

SPRUHAN ENGINEERING, P.C.

STORMWATER REPORT

19 KIMBALL BEACH ROAD, HINGHAM, MA



Prepared By: Spruhan Engineering, P.C.

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Appendix A – HydroCAD Calculations

Appendix B – Soils Information (NRCS)

1.0 Introduction

Spruhan Engineering, P.C. has prepared this Storm water Report for the proposed development located at 19 Kimball Beach Rd, Hingham, Massachusetts.

The proposed development new residential house, driveway, patio 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 a crushed stone infiltration system.

2.0 Existing Conditions

The existing property is located at 19 Kimball Beach Rd, Hingham, MA. The site is bounded by residential dwellings on the rear and sides. Table 1 provides a summary of the existing site conditions at the Property.

EXISTING AREAS		
LOT AREA	8,833.0	S.F.
EXISTING IMPERVIOUS AREA		
BUILDING	1,220.7	S.F.
DRIVEWAY	491.6	S.F.
GARAGE	400.8	S.F.
GENERAL IMPERVIOUS	464.6	S.F.
TOTAL	2,577.7	S.F.
EXISTING PERVIOUS AREA		
WINDOW WELL	18.11	S.F.
TOTAL	18.1	S.F.
LANDSCAPE AREA	6,237.2	S.F.

Table 1. Summary of the existing impervious, pervious and landscaped areas at the Property

2.1 Existing Topography and Drainage Infrastructure.

In general, the property has varying grades with two low points located at the street frontage along the street and at the rear right of the lot. Slopes vary between approximately 2% and 5%. As there is no drainage system currently installed, all stormwater scours across the surface at grade.

3.0 Proposed Conditions

3.1 Project Description

The proposed development consists in a new Single-family dwelling. The Property will also be improved with a driveway, and landscaped areas. Table 2 provides details on the proposed impervious, pervious, and landscaped areas at the Property.

LOT AREA	8,833.0	S.F.
PROPOSED IMPERVIOUS AREA		
BUILDING	2,006.2	S.F.
DRIVEWAY	791.4	S.F.
GENERAL IMPERVIOUS	243.65	S.F.
TOTAL	3,041.3	S.F.
PROPOSED PERVIOUS AREA		
TOTAL	0.0	S.F.
LANDSCAPE AREA	5,791.7	S.F.

Table 2-Proposed impervious, pervious, and landscaped areas at the Property

3.1 Storm Water Runoff

HydroCAD was used to model the site for the existing and proposed conditions for the 1-year, 2-year, 5-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.

3.2 Infiltration system

A sub-surface system was proposed to control the runoff generated by the proposed roof and driveway. The system consists of one (01) set of Cultec R-150XLHD Chambers embedded in a crushed stone pit, composed by a total of 4 chambers of 12.67 ft x 27.92 ft x 2.54 ft with 6” SOLID PVC pipes inside.

The HydroCAD results summary can be seen in the table below.

<u>Overall summary Table (HydroCAD results)</u>				
Storm Event	Runoff flow rate		Runoff Volume	
	Existing	Proposed	Existing	Proposed
2-Year	0.19	0.02	649	62
10-Year	0.28	0.03	1,034	160
25-Year	0.33	0.09	1,293	298
100-Year	0.41	0.25	1,657	580

4.0 Soil Information

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

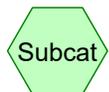
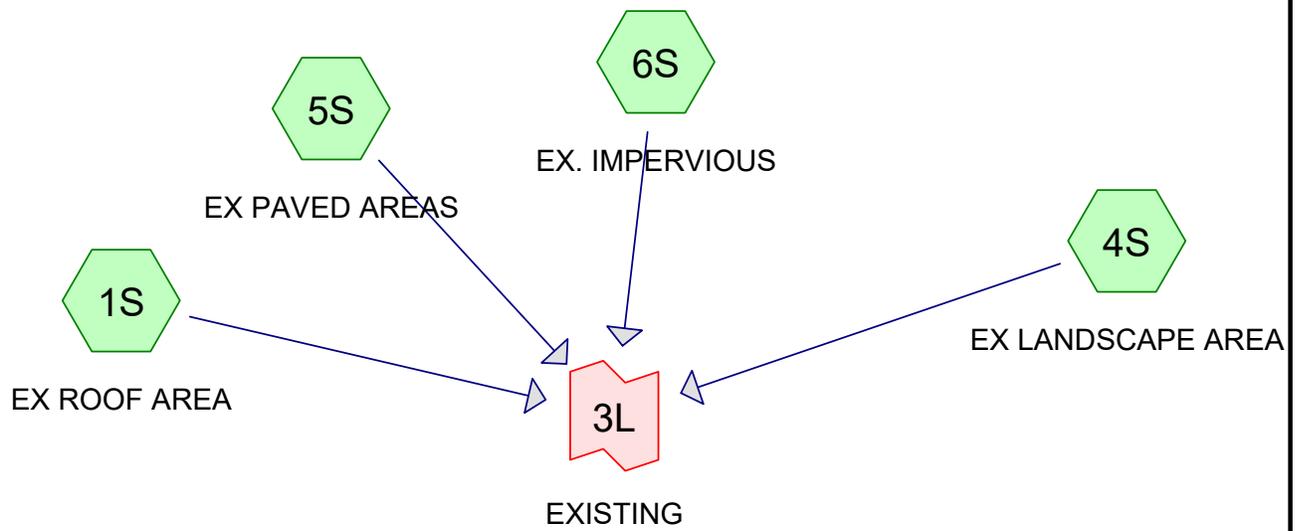
Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
110C	Canton-Chatfield-Rock outcrop complex, 8 to 15 percent slopes, very stony	0.2	100.0%
Totals for Area of Interest		0.2	100.0%

- Map unit 110C shows Hydrological group B.

Also, as the soils log shows Loamy sand was found in the field during the test pit, which has Hydrological group A and these properties were applied to HydroCAD for runoff calculations.

Further detailed information is described in Appendix B.

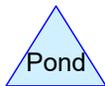
Appendix A – HydroCAD Calculations



Subcat



Reach



Pond



Link

Routing Diagram for EXISTING
 Prepared by SPRUHAN ENGINEERING P.C
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EXISTING

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Page 2

Area Listing (all nodes)

Area (sq-ft)	CN	Description (subcatchment-numbers)
6,237	39	>75% Grass cover, Good, HSG A (4S)
492	98	Driveway, HSG A (5S)
401	98	Garage, HSG A (1S)
465	98	General Impersious, HSG A (6S)
1,220	98	Roofs, HSG A (House) (1S)
18	39	Window Well, HSG A (4S)
8,833	56	TOTAL AREA

EXISTING

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Page 3

Soil Listing (all nodes)

Area (sq-ft)	Soil Group	Subcatchment Numbers
8,833	HSG A	1S, 4S, 5S, 6S
0	HSG B	
0	HSG C	
0	HSG D	
0	Other	
8,833		TOTAL AREA

EXISTING

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Ground Covers (all nodes)

HSG-A (sq-ft)	HSG-B (sq-ft)	HSG-C (sq-ft)	HSG-D (sq-ft)	Other (sq-ft)	Total (sq-ft)	Ground Cover	Sub Num
6,237	0	0	0	0	6,237	>75% Grass cover, Good	
492	0	0	0	0	492	Driveway	
401	0	0	0	0	401	Garage	
465	0	0	0	0	465	General Impersious	
1,220	0	0	0	0	1,220	Roofs	
18	0	0	0	0	18	Window Well	
8,833	0	0	0	0	8,833	TOTAL AREA	

EXISTING

Type III 24-hr 2-Year Rainfall=3.25"

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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 AREA Runoff Area=1,621 sf 100.00% Impervious Runoff Depth=3.02"
Tc=5.0 min CN=98 Runoff=0.12 cfs 408 cf

Subcatchment 4S: EX LANDSCAPE AREA Runoff Area=6,255 sf 0.00% Impervious Runoff Depth=0.00"
Tc=5.0 min CN=39 Runoff=0.00 cfs 0 cf

Subcatchment 5S: EX PAVED AREAS Runoff Area=492 sf 100.00% Impervious Runoff Depth=3.02"
Tc=5.0 min CN=98 Runoff=0.04 cfs 124 cf

Subcatchment 6S: EX. IMPERVIOUS Runoff Area=465 sf 100.00% Impervious Runoff Depth=3.02"
Tc=5.0 min CN=98 Runoff=0.03 cfs 117 cf

Link 3L: EXISTING Inflow=0.19 cfs 649 cf
Primary=0.19 cfs 649 cf

Total Runoff Area = 8,833 sf Runoff Volume = 649 cf Average Runoff Depth = 0.88"
70.81% Pervious = 6,255 sf 29.19% Impervious = 2,578 sf

EXISTING

Type III 24-hr 2-Year Rainfall=3.25"

Prepared by SPRUHAN ENGINEERING P.C

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Summary for Subcatchment 1S: EX ROOF AREA

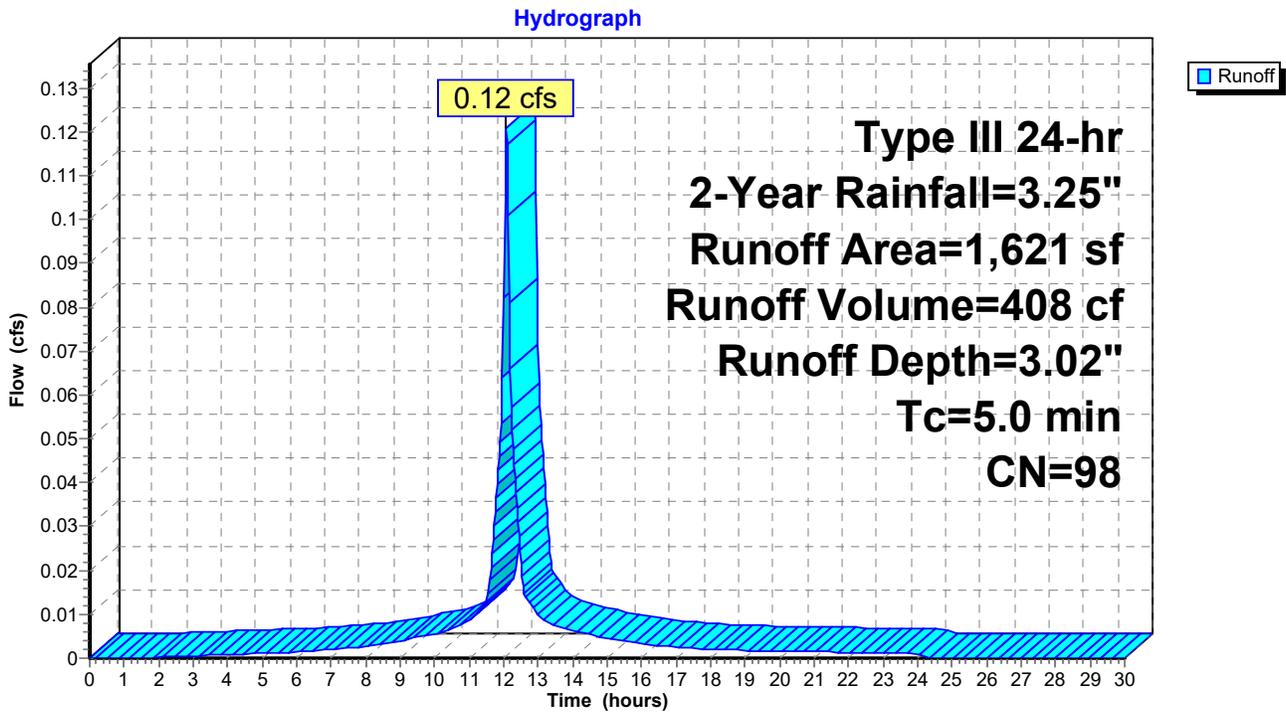
Runoff = 0.12 cfs @ 12.07 hrs, Volume= 408 cf, Depth= 3.02"

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=3.25"

	Area (sf)	CN	Description
*	1,220	98	Roofs, HSG A (House)
*	401	98	Garage, HSG A
	1,621	98	Weighted Average
	1,621		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 AREA



EXISTING

Type III 24-hr 2-Year Rainfall=3.25"

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Summary for Subcatchment 4S: EX LANDSCAPE AREA

Runoff = 0.00 cfs @ 24.00 hrs, Volume= 0 cf, Depth= 0.00"

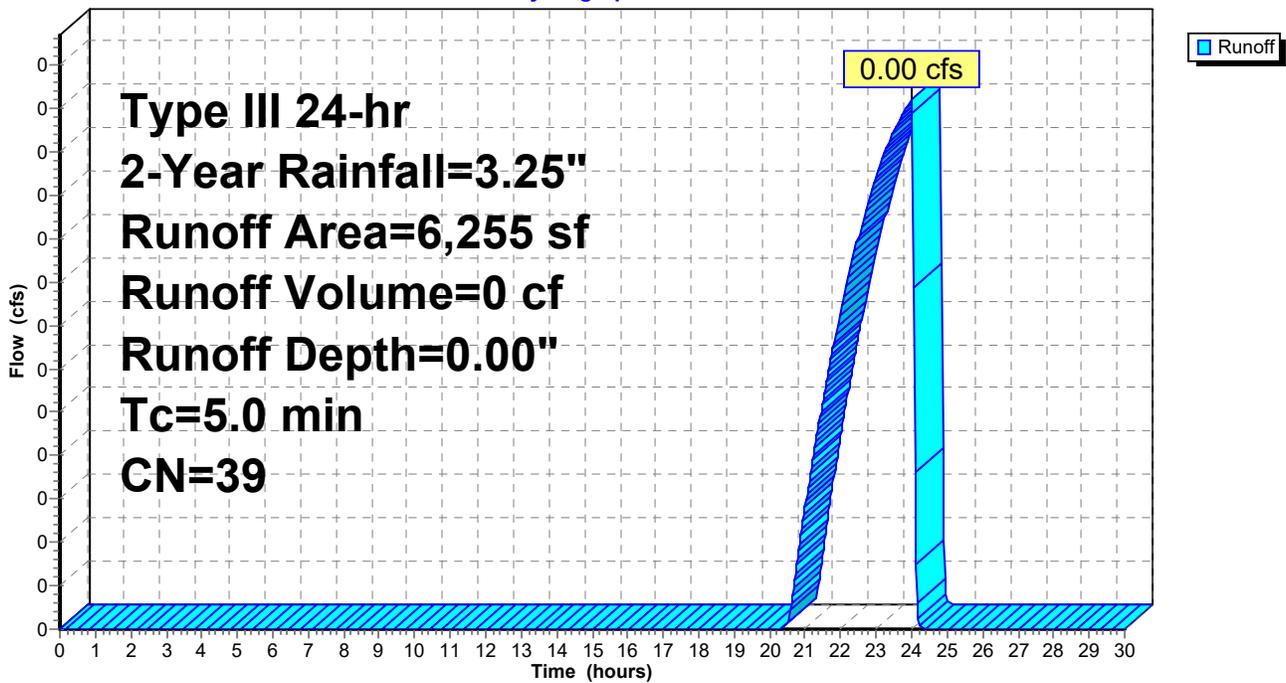
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.03 hrs
Type III 24-hr 2-Year Rainfall=3.25"

Area (sf)	CN	Description
6,237	39	>75% Grass cover, Good, HSG A
* 18	39	Window Well, HSG A
6,255	39	Weighted Average
6,255		100.00% Pervious Area

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

Subcatchment 4S: EX LANDSCAPE AREA

Hydrograph



EXISTING

Type III 24-hr 2-Year Rainfall=3.25"

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Summary for Subcatchment 5S: EX PAVED AREAS

Runoff = 0.04 cfs @ 12.07 hrs, Volume= 124 cf, Depth= 3.02"

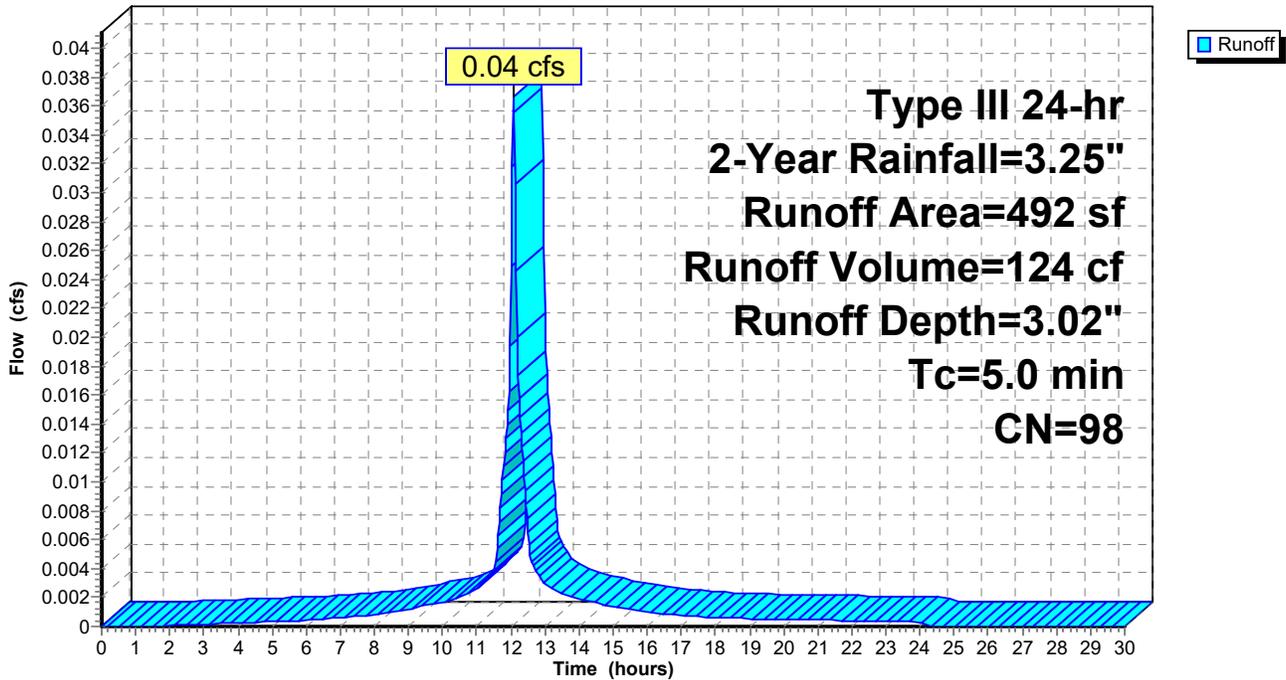
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.03 hrs
Type III 24-hr 2-Year Rainfall=3.25"

Area (sf)	CN	Description
* 492	98	Driveway, HSG A
492		100.00% Impervious Area

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

Subcatchment 5S: EX PAVED AREAS

Hydrograph



EXISTING

Type III 24-hr 2-Year Rainfall=3.25"

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Summary for Subcatchment 6S: EX. IMPERVIOUS

Runoff = 0.03 cfs @ 12.07 hrs, Volume= 117 cf, Depth= 3.02"

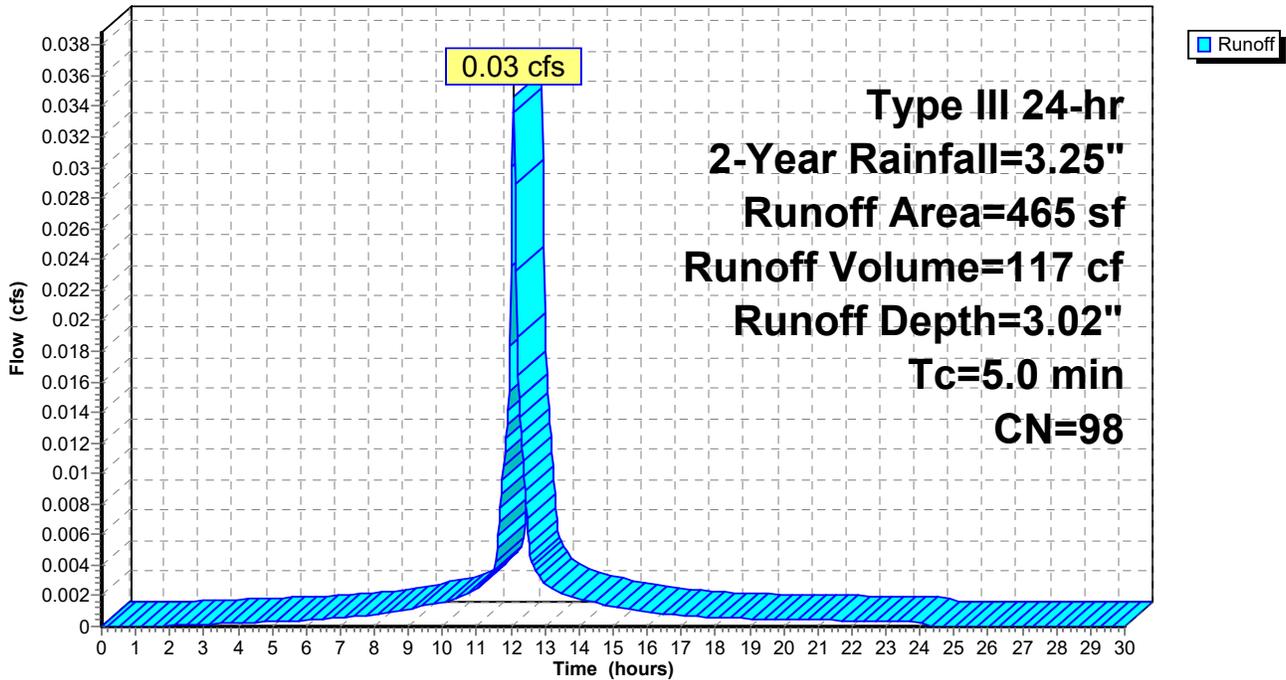
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.03 hrs
Type III 24-hr 2-Year Rainfall=3.25"

Area (sf)	CN	Description
* 465	98	General Impersious, HSG A
465		100.00% Impervious Area

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

Subcatchment 6S: EX. IMPERVIOUS

Hydrograph



EXISTING

Type III 24-hr 2-Year Rainfall=3.25"

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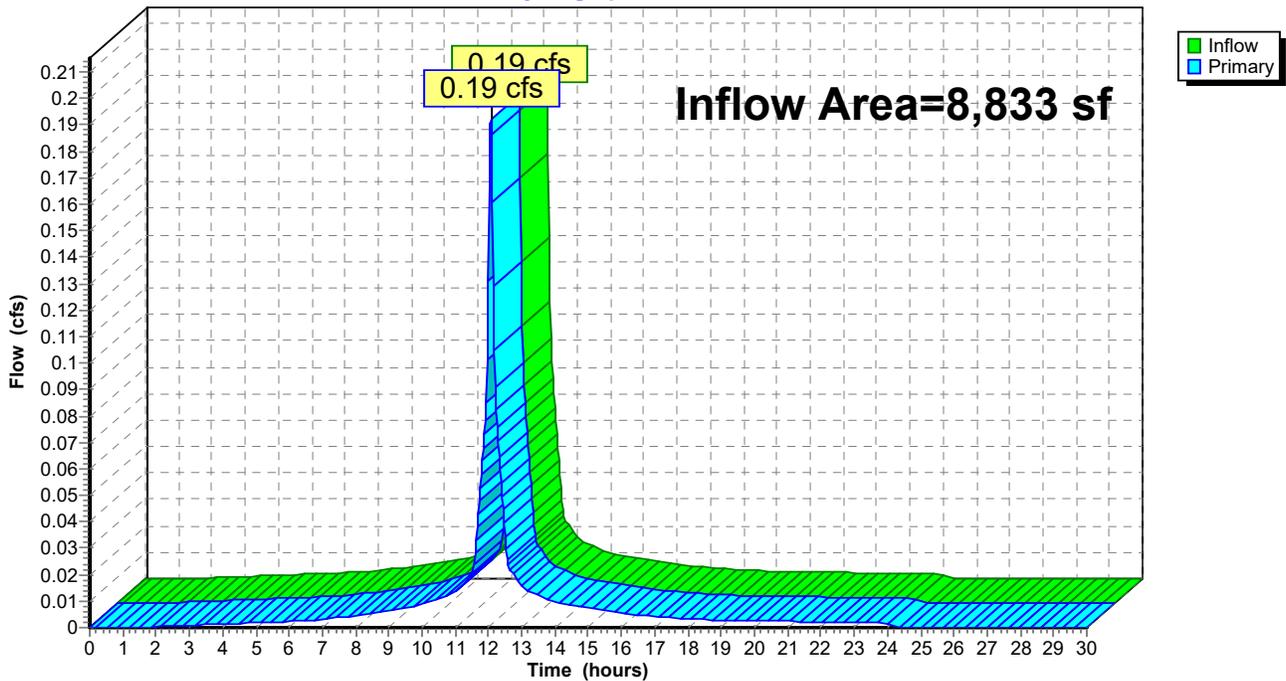
Summary for Link 3L: EXISTING

