SHORE POINT ENGINEERING

May 31, 2021 Revised December 23, 2022 RPM-211

STORMWATER MANAGEMENT REPORT

FOR

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

> PREPARED BY: SHORE POINT ENGINEERING, LLC 1985 Highway 34, Suite A7 Wall, NJ 07719

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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.

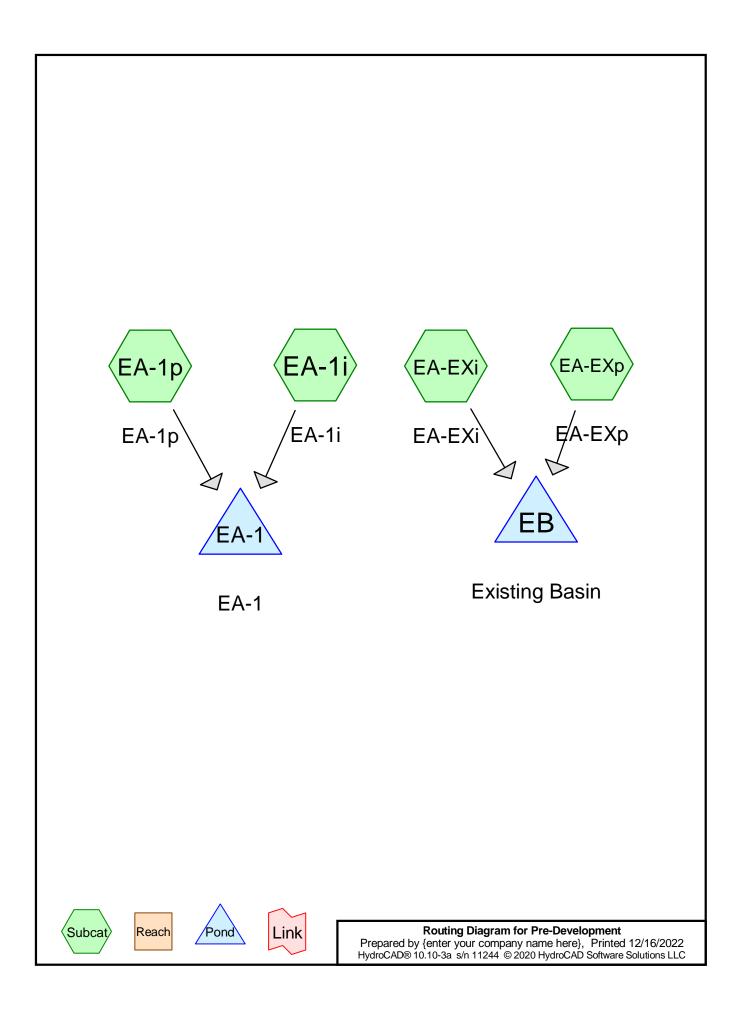
V. CONCLUSION

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

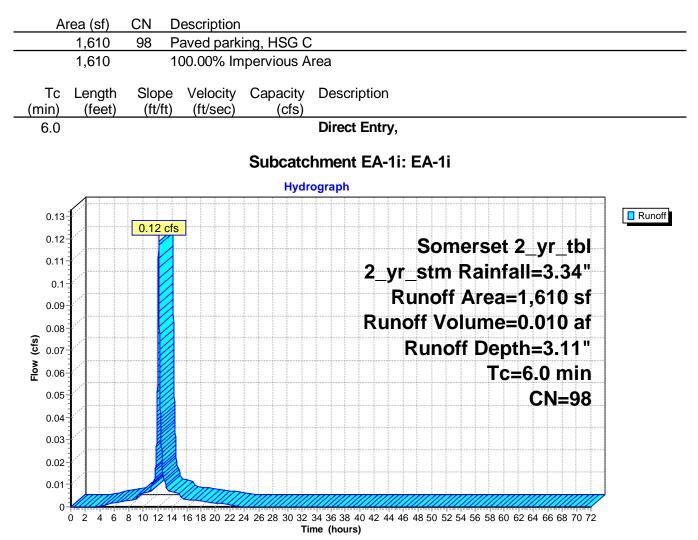


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Summary for Subcatchment EA-1i: EA-1i

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"



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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 79,889	 74 >75% Grass cover, Good, HSG C 80 >75% Grass cover, Good, HSG D 						
151,954 151,954	72 Weighted Average 100.00% Pervious Area						
Tc Length (min) (feet)	Slope Velocity Capacity Description (ft/ft) (ft/sec) (cfs)						
6.0	Direct Entry,						
	Subcatchment EA-1p: EA-1p						
	Hydrograph						
4	3.92 cfs Somerset 2_yr_tbl						
	2_yr_stm Rainfall=3.34"						
3	Runoff Area=151,954 sf						
	Runoff Volume=0.296 af						
- 10w (cts)	Runoff Depth=1.02"						
80 2- ⊢	Tc=6.0 min CN=72						
]							
$0 \frac{1}{246}$	8 10 12 14 16 18 20 22 24 26 28 30 32 34 36 38 40 42 44 46 48 50 52 54 56 58 60 62 64 66 68 70 72						
0 2 7 0	Time (hours)						

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Summary for Subcatchment EA-EXi: EA-EXi

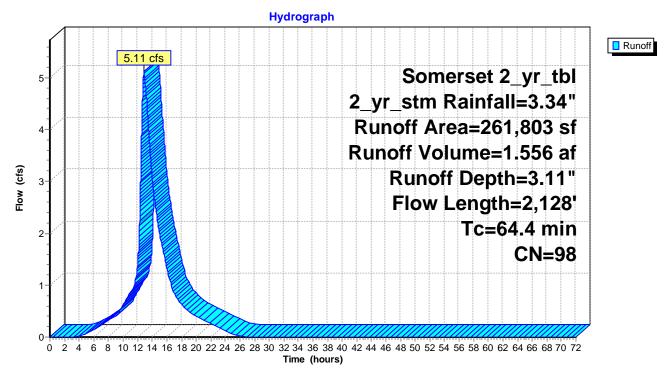
Runoff = 5.11 cfs @ 12.88 hrs, Volume= 1.556 af, Depth= 3.11"

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"

	A	rea (sf)	CN I	Description		
*		34,826	98	Roofs		
*		92,386		Roads		
*		20,721		Driveways		
*	1	13,870	98	Parking Lot		
		61,803		Weighted A		
	2	61,803		100.00% lm	pervious A	rea
	_				- ·	
	Tc	Length	Slope		Capacity	Description
	(min)	(feet)	(ft/ft)		(cfs)	
	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,
		400	0 0050	0.40		Woods: Light underbrush n= 0.400 P2= 3.35"
	4.4	130	0.0050	0.49		Shallow Concentrated Flow,
	1.7	73	0.0200	0.71		Short Grass Pasture Kv= 7.0 fps Shallow Concentrated Flow,
	1.7	13	0.0200	0.71		Woodland Kv= 5.0 fps
	0.2	24	0.0100	2.03		Shallow Concentrated Flow,
	0.2	27	0.0100	2.05		Paved Kv= 20.3 fps
	4.4	132	0.0100	0.50		Shallow Concentrated Flow,
		.02	010100	0.00		Woodland $Kv = 5.0 \text{ fps}$
	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,
	4.0	00	0 0000	4.04		Woodland Kv= 5.0 fps
	1.2	90	0.0300	1.21		Shallow Concentrated Flow,
	0.9	182	0.0250	3.21		Short Grass Pasture Kv= 7.0 fps
	0.9	102	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"
	0.0	002	0.0130	11.32	04.20	36.0" Round Area= 7.1 sf Perim= 9.4' r= 0.75'
						n = 0.012 Concrete pipe, finished
_	04.4	0.400	Tatal			

64.4 2,128 Total

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Subcatchment EA-EXi: EA-EXi

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Summary for Subcatchment EA-EXp: EA-EXp

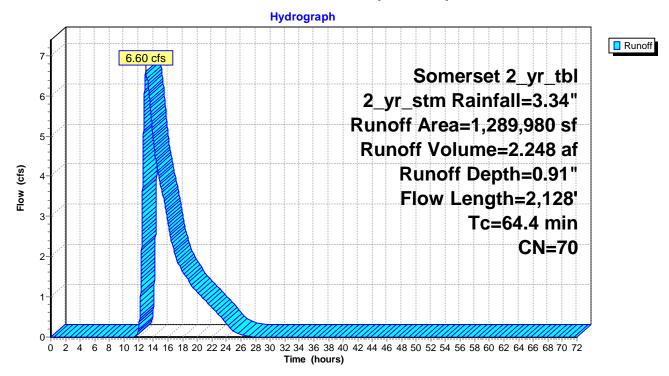
Runoff = 6.60 cfs @ 13.02 hrs, Volume= 2.248 af, Depth= 0.91"

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"

Ai	rea (sf)	CN I	Description			
	45,815		Woods, Good, HSG C			
	45,815		>75% Grass cover, Good, HSG C			
	42,152		Woods, Good, HSG B			
	42,152				ood, HSG B	
	14,046				ood, HSG D	
	89,980		Neighted A		· · · · · · · · · · · · · · · · · · ·	
	89,980		100.00% Pe		а	
- ,	,				-	
Тс	Length	Slope	Velocity	Capacity	Description	
(min)	(feet)	(ft/ft)		(cfs)	·	
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,	
4.5	400	0 0000	0.74		Short Grass Pasture Kv= 7.0 fps	
4.5	189	0.0200	0.71		Shallow Concentrated Flow,	
1.5	60	0.0100	0.70		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,	
12.9	300	0.0100	0.50		Woodland Kv= 5.0 fps	
1.2	90	0.0300	1.21		Shallow Concentrated Flow,	
1.2	90	0.0300	1.21		Short Grass Pasture Kv= 7.0 fps	
0.9	182	0.0250	3.21		Shallow Concentrated Flow,	
0.3	102	0.0200	5.21		Paved Kv= 20.3 fps	
0.8	602	0.0136	11.92	84.26		
0.0	002	0.0100	11.02	04.20	36.0" Round Area= 7.1 sf Perim= 9.4' r= 0.75'	
					n= 0.012 Concrete pipe, finished	

64.4 2,128 Total

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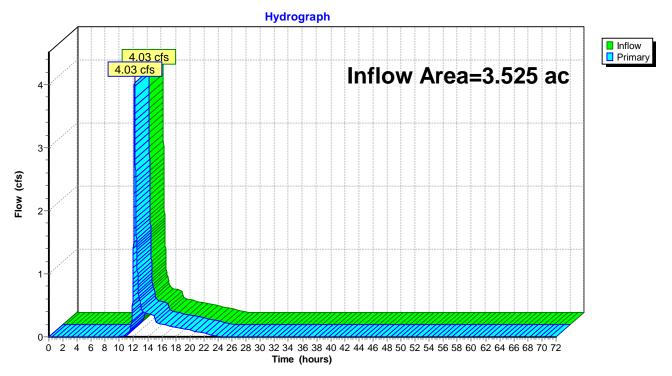
Subcatchment EA-EXp: EA-EXp

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Summary for Pond EA-1: EA-1

Inflow Area =	3.525 ac,	1.05% Impervious, Inflow E	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, Atte	n= 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	Invei	t Avail.Sto	rage Storage	Description
#1	78.80' 223,1		29 cf Custom	Stage Data (Prismatic) Listed below (Recalc)
Elevation Surf.Area		Inc.Store	Cum.Store	
(fee	et)	(sq-ft)	(cubic-feet)	(cubic-feet)
78.8	30	1	0	0
79.0	-	16	2	2
80.0		2,181	1,099	1,100
81.0		15,895	9,038	10,138
82.0		29,262	22,579	32,717
83.0		34,004	31,633	64,350
84.0		36,834	35,419	99,769
85.0		39,677	38,256	138,024
86.0 87.0		42,533 45,467	41,105 44,000	179,129 223,129
07.0	0	45,407	44,000	223,129
Device	Routing	Invert	Outlet Devices	s
#1	Primary	76.60'	48.0" Round	48" Culvert
				P, square edge headwall, Ke= 0.500
				nvert= 76.60' / 76.10' S= 0.0100 '/' Cc= 0.900
				ncrete pipe, finished, Flow Area= 12.57 sf
#2	Device 1	76.60'		Drifice C= 0.600 Limited to weir flow at low heads
#3	Device 1	81.90'		5" H Vert. 42" Weir C= 0.600
<i>щ</i> л	Device 1	85.44'		ir flow at low heads
#4	Device 1	60.44	-	16.0' breadth Outlet Structure Overflow 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60
			· · ·	n) 2.68 2.70 2.70 2.64 2.63 2.64 2.64 2.63
#5	Device 1	78.80'		Headwall Outlet (15" RCP)
#5	Device I	70.00		, square edge headwall, Ke= 0.500
				nvert= 78.80' / 78.30' S= 0.1250 '/' Cc= 0.900
				ncrete pipe, finished, Flow Area= 1.23 sf
#6	Device 5	78.80'		Drifice $C = 0.600$ Limited to weir flow at low heads
#7	Device 2	78.80'	0.500 in/hr Un	nderdrain 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)

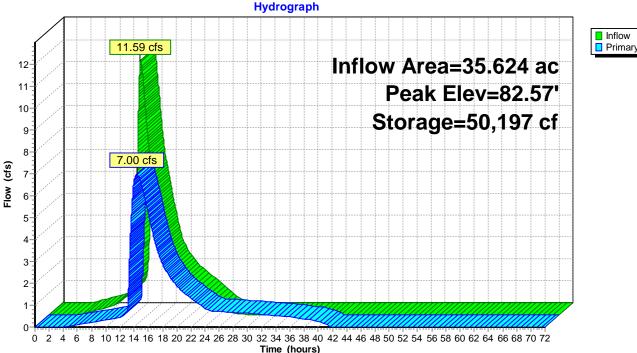
-3=42" Weir (Orifice Controls 6.17 cfs @ 2.63 fps)

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





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Hydrograph for Pond EB: Existing Basin

-	1.4.	0		
Time	Inflow	Storage	Elevation	Primary
(hours)	(cfs)	(cubic-feet)	(feet)	(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

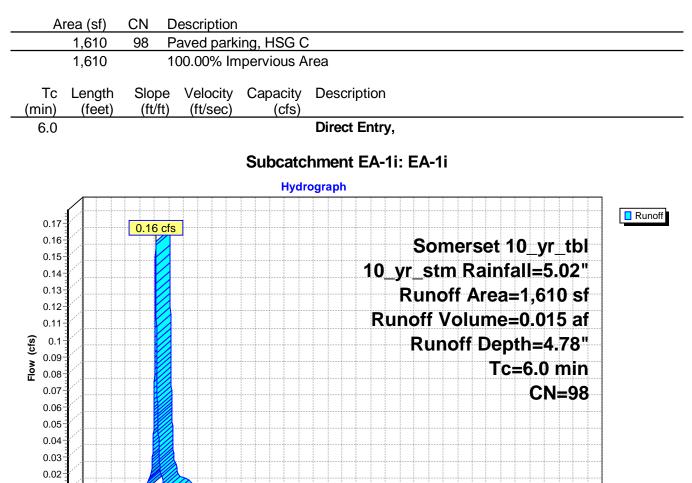
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Summary for Subcatchment EA-1i: EA-1i

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"



0 2 4 6 8 10 12 14 16 18 20 22 24 26 28 30 32 34 36 38 40 42 44 46 48 50 52 54 56 58 60 62 64 66 68 70 72 Time (hours)

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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"

A	Area (sf)	CN	Description								
	60,949	61 >75% Grass cover, Good, HSG B									
	11,116 79,889		 74 >75% Grass cover, Good, HSG C 80 >75% Grass cover, Good, HSG D 								
·	<u>151,954</u>		Weighted A			<u> </u>					
	151,954	,	100.00% Pe	ervious Are	а						
Tc (min)	Length (feet)	Slope (ft/ft)		Capacity (cfs)	Descripti	on					
6.0					Direct Er	ntry,					
				Subcatch	nment FA	-1p: F	A-1n				
					ograph	· ·p. =	- 'P				
											Runoff
8-		7.92 cfs					Some	rset	10_y	r_tbl	
7-					1		_stm				
6-						Run	off Ar	'ea='	151,9	54 sf	
0	-					Runc	off Vo	lum	e=0.6	43 af	
-5 -4						F	Runof	f De	pth=	2.21"	
мон 4-								Т	c=6.0) min	
3-									C	N=72	
5	-										
2-											
1-											
			4111								
0-	0 2 4 6	8 10 12 14	16 18 20 22 24	4 26 28 30 32 3		2 44 46 48	3 50 52 54	56 58 6	0 62 64 6	6 68 70 72	
				l in	ne (hours)						

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Summary for Subcatchment EA-EXi: EA-EXi

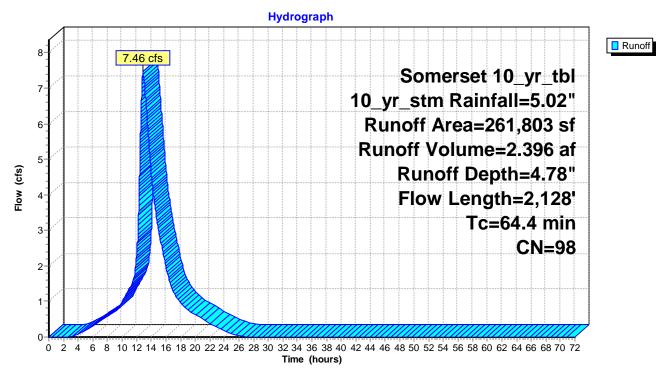
Runoff = 7.46 cfs @ 12.88 hrs, Volume= 2.396 af, Depth= 4.78"

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"

	A	rea (sf)	CN I	Description		
*		34,826	98 I	Roofs		
*		92,386	98 I	Roads		
*		20,721		Driveways		
*	1	13,870	98 I	Parking Lot		
		61,803		Weighted A		
	2	61,803		100.00% lm	pervious A	rea
	_		-		- ·	
	Tc	Length	Slope		Capacity	Description
	(min)	(feet)	(ft/ft)		(cfs)	
	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,
		400	0 0050	0.40		Woods: Light underbrush n= 0.400 P2= 3.35"
	4.4	130	0.0050	0.49		Shallow Concentrated Flow,
	1.7	73	0.0200	0.71		Short Grass Pasture Kv= 7.0 fps Shallow Concentrated Flow,
	1.7	13	0.0200	0.71		Woodland Kv= 5.0 fps
	0.2	24	0.0100	2.03		Shallow Concentrated Flow,
	0.2	27	0.0100	2.00		Paved Kv= 20.3 fps
	4.4	132	0.0100	0.50		Shallow Concentrated Flow,
		.02	0.0100	0.00		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,
	4.0	00	0 0000	4.04		Woodland Kv= 5.0 fps
	1.2	90	0.0300	1.21		Shallow Concentrated Flow,
	0.0	100	0.0050	2.04		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	Paved KV= 20.3 lps Pipe Channel, RCP_Round 36"
	0.0	002	0.0130	11.92	04.20	36.0" Round Area= 7.1 sf Perim= 9.4' r= 0.75'
						n = 0.012 Concrete pipe, finished
	04.4	0.400	T . (.)			

64.4 2,128 Total

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Subcatchment EA-EXi: EA-EXi

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Summary for Subcatchment EA-EXp: EA-EXp

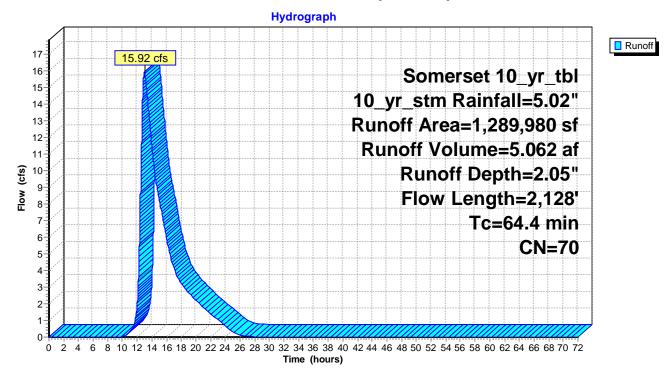
Runoff = 15.92 cfs @ 13.02 hrs, Volume= 5.062 af, Depth= 2.05"

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"

Aı	rea (sf)	CN	Description				
	45,815		Woods, Good, HSG C				
	45,815				ood, HSG C		
	42,152		Woods, Go				
	42,152				ood, HSG B		
	14,046				bod, HSG D		
					Jou, 1100 D		
,	89,980	-	Weighted A 100.00% Pe				
∠,۱	89,980		100.00% Pe	ervious Are	d		
Тс	Length	Slope	e Velocity	Capacity	Description		
(min)	(feet)	(ft/ft)		(cfs)	Description		
6.8	46	0.0100		(013)	Sheet Flow,		
0.0	40	0.0100	0.11		Grass: Short $n= 0.150 P2= 3.35"$		
22.3	54	0.0050	0.04		Sheet Flow,		
22.3	54	0.0050	0.04		Woods: Light underbrush n= 0.400 P2= 3.35"		
4.4	130	0.0050	0.49		Shallow Concentrated Flow,		
4.4	130	0.0050	0.49		Short Grass Pasture Kv= 7.0 fps		
1.7	70	0.0200	0.71		Shallow Concentrated Flow,		
1.7	73	0.0200	0.71		· · · · · · · · · · · · · · · · · · ·		
0.2	24	0.0100) 2.03		Woodland Kv= 5.0 fps Shallow Concentrated Flow,		
0.2	24	0.0100	2.03		Paved Kv= 20.3 fps		
4.4	132	0.0100	0.50		Shallow Concentrated Flow,		
4.4	132	0.0100	0.50		Woodland Kv= 5.0 fps		
0.2	24	0.0100) 2.03		Shallow Concentrated Flow,		
0.2	24	0.0100	2.03		Paved Kv= 20.3 fps		
2.6	132	0.0150	0.86		Shallow Concentrated Flow,		
2.0	152	0.0150	0.00		Short Grass Pasture Kv= 7.0 fps		
4.5	189	0.0200) 0.71		Shallow Concentrated Flow,		
4.5	109	0.0200	0.71		Woodland Kv= 5.0 fps		
1.5	62	0.0100	0.70		Shallow Concentrated Flow,		
1.5	02	0.0100	0.70		Short Grass Pasture Kv= 7.0 fps		
12.9	388	0.0100	0.50		Shallow Concentrated Flow,		
12.9	300	0.0100	0.50		Woodland Kv= 5.0 fps		
1.2	90	0.0300) 1.21		Shallow Concentrated Flow,		
1.2	90	0.0300) 1.21		Short Grass Pasture Kv= 7.0 fps		
0.9	182	0.0250) 3.21		Shallow Concentrated Flow,		
0.9	102	0.0230	0.21		Paved Kv= 20.3 fps		
0.8	602	0.0136	6 11.92	84.26	I I I I I I I I I I I I I I I I I I I		
0.0	002	0.0130	5 11.92	04.20	36.0" Round Area= 7.1 sf Perim= 9.4' r= 0.75'		
					n= 0.012 Concrete pipe, finished		

64.4 2,128 Total

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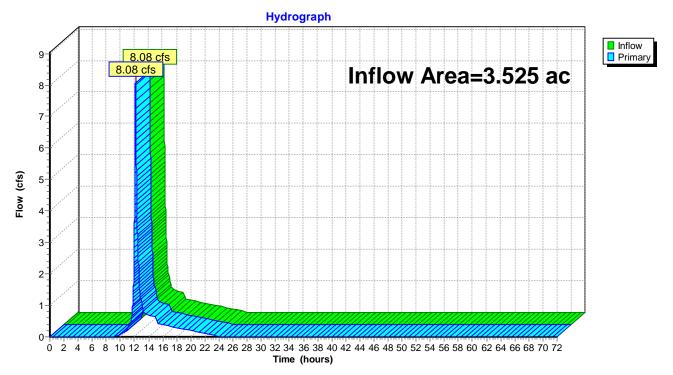
Subcatchment EA-EXp: EA-EXp

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Summary for Pond EA-1: EA-1

Inflow Area =	3.525 ac,	1.05% Impervious, Inflow I	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, Atte	en= 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	Inve	rt Avail.Sto	rage Storage	e Description
#1	#1 78.80' 223,12		29 cf Custom	n Stage Data (Prismatic) Listed below (Recalc)
Elevatio	on S	Surf.Area	Inc.Store	Cum.Store
(fee	et)	(sq-ft)	(cubic-feet)	(cubic-feet)
78.8	30	1	0	0
79.0	00	16	2	2
80.0		2,181	1,099	1,100
81.0	00	15,895	9,038	10,138
82.0		29,262	22,579	32,717
83.0		34,004	31,633	64,350
84.0		36,834	35,419	99,769
85.0		39,677	38,256	138,024
86.0		42,533	41,105	179,129
87.0	00	45,467	44,000	223,129
Device	Routing	Invert	Outlet Device	es
#1	Primary	76.60'	48.0" Round	d 48" Culvert
				CP, square edge headwall, Ke= 0.500
				Invert= 76.60' / 76.10' S= 0.0100 '/' Cc= 0.900
				ncrete pipe, finished, Flow Area= 12.57 sf
#2	Device 1	76.60'		Orifice C= 0.600 Limited to weir flow at low heads
#3	Device 1	81.90'		.5" H Vert. 42" Weir C= 0.600
	.			eir flow at low heads
#4	Device 1	85.44'		16.0' breadth Outlet Structure Overflow
				0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60
#6	Davias 1	70.00		sh) 2.68 2.70 2.70 2.64 2.63 2.64 2.64 2.63 d Headwall Outlet (15" RCP)
#5	Device 1	78.80'		P, square edge headwall, Ke= 0.500
				Invert= $78.80' / 78.30'$ S= $0.1250 '/$ Cc= 0.900
				$r_{1} = 78.80 / 78.80 = 0.1250 / CC = 0.900$
#6	Device 5	78.80'		Orifice C= 0.600 Limited to weir flow at low heads
#0 #7	Device 3	78.80'		Inderdrain over Surface area
	200100 Z	10.00		

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)

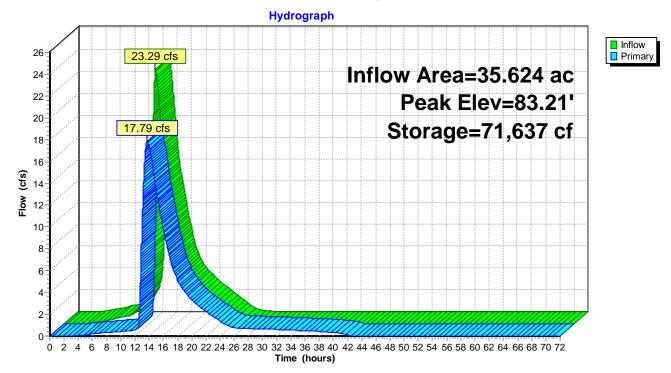
-3=42" Weir (Orifice Controls 16.89 cfs @ 3.68 fps)

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



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Hydrograph for Pond EB: Existing Basin

Time	Inflow	Storage	Elevation	Primary
(hours)	(cfs)	(cubic-feet)	(feet)	(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

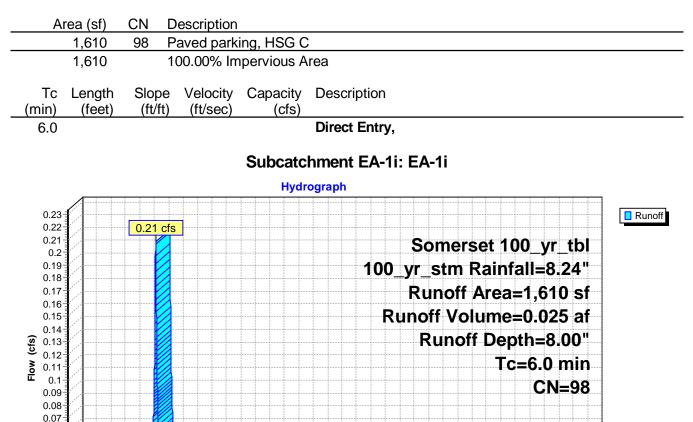
0.06 0.05 0.04 0.03 0.02 0.01 0

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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"



0 2 4 6 8 10 12 14 16 18 20 22 24 26 28 30 32 34 36 38 40 42 44 46 48 50 52 54 56 58 60 62 64 66 68 70 72 Time (hours)

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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 I	Description							
	60,949				ood, HSG B					
	11,116									
	79,889	80 :	>75% Gras	s cover, Go	bod, HSG D					
	151,954		Weighted A							
	151,954	·	100.00% Pe	ervious Are	a					
Т	c Length	Slope	Velocity	Capacity	Description					
(mir		(ft/ft)		(cfs)	•					
6.	0				Direct Entry,					
				Subcatch	hment EA-1p: EA-1p					
				Hydr	rograph					
						Runoff				
15	;	14.02 cfs	,			Kunon				
14	€{				Somerset 100_yr_t	bl				
13	·				100_yr_stm Rainfall=8.24					
12					Runoff Area=151,954					
11 1(Runoff Volume=1.426					
					Runoff Depth=4.9					
č,										
Nol-					Tc=6.0 m	In				
-					CN=7	72				
Ę										
2										
3										
2										
1			Imm	-						
(
	0 2 4 6 8	3 10 12 14	16 18 20 22 24	1 26 28 30 32 3	34 36 38 40 42 44 46 48 50 52 54 56 58 60 62 64 66 68 70	0 72				

Time (hours)

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Summary for Subcatchment EA-EXi: EA-EXi

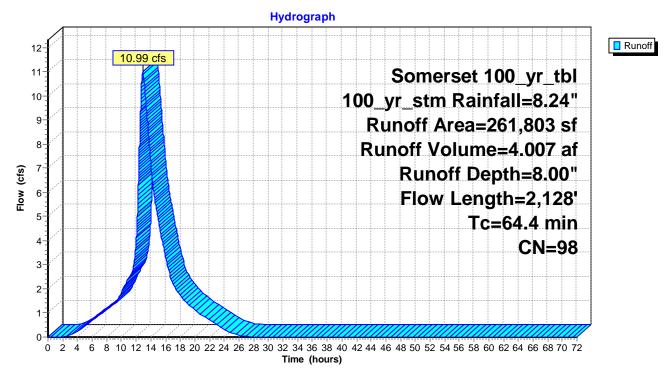
Runoff = 10.99 cfs @ 12.88 hrs, Volume= 4.007 af, Depth= 8.00"

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"

	A	rea (sf)	CN [Description		
*		34,826	98 F	Roofs		
*		92,386	98 F	Roads		
*		20,721		Driveways		
*	1	13,870	<u>98</u> F	Parking Lot		
		61,803		Veighted A		
	2	61,803	1	00.00% lm	pervious A	rea
	Tc	Length	Slope		Capacity	Description
	(min)	(feet)	(ft/ft)	(ft/sec)	(cfs)	
	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,
	4 7	70	0 0000	0.74		Short Grass Pasture Kv= 7.0 fps
	1.7	73	0.0200	0.71		Shallow Concentrated Flow,
	<u> </u>	04	0.0400	0.00		Woodland Kv= 5.0 fps
	0.2	24	0.0100	2.03		Shallow Concentrated Flow,
	4.4	132	0.0100	0.50		Paved Kv= 20.3 fps Shallow Concentrated Flow,
	4.4	152	0.0100	0.50		Woodland Kv= 5.0 fps
	0.2	24	0.0100	2.03		Shallow Concentrated Flow,
	0.2	24	0.0100	2.05		Paved Kv= 20.3 fps
	2.6	132	0.0150	0.86		Shallow Concentrated Flow,
	2.0	102	0.0100	0.00		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'
	04.4	0.400	Tatal			n= 0.012 Concrete pipe, finished

