May 31, 2021
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RPM-211

STORMWATER MANAGEMENT REPORT

FOR

RPM DEVELOPMENT GROUP
MONTGOMERY SENIOR AFFORDABLE HOUSING
BLOCK 20001, LOT 10.05
MONTGOMERY TOWNSHIP, SOMERSET COUNTY, NEW JERSEY

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I. SITE DESCRIPTION

The subject property, located in Montgomery Township, is known and designated as Block 20001, Lot 10.05 as shown on the current tax assessment map of the Montgomery Township, Somerset County, New Jersey. The applicant, RPM Development Group, proposes to construct a senior affordable housing building containing 71 units on a portion of the 45-acre parcel, that is currently owned by the Somerset County Improvement Authority (SCIA). A lease purchase agreement is in place between Montgomery Township and SCIA for the Township to acquire the property for various municipal purposed and the construction of affordable housing.

The site was previously utilized as the corporate offices of medical device maker ConvaTec, until it announced its intention to close the office back in 2014. The County acquired the property in 2017. Montgomery Township recently completed construction of a new municipal complex on a large portion of the site, closest to Orchard Road.

The rear portion of the site where the proposed senior affordable housing development is proposed contains a large asphalt parking lot with approximately 280 parking spaces and a detention basin for the current and former on-site improvements and off-site improvements as well. The previous office headquarters was recently demolished, along with some other impervious surfaces surrounding the former building.

II. STORMWATER DESIGN OVERVIEW

This report describes and analyzes how the proposed stormwater management system has been designed in accordance with the applicable stormwater management rules and regulations established in N.J.A.C. 7:8 and the Montgomery Township Ordinance. The proposed project is classified as a major development as it disturbs more than one (1) acre of land and increases the amount of impervious cover onsite by more than ¼ acre.

Runoff from 1.75 acres of developed area is collected and conveyed to two proposed stormwater management basins. One basin is designed as a bioretention basin and the other is an underground detention basin for the proposed building's roof runoff.

In accordance with the stormwater management rules, the proposed stormwater management system must achieve an 80% reduction in the post-developed total suspended solids (TSS) runoff from the new impervious surfaces, to satisfy the water quality requirements. TSS removal will be achieved through the use of a bioretention basin which is approved for 80% TSS removal.

Additionally, the stormwater management rules also require major developments include measures to prevent the loss of groundwater recharge at the project site. Soil testing performed in the basin footprints determined that permeability rates are below the 0.2 in/hr minimum design soil permeability rate for groundwater recharge and therefore, infiltration basins to provide groundwater recharge would be ineffective on this property. While the NRCS Soil Survey indicates the presence of Hydrologic Soil Group (HSG) B, C & D soils, due to the subsoil composition consisting of mostly clay and the shallow weather rock restriction encountered in each test pit, the soils function as an HSG D soil. Permeability testing was done for each two samples from each test pit and all sample resulted in permeability rates of 0.00 in/hr.

III. PRE-DEVELOPMENT CONDITIONS

The stormwater analysis of this report is limited to the 3.52-acres that will be disturbed as part of this project. Majority of the existing parking lot will not be disturbed. The existing 3.53-acre drainage area (EA-1) includes the grassed area where the former building used to stand, between the existing parking lot and the detention basin. Time of concentration was calculated assuming 100 linear feet of sheet flow and the remaining calculated as shallow concentrated and pipe flow. Based on Somerset County soils survey information, the various onsite soils are parts of Hydrologic Soil Group (HSG) B, C & D.

Runoff from the drainage area was modeled separately using HydroCAD 10.10 to determine the peak runoff rates during the 2, 10 and 100-year storms. The calculated peak runoff rates are as follows:

Drainage Area (EA-1)	
Storm Event (YR)	**Pre-Dev Runoff (cfs)**
2	4.03
10	8.08
100	14.23

The stormwater analysis of this report is limited to the 3.53-acres that will be disturbed as part of this project. Majority of the existing parking lot will not be disturbed. The existing 3.53-acre drainage area (EA-1) includes the grassed area where the former building used to stand, between the existing parking lot and the detention basin. Time of concentration was calculated assuming 100 linear feet of sheet flow and the remaining calculated as shallow concentrated and pipe flow. Based on Somerset County soils survey information, the various onsite soils are parts of Hydrologic Soil Group (HSG) B, C & D.

The existing detention basin in the rear of the property was also analyzed, based on a 35.62-acre drainage area, comprised on-site and off-site runoff. The analysis excluded exfiltration based on the results of the soil testing performed within the existing basin footprint. The basin was modeled and analyzed with the HydroCAD 10.10 software and a summary of the peak flows, storage and basin elevations are outlined below:

Storm Event (YR)	Basin Inflow (cfs)	Basin Outflow (cfs)	Max. Basin Storage (cu-ft)	Water Surface Elevation
2	11.59	7.00	50,197	82.57
10	23.29	17.79	71,637	83.21
100	45.08	39.31	105,932	84.17

Flows from the basin are controlled through the outlet structure. Outflow from the basin is discharged through a headwall into an unnamed tributary to Beden Brook. The tributary conveys the outflow to a pond adjacent to Orchard Road on Block 20001, Lot 11, before ultimately discharging to the tributary's convergence with Beden Brook further to the south of Orchard Road.

IV. POST-DEVELOPMENT SUMMARY

A. DESIGN METHODOLOGY

The pre- and post-development flows were calculated using the USDA Natural Resources Conservation Service methodology, as presented in Technical Release 55 (TR-55), which is incorporated into HydroCAD 10.10 modeling software. NOAA_C rainfall distribution was utilized for this development and all undisturbed areas of the site have been assumed to be in good hydrologic condition with good ground cover for the pre-development analysis.

B. RUNOFF QUANTITY

The stormwater management system has been designed to store and reduce the development runoff to 50%, 75% and 80% of the 2, 10 and 100-year storm storms, respectively, in the pre-developed condition for the area being disturbed. Flows are reduced by utilizing outlet structures in the basins. As such, the proposed system has been designed in accordance with Water Quantity requirements of N.J.A.C. 7-8-5.4.

C. STORMWATER MANAGEMENT DESIGN

The site has been designed so that majority of the runoff will be collected and conveyed via conventional drainage pipe networks to two basins. The underground detention basin attenuates all flows from the proposed building roof area, whereas the bioretention basin discharges storms larger than the 2-year storm into the exiting detention basin in the rear of the property that is being converted into a bioretention basin. The post-development allowable peak runoff rates were calculated by applying the required reduction rates to the pre-development peak runoff rates for EA-1. The allowable peak runoff rates are as follows:

Storm Event (YR)	Pre-Dev Runoff (cfs)	% Reduction	Allowable Runoff (cfs)	Post-Dev Runoff (cfs)
2	4.03	50	2.02	1.99
10	8.08	75	6.06	3.64
100	14.23	80	11.38	10.44

For each of the storms, the post-development runoff rates are less than the allowable runoff rates, this meeting the requirements of N.J.A.C. 7-8-5.4.

UNDERGROUND DETENTION BASIN

The underground detention basin has been designed to accept runoff from the proposed building, totaling 0.59 acres of all impervious coverage. The basin is a series of 48" HDPE pipes surrounded by stone, with a total pipe length of 700 LF. The basin was modeled and analyzed with the HydroCAD 10.10 software and a summary of the peak flows, storage and basin elevations are outlined below:

Storm Event (YR)	Basin Inflow (cfs)	Basin Outflow (cfs)	Max. Basin Storage (ac-ft)	Water Surface Elevation
WQ	1.40	0.15	0.038	84.98
2	1.90	0.19	0.067	85.46
10	2.54	0.23	0.109	86.12
100	3.33	0.30	0.187	87.49

The underground pipes will be constructed above a 12" thick stone bottom layer at elevation, with a pipe invert elevation of 84.00. Soil testing performed in the basin footprint determined that permeability rates are below the 0.2 in/hr minimum design soil permeability rate for groundwater recharge and therefore, an infiltration basin to provide groundwater recharge would be ineffective on this property. While the NRCS Soil Survey indicates that the proposed basin is located within an area of Hydrologic Soil Group (HSG) B soils, due to the subsoil composition consisting of mostly clay and the shallow weather rock restriction encountered in each test pit, the soils function as an HSG D soil. Permeability testing was done for each two samples from each test pit and all sample resulted in permeability rates of 0.00 in/hr.

BIORETENTION BASIN

The bioretention basin has been designed to accept runoff from 1.16 acres of the proposed development, with majority of the new pavement and sidewalks including in this area. The basin was analyzed without exfiltration as the basin is located within an area of Hydrologic Soil Group (HSG) D soils. Instead, the basin will be designed with an underdrain system to bypass runoff once filtered through the bio-filtration media. The basin was modeled and analyzed with the HydroCAD 10.10 software and a summary of the peak flows, storage and basin elevations are outlined below:

Storm Event (YR)	Basin Inflow (cfs)	Basin Outflow (cfs)	Max. Basin Storage (cf)	Water Surface Elevation
WQ	0.76	0.00	1,300	86.56
2	1.84	0.06	5,393	87.95
10	3.13	1.06	5,821	88.07
100	5.03	4.53	6,625	88.30

The bioretention basin bottom, which will be heavily vegetated with trees, shrubs and various plantings, is set at elevation 86.00 with a 24" deep soil bed above 6" of sand and 3" of stone above and below the underdrain, in accordance with the New Jersey Stormwater Best Management Practices Manual.

EXISTING BASIN

The existing detention basin in the rear of the property is proposed to be converted into a bio-retention basin. Flows from the same 35.62-acre drainage area, comprised on-site and off-site runoff were routed through the basin to ensure that the proposed site improvements do not negatively impact the basin or the downstream tributary. The bioretention basin bottom, which will be heavily vegetated with trees, shrubs and various plantings, is set at elevation 86.00 with a 24" deep soil bed above 6" of sand and 3" of stone above and below the underdrain, in accordance with the New Jersey Stormwater Best Management Practices Manual. The basin was modeled and analyzed with the HydroCAD 10.10 software and a summary of the peak flows, storage and basin elevations are outlined below:

Storm Event (YR)	Basin Inflow (cfs)	Basin Outflow (cfs)	Max. Basin Storage (cu-ft)	Water Surface Elevation
2	10.83	6.66	49,398	82.55
10	22.05	17.07	70,348	83.18
100	42.81	37.62	103,454	84.10

The post-development basin water surface elevations are lower than the current basin conditions. The basin outflow is also reduced to ensure that there is no downstream concerns with the unnamed tributary to Beden Brook.

D. WATER QUALITY

Bioretention basins are approved as having an 80% total suspended solids (TSS) removal rate. Roof runoff entering the underground detention basin is considered clean and does not need to be treated for TSS removal. All runoff from paved surface is collected and conveyed to the proposed bio-retention basin or the existing detention basin that is being converted to bio-retention. As such, the proposed systems have been designed in accordance with Water Quality requirements of N.J.A.C. 7-8-5.5.

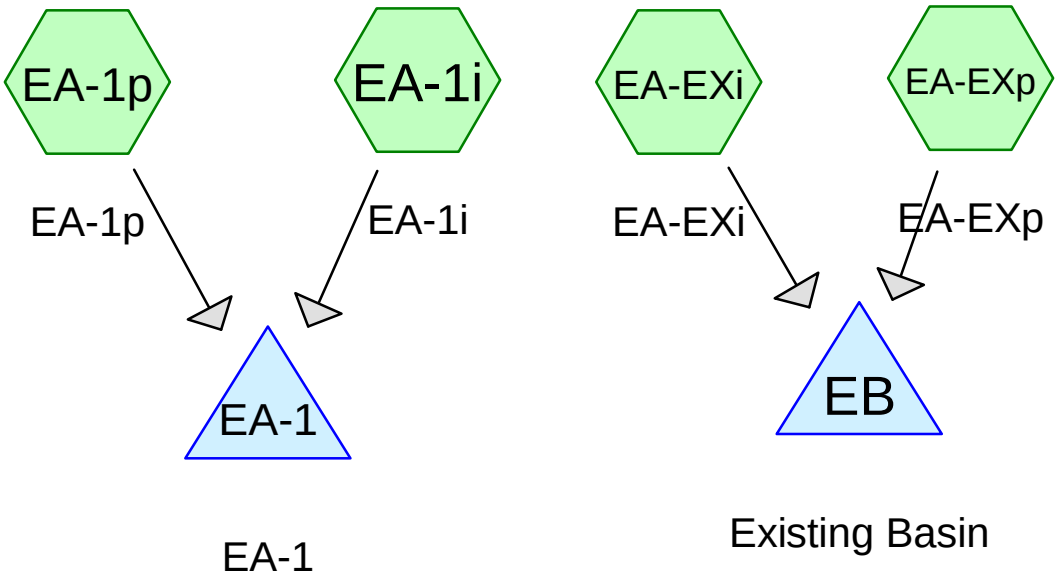
V. CONCLUSION

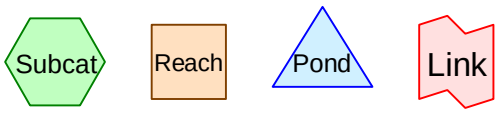
As demonstrated in this report, the proposed development has been designed with provisions for the safe and efficient control of stormwater runoff in a manner that will not adversely impact the existing drainage patterns, adjacent roadways or adjacent properties.

The proposed stormwater management system incorporates two different types of stormwater management basins designed to reduce peak flow rates for the proposed development to meet the Water Quantity requirements of N.J.A.C. 7-8-5.4. The bioretention basin provides an 80% total suspended solid (TSS) removal rate to meet the Water Quality requirements of N.J.A.C. 7-8-5.5. The existing detention basin is also being converted to a bio-retention basin, providing water quality treatment to the large existing pavement area that is currently being discharged untreated into the unnamed tributary to Beden Brook.

APPENDIX A

PRE-DEVELOPMENT ANALYSIS





Routing Diagram for Pre-Development
Prepared by {enter your company name here}, Printed 12/16/2022
HydroCAD® 10.10-3a s/n 11244 © 2020 HydroCAD Software Solutions LLC

Summary for Subcatchment EA-1i: EA-1i

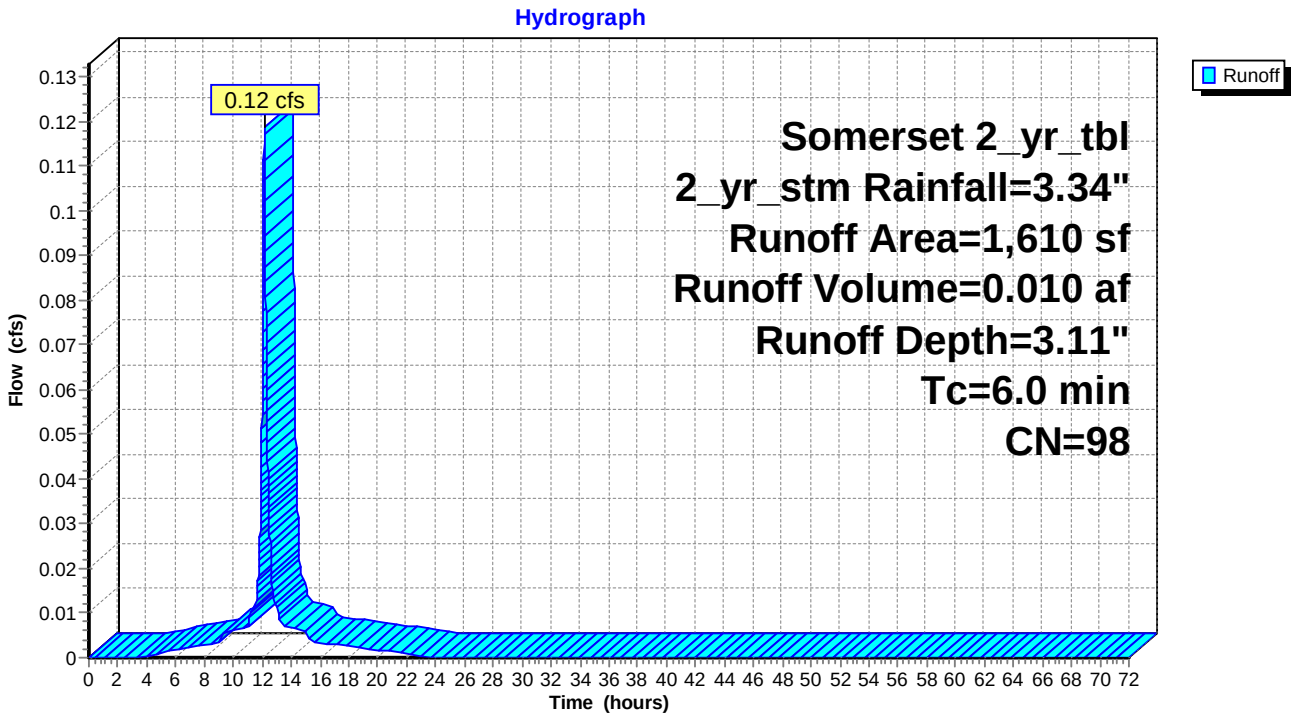
Runoff = 0.12 cfs @ 12.14 hrs, Volume= 0.010 af, Depth= 3.11"

Runoff by SCS TR-20 method, UH=Delmarva, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Somerset 2_yr_tbl 2_yr_stm Rainfall=3.34"

Area (sf)	CN	Description
1,610	98	Paved parking, HSG C
1,610		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry,**

Subcatchment EA-1i: EA-1i



Summary for Subcatchment EA-1p: EA-1p

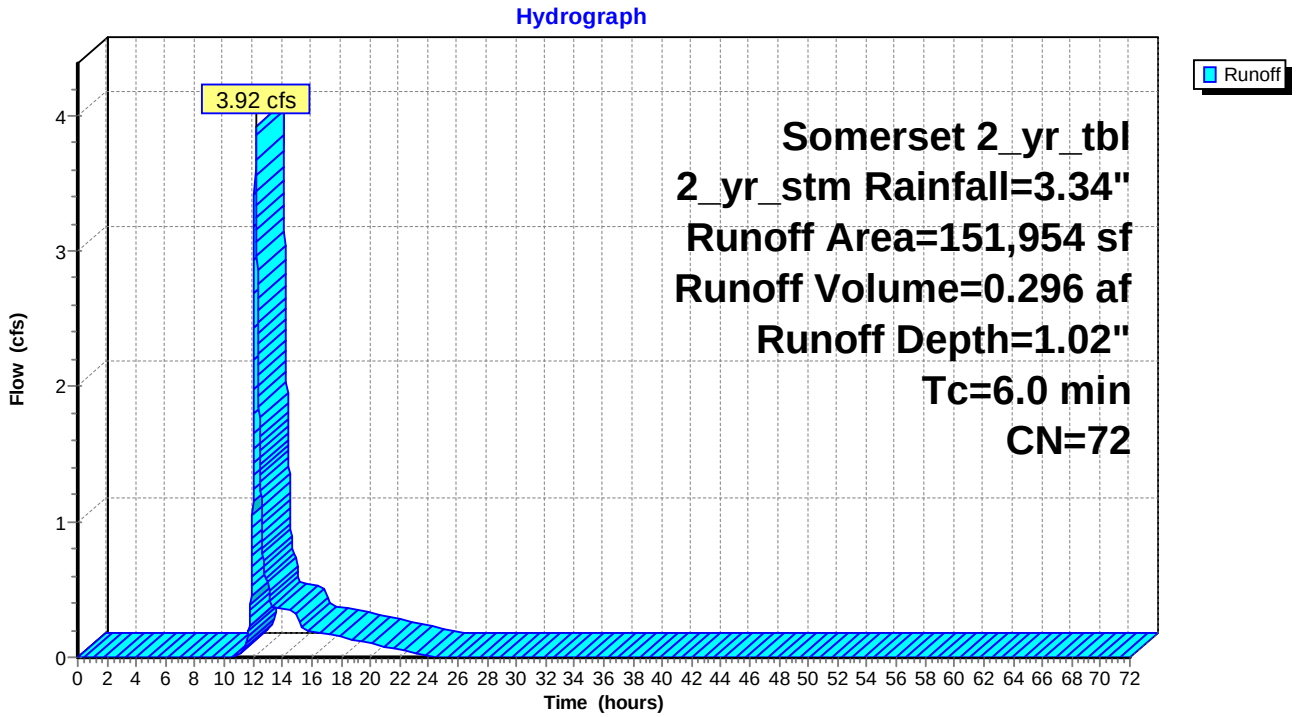
Runoff = 3.92 cfs @ 12.15 hrs, Volume= 0.296 af, Depth= 1.02"

Runoff by SCS TR-20 method, UH=Delmarva, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Somerset 2_yr_tbl 2_yr_stm Rainfall=3.34"

Area (sf)	CN	Description
60,949	61	>75% Grass cover, Good, HSG B
11,116	74	>75% Grass cover, Good, HSG C
79,889	80	>75% Grass cover, Good, HSG D
151,954	72	Weighted Average
151,954		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry,**

Subcatchment EA-1p: EA-1p



Summary for Subcatchment EA-EXi: EA-EXi

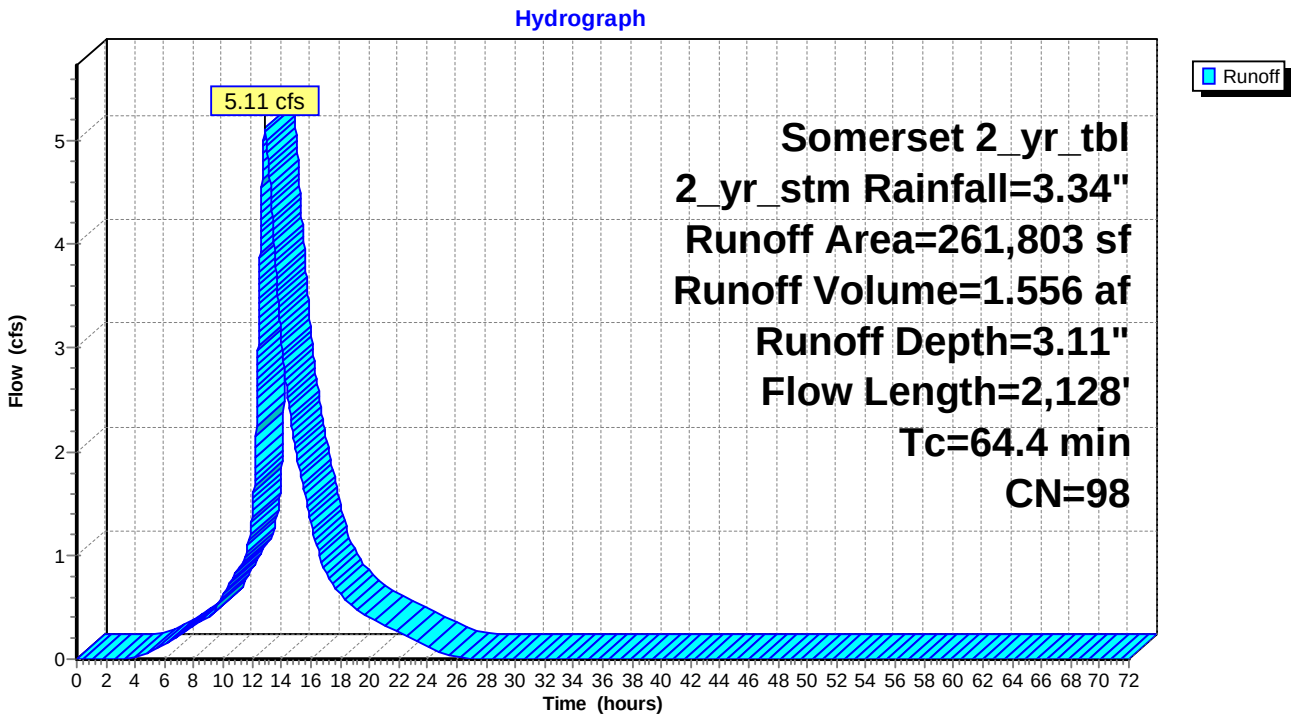
Runoff = 5.11 cfs @ 12.88 hrs, Volume= 1.556 af, Depth= 3.11"

Runoff by SCS TR-20 method, UH=Delmarva, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Somerset 2_yr_tbl 2_yr_stm Rainfall=3.34"

	Area (sf)	CN	Description
*	34,826	98	Roofs
*	92,386	98	Roads
*	20,721	98	Driveways
*	113,870	98	Parking Lot
	261,803	98	Weighted Average
	261,803		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.8	46	0.0100	0.11		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.35"
22.3	54	0.0050	0.04		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.35"
4.4	130	0.0050	0.49		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
1.7	73	0.0200	0.71		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
0.2	24	0.0100	2.03		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
4.4	132	0.0100	0.50		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
0.2	24	0.0100	2.03		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
2.6	132	0.0150	0.86		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
4.5	189	0.0200	0.71		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
1.5	62	0.0100	0.70		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
12.9	388	0.0100	0.50		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
1.2	90	0.0300	1.21		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.9	182	0.0250	3.21		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
0.8	602	0.0136	11.92	84.26	**Pipe Channel, RCP_Round 36"** 36.0" Round Area= 7.1 sf Perim= 9.4' r= 0.75' n= 0.012 Concrete pipe, finished
64.4	2,128	Total			

Subcatchment EA-EXi: EA-EXi



Summary for Subcatchment EA-EXp: EA-EXp

Runoff = 6.60 cfs @ 13.02 hrs, Volume= 2.248 af, Depth= 0.91"

Runoff by SCS TR-20 method, UH=Delmarva, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Somerset 2_yr_tbl 2_yr_stm Rainfall=3.34"

Area (sf)	CN	Description
445,815	70	Woods, Good, HSG C
445,815	74	>75% Grass cover, Good, HSG C
142,152	55	Woods, Good, HSG B
142,152	61	>75% Grass cover, Good, HSG B
114,046	80	>75% Grass cover, Good, HSG D
1,289,980	70	Weighted Average
1,289,980		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.8	46	0.0100	0.11		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.35"
22.3	54	0.0050	0.04		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.35"
4.4	130	0.0050	0.49		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
1.7	73	0.0200	0.71		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
0.2	24	0.0100	2.03		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
4.4	132	0.0100	0.50		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
0.2	24	0.0100	2.03		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
2.6	132	0.0150	0.86		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
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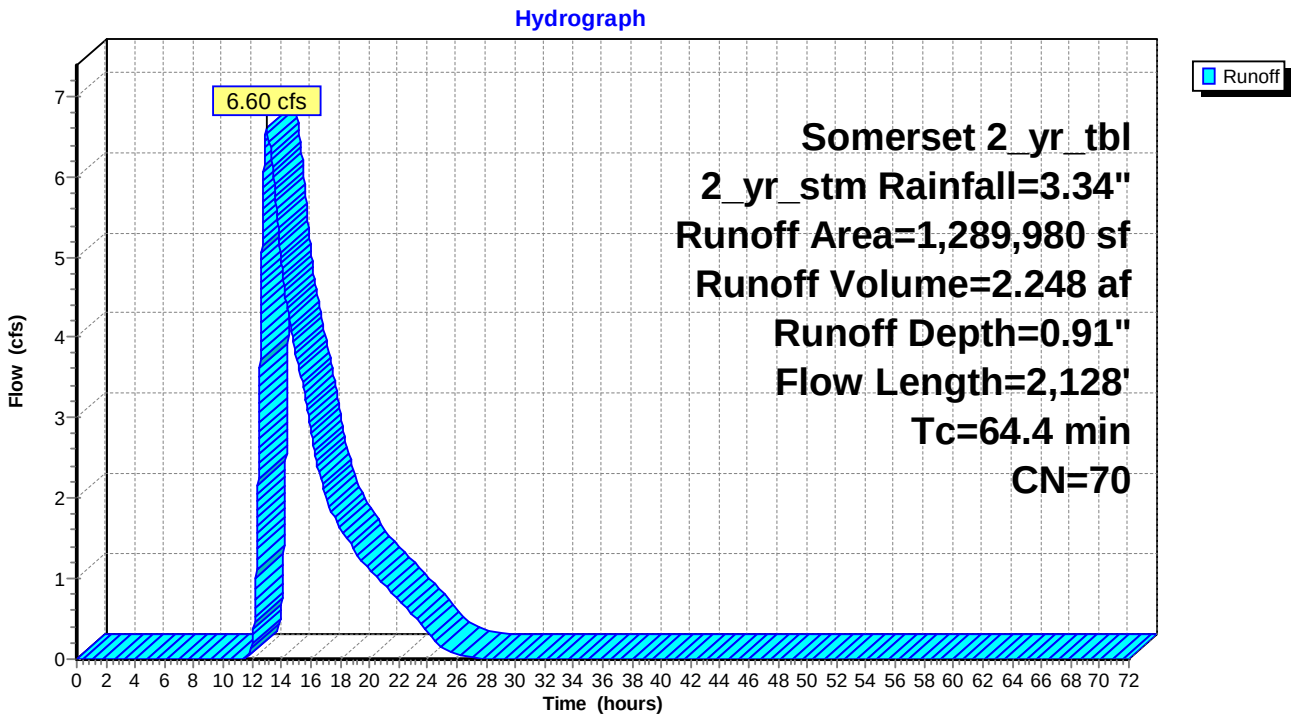
1.5	62	0.0100	0.70		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
12.9	388	0.0100	0.50		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
1.2	90	0.0300	1.21		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.9	182	0.0250	3.21		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
0.8	602	0.0136	11.92	84.26	**Pipe Channel, RCP_Round 36"** 36.0" Round Area= 7.1 sf Perim= 9.4' r= 0.75' n= 0.012 Concrete pipe, finished
64.4	2,128	Total			

Subcatchment EA-EXp: EA-EXp

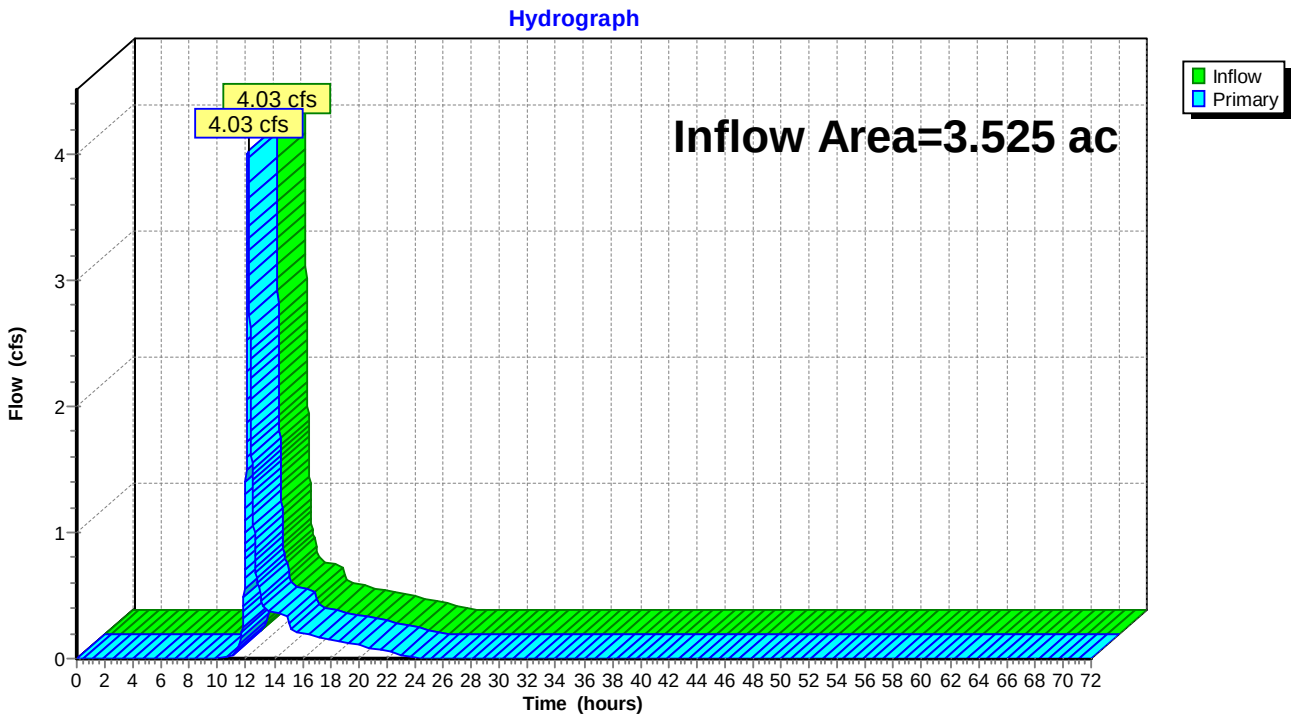


Summary for Pond EA-1: EA-1

Inflow Area = 3.525 ac, 1.05% Impervious, Inflow Depth = 1.04" for 2_yr_stm event
Inflow = 4.03 cfs @ 12.15 hrs, Volume= 0.305 af
Primary = 4.03 cfs @ 12.15 hrs, Volume= 0.305 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs

Pond EA-1: EA-1



Summary for Pond EB: Existing Basin

Inflow Area = 35.624 ac, 16.87% Impervious, Inflow Depth = 1.28" for 2_yr_stm event
Inflow = 11.59 cfs @ 12.89 hrs, Volume= 3.804 af
Outflow = 7.00 cfs @ 14.37 hrs, Volume= 3.804 af, Atten= 40%, Lag= 88.8 min
Primary = 7.00 cfs @ 14.37 hrs, Volume= 3.804 af

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Peak Elev= 82.57' @ 14.37 hrs Surf.Area= 31,969 sf Storage= 50,197 cf

Plug-Flow detention time= 250.0 min calculated for 3.803 af (100% of inflow)
Center-of-Mass det. time= 250.1 min (1,160.2 - 910.1)

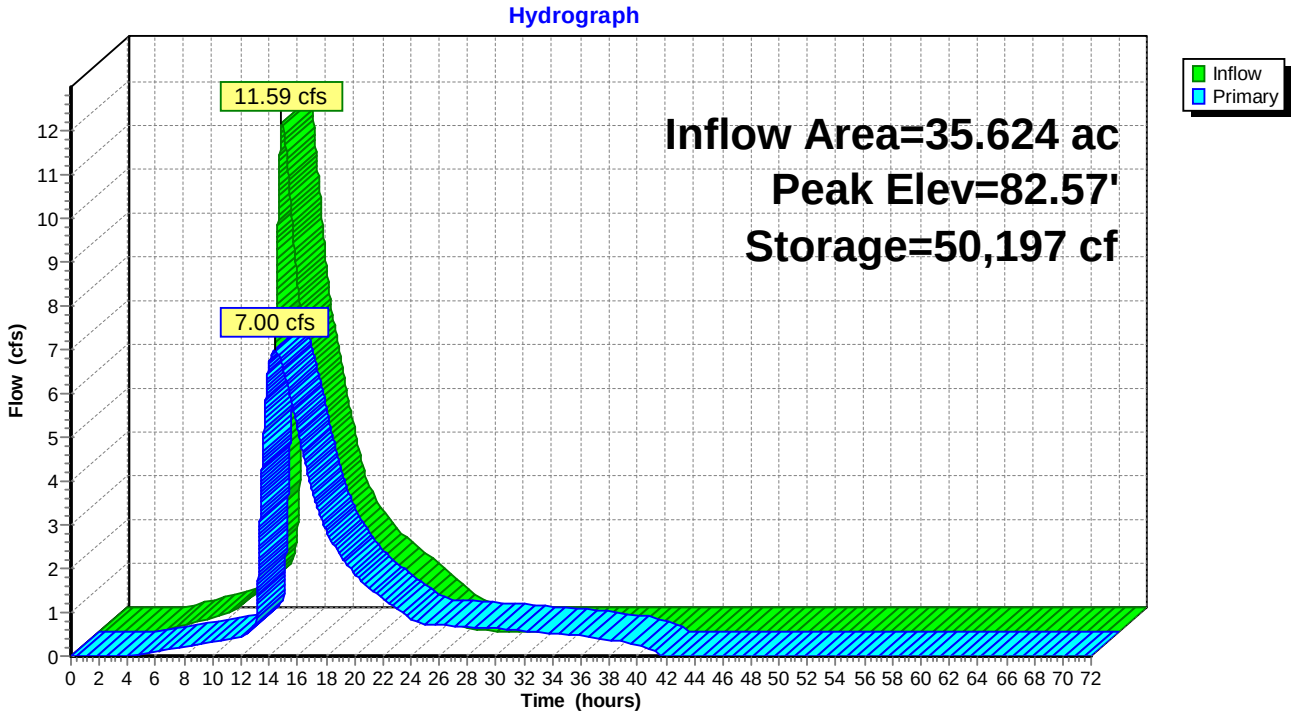
Volume	Invert	Avail.Storage	Storage Description
#1	78.80'	223,129 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
78.80	1	0	0
79.00	16	2	2
80.00	2,181	1,099	1,100
81.00	15,895	9,038	10,138
82.00	29,262	22,579	32,717
83.00	34,004	31,633	64,350
84.00	36,834	35,419	99,769
85.00	39,677	38,256	138,024
86.00	42,533	41,105	179,129
87.00	45,467	44,000	223,129

Device	Routing	Invert	Outlet Devices
#1	Primary	76.60'	**48.0" Round 48" Culvert** L= 50.0' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 76.60' / 76.10' S= 0.0100 '/' Cc= 0.900 n= 0.012 Concrete pipe, finished, Flow Area= 12.57 sf
#2	Device 1	76.60'	**3.0" Vert. 3" Orifice** C= 0.600 Limited to weir flow at low heads
#3	Device 1	81.90'	**42.0" W x 38.5" H Vert. 42" Weir** C= 0.600 Limited to weir flow at low heads
#4	Device 1	85.44'	**16.0' long x 16.0' breadth Outlet Structure Overflow** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.68 2.70 2.70 2.64 2.63 2.64 2.64 2.63
#5	Device 1	78.80'	**15.0" Round Headwall Outlet (15" RCP)** L= 4.0' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 78.80' / 78.30' S= 0.1250 '/' Cc= 0.900 n= 0.012 Concrete pipe, finished, Flow Area= 1.23 sf
#6	Device 5	78.80'	**3.0" Vert. 3" Orifice** C= 0.600 Limited to weir flow at low heads
#7	Device 2	78.80'	**0.500 in/hr Underdrain over Surface area**

Primary OutFlow Max=7.00 cfs @ 14.37 hrs HW=82.57' (Free Discharge)
- **1=48" Culvert** (Passes 7.00 cfs of 120.57 cfs potential flow)
  - **2=3" Orifice** (Passes 0.37 cfs of 0.57 cfs potential flow)
    - **7=Underdrain** (Exfiltration Controls 0.37 cfs)
  - **3=42" Weir** (Orifice Controls 6.17 cfs @ 2.63 fps)
  - **4=Outlet Structure Overflow** (Controls 0.00 cfs)
  - **5=Headwall Outlet (15" RCP)** (Passes 0.45 cfs of 10.48 cfs potential flow)
    - **6=3" Orifice** (Orifice Controls 0.45 cfs @ 9.19 fps)

Pond EB: Existing Basin



Hydrograph for Pond EB: Existing Basin

Time (hours)	Inflow (cfs)	Storage (cubic-feet)	Elevation (feet)	Primary (cfs)
0.00	0.00	0	78.80	0.00
2.00	0.00	0	78.80	0.00
4.00	0.02	0	78.89	0.02
6.00	0.14	39	79.17	0.12
8.00	0.32	476	79.65	0.22
10.00	0.62	1,692	80.17	0.32
12.00	**1.57**	5,464	80.65	0.44
14.00	**8.01**	**49,415**	**82.55**	**6.66**
16.00	4.14	**45,856**	**82.43**	**5.19**
18.00	2.25	39,434	82.23	2.87
20.00	1.52	36,068	82.11	1.89
22.00	0.99	33,684	82.03	1.32
24.00	0.45	31,082	81.94	0.87
26.00	0.09	27,354	81.81	0.71
28.00	0.01	22,651	81.62	0.67
30.00	0.00	18,027	81.42	0.62
32.00	0.00	13,721	81.21	0.57
34.00	0.00	9,787	80.98	0.52
36.00	0.00	6,268	80.72	0.46
38.00	0.00	3,239	80.42	0.38
40.00	0.00	892	79.90	0.26
42.00	0.00	0	78.80	0.00
44.00	0.00	0	78.80	0.00
46.00	0.00	0	78.80	0.00
48.00	0.00	0	78.80	0.00
50.00	0.00	0	78.80	0.00
52.00	0.00	0	78.80	0.00
54.00	0.00	0	78.80	0.00
56.00	0.00	0	78.80	0.00
58.00	0.00	0	78.80	0.00
60.00	0.00	0	78.80	0.00
62.00	0.00	0	78.80	0.00
64.00	0.00	0	78.80	0.00
66.00	0.00	0	78.80	0.00
68.00	0.00	0	78.80	0.00
70.00	0.00	0	78.80	0.00
72.00	0.00	0	78.80	0.00

Summary for Subcatchment EA-1i: EA-1i

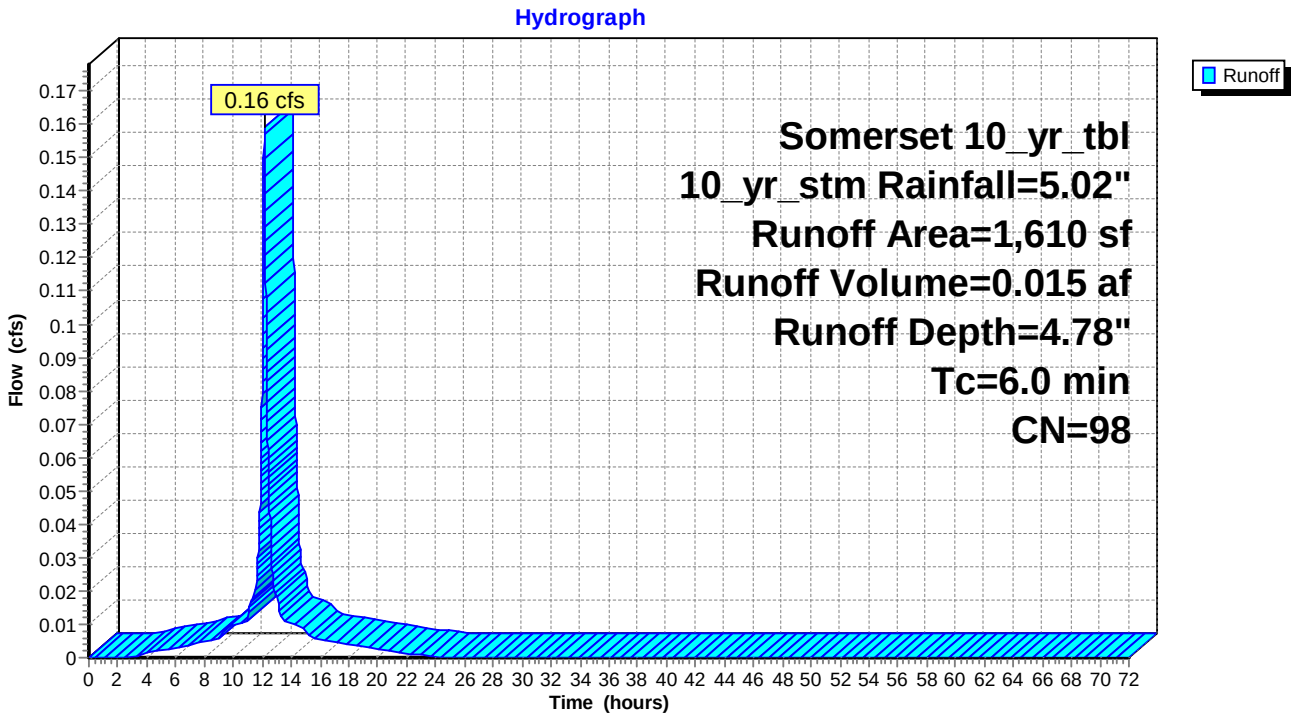
Runoff = 0.16 cfs @ 12.14 hrs, Volume= 0.015 af, Depth= 4.78"

Runoff by SCS TR-20 method, UH=Delmarva, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Somerset 10_yr_tbl 10_yr_stm Rainfall=5.02"

Area (sf)	CN	Description
1,610	98	Paved parking, HSG C
1,610		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry,**

Subcatchment EA-1i: EA-1i



Summary for Subcatchment EA-1p: EA-1p

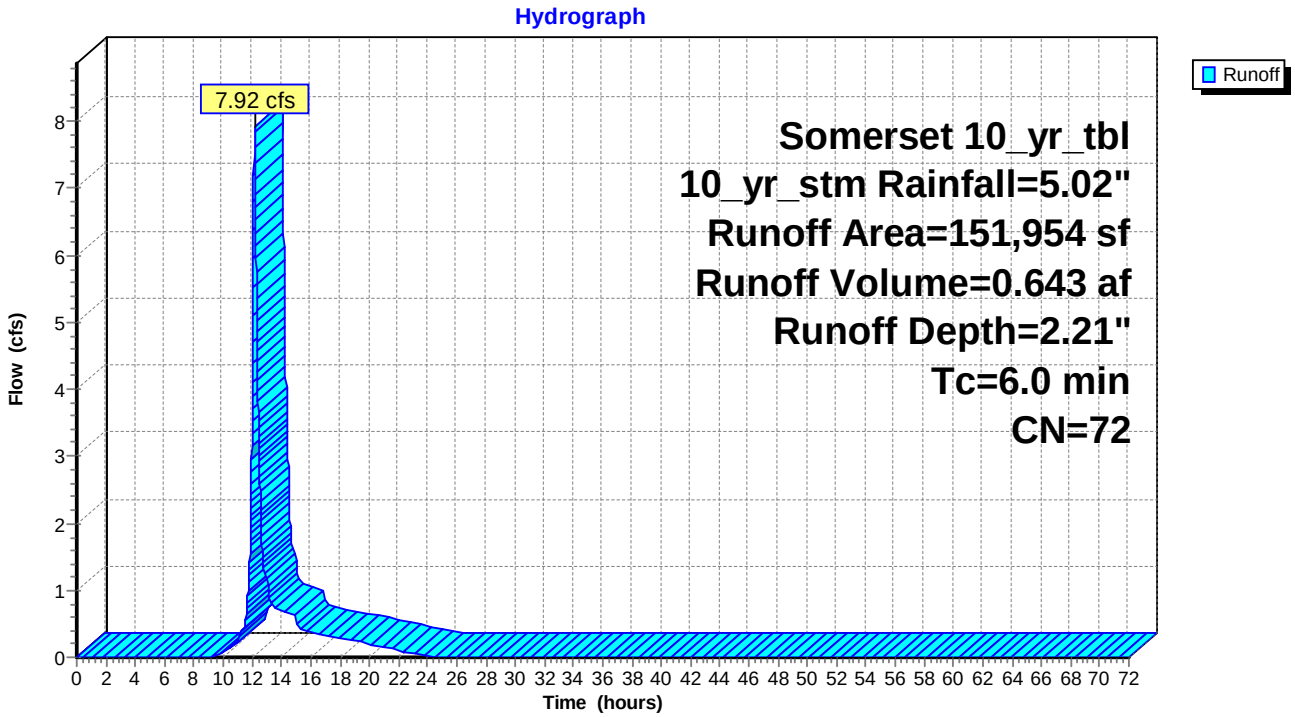
Runoff = 7.92 cfs @ 12.15 hrs, Volume= 0.643 af, Depth= 2.21"

Runoff by SCS TR-20 method, UH=Delmarva, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Somerset 10_yr_tbl 10_yr_stm Rainfall=5.02"

Area (sf)	CN	Description
60,949	61	>75% Grass cover, Good, HSG B
11,116	74	>75% Grass cover, Good, HSG C
79,889	80	>75% Grass cover, Good, HSG D
151,954	72	Weighted Average
151,954		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry,**

Subcatchment EA-1p: EA-1p



Summary for Subcatchment EA-EXi: EA-EXi

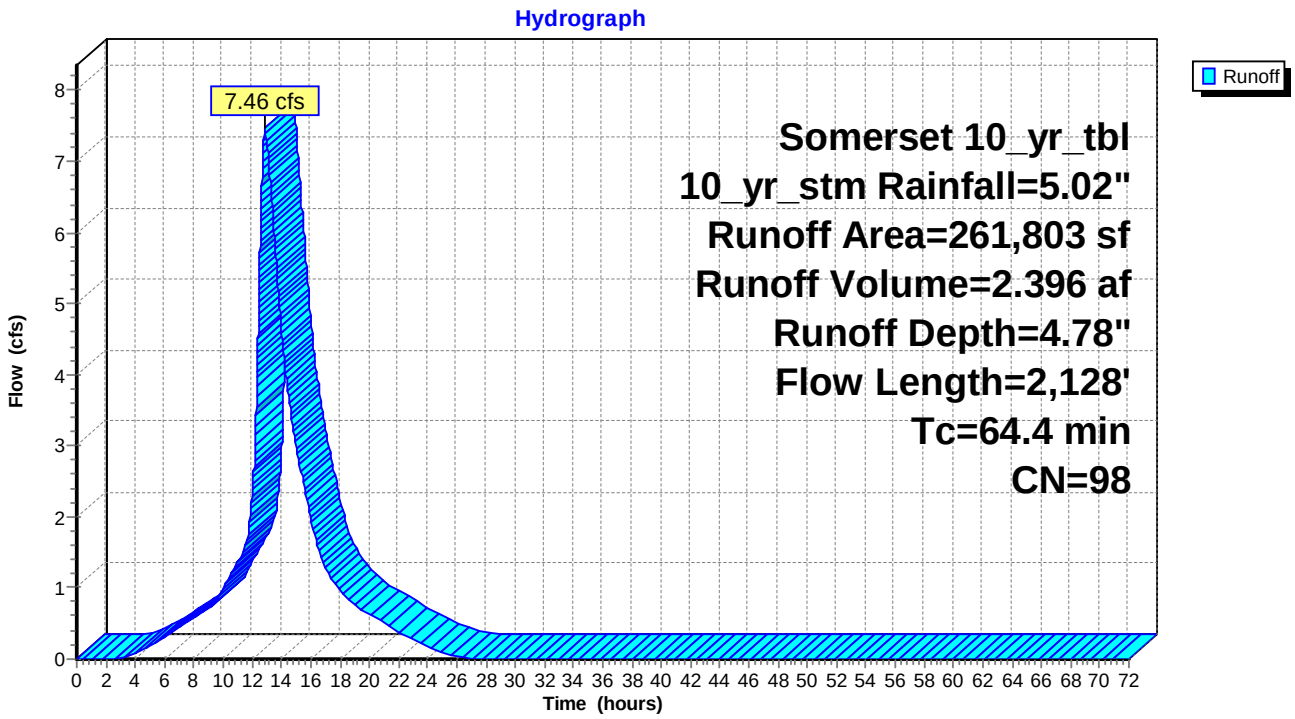
Runoff = 7.46 cfs @ 12.88 hrs, Volume= 2.396 af, Depth= 4.78"

Runoff by SCS TR-20 method, UH=Delmarva, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Somerset 10_yr_tbl 10_yr_stm Rainfall=5.02"

	Area (sf)	CN	Description
*	34,826	98	Roofs
*	92,386	98	Roads
*	20,721	98	Driveways
*	113,870	98	Parking Lot
	261,803	98	Weighted Average
	261,803		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.8	46	0.0100	0.11		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.35"
22.3	54	0.0050	0.04		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.35"
4.4	130	0.0050	0.49		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
1.7	73	0.0200	0.71		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
0.2	24	0.0100	2.03		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
4.4	132	0.0100	0.50		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
0.2	24	0.0100	2.03		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
2.6	132	0.0150	0.86		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
4.5	189	0.0200	0.71		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
1.5	62	0.0100	0.70		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
12.9	388	0.0100	0.50		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
1.2	90	0.0300	1.21		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.9	182	0.0250	3.21		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
0.8	602	0.0136	11.92	84.26	**Pipe Channel, RCP_Round 36"** 36.0" Round Area= 7.1 sf Perim= 9.4' r= 0.75' n= 0.012 Concrete pipe, finished
64.4	2,128	Total			

Subcatchment EA-EXi: EA-EXi



Summary for Subcatchment EA-EXp: EA-EXp

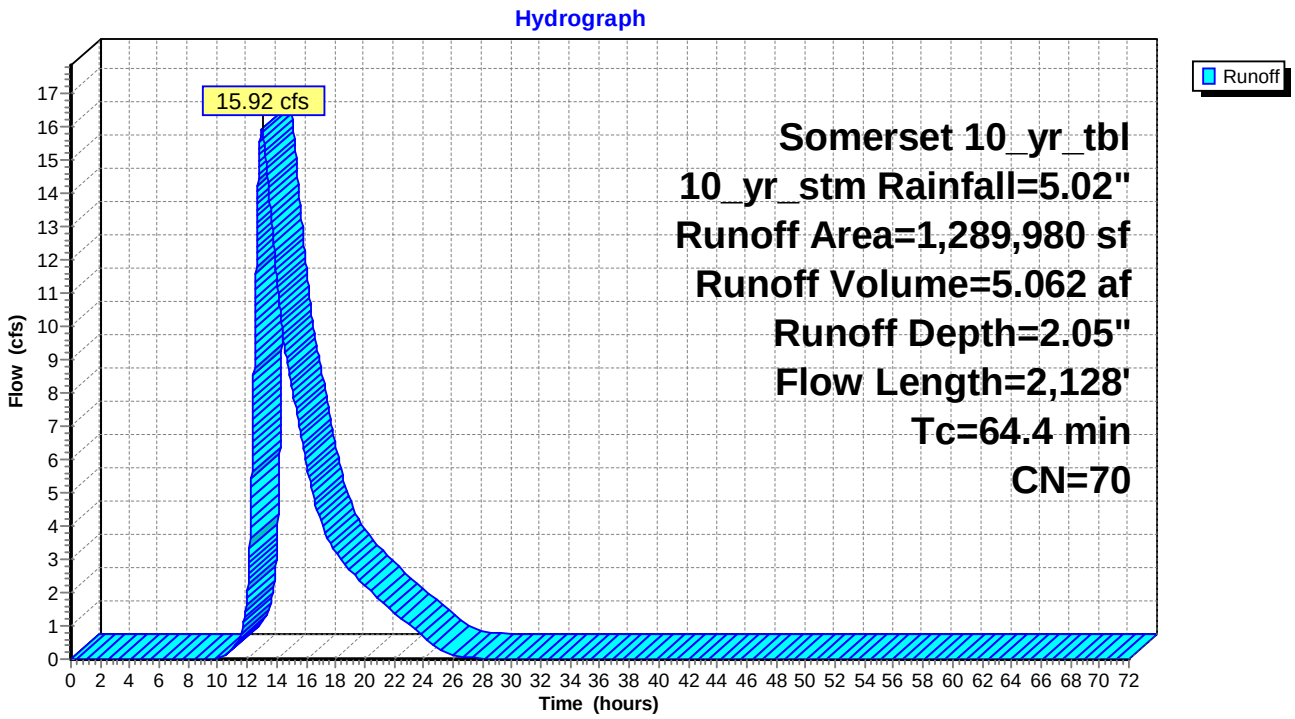
Runoff = 15.92 cfs @ 13.02 hrs, Volume= 5.062 af, Depth= 2.05"

Runoff by SCS TR-20 method, UH=Delmarva, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Somerset 10_yr_tbl 10_yr_stm Rainfall=5.02"

Area (sf)	CN	Description
445,815	70	Woods, Good, HSG C
445,815	74	>75% Grass cover, Good, HSG C
142,152	55	Woods, Good, HSG B
142,152	61	>75% Grass cover, Good, HSG B
114,046	80	>75% Grass cover, Good, HSG D
1,289,980	70	Weighted Average
1,289,980		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.8	46	0.0100	0.11		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.35"
22.3	54	0.0050	0.04		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.35"
4.4	130	0.0050	0.49		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
1.7	73	0.0200	0.71		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
0.2	24	0.0100	2.03		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
4.4	132	0.0100	0.50		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
0.2	24	0.0100	2.03		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
2.6	132	0.0150	0.86		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
4.5	189	0.0200	0.71		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
1.5	62	0.0100	0.70		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
12.9	388	0.0100	0.50		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
1.2	90	0.0300	1.21		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.9	182	0.0250	3.21		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
0.8	602	0.0136	11.92	84.26	**Pipe Channel, RCP_Round 36"** 36.0" Round Area= 7.1 sf Perim= 9.4' r= 0.75' n= 0.012 Concrete pipe, finished
64.4	2,128	Total			

