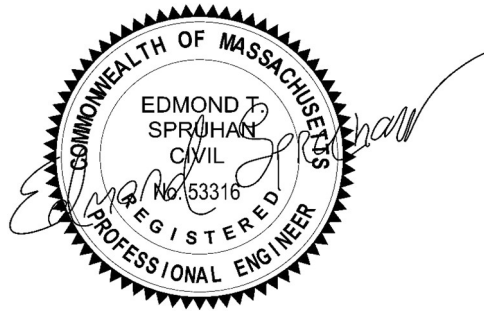


SPRUHAN ENGINEERING, P.C.

STORMWATER REPORT

148 MYRTLE ST, MELROSE, MA



**Prepared By: Spruhan Engineering, P.C.
March 16, 2022**

1.0 Introduction

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1.0 Introduction

Spruhan Engineering, P.C. has prepared this Storm water Report for the proposed development located at 148 Myrtle St, Melrose, Massachusetts.

The proposed development consists of a 5-Unit residential dwelling, paved driveway/parking, permeable pavers walkways, patios, and landscaped areas. The purpose of this report is to demonstrate that the proposed conditions do not create any increased flowrate or runoff from the site. This is achieved by proposing an infiltration system.

2.0 Existing Conditions

The existing property is located at 148 Myrtle St, Melrose, Massachusetts. The site is bounded by residential dwellings on the sides and rear. The property is located in Myrtle St between Vine St and W Emerson St. The existing roof area is 1,439 S.F., the existing paved area is 3,961 S.F., the existing impervious areas are 285.3 S.F. and the remaining landscaped areas are 5,318.4 S.F.

3.0 Proposed Conditions

3.1 Project Description

The development consists of a 5-Unit residential dwelling, paved driveway/parking, permeable pavers walkways, patios, and landscaped areas. The proposed roof will have an area of 3,406 S.F., the proposed paved driveway/parking will have an area of 1,536 S.F., the unconnected impervious will have an area of 648 S.F., the permeable pavers will have an area of 2,172 S.F. and the remaining landscaped portion will have a footprint of 3,242 S.F.

3.2 Storm Water Runoff

HydroCAD was used to model the site for the existing and proposed conditions for the 2-year, 10-year, 25-year, and 100-year type III storm events based on Atlas-14 Rain information for Middlesex County Central Area. HydroCAD calculations can be seen in Appendix A. The following table shows a summary of the existing and proposed conditions on the site as they relate to flowrate and volume of storm water runoff for each of the storm events.

3.3 Infiltration system

An infiltration system is proposed to control the runoff from the roof and proposed paved driveway. The system consists of 6 subsurface Stormtech plastic chambers with a 1ft crushed stone bed below.

The system is 22' x 21' x 4'.

<u>Summary Table (HydroCAD results)</u>				
Storm Event	Runoff rate		Volume of runoff	
	Existing	Proposed	Existing	Proposed
2-Year	0.43 cfs	0.10 cfs	1,504 cf	506 cf
10-Year	0.74 cfs	0.22 cfs	2,650 cf	1,048 cf
25-Year	0.98 cfs	0.32 cfs	3,445 cf	1,441 cf
100-Year	1.37 cfs	0.53 cfs	4,745 cf	2,162 cf

3.4 Groundwater recharge calculations.

System #1:

$$Time = \frac{rv}{(k)(Bottom\ Area)}$$

$$Time = \frac{908.3\ cf}{(8.27\ in/hr)(\frac{1ft}{12in})(462\ Sf)} = 2.85\ Hr$$

4.0 Soil Information

The NRCS Web Soil Survey shows one map unit inside our area of interest. Is listed next and the percentages of Area of Interest in the Map unit Legend Table:

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
603	Urban land, wet substratum	0.2	100.0%
Totals for Area of Interest		0.2	100.0%

Map unit 603 does not show any Hydrological group, this information is shown in Appendix B, in the Map unit descriptions.

Also, as the soils log show that coarse/fine sand was found in the field during the test pit, which has the NRCS “A” properties and these properties were applied to the HydroCAD software calcs. Further detailed information is described in Appendix B.

5.0 Total Suspended Solids (TSS) removal calculations

At a minimum all projects subject to a Major Stormwater Management Permit shall comply with the performance standards of the most recent version of Massachusetts Stormwater Standards and accompanying Stormwater Management Handbook (Handbook). The following design standard considering TSS removal must be addressed:

Stormwater management systems shall be designed to remove 80% of the average annual post-construction impervious area load of Total Suspended Solids (TSS). This Standard is met when:

- a. Suitable practices for source control and pollution prevention are identified in a long-term pollution prevention plan, and thereafter are implemented and maintained.
- b. Structural stormwater best management practices are sized to capture the required water quality volume determined in accordance with the Massachusetts Stormwater Handbook; and
- c. Pretreatment is provided in accordance with the Massachusetts Stormwater Handbook.

The 80% credit was achieved in this project using the following strategies:

Deep Sump Catch Basin + Oil Grit separator + Infiltration trench.

Pre-treatment TSS = 44%

Treatment TSS = 80%

Full treatment train TSS = 89%

Based on documentation for the “Unistorm” device selected for pre-treatment, the actual TSS removal rate will vary depending on the intensity of the storm. Documentation states that this removal rate can range between 52-77%. In order to remain conservative in the design, 25% was selected in the calculations.

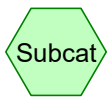
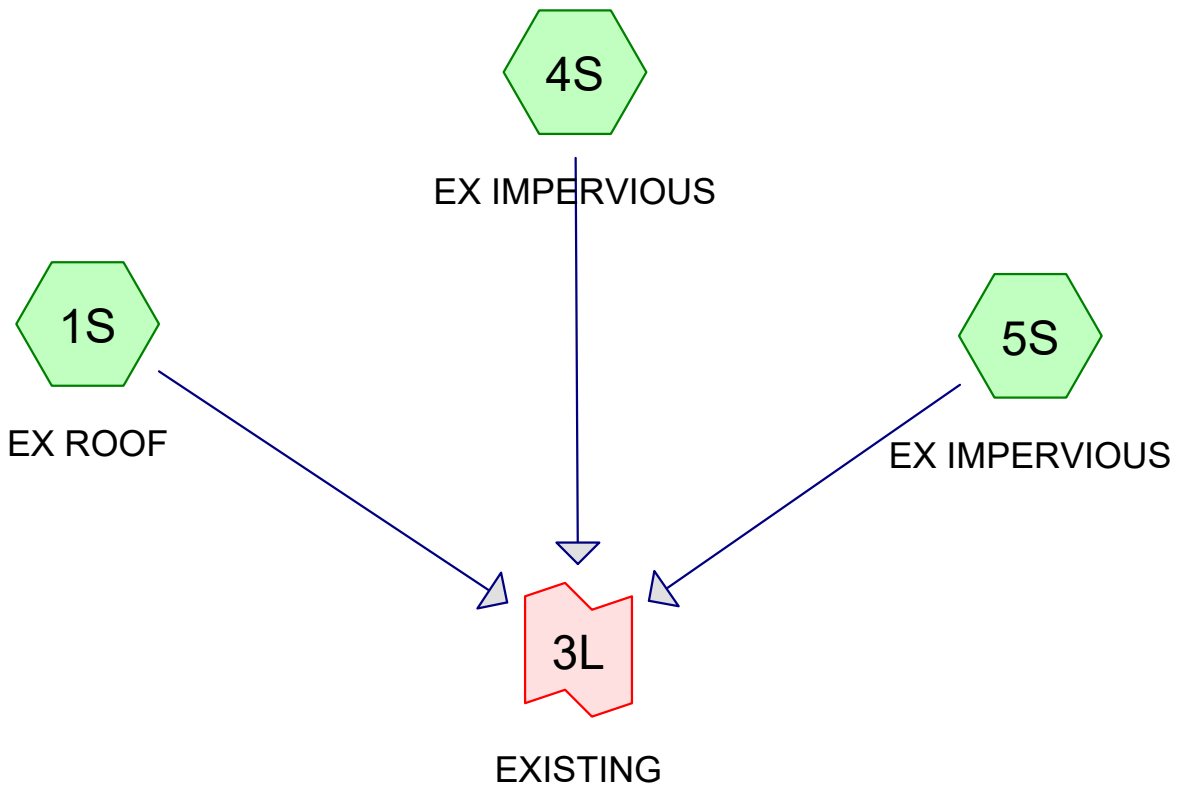
Total TSS Removal achieve is 89%. The breakdown of these calculations can be seen in Appendix C.

6.0 Illicit discharge compliance statement

This statement is provided in accordance with the provisions of the Massachusetts Stormwater Management Standard 10 and of the Massachusetts Stormwater Management Handbook. Note the following:

- All stormwater management systems contain no connection to the site's wastewater sewer system or to any other non-stormwater collection system.
- Groundwater collection systems on the site are not connected to the site's wastewater sewer system or to any other non-stormwater collection system.
- Any illicit discharges identified during or after construction will be immediately disconnected.

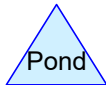
Appendix A – HydroCAD Calculations



Subcat



Reach



Pond



Link

Routing Diagram for EXISTING

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EXISTING

Area Listing (all nodes)

Area (sq-ft)	CN	Description (subcatchment-numbers)
5,318	49	50-75% Grass cover, Fair, HSG A (5S)
3,961	98	Driveway (4S)
1,439	98	Roofs, HSG A (1S)
285	98	Walkway/porch/steps (4S)
11,003	74	TOTAL AREA

EXISTING

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Soil Listing (all nodes)

Area (sq-ft)	Soil Group	Subcatchment Numbers
6,757	HSG A	1S, 5S
0	HSG B	
0	HSG C	
0	HSG D	
4,246	Other	4S
11,003		TOTAL AREA

EXISTING

Type III 24-hr 2-Year Rainfall=3.29"

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Time span=0.00-30.00 hrs, dt=0.03 hrs, 1001 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 1S: EX ROOF Runoff Area=1,439 sf 100.00% Impervious Runoff Depth=3.06"
Tc=5.0 min CN=98 Runoff=0.11 cfs 367 cf

Subcatchment 4S: EX IMPERVIOUS Runoff Area=4,246 sf 100.00% Impervious Runoff Depth=3.06"
Tc=5.0 min CN=98 Runoff=0.32 cfs 1,082 cf

Subcatchment 5S: EX IMPERVIOUS Runoff Area=5,318 sf 0.00% Impervious Runoff Depth=0.13"
Tc=5.0 min CN=49 Runoff=0.00 cfs 56 cf

Link 3L: EXISTING Inflow=0.43 cfs 1,504 cf
Primary=0.43 cfs 1,504 cf

Total Runoff Area = 11,003 sf Runoff Volume = 1,504 cf Average Runoff Depth = 1.64"
48.33% Pervious = 5,318 sf 51.67% Impervious = 5,685 sf

EXISTING

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Type III 24-hr 2-Year Rainfall=3.29"

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Summary for Subcatchment 1S: EX ROOF

Runoff = 0.11 cfs @ 12.07 hrs, Volume= 367 cf, Depth= 3.06"

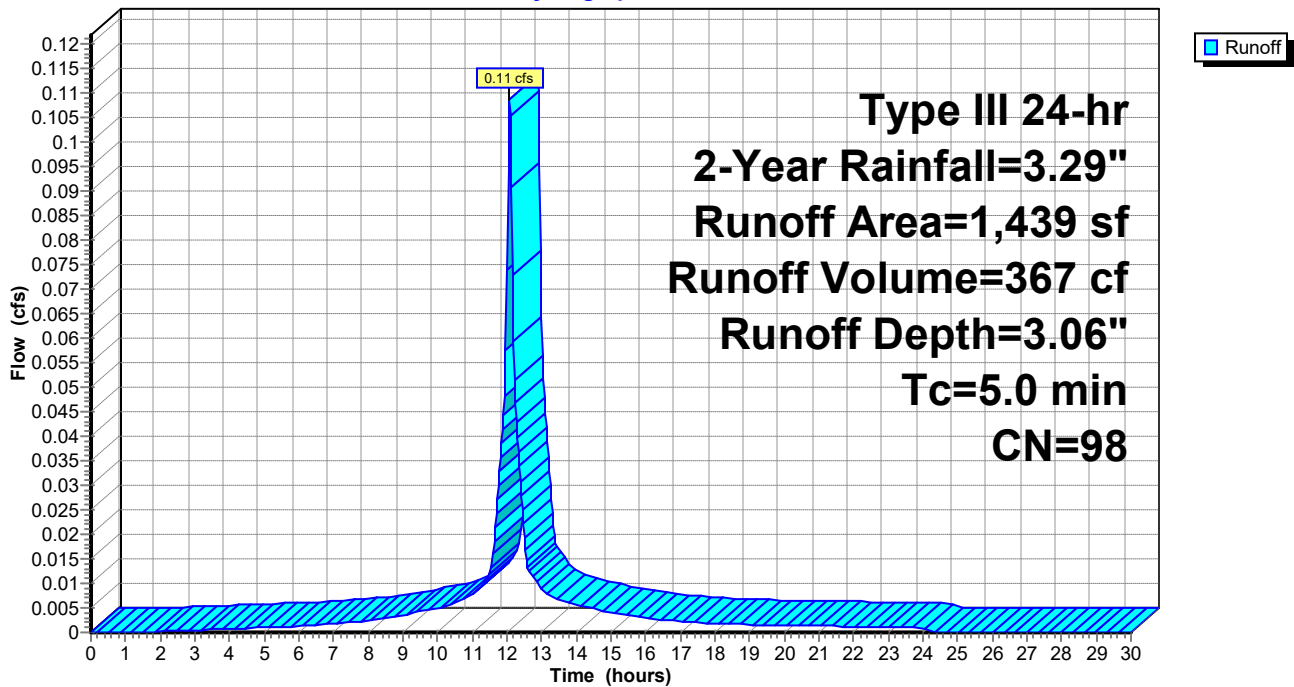
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.03 hrs
Type III 24-hr 2-Year Rainfall=3.29"

Area (sf)	CN	Description
1,439	98	Roofs, HSG A
1,439		100.00% Impervious Area

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

Subcatchment 1S: EX ROOF

Hydrograph



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Type III 24-hr 2-Year Rainfall=3.29"

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Summary for Subcatchment 4S: EX IMPERVIOUS

Runoff = 0.32 cfs @ 12.07 hrs, Volume= 1,082 cf, Depth= 3.06"

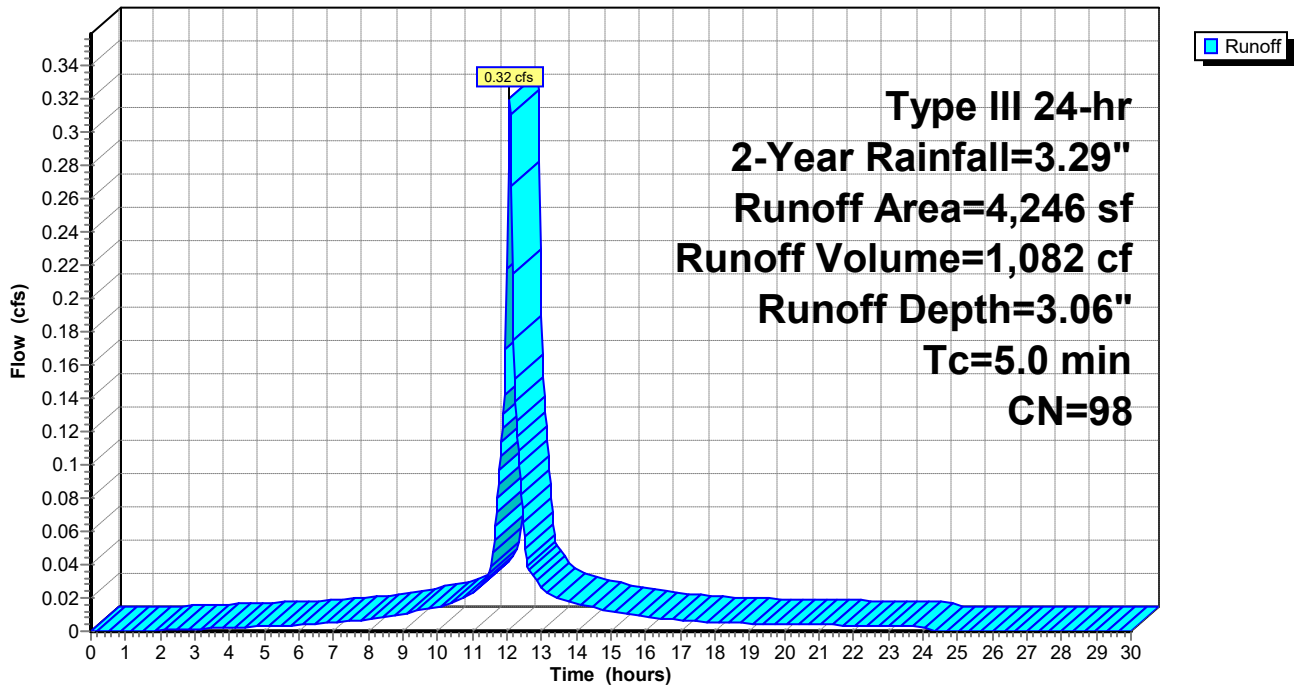
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.03 hrs
Type III 24-hr 2-Year Rainfall=3.29"

	Area (sf)	CN	Description
*	3,961	98	Driveway
*	285	98	Walkway/porch/steps
	4,246	98	Weighted Average
	4,246		100.00% Impervious Area

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

Subcatchment 4S: EX IMPERVIOUS

Hydrograph



EXISTING

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Type III 24-hr 2-Year Rainfall=3.29"

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Summary for Subcatchment 5S: EX IMPERVIOUS

Runoff = 0.00 cfs @ 12.47 hrs, Volume= 56 cf, Depth= 0.13"

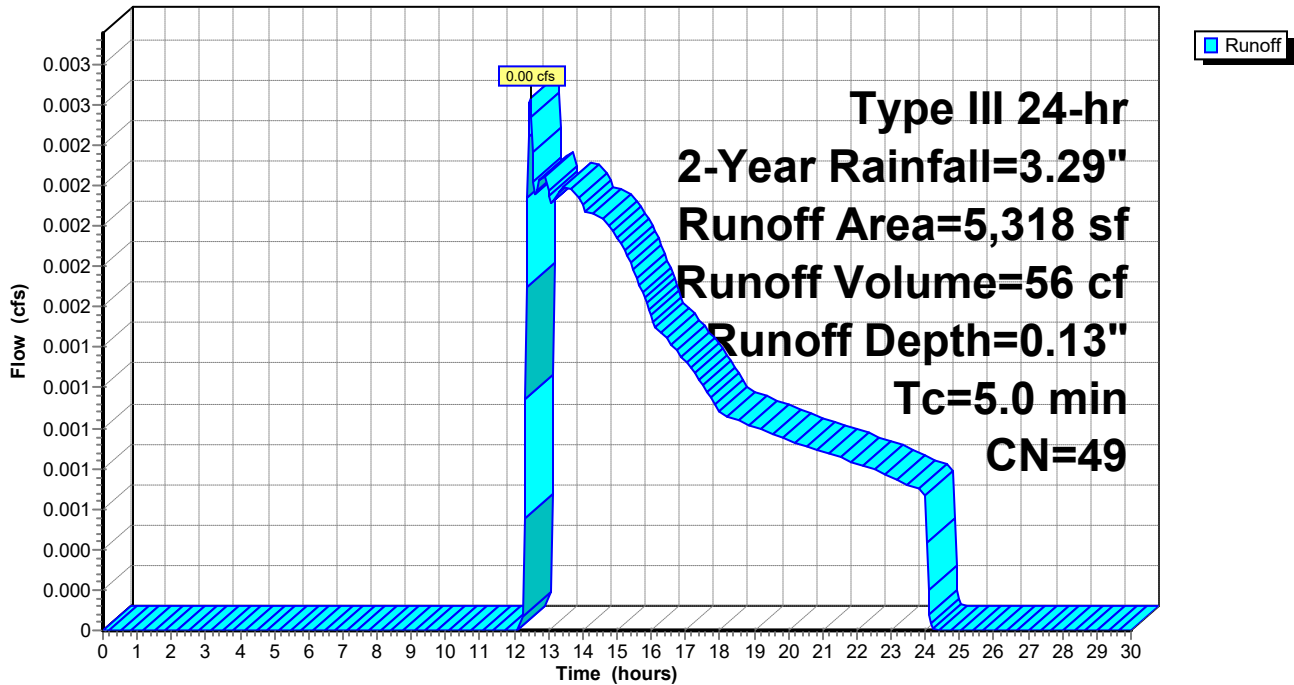
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.03 hrs
Type III 24-hr 2-Year Rainfall=3.29"

Area (sf)	CN	Description
5,318	49	50-75% Grass cover, Fair, HSG A
5,318		100.00% Pervious Area

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

Subcatchment 5S: EX IMPERVIOUS

Hydrograph



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Type III 24-hr 2-Year Rainfall=3.29"

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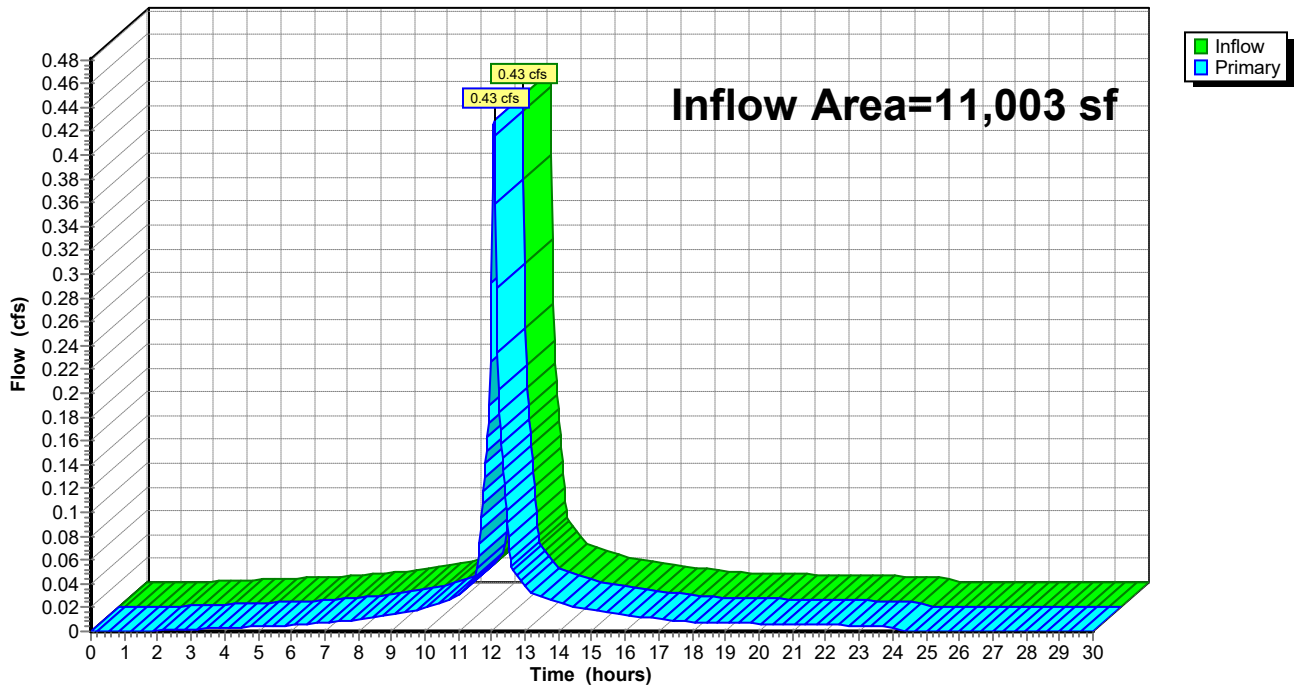
Summary for Link 3L: EXISTING

Inflow Area = 11,003 sf, 51.67% Impervious, Inflow Depth = 1.64" for 2-Year event
Inflow = 0.43 cfs @ 12.07 hrs, Volume= 1,504 cf
Primary = 0.43 cfs @ 12.07 hrs, Volume= 1,504 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-30.00 hrs, dt= 0.03 hrs

Link 3L: EXISTING

Hydrograph



EXISTING

Type III 24-hr 10-Year Rainfall=5.17"

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Time span=0.00-30.00 hrs, dt=0.03 hrs, 1001 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 1S: EX ROOF Runoff Area=1,439 sf 100.00% Impervious Runoff Depth=4.93"
Tc=5.0 min CN=98 Runoff=0.17 cfs 592 cf

Subcatchment 4S: EX IMPERVIOUS Runoff Area=4,246 sf 100.00% Impervious Runoff Depth=4.93"
Tc=5.0 min CN=98 Runoff=0.51 cfs 1,745 cf

Subcatchment 5S: EX IMPERVIOUS Runoff Area=5,318 sf 0.00% Impervious Runoff Depth=0.71"
Tc=5.0 min CN=49 Runoff=0.06 cfs 313 cf

Link 3L: EXISTING Inflow=0.74 cfs 2,650 cf
Primary=0.74 cfs 2,650 cf

Total Runoff Area = 11,003 sf Runoff Volume = 2,650 cf Average Runoff Depth = 2.89"
48.33% Pervious = 5,318 sf 51.67% Impervious = 5,685 sf

EXISTING

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Type III 24-hr 10-Year Rainfall=5.17"

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Summary for Subcatchment 1S: EX ROOF

Runoff = 0.17 cfs @ 12.07 hrs, Volume= 592 cf, Depth= 4.93"

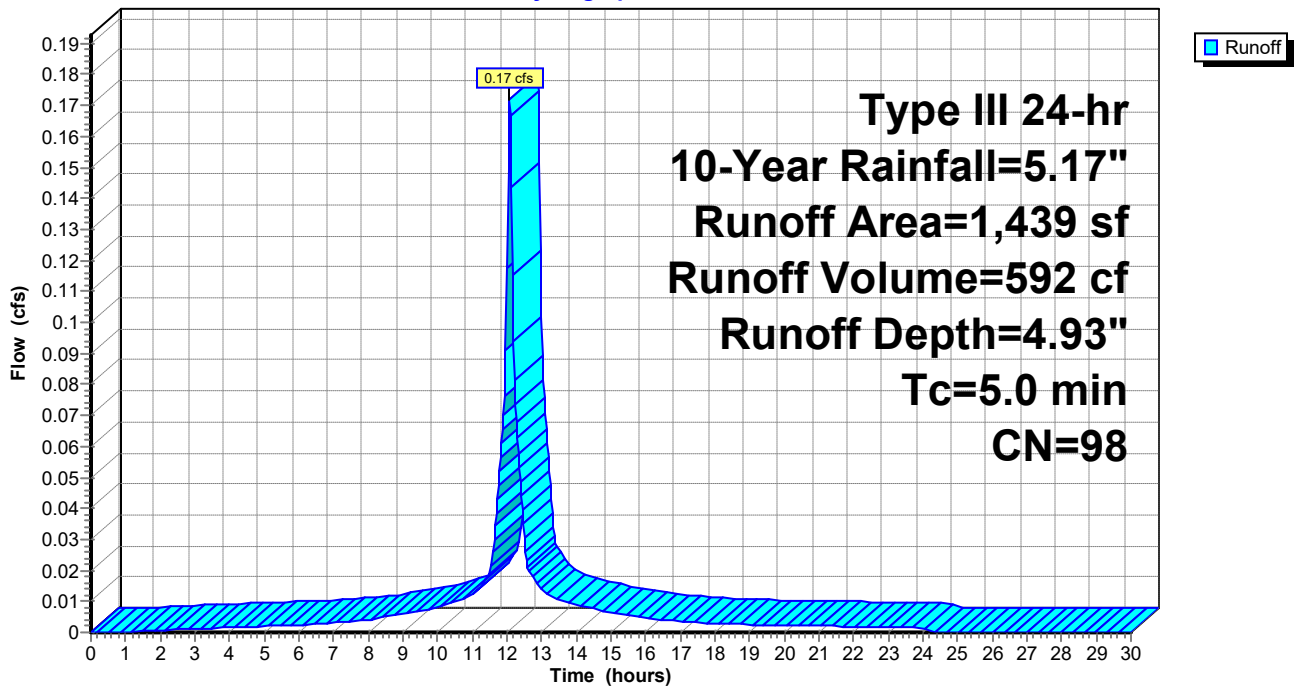
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.03 hrs
Type III 24-hr 10-Year Rainfall=5.17"

Area (sf)	CN	Description
1,439	98	Roofs, HSG A
1,439		100.00% Impervious Area

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

Subcatchment 1S: EX ROOF

Hydrograph



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Type III 24-hr 10-Year Rainfall=5.17"

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Summary for Subcatchment 4S: EX IMPERVIOUS

Runoff = 0.51 cfs @ 12.07 hrs, Volume= 1,745 cf, Depth= 4.93"

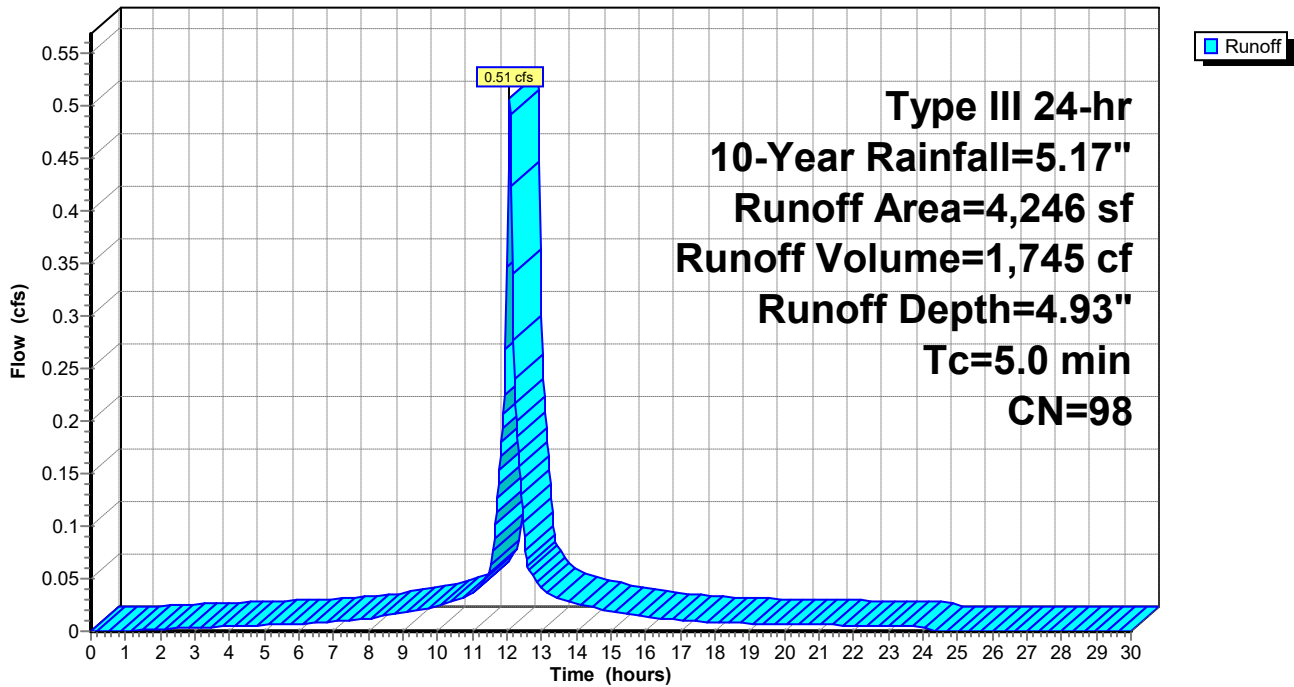
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.03 hrs
Type III 24-hr 10-Year Rainfall=5.17"

