

HYDROLOGY REPORT

PREPARED FOR

8 Hilda Lane Realty Trust

FOR

**“Brookside Farm”
Proposed Multifamily Development
in
Halifax, MA**

PREPARED BY

**BRACKEN ENGINEERING, INC.
49 Herring Pond Road
Buzzard’s Bay, MA 02532**

A circular red seal for the Commonwealth of Massachusetts, featuring the text "COMMONWEALTH OF MASSACHUSETTS" around the perimeter. Inside the seal, it reads "DONALD F. BRACKEN, JR. CIVIL No. 37071 REGISTERED PROFESSIONAL ENGINEER". Overlaid on the seal is a handwritten signature in black ink that reads "Donald F. Bracken, Jr.".

**Donald F. Bracken, Jr., P.E.
November 20, 2020**

Introduction:

The purpose of this report is to analyze the runoff from the proposed multifamily development in accordance with the Town of Halifax's Zoning Bylaw and Site Plan requirements.

This report utilizes the previously approved drainage study which was prepared for the construction of the Hilda Lane roadway. See "Definitive Study Hilda Lane Extension Halifax, MA March 16, 2005 prepare by Barbara J. Thissell, P.E., Inc." (The Report)

The Project:

The proposed project will consist of the construction of 21 condo units in 5 multifamily buildings along with the associated paved parking areas, grading, landscaping and utilities.

A drainage system for the multifamily development has been designed to contain and infiltrate up to the 25-year storm event. All runoff from paved surfaces for the development are treated through deep sump catch basins, oil/grit separators and subsurface infiltration systems. Roof runoff will be directly discharged to subsurface infiltration systems. Individual subsurface drainage systems have been designed to contain up to the 25-year storm event. The rear yards and rear roof will be allowed to travel via overland flow to the adjacent wetland.

Method of Calculation:

The infiltration system at the project entrance was analyzed utilizing standard engineering practices and the Soil Conservation Service (SCS) Technical Release 20 (TR20). The system was analyzed using the rainfall data for a twenty-five (25) year, twenty-four (24) hour duration storm frequency. Based on the U.S. Department of Agriculture's Technical Release Paper 40 (TP40) rainfall maps, the precipitation is 5.5".

The calculations herein are an update of the calculations from The Report. Tributary drainage areas have been modified for proposed conditions to account for the proposed development and updated topographical information.

To assist in the analysis, the computer software program "Hydrocad" was used to develop hydrographs and infiltration area inflow/outflow calculations.

The infiltration system has been designed to accept flows generated for the 25-year storm event. An infiltration rate of 2.41 in/hr was utilized in the model based on the soils test pits on site.

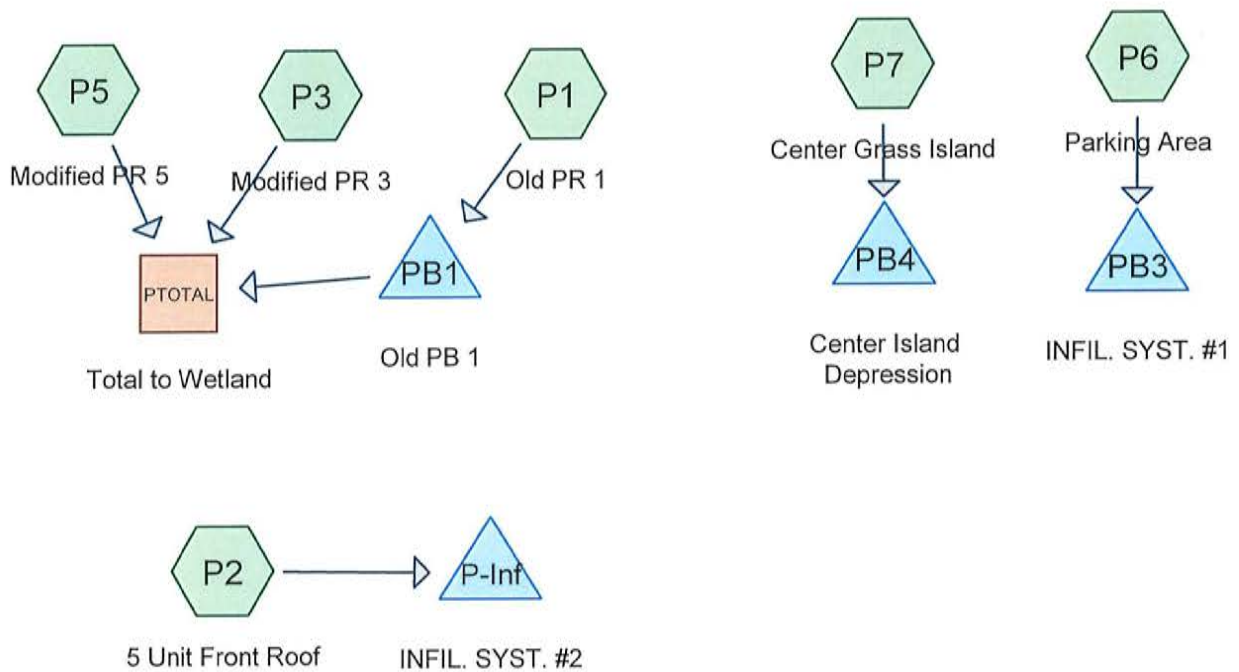
Conclusion:

The infiltration system has been sized to contain and infiltrate up to the 25-year storm event onsite, and the remaining overland flow to the wetland does not result in an increase in rate under post-development conditions.

The following table shows a comparison of the pre- and post-development rates of flow to the wetland (design point PTOTAL). The pre-development rates provided are taken from the approved drainage study for Hilda Lane, The Report.

Storm Event	Rate (CFS)	
	Pre	Post
2 Year	0.17	0.15
10 Year	1.37	0.90
25 Year	3.98	2.72
100 Year	10.02	6.33

CFS = Cubic Feet Per Second



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Type III 24-hr 2 YR Rainfall=3.40"

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Time span=0.00-24.00 hrs, dt=0.05 hrs, 481 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment P1: Old PR 1	Runoff Area=5,240 ac 0.00% Impervious Runoff Depth>0.03" Tc=24.7 min CN=42 Runoff=0.02 cfs 0.012 af
Subcatchment P2: 5 Unit Front Roof	Runoff Area=2,320 sf 100.00% Impervious Runoff Depth>3.17" Tc=5.0 min CN=98 Runoff=0.18 cfs 0.014 af
Subcatchment P3: Modified PR 3	Runoff Area=137,686 sf 3.83% Impervious Runoff Depth>0.14" Flow Length=705' Tc=50.4 min CN=49 Runoff=0.07 cfs 0.038 af
Subcatchment P5: Modified PR 5	Runoff Area=168,611 sf 2.35% Impervious Runoff Depth>0.15" Tc=5.0 min CN=49 Runoff=0.13 cfs 0.048 af
Subcatchment P6: Parking Area	Runoff Area=34,142 sf 88.71% Impervious Runoff Depth>2.45" Tc=5.0 min CN=91 Runoff=2.22 cfs 0.160 af
Subcatchment P7: Center Grass Island	Runoff Area=22,204 sf 0.00% Impervious Runoff Depth>0.00" Tc=5.0 min CN=39 Runoff=0.00 cfs 0.000 af
Reach PTOTAL: Total to Wetland	Inflow=0.15 cfs 0.085 af Outflow=0.15 cfs 0.085 af
Pond P-Inf: INFIL. SYST. #2	Peak Elev=1.53' Storage=149 cf Inflow=0.18 cfs 0.014 af Outflow=0.03 cfs 0.014 af
Pond PB1: Old PB 1	Peak Elev=31.46' Storage=518 cf Inflow=0.02 cfs 0.012 af Outflow=0.00 cfs 0.000 af
Pond PB3: INFIL. SYST. #1	Peak Elev=32.85' Storage=2,712 cf Inflow=2.22 cfs 0.160 af Outflow=0.19 cfs 0.160 af
Pond PB4: Center Island Depression	Peak Elev=37.00' Storage=8 cf Inflow=0.00 cfs 0.000 af Outflow=0.00 cfs 0.000 af

Total Runoff Area = 13.618 ac Runoff Volume = 0.271 af Average Runoff Depth = 0.24"
92.95% Pervious = 12.658 ac 7.05% Impervious = 0.961 ac

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Brookside Farm Hilda lane Halifax, MA

Type III 24-hr 2 YR Rainfall=3.40"

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Summary for Subcatchment P1: Old PR 1

Runoff = 0.02 cfs @ 17.19 hrs, Volume= 0.012 af, Depth> 0.03"

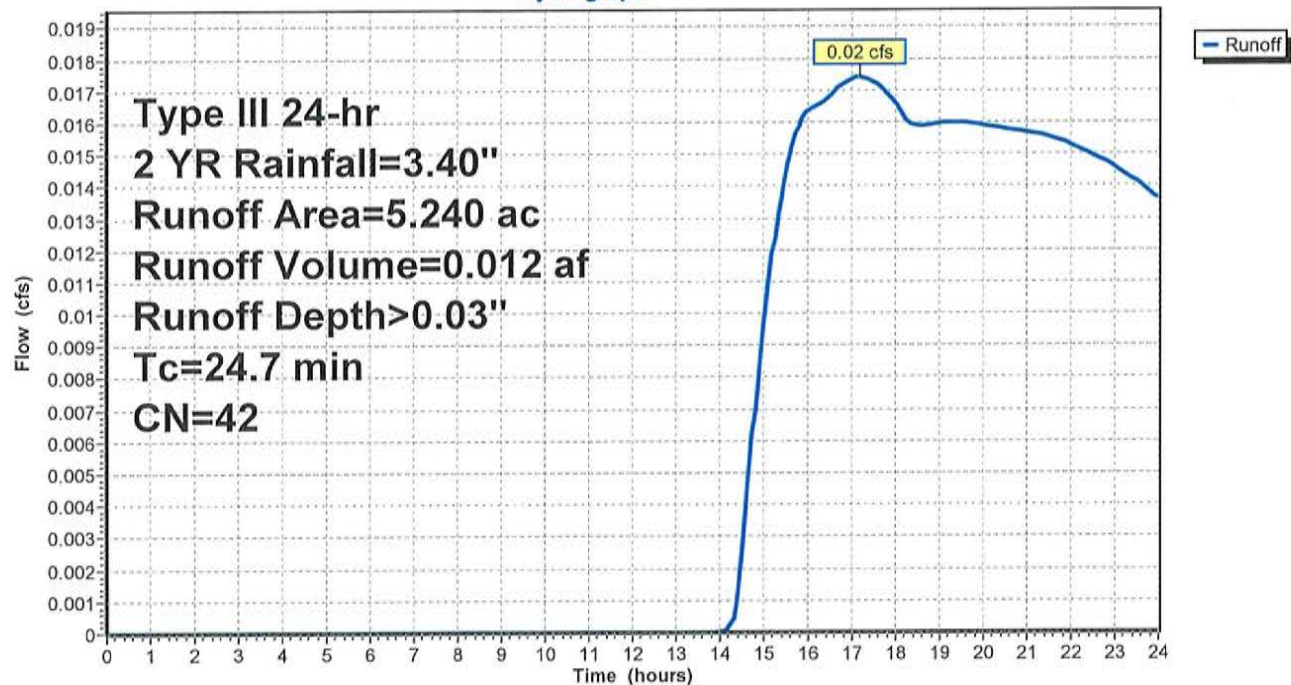
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 2 YR Rainfall=3.40"

Area (ac)	CN	Description
* 5.240	42	
5.240		100.00% Pervious Area

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

Subcatchment P1: Old PR 1

Hydrograph



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Type III 24-hr 2 YR Rainfall=3.40"

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Summary for Subcatchment P2: 5 Unit Front Roof

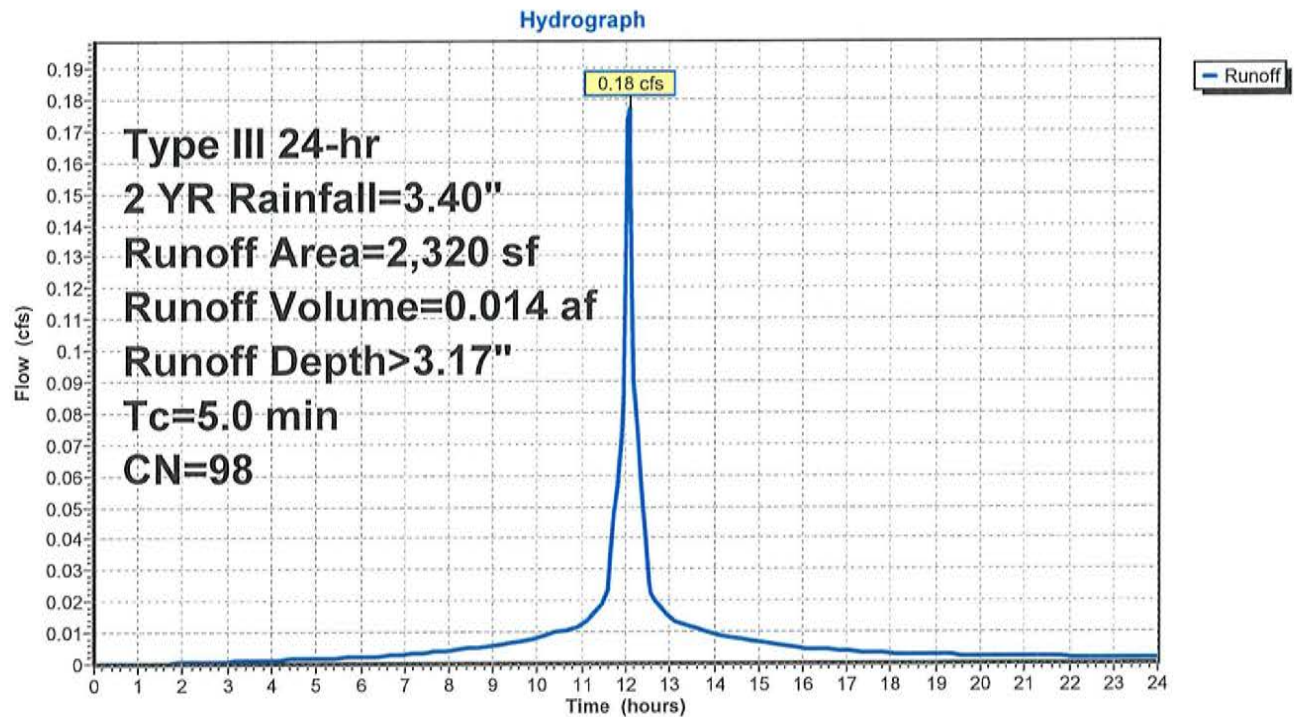
Runoff = 0.18 cfs @ 12.07 hrs, Volume= 0.014 af, Depth> 3.17"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 2 YR Rainfall=3.40"

Area (sf)	CN	Description
2,320	98	Roofs, HSG A
2,320		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					Direct Entry, Minimum Time

Subcatchment P2: 5 Unit Front Roof



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Type III 24-hr 2 YR Rainfall=3.40"

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Summary for Subcatchment P3: Modified PR 3

Runoff = 0.07 cfs @ 13.84 hrs, Volume= 0.038 af, Depth> 0.14"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 2 YR Rainfall=3.40"

Area (sf)	CN	Description
14,608	39	>75% Grass cover, Good, HSG A
23,786	61	>75% Grass cover, Good, HSG B
38,250	30	Woods, Good, HSG A
55,762	55	Woods, Good, HSG B
* 5,280	98	Roof
137,686	49	Weighted Average
132,406		96.17% Pervious Area
5,280		3.83% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.1	50	0.0400	0.20		Sheet Flow, AB Grass: Short n= 0.150 P2= 3.50"
0.2	37	0.1350	2.57		Shallow Concentrated Flow, BC Short Grass Pasture Kv= 7.0 fps
46.1	618	0.0080	0.22		Shallow Concentrated Flow, CD Forest w/Heavy Litter Kv= 2.5 fps
50.4	705	Total			

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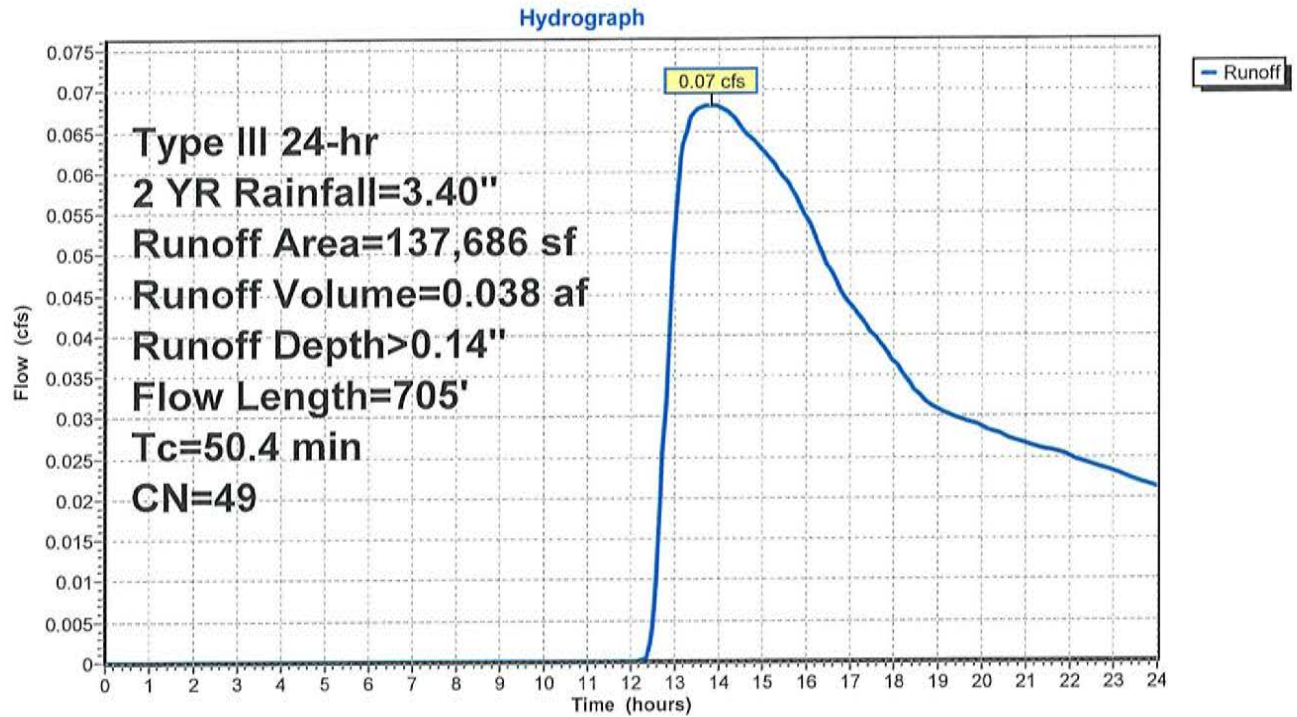
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Type III 24-hr 2 YR Rainfall=3.40"

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Subcatchment P3: Modified PR 3



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Summary for Subcatchment P5: Modified PR 5