Subcatchment EA-EXp: EA-EXp

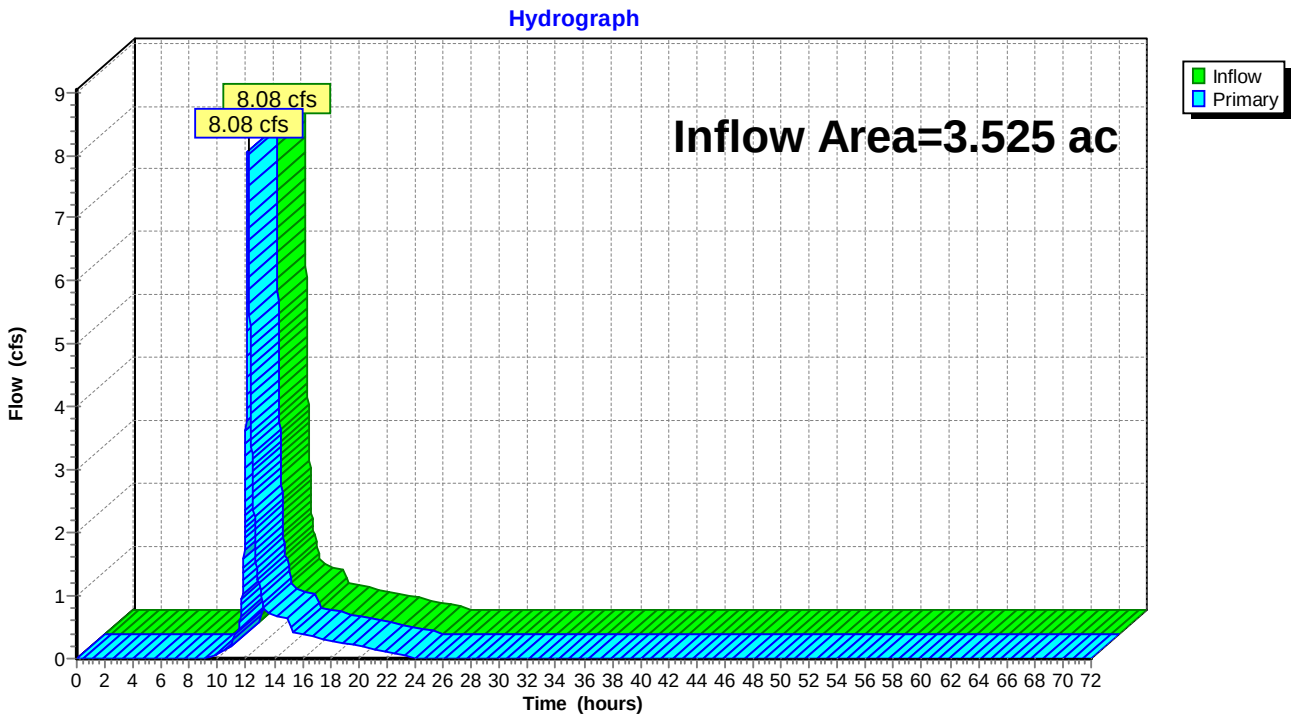


Summary for Pond EA-1: EA-1

Inflow Area = 3.525 ac, 1.05% Impervious, Inflow Depth = 2.24" for 10_yr_stm event
Inflow = 8.08 cfs @ 12.15 hrs, Volume= 0.658 af
Primary = 8.08 cfs @ 12.15 hrs, Volume= 0.658 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs

Pond EA-1: EA-1



Summary for Pond EB: Existing Basin

Inflow Area = 35.624 ac, 16.87% Impervious, Inflow Depth = 2.51" for 10_yr_stm event
Inflow = 23.29 cfs @ 12.89 hrs, Volume= 7.458 af
Outflow = 17.79 cfs @ 13.76 hrs, Volume= 7.458 af, Atten= 24%, Lag= 52.0 min
Primary = 17.79 cfs @ 13.76 hrs, Volume= 7.458 af

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Peak Elev= 83.21' @ 13.76 hrs Surf.Area= 34,605 sf Storage= 71,637 cf

Plug-Flow detention time= 158.0 min calculated for 7.456 af (100% of inflow)
Center-of-Mass det. time= 158.1 min (1,061.5 - 903.4)

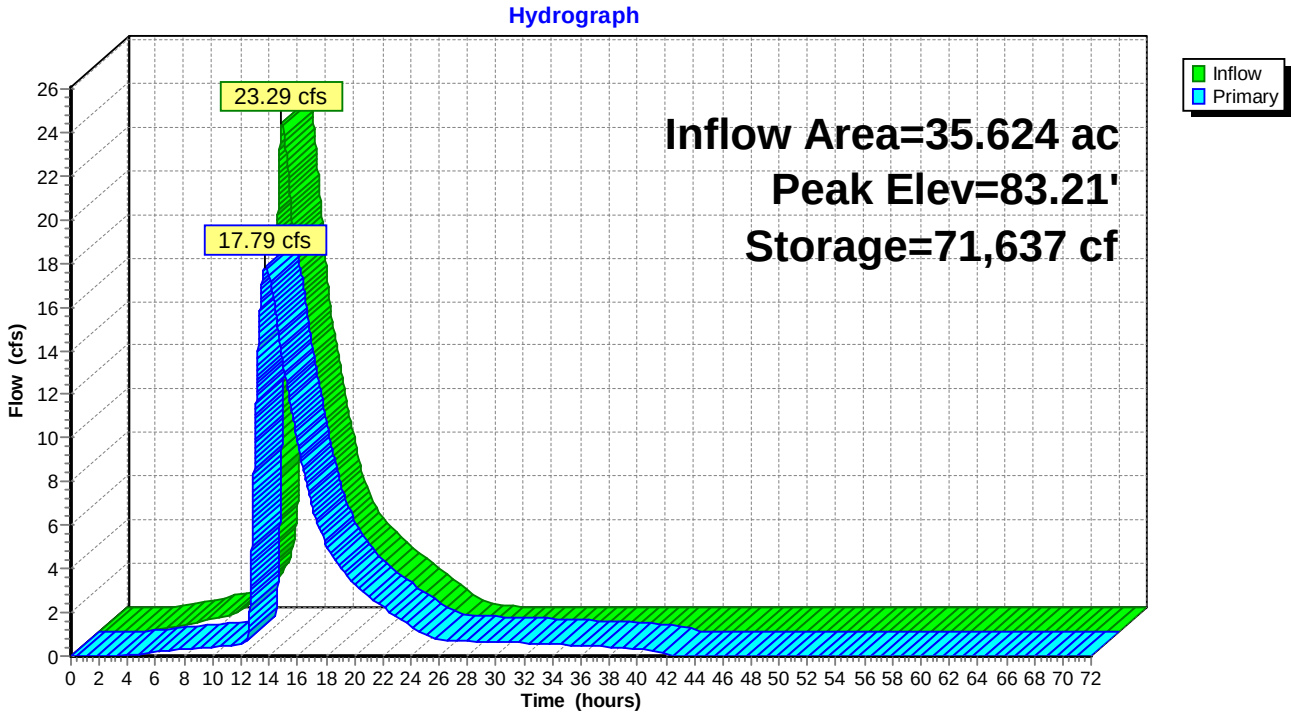
Volume	Invert	Avail.Storage	Storage Description
#1	78.80'	223,129 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
78.80	1	0	0
79.00	16	2	2
80.00	2,181	1,099	1,100
81.00	15,895	9,038	10,138
82.00	29,262	22,579	32,717
83.00	34,004	31,633	64,350
84.00	36,834	35,419	99,769
85.00	39,677	38,256	138,024
86.00	42,533	41,105	179,129
87.00	45,467	44,000	223,129

Device	Routing	Invert	Outlet Devices
#1	Primary	76.60'	**48.0" Round 48" Culvert** L= 50.0' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 76.60' / 76.10' S= 0.0100 '/' Cc= 0.900 n= 0.012 Concrete pipe, finished, Flow Area= 12.57 sf
#2	Device 1	76.60'	**3.0" Vert. 3" Orifice** C= 0.600 Limited to weir flow at low heads
#3	Device 1	81.90'	**42.0" W x 38.5" H Vert. 42" Weir** C= 0.600 Limited to weir flow at low heads
#4	Device 1	85.44'	**16.0' long x 16.0' breadth Outlet Structure Overflow** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.68 2.70 2.70 2.64 2.63 2.64 2.64 2.63
#5	Device 1	78.80'	**15.0" Round Headwall Outlet (15" RCP)** L= 4.0' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 78.80' / 78.30' S= 0.1250 '/' Cc= 0.900 n= 0.012 Concrete pipe, finished, Flow Area= 1.23 sf
#6	Device 5	78.80'	**3.0" Vert. 3" Orifice** C= 0.600 Limited to weir flow at low heads
#7	Device 2	78.80'	**0.500 in/hr Underdrain over Surface area**

Primary OutFlow Max=17.78 cfs @ 13.76 hrs HW=83.21' (Free Discharge)
- **1=48" Culvert** (Passes 17.78 cfs of 129.95 cfs potential flow)
  - **2=3" Orifice** (Passes 0.40 cfs of 0.60 cfs potential flow)
    - **7=Underdrain** (Exfiltration Controls 0.40 cfs)
  - **3=42" Weir** (Orifice Controls 16.89 cfs @ 3.68 fps)
  - **4=Outlet Structure Overflow** (Controls 0.00 cfs)
  - **5=Headwall Outlet (15" RCP)** (Passes 0.49 cfs of 11.50 cfs potential flow)
    - **6=3" Orifice** (Orifice Controls 0.49 cfs @ 9.97 fps)

Pond EB: Existing Basin



Hydrograph for Pond EB: Existing Basin

Time (hours)	Inflow (cfs)	Storage (cubic-feet)	Elevation (feet)	Primary (cfs)
0.00	0.00	0	78.80	0.00
2.00	0.00	0	78.80	0.00
4.00	0.06	2	79.00	0.06
6.00	0.30	306	79.52	0.20
8.00	0.58	1,645	80.16	0.31
10.00	1.00	4,307	80.54	0.41
12.00	**4.16**	**14,400**	**81.24**	**0.58**
14.00	**16.01**	**70,958**	**83.19**	**17.41**
16.00	7.85	56,289	82.76	9.79
18.00	4.20	45,697	82.43	5.13
20.00	2.81	40,794	82.27	3.32
22.00	1.81	37,454	82.16	2.26
24.00	0.82	33,929	82.04	1.37
26.00	0.16	29,762	81.90	0.73
28.00	0.02	25,125	81.72	0.69
30.00	0.00	20,356	81.53	0.65
32.00	0.00	15,872	81.32	0.60
34.00	0.00	11,744	81.10	0.55
36.00	0.00	8,006	80.86	0.49
38.00	0.00	4,715	80.58	0.42
40.00	0.00	1,977	80.23	0.33
42.00	0.00	133	79.34	0.16
44.00	0.00	0	78.80	0.00
46.00	0.00	0	78.80	0.00
48.00	0.00	0	78.80	0.00
50.00	0.00	0	78.80	0.00
52.00	0.00	0	78.80	0.00
54.00	0.00	0	78.80	0.00
56.00	0.00	0	78.80	0.00
58.00	0.00	0	78.80	0.00
60.00	0.00	0	78.80	0.00
62.00	0.00	0	78.80	0.00
64.00	0.00	0	78.80	0.00
66.00	0.00	0	78.80	0.00
68.00	0.00	0	78.80	0.00
70.00	0.00	0	78.80	0.00
72.00	0.00	0	78.80	0.00

Summary for Subcatchment EA-1i: EA-1i

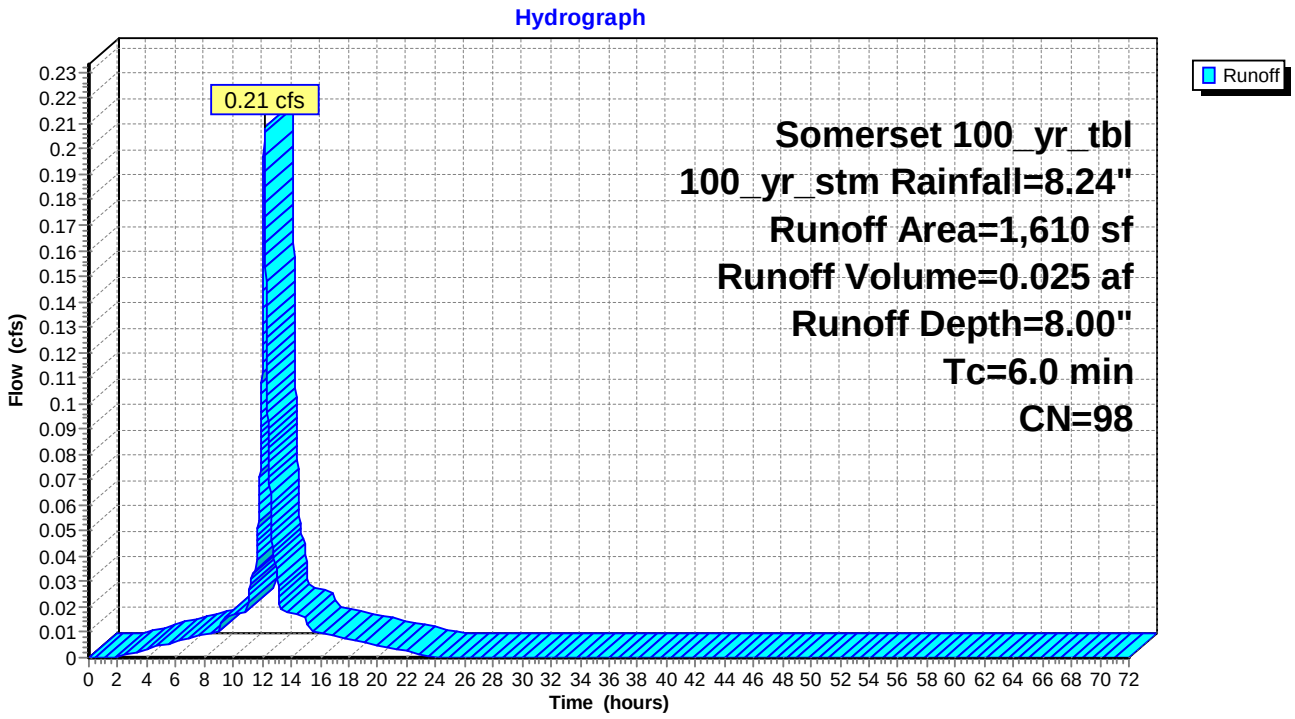
Runoff = 0.21 cfs @ 12.14 hrs, Volume= 0.025 af, Depth= 8.00"

Runoff by SCS TR-20 method, UH=Delmarva, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Somerset 100_yr_tbl 100_yr_stm Rainfall=8.24"

Area (sf)	CN	Description
1,610	98	Paved parking, HSG C
1,610		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry,**

Subcatchment EA-1i: EA-1i



Summary for Subcatchment EA-1p: EA-1p

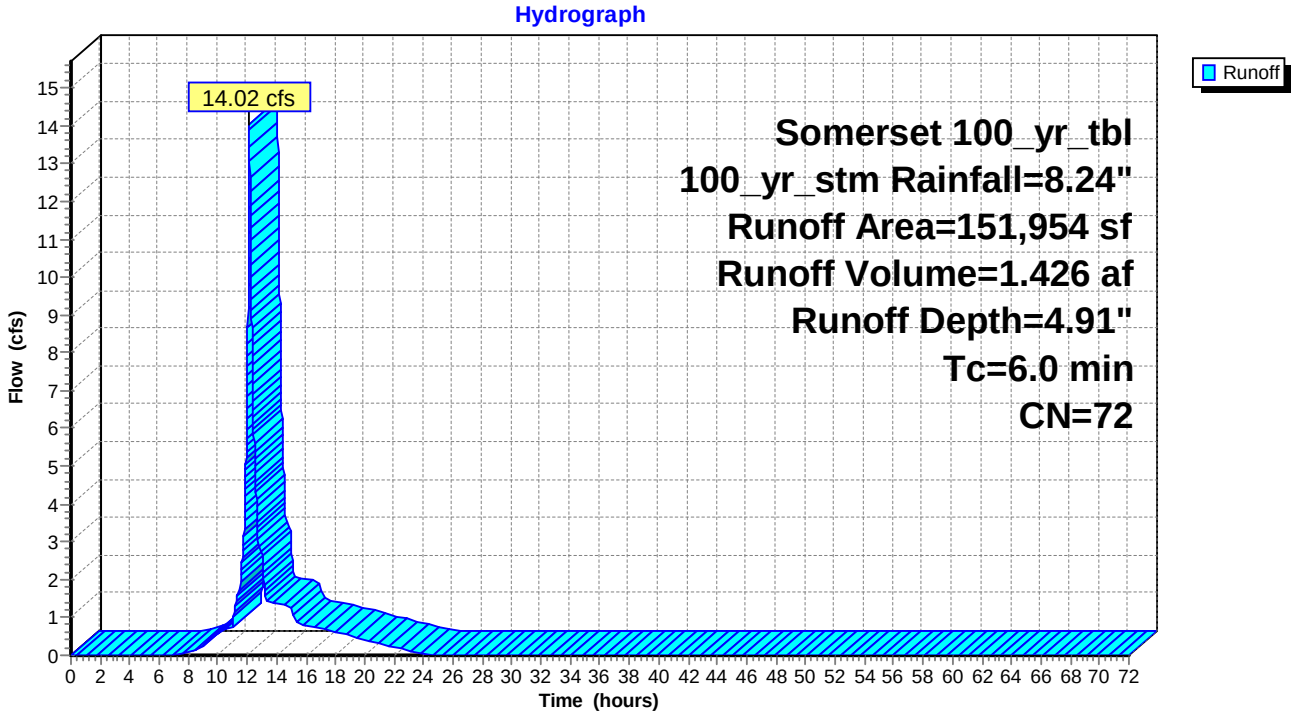
Runoff = 14.02 cfs @ 12.14 hrs, Volume= 1.426 af, Depth= 4.91"

Runoff by SCS TR-20 method, UH=Delmarva, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Somerset 100_yr_tbl 100_yr_stm Rainfall=8.24"

Area (sf)	CN	Description
60,949	61	>75% Grass cover, Good, HSG B
11,116	74	>75% Grass cover, Good, HSG C
79,889	80	>75% Grass cover, Good, HSG D
151,954	72	Weighted Average
151,954		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry,**

Subcatchment EA-1p: EA-1p



Summary for Subcatchment EA-EXi: EA-EXi

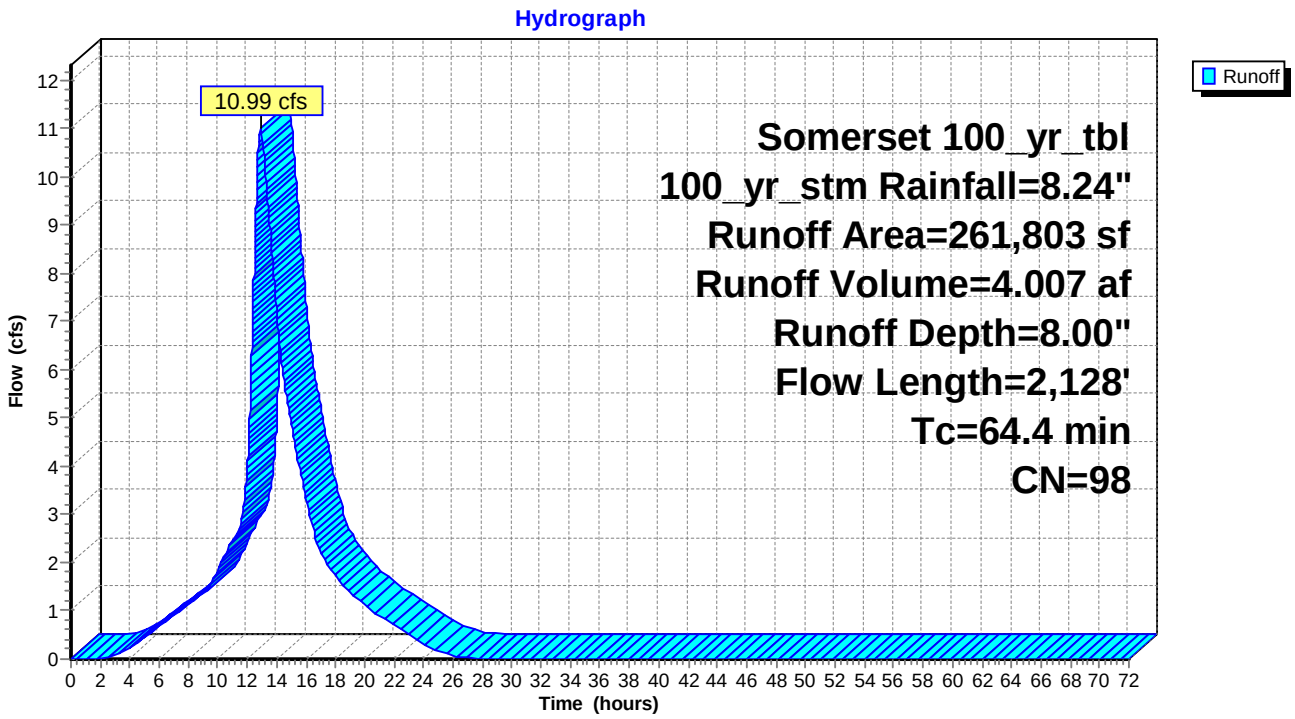
Runoff = 10.99 cfs @ 12.88 hrs, Volume= 4.007 af, Depth= 8.00"

Runoff by SCS TR-20 method, UH=Delmarva, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Somerset 100_yr_tbl 100_yr_stm Rainfall=8.24"

	Area (sf)	CN	Description
*	34,826	98	Roofs
*	92,386	98	Roads
*	20,721	98	Driveways
*	113,870	98	Parking Lot
	261,803	98	Weighted Average
	261,803		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.8	46	0.0100	0.11		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.35"
22.3	54	0.0050	0.04		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.35"
4.4	130	0.0050	0.49		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
1.7	73	0.0200	0.71		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
0.2	24	0.0100	2.03		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
4.4	132	0.0100	0.50		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
0.2	24	0.0100	2.03		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
2.6	132	0.0150	0.86		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
4.5	189	0.0200	0.71		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
1.5	62	0.0100	0.70		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
12.9	388	0.0100	0.50		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
1.2	90	0.0300	1.21		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.9	182	0.0250	3.21		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
0.8	602	0.0136	11.92	84.26	**Pipe Channel, RCP_Round 36"** 36.0" Round Area= 7.1 sf Perim= 9.4' r= 0.75' n= 0.012 Concrete pipe, finished
64.4	2,128	Total			

Subcatchment EA-EXi: EA-EXi



Summary for Subcatchment EA-EXp: EA-EXp

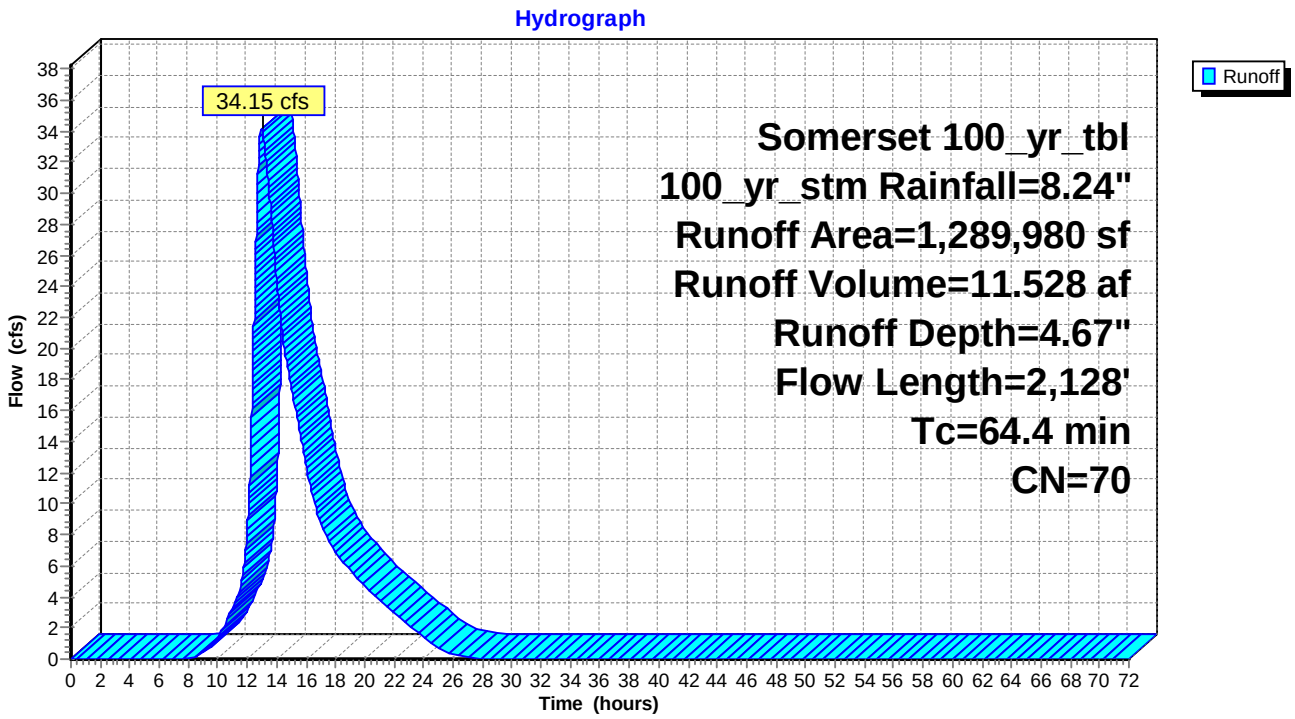
Runoff = 34.15 cfs @ 13.02 hrs, Volume= 11.528 af, Depth= 4.67"

Runoff by SCS TR-20 method, UH=Delmarva, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Somerset 100_yr_tbl 100_yr_stm Rainfall=8.24"

Area (sf)	CN	Description
445,815	70	Woods, Good, HSG C
445,815	74	>75% Grass cover, Good, HSG C
142,152	55	Woods, Good, HSG B
142,152	61	>75% Grass cover, Good, HSG B
114,046	80	>75% Grass cover, Good, HSG D
1,289,980	70	Weighted Average
1,289,980		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.8	46	0.0100	0.11		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.35"
22.3	54	0.0050	0.04		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.35"
4.4	130	0.0050	0.49		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
1.7	73	0.0200	0.71		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
0.2	24	0.0100	2.03		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
4.4	132	0.0100	0.50		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
0.2	24	0.0100	2.03		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
2.6	132	0.0150	0.86		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
4.5	189	0.0200	0.71		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
1.5	62	0.0100	0.70		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
12.9	388	0.0100	0.50		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
1.2	90	0.0300	1.21		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.9	182	0.0250	3.21		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
0.8	602	0.0136	11.92	84.26	**Pipe Channel, RCP_Round 36"** 36.0" Round Area= 7.1 sf Perim= 9.4' r= 0.75' n= 0.012 Concrete pipe, finished
64.4	2,128	Total			

Subcatchment EA-EXp: EA-EXp

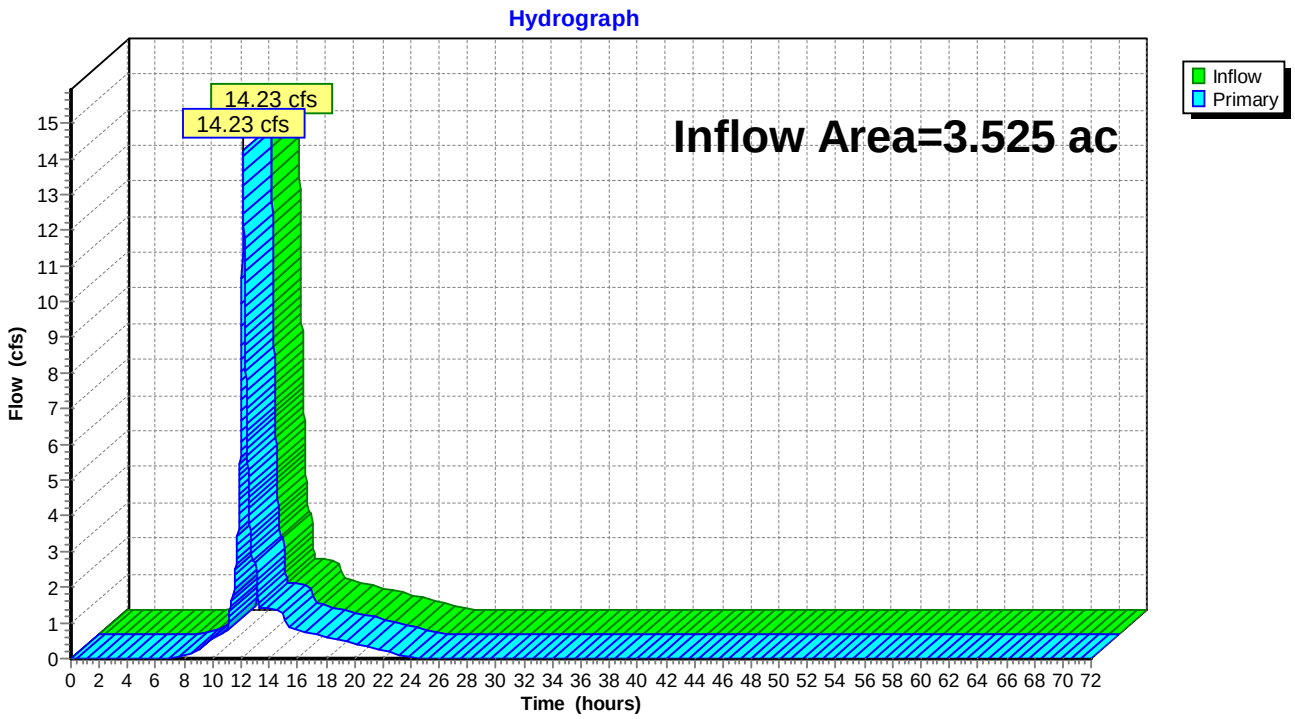


Summary for Pond EA-1: EA-1

Inflow Area = 3.525 ac, 1.05% Impervious, Inflow Depth = 4.94" for 100_yr_stm event
Inflow = 14.23 cfs @ 12.14 hrs, Volume= 1.451 af
Primary = 14.23 cfs @ 12.14 hrs, Volume= 1.451 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs

Pond EA-1: EA-1



Summary for Pond EB: Existing Basin

Inflow Area = 35.624 ac, 16.87% Impervious, Inflow Depth = 5.23" for 100_yr_stm event
Inflow = 45.08 cfs @ 12.89 hrs, Volume= 15.535 af
Outflow = 39.31 cfs @ 13.49 hrs, Volume= 15.535 af, Atten= 13%, Lag= 35.8 min
Primary = 39.31 cfs @ 13.49 hrs, Volume= 15.535 af

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Peak Elev= 84.17' @ 13.49 hrs Surf.Area= 37,307 sf Storage= 105,932 cf

Plug-Flow detention time= 101.7 min calculated for 15.532 af (100% of inflow)
Center-of-Mass det. time= 101.8 min (997.4 - 895.5)

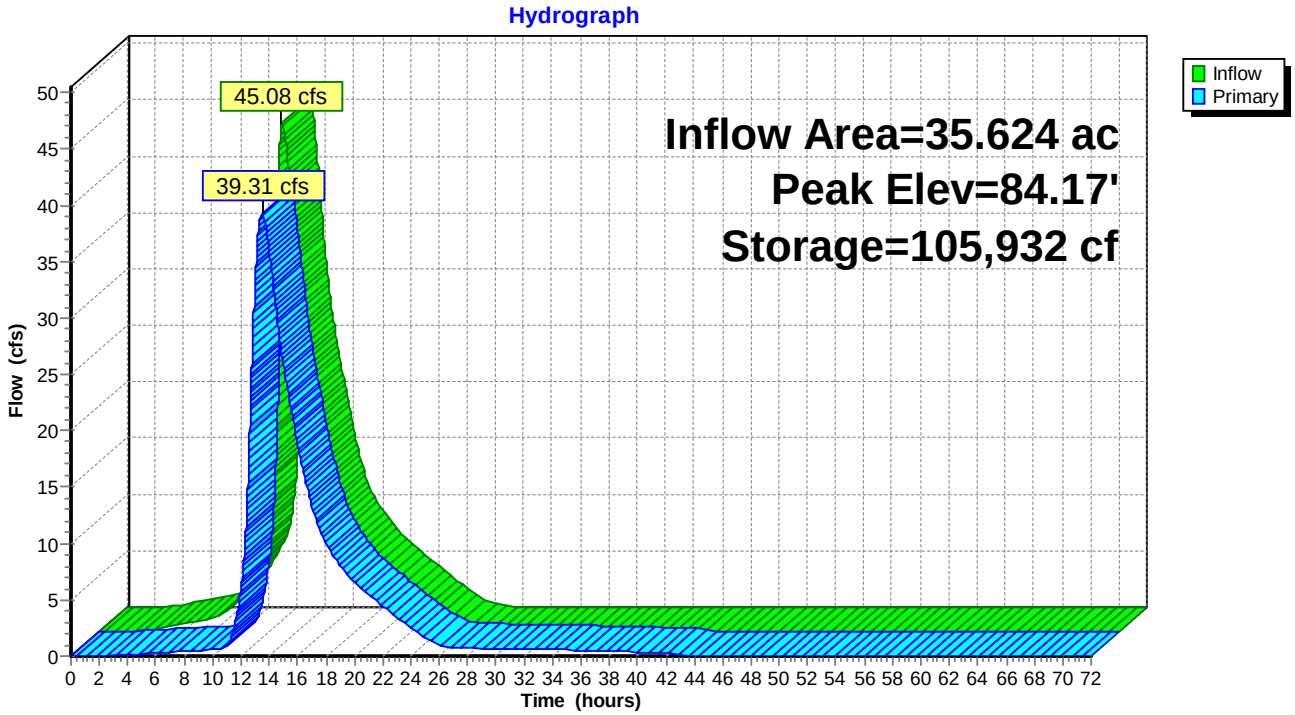
Volume	Invert	Avail.Storage	Storage Description
#1	78.80'	223,129 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
78.80	1	0	0
79.00	16	2	2
80.00	2,181	1,099	1,100
81.00	15,895	9,038	10,138
82.00	29,262	22,579	32,717
83.00	34,004	31,633	64,350
84.00	36,834	35,419	99,769
85.00	39,677	38,256	138,024
86.00	42,533	41,105	179,129
87.00	45,467	44,000	223,129

Device	Routing	Invert	Outlet Devices
#1	Primary	76.60'	**48.0" Round 48" Culvert** L= 50.0' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 76.60' / 76.10' S= 0.0100 '/' Cc= 0.900 n= 0.012 Concrete pipe, finished, Flow Area= 12.57 sf
#2	Device 1	76.60'	**3.0" Vert. 3" Orifice** C= 0.600 Limited to weir flow at low heads
#3	Device 1	81.90'	**42.0" W x 38.5" H Vert. 42" Weir** C= 0.600 Limited to weir flow at low heads
#4	Device 1	85.44'	**16.0' long x 16.0' breadth Outlet Structure Overflow** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.68 2.70 2.70 2.64 2.63 2.64 2.64 2.63
#5	Device 1	78.80'	**15.0" Round Headwall Outlet (15" RCP)** L= 4.0' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 78.80' / 78.30' S= 0.1250 '/' Cc= 0.900 n= 0.012 Concrete pipe, finished, Flow Area= 1.23 sf
#6	Device 5	78.80'	**3.0" Vert. 3" Orifice** C= 0.600 Limited to weir flow at low heads
#7	Device 2	78.80'	**0.500 in/hr Underdrain over Surface area**

Primary OutFlow Max=39.30 cfs @ 13.49 hrs HW=84.17' (Free Discharge)
- **1=48" Culvert** (Passes 39.30 cfs of 142.75 cfs potential flow)
  - **2=3" Orifice** (Passes 0.43 cfs of 0.64 cfs potential flow)
    - **7=Underdrain** (Exfiltration Controls 0.43 cfs)
  - **3=42" Weir** (Orifice Controls 38.33 cfs @ 4.83 fps)
  - **4=Outlet Structure Overflow** (Controls 0.00 cfs)
  - **5=Headwall Outlet (15" RCP)** (Passes 0.54 cfs of 12.87 cfs potential flow)
    - **6=3" Orifice** (Orifice Controls 0.54 cfs @ 11.02 fps)

Pond EB: Existing Basin

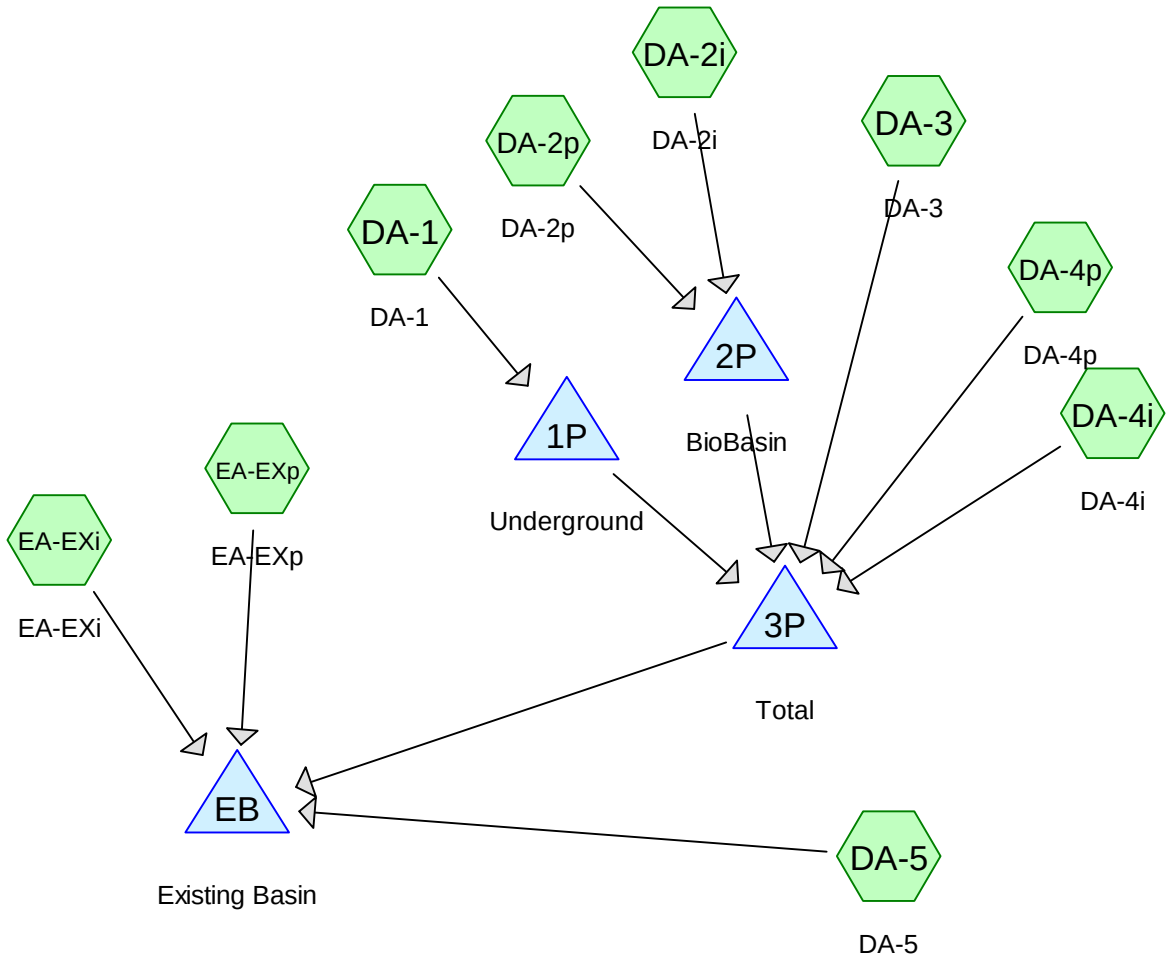


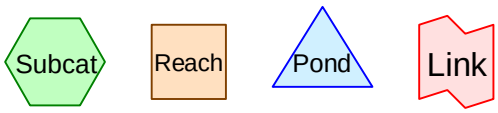
Hydrograph for Pond EB: Existing Basin

Time (hours)	Inflow (cfs)	Storage (cubic-feet)	Elevation (feet)	Primary (cfs)
0.00	0.00	0	78.80	0.00
2.00	0.00	0	78.80	0.00
4.00	0.22	105	79.30	0.15
6.00	0.69	1,674	80.17	0.32
8.00	1.18	5,592	80.67	0.44
10.00	3.33	15,726	81.31	0.60
12.00	**12.17**	**47,726**	**82.49**	**5.95**
14.00	**31.43**	**100,841**	**84.03**	**35.87**
16.00	15.76	73,628	83.27	18.91
18.00	8.63	56,844	82.78	10.06
20.00	5.78	49,264	82.54	6.60
22.00	3.73	43,958	82.37	4.46
24.00	1.69	38,354	82.19	2.54
26.00	0.32	32,290	81.99	1.04
28.00	0.04	27,559	81.82	0.71
30.00	0.00	22,683	81.62	0.67
32.00	0.00	18,034	81.42	0.62
34.00	0.00	13,727	81.21	0.57
36.00	0.00	9,792	80.98	0.52
38.00	0.00	6,273	80.72	0.46
40.00	0.00	3,243	80.42	0.38
42.00	0.00	895	79.90	0.26
44.00	0.00	0	78.80	0.00
46.00	0.00	0	78.80	0.00
48.00	0.00	0	78.80	0.00
50.00	0.00	0	78.80	0.00
52.00	0.00	0	78.80	0.00
54.00	0.00	0	78.80	0.00
56.00	0.00	0	78.80	0.00
58.00	0.00	0	78.80	0.00
60.00	0.00	0	78.80	0.00
62.00	0.00	0	78.80	0.00
64.00	0.00	0	78.80	0.00
66.00	0.00	0	78.80	0.00
68.00	0.00	0	78.80	0.00
70.00	0.00	0	78.80	0.00
72.00	0.00	0	78.80	0.00

APPENDIX B

POST-DEVELOPMENT ANALYSIS





Routing Diagram for Post-Development
Prepared by {enter your company name here}, Printed 12/16/2022
HydroCAD® 10.10-3a s/n 11244 © 2020 HydroCAD Software Solutions LLC

Summary for Subcatchment DA-1: DA-1

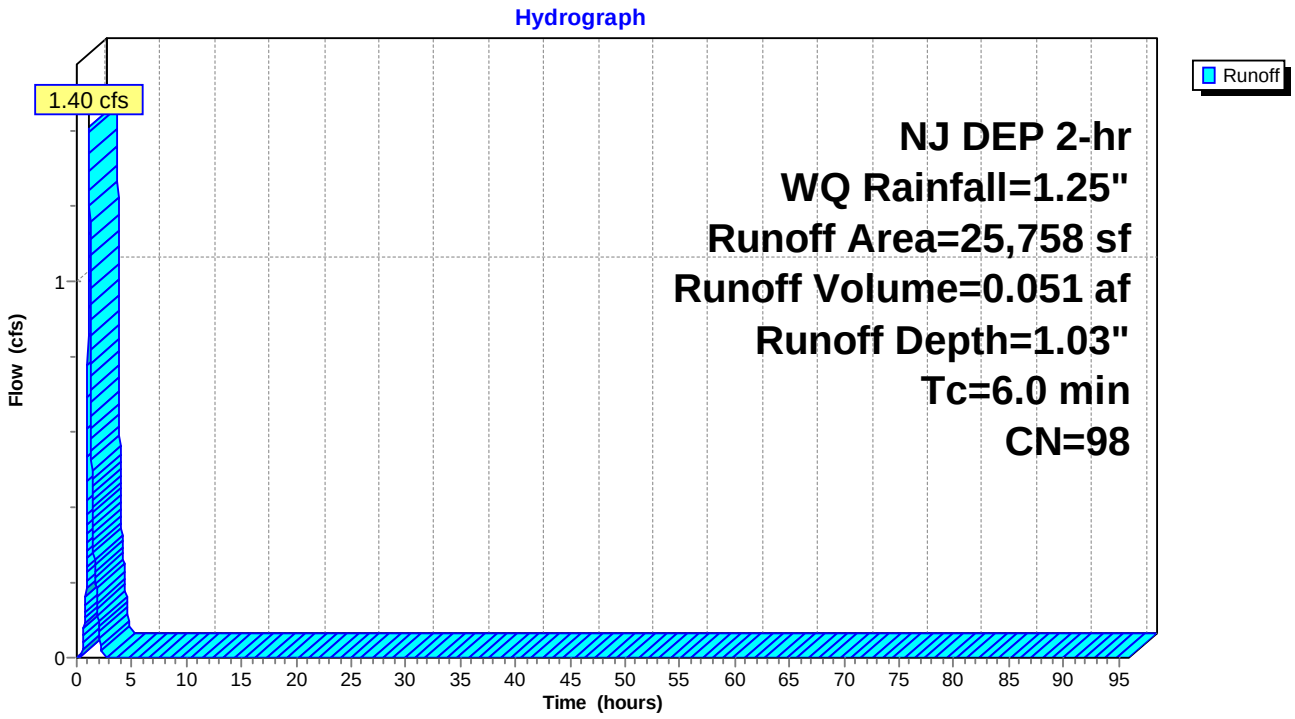
Runoff = 1.40 cfs @ 1.12 hrs, Volume= 0.051 af, Depth= 1.03"

Runoff by SCS TR-20 method, UH=Delmarva, Weighted-CN, Time Span= 0.00-96.00 hrs, dt= 0.01 hrs
NJ DEP 2-hr WQ Rainfall=1.25"

Area (sf)	CN	Description
25,758	98	Roofs, HSG D
25,758		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry,**

Subcatchment DA-1: DA-1



Summary for Subcatchment DA-2i: DA-2i

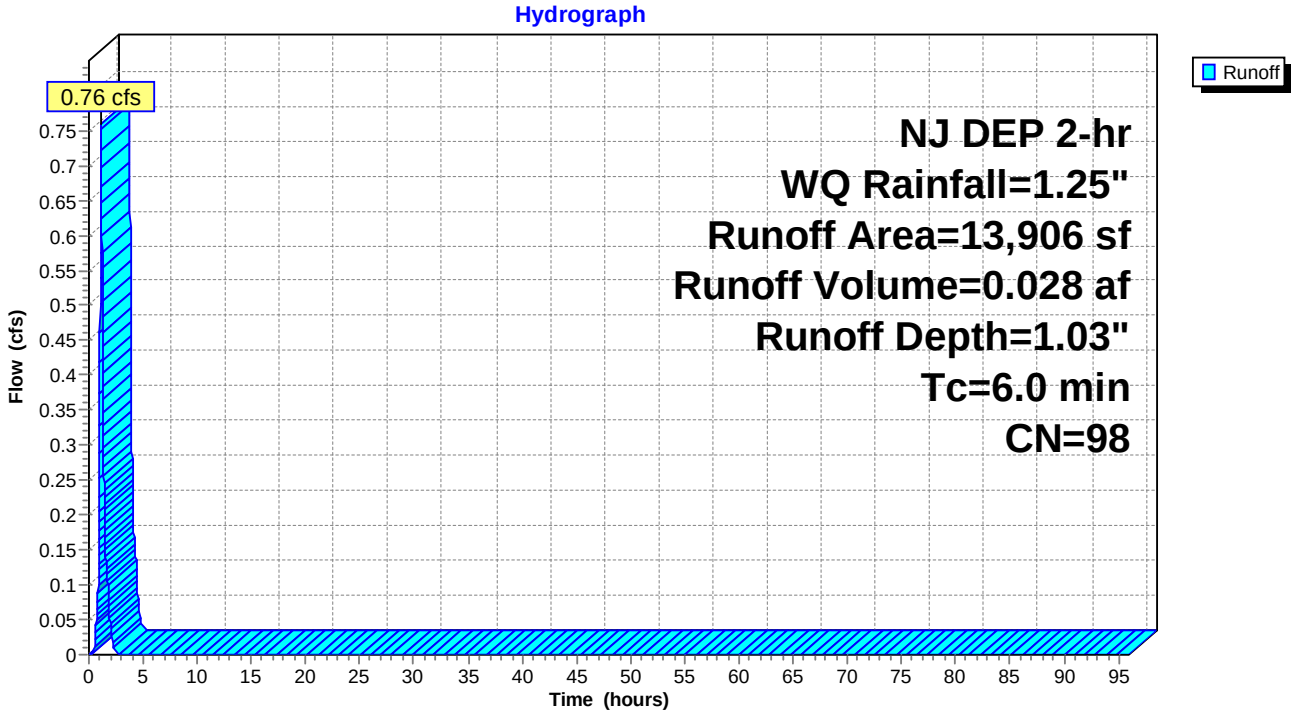
Runoff = 0.76 cfs @ 1.12 hrs, Volume= 0.028 af, Depth= 1.03"

Runoff by SCS TR-20 method, UH=Delmarva, Weighted-CN, Time Span= 0.00-96.00 hrs, dt= 0.01 hrs
NJ DEP 2-hr WQ Rainfall=1.25"

	Area (sf)	CN	Description
*	2,940	98	Sidewalks, HSG C
	9,656	98	Paved parking, HSG C
*	649	98	Hardscape, HSG C
*	661	98	Hardscape, HSG B
	13,906	98	Weighted Average
	13,906		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry,**

Subcatchment DA-2i: DA-2i



Summary for Subcatchment DA-2p: DA-2p

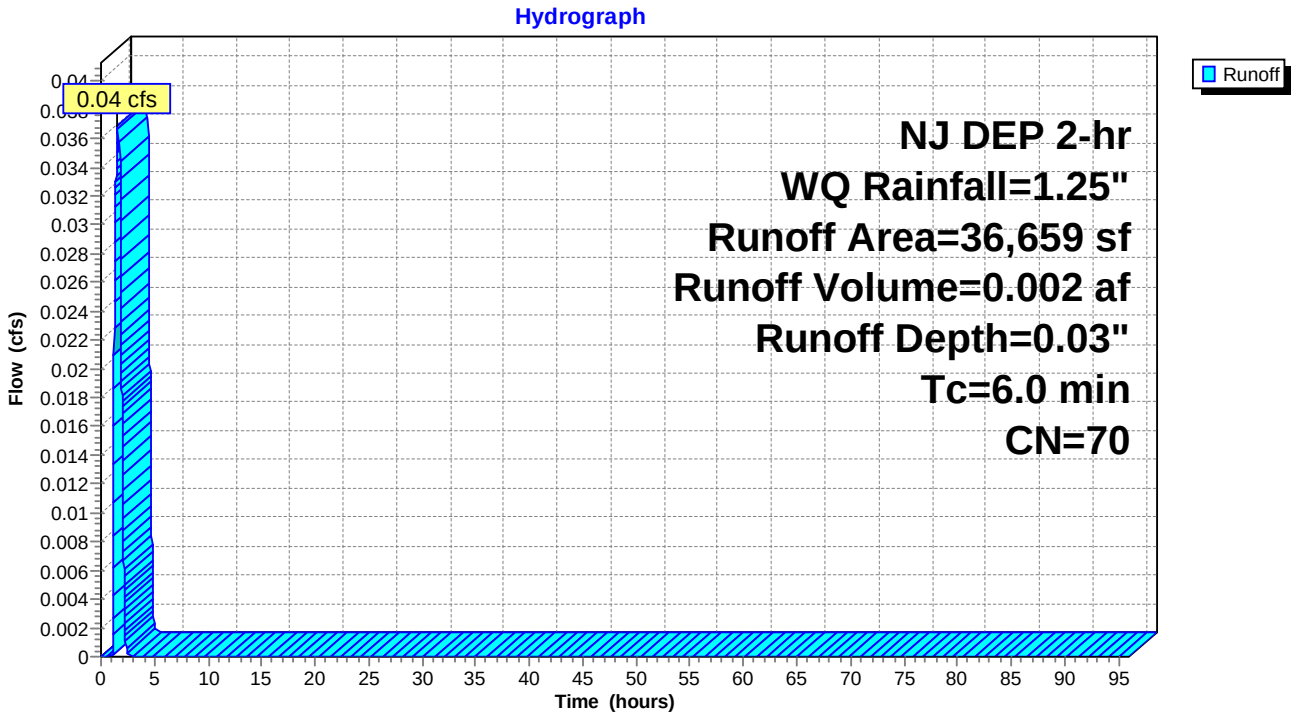
Runoff = 0.04 cfs @ 1.54 hrs, Volume= 0.002 af, Depth= 0.03"

Runoff by SCS TR-20 method, UH=Delmarva, Weighted-CN, Time Span= 0.00-96.00 hrs, dt= 0.01 hrs
NJ DEP 2-hr WQ Rainfall=1.25"

Area (sf)	CN	Description
5,773	61	>75% Grass cover, Good, HSG B
5,981	74	>75% Grass cover, Good, HSG C
14,003	80	>75% Grass cover, Good, HSG D
10,902	61	>75% Grass cover, Good, HSG B
36,659	70	Weighted Average
36,659		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry,**

Subcatchment DA-2p: DA-2p



Summary for Subcatchment DA-3: DA-3

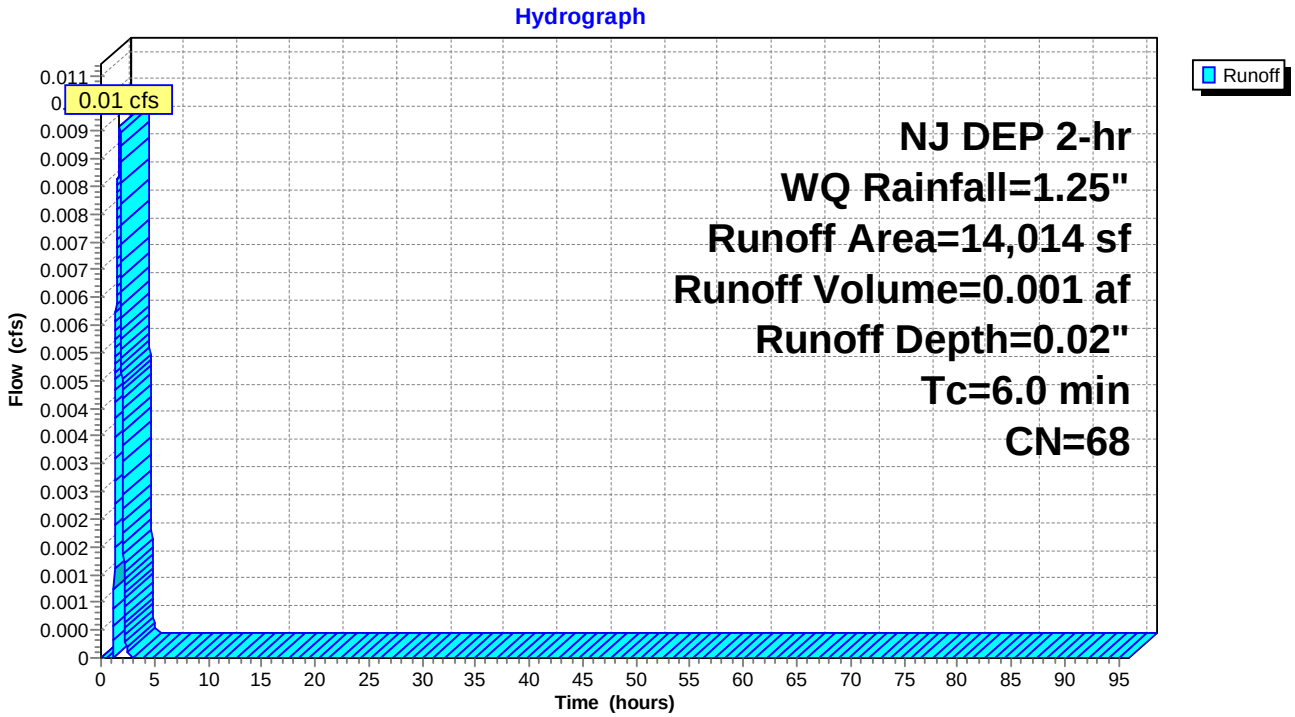
Runoff = 0.01 cfs @ 1.77 hrs, Volume= 0.001 af, Depth= 0.02"

Runoff by SCS TR-20 method, UH=Delmarva, Weighted-CN, Time Span= 0.00-96.00 hrs, dt= 0.01 hrs
NJ DEP 2-hr WQ Rainfall=1.25"

	Area (sf)	CN	Description
*	4,993	80	>75% Grass cover, Good, HSG D
	9,021	61	>75% Grass cover, Good, HSG B
	14,014	68	Weighted Average
	14,014		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry,**

Subcatchment DA-3: DA-3



Summary for Subcatchment DA-4i: DA-4i

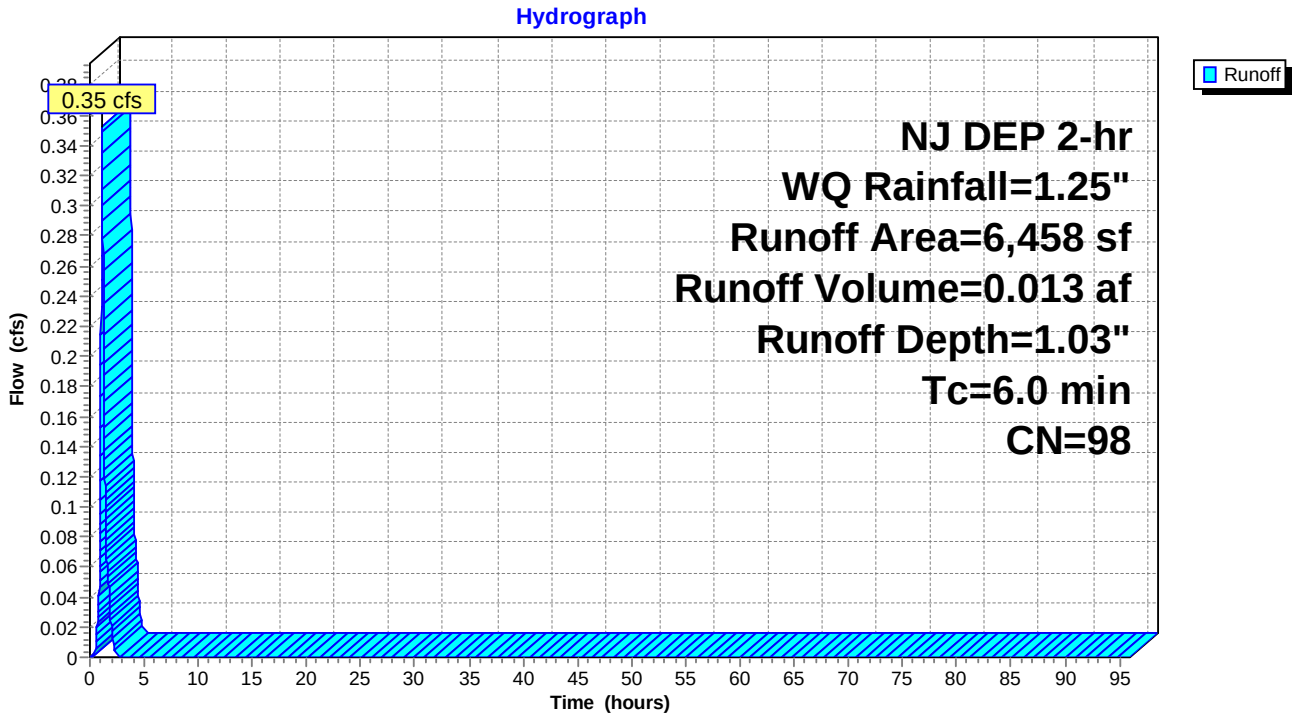
Runoff = 0.35 cfs @ 1.12 hrs, Volume= 0.013 af, Depth= 1.03"