Inflow Area = 8,833 sf, 29.19% Impervious, Inflow Depth = 0.88" for 2-Year event
Inflow = 0.19 cfs @ 12.07 hrs, Volume= 649 cf
Primary = 0.19 cfs @ 12.07 hrs, Volume= 649 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=4.70"

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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 AREA Runoff Area=1,621 sf 100.00% Impervious Runoff Depth=4.46"
Tc=5.0 min CN=98 Runoff=0.18 cfs 603 cf

Subcatchment 4S: EX LANDSCAPE AREA Runoff Area=6,255 sf 0.00% Impervious Runoff Depth=0.14"
Tc=5.0 min CN=39 Runoff=0.00 cfs 75 cf

Subcatchment 5S: EX PAVED AREAS Runoff Area=492 sf 100.00% Impervious Runoff Depth=4.46"
Tc=5.0 min CN=98 Runoff=0.05 cfs 183 cf

Subcatchment 6S: EX. IMPERVIOUS Runoff Area=465 sf 100.00% Impervious Runoff Depth=4.46"
Tc=5.0 min CN=98 Runoff=0.05 cfs 173 cf

Link 3L: EXISTING Inflow=0.28 cfs 1,034 cf
Primary=0.28 cfs 1,034 cf

Total Runoff Area = 8,833 sf Runoff Volume = 1,034 cf Average Runoff Depth = 1.40"
70.81% Pervious = 6,255 sf 29.19% Impervious = 2,578 sf

EXISTING

Type III 24-hr 10-Year Rainfall=4.70"

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Summary for Subcatchment 1S: EX ROOF AREA

Runoff = 0.18 cfs @ 12.07 hrs, Volume= 603 cf, Depth= 4.46"

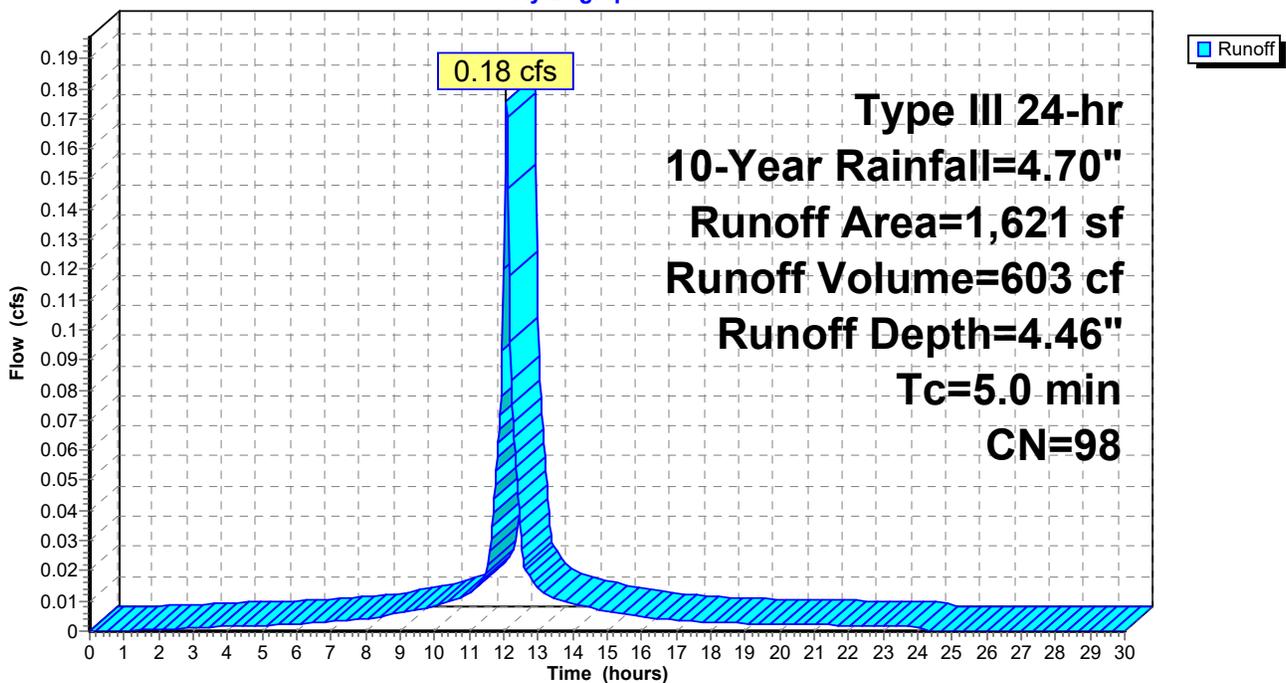
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.03 hrs
Type III 24-hr 10-Year Rainfall=4.70"

	Area (sf)	CN	Description
*	1,220	98	Roofs, HSG A (House)
*	401	98	Garage, HSG A
	1,621	98	Weighted Average
	1,621		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 AREA

Hydrograph



EXISTING

Type III 24-hr 10-Year Rainfall=4.70"

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Summary for Subcatchment 4S: EX LANDSCAPE AREA

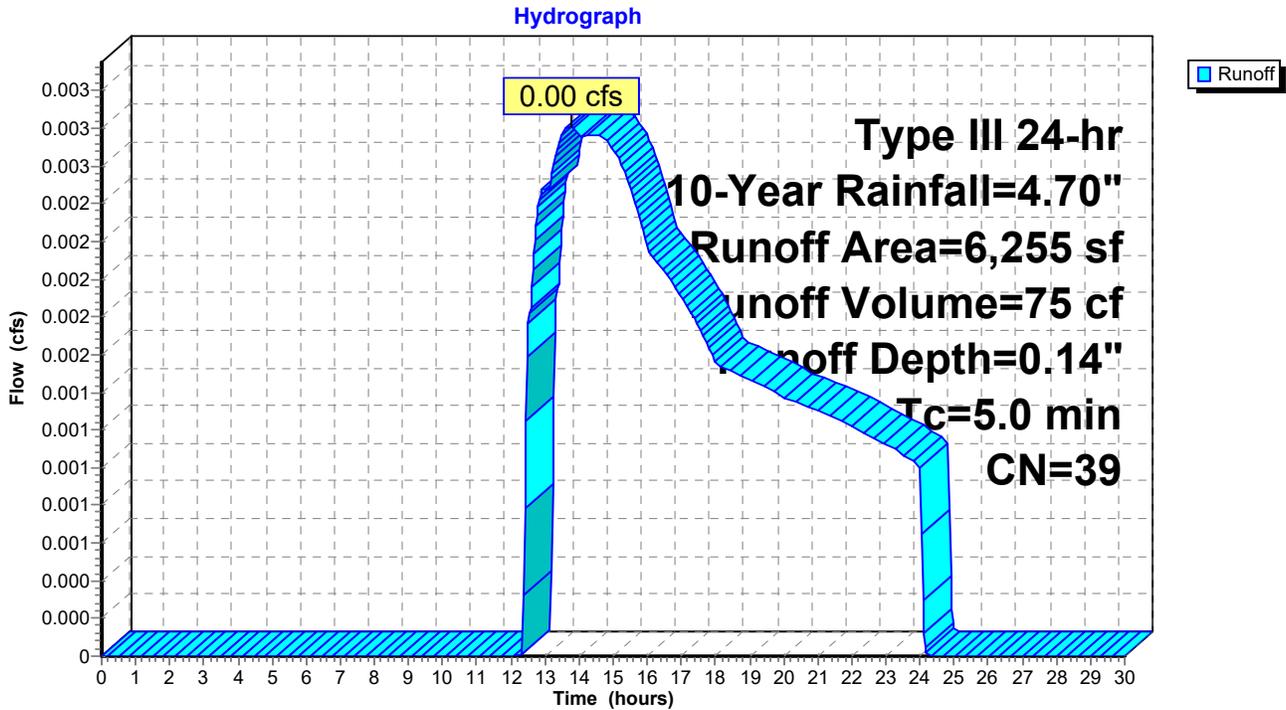
Runoff = 0.00 cfs @ 13.75 hrs, Volume= 75 cf, Depth= 0.14"

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=4.70"

Area (sf)	CN	Description
6,237	39	>75% Grass cover, Good, HSG A
* 18	39	Window Well, HSG A
6,255	39	Weighted Average
6,255		100.00% Pervious Area

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

Subcatchment 4S: EX LANDSCAPE AREA



EXISTING

Type III 24-hr 10-Year Rainfall=4.70"

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Summary for Subcatchment 5S: EX PAVED AREAS

Runoff = 0.05 cfs @ 12.07 hrs, Volume= 183 cf, Depth= 4.46"

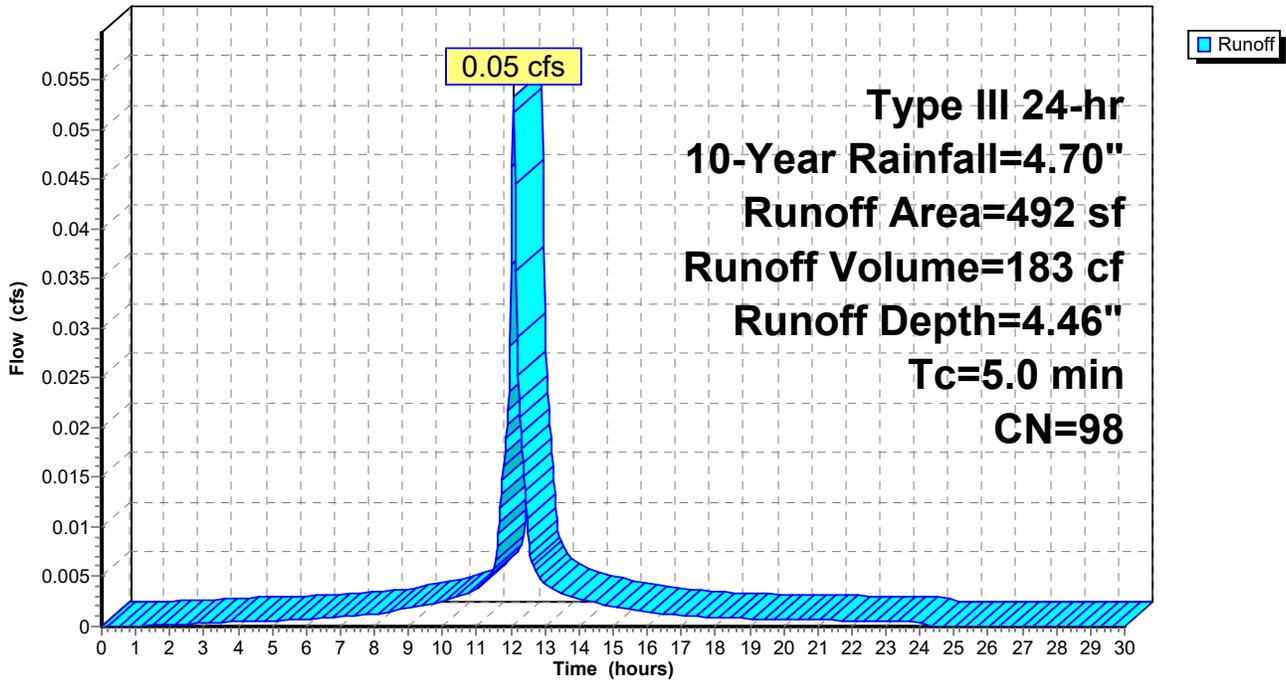
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.03 hrs
Type III 24-hr 10-Year Rainfall=4.70"

Area (sf)	CN	Description
* 492	98	Driveway, HSG A
492		100.00% Impervious Area

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

Subcatchment 5S: EX PAVED AREAS

Hydrograph



EXISTING

Type III 24-hr 10-Year Rainfall=4.70"

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Summary for Subcatchment 6S: EX. IMPERVIOUS

Runoff = 0.05 cfs @ 12.07 hrs, Volume= 173 cf, Depth= 4.46"

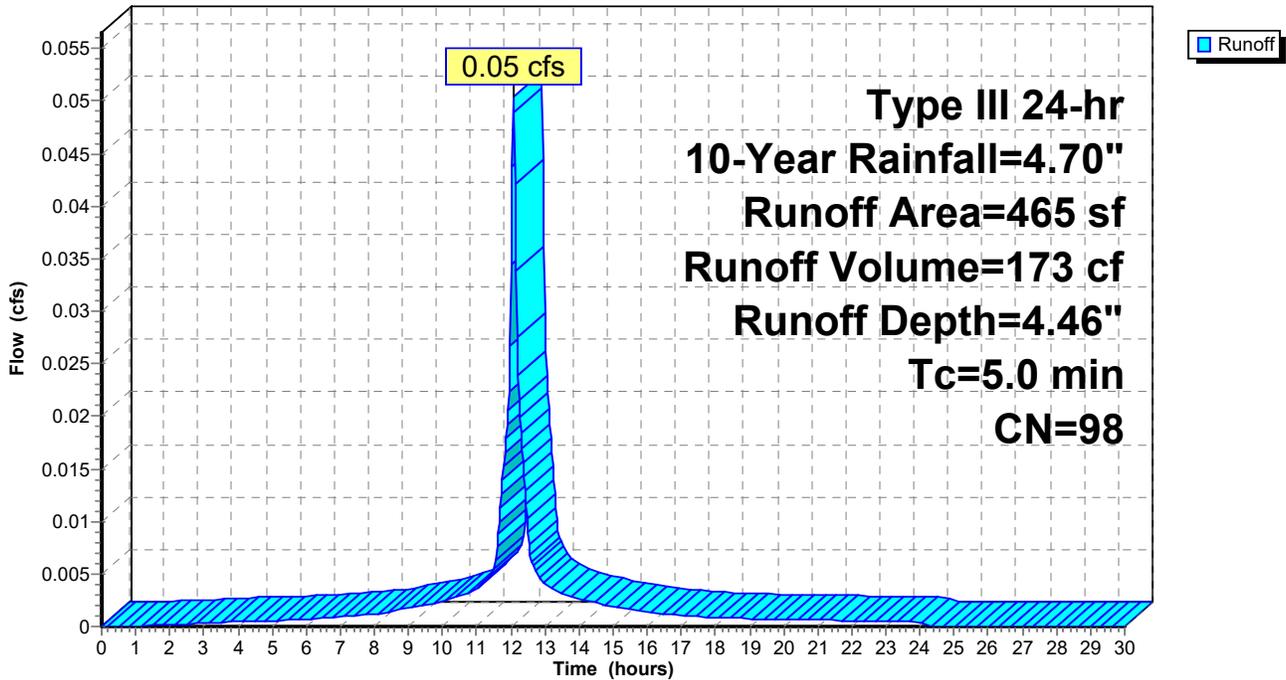
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.03 hrs
Type III 24-hr 10-Year Rainfall=4.70"

Area (sf)	CN	Description
* 465	98	General Impersious, HSG A
465		100.00% Impervious Area

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

Subcatchment 6S: EX. IMPERVIOUS

Hydrograph



EXISTING

Type III 24-hr 10-Year Rainfall=4.70"

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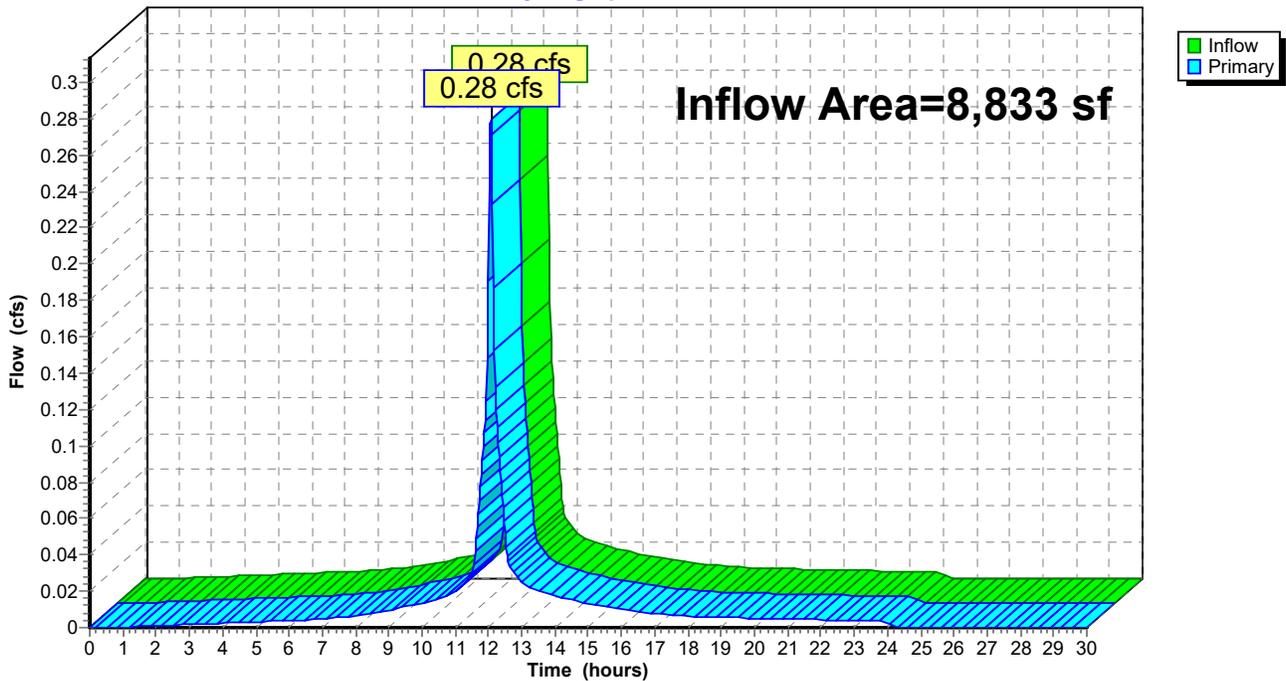
Summary for Link 3L: EXISTING

Inflow Area = 8,833 sf, 29.19% Impervious, Inflow Depth = 1.40" for 10-Year event
Inflow = 0.28 cfs @ 12.07 hrs, Volume= 1,034 cf
Primary = 0.28 cfs @ 12.07 hrs, Volume= 1,034 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=5.50"

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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 AREA Runoff Area=1,621 sf 100.00% Impervious Runoff Depth=5.26"
Tc=5.0 min CN=98 Runoff=0.21 cfs 711 cf

Subcatchment 4S: EX LANDSCAPE AREA Runoff Area=6,255 sf 0.00% Impervious Runoff Depth=0.31"
Tc=5.0 min CN=39 Runoff=0.01 cfs 163 cf

Subcatchment 5S: EX PAVED AREAS Runoff Area=492 sf 100.00% Impervious Runoff Depth=5.26"
Tc=5.0 min CN=98 Runoff=0.06 cfs 216 cf

Subcatchment 6S: EX. IMPERVIOUS Runoff Area=465 sf 100.00% Impervious Runoff Depth=5.26"
Tc=5.0 min CN=98 Runoff=0.06 cfs 204 cf

Link 3L: EXISTING Inflow=0.33 cfs 1,293 cf
Primary=0.33 cfs 1,293 cf

Total Runoff Area = 8,833 sf Runoff Volume = 1,293 cf Average Runoff Depth = 1.76"
70.81% Pervious = 6,255 sf 29.19% Impervious = 2,578 sf

EXISTING

Type III 24-hr 25-Year Rainfall=5.50"

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Summary for Subcatchment 1S: EX ROOF AREA

Runoff = 0.21 cfs @ 12.07 hrs, Volume= 711 cf, Depth= 5.26"

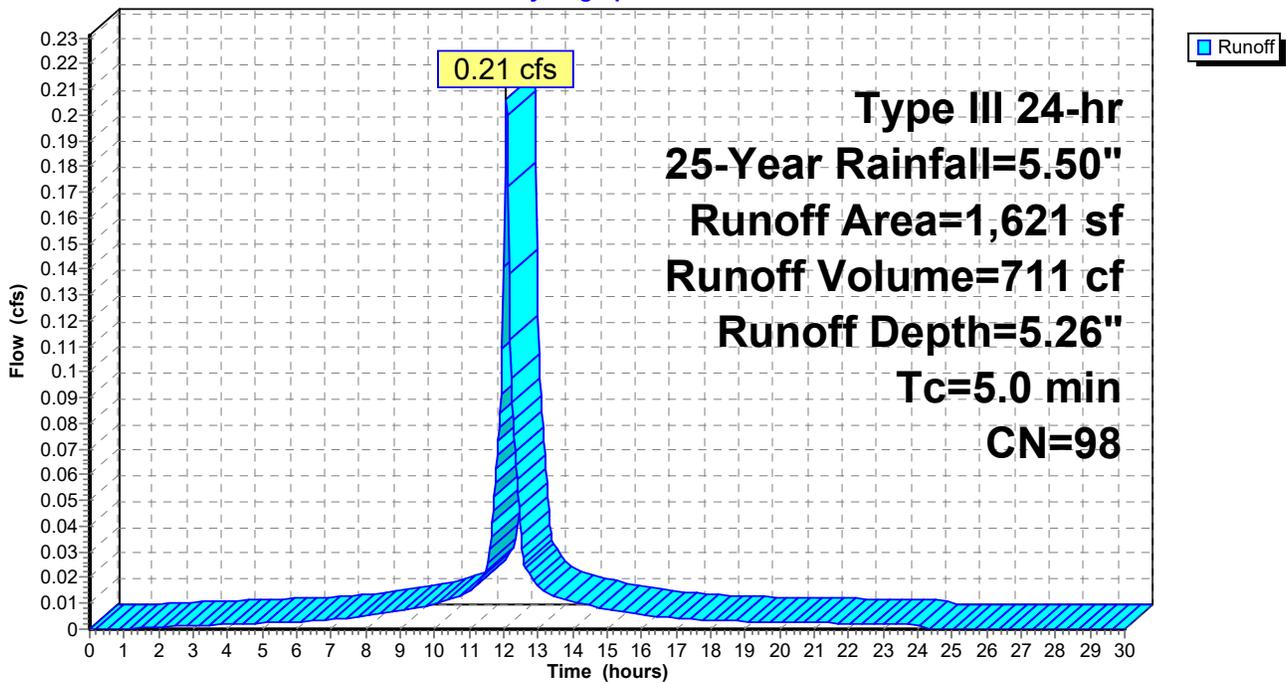
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.03 hrs
Type III 24-hr 25-Year Rainfall=5.50"

	Area (sf)	CN	Description
*	1,220	98	Roofs, HSG A (House)
*	401	98	Garage, HSG A
	1,621	98	Weighted Average
	1,621		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 AREA

Hydrograph



EXISTING

Type III 24-hr 25-Year Rainfall=5.50"

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Summary for Subcatchment 4S: EX LANDSCAPE AREA

Runoff = 0.01 cfs @ 12.38 hrs, Volume= 163 cf, Depth= 0.31"

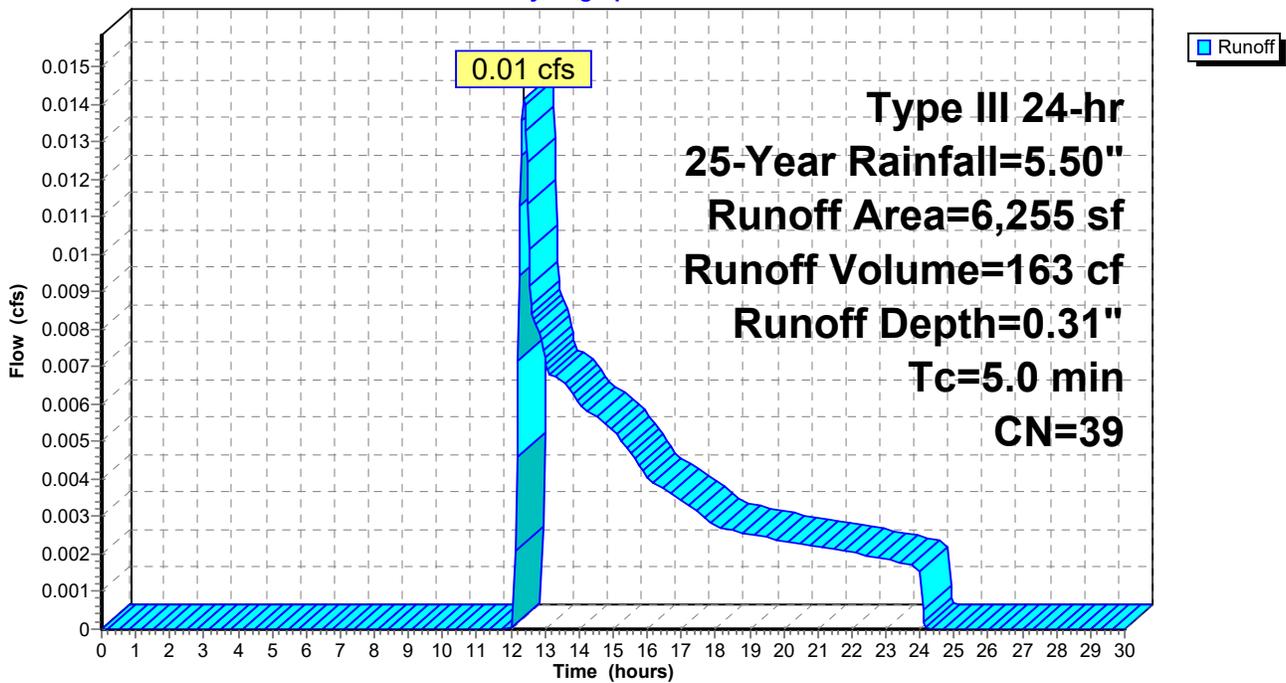
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.03 hrs
Type III 24-hr 25-Year Rainfall=5.50"