	Area (sf)	CN	Description
*	3,961	98	Driveway
*	285	98	Walkway/porch/steps
	4,246	98	Weighted Average
	4,246		100.00% Impervious Area

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

Subcatchment 4S: EX IMPERVIOUS

Hydrograph



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Type III 24-hr 10-Year Rainfall=5.17"

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Summary for Subcatchment 5S: EX IMPERVIOUS

Runoff = 0.06 cfs @ 12.11 hrs, Volume= 313 cf, Depth= 0.71"

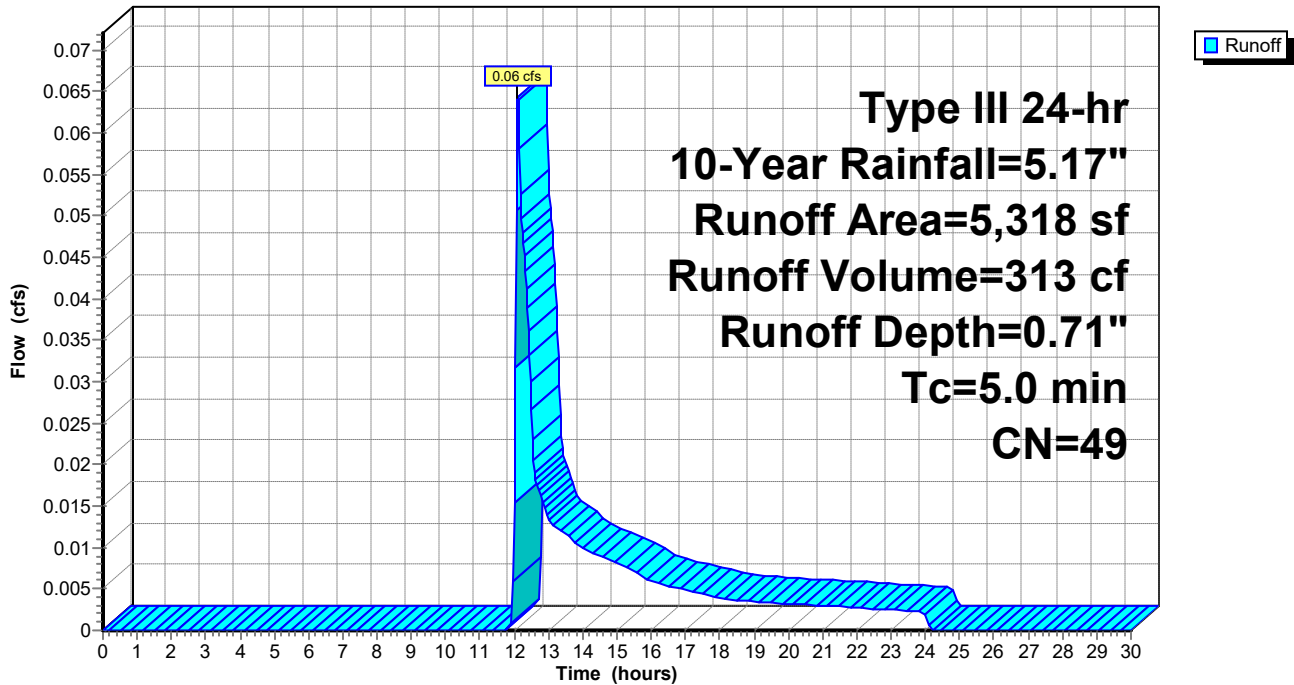
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.03 hrs
Type III 24-hr 10-Year Rainfall=5.17"

Area (sf)	CN	Description
5,318	49	50-75% Grass cover, Fair, HSG A
5,318		100.00% Pervious Area

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

Subcatchment 5S: EX IMPERVIOUS

Hydrograph



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Type III 24-hr 10-Year Rainfall=5.17"

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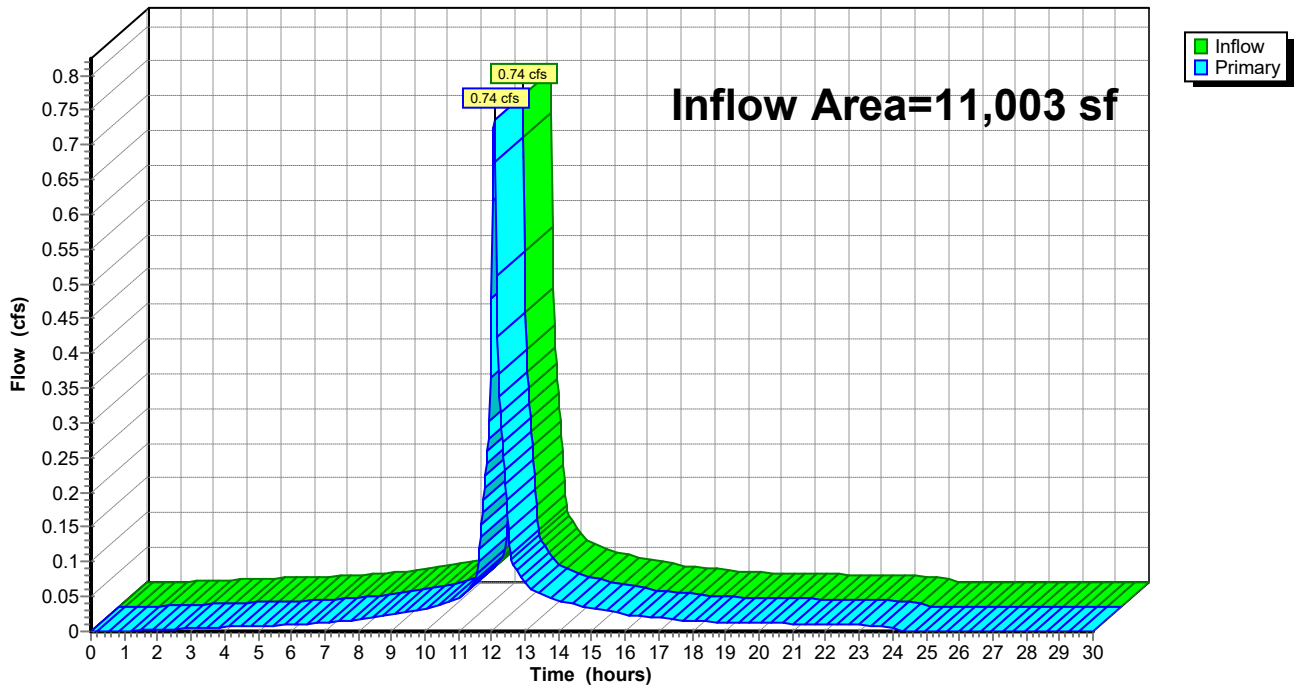
Summary for Link 3L: EXISTING

Inflow Area = 11,003 sf, 51.67% Impervious, Inflow Depth = 2.89" for 10-Year event
Inflow = 0.74 cfs @ 12.07 hrs, Volume= 2,650 cf
Primary = 0.74 cfs @ 12.07 hrs, Volume= 2,650 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-30.00 hrs, dt= 0.03 hrs

Link 3L: EXISTING

Hydrograph



EXISTING

Type III 24-hr 25-Year Rainfall=6.35"

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Time span=0.00-30.00 hrs, dt=0.03 hrs, 1001 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 1S: EX ROOF Runoff Area=1,439 sf 100.00% Impervious Runoff Depth=6.11"
Tc=5.0 min CN=98 Runoff=0.21 cfs 733 cf

Subcatchment 4S: EX IMPERVIOUS Runoff Area=4,246 sf 100.00% Impervious Runoff Depth=6.11"
Tc=5.0 min CN=98 Runoff=0.62 cfs 2,162 cf

Subcatchment 5S: EX IMPERVIOUS Runoff Area=5,318 sf 0.00% Impervious Runoff Depth=1.24"
Tc=5.0 min CN=49 Runoff=0.15 cfs 550 cf

Link 3L: EXISTING Inflow=0.98 cfs 3,445 cf
Primary=0.98 cfs 3,445 cf

Total Runoff Area = 11,003 sf Runoff Volume = 3,445 cf Average Runoff Depth = 3.76"
48.33% Pervious = 5,318 sf 51.67% Impervious = 5,685 sf

EXISTING

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Type III 24-hr 25-Year Rainfall=6.35"

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Summary for Subcatchment 1S: EX ROOF

Runoff = 0.21 cfs @ 12.07 hrs, Volume= 733 cf, Depth= 6.11"

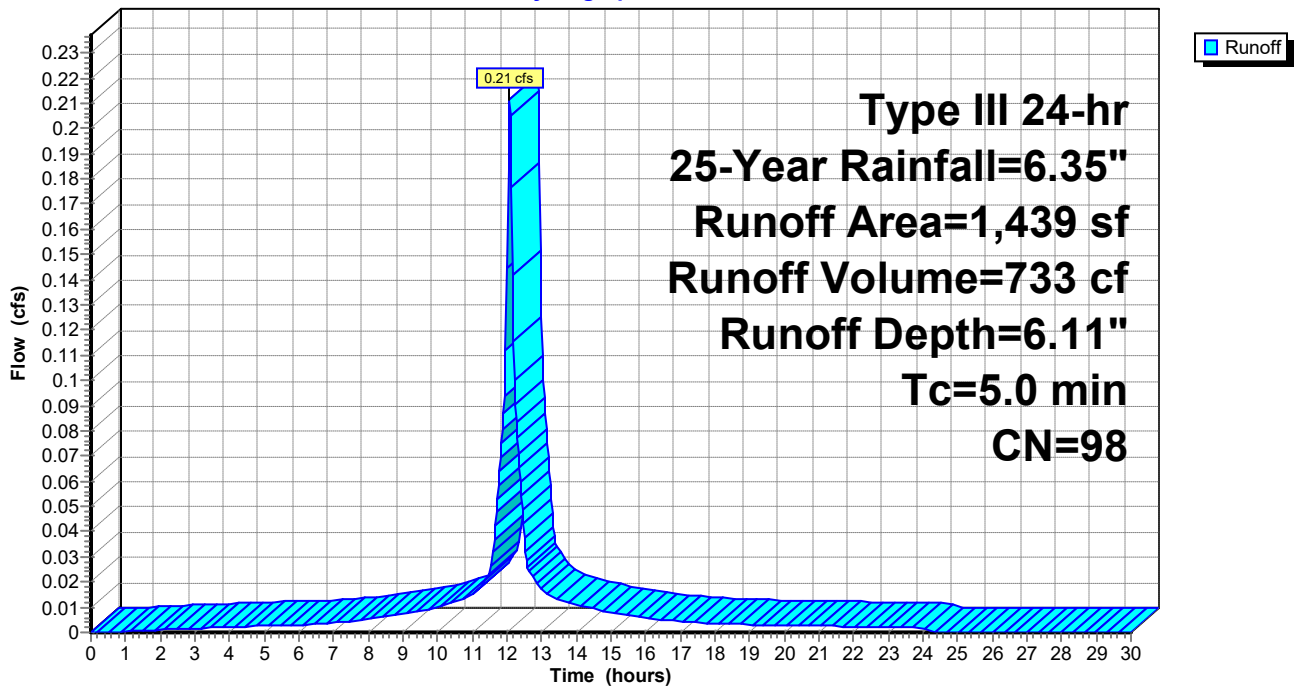
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.03 hrs
Type III 24-hr 25-Year Rainfall=6.35"

Area (sf)	CN	Description
1,439	98	Roofs, HSG A
1,439		100.00% Impervious Area

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

Subcatchment 1S: EX ROOF

Hydrograph



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Type III 24-hr 25-Year Rainfall=6.35"

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Summary for Subcatchment 4S: EX IMPERVIOUS

Runoff = 0.62 cfs @ 12.07 hrs, Volume= 2,162 cf, Depth= 6.11"

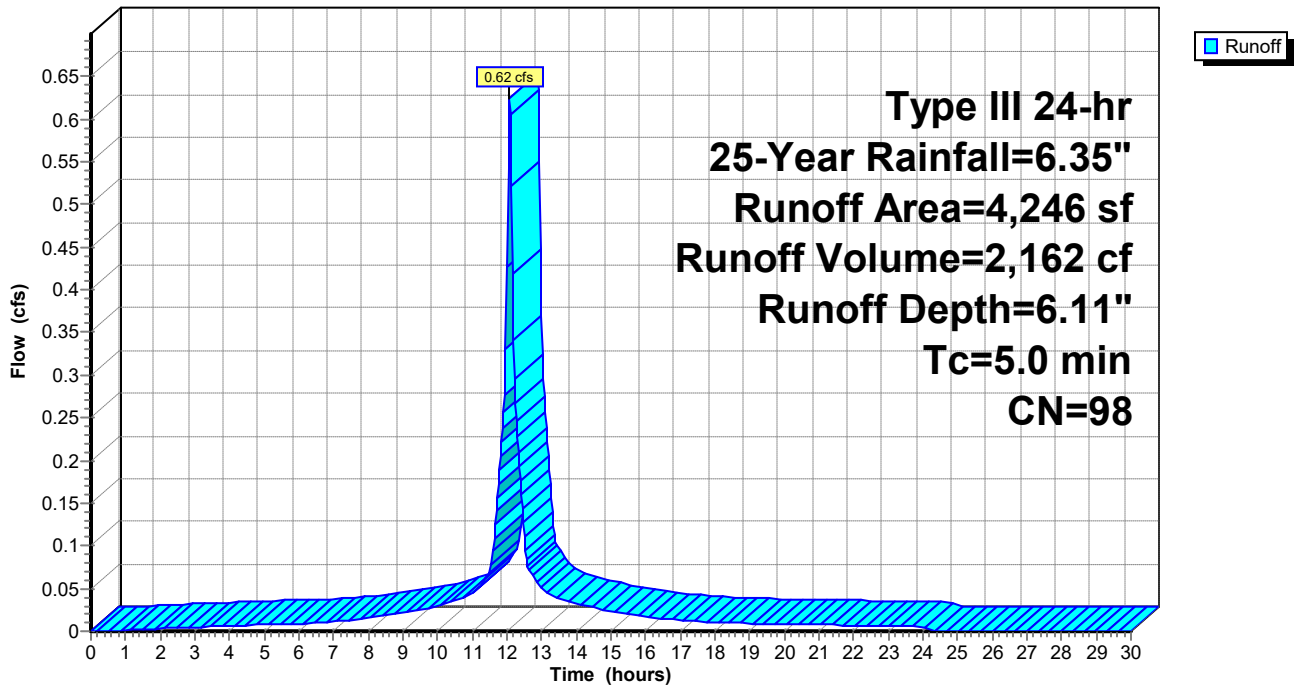
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.03 hrs
Type III 24-hr 25-Year Rainfall=6.35"

	Area (sf)	CN	Description
*	3,961	98	Driveway
*	285	98	Walkway/porch/steps
	4,246	98	Weighted Average
	4,246		100.00% Impervious Area

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

Subcatchment 4S: EX IMPERVIOUS

Hydrograph



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Type III 24-hr 25-Year Rainfall=6.35"

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Summary for Subcatchment 5S: EX IMPERVIOUS

Runoff = 0.15 cfs @ 12.09 hrs, Volume= 550 cf, Depth= 1.24"

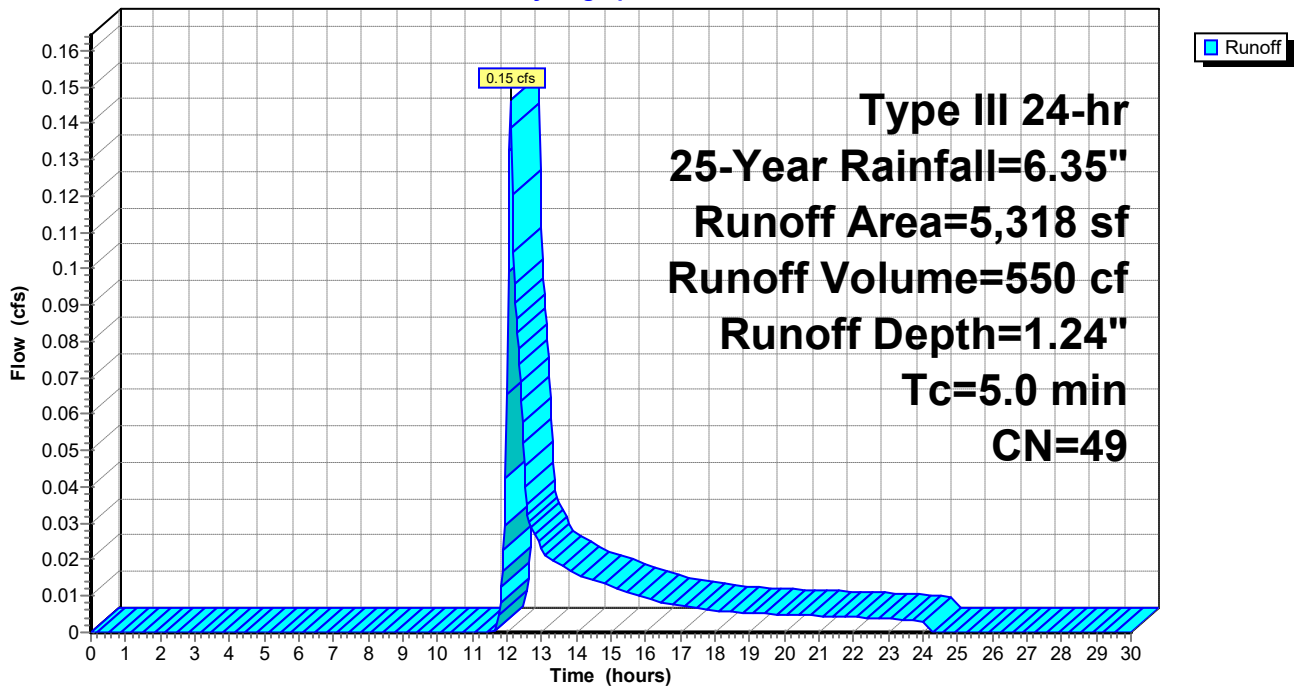
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.03 hrs
Type III 24-hr 25-Year Rainfall=6.35"

Area (sf)	CN	Description
5,318	49	50-75% Grass cover, Fair, HSG A
5,318		100.00% Pervious Area

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

Subcatchment 5S: EX IMPERVIOUS

Hydrograph



EXISTING

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Type III 24-hr 25-Year Rainfall=6.35"

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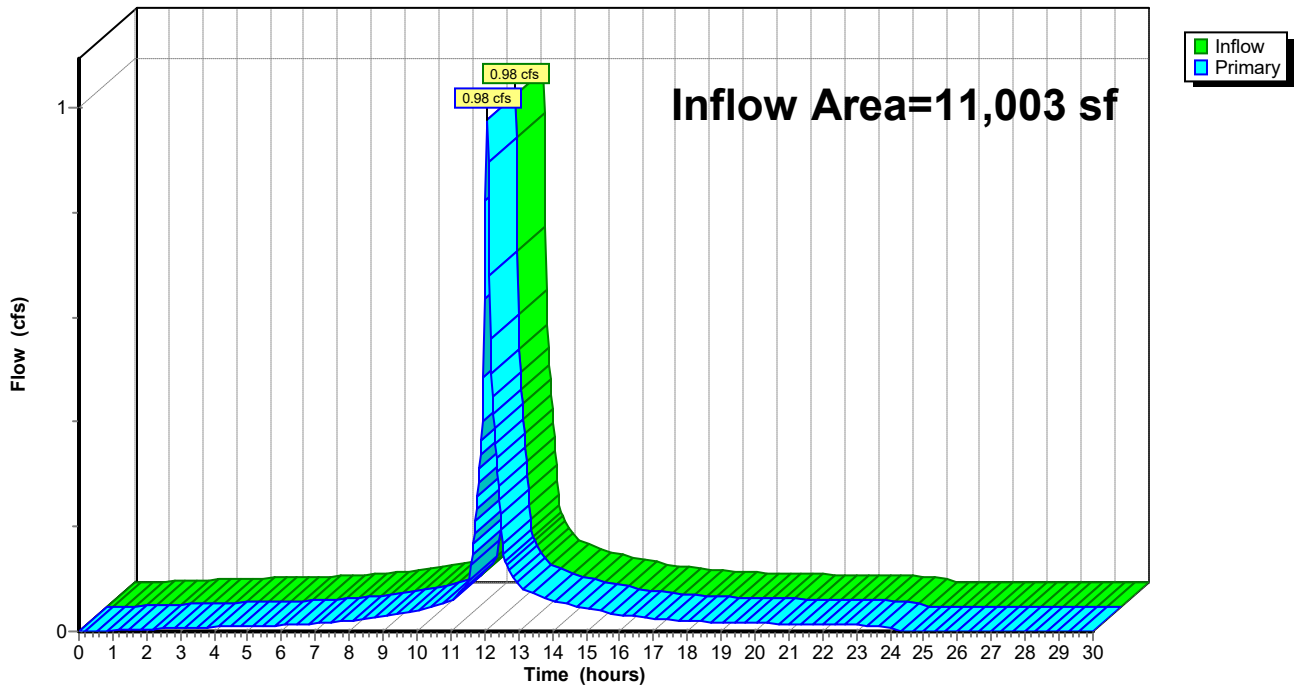
Summary for Link 3L: EXISTING

Inflow Area = 11,003 sf, 51.67% Impervious, Inflow Depth = 3.76" for 25-Year event
Inflow = 0.98 cfs @ 12.07 hrs, Volume= 3,445 cf
Primary = 0.98 cfs @ 12.07 hrs, Volume= 3,445 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-30.00 hrs, dt= 0.03 hrs

Link 3L: EXISTING

Hydrograph



EXISTING

Type III 24-hr 100-Year Rainfall=8.16"

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Time span=0.00-30.00 hrs, dt=0.03 hrs, 1001 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 1S: EX ROOF Runoff Area=1,439 sf 100.00% Impervious Runoff Depth=7.92"
Tc=5.0 min CN=98 Runoff=0.27 cfs 950 cf

Subcatchment 4S: EX IMPERVIOUS Runoff Area=4,246 sf 100.00% Impervious Runoff Depth=7.92"
Tc=5.0 min CN=98 Runoff=0.80 cfs 2,802 cf

Subcatchment 5S: EX IMPERVIOUS Runoff Area=5,318 sf 0.00% Impervious Runoff Depth=2.24"
Tc=5.0 min CN=49 Runoff=0.30 cfs 993 cf

Link 3L: EXISTING Inflow=1.37 cfs 4,745 cf
Primary=1.37 cfs 4,745 cf

Total Runoff Area = 11,003 sf Runoff Volume = 4,745 cf Average Runoff Depth = 5.18"
48.33% Pervious = 5,318 sf 51.67% Impervious = 5,685 sf

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Type III 24-hr 100-Year Rainfall=8.16"

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Summary for Subcatchment 1S: EX ROOF

Runoff = 0.27 cfs @ 12.07 hrs, Volume= 950 cf, Depth= 7.92"

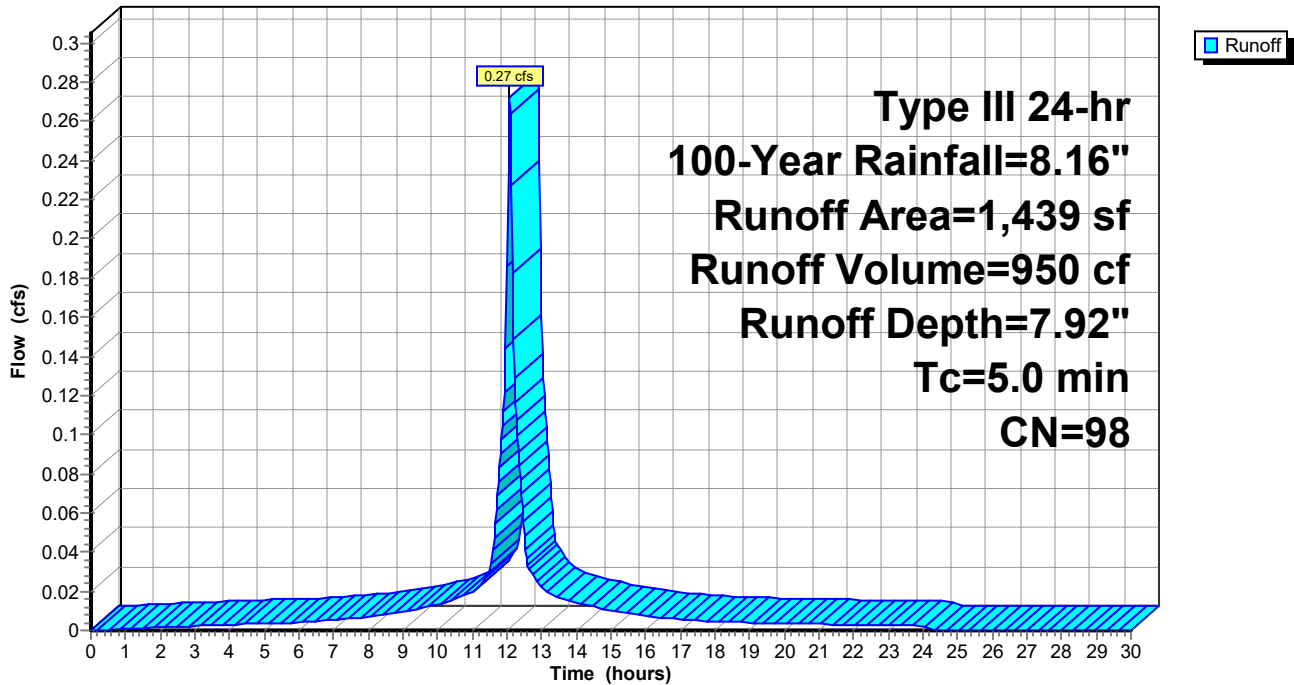
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.03 hrs
Type III 24-hr 100-Year Rainfall=8.16"

Area (sf)	CN	Description
1,439	98	Roofs, HSG A
1,439		100.00% Impervious Area

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

Subcatchment 1S: EX ROOF

Hydrograph



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Type III 24-hr 100-Year Rainfall=8.16"

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Summary for Subcatchment 4S: EX IMPERVIOUS

Runoff = 0.80 cfs @ 12.07 hrs, Volume= 2,802 cf, Depth= 7.92"

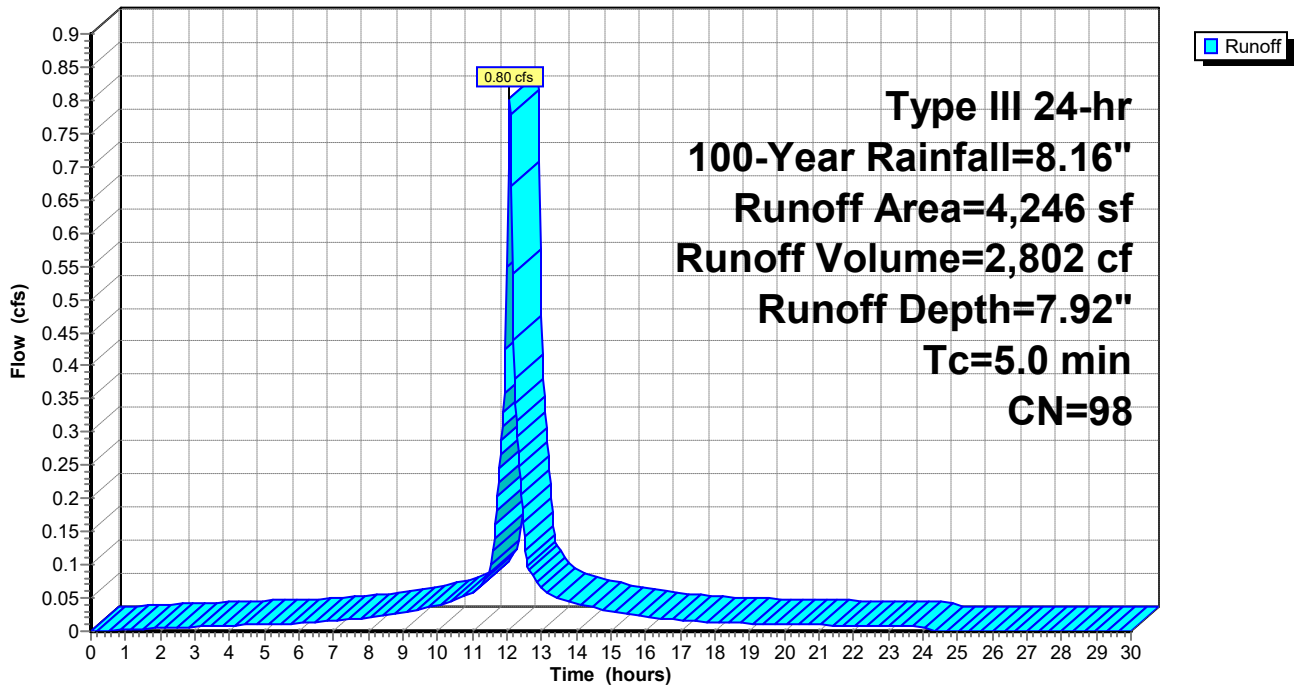
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.03 hrs
Type III 24-hr 100-Year Rainfall=8.16"

	Area (sf)	CN	Description
*	3,961	98	Driveway
*	285	98	Walkway/porch/steps
	4,246	98	Weighted Average
	4,246		100.00% Impervious Area

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

Subcatchment 4S: EX IMPERVIOUS

Hydrograph



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Type III 24-hr 100-Year Rainfall=8.16"

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Summary for Subcatchment 5S: EX IMPERVIOUS

Runoff = 0.30 cfs @ 12.09 hrs, Volume= 993 cf, Depth= 2.24"

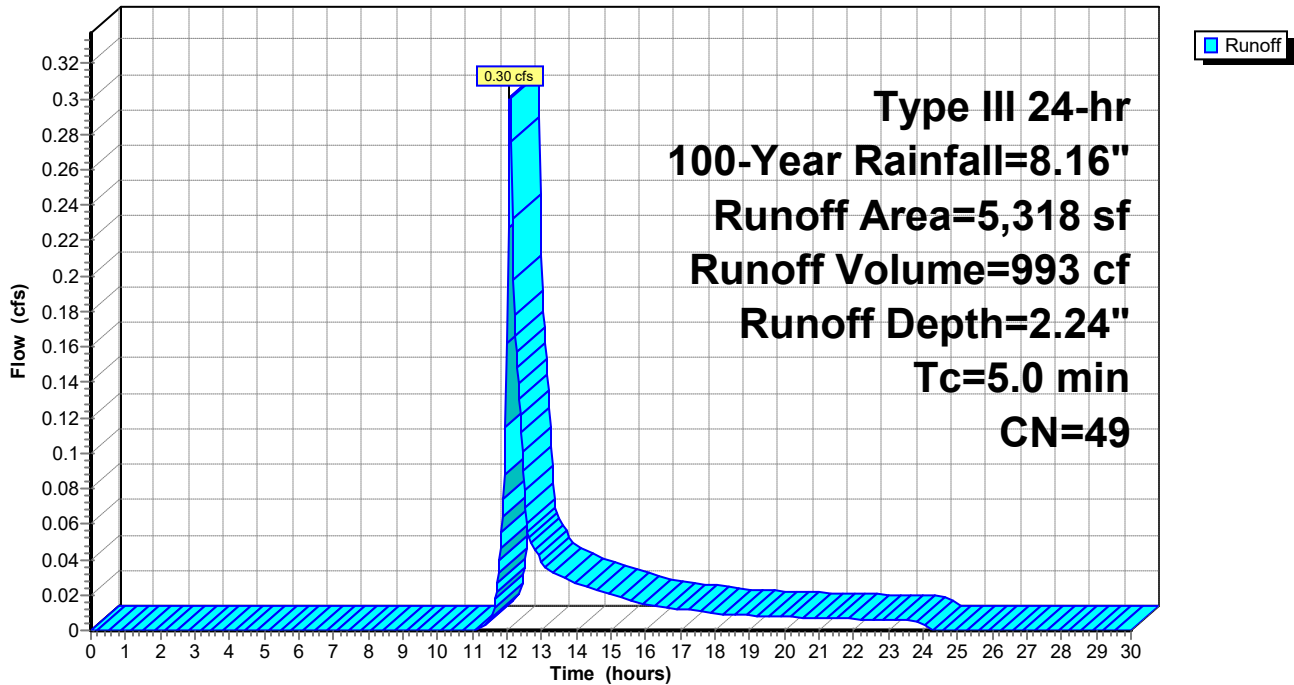
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.03 hrs
Type III 24-hr 100-Year Rainfall=8.16"

