Stormwater Management Plan

for

Medical Office Building

Proposed Site Plan

Block 106, Lot 6

City of Northfield
Atlantic County, New Jersey

Prepared by:

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CONSULTING ENGINEERS AND PLANNERS

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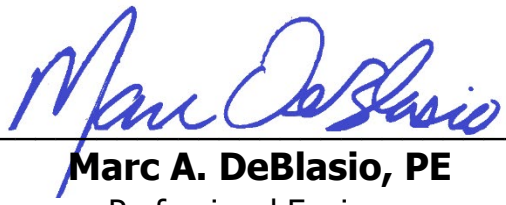

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Site Information

This development plan proposes to subdivide and complete site improvements at the property known as Block 106 Lot 8 in the City of Northfield, NJ. The project will include subdividing a new, 175' x 200' lot from existing Block 106 Lot 8 to allow for the construction of an approximate 5,116 square foot medical office building with associated parking. The plan has been developed in accordance with the standards of the Development Ordinances of the City of Northfield, as well as the New Jersey Department of Environmental Protection. Additional improvements to the site include driveways, utilities, and stormwater management.

The subject property is shown as Block 106, Lot 8 on the current tax maps for the City of Northfield. The proposed improvements are detailed on the plans entitled Pre & Post Development Drainage Boundaries, Major Site Plan, Proposed Medical Office, Block 106, Lot 8, City of Northfield, Atlantic County, New Jersey as prepared by DeBlasio & Associates.

The site is located in the R2, Residential Zone district, as shown on the City of Northfield Zoning Map.

Design Objectives

This stormwater management plan has been developed in accordance with the current requirements of the Stormwater Management section of City's Land and Site Plan Review Design Standards Ordinance (Chapter 325). These standards are consistent with the New Jersey Stormwater Best Management Practices (BMP) Manual.

The specific performance standards for stormwater management plans are outlined in Chapter 325 of the City's Ordinance. More specifically, this Drainage and Stormwater Management Plan will demonstrate compliance with the following:

A. The nine (9) non-structural stormwater management strategies found in Subchapter 5 of the NJDEP Stormwater Management Rules (NJAC 7:8-5);

B. The maximum stormwater runoff rates and volume;

C. The standards for groundwater recharge;

D. Soil erosion control standards; and

E. Stormwater runoff water quality.

Non-Structural Stormwater Management Strategies

As stated above, City Ordinance requires that a stormwater management plan incorporate, to the maximum extent possible, the nine (9) non-structural stormwater management strategies identified in Subchapter 5 of the NJDEP Stormwater Management Rules.

The nine strategies are listed below with an explanation as to how the proposed development attempts to incorporate each strategy, to the maximum extent possible.

1. ***Protect areas that provide water quality benefits or areas particularly susceptible to erosion and sediment loss.***

   The site provides sufficient soil stabilization to prevent erosion and sediment loss from the site.

2. ***Minimize impervious surfaces and break up or disconnect the flow of runoff over impervious surfaces.***

   Although the proposed development contains an increased amount of imperious area, the flow of runoff over the impervious areas is minimized by providing multiple points of inflow into the stormwater management areas.

3. ***Maximize the protection of natural drainage features and vegetation.***

   The development plan does not require any proposed clearing to complete the necessary improvements.

4. ***Minimize the decrease in the pre-construction time of concentration.***

   The proposed development plan minimizes the decreases in the pre-construction time of concentration by retaining a large a portion of the runoff volume generated in the on-site stormwater management areas located on the site. The storage areas are each designed to collect runoff from the site, retain it and infiltrate as much of it as possible, and then regulate the outflow to the site discharge point.

5. ***Minimize land disturbance including clearing and grading.***

   The proposed development plan has been designed such that the clearing will be limited to that that which is necessary to create the proposed improvements. Additionally, the amount of cut and fill areas has been minimized, thereby reducing the total amount of land grading necessary.

6. ***Minimize soil compaction.***

   As stated above, the development plan has been created to limit the amount of cut and fill required to only that which is necessary for the construction of the improvements. By limiting the amount of cut and fill, the amount of soil compaction has also been minimized.

7. ***Provide low maintenance landscaping that encourages retention and planting of native vegetation and minimizes the sizes of lawns, fertilizers and pesticides.***

   The landscaping included in the development plan consists mainly of low maintenance, native species and limits the number of ornamental species. This low-maintenance approach will limit the amount of fertilizers and pesticides used on the site.

8. ***Provide vegetated open-channel conveyance systems discharging into and through stable vegetated areas.***

   The proposed development plan retains a large portion of the stormwater runoff and infiltrates in on-site. This allows any sediment collected in the runoff to settle and not be discharged off-site, thereby improving the water quality of the runoff.

9. ***Provide other preventative source controls to prevent or minimize the use or exposure of pollutants at the site in order to prevent or minimize the release of those pollutants into stormwater runoff. These source controls include, but are not limited to:***

   a. ***Site design features that help to prevent accumulation of trash and debris in drainage systems;***

   b. ***Site design features that help prevent discharge of trash and debris from drainage systems;***

   c. ***Site design features that help to prevent and/or contain spills or other harmful accumulations of pollutants at industrial or commercial developments; and***

   d. ***When establishing vegetation after land disturbance, applying fertilizer in accordance with the requirements established under the Soil Erosion and Sediment Control Act (NJSA 4:24-39 et. seq.) and applying rules.***

   The development plans include the use of stormwater facilities that meet the standards promulgated by the NJDEP's Stormwater Management Rules. The development plan requires approval from the Cape Atlantic Soil Conservation District. The proposed stabilization of the disturbed areas meets with the standards of the Cape Atlantic SCD.

To determine if the proposed development plan meets the requirements for nonstructural stormwater strategies, the NJDEP developed the Nonstructural Strategies Points System Spreadsheet. This spreadsheet quantifies the proposed nonstructural strategies implemented by a proposed development. Appendix E contains a copy of the completed spreadsheet for the proposed development. Since the project is located within a Metropolitan Area, the site is considered to be located in State Planning Area 1 (PA-2) for the purpose of determining the adequacy of the nonstructural stormwater strategies. Accordingly, the proposed development is required to maintain 78% of the points calculated for the existing conditions of the site. As demonstrated in the spreadsheet, based on the existing land use and cover, the site scores a total of 331 points. As a result of the nonstructural strategies implemented by the development plan, the proposed site scores a total of 326 points, or 98% of the existing points. Therefore, the development plan satisfied the requirement for nonstructural stormwater management strategies.

Stormwater Runoff Rates and Volume

Chapter 325-16R. (2)(c) details the required standards for stormwater runoff rates and quantity. More specifically, this section requires that the design must 'd*emonstrate that the peak post-developed stormwater runoff rates from the project site for the two-, ten-, and one-hundred-year storms are 50%, 75% and 80%, respectively, of the site's peak pre-developed stormwater runoff rates for the same storms.'*

Existing Runoff

The existing site is comprised of one drainage area as shown on Sheet 11, found in Appendix I of this report. Based on the existing impervious areas and other land uses, the existing drainage areas have been assigned the appropriate curve numbers (CN). The existing site has been previously disturbed, and the surface now consists of an existing asphalt parking area and open grassed areas.

The existing drainage areas encompasses the entire site. There is a minor depression in the grassed area on the south side of the site which provides minor detention of the existing stormwater runoff prior to it being discharged from the site.

The following is a summary of the peak rates of runoff and the total runoff volumes for the existing pre-construction conditions for each of the design storms. A full accounting of the existing conditions can be found in Appendix A of this report.

For Existing Drainage Area 1 (XA-01), Area = 2.540 ac, CN=98/61/58

Design Storm	Volume (acre-ft)	Peak Rate (cfs)
2	0.196	0.56
10	0.407	1.23
100	0.940	2.99

Proposed Runoff

Due to the proposed development, the post-construction site will contain three (3) drainage subareas. The proposed subareas are detailed on Sheet 12, found in Appendix I of this report.

As a result of the development, the curve numbers for each of the proposed drainage areas will change. It is assumed that after development, all of the open space (lawns, swales, depressions, etc.) will be grassed and in good condition.

In accordance with the NJDEP Stormwater Rules, the proposed runoff for each proposed subarea has been calculated by considering the impervious and pervious areas separately. The Curve Numbers for each of the subareas have not simply been averaged, but separate hydrographs for the pervious and impervious areas have been calculated and then summed to create a final runoff hydrograph for the subarea.

Runoff from the site will flow towards the basins that will be constructed on the site. The basins will be located along the north, west and east property lines. The Runoff from the proposed asphalt parking lot will first be directed towards underground recharge prior to entering the basin. Runoff from the site will be controlled by the use of a weir out of Basin 1. The proposed discharge point is located at the north property line.

The following are summaries of the peak rates of runoff and total runoff volumes for each of the three subareas. The detailed calculations for each proposed drainage area can be found in Appendix B.

For Proposed Drainage Area 1 (PR-01), Area = 1.110 ac., CN=98/61/58

Design Storm	Volume (acre-ft)	Peak Rate (cfs)
2	0.141	0.84
10	0.255	1.57
100	0.517	3.28

For Proposed Drainage Area 2 (PR-02), Area = 0.390 ac., CN=98/61

Design Storm	Volume (acre-ft)	Peak Rate (cfs)
2	0.080	0.91
10	0.131	1.49
100	0.234	2.67

For Proposed Drainage Area 3 (PR-03), Area = 0.920 ac., CN=98/58

Design Storm	Volume (acre-ft)	Peak Rate (cfs)
2	0.034	0.10
10	0.096	0.35
100	0.270	1.10

The Ordinance requires that the post-construction peak runoff rate is reduced to 50%, 75% and 80% of the pre-construction peak runoff rate for the 2-year, 10-year and 100-year storms, respectively. Due to the proposed development the size and composition (CN) of the proposed drainage areas, and the amount of impervious coverage has increased. Therefore, the proposed drainage areas must be routed through a stormwater management system to reduce the peak rate of runoff off-site. Runoff from Drainage Area 2 is collected by the proposed underground recharge that will be placed along the edges of the parking lot. Runoff from proposed Drainage Areas 1 and Drainage Area 3 is collected by the proposed stormwater management basin (Basin 1) that is located along the property edges. Runoff will be collected in each basin until the water level reaches the discharge point, which is controlled by a weir located along the northeastern property line. The proposed stormwater management controls all discharge from a 100 year storm.

The table below summarizes the total reduction in the existing peak flow for each of the design storms.

Design Storm	Peak Flow - Existing XA-01 (cfs)	Target Peak Flow (cfs)	Reduced Peak Flow @ Outlet (cfs)	Pre vs. Post Reduction
2	0.54	< 0.27 (50%)	0.00	0%
10	1.19	< 0.89 (75%)	0.00	0%
100	2.90	< 2.32 (80%)	0.00	0%

Since the peak rates of runoff at the existing discharge point has been reduced to a level that is less than 50%, 75% and 80% of the pre-construction peak rates for the 2, 10 and 100 year design storms, the proposed stormwater management system satisfies the requirements of the Ordinance for stormwater runoff rates.

Soil Erosion & Sediment Control Standards

The project site is located within the jurisdictional area of the Cape-Atlantic Soil Conservation District. Therefore, the proposed development plan will need to be certified by the SCD prior to the start of construction. Therefore, the plan will meet the requirements of the Ordinance and the SCD before construction begins.

Runoff Quality

The development plan is required to meet the standards for runoff quality as defined in the Ordinance and in the NJDEP Stormwater Rules. These standards require a total suspended solids (TSS) removal rate of 80%.

An infiltration basin provides a TSS removal rate of 80%, according to NJDEP regulations. To qualify as an infiltration basin, a proposed basin must fully store the NJDEP water quality storm (defined as 1 ¼" of rain over 2 hours) without exceeding a depth of 2 feet. Additionally, the maximum water surface elevation (WSEL) is well below the discharge point for the basin, so there is no

discharge from the basin for the water quality storm. Therefore, the proposed infiltration areas qualify.

Groundwater Recharge

The Stormwater Management Rules require that all proposed major land development have 100 percent of the difference between the site's pre- and post-development 2-year runoff volumes be infiltrated. There is no outflow from the basin for the 2-year storm. Therefore, all runoff volume for the post-development 2-year storm is infiltrated in the underground storage areas. The New Jersey Groundwater Recharge Spreadsheet (NJGRS) has also been completed for this development and is included in Appendix G.

Additionally, the maximum depth of water in the storage system is 3 feet. Based on a conservative estimate for the permeability of the soils underlying the storage areas of 6 inches per hour, it is estimated that all runoff stored in the system will infiltrate in to the ground in approximately 6 hours, which is significantly less than the maximum allowable time of 72 hours.

Groundwater Mounding

A Groundwater Mounding analysis was completed to determine the impacts of the new stormwater management basin on the surrounding structures, stormwater management basins and septic systems. The methodology for the analysis is outlined in the United States Geologic Service's (USGS) publication entitled Simulation of Groundwater Mounding Beneath Hypothetical Stormwater Infiltration Basins. The methodology utilized is based on the Hantush equation and three-dimensional finite-difference groundwater-flow models.

The closest structure to the proposed basin is the new proposed building. Based on the groundwater model, the groundwater will not mound too close to the foundation of the new building. Since there is no basement proposed for the new building, the effects in this area are negligible. Additionally, the surrounding area is serviced by public sewer, so the effects of groundwater mounding on nearby septic systems is also negligible.

Summary

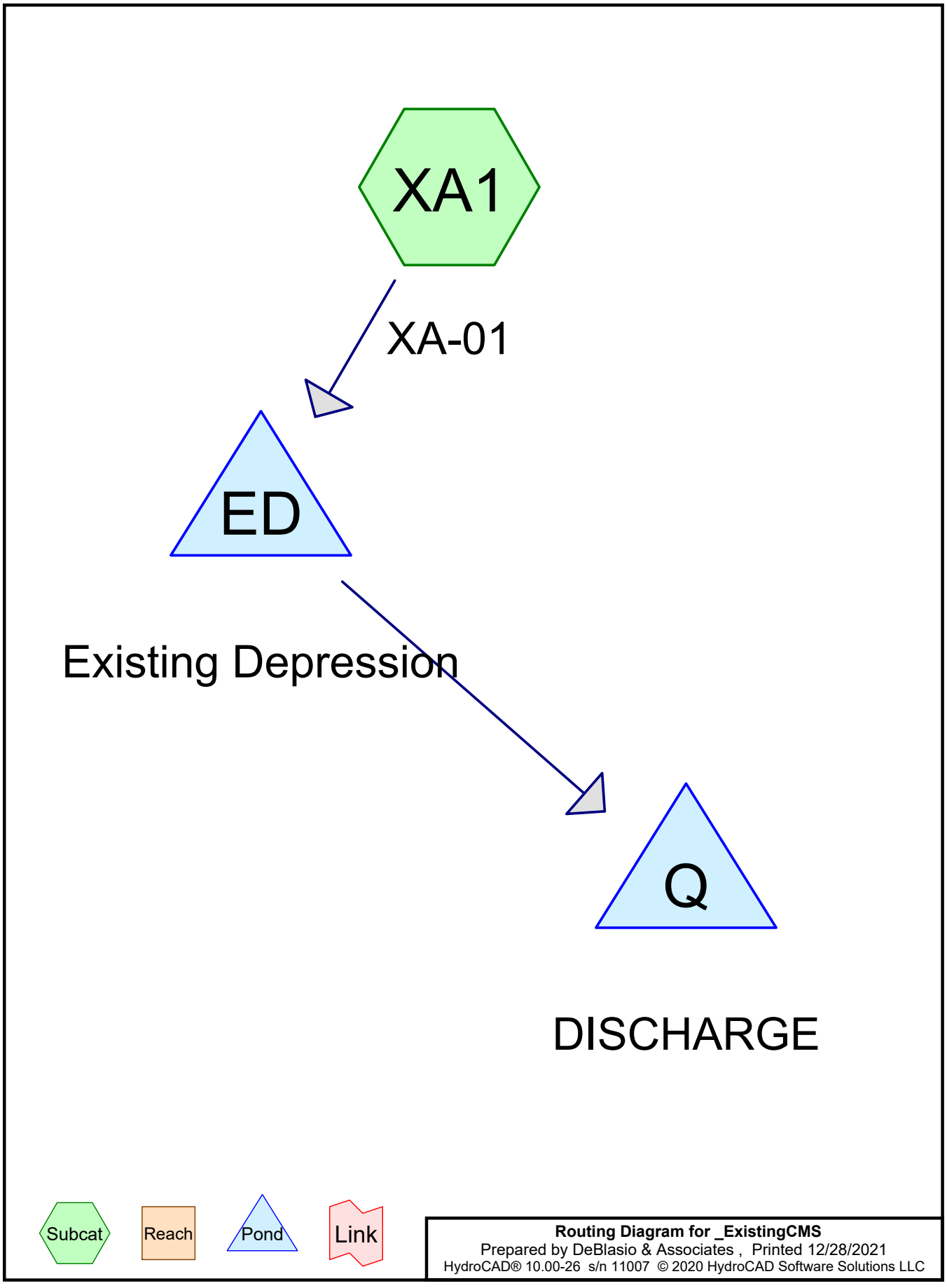
Due to the change in land use and the subsequent improvements made to the site, the total volumes of runoff between the existing and developed condition, as well as the rates of release, have decreased. The post-construction peak runoff rates have been reduced to less than 50%, 75% and 80% of the pre-construction peak runoff rates for the 2-, 10-, and 100-year storms, respectively. Therefore, the requirements of the ordinance have been met.

The groundwater recharge requirement has been met by recharging a runoff volume that is greater than the difference between the pre- and post-construction volume for the 2-year storm. There is no discharge from the site during the two-year storm. Therefore, the groundwater recharge requirements of the ordinance have been met.

The groundwater quality requirements of the ordinance have been met by the construction of an infiltration structure. The total TSS removal rate provided by the infiltration structure is 80%, which satisfies the requirement of an 80% minimum TSS removal.

Appendix A

Pre-Development Conditions



Routing Diagram for _ExistingCMS
Prepared by DeBlasio & Associates , Printed 12/28/2021
HydroCAD® 10.00-26 s/n 11007 © 2020 HydroCAD Software Solutions LLC

Area Listing (all nodes)

Area (acres)	CN	Description (subcatchment-numbers)
1.126	61	>75% Grass cover, Good, HSG B (XA1)
0.620	98	Impervious (XA1)
0.794	58	Woods/grass comb., Good, HSG B (XA1)
2.540	**69**	**TOTAL AREA**

Time span=5.00-20.00 hrs, dt=0.05 hrs, 301 points
Runoff by SCS TR-20 method, UH=Delmarva, Split Pervious/Imperv.
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment XA1: XA-01 Runoff Area=2.540 ac 24.41% Impervious Runoff Depth>0.93"
Flow Length=323' Tc=76.3 min CN=60/98 Runoff=0.56 cfs 0.196 af

Pond ED: Existing Depression Peak Elev=26.49' Storage=1,691 cf Inflow=0.56 cfs 0.196 af
Outflow=0.54 cfs 0.166 af

Pond Q: DISCHARGE Inflow=0.54 cfs 0.166 af
Primary=0.54 cfs 0.166 af

Total Runoff Area = 2.540 ac Runoff Volume = 0.196 af Average Runoff Depth = 0.93"
75.59% Pervious = 1.920 ac 24.41% Impervious = 0.620 ac

Summary for Subcatchment XA1: XA-01

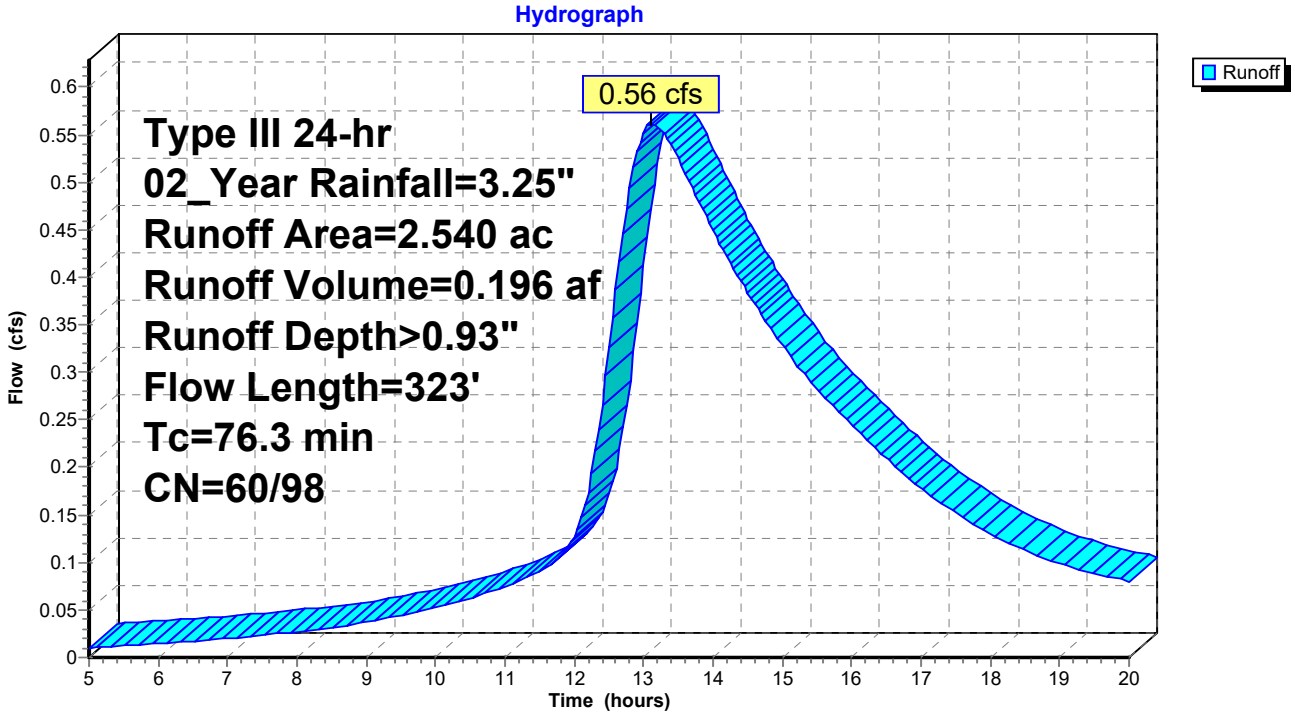
Runoff = 0.56 cfs @ 13.11 hrs, Volume= 0.196 af, Depth> 0.93"

Runoff by SCS TR-20 method, UH=Delmarva, Split Pervious/Imperv., Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 02_Year Rainfall=3.25"

	Area (ac)	CN	Description
*	0.620	98	Impervious
	1.126	61	>75% Grass cover, Good, HSG B
	0.794	58	Woods/grass comb., Good, HSG B
	2.540	69	Weighted Average
	1.920	60	75.59% Pervious Area
	0.620	98	24.41% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
52.8	222	0.0100	0.07		**Sheet Flow, a-b** Woods: Light underbrush n= 0.400 P2= 3.30"
22.9	78	0.0100	0.06		**Sheet Flow, b-c** Woods: Light underbrush n= 0.400 P2= 3.30"
0.6	23	0.0090	0.66		**Shallow Concentrated Flow, b-c** Short Grass Pasture Kv= 7.0 fps
76.3	323	Total			

Subcatchment XA1: XA-01



Summary for Pond ED: Existing Depression

[82] Warning: Early inflow requires earlier time span

Inflow Area = 2.540 ac, 24.41% Impervious, Inflow Depth > 0.93" for 02_Year event
Inflow = 0.56 cfs @ 13.11 hrs, Volume= 0.196 af
Outflow = 0.54 cfs @ 13.41 hrs, Volume= 0.166 af, Atten= 4%, Lag= 18.1 min
Primary = 0.54 cfs @ 13.41 hrs, Volume= 0.166 af

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 26.49' @ 13.41 hrs Surf.Area= 8,021 sf Storage= 1,691 cf

Plug-Flow detention time= 96.6 min calculated for 0.166 af (85% of inflow)
Center-of-Mass det. time= 53.9 min (912.2 - 858.2)

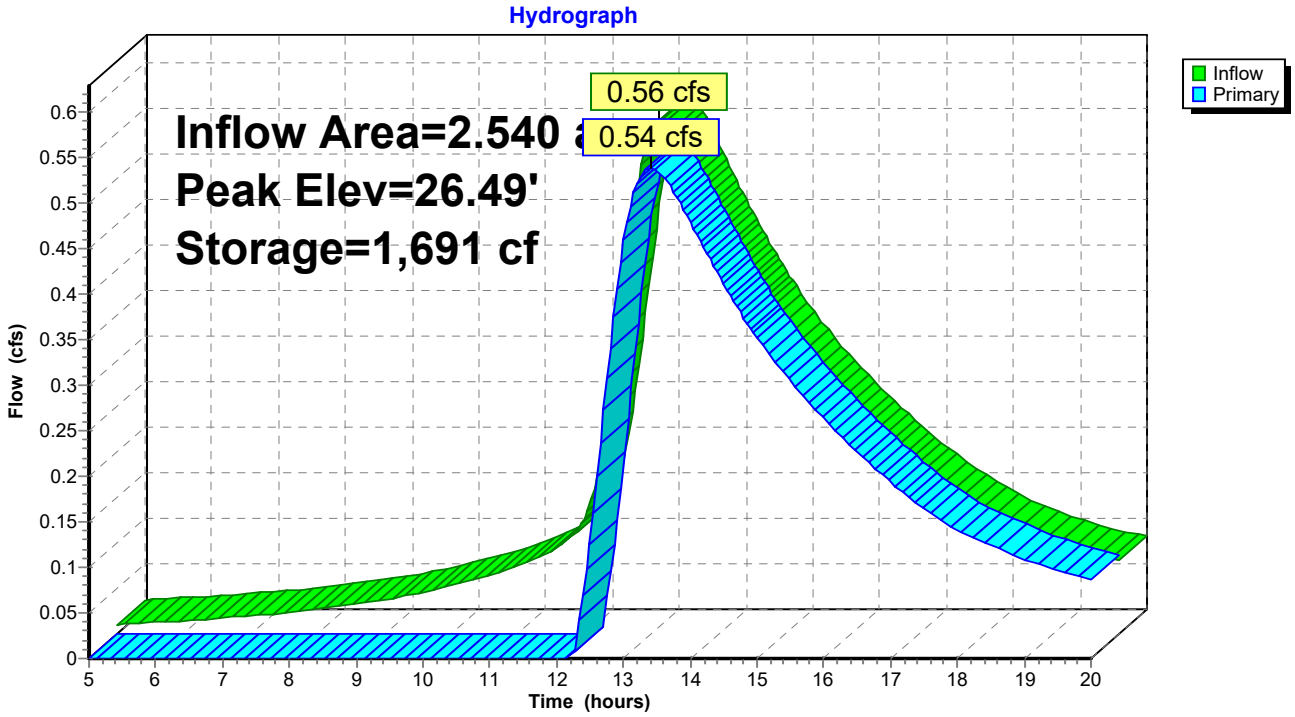
Volume	Invert	Avail.Storage	Storage Description
#1	26.00'	66,915 cf	**Custom Stage Data (Irregular)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
26.00	422	151.0	0	0	422
27.00	25,750	777.0	9,823	9,823	46,653
28.00	42,800	1,000.0	33,916	43,739	78,200
28.50	50,000	1,200.0	23,177	66,915	113,218