64.4 2,128 Total

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Subcatchment EA-EXi: EA-EXi

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Summary for Subcatchment EA-EXp: EA-EXp

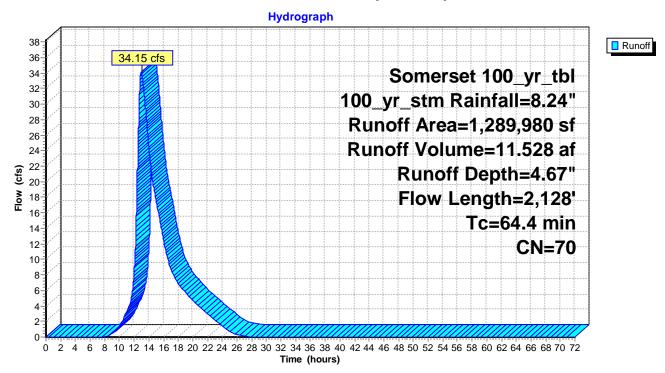
Runoff = 34.15 cfs @ 13.02 hrs, Volume= 11.528 af, Depth= 4.67"

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"

A	rea (sf)	CN	Description				
	45,815		Woods, Good, HSG C				
	45,815				ood, HSG C		
	42,152		Woods, Go				
	42,152				ood, HSG B		
	14,046				ood, HSG D		
	89,980		Weighted A	· · · ·	· · · · · · · · · · · · · · · · · · ·		
	89,980		100.00% Pe		а		
,	,						
Tc	Length	Slope	Velocity	Capacity	Description		
(min)	(feet)	(ft/ft)	(ft/sec)	(cfs)			
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,		
0.0	400	0.0450	0.00		Paved Kv= 20.3 fps		
2.6	132	0.0150	0.86		Shallow Concentrated Flow,		
4.5	189	0.0200	0.71		Short Grass Pasture Kv= 7.0 fps Shallow Concentrated Flow,		
4.5	109	0.0200	0.71		Woodland Kv= 5.0 fps		
1.5	62	0.0100	0.70		Shallow Concentrated Flow,		
1.5	02	0.0100	0.70		Short Grass Pasture Kv= 7.0 fps		
12.9	388	0.0100	0.50		Shallow Concentrated Flow,		
12.5	500	0.0100	0.50		Woodland Kv= 5.0 fps		
1.2	90	0.0300	1.21		Shallow Concentrated Flow,		
	00	0.0000	1.21		Short Grass Pasture Kv= 7.0 fps		
0.9	182	0.0250	3.21		Shallow Concentrated Flow,		
0.0		0.0200	0.2.		Paved Kv= 20.3 fps		
0.8	602	0.0136	11.92	84.26			
-			-	-	36.0" Round Area= 7.1 sf Perim= 9.4' r= 0.75'		
					n= 0.012 Concrete pipe, finished		

64.4 2,128 Total

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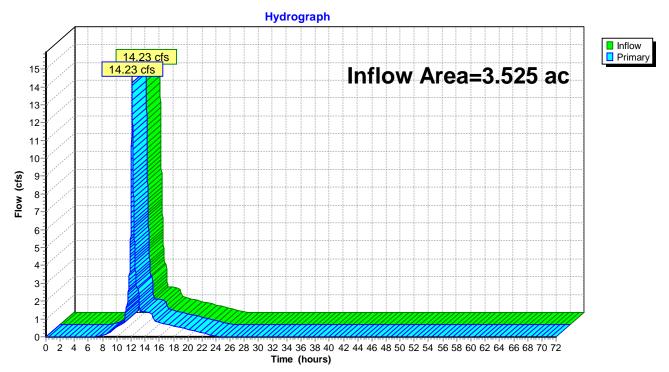
Subcatchment EA-EXp: EA-EXp

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Summary for Pond EA-1: EA-1

Inflow Area =	3.525 ac,	1.05% Impervious, Inflow D	epth = 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, Inflov	w 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	Invei	rt Avail.Stor	rage Storage I	Description
#1	78.80)' 223,12	29 cf Custom	Stage Data (Prismatic) Listed below (Recalc)
Elevatio	-	Surf.Area	Inc.Store	Cum.Store
(fee	/	(sq-ft)	(cubic-feet)	(cubic-feet)
78.8		1	0	0
79.0	-	16	2	2
80.0		2,181	1,099	1,100
81.0		15,895	9,038	10,138
82.0		29,262	22,579	32,717
83.0		34,004	31,633	64,350
84.0		36,834	35,419	99,769
85.0		39,677	38,256	138,024
86.0		42,533	41,105	179,129
87.0	00	45,467	44,000	223,129
Device	Routing	Invert	Outlet Devices	8
#1	Primary	76.60'	48.0" Round	48" Culvert
	-		L= 50.0' RCP	P, square edge headwall, Ke= 0.500
			Inlet / Outlet In	nvert= 76.60' / 76.10' S= 0.0100 '/' Cc= 0.900
			n= 0.012 Con	crete pipe, finished, Flow Area= 12.57 sf
#2	Device 1	76.60'		Drifice C= 0.600 Limited to weir flow at low heads
#3	Device 1	81.90'	42.0" W x 38.5	5" H Vert. 42" Weir C= 0.600
			Limited to weir	r flow at low heads
#4	Device 1	85.44'		
			· · ·	
#5	Device 1	78.80'		
#6				
#7	Device 2	78.80'	0.500 in/hr Un	derdrain over Surface area
#4 #5	Device 1	85.44'	Limited to wein 16.0' long x 1 Head (feet) 0. Coef. (English 15.0" Round L= 4.0' RCP, Inlet / Outlet In n= 0.012 Con- 3.0" Vert. 3" C	

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)

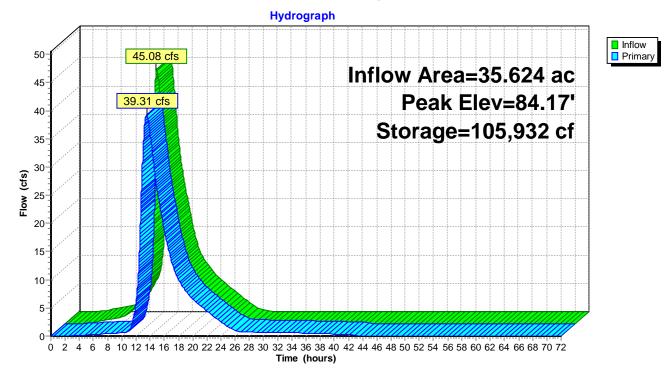
-3=42" Weir (Orifice Controls 38.33 cfs @ 4.83 fps)

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



Pre-Development

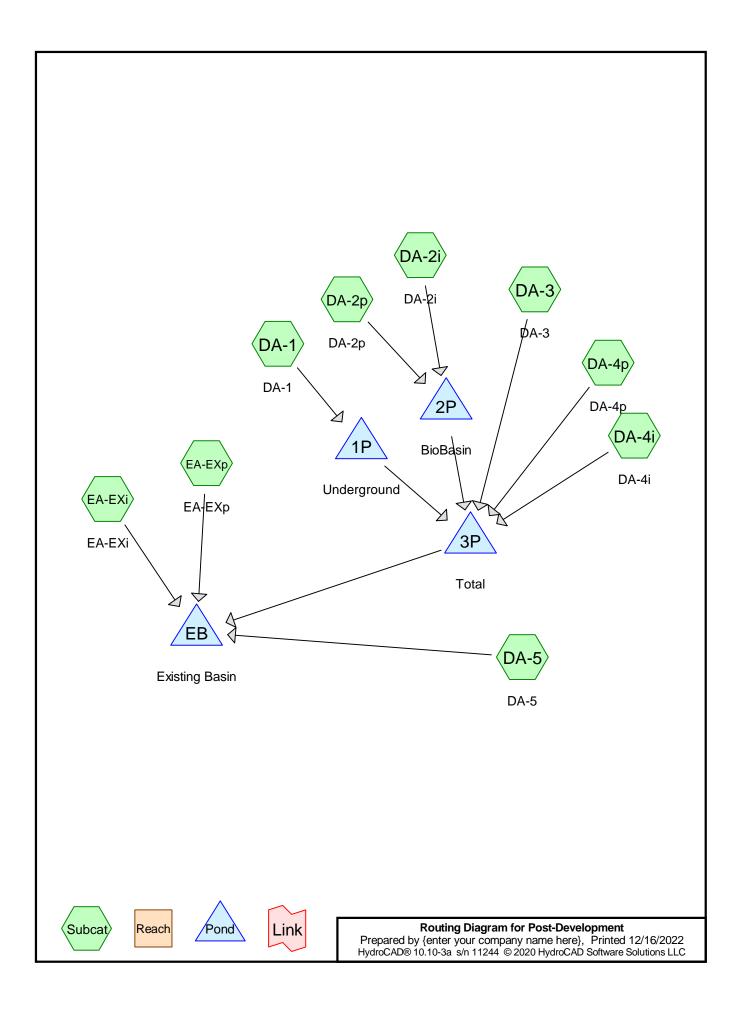
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Hydrograph for Pond EB: Existing Basin

T :	left e	0		Duine en l
Time	Inflow	Storage	Elevation	Primary
(hours)	(cfs)	(cubic-feet)	(feet)	<u>(cfs)</u>
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

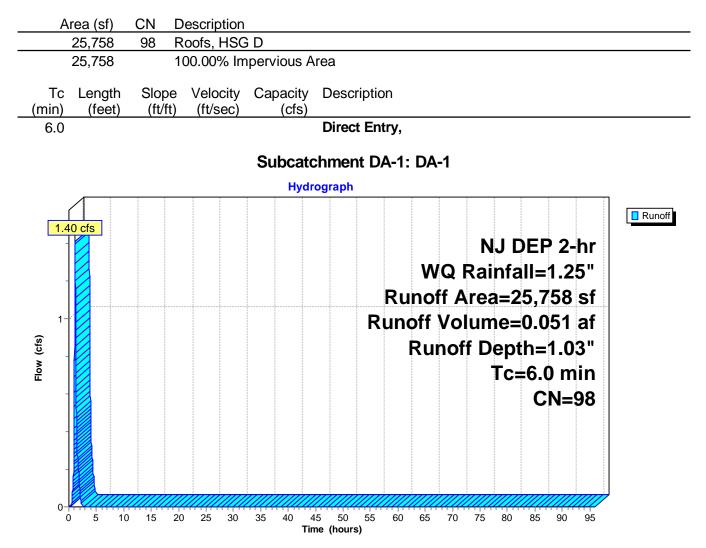
APPENDIX B

POST-DEVELOPMENT ANALYSIS



Summary for Subcatchment DA-1: DA-1

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



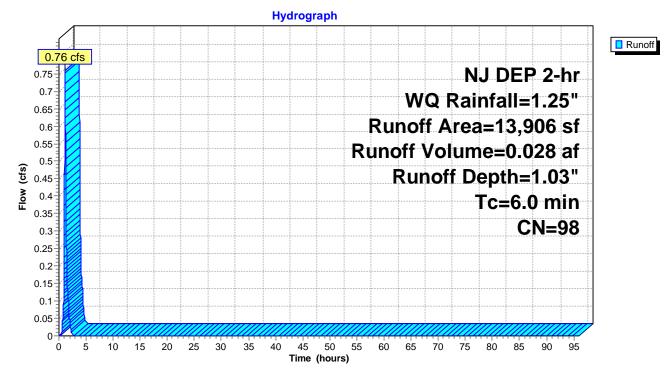
Summary for Subcatchment DA-2i: DA-2i

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"

	A	rea (sf)	CN	Description					
*		2,940	98	Sidewalks,	HSG C				
		9,656	98	Paved park	ing, HSG C	C			
*		649	98	Hardscape,	HSG C				
*		661	98	Hardscape,	HSG B				
		13,906	98	Weighted A	verage				
		13,906		100.00% Im	pervious A	Area			
	Tc (min)	Length (feet)	Slop (ft/f		Capacity (cfs)	Description			
	6.0	,	<u> </u>	, , , , , , , , , , , , , , , , , , , ,	<u> </u>	Direct Entry,			

Subcatchment DA-2i: DA-2i



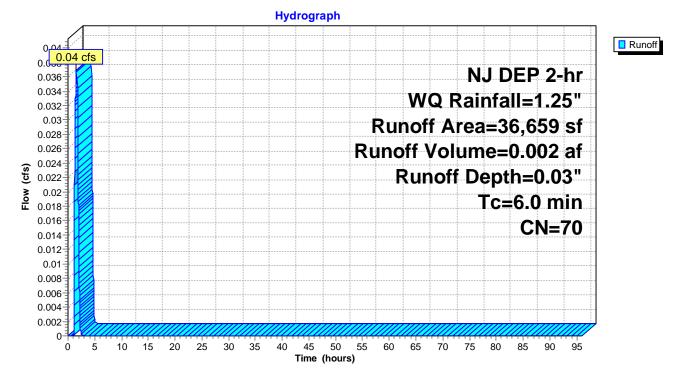
Summary for Subcatchment DA-2p: DA-2p

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"

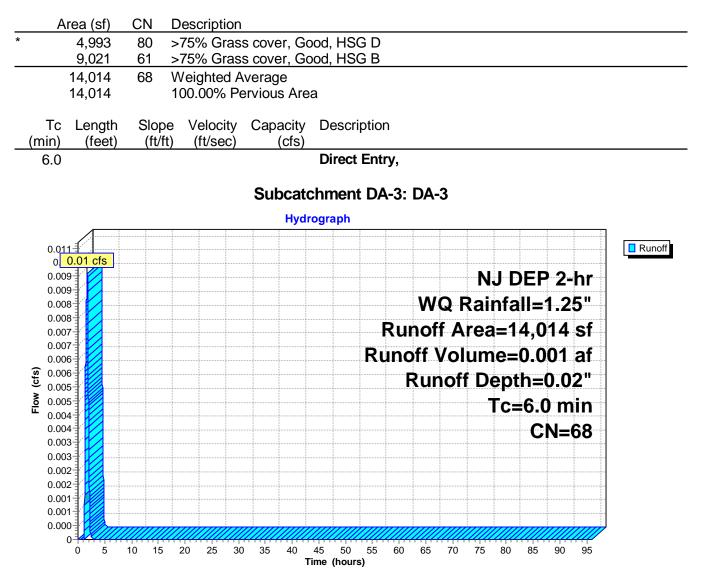
Area	(sf) CN	Description
5,	773 61	>75% Grass cover, Good, HSG B
5,	981 74	>75% Grass cover, Good, HSG C
14,	003 80	>75% Grass cover, Good, HSG D
10,	902 61	>75% Grass cover, Good, HSG B
36,	659 70	Weighted Average
36,	659	100.00% Pervious Area
	ength Slop	
(min)	(feet) (ft/	ft) (ft/sec) (cfs)
6.0		Direct Entry,

Subcatchment DA-2p: DA-2p



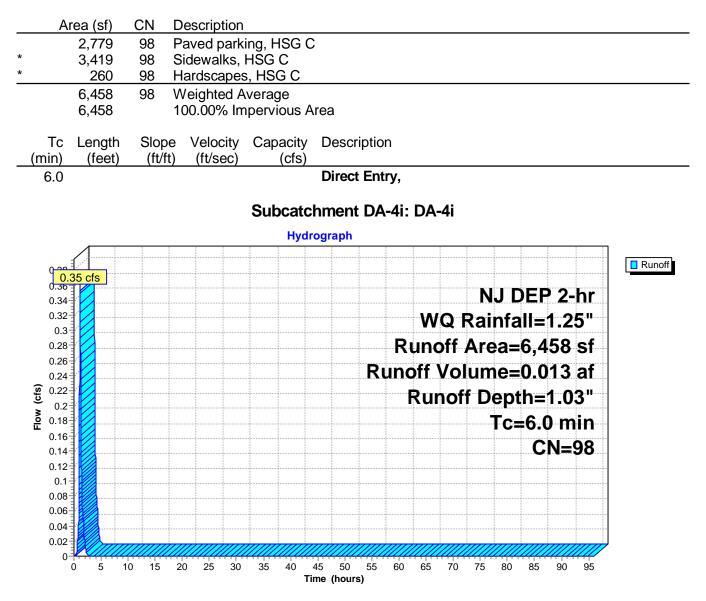
Summary for Subcatchment DA-3: DA-3

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



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

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



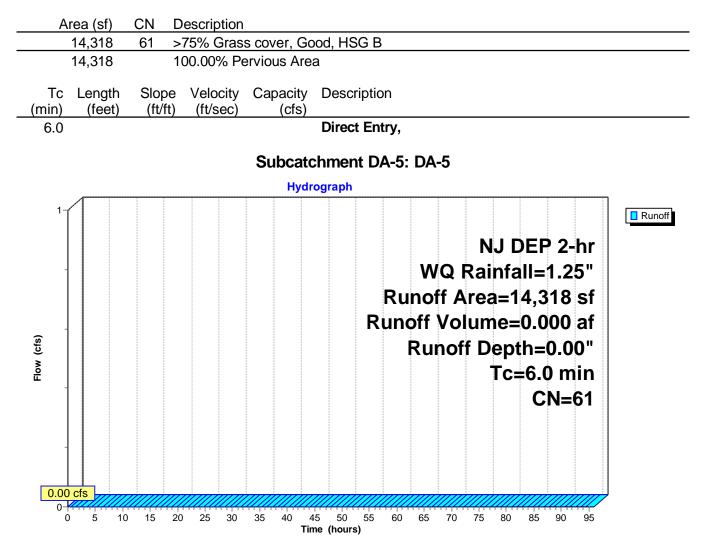
Summary for Subcatchment DA-4p: DA-4p

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

	Area (sf)	C	N	Des	cripti	on														
	16,312									, HSC										
	2,332 23,645									, HSC , HSC										
	42,289				ghte			,	000	, 130	ספ									
	42,289	,			00%				ea											
	Tc Lengt		Slope		eloci		Capa			escrip	otior	۱								
(mi	in) (feet 5.0)	(ft/ft)) (ft/se	C)		(cfs)		irect	Enti	37								
C	5.0								U	reci	Enu	у,								
						S	Suba	atc	hm	ent [)A-4	4p:	DA-	4p						
														. 12						
			1	1	1	1		пус	lrogr				1	1		1				ן
	0.075																			📘 Runoff
	0.07 cfs														NI	1 Г)EP	2	hr	
	0.065																			
	0.06					 							W	QF	Rail	nta	ll='	1.2	5"	
	0.055											Rui	nof	fΑ	rea	=4	2,2	89	sf	
	0.05					 					Rı	ino	ff \	/ﻣﺎ	um	e=	0.0	04	af	
fs)	0.045					- - - 										-				
Flow (cfs)	0.04		 			 						Γ	KUI	1011		•••••	:h=(
Б	0.035					- - - - - -										ГС=	=6.0) m	in	
	0.03					 											С	N=7	72	
	0.025					 														
	0.02																			
	0.015					 														
	0.01																			
																				J
	0 7 7 7 7 7 7	10	15	20	25	30	35	40	45	50	55	60	65	70	75	80	85	90	95	

Summary for Subcatchment DA-5: DA-5

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



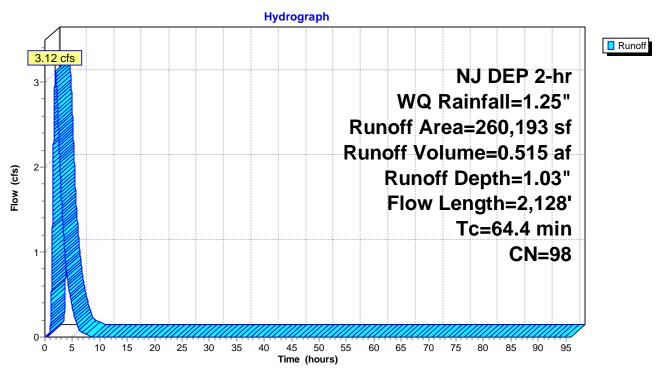
Summary for Subcatchment EA-EXi: EA-EXi

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"

 34,826 98 Roofs 92,386 98 Roads 20,721 98 Driveways 112,260 98 Parking Lot 260,193 98 Weighted Average 22.3 54 0.0050 0.11 Sheet Flow, Woods: Light underbrush n = 0.400 P2= 3.35" 3.4 130 0.0050 0.49 Shallow Concentrated Flow, Woodland Kv= 5.0 fps 0.2 24 0.0100 2.03 Shallow Concentrated Flow, Paved Kv= 20.3 fps 0.2 24 0.0100 2.03 Shallow Concentrated Flow, Paved Kv= 2.0.3 fps 2.6 132 0.0150 0.86 Shallow Concentrated Flow, Paved Kv= 2.0.3 fps 2.6 132 0.0150 0.86 Shallow Concentrated Flow, Paved Kv= 2.0.3 fps 1.5 62 0.0100 0.70 Shallow Concentrated Flow, Woodland Kv= 5.0 fps 1.5 62 0.0100 0.70 Shallow Concentrated Flow, Woodland Kv= 5.0 fps 1.5 62 0.0100 0.70 Shallow Concentrated Flow, Woodland Kv= 5.0 fps 1.5 62 0.0100 0.70 Shallow Concentrated Flow, Woodland Kv= 5.0 fps 1.5 62 0.0100 0.50 Shallow Concentrated Flow, Woodland Kv= 5.0 fps 1.5 62 0.0100 0.50 Shallow Concentrated Flow, <		A	rea (sf)	CN	Description		
 20,721 98 Driveways 112,260 98 Parking Lot 260,193 98 Weighted Average 260,193 100.00% Impervious Area Tc Length Slope Velocity Capacity Description (min) (feet) (ft/ft) (ft/sec) (cfs) 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, Woodds: Light underbrush n = 0.400 P2= 3.35" 4.4 130 0.0050 0.49 Shallow Concentrated Flow, Woodland Kv= 5.0 fps 0.2 24 0.0100 2.03 Shallow Concentrated Flow, Paved Kv= 20.3 fps 0.2 24 0.0100 2.03 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, Woodland Kv= 5.0 fps 2.6 132 0.0150 0.86 Shallow Concentrated Flow, Woodland Kv= 5.0 fps 1.5 62 0.0100 0.70 Shallow Concentrated Flow, Woodland Kv= 5.0 fps 1.5 62 0.0100 0.70 Shallow Concentrated Flow, Woodland Kv= 5.0 fps 1.5 62 0.0100 0.70 Shallow Concentrated Flow, Woodland Kv= 5.0 fps 1.5 62 0.0100 0.70 Shallow Concentrated Flow, Woodland Kv= 5.0 fps 1.5 62 0.0100 0.70 Shallow Concentrated Flow, Woodland Kv= 5.0 fps 1.5 62 0.0100 0.70 Shallow Concentrated Flow, Woodland Kv= 5.0 fps 1.5 62 0.0100 0.50 Shallow Concentrated Flow, Woodland Kv= 5.0 fps 1.2 90 0.0300 1.21 Shallow Concentrated Flow, Woodland Kv= 5.0 fps 1.2 90 0.0300 1.21 Shallow Concentrated Flow, Paved Kv= 20.3 fps 0.9 182 0.0250 3.21 Shallow Concentrated Flow, Paved Kv= 2.0.3 fps 0.8 602 0.0136 11.92 84.26 Fip Channel, 36.0" Round Area= 7.1 sf Perime 9.4' r= 0.75' n= 0.012 Concrete pipe, finished 	*		,				
* 112,260 98 Parking Lot 260,193 98 Weighted Average 100,00% Impervious Area Tc Length Slope Velocity Capacity Description (min) (feet) (ft/ft) (ft/sc) (cfs) 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, Woodland Kv= 5.0 fps 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, Woodland Kv= 5.0 fps 0.2 24 0.0100 2.03 Shallow Concentrated Flow, Woodland Kv= 5.0 fps 1.5 62 0.0100 2.03 Shallow Concentrated Flow, Woodland Kv= 5.0 fps 1.5 62 0.0100 0.70 Shallow Concentrated Flow, Woodland Kv= 5.0 fps 1.5 62 </td <td>*</td> <td></td> <td>,</td> <td></td> <td></td> <td></td> <td></td>	*		,				
260,193 98 Weighted Average 100.00% Impervious Area Tc 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, Woodand Kv= 5.0 fps 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, Woodland Kv= 5.0 fps 0.2 24 0.0100 2.03 Shallow Concentrated Flow, Woodland Kv= 5.0 fps 0.2 24 0.0100 2.03 Shallow Concentrated Flow, Woodland Kv= 5.0 fps 1.5 62 0.0100 2.03 Shallow Concentrated Flow, Woodland Kv= 5.0 fps 1.5 62 0.0100 0.70 Shallow Concentrated Flow, Woodland Kv= 5.0 fps 1.5 62 0.0100 0.50	*						
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$\begin{array}{c c c c c c c c c c c c c c c c c c c $		Тс	Length	Slone	Velocity	Canacity	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, Woodland Kv= 5.0 fps 0.2 24 0.0100 2.03 Shallow Concentrated Flow, Paved Kv= 20.3 fps 0.2 24 0.0100 2.03 Shallow Concentrated Flow, Woodland Kv= 5.0 fps 0.2 24 0.0100 2.03 Shallow Concentrated Flow, Woodland Kv= 5.0 fps 0.2 24 0.0100 2.03 Shallow Concentrated Flow, Woodland Kv= 5.0 fps 1.5 62 0.0100 0.70 Shallow Concentrated Flow, Woodland Kv= 5.0 fps 1.5 62 0.0100 0.70 Shallow Concentrated Flow, Woodland Kv= 5.0 fps 1.5 62 0.0100 0.50 Shallow Concentrated Flow, Woodland Kv= 5.0 fps 1.2 90 0.0300 <td< td=""><td></td><td></td><td></td><td></td><td></td><td></td><td>Description</td></td<>							Description
22.354 0.0050 0.04 Grass: Short n= 0.150 P2= $3.35"$ 4.4130 0.0050 0.49 Sheet Flow, Woods: Light underbrush n= 0.400 P2= $3.35"$ 4.4130 0.0050 0.49 Shallow Concentrated Flow, Short Grass Pasture Kv= 7.0 fps1.773 0.0200 0.71 Shallow Concentrated Flow, Woodland Kv= 5.0 fps0.224 0.0100 2.03 Shallow Concentrated Flow, Paved Kv= 20.3 fps4.4132 0.0100 0.50 Shallow Concentrated Flow, Paved Kv= 20.3 fps0.224 0.0100 2.03 Shallow Concentrated Flow, Paved Kv= 20.3 fps2.6132 0.0150 0.86 Shallow Concentrated Flow, Paved Kv= 20.3 fps4.5189 0.0200 0.71 Shallow Concentrated Flow, Woodland Kv= 5.0 fps1.562 0.0100 0.70 Shallow Concentrated Flow, Woodland Kv= 5.0 fps1.290 0.300 1.21 Shallow Concentrated Flow, Woodland Kv= 5.0 fps 1.2 90 0.0300 1.21 0.3100 1.21 Shallow Concentrated Flow, Woodland Kv= 5.0 fps 0.9 182 0.0250 3.21 0.8 602 0.0136 11.92 84.26 Pipe Channel, G.0" Round Area= 7.1 sf Perime 9.4° r = 0.75° n= 0.012 Concrete pipe, finished	_					(0.0)	Sheet Flow.
22.3 54 0.050 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, Paved Kv= 20.3 fps 0.2 24 0.0100 2.03 Shallow Concentrated Flow, Woodland Kv= 5.0 fps 0.2 24 0.0100 2.03 Shallow Concentrated Flow, Woodland Kv= 5.0 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 0.50 Shallow Concentrated Flow, Woodland Kv= 5.0 fps 1.2 90 0.0300 1.21 Shallow Concentrated Flow, Woodland Kv= 5.0 fps 0.9 182 0.0250 3.21 Shallow Concentrated Flow, Paved Kv= 20.3 fps 0.8		0.0	10	0.0100	0.11		
4.4130 0.0050 0.49 Woods: Light underbrush $n = 0.400$ $P2= 3.35"$ 4.4130 0.0050 0.49 Shallow Concentrated Flow, Short Grass Pasture Kv= 7.0 fps1.773 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 fps4.4132 0.0100 2.03 Shallow Concentrated Flow, Woodland Kv= 5.0 fps 0.2 24 0.0100 2.03 Shallow Concentrated Flow, Woodland Kv= 5.0 fps 0.2 24 0.0100 2.03 Shallow Concentrated Flow, Woodland Kv= 5.0 fps 0.2 24 0.0100 2.03 Shallow Concentrated Flow, Woodland Kv= 5.0 fps 0.2 24 0.0100 2.03 Shallow Concentrated Flow, Woodland Kv= 5.0 fps 1.5 62 0.0100 0.70 Shallow Concentrated Flow, Woodland Kv= 5.0 fps 1.5 62 0.0100 0.70 Shallow Concentrated Flow, Woodland Kv= 5.0 fps 1.2 90 0.300 1.21 Shallow Concentrated Flow, Woodland Kv= 5.0 fps 1.2 90 0.0300 1.21 Shallow Concentrated Flow, Woodland Kv= 20.3 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 Fipe Channel, $36.0"$ Round Area= 7.1 sf Perim= $9.4'$ r= $0.75'$ n= 0.012 Concrete pipe, finished		22.3	54	0.0050	0.04		
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 2.03 Shallow Concentrated Flow, Paved Kv= 20.3 fps 0.2 24 0.0100 2.03 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, Short Grass Pasture Kv= 7.0 fps 1.5 62 0.0100 0.70 Shallow Concentrated Flow, Woodland Kv= 5.0 fps 1.2 90 0.0300 1.21 Shallow Concentrated Flow, Woodland Kv= 5.0 fps 1.2 90 0.0250 3.21 Shallow Concentrated Flow, Woodland Kv= 5.0 fps 0.9 182 0.0250 3.21 Shallow Concentrated Flow, Paved Kv= 20.3 fps 0.8			•				
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, 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, Woodland Kv= 5.0 fps 1.2 90 0.300 1.21 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, Short Grass Pasture Kv= 7.0 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		4.4	130	0.0050	0.49		
0.2 24 0.0100 2.03 Woodland $Kv = 5.0$ fps 0.4 132 0.0100 2.03 Shallow Concentrated Flow, Paved Kv = 20.3 fps 0.2 24 0.0100 2.03 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, Woodland Kv = 5.0 fps 1.5 62 0.0100 0.70 Shallow Concentrated Flow, Woodland Kv = 5.0 fps 1.2 90 0.0300 1.21 Shallow Concentrated Flow, Woodland Kv = 5.0 fps 1.2 90 0.0300 1.21 Shallow Concentrated Flow, Woodland Kv = 5.0 fps 0.9 182 0.0250 3.21 Shallow Concentrated Flow, Short Grass Pasture Kv = 7.0 fps 0.8 602 0.0136 11.92 84.26 Pipe Channel, 36.0° Round Area= 7.1 sf Perime 9.4° r = 0.75° n = 0.012 Concrete pipe, finished							Short Grass Pasture Kv= 7.0 fps
$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$		1.7	73	0.0200	0.71		Shallow Concentrated Flow,
4.4132 0.0100 0.50 Paved Kv= 20.3 fps 4.4 132 0.0100 2.03 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 4.5 62 0.0100 0.70 Shallow Concentrated Flow, Woodland Kv= 5.0 fps 1.5 62 0.0100 0.50 Shallow Concentrated Flow, Woodland Kv= 5.0 fps 1.2 90 0.0300 1.21 Shallow Concentrated Flow, Woodland Kv= 5.0 fps 1.2 90 0.0300 1.21 Shallow Concentrated Flow, Woodland Kv= 5.0 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							
4.4132 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, Woodland Kv= 5.0 fps 1.2 90 0.0300 1.21 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, Woodland Kv= 5.0 fps 0.8 602 0.0136 11.92 84.26 91 92 93.21 93.21 90 93.21 93.21 93.21 93.20 93.21 93.21 93.20 93.21 93.21 93.20 93.21 93.21 93.20 93.21 93.21 93.20 93.21 93.21 93.20 93.21 93.21 93.20 93.21 93.21 93.20 93.21 93.21 93.20 93.21 93.21 93.20 93.21 93.21 93.20 93.21 93.21 93.20 93.21 93.21 93.20 93.21 93.21 93.20 93		0.2	24	0.0100) 2.03		•
0.2 24 0.0100 2.03 Woodland $Kv = 5.0$ fps 2.6 132 0.0150 0.86 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, Woodland Kv = 5.0 fps 1.2 90 0.0300 0.50 Shallow Concentrated Flow, Woodland Kv = 5.0 fps 1.2 90 0.0300 1.21 Shallow Concentrated Flow, Woodland Kv = 5.0 fps 1.2 90 0.0300 1.21 Shallow Concentrated Flow, Woodland Kv = 5.0 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 Perime 9.4° r = 0.75° n = 0.012 Concrete pipe, finished							
$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$		4.4	132	0.0100	0.50		•
2.6132 0.0150 0.86 Shallow Concentrated Flow, Short Grass PastureKv= 7.0 fps4.5189 0.0200 0.71 Shallow Concentrated Flow, WoodlandKv= 5.0 fps1.562 0.0100 0.70 Shallow Concentrated Flow, Short Grass PastureKv= 7.0 fps1.562 0.0100 0.70 Shallow Concentrated Flow, WoodlandKv= 7.0 fps1.290 0.0300 1.21 Shallow Concentrated Flow, WoodlandKv= 5.0 fps1.290 0.0300 1.21 Shallow Concentrated Flow, WoodlandShort Grass Pasture0.9182 0.0250 3.21 Shallow Concentrated Flow, Paved Kv= 20.3 fps0.8602 0.0136 11.92 84.26Pipe Channel, $36.0"$ Round Area= 7.1 sf Perim= 9.4' r= 0.75' n= 0.012 Concrete pipe, finished		~ ~		0.0400			
$ \begin{array}{cccccccccccccccccccccccccccccccccccc$		0.2	24	0.0100) 2.03		•
4.5189 0.0200 0.71 Short Grass PastureKv= 7.0 fps1.562 0.0100 0.70 Shallow Concentrated Flow, Woodland Kv= 5.0 fps1.562 0.0100 0.70 Shallow Concentrated Flow, Short Grass Pasture Kv= 7.0 fps12.9388 0.0100 0.50 Shallow Concentrated Flow, Woodland Kv= 5.0 fps1.290 0.0300 1.21 Shallow Concentrated Flow, Woodland Kv= 5.0 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		2.0	400	0.0450	0.00		
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, Woodland Kv= 5.0 fps 1.2 90 0.0250 3.21 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		2.6	132	0.0150	0.86		•
1.5 62 0.0100 0.70 Woodland $Kv = 5.0$ fps1.5 62 0.0100 0.70 Shallow Concentrated Flow, Short Grass Pasture $Kv = 7.0$ fps12.9 388 0.0100 0.50 Shallow Concentrated Flow, Woodland $Kv = 5.0$ fps1.290 0.0300 1.21 Shallow Concentrated Flow, Short Grass Pasture $Kv = 7.0$ fps0.9182 0.0250 3.21 Shallow Concentrated Flow, Paved $Kv = 20.3$ fps0.8 602 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		15	180	0 0200	0.71		
$ \begin{array}{cccccccccccccccccccccccccccccccccccc$		4.5	109	0.0200	0.71		•
12.9388 0.0100 0.50 Short Grass PastureKv= 7.0 fps1.290 0.0300 1.21Shallow Concentrated Flow, Woodland Kv= 5.0 fps1.290 0.0300 1.21Shallow Concentrated Flow, Short Grass Pasture0.9182 0.0250 3.21Shallow Concentrated Flow, Paved Kv= 20.3 fps0.8602 0.0136 11.9284.26Pipe Channel, 36.0" Round Area= 7.1 sf Perim= 9.4' r= 0.75' n= 0.012 Concrete pipe, finished		15	62	0.0100	0 70		
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		1.0	02	0.0100			•
1.290 0.0300 1.21 Woodland $Kv = 5.0$ fps1.290 0.0300 1.21 Shallow Concentrated Flow, Short Grass Pasture $Kv = 7.0$ fps0.9182 0.0250 3.21 Shallow Concentrated Flow, Paved $Kv = 20.3$ fps0.8602 0.0136 11.9284.26 Pipe Channel, 36.0" Round Area= 7.1 sf Perim= 9.4' r= 0.75' n= 0.012 Concrete pipe, finished		12.9	388	0.0100	0.50		
0.9 182 0.0250 3.21 Short Grass Pasture Kv= 7.0 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		-					
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		1.2	90	0.0300) 1.21		Shallow Concentrated Flow,
0.8 602 0.0136 11.92 84.26 Paved Kv= 20.3 fps Pipe Channel, 36.0" Round Area= 7.1 sf Perim= 9.4' r= 0.75' n= 0.012 Concrete pipe, finished							Short Grass Pasture Kv= 7.0 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		0.9	182	0.0250) 3.21		Shallow Concentrated Flow,
36.0" Round Area= 7.1 sf Perim= 9.4' r= 0.75' n= 0.012 Concrete pipe, finished							
n= 0.012 Concrete pipe, finished		0.8	602	0.0136	5 11.92	84.26	
	_						n= 0.012 Concrete pipe, finished