Area (sf)	CN	Description
5,318	49	50-75% Grass cover, Fair, HSG A
5,318		100.00% Pervious Area

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

Subcatchment 5S: EX IMPERVIOUS

Hydrograph



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Type III 24-hr 100-Year Rainfall=8.16"

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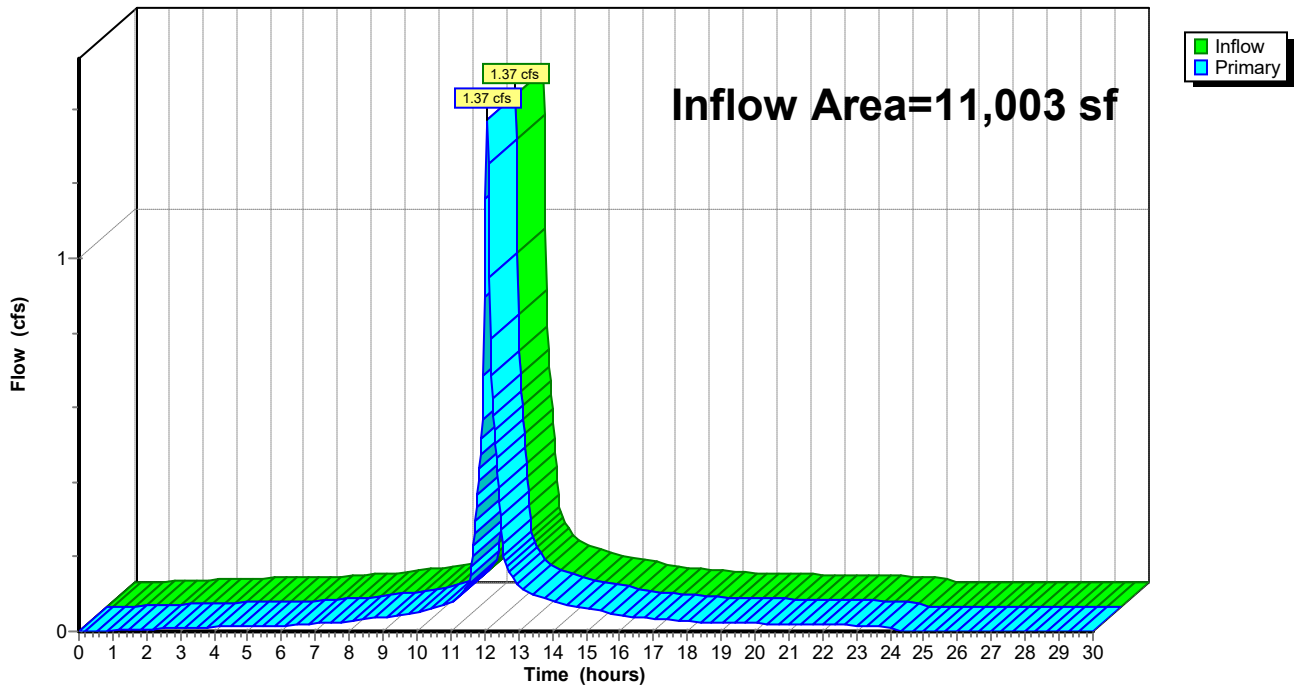
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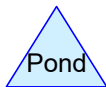
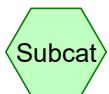
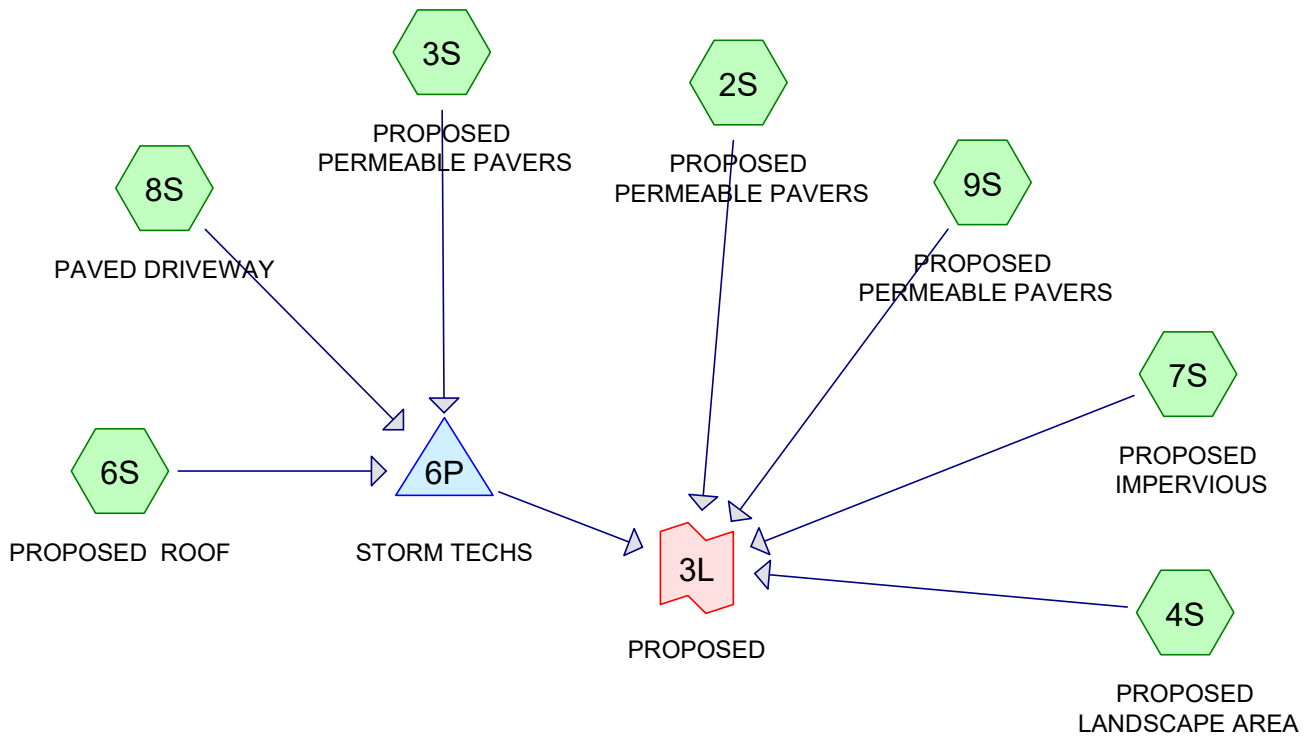
Inflow Area = 11,003 sf, 51.67% Impervious, Inflow Depth = 5.18" for 100-Year event
Inflow = 1.37 cfs @ 12.07 hrs, Volume= 4,745 cf
Primary = 1.37 cfs @ 12.07 hrs, Volume= 4,745 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-30.00 hrs, dt= 0.03 hrs

Link 3L: EXISTING

Hydrograph





Routing Diagram for PROPOSED

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PROPOSED

Area Listing (all nodes)

Area (sq-ft)	CN	Description (subcatchment-numbers)
3,242	49	50-75% Grass cover, Fair, HSG A (4S)
588	85	Driveway portion (2S)
163	85	Parking space (3S)
1,421	85	Patios, walkways (9S)
1,536	98	Paved parking, HSG A (8S)
3,406	98	Roofs, HSG A (6S)
648	98	Unconnected roofs, HSG A (7S)
11,004	81	TOTAL AREA

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Soil Listing (all nodes)

Area (sq-ft)	Soil Group	Subcatchment Numbers
8,832	HSG A	4S, 6S, 7S, 8S
0	HSG B	
0	HSG C	
0	HSG D	
2,172	Other	2S, 3S, 9S
11,004		TOTAL AREA

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Type III 24-hr 2-Year Rainfall=3.29"

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Time span=0.00-30.00 hrs, dt=0.03 hrs, 1001 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 2S: PROPOSED PERMEABLE Runoff Area=588 sf 0.00% Impervious Runoff Depth=1.83"
Tc=15.0 min CN=85 Runoff=0.02 cfs 90 cf

Subcatchment 3S: PROPOSED PERMEABLE Runoff Area=163 sf 0.00% Impervious Runoff Depth=1.83"
Tc=15.0 min CN=85 Runoff=0.01 cfs 25 cf

Subcatchment 4S: PROPOSED LANDSCAPE Runoff Area=3,242 sf 0.00% Impervious Runoff Depth=0.13"
Tc=5.0 min CN=49 Runoff=0.00 cfs 34 cf

Subcatchment 6S: PROPOSED ROOF Runoff Area=3,406 sf 100.00% Impervious Runoff Depth=3.06"
Tc=5.0 min CN=98 Runoff=0.26 cfs 868 cf

Subcatchment 7S: PROPOSED IMPERVIOUS Runoff Area=648 sf 100.00% Impervious Runoff Depth=3.06"
Tc=5.0 min CN=98 Runoff=0.05 cfs 165 cf

Subcatchment 8S: PAVED DRIVEWAY Runoff Area=1,536 sf 100.00% Impervious Runoff Depth=3.06"
Tc=5.0 min CN=98 Runoff=0.12 cfs 391 cf

Subcatchment 9S: PROPOSED PERMEABLE Runoff Area=1,421 sf 0.00% Impervious Runoff Depth=1.83"
Tc=15.0 min CN=85 Runoff=0.05 cfs 217 cf

Pond 6P: STORM TECHS Peak Elev=59.17' Storage=233 cf Inflow=0.38 cfs 1,284 cf
Discarded=0.11 cfs 1,284 cf Primary=0.00 cfs 0 cf Outflow=0.11 cfs 1,284 cf

Link 3L: PROPOSED Inflow=0.10 cfs 506 cf
Primary=0.10 cfs 506 cf

Total Runoff Area = 11,004 sf Runoff Volume = 1,790 cf Average Runoff Depth = 1.95"
49.20% Pervious = 5,414 sf 50.80% Impervious = 5,590 sf

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Type III 24-hr 2-Year Rainfall=3.29"

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Summary for Subcatchment 2S: PROPOSED PERMEABLE PAVERS

Runoff = 0.02 cfs @ 12.21 hrs, Volume= 90 cf, Depth= 1.83"

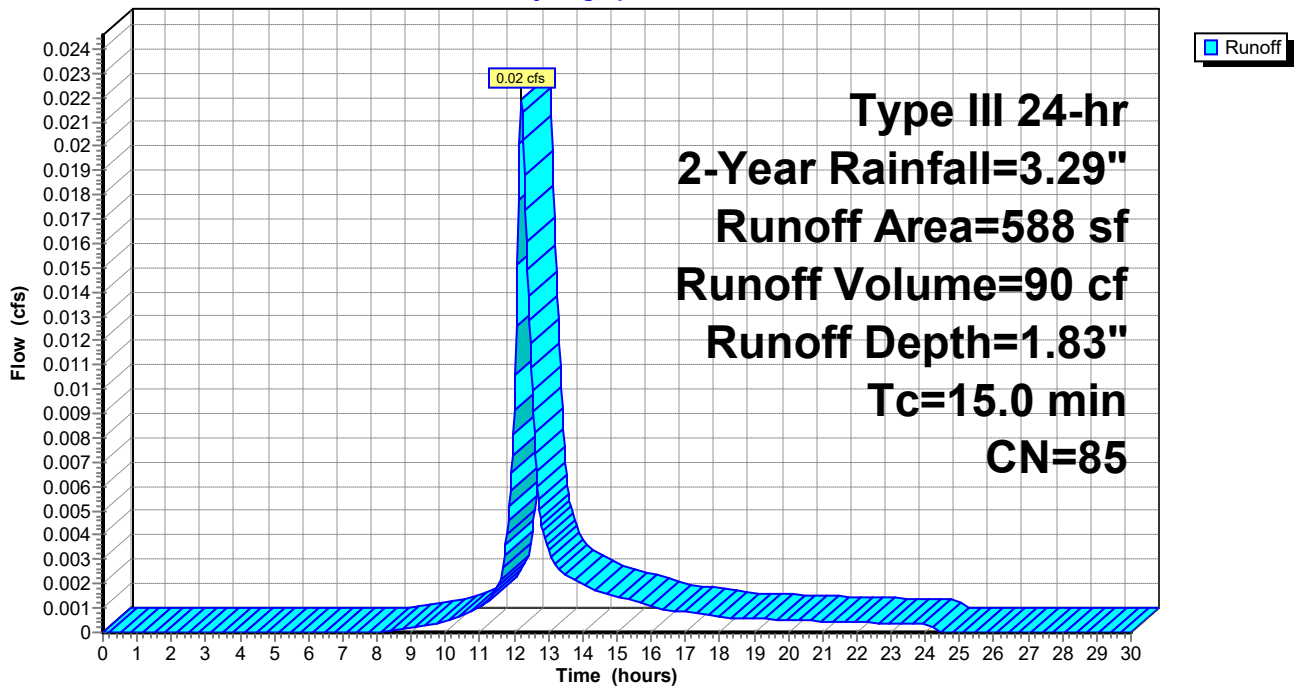
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.03 hrs
Type III 24-hr 2-Year Rainfall=3.29"

Area (sf)	CN	Description
* 588	85	Driveway portion
588		100.00% Pervious Area

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

Subcatchment 2S: PROPOSED PERMEABLE PAVERS

Hydrograph



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Type III 24-hr 2-Year Rainfall=3.29"

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Summary for Subcatchment 3S: PROPOSED PERMEABLE PAVERS

Runoff = 0.01 cfs @ 12.21 hrs, Volume= 25 cf, Depth= 1.83"

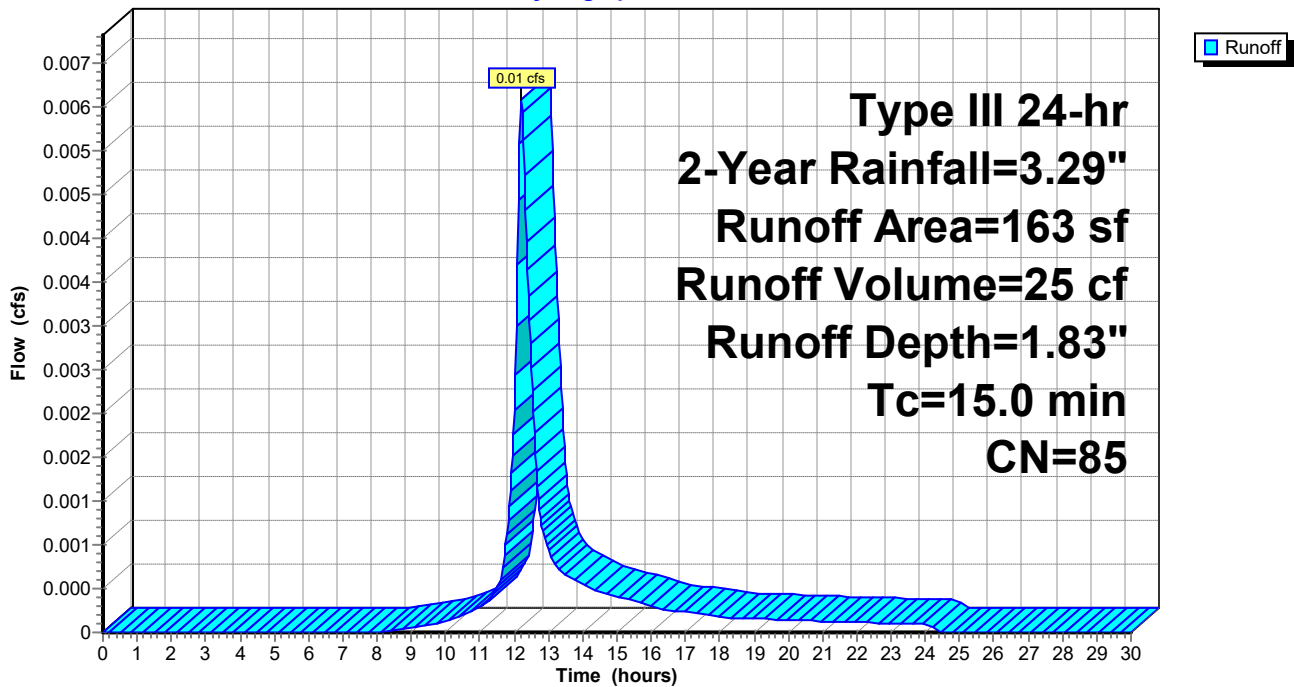
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.03 hrs
Type III 24-hr 2-Year Rainfall=3.29"

Area (sf)	CN	Description
* 163	85	Parking space
163		100.00% Pervious Area

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

Subcatchment 3S: PROPOSED PERMEABLE PAVERS

Hydrograph



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Type III 24-hr 2-Year Rainfall=3.29"

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Summary for Subcatchment 4S: PROPOSED LANDSCAPE AREA

Runoff = 0.00 cfs @ 12.47 hrs, Volume= 34 cf, Depth= 0.13"

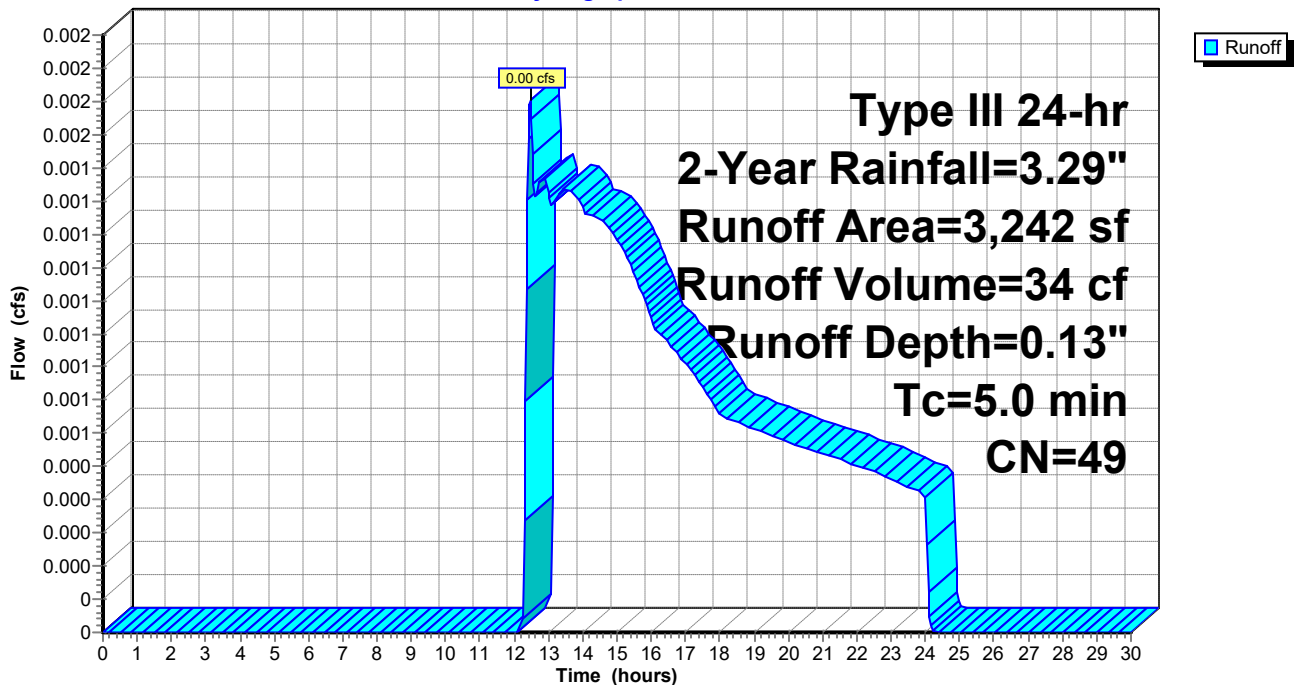
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.03 hrs
Type III 24-hr 2-Year Rainfall=3.29"

Area (sf)	CN	Description
3,242	49	50-75% Grass cover, Fair, HSG A
3,242		100.00% Pervious Area

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

Subcatchment 4S: PROPOSED LANDSCAPE AREA

Hydrograph



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Type III 24-hr 2-Year Rainfall=3.29"

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Summary for Subcatchment 6S: PROPOSED ROOF

Runoff = 0.26 cfs @ 12.07 hrs, Volume= 868 cf, Depth= 3.06"

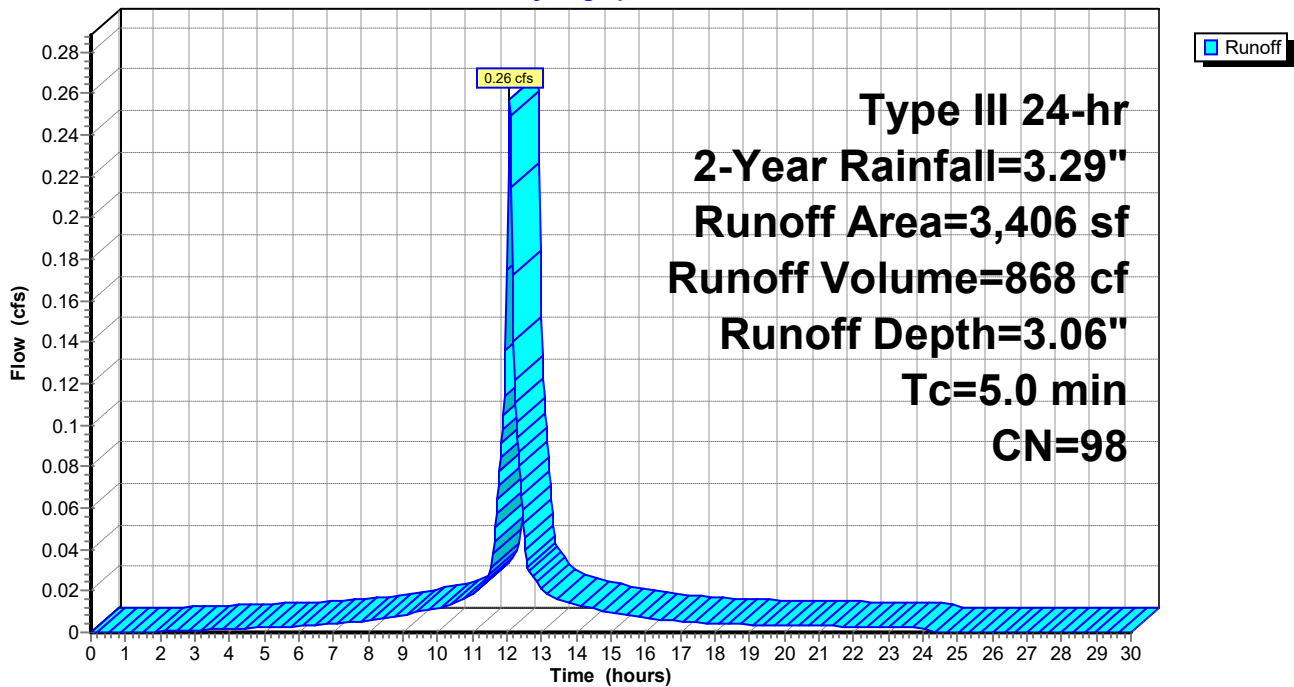
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.03 hrs
Type III 24-hr 2-Year Rainfall=3.29"

Area (sf)	CN	Description
3,406	98	Roofs, HSG A
3,406		100.00% Impervious Area

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

Subcatchment 6S: PROPOSED ROOF

Hydrograph



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Type III 24-hr 2-Year Rainfall=3.29"

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Summary for Subcatchment 7S: PROPOSED IMPERVIOUS

Runoff = 0.05 cfs @ 12.07 hrs, Volume= 165 cf, Depth= 3.06"

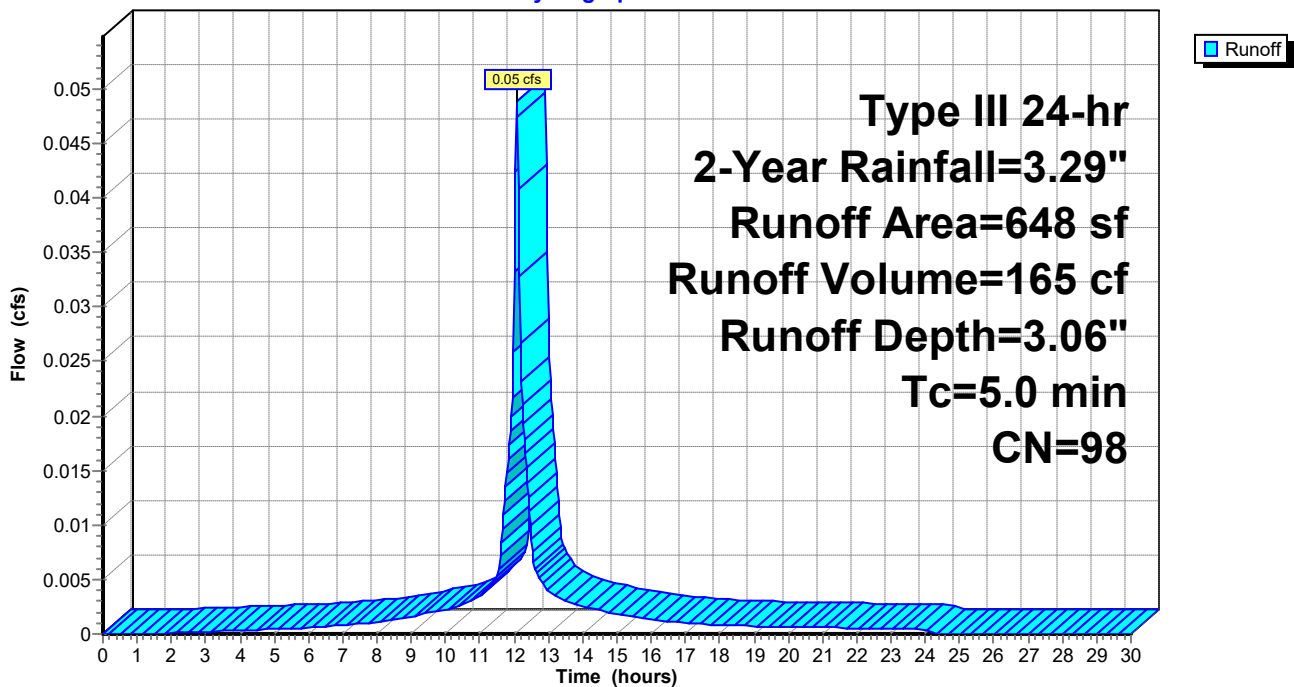
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.03 hrs
Type III 24-hr 2-Year Rainfall=3.29"

Area (sf)	CN	Description
648	98	Unconnected roofs, HSG A
648		100.00% Impervious Area
648		100.00% Unconnected

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

Subcatchment 7S: PROPOSED IMPERVIOUS

Hydrograph



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Type III 24-hr 2-Year Rainfall=3.29"

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Summary for Subcatchment 8S: PAVED DRIVEWAY

Runoff = 0.12 cfs @ 12.07 hrs, Volume= 391 cf, Depth= 3.06"

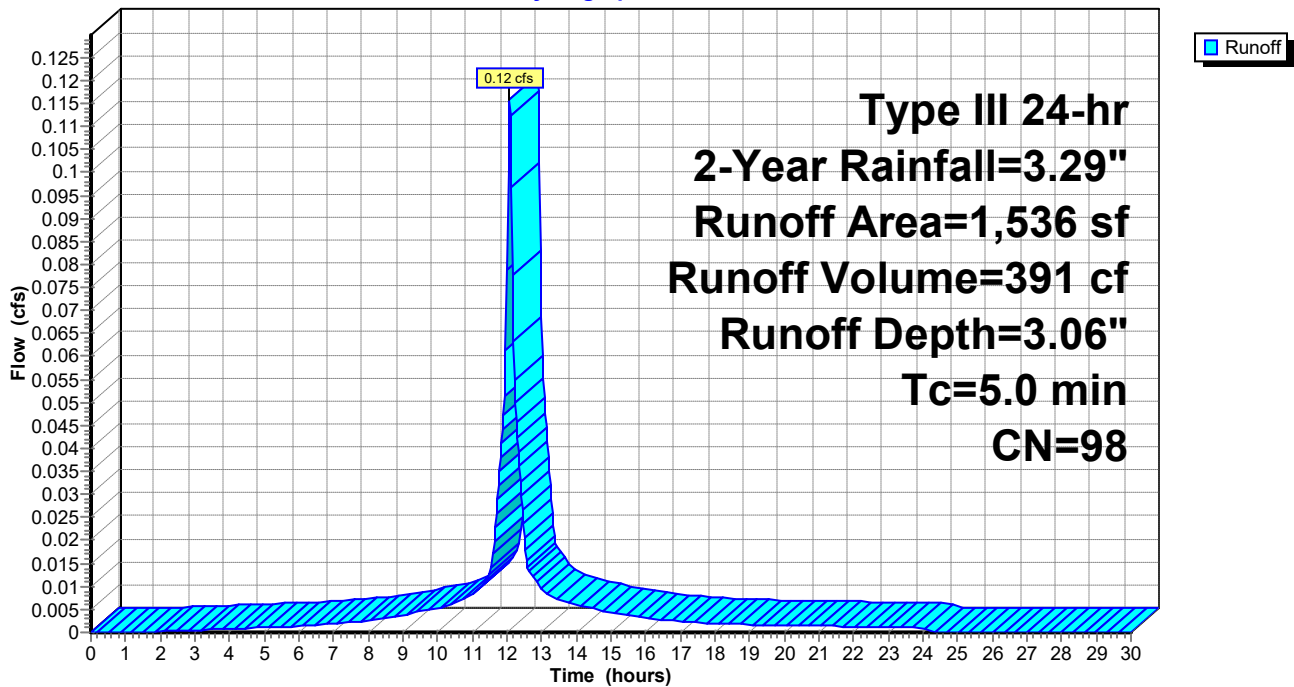
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.03 hrs
Type III 24-hr 2-Year Rainfall=3.29"

Area (sf)	CN	Description
1,536	98	Paved parking, HSG A
1,536		100.00% Impervious Area

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

Subcatchment 8S: PAVED DRIVEWAY

Hydrograph



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Type III 24-hr 2-Year Rainfall=3.29"

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Summary for Subcatchment 9S: PROPOSED PERMEABLE PAVERS

Runoff = 0.05 cfs @ 12.21 hrs, Volume= 217 cf, Depth= 1.83"