Area (sf)	CN	Description
6,237	39	>75% Grass cover, Good, HSG A
* 18	39	Window Well, HSG A
6,255	39	Weighted Average
6,255		100.00% Pervious Area

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

Subcatchment 4S: EX LANDSCAPE AREA

Hydrograph



EXISTING

Type III 24-hr 25-Year Rainfall=5.50"

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Summary for Subcatchment 5S: EX PAVED AREAS

Runoff = 0.06 cfs @ 12.07 hrs, Volume= 216 cf, Depth= 5.26"

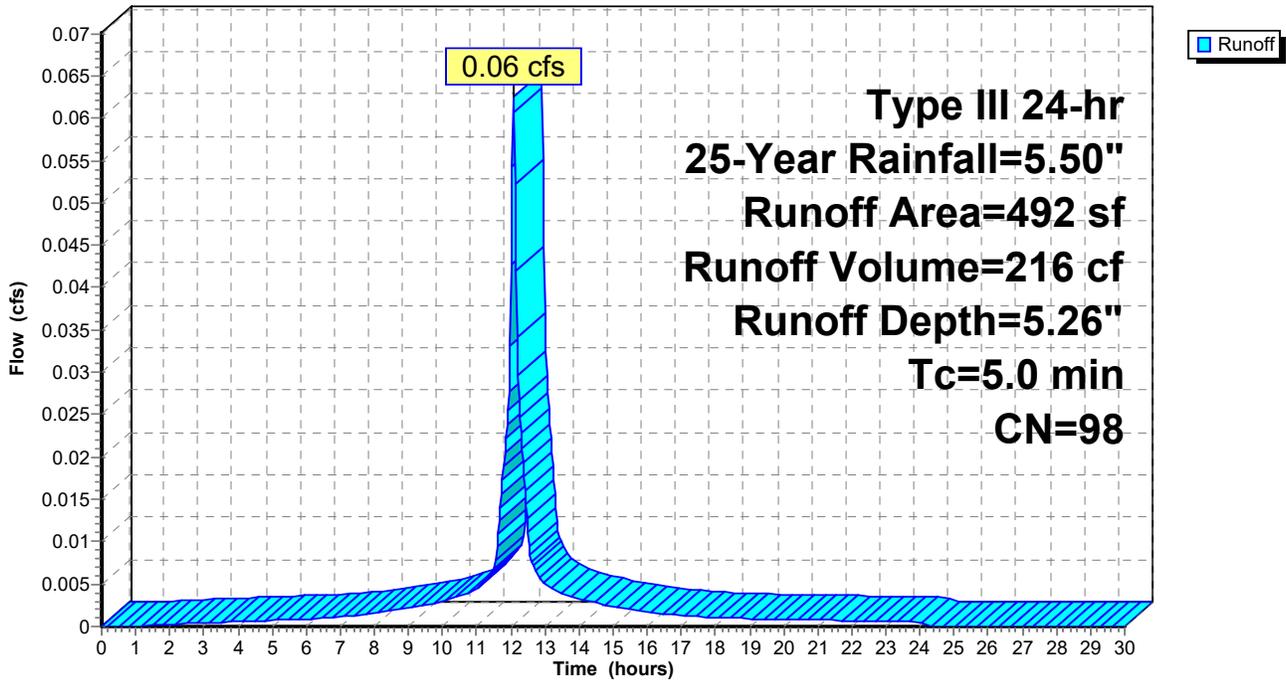
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.03 hrs
Type III 24-hr 25-Year Rainfall=5.50"

Area (sf)	CN	Description
* 492	98	Driveway, HSG A
492		100.00% Impervious Area

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

Subcatchment 5S: EX PAVED AREAS

Hydrograph



EXISTING

Type III 24-hr 25-Year Rainfall=5.50"

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Summary for Subcatchment 6S: EX. IMPERVIOUS

Runoff = 0.06 cfs @ 12.07 hrs, Volume= 204 cf, Depth= 5.26"

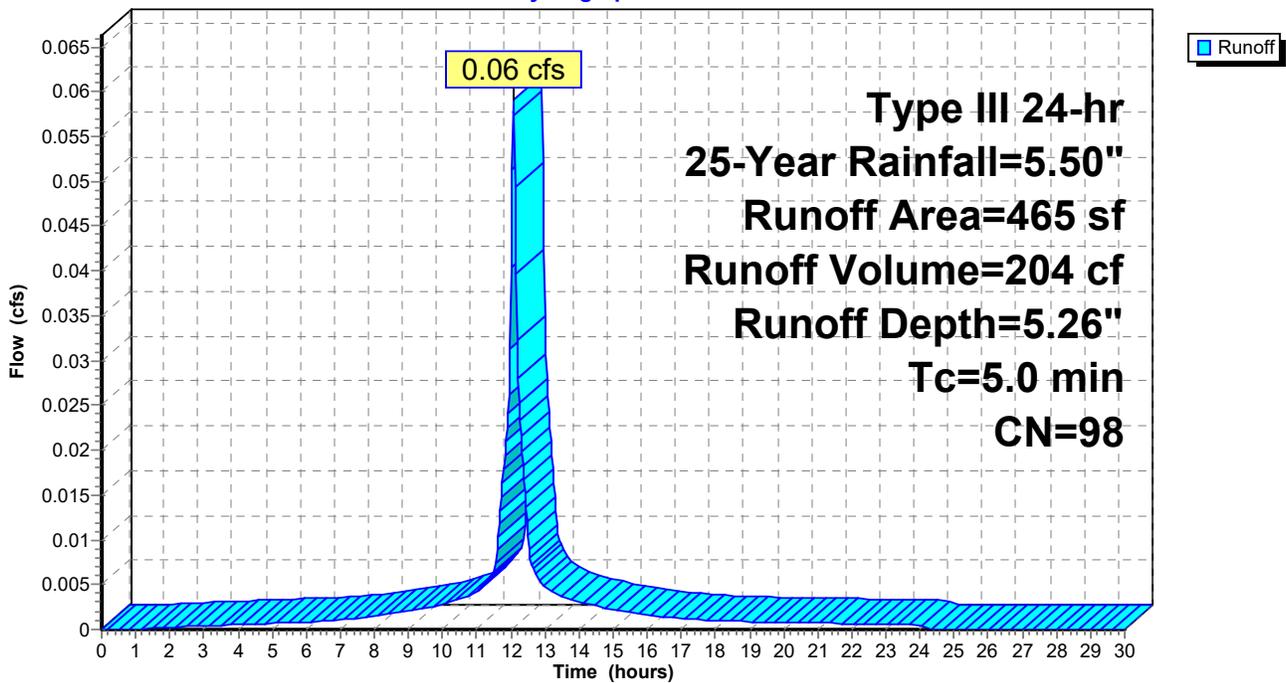
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.03 hrs
Type III 24-hr 25-Year Rainfall=5.50"

Area (sf)	CN	Description
* 465	98	General Impersious, HSG A
465		100.00% Impervious Area

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

Subcatchment 6S: EX. IMPERVIOUS

Hydrograph



EXISTING

Type III 24-hr 25-Year Rainfall=5.50"

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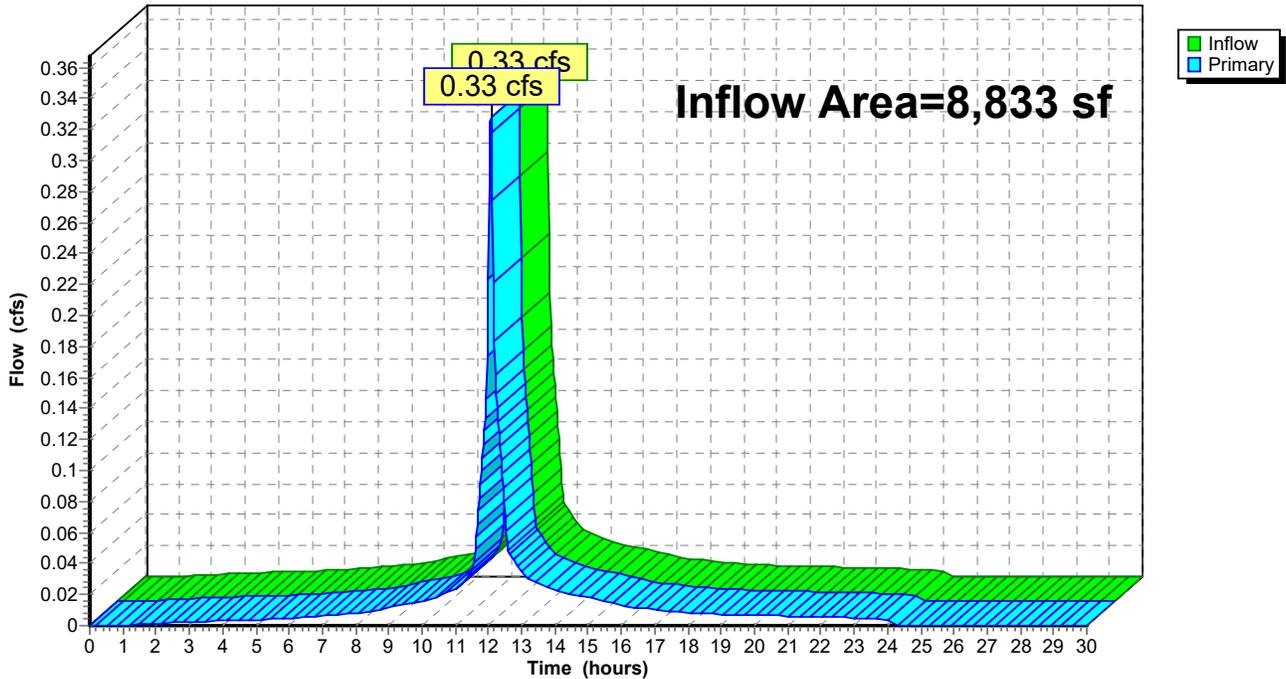
Summary for Link 3L: EXISTING

Inflow Area = 8,833 sf, 29.19% Impervious, Inflow Depth = 1.76" for 25-Year event
Inflow = 0.33 cfs @ 12.07 hrs, Volume= 1,293 cf
Primary = 0.33 cfs @ 12.07 hrs, Volume= 1,293 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=6.50"

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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 AREA Runoff Area=1,621 sf 100.00% Impervious Runoff Depth=6.26"
Tc=5.0 min CN=98 Runoff=0.24 cfs 846 cf

Subcatchment 4S: EX LANDSCAPE AREA Runoff Area=6,255 sf 0.00% Impervious Runoff Depth=0.60"
Tc=5.0 min CN=39 Runoff=0.04 cfs 312 cf

Subcatchment 5S: EX PAVED AREAS Runoff Area=492 sf 100.00% Impervious Runoff Depth=6.26"
Tc=5.0 min CN=98 Runoff=0.07 cfs 257 cf

Subcatchment 6S: EX. IMPERVIOUS Runoff Area=465 sf 100.00% Impervious Runoff Depth=6.26"
Tc=5.0 min CN=98 Runoff=0.07 cfs 243 cf

Link 3L: EXISTING Inflow=0.41 cfs 1,657 cf
Primary=0.41 cfs 1,657 cf

Total Runoff Area = 8,833 sf Runoff Volume = 1,657 cf Average Runoff Depth = 2.25"
70.81% Pervious = 6,255 sf 29.19% Impervious = 2,578 sf

EXISTING

Type III 24-hr 100-Year Rainfall=6.50"

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Summary for Subcatchment 1S: EX ROOF AREA

Runoff = 0.24 cfs @ 12.07 hrs, Volume= 846 cf, Depth= 6.26"

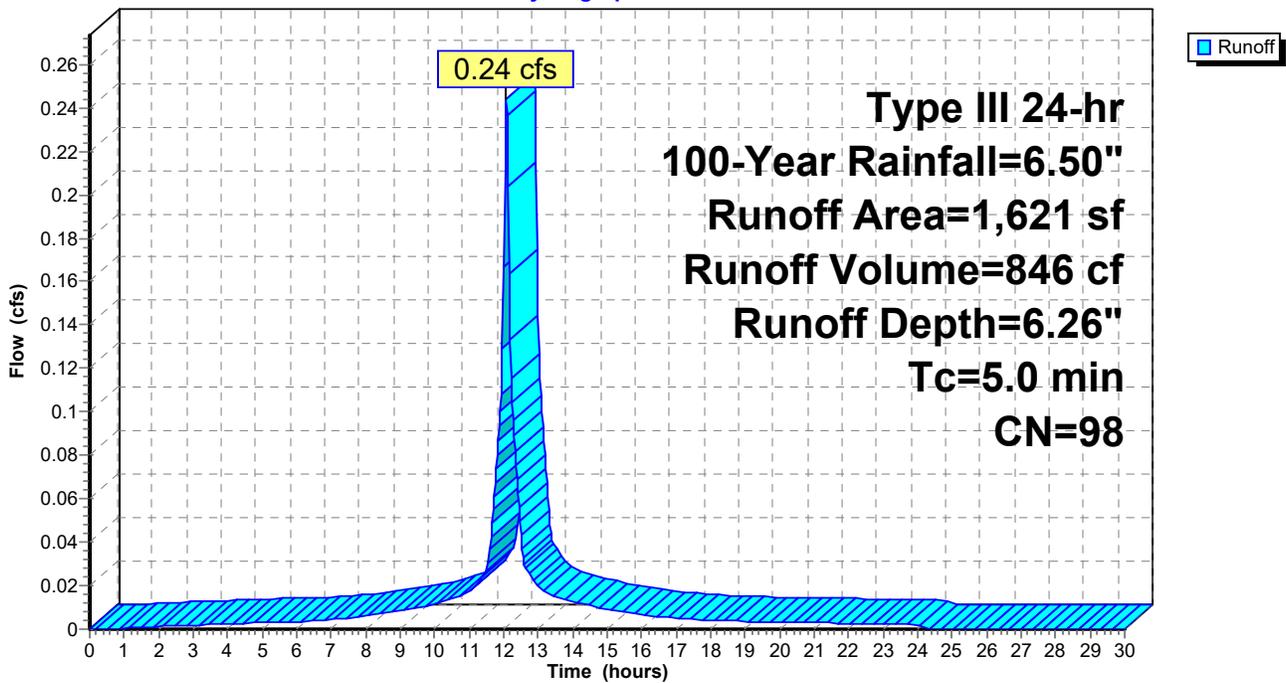
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.03 hrs
Type III 24-hr 100-Year Rainfall=6.50"

	Area (sf)	CN	Description
*	1,220	98	Roofs, HSG A (House)
*	401	98	Garage, HSG A
	1,621	98	Weighted Average
	1,621		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 AREA

Hydrograph



EXISTING

Type III 24-hr 100-Year Rainfall=6.50"

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Summary for Subcatchment 4S: EX LANDSCAPE AREA

Runoff = 0.04 cfs @ 12.28 hrs, Volume= 312 cf, Depth= 0.60"

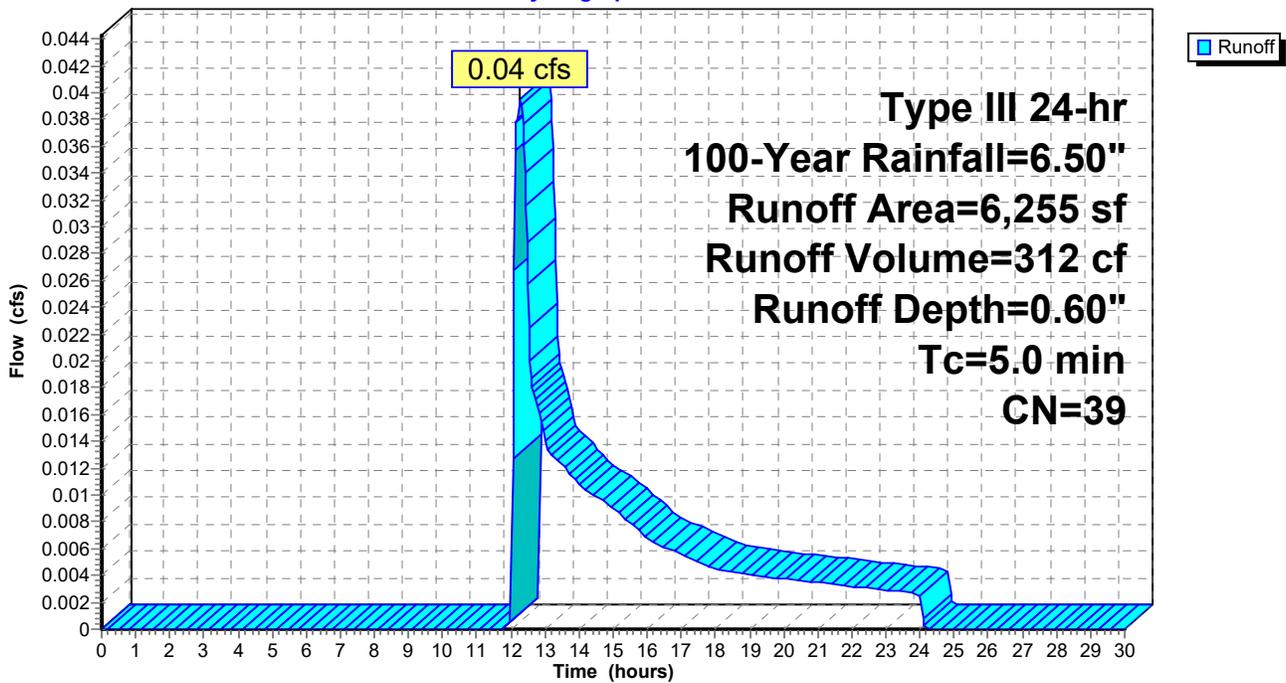
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.03 hrs
Type III 24-hr 100-Year Rainfall=6.50"

Area (sf)	CN	Description
6,237	39	>75% Grass cover, Good, HSG A
* 18	39	Window Well, HSG A
6,255	39	Weighted Average
6,255		100.00% Pervious Area

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

Subcatchment 4S: EX LANDSCAPE AREA

Hydrograph



EXISTING

Type III 24-hr 100-Year Rainfall=6.50"

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Summary for Subcatchment 5S: EX PAVED AREAS

Runoff = 0.07 cfs @ 12.07 hrs, Volume= 257 cf, Depth= 6.26"

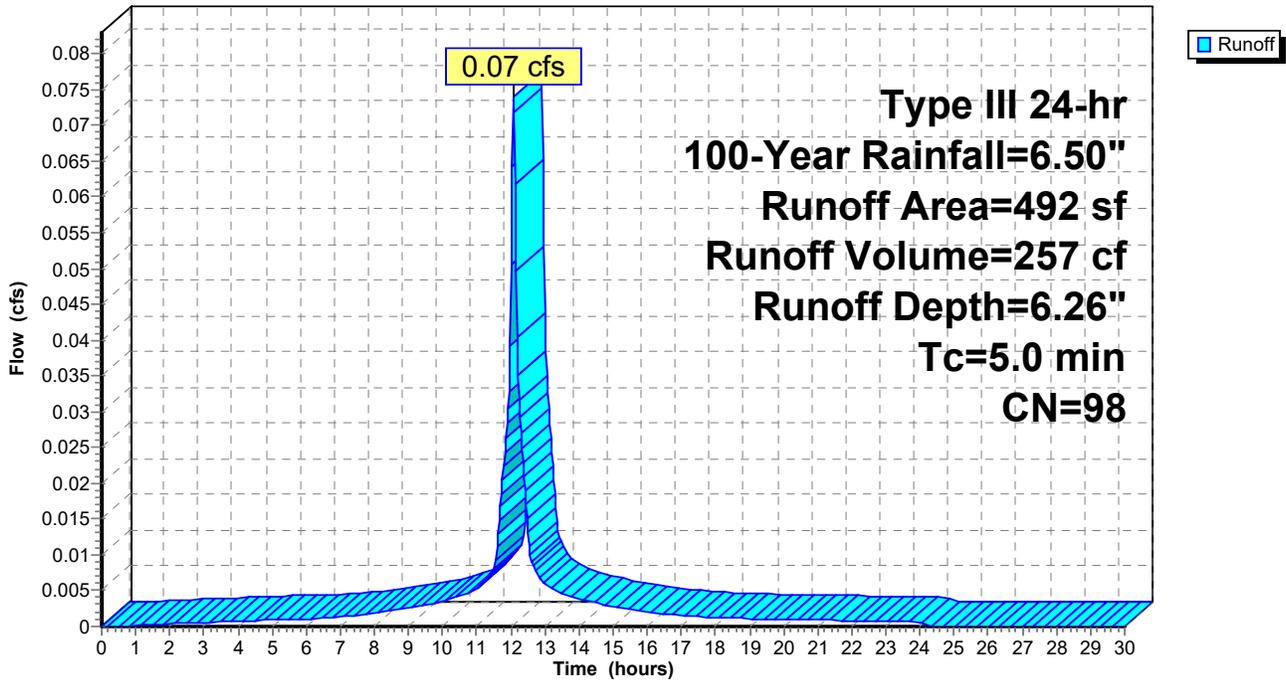
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.03 hrs
Type III 24-hr 100-Year Rainfall=6.50"

Area (sf)	CN	Description
* 492	98	Driveway, HSG A
492		100.00% Impervious Area

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

Subcatchment 5S: EX PAVED AREAS

Hydrograph



EXISTING

Type III 24-hr 100-Year Rainfall=6.50"

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Summary for Subcatchment 6S: EX. IMPERVIOUS

Runoff = 0.07 cfs @ 12.07 hrs, Volume= 243 cf, Depth= 6.26"

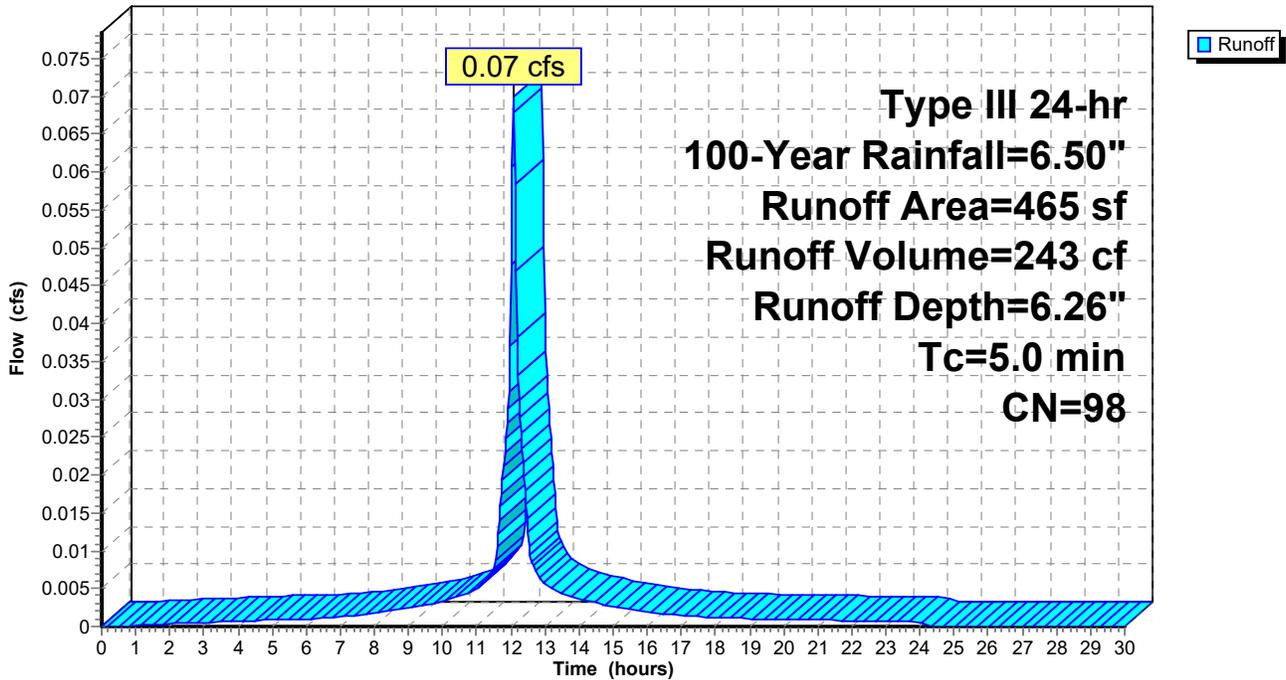
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.03 hrs
Type III 24-hr 100-Year Rainfall=6.50"

Area (sf)	CN	Description
* 465	98	General Impersious, HSG A
465		100.00% Impervious Area