Runoff by SCS TR-20 method, UH=Delmarva, Weighted-CN, Time Span= 0.00-96.00 hrs, dt= 0.01 hrs
NJ DEP 2-hr WQ Rainfall=1.25"

	Area (sf)	CN	Description
	2,779	98	Paved parking, HSG C
*	3,419	98	Sidewalks, HSG C
*	260	98	Hardscapes, HSG C
	6,458	98	Weighted Average
	6,458		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry,**

Subcatchment DA-4i: DA-4i



Summary for Subcatchment DA-4p: DA-4p

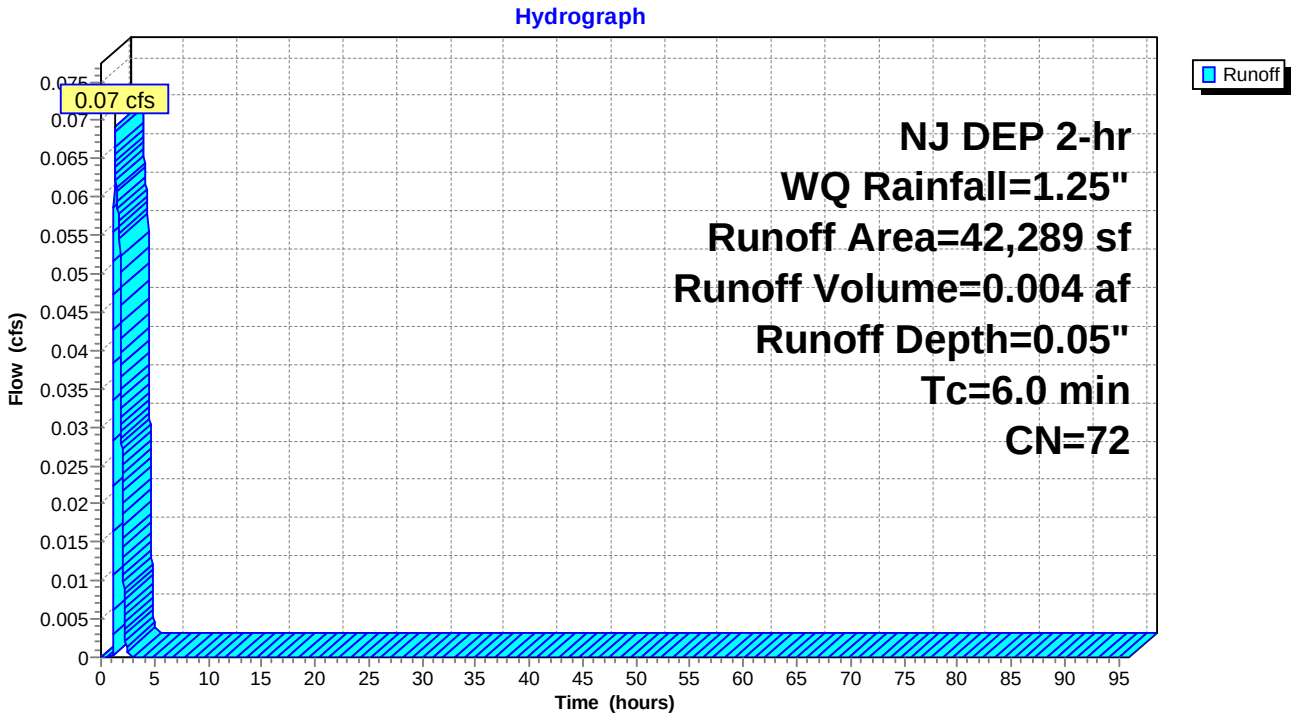
Runoff = 0.07 cfs @ 1.29 hrs, Volume= 0.004 af, Depth= 0.05"

Runoff by SCS TR-20 method, UH=Delmarva, Weighted-CN, Time Span= 0.00-96.00 hrs, dt= 0.01 hrs
NJ DEP 2-hr WQ Rainfall=1.25"

Area (sf)	CN	Description
16,312	61	>75% Grass cover, Good, HSG B
2,332	74	>75% Grass cover, Good, HSG C
23,645	80	>75% Grass cover, Good, HSG D
42,289	72	Weighted Average
42,289		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry,**

Subcatchment DA-4p: DA-4p



Summary for Subcatchment DA-5: DA-5

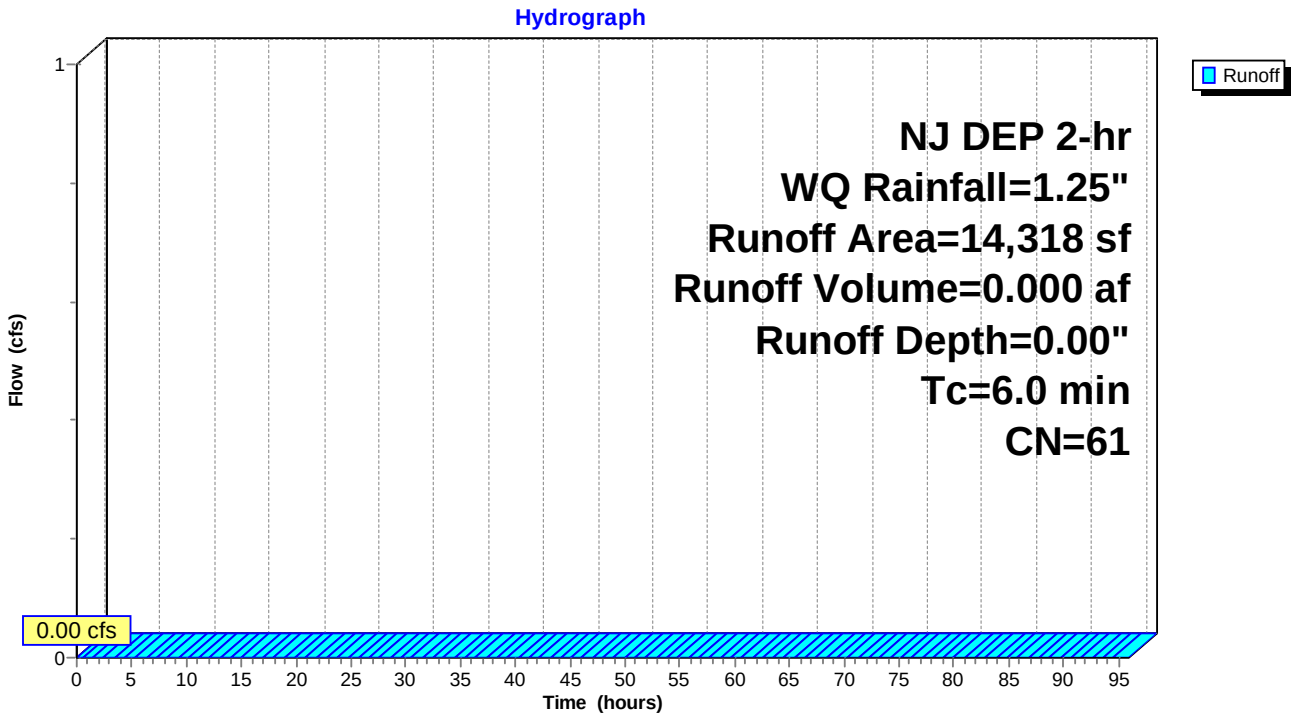
Runoff = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Depth= 0.00"

Runoff by SCS TR-20 method, UH=Delmarva, Weighted-CN, Time Span= 0.00-96.00 hrs, dt= 0.01 hrs
NJ DEP 2-hr WQ Rainfall=1.25"

Area (sf)	CN	Description
14,318	61	>75% Grass cover, Good, HSG B
14,318		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry,**

Subcatchment DA-5: DA-5



Summary for Subcatchment EA-EXi: EA-EXi

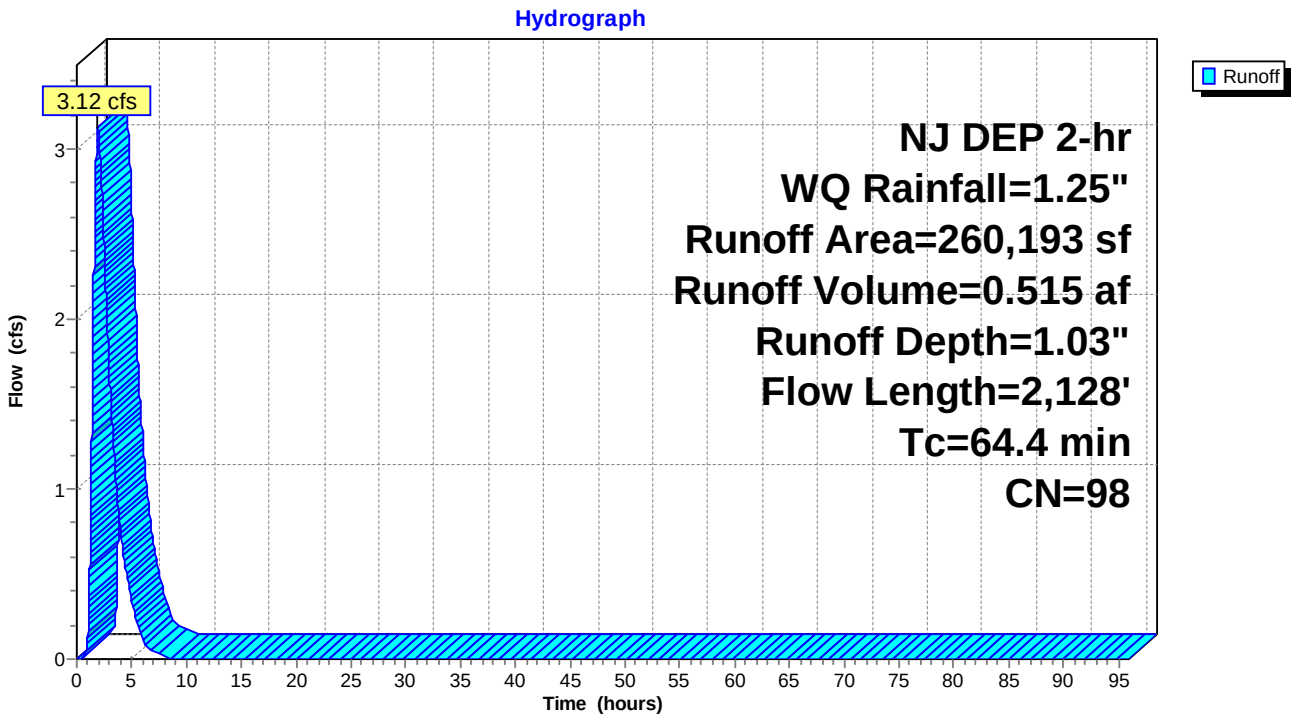
Runoff = 3.12 cfs @ 1.86 hrs, Volume= 0.515 af, Depth= 1.03"

Runoff by SCS TR-20 method, UH=Delmarva, Weighted-CN, Time Span= 0.00-96.00 hrs, dt= 0.01 hrs
NJ DEP 2-hr WQ Rainfall=1.25"

	Area (sf)	CN	Description
*	34,826	98	Roofs
*	92,386	98	Roads
*	20,721	98	Driveways
*	112,260	98	Parking Lot
	260,193	98	Weighted Average
	260,193		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.8	46	0.0100	0.11		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.35"
22.3	54	0.0050	0.04		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.35"
4.4	130	0.0050	0.49		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
1.7	73	0.0200	0.71		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
0.2	24	0.0100	2.03		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
4.4	132	0.0100	0.50		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
0.2	24	0.0100	2.03		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
2.6	132	0.0150	0.86		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
4.5	189	0.0200	0.71		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
1.5	62	0.0100	0.70		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
12.9	388	0.0100	0.50		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
1.2	90	0.0300	1.21		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.9	182	0.0250	3.21		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
0.8	602	0.0136	11.92	84.26	**Pipe Channel,** 36.0" Round Area= 7.1 sf Perim= 9.4' r= 0.75' n= 0.012 Concrete pipe, finished
64.4	2,128	Total			

Subcatchment EA-EXi: EA-EXi



Summary for Subcatchment EA-EXp: EA-EXp

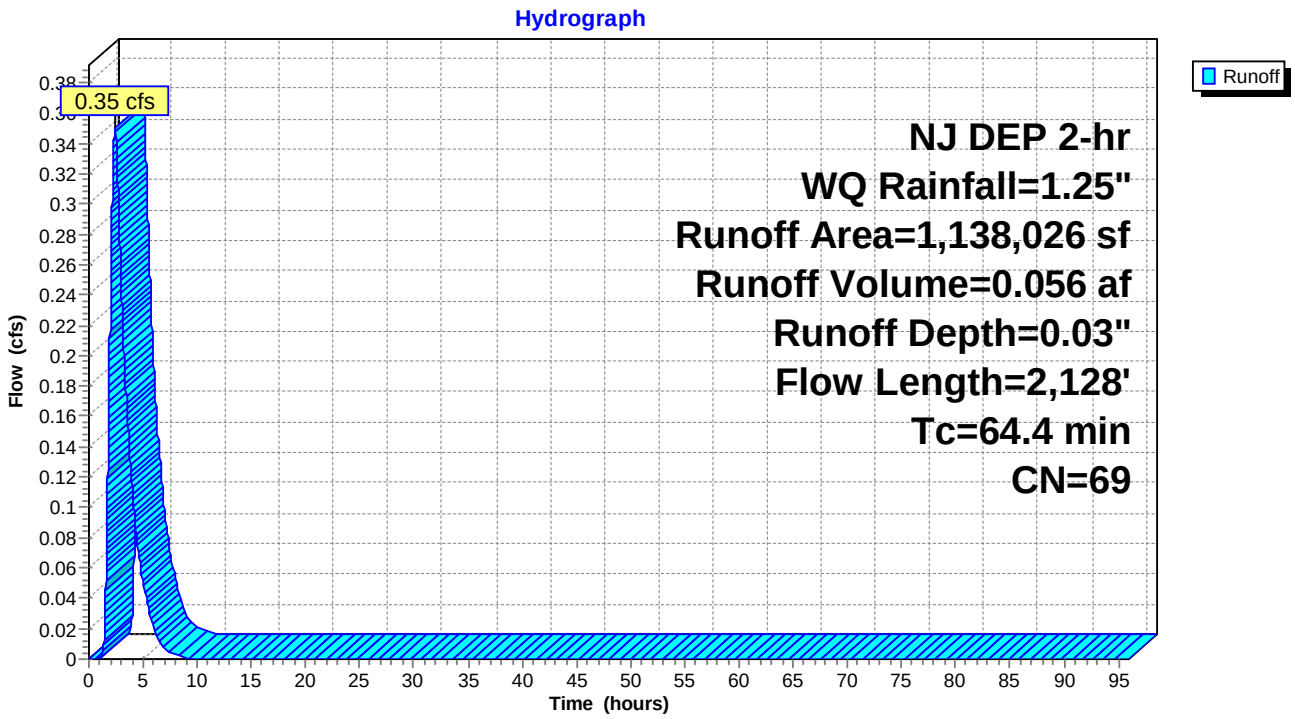
Runoff = 0.35 cfs @ 2.43 hrs, Volume= 0.056 af, Depth= 0.03"

Runoff by SCS TR-20 method, UH=Delmarva, Weighted-CN, Time Span= 0.00-96.00 hrs, dt= 0.01 hrs
NJ DEP 2-hr WQ Rainfall=1.25"

Area (sf)	CN	Description
445,815	70	Woods, Good, HSG C
434,699	74	>75% Grass cover, Good, HSG C
142,152	55	Woods, Good, HSG B
81,203	61	>75% Grass cover, Good, HSG B
34,157	80	>75% Grass cover, Good, HSG D
1,138,026	69	Weighted Average
1,138,026		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.8	46	0.0100	0.11		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.35"
22.3	54	0.0050	0.04		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.35"
4.4	130	0.0050	0.49		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
1.7	73	0.0200	0.71		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
0.2	24	0.0100	2.03		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
4.4	132	0.0100	0.50		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
0.2	24	0.0100	2.03		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
2.6	132	0.0150	0.86		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
4.5	189	0.0200	0.71		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
1.5	62	0.0100	0.70		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
12.9	388	0.0100	0.50		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
1.2	90	0.0300	1.21		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.9	182	0.0250	3.21		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
0.8	602	0.0136	11.92	84.26	**Pipe Channel,** 36.0" Round Area= 7.1 sf Perim= 9.4' r= 0.75' n= 0.012 Concrete pipe, finished
64.4	2,128	Total			

Subcatchment EA-EXp: EA-EXp



Summary for Pond 1P: Underground

Inflow Area =	0.591 ac,100.00% Impervious, Inflow Depth = 1.03" for WQ event				
Inflow =	1.40 cfs @	1.12 hrs,	Volume=	0.051 af	
Outflow =	0.15 cfs @	1.82 hrs,	Volume=	0.051 af,	Atten= 89%, Lag= 42.2 min
Primary =	0.15 cfs @	1.82 hrs,	Volume=	0.051 af	

Routing by Stor-Ind method, Time Span= 0.00-96.00 hrs, dt= 0.01 hrs
Peak Elev= 84.98' @ 1.82 hrs Surf.Area= 0.055 ac Storage= 0.038 af

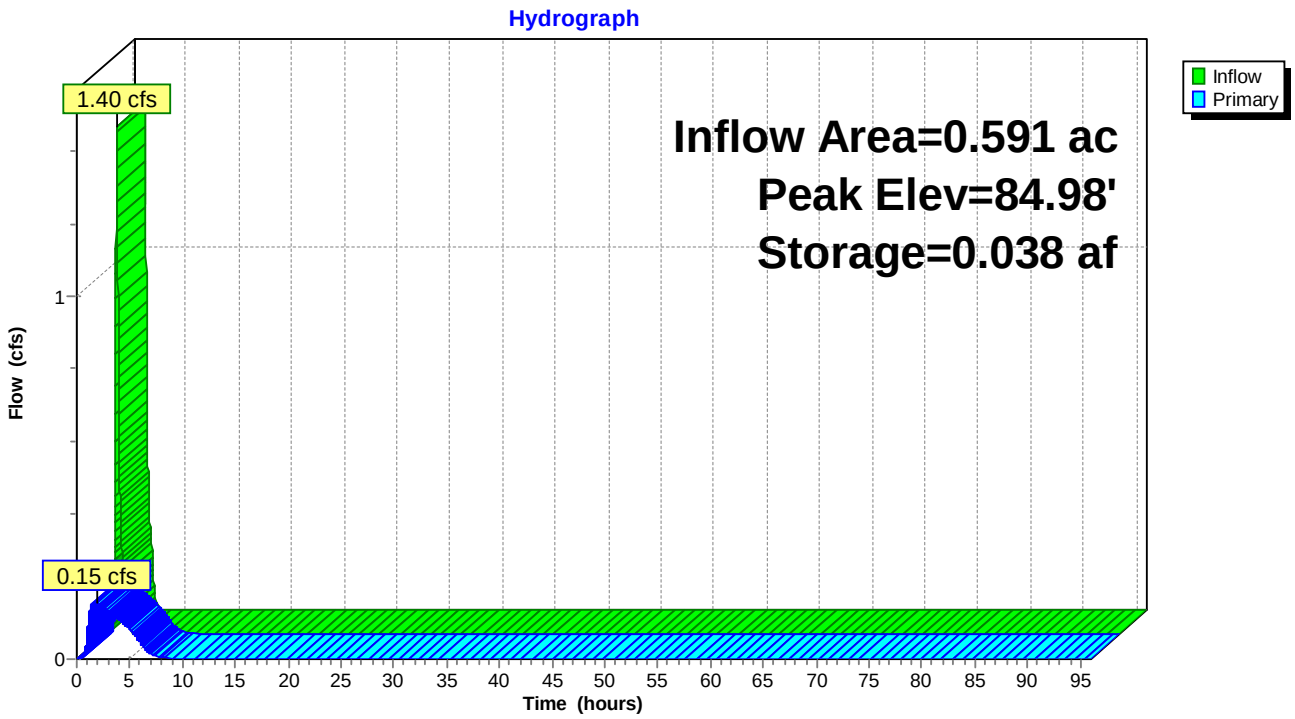
Plug-Flow detention time= 126.7 min calculated for 0.051 af (100% of inflow)
Center-of-Mass det. time= 126.6 min (200.5 - 73.9)

Volume	Invert	Avail.Storage	Storage Description
#1	84.00'	0.202 af	**48.0" Round Pipe Storage** x 5 L= 140.0'

Device	Routing	Invert	Outlet Devices
#1	Primary	84.00'	**15.0" Round Culvert** L= 22.0' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 84.00' / 83.78' S= 0.0100 '/' Cc= 0.900 n= 0.012 Concrete pipe, finished, Flow Area= 1.23 sf
#2	Device 1	84.00'	**2.5" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=0.15 cfs @ 1.82 hrs HW=84.98' (Free Discharge)
└─**1=Culvert** (Passes 0.15 cfs of 2.97 cfs potential flow)
  └─**2=Orifice/Grate** (Orifice Controls 0.15 cfs @ 4.50 fps)

Pond 1P: Underground



Hydrograph for Pond 1P: Underground

Time (hours)	Inflow (cfs)	Storage (acre-feet)	Elevation (feet)	Primary (cfs)
0.00	**0.00**	**0.000**	**84.00**	**0.00**
2.00	**0.08**	**0.037**	**84.96**	**0.15**
4.00	0.00	0.017	84.55	0.11
6.00	0.00	0.003	84.18	0.05
8.00	0.00	0.000	84.05	0.00
10.00	0.00	0.000	84.01	0.00
12.00	0.00	0.000	84.00	0.00
14.00	0.00	0.000	84.00	0.00
16.00	0.00	0.000	84.00	0.00
18.00	0.00	0.000	84.00	0.00
20.00	0.00	0.000	84.00	0.00
22.00	0.00	0.000	84.00	0.00
24.00	0.00	0.000	84.00	0.00
26.00	0.00	0.000	84.00	0.00
28.00	0.00	0.000	84.00	0.00
30.00	0.00	0.000	84.00	0.00
32.00	0.00	0.000	84.00	0.00
34.00	0.00	0.000	84.00	0.00
36.00	0.00	0.000	84.00	0.00
38.00	0.00	0.000	84.00	0.00
40.00	0.00	0.000	84.00	0.00
42.00	0.00	0.000	84.00	0.00
44.00	0.00	0.000	84.00	0.00
46.00	0.00	0.000	84.00	0.00
48.00	0.00	0.000	84.00	0.00
50.00	0.00	0.000	84.00	0.00
52.00	0.00	0.000	84.00	0.00
54.00	0.00	0.000	84.00	0.00
56.00	0.00	0.000	84.00	0.00
58.00	0.00	0.000	84.00	0.00
60.00	0.00	0.000	84.00	0.00
62.00	0.00	0.000	84.00	0.00
64.00	0.00	0.000	84.00	0.00
66.00	0.00	0.000	84.00	0.00
68.00	0.00	0.000	84.00	0.00
70.00	0.00	0.000	84.00	0.00
72.00	0.00	0.000	84.00	0.00
74.00	0.00	0.000	84.00	0.00
76.00	0.00	0.000	84.00	0.00
78.00	0.00	0.000	84.00	0.00
80.00	0.00	0.000	84.00	0.00
82.00	0.00	0.000	84.00	0.00
84.00	0.00	0.000	84.00	0.00
86.00	0.00	0.000	84.00	0.00
88.00	0.00	0.000	84.00	0.00
90.00	0.00	0.000	84.00	0.00
92.00	0.00	0.000	84.00	0.00
94.00	0.00	0.000	84.00	0.00
96.00	0.00	0.000	84.00	0.00

Summary for Pond 2P: BioBasin

Inflow Area = 1.161 ac, 27.50% Impervious, Inflow Depth = 0.31" for WQ event
Inflow = 0.76 cfs @ 1.12 hrs, Volume= 0.030 af
Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Atten= 100%, Lag= 0.0 min
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 0.00-96.00 hrs, dt= 0.01 hrs
Peak Elev= 86.56' @ 2.66 hrs Surf.Area= 2,502 sf Storage= 1,300 cf

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

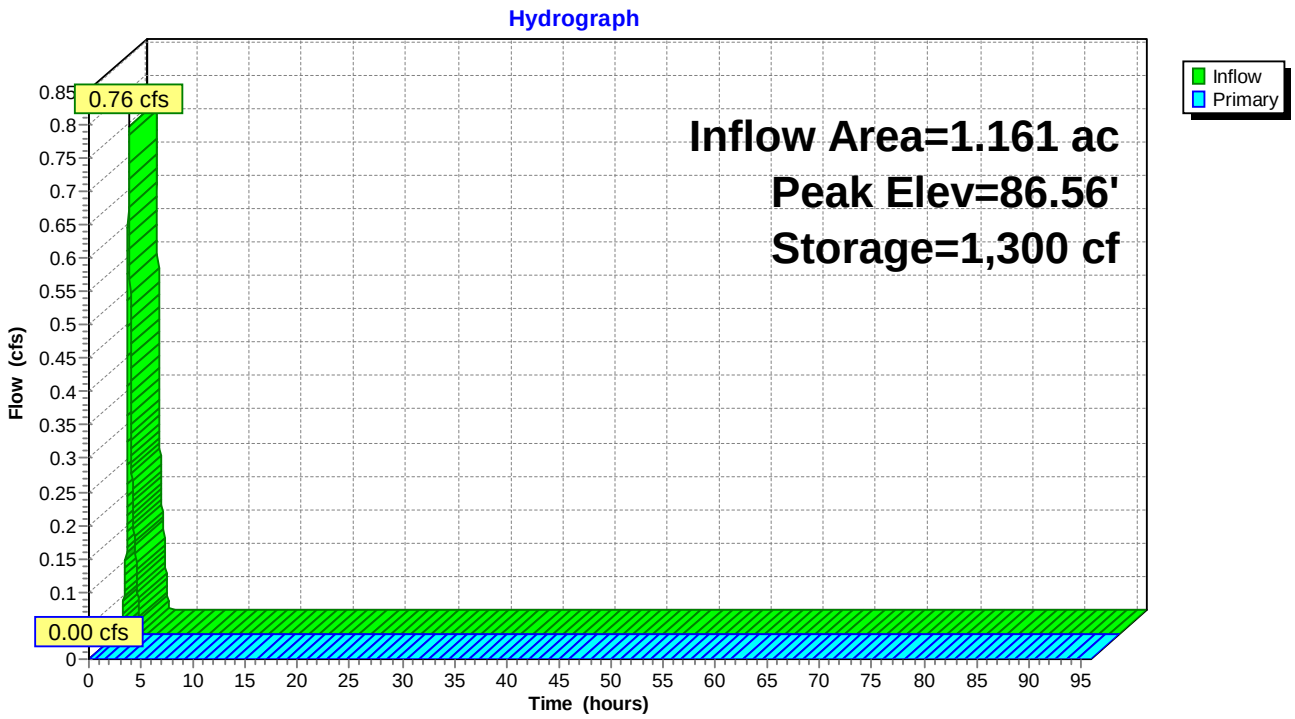
Volume	Invert	Avail.Storage	Storage Description
#1	86.00'	11,525 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
86.00	2,166	0	0
87.00	2,769	2,468	2,468
88.00	3,431	3,100	5,568
89.00	4,147	3,789	9,357
89.50	4,527	2,169	11,525

Device	Routing	Invert	Outlet Devices
#1	Primary	86.00'	**15.0" Round Culvert** L= 139.0' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 86.00' / 84.61' S= 0.0100 '/' Cc= 0.900 n= 0.012 Concrete pipe, finished, Flow Area= 1.23 sf
#2	Device 1	87.93'	**8.0' long x 8.0' 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 3.50 4.00 4.50 5.00 5.50 Coef. (English) 2.43 2.54 2.70 2.69 2.68 2.68 2.66 2.64 2.64 2.64 2.65 2.65 2.66 2.66 2.68 2.70 2.74

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=86.00' (Free Discharge)
└─**1=Culvert** (Controls 0.00 cfs)
  └─**2=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond 2P: BioBasin



Hydrograph for Pond 2P: BioBasin

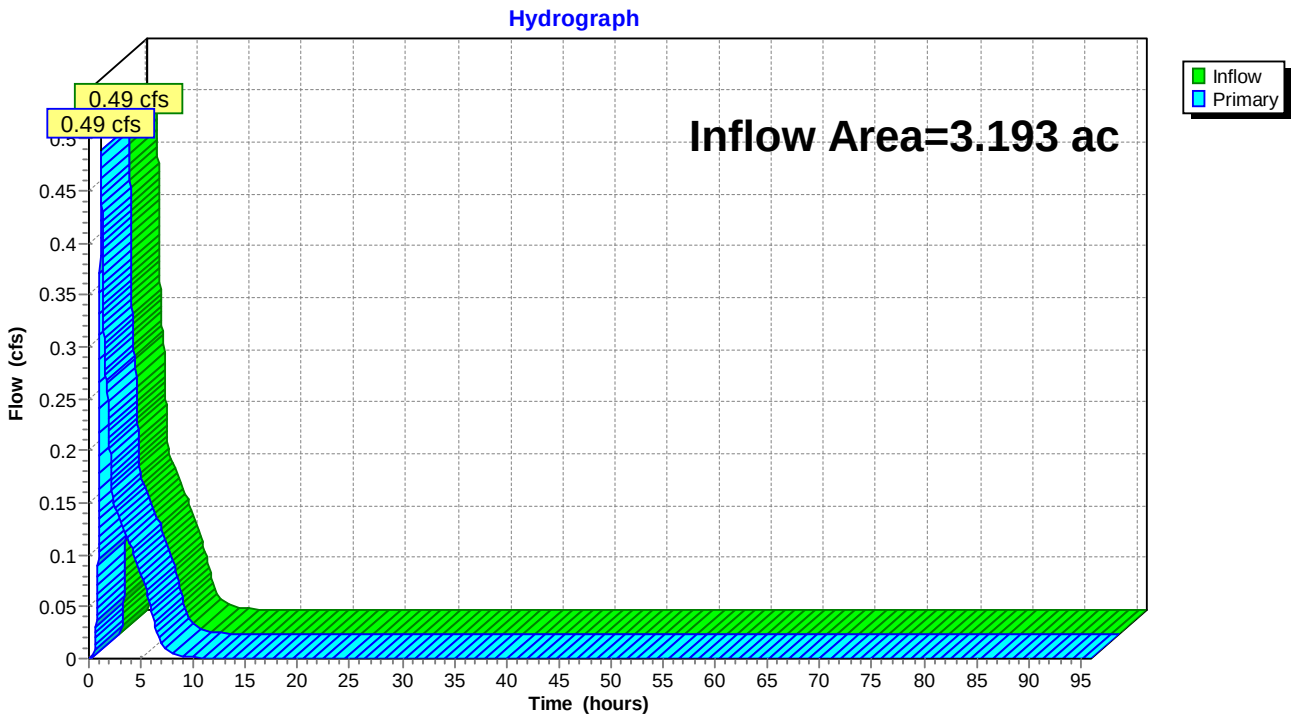
Time (hours)	Inflow (cfs)	Storage (cubic-feet)	Elevation (feet)	Primary (cfs)
0.00	**0.00**	0	86.00	**0.00**
2.00	**0.06**	**1,270**	**86.55**	0.00
4.00	0.00	**1,300**	**86.56**	0.00
6.00	0.00	1,300	86.56	0.00
8.00	0.00	1,300	86.56	0.00
10.00	0.00	1,300	86.56	0.00
12.00	0.00	1,300	86.56	0.00
14.00	0.00	1,300	86.56	0.00
16.00	0.00	1,300	86.56	0.00
18.00	0.00	1,300	86.56	0.00
20.00	0.00	1,300	86.56	0.00
22.00	0.00	1,300	86.56	0.00
24.00	0.00	1,300	86.56	0.00
26.00	0.00	1,300	86.56	0.00
28.00	0.00	1,300	86.56	0.00
30.00	0.00	1,300	86.56	0.00
32.00	0.00	1,300	86.56	0.00
34.00	0.00	1,300	86.56	0.00
36.00	0.00	1,300	86.56	0.00
38.00	0.00	1,300	86.56	0.00
40.00	0.00	1,300	86.56	0.00
42.00	0.00	1,300	86.56	0.00
44.00	0.00	1,300	86.56	0.00
46.00	0.00	1,300	86.56	0.00
48.00	0.00	1,300	86.56	0.00
50.00	0.00	1,300	86.56	0.00
52.00	0.00	1,300	86.56	0.00
54.00	0.00	1,300	86.56	0.00
56.00	0.00	1,300	86.56	0.00
58.00	0.00	1,300	86.56	0.00
60.00	0.00	1,300	86.56	0.00
62.00	0.00	1,300	86.56	0.00
64.00	0.00	1,300	86.56	0.00
66.00	0.00	1,300	86.56	0.00
68.00	0.00	1,300	86.56	0.00
70.00	0.00	1,300	86.56	0.00
72.00	0.00	1,300	86.56	0.00
74.00	0.00	1,300	86.56	0.00
76.00	0.00	1,300	86.56	0.00
78.00	0.00	1,300	86.56	0.00
80.00	0.00	1,300	86.56	0.00
82.00	0.00	1,300	86.56	0.00
84.00	0.00	1,300	86.56	0.00
86.00	0.00	1,300	86.56	0.00
88.00	0.00	1,300	86.56	0.00
90.00	0.00	1,300	86.56	0.00
92.00	0.00	1,300	86.56	0.00
94.00	0.00	1,300	86.56	0.00
96.00	0.00	1,300	86.56	0.00

Summary for Pond 3P: Total

Inflow Area = 3.193 ac, 33.16% Impervious, Inflow Depth = 0.26" for WQ event
Inflow = 0.49 cfs @ 1.14 hrs, Volume= 0.068 af
Primary = 0.49 cfs @ 1.14 hrs, Volume= 0.068 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind method, Time Span= 0.00-96.00 hrs, dt= 0.01 hrs

Pond 3P: Total



Summary for Pond EB: Existing Basin

Inflow Area = 35.620 ac, 19.74% Impervious, Inflow Depth = 0.22" for WQ event
Inflow = 3.53 cfs @ 1.87 hrs, Volume= 0.639 af
Outflow = 0.63 cfs @ 4.61 hrs, Volume= 0.639 af, Atten= 82%, Lag= 164.7 min
Primary = 0.63 cfs @ 4.61 hrs, Volume= 0.639 af

Routing by Stor-Ind method, Time Span= 0.00-96.00 hrs, dt= 0.01 hrs
Peak Elev= 81.44' @ 4.61 hrs Surf.Area= 21,841 sf Storage= 18,530 cf

Plug-Flow detention time= 326.0 min calculated for 0.639 af (100% of inflow)
Center-of-Mass det. time= 326.0 min (492.6 - 166.5)

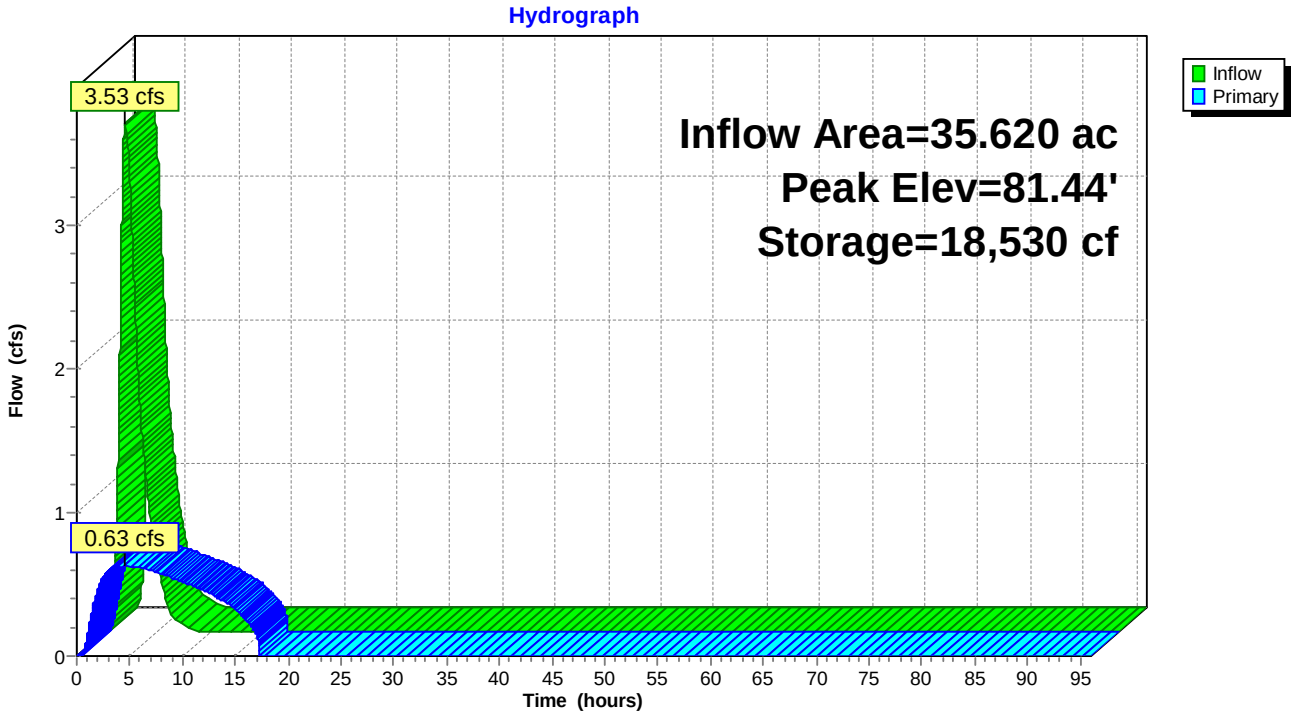
Volume	Invert	Avail.Storage	Storage Description
#1	78.80'	223,129 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
78.80	1	0	0
79.00	16	2	2
80.00	2,181	1,099	1,100
81.00	15,895	9,038	10,138
82.00	29,262	22,579	32,717
83.00	34,004	31,633	64,350
84.00	36,834	35,419	99,769
85.00	39,677	38,256	138,024
86.00	42,533	41,105	179,129
87.00	45,467	44,000	223,129

Device	Routing	Invert	Outlet Devices
#1	Primary	76.60'	**48.0" Round 48" Culvert** L= 50.0' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 76.60' / 76.10' S= 0.0100 '/' Cc= 0.900 n= 0.012 Concrete pipe, finished, Flow Area= 12.57 sf
#2	Device 1	76.60'	**3.0" Vert. 3" Orifice** C= 0.600 Limited to weir flow at low heads
#3	Device 1	81.90'	**42.0" W x 38.5" H Vert. 42" Weir** C= 0.600 Limited to weir flow at low heads
#4	Device 1	85.44'	**16.0' long x 16.0' breadth Outlet Structure Overflow** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.68 2.70 2.70 2.64 2.63 2.64 2.64 2.63
#5	Device 1	78.80'	**15.0" Round Headwall Outlet (15" RCP)** L= 4.0' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 78.80' / 78.30' S= 0.1250 '/' Cc= 0.900 n= 0.012 Concrete pipe, finished, Flow Area= 1.23 sf
#6	Device 5	78.80'	**3.0" Vert. 3" Orifice** C= 0.600 Limited to weir flow at low heads
#7	Device 2	78.80'	**0.500 in/hr Underdrain over Surface area**

Primary OutFlow Max=0.63 cfs @ 4.61 hrs HW=81.44' (Free Discharge)
- **1=48" Culvert** (Passes 0.63 cfs of 97.47 cfs potential flow)
  - **2=3" Orifice** (Passes 0.25 cfs of 0.51 cfs potential flow)
    - **7=Underdrain** (Exfiltration Controls 0.25 cfs)
  - **3=42" Weir** (Controls 0.00 cfs)
  - **4=Outlet Structure Overflow** (Controls 0.00 cfs)
  - **5=Headwall Outlet (15" RCP)** (Passes 0.38 cfs of 8.40 cfs potential flow)
    - **6=3" Orifice** (Orifice Controls 0.38 cfs @ 7.64 fps)

Pond EB: Existing Basin



Hydrograph for Pond EB: Existing Basin

Time (hours)	Inflow (cfs)	Storage (cubic-feet)	Elevation (feet)	Primary (cfs)
0.00	**0.00**	0	78.80	0.00
2.00	**3.53**	6,973	80.78	0.47
4.00	0.97	**18,186**	**81.43**	**0.62**
6.00	0.18	**17,317**	**81.39**	**0.61**
8.00	0.02	13,579	81.20	0.57
10.00	0.00	9,686	80.97	0.52
12.00	0.00	6,183	80.72	0.46
14.00	0.00	3,169	80.41	0.38
16.00	0.00	845	79.87	0.25
18.00	0.00	0	78.80	0.00
20.00	0.00	0	78.80	0.00
22.00	0.00	0	78.80	0.00
24.00	0.00	0	78.80	0.00
26.00	0.00	0	78.80	0.00
28.00	0.00	0	78.80	0.00
30.00	0.00	0	78.80	0.00
32.00	0.00	0	78.80	0.00
34.00	0.00	0	78.80	0.00
36.00	0.00	0	78.80	0.00
38.00	0.00	0	78.80	0.00
40.00	0.00	0	78.80	0.00
42.00	0.00	0	78.80	0.00
44.00	0.00	0	78.80	0.00
46.00	0.00	0	78.80	0.00
48.00	0.00	0	78.80	0.00
50.00	0.00	0	78.80	0.00
52.00	0.00	0	78.80	0.00
54.00	0.00	0	78.80	0.00
56.00	0.00	0	78.80	0.00
58.00	0.00	0	78.80	0.00
60.00	0.00	0	78.80	0.00
62.00	0.00	0	78.80	0.00
64.00	0.00	0	78.80	0.00
66.00	0.00	0	78.80	0.00
68.00	0.00	0	78.80	0.00
70.00	0.00	0	78.80	0.00
72.00	0.00	0	78.80	0.00
74.00	0.00	0	78.80	0.00
76.00	0.00	0	78.80	0.00
78.00	0.00	0	78.80	0.00
80.00	0.00	0	78.80	0.00
82.00	0.00	0	78.80	0.00
84.00	0.00	0	78.80	0.00
86.00	0.00	0	78.80	0.00
88.00	0.00	0	78.80	0.00
90.00	0.00	0	78.80	0.00
92.00	0.00	0	78.80	0.00
94.00	0.00	0	78.80	0.00
96.00	0.00	0	78.80	0.00

Summary for Subcatchment DA-1: DA-1

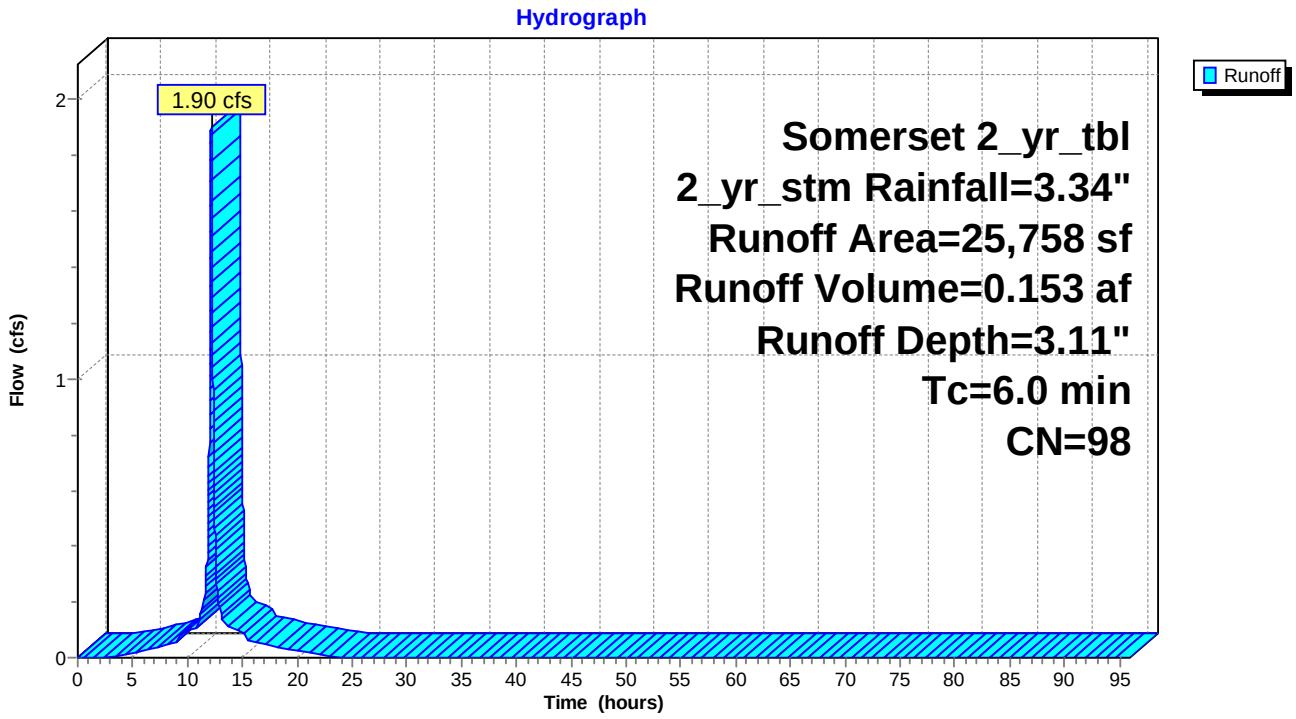
Runoff = 1.90 cfs @ 12.14 hrs, Volume= 0.153 af, Depth= 3.11"

Runoff by SCS TR-20 method, UH=Delmarva, Weighted-CN, Time Span= 0.00-96.00 hrs, dt= 0.01 hrs
Somerset 2_yr_tbl 2_yr_stm Rainfall=3.34"

Area (sf)	CN	Description
25,758	98	Roofs, HSG D
25,758		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry,**

Subcatchment DA-1: DA-1



Summary for Subcatchment DA-2i: DA-2i

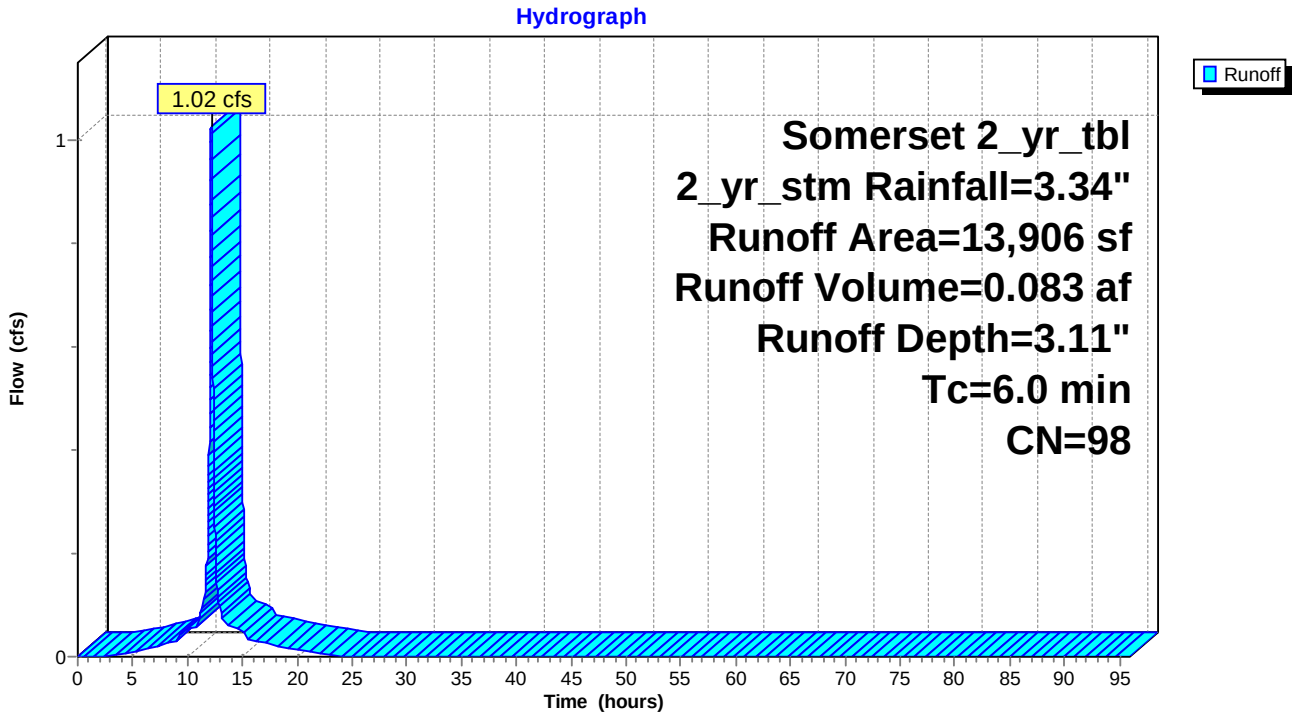
Runoff = 1.02 cfs @ 12.14 hrs, Volume= 0.083 af, Depth= 3.11"

Runoff by SCS TR-20 method, UH=Delmarva, Weighted-CN, Time Span= 0.00-96.00 hrs, dt= 0.01 hrs
Somerset 2_yr_tbl 2_yr_stm Rainfall=3.34"

	Area (sf)	CN	Description
*	2,940	98	Sidewalks, HSG C
	9,656	98	Paved parking, HSG C
*	649	98	Hardscape, HSG C
*	661	98	Hardscape, HSG B
	13,906	98	Weighted Average
	13,906		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry,**

Subcatchment DA-2i: DA-2i



Summary for Subcatchment DA-2p: DA-2p

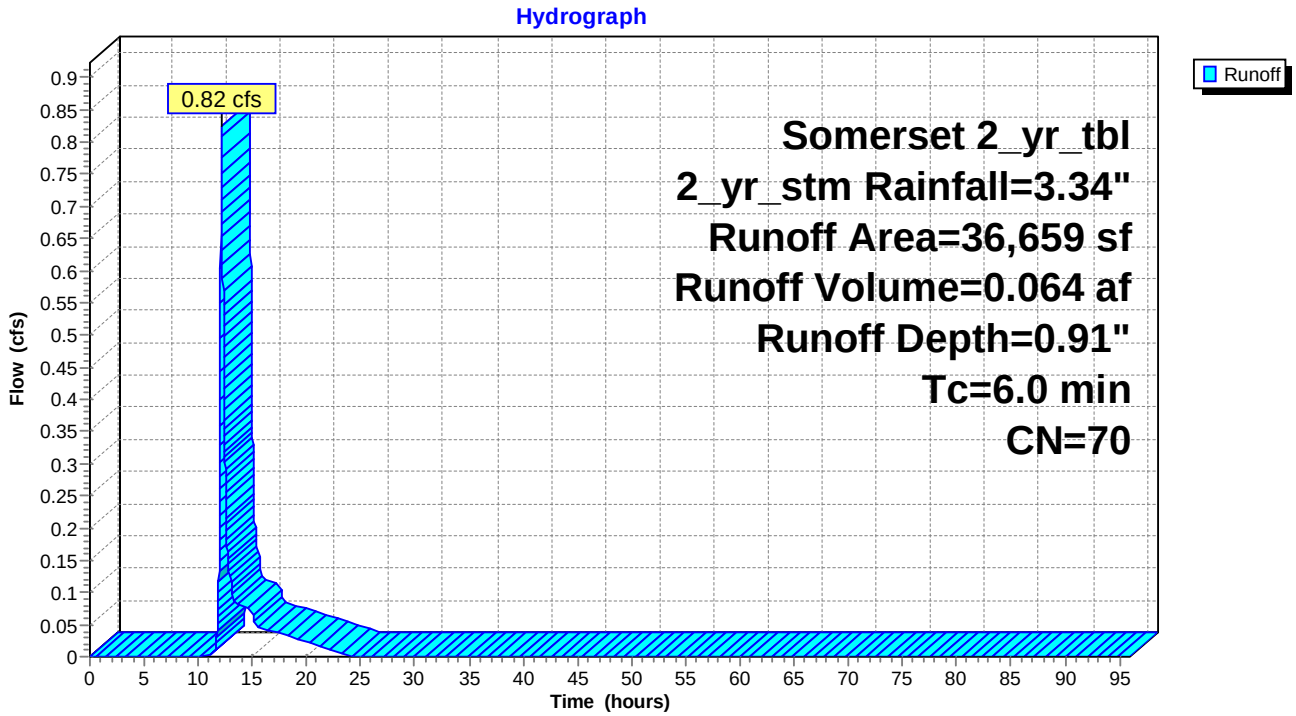
Runoff = 0.82 cfs @ 12.15 hrs, Volume= 0.064 af, Depth= 0.91"

Runoff by SCS TR-20 method, UH=Delmarva, Weighted-CN, Time Span= 0.00-96.00 hrs, dt= 0.01 hrs
Somerset 2_yr_tbl 2_yr_stm Rainfall=3.34"

Area (sf)	CN	Description
5,773	61	>75% Grass cover, Good, HSG B
5,981	74	>75% Grass cover, Good, HSG C
14,003	80	>75% Grass cover, Good, HSG D
10,902	61	>75% Grass cover, Good, HSG B
36,659	70	Weighted Average
36,659		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry,**

Subcatchment DA-2p: DA-2p



Summary for Subcatchment DA-3: DA-3

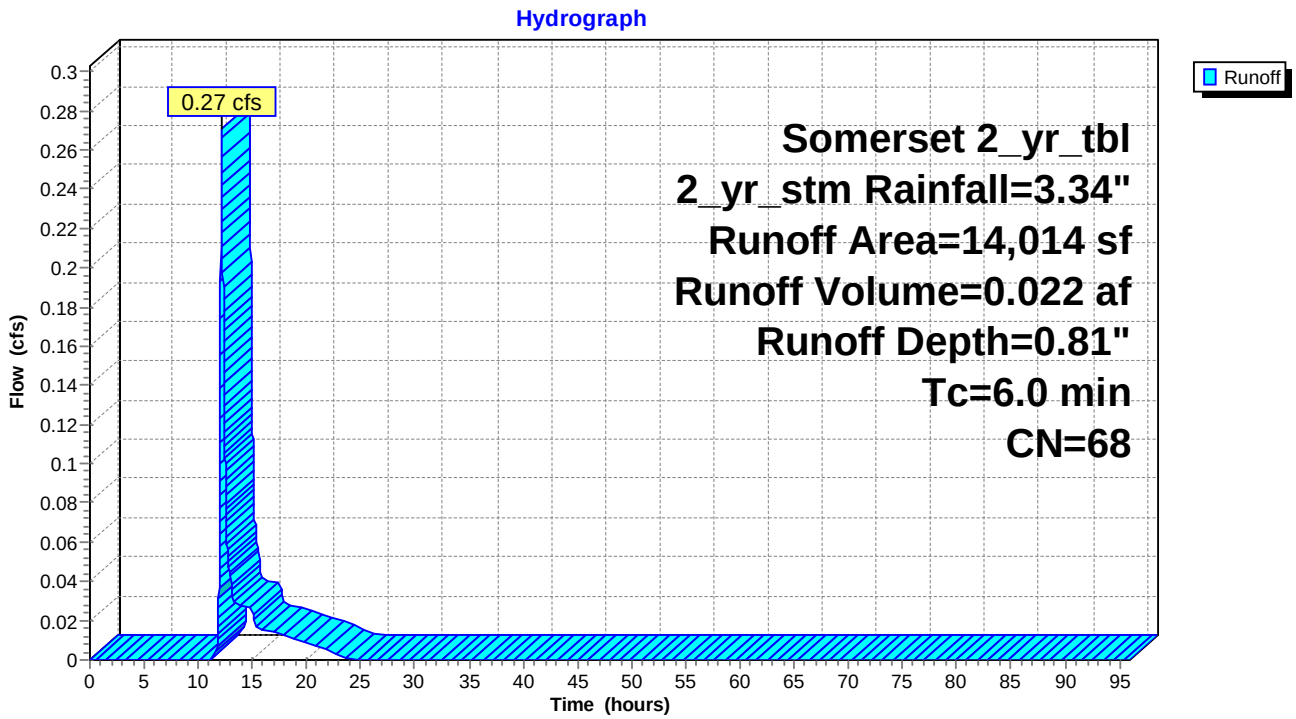
Runoff = 0.27 cfs @ 12.15 hrs, Volume= 0.022 af, Depth= 0.81"

Runoff by SCS TR-20 method, UH=Delmarva, Weighted-CN, Time Span= 0.00-96.00 hrs, dt= 0.01 hrs
Somerset 2_yr_tbl 2_yr_stm Rainfall=3.34"

	Area (sf)	CN	Description
*	4,993	80	>75% Grass cover, Good, HSG D
	9,021	61	>75% Grass cover, Good, HSG B
	14,014	68	Weighted Average
	14,014		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry,**