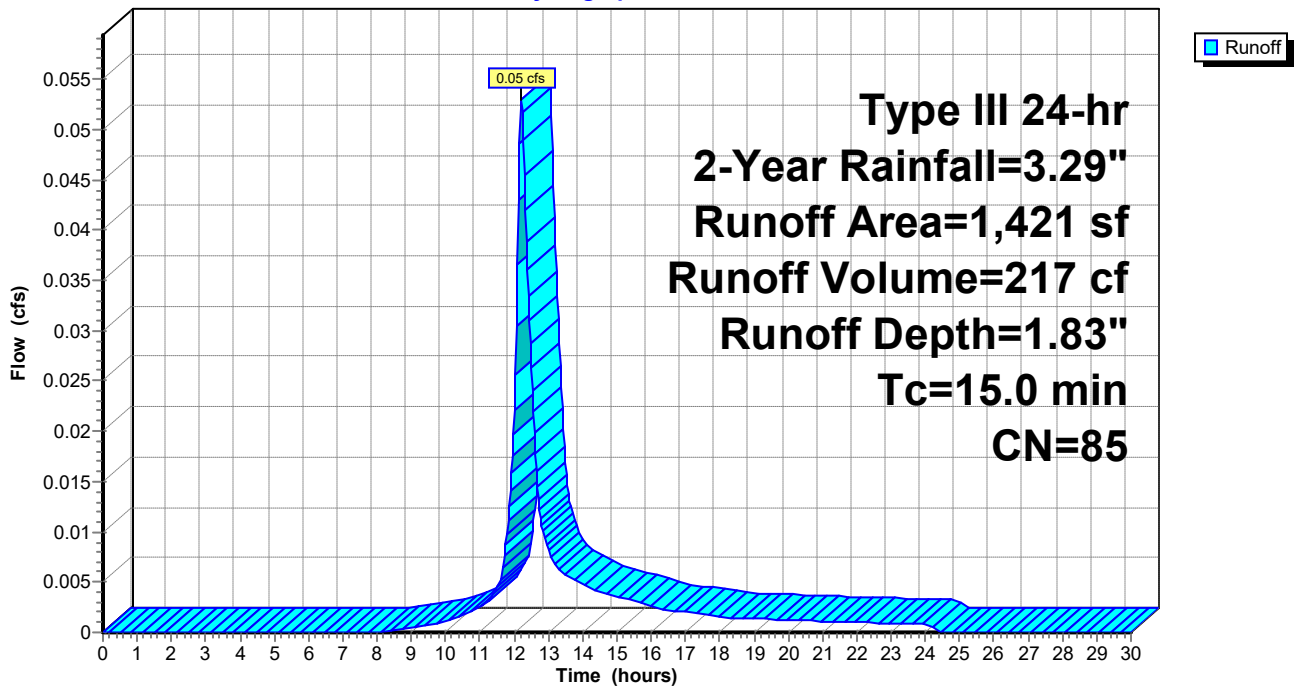
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.03 hrs
Type III 24-hr 2-Year Rainfall=3.29"

Area (sf)	CN	Description
* 1,421	85	Patios, walkways
1,421		100.00% Pervious Area

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

Subcatchment 9S: PROPOSED PERMEABLE PAVERS

Hydrograph



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Type III 24-hr 2-Year Rainfall=3.29"

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Summary for Pond 6P: STORM TECHS

Inflow Area = 5,105 sf, 96.81% Impervious, Inflow Depth = 3.02" for 2-Year event
 Inflow = 0.38 cfs @ 12.07 hrs, Volume= 1,284 cf
 Outflow = 0.11 cfs @ 12.40 hrs, Volume= 1,284 cf, Atten= 71%, Lag= 19.5 min
 Discarded = 0.11 cfs @ 12.40 hrs, Volume= 1,284 cf
 Primary = 0.00 cfs @ 0.00 hrs, Volume= 0 cf

Routing by Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.03 hrs / 3
 Peak Elev= 59.17' @ 12.40 hrs Surf.Area= 464 sf Storage= 233 cf

Plug-Flow detention time= 11.4 min calculated for 1,282 cf (100% of inflow)
 Center-of-Mass det. time= 11.3 min (767.7 - 756.4)

Volume	Invert	Avail.Storage	Storage Description
#1A	58.00'	633 cf	21.08'W x 22.02'L x 4.00'H Field A 1,857 cf Overall - 276 cf Embedded = 1,582 cf x 40.0% Voids
#2A	59.00'	276 cf	ADS_StormTech SC-740 +Cap x 6 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 6 Chambers in 3 Rows
#3	62.00'	10 cf	Ponding Listed below -Impervious
		918 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Elevation (feet)	Cum.Store (cubic-feet)
62.00	0
64.00	5
64.20	10

Device	Routing	Invert	Outlet Devices
#1	Discarded	58.00'	8.270 in/hr Exfiltration over Wetted area
#2	Primary	62.00'	4.0" Horiz. Orifice/Grate C= 0.600 Limited to weir flow at low heads

Discarded OutFlow Max=0.11 cfs @ 12.40 hrs HW=59.17' (Free Discharge)
 ↑1=Exfiltration (Exfiltration Controls 0.11 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=58.00' (Free Discharge)
 ↑2=Orifice/Grate (Controls 0.00 cfs)

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Type III 24-hr 2-Year Rainfall=3.29"

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Pond 6P: STORM TECHS - Chamber Wizard Field A

Chamber Model = ADS_StormTech SC-740 +Cap (ADS StormTech® SC-740 with cap length)

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

51.0" Wide + 18.0" Spacing = 69.0" C-C Row Spacing

2 Chambers/Row x 7.12' Long +0.81' Cap Length x 2 = 15.86' Row Length +37.0" End Stone x 2 = 22.02' Base Length

3 Rows x 51.0" Wide + 18.0" Spacing x 2 + 32.0" Side Stone x 2 = 21.08' Base Width

12.0" Base + 30.0" Chamber Height + 6.0" Cover = 4.00' Field Height

6 Chambers x 45.9 cf = 275.6 cf Chamber Storage

1,857.3 cf Field - 275.6 cf Chambers = 1,581.7 cf Stone x 40.0% Voids = 632.7 cf Stone Storage

Chamber Storage + Stone Storage = 908.3 cf = 0.021 af

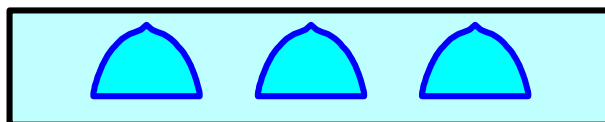
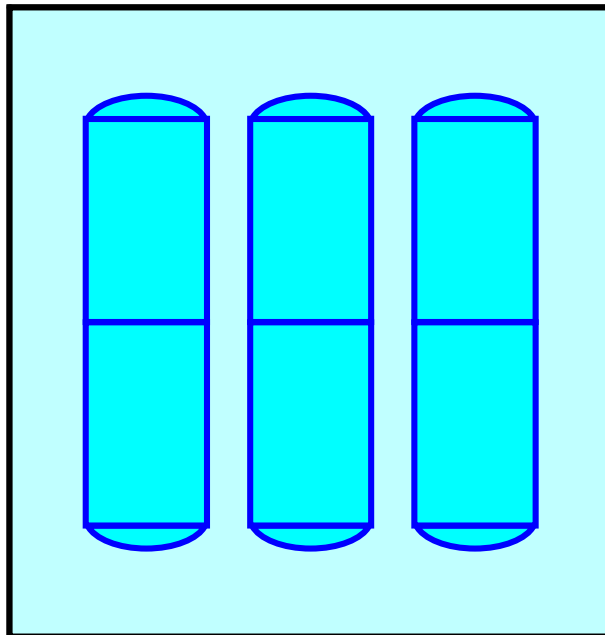
Overall Storage Efficiency = 48.9%

Overall System Size = 22.02' x 21.08' x 4.00'

6 Chambers

68.8 cy Field

58.6 cy Stone



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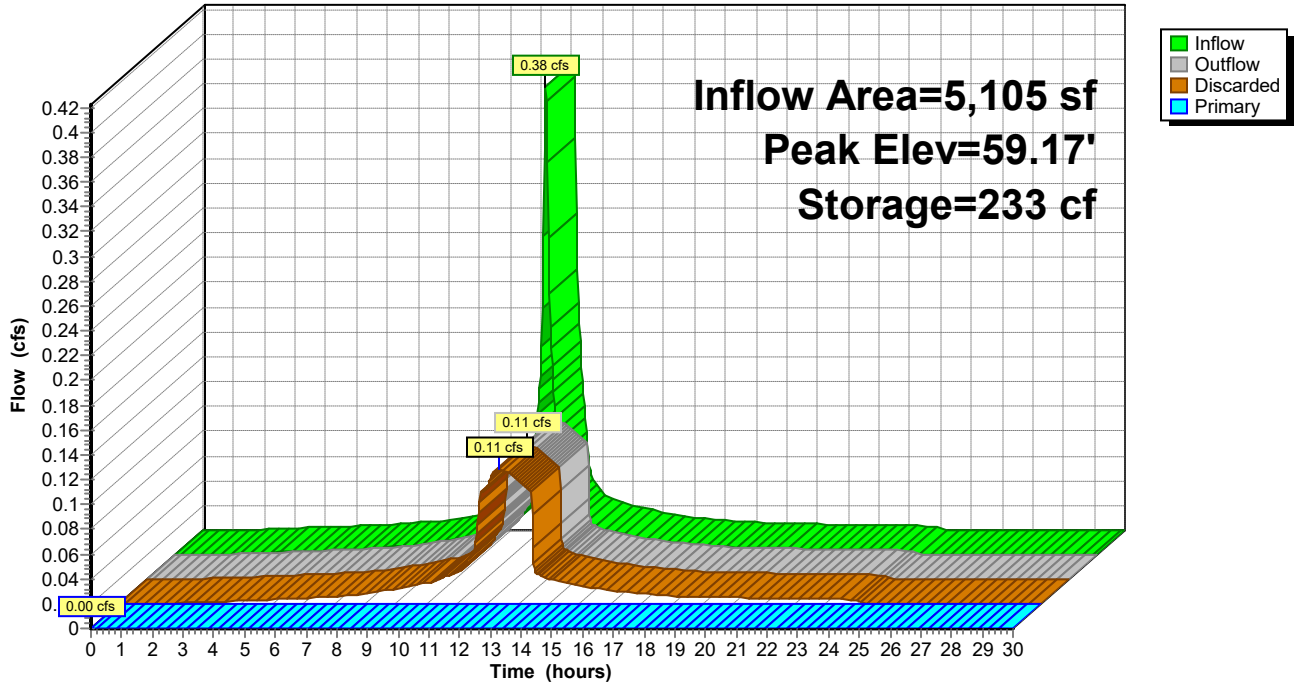
Type III 24-hr 2-Year Rainfall=3.29"

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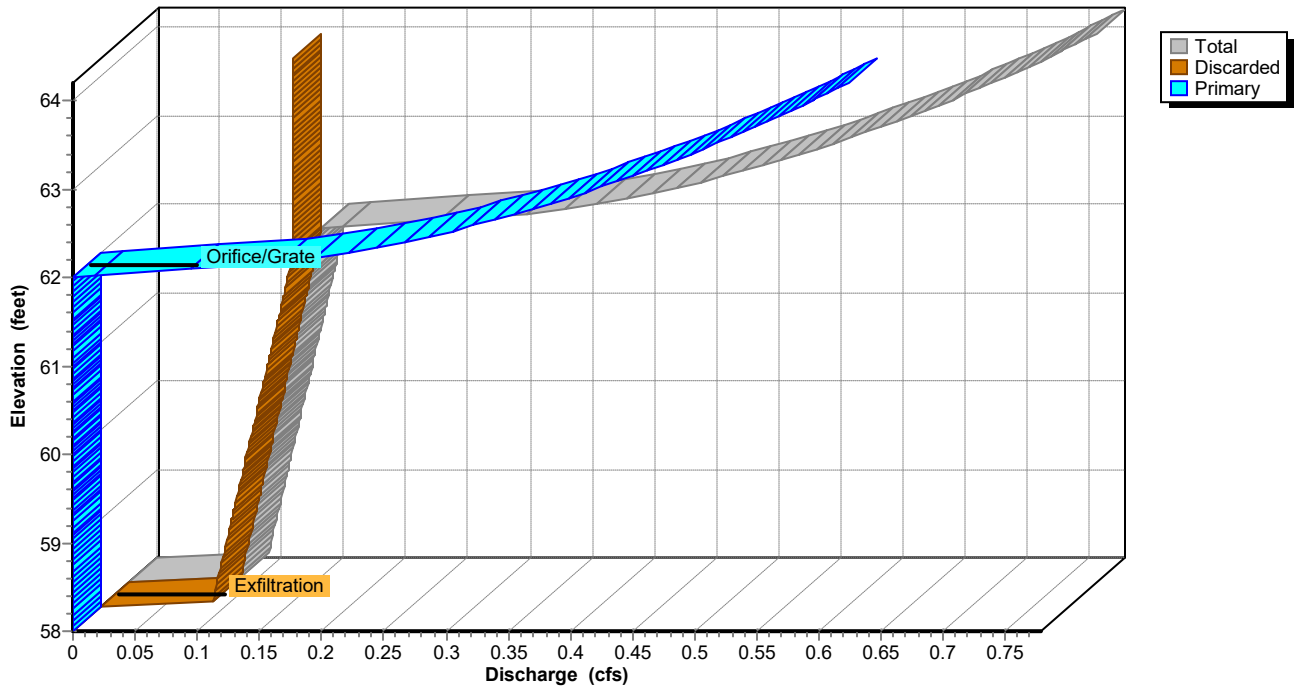
Pond 6P: STORM TECHS

Hydrograph



Pond 6P: STORM TECHS

Stage-Discharge



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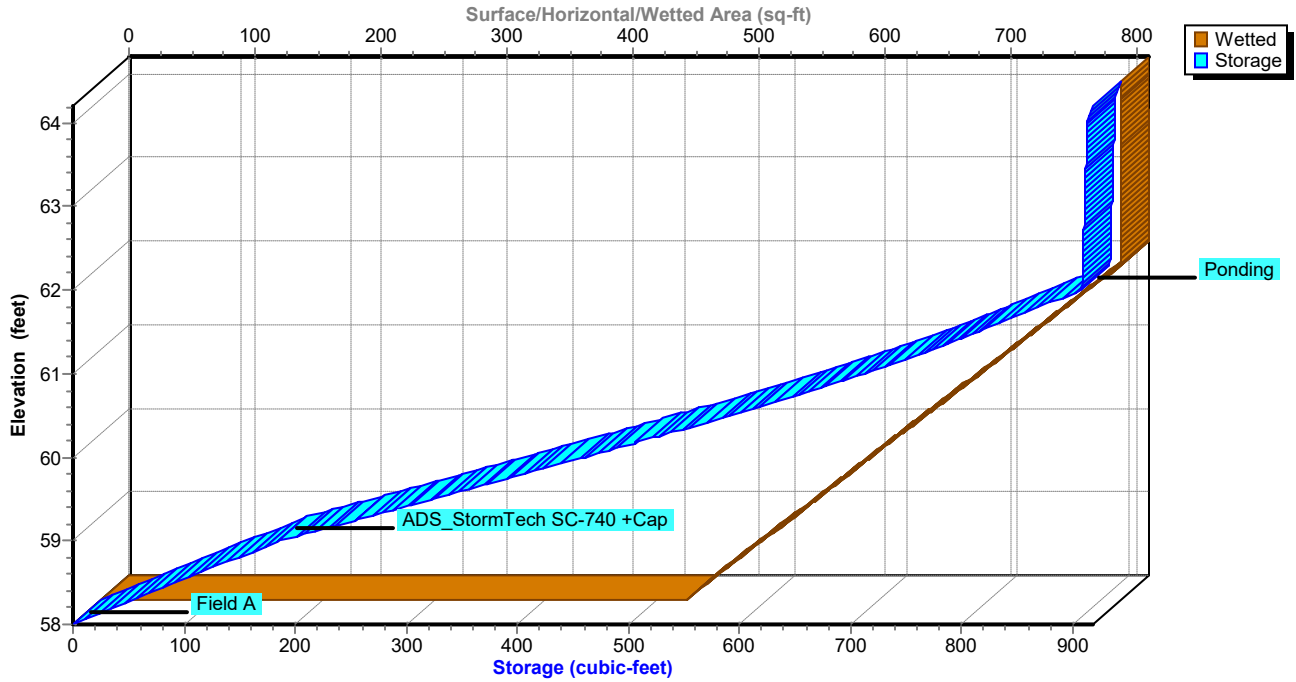
Type III 24-hr 2-Year Rainfall=3.29"

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Pond 6P: STORM TECHS

Stage-Area-Storage



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Type III 24-hr 2-Year Rainfall=3.29"

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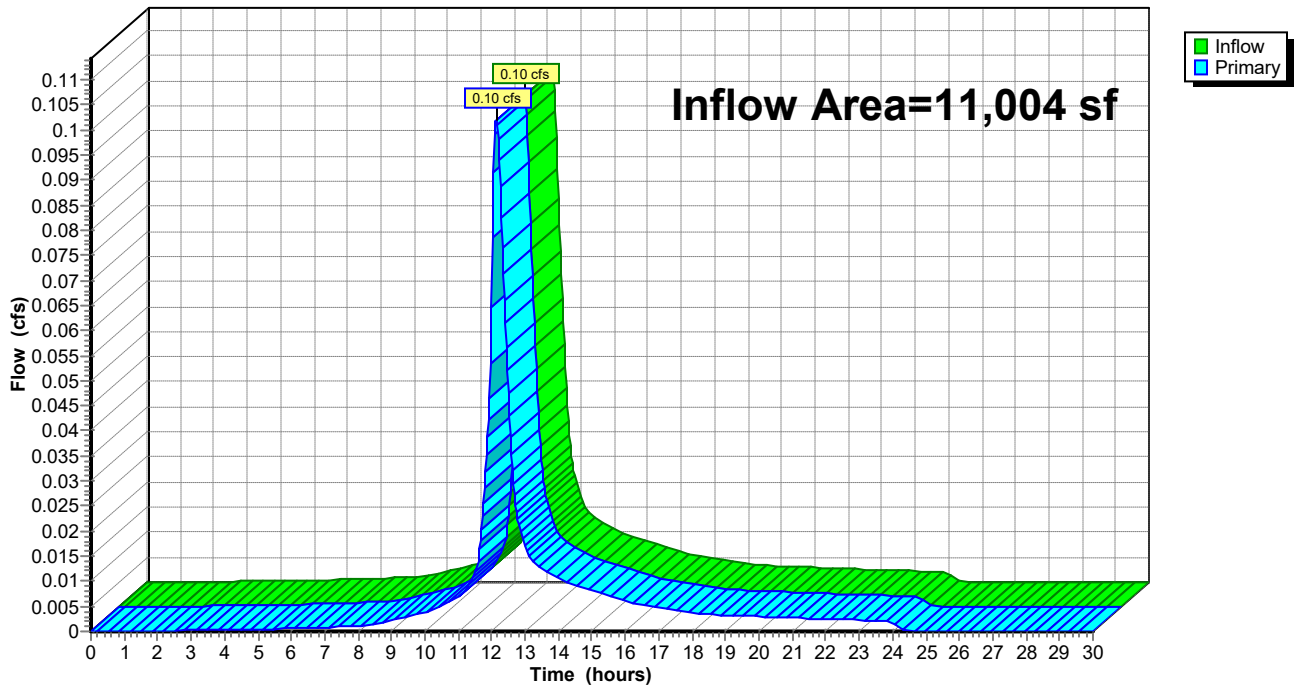
Summary for Link 3L: PROPOSED

Inflow Area = 11,004 sf, 50.80% Impervious, Inflow Depth = 0.55" for 2-Year event
Inflow = 0.10 cfs @ 12.13 hrs, Volume= 506 cf
Primary = 0.10 cfs @ 12.13 hrs, Volume= 506 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-30.00 hrs, dt= 0.03 hrs

Link 3L: PROPOSED

Hydrograph



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Type III 24-hr 10-Year Rainfall=5.17"

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Time span=0.00-30.00 hrs, dt=0.03 hrs, 1001 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 2S: PROPOSED PERMEABLE Runoff Area=588 sf 0.00% Impervious Runoff Depth=3.53"
Tc=15.0 min CN=85 Runoff=0.04 cfs 173 cf

Subcatchment 3S: PROPOSED PERMEABLE Runoff Area=163 sf 0.00% Impervious Runoff Depth=3.53"
Tc=15.0 min CN=85 Runoff=0.01 cfs 48 cf

Subcatchment 4S: PROPOSED LANDSCAPE Runoff Area=3,242 sf 0.00% Impervious Runoff Depth=0.71"
Tc=5.0 min CN=49 Runoff=0.04 cfs 191 cf

Subcatchment 6S: PROPOSED ROOF Runoff Area=3,406 sf 100.00% Impervious Runoff Depth=4.93"
Tc=5.0 min CN=98 Runoff=0.41 cfs 1,400 cf

Subcatchment 7S: PROPOSED IMPERVIOUS Runoff Area=648 sf 100.00% Impervious Runoff Depth=4.93"
Tc=5.0 min CN=98 Runoff=0.08 cfs 266 cf

Subcatchment 8S: PAVED DRIVEWAY Runoff Area=1,536 sf 100.00% Impervious Runoff Depth=4.93"
Tc=5.0 min CN=98 Runoff=0.18 cfs 631 cf

Subcatchment 9S: PROPOSED PERMEABLE Runoff Area=1,421 sf 0.00% Impervious Runoff Depth=3.53"
Tc=15.0 min CN=85 Runoff=0.10 cfs 417 cf

Pond 6P: STORM TECHS Peak Elev=60.16' Storage=503 cf Inflow=0.60 cfs 2,079 cf
Discarded=0.12 cfs 2,080 cf Primary=0.00 cfs 0 cf Outflow=0.12 cfs 2,080 cf

Link 3L: PROPOSED Inflow=0.22 cfs 1,048 cf
Primary=0.22 cfs 1,048 cf

Total Runoff Area = 11,004 sf Runoff Volume = 3,127 cf Average Runoff Depth = 3.41"
49.20% Pervious = 5,414 sf 50.80% Impervious = 5,590 sf

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Type III 24-hr 10-Year Rainfall=5.17"

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Summary for Subcatchment 2S: PROPOSED PERMEABLE PAVERS

Runoff = 0.04 cfs @ 12.20 hrs, Volume= 173 cf, Depth= 3.53"

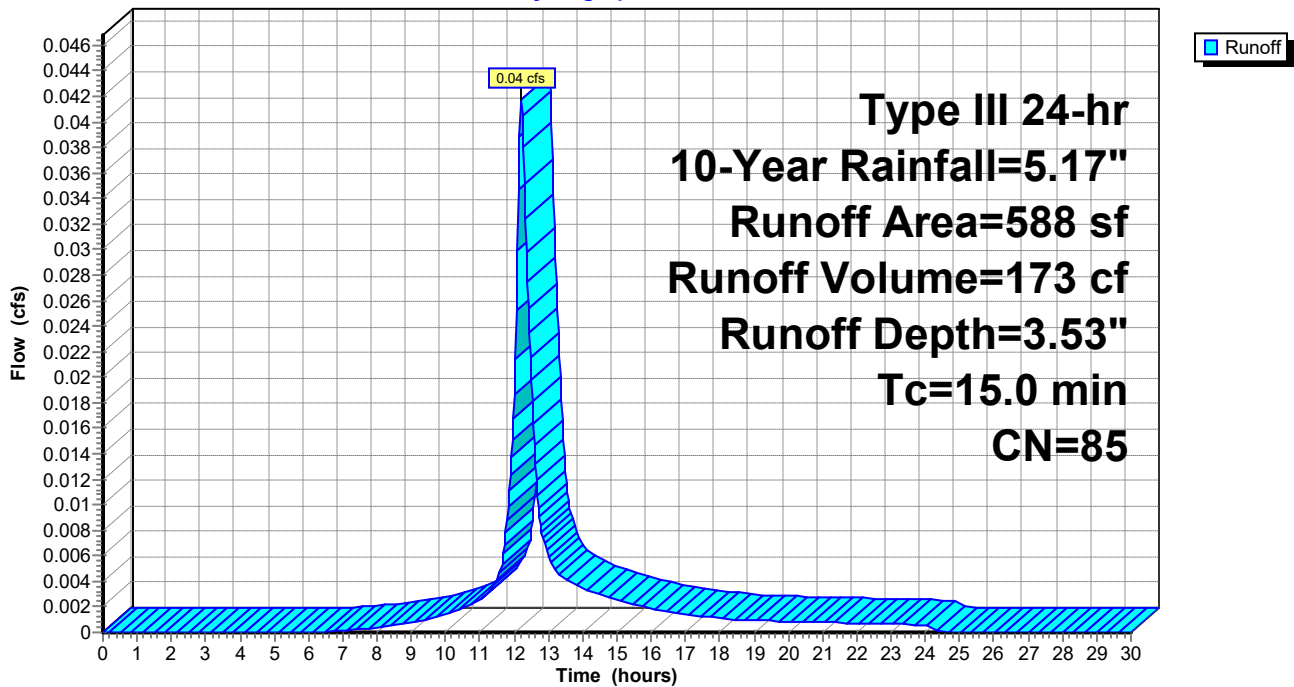
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.03 hrs
Type III 24-hr 10-Year Rainfall=5.17"

Area (sf)	CN	Description
* 588	85	Driveway portion
588		100.00% Pervious Area

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

Subcatchment 2S: PROPOSED PERMEABLE PAVERS

Hydrograph



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Type III 24-hr 10-Year Rainfall=5.17"

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Summary for Subcatchment 3S: PROPOSED PERMEABLE PAVERS

Runoff = 0.01 cfs @ 12.20 hrs, Volume= 48 cf, Depth= 3.53"

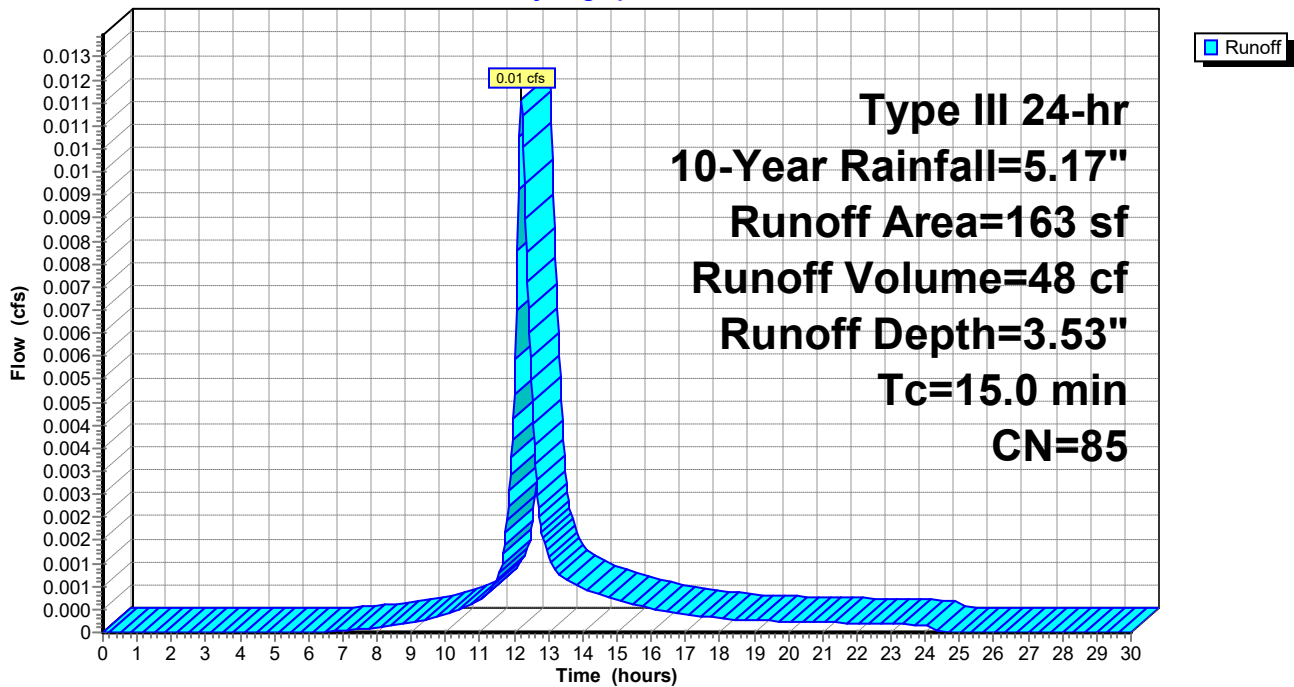
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.03 hrs
Type III 24-hr 10-Year Rainfall=5.17"

Area (sf)	CN	Description
* 163	85	Parking space
163		100.00% Pervious Area

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

Subcatchment 3S: PROPOSED PERMEABLE PAVERS

Hydrograph



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Type III 24-hr 10-Year Rainfall=5.17"

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Summary for Subcatchment 4S: PROPOSED LANDSCAPE AREA

Runoff = 0.04 cfs @ 12.11 hrs, Volume= 191 cf, Depth= 0.71"

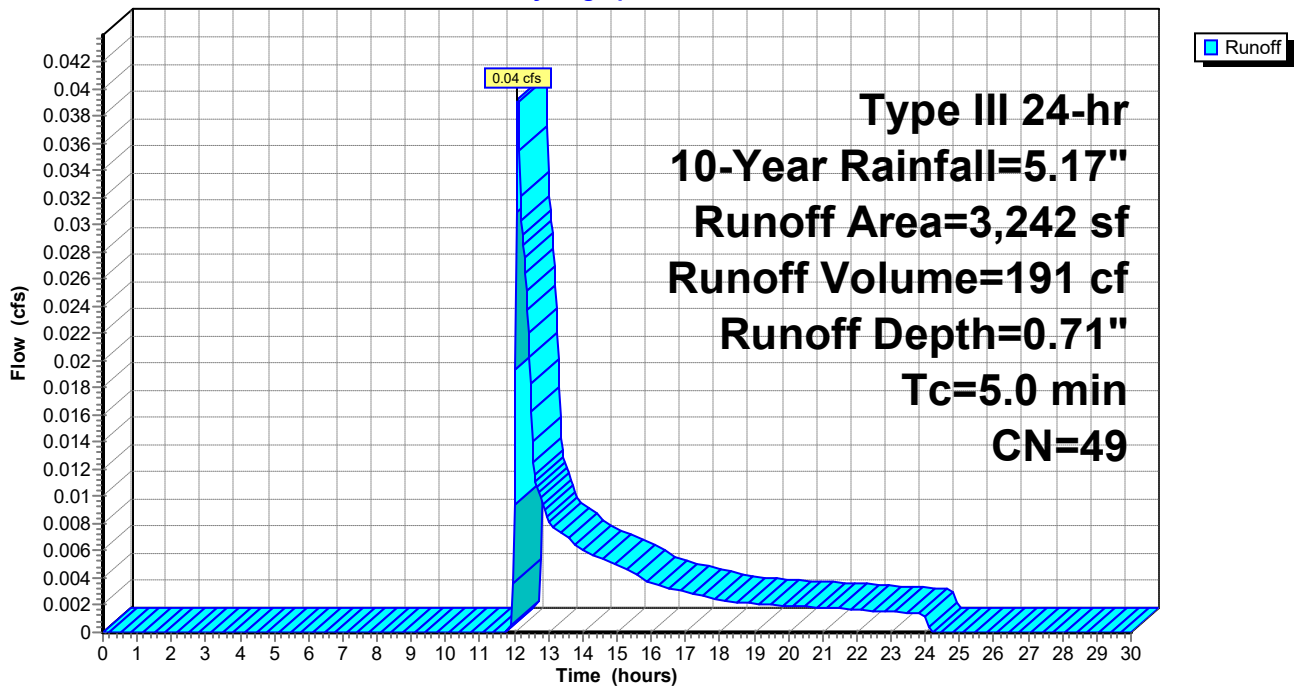
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.03 hrs
 Type III 24-hr 10-Year Rainfall=5.17"