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

Subcatchment 6S: EX. IMPERVIOUS

Hydrograph



EXISTING

Type III 24-hr 100-Year Rainfall=6.50"

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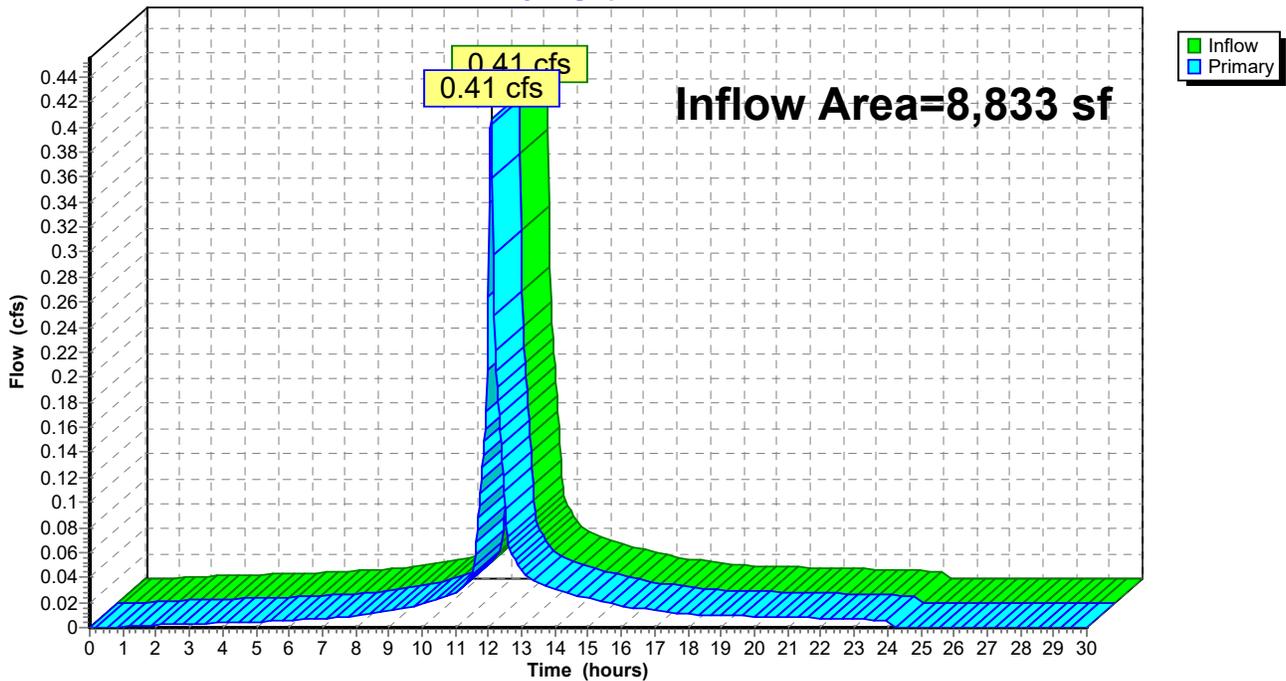
Summary for Link 3L: EXISTING

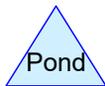
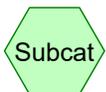
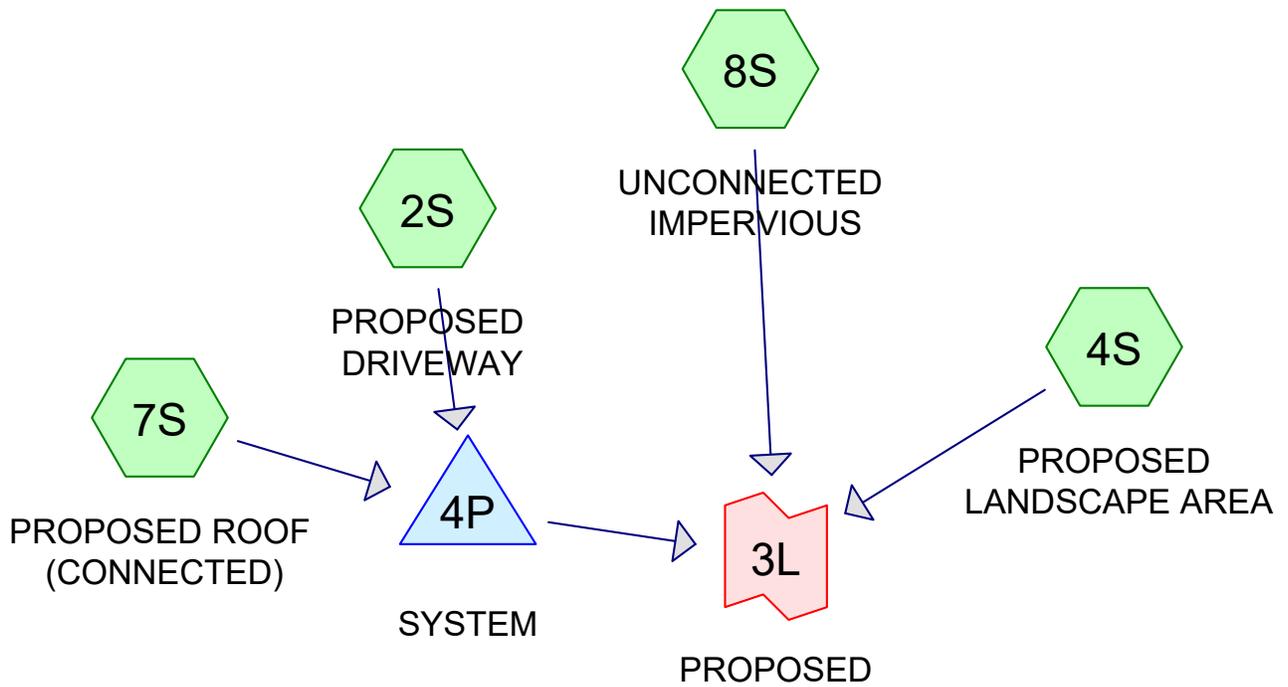
Inflow Area = 8,833 sf, 29.19% Impervious, Inflow Depth = 2.25" for 100-Year event
Inflow = 0.41 cfs @ 12.08 hrs, Volume= 1,657 cf
Primary = 0.41 cfs @ 12.08 hrs, Volume= 1,657 cf, Atten= 0%, Lag= 0.0 min

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

Link 3L: EXISTING

Hydrograph





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Page 2

Area Listing (all nodes)

Area (sq-ft)	CN	Description (subcatchment-numbers)
5,792	39	>75% Grass cover, Good, HSG A (4S)
791	98	Driveway, HSG A (2S)
244	98	General Impervious, HSG A (8S)
2,006	98	Roofs, HSG A (7S)
8,833	59	TOTAL AREA

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Soil Listing (all nodes)

Area (sq-ft)	Soil Group	Subcatchment Numbers
8,833	HSG A	2S, 4S, 7S, 8S
0	HSG B	
0	HSG C	
0	HSG D	
0	Other	
8,833		TOTAL AREA

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Ground Covers (all nodes)

HSG-A (sq-ft)	HSG-B (sq-ft)	HSG-C (sq-ft)	HSG-D (sq-ft)	Other (sq-ft)	Total (sq-ft)	Ground Cover	Sub Num
5,792	0	0	0	0	5,792	>75% Grass cover, Good	
791	0	0	0	0	791	Driveway	
244	0	0	0	0	244	General Impervious	
2,006	0	0	0	0	2,006	Roofs	
8,833	0	0	0	0	8,833	TOTAL AREA	

PROPOSED

Type III 24-hr 2-Year Rainfall=3.25"

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Time span=0.00-30.00 hrs, dt=0.01 hrs, 3001 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment2S: PROPOSED DRIVEWAY Runoff Area=791 sf 100.00% Impervious Runoff Depth=3.02"
Tc=15.0 min CN=98 Runoff=0.04 cfs 199 cf

Subcatchment4S: PROPOSED LANDSCAPE Runoff Area=5,792 sf 0.00% Impervious Runoff Depth=0.00"
Tc=5.0 min CN=39 Runoff=0.00 cfs 0 cf

Subcatchment7S: PROPOSED ROOF Runoff Area=2,006 sf 100.00% Impervious Runoff Depth=3.02"
Tc=5.0 min CN=98 Runoff=0.15 cfs 504 cf

Subcatchment8S: UNCONNECTED Runoff Area=244 sf 100.00% Impervious Runoff Depth=3.02"
Tc=5.0 min CN=98 Runoff=0.02 cfs 61 cf

Pond 4P: SYSTEM Peak Elev=31.27' Storage=224 cf Inflow=0.18 cfs 703 cf
Discarded=0.03 cfs 703 cf Primary=0.00 cfs 0 cf Outflow=0.03 cfs 703 cf

Link 3L: PROPOSED Inflow=0.02 cfs 62 cf
Primary=0.02 cfs 62 cf

Total Runoff Area = 8,833 sf Runoff Volume = 765 cf Average Runoff Depth = 1.04"
65.57% Pervious = 5,792 sf 34.43% Impervious = 3,041 sf

PROPOSED

Type III 24-hr 2-Year Rainfall=3.25"

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Summary for Subcatchment 2S: PROPOSED DRIVEWAY

Runoff = 0.04 cfs @ 12.19 hrs, Volume= 199 cf, Depth= 3.02"

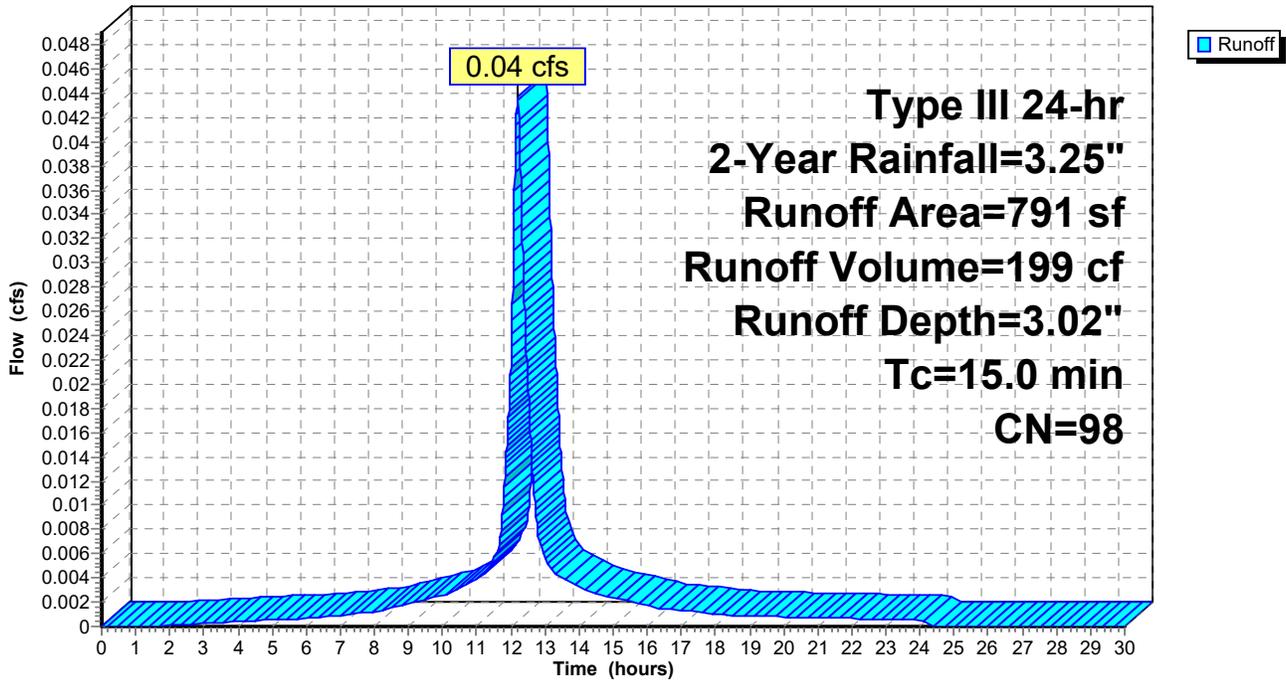
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 2-Year Rainfall=3.25"

Area (sf)	CN	Description
* 791	98	Driveway, HSG A
791		100.00% Impervious Area

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

Subcatchment 2S: PROPOSED DRIVEWAY

Hydrograph



PROPOSED

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Type III 24-hr 2-Year Rainfall=3.25"

Summary for Subcatchment 4S: PROPOSED LANDSCAPE AREA

Runoff = 0.00 cfs @ 24.01 hrs, Volume= 0 cf, Depth= 0.00"

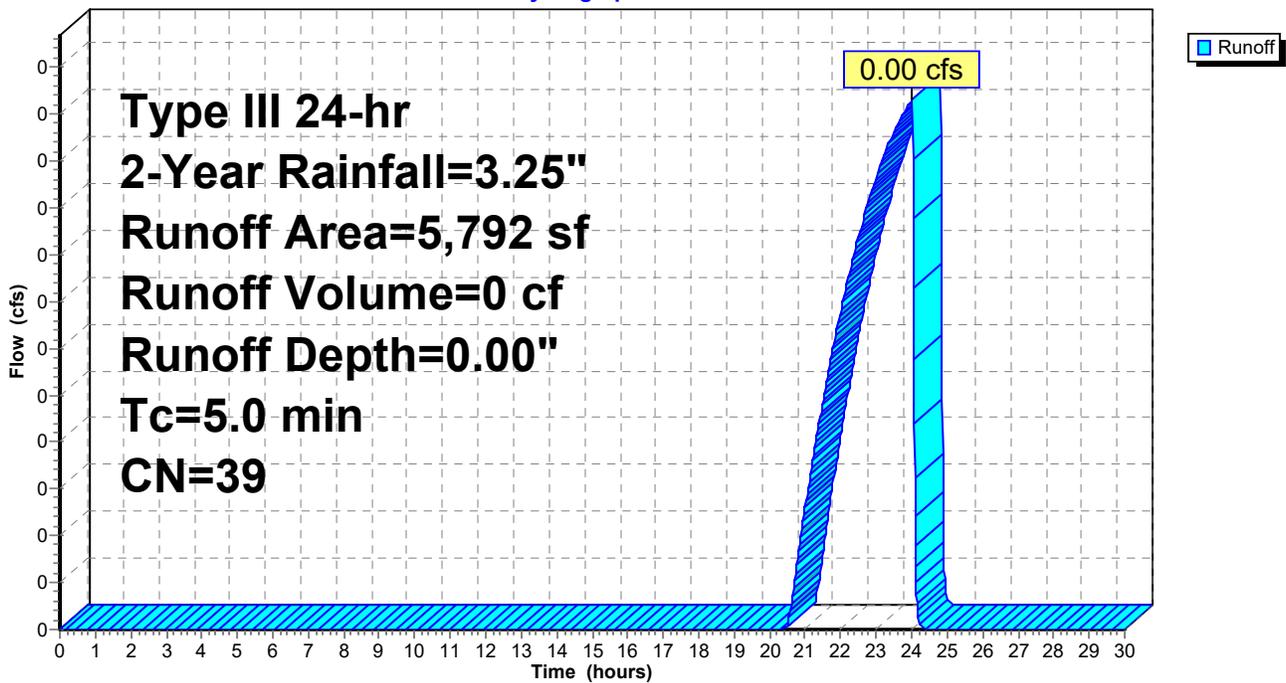
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 2-Year Rainfall=3.25"

Area (sf)	CN	Description
5,792	39	>75% Grass cover, Good, HSG A
5,792		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



PROPOSED

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Type III 24-hr 2-Year Rainfall=3.25"

Summary for Subcatchment 7S: PROPOSED ROOF (CONNECTED)

Runoff = 0.15 cfs @ 12.07 hrs, Volume= 504 cf, Depth= 3.02"

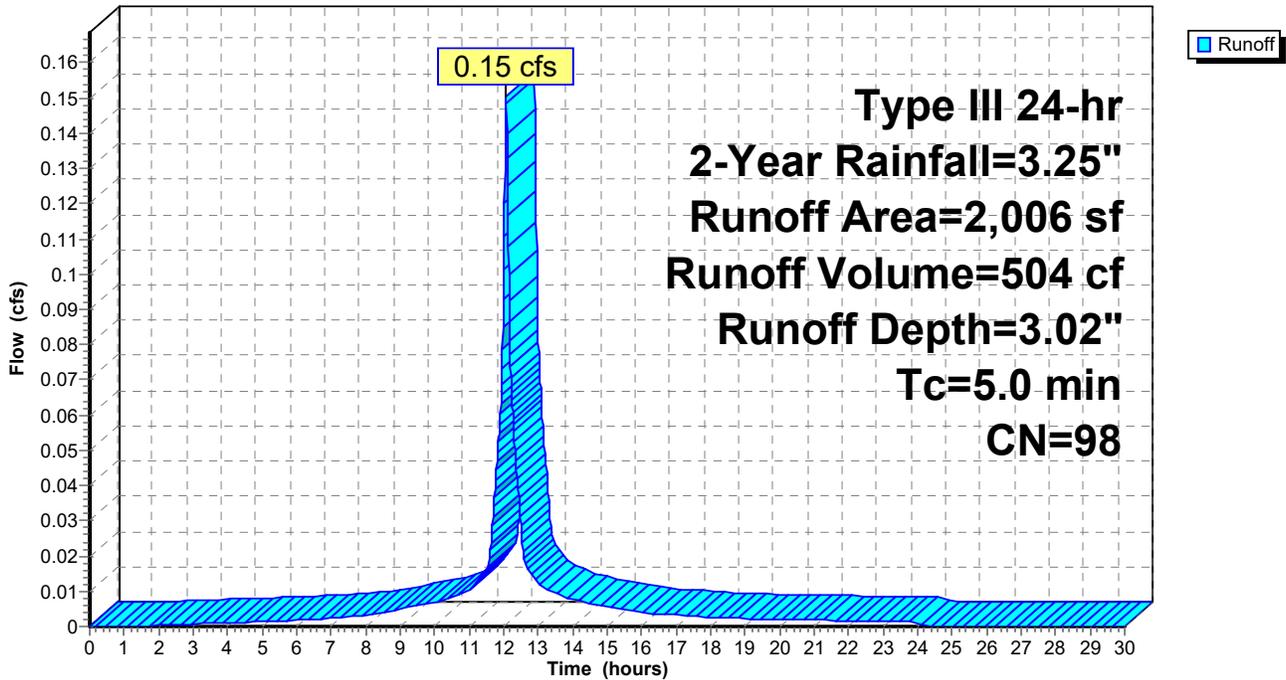
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 2-Year Rainfall=3.25"

Area (sf)	CN	Description
2,006	98	Roofs, HSG A
2,006		100.00% Impervious Area

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

Subcatchment 7S: PROPOSED ROOF (CONNECTED)

Hydrograph



PROPOSED

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Type III 24-hr 2-Year Rainfall=3.25"

Summary for Subcatchment 8S: UNCONNECTED IMPERVIOUS

Runoff = 0.02 cfs @ 12.07 hrs, Volume= 61 cf, Depth= 3.02"

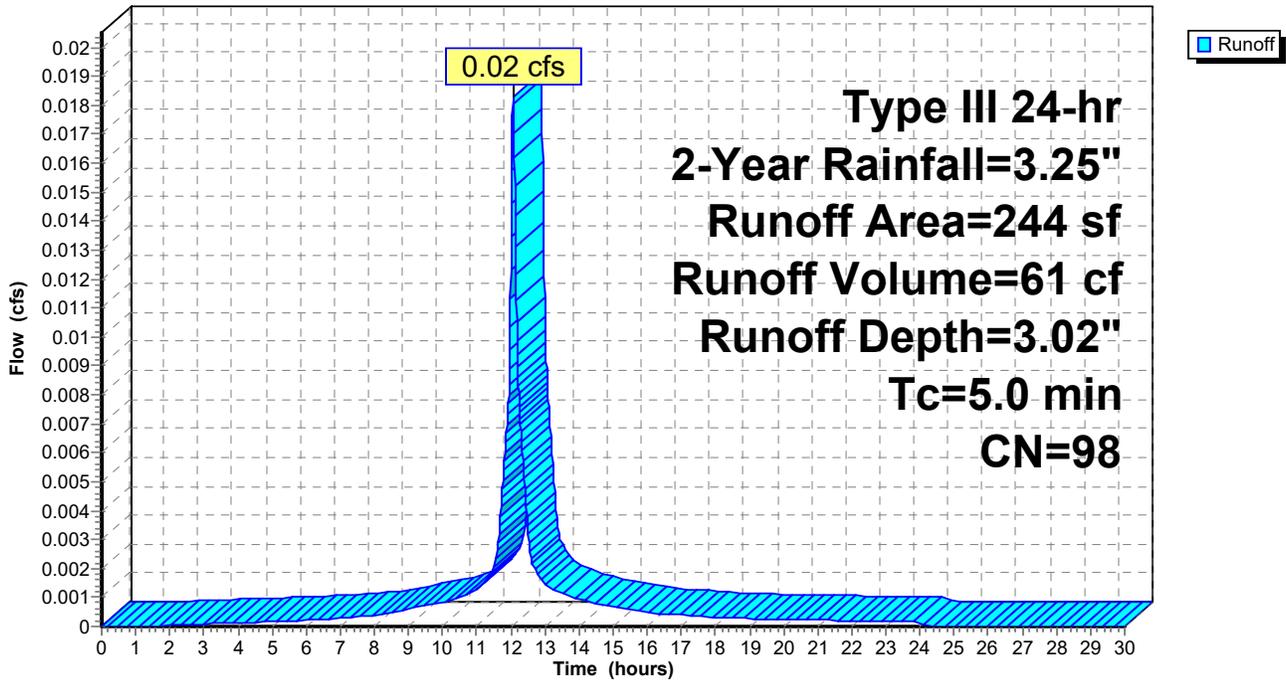
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 2-Year Rainfall=3.25"

Area (sf)	CN	Description
* 244	98	General Impervious, HSG A
244		100.00% Impervious Area

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

Subcatchment 8S: UNCONNECTED IMPERVIOUS

Hydrograph



PROPOSED

Type III 24-hr 2-Year Rainfall=3.25"

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Summary for Pond 4P: SYSTEM

Inflow Area = 2,797 sf, 100.00% Impervious, Inflow Depth = 3.02" for 2-Year event
 Inflow = 0.18 cfs @ 12.08 hrs, Volume= 703 cf
 Outflow = 0.03 cfs @ 12.72 hrs, Volume= 703 cf, Atten= 86%, Lag= 38.4 min
 Discarded = 0.03 cfs @ 12.72 hrs, Volume= 703 cf
 Primary = 0.00 cfs @ 0.00 hrs, Volume= 0 cf

Routing by Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
 Peak Elev= 31.27' @ 12.72 hrs Surf.Area= 354 sf Storage= 224 cf

Plug-Flow detention time= 60.9 min calculated for 703 cf (100% of inflow)
 Center-of-Mass det. time= 60.9 min (818.7 - 757.8)

Volume	Invert	Avail.Storage	Storage Description
#1A	30.00'	314 cf	12.67'W x 27.92'L x 2.54'H Field A 899 cf Overall - 113 cf Embedded = 786 cf x 40.0% Voids
#2A	30.50'	113 cf	Cultec R-150XLHD x 4 Inside #1 Effective Size= 29.8"W x 18.0"H => 2.65 sf x 10.25'L = 27.2 cf Overall Size= 33.0"W x 18.5"H x 11.00'L with 0.75' Overlap Row Length Adjustment= +0.75' x 2.65 sf x 2 rows
#3	32.50'	15 cf	Ponding Listed below -Impervious
		442 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Elevation (feet)	Cum.Store (cubic-feet)
32.50	0
33.50	5
33.70	15

Device	Routing	Invert	Outlet Devices
#1	Discarded	30.00'	2.410 in/hr Exfiltration over Wetted area Phase-In= 0.01'
#2	Primary	32.50'	6.0" Horiz. Orifice/Grate C= 0.600 Limited to weir flow at low heads

Discarded OutFlow Max=0.03 cfs @ 12.72 hrs HW=31.27' (Free Discharge)
 ↑1=Exfiltration (Exfiltration Controls 0.03 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=30.00' (Free Discharge)
 ↑2=Orifice/Grate (Controls 0.00 cfs)

PROPOSED

Type III 24-hr 2-Year Rainfall=3.25"

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Pond 4P: SYSTEM - Chamber Wizard Field A

Chamber Model = Cultec R-150XLHD (Cultec Recharger® 150XLHD)

Effective Size= 29.8"W x 18.0"H => 2.65 sf x 10.25'L = 27.2 cf

Overall Size= 33.0"W x 18.5"H x 11.00'L with 0.75' Overlap

Row Length Adjustment= +0.75' x 2.65 sf x 2 rows

33.0" Wide + 6.0" Spacing = 39.0" C-C Row Spacing

2 Chambers/Row x 10.25' Long +0.75' Row Adjustment = 21.25' Row Length +40.0" End Stone x 2 = 27.92' Base Length

2 Rows x 33.0" Wide + 6.0" Spacing x 1 + 40.0" Side Stone x 2 = 12.67' Base Width

6.0" Base + 18.5" Chamber Height + 6.0" Cover = 2.54' Field Height

4 Chambers x 27.2 cf +0.75' Row Adjustment x 2.65 sf x 2 Rows = 112.6 cf Chamber Storage

898.8 cf Field - 112.6 cf Chambers = 786.2 cf Stone x 40.0% Voids = 314.5 cf Stone Storage