Subcatchment DA-3: DA-3



Summary for Subcatchment DA-4i: DA-4i

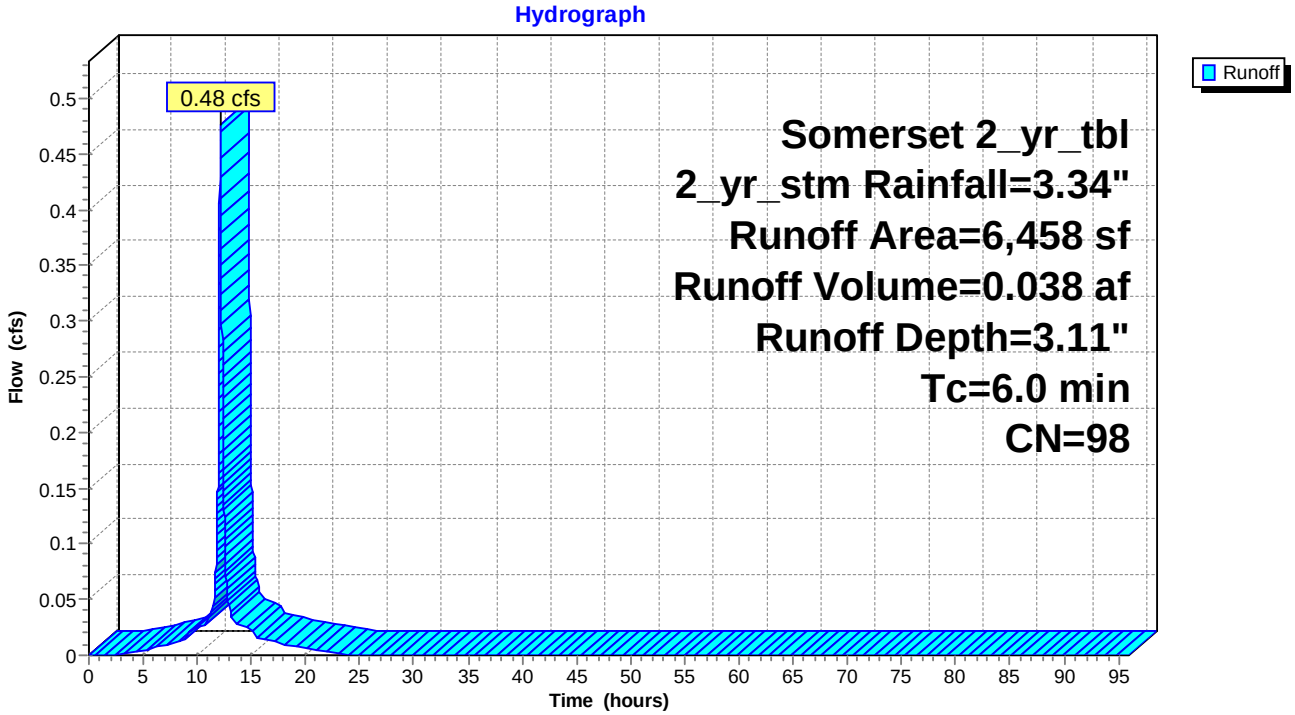
Runoff = 0.48 cfs @ 12.14 hrs, Volume= 0.038 af, Depth= 3.11"

Runoff by SCS TR-20 method, UH=Delmarva, Weighted-CN, Time Span= 0.00-96.00 hrs, dt= 0.01 hrs
Somerset 2_yr_tbl 2_yr_stm Rainfall=3.34"

	Area (sf)	CN	Description
	2,779	98	Paved parking, HSG C
*	3,419	98	Sidewalks, HSG C
*	260	98	Hardscapes, HSG C
	6,458	98	Weighted Average
	6,458		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry,**

Subcatchment DA-4i: DA-4i



Summary for Subcatchment DA-4p: DA-4p

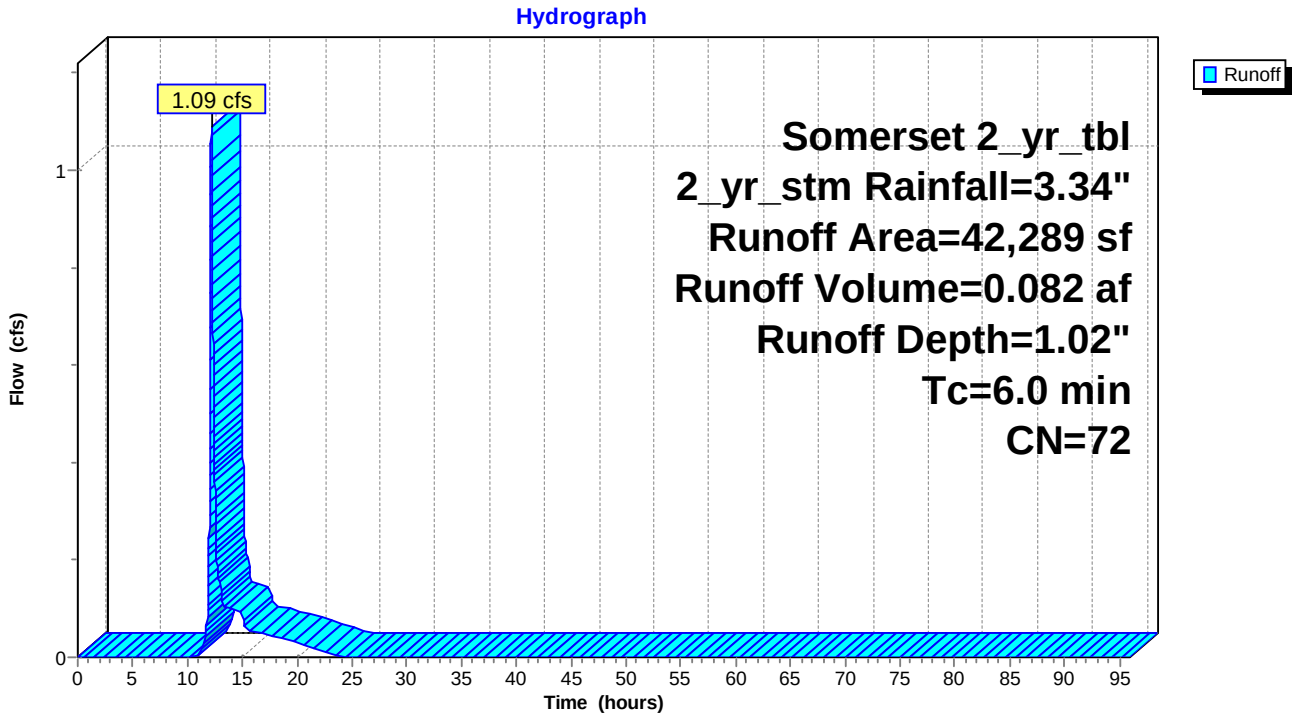
Runoff = 1.09 cfs @ 12.15 hrs, Volume= 0.082 af, Depth= 1.02"

Runoff by SCS TR-20 method, UH=Delmarva, Weighted-CN, Time Span= 0.00-96.00 hrs, dt= 0.01 hrs
Somerset 2_yr_tbl 2_yr_stm Rainfall=3.34"

Area (sf)	CN	Description
16,312	61	>75% Grass cover, Good, HSG B
2,332	74	>75% Grass cover, Good, HSG C
23,645	80	>75% Grass cover, Good, HSG D
42,289	72	Weighted Average
42,289		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry,**

Subcatchment DA-4p: DA-4p



Summary for Subcatchment DA-5: DA-5

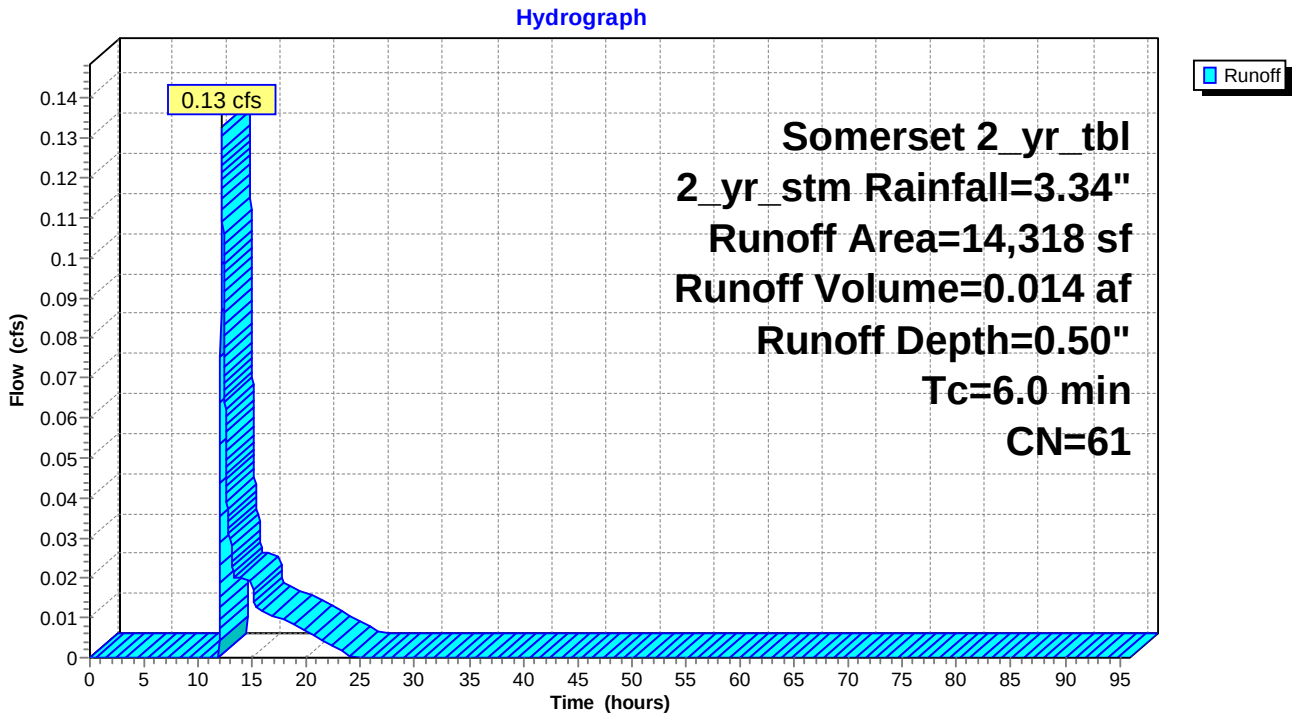
Runoff = 0.13 cfs @ 12.16 hrs, Volume= 0.014 af, Depth= 0.50"

Runoff by SCS TR-20 method, UH=Delmarva, Weighted-CN, Time Span= 0.00-96.00 hrs, dt= 0.01 hrs
Somerset 2_yr_tbl 2_yr_stm Rainfall=3.34"

Area (sf)	CN	Description
14,318	61	>75% Grass cover, Good, HSG B
14,318		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry,**

Subcatchment DA-5: DA-5



Summary for Subcatchment EA-EXi: EA-EXi

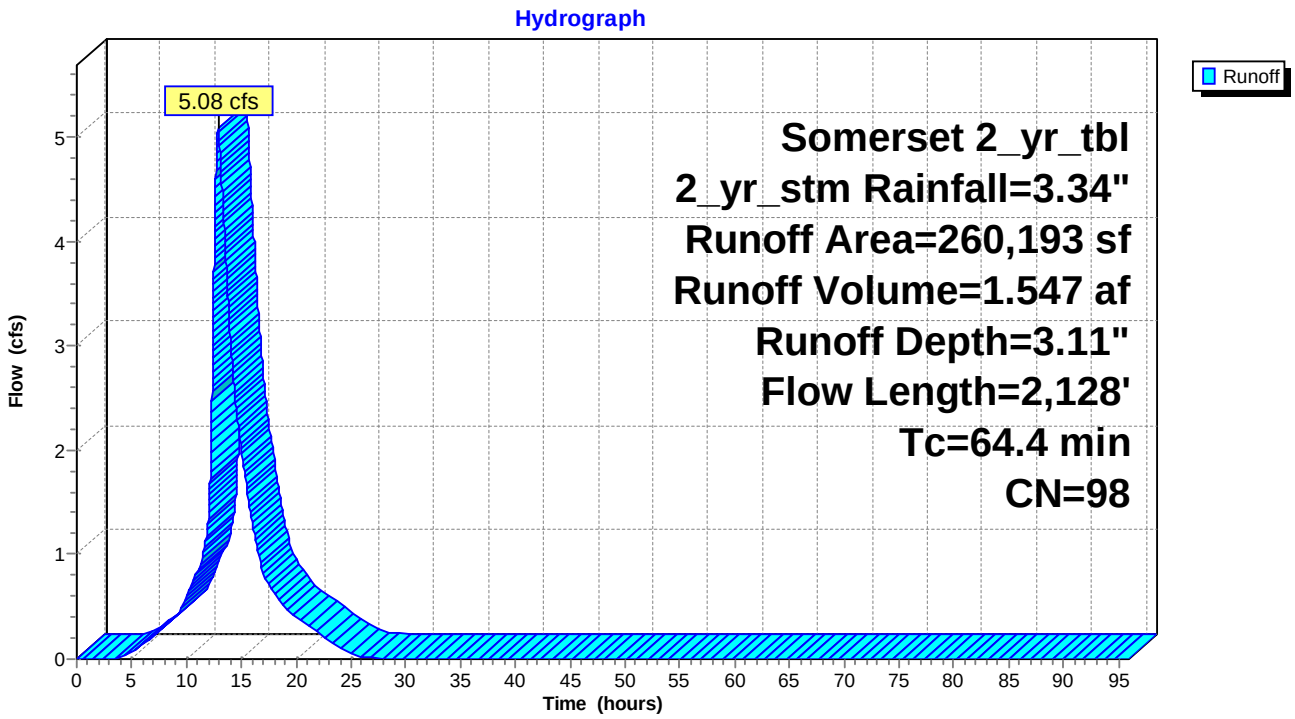
Runoff = 5.08 cfs @ 12.88 hrs, Volume= 1.547 af, Depth= 3.11"

Runoff by SCS TR-20 method, UH=Delmarva, Weighted-CN, Time Span= 0.00-96.00 hrs, dt= 0.01 hrs
Somerset 2_yr_tbl 2_yr_stm Rainfall=3.34"

	Area (sf)	CN	Description
*	34,826	98	Roofs
*	92,386	98	Roads
*	20,721	98	Driveways
*	112,260	98	Parking Lot
	260,193	98	Weighted Average
	260,193		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.8	46	0.0100	0.11		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.35"
22.3	54	0.0050	0.04		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.35"
4.4	130	0.0050	0.49		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
1.7	73	0.0200	0.71		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
0.2	24	0.0100	2.03		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
4.4	132	0.0100	0.50		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
0.2	24	0.0100	2.03		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
2.6	132	0.0150	0.86		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
4.5	189	0.0200	0.71		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
1.5	62	0.0100	0.70		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
12.9	388	0.0100	0.50		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
1.2	90	0.0300	1.21		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.9	182	0.0250	3.21		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
0.8	602	0.0136	11.92	84.26	**Pipe Channel,** 36.0" Round Area= 7.1 sf Perim= 9.4' r= 0.75' n= 0.012 Concrete pipe, finished
64.4	2,128	Total			

Subcatchment EA-EXi: EA-EXi



Summary for Subcatchment EA-EXp: EA-EXp

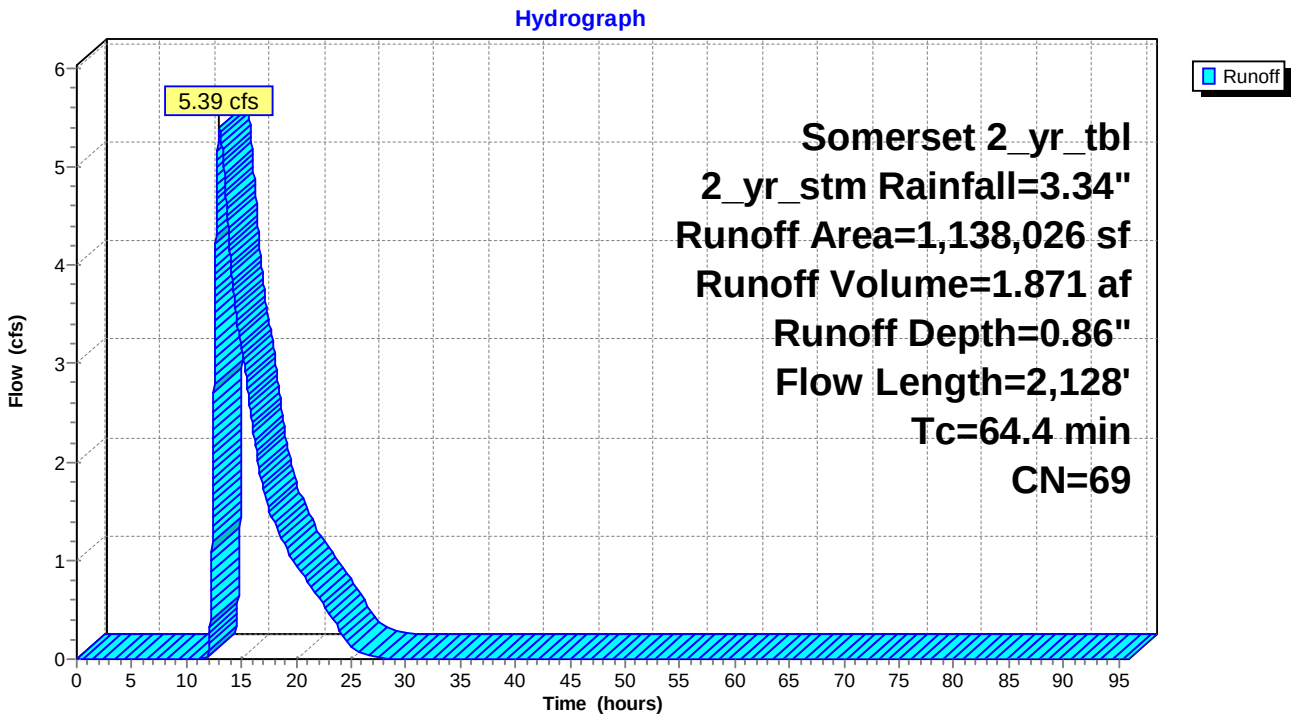
Runoff = 5.39 cfs @ 13.02 hrs, Volume= 1.871 af, Depth= 0.86"

Runoff by SCS TR-20 method, UH=Delmarva, Weighted-CN, Time Span= 0.00-96.00 hrs, dt= 0.01 hrs
Somerset 2_yr_tbl 2_yr_stm Rainfall=3.34"

Area (sf)	CN	Description
445,815	70	Woods, Good, HSG C
434,699	74	>75% Grass cover, Good, HSG C
142,152	55	Woods, Good, HSG B
81,203	61	>75% Grass cover, Good, HSG B
34,157	80	>75% Grass cover, Good, HSG D
1,138,026	69	Weighted Average
1,138,026		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.8	46	0.0100	0.11		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.35"
22.3	54	0.0050	0.04		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.35"
4.4	130	0.0050	0.49		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
1.7	73	0.0200	0.71		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
0.2	24	0.0100	2.03		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
4.4	132	0.0100	0.50		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
0.2	24	0.0100	2.03		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
2.6	132	0.0150	0.86		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
4.5	189	0.0200	0.71		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
1.5	62	0.0100	0.70		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
12.9	388	0.0100	0.50		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
1.2	90	0.0300	1.21		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.9	182	0.0250	3.21		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
0.8	602	0.0136	11.92	84.26	**Pipe Channel,** 36.0" Round Area= 7.1 sf Perim= 9.4' r= 0.75' n= 0.012 Concrete pipe, finished
64.4	2,128	Total			

Subcatchment EA-EXp: EA-EXp



Summary for Pond 1P: Underground

Inflow Area = 0.591 ac,100.00% Impervious, Inflow Depth = 3.11" for 2_yr_stm event
Inflow = 1.90 cfs @ 12.14 hrs, Volume= 0.153 af
Outflow = 0.19 cfs @ 12.87 hrs, Volume= 0.153 af, Atten= 90%, Lag= 43.8 min
Primary = 0.19 cfs @ 12.87 hrs, Volume= 0.153 af

Routing by Stor-Ind method, Time Span= 0.00-96.00 hrs, dt= 0.01 hrs
Peak Elev= 85.46' @ 12.87 hrs Surf.Area= 0.062 ac Storage= 0.067 af

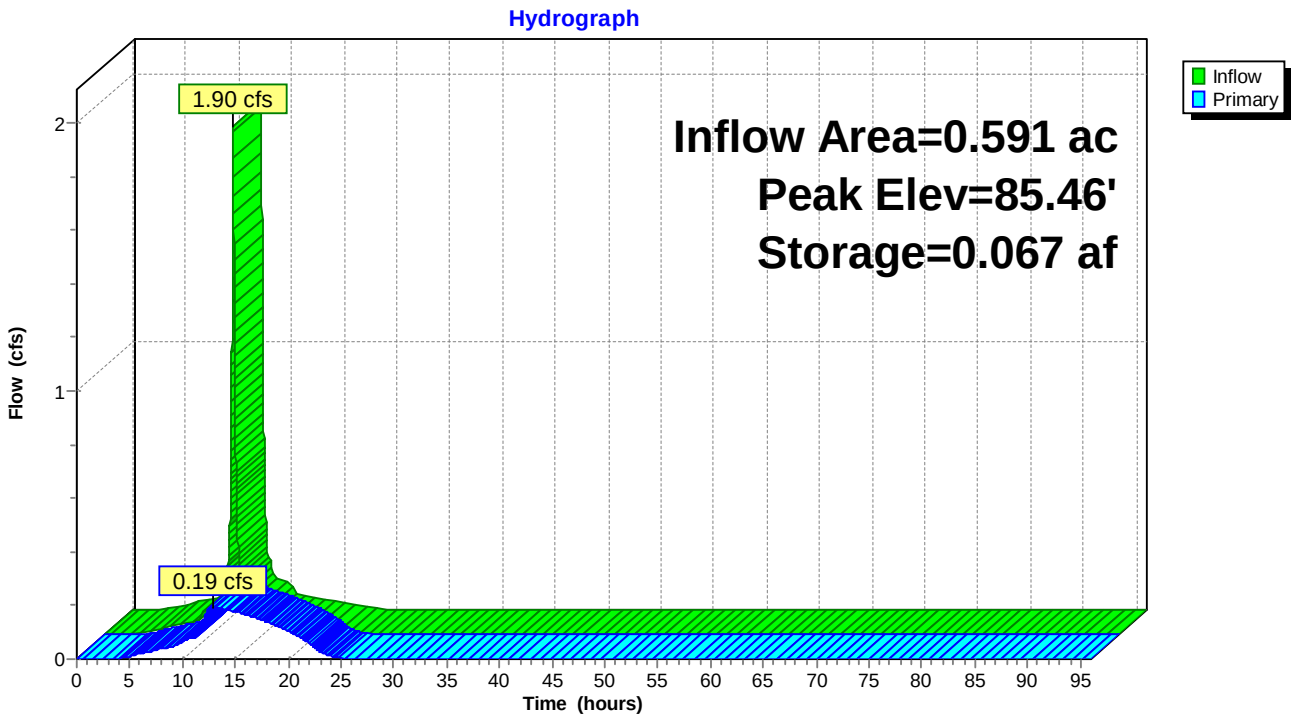
Plug-Flow detention time= 159.4 min calculated for 0.153 af (100% of inflow)
Center-of-Mass det. time= 159.4 min (915.6 - 756.2)

Volume	Invert	Avail.Storage	Storage Description
#1	84.00'	0.202 af	**48.0" Round Pipe Storage** x 5 L= 140.0'

Device	Routing	Invert	Outlet Devices
#1	Primary	84.00'	**15.0" Round Culvert** L= 22.0' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 84.00' / 83.78' S= 0.0100 '/' Cc= 0.900 n= 0.012 Concrete pipe, finished, Flow Area= 1.23 sf
#2	Device 1	84.00'	**2.5" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=0.19 cfs @ 12.87 hrs HW=85.46' (Free Discharge)
└─**1=Culvert** (Passes 0.19 cfs of 5.17 cfs potential flow)
  └─**2=Orifice/Grate** (Orifice Controls 0.19 cfs @ 5.61 fps)

Pond 1P: Underground



Hydrograph for Pond 1P: Underground

Time (hours)	Inflow (cfs)	Storage (acre-feet)	Elevation (feet)	Primary (cfs)
0.00	0.00	0.000	84.00	0.00
2.00	0.00	0.000	84.00	0.00
4.00	0.01	0.000	84.03	0.00
6.00	0.03	0.001	84.11	0.02
8.00	0.05	0.003	84.16	0.04
10.00	0.10	0.006	84.27	0.07
12.00	**0.97**	**0.024**	**84.70**	**0.13**
14.00	**0.11**	**0.061**	**85.37**	**0.19**
16.00	0.06	0.046	85.12	0.17
18.00	0.04	0.029	84.81	0.14
20.00	0.03	0.015	84.51	0.10
22.00	0.01	0.005	84.23	0.06
24.00	0.00	0.001	84.08	0.01
26.00	0.00	0.000	84.02	0.00
28.00	0.00	0.000	84.00	0.00
30.00	0.00	0.000	84.00	0.00
32.00	0.00	0.000	84.00	0.00
34.00	0.00	0.000	84.00	0.00
36.00	0.00	0.000	84.00	0.00
38.00	0.00	0.000	84.00	0.00
40.00	0.00	0.000	84.00	0.00
42.00	0.00	0.000	84.00	0.00
44.00	0.00	0.000	84.00	0.00
46.00	0.00	0.000	84.00	0.00
48.00	0.00	0.000	84.00	0.00
50.00	0.00	0.000	84.00	0.00
52.00	0.00	0.000	84.00	0.00
54.00	0.00	0.000	84.00	0.00
56.00	0.00	0.000	84.00	0.00
58.00	0.00	0.000	84.00	0.00
60.00	0.00	0.000	84.00	0.00
62.00	0.00	0.000	84.00	0.00
64.00	0.00	0.000	84.00	0.00
66.00	0.00	0.000	84.00	0.00
68.00	0.00	0.000	84.00	0.00
70.00	0.00	0.000	84.00	0.00
72.00	0.00	0.000	84.00	0.00
74.00	0.00	0.000	84.00	0.00
76.00	0.00	0.000	84.00	0.00
78.00	0.00	0.000	84.00	0.00
80.00	0.00	0.000	84.00	0.00
82.00	0.00	0.000	84.00	0.00
84.00	0.00	0.000	84.00	0.00
86.00	0.00	0.000	84.00	0.00
88.00	0.00	0.000	84.00	0.00
90.00	0.00	0.000	84.00	0.00
92.00	0.00	0.000	84.00	0.00
94.00	0.00	0.000	84.00	0.00
96.00	0.00	0.000	84.00	0.00

Summary for Pond 2P: BioBasin

Inflow Area = 1.161 ac, 27.50% Impervious, Inflow Depth = 1.51" for 2_yr_stm event
Inflow = 1.84 cfs @ 12.15 hrs, Volume= 0.147 af
Outflow = 0.06 cfs @ 17.16 hrs, Volume= 0.024 af, Atten= 97%, Lag= 301.0 min
Primary = 0.06 cfs @ 17.16 hrs, Volume= 0.024 af

Routing by Stor-Ind method, Time Span= 0.00-96.00 hrs, dt= 0.01 hrs
Peak Elev= 87.95' @ 17.16 hrs Surf.Area= 3,397 sf Storage= 5,393 cf

Plug-Flow detention time= 571.1 min calculated for 0.024 af (17% of inflow)
Center-of-Mass det. time= 346.8 min (1,150.3 - 803.5)

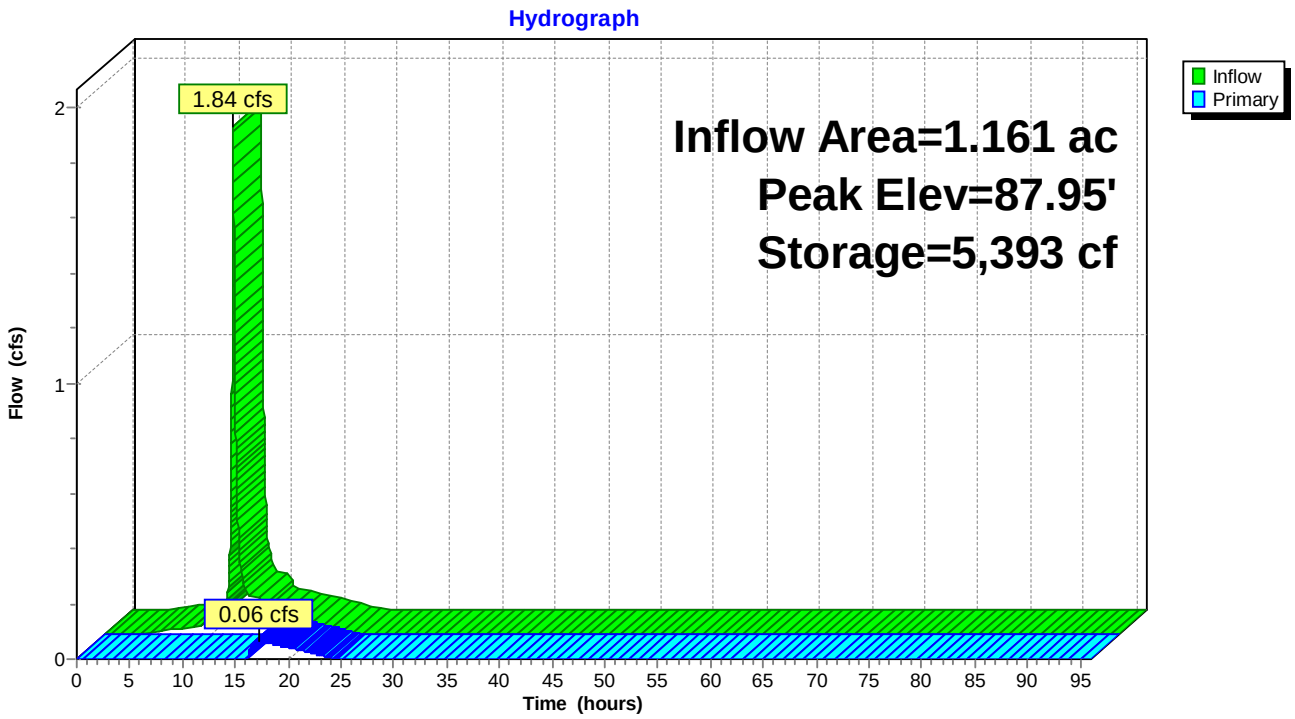
Volume	Invert	Avail.Storage	Storage Description
#1	86.00'	11,525 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
86.00	2,166	0	0
87.00	2,769	2,468	2,468
88.00	3,431	3,100	5,568
89.00	4,147	3,789	9,357
89.50	4,527	2,169	11,525

Device	Routing	Invert	Outlet Devices
#1	Primary	86.00'	**15.0" Round Culvert** L= 139.0' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 86.00' / 84.61' S= 0.0100 '/' Cc= 0.900 n= 0.012 Concrete pipe, finished, Flow Area= 1.23 sf
#2	Device 1	87.93'	**8.0' long x 8.0' 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 3.50 4.00 4.50 5.00 5.50 Coef. (English) 2.43 2.54 2.70 2.69 2.68 2.68 2.66 2.64 2.64 2.64 2.65 2.65 2.66 2.66 2.68 2.70 2.74

Primary OutFlow Max=0.05 cfs @ 17.16 hrs HW=87.95' (Free Discharge)
└─**1=Culvert** (Passes 0.05 cfs of 6.80 cfs potential flow)
└─**2=Broad-Crested Rectangular Weir** (Weir Controls 0.05 cfs @ 0.34 fps)

Pond 2P: BioBasin



Hydrograph for Pond 2P: BioBasin

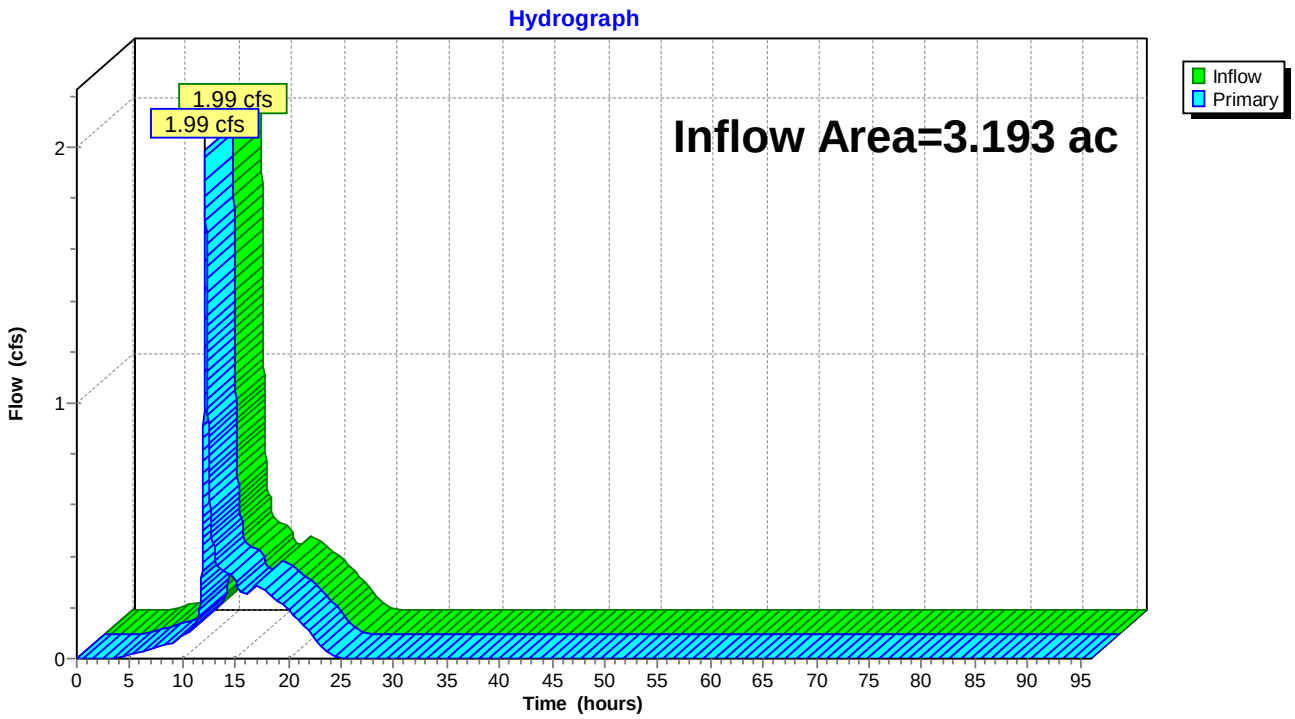
Time (hours)	Inflow (cfs)	Storage (cubic-feet)	Elevation (feet)	Primary (cfs)
0.00	0.00	0	86.00	0.00
2.00	0.00	0	86.00	0.00
4.00	0.00	9	86.00	0.00
6.00	0.01	78	86.04	0.00
8.00	0.02	219	86.10	0.00
10.00	0.05	483	86.22	0.00
12.00	**0.78**	1,353	86.58	0.00
14.00	**0.14**	4,489	87.68	0.00
16.00	0.07	**5,271**	**87.91**	**0.00**
18.00	0.06	**5,388**	**87.95**	**0.06**
20.00	0.04	5,371	87.94	0.04
22.00	0.02	5,352	87.94	0.02
24.00	0.00	5,333	87.93	0.00
26.00	0.00	5,329	87.93	0.00
28.00	0.00	5,329	87.93	0.00
30.00	0.00	5,329	87.93	0.00
32.00	0.00	5,329	87.93	0.00
34.00	0.00	5,329	87.93	0.00
36.00	0.00	5,329	87.93	0.00
38.00	0.00	5,329	87.93	0.00
40.00	0.00	5,329	87.93	0.00
42.00	0.00	5,329	87.93	0.00
44.00	0.00	5,329	87.93	0.00
46.00	0.00	5,329	87.93	0.00
48.00	0.00	5,329	87.93	0.00
50.00	0.00	5,329	87.93	0.00
52.00	0.00	5,329	87.93	0.00
54.00	0.00	5,329	87.93	0.00
56.00	0.00	5,329	87.93	0.00
58.00	0.00	5,329	87.93	0.00
60.00	0.00	5,329	87.93	0.00
62.00	0.00	5,329	87.93	0.00
64.00	0.00	5,329	87.93	0.00
66.00	0.00	5,329	87.93	0.00
68.00	0.00	5,329	87.93	0.00
70.00	0.00	5,329	87.93	0.00
72.00	0.00	5,329	87.93	0.00
74.00	0.00	5,329	87.93	0.00
76.00	0.00	5,329	87.93	0.00
78.00	0.00	5,329	87.93	0.00
80.00	0.00	5,329	87.93	0.00
82.00	0.00	5,329	87.93	0.00
84.00	0.00	5,329	87.93	0.00
86.00	0.00	5,329	87.93	0.00
88.00	0.00	5,329	87.93	0.00
90.00	0.00	5,329	87.93	0.00
92.00	0.00	5,329	87.93	0.00
94.00	0.00	5,329	87.93	0.00
96.00	0.00	5,329	87.93	0.00

Summary for Pond 3P: Total

Inflow Area = 3.193 ac, 33.16% Impervious, Inflow Depth = 1.20" for 2_yr_stm event
Inflow = 1.99 cfs @ 12.15 hrs, Volume= 0.320 af
Primary = 1.99 cfs @ 12.15 hrs, Volume= 0.320 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind method, Time Span= 0.00-96.00 hrs, dt= 0.01 hrs

Pond 3P: Total



Summary for Pond EB: Existing Basin

Inflow Area = 35.620 ac, 19.74% Impervious, Inflow Depth = 1.26" for 2_yr_stm event
Inflow = 10.83 cfs @ 12.89 hrs, Volume= 3.752 af
Outflow = 6.66 cfs @ 14.34 hrs, Volume= 3.752 af, Atten= 38%, Lag= 86.8 min
Primary = 6.66 cfs @ 14.34 hrs, Volume= 3.752 af

Routing by Stor-Ind method, Time Span= 0.00-96.00 hrs, dt= 0.01 hrs
Peak Elev= 82.55' @ 14.34 hrs Surf.Area= 31,851 sf Storage= 49,398 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 253.9 min (1,160.1 - 906.2)

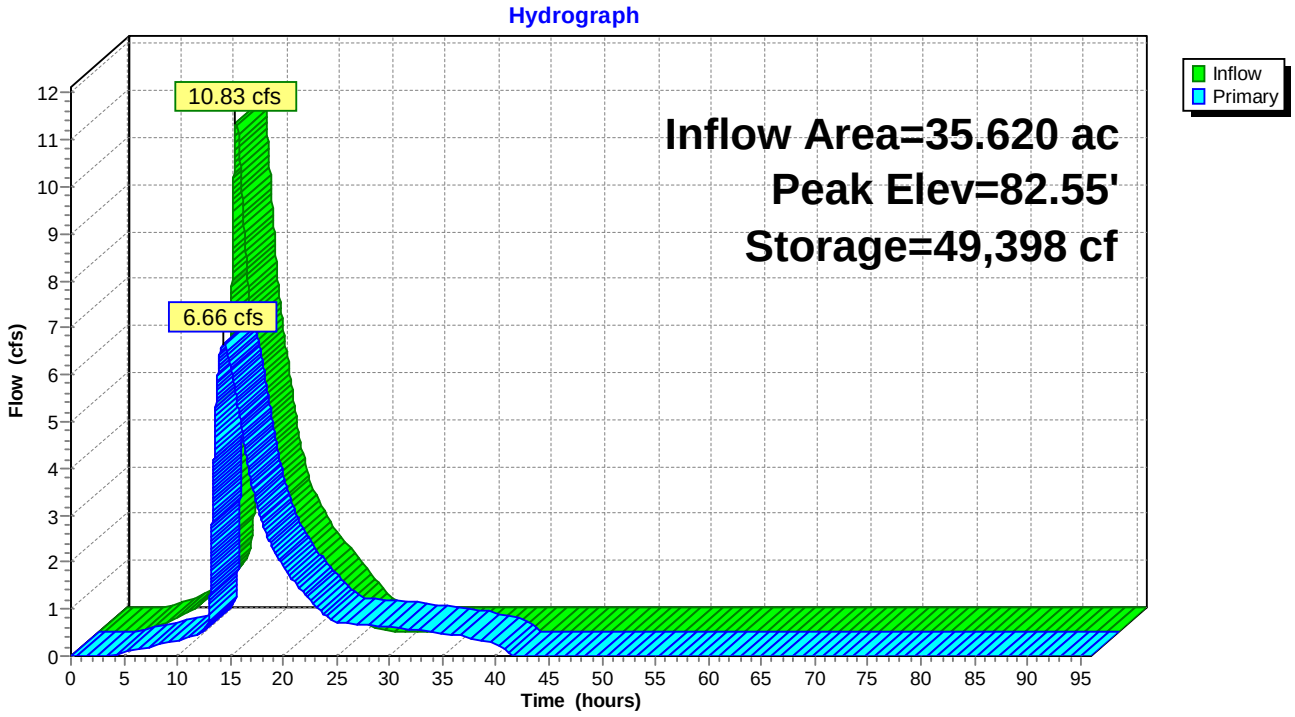
Volume	Invert	Avail.Storage	Storage Description
#1	78.80'	223,129 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
78.80	1	0	0
79.00	16	2	2
80.00	2,181	1,099	1,100
81.00	15,895	9,038	10,138
82.00	29,262	22,579	32,717
83.00	34,004	31,633	64,350
84.00	36,834	35,419	99,769
85.00	39,677	38,256	138,024
86.00	42,533	41,105	179,129
87.00	45,467	44,000	223,129

Device	Routing	Invert	Outlet Devices
#1	Primary	76.60'	**48.0" Round 48" Culvert** L= 50.0' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 76.60' / 76.10' S= 0.0100 '/' Cc= 0.900 n= 0.012 Concrete pipe, finished, Flow Area= 12.57 sf
#2	Device 1	76.60'	**3.0" Vert. 3" Orifice** C= 0.600 Limited to weir flow at low heads
#3	Device 1	81.90'	**42.0" W x 38.5" H Vert. 42" Weir** C= 0.600 Limited to weir flow at low heads
#4	Device 1	85.44'	**16.0' long x 16.0' breadth Outlet Structure Overflow** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.68 2.70 2.70 2.64 2.63 2.64 2.64 2.63
#5	Device 1	78.80'	**15.0" Round Headwall Outlet (15" RCP)** L= 4.0' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 78.80' / 78.30' S= 0.1250 '/' Cc= 0.900 n= 0.012 Concrete pipe, finished, Flow Area= 1.23 sf
#6	Device 5	78.80'	**3.0" Vert. 3" Orifice** C= 0.600 Limited to weir flow at low heads
#7	Device 2	78.80'	**0.500 in/hr Underdrain over Surface area**

Primary OutFlow Max=6.65 cfs @ 14.34 hrs HW=82.55' (Free Discharge)
- **1=48" Culvert** (Passes 6.65 cfs of 120.19 cfs potential flow)
  - **2=3" Orifice** (Passes 0.37 cfs of 0.57 cfs potential flow)
    - **7=Underdrain** (Exfiltration Controls 0.37 cfs)
  - **3=42" Weir** (Orifice Controls 5.83 cfs @ 2.58 fps)
  - **4=Outlet Structure Overflow** (Controls 0.00 cfs)
  - **5=Headwall Outlet (15" RCP)** (Passes 0.45 cfs of 10.44 cfs potential flow)
    - **6=3" Orifice** (Orifice Controls 0.45 cfs @ 9.16 fps)

Pond EB: Existing Basin



Hydrograph for Pond EB: Existing Basin

Time (hours)	Inflow (cfs)	Storage (cubic-feet)	Elevation (feet)	Primary (cfs)
0.00	0.00	0	78.80	0.00
2.00	0.00	0	78.80	0.00
4.00	0.02	1	78.90	0.02
6.00	0.17	65	79.23	0.14
8.00	0.37	650	79.77	0.24
10.00	0.70	2,159	80.26	0.34
12.00	**2.32**	6,870	80.77	0.47
14.00	**7.50**	**48,822**	**82.53**	**6.41**
16.00	3.94	**45,186**	**82.41**	**4.92**
18.00	2.28	39,355	82.22	2.85
20.00	1.55	36,153	82.12	1.91
22.00	0.99	33,741	82.03	1.33
24.00	0.42	30,995	81.94	0.86
26.00	0.08	27,160	81.80	0.71
28.00	0.01	22,447	81.61	0.67
30.00	0.00	17,835	81.41	0.62
32.00	0.00	13,545	81.20	0.57
34.00	0.00	9,627	80.97	0.52
36.00	0.00	6,128	80.71	0.45
38.00	0.00	3,123	80.41	0.38
40.00	0.00	814	79.86	0.25
42.00	0.00	0	78.80	0.00
44.00	0.00	0	78.80	0.00
46.00	0.00	0	78.80	0.00
48.00	0.00	0	78.80	0.00
50.00	0.00	0	78.80	0.00
52.00	0.00	0	78.80	0.00
54.00	0.00	0	78.80	0.00
56.00	0.00	0	78.80	0.00
58.00	0.00	0	78.80	0.00
60.00	0.00	0	78.80	0.00
62.00	0.00	0	78.80	0.00
64.00	0.00	0	78.80	0.00
66.00	0.00	0	78.80	0.00
68.00	0.00	0	78.80	0.00
70.00	0.00	0	78.80	0.00
72.00	0.00	0	78.80	0.00
74.00	0.00	0	78.80	0.00
76.00	0.00	0	78.80	0.00
78.00	0.00	0	78.80	0.00
80.00	0.00	0	78.80	0.00
82.00	0.00	0	78.80	0.00
84.00	0.00	0	78.80	0.00
86.00	0.00	0	78.80	0.00
88.00	0.00	0	78.80	0.00
90.00	0.00	0	78.80	0.00
92.00	0.00	0	78.80	0.00
94.00	0.00	0	78.80	0.00
96.00	0.00	0	78.80	0.00

Summary for Subcatchment DA-1: DA-1

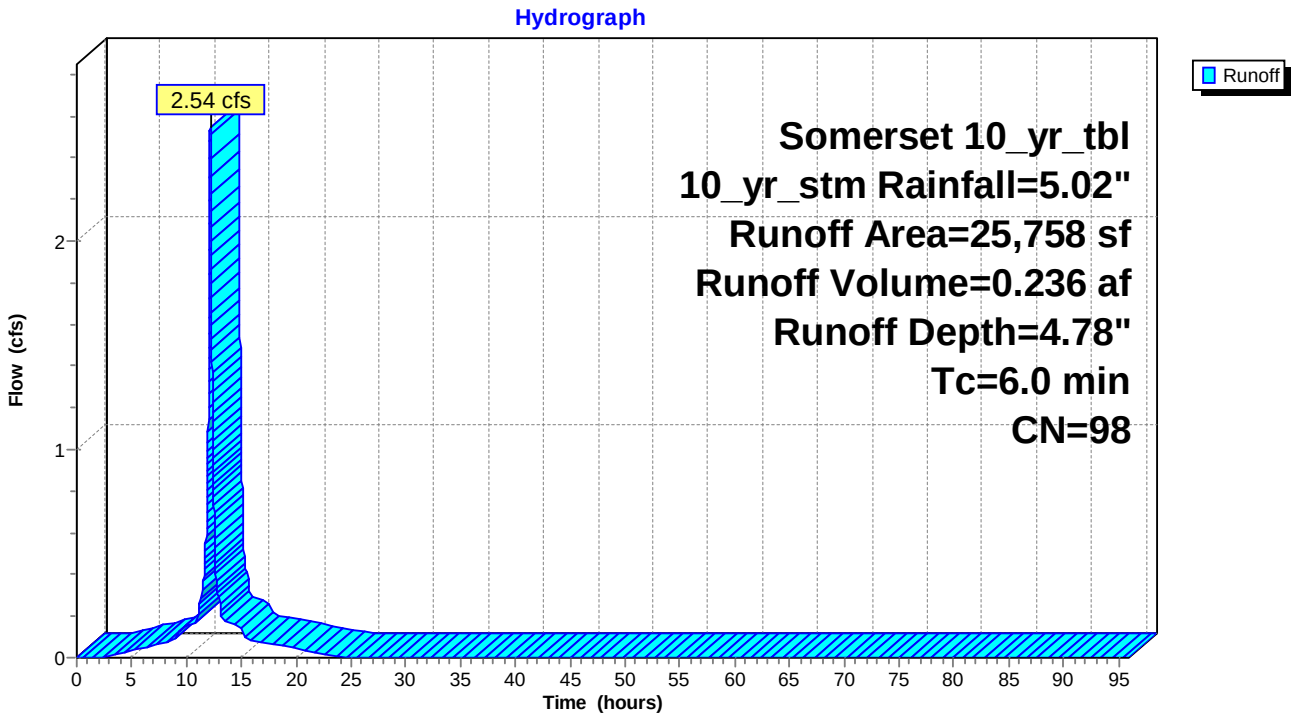
Runoff = 2.54 cfs @ 12.14 hrs, Volume= 0.236 af, Depth= 4.78"

Runoff by SCS TR-20 method, UH=Delmarva, Weighted-CN, Time Span= 0.00-96.00 hrs, dt= 0.01 hrs
Somerset 10_yr_tbl 10_yr_stm Rainfall=5.02"

Area (sf)	CN	Description
25,758	98	Roofs, HSG D
25,758		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry,**

Subcatchment DA-1: DA-1



Summary for Subcatchment DA-2i: DA-2i

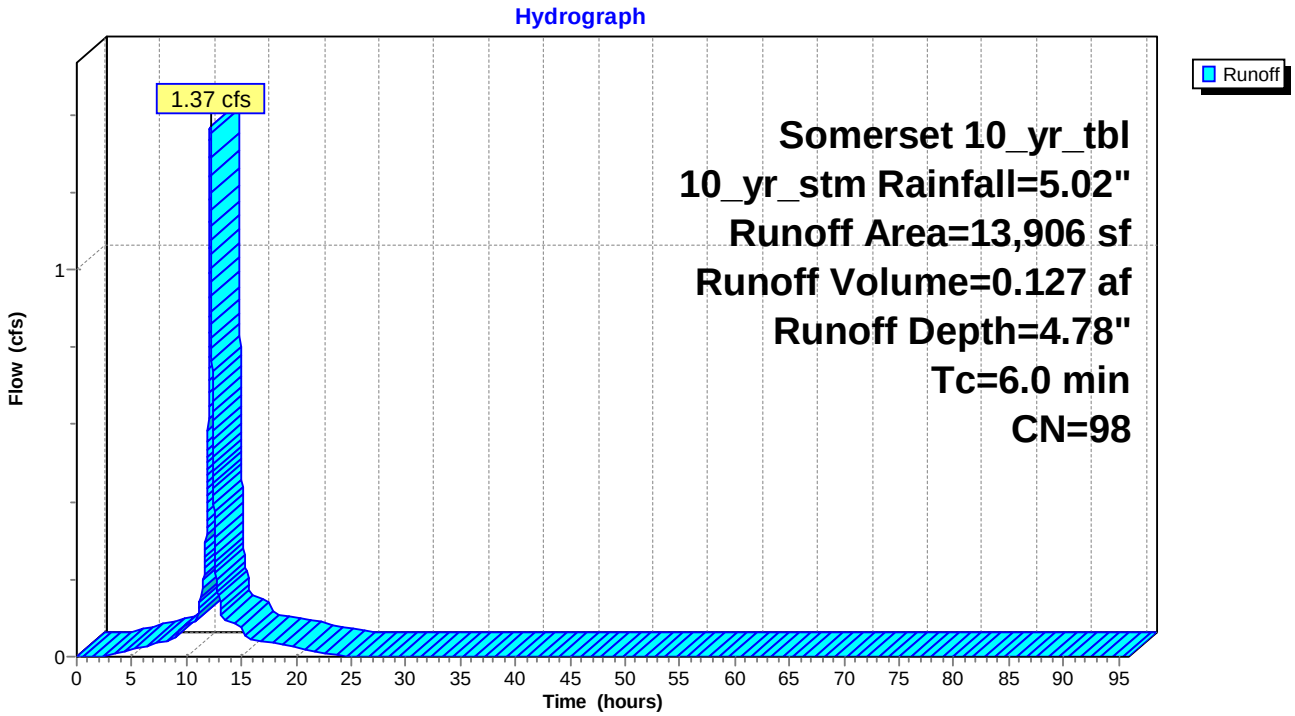
Runoff = 1.37 cfs @ 12.14 hrs, Volume= 0.127 af, Depth= 4.78"

Runoff by SCS TR-20 method, UH=Delmarva, Weighted-CN, Time Span= 0.00-96.00 hrs, dt= 0.01 hrs
Somerset 10_yr_tbl 10_yr_stm Rainfall=5.02"

	Area (sf)	CN	Description
*	2,940	98	Sidewalks, HSG C
	9,656	98	Paved parking, HSG C
*	649	98	Hardscape, HSG C
*	661	98	Hardscape, HSG B
	13,906	98	Weighted Average
	13,906		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry,**

Subcatchment DA-2i: DA-2i



Summary for Subcatchment DA-2p: DA-2p

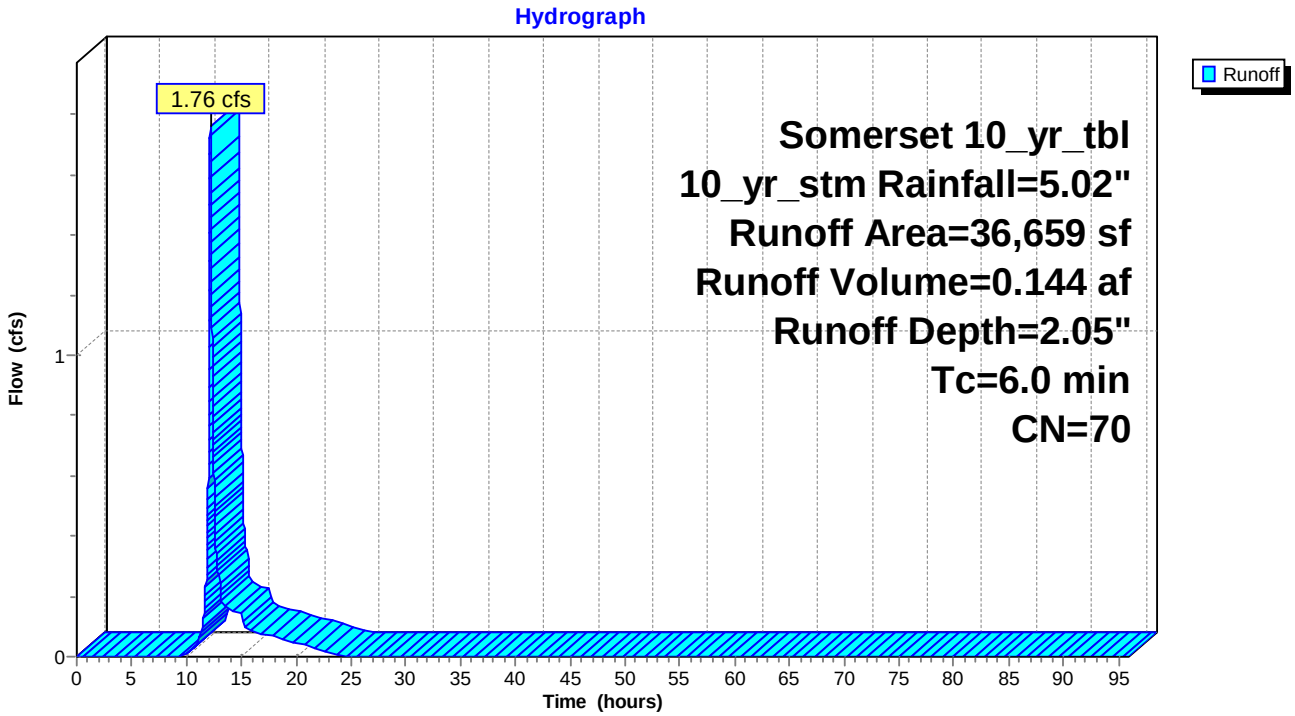
Runoff = 1.76 cfs @ 12.15 hrs, Volume= 0.144 af, Depth= 2.05"

Runoff by SCS TR-20 method, UH=Delmarva, Weighted-CN, Time Span= 0.00-96.00 hrs, dt= 0.01 hrs
Somerset 10_yr_tbl 10_yr_stm Rainfall=5.02"

Area (sf)	CN	Description
5,773	61	>75% Grass cover, Good, HSG B
5,981	74	>75% Grass cover, Good, HSG C
14,003	80	>75% Grass cover, Good, HSG D
10,902	61	>75% Grass cover, Good, HSG B
36,659	70	Weighted Average
36,659		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry,**

Subcatchment DA-2p: DA-2p



Summary for Subcatchment DA-3: DA-3

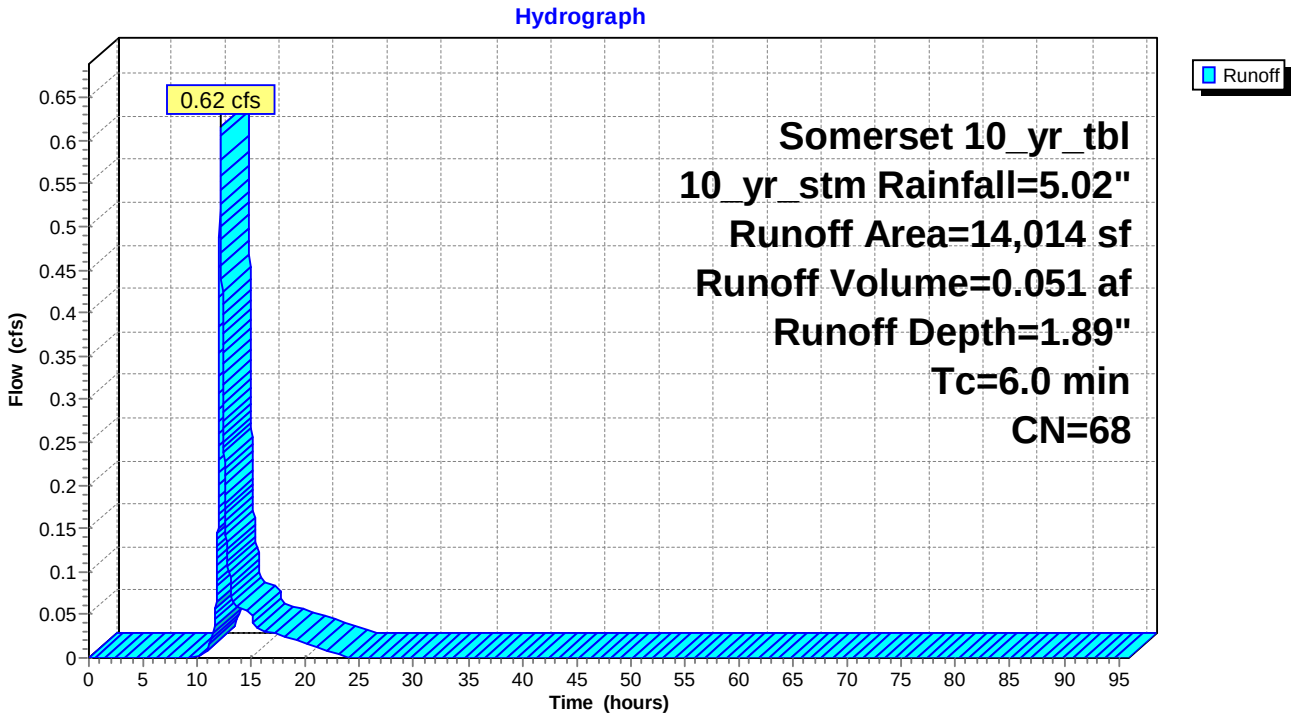
Runoff = 0.62 cfs @ 12.15 hrs, Volume= 0.051 af, Depth= 1.89"

