1 sf Perim= 21.7' r= 0.93' n= 0.030
1.5	237	0.0028	2.71	51.96	Channel Flow, Area= 19.2 sf Perim= 18.3' r= 1.05' n= 0.030
5.8	769	Total, Increased to minimum Tc = 6.0 min			

Subcatchment SC-19A1: 19A

Hydrograph



Summary for Pond BMP-19A1: (new Pond)

Inflow Area = 1.420 ac, 14.79% Impervious, Inflow Depth > 0.35" for 1-Year (Rpv) event
 Inflow = 0.57 cfs @ 12.14 hrs, Volume= 0.041 af
 Outflow = 0.06 cfs @ 13.50 hrs, Volume= 0.041 af, Atten= 89%, Lag= 81.5 min
 Discarded = 0.06 cfs @ 13.50 hrs, Volume= 0.041 af
 Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 0.00-20.00 hrs, dt= 0.05 hrs
 Peak Elev= 23.29' @ 13.50 hrs Surf.Area= 0.028 ac Storage= 0.015 af

Plug-Flow detention time= 105.2 min calculated for 0.041 af (99% of inflow)
 Center-of-Mass det. time= 103.6 min (932.4 - 828.8)

Volume	Invert	Avail.Storage	Storage Description
#1	21.95'	0.022 af	8.00'W x 150.00'L x 2.00'H Prismatic 0.055 af Overall x 40.0% Voids
#2	23.95'	0.085 af	8.00'W x 150.00'L x 2.00'H Prismatic Z=2.0
		0.107 af	Total Available Storage

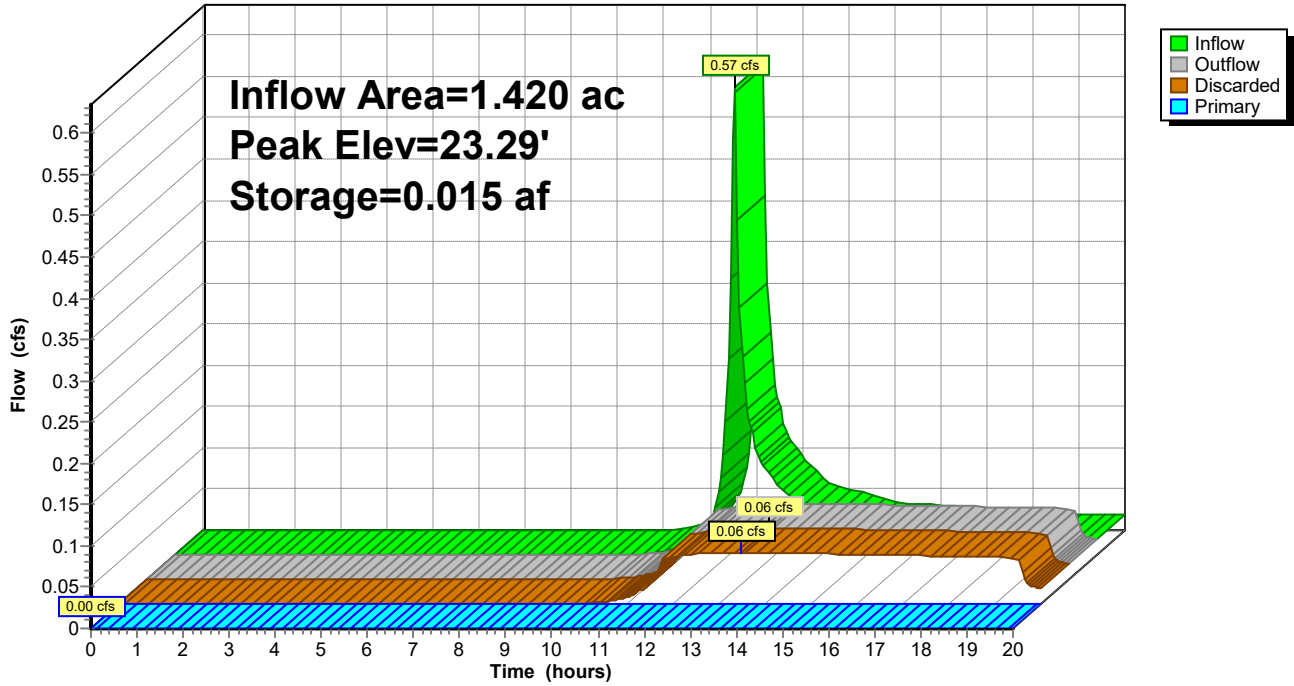
Device	Routing	Invert	Outlet Devices
#1	Discarded	21.95'	2.000 in/hr Exfiltration over Surface area Conductivity to Groundwater Elevation = 10.00'
#2	Primary	25.75'	16.0' long (Profile 1) Broad-Crested Rectangular Weir Head (feet) 0.49 0.98 1.48 Coef. (English) 2.92 3.37 3.59

Discarded OutFlow Max=0.06 cfs @ 13.50 hrs HW=23.29' (Free Discharge)
 ↑1=Exfiltration (Controls 0.06 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=21.95' (Free Discharge)
 ↑2=Broad-Crested Rectangular Weir (Controls 0.00 cfs)

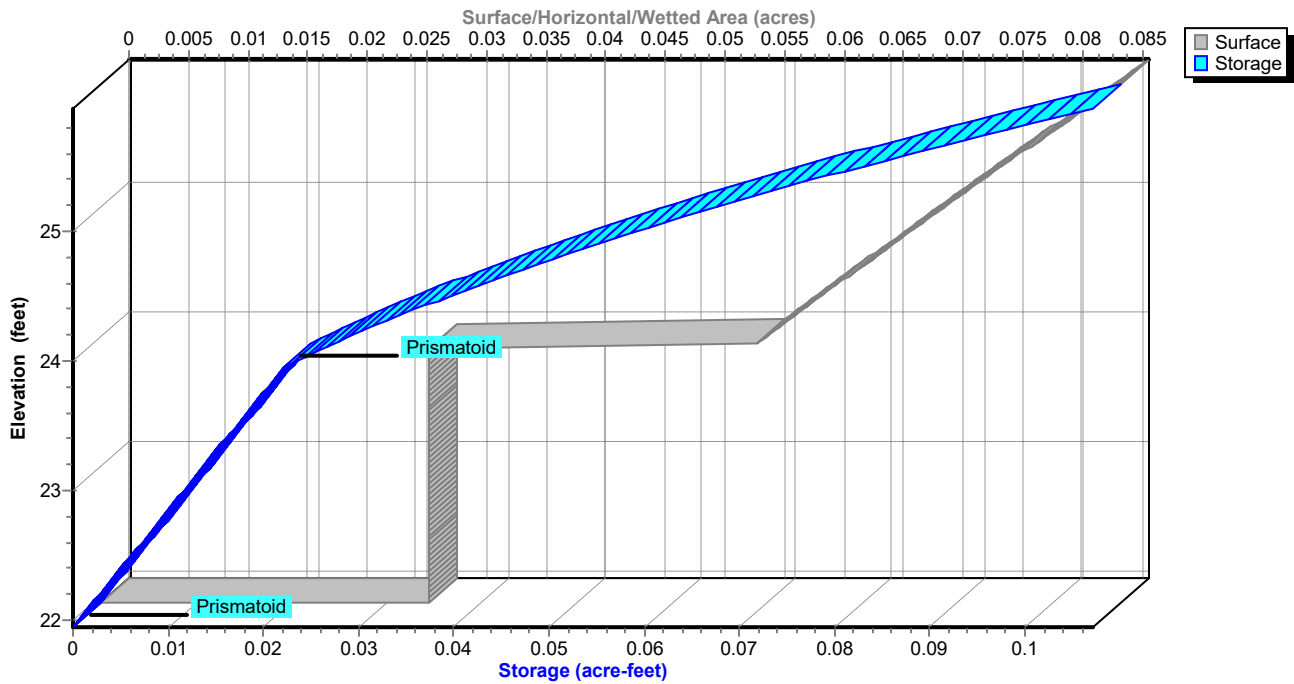
Pond BMP-19A1: (new Pond)

Hydrograph



Pond BMP-19A1: (new Pond)

Stage-Area-Storage



Summary for Subcatchment SC-19A2: 19A

Runoff = 0.69 cfs @ 12.13 hrs, Volume= 0.049 af, Depth> 0.68"

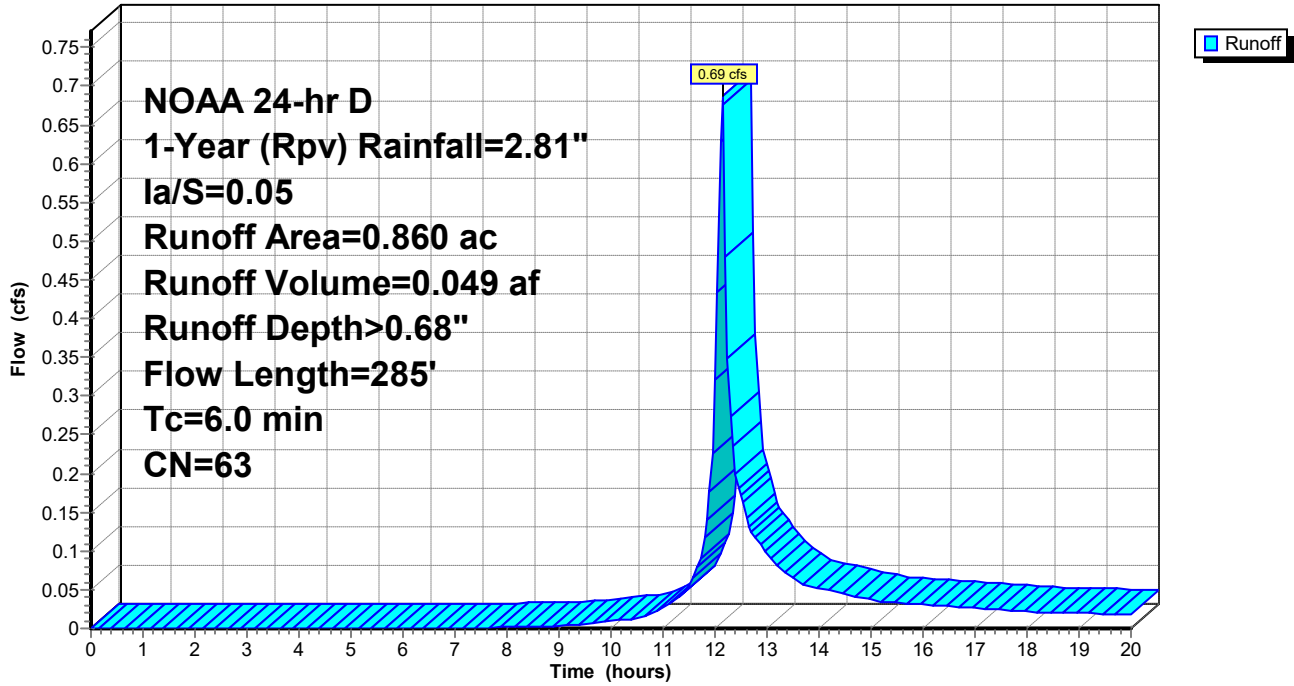
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-20.00 hrs, dt= 0.05 hrs
 NOAA 24-hr D 1-Year (Rpv) Rainfall=2.81", Ia/S=0.05

Area (ac)	CN	Description
0.510	39	>75% Grass cover, Good, HSG A
0.350	98	Paved roads w/curbs & sewers, HSG A
0.860	63	Weighted Average
0.510		59.30% Pervious Area
0.350		40.70% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.6	56	0.0434	1.70		Sheet Flow, Smooth surfaces n= 0.011 P2= 3.30"
0.1	6	0.0520	1.60		Shallow Concentrated Flow, Short Grass Pasture Kv= 7.0 fps
0.0	10	0.0280	3.40		Shallow Concentrated Flow, Paved Kv= 20.3 fps
0.2	45	0.2840	3.73		Shallow Concentrated Flow, Short Grass Pasture Kv= 7.0 fps
1.1	168	0.0023	2.44	46.28	Channel Flow, Area= 19.0 sf Perim= 18.3' r= 1.04' n= 0.030
2.0	285	Total, Increased to minimum Tc = 6.0 min			

Subcatchment SC-19A2: 19A

Hydrograph



Summary for Pond BMP-19A2: (new Pond)

Inflow Area = 0.860 ac, 40.70% Impervious, Inflow Depth > 0.68" for 1-Year (Rpv) event
 Inflow = 0.69 cfs @ 12.13 hrs, Volume= 0.049 af
 Outflow = 0.07 cfs @ 13.37 hrs, Volume= 0.049 af, Atten= 89%, Lag= 74.0 min
 Discarded = 0.07 cfs @ 13.37 hrs, Volume= 0.049 af
 Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 0.00-20.00 hrs, dt= 0.05 hrs
 Peak Elev= 23.34' @ 13.37 hrs Surf.Area= 0.032 ac Storage= 0.018 af

Plug-Flow detention time= 101.2 min calculated for 0.049 af (100% of inflow)
 Center-of-Mass det. time= 100.0 min (908.4 - 808.4)

Volume	Invert	Avail.Storage	Storage Description
#1	21.95'	0.026 af	8.00'W x 175.00'L x 2.00'H Prismatic 0.064 af Overall x 40.0% Voids
#2	23.95'	0.099 af	8.00'W x 175.00'L x 2.00'H Prismatic Z=2.0
		0.125 af	Total Available Storage

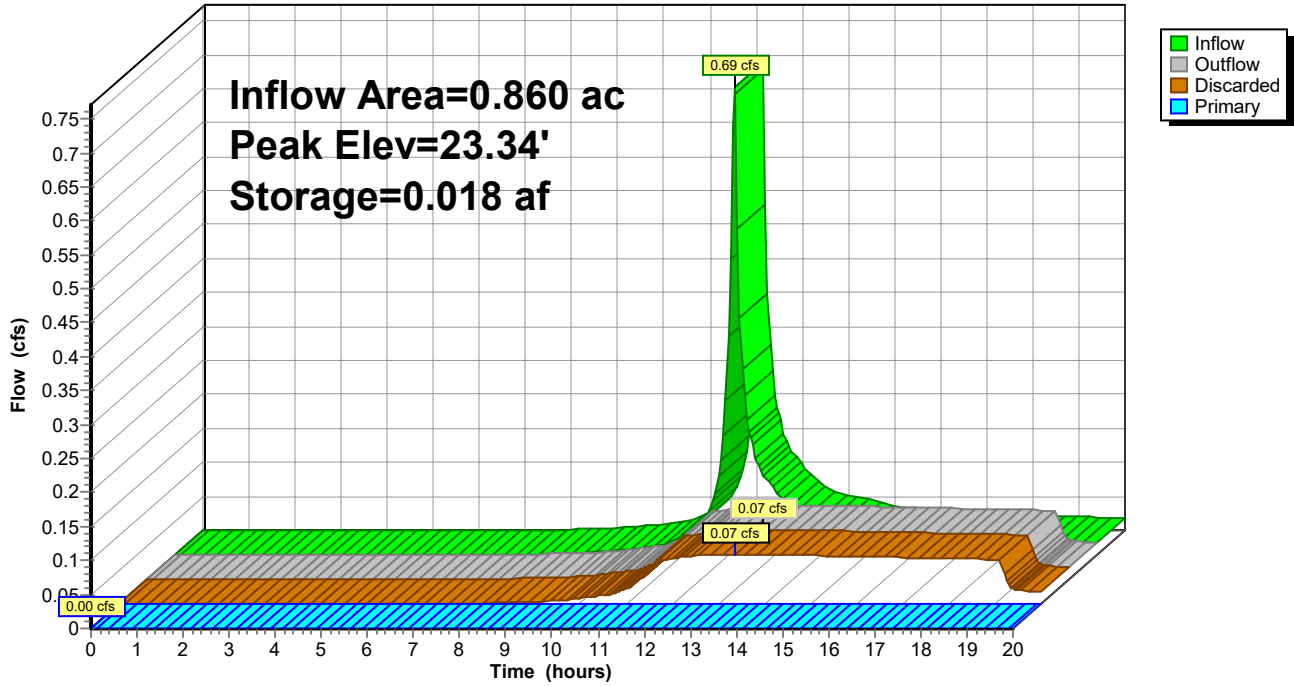
Device	Routing	Invert	Outlet Devices
#1	Discarded	21.95'	2.000 in/hr Exfiltration over Surface area Conductivity to Groundwater Elevation = 10.00'
#2	Primary	25.75'	16.0' long (Profile 1) Broad-Crested Rectangular Weir Head (feet) 0.49 0.98 1.48 Coef. (English) 2.92 3.37 3.59

Discarded OutFlow Max=0.07 cfs @ 13.37 hrs HW=23.34' (Free Discharge)
 ↑1=Exfiltration (Controls 0.07 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=21.95' (Free Discharge)
 ↑2=Broad-Crested Rectangular Weir (Controls 0.00 cfs)

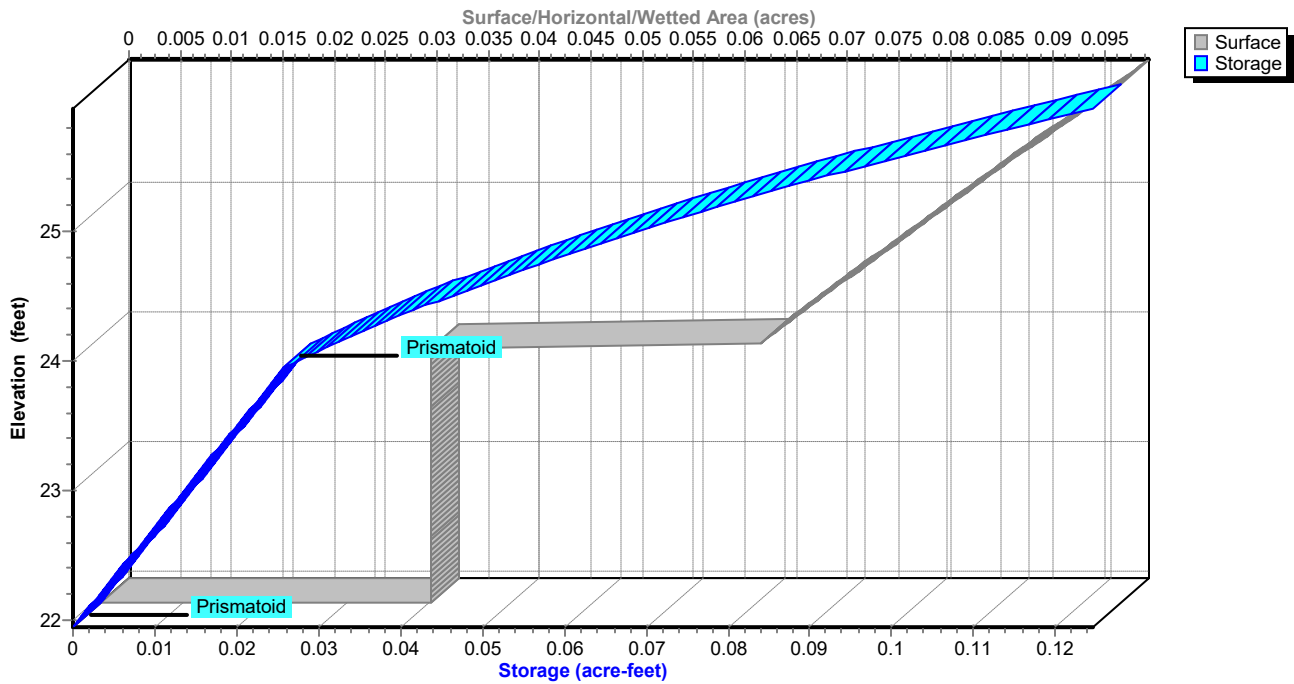
Pond BMP-19A2: (new Pond)

Hydrograph



Pond BMP-19A2: (new Pond)

Stage-Area-Storage



Summary for Subcatchment SC-19B: 19B

Runoff = 0.54 cfs @ 12.14 hrs, Volume= 0.038 af, Depth> 0.46"

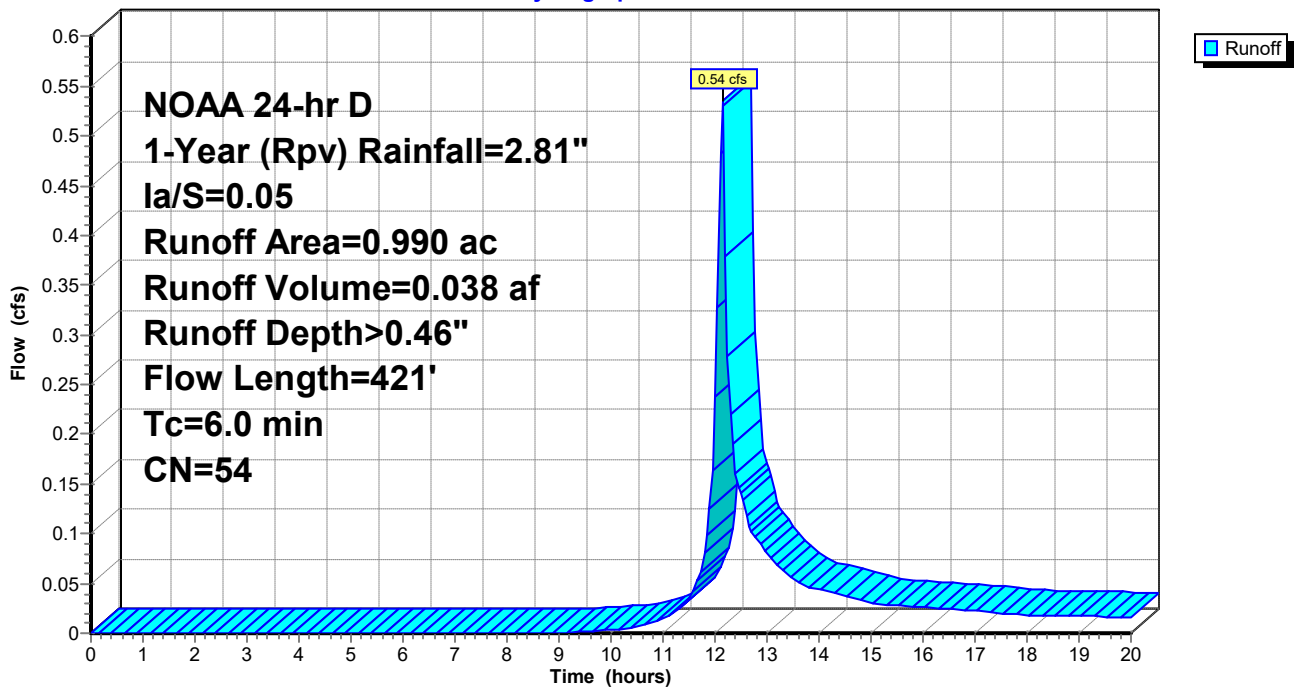
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-20.00 hrs, dt= 0.05 hrs
 NOAA 24-hr D 1-Year (Rpv) Rainfall=2.81", Ia/S=0.05

Area (ac)	CN	Description
0.740	39	>75% Grass cover, Good, HSG A
0.250	98	Paved roads w/curbs & sewers, HSG A
0.990	54	Weighted Average
0.740		74.75% Pervious Area
0.250		25.25% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.5	40	0.0239	1.25		Sheet Flow, Smooth surfaces n= 0.011 P2= 3.30"
0.4	91	0.3000	3.83		Shallow Concentrated Flow, Short Grass Pasture Kv= 7.0 fps
3.5	290	0.0010	1.39	16.67	Trap/Vee/Rect Channel Flow, Bot.W=2.00' D=1.50' Z= 4.0 '/' Top.W=14.00' n= 0.030
4.4	421	Total, Increased to minimum Tc = 6.0 min			

Subcatchment SC-19B: 19B

Hydrograph



Summary for Pond BMP-19B: (new Pond)

Inflow Area = 0.990 ac, 25.25% Impervious, Inflow Depth > 0.46" for 1-Year (Rpv) event
 Inflow = 0.54 cfs @ 12.14 hrs, Volume= 0.038 af
 Outflow = 0.08 cfs @ 13.04 hrs, Volume= 0.038 af, Atten= 85%, Lag= 54.0 min
 Discarded = 0.08 cfs @ 13.04 hrs, Volume= 0.038 af
 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= 0.00-20.00 hrs, dt= 0.05 hrs
 Peak Elev= 23.78' @ 13.04 hrs Surf.Area= 0.037 ac Storage= 0.011 af

Plug-Flow detention time= 53.7 min calculated for 0.038 af (99% of inflow)
 Center-of-Mass det. time= 52.4 min (872.6 - 820.2)

Volume	Invert	Avail.Storage	Storage Description
#1	23.00'	0.029 af	8.00'W x 200.00'L x 2.00'H Prismatic 0.073 af Overall x 40.0% Voids
#2	25.00'	0.113 af	8.00'W x 200.00'L x 2.00'H Prismatic Z=2.0
		0.142 af	Total Available Storage

Device	Routing	Invert	Outlet Devices
#1	Discarded	23.00'	2.000 in/hr Exfiltration over Surface area Conductivity to Groundwater Elevation = 10.00'
#2	Secondary	26.75'	16.0' long (Profile 1) Broad-Crested Rectangular Weir Head (feet) 0.49 0.98 1.48 Coef. (English) 2.92 3.37 3.59
#3	Primary	25.00'	24.0" Round CMP_Round 24" L= 230.0' CMP, end-section conforming to fill, Ke= 0.500 Inlet / Outlet Invert= 25.00' / 23.95' S= 0.0046 '/ Cc= 0.900 n= 0.024, Flow Area= 3.14 sf

Discarded OutFlow Max=0.08 cfs @ 13.04 hrs HW=23.78' (Free Discharge)

↑1=Exfiltration (Controls 0.08 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=23.00' (Free Discharge)