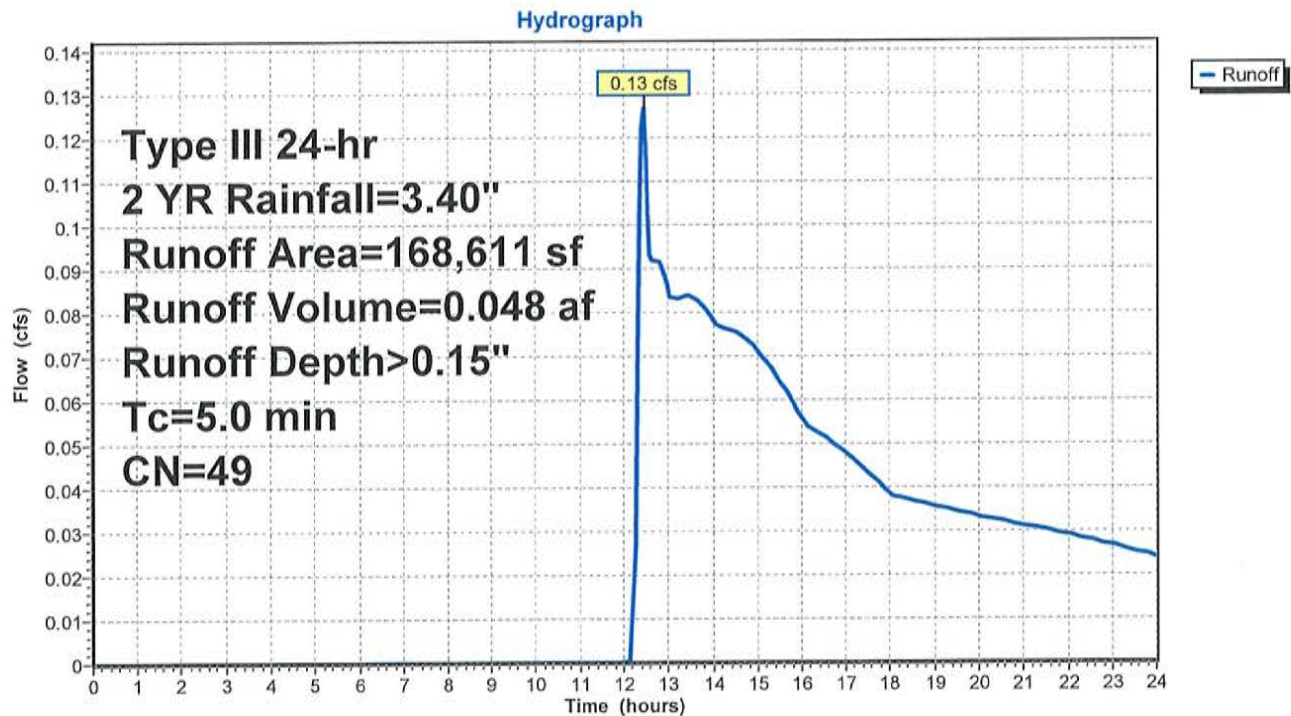
Runoff = 0.13 cfs @ 12.44 hrs, Volume= 0.048 af, Depth> 0.15"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 2 YR Rainfall=3.40"

Area (sf)	CN	Description
19,956	39	>75% Grass cover, Good, HSG A
16,848	61	>75% Grass cover, Good, HSG B
35,654	30	Woods, Good, HSG A
92,193	55	Woods, Good, HSG B
* 3,960	98	Roof
168,611	49	Weighted Average
164,651		97.65% Pervious Area
3,960		2.35% Impervious Area

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

Subcatchment P5: Modified PR 5



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Type III 24-hr 2 YR Rainfall=3.40"

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Summary for Subcatchment P6: Parking Area

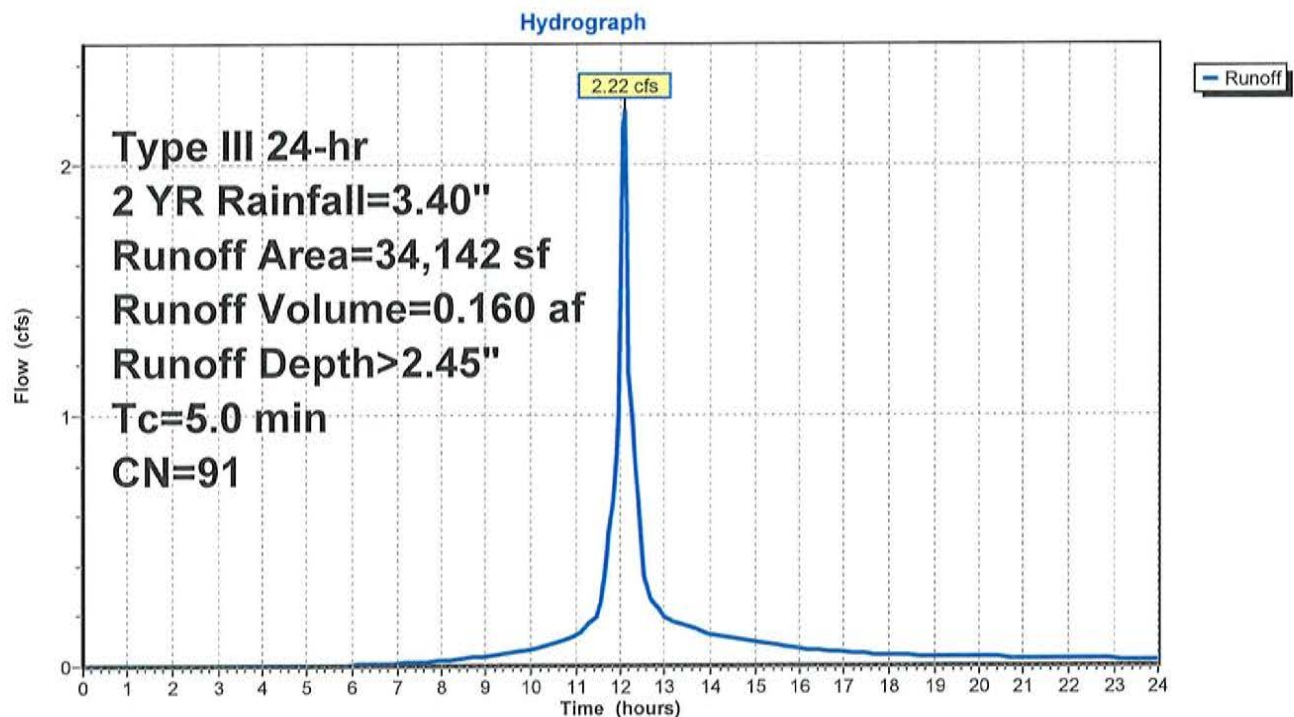
Runoff = 2.22 cfs @ 12.07 hrs, Volume= 0.160 af, Depth> 2.45"

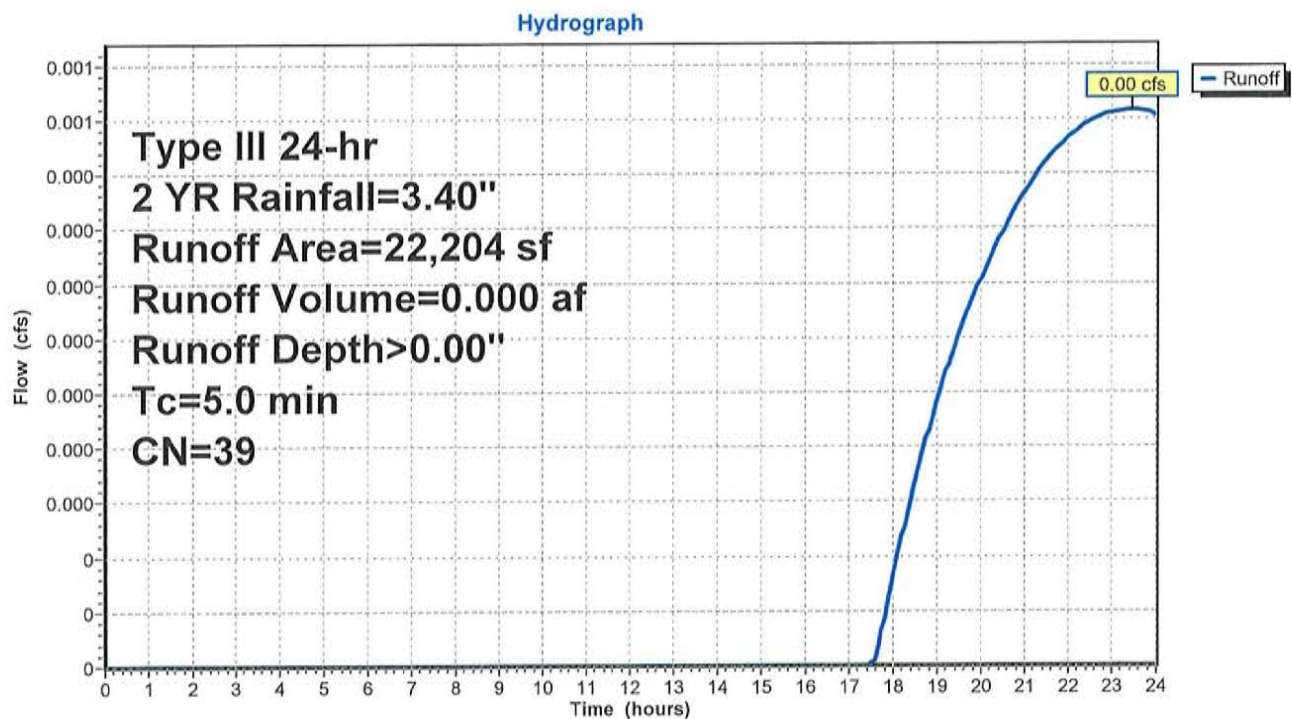
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 2 YR Rainfall=3.40"

Area (sf)	CN	Description
30,287	98	Paved parking, HSG A
3,855	39	>75% Grass cover, Good, HSG A
34,142	91	Weighted Average
3,855		11.29% Pervious Area
30,287		88.71% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					Direct Entry, Minimum Time

Subcatchment P6: Parking Area





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Type III 24-hr 2 YR Rainfall=3.40"

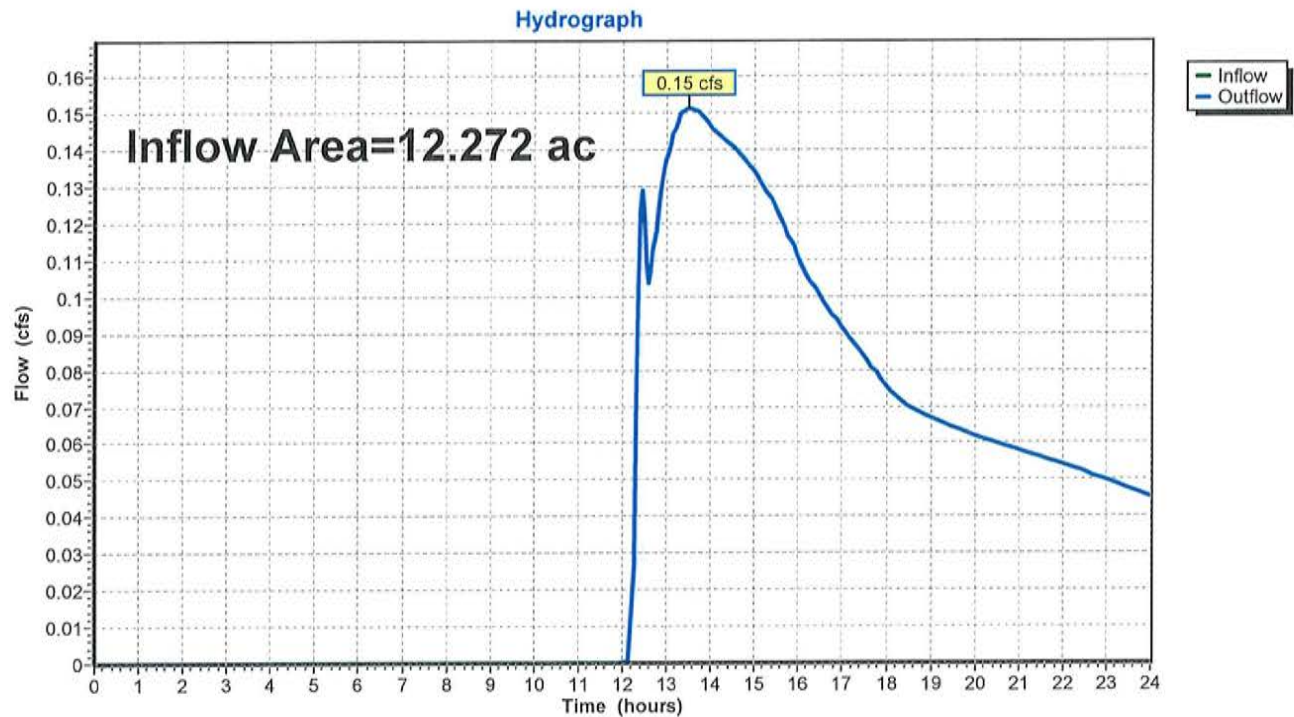
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Summary for Reach PTOTAL: Total to Wetland

Inflow Area = 12.272 ac, 1.73% Impervious, Inflow Depth > 0.08" for 2 YR event
Inflow = 0.15 cfs @ 13.52 hrs, Volume= 0.085 af
Outflow = 0.15 cfs @ 13.52 hrs, Volume= 0.085 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Reach PTOTAL: Total to Wetland



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Type III 24-hr 2 YR Rainfall=3.40"

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Summary for Pond P-Inf: INFIL. SYST. #2

Refer to Table 7-SC-740 Incremental Storage Volumes Per Chamber attached with this report.

Inflow Area = 0.053 ac, 100.00% Impervious, Inflow Depth > 3.17" for 2 YR event
Inflow = 0.18 cfs @ 12.07 hrs, Volume= 0.014 af
Outflow = 0.03 cfs @ 11.70 hrs, Volume= 0.014 af, Atten= 82%, Lag= 0.0 min
Discarded = 0.03 cfs @ 11.70 hrs, Volume= 0.014 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Peak Elev= 1.53' @ 12.51 hrs Surf.Area= 169 sf Storage= 149 cf

Plug-Flow detention time= 24.1 min calculated for 0.014 af (100% of inflow)

Center-of-Mass det. time= 24.0 min (777.9 - 753.9)

Volume	Invert	Avail.Storage	Storage Description
#1A	0.00'	182 cf	15.75'W x 10.74'L x 3.50'H Field A 592 cf Overall - 138 cf Embedded = 454 cf x 40.0% Voids
#2A	0.50'	138 cf	ADS_StormTech SC-740 +Cap x 3 Inside #1 Effective Size= 44.6"W x 30.0"H => 6.45 sf x 7.12'L = 45.9 cf Overall Size= 51.0"W x 30.0"H x 7.56'L with 0.44' Overlap 3 Chambers in 3 Rows
		319 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	0.00'	8.270 in/hr Exfiltration over Surface area

Discarded OutFlow Max=0.03 cfs @ 11.70 hrs HW=0.05' (Free Discharge)

↑1=Exfiltration (Exfiltration Controls 0.03 cfs)

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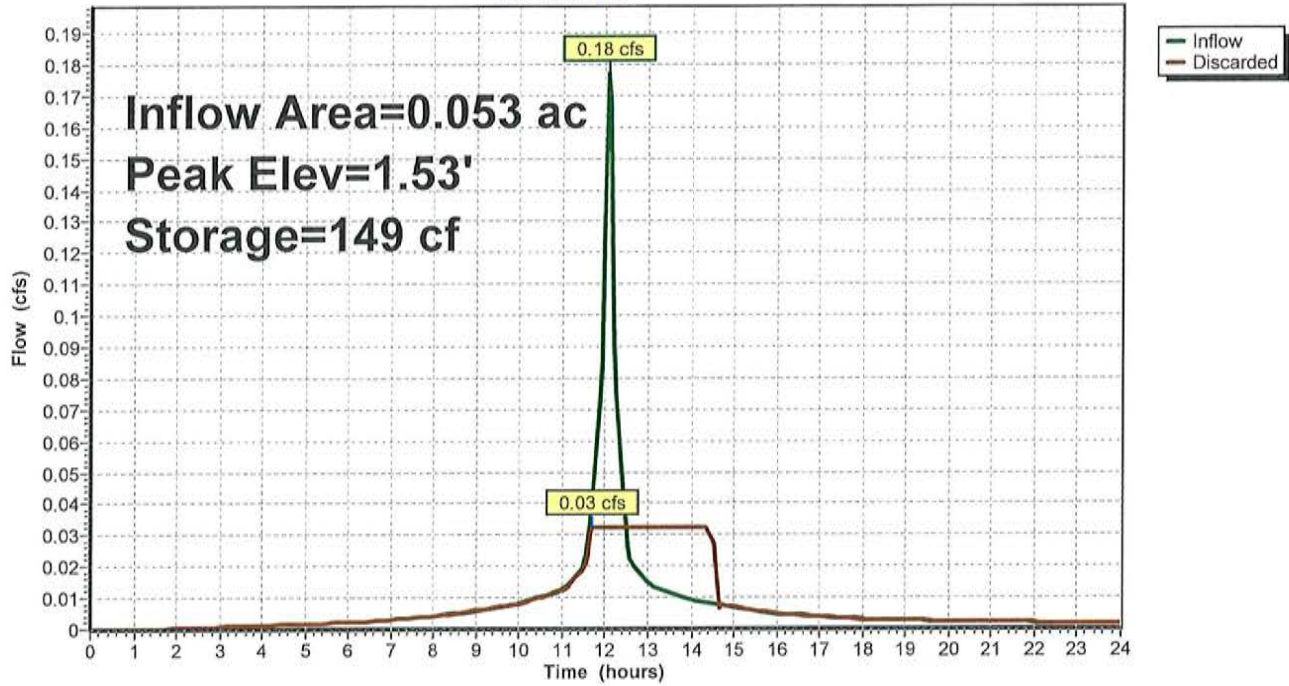
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Type III 24-hr 2 YR Rainfall=3.40"

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Pond P-Inf: INFIL. SYST. #2

Hydrograph



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Summary for Pond PB1: Old PB 1

Inflow Area = 5.240 ac, 0.00% Impervious, Inflow Depth > 0.03" for 2 YR event
Inflow = 0.02 cfs @ 17.19 hrs, Volume= 0.012 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= 0.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 31.46' @ 24.00 hrs Storage= 518 cf

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

Volume	Invert	Avail.Storage	Storage Description
#1	31.40'	13,303 cf	Custom Stage Data Listed below

Elevation (feet)	Cum.Store (cubic-feet)
31.40	0
32.00	5,103
33.00	13,303

Device	Routing	Invert	Outlet Devices
#1	Primary	32.00'	120.0 deg Sharp-Crested Vee/Trap Weir Cv= 2.48 (C= 3.10)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=31.40' (Free Discharge)
↑1=Sharp-Crested Vee/Trap Weir (Controls 0.00 cfs)

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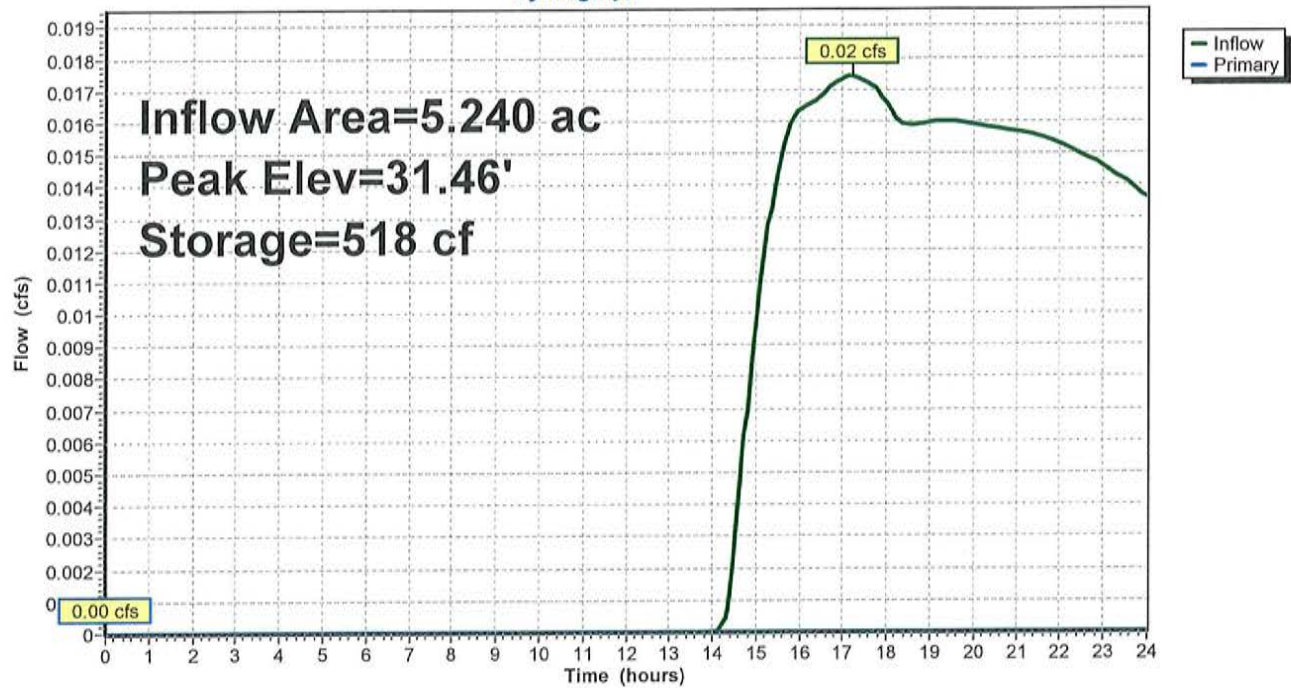
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Type III 24-hr 2 YR Rainfall=3.40"

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Pond PB1: Old PB 1

Hydrograph



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Type III 24-hr 2 YR Rainfall=3.40"

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Summary for Pond PB3: INFIL. SYST. #1

Refer to Table 7-SC-740 Incremental Storage Volumes Per Chamber attached with this report.

