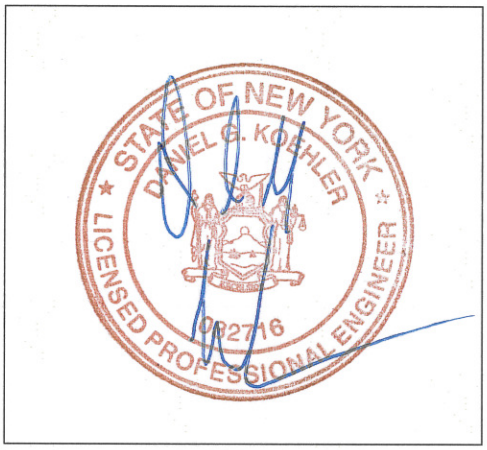
Drainage Report:
for
160 Rombout Avenue

Prepared for:

Karic Associates, LLC
4 Schoen Lane
New Rochelle, NY 10804

February 25, 2020



Prepared by:
Hudson Land Design Professional Engineering, P.C.
174 Main Street
Beacon, NY 12508
Ph: (845) 440-6926

TABLE OF CONTENTS

APPENDICES

APPENDIX A: DRAINAGE MAPS
APPENDIX B: SUPPORTING DATA
APPENDIX C: PRE-DEVELOPMENT HYDROLOGY CALCULATIONS
APPENDIX D: POST-DEVELOPMENT HYDROLOGY CALCULATIONS

1.0 INTRODUCTION

The 160 Rombout Subdivision project is located at 160 Rombout Avenue in the City of Beacon, Dutchess County, New York. The project consists of one parcel, Tax ID: 5954-35-853796 (+/- 0.34 acres). Parcel 853796 contains an existing single-family residence. The project proposes to subdivide Parcel 853796 into two single family lots each with a private driveway and associated parking. The subdivided lot will have a proposed single-family residence, water and sewer utilities and a stormwater management area. The parent parcel is in the R1-5 zoning district.

2.0 METHODOLOGY AND REGULATORY COMPLIANCE

The proposed subdivision of Parcel 853796 will result in 2,342 sqft of additional impervious area and 7,600 sqft of disturbance, and therefore is not subject to the requirements of NYSDEC GP-0-20-001 General Permit for Construction Activities. Pre-development vs. post-development drainage analysis for the project was performed to evaluate stormwater runoff patterns and demonstrate that the post-development runoff rates to the existing stormwater discharge points do not exceed the pre-development runoff rates.

Runoff calculations were performed utilizing HydroCAD® version 10.00 published by HydroCAD Software Solutions, LLC. The software utilizes the principles of TR-55 and TR-20 to generate unit hydrographs. Rainfall events are generated utilizing Soil Conservation Service (SCS) Type III, 24-hour rainfall event for Dutchess County, NY. The Type III rainfall depths for the 1-Year, 10-Year, 25-Year and 100-Year rainfall events are 2.61, 4.70, 5.90 and 8.34 inches, respectively. Rainfall Data can be found within Appendix B of this report.

3.0 SOIL CONDITIONS

A review of the Soil Survey of Dutchess County indicates that there are three types of soil present on the project site and its associated contributing drainage area. Table I below summarizes the characteristics of the soil types present within the drainage area.

Table I: Soil Types

Map Unit	Soil Names	Water Table (ft)	Bedrock	Hydrologic Soil Group	Erosion Hazard
DxB	Dutchess-Cardigan Urban Land Complex, Undulating and Rocky	>80”	>80”	C	Moderate

Source: websoilsurvey.sc.egov.usda.gov

Soil testing in the proposed stormwater sump on the northern side of the project area was conducted on February 21, 2020 (Deep Test Pits and Infiltration Tests). Two test pits were excavated to a total depth of 6 feet and were primarily comprised of a brown sandy-clay loam.

Test Pit 1 had 2" of topsoil over 14" of the brown sandy. At 16"-18" in depth a coal ash layer was observed. At >18" of depth the soil strata changed to a brown sandy-clay loam. No bedrock or mottling was observed. Groundwater was observed at 60" in depth. Test Pit 2 had the same soil strata as Test Pit 1.

One infiltration test was conducted in the area of the proposed stormwater area. The infiltration test was run three times at a depth of 36" below existing grade. Existing grade in the stormwater sump area is at elevation 92.5. The 36" test was conducted 2' below the bottom of the stormwater area, elevation 91.5. Infiltration Test 1 was repeated three times infiltrating 24" of water in less than an hour. The slowest test resulted in an infiltration of 30 inches/hour, to be conservative an infiltration rate of 15 inches/hour was used for the stormwater modeling.