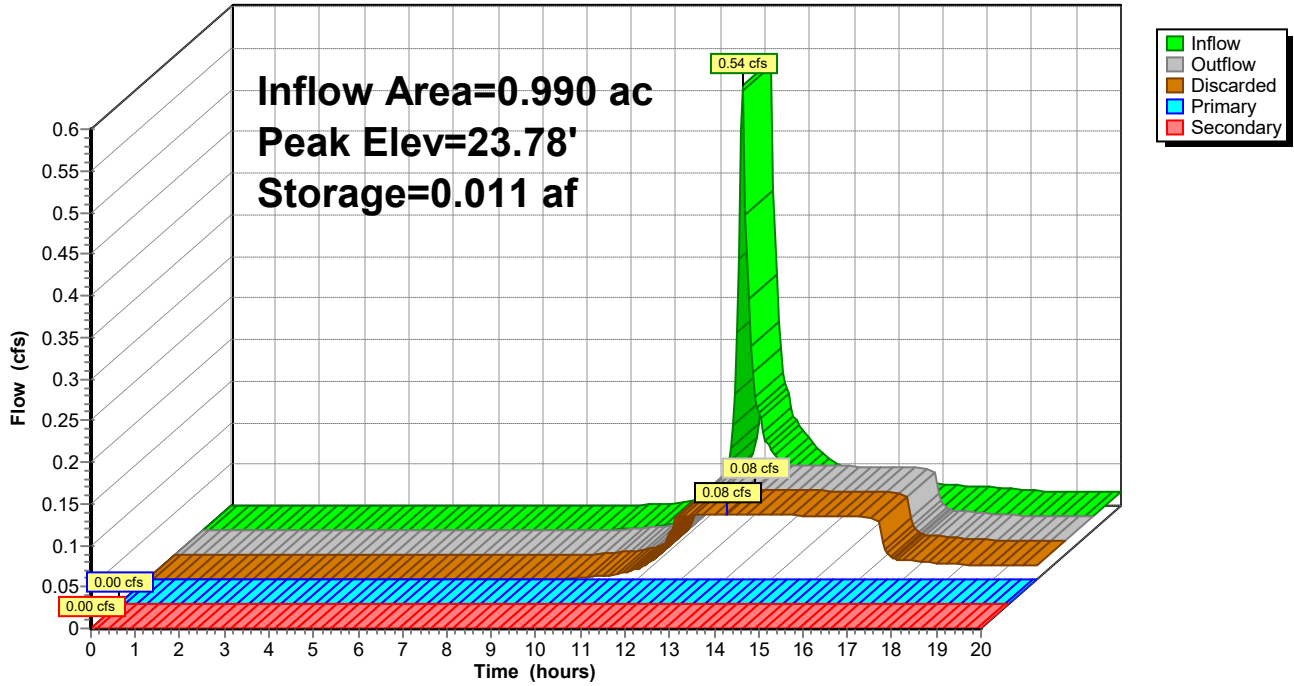
↑3=CMP_Round 24" (Controls 0.00 cfs)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=23.00' (Free Discharge)

↑2=Broad-Crested Rectangular Weir (Controls 0.00 cfs)

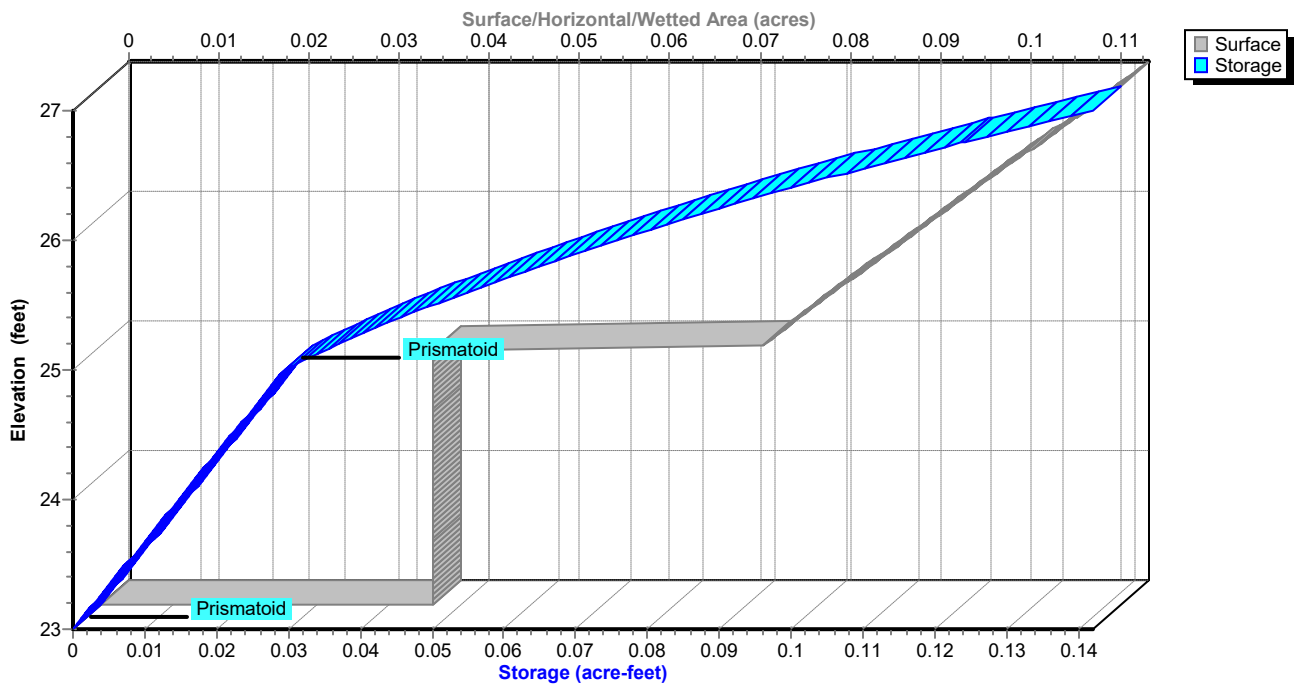
Pond BMP-19B: (new Pond)

Hydrograph



Pond BMP-19B: (new Pond)

Stage-Area-Storage



Summary for Subcatchment SC-19C: 19C

Runoff = 0.84 cfs @ 12.13 hrs, Volume= 0.059 af, Depth> 0.82"

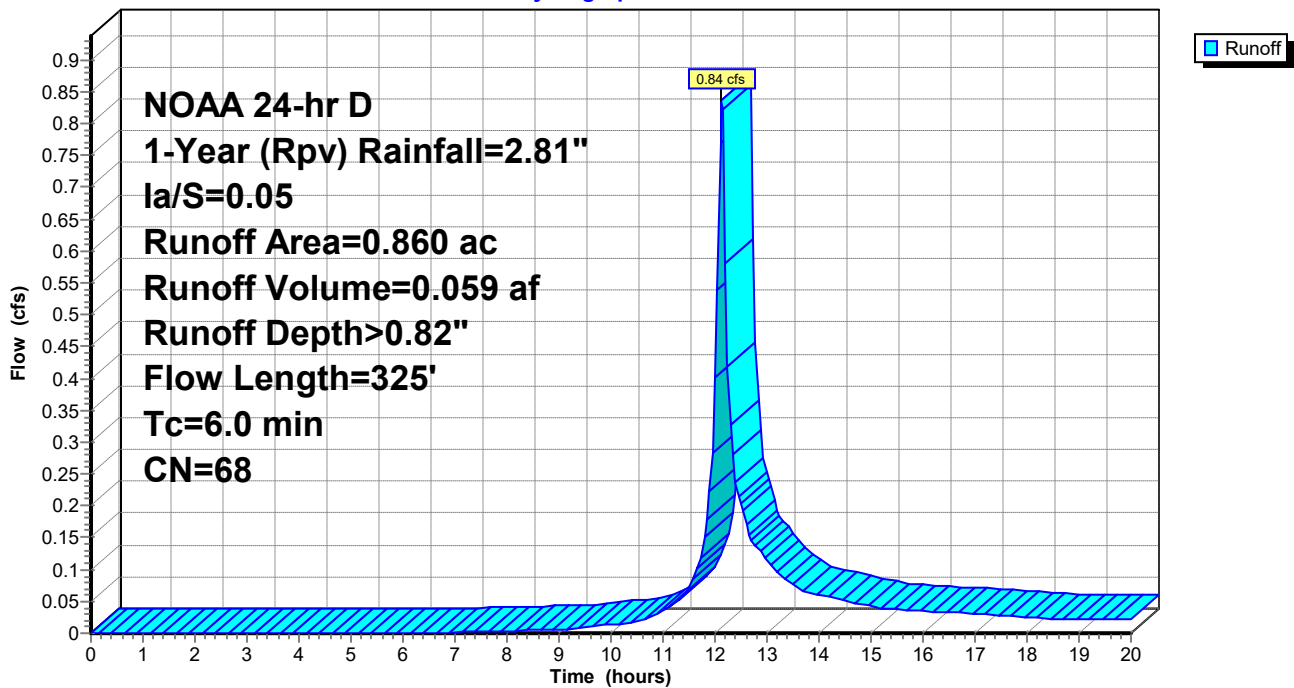
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-20.00 hrs, dt= 0.05 hrs
 NOAA 24-hr D 1-Year (Rpv) Rainfall=2.81", Ia/S=0.05

Area (ac)	CN	Description
0.440	39	>75% Grass cover, Good, HSG A
0.420	98	Paved roads w/curbs & sewers, HSG A
0.860	68	Weighted Average
0.440		51.16% Pervious Area
0.420		48.84% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.6	54	0.0366	1.57		Sheet Flow, Smooth surfaces n= 0.011 P2= 3.30"
0.2	53	0.2850	3.74		Shallow Concentrated Flow, Short Grass Pasture Kv= 7.0 fps
1.7	218	0.0025	2.20	26.36	Trap/Vee/Rect Channel Flow, Bot.W=2.00' D=1.50' Z= 4.0 '/' Top.W=14.00' n= 0.030
2.5	325	Total, Increased to minimum Tc = 6.0 min			

Subcatchment SC-19C: 19C

Hydrograph



Summary for Pond BMP-19C: (new Pond)

Inflow Area = 0.860 ac, 48.84% Impervious, Inflow Depth > 0.82" for 1-Year (Rpv) event
 Inflow = 0.84 cfs @ 12.13 hrs, Volume= 0.059 af
 Outflow = 0.10 cfs @ 13.14 hrs, Volume= 0.059 af, Atten= 88%, Lag= 60.1 min
 Discarded = 0.10 cfs @ 13.14 hrs, Volume= 0.059 af
 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= 0.00-20.00 hrs, dt= 0.05 hrs
 Peak Elev= 24.09' @ 13.14 hrs Surf.Area= 0.046 ac Storage= 0.020 af

Plug-Flow detention time= 75.2 min calculated for 0.059 af (99% of inflow)
 Center-of-Mass det. time= 73.9 min (875.8 - 801.9)

Volume	Invert	Avail.Storage	Storage Description
#1	23.00'	0.037 af	8.00'W x 250.00'L x 2.00'H Prismatic 0.092 af Overall x 40.0% Voids
#2	25.00'	0.140 af	8.00'W x 250.00'L x 2.00'H Prismatic Z=2.0
		0.177 af	Total Available Storage

Device	Routing	Invert	Outlet Devices
#1	Discarded	23.00'	2.000 in/hr Exfiltration over Surface area Conductivity to Groundwater Elevation = 10.00'
#2	Secondary	26.75'	16.0' long (Profile 1) Broad-Crested Rectangular Weir Head (feet) 0.49 0.98 1.48 Coef. (English) 2.92 3.37 3.59
#3	Primary	25.00'	24.0" Round CMP_Round 24" L= 230.0' CMP, end-section conforming to fill, Ke= 0.500 Inlet / Outlet Invert= 25.00' / 23.95' S= 0.0046 '/' Cc= 0.900 n= 0.024, Flow Area= 3.14 sf

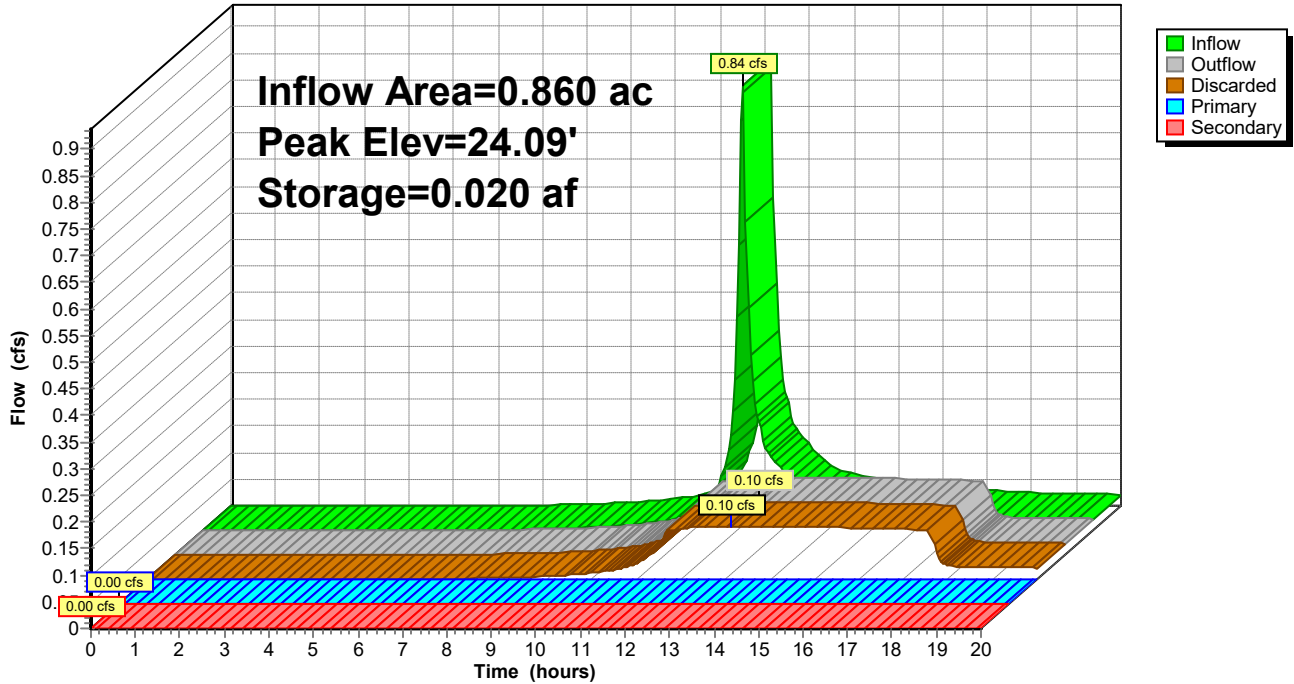
Discarded OutFlow Max=0.10 cfs @ 13.14 hrs HW=24.09' (Free Discharge)
 ↑1=Exfiltration (Controls 0.10 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=23.00' (Free Discharge)
 ↑3=CMP_Round 24" (Controls 0.00 cfs)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=23.00' (Free Discharge)
 ↑2=Broad-Crested Rectangular Weir (Controls 0.00 cfs)

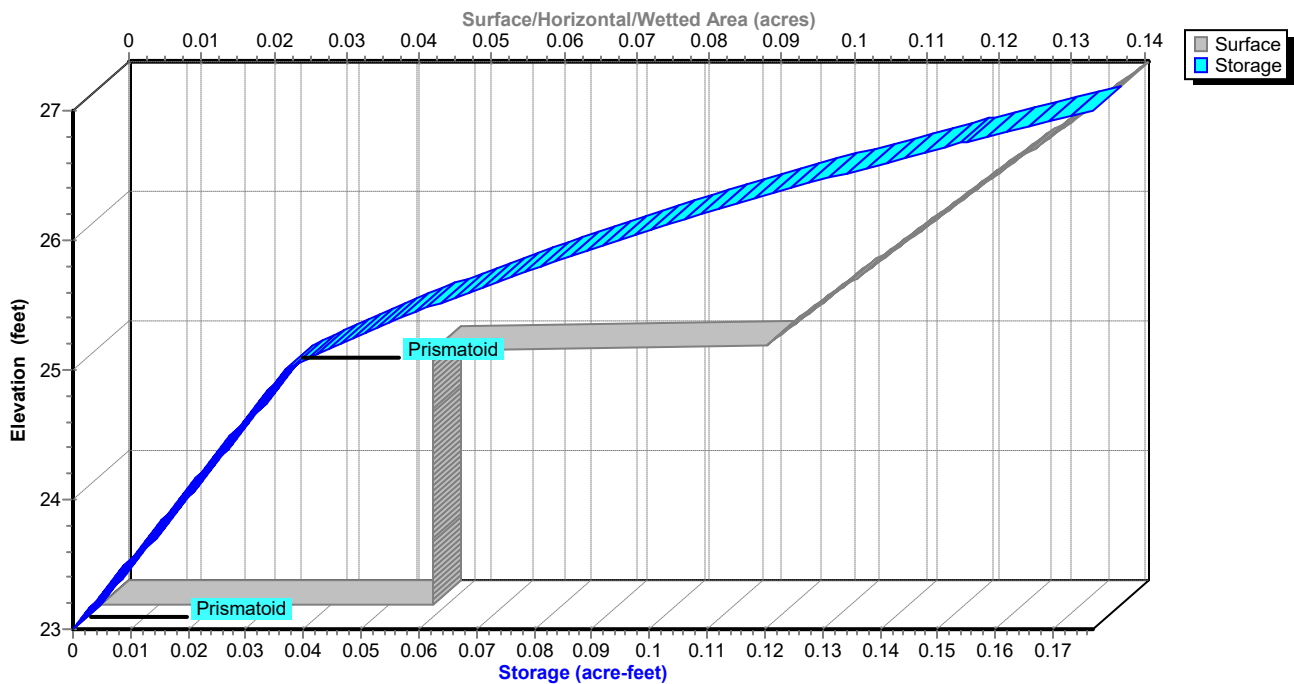
Pond BMP-19C: (new Pond)

Hydrograph



Pond BMP-19C: (new Pond)

Stage-Area-Storage



Summary for Subcatchment SC-19D: 19D

Runoff = 1.94 cfs @ 12.74 hrs, Volume= 0.339 af, Depth> 0.32"

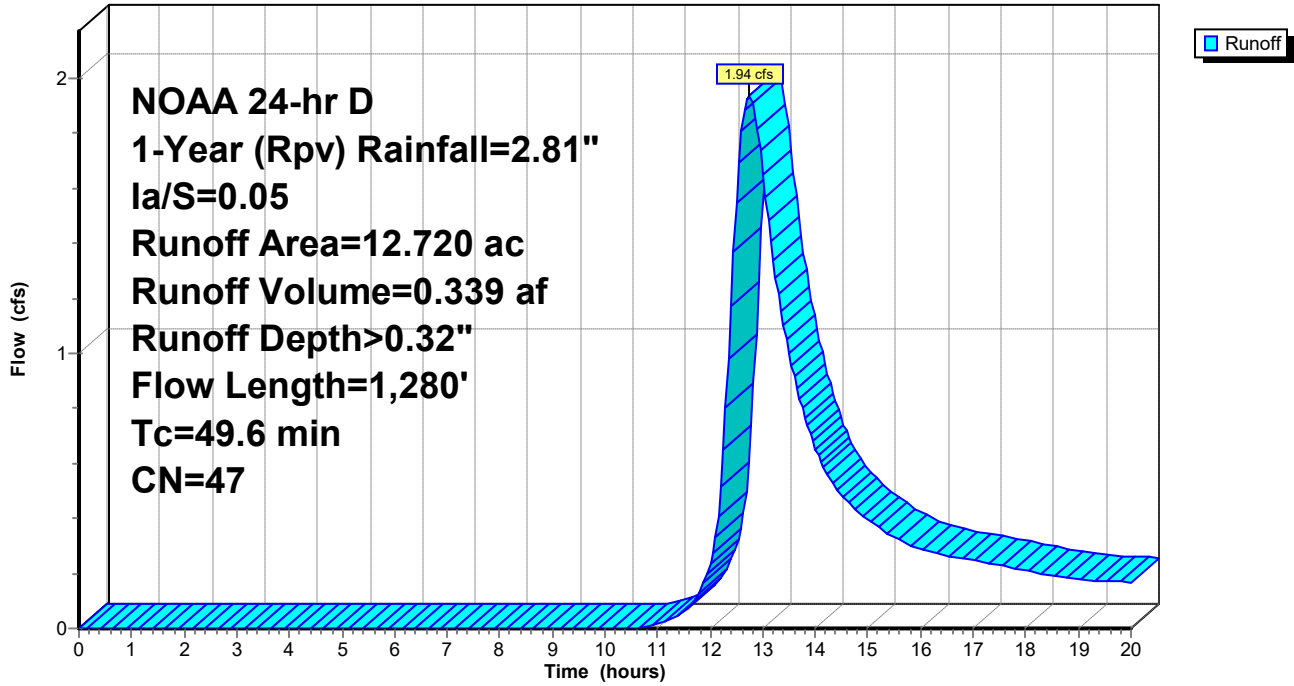
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-20.00 hrs, dt= 0.05 hrs
 NOAA 24-hr D 1-Year (Rpv) Rainfall=2.81", Ia/S=0.05

Area (ac)	CN	Description
10.940	39	>75% Grass cover, Good, HSG A
1.780	98	Paved roads w/curbs & sewers, HSG A
12.720	47	Weighted Average
10.940		86.01% Pervious Area
1.780		13.99% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.8	50	0.0280	0.17		Sheet Flow, Grass: Short n= 0.150 P2= 3.30"
0.3	21	0.0280	1.17		Shallow Concentrated Flow, Short Grass Pasture Kv= 7.0 fps
1.9	108	0.0192	0.97		Shallow Concentrated Flow, Short Grass Pasture Kv= 7.0 fps
2.3	83	0.0073	0.60		Shallow Concentrated Flow, Short Grass Pasture Kv= 7.0 fps
3.1	72	0.0030	0.38		Shallow Concentrated Flow, Short Grass Pasture Kv= 7.0 fps
2.0	27	0.0010	0.22		Shallow Concentrated Flow, Short Grass Pasture Kv= 7.0 fps
0.2	55	0.0050	4.55	8.05	Pipe Channel, RCP_Round 18" 18.0" Round Area= 1.8 sf Perim= 4.7' r= 0.38' n= 0.012
2.1	60	0.0048	0.48		Shallow Concentrated Flow, Short Grass Pasture Kv= 7.0 fps
16.2	215	0.0010	0.22		Shallow Concentrated Flow, Short Grass Pasture Kv= 7.0 fps
10.5	233	0.0028	0.37		Shallow Concentrated Flow, Short Grass Pasture Kv= 7.0 fps
4.8	126	0.0039	0.44		Shallow Concentrated Flow, Short Grass Pasture Kv= 7.0 fps
1.4	230	0.0050	2.76	8.66	Pipe Channel, CMP_Round 24" 24.0" Round Area= 3.1 sf Perim= 6.3' r= 0.50' n= 0.024
49.6	1,280	Total			

Subcatchment SC-19D: 19D

Hydrograph

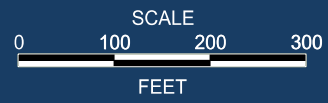




APPENDIX J

POI-20








- POI-20 Drainage Area Maps
- HydroCAD Calculations

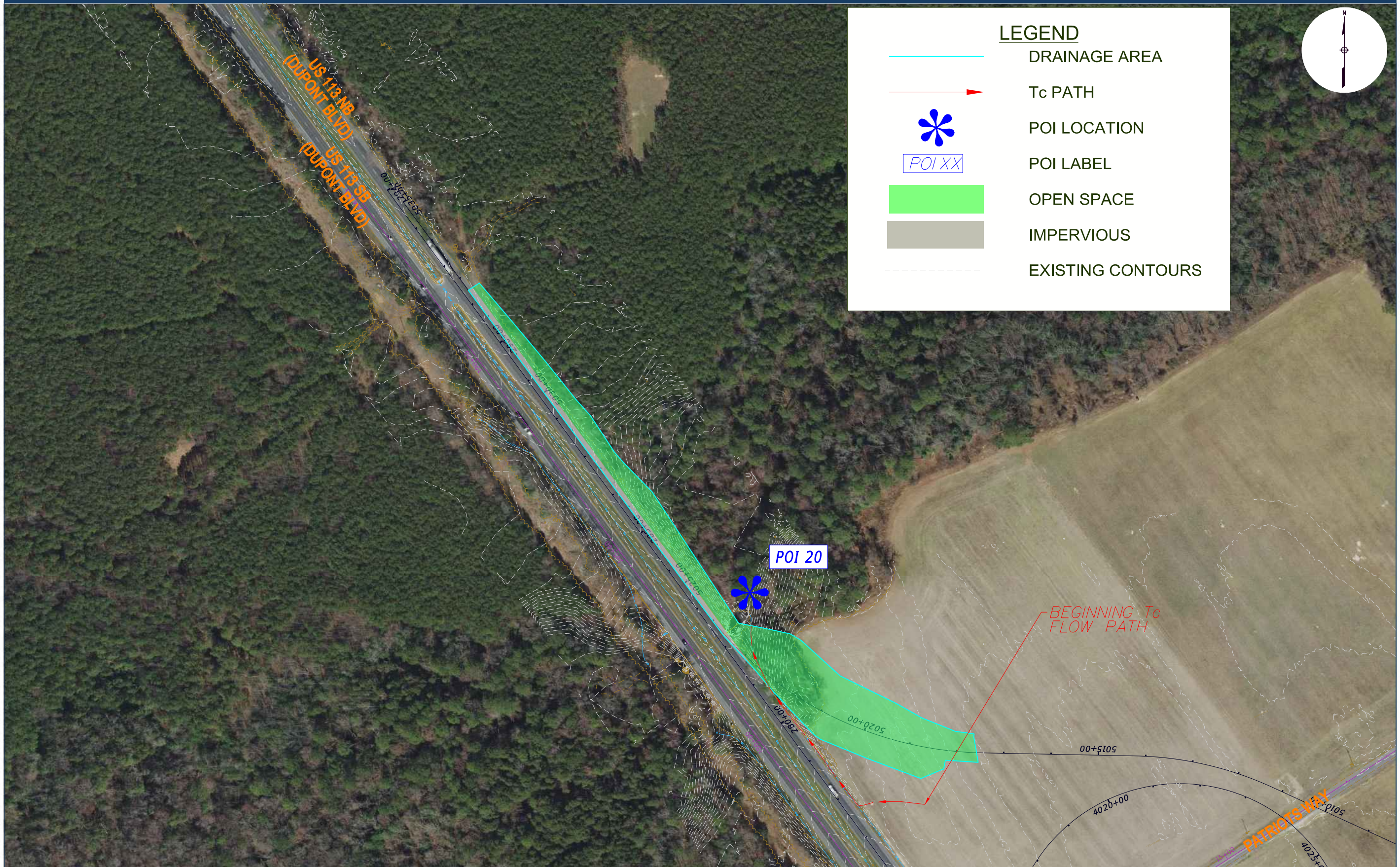


NORTH MILLSBORO BYPASS, US 113 TO SR 24

CONTRACT NO. T201912701
SUSSEX COUNTY

LEGEND

-  DRAINAGE AREA
-  Tc PATH
-  POI LOCATION
-  POI LABEL
-  OPEN SPACE
-  IMPERVIOUS
-  EXISTING CONTOURS



Summary for Subcatchment SC-20A: SC-20A

Runoff = 0.29 cfs @ 12.17 hrs, Volume= 0.025 af, Depth> 0.20"