Inflow Area = 0.784 ac, 88.71% Impervious, Inflow Depth > 2.45" for 2 YR event
Inflow = 2.22 cfs @ 12.07 hrs, Volume= 0.160 af
Outflow = 0.19 cfs @ 11.50 hrs, Volume= 0.160 af, Atten= 92%, Lag= 0.0 min
Discarded = 0.19 cfs @ 11.50 hrs, Volume= 0.160 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 32.85' @ 13.05 hrs Surf.Area= 3,342 sf Storage= 2,712 cf

Plug-Flow detention time= 118.3 min calculated for 0.160 af (100% of inflow)
Center-of-Mass det. time= 117.8 min (916.7 - 798.9)

Volume	Invert	Avail.Storage	Storage Description
#1A	31.60'	3,007 cf	34.75'W x 96.18'L x 3.50'H Field A 11,697 cf Overall - 4,181 cf Embedded = 7,517 cf x 40.0% Voids
#2A	32.10'	4,181 cf	ADS_StormTech SC-740 +Cap x 91 Inside #1 Effective Size= 44.6"W x 30.0"H => 6.45 sf x 7.12'L = 45.9 cf Overall Size= 51.0"W x 30.0"H x 7.56'L with 0.44' Overlap 91 Chambers in 7 Rows
		7,187 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	31.60'	2.410 in/hr Exfiltration over Surface area

Discarded OutFlow Max=0.19 cfs @ 11.50 hrs HW=31.64' (Free Discharge)
↑1=Exfiltration (Exfiltration Controls 0.19 cfs)

Hilda Lane - Multifamily Development

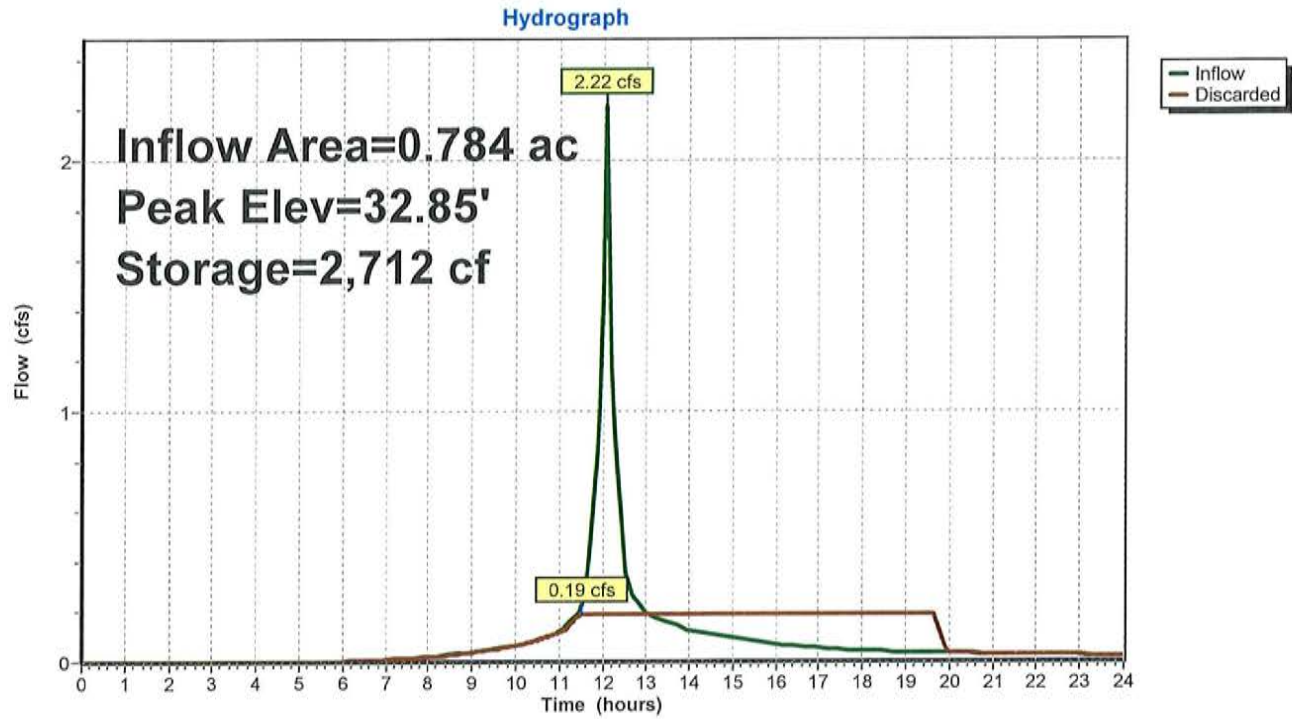
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Type III 24-hr 2 YR Rainfall=3.40"

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Pond PB3: INFIL. SYST. #1



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Type III 24-hr 2 YR Rainfall=3.40"

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Summary for Pond PB4: Center Island Depression

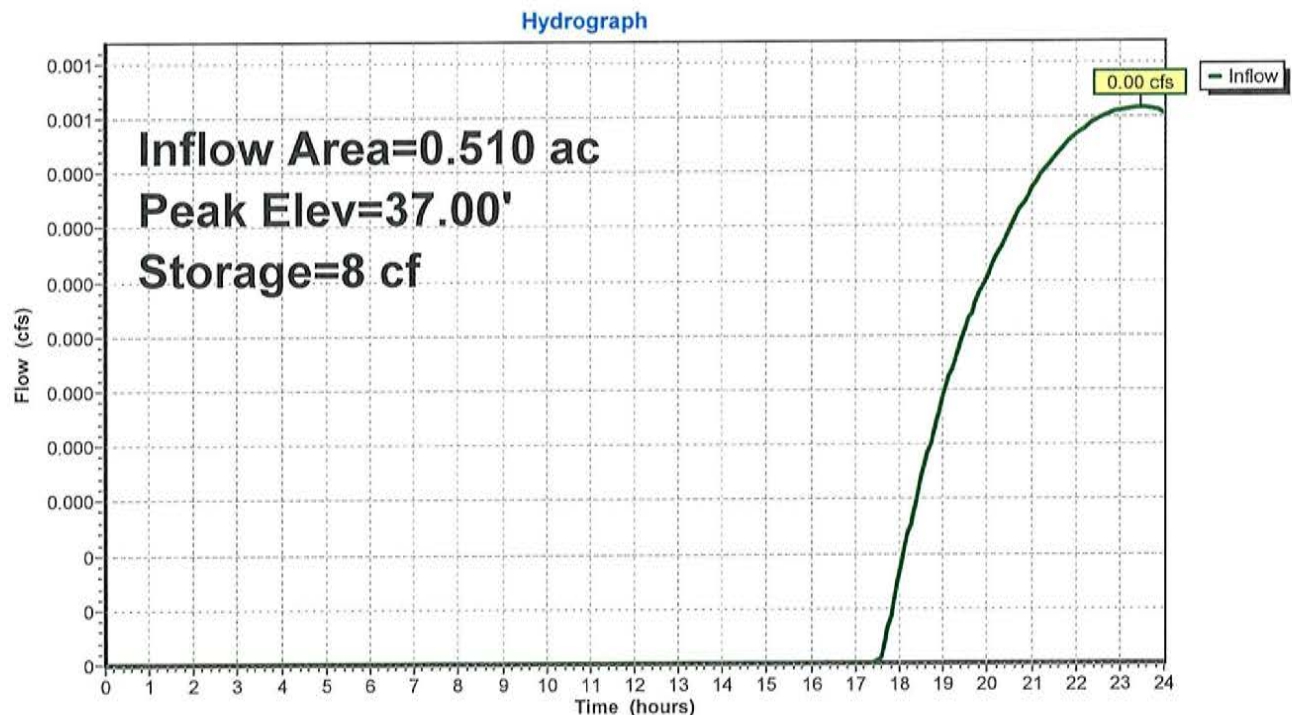
Inflow Area = 0.510 ac, 0.00% Impervious, Inflow Depth > 0.00" for 2 YR event
Inflow = 0.00 cfs @ 23.44 hrs, Volume= 0.000 af
Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Atten= 100%, Lag= 0.0 min

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 37.00' @ 24.00 hrs Surf.Area= 1,851 sf Storage= 8 cf

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

Volume	Invert	Avail.Storage	Storage Description		
#1	37.00'	2,392 cf	Custom Stage Data (Irregular) Listed below (Recalc)		
Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
37.00	1,846	170.8	0	0	1,846
38.00	2,984	208.5	2,392	2,392	3,000

Pond PB4: Center Island Depression



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Type III 24-hr 10 YR Rainfall=4.50"

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Time span=0.00-24.00 hrs, dt=0.05 hrs, 481 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment P1: Old PR 1	Runoff Area=5,240 ac 0.00% Impervious Runoff Depth>0.19" Tc=24.7 min CN=42 Runoff=0.16 cfs 0.084 af
Subcatchment P2: 5 Unit Front Roof	Runoff Area=2,320 sf 100.00% Impervious Runoff Depth>4.26" Tc=5.0 min CN=98 Runoff=0.24 cfs 0.019 af
Subcatchment P3: Modified PR 3	Runoff Area=137,686 sf 3.83% Impervious Runoff Depth>0.45" Flow Length=705' Tc=50.4 min CN=49 Runoff=0.41 cfs 0.117 af
Subcatchment P5: Modified PR 5	Runoff Area=168,611 sf 2.35% Impervious Runoff Depth>0.46" Tc=5.0 min CN=49 Runoff=0.90 cfs 0.147 af
Subcatchment P6: Parking Area	Runoff Area=34,142 sf 88.71% Impervious Runoff Depth>3.50" Tc=5.0 min CN=91 Runoff=3.12 cfs 0.228 af
Subcatchment P7: Center Grass Island	Runoff Area=22,204 sf 0.00% Impervious Runoff Depth>0.11" Tc=5.0 min CN=39 Runoff=0.01 cfs 0.005 af
Reach PTOTAL: Total to Wetland	Inflow=0.90 cfs 0.264 af Outflow=0.90 cfs 0.264 af
Pond P-Inf: INFIL. SYST. #2	Peak Elev=2.36' Storage=233 cf Inflow=0.24 cfs 0.019 af Outflow=0.03 cfs 0.019 af
Pond PB1: Old PB 1	Peak Elev=31.83' Storage=3,636 cf Inflow=0.16 cfs 0.084 af Outflow=0.00 cfs 0.000 af
Pond PB3: INFIL. SYST. #1	Peak Elev=33.52' Storage=4,399 cf Inflow=3.12 cfs 0.228 af Outflow=0.19 cfs 0.228 af
Pond PB4: Center Island Depression	Peak Elev=37.11' Storage=204 cf Inflow=0.01 cfs 0.005 af Outflow=0.00 cfs 0.000 af

Total Runoff Area = 13.618 ac Runoff Volume = 0.600 af Average Runoff Depth = 0.53"
92.95% Pervious = 12.658 ac 7.05% Impervious = 0.961 ac

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Type III 24-hr 10 YR Rainfall=4.50"

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Summary for Subcatchment P1: Old PR 1

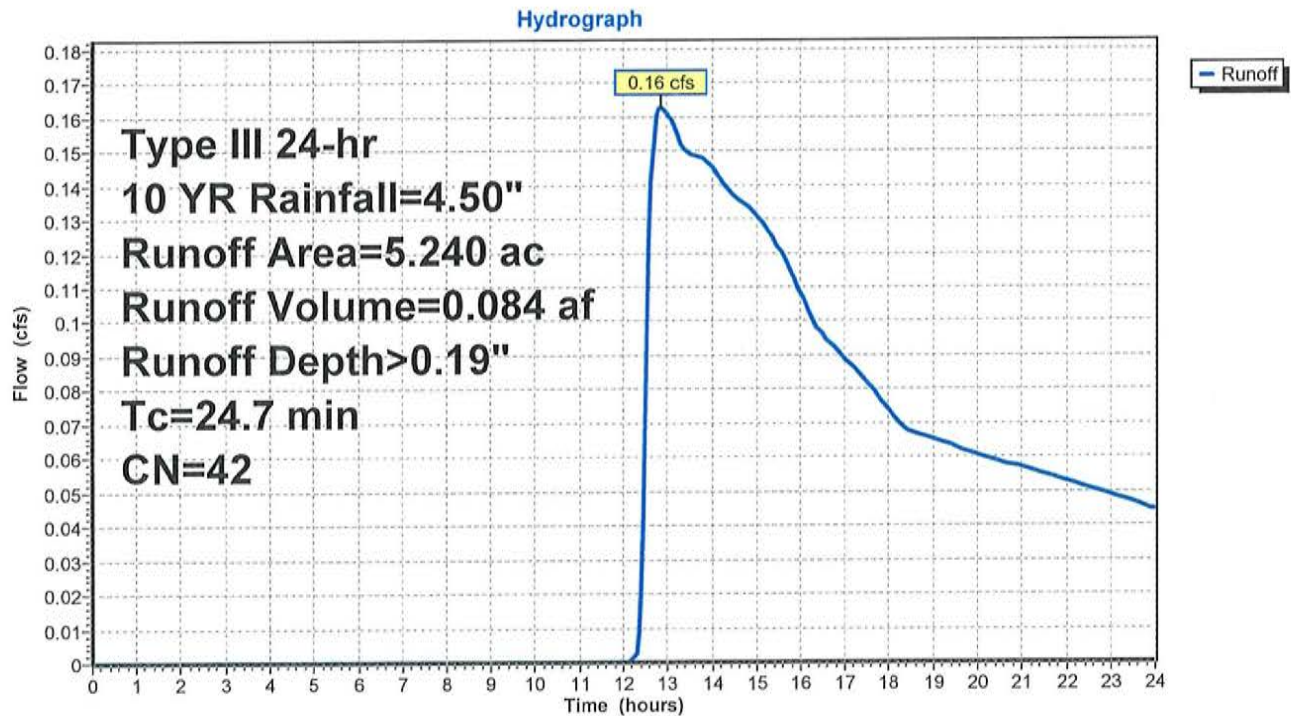
Runoff = 0.16 cfs @ 12.85 hrs, Volume= 0.084 af, Depth> 0.19"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 10 YR Rainfall=4.50"

Area (ac)	CN	Description
* 5.240	42	
5.240		100.00% Pervious Area

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

Subcatchment P1: Old PR 1



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Type III 24-hr 10 YR Rainfall=4.50"

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Summary for Subcatchment P2: 5 Unit Front Roof

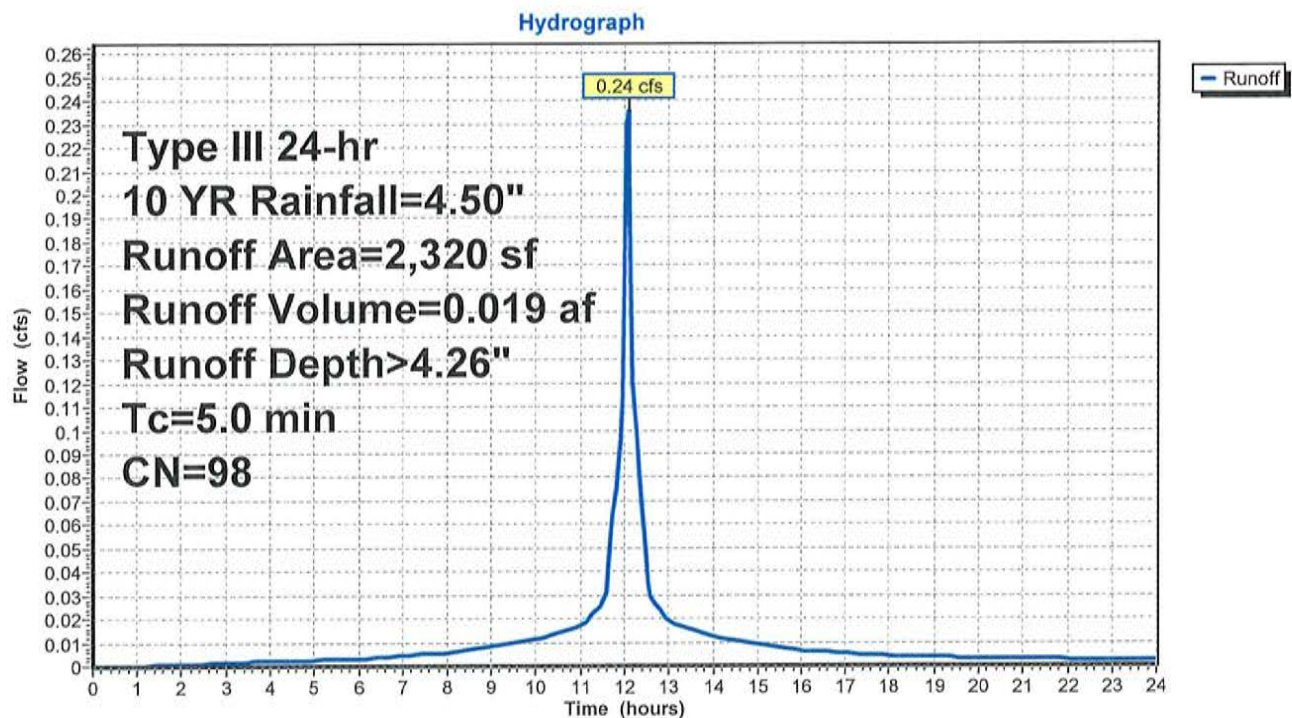
Runoff = 0.24 cfs @ 12.07 hrs, Volume= 0.019 af, Depth> 4.26"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 10 YR Rainfall=4.50"

Area (sf)	CN	Description
2,320	98	Roofs, HSG A
2,320		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					Direct Entry, Minimum Time

Subcatchment P2: 5 Unit Front Roof



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Type III 24-hr 10 YR Rainfall=4.50"

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Summary for Subcatchment P3: Modified PR 3

Runoff = 0.41 cfs @ 12.94 hrs, Volume= 0.117 af, Depth> 0.45"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 10 YR Rainfall=4.50"