Runoff by SCS TR-20 method, UH=Delmarva, Weighted-CN, Time Span= 0.00-96.00 hrs, dt= 0.01 hrs
Somerset 10_yr_tbl 10_yr_stm Rainfall=5.02"

	Area (sf)	CN	Description
*	4,993	80	>75% Grass cover, Good, HSG D
	9,021	61	>75% Grass cover, Good, HSG B
	14,014	68	Weighted Average
	14,014		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry,**

Subcatchment DA-3: DA-3



Summary for Subcatchment DA-4i: DA-4i

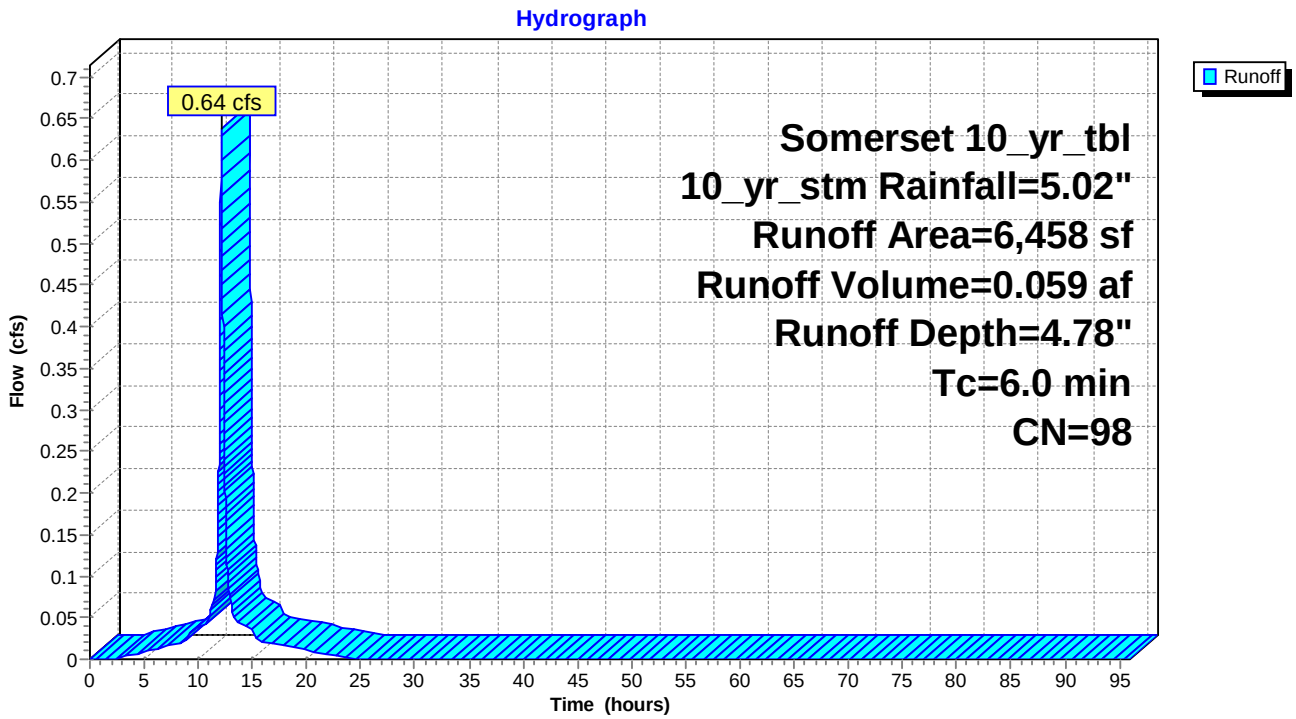
Runoff = 0.64 cfs @ 12.14 hrs, Volume= 0.059 af, Depth= 4.78"

Runoff by SCS TR-20 method, UH=Delmarva, Weighted-CN, Time Span= 0.00-96.00 hrs, dt= 0.01 hrs
Somerset 10_yr_tbl 10_yr_stm Rainfall=5.02"

	Area (sf)	CN	Description
	2,779	98	Paved parking, HSG C
*	3,419	98	Sidewalks, HSG C
*	260	98	Hardscapes, HSG C
	6,458	98	Weighted Average
	6,458		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry,**

Subcatchment DA-4i: DA-4i



Summary for Subcatchment DA-4p: DA-4p

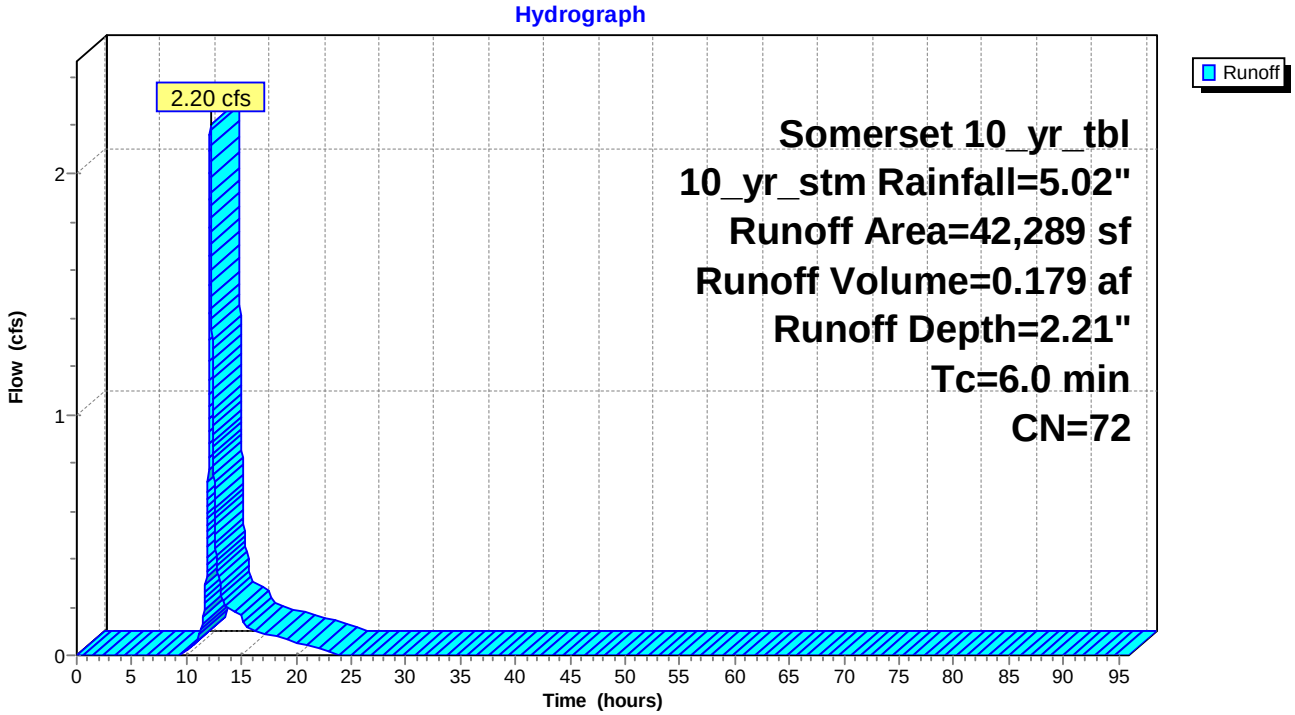
Runoff = 2.20 cfs @ 12.15 hrs, Volume= 0.179 af, Depth= 2.21"

Runoff by SCS TR-20 method, UH=Delmarva, Weighted-CN, Time Span= 0.00-96.00 hrs, dt= 0.01 hrs
Somerset 10_yr_tbl 10_yr_stm Rainfall=5.02"

Area (sf)	CN	Description
16,312	61	>75% Grass cover, Good, HSG B
2,332	74	>75% Grass cover, Good, HSG C
23,645	80	>75% Grass cover, Good, HSG D
42,289	72	Weighted Average
42,289		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry,**

Subcatchment DA-4p: DA-4p



Summary for Subcatchment DA-5: DA-5

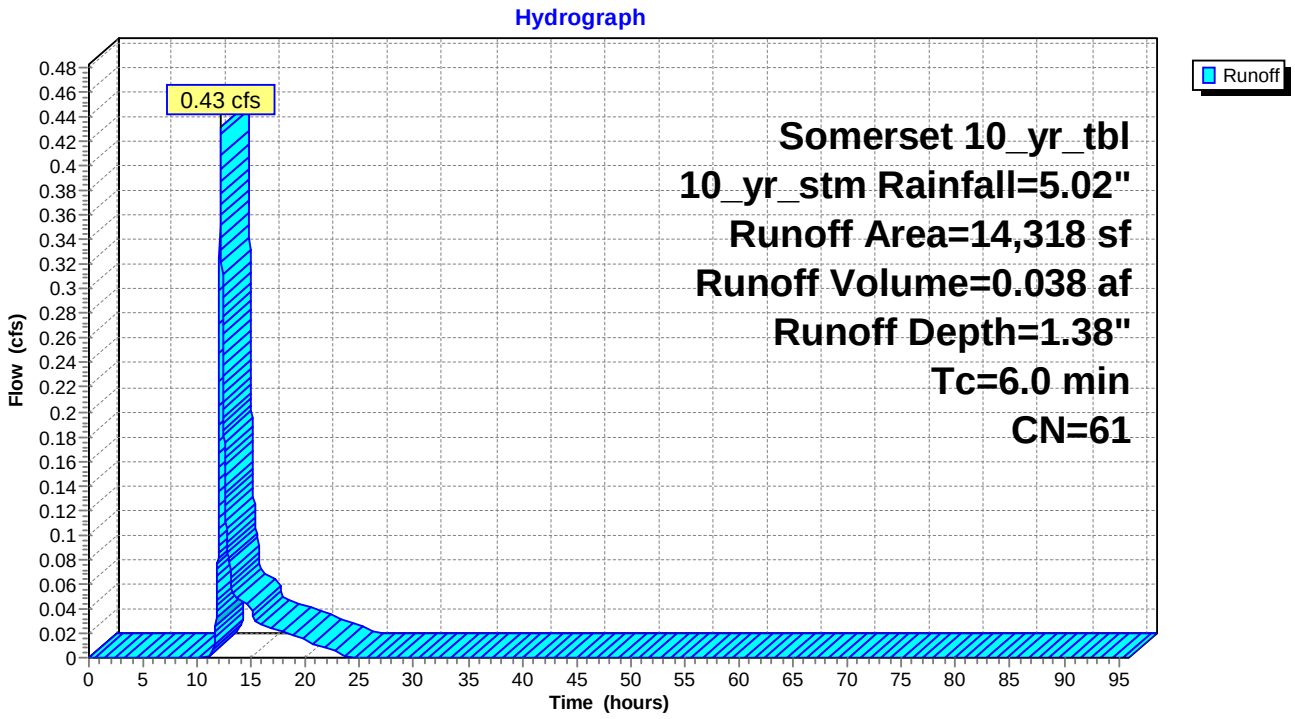
Runoff = 0.43 cfs @ 12.15 hrs, Volume= 0.038 af, Depth= 1.38"

Runoff by SCS TR-20 method, UH=Delmarva, Weighted-CN, Time Span= 0.00-96.00 hrs, dt= 0.01 hrs
Somerset 10_yr_tbl 10_yr_stm Rainfall=5.02"

Area (sf)	CN	Description
14,318	61	>75% Grass cover, Good, HSG B
14,318		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry,**

Subcatchment DA-5: DA-5



Summary for Subcatchment EA-EXi: EA-EXi

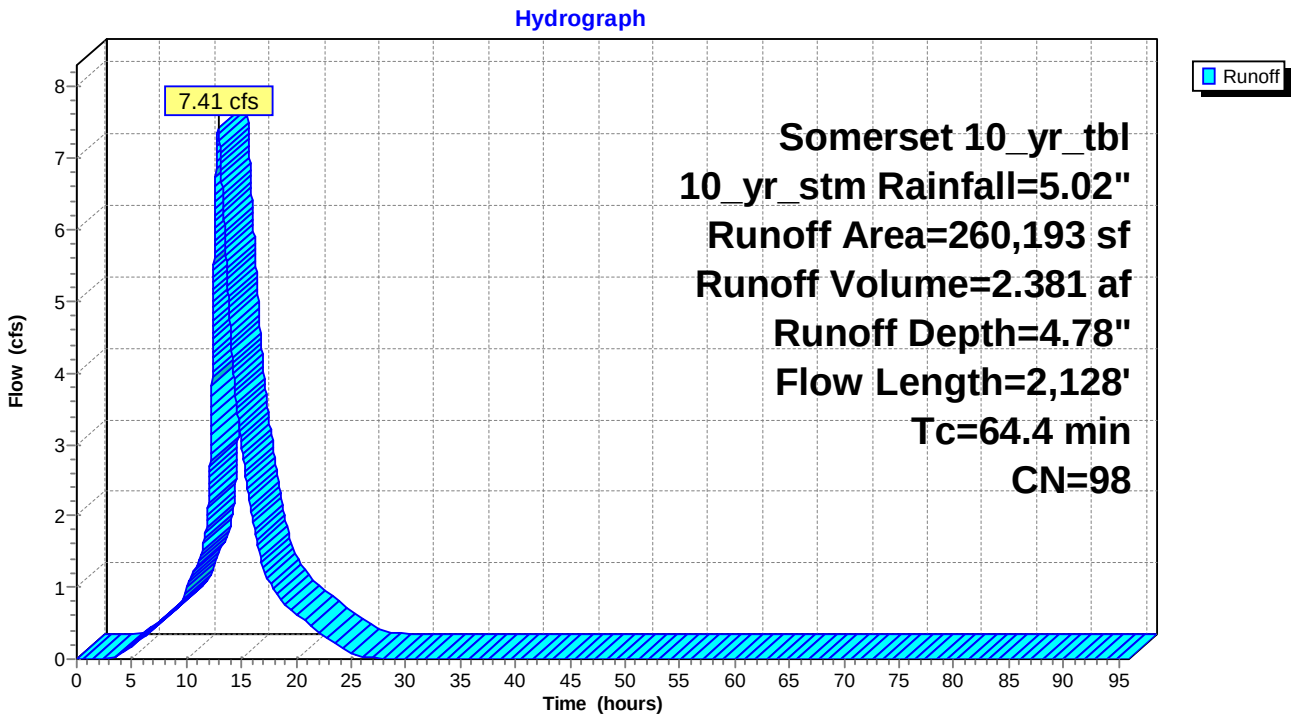
Runoff = 7.41 cfs @ 12.88 hrs, Volume= 2.381 af, Depth= 4.78"

Runoff by SCS TR-20 method, UH=Delmarva, Weighted-CN, Time Span= 0.00-96.00 hrs, dt= 0.01 hrs
Somerset 10_yr_tbl 10_yr_stm Rainfall=5.02"

	Area (sf)	CN	Description
*	34,826	98	Roofs
*	92,386	98	Roads
*	20,721	98	Driveways
*	112,260	98	Parking Lot
	260,193	98	Weighted Average
	260,193		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.8	46	0.0100	0.11		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.35"
22.3	54	0.0050	0.04		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.35"
4.4	130	0.0050	0.49		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
1.7	73	0.0200	0.71		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
0.2	24	0.0100	2.03		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
4.4	132	0.0100	0.50		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
0.2	24	0.0100	2.03		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
2.6	132	0.0150	0.86		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
4.5	189	0.0200	0.71		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
1.5	62	0.0100	0.70		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
12.9	388	0.0100	0.50		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
1.2	90	0.0300	1.21		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.9	182	0.0250	3.21		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
0.8	602	0.0136	11.92	84.26	**Pipe Channel,** 36.0" Round Area= 7.1 sf Perim= 9.4' r= 0.75' n= 0.012 Concrete pipe, finished
64.4	2,128	Total			

Subcatchment EA-EXi: EA-EXi



Summary for Subcatchment EA-EXp: EA-EXp

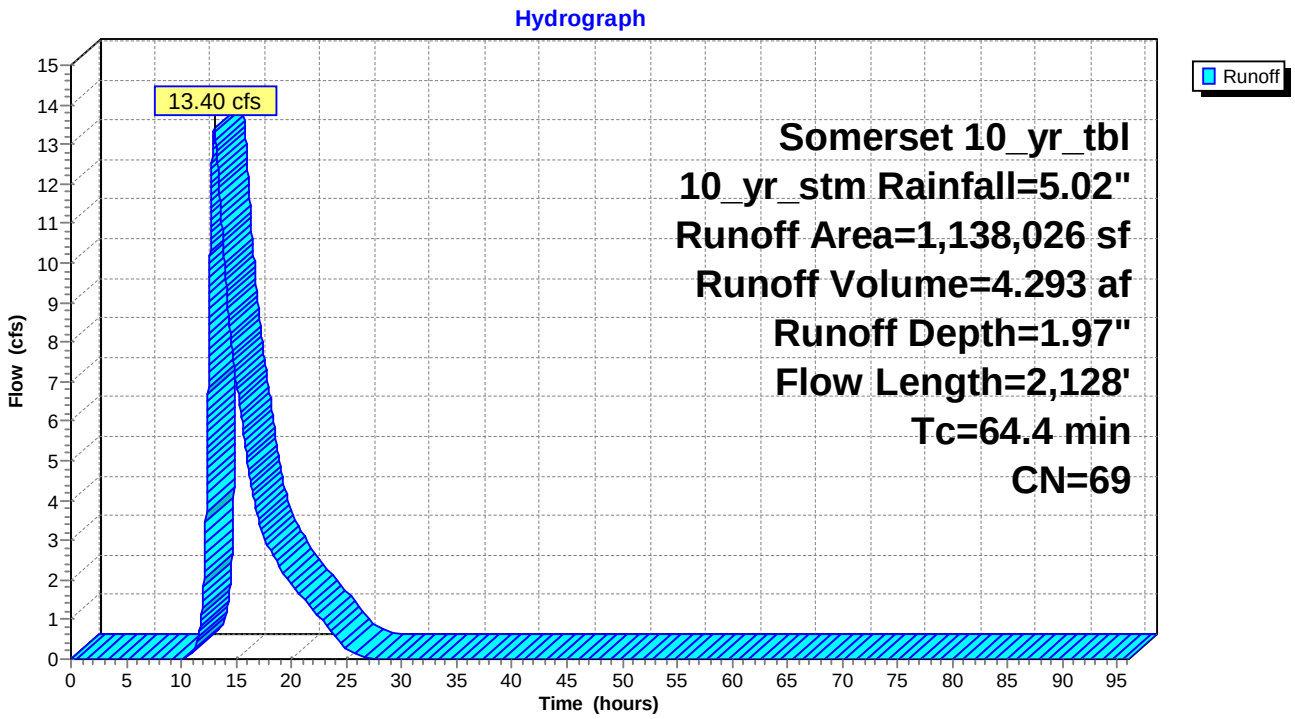
Runoff = 13.40 cfs @ 13.02 hrs, Volume= 4.293 af, Depth= 1.97"

Runoff by SCS TR-20 method, UH=Delmarva, Weighted-CN, Time Span= 0.00-96.00 hrs, dt= 0.01 hrs
Somerset 10_yr_tbl 10_yr_stm Rainfall=5.02"

Area (sf)	CN	Description
445,815	70	Woods, Good, HSG C
434,699	74	>75% Grass cover, Good, HSG C
142,152	55	Woods, Good, HSG B
81,203	61	>75% Grass cover, Good, HSG B
34,157	80	>75% Grass cover, Good, HSG D
1,138,026	69	Weighted Average
1,138,026		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.8	46	0.0100	0.11		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.35"
22.3	54	0.0050	0.04		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.35"
4.4	130	0.0050	0.49		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
1.7	73	0.0200	0.71		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
0.2	24	0.0100	2.03		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
4.4	132	0.0100	0.50		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
0.2	24	0.0100	2.03		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
2.6	132	0.0150	0.86		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
4.5	189	0.0200	0.71		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
1.5	62	0.0100	0.70		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
12.9	388	0.0100	0.50		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
1.2	90	0.0300	1.21		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.9	182	0.0250	3.21		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
0.8	602	0.0136	11.92	84.26	**Pipe Channel,** 36.0" Round Area= 7.1 sf Perim= 9.4' r= 0.75' n= 0.012 Concrete pipe, finished
64.4	2,128	Total			

Subcatchment EA-EXp: EA-EXp



Summary for Pond 1P: Underground

Inflow Area =	0.591 ac,100.00% Impervious, Inflow Depth = 4.78" for 10_yr_stm event				
Inflow =	2.54 cfs @	12.14 hrs,	Volume=	0.236 af	
Outflow =	0.23 cfs @	13.14 hrs,	Volume=	0.236 af,	Atten= 91%, Lag= 59.7 min
Primary =	0.23 cfs @	13.14 hrs,	Volume=	0.236 af	

Routing by Stor-Ind method, Time Span= 0.00-96.00 hrs, dt= 0.01 hrs
Peak Elev= 86.12' @ 13.14 hrs Surf.Area= 0.064 ac Storage= 0.109 af

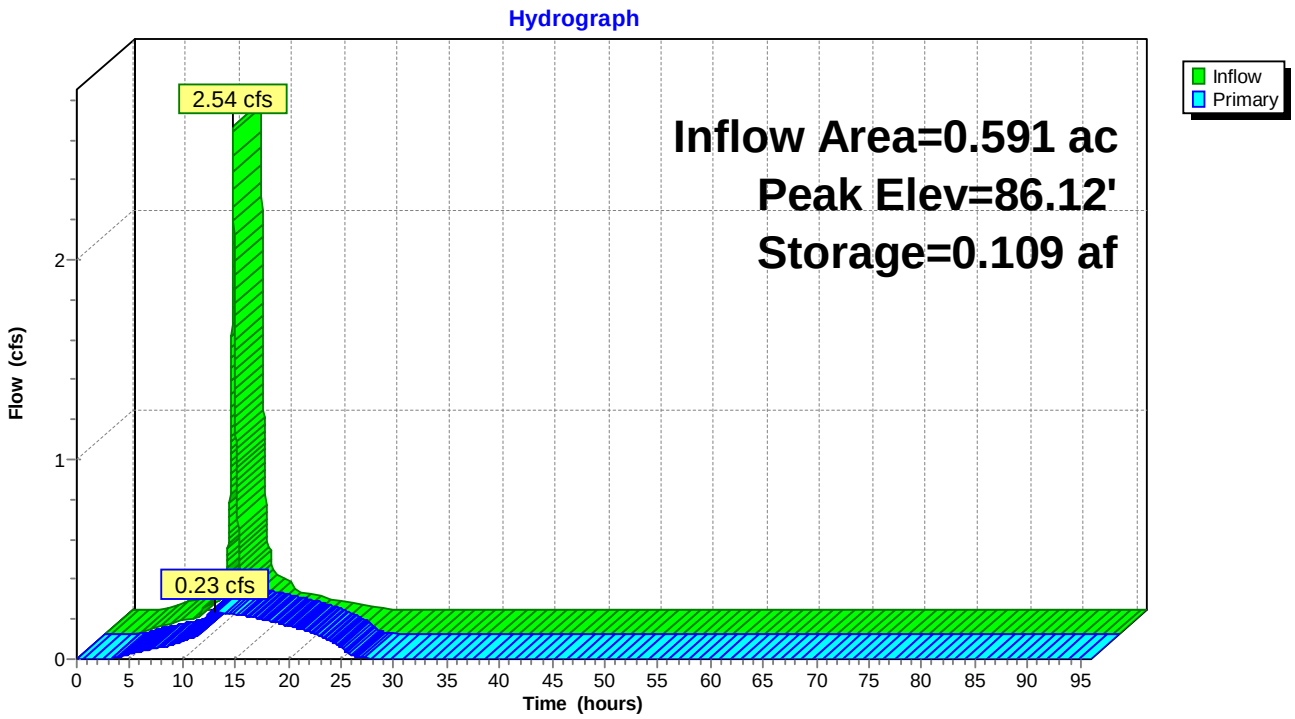
Plug-Flow detention time= 217.9 min calculated for 0.236 af (100% of inflow)
Center-of-Mass det. time= 217.8 min (967.4 - 749.6)

Volume	Invert	Avail.Storage	Storage Description
#1	84.00'	0.202 af	**48.0" Round Pipe Storage** x 5 L= 140.0'

Device	Routing	Invert	Outlet Devices
#1	Primary	84.00'	**15.0" Round Culvert** L= 22.0' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 84.00' / 83.78' S= 0.0100 '/' Cc= 0.900 n= 0.012 Concrete pipe, finished, Flow Area= 1.23 sf
#2	Device 1	84.00'	**2.5" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=0.23 cfs @ 13.14 hrs HW=86.12' (Free Discharge)
└─**1=Culvert** (Passes 0.23 cfs of 7.23 cfs potential flow)
  └─**2=Orifice/Grate** (Orifice Controls 0.23 cfs @ 6.84 fps)

Pond 1P: Underground



Hydrograph for Pond 1P: Underground

Time (hours)	Inflow (cfs)	Storage (acre-feet)	Elevation (feet)	Primary (cfs)
0.00	0.00	0.000	84.00	0.00
2.00	0.00	0.000	84.00	0.00
4.00	0.02	0.001	84.08	0.01
6.00	0.05	0.003	84.16	0.04
8.00	0.08	0.005	84.24	0.06
10.00	0.15	0.011	84.41	0.09
12.00	**1.38**	**0.043**	**85.06**	**0.16**
14.00	**0.17**	**0.105**	**86.06**	**0.23**
16.00	0.09	0.089	85.82	0.21
18.00	0.07	0.068	85.48	0.19
20.00	0.04	0.047	85.14	0.17
22.00	0.02	0.028	84.78	0.13
24.00	0.00	0.011	84.41	0.09
26.00	0.00	0.002	84.11	0.02
28.00	0.00	0.000	84.03	0.00
30.00	0.00	0.000	84.01	0.00
32.00	0.00	0.000	84.00	0.00
34.00	0.00	0.000	84.00	0.00
36.00	0.00	0.000	84.00	0.00
38.00	0.00	0.000	84.00	0.00
40.00	0.00	0.000	84.00	0.00
42.00	0.00	0.000	84.00	0.00
44.00	0.00	0.000	84.00	0.00
46.00	0.00	0.000	84.00	0.00
48.00	0.00	0.000	84.00	0.00
50.00	0.00	0.000	84.00	0.00
52.00	0.00	0.000	84.00	0.00
54.00	0.00	0.000	84.00	0.00
56.00	0.00	0.000	84.00	0.00
58.00	0.00	0.000	84.00	0.00
60.00	0.00	0.000	84.00	0.00
62.00	0.00	0.000	84.00	0.00
64.00	0.00	0.000	84.00	0.00
66.00	0.00	0.000	84.00	0.00
68.00	0.00	0.000	84.00	0.00
70.00	0.00	0.000	84.00	0.00
72.00	0.00	0.000	84.00	0.00
74.00	0.00	0.000	84.00	0.00
76.00	0.00	0.000	84.00	0.00
78.00	0.00	0.000	84.00	0.00
80.00	0.00	0.000	84.00	0.00
82.00	0.00	0.000	84.00	0.00
84.00	0.00	0.000	84.00	0.00
86.00	0.00	0.000	84.00	0.00
88.00	0.00	0.000	84.00	0.00
90.00	0.00	0.000	84.00	0.00
92.00	0.00	0.000	84.00	0.00
94.00	0.00	0.000	84.00	0.00
96.00	0.00	0.000	84.00	0.00

Summary for Pond 2P: BioBasin

Inflow Area = 1.161 ac, 27.50% Impervious, Inflow Depth = 2.80" for 10_yr_stm event
Inflow = 3.13 cfs @ 12.14 hrs, Volume= 0.271 af
Outflow = 1.06 cfs @ 12.48 hrs, Volume= 0.149 af, Atten= 66%, Lag= 19.9 min
Primary = 1.06 cfs @ 12.48 hrs, Volume= 0.149 af

Routing by Stor-Ind method, Time Span= 0.00-96.00 hrs, dt= 0.01 hrs
Peak Elev= 88.07' @ 12.48 hrs Surf.Area= 3,483 sf Storage= 5,821 cf

Plug-Flow detention time= 233.9 min calculated for 0.149 af (55% of inflow)
Center-of-Mass det. time= 118.3 min (917.9 - 799.6)

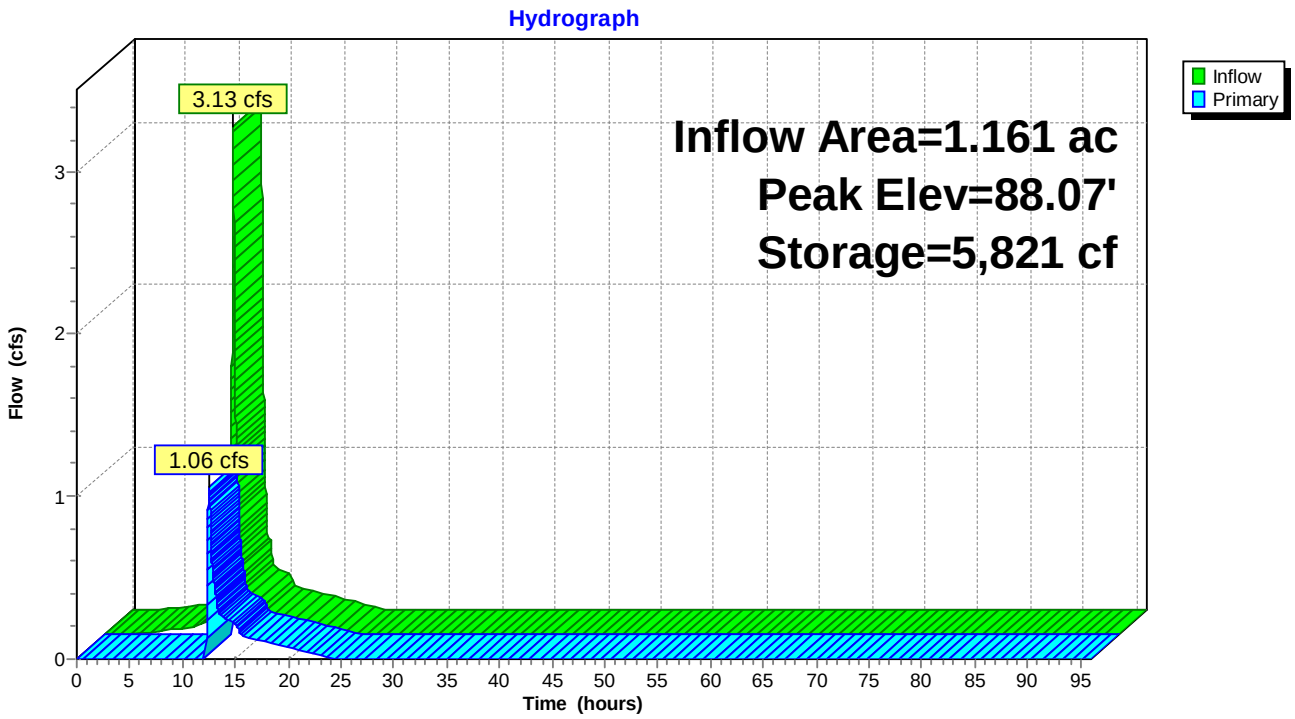
Volume	Invert	Avail.Storage	Storage Description
#1	86.00'	11,525 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
86.00	2,166	0	0
87.00	2,769	2,468	2,468
88.00	3,431	3,100	5,568
89.00	4,147	3,789	9,357
89.50	4,527	2,169	11,525

Device	Routing	Invert	Outlet Devices
#1	Primary	86.00'	**15.0" Round Culvert** L= 139.0' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 86.00' / 84.61' S= 0.0100 '/' Cc= 0.900 n= 0.012 Concrete pipe, finished, Flow Area= 1.23 sf
#2	Device 1	87.93'	**8.0' long x 8.0' 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 3.50 4.00 4.50 5.00 5.50 Coef. (English) 2.43 2.54 2.70 2.69 2.68 2.68 2.66 2.64 2.64 2.64 2.65 2.65 2.66 2.66 2.68 2.70 2.74

Primary OutFlow Max=1.05 cfs @ 12.48 hrs HW=88.07' (Free Discharge)
└─**1=Culvert** (Passes 1.05 cfs of 7.10 cfs potential flow)
└─**2=Broad-Crested Rectangular Weir** (Weir Controls 1.05 cfs @ 0.92 fps)

Pond 2P: BioBasin



Hydrograph for Pond 2P: BioBasin

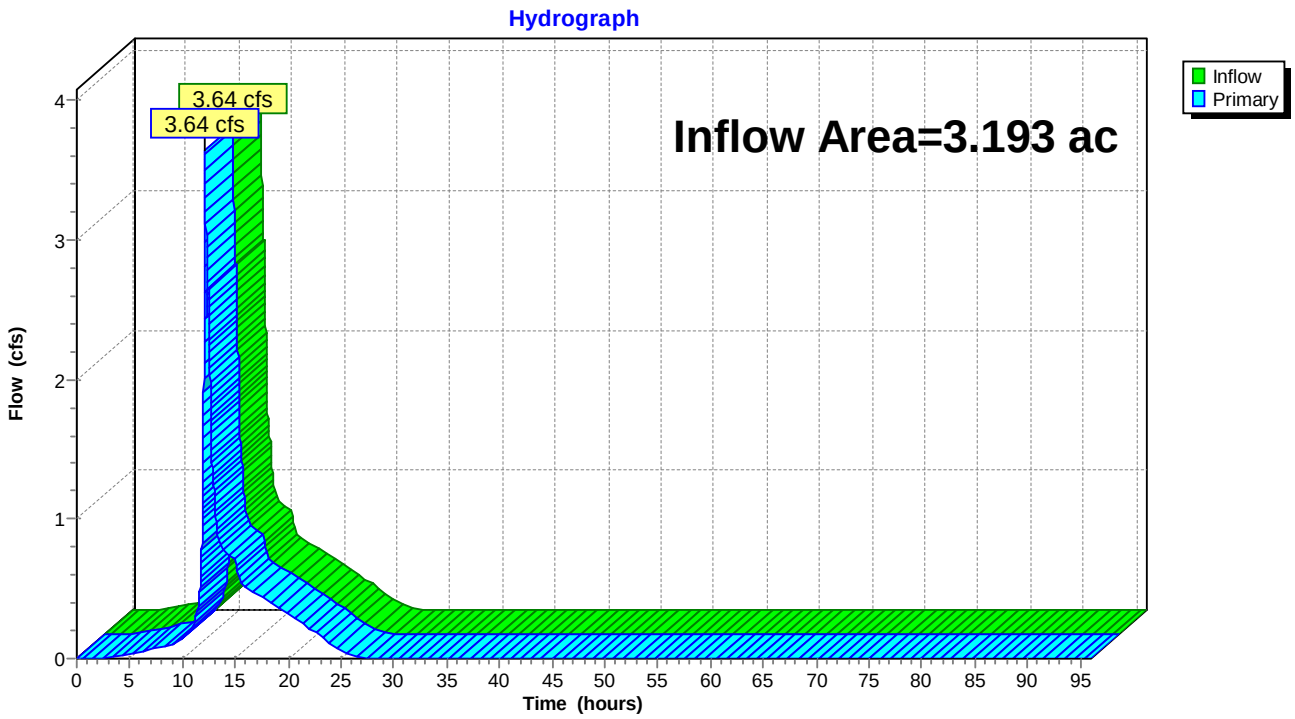
Time (hours)	Inflow (cfs)	Storage (cubic-feet)	Elevation (feet)	Primary (cfs)
0.00	0.00	0	86.00	0.00
2.00	0.00	0	86.00	0.00
4.00	0.01	32	86.01	0.00
6.00	0.03	172	86.08	0.00
8.00	0.04	418	86.19	0.00
10.00	0.09	847	86.37	0.00
12.00	**1.51**	**2,752**	**87.10**	**0.00**
14.00	**0.25**	**5,512**	**87.98**	**0.25**
16.00	0.13	5,449	87.97	0.14
18.00	0.10	5,433	87.96	0.10
20.00	0.07	5,404	87.95	0.07
22.00	0.04	5,370	87.94	0.04
24.00	0.00	5,336	87.93	0.01
26.00	0.00	5,329	87.93	0.00
28.00	0.00	5,329	87.93	0.00
30.00	0.00	5,329	87.93	0.00
32.00	0.00	5,329	87.93	0.00
34.00	0.00	5,329	87.93	0.00
36.00	0.00	5,329	87.93	0.00
38.00	0.00	5,329	87.93	0.00
40.00	0.00	5,329	87.93	0.00
42.00	0.00	5,329	87.93	0.00
44.00	0.00	5,329	87.93	0.00
46.00	0.00	5,329	87.93	0.00
48.00	0.00	5,329	87.93	0.00
50.00	0.00	5,329	87.93	0.00
52.00	0.00	5,329	87.93	0.00
54.00	0.00	5,329	87.93	0.00
56.00	0.00	5,329	87.93	0.00
58.00	0.00	5,329	87.93	0.00
60.00	0.00	5,329	87.93	0.00
62.00	0.00	5,329	87.93	0.00
64.00	0.00	5,329	87.93	0.00
66.00	0.00	5,329	87.93	0.00
68.00	0.00	5,329	87.93	0.00
70.00	0.00	5,329	87.93	0.00
72.00	0.00	5,329	87.93	0.00
74.00	0.00	5,329	87.93	0.00
76.00	0.00	5,329	87.93	0.00
78.00	0.00	5,329	87.93	0.00
80.00	0.00	5,329	87.93	0.00
82.00	0.00	5,329	87.93	0.00
84.00	0.00	5,329	87.93	0.00
86.00	0.00	5,329	87.93	0.00
88.00	0.00	5,329	87.93	0.00
90.00	0.00	5,329	87.93	0.00
92.00	0.00	5,329	87.93	0.00
94.00	0.00	5,329	87.93	0.00
96.00	0.00	5,329	87.93	0.00

Summary for Pond 3P: Total

Inflow Area = 3.193 ac, 33.16% Impervious, Inflow Depth = 2.53" for 10_yr_stm event
Inflow = 3.64 cfs @ 12.15 hrs, Volume= 0.673 af
Primary = 3.64 cfs @ 12.15 hrs, Volume= 0.673 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind method, Time Span= 0.00-96.00 hrs, dt= 0.01 hrs

Pond 3P: Total



Summary for Pond EB: Existing Basin

Inflow Area = 35.620 ac, 19.74% Impervious, Inflow Depth = 2.49" for 10_yr_stm event
Inflow = 22.05 cfs @ 12.88 hrs, Volume= 7.385 af
Outflow = 17.07 cfs @ 13.70 hrs, Volume= 7.385 af, Atten= 23%, Lag= 48.8 min
Primary = 17.07 cfs @ 13.70 hrs, Volume= 7.385 af

Routing by Stor-Ind method, Time Span= 0.00-96.00 hrs, dt= 0.01 hrs
Peak Elev= 83.18' @ 13.70 hrs Surf.Area= 34,500 sf Storage= 70,348 cf

Plug-Flow detention time= 160.9 min calculated for 7.385 af (100% of inflow)
Center-of-Mass det. time= 160.9 min (1,061.7 - 900.8)

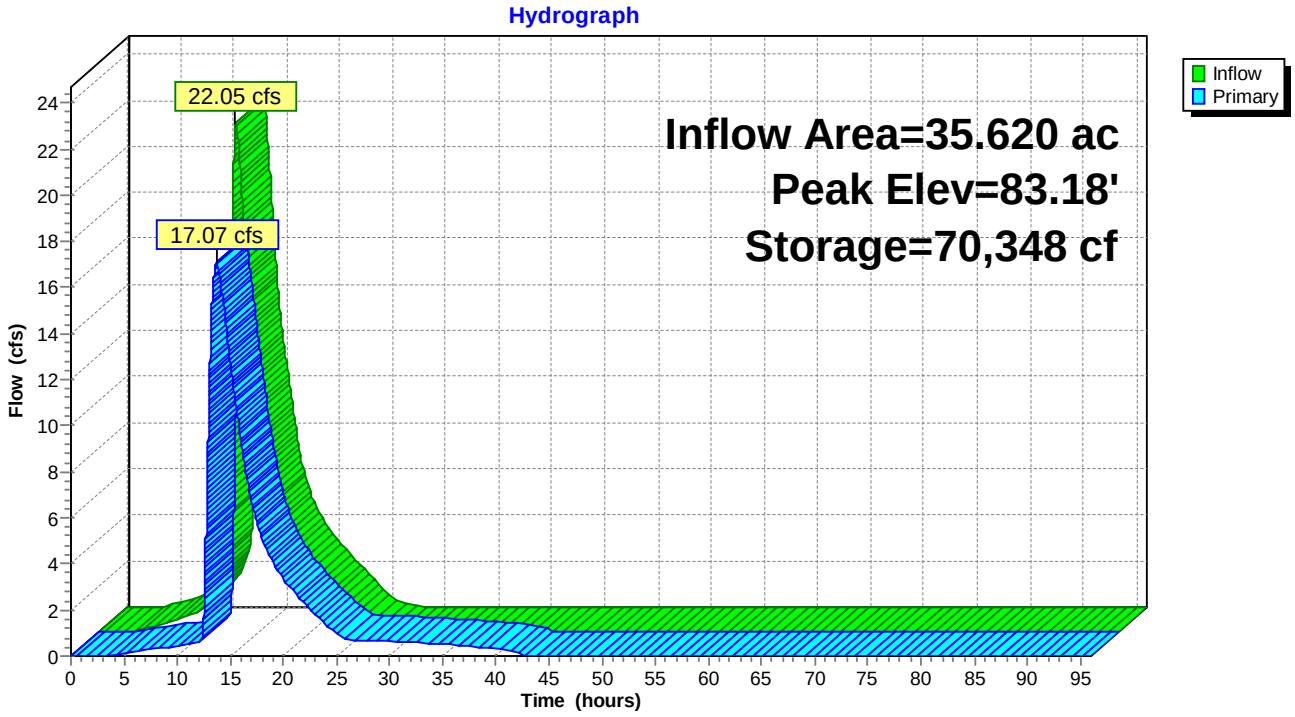
Volume	Invert	Avail.Storage	Storage Description
#1	78.80'	223,129 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
78.80	1	0	0
79.00	16	2	2
80.00	2,181	1,099	1,100
81.00	15,895	9,038	10,138
82.00	29,262	22,579	32,717
83.00	34,004	31,633	64,350
84.00	36,834	35,419	99,769
85.00	39,677	38,256	138,024
86.00	42,533	41,105	179,129
87.00	45,467	44,000	223,129

Device	Routing	Invert	Outlet Devices
#1	Primary	76.60'	**48.0" Round 48" Culvert** L= 50.0' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 76.60' / 76.10' S= 0.0100 '/' Cc= 0.900 n= 0.012 Concrete pipe, finished, Flow Area= 12.57 sf
#2	Device 1	76.60'	**3.0" Vert. 3" Orifice** C= 0.600 Limited to weir flow at low heads
#3	Device 1	81.90'	**42.0" W x 38.5" H Vert. 42" Weir** C= 0.600 Limited to weir flow at low heads
#4	Device 1	85.44'	**16.0' long x 16.0' breadth Outlet Structure Overflow** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.68 2.70 2.70 2.64 2.63 2.64 2.64 2.63
#5	Device 1	78.80'	**15.0" Round Headwall Outlet (15" RCP)** L= 4.0' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 78.80' / 78.30' S= 0.1250 '/' Cc= 0.900 n= 0.012 Concrete pipe, finished, Flow Area= 1.23 sf
#6	Device 5	78.80'	**3.0" Vert. 3" Orifice** C= 0.600 Limited to weir flow at low heads
#7	Device 2	78.80'	**0.500 in/hr Underdrain over Surface area**

Primary OutFlow Max=17.06 cfs @ 13.70 hrs HW=83.18' (Free Discharge)
- **1=48" Culvert** (Passes 17.06 cfs of 129.42 cfs potential flow)
  - **2=3" Orifice** (Passes 0.40 cfs of 0.60 cfs potential flow)
    - **7=Underdrain** (Exfiltration Controls 0.40 cfs)
  - **3=42" Weir** (Orifice Controls 16.18 cfs @ 3.62 fps)
  - **4=Outlet Structure Overflow** (Controls 0.00 cfs)
  - **5=Headwall Outlet (15" RCP)** (Passes 0.49 cfs of 11.44 cfs potential flow)
    - **6=3" Orifice** (Orifice Controls 0.49 cfs @ 9.93 fps)

Pond EB: Existing Basin



Hydrograph for Pond EB: Existing Basin

Time (hours)	Inflow (cfs)	Storage (cubic-feet)	Elevation (feet)	Primary (cfs)
0.00	0.00	0	78.80	0.00
2.00	0.00	0	78.80	0.00
4.00	0.08	3	79.03	0.08
6.00	0.35	432	79.62	0.21
8.00	0.65	2,073	80.25	0.34
10.00	1.14	5,282	80.64	0.44
12.00	**5.63**	**16,848**	**81.37**	**0.61**
14.00	**15.06**	**69,426**	**83.15**	**16.56**
16.00	7.53	55,361	82.73	9.35
18.00	4.19	45,503	82.42	5.05
20.00	2.84	40,851	82.27	3.34
22.00	1.84	37,556	82.16	2.29
24.00	0.84	34,017	82.04	1.39
26.00	0.16	29,848	81.90	0.73
28.00	0.02	25,208	81.73	0.69
30.00	0.00	20,436	81.53	0.65
32.00	0.00	15,948	81.32	0.60
34.00	0.00	11,814	81.10	0.55
36.00	0.00	8,069	80.86	0.49
38.00	0.00	4,770	80.59	0.42
40.00	0.00	2,019	80.24	0.33
42.00	0.00	154	79.37	0.17
44.00	0.00	0	78.80	0.00
46.00	0.00	0	78.80	0.00
48.00	0.00	0	78.80	0.00
50.00	0.00	0	78.80	0.00
52.00	0.00	0	78.80	0.00
54.00	0.00	0	78.80	0.00
56.00	0.00	0	78.80	0.00
58.00	0.00	0	78.80	0.00
60.00	0.00	0	78.80	0.00
62.00	0.00	0	78.80	0.00
64.00	0.00	0	78.80	0.00
66.00	0.00	0	78.80	0.00
68.00	0.00	0	78.80	0.00
70.00	0.00	0	78.80	0.00
72.00	0.00	0	78.80	0.00
74.00	0.00	0	78.80	0.00
76.00	0.00	0	78.80	0.00
78.00	0.00	0	78.80	0.00
80.00	0.00	0	78.80	0.00
82.00	0.00	0	78.80	0.00
84.00	0.00	0	78.80	0.00
86.00	0.00	0	78.80	0.00
88.00	0.00	0	78.80	0.00
90.00	0.00	0	78.80	0.00
92.00	0.00	0	78.80	0.00
94.00	0.00	0	78.80	0.00
96.00	0.00	0	78.80	0.00

Summary for Subcatchment DA-1: DA-1

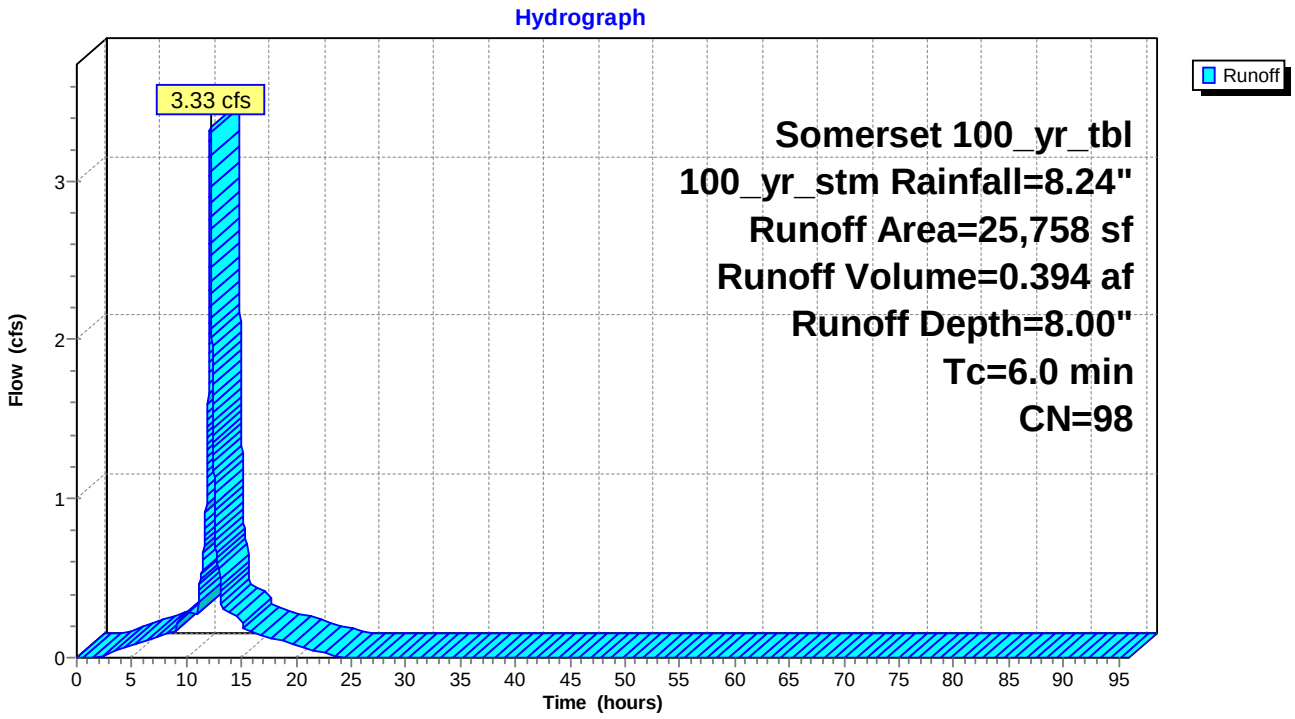
Runoff = 3.33 cfs @ 12.14 hrs, Volume= 0.394 af, Depth= 8.00"

Runoff by SCS TR-20 method, UH=Delmarva, Weighted-CN, Time Span= 0.00-96.00 hrs, dt= 0.01 hrs
Somerset 100_yr_tbl 100_yr_stm Rainfall=8.24"

Area (sf)	CN	Description
25,758	98	Roofs, HSG D
25,758		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry,**

Subcatchment DA-1: DA-1



Summary for Subcatchment DA-2i: DA-2i

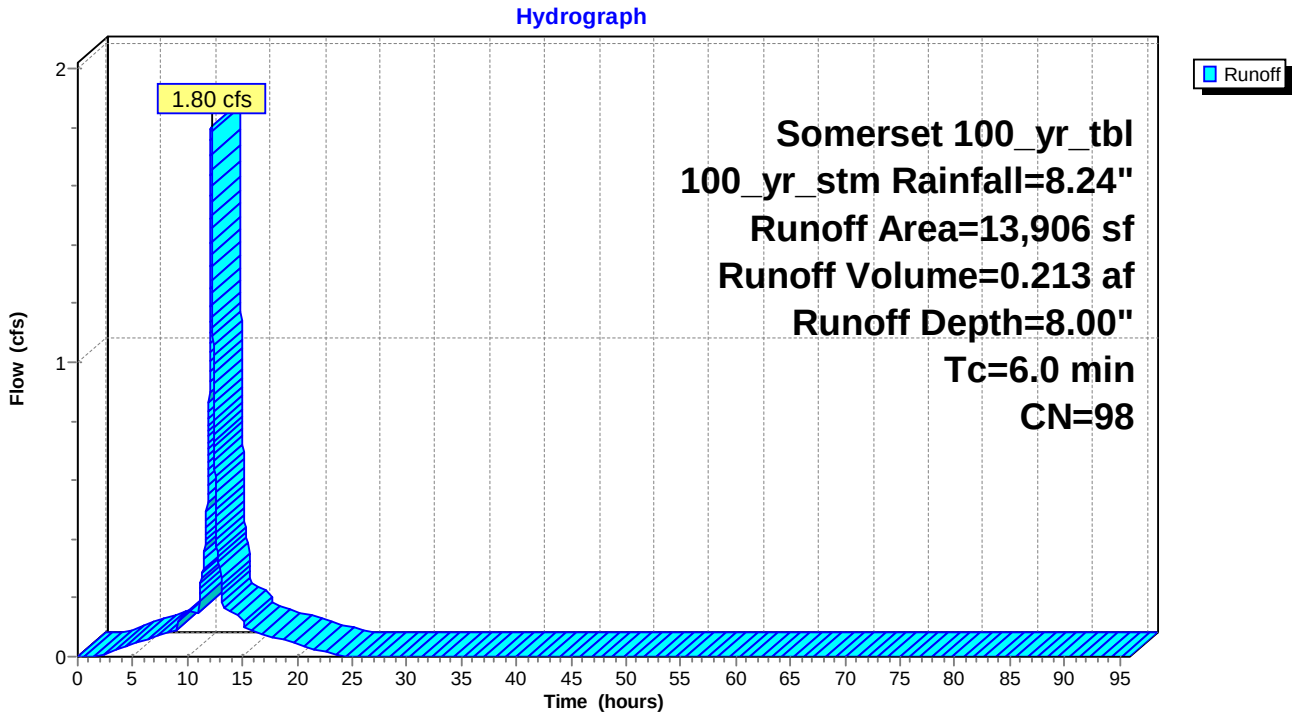
Runoff = 1.80 cfs @ 12.14 hrs, Volume= 0.213 af, Depth= 8.00"

Runoff by SCS TR-20 method, UH=Delmarva, Weighted-CN, Time Span= 0.00-96.00 hrs, dt= 0.01 hrs
Somerset 100_yr_tbl 100_yr_stm Rainfall=8.24"

	Area (sf)	CN	Description
*	2,940	98	Sidewalks, HSG C
	9,656	98	Paved parking, HSG C
*	649	98	Hardscape, HSG C
*	661	98	Hardscape, HSG B
	13,906	98	Weighted Average
	13,906		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry,**

Subcatchment DA-2i: DA-2i



Summary for Subcatchment DA-2p: DA-2p

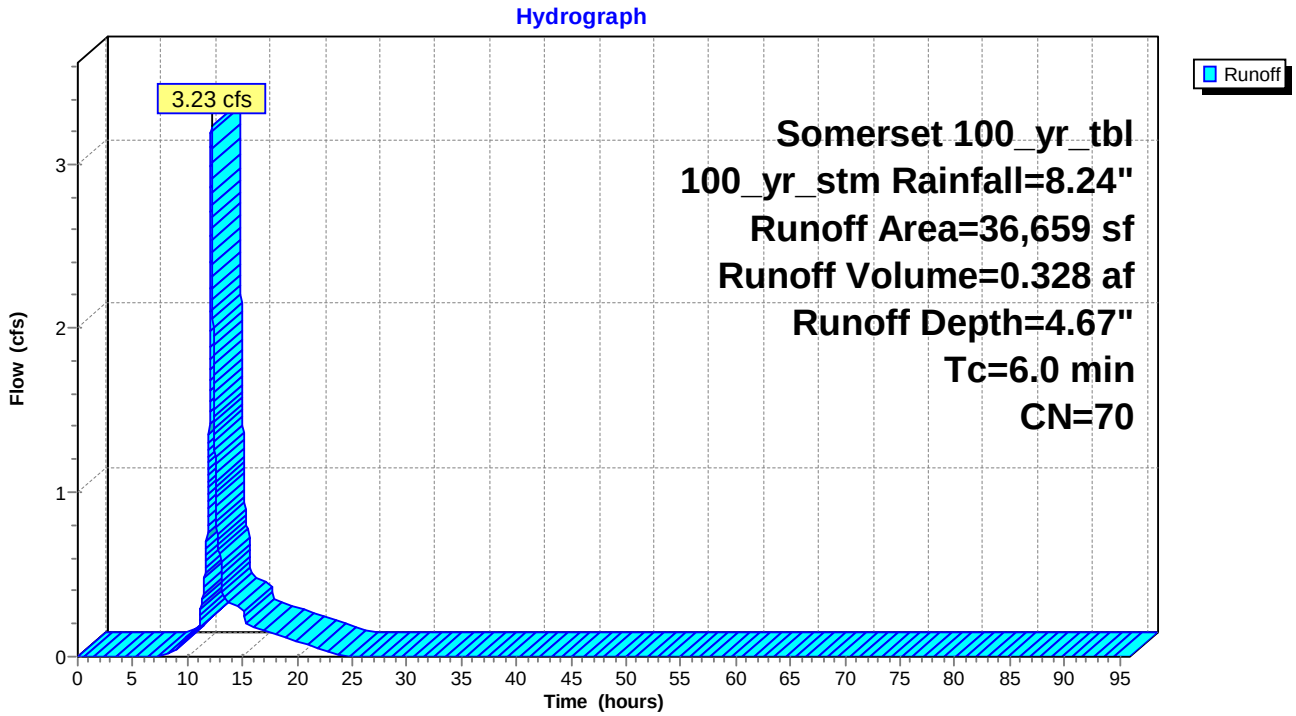
Runoff = 3.23 cfs @ 12.14 hrs, Volume= 0.328 af, Depth= 4.67"