Chamber Storage + Stone Storage = 427.1 cf = 0.010 af

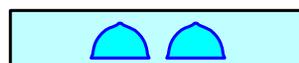
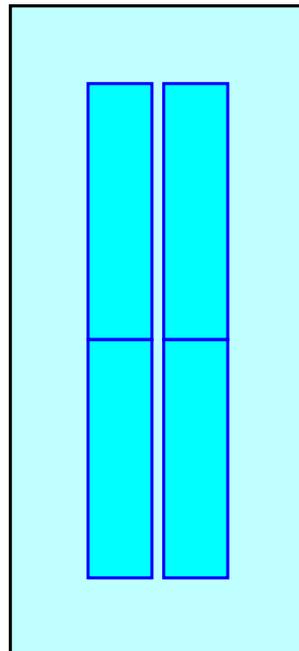
Overall Storage Efficiency = 47.5%

Overall System Size = 27.92' x 12.67' x 2.54'

4 Chambers

33.3 cy Field

29.1 cy Stone



PROPOSED

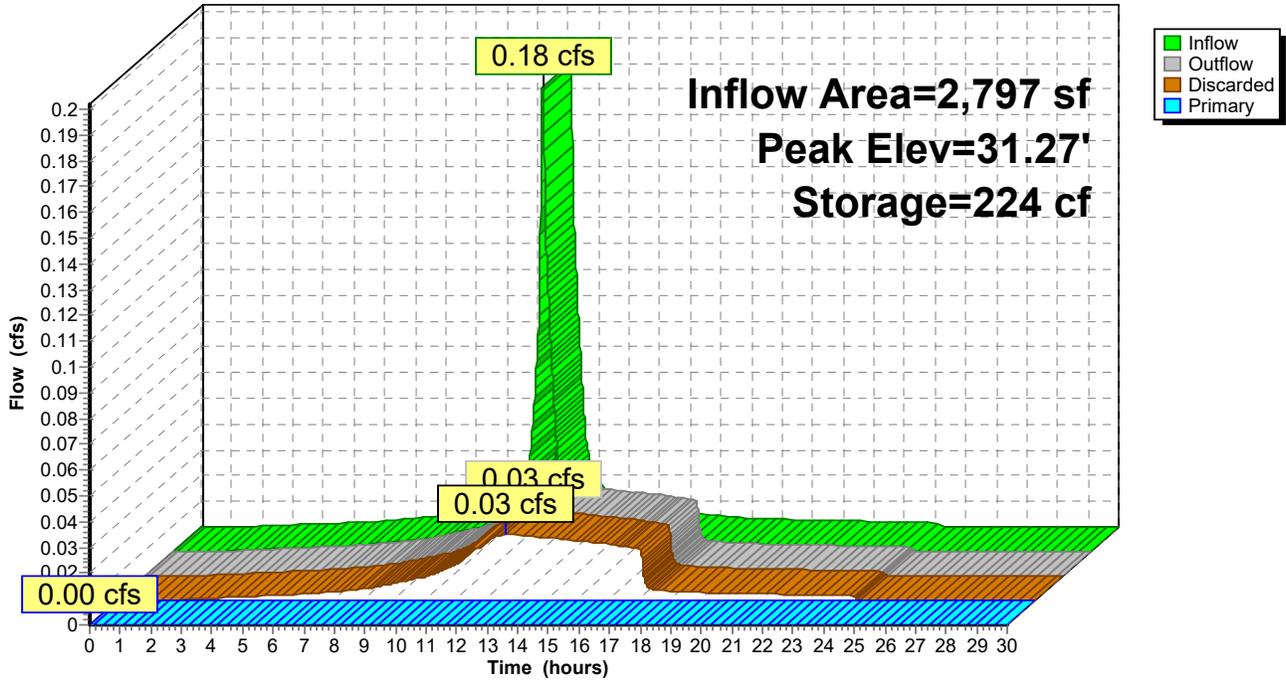
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Type III 24-hr 2-Year Rainfall=3.25"

Pond 4P: SYSTEM

Hydrograph



PROPOSED

Type III 24-hr 2-Year Rainfall=3.25"

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Stage-Area-Storage for Pond 4P: SYSTEM

Elevation (feet)	Wetted (sq-ft)	Storage (cubic-feet)	Elevation (feet)	Wetted (sq-ft)	Storage (cubic-feet)
30.00	354	0	32.65	560	428
30.05	358	7	32.70	560	428
30.10	362	14	32.75	560	428
30.15	366	21	32.80	560	429
30.20	370	28	32.85	560	429
30.25	374	35	32.90	560	429
30.30	378	42	32.95	560	429
30.35	382	50	33.00	560	430
30.40	386	57	33.05	560	430
30.45	390	64	33.10	560	430
30.50	394	71	33.15	560	430
30.55	398	81	33.20	560	431
30.60	402	91	33.25	560	431
30.65	406	101	33.30	560	431
30.70	410	111	33.35	560	431
30.75	414	121	33.40	560	432
30.80	419	131	33.45	560	432
30.85	423	141	33.50	560	432
30.90	427	151	33.55	560	435
30.95	431	161	33.60	560	437
31.00	435	171	33.65	560	440
31.05	439	181	33.70	560	442
31.10	443	191			
31.15	447	201			
31.20	451	211			
31.25	455	220			
31.30	459	230			
31.35	463	239			
31.40	467	249			
31.45	471	258			
31.50	475	268			
31.55	479	277			
31.60	483	286			
31.65	488	295			
31.70	492	303			
31.75	496	312			
31.80	500	320			
31.85	504	328			
31.90	508	336			
31.95	512	343			
32.00	516	350			
32.05	520	358			
32.10	524	365			
32.15	528	372			
32.20	532	379			
32.25	536	386			
32.30	540	393			
32.35	544	400			
32.40	548	407			
32.45	552	414			
32.50	557	421			
32.55	560	427			
32.60	560	428			

PROPOSED

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Type III 24-hr 2-Year Rainfall=3.25"

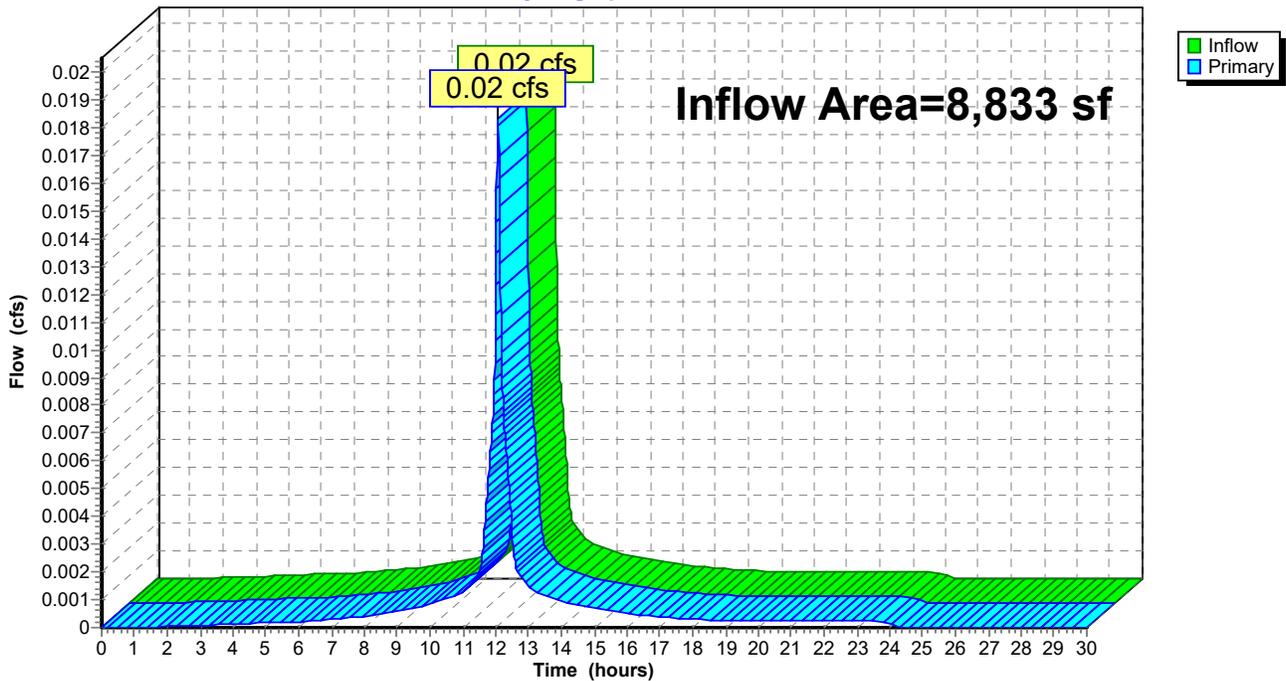
Summary for Link 3L: PROPOSED

Inflow Area = 8,833 sf, 34.43% Impervious, Inflow Depth = 0.08" for 2-Year event
Inflow = 0.02 cfs @ 12.07 hrs, Volume= 62 cf
Primary = 0.02 cfs @ 12.07 hrs, Volume= 62 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs

Link 3L: PROPOSED

Hydrograph



PROPOSED

Type III 24-hr 10-Year Rainfall=4.70"

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Time span=0.00-30.00 hrs, dt=0.01 hrs, 3001 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment2S: PROPOSED DRIVEWAY Runoff Area=791 sf 100.00% Impervious Runoff Depth=4.46"
Tc=15.0 min CN=98 Runoff=0.06 cfs 294 cf

Subcatchment4S: PROPOSED LANDSCAPE Runoff Area=5,792 sf 0.00% Impervious Runoff Depth=0.14"
Tc=5.0 min CN=39 Runoff=0.00 cfs 69 cf

Subcatchment7S: PROPOSED ROOF Runoff Area=2,006 sf 100.00% Impervious Runoff Depth=4.46"
Tc=5.0 min CN=98 Runoff=0.22 cfs 746 cf

Subcatchment8S: UNCONNECTED Runoff Area=244 sf 100.00% Impervious Runoff Depth=4.46"
Tc=5.0 min CN=98 Runoff=0.03 cfs 91 cf

Pond 4P: SYSTEM Peak Elev=32.16' Storage=373 cf Inflow=0.26 cfs 1,040 cf
Discarded=0.03 cfs 1,040 cf Primary=0.00 cfs 0 cf Outflow=0.03 cfs 1,040 cf

Link 3L: PROPOSED Inflow=0.03 cfs 160 cf
Primary=0.03 cfs 160 cf

Total Runoff Area = 8,833 sf Runoff Volume = 1,200 cf Average Runoff Depth = 1.63"
65.57% Pervious = 5,792 sf 34.43% Impervious = 3,041 sf

PROPOSED

Type III 24-hr 10-Year Rainfall=4.70"

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Summary for Subcatchment 2S: PROPOSED DRIVEWAY

Runoff = 0.06 cfs @ 12.19 hrs, Volume= 294 cf, Depth= 4.46"

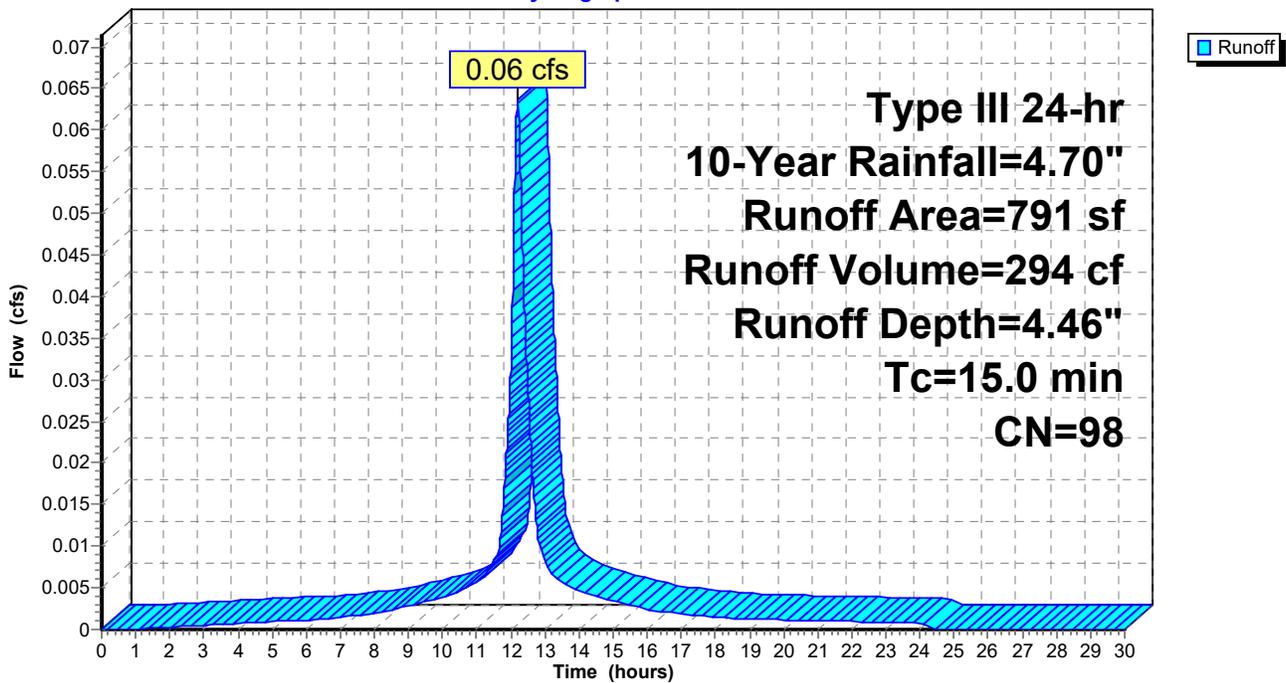
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-Year Rainfall=4.70"

Area (sf)	CN	Description
* 791	98	Driveway, HSG A
791		100.00% Impervious Area

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

Subcatchment 2S: PROPOSED DRIVEWAY

Hydrograph



PROPOSED

Type III 24-hr 10-Year Rainfall=4.70"

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Summary for Subcatchment 4S: PROPOSED LANDSCAPE AREA

Runoff = 0.00 cfs @ 13.75 hrs, Volume= 69 cf, Depth= 0.14"

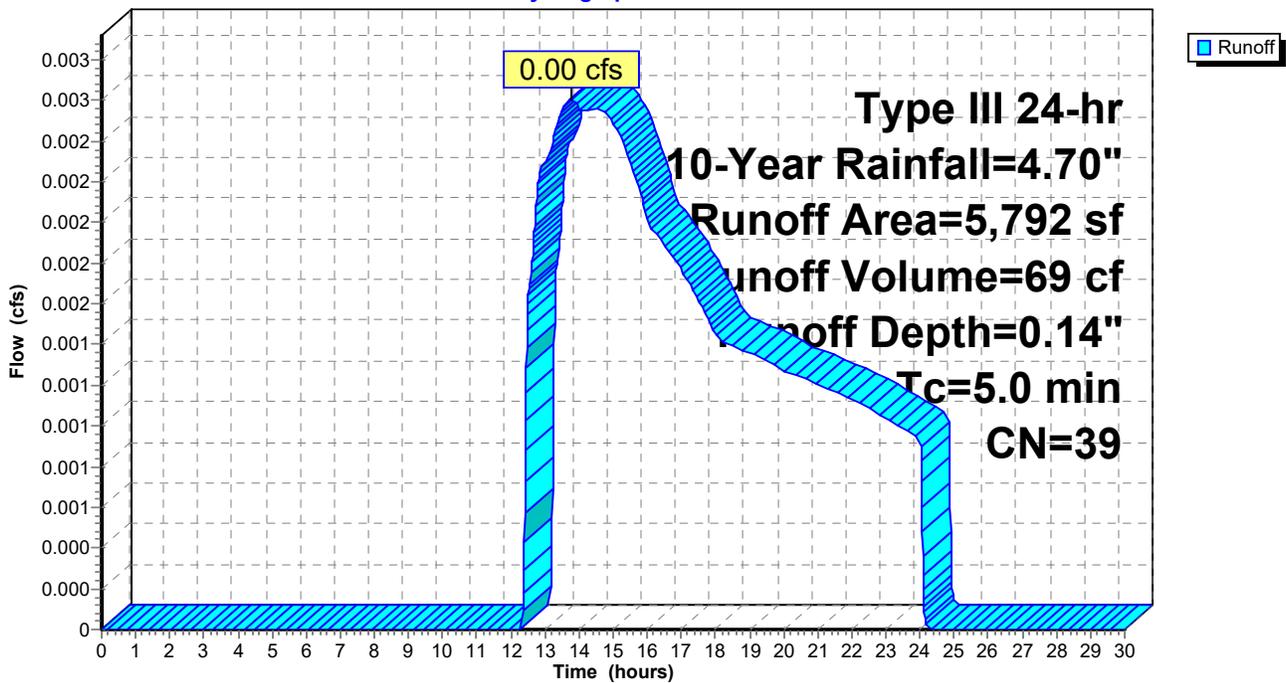
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-Year Rainfall=4.70"

Area (sf)	CN	Description
5,792	39	>75% Grass cover, Good, HSG A
5,792		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



PROPOSED

Type III 24-hr 10-Year Rainfall=4.70"

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Summary for Subcatchment 7S: PROPOSED ROOF (CONNECTED)

Runoff = 0.22 cfs @ 12.07 hrs, Volume= 746 cf, Depth= 4.46"

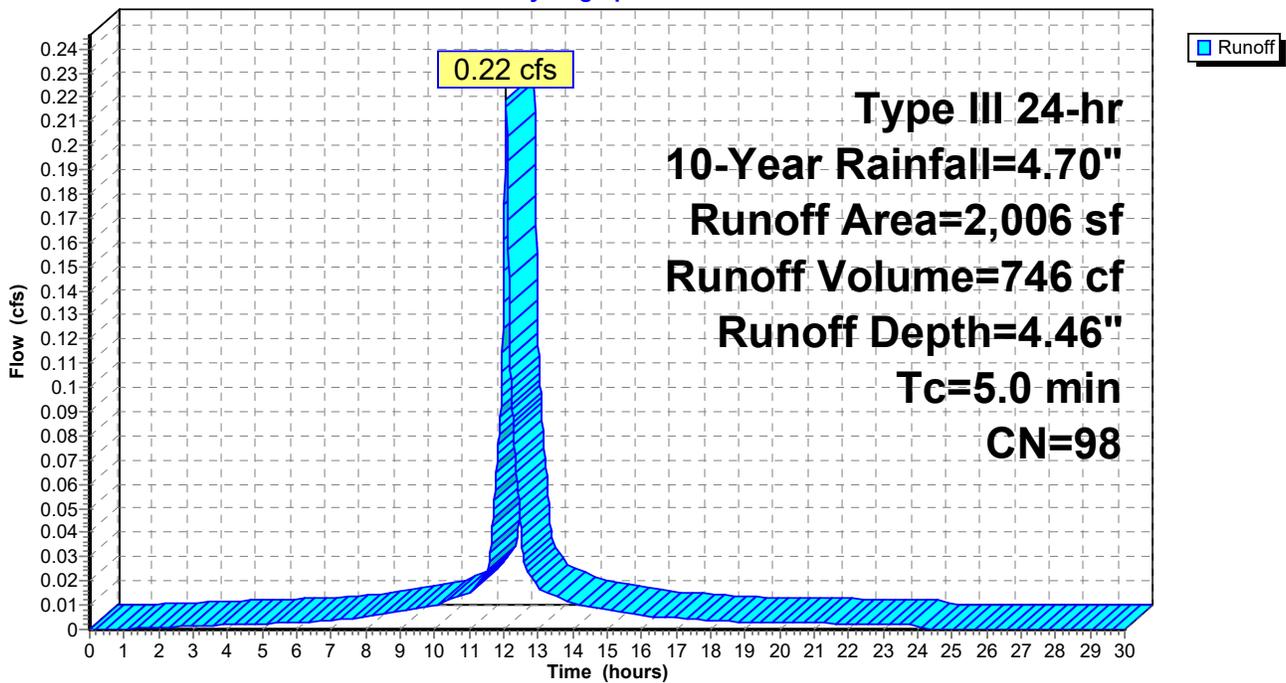
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-Year Rainfall=4.70"

Area (sf)	CN	Description
2,006	98	Roofs, HSG A
2,006		100.00% Impervious Area

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

Subcatchment 7S: PROPOSED ROOF (CONNECTED)

Hydrograph



PROPOSED

Type III 24-hr 10-Year Rainfall=4.70"

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Summary for Subcatchment 8S: UNCONNECTED IMPERVIOUS

Runoff = 0.03 cfs @ 12.07 hrs, Volume= 91 cf, Depth= 4.46"

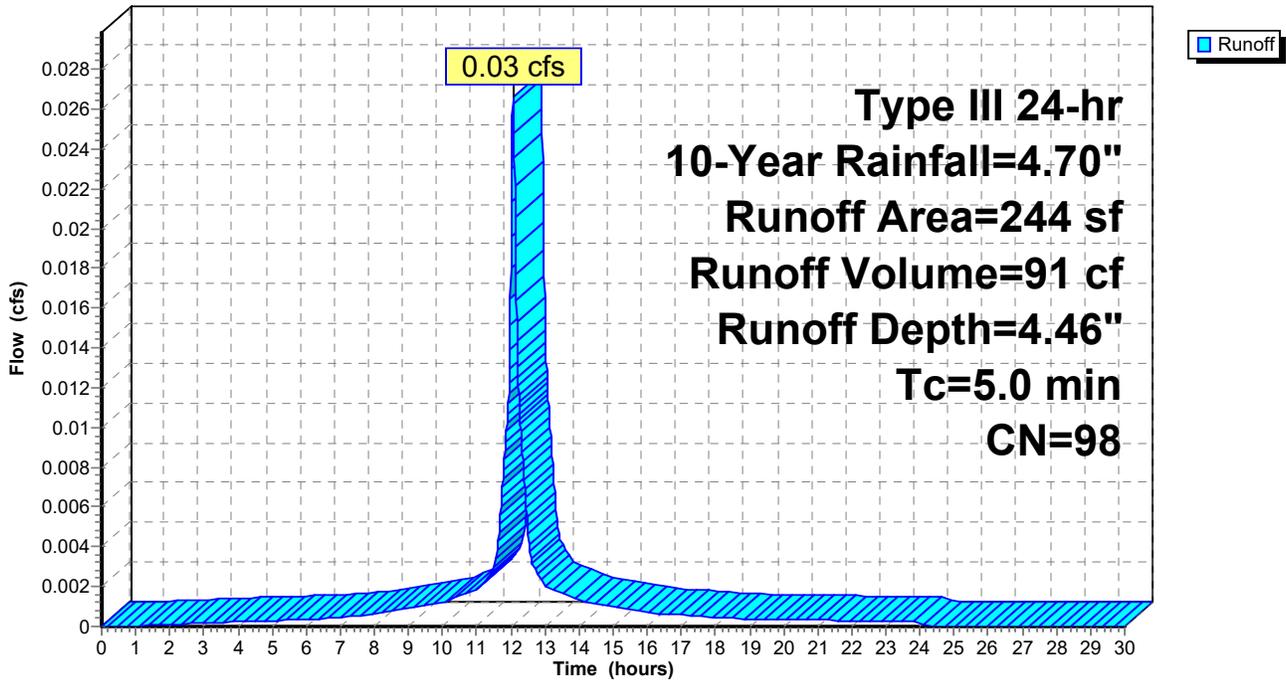
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-Year Rainfall=4.70"

Area (sf)	CN	Description
* 244	98	General Impervious, HSG A
244		100.00% Impervious Area

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

Subcatchment 8S: UNCONNECTED IMPERVIOUS

Hydrograph



PROPOSED

Type III 24-hr 10-Year Rainfall=4.70"

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Summary for Pond 4P: SYSTEM

Inflow Area = 2,797 sf, 100.00% Impervious, Inflow Depth = 4.46" for 10-Year event
 Inflow = 0.26 cfs @ 12.08 hrs, Volume= 1,040 cf
 Outflow = 0.03 cfs @ 12.88 hrs, Volume= 1,040 cf, Atten= 89%, Lag= 48.3 min
 Discarded = 0.03 cfs @ 12.88 hrs, Volume= 1,040 cf
 Primary = 0.00 cfs @ 0.00 hrs, Volume= 0 cf

Routing by Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
 Peak Elev= 32.16' @ 12.88 hrs Surf.Area= 354 sf Storage= 373 cf

Plug-Flow detention time= 98.7 min calculated for 1,040 cf (100% of inflow)
 Center-of-Mass det. time= 98.7 min (849.5 - 750.8)