Supporting information has been provided in Appendix B.

4.0 EXISTING DRAINAGE CONDITIONS

4.1 Design Points

Design Points represent the location where the majority of runoff from an area exits the site. The same design point is identified in post-development conditions, so that a comparison can be made between the pre-development and post-development conditions. One design point for the main project area was selected, and is as follows:

Table II - Stormwater Design/Discharge Point

SDP	Description
1	Northern Property Line
2	Existing Catch Basin in Rombout Avenue*

***** Under existing conditions the site does not contribute runoff to this catch basin.

4.2 Existing Watershed Area

The pre-developed watershed is 15,206 sqft in total, and includes the existing single-family residence and shed, gravel parking areas on Parcel 853796 and landscaped areas. In the drainage analysis model, the existing pre-development area is delineated as subcatchment 1. The drainage area consists of impervious surfaces, woods/grass combination, and grass area. Drainage generally flows via sheet flow to the stormwater design point located on the northern property line. Based on field conditions it appears that runoff collects in this area and does not leave the property.

The Time of Concentration (Tc) is less than 6 minutes, so a minimum of 6 minutes was used, and therefore the Tc is not graphically shown or listed on the drainage map. The watershed area contributing to the SDP is graphically shown and listed on the drainage map, and is also

provided within the HydroCAD computations within Appendix C. A drainage map is included within Appendix A.

4.3 Existing Runoff Rates

Runoff rates for existing conditions have been calculated at the designated SDP and summarized in Table III as follows:

TABLE III - EXISTING RUNOFF RATES

		Runoff Rates (cfs)			
Designation	**Area (sqft)**	**1-Year**	**10-Year**	**25-Year**	**100-Year**
SDP 1	15,206	0.35	1.02	1.44	2.30

Unit hydrograph analysis results for pre-development conditions have been included as Appendix C.

5.0 PROPOSED DRAINAGE CONDITIONS

5.1 Developed Watershed Area

The proposed project results in a total of 7,600 sqft of disturbance due to the construction of the proposed single-family residence and driveway. The post-developed watershed area is 15,205 sqft in total, and includes the existing & proposed residences, proposed driveway, as well as the grass & landscaped areas. The post development watershed was divided into two stormwater subcatchments; Subcatchment 10 and Subcatchment 11.

Subcatchment 10 consists of the existed single-family residence, driveway, and yard. The subcatchment contains soils in hydrologic soil group C. Drainage generally flows via sheet flow to the stormwater design point, SDP1, located on the northern property line.

Subcatchment 11 consists of the proposed driveway and yard surrounding the proposed single-family residence. The subcatchment contains soils in hydrologic soil group C. Drainage generally flows via sheet flow to the stormwater system located along the northern property line.

Subcatchment 12 consists of the proposed single-family residence's roof. Due to the lack of existing stormwater infrastructure in the rear of the property, the runoff from the roof will be directed to the existing catch basin in Rombout Avenue, SDP2. This connection will help prevent any flooding of the rear of the property and will not significantly impact the existing stormwater infrastructure in Rombout Avenue.

The Time of Concentration (Tc) is less than 6 minutes for all analyzed subcatchments, so a minimum of 6 minutes was used, and therefore the Tc is not graphically shown or listed on the drainage map. The watershed area contributing to each SDP is graphically shown and listed on the drainage map. The hydrologic model can be found in Appendix D. A post-development drainage map is included within Appendix A.

5.2 Proposed Runoff Rates

Runoff rates for proposed conditions have been calculated at the designated SDP and summarized in Table IV as follows:

TABLE IV
PROPOSED RUNOFF RATES

Runoff Rates (cfs)

Designation	Area (sqft)	1-Year	10-Year	25-Year	100-Year
SDP1	14,057	0.25	0.60	0.81	1.23
SDP2	1,148	0.06	0.12	0.15	0.21

Unit hydrograph analysis results for post-development conditions have been included as Appendix D.

6.0 DRAINAGE ANALYSIS CONCLUSIONS

The stormwater runoff rates at SDP1 under pre-development and post-development conditions are summarized below.

SDP	1 – Year (cfs)		10 – Year (cfs)		25 – Year (cfs)		100 – Year (cfs)	
	Pre	Post	Pre	Post	Post	Post	Pre	Post
1	0.35	0.25	1.02	0.60	1.44	0.81	2.30	1.23

The runoff rates at the SDP1 decrease from pre-development to post-development conditions with the infiltration facility in place. The runoff from the proposed dwelling roof will be directed to the existing catch basin in Rombout Avenue, this small amount of additional runoff is not expected to have a significant impact on the existing stormwater system.

