

TRANE PARK PRELIMINARY STORMWATER REPORT

August 3, 2018

REPORT FOR:
City of La Crosse Engineering Dept.

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TABLE OF CONTENTS

Introduction 1

Design Standards..... 1

Existing Conditions..... 2

Proposed Conditions..... 2

Stormwater Management Summary 2

Calculation summary 3

Introduction

This stormwater management report has been prepared to accompany the submitted plans and stormwater calculations for the proposed redevelopment of Trane Park. The project will consist of a new addition to the existing park shelter, construction of asphalt pavement, concrete driveways, concrete walk, utilities, erosion control, stormwater management, and landscaping. A project location map is provided on Sheet C0-10 in the submitted plan set.

A soils evaluation will be completed by High Cliff Consulting to determine final design infiltration rates according to the requirements of Wisconsin DNR Conservation practice Standard 1002. An NRCS soils report for La Crosse County indicated that soils near the site are of hydrologic soil group A. An infiltration rate of 0.5 in/hr has been assumed for the calculations included in this submittal. The design of the proposed stormwater management will be revised as needed according to the completed soil evaluation

Design Standards

Stormwater management plans and calculations have been prepared to meet the requirements of the City of La Crosse Municipal Code 115-555 (La Crosse County Code Chapter 29) as listed in the table below. The disturbed area for the project is over one acre therefore it will require a Wisconsin DNR WPDES permit and meet the requirements of NR 151 as listed in the table below.

Table 1.1: Design Criteria

	Performance Standard	Requirements
La Crosse County Code of Ordinance Chapter 29	Runoff Control 29.09 (1)	Maintain or reduce peak runoff rates from existing conditions for 10 and 25-year 24 hour design storm events.
	Water Quality 29.09 (2)	Re-development – 60% of load from impervious surfaces other than disconnected rooftops compared to no controls.
	Infiltration 29.09 (3)	Exempt – re-development.
	Thermal Controls 29.09 (4)	N/A – No adjacent cold water streams.
	Protective Areas 29.09 (5)	N/A – No protective areas within proposed site.
	Fueling & Vehicle Maintenance 29.09 (6)	N/A – No proposed fueling or maintenance on site.
Wisconsin Department of Natural Resources NR 151	Total Suspended Solids NR 151.122	Re-development – 40% TSS reduction compared to no controls.
	Peak Discharge NR 151.123	Exempt – re-development.
	Infiltration NR 151.124	Exempt – re-development.
	Protective Areas NR 151.125	N/A – No protective areas within proposed site.
	Fueling & Vehicle Maintenance NR 151.126	N/A – No proposed fueling or maintenance on site.
	Location NR 151.127	BMP's will be located on site.
	Timing NR 151.128	BMP's will be installed prior to final stabilization.

Existing Conditions

The existing site consists of the existing park shelter, asphalt drive, tennis courts, playground, baseball diamond, concrete splash pad, concrete sidewalk, and open park space. The site consists of several separate parcels and City Right-of-Way which will be vacated and parcels combined as part of the project.

The existing site has been separated into 2 watersheds to depict the routing of the runoff from the site as well as run-on from adjacent sites. An existing drainage map showing the drainage areas and land cover can be found in the attachments.

Proposed Conditions

The construction of the proposed site will be separated into two phases. The first phase will consist of a new addition to the existing park shelter along with concrete walk and parking lot. The second phase will consist of multiple areas with playground equipment separated by walking paths and landscaped areas. The proposed site has been separated into 6 watersheds to depict the proposed routing of runoff from the site. It should be noted that runoff from phase II of construction has been included in the proposed stormwater management design. A proposed drainage map showing the drainage areas and land cover can be found in the attachments.

Stormwater Management Summary

Temporary erosion control measures will be implicated for the proposed project prior to the start of construction. Proposed erosion control measures include silt fence, stabilized construction exit, inlet protection, erosion control mat, and a concrete washout area. Locations of the proposed BMPs along with construction activity notes are provided on sheets C1-10 through C1-30 of Appendix A.

Approximate construction sequencing for the project is listed below.

- Install temporary erosion control BMPs
- Stripping topsoil, soil corrections and rough grading
- Footing excavation and construction
- Installation of underground utilities
- Subgrade preparation for parking lot
- Construction of curb and gutter
- Construction of pavement

- Turf restoration and landscaping
- Stabilization and establishment of turf
- Removal of temporary erosion control BMPs

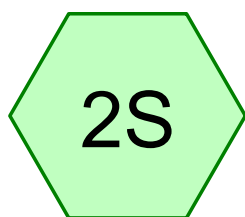
Calculation summary

In conjunction with the plans for the project, calculations were performed for the existing and proposed drainage conditions. Water quantity calculations were completed using hydraulic models developed by utilizing the design data and the HydroCAD Version 10.00-19 computer modeling system. This was used to provide sizing and analysis for the proposed bio-infiltration basin. Hydrographs for existing and proposed scenarios were generated and routed through these models using the Atlas-14 rainfall distribution. The proposed runoff from the analyzed events is provided in the table below. The HydroCAD calculations for the proposed conditions are included in the attachments. It should be noted that drainage area 4 (Phase II) has not been included at this time. The drainage area will be added once final soils information is obtained.

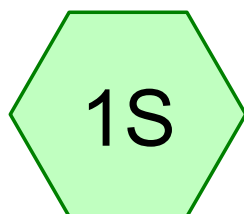
Table 1.2: Site Runoff Calculations

Rainfall Event	Existing Conditions	Proposed Conditions
24-Hour Storm	Peak Flow (CFS)	Peak Flow (CFS)
1-year	0.00	0.02
2-year	0.02	0.04
5-year	0.21	0.13
10-year	0.74	0.26
25-year	2.27	0.49
100-year	6.90	3.27

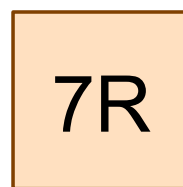
Water quality calculations will be completed by utilizing the design data and the WinSLAMM Version 10.3.3 computer modeling system. The majority of the runoff from the site is routed to the proposed bio-infiltration basin and infiltrated. Therefore it is estimated that greater than 60% reduction will be achieved for the site.



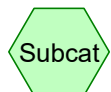
DA-2



DA-1



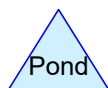
Existing Runoff



Subcat



Reach



Pond



Link

Routing Diagram for 21997 Existing Conditions

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21997 Existing Conditions

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Page 2

Area Listing (all nodes)

Area (acres)	CN	Description (subcatchment-numbers)
6.306	39	>75% Grass cover, Good, HSG A (1S, 2S)
0.694	98	Paved parking, HSG A (1S, 2S)
7.000	45	TOTAL AREA

21997 Existing Conditions

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Page 3

Soil Listing (all nodes)

Area (acres)	Soil Group	Subcatchment Numbers
7.000	HSG A	1S, 2S
0.000	HSG B	
0.000	HSG C	
0.000	HSG D	
0.000	Other	
7.000		TOTAL AREA

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Page 4

Ground Covers (all nodes)

HSG-A (acres)	HSG-B (acres)	HSG-C (acres)	HSG-D (acres)	Other (acres)	Total (acres)	Ground Cover	Subcatchment Numbers
6.306	0.000	0.000	0.000	0.000	6.306	>75% Grass cover, Good	1S, 2S
0.694	0.000	0.000	0.000	0.000	0.694	Paved parking	1S, 2S
7.000	0.000	0.000	0.000	0.000	7.000	TOTAL AREA	

21997 Existing Conditions

PF_Depth_English_PDS 24-hr S0 1-yr Rainfall=2.61"

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Page 5

Time span=0.00-48.00 hrs, dt=0.01 hrs, 4801 points

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN

Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment1S: DA-1

Runoff Area=6.581 ac 10.01% Impervious Runoff Depth=0.00"

Flow Length=260' Slope=0.0050 '/' Tc=23.0 min CN=45 Runoff=0.00 cfs 0.001 af

Subcatchment2S: DA-2

Runoff Area=0.419 ac 8.35% Impervious Runoff Depth=0.00"

Flow Length=70' Slope=0.0390 '/' Tc=5.8 min CN=44 Runoff=0.00 cfs 0.000 af

Reach 7R: Existing Runoff

Inflow=0.00 cfs 0.001 af

Outflow=0.00 cfs 0.001 af

Total Runoff Area = 7.000 ac Runoff Volume = 0.001 af Average Runoff Depth = 0.00"
90.09% Pervious = 6.306 ac 9.91% Impervious = 0.694 ac

21997 Existing Conditions

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PF_Depth_English_PDS 24-hr S0 1-yr Rainfall=2.61"

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Page 6

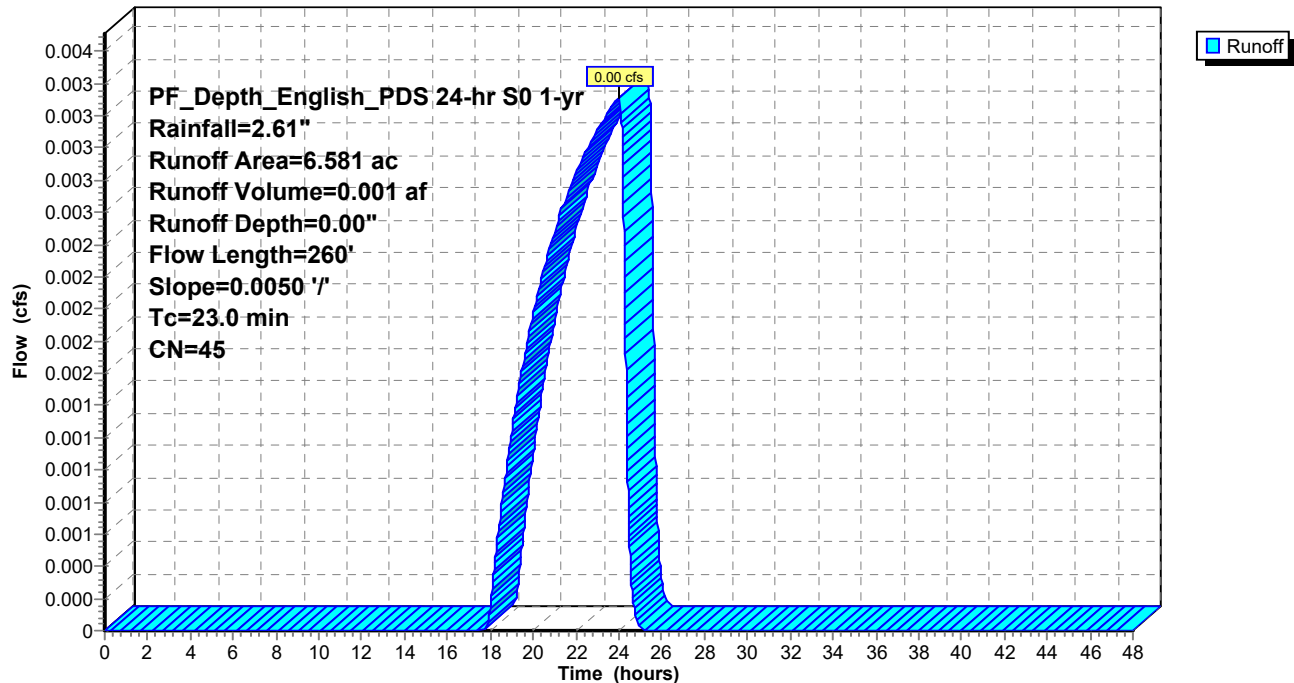
Summary for Subcatchment 1S: DA-1

Runoff = 0.00 cfs @ 24.04 hrs, Volume= 0.001 af, Depth= 0.00"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
PF_Depth_English_PDS 24-hr S0 1-yr Rainfall=2.61"

Area (ac)	CN	Description
0.659	98	Paved parking, HSG A
5.922	39	>75% Grass cover, Good, HSG A
6.581	45	Weighted Average
5.922		89.99% Pervious Area
0.659		10.01% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
17.6	100	0.0050	0.09		Sheet Flow,
					Grass: Short n= 0.150 P2= 3.01"
5.4	160	0.0050	0.49		Shallow Concentrated Flow,
					Short Grass Pasture Kv= 7.0 fps
23.0	260	Total			

Subcatchment 1S: DA-1**Hydrograph**

21997 Existing Conditions

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PF_Depth_English_PDS 24-hr S0 1-yr Rainfall=2.61"

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Page 7

Summary for Subcatchment 2S: DA-2

Runoff = 0.00 cfs @ 24.01 hrs, Volume= 0.000 af, Depth= 0.00"

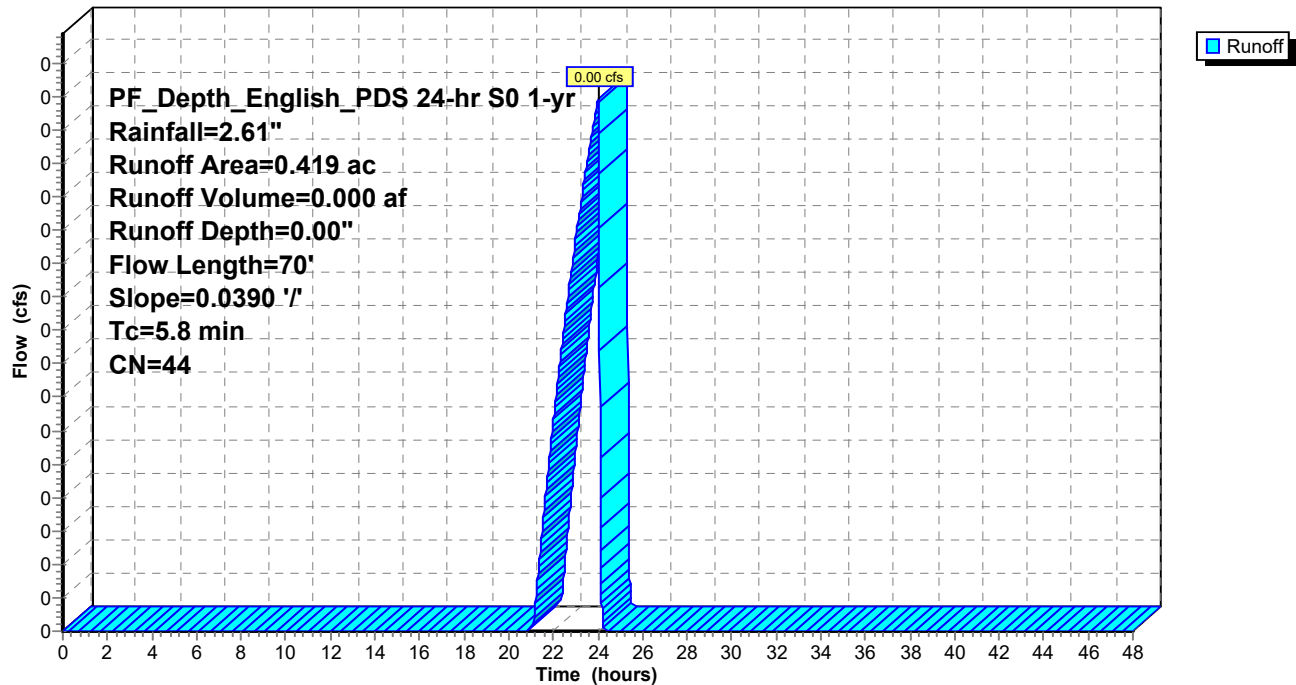
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
PF_Depth_English_PDS 24-hr S0 1-yr Rainfall=2.61"

Area (ac)	CN	Description
0.035	98	Paved parking, HSG A
0.384	39	>75% Grass cover, Good, HSG A
0.419	44	Weighted Average
0.384		91.65% Pervious Area
0.035		8.35% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.8	70	0.0390	0.20		Sheet Flow, Grass: Short n= 0.150 P2= 3.01"

Subcatchment 2S: DA-2

Hydrograph



21997 Existing Conditions

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PF_Depth_English_PDS 24-hr S0 1-yr Rainfall=2.61"

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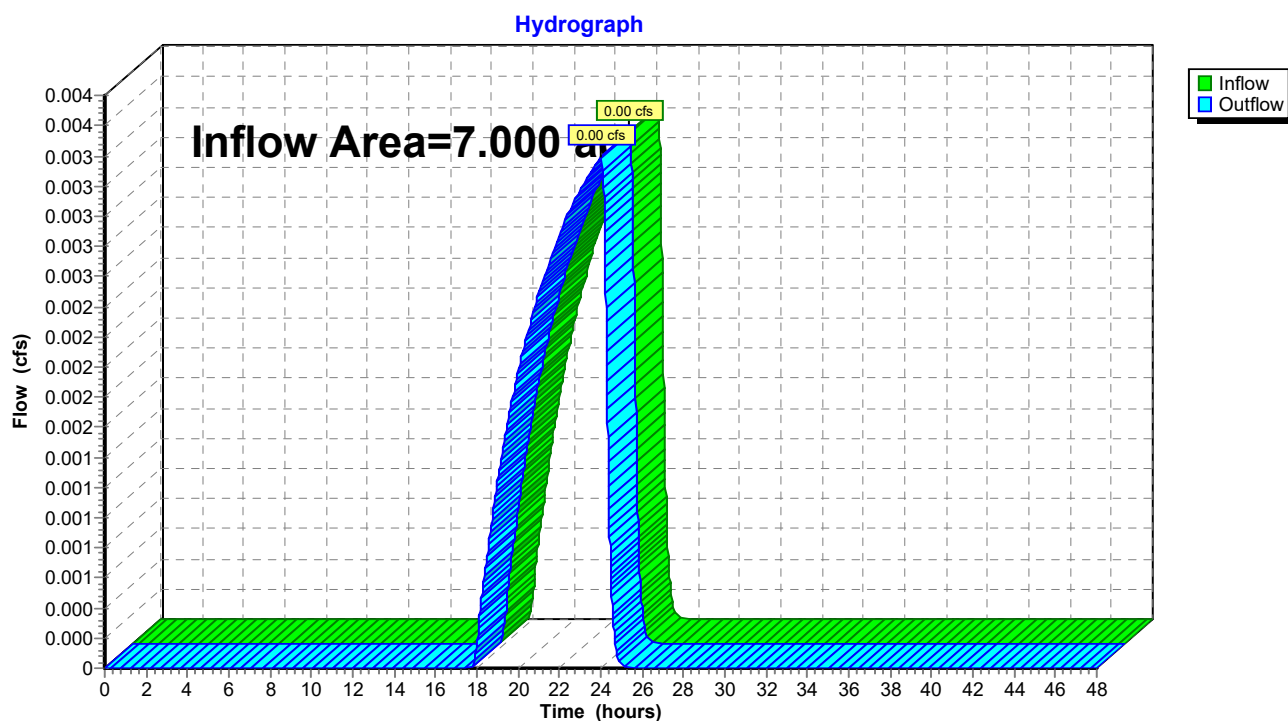
Page 8

Summary for Reach 7R: Existing Runoff

Inflow Area = 7.000 ac, 9.91% Impervious, Inflow Depth = 0.00" for 1-yr event
Inflow = 0.00 cfs @ 24.00 hrs, Volume= 0.001 af
Outflow = 0.00 cfs @ 24.00 hrs, Volume= 0.001 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs

Reach 7R: Existing Runoff



21997 Existing Conditions

PF_Depth_English_PDS 24-hr S0 2-yr Rainfall=3.01"

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Page 9

Time span=0.00-48.00 hrs, dt=0.01 hrs, 4801 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment1S: DA-1

Runoff Area=6.581 ac 10.01% Impervious Runoff Depth=0.03"
Flow Length=260' Slope=0.0050 '/' Tc=23.0 min CN=45 Runoff=0.02 cfs 0.014 af

Subcatchment2S: DA-2

Runoff Area=0.419 ac 8.35% Impervious Runoff Depth=0.02"
Flow Length=70' Slope=0.0390 '/' Tc=5.8 min CN=44 Runoff=0.00 cfs 0.001 af

Reach 7R: Existing Runoff

Inflow=0.02 cfs 0.014 af
Outflow=0.02 cfs 0.014 af

Total Runoff Area = 7.000 ac Runoff Volume = 0.014 af Average Runoff Depth = 0.02"
90.09% Pervious = 6.306 ac 9.91% Impervious = 0.694 ac

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PF_Depth_English_PDS 24-hr S0 2-yr Rainfall=3.01"

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Page 10

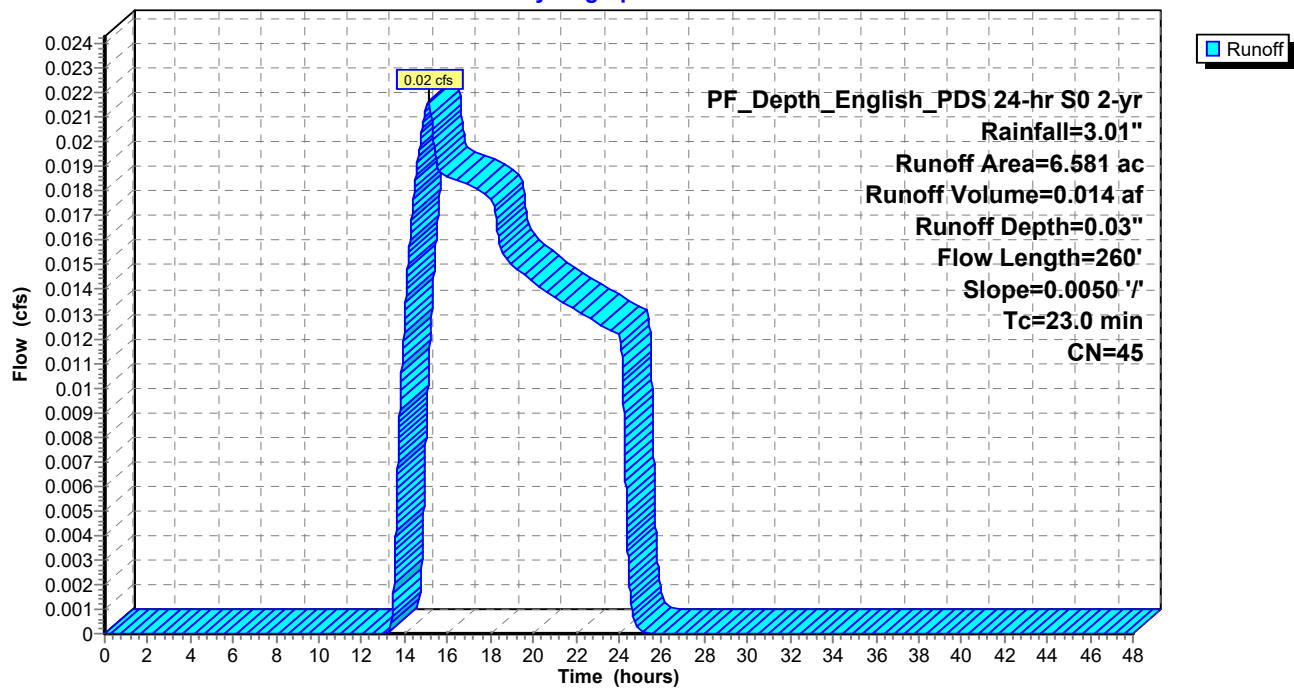
Summary for Subcatchment 1S: DA-1

Runoff = 0.02 cfs @ 15.11 hrs, Volume= 0.014 af, Depth= 0.03"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
PF_Depth_English_PDS 24-hr S0 2-yr Rainfall=3.01"

Area (ac)	CN	Description
0.659	98	Paved parking, HSG A
5.922	39	>75% Grass cover, Good, HSG A
6.581	45	Weighted Average
5.922		89.99% Pervious Area
0.659		10.01% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
17.6	100	0.0050	0.09		Sheet Flow,
					Grass: Short n= 0.150 P2= 3.01"
5.4	160	0.0050	0.49		Shallow Concentrated Flow,
					Short Grass Pasture Kv= 7.0 fps
23.0	260	Total			

Subcatchment 1S: DA-1**Hydrograph**

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PF_Depth_English_PDS 24-hr S0 2-yr Rainfall=3.01"

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Page 11

Summary for Subcatchment 2S: DA-2

Runoff = 0.00 cfs @ 17.95 hrs, Volume= 0.001 af, Depth= 0.02"

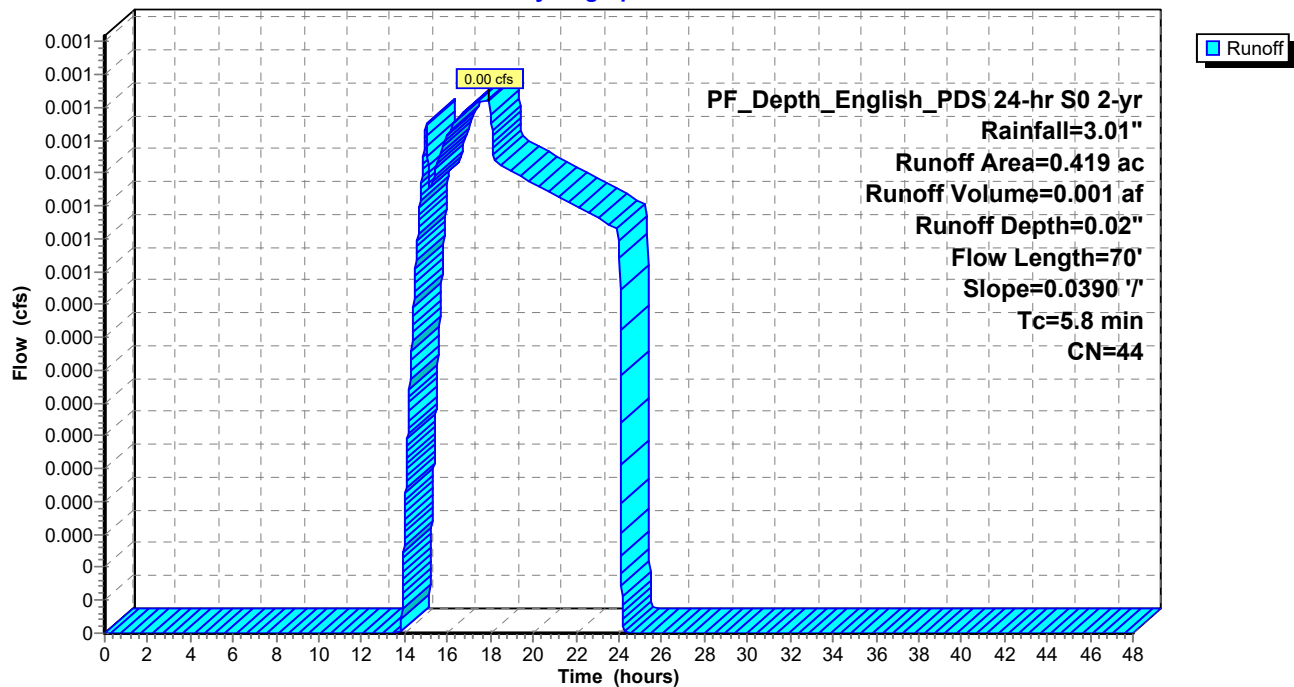
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
PF_Depth_English_PDS 24-hr S0 2-yr Rainfall=3.01"

Area (ac)	CN	Description
0.035	98	Paved parking, HSG A
0.384	39	>75% Grass cover, Good, HSG A
0.419	44	Weighted Average
0.384		91.65% Pervious Area
0.035		8.35% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.8	70	0.0390	0.20		Sheet Flow, Grass: Short n= 0.150 P2= 3.01"

Subcatchment 2S: DA-2

Hydrograph



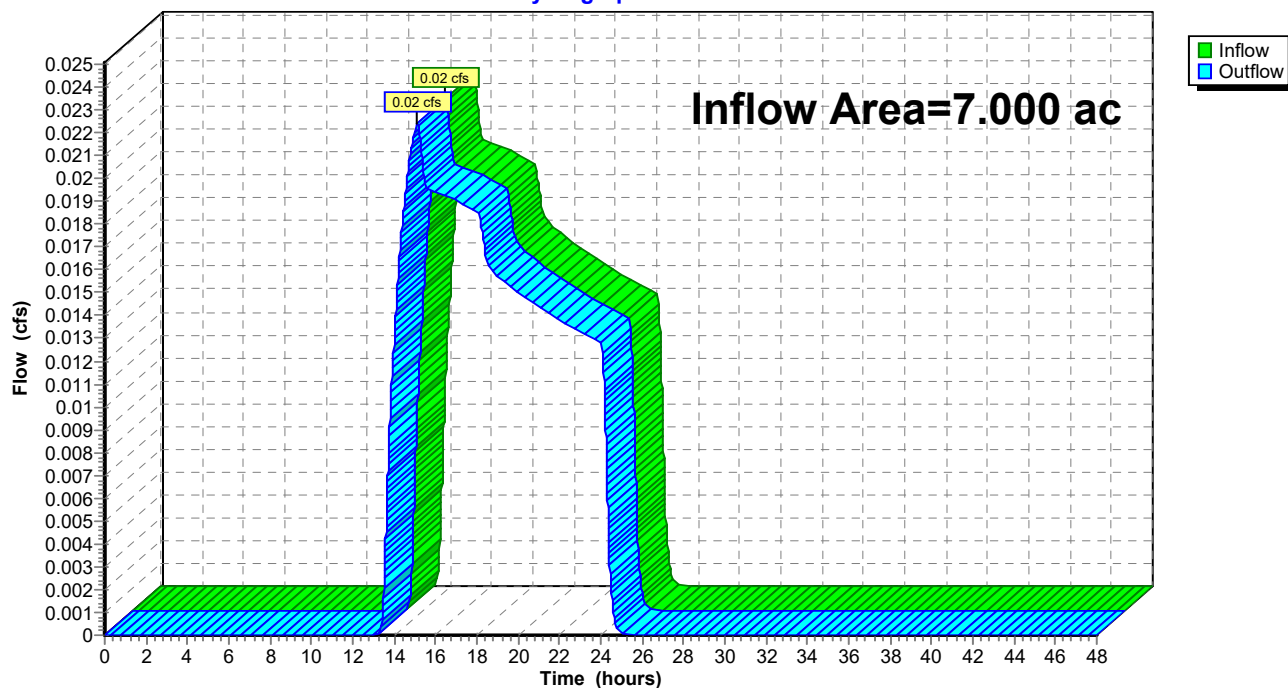
Summary for Reach 7R: Existing Runoff

Inflow Area = 7.000 ac, 9.91% Impervious, Inflow Depth = 0.02" for 2-yr event
Inflow = 0.02 cfs @ 15.10 hrs, Volume= 0.014 af
Outflow = 0.02 cfs @ 15.10 hrs, Volume= 0.014 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs

Reach 7R: Existing Runoff

Hydrograph



21997 Existing Conditions

PF_Depth_English_PDS 24-hr S0 5-yr Rainfall=3.75"

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Page 13

Time span=0.00-48.00 hrs, dt=0.01 hrs, 4801 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment1S: DA-1

Runoff Area=6.581 ac 10.01% Impervious Runoff Depth=0.13"
Flow Length=260' Slope=0.0050 '/' Tc=23.0 min CN=45 Runoff=0.20 cfs 0.069 af

Subcatchment2S: DA-2

Runoff Area=0.419 ac 8.35% Impervious Runoff Depth=0.10"
Flow Length=70' Slope=0.0390 '/' Tc=5.8 min CN=44 Runoff=0.01 cfs 0.004 af