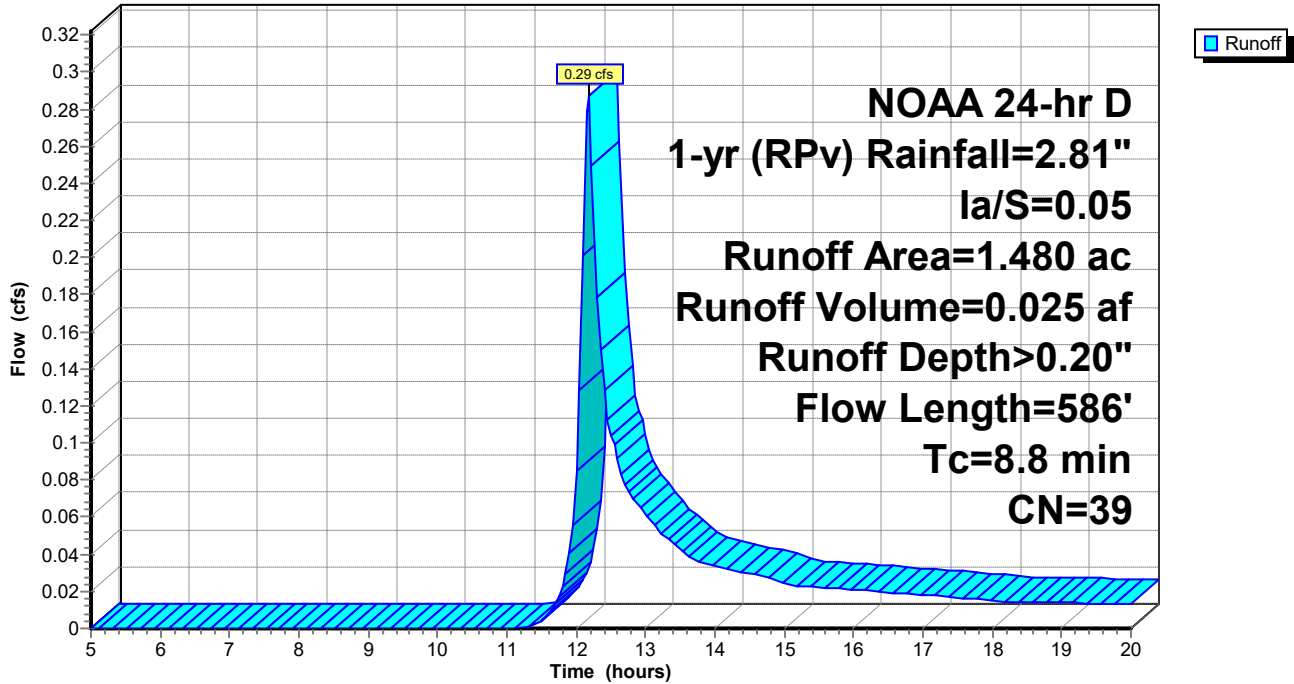
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
 NOAA 24-hr D 1-yr (RPv) Rainfall=2.81", Ia/S=0.05

Area (ac)	CN	Description
1.470	39	>75% Grass cover, Good, HSG A
0.010	98	Paved roads w/curbs & sewers, HSG A
1.480	39	Weighted Average
1.470		99.32% Pervious Area
0.010		0.68% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.8	52	0.0194	0.15		Sheet Flow, Grass: Short n= 0.150 P2= 3.30"
1.1	60	0.0179	0.94		Shallow Concentrated Flow, Short Grass Pasture Kv= 7.0 fps
0.2	31	0.1190	2.41		Shallow Concentrated Flow, Short Grass Pasture Kv= 7.0 fps
1.4	243	0.0122	2.93	7.63	Channel Flow, Area= 2.6 sf Perim= 17.0' r= 0.15' n= 0.016 Asphalt, rough
0.3	200	0.0577	10.44	197.29	Channel Flow, Area= 18.9 sf Perim= 23.0' r= 0.82' n= 0.030
8.8	586	Total			

Subcatchment SC-20A: SC-20A

Hydrograph



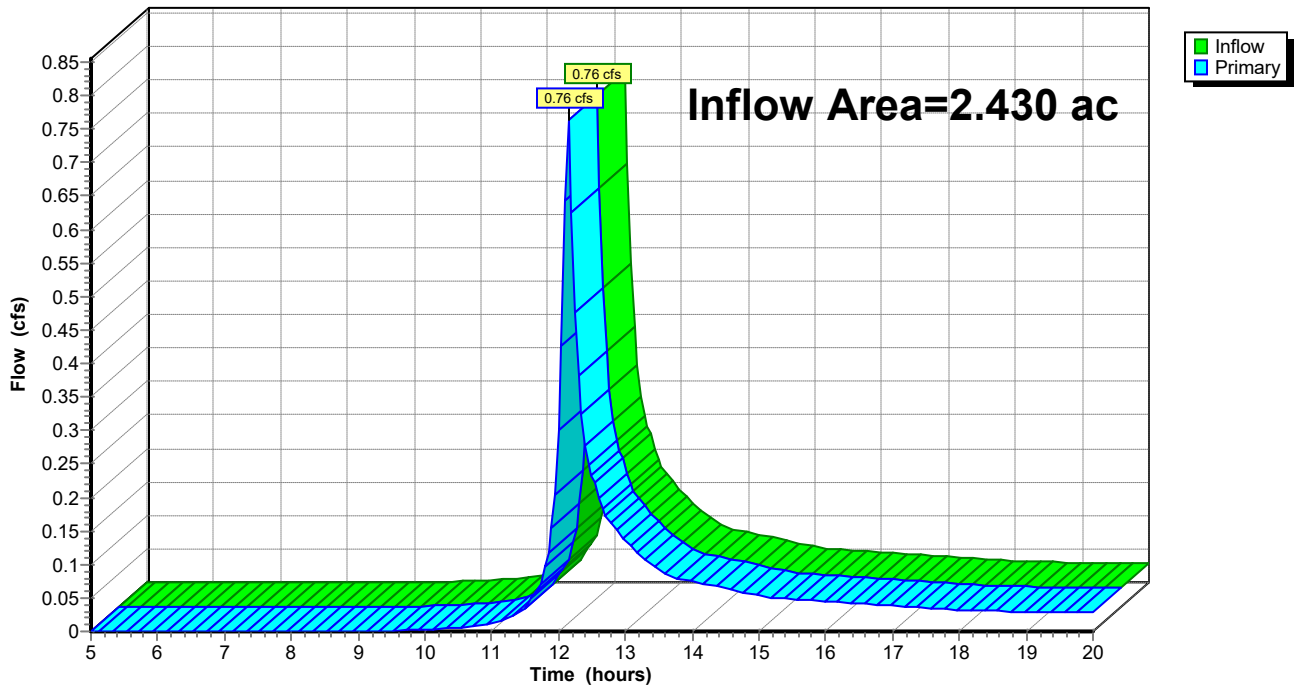
Summary for Link POI20: LOI20

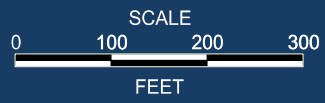
Inflow Area = 2.430 ac, 9.47% Impervious, Inflow Depth > 0.30" for 1-yr (RPv) event
Inflow = 0.76 cfs @ 12.15 hrs, Volume= 0.060 af
Primary = 0.76 cfs @ 12.15 hrs, Volume= 0.060 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Link POI20: LOI20

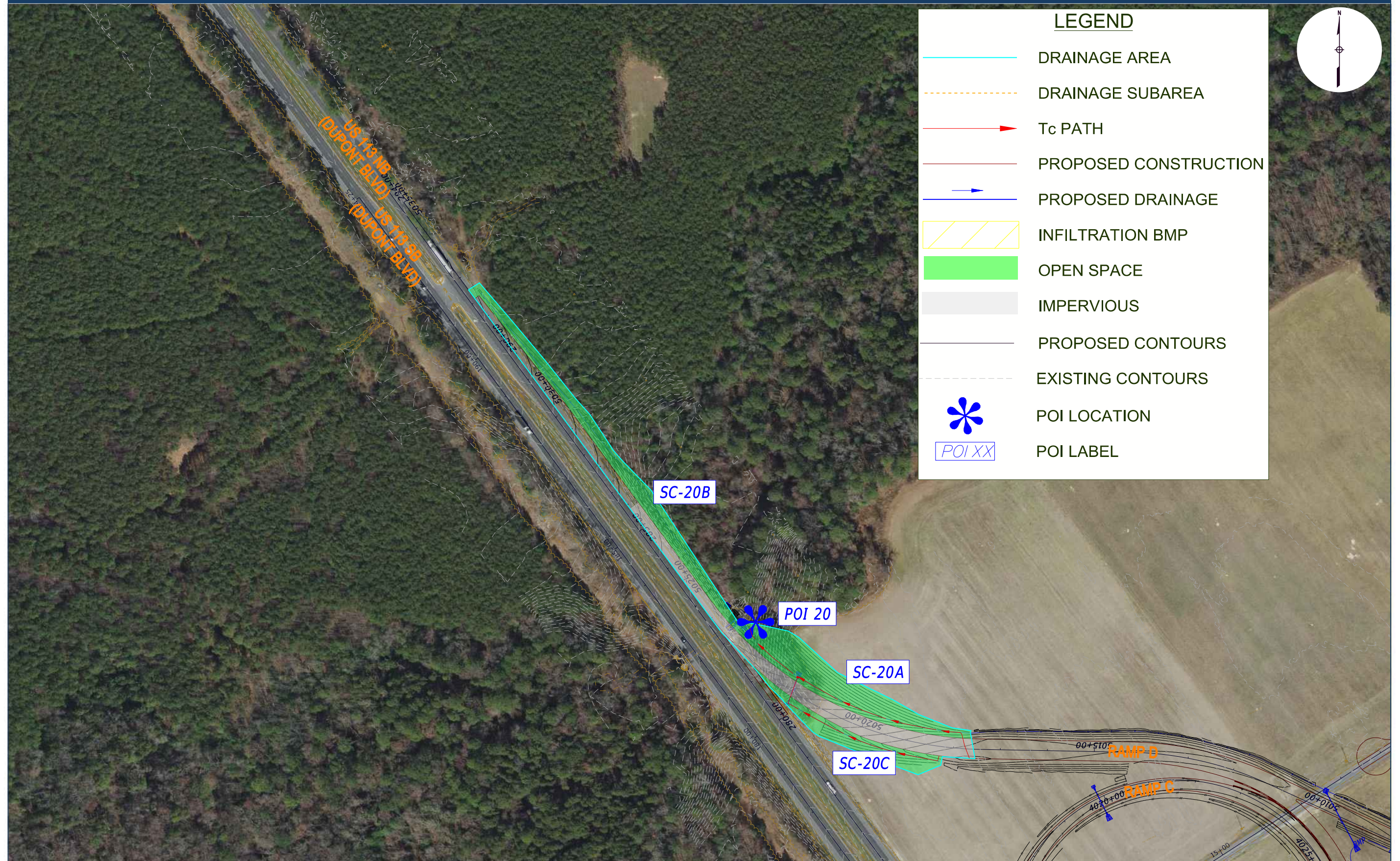
Hydrograph





NORTH MILLSBORO BYPASS, US 113 TO SR 24

CONTRACT NO. T201912701
SUSSEX COUNTY



LEGEND	
	DRAINAGE AREA
	DRAINAGE SUBAREA
	Tc PATH
	PROPOSED CONSTRUCTION
	PROPOSED DRAINAGE
	INFILTRATION BMP
	OPEN SPACE
	IMPERVIOUS
	PROPOSED CONTOURS
	EXISTING CONTOURS
	POI LOCATION
	POI LABEL



Summary for Subcatchment SC-20A: SC-20A

Runoff = 2.08 cfs @ 12.13 hrs, Volume= 0.147 af, Depth> 1.19"

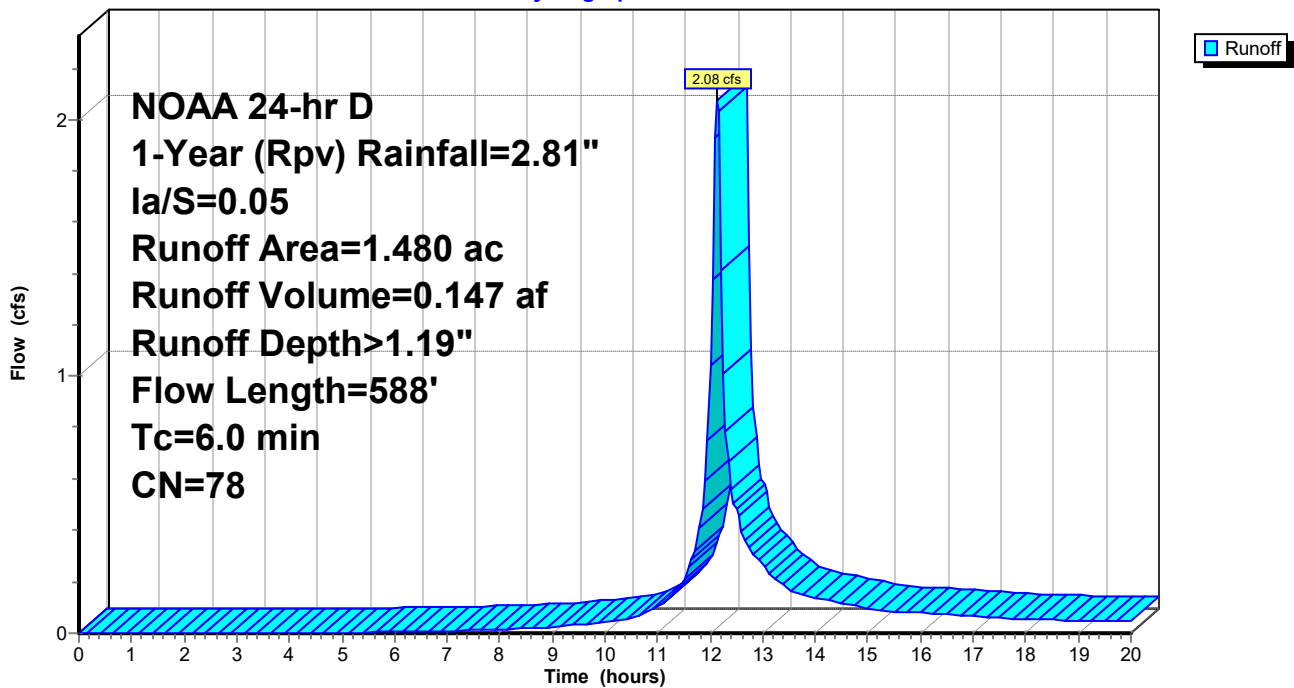
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-20.00 hrs, dt= 0.05 hrs
 NOAA 24-hr D 1-Year (Rpv) Rainfall=2.81", Ia/S=0.05

Area (ac)	CN	Description
0.990	98	Paved roads w/curbs & sewers, HSG A
0.490	39	>75% Grass cover, Good, HSG A
1.480	78	Weighted Average
0.490		33.11% Pervious Area
0.990		66.89% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.4	44	0.0462	1.66		Sheet Flow, Smooth surfaces n= 0.011 P2= 3.30"
0.8	12	0.1380	0.24		Sheet Flow, Grass: Short n= 0.150 P2= 3.30"
1.3	532	0.0223	6.71	131.46	Channel Flow, Area= 19.6 sf Perim= 22.7' r= 0.86' n= 0.030 Earth, grassed & winding
2.5	588	Total, Increased to minimum Tc = 6.0 min			

Subcatchment SC-20A: SC-20A

Hydrograph



Summary for Subcatchment SC-20B: SC-20B

Runoff = 0.82 cfs @ 12.13 hrs, Volume= 0.058 af, Depth> 0.73"

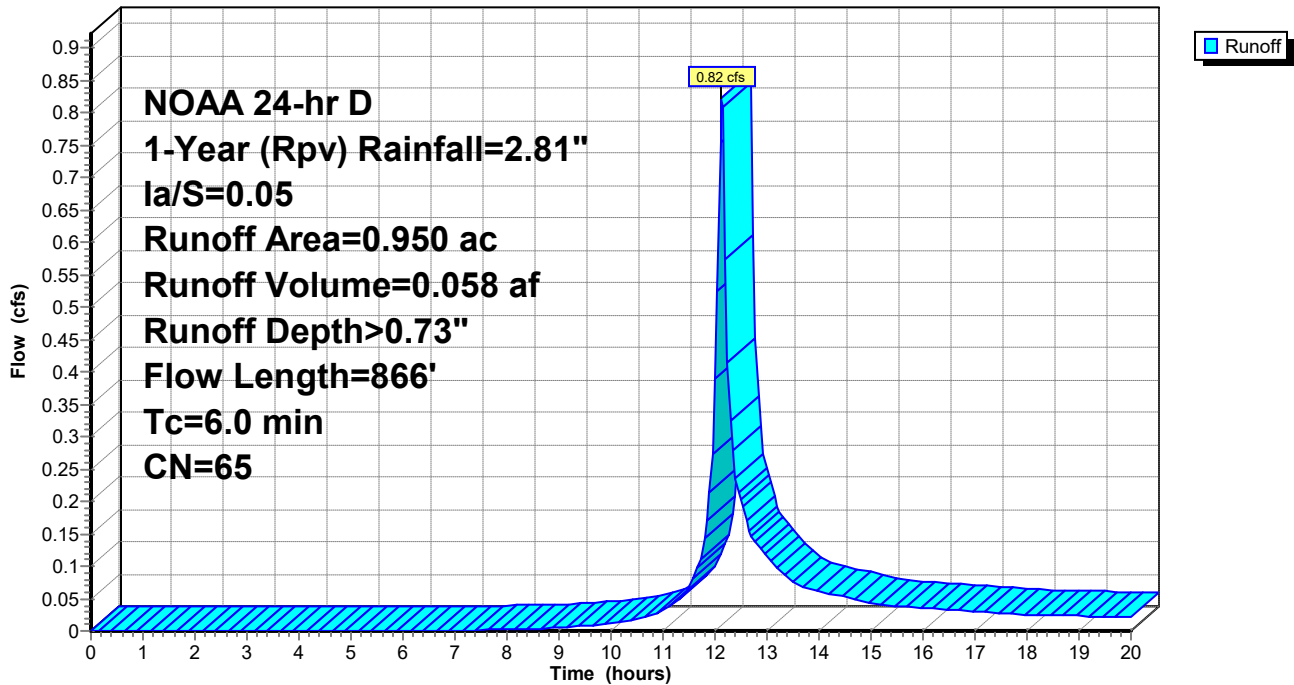
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-20.00 hrs, dt= 0.05 hrs
 NOAA 24-hr D 1-Year (Rpv) Rainfall=2.81", Ia/S=0.05

Area (ac)	CN	Description
* 0.530	39	
* 0.420	98	
0.950	65	Weighted Average
0.530		55.79% Pervious Area
0.420		44.21% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.2	11	0.0395	1.18		Sheet Flow, Smooth surfaces n= 0.011 P2= 3.30"
0.6	8	0.1350	0.22		Sheet Flow, Grass: Short n= 0.150 P2= 3.30"
4.1	847	0.0100	3.45	28.61	Channel Flow, Area= 8.3 sf Perim= 14.3' r= 0.58' n= 0.030
4.9	866	Total, Increased to minimum Tc = 6.0 min			

Subcatchment SC-20B: SC-20B

Hydrograph

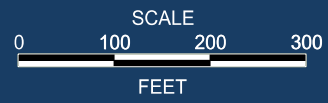




APPENDIX K

POI-21, POI-22, & POI-23

- POI Drainage Area Maps
- POI-21 HydroCAD Calculations
- POI-22 HydroCAD Calculations
- POI-23 HydroCAD Calculations



NORTH MILLSBORO BYPASS, US 113 TO SR 24

CONTRACT NO. T201912701
SUSSEX COUNTY



LEGEND	
	DRAINAGE AREA
	Tc PATH
	POI LOCATION
	POI LABEL
	OPEN SPACE
	IMPERVIOUS
	EXISTING CONTOURS



Summary for Subcatchment SC-21: SC-21

Runoff = 4.10 cfs @ 12.14 hrs, Volume= 0.290 af, Depth> 0.65"

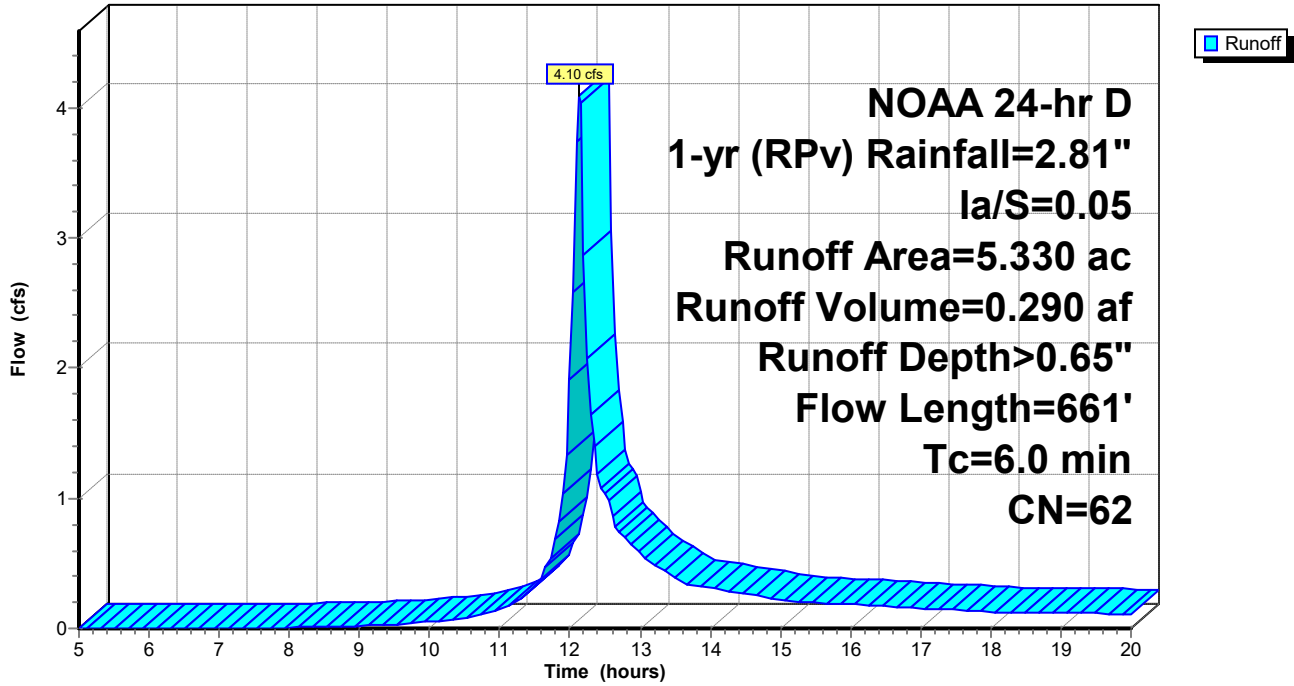
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
 NOAA 24-hr D 1-yr (RPv) Rainfall=2.81", Ia/S=0.05

Area (ac)	CN	Description
2.040	98	Paved roads w/curbs & sewers, HSG A
3.290	39	>75% Grass cover, Good, HSG A
5.330	62	Weighted Average
3.290		61.73% Pervious Area
2.040		38.27% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.4	26	0.0172	1.00		Sheet Flow, Smooth surfaces n= 0.011 P2= 3.30"
1.4	58	0.0100	0.70		Shallow Concentrated Flow, Short Grass Pasture Kv= 7.0 fps
0.1	40	0.0360	5.26	7.90	Pipe Channel, 12.0" x 18.0" Box Area= 1.5 sf Perim= 5.0' r= 0.30' n= 0.024
0.6	135	0.0104	3.62	13.39	Channel Flow, Area= 3.7 sf Perim= 6.1' r= 0.61' n= 0.030
0.1	40	0.0250	4.51	5.53	Pipe Channel, RCP_Round 15" 15.0" Round Area= 1.2 sf Perim= 3.9' r= 0.31' n= 0.024
1.6	303	0.0065	3.19	28.72	Channel Flow, Area= 9.0 sf Perim= 12.6' r= 0.71' n= 0.030
0.2	59	0.0050	4.55	8.05	Pipe Channel, RCP_Round 18" 18.0" Round Area= 1.8 sf Perim= 4.7' r= 0.38' n= 0.012
4.4	661	Total, Increased to minimum Tc = 6.0 min			

Subcatchment SC-21: SC-21

Hydrograph



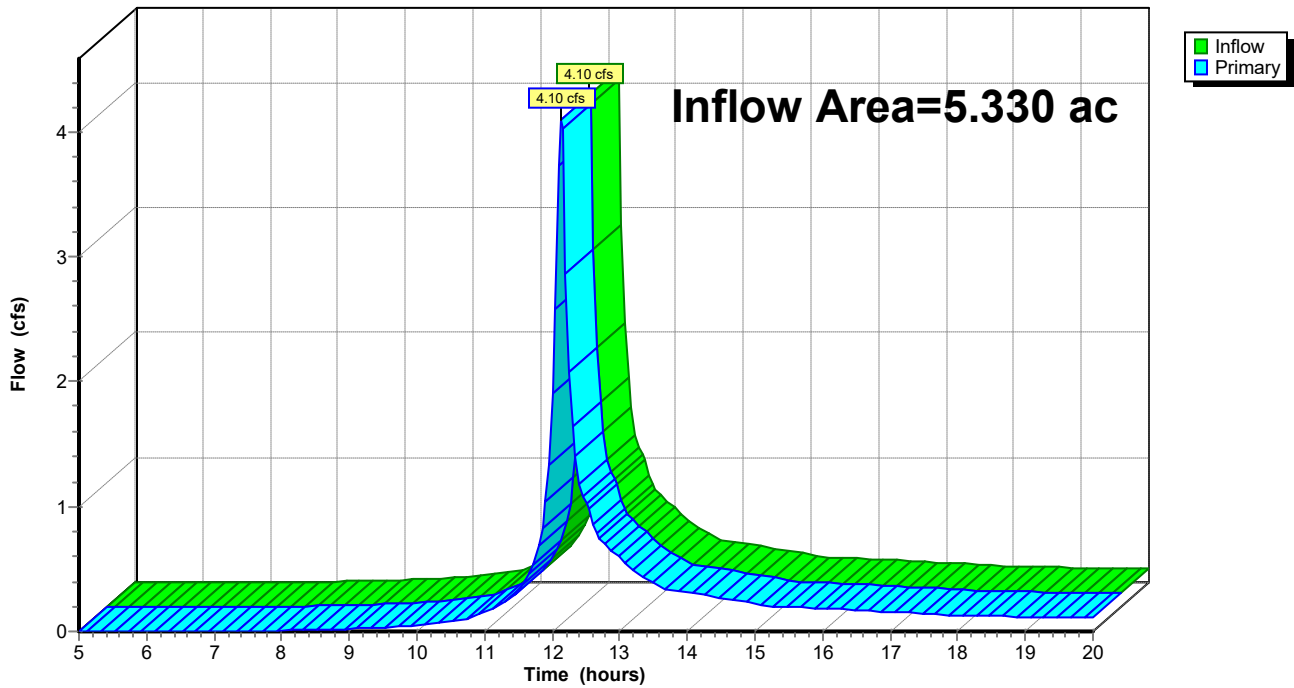
Summary for Link POI21: POI21

Inflow Area = 5.330 ac, 38.27% Impervious, Inflow Depth > 0.65" for 1-yr (RPv) event
Inflow = 4.10 cfs @ 12.14 hrs, Volume= 0.290 af
Primary = 4.10 cfs @ 12.14 hrs, Volume= 0.290 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Link POI21: POI21