Supporting hydrologic analyses for pre-development and post-development conditions are included in Appendices C and D.

7.0 EROSION AND SEDIMENT CONTROL

Contractors shall adhere to the temporary and permanent erosion control measures as indicated on the plans. Repairs shall be made as necessary to remain in compliance with the New York State Standards and Specifications for Erosion and Sediment Control, 2016.

APPENDIX A

DRAINAGE MAPS

APPENDIX B

SUPPORTING DATA

Extreme Precipitation Tables

Northeast Regional Climate Center

Data represents point estimates calculated from partial duration series. All precipitation amounts are displayed in inches.

Smoothing	Yes
State	New York
Location	
Longitude	73.973 degrees West
Latitude	41.504 degrees North
Elevation	0 feet
Date/Time	Mon, 24 Feb 2020 15:49:55 -0500

Extreme Precipitation Estimates

	5min	10min	15min	30min	60min	120min		1hr	2hr	3hr	6hr	12hr	24hr	48hr
1yr	0.33	0.50	0.62	0.82	1.02	1.26	**1yr**	0.88	1.19	1.45	1.77	2.15	2.61	2.96
2yr	0.39	0.60	0.74	0.98	1.23	1.53	**2yr**	1.06	1.43	1.75	2.14	2.61	3.16	3.57
5yr	0.46	0.71	0.89	1.19	1.52	1.91	**5yr**	1.31	1.76	2.20	2.70	3.28	3.96	4.52
10yr	0.51	0.80	1.02	1.38	1.79	2.27	**10yr**	1.55	2.07	2.62	3.22	3.90	4.70	5.40
25yr	0.60	0.95	1.21	1.67	2.23	2.85	**25yr**	1.92	2.56	3.30	4.06	4.93	5.90	6.86
50yr	0.68	1.09	1.39	1.95	2.63	3.39	**50yr**	2.27	3.00	3.93	4.84	5.86	7.02	8.21
100yr	0.77	1.24	1.60	2.28	3.10	4.03	**100yr**	2.68	3.53	4.68	5.77	6.99	8.34	9.84
200yr	0.87	1.43	1.85	2.66	3.67	4.79	**200yr**	3.17	4.15	5.58	6.89	8.33	9.93	11.79
500yr	1.05	1.73	2.26	3.28	4.59	6.03	**500yr**	3.96	5.15	7.04	8.70	10.51	12.50	14.99

Lower Confidence Limits

	5min	10min	15min	30min	60min	120min		1hr	2hr	3hr	6hr	12hr	24hr	48hr	
1yr	0.28	0.44	0.53	0.72	0.88	1.09	**1yr**	0.76	1.06	1.24	1.59	2.01	2.08	2.36	
2yr	0.37	0.58	0.71	0.96	1.19	1.42	**2yr**	1.03	1.39	1.61	2.05	2.58	3.07	3.45	
5yr	0.42	0.65	0.81	1.11	1.41	1.65	**5yr**	1.22	1.62	1.88	2.42	3.01	3.65	4.17	
10yr	0.47	0.72	0.89	1.25	1.61	1.85	**10yr**	1.39	1.81	2.11	2.71	3.38	4.14	4.81	
25yr	0.54	0.82	1.02	1.46	1.92	2.13	**25yr**	1.66	2.09	2.45	3.05	3.94	4.86	5.81	
50yr	0.60	0.92	1.14	1.64	2.21	2.38	**50yr**	1.91	2.33	2.76	3.41	4.43	5.50	6.73	
100yr	0.68	1.03	1.29	1.86	2.56	2.67	**100yr**	2.21	2.61	3.12	3.81	5.01	6.19	7.79	1
200yr	0.77	1.16	1.47	2.13	2.97	2.98	**200yr**	2.56	2.92	3.52	4.27	5.66	6.92	9.05	2
500yr	0.92	1.37	1.76	2.56	3.64	3.48	**500yr**	3.14	3.40	4.16	4.98	6.68	8.02	11.04	5

Hydrologic Soil Group—Dutchess County, New York
(160 Rombout)

Map Scale: 1:419 if printed on A landscape (11" x 8.5") sheet.