Reach 7R: Existing Runoff

Inflow=0.21 cfs 0.073 af
Outflow=0.21 cfs 0.073 af

Total Runoff Area = 7.000 ac Runoff Volume = 0.073 af Average Runoff Depth = 0.12"
90.09% Pervious = 6.306 ac 9.91% Impervious = 0.694 ac

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PF_Depth_English_PDS 24-hr S0 5-yr Rainfall=3.75"

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Page 14

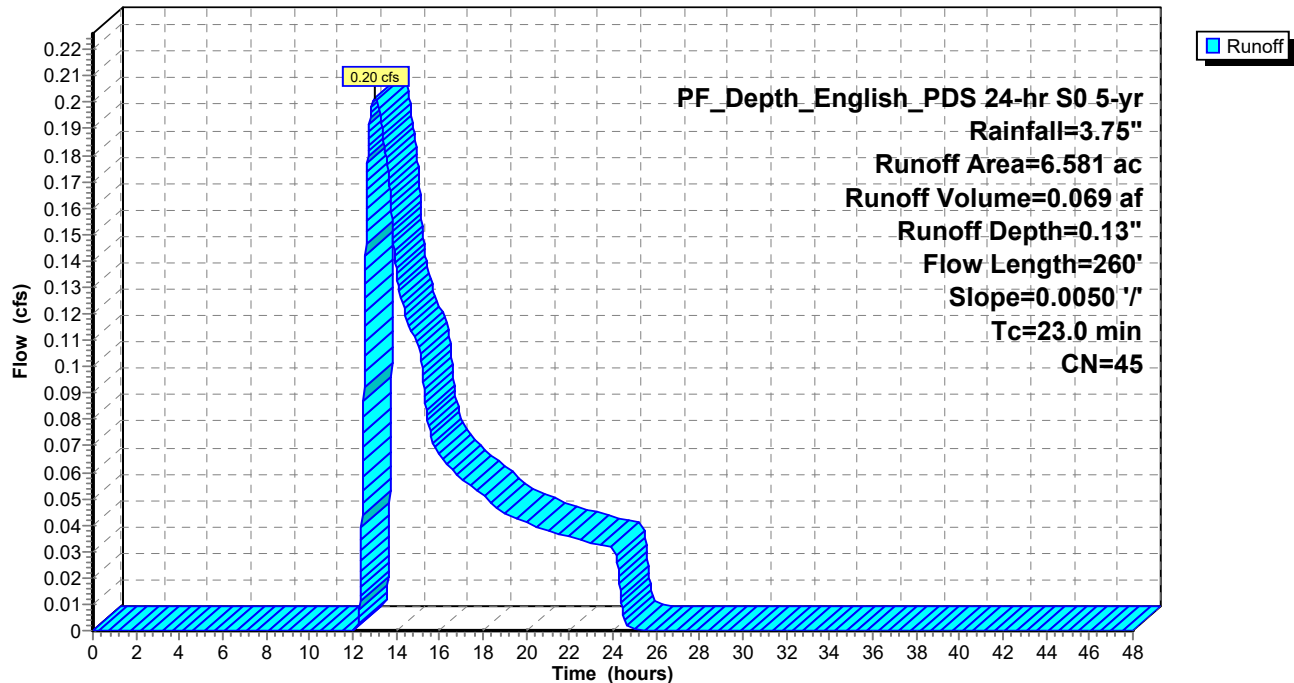
Summary for Subcatchment 1S: DA-1

Runoff = 0.20 cfs @ 13.06 hrs, Volume= 0.069 af, Depth= 0.13"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
PF_Depth_English_PDS 24-hr S0 5-yr Rainfall=3.75"

Area (ac)	CN	Description
0.659	98	Paved parking, HSG A
5.922	39	>75% Grass cover, Good, HSG A
6.581	45	Weighted Average
5.922		89.99% Pervious Area
0.659		10.01% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
17.6	100	0.0050	0.09		Sheet Flow,
					Grass: Short n= 0.150 P2= 3.01"
5.4	160	0.0050	0.49		Shallow Concentrated Flow,
					Short Grass Pasture Kv= 7.0 fps
23.0	260	Total			

Subcatchment 1S: DA-1**Hydrograph**

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PF_Depth_English_PDS 24-hr S0 5-yr Rainfall=3.75"

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Page 15

Summary for Subcatchment 2S: DA-2

Runoff = 0.01 cfs @ 13.03 hrs, Volume= 0.004 af, Depth= 0.10"

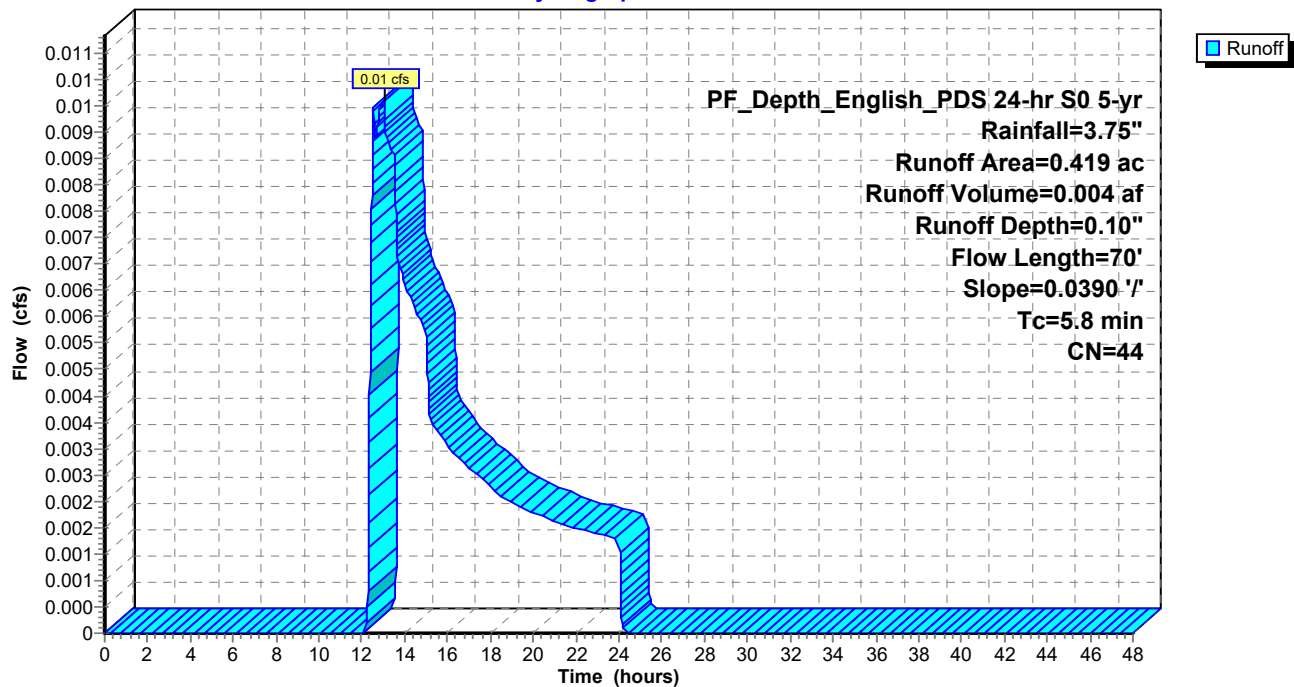
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
PF_Depth_English_PDS 24-hr S0 5-yr Rainfall=3.75"

Area (ac)	CN	Description
0.035	98	Paved parking, HSG A
0.384	39	>75% Grass cover, Good, HSG A
0.419	44	Weighted Average
0.384		91.65% Pervious Area
0.035		8.35% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.8	70	0.0390	0.20		Sheet Flow, Grass: Short n= 0.150 P2= 3.01"

Subcatchment 2S: DA-2

Hydrograph



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PF_Depth_English_PDS 24-hr S0 5-yr Rainfall=3.75"

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Page 16

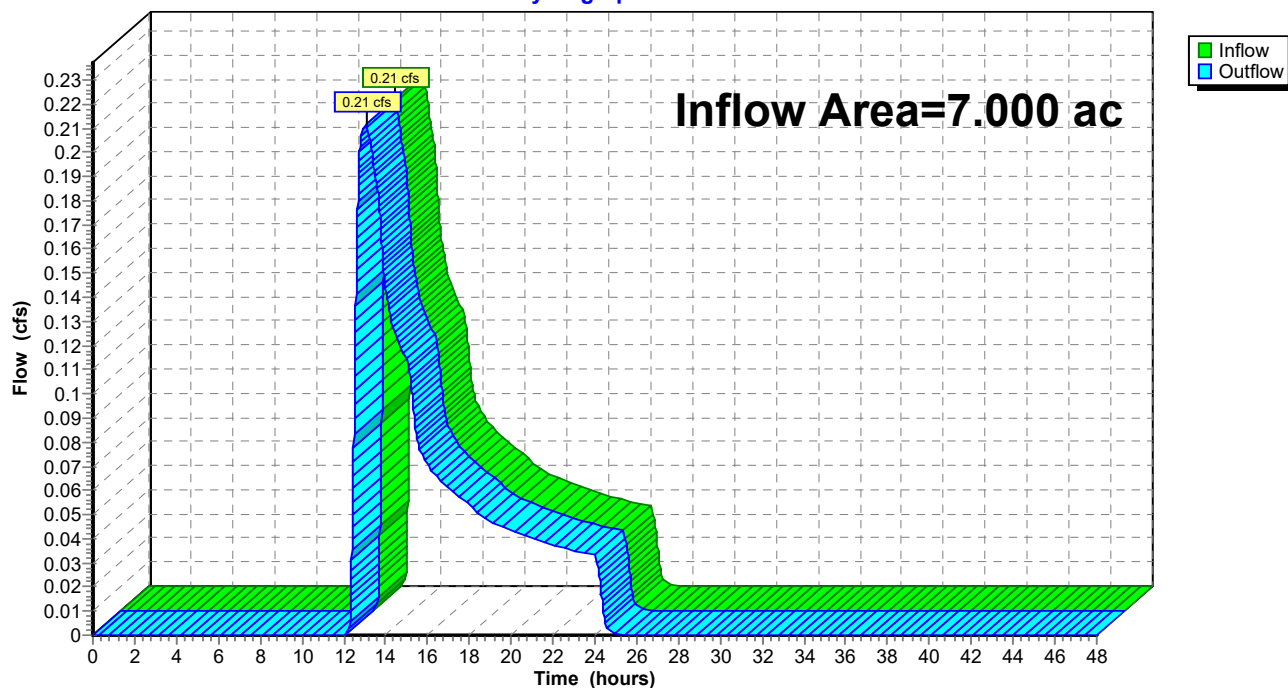
Summary for Reach 7R: Existing Runoff

Inflow Area = 7.000 ac, 9.91% Impervious, Inflow Depth = 0.12" for 5-yr event
Inflow = 0.21 cfs @ 13.05 hrs, Volume= 0.073 af
Outflow = 0.21 cfs @ 13.05 hrs, Volume= 0.073 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs

Reach 7R: Existing Runoff

Hydrograph



21997 Existing Conditions

PF_Depth_English_PDS 24-hr S0 10-yr Rainfall=4.46"

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Page 17

Time span=0.00-48.00 hrs, dt=0.01 hrs, 4801 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment1S: DA-1

Runoff Area=6.581 ac 10.01% Impervious Runoff Depth=0.29"
Flow Length=260' Slope=0.0050 '/' Tc=23.0 min CN=45 Runoff=0.70 cfs 0.156 af

Subcatchment2S: DA-2

Runoff Area=0.419 ac 8.35% Impervious Runoff Depth=0.25"
Flow Length=70' Slope=0.0390 '/' Tc=5.8 min CN=44 Runoff=0.04 cfs 0.009 af

Reach 7R: Existing Runoff

Inflow=0.74 cfs 0.165 af
Outflow=0.74 cfs 0.165 af

Total Runoff Area = 7.000 ac Runoff Volume = 0.165 af Average Runoff Depth = 0.28"
90.09% Pervious = 6.306 ac 9.91% Impervious = 0.694 ac

21997 Existing Conditions

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PF_Depth_English_PDS 24-hr S0 10-yr Rainfall=4.46"

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Page 18

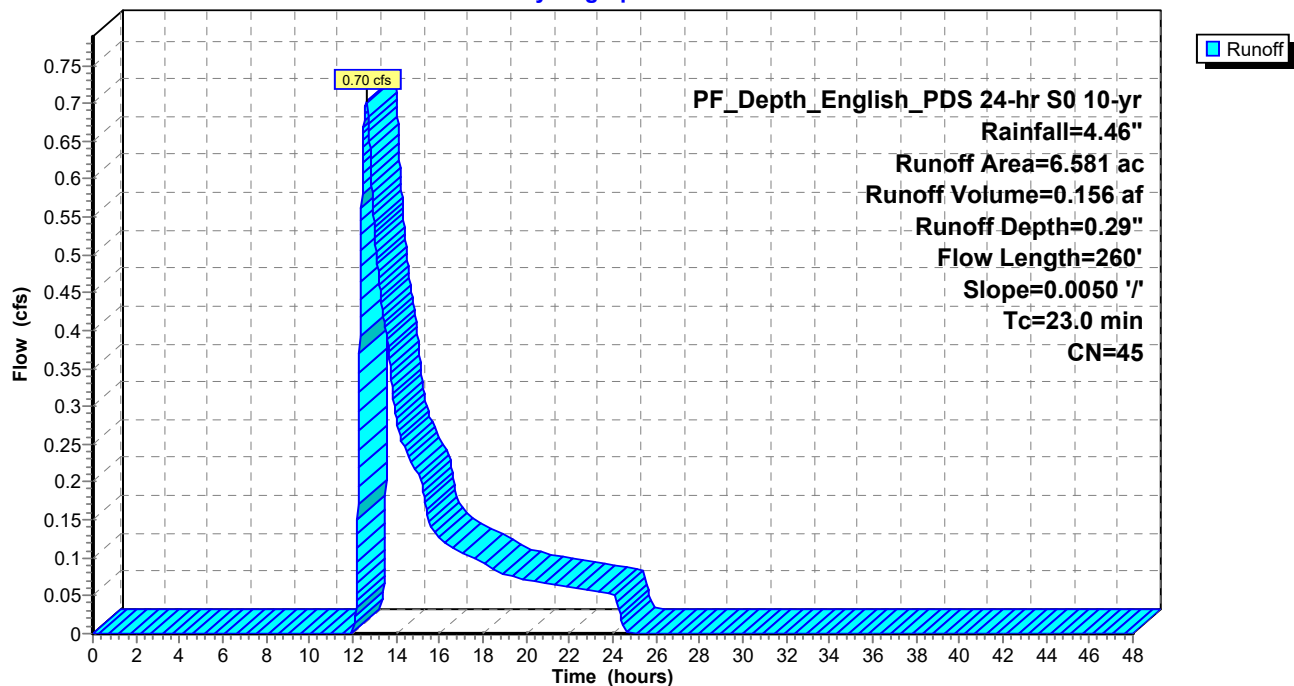
Summary for Subcatchment 1S: DA-1

Runoff = 0.70 cfs @ 12.60 hrs, Volume= 0.156 af, Depth= 0.29"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
PF_Depth_English_PDS 24-hr S0 10-yr Rainfall=4.46"

Area (ac)	CN	Description
0.659	98	Paved parking, HSG A
5.922	39	>75% Grass cover, Good, HSG A
6.581	45	Weighted Average
5.922		89.99% Pervious Area
0.659		10.01% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
17.6	100	0.0050	0.09		Sheet Flow,
					Grass: Short n= 0.150 P2= 3.01"
5.4	160	0.0050	0.49		Shallow Concentrated Flow,
					Short Grass Pasture Kv= 7.0 fps
23.0	260	Total			

Subcatchment 1S: DA-1**Hydrograph**

21997 Existing Conditions

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PF_Depth_English_PDS 24-hr S0 10-yr Rainfall=4.46"

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Page 19

Summary for Subcatchment 2S: DA-2

Runoff = 0.04 cfs @ 12.25 hrs, Volume= 0.009 af, Depth= 0.25"

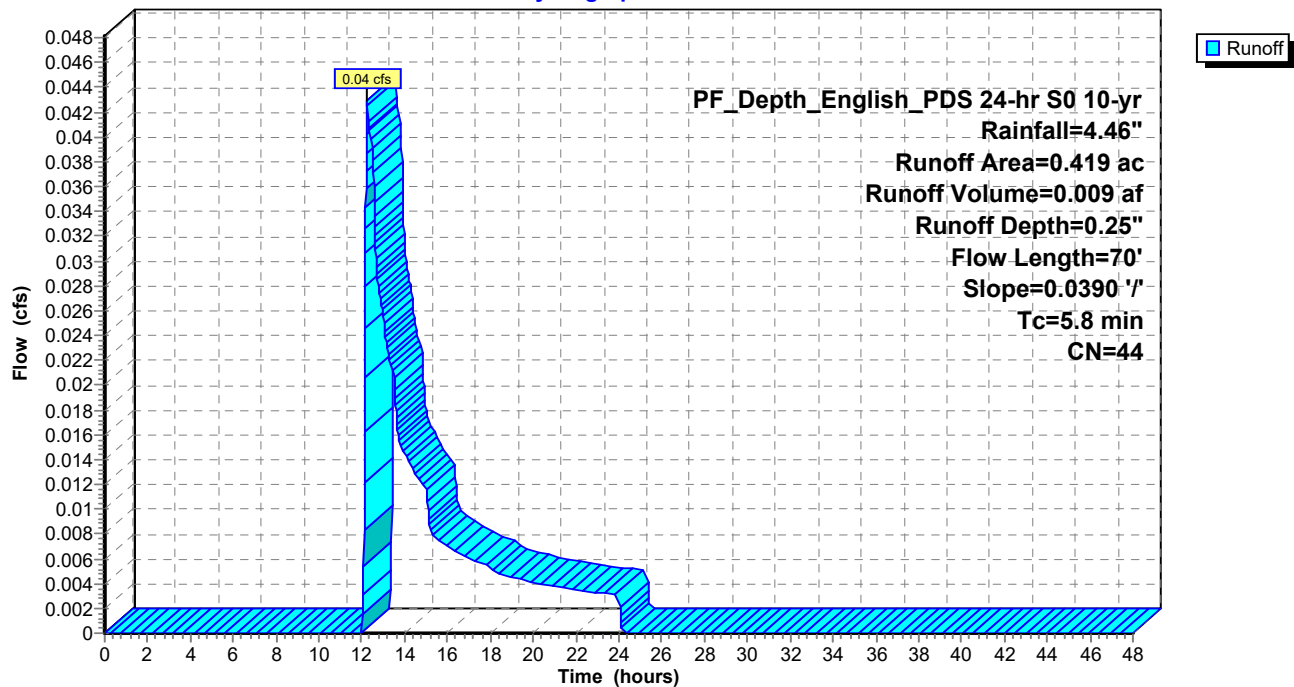
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
PF_Depth_English_PDS 24-hr S0 10-yr Rainfall=4.46"

Area (ac)	CN	Description
0.035	98	Paved parking, HSG A
0.384	39	>75% Grass cover, Good, HSG A
0.419	44	Weighted Average
0.384		91.65% Pervious Area
0.035		8.35% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.8	70	0.0390	0.20		Sheet Flow, Grass: Short n= 0.150 P2= 3.01"

Subcatchment 2S: DA-2

Hydrograph



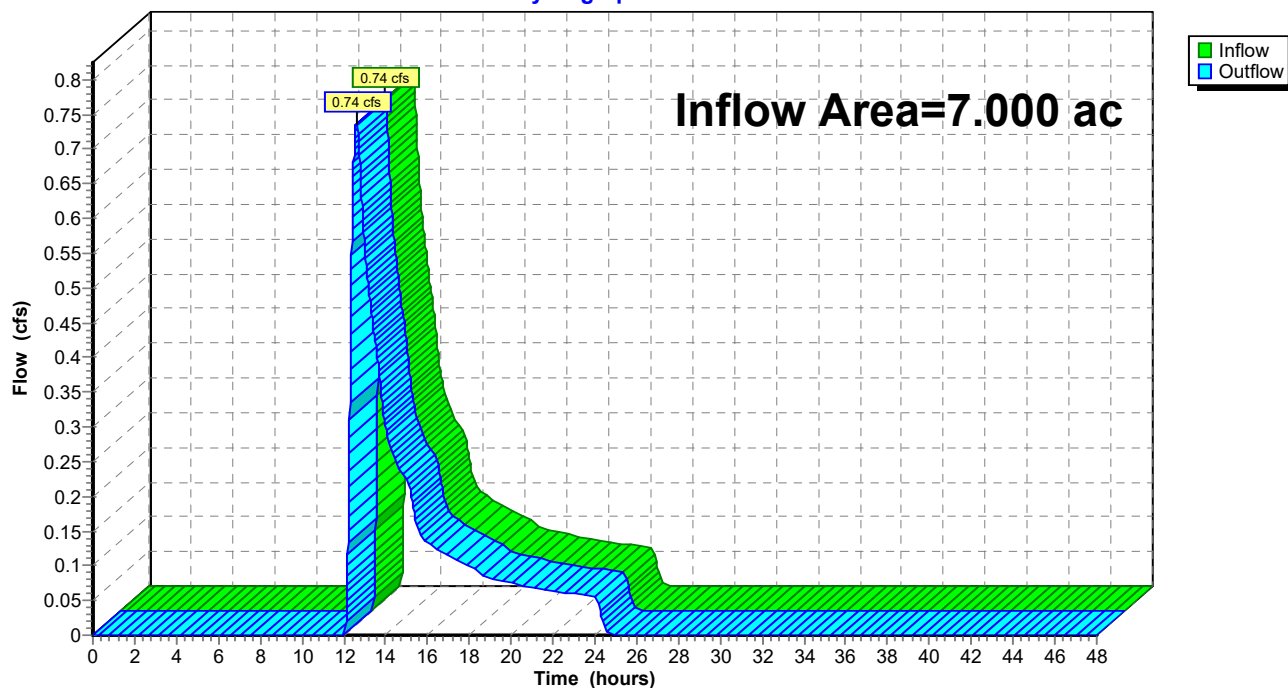
Summary for Reach 7R: Existing Runoff

Inflow Area = 7.000 ac, 9.91% Impervious, Inflow Depth = 0.28" for 10-yr event
Inflow = 0.74 cfs @ 12.60 hrs, Volume= 0.165 af
Outflow = 0.74 cfs @ 12.60 hrs, Volume= 0.165 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs

Reach 7R: Existing Runoff

Hydrograph



21997 Existing Conditions

PF_Depth_English_PDS 24-hr S0 25-yr Rainfall=5.56"

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Page 21

Time span=0.00-48.00 hrs, dt=0.01 hrs, 4801 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment1S: DA-1

Runoff Area=6.581 ac 10.01% Impervious Runoff Depth=0.63"
Flow Length=260' Slope=0.0050 '/' Tc=23.0 min CN=45 Runoff=2.17 cfs 0.347 af

Subcatchment2S: DA-2

Runoff Area=0.419 ac 8.35% Impervious Runoff Depth=0.58"
Flow Length=70' Slope=0.0390 '/' Tc=5.8 min CN=44 Runoff=0.17 cfs 0.020 af

Reach 7R: Existing Runoff

Inflow=2.27 cfs 0.367 af
Outflow=2.27 cfs 0.367 af

Total Runoff Area = 7.000 ac Runoff Volume = 0.367 af Average Runoff Depth = 0.63"
90.09% Pervious = 6.306 ac 9.91% Impervious = 0.694 ac

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PF_Depth_English_PDS 24-hr S0 25-yr Rainfall=5.56"

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Page 22

Summary for Subcatchment 1S: DA-1

Runoff = 2.17 cfs @ 12.42 hrs, Volume= 0.347 af, Depth= 0.63"

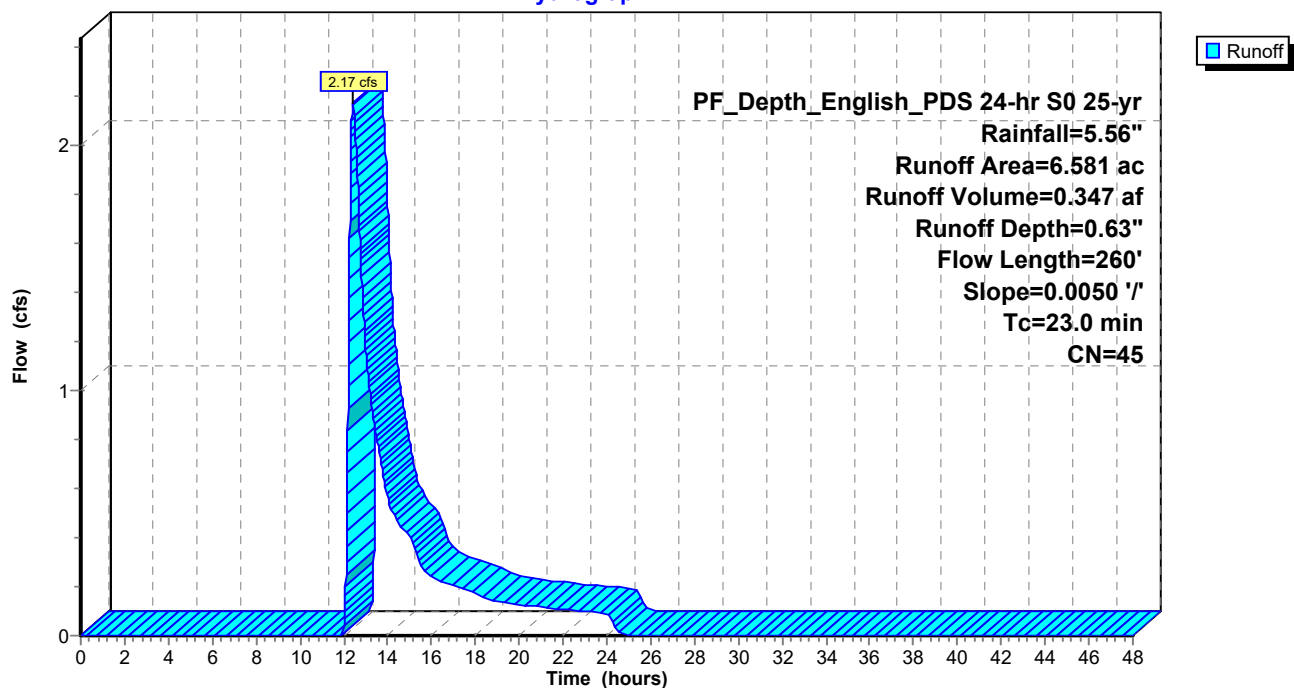
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
PF_Depth_English_PDS 24-hr S0 25-yr Rainfall=5.56"

Area (ac)	CN	Description
0.659	98	Paved parking, HSG A
5.922	39	>75% Grass cover, Good, HSG A
6.581	45	Weighted Average
5.922		89.99% Pervious Area
0.659		10.01% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
17.6	100	0.0050	0.09		Sheet Flow, Grass: Short n= 0.150 P2= 3.01"
5.4	160	0.0050	0.49		Shallow Concentrated Flow, Short Grass Pasture Kv= 7.0 fps
23.0	260	Total			

Subcatchment 1S: DA-1

Hydrograph



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PF_Depth_English_PDS 24-hr S0 25-yr Rainfall=5.56"

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Page 23

Summary for Subcatchment 2S: DA-2

Runoff = 0.17 cfs @ 12.14 hrs, Volume= 0.020 af, Depth= 0.58"

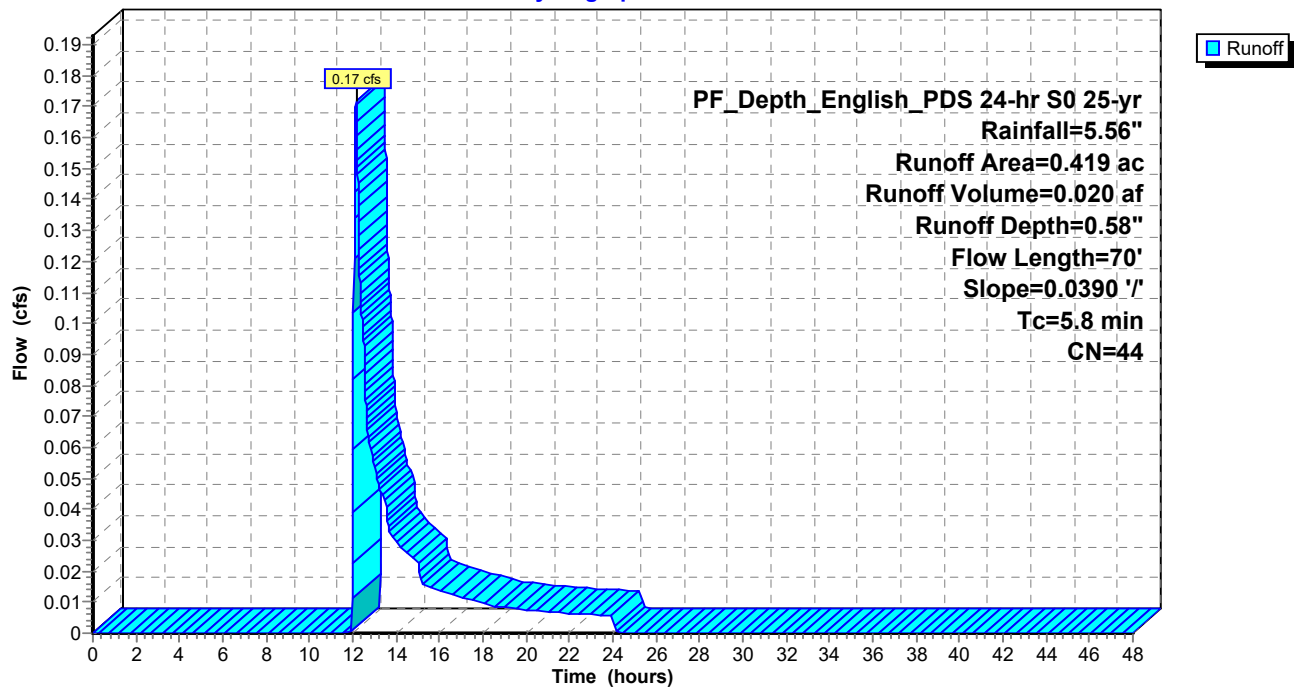
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
PF_Depth_English_PDS 24-hr S0 25-yr Rainfall=5.56"

Area (ac)	CN	Description
0.035	98	Paved parking, HSG A
0.384	39	>75% Grass cover, Good, HSG A
0.419	44	Weighted Average
0.384		91.65% Pervious Area
0.035		8.35% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.8	70	0.0390	0.20		Sheet Flow, Grass: Short n= 0.150 P2= 3.01"

Subcatchment 2S: DA-2

Hydrograph



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PF_Depth_English_PDS 24-hr S0 25-yr Rainfall=5.56"