Device	Routing	Invert	Outlet Devices
#1	Primary	26.42'	**10.0' long x 1.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 Coef. (English) 2.69 2.72 2.75 2.85 2.98 3.08 3.20 3.28 3.31 3.30 3.31 3.32

Primary OutFlow Max=0.53 cfs @ 13.41 hrs HW=26.49' (Free Discharge)
1=Broad-Crested Rectangular Weir (Weir Controls 0.53 cfs @ 0.73 fps)

Pond ED: Existing Depression



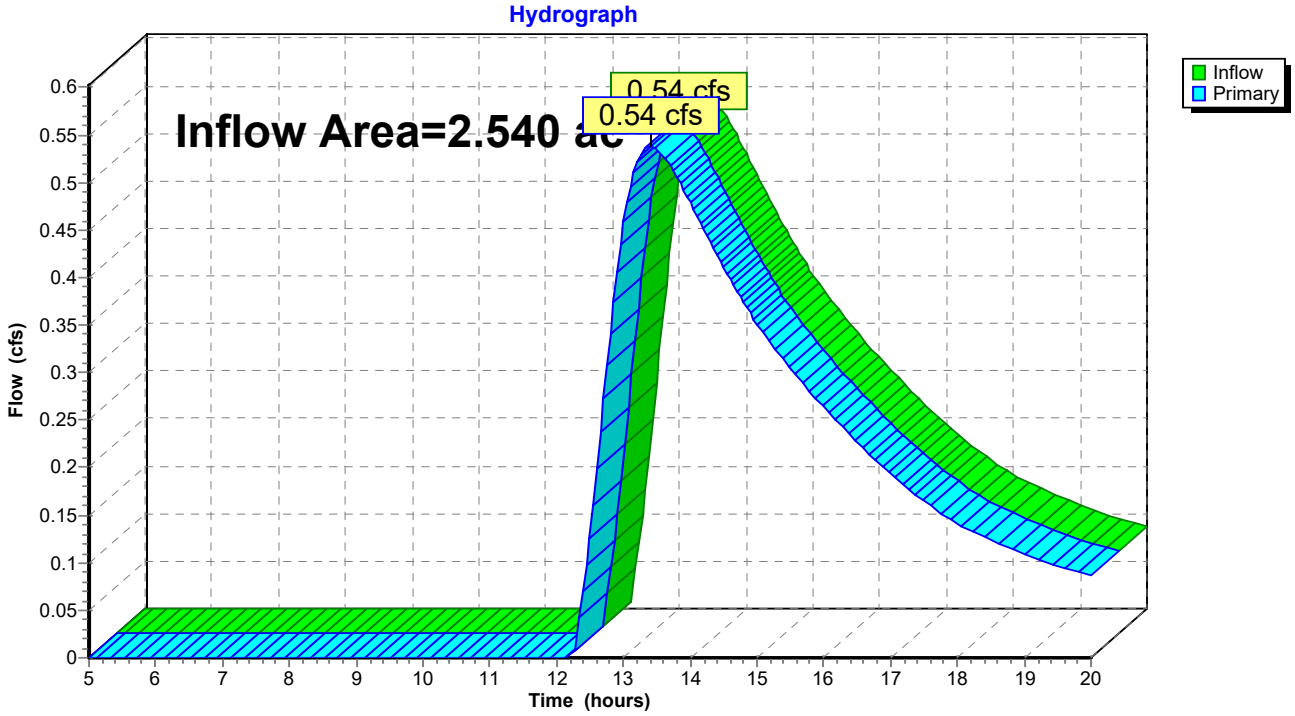
Summary for Pond Q: DISCHARGE

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 2.540 ac, 24.41% Impervious, Inflow Depth > 0.79" for 02_Year event
Inflow = 0.54 cfs @ 13.41 hrs, Volume= 0.166 af
Primary = 0.54 cfs @ 13.41 hrs, Volume= 0.166 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Pond Q: DISCHARGE



Time span=5.00-20.00 hrs, dt=0.05 hrs, 301 points
Runoff by SCS TR-20 method, UH=Delmarva, Split Pervious/Imperv.
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment XA1: XA-01 Runoff Area=2.540 ac 24.41% Impervious Runoff Depth>1.92"
Flow Length=323' Tc=76.3 min CN=60/98 Runoff=1.23 cfs 0.407 af

Pond ED: Existing Depression Peak Elev=26.54' Storage=2,139 cf Inflow=1.23 cfs 0.407 af
Outflow=1.19 cfs 0.375 af

Pond Q: DISCHARGE Inflow=1.19 cfs 0.375 af
Primary=1.19 cfs 0.375 af

Total Runoff Area = 2.540 ac Runoff Volume = 0.407 af Average Runoff Depth = 1.92"
75.59% Pervious = 1.920 ac 24.41% Impervious = 0.620 ac

Summary for Subcatchment XA1: XA-01

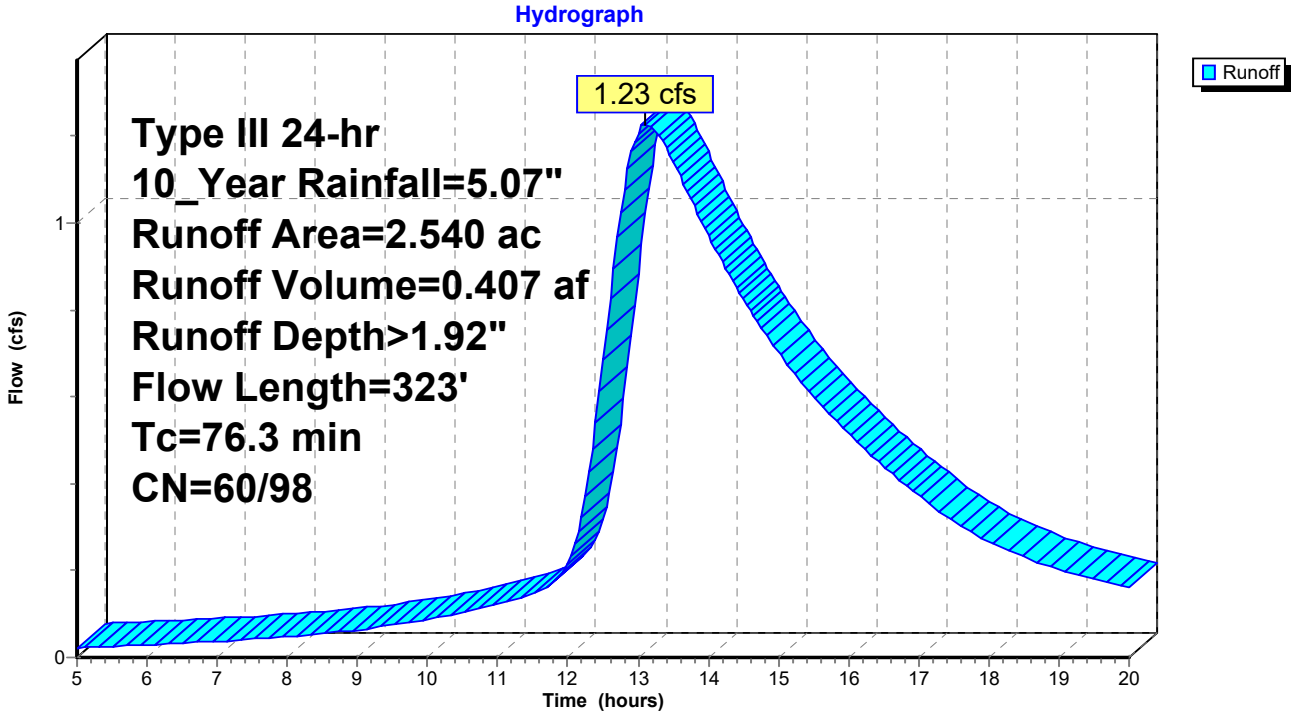
Runoff = 1.23 cfs @ 13.10 hrs, Volume= 0.407 af, Depth> 1.92"

Runoff by SCS TR-20 method, UH=Delmarva, Split Pervious/Imperv., Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 10_Year Rainfall=5.07"

	Area (ac)	CN	Description
*	0.620	98	Impervious
	1.126	61	>75% Grass cover, Good, HSG B
	0.794	58	Woods/grass comb., Good, HSG B
	2.540	69	Weighted Average
	1.920	60	75.59% Pervious Area
	0.620	98	24.41% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
52.8	222	0.0100	0.07		**Sheet Flow, a-b** Woods: Light underbrush n= 0.400 P2= 3.30"
22.9	78	0.0100	0.06		**Sheet Flow, b-c** Woods: Light underbrush n= 0.400 P2= 3.30"
0.6	23	0.0090	0.66		**Shallow Concentrated Flow, b-c** Short Grass Pasture Kv= 7.0 fps
76.3	323	Total			

Subcatchment XA1: XA-01



Summary for Pond ED: Existing Depression

[82] Warning: Early inflow requires earlier time span

Inflow Area = 2.540 ac, 24.41% Impervious, Inflow Depth > 1.92" for 10_Year event
Inflow = 1.23 cfs @ 13.10 hrs, Volume= 0.407 af
Outflow = 1.19 cfs @ 13.35 hrs, Volume= 0.375 af, Atten= 3%, Lag= 15.4 min
Primary = 1.19 cfs @ 13.35 hrs, Volume= 0.375 af

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 26.54' @ 13.35 hrs Surf.Area= 9,368 sf Storage= 2,139 cf

Plug-Flow detention time= 59.0 min calculated for 0.374 af (92% of inflow)
Center-of-Mass det. time= 35.5 min (898.1 - 862.6)

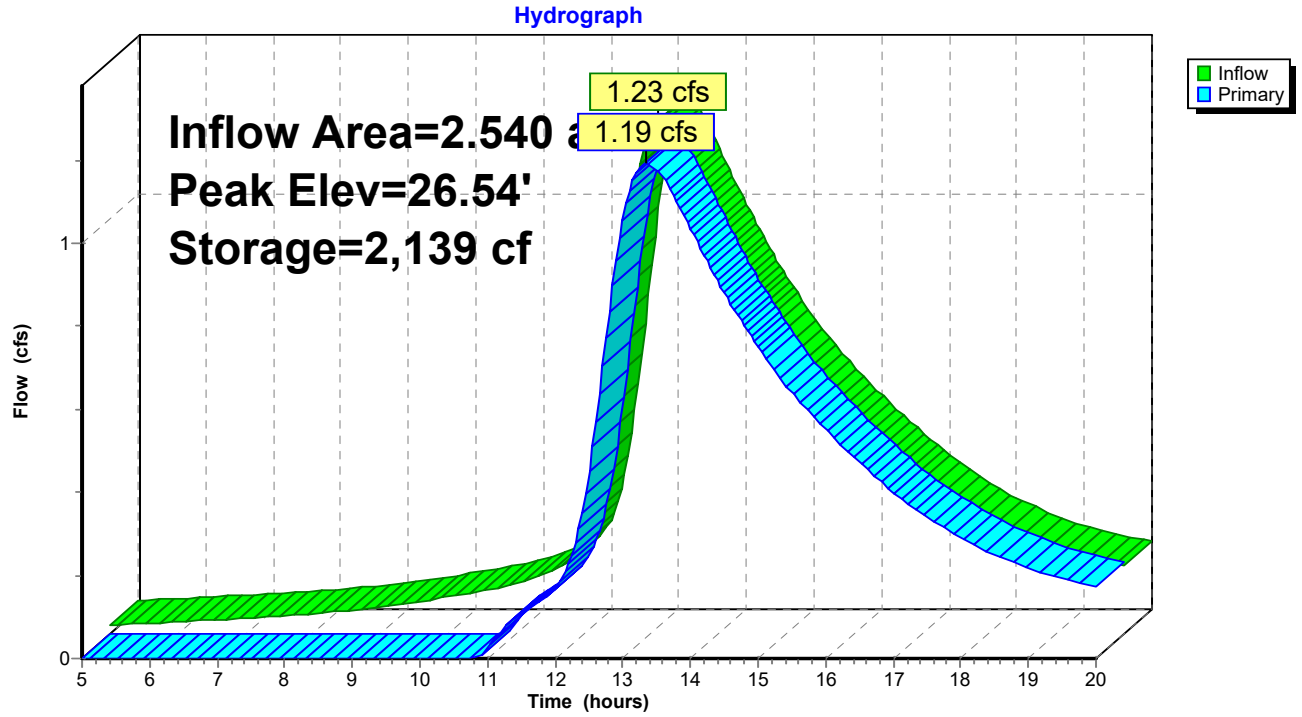
Volume	Invert	Avail.Storage	Storage Description
#1	26.00'	66,915 cf	**Custom Stage Data (Irregular)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
26.00	422	151.0	0	0	422
27.00	25,750	777.0	9,823	9,823	46,653
28.00	42,800	1,000.0	33,916	43,739	78,200
28.50	50,000	1,200.0	23,177	66,915	113,218

Device	Routing	Invert	Outlet Devices
#1	Primary	26.42'	**10.0' long x 1.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 Coef. (English) 2.69 2.72 2.75 2.85 2.98 3.08 3.20 3.28 3.31 3.30 3.31 3.32

Primary OutFlow Max=1.19 cfs @ 13.35 hrs HW=26.54' (Free Discharge)
1=Broad-Crested Rectangular Weir (Weir Controls 1.19 cfs @ 0.95 fps)

Pond ED: Existing Depression



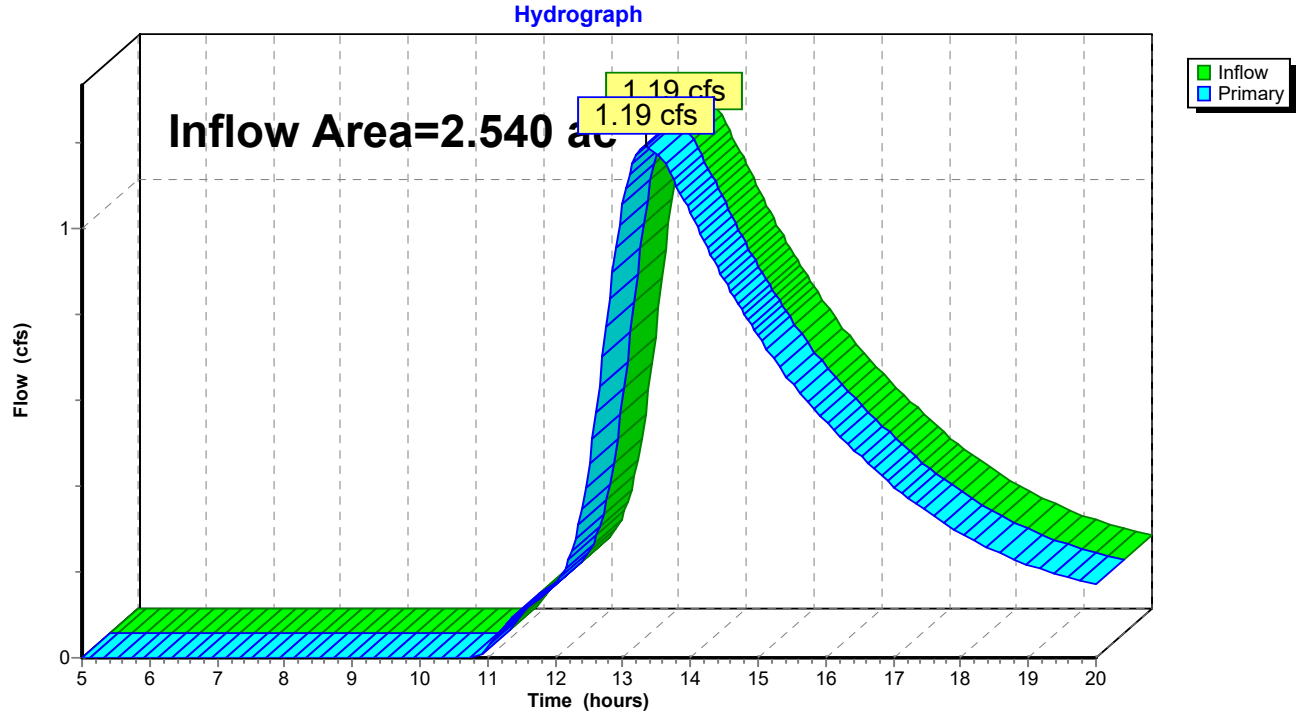
Summary for Pond Q: DISCHARGE

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 2.540 ac, 24.41% Impervious, Inflow Depth > 1.77" for 10_Year event
Inflow = 1.19 cfs @ 13.35 hrs, Volume= 0.375 af
Primary = 1.19 cfs @ 13.35 hrs, Volume= 0.375 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Pond Q: DISCHARGE



Time span=5.00-20.00 hrs, dt=0.05 hrs, 301 points
Runoff by SCS TR-20 method, UH=Delmarva, Split Pervious/Imperv.
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment XA1: XA-01 Runoff Area=2.540 ac 24.41% Impervious Runoff Depth>4.44"
Flow Length=323' Tc=76.3 min CN=60/98 Runoff=2.99 cfs 0.940 af

Pond ED: Existing Depression Peak Elev=26.65' Storage=3,233 cf Inflow=2.99 cfs 0.940 af
Outflow=2.90 cfs 0.904 af

Pond Q: DISCHARGE Inflow=2.90 cfs 0.904 af
Primary=2.90 cfs 0.904 af

Total Runoff Area = 2.540 ac Runoff Volume = 0.940 af Average Runoff Depth = 4.44"
75.59% Pervious = 1.920 ac 24.41% Impervious = 0.620 ac

Summary for Subcatchment XA1: XA-01

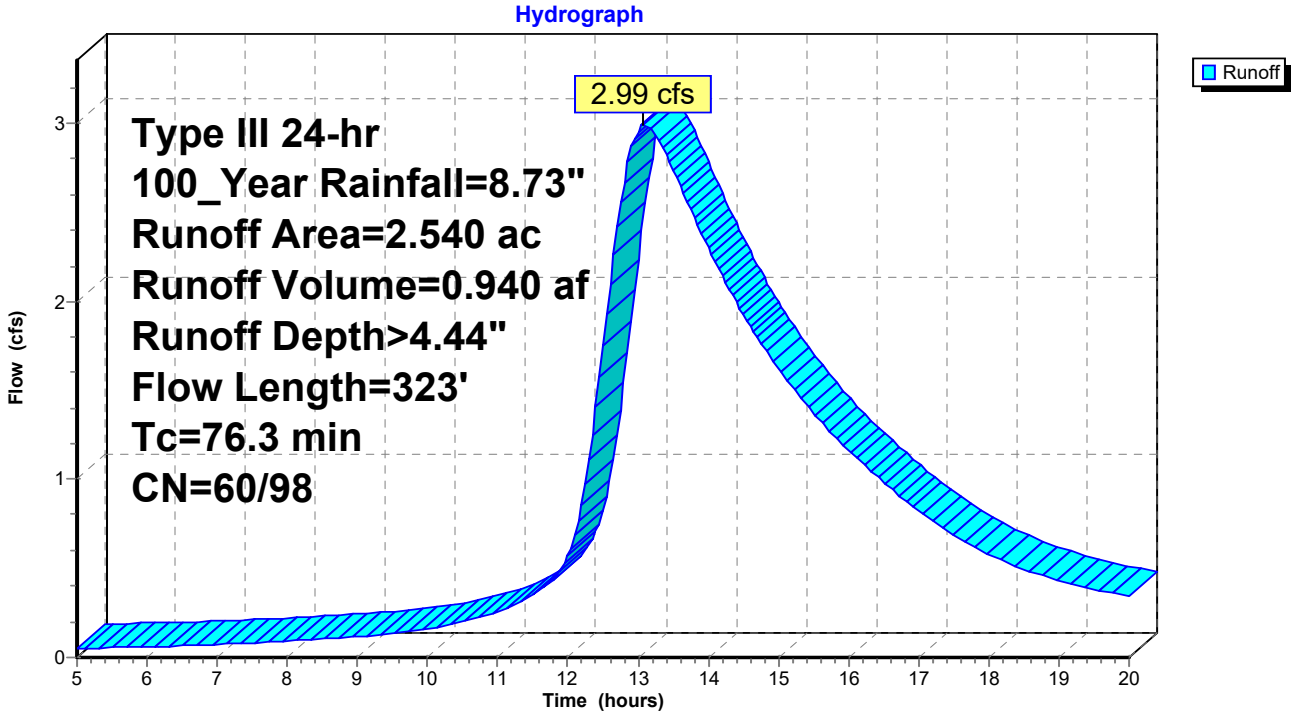
Runoff = 2.99 cfs @ 13.07 hrs, Volume= 0.940 af, Depth> 4.44"

Runoff by SCS TR-20 method, UH=Delmarva, Split Pervious/Imperv., Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 100_Year Rainfall=8.73"

	Area (ac)	CN	Description
*	0.620	98	Impervious
	1.126	61	>75% Grass cover, Good, HSG B
	0.794	58	Woods/grass comb., Good, HSG B
	2.540	69	Weighted Average
	1.920	60	75.59% Pervious Area
	0.620	98	24.41% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
52.8	222	0.0100	0.07		**Sheet Flow, a-b** Woods: Light underbrush n= 0.400 P2= 3.30"
22.9	78	0.0100	0.06		**Sheet Flow, b-c** Woods: Light underbrush n= 0.400 P2= 3.30"
0.6	23	0.0090	0.66		**Shallow Concentrated Flow, b-c** Short Grass Pasture Kv= 7.0 fps
76.3	323	Total			

Subcatchment XA1: XA-01



Summary for Pond ED: Existing Depression

[82] Warning: Early inflow requires earlier time span

Inflow Area = 2.540 ac, 24.41% Impervious, Inflow Depth > 4.44" for 100_Year event
Inflow = 2.99 cfs @ 13.07 hrs, Volume= 0.940 af
Outflow = 2.90 cfs @ 13.31 hrs, Volume= 0.904 af, Atten= 3%, Lag= 14.2 min
Primary = 2.90 cfs @ 13.31 hrs, Volume= 0.904 af

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 26.65' @ 13.31 hrs Surf.Area= 12,309 sf Storage= 3,233 cf

Plug-Flow detention time= 34.8 min calculated for 0.904 af (96% of inflow)
Center-of-Mass det. time= 22.6 min (884.2 - 861.5)

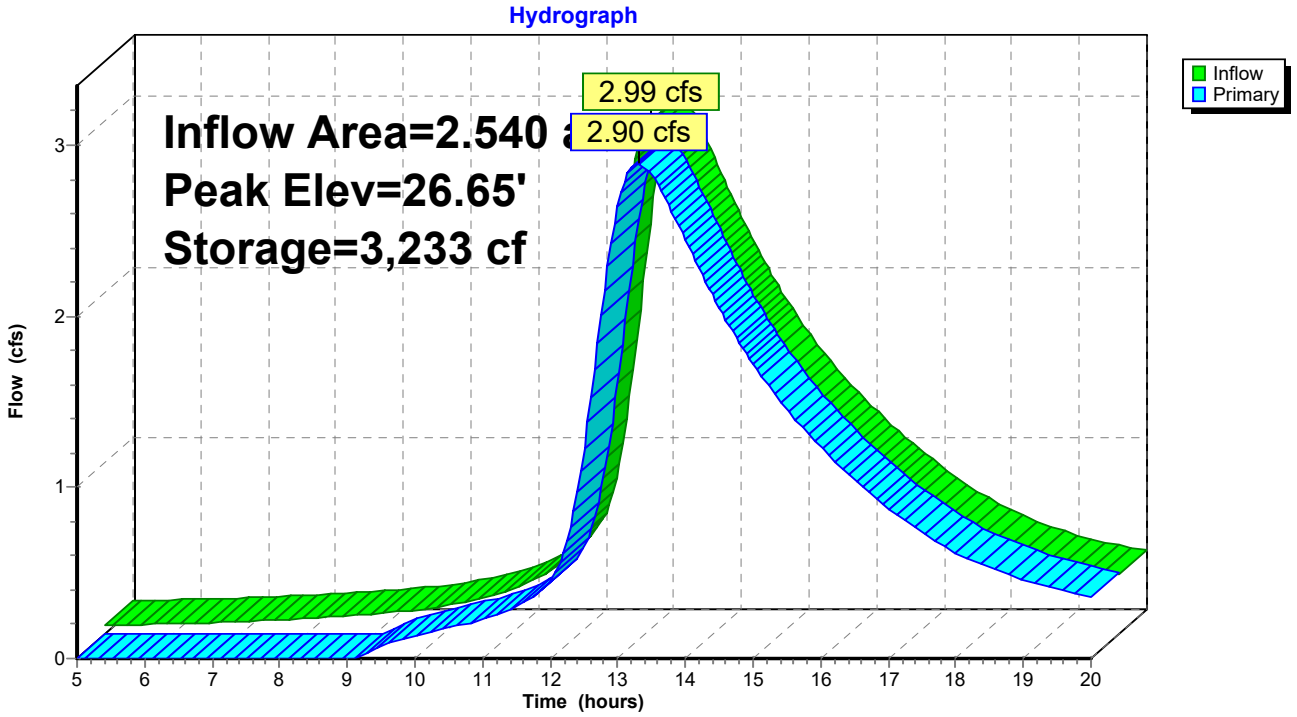
Volume	Invert	Avail.Storage	Storage Description
#1	26.00'	66,915 cf	**Custom Stage Data (Irregular)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
26.00	422	151.0	0	0	422
27.00	25,750	777.0	9,823	9,823	46,653
28.00	42,800	1,000.0	33,916	43,739	78,200
28.50	50,000	1,200.0	23,177	66,915	113,218