Area (sf)	CN	Description
14,608	39	>75% Grass cover, Good, HSG A
23,786	61	>75% Grass cover, Good, HSG B
38,250	30	Woods, Good, HSG A
55,762	55	Woods, Good, HSG B
* 5,280	98	Roof
137,686	49	Weighted Average
132,406		96.17% Pervious Area
5,280		3.83% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.1	50	0.0400	0.20		Sheet Flow, AB Grass: Short n= 0.150 P2= 3.50"
0.2	37	0.1350	2.57		Shallow Concentrated Flow, BC Short Grass Pasture Kv= 7.0 fps
46.1	618	0.0080	0.22		Shallow Concentrated Flow, CD Forest w/Heavy Litter Kv= 2.5 fps
50.4	705	Total			

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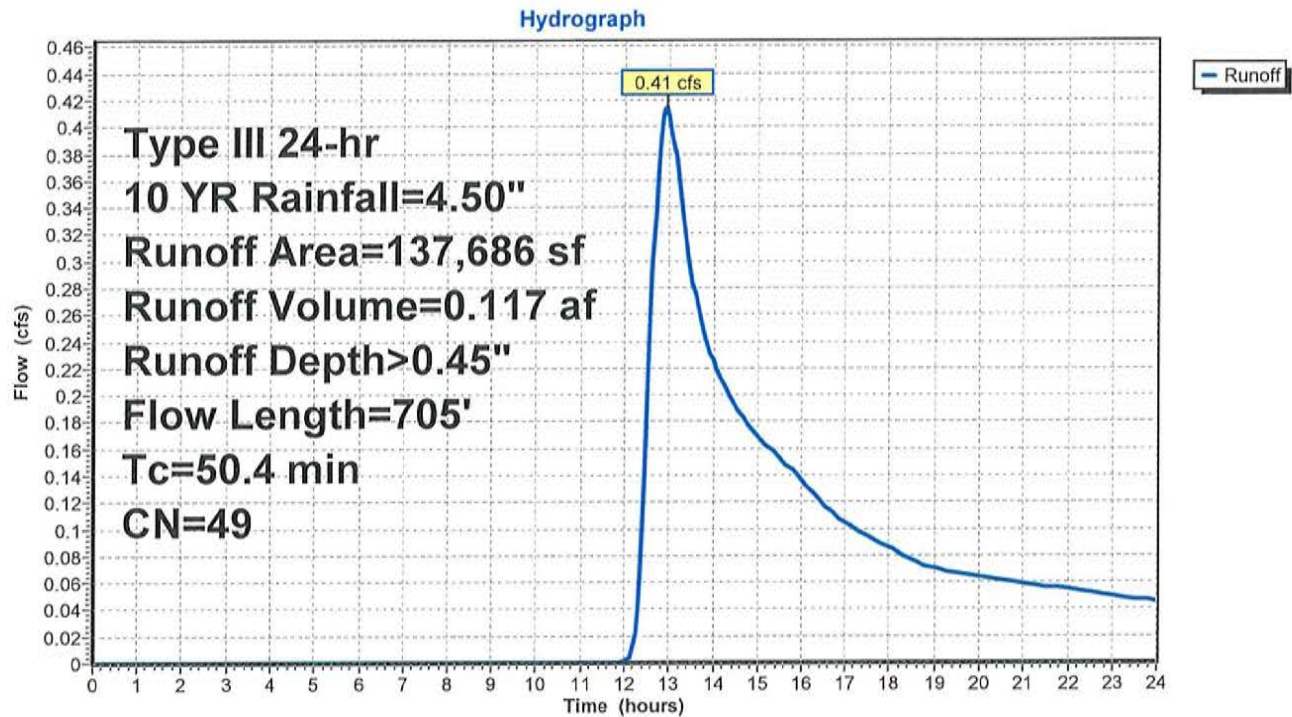
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Type III 24-hr 10 YR Rainfall=4.50"

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Subcatchment P3: Modified PR 3



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Type III 24-hr 10 YR Rainfall=4.50"

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Summary for Subcatchment P5: Modified PR 5

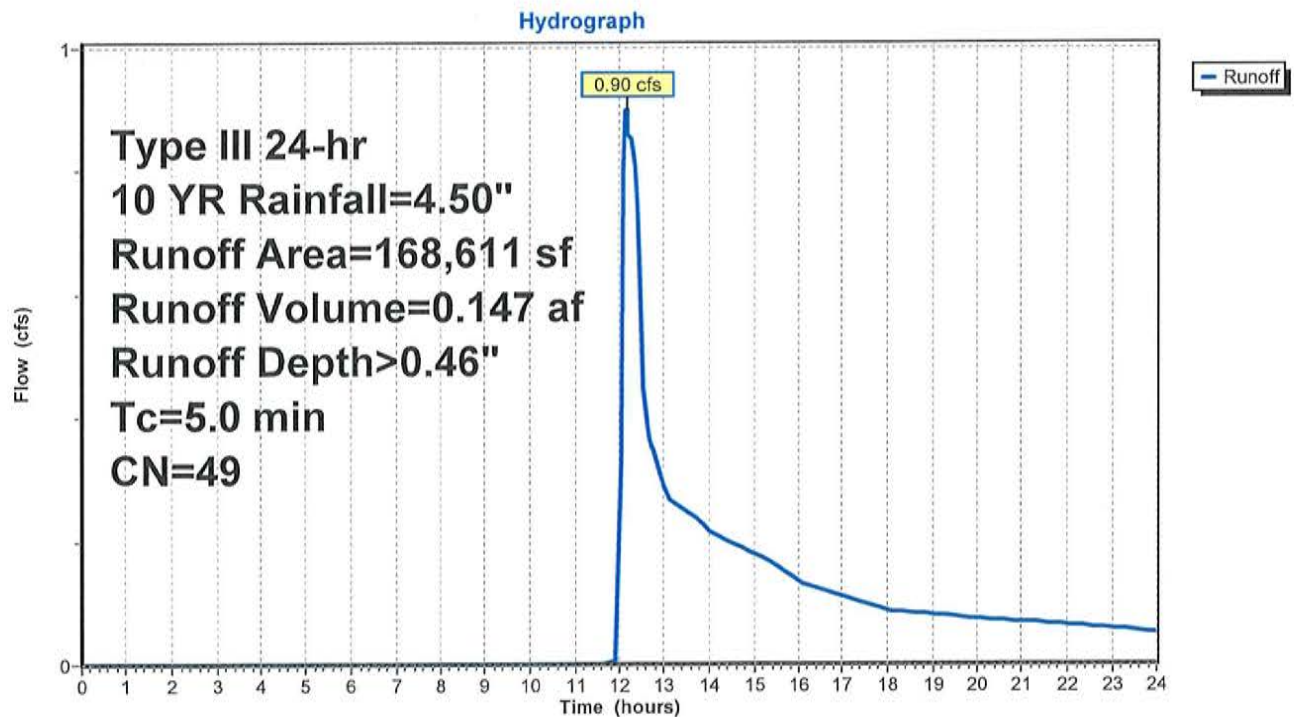
Runoff = 0.90 cfs @ 12.16 hrs, Volume= 0.147 af, Depth> 0.46"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 10 YR Rainfall=4.50"

Area (sf)	CN	Description
19,956	39	>75% Grass cover, Good, HSG A
16,848	61	>75% Grass cover, Good, HSG B
35,654	30	Woods, Good, HSG A
92,193	55	Woods, Good, HSG B
* 3,960	98	Roof
168,611	49	Weighted Average
164,651		97.65% Pervious Area
3,960		2.35% Impervious Area

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

Subcatchment P5: Modified PR 5



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Type III 24-hr 10 YR Rainfall=4.50"

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Summary for Subcatchment P6: Parking Area

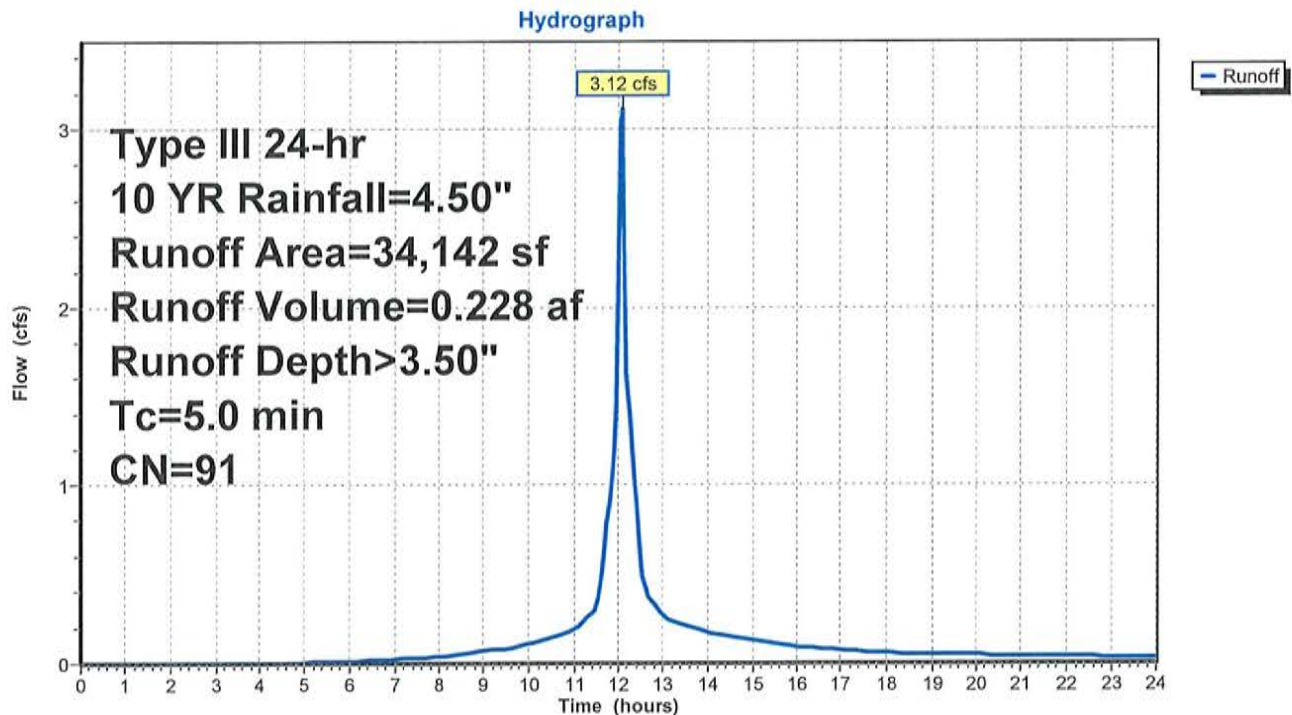
Runoff = 3.12 cfs @ 12.07 hrs, Volume= 0.228 af, Depth> 3.50"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 10 YR Rainfall=4.50"

Area (sf)	CN	Description
30,287	98	Paved parking, HSG A
3,855	39	>75% Grass cover, Good, HSG A
34,142	91	Weighted Average
3,855		11.29% Pervious Area
30,287		88.71% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					Direct Entry, Minimum Time

Subcatchment P6: Parking Area



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Type III 24-hr 10 YR Rainfall=4.50"

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Summary for Subcatchment P7: Center Grass Island

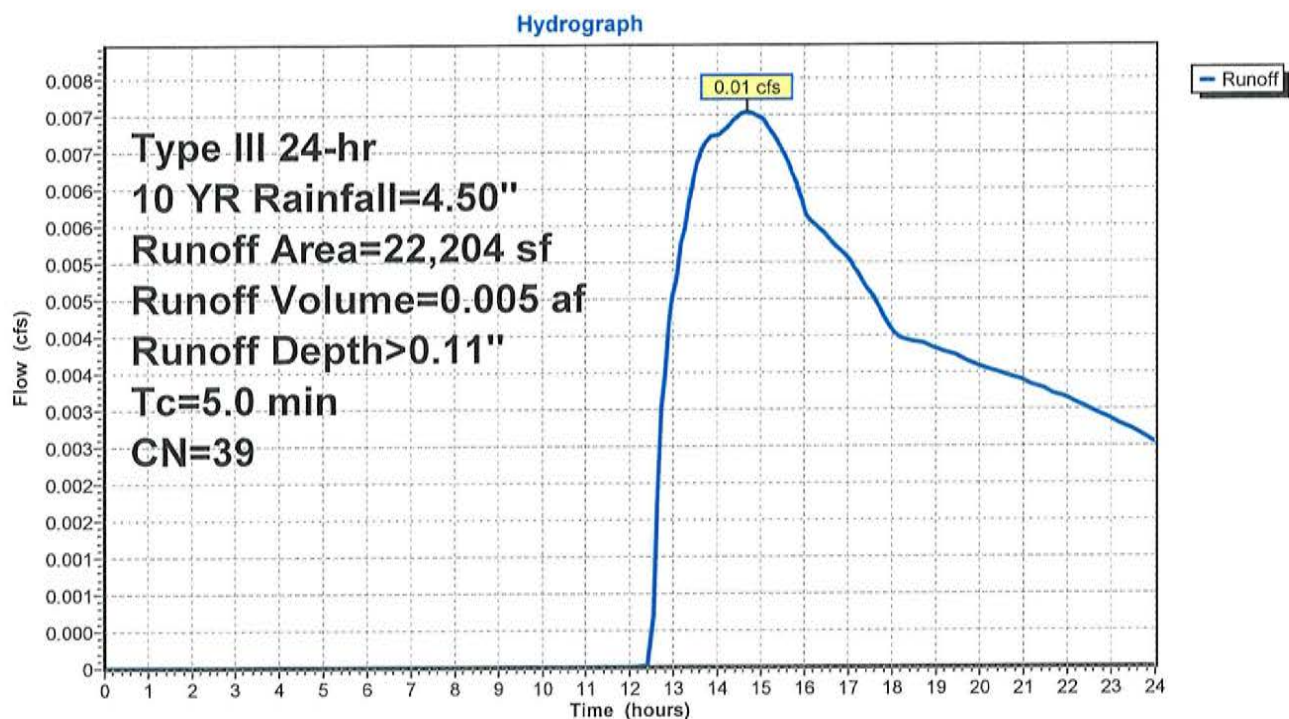
Runoff = 0.01 cfs @ 14.69 hrs, Volume= 0.005 af, Depth> 0.11"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 10 YR Rainfall=4.50"

Area (sf)	CN	Description
22,204	39	>75% Grass cover, Good, HSG A
22,204		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					Direct Entry, Minimum Time

Subcatchment P7: Center Grass Island



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Type III 24-hr 10 YR Rainfall=4.50"

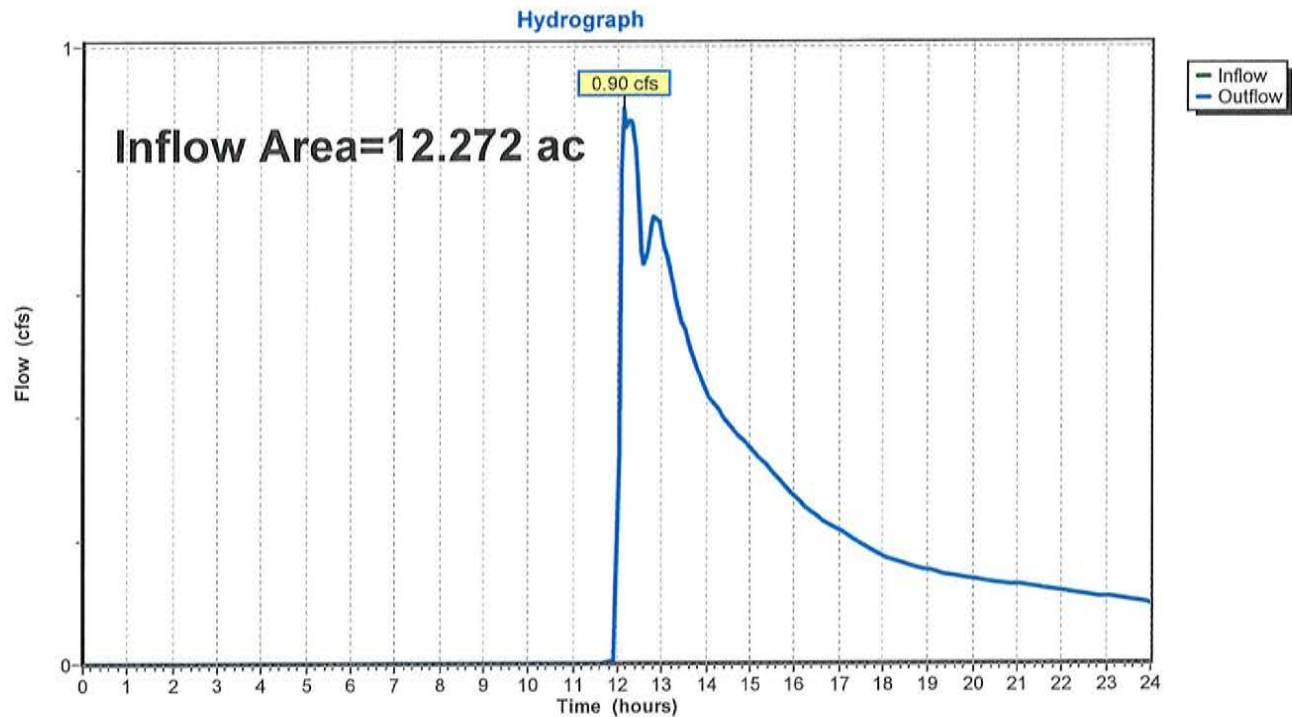
Page 26

Summary for Reach PTOTAL: Total to Wetland

Inflow Area = 12.272 ac, 1.73% Impervious, Inflow Depth > 0.26" for 10 YR event
Inflow = 0.90 cfs @ 12.15 hrs, Volume= 0.264 af
Outflow = 0.90 cfs @ 12.15 hrs, Volume= 0.264 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Reach PTOTAL: Total to Wetland



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Type III 24-hr 10 YR Rainfall=4.50"

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Summary for Pond P-Inf: INFIL. SYST. #2

Refer to Table 7-SC-740 Incremental Storage Volumes Per Chamber attached with this report.