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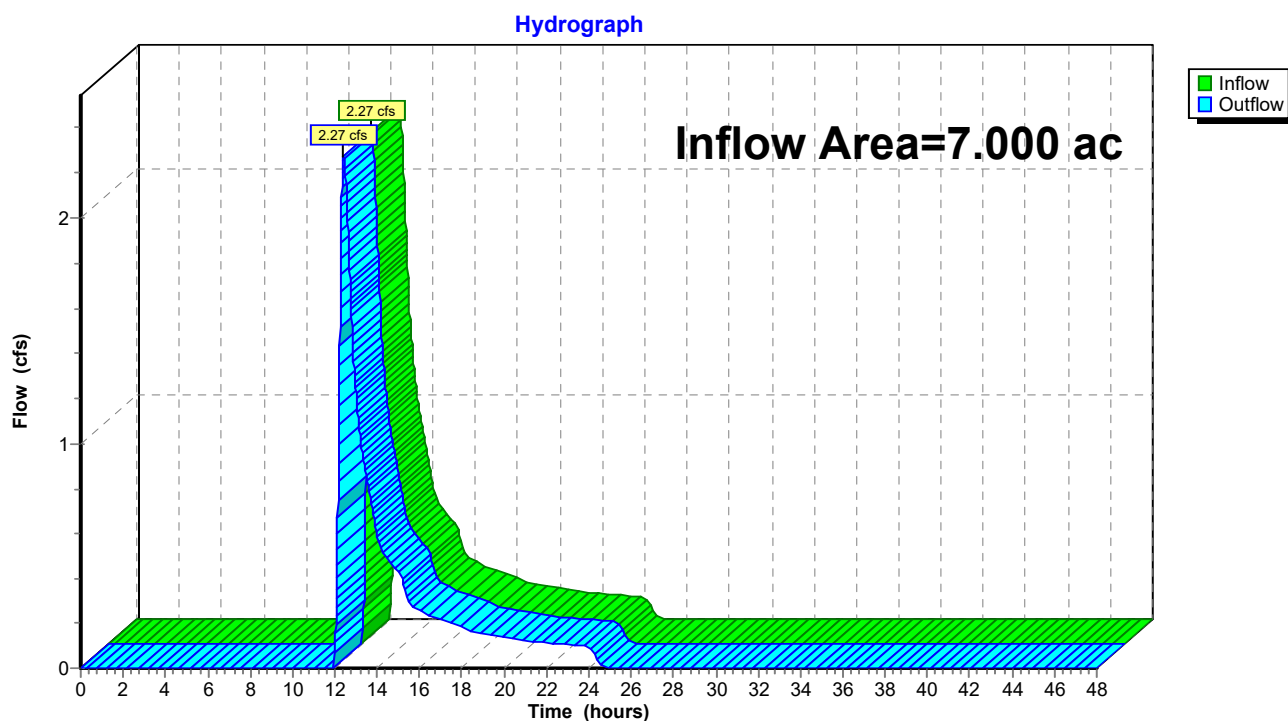
Page 24

Summary for Reach 7R: Existing Runoff

Inflow Area = 7.000 ac, 9.91% Impervious, Inflow Depth = 0.63" for 25-yr event
Inflow = 2.27 cfs @ 12.42 hrs, Volume= 0.367 af
Outflow = 2.27 cfs @ 12.42 hrs, Volume= 0.367 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs

Reach 7R: Existing Runoff



21997 Existing Conditions

PF_Depth_English_PDS 24-hr S0 100-yr Rainfall=7.55"

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Page 25

Time span=0.00-48.00 hrs, dt=0.01 hrs, 4801 points

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN

Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment1S: DA-1

Runoff Area=6.581 ac 10.01% Impervious Runoff Depth=1.50"

Flow Length=260' Slope=0.0050 '/' Tc=23.0 min CN=45 Runoff=6.64 cfs 0.825 af

Subcatchment2S: DA-2

Runoff Area=0.419 ac 8.35% Impervious Runoff Depth=1.41"

Flow Length=70' Slope=0.0390 '/' Tc=5.8 min CN=44 Runoff=0.65 cfs 0.049 af

Reach 7R: Existing Runoff

Inflow=6.90 cfs 0.874 af

Outflow=6.90 cfs 0.874 af

Total Runoff Area = 7.000 ac Runoff Volume = 0.874 af Average Runoff Depth = 1.50"
90.09% Pervious = 6.306 ac 9.91% Impervious = 0.694 ac

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PF_Depth_English_PDS 24-hr S0 100-yr Rainfall=7.55"

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Page 26

Summary for Subcatchment 1S: DA-1

Runoff = 6.64 cfs @ 12.34 hrs, Volume= 0.825 af, Depth= 1.50"

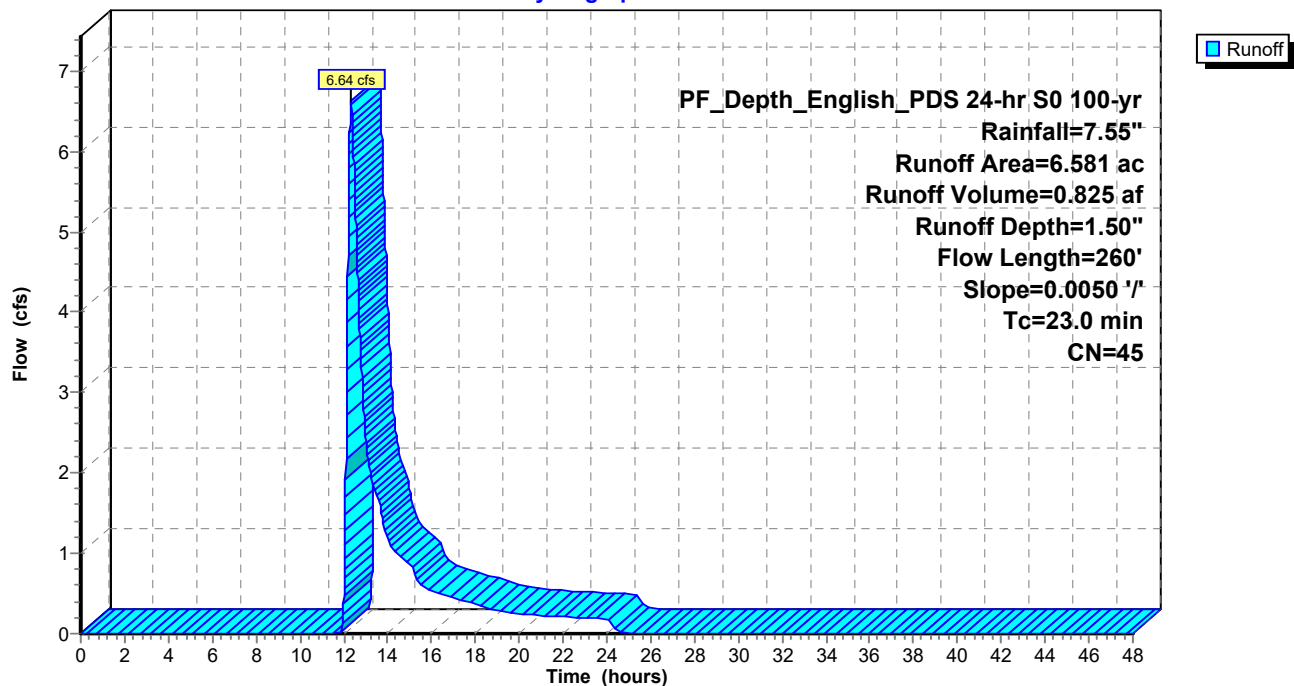
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
PF_Depth_English_PDS 24-hr S0 100-yr Rainfall=7.55"

Area (ac)	CN	Description
0.659	98	Paved parking, HSG A
5.922	39	>75% Grass cover, Good, HSG A
6.581	45	Weighted Average
5.922		89.99% Pervious Area
0.659		10.01% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
17.6	100	0.0050	0.09		Sheet Flow, Grass: Short n= 0.150 P2= 3.01"
5.4	160	0.0050	0.49		Shallow Concentrated Flow, Short Grass Pasture Kv= 7.0 fps
23.0	260	Total			

Subcatchment 1S: DA-1

Hydrograph



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PF_Depth_English_PDS 24-hr S0 100-yr Rainfall=7.55"

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Page 27

Summary for Subcatchment 2S: DA-2

Runoff = 0.65 cfs @ 12.05 hrs, Volume= 0.049 af, Depth= 1.41"

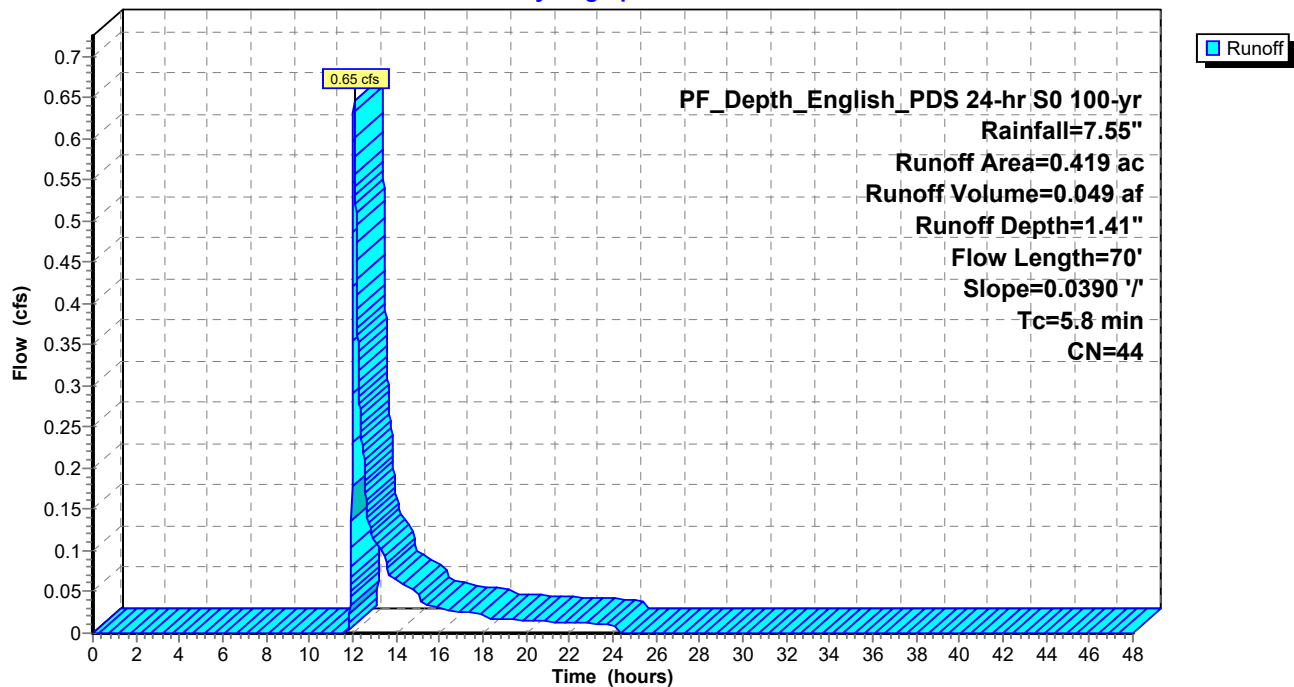
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
PF_Depth_English_PDS 24-hr S0 100-yr Rainfall=7.55"

Area (ac)	CN	Description
0.035	98	Paved parking, HSG A
0.384	39	>75% Grass cover, Good, HSG A
0.419	44	Weighted Average
0.384		91.65% Pervious Area
0.035		8.35% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.8	70	0.0390	0.20		Sheet Flow, Grass: Short n= 0.150 P2= 3.01"

Subcatchment 2S: DA-2

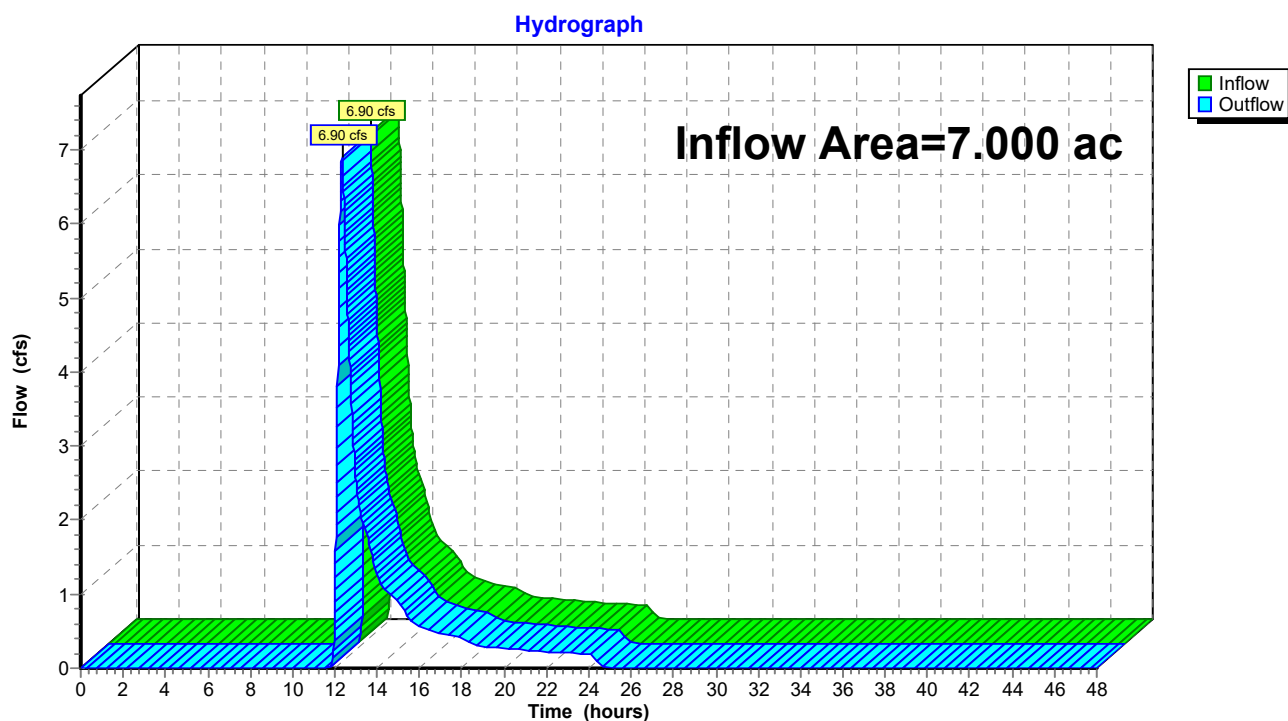
Hydrograph

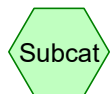
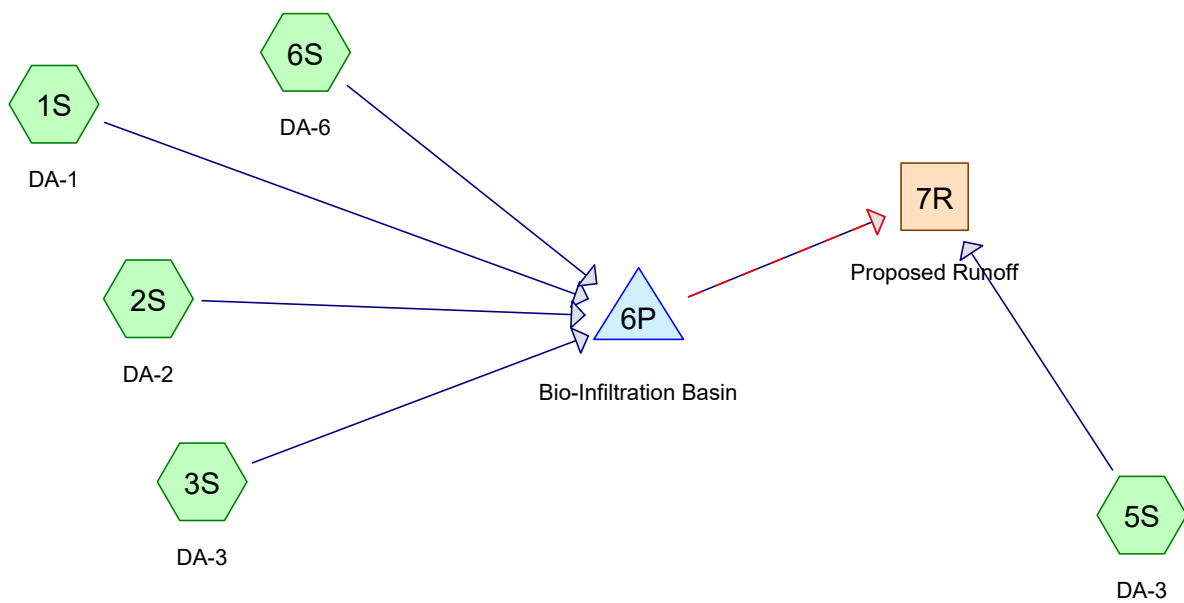


Summary for Reach 7R: Existing Runoff

Inflow Area = 7.000 ac, 9.91% Impervious, Inflow Depth = 1.50" for 100-yr event
Inflow = 6.90 cfs @ 12.34 hrs, Volume= 0.874 af
Outflow = 6.90 cfs @ 12.34 hrs, Volume= 0.874 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs

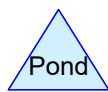
Reach 7R: Existing Runoff



Subcat



Reach



Pond



Link

Routing Diagram for 21997 Proposed Conditions
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21997 Proposed Conditions

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Page 2

Area Listing (all nodes)

Area (acres)	CN	Description (subcatchment-numbers)
2.917	39	>75% Grass cover, Good, HSG A (1S, 2S, 3S, 5S, 6S)
1.116	98	Paved parking, HSG A (1S, 2S, 3S, 5S, 6S)
4.033	55	TOTAL AREA

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Page 3

Soil Listing (all nodes)

Area (acres)	Soil Group	Subcatchment Numbers
4.033	HSG A	1S, 2S, 3S, 5S, 6S
0.000	HSG B	
0.000	HSG C	
0.000	HSG D	
0.000	Other	
4.033		TOTAL AREA

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Page 4

Ground Covers (all nodes)

HSG-A (acres)	HSG-B (acres)	HSG-C (acres)	HSG-D (acres)	Other (acres)	Total (acres)	Ground Cover	Subcatchment Numbers
2.917	0.000	0.000	0.000	0.000	2.917	>75% Grass cover, Good	1S, 2S, 3S, 5S, 6S
1.116	0.000	0.000	0.000	0.000	1.116	Paved parking	1S, 2S, 3S, 5S, 6S
4.033	0.000	0.000	0.000	0.000	4.033	TOTAL AREA	

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Page 5

Pipe Listing (all nodes)

Line#	Node Number	In-Invert (feet)	Out-Invert (feet)	Length (feet)	Slope (ft/ft)	n	Diam/Width (inches)	Height (inches)	Inside-Fill (inches)
1	6P	664.00	663.95	10.0	0.0050	0.010	15.0	0.0	0.0

21997 Proposed Conditions*PF_Depth_English_PDS 24-hr S0 1-yr Rainfall=2.61"*

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Page 6

Time span=0.00-48.00 hrs, dt=0.01 hrs, 4801 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment1S: DA-1 Runoff Area=2.383 ac 6.04% Impervious Runoff Depth=0.00"
Flow Length=260' Slope=0.0050 '/' Tc=23.0 min CN=43 Runoff=0.00 cfs 0.000 af

Subcatchment2S: DA-2 Runoff Area=0.379 ac 71.77% Impervious Runoff Depth=1.02"
Tc=5.0 min CN=81 Runoff=0.67 cfs 0.032 af

Subcatchment3S: DA-3 Runoff Area=0.632 ac 93.83% Impervious Runoff Depth=1.97"
Tc=5.0 min CN=94 Runoff=2.18 cfs 0.104 af

Subcatchment5S: DA-3 Runoff Area=0.220 ac 32.73% Impervious Runoff Depth=0.16"
Tc=5.0 min CN=58 Runoff=0.02 cfs 0.003 af

Subcatchment6S: DA-6 Runoff Area=0.419 ac 8.35% Impervious Runoff Depth=0.00"
Flow Length=70' Slope=0.0390 '/' Tc=5.8 min CN=44 Runoff=0.00 cfs 0.000 af

Reach 7R: Proposed Runoff Inflow=0.02 cfs 0.003 af
Outflow=0.02 cfs 0.003 af

Pond 6P: Bio-Infiltration Basin Peak Elev=666.41' Storage=3,289 cf Inflow=2.85 cfs 0.136 af
Discarded=0.11 cfs 0.136 af Primary=0.00 cfs 0.000 af Secondary=0.00 cfs 0.000 af Outflow=0.11 cfs 0.136 af

Total Runoff Area = 4.033 ac Runoff Volume = 0.139 af Average Runoff Depth = 0.41"
72.33% Pervious = 2.917 ac 27.67% Impervious = 1.116 ac

21997 Proposed Conditions

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PF_Depth_English_PDS 24-hr S0 1-yr Rainfall=2.61"

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Page 7

Summary for Subcatchment 1S: DA-1

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

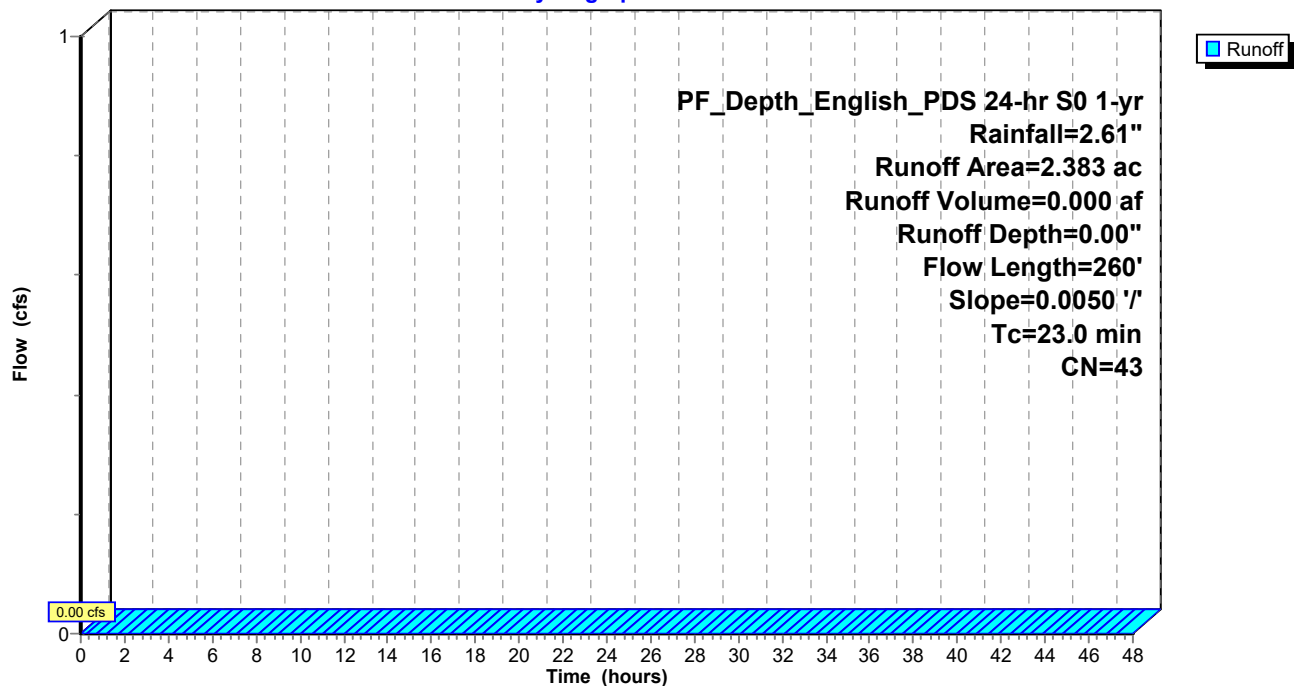
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
PF_Depth_English_PDS 24-hr S0 1-yr Rainfall=2.61"

Area (ac)	CN	Description
0.144	98	Paved parking, HSG A
2.239	39	>75% Grass cover, Good, HSG A
2.383	43	Weighted Average
2.239		93.96% Pervious Area
0.144		6.04% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
17.6	100	0.0050	0.09		Sheet Flow, Grass: Short n= 0.150 P2= 3.01"
5.4	160	0.0050	0.49		Shallow Concentrated Flow, Short Grass Pasture Kv= 7.0 fps
23.0	260	Total			

Subcatchment 1S: DA-1

Hydrograph



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PF_Depth_English_PDS 24-hr S0 1-yr Rainfall=2.61"

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Page 8

Summary for Subcatchment 2S: DA-2

Runoff = 0.67 cfs @ 12.03 hrs, Volume= 0.032 af, Depth= 1.02"

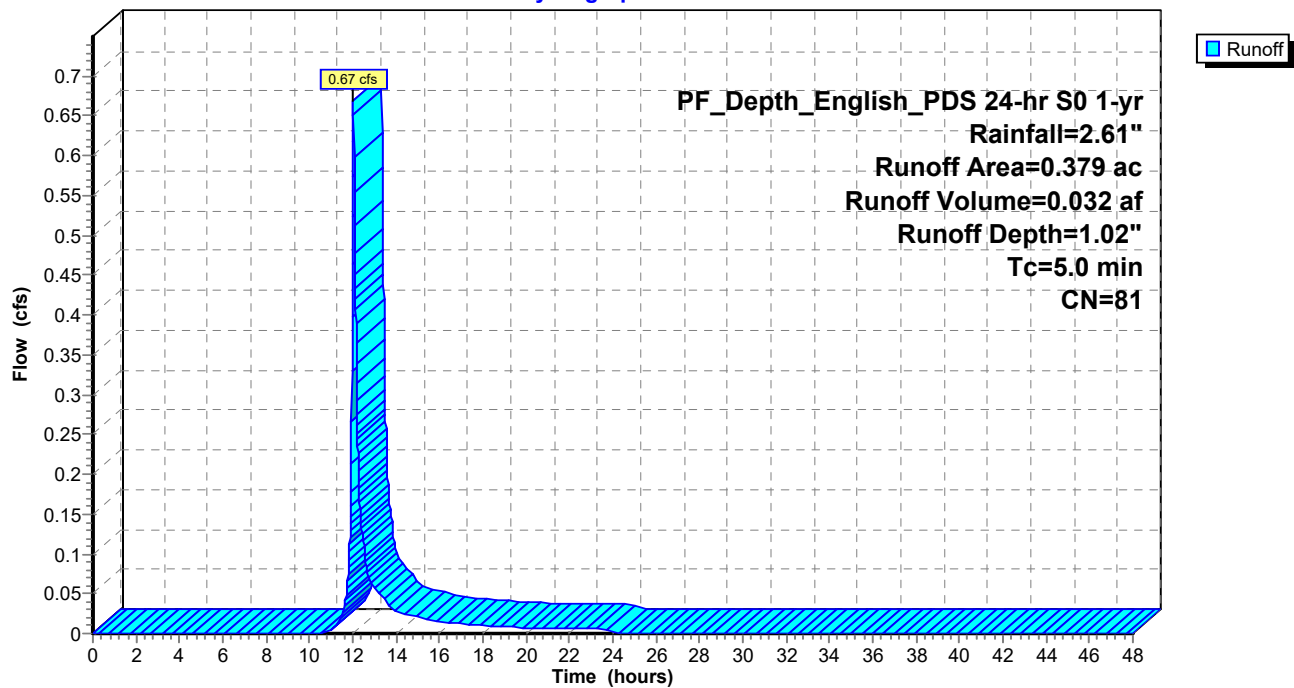
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
PF_Depth_English_PDS 24-hr S0 1-yr Rainfall=2.61"

Area (ac)	CN	Description
0.272	98	Paved parking, HSG A
0.107	39	>75% Grass cover, Good, HSG A
0.379	81	Weighted Average
0.107		28.23% Pervious Area
0.272		71.77% Impervious Area

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

Subcatchment 2S: DA-2

Hydrograph



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PF_Depth_English_PDS 24-hr S0 1-yr Rainfall=2.61"

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Page 9

Summary for Subcatchment 3S: DA-3

Runoff = 2.18 cfs @ 12.03 hrs, Volume= 0.104 af, Depth= 1.97"

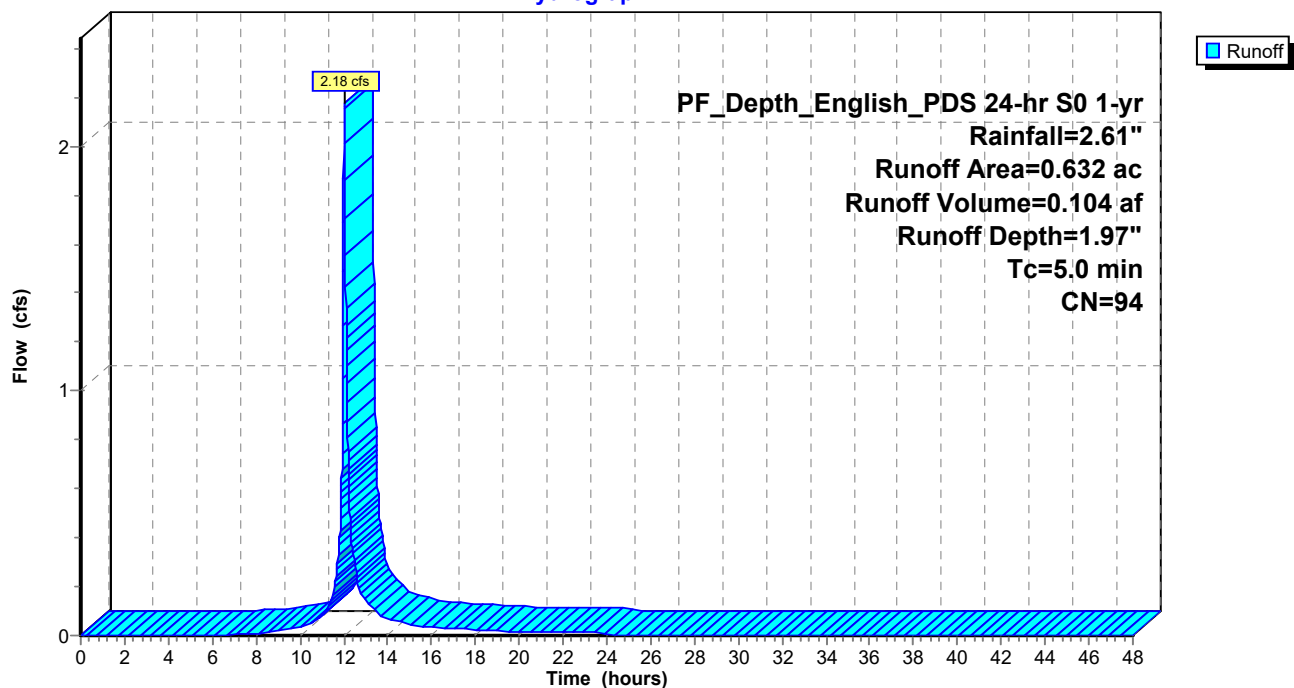
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
PF_Depth_English_PDS 24-hr S0 1-yr Rainfall=2.61"

Area (ac)	CN	Description
0.593	98	Paved parking, HSG A
0.039	39	>75% Grass cover, Good, HSG A
0.632	94	Weighted Average
0.039		6.17% Pervious Area
0.593		93.83% Impervious Area