Runoff by SCS TR-20 method, UH=Delmarva, Weighted-CN, Time Span= 0.00-96.00 hrs, dt= 0.01 hrs
Somerset 100_yr_tbl 100_yr_stm Rainfall=8.24"

Area (sf)	CN	Description
5,773	61	>75% Grass cover, Good, HSG B
5,981	74	>75% Grass cover, Good, HSG C
14,003	80	>75% Grass cover, Good, HSG D
10,902	61	>75% Grass cover, Good, HSG B
36,659	70	Weighted Average
36,659		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry,**

Subcatchment DA-2p: DA-2p



Summary for Subcatchment DA-3: DA-3

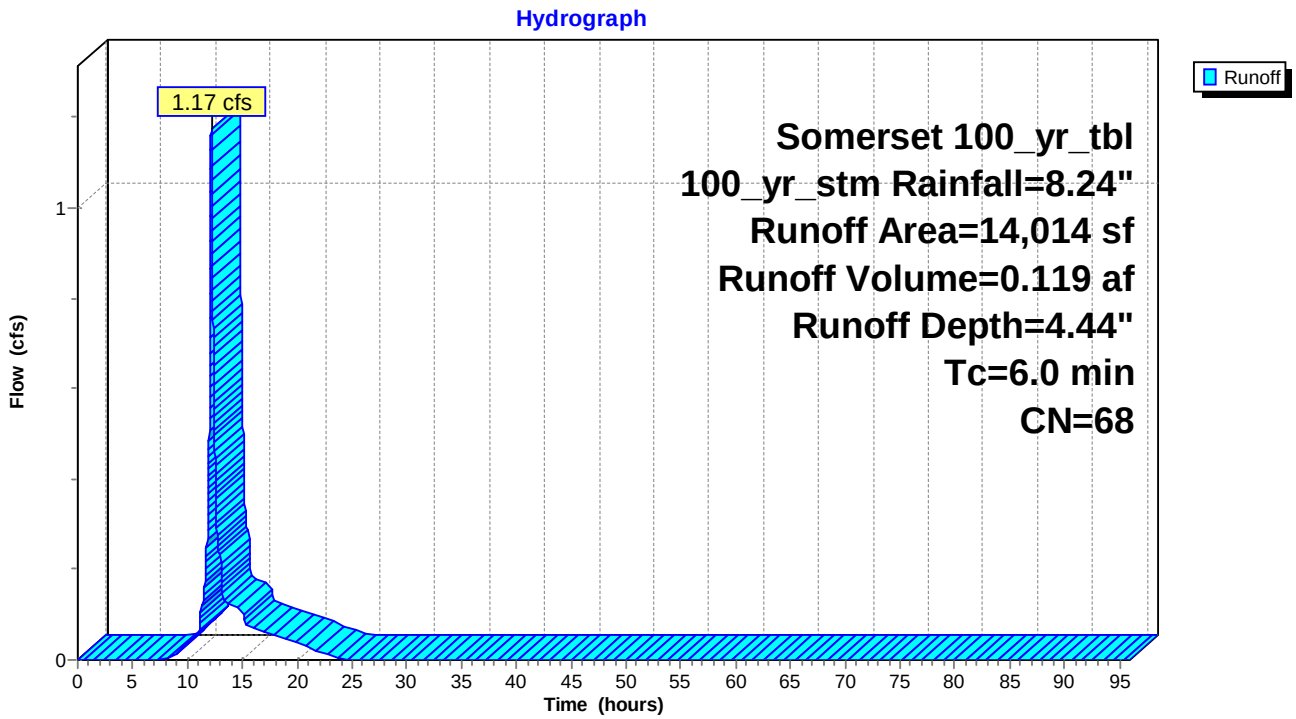
Runoff = 1.17 cfs @ 12.14 hrs, Volume= 0.119 af, Depth= 4.44"

Runoff by SCS TR-20 method, UH=Delmarva, Weighted-CN, Time Span= 0.00-96.00 hrs, dt= 0.01 hrs
Somerset 100_yr_tbl 100_yr_stm Rainfall=8.24"

	Area (sf)	CN	Description
*	4,993	80	>75% Grass cover, Good, HSG D
	9,021	61	>75% Grass cover, Good, HSG B
	14,014	68	Weighted Average
	14,014		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry,**

Subcatchment DA-3: DA-3



Summary for Subcatchment DA-4i: DA-4i

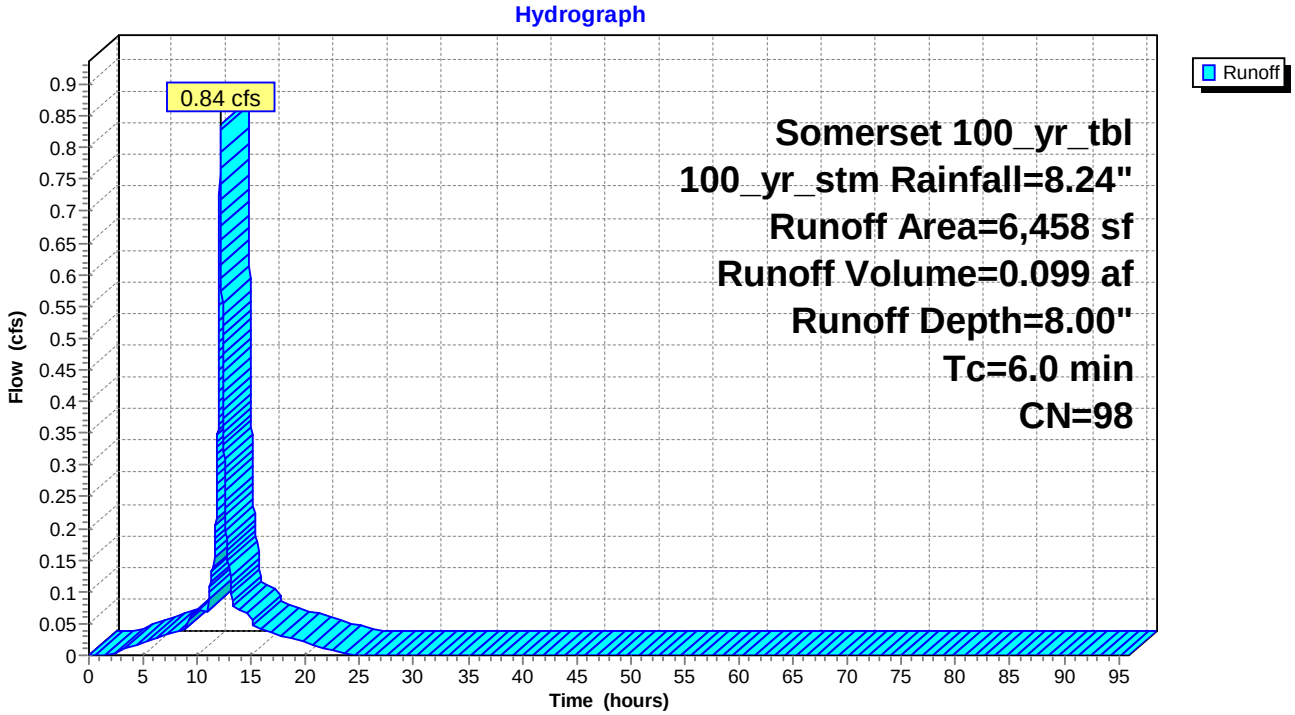
Runoff = 0.84 cfs @ 12.14 hrs, Volume= 0.099 af, Depth= 8.00"

Runoff by SCS TR-20 method, UH=Delmarva, Weighted-CN, Time Span= 0.00-96.00 hrs, dt= 0.01 hrs
Somerset 100_yr_tbl 100_yr_stm Rainfall=8.24"

	Area (sf)	CN	Description
	2,779	98	Paved parking, HSG C
*	3,419	98	Sidewalks, HSG C
*	260	98	Hardscapes, HSG C
	6,458	98	Weighted Average
	6,458		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry,**

Subcatchment DA-4i: DA-4i



Summary for Subcatchment DA-4p: DA-4p

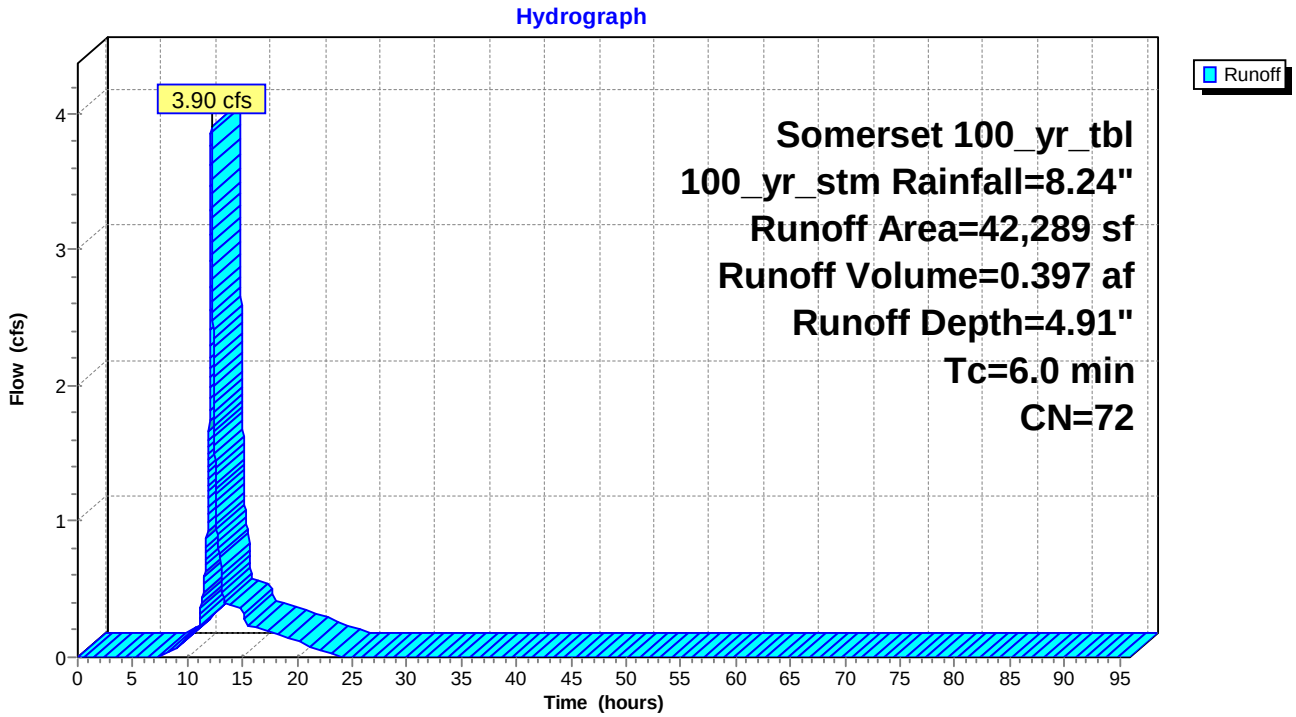
Runoff = 3.90 cfs @ 12.14 hrs, Volume= 0.397 af, Depth= 4.91"

Runoff by SCS TR-20 method, UH=Delmarva, Weighted-CN, Time Span= 0.00-96.00 hrs, dt= 0.01 hrs
Somerset 100_yr_tbl 100_yr_stm Rainfall=8.24"

Area (sf)	CN	Description
16,312	61	>75% Grass cover, Good, HSG B
2,332	74	>75% Grass cover, Good, HSG C
23,645	80	>75% Grass cover, Good, HSG D
42,289	72	Weighted Average
42,289		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry,**

Subcatchment DA-4p: DA-4p



Summary for Subcatchment DA-5: DA-5

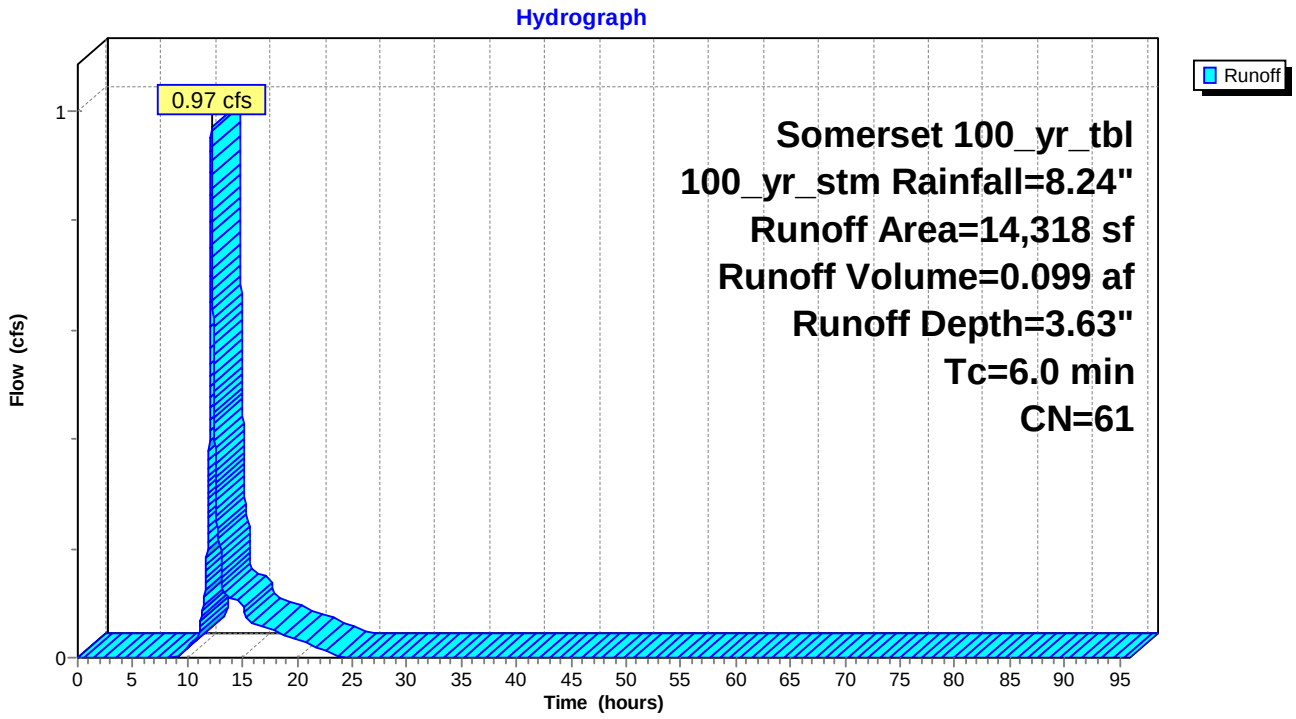
Runoff = 0.97 cfs @ 12.15 hrs, Volume= 0.099 af, Depth= 3.63"

Runoff by SCS TR-20 method, UH=Delmarva, Weighted-CN, Time Span= 0.00-96.00 hrs, dt= 0.01 hrs
Somerset 100_yr_tbl 100_yr_stm Rainfall=8.24"

Area (sf)	CN	Description
14,318	61	>75% Grass cover, Good, HSG B
14,318		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry,**

Subcatchment DA-5: DA-5



Summary for Subcatchment EA-EXi: EA-EXi

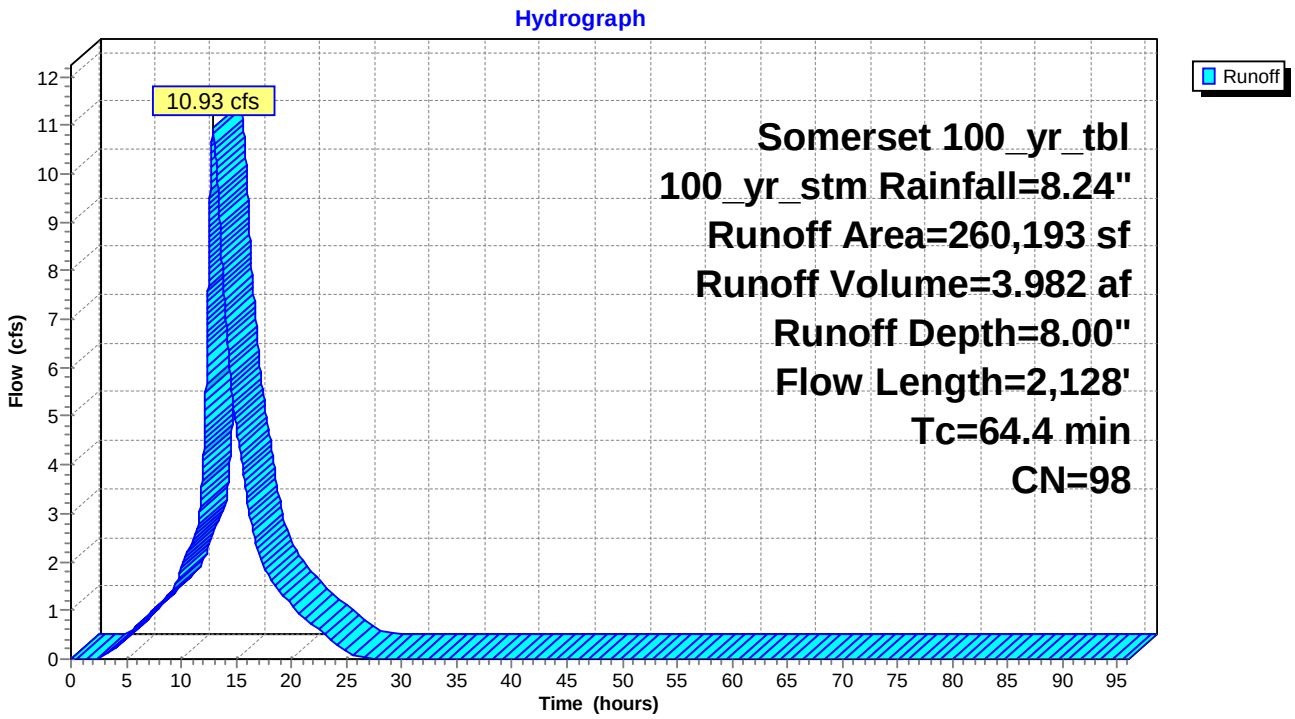
Runoff = 10.93 cfs @ 12.88 hrs, Volume= 3.982 af, Depth= 8.00"

Runoff by SCS TR-20 method, UH=Delmarva, Weighted-CN, Time Span= 0.00-96.00 hrs, dt= 0.01 hrs
Somerset 100_yr_tbl 100_yr_stm Rainfall=8.24"

	Area (sf)	CN	Description
*	34,826	98	Roofs
*	92,386	98	Roads
*	20,721	98	Driveways
*	112,260	98	Parking Lot
	260,193	98	Weighted Average
	260,193		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.8	46	0.0100	0.11		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.35"
22.3	54	0.0050	0.04		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.35"
4.4	130	0.0050	0.49		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
1.7	73	0.0200	0.71		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
0.2	24	0.0100	2.03		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
4.4	132	0.0100	0.50		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
0.2	24	0.0100	2.03		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
2.6	132	0.0150	0.86		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
4.5	189	0.0200	0.71		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
1.5	62	0.0100	0.70		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
12.9	388	0.0100	0.50		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
1.2	90	0.0300	1.21		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.9	182	0.0250	3.21		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
0.8	602	0.0136	11.92	84.26	**Pipe Channel,** 36.0" Round Area= 7.1 sf Perim= 9.4' r= 0.75' n= 0.012 Concrete pipe, finished
64.4	2,128	Total			

Subcatchment EA-EXi: EA-EXi



Summary for Subcatchment EA-EXp: EA-EXp

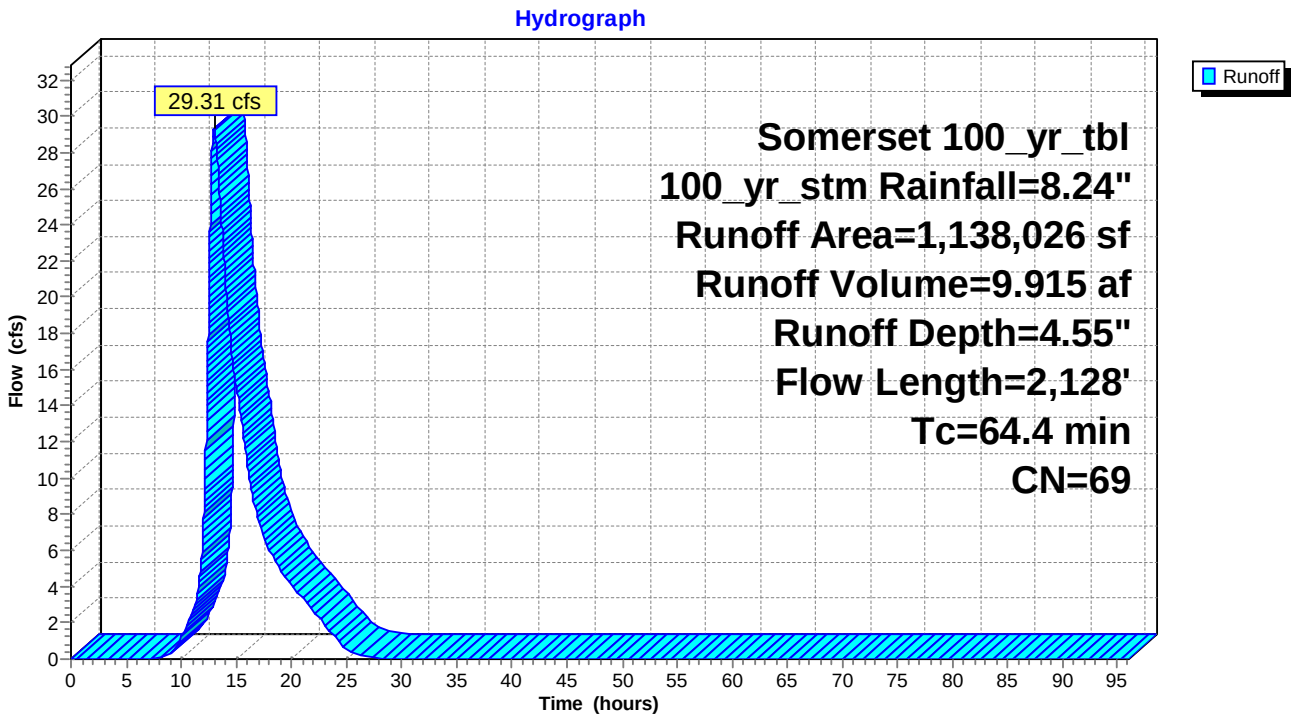
Runoff = 29.31 cfs @ 13.02 hrs, Volume= 9.915 af, Depth= 4.55"

Runoff by SCS TR-20 method, UH=Delmarva, Weighted-CN, Time Span= 0.00-96.00 hrs, dt= 0.01 hrs
Somerset 100_yr_tbl 100_yr_stm Rainfall=8.24"

Area (sf)	CN	Description
445,815	70	Woods, Good, HSG C
434,699	74	>75% Grass cover, Good, HSG C
142,152	55	Woods, Good, HSG B
81,203	61	>75% Grass cover, Good, HSG B
34,157	80	>75% Grass cover, Good, HSG D
1,138,026	69	Weighted Average
1,138,026		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.8	46	0.0100	0.11		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.35"
22.3	54	0.0050	0.04		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.35"
4.4	130	0.0050	0.49		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
1.7	73	0.0200	0.71		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
0.2	24	0.0100	2.03		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
4.4	132	0.0100	0.50		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
0.2	24	0.0100	2.03		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
2.6	132	0.0150	0.86		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
4.5	189	0.0200	0.71		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
1.5	62	0.0100	0.70		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
12.9	388	0.0100	0.50		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
1.2	90	0.0300	1.21		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.9	182	0.0250	3.21		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
0.8	602	0.0136	11.92	84.26	**Pipe Channel,** 36.0" Round Area= 7.1 sf Perim= 9.4' r= 0.75' n= 0.012 Concrete pipe, finished
64.4	2,128	Total			

Subcatchment EA-EXp: EA-EXp



Summary for Pond 1P: Underground

Inflow Area = 0.591 ac,100.00% Impervious, Inflow Depth = 8.00" for 100_yr_stm event
Inflow = 3.33 cfs @ 12.14 hrs, Volume= 0.394 af
Outflow = 0.30 cfs @ 13.30 hrs, Volume= 0.394 af, Atten= 91%, Lag= 69.4 min
Primary = 0.30 cfs @ 13.30 hrs, Volume= 0.394 af

Routing by Stor-Ind method, Time Span= 0.00-96.00 hrs, dt= 0.01 hrs
Peak Elev= 87.49' @ 13.30 hrs Surf.Area= 0.043 ac Storage= 0.187 af

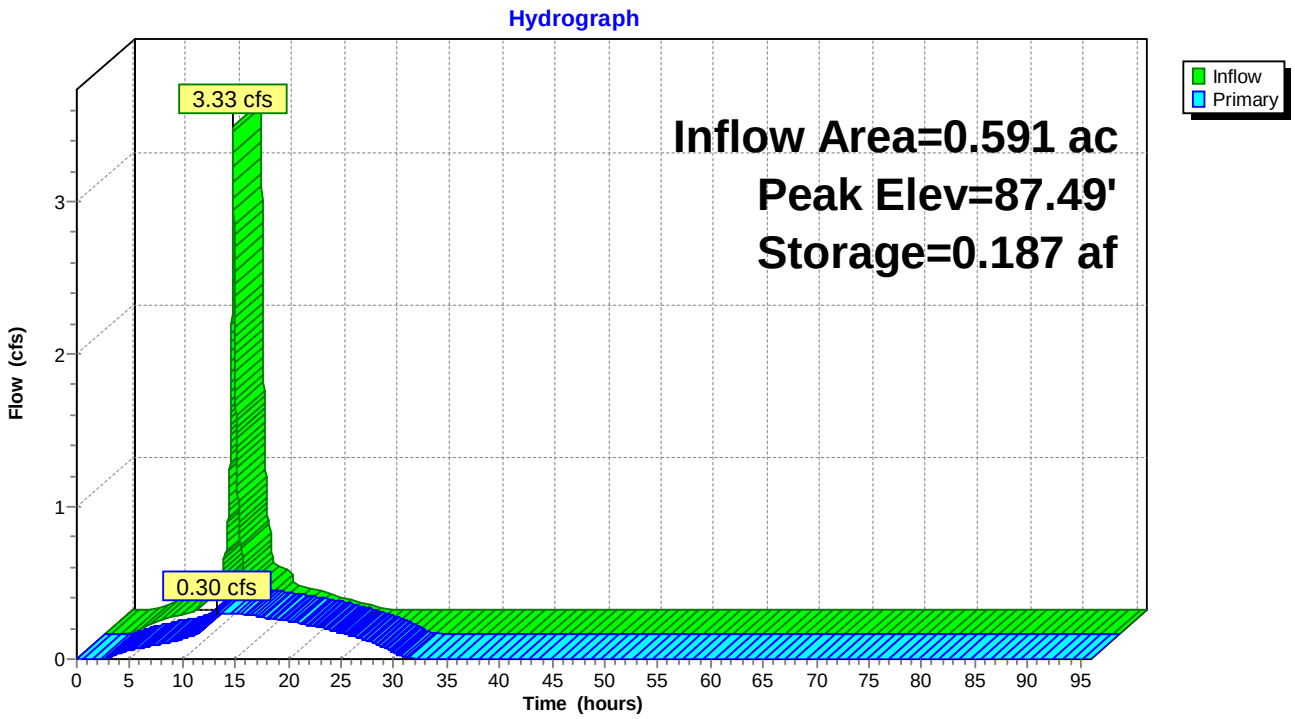
Plug-Flow detention time= 306.6 min calculated for 0.394 af (100% of inflow)
Center-of-Mass det. time= 306.7 min (1,050.1 - 743.5)

Volume	Invert	Avail.Storage	Storage Description
#1	84.00'	0.202 af	**48.0" Round Pipe Storage** x 5 L= 140.0'

Device	Routing	Invert	Outlet Devices
#1	Primary	84.00'	**15.0" Round Culvert** L= 22.0' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 84.00' / 83.78' S= 0.0100 '/' Cc= 0.900 n= 0.012 Concrete pipe, finished, Flow Area= 1.23 sf
#2	Device 1	84.00'	**2.5" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=0.30 cfs @ 13.30 hrs HW=87.49' (Free Discharge)
└─**1=Culvert** (Passes 0.30 cfs of 9.99 cfs potential flow)
  └─**2=Orifice/Grate** (Orifice Controls 0.30 cfs @ 8.85 fps)

Pond 1P: Underground



Hydrograph for Pond 1P: Underground

Time (hours)	Inflow (cfs)	Storage (acre-feet)	Elevation (feet)	Primary (cfs)
0.00	0.00	0.000	84.00	0.00
2.00	0.00	0.000	84.01	0.00
4.00	0.06	0.002	84.15	0.03
6.00	0.10	0.007	84.29	0.07
8.00	0.15	0.013	84.47	0.10
10.00	0.28	0.028	84.78	0.13
12.00	**1.92**	**0.086**	**85.76**	**0.21**
14.00	**0.29**	**0.186**	**87.47**	**0.30**
16.00	0.16	0.174	87.22	0.29
18.00	0.12	0.151	86.79	0.27
20.00	0.08	0.124	86.36	0.25
22.00	0.04	0.096	85.92	0.22
24.00	0.00	0.065	85.44	0.19
26.00	0.00	0.037	84.96	0.15
28.00	0.00	0.016	84.52	0.11
30.00	0.00	0.003	84.17	0.04
32.00	0.00	0.000	84.04	0.00
34.00	0.00	0.000	84.01	0.00
36.00	0.00	0.000	84.00	0.00
38.00	0.00	0.000	84.00	0.00
40.00	0.00	0.000	84.00	0.00
42.00	0.00	0.000	84.00	0.00
44.00	0.00	0.000	84.00	0.00
46.00	0.00	0.000	84.00	0.00
48.00	0.00	0.000	84.00	0.00
50.00	0.00	0.000	84.00	0.00
52.00	0.00	0.000	84.00	0.00
54.00	0.00	0.000	84.00	0.00
56.00	0.00	0.000	84.00	0.00
58.00	0.00	0.000	84.00	0.00
60.00	0.00	0.000	84.00	0.00
62.00	0.00	0.000	84.00	0.00
64.00	0.00	0.000	84.00	0.00
66.00	0.00	0.000	84.00	0.00
68.00	0.00	0.000	84.00	0.00
70.00	0.00	0.000	84.00	0.00
72.00	0.00	0.000	84.00	0.00
74.00	0.00	0.000	84.00	0.00
76.00	0.00	0.000	84.00	0.00
78.00	0.00	0.000	84.00	0.00
80.00	0.00	0.000	84.00	0.00
82.00	0.00	0.000	84.00	0.00
84.00	0.00	0.000	84.00	0.00
86.00	0.00	0.000	84.00	0.00
88.00	0.00	0.000	84.00	0.00
90.00	0.00	0.000	84.00	0.00
92.00	0.00	0.000	84.00	0.00
94.00	0.00	0.000	84.00	0.00
96.00	0.00	0.000	84.00	0.00

Summary for Pond 2P: BioBasin

Inflow Area = 1.161 ac, 27.50% Impervious, Inflow Depth = 5.59" for 100_yr_stm event
Inflow = 5.03 cfs @ 12.14 hrs, Volume= 0.540 af
Outflow = 4.53 cfs @ 12.19 hrs, Volume= 0.418 af, Atten= 10%, Lag= 2.8 min
Primary = 4.53 cfs @ 12.19 hrs, Volume= 0.418 af

Routing by Stor-Ind method, Time Span= 0.00-96.00 hrs, dt= 0.01 hrs
Peak Elev= 88.30' @ 12.19 hrs Surf.Area= 3,645 sf Storage= 6,625 cf

Plug-Flow detention time= 150.8 min calculated for 0.418 af (77% of inflow)
Center-of-Mass det. time= 68.6 min (863.0 - 794.3)

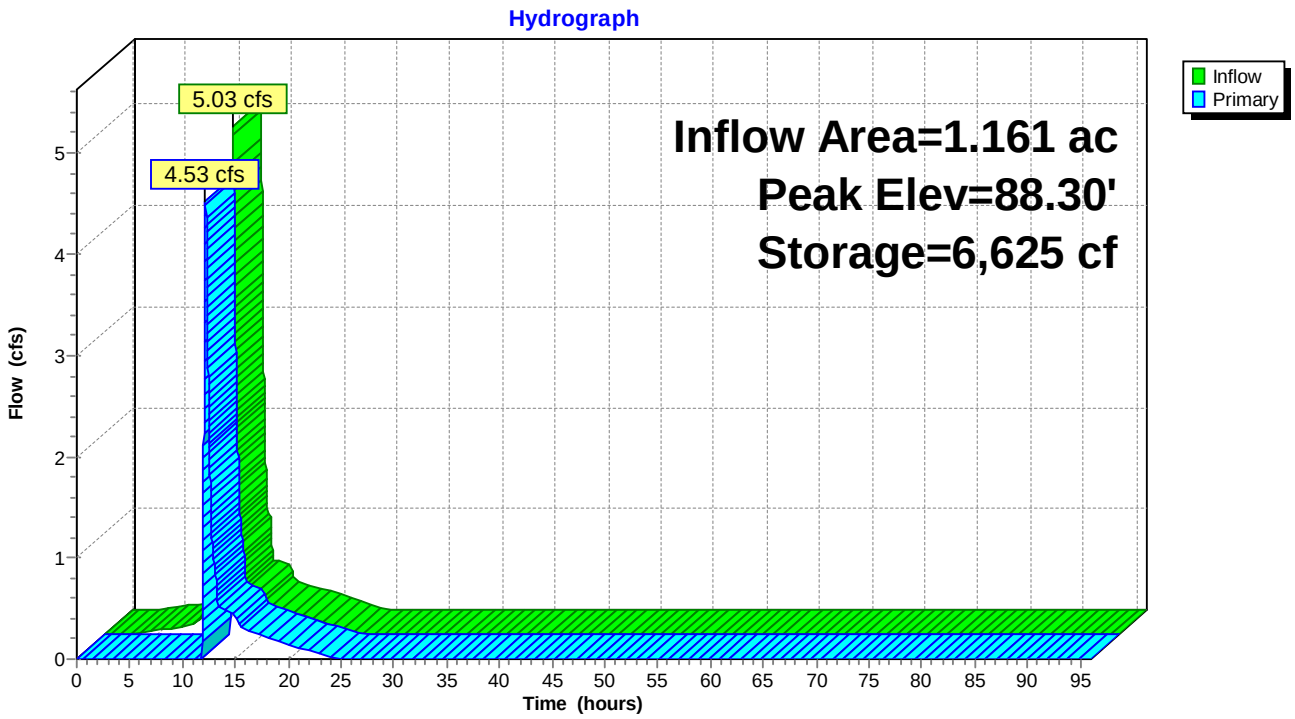
Volume	Invert	Avail.Storage	Storage Description
#1	86.00'	11,525 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
86.00	2,166	0	0
87.00	2,769	2,468	2,468
88.00	3,431	3,100	5,568
89.00	4,147	3,789	9,357
89.50	4,527	2,169	11,525

Device	Routing	Invert	Outlet Devices
#1	Primary	86.00'	**15.0" Round Culvert** L= 139.0' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 86.00' / 84.61' S= 0.0100 '/' Cc= 0.900 n= 0.012 Concrete pipe, finished, Flow Area= 1.23 sf
#2	Device 1	87.93'	**8.0' long x 8.0' 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 3.50 4.00 4.50 5.00 5.50 Coef. (English) 2.43 2.54 2.70 2.69 2.68 2.68 2.66 2.64 2.64 2.64 2.65 2.65 2.66 2.66 2.68 2.70 2.74

Primary OutFlow Max=4.52 cfs @ 12.19 hrs HW=88.30' (Free Discharge)
└─**1=Culvert** (Passes 4.52 cfs of 7.45 cfs potential flow)
  └─**2=Broad-Crested Rectangular Weir** (Weir Controls 4.52 cfs @ 1.53 fps)

Pond 2P: BioBasin



Hydrograph for Pond 2P: BioBasin

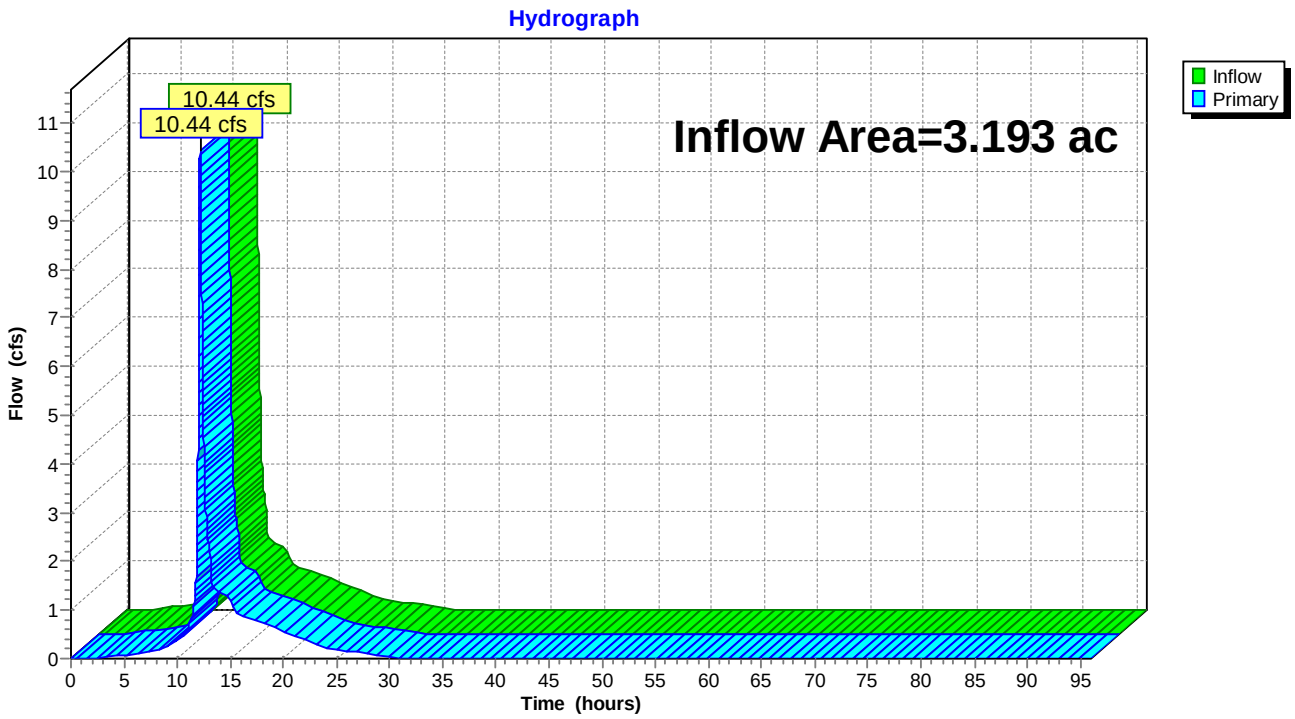
Time (hours)	Inflow (cfs)	Storage (cubic-feet)	Elevation (feet)	Primary (cfs)
0.00	0.00	0	86.00	0.00
2.00	0.00	1	86.00	0.00
4.00	0.03	113	86.05	0.00
6.00	0.06	422	86.19	0.00
8.00	0.09	921	86.40	0.00
10.00	0.27	2,097	86.86	0.00
12.00	**2.72**	**6,054**	**88.14**	**1.87**
14.00	**0.49**	**5,622**	**88.02**	**0.49**
16.00	0.27	5,526	87.99	0.28
18.00	0.21	5,490	87.98	0.21
20.00	0.14	5,455	87.97	0.15
22.00	0.07	5,412	87.95	0.08
24.00	0.01	5,344	87.93	0.01
26.00	0.00	5,329	87.93	0.00
28.00	0.00	5,329	87.93	0.00
30.00	0.00	5,329	87.93	0.00
32.00	0.00	5,329	87.93	0.00
34.00	0.00	5,329	87.93	0.00
36.00	0.00	5,329	87.93	0.00
38.00	0.00	5,329	87.93	0.00
40.00	0.00	5,329	87.93	0.00
42.00	0.00	5,329	87.93	0.00
44.00	0.00	5,329	87.93	0.00
46.00	0.00	5,329	87.93	0.00
48.00	0.00	5,329	87.93	0.00
50.00	0.00	5,329	87.93	0.00
52.00	0.00	5,329	87.93	0.00
54.00	0.00	5,329	87.93	0.00
56.00	0.00	5,329	87.93	0.00
58.00	0.00	5,329	87.93	0.00
60.00	0.00	5,329	87.93	0.00
62.00	0.00	5,329	87.93	0.00
64.00	0.00	5,329	87.93	0.00
66.00	0.00	5,329	87.93	0.00
68.00	0.00	5,329	87.93	0.00
70.00	0.00	5,329	87.93	0.00
72.00	0.00	5,329	87.93	0.00
74.00	0.00	5,329	87.93	0.00
76.00	0.00	5,329	87.93	0.00
78.00	0.00	5,329	87.93	0.00
80.00	0.00	5,329	87.93	0.00
82.00	0.00	5,329	87.93	0.00
84.00	0.00	5,329	87.93	0.00
86.00	0.00	5,329	87.93	0.00
88.00	0.00	5,329	87.93	0.00
90.00	0.00	5,329	87.93	0.00
92.00	0.00	5,329	87.93	0.00
94.00	0.00	5,329	87.93	0.00
96.00	0.00	5,329	87.93	0.00

Summary for Pond 3P: Total

Inflow Area = 3.193 ac, 33.16% Impervious, Inflow Depth = 5.36" for 100_yr_stm event
Inflow = 10.44 cfs @ 12.16 hrs, Volume= 1.427 af
Primary = 10.44 cfs @ 12.16 hrs, Volume= 1.427 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind method, Time Span= 0.00-96.00 hrs, dt= 0.01 hrs

Pond 3P: Total



Summary for Pond EB: Existing Basin

Inflow Area = 35.620 ac, 19.74% Impervious, Inflow Depth = 5.20" for 100_yr_stm event
Inflow = 42.81 cfs @ 12.89 hrs, Volume= 15.424 af
Outflow = 37.62 cfs @ 13.41 hrs, Volume= 15.424 af, Atten= 12%, Lag= 31.2 min
Primary = 37.62 cfs @ 13.41 hrs, Volume= 15.424 af

Routing by Stor-Ind method, Time Span= 0.00-96.00 hrs, dt= 0.01 hrs
Peak Elev= 84.10' @ 13.41 hrs Surf.Area= 37,117 sf Storage= 103,454 cf

Plug-Flow detention time= 104.6 min calculated for 15.424 af (100% of inflow)
Center-of-Mass det. time= 104.6 min (998.8 - 894.2)

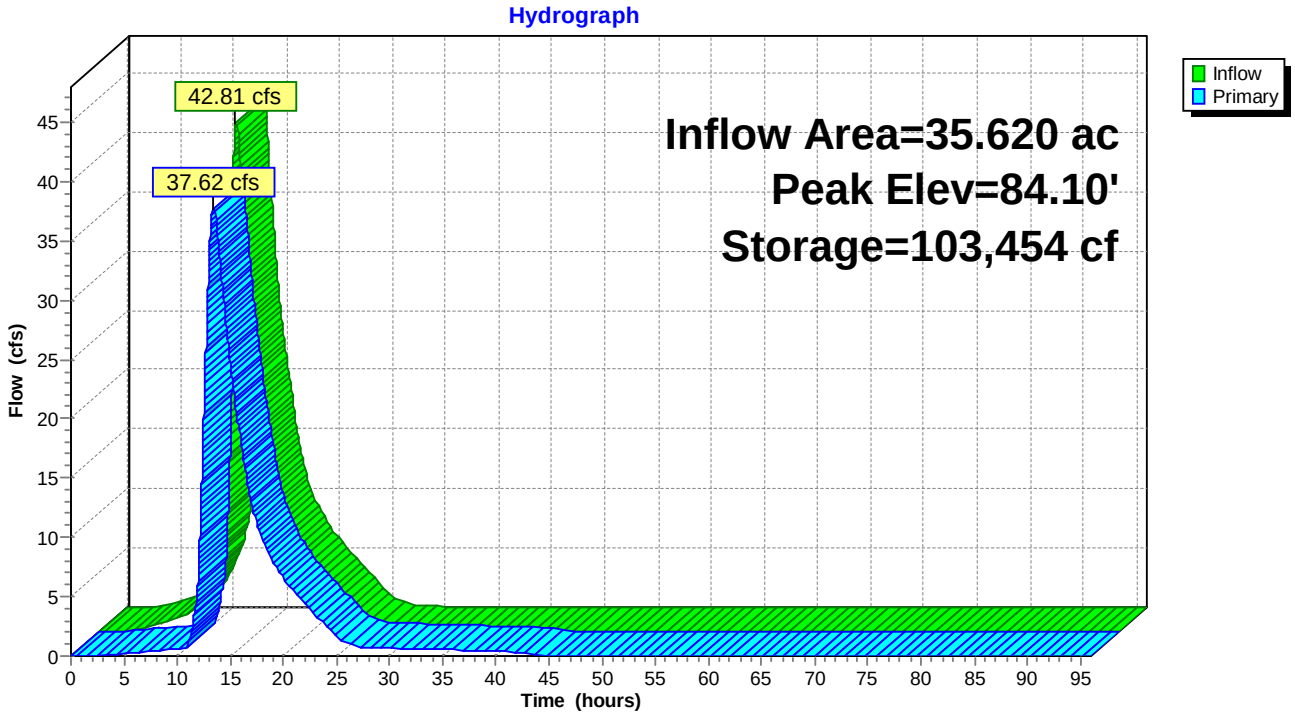
Volume	Invert	Avail.Storage	Storage Description
#1	78.80'	223,129 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
78.80	1	0	0
79.00	16	2	2
80.00	2,181	1,099	1,100
81.00	15,895	9,038	10,138
82.00	29,262	22,579	32,717
83.00	34,004	31,633	64,350
84.00	36,834	35,419	99,769
85.00	39,677	38,256	138,024
86.00	42,533	41,105	179,129
87.00	45,467	44,000	223,129

Device	Routing	Invert	Outlet Devices
#1	Primary	76.60'	**48.0" Round 48" Culvert** L= 50.0' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 76.60' / 76.10' S= 0.0100 '/' Cc= 0.900 n= 0.012 Concrete pipe, finished, Flow Area= 12.57 sf
#2	Device 1	76.60'	**3.0" Vert. 3" Orifice** C= 0.600 Limited to weir flow at low heads
#3	Device 1	81.90'	**42.0" W x 38.5" H Vert. 42" Weir** C= 0.600 Limited to weir flow at low heads
#4	Device 1	85.44'	**16.0' long x 16.0' breadth Outlet Structure Overflow** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.68 2.70 2.70 2.64 2.63 2.64 2.64 2.63
#5	Device 1	78.80'	**15.0" Round Headwall Outlet (15" RCP)** L= 4.0' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 78.80' / 78.30' S= 0.1250 '/' Cc= 0.900 n= 0.012 Concrete pipe, finished, Flow Area= 1.23 sf
#6	Device 5	78.80'	**3.0" Vert. 3" Orifice** C= 0.600 Limited to weir flow at low heads
#7	Device 2	78.80'	**0.500 in/hr Underdrain over Surface area**

Primary OutFlow Max=37.62 cfs @ 13.41 hrs HW=84.10' (Free Discharge)
- **1=48" Culvert** (Passes 37.62 cfs of 141.90 cfs potential flow)
  - **2=3" Orifice** (Passes 0.43 cfs of 0.64 cfs potential flow)
    - **7=Underdrain** (Exfiltration Controls 0.43 cfs)
  - **3=42" Weir** (Orifice Controls 36.65 cfs @ 4.76 fps)
  - **4=Outlet Structure Overflow** (Controls 0.00 cfs)
  - **5=Headwall Outlet (15" RCP)** (Passes 0.54 cfs of 12.78 cfs potential flow)
    - **6=3" Orifice** (Orifice Controls 0.54 cfs @ 10.95 fps)

Pond EB: Existing Basin



Hydrograph for Pond EB: Existing Basin

Time (hours)	Inflow (cfs)	Storage (cubic-feet)	Elevation (feet)	Primary (cfs)
0.00	0.00	0	78.80	0.00
2.00	0.00	0	78.81	0.00
4.00	0.27	166	79.38	0.17
6.00	0.78	2,105	80.25	0.34
8.00	1.32	6,696	80.76	0.47
10.00	3.41	17,473	81.40	0.62
12.00	**16.53**	**50,240**	**82.57**	**7.01**
14.00	**29.53**	**97,714**	**83.94**	**33.79**
16.00	15.04	72,015	83.22	18.00
18.00	8.51	56,393	82.76	9.84
20.00	5.78	49,184	82.54	6.57
22.00	3.75	43,985	82.37	4.47
24.00	1.73	38,445	82.19	2.57
26.00	0.44	32,652	82.00	1.10
28.00	0.14	28,480	81.85	0.72
30.00	0.04	24,070	81.68	0.68
32.00	0.00	19,431	81.49	0.64
34.00	0.00	15,028	81.28	0.59
36.00	0.00	10,977	81.05	0.54
38.00	0.00	7,322	80.81	0.48
40.00	0.00	4,129	80.52	0.41
42.00	0.00	1,525	80.13	0.31
44.00	0.00	0	78.80	0.00
46.00	0.00	0	78.80	0.00
48.00	0.00	0	78.80	0.00
50.00	0.00	0	78.80	0.00
52.00	0.00	0	78.80	0.00
54.00	0.00	0	78.80	0.00
56.00	0.00	0	78.80	0.00
58.00	0.00	0	78.80	0.00
60.00	0.00	0	78.80	0.00
62.00	0.00	0	78.80	0.00
64.00	0.00	0	78.80	0.00
66.00	0.00	0	78.80	0.00
68.00	0.00	0	78.80	0.00
70.00	0.00	0	78.80	0.00
72.00	0.00	0	78.80	0.00
74.00	0.00	0	78.80	0.00
76.00	0.00	0	78.80	0.00
78.00	0.00	0	78.80	0.00
80.00	0.00	0	78.80	0.00
82.00	0.00	0	78.80	0.00
84.00	0.00	0	78.80	0.00
86.00	0.00	0	78.80	0.00
88.00	0.00	0	78.80	0.00
90.00	0.00	0	78.80	0.00
92.00	0.00	0	78.80	0.00
94.00	0.00	0	78.80	0.00
96.00	0.00	0	78.80	0.00

APPENDIX C

BASIN DRAIN TIME ANALYSIS

Hydrograph for Pond 1P: Underground

Time (hours)	Inflow (cfs)	Storage (acre-feet)	Elevation (feet)	Primary (cfs)
0.00	0.00	0.000	84.00	0.00
2.00	0.00	0.000	84.01	0.00
4.00	0.06	0.002	84.15	0.03
6.00	0.10	0.007	84.29	0.07
8.00	0.15	0.013	84.47	0.10
10.00	0.28	0.028	84.78	0.13
12.00	**1.92**	**0.086**	**85.76**	**0.21**
14.00	**0.29**	**0.186**	**87.47**	**0.30**
16.00	0.16	0.174	87.22	0.29
18.00	0.12	0.151	86.79	0.27
20.00	0.08	0.124	86.36	0.25
22.00	0.04	0.096	85.92	0.22
24.00	0.00	0.065	85.44	0.19
26.00	0.00	0.037	84.96	0.15
28.00	0.00	0.016	84.52	0.11
30.00	0.00	0.003	84.17	0.04
32.00	0.00	0.000	84.04	0.00
34.00	0.00	0.000	84.01	0.00
36.00	0.00	0.000	84.00	0.00
38.00	0.00	0.000	84.00	0.00
40.00	0.00	0.000	84.00	0.00
42.00	0.00	0.000	84.00	0.00
44.00	0.00	0.000	84.00	0.00
46.00	0.00	0.000	84.00	0.00
48.00	0.00	0.000	84.00	0.00
50.00	0.00	0.000	84.00	0.00
52.00	0.00	0.000	84.00	0.00
54.00	0.00	0.000	84.00	0.00
56.00	0.00	0.000	84.00	0.00
58.00	0.00	0.000	84.00	0.00
60.00	0.00	0.000	84.00	0.00
62.00	0.00	0.000	84.00	0.00
64.00	0.00	0.000	84.00	0.00
66.00	0.00	0.000	84.00	0.00
68.00	0.00	0.000	84.00	0.00
70.00	0.00	0.000	84.00	0.00
72.00	0.00	0.000	84.00	0.00
74.00	0.00	0.000	84.00	0.00
76.00	0.00	0.000	84.00	0.00
78.00	0.00	0.000	84.00	0.00
80.00	0.00	0.000	84.00	0.00
82.00	0.00	0.000	84.00	0.00
84.00	0.00	0.000	84.00	0.00
86.00	0.00	0.000	84.00	0.00
88.00	0.00	0.000	84.00	0.00
90.00	0.00	0.000	84.00	0.00
92.00	0.00	0.000	84.00	0.00
94.00	0.00	0.000	84.00	0.00
96.00	0.00	0.000	84.00	0.00

Basin fully drains in less than 72 hours

Hydrograph for Pond 2P: BioBasin

Time (hours)	Inflow (cfs)	Storage (cubic-feet)	Elevation (feet)	Primary (cfs)
0.00	0.00	0	86.00	0.00
2.00	0.00	1	86.00	0.00
4.00	0.03	113	86.05	0.00
6.00	0.06	422	86.19	0.00
8.00	0.09	921	86.40	0.00
10.00	0.27	2,097	86.86	0.00
12.00	**2.72**	**6,054**	**88.14**	**1.87**
14.00	**0.49**	**5,622**	**88.02**	**0.49**
16.00	0.27	5,526	87.99	0.28
18.00	0.21	5,490	87.98	0.21
20.00	0.14	5,455	87.97	0.15
22.00	0.07	5,412	87.95	0.08
24.00	0.01	5,344	87.93	0.01
26.00	0.00	5,329	87.93	0.00
28.00	0.00	5,329	87.93	0.00
30.00	0.00	5,329	87.93	0.00
32.00	0.00	5,329	87.93	0.00
34.00	0.00	5,329	87.93	0.00
36.00	0.00	5,329	87.93	0.00
38.00	0.00	5,329	87.93	0.00
40.00	0.00	5,329	87.93	0.00
42.00	0.00	5,329	87.93	0.00
44.00	0.00	5,329	87.93	0.00
46.00	0.00	5,329	87.93	0.00
48.00	0.00	5,329	87.93	0.00
50.00	0.00	5,329	87.93	0.00
52.00	0.00	5,329	87.93	0.00
54.00	0.00	5,329	87.93	0.00
56.00	0.00	5,329	87.93	0.00
58.00	0.00	5,329	87.93	0.00
60.00	0.00	5,329	87.93	0.00
62.00	0.00	5,329	87.93	0.00
64.00	0.00	5,329	87.93	0.00
66.00	0.00	5,329	87.93	0.00
68.00	0.00	5,329	87.93	0.00
70.00	0.00	5,329	87.93	0.00
72.00	0.00	5,329	87.93	0.00
74.00	0.00	5,329	87.93	0.00
76.00	0.00	5,329	87.93	0.00
78.00	0.00	5,329	87.93	0.00
80.00	0.00	5,329	87.93	0.00
82.00	0.00	5,329	87.93	0.00
84.00	0.00	5,329	87.93	0.00
86.00	0.00	5,329	87.93	0.00
88.00	0.00	5,329	87.93	0.00
90.00	0.00	5,329	87.93	0.00
92.00	0.00	5,329	87.93	0.00
94.00	0.00	5,329	87.93	0.00
96.00	0.00	5,329	87.93	0.00

Basin fully drains in less than 72 hours

Hydrograph for Pond EB: Existing Basin

Time (hours)	Inflow (cfs)	Storage (cubic-feet)	Elevation (feet)	Primary (cfs)
0.00	0.00	0	78.80	0.00
2.00	0.00	0	78.81	0.00
4.00	0.27	166	79.38	0.17
6.00	0.78	2,105	80.25	0.34
8.00	1.32	6,696	80.76	0.47
10.00	3.41	17,473	81.40	0.62
12.00	**16.53**	**50,240**	**82.57**	**7.01**
14.00	**29.53**	**97,714**	**83.94**	**33.79**
16.00	15.04	72,015	83.22	18.00
18.00	8.51	56,393	82.76	9.84
20.00	5.78	49,184	82.54	6.57
22.00	3.75	43,985	82.37	4.47
24.00	1.73	38,445	82.19	2.57
26.00	0.44	32,652	82.00	1.10
28.00	0.14	28,480	81.85	0.72
30.00	0.04	24,070	81.68	0.68
32.00	0.00	19,431	81.49	0.64
34.00	0.00	15,028	81.28	0.59
36.00	0.00	10,977	81.05	0.54
38.00	0.00	7,322	80.81	0.48
40.00	0.00	4,129	80.52	0.41
42.00	0.00	1,525	80.13	0.31
44.00	0.00	0	78.80	0.00
46.00	0.00	0	78.80	0.00
48.00	0.00	0	78.80	0.00
50.00	0.00	0	78.80	0.00
52.00	0.00	0	78.80	0.00
54.00	0.00	0	78.80	0.00
56.00	0.00	0	78.80	0.00
58.00	0.00	0	78.80	0.00
60.00	0.00	0	78.80	0.00
62.00	0.00	0	78.80	0.00
64.00	0.00	0	78.80	0.00
66.00	0.00	0	78.80	0.00
68.00	0.00	0	78.80	0.00
70.00	0.00	0	78.80	0.00
72.00	0.00	0	78.80	0.00
74.00	0.00	0	78.80	0.00
76.00	0.00	0	78.80	0.00
78.00	0.00	0	78.80	0.00
80.00	0.00	0	78.80	0.00
82.00	0.00	0	78.80	0.00
84.00	0.00	0	78.80	0.00
86.00	0.00	0	78.80	0.00
88.00	0.00	0	78.80	0.00
90.00	0.00	0	78.80	0.00
92.00	0.00	0	78.80	0.00
94.00	0.00	0	78.80	0.00
96.00	0.00	0	78.80	0.00

Basin fully drains in less than 72 hours

APPENDIX D

BASIN SUMMARY SHEETS

New Jersey Department of Agriculture

Hydrologic Modeling Database – Data Entry Form

Project Site Details

Chpt. 251 Application Number:

Start Date (if known):

Street Address: Headquarters Park Drive

County: Somerset

Municipality: Montgomery Township

Block: 20001

Lot: 10.05

NJDEP Anderson Landuse Code (4 digits): 1600

Landuse description: Mixed Urban or Built-up Land

Site Centroid Location (NJ State Plane Feet): [1]

Northing: 577,528 Easting: 448,057

Project Contact Details

Applicant: RPM Development Group

Address: 77 Park Street, Montclair, NJ 07042

Phone: 973-744-5410

Email: shenschel@rpmdev.com

Post Construction Operation & Maintenance:[2]

Party Name: RPM Development Group

Address: 77 Park Street, Montclair, NJ 07042

Phone: 973-744-5410

Email: shenschel@rpmdev.com

Party type: Owner

New Jersey Department of Agriculture

Hydrologic Modeling Database – Data Entry Form

Basin Details:[3] Underground Detention Basin

Basin Centroid (NJ State Plane Feet):[4]

Northing: 585,480 Easting: 546,605

Basin Type: Detention Basin

Construction: HDPE Pipe

Status phase:[5] Design ☒ As-built ☐

Dam Height (ft) N/A top width (ft) N/A

Dam Classification: N/A

Drainage Area(s) to Basin [note- include any bypass areas][6]

Drainage Area Name	Drainage Area (acres)	Post-Development CN#	Percent Impervious	Time of Concentration (min)
DA-1	0.59	98	100%	6

Basin Outlet Structure(s)[7]

ID: Dentention

End of Pipe Location:[8] Northing: 577,695 Easting: 447,813

Discharge Type[9] (weir, orifice, etc)	Dimensions (diameter, length)	Elevation (USGS)	Discharge [10]Coefficient	Equation Used[11]
Orifice	2.5	84.00	0.60	Q=CA(2gh)^0.5

New Jersey Department of Agriculture

Hydrologic Modeling Database – Data Entry Form

Basin Outlet Structure(s)

ID.