64.4 2,128 Total



Subcatchment EA-EXi: EA-EXi

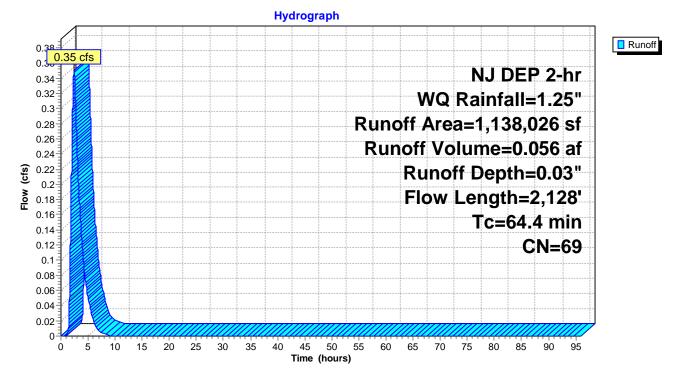
Summary for Subcatchment EA-EXp: EA-EXp

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"

A	rea (sf)	CN D	escription				
2	45,815	70 V	Woods, Good, HSG C				
2	134,699	74 >	75% Grass	s cover, Go	ood, HSG C		
1	42,152			od, HSG B			
	81,203				ood, HSG B		
	34,157				ood, HSG D		
1.1	38,026	69 V	Veighted A	verage			
	38,026			ervious Area	а		
- , ,					-		
Tc	Length	Slope	Velocity	Capacity	Description		
(min)	(feet)	(ft/ft)	(ft/sec)	(cfs)	1		
6.8	46	0.0100	0.11	Y	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			
					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 A Inflow Outflow Primary	= =	0.591 ac,100.00% Impervious, Inflow Depth = 1.03" for WQ event 1.40 cfs @ 1.12 hrs, Volume= 0.051 af 0.15 cfs @ 1.82 hrs, Volume= 0.051 af, Atten= 89%, Lag= 42.2 min 0.15 cfs @ 1.82 hrs, Volume= 0.051 af							
0	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								
Center-o	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	Inve	t 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									
1=Cu	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)								

2=Orifice/Grate (Orifice Controls 0.15 cfs @ 4.50 fps)

Hydrograph InflowPrimary 1.40 cfs Inflow Area=0.591 ac Peak Elev=84.98' Storage=0.038 af 1 Flow (cfs) 0.15 cfs 0 ò 5 10 15 20 25 30 35 40 45 50 55 60 65 70 75 80 85 90 95 Time (hours)

Pond 1P: Underground

Prepared by {enter your company name here} HydroCAD® 10.10-3a s/n 11244 © 2020 HydroCAD Software Solutions LLC

Hydrograph for Pond 1P: Underground

Time	Inflow	Storage	Elevation	Primary
(hours)	(cfs)	(acre-feet)	(feet)	(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 90.00	0.00 0.00	0.000 0.000	84.00 84.00	0.00 0.00
90.00 92.00	0.00	0.000	84.00 84.00	0.00
92.00 94.00	0.00	0.000	84.00 84.00	0.00
94.00 96.00	0.00	0.000	84.00 84.00	0.00
90.00	0.00	0.000	04.00	0.00

Summary for Pond 2P: BioBasin

Inflow Area	a =	1.161 ac, 27	7.50% Impervious, Inflow D	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)

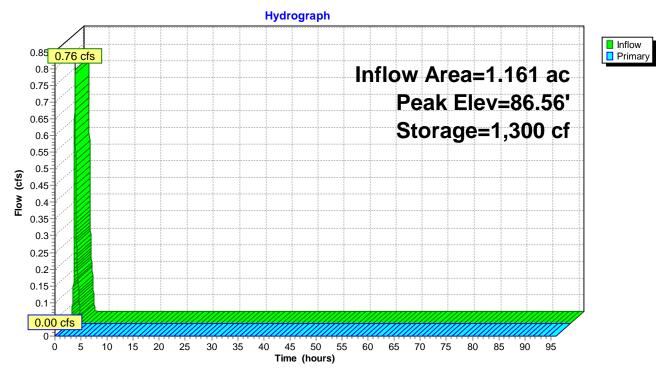
Volume	Inver	t Avail.Sto	rage Storage	Description	
#1	86.00)' 11,52	25 cf Custom	Stage Data (Pri	ismatic) Listed below (Recalc)
_	-				
Elevatio	-	Surf.Area	Inc.Store	Cum.Store	
(fee		(sq-ft)	(cubic-feet)	(cubic-feet)	
86.0	00	2,166	0	0	
87.0	00	2,769	2,468	2,468	
88.0	00	3,431	3,100	5,568	
89.0	00	4,147	3,789	9,357	
89.5	50	4,527	2,169	11,525	
Device	Routing	Invert	Outlet Devices	S	
#1	Primary	86.00'	15.0" Round	Culvert	
			L= 139.0' RC	CP, square edge	e headwall, Ke= 0.500
			Inlet / Outlet Ir	nvert= 86.00' / 8	34.61' S= 0.0100 '/' Cc= 0.900
			n= 0.012 Con	ncrete pipe, finis	shed, Flow Area= 1.23 sf
#2	Device 1	87.93'	8.0' long x 8.	0' breadth Broa	d-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 3.5	50 4.00 4.50 5	.00 5.50
			Coef. (English	n) 2.43 2.54 2.	70 2.69 2.68 2.68 2.66 2.64 2.64 2.64
			2.65 2.65 2.6	6 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)

1-2=Broad-Crested Rectangular Weir (Controls 0.00 cfs)

Pond 2P: BioBasin



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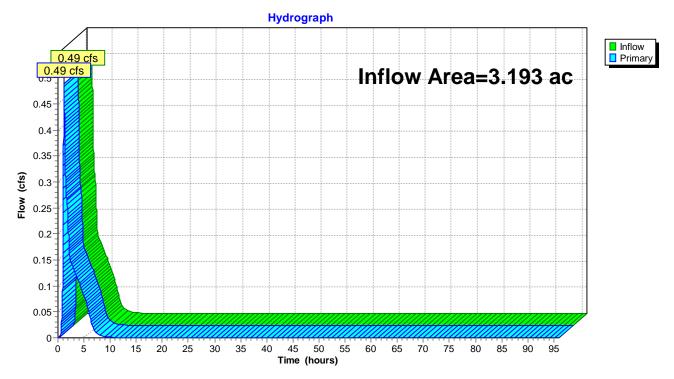
Hydrograph for Pond 2P: BioBasin

Time	Inflow	Storogo	Flavation	Drimory
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 54.00	0.00 0.00	1,300 1,300	86.56 86.56	0.00 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	3.16% 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, Atte	n= 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	Inve	rt Avail.Sto	rage Storage	e Description
#1	78.80)' 223,12	29 cf Custom	n Stage Data (Prismatic) Listed below (Recalc)
Elevatio	on S	Surf.Area	Inc.Store	Cum.Store
(fee	et)	(sq-ft)	(cubic-feet)	(cubic-feet)
78.8	30	1	0	0
79.0	00	16	2	2
80.0		2,181	1,099	1,100
81.0	00	15,895	9,038	10,138
82.0		29,262	22,579	32,717
83.0		34,004	31,633	64,350
84.0		36,834	35,419	99,769
85.0		39,677	38,256	138,024
86.0		42,533	41,105	179,129
87.0	00	45,467	44,000	223,129
Device	Routing	Invert	Outlet Device	es
#1	Primary	76.60'	48.0" Round	d 48" Culvert
				CP, square edge headwall, Ke= 0.500
				Invert= 76.60' / 76.10' S= 0.0100 '/' Cc= 0.900
				ncrete pipe, finished, Flow Area= 12.57 sf
#2	Device 1	76.60'		Orifice C= 0.600 Limited to weir flow at low heads
#3	Device 1	81.90'		.5" H Vert. 42" Weir C= 0.600
				eir flow at low heads
#4	Device 1	85.44'		16.0' breadth Outlet Structure Overflow
				0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60
#6	Davias 1	70.00		sh) 2.68 2.70 2.70 2.64 2.63 2.64 2.64 2.63 d Headwall Outlet (15" RCP)
#5	Device 1	78.80'		P, square edge headwall, Ke= 0.500
				Invert= $78.80' / 78.30'$ S= $0.1250 '/$ Cc= 0.900
				$r_{1} = 78.80 / 78.80 = 0.1250 / CC = 0.900$
#6	Device 5	78.80'		Orifice C= 0.600 Limited to weir flow at low heads
#0 #7	Device 3	78.80'		Inderdrain over Surface area
	200100 Z	10.00		

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)

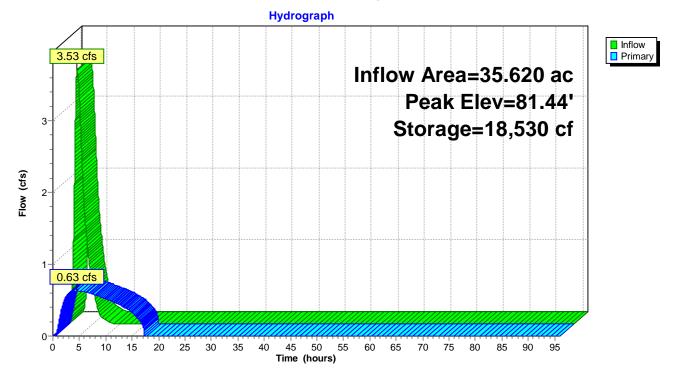
-3=42" Weir (Controls 0.00 cfs)

-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



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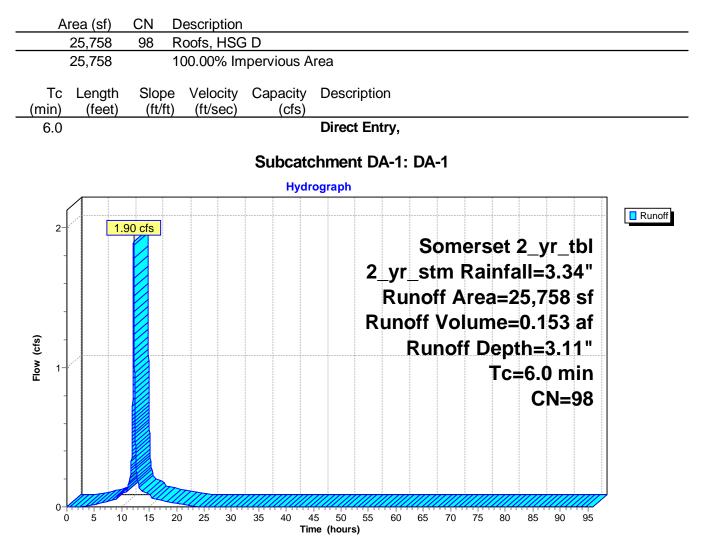
Hydrograph for Pond EB: Existing Basin

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	0.00
4.00	0.97	18,186	81.43	0.47
6.00	0.18	17,317	81.39	0.61
8.00	0.10	13,579	81.20	0.57
10.00	0.02	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	Ő	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 70.00	0.00	0 0	78.80 78.80	0.00 0.00
70.00	0.00 0.00	0	78.80 78.80	0.00
72.00	0.00	0	78.80	0.00
74.00	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 0	78.80	0.00
94.00	0.00	0 0	78.80	0.00
96.00	0.00	0	78.80	0.00

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Summary for Subcatchment DA-1: DA-1

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



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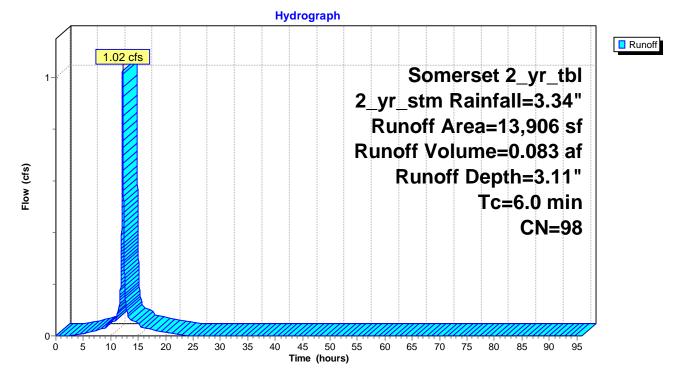
Summary for Subcatchment DA-2i: DA-2i

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 Length	Slop	pe Velocity Capacity Description						
nin) (feet)	(ft/	ft) (ft/sec) (cfs)						
6.0		Direct Entry,						
	2,940 9,656 649 661 13,906 13,906 Tc Length nin) (feet)	2,940 98 9,656 98 649 98 661 98 13,906 98 13,906 7c Length Slop nin) (feet) (ft/						

Subcatchment DA-2i: DA-2i



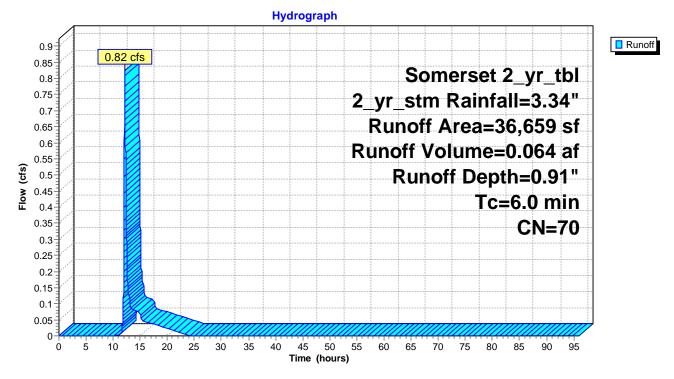
Summary for Subcatchment DA-2p: DA-2p

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 (s	f) CN	Description
5,77	3 61	>75% Grass cover, Good, HSG B
5,98	1 74	>75% Grass cover, Good, HSG C
14,00	3 80	>75% Grass cover, Good, HSG D
10,90	2 61	>75% Grass cover, Good, HSG B
36,65	9 70	Weighted Average
36,65	9	100.00% Pervious Area
Tc Leng		
<u>(min)</u> (fe	et) (ft/	it) (ft/sec) (cfs)
6.0		Direct Entry,

Subcatchment DA-2p: DA-2p



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Summary for Subcatchment DA-3: DA-3

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

	Area (sf)	CN	Des	script	tion														
*	4,9		80					,		, HSC										
	9,0		61						ood	, HS0	GΒ									
	14,0 14,0		68		ighte).00%				~~											
	14,0	14		100	0.007	оге	IVIOU	IS AI	đ											
	Tc Len	igth	Slop	e \	/eloc	city	Сар	acity	D	escri	ptio	n								
(m		eet)	(ft/f	t)	(ft/se	ec)		(cfs)												
6	5.0								D	irect	Ent	ry,								
							Sul	hcat	chr	nent	ח י	1-3.	Δ٨_	2						
							Su					ч- Э.	DA-	5						
	4					1		Hyd	rogi	aph						+				1
	0.3																			Runoff
	0.28	0.2	7 cfs										6				.		L 1	
	0.26															+		/r_t	r	
	0.24										2_	_yr_	_sti	m F	Rai	nfa	II=	3.3	4"	
	0.22											Ru	nof	fΑ	rea	a=1	4.0	14	sf	
	0.2																1	22		
(s)	0.18										••••									
>	0.16											ľ	Kur	1011		-		0.8		
_	0.14		-													TC=	=6.() m	in 🛛	
	0.12																С	N=(68	
	0.1																			
	0.08																			
	0.06																			
	0.02																			
	0.02			<u> </u>								/////								
		5 10	15	20	25	30	35	40	45	50 (hours	55	60	65	70	75	80	85	90	95	

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

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

	Area (sf) CN	Descrip	otion													
	2,779		Paved														
*	3,419		Sidewa														
	<u>260</u> 6,458		Hardsc Weight														
	6,458		100.00				rea										
	0,100		100100	, or													
,	Tc Leng				Capa		Desci	riptio	n								
	nin) (fee	et) (ft/1	ft) (ft/s	ec)	(0	cfs)	D:	• F 4									
	6.0						Direc	t Ent	ry,								
					Subc	atcl	hment	t DA	-4i:	DA-	-4i						
						Hydro	ograph										
	-					-											
	0.5	0.48 cfs]														Runoff
	0.45									Sc	ome	ers	et 2	2_у	∕r_t	bl	
	0.45							2	vr					-	3.3		
	0.4								-						58		
	0.35							-									
	0.0							R			_	-	-		38		
Flow (cfs)	0.3								F	Rur	۱Of	f Do	ept	h=	3.1	1"	
Flow	0.25											-	Гс=	-6.0) m	in	
	0.2									L				೧	N=9	98	
										 				V			
	0.15																
	0.1																
	0.05																
														////			
	0- <mark>777777</mark> 0 5	10 15	20 25	30	35 4		45 50	55	60	65	70	75	80	85	90	95	
						Tir	ne (hour	s)									

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

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

Area (sf) CN Description	
16,312 61 >75% Grass cover, Good	
2,332 74 >75% Grass cover, Good	
23,645 80 >75% Grass cover, Good	d, HSG D
42,289 72 Weighted Average 42,289 100.00% Pervious Area	
Tc Length Slope Velocity Capacity D	Description
(min) (feet) (ft/ft) (ft/sec) (cfs)	
6.0 C	Direct Entry,
Subactohm	ant DA Ani DA An
	nent DA-4p: DA-4p
Hydrog	raph
	Runoff
1.09 cfs	
	Somerset 2_yr_tbl
	2_yr_stm Rainfall=3.34"
	Runoff Area=42,289 sf
	Runoff Volume=0.082 af
Flow (cfs)	Runoff Depth=1.02"
	Tc=6.0 min
ш	
	CN=72
0 5 10 15 20 25 30 35 40 45 Time	50 55 60 65 70 75 80 85 90 95 (hours)

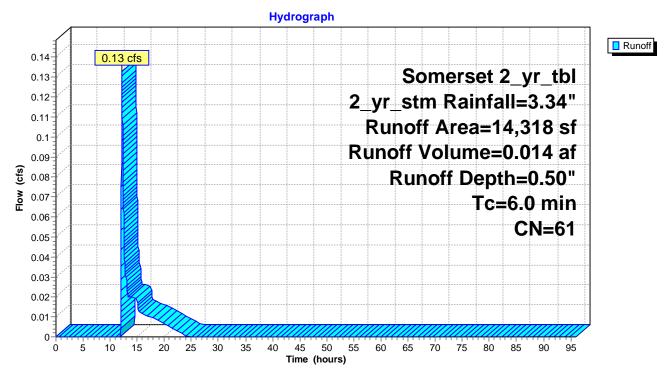
Summary for Subcatchment DA-5: DA-5

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% Gras	>75% Grass cover, Good, HSG B							
14,318	14,318 100.00% Pervious Area									
Tc Length (min) (feet)	Slop (ft/f		Capacity (cfs)	Description						
6.0				Direct Entry,						

Subcatchment DA-5: DA-5



Summary for Subcatchment EA-EXi: EA-EXi

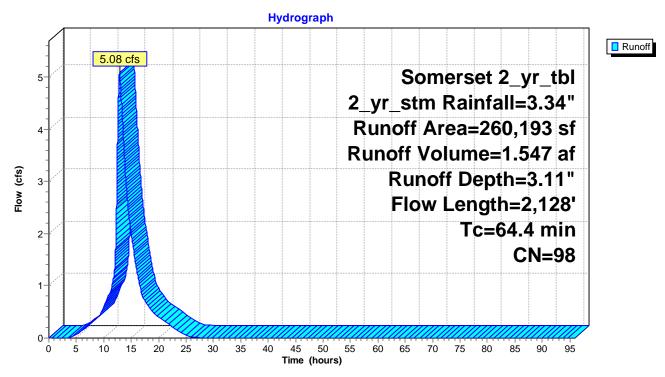
Runoff = 5.08 cfs @ 12.88 hrs, Volume= 1.547 af, Depth= 3.11"

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"

	A	rea (sf)	CN	Description		
*		34,826		Roofs		
*		92,386		Roads		
*		20,721		Driveways		
*		12,260		Parking Lot		
		60,193		Weighted A		
	2	60,193		100.00% Im	pervious A	rea
	Тс	Length	Slope	Velocity	Capacity	Description
	(min)	(feet)	(ft/ft)		(cfs)	Description
_	6.8	46	· · · · ·		(013)	Sheet Flow,
	0.0	40	0.0100	0.11		Grass: Short $n = 0.150 P2 = 3.35"$
	22.3	54	0.0050	0.04		Sheet Flow,
	22.0	04	0.0000	0.04		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,
	~ ~	400	0.0450			Paved Kv= 20.3 fps
	2.6	132	0.0150	0.86		Shallow Concentrated Flow,
	4.5	100	0.0200	0.71		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,
	1.5	02	0.0100	0.70		Short Grass Pasture Kv= 7.0 fps
	12.9	388	0.0100	0.50		Shallow Concentrated Flow,
		000	0.0100	0100		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
	611	2 1 2 0	Total			

64.4 2,128 Total

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Subcatchment EA-EXi: EA-EXi

Summary for Subcatchment EA-EXp: EA-EXp

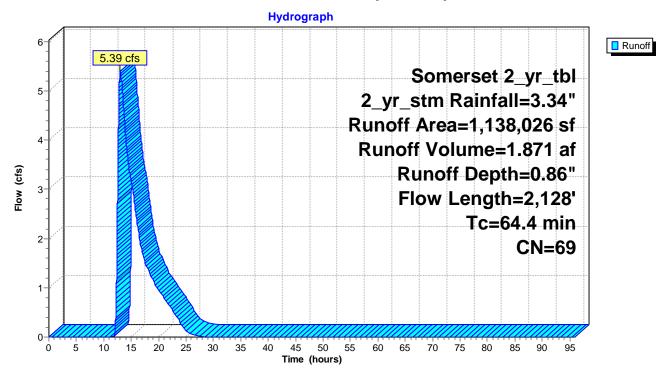
Runoff = 5.39 cfs @ 13.02 hrs, Volume= 1.871 af, Depth= 0.86"

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"