Inflow Area = 0.053 ac, 100.00% Impervious, Inflow Depth > 4.26" for 10 YR event
Inflow = 0.24 cfs @ 12.07 hrs, Volume= 0.019 af
Outflow = 0.03 cfs @ 11.65 hrs, Volume= 0.019 af, Atten= 86%, Lag= 0.0 min
Discarded = 0.03 cfs @ 11.65 hrs, Volume= 0.019 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Peak Elev= 2.36' @ 12.58 hrs Surf.Area= 169 sf Storage= 233 cf

Plug-Flow detention time= 41.7 min calculated for 0.019 af (100% of inflow)

Center-of-Mass det. time= 41.5 min (790.1 - 748.6)

Volume	Invert	Avail.Storage	Storage Description
#1A	0.00'	182 cf	15.75'W x 10.74'L x 3.50'H Field A 592 cf Overall - 138 cf Embedded = 454 cf x 40.0% Voids
#2A	0.50'	138 cf	ADS_StormTech SC-740 +Cap x 3 Inside #1 Effective Size= 44.6"W x 30.0"H => 6.45 sf x 7.12'L = 45.9 cf Overall Size= 51.0"W x 30.0"H x 7.56'L with 0.44' Overlap 3 Chambers in 3 Rows
		319 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	0.00'	8.270 in/hr Exfiltration over Surface area

Discarded OutFlow Max=0.03 cfs @ 11.65 hrs HW=0.05' (Free Discharge)

↑1=Exfiltration (Exfiltration Controls 0.03 cfs)

Hilda Lane - Multifamily Development

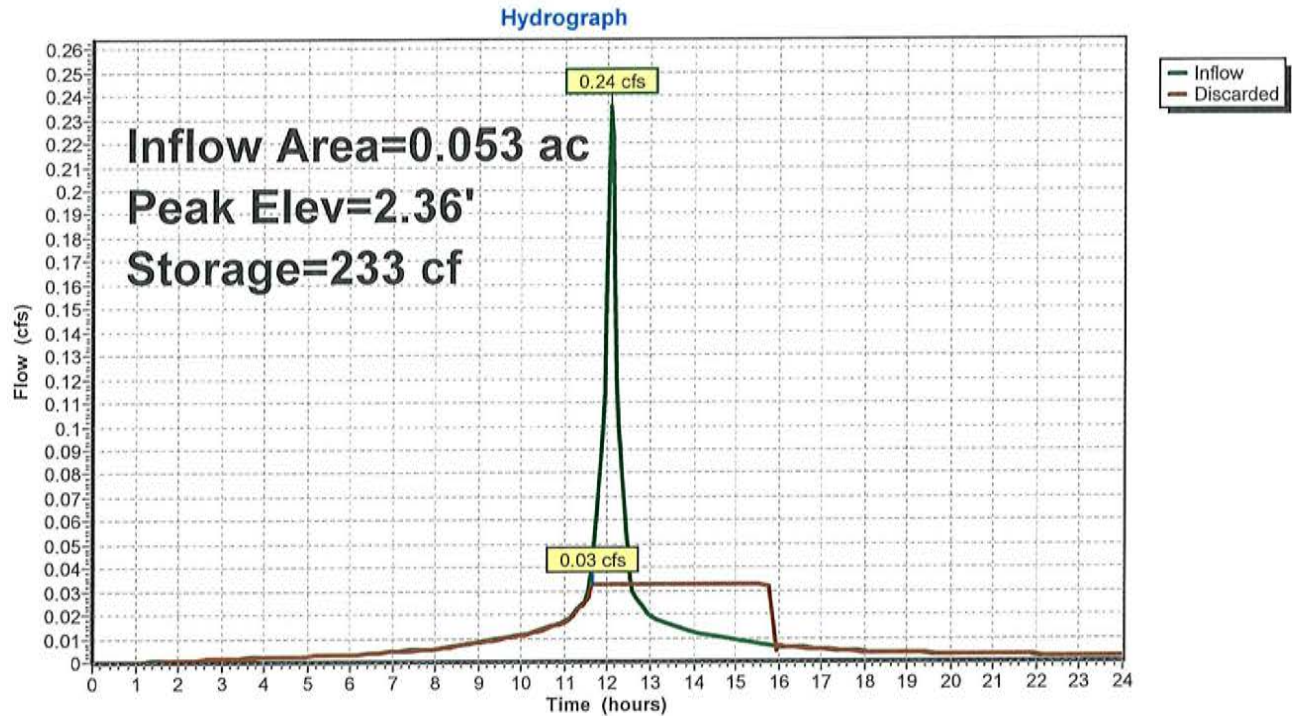
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Type III 24-hr 10 YR Rainfall=4.50"

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Pond P-Inf: INFIL. SYST. #2



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Type III 24-hr 10 YR Rainfall=4.50"

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Summary for Pond PB1: Old PB 1

Inflow Area = 5.240 ac, 0.00% Impervious, Inflow Depth > 0.19" for 10 YR event
Inflow = 0.16 cfs @ 12.85 hrs, Volume= 0.084 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= 0.00-24.00 hrs, dt= 0.05 hrs

Peak Elev= 31.83' @ 24.00 hrs Storage= 3,636 cf

Plug-Flow detention time= (not calculated: initial storage exceeds outflow)

Center-of-Mass det. time= (not calculated: no outflow)

Volume	Invert	Avail.Storage	Storage Description
#1	31.40'	13,303 cf	Custom Stage Data Listed below

Elevation (feet)	Cum.Store (cubic-feet)
31.40	0
32.00	5,103
33.00	13,303

Device	Routing	Invert	Outlet Devices
#1	Primary	32.00'	120.0 deg Sharp-Crested Vee/Trap Weir Cv= 2.48 (C= 3.10)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=31.40' (Free Discharge)

↑1=Sharp-Crested Vee/Trap Weir (Controls 0.00 cfs)

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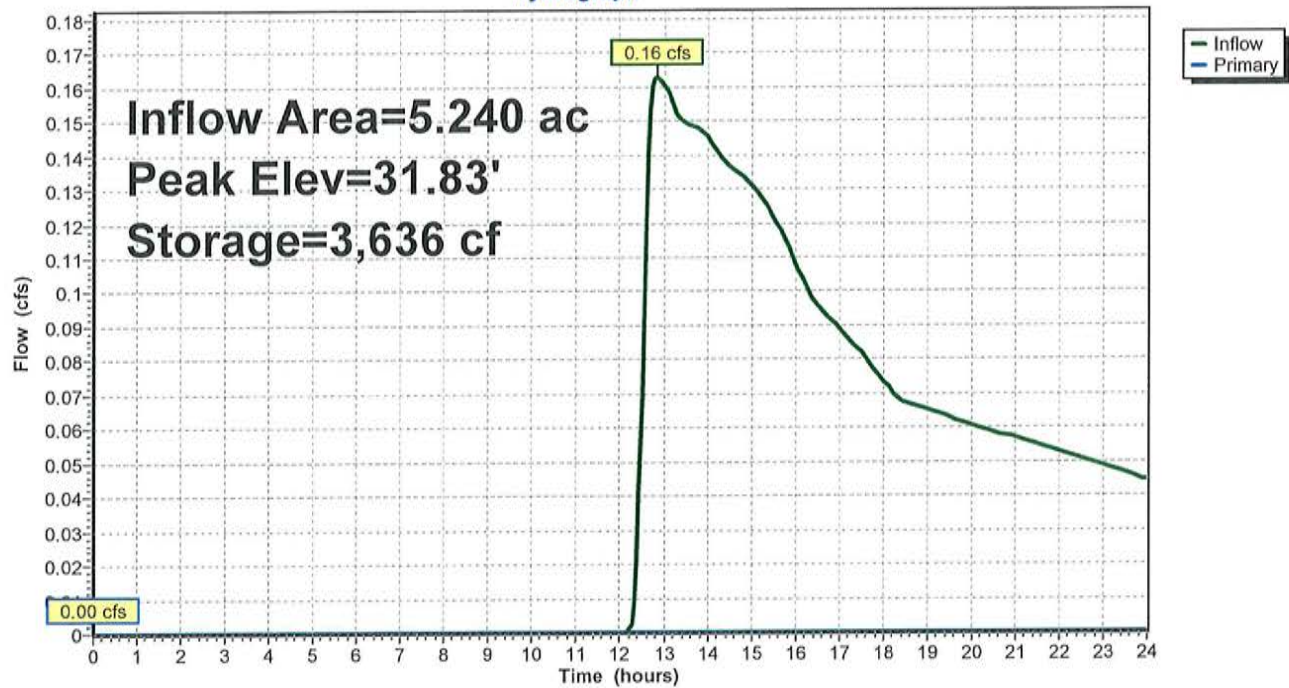
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Type III 24-hr 10 YR Rainfall=4.50"

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Pond PB1: Old PB 1

Hydrograph



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Type III 24-hr 10 YR Rainfall=4.50"

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Summary for Pond PB3: INFIL. SYST. #1

Refer to Table 7-SC-740 Incremental Storage Volumes Per Chamber attached with this report.

Inflow Area = 0.784 ac, 88.71% Impervious, Inflow Depth > 3.50" for 10 YR event
Inflow = 3.12 cfs @ 12.07 hrs, Volume= 0.228 af
Outflow = 0.19 cfs @ 11.10 hrs, Volume= 0.228 af, Atten= 94%, Lag= 0.0 min
Discarded = 0.19 cfs @ 11.10 hrs, Volume= 0.228 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 33.52' @ 13.82 hrs Surf.Area= 3,342 sf Storage= 4,399 cf

Plug-Flow detention time= 205.8 min calculated for 0.227 af (99% of inflow)
Center-of-Mass det. time= 203.5 min (992.5 - 789.1)

Volume	Invert	Avail.Storage	Storage Description
#1A	31.60'	3,007 cf	34.75'W x 96.18'L x 3.50'H Field A 11,697 cf Overall - 4,181 cf Embedded = 7,517 cf x 40.0% Voids
#2A	32.10'	4,181 cf	ADS_StormTech SC-740 +Cap x 91 Inside #1 Effective Size= 44.6"W x 30.0"H => 6.45 sf x 7.12'L = 45.9 cf Overall Size= 51.0"W x 30.0"H x 7.56'L with 0.44' Overlap 91 Chambers in 7 Rows
		7,187 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	31.60'	2.410 in/hr Exfiltration over Surface area

Discarded OutFlow Max=0.19 cfs @ 11.10 hrs HW=31.64' (Free Discharge)

↑ **1=Exfiltration** (Exfiltration Controls 0.19 cfs)

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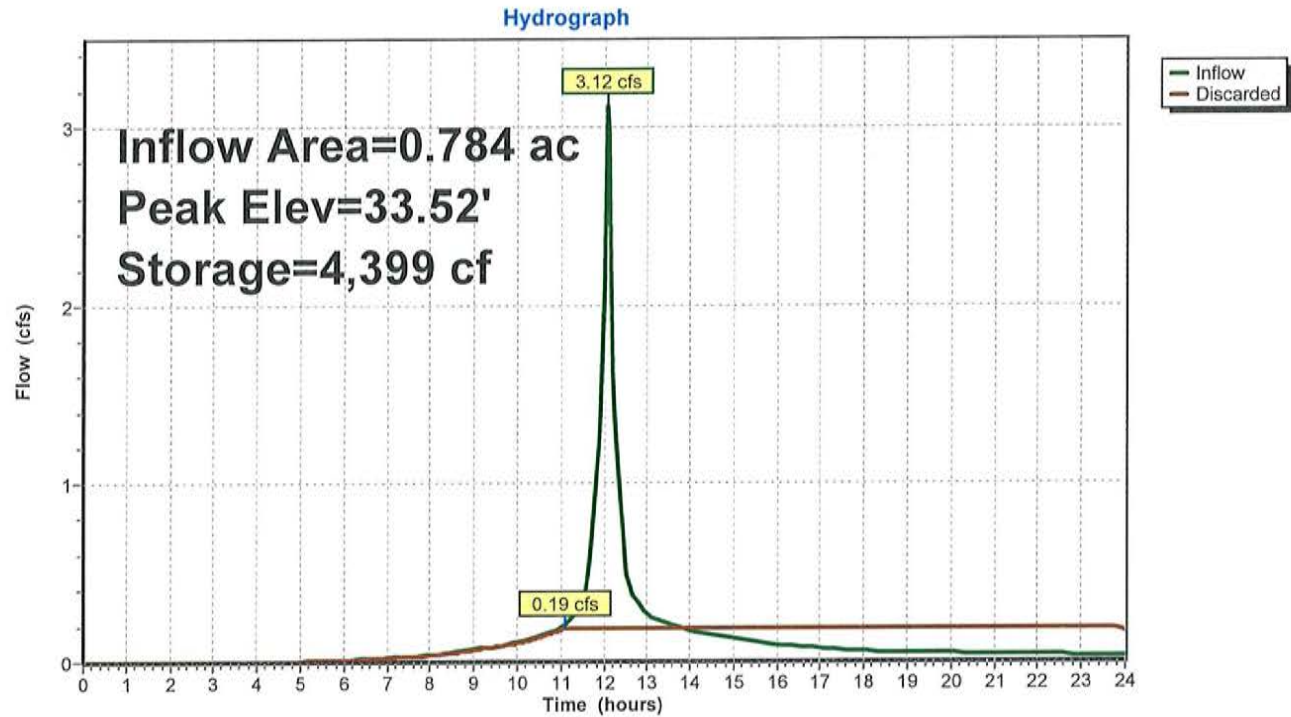
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Type III 24-hr 10 YR Rainfall=4.50"

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Pond PB3: INFIL. SYST. #1



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Type III 24-hr 25 YR Rainfall=5.50"

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Time span=0.00-24.00 hrs, dt=0.05 hrs, 481 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment P1: Old PR 1	Runoff Area=5,240 ac 0.00% Impervious Runoff Depth>0.45" Tc=24.7 min CN=42 Runoff=0.80 cfs 0.196 af
Subcatchment P2: 5 Unit Front Roof	Runoff Area=2,320 sf 100.00% Impervious Runoff Depth>5.26" Tc=5.0 min CN=98 Runoff=0.29 cfs 0.023 af
Subcatchment P3: Modified PR 3	Runoff Area=137,686 sf 3.83% Impervious Runoff Depth>0.83" Flow Length=705' Tc=50.4 min CN=49 Runoff=0.98 cfs 0.218 af
Subcatchment P5: Modified PR 5	Runoff Area=168,611 sf 2.35% Impervious Runoff Depth>0.84" Tc=5.0 min CN=49 Runoff=2.70 cfs 0.272 af
Subcatchment P6: Parking Area	Runoff Area=34,142 sf 88.71% Impervious Runoff Depth>4.47" Tc=5.0 min CN=91 Runoff=3.93 cfs 0.292 af
Subcatchment P7: Center Grass Island	Runoff Area=22,204 sf 0.00% Impervious Runoff Depth>0.31" Tc=5.0 min CN=39 Runoff=0.05 cfs 0.013 af
Reach PTOTAL: Total to Wetland	Inflow=2.72 cfs 0.530 af Outflow=2.72 cfs 0.530 af
Pond P-Inf: INFIL. SYST. #2	Peak Elev=3.41' Storage=314 cf Inflow=0.29 cfs 0.023 af Outflow=0.03 cfs 0.023 af
Pond PB1: Old PB 1	Peak Elev=32.21' Storage=6,850 cf Inflow=0.80 cfs 0.196 af Outflow=0.09 cfs 0.039 af
Pond PB3: INFIL. SYST. #1	Peak Elev=34.34' Storage=6,142 cf Inflow=3.93 cfs 0.292 af Outflow=0.19 cfs 0.239 af
Pond PB4: Center Island Depression	Peak Elev=37.29' Storage=576 cf Inflow=0.05 cfs 0.013 af Outflow=0.00 cfs 0.000 af

Total Runoff Area = 13.618 ac Runoff Volume = 1.014 af Average Runoff Depth = 0.89"
92.95% Pervious = 12.658 ac 7.05% Impervious = 0.961 ac

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Type III 24-hr 25 YR Rainfall=5.50"

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Summary for Subcatchment P1: Old PR 1

Runoff = 0.80 cfs @ 12.60 hrs, Volume= 0.196 af, Depth> 0.45"

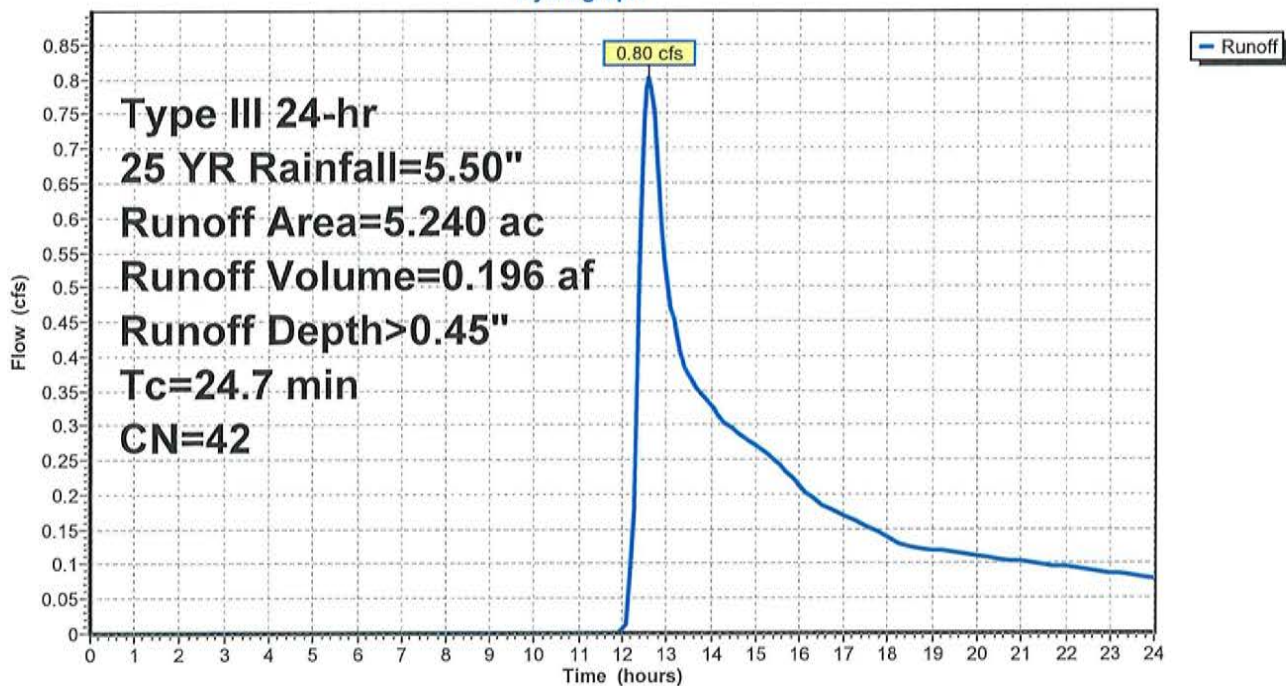
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 25 YR Rainfall=5.50"

Area (ac)	CN	Description
* 5.240	42	
5.240		100.00% Pervious Area

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

Subcatchment P1: Old PR 1

Hydrograph



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Type III 24-hr 25 YR Rainfall=5.50"

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Summary for Subcatchment P2: 5 Unit Front Roof

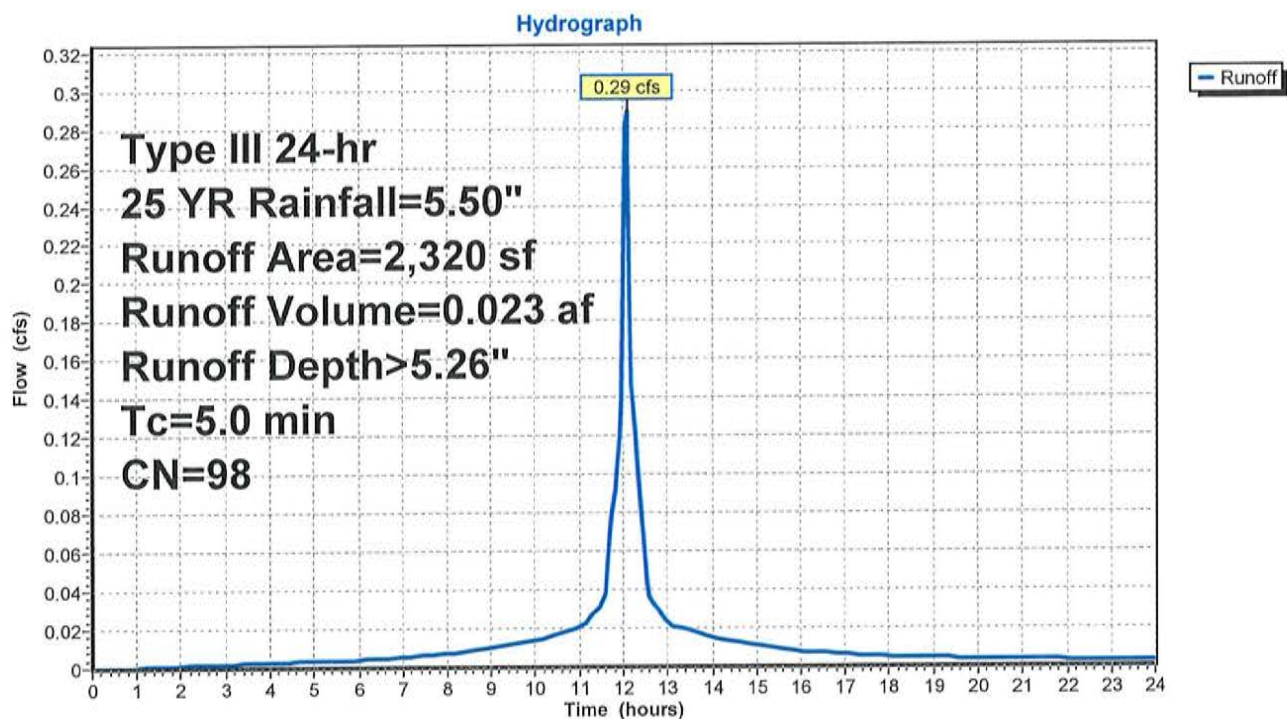
Runoff = 0.29 cfs @ 12.07 hrs, Volume= 0.023 af, Depth> 5.26"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 25 YR Rainfall=5.50"