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

Subcatchment 3S: DA-3

Hydrograph



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PF_Depth_English_PDS 24-hr S0 1-yr Rainfall=2.61"

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Page 10

Summary for Subcatchment 5S: DA-3

Runoff = 0.02 cfs @ 12.23 hrs, Volume= 0.003 af, Depth= 0.16"

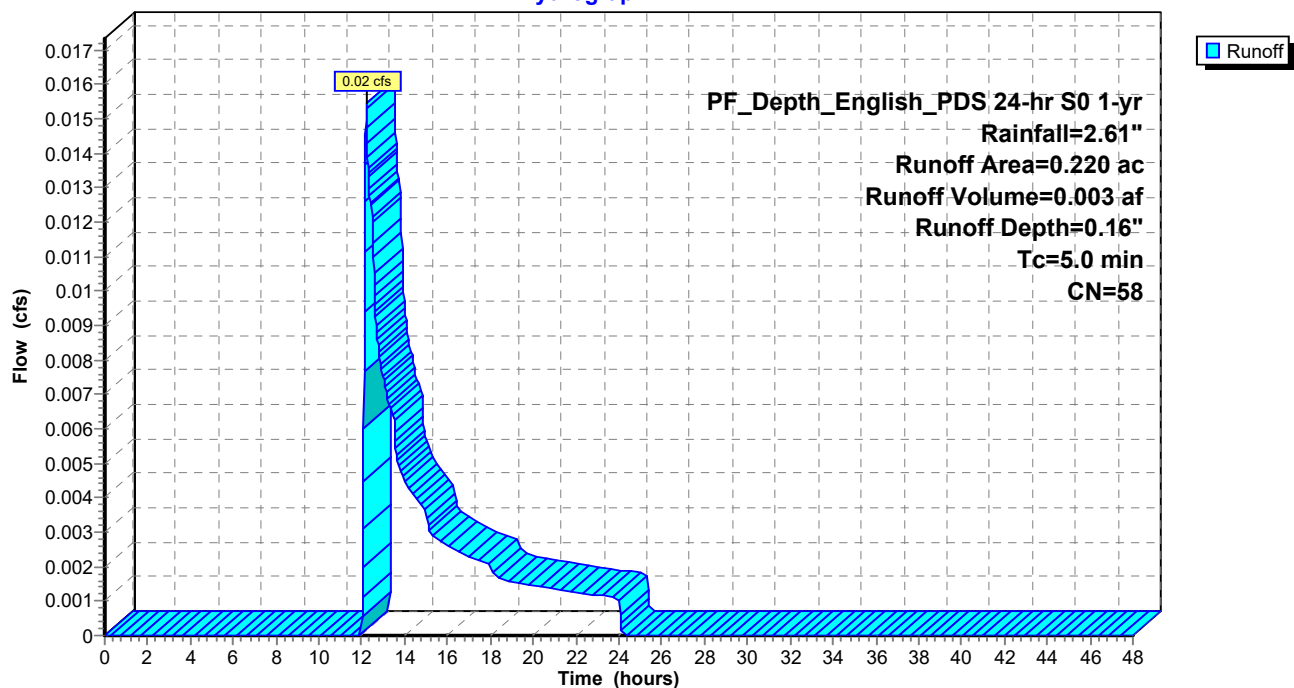
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
PF_Depth_English_PDS 24-hr S0 1-yr Rainfall=2.61"

Area (ac)	CN	Description
0.072	98	Paved parking, HSG A
0.148	39	>75% Grass cover, Good, HSG A
0.220	58	Weighted Average
0.148		67.27% Pervious Area
0.072		32.73% Impervious Area

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

Subcatchment 5S: DA-3

Hydrograph



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PF_Depth_English_PDS 24-hr S0 1-yr Rainfall=2.61"

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Page 11

Summary for Subcatchment 6S: DA-6

Runoff = 0.00 cfs @ 24.01 hrs, Volume= 0.000 af, Depth= 0.00"

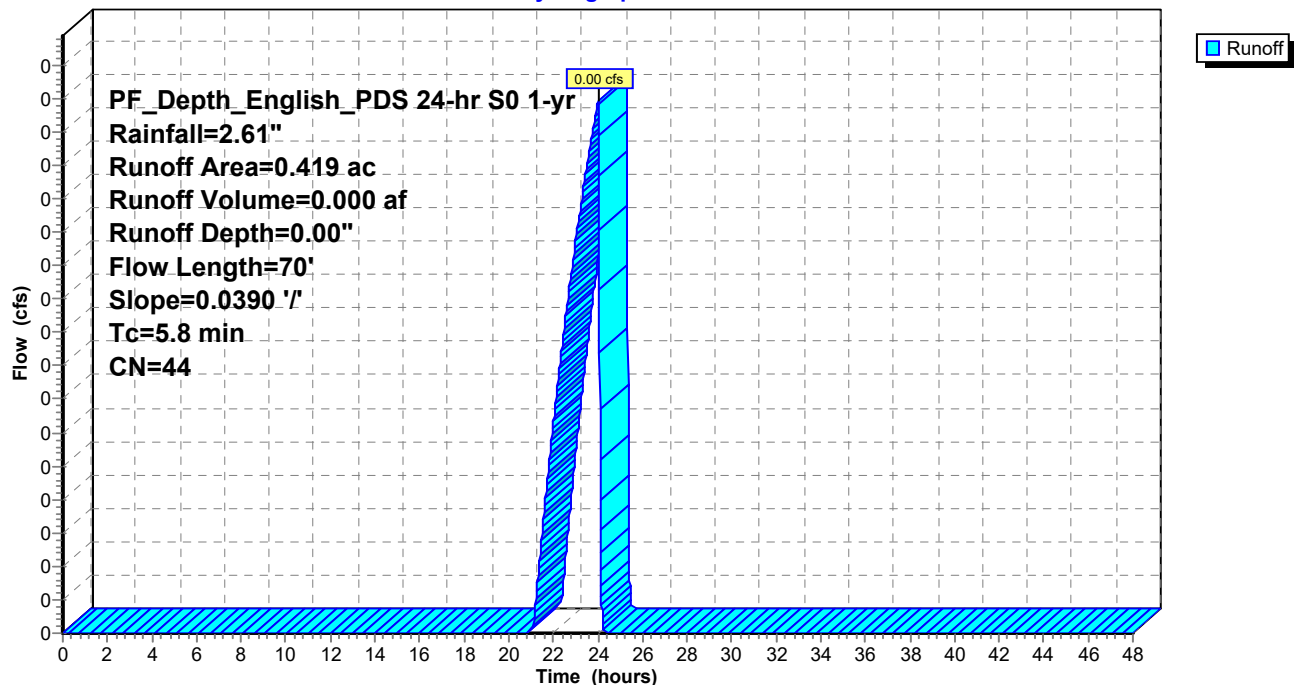
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
PF_Depth_English_PDS 24-hr S0 1-yr Rainfall=2.61"

Area (ac)	CN	Description
0.035	98	Paved parking, HSG A
0.384	39	>75% Grass cover, Good, HSG A
0.419	44	Weighted Average
0.384		91.65% Pervious Area
0.035		8.35% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.8	70	0.0390	0.20		Sheet Flow, Grass: Short n= 0.150 P2= 3.01"

Subcatchment 6S: DA-6

Hydrograph



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PF_Depth_English_PDS 24-hr S0 1-yr Rainfall=2.61"

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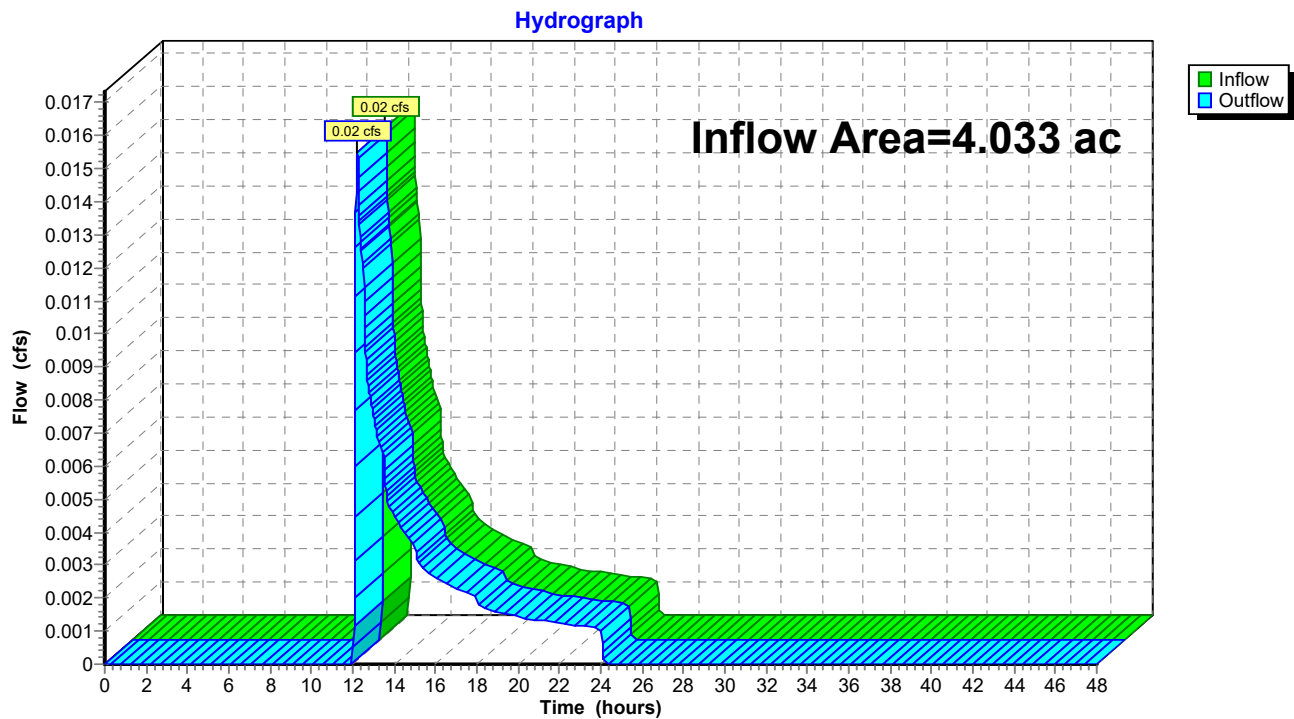
Page 12

Summary for Reach 7R: Proposed Runoff

Inflow Area = 4.033 ac, 27.67% Impervious, Inflow Depth = 0.01" for 1-yr event
Inflow = 0.02 cfs @ 12.23 hrs, Volume= 0.003 af
Outflow = 0.02 cfs @ 12.23 hrs, Volume= 0.003 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs

Reach 7R: Proposed Runoff



21997 Proposed Conditions

PF_Depth_English_PDS 24-hr S0 1-yr Rainfall=2.61"

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Page 13

Summary for Pond 6P: Bio-Infiltration Basin

Inflow Area = 3.813 ac, 27.38% Impervious, Inflow Depth = 0.43" for 1-yr event
 Inflow = 2.85 cfs @ 12.03 hrs, Volume= 0.136 af
 Outflow = 0.11 cfs @ 13.76 hrs, Volume= 0.136 af, Atten= 96%, Lag= 103.6 min
 Discarded = 0.11 cfs @ 13.76 hrs, Volume= 0.136 af
 Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
 Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
 Peak Elev= 666.41' @ 13.76 hrs Surf.Area= 2,823 sf Storage= 3,289 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)

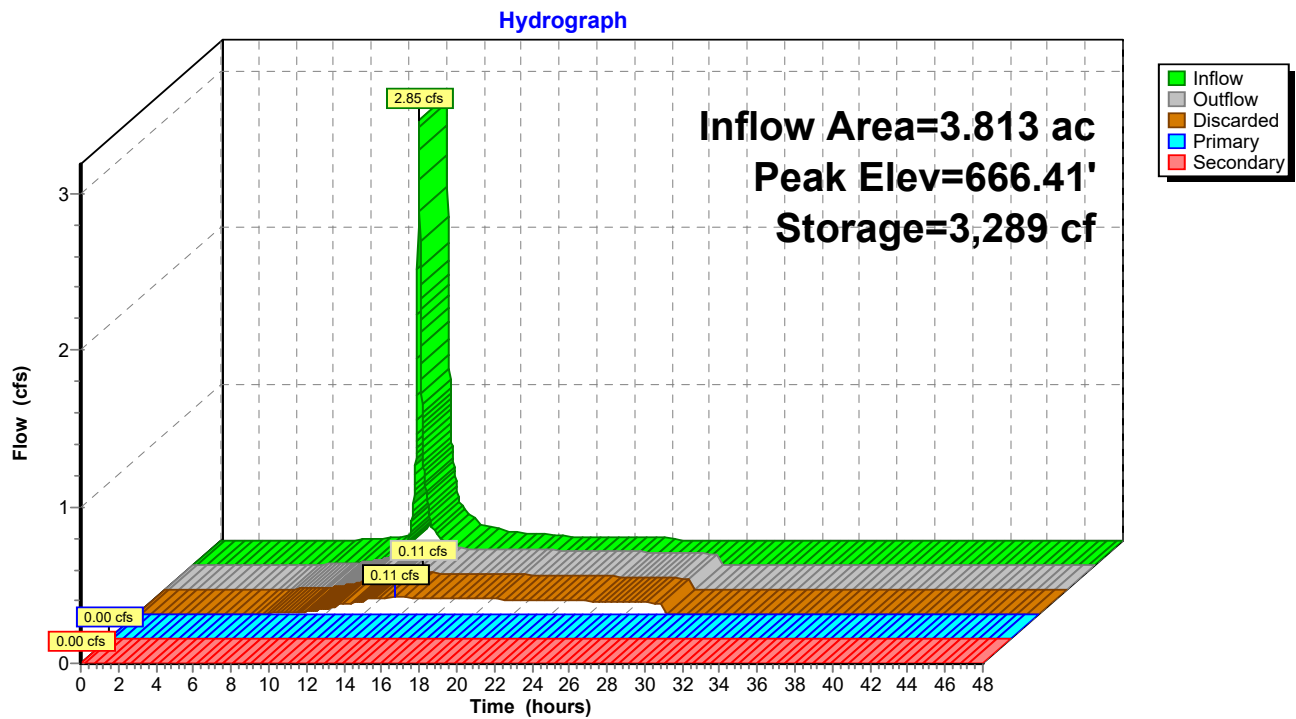
Center-of-Mass det. time= 316.4 min (1,110.6 - 794.2)

Volume	Invert	Avail.Storage	Storage Description
#1	665.00'	41,786 cf	Custom Stage Data (Prismatic) Listed below (Recalc)
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
665.00	1,870	0	0
666.00	2,505	2,188	2,188
668.00	4,042	6,547	8,735
670.00	5,920	9,962	18,697
672.00	8,046	13,966	32,663
673.00	10,200	9,123	41,786

Device	Routing	Invert	Outlet Devices
#1	Discarded	665.00'	1.630 in/hr Exfiltration over Surface area
#2	Device 4	669.00'	24.0" Horiz. Orifice/Grate C= 0.600 in 24.0" Grate (100% open area) Limited to weir flow at low heads
#3	Secondary	672.00'	5.0' long x 5.0' breadth Broad-Crested Rectangular Weir Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 5.00 5.50 Coef. (English) 2.34 2.50 2.70 2.68 2.68 2.66 2.65 2.65 2.65 2.65 2.67 2.66 2.68 2.70 2.74 2.79 2.88
#4	Primary	664.00'	15.0" Round Culvert L= 10.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 664.00' / 663.95' S= 0.0050 '/' Cc= 0.900 n= 0.010, Flow Area= 1.23 sf

Discarded OutFlow Max=0.11 cfs @ 13.76 hrs HW=666.41' (Free Discharge)↑ **1=Exfiltration** (Exfiltration Controls 0.11 cfs)**Primary OutFlow** Max=0.00 cfs @ 0.00 hrs HW=665.00' TW=0.00' (Dynamic Tailwater)↑ **4=Culvert** (Passes 0.00 cfs of 2.38 cfs potential flow)↑ **2=Orifice/Grate** (Controls 0.00 cfs)**Secondary OutFlow** Max=0.00 cfs @ 0.00 hrs HW=665.00' TW=0.00' (Dynamic Tailwater)↑ **3=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond 6P: Bio-Infiltration Basin



21997 Proposed Conditions*PF_Depth_English_PDS 24-hr S0 2-yr Rainfall=3.01"*

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Page 15

Time span=0.00-48.00 hrs, dt=0.01 hrs, 4801 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment1S: DA-1 Runoff Area=2.383 ac 6.04% Impervious Runoff Depth=0.01"
Flow Length=260' Slope=0.0050 '/' Tc=23.0 min CN=43 Runoff=0.00 cfs 0.002 af

Subcatchment2S: DA-2 Runoff Area=0.379 ac 71.77% Impervious Runoff Depth=1.32"
Tc=5.0 min CN=81 Runoff=0.88 cfs 0.042 af

Subcatchment3S: DA-3 Runoff Area=0.632 ac 93.83% Impervious Runoff Depth=2.36"
Tc=5.0 min CN=94 Runoff=2.60 cfs 0.124 af

Subcatchment5S: DA-3 Runoff Area=0.220 ac 32.73% Impervious Runoff Depth=0.28"
Tc=5.0 min CN=58 Runoff=0.04 cfs 0.005 af

Subcatchment6S: DA-6 Runoff Area=0.419 ac 8.35% Impervious Runoff Depth=0.02"
Flow Length=70' Slope=0.0390 '/' Tc=5.8 min CN=44 Runoff=0.00 cfs 0.001 af

Reach 7R: Proposed Runoff Inflow=0.04 cfs 0.005 af
Outflow=0.04 cfs 0.005 af

Pond 6P: Bio-Infiltration Basin Peak Elev=666.75' Storage=4,287 cf Inflow=3.48 cfs 0.168 af
Discarded=0.12 cfs 0.168 af Primary=0.00 cfs 0.000 af Secondary=0.00 cfs 0.000 af Outflow=0.12 cfs 0.168 af

Total Runoff Area = 4.033 ac Runoff Volume = 0.174 af Average Runoff Depth = 0.52"
72.33% Pervious = 2.917 ac 27.67% Impervious = 1.116 ac

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PF_Depth_English_PDS 24-hr S0 2-yr Rainfall=3.01"

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Page 16

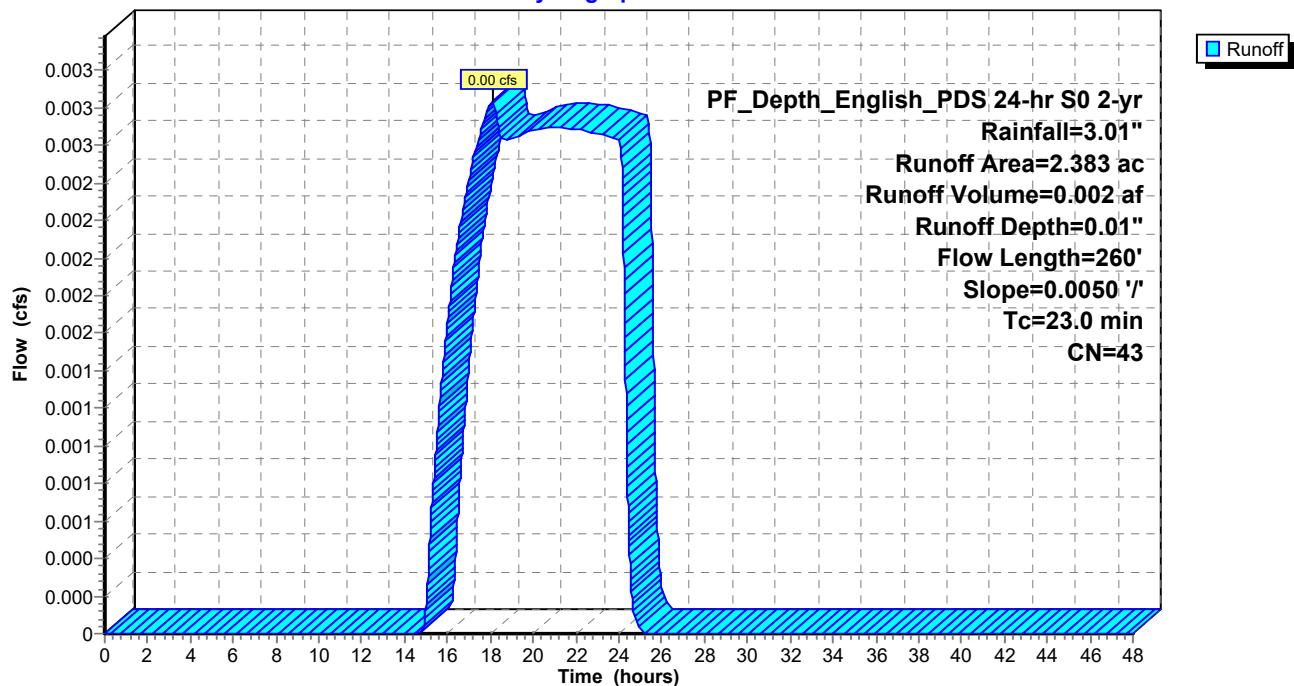
Summary for Subcatchment 1S: DA-1

Runoff = 0.00 cfs @ 18.12 hrs, Volume= 0.002 af, Depth= 0.01"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
PF_Depth_English_PDS 24-hr S0 2-yr Rainfall=3.01"

Area (ac)	CN	Description
0.144	98	Paved parking, HSG A
2.239	39	>75% Grass cover, Good, HSG A
2.383	43	Weighted Average
2.239		93.96% Pervious Area
0.144		6.04% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
17.6	100	0.0050	0.09		Sheet Flow, Grass: Short n= 0.150 P2= 3.01"
5.4	160	0.0050	0.49		Shallow Concentrated Flow, Short Grass Pasture Kv= 7.0 fps
23.0	260	Total			

Subcatchment 1S: DA-1**Hydrograph**

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PF_Depth_English_PDS 24-hr S0 2-yr Rainfall=3.01"

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Page 17

Summary for Subcatchment 2S: DA-2

Runoff = 0.88 cfs @ 12.03 hrs, Volume= 0.042 af, Depth= 1.32"

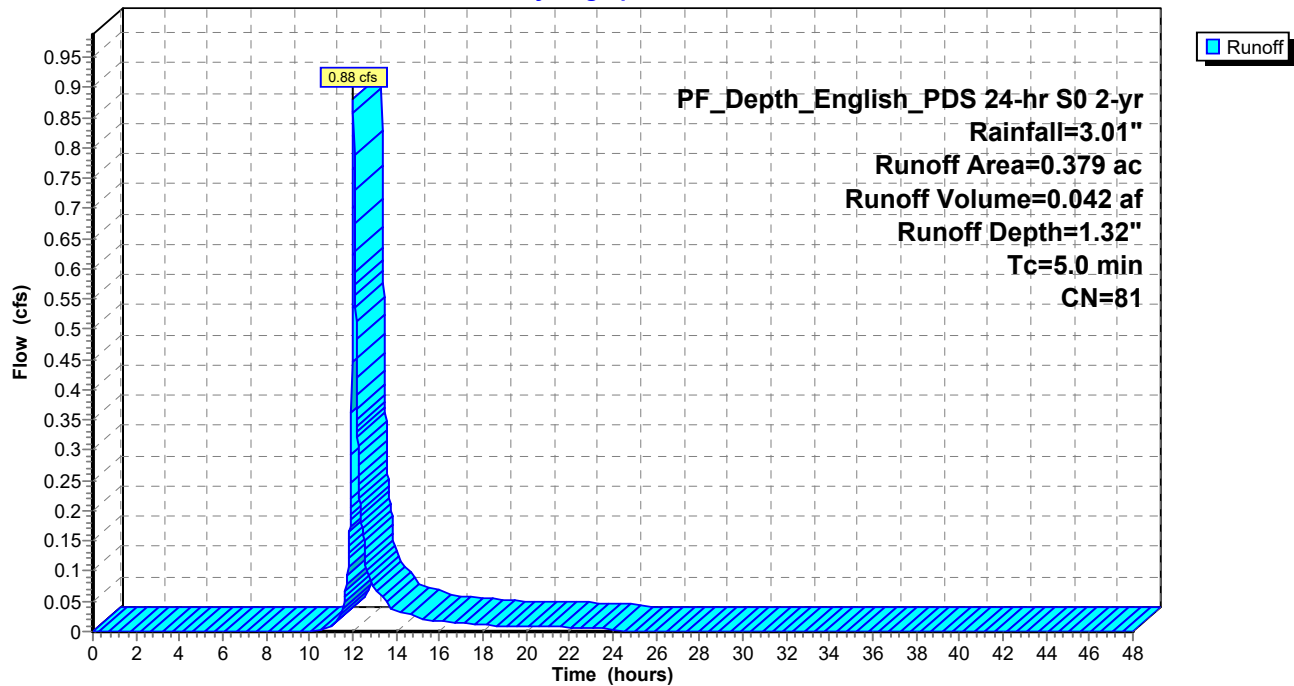
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
PF_Depth_English_PDS 24-hr S0 2-yr Rainfall=3.01"

Area (ac)	CN	Description
0.272	98	Paved parking, HSG A
0.107	39	>75% Grass cover, Good, HSG A
0.379	81	Weighted Average
0.107		28.23% Pervious Area
0.272		71.77% Impervious Area

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

Subcatchment 2S: DA-2

Hydrograph



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PF_Depth_English_PDS 24-hr S0 2-yr Rainfall=3.01"

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Page 18

Summary for Subcatchment 3S: DA-3

Runoff = 2.60 cfs @ 12.03 hrs, Volume= 0.124 af, Depth= 2.36"

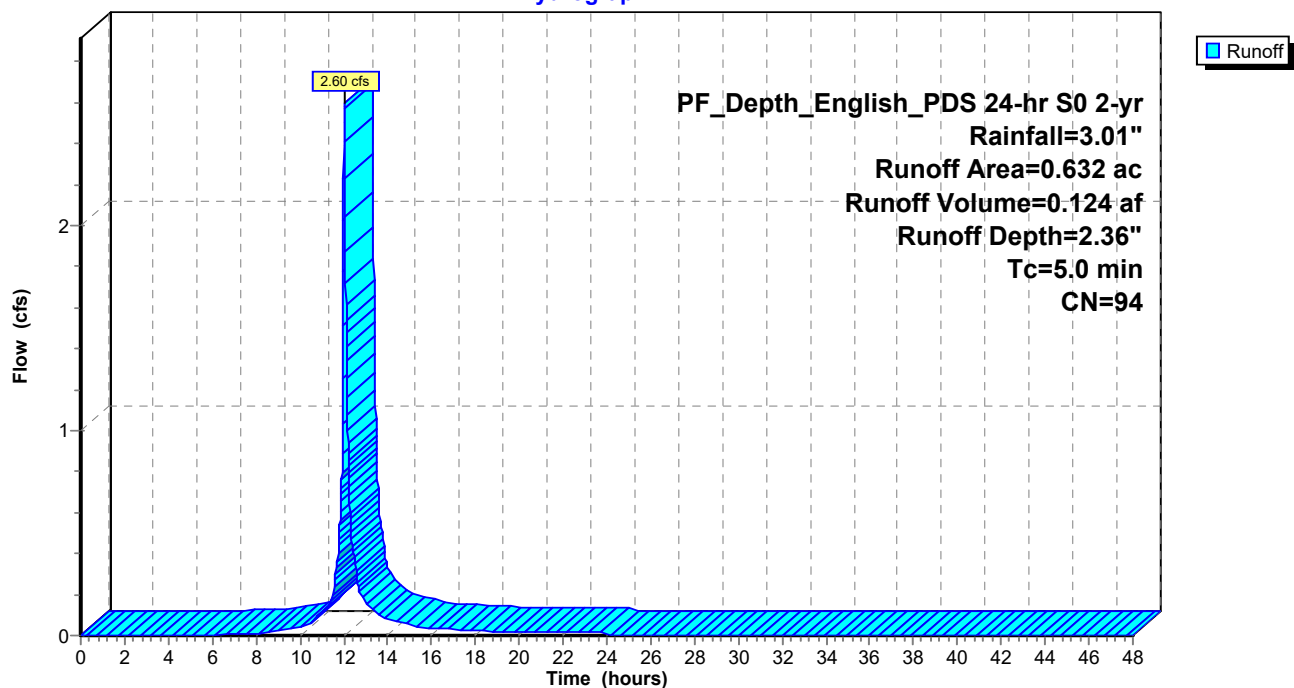
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
PF_Depth_English_PDS 24-hr S0 2-yr Rainfall=3.01"

Area (ac)	CN	Description
0.593	98	Paved parking, HSG A
0.039	39	>75% Grass cover, Good, HSG A
0.632	94	Weighted Average
0.039		6.17% Pervious Area
0.593		93.83% Impervious Area

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

Subcatchment 3S: DA-3

Hydrograph



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PF_Depth_English_PDS 24-hr S0 2-yr Rainfall=3.01"

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Page 19

Summary for Subcatchment 5S: DA-3

Runoff = 0.04 cfs @ 12.14 hrs, Volume= 0.005 af, Depth= 0.28"

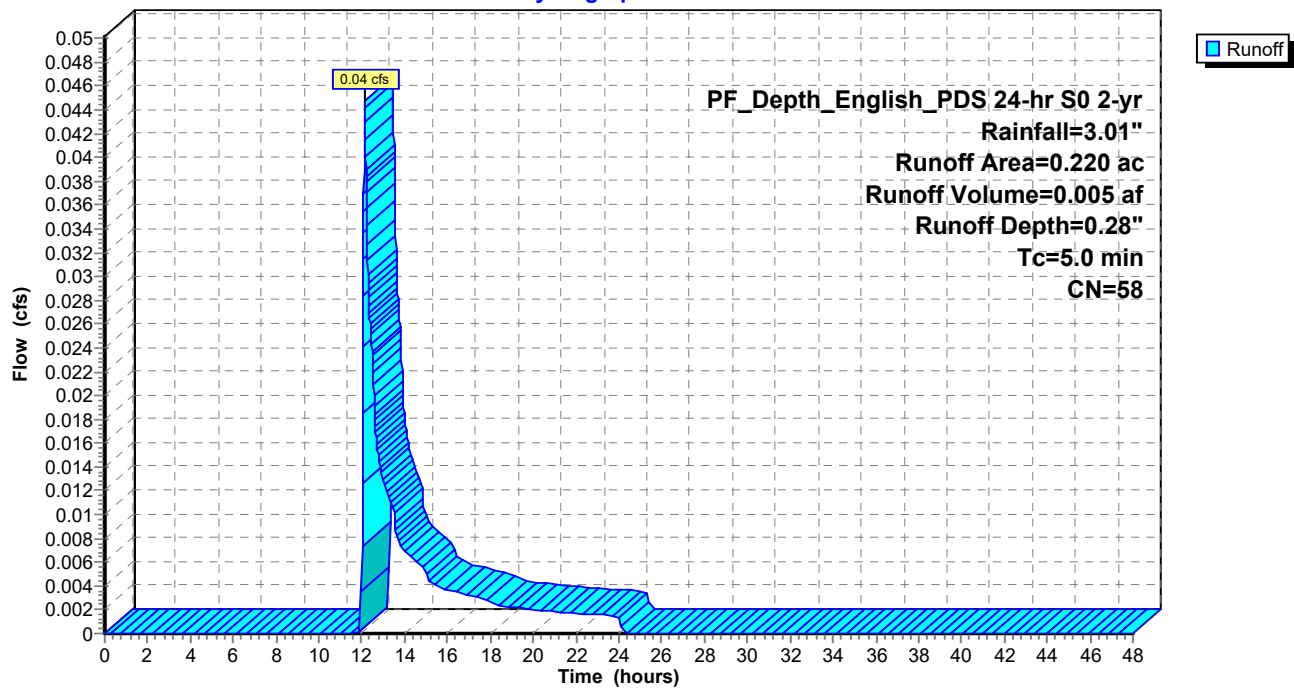
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
PF_Depth_English_PDS 24-hr S0 2-yr Rainfall=3.01"