Device	Routing	Invert	Outlet Devices
#1	Primary	26.42'	**10.0' long x 1.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 Coef. (English) 2.69 2.72 2.75 2.85 2.98 3.08 3.20 3.28 3.31 3.30 3.31 3.32

Primary OutFlow Max=2.90 cfs @ 13.31 hrs HW=26.65' (Free Discharge)
1=Broad-Crested Rectangular Weir (Weir Controls 2.90 cfs @ 1.28 fps)

Pond ED: Existing Depression



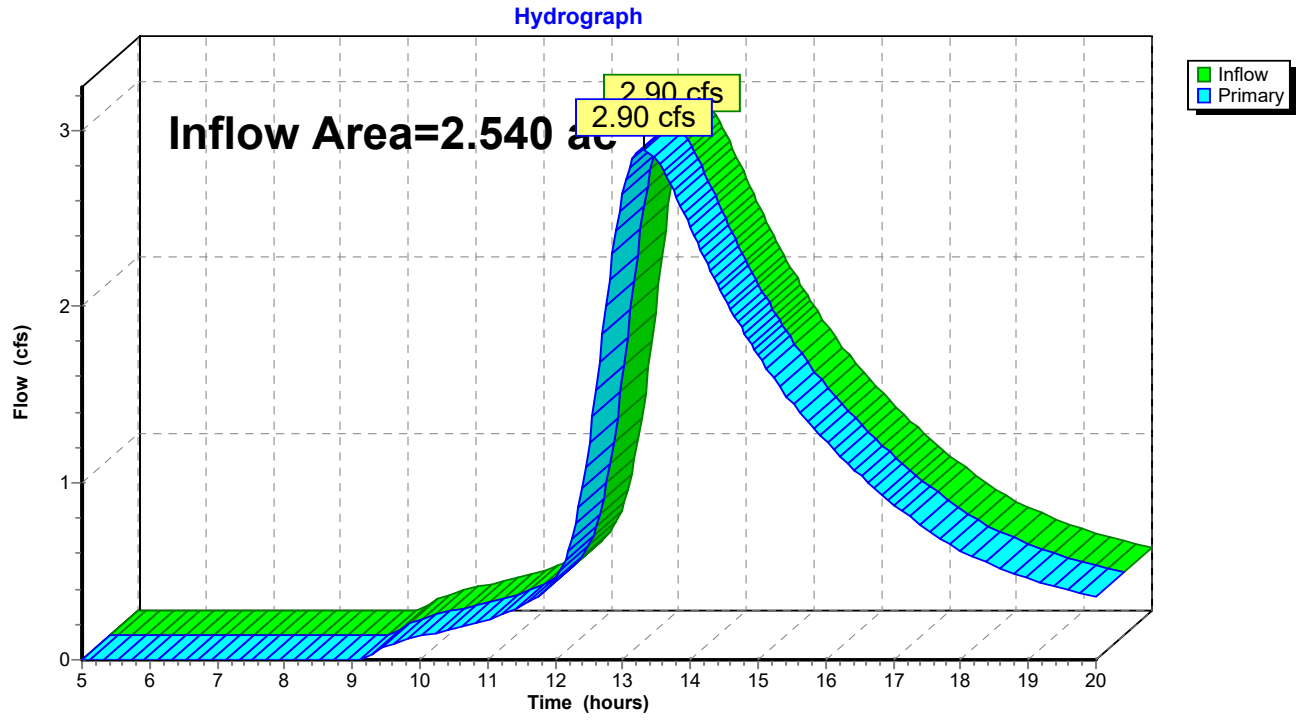
Summary for Pond Q: DISCHARGE

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 2.540 ac, 24.41% Impervious, Inflow Depth > 4.27" for 100_Year event
Inflow = 2.90 cfs @ 13.31 hrs, Volume= 0.904 af
Primary = 2.90 cfs @ 13.31 hrs, Volume= 0.904 af, Atten= 0%, Lag= 0.0 min

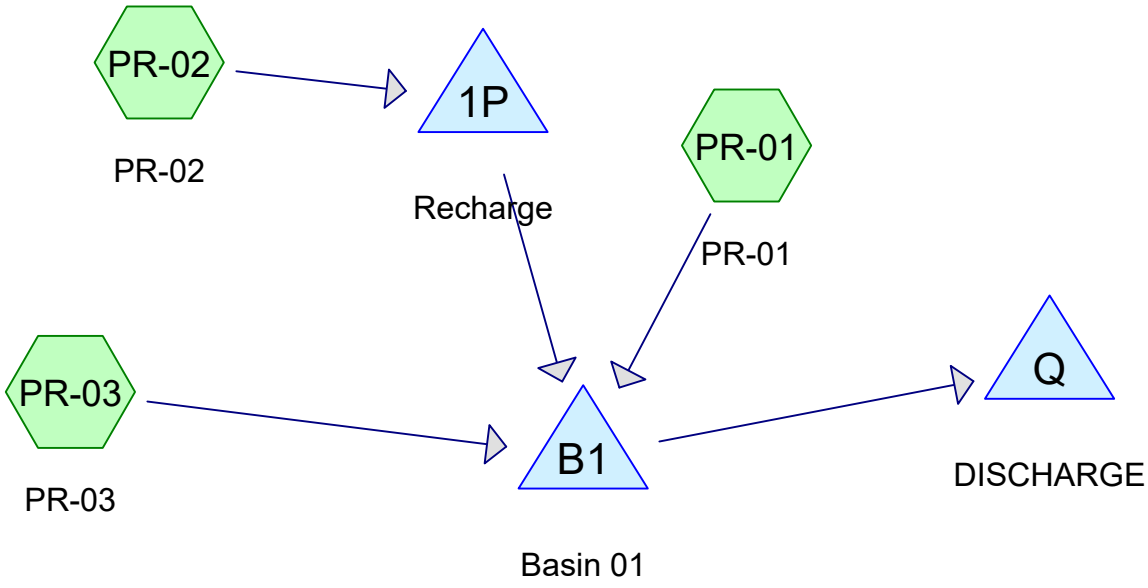
Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Pond Q: DISCHARGE



Appendix B

Post-Development Conditions



Subcat Reach Pond Link

Routing Diagram for _ProposedCMS
Prepared by DeBlasio & Associates , Printed 12/28/2021
HydroCAD® 10.00-26 s/n 11007 © 2020 HydroCAD Software Solutions LLC

Area Listing (all nodes)

Area (acres)	CN	Description (subcatchment-numbers)
0.587	61	>75% Grass cover, Good, HSG B (PR-01, PR-02)
0.852	98	Paved parking, HSG B (PR-01, PR-02)
0.057	98	Unconnected roofs, HSG B (PR-03)
0.924	58	Woods/grass comb., Good, HSG B (PR-01, PR-03)
2.420	**74**	**TOTAL AREA**

Time span=5.00-20.00 hrs, dt=0.01 hrs, 1501 points
Runoff by SCS TR-20 method, UH=Delmarva, Split Pervious/Imperv.
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment PR-01: PR-01 Runoff Area=1.110 ac 46.67% Impervious Runoff Depth>1.52"
Flow Length=231' Tc=22.0 min CN=61/98 Runoff=0.84 cfs 0.141 af

Subcatchment PR-02: PR-02 Runoff Area=0.390 ac 85.64% Impervious Runoff Depth>2.47"
Flow Length=175' Slope=0.0017 '/' Tc=5.0 min CN=61/98 Runoff=0.91 cfs 0.080 af

Subcatchment PR-03: PR-03 Runoff Area=0.920 ac 6.20% Impervious Runoff Depth>0.44"
Flow Length=222' Slope=0.0100 '/' Tc=52.8 min CN=58/98 Runoff=0.10 cfs 0.034 af

Pond 1P: Recharge Peak Elev=25.63' Storage=0.013 af Inflow=0.91 cfs 0.080 af
Discarded=0.40 cfs 0.080 af Primary=0.00 cfs 0.000 af Outflow=0.40 cfs 0.080 af

Pond B1: Basin 01 Peak Elev=24.61' Storage=933 cf Inflow=0.89 cfs 0.175 af
Discarded=0.60 cfs 0.175 af Primary=0.00 cfs 0.000 af Outflow=0.60 cfs 0.175 af

Pond Q: DISCHARGE Inflow=0.00 cfs 0.000 af
Primary=0.00 cfs 0.000 af

Total Runoff Area = 2.420 ac Runoff Volume = 0.255 af Average Runoff Depth = 1.27"
62.44% Pervious = 1.511 ac 37.56% Impervious = 0.909 ac

Summary for Subcatchment PR-01: PR-01

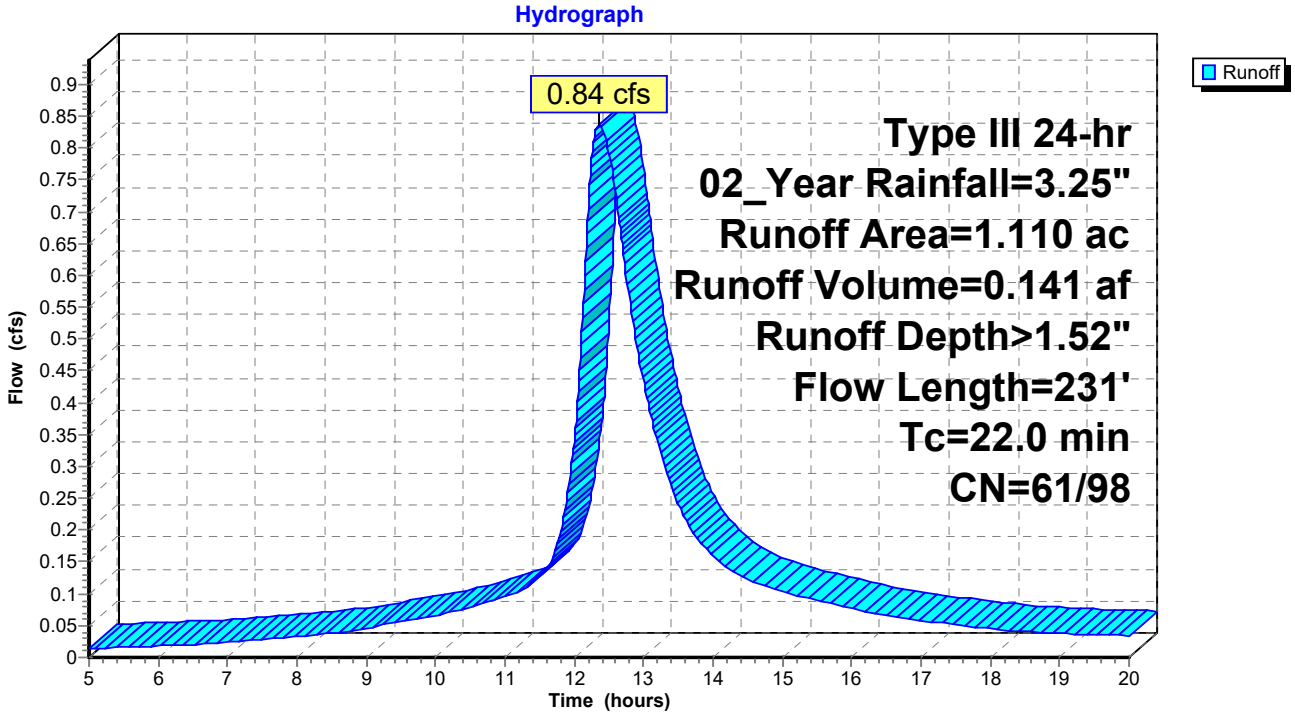
Runoff = 0.84 cfs @ 12.36 hrs, Volume= 0.141 af, Depth> 1.52"

Runoff by SCS TR-20 method, UH=Delmarva, Split Pervious/Imperv., Time Span= 5.00-20.00 hrs, dt= 0.01 hrs
Type III 24-hr 02_Year Rainfall=3.25"

Area (ac)	CN	Description
0.518	98	Paved parking, HSG B
0.531	61	>75% Grass cover, Good, HSG B
0.061	58	Woods/grass comb., Good, HSG B
1.110	78	Weighted Average
0.592	61	53.33% Pervious Area
0.518	98	46.67% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.2	117	0.0060	0.89		**Sheet Flow, A-B** Smooth surfaces n= 0.011 P2= 3.30"
19.8	114	0.0110	0.10		**Sheet Flow, B-C** Grass: Dense n= 0.240 P2= 3.30"
22.0	231	Total			

Subcatchment PR-01: PR-01



Summary for Subcatchment PR-02: PR-02

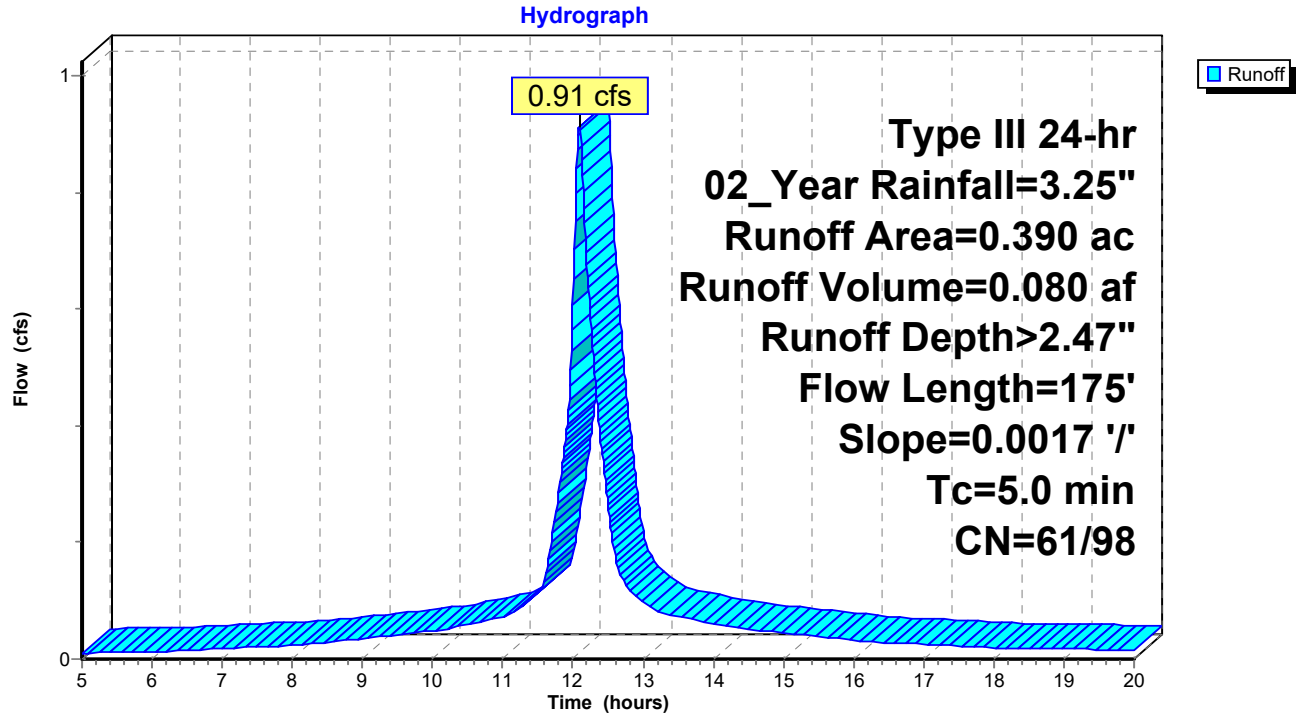
Runoff = 0.91 cfs @ 12.09 hrs, Volume= 0.080 af, Depth> 2.47"

Runoff by SCS TR-20 method, UH=Delmarva, Split Pervious/Imperv., Time Span= 5.00-20.00 hrs, dt= 0.01 hrs
Type III 24-hr 02_Year Rainfall=3.25"

Area (ac)	CN	Description
0.334	98	Paved parking, HSG B
0.056	61	>75% Grass cover, Good, HSG B
0.390	93	Weighted Average
0.056	61	14.36% Pervious Area
0.334	98	85.64% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0	175	0.0017	0.58		**Sheet Flow, A-B** Smooth surfaces n= 0.011 P2= 3.30"

Subcatchment PR-02: PR-02



Summary for Subcatchment PR-03: PR-03

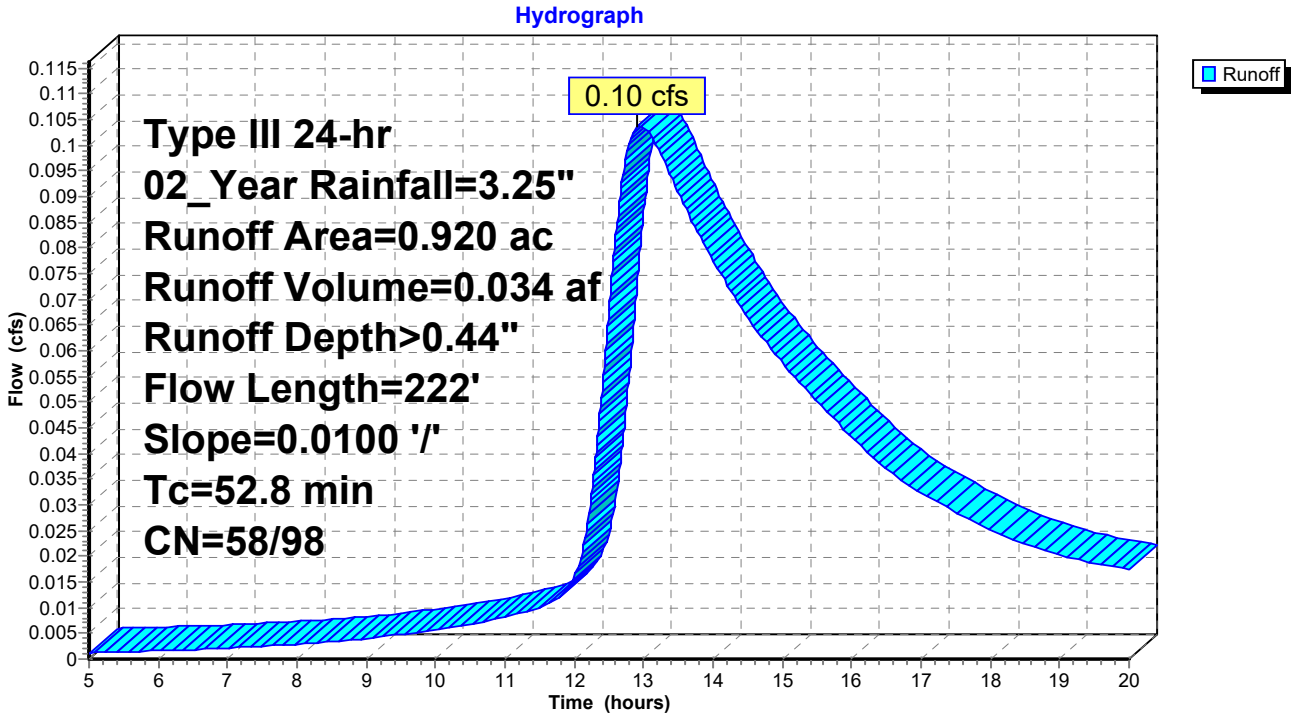
Runoff = 0.10 cfs @ 12.91 hrs, Volume= 0.034 af, Depth> 0.44"

Runoff by SCS TR-20 method, UH=Delmarva, Split Pervious/Imperv., Time Span= 5.00-20.00 hrs, dt= 0.01 hrs
Type III 24-hr 02_Year Rainfall=3.25"

Area (ac)	CN	Description
0.057	98	Unconnected roofs, HSG B
0.863	58	Woods/grass comb., Good, HSG B
0.920	60	Weighted Average
0.863	58	93.80% Pervious Area
0.057	98	6.20% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
52.8	222	0.0100	0.07		**Sheet Flow, A-B** Woods: Light underbrush n= 0.400 P2= 3.30"

Subcatchment PR-03: PR-03



Summary for Pond 1P: Recharge

[82] Warning: Early inflow requires earlier time span
[92] Warning: Device #2 is above defined storage

Inflow Area = 0.390 ac, 85.64% Impervious, Inflow Depth > 2.47" for 02_Year event
Inflow = 0.91 cfs @ 12.09 hrs, Volume= 0.080 af
Outflow = 0.40 cfs @ 12.38 hrs, Volume= 0.080 af, Atten= 57%, Lag= 17.4 min
Discarded = 0.40 cfs @ 12.38 hrs, Volume= 0.080 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= 0.01 hrs
Peak Elev= 25.63' @ 12.38 hrs Surf.Area= 0.014 ac Storage= 0.013 af

Plug-Flow detention time= 8.4 min calculated for 0.080 af (100% of inflow)
Center-of-Mass det. time= 8.3 min (751.2 - 742.8)

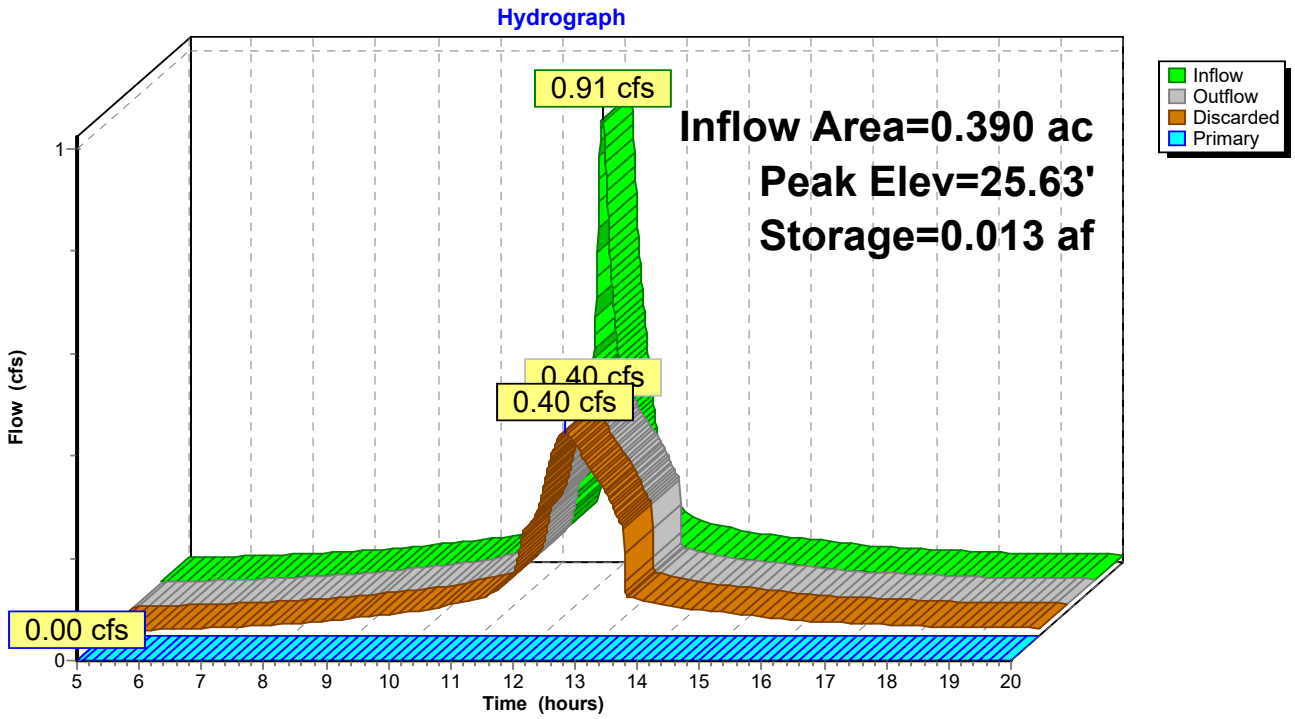
Volume	Invert	Avail.Storage	Storage Description
#1	24.00'	0.009 af	**3.50'W x 180.00'L x 2.00'H Prismatoid** 0.029 af Overall - 0.006 af Embedded = 0.022 af x 40.0% Voids
#2	24.50'	0.006 af	**12.0" Round CMP_Round 12"** x 2 Inside #1 L= 180.0'
		0.015 af	Total Available Storage

Device	Routing	Invert	Outlet Devices
#1	Discarded	24.00'	**14.000 in/hr Exfiltration over Wetted area**
#2	Primary	27.00'	**4.0" Horiz. Orifice/Grate X 8.00 columns** X 8 rows C= 0.600 in 24.0" x 48.0" Grate (70% open area) Limited to weir flow at low heads

Discarded OutFlow Max=0.40 cfs @ 12.38 hrs HW=25.63' (Free Discharge)
↑—**1=Exfiltration** (Exfiltration Controls 0.40 cfs)

Primary OutFlow Max=0.00 cfs @ 5.00 hrs HW=24.00' (Free Discharge)
↑—**2=Orifice/Grate** (Controls 0.00 cfs)

Pond 1P: Recharge



Summary for Pond B1: Basin 01

[82] Warning: Early inflow requires earlier time span

Inflow Area = 2.420 ac, 37.56% Impervious, Inflow Depth > 0.87" for 02_Year event
Inflow = 0.89 cfs @ 12.37 hrs, Volume= 0.175 af
Outflow = 0.60 cfs @ 12.90 hrs, Volume= 0.175 af, Atten= 33%, Lag= 31.5 min
Discarded = 0.60 cfs @ 12.90 hrs, Volume= 0.175 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= 0.01 hrs
Peak Elev= 24.61' @ 12.90 hrs Surf.Area= 2,337 sf Storage= 933 cf

Plug-Flow detention time= 12.4 min calculated for 0.175 af (100% of inflow)
Center-of-Mass det. time= 12.0 min (808.1 - 796.1)

Volume	Invert	Avail.Storage	Storage Description
#1	24.00'	30,976 cf	**Custom Stage Data (Irregular)** Listed below (Recalc)