N

Meters
0 5 10 20 30

Feet
0 20 40 80 120

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 18N WGS84

MAP LEGEND

Area of Interest (AOI)

- Area of Interest (AOI)

Soils

Soil Rating Polygons

- A
- A/D
- B
- B/D
- C
- C/D
- D
- Not rated or not available

Soil Rating Lines

- A
- A/D
- B
- B/D
- C
- C/D
- D
- Not rated or not available

Soil Rating Points

- A
- A/D
- B
- B/D
- C
- C/D
- D
- Not rated or not available

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 1:24,000.

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: Dutchess County, New York
Survey Area Data: Version 16, Sep 16, 2019

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

Date(s) aerial images were photographed: Oct 7, 2013—Feb 26, 2017

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.

Hydrologic Soil Group

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
DxB	Dutchess-Cardigan-Urban land complex, undulating, rocky	C	0.3	100.0%
Totals for Area of Interest			**0.3**	**100.0%**

Description

Hydrologic soil groups are based on estimates of runoff potential. Soils are assigned to one of four groups according to the rate of water infiltration when the soils are not protected by vegetation, are thoroughly wet, and receive precipitation from long-duration storms.

The soils in the United States are assigned to four groups (A, B, C, and D) and three dual classes (A/D, B/D, and C/D). The groups are defined as follows:

Group A. Soils having a high infiltration rate (low runoff potential) when thoroughly wet. These consist mainly of deep, well drained to excessively drained sands or gravelly sands. These soils have a high rate of water transmission.

Group B. Soils having a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep or deep, moderately well drained or well drained soils that have moderately fine texture to moderately coarse texture. These soils have a moderate rate of water transmission.

Group C. Soils having a slow infiltration rate when thoroughly wet. These consist chiefly of soils having a layer that impedes the downward movement of water or soils of moderately fine texture or fine texture. These soils have a slow rate of water transmission.

Group D. Soils having a very slow infiltration rate (high runoff potential) when thoroughly wet. These consist chiefly of clays that have a high shrink-swell potential, soils that have a high water table, soils that have a claypan or clay layer at or near the surface, and soils that are shallow over nearly impervious material. These soils have a very slow rate of water transmission.

If a soil is assigned to a dual hydrologic group (A/D, B/D, or C/D), the first letter is for drained areas and the second is for undrained areas. Only the soils that in their natural condition are in group D are assigned to dual classes.

Rating Options

Aggregation Method: Dominant Component

Component Percent Cutoff: None Specified

Tie-break Rule: Higher

D E E P T E S T P I T R E S U L T S

Date: 2/21/2020

Name of property: 160 Rombout Avenue (C)(~~T~~)(~~V~~)

TAX GRID #

5	9	5	4	-	3	5	-	8	5	3	7	9	6

Owner of property: Engineer: Hudson Land Design

Person directing test: Daniel G. Koehler, P.E.

HOLE #	LOT #	TOTAL DEPTH	ROCK DEPTH	WATER DEPTH	MOTTLING DEPTH	SOIL DESCRIPTION
1	1	72”		60”		0 – 2” Topsoil; 2 – 16” Sand; 16 - 18” Ash; 18 – 60” Sandy-Clay Loam
2	1	80”		60”		0 – 2” Topsoil; 2 – 16” Sand; 16 - 18” Ash; 18 – 60” Sandy-Clay Loam

General remarks (terrain; weather; springs, streams, etc.)

INFILTRATION TEST DATA

Project: 160 Rombout Ave. City of Beacon Date: 2/21/2020

By: Daniel G. Koehler, P.E.

Test Hole #	Test Hole Bottom Elevation	Soil Type	Soaked	TEST RUNS					
				*	1	2	3	4	5
IT 1	90.4	Sandy-Clay Loam	Yes	Finish	11:57	12:36	13:15		
				Start	11:31	11:48	12:37		
				Depth (in)	24	24	24		
				Finish					
				Start					
				Depth (in)					
				Finish					
				Start					
				Depth (in)					
				Finish					
				Start					
				Depth (in)					
				Finish					
				Start					
				Depth (in)					
				Finish					
				Start					
				Depth (in)					
				Finish					
				Start					
				Depth (in)					

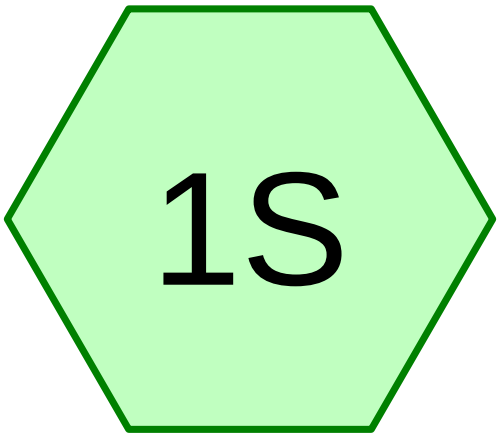
I, Daniel G. Koehler, P.E., the undersigned, certify that these infiltration tests were done by myself or under my direction according to the standard procedure as outlined in the NYS Stormwater Management Design Manual. The data and results presented are true and correct.