Area (sf)	CN	Description
3,242	49	50-75% Grass cover, Fair, HSG A
3,242		100.00% Pervious Area

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

Subcatchment 4S: PROPOSED LANDSCAPE AREA

Hydrograph



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Type III 24-hr 10-Year Rainfall=5.17"

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Summary for Subcatchment 6S: PROPOSED ROOF

Runoff = 0.41 cfs @ 12.07 hrs, Volume= 1,400 cf, Depth= 4.93"

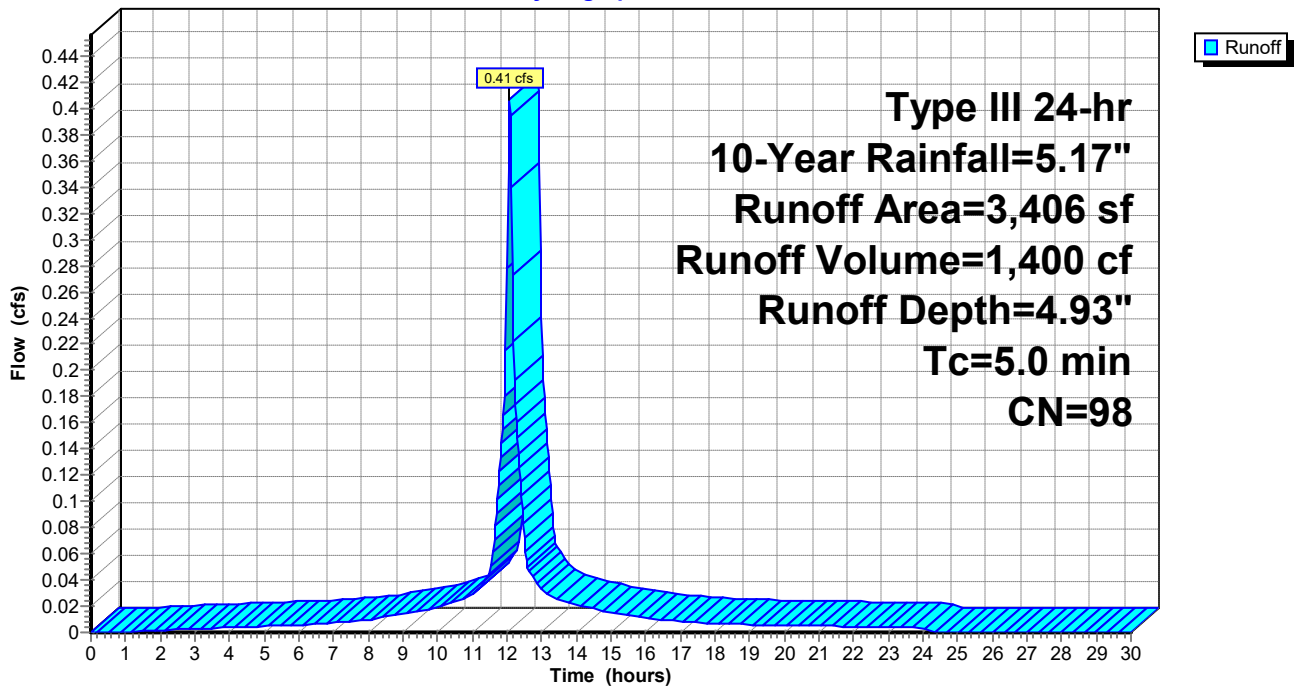
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.03 hrs
Type III 24-hr 10-Year Rainfall=5.17"

Area (sf)	CN	Description
3,406	98	Roofs, HSG A
3,406		100.00% Impervious Area

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

Subcatchment 6S: PROPOSED ROOF

Hydrograph



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Type III 24-hr 10-Year Rainfall=5.17"

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Summary for Subcatchment 7S: PROPOSED IMPERVIOUS

Runoff = 0.08 cfs @ 12.07 hrs, Volume= 266 cf, Depth= 4.93"

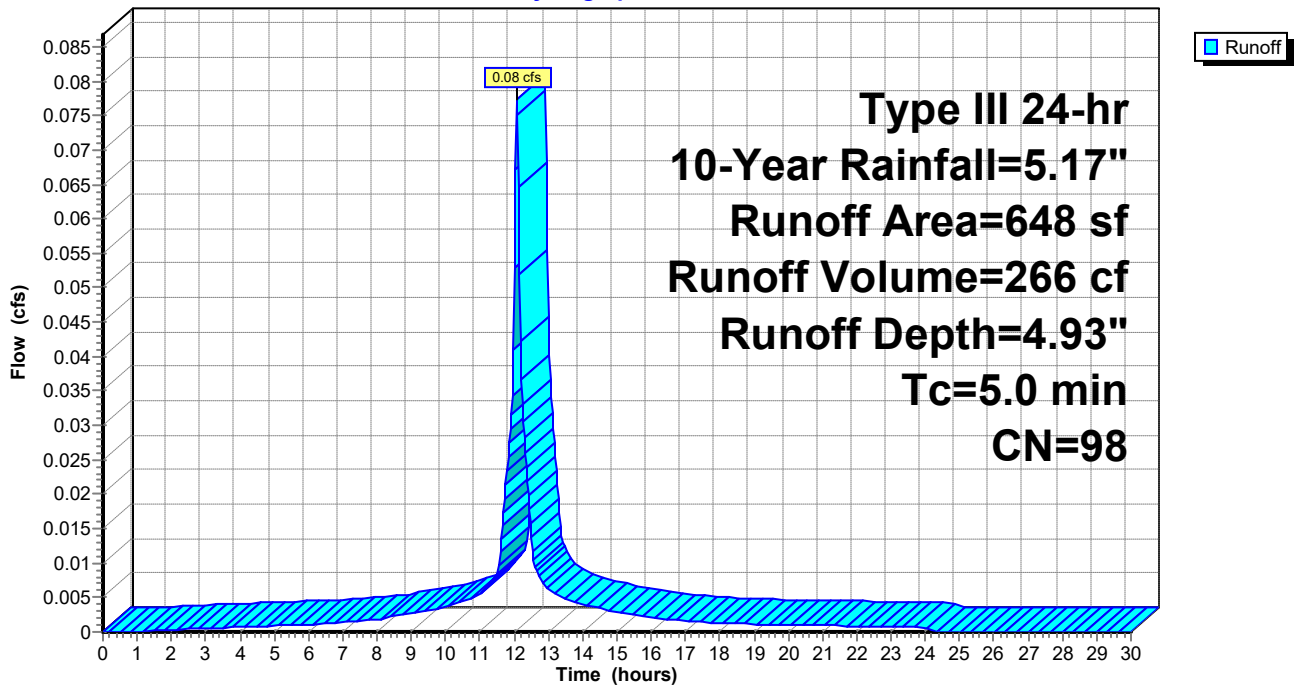
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.03 hrs
Type III 24-hr 10-Year Rainfall=5.17"

Area (sf)	CN	Description
648	98	Unconnected roofs, HSG A
648		100.00% Impervious Area
648		100.00% Unconnected

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

Subcatchment 7S: PROPOSED IMPERVIOUS

Hydrograph



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Type III 24-hr 10-Year Rainfall=5.17"

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Summary for Subcatchment 8S: PAVED DRIVEWAY

Runoff = 0.18 cfs @ 12.07 hrs, Volume= 631 cf, Depth= 4.93"

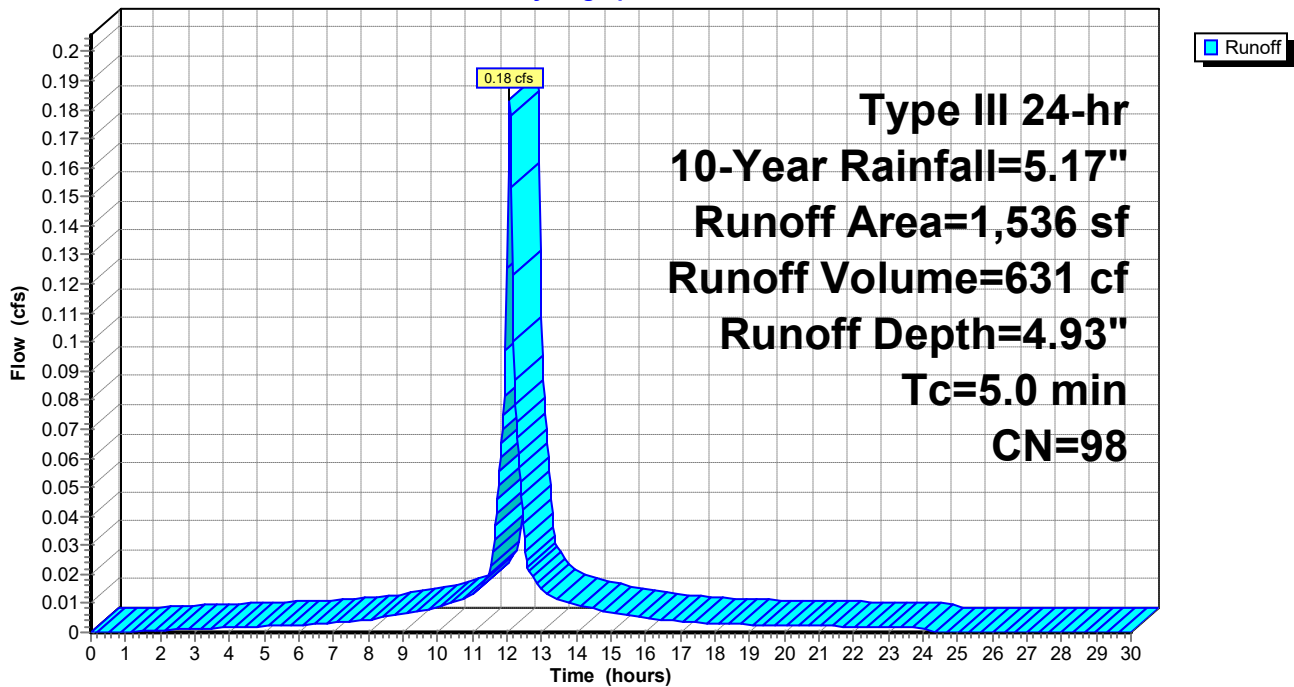
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.03 hrs
Type III 24-hr 10-Year Rainfall=5.17"

Area (sf)	CN	Description
1,536	98	Paved parking, HSG A
1,536		100.00% Impervious Area

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

Subcatchment 8S: PAVED DRIVEWAY

Hydrograph



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Type III 24-hr 10-Year Rainfall=5.17"

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Summary for Subcatchment 9S: PROPOSED PERMEABLE PAVERS

Runoff = 0.10 cfs @ 12.20 hrs, Volume= 417 cf, Depth= 3.53"

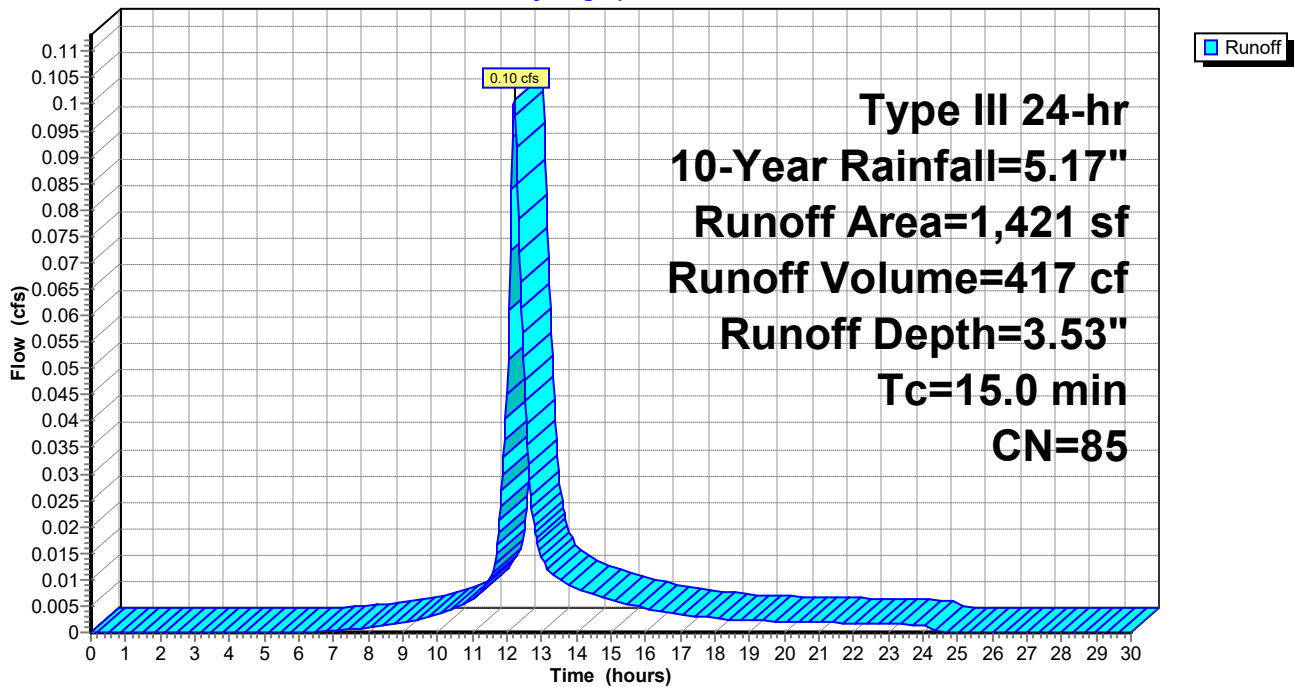
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.03 hrs
Type III 24-hr 10-Year Rainfall=5.17"

Area (sf)	CN	Description
* 1,421	85	Patios, walkways
1,421		100.00% Pervious Area

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

Subcatchment 9S: PROPOSED PERMEABLE PAVERS

Hydrograph



PROPOSED

Type III 24-hr 10-Year Rainfall=5.17"

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Summary for Pond 6P: STORM TECHS

Inflow Area = 5,105 sf, 96.81% Impervious, Inflow Depth = 4.89" for 10-Year event
 Inflow = 0.60 cfs @ 12.07 hrs, Volume= 2,079 cf
 Outflow = 0.12 cfs @ 12.48 hrs, Volume= 2,080 cf, Atten= 79%, Lag= 24.8 min
 Discarded = 0.12 cfs @ 12.48 hrs, Volume= 2,080 cf
 Primary = 0.00 cfs @ 0.00 hrs, Volume= 0 cf

Routing by Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.03 hrs / 3
 Peak Elev= 60.16' @ 12.48 hrs Surf.Area= 464 sf Storage= 503 cf

Plug-Flow detention time= 23.1 min calculated for 2,078 cf (100% of inflow)
 Center-of-Mass det. time= 23.2 min (771.4 - 748.1)

Volume	Invert	Avail.Storage	Storage Description
#1A	58.00'	633 cf	21.08'W x 22.02'L x 4.00'H Field A 1,857 cf Overall - 276 cf Embedded = 1,582 cf x 40.0% Voids
#2A	59.00'	276 cf	ADS_StormTech SC-740 +Cap x 6 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 6 Chambers in 3 Rows
#3	62.00'	10 cf	Ponding Listed below -Impervious
		918 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Elevation (feet)	Cum.Store (cubic-feet)
62.00	0
64.00	5
64.20	10

Device	Routing	Invert	Outlet Devices
#1	Discarded	58.00'	8.270 in/hr Exfiltration over Wetted area
#2	Primary	62.00'	4.0" Horiz. Orifice/Grate C= 0.600 Limited to weir flow at low heads

Discarded OutFlow Max=0.12 cfs @ 12.48 hrs HW=60.16' (Free Discharge)
 ↑1=Exfiltration (Exfiltration Controls 0.12 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=58.00' (Free Discharge)
 ↑2=Orifice/Grate (Controls 0.00 cfs)

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Type III 24-hr 10-Year Rainfall=5.17"

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Pond 6P: STORM TECHS - Chamber Wizard Field A

Chamber Model = ADS_StormTech SC-740 +Cap (ADS StormTech® SC-740 with cap length)

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

51.0" Wide + 18.0" Spacing = 69.0" C-C Row Spacing

2 Chambers/Row x 7.12' Long +0.81' Cap Length x 2 = 15.86' Row Length +37.0" End Stone x 2 = 22.02' Base Length

3 Rows x 51.0" Wide + 18.0" Spacing x 2 + 32.0" Side Stone x 2 = 21.08' Base Width

12.0" Base + 30.0" Chamber Height + 6.0" Cover = 4.00' Field Height

6 Chambers x 45.9 cf = 275.6 cf Chamber Storage

1,857.3 cf Field - 275.6 cf Chambers = 1,581.7 cf Stone x 40.0% Voids = 632.7 cf Stone Storage

Chamber Storage + Stone Storage = 908.3 cf = 0.021 af

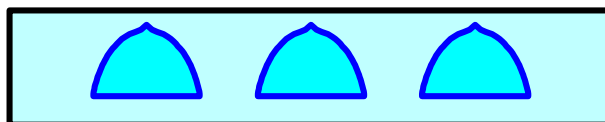
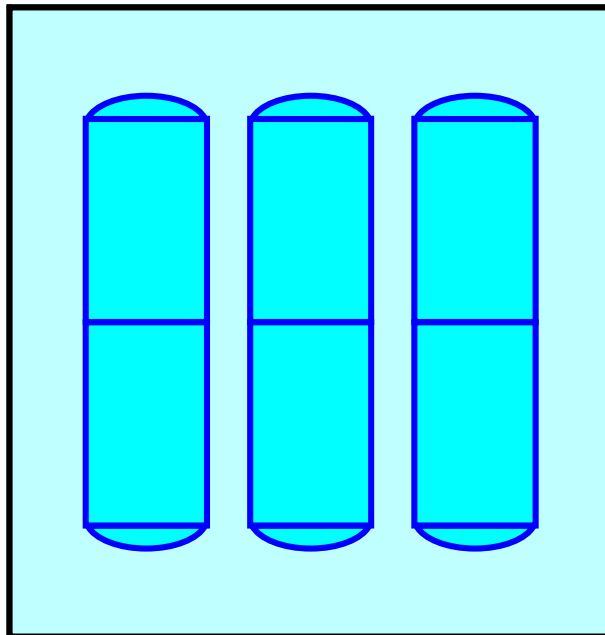
Overall Storage Efficiency = 48.9%

Overall System Size = 22.02' x 21.08' x 4.00'

6 Chambers

68.8 cy Field

58.6 cy Stone



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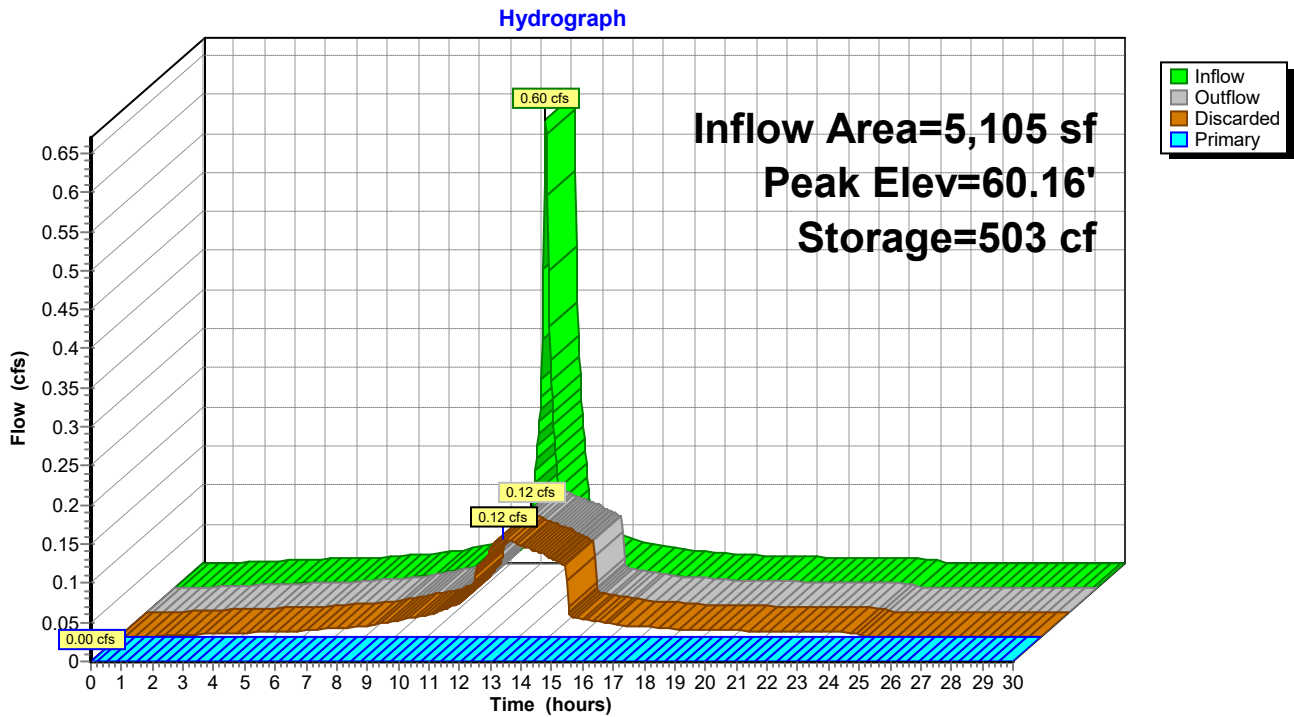
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Type III 24-hr 10-Year Rainfall=5.17"

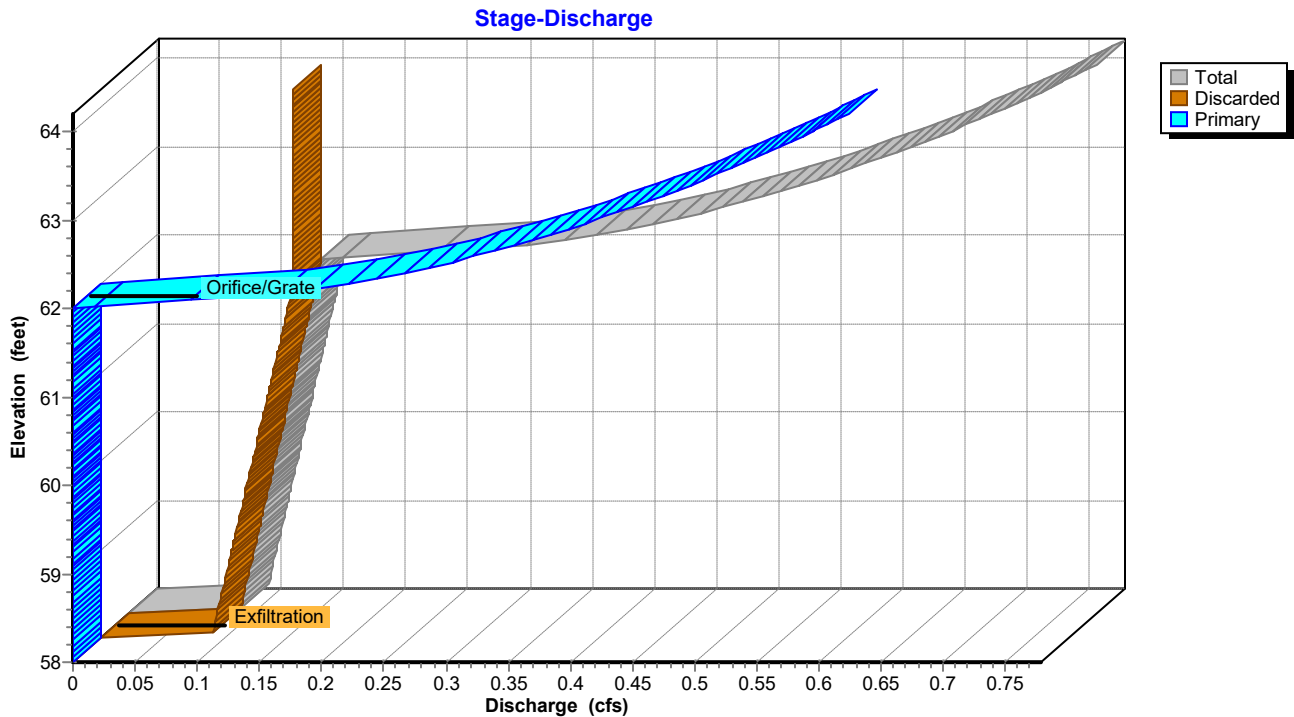
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Pond 6P: STORM TECHS



Pond 6P: STORM TECHS



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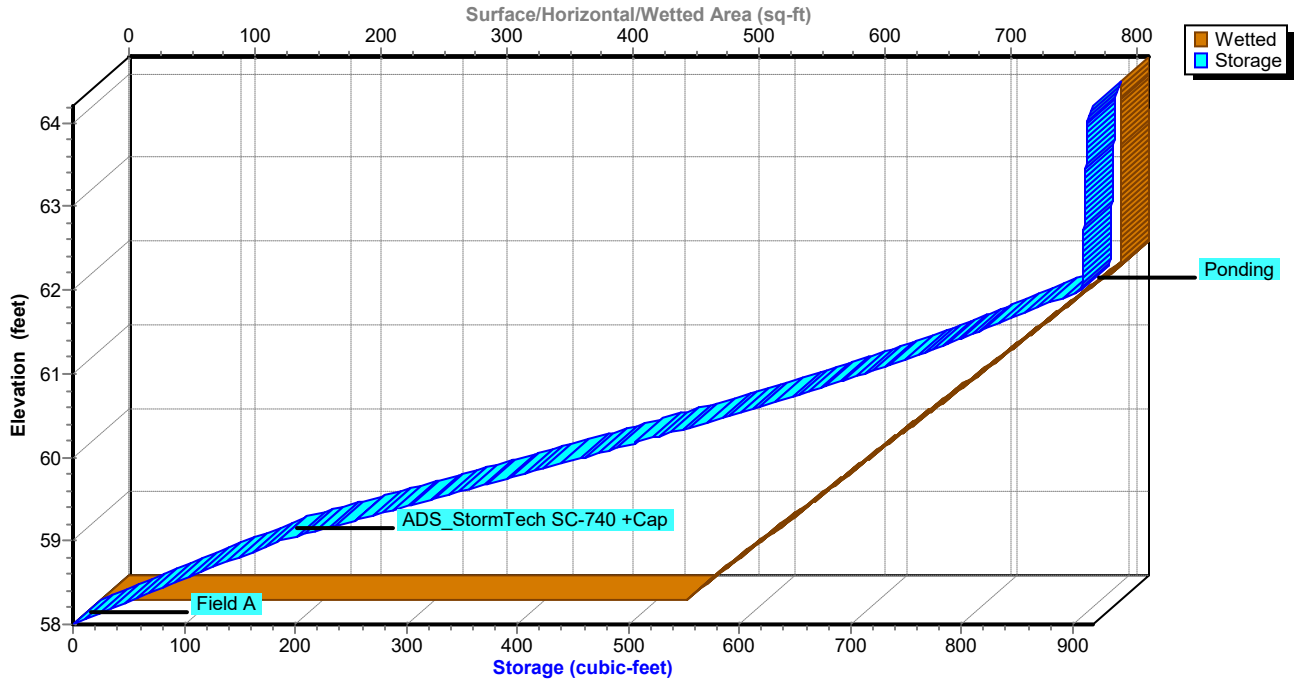
Type III 24-hr 10-Year Rainfall=5.17"

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Pond 6P: STORM TECHS

Stage-Area-Storage



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Type III 24-hr 10-Year Rainfall=5.17"

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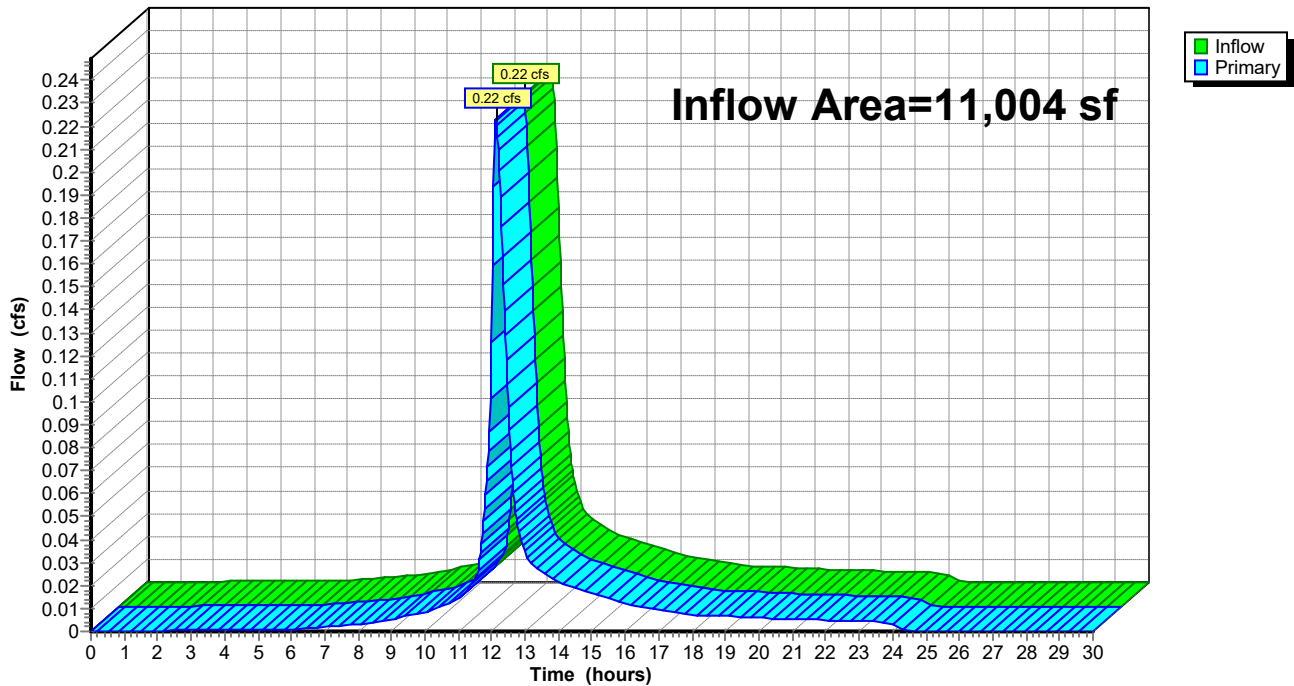
Summary for Link 3L: PROPOSED

Inflow Area = 11,004 sf, 50.80% Impervious, Inflow Depth = 1.14" for 10-Year event
Inflow = 0.22 cfs @ 12.13 hrs, Volume= 1,048 cf
Primary = 0.22 cfs @ 12.13 hrs, Volume= 1,048 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-30.00 hrs, dt= 0.03 hrs

Link 3L: PROPOSED

Hydrograph



PROPOSED

Type III 24-hr 25-Year Rainfall=6.35"

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Time span=0.00-30.00 hrs, dt=0.03 hrs, 1001 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 2S: PROPOSED PERMEABLE Runoff Area=588 sf 0.00% Impervious Runoff Depth=4.63"
Tc=15.0 min CN=85 Runoff=0.05 cfs 227 cf