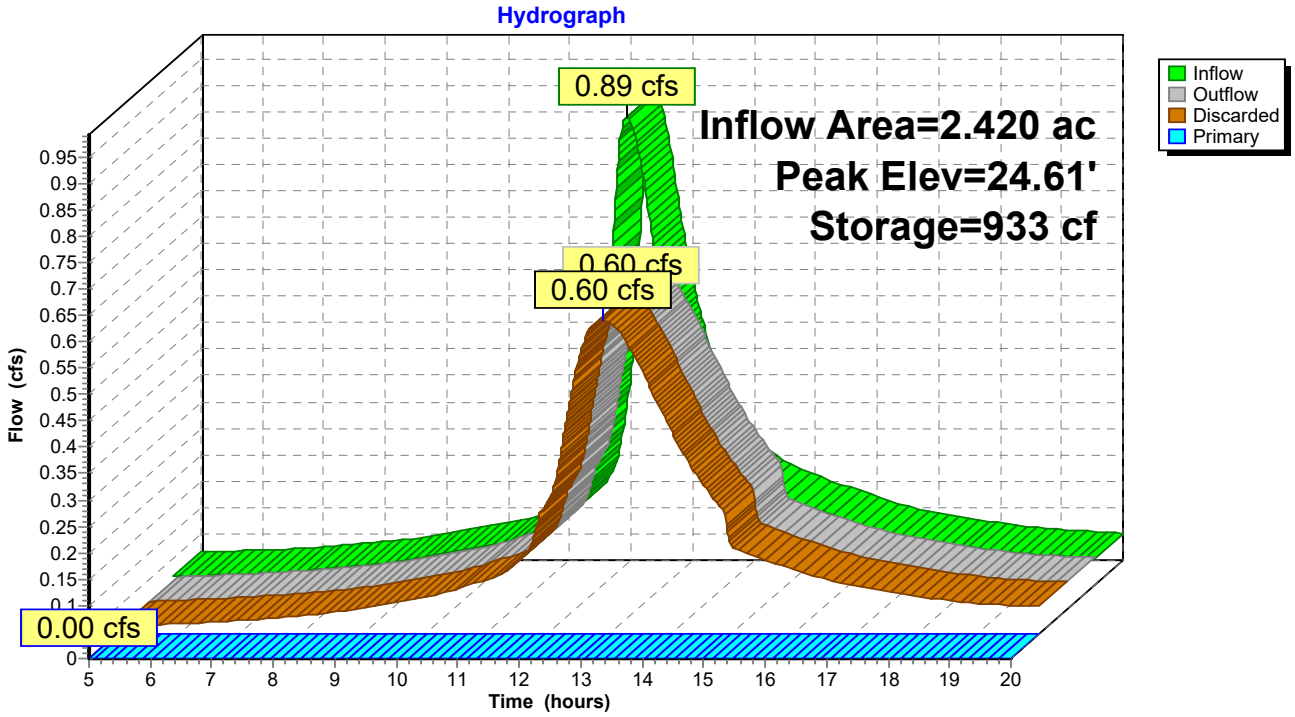
Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
24.00	830	560.0	0	0	830
25.00	3,675	1,010.0	2,084	2,084	57,057
26.00	6,732	1,030.0	5,127	7,211	60,460
27.00	9,850	1,050.0	8,242	15,453	63,930
28.00	22,000	1,200.0	15,524	30,976	90,811

Device	Routing	Invert	Outlet Devices
#1	Primary	26.50'	**10.0' long x 1.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 Coef. (English) 2.69 2.72 2.75 2.85 2.98 3.08 3.20 3.28 3.31 3.30 3.31 3.32
#2	Discarded	24.00'	**11.000 in/hr Exfiltration over Surface area**

Discarded OutFlow Max=0.59 cfs @ 12.90 hrs HW=24.61' (Free Discharge)
2=Exfiltration (Exfiltration Controls 0.59 cfs)

Primary OutFlow Max=0.00 cfs @ 5.00 hrs HW=24.00' (Free Discharge)
1=Broad-Crested Rectangular Weir (Controls 0.00 cfs)

Pond B1: Basin 01



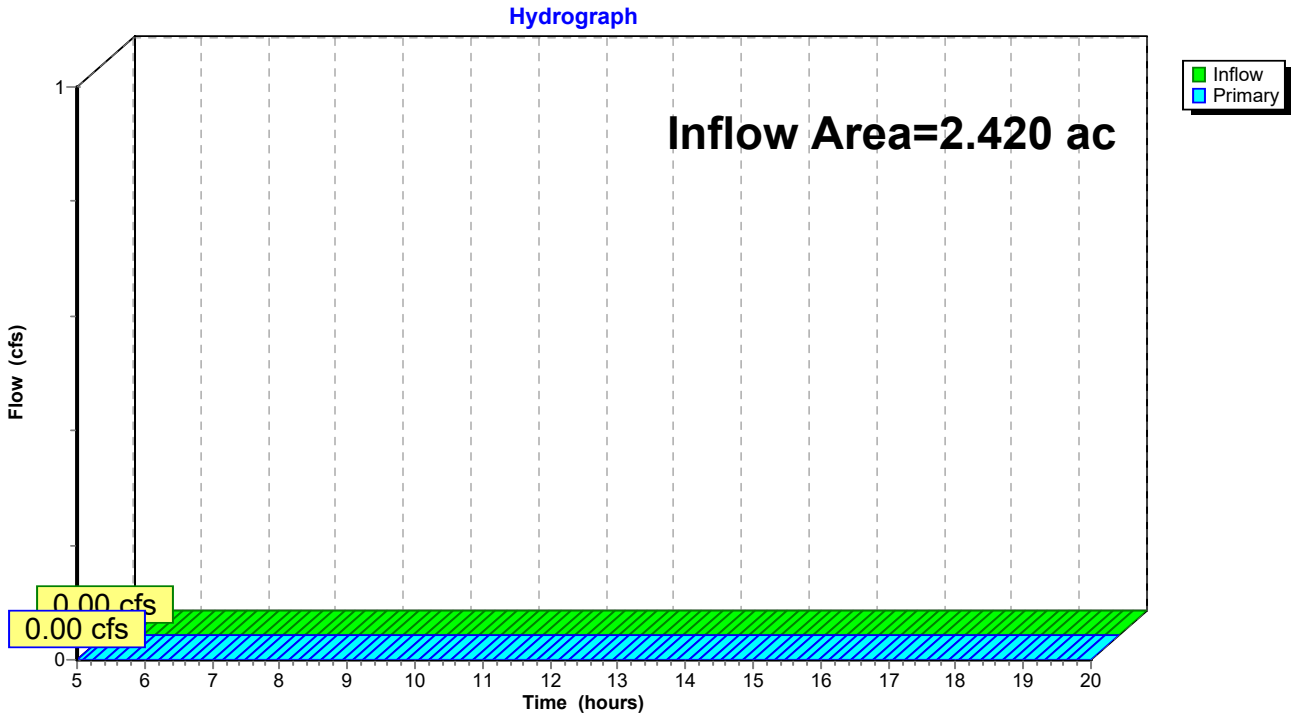
Summary for Pond Q: DISCHARGE

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 2.420 ac, 37.56% Impervious, Inflow Depth = 0.00" for 02_Year event
Inflow = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af
Primary = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.01 hrs

Pond Q: DISCHARGE



Time span=5.00-20.00 hrs, dt=0.01 hrs, 1501 points
Runoff by SCS TR-20 method, UH=Delmarva, Split Pervious/Imperv.
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment PR-01: PR-01 Runoff Area=1.110 ac 46.67% Impervious Runoff Depth>2.76"
Flow Length=231' Tc=22.0 min CN=61/98 Runoff=1.57 cfs 0.255 af

Subcatchment PR-02: PR-02 Runoff Area=0.390 ac 85.64% Impervious Runoff Depth>4.02"
Flow Length=175' Slope=0.0017 '/' Tc=5.0 min CN=61/98 Runoff=1.49 cfs 0.131 af

Subcatchment PR-03: PR-03 Runoff Area=0.920 ac 6.20% Impervious Runoff Depth>1.25"
Flow Length=222' Slope=0.0100 '/' Tc=52.8 min CN=58/98 Runoff=0.35 cfs 0.096 af

Pond 1P: Recharge Peak Elev=27.09' Storage=0.015 af Inflow=1.49 cfs 0.131 af
Discarded=0.44 cfs 0.116 af Primary=1.05 cfs 0.014 af Outflow=1.49 cfs 0.131 af

Pond B1: Basin 01 Peak Elev=25.22' Storage=2,950 cf Inflow=2.12 cfs 0.365 af
Discarded=1.09 cfs 0.365 af Primary=0.00 cfs 0.000 af Outflow=1.09 cfs 0.365 af

Pond Q: DISCHARGE Inflow=0.00 cfs 0.000 af
Primary=0.00 cfs 0.000 af

Total Runoff Area = 2.420 ac Runoff Volume = 0.481 af Average Runoff Depth = 2.39"
62.44% Pervious = 1.511 ac 37.56% Impervious = 0.909 ac

Summary for Subcatchment PR-01: PR-01

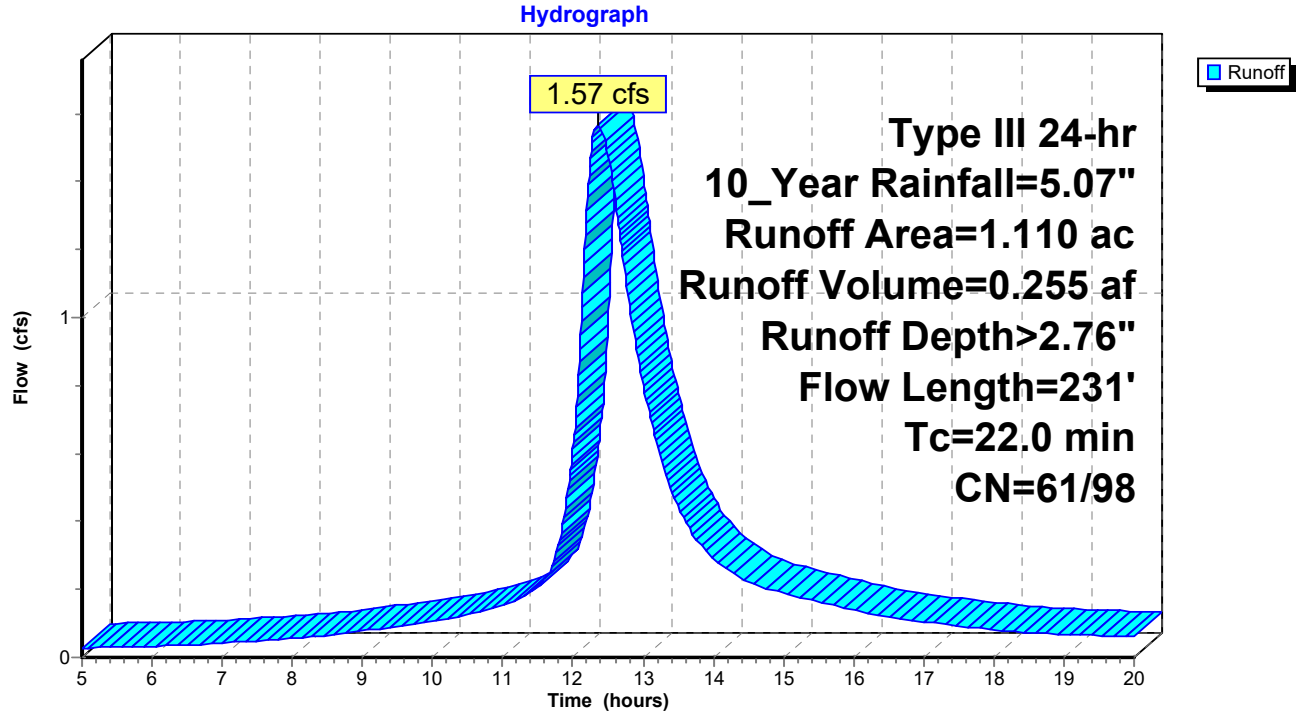
Runoff = 1.57 cfs @ 12.36 hrs, Volume= 0.255 af, Depth> 2.76"

Runoff by SCS TR-20 method, UH=Delmarva, Split Pervious/Imperv., Time Span= 5.00-20.00 hrs, dt= 0.01 hrs
Type III 24-hr 10_Year Rainfall=5.07"

Area (ac)	CN	Description
0.518	98	Paved parking, HSG B
0.531	61	>75% Grass cover, Good, HSG B
0.061	58	Woods/grass comb., Good, HSG B
1.110	78	Weighted Average
0.592	61	53.33% Pervious Area
0.518	98	46.67% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.2	117	0.0060	0.89		**Sheet Flow, A-B** Smooth surfaces n= 0.011 P2= 3.30"
19.8	114	0.0110	0.10		**Sheet Flow, B-C** Grass: Dense n= 0.240 P2= 3.30"
22.0	231	Total			

Subcatchment PR-01: PR-01



Summary for Subcatchment PR-02: PR-02

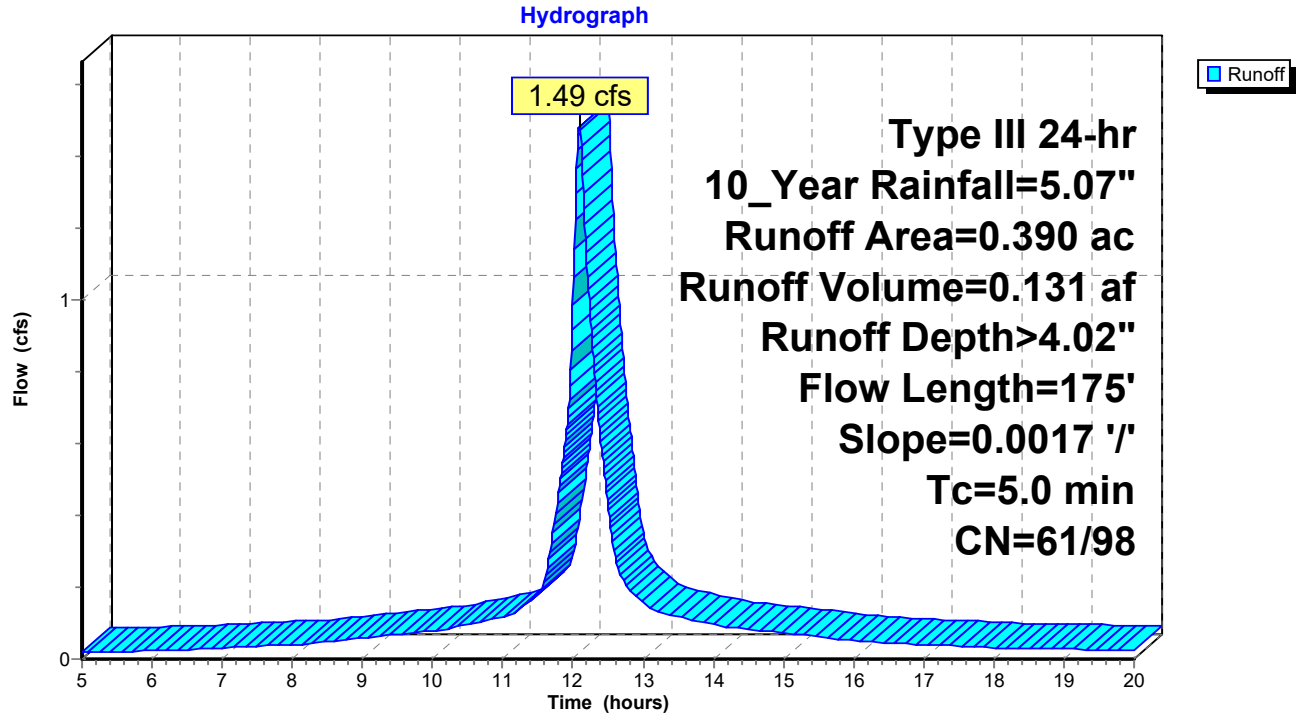
Runoff = 1.49 cfs @ 12.09 hrs, Volume= 0.131 af, Depth> 4.02"

Runoff by SCS TR-20 method, UH=Delmarva, Split Pervious/Imperv., Time Span= 5.00-20.00 hrs, dt= 0.01 hrs
Type III 24-hr 10_Year Rainfall=5.07"

Area (ac)	CN	Description
0.334	98	Paved parking, HSG B
0.056	61	>75% Grass cover, Good, HSG B
0.390	93	Weighted Average
0.056	61	14.36% Pervious Area
0.334	98	85.64% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0	175	0.0017	0.58		**Sheet Flow, A-B** Smooth surfaces n= 0.011 P2= 3.30"

Subcatchment PR-02: PR-02



Summary for Subcatchment PR-03: PR-03

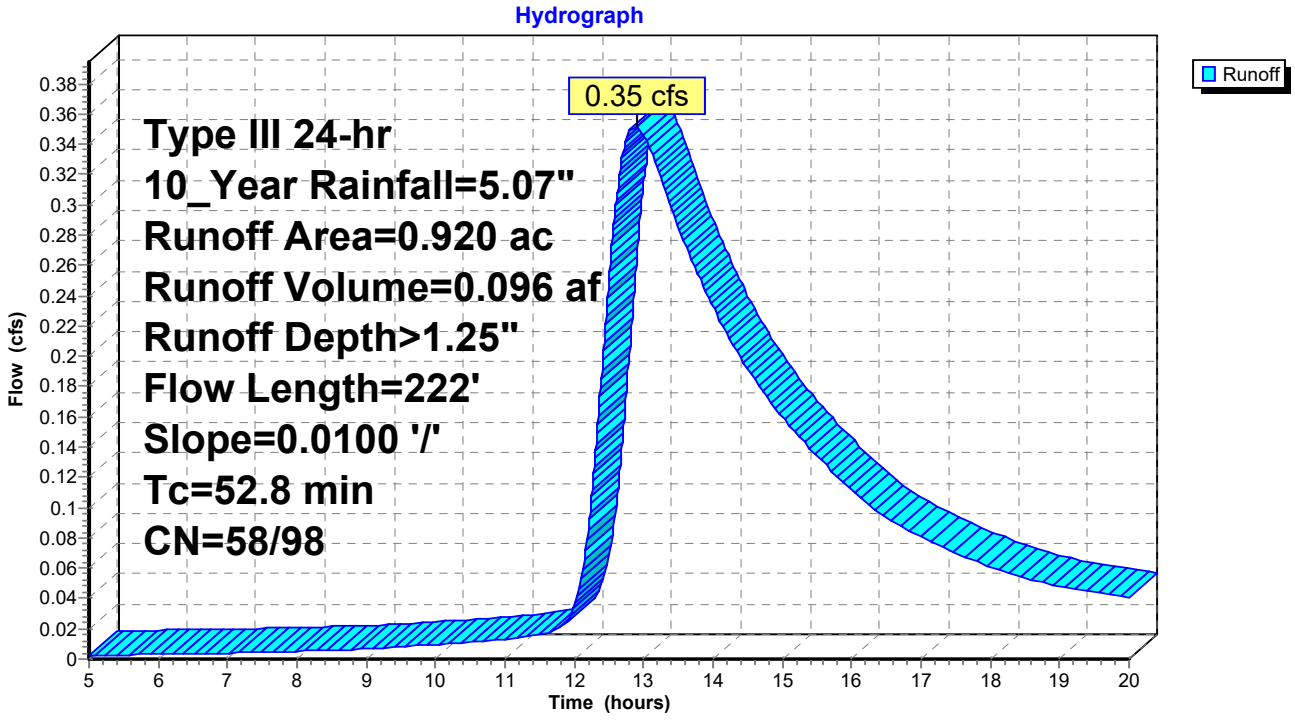
Runoff = 0.35 cfs @ 12.90 hrs, Volume= 0.096 af, Depth> 1.25"

Runoff by SCS TR-20 method, UH=Delmarva, Split Pervious/Imperv., Time Span= 5.00-20.00 hrs, dt= 0.01 hrs
Type III 24-hr 10_Year Rainfall=5.07"

Area (ac)	CN	Description
0.057	98	Unconnected roofs, HSG B
0.863	58	Woods/grass comb., Good, HSG B
0.920	60	Weighted Average
0.863	58	93.80% Pervious Area
0.057	98	6.20% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
52.8	222	0.0100	0.07		**Sheet Flow, A-B** Woods: Light underbrush n= 0.400 P2= 3.30"

Subcatchment PR-03: PR-03



Summary for Pond 1P: Recharge

[82] Warning: Early inflow requires earlier time span
[92] Warning: Device #2 is above defined storage
[93] Warning: Storage range exceeded by 1.09'
[88] Warning: Qout>Qin may require smaller dt or Finer Routing
[85] Warning: Oscillations may require smaller dt or Finer Routing (severity=17)

Inflow Area = 0.390 ac, 85.64% Impervious, Inflow Depth > 4.02" for 10_Year event
Inflow = 1.49 cfs @ 12.09 hrs, Volume= 0.131 af
Outflow = 1.49 cfs @ 12.11 hrs, Volume= 0.131 af, Atten= 0%, Lag= 1.1 min
Discarded = 0.44 cfs @ 12.10 hrs, Volume= 0.116 af
Primary = 1.05 cfs @ 12.11 hrs, Volume= 0.014 af

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.01 hrs
Peak Elev= 27.09' @ 12.11 hrs Surf.Area= 0.014 ac Storage= 0.015 af

Plug-Flow detention time= 8.4 min calculated for 0.131 af (100% of inflow)
Center-of-Mass det. time= 8.3 min (749.1 - 740.8)

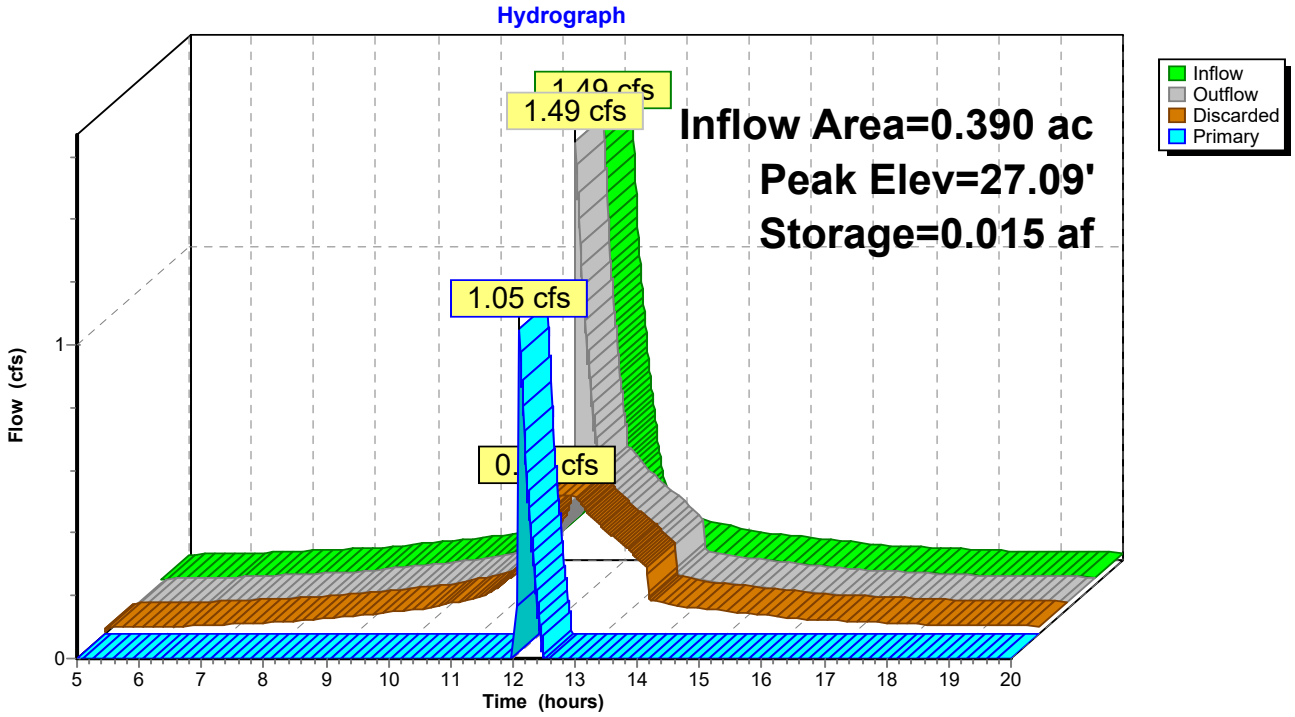
Volume	Invert	Avail.Storage	Storage Description
#1	24.00'	0.009 af	**3.50'W x 180.00'L x 2.00'H Prismatoid** 0.029 af Overall - 0.006 af Embedded = 0.022 af x 40.0% Voids
#2	24.50'	0.006 af	**12.0" Round CMP_Round 12"** x 2 Inside #1 L= 180.0'
		0.015 af	Total Available Storage

Device	Routing	Invert	Outlet Devices
#1	Discarded	24.00'	**14.000 in/hr Exfiltration over Wetted area**
#2	Primary	27.00'	**4.0" Horiz. Orifice/Grate X 8.00 columns** X 8 rows C= 0.600 in 24.0" x 48.0" Grate (70% open area) Limited to weir flow at low heads

Discarded OutFlow Max=0.44 cfs @ 12.10 hrs HW=27.09' (Free Discharge)
↑—**1=Exfiltration** (Exfiltration Controls 0.44 cfs)

Primary OutFlow Max=1.04 cfs @ 12.11 hrs HW=27.09' (Free Discharge)
↑—**2=Orifice/Grate** (Weir Controls 1.04 cfs @ 0.98 fps)

Pond 1P: Recharge



Summary for Pond B1: Basin 01

[82] Warning: Early inflow requires earlier time span

Inflow Area = 2.420 ac, 37.56% Impervious, Inflow Depth > 1.81" for 10_Year event
Inflow = 2.12 cfs @ 12.27 hrs, Volume= 0.365 af
Outflow = 1.09 cfs @ 13.06 hrs, Volume= 0.365 af, Atten= 49%, Lag= 47.5 min
Discarded = 1.09 cfs @ 13.06 hrs, Volume= 0.365 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= 0.01 hrs
Peak Elev= 25.22' @ 13.06 hrs Surf.Area= 4,264 sf Storage= 2,950 cf

Plug-Flow detention time= 25.8 min calculated for 0.365 af (100% of inflow)
Center-of-Mass det. time= 25.3 min (826.4 - 801.1)

Volume	Invert	Avail.Storage	Storage Description
#1	24.00'	30,976 cf	**Custom Stage Data (Irregular)** Listed below (Recalc)