Area (sf)	CN	Description
2,320	98	Roofs, HSG A
2,320		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					Direct Entry, Minimum Time

Subcatchment P2: 5 Unit Front Roof



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Type III 24-hr 25 YR Rainfall=5.50"

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Summary for Subcatchment P3: Modified PR 3

Runoff = 0.98 cfs @ 12.85 hrs, Volume= 0.218 af, Depth> 0.83"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 25 YR Rainfall=5.50"

Area (sf)	CN	Description
14,608	39	>75% Grass cover, Good, HSG A
23,786	61	>75% Grass cover, Good, HSG B
38,250	30	Woods, Good, HSG A
55,762	55	Woods, Good, HSG B
* 5,280	98	Roof
137,686	49	Weighted Average
132,406		96.17% Pervious Area
5,280		3.83% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.1	50	0.0400	0.20		Sheet Flow, AB Grass: Short n= 0.150 P2= 3.50"
0.2	37	0.1350	2.57		Shallow Concentrated Flow, BC Short Grass Pasture Kv= 7.0 fps
46.1	618	0.0080	0.22		Shallow Concentrated Flow, CD Forest w/Heavy Litter Kv= 2.5 fps
50.4	705	Total			

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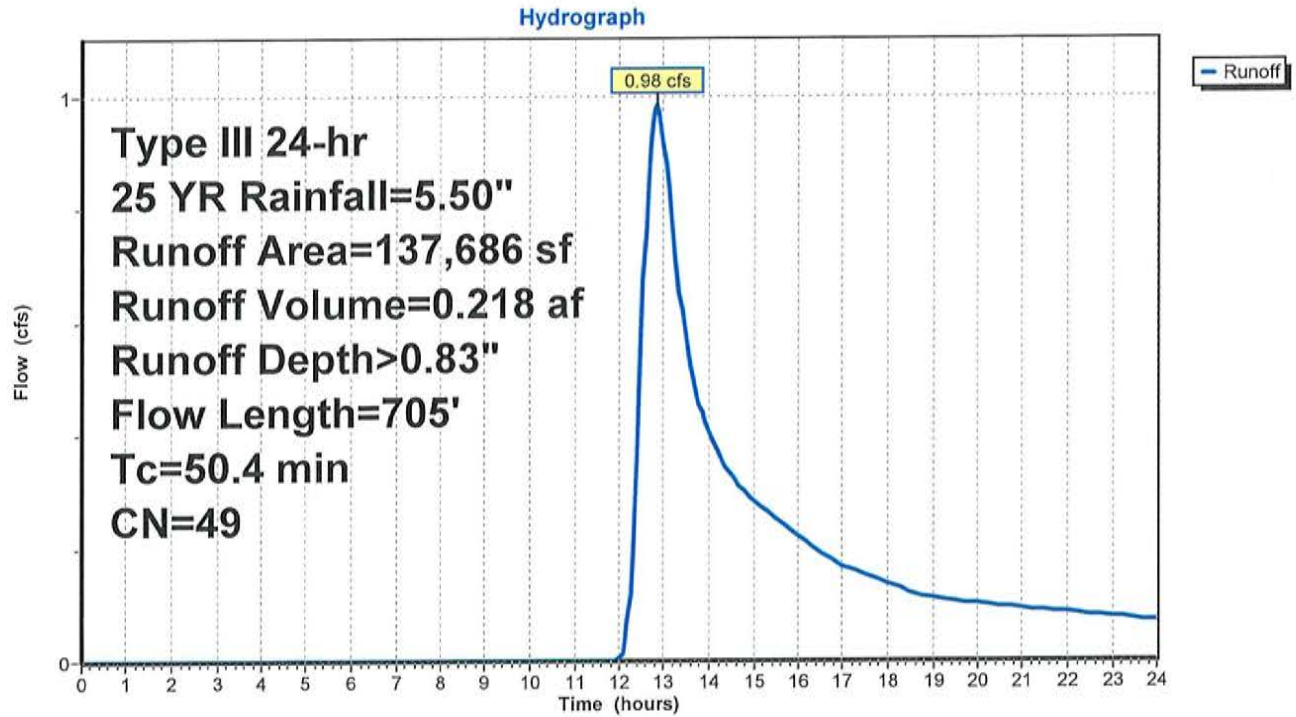
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Type III 24-hr 25 YR Rainfall=5.50"

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Subcatchment P3: Modified PR 3



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Type III 24-hr 25 YR Rainfall=5.50"

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Summary for Subcatchment P5: Modified PR 5

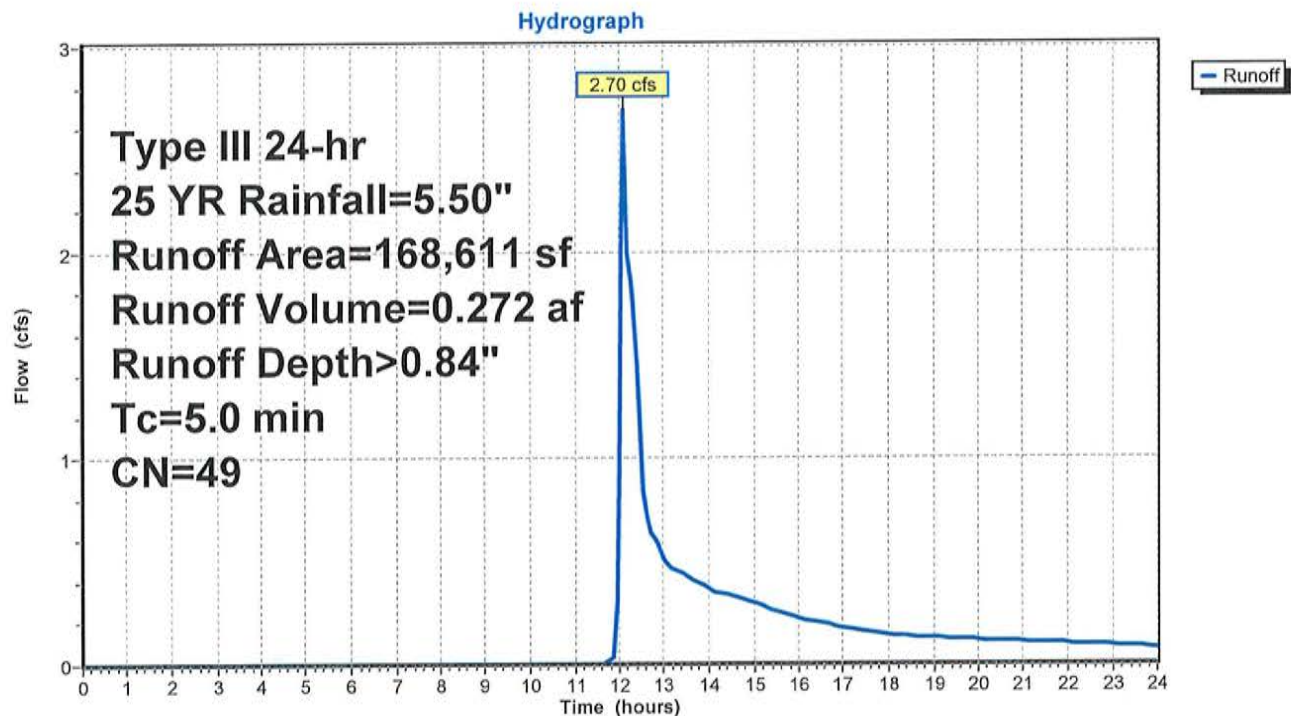
Runoff = 2.70 cfs @ 12.11 hrs, Volume= 0.272 af, Depth> 0.84"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 25 YR Rainfall=5.50"

Area (sf)	CN	Description
19,956	39	>75% Grass cover, Good, HSG A
16,848	61	>75% Grass cover, Good, HSG B
35,654	30	Woods, Good, HSG A
92,193	55	Woods, Good, HSG B
* 3,960	98	Roof
168,611	49	Weighted Average
164,651		97.65% Pervious Area
3,960		2.35% Impervious Area

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

Subcatchment P5: Modified PR 5



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Type III 24-hr 25 YR Rainfall=5.50"

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Summary for Subcatchment P6: Parking Area

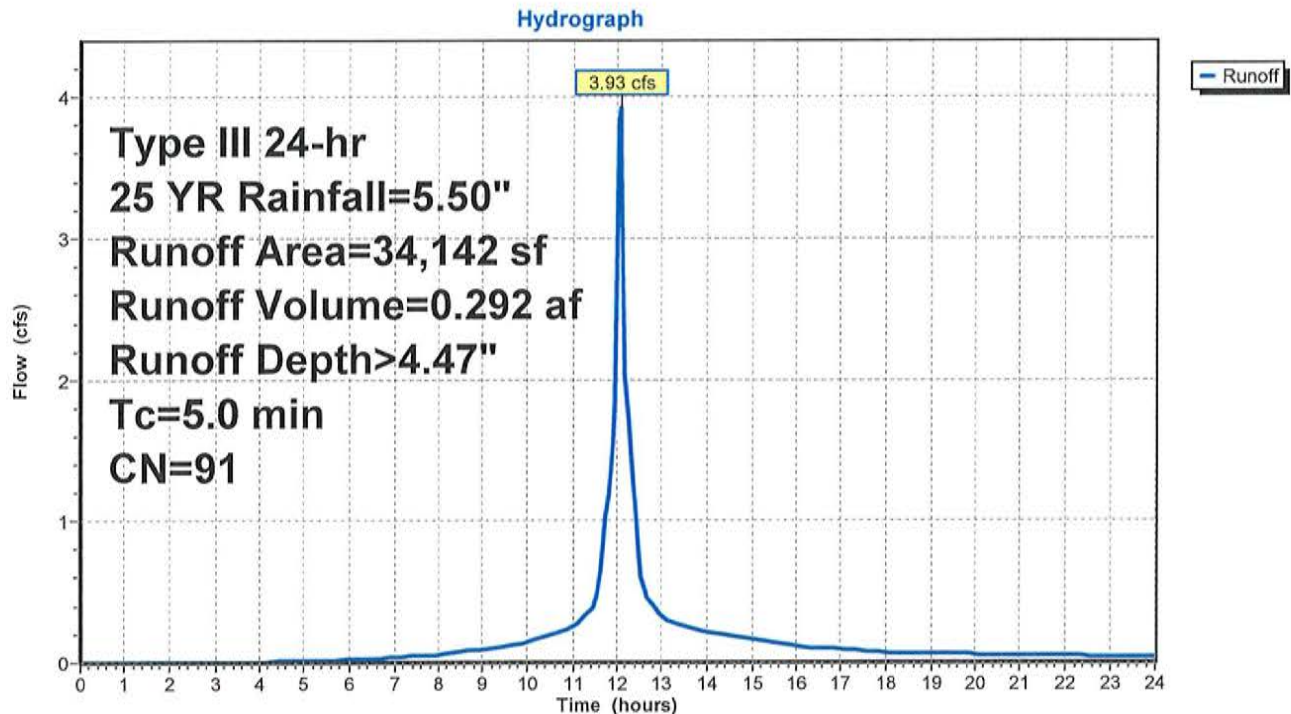
Runoff = 3.93 cfs @ 12.07 hrs, Volume= 0.292 af, Depth> 4.47"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 25 YR Rainfall=5.50"

Area (sf)	CN	Description
30,287	98	Paved parking, HSG A
3,855	39	>75% Grass cover, Good, HSG A
34,142	91	Weighted Average
3,855		11.29% Pervious Area
30,287		88.71% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					Direct Entry, Minimum Time

Subcatchment P6: Parking Area



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Type III 24-hr 25 YR Rainfall=5.50"

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Summary for Subcatchment P7: Center Grass Island

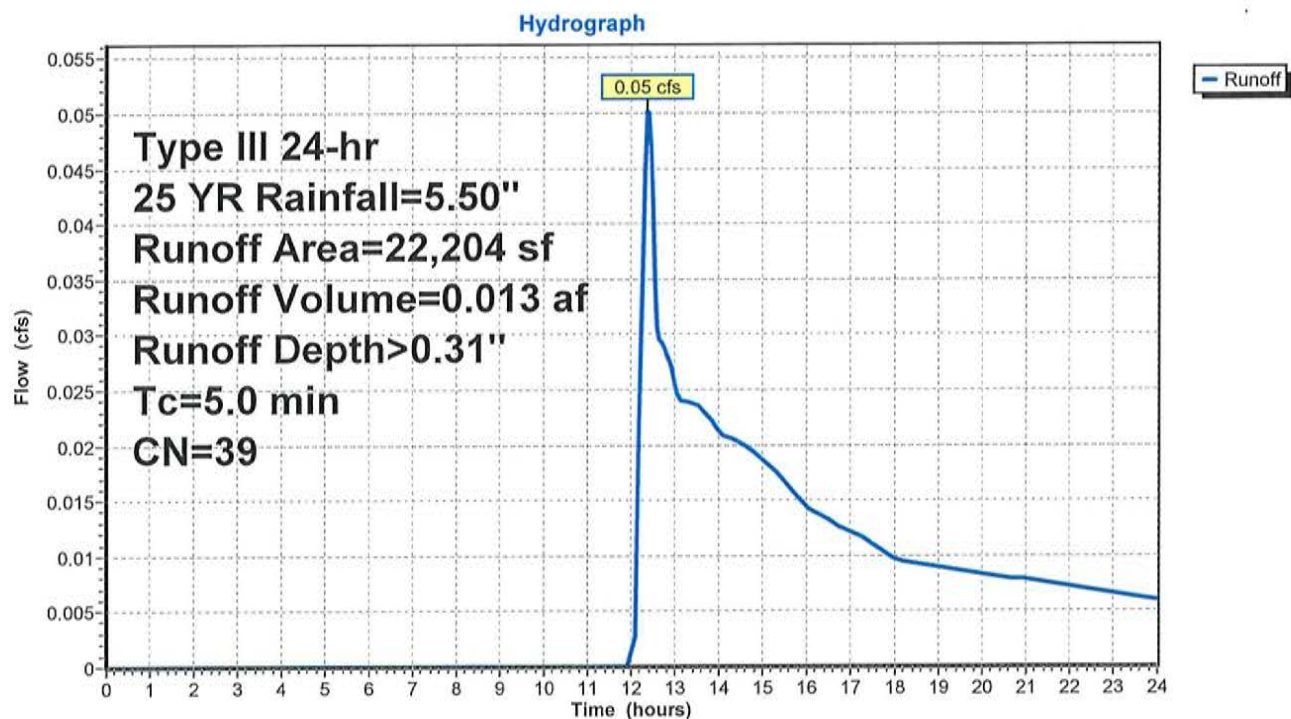
Runoff = 0.05 cfs @ 12.38 hrs, Volume= 0.013 af, Depth> 0.31"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 25 YR Rainfall=5.50"

Area (sf)	CN	Description
22,204	39	>75% Grass cover, Good, HSG A
22,204		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					Direct Entry, Minimum Time

Subcatchment P7: Center Grass Island



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Type III 24-hr 25 YR Rainfall=5.50"

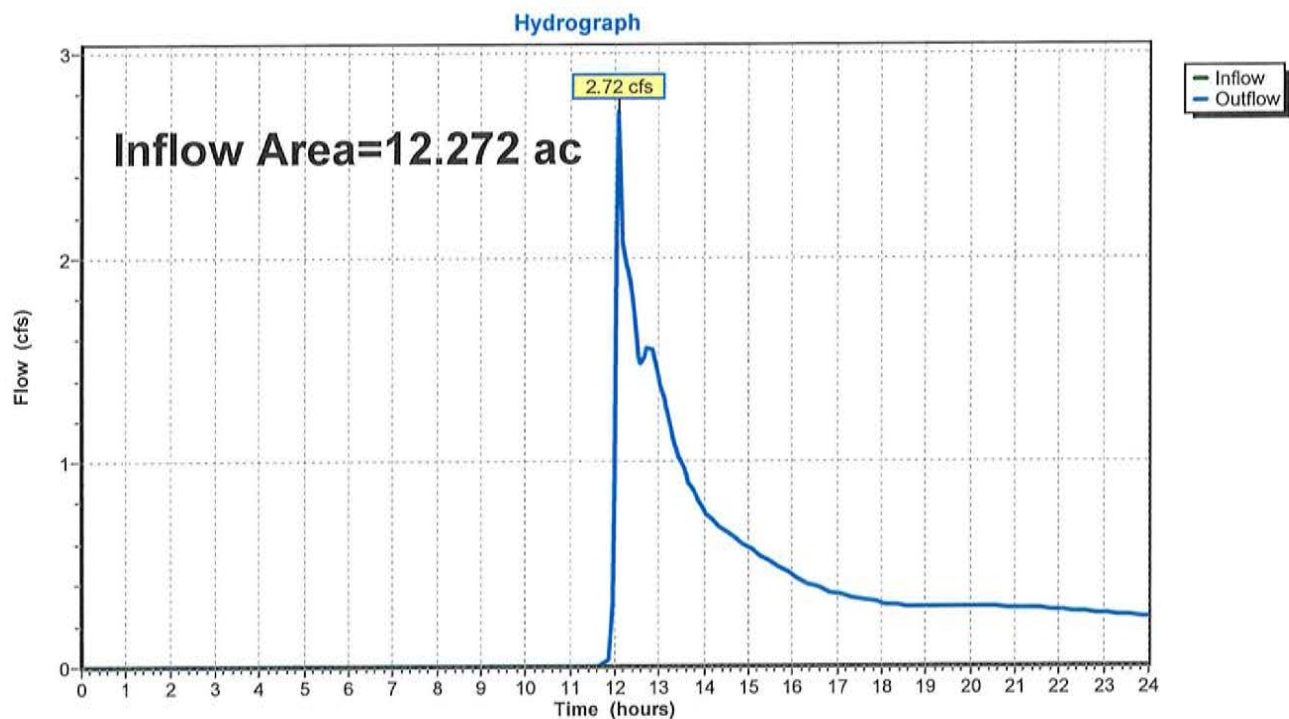
Page 41

Summary for Reach PTOTAL: Total to Wetland

Inflow Area = 12.272 ac, 1.73% Impervious, Inflow Depth > 0.52" for 25 YR event
Inflow = 2.72 cfs @ 12.11 hrs, Volume= 0.530 af
Outflow = 2.72 cfs @ 12.11 hrs, Volume= 0.530 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Reach PTOTAL: Total to Wetland



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Type III 24-hr 25 YR Rainfall=5.50"

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Summary for Pond P-Inf: INFIL. SYST. #2

Refer to Table 7-SC-740 Incremental Storage Volumes Per Chamber attached with this report.