Area (ac)	CN	Description
0.072	98	Paved parking, HSG A
0.148	39	>75% Grass cover, Good, HSG A
0.220	58	Weighted Average
0.148		67.27% Pervious Area
0.072		32.73% Impervious Area

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

Subcatchment 5S: DA-3

Hydrograph



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PF_Depth_English_PDS 24-hr S0 2-yr Rainfall=3.01"

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Page 20

Summary for Subcatchment 6S: DA-6

Runoff = 0.00 cfs @ 17.95 hrs, Volume= 0.001 af, Depth= 0.02"

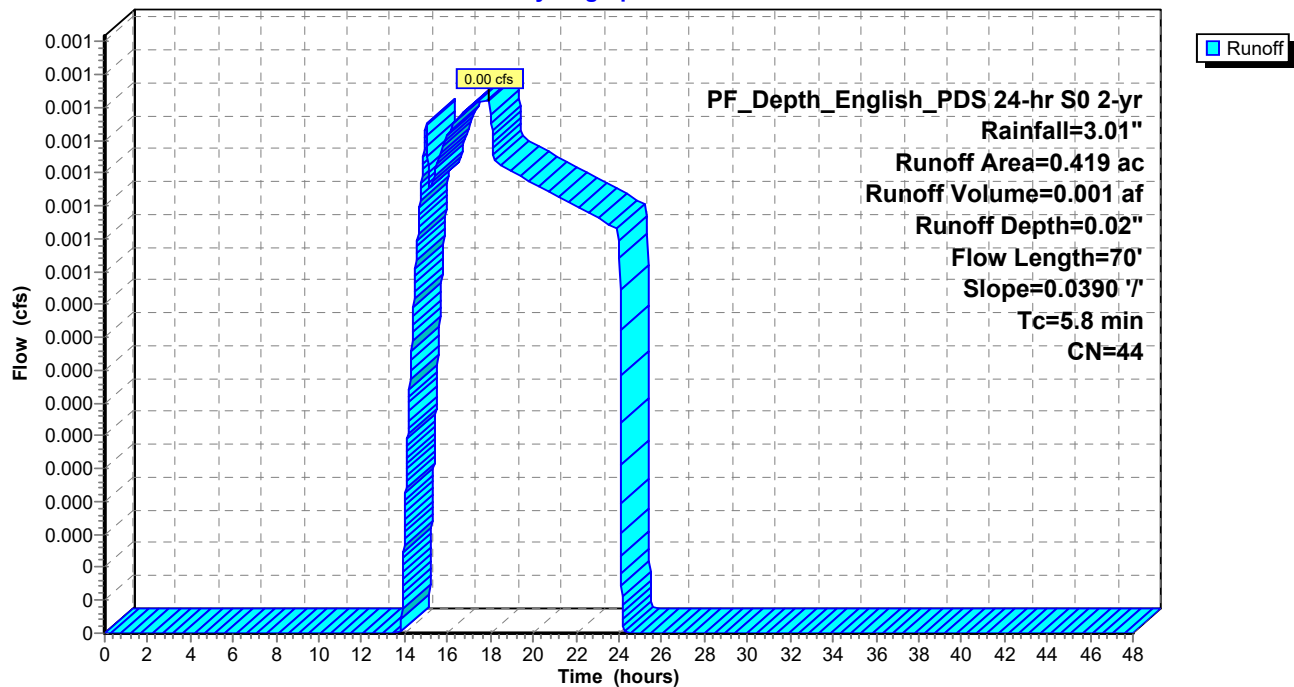
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
PF_Depth_English_PDS 24-hr S0 2-yr Rainfall=3.01"

Area (ac)	CN	Description
0.035	98	Paved parking, HSG A
0.384	39	>75% Grass cover, Good, HSG A
0.419	44	Weighted Average
0.384		91.65% Pervious Area
0.035		8.35% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.8	70	0.0390	0.20		Sheet Flow, Grass: Short n= 0.150 P2= 3.01"

Subcatchment 6S: DA-6

Hydrograph



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PF_Depth_English_PDS 24-hr S0 2-yr Rainfall=3.01"

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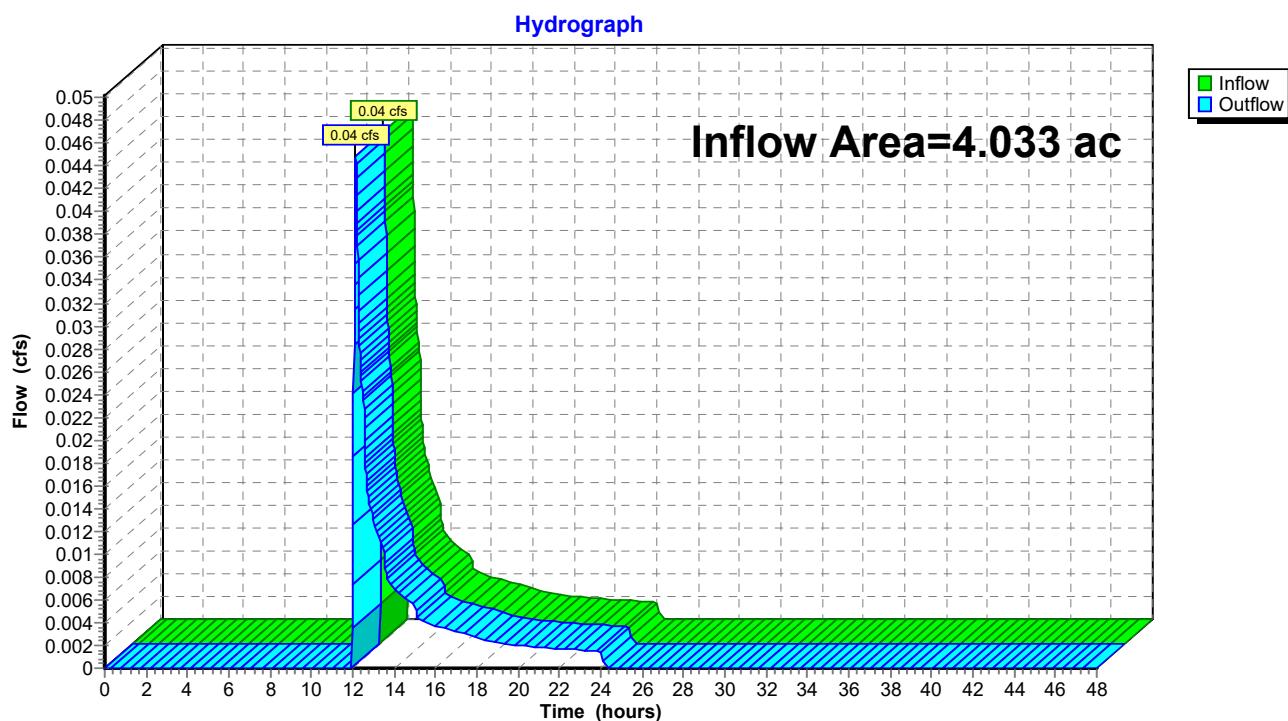
Page 21

Summary for Reach 7R: Proposed Runoff

Inflow Area = 4.033 ac, 27.67% Impervious, Inflow Depth = 0.02" for 2-yr event
Inflow = 0.04 cfs @ 12.14 hrs, Volume= 0.005 af
Outflow = 0.04 cfs @ 12.14 hrs, Volume= 0.005 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs

Reach 7R: Proposed Runoff



21997 Proposed Conditions

PF_Depth_English_PDS 24-hr S0 2-yr Rainfall=3.01"

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Page 22

Summary for Pond 6P: Bio-Infiltration Basin

Inflow Area = 3.813 ac, 27.38% Impervious, Inflow Depth = 0.53" for 2-yr event
 Inflow = 3.48 cfs @ 12.03 hrs, Volume= 0.168 af
 Outflow = 0.12 cfs @ 13.92 hrs, Volume= 0.168 af, Atten= 97%, Lag= 113.4 min
 Discarded = 0.12 cfs @ 13.92 hrs, Volume= 0.168 af
 Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
 Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
 Peak Elev= 666.75' @ 13.92 hrs Surf.Area= 3,083 sf Storage= 4,287 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
 Center-of-Mass det. time= 386.7 min (1,180.4 - 793.7)

Volume	Invert	Avail.Storage	Storage Description
#1	665.00'	41,786 cf	Custom Stage Data (Prismatic) Listed below (Recalc)
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
665.00	1,870	0	0
666.00	2,505	2,188	2,188
668.00	4,042	6,547	8,735
670.00	5,920	9,962	18,697
672.00	8,046	13,966	32,663
673.00	10,200	9,123	41,786

Device	Routing	Invert	Outlet Devices
#1	Discarded	665.00'	1.630 in/hr Exfiltration over Surface area
#2	Device 4	669.00'	24.0" Horiz. Orifice/Grate C= 0.600 in 24.0" Grate (100% open area) Limited to weir flow at low heads
#3	Secondary	672.00'	5.0' long x 5.0' breadth Broad-Crested Rectangular Weir Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 5.00 5.50 Coef. (English) 2.34 2.50 2.70 2.68 2.68 2.66 2.65 2.65 2.65 2.65 2.67 2.66 2.68 2.70 2.74 2.79 2.88
#4	Primary	664.00'	15.0" Round Culvert L= 10.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 664.00' / 663.95' S= 0.0050 '/' Cc= 0.900 n= 0.010, Flow Area= 1.23 sf

Discarded OutFlow Max=0.12 cfs @ 13.92 hrs HW=666.75' (Free Discharge)

↑ **1=Exfiltration** (Exfiltration Controls 0.12 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=665.00' TW=0.00' (Dynamic Tailwater)

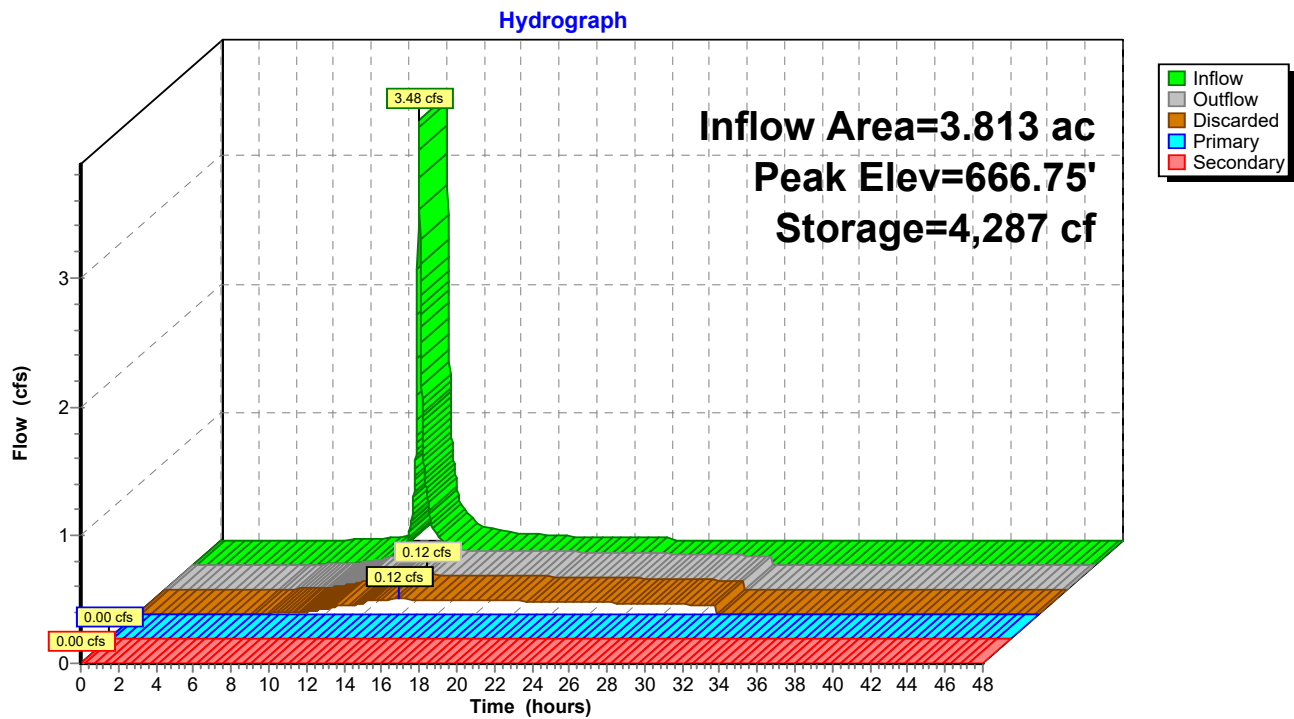
↑ **4=Culvert** (Passes 0.00 cfs of 2.38 cfs potential flow)

↑ **2=Orifice/Grate** (Controls 0.00 cfs)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=665.00' TW=0.00' (Dynamic Tailwater)

↑ **3=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond 6P: Bio-Infiltration Basin



21997 Proposed Conditions*PF_Depth_English_PDS 24-hr S0 5-yr Rainfall=3.75"*

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Page 24

Time span=0.00-48.00 hrs, dt=0.01 hrs, 4801 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment1S: DA-1 Runoff Area=2.383 ac 6.04% Impervious Runoff Depth=0.08"
Flow Length=260' Slope=0.0050 '/' Tc=23.0 min CN=43 Runoff=0.04 cfs 0.017 af

Subcatchment2S: DA-2 Runoff Area=0.379 ac 71.77% Impervious Runoff Depth=1.91"
Tc=5.0 min CN=81 Runoff=1.29 cfs 0.060 af

Subcatchment3S: DA-3 Runoff Area=0.632 ac 93.83% Impervious Runoff Depth=3.08"
Tc=5.0 min CN=94 Runoff=3.34 cfs 0.162 af

Subcatchment5S: DA-3 Runoff Area=0.220 ac 32.73% Impervious Runoff Depth=0.56"
Tc=5.0 min CN=58 Runoff=0.13 cfs 0.010 af

Subcatchment6S: DA-6 Runoff Area=0.419 ac 8.35% Impervious Runoff Depth=0.10"
Flow Length=70' Slope=0.0390 '/' Tc=5.8 min CN=44 Runoff=0.01 cfs 0.004 af

Reach 7R: Proposed Runoff Inflow=0.13 cfs 0.010 af
Outflow=0.13 cfs 0.010 af

Pond 6P: Bio-Infiltration Basin Peak Elev=667.41' Storage=6,472 cf Inflow=4.63 cfs 0.243 af
Discarded=0.14 cfs 0.243 af Primary=0.00 cfs 0.000 af Secondary=0.00 cfs 0.000 af Outflow=0.14 cfs 0.243 af

Total Runoff Area = 4.033 ac Runoff Volume = 0.253 af Average Runoff Depth = 0.75"
72.33% Pervious = 2.917 ac 27.67% Impervious = 1.116 ac

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PF_Depth_English_PDS 24-hr S0 5-yr Rainfall=3.75"

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Page 25

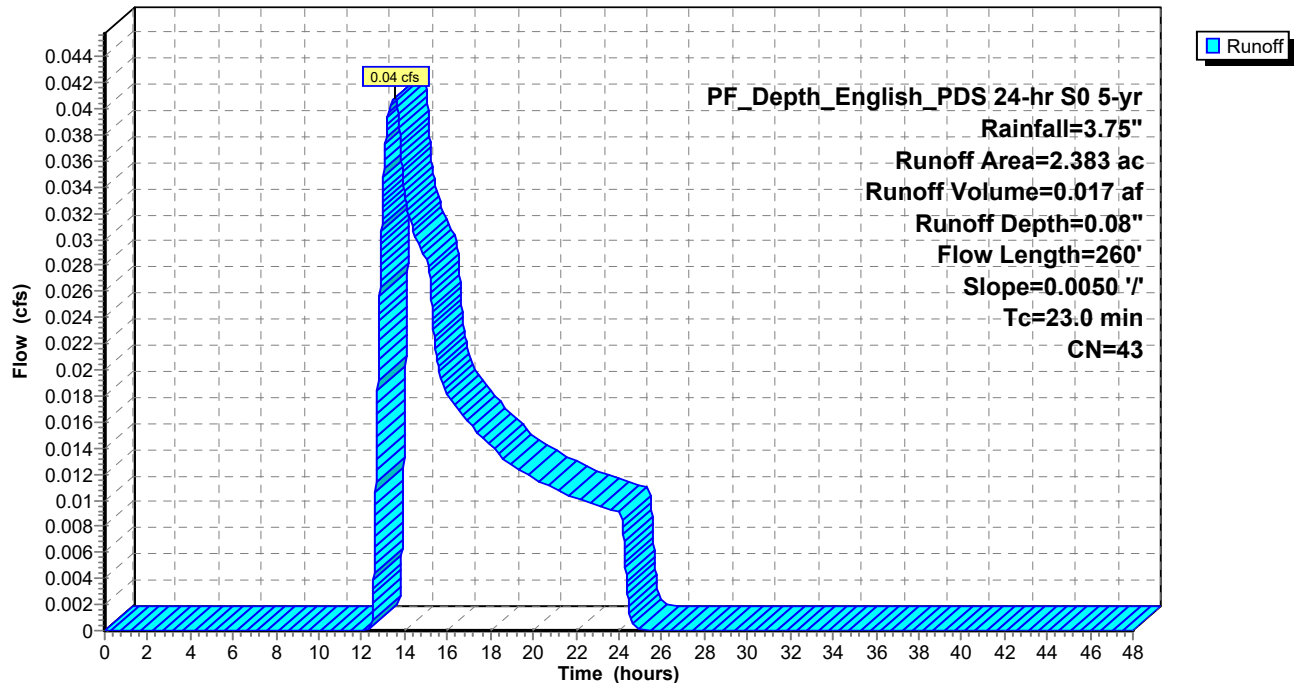
Summary for Subcatchment 1S: DA-1

Runoff = 0.04 cfs @ 13.57 hrs, Volume= 0.017 af, Depth= 0.08"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
PF_Depth_English_PDS 24-hr S0 5-yr Rainfall=3.75"

Area (ac)	CN	Description
0.144	98	Paved parking, HSG A
2.239	39	>75% Grass cover, Good, HSG A
2.383	43	Weighted Average
2.239		93.96% Pervious Area
0.144		6.04% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
17.6	100	0.0050	0.09		Sheet Flow, Grass: Short n= 0.150 P2= 3.01"
5.4	160	0.0050	0.49		Shallow Concentrated Flow, Short Grass Pasture Kv= 7.0 fps
23.0	260	Total			

Subcatchment 1S: DA-1**Hydrograph**

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PF_Depth_English_PDS 24-hr S0 5-yr Rainfall=3.75"

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Page 26

Summary for Subcatchment 2S: DA-2

Runoff = 1.29 cfs @ 12.03 hrs, Volume= 0.060 af, Depth= 1.91"

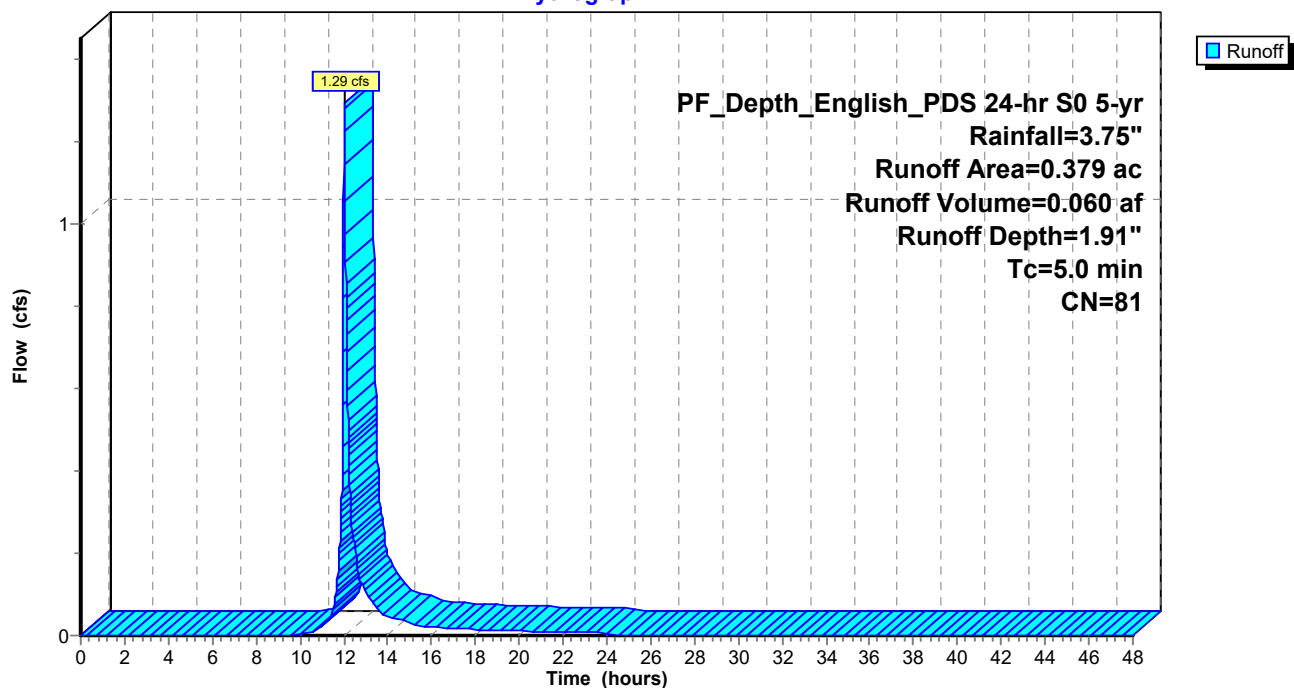
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
PF_Depth_English_PDS 24-hr S0 5-yr Rainfall=3.75"

Area (ac)	CN	Description
0.272	98	Paved parking, HSG A
0.107	39	>75% Grass cover, Good, HSG A
0.379	81	Weighted Average
0.107		28.23% Pervious Area
0.272		71.77% Impervious Area

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

Subcatchment 2S: DA-2

Hydrograph



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Page 27

Summary for Subcatchment 3S: DA-3

Runoff = 3.34 cfs @ 12.03 hrs, Volume= 0.162 af, Depth= 3.08"

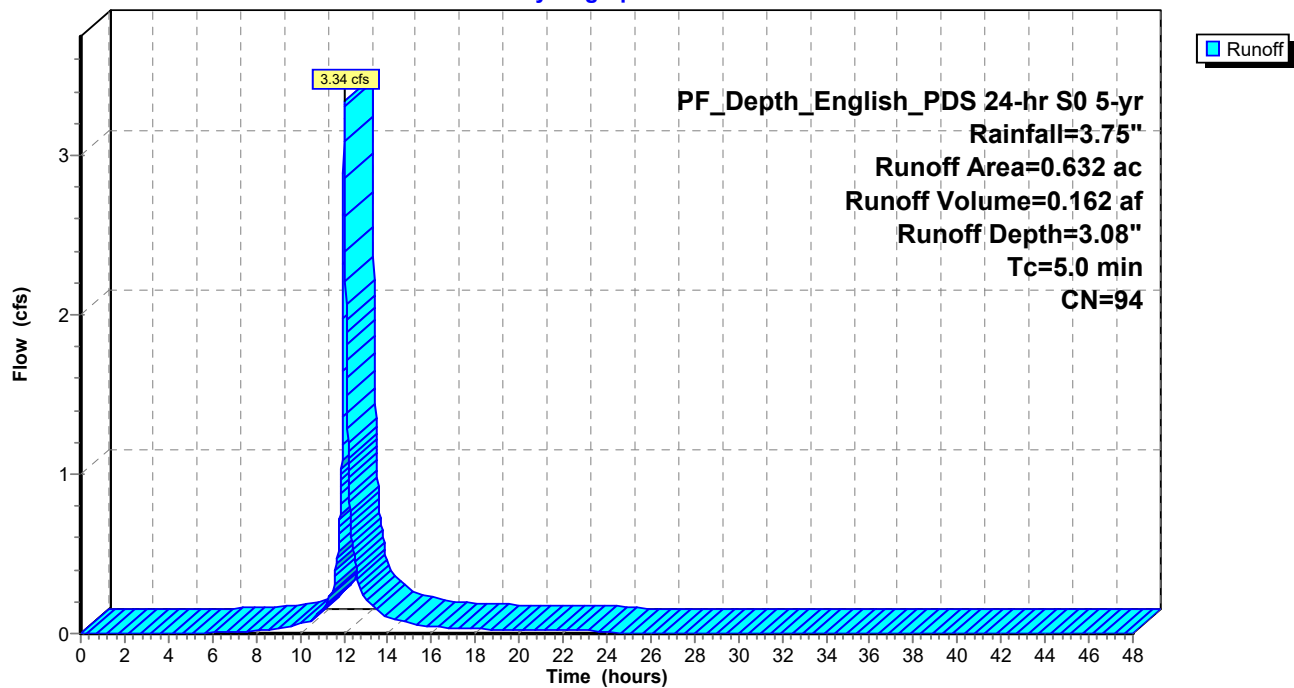
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
PF_Depth_English_PDS 24-hr S0 5-yr Rainfall=3.75"

Area (ac)	CN	Description
0.593	98	Paved parking, HSG A
0.039	39	>75% Grass cover, Good, HSG A
0.632	94	Weighted Average
0.039		6.17% Pervious Area
0.593		93.83% Impervious Area

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

Subcatchment 3S: DA-3

Hydrograph



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PF_Depth_English_PDS 24-hr S0 5-yr Rainfall=3.75"

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Page 28

Summary for Subcatchment 5S: DA-3

Runoff = 0.13 cfs @ 12.05 hrs, Volume= 0.010 af, Depth= 0.56"

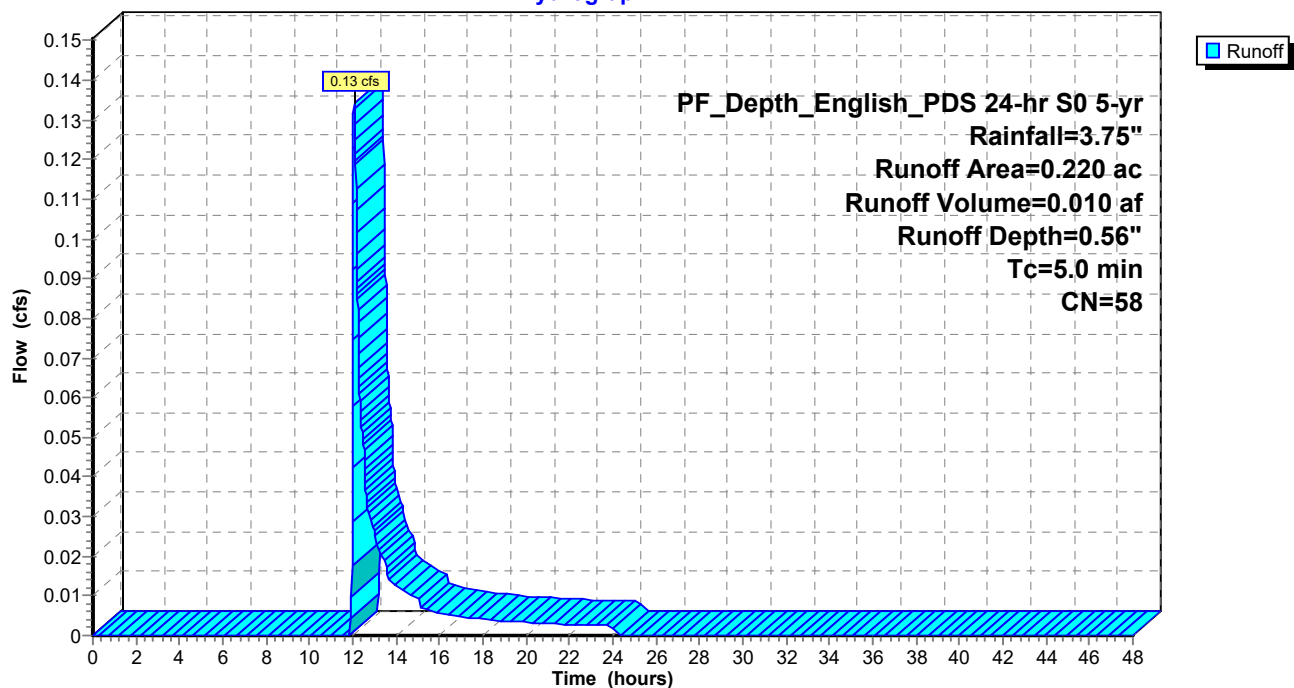
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
PF_Depth_English_PDS 24-hr S0 5-yr Rainfall=3.75"

Area (ac)	CN	Description
0.072	98	Paved parking, HSG A
0.148	39	>75% Grass cover, Good, HSG A
0.220	58	Weighted Average
0.148		67.27% Pervious Area
0.072		32.73% Impervious Area

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

Subcatchment 5S: DA-3

Hydrograph



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PF_Depth_English_PDS 24-hr S0 5-yr Rainfall=3.75"

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Page 29

Summary for Subcatchment 6S: DA-6

Runoff = 0.01 cfs @ 13.03 hrs, Volume= 0.004 af, Depth= 0.10"