A	rea (sf)	CN [Description					
	45,815		Woods, Good, HSG C					
434,699			>75% Grass cover, Good, HSG C					
	42,152							
	81,203		61 >75% Grass cover, Good, HSG B					
	34,157		80 >75% Grass cover, Good, HSG D					
-		69 Weighted Average						
	1,138,026 1,138,026		100.00% Pervious Area					
1,1	30,020		00.00% Fe	ervious Are	d			
Тс	Length	Slope	Velocity	Capacity	Description			
(min)	(feet)	(ft/ft)	(ft/sec)	(cfs)	Description			
	<u>(1881)</u> 46	0.0100		(013)	Shoot Flow			
6.8	40	0.0100	0.11		Sheet Flow, Grass: Short n= 0.150 P2= 3.35"			
00.0	F 4	0.0050	0.04					
22.3	54	0.0050	0.04		Sheet Flow,			
	400	0.0050	0.40		Woods: Light underbrush n= 0.400 P2= 3.35"			
4.4	130	0.0050	0.49		Shallow Concentrated Flow,			
4 7	70	0 0000	0.74		Short Grass Pasture Kv= 7.0 fps			
1.7	73	0.0200	0.71		Shallow Concentrated Flow,			
	0.4	0.0400	0.00		Woodland Kv= 5.0 fps			
0.2	24	0.0100	2.03		Shallow Concentrated Flow,			
	400	0.04.00	0.50		Paved Kv= 20.3 fps			
4.4	132	0.0100	0.50		Shallow Concentrated Flow,			
0.0	0.4	0.04.00	0.00		Woodland Kv= 5.0 fps			
0.2	24	0.0100	2.03		Shallow Concentrated Flow,			
0.0	400	0.0450	0.00		Paved Kv= 20.3 fps			
2.6	132	0.0150	0.86		Shallow Concentrated Flow,			
	400		0.74		Short Grass Pasture Kv= 7.0 fps			
4.5	189	0.0200	0.71		Shallow Concentrated Flow,			
4 5	00	0.04.00	0.70		Woodland Kv= 5.0 fps			
1.5	62	0.0100	0.70		Shallow Concentrated Flow,			
40.0	000	0.0400	0.50		Short Grass Pasture Kv= 7.0 fps			
12.9	388	0.0100	0.50		Shallow Concentrated Flow,			
4.0			4.04		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,			
	~~~	0.0405	44.00	0 4 0 5	Paved Kv= 20.3 fps			
0.8	602	0.0136	11.92	84.26				
					36.0" Round Area= 7.1 sf Perim= 9.4' r= 0.75'			
					n= 0.012 Concrete pipe, finished			

64.4 2,128 Total

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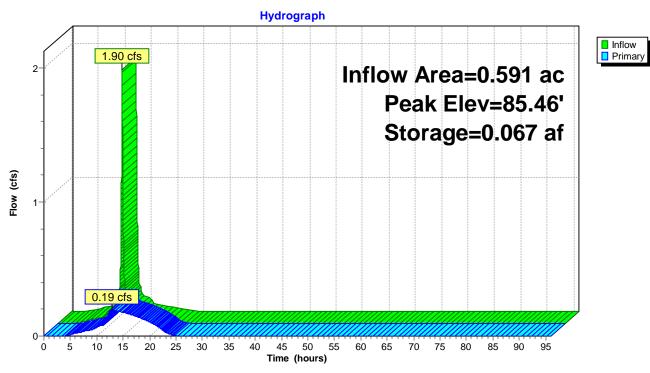
# Subcatchment EA-EXp: EA-EXp

# Summary for Pond 1P: Underground

Inflow A Inflow Outflow Primary	= =	1.90 cfs @ 12 0.19 cfs @ 12	0% Impervious, Inflow Depth = 3.11" for 2_yr_stm event         .14 hrs, Volume=       0.153 af         .87 hrs, Volume=       0.153 af, Atten= 90%, Lag= 43.8 min         .87 hrs, Volume=       0.153 af								
0	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	Inve	rt Avail.Storag	ge Storage Description								
#1	84.0	0' 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'	<b>2.5" Vert. Orifice/Grate</b> C= 0.600 Limited to weir flow at low heads								
1=Ci	<b>Ilvert</b> (Pas	ses 0.19 cfs of 5	2 12.87 hrs HW=85.46' (Free Discharge) 5.17 cfs potential flow) trols 0.19 cfs @ 5.61 fps)								

**2=Orifice/Grate** (Orifice Controls 0.19 cfs @ 5.61 fps)

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# Pond 1P: Underground

## Hydrograph for Pond 1P: Underground

Time	Inflow	Storage	Elevation	Primary
(hours)	(cfs)	(acre-feet)	(feet)	(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 24.00	0.01 0.00	0.005 0.001	84.23 84.08	0.06 0.01
24.00	0.00	0.001	84.08 84.02	0.01
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 56.00	0.00 0.00	0.000 0.000	84.00 84.00	0.00
58.00 58.00	0.00	0.000	84.00 84.00	0.00 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 84.00	0.00
86.00 88.00	0.00 0.00	0.000 0.000	84.00 84.00	0.00 0.00
90.00	0.00	0.000	84.00 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)

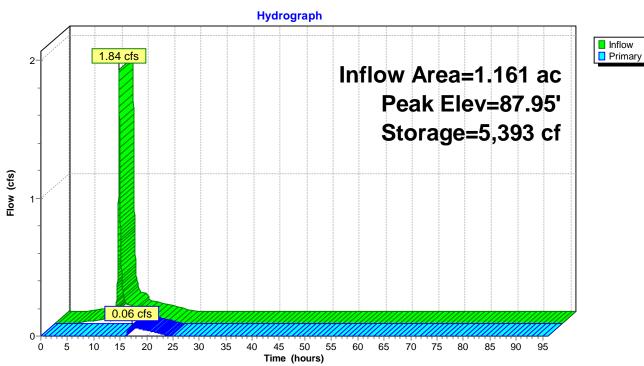
Volume	Inve	rt Avail.Sto	rage Storage	Description
#1	86.00	D' 11,52	25 cf Custom	Stage Data (Prismatic) Listed below (Recalc)
<b>-</b>				
Elevatio		Surf.Area	Inc.Store	Cum.Store
(fee	et)	(sq-ft)	(cubic-feet)	(cubic-feet)
86.0	00	2,166	0	0
87.0	00	2,769	2,468	2,468
88.0	00	3,431	3,100	5,568
89.0	00	4,147	3,789	9,357
89.5	50	4,527	2,169	11,525
Device	Routing	Invert	Outlet Devices	es
#1	Primary	86.00'	15.0" Round	Culvert
	2		L= 139.0' RC	CP, square edge headwall, Ke= 0.500
				nvert= 86.00' / 84.61' S= 0.0100 '/' Cc= 0.900
			n= 0.012 Con	ncrete pipe, finished, Flow Area= 1.23 sf
#2	Device 1	87.93'		.0' breadth Broad-Crested Rectangular Weir
			-	0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00
			· · ·	50 4.00 4.50 5.00 5.50
			Coef. (Enalish	h) 2.43 2.54 2.70 2.69 2.68 2.68 2.66 2.64 2.64 2.64
			· •	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)

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# Pond 2P: BioBasin

# Hydrograph for Pond 2P: BioBasin

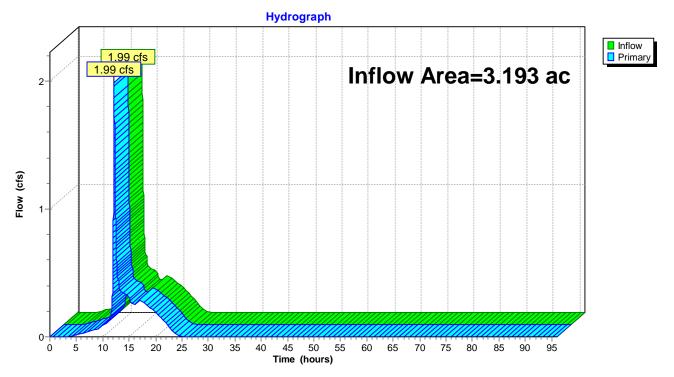
<b>T</b>	1.4	0		Di
Time	Inflow	Storage	Elevation	Primary
(hours)	(cfs)	(cubic-feet)	(feet)	(cfs)
0.00 2.00	0.00	0	86.00	0.00
2.00 4.00	0.00 0.00	0 9	86.00 86.00	0.00 0.00
4.00 6.00	0.00	9 78	86.00	0.00
8.00	0.02	219	86.10	0.00
10.00	0.02	483	86.22	0.00
12.00	0.00	1,353	86.58	0.00
14.00	0.14	4,489	87.68	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 5,329	87.93 87.93	0.00
56.00 58.00	0.00 0.00	5,329 5,329	87.93 87.93	0.00 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

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## Summary for Pond 3P: Total

Inflow Area =		3.193 ac, 3	33.16% lmp	ervious,	Inflow De	pth = 1	.20" fe	or 2_y	r_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	a =	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	Invei	rt Avail.Stor	rage Storage I	Description
#1	78.80	0' 223,12	29 cf Custom	Stage Data (Prismatic) Listed below (Recalc)
Elevatio	-	Surf.Area	Inc.Store	Cum.Store
(fee		(sq-ft)	(cubic-feet)	(cubic-feet)
78.8		1	0	0
79.0		16	2	2
80.0		2,181	1,099	1,100
81.0		15,895	9,038	10,138
82.0		29,262	22,579	32,717
83.0		34,004	31,633	64,350
84.0		36,834	35,419	99,769
85.0		39,677	38,256	138,024
86.0 87.0		42,533 45,467	41,105	179,129 223,129
07.0	0	40,407	44,000	223,129
Device	Routing	Invert	Outlet Devices	8
#1	Primary	76.60'	48.0" Round	48" Culvert
	2		L= 50.0' RCP	P, square edge headwall, Ke= 0.500
			Inlet / Outlet In	nvert= 76.60' / 76.10' S= 0.0100 '/' Cc= 0.900
			n= 0.012 Con	crete pipe, finished, Flow Area= 12.57 sf
#2	Device 1	76.60'		<b>Drifice</b> C= 0.600 Limited to weir flow at low heads
#3	Device 1	81.90'		<b>5" H Vert. 42" Weir</b> C= 0.600
				r flow at low heads
#4	Device 1	85.44'	-	6.0' breadth Outlet Structure Overflow
			· · ·	.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60
				) 2.68 2.70 2.70 2.64 2.63 2.64 2.64 2.63
#5	Device 1	78.80'		Headwall Outlet (15" RCP)
				square edge headwall, Ke= 0.500
				nvert= 78.80' / 78.30' S= 0.1250 '/' Cc= 0.900
				crete pipe, finished, Flow Area= 1.23 sf
#6	Device 5	78.80'		Drifice C= 0.600 Limited to weir flow at low heads
#7	Device 2	78.80'	0.500 in/hr Un	derdrain 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)

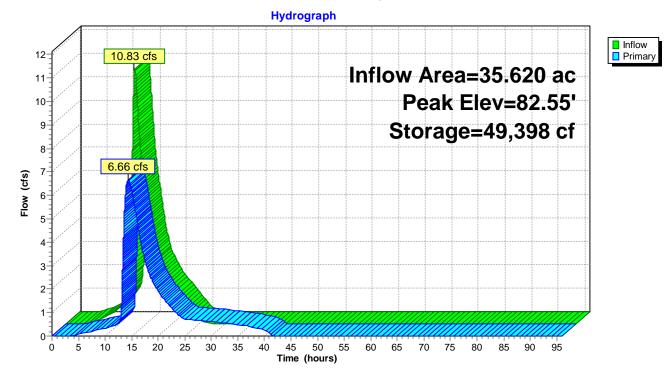
-3=42" Weir (Orifice Controls 5.83 cfs @ 2.58 fps)

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



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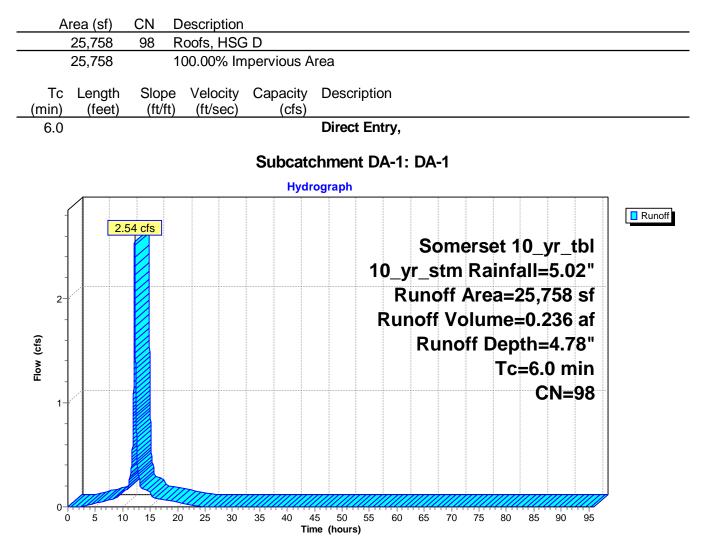
## Hydrograph for Pond EB: Existing Basin

		_		
Time	Inflow	Storage	Elevation	Primary
(hours)	<u>(cfs)</u>	(cubic-feet)	(feet)	(cfs)
0.00	0.00	0	78.80	0.00
2.00	0.00	0 1	78.80 78.90	0.00
4.00	0.02 0.17	65	78.90 79.23	0.02 0.14
6.00 8.00	0.17	650	79.23 79.77	0.14
10.00	0.37	2,159	80.26	0.24
12.00	2.32	6,870	80.77	0.47
14.00	7.50	48,822	82.53	<b>6.41</b>
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 50.00	0.00 0.00	0 0	78.80 78.80	0.00 0.00
52.00	0.00	0	78.80	0.00
52.00 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	Ő	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 90.00	0.00 0.00	0 0	78.80 78.80	0.00 0.00
90.00 92.00	0.00	0	78.80	0.00
92.00 94.00	0.00	0	78.80	0.00
96.00	0.00	0	78.80	0.00
00.00	0.00	0	10.00	0.00

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### Summary for Subcatchment DA-1: DA-1

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



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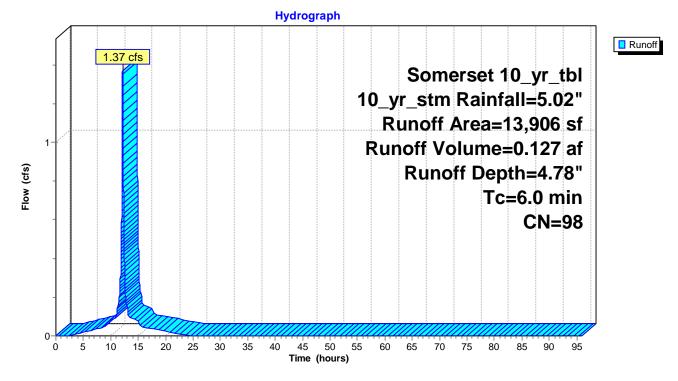
## Summary for Subcatchment DA-2i: DA-2i

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"

	A	rea (sf)	CN	Description										
*		2,940	98	Sidewalks,	HSG C									
		9,656	98	Paved park	d parking, HSG C									
*		649	98	Hardscape,	scape, HSG C									
*		661	98	Hardscape, HSG B										
		13,906 98 Weighted Average												
		13,906		100.00% Im	pervious A	Area								
	Tc (min)													
	6.0					Direct Entry,								

### Subcatchment DA-2i: DA-2i



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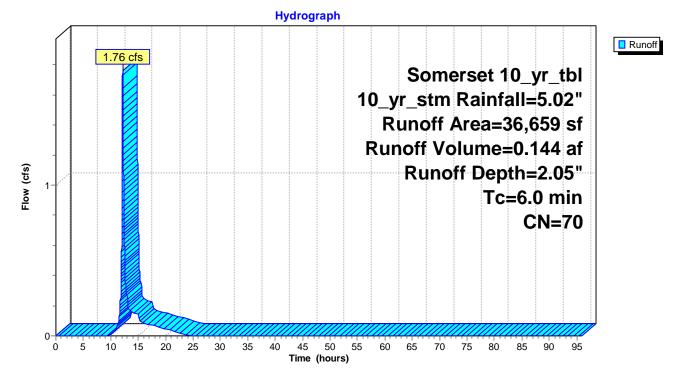
## Summary for Subcatchment DA-2p: DA-2p

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	5% 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,	36,659 70 Weighted Average											
36,	659	100.00% Pervious Area										
6.0		Direct Entry,										

## Subcatchment DA-2p: DA-2p



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### Summary for Subcatchment DA-3: DA-3

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

*				Ν		scrip															
		4,993		0							, HSC										
		9,021		5 <u>1</u>						ood	, HS0	ЭB									
		4,014 4,014	6	8				/erac	ge is Are	22											
		4,014			100	.007	010	1 1 1 0 0	10 / 11	54											
		Length		Slop		/eloc		Cap	acity	D	escri	ptior	۱								
<u>(mi</u>		(feet	)	(ft/ft	:)	(ft/se	ec)		(cfs)		ineet	<b>F</b>									
C	5.0									U	irect	Enti	у,								
								Su	bcat	chr	nent	DA	-3:	DA-	3						
									Hvd	rogr	aph										
																					]
	0.65		0.62	cfs																	Runoff
	0.6													Sc	ome	erse	et 1	0_\	yr_1	tbl	
	0.55											10	) V		tm		+	· · · · · · · · · · · · · · · · · · ·			
	0.5														off A		1	1	1	1 1	
	0.45	/										D			Vo				1	1	
â	0.4	/										<b>F</b>	un								
Flow (cfs)	0.35													КU	no	ft L	•				
Flow	0.3	/															TC	=6.	0 m	in	
	0.25																	С	N=	68	
	0.2	/																			
	0.15																				
	0.1	/																			
	0.05			$\langle \rangle \rangle$																	
	0					<u>III</u>															ļ
	0	5	10	15	20	25	30	35	40	45 Time	50 (hours	55	60	65	70	75	80	85	90	95	

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

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

* 3,419	98 Paved park								
* 000	98 Sidewalks,								
	98 Hardscapes 98 Weighted A								
6,458 6,458	100.00% Im		rea						
0,100	100.0070 11		100						
Tc Length	Slope Velocity	Capacity	Description	on					
(min) (feet)	(ft/ft) (ft/sec)	(cfs)		•					
6.0			Direct En	try,					
		Subcatcl	hment D/	4-4i: D	<b>A-4i</b>				
		Hydro	ograph						
0.7									Runoff
	4 cfs						-		
0.6					1 1		-	/r_tbl	
0.55			1	0_yr_	stm	Rainf	all=	5.02"	
0.5				Ru	noff	Area	=6,4	l58 sf	
0.45				Runo	ff Vo	lume:	=0.0	<b>)</b> 59 af	
= /								4.78"	-
(s) 0.4 x 0.35 OH 0.0					unoi	-			
Ê _{0.3}						IC		0 min	
0.25							С	N=98	
0.2									
0.15							-		
0.1									
0.05									
0							/////		7
0 5 10	15 20 25 30		45 50 55 me (hours)	60 6	5 70	75 80	85	90 95	

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

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

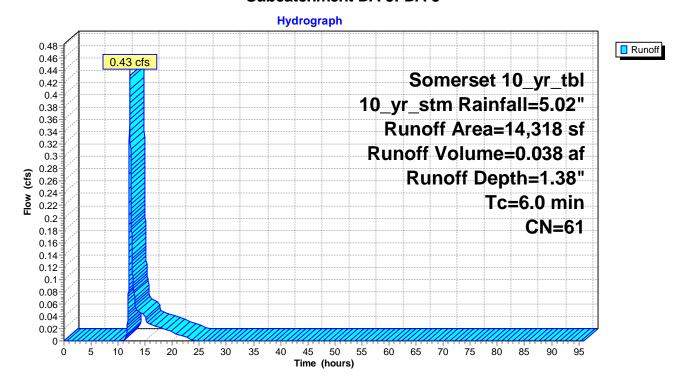
Area (sf) CN Description	
16,312 61 >75% Grass cover, Good, HSG B	
2,332 74 >75% Grass cover, Good, HSG C	
23,645 80 >75% Grass cover, Good, HSG D 42,289 72 Weighted Average	
42,289 72 Weighted Average 42,289 100.00% Pervious Area	
Tc Length Slope Velocity Capacity Description	
(min) (feet) (ft/ft) (ft/sec) (cfs) 6.0 Direct Entry,	
b.0 Direct Entry,	
Subcatchment DA-4p: DA-4p	
Hydrograph	
	Runoff
2.20 cfs	
Somerset 10_yr_tb	
²⁻¹ 10_yr_stm Rainfall=5.02	•
Runoff Area=42,289 s	•
Runoff Volume=0.179 a	
ଞ୍ଚି Runoff Depth=2.21 ଜୁ Tc=6.0 mir	
	2
0 5 10 15 20 25 30 35 40 45 50 55 60 65 70 75 80 85 90 9	5

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### Summary for Subcatchment DA-5: DA-5

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

Area (sf)	CN	Description				
14,318	61	61 >75% Grass cover, Good, HSG B				
14,318 100.00% Pervious Area						
Tc Length (min) (feet)	Slop (ft/f		Capacity (cfs)	Description		
6.0 Direct Entry,						
Subcatchment DA-5: DA-5						



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### Summary for Subcatchment EA-EXi: EA-EXi

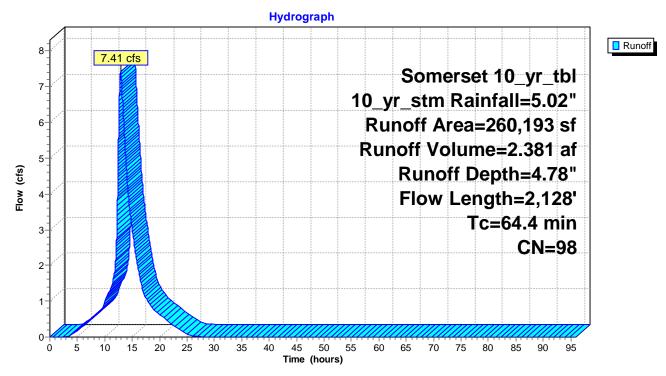
Runoff = 7.41 cfs @ 12.88 hrs, Volume= 2.381 af, Depth= 4.78"

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"

	А	rea (sf)	CN [	Description		
*		34,826		Roofs		
*		92,386		Roads		
*		20,721		Driveways		
*		12,260		Parking Lot		
		60,193		Neighted A		
	2	60,193	-	100.00% Im	pervious A	rea
	То	Longth	Slope	Volocity	Conocity	Description
	Tc (min)	Length (feet)	Slope (ft/ft)		Capacity (cfs)	Description
	6.8	<u>(1881)</u> 46	0.0100	i	(013)	Shoot Flow
	0.0	40	0.0100	0.11		Sheet Flow, Grass: Short n= 0.150 P2= 3.35"
	22.3	54	0.0050	0.04		Sheet Flow,
	22.5	54	0.0000	0.04		Woods: Light underbrush $n= 0.400$ P2= 3.35"
	4.4	130	0.0050	0.49		Shallow Concentrated Flow,
		100	0.0000	0.10		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,
		400		0.74		Short Grass Pasture Kv= 7.0 fps
	4.5	189	0.0200	0.71		Shallow Concentrated Flow,
	1.5	62	0.0100	0.70		Woodland Kv= 5.0 fps Shallow Concentrated Flow,
	1.5	02	0.0100	0.70		Short Grass Pasture Kv= 7.0 fps
	12.9	388	0.0100	0.50		Shallow Concentrated Flow,
	12.5	500	0.0100	0.00		Woodland Kv= 5.0 fps
	1.2	90	0.0300	1.21		Shallow Concentrated Flow,
			0.0000			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	
						36.0" Round Area= 7.1 sf Perim= 9.4' r= 0.75'
						n= 0.012 Concrete pipe, finished
	61 1	2 1 2 0	Total			

64.4 2,128 Total

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## Subcatchment EA-EXi: EA-EXi

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## Summary for Subcatchment EA-EXp: EA-EXp

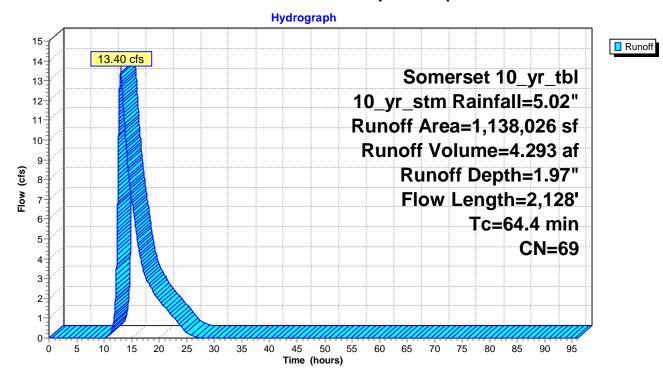
Runoff = 13.40 cfs @ 13.02 hrs, Volume= 4.293 af, Depth= 1.97"

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"

445,815       70       Woods, Good, HSG C         434,699       74       >75% Grass cover, Good, HSG B         142,125       55       Woods, Good, HSG B         31,203       61       >75% Grass cover, Good, HSG D         34,157       80       >75% Grass cover, Good, HSG D         1,138,026       69       Weighted Average         1,138,026       100.00% Pervious Area         Tc       Length       Slope       Velocity         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,         Woodland Kv= 5.0 fps       5.1       Not 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       2.6       132       0.0150       0.86       Shallow Concentrated Flow,         Paved Kv= 20.3	A	rea (sf)	CN	Description					
434,699       74       >75% Grass cover, Good, HSG C         142,152       55       Woods, 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       Length       Slope       Velocity       Capacity       Description         (min)       (feet)       (ft/ft)       (ft/sec)       (cfs)         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       Short Grass Pasture       FN         0.2       24       0.0100       2.03       Shallow Concentrated Flow,         Woodand       Kv= 5.0 fps       Ne       Paved Kv= 20.3 fps         0.2       24       0.0100       2.03       Shallow Concentrated Flow,         Woodand Kv= 5.0 fps       Short Grass Pasture       Kv= 7.0 fps         1.5 <td></td> <td></td> <td></td> <td></td> <td></td> <td></td>									
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1,138,026       100.00% Pervious Area         Tc       Length       Slope       Velocity       Capacity       Description         (min)       (feet)       (ft/tt)       (ff/sec)       (cfs)         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, Woodland Kv= 5.0 fps         0.2       24       0.0100       2.03       Shallow Concentrated Flow, Woodland Kv= 5.0 fps         0.2       24       0.0100       2.03       Shallow Concentrated Flow, Woodland Kv= 5.0 fps         2.6       132       0.0150       0.86       Shallow Concentrated Flow, Woodland Kv= 5.0 fps         2.6       132       0.0100       0.70       Shallow Concentrated Flow, Woodland Kv= 5.0 fps         1.5       62       0.0100       0.70       Shallow Concentrated Flow, Woodland Kv= 5.0 fps         1.2       9						500, 1150 D			
$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$									
$\begin{array}{c c c c c c c c c c c c c c c c c c c $	1,1	38,026		100.00% Pe	ervious Are	a			
$\begin{array}{c c c c c c c c c c c c c c c c c c c $	Та	ما به مربعا م	Clana	Valasitu	Conseitu	Description			
6.846 $0.0100$ $0.11$ 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, Paved Kv= 20.3 fps $0.2$ $24$ $0.0100$ $2.03$ Shallow Concentrated Flow, Paved Kv= 20.3 fps $0.2$ $24$ $0.0100$ $2.03$ Shallow Concentrated Flow, Paved Kv= 20.3 fps $0.2$ $24$ $0.0100$ $2.03$ Shallow Concentrated Flow, Woodland Kv= 5.0 fps $0.2$ $24$ $0.0100$ $2.03$ Shallow Concentrated Flow, Woodland Kv= 5.0 fps $1.5$ $132$ $0.0150$ $0.86$ Shallow Concentrated Flow, Woodland Kv= 5.0 fps $1.5$ $62$ $0.0100$ $0.70$ Shallow Concentrated Flow, Woodland Kv= 5.0 fps $1.5$ $62$ $0.0100$ $0.50$ Shallow Concentrated Flow, Woodland Kv= 5.0 fps $1.2$ $90$ $0.0300$ $1.21$ 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 $1.2$ $90$ $0.0250$ $3.21$ Shallow Concentrated Flow, Sh		•				Description			
22.354 $0.0050$ $0.04$ Grass: Short n= 0.150 P2= 3.35"4.4130 $0.0050$ $0.49$ Sheet Flow, Woods: Light underbrush n= 0.400 P2= 3.35"4.4130 $0.0050$ $0.49$ Shallow Concentrated Flow, Short Grass Pasture Kv= 7.0 fps1.773 $0.0200$ $0.71$ Shallow Concentrated Flow, Woodland Kv= 5.0 fps $0.2$ 24 $0.0100$ $2.03$ Shallow Concentrated Flow, Paved Kv= 20.3 fps4.4132 $0.0100$ $0.50$ Shallow Concentrated Flow, Paved Kv= 20.3 fps $0.2$ 24 $0.0100$ $2.03$ Shallow Concentrated Flow, Paved Kv= 20.3 fps $0.2$ 24 $0.0100$ $2.03$ Shallow Concentrated Flow, Woodland Kv= 5.0 fps $0.2$ 24 $0.0100$ $2.03$ Shallow Concentrated Flow, Woodland Kv= 5.0 fps $0.2$ 24 $0.0100$ $2.03$ Shallow Concentrated Flow, Paved Kv= 2.0 fps $1.5$ $62$ $0.0100$ $0.70$ Shallow Concentrated Flow, Short Grass Pasture Kv= 7.0 fps $1.5$ $62$ $0.0100$ $0.70$ Shallow Concentrated Flow, Woodland Kv= 5.0 fps $1.2$ $90$ $0.0300$ $1.21$ 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 $1.2$ $90$ $0.0250$ $3.21$ Shallow Concentrated Flow, Paved Kv= 20.3 fps					(CIS)				
22.354 $0.0050$ $0.04$ Sheet Flow, Woods: Light underbrush n= 0.400 P2= 3.35"4.4130 $0.0050$ $0.49$ Shallow Concentrated Flow, Short Grass Pasture Kv= 7.0 fps1.773 $0.0200$ $0.71$ 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 $0.2$ 24 $0.0100$ $2.03$ Shallow Concentrated Flow, Paved Kv= 20.3 fps $0.2$ 24 $0.0100$ $2.03$ Shallow Concentrated Flow, Paved Kv= 20.3 fps $0.2$ 24 $0.0100$ $2.03$ Shallow Concentrated Flow, Paved Kv= 20.3 fps $1.5$ $62$ $0.0100$ $0.70$ Shallow Concentrated Flow, Short Grass Pasture Kv= 7.0 fps $1.5$ $62$ $0.0100$ $0.70$ Shallow Concentrated Flow, Woodland Kv= 5.0 fps $1.2$ $90$ $0.300$ $1.21$ 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, Short Grass Pasture Kv= 7.0 fps $0.9$ $182$ $0.0250$ $3.21$ Shallow Concentrated Flow, Paved Kv= 20.3 fps	6.8	46	0.0100	) 0.11					
4.4130 $0.0050$ $0.49$ Woods: Light underbrush $n = 0.400$ $P2=3.35"$ 4.4130 $0.0050$ $0.49$ Shallow Concentrated Flow, Short Grass Pasture Kv= 7.0 fps1.773 $0.0200$ $0.71$ Shallow Concentrated Flow, Woodland Kv= 5.0 fps $0.2$ 24 $0.0100$ 2.03Shallow Concentrated Flow, Paved Kv= 20.3 fps4.4132 $0.0100$ $0.50$ Shallow Concentrated Flow, Paved Kv= 20.3 fps $0.2$ 24 $0.0100$ 2.03Shallow Concentrated Flow, Paved Kv= 20.3 fps $0.2$ 24 $0.0100$ 2.03Shallow Concentrated Flow, Paved Kv= 20.3 fps $0.2$ 24 $0.0100$ 2.03Shallow Concentrated Flow, Paved Kv= 20.3 fps $0.2$ 24 $0.0100$ $0.50$ Shallow Concentrated Flow, Paved Kv= 20.3 fps $1.5$ $189$ $0.0200$ $0.71$ Shallow Concentrated Flow, Woodland Kv= 5.0 fps $1.5$ $62$ $0.0100$ $0.70$ Shallow Concentrated Flow, Woodland Kv= 5.0 fps $1.5$ $62$ $0.0100$ $0.50$ 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 $1.2$ $90$ $0.0300$ $1.21$ 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									
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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	1.5	62	0.0100	) 0.70					
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0.9 182 0.0250 3.21 <b>Shallow Concentrated Flow,</b> Paved Kv= 20.3 fps	1.2	90	0.0300	) 1.21		•			
Paved Kv= 20.3 fps									
	0.9	182	0.0250	) 3.21					
						Paved Kv= 20.3 fps			
0.8 602 0.0136 11.92 84.26 Pipe Channel,	0.8	602	0.0136	5 11.92	84.26				
36.0" Round Area= 7.1 sf Perim= 9.4' r= 0.75'						36.0" Round Area= 7.1 sf Perim= 9.4' r= 0.75'			
n= 0.012 Concrete pipe, finished						n= 0.012 Concrete pipe, finished			

64.4 2,128 Total

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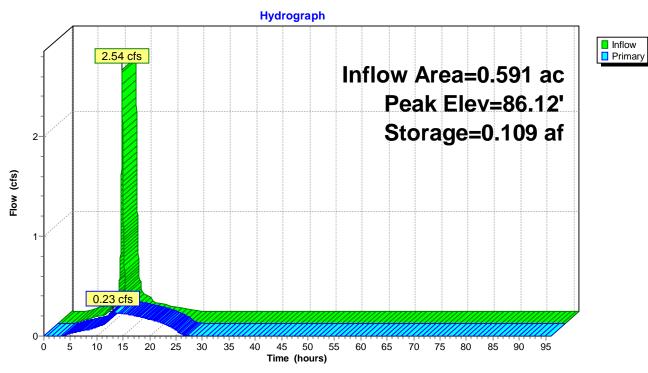
## Subcatchment EA-EXp: EA-EXp

# Summary for Pond 1P: Underground

Inflow A Inflow Outflow Primary	=	2.54 cfs @ 12.1	4 hrs, Volume= 0.236 af, Atten= 91%, Lag= 59.7 min				
	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						
Center-o	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	Inve	rt Avail.Storage	e Storage Description				
#1	84.00	0.202 af	f <b>48.0" Round Pipe Storage</b> x 5 L= 140.0'				
Device	Routing	Invert C	Dutlet Devices				
#1							
#2	Device 1		<b>2.5" Vert. Orifice/Grate</b> C= 0.600 Limited to weir flow at low heads				