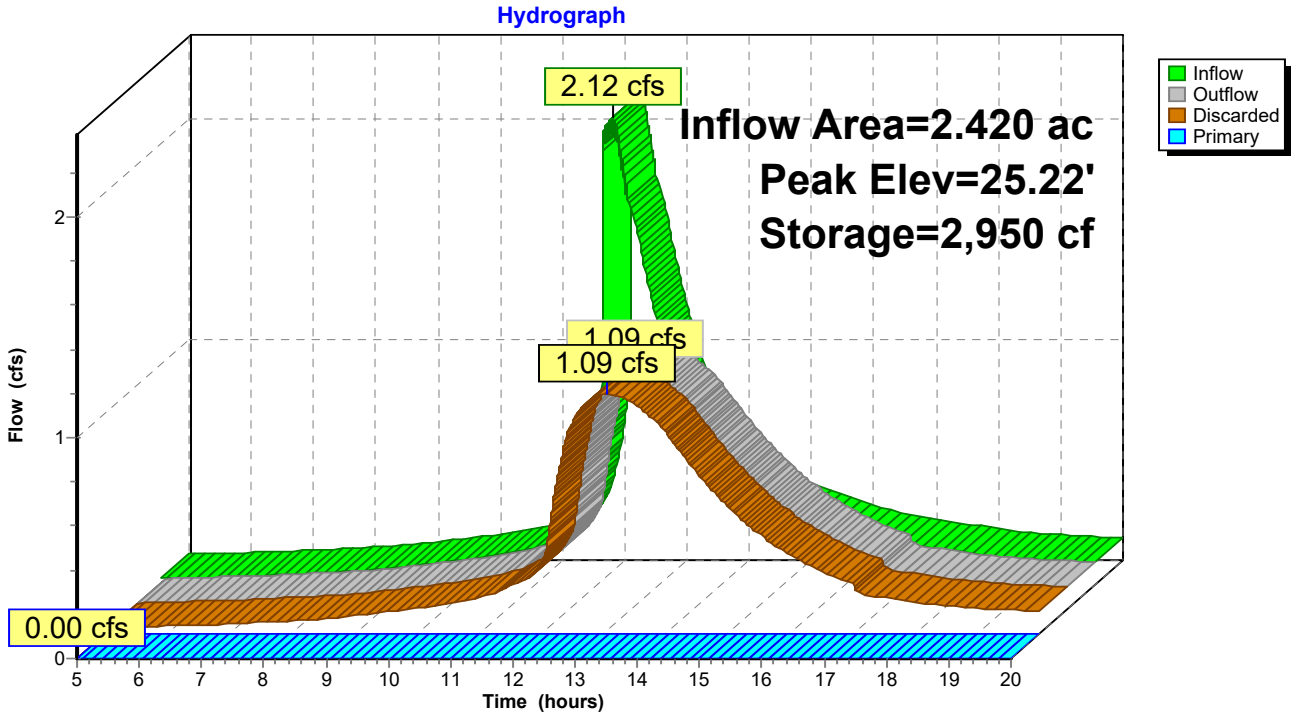
Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
24.00	830	560.0	0	0	830
25.00	3,675	1,010.0	2,084	2,084	57,057
26.00	6,732	1,030.0	5,127	7,211	60,460
27.00	9,850	1,050.0	8,242	15,453	63,930
28.00	22,000	1,200.0	15,524	30,976	90,811

Device	Routing	Invert	Outlet Devices
#1	Primary	26.50'	**10.0' long x 1.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 Coef. (English) 2.69 2.72 2.75 2.85 2.98 3.08 3.20 3.28 3.31 3.30 3.31 3.32
#2	Discarded	24.00'	**11.000 in/hr Exfiltration over Surface area**

Discarded OutFlow Max=1.09 cfs @ 13.06 hrs HW=25.22' (Free Discharge)
2=Exfiltration (Exfiltration Controls 1.09 cfs)

Primary OutFlow Max=0.00 cfs @ 5.00 hrs HW=24.00' (Free Discharge)
1=Broad-Crested Rectangular Weir (Controls 0.00 cfs)

Pond B1: Basin 01



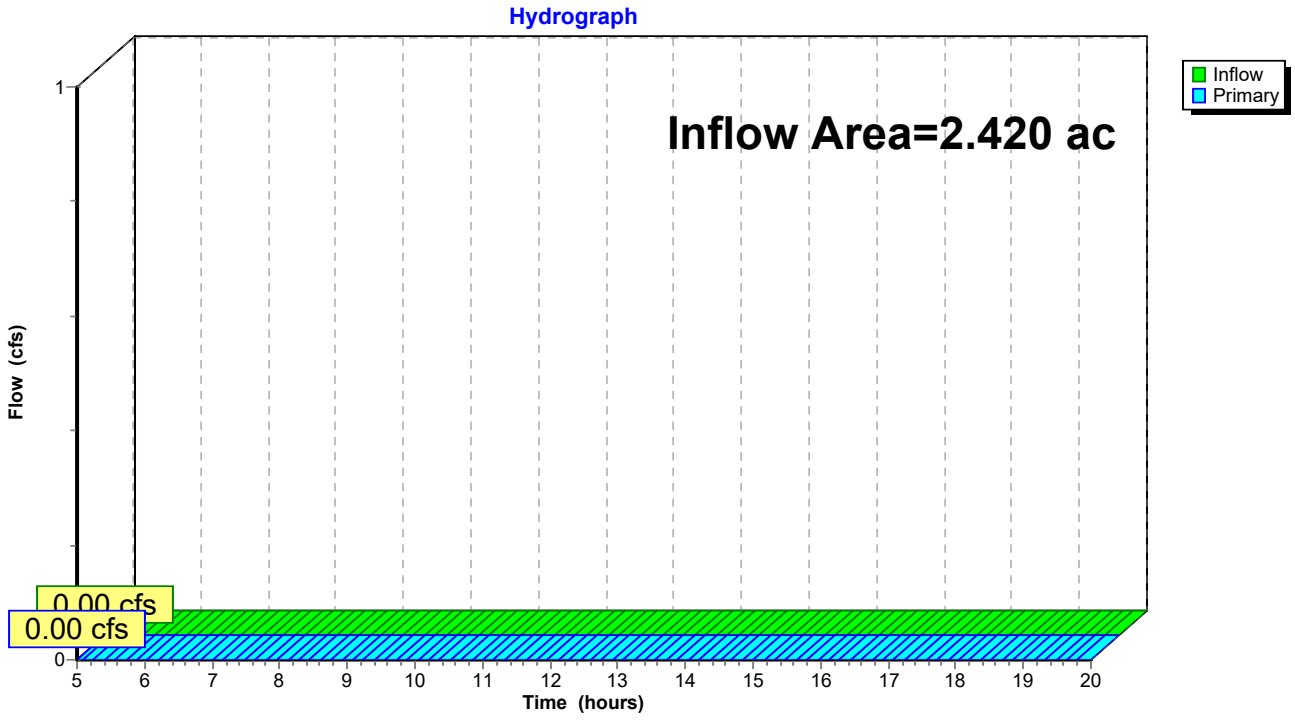
Summary for Pond Q: DISCHARGE

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 2.420 ac, 37.56% Impervious, Inflow Depth = 0.00" for 10_Year event
Inflow = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af
Primary = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.01 hrs

Pond Q: DISCHARGE



Time span=5.00-20.00 hrs, dt=0.01 hrs, 1501 points
Runoff by SCS TR-20 method, UH=Delmarva, Split Pervious/Imperv.
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment PR-01: PR-01 Runoff Area=1.110 ac 46.67% Impervious Runoff Depth>5.59"
Flow Length=231' Tc=22.0 min CN=61/98 Runoff=3.28 cfs 0.517 af

Subcatchment PR-02: PR-02 Runoff Area=0.390 ac 85.64% Impervious Runoff Depth>7.21"
Flow Length=175' Slope=0.0017 '/' Tc=5.0 min CN=61/98 Runoff=2.67 cfs 0.234 af

Subcatchment PR-03: PR-03 Runoff Area=0.920 ac 6.20% Impervious Runoff Depth>3.52"
Flow Length=222' Slope=0.0100 '/' Tc=52.8 min CN=58/98 Runoff=1.10 cfs 0.270 af

Pond 1P: Recharge Peak Elev=27.15' Storage=0.015 af Inflow=2.67 cfs 0.234 af
Discarded=0.44 cfs 0.175 af Primary=2.37 cfs 0.060 af Outflow=2.82 cfs 0.234 af

Pond B1: Basin 01 Peak Elev=26.41' Storage=10,180 cf Inflow=4.96 cfs 0.847 af
Discarded=2.02 cfs 0.846 af Primary=0.00 cfs 0.000 af Outflow=2.02 cfs 0.846 af

Pond Q: DISCHARGE Inflow=0.00 cfs 0.000 af
Primary=0.00 cfs 0.000 af

Total Runoff Area = 2.420 ac Runoff Volume = 1.022 af Average Runoff Depth = 5.07"
62.44% Pervious = 1.511 ac 37.56% Impervious = 0.909 ac

Summary for Subcatchment PR-01: PR-01

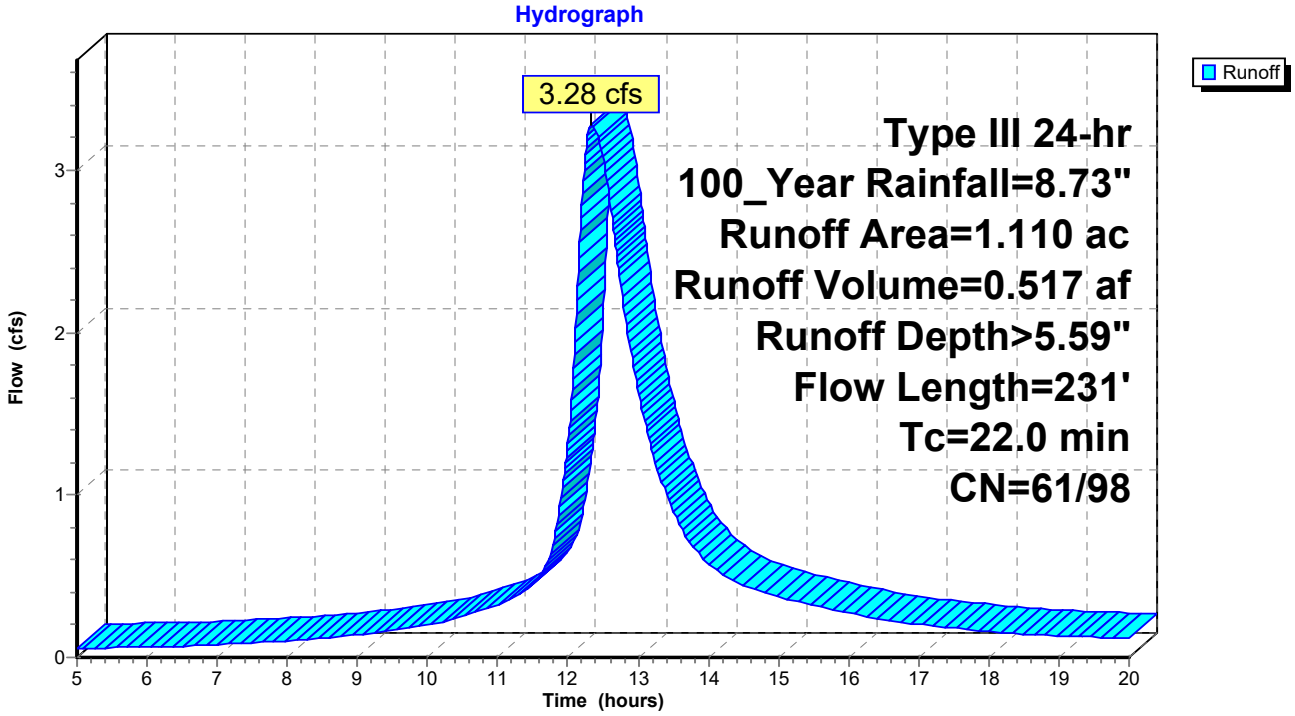
Runoff = 3.28 cfs @ 12.33 hrs, Volume= 0.517 af, Depth> 5.59"

Runoff by SCS TR-20 method, UH=Delmarva, Split Pervious/Imperv., Time Span= 5.00-20.00 hrs, dt= 0.01 hrs
Type III 24-hr 100_Year Rainfall=8.73"

Area (ac)	CN	Description
0.518	98	Paved parking, HSG B
0.531	61	>75% Grass cover, Good, HSG B
0.061	58	Woods/grass comb., Good, HSG B
1.110	78	Weighted Average
0.592	61	53.33% Pervious Area
0.518	98	46.67% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.2	117	0.0060	0.89		**Sheet Flow, A-B** Smooth surfaces n= 0.011 P2= 3.30"
19.8	114	0.0110	0.10		**Sheet Flow, B-C** Grass: Dense n= 0.240 P2= 3.30"
22.0	231	Total			

Subcatchment PR-01: PR-01



Summary for Subcatchment PR-02: PR-02

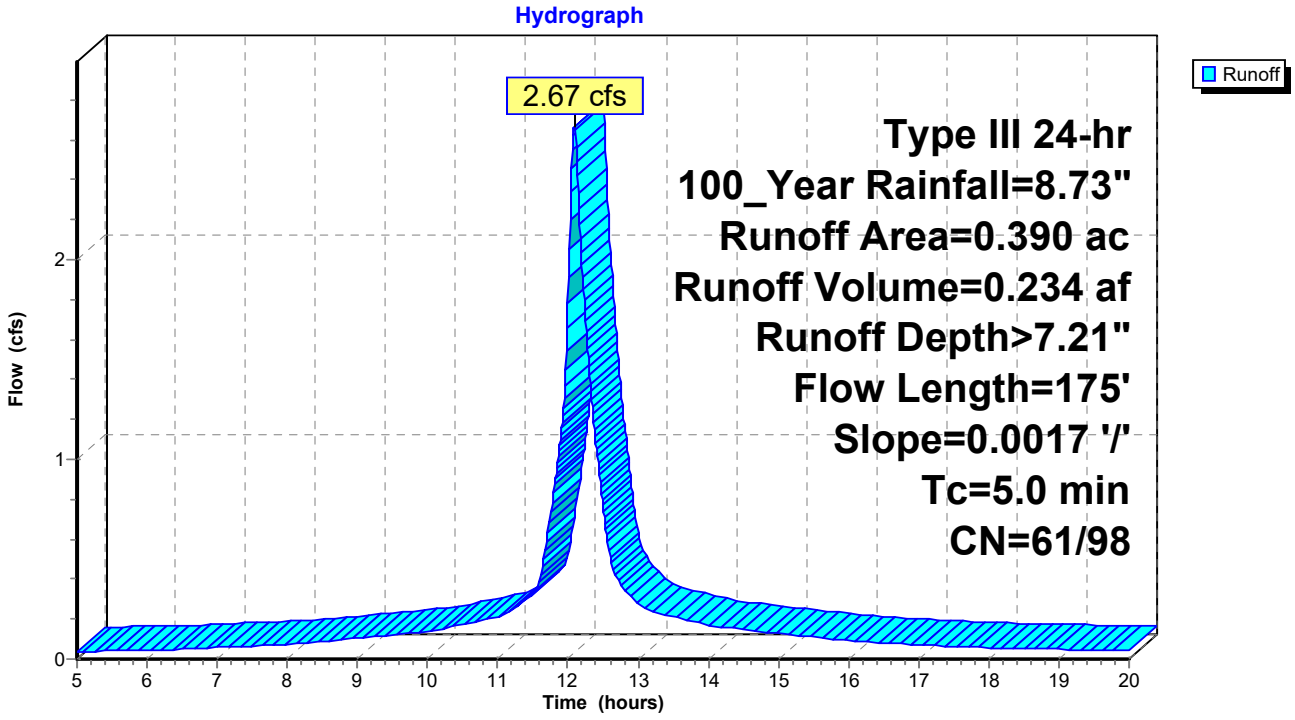
Runoff = 2.67 cfs @ 12.09 hrs, Volume= 0.234 af, Depth> 7.21"

Runoff by SCS TR-20 method, UH=Delmarva, Split Pervious/Imperv., Time Span= 5.00-20.00 hrs, dt= 0.01 hrs
Type III 24-hr 100_Year Rainfall=8.73"

Area (ac)	CN	Description
0.334	98	Paved parking, HSG B
0.056	61	>75% Grass cover, Good, HSG B
0.390	93	Weighted Average
0.056	61	14.36% Pervious Area
0.334	98	85.64% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0	175	0.0017	0.58		**Sheet Flow, A-B** Smooth surfaces n= 0.011 P2= 3.30"

Subcatchment PR-02: PR-02



Summary for Subcatchment PR-03: PR-03

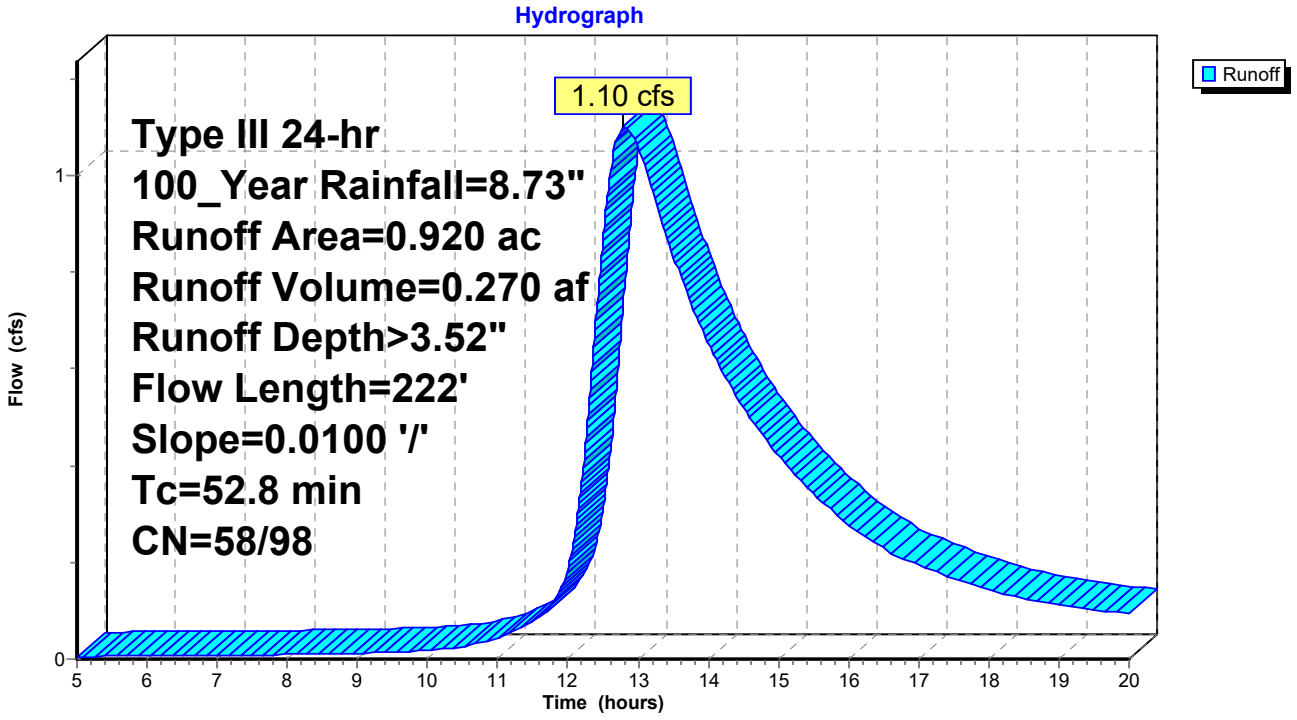
Runoff = 1.10 cfs @ 12.79 hrs, Volume= 0.270 af, Depth> 3.52"

Runoff by SCS TR-20 method, UH=Delmarva, Split Pervious/Imperv., Time Span= 5.00-20.00 hrs, dt= 0.01 hrs
Type III 24-hr 100_Year Rainfall=8.73"

Area (ac)	CN	Description
0.057	98	Unconnected roofs, HSG B
0.863	58	Woods/grass comb., Good, HSG B
0.920	60	Weighted Average
0.863	58	93.80% Pervious Area
0.057	98	6.20% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
52.8	222	0.0100	0.07		**Sheet Flow, A-B** Woods: Light underbrush n= 0.400 P2= 3.30"

Subcatchment PR-03: PR-03



Summary for Pond 1P: Recharge

[82] Warning: Early inflow requires earlier time span
[92] Warning: Device #2 is above defined storage
[93] Warning: Storage range exceeded by 1.15'
[88] Warning: Qout>Qin may require smaller dt or Finer Routing
[85] Warning: Oscillations may require smaller dt or Finer Routing (severity=33)

Inflow Area = 0.390 ac, 85.64% Impervious, Inflow Depth > 7.21" for 100_Year event
Inflow = 2.67 cfs @ 12.09 hrs, Volume= 0.234 af
Outflow = 2.82 cfs @ 12.09 hrs, Volume= 0.234 af, Atten= 0%, Lag= 0.0 min
Discarded = 0.44 cfs @ 11.94 hrs, Volume= 0.175 af
Primary = 2.37 cfs @ 12.09 hrs, Volume= 0.060 af

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.01 hrs
Peak Elev= 27.15' @ 12.09 hrs Surf.Area= 0.014 ac Storage= 0.015 af

Plug-Flow detention time= 7.5 min calculated for 0.234 af (100% of inflow)
Center-of-Mass det. time= 7.4 min (746.9 - 739.5)

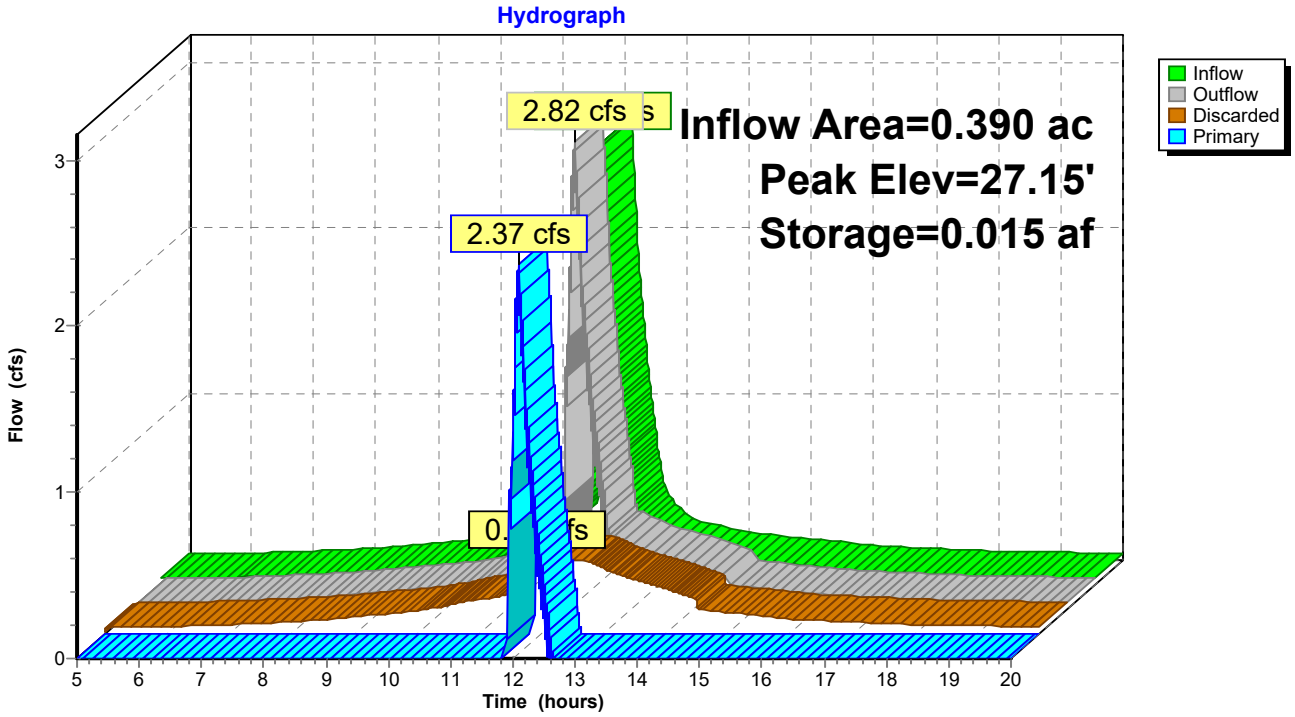
Volume	Invert	Avail.Storage	Storage Description
#1	24.00'	0.009 af	**3.50'W x 180.00'L x 2.00'H Prismatoid** 0.029 af Overall - 0.006 af Embedded = 0.022 af x 40.0% Voids
#2	24.50'	0.006 af	**12.0" Round CMP_Round 12"** x 2 Inside #1 L= 180.0'
		0.015 af	Total Available Storage

Device	Routing	Invert	Outlet Devices
#1	Discarded	24.00'	**14.000 in/hr Exfiltration over Wetted area**
#2	Primary	27.00'	**4.0" Horiz. Orifice/Grate X 8.00 columns** X 8 rows C= 0.600 in 24.0" x 48.0" Grate (70% open area) Limited to weir flow at low heads

Discarded OutFlow Max=0.44 cfs @ 11.94 hrs HW=27.07' (Free Discharge)
↑—**1=Exfiltration** (Exfiltration Controls 0.44 cfs)

Primary OutFlow Max=2.37 cfs @ 12.09 hrs HW=27.15' (Free Discharge)
↑—**2=Orifice/Grate** (Weir Controls 2.37 cfs @ 1.28 fps)

Pond 1P: Recharge



Summary for Pond B1: Basin 01

[82] Warning: Early inflow requires earlier time span

Inflow Area = 2.420 ac, 37.56% Impervious, Inflow Depth > 4.20" for 100_Year event
Inflow = 4.96 cfs @ 12.27 hrs, Volume= 0.847 af
Outflow = 2.02 cfs @ 13.32 hrs, Volume= 0.846 af, Atten= 59%, Lag= 63.1 min
Discarded = 2.02 cfs @ 13.32 hrs, Volume= 0.846 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= 0.01 hrs
Peak Elev= 26.41' @ 13.32 hrs Surf.Area= 7,925 sf Storage= 10,180 cf

Plug-Flow detention time= 55.1 min calculated for 0.846 af (100% of inflow)
Center-of-Mass det. time= 54.5 min (855.2 - 800.7)

Volume	Invert	Avail.Storage	Storage Description
#1	24.00'	30,976 cf	**Custom Stage Data (Irregular)** Listed below (Recalc)