Hydrograph



Summary for Subcatchment SC-22: 22

Runoff = 0.74 cfs @ 12.14 hrs, Volume= 0.053 af, Depth> 0.44"

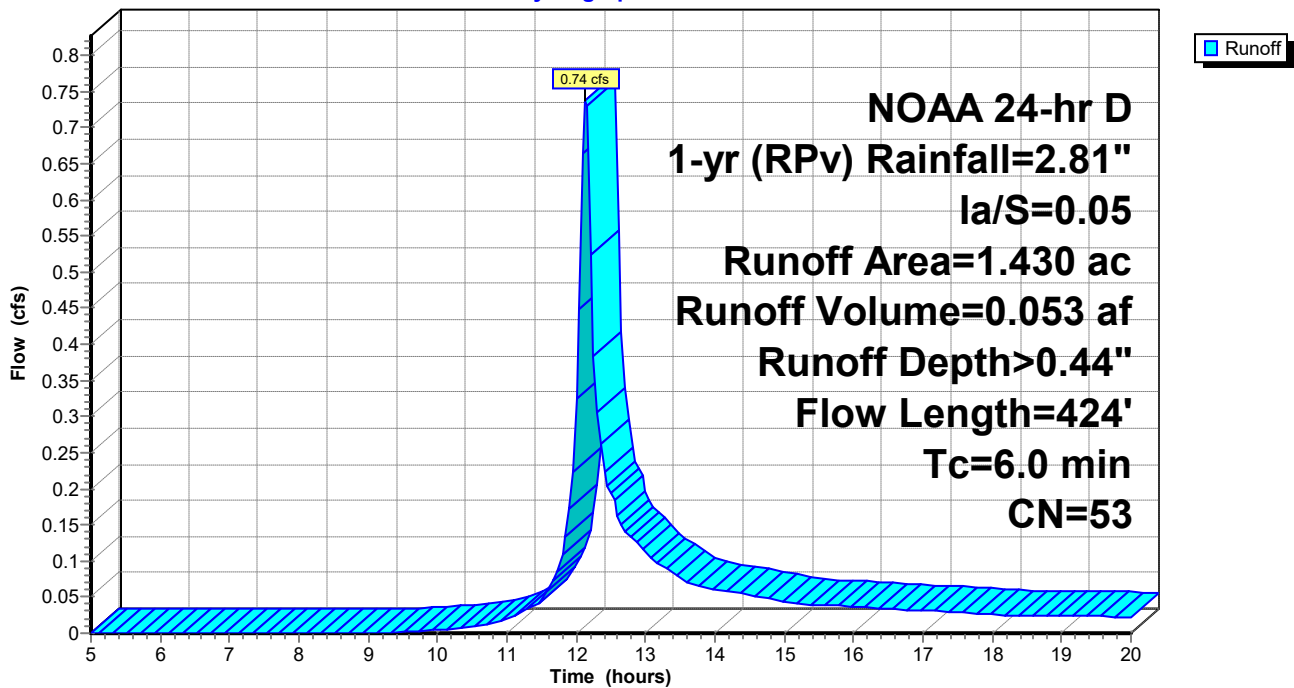
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
 NOAA 24-hr D 1-yr (RPv) Rainfall=2.81", Ia/S=0.05

Area (ac)	CN	Description
0.340	98	Paved roads w/curbs & sewers, HSG A
1.090	39	>75% Grass cover, Good, HSG A
1.430	53	Weighted Average
1.090		76.22% Pervious Area
0.340		23.78% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.3	18	0.0200	0.99		Sheet Flow, Smooth surfaces n= 0.011 P2= 3.30"
0.2	25	0.0800	1.98		Shallow Concentrated Flow, Short Grass Pasture Kv= 7.0 fps
1.3	381	0.0150	4.72	38.50	Trap/Vee/Rect Channel Flow, Bot.W=2.00' D=1.20' Z= 4.0 '/' Top.W=11.60' n= 0.030
1.8	424	Total, Increased to minimum Tc = 6.0 min			

Subcatchment SC-22: 22

Hydrograph



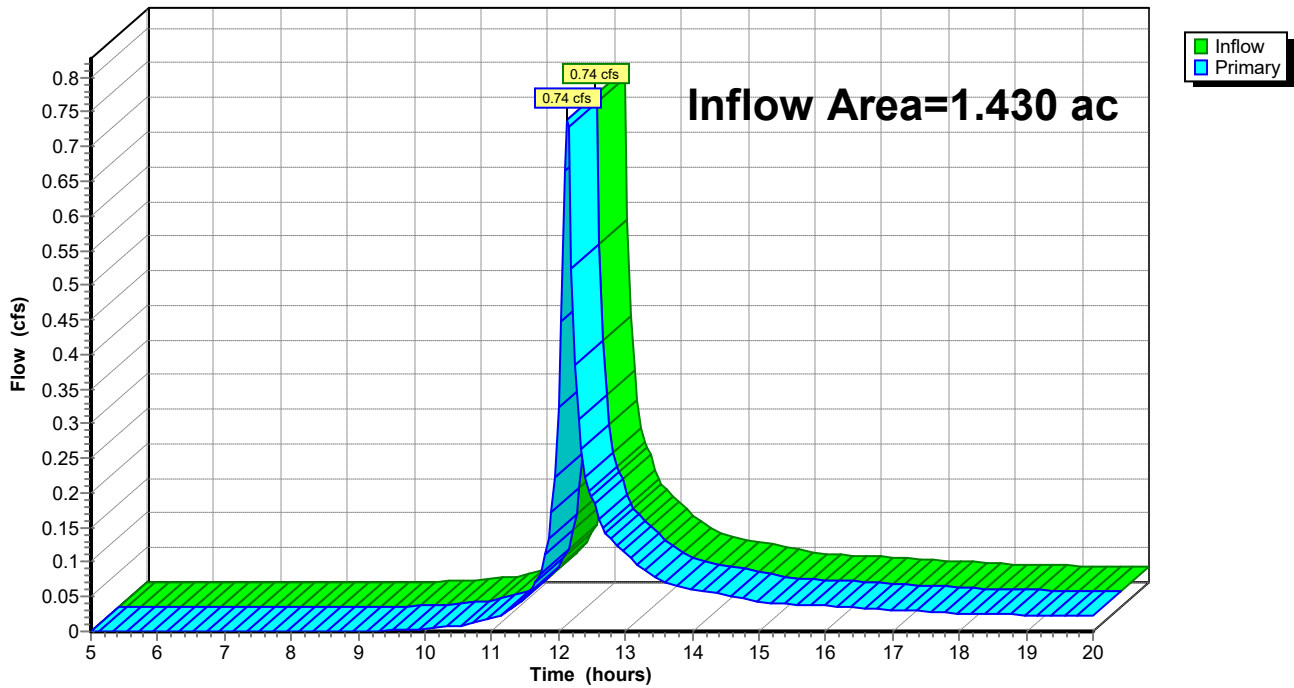
Summary for Link POI22: (new Link)

Inflow Area = 1.430 ac, 23.78% Impervious, Inflow Depth > 0.44" for 1-yr (RPv) event
Inflow = 0.74 cfs @ 12.14 hrs, Volume= 0.053 af
Primary = 0.74 cfs @ 12.14 hrs, Volume= 0.053 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Link POI22: (new Link)

Hydrograph



Summary for Subcatchment SC-23: 23

Runoff = 4.24 cfs @ 12.14 hrs, Volume= 0.302 af, Depth> 0.51"

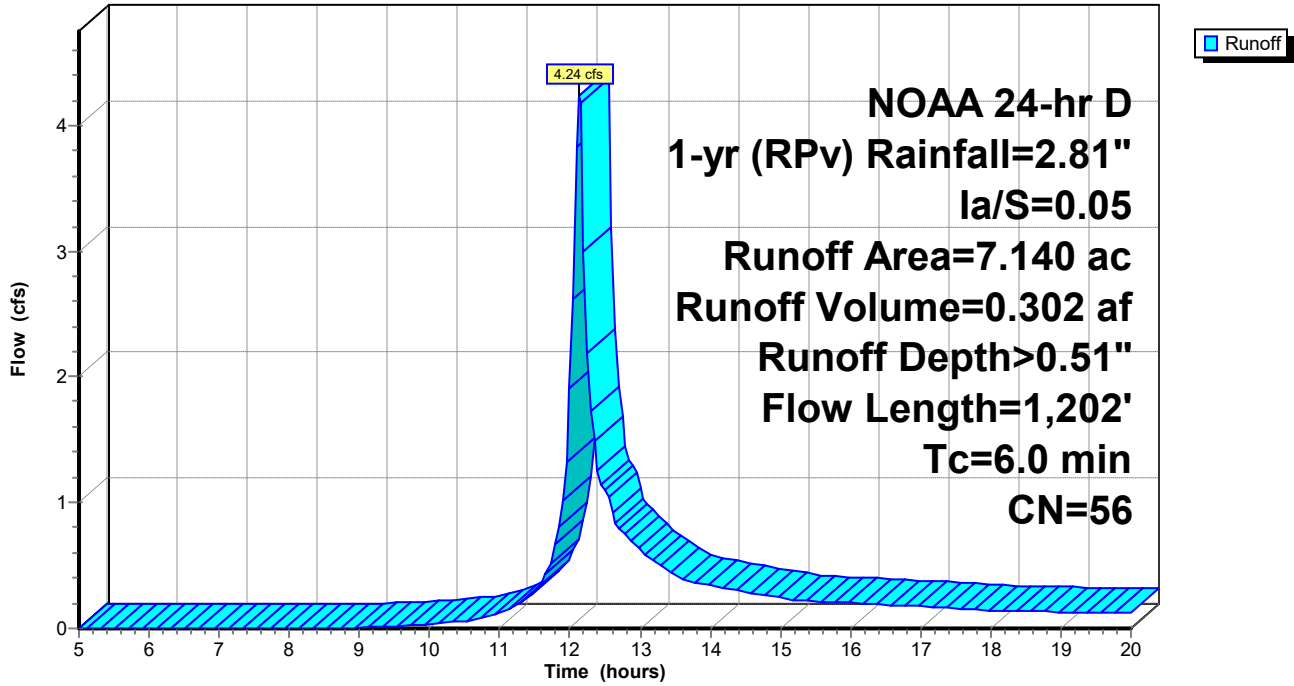
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
 NOAA 24-hr D 1-yr (RPv) Rainfall=2.81", Ia/S=0.05

Area (ac)	CN	Description
5.040	39	>75% Grass cover, Good, HSG A
2.100	98	Paved roads w/curbs & sewers, HSG A
7.140	56	Weighted Average
5.040		70.59% Pervious Area
2.100		29.41% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.4	26	0.0200	1.07		Sheet Flow, Smooth surfaces n= 0.011 P2= 3.30"
0.3	33	0.0800	1.98		Shallow Concentrated Flow, Short Grass Pasture Kv= 7.0 fps
1.1	403	0.0250	6.24	54.59	Trap/Vee/Rect Channel Flow, Bot.W=2.00' D=1.25' Z= 4.0 '/' Top.W=12.00' n= 0.030
0.2	65	0.0050	4.55	8.05	Pipe Channel, RCP_Round 18" 18.0" Round Area= 1.8 sf Perim= 4.7' r= 0.38' n= 0.012
1.5	675	0.0250	7.61	119.92	Trap/Vee/Rect Channel Flow, Bot.W=2.00' D=1.75' Z= 4.0 '/' Top.W=16.00' n= 0.030
3.5	1,202	Total, Increased to minimum Tc = 6.0 min			

Subcatchment SC-23: 23

Hydrograph



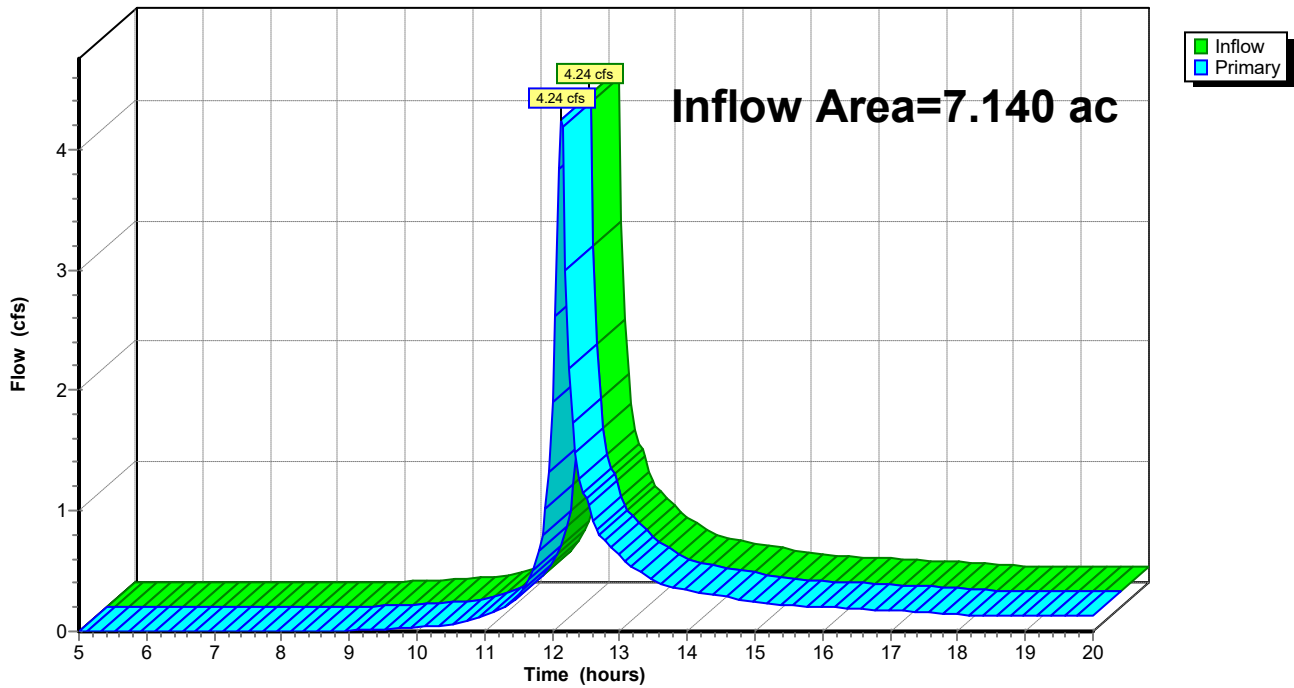
Summary for Link POI23: (new Link)

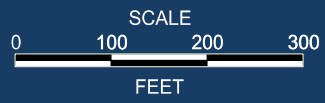
Inflow Area = 7.140 ac, 29.41% Impervious, Inflow Depth > 0.51" for 1-yr (RPv) event
Inflow = 4.24 cfs @ 12.14 hrs, Volume= 0.302 af
Primary = 4.24 cfs @ 12.14 hrs, Volume= 0.302 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Link POI23: (new Link)

Hydrograph





NORTH MILLSBORO BYPASS, US 113 TO SR 24

CONTRACT NO. T201912701
SUSSEX COUNTY



LEGEND	
	DRAINAGE AREA
	DRAINAGE SUBAREA
	Tc PATH
	PROPOSED CONSTRUCTION
	PROPOSED DRAINAGE
	INFILTRATION BMP
	OPEN SPACE
	IMPERVIOUS
	PROPOSED CONTOURS
	EXISTING CONTOURS
	POI LOCATION
	POI LABEL



Summary for Subcatchment SC-21A: SC-21A

Runoff = 0.92 cfs @ 12.32 hrs, Volume= 0.101 af, Depth> 0.88"

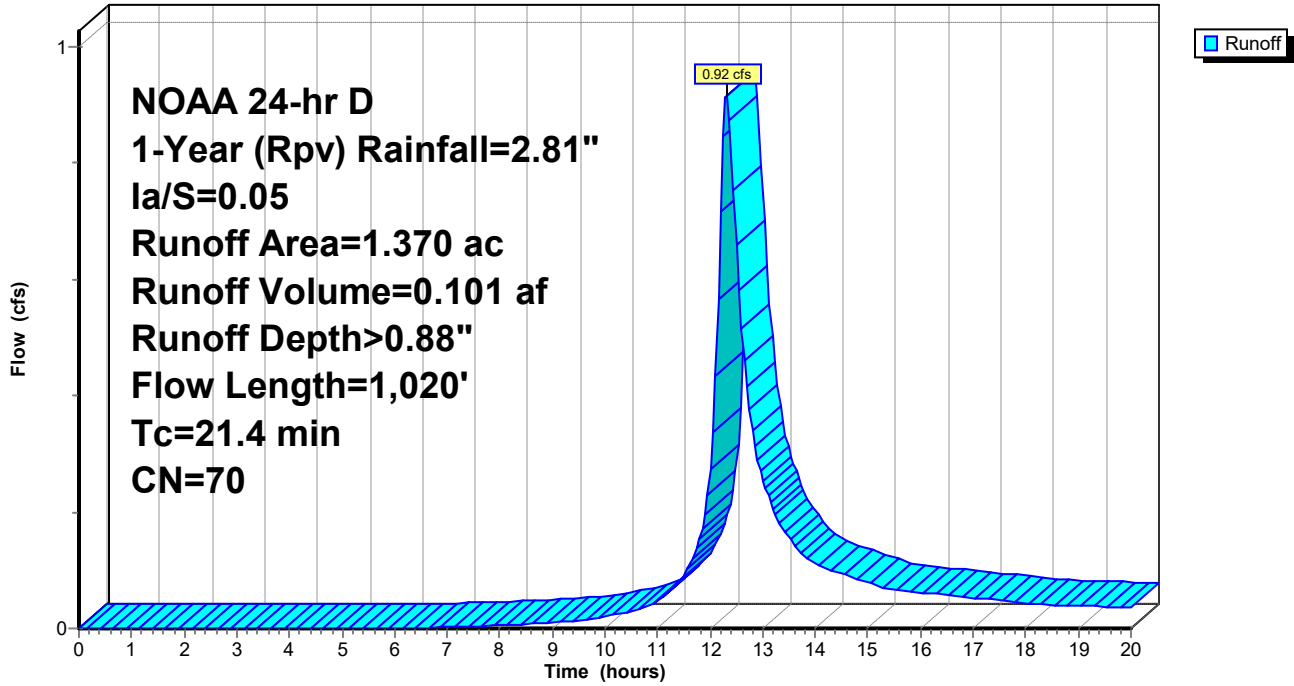
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-20.00 hrs, dt= 0.05 hrs
 NOAA 24-hr D 1-Year (Rpv) Rainfall=2.81", Ia/S=0.05

Area (ac)	CN	Description
* 0.710	98	
* 0.660	39	
1.370	70	Weighted Average
0.660		48.18% Pervious Area
0.710		51.82% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.8	24	0.0004	0.22		Sheet Flow, Smooth surfaces n= 0.011 P2= 3.30"
13.7	19	0.0003	0.02		Sheet Flow, Grass: Short n= 0.150 P2= 3.30"
2.6	422	0.0033	2.69	48.96	Channel Flow, Area= 18.2 sf Perim= 19.8' r= 0.92' n= 0.030
1.4	265	0.0100	3.22	5.69	Pipe Channel, CMP_Round 18" 18.0" Round Area= 1.8 sf Perim= 4.7' r= 0.38' n= 0.024
1.3	195	0.0052	2.43	15.33	Channel Flow, Area= 6.3 sf Perim= 11.2' r= 0.56' n= 0.030
0.6	95	0.0050	2.76	8.66	Pipe Channel, CMP_Round 24" 24.0" Round Area= 3.1 sf Perim= 6.3' r= 0.50' n= 0.024
21.4	1,020	Total			

Subcatchment SC-21A: SC-21A

Hydrograph



Summary for Subcatchment SC-21B: SC-21B

Runoff = 1.44 cfs @ 12.14 hrs, Volume= 0.102 af, Depth> 0.79"

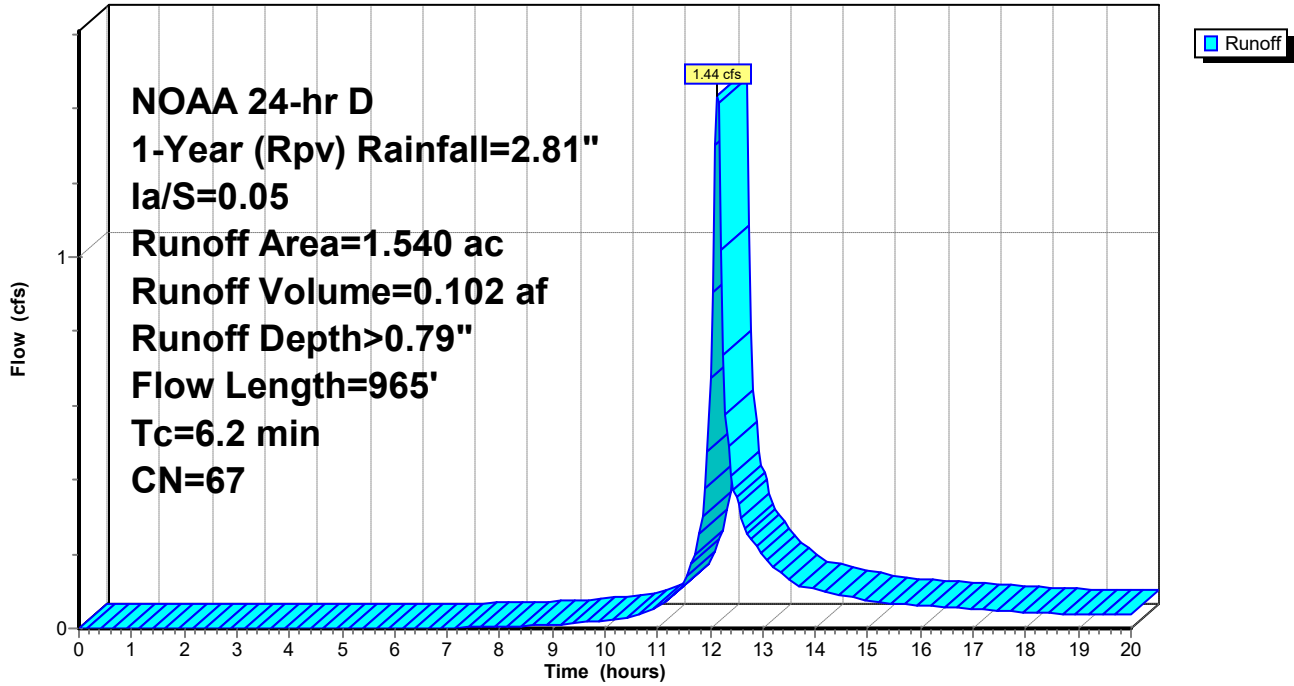
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-20.00 hrs, dt= 0.05 hrs
 NOAA 24-hr D 1-Year (Rpv) Rainfall=2.81", Ia/S=0.05

Area (ac)	CN	Description
* 0.740	98	
* 0.800	39	
1.540	67	Weighted Average
0.800		51.95% Pervious Area
0.740		48.05% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.4	33	0.0300	1.32		Sheet Flow, Smooth surfaces n= 0.011 P2= 3.30"
1.3	12	0.0400	0.15		Sheet Flow, Grass: Short n= 0.150 P2= 3.30"
0.2	13	0.0275	1.06		Sheet Flow, Smooth surfaces n= 0.011 P2= 3.30"
1.4	25	0.1690	0.31		Sheet Flow, Grass: Short n= 0.150 P2= 3.30"
0.6	355	0.0370	9.78	179.91	Channel Flow, Area= 18.4 sf Perim= 17.7' r= 1.04' n= 0.030
2.3	527	0.0050	3.79	87.61	Channel Flow, Area= 23.1 sf Perim= 20.5' r= 1.13' n= 0.030
6.2	965	Total			

Subcatchment SC-21B: SC-21B

Hydrograph



Summary for Pond BMP-21B: BMP 21B

Inflow Area = 1.540 ac, 48.05% Impervious, Inflow Depth > 0.79" for 1-Year (Rpv) event
 Inflow = 1.44 cfs @ 12.14 hrs, Volume= 0.102 af
 Outflow = 0.16 cfs @ 13.24 hrs, Volume= 0.102 af, Atten= 89%, Lag= 66.0 min
 Discarded = 0.16 cfs @ 13.24 hrs, Volume= 0.102 af
 Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 0.00-20.00 hrs, dt= 0.05 hrs
 Peak Elev= 26.60' @ 13.24 hrs Surf.Area= 0.075 ac Storage= 0.036 af

Plug-Flow detention time= 85.5 min calculated for 0.101 af (99% of inflow)
 Center-of-Mass det. time= 84.2 min (887.5 - 803.4)

Volume	Invert	Avail.Storage	Storage Description
#1	25.40'	0.060 af	10.00'W x 325.00'L x 2.00'H Prismaticoid 0.149 af Overall x 40.0% Voids
#2	27.40'	0.212 af	10.00'W x 325.00'L x 2.00'H Prismaticoid Z=2.0
		0.271 af	Total Available Storage