Subcatchment 3S: PROPOSED PERMEABLE Runoff Area=163 sf 0.00% Impervious Runoff Depth=4.63"
Tc=15.0 min CN=85 Runoff=0.02 cfs 63 cf

Subcatchment 4S: PROPOSED LANDSCAPE Runoff Area=3,242 sf 0.00% Impervious Runoff Depth=1.24"
Tc=5.0 min CN=49 Runoff=0.09 cfs 335 cf

Subcatchment 6S: PROPOSED ROOF Runoff Area=3,406 sf 100.00% Impervious Runoff Depth=6.11"
Tc=5.0 min CN=98 Runoff=0.50 cfs 1,735 cf

Subcatchment 7S: PROPOSED IMPERVIOUS Runoff Area=648 sf 100.00% Impervious Runoff Depth=6.11"
Tc=5.0 min CN=98 Runoff=0.10 cfs 330 cf

Subcatchment 8S: PAVED DRIVEWAY Runoff Area=1,536 sf 100.00% Impervious Runoff Depth=6.11"
Tc=5.0 min CN=98 Runoff=0.23 cfs 782 cf

Subcatchment 9S: PROPOSED PERMEABLE Runoff Area=1,421 sf 0.00% Impervious Runoff Depth=4.63"
Tc=15.0 min CN=85 Runoff=0.13 cfs 549 cf

Pond 6P: STORM TECHS Peak Elev=60.86' Storage=680 cf Inflow=0.74 cfs 2,580 cf
Discarded=0.14 cfs 2,580 cf Primary=0.00 cfs 0 cf Outflow=0.14 cfs 2,580 cf

Link 3L: PROPOSED Inflow=0.32 cfs 1,441 cf
Primary=0.32 cfs 1,441 cf

Total Runoff Area = 11,004 sf Runoff Volume = 4,021 cf Average Runoff Depth = 4.38"
49.20% Pervious = 5,414 sf 50.80% Impervious = 5,590 sf

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Type III 24-hr 25-Year Rainfall=6.35"

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Summary for Subcatchment 2S: PROPOSED PERMEABLE PAVERS

Runoff = 0.05 cfs @ 12.20 hrs, Volume= 227 cf, Depth= 4.63"

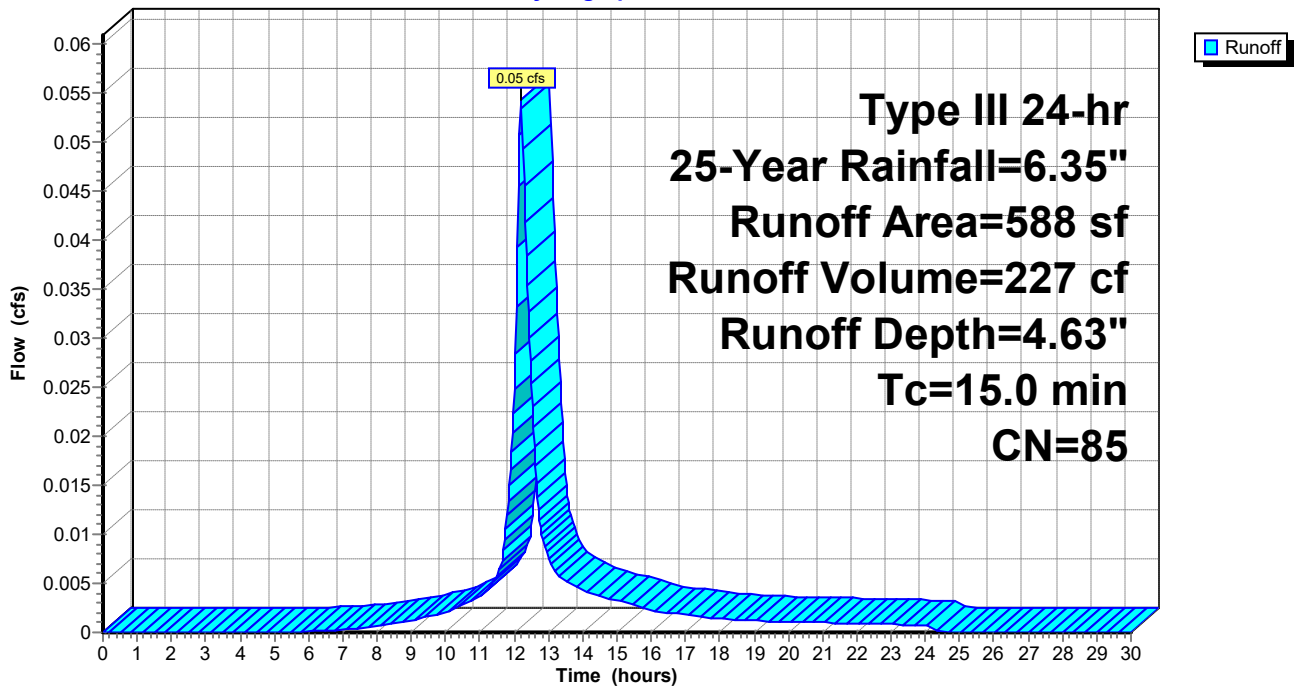
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.03 hrs
Type III 24-hr 25-Year Rainfall=6.35"

Area (sf)	CN	Description
* 588	85	Driveway portion
588		100.00% Pervious Area

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

Subcatchment 2S: PROPOSED PERMEABLE PAVERS

Hydrograph



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Type III 24-hr 25-Year Rainfall=6.35"

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Summary for Subcatchment 3S: PROPOSED PERMEABLE PAVERS

Runoff = 0.02 cfs @ 12.20 hrs, Volume= 63 cf, Depth= 4.63"

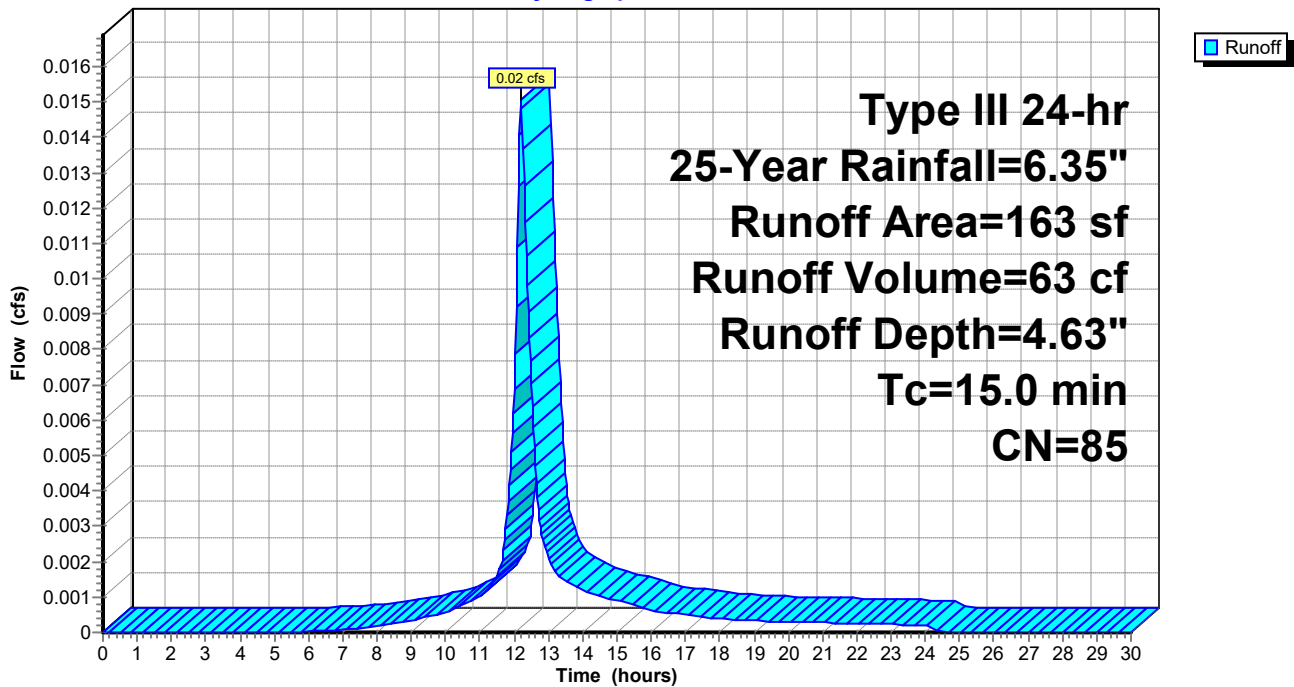
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.03 hrs
Type III 24-hr 25-Year Rainfall=6.35"

Area (sf)	CN	Description
* 163	85	Parking space
163		100.00% Pervious Area

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

Subcatchment 3S: PROPOSED PERMEABLE PAVERS

Hydrograph



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Type III 24-hr 25-Year Rainfall=6.35"

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Summary for Subcatchment 4S: PROPOSED LANDSCAPE AREA

Runoff = 0.09 cfs @ 12.09 hrs, Volume= 335 cf, Depth= 1.24"

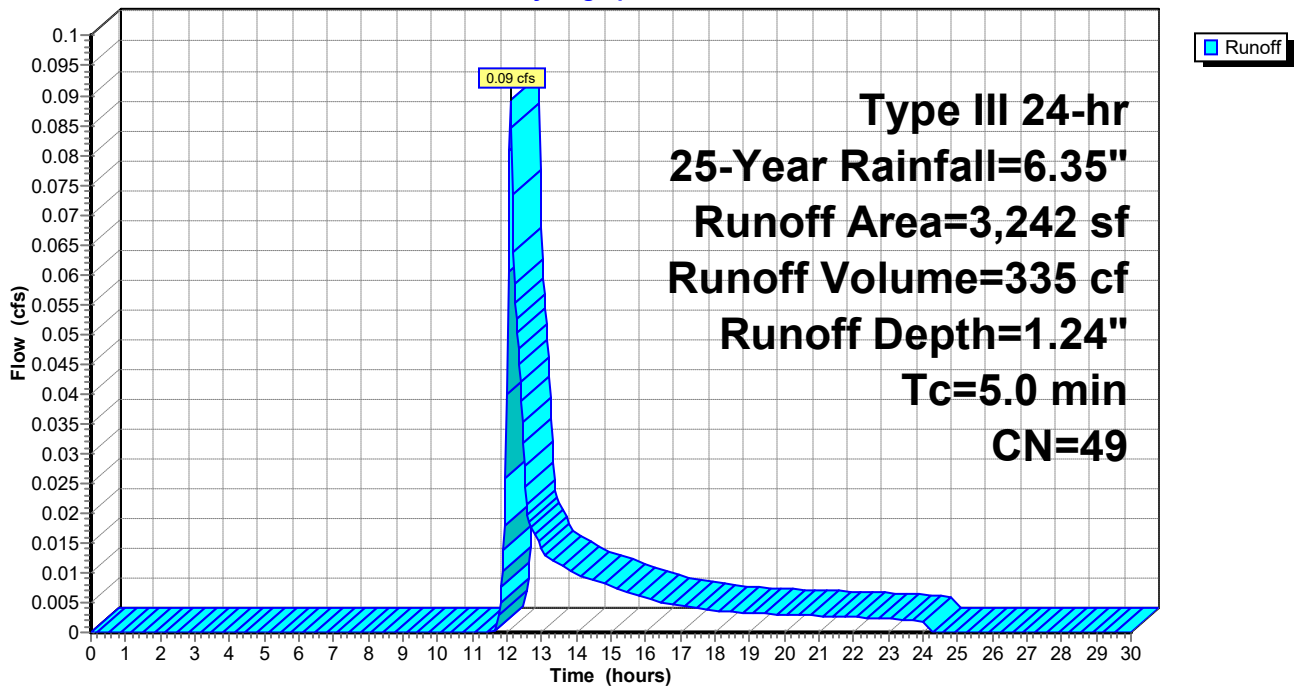
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.03 hrs
Type III 24-hr 25-Year Rainfall=6.35"

Area (sf)	CN	Description
3,242	49	50-75% Grass cover, Fair, HSG A
3,242		100.00% Pervious Area

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

Subcatchment 4S: PROPOSED LANDSCAPE AREA

Hydrograph



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Type III 24-hr 25-Year Rainfall=6.35"

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Summary for Subcatchment 6S: PROPOSED ROOF

Runoff = 0.50 cfs @ 12.07 hrs, Volume= 1,735 cf, Depth= 6.11"

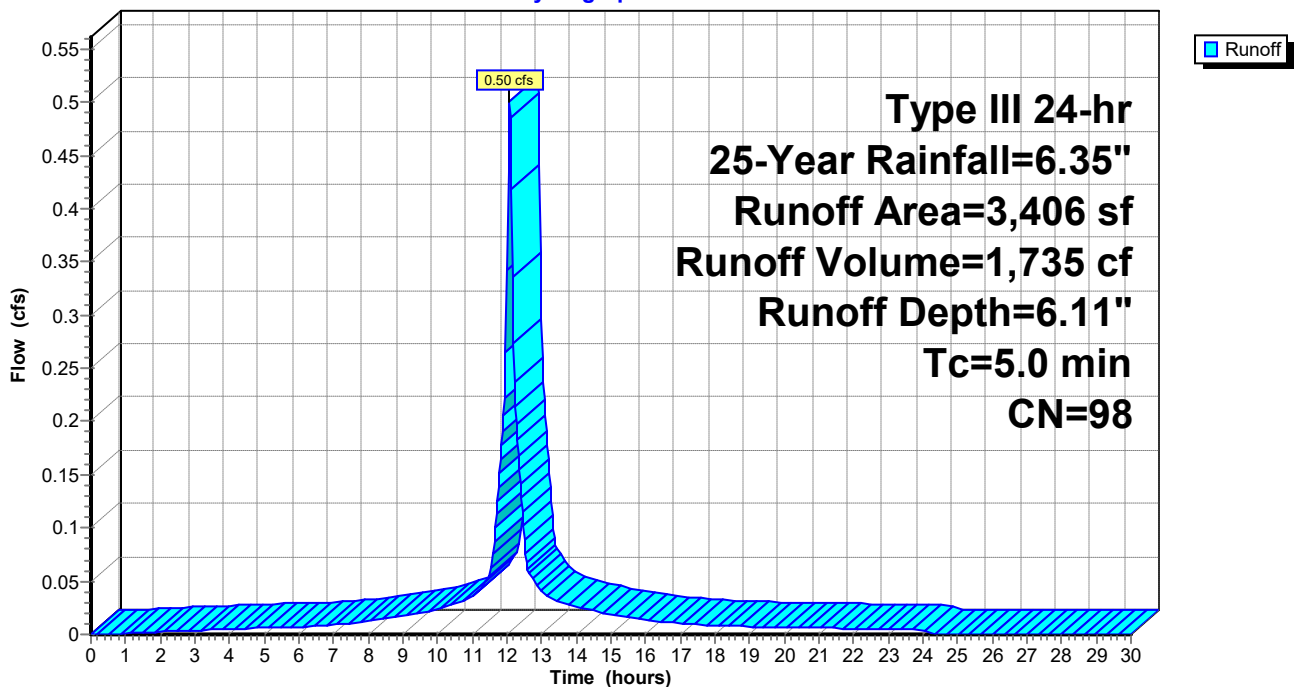
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.03 hrs
Type III 24-hr 25-Year Rainfall=6.35"

Area (sf)	CN	Description
3,406	98	Roofs, HSG A
3,406		100.00% Impervious Area

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

Subcatchment 6S: PROPOSED ROOF

Hydrograph



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Type III 24-hr 25-Year Rainfall=6.35"

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Summary for Subcatchment 7S: PROPOSED IMPERVIOUS

Runoff = 0.10 cfs @ 12.07 hrs, Volume= 330 cf, Depth= 6.11"

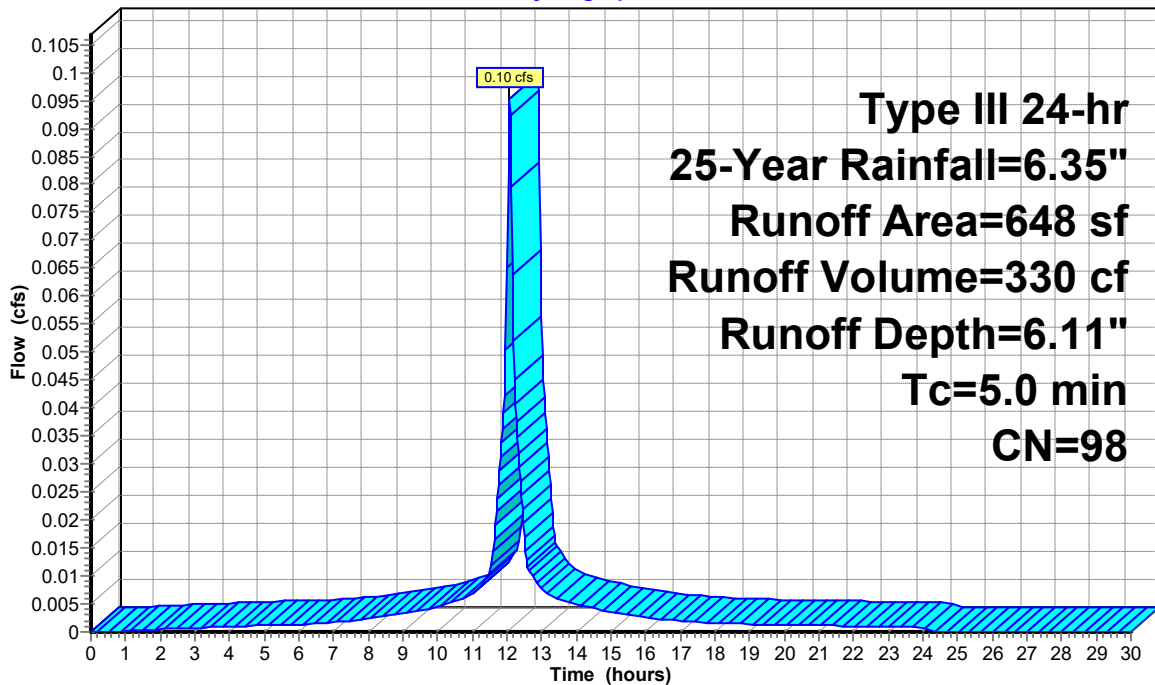
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.03 hrs
Type III 24-hr 25-Year Rainfall=6.35"

Area (sf)	CN	Description
648	98	Unconnected roofs, HSG A
648		100.00% Impervious Area
648		100.00% Unconnected

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

Subcatchment 7S: PROPOSED IMPERVIOUS

Hydrograph



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Type III 24-hr 25-Year Rainfall=6.35"

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Summary for Subcatchment 8S: PAVED DRIVEWAY

Runoff = 0.23 cfs @ 12.07 hrs, Volume= 782 cf, Depth= 6.11"

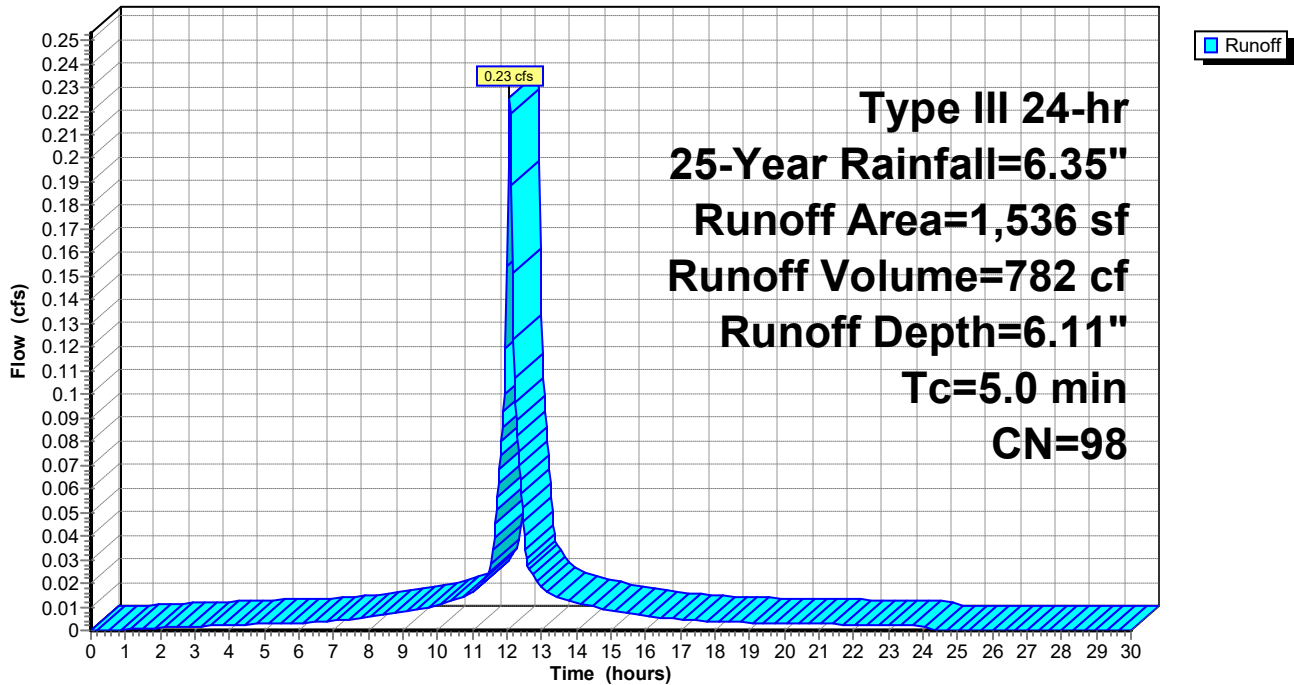
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.03 hrs
Type III 24-hr 25-Year Rainfall=6.35"

Area (sf)	CN	Description
1,536	98	Paved parking, HSG A
1,536		100.00% Impervious Area

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

Subcatchment 8S: PAVED DRIVEWAY

Hydrograph



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Type III 24-hr 25-Year Rainfall=6.35"

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Summary for Subcatchment 9S: PROPOSED PERMEABLE PAVERS

Runoff = 0.13 cfs @ 12.20 hrs, Volume= 549 cf, Depth= 4.63"

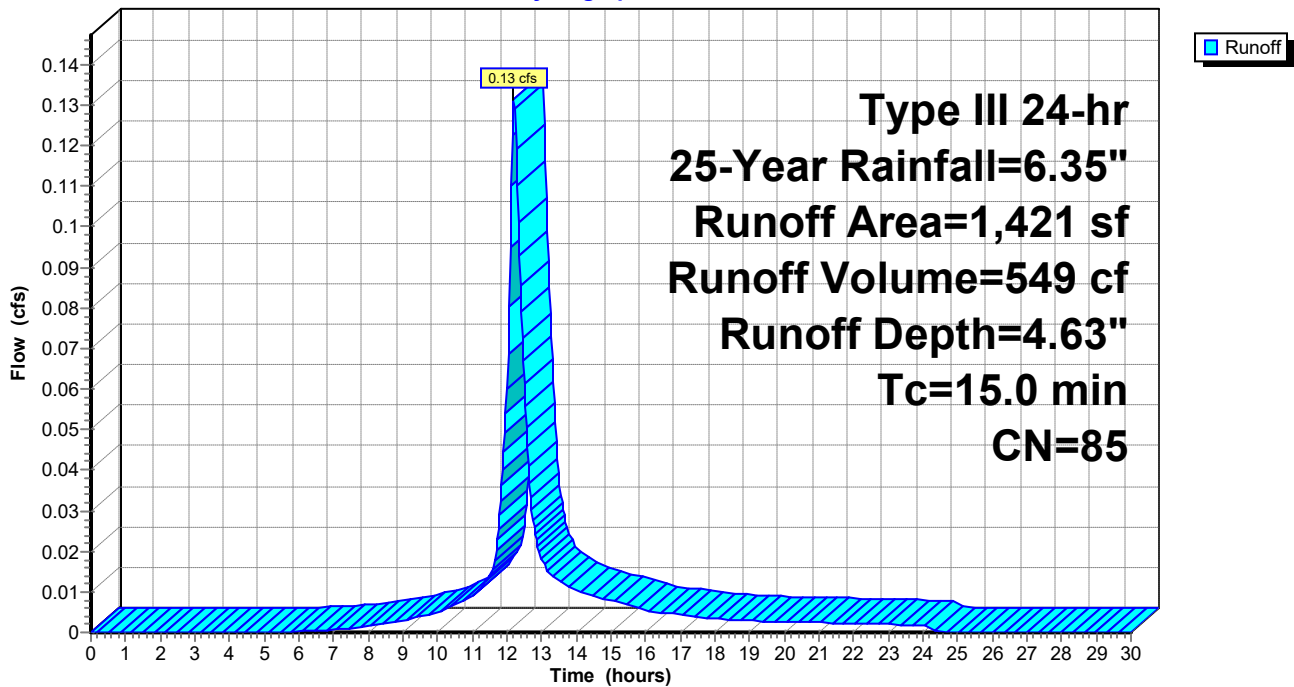
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.03 hrs
Type III 24-hr 25-Year Rainfall=6.35"

Area (sf)	CN	Description
* 1,421	85	Patios, walkways
1,421		100.00% Pervious Area

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

Subcatchment 9S: PROPOSED PERMEABLE PAVERS

Hydrograph



PROPOSED

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Type III 24-hr 25-Year Rainfall=6.35"

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Summary for Pond 6P: STORM TECHS

Inflow Area = 5,105 sf, 96.81% Impervious, Inflow Depth = 6.06" for 25-Year event
 Inflow = 0.74 cfs @ 12.07 hrs, Volume= 2,580 cf
 Outflow = 0.14 cfs @ 12.51 hrs, Volume= 2,580 cf, Atten= 82%, Lag= 26.4 min
 Discarded = 0.14 cfs @ 12.51 hrs, Volume= 2,580 cf
 Primary = 0.00 cfs @ 0.00 hrs, Volume= 0 cf

Routing by Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.03 hrs / 3
 Peak Elev= 60.86' @ 12.51 hrs Surf.Area= 464 sf Storage= 680 cf

Plug-Flow detention time= 30.8 min calculated for 2,580 cf (100% of inflow)
 Center-of-Mass det. time= 30.7 min (775.6 - 744.9)

Volume	Invert	Avail.Storage	Storage Description
#1A	58.00'	633 cf	21.08'W x 22.02'L x 4.00'H Field A 1,857 cf Overall - 276 cf Embedded = 1,582 cf x 40.0% Voids
#2A	59.00'	276 cf	ADS_StormTech SC-740 +Cap x 6 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 6 Chambers in 3 Rows
#3	62.00'	10 cf	Ponding Listed below -Impervious
		918 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Elevation (feet)	Cum.Store (cubic-feet)
62.00	0
64.00	5
64.20	10

Device	Routing	Invert	Outlet Devices
#1	Discarded	58.00'	8.270 in/hr Exfiltration over Wetted area
#2	Primary	62.00'	4.0" Horiz. Orifice/Grate C= 0.600 Limited to weir flow at low heads

Discarded OutFlow Max=0.14 cfs @ 12.51 hrs HW=60.86' (Free Discharge)
 ↑1=Exfiltration (Exfiltration Controls 0.14 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=58.00' (Free Discharge)
 ↑2=Orifice/Grate (Controls 0.00 cfs)

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Type III 24-hr 25-Year Rainfall=6.35"

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Pond 6P: STORM TECHS - Chamber Wizard Field A

Chamber Model = ADS_StormTech SC-740 +Cap (ADS StormTech® SC-740 with cap length)

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

51.0" Wide + 18.0" Spacing = 69.0" C-C Row Spacing

2 Chambers/Row x 7.12' Long +0.81' Cap Length x 2 = 15.86' Row Length +37.0" End Stone x 2 = 22.02' Base Length

3 Rows x 51.0" Wide + 18.0" Spacing x 2 + 32.0" Side Stone x 2 = 21.08' Base Width

12.0" Base + 30.0" Chamber Height + 6.0" Cover = 4.00' Field Height

6 Chambers x 45.9 cf = 275.6 cf Chamber Storage

1,857.3 cf Field - 275.6 cf Chambers = 1,581.7 cf Stone x 40.0% Voids = 632.7 cf Stone Storage

Chamber Storage + Stone Storage = 908.3 cf = 0.021 af

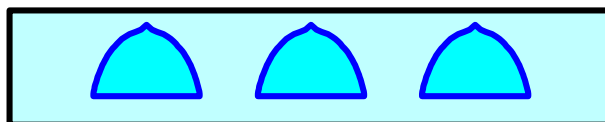
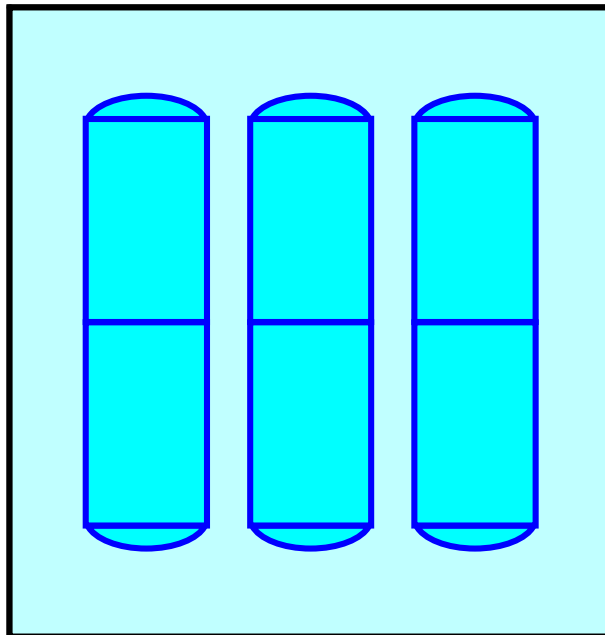
Overall Storage Efficiency = 48.9%

Overall System Size = 22.02' x 21.08' x 4.00'

6 Chambers

68.8 cy Field

58.6 cy Stone



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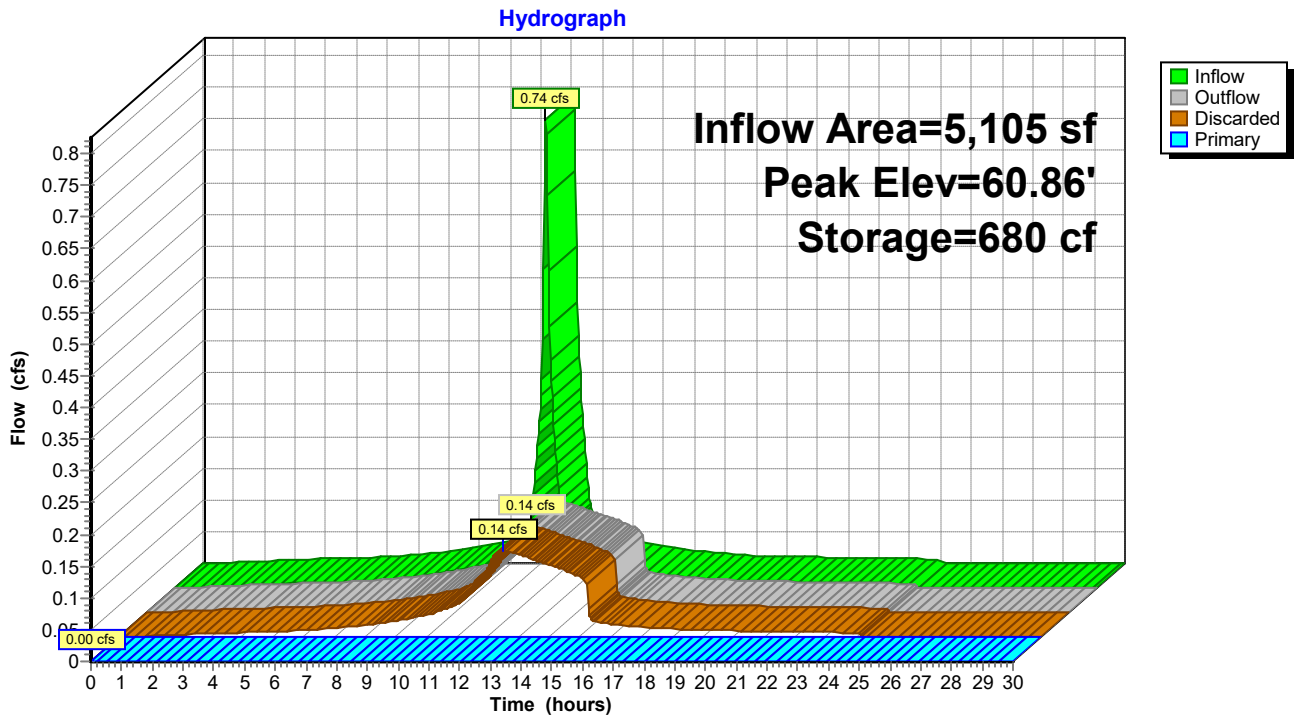
HydroCAD® 10.00-25 s/n 09067 © 2019 HydroCAD Software Solutions LLC