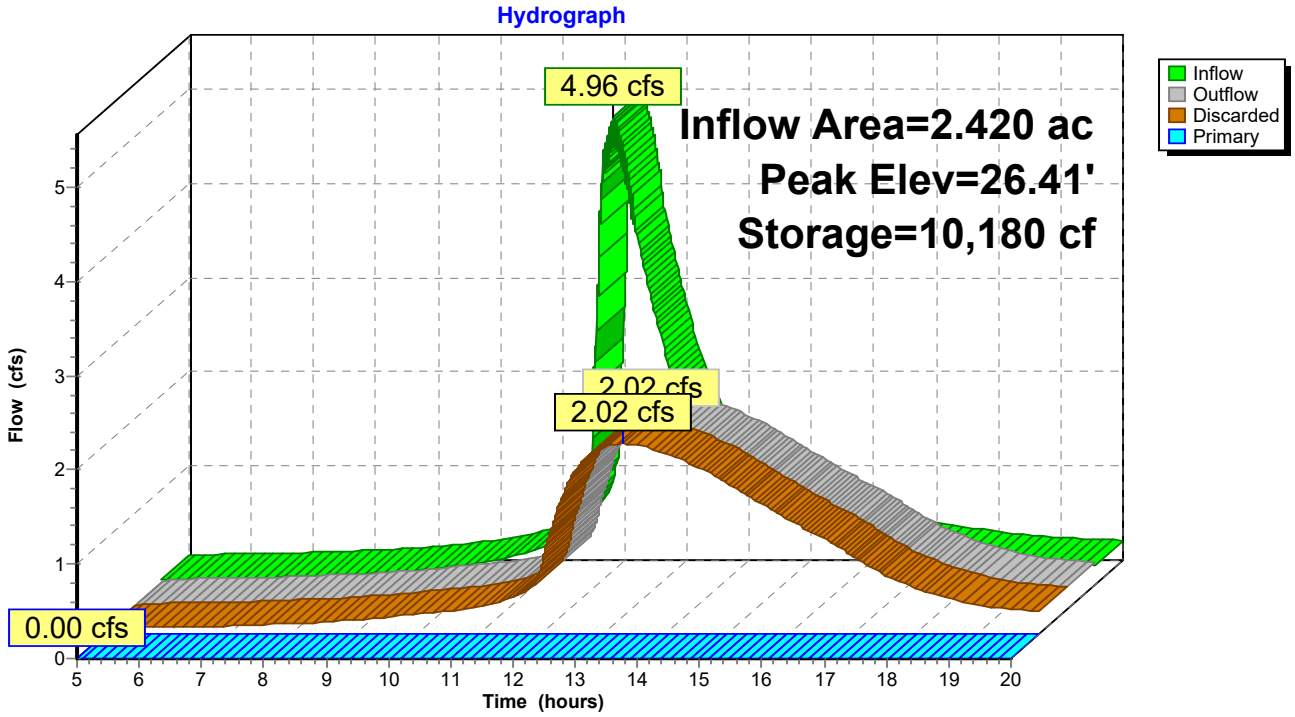
Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
24.00	830	560.0	0	0	830
25.00	3,675	1,010.0	2,084	2,084	57,057
26.00	6,732	1,030.0	5,127	7,211	60,460
27.00	9,850	1,050.0	8,242	15,453	63,930
28.00	22,000	1,200.0	15,524	30,976	90,811

Device	Routing	Invert	Outlet Devices
#1	Primary	26.50'	**10.0' long x 1.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 Coef. (English) 2.69 2.72 2.75 2.85 2.98 3.08 3.20 3.28 3.31 3.30 3.31 3.32
#2	Discarded	24.00'	**11.000 in/hr Exfiltration over Surface area**

Discarded OutFlow Max=2.02 cfs @ 13.32 hrs HW=26.41' (Free Discharge)
↑—**2=Exfiltration** (Exfiltration Controls 2.02 cfs)

Primary OutFlow Max=0.00 cfs @ 5.00 hrs HW=24.00' (Free Discharge)
↑—**1=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond B1: Basin 01



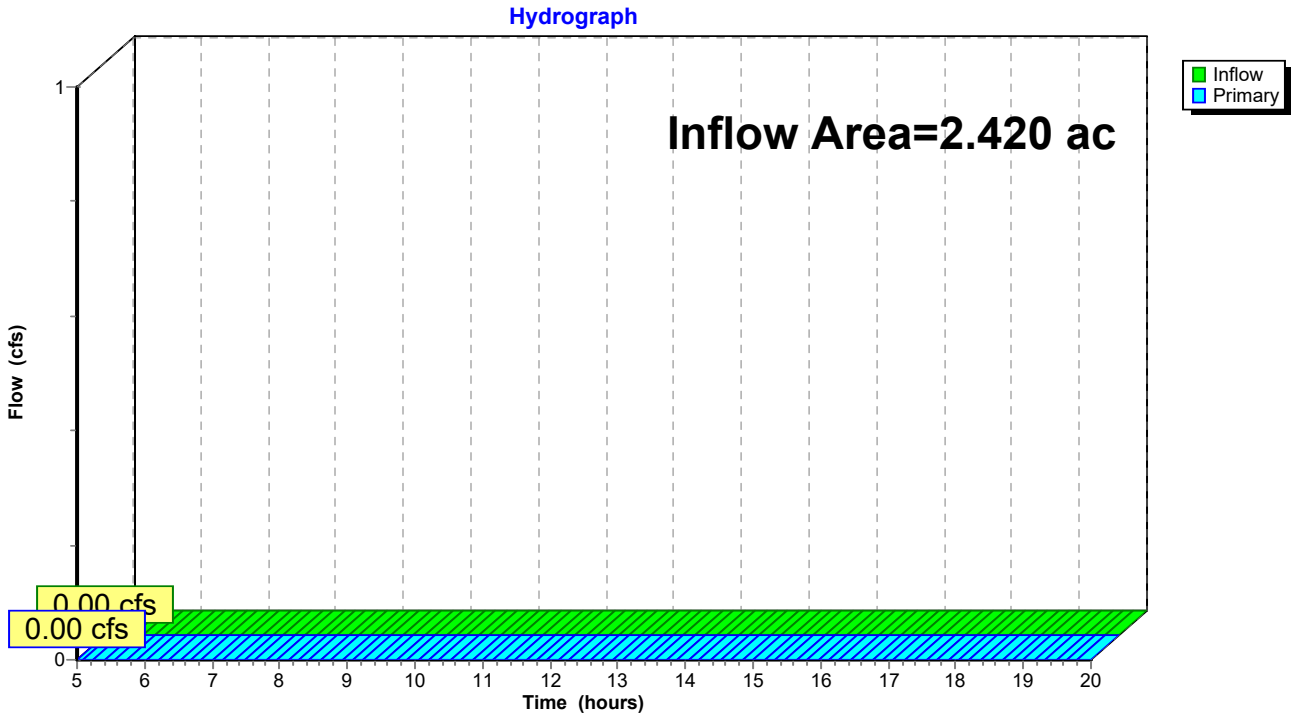
Summary for Pond Q: DISCHARGE

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 2.420 ac, 37.56% Impervious, Inflow Depth = 0.00" for 100_Year event
Inflow = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af
Primary = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.01 hrs

Pond Q: DISCHARGE



Appendix C

NJDEP Water Quality Storm

Time span=5.00-20.00 hrs, dt=0.01 hrs, 1501 points
Runoff by SCS TR-20 method, UH=Delmarva, Split Pervious/Imperv.
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment PR-01: PR-01 Runoff Area=1.110 ac 46.67% Impervious Runoff Depth=0.00"
Flow Length=231' Tc=22.0 min CN=61/98 Runoff=0.00 cfs 0.000 af

Subcatchment PR-02: PR-02 Runoff Area=0.390 ac 85.64% Impervious Runoff Depth=0.00"
Flow Length=175' Slope=0.0017 '/' Tc=5.0 min CN=61/98 Runoff=0.00 cfs 0.000 af

Subcatchment PR-03: PR-03 Runoff Area=0.920 ac 6.20% Impervious Runoff Depth>0.00"
Flow Length=222' Slope=0.0100 '/' Tc=52.8 min CN=58/98 Runoff=0.00 cfs 0.000 af

Pond 1P: Recharge Peak Elev=24.00' Storage=0.000 af Inflow=0.00 cfs 0.000 af
Discarded=0.00 cfs 0.000 af Primary=0.00 cfs 0.000 af Outflow=0.00 cfs 0.000 af

Pond B1: Basin 01 Peak Elev=24.00' Storage=0 cf Inflow=0.00 cfs 0.000 af
Discarded=0.00 cfs 0.000 af Primary=0.00 cfs 0.000 af Outflow=0.00 cfs 0.000 af

Pond Q: DISCHARGE Inflow=0.00 cfs 0.000 af
Primary=0.00 cfs 0.000 af

Total Runoff Area = 2.420 ac Runoff Volume = 0.000 af Average Runoff Depth = 0.00"
62.44% Pervious = 1.511 ac 37.56% Impervious = 0.909 ac

Summary for Subcatchment PR-01: PR-01

[45] Hint: Runoff=Zero

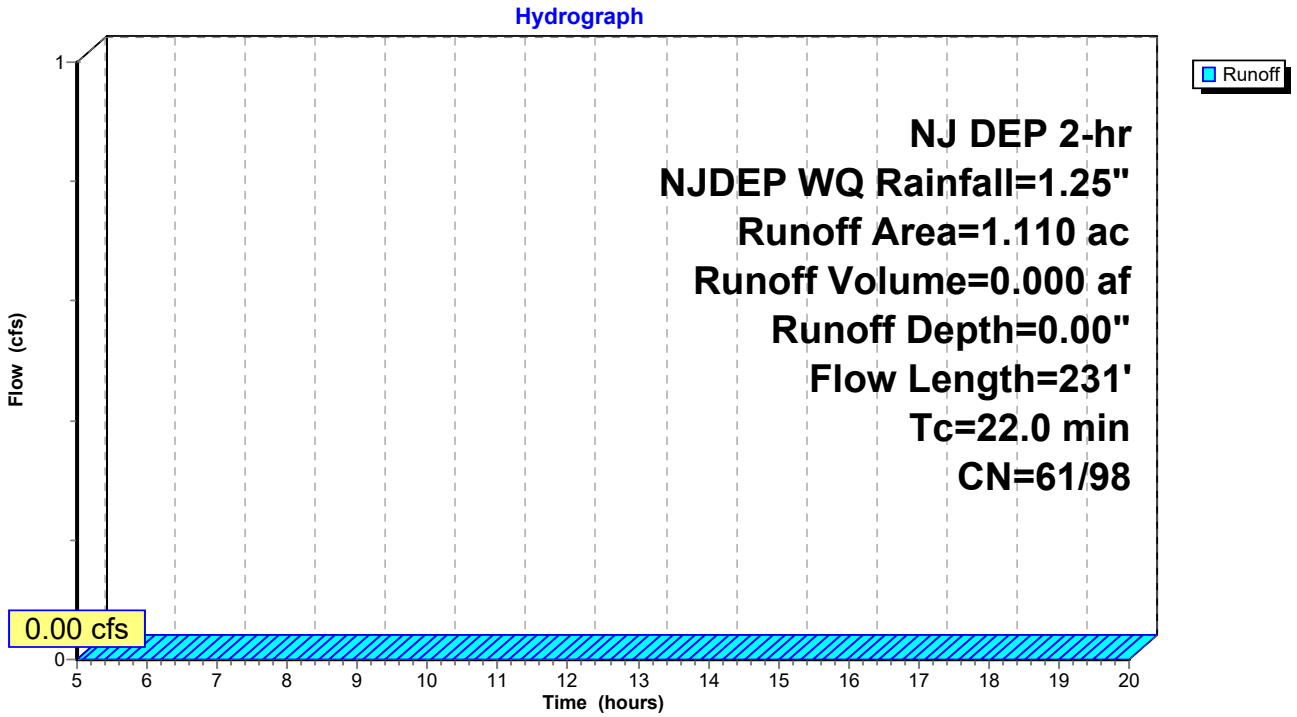
Runoff = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af, Depth= 0.00"

Runoff by SCS TR-20 method, UH=Delmarva, Split Pervious/Imperv., Time Span= 5.00-20.00 hrs, dt= 0.01 hrs
NJ DEP 2-hr NJDEP WQ Rainfall=1.25"

Area (ac)	CN	Description
0.518	98	Paved parking, HSG B
0.531	61	>75% Grass cover, Good, HSG B
0.061	58	Woods/grass comb., Good, HSG B
1.110	78	Weighted Average
0.592	61	53.33% Pervious Area
0.518	98	46.67% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.2	117	0.0060	0.89		**Sheet Flow, A-B** Smooth surfaces n= 0.011 P2= 3.30"
19.8	114	0.0110	0.10		**Sheet Flow, B-C** Grass: Dense n= 0.240 P2= 3.30"
22.0	231	Total			

Subcatchment PR-01: PR-01



Summary for Subcatchment PR-02: PR-02

[45] Hint: Runoff=Zero

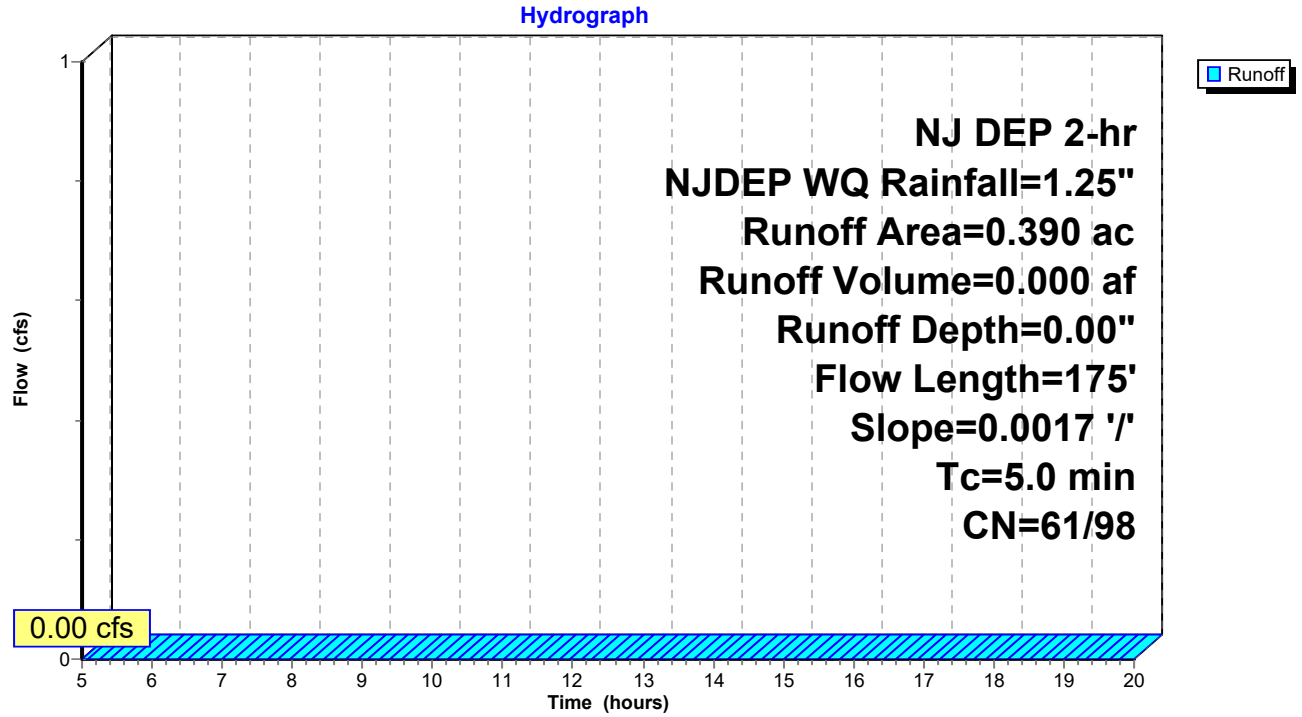
Runoff = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af, Depth= 0.00"

Runoff by SCS TR-20 method, UH=Delmarva, Split Pervious/Imperv., Time Span= 5.00-20.00 hrs, dt= 0.01 hrs
NJ DEP 2-hr NJDEP WQ Rainfall=1.25"

Area (ac)	CN	Description
0.334	98	Paved parking, HSG B
0.056	61	>75% Grass cover, Good, HSG B
0.390	93	Weighted Average
0.056	61	14.36% Pervious Area
0.334	98	85.64% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0	175	0.0017	0.58		**Sheet Flow, A-B** Smooth surfaces n= 0.011 P2= 3.30"

Subcatchment PR-02: PR-02



Summary for Subcatchment PR-03: PR-03

[73] Warning: Peak may fall outside time span

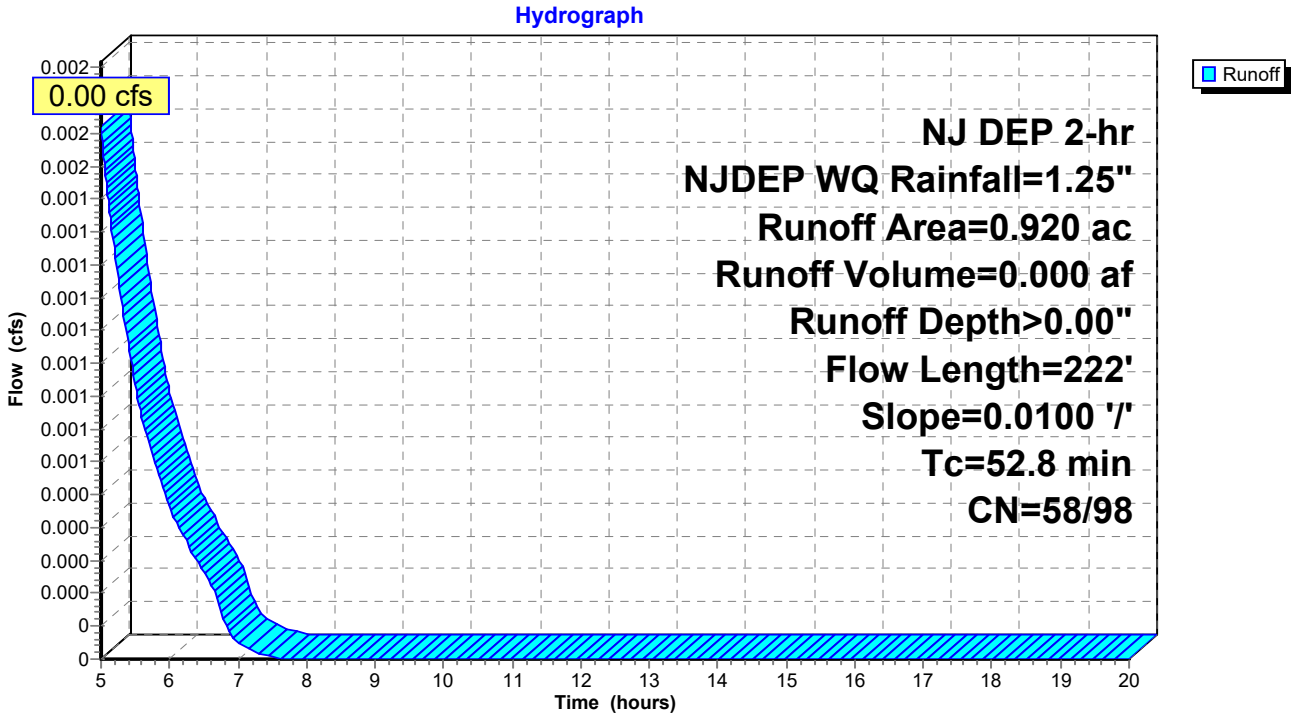
Runoff = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af, Depth> 0.00"

Runoff by SCS TR-20 method, UH=Delmarva, Split Pervious/Imperv., Time Span= 5.00-20.00 hrs, dt= 0.01 hrs
NJ DEP 2-hr NJDEP WQ Rainfall=1.25"

Area (ac)	CN	Description
0.057	98	Unconnected roofs, HSG B
0.863	58	Woods/grass comb., Good, HSG B
0.920	60	Weighted Average
0.863	58	93.80% Pervious Area
0.057	98	6.20% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
52.8	222	0.0100	0.07		**Sheet Flow, A-B** Woods: Light underbrush n= 0.400 P2= 3.30"

Subcatchment PR-03: PR-03



Summary for Pond 1P: Recharge

[92] Warning: Device #2 is above defined storage

Inflow Area = 0.390 ac, 85.64% Impervious, Inflow Depth = 0.00" for NJDEP WQ event
Inflow = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af
Outflow = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af, Atten= 0%, Lag= 0.0 min
Discarded = 0.00 cfs @ 5.00 hrs, Volume= 0.000 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= 0.01 hrs
Peak Elev= 24.00' @ 5.00 hrs Surf.Area= 0.014 ac Storage= 0.000 af

Plug-Flow detention time= (not calculated: initial storage exceeds outflow)
Center-of-Mass det. time= (not calculated: no inflow)

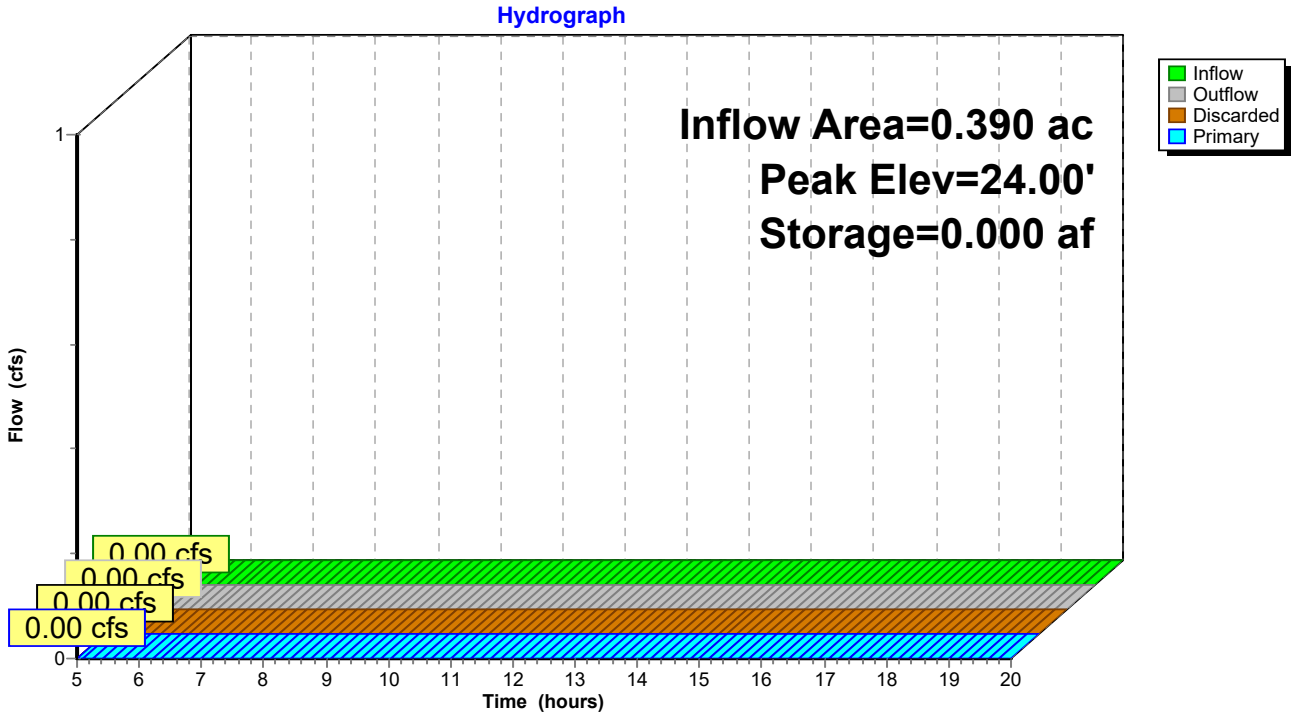
Volume	Invert	Avail.Storage	Storage Description
#1	24.00'	0.009 af	**3.50'W x 180.00'L x 2.00'H Prismatoid** 0.029 af Overall - 0.006 af Embedded = 0.022 af x 40.0% Voids
#2	24.50'	0.006 af	**12.0" Round CMP_Round 12"** x 2 Inside #1 L= 180.0'
		0.015 af	Total Available Storage

Device	Routing	Invert	Outlet Devices
#1	Discarded	24.00'	**14.000 in/hr Exfiltration over Wetted area**
#2	Primary	27.00'	**4.0" Horiz. Orifice/Grate X 8.00 columns** X 8 rows C= 0.600 in 24.0" x 48.0" Grate (70% open area) Limited to weir flow at low heads

Discarded OutFlow Max=0.00 cfs @ 5.00 hrs HW=24.00' (Free Discharge)
↑—**1=Exfiltration** (Passes 0.00 cfs of 0.20 cfs potential flow)

Primary OutFlow Max=0.00 cfs @ 5.00 hrs HW=24.00' (Free Discharge)
↑—**2=Orifice/Grate** (Controls 0.00 cfs)

Pond 1P: Recharge



Summary for Pond B1: Basin 01

[82] Warning: Early inflow requires earlier time span

Inflow Area = 2.420 ac, 37.56% Impervious, Inflow Depth > 0.00" for NJDEP WQ event
Inflow = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af
Outflow = 0.00 cfs @ 5.12 hrs, Volume= 0.000 af, Atten= 15%, Lag= 7.4 min
Discarded = 0.00 cfs @ 5.12 hrs, Volume= 0.000 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= 0.01 hrs
Peak Elev= 24.00' @ 5.12 hrs Surf.Area= 830 sf Storage= 0 cf

Plug-Flow detention time= 3.4 min calculated for 0.000 af (99% of inflow)
Center-of-Mass det. time= 2.5 min (339.9 - 337.4)

Volume	Invert	Avail.Storage	Storage Description
#1	24.00'	30,976 cf	**Custom Stage Data (Irregular)** Listed below (Recalc)