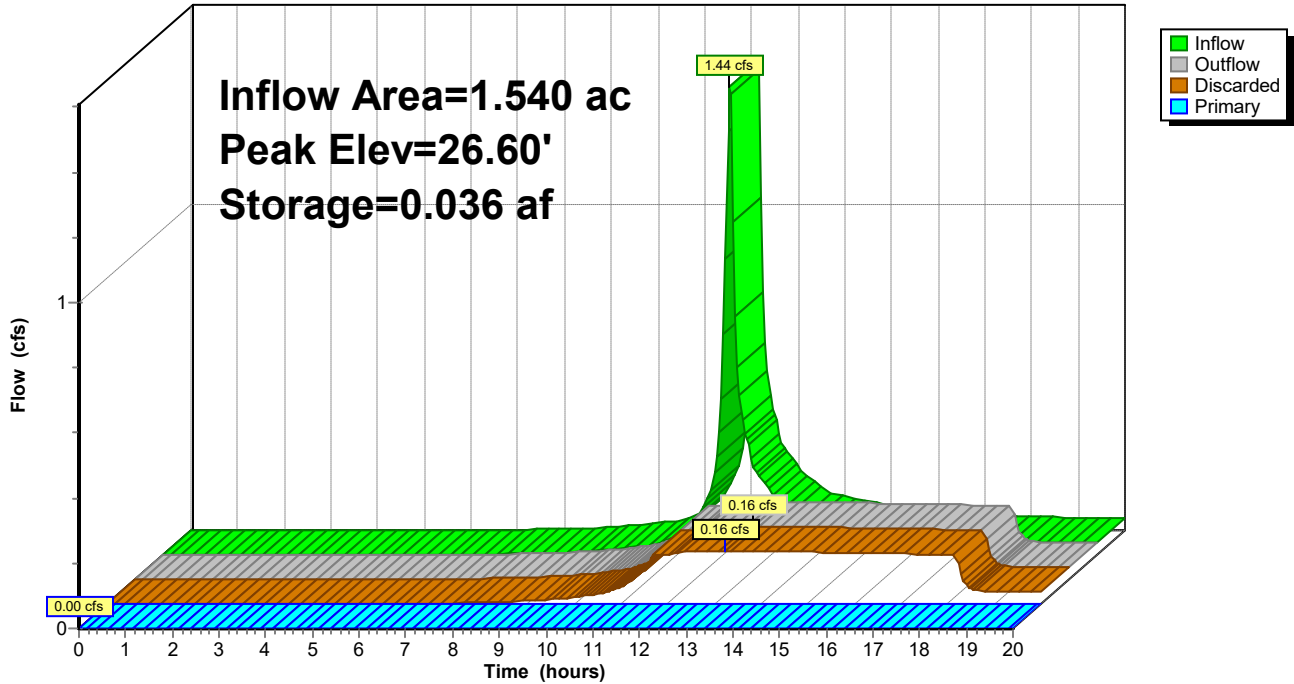
Device	Routing	Invert	Outlet Devices
#1	Discarded	25.40'	2.000 in/hr Exfiltration over Surface area Conductivity to Groundwater Elevation = 10.00'
#2	Primary	29.00'	18.0' long (Profile 1) Broad-Crested Rectangular Weir Head (feet) 0.49 0.98 1.48 Coef. (English) 2.92 3.37 3.59

Discarded OutFlow Max=0.16 cfs @ 13.24 hrs HW=26.60' (Free Discharge)
 ↑1=Exfiltration (Controls 0.16 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=25.40' (Free Discharge)
 ↑2=Broad-Crested Rectangular Weir (Controls 0.00 cfs)

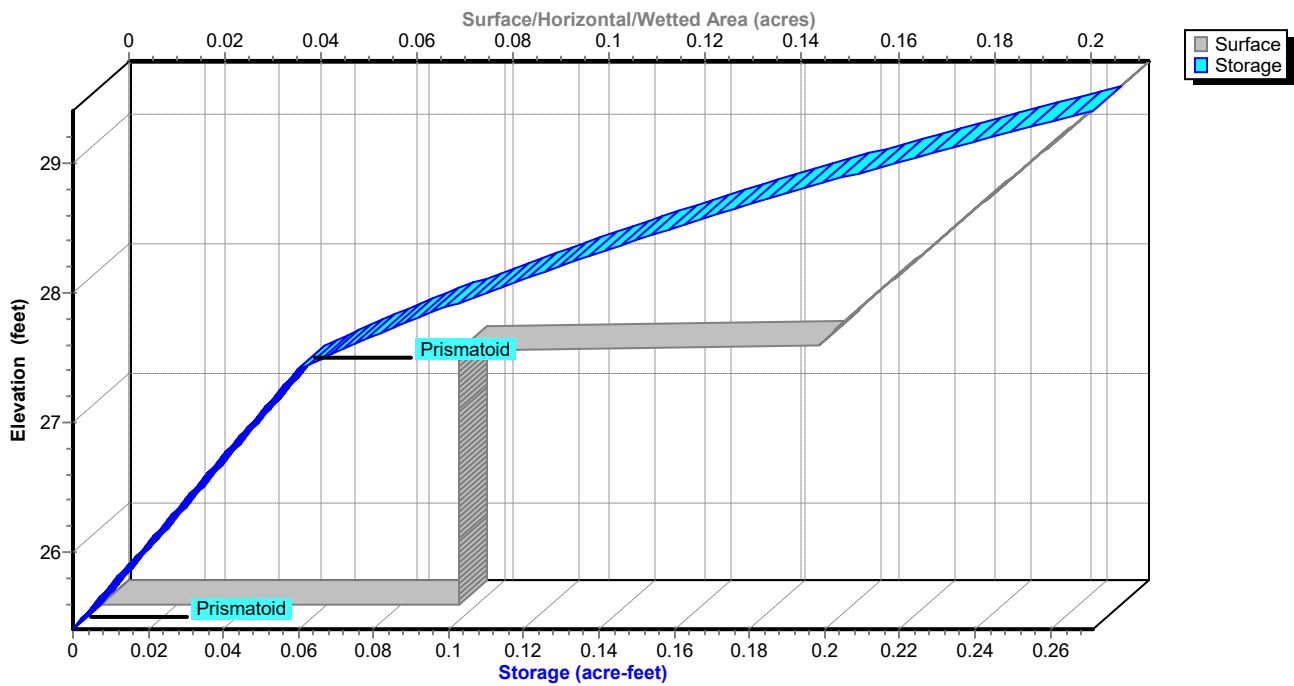
Pond BMP-21B: BMP 21B

Hydrograph



Pond BMP-21B: BMP 21B

Stage-Area-Storage



Summary for Subcatchment SC-21C: SC-21C

Runoff = 1.75 cfs @ 12.13 hrs, Volume= 0.124 af, Depth> 1.07"

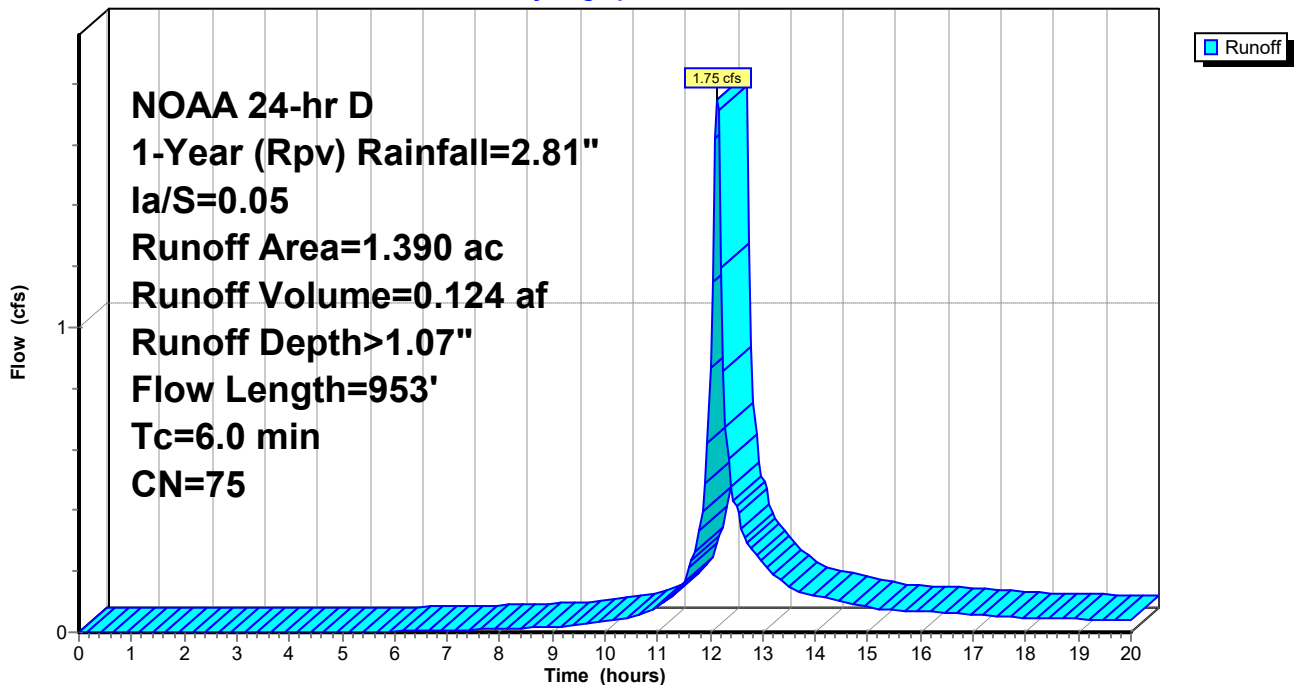
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-20.00 hrs, dt= 0.05 hrs
 NOAA 24-hr D 1-Year (Rpv) Rainfall=2.81", Ia/S=0.05

Area (ac)	CN	Description
* 0.550	39	
* 0.840	98	
1.390	75	Weighted Average
0.550		39.57% Pervious Area
0.840		60.43% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.6	67	0.0610	2.01		Sheet Flow, Smooth surfaces n= 0.011 P2= 3.30"
1.1	21	0.1810	0.31		Sheet Flow, Grass: Short n= 0.150 P2= 3.30"
1.5	565	0.0210	6.47	102.80	Channel Flow, Area= 15.9 sf Perim= 18.6' r= 0.85' n= 0.030
1.1	300	0.0050	4.55	8.05	Pipe Channel, RCP_Round 18" 18.0" Round Area= 1.8 sf Perim= 4.7' r= 0.38' n= 0.012
4.3	953	Total, Increased to minimum Tc = 6.0 min			

Subcatchment SC-21C: SC-21C

Hydrograph



Summary for Pond BMP-21C: BMP 21C

Inflow Area = 1.390 ac, 60.43% Impervious, Inflow Depth > 1.07" for 1-Year (Rpv) event
 Inflow = 1.75 cfs @ 12.13 hrs, Volume= 0.124 af
 Outflow = 0.24 cfs @ 12.95 hrs, Volume= 0.109 af, Atten= 86%, Lag= 49.2 min
 Discarded = 0.24 cfs @ 12.95 hrs, Volume= 0.109 af
 Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 0.00-20.00 hrs, dt= 0.05 hrs
 Peak Elev= 27.45' @ 12.95 hrs Surf.Area= 0.111 ac Storage= 0.047 af

Plug-Flow detention time= 135.8 min calculated for 0.109 af (88% of inflow)
 Center-of-Mass det. time= 97.6 min (889.6 - 792.0)

Volume	Invert	Avail.Storage	Storage Description
#1	25.40'	0.044 af	12.00'W x 200.00'L x 2.00'H Prismatic 0.110 af Overall x 40.0% Voids
#2	27.40'	0.150 af	12.00'W x 200.00'L x 2.00'H Prismatic Z=2.0
		0.194 af	Total Available Storage

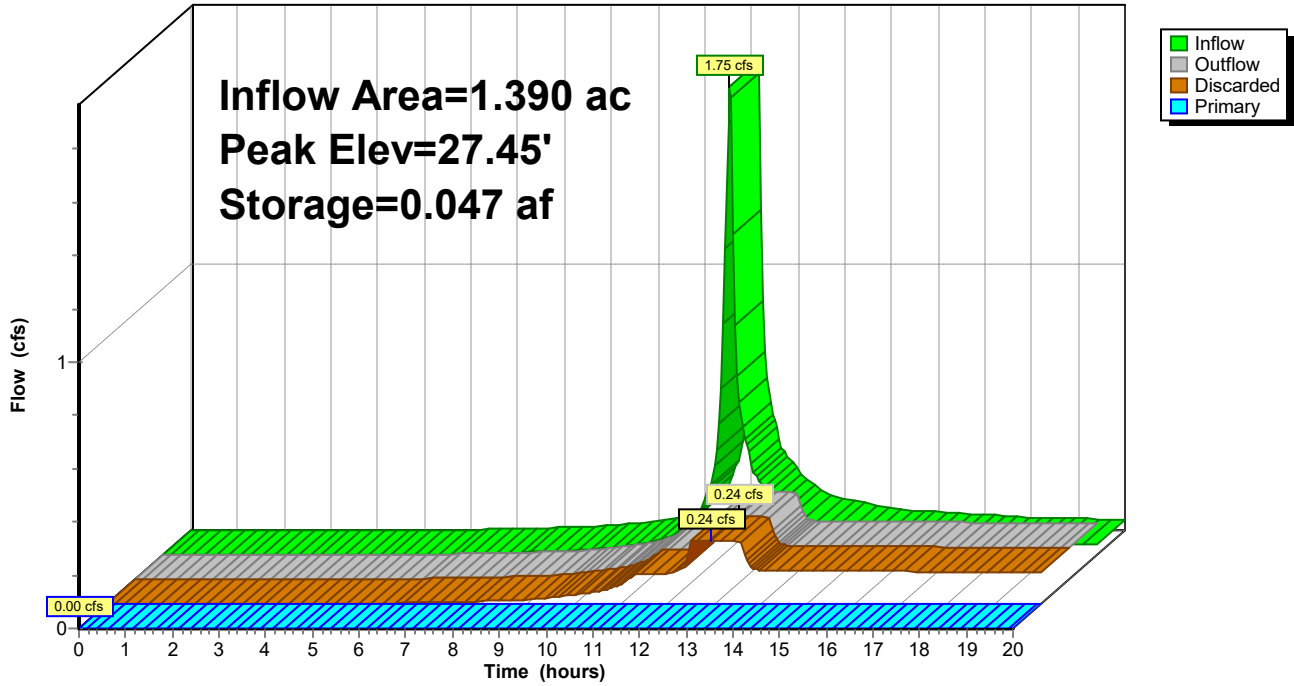
Device	Routing	Invert	Outlet Devices
#1	Discarded	25.40'	2.000 in/hr Exfiltration over Surface area Conductivity to Groundwater Elevation = 10.00'
#2	Primary	29.00'	18.0' long (Profile 1) Broad-Crested Rectangular Weir Head (feet) 0.49 0.98 1.48 Coef. (English) 2.92 3.37 3.59

Discarded OutFlow Max=0.24 cfs @ 12.95 hrs HW=27.45' (Free Discharge)
 ↑1=Exfiltration (Controls 0.24 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=25.40' (Free Discharge)
 ↑2=Broad-Crested Rectangular Weir (Controls 0.00 cfs)

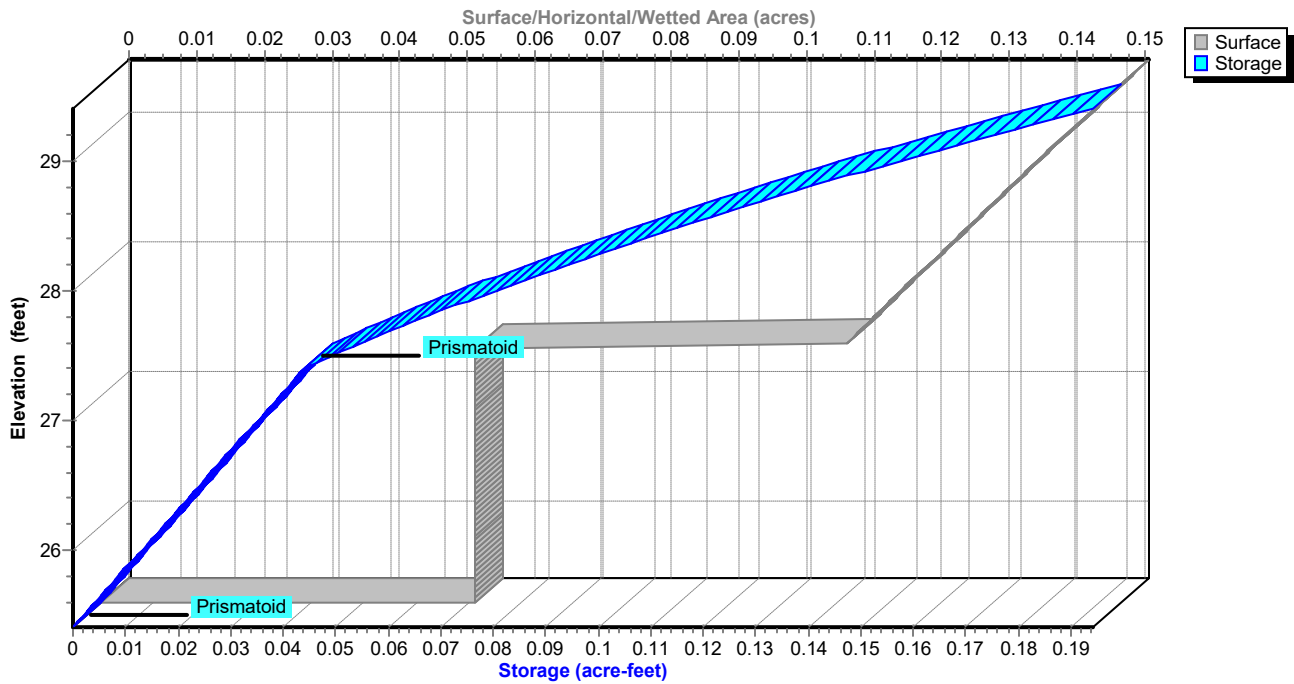
Pond BMP-21C: BMP 21C

Hydrograph



Pond BMP-21C: BMP 21C

Stage-Area-Storage



Summary for Subcatchment SC-21D: SC-21D

Runoff = 1.12 cfs @ 12.13 hrs, Volume= 0.079 af, Depth> 0.96"

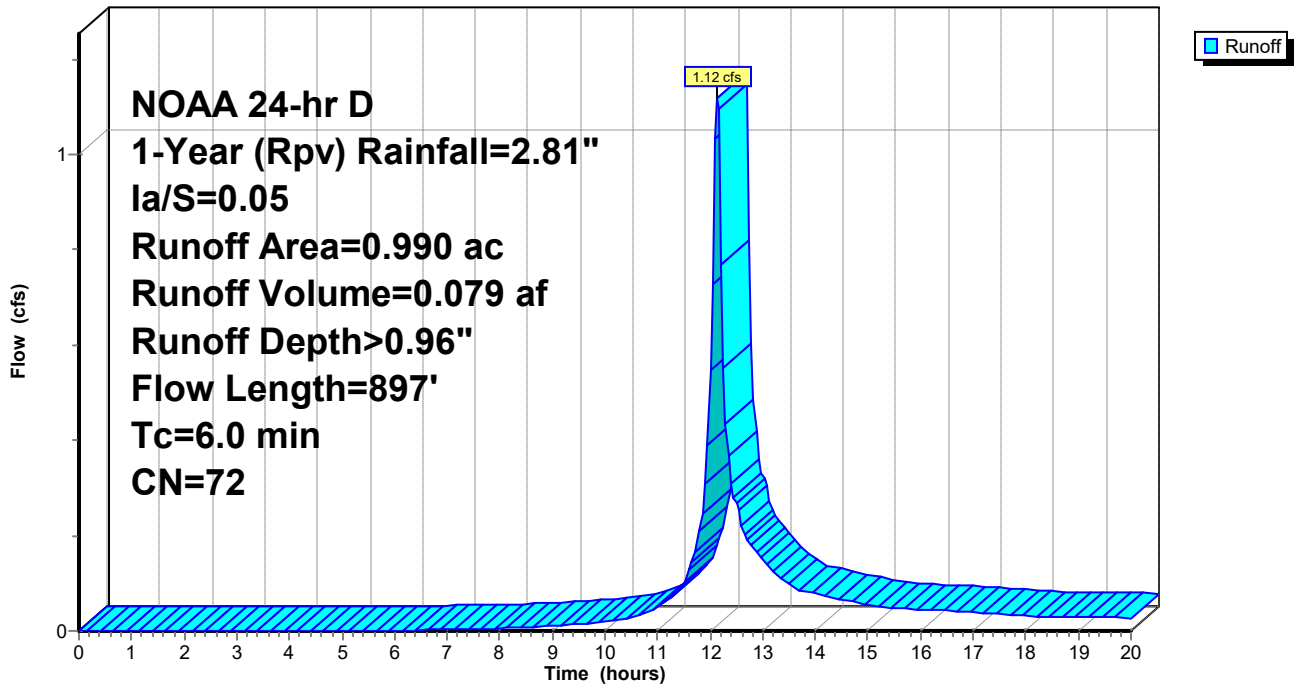
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-20.00 hrs, dt= 0.05 hrs
 NOAA 24-hr D 1-Year (Rpv) Rainfall=2.81", Ia/S=0.05

Area (ac)	CN	Description
* 0.440	39	
* 0.550	98	
0.990	72	Weighted Average
0.440		44.44% Pervious Area
0.550		55.56% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.3	24	0.0290	1.22		Sheet Flow, Smooth surfaces n= 0.011 P2= 3.30"
0.8	13	0.1590	0.26		Sheet Flow, Grass: Short n= 0.150 P2= 3.30"
3.2	860	0.0061	4.46	137.30	Channel Flow, Area= 30.8 sf Perim= 24.9' r= 1.24' n= 0.030
4.3	897	Total, Increased to minimum Tc = 6.0 min			

Subcatchment SC-21D: SC-21D

Hydrograph



Summary for Pond BMP-21D: BMP 21D

Inflow Area = 0.990 ac, 55.56% Impervious, Inflow Depth > 0.96" for 1-Year (Rpv) event
 Inflow = 1.12 cfs @ 12.13 hrs, Volume= 0.079 af
 Outflow = 0.14 cfs @ 13.09 hrs, Volume= 0.079 af, Atten= 88%, Lag= 57.7 min
 Discarded = 0.14 cfs @ 13.09 hrs, Volume= 0.079 af
 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= 0.00-20.00 hrs, dt= 0.05 hrs
 Peak Elev= 26.80' @ 13.09 hrs Surf.Area= 0.063 ac Storage= 0.026 af

Plug-Flow detention time= 71.5 min calculated for 0.078 af (99% of inflow)
 Center-of-Mass det. time= 70.3 min (866.7 - 796.4)

Volume	Invert	Avail.Storage	Storage Description
#1	25.75'	0.051 af	10.00'W x 275.00'L x 2.00'H Prismatic 0.126 af Overall x 40.0% Voids
#2	27.75'	0.180 af	10.00'W x 275.00'L x 2.00'H Prismatic Z=2.0
		0.230 af	Total Available Storage

Device	Routing	Invert	Outlet Devices
#1	Discarded	25.75'	2.000 in/hr Exfiltration over Surface area Conductivity to Groundwater Elevation = 10.00'
#2	Primary	27.75'	18.0" Round Culvert L= 85.0' RCP, end-section conforming to fill, Ke= 0.500 Inlet / Outlet Invert= 27.75' / 27.40' S= 0.0041 '/ Cc= 0.900 n= 0.012, Flow Area= 1.77 sf
#3	Secondary	29.00'	18.0' long (Profile 1) Broad-Crested Rectangular Weir Head (feet) 0.49 0.98 1.48 Coef. (English) 2.92 3.37 3.59

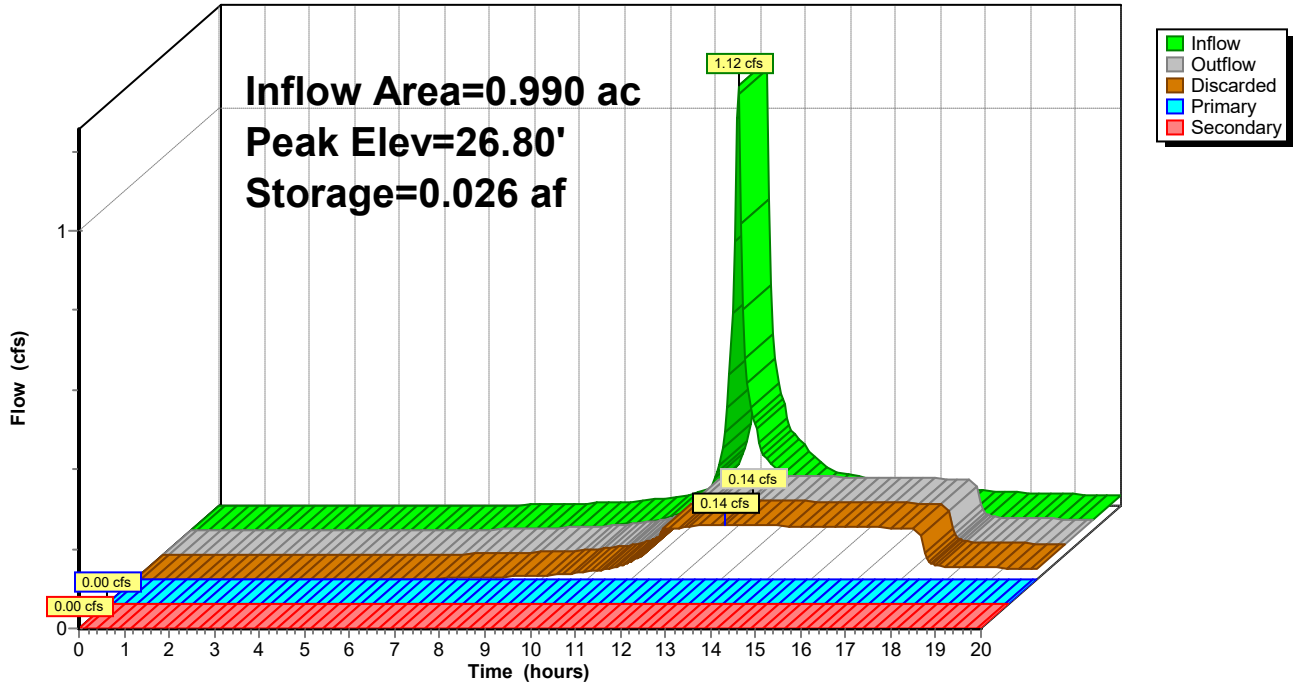
Discarded OutFlow Max=0.14 cfs @ 13.09 hrs HW=26.80' (Free Discharge)
 ↑1=Exfiltration (Controls 0.14 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=25.75' (Free Discharge)
 ↑2=Culvert (Controls 0.00 cfs)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=25.75' (Free Discharge)
 ↑3=Broad-Crested Rectangular Weir (Controls 0.00 cfs)