End of Pipe Location: Northing: Easting:

Discharge Type (weir, orifice, etc)	Dimensions (diameter, length)	Elevation (USGS)	Discharge Coefficient	Equation Used

Basin Stage-Discharge Rating Table[12]

Elevation (USGS Feet)	Storage (Acre-Ft)	Total Outlet Structure Discharge (cfs)
84.00	0.000	0.00
84.50	0.015	0.10
85.00	0.039	0.16
85.50	0.069	0.19
86.00	0.101	0.23
86.50	0.133	0.25
87.00	0.162	0.28
87.50	0.187	0.30
88.00	0.202	0.32

New Jersey Department of Agriculture

Hydrologic Modeling Database – Data Entry Form

NJDEP BMP Water Quality Structures[13]

Type (rain garden, green roof, seepage pit etc)	Size	Size Units (cu ft, sq ft etc)	Northing (SPF)	Easting (SPF)
N/A				

Explanatory Notes-

[1] Approximate location of center of site, coordinates in state plane feet
[2] Indicate who will be responsible for permanent operation and maintenance
[3] Additional Basin Detail Pages can be used for more than one basin in a project.
[4] Approximate location of center of basin, coordinates in state plane feet
[5] Indicate "design" for basins not yet constructed
[6] Drainage areas which are modified by construction, but not directed to the basin should still be listed and described
[7] "Outlet structure" means the control box, outlet headwall, FES etc. This does not refer to an individual control on the structure such as a weir or orifice. There are two tables for more than one outlet structure
[8] Approximate location of terminal discharge end of basin outfall, coordinates instate plane feet
[9] Indicate the type of outlet – weir, orifice, hydro brake, etc.
[10] Discharge Coefficient specific to the type of outlet control i.e., 0.6 for circular orifice
[11] List the discharge equation for each outlet (weir, orifice etc) used
[12] For basins with dead storage below the primary outlet, indicate 0 cfs discharge until the lowest outlet is reached. Routing table should begin at the lowest basin elevation.
[13] Describe NJDEP BMP Manual water quality devices such as seepage pits, rain gardens etc. Size is appropriate for device – cubic feet, square feet or linear feet. Location of device using state plane feet coordinates.

New Jersey Department of Agriculture

Hydrologic Modeling Database – Data Entry Form

Basin Details:[3] Bio-retention Basin

Basin Centroid (NJ State Plane Feet):[4]

Northing: 577,607 Easting: 448,016

Basin Type: Infiltration Basin

Construction: Bio-Retention

Status phase:[5] Design ☒ As-built ☐

Dam Height (ft) N/A top width (ft) N/A

Dam Classification: N/A

Drainage Area(s) to Basin [note- include any bypass areas][6]

Drainage Area Name	Drainage Area (acres)	Post-Development CN#	Percent Impervious	Time of Concentration (min)
DA-2	1.16	78	27.5%	6

Basin Outlet Structure(s)[7]

ID: OS-9

End of Pipe Location:[8] Northing: 577,607 Easting: 448,016

Discharge Type[9] (weir, orifice, etc)	Dimensions (diameter, length)	Elevation (USGS)	Discharge [10]Coefficient	Equation Used[11]
Culvert	15"	86.00	0.60	Q=CA(2gh)^0.5
Spillway	2'x2'	87.93		

New Jersey Department of Agriculture

Hydrologic Modeling Database – Data Entry Form

Basin Outlet Structure(s)

ID.

End of Pipe Location: Northing: Easting:

Discharge Type (weir, orifice, etc)	Dimensions (diameter, length)	Elevation (USGS)	Discharge Coefficient	Equation Used

Basin Stage-Discharge Rating Table[12]

Elevation (USGS Feet)	Storage (Acre-Ft)	Total Outlet Structure Discharge (cfs)
86.00	0.000	0.00
86.50	0.027	0.00
87.00	0.057	0.00
87.50	0.090	0.00
88.00	0.128	0.36
88.50	0.169	7.75
89.00	0.215	8.45
89.50	0.265	9.10

New Jersey Department of Agriculture

Hydrologic Modeling Database – Data Entry Form

NJDEP BMP Water Quality Structures[13]

Type (rain garden, green roof, seepage pit etc)	Size	Size Units (cu ft, sq ft etc)	Northing (SPF)	Easting (SPF)
small scale bioretention systems - 80% TSS - Chapter 9.7 NJ Stormwater BMP Manual				

Explanatory Notes-

[1] Approximate location of center of site, coordinates in state plane feet
[2] Indicate who will be responsible for permanent operation and maintenance
[3] Additional Basin Detail Pages can be used for more than one basin in a project.
[4] Approximate location of center of basin, coordinates in state plane feet
[5] Indicate "design" for basins not yet constructed
[6] Drainage areas which are modified by construction, but not directed to the basin should still be listed and described
[7] "Outlet structure" means the control box, outlet headwall, FES etc. This does not refer to an individual control on the structure such as a weir or orifice. There are two tables for more than one outlet structure
[8] Approximate location of terminal discharge end of basin outfall, coordinates instate plane feet
[9] Indicate the type of outlet – weir, orifice, hydro brake, etc.
[10] Discharge Coefficient specific to the type of outlet control i.e., 0.6 for circular orifice
[11] List the discharge equation for each outlet (weir, orifice etc) used
[12] For basins with dead storage below the primary outlet, indicate 0 cfs discharge until the lowest outlet is reached. Routing table should begin at the lowest basin elevation.
[13] Describe NJDEP BMP Manual water quality devices such as seepage pits, rain gardens etc. Size is appropriate for device – cubic feet, square feet or linear feet. Location of device using state plane feet coordinates.

APPENDIX E

LOW IMPACT DEVELOPMENT CHECKLIST

New Jersey Stormwater Best Management Practices Manual

February 2004

A P P E N D I X 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: Montgomery Township

County: Somerset Date: 05/31/21

Review board or agency: Montgomery Township

Proposed land development name: Montgomery Senior Affordable Housing

Lot(s): 10.05 Block(s): 20001

Project or application number: _____

Applicant's name: RPM Development Group

Applicant's address: 77 Park Street

Montclair, NJ 07042

Telephone: 973-744-5410 Fax: _____

Email address: shenschel@rpmdev.com

Designer's name: Kevin E. Shelly, P.E., Shore Point Engineering

Designer's address: 1985 Highway 34, Suite A7

Wall, NJ 07719

Telephone: 732-924-8100 Fax: 732-924-8110

Email address: kshelly@shorepointengineering.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 45-acre parcel was previously utilized as the corporate offices until 2014. Somerset County acquired the property in 2017 and Montgomery Township is currently constructing a new municipal complex on a large portion of the site, closest to Orchard Road. The application is proposing a senior affordable housing development with 280 parking spaces.

For the post development condition, the runoff will be collected via a conventional piped stormwater collection system and conveyed to one of one (1) underground extended detention basins, one (1) bio-retention basin, and one (1) existing basin to be converted to a bio-retention basin. Both quality and quantity control are provided by basins. The allowable peak runoff rates for the post-developed site were found by applying the required reductions to the pre-developed peak flows for the onsite disturbed areas

The stormwater management basins have been designed to meet the requirements of the "NJDEP Stormwater and Non-point Source Pollution - Best Management Practices Manual." It is designed for minimum disturbance to the natural landscape and utilizes the natural terrain for the majority of its storage. The stormwater collection system also utilizes both a pipe network, and to the maximum extent possible, overland drainage swales.

The system meets the technical requirements as well as the overall intent of the NJDEP regulations in an aesthetically pleasing and technically compliant manner.

Site design has been adjusted to minimize land disturbance and impervious coverage while maximizing preservation of existing vegetation and natural drainage features. Site landscaping will also utilize native plant species where possible. Trash refuse areas are provided inside the buildings and in an enclosed dumpster to help minimize the accumulation of trash and debris that may otherwise enter the drainage system.

Part 2: Review of Local Stormwater Management Regulations

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

N.J.A.C. 7:8 Stormwater Management Rules - Last revised 3/2/20

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

If yes, briefly describe: Protect areas that provide water quality benefits or areas particularly susceptible to erosion and sediment loss; Minimize impervious surfaces and break up or disconnect the flow of runoff over impervious surfaces; Maximize the protection of natural drainage features and vegetation; Minimize the decrease in the "time of concentration" from pre-construction to postconstruction.; Minimize land disturbance including clearing and grading; Minimize soil compaction; Provide low-maintenance landscaping that encourages retention and planting of native vegetation and minimizes the use of lawns, fertilizers and pesticides

List LID-BMPs prohibited by local regulations: N/A

Pre-design meeting held? Yes: X Date: 5/2021 No: _____

Meeting held with: Shore Point Engineering

RPM Development Group

Pre-design site walk held? Yes: X Date: 5/2021 No: _____

Site walk held with: Shore Point Engineering

RPM Development Group

Other agencies with stormwater review jurisdiction:

Name: Somerset Soil Conservation District

Required approval: Soil Erosion Permit

Name: Montgomery Township

Required approval: Site Plan Approval

Name: Somerset County

Required approval: Site Plan 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: N/A

Reduce runoff pollutant loads through runoff treatment: Yes: _____ No: N/A

Maintain groundwater recharge by preserving natural areas: Yes: _____ No: N/A

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: _____ No: X

If yes, how: _____

_____

Consider soils and slopes in selecting disturbance limits? N/A Yes: _____ No: _____

If yes, how: _____

_____

C. Specify percentage of site to be cleared: 0% Regraded: 12.4%

D. Specify percentage of cleared areas done so for buildings: 0%

For driveways and parking: 0% For roadways: _____

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

The site has been designed to reduce disturbance and minimize impervious coverage to the maximum extent possible while complying with municipal zone requirements. Reduction of precentages in C & D will result in a loss of units, making the project no longer viable.

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

HSG A: _____ HSG B: 16.7% HSG C: 76.0% HSG D: 7.3%

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

HSG A: _____ HSG B: 33% HSG C: 22.4% HSG D: 44.6%

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?

The project area is located within HSG B, C and D soils. Disturbance areas have been minimized to the maximum extent feasible.

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: 0.01% Proposed: 2.3%

B. Specify maximum site impervious coverage allowed by regulations: 25%

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		
Residential access – medium intensity		
Residential access – high intensity with parking	24'	24'
Residential access – high intensity without parking		
Neighborhood		
Minor collector – low intensity without parking		
Minor collector – with one parking lane		
Minor collector – with two parking lanes		
Minor collector – without parking		
Major collector		

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

Proposed: 9'x18' Regulations: RSIS – 9'x18'

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

Proposed: 129 Regulations: RSIS - 128

F. Specify percentage of total site impervious cover created by buildings: 57.2%

By driveways and parking: 42.8% By roadways: 0%

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

In order to reduce with percentages above, buildings/units would need to be removed, which is not a viable option.

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

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

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

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

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: 68.9% Vegetated swale: _____ Natural channel: _____

Stormwater management facility: 31.1% 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?

Any changes to the site design to increase vegetated swales and natural channels would impact the site layout and require the loss of parking spaces or residential units which is not viable.

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: N/A

Increase overland flow roughness: N/A

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: 1

Specify the spacing between the trash receptacles: N/A

Compare trash receptacles proposed with those required by regulations:

Proposed: 1 Regulations: 1

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: N/A Regulations: N/A

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: N/A

Litter collection: Proposed: Weekly Regulations: N/A

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

N/A

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: 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: _____

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 F

SOIL TESTING ANALYSIS

WHITESTONE ASSOCIATES, INC.
Environmental & Geotechnical Engineers & Consultants

2430 HIGHWAY 34
BUILDING B, SUITE 101
MANASQUAN, NJ 08736
732.592.2101
whitestoneassoc.com

June 1, 2021

via email

SHORE POINT ENGINEERING
P.O. Box 257
Manasquan, New Jersey 08736

Attention: Kevin E. Shelly, P.E.
Owner

Regarding: PRELIMINARY SWM AREA EVALUATION
HEADQUARTERS PARK DRIVE
BLOCK 20001, LOT 10.05
MONTGOMERY, SOMERSET COUNTY, NEW JERSEY
WHITESTONE PROJECT NO.: GS2118024.000

Dear Mr. Shelly:

Whitestone Associates, Inc. (Whitestone) is pleased to submit this *Preliminary Stormwater Management* (SWM) *Area Evaluation* report in support of the proposed development referenced above. This report is based on the November 16, 2016 *ALTA/NSPS Title Survey* prepared by Van Cleef Engineering Associates and correspondence with Shore Point Engineering (Shore Point).

1.0 PROJECT DESCRIPTION

The subject site located at Headquarters Park Drive (Block 20001, Lot 10.05) in Montgomery, Somerset County, New Jersey currently houses a commercial building with associated SWM facilities, pavements, landscaped areas, and utilities. Based on correspondence with Shore Point Engineering, the proposed redevelopment will include minor improvements to the subject site. In support of the proposed improvements, Whitestone confirmed the existing conditions within the SWM facilities for subsequent design by Shore Point.

2.0 FIELD EXPLORATION

Field exploration of the project site was conducted by means of seven test pits (identified as TP-1 through TP-7) performed within accessible portions of the subject site with a rubber-tire backhoe. The locations of the subsurface tests are shown on the *Test Location Plan* included as Figure 1. *Records of Subsurface Exploration* are provided in Appendix A.

The subsurface tests were conducted in the presence of a Whitestone geologist who performed field tests, recorded visual classifications, and collected samples of the various strata encountered. The profile pits were located in the field using normal taping procedures and estimated right angles. These locations are presumed to be accurate within a few feet.

Groundwater level observations, where encountered, were recorded during and immediately after the completion of field operations prior to backfilling the test locations. Groundwater elevations derived from

sources other than seasonally observed groundwater monitor wells may not be representative of true groundwater levels.

3.0 SUMMARY OF FINDINGS

Estimated Seasonal High Groundwater Levels & Infiltration Results: The methods used in determining the estimated seasonal high groundwater level (ESHGW) included evaluating the soil morphology within a test excavation and identifying irregular spots or blotches of different colors or minerals unlike that of the surrounding soil (mottles). A summary of the estimated seasonal high groundwater observations and infiltration test results associated with this investigation are included in the following table.

PERMEABILITY TEST SUMMARY				
Boring #	**ESHGW (fbgs/NAVD 88)**	**USDA Classification @ Test Depth**	**Permeability Test Results**	
			Depth (fbgs/NAVD 88)	**Rate (in/hour)**
TP-1	NE	Clay	4.0/76.0	< 0.2
TP-2	NE	Clay	4.0/76.0	< 0.2
TP-3	NE	Clay	2.0/78.0	< 0.2
TP-4	NE	Clay	1.0/79.0	< 0.2
TP-5	NE	Clay	NT	NT
TP-6	NE	Clay	2.0/78.0	< 0.2
TP-7	NE	Clay	2.0/78.0	< 0.2

USDA - United States Department of Agriculture; NE - Not Encountered; fbgs - Feet Below Ground Surface; NT – Not Tested

Soil Infiltration Rates: Laboratory tube permeameter testing was performed within the profile pits in accordance with the New Jersey *Stormwater Best Management Practices Manual*. Permeability rates were generally measured as less than 0.2 inches per hour. Detailed permeability test results are provided in Appendix B.

4.0 CLOSING

Whitestone appreciates the opportunity to be of continued service to Shore Point Engineering, LLC. Please contact us with any questions or comments regarding the information herein.

Sincerely,

WHITESTONE ASSOCIATES, INC.

Kyle J. Kopacz, P.E.
Project Manager

Laurence W. Keller, P.E.
Principal, Geotechnical Services

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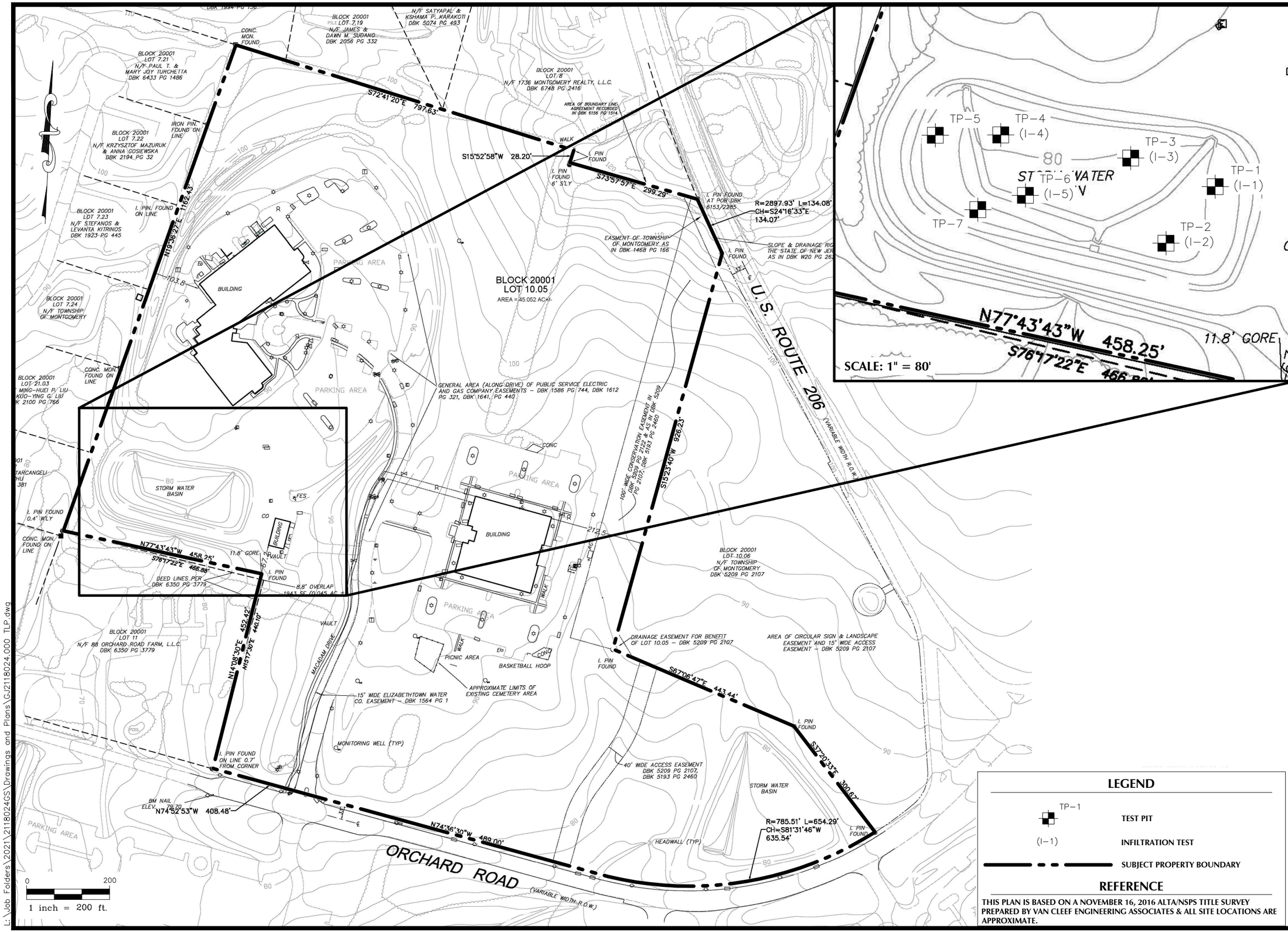
Enclosures

WHITESTONE ASSOCIATES, INC.

FIGURE 1
Test Location Plan



LEGEND

TP-1	TEST PIT
(I-1)	INFILTRATION TEST
	SUBJECT PROPERTY BOUNDARY

REFERENCE

THIS PLAN IS BASED ON A NOVEMBER 16, 2016 ALTA/NSPS TITLE SURVEY PREPARED BY VAN CLEEF ENGINEERING ASSOCIATES & ALL SITE LOCATIONS ARE APPROXIMATE.

WHITESTONE ASSOCIATES, INC.
Environmental & Geotechnical Engineers & Consultants
2430 HIGHWAY 34 BUILDING B, SUITE 101 MANASQUAN, NJ 08736
908.668.7777 WHITESTONEASSOC.COM

DRAWING TITLE: **TEST LOCATION PLAN**

CLIENT: **SHORE POINT ENGINEERING**

PROJECT: PROPOSED RESIDENTIAL DEVELOPMENT
HEADQUARTERS PARK DRIVE
MONTGOMERY, SOMERSET COUNTY, NJ

PROJECT #: GS2118024.000	
DESIGNED BY: GR	PROJ. MGR.: KK
DATE: 5/19/21	FIGURE: 1
SCALE: AS SHOWN	

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WHITESTONE
ASSOCIATES, INC.

APPENDIX A
Records of Subsurface Exploration

WHITESTONE ASSOCIATES, INC.

RECORD OF SUBSURFACE EXPLORATION

Test Pit No.: TP-1

Project:	Proposed Development	**WAI Project No.:**	GS2118024.000
Location:	Headquarters Park Drive; Montgomery, Somerset County, NJ	**Client:**	Shore Point Engineering

Surface Elevation:	± 80.0 feet	**Date Started:**	5/20/2021		**Water Depth (feet bgs)** | **Elevation (feet)**		**Cave-In Depth (feet bgs)** | **Elevation (feet)**
Termination Depth:	12.0 feet bgs	**Date Completed:**	5/20/2021				
Proposed Location:	SWM Basin	**Logged By:**	TJ	**During:**	NE | ---		
Excavating Method:	Test Pit Excavation	**Contractor:**	MC	**At Completion:**	NE | ---	**At Completion:**	NE | ---
Test Method:	Visual Observation	**Rig Type:**	Deere 310E	**24 Hours:**	--- | ---		

SAMPLE INFORMATION Depth (ft.)	Number	Type	DEPTH (feet)	STRATA	DESCRIPTION OF MATERIALS (Classification)	REMARKS
			0.0			
			0.5	TOPSOIL	6" Topsoil with Grass	
			3.0	RESIDUAL	Dark Reddish-Brown (2.5YR 2.5/3) SANDY CLAY; 5% to 10% Gravel Subangular Blocky Structure; Moist; Firm to Plastic; Roots (5%); No Mottling; Clear Boundary	
4 - 6	S-1	BAG	5.0		Dark Reddish-Brown (2.5YR 2.5/3) CLAY; 5% Gravel; Subangular Blocky Structure; Moist; Plastic; No Roots; No Mottling; Clear Boundary	Infiltration Testing @ 4.0 fbgs in Clay (elev. 76.0)
6 - 8	S-2	BAG	6.0		Dark Reddish-Brown (2.5YR 2.5/3) SANDY CLAY; 10% to 15% Gravel; Subangular Blocky Structure; Moist; Plastic; No Roots; Clear Boundary	
			8.0	WEATHERED ROCK	Dark Reddish-Brown (2.5YR 2.5/3) Highly Weathered Rock (Shale); Highly Fractured; Very Low Strength; Moist	Passive Formation Many Horizontal and Vertical Fractures in Sidewall Clayey Soil Present in Rock Fractures
			10.0			
			12.0		Test Pit Log TP-1 Terminated at a Depth of 12.0 Feet Below Ground Surface in Shale	
			15.0			

NOTES: bgs = below ground surface, DNC = Did Not Cave, NA = Not Applicable, NE = Not Encountered, NS = Not Surveyed, P = Perched

WHITESTONE ASSOCIATES, INC.

RECORD OF SUBSURFACE EXPLORATION

Test Pit No.: TP-2

Page 1 of 1

Project:	Proposed Development	**WAI Project No.:**	GS2118024.000
Location:	Headquarters Park Drive; Montgomery, Somerset County, NJ	**Client:**	Shore Point Engineering

Surface Elevation:	± 80.0 feet	**Date Started:**	5/20/2021		**Water Depth (feet bgs)**	**Elevation (feet)**	**Cave-In Depth (feet bgs)** / **Elevation (feet)**
Termination Depth:	11.0 feet bgs	**Date Completed:**	5/20/2021				
Proposed Location:	SWM Basin	**Logged By:**	TJ	**During:**	NE	---	
Excavating Method:	Test Pit Excavation	**Contractor:**	MC	**At Completion:**	NE	---	**At Completion:** NE / ---
Test Method:	Visual Observation	**Rig Type:**	Deere 310E	**24 Hours:**	---	---	

SAMPLE INFORMATION Depth (ft.)	Number	Type	DEPTH (feet)	STRATA	DESCRIPTION OF MATERIALS (Classification)	REMARKS
			0.0			
			0.5	TOPSOIL	6" Topsoil with Grass	
				RESIDUAL	Dark Reddish-Brown (2.5YR 2.5/3) CLAY LOAM; 5% to 10% Gravel, <5% Cobbles; Subangular Blocky Structure; Moist; Firm to Plastic; Roots (5%); No Mottling; Clear Boundary	
			3.5		Dark Reddish-Brown (2.5YR 2.5/3) CLAY: 5% Gravel; Subangular Blocky Structure; Moist; Plastic; No Roots; No Mottling; Clear Boundary	
4 - 5	S-1	BAG				Infiltration Testing @ 4.0 fbgs (elev. 76.0)
			5.0			
			6.5		Dark Reddish-Brown (2.5YR 2.5/3) SANDY CLAY; 5% to 15% Gravel; Subangular Blocky Structure; Moist; Plastic; No Roots; No Mottling; Clear Boundary	
			8.0	WEATHERED ROCK	Dark Reddish-Brown (2.5YR 2.5/3) Highly Weathered Rock (Shale); Highly Fractured; Very Low Strength; Moist	Passaic Formation Clayey Soil in Rock Fractures Many Horizontal and Vertical Fractures in Sidewall
			10.0			
			11.0			
			15.0		Test Pit Log TP-2 Terminated at a Depth of 11.0 Feet Below Ground Surface in Shale Due to Bucket Refusal	

NOTES: bgs = below ground surface, DNC = Did Not Cave, NA = Not Applicable, NE = Not Encountered, NS = Not Surveyed, P = Perched

WHITESTONE ASSOCIATES, INC.

RECORD OF SUBSURFACE EXPLORATION

Test Pit No.: TP-3

Page 1 of 1

Project:	Proposed Development	**WAI Project No.:**	GS2118024.000
Location:	Headquarters Park Drive; Montgomery, Somerset County, NJ	**Client:**	Shore Point Engineering

Surface Elevation:	± 80.0 feet	**Date Started:**	5/20/2021		**Water Depth (feet bgs)**	**Elevation (feet)**	**Cave-In Depth (feet bgs)** / **Elevation (feet)**
Termination Depth:	7.5 feet bgs	**Date Completed:**	5/20/2021				
Proposed Location:	SWM Basin	**Logged By:**	TJ	**During:**	NE	---	
Excavating Method:	Test Pit Excavation	**Contractor:**	MC	**At Completion:**	NE	---	**At Completion:** NE / ---
Test Method:	Visual Observation	**Rig Type:**	Deere 310E	**24 Hours:**	---	---	

SAMPLE INFORMATION Depth (ft.)	Number	Type	DEPTH (feet)	STRATA	DESCRIPTION OF MATERIALS (Classification)	REMARKS
			0.0			
			0.5	TOPSOIL	6" Topsoil with Grass	
			2.0	RESIDUAL	Dark Reddish-Brown (2.5YR 2.5/3) CLAY LOAM; 5% Gravel, 0% Cobbles; Subangular Blocky Structure; Moist; Firm to Plastic; Roots (5%); No Mottling; Clear Boundary	
2 - 3	S-1	BAG			Dark Reddish-Brown (2.5YR 2.5/3) SANDY CLAY; 5% to 10% Gravel, 0% Cobbles; Subangular Blocky Structure; Moist; Plastic; No Roots; No Mottling; Clear Boundary	Infiltration Testing @ 2.0 fbgs (elev. 78.0) (2 ft. Above WR)
			4.5			
4.5 - 7	S-2	BAG	5.0	WEATHERED ROCK	Dark Reddish-Brown (2.5YR 2.5/3) Highly Weathered Rock (Shale); Very Low Strength; Highly Fractured	Weathered Rock Fragments Ranging from 1" to 12" Diameter Clayey Soil in Rock Fractures
			7.5			
			10.0		Test Pit Log TP-3 Terminated at a Depth of 7.5 Feet Below Ground Surface in Shale Due to Bucket Refusal	
			15.0			

NOTES: bgs = below ground surface, DNC = Did Not Cave, NA = Not Applicable, NE = Not Encountered, NS = Not Surveyed, P = Perched

WHITESTONE ASSOCIATES, INC.

RECORD OF SUBSURFACE EXPLORATION

Test Pit No.: TP-4

Project:	Proposed Development	**WAI Project No.:**	GS2118024.000
Location:	Headquarters Park Drive; Montgomery, Somerset County, NJ	**Client:**	Shore Point Engineering

Surface Elevation:	± 81.0 feet	**Date Started:**	5/20/2021		**Water Depth (feet bgs)** | **Elevation (feet)**		**Cave-In Depth (feet bgs)** | **Elevation (feet)**
Termination Depth:	7.5 feet bgs	**Date Completed:**	5/20/2021				
Proposed Location:	SWM Basin	**Logged By:**	TJ	**During:**	NE | ---		
Excavating Method:	Test Pit Excavation	**Contractor:**	MC	**At Completion:**	NE | ---	**At Completion:**	NE | ---
Test Method:	Visual Observation	**Rig Type:**	Deere 310E	**24 Hours:**	--- | ---		

SAMPLE INFORMATION Depth (ft.)	Number	Type	DEPTH (feet)	STRATA	DESCRIPTION OF MATERIALS (Classification)	REMARKS
			0.0			
			0.5	TOPSOIL	6" Topsoil with Grass	
1 - 3	S-1	BAG	3.0	RESIDUAL	Dark Reddish-Brown (2.5YR 2.5/3) SANDY CLAY/CLAY; 5% Gravel, 10% Cobbles; Subangular Blocky Structure; Firm to Plastic; Moist; Roots (5% to 10%); No Mottling; Clear Boundary	Infiltration Testing @ 1.0 fbgs (elev. 80.0)
			5.0	WEATHERED ROCK	Dark Reddish-Brown (2.5YR 2.5/3) Highly Weathered Rock (Shale); Highly Fractured; Very Low Strength; Moist; Hard	Passaic Formation Clayey Soil in Rock Horizontal and Vertical Fractures Visible in Sidewall
			7.5		Test Pit Log TP-4 Terminated at a Depth of 7.5 Feet Below Ground Surface in Shale Due to Bucket Refusal	
			10.0			
			15.0			

NOTES: bgs = below ground surface, DNC = Did Not Cave, NA = Not Applicable, NE = Not Encountered, NS = Not Surveyed, P = Perched

WHITESTONE ASSOCIATES, INC.

RECORD OF SUBSURFACE EXPLORATION

Test Pit No.: TP-5

Page 1 of 1

Project:	Proposed Development	**WAI Project No.:**	GS2118024.000
Location:	Headquarters Park Drive; Montgomery, Somerset County, NJ	**Client:**	Shore Point Engineering

Surface Elevation:	± 80.0 feet	**Date Started:**	5/20/2021		**Water Depth (feet bgs)**	**Elevation (feet)**	**Cave-In Depth (feet bgs)** / **Elevation (feet)**
Termination Depth:	6.5 feet bgs	**Date Completed:**	5/20/2021				
Proposed Location:	SWM Basin	**Logged By:**	TJ	**During:**	NE	---	
Excavating Method:	Test Pit Excavation	**Contractor:**	MC	**At Completion:**	NE	---	**At Completion:** NE / ---
Test Method:	Visual Observation	**Rig Type:**	Deere 310E	**24 Hours:**	---	---	

SAMPLE INFORMATION Depth (ft.)	Number	Type	DEPTH (feet)	STRATA	DESCRIPTION OF MATERIALS (Classification)	REMARKS
			0.0			
				TOPSOIL	7" Topsoil with Grass	
			0.6	WEATHERED ROCK	Dark Reddish-Brown (2.5YR 2.5/3) Highly Weathered Rock (Shale); Highly Fractured; Very Low Strength; Moist	Passaic Formation Many Horizontal and Vertical Fractures Observed in Sidewalls Intermittent Layers of Clayey Soil in Rock Fractures
			5.0			
5 - 6	S-1	BAG				
			6.5			
					Test Pit Log TP-5 Terminated at a Depth of 6.50 Feet Below Ground Surface in shale Due to Bucket Refusal	Could Not Perform Infiltration Testing Due to Shallow Rock Depth
			10.0			
			15.0			

NOTES: bgs = below ground surface, DNC = Did Not Cave, NA = Not Applicable, NE = Not Encountered, NS = Not Surveyed, P = Perched

WHITESTONE ASSOCIATES, INC.

RECORD OF SUBSURFACE EXPLORATION

Test Pit No.: TP-6

Project:	Proposed Development	**WAI Project No.:**	GS2118024.000
Location:	Headquarters Park Drive; Montgomery, Somerset County, NJ	**Client:**	Shore Point Engineering

Surface Elevation:	± 80.0 feet	**Date Started:**	5/20/2021		**Water Depth (feet bgs)** | **Elevation (feet)**		**Cave-In Depth (feet bgs)** | **Elevation (feet)**
Termination Depth:	12.0 feet bgs	**Date Completed:**	5/20/2021				
Proposed Location:	SWM Basin	**Logged By:**	TJ	**During:**	NE | ---		
Excavating Method:	Test Pit Excavation	**Contractor:**	MC	**At Completion:**	NE | ---	**At Completion:**	NE | ---
Test Method:	Visual Observation	**Rig Type:**	Deere 310E	**24 Hours:**	--- | ---		

SAMPLE INFORMATION Depth (ft.)	Number	Type	DEPTH (feet)	STRATA		DESCRIPTION OF MATERIALS (Classification)	REMARKS
			0.0				
			0.5	TOPSOIL		6" Topsoil with Grass	
0.5 - 3	S-1	BAG		RESIDUAL		Dark Reddish-Brown (2.5YR 2.5/3) SANDY CLAY/CLAY; 5% to 10% Gravel, 0% Cobbles; Subangular Blocky Structure; Moist; Firm to Plastic; Roots (5% to 10%); No Mottling; Clear Boundary	Infiltration Testing @ 2.0 fbgs (elev. 78.0)
			4.0				
			5.0	WEATHERED ROCK		Dark Reddish-Brown (2.5YR 2.5/3) Highly Weathered Rock (Shale); Highly Fractured; Very Low Strength; Moist	Passaic Formation Many Horizontal and Vertical Fractures in Sidewalls Clayey Soil in Rock Fractures
			7.0				
			10.0			Test Pit Log TP-6 Terminated at a Depth of 7.0 Feet Below Ground Surface on Shale Due to Bucket Refusal	
			15.0				

NOTES: bgs = below ground surface, DNC = Did Not Cave, NA = Not Applicable, NE = Not Encountered, NS = Not Surveyed, P = Perched

WHITESTONE ASSOCIATES, INC.

RECORD OF SUBSURFACE EXPLORATION

Test Pit No.: TP-7

Project:	Proposed Development	**WAI Project No.:**	GS2118024.000
Location:	Headquarters Park Drive; Montgomery, Somerset County, NJ	**Client:**	Shore Point Engineering

Surface Elevation:	± 80.0 feet	**Date Started:**	5/20/2021		**Water Depth (feet bgs)**	**Elevation (feet)**	**Cave-In Depth (feet bgs)** / **Elevation (feet)**
Termination Depth:	6.0 feet bgs	**Date Completed:**	5/20/2021				
Proposed Location:	SWM Basin	**Logged By:**	TJ	**During:**	NE	---	
Excavating Method:	Test Pit Excavation	**Contractor:**	MC	**At Completion:**	NE	---	**At Completion:** NE / ---
Test Method:	Visual Observation	**Rig Type:**	Deere 310E	**24 Hours:**	---	---	

SAMPLE INFORMATION Depth (ft.)	Number	Type	DEPTH (feet)	STRATA	DESCRIPTION OF MATERIALS (Classification)	REMARKS
			0.0			
				TOPSOIL	8" Topsoil with Grass	
			0.7	RESIDUAL	Dark Reddish-Brown (2.5YR 2.5/3) SANDY CLAY; 5% to 10% Gravel, <5% Cobbles; Subangular Blocky Structure; Moist; Firm to Plastic; Roots (5% to 10%); No Mottling; Clear Boundary	
			3.0	WEATHERED ROCK	Dark Reddish- Brown (2.5YR 2.5/3) Highly Weathered Rock (Shale); Highly Fractured; Very Low Strength; Moist	Passaic Formation Many Horizontal and Vertical Fractures in Sidewall
			5.0			
			6.0			
					Test Pit Log TP-7 Terminated at a Depth of 6.0 Feet Below Ground Surface in Shale Due to Bucket Refusal	
			10.0			
			15.0			

NOTES: bgs = below ground surface, DNC = Did Not Cave, NA = Not Applicable, NE = Not Encountered, NS = Not Surveyed, P = Perched

APPENDIX B
Permeability Test Results

Tube Permeameter Test Data

Job Number: GJ2118024.000
Project: Proposed Site Improvement
Client: Shore Point
Lab Tech: MH

Sample ID: **Profile Pit No.:** **TP-1** **Sample No.:** **T-1** **Depth:** 4.0'

COUNTY/MUNICIPALITY Edison BLOCK _____ LOT _____

1. Test Number 1 Replicate (letter) A Date Collected _____

2. Material Tested: _____ Fill X Test in Native Soil

3. Type of Sample: X Undisturbed _____ Disturbed

4. Sample Dimensions: Inside Radius of Sample Tube, R, in cm 1.91
Length of Sample, L, in inches 3.00

5. Bulk Density Determination (Disturbed Samples Only): N/A

6. Sample Weight (Wt. Tube Containing Sample-Wt. of Empty Tube), grams 0.00

Wt. of Tube Containing Sample _____
Wt. of Empty Tube _____

7. Sample Volume (L x 2.54 cm./inch x 3.14R2), cc. 86.83

8. Bulk Density (Sample Wt./Sample Volume), grams/cc. 0 > 1.2

9. Standpipe Used: X No _____ Yes, Indicate Internal Radius, cm. N/A

10. Height of Water Level Above Rim of Test Basin, in inches:

At the Beginning of Each Test Interval, H1 5.00
At the End of Each Test Interval, H2 5.00

11. Rate of Water Level Drop (Add additional lines if needed):

Time, Start of Test Interval, T1	Time End of Test Interval T2	Length of Test Interval, T, Minutes
12:00:00	4:00:00	240.00

12. Calculation of Permeability: K, (in/hr) = 60 min/hr x r2/R2 x L(in)/T(min) x ln (H1/H2) T= 240.00

K (in/hr) = 0.00 **Classification:** **K0**

13. Defects in the Sample (Check appropriate items):

X None

_____ Soil/Tube Contact _____Large Gravel _____ Large Roots

_____ Dry Soil _____Smearing _____ Compaction

_____ Other - Specify _____

Tube Permeameter Test Data

Job Number: GJ2118024.000
Project: Proposed Site Improvement
Client: Shore Point
Lab Tech: MH

Sample ID: **Profile Pit No.:** **TP-1** **Sample No.:** **T-1** **Depth:** 4.0'

COUNTY/MUNICIPALITY Edison BLOCK _____ LOT _____

1. Test Number 1 Replicate (letter) B Date Collected _____

2. Material Tested: _____ Fill X Test in Native Soil

3. Type of Sample: X Undisturbed _____ Disturbed

4. Sample Dimensions: Inside Radius of Sample Tube, R, in cm 1.91
Length of Sample, L, in inches 3.00

5. Bulk Density Determination (Disturbed Samples Only): N/A

6. Sample Weight (Wt. Tube Containing Sample-Wt. of Empty Tube), grams 0.00

Wt. of Tube Containing Sample _____
Wt. of Empty Tube _____

7. Sample Volume (L x 2.54 cm./inch x 3.14R2), cc. 86.83

8. Bulk Density (Sample Wt./Sample Volume), grams/cc. 0 > 1.2

9. Standpipe Used: X No _____ Yes, Indicate Internal Radius, cm. N/A

10. Height of Water Level Above Rim of Test Basin, in inches:

At the Beginning of Each Test Interval, H1 5.00
At the End of Each Test Interval, H2 5.00

11. Rate of Water Level Drop (Add additional lines if needed):

Time, Start of Test Interval, T1	Time End of Test Interval T2	Length of Test Interval, T, Minutes
12:00:00	4:00:00	240.00

12. Calculation of Permeability: K, (in/hr) = 60 min/hr x r2/R2 x L(in)/T(min) x ln (H1/H2) T= 240.00

K (in/hr) = 0.00 **Classification:** **K0**

13. Defects in the Sample (Check appropriate items):

X None

_____ Soil/Tube Contact _____Large Gravel _____ Large Roots

_____ Dry Soil _____Smearing _____ Compaction

_____ Other - Specify _____

Tube Permeameter Test Data

Job Number: GJ2118024.000
Project: Proposed Site Improvement
Client: Shore Point
Lab Tech: MH

Sample ID: **Profile Pit No.:** **TP-2** **Sample No.:** **T-1** **Depth:** 4.0'

COUNTY/MUNICIPALITY Edison BLOCK _____ LOT _____

1. Test Number 1 Replicate (letter) A Date Collected _____

2. Material Tested: _____ Fill X Test in Native Soil

3. Type of Sample: X Undisturbed _____ Disturbed

4. Sample Dimensions: Inside Radius of Sample Tube, R, in cm 1.91
Length of Sample, L, in inches 3.00

5. Bulk Density Determination (Disturbed Samples Only): N/A

6. Sample Weight (Wt. Tube Containing Sample-Wt. of Empty Tube), grams 0.00

Wt. of Tube Containing Sample _____
Wt. of Empty Tube _____

7. Sample Volume (L x 2.54 cm./inch x 3.14R2), cc. 86.83

8. Bulk Density (Sample Wt./Sample Volume), grams/cc. 0 > 1.2

9. Standpipe Used: X No _____ Yes, Indicate Internal Radius, cm. N/A

10. Height of Water Level Above Rim of Test Basin, in inches:

At the Beginning of Each Test Interval, H1 5.00
At the End of Each Test Interval, H2 5.00

11. Rate of Water Level Drop (Add additional lines if needed):

Time, Start of Test Interval, T1	Time End of Test Interval T2	Length of Test Interval, T, Minutes
12:00:00	4:00:00	240.00

12. Calculation of Permeability: K, (in/hr) = 60 min/hr x r2/R2 x L(in)/T(min) x ln (H1/H2) T= 240.00

K (in/hr) = 0.00 **Classification:** **K0**

13. Defects in the Sample (Check appropriate items):

X None

_____ Soil/Tube Contact _____Large Gravel _____ Large Roots

_____ Dry Soil _____Smearing _____ Compaction

_____ Other - Specify _____

Tube Permeameter Test Data

Job Number: GJ2118024.000
Project: Proposed Site Improvement
Client: Shore Point
Lab Tech: MH

Sample ID: **Profile Pit No.:** **TP-2** **Sample No.:** **T-1** **Depth:** 4.0'

COUNTY/MUNICIPALITY Edison BLOCK _____ LOT _____

1. Test Number 1 Replicate (letter) A Date Collected _____

2. Material Tested: _____ Fill X Test in Native Soil

3. Type of Sample: X Undisturbed _____ Disturbed

4. Sample Dimensions: Inside Radius of Sample Tube, R, in cm 1.91
Length of Sample, L, in inches 3.00

5. Bulk Density Determination (Disturbed Samples Only): N/A

6. Sample Weight (Wt. Tube Containing Sample-Wt. of Empty Tube), grams 0.00

Wt. of Tube Containing Sample _____
Wt. of Empty Tube _____

7. Sample Volume (L x 2.54 cm./inch x 3.14R2), cc. 86.83

8. Bulk Density (Sample Wt./Sample Volume), grams/cc. 0 > 1.2

9. Standpipe Used: X No _____ Yes, Indicate Internal Radius, cm. N/A

10. Height of Water Level Above Rim of Test Basin, in inches:

At the Beginning of Each Test Interval, H1 5.00
At the End of Each Test Interval, H2 5.00

11. Rate of Water Level Drop (Add additional lines if needed):

Time, Start of Test Interval, T1	Time End of Test Interval T2	Length of Test Interval, T, Minutes
12:00:00	4:00:00	240.00

12. Calculation of Permeability: K, (in/hr) = 60 min/hr x r2/R2 x L(in)/T(min) x ln (H1/H2) T= 240.00

K (in/hr) = 0.00 **Classification:** **K0**

13. Defects in the Sample (Check appropriate items):

X None

_____ Soil/Tube Contact _____Large Gravel _____ Large Roots

_____ Dry Soil _____Smearing _____ Compaction

_____ Other - Specify _____

Tube Permeameter Test Data

Job Number: GJ2118024.000
Project: Proposed Site Improvement
Client: Shore Point
Lab Tech: MH

Sample ID: **Profile Pit No.:** **TP-3** **Sample No.:** **T-1** **Depth:** 2.0'

COUNTY/MUNICIPALITY Edison BLOCK _____ LOT _____

1. Test Number 1 Replicate (letter) A Date Collected _____

2. Material Tested: _____ Fill X Test in Native Soil

3. Type of Sample: X Undisturbed _____ Disturbed

4. Sample Dimensions: Inside Radius of Sample Tube, R, in cm 1.91
Length of Sample, L, in inches 3.00

5. Bulk Density Determination (Disturbed Samples Only): N/A

6. Sample Weight (Wt. Tube Containing Sample-Wt. of Empty Tube), grams 0.00

Wt. of Tube Containing Sample _____
Wt. of Empty Tube _____

7. Sample Volume (L x 2.54 cm./inch x 3.14R2), cc. 86.83

8. Bulk Density (Sample Wt./Sample Volume), grams/cc. 0 > 1.2

9. Standpipe Used: X No _____ Yes, Indicate Internal Radius, cm. N/A

10. Height of Water Level Above Rim of Test Basin, in inches:

At the Beginning of Each Test Interval, H1 5.00
At the End of Each Test Interval, H2 5.00

11. Rate of Water Level Drop (Add additional lines if needed):

Time, Start of Test Interval, T1	Time End of Test Interval T2	Length of Test Interval, T, Minutes
12:00:00	4:00:00	240.00

12. Calculation of Permeability: K, (in/hr) = 60 min/hr x r2/R2 x L(in)/T(min) x ln (H1/H2) T= 240.00

K (in/hr) = 0.00 **Classification:** **K0**

13. Defects in the Sample (Check appropriate items):

X _____ None

_____ Soil/Tube Contact _____ Large Gravel _____ Large Roots

_____ Dry Soil _____ Smearing _____ Compaction

_____ Other - Specify _____

Tube Permeameter Test Data

Job Number: GJ2118024.000
Project: Proposed Site Improvement
Client: Shore Point
Lab Tech: MH

Sample ID: **Profile Pit No.:** **TP-3** **Sample No.:** **T-1** **Depth:** 2.0'

COUNTY/MUNICIPALITY Edison BLOCK _____ LOT _____

1. Test Number 1 Replicate (letter) B Date Collected _____

2. Material Tested: _____ Fill X Test in Native Soil

3. Type of Sample: X Undisturbed _____ Disturbed

4. Sample Dimensions: Inside Radius of Sample Tube, R, in cm 1.91
Length of Sample, L, in inches 3.00

5. Bulk Density Determination (Disturbed Samples Only): N/A

6. Sample Weight (Wt. Tube Containing Sample-Wt. of Empty Tube), grams 0.00

Wt. of Tube Containing Sample _____
Wt. of Empty Tube _____

7. Sample Volume (L x 2.54 cm./inch x 3.14R2), cc. 86.83

8. Bulk Density (Sample Wt./Sample Volume), grams/cc. 0 > 1.2

9. Standpipe Used: X No _____ Yes, Indicate Internal Radius, cm. N/A

10. Height of Water Level Above Rim of Test Basin, in inches:

At the Beginning of Each Test Interval, H1 5.00
At the End of Each Test Interval, H2 5.00

11. Rate of Water Level Drop (Add additional lines if needed):

Time, Start of Test Interval, T1	Time End of Test Interval T2	Length of Test Interval, T, Minutes
12:00:00	4:00:00	240.00

12. Calculation of Permeability: K, (in/hr) = 60 min/hr x r2/R2 x L(in)/T(min) x ln (H1/H2) T= 240.00

K (in/hr) = 0.00 **Classification:** **K0**

13. Defects in the Sample (Check appropriate items):

X _____ None

_____ Soil/Tube Contact _____ Large Gravel _____ Large Roots

_____ Dry Soil _____ Smearing _____ Compaction

_____ Other - Specify _____

Tube Permeameter Test Data

Job Number: GJ2118024.000
Project: Proposed Site Improvement
Client: Shore Point
Lab Tech: MH

Sample ID: **Profile Pit No.:** **TP-4** **Sample No.:** **T-1** **Depth:** 1.0'

COUNTY/MUNICIPALITY Edison BLOCK _____ LOT _____

1. Test Number 1 Replicate (letter) A Date Collected _____

2. Material Tested: _____ Fill X Test in Native Soil

3. Type of Sample: X Undisturbed _____ Disturbed

4. Sample Dimensions: Inside Radius of Sample Tube, R, in cm 1.91
Length of Sample, L, in inches 3.00

5. Bulk Density Determination (Disturbed Samples Only): N/A

6. Sample Weight (Wt. Tube Containing Sample-Wt. of Empty Tube), grams 0.00

Wt. of Tube Containing Sample _____
Wt. of Empty Tube _____

7. Sample Volume (L x 2.54 cm./inch x 3.14R2), cc. 86.83

8. Bulk Density (Sample Wt./Sample Volume), grams/cc. 0 > 1.2

9. Standpipe Used: X No _____ Yes, Indicate Internal Radius, cm. N/A

10. Height of Water Level Above Rim of Test Basin, in inches:

At the Beginning of Each Test Interval, H1 5.00
At the End of Each Test Interval, H2 5.00

11. Rate of Water Level Drop (Add additional lines if needed):

Time, Start of Test Interval, T1	Time End of Test Interval T2	Length of Test Interval, T, Minutes
12:00:00	4:00:00	240.00

12. Calculation of Permeability: K, (in/hr) = 60 min/hr x r2/R2 x L(in)/T(min) x ln (H1/H2) T= 240.00

K (in/hr) = 0.00 **Classification:** **K0**

13. Defects in the Sample (Check appropriate items):

X _____ None

_____ Soil/Tube Contact _____ Large Gravel _____ Large Roots

_____ Dry Soil _____ Smearing _____ Compaction

_____ Other - Specify _____

Tube Permeameter Test Data

Job Number: GJ2118024.000
Project: Proposed Site Improvement
Client: Shore Point
Lab Tech: MH

Sample ID: **Profile Pit No.:** **TP-4** **Sample No.:** **T-1** **Depth:** 1.0'

COUNTY/MUNICIPALITY Edison BLOCK _____ LOT _____

1. Test Number 1 Replicate (letter) B Date Collected _____

2. Material Tested: _____ Fill X Test in Native Soil

3. Type of Sample: X Undisturbed _____ Disturbed

4. Sample Dimensions: Inside Radius of Sample Tube, R, in cm 1.91
Length of Sample, L, in inches 3.00

5. Bulk Density Determination (Disturbed Samples Only): N/A

6. Sample Weight (Wt. Tube Containing Sample-Wt. of Empty Tube), grams 0.00

Wt. of Tube Containing Sample _____
Wt. of Empty Tube _____

7. Sample Volume (L x 2.54 cm./inch x 3.14R2), cc. 86.83

8. Bulk Density (Sample Wt./Sample Volume), grams/cc. 0 > 1.2

9. Standpipe Used: X No _____ Yes, Indicate Internal Radius, cm. N/A

10. Height of Water Level Above Rim of Test Basin, in inches:

At the Beginning of Each Test Interval, H1 5.00
At the End of Each Test Interval, H2 5.00

11. Rate of Water Level Drop (Add additional lines if needed):

Time, Start of Test Interval, T1	Time End of Test Interval T2	Length of Test Interval, T, Minutes
12:00:00	4:00:00	240.00

12. Calculation of Permeability: K, (in/hr) = 60 min/hr x r2/R2 x L(in)/T(min) x ln (H1/H2) T= 240.00

K (in/hr) = 0.00 **Classification:** **K0**

13. Defects in the Sample (Check appropriate items):

X _____ None

_____ Soil/Tube Contact _____ Large Gravel _____ Large Roots

_____ Dry Soil _____ Smearing _____ Compaction

_____ Other - Specify _____

Tube Permeameter Test Data

Job Number: GJ2118024.000
Project: Proposed Site Improvement
Client: Shore Point
Lab Tech: MH

Sample ID: **Profile Pit No.:** **TP-6** **Sample No.:** **T-1** **Depth:** 2.0'

COUNTY/MUNICIPALITY Edison BLOCK _____ LOT _____

1. Test Number 1 Replicate (letter) A Date Collected _____

2. Material Tested: _____ Fill X Test in Native Soil

3. Type of Sample: X Undisturbed _____ Disturbed

4. Sample Dimensions: Inside Radius of Sample Tube, R, in cm 1.91
Length of Sample, L, in inches 3.00

5. Bulk Density Determination (Disturbed Samples Only): N/A

6. Sample Weight (Wt. Tube Containing Sample-Wt. of Empty Tube), grams 0.00

Wt. of Tube Containing Sample _____
Wt. of Empty Tube _____

7. Sample Volume (L x 2.54 cm./inch x 3.14R2), cc. 86.83

8. Bulk Density (Sample Wt./Sample Volume), grams/cc. 0 > 1.2

9. Standpipe Used: X No _____ Yes, Indicate Internal Radius, cm. N/A

10. Height of Water Level Above Rim of Test Basin, in inches:

At the Beginning of Each Test Interval, H1 5.00
At the End of Each Test Interval, H2 5.00

11. Rate of Water Level Drop (Add additional lines if needed):

Time, Start of Test Interval, T1	Time End of Test Interval T2	Length of Test Interval, T, Minutes
12:00:00	4:00:00	240.00

12. Calculation of Permeability: K, (in/hr) = 60 min/hr x r2/R2 x L(in)/T(min) x ln (H1/H2) T= 240.00

K (in/hr) = 0.00 **Classification:** **K0**

13. Defects in the Sample (Check appropriate items):

X None

_____ Soil/Tube Contact _____Large Gravel _____ Large Roots

_____ Dry Soil _____Smearing _____ Compaction

_____ Other - Specify _____

Tube Permeameter Test Data

Job Number: GJ2118024.000
Project: Proposed Site Improvement
Client: Shore Point
Lab Tech: MH

Sample ID: **Profile Pit No.:** **TP-6** **Sample No.:** **T-1** **Depth:** 2.0'

COUNTY/MUNICIPALITY Edison BLOCK _____ LOT _____

1. Test Number 1 Replicate (letter) B Date Collected _____

2. Material Tested: _____ Fill X Test in Native Soil

3. Type of Sample: X Undisturbed _____ Disturbed

4. Sample Dimensions: Inside Radius of Sample Tube, R, in cm 1.91
Length of Sample, L, in inches 3.00

5. Bulk Density Determination (Disturbed Samples Only): N/A

6. Sample Weight (Wt. Tube Containing Sample-Wt. of Empty Tube), grams 0.00

Wt. of Tube Containing Sample _____
Wt. of Empty Tube _____

7. Sample Volume (L x 2.54 cm./inch x 3.14R2), cc. 86.83

8. Bulk Density (Sample Wt./Sample Volume), grams/cc. 0 > 1.2

9. Standpipe Used: X No _____ Yes, Indicate Internal Radius, cm. N/A

10. Height of Water Level Above Rim of Test Basin, in inches:

At the Beginning of Each Test Interval, H1 5.00
At the End of Each Test Interval, H2 5.00

11. Rate of Water Level Drop (Add additional lines if needed):

Time, Start of Test Interval, T1	Time End of Test Interval T2	Length of Test Interval, T, Minutes
12:00:00	4:00:00	240.00

12. Calculation of Permeability: K, (in/hr) = 60 min/hr x r2/R2 x L(in)/T(min) x ln (H1/H2) T= 240.00

K (in/hr) = 0.00 **Classification:** **K0**

13. Defects in the Sample (Check appropriate items):

X None

_____ Soil/Tube Contact _____Large Gravel _____ Large Roots

_____ Dry Soil _____Smearing _____ Compaction

_____ Other - Specify _____

Tube Permeameter Test Data

Job Number: GJ2118024.000
Project: Proposed Site Improvement
Client: Shore Point
Lab Tech: MH

Sample ID: **Profile Pit No.:** **TP-7** **Sample No.:** **T-1** **Depth:** 2.0'

COUNTY/MUNICIPALITY Edison BLOCK _____ LOT _____

1. Test Number 1 Replicate (letter) A Date Collected _____

2. Material Tested: _____ Fill X Test in Native Soil

3. Type of Sample: X Undisturbed _____ Disturbed

4. Sample Dimensions: Inside Radius of Sample Tube, R, in cm 1.91
Length of Sample, L, in inches 3.00

5. Bulk Density Determination (Disturbed Samples Only): N/A

6. Sample Weight (Wt. Tube Containing Sample-Wt. of Empty Tube), grams 0.00

Wt. of Tube Containing Sample _____
Wt. of Empty Tube _____

7. Sample Volume (L x 2.54 cm./inch x 3.14R2), cc. 86.83

8. Bulk Density (Sample Wt./Sample Volume), grams/cc. 0 > 1.2

9. Standpipe Used: X No _____ Yes, Indicate Internal Radius, cm. N/A

10. Height of Water Level Above Rim of Test Basin, in inches:

At the Beginning of Each Test Interval, H1 5.00
At the End of Each Test Interval, H2 5.00

11. Rate of Water Level Drop (Add additional lines if needed):

Time, Start of Test Interval, T1	Time End of Test Interval T2	Length of Test Interval, T, Minutes
12:00:00	4:00:00	240.00

12. Calculation of Permeability: K, (in/hr) = 60 min/hr x r2/R2 x L(in)/T(min) x ln (H1/H2) T= 240.00

K (in/hr) = 0.00 **Classification:** **K0**

13. Defects in the Sample (Check appropriate items):

X None

_____ Soil/Tube Contact _____Large Gravel _____ Large Roots

_____ Dry Soil _____Smearing _____ Compaction

_____ Other - Specify _____

Tube Permeameter Test Data

Job Number: GJ2118024.000
Project: Proposed Site Improvement
Client: Shore Point
Lab Tech: MH

Sample ID: **Profile Pit No.:** **TP-7** **Sample No.:** **T-1** **Depth:** 2.0'

COUNTY/MUNICIPALITY Edison BLOCK _____ LOT _____

1. Test Number 1 Replicate (letter) B Date Collected _____

2. Material Tested: _____ Fill X Test in Native Soil

3. Type of Sample: X Undisturbed _____ Disturbed

4. Sample Dimensions: Inside Radius of Sample Tube, R, in cm 1.91
Length of Sample, L, in inches 3.00

5. Bulk Density Determination (Disturbed Samples Only): N/A

6. Sample Weight (Wt. Tube Containing Sample-Wt. of Empty Tube), grams 0.00

Wt. of Tube Containing Sample _____
Wt. of Empty Tube _____

7. Sample Volume (L x 2.54 cm./inch x 3.14R2), cc. 86.83

8. Bulk Density (Sample Wt./Sample Volume), grams/cc. 0 > 1.2

9. Standpipe Used: X No _____ Yes, Indicate Internal Radius, cm. N/A

10. Height of Water Level Above Rim of Test Basin, in inches:

At the Beginning of Each Test Interval, H1 5.00
At the End of Each Test Interval, H2 5.00

11. Rate of Water Level Drop (Add additional lines if needed):

Time, Start of Test Interval, T1	Time End of Test Interval T2	Length of Test Interval, T, Minutes
12:00:00	4:00:00	240.00

12. Calculation of Permeability: K, (in/hr) = 60 min/hr x r2/R2 x L(in)/T(min) x ln (H1/H2) T= 240.00

K (in/hr) = 0.00 **Classification:** **K0**

13. Defects in the Sample (Check appropriate items):

X None

_____ Soil/Tube Contact _____Large Gravel _____ Large Roots

_____ Dry Soil _____Smearing _____ Compaction

_____ Other - Specify _____

WHITESTONE
ASSOCIATES, INC.