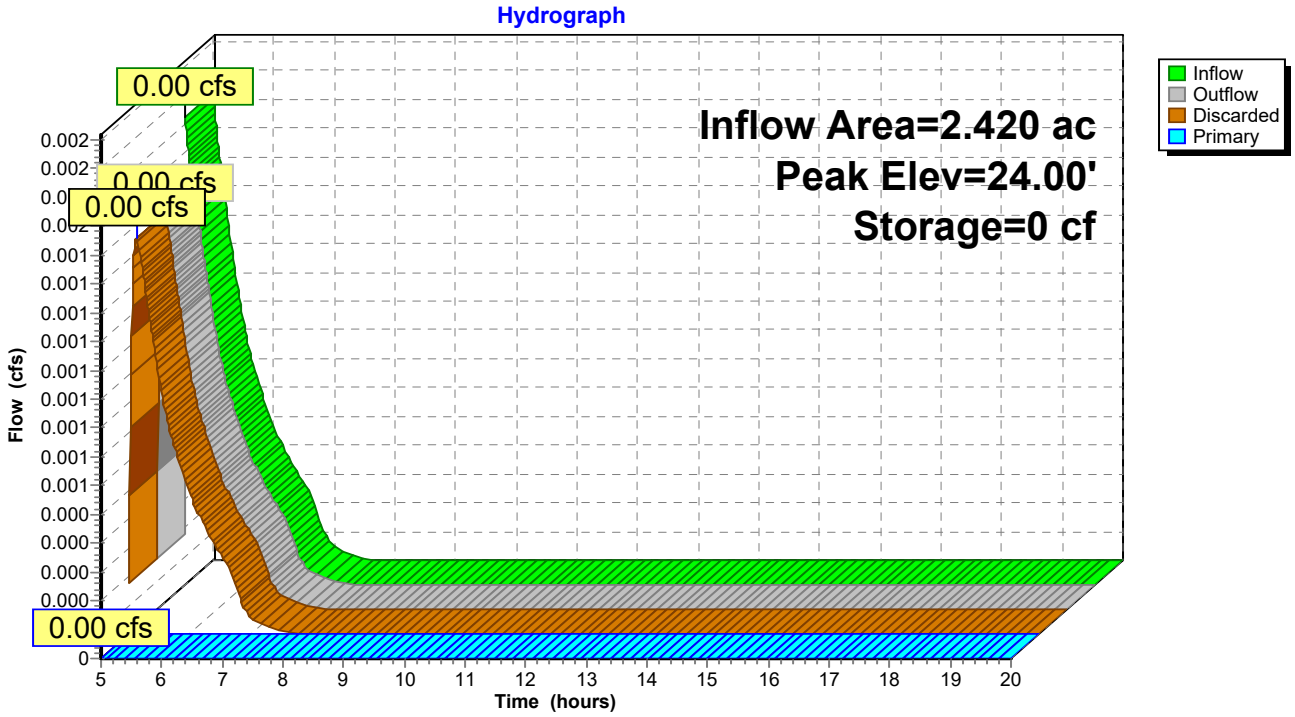
Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
24.00	830	560.0	0	0	830
25.00	3,675	1,010.0	2,084	2,084	57,057
26.00	6,732	1,030.0	5,127	7,211	60,460
27.00	9,850	1,050.0	8,242	15,453	63,930
28.00	22,000	1,200.0	15,524	30,976	90,811

Device	Routing	Invert	Outlet Devices
#1	Primary	26.50'	**10.0' long x 1.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 Coef. (English) 2.69 2.72 2.75 2.85 2.98 3.08 3.20 3.28 3.31 3.30 3.31 3.32
#2	Discarded	24.00'	**11.000 in/hr Exfiltration over Surface area**

Discarded OutFlow Max=0.21 cfs @ 5.12 hrs HW=24.00' (Free Discharge)
2=Exfiltration (Exfiltration Controls 0.21 cfs)

Primary OutFlow Max=0.00 cfs @ 5.00 hrs HW=24.00' (Free Discharge)
1=Broad-Crested Rectangular Weir (Controls 0.00 cfs)

Pond B1: Basin 01



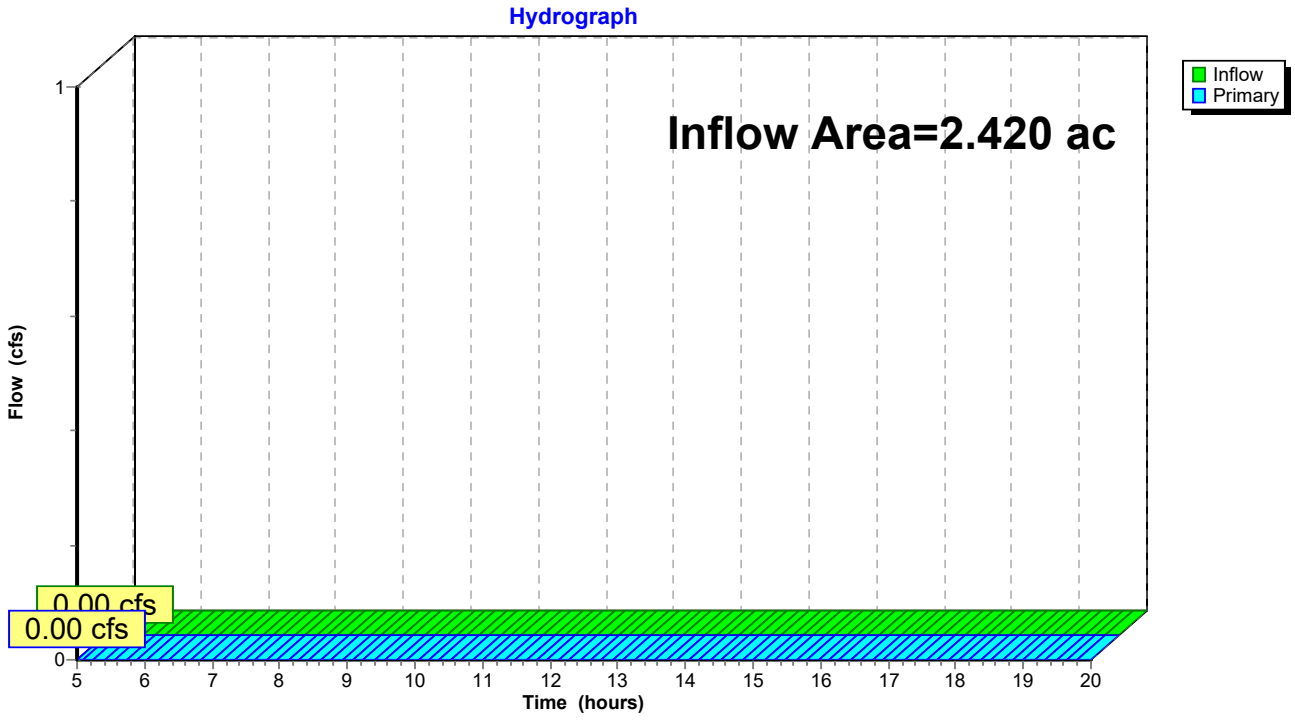
Summary for Pond Q: DISCHARGE

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 2.420 ac, 37.56% Impervious, Inflow Depth = 0.00" for NJDEP WQ event
Inflow = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af
Primary = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.01 hrs

Pond Q: DISCHARGE



Appendix D

Soil Boring Logs

320 S. Shore Road, Suite D
Marmora, New Jersey 08223
Telephone No. (609) 918-0200 Ext. 287
www.actengineers.com

SOIL BORING LOG #1 (CLOSEST TO NORTHFIELD AVENUE)

BLOCK 106, LOT 8; CITY OF NORTHFIELD; ATLANTIC COUNTY
Excavated by Junetta N. Dix with 4" hand auger on September 28, 2021

DEPTH (INCHES)	SOIL DESCRIPTION
0 – 14"	10YR 4/2 Dark grayish brown medium loam; 0% coarse material content; angular blocky; friable; few roots.
14 – 26"	10YR 5/4 Yellowish brown medium loam; 0% coarse material content; angular blocky; friable.
26 – 58"	10YR 6/4 Light yellowish brown medium sandy loam; 0% coarse material content; angular blocky; friable. ***Permeability rate = 11.907 in/hr. (K4)***
58 – 64"	10YR 8/4 Very pale brown coarse sand; 2% gravel content; single grained; loose; with common, distinct 10 YR 5/6 yellowish brown mottles at 58"; damp but no obvious seepage.

Soil Sample Depth: **36"**
Depth to estimated SHWT: **58"**
Restrictive Horizon: **None Encountered**
Depth to groundwater: **Not Encountered**

This document is an instrument of professional service, is the property of ACT Engineers, Inc. (ACT) and shall not be used in whole or in part for any other project without the written consent of ACT. This soil boring/pit log has been completed to assess the probable soil conditions, which may be found in the immediate vicinity of the specific boring location. ACT does not guarantee that all soils on this specific site will be similar in texture, structure, or other physical properties. Seasonal high water table determinations and hydrologically restrictive horizons are estimated only and can vary across a site. Some borings/pits may be subject to regulatory agency review. ACT does not guarantee that unwitnessed borings/pits will be acceptable to the applicable regulatory agency. However, all borings and test pits will be completed in a professional manner utilizing currently acceptable standards.

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SOIL BORING LOG #2 (CLOSEST TO REAR PROPERTY LINE)

BLOCK 106, LOT 8; CITY OF NORTHFIELD; ATLANTIC COUNTY
Excavated by Junetta N. Dix with 4" hand auger on September 28, 2021

DEPTH (INCHES)	SOIL DESCRIPTION
0 – 4"	10YR 4/2 Dark grayish brown medium loam; 0% coarse material content; angular blocky; friable; few roots.
4 – 30"	10YR 6/6 Brownish yellow medium loamy sand; 0% coarse material content; angular blocky; friable.
30 – 36"	10YR 6/6 Brownish yellow medium to coarse sand; 2% gravel content; angular blocky; friable.
36 – 42"	10YR 5/6 Yellowish brown medium loamy sand; 2% gravel content; angular blocky; friable; ***Permeability rate = 14.032 in/hr. (K4).***
42 – 48"	10YR 8/4 Very pale brown medium sand; 0% coarse material content; angular blocky; friable; with common, distinct 10 YR 5/6 yellowish brown mottles at 42".
48 – 64"	10YR 8/3 Very pale brown fine sand; 0% coarse material content; angular blocky; friable; with common, distinct 10 YR 5/6 yellowish brown mottles throughout horizon; damp, but no obvious seepage.

Soil Sample Depth: **40"**
Depth to estimated SHWT: **42"**
Restrictive Horizon: **None Encountered**
Depth to groundwater: **Not Encountered**

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320 S. Shore Road, Suite D
Marmora, NJ 08223

TUBE PERMEAMETER TEST #1 (From Soil Boring #1)

BLOCK 106, LOT 8; CITY OF NORTHFIELD; ATLANTIC COUNTY

1 Test No. **1** Replicate (letter) **A** Date Collected 9/28/21

2 Material Tested _____ Fill Native Soil Test- depth 36"

3 Type of sample: Undisturbed **XX** Disturbed

4 Sample dimensions: Inside radius of sample tube, R (cm) _____

Length of sample, L (inches) 5.00

5 Bulk density determination (disturbed samples only): _____

Sample weight (grams) 700

Sample volume (L x 2.54 cm/in. x (3.14r2) 578.866

Bulk density (Sample weight/Sample volume) 1.209260865

6 Standpipe Used: _____ Yes **X** No

Indicate Internal Radius _____

7 Height of water above rim of test basin, inche Refer to following table _____

At the beginning of each test interval,H1 Refer to following table

At the end of each test interval H2 Refer to following table

Rate of water level drop

	H1 (in)	H2 (in)	Time, Start of Test Interval, T1 (min)	Time, End of Test Interval, T2 (mi		Length of Test Interval, T, minutes
Test 1	5.50	5.00	0.00	2.05		2.05
Test 2	5.50	4.75	0.00	3.40		3.40
Test 3	5.50	4.50	0.00	5.00		5.00
Test 4	5.50	4.50	0.00	4.95		4.95
Test 5	5.50	4.50	0.00	5.05		5.05

8 **Calculation of Permeability:**

K, (in/hr)= 60 min/hr*L(in)/T(min)*Ln (H1/H2)

K1 (in/hr)=	13.948	K4	Soil Permeability Class
K2 (in/hr)=	12.936	K4	Soil Permeability Class
K3 (in/hr)=	12.040	K4	Soil Permeability Class
K4 (in/hr)=	12.162	K4	Soil Permeability Class
K4 (in/hr)=	11.921	K4	Soil Permeability Class
AVERAGE	**12.601**	K4	

9 I hereby certify that the information furnished on this form is true and accurate.

Signature of Soil Evaluator _____ Date 9/28/21

Signature of Professional Engineer _____ Lic. # _____

ACT ENGINEERS, INC.
320 S. Shore Road, Suite D
Marmora, NJ 08223

TUBE PERMEAMETER TEST #1 (From Soil Boring #1)

BLOCK 106, LOT 8; CITY OF NORTHFIELD; ATLANTIC COUNTY

1 Test No. **1** Replicate (letter) **B** Date Collected 9/28/21

2 Material Tested _____ Fill Native Soil Test- depth 36"

3 Type of sample: Undisturbed **XX** Disturbed

4 Sample dimensions: Inside radius of sample tube, R (cm)

Length of sample, L (inches) 4.00

5 Bulk density determination (disturbed samples only):

Sample weight (grams) 598

Sample volume (L x 2.54 cm/in. x (3.14r2) 463.0928

Bulk density (Sample weight/Sample volume) 1.291317852

6 Standpipe Used: _____ Yes **X** No

Indicate Internal Radius

7 Height of water above rim of test basin, inche Refer to following table

At the beginning of each test interval,H1 Refer to following table

At the end of each test interval H2 Refer to following table

Rate of water level drop

	H1 (in)	H2 (in)	Time, Start of Test Interval, T1 (min)	Time, End of Test Interval, T2 (mi		Length of Test Interval, T, minutes
Test 1	4.50	3.50	0.00	5.00		5.00
Test 2	4.50	3.50	0.00	5.20		5.20
Test 3	4.50	3.50	0.00	4.98		4.98
Test 4	4.50	3.50	0.00	5.00		5.00
Test 5	4.50	3.50	0.00	5.02		5.02

8 **Calculation of Permeability:**

K, (in/hr)= 60 min/hr*L(in)/T(min)*Ln (H1/H2)

K1 (in/hr)=	12.063	K4	Soil Permeability Class
K2 (in/hr)=	11.599	K4	Soil Permeability Class
K3 (in/hr)=	12.112	K4	Soil Permeability Class
K4 (in/hr)=	12.063	K4	Soil Permeability Class
K4 (in/hr)=	12.015	K4	Soil Permeability Class
AVERAGE	**11.970**	K4	

9 I hereby certify that the information furnished on this form is true and accurate.

Signature of Soil Evaluator _____ Date 9/28/21

Signature of Professional Engineer _____ Lic. # _____

ACT ENGINEERS, INC.
320 S. Shore Road, Suite D
Marmora, NJ 08223

TUBE PERMEAMETER TEST #2 (From Soil Boring #2)

BLOCK 106, LOT 8; CITY OF NORTHFIELD; ATLANTIC COUNTY

1	Test No.	**2**	Replicate (letter)	**A**	Date Collected		9/28/21
2	Material Tested		Fill	Native Soil Test- depth			40"
3	Type of sample:		Undisturbed	**XX**	Disturbed		
4	Sample dimensions: Inside radius of sample tube, R (cm)						
	Length of sample, L (inches)						4.00
5	Bulk density determination (disturbed samples only):						
	Sample weight (grams)					570	
	Sample volume (L x 2.54 cm/in. x (3.14r2)					463.0928	
	Bulk density (Sample weight/Sample volume)					1.230854809	
6	Standpipe Used:		Yes			**X**	No
	Indicate Internal Radius						
7	Height of water above rim of test basin, inche		Refer to following table				
	At the beginning of each test interval,H1		Refer to following table				
	At the end of each test interval H2		Refer to following table				

Rate of water level drop

	H1 (in)	H2 (in)	Time, Start of Test Interval, T1 (min)	Time, End of Test Interval, T2 (mi		Length of Test Interval, T, minutes
Test 1	5.50	5.00	0.00	1.60		1.60
Test 2	5.50	4.50	0.00	3.40		3.40
Test 3	5.50	4.50	0.00	3.33		3.33
Test 4	5.50	4.50	0.00	3.45		3.45
Test 5	5.50	4.50	0.00	3.47		3.47

8 **Calculation of Permeability:**

K, (in/hr)= 60 min/hr*L(in)/T(min)*Ln (H1/H2)

K1 (in/hr)=	14.297	K4	Soil Permeability Class
K2 (in/hr)=	14.165	K4	Soil Permeability Class
K3 (in/hr)=	14.463	K4	Soil Permeability Class
K4 (in/hr)=	13.960	K4	Soil Permeability Class
K4 (in/hr)=	13.879	K4	Soil Permeability Class
AVERAGE	**14.153**	K4	

9 I hereby certify that the information furnished on this form is true and accurate.

Signature of Soil Evaluator  Date 9/28/21

Signature of Professional Engineer _____ Lic. # _____

ACT ENGINEERS, INC.
320 S. Shore Road, Suite D
Marmora, NJ 08223

TUBE PERMEAMETER TEST #2 (From Soil Boring #2)

BLOCK 106, LOT 8; CITY OF NORTHFIELD; ATLANTIC COUNTY

1	Test No.	**2**	Replicate (letter)	**B**	Date Collected		9/28/21
2	Material Tested		Fill	Native Soil Test- depth			40"
3	Type of sample:		Undisturbed	**XX**	Disturbed		
4	Sample dimensions: Inside radius of sample tube, R (cm)						
	Length of sample, L (inches)						4.00
5	Bulk density determination (disturbed samples only):						
	Sample weight (grams)					630	
	Sample volume (L x 2.54 cm/in. x (3.14r2)					463.0928	
	Bulk density (Sample weight/Sample volume)					1.360418473	
6	Standpipe Used:		Yes			**X**	No
	Indicate Internal Radius						
7	Height of water above rim of test basin, inche		Refer to following table				
	At the beginning of each test interval,H1		Refer to following table				
	At the end of each test interval H2		Refer to following table				

Rate of water level drop

	H1 (in)	H2 (in)	Time, Start of Test Interval, T1 (min)	Time, End of Test Interval, T2 (mi		Length of Test Interval, T, minutes
Test 1	4.50	3.50	0.00	4.30		4.30
Test 2	4.50	3.50	0.00	4.33		4.33
Test 3	4.50	3.50	0.00	4.40		4.40
Test 4	4.50	3.50	0.00	4.32		4.32
Test 5	4.50	3.50	0.00	4.15		4.15

8 **Calculation of Permeability:**

K, (in/hr)= 60 min/hr*L(in)/T(min)*Ln (H1/H2)

K1 (in/hr)=	14.027	K4	Soil Permeability Class
K2 (in/hr)=	13.930	K4	Soil Permeability Class
K3 (in/hr)=	13.708	K4	Soil Permeability Class
K4 (in/hr)=	13.962	K4	Soil Permeability Class
K4 (in/hr)=	14.534	K4	Soil Permeability Class
AVERAGE	**14.032**	K4	

9 I hereby certify that the information furnished on this form is true and accurate.

Signature of Soil Evaluator _____ Date 9/28/21

Signature of Professional Engineer _____ Lic. # _____

Appendix E

NJDEP Nonstructural Points System Spreadsheet

NJDEP Nonstructural Strategies Points System (NSPS)

Version: January 31, 2006

Note: Input Values in Yellow Cells Only

Project:	Medical Office Building
Date:	December 15, 2021
User:	DeBlasio & Associates
Notes:	

Step 1 - Provide Basic Major Development Site Information

A. Specify Total Area in Acres of Development Site Described in Steps 2 and 3 = 0.7 **Acres**

B. Specify by Percent the Various Planning Areas Located within the Development Site:

State Plan Planning Area:	PA-1	PA-2	PA-3	PA-4	PA-4B	PA-5	Total % Area
Percent of Each Planning Area within Site:		100.0%					100.0%

Note: See User's Guide for Equivalent Zones within Designated Centers and the NJ Meadowlands, Pinelands, and Highlands Districts

Step 2 - Describe Existing or Pre-Developed Site Conditions

A. Specify Existing Land Use/Land Cover Descriptions and Areas:

Site Segment	Land Use/Land Cover Description	Specify Land Use/Land Cover in Acres for Each HSG				Use/Cover Subtotals	Points
		HSG A	HSG B	HSG C	HSG D		
1	Wetlands and Undisturbed Stream Buffers					0.0	0
2	Lawn and Open Space		0.7			0.7	331
3	Brush and Shrub					0.0	0
4	Meadow, Pasture, Grassland, or Range					0.0	0
5	Row Crop					0.0	0
6	Small Grain and Legumes					0.0	0
7	Woods - Indigenous					0.0	0
8	Woods - Planted					0.0	0
9	Woods and Grass Combination					0.0	0
10	Ponds, Lakes, and Other Open Water					0.0	0
11	Gravel and Dirt					0.0	0
12	Porous and Permeable Paving					0.0	0
13	Directly Connected Impervious					0.0	0
14	Unconnected Impervious with Small D/S Pervious					0.0	0
15	Unconnected Impervious with Large D/S Pervious					0.0	0
	HSG Subtotals (Acres):	0.0	0.7	0.0	0.0	**Total Area:**	0.7
	HSG Subtotals (%):	0.0%	100.0%	0.0%	0.0%	**Total % Area:**	100.0%

Points Subtotal: **331**

Total Existing Site Points: **331**

Step 3 - Describe Proposed or Post-Developed Site Conditions

A. Specify Proposed Land Use/Land Cover Descriptions and Areas:

Site Segment	Land Use/Land Cover Description	Specify Land Use/Land Cover in Acres for Each HSG				Use/Cover Subtotals	Points
		HSG A	HSG B	HSG C	HSG D		
1	Wetlands and Undisturbed Stream Buffers					0.0	0
2	Lawn and Open Space		0.4			0.4	179
3	Brush and Shrub					0.0	0
4	Meadow, Pasture, Grassland, or Range					0.0	0
5	Row Crop					0.0	0
6	Small Grain and Legumes					0.0	0
7	Woods - Indigenous					0.0	0
8	Woods - Planted					0.0	0
9	Woods and Grass Combination					0.0	0
10	Ponds, Lakes, and Other Open Water					0.0	0
11	Gravel and Dirt					0.0	0
12	Porous and Permeable Paving					0.0	0
13	Directly Connected Impervious		0.3			0.3	0
14	Unconnected Impervious with Small D/S Pervious					0.0	46
15	Unconnected Impervious with Large D/S Pervious					0.0	0
	HSG Subtotals (Acres):	0.0	0.7	0.0	0.0	**Total Area:**	0.7
	HSG Subtotals (%):	0.0%	100.0%	0.0%	0.0%	**Total % Area:**	100.0%
						Points Subtotal:	**224**

B. Compare Proposed Impervious Coverage with Maximum Allowable Impervious Coverage:

Total Directly Connected Impervious Coverage =	46%	% of Site
Total Unconnected Impervious Coverage with Small D/S Pervious =	0%	% of Site
Total Unconnected Impervious Coverage with Large D/S Pervious =	0%	% of Site
Total Site Impervious Coverage =	46%	% of Site
Effective Site Impervious Coverage =	46%	% of Site
Specify Source of Maximum Allowable Impervious Coverage:	Table	(None or Table)
Allowable Site Impervious Cover from Maximum Impervious Cover Table:	0%	

Note: See Maximum Impervious Cover Table Worksheet for Details

Points Subtotal: 0

C. Compare Proposed Site Disturbance with Maximum Allowable Site Disturbance:

Total Proposed Site Disturbance =	90%	% of Site
Maximum Allowable Site Disturbance by Municipal Ordinance =	100%	% of Site

Points Subtotal: 7

D. Describe Proposed Runoff Conveyance System:

Total Length of Runoff Conveyance System =	0	Feet
Length of Vegetated Runoff Conveyance System =	0	Feet
% of Total Runoff Conveyance System That is Vegetated =	0%	

Points Subtotal: 0

E. Residential Lot Clustering:

Percent of Total Site Area that will be Clustered =		% of Site
Minimum Standard Lot Size as Per Zoning (Note: 1/2 Acre or Greater) =		Acres
Maximum Proposed Cluster Lot Size (Note:1/4 Acre or Less) =		Acres
Percent of Clustered Portion of Site to be Preserved as Vegetated Open Space =		% of Clustered Site Portion

Points Subtotal: 0

F. Will the Following be Utilized to Minimize Soil Compaction?

Proposed Lawn Areas will be Graded with Lightweight Construction Equipment:	Yes	(Yes or No)
Percent of Proposed Lawn Areas to be Graded with Such Equipment:	25%	% of Lawn Areas

Points Subtotal: 8

G. Are Any of the Following Stormwater Management Standards Met Using Only Nonstructural Strategies and Measures?

Groundwater Recharge Standards (NJAC 7:8-5.4-a-2):	No	(Yes or No)
Stormwater Runoff Quality Standards (NJAC 7:8-5.5):	Yes	(Yes or No)
Stormwater Runoff Quantity Standards (NJAC 7:8-5.4-a-3):	No	(Yes or No)

Points Subtotal: 86

Note: If the Answers to All Three Questions at G Above are "Yes", Adequate Nonstructural Measures have been Utilized.

Total Proposed Site Points: 326

Ratio of Proposed to Existing Site Points: 98%

Required Site Points Ratio: 78%

Nonstructural Point System Results: Proposed Nonstructural Measures are Adequate

Appendix F

Low Impact Development Checklist

New Jersey Stormwater Best Management Practices Manual

February 2004

APPENDIX A

Low Impact Development Checklist

A checklist for identifying nonstructural stormwater management strategies incorporated into proposed land development

According to the NJDEP Stormwater Management Rules at N.J.A.C. 7:8, the groundwater recharge, stormwater quality, and stormwater quantity standards established by the Rules for major land development projects must be met by incorporating nine specific nonstructural stormwater management strategies into the project's design to the maximum extent practicable.

To accomplish this, the Rules require an applicant seeking land development approval from a regulatory board or agency to identify those nonstructural strategies that have been incorporated into the project's design. In addition, if an applicant contends that it is not feasible to incorporate any of the specific strategies into the project's design, particularly for engineering, environmental, or safety reasons, the Rules further require that the applicant provide a basis for that contention.

This checklist has been prepared to assist applicants, site designers, and regulatory boards and agencies in ensuring that the nonstructural stormwater management requirements of the Rules are met. It provides an applicant with a means to identify both the nonstructural strategies incorporated into the development's design and the specific low impact development BMPs (LID-BMPs) that have been used to do so. It can also help an applicant explain the engineering, environmental, and/or safety reasons that a specific nonstructural strategy could not be incorporated into the development's design.