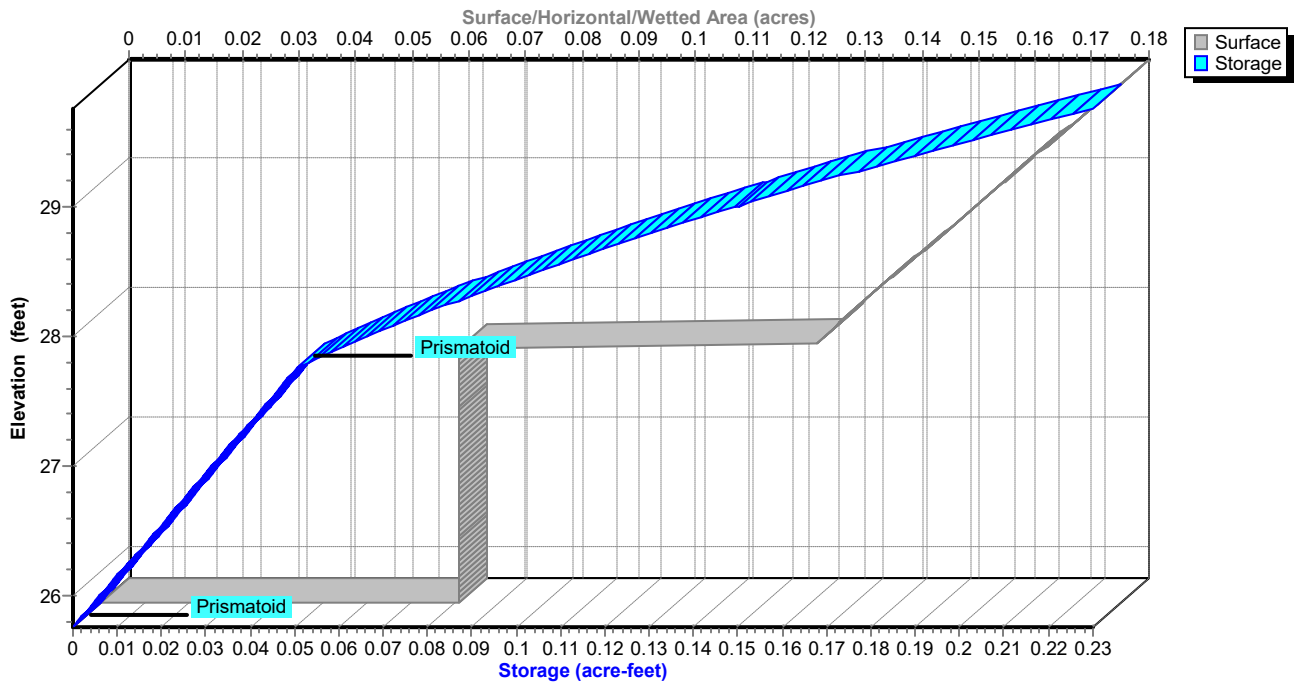
Pond BMP-21D: BMP 21D

Hydrograph



Pond BMP-21D: BMP 21D

Stage-Area-Storage



Summary for Subcatchment SC-22: 22

Runoff = 0.74 cfs @ 12.14 hrs, Volume= 0.053 af, Depth> 0.44"

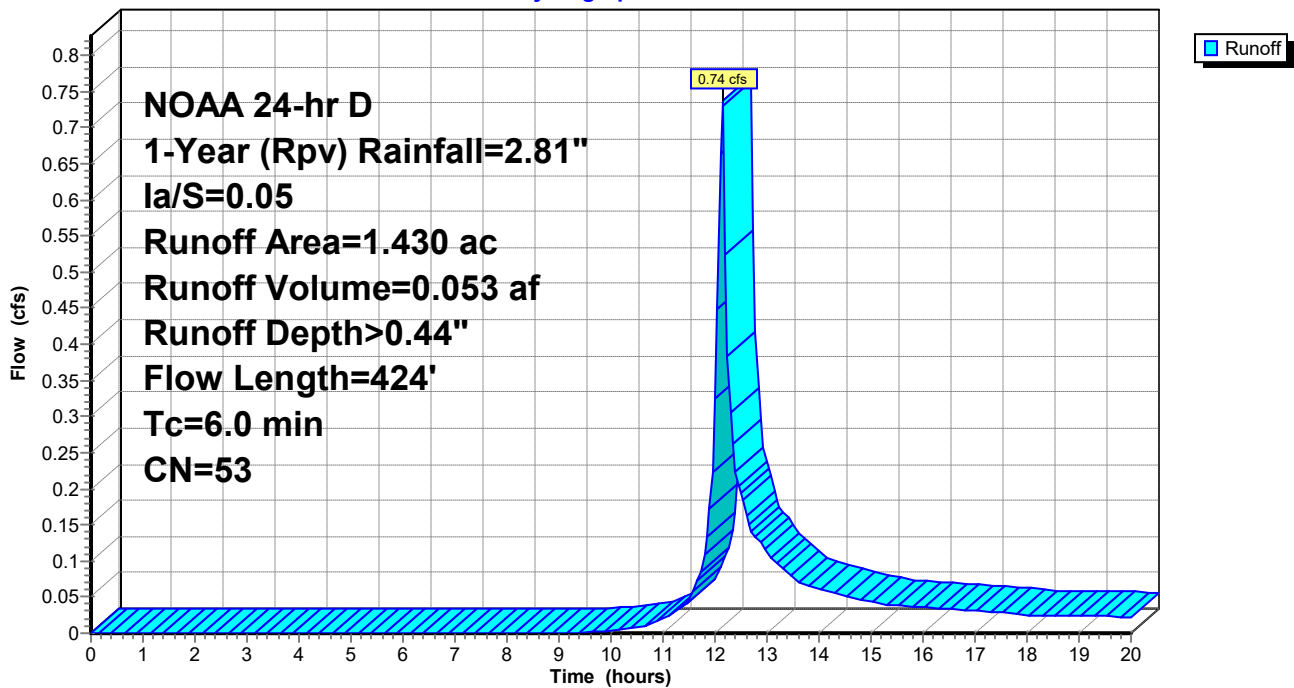
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-20.00 hrs, dt= 0.05 hrs
 NOAA 24-hr D 1-Year (Rpv) Rainfall=2.81", Ia/S=0.05

Area (ac)	CN	Description
0.340	98	Paved roads w/curbs & sewers, HSG A
1.090	39	>75% Grass cover, Good, HSG A
1.430	53	Weighted Average
1.090		76.22% Pervious Area
0.340		23.78% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.3	18	0.0200	0.99		Sheet Flow, Smooth surfaces n= 0.011 P2= 3.30"
0.2	25	0.0800	1.98		Shallow Concentrated Flow, Short Grass Pasture Kv= 7.0 fps
1.3	381	0.0150	4.72	38.50	Trap/Vee/Rect Channel Flow, Bot.W=2.00' D=1.20' Z= 4.0 '/' Top.W=11.60' n= 0.030
1.8	424	Total, Increased to minimum Tc = 6.0 min			

Subcatchment SC-22: 22

Hydrograph



Summary for Subcatchment SC-23: 23

Runoff = 4.24 cfs @ 12.14 hrs, Volume= 0.302 af, Depth> 0.51"

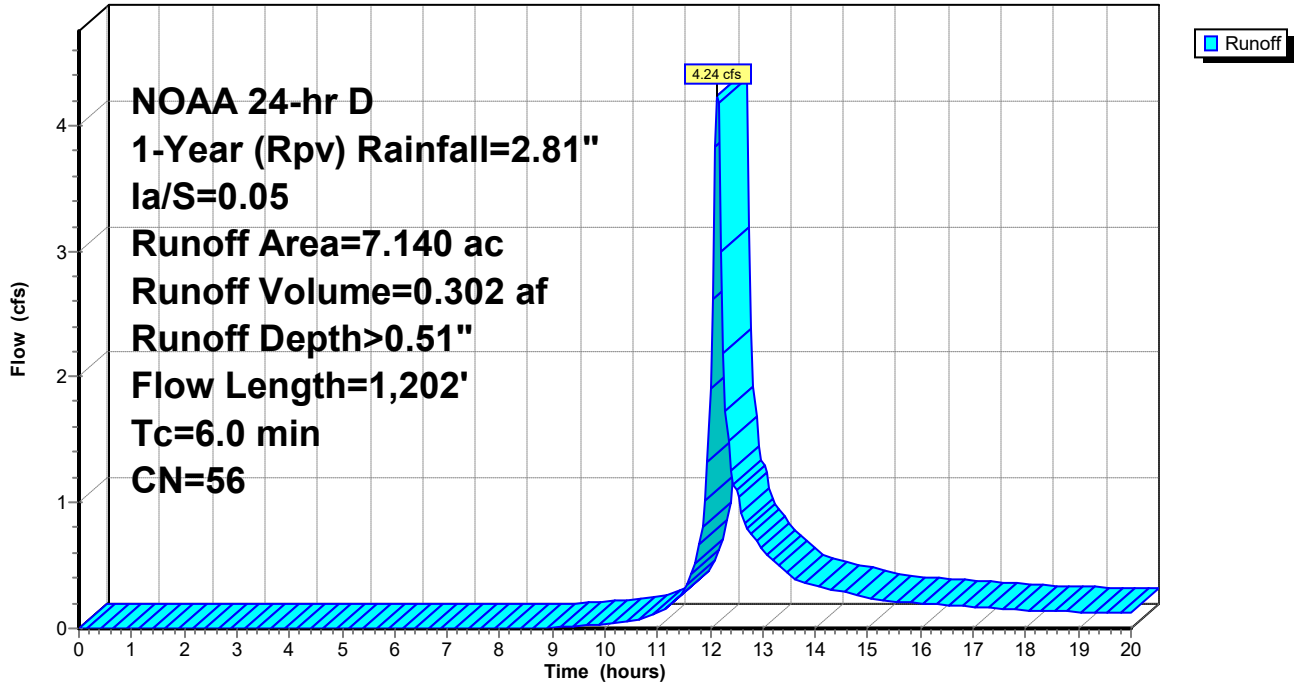
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-20.00 hrs, dt= 0.05 hrs
 NOAA 24-hr D 1-Year (Rpv) Rainfall=2.81", Ia/S=0.05

Area (ac)	CN	Description
5.040	39	>75% Grass cover, Good, HSG A
2.100	98	Paved roads w/curbs & sewers, HSG A
7.140	56	Weighted Average
5.040		70.59% Pervious Area
2.100		29.41% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.4	26	0.0200	1.07		Sheet Flow, Smooth surfaces n= 0.011 P2= 3.30"
0.3	33	0.0800	1.98		Shallow Concentrated Flow, Short Grass Pasture Kv= 7.0 fps
1.1	403	0.0250	6.24	54.59	Trap/Vee/Rect Channel Flow, Bot.W=2.00' D=1.25' Z= 4.0 '/' Top.W=12.00' n= 0.030
0.2	65	0.0050	4.55	8.05	Pipe Channel, RCP_Round 18" 18.0" Round Area= 1.8 sf Perim= 4.7' r= 0.38' n= 0.012
1.5	675	0.0250	7.61	119.92	Trap/Vee/Rect Channel Flow, Bot.W=2.00' D=1.75' Z= 4.0 '/' Top.W=16.00' n= 0.030
3.5	1,202	Total, Increased to minimum Tc = 6.0 min			

Subcatchment SC-23: 23

Hydrograph

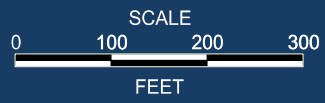




APPENDIX L

POI-24, POI-25 & POI-26

- POI Drainage Area Maps
- POI-24 HydroCAD Calculations
- POI-25 HydroCAD Calculations
- POI-26 HydroCAD Calculations






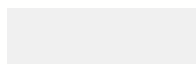



NORTH MILLSBORO BYPASS, US 113 TO SR 24

CONTRACT NO. T201912701
SUSSEX COUNTY



LEGEND

-  DRAINAGE AREA
-  Tc PATH
-  POI LOCATION
-  POI LABEL
-  OPEN SPACE
-  IMPERVIOUS
-  EXISTING CONTOURS



Summary for Subcatchment SC-24: SC-24

Runoff = 0.19 cfs @ 12.22 hrs, Volume= 0.018 af, Depth> 0.20"

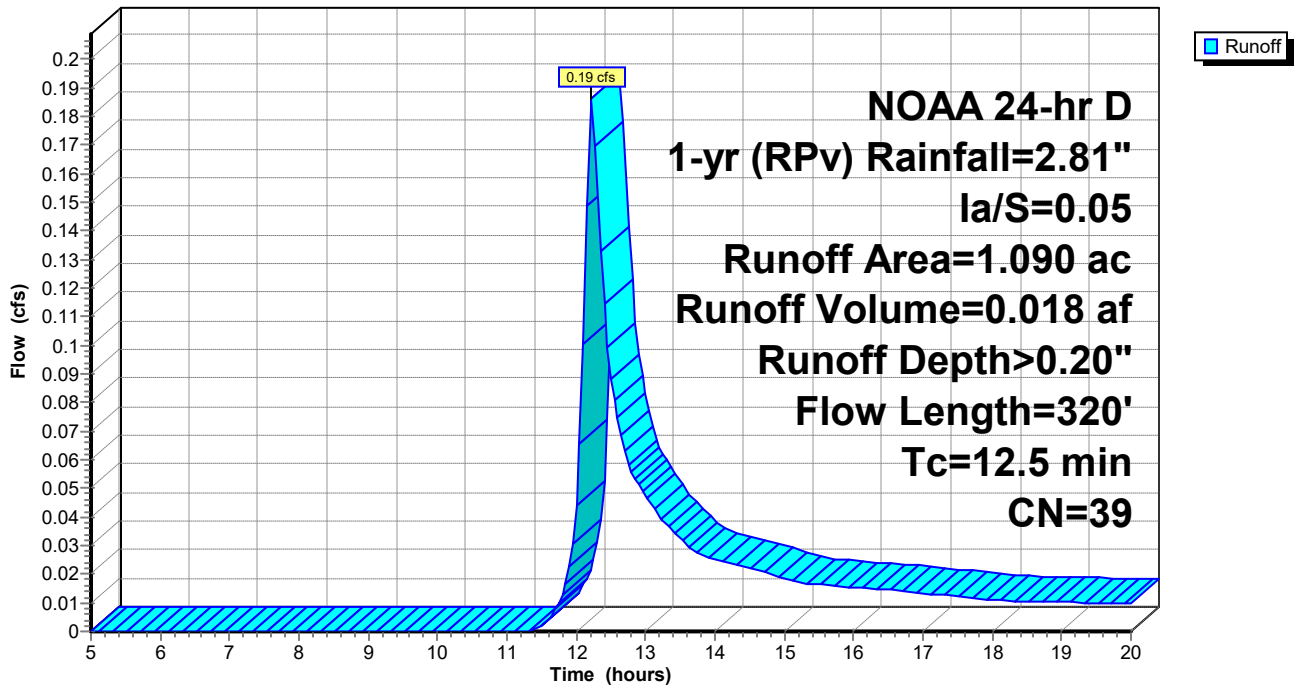
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
 NOAA 24-hr D 1-yr (RPv) Rainfall=2.81", Ia/S=0.05

Area (ac)	CN	Description
1.090	39	>75% Grass cover, Good, HSG A
1.090		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.4	50	0.0096	0.11		Sheet Flow, Grass: Short n= 0.150 P2= 3.30"
0.7	43	0.0236	1.08		Shallow Concentrated Flow, Short Grass Pasture Kv= 7.0 fps
2.0	110	0.0171	0.92		Shallow Concentrated Flow, Short Grass Pasture Kv= 7.0 fps
2.4	117	0.0138	0.82		Shallow Concentrated Flow, Short Grass Pasture Kv= 7.0 fps
12.5	320	Total			

Subcatchment SC-24: SC-24

Hydrograph



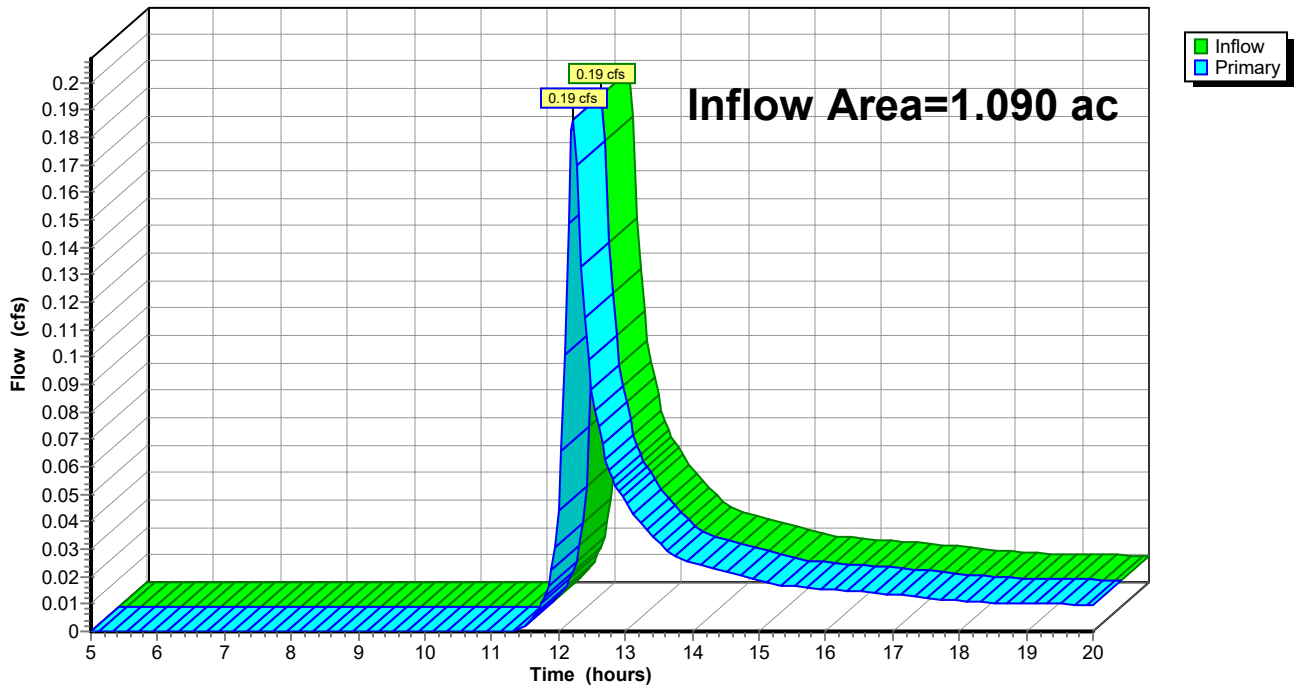
Summary for Link POI24: (new Link)

Inflow Area = 1.090 ac, 0.00% Impervious, Inflow Depth > 0.20" for 1-yr (RPv) event
Inflow = 0.19 cfs @ 12.22 hrs, Volume= 0.018 af
Primary = 0.19 cfs @ 12.22 hrs, Volume= 0.018 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Link POI24: (new Link)

Hydrograph



Summary for Subcatchment SC-25: 25

Runoff = 3.15 cfs @ 12.39 hrs, Volume= 0.393 af, Depth> 0.32"

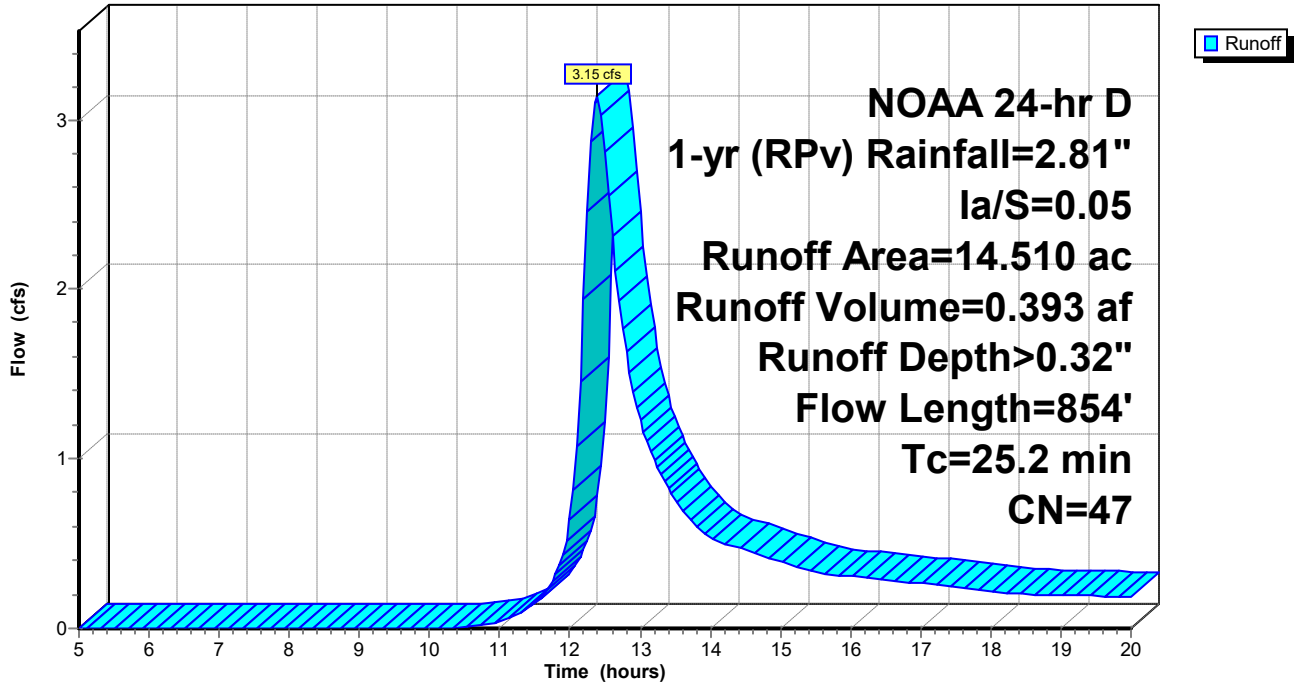
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
 NOAA 24-hr D 1-yr (RPv) Rainfall=2.81", Ia/S=0.05

Area (ac)	CN	Description
1.970	98	Paved roads w/curbs & sewers, HSG A
12.540	39	>75% Grass cover, Good, HSG A
14.510	47	Weighted Average
12.540		86.42% Pervious Area
1.970		13.58% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0	50	0.0167	0.14		Sheet Flow, Grass: Short n= 0.150 P2= 3.30"
0.4	31	0.0331	1.27		Shallow Concentrated Flow, Short Grass Pasture Kv= 7.0 fps
1.4	100	0.0278	1.17		Shallow Concentrated Flow, Short Grass Pasture Kv= 7.0 fps
1.5	63	0.0098	0.69		Shallow Concentrated Flow, Short Grass Pasture Kv= 7.0 fps
2.0	99	0.0141	0.83		Shallow Concentrated Flow, Short Grass Pasture Kv= 7.0 fps
2.9	99	0.0066	0.57		Shallow Concentrated Flow, Short Grass Pasture Kv= 7.0 fps
6.0	200	0.0062	0.55		Shallow Concentrated Flow, Short Grass Pasture Kv= 7.0 fps
5.0	212	0.0100	0.70		Shallow Concentrated Flow, Short Grass Pasture Kv= 7.0 fps
25.2	854	Total			

Subcatchment SC-25: 25

Hydrograph



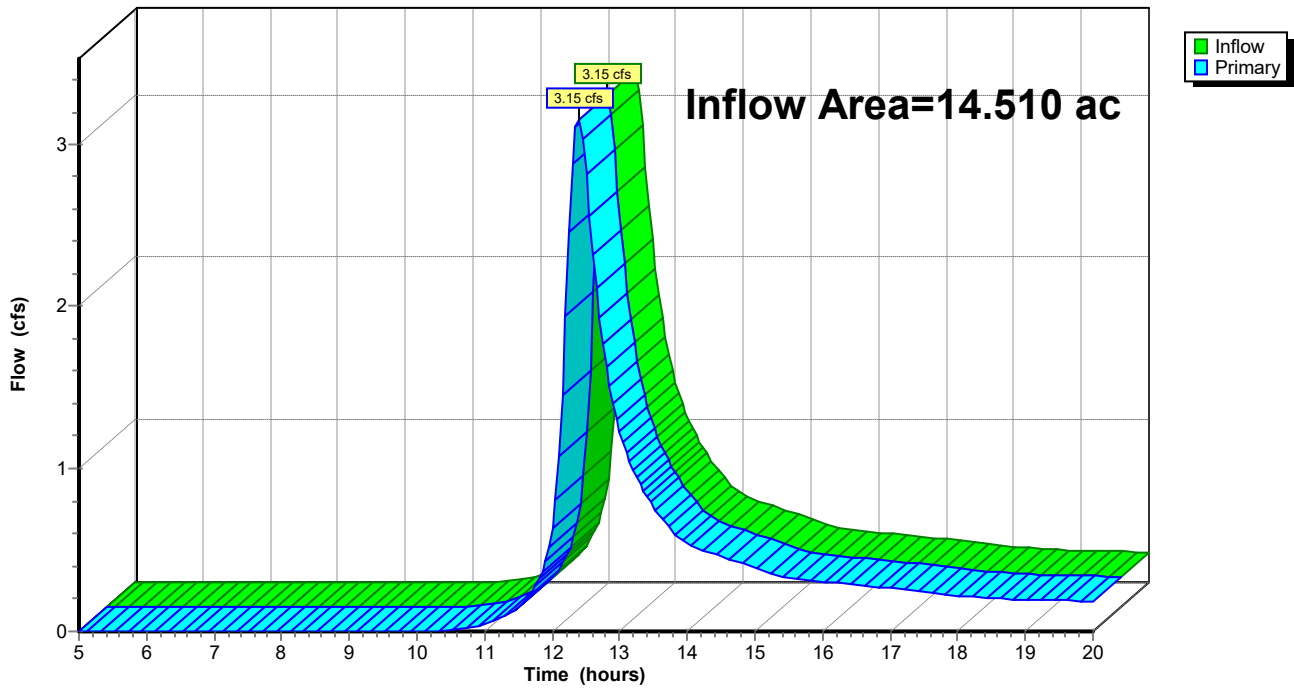
Summary for Link POI25: (new Link)