Inflow Area = 0.053 ac, 100.00% Impervious, Inflow Depth > 5.26" for 25 YR event
Inflow = 0.29 cfs @ 12.07 hrs, Volume= 0.023 af
Outflow = 0.03 cfs @ 11.55 hrs, Volume= 0.023 af, Atten= 89%, Lag= 0.0 min
Discarded = 0.03 cfs @ 11.55 hrs, Volume= 0.023 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Peak Elev= 3.41' @ 12.68 hrs Surf.Area= 169 sf Storage= 314 cf

Plug-Flow detention time= 60.3 min calculated for 0.023 af (100% of inflow)

Center-of-Mass det. time= 60.1 min (805.4 - 745.2)

Volume	Invert	Avail.Storage	Storage Description
#1A	0.00'	182 cf	15.75'W x 10.74'L x 3.50'H Field A 592 cf Overall - 138 cf Embedded = 454 cf x 40.0% Voids
#2A	0.50'	138 cf	ADS_StormTech SC-740 +Cap x 3 Inside #1 Effective Size= 44.6"W x 30.0"H => 6.45 sf x 7.12'L = 45.9 cf Overall Size= 51.0"W x 30.0"H x 7.56'L with 0.44' Overlap 3 Chambers in 3 Rows
		319 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	0.00'	8.270 in/hr Exfiltration over Surface area

Discarded OutFlow Max=0.03 cfs @ 11.55 hrs HW=0.04' (Free Discharge)

↑1=Exfiltration (Exfiltration Controls 0.03 cfs)

Hilda Lane - Multifamily Development

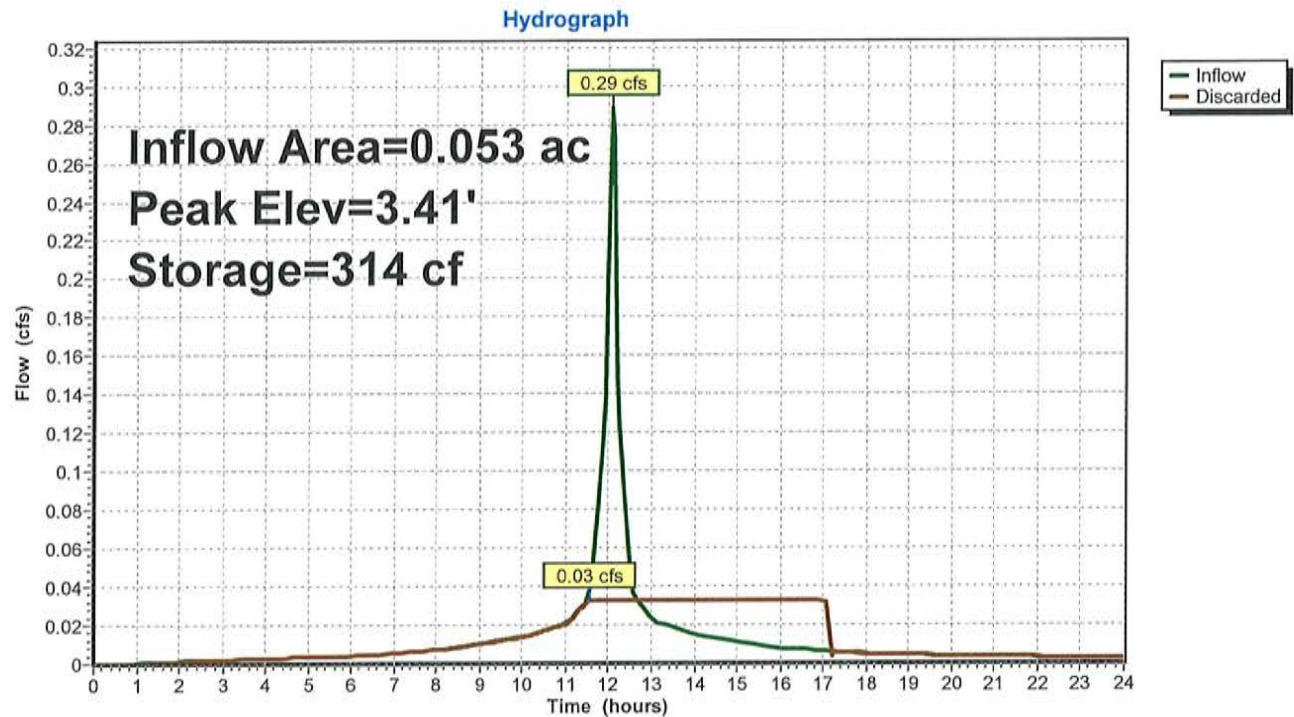
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Type III 24-hr 25 YR Rainfall=5.50"

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Pond P-Inf: INFIL. SYST. #2



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Brookside Farm Hilda lane Halifax, MA
Type III 24-hr 25 YR Rainfall=5.50"

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Summary for Pond PB1: Old PB 1

Inflow Area = 5.240 ac, 0.00% Impervious, Inflow Depth > 0.45" for 25 YR event
Inflow = 0.80 cfs @ 12.60 hrs, Volume= 0.196 af
Outflow = 0.09 cfs @ 22.61 hrs, Volume= 0.039 af, Atten= 89%, Lag= 600.7 min
Primary = 0.09 cfs @ 22.61 hrs, Volume= 0.039 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 32.21' @ 22.61 hrs Storage= 6,850 cf

Plug-Flow detention time= 515.4 min calculated for 0.039 af (20% of inflow)
Center-of-Mass det. time= 310.6 min (1,273.9 - 963.3)

Volume	Invert	Avail.Storage	Storage Description
#1	31.40'	13,303 cf	Custom Stage Data Listed below

Elevation (feet)	Cum.Store (cubic-feet)
31.40	0
32.00	5,103
33.00	13,303

Device	Routing	Invert	Outlet Devices
#1	Primary	32.00'	120.0 deg Sharp-Crested Vee/Trap Weir Cv= 2.48 (C= 3.10)

Primary OutFlow Max=0.09 cfs @ 22.61 hrs HW=32.21' (Free Discharge)
↑1=Sharp-Crested Vee/Trap Weir (Weir Controls 0.09 cfs @ 1.14 fps)

Hilda Lane - Multifamily Development

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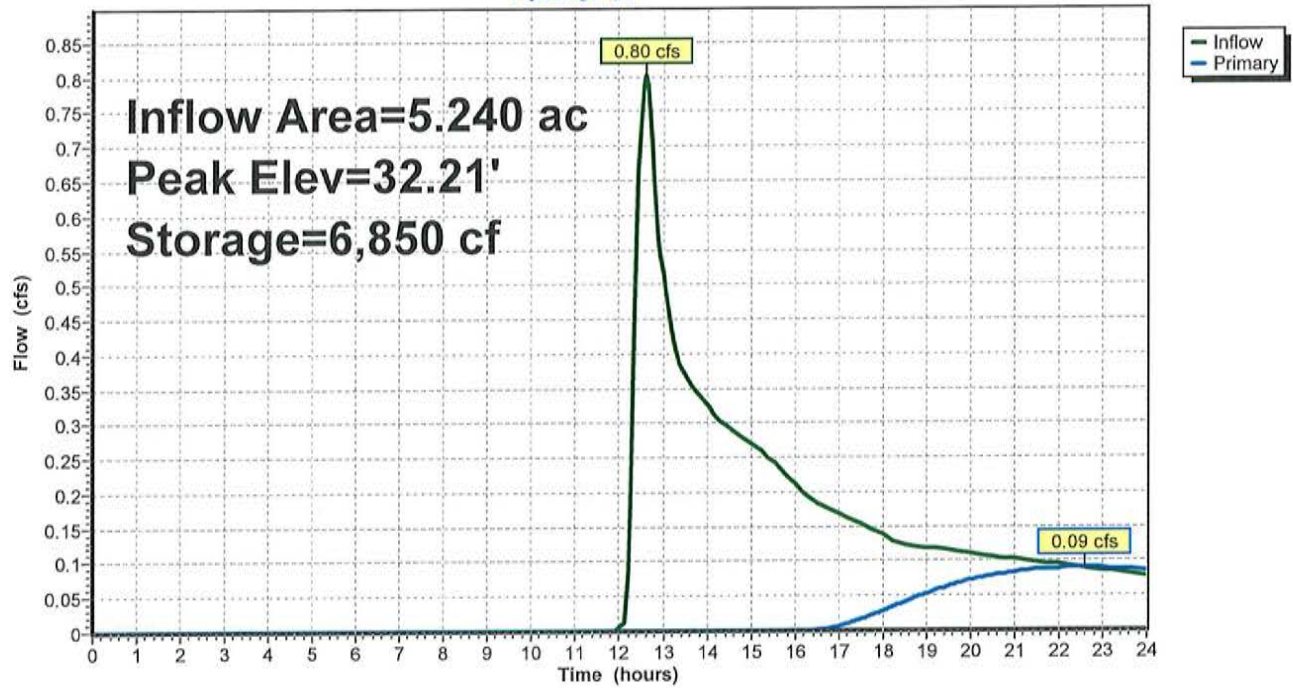
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Type III 24-hr 25 YR Rainfall=5.50"

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Pond PB1: Old PB 1

Hydrograph



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Type III 24-hr 25 YR Rainfall=5.50"

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Summary for Pond PB3: INFIL. SYST. #1

Refer to Table 7-SC-740 Incremental Storage Volumes Per Chamber attached with this report.

Inflow Area = 0.784 ac, 88.71% Impervious, Inflow Depth > 4.47" for 25 YR event
Inflow = 3.93 cfs @ 12.07 hrs, Volume= 0.292 af
Outflow = 0.19 cfs @ 10.55 hrs, Volume= 0.239 af, Atten= 95%, Lag= 0.0 min
Discarded = 0.19 cfs @ 10.55 hrs, Volume= 0.239 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 34.34' @ 14.48 hrs Surf.Area= 3,342 sf Storage= 6,142 cf

Plug-Flow detention time= 259.4 min calculated for 0.238 af (82% of inflow)
Center-of-Mass det. time= 188.7 min (971.2 - 782.5)

Volume	Invert	Avail.Storage	Storage Description
#1A	31.60'	3,007 cf	34.75'W x 96.18'L x 3.50'H Field A 11,697 cf Overall - 4,181 cf Embedded = 7,517 cf x 40.0% Voids
#2A	32.10'	4,181 cf	ADS_StormTech SC-740 +Cap x 91 Inside #1 Effective Size= 44.6"W x 30.0"H => 6.45 sf x 7.12'L = 45.9 cf Overall Size= 51.0"W x 30.0"H x 7.56'L with 0.44' Overlap 91 Chambers in 7 Rows
		7,187 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	31.60'	2.410 in/hr Exfiltration over Surface area

Discarded OutFlow Max=0.19 cfs @ 10.55 hrs HW=31.64' (Free Discharge)
↑1=Exfiltration (Exfiltration Controls 0.19 cfs)

Hilda Lane - Multifamily Development

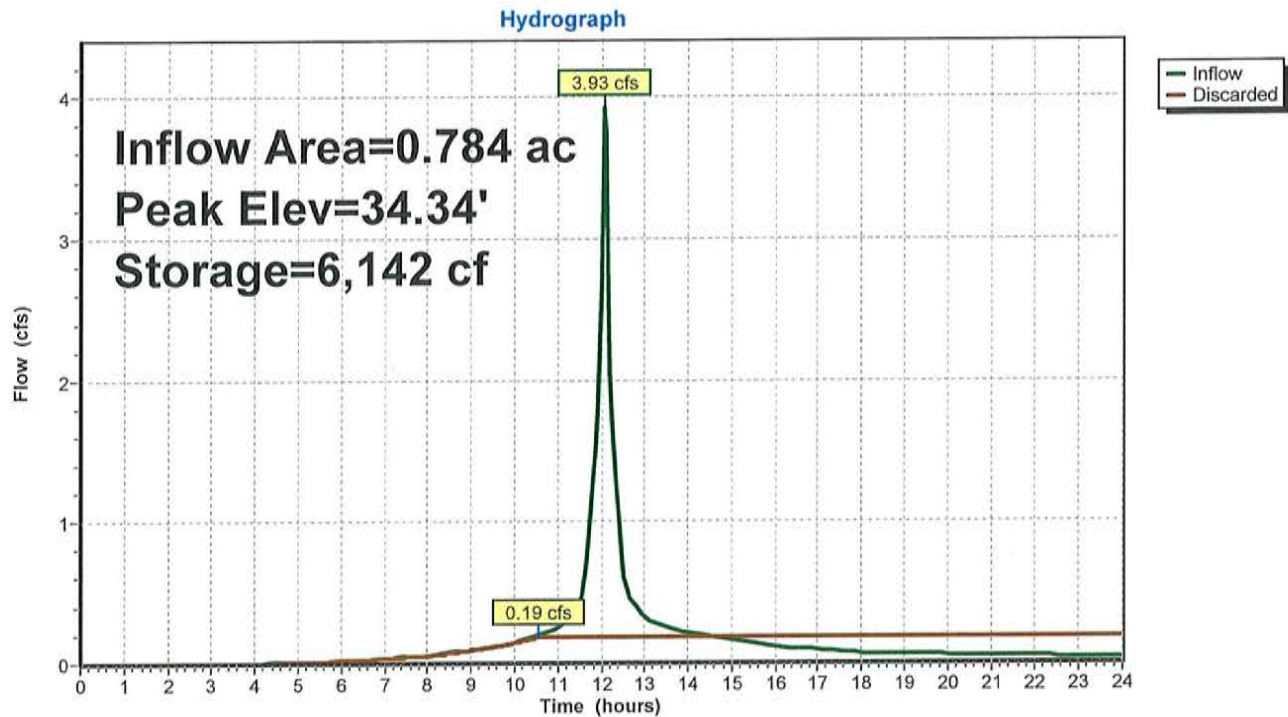
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Brookside Farm Hilda lane Halifax, MA
Type III 24-hr 25 YR Rainfall=5.50"

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Pond PB3: INFIL. SYST. #1



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Type III 24-hr 25 YR Rainfall=5.50"

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Summary for Pond PB4: Center Island Depression

Inflow Area = 0.510 ac, 0.00% Impervious, Inflow Depth > 0.31" for 25 YR event
Inflow = 0.05 cfs @ 12.38 hrs, Volume= 0.013 af
Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Atten= 100%, Lag= 0.0 min

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 37.29' @ 24.00 hrs Surf.Area= 2,147 sf Storage= 576 cf

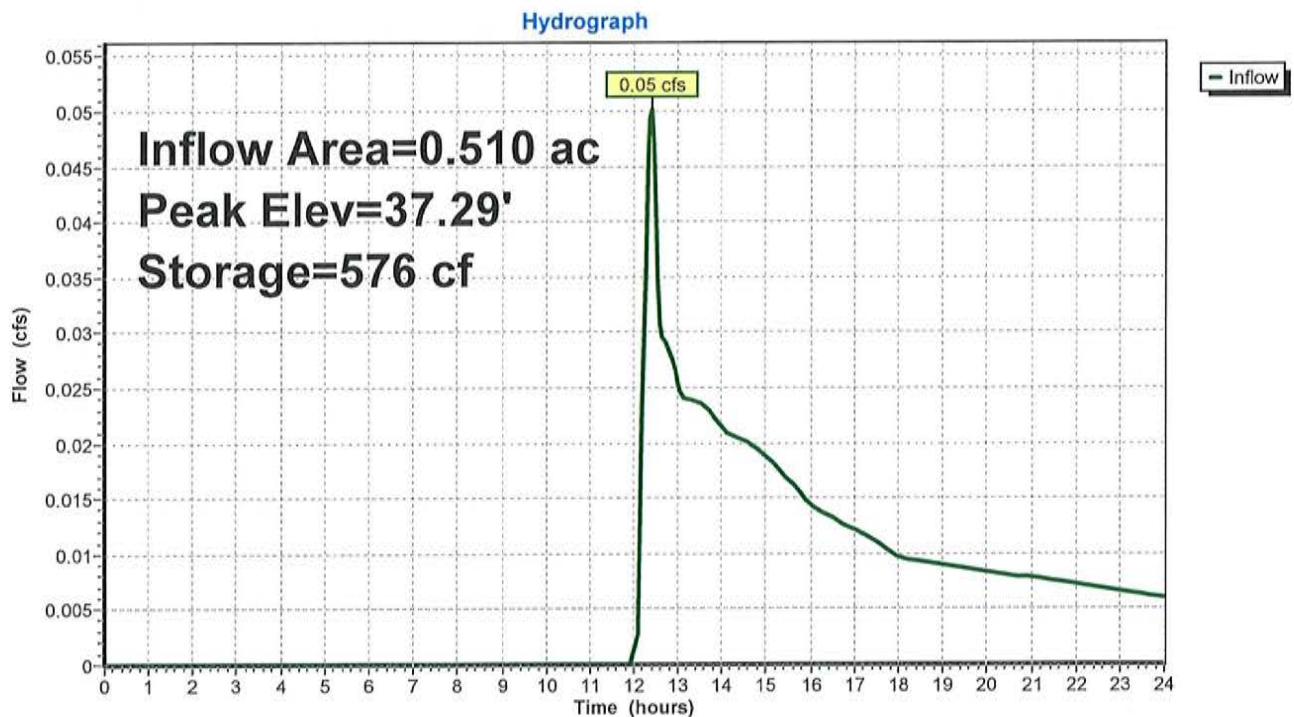
Plug-Flow detention time= (not calculated: initial storage exceeds outflow)

Center-of-Mass det. time= (not calculated: no outflow)

Volume	Invert	Avail.Storage	Storage Description
#1	37.00'	2,392 cf	Custom Stage Data (Irregular) Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
37.00	1,846	170.8	0	0	1,846
38.00	2,984	208.5	2,392	2,392	3,000

Pond PB4: Center Island Depression



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Type III 24-hr 100YR Rainfall=7.00"

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Summary for Subcatchment P1: Old PR 1

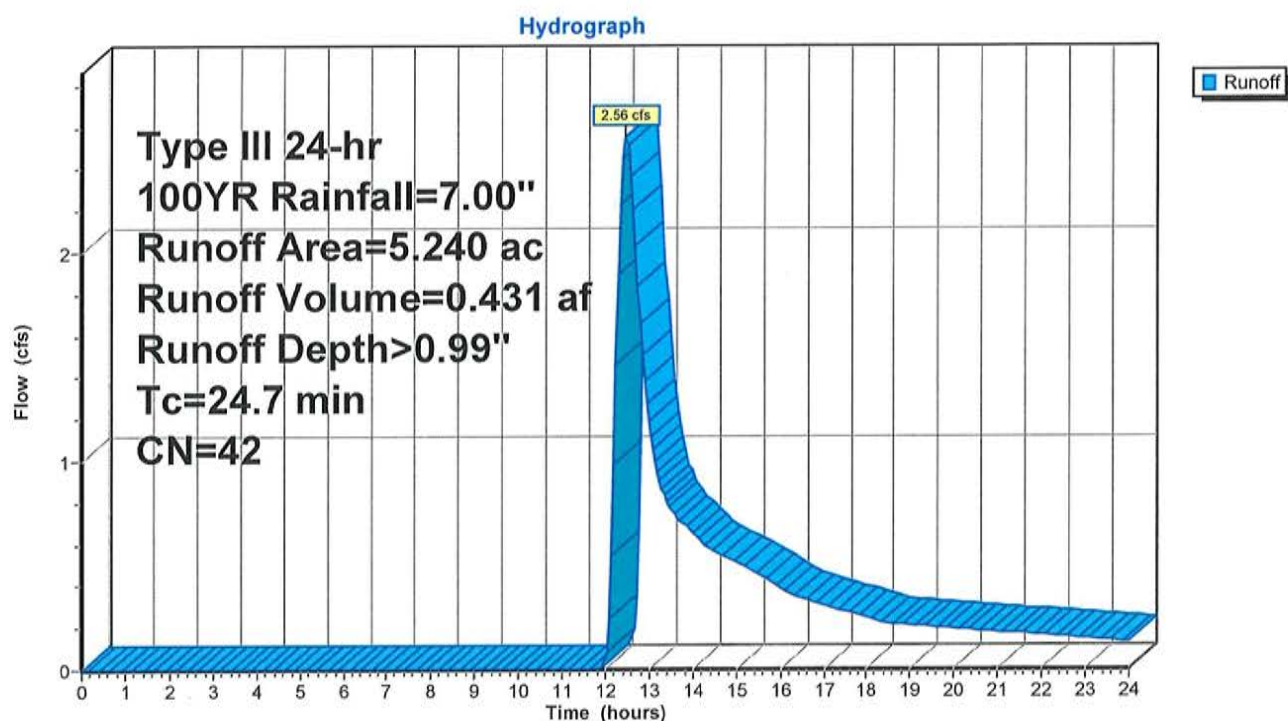
Runoff = 2.56 cfs @ 12.48 hrs, Volume= 0.431 af, Depth> 0.99"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 100YR Rainfall=7.00"