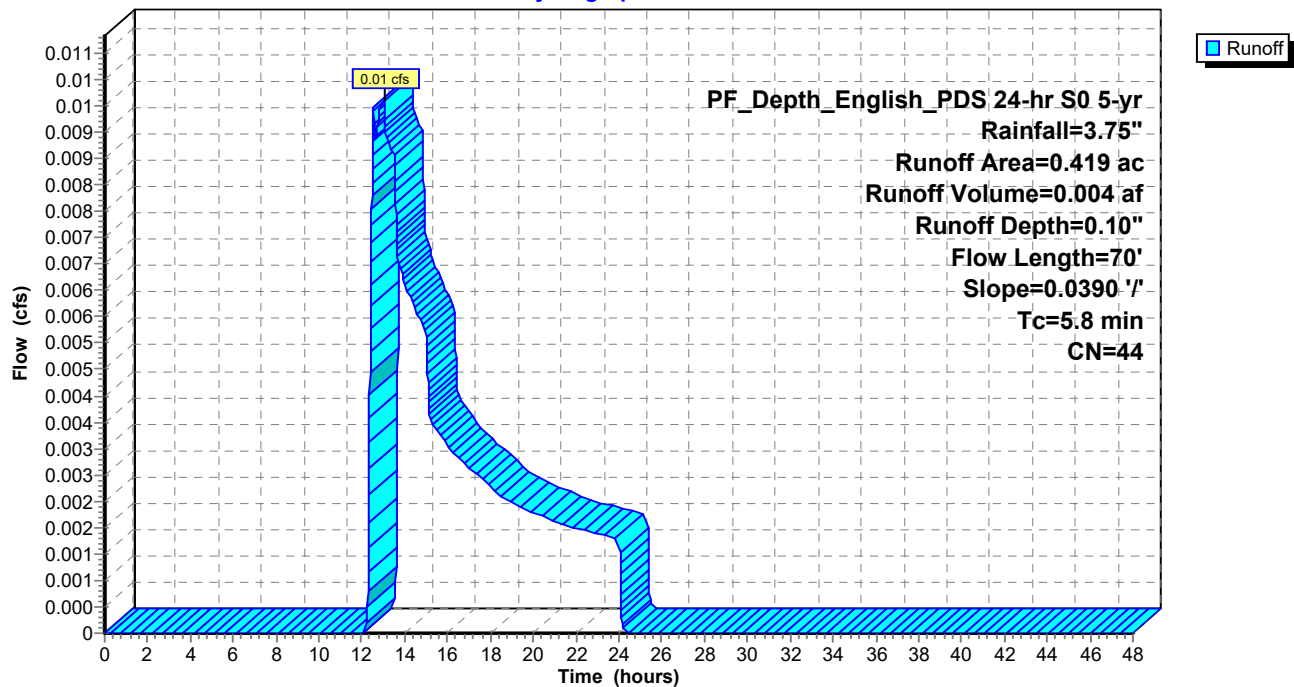
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
PF_Depth_English_PDS 24-hr S0 5-yr Rainfall=3.75"

Area (ac)	CN	Description
0.035	98	Paved parking, HSG A
0.384	39	>75% Grass cover, Good, HSG A
0.419	44	Weighted Average
0.384		91.65% Pervious Area
0.035		8.35% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.8	70	0.0390	0.20		Sheet Flow, Grass: Short n= 0.150 P2= 3.01"

Subcatchment 6S: DA-6

Hydrograph

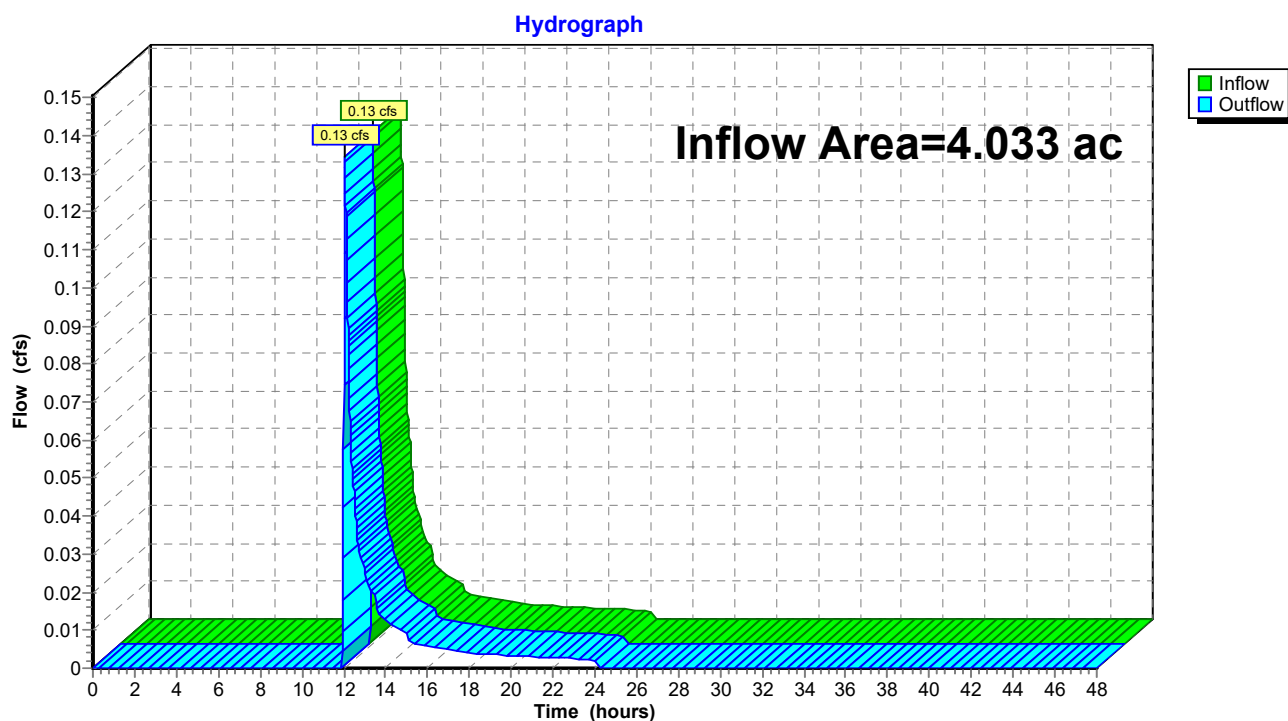


Summary for Reach 7R: Proposed Runoff

Inflow Area = 4.033 ac, 27.67% Impervious, Inflow Depth = 0.03" for 5-yr event
 Inflow = 0.13 cfs @ 12.05 hrs, Volume= 0.010 af
 Outflow = 0.13 cfs @ 12.05 hrs, Volume= 0.010 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs

Reach 7R: Proposed Runoff



21997 Proposed Conditions

PF_Depth_English_PDS 24-hr S0 5-yr Rainfall=3.75"

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Page 31

Summary for Pond 6P: Bio-Infiltration Basin

Inflow Area = 3.813 ac, 27.38% Impervious, Inflow Depth = 0.76" for 5-yr event
 Inflow = 4.63 cfs @ 12.03 hrs, Volume= 0.243 af
 Outflow = 0.14 cfs @ 15.04 hrs, Volume= 0.243 af, Atten= 97%, Lag= 181.0 min
 Discarded = 0.14 cfs @ 15.04 hrs, Volume= 0.243 af
 Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
 Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
 Peak Elev= 667.41' @ 15.04 hrs Surf.Area= 3,586 sf Storage= 6,472 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
 Center-of-Mass det. time= 521.2 min (1,321.3 - 800.1)

Volume	Invert	Avail.Storage	Storage Description
#1	665.00'	41,786 cf	Custom Stage Data (Prismatic) Listed below (Recalc)
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
665.00	1,870	0	0
666.00	2,505	2,188	2,188
668.00	4,042	6,547	8,735
670.00	5,920	9,962	18,697
672.00	8,046	13,966	32,663
673.00	10,200	9,123	41,786

Device	Routing	Invert	Outlet Devices
#1	Discarded	665.00'	1.630 in/hr Exfiltration over Surface area
#2	Device 4	669.00'	24.0" Horiz. Orifice/Grate C= 0.600 in 24.0" Grate (100% open area) Limited to weir flow at low heads
#3	Secondary	672.00'	5.0' long x 5.0' breadth Broad-Crested Rectangular Weir Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 5.00 5.50 Coef. (English) 2.34 2.50 2.70 2.68 2.68 2.66 2.65 2.65 2.65 2.65 2.67 2.66 2.68 2.70 2.74 2.79 2.88
#4	Primary	664.00'	15.0" Round Culvert L= 10.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 664.00' / 663.95' S= 0.0050 '/ Cc= 0.900 n= 0.010, Flow Area= 1.23 sf

Discarded OutFlow Max=0.14 cfs @ 15.04 hrs HW=667.41' (Free Discharge)

↑ **1=Exfiltration** (Exfiltration Controls 0.14 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=665.00' TW=0.00' (Dynamic Tailwater)

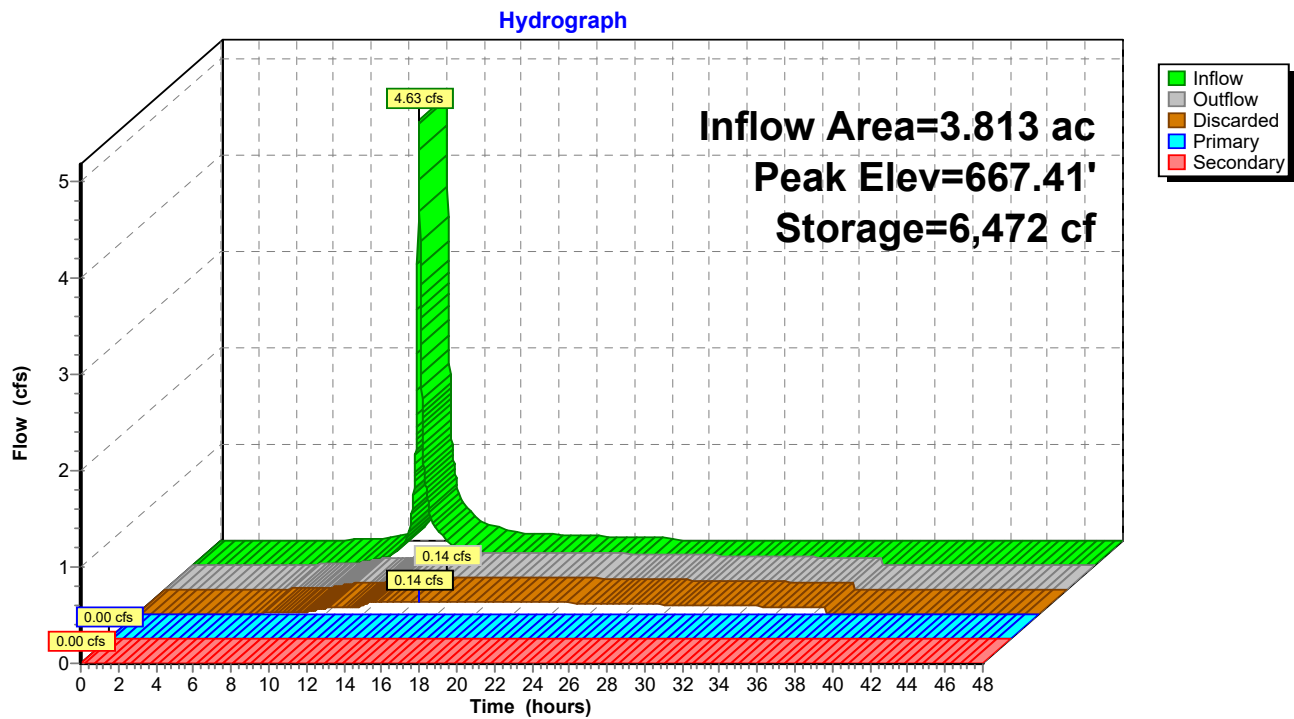
↑ **4=Culvert** (Passes 0.00 cfs of 2.38 cfs potential flow)

↑ **2=Orifice/Grate** (Controls 0.00 cfs)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=665.00' TW=0.00' (Dynamic Tailwater)

↑ **3=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond 6P: Bio-Infiltration Basin



21997 Proposed Conditions*PF_Depth_English_PDS 24-hr S0 10-yr Rainfall=4.46"*

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Page 33

Time span=0.00-48.00 hrs, dt=0.01 hrs, 4801 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment1S: DA-1 Runoff Area=2.383 ac 6.04% Impervious Runoff Depth=0.22"
Flow Length=260' Slope=0.0050 '/' Tc=23.0 min CN=43 Runoff=0.16 cfs 0.043 af

Subcatchment2S: DA-2 Runoff Area=0.379 ac 71.77% Impervious Runoff Depth=2.51"
Tc=5.0 min CN=81 Runoff=1.67 cfs 0.079 af

Subcatchment3S: DA-3 Runoff Area=0.632 ac 93.83% Impervious Runoff Depth=3.78"
Tc=5.0 min CN=94 Runoff=3.96 cfs 0.199 af

Subcatchment5S: DA-3 Runoff Area=0.220 ac 32.73% Impervious Runoff Depth=0.88"
Tc=5.0 min CN=58 Runoff=0.26 cfs 0.016 af

Subcatchment6S: DA-6 Runoff Area=0.419 ac 8.35% Impervious Runoff Depth=0.25"
Flow Length=70' Slope=0.0390 '/' Tc=5.8 min CN=44 Runoff=0.04 cfs 0.009 af

Reach 7R: Proposed Runoff Inflow=0.26 cfs 0.016 af
Outflow=0.26 cfs 0.016 af

Pond 6P: Bio-Infiltration Basin Peak Elev=668.10' Storage=9,142 cf Inflow=5.62 cfs 0.330 af
Discarded=0.16 cfs 0.330 af Primary=0.00 cfs 0.000 af Secondary=0.00 cfs 0.000 af Outflow=0.16 cfs 0.330 af

Total Runoff Area = 4.033 ac Runoff Volume = 0.346 af Average Runoff Depth = 1.03"
72.33% Pervious = 2.917 ac 27.67% Impervious = 1.116 ac

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PF_Depth_English_PDS 24-hr S0 10-yr Rainfall=4.46"

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Page 34

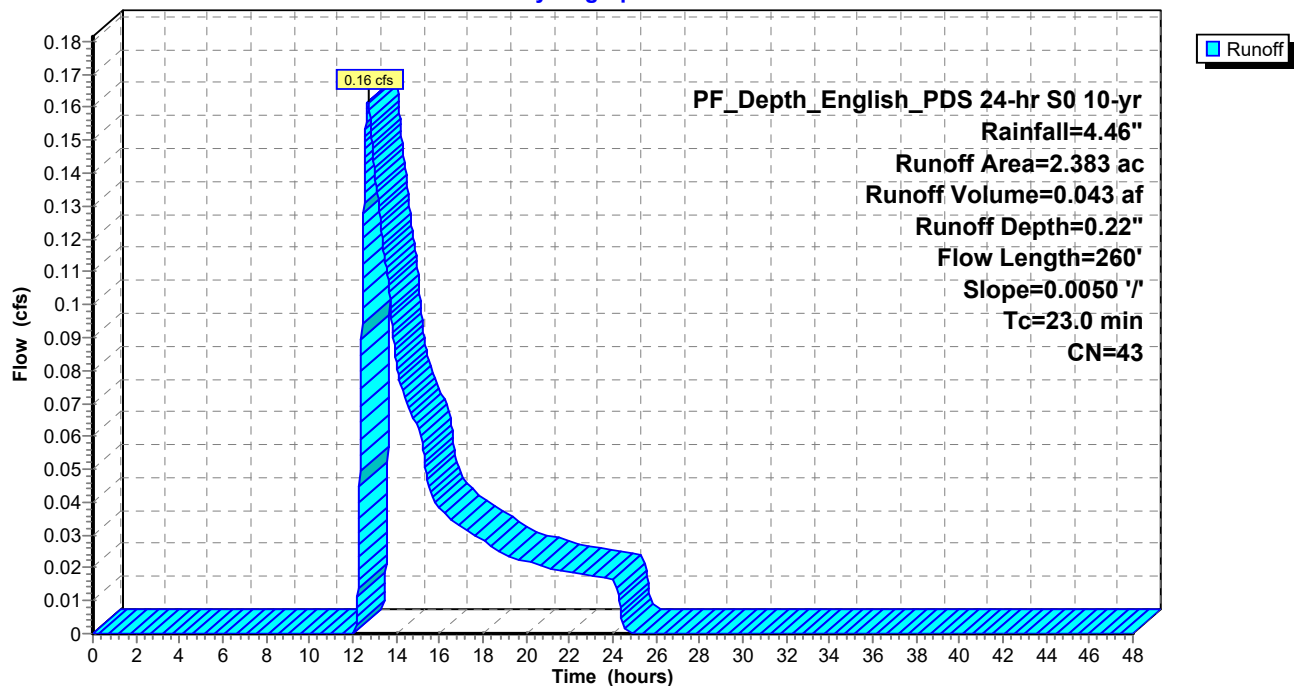
Summary for Subcatchment 1S: DA-1

Runoff = 0.16 cfs @ 12.70 hrs, Volume= 0.043 af, Depth= 0.22"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
PF_Depth_English_PDS 24-hr S0 10-yr Rainfall=4.46"

Area (ac)	CN	Description
0.144	98	Paved parking, HSG A
2.239	39	>75% Grass cover, Good, HSG A
2.383	43	Weighted Average
2.239		93.96% Pervious Area
0.144		6.04% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
17.6	100	0.0050	0.09		Sheet Flow,
					Grass: Short n= 0.150 P2= 3.01"
5.4	160	0.0050	0.49		Shallow Concentrated Flow,
					Short Grass Pasture Kv= 7.0 fps
23.0	260	Total			

Subcatchment 1S: DA-1**Hydrograph**

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PF_Depth_English_PDS 24-hr S0 10-yr Rainfall=4.46"

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Page 35

Summary for Subcatchment 2S: DA-2

Runoff = 1.67 cfs @ 12.03 hrs, Volume= 0.079 af, Depth= 2.51"

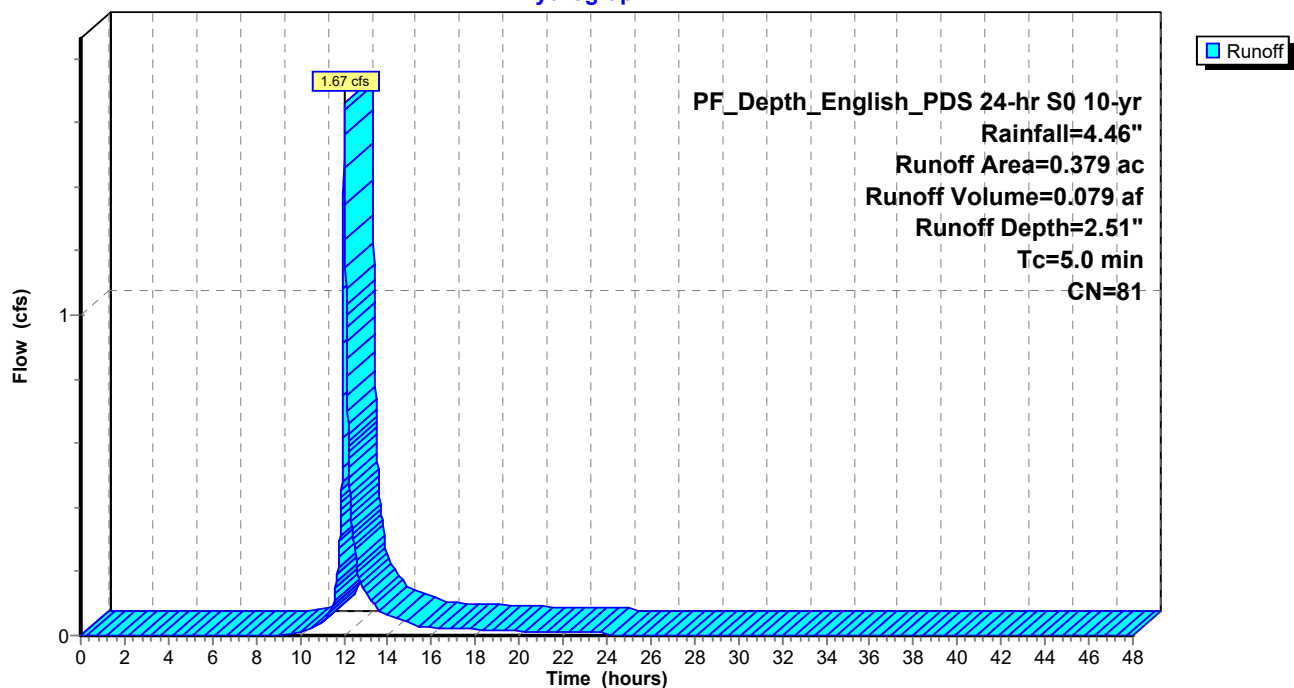
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
PF_Depth_English_PDS 24-hr S0 10-yr Rainfall=4.46"

Area (ac)	CN	Description
0.272	98	Paved parking, HSG A
0.107	39	>75% Grass cover, Good, HSG A
0.379	81	Weighted Average
0.107		28.23% Pervious Area
0.272		71.77% Impervious Area

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

Subcatchment 2S: DA-2

Hydrograph



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PF_Depth_English_PDS 24-hr S0 10-yr Rainfall=4.46"

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Page 36

Summary for Subcatchment 3S: DA-3

Runoff = 3.96 cfs @ 12.03 hrs, Volume= 0.199 af, Depth= 3.78"

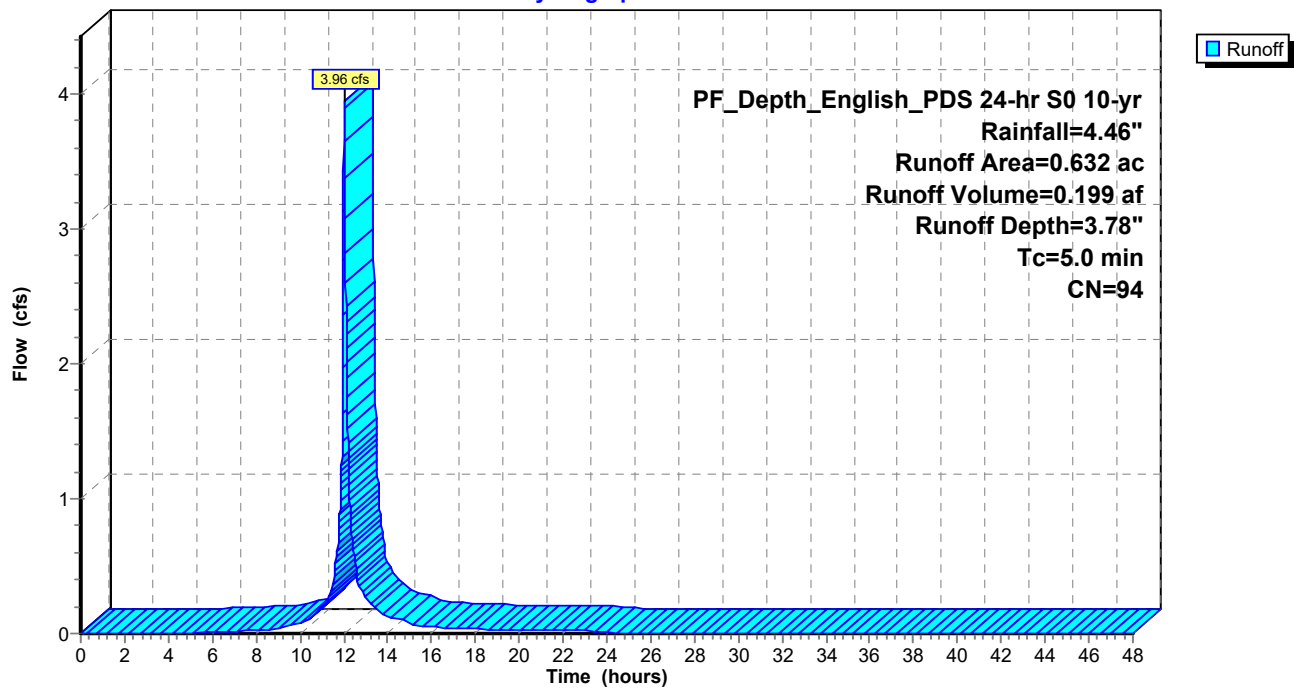
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
PF_Depth_English_PDS 24-hr S0 10-yr Rainfall=4.46"

Area (ac)	CN	Description
0.593	98	Paved parking, HSG A
0.039	39	>75% Grass cover, Good, HSG A
0.632	94	Weighted Average
0.039		6.17% Pervious Area
0.593		93.83% Impervious Area

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

Subcatchment 3S: DA-3

Hydrograph



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PF_Depth_English_PDS 24-hr S0 10-yr Rainfall=4.46"

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Page 37

Summary for Subcatchment 5S: DA-3

Runoff = 0.26 cfs @ 12.04 hrs, Volume= 0.016 af, Depth= 0.88"

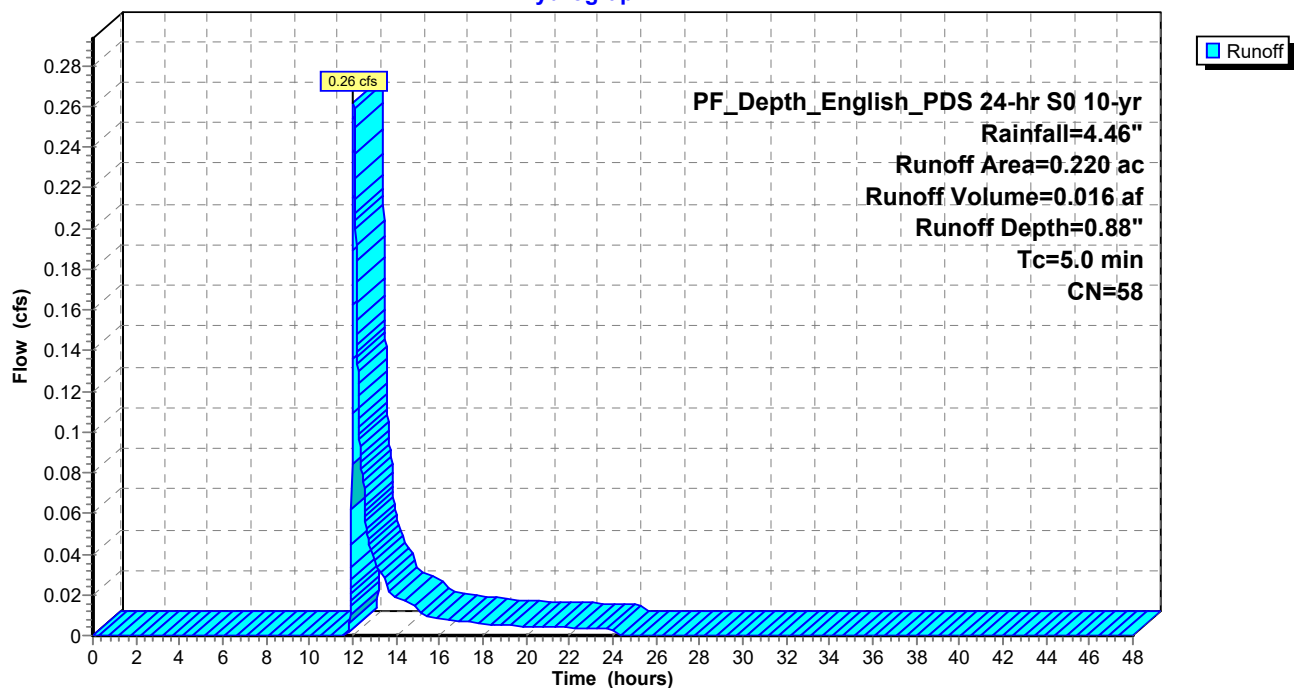
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
PF_Depth_English_PDS 24-hr S0 10-yr Rainfall=4.46"

Area (ac)	CN	Description
0.072	98	Paved parking, HSG A
0.148	39	>75% Grass cover, Good, HSG A
0.220	58	Weighted Average
0.148		67.27% Pervious Area
0.072		32.73% Impervious Area

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

Subcatchment 5S: DA-3

Hydrograph



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PF_Depth_English_PDS 24-hr S0 10-yr Rainfall=4.46"

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Page 38

Summary for Subcatchment 6S: DA-6

Runoff = 0.04 cfs @ 12.25 hrs, Volume= 0.009 af, Depth= 0.25"

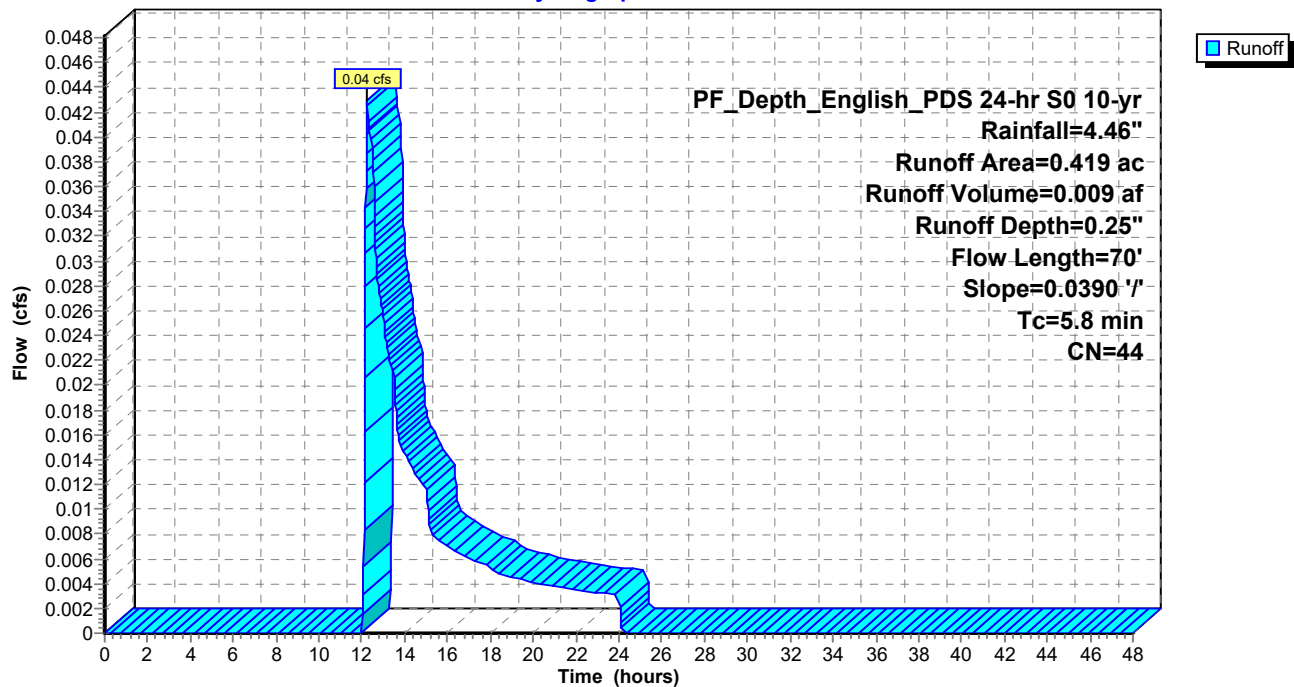
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
PF_Depth_English_PDS 24-hr S0 10-yr Rainfall=4.46"

Area (ac)	CN	Description
0.035	98	Paved parking, HSG A
0.384	39	>75% Grass cover, Good, HSG A
0.419	44	Weighted Average
0.384		91.65% Pervious Area
0.035		8.35% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.8	70	0.0390	0.20		Sheet Flow, Grass: Short n= 0.150 P2= 3.01"