<b>Primary OutFlow</b> 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)

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# Pond 1P: Underground

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## Hydrograph for Pond 1P: Underground

Time	Inflow	Storage	Elevation	Primary
(hours)	(cfs)	(acre-feet)	(feet)	(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 12.00	0.15 <b>1.38</b>	0.011	84.41	0.09
12.00	0.17	0.043 0.105	85.06 86.06	0.16 0.23
16.00	0.09	0.089	85.82	0.23
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 36.00	0.00 0.00	0.000 0.000	84.00 84.00	0.00 0.00
38.00	0.00	0.000	84.00 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 58.00	0.00 0.00	0.000 0.000	84.00 84.00	0.00 0.00
60.00	0.00	0.000	84.00 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 80.00	0.00 0.00	0.000 0.000	84.00 84.00	0.00 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

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)

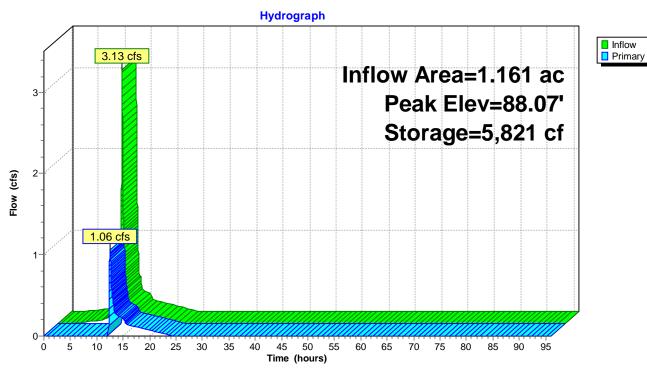
Volume	Inver	t Avail.Stor	rage Storage	Description	
#1	86.00	)' 11,52	25 cf Custom	Stage Data (Pri	smatic) Listed below (Recalc)
				0	
Elevatio		Surf.Area	Inc.Store	Cum.Store	
(fee	et)	(sq-ft)	(cubic-feet)	(cubic-feet)	
86.0		2,166	0	0	
87.0	00	2,769	2,468	2,468	
88.0	00	3,431	3,100	5,568	
89.0	00	4,147	3,789	9,357	
89.5	50	4,527	2,169	11,525	
Device	Routing	Invert	Outlet Devices	S	
#1	Primary	86.00'	15.0" Round	Culvert	
	-		L= 139.0' RC	P, square edge	e headwall, Ke= 0.500
			Inlet / Outlet Ir	nvert= 86.00' / 8	4.61' S= 0.0100 '/' Cc= 0.900
			n= 0.012 Con	crete pipe, finis	hed, Flow Area= 1.23 sf
#2	Device 1	87.93'			d-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
			· · ·	60 4.00 4.50 5	
			Coef. (Enalish	) 2.43 2.54 2.	70 2.69 2.68 2.68 2.66 2.64 2.64 2.64
				6 2.66 2.68 2	

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)

**1**-2=Broad-Crested Rectangular Weir (Weir Controls 1.05 cfs @ 0.92 fps)

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# Pond 2P: BioBasin

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## Hydrograph for Pond 2P: BioBasin

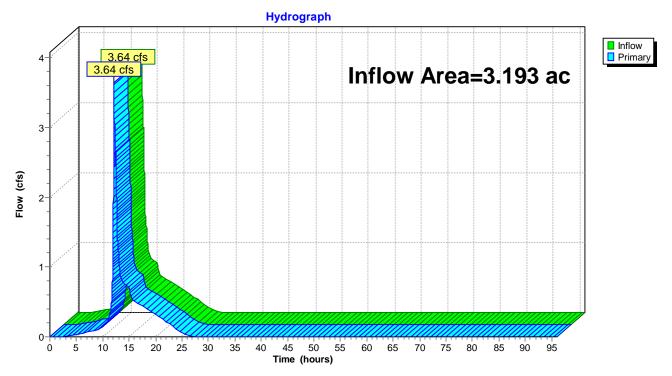
Time	Inflow	Storage	Elevation	Primary
(hours)	(cfs)	(cubic-feet)	(feet)	(cfs)
0.00	0.00	0	86.00	0.00
2.00	0.00	0	86.00	0.00
4.00	0.01	32	86.01	0.00
6.00	0.03	172	86.08	0.00
8.00	0.04	418	86.19	0.00
10.00	0.09	847	86.37	0.00
12.00	1.51	2,752	87.10	0.00
14.00	0.25	5,512	87.98	0.25
16.00	0.13	5,449	87.97	0.14
18.00	0.10	5,433	87.96 87.95	0.10
20.00 22.00	0.07 0.04	5,404 5,370	87.95 87.94	0.07 0.04
22.00	0.04	5,336	87.94	0.04
24.00	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 87.93	0.00
70.00 72.00	0.00 0.00	5,329 5,329	87.93 87.93	0.00 0.00
72.00	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

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# Summary for Pond 3P: Total

Inflow Area =	3.193 ac, 33.16% Impervious, Inflow D	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, Inflo	w 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 Inv		rt Avail.Sto	rage Storage	Description
#1	78.80	)' 223,12	29 cf Custom	n Stage Data (Prismatic) Listed below (Recalc)
Elevation Surf.Area			Inc.Store	Cum.Store
		(sq-ft)	(cubic-feet)	(cubic-feet)
78.8	30	1	0	0
79.0	00	16	2	2
80.0		2,181	1,099	1,100
81.0		15,895	9,038	10,138
82.0		29,262	22,579	32,717
83.0		34,004	31,633	64,350
84.00		36,834	35,419	99,769
85.00 39,677		,	38,256	138,024
		42,533	41,105	179,129
87.0	00	45,467	44,000	223,129
Device	Routing	Invert	Outlet Device	25
#1	Primary	76.60'	48.0" Round	I 48" Culvert
				P, square edge headwall, Ke= 0.500
				Invert= 76.60' / 76.10' S= 0.0100 '/' Cc= 0.900
				ncrete pipe, finished, Flow Area= 12.57 sf
#2	Device 1	76.60'		<b>Orifice</b> C= 0.600 Limited to weir flow at low heads
#3	Device 1	81.90'		<b>.5" H Vert. 42" Weir</b> C= 0.600
	Du lui 4	05 44		eir flow at low heads
#4	Device 1	85.44'		16.0' breadth Outlet Structure Overflow
			· · · /	0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60
#5	Device 1	78.80'		h) 2.68 2.70 2.70 2.64 2.63 2.64 2.64 2.63 I Headwall Outlet (15" RCP)
#3	Device I	70.00		P, square edge headwall, Ke= 0.500
				nvert= 78.80' / 78.30' S= 0.1250 '/' Cc= 0.900
				ncrete pipe, finished, Flow Area= 1.23 sf
#6	Device 5	78.80'		<b>Orifice</b> C= 0.600 Limited to weir flow at low heads
#7	Device 2	78.80'		nderdrain 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)

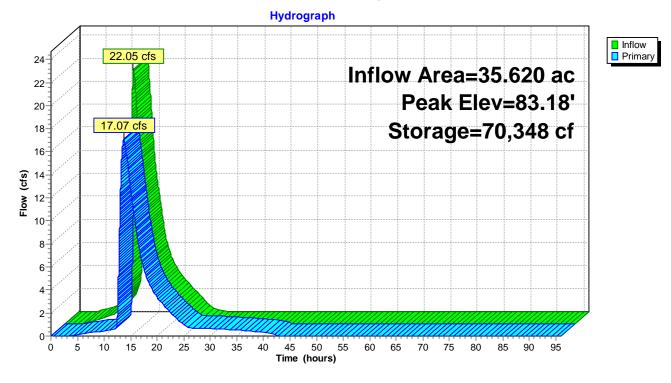
-3=42" Weir (Orifice Controls 16.18 cfs @ 3.62 fps)

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



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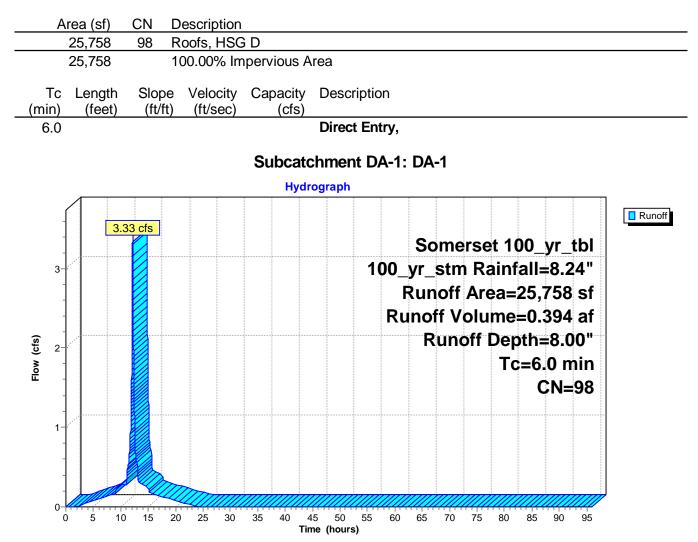
## Hydrograph for Pond EB: Existing Basin

Time	Inflow	Storage	Elevation	Primary
(hours)	(cfs)	(cubic-feet)	(feet)	(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 70.00	0.00 0.00	0 0	78.80 78.80	0.00 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
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 0	78.80	0.00
94.00	0.00	0 0	78.80	0.00
96.00	0.00	0	78.80	0.00
		-		

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## Summary for Subcatchment DA-1: DA-1

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



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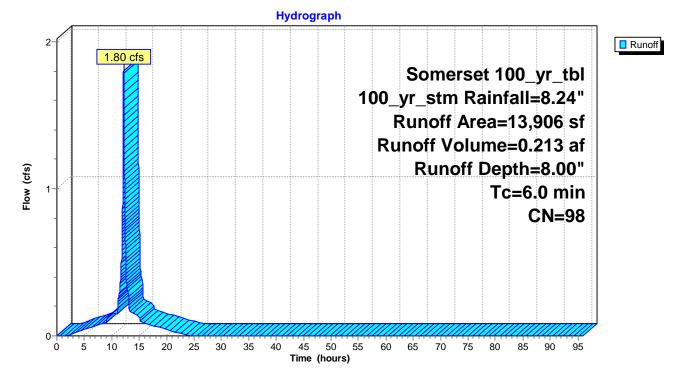
### Summary for Subcatchment DA-2i: DA-2i

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"

_	A	rea (sf)	CN	Description		
*		2,940	98	Sidewalks,	HSG C	
		9,656	98	Paved park	ing, HSG C	
*		649	98	Hardscape,	HSG C	
*		661	98	Hardscape,	HSG B	
		13,906	98	Weighted A	verage	
		13,906		100.00% Im	pervious A	rea
	Tc (min)	Length (feet)	Slop (ft/f		Capacity (cfs)	Description
	6.0					Direct Entry,

#### Subcatchment DA-2i: DA-2i



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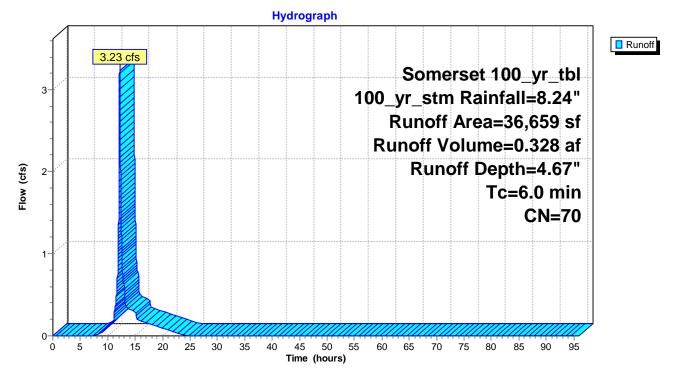
## Summary for Subcatchment DA-2p: DA-2p

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 Length (min) (feet)	Sloj (ft/	
6.0		Direct Entry,

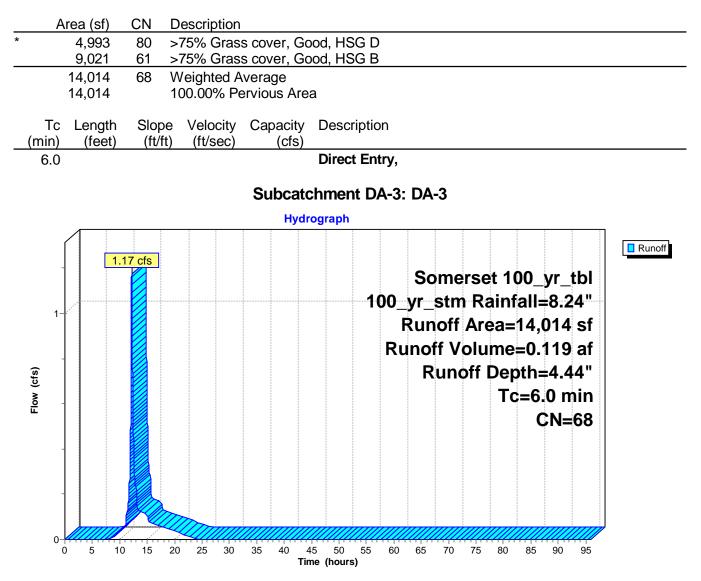
## Subcatchment DA-2p: DA-2p



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## Summary for Subcatchment DA-3: DA-3

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



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#### 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"

	Ai	rea (sf)	С	N	Des	scrip	tion														
		2,779	ę	98				ng, F	ISG	С											
*		3,419		98	Sid	ewal	ks, ł	HŠG	С												
*		260		98				, HS													
		6,458	ę	98				verag													
		6,458			100	0.00%	% Im	pervi	ous	Area	а										
	Тс	Length		Slop		/eloc		Сар			escr	iptio	n								
(r	nin)	(feet	)	(ft/f	t)	(ft/se	ec)		(cfs)												
	6.0									D	Direct	Ent	ry,								
								Sub	ocat	chn	nent	DA	-4i:	DA-	4i						
										drog											
		<u></u>																			
	0.9-		0.84	cfs																	Runoff
	0.85													So	me	rse	t 1(	00	yr_	tbl	
	0.8- 0.75-	[/										11					+		=8.2		
	0.75												ю <u>–</u>								
	0.65-																+	· • · · · · · · · · ·	458		
	0.6			2									Ru	nof	f Vo	olu	me	=0.	099	af	
5	0.55			0										R	und	off I	Der	oth:	=8.0	)0"	-
Flow (cfs)	0.5 0.45																÷		.0 n		
EOV E	0.45																- 1 (	-	1		
	0.35-																		CN=	:98	·
	0.3-			Ø																	
	0.25																				
	0.2	()																			1
	0.15																				
	0.1 ⁻ 0.05-			Ŵ	TT																
	0.05*								////	////				////		////	////				7
		0 5	10	15	20	25	30	35	40	45 Time	50 (hours	55 5)	60	65	70	75	80	85	90	95	

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#### 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"

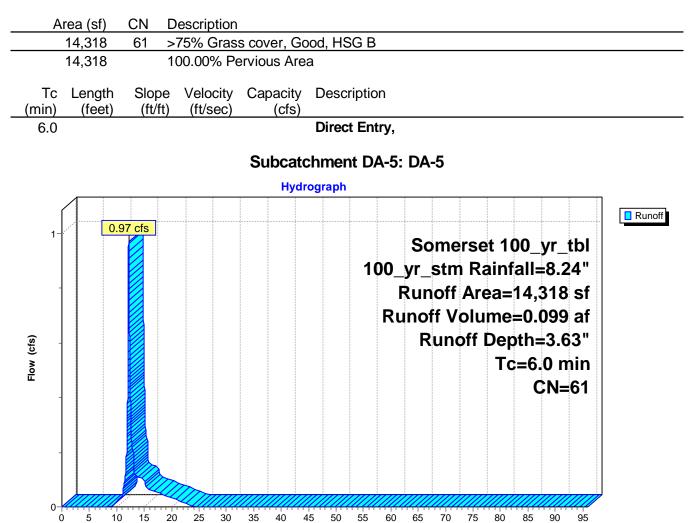
Area (sf) CN Description	
16,312 61 >75% Grass cover, Good, HSG B	
2,332 74 >75% Grass cover, Good, HSG C	
23,645 80 >75% Grass cover, Good, HSG D 42,289 72 Weighted Average	
42,289 100.00% Pervious Area	
Tc Length Slope Velocity Capacity Description (min) (feet) (ft/ft) (ft/sec) (cfs)	
6.0Direct Entry,	
Subcatchment DA-4p: DA-4p	
Hydrograph	
	Runoff
4 3.90 cfs Somerset 100_y	/r thi
100_yr_stm Rainfall=	
³ - Runoff Area=42,2	
Runoff Volume=0.3	
ଞ୍ଚୁ Runoff Depth= ଜୁ ₂ Tc=6.0	
<u>۽</u> ۽ Tc=6.0	) min
	N=72
0 5 10 15 20 25 30 35 40 45 50 55 60 65 70 75 80 85 Time (hours)	90 95

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#### 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"



Time (hours)

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#### Summary for Subcatchment EA-EXi: EA-EXi

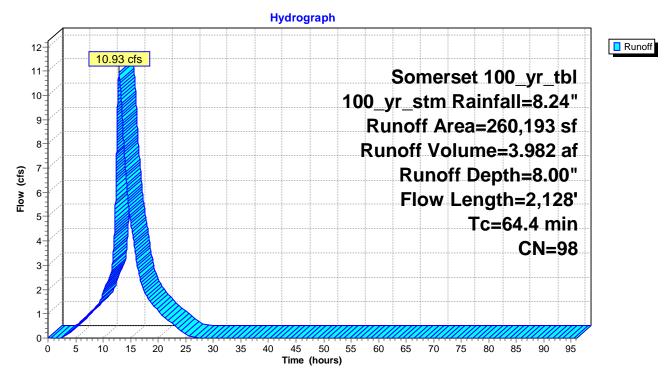
Runoff = 10.93 cfs @ 12.88 hrs, Volume= 3.982 af, Depth= 8.00"

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"

	А	rea (sf)	CN I	Description		
*		34,826	98	Roofs		
*		92,386		Roads		
*		20,721		Driveways		
*	1	12,260	98	Parking Lot		
		60,193		Weighted A		
	2	60,193		100.00% lm	pervious A	rea
	-		<u></u>		<b>A B</b>	
	Tc	Length	Slope		Capacity	Description
	<u>(min)</u>	(feet)	<u>(ft/ft)</u>		(cfs)	
	6.8	46	0.0100	0.11		Sheet Flow,
	00.0	<b>F</b> 4	0.0050	0.04		Grass: Short n= 0.150 P2= 3.35"
	22.3	54	0.0050	0.04		Sheet Flow,
	4.4	130	0.0050	0.49		Woods: Light underbrush n= 0.400 P2= 3.35" Shallow Concentrated Flow,
	4.4	130	0.0050	0.49		Short Grass Pasture Kv= 7.0 fps
	1.7	73	0.0200	0.71		Shallow Concentrated Flow,
	1.7	70	0.0200	0.71		Woodland Kv= 5.0 fps
	0.2	24	0.0100	2.03		Shallow Concentrated Flow,
	0					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,
	40.0	000	0.04.00	0.50		Short Grass Pasture Kv= 7.0 fps
	12.9	388	0.0100	0.50		Shallow Concentrated Flow,
	1.2	90	0.0300	1.21		Woodland Kv= 5.0 fps Shallow Concentrated Flow,
	1.2	90	0.0300	1.21		Short Grass Pasture Kv= 7.0 fps
	0.9	182	0.0250	3.21		Shallow Concentrated Flow,
	0.5	102	0.0200	0.21		Paved Kv= 20.3 fps
	0.8	602	0.0136	11.92	84.26	Pipe Channel,
	0.0	002	0.0100		0 1120	36.0" Round Area= 7.1 sf Perim= 9.4' r= 0.75'
						n= 0.012 Concrete pipe, finished
	64.4	2 1 2 0	Total			

64.4 2,128 Total

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Subcatchment EA-EXi: EA-EXi

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#### Summary for Subcatchment EA-EXp: EA-EXp

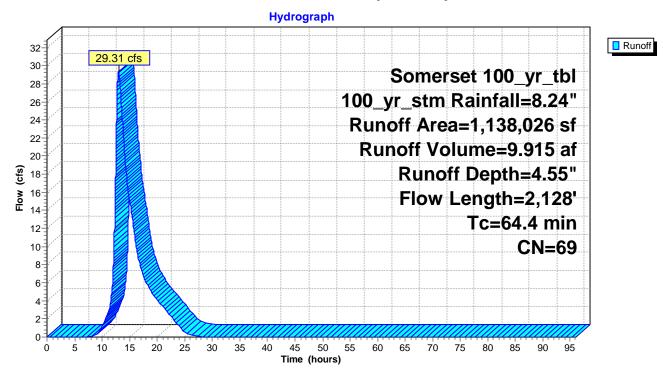
Runoff = 29.31 cfs @ 13.02 hrs, Volume= 9.915 af, Depth= 4.55"

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"

445,815       70       Woods, Good, HSG C         434,699       74       >75% Grass cover, Good, HSG B         142,125       55       Woods, Good, HSG B         31,203       61       >75% Grass cover, Good, HSG D         34,157       80       >75% Grass cover, Good, HSG D         1,138,026       69       Weighted Average         1,138,026       100.00% Pervious Area         Tc       Length       Slope       Velocity         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,         Woodland Kv= 5.0 fps       5.1       Not 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       2.6       132       0.0150       0.86       Shallow Concentrated Flow,         Paved Kv= 20.3	A	rea (sf)	CN	Description				
434,699       74       >75% Grass cover, Good, HSG C         142,152       55       Woods, 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       Length       Slope       Velocity       Capacity       Description         (min)       (feet)       (ft/ft)       (ft/sec)       (cfs)         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       Short Grass Pasture       FN         0.2       24       0.0100       2.03       Shallow Concentrated Flow,         Woodand       Kv= 5.0 fps       Ne       Paved Kv= 20.3 fps         0.2       24       0.0100       2.03       Shallow Concentrated Flow,         Woodand Kv= 5.0 fps       Short Grass Pasture       Kv= 7.0 fps         1.5 <td></td> <td></td> <td colspan="6"></td>								
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1,138,026       100.00% Pervious Area         Tc       Length       Slope       Velocity       Capacity       Description         (min)       (feet)       (ft/tt)       (ff/sec)       (cfs)         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, Woodland Kv= 5.0 fps         0.2       24       0.0100       2.03       Shallow Concentrated Flow, Woodland Kv= 5.0 fps         0.2       24       0.0100       2.03       Shallow Concentrated Flow, Woodland Kv= 5.0 fps         2.6       132       0.0150       0.86       Shallow Concentrated Flow, Woodland Kv= 5.0 fps         2.6       132       0.0100       0.70       Shallow Concentrated Flow, Woodland Kv= 5.0 fps         1.5       62       0.0100       0.70       Shallow Concentrated Flow, Woodland Kv= 5.0 fps         1.2       9						500, 1150 D		
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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	1.5	62	0.0100	) 0.70				
1.2900.03001.21WoodlandKv= 5.0 fps1.2900.03001.21Shallow Concentrated Flow, Short Grass PastureShort Grass PastureKv= 7.0 fps0.91820.02503.21Shallow Concentrated Flow, PavedShort Grass PastureKv= 20.3 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       Flow, Kv= 20.3 fps	12.9	388	0.0100	) 0.50		•		
0.91820.02503.21Short Grass PastureKv= 7.0 fpsShallow Concentrated Flow, PavedKv= 20.3 fps								
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Paved Kv= 20.3 fps								
	0.9	182	0.0250	) 3.21				
						Paved Kv= 20.3 fps		
0.8 602 0.0136 11.92 84.26 Pipe Channel,	0.8	602	0.0136	5 11.92	84.26			
36.0" Round Area= 7.1 sf Perim= 9.4' r= 0.75'						36.0" Round Area= 7.1 sf Perim= 9.4' r= 0.75'		
n= 0.012 Concrete pipe, finished						n= 0.012 Concrete pipe, finished		

64.4 2,128 Total

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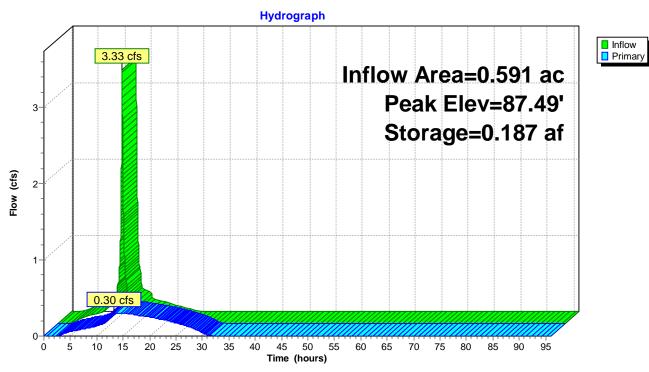
#### Subcatchment EA-EXp: EA-EXp

#### Summary for Pond 1P: Underground

Inflow A Inflow Outflow Primary	=	3.33 cfs @12.0.30 cfs @13.	0% Impervious, Inflow Depth =       8.00" for 100_yr_stm event         .14 hrs, Volume=       0.394 af         .30 hrs, Volume=       0.394 af, Atten= 91%, Lag= 69.4 min         .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								
Center-o	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	Inve	ert Avall.Storag	ge Storage Description						
#1	84.0	0' 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		<b>2.5" Vert. Orifice/Grate</b> 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)									

**1**–2=Orifice/Grate (Orifice Controls 0.30 cfs @ 8.85 fps)

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Pond 1P: Underground

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#### Hydrograph for Pond 1P: Underground

Time	Inflow	Storage	Elevation	Primary
(hours)	(cfs)	(acre-feet)	(feet)	(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 22.00	0.08 0.04	0.124 0.096	86.36 85.92	0.25 0.22
22.00	0.04	0.090	85.44	0.22
26.00	0.00	0.003	84.96	0.19
28.00	0.00	0.016	84.52	0.10
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 58.00	0.00 0.00	0.000 0.000	84.00 84.00	0.00 0.00
60.00	0.00	0.000	84.00 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 90.00	0.00 0.00	0.000 0.000	84.00 84.00	0.00 0.00
90.00 92.00	0.00	0.000	84.00 84.00	0.00
92.00 94.00	0.00	0.000	84.00 84.00	0.00
96.00	0.00	0.000	84.00	0.00
00.00	0.00	0.000	0 1100	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 )

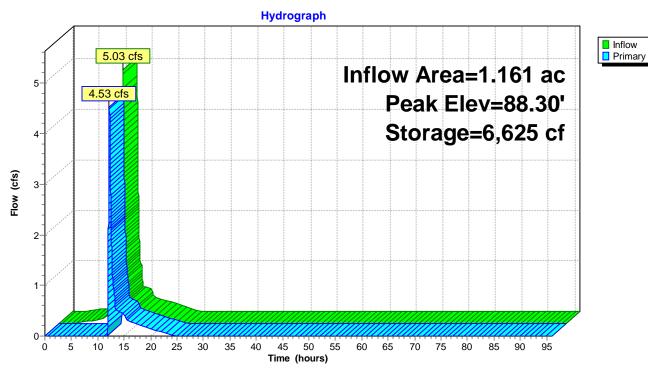
Volume	Inver	t Avail.Stor	rage Storage	Description				
#1	86.00	' 11,52	25 cf Custom	Stage Data (Pri	smatic) Listed below (Recalc)			
<b>-</b>	~	<b>6 A</b>						
Elevatio		urf.Area	Inc.Store	Cum.Store				
(fee	et)	(sq-ft)	(cubic-feet)	(cubic-feet)				
86.0	00	2,166	0	0				
87.0	00	2,769	2,468	2,468				
88.0	00	3,431	3,100	5,568				
89.0	00	4,147	3,789	9,357				
89.5	50	4,527	2,169	11,525				
Device	Routing	Invert	Outlet Device	S				
#1	Primary	86.00'	15.0" Round	Culvert				
	-		L= 139.0' RC	CP, square edge	headwall, Ke= 0.500			
			Inlet / Outlet I	nvert= 86.00' / 8	4.61' S= 0.0100 '/' Cc= 0.900			
			n= 0.012 Cor	ncrete pipe, finis	hed, 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 3.5	50 4.00 4.50 5	.00 5.50			
			Coef. (English	n) 2.43 2.54 2.	70 2.69 2.68 2.68 2.66 2.64 2.64 2.64			
			· •	6 2.66 2.68 2				

**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)

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Pond 2P: BioBasin

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#### Hydrograph for Pond 2P: BioBasin

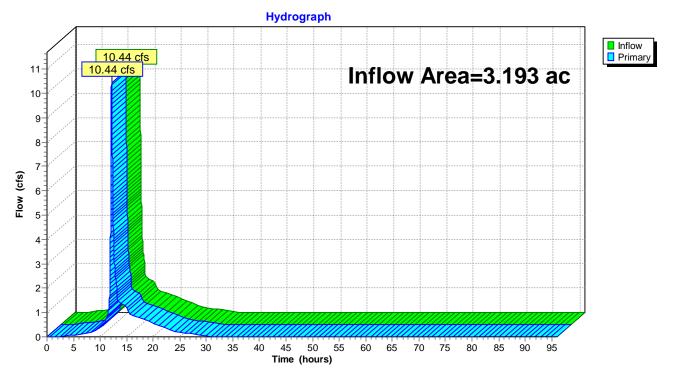
TimeInflowStorageElevationPrimary $(hours)$ $(cfs)$ $(cubic-feet)$ $(feet)$ $(cfs)$ $0.00$ $0.00$ 086.00 $0.00$ $2.00$ $0.00$ 186.00 $0.00$ $4.00$ $0.03$ 11386.05 $0.00$ $6.00$ $0.06$ $422$ 86.19 $0.00$ $8.00$ $0.27$ $2,097$ 86.86 $0.00$ $12.00$ $2.72$ $6,054$ 88.14 $1.87$ $14.00$ $0.49$ $5,622$ 88.02 $0.49$ $16.00$ $0.27$ $5,526$ $87.99$ $0.28$ $18.00$ $0.21$ $5,490$ $87.98$ $0.21$ $22.00$ $0.07$ $5,412$ $87.95$ $0.08$ $24.00$ $0.01$ $5,329$ $87.93$ $0.00$ $28.00$ $0.00$ $5,329$ $87.93$ $0.00$ $32.00$ $0.00$ $5,329$ $87.93$ $0.00$ $34.00$ $0.00$ $5,329$ $87.93$ $0.00$ $34.00$ $0.00$ $5,329$ $87.93$ $0.00$ $44.00$ $0.00$ $5,329$ $87.93$ $0.00$ $44.00$ $0.00$ $5,329$ $87.93$ $0.00$ $54.00$ $0.00$ $5,329$ $87.93$ $0.00$ $44.00$ $0.00$ $5,329$ $87.93$ $0.00$ $44.00$ $0.00$ $5,329$ $87.93$ $0.00$ $54.00$ $0.00$ $5,329$ $87.93$ $0.00$ $54.00$ $0.00$ $5,329$ $87.93$
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96.00 0.00 5,329 87.93 0.00

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#### 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

Printed 12/16/2022

Inflow Area =	35.620 ac, 19.74% Impervious, Inflov	w 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	Inve	rt Avail.Stor	rage Storage [	Description
#1	78.80	)' 223,12	29 cf Custom S	Stage Data (Prismatic) Listed below (Recalc)
Elevatio	-	Surf.Area	Inc.Store	Cum.Store
(fee		(sq-ft)	(cubic-feet)	(cubic-feet)
78.8		1	0	0
79.0		16	2	2
80.0		2,181	1,099	1,100
81.0		15,895	9,038	10,138
82.0		29,262	22,579	32,717
83.0		34,004	31,633	64,350
84.0		36,834	35,419	99,769
85.0		39,677	38,256	138,024
86.0		42,533	41,105	179,129
87.0	00	45,467	44,000	223,129
Device	Routing	Invert	Outlet Devices	8
#1	Primary	76.60'	48.0" Round 4	48" Culvert
	-		L= 50.0' RCP	P, square edge headwall, Ke= 0.500
				vert= 76.60' / 76.10' S= 0.0100 '/' Cc= 0.900
			n= 0.012 Cond	crete pipe, finished, Flow Area= 12.57 sf
#2	Device 1	76.60'	3.0" Vert. 3" O	Drifice C= 0.600 Limited to weir flow at low heads
#3	Device 1	81.90'	42.0" W x 38.5	<b>5" H Vert. 42" Weir</b> C= 0.600
			Limited to weir	r flow at low heads
#4	Device 1	85.44'	16.0' long x 10	6.0' 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 I	Headwall Outlet (15" RCP)
				square edge headwall, Ke= 0.500
			Inlet / Outlet In	nvert= 78.80' / 78.30' S= 0.1250 '/' Cc= 0.900
				crete pipe, finished, Flow Area= 1.23 sf
#6	Device 5	78.80'		Drifice C= 0.600 Limited to weir flow at low heads
#7	Device 2	78.80'	0.500 in/hr Un	derdrain 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)

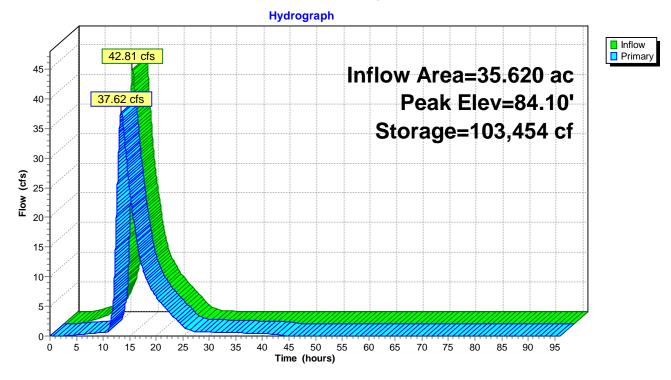
-3=42" Weir (Orifice Controls 36.65 cfs @ 4.76 fps)

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



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#### Hydrograph for Pond EB: Existing Basin

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66.000.00078.800.0068.000.00078.800.0070.000.00078.800.0072.000.00078.800.0074.000.00078.800.0076.000.00078.800.0078.000.00078.800.0080.000.00078.800.00
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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**

Prepared by {enter your company name here} HydroCAD® 10.10-3a s/n 11244 © 2020 HydroCAD Software Solutions LLC

#### Hydrograph for Pond 1P: Underground

Time	Inflow	Storage	Elevation	Primary	
(hours)	(cfs)	(acre-feet)	(feet)	(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	Basin fully drains in
24.00	0.00	0.065	85.44	0.19	less than 72 hours
26.00	0.00	0.037	84.96	0.15	less than 72 hours
28.00	0.00	0.016	84.52	0.11	
30.00	0.00	0.003	84.17	0.04	
32.00	0.00 0.00	0.000	84.04	0.00 0.00	
34.00	0.00	<u>0.000</u> 0.000	84.01	0.00	1
36.00 38.00	0.00	0.000	84.00 84.00	0.00	
40.00	0.00	0.000	84.00 84.00	0.00	
40.00	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	

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#### Hydrograph for Pond 2P: BioBasin

<b>T</b> ¹	1.0	0				
Time	Inflow	Storage	Elevation	Primary		
(hours)	(cfs)	(cubic-feet)	(feet)	(cfs)		
0.00 2.00	0.00 0.00	0 1	86.00	0.00		
2.00 4.00	0.00	113	86.00 86.05	0.00 0.00		
4.00 6.00	0.03	422		0.00		
8.00	0.00	921	86.19 86.40	0.00		
10.00	0.09	2,097	86.86	0.00		
12.00	<b>2.72</b>	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	Basin fully drains in	
20.00	0.14	5,455	87.97	0.15	less than 72 hours	
22.00	0.07	5,412	87.95	0.08		1
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 5,320	87.93	0.00		
88.00 90.00	0.00 0.00	5,329 5,320	87.93 87.93	0.00 0.00		
90.00 92.00	0.00	5,329 5,329	87.93 87.93	0.00		
92.00 94.00	0.00	5,329 5,329	87.93 87.93	0.00		
94.00 96.00	0.00	5,329 5,329	87.93 87.93	0.00		
90.00	0.00	5,529	01.90	0.00		

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#### Hydrograph for Pond EB: Existing Basin

<b>T</b> :	left area	0.1.0.0.0.0		Duine and	
Time	Inflow (cfs)	Storage (cubic-feet)	Elevation	Primary (cfo)	
<u>(hours)</u> 0.00	0.00	<u>(cubic-reet)</u> 0	(feet) 78.80	(cfs) 0.00	
2.00	0.00	0	78.80	0.00	
4.00	0.00	166	79.38	0.00	
6.00	0.27	2,105	80.25	0.17	