The checklist can also assist municipalities and other land development review agencies in the development of specific requirements for both nonstructural strategies and LID-BMPs in zoning and/or land use ordinances and regulations. As such, where requirements consistent with the Rules have been adopted, they may supersede this checklist.

Finally, the checklist can be used during a pre-design meeting between an applicant and pertinent review personnel to discuss local nonstructural strategies and LID-BMPs requirements in order to optimize the development's nonstructural stormwater management design.

Since this checklist is intended to promote the use of nonstructural stormwater management strategies and provide guidance in their incorporation in land development projects, municipalities are permitted to revise it as necessary to meet the goals and objectives of their specific stormwater management program and plan within the limits of N.J.A.C. 7:8.

Low Impact Development Checklist

A checklist for identifying nonstructural stormwater management strategies incorporated into proposed land development

Municipality: Northfield

County: Atlantic County Date: 12 - 15 - 21

Review board or agency: Northfield Planning Board

Proposed land development name: Proposed Medical Office

Lot(s): 8 Block(s): 106

Project or application number: _____

Applicant's name: Brett Foxman / Webster Property Management, LLC

Applicant's address: 1500 Tilton Road

Northfield, NJ 08225

Telephone: _____ Fax: _____

Email address: _____

Designer's name: DeBlasio and Associate

Designer's address: 4701 New Jersey Avenue

Wildwood, NJ 08260

Telephone: 609-856-3311 Fax: 609-854-4323

Email address: marc@deblasioassoc.com

Part 1: Description of Nonstructural Approach to Site Design

In narrative form, provide an overall description of the nonstructural stormwater management approach and strategies incorporated into the proposed site's design. Attach additional pages as necessary. Details of each nonstructural strategy are provided in Part 3 below.

The nonstructural approach to stormwater management for this site design was developed primarily to minimize the impervious cover and minimize compaction. The application consist of the construction of a medical office building and associated parking lot.

Part 2: Review of Local Stormwater Management Regulations

Title and date of stormwater management regulations used in development design:

NJAC 7:8

Do regulations include nonstructural requirements? Yes: X No: _____

If yes, briefly describe: Chapter 8

List LID-BMPs prohibited by local regulations: None

Pre-design meeting held? Yes: _____ Date: _____ No: X

Meeting held with: _____

Pre-design site walk held? Yes: _____ Date: _____ No: X

Site walk held with: _____

Other agencies with stormwater review jurisdiction:

Name: Cape Atlantic SCD

Required approval: Soil Erosion and Sediment Control

Name: _____

Required approval: _____

Name: _____

Required approval: _____

Part 3: Nonstructural Strategies and LID-BMPs in Design

3.1 Vegetation and Landscaping

Effective management of both existing and proposed site vegetation can reduce a development's adverse impacts on groundwater recharges and runoff quality and quantity. This section of the checklist helps identify the vegetation and landscaping strategies and nonstructural LID-BMPs that have been incorporated into the proposed development's design to help maintain existing recharge rates and/or minimize or prevent increases in runoff quantity and pollutant loading.

A. Has an inventory of existing site vegetation been performed? Yes: X No: _____

If yes, was this inventory a factor in the site's layout and design? Yes: X No: _____

B. Does the site design utilize any of the following nonstructural LID-BMPs?

Preservation of natural areas? Yes: _____ No: X If yes, specify % of site: _____

Native ground cover? Yes: _____ No: X If yes, specify % of site: _____

Vegetated buffers? Yes: _____ No: X If yes, specify % of site: _____

C. Do the land development regulations require these nonstructural LID-BMPs?

Preservation of natural areas? Yes: _____ No: X If yes, specify % of site: _____

Native ground cover? Yes: _____ No: X If yes, specify % of site: _____

Vegetated buffers? Yes: _____ No: X If yes, specify % of site: _____

D. If vegetated filter strips or buffers are utilized, specify their functions:

Reduce runoff volume increases through lower runoff coefficient: Yes: _____ No: _____

Reduce runoff pollutant loads through runoff treatment: Yes: _____ No: _____

Maintain groundwater recharge by preserving natural areas: Yes: _____ No: _____

3.2 Minimize Land Disturbance

Minimizing land disturbance is a nonstructural LID-BMP that can be applied during both the development's construction and post-construction phases. This section of the checklist helps identify those land disturbance strategies and nonstructural LID-BMPs that have been incorporated into the proposed development's design to minimize land disturbance and the resultant change in the site's hydrologic character.

A. Have inventories of existing site soils and slopes been performed? Yes: X No: _____

If yes, were these inventories factors in the site's layout and design? Yes: X No: _____

B. Does the development's design utilize any of the following nonstructural LID-BMPs?

Restrict permanent site disturbance by land owners? Yes: _____ No: X

If yes, how: _____

_____

Restrict temporary site disturbance during construction? Yes: X No: _____

If yes, how: Temporary soil stabilization is required on all exposed soil surfaces.

_____

Consider soils and slopes in selecting disturbance limits? Yes: X No: _____

If yes, how: No disturbance of steep slopes is proposed.

_____

C. Specify percentage of site to be cleared: N/A (Site is cleared) Regraded: 95%

D. Specify percentage of cleared areas done so for buildings: 20%

For driveways and parking: 30% For roadways: 0%

E. What design criteria and/or site changes would be required to reduce the percentages in C and D above?

Reduce the amount of parking in the driveways

F. Specify site's hydrologic soil group (HSG) percentages:

HSG A: _____ HSG B: 100% HSG C: _____ HSG D: _____

G. Specify percentage of each HSG that will be permanently disturbed:

HSG A: _____ HSG B: 95% HSG C: _____ HSG D: _____

H. Locating site disturbance within areas with less permeable soils (HSG C and D) and minimizing disturbance within areas with greater permeable soils (HSG A and B) can help maintain groundwater recharge rates and reduce runoff volume increases. In light of the HSG percentages in F and G above, what other practical measures if any can be taken to achieve this?

There are no HSG C or D soil types located on the site. Recharge rates have been maximized by maintaining the pre-developed annual recharge volume.

I. Does the site include Karst topography? Yes: _____ No: X

If yes, discuss measures taken to limit Karst impacts:

3.3 Impervious Area Management

New impervious surfaces at a development site can have the greatest adverse effect on groundwater recharge and stormwater quality and quantity. This section of the checklist helps identify those nonstructural strategies and LID-BMPs that have been incorporated into a proposed development's design to comprehensively manage the extent and impacts of new impervious surfaces.

A. Specify impervious cover at site: Existing: 0 Proposed: 0.338 ac

B. Specify maximum site impervious coverage allowed by regulations: 45%

C. Compare proposed street cartway widths with those required by regulations:

Type of Street	Proposed Cartway Width (feet)	Required Cartway Width (feet)
Residential access – low intensity	N/A	N/A
Residential access – medium intensity	N/A	N/A
Residential access – high intensity with parking	N/A	N/A
Residential access – high intensity without parking	N/A	N/A
Neighborhood	N/A	N/A
Minor collector – low intensity without parking	N/A	N/A
Minor collector – with one parking lane	N/A	N/A
Minor collector – with two parking lanes	N/A	N/A
Minor collector – without parking	N/A	N/A
Major collector	N/A	N/A

D. Compare proposed parking space dimensions with those required by regulations:

Proposed: 18' x 9' Regulations: _____

E. Compare proposed number of parking spaces with those required by regulations:

Proposed: 36 Regulations: 34

F. Specify percentage of total site impervious cover created by buildings: 20%

By driveways and parking: 30% By roadways: 0%

G. What design criteria and/or site changes would be required to reduce the percentages in F above?

Reduction in parking at the driveways.

H. Specify percentage of total impervious area that will be unconnected:

Total site: 50 Buildings: 0 Driveways and parking: 100 Roads: 0

I. Specify percentage of total impervious area that will be porous:

Total site: 0 Buildings: 0 Driveways and parking: 0 Roads: 0

J. Specify percentage of total building roof area that will be vegetated: 0

K. Specify percentage of total parking area located beneath buildings: 0

L. Specify percentage of total parking located within multi-level parking deck: 0

3.4 Time of Concentration Modifications

Decreasing a site's time of concentration (Tc) can lead directly to increased site runoff rates which, in turn, can create new and/or aggravate existing erosion and flooding problems downstream. This section of the checklist helps identify those nonstructural strategies and LID-BMPs that have been incorporated into the proposed development's design to effectively minimize such Tc decreases.

When reviewing Tc modification strategies, it is important to remember that a drainage area's Tc should reflect the general conditions throughout the area. As a result, Tc modifications must generally be applied throughout a drainage area, not just along a specific Tc route.

A. Specify percentage of site's total stormwater conveyance system length that will be:

Storm sewer: 10 Vegetated swale: 0 Natural channel: 0

Stormwater management facility: 90 Other: _____

Note: the total length of the stormwater conveyance system should be measured from the site's downstream property line to the downstream limit of sheet flow at the system's headwaters.

B. What design criteria and/or site changes would be required to reduce the storm sewer percentages and increase the vegetated swale and natural channel percentages in A above?

None

C. In conveyance system subareas that have overland or sheet flow over impervious surfaces or turf grass, what practical and effective site changes can be made to:

Decrease overland flow slope: None

Increase overland flow roughness: All cleared pervious areas will be stabilized with vegetation. The use of grass will be minimized to the maximum extent practical.

3.5 Preventative Source Controls

The most effective way to address water quality concerns is by pollution prevention. This section of the checklist helps identify those nonstructural strategies and LID-BMPs that have been incorporated into the proposed development's design to reduce the exposure of pollutants to prevent their release into the stormwater runoff.

A. Trash Receptacles

Specify the number of trash receptacles provided: N/A

Specify the spacing between the trash receptacles: N/A

Compare trash receptacles proposed with those required by regulations:

Proposed: 0 Regulations: 0

B. Pet Waste Stations

Specify the number of pet waste stations provided: 0

Specify the spacing between the pet waste stations: N/A

Compare pet waste stations proposed with those required by regulations:

Proposed: 0 Regulations: 0

C. Inlets, Trash Racks, and Other Devices that Prevent Discharge of Large Trash and Debris

Specify percentage of total inlets that comply with the NJPDES storm drain inlet criteria: 100

D. Maintenance

Specify the frequency of the following maintenance activities:

Street sweeping: Proposed: Monthly Regulations: 0

Litter collection: Proposed: Weekly Regulations: 0

Identify other stormwater management measures on the site that prevent discharge of large trash and debris:

None

E. Prevention and Containment of Spills

Identify locations where pollutants are located on the site, and the features that prevent these pollutants from being exposed to stormwater runoff:

Pollutant: None Location: N/A

Feature utilized to prevent pollutant exposure, harmful accumulation, or contain spills:

Pollutant: N/A Location: N/A

Feature utilized to prevent pollutant exposure, harmful accumulation, or contain spills:

Pollutant: _____ Location: _____

Feature utilized to prevent pollutant exposure, harmful accumulation, or contain spills:

Pollutant: _____ Location: _____

Feature utilized to prevent pollutant exposure, harmful accumulation, or contain spills:

Pollutant: _____ Location: _____

Part 4: Compliance with Nonstructural Requirements of NJDEP Stormwater Management Rules

1. Based upon the checklist responses above, indicate which nonstructural strategies have been incorporated into the proposed development's design in accordance with N.J.A.C. 7:8-5.3(b):

No.	Nonstructural Strategy	Yes	No
1.	Protect areas that provide water quality benefits or areas particularly susceptible to erosion and sediment loss.	X	
2.	Minimize impervious surfaces and break up or disconnect the flow of runoff over impervious surfaces.	X	
3.	Maximize the protection of natural drainage features and vegetation.	X	
4.	Minimize the decrease in the pre-construction time of concentration.	X	
5.	Minimize land disturbance including clearing and grading.	X	
6.	Minimize soil compaction.	X	
7.	Provide low maintenance landscaping that encourages retention and planting of native vegetation and minimizes the use of lawns, fertilizers, and pesticides.	X	
8.	Provide vegetated open-channel conveyance systems discharge into and through stable vegetated areas.	X	
9.	Provide preventative source controls.	X	

2. For those strategies that have not been incorporated into the proposed development's design, provide engineering, environmental, and/or safety reasons. Attached additional pages as necessary.

_____

_____

_____

_____

_____

_____

_____

_____

Appendix G

Groundwater Recharge Spreadsheet & Storage Calculations

New Jersey Groundwater Recharge Spreadsheet Version 2.0 November 2003

Annual Groundwater Recharge Analysis (based on GSR-32)

Select Township ↓	Average Annual P (in)	Climatic Factor
ATLANTIC CO., NORTHFIELD CITY	38.4	1.18

Project Name:	**Major Site Plan**
Description:	**Medical Office Building**
Analysis Date:	**12/15/21**

Pre-Developed Conditions

Land Segment	Area (acres)	TR-55 Land Cover	Soil	Annual Recharge (in)	Annual Recharge (cu.ft)
1	0				
2	0.735	Open space	Berryland	0.0	-
3	0				
4	0				
5	0				
6	0				
7	0				
8	0				
9	0				
10	0				
11	0				
12	0				
13	0				
14	0				
15	0				
Total =	0.7			Total Annual Recharge (in)	Total Annual Recharge (cu-ft)
				0.0	-

Post-Developed Conditions

Land Segment	Area (acres)	TR-55 Land Cover	Soil	Annual Recharge (in)	Annual Recharge (cu.ft)
1	0.397	Open space	Berryland	0.0	-
2	0.338	Impervious areas	Berryland	0.0	-
3	0				
4	0				
5	0				
6	0				
7	0				
8	0				
9	0				
10	0				
11	0				
12	0				
13	0				
14	0				
15	0				
Total =	0.7			Total Annual Recharge (in)	Total Annual Recharge (cu.ft)
				0.0	-

Annual Recharge Requirements Calculation ↓

% of Pre-Developed Annual Recharge to Preserve =	100%	Total Impervious Area (sq.ft)	14,723
Post-Development Annual Recharge Deficit=	*0*	(cubic feet)	

Recharge Efficiency Parameters Calculations (area averages)

RWC=	0.00	(in)	DRWC=	0.00	(in)
ERWC =	0.00	(in)	EDRWC=	0.00	(in)

Procedure to fill the Pre-Development and Post-Development Conditions Tables

For each land segment, first enter the area, then select TR-55 Land Cover, then select Soil. Start from the top of the table and proceed downward. Don't leave blank rows (with A=0) in between your segment entries. Rows with A=0 will not be displayed or used in calculations. For impervious areas outside of standard lots select "Impervious Areas" as the Land Cover. Soil type for impervious areas are only required if an infiltration facility will be built within these areas.

Project Name	Description	Analysis Date	BMP or LID Type
Major Site Plan	Medical Office Building	12/15/21	

Recharge BMP Input Parameters

Parameter	Symbol	Value	Unit
BMP Area	ABMP	-790.0	sq.ft
BMP Effective Depth, this is the design variable	dBMP	0.6	in
Upper level of the BMP surface (negative if above ground)	dBMPu	-24.0	in
Depth of lower surface of BMP, must be>=dBMPu	dEXC	24.0	in
Post-development Land Segment Location of BMP , Input Zero if Location is distributed or undetermined	SegBMP	0	unitless

Root Zone Water capacity Calculated Parameters

Parameter	Symbol	Value	Unit
Empty Portion of RWC under Post-D Natural Recharge	ERWC	0.00	in
ERWC Modified to consider dEXC	EDRWC	0.00	in
Empty Portion of RWC under Infilt. BMP	RERWC	1.50	in

Recharge Design Parameters

Parameter	Symbol	Value	Unit
Inches of Runoff to capture	Qdesign	0.03	in
Inches of Rainfall to capture	Pdesign	0.07	in
Recharge Provided Avg. over Imp. Area		0.0	in
Runoff Captured Avg. over imp. Area		#DIV/0!	in

BMP Calculated Size Parameters

ABMP/Aimp	Aratio	-0.05	unitless
BMP Volume	VBMP	(43)	cu.ft

Parameters from Annual Recharge Worksheet

Post-D Deficit Recharge (or desired recharge volume)	Vdef	-	cu.ft
Post-D Impervious Area (or target Impervious Area)	Aimp	14,723	sq.ft
Root Zone Water Capacity	RWC	0.00	in
RWC Modified to consider dEXC	DRWC	0.00	in
Climatic Factor	C-factor	1.18	no units
Average Annual P	Pavg	38.4	in
Recharge Requirement over Imp. Area	dr	0.0	in

System Performance Calculated Parameters

Annual BMP Recharge Volume		-	cu.ft
Avg BMP Recharge Efficiency		0.0%	Represents % Infiltration Recharged
%Rainfall became Runoff		76.3%	%
%Runoff Infiltrated		100.0%	%
%Runoff Recharged		0.0%	%
%Rainfall Recharged		0.0%	%

CALCULATION CHECK MESSAGES

Volume Balance-> OK
dBMP Check---> OK
dEXC Check---> OK

BMP Location---> Location is selected as distributed or undetermined

OTHER NOTES

Pdesign is accurate only after BMP dimensions are updated to make rech volume= deficit volume. The portion of BMP infiltration prior to filling and the area occupied by BMP are ignored in these calculations. Results are sensetive to dBMP, make sure dBMP selected is small enough for BMP to empty in less than 3 days. For land Segment Location of BMP if you select "impervious areas" RWC will be minimal but not zero as determined by the soil type and a shallow root zone for this Land Cover allowing consideration of lateral flow and other losses.

How to solve for different recharge volumes: By default the spreadsheet assigns the values of total deficit recharge volume "Vdef" and total proposed impervious area "Aimp" from the "Annual Recharge" sheet to "Vdef" and "Aimp" on this page. This allows solution for a single BMP to handle the entire recharge requirement assuming the runoff from entire impervious area is available to the BMP.
To solve for a smaller BMP or a LID-IMP to recharge only part of the recharge requirement, set Vdef to your target value and Aimp to impervious area directly connected to your infiltration facility and then solve for ABMP or dBMP. To go back to the default configuration clik the "Default Vdef & Aimp" button.

Appendix H

Groundwater Mounding Calculations

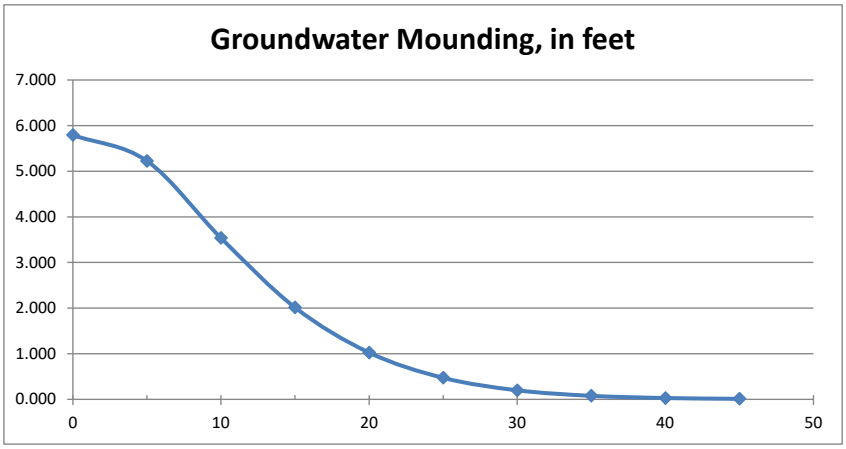
Input Values

12.00	R	Recharge rate (permeability rate) (in/hr)
		Specific yield, Sy (dimensionless)
0.150	Sy	default value is 0.15; max value is 0.2 provided that a lab test data is submitted
		Horizontal hydraulic conductivity (in/hr)
12.00	Kh	Kh = 5xRecharge Rate (R) in the costal plan; Kh=R outside the coastal plan
8.000	x	1/2 length of basin (x direction, in feet)
100.000	y	1/2 width of basin (y direction, in feet)
1.50	t	Duration of infiltration period (hours)
10.00	hi(0)	Initial thickness of saturated zone (feet)

15.792	h(max)	Maximum thickness of saturated zone (beneath center of basin at end of infiltration period)
5.792	Δh(max)	Maximum groundwater mounding (beneath center of basin at end of infiltration period)

Ground-water Mounding, in feet	Distance from center of basin in x direction, in feet
5.792	0
5.225	5
3.537	10
2.013	15
1.025	20
0.472	25
0.199	30
0.077	35
0.029	40
0.011	45

Re-Calculate Now



Disclaimer

This spreadsheet solving the Hantush (1967) equation for ground-water mounding beneath an infiltration basin is made available to the general public as a convenience for those wishing to replicate values documented in the USGS Scientific Investigations Report 2010-5102 "Groundwater mounding beneath hypothetical stormwater infiltration basins" or to calculate values based on user-specified site conditions. Any changes made to the spreadsheet (other than values identified as user-specified) after transmission from the USGS could have unintended, undesirable consequences. These consequences could include, but may not be limited to: erroneous output, numerical instabilities, and violations of underlying assumptions that are inherent in results presented in the accompanying USGS published report. The USGS assumes no responsibility for the consequences of any changes made to the spreadsheet. If changes are made to the spreadsheet, the user is responsible for documenting the changes and justifying the results and conclusions.

Appendix I

Drainage Area Maps

PLAN

SCALE : 1"=20'

LEGEND

——— >>> ——— PATH FOR TIME OF CONCENTRATION

THIS PLAN IS INTENDED FOR DRAINAGE BOUNDARY AREAS ONLY

GRAPHIC SCALE

20 0 10 20 40 80

(IN FEET)
1 inch = 20 ft.

NO.	DATE	APPR.	REVISION

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PRE - DEVELOPMENT DRAINAGE BOUNDARIES

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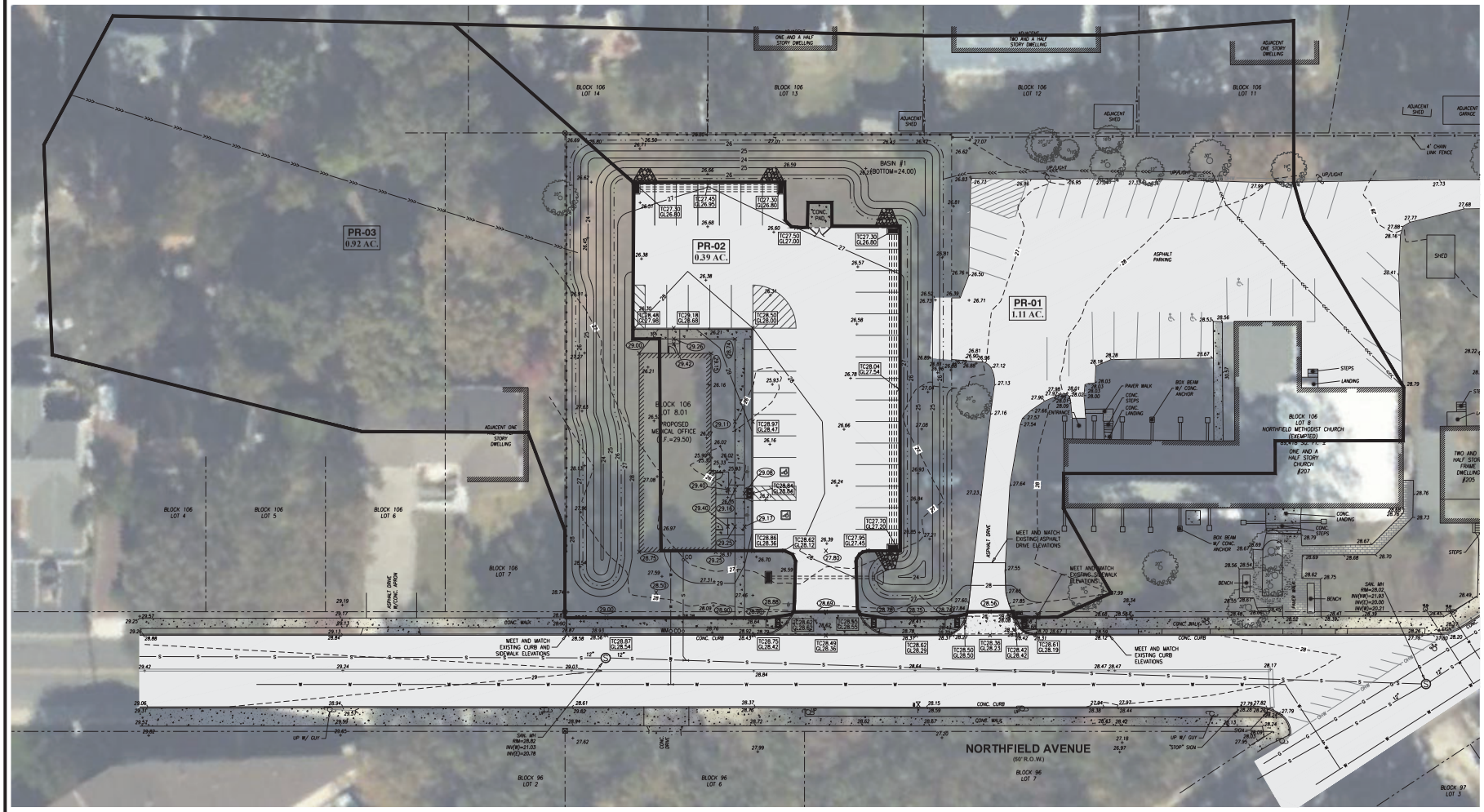
Certification of Authorization No. 24GA28284900

MAJOR SITE PLAN
PROPOSED MEDICAL OFFICE
BLOCK 106, LOT 8
CITY OF NORTHFIELD
ATLANTIC COUNTY, NEW JERSEY

Design:	Drawn:	Check:	Date:
MWA	MWA	MAD	12/14/2021

12/14/2021
MARC A. DEBLASIO, PE — DATE
New Jersey License No. 41599

Scale:	Job No.:	Sheet No:	Total:
	PV-MPM-20002	11	12



PLAN

SCALE : 1"=20'

LEGEND

——>>>——>>>—— PATH FOR TIME OF CONCENTRATION

THIS PLAN IS INTENDED FOR DRAINAGE BOUNDARY AREAS ONLY

GRAPHIC SCALE

20 0 10 20 40 80

(IN FEET)
1 inch = 20 ft.

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BH	BH	MD	12/14/2021

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Scale:	Job No.:	Sheet No:	Total:
AS NOTED	PV-NFM-20002	12	12