Volume	Invert	Avail.Storage	Storage Description
#1A	30.00'	314 cf	12.67'W x 27.92'L x 2.54'H Field A 899 cf Overall - 113 cf Embedded = 786 cf x 40.0% Voids
#2A	30.50'	113 cf	Cultec R-150XLHD x 4 Inside #1 Effective Size= 29.8"W x 18.0"H => 2.65 sf x 10.25'L = 27.2 cf Overall Size= 33.0"W x 18.5"H x 11.00'L with 0.75' Overlap Row Length Adjustment= +0.75' x 2.65 sf x 2 rows
#3	32.50'	15 cf	Ponding Listed below -Impervious
		442 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Elevation (feet)	Cum.Store (cubic-feet)
32.50	0
33.50	5
33.70	15

Device	Routing	Invert	Outlet Devices
#1	Discarded	30.00'	2.410 in/hr Exfiltration over Wetted area Phase-In= 0.01'
#2	Primary	32.50'	6.0" Horiz. Orifice/Grate C= 0.600 Limited to weir flow at low heads

Discarded OutFlow Max=0.03 cfs @ 12.88 hrs HW=32.16' (Free Discharge)
 ↑1=Exfiltration (Exfiltration Controls 0.03 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=30.00' (Free Discharge)
 ↑2=Orifice/Grate (Controls 0.00 cfs)

PROPOSED

Type III 24-hr 10-Year Rainfall=4.70"

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Pond 4P: SYSTEM - Chamber Wizard Field A

Chamber Model = Cultec R-150XLHD (Cultec Recharger® 150XLHD)

Effective Size= 29.8"W x 18.0"H => 2.65 sf x 10.25'L = 27.2 cf

Overall Size= 33.0"W x 18.5"H x 11.00'L with 0.75' Overlap

Row Length Adjustment= +0.75' x 2.65 sf x 2 rows

33.0" Wide + 6.0" Spacing = 39.0" C-C Row Spacing

2 Chambers/Row x 10.25' Long +0.75' Row Adjustment = 21.25' Row Length +40.0" End Stone x 2 = 27.92' Base Length

2 Rows x 33.0" Wide + 6.0" Spacing x 1 + 40.0" Side Stone x 2 = 12.67' Base Width

6.0" Base + 18.5" Chamber Height + 6.0" Cover = 2.54' Field Height

4 Chambers x 27.2 cf +0.75' Row Adjustment x 2.65 sf x 2 Rows = 112.6 cf Chamber Storage

898.8 cf Field - 112.6 cf Chambers = 786.2 cf Stone x 40.0% Voids = 314.5 cf Stone Storage

Chamber Storage + Stone Storage = 427.1 cf = 0.010 af

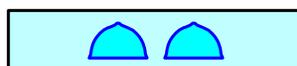
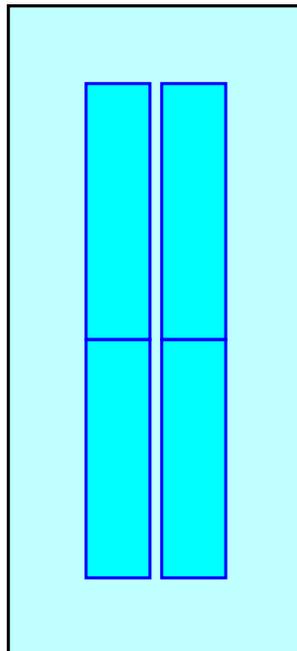
Overall Storage Efficiency = 47.5%

Overall System Size = 27.92' x 12.67' x 2.54'

4 Chambers

33.3 cy Field

29.1 cy Stone



PROPOSED

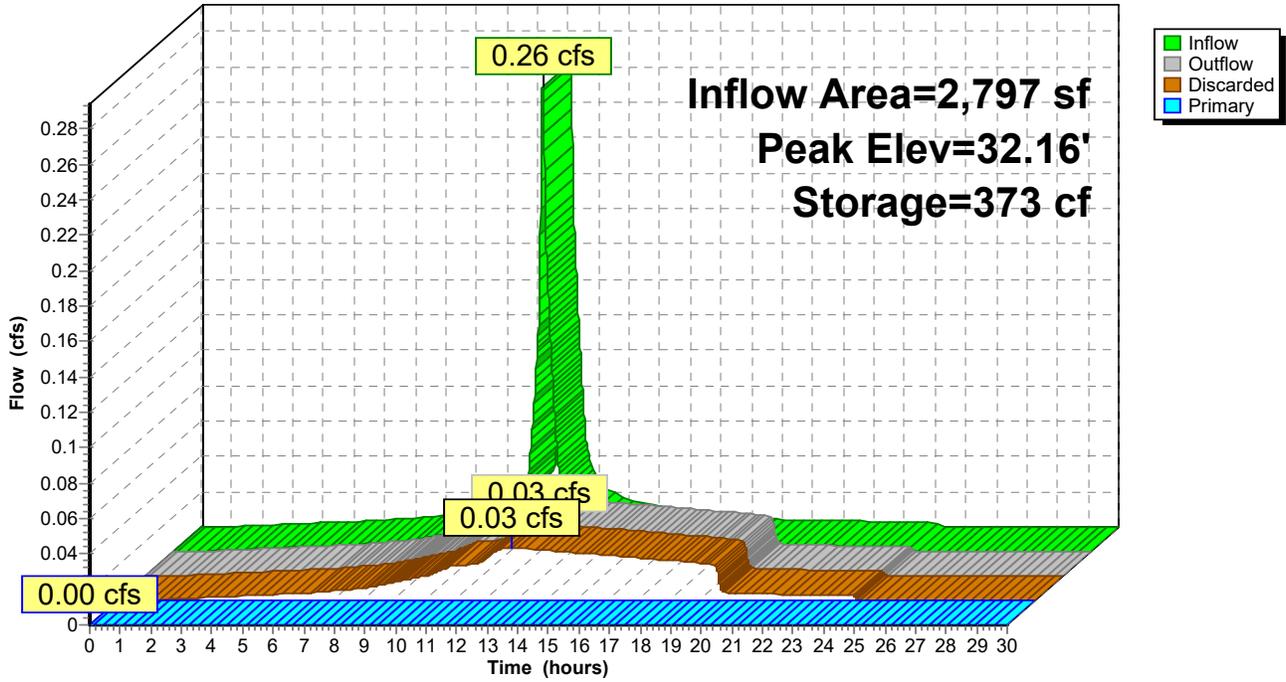
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Type III 24-hr 10-Year Rainfall=4.70"

Pond 4P: SYSTEM

Hydrograph



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Type III 24-hr 10-Year Rainfall=4.70"

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Stage-Area-Storage for Pond 4P: SYSTEM

Elevation (feet)	Wetted (sq-ft)	Storage (cubic-feet)	Elevation (feet)	Wetted (sq-ft)	Storage (cubic-feet)
30.00	354	0	32.65	560	428
30.05	358	7	32.70	560	428
30.10	362	14	32.75	560	428
30.15	366	21	32.80	560	429
30.20	370	28	32.85	560	429
30.25	374	35	32.90	560	429
30.30	378	42	32.95	560	429
30.35	382	50	33.00	560	430
30.40	386	57	33.05	560	430
30.45	390	64	33.10	560	430
30.50	394	71	33.15	560	430
30.55	398	81	33.20	560	431
30.60	402	91	33.25	560	431
30.65	406	101	33.30	560	431
30.70	410	111	33.35	560	431
30.75	414	121	33.40	560	432
30.80	419	131	33.45	560	432
30.85	423	141	33.50	560	432
30.90	427	151	33.55	560	435
30.95	431	161	33.60	560	437
31.00	435	171	33.65	560	440
31.05	439	181	33.70	560	442
31.10	443	191			
31.15	447	201			
31.20	451	211			
31.25	455	220			
31.30	459	230			
31.35	463	239			
31.40	467	249			
31.45	471	258			
31.50	475	268			
31.55	479	277			
31.60	483	286			
31.65	488	295			
31.70	492	303			
31.75	496	312			
31.80	500	320			
31.85	504	328			
31.90	508	336			
31.95	512	343			
32.00	516	350			
32.05	520	358			
32.10	524	365			
32.15	528	372			
32.20	532	379			
32.25	536	386			
32.30	540	393			
32.35	544	400			
32.40	548	407			
32.45	552	414			
32.50	557	421			
32.55	560	427			
32.60	560	428			

PROPOSED

Type III 24-hr 10-Year Rainfall=4.70"

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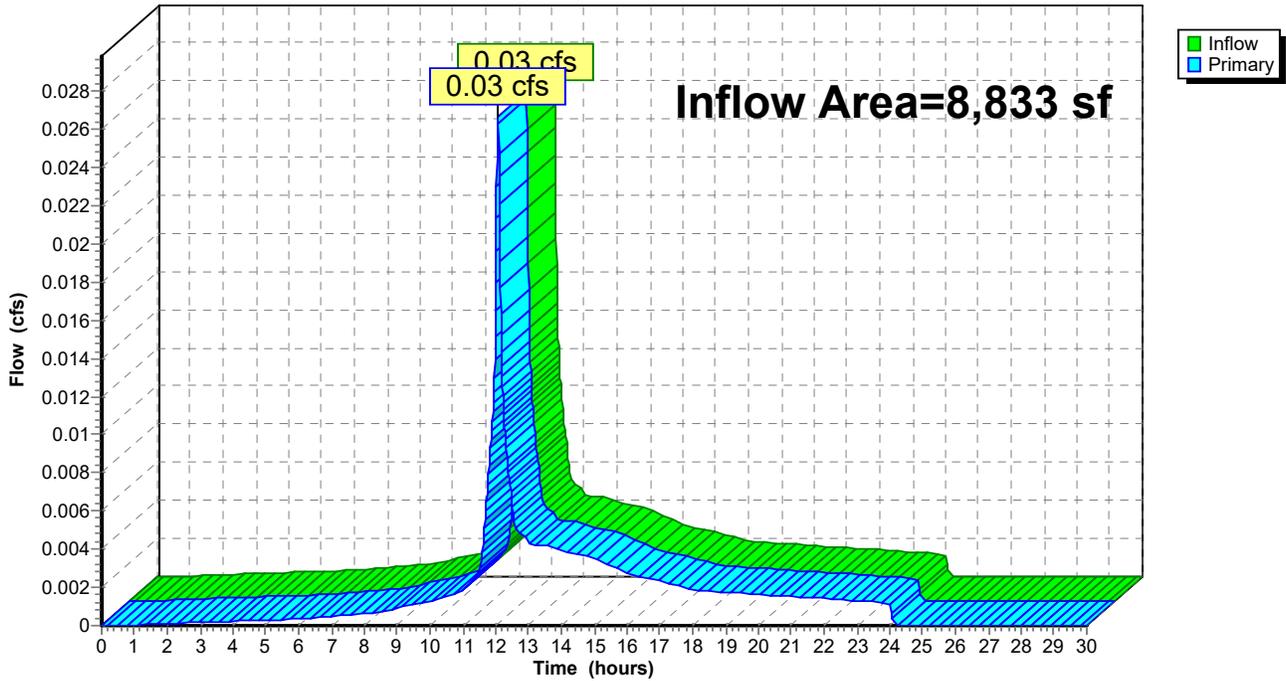
Summary for Link 3L: PROPOSED

Inflow Area = 8,833 sf, 34.43% Impervious, Inflow Depth = 0.22" for 10-Year event
Inflow = 0.03 cfs @ 12.07 hrs, Volume= 160 cf
Primary = 0.03 cfs @ 12.07 hrs, Volume= 160 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs

Link 3L: PROPOSED

Hydrograph



PROPOSED

Type III 24-hr 25-Year Rainfall=5.50"

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Time span=0.00-30.00 hrs, dt=0.01 hrs, 3001 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 DRIVEWAY Runoff Area=791 sf 100.00% Impervious Runoff Depth=5.26"
Tc=15.0 min CN=98 Runoff=0.07 cfs 347 cf

Subcatchment 4S: PROPOSED LANDSCAPE Runoff Area=5,792 sf 0.00% Impervious Runoff Depth=0.31"
Tc=5.0 min CN=39 Runoff=0.01 cfs 151 cf

Subcatchment 7S: PROPOSED ROOF Runoff Area=2,006 sf 100.00% Impervious Runoff Depth=5.26"
Tc=5.0 min CN=98 Runoff=0.26 cfs 880 cf

Subcatchment 8S: UNCONNECTED Runoff Area=244 sf 100.00% Impervious Runoff Depth=5.26"
Tc=5.0 min CN=98 Runoff=0.03 cfs 107 cf

Pond 4P: SYSTEM Peak Elev=32.56' Storage=427 cf Inflow=0.31 cfs 1,227 cf
Discarded=0.03 cfs 1,186 cf Primary=0.07 cfs 40 cf Outflow=0.10 cfs 1,227 cf

Link 3L: PROPOSED Inflow=0.09 cfs 298 cf
Primary=0.09 cfs 298 cf

Total Runoff Area = 8,833 sf Runoff Volume = 1,484 cf Average Runoff Depth = 2.02"
65.57% Pervious = 5,792 sf 34.43% Impervious = 3,041 sf

PROPOSED

Type III 24-hr 25-Year Rainfall=5.50"

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Summary for Subcatchment 2S: PROPOSED DRIVEWAY

Runoff = 0.07 cfs @ 12.19 hrs, Volume= 347 cf, Depth= 5.26"

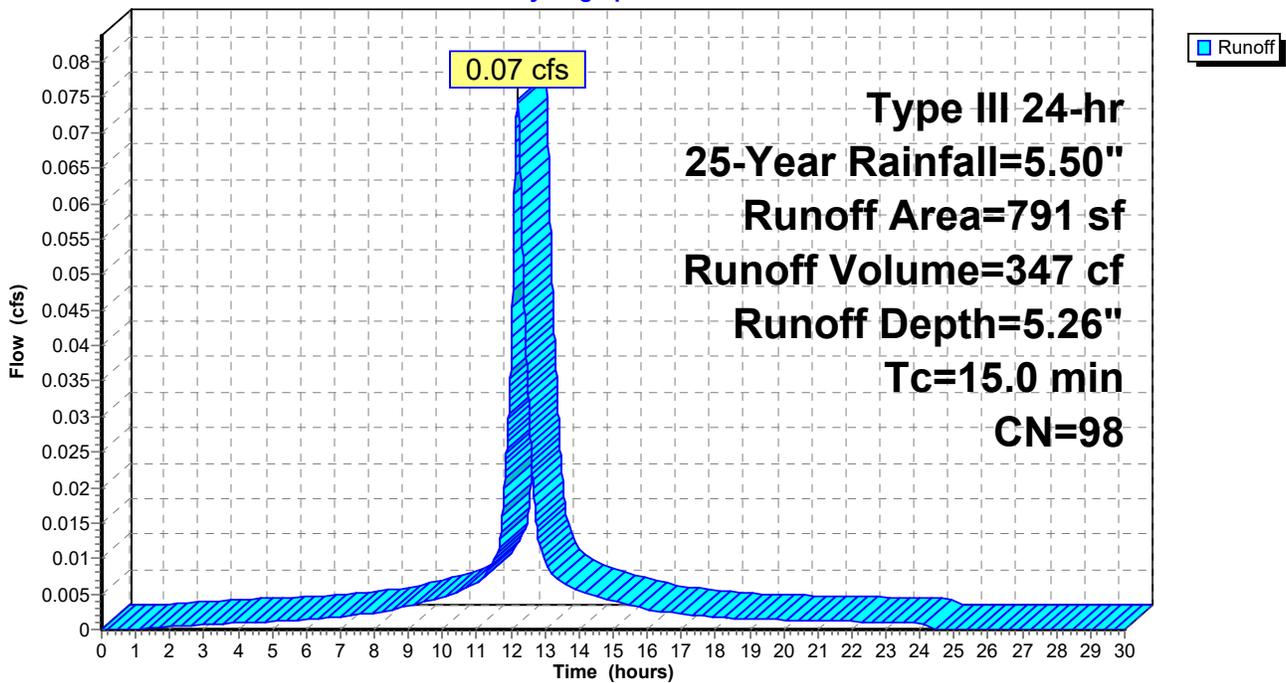
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 25-Year Rainfall=5.50"

Area (sf)	CN	Description
* 791	98	Driveway, HSG A
791		100.00% Impervious Area

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

Subcatchment 2S: PROPOSED DRIVEWAY

Hydrograph



PROPOSED

Type III 24-hr 25-Year Rainfall=5.50"

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Summary for Subcatchment 4S: PROPOSED LANDSCAPE AREA

Runoff = 0.01 cfs @ 12.38 hrs, Volume= 151 cf, Depth= 0.31"

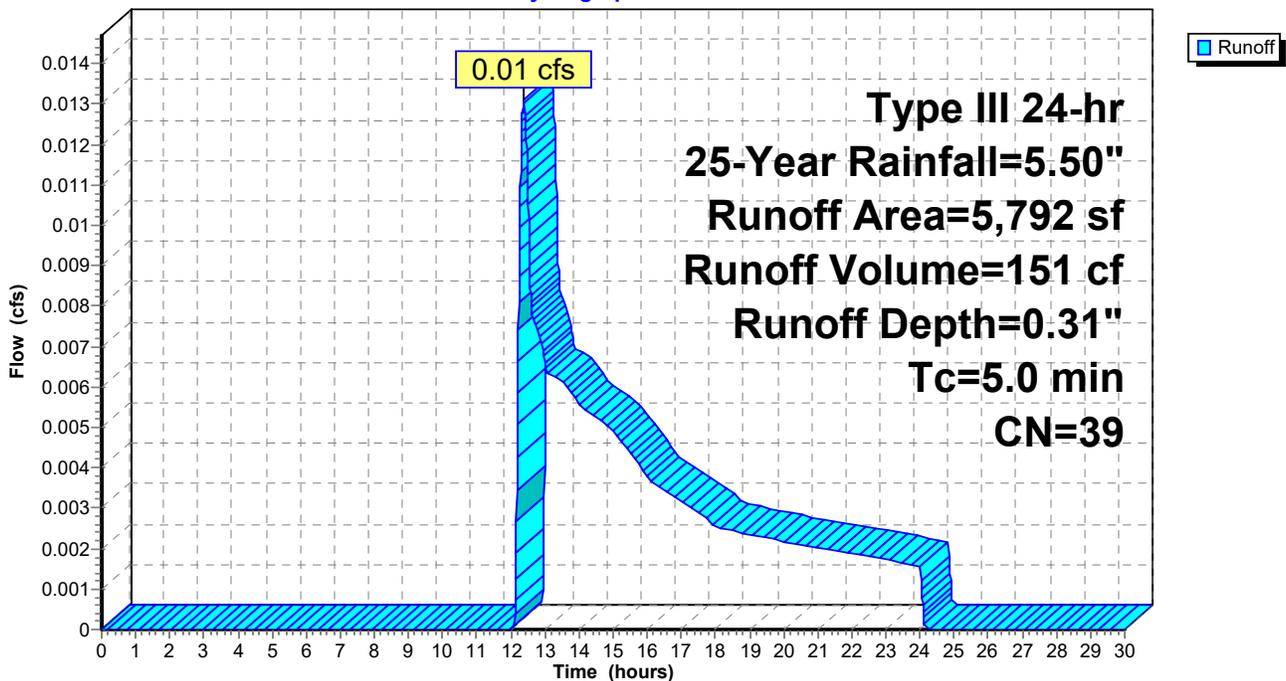
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 25-Year Rainfall=5.50"

Area (sf)	CN	Description
5,792	39	>75% Grass cover, Good, HSG A
5,792		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



PROPOSED

Type III 24-hr 25-Year Rainfall=5.50"

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Summary for Subcatchment 7S: PROPOSED ROOF (CONNECTED)

Runoff = 0.26 cfs @ 12.07 hrs, Volume= 880 cf, Depth= 5.26"

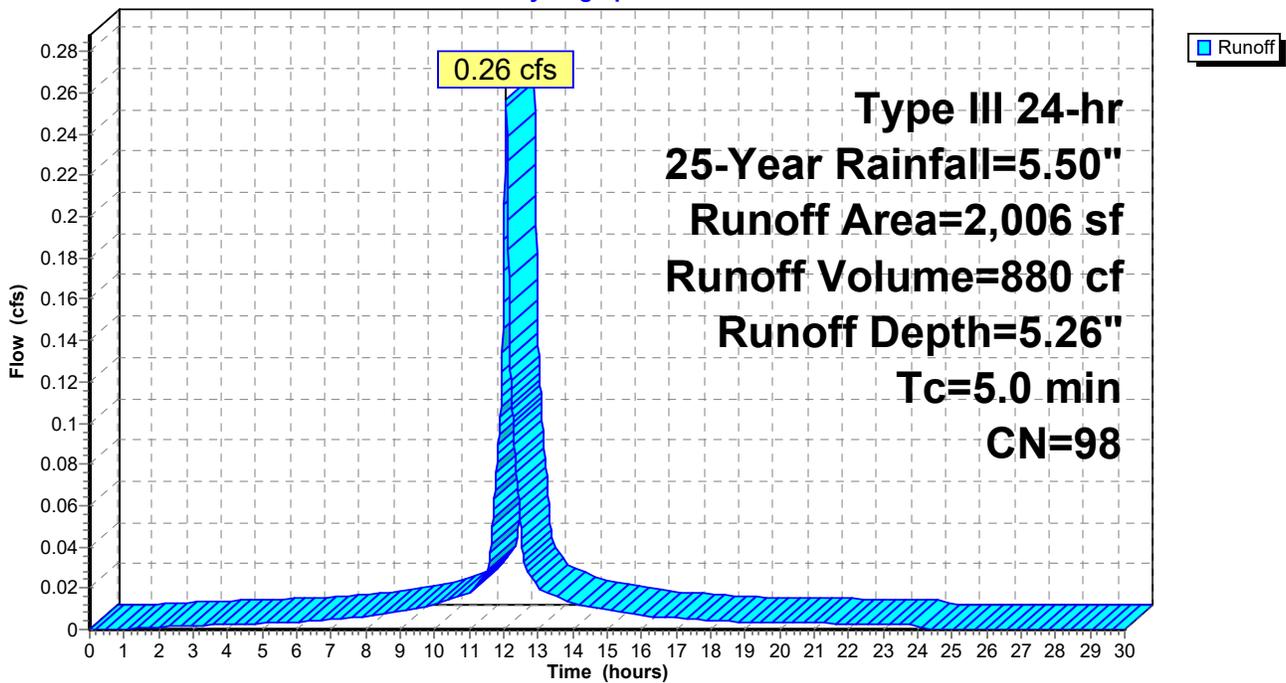
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 25-Year Rainfall=5.50"

Area (sf)	CN	Description
2,006	98	Roofs, HSG A
2,006		100.00% Impervious Area

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

Subcatchment 7S: PROPOSED ROOF (CONNECTED)

Hydrograph



PROPOSED

Type III 24-hr 25-Year Rainfall=5.50"

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Summary for Subcatchment 8S: UNCONNECTED IMPERVIOUS

Runoff = 0.03 cfs @ 12.07 hrs, Volume= 107 cf, Depth= 5.26"

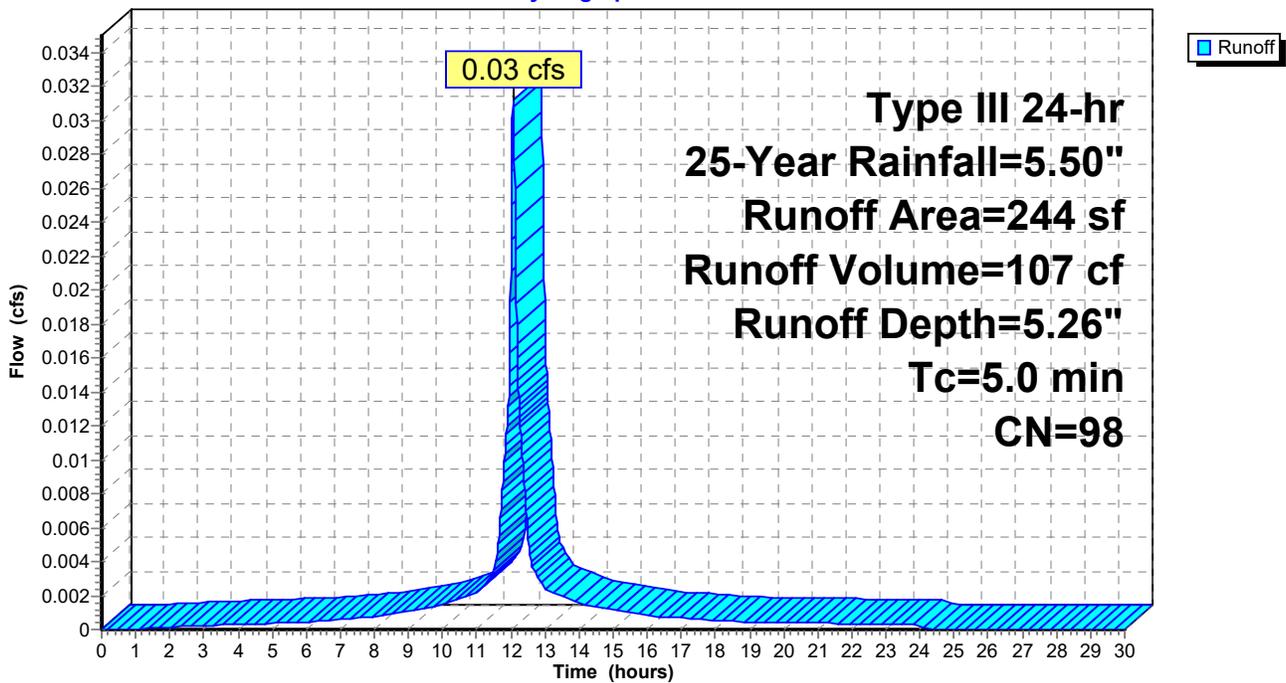
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 25-Year Rainfall=5.50"