8.00	1.32	6,696	80.25	0.34	
10.00	3.41	17,473	81.40	0.47	
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	Basin fully drains in
28.00	0.14	28,480	81.85	0.72	
30.00	0.04	24,070	81.68	0.68	less than 72 hours
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 80.00	0.00 0.00	0	78.80 78.80	0.00 0.00	
80.00	0.00	0	78.80 78.80	0.00	
82.00 84.00	0.00	0 0	78.80 78.80	0.00	
86.00	0.00	0	78.80 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	
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# **APPENDIX D**

# **BASIN SUMMARY SHEETS**

#### 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

### Hydrologic Modeling Database – Data Entry Form

Basin Details: ³	Underground Detention	Basin
Basin C	entroid (NJ State Plane F	eet): ⁴
	Northing: 585,480	Easting: 546,605
	Basin Type: Detention	Basin
Constru	iction: HDPE Pipe	
Status p	ohase:⁵ Design ⊠	As-built 🗆
Dam He	eight (ft) N/A	top width (ft) N/A
Dam Cla	assification: N/A	

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

Drainage Area Name	Drainage Area (acres)	Post- Development	Percent Impervious	Time of Concentration
DA-1	0.59	CN# 98	100%	(min) 6
	0.59	90	10078	0

#### **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

NJDA-HMD Form 2014

## 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 Table¹²

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 -
-		-
	1	1

#### Hydrologic Modeling Database - Data Entry Form

#### NJDEP BMP Water Quality Structures¹³

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

**Explanatory Notes-**

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.

¹ Approximate location of center of site, coordinates in state plane feet

² Indicate who will be responsible for permanent operation and maintenance

### Hydrologic Modeling Database – Data Entry Form

Basin Details: ³	Bio-retention Basin			
Basin C	entroid (NJ State Plane F	eet): ⁴		
	Northing: 577,607		Easting: 448,	,016
	Basin Type: Infiltration	Basin		
Constru	iction: Bio-Retention			
Status p	ohase:⁵ Design ⊠	As-built	t 🗆	
Dam He	eight (ft) N/A		top width (ft)	N/A
Dam Cla	assification: 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		

## 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 Table¹²

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
F		-
F		
	1	

#### Hydrologic Modeling Database - Data Entry Form

#### NJDEP BMP Water Quality Structures¹³

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 - Ch 	l apter 9.7 NJ S [:] I	l tormwater BMP Manu I	l al I

**Explanatory Notes-**

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.

¹ Approximate location of center of site, coordinates in state plane feet

² Indicate who will be responsible for permanent operation and maintenance

# **APPENDIX E**

# LOW IMPACT DEVELOPMENT CHECKLIST

# New Jersey Stormwater Best Management Practices Manual

February 2004

#### APPENDIX A

# Low Impact Development Checklist

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

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

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

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

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

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

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

# Low Impact Development Checklist

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

Municipality:Montgomery Township
County: Somerset Date:05/31/21
Montgomery Township
Proposed land development name: Montgomery Senior Affordable Housing
Proposed land development name:
Lot(s) Diock(s)
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
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: No:
If yes, briefly describe: Protect areas that provide water quality benefits or areas particu- larly 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 concen- tration" 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.

А.	Has an inventory of existing sit	e vegetation bee	n perforn	ned? Yes	s: <u>X</u> No:
	If yes, was this inventory a fact	or in the site's la	yout and	design?	Yes: <u>X</u> No:
B.	Does the site design utilize any	of the following	g nonstruc	ctural LI	D-BMPs?
	Preservation of natural areas?	Yes:	No:	Х	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 regu	lations require th	nese nons	tructural	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.

А.	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: <u>X</u>	No:
B.	Does the development's design utilize any of the following nonstru	ctural LID-BMPs?	
	Restrict permanent site disturbance by land owners?	Yes:	No: <u>X</u>
	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 road	ways:	

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: _____ 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 sit	e 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.

- I. Specify percentage of total impervious area that will be porous:
   Total site: <u>0%</u> 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: <u>68.9%</u> 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: <u>N/A</u>

### **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 req	uired by regulations:					
	Proposed: Regulations: _	1					
В.	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 re-	quired by regulations:					
	Proposed: <u>N/A</u> 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: <u>100%</u>
- 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, har	mful accumulation, or contain spills:
Pollutant:	Location:
Feature utilized to prevent pollutant exposure, has	mful accumulation, or contain spills:
Pollutant:	Location:
Feature utilized to prevent pollutant exposure, has	mful accumulation, or contain spills:
Pollutant:	Location:
- Ondunt	
Feature utilized to prevent pollutant exposure, har	mful 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.	Х	
2.	Minimize impervious surfaces and break up or disconnect the flow of runoff over impervious surfaces.	Х	
3.	Maximize the protection of natural drainage features and vegetation.	Х	
4.	Minimize the decrease in the pre-construction time of concentration.	Х	
5.	Minimize land disturbance including clearing and grading.	Х	
6.	Minimize soil compaction.	Х	
7.	Provide low maintenance landscaping that encourages retention and planting of native vegetation and minimizes the use of lawns, fertilizers, and pesticides.	Х	
8.	Provide vegetated open-channel conveyance systems discharge into and through stable vegetated areas.	Х	
9.	Provide preventative source controls.	Х	

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



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

WARREN, NJ 908.668.7777 CHALFONT, PA 215.712.2700

Other Office Locations: SOUTHBOROUGH, MA 508.485.0755

ROCKY HILL, CT 860.726.7889 EVERGREEN, CO 303.670.6905



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									
	ESHGW	USDA Classification	Permeabilit	y Test Results					
Boring #	(fbgs/NAVD 88)	@ Test Depth	Depth (fbgs/NAVD 88)	Rate (in/hour)         < 0.2         < 0.2         < 0.2         < 0.2         < 0.2         < 0.2         < 0.2         < 0.2         < 0.2         < 0.2         < 0.2         < 0.2         < 0.2         < 0.2         < 0.2         < 0.2         < 0.2         < 0.2         < 0.2					
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

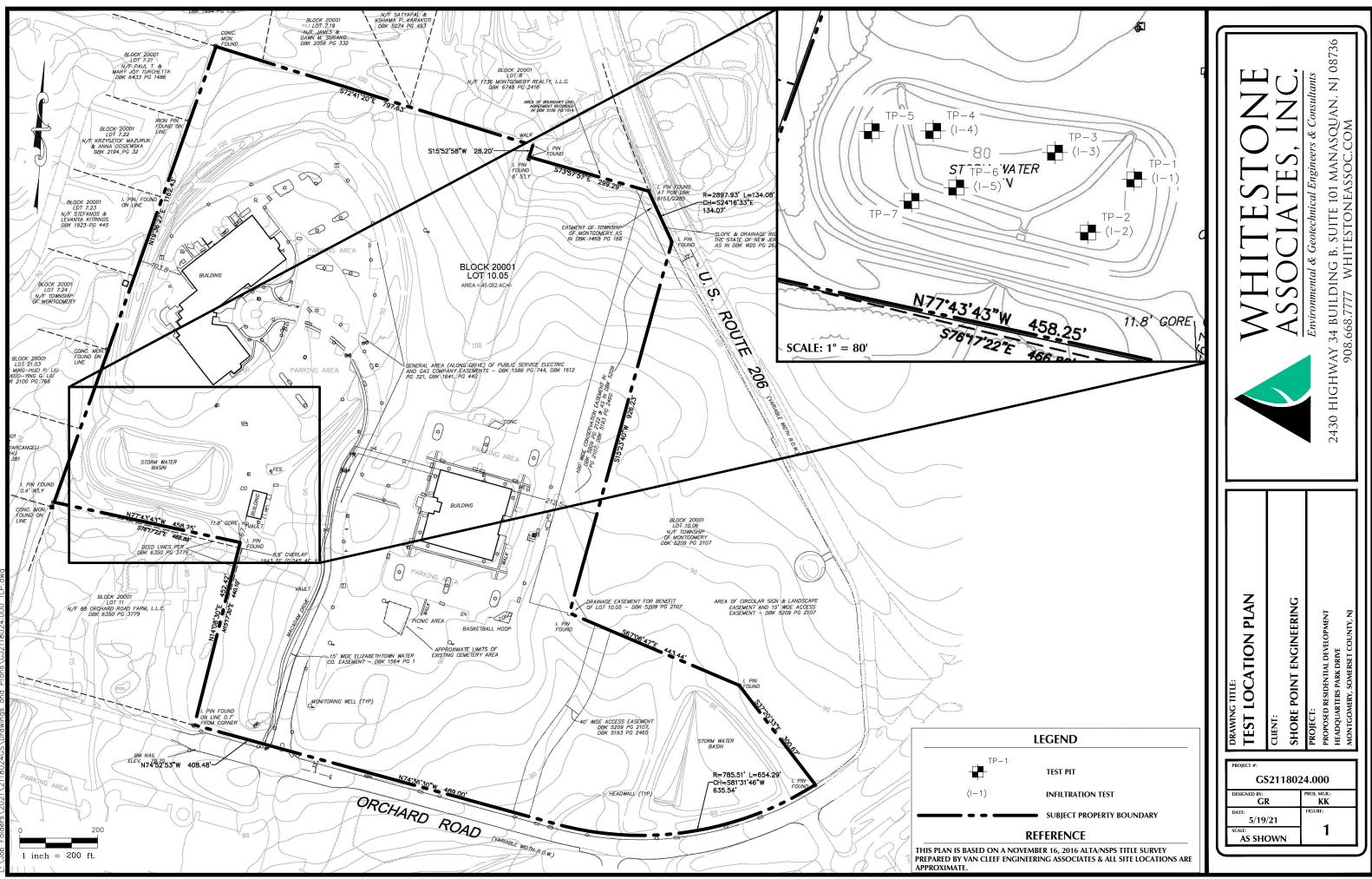
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Laurence W. Keller, P.E. Principal, Geotechnical Services

### **ENVIRONMENTAL & GEOTECHNICAL ENGINEERS & CONSULTANTS**



# **FIGURE 1 Test Location Plan**



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# **APPENDIX A Records of Subsurface Exploration**



Test Pit No.: TP-1

Project: Proposed Development WAI Project No.: GS2118024.000											
	· ·			ry, Somerset Cou	nty, NJ				Client:	Shore Point Engir	neering
Surface Eleva	ation: ±	80.0	feet	Date Started		5/20/2021	Wat	er Depth	Elevation	Cave	-In Depth   Elevation
Termination I	Depth:	12.0	feet bgs	Date Comple	ted:	5/20/2021	(1	feet bgs)	(feet)		(feet bgs)   (feet)
Proposed Lo	cation:	SWM Basir	n	Logged By:	тJ		During:	NE	<u></u> 7		
Excavating M	lethod:	Test Pit Ex	cavation	Contractor:	MC		At Completion:	NE	I V		NE   📓
Test Method:		Visual Obs	ervation	Rig Type:	Deere	310E	24 Hours:		<b>_</b>		=
							· · · ·			1	
	1	DEPTH	STRATA				'ION OF lassifica	MATERIALS		REMARKS	
Depth (ft.)	Number	Туре	(feet)		<b>r</b>		(0)	assinca			
			0.0								
			0.5	TOPSOIL	<u>&gt;/</u>	6" Topsoil with	Grass				
				RESIDUAL	11	Dark Reddish-	Brown (2.5YR 2.5/3) SA	NDY CLAY	'; 5% to 10% Grav	el Subangular Blocky	
						Structure; Mois	st; Firm to Plastic; Roots	s (5%); No I	Mottling; Clear Bou	ndary	
			3.0								
					11		Brown (2.5YR 2.5/3) CL No Roots; No Mottling;			llocky Structure;	
						worst, Flastic,	No Notis, No Motiling,		uary		
											Infiltration Testing @ 4.0 fbgs in
											Clay (elev. 76.0)
1.6	6.1	BAG	5.0								
4 - 6	S-1	BAG									
			6.0								
					1/1		Brown (2.5YR 2.5/3) SA			vel; Subangular	
					11	BIOCKY Structu	re; Moist; Plastic; No Ro	bots; Clear	Boundary		
6 - 8	S-2	BAG									
0-0	0-2	BAG									
			8.0 🕎								
				WEATHERED ROCK		Dark Reddish- Very Low Stree	Brown (2.5YR 2.5/3) Hig arth: Moist	ghly Weath	ered Rock (Shale)	Highly Fractured;	Passive Formation
			-	NOON	≣	very Low Siler	1911, WORL				Many Horizontal and Vertical
					33						Fractures in Sidewall
					22						
			-		22						Clayey Soil Present in Rock
			10.0		<b>33</b>						Fractures
					<b>3</b>						
			-		<b>3</b> 3						
					<b>3</b>						
					ΞĒ						
			-								
			12.0								
			I T			Test Pit Log TI	P-1 Terminated at a De	pth of 12.0	Feet Below Ground	Surface in Shale	
			-								
			-								
			-								
			15.0								



Test Pit No.: TP-2

Project:											
Location:			-	y, Somerset Cou	-				1	Shore Point Engir	-
Surface Eleva		80.0 11.0	_feet	Date Started	-	5/20/2021		epth   Elev bgs)   (feet			-In Depth   Elevation
Termination I Proposed Lo	-	SWM Basii	feet bgs	Date Comple Logged By:	-	5/20/2021	During: NE		-		(feet bgs) │ (feet)
Excavating N		Test Pit Ex		Contractor:	-		At Completion: NE		$\overline{\mathbf{v}}_{\overline{\mathbf{v}}}$	At Completion:	NE   🔛
Test Method:		Visual Obs		Rig Type:	Deere	310F	24 Hours:		¥ Ţ	At completion.	
									*		
SAMPLE INFORMATION DEPTH				STRATA			DESCRIPTION (Class)	I OF MATE	RIALS		REMARKS
Depth (ft.)	Number	Туре	(feet)		1		(	, ,			
			0.0	TOPSOIL			0				
			0.5	TOPSOIL	<u>»</u>	6" Topsoil with	Glass				
				RESIDUAL	11		Brown (2.5YR 2.5/3) CLAY Lo				
						Boundary	cky Structure; Moist; Firm to	D Plastic, Roots	5 (5%); NO N	iottiing, Clear	
			_								
					$\mathbb{Z}$						
			-		$\mathbb{M}$						
			3.5								
					11		Brown (2.5YR 2.5/3) CLAY: 5		bangular Blo	ocky Structure;	1
						Moist; Plastic; I	No Roots; No Mottling; Clear	r Boundary			Infiltration Testing @ 4.0 fbgs
4 - 5	S-1	BAG			$\mathbb{Z}$						(elev. 76.0)
4-0	0-1	BAG	5.0								
			_								
			6.5								
			0.5		11	Dark Reddish-	Brown (2.5YR 2.5/3) SANDY	' CLAY; 5% to	15% Gravel;	Subangular Blocky	-
							t; Plastic; No Roots; No Mott			0 ,	
			8.0 🕎	WEATHERED	1/1	Dark Reddish-F	Brown (2.5YR 2.5/3) Highly V	Weathered Ro	ck (Shale): F	lighty Fractured	Passaic Formation
				ROCK		Very Low Stren			on (ondio), i		
					<b>E</b>						Clayey Soil in Rock Fractures
											Many Horizontal and Vertical
			-								Fractures in Sidewall
			10.0								
			11.0			Test Pit Log TE	P-2 Terminated at a Depth of	f 11 () Feet Rel	ow Ground	Surface in Shale	
						Due to Bucket					
			]								
			-								
			15.0								
I	I	l	15.0								



Test Pit No.: TP-3

Project:										
Location:					-			Client:	Shore Point Engir	-
Surface Eleva	ation: ±	80.0	feet	Date Started	-	5/20/2021	Water Depth			-In Depth   Elevation
Termination I	•	7.5	feet bgs	Date Comple	ted:	5/20/2021	(feet bgs)	(feet)	(	(feet bgs)   (feet)
Proposed Lo	cation:	SWM Basir	n	Logged By:	TJ		During: NE	TA		
Excavating M	lethod:	Test Pit Ex	cavation	Contractor:	MC		At Completion: NE	∇	At Completion:	<u>NE  </u>
Test Method:		Visual Obs	ervation	Rig Type:	Deere	310E	24 Hours:	⊥ <u></u> ▼		
SAMPLE	IATION	DEPTH	STRATA			DESCRIPTION OF			REMARKS	
Depth (ft.)	Number	Туре	(feet)		r		(Classifica	tion)		
			0.0							
			0.5	TOPSOIL	<u>&gt;</u>	6" Topsoil with	Grass			
				RESIDUAL	111	Dark Reddish-	Brown (2.5YR 2.5/3) CLAY LOAM;	5% Gravel, 0% Col	bles; Subangular	
						Blocky Structu	re; Moist; Firm to Plastic; Roots (5%	6); No Mottling; Cle	ar Boundary	
			2.0		<u>///</u>					
					11		Brown (2.5YR 2.5/3) SANDY CLAY ocky Structure; Moist; Plastic; No R			Infiltration Testing @ 2.0 fbgs (elev. 78.0) (2 ft. Above WR)
2 - 3	S-1	BAG					<b>,</b> ,,,		,	(, (, (,
			4.5							
			1 +	WEATHERED			Brown (2.5YR 2.5/3) Highly Weath	ered Rock (Shale);	Very Low Strength;	Weathered Rock Fragments
			5.0	ROCK		Highly Fracture	ed			Ranging from 1" to 12" Diameter
4.5 - 7	S-2	BAG								Clayey Soil in Rock Fractures
4.5 - 7	5-2	DAG								
			7.5							
						Test Pit Log TI to Bucket Refu	P-3 Terminated at a Depth of 7.5 Fe Isal	eet Below Ground S	Surface in Shale Due	
			10.0							
			15.0							
l	l		15.0							I



Test Pit No.: TP-4

Project:	Project: Proposed Development WAI Project No.: GS2118024.000										
Location:	Headquart	ters Park Dri	ive; Montgomer	y, Somerset Cou	nty, NJ				Client:	Shore Point Engir	neering
Surface Eleva	ation: ±	81.0	feet	Date Started	: _	5/20/2021			Elevation	Cave	In Depth   Elevation
Termination I	Depth:	7.5	feet bgs	Date Comple	ted:	5/20/2021	(	feet bgs)	(feet)	(	feet bgs)   (feet)
Proposed Lo	cation:	SWM Basir	ו	Logged By:	TJ		During:	NE	⊥ <u></u> ▼		
Excavating M	lethod:	Test Pit Exc	cavation	Contractor:	MC		At Completion:	NE	▽	At Completion:	<u>NE  </u>
Test Method:		Visual Obse	ervation	Rig Type:	Deere	310E	24 Hours:		⊥ <u></u> ▼		
SAMPLE	IATION	DEPTH	STRATA					MATERIALS		REMARKS	
Depth (ft.)	Number	Туре	(feet)				(C	lassifica	tion)		
			0.0								
				TOPSOIL	<u>&gt;\\/</u>	6" Topsoil with	Grass				
			0.5	RESIDUAL	110	Dark Daddiah (	Brown (2.5YR 2.5/3) S/			10% Cabblas	
				RESIDUAL	2		cky Structure; Firm to				
					2	Clear Boundary	,				Infiltration Testing @ 1.0 fbgs
					X						(elev. 80.0)
1 0	6.4	RAC			X						
1 - 3	S-1	BAG			X.						
			_		Ø.						
			3.0		18/						
				WEATHERED			Brown (2.5YR 2.5/3) Hi	ighly Weathe	ered Rock (Shale);	Highly Fractured;	Passaic Formation
				ROCK		very Low Stren	gth; Moist; Hard				Clayey Soil in Rock
											Horizontal and Vertical Fractures
			_								Visible in Sidewall
			5.0								
			-								
			$\nabla Y$								
			7.5		<b>H</b>						
							-4 Terminated at a De	pth of 7.5 Fe	eet Below Ground S	urface in Shale Due	
						to Bucket Refu	sal				
			10.0								
			10.0								
			15.0								
I		I	13.0			1					I



Test Pit No.: TP-5

Project:	Proposed	Developmer	nt					W۵I	Project No.:	GS2118024.000	
Location:				ery, Somerset Cou	ntv. N.I			11AI	Client:	Shore Point Engir	neering
Surface Eleva		80.0	feet	Date Started		5/20/2021	Wa	ter Depth	Elevation	-	-In Depth   Elevation
Termination		6.5	feet bgs	Date Comple	-	5/20/2021		(feet bgs)			(feet bgs)   (feet)
Proposed Lo		SWM Basir	-	Logged By:	-		During:	NE	<u></u> 7		
Excavating N		Test Pit Ex	cavation	Contractor:			At Completion:	NE		At Completion:	NE   📓
Test Method:		Visual Obs		Rig Type:	Deere	310E	24 Hours:		·▼		' <u> </u>
		1	DEPTH	STRATA			DESCRIP	TION OF lassifica	REMARKS		
Depth (ft.)	Number	Туре	(feet)		<u> </u>		(0	lassilica			
			0.0								
				TOPSOIL	<u>NII/</u>	7" Topsoil with	Grass				
			0.6	WEATHERED	_	Dark Reddish-	Brown (2.5YR 2.5/3) H	lighly Weath	ered Rock (Shale);	Highly Fractured;	Passaic Formation
			0.0	ROCK	Ē	Very Low Strer	ngth; Moist				
					<u> </u>						Many Horizontal and Vertical Fractures Observed in Sidewalls
			-		E.						
					E.						Intermittent Lawrence (C)
					<b>199</b>						Intermittent Layers of Clayey Soil in Rock Fractures
			$  \neg$		<b>199</b>						
					<u> </u>						
			5.0		<u> </u>						
					<u> </u>						
5 - 6	S-1	BAG	_		<u> </u>						
					<u> </u>						
			6.5								
								epth of 6.50 I	Feet Below Ground	Surface in shale Due	Could Not Perform Infiltration
						to Bucket Refu	sal				Testing Due to Shallow Rock Depth
			-								
			10.0								
			–								
			-								
			<u> </u>								
			-								
			-								
			15.0								



# RECORD OF SUBSURFACE EXPLORATION

Test Pit No.: TP-6

Project:		Developmer						WAI	-	GS2118024.000			
Location:	Headquart		ive; Montgomer	/, Somerset Cou					Client:	Shore Point Engin			
Surface Eleva		80.0	feet	Date Started:	-	5/20/2021							
Termination I	-	12.0	feet bgs	Date Comple	-	5/20/2021		0,	(feet)	(	feet bgs) │ (feet)		
Proposed Lo		SWM Basir		Logged By:			During:	NE	<u></u> 7				
Excavating M		Test Pit Exe		Contractor:			At Completion:	NE	▽	At Completion:	<u>NE  </u> 幽		
Test Method:		Visual Obse	ervation	Rig Type:	Deere	310E	24 Hours:		<u></u> ▼				
SAMPLE		IATION	DEPTH	STRATA	STRATA				MATERIALS		REMARKS		
Depth (ft.)	Number	Туре	(feet)		-		(01	assificat	lion)				
			0.0										
				TOPSOIL	\$112	6" Topsoil with	Grass						
			0.5	RESIDUAL	11	Dark Reddish-	Brown (2.5YR 2.5/3) SA		CLAX: 5% to 10%	Gravel 0% Cobbles:			
				REGIDIORE		Subangular Blo	ocky Structure; Moist; F						
						Clear Boundar	/						
			-										
0.5 - 3	S-1	BAG											
											Infiltration Testing @ 2.0 fbgs (elev. 78.0)		
			-								(0.07. 10.0)		
					11								
					11								
					11								
			4.0	WEATHERED	11	Deals Dealstick				Balaka Engatura di	Desseis Fernation		
				ROCK		Very Low Stren	Brown (2.5YR 2.5/3) Hig igth; Moist	gniy weathe	ered Rock (Shale);	Hignly Fractured;	Passaic Formation		
					<u> </u>		-				Many Horizontal and Vertical		
			5.0								Fractures in Sidewalls		
											Clayey Soil in Rock Fractures		
			7.0										
			1.0			Test Pit Log TF	P-6 Terminated at a Dep	oth of 7.0 Fe	et Below Ground S	urface on Shale Due			
						to Bucket Refu	sal						
			-										
			10.0										
			1										
			15.0										
I			15.0										



Test Pit No.: TP-7

Project:	Proposed	Developmer	nt					WAI P	Project No.:	GS2118024.000	
Location:	Headquar	ters Park Dri	ive; Montgomer	y, Somerset Cou	nty, NJ		-		Client:	Shore Point Engir	neering
Surface Eleva	ation: ±	80.0	feet	Date Started:	4	5/20/2021			Elevation	Cave	In Depth   Elevation
Termination I	Depth:	6.0	feet bgs	Date Comple	ted:	5/20/2021	(f	eet bgs)	(feet)	(	feet bgs) │ (feet)
Proposed Lo	cation:	SWM Basir		Logged By:			During:	NE	<u> </u>		
Excavating M	lethod:	Test Pit Exc	cavation	Contractor:	MC		At Completion:	NE	<u></u> \(\nabla\)	At Completion:	NE   📓
Test Method:		Visual Obse	ervation	Rig Type:	Deere	310E	24 Hours:		<u> </u>		
SAMPLE		IATION	DEPTH	STRATA	STRATA					REMARKS	
Depth (ft.)	Number	Туре	(feet)				(Cl	assificat	ion)		
			0.0								
				TOPSOIL	<u>\\!/</u>	8" Topsoil with	Grass				
			_		<u>\\\/</u>						
			0.7	RESIDUAL		Dark Reddish-E	rown (2.5YR 2.5/3) SA	NDY CLAY;	5% to 10% Grave	, <5% Cobbles;	
							cky Structure; Moist; Fi	rm to Plastic	; Roots (5% to 10	%); No Mottling;	
			_			Clear Boundary					
					11						
			_								
			3.0								
				WEATHERED	ΞΞ		Brown (2.5YR 2.5/3) Hi	ghly Weathe	ered Rock (Shale);	Highly Fractured;	Passaic Formation
			-	ROCK		Very Low Stren	jin, Moist				Many Horizontal and Vertical
											Fractures in Sidewall
			5.0								
					333						
			_		333						
			6.0		æ						
						Test Pit Log TP to Bucket Refus	-7 Terminated at a Dep al	oth of 6.0 Fe	et Below Ground S	urface in Shale Due	
			_								
			10.0								
			10.0								
			15.0								



# **APPENDIX B Permeability Test Results**

	Tu	be Permeameter T	Job Number: GJ2118024.000 Project: Proposed Site Improvement				
Sample ID:	Profile Pit No.:	TP-1 Samp	le No.:	T-1	Depth:		
COUNTY/MU	NICIPALITY Edison		BLOCK		LOT		Lab lech: MH
1. Test Numb	er <u>1</u>	Replicate (letter)	Α	Date Coll	ected		_
2. Material T	ested:	Fill X	Test in N	ative Soil			
3. Type of Sa	ample: X	Undisturbed		Disturbed	ł		
4. Sample D	mensions:	Inside Radius of Sam Length of Sample, L,		R, in cm	1.91 3.00	_	
5. Bulk Dens	ity Determination (Distu	bed Samples Only): N	I/A				
6. Sample W	eight (Wt. Tube Contain	ing Sample-Wt. of Emp	ty Tube), g	rams	0.00	_	Wt. of Tube Containing Sample Wt. of Empty Tube
7. Sample Ve	olume (L x 2.54 cm./inch	x 3.14R2), cc.			86.83	_	
8. Bulk Dens	ity (Sample Wt./Sample	Volume), grams/cc.			0	> 1.2	
9. Standpipe	Used: X	No	Yes, Indi	icate Interr	nal Radius,	cm. N/A	
10. Height of	Water Level Above Rim	ı of Test Basin, in inche	s:				
	At the Beginning of Eac At the End of Each Tes		5.00 5.00				
11. Rate of V	Vater Level Drop (Add a	dditional lines if needed	):				
	Time, Start of Test Interval, T1	Time End of Test Interval T2		n of Test T, Minutes			
	12:00:00	4:00:00	24	0.00	]		
					_		
					_		
12. Calculati	on of Permeability:	K, (in/hr) = 60 min/hr	x r2/R2 x L	.(in)/T(min)	) x ln (H1/H	2) T=	240.00
	K (in/hr) = 0.00	Classifica	ation:	К0			
13. Defects i	n the Sample (Check ap	propriate items):					
	X None						
	Soil/Tube Co	ontactLarge 0	Gravel		Large R	oots	
	Dry Soil	Smearing		_ Compa	ction		
	Other - Spec	ify					