Subcatchment 6S: DA-6

Hydrograph

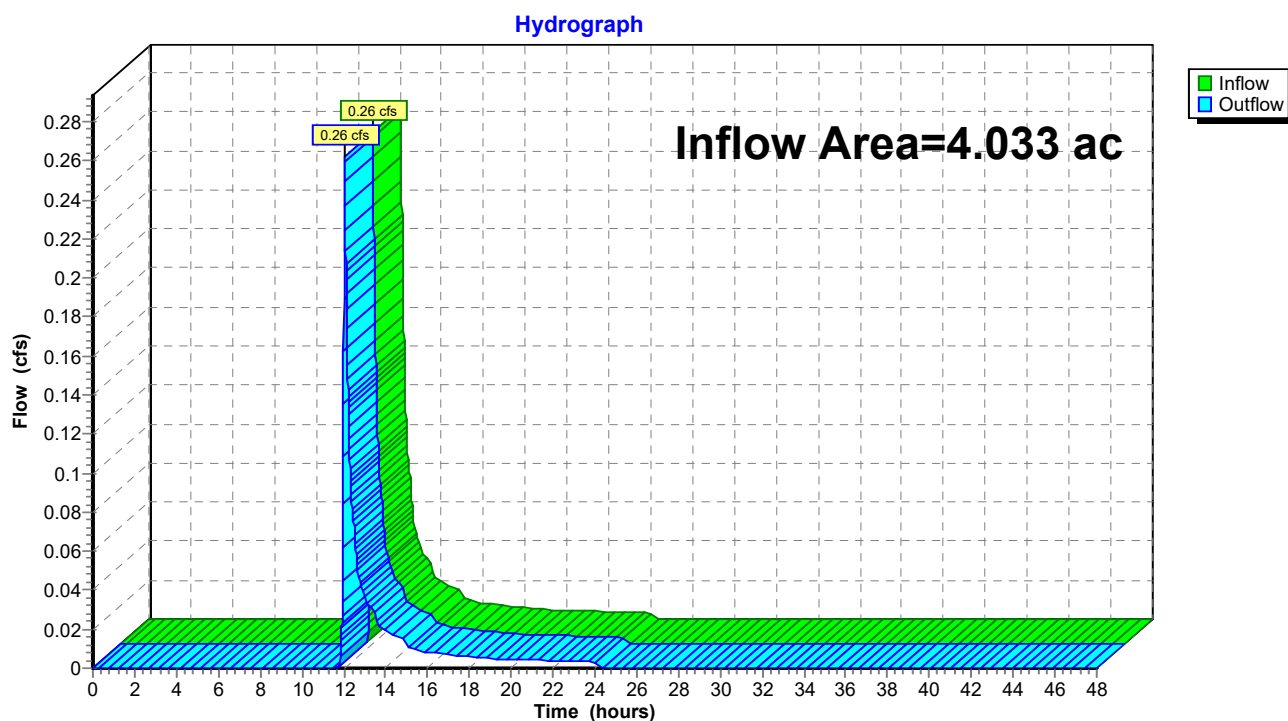


Summary for Reach 7R: Proposed Runoff

Inflow Area = 4.033 ac, 27.67% Impervious, Inflow Depth = 0.05" for 10-yr event
 Inflow = 0.26 cfs @ 12.04 hrs, Volume= 0.016 af
 Outflow = 0.26 cfs @ 12.04 hrs, Volume= 0.016 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs

Reach 7R: Proposed Runoff



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PF_Depth_English_PDS 24-hr S0 10-yr Rainfall=4.46"

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Page 40

Summary for Pond 6P: Bio-Infiltration Basin

Inflow Area = 3.813 ac, 27.38% Impervious, Inflow Depth = 1.04" for 10-yr event
 Inflow = 5.62 cfs @ 12.03 hrs, Volume= 0.330 af
 Outflow = 0.16 cfs @ 15.24 hrs, Volume= 0.330 af, Atten= 97%, Lag= 193.0 min
 Discarded = 0.16 cfs @ 15.24 hrs, Volume= 0.330 af
 Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
 Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
 Peak Elev= 668.10' @ 15.24 hrs Surf.Area= 4,136 sf Storage= 9,142 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
 Center-of-Mass det. time= 653.6 min (1,457.9 - 804.4)

Volume	Invert	Avail.Storage	Storage Description
#1	665.00'	41,786 cf	Custom Stage Data (Prismatic) Listed below (Recalc)
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
665.00	1,870	0	0
666.00	2,505	2,188	2,188
668.00	4,042	6,547	8,735
670.00	5,920	9,962	18,697
672.00	8,046	13,966	32,663
673.00	10,200	9,123	41,786

Device	Routing	Invert	Outlet Devices
#1	Discarded	665.00'	1.630 in/hr Exfiltration over Surface area
#2	Device 4	669.00'	24.0" Horiz. Orifice/Grate C= 0.600 in 24.0" Grate (100% open area) Limited to weir flow at low heads
#3	Secondary	672.00'	5.0' long x 5.0' breadth Broad-Crested Rectangular Weir Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 5.00 5.50 Coef. (English) 2.34 2.50 2.70 2.68 2.68 2.66 2.65 2.65 2.65 2.65 2.67 2.66 2.68 2.70 2.74 2.79 2.88
#4	Primary	664.00'	15.0" Round Culvert L= 10.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 664.00' / 663.95' S= 0.0050 '/' Cc= 0.900 n= 0.010, Flow Area= 1.23 sf

Discarded OutFlow Max=0.16 cfs @ 15.24 hrs HW=668.10' (Free Discharge)

↑ **1=Exfiltration** (Exfiltration Controls 0.16 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=665.00' TW=0.00' (Dynamic Tailwater)

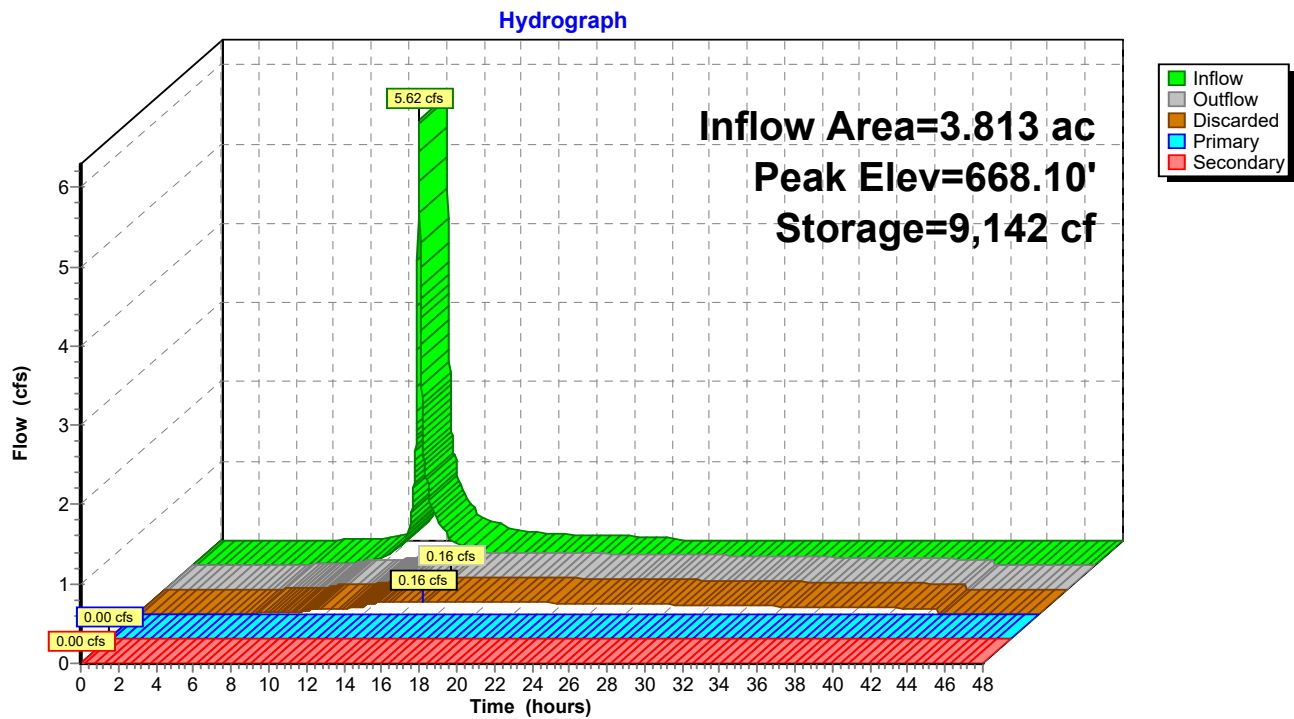
↑ **4=Culvert** (Passes 0.00 cfs of 2.38 cfs potential flow)

↑ **2=Orifice/Grate** (Controls 0.00 cfs)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=665.00' TW=0.00' (Dynamic Tailwater)

↑ **3=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond 6P: Bio-Infiltration Basin



21997 Proposed Conditions*PF_Depth_English_PDS 24-hr S0 25-yr Rainfall=5.56"*

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Page 42

Time span=0.00-48.00 hrs, dt=0.01 hrs, 4801 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment1S: DA-1 Runoff Area=2.383 ac 6.04% Impervious Runoff Depth=0.52"
Flow Length=260' Slope=0.0050 '/' Tc=23.0 min CN=43 Runoff=0.57 cfs 0.104 af

Subcatchment2S: DA-2 Runoff Area=0.379 ac 71.77% Impervious Runoff Depth=3.49"
Tc=5.0 min CN=81 Runoff=2.22 cfs 0.110 af

Subcatchment3S: DA-3 Runoff Area=0.632 ac 93.83% Impervious Runoff Depth=4.86"
Tc=5.0 min CN=94 Runoff=4.84 cfs 0.256 af

Subcatchment5S: DA-3 Runoff Area=0.220 ac 32.73% Impervious Runoff Depth=1.49"
Tc=5.0 min CN=58 Runoff=0.49 cfs 0.027 af

Subcatchment6S: DA-6 Runoff Area=0.419 ac 8.35% Impervious Runoff Depth=0.58"
Flow Length=70' Slope=0.0390 '/' Tc=5.8 min CN=44 Runoff=0.17 cfs 0.020 af

Reach 7R: Proposed Runoff Inflow=0.49 cfs 0.048 af
Outflow=0.49 cfs 0.048 af

Pond 6P: Bio-Infiltration Basin Peak Elev=669.04' Storage=13,464 cf Inflow=7.14 cfs 0.490 af
Discarded=0.19 cfs 0.454 af Primary=0.19 cfs 0.021 af Secondary=0.00 cfs 0.000 af Outflow=0.38 cfs 0.475 af

Total Runoff Area = 4.033 ac Runoff Volume = 0.517 af Average Runoff Depth = 1.54"
72.33% Pervious = 2.917 ac 27.67% Impervious = 1.116 ac

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PF_Depth_English_PDS 24-hr S0 25-yr Rainfall=5.56"

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Page 43

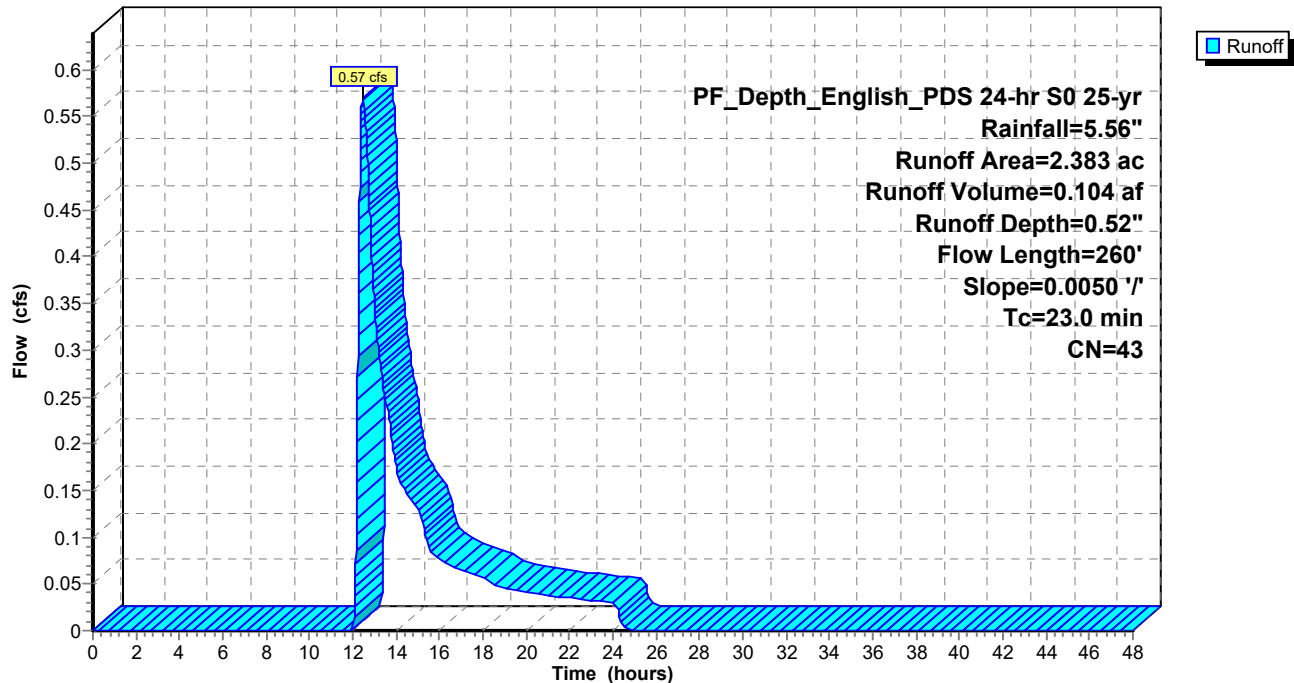
Summary for Subcatchment 1S: DA-1

Runoff = 0.57 cfs @ 12.47 hrs, Volume= 0.104 af, Depth= 0.52"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
PF_Depth_English_PDS 24-hr S0 25-yr Rainfall=5.56"

Area (ac)	CN	Description
0.144	98	Paved parking, HSG A
2.239	39	>75% Grass cover, Good, HSG A
2.383	43	Weighted Average
2.239		93.96% Pervious Area
0.144		6.04% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
17.6	100	0.0050	0.09		Sheet Flow,
					Grass: Short n= 0.150 P2= 3.01"
5.4	160	0.0050	0.49		Shallow Concentrated Flow,
					Short Grass Pasture Kv= 7.0 fps
23.0	260	Total			

Subcatchment 1S: DA-1**Hydrograph**

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PF_Depth_English_PDS 24-hr S0 25-yr Rainfall=5.56"

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Page 44

Summary for Subcatchment 2S: DA-2

Runoff = 2.22 cfs @ 12.03 hrs, Volume= 0.110 af, Depth= 3.49"

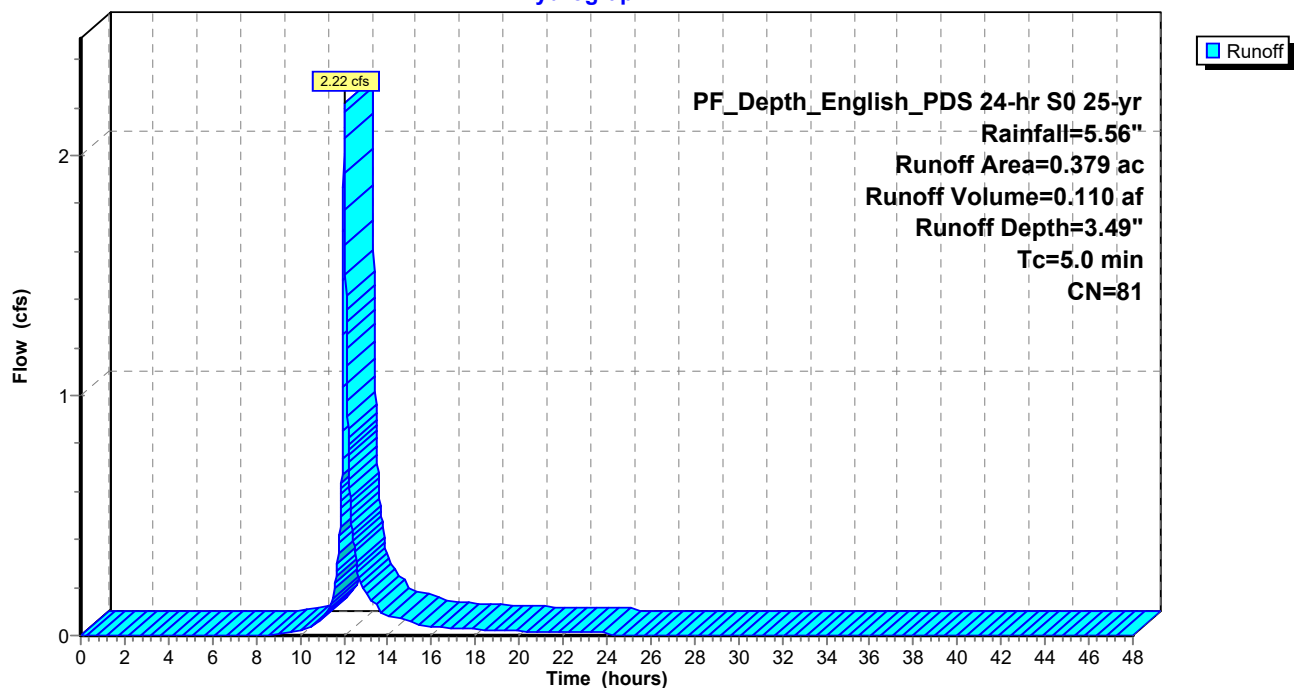
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
PF_Depth_English_PDS 24-hr S0 25-yr Rainfall=5.56"

Area (ac)	CN	Description
0.272	98	Paved parking, HSG A
0.107	39	>75% Grass cover, Good, HSG A
0.379	81	Weighted Average
0.107		28.23% Pervious Area
0.272		71.77% Impervious Area

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

Subcatchment 2S: DA-2

Hydrograph



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PF_Depth_English_PDS 24-hr S0 25-yr Rainfall=5.56"

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Page 45

Summary for Subcatchment 3S: DA-3

Runoff = 4.84 cfs @ 12.03 hrs, Volume= 0.256 af, Depth= 4.86"

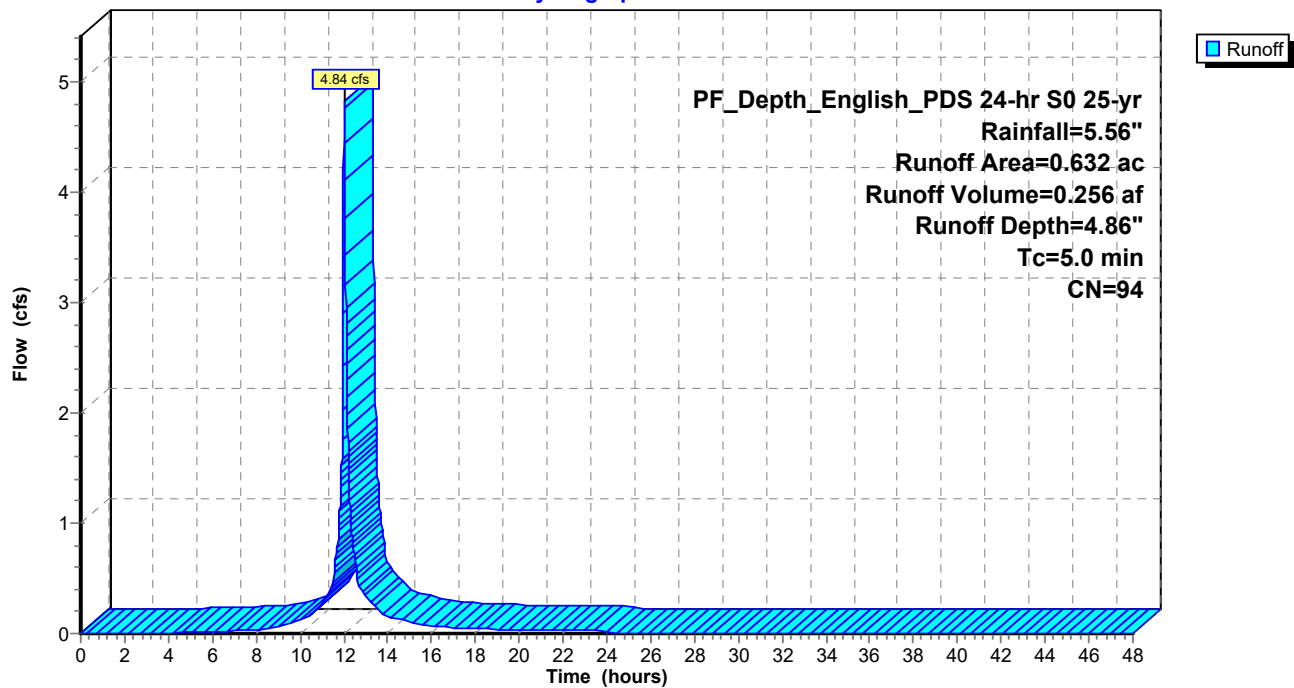
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
PF_Depth_English_PDS 24-hr S0 25-yr Rainfall=5.56"

Area (ac)	CN	Description
0.593	98	Paved parking, HSG A
0.039	39	>75% Grass cover, Good, HSG A
0.632	94	Weighted Average
0.039		6.17% Pervious Area
0.593		93.83% Impervious Area

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

Subcatchment 3S: DA-3

Hydrograph



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PF_Depth_English_PDS 24-hr S0 25-yr Rainfall=5.56"

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Page 46

Summary for Subcatchment 5S: DA-3

Runoff = 0.49 cfs @ 12.04 hrs, Volume= 0.027 af, Depth= 1.49"

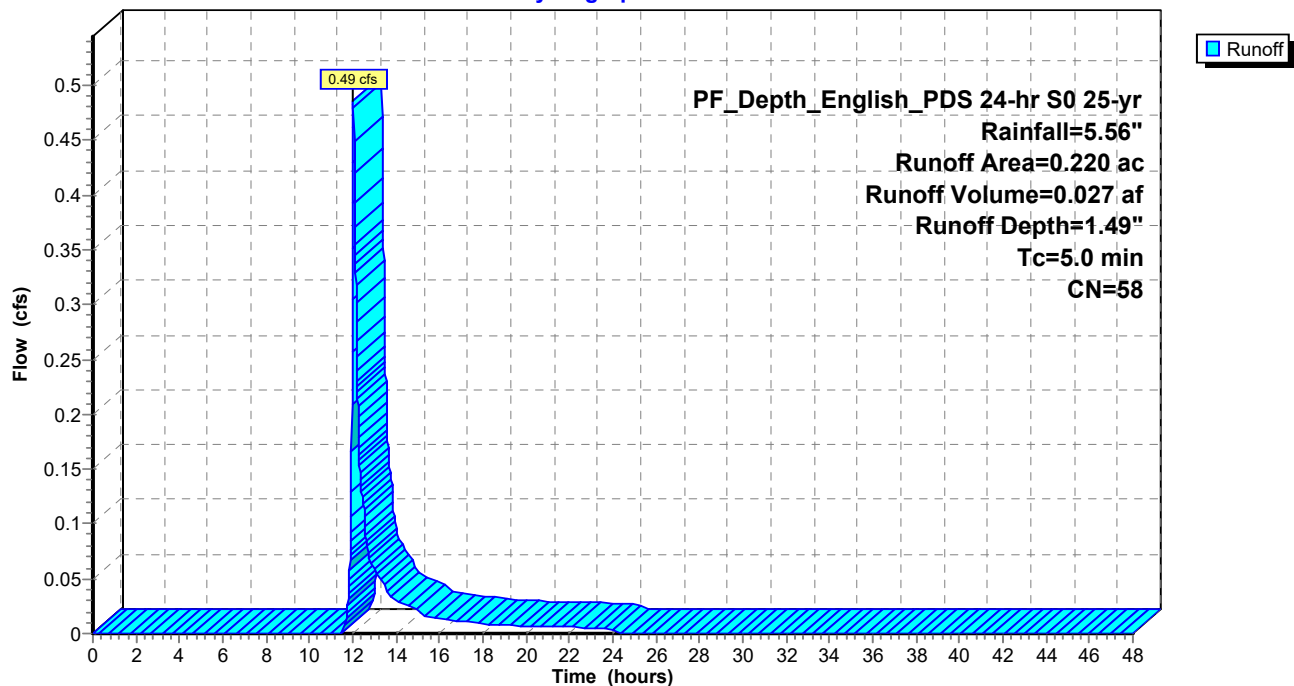
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
PF_Depth_English_PDS 24-hr S0 25-yr Rainfall=5.56"

Area (ac)	CN	Description
0.072	98	Paved parking, HSG A
0.148	39	>75% Grass cover, Good, HSG A
0.220	58	Weighted Average
0.148		67.27% Pervious Area
0.072		32.73% Impervious Area

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

Subcatchment 5S: DA-3

Hydrograph



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PF_Depth_English_PDS 24-hr S0 25-yr Rainfall=5.56"

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Page 47

Summary for Subcatchment 6S: DA-6

Runoff = 0.17 cfs @ 12.14 hrs, Volume= 0.020 af, Depth= 0.58"

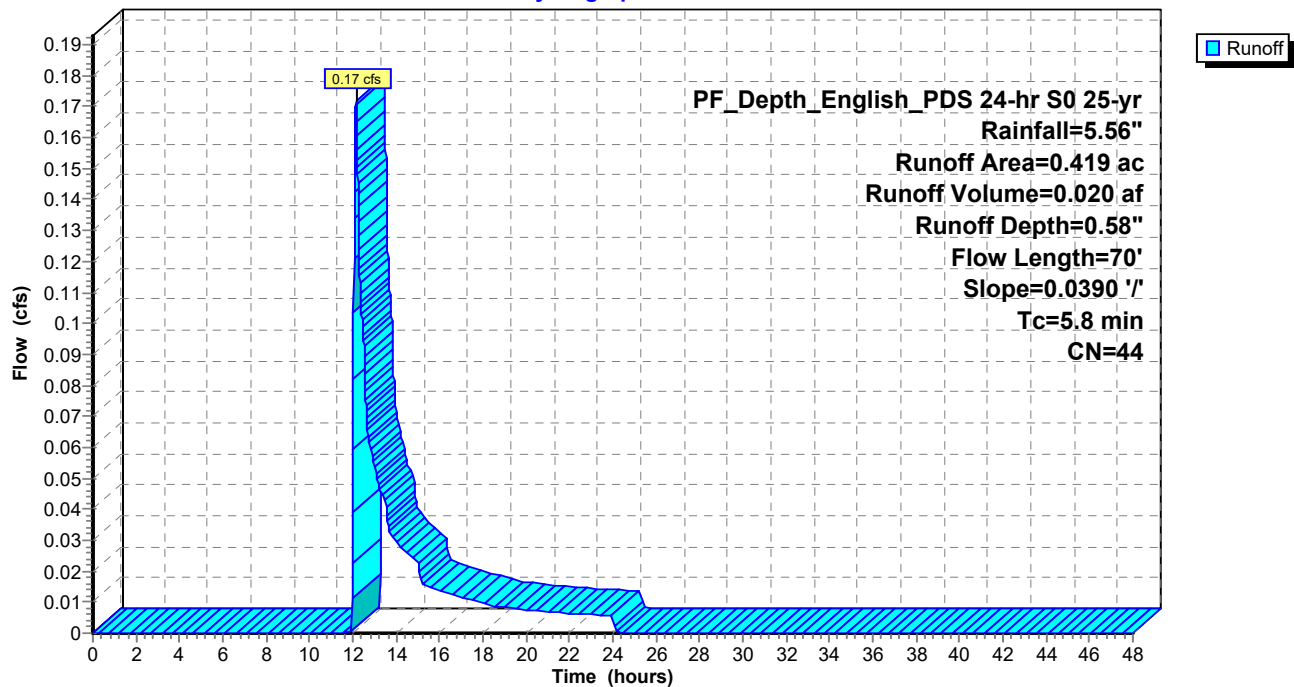
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
PF_Depth_English_PDS 24-hr S0 25-yr Rainfall=5.56"

Area (ac)	CN	Description
0.035	98	Paved parking, HSG A
0.384	39	>75% Grass cover, Good, HSG A
0.419	44	Weighted Average
0.384		91.65% Pervious Area
0.035		8.35% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.8	70	0.0390	0.20		Sheet Flow, Grass: Short n= 0.150 P2= 3.01"

Subcatchment 6S: DA-6

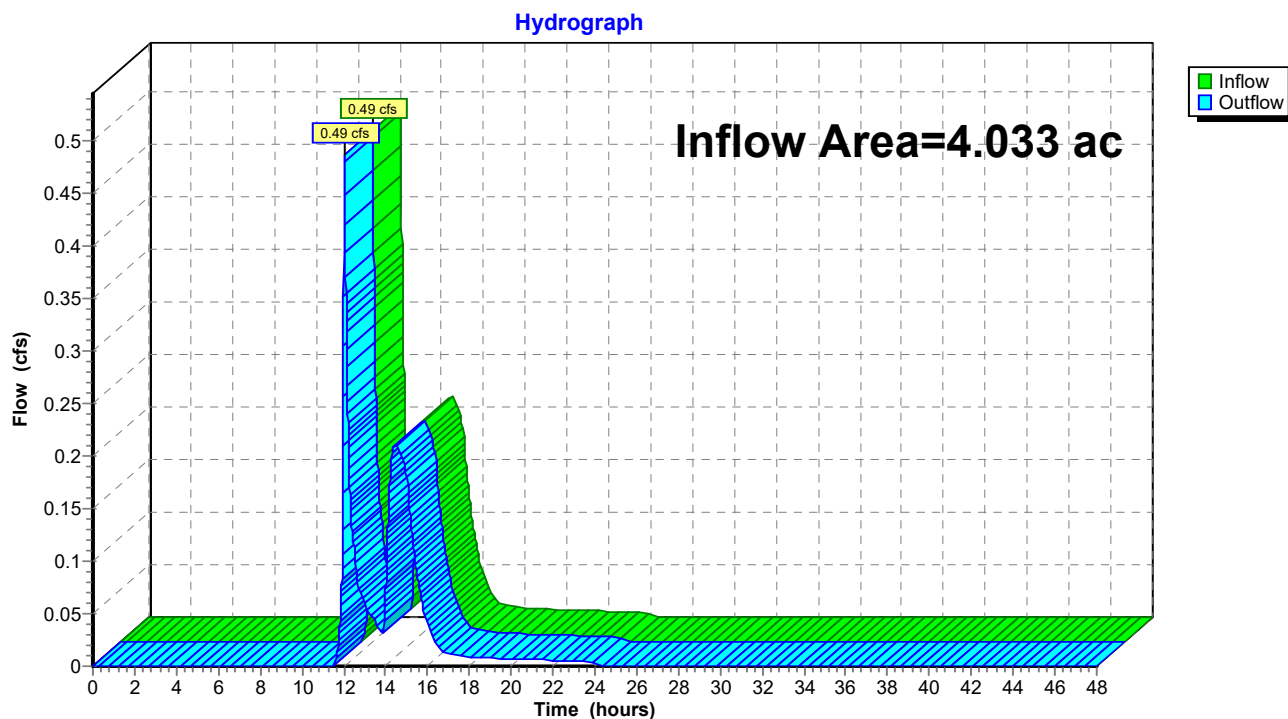
Hydrograph



Summary for Reach 7R: Proposed Runoff

Inflow Area = 4.033 ac, 27.67% Impervious, Inflow Depth = 0.14" for 25-yr event
Inflow = 0.49 cfs @ 12.04 hrs, Volume= 0.048 af
Outflow = 0.49 cfs @ 12.04 hrs, Volume= 0.048 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs

Reach 7R: Proposed Runoff

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PF_Depth_English_PDS 24-hr S0 25-yr Rainfall=5.56"