Area (ac)	CN	Description
* 5.240	42	
5.240		100.00% Pervious Area

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

Subcatchment P1: Old PR 1



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Type III 24-hr 100YR Rainfall=7.00"

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Summary for Subcatchment P3: Modified PR 3

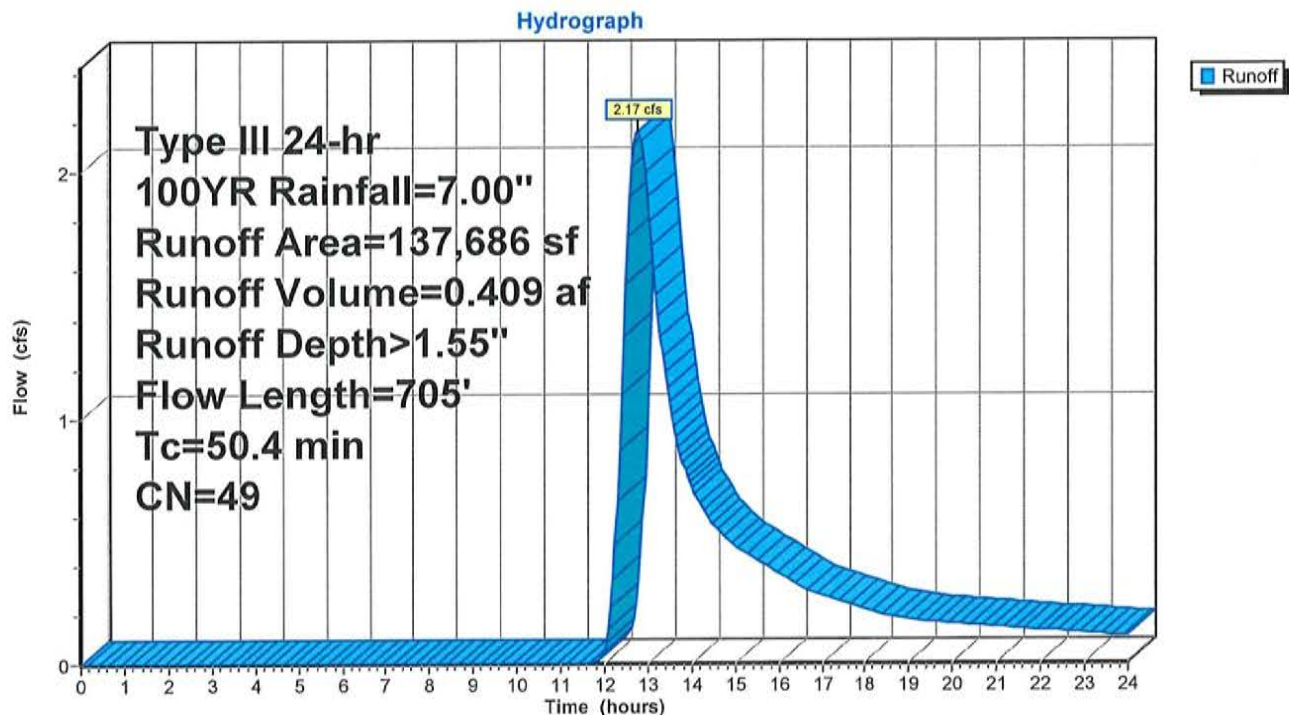
Runoff = 2.17 cfs @ 12.79 hrs, Volume= 0.409 af, Depth> 1.55"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 100YR Rainfall=7.00"

Area (sf)	CN	Description
14,608	39	>75% Grass cover, Good, HSG A
23,786	61	>75% Grass cover, Good, HSG B
38,250	30	Woods, Good, HSG A
55,762	55	Woods, Good, HSG B
* 5,280	98	Roof
137,686	49	Weighted Average
132,406		96.17% Pervious Area
5,280		3.83% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.1	50	0.0400	0.20		Sheet Flow, AB Grass: Short n= 0.150 P2= 3.50"
0.2	37	0.1350	2.57		Shallow Concentrated Flow, BC Short Grass Pasture Kv= 7.0 fps
46.1	618	0.0080	0.22		Shallow Concentrated Flow, CD Forest w/Heavy Litter Kv= 2.5 fps
50.4	705	Total			

Subcatchment P3: Modified PR 3



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Type III 24-hr 100YR Rainfall=7.00"

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Summary for Subcatchment P5: Modified PR 5

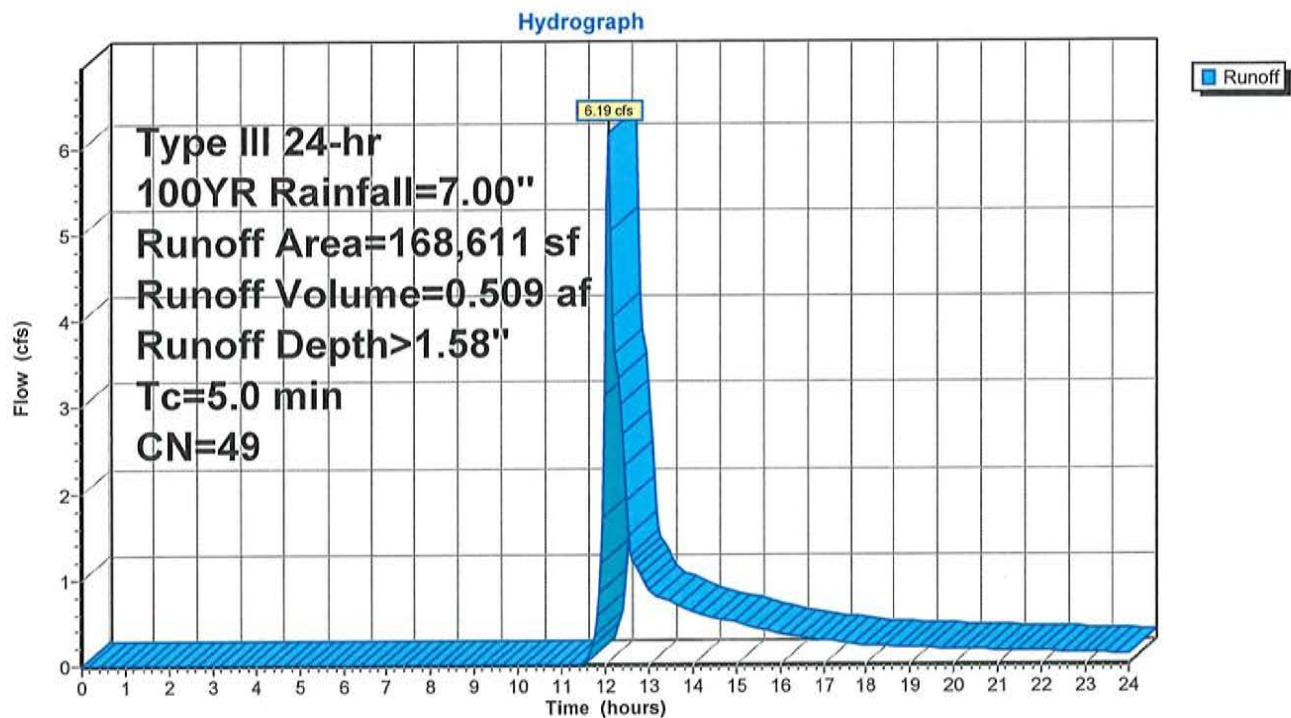
Runoff = 6.19 cfs @ 12.10 hrs, Volume= 0.509 af, Depth> 1.58"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 100YR Rainfall=7.00"

Area (sf)	CN	Description
19,956	39	>75% Grass cover, Good, HSG A
16,848	61	>75% Grass cover, Good, HSG B
35,654	30	Woods, Good, HSG A
92,193	55	Woods, Good, HSG B
* 3,960	98	Roof
168,611	49	Weighted Average
164,651		97.65% Pervious Area
3,960		2.35% Impervious Area

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

Subcatchment P5: Modified PR 5



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Type III 24-hr 100YR Rainfall=7.00"

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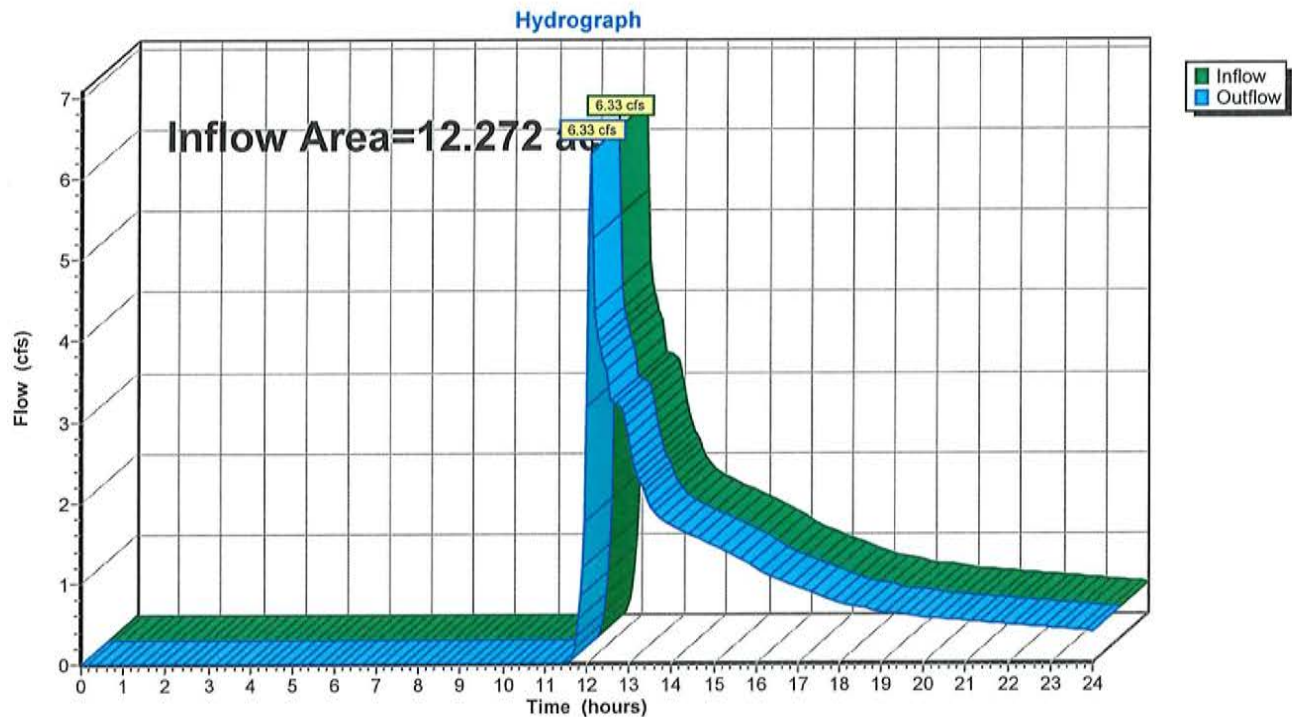
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Summary for Reach PTOTAL: Total to Wetland

Inflow Area = 12.272 ac, 1.73% Impervious, Inflow Depth > 1.15" for 100YR event
Inflow = 6.33 cfs @ 12.10 hrs, Volume= 1.181 af
Outflow = 6.33 cfs @ 12.10 hrs, Volume= 1.181 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Reach PTOTAL: Total to Wetland



Hilda Lane - Multifamily Development

Type III 24-hr 100YR Rainfall=7.00"

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Summary for Pond PB1: Old PB 1

Inflow Area = 5.240 ac, 0.00% Impervious, Inflow Depth > 0.99" for 100YR event
 Inflow = 2.56 cfs @ 12.48 hrs, Volume= 0.431 af
 Outflow = 0.51 cfs @ 15.11 hrs, Volume= 0.263 af, Atten= 80%, Lag= 158.1 min
 Primary = 0.51 cfs @ 15.11 hrs, Volume= 0.263 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
 Peak Elev= 32.42' @ 15.11 hrs Surf.Area= 0 sf Storage= 8,586 cf

Plug-Flow detention time= 265.6 min calculated for 0.263 af (61% of inflow)
 Center-of-Mass det. time= 136.8 min (1,062.4 - 925.7)

Volume	Invert	Avail.Storage	Storage Description
#1	31.40'	13,303 cf	Custom Stage Data Listed below

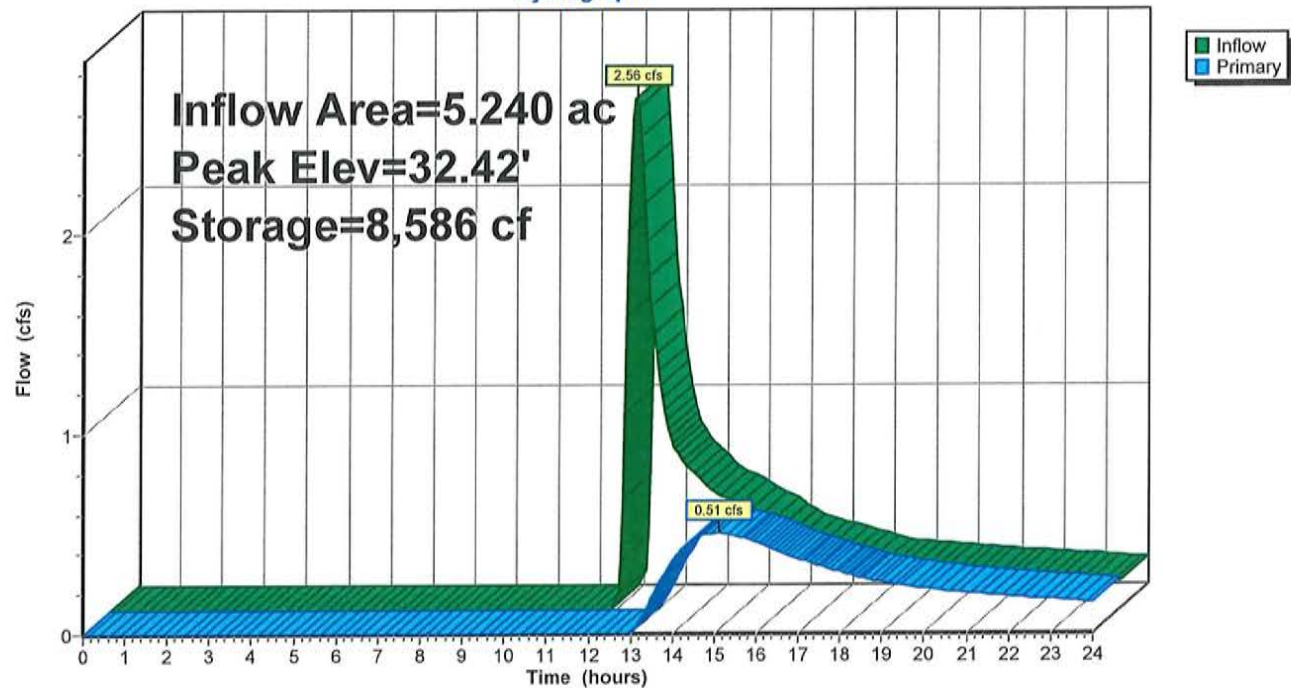
Elevation (feet)	Cum.Store (cubic-feet)
31.40	0
32.00	5,103
33.00	13,303

Device	Routing	Invert	Outlet Devices
#1	Primary	32.00'	120.0 deg Sharp-Crested Vee/Trap Weir Cv= 2.48 (C= 3.10)

Primary OutFlow Max=0.51 cfs @ 15.11 hrs HW=32.42' (Free Discharge)
 ↑1=Sharp-Crested Vee/Trap Weir (Weir Controls 0.51 cfs @ 1.62 fps)

Pond PB1: Old PB 1

Hydrograph





APPENDIX

BRACKEN ENGINEERING, INC.
49 HERRING POND ROAD
BUZZARDS BAY, MA 02532

Location: Halifax, MA
Development: Brookside Farm
Project No.:
Storm Frequency: 25 Year
Runs:

Date: 20-Nov-20
Revised:
Computed By: RMM/ERC
Checked By: DFB

From		To	Drainage Area (acres)	C	Total C x A (acres)	Tc (min)	I(25) (in/hr)	Q = (CIA) (cfs)	Flow from others (cfs)		Total Q (cfs)	Min. Slope (ft/ft)	Pipe Material	Manning's n	Dia (in)	Q (full) (cfs)	V (full) (fps)	Q/Q(full) < 1?	INV. DOWN (ft)	INV. UP (ft)	Length (ft)	Pipe Rad. (ft)	Hydraulic Radius (ft)	Area (ft2)	Perimeter (ft)
Run 1																									
CB 1	DMH 1		0.000	0.20	0.25	5.0	5.5	1.38	0.00	1.38	0.010	HDPE	0.011	12	4.31	5.49	0.32		33.5	34	48	0.5	0.25	0.785	3.142
		0.027	0.30																						
		0.270	0.90																						
CB 2	DMH 1		0.000	0.20	0.12	5.0	5.5	0.68	0.00	0.68	0.016	HDPE	0.011	12	5.41	6.89	0.13		33.5	35.7	134	0.5	0.25	0.785	3.142
		0.022	0.30																						
		0.130	0.90																						
DMH 1	DMH 2		0.000	0.20	0.00	5.0	5.5	0.00	2.06	2.06	0.011	HDPE	0.011	12	4.51	5.75	0.46		33	33.4	35	0.5	0.25	0.785	3.142
		0.000	0.30																						
		0.000	0.90																						
CB 3	DMH 2		0.000	0.20	0.28	5.0	5.5	1.55	0.00	1.55	0.013	HDPE	0.011	12	4.72	6.01	0.33		33	33.5	40	0.5	0.25	0.785	3.142
		0.040	0.30																						
		0.300	0.90																						
DMH 2	OGS 1		0.000	0.20	0.00	5.0	5.5	0.00	3.61	3.61	0.050	HDPE	0.011	12	9.44	12.02	0.38		32.8	32.9	2	0.5	0.25	0.785	3.142
		0.000	0.30																						
		0.000	0.90																						



APPENDIX

Location: Hilda Lane
Development: _____

Date: 20-Oct-20
Revised: _____
Computed By: RMM/ERC
Checked By: DFB

Oil/Grit Separator Sizing Requirements

Drainage Area	Impervious Area (s.f.)	WQ Volume Required (c.f.) (@ 400 cf/imp ac.)	Oil Grit Separator Size Required (gal.)	First Compartment Provided (gal.)	Oil Grit Separator Provided (gal.)
WQI #1	30,286	278	2080	2184	3000



Appendix

Project: Brookside Farm, Halifax, MA
 Prepared By: DFB
 Date: 10/20/20

TSS Removal Calculation Worksheet

A BMP	B TSS Removal Rate	C Starting TSS Load	D Amount Removed (BxC)	E Remaining Load (C-D)
DEEP SUMP CATCH BASIN	25%	1.00	0.25	0.75
OIL/GRIT SEPARATOR	25%	0.75	0.19	0.56
INFILTRATION SYSTEM	80%	0.56	0.45	0.11
Total TSS Removal =			89%	

Note: 1) 44% min. TSS removal prior to infiltration.

49 Herring Pond Road
 Buzzards Bay, MA 02532
 ph: 508-833-0070
 fx: 505-833-2282