Inflow Area = 14.510 ac, 13.58% Impervious, Inflow Depth > 0.32" for 1-yr (RPv) event
Inflow = 3.15 cfs @ 12.39 hrs, Volume= 0.393 af
Primary = 3.15 cfs @ 12.39 hrs, Volume= 0.393 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Link POI25: (new Link)

Hydrograph



Summary for Subcatchment SC-26: 26

Runoff = 1.89 cfs @ 12.14 hrs, Volume= 0.134 af, Depth> 0.53"

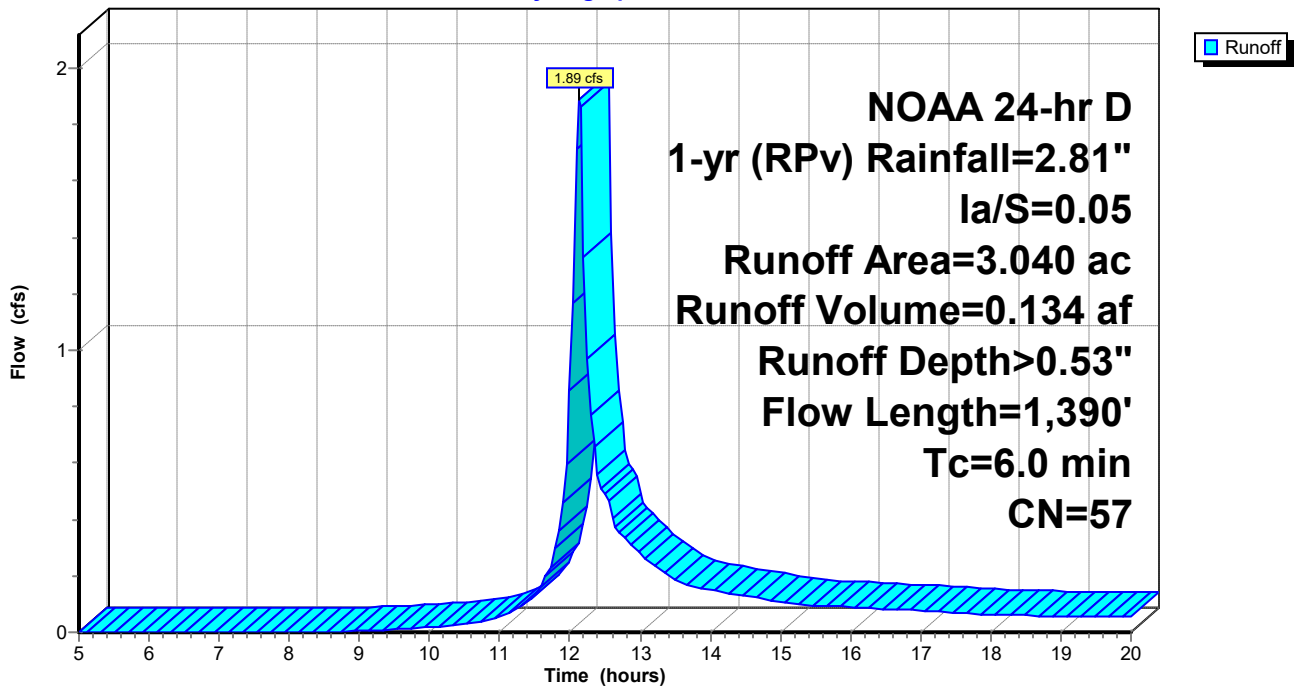
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
 NOAA 24-hr D 1-yr (RPv) Rainfall=2.81", Ia/S=0.05

Area (ac)	CN	Description
0.910	98	Paved roads w/curbs & sewers, HSG A
2.130	39	>75% Grass cover, Good, HSG A
3.040	57	Weighted Average
2.130		70.07% Pervious Area
0.910		29.93% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.4	21	0.0157	0.93		Sheet Flow, Smooth surfaces n= 0.011 P2= 3.30"
0.1	18	0.0857	2.05		Shallow Concentrated Flow, Short Grass Pasture Kv= 7.0 fps
0.4	121	0.0083	4.70	132.64	Channel Flow, Area= 28.2 sf Perim= 26.5' r= 1.06' n= 0.030
3.9	1,230	0.0068	5.31	9.38	Pipe Channel, RCP_Round 18" 18.0" Round Area= 1.8 sf Perim= 4.7' r= 0.38' n= 0.012
4.8	1,390	Total, Increased to minimum Tc = 6.0 min			

Subcatchment SC-26: 26

Hydrograph



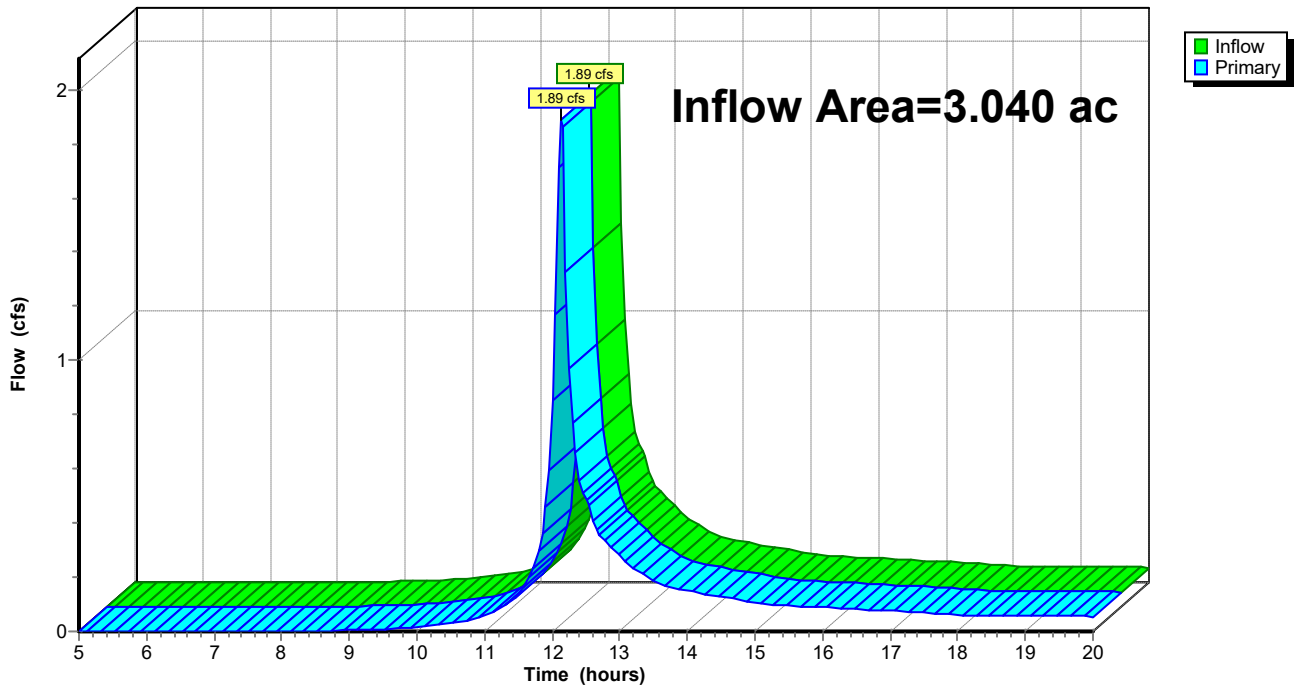
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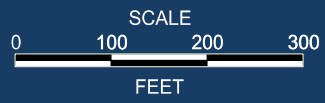
Inflow Area = 3.040 ac, 29.93% Impervious, Inflow Depth > 0.53" for 1-yr (RPv) event
Inflow = 1.89 cfs @ 12.14 hrs, Volume= 0.134 af
Primary = 1.89 cfs @ 12.14 hrs, Volume= 0.134 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Link POI26: (new Link)

Hydrograph





NORTH MILLSBORO BYPASS, US 113 TO SR 24

CONTRACT NO. T201912701
SUSSEX COUNTY



LEGEND

- DRAINAGE AREA
- DRAINAGE SUBAREA
- Tc PATH
- PROPOSED CONSTRUCTION
- PROPOSED DRAINAGE
- INFILTRATION BMP
- OPEN SPACE
- IMPERVIOUS
- PROPOSED CONTOURS
- EXISTING CONTOURS
- POI LOCATION
- POI LABEL



Summary for Subcatchment SC-24A: SC-24A

Runoff = 0.44 cfs @ 12.14 hrs, Volume= 0.032 af, Depth> 0.36"

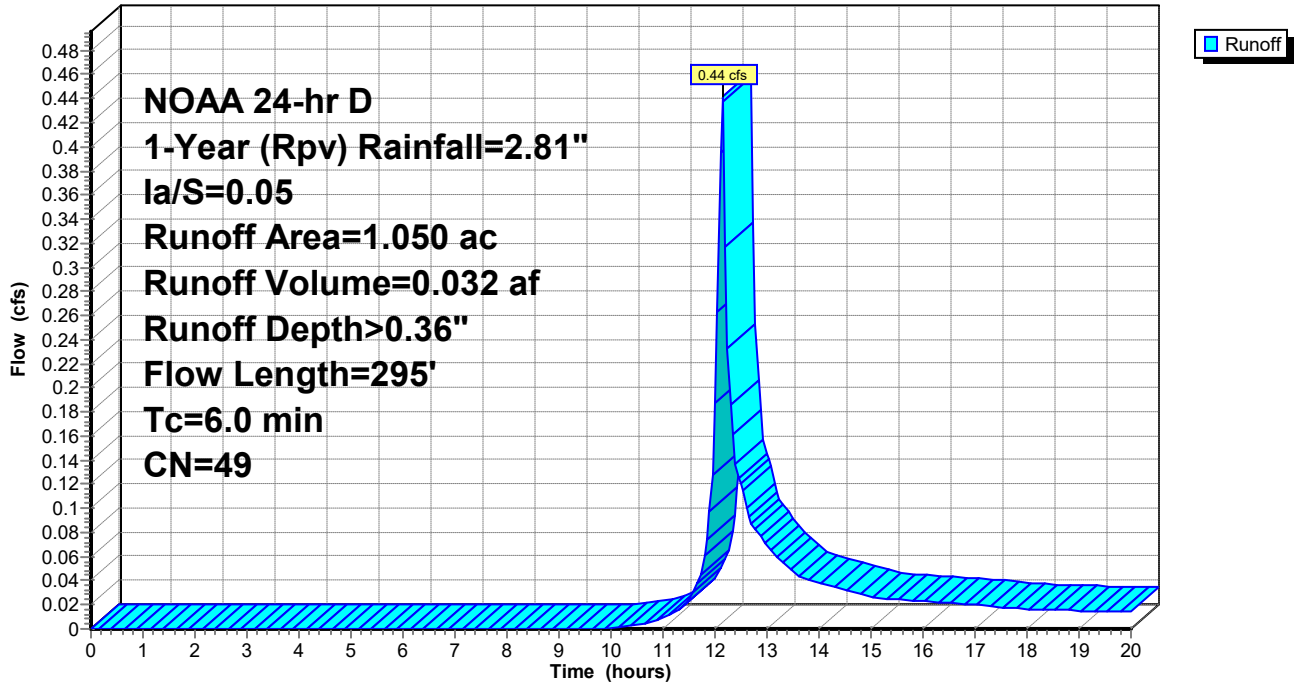
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-20.00 hrs, dt= 0.05 hrs
 NOAA 24-hr D 1-Year (Rpv) Rainfall=2.81", Ia/S=0.05

Area (ac)	CN	Description
* 0.870	39	
* 0.180	98	
1.050	49	Weighted Average
0.870		82.86% Pervious Area
0.180		17.14% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.5	38	0.0263	1.28		Sheet Flow, Smooth surfaces n= 0.011 P2= 3.30"
2.0	45	0.2090	0.38		Sheet Flow, Grass: Short n= 0.150 P2= 3.30"
0.5	212	0.0225	6.82	79.07	Channel Flow, Area= 11.6 sf Perim= 13.2' r= 0.88' n= 0.030
3.0	295	Total, Increased to minimum Tc = 6.0 min			

Subcatchment SC-24A: SC-24A

Hydrograph



Summary for Subcatchment SC-24B: (new Subcat)

Runoff = 0.23 cfs @ 12.14 hrs, Volume= 0.017 af, Depth> 0.23"

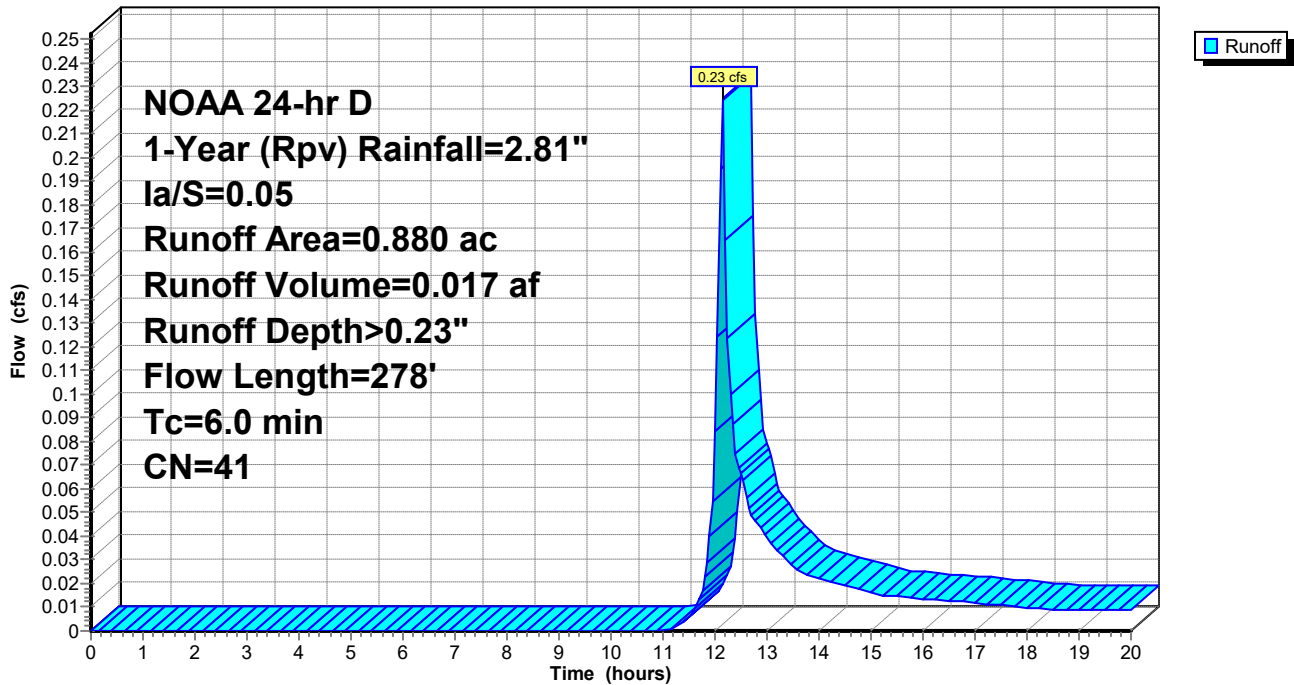
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-20.00 hrs, dt= 0.05 hrs
 NOAA 24-hr D 1-Year (Rpv) Rainfall=2.81", Ia/S=0.05

Area (ac)	CN	Description
* 0.850	39	
* 0.030	98	
0.880	41	Weighted Average
0.850		96.59% Pervious Area
0.030		3.41% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.1	6	0.0223	0.83		Sheet Flow, Smooth surfaces n= 0.011 P2= 3.30"
1.6	33	0.1840	0.34		Sheet Flow, Grass: Short n= 0.150 P2= 3.30"
0.4	239	0.0310	9.33	193.18	Channel Flow, Area= 20.7 sf Perim= 18.7' r= 1.11' n= 0.030
2.1	278	Total, Increased to minimum Tc = 6.0 min			

Subcatchment SC-24B: (new Subcat)

Hydrograph



Summary for Subcatchment SC-25A: 25A

Runoff = 0.48 cfs @ 12.68 hrs, Volume= 0.078 af, Depth> 0.61"

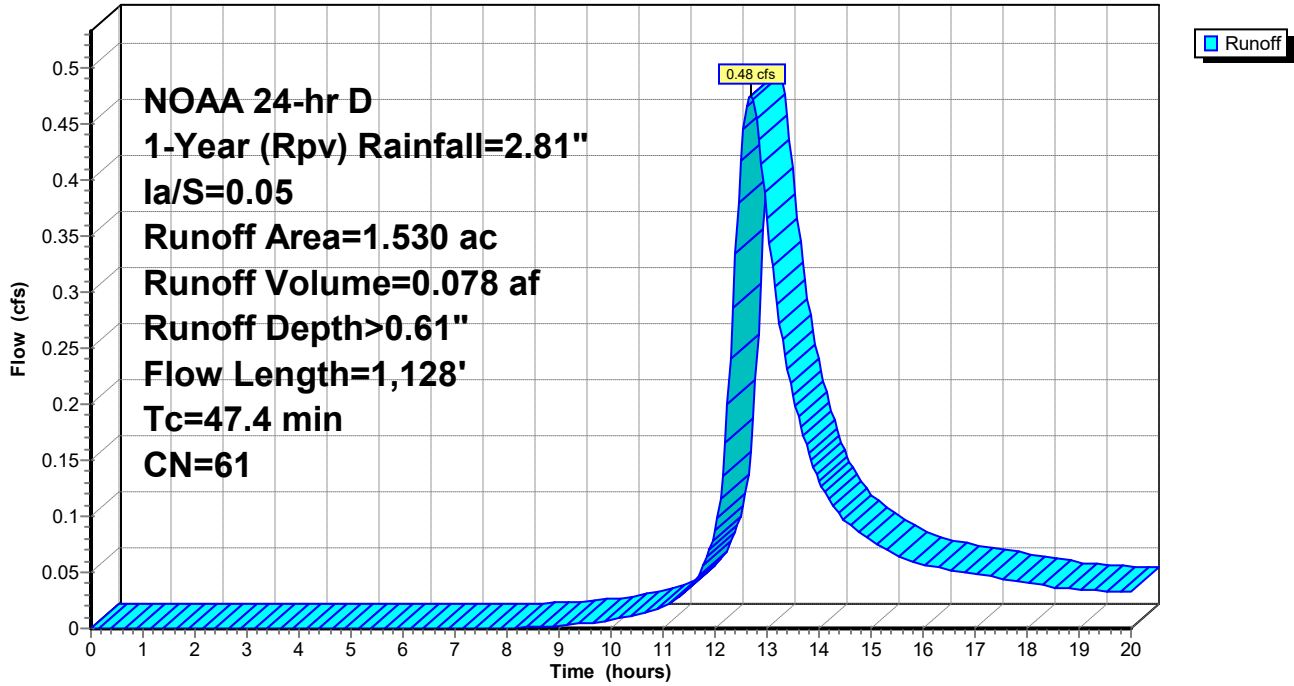
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-20.00 hrs, dt= 0.05 hrs
 NOAA 24-hr D 1-Year (Rpv) Rainfall=2.81", Ia/S=0.05

Area (ac)	CN	Description
0.950	39	>75% Grass cover, Good, HSG A
0.580	98	Paved roads w/curbs & sewers, HSG A
1.530	61	Weighted Average
0.950		62.09% Pervious Area
0.580		37.91% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.6	43	0.0225	1.24		Sheet Flow, Smooth surfaces n= 0.011 P2= 3.30"
0.4	85	0.2940	3.80		Shallow Concentrated Flow, Short Grass Pasture Kv= 7.0 fps
0.4	180	0.0200	7.40	148.81	Channel Flow, Area= 20.1 sf Perim= 18.5' r= 1.09' n= 0.030
0.8	220	0.0050	4.55	8.05	Pipe Channel, RCP_Round 18" 18.0" Round Area= 1.8 sf Perim= 4.7' r= 0.38' n= 0.012
45.2	600	0.0010	0.22		Shallow Concentrated Flow, Short Grass Pasture Kv= 7.0 fps
47.4	1,128	Total			

Subcatchment SC-25A: 25A

Hydrograph



Summary for Subcatchment SC-25B: 25B

Runoff = 3.00 cfs @ 12.13 hrs, Volume= 0.224 af, Depth> 2.11"

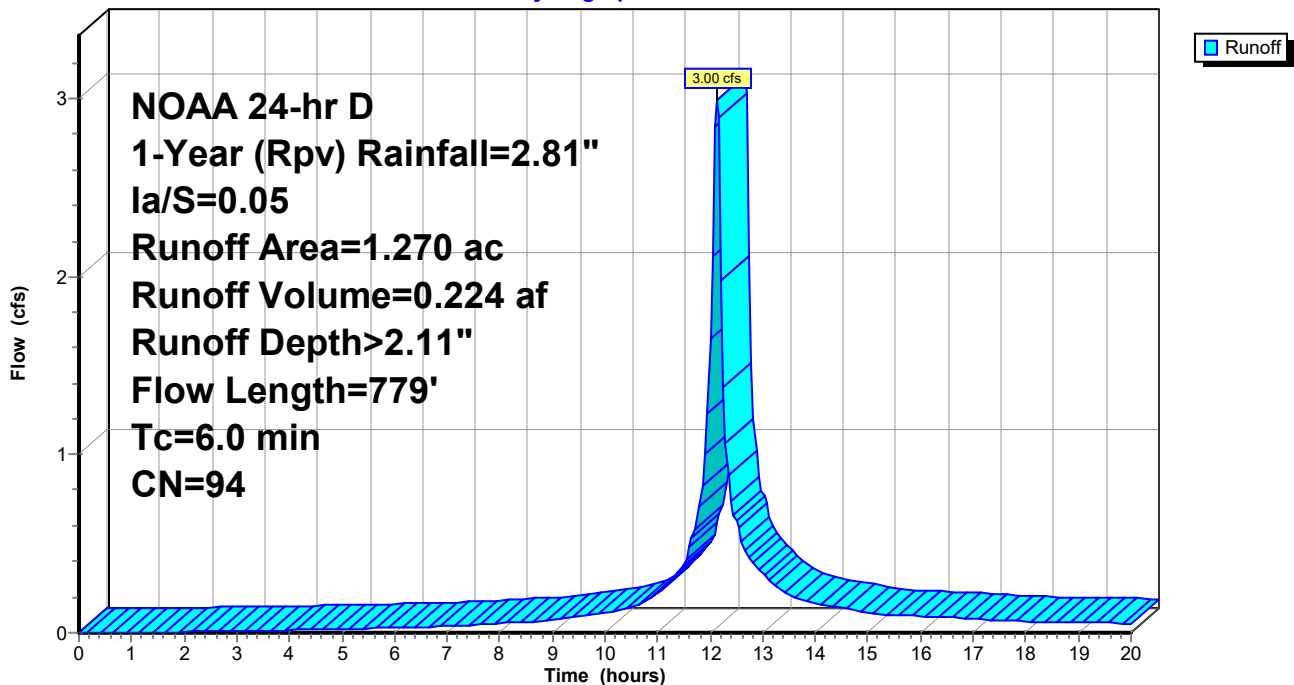
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-20.00 hrs, dt= 0.05 hrs
 NOAA 24-hr D 1-Year (Rpv) Rainfall=2.81", Ia/S=0.05

Area (ac)	CN	Description
1.180	98	Paved roads w/curbs & sewers, HSG A
0.090	39	>75% Grass cover, Good, HSG A
1.270	94	Weighted Average
0.090		7.09% Pervious Area
1.180		92.91% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.7	46	0.0166	1.11		Sheet Flow, Smooth surfaces n= 0.011 P2= 3.30"
0.2	115	0.0200	9.11	16.09	Pipe Channel, RCP_Round 18" 18.0" Round Area= 1.8 sf Perim= 4.7' r= 0.38' n= 0.012
2.1	618	0.0080	5.01	124.11	Trap/Vee/Rect Channel Flow, Bot.W=2.00' D=2.25' Z= 4.0 ' /' Top.W=20.00' n= 0.030
3.0	779	Total, Increased to minimum Tc = 6.0 min			

Subcatchment SC-25B: 25B

Hydrograph



Summary for Pond BMP-25B: (new Pond)

Inflow Area = 1.270 ac, 92.91% Impervious, Inflow Depth > 2.11" for 1-Year (Rpv) event
 Inflow = 3.00 cfs @ 12.13 hrs, Volume= 0.224 af
 Outflow = 0.33 cfs @ 13.00 hrs, Volume= 0.199 af, Atten= 89%, Lag= 52.2 min
 Discarded = 0.33 cfs @ 13.00 hrs, Volume= 0.199 af
 Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 0.00-20.00 hrs, dt= 0.05 hrs
 Peak Elev= 26.98' @ 13.00 hrs Surf.Area= 0.152 ac Storage= 0.092 af

Plug-Flow detention time= 126.7 min calculated for 0.199 af (89% of inflow)
 Center-of-Mass det. time= 87.7 min (834.6 - 746.9)

Volume	Invert	Avail.Storage	Storage Description
#1	24.50'	0.055 af	10.00'W x 300.00'L x 2.00'H Prismatic 0.138 af Overall x 40.0% Voids
#2	26.50'	0.196 af	10.00'W x 300.00'L x 2.00'H Prismatic Z=2.0
		0.251 af	Total Available Storage