Type III 24-hr 25-Year Rainfall=6.35"

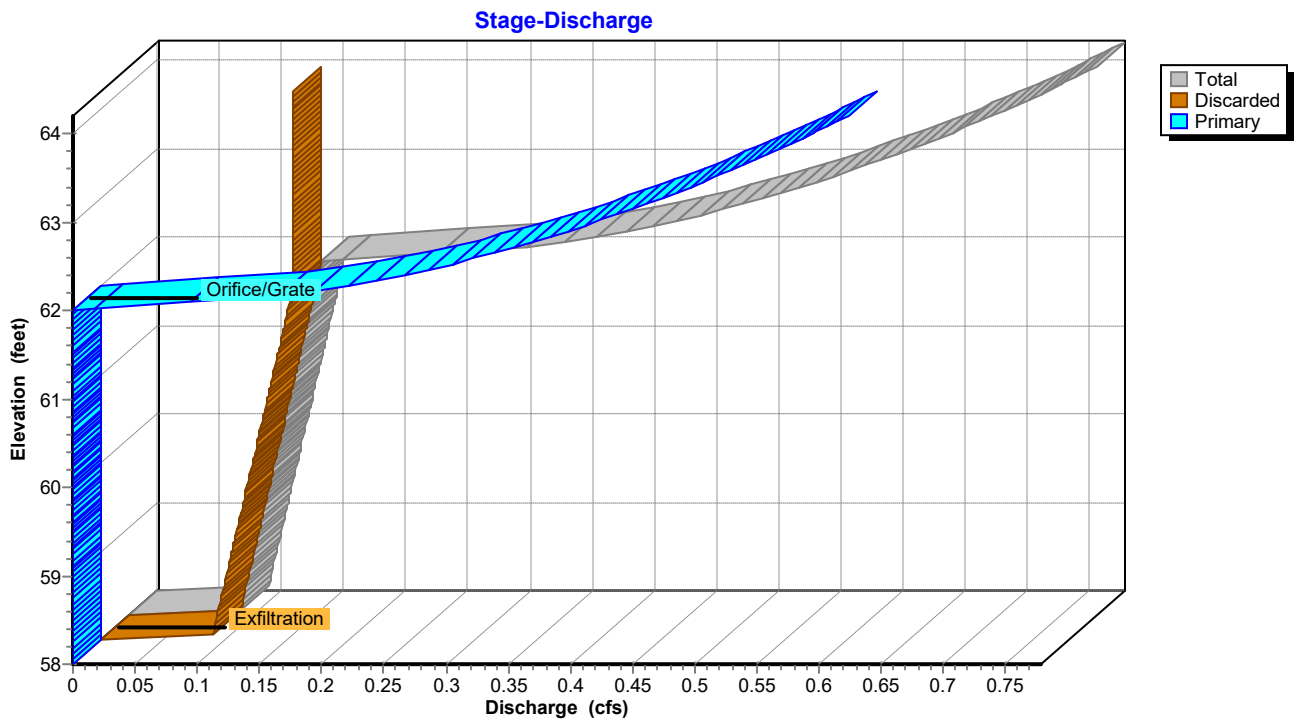
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Pond 6P: STORM TECHS



Pond 6P: STORM TECHS



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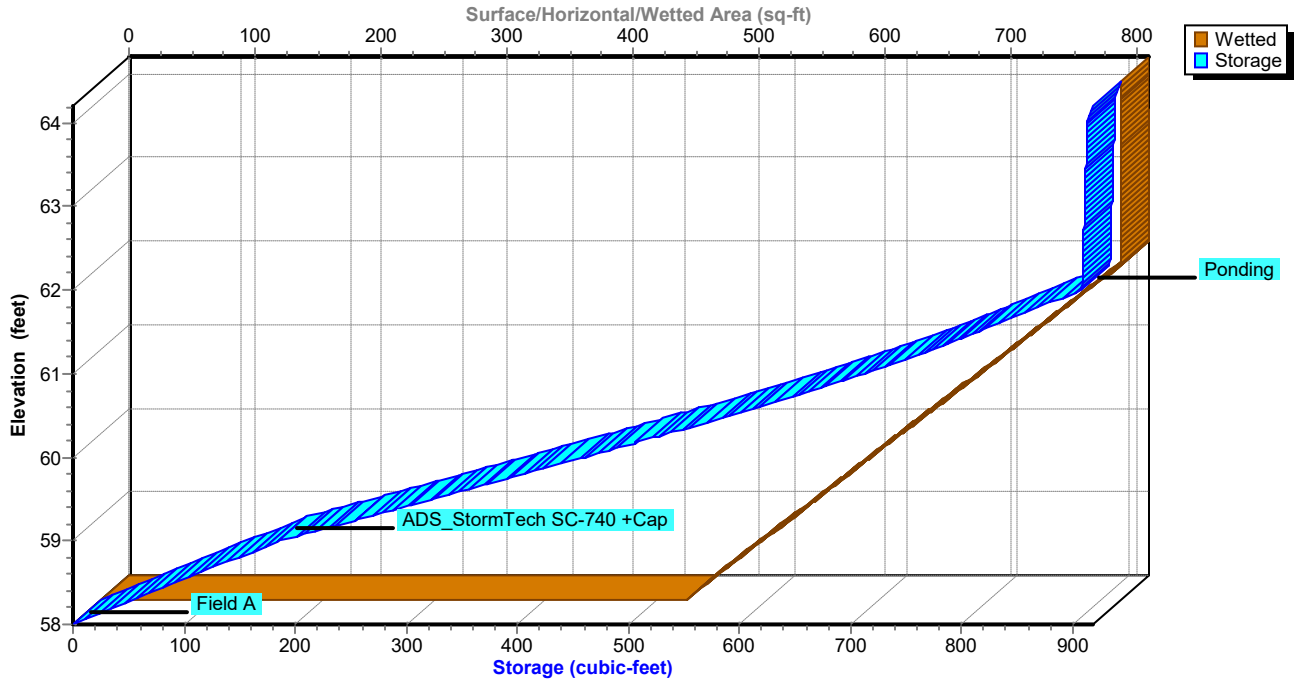
Type III 24-hr 25-Year Rainfall=6.35"

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Pond 6P: STORM TECHS

Stage-Area-Storage



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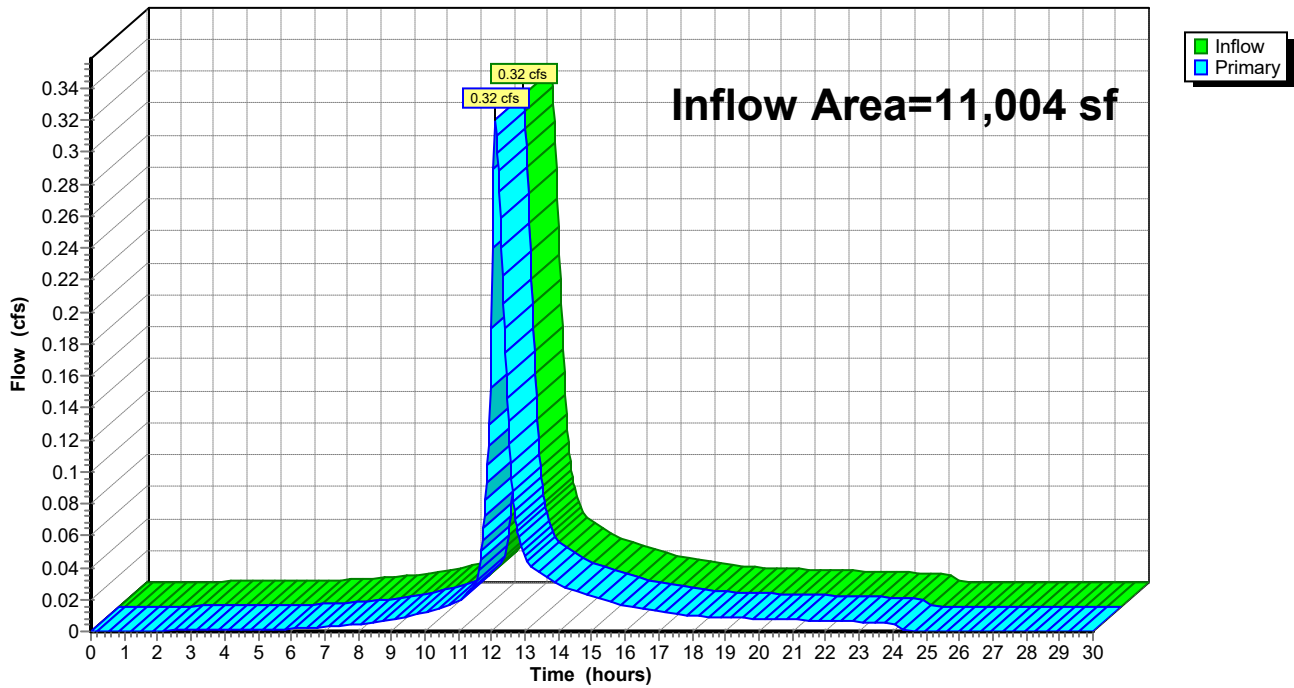
Summary for Link 3L: PROPOSED

Inflow Area = 11,004 sf, 50.80% Impervious, Inflow Depth = 1.57" for 25-Year event
Inflow = 0.32 cfs @ 12.11 hrs, Volume= 1,441 cf
Primary = 0.32 cfs @ 12.11 hrs, Volume= 1,441 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-30.00 hrs, dt= 0.03 hrs

Link 3L: PROPOSED

Hydrograph



PROPOSED

Type III 24-hr 100-Year Rainfall=8.16"

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Time span=0.00-30.00 hrs, dt=0.03 hrs, 1001 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 2S: PROPOSED PERMEABLE Runoff Area=588 sf 0.00% Impervious Runoff Depth=6.37"
Tc=15.0 min CN=85 Runoff=0.07 cfs 312 cf

Subcatchment 3S: PROPOSED PERMEABLE Runoff Area=163 sf 0.00% Impervious Runoff Depth=6.37"
Tc=15.0 min CN=85 Runoff=0.02 cfs 86 cf

Subcatchment 4S: PROPOSED LANDSCAPE Runoff Area=3,242 sf 0.00% Impervious Runoff Depth=2.24"
Tc=5.0 min CN=49 Runoff=0.18 cfs 605 cf

Subcatchment 6S: PROPOSED ROOF Runoff Area=3,406 sf 100.00% Impervious Runoff Depth=7.92"
Tc=5.0 min CN=98 Runoff=0.64 cfs 2,248 cf

Subcatchment 7S: PROPOSED IMPERVIOUS Runoff Area=648 sf 100.00% Impervious Runoff Depth=7.92"
Tc=5.0 min CN=98 Runoff=0.12 cfs 428 cf

Subcatchment 8S: PAVED DRIVEWAY Runoff Area=1,536 sf 100.00% Impervious Runoff Depth=7.92"
Tc=5.0 min CN=98 Runoff=0.29 cfs 1,014 cf

Subcatchment 9S: PROPOSED PERMEABLE Runoff Area=1,421 sf 0.00% Impervious Runoff Depth=6.37"
Tc=15.0 min CN=85 Runoff=0.18 cfs 754 cf

Pond 6P: STORM TECHS Peak Elev=62.33' Storage=909 cf Inflow=0.95 cfs 3,348 cf
Discarded=0.15 cfs 3,296 cf Primary=0.24 cfs 62 cf Outflow=0.40 cfs 3,358 cf

Link 3L: PROPOSED Inflow=0.53 cfs 2,162 cf
Primary=0.53 cfs 2,162 cf

Total Runoff Area = 11,004 sf Runoff Volume = 5,447 cf Average Runoff Depth = 5.94"
49.20% Pervious = 5,414 sf 50.80% Impervious = 5,590 sf

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Type III 24-hr 100-Year Rainfall=8.16"

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Summary for Subcatchment 2S: PROPOSED PERMEABLE PAVERS

Runoff = 0.07 cfs @ 12.20 hrs, Volume= 312 cf, Depth= 6.37"

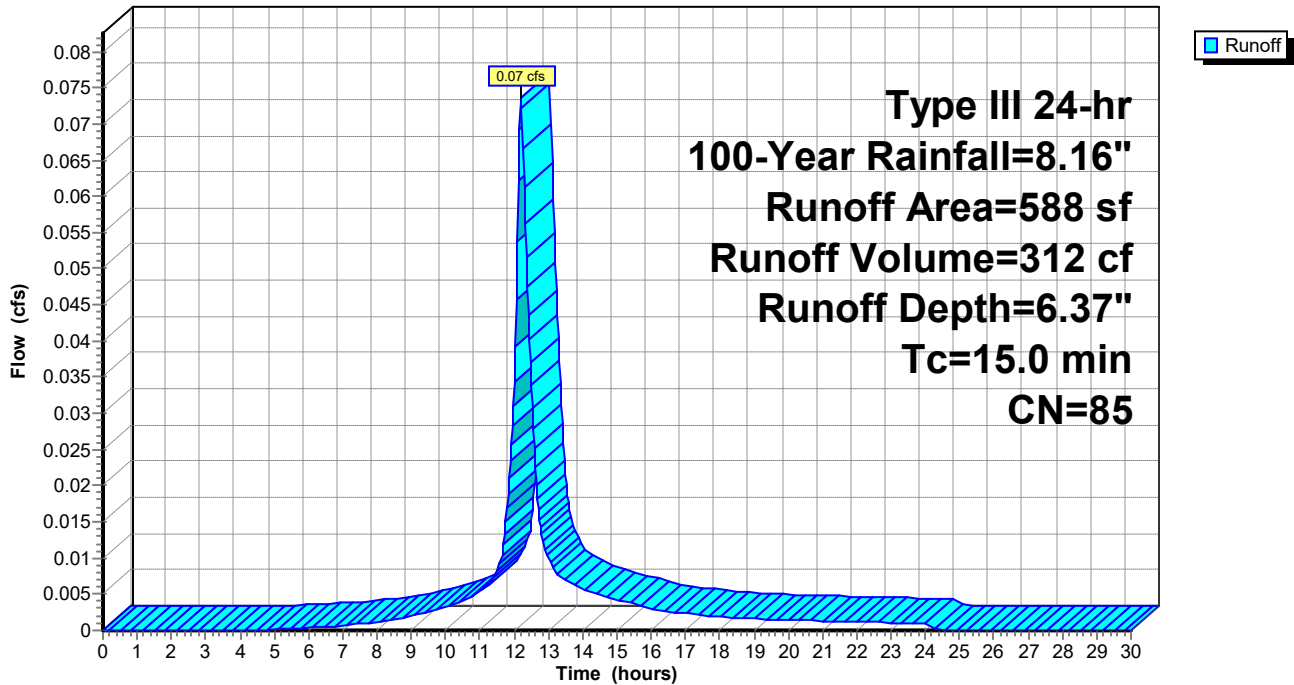
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.03 hrs
Type III 24-hr 100-Year Rainfall=8.16"

Area (sf)	CN	Description
* 588	85	Driveway portion
588		100.00% Pervious Area

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

Subcatchment 2S: PROPOSED PERMEABLE PAVERS

Hydrograph



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Type III 24-hr 100-Year Rainfall=8.16"

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Summary for Subcatchment 3S: PROPOSED PERMEABLE PAVERS

Runoff = 0.02 cfs @ 12.20 hrs, Volume= 86 cf, Depth= 6.37"

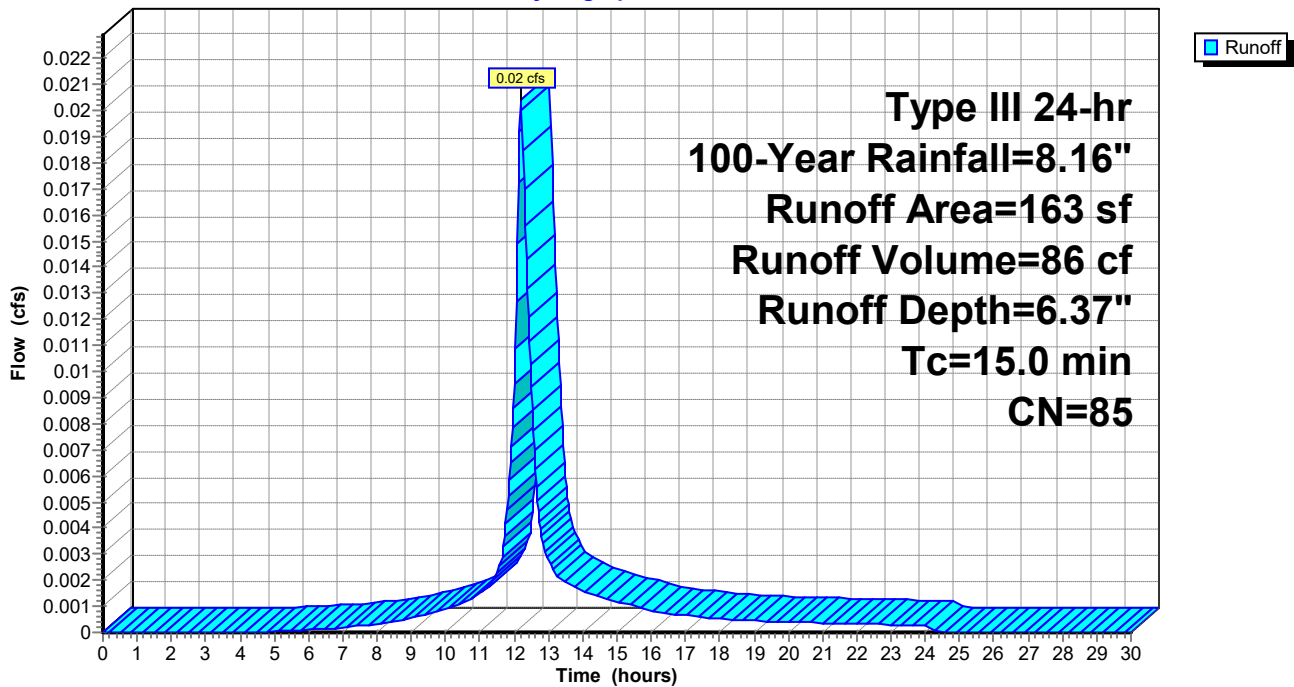
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.03 hrs
Type III 24-hr 100-Year Rainfall=8.16"

Area (sf)	CN	Description
* 163	85	Parking space
163		100.00% Pervious Area

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

Subcatchment 3S: PROPOSED PERMEABLE PAVERS

Hydrograph



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Type III 24-hr 100-Year Rainfall=8.16"

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Summary for Subcatchment 4S: PROPOSED LANDSCAPE AREA

Runoff = 0.18 cfs @ 12.09 hrs, Volume= 605 cf, Depth= 2.24"

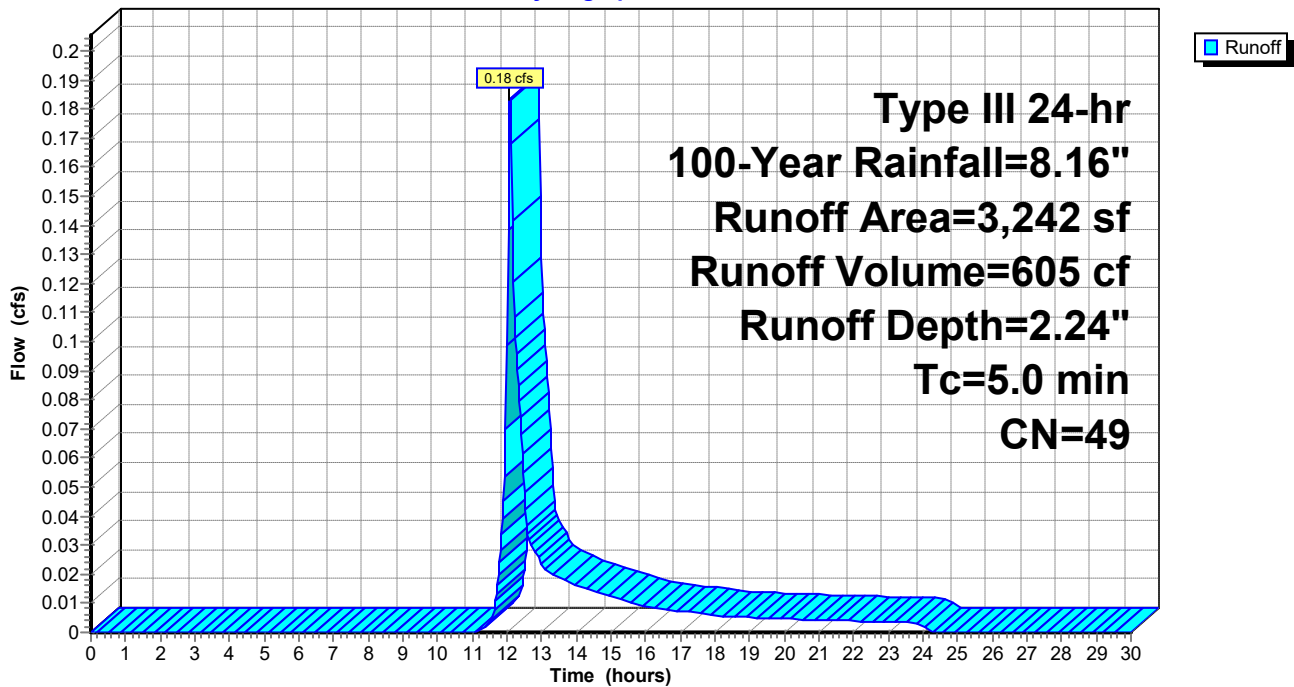
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.03 hrs
Type III 24-hr 100-Year Rainfall=8.16"

Area (sf)	CN	Description
3,242	49	50-75% Grass cover, Fair, HSG A
3,242		100.00% Pervious Area

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

Subcatchment 4S: PROPOSED LANDSCAPE AREA

Hydrograph



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Type III 24-hr 100-Year Rainfall=8.16"

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Summary for Subcatchment 6S: PROPOSED ROOF

Runoff = 0.64 cfs @ 12.07 hrs, Volume= 2,248 cf, Depth= 7.92"

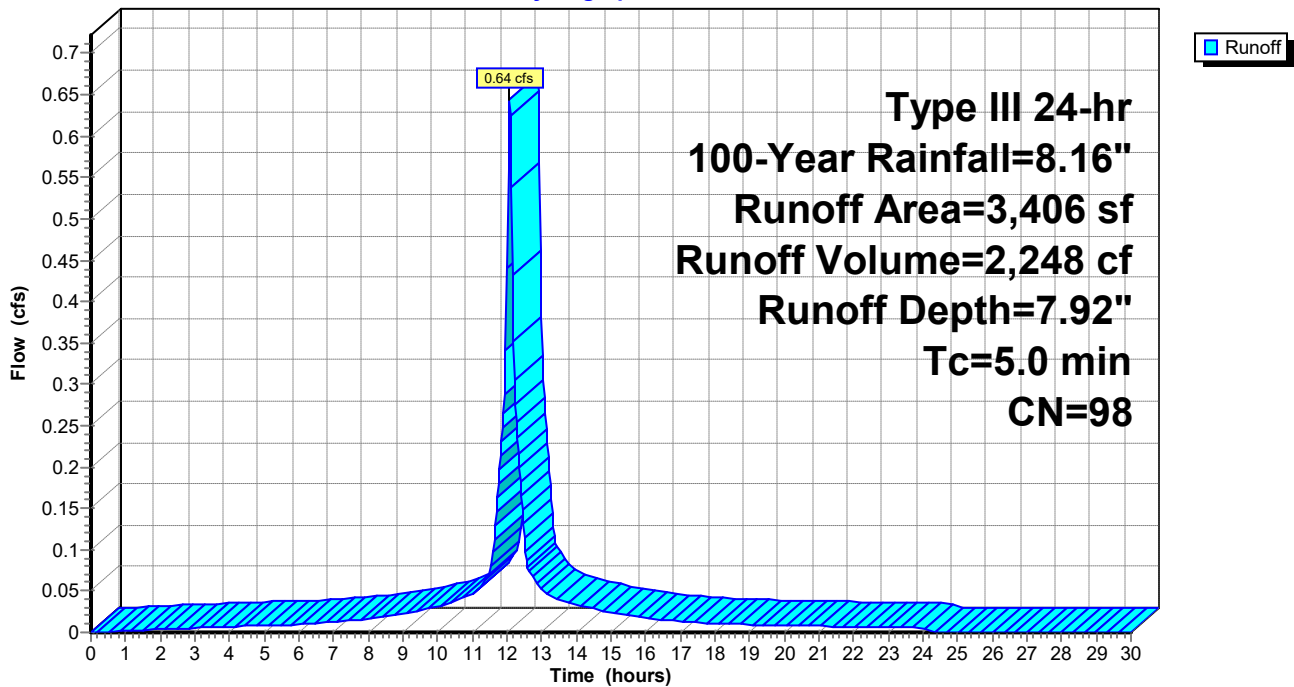
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.03 hrs
Type III 24-hr 100-Year Rainfall=8.16"

Area (sf)	CN	Description
3,406	98	Roofs, HSG A
3,406		100.00% Impervious Area

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

Subcatchment 6S: PROPOSED ROOF

Hydrograph



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Type III 24-hr 100-Year Rainfall=8.16"

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Summary for Subcatchment 7S: PROPOSED IMPERVIOUS

Runoff = 0.12 cfs @ 12.07 hrs, Volume= 428 cf, Depth= 7.92"

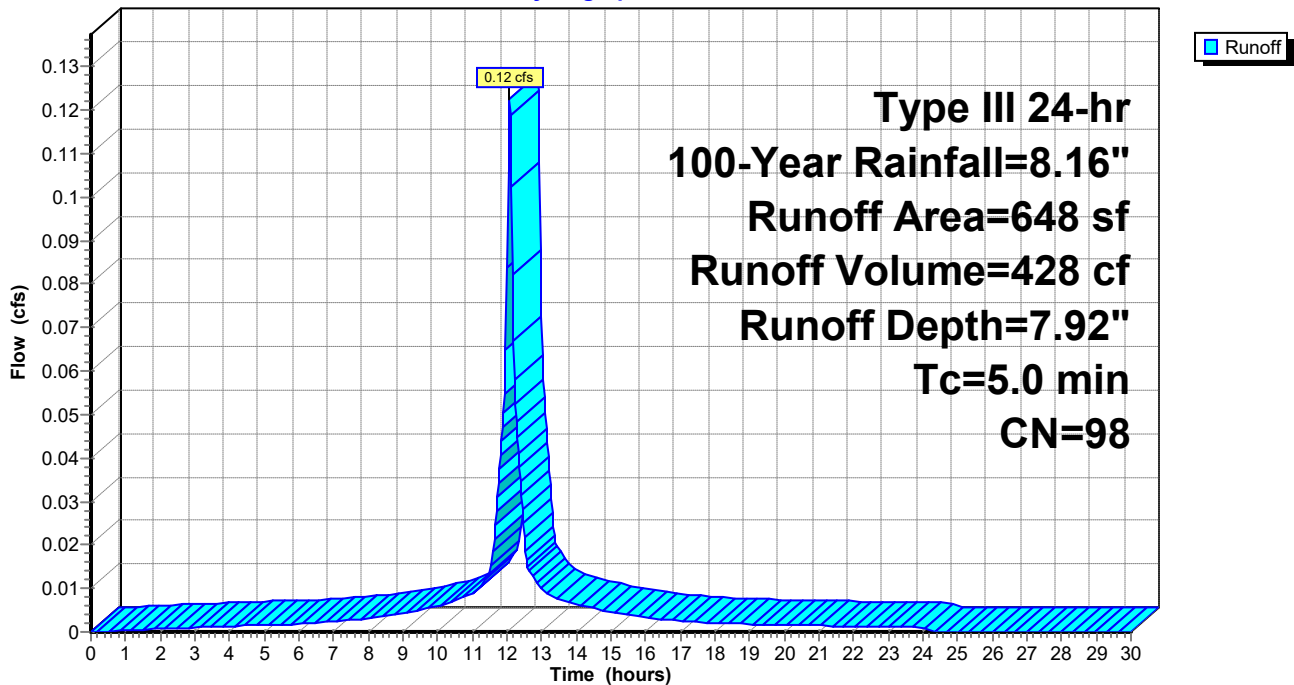
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.03 hrs
Type III 24-hr 100-Year Rainfall=8.16"

Area (sf)	CN	Description
648	98	Unconnected roofs, HSG A
648		100.00% Impervious Area
648		100.00% Unconnected

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

Subcatchment 7S: PROPOSED IMPERVIOUS

Hydrograph



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Type III 24-hr 100-Year Rainfall=8.16"

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Summary for Subcatchment 8S: PAVED DRIVEWAY

Runoff = 0.29 cfs @ 12.07 hrs, Volume= 1,014 cf, Depth= 7.92"

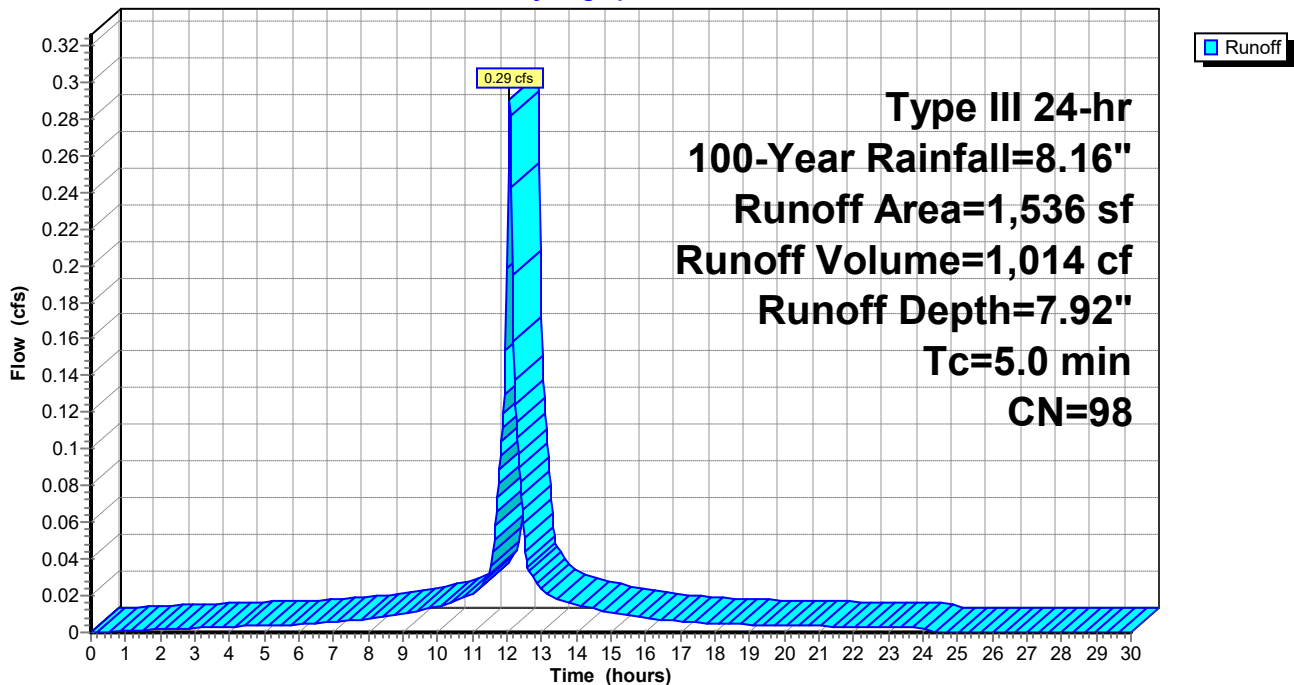
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.03 hrs
Type III 24-hr 100-Year Rainfall=8.16"