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Page 49

Summary for Pond 6P: Bio-Infiltration Basin

Inflow Area = 3.813 ac, 27.38% Impervious, Inflow Depth = 1.54" for 25-yr event
 Inflow = 7.14 cfs @ 12.03 hrs, Volume= 0.490 af
 Outflow = 0.38 cfs @ 14.51 hrs, Volume= 0.475 af, Atten= 95%, Lag= 148.6 min
 Discarded = 0.19 cfs @ 14.51 hrs, Volume= 0.454 af
 Primary = 0.19 cfs @ 14.51 hrs, Volume= 0.021 af
 Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs

Peak Elev= 669.04' @ 14.51 hrs Surf.Area= 5,022 sf Storage= 13,464 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)

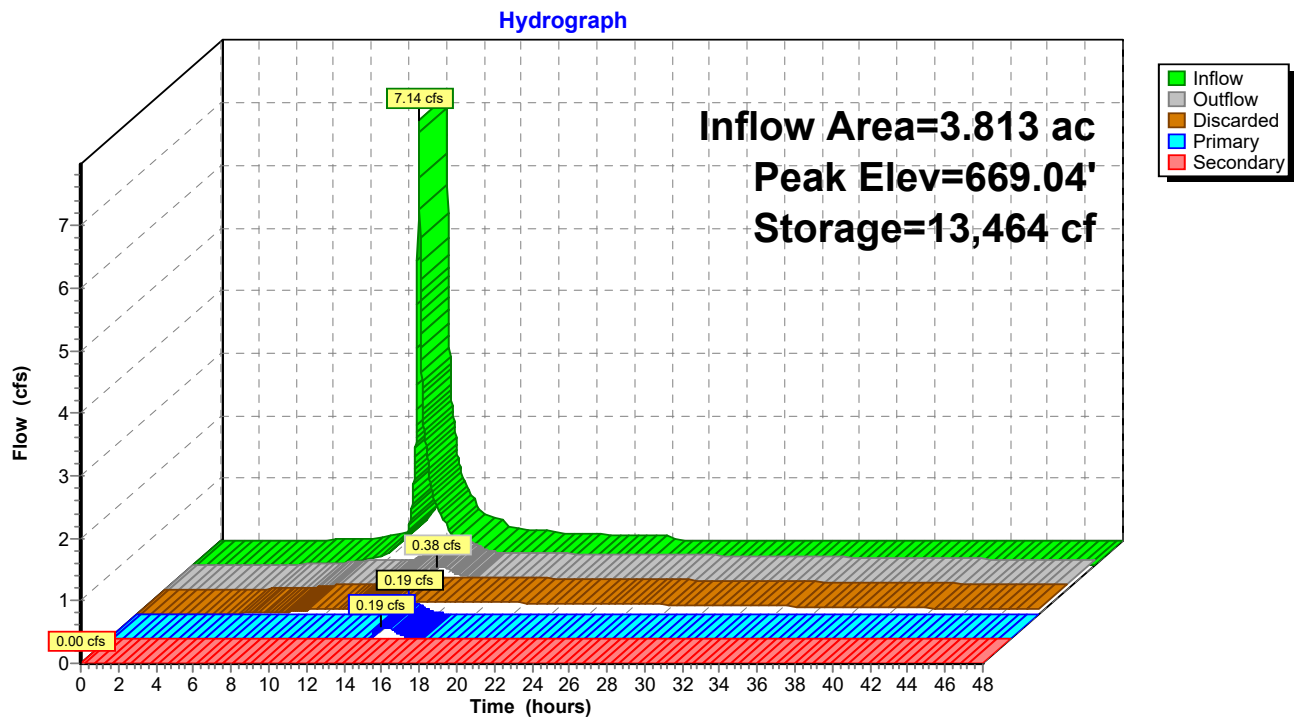
Center-of-Mass det. time= 739.8 min (1,548.3 - 808.5)

Volume	Invert	Avail.Storage	Storage Description
#1	665.00'	41,786 cf	Custom Stage Data (Prismatic) Listed below (Recalc)
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
665.00	1,870	0	0
666.00	2,505	2,188	2,188
668.00	4,042	6,547	8,735
670.00	5,920	9,962	18,697
672.00	8,046	13,966	32,663
673.00	10,200	9,123	41,786

Device	Routing	Invert	Outlet Devices
#1	Discarded	665.00'	1.630 in/hr Exfiltration over Surface area
#2	Device 4	669.00'	24.0" Horiz. Orifice/Grate C= 0.600 in 24.0" Grate (100% open area) Limited to weir flow at low heads
#3	Secondary	672.00'	5.0' long x 5.0' breadth Broad-Crested Rectangular Weir Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 5.00 5.50 Coef. (English) 2.34 2.50 2.70 2.68 2.68 2.66 2.65 2.65 2.65 2.65 2.67 2.66 2.68 2.70 2.74 2.79 2.88
#4	Primary	664.00'	15.0" Round Culvert L= 10.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 664.00' / 663.95' S= 0.0050 ' / Cc= 0.900 n= 0.010, Flow Area= 1.23 sf

Discarded OutFlow Max=0.19 cfs @ 14.51 hrs HW=669.04' (Free Discharge)↑ **1=Exfiltration** (Exfiltration Controls 0.19 cfs)**Primary OutFlow** Max=0.19 cfs @ 14.51 hrs HW=669.04' TW=0.00' (Dynamic Tailwater)↑ **4=Culvert** (Passes 0.19 cfs of 9.81 cfs potential flow)↑ **2=Orifice/Grate** (Weir Controls 0.19 cfs @ 0.68 fps)**Secondary OutFlow** Max=0.00 cfs @ 0.00 hrs HW=665.00' TW=0.00' (Dynamic Tailwater)↑ **3=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond 6P: Bio-Infiltration Basin



21997 Proposed Conditions*PF_Depth_English_PDS 24-hr S0 100-yr Rainfall=7.55"*

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Page 51

Time span=0.00-48.00 hrs, dt=0.01 hrs, 4801 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment1S: DA-1 Runoff Area=2.383 ac 6.04% Impervious Runoff Depth=1.32"
Flow Length=260' Slope=0.0050 '/' Tc=23.0 min CN=43 Runoff=1.97 cfs 0.263 af

Subcatchment2S: DA-2 Runoff Area=0.379 ac 71.77% Impervious Runoff Depth=5.32"
Tc=5.0 min CN=81 Runoff=3.11 cfs 0.168 af

Subcatchment3S: DA-3 Runoff Area=0.632 ac 93.83% Impervious Runoff Depth=6.83"
Tc=5.0 min CN=94 Runoff=6.18 cfs 0.360 af

Subcatchment5S: DA-3 Runoff Area=0.220 ac 32.73% Impervious Runoff Depth=2.79"
Tc=5.0 min CN=58 Runoff=0.92 cfs 0.051 af

Subcatchment6S: DA-6 Runoff Area=0.419 ac 8.35% Impervious Runoff Depth=1.41"
Flow Length=70' Slope=0.0390 '/' Tc=5.8 min CN=44 Runoff=0.65 cfs 0.049 af

Reach 7R: Proposed Runoff Inflow=3.27 cfs 0.369 af
Outflow=3.27 cfs 0.369 af

Pond 6P: Bio-Infiltration Basin Peak Elev=669.28' Storage=14,687 cf Inflow=10.04 cfs 0.840 af
Discarded=0.20 cfs 0.491 af Primary=3.07 cfs 0.318 af Secondary=0.00 cfs 0.000 af Outflow=3.27 cfs 0.809 af

Total Runoff Area = 4.033 ac Runoff Volume = 0.891 af Average Runoff Depth = 2.65"
72.33% Pervious = 2.917 ac 27.67% Impervious = 1.116 ac

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PF_Depth_English_PDS 24-hr S0 100-yr Rainfall=7.55"

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Page 52

Summary for Subcatchment 1S: DA-1

Runoff = 1.97 cfs @ 12.35 hrs, Volume= 0.263 af, Depth= 1.32"

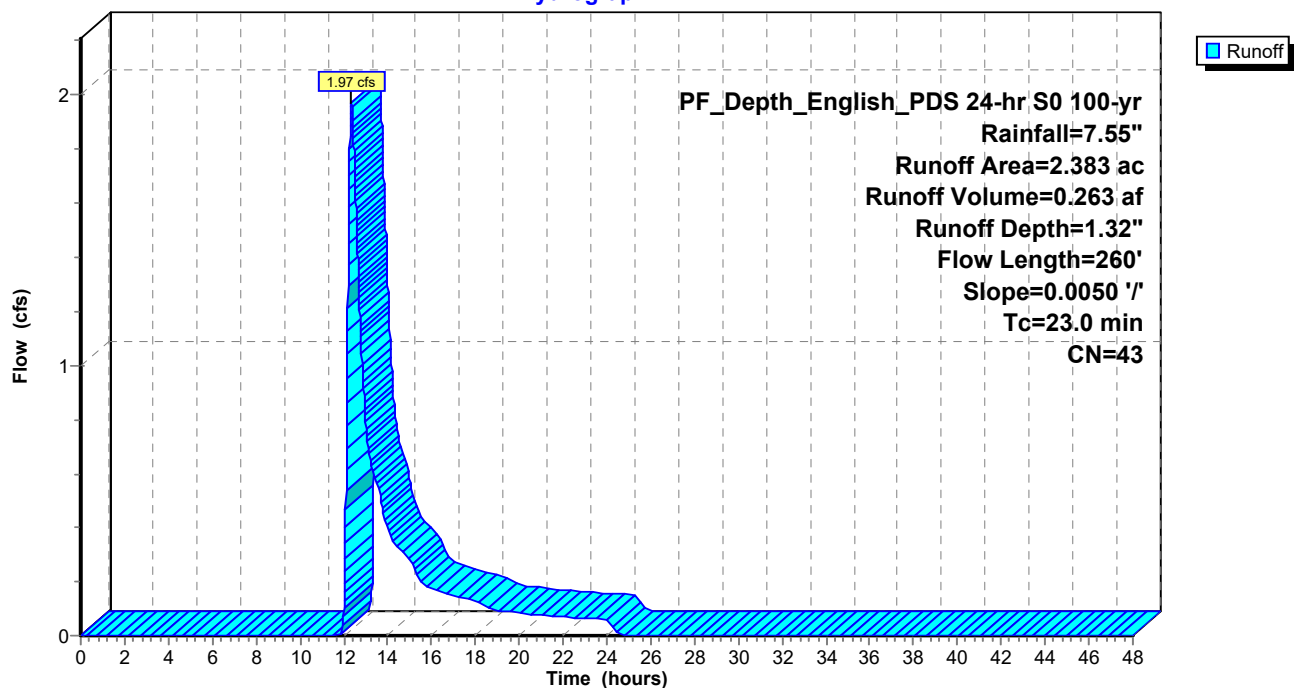
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
PF_Depth_English_PDS 24-hr S0 100-yr Rainfall=7.55"

Area (ac)	CN	Description
0.144	98	Paved parking, HSG A
2.239	39	>75% Grass cover, Good, HSG A
2.383	43	Weighted Average
2.239		93.96% Pervious Area
0.144		6.04% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
17.6	100	0.0050	0.09		Sheet Flow, Grass: Short n= 0.150 P2= 3.01"
5.4	160	0.0050	0.49		Shallow Concentrated Flow, Short Grass Pasture Kv= 7.0 fps
23.0	260	Total			

Subcatchment 1S: DA-1

Hydrograph



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Page 53

Summary for Subcatchment 2S: DA-2

Runoff = 3.11 cfs @ 12.03 hrs, Volume= 0.168 af, Depth= 5.32"

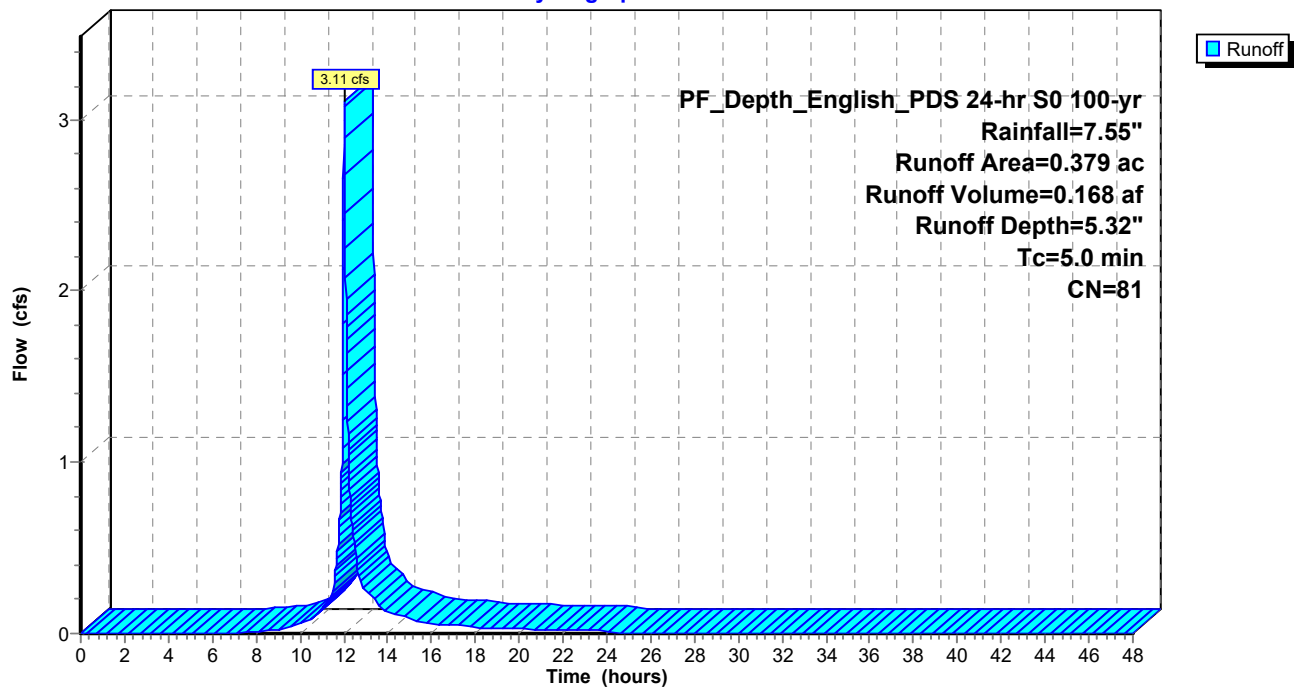
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
PF_Depth_English_PDS 24-hr S0 100-yr Rainfall=7.55"

Area (ac)	CN	Description
0.272	98	Paved parking, HSG A
0.107	39	>75% Grass cover, Good, HSG A
0.379	81	Weighted Average
0.107		28.23% Pervious Area
0.272		71.77% Impervious Area

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

Subcatchment 2S: DA-2

Hydrograph



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Page 54

Summary for Subcatchment 3S: DA-3

Runoff = 6.18 cfs @ 12.03 hrs, Volume= 0.360 af, Depth= 6.83"

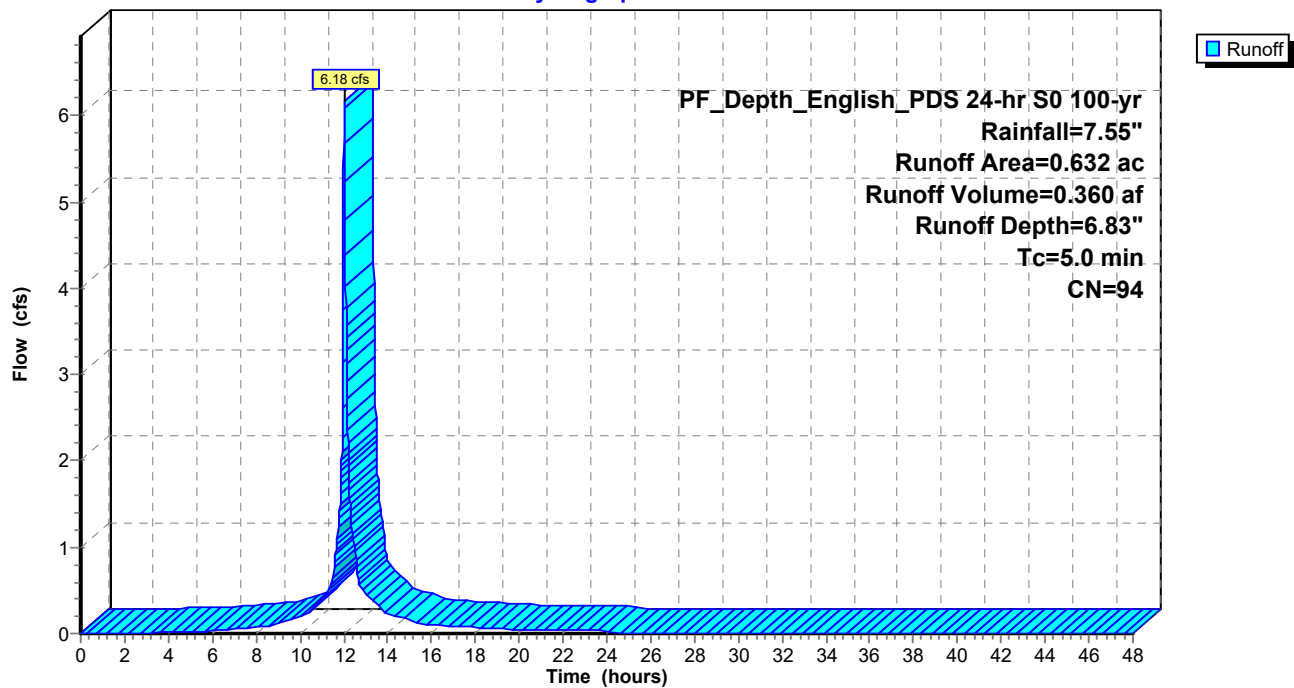
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
PF_Depth_English_PDS 24-hr S0 100-yr Rainfall=7.55"

Area (ac)	CN	Description
0.593	98	Paved parking, HSG A
0.039	39	>75% Grass cover, Good, HSG A
0.632	94	Weighted Average
0.039		6.17% Pervious Area
0.593		93.83% Impervious Area

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

Subcatchment 3S: DA-3

Hydrograph



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PF_Depth_English_PDS 24-hr S0 100-yr Rainfall=7.55"

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Page 55

Summary for Subcatchment 5S: DA-3

Runoff = 0.92 cfs @ 12.03 hrs, Volume= 0.051 af, Depth= 2.79"

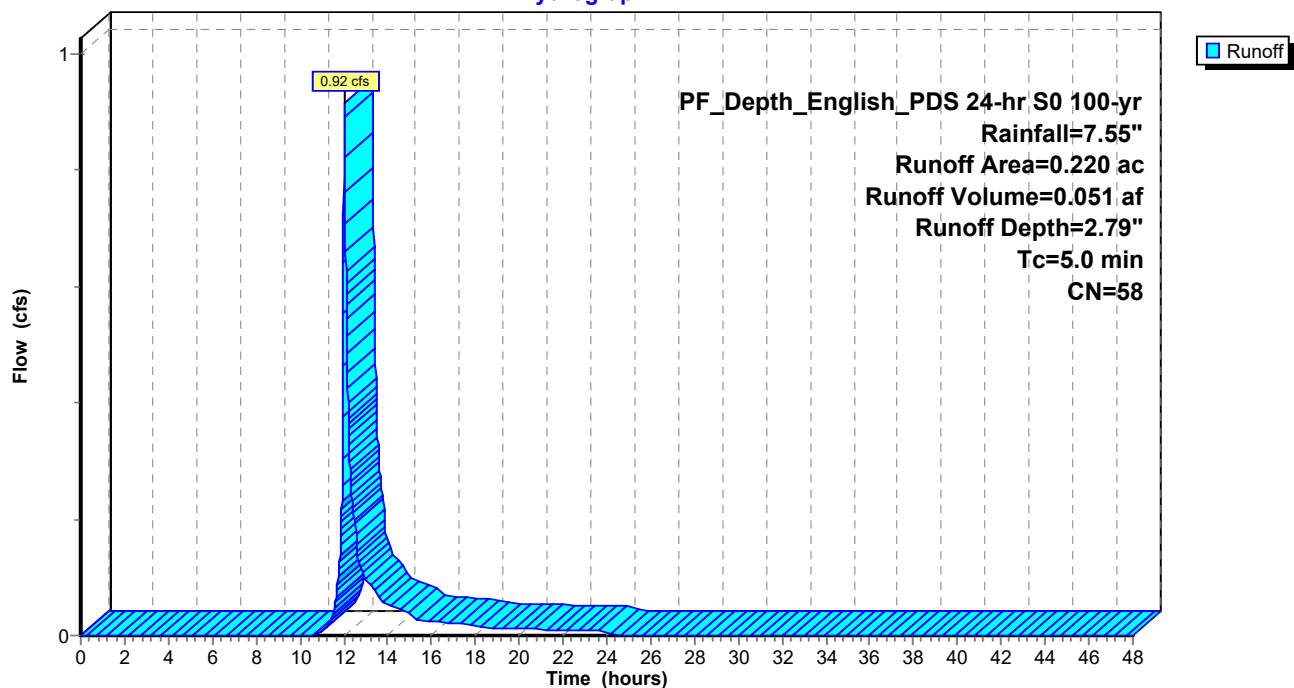
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
PF_Depth_English_PDS 24-hr S0 100-yr Rainfall=7.55"

Area (ac)	CN	Description
0.072	98	Paved parking, HSG A
0.148	39	>75% Grass cover, Good, HSG A
0.220	58	Weighted Average
0.148		67.27% Pervious Area
0.072		32.73% Impervious Area

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

Subcatchment 5S: DA-3

Hydrograph



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Page 56

Summary for Subcatchment 6S: DA-6

Runoff = 0.65 cfs @ 12.05 hrs, Volume= 0.049 af, Depth= 1.41"

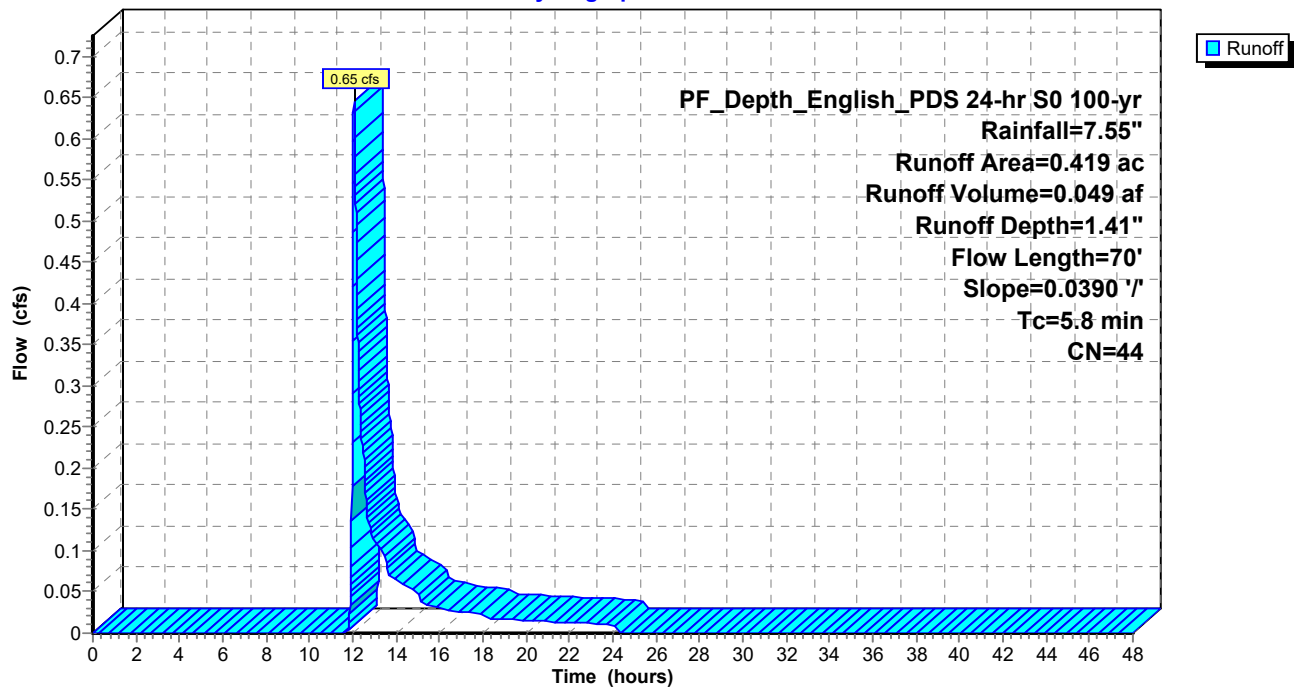
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
PF_Depth_English_PDS 24-hr S0 100-yr Rainfall=7.55"

Area (ac)	CN	Description
0.035	98	Paved parking, HSG A
0.384	39	>75% Grass cover, Good, HSG A
0.419	44	Weighted Average
0.384		91.65% Pervious Area
0.035		8.35% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.8	70	0.0390	0.20		Sheet Flow, Grass: Short n= 0.150 P2= 3.01"

Subcatchment 6S: DA-6

Hydrograph



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PF_Depth_English_PDS 24-hr S0 100-yr Rainfall=7.55"

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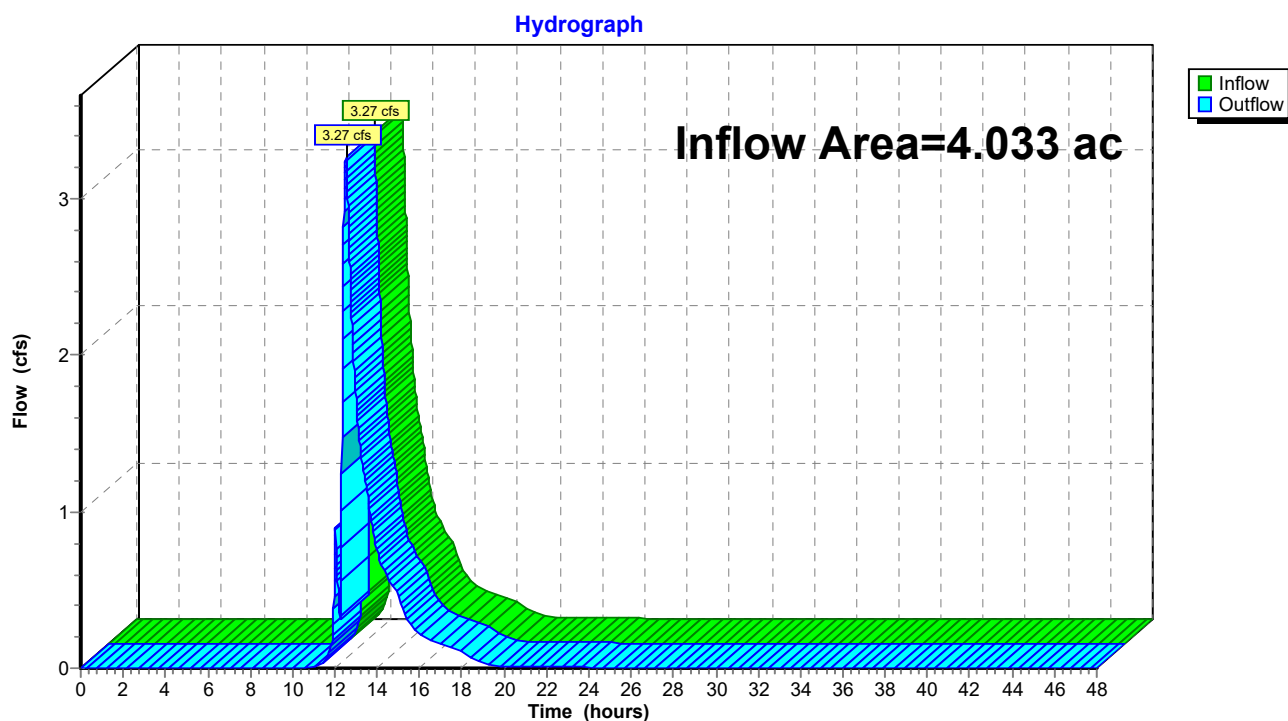
Page 57

Summary for Reach 7R: Proposed Runoff

Inflow Area = 4.033 ac, 27.67% Impervious, Inflow Depth = 1.10" for 100-yr event
Inflow = 3.27 cfs @ 12.53 hrs, Volume= 0.369 af
Outflow = 3.27 cfs @ 12.53 hrs, Volume= 0.369 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs

Reach 7R: Proposed Runoff



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PF_Depth_English_PDS 24-hr S0 100-yr Rainfall=7.55"

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Page 58

Summary for Pond 6P: Bio-Infiltration Basin

Inflow Area = 3.813 ac, 27.38% Impervious, Inflow Depth = 2.64" for 100-yr event
 Inflow = 10.04 cfs @ 12.03 hrs, Volume= 0.840 af
 Outflow = 3.27 cfs @ 12.53 hrs, Volume= 0.809 af, Atten= 67%, Lag= 30.0 min
 Discarded = 0.20 cfs @ 12.53 hrs, Volume= 0.491 af
 Primary = 3.07 cfs @ 12.53 hrs, Volume= 0.318 af
 Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs

Peak Elev= 669.28' @ 12.53 hrs Surf.Area= 5,246 sf Storage= 14,687 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)

Center-of-Mass det. time= 460.8 min (1,272.4 - 811.6)

Volume	Invert	Avail.Storage	Storage Description
#1	665.00'	41,786 cf	Custom Stage Data (Prismatic) Listed below (Recalc)
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
665.00	1,870	0	0
666.00	2,505	2,188	2,188
668.00	4,042	6,547	8,735
670.00	5,920	9,962	18,697
672.00	8,046	13,966	32,663
673.00	10,200	9,123	41,786

Device	Routing	Invert	Outlet Devices
#1	Discarded	665.00'	1.630 in/hr Exfiltration over Surface area
#2	Device 4	669.00'	24.0" Horiz. Orifice/Grate C= 0.600 in 24.0" Grate (100% open area) Limited to weir flow at low heads
#3	Secondary	672.00'	5.0' long x 5.0' breadth Broad-Crested Rectangular Weir Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 5.00 5.50 Coef. (English) 2.34 2.50 2.70 2.68 2.68 2.66 2.65 2.65 2.65 2.65 2.67 2.66 2.68 2.70 2.74 2.79 2.88
#4	Primary	664.00'	15.0" Round Culvert L= 10.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 664.00' / 663.95' S= 0.0050 ' / Cc= 0.900 n= 0.010, Flow Area= 1.23 sf

Discarded OutFlow Max=0.20 cfs @ 12.53 hrs HW=669.28' (Free Discharge)↑**1=Exfiltration** (Exfiltration Controls 0.20 cfs)**Primary OutFlow** Max=3.07 cfs @ 12.53 hrs HW=669.28' TW=0.00' (Dynamic Tailwater)↑**4=Culvert** (Passes 3.07 cfs of 10.07 cfs potential flow)↑**2=Orifice/Grate** (Weir Controls 3.07 cfs @ 1.74 fps)**Secondary OutFlow** Max=0.00 cfs @ 0.00 hrs HW=665.00' TW=0.00' (Dynamic Tailwater)↑**3=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond 6P: Bio-Infiltration Basin

Hydrograph