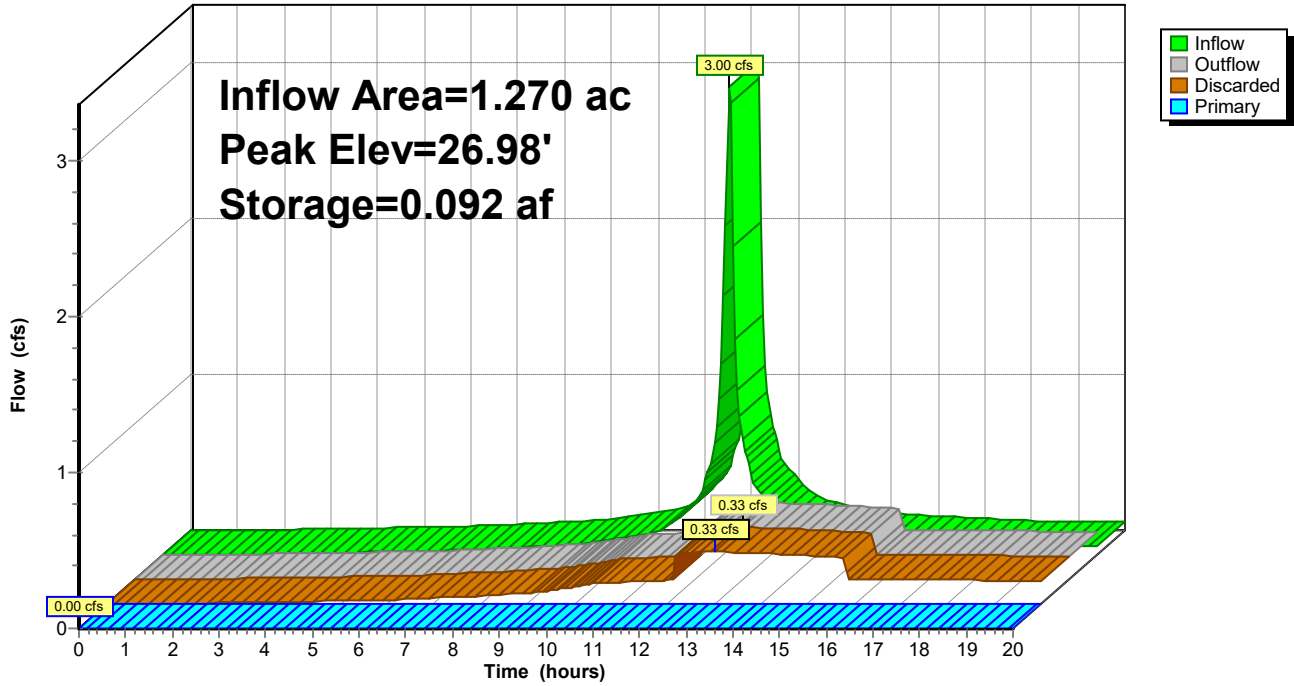
Device	Routing	Invert	Outlet Devices
#1	Discarded	24.50'	2.000 in/hr Exfiltration over Surface area Conductivity to Groundwater Elevation = 10.00'
#2	Primary	28.25'	18.0' long (Profile 1) Broad-Crested Rectangular Weir Head (feet) 0.49 0.98 1.48 Coef. (English) 2.92 3.37 3.59

Discarded OutFlow Max=0.33 cfs @ 13.00 hrs HW=26.98' (Free Discharge)
 ↑1=Exfiltration (Controls 0.33 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=24.50' (Free Discharge)
 ↑2=Broad-Crested Rectangular Weir (Controls 0.00 cfs)

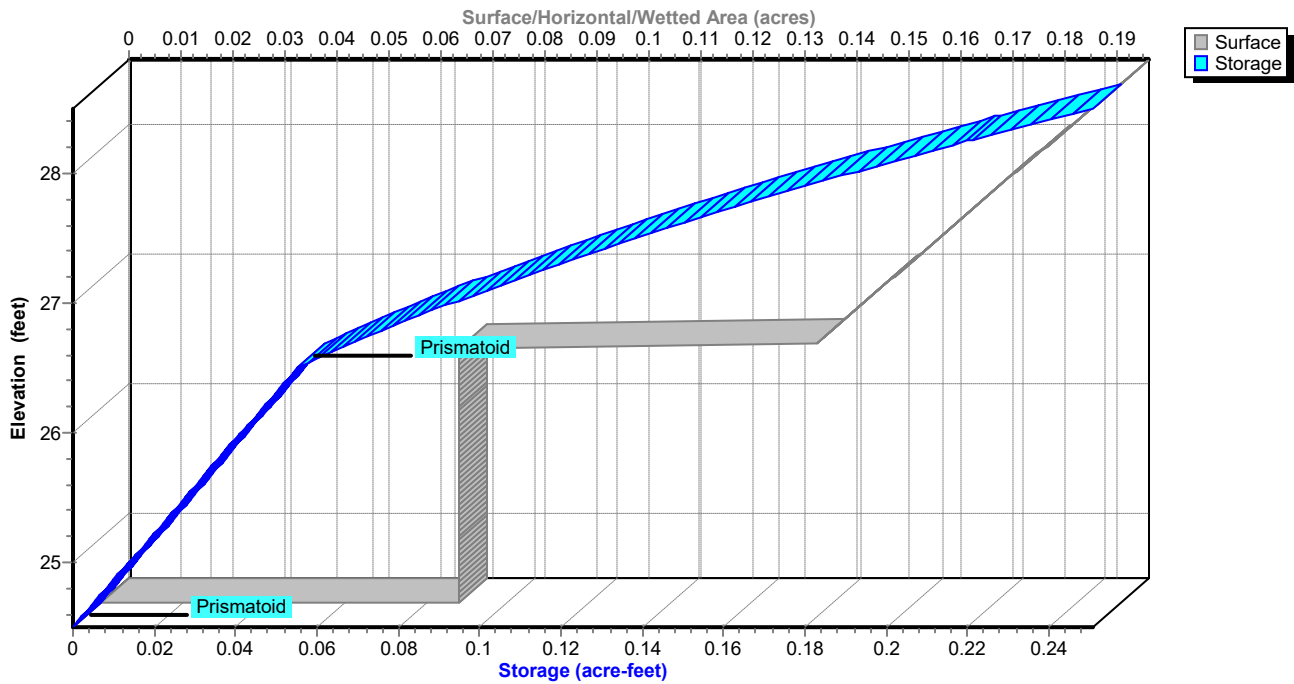
Pond BMP-25B: (new Pond)

Hydrograph



Pond BMP-25B: (new Pond)

Stage-Area-Storage



Summary for Subcatchment SC-25C: 25C

Runoff = 1.81 cfs @ 12.43 hrs, Volume= 0.241 af, Depth> 0.29"

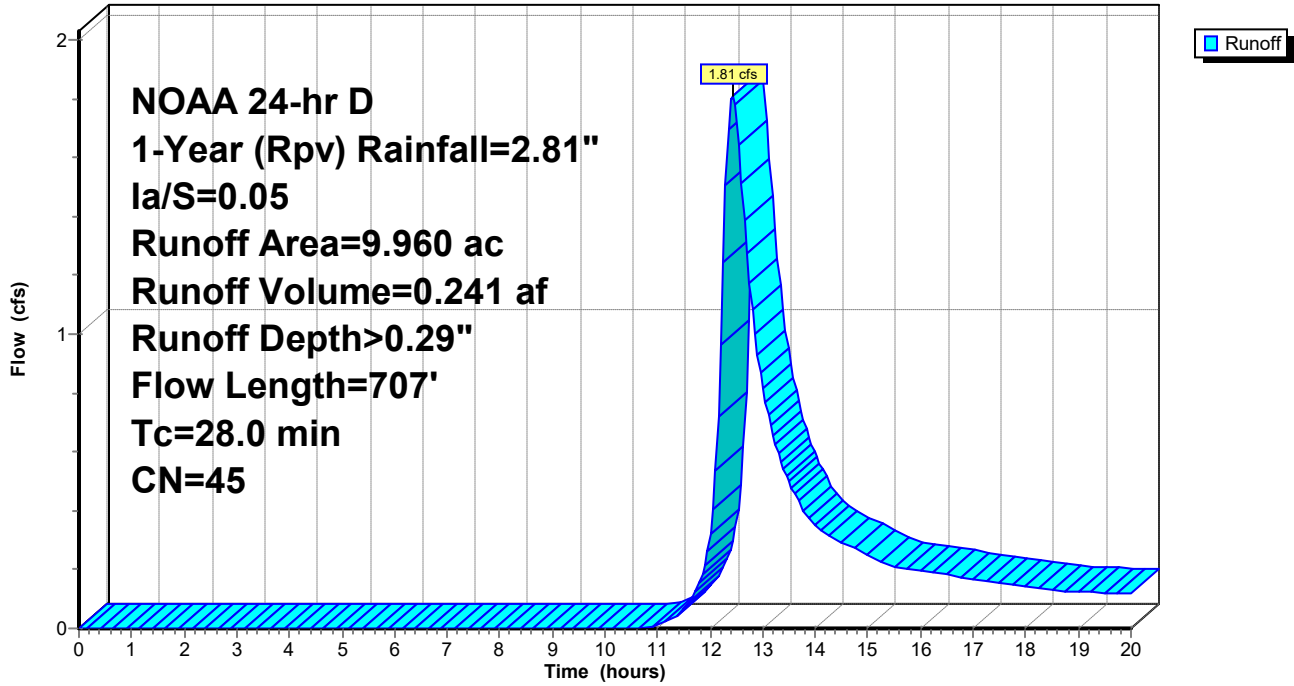
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-20.00 hrs, dt= 0.05 hrs
 NOAA 24-hr D 1-Year (Rpv) Rainfall=2.81", Ia/S=0.05

Area (ac)	CN	Description
8.950	39	>75% Grass cover, Good, HSG A
1.010	98	Paved roads w/curbs & sewers, HSG A
9.960	45	Weighted Average
8.950		89.86% Pervious Area
1.010		10.14% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.5	31	0.0154	1.00		Sheet Flow, Smooth surfaces n= 0.011 P2= 3.30"
0.1	10	0.0390	1.38		Shallow Concentrated Flow, Short Grass Pasture Kv= 7.0 fps
0.0	10	0.0440	4.26		Shallow Concentrated Flow, Paved Kv= 20.3 fps
0.3	75	0.3070	3.88		Shallow Concentrated Flow, Short Grass Pasture Kv= 7.0 fps
27.1	581	0.0026	0.36		Shallow Concentrated Flow, Short Grass Pasture Kv= 7.0 fps
28.0	707	Total			

Subcatchment SC-25C: 25C

Hydrograph



Summary for Subcatchment SC-25D: 25D

Runoff = 0.32 cfs @ 12.14 hrs, Volume= 0.023 af, Depth> 0.35"

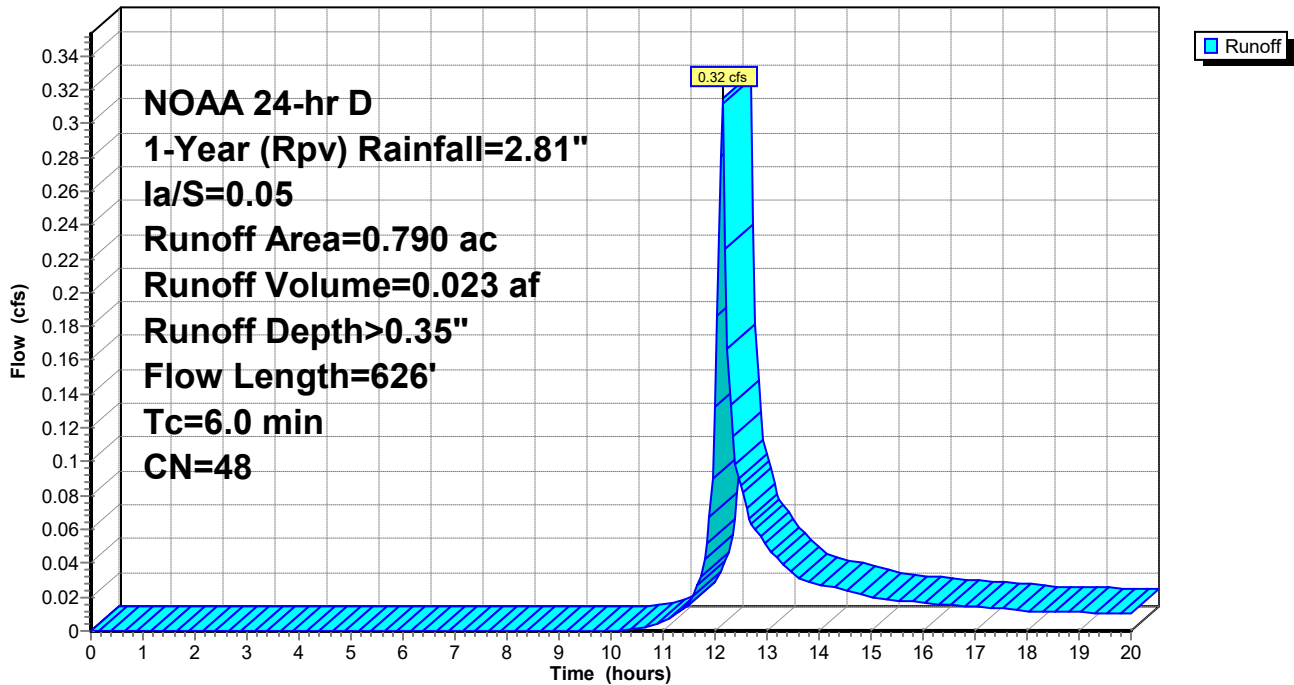
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-20.00 hrs, dt= 0.05 hrs
 NOAA 24-hr D 1-Year (Rpv) Rainfall=2.81", Ia/S=0.05

Area (ac)	CN	Description
0.670	39	>75% Grass cover, Good, HSG A
0.120	98	Paved roads w/curbs & sewers, HSG A
0.790	48	Weighted Average
0.670		84.81% Pervious Area
0.120		15.19% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.2	11	0.0257	0.99		Sheet Flow, Smooth surfaces n= 0.011 P2= 3.30"
0.2	31	0.1870	3.03		Shallow Concentrated Flow, Short Grass Pasture Kv= 7.0 fps
1.6	584	0.0140	6.07	104.48	Channel Flow, Area= 17.2 sf Perim= 16.3' r= 1.06' n= 0.030
2.0	626	Total, Increased to minimum Tc = 6.0 min			

Subcatchment SC-25D: 25D

Hydrograph



Summary for Pond BMP-25D: (new Pond)

Inflow Area = 0.790 ac, 15.19% Impervious, Inflow Depth > 0.35" for 1-Year (Rpv) event
 Inflow = 0.32 cfs @ 12.14 hrs, Volume= 0.023 af
 Outflow = 0.04 cfs @ 13.13 hrs, Volume= 0.023 af, Atten= 86%, Lag= 59.6 min
 Discarded = 0.04 cfs @ 13.13 hrs, Volume= 0.023 af
 Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 0.00-20.00 hrs, dt= 0.05 hrs
 Peak Elev= 22.59' @ 13.13 hrs Surf.Area= 0.021 ac Storage= 0.007 af

Plug-Flow detention time= 60.3 min calculated for 0.023 af (99% of inflow)
 Center-of-Mass det. time= 58.8 min (887.6 - 828.8)

Volume	Invert	Avail.Storage	Storage Description
#1	21.75'	0.017 af	6.00'W x 150.00'L x 2.00'H Prismatic 0.041 af Overall x 40.0% Voids
#2	23.75'	0.071 af	6.00'W x 150.00'L x 2.00'H Prismatic Z=2.0
		0.087 af	Total Available Storage

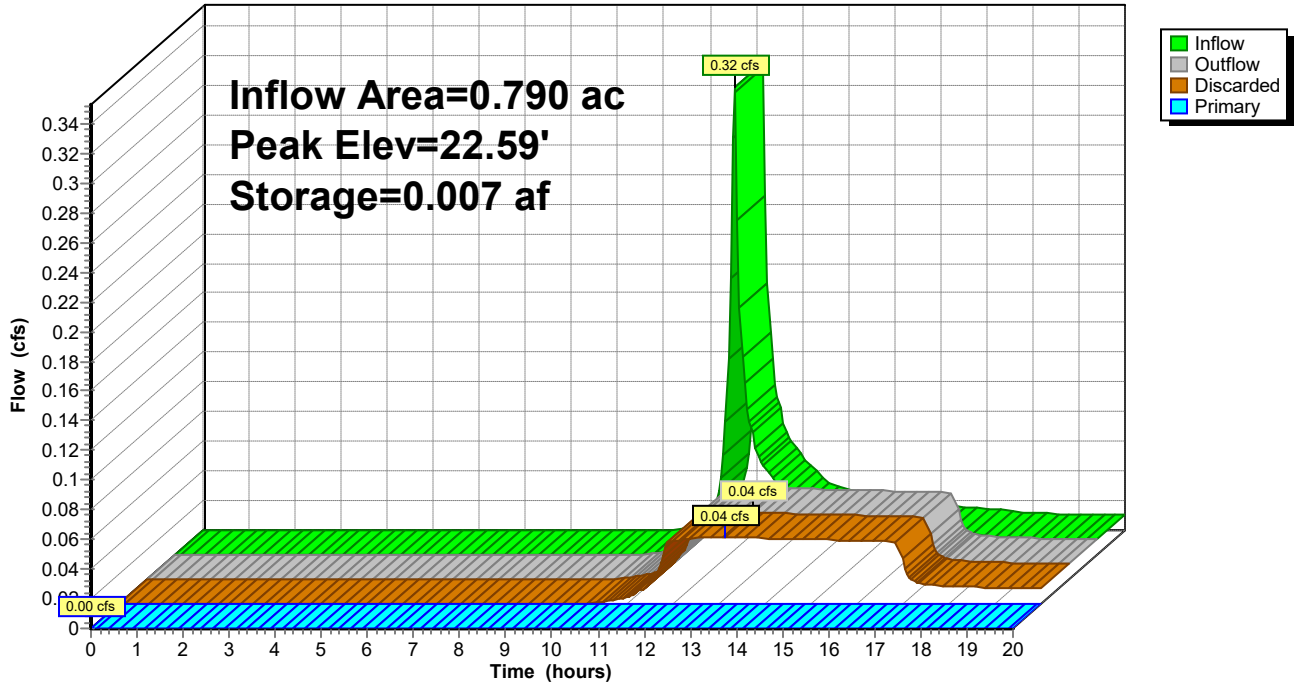
Device	Routing	Invert	Outlet Devices
#1	Discarded	21.75'	2.000 in/hr Exfiltration over Surface area Conductivity to Groundwater Elevation = 10.00'
#2	Primary	25.50'	14.0' long (Profile 1) Broad-Crested Rectangular Weir Head (feet) 0.49 0.98 1.48 Coef. (English) 2.92 3.37 3.59

Discarded OutFlow Max=0.04 cfs @ 13.13 hrs HW=22.59' (Free Discharge)
 ↑1=Exfiltration (Controls 0.04 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=21.75' (Free Discharge)
 ↑2=Broad-Crested Rectangular Weir (Controls 0.00 cfs)

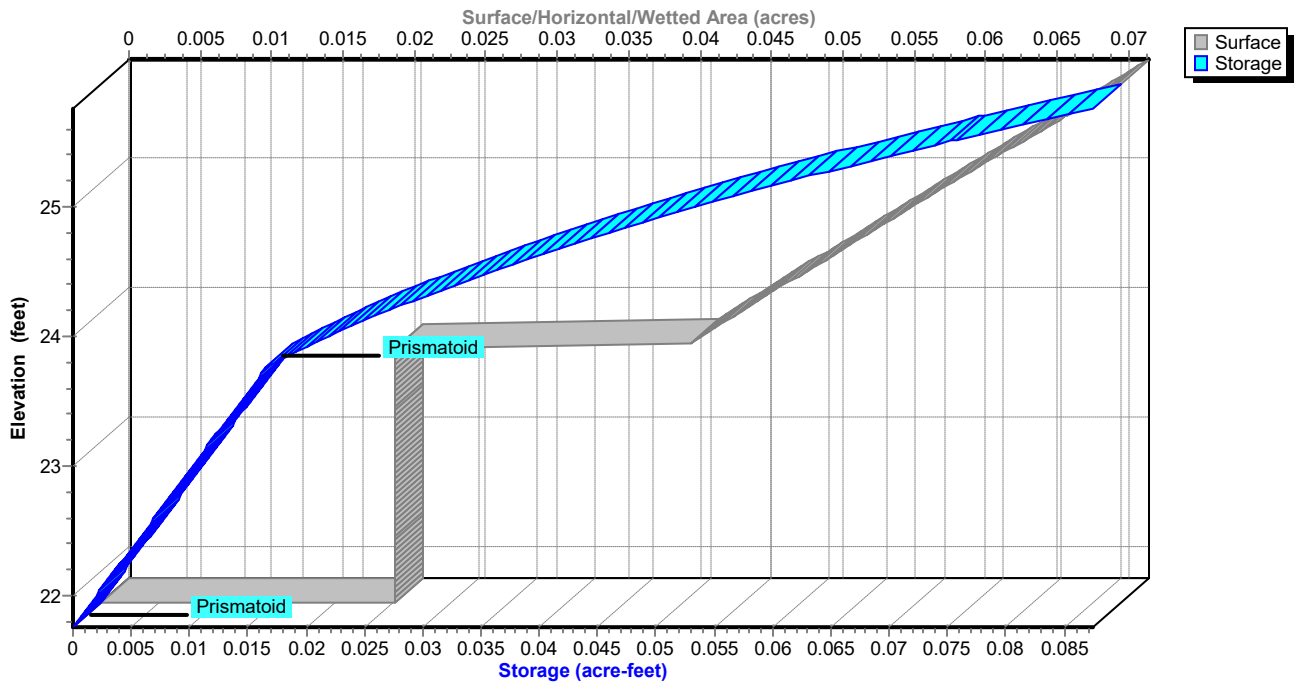
Pond BMP-25D: (new Pond)

Hydrograph



Pond BMP-25D: (new Pond)

Stage-Area-Storage



Summary for Subcatchment SC-25E: 25E

Runoff = 0.71 cfs @ 12.14 hrs, Volume= 0.050 af, Depth> 0.63"

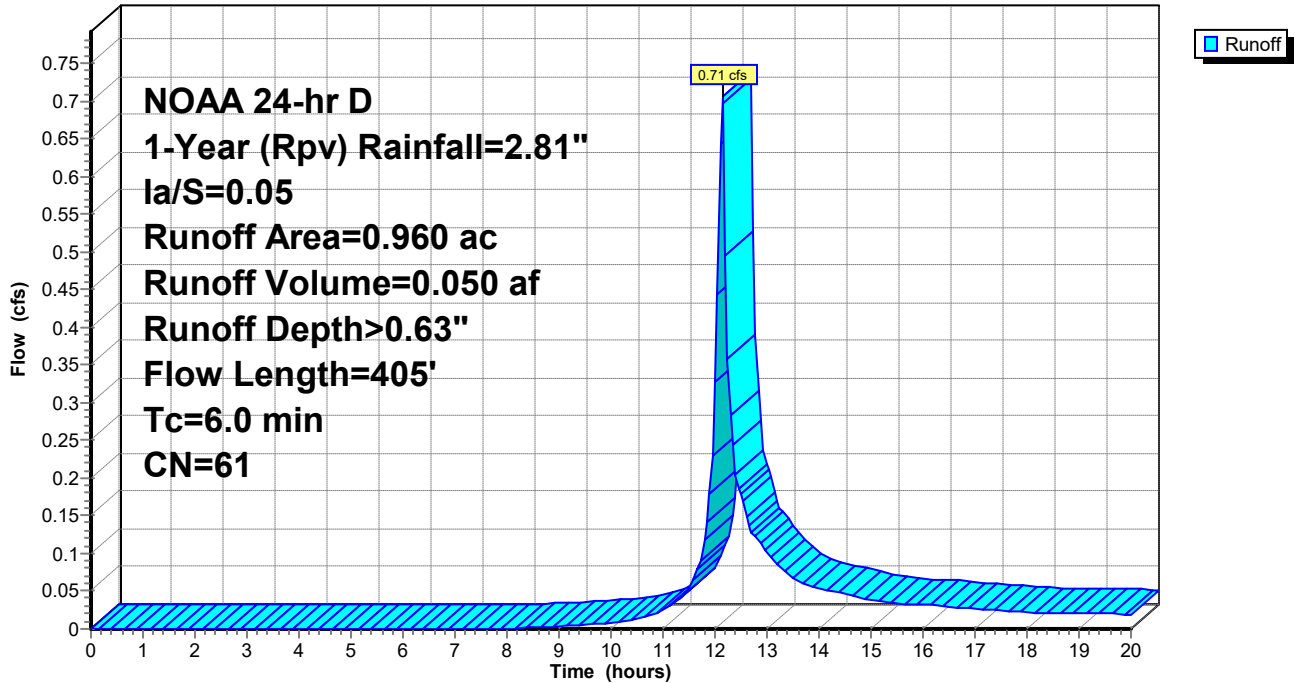
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-20.00 hrs, dt= 0.05 hrs
 NOAA 24-hr D 1-Year (Rpv) Rainfall=2.81", Ia/S=0.05

Area (ac)	CN	Description
0.610	39	>75% Grass cover, Good, HSG A
0.350	98	Paved roads w/curbs & sewers, HSG A
0.960	61	Weighted Average
0.610		63.54% Pervious Area
0.350		36.46% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.2	21	0.0463	1.43		Sheet Flow, Smooth surfaces n= 0.011 P2= 3.30"
0.1	19	0.1990	3.12		Shallow Concentrated Flow, Short Grass Pasture Kv= 7.0 fps
1.1	365	0.0052	5.77	427.32	Channel Flow, Area= 74.0 sf Perim= 36.0' r= 2.06' n= 0.030
1.4	405	Total, Increased to minimum Tc = 6.0 min			

Subcatchment SC-25E: 25E

Hydrograph



Summary for Subcatchment SC-26: 26

Runoff = 4.12 cfs @ 12.13 hrs, Volume= 0.290 af, Depth> 1.15"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-20.00 hrs, dt= 0.05 hrs
 NOAA 24-hr D 1-Year (Rpv) Rainfall=2.81", Ia/S=0.05

Area (ac)	CN	Description
1.090	39	>75% Grass cover, Good, HSG A
1.950	98	Paved roads w/curbs & sewers, HSG A
3.040	77	Weighted Average
1.090		35.86% Pervious Area
1.950		64.14% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.4	21	0.0157	0.93		Sheet Flow, Smooth surfaces n= 0.011 P2= 3.30"
0.1	18	0.0857	2.05		Shallow Concentrated Flow, Short Grass Pasture Kv= 7.0 fps
1.3	376	0.0083	4.70	132.64	Channel Flow, Area= 28.2 sf Perim= 26.5' r= 1.06' n= 0.030
0.1	40	0.0050	4.55	8.05	Pipe Channel, RCP_Round 18" 18.0" Round Area= 1.8 sf Perim= 4.7' r= 0.38' n= 0.012
3.2	618	0.0034	3.18	68.97	Channel Flow, Area= 21.7 sf Perim= 18.8' r= 1.15' n= 0.030
0.1	37	0.0050	4.55	8.05	Pipe Channel, RCP_Round 18" 18.0" Round Area= 1.8 sf Perim= 4.7' r= 0.38' n= 0.012
0.5	317	0.0250	11.61	377.42	Channel Flow, Area= 32.5 sf Perim= 18.0' r= 1.81' n= 0.030
5.7	1,427	Total, Increased to minimum Tc = 6.0 min			

Subcatchment SC-26: 26

Hydrograph