Area (sf)	CN	Description
* 244	98	General Impervious, HSG A
244		100.00% Impervious Area

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

Subcatchment 8S: UNCONNECTED IMPERVIOUS

Hydrograph



PROPOSED

Type III 24-hr 25-Year Rainfall=5.50"

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Summary for Pond 4P: SYSTEM

Inflow Area = 2,797 sf, 100.00% Impervious, Inflow Depth = 5.26" for 25-Year event
 Inflow = 0.31 cfs @ 12.08 hrs, Volume= 1,227 cf
 Outflow = 0.10 cfs @ 12.48 hrs, Volume= 1,227 cf, Atten= 68%, Lag= 24.3 min
 Discarded = 0.03 cfs @ 12.48 hrs, Volume= 1,186 cf
 Primary = 0.07 cfs @ 12.48 hrs, Volume= 40 cf

Routing by Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
 Peak Elev= 32.56' @ 12.48 hrs Surf.Area= 354 sf Storage= 427 cf

Plug-Flow detention time= 107.2 min calculated for 1,226 cf (100% of inflow)
 Center-of-Mass det. time= 107.1 min (855.3 - 748.2)

Volume	Invert	Avail.Storage	Storage Description
#1A	30.00'	314 cf	12.67'W x 27.92'L x 2.54'H Field A 899 cf Overall - 113 cf Embedded = 786 cf x 40.0% Voids
#2A	30.50'	113 cf	Cultec R-150XLHD x 4 Inside #1 Effective Size= 29.8"W x 18.0"H => 2.65 sf x 10.25'L = 27.2 cf Overall Size= 33.0"W x 18.5"H x 11.00'L with 0.75' Overlap Row Length Adjustment= +0.75' x 2.65 sf x 2 rows
#3	32.50'	15 cf	Ponding Listed below -Impervious
		442 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Elevation (feet)	Cum.Store (cubic-feet)
32.50	0
33.50	5
33.70	15

Device	Routing	Invert	Outlet Devices
#1	Discarded	30.00'	2.410 in/hr Exfiltration over Wetted area Phase-In= 0.01'
#2	Primary	32.50'	6.0" Horiz. Orifice/Grate C= 0.600 Limited to weir flow at low heads

Discarded OutFlow Max=0.03 cfs @ 12.48 hrs HW=32.56' (Free Discharge)
 ↳1=Exfiltration (Exfiltration Controls 0.03 cfs)

Primary OutFlow Max=0.07 cfs @ 12.48 hrs HW=32.56' (Free Discharge)
 ↳2=Orifice/Grate (Weir Controls 0.07 cfs @ 0.77 fps)

PROPOSED

Type III 24-hr 25-Year Rainfall=5.50"

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Pond 4P: SYSTEM - Chamber Wizard Field A

Chamber Model = Cultec R-150XLHD (Cultec Recharger® 150XLHD)

Effective Size= 29.8"W x 18.0"H => 2.65 sf x 10.25'L = 27.2 cf

Overall Size= 33.0"W x 18.5"H x 11.00'L with 0.75' Overlap

Row Length Adjustment= +0.75' x 2.65 sf x 2 rows

33.0" Wide + 6.0" Spacing = 39.0" C-C Row Spacing

2 Chambers/Row x 10.25' Long +0.75' Row Adjustment = 21.25' Row Length +40.0" End Stone x 2 = 27.92' Base Length

2 Rows x 33.0" Wide + 6.0" Spacing x 1 + 40.0" Side Stone x 2 = 12.67' Base Width

6.0" Base + 18.5" Chamber Height + 6.0" Cover = 2.54' Field Height

4 Chambers x 27.2 cf +0.75' Row Adjustment x 2.65 sf x 2 Rows = 112.6 cf Chamber Storage

898.8 cf Field - 112.6 cf Chambers = 786.2 cf Stone x 40.0% Voids = 314.5 cf Stone Storage

Chamber Storage + Stone Storage = 427.1 cf = 0.010 af

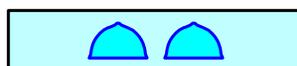
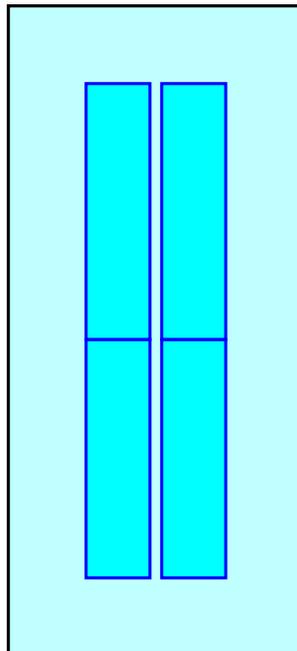
Overall Storage Efficiency = 47.5%

Overall System Size = 27.92' x 12.67' x 2.54'

4 Chambers

33.3 cy Field

29.1 cy Stone



PROPOSED

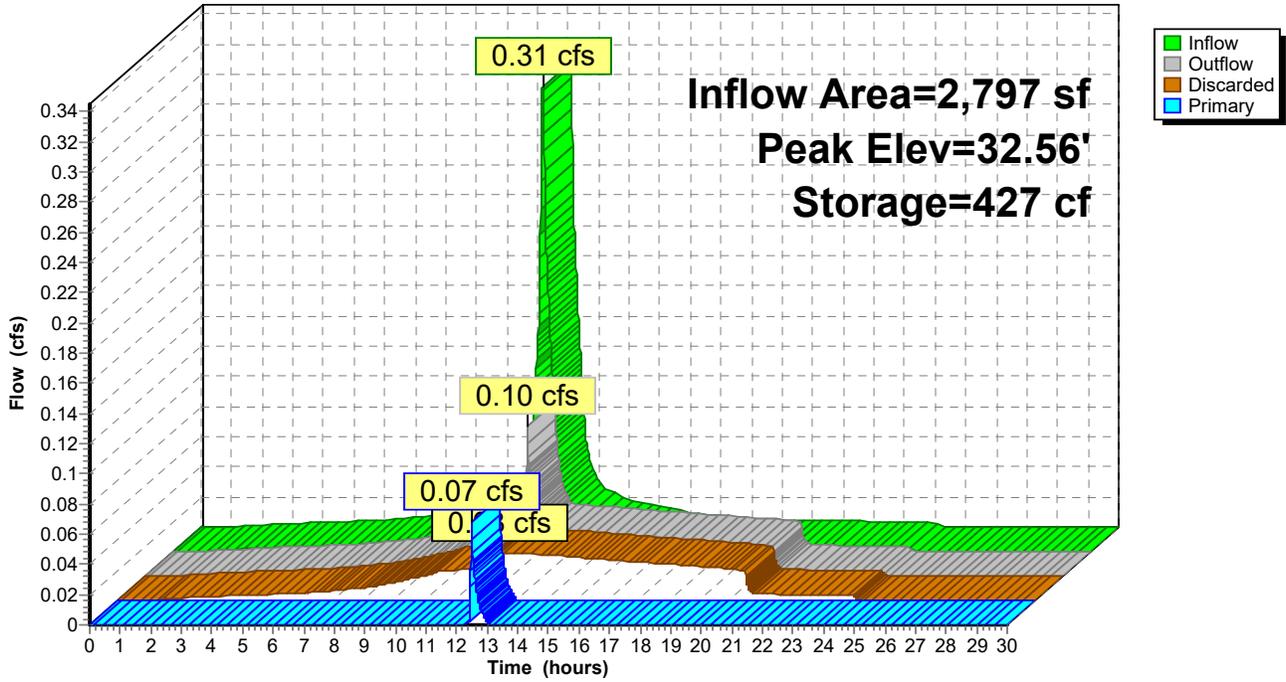
Prepared by SPRUHAN ENGINEERING P.C

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Type III 24-hr 25-Year Rainfall=5.50"

Pond 4P: SYSTEM

Hydrograph



PROPOSED

Type III 24-hr 25-Year Rainfall=5.50"

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Stage-Area-Storage for Pond 4P: SYSTEM

Elevation (feet)	Wetted (sq-ft)	Storage (cubic-feet)	Elevation (feet)	Wetted (sq-ft)	Storage (cubic-feet)
30.00	354	0	32.65	560	428
30.05	358	7	32.70	560	428
30.10	362	14	32.75	560	428
30.15	366	21	32.80	560	429
30.20	370	28	32.85	560	429
30.25	374	35	32.90	560	429
30.30	378	42	32.95	560	429
30.35	382	50	33.00	560	430
30.40	386	57	33.05	560	430
30.45	390	64	33.10	560	430
30.50	394	71	33.15	560	430
30.55	398	81	33.20	560	431
30.60	402	91	33.25	560	431
30.65	406	101	33.30	560	431
30.70	410	111	33.35	560	431
30.75	414	121	33.40	560	432
30.80	419	131	33.45	560	432
30.85	423	141	33.50	560	432
30.90	427	151	33.55	560	435
30.95	431	161	33.60	560	437
31.00	435	171	33.65	560	440
31.05	439	181	33.70	560	442
31.10	443	191			
31.15	447	201			
31.20	451	211			
31.25	455	220			
31.30	459	230			
31.35	463	239			
31.40	467	249			
31.45	471	258			
31.50	475	268			
31.55	479	277			
31.60	483	286			
31.65	488	295			
31.70	492	303			
31.75	496	312			
31.80	500	320			
31.85	504	328			
31.90	508	336			
31.95	512	343			
32.00	516	350			
32.05	520	358			
32.10	524	365			
32.15	528	372			
32.20	532	379			
32.25	536	386			
32.30	540	393			
32.35	544	400			
32.40	548	407			
32.45	552	414			
32.50	557	421			
32.55	560	427			
32.60	560	428			

PROPOSED

Type III 24-hr 25-Year Rainfall=5.50"

Prepared by SPRUHAN ENGINEERING P.C

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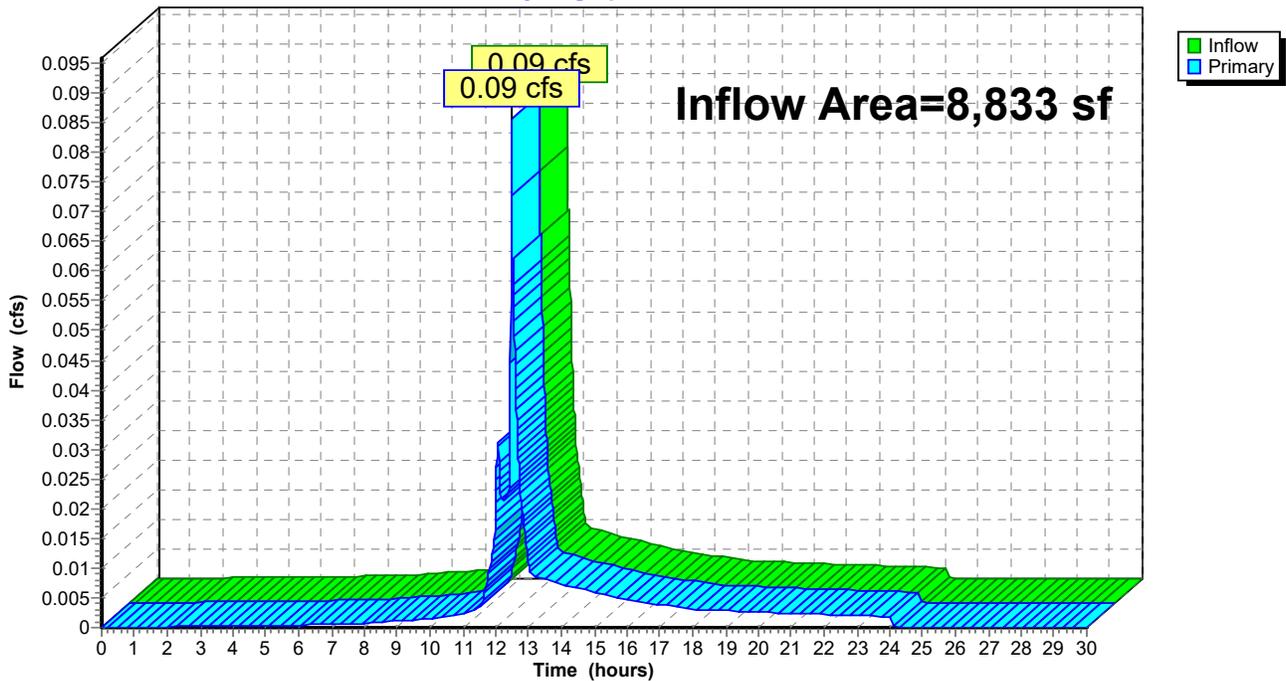
Summary for Link 3L: PROPOSED

Inflow Area = 8,833 sf, 34.43% Impervious, Inflow Depth = 0.40" for 25-Year event
Inflow = 0.09 cfs @ 12.48 hrs, Volume= 298 cf
Primary = 0.09 cfs @ 12.48 hrs, Volume= 298 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs

Link 3L: PROPOSED

Hydrograph



PROPOSED

Type III 24-hr 100-Year Rainfall=6.50"

Prepared by SPRUHAN ENGINEERING P.C

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Time span=0.00-30.00 hrs, dt=0.01 hrs, 3001 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 DRIVEWAY Runoff Area=791 sf 100.00% Impervious Runoff Depth=6.26"
Tc=15.0 min CN=98 Runoff=0.09 cfs 413 cf

Subcatchment 4S: PROPOSED LANDSCAPE Runoff Area=5,792 sf 0.00% Impervious Runoff Depth=0.60"
Tc=5.0 min CN=39 Runoff=0.04 cfs 289 cf

Subcatchment 7S: PROPOSED ROOF Runoff Area=2,006 sf 100.00% Impervious Runoff Depth=6.26"
Tc=5.0 min CN=98 Runoff=0.30 cfs 1,047 cf

Subcatchment 8S: UNCONNECTED Runoff Area=244 sf 100.00% Impervious Runoff Depth=6.26"
Tc=5.0 min CN=98 Runoff=0.04 cfs 127 cf

Pond 4P: SYSTEM Peak Elev=32.61' Storage=428 cf Inflow=0.36 cfs 1,459 cf
Discarded=0.03 cfs 1,296 cf Primary=0.20 cfs 164 cf Outflow=0.23 cfs 1,459 cf

Link 3L: PROPOSED Inflow=0.25 cfs 580 cf
Primary=0.25 cfs 580 cf

Total Runoff Area = 8,833 sf Runoff Volume = 1,875 cf Average Runoff Depth = 2.55"
65.57% Pervious = 5,792 sf 34.43% Impervious = 3,041 sf

PROPOSED

Type III 24-hr 100-Year Rainfall=6.50"

Prepared by SPRUHAN ENGINEERING P.C

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Summary for Subcatchment 2S: PROPOSED DRIVEWAY

Runoff = 0.09 cfs @ 12.19 hrs, Volume= 413 cf, Depth= 6.26"

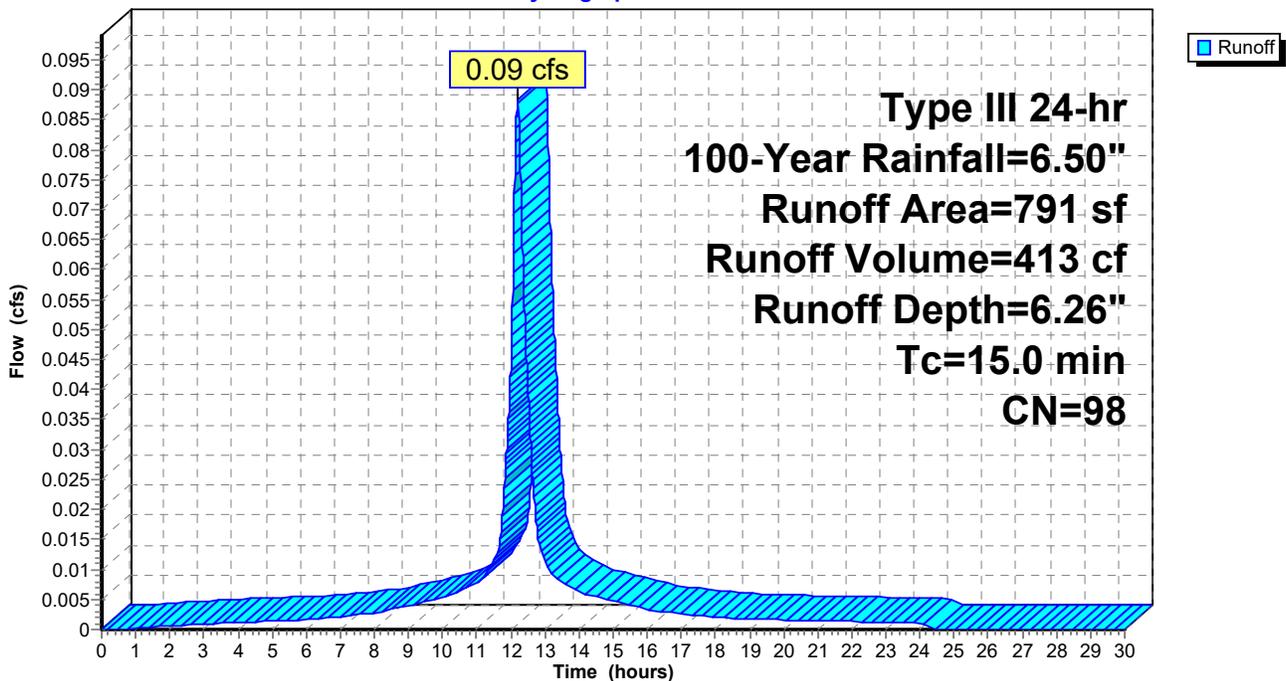
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-Year Rainfall=6.50"

Area (sf)	CN	Description
* 791	98	Driveway, HSG A
791		100.00% Impervious Area

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

Subcatchment 2S: PROPOSED DRIVEWAY

Hydrograph



PROPOSED

Type III 24-hr 100-Year Rainfall=6.50"

Prepared by SPRUHAN ENGINEERING P.C

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Summary for Subcatchment 4S: PROPOSED LANDSCAPE AREA

Runoff = 0.04 cfs @ 12.28 hrs, Volume= 289 cf, Depth= 0.60"

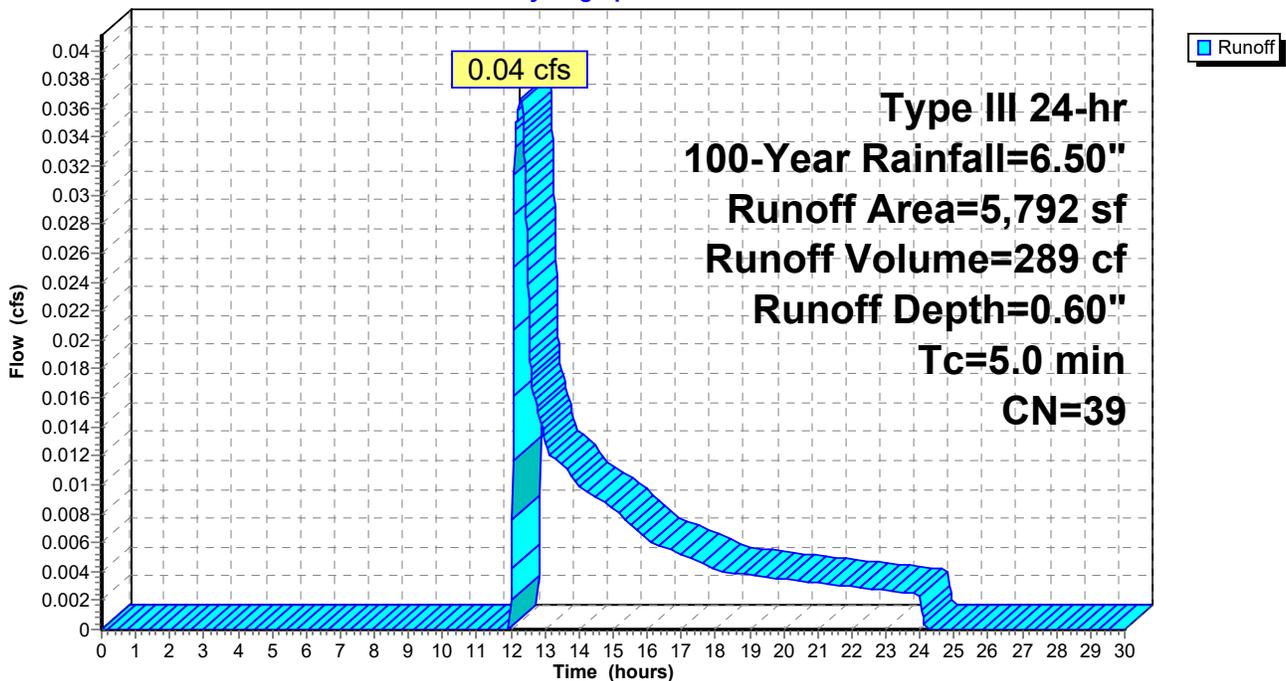
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-Year Rainfall=6.50"

Area (sf)	CN	Description
5,792	39	>75% Grass cover, Good, HSG A
5,792		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



PROPOSED

Type III 24-hr 100-Year Rainfall=6.50"

Prepared by SPRUHAN ENGINEERING P.C

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Summary for Subcatchment 7S: PROPOSED ROOF (CONNECTED)

Runoff = 0.30 cfs @ 12.07 hrs, Volume= 1,047 cf, Depth= 6.26"

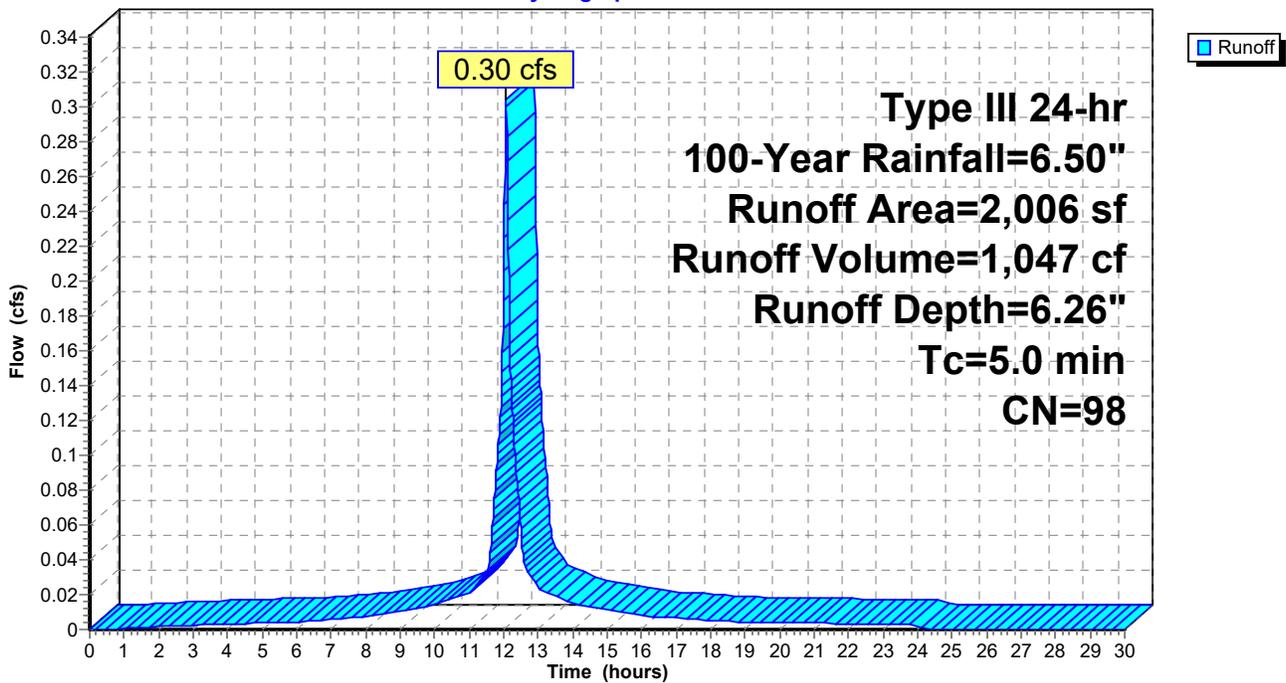
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-Year Rainfall=6.50"