APPENDIX C
Supplemental Information
(USCS, Terms & Symbols)

WHITESTONE ASSOCIATES, INC.
Environmental & Geotechnical Engineers & Consultants

2430 HIGHWAY 34
BUILDING B, SUITE 101
MANASQUAN, NJ 08736
732.592.2101
whitestoneassoc.com

UNIFIED SOIL CLASSIFICATION SYSTEM

SOIL CLASSIFICATION CHART

MAJOR DIVISIONS			LETTER SYMBOL	TYPICAL DESCRIPTIONS
COARSE GRAINED SOILS	GRAVEL AND GRAVELLY SOILS	CLEAN GRAVELS (LITTLE OR NO FINES)	GW	WELL-GRADED GRAVELS, GRAVEL-SAND MIXTURES, LITTLE OR NO FINES
			GP	POORLY-GRADED GRAVELS, GRAVEL-SAND MIXTURES, LITTLE OR NO FINES
	MORE THAN 50% OF COARSE FRACTION RETAINED ON NO. 4 SIEVE	GRAVELS WITH FINES (APPRECIABLE AMOUNT OF FINES)	GM	SILTY GRAVELS, GRAVEL-SAND-SILT MIXTURES
			GC	CLAYEY GRAVELS, GRAVEL-SAND-CLAY MIXTURES
	SAND AND SANDY SOILS	CLEAN SAND (LITTLE OR NO FINES)	SW	WELL-GRADED SANDS, GRAVELLY SANDS, LITTLE OR NO FINES
			SP	POORLY-GRADED SANDS, GRAVELLY SANDS, LITTLE OR NO FINES
MORE THAN 50% OF MATERIAL IS LARGER THAN NO. 200 SIEVE SIZE	MORE THAN 50% OF COARSE FRACTION PASSING NO. 4 SIEVE	SANDS WITH FINES (APPRECIABLE AMOUNT OF FINES)	SM	SILTY SANDS, SAND-SILT MIXTURES
			SC	CLAYEY SANDS, SAND-CLAY MIXTURES
FINE GRAINED SOILS	SILTS AND CLAYS	LIQUID LIMITS LESS THAN 50	ML	INORGANIC SILTS AND VERY FINE SANDS, ROCK FLOUR, SILTY OR CLAYEY FINE SANDS OR CLAYEY SILTS WITH SLIGHT PLASTICITY
			CL	INORGANIC CLAYS OF LOW TO MEDIUM PLASTICITY, GRAVELLY CLAYS, SANDY CLAYS, SILTY CLAYS, LEAN CLAYS
			OL	ORGANIC SILTS AND ORGANIC SILTY CLAYS OF LOW PLASTICITY
MORE THAN 50% OF MATERIAL IS SMALLER THAN NO. 200 SIEVE SIZE	SILTS AND CLAYS	LIQUID LIMITS GREATER THAN 50	MH	INORGANIC SILTS, MICACEOUS OR DIATOMACEOUS FINE SAND OR SILTY SOILS
			CH	INORGANIC CLAYS OF HIGH PLASTICITY, FAT CLAYS
			OH	ORGANIC CLAYS OF MEDIUM TO HIGH PLASTICITY, ORGANIC SILTS
HIGHLY ORGANIC SOILS			PT	PEAT, HUMUS, SWAMP SOILS WITH HIGH ORGANIC CONTENTS

NOTE: DUAL SYMBOLS ARE USED TO INDICATE BORDERLINE SOIL CLASSIFICATIONS FOR SAMPLES WITH 5% TO 12% FINES

GRADATION*

% FINER BY WEIGHT

TRACE..... 1% TO 10%
LITTLE..... 10% TO 20%
SOME..... 20% TO 35%
AND..... 35% TO 50%

COMPACTNESS*
Sand and/or Gravel

RELATIVE DENSITY

LOOSE. ..... 0% TO 40%
MEDIUM DENSE.... 40% TO 70%
DENSE..... 70% TO 90%
VERY DENSE..... 90% TO 100%

CONSISTENCY*
Clay and/or Silt

RANGE OF SHEARING STRENGTH IN POUNDS PER SQUARE FOOT

VERY SOFT..... LESS THAN 250
SOFT..... ..... 250 TO 500
MEDIUM..... 500 TO 1000
STIFF..... 1000 TO 2000
VERY STIFF..... 2000 TO 4000
HARD..... GREATER THAN 4000

** VALUES ARE FROM LABORATORY OR FIELD TEST DATA, WHERE APPLICABLE. WHEN NO TESTING WAS PERFORMED, VALUES ARE ESTIMATED.*

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WHITESTONE ASSOCIATES, INC.
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whitestoneassoc.com

GEOTECHNICAL TERMS AND SYMBOLS

SAMPLE IDENTIFICATION

The Unified Soil Classification System is used to identify the soil unless otherwise noted.

SOIL PROPERTY SYMBOLS

N: Standard Penetration Value: Blows per ft. of a 140 lb. hammer falling 30" on a 2" O.D. split-spoon.
Qu: Unconfined compressive strength, TSF.
Qp: Penetrometer value, unconfined compressive strength, TSF.
Mc: Moisture content, %.
LL: Liquid limit, %.
PI: Plasticity index, %.
δd: Natural dry density, PCF.
▼: Apparent groundwater level at time noted after completion of boring.

DRILLING AND SAMPLING SYMBOLS

NE: Not Encountered (Groundwater was not encountered).
SS: Split-Spoon - 1 ⅜" I.D., 2" O.D., except where noted.
ST: Shelby Tube - 3" O.D., except where noted.
AU: Auger Sample.
OB: Diamond Bit.
CB: Carbide Bit
WS: Washed Sample.

RELATIVE DENSITY AND CONSISTENCY CLASSIFICATION

Term (Non-Cohesive Soils)	Standard Penetration Resistance
Very Loose	0-4
Loose	4-10
Medium Dense	10-30
Dense	30-50
Very Dense	Over 50

Term (Cohesive Soils)	Qu (TSF)
Very Soft	0 - 0.25
Soft	0.25 - 0.50
Firm (Medium)	0.50 - 1.00
Stiff	1.00 - 2.00
Very Stiff	2.00 - 4.00
Hard	4.00+

PARTICLE SIZE

Boulders	8 in.+	Coarse Sand	5mm-0.6mm	Silt	0.074mm-0.005mm
Cobbles	8 in.-3 in.	Medium Sand	0.6mm-0.2mm	Clay	-0.005mm
Gravel	3 in.-5mm	Fine Sand	0.2mm-0.074mm		

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WHITESTONE
An Employee-Owned Company

2430 HIGHWAY 34
BUILDING B, SUITE 101
MANASQUAN, NJ 08736
732.592.2101
whitestoneassoc.com

December 29 2021

via email

SHORE POINT ENGINEERING
1985 Highway 34
Suite A7
Wall, New Jersey 07719

Attention: Kevin E. Shelly, P.E.
Owner

Regarding: PRELIMINARY SWM AREA EVALUATION
HEADQUARTERS PARK DRIVE
BLOCK 20001, LOT 10.05
MONTGOMERY, SOMERSET COUNTY, NEW JERSEY
WHITESTONE PROJECT NO.: GS2118024.001

Dear Mr. Shelly:

Whitestone Associates, Inc. (Whitestone) is pleased to submit this *Preliminary Stormwater Management* (SWM) *Area Evaluation* report in support of the proposed development referenced above. This report is based on the May 31, 2021 *Grading Plan* prepared by Shore Point Engineering (Shore Point), correspondence with Shore Point, and Whitestone's previous experience at the site.

1.0 PROJECT DESCRIPTION

The subject site located at Headquarters Park Drive (Block 20001, Lot 10.05) in Montgomery, Somerset County, New Jersey currently houses a partially demolished commercial building with associated SWM facilities, pavements, landscaped areas, and utilities. Based on correspondence with Shore Point Engineering, the proposed construction will include minor improvements to the subject site and new SWM facilities. The proposed SWM facilities will consist of two separate basins with bottoms situated approximately four feet to nine feet below existing site grades.

2.0 FIELD EXPLORATION

Field exploration of the project site was conducted by means of four soil profile pits (identified as SPP-1 through SPP-4) conducted within accessible portions of the subject site with a rubber-tire backhoe. The locations of the subsurface tests are shown on the *Test Location Plan* included as Figure 1. *Records of Subsurface Exploration* are provided in Appendix A.

The subsurface tests were conducted in the presence of a Whitestone geologist who conducted field tests, recorded visual classifications, and collected samples of the various strata encountered. The profile pits were located in the field using normal taping procedures and estimated right angles. These locations are presumed to be accurate within a few feet.

Groundwater level observations, where encountered, were recorded during and immediately after the completion of field operations prior to backfilling the test locations. Groundwater elevations derived from sources other than seasonally observed groundwater monitor wells may not be representative of true groundwater levels.

3.0 SUMMARY OF FINDINGS

Estimated Seasonal High Groundwater Levels & Infiltration Results: The methods used in determining the estimated seasonal high groundwater level (ESHGW) included evaluating the soil morphology within a test excavation and identifying irregular spots or blotches of different colors or minerals unlike that of the surrounding soil (mottles). A summary of the estimated seasonal high groundwater observations and infiltration test results associated with this investigation are included in the following table.

PERMEABILITY TEST SUMMARY				
Boring #	**ESHGW (fbgs/NAVD 88)**	**USDA Classification @ Test Depth**	**Permeability Test Results**	
			Depth (fbgs/NAVD 88)	**Rate (in/hour)**
SPP-1	NE	Clay	5.0/86.0	< 0.2
SPP-2	NE	Clay	5.0/86.0	< 0.2
SPP-3	NE	Clay	5.0/85.0	< 0.2
SPP-4	NE	Clay	5.0/85.0	< 0.2

USDA - United States Department of Agriculture; NE - Not Encountered; fbgs - Feet Below Ground Surface; NT – Not Tested

Soil Infiltration Rates: Laboratory tube permeameter testing was conducted within the profile pits in accordance with the New Jersey *Stormwater Best Management Practices Manual*. Permeability rates were generally measured as less than 0.2 inches per hour. Detailed permeability test results are provided in Appendix B.

4.0 CLOSING

Whitestone appreciates the opportunity to be of continued service to Shore Point Engineering, LLC. Please contact us with any questions or comments regarding the information herein.

Sincerely,

WHITESTONE ASSOCIATES, INC.

Kyle J. Kopacz, P.E.
Associate

Laurence W. Keller, P.E.
Vice President

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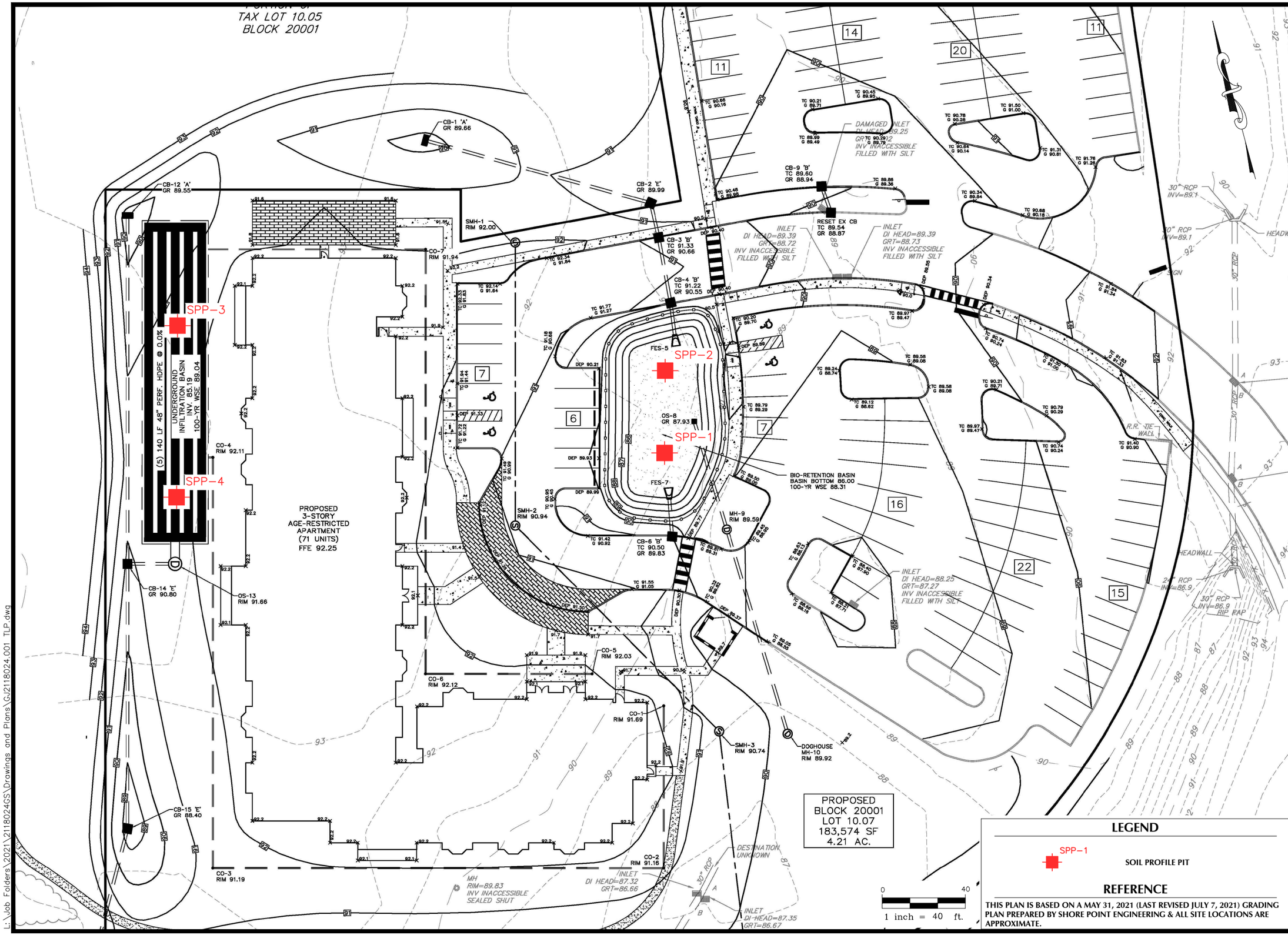
Enclosures

FIGURE 1
Test Location Plan



LEGEND

SPP-1 — SOIL PROFILE PIT

REFERENCE

THIS PLAN IS BASED ON A MAY 31, 2021 (LAST REVISED JULY 7, 2021) GRADING PLAN PREPARED BY SHORE POINT ENGINEERING & ALL SITE LOCATIONS ARE APPROXIMATE.

WHITESTONE
An Employee-Owned Company
2430 HIGHWAY 34 BUILDING B, SUITE 101 MANASQUAN, NJ 08736
908.668.7777 WHITESTONEASSOC.COM

DRAWING TITLE: TEST LOCATION PLAN

CLIENT: SHORE POINT ENGINEERING

PROJECT: PROPOSED RESIDENTIAL DEVELOPMENT HEADQUARTERS PARK DRIVE MONTGOMERY, SOMERSET COUNTY, NJ

PROJECT #: GS2118024.001	
DESIGNED BY: GR	PROJ. MGR.: KK
DATE: 12/28/21	FIGURE: 1
SCALE: 1" = 40'	

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WHITESTONE

APPENDIX A
Records of Subsurface Exploration

RECORD OF SUBSURFACE EXPLORATION

WHITESTONE

Soil Profile Pit No.: SPP-1

Project:	Proposed Development	**WAI Project No.:**	GS2118024.001
Location:	Headquarters Park Drive; Montgomery, Somerset County, NJ	**Client:**	Shore Point Engineering

Surface Elevation:	± 91.0 feet	**Date Started:**	12/13/2021	**Water Depth (feet bgs) | Elevation (feet)**		**Estimated Seasonal High Groundwater Depth (feet bgs) | Elevation (feet)**	
Termination Depth:	12.0 feet bgs	**Date Completed:**	12/13/2021				
Proposed Location:	SWM Area	**Logged By:**	RL	**During:**	NE | ---		
Excavating Method:	Test Pit Excavation	**Contractor:**	TS	**At Completion:**	NE | ---	**At Completion:**	NE | ---
Test Method:	Visual Observation	**Rig Type:**	Backhoe	**24 Hours:**	--- | ---		

SAMPLE INFORMATION Depth (feet)	Number	Type	DEPTH feet		HORIZON	DESCRIPTION OF MATERIALS (Classification)	REMARKS
			0.0				
0 - 0.3	S-1	BAG		0 - 0.3	TOPSOIL	4" Topsoil	
0.3 - 7	S-2	BAG	1.0, 2.0, 3.0, 4.0, 5.0, 6.0, 7.0	0.3 - 7	RESIDUAL	Dark Red (2.5YR 3/6) CLAY; 25% Gravel, 10% Cobble; Fine, Strong Blocky Structure; Moist; Friable; No Roots	3" Localized Sand Layer 4.0 fbgs to 4.25 fbgs; Possible Fill 2 Tube Permeameter Samples Collected @ 5.0 fbgs
7 - 12	S-3	BAG	8.0, 9.0, 10.0, 11.0, 12.0	7 - 12	WEATHERED ROCK	Dark Red (2.5YR 3/6) Weathered Rock	
			13.0, 14.0, 15.0			Soil Profile Pit SPP-1 Terminated at a Depth of 12.0 Feet Below Ground Surface	

NOTES: bgs = below ground surface, NA = Not Applicable, NE = Not Encountered, NS = Not Surveyed, P = Perched

RECORD OF SUBSURFACE EXPLORATION

WHITESTONE

Soil Profile Pit No.: SPP-2

Project:	Proposed Development	**WAI Project No.:**	GS2118024.001
Location:	Headquarters Park Drive; Montgomery, Somerset County, NJ	**Client:**	Shore Point Engineering

Surface Elevation:	± 92.0 feet	**Date Started:**	12/13/2021	**Water Depth (feet bgs) | Elevation (feet)**		**Estimated Seasonal High Groundwater Depth (feet bgs) | Elevation (feet)**	
Termination Depth:	12.0 feet bgs	**Date Completed:**	12/13/2021				
Proposed Location:	SWM Area	**Logged By:**	RL	**During:**	NE | ---		
Excavating Method:	Test Pit Excavation	**Contractor:**	TS	**At Completion:**	NE | ---	**At Completion:**	NE | ---
Test Method:	Visual Observation	**Rig Type:**	Backhoe	**24 Hours:**	--- | ---		

SAMPLE INFORMATION Depth (feet)	Number	Type	DEPTH feet	HORIZON	DESCRIPTION OF MATERIALS (Classification)	REMARKS
			0.0			
0 - 0.3	S-1	BAG	0 - 0.3	TOPSOIL	3" Topsoil	
0.3 - 3	S-2	BAG	0.3 - 3 (1.0, 2.0, 3.0)	FILL	Dark Red (2.5YR 3/6) CLAY; 20% Gravel, 20% Cobble; Fine, Strong Blocky Structure; Moist; Friable; No Roots	Reworked Natural Soil
3 - 10	S-3	BAG	3 - 10 (4.0, 5.0, 6.0, 7.0, 8.0, 9.0, 10.0)	RESIDUAL	Dark Red (2.5YR 3/6) CLAY; 20% Gravel, 10% Cobble; Fine, Strong Blocky Structure; Moist; Friable; No Roots	2 Tube Permeameter Samples Collected @ 5.0 fbgs
10 - 12	S-4	BAG	10 - 12 (11.0, 12.0)	WEATHERED ROCK	Dark Red (2.5YR 3/6) Weathered Rock	
			13.0, 14.0, 15.0		Soil Profile Pit SPP-2 Terminated at a Depth of 12.0 Feet Below Ground Surface	

NOTES: bgs = below ground surface, NA = Not Applicable, NE = Not Encountered, NS = Not Surveyed, P = Perched

RECORD OF SUBSURFACE EXPLORATION

WHITESTONE

Soil Profile Pit No.: SPP-3

Project:	Proposed Development	**WAI Project No.:**	GS2118024.001
Location:	Headquarters Park Drive; Montgomery, Somerset County, NJ	**Client:**	Shore Point Engineering

Surface Elevation:	± 94.0 feet	**Date Started:**	12/13/2021		**Water Depth (feet bgs)**	**Elevation (feet)**	**Estimated Seasonal High Groundwater Depth (feet bgs)** / **Elevation (feet)**
Termination Depth:	10.0 feet bgs	**Date Completed:**	12/13/2021				
Proposed Location:	SWM Area	**Logged By:**	RL	**During:**	NE	---	
Excavating Method:	Test Pit Excavation	**Contractor:**	TS	**At Completion:**	NE	---	**At Completion:** NE / ---
Test Method:	Visual Observation	**Rig Type:**	Backhoe	**24 Hours:**	---	---	

SAMPLE INFORMATION Depth (feet)	Number	Type	DEPTH feet		HORIZON	DESCRIPTION OF MATERIALS (Classification)	REMARKS
			0.0				
0 - 0.3	S-1	BAG		0 - 0.3	TOPSOIL	3" Topsoil	
0.3 - 5	S-2	BAG	1.0, 2.0, 3.0, 4.0, 5.0	0.3 - 5	RESIDUAL	Dark Red (2.5YR 3/6) CLAY; 25% Gravel, 10% Cobble, 10% Boulder; Fine, Strong Blocky Structure; Moist; Firm; No Roots	
5 - 10	S-3		6.0, 7.0, 8.0, 9.0, 10.0	5 - 10	WEATHERED ROCK	Dark Red (2.5YR 3/6) Weathered Rock	2 Tube Permeameter Samples Collected @ 5.0 fbgs Could Not Collect Tube Permeameter Samples @ 7.0 fbgs Due to Weathered Rock
			11.0, 12.0, 13.0, 14.0, 15.0			Soil Profile Pit SPP-3 Terminated at a Depth of 10.0 Feet Below Ground Surface Due to Bucket Refusal	

NOTES: bgs = below ground surface, NA = Not Applicable, NE = Not Encountered, NS = Not Surveyed, P = Perched

RECORD OF SUBSURFACE EXPLORATION

WHITESTONE

Soil Profile Pit No.: SPP-4

Project:	Proposed Development	**WAI Project No.:**	GS2118024.001
Location:	Headquarters Park Drive; Montgomery, Somerset County, NJ	**Client:**	Shore Point Engineering

Surface Elevation:	± 94.0 feet	**Date Started:**	12/13/2021	**Water Depth (feet bgs) | Elevation (feet)**		**Estimated Seasonal High Groundwater Depth (feet bgs) | Elevation (feet)**	
Termination Depth:	11.0 feet bgs	**Date Completed:**	12/13/2021				
Proposed Location:	SWM Area	**Logged By:**	RL	**During:**	NE | ---		
Excavating Method:	Test Pit Excavation	**Contractor:**	TS	**At Completion:**	NE | ---	**At Completion:**	NE | ---
Test Method:	Visual Observation	**Rig Type:**	Backhoe	**24 Hours:**	--- | ---		

SAMPLE INFORMATION Depth (feet)	Number	Type	DEPTH feet		HORIZON	DESCRIPTION OF MATERIALS (Classification)	REMARKS
			0.0				
0 - 0.3	S-1	BAG		0 - 0.3	TOPSOIL	3" Topsoil	
0.3 - 2.5	S-2	BAG	1.0 2.0	0.3 - 2.5	FILL	Dark Red (2.5YR 3/6) CLAY; 20% Gravel, 10% Cobble; Fine, Strong Blocky Structure; Moist; Firm; No Roots	Buried PVC
2.5 - 5	S-3	BAG	3.0 4.0 5.0	2.5 - 5	RESIDUAL	Dark Red (2.5YR 3/6) CLAY; 25% Gravel, 10% Cobble, 10% Boulder; Fine, Strong Blocky Structure; Moist; Firm; No Roots	
5 - 11	S-4	BAG	6.0 7.0 8.0 9.0 10.0 11.0	5 - 11	WEATHERED ROCK	Dark Red (2.5YR 3/6) Weathered Rock	2 Tube Permeameter Samples Collected @ 5.0 fbgs Could Not Collect Tube Permeameter Samples @ 7.0 fbgs Due to Weathered Rock
			12.0 13.0 14.0 15.0			Soil Profile Pit SPP-4 Terminated at a Depth of 11.0 Feet Below Ground Surface Due to Bucket Refusal	

NOTES: bgs = below ground surface, NA = Not Applicable, NE = Not Encountered, NS = Not Surveyed, P = Perched

APPENDIX B
Permeability Test Results

Tube Permeameter Test Data

Job Number: GJ2118024.001
Project: Proposed Site Improvement
Client: Shore Point
Lab Tech: MH

Sample ID: **Profile Pit No.:** **SPP-1** **Sample No.:** **T-1** **Depth:** 5.0'

COUNTY/MUNICIPALITY Montgomery BLOCK _____ LOT _____

1. Test Number 1 Replicate (letter) A Date Collected _____

2. Material Tested: _____ Fill X Test in Native Soil

3. Type of Sample: X Undisturbed _____ Disturbed

4. Sample Dimensions: Inside Radius of Sample Tube, R, in cm 1.91
Length of Sample, L, in inches 3.00

5. Bulk Density Determination (Disturbed Samples Only): N/A

6. Sample Weight (Wt. Tube Containing Sample-Wt. of Empty Tube), grams 0.00

Wt. of Tube Containing Sample _____
Wt. of Empty Tube _____

7. Sample Volume (L x 2.54 cm./inch x 3.14R2), cc. 86.83

8. Bulk Density (Sample Wt./Sample Volume), grams/cc. 0 > 1.2

9. Standpipe Used: X No _____ Yes, Indicate Internal Radius, cm. N/A

10. Height of Water Level Above Rim of Test Basin, in inches:

At the Beginning of Each Test Interval, H1 5.00
At the End of Each Test Interval, H2 5.00

11. Rate of Water Level Drop (Add additional lines if needed):

Time, Start of Test Interval, T1	Time End of Test Interval T2	Length of Test Interval, T, Minutes
12:00:00	4:00:00	240.00

12. Calculation of Permeability: K, (in/hr) = 60 min/hr x r2/R2 x L(in)/T(min) x ln (H1/H2) T= 240.00

K (in/hr) = 0.00 **Classification:** **K0**

13. Defects in the Sample (Check appropriate items):

X None

_____ Soil/Tube Contact _____Large Gravel _____ Large Roots

_____ Dry Soil _____Smearing _____ Compaction

_____ Other - Specify _____

Tube Permeameter Test Data

Job Number: GJ2118024.001
Project: Proposed Site Improvement
Client: Shore Point
Lab Tech: MH

Sample ID: **Profile Pit No.:** **SPP-1** **Sample No.:** **T-1** **Depth:** 5.0'

COUNTY/MUNICIPALITY Montgomery BLOCK _____ LOT _____

1. Test Number 1 Replicate (letter) B Date Collected _____

2. Material Tested: _____ Fill X Test in Native Soil

3. Type of Sample: X Undisturbed _____ Disturbed

4. Sample Dimensions: Inside Radius of Sample Tube, R, in cm 1.91
Length of Sample, L, in inches 3.00

5. Bulk Density Determination (Disturbed Samples Only): N/A

6. Sample Weight (Wt. Tube Containing Sample-Wt. of Empty Tube), grams 0.00

Wt. of Tube Containing Sample _____
Wt. of Empty Tube _____

7. Sample Volume (L x 2.54 cm./inch x 3.14R2), cc. 86.83

8. Bulk Density (Sample Wt./Sample Volume), grams/cc. 0 > 1.2

9. Standpipe Used: X No _____ Yes, Indicate Internal Radius, cm. N/A

10. Height of Water Level Above Rim of Test Basin, in inches:

At the Beginning of Each Test Interval, H1 5.00
At the End of Each Test Interval, H2 5.00

11. Rate of Water Level Drop (Add additional lines if needed):

Time, Start of Test Interval, T1	Time End of Test Interval T2	Length of Test Interval, T, Minutes
12:00:00	4:00:00	240.00

12. Calculation of Permeability: K, (in/hr) = 60 min/hr x r2/R2 x L(in)/T(min) x ln (H1/H2) T= 240.00

K (in/hr) = 0.00 **Classification:** **K0**

13. Defects in the Sample (Check appropriate items):

X None

_____ Soil/Tube Contact _____Large Gravel _____ Large Roots

_____ Dry Soil _____Smearing _____ Compaction

_____ Other - Specify _____

Tube Permeameter Test Data

Job Number: GJ2118024.001
Project: Proposed Site Improvement
Client: Shore Point
Lab Tech: MH

Sample ID: **Profile Pit No.:** **SPP-2** **Sample No.:** **T-1** **Depth:** 5.0'

COUNTY/MUNICIPALITY Montgomery BLOCK _____ LOT _____

1. Test Number 1 Replicate (letter) A Date Collected _____

2. Material Tested: _____ Fill X Test in Native Soil

3. Type of Sample: X Undisturbed _____ Disturbed

4. Sample Dimensions: Inside Radius of Sample Tube, R, in cm 1.91
Length of Sample, L, in inches 3.00

5. Bulk Density Determination (Disturbed Samples Only): N/A

6. Sample Weight (Wt. Tube Containing Sample-Wt. of Empty Tube), grams 0.00

Wt. of Tube Containing Sample _____
Wt. of Empty Tube _____

7. Sample Volume (L x 2.54 cm./inch x 3.14R2), cc. 86.83

8. Bulk Density (Sample Wt./Sample Volume), grams/cc. 0 > 1.2

9. Standpipe Used: X No _____ Yes, Indicate Internal Radius, cm. N/A

10. Height of Water Level Above Rim of Test Basin, in inches:

At the Beginning of Each Test Interval, H1 5.00
At the End of Each Test Interval, H2 5.00

11. Rate of Water Level Drop (Add additional lines if needed):

Time, Start of Test Interval, T1	Time End of Test Interval T2	Length of Test Interval, T, Minutes
12:00:00	4:00:00	240.00

12. Calculation of Permeability: K, (in/hr) = 60 min/hr x r2/R2 x L(in)/T(min) x ln (H1/H2) T= 240.00

K (in/hr) = 0.00 **Classification:** **K0**

13. Defects in the Sample (Check appropriate items):

X None

_____ Soil/Tube Contact _____Large Gravel _____ Large Roots

_____ Dry Soil _____Smearing _____ Compaction

_____ Other - Specify _____

Tube Permeameter Test Data

Job Number: GJ2118024.001
Project: Proposed Site Improvement
Client: Shore Point
Lab Tech: MH

Sample ID: **Profile Pit No.:** **SPP-2** **Sample No.:** **T-1** **Depth:** 5.0'

COUNTY/MUNICIPALITY Montgomery BLOCK _____ LOT _____

1. Test Number 1 Replicate (letter) B Date Collected _____

2. Material Tested: _____ Fill X Test in Native Soil

3. Type of Sample: X Undisturbed _____ Disturbed

4. Sample Dimensions: Inside Radius of Sample Tube, R, in cm 1.91
Length of Sample, L, in inches 3.00

5. Bulk Density Determination (Disturbed Samples Only): N/A

6. Sample Weight (Wt. Tube Containing Sample-Wt. of Empty Tube), grams 0.00

Wt. of Tube Containing Sample _____
Wt. of Empty Tube _____

7. Sample Volume (L x 2.54 cm./inch x 3.14R2), cc. 86.83

8. Bulk Density (Sample Wt./Sample Volume), grams/cc. 0 > 1.2

9. Standpipe Used: X No _____ Yes, Indicate Internal Radius, cm. N/A

10. Height of Water Level Above Rim of Test Basin, in inches:

At the Beginning of Each Test Interval, H1 5.00
At the End of Each Test Interval, H2 5.00

11. Rate of Water Level Drop (Add additional lines if needed):

Time, Start of Test Interval, T1	Time End of Test Interval T2	Length of Test Interval, T, Minutes
12:00:00	4:00:00	240.00

12. Calculation of Permeability: K, (in/hr) = 60 min/hr x r2/R2 x L(in)/T(min) x ln (H1/H2) T= 240.00

K (in/hr) = 0.00 **Classification:** **K0**

13. Defects in the Sample (Check appropriate items):

X None

_____ Soil/Tube Contact _____Large Gravel _____ Large Roots

_____ Dry Soil _____Smearing _____ Compaction

_____ Other - Specify _____

Tube Permeameter Test Data

Job Number: GJ2118024.001
Project: Proposed Site Improvement
Client: Shore Point
Lab Tech: MH

Sample ID: **Profile Pit No.:** **SPP-3** **Sample No.:** **T-1** **Depth:** 5.0'

COUNTY/MUNICIPALITY Montgomery BLOCK _____ LOT _____

1. Test Number 1 Replicate (letter) A Date Collected _____

2. Material Tested: _____ Fill X Test in Native Soil

3. Type of Sample: X Undisturbed _____ Disturbed

4. Sample Dimensions: Inside Radius of Sample Tube, R, in cm 1.91
Length of Sample, L, in inches 3.00

5. Bulk Density Determination (Disturbed Samples Only): N/A

6. Sample Weight (Wt. Tube Containing Sample-Wt. of Empty Tube), grams 0.00

Wt. of Tube Containing Sample _____
Wt. of Empty Tube _____

7. Sample Volume (L x 2.54 cm./inch x 3.14R2), cc. 86.83

8. Bulk Density (Sample Wt./Sample Volume), grams/cc. 0 > 1.2

9. Standpipe Used: X No _____ Yes, Indicate Internal Radius, cm. N/A

10. Height of Water Level Above Rim of Test Basin, in inches:

At the Beginning of Each Test Interval, H1 5.00
At the End of Each Test Interval, H2 5.00

11. Rate of Water Level Drop (Add additional lines if needed):

Time, Start of Test Interval, T1	Time End of Test Interval T2	Length of Test Interval, T, Minutes
12:00:00	4:00:00	240.00

12. Calculation of Permeability: K, (in/hr) = 60 min/hr x r2/R2 x L(in)/T(min) x ln (H1/H2) T= 240.00

K (in/hr) = 0.00 **Classification:** **K0**

13. Defects in the Sample (Check appropriate items):

X None

_____ Soil/Tube Contact _____Large Gravel _____ Large Roots

_____ Dry Soil _____Smearing _____ Compaction

_____ Other - Specify _____

Tube Permeameter Test Data

Job Number: GJ2118024.001
Project: Proposed Site Improvement
Client: Shore Point
Lab Tech: MH

Sample ID: **Profile Pit No.:** **SPP-3** **Sample No.:** **T-1** **Depth:** 5.0'

COUNTY/MUNICIPALITY Montgomery BLOCK _____ LOT _____

1. Test Number 1 Replicate (letter) B Date Collected _____

2. Material Tested: _____ Fill X Test in Native Soil

3. Type of Sample: X Undisturbed _____ Disturbed

4. Sample Dimensions: Inside Radius of Sample Tube, R, in cm 1.91
Length of Sample, L, in inches 3.00

5. Bulk Density Determination (Disturbed Samples Only): N/A

6. Sample Weight (Wt. Tube Containing Sample-Wt. of Empty Tube), grams 0.00

Wt. of Tube Containing Sample _____
Wt. of Empty Tube _____

7. Sample Volume (L x 2.54 cm./inch x 3.14R2), cc. 86.83

8. Bulk Density (Sample Wt./Sample Volume), grams/cc. 0 > 1.2

9. Standpipe Used: X No _____ Yes, Indicate Internal Radius, cm. N/A

10. Height of Water Level Above Rim of Test Basin, in inches:

At the Beginning of Each Test Interval, H1 5.00
At the End of Each Test Interval, H2 5.00

11. Rate of Water Level Drop (Add additional lines if needed):

Time, Start of Test Interval, T1	Time End of Test Interval T2	Length of Test Interval, T, Minutes
12:00:00	4:00:00	240.00

12. Calculation of Permeability: K, (in/hr) = 60 min/hr x r2/R2 x L(in)/T(min) x ln (H1/H2) T= 240.00

K (in/hr) = 0.00 **Classification:** **K0**

13. Defects in the Sample (Check appropriate items):

X None

_____ Soil/Tube Contact _____Large Gravel _____ Large Roots

_____ Dry Soil _____Smearing _____ Compaction

_____ Other - Specify _____

Tube Permeameter Test Data

Job Number: GJ2118024.001
Project: Proposed Site Improvement
Client: Shore Point
Lab Tech: MH

Sample ID: **Profile Pit No.:** **SPP-4** **Sample No.:** **T-1** **Depth:** 5.0'

COUNTY/MUNICIPALITY Montgomery BLOCK _____ LOT _____

1. Test Number 1 Replicate (letter) A Date Collected _____

2. Material Tested: _____ Fill X Test in Native Soil

3. Type of Sample: X Undisturbed _____ Disturbed

4. Sample Dimensions: Inside Radius of Sample Tube, R, in cm 1.91
Length of Sample, L, in inches 3.00

5. Bulk Density Determination (Disturbed Samples Only): N/A

6. Sample Weight (Wt. Tube Containing Sample-Wt. of Empty Tube), grams 0.00

Wt. of Tube Containing Sample _____
Wt. of Empty Tube _____

7. Sample Volume (L x 2.54 cm./inch x 3.14R2), cc. 86.83

8. Bulk Density (Sample Wt./Sample Volume), grams/cc. 0 > 1.2

9. Standpipe Used: X No _____ Yes, Indicate Internal Radius, cm. N/A

10. Height of Water Level Above Rim of Test Basin, in inches:

At the Beginning of Each Test Interval, H1 5.00
At the End of Each Test Interval, H2 5.00

11. Rate of Water Level Drop (Add additional lines if needed):

Time, Start of Test Interval, T1	Time End of Test Interval T2	Length of Test Interval, T, Minutes
12:00:00	4:00:00	240.00

12. Calculation of Permeability: K, (in/hr) = 60 min/hr x r2/R2 x L(in)/T(min) x ln (H1/H2) T= 240.00

K (in/hr) = 0.00 **Classification:** **K0**

13. Defects in the Sample (Check appropriate items):

X None

_____ Soil/Tube Contact _____Large Gravel _____ Large Roots

_____ Dry Soil _____Smearing _____ Compaction

_____ Other - Specify _____

Tube Permeameter Test Data

Job Number: GJ2118024.001
Project: Proposed Site Improvement
Client: Shore Point
Lab Tech: MH

Sample ID: **Profile Pit No.:** **SPP-4** **Sample No.:** **T-1** **Depth:** 5.0'

COUNTY/MUNICIPALITY Montgomery BLOCK _____ LOT _____

1. Test Number 1 Replicate (letter) B Date Collected _____

2. Material Tested: _____ Fill X Test in Native Soil

3. Type of Sample: X Undisturbed _____ Disturbed

4. Sample Dimensions: Inside Radius of Sample Tube, R, in cm 1.91
Length of Sample, L, in inches 3.00

5. Bulk Density Determination (Disturbed Samples Only): N/A

6. Sample Weight (Wt. Tube Containing Sample-Wt. of Empty Tube), grams 0.00

Wt. of Tube Containing Sample _____
Wt. of Empty Tube _____

7. Sample Volume (L x 2.54 cm./inch x 3.14R2), cc. 86.83

8. Bulk Density (Sample Wt./Sample Volume), grams/cc. 0 > 1.2

9. Standpipe Used: X No _____ Yes, Indicate Internal Radius, cm. N/A

10. Height of Water Level Above Rim of Test Basin, in inches:

At the Beginning of Each Test Interval, H1 5.00
At the End of Each Test Interval, H2 5.00

11. Rate of Water Level Drop (Add additional lines if needed):

Time, Start of Test Interval, T1	Time End of Test Interval T2	Length of Test Interval, T, Minutes
12:00:00	4:00:00	240.00

12. Calculation of Permeability: K, (in/hr) = 60 min/hr x r2/R2 x L(in)/T(min) x ln (H1/H2) T= 240.00

K (in/hr) = 0.00 **Classification:** **K0**

13. Defects in the Sample (Check appropriate items):

X None

_____ Soil/Tube Contact _____Large Gravel _____ Large Roots

_____ Dry Soil _____Smearing _____ Compaction

_____ Other - Specify _____

WHITESTONE

APPENDIX C
Supplemental Information
(USCS, Terms & Symbols)

WHITESTONE
An Employee-Owned Company

2430 HIGHWAY 34
BUILDING B, SUITE 101
MANASQUAN, NJ 08736
732.592.2101
whitestoneassoc.com

UNIFIED SOIL CLASSIFICATION SYSTEM

SOIL CLASSIFICATION CHART

MAJOR DIVISIONS			LETTER SYMBOL	TYPICAL DESCRIPTIONS
COARSE GRAINED SOILS	GRAVEL AND GRAVELLY SOILS	CLEAN GRAVELS (LITTLE OR NO FINES)	GW	WELL-GRADED GRAVELS, GRAVEL-SAND MIXTURES, LITTLE OR NO FINES
			GP	POORLY-GRADED GRAVELS, GRAVEL-SAND MIXTURES, LITTLE OR NO FINES
	MORE THAN 50% OF COARSE FRACTION RETAINED ON NO. 4 SIEVE	GRAVELS WITH FINES (APPRECIABLE AMOUNT OF FINES)	GM	SILTY GRAVELS, GRAVEL-SAND-SILT MIXTURES
			GC	CLAYEY GRAVELS, GRAVEL-SAND-CLAY MIXTURES
	SAND AND SANDY SOILS	CLEAN SAND (LITTLE OR NO FINES)	SW	WELL-GRADED SANDS, GRAVELLY SANDS, LITTLE OR NO FINES
			SP	POORLY-GRADED SANDS, GRAVELLY SANDS, LITTLE OR NO FINES
MORE THAN 50% OF MATERIAL IS LARGER THAN NO. 200 SIEVE SIZE	MORE THAN 50% OF COARSE FRACTION PASSING NO. 4 SIEVE	SANDS WITH FINES (APPRECIABLE AMOUNT OF FINES)	SM	SILTY SANDS, SAND-SILT MIXTURES
			SC	CLAYEY SANDS, SAND-CLAY MIXTURES
FINE GRAINED SOILS	SILTS AND CLAYS	LIQUID LIMITS LESS THAN 50	ML	INORGANIC SILTS AND VERY FINE SANDS, ROCK FLOUR, SILTY OR CLAYEY FINE SANDS OR CLAYEY SILTS WITH SLIGHT PLASTICITY
			CL	INORGANIC CLAYS OF LOW TO MEDIUM PLASTICITY, GRAVELLY CLAYS, SANDY CLAYS, SILTY CLAYS, LEAN CLAYS
			OL	ORGANIC SILTS AND ORGANIC SILTY CLAYS OF LOW PLASTICITY
MORE THAN 50% OF MATERIAL IS SMALLER THAN NO. 200 SIEVE SIZE	SILTS AND CLAYS	LIQUID LIMITS GREATER THAN 50	MH	INORGANIC SILTS, MICACEOUS OR DIATOMACEOUS FINE SAND OR SILTY SOILS
			CH	INORGANIC CLAYS OF HIGH PLASTICITY, FAT CLAYS
			OH	ORGANIC CLAYS OF MEDIUM TO HIGH PLASTICITY, ORGANIC SILTS
HIGHLY ORGANIC SOILS			PT	PEAT, HUMUS, SWAMP SOILS WITH HIGH ORGANIC CONTENTS

NOTE: DUAL SYMBOLS ARE USED TO INDICATE BORDERLINE SOIL CLASSIFICATIONS FOR SAMPLES WITH 5% TO 12% FINES

GRADATION*

% FINER BY WEIGHT

TRACE..... 1% TO 10%
LITTLE..... 10% TO 20%
SOME..... 20% TO 35%
AND..... 35% TO 50%

COMPACTNESS*
Sand and/or Gravel

RELATIVE DENSITY

LOOSE. ..... 0% TO 40%
MEDIUM DENSE.... 40% TO 70%
DENSE..... 70% TO 90%
VERY DENSE..... 90% TO 100%

CONSISTENCY*
Clay and/or Silt

RANGE OF SHEARING STRENGTH IN POUNDS PER SQUARE FOOT

VERY SOFT..... LESS THAN 250
SOFT..... ..... 250 TO 500
MEDIUM..... 500 TO 1000
STIFF..... 1000 TO 2000
VERY STIFF..... 2000 TO 4000
HARD..... GREATER THAN 4000

** VALUES ARE FROM LABORATORY OR FIELD TEST DATA, WHERE APPLICABLE. WHEN NO TESTING WAS PERFORMED, VALUES ARE ESTIMATED.*

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WHITESTONE
An Employee-Owned Company

2430 HIGHWAY 34
BUILDING B, SUITE 101
MANASQUAN, NJ 08736
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GEOTECHNICAL TERMS AND SYMBOLS

SAMPLE IDENTIFICATION

The Unified Soil Classification System is used to identify the soil unless otherwise noted.

SOIL PROPERTY SYMBOLS

N: Standard Penetration Value: Blows per ft. of a 140 lb. hammer falling 30" on a 2" O.D. split-spoon.
Qu: Unconfined compressive strength, TSF.
Qp: Penetrometer value, unconfined compressive strength, TSF.
Mc: Moisture content, %.
LL: Liquid limit, %.
PI: Plasticity index, %.
δd: Natural dry density, PCF.
▼: Apparent groundwater level at time noted after completion of boring.

DRILLING AND SAMPLING SYMBOLS

NE: Not Encountered (Groundwater was not encountered).
SS: Split-Spoon - 1 ⅜" I.D., 2" O.D., except where noted.
ST: Shelby Tube - 3" O.D., except where noted.
AU: Auger Sample.
OB: Diamond Bit.
CB: Carbide Bit
WS: Washed Sample.

RELATIVE DENSITY AND CONSISTENCY CLASSIFICATION

Term (Non-Cohesive Soils)	Standard Penetration Resistance
Very Loose	0-4
Loose	4-10
Medium Dense	10-30
Dense	30-50
Very Dense	Over 50

Term (Cohesive Soils)	Qu (TSF)
Very Soft	0 - 0.25
Soft	0.25 - 0.50
Firm (Medium)	0.50 - 1.00
Stiff	1.00 - 2.00
Very Stiff	2.00 - 4.00
Hard	4.00+

PARTICLE SIZE

Boulders	8 in.+	Coarse Sand	5mm-0.6mm	Silt	0.074mm-0.005mm
Cobbles	8 in.-3 in.	Medium Sand	0.6mm-0.2mm	Clay	-0.005mm
Gravel	3 in.-5mm	Fine Sand	0.2mm-0.074mm		

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APPENDIX G

DRAINAGE PIPE DESIGN

ShorePt

Line No.	Inlet ID	Drng Area (ac)	Total Area (ac)	Runoff Coeff (C)	i Sys (in/hr)	Line Size (in)	Line Length (ft)	Invert Up (ft)	Invert Dn (ft)	Line Slope (%)	Flow Rate (cfs)	Capac Full (cfs)	n-val Pipe	Vel Ave (ft/s)	Vel Up (ft/s)	Vel Dn (ft/s)	HGL Up (ft)	HGL Dn (ft)	Tc (min)
1	CB-5 'B'	0.01	0.61	0.99	6.38	15	15.105	86.08	86.00	0.53	3.38	5.09	0.012	4.44	4.42	4.46	86.83	86.74	12.9
2	CB-4 'B'	0.03	0.60	0.99	6.42	15	29.916	86.23	86.08	0.50	3.33	4.95	0.012	3.78	4.04	3.53	87.03	86.98	12.7
3	CB-3 'E'	0.08	0.57	0.85	6.43	15	15.957	86.31	86.23	0.50	3.15	4.95	0.012	3.37	3.49	3.24	87.17	87.15	12.6
4	CB-2 'A'	0.23	0.49	0.86	6.57	15	105.884	86.84	86.31	0.50	2.77	4.95	0.012	3.05	3.71	2.39	87.57	87.43	11.8
5	CB-1 'A'	0.26	0.26	0.86	6.95	15	139.014	87.53	86.84	0.50	1.55	4.93	0.012	2.54	3.45	1.62	88.02	87.75	10.0
6	CB-7 'B'	0.01	0.01	0.99	6.95	15	17.496	86.09	86.00	0.51	0.07	5.02	0.012	1.45	1.41	1.48	86.19	86.10	10.0
7	CB-12 'B'	0.55	0.55	0.98	6.95	15	12.163	86.00	85.94	0.49	3.74	4.91	0.012	4.50	4.37	4.64	86.82	86.72	10.0
8	CB-15 'E'	0.27	0.33	0.85	5.09	15	92.000	82.42	81.36	1.15	1.73	7.51	0.012	4.25	3.56	4.93	82.94	81.77	22.2
9	CB-14 'E'	0.06	0.06	0.85	5.53	15	119.628	82.82	81.62	1.00	0.58	7.01	0.012	1.52	2.57	0.47	83.12 j	82.94	18.5
10	OS-13	0.00	0.00	0.00	0.00	15	21.543	84.00	83.78	1.02	0.30	7.07	0.012	2.52	2.18	2.86	84.21	83.96	17.0
11	Null Structure	0.00	0.00	0.00	0.00	48	10.000	84.00	84.00	0.00	0.30	0.00	0.012	1.11	1.05	1.17	84.23	84.21	10.0
12	MH-10	0.00	0.00	0.00	0.00	15	96.410	83.14	82.66	0.50	4.53	4.94	0.012	3.69	3.69	3.69	84.61	84.21	10.2
13	OS-9	0.00	0.00	0.00	0.00	15	51.069	83.40	83.14	0.51	4.53	4.99	0.012	3.69	3.69	3.69	84.86	84.65	10.0

Project File: 2022-12-22 Proposed Drainage.stm | Number of lines: 13 | Date: 1/3/2023

NOTES: Intensity = 102.61 / (Inlet time + 16.50) ^ 0.82 -- Return period = 25 Yrs. ; ** Critical depth

APPENDIX H

OUTLET PROTECTION

JOB NAME: MONTGOMERY SENIOR AFFORDABLE HOUSING
JOB NUMBER: RPM-211
CALCULATED: RZH
DATE: 12/22/22
OUTLET ID: FES-6

Rip-Rap Design

Scour Hole

Q (cfs)	W (in)	H (in)	TW	W_o (ft)	H (ft)	D_o Multiplier	W (Total)	L	D_{50} (in)	
3.38	15	15	1.95	1.25	1.25	1	10.0	11.3	0.2	--------
3.38	15	15	1.95	1.25	1.25	0.5	6.25	7.5	0.3	THIS ONE

Rip Rap Apron

	Q (cfs)	W (in)	H (in)	TW	W_o (ft)	H (ft)	$3W_o$	W (Total)	L_a	D_{50} (in)	
$TW < 0.5D_o$	3.38	15	15	1.95	1.25	1.25	3.8	16.9	13.1	0.4	------
$TW > 0.5D_o$	3.38	15	15	1.95	1.25	1.25	3.8	6.7	7.3	0.4	THIS ONE

JOB NAME: MONTGOMERY SENIOR AFFORDABLE HOUSING
JOB NUMBER: RPM-211
CALCULATED: RZH
DATE: 12/22/22
OUTLET ID: FES-8

Rip-Rap Design

Scour Hole

Q (cfs)	W (in)	H (in)	TW	W_o (ft)	H (ft)	D_o Multiplier	W (Total)	L	D_{50} (in)	
0.07	15	15	1.95	1.25	1.25	1	10.0	11.3	0.0	--------
0.07	15	15	1.95	1.25	1.25	0.5	6.25	7.5	0.0	THIS ONE

Rip Rap Apron

	Q (cfs)	W (in)	H (in)	TW	W_o (ft)	H (ft)	$3W_o$	W (Total)	L_a	D_{50} (in)	
$TW < 0.5D_o$	0.07	15	15	1.95	1.25	1.25	3.8	12.6	8.8	0.0	------
$TW > 0.5D_o$	0.07	15	15	1.95	1.25	1.25	3.8	3.8	0.2	0.0	THIS ONE

JOB NAME: MONTGOMERY SENIOR AFFORDABLE HOUSING
JOB NUMBER: RPM-211
CALCULATED: RZH
DATE: 12/22/22
OUTLET ID: EX FES

Rip-Rap Design

Scour Hole

	Q (cfs)	W (in)	H (in)	TW	W_o (ft)	H (ft)	D_o Multiplier	W (Total)	L	D_{50} (in)	
	1.73	15	15	2	1.25	1.25	1	10.0	11.3	0.1	--------
	1.73	15	15	2	1.25	1.25	0.5	6.25	7.5	0.1	THIS ONE

Rip Rap Apron

	Q (cfs)	W (in)	H (in)	TW	W_o (ft)	H (ft)	$3W_o$	W (Total)	L_a	D_{50} (in)	
$TW < 0.5D_o$	1.73	15	15	2	1.25	1.25	3.8	14.7	11.0	0.1	------
$TW > 0.5D_o$	1.73	15	15	2	1.25	1.25	3.8	5.2	3.7	0.1	THIS ONE

APPENDIX I

DRAINAGE AREA MAPS