Area (sf)	CN	Description
1,536	98	Paved parking, HSG A
1,536		100.00% Impervious Area

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

Subcatchment 8S: PAVED DRIVEWAY

Hydrograph



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Type III 24-hr 100-Year Rainfall=8.16"

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Summary for Subcatchment 9S: PROPOSED PERMEABLE PAVERS

Runoff = 0.18 cfs @ 12.20 hrs, Volume= 754 cf, Depth= 6.37"

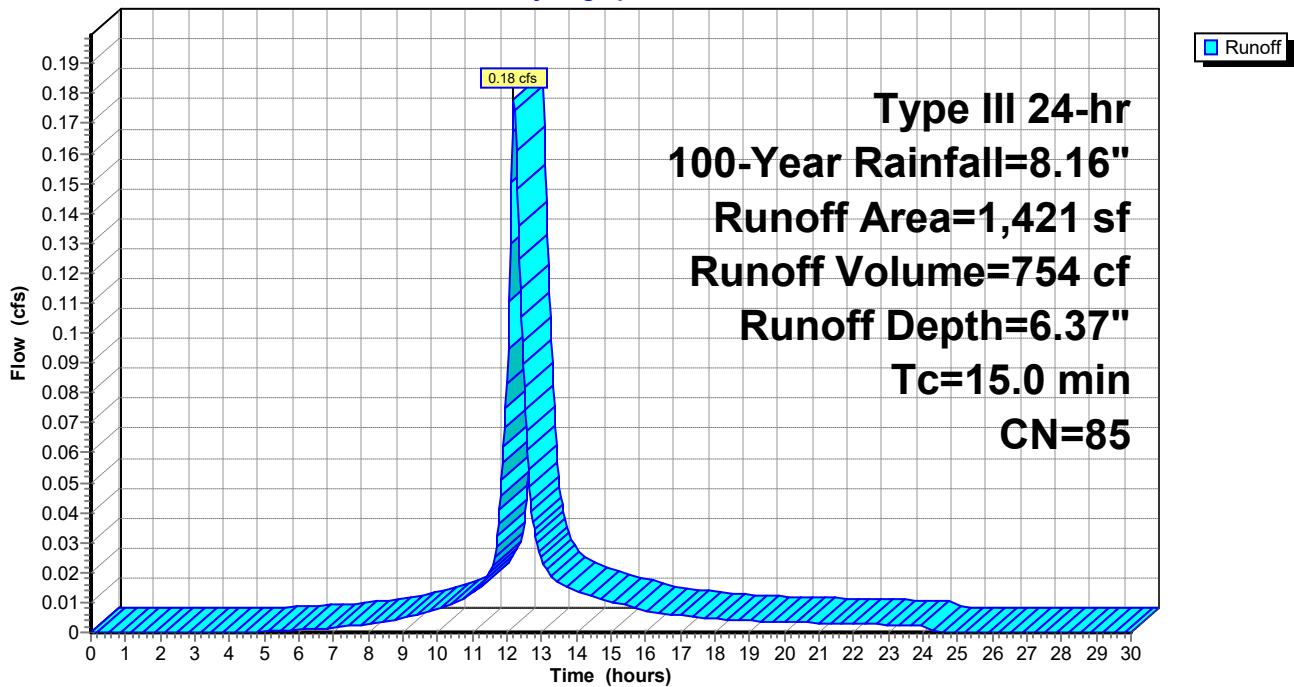
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.03 hrs
Type III 24-hr 100-Year Rainfall=8.16"

	Area (sf)	CN	Description
*	1,421	85	Patios, walkways
	1,421		100.00% Pervious Area

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

Subcatchment 9S: PROPOSED PERMEABLE PAVERS

Hydrograph



PROPOSED

Type III 24-hr 100-Year Rainfall=8.16"

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Summary for Pond 6P: STORM TECHS

Inflow Area = 5,105 sf, 96.81% Impervious, Inflow Depth = 7.87" for 100-Year event
 Inflow = 0.95 cfs @ 12.07 hrs, Volume= 3,348 cf
 Outflow = 0.40 cfs @ 12.36 hrs, Volume= 3,358 cf, Atten= 58%, Lag= 17.6 min
 Discarded = 0.15 cfs @ 12.36 hrs, Volume= 3,296 cf
 Primary = 0.24 cfs @ 12.36 hrs, Volume= 62 cf

Routing by Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.03 hrs / 3
 Peak Elev= 62.33' @ 12.36 hrs Surf.Area= 464 sf Storage= 909 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
 Center-of-Mass det. time= 38.7 min (780.3 - 741.5)

Volume	Invert	Avail.Storage	Storage Description
#1A	58.00'	633 cf	21.08'W x 22.02'L x 4.00'H Field A 1,857 cf Overall - 276 cf Embedded = 1,582 cf x 40.0% Voids
#2A	59.00'	276 cf	ADS_StormTech SC-740 +Cap x 6 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 6 Chambers in 3 Rows
#3	62.00'	10 cf	Ponding Listed below -Impervious
		918 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Elevation (feet)	Cum.Store (cubic-feet)
62.00	0
64.00	5
64.20	10

Device	Routing	Invert	Outlet Devices
#1	Discarded	58.00'	8.270 in/hr Exfiltration over Wetted area
#2	Primary	62.00'	4.0" Horiz. Orifice/Grate C= 0.600 Limited to weir flow at low heads

Discarded OutFlow Max=0.15 cfs @ 12.36 hrs HW=62.33' (Free Discharge)
 ↑1=Exfiltration (Exfiltration Controls 0.15 cfs)

Primary OutFlow Max=0.23 cfs @ 12.36 hrs HW=62.30' (Free Discharge)
 ↑2=Orifice/Grate (Orifice Controls 0.23 cfs @ 2.64 fps)

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Type III 24-hr 100-Year Rainfall=8.16"

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Pond 6P: STORM TECHS - Chamber Wizard Field A

Chamber Model = ADS_StormTech SC-740 +Cap (ADS StormTech® SC-740 with cap length)

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

51.0" Wide + 18.0" Spacing = 69.0" C-C Row Spacing

2 Chambers/Row x 7.12' Long +0.81' Cap Length x 2 = 15.86' Row Length +37.0" End Stone x 2 = 22.02' Base Length

3 Rows x 51.0" Wide + 18.0" Spacing x 2 + 32.0" Side Stone x 2 = 21.08' Base Width

12.0" Base + 30.0" Chamber Height + 6.0" Cover = 4.00' Field Height

6 Chambers x 45.9 cf = 275.6 cf Chamber Storage

1,857.3 cf Field - 275.6 cf Chambers = 1,581.7 cf Stone x 40.0% Voids = 632.7 cf Stone Storage

Chamber Storage + Stone Storage = 908.3 cf = 0.021 af

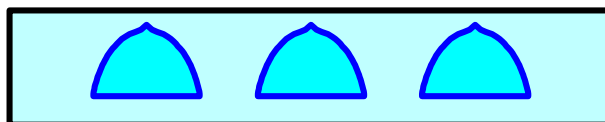
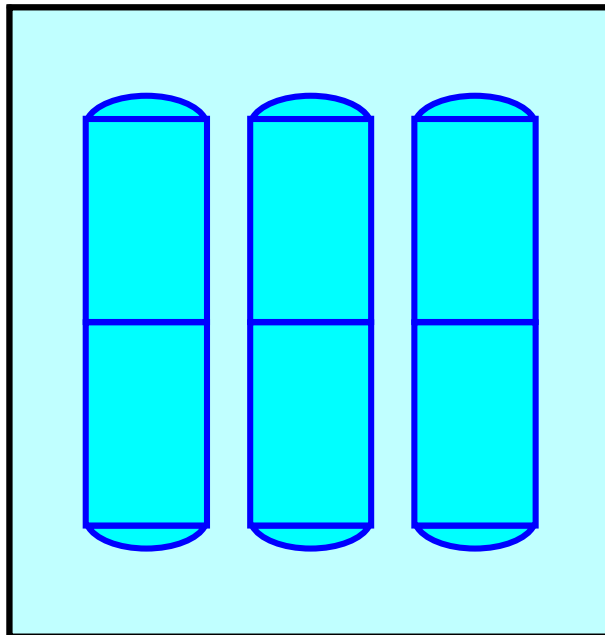
Overall Storage Efficiency = 48.9%

Overall System Size = 22.02' x 21.08' x 4.00'

6 Chambers

68.8 cy Field

58.6 cy Stone



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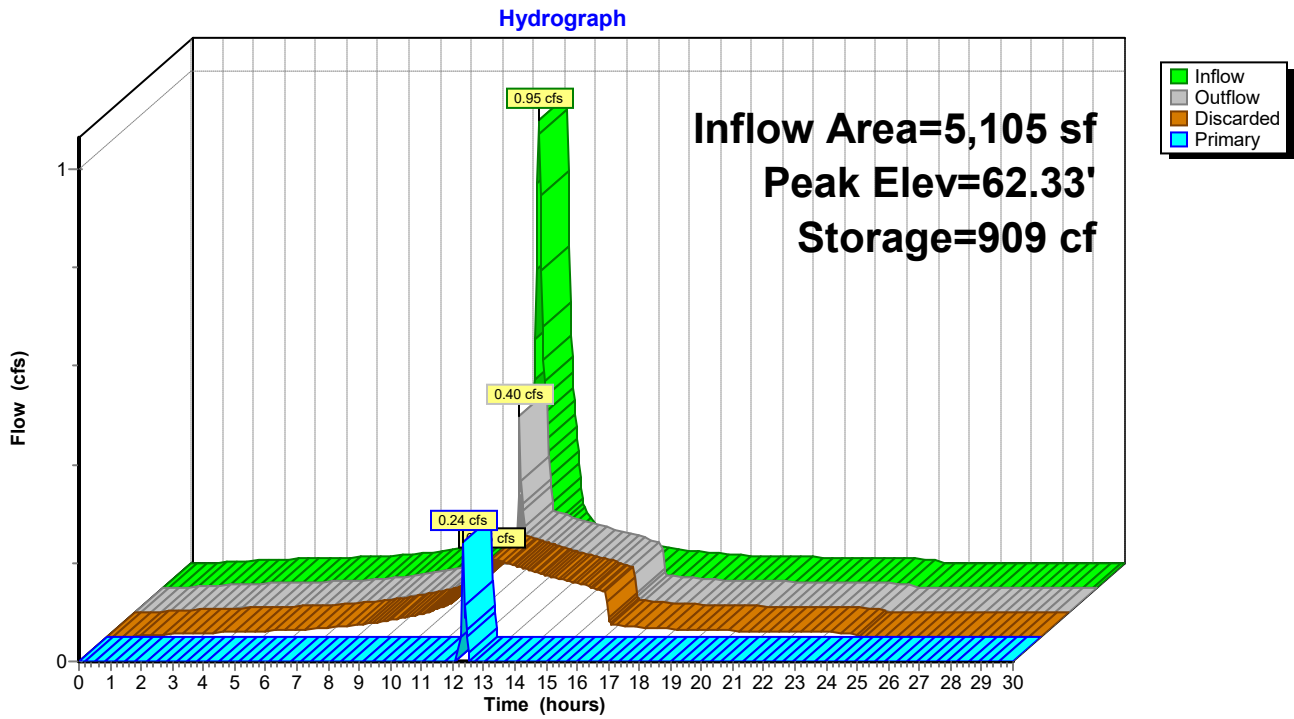
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Type III 24-hr 100-Year Rainfall=8.16"

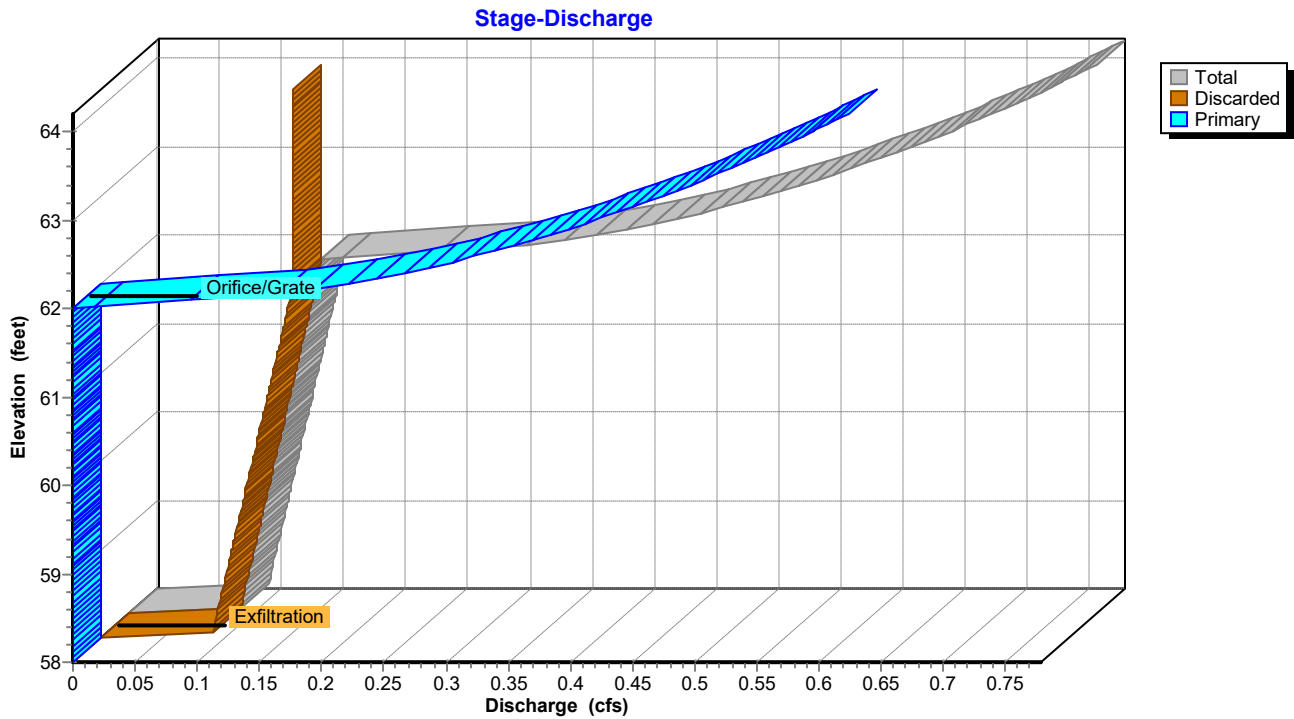
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Pond 6P: STORM TECHS



Pond 6P: STORM TECHS



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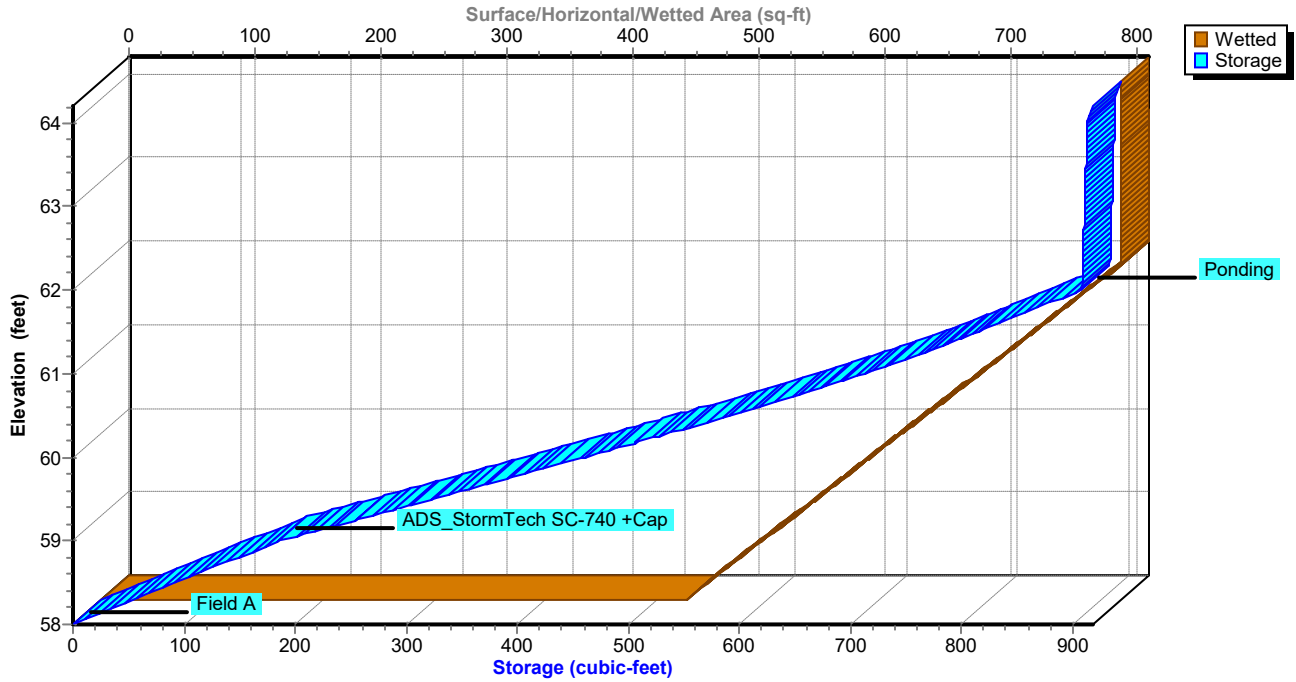
Type III 24-hr 100-Year Rainfall=8.16"

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Pond 6P: STORM TECHS

Stage-Area-Storage



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Type III 24-hr 100-Year Rainfall=8.16"

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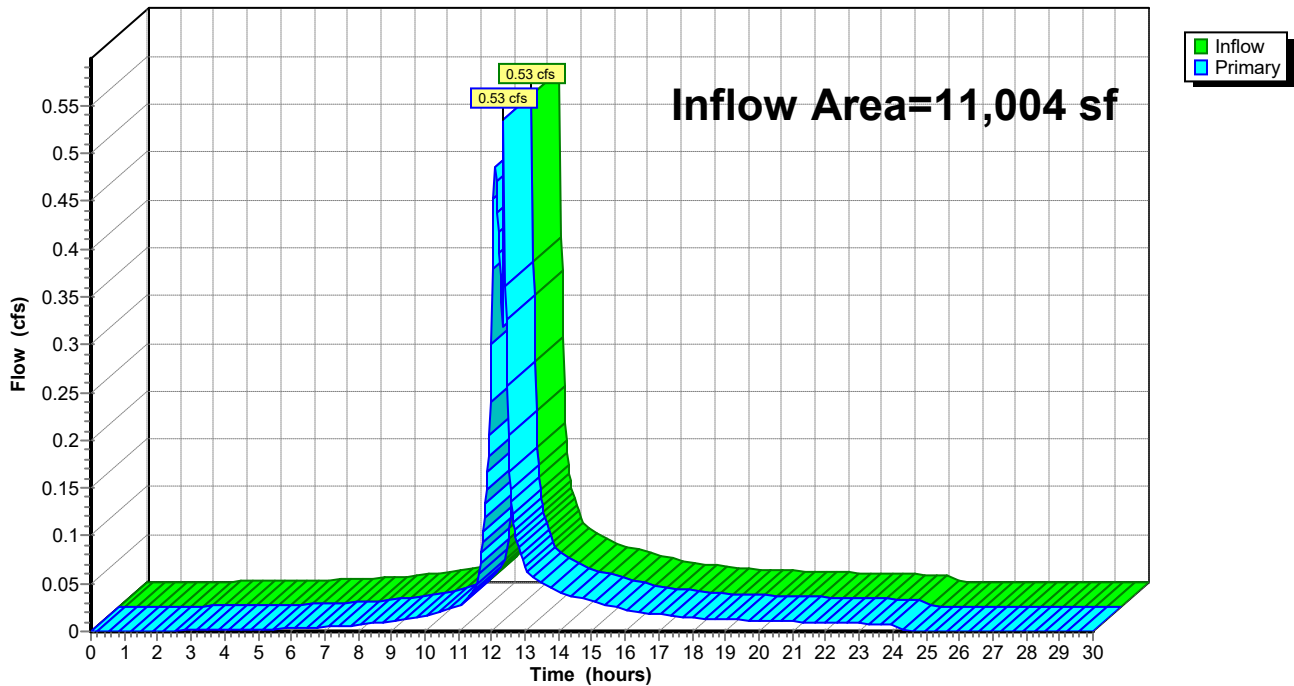
Summary for Link 3L: PROPOSED

Inflow Area = 11,004 sf, 50.80% Impervious, Inflow Depth = 2.36" for 100-Year event
Inflow = 0.53 cfs @ 12.36 hrs, Volume= 2,162 cf
Primary = 0.53 cfs @ 12.36 hrs, Volume= 2,162 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-30.00 hrs, dt= 0.03 hrs

Link 3L: PROPOSED

Hydrograph



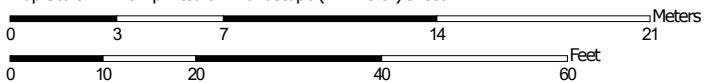
Appendix B – Soils Information

Custom Soil Resource Report Soil Map



Soil Map may not be valid at this scale.


Map Scale: 1:248 if printed on A landscape (11" x 8.5") sheet.




Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 19N WGS84


MAP LEGEND

Area of Interest (AOI)

 Area of Interest (AOI)




















Soils







 Soil Map Unit Polygons

 Soil Map Unit Lines


 Soil Map Unit Points

Special Point Features






-  Blowout
-  Borrow Pit
-  Clay Spot
-  Closed Depression
-  Gravel Pit
-  Gravelly Spot
-  Landfill
-  Lava Flow
-  Marsh or swamp
-  Mine or Quarry
-  Miscellaneous Water
-  Perennial Water
-  Rock Outcrop
-  Saline Spot
-  Sandy Spot
-  Severely Eroded Spot
-  Sinkhole
-  Slide or Slip
-  Sodic Spot

-  Spoil Area
-  Stony Spot
-  Very Stony Spot
-  Wet Spot
-  Other
-  Special Line Features


Water Features

 Streams and Canals

Transportation

-  Rails
-  Interstate Highways
-  US Routes
-  Major Roads
-  Local Roads

Background

 Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:25,000.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
 Web Soil Survey URL:
 Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Middlesex County, Massachusetts
 Survey Area Data: Version 21, Sep 2, 2021

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Aug 13, 2020—Oct 18, 2020

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Map Unit Legend

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
603	Urban land, wet substratum	0.2	100.0%
Totals for Area of Interest		0.2	100.0%

Map Unit Descriptions

The map units delineated on the detailed soil maps in a soil survey represent the soils or miscellaneous areas in the survey area. The map unit descriptions, along with the maps, can be used to determine the composition and properties of a unit.

A map unit delineation on a soil map represents an area dominated by one or more major kinds of soil or miscellaneous areas. A map unit is identified and named according to the taxonomic classification of the dominant soils. Within a taxonomic class there are precisely defined limits for the properties of the soils. On the landscape, however, the soils are natural phenomena, and they have the characteristic variability of all natural phenomena. Thus, the range of some observed properties may extend beyond the limits defined for a taxonomic class. Areas of soils of a single taxonomic class rarely, if ever, can be mapped without including areas of other taxonomic classes. Consequently, every map unit is made up of the soils or miscellaneous areas for which it is named and some minor components that belong to taxonomic classes other than those of the major soils.

Most minor soils have properties similar to those of the dominant soil or soils in the map unit, and thus they do not affect use and management. These are called noncontrasting, or similar, components. They may or may not be mentioned in a particular map unit description. Other minor components, however, have properties and behavioral characteristics divergent enough to affect use or to require different management. These are called contrasting, or dissimilar, components. They generally are in small areas and could not be mapped separately because of the scale used. Some small areas of strongly contrasting soils or miscellaneous areas are identified by a special symbol on the maps. If included in the database for a given area, the contrasting minor components are identified in the map unit descriptions along with some characteristics of each. A few areas of minor components may not have been observed, and consequently they are not mentioned in the descriptions, especially where the pattern was so complex that it was impractical to make enough observations to identify all the soils and miscellaneous areas on the landscape.

The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The objective of mapping is not to delineate pure taxonomic classes but rather to separate the landscape into landforms or landform segments that have similar use and management requirements. The delineation of such segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, however, onsite investigation is needed to define and locate the soils and miscellaneous areas.

Custom Soil Resource Report

An identifying symbol precedes the map unit name in the map unit descriptions. Each description includes general facts about the unit and gives important soil properties and qualities.

Soils that have profiles that are almost alike make up a *soil series*. Except for differences in texture of the surface layer, all the soils of a series have major horizons that are similar in composition, thickness, and arrangement.

Soils of one series can differ in texture of the surface layer, slope, stoniness, salinity, degree of erosion, and other characteristics that affect their use. On the basis of such differences, a soil series is divided into *soil phases*. Most of the areas shown on the detailed soil maps are phases of soil series. The name of a soil phase commonly indicates a feature that affects use or management. For example, Alpha silt loam, 0 to 2 percent slopes, is a phase of the Alpha series.

Some map units are made up of two or more major soils or miscellaneous areas. These map units are complexes, associations, or undifferentiated groups.

A *complex* consists of two or more soils or miscellaneous areas in such an intricate pattern or in such small areas that they cannot be shown separately on the maps. The pattern and proportion of the soils or miscellaneous areas are somewhat similar in all areas. Alpha-Beta complex, 0 to 6 percent slopes, is an example.

An *association* is made up of two or more geographically associated soils or miscellaneous areas that are shown as one unit on the maps. Because of present or anticipated uses of the map units in the survey area, it was not considered practical or necessary to map the soils or miscellaneous areas separately. The pattern and relative proportion of the soils or miscellaneous areas are somewhat similar. Alpha-Beta association, 0 to 2 percent slopes, is an example.

An *undifferentiated group* is made up of two or more soils or miscellaneous areas that could be mapped individually but are mapped as one unit because similar interpretations can be made for use and management. The pattern and proportion of the soils or miscellaneous areas in a mapped area are not uniform. An area can be made up of only one of the major soils or miscellaneous areas, or it can be made up of all of them. Alpha and Beta soils, 0 to 2 percent slopes, is an example.

Some surveys include *miscellaneous areas*. Such areas have little or no soil material and support little or no vegetation. Rock outcrop is an example.

Middlesex County, Massachusetts

603—Urban land, wet substratum

Map Unit Setting

National map unit symbol: 9951
Mean annual precipitation: 32 to 50 inches
Mean annual air temperature: 45 to 50 degrees F
Frost-free period: 110 to 200 days
Farmland classification: Not prime farmland

Map Unit Composition

Urban land: 85 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Urban Land

Setting

Landform position (two-dimensional): Footslope
Landform position (three-dimensional): Base slope
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Excavated and filled land over alluvium and/or marine deposits

Minor Components

Udorthents, loamy

Percent of map unit: 10 percent
Hydric soil rating: No

Rock outcrop

Percent of map unit: 5 percent
Landform: Ledges
Landform position (two-dimensional): Summit
Landform position (three-dimensional): Head slope
Down-slope shape: Concave
Across-slope shape: Concave

APENDIX C – TSS REMOVAL CALCULATIONS

INSTRUCTIONS:

1. In BMP Column, click on Blue Cell to Activate Drop Down Menu
2. Select BMP from Drop Down Menu
3. After BMP is selected, TSS Removal and other Columns are automatically completed.

Version 1, Automated: Mar. 4, 2008

Location:

	B	C	D	E	F
	BMP ¹	TSS Removal Rate ¹	Starting TSS Load*	Amount Removed (C*D)	Remaining Load (D-E)
TSS Removal Calculation Worksheet	Deep Sump and Hooded Catch Basin	0.25	1.00	0.25	0.75
	Oil Grit Separator	0.25	0.75	0.19	0.56
		0.00	0.56	0.00	0.56
		0.00	0.56	0.00	0.56
		0.00	0.56	0.00	0.56

Total TSS Removal =

Separate Form Needs to be Completed for Each Outlet or BMP Train

Project:
 Prepared By:
 Date:

*Equals remaining load from previous BMP (E) which enters the BMP

Non-automated TSS Calculation Sheet must be used if Proprietary BMP Proposed
 1. From MassDEP Stormwater Handbook Vol. 1

INSTRUCTIONS:

1. In BMP Column, click on Blue Cell to Activate Drop Down Menu
2. Select BMP from Drop Down Menu
3. After BMP is selected, TSS Removal and other Columns are automatically completed.

Version 1, Automated: Mar. 4, 2008

Location:

	B	C	D	E	F
	BMP ¹	TSS Removal Rate ¹	Starting TSS Load*	Amount Removed (C*D)	Remaining Load (D-E)
TSS Removal Calculation Worksheet	Infiltration Trench	0.80	1.00	0.80	0.20
		0.00	0.20	0.00	0.20
		0.00	0.20	0.00	0.20
		0.00	0.20	0.00	0.20
		0.00	0.20	0.00	0.20

Total TSS Removal =

Separate Form Needs to be Completed for Each Outlet or BMP Train

Project:
 Prepared By:
 Date:

*Equals remaining load from previous BMP (E) which enters the BMP

Non-automated TSS Calculation Sheet must be used if Proprietary BMP Proposed
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INSTRUCTIONS:

1. In BMP Column, click on Blue Cell to Activate Drop Down Menu
2. Select BMP from Drop Down Menu
3. After BMP is selected, TSS Removal and other Columns are automatically completed.

Version 1, Automated: Mar. 4, 2008

Location:

TSS Removal Calculation Worksheet

	B BMP ¹	C TSS Removal Rate ¹	D Starting TSS Load*	E Amount Removed (C*D)	F Remaining Load (D-E)
	Deep Sump and Hooded Catch Basin	0.25	1.00	0.25	0.75
	Oil Grit Separator	0.25	0.75	0.19	0.56
	Infiltration Trench	0.80	0.56	0.45	0.11
		0.00	0.11	0.00	0.11
		0.00	0.11	0.00	0.11

Total TSS Removal =

Separate Form Needs to be Completed for Each Outlet or BMP Train

Project:
 Prepared By:
 Date:

*Equals remaining load from previous BMP (E) which enters the BMP

Non-automated TSS Calculation Sheet must be used if Proprietary BMP Proposed
 1. From MassDEP Stormwater Handbook Vol. 1