	Tu	be Permeameter T	Job Number: GJ2118024.000 Project: Proposed Site Improvement				
Sample ID:	Profile Pit No.:	TP-1 Samp	le No.:	T-1	Depth:	4.0'	Client: Shore Point
COUNTY/MU	NICIPALITY Edison		BLOCK		LOT		Lab Tech: MH
1. Test Numb	er <u>1</u>	Replicate (letter)	В	Date Coll	ected		_
2. Material T	ested:	Fill X	Test in N	ative Soil			
3. Type of Sa	ample: X	Undisturbed		Disturbed	ł		
4. Sample Di	mensions:	Inside Radius of Sam Length of Sample, L,		R, in cm	1.91 3.00	_	
5. Bulk Dens	ity Determination (Distu	bed Samples Only): N	I/A				
6. Sample W	eight (Wt. Tube Contain	ing Sample-Wt. of Emp	ty Tube), g	rams	0.00	_	Wt. of Tube Containing Sample Wt. of Empty Tube
7. Sample Vo	olume (L x 2.54 cm./inch	x 3.14R2), cc.			86.83	_	
8. Bulk Dens	ity (Sample Wt./Sample	Volume), grams/cc.			0	> 1.2	
9. Standpipe	Used: X	No	Yes, Indi	icate Interr	nal Radius,	cm. N/A	
10. Height of	Water Level Above Rim	ı of Test Basin, in inche	s:				
	At the Beginning of Eac At the End of Each Tes		5.00 5.00				
11. Rate of V	Vater Level Drop (Add a	dditional lines if needed	):				
	Time, Start of Test Interval, T1	Time End of Test Interval T2		n of Test T, Minutes			
	12:00:00	4:00:00	24	0.00	]		
					_		
					_		
12. Calculation	on of Permeability:	K, (in/hr) = 60 min/hr	x r2/R2 x L	.(in)/T(min)	) x ln (H1/H	2) T=	240.00
	K (in/hr) = 0.00	Classifica	ation:	К0			
13. Defects i	n the Sample (Check ap	propriate items):					
	X None						
	Soil/Tube Co	ontactLarge 0	Gravel		Large R	oots	
	Dry Soil	Smearing		_ Compa	ction		
	Other - Spec	ify					

	Τι	ibe Permeameter	Job Number: GJ2118024.000 Project: Proposed Site Improvement				
Sample ID:	Profile Pit No.:	TP-2 Sam	ple No.:	T-1	Depth:	4.0'	Client: Shore Point
COUNTY/MU	NICIPALITY Edison		BLOCK		LOT		Lab Tech: MH
1. Test Numb	er <u>1</u>	Replicate (letter)	A	Date Col	lected		_
2. Material T	ested:	FillX	Test in N	ative Soil			
3. Type of Sa	ample: X	Undisturbed		Disturbed	ł		
4. Sample Di	mensions:	Inside Radius of Sa Length of Sample,		R, in cm	1.91 3.00	_	
5. Bulk Dens	ity Determination (Distu	irbed Samples Only):	N/A				
6. Sample W	eight (Wt. Tube Contai	ning Sample-Wt. of Err	pty Tube), g	grams	0.00	_	Wt. of Tube Containing Sample Wt. of Empty Tube
7. Sample Vo	olume (L x 2.54 cm./inc	h x 3.14R2), cc.			86.83	_	
8. Bulk Dens	ity (Sample Wt./Sample	e Volume), grams/cc.			0	> 1.2	
9. Standpipe	Used: X	No	Yes, Inc	licate Interr	nal Radius,	cm. N/A	
10. Height of	Water Level Above Ri	n of Test Basin, in inch	es:				
	At the Beginning of Ea At the End of Each Te		5.0				
11. Rate of V	Vater Level Drop (Add a	additional lines if neede	ed):				
	Time, Start of Test Interval, T1	Time End of Test Interval T2		h of Test T, Minutes	5		
	12:00:00	4:00:00	24	10.00			
12. Calculation	on of Permeability:	K, (in/hr) = 60 min/ł	nr x r2/R2 x	L(in)/T(min	) x ln (H1/⊢	2) T=	240.00
	K (in/hr) = 0.00	Classifi	cation:	K0			
13. Defects i	n the Sample (Check a	ppropriate items):					
	X None						
	Soil/Tube C	ontactLarge	Gravel		Large R	oots	
	Dry Soil	Smearing		Compa	ction		
	Other - Spe	cify					

	Τι	ibe Permeameter	Job Number: GJ2118024.000 Project: Proposed Site Improvement				
Sample ID:	Profile Pit No.:	TP-2 Sam	ple No.:	T-1	Depth:	4.0'	Client: Shore Point
COUNTY/MU	NICIPALITY Edison		BLOCK		LOT		Lab Tech: MH
1. Test Numb	er <u>1</u>	Replicate (letter)	A	Date Col	lected		_
2. Material T	ested:	FillX	Test in N	ative Soil			
3. Type of Sa	ample: X	Undisturbed		Disturbed	ł		
4. Sample Di	mensions:	Inside Radius of Sa Length of Sample,		R, in cm	1.91 3.00	_	
5. Bulk Dens	ity Determination (Distu	irbed Samples Only):	N/A				
6. Sample W	eight (Wt. Tube Contai	ning Sample-Wt. of Err	pty Tube), g	grams	0.00	_	Wt. of Tube Containing Sample Wt. of Empty Tube
7. Sample Vo	olume (L x 2.54 cm./inc	h x 3.14R2), cc.			86.83	_	
8. Bulk Dens	ity (Sample Wt./Sample	e Volume), grams/cc.			0	> 1.2	
9. Standpipe	Used: X	No	Yes, Inc	licate Interr	nal Radius,	cm. N/A	
10. Height of	Water Level Above Ri	n of Test Basin, in inch	es:				
	At the Beginning of Ea At the End of Each Te		5.0				
11. Rate of V	Vater Level Drop (Add a	additional lines if neede	ed):				
	Time, Start of Test Interval, T1	Time End of Test Interval T2		h of Test T, Minutes	5		
	12:00:00	4:00:00	24	10.00			
12. Calculation	on of Permeability:	K, (in/hr) = 60 min/ł	nr x r2/R2 x	L(in)/T(min	) x ln (H1/⊢	2) T=	240.00
	K (in/hr) = 0.00	Classifi	cation:	K0			
13. Defects i	n the Sample (Check a	ppropriate items):					
	X None						
	Soil/Tube C	ontactLarge	Gravel		Large R	oots	
	Dry Soil	Smearing		Compa	ction		
	Other - Spe	cify					

	Т	ube Permeameter 1	Job Number: GJ2118024.000 Project: Proposed Site Improvement				
Sample ID:	Profile Pit No.:	TP-3 Samp	le No.:	T-1	Depth:	2.0'	Client: Shore Point
COUNTY/MU	NICIPALITY Edison		BLOCK		LOT		Lab Tech: MH
1. Test Numb	er <u>1</u>	Replicate (letter)	Α	Date Coll	lected		_
2. Material T	ested:	FillX	Test in N	lative Soil			
3. Type of Sa	ample: X	Undisturbed		Disturbed	d		
4. Sample Di	mensions:	Inside Radius of Sar Length of Sample, L		R, in cm	1.91 3.00	_	
5. Bulk Dens	ity Determination (Dist	urbed Samples Only): I	N/A				
6. Sample W	eight (Wt. Tube Contai	ning Sample-Wt. of Em	oty Tube), g	grams	0.00	_	Wt. of Tube Containing Sample Wt. of Empty Tube
7. Sample Vo	olume (L x 2.54 cm./inc	h x 3.14R2), cc.			86.83	_	
8. Bulk Dens	ity (Sample Wt./Sampl	e Volume), grams/cc.			0	> 1.2	
9. Standpipe	Used: X	No	Yes, Ind	licate Interr	nal Radius,	cm. N/A	
10. Height of	Water Level Above Ri	m of Test Basin, in inche	es:				
	At the Beginning of Ea At the End of Each Te		5.00 5.00				
11. Rate of V	Vater Level Drop (Add	additional lines if neede	:(t				
	Time, Start of Test Interval, T1	Time End of Test Interval T2		h of Test T, Minutes	3		
	12:00:00	4:00:00	24	10.00			
					_		
					_		
12. Calculation	on of Permeability:	K, (in/hr) = 60 min/h	r x r2/R2 x I	L(in)/T(min	) x ln (H1/H	l2) T=	240.00
	K (in/hr) = 0.00	Classific	ation:	K0			
13. Defects i	n the Sample (Check a	ppropriate items):					
	X None						
	Soil/Tube C	contactLarge	Gravel		Large R	oots	
	Dry Soil	Smearing _		Compa	ction		
	Other - Spe	cify					

	Т	ube Permeameter 1	Job Number: GJ2118024.000 Project: Proposed Site Improvement				
Sample ID:	Profile Pit No.:	TP-3 Samp	ole No.:	T-1	Depth:	2.0'	Client: Shore Point
COUNTY/MU	NICIPALITY Edison		BLOCK		LOT		Lab Tech: MH
1. Test Numb	er <u>1</u>	Replicate (letter)	В	Date Coll	ected		_
2. Material T	ested:	FillX	Test in N	lative Soil			
3. Type of Sa	ample: X	Undisturbed		Disturbed	ł		
4. Sample Di	mensions:	Inside Radius of Sar Length of Sample, L		R, in cm	1.91 3.00	_	
5. Bulk Dens	ity Determination (Dist	urbed Samples Only): I	N/A				
6. Sample W	eight (Wt. Tube Conta	ning Sample-Wt. of Em	oty Tube), g	grams	0.00	_	Wt. of Tube Containing Sample Wt. of Empty Tube
7. Sample Vo	olume (L x 2.54 cm./inc	h x 3.14R2), cc.			86.83	_	
8. Bulk Dens	ity (Sample Wt./Sampl	e Volume), grams/cc.			0	> 1.2	
9. Standpipe	Used: X	No	Yes, Ind	licate Interr	nal Radius,	cm. N/A	
10. Height of	Water Level Above Ri	m of Test Basin, in inche	es:				
	At the Beginning of Ea At the End of Each Te		5.00 5.00				
11. Rate of V	Vater Level Drop (Add	additional lines if neede	d):				
	Time, Start of Test Interval, T1	Time End of Test Interval T2		h of Test T, Minutes			
	12:00:00	4:00:00	24	10.00			
12. Calculation	on of Permeability:	K, (in/hr) = 60 min/h	r x r2/R2 x I	L(in)/T(min	) x ln (H1/H	l2) T=	240.00
	K (in/hr) = 0.00	Classific	ation:	K0			
13. Defects i	n the Sample (Check a	ppropriate items):					
	X None						
	Soil/Tube C	contactLarge	Gravel		Large R	oots	
	Dry Soil	Smearing _		Compa	ction		
	Other - Spe	cify					

Tul	e Permeameter T	Job Number: GJ2118024.000 Project: Proposed Site Improvement			
Sample ID: Profile Pit No.:	TP-4 Sampl	e No.: <u>T-1</u>	Depth:	1.0'	Client: Shore Point
COUNTY/MUNICIPALITY Edison		BLOCK	LOT		Lab Tech: MH
1. Test Number 1	_Replicate (letter)	<u>A</u> Date	Collected		_
2. Material Tested:	Fill X	Test in Native S	oil		
3. Type of Sample: X	Undisturbed	Distu	rbed		
4. Sample Dimensions:	Inside Radius of Sam Length of Sample, L,		m <u>1.91</u> <u>3.00</u>	_	
5. Bulk Density Determination (Distur	bed Samples Only): N	/A			
6. Sample Weight (Wt. Tube Containi	ng Sample-Wt. of Emp	ty 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 Ir	ternal Radius	cm. N/A	
10. Height of Water Level Above Rim	of Test Basin, in inche	s:			
At the Beginning of Eac At the End of Each Test		5.00			
11. Rate of Water Level Drop (Add ad	ditional lines if needed	):			
Time, Start of Test Interval, T1	Time End of Test Interval T2	Length of Te Interval, T, Min			
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/ŀ	12) T=	240.00
K (in/hr) =0.00	Classifica	ation: K	0		
13. Defects in the Sample (Check ap	propriate items):				
X None					
Soil/Tube Co	ntactLarge G	Gravel	Large R	oots	
Dry Soil	Smearing	Con	npaction		
Other - Spec	fy				

Tut	e Permeameter Te	Job Number: GJ2118024.000 Project: Proposed Site Improvement			
Sample ID: Profile Pit No.:	TP-4 Sampl	e No.: <u>T-1</u>	Depth:	1.0'	Client: Shore Point
COUNTY/MUNICIPALITY Edison		BLOCK	LOT		Lab Tech: MH
1. Test Number 1	_Replicate (letter)	B Date 0	Collected		_
2. Material Tested:	Fill X	Test in Native So	bil		
3. Type of Sample: X	Undisturbed	Distur	bed		
4. Sample Dimensions:	Inside Radius of Sam Length of Sample, L,		n <u>1.91</u> <u>3.00</u>	_	
5. Bulk Density Determination (Distur	bed Samples Only): N	/A			
6. Sample Weight (Wt. Tube Containi	ng Sample-Wt. of Empt	ty 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 In	ternal Radius,	cm. N/A	
10. Height of Water Level Above Rim	of Test Basin, in inches	s:			
At the Beginning of Eac At the End of Each Test		5.00 5.00			
11. Rate of Water Level Drop (Add ad	ditional lines if needed	):			
Time, Start of Test Interval, T1	Time End of Test Interval T2	Length of Tes Interval, T, Minu			
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(r	nin) x ln (H1/ŀ	12) T=	_240.00
K (in/hr) =0.00	Classifica	ition: K0	)		
13. Defects in the Sample (Check app	propriate items):				
X None					
Soil/Tube Co	ntactLarge G	Gravel	Large R	oots	
Dry Soil	Smearing	Com	paction		
Other - Speci	fy				

	Т	ube Permeameter 1	Job Number: GJ2118024.000 Project: Proposed Site Improvement				
Sample ID:	Profile Pit No.:	TP-6 Sam	ole No.:	T-1	Depth:	2.0'	Client: Shore Point
COUNTY/MU	NICIPALITY Edison		BLOCK		LOT		Lab Tech: MH
1. Test Numb	er <u>1</u>	Replicate (letter)	Α	Date Col	lected		_
2. Material T	ested:	FillX	Test in N	ative Soil			
3. Type of Sa	ample: X	Undisturbed		Disturbed	Ł		
4. Sample Di	mensions:	Inside Radius of Sa Length of Sample, L		R, in cm	1.91 3.00	_	
5. Bulk Dens	ity Determination (Dist	urbed Samples Only):	N/A				
6. Sample W	eight (Wt. Tube Conta	ning Sample-Wt. of Em	oty Tube), g	grams	0.00	_	Wt. of Tube Containing Sample Wt. of Empty Tube
7. Sample Vo	olume (L x 2.54 cm./inc	h x 3.14R2), cc.			86.83	_	
8. Bulk Dens	ity (Sample Wt./Sampl	e Volume), grams/cc.			0	> 1.2	
9. Standpipe	Used: X	No	Yes, Ind	licate Interr	nal Radius,	cm. N/A	
10. Height of	Water Level Above Ri	m of Test Basin, in inch	es:				
	At the Beginning of Ea At the End of Each Te		5.00 5.00				
11. Rate of V	Vater Level Drop (Add	additional lines if neede	d):				
	Time, Start of Test Interval, T1	Time End of Test Interval T2		h of Test T, Minutes	;		
	12:00:00	4:00:00	24	10.00			
					_		
12. Calculation	on of Permeability:	K, (in/hr) = 60 min/h	r x r2/R2 x	L(in)/T(min	) x ln (H1/H	2) T=	240.00
	K (in/hr) = 0.00	Classific	ation:	K0			
13. Defects i	n the Sample (Check a	ppropriate items):					
	X None						
	Soil/Tube C	ContactLarge	Gravel		Large R	oots	
	Dry Soil	Smearing _		Compa	ction		
	Other - Spe	cify					

	т	ube Permeameter	Job Number: GJ2118024.000				
Sample ID:	Profile Pit No.:	TP-6 Sam	ple No.:	T-1	Depth:	2.0'	Project: Proposed Site Improvement Client: Shore Point
COUNTY/MU	NICIPALITY Edison		BLOCK		LOT		Lab Tech: MH
1. Test Numb	er <u>1</u>	Replicate (letter)	В	_Date Coll	lected		_
2. Material T	ested:	FillX	Test in N	Native Soil			
3. Type of Sa	ample: X	Undisturbed		Disturbed	ł		
4. Sample Di	mensions:	Inside Radius of Sa Length of Sample,		R, in cm	1.91 3.00	_	
5. Bulk Dens	ity Determination (Dist	urbed Samples Only):	N/A				
6. Sample W	eight (Wt. Tube Conta	ining Sample-Wt. of Err	ipty Tube), ç	grams	0.00	_	Wt. of Tube Containing Sample Wt. of Empty Tube
7. Sample Vo	olume (L x 2.54 cm./ine	ch x 3.14R2), cc.			86.83	_	
8. Bulk Dens	ity (Sample Wt./Samp	e Volume), grams/cc.			0	> 1.2	
9. Standpipe	Used: X	No	Yes, Inc	dicate Interr	nal Radius,	cm. N/A	
10. Height of	Water Level Above R	m of Test Basin, in inch	ies:				
	At the Beginning of Each Te		5.0 5.0				
11. Rate of V	Vater Level Drop (Add	additional lines if neede	ed):				
	Time, Start of Test Interval, T1	Time End of Test Interval T2	0	th of Test T, Minutes	5		
	12:00:00	4:00:00	24	40.00			
12. Calculation	on of Permeability:	K, (in/hr) = 60 min/l	nr x r2/R2 x	L(in)/T(min	) x ln (H1/H	l2) T=	240.00
	K (in/hr) =0.00	Classifi	cation:	К0			
13. Defects i	n the Sample (Check a	ppropriate items):					
	X None						
	Soil/Tube (	ContactLarge	Gravel		Large R	oots	
	Dry Soil	Smearing		Compa	ction		
Other - Specify							

	Т	ube Permeameter 1	Job Number: GJ2118024.000				
Sample ID:	Profile Pit No.:	TP-7 Samp	le No.:	T-1	Depth:	2.0'	Project: Proposed Site Improvement Client: Shore Point
COUNTY/MU	NICIPALITY Edison		BLOCK		LOT		Lab Tech: MH –
1. Test Numb	er <u>1</u>	Replicate (letter)	Α	_Date Coll	lected		_
2. Material T	ested:	FillX	Test in N	lative Soil			
3. Type of Sa	ample: X	Undisturbed		Disturbed	b		
4. Sample Di	mensions:	Inside Radius of Sar Length of Sample, L		R, in cm	1.91 3.00	_	
5. Bulk Dens	ity Determination (Dist	urbed Samples Only): I	N/A				
6. Sample W	eight (Wt. Tube Conta	ning Sample-Wt. of Em	oty Tube), g	grams	0.00	_	Wt. of Tube Containing Sample Wt. of Empty Tube
7. Sample Vo	olume (L x 2.54 cm./ind	h x 3.14R2), cc.			86.83	_	
8. Bulk Dens	ity (Sample Wt./Sampl	e Volume), grams/cc.			0	> 1.2	
9. Standpipe	Used: X	No	Yes, Ind	licate Interr	nal Radius,	cm. N/A	
10. Height of	Water Level Above R	m of Test Basin, in inche	es:				
	At the Beginning of Ea At the End of Each Te		5.00 5.00				
11. Rate of V	Vater Level Drop (Add	additional lines if neede	:(t				
	Time, Start of Test Interval, T1	Time End of Test Interval T2		h of Test T, Minutes	3		
	12:00:00	4:00:00	24	10.00			
					_		
					_		
12. Calculation	on of Permeability:	K, (in/hr) = 60 min/h	r x r2/R2 x	L(in)/T(min	) x ln (H1/H	l2) T=	240.00
	K (in/hr) = 0.00	Classific	ation:	K0			
13. Defects i	n the Sample (Check a	ppropriate items):					
	X None						
	Soil/Tube (	ContactLarge	Gravel		Large R	oots	
	Dry Soil	Smearing _		Compa	ction		
	Other - Spe	cify					

	т	ube Permeameter	Job Number: GJ2118024.000				
Sample ID:	Profile Pit No.:	TP-7 San	ple No.:	T-1	Depth:	2.0'	Project: Proposed Site Improvement Client: Shore Point
COUNTY/MU	NICIPALITY Edison		BLOCK		LOT		Lab Tech: MH –
1. Test Numb	er <u>1</u>	Replicate (letter)	В	_Date Col	lected		_
2. Material T	ested:	Fill X	Test in N	Native Soil			
3. Type of Sa	ample: X	Undisturbed		Disturbed	b		
4. Sample Di	mensions:	Inside Radius of S Length of Sample,		R, in cm	1.91 3.00	_	
5. Bulk Dens	ity Determination (Dis	urbed Samples Only):	N/A				
6. Sample W	eight (Wt. Tube Conta	ning Sample-Wt. of Er	າpty Tube), ູ	grams	0.00	_	Wt. of Tube Containing Sample Wt. of Empty Tube
7. Sample Vo	olume (L x 2.54 cm./in	h x 3.14R2), cc.			86.83	_	
8. Bulk Dens	ity (Sample Wt./Samp	e Volume), grams/cc.			0	> 1.2	
9. Standpipe	Used: X	No	Yes, Inc	dicate Interr	nal Radius,	cm. N/A	
10. Height of	Water Level Above R	m of Test Basin, in inc	nes:				
	At the Beginning of E At the End of Each Te		5.0 5.0				
11. Rate of V	Vater Level Drop (Add	additional lines if need	ed):				
	Time, Start of Tes Interval, T1	Time End of Tes Interval T2	0	th of Test T, Minutes	3		
	12:00:00	4:00:00	24	40.00			
					_		
					_		
12. Calculation	on of Permeability:	K, (in/hr) = 60 min/	hr x r2/R2 x	L(in)/T(min	) x ln (H1/H	l2) T=	240.00
	K (in/hr) =0.00	Classif	cation:	К0			
13. Defects i	n the Sample (Check a	ppropriate items):					
	X None						
	Soil/Tube	ContactLarge	e Gravel		Large R	oots	
	Dry Soil	Smearing		Compa	ction		
	Other - Sp	cify					



# **APPENDIX C Supplemental Information** (USCS, Terms & Symbols)



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

# **UNIFIED SOIL CLASSIFICATION SYSTEM**

	MAJOR DIVISIONS		LETTER SYMBOL	TYPICAL DESCRIPTIONS
	GRAVEL AND	CLEAN GRAVELS	GW	WELL-GRADED GRAVELS, GRAVEL-SAND MIXTURES, LITTLE OR NO FINES
	GRAVELLY SOILS	(LITTLE OR NO FINES)	GP	POORLY-GRADED GRAVELS, GRAVEL- SAND MIXTURES, LITTLE OR NO FINES
COARSE GRAINED SOILS	MORE THAN 50% OF COARSE FRACTION	GRAVELS WITH FINES	GM	SILTY GRAVELS, GRAVEL-SAND-SILT MIXTURES
COLO	RETAINED ON NO. 4 SIEVE	(APPRECIABLE AMOUNT OF FINES)	GC	CLAYEY GRAVELS, GRAVEL-SAND-CLAY MIXTURES
	SAND AND SANDY	CLEAN SAND (LITTLE OR NO	SW	WELL-GRADED SANDS, GRAVELLY SANDS, LITTLE OR NO FINES
	SOILS	FINES)	SP	POORLY-GRADED SANDS, GRAVELLY SANDS, LITTLE OR NO FINES
MORE THAN	MORE THAN 50% OF	SANDS WITH	SM	SILTY SANDS, SAND-SILT MIXTURES
50% OF MATERIAL IS LARGER THAN NO. 200 SIEVE SIZE	COARSE FRACTION PASSING NO. 4 SIEVE	FINES (APPRECIABLE AMOUNT OF FINES)	SC	CLAYEY SANDS, SAND-CLAY MIXTURES
FINE	SILTS		ML	INORGANIC SILTS AND VERY FINE SANDS, ROCK FLOUR, SILTY OR CLAYEY FINE SANDS OR CLAYEY SILTS WITH SLIGHT PLASTICITY
GRAINED SOILS	AND CLAYS	<u>LESS</u> THAN 50	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	0.11 70		МН	INORGANIC SILTS, MICACEOUS OR DIATOMACEOUS FINE SAND OR SILTY SOILS
MATERIAL IS <u>SMALLER</u> THAN NO. 200 SIEVE	SILTS AND CLAYS	LIQUID LIMITS <u>GREATER</u> THAN 50	СН	INORGANIC CLAYS OF HIGH PLASTICITY, FAT CLAYS
SIZE			ОН	ORGANIC CLAYS OF MEDIUM TO HIGH PLASTICITY, ORGANIC SILTS
ŀ	HIGHLY ORGANIC SOILS		PT	PEAT, HUMUS, SWAMP SOILS WITH HIGH ORGANIC CONTENTS

SOIL CLASSIFICATION CHART

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

COMPACTNESS*

#### **GRADATION***

# Sand and/or Gravel

R	RELATIVE DENSITY	% FINER BY WEIGHT
	LOOSE	TRACE 1% TO 10% LITTLE 10% TO 20% SOME 20% TO 35% AND 35% TO 50%

CONSISTENCY* Clay and/or Silt

RANGE OF SHEARING STRENGTH IN POUNDS PER SQUARE FOOT

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

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CHALFONT, PA 215.712.2700

#### Other Office Locations: SOUTHBOROUGH, MA 508.485.0755

ROCKY HILL, CT 860.726.7889



# GEOTECHNICAL TERMS AND SYMBOLS

#### SAMPLE IDENTIFICATION

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

#### SOIL PROPERTY SYMBOLS

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

#### DRILLING AND SAMPLING SYMBOLS

- NE: Not Encountered (Groundwater was not encountered).
- Split-Spoon 1 3/8" I.D., 2" O.D., except where noted. SS:
- Shelby Tube 3" O.D., except where noted. ST:
- Auger Sample. AU:
- Diamond Bit. OB:
- CB: Carbide Bit
- WS: Washed Sample.

#### RELATIVE DENSITY AND CONSISTENCY CLASSIFICATION

#### Term (Non-Cohesive Soils)

<u>Term (Non-O</u>	<u>Cohesive Soils)</u>		<u>Standard P</u>	enetratio	on Resistance
Very Loose Loose Medium Den Dense Very Dense	se			0-4 4-1 10-3 30-5 Over	0 30 50
<u>Term (Cohe</u>	sive Soils)	<u>Qu (TSF)</u>			
Very Soft Soft Firm (Mediun Stiff Very Stiff Hard	n)	$\begin{array}{c} 0 - 0.25 \\ 0.25 - 0.50 \\ 0.50 - 1.00 \\ 1.00 - 2.00 \\ 2.00 - 4.00 \\ 4.00 + \end{array}$			
PARTICLE	SIZE				
Boulders Cobbles Gravel	8 in.+ 8 in3 in. 3 in5mm	Coarse Sand Medium Sand Fine Sand	5mm-0.6mm 0.6mm-0.2mm 0.2mm-0.074mm	Silt Clay	0.074mm-0.005mm -0.005mm

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	C	Other Office Locations:	
WARREN, NJ	CHALFONT, PA	Southborough, MA	ROCKY HILL, CT
908.668.7777	215.712.2700	508.485.0755	860.726.7889

PHILADELPHIA, PA 215.848.2323



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.

		Other Office Locations:		
WARREN, NJ	CHALFONT, PA 215.712.2700	Southborough, MA	ROCKY HILL, CT	PHILADELPHIA, PA
908.668.7777		508.485.0755	860.726.7889	215.848.2323



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										
	ESHGW USDA Classification Permeability Test Result										
Boring #	(fbgs/NAVD 88)	@ Test Depth	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

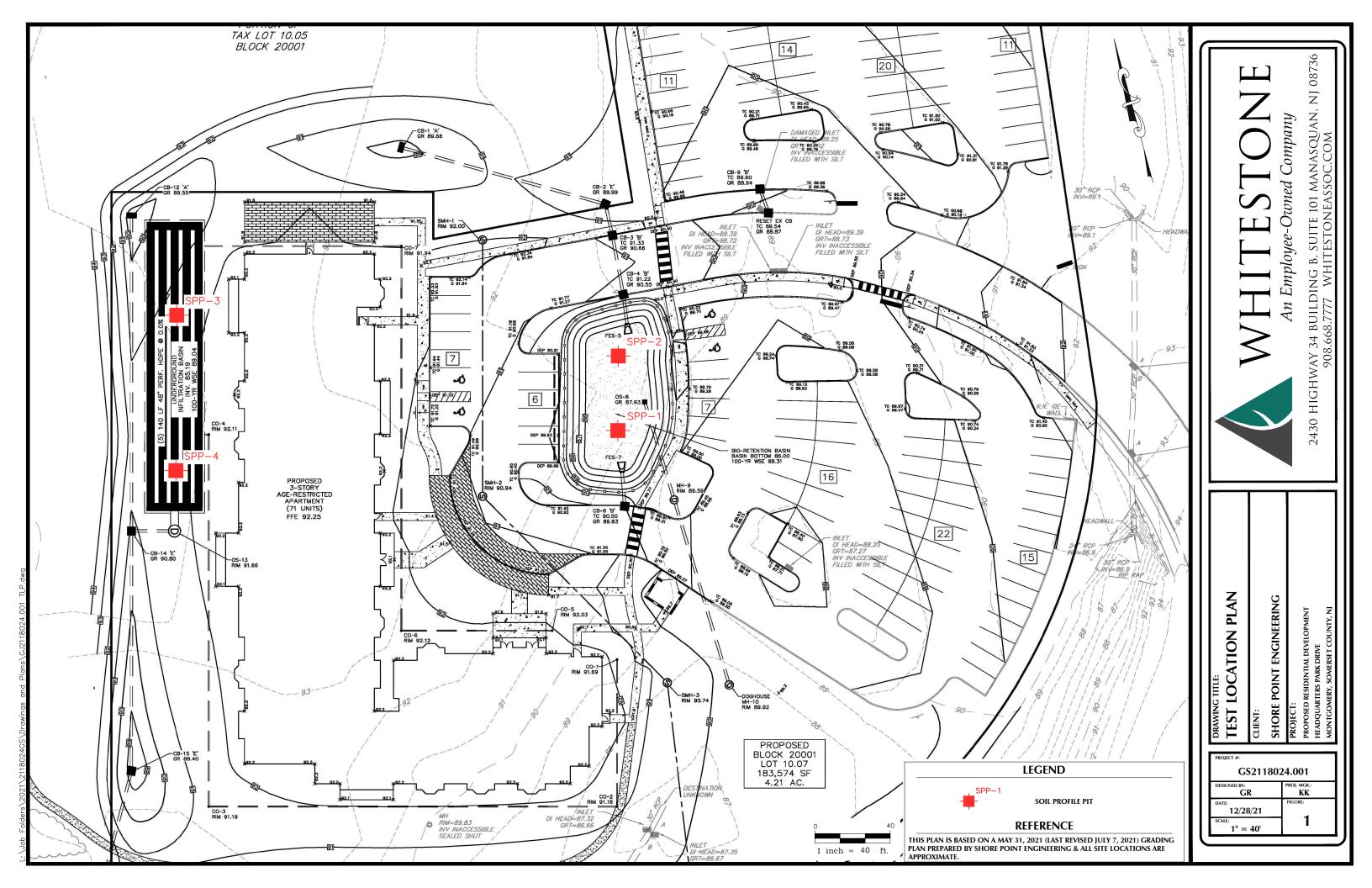
Laurence W. Keller, P.E. Vice President

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### Environmental & Geotechnical Engineers & Consultants



# **FIGURE 1 Test Location Plan**





# **APPENDIX A Records of Subsurface Exploration**



## **RECORD OF** WHITESTONE SUBSURFACE EXPLORATION

Soil Profile Pit No.: SPP-1

Project:	-	Developm					WAI P	Project No.:	GS2118024.001	
				ntgomery,	Somerset Count		1	Client:	Shore Point Engin	-
Surface Eleva			feet		Date Started:		Water Depth			d Seasonal High
Termination I	-		feet bgs		Date Comple		(feet bgs)			r Depth   Elevation
Proposed Lo		SWM Area			Logged By:	RL	During: NE	<u> </u>		et bgs)   (feet)
Excavating M	lethod:	Test Pit Ex	xcavation	1	Contractor:	TS	At Completion: NE	▽	At Completion:	NE
Test Method:	:	Visual Obs	servation		Rig Type:	Backhoe	24 Hours:	<u></u> ₹		
SAMPLE	INFORM	ATION	DE	PTH	HORIZON	[	DESCRIPTION OF MAT			REMARKS