Area (sf)	CN	Description
2,006	98	Roofs, HSG A
2,006		100.00% Impervious Area

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

Subcatchment 7S: PROPOSED ROOF (CONNECTED)

Hydrograph



PROPOSED

Type III 24-hr 100-Year Rainfall=6.50"

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Summary for Subcatchment 8S: UNCONNECTED IMPERVIOUS

Runoff = 0.04 cfs @ 12.07 hrs, Volume= 127 cf, Depth= 6.26"

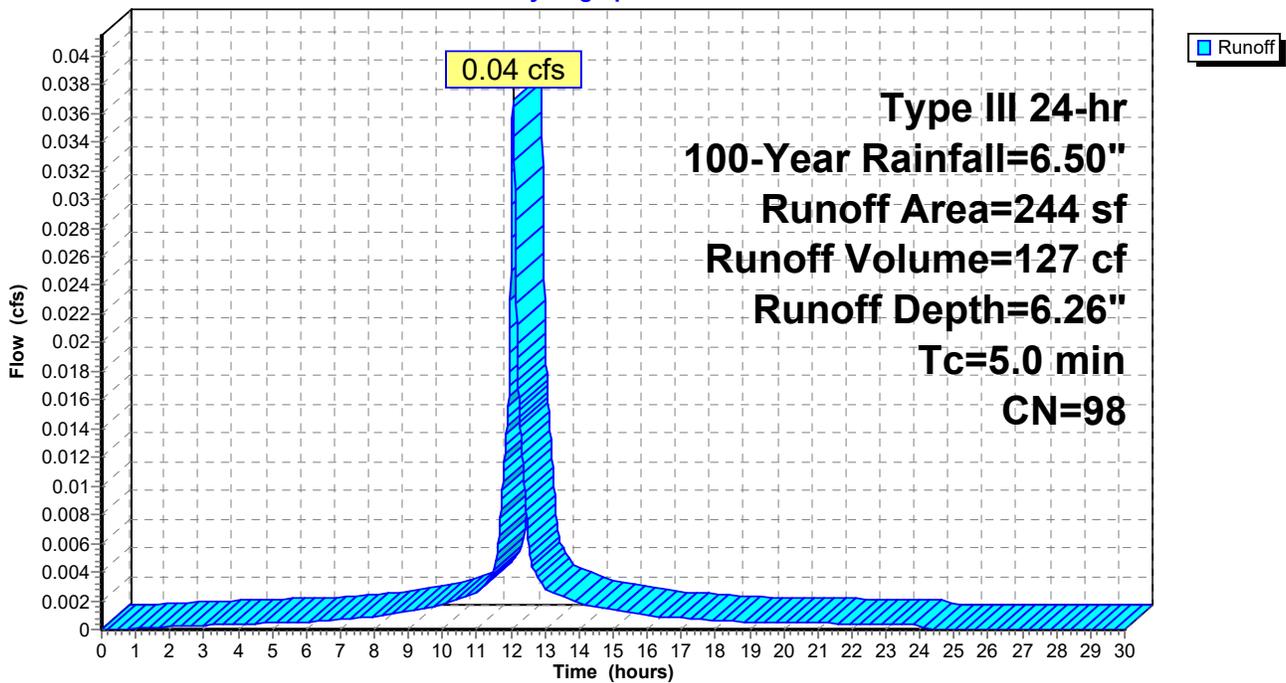
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-Year Rainfall=6.50"

Area (sf)	CN	Description
* 244	98	General Impervious, HSG A
244		100.00% Impervious Area

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

Subcatchment 8S: UNCONNECTED IMPERVIOUS

Hydrograph



PROPOSED

Type III 24-hr 100-Year Rainfall=6.50"

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Summary for Pond 4P: SYSTEM

Inflow Area = 2,797 sf, 100.00% Impervious, Inflow Depth = 6.26" for 100-Year event
 Inflow = 0.36 cfs @ 12.08 hrs, Volume= 1,459 cf
 Outflow = 0.23 cfs @ 12.24 hrs, Volume= 1,459 cf, Atten= 37%, Lag= 10.1 min
 Discarded = 0.03 cfs @ 12.24 hrs, Volume= 1,296 cf
 Primary = 0.20 cfs @ 12.24 hrs, Volume= 164 cf

Routing by Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
 Peak Elev= 32.61' @ 12.24 hrs Surf.Area= 354 sf Storage= 428 cf

Plug-Flow detention time= 100.6 min calculated for 1,459 cf (100% of inflow)
 Center-of-Mass det. time= 100.6 min (846.3 - 745.7)

Volume	Invert	Avail.Storage	Storage Description
#1A	30.00'	314 cf	12.67'W x 27.92'L x 2.54'H Field A 899 cf Overall - 113 cf Embedded = 786 cf x 40.0% Voids
#2A	30.50'	113 cf	Cultec R-150XLHD x 4 Inside #1 Effective Size= 29.8"W x 18.0"H => 2.65 sf x 10.25'L = 27.2 cf Overall Size= 33.0"W x 18.5"H x 11.00'L with 0.75' Overlap Row Length Adjustment= +0.75' x 2.65 sf x 2 rows
#3	32.50'	15 cf	Ponding Listed below -Impervious
		442 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Elevation (feet)	Cum.Store (cubic-feet)
32.50	0
33.50	5
33.70	15

Device	Routing	Invert	Outlet Devices
#1	Discarded	30.00'	2.410 in/hr Exfiltration over Wetted area Phase-In= 0.01'
#2	Primary	32.50'	6.0" Horiz. Orifice/Grate C= 0.600 Limited to weir flow at low heads

Discarded OutFlow Max=0.03 cfs @ 12.24 hrs HW=32.61' (Free Discharge)
 ↳1=Exfiltration (Exfiltration Controls 0.03 cfs)

Primary OutFlow Max=0.18 cfs @ 12.24 hrs HW=32.61' (Free Discharge)
 ↳2=Orifice/Grate (Weir Controls 0.18 cfs @ 1.07 fps)

PROPOSED

Type III 24-hr 100-Year Rainfall=6.50"

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Pond 4P: SYSTEM - Chamber Wizard Field A

Chamber Model = Cultec R-150XLHD (Cultec Recharger® 150XLHD)

Effective Size= 29.8"W x 18.0"H => 2.65 sf x 10.25'L = 27.2 cf

Overall Size= 33.0"W x 18.5"H x 11.00'L with 0.75' Overlap

Row Length Adjustment= +0.75' x 2.65 sf x 2 rows

33.0" Wide + 6.0" Spacing = 39.0" C-C Row Spacing

2 Chambers/Row x 10.25' Long +0.75' Row Adjustment = 21.25' Row Length +40.0" End Stone x 2 = 27.92' Base Length

2 Rows x 33.0" Wide + 6.0" Spacing x 1 + 40.0" Side Stone x 2 = 12.67' Base Width

6.0" Base + 18.5" Chamber Height + 6.0" Cover = 2.54' Field Height

4 Chambers x 27.2 cf +0.75' Row Adjustment x 2.65 sf x 2 Rows = 112.6 cf Chamber Storage

898.8 cf Field - 112.6 cf Chambers = 786.2 cf Stone x 40.0% Voids = 314.5 cf Stone Storage

Chamber Storage + Stone Storage = 427.1 cf = 0.010 af

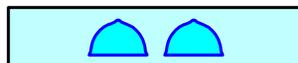
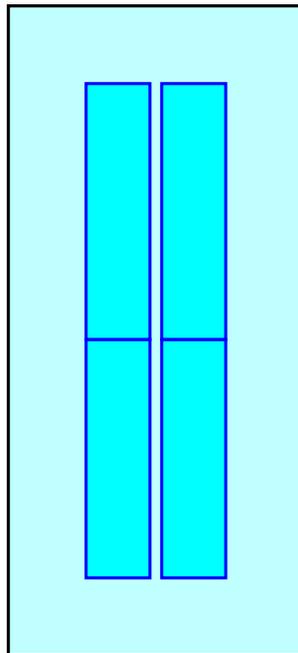
Overall Storage Efficiency = 47.5%

Overall System Size = 27.92' x 12.67' x 2.54'

4 Chambers

33.3 cy Field

29.1 cy Stone



PROPOSED

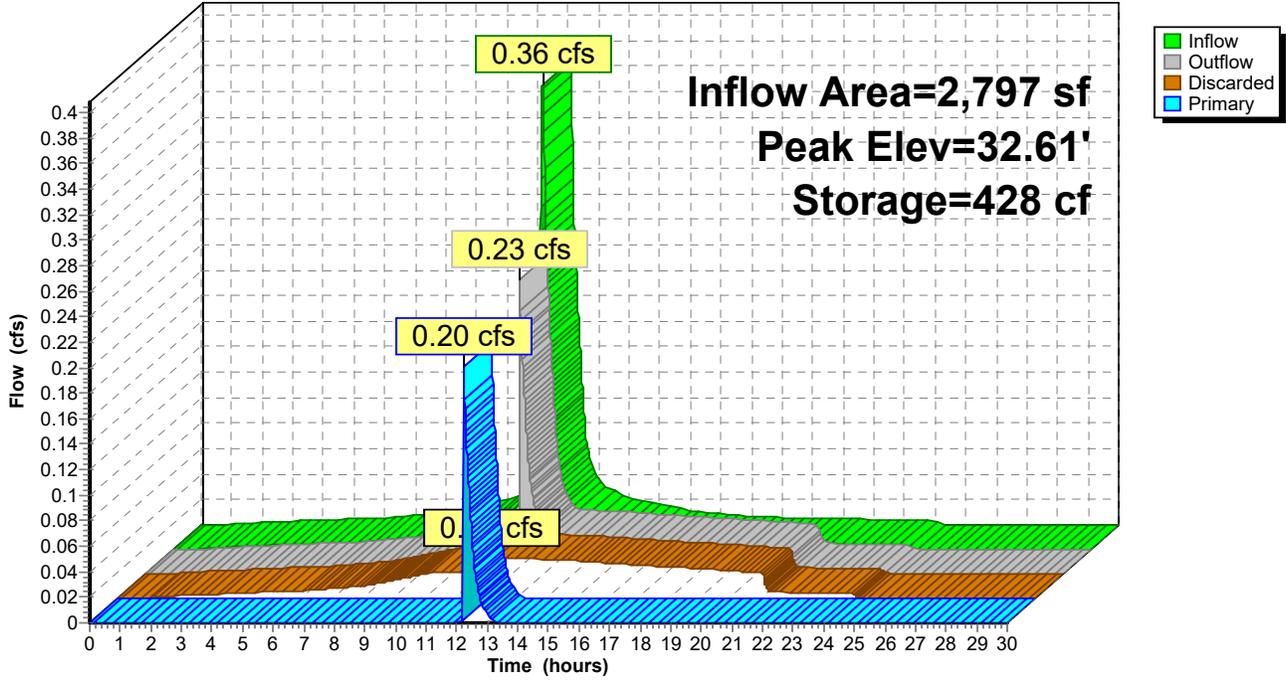
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Type III 24-hr 100-Year Rainfall=6.50"

Pond 4P: SYSTEM

Hydrograph



PROPOSED

Type III 24-hr 100-Year Rainfall=6.50"

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Stage-Area-Storage for Pond 4P: SYSTEM

Elevation (feet)	Wetted (sq-ft)	Storage (cubic-feet)	Elevation (feet)	Wetted (sq-ft)	Storage (cubic-feet)
30.00	354	0	32.65	560	428
30.05	358	7	32.70	560	428
30.10	362	14	32.75	560	428
30.15	366	21	32.80	560	429
30.20	370	28	32.85	560	429
30.25	374	35	32.90	560	429
30.30	378	42	32.95	560	429
30.35	382	50	33.00	560	430
30.40	386	57	33.05	560	430
30.45	390	64	33.10	560	430
30.50	394	71	33.15	560	430
30.55	398	81	33.20	560	431
30.60	402	91	33.25	560	431
30.65	406	101	33.30	560	431
30.70	410	111	33.35	560	431
30.75	414	121	33.40	560	432
30.80	419	131	33.45	560	432
30.85	423	141	33.50	560	432
30.90	427	151	33.55	560	435
30.95	431	161	33.60	560	437
31.00	435	171	33.65	560	440
31.05	439	181	33.70	560	442
31.10	443	191			
31.15	447	201			
31.20	451	211			
31.25	455	220			
31.30	459	230			
31.35	463	239			
31.40	467	249			
31.45	471	258			
31.50	475	268			
31.55	479	277			
31.60	483	286			
31.65	488	295			
31.70	492	303			
31.75	496	312			
31.80	500	320			
31.85	504	328			
31.90	508	336			
31.95	512	343			
32.00	516	350			
32.05	520	358			
32.10	524	365			
32.15	528	372			
32.20	532	379			
32.25	536	386			
32.30	540	393			
32.35	544	400			
32.40	548	407			
32.45	552	414			
32.50	557	421			
32.55	560	427			
32.60	560	428			

PROPOSED

Type III 24-hr 100-Year Rainfall=6.50"

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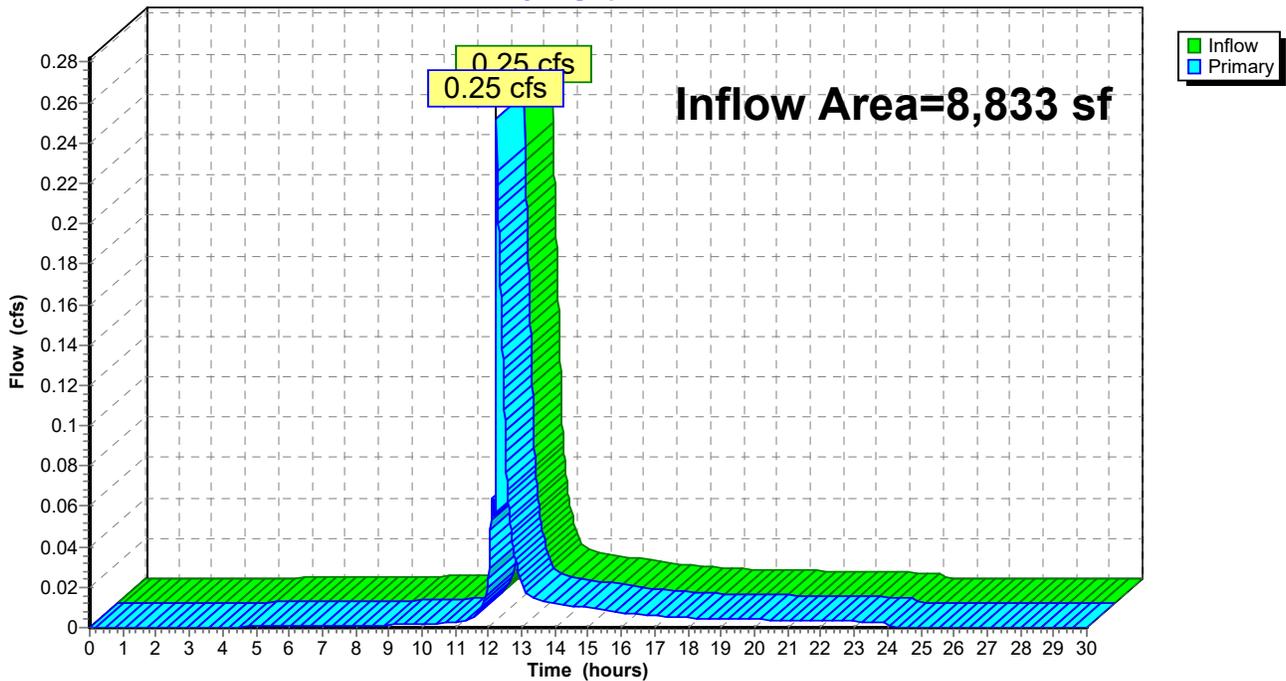
Summary for Link 3L: PROPOSED

Inflow Area = 8,833 sf, 34.43% Impervious, Inflow Depth = 0.79" for 100-Year event
Inflow = 0.25 cfs @ 12.24 hrs, Volume= 580 cf
Primary = 0.25 cfs @ 12.24 hrs, Volume= 580 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs

Link 3L: PROPOSED

Hydrograph

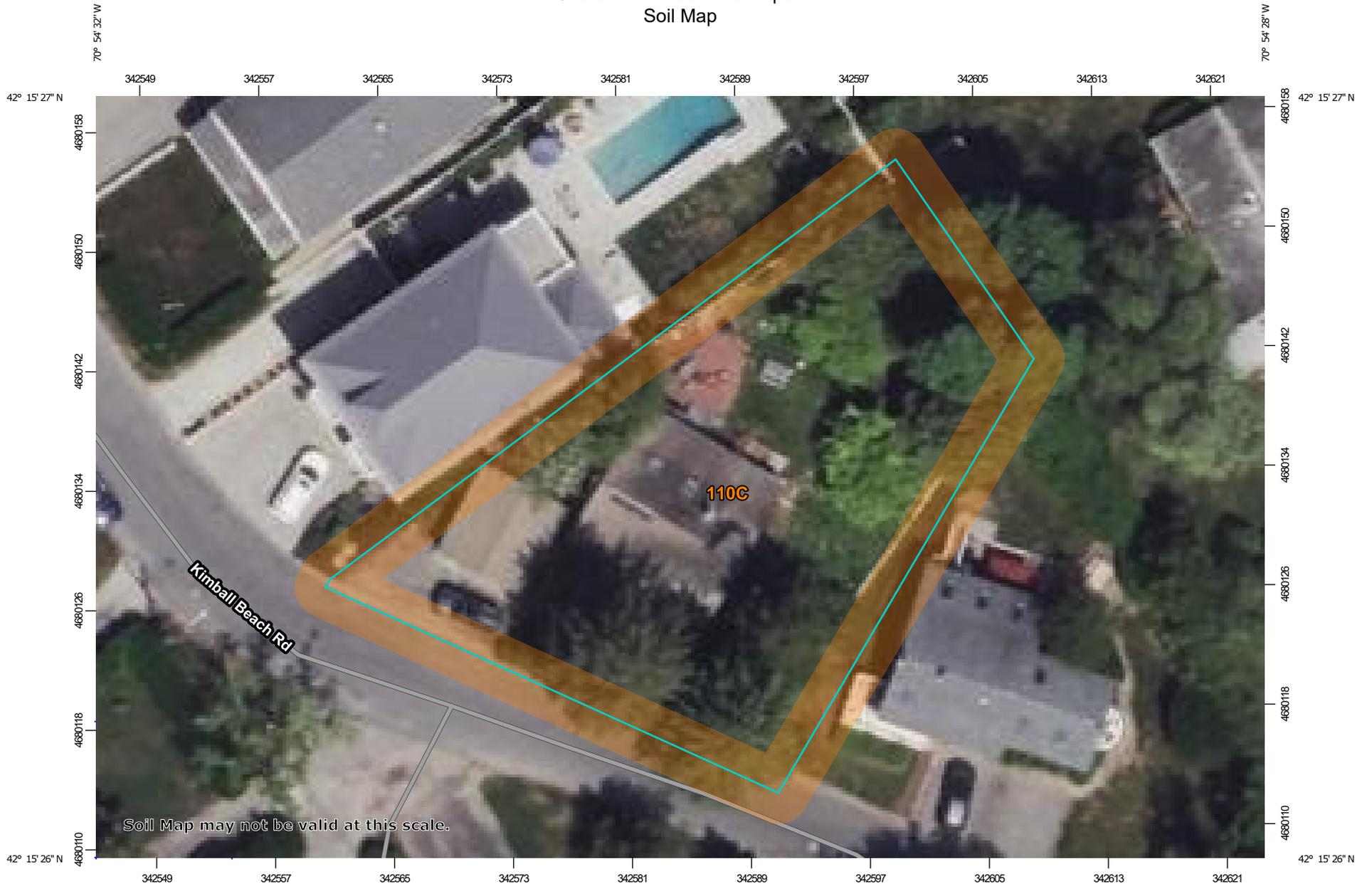


Appendix B – Soils Information

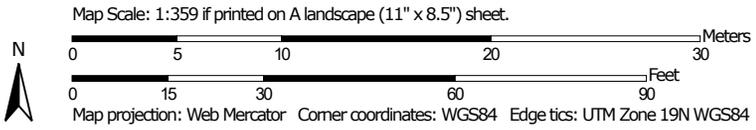
Soil Map

The soil map section includes the soil map for the defined area of interest, a list of soil map units on the map and extent of each map unit, and cartographic symbols displayed on the map. Also presented are various metadata about data used to produce the map, and a description of each soil map unit.

Custom Soil Resource Report Soil Map



Soil Map may not be valid at this scale.



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 1:12,000.

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: Plymouth County, Massachusetts
 Survey Area Data: Version 18, Sep 5, 2025

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

Date(s) aerial images were photographed: May 22, 2022—Jun 5, 2022

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
110C	Canton-Chatfield-Rock outcrop complex, 8 to 15 percent slopes, very stony	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,

Custom Soil Resource Report

onsite investigation is needed to define and locate the soils and miscellaneous areas.

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.

Plymouth County, Massachusetts

110C—Canton-Chatfield-Rock outcrop complex, 8 to 15 percent slopes, very stony

Map Unit Setting

National map unit symbol: 2w82g
Elevation: 0 to 260 feet
Mean annual precipitation: 36 to 71 inches
Mean annual air temperature: 39 to 55 degrees F
Frost-free period: 140 to 240 days
Farmland classification: Not prime farmland

Map Unit Composition

Canton, very stony, and similar soils: 40 percent
Chatfield, very stony, and similar soils: 25 percent
Rock outcrop: 20 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Canton, Very Stony

Setting

Landform: Ridges, moraines, hills
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Convex, linear
Across-slope shape: Convex
Parent material: Coarse-loamy over sandy melt-out till derived from gneiss, granite, and/or schist

Typical profile

O_i - 0 to 2 inches: slightly decomposed plant material
A - 2 to 5 inches: fine sandy loam
Bw₁ - 5 to 16 inches: fine sandy loam
Bw₂ - 16 to 22 inches: gravelly fine sandy loam
2C - 22 to 67 inches: gravelly loamy sand

Properties and qualities

Slope: 8 to 15 percent
Surface area covered with cobbles, stones or boulders: 1.6 percent
Depth to restrictive feature: 19 to 39 inches to strongly contrasting textural stratification
Drainage class: Well drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (K_{sat}): Moderately low to high (0.14 to 14.17 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Maximum salinity: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Available water supply, 0 to 60 inches: Low (about 3.6 inches)

Interpretive groups

Land capability classification (irrigated): None specified

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Land capability classification (nonirrigated): 6s
Hydrologic Soil Group: B
Ecological site: F144AY034CT - Well Drained Till Uplands
Hydric soil rating: No

Description of Chatfield, Very Stony

Setting

Landform: Ridges, hills
Landform position (two-dimensional): Summit, shoulder, backslope
Landform position (three-dimensional): Nose slope, side slope, crest
Down-slope shape: Convex
Across-slope shape: Linear, convex
Parent material: Coarse-loamy melt-out till derived from granite, gneiss, and/or schist

Typical profile

O_i - 0 to 1 inches: slightly decomposed plant material
A - 1 to 2 inches: fine sandy loam
B_w - 2 to 30 inches: gravelly fine sandy loam
2R - 30 to 40 inches: bedrock

Properties and qualities

Slope: 8 to 15 percent
Surface area covered with cobbles, stones or boulders: 1.6 percent
Depth to restrictive feature: 20 to 41 inches to lithic bedrock
Drainage class: Well drained
Runoff class: High
Capacity of the most limiting layer to transmit water (K_{sat}): Very low (0.00 to 0.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Maximum salinity: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Available water supply, 0 to 60 inches: Low (about 4.3 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 6s
Hydrologic Soil Group: B
Ecological site: F144AY034CT - Well Drained Till Uplands
Hydric soil rating: No

Description of Rock Outcrop

Setting

Landform: Ridges, hills
Parent material: Igneous and metamorphic rock

Typical profile

R - 0 to 79 inches: bedrock

Properties and qualities

Slope: 8 to 15 percent
Depth to restrictive feature: 0 inches to lithic bedrock
Runoff class: Very high
Capacity of the most limiting layer to transmit water (K_{sat}): Very low (0.00 to 0.00 in/hr)

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Available water supply, 0 to 60 inches: Very low (about 0.0 inches)

Interpretive groups

Land capability classification (irrigated): None specified

Land capability classification (nonirrigated): 8

Hydric soil rating: No

Minor Components

Newfields, very stony

Percent of map unit: 10 percent

Landform: Ground moraines, moraines, hills

Landform position (two-dimensional): Footslope

Landform position (three-dimensional): Base slope

Down-slope shape: Linear

Across-slope shape: Concave

Hydric soil rating: No

Hollis, very stony

Percent of map unit: 5 percent

Landform: Ridges, hills

Landform position (two-dimensional): Summit, shoulder, backslope

Landform position (three-dimensional): Nose slope, side slope, crest

Down-slope shape: Convex

Across-slope shape: Linear, convex

Hydric soil rating: No

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