Depth (feet)	Number	Туре	f	eet			(Classification)			
			0.0							
0 - 0.3	S-1	BAG	0.0	0 - 0.3	TOPSOIL	4" Topsoil				
			1 ]	0.3 - 7	RESIDUAL	Dark Red (2.5YR 3/6) CLAY; 2	25% Gravel, 10% Cobble; Fine,	Strong Blocky Stru	cture; Moist; Friable;	
			1.0			No Roots				
			1.0							
			2.0							
			-							
			3.0							
0.3 - 7	S-2	BAG	-							
		-	4.0							
										3" Localized Sand Layer
			-							4.0 fbgs to 4.25 fbgs; Possible Fill
			5.0							
										2 Tube Permeameter
			_							Samples Collected @ 5.0 fbgs
			6.0							0.0 1093
			_							
			7.0							
				7 - 12	WEATHERED	Dark Red (2.5YR 3/6) Weathe	ered Rock			
			_		ROCK					
			8.0							
			9.0							
			<u> </u>							
7 - 12	S-3	BAG								
1 12		200	10.0							
			10.0							
			11.0							
			12.0							
			12.0			Soil Profile Pit SPP-1 Termina	ited at a Depth of 12.0 Feet Belo	w Ground Surface		
			10.0							
			13.0							
			14.0							
			-							
			15.0							



## **RECORD OF** WHITESTONE SUBSURFACE EXPLORATION

Soil Profile Pit No.: SPP-2

		Developm				WAI Project No.: GS2118024.001	
				ntgomery,	Somerset Count		-
Surface Eleva			feet		Date Started:		Seasonal High
Termination D	-		feet bgs	6	Date Comple		Depth   Elevation
Proposed Loc		SWM Area			Logged By:		et bgs)   (feet)
Excavating M		Test Pit Ex			Contractor:	TS At Completion: NE   $\heartsuit$ At Completion:	NE
Test Method:		Visual Obs	servation	1	Rig Type:	Backhoe 24 Hours:   T	
SAMPLE	INFORM	ATION	DE	PTH	HORIZON	DESCRIPTION OF MATERIALS	REMARKS
Depth (feet)	Number	Туре	1	feet	HORIZON	(Classification)	I E III AI I I
			0.0				
0 - 0.3	S-1	BAG	0.0	0 - 0.3	TOPSOIL	3" Topsoil	
		-		0.3 - 3	FILL	Dark Red (2.5YR 3/6) CLAY; 20% Gravel, 20% Cobble; Fine, Strong Blocky Structure; Moist; Friable;	Reworked Natural Soil
			1.0			No Roots	
			1.0	-			
0.3 - 3	S-2	BAG					
			2.0	-			
			-	1			
			3.0				
				3 - 10	RESIDUAL	Dark Red (2.5YR 3/6) CLAY; 20% Gravel, 10% Cobble; Fine, Strong Blocky Structure; Moist; Friable; No Roots	
			-	1			
			4.0				
			5.0				
							2 Tube Permeameter
			- 1				Samples Collected @ 5.0 fbgs
			6.0			Ň	
			_				
3 - 10	S-3	BAG					
			7.0				
			_				
			8.0				
			-				
			_				
			9.0				
				1			
			_				
			10.0				
			1	10 - 12	WEATHERED	Dark Red (2.5YR 3/6) Weathered Rock	
			_		ROCK		
			11.0				
10 - 12	S-4	BAG		1			
			12.0	]			
			12.0			Soil Profile Pit SPP-2 Terminated at a Depth of 12.0 Feet Below Ground Surface	
			-	1			
			13.0	4			
			-	1			
			14.0				
			-	1			
			15.0				



## **RECORD OF** WHITESTONE SUBSURFACE EXPLORATION

Soil Profile Pit No.: SPP-3

Project:	Proposed	d Developm	ient				WAIF	Project No.:	GS2118024.001	
				ntgomerv.	Somerset Coun	y, NJ		Client:	Shore Point Engir	neering
Surface Eleva			feet	5 7,	Date Started		Water Depth			d Seasonal High
Fermination E		10.0	feet bgs		Date Comple		(feet bgs)			r Depth   Elevation
Proposed Loc	-	SWM Are	-		-	RL	During: NE			et bgs)   (feet)
-					Logged By:					
Excavating M		Test Pit E			Contractor:	TS	At Completion:NE		At Completion:	NE
Test Method:		Visual Ob	servation		Rig Type:	Backhoe	24 Hours:	⊥ <u></u> ▼		
SAMPLE	INFORM	ATION	DE	PTH	HORIZON		DESCRIPTION OF MAT			REMARKS
Depth (feet)	Number	Туре	f	eet			(Classification)			
			0.0							
0 - 0.3	S-1	BAG		0 - 0.3	TOPSOIL	3" Topsoil				
			L _	0.3 - 5	RESIDUAL	Dark Red (2.5YR 3/6) CLA Moist; Firm; No Roots	Y; 25% Gravel, 10% Cobble, 10% I	Boulder; Fine, Stro	ng Blocky Structure;	
			1.0			WOISI, FIITH, NO ROOIS				
			2.0							
			2.0							
0.3 - 5	S-2	BAG								
			3.0							
			-							
			4.0							
			-							
			5.0							
			1 —	5 - 10	WEATHERED	Dark Red (2.5YR 3/6) We	athered Rock			2 Tube Permeameter
					ROCK					Samples Collected @ 5.0 fbgs
			6.0							5.0 lbgs
			_							
			7.0							
			·							Could Not Collect Tube
5 - 10	S-3									Permeameter Samples @
5-10	5-5									7.0 fbgs Due to Weathere Rock
			8.0							RUCK
			-							
			9.0							
			-							
			10.0							
T						Soil Profile Pit SPP-3 Terr Refusal	ninated at a Depth of 10.0 Feet Belo	ow Ground Surface	Due to Bucket	
			-			Nelusai				
			11.0							
			-							
			12.0							
				1						
			_							
			13.0							
			_							
			14.0							
			14.0							
			-							
			15.0							



## RECORD OF SUBSURFACE EXPLORATION

Soil Profile Pit No.: SPP-4

Project:		Developm					WAI P	roject No.:	GS2118024.001	
_ocation:	Headqua	rters Park	Drive; Mo	ntgomery,	Somerset Count	y, NJ		Client:	Shore Point Engin	neering
Surface Eleva	ation: ±	94.0	feet		Date Started:	12/13/2021	Water Depth		Estimate	d Seasonal High
Fermination E	Depth:	11.0	feet bgs	5	Date Comple	ted: 12/13/2021	(feet bgs)	(feet)		er Depth   Elevation
Proposed Loo	cation:	SWM Area	а		Logged By:	RL	During: NE	<u> </u>	(f	eet bgs)   (feet)
Excavating M	ethod:	Test Pit E	xcavatior	า	Contractor:	TS	At Completion: NE		At Completion:	NE
Fest Method:		Visual Ob	servation	l	Rig Type:	Backhoe	24 Hours:	<u> </u>		
SAMPLE	INFORM	IATION	DE	EPTH	HORIZON		DESCRIPTION OF MATE	ERIALS		REMARKS
Depth (feet)	Number	Туре	1	feet			(Classification)			
			0.0							
0 - 0.3	S-1	BAG		0 - 0.3	TOPSOIL	3" Topsoil				1
				0.3 - 2.5	FILL	Dark Red (2.5YR 3/6) CLAY No Roots	; 20% Gravel, 10% Cobble; Fine, S	Strong Blocky Stru	cture; Moist; Firm;	Buried PVC
			1.0			10 10003				
0.3 - 2.5	S-2	BAG	-							
			2.0							
			- 1	2.5 - 5	RESIDUAL	Dark Red (2.5YR 3/6) CLAY	; 25% Gravel, 10% Cobble, 10% B	oulder; Fine, Stror	ng Blocky Structure;	4
			3.0			Moist; Firm; No Roots			_ ,,	
2.5 - 5	S-3	BAG								
2.5 - 5	0-0	BAG	4.0							
			5.0	5 - 11	WEATHERED	Dark Red (2.5YR 3/6) Weat	hered Rock			2 Tube Permeameter
				5-11	ROCK	Dark Red (2.511 5/0) Weat				Samples Collected @
			6.0							5.0 fbgs
			0.0							
			_							
			7.0							
			-							Could Not Collect Tube
			_							Permeameter Samples @ 7.0 fbgs Due to Weathere
	<u> </u>	510	8.0							Rock
5 - 11	S-4	BAG								
				-						
			9.0							
			-	1						
			10.0	.						
			11.0	1						
			11.0			Soil Profile Pit SPP-4 Termi	nated at a Depth of 11.0 Feet Belov	w Ground Surface	Due to Bucket	
						Refusal				
			12.0							
			-	1						
			-	4						
			13.0							
				1						
			-	-						
			14.0							
				]						
			-	-						
			15.0							
			1							



# **APPENDIX B Permeability Test Results**

	т	ube Permea	Job Number: GJ2118024.001 Project: Proposed Site Improvement				
Sample ID:	Profile Pit No.:	SPP-1	Sample No.:	<u>T-1</u>	Depth:	5.0'	Client: Shore Point Lab Tech: MH
COUNTY/MU	JNICIPALITY Montgom	ery	BLOCK		LOT		
1. Test Numb	ber <u>1</u>	Replicate (le	etter) A	Date Colle	ected		_
2. Material T	ested:	Fill	X Test in	Native Soil			
3. Type of S	ample: X	Undisturbed	t	Disturbed	l		
4. Sample D	)imensions:		us of Sample Tube, ample, L, in inches	R, in cm	1.91 3.00	_	
5. Bulk Dens	sity Determination (Distu	bed Samples	Only): N/A				
6. Sample W	Veight (Wt. Tube Contair	ing Sample-W	t. of Empty Tube), g	rams	0.00	_	Wt. of Tube Containing Sample Wt. of Empty Tube
7. Sample V	olume (L x 2.54 cm./incl	x 3.14R2), cc			86.83	_	
8. Bulk Dens	sity (Sample Wt./Sample	Volume), gran	ns/cc.		0	> 1.2	
9. Standpipe	e Used: X	No	Yes, In	dicate Interna	al Radius, cr	m. N/A	
10. Height o	f Water Level Above Rir	n of Test Basin	, in inches:				
	At the Beginning of Eac At the End of Each Tes			00			
11. Rate of V	Water Level Drop (Add a	dditional lines i	if needed):				
	Time, Start of Test Interval, T1	Time End Interv		jth of Test I, T, Minutes			
	12:00:00	4:00	):00 2	240.00			
12 Calculati	ion of Permeability:	K (in/br) = (	60 min/hr x r2/R2 x l	(in)/T(min) x	In (H1/H2)	T=	240.00
	K (in/hr) = 0.00		Classification:	K0	(III (III/II2)		
13 Defects	in the Sample (Check ap						
	X None		5).				
		ontact	_Large Gravel		Large Roots		
			earing		•		
	Other - Spec			_ 501112000			

	Tu	be Permeameter T	Job Number: GJ2118024.001 Project: Proposed Site Improvement						
Sample ID:	Profile Pit No.:	SPP-1 Sampl	e No.:	T-1	Depth:	5.0'		Shore Point	
COUNTY/MUN	ICIPALITY Montgome	ry	BLOCK		LOT		- Lab Tech:	MIT	
1. Test Numbe	r <u>1</u>	Replicate (letter)	В	Date Colle	ected		_		
2. Material Tes	sted:	_Fill X	Test in Na	ative Soil					
3. Type of Sar	mple: X	Undisturbed		Disturbed					
4. Sample Din	nensions:	Inside Radius of Samp Length of Sample, L, in		in cm	1.91 3.00	_			
5. Bulk Densit	y Determination (Disturb	ed Samples Only): N/A	N Contraction of the second se						
6. Sample We	ight (Wt. Tube Containii	ng Sample-Wt. of Empty	Tube), gra	ms	0.00			Wt. of Tube Containing Sample Wt. of Empty Tube	
7. Sample Vol	ume (L x 2.54 cm./inch	x 3.14R2), cc.			86.83	_			
8. Bulk Density	y (Sample Wt./Sample \	/olume), grams/cc.			0	> 1.2			
9. Standpipe U	Jsed: X	No	Yes, India	cate Interna	al Radius, cr	m. N/A			
10. Height of V	Water Level Above Rim	of Test Basin, in inches:							
	At the Beginning of Each At the End of Each Test		5.00 5.00						
11. Rate of W	ater Level Drop (Add ad	ditional lines if needed):							
	Time, Start of Test Interval, T1	Time End of Test Interval T2		n of Test T, Minutes					
-	12:00:00	4:00:00	240	0.00	_				
-					_				
_									
12. Calculation	n of Permeability:	K, (in/hr) = 60 min/hr x	r2/R2 x L(ii	n)/T(min) x	 : In (H1/H2)	T=	240.00		
ł	K (in/hr) =0.00	Classifica	tion:	К0					
13. Defects in	the Sample (Check app	ropriate items):							
<u>)</u>	K None								
-	Soil/Tube Cor	tactLarge Gra	avel	I	Large Roots	6			
-	Dry Soil	Smearing		Compactio	n				
-	Other - Specif	у							

	٦	Tube Perme	Job Number: GJ2118024.001 Project: Proposed Site Improvement				
Sample ID:	Profile Pit No.:	SPP-2	Sample No	.: <u>T-1</u>	Depth:	5.0'	Client: Shore Point Lab Tech: MH
COUNTY/MU	NICIPALITY Montgor	nery	BLC	ОСК	LOT		
1. Test Numb	er <u>1</u>	Replicate (I	etter)	A Date Col	lected		_
2. Material T	ested:	Fill	X Tes	at in Native Soil			
3. Type of Sa	ample: X	Undisturbed	t	Disturbed	d		
4. Sample Di	mensions:		us of Sample Tu ample, L, in incl		1.91 3.00	_	
5. Bulk Dens	ity Determination (Dist	urbed Samples	Only): N/A				
6. Sample W	eight (Wt. Tube Conta	ining Sample-W	t. of Empty Tub	e), grams	0.00	_	Wt. of Tube Containing Sample Wt. of Empty Tube
7. Sample Vo	olume (L x 2.54 cm./inc	h x 3.14R2), cc			86.83	_	
8. Bulk Dens	ity (Sample Wt./Sample	e Volume), grar	ns/cc.		0	> 1.2	
9. Standpipe	Used: X	No	Yes	s, Indicate Intern	nal Radius, ci	m. N/A	
10. Height of	Water Level Above Ri	m of Test Basir	, in inches:				
	At the Beginning of Ea At the End of Each Te		I, H1	5.00 5.00			
11. Rate of V	Vater Level Drop (Add	additional lines	if needed):				
	Time, Start of Test Interval, T1	Time Ene Interv		Length of Test erval, T, Minutes	5		
	12:00:00	4:00	):00	240.00			
12. Calculatio	on of Permeability:	K, (in/hr) =	60 min/hr x r2/R	2 x L(in)/T(min) :	x ln (H1/H2)	T=	240.00
	K (in/hr) = 0.00		Classification:		( )		
13. Defects i	n the Sample (Check a	ppropriate item	s):				
	X None		- /				
		ontact	Large Gravel		Large Roots	5	
				Compacti		-	
	Other - Spe				-		

	Т	ibe Permeame	Job Number: GJ2118024.001 Project: Proposed Site Improvement				
Sample ID:	Profile Pit No.:	SPP-2 S	ample No.:	<u>T-1</u>	Depth:	5.0'	Client: Shore Point Lab Tech: MH
COUNTY/MUN	ICIPALITY Montgome	ry	BLOCK		LOT		
1. Test Number	<u> </u>	Replicate (letter)	В	Date Colle	ected		_
2. Material Tes	ted:	_Fill	C Test in N	lative Soil			
3. Type of Sam	nple: X	Undisturbed		Disturbed			
4. Sample Dim	ensions:	Inside Radius of Length of Sample		R, in cm	1.91 3.00	-	
5. Bulk Density	Determination (Distur	ped Samples Only)	N/A				
6. Sample Wei	ght (Wt. Tube Contain	ng Sample-Wt. of I	Empty Tube), gr	ams	0.00	_	Wt. of Tube Containing Sample Wt. of Empty Tube
7. Sample Volu	ume (L x 2.54 cm./inch	x 3.14R2), cc.			86.83	_	
8. Bulk Density	v (Sample Wt./Sample	Volume), grams/cc			0	> 1.2	
9. Standpipe U	sed: X	No	Yes, Inc	licate Interna	al Radius, cr	n. N/A	
10. Height of W	Vater Level Above Rim	of Test Basin, in in	ches:				
	t the Beginning of Eac t the End of Each Test		<u>5.0</u> 5.0				
11. Rate of Wa	ater Level Drop (Add a	ditional lines if nee	ded):				
	Time, Start of Test Interval, T1	Time End of T Interval T2		th of Test , T, Minutes			
	12:00:00	4:00:00	2	40.00			
_					-		
_					-		
12. Calculation	of Permeability:	K, (in/hr) = 60 mi	n/hr x r2/R2 x L	(in)/T(min) x	In (H1/H2)	T=	240.00
к	(in/hr) = 0.00	Class	sification:	K0			
13. Defects in t	the Sample (Check ap	propriate items):					
х	None						
-	Soil/Tube Co	ntactLarg	ge Gravel	I	Large Roots	5	
_	Dry Soil	Smearing		_ Compactio	n		
-	Other - Spec	fy					

	Τι	be Permeamet	Job Number: GJ2118024.001 Project: Proposed Site Improvement				
Sample ID:	Profile Pit No.:	SPP-3 Sa	mple No.:	<u>T-1</u>	Depth:	5.0'	Client: Shore Point Lab Tech: MH
COUNTY/MUN	ICIPALITY Montgome	ry	BLOCK		LOT		
1. Test Number	1	Replicate (letter)	Α	Date Colle	ected		_
2. Material Tes	ted:	_FillX	Test in N	lative Soil			
3. Type of Sam	nple: X	Undisturbed		Disturbed			
4. Sample Dim	ensions:	Inside Radius of S Length of Sample		R, in cm	1.91 3.00	_	
5. Bulk Density	Determination (Disturb	ed Samples Only):	N/A				
6. Sample Wei	ght (Wt. Tube Containi	ng Sample-Wt. of E	mpty Tube), gr	ams	0.00	_	Wt. of Tube Containing Sample Wt. of Empty Tube
7. Sample Volu	ime (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 U	sed: X	_No	Yes, Ind	licate Interna	al Radius, cr	m. N/A	
10. Height of W	/ater Level Above Rim	of Test Basin, in inc	hes:				
	t the Beginning of Eacl t the End of Each Test		<u>5.0</u> 5.0				
11. Rate of Wa	ater Level Drop (Add ad	Iditional lines if need	ed):				
	Time, Start of Test Interval, T1	Time End of Te Interval T2		th of Test , T, Minutes			
	12:00:00	4:00:00	24	40.00	]		
-							
_					_		
12. Calculation	of Permeability:	K, (in/hr) = 60 min	/hr x r2/R2 x L	(in)/T(min) x	 (In (H1/H2)	T=	240.00
к	(in/hr) =0.00	Classi	fication:	К0			
13. Defects in t	he Sample (Check app	propriate items):					
x	None						
_	Soil/Tube Co	ntactLarg	e Gravel		Large Roots	6	
_	Dry Soil	Smearing		_ Compactio	on		
_	Other - Speci	fy					

	Т	ube Permeame	Job Number: GJ2118024.001 Project: Proposed Site Improvement				
Sample ID:	Profile Pit No.:	SPP-3	Sample No.:	<u>T-1</u>	Depth:	5.0'	Client: Shore Point Lab Tech: MH
COUNTY/MUN	ICIPALITY Montgome	ery	BLOCK		LOT		
1. Test Number	r <u>1</u>	Replicate (letter)	В	Date Colle	ected		_
2. Material Tes	sted:	Fill	X Test in N	lative Soil			
3. Type of Sam	nple: X	Undisturbed		Disturbed			
4. Sample Dim	ensions:	Inside Radius of Length of Sampl		R, in cm	1.91 3.00		
5. Bulk Density	Determination (Distur	bed Samples Only)	: N/A				
6. Sample Wei	ight (Wt. Tube Contain	ing Sample-Wt. of	Empty Tube), gr	ams	0.00	_	Wt. of Tube Containing Sample Wt. of Empty Tube
7. Sample Volu	ume (L x 2.54 cm./inch	x 3.14R2), cc.			86.83	_	
8. Bulk Density	v (Sample Wt./Sample	Volume), grams/cc			0	> 1.2	
9. Standpipe U	lsed: X	No	Yes, Ind	licate Interna	al Radius, cr	m. N/A	
10. Height of V	Vater Level Above Rim	of Test Basin, in ir	nches:				
	t the Beginning of Eac t the End of Each Tes		<u>5.0</u> 5.0				
11. Rate of Wa	ater Level Drop (Add a	dditional lines if nee	eded):				
	Time, Start of Test Interval, T1	Time End of T Interval T2		th of Test , T, Minutes			
F	12:00:00	4:00:00	24	40.00	]		
_					_		
_					_		
12. Calculation	of Permeability:	K, (in/hr) = 60 m	in/hr x r2/R2 x L	(in)/T(min) x	In (H1/H2)	T=	240.00
к	(in/hr) = 0.00	Clas	sification:	К0			
13. Defects in	the Sample (Check ap	propriate items):					
x	None						
_		ntactLar	ge Gravel	I	Large Roots	6	
_	Dry Soil	Smearing	]	_ Compactio	n		
-	Other - Spec	ify					

	Τι	ibe Permeame	Job Number: GJ2118024.001 Project: Proposed Site Improvement				
Sample ID:	Profile Pit No.:	SPP-4 S	Sample No.:	<u>T-1</u>	Depth:	5.0'	Client: Shore Point Lab Tech: MH
COUNTY/MUN	ICIPALITY Montgome	ry	BLOCK		LOT		
1. Test Number	1	Replicate (letter)	Α	Date Colle	ected		_
2. Material Tes	ited:	_Fill	X Test in N	lative Soil			
3. Type of Sam	nple: X	Undisturbed		Disturbed			
4. Sample Dim	ensions:	Inside Radius of Length of Sampl		R, in cm	1.91 3.00	-	
5. Bulk Density	Determination (Disturb	ed Samples Only)	: N/A				
6. Sample Wei	ght (Wt. Tube Containi	ng Sample-Wt. of	Empty Tube), gr	ams	0.00	-	Wt. of Tube Containing Sample Wt. of Empty Tube
7. Sample Volu	ume (L x 2.54 cm./inch	x 3.14R2), cc.			86.83	_	
8. Bulk Density	v (Sample Wt./Sample )	Volume), grams/cc			0	> 1.2	
9. Standpipe U	sed: X	No	Yes, Ind	licate Interna	al Radius, cr	n. N/A	
10. Height of V	Vater Level Above Rim	of Test Basin, in ir	nches:				
	t the Beginning of Each t the End of Each Test		<u>5.0</u> 5.0				
11. Rate of Wa	ater Level Drop (Add ad	Iditional lines if nee	eded):				
	Time, Start of Test Interval, T1	Time End of T Interval T2		th of Test , T, Minutes			
F	12:00:00	4:00:00	2	40.00			
_					-		
					-		
12. Calculation	of Permeability:	K, (in/hr) = 60 m	in/hr x r2/R2 x L	(in)/T(min) x	In (H1/H2)	T=	240.00
к	(in/hr) = 0.00	Clas	sification:	К0			
13. Defects in	the Sample (Check app	propriate items):					
x	None						
_	Soil/Tube Co	ntactLar	ge Gravel	I	Large Roots	6	
_	Dry Soil	Smearing		_ Compactio	n		
_	Other - Speci	fy					

	Т	ube Permean	Job Number: GJ2118024.001 Project: Proposed Site Improvement				
Sample ID:	Profile Pit No.:	SPP-4	Sample No.:	<u>T-1</u>	Depth:	5.0'	Client: Shore Point Lab Tech: MH
COUNTY/MUN	ICIPALITY Montgom	ery	BLOCK		LOT		
1. Test Numbe	r <u>1</u>	Replicate (lett	er) B	Date Colle	ected		_
2. Material Tes	sted:	Fill	X Test in N	lative Soil			
3. Type of San	nple: X	Undisturbed		Disturbed			
4. Sample Dim	ensions:		of Sample Tube, F nple, L, in inches	R, in cm	1.91 3.00	_	
5. Bulk Density	/ Determination (Distur	bed Samples Or	nly): N/A				
6. Sample We	ight (Wt. Tube Contain	ing Sample-Wt.	of Empty Tube), gr	ams	0.00	_	Wt. of Tube Containing Sample Wt. of Empty Tube
7. Sample Vol	ume (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 L	Jsed: X	_No	Yes, Inc	dicate Interna	al Radius, cr	n. N/A	
10. Height of V	Vater Level Above Rim	n of Test Basin, i	n inches:				
	At the Beginning of Eac At the End of Each Tes		H1 <u>5.0</u> 5.0				
11. Rate of Wa	ater Level Drop (Add a	dditional lines if r	needed):				
	Time, Start of Test Interval, T1	Time End c Interval		th of Test , T, Minutes			
F	12:00:00	4:00:0	0 2	40.00	]		
-					_		
-					_		
12. Calculation	of Permeability:	K, (in/hr) = 60	min/hr x r2/R2 x L	(in)/T(min) x	In (H1/H2)	T=	240.00
٢	(in/hr) = 0.00	CI	assification:	КО	. ,		
13. Defects in	the Sample (Check ap	propriate items):					
>		· · <i>·</i> /					
_		ntactL	arge Gravel		Large Roots	6	
-			ring		•		
_	Other - Spec			•			



# APPENDIX C Supplemental Information (USCS, Terms & Symbols)



# **UNIFIED SOIL CLASSIFICATION SYSTEM**

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

SOIL CLASSIFICATION CHART

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

COMPACTNESS*

Sand and/or Gravel

#### **GRADATION***

#### % FINER BY WEIGHT

AND..... 359

RELATIVE DENSITY 0% TO 40%

70 10 1070	LOUSE
)% TO 20%	MEDIUM DENSE 40% TO 70%
)% TO 35%	DENSE 70% TO 90%
5% TO 50%	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 GRE	ATER THAN 4000

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

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		Other Office Locations:		
WARREN, NJ 908.668.7777	CHALFONT, PA 215,712,2700	SOUTHBOROUGH, MA 508.485.0755	ROCKY HILL, CT 860.726.7889	PHILADELPHIA, PA 215.848.2323
908.668.7777	215.712.2700	508.485.0755	860.726.7889	215.848.2323

## Environmental & Geotechnical Engineers & Consultants



# **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 ³/₈" 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)

Very Loose	0-4
Loose	4-10
Medium Dense	10-30
Dense	30-50
Very Dense	Over 50

Term (Cohesive Soils)	<u>Qu (TSF)</u>
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 in3 in.	Medium Sand	0.6mm-0.2mm	Clay	-0.005mm
Gravel	3 in5mm	Fine Sand	0.2mm-0.074mm	-	

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		Other Office Locations:		
Warren, NJ	CHALFONT, PA 215.712.2700	Southborough, MA	ROCKY HILL, CT	Philadelphia, PA
908.668.7777		508.485.0755	860.726.7889	215.848.2323

**Standard Penetration Resistance** 

### Environmental & Geotechnical Engineers & Consultants

# **APPENDIX G**

# **DRAINAGE PIPE DESIGN**

# ShorePt

Line No.	Inlet ID	Drng Area	Total Area	Runoff Coeff	i Sys	Line Size	Line Length	Invert Up	Invert Dn	Line Slope	Flow Rate	Capac Full	n-val Pipe	Vel Ave	Vel Up	Vel Dn	HGL Up	HGL Dn	Тс	
		(ac)	(ac)	(C)	(in/hr)	(in)	(ft)	(ft)	(ft)	(%)	(cfs)	(cfs)		(ft/s)	(ft/s)	(ft/s)	(ft)	(ft)	(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	
Projec	t File: 2022-12-2	2 Propo	sed Dra	inage.stm									Num	ber of lir	ies: 13			Date:	1/3/2023	3
	S: Intensity = 102	2 61 / //-	let time	+ 16 50) ^	0.82	Poturn n	eriod - 25 V	/re · **	Critical d	enth										

# **APPENDIX H**

# **OUTLET PROTECTION**

### JOB NAME: MONTGOMERY SENIOR AFFORDABLE HOUSING JOB NUMBER: RPM-211 CALCULATED: RZH DATE: 12/22/22 OUTLET ID: FES-6

# <u>Rip-Rap Design</u>

### 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
<u>Rip Rap Apron</u>											
	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

# <u>Rip-Rap Design</u>

### 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

# <u>Rip-Rap Design</u>

### 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**