Dated: 2/21/2020 Signature: _____

License No. (P.E.) _____

APPENDIX C

PRE-DEVELOPMENT HYDROLOGY CALCULATIONS



DA 1

Subcat Reach Pond Link

Routing Diagram for Galezo Model

Prepared by Hudson Land Design Professional Engineering, P.C., Printed 2/25/2020

Summary for Subcatchment 1S: DA 1

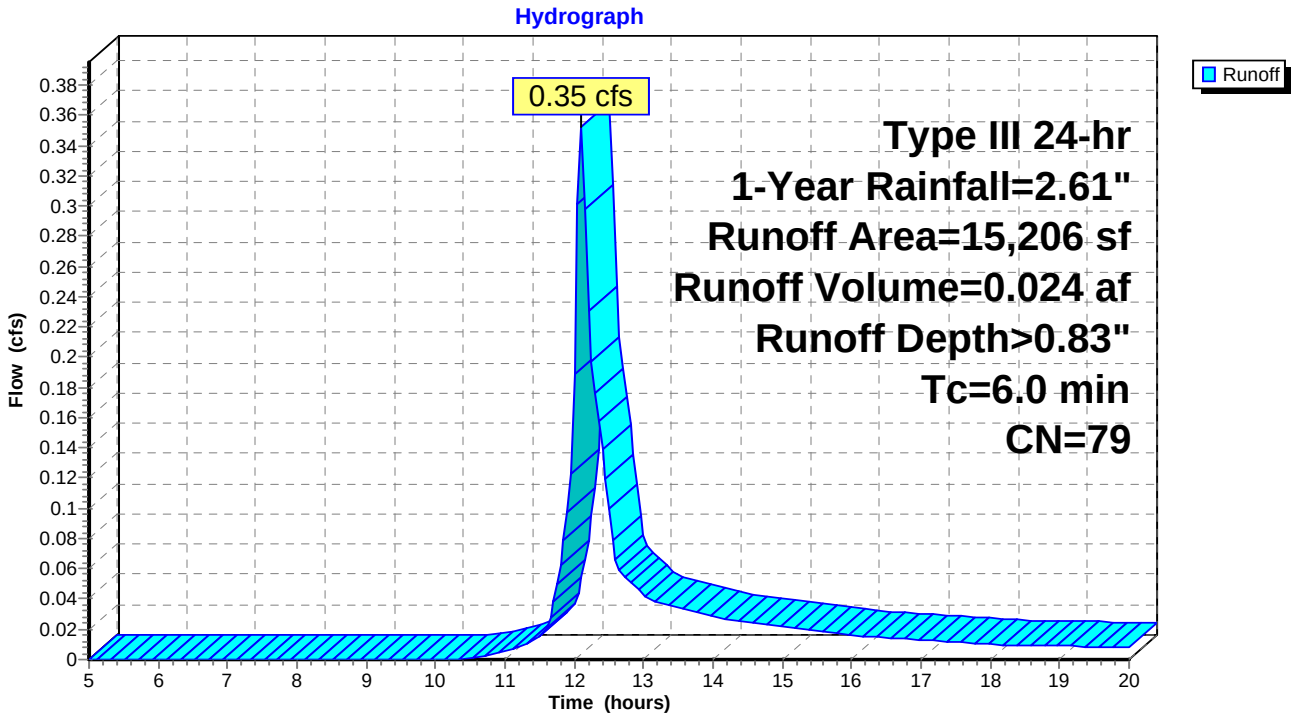
Runoff = 0.35 cfs @ 12.10 hrs, Volume= 0.024 af, Depth> 0.83"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 1-Year Rainfall=2.61"

Area (sf)	CN	Description
3,331	98	Paved roads w/curbs & sewers, HSG C
11,875	74	>75% Grass cover, Good, HSG C
15,206	79	Weighted Average
11,875		78.09% Pervious Area
3,331		21.91% Impervious Area

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

Subcatchment 1S: DA 1



Summary for Subcatchment 1S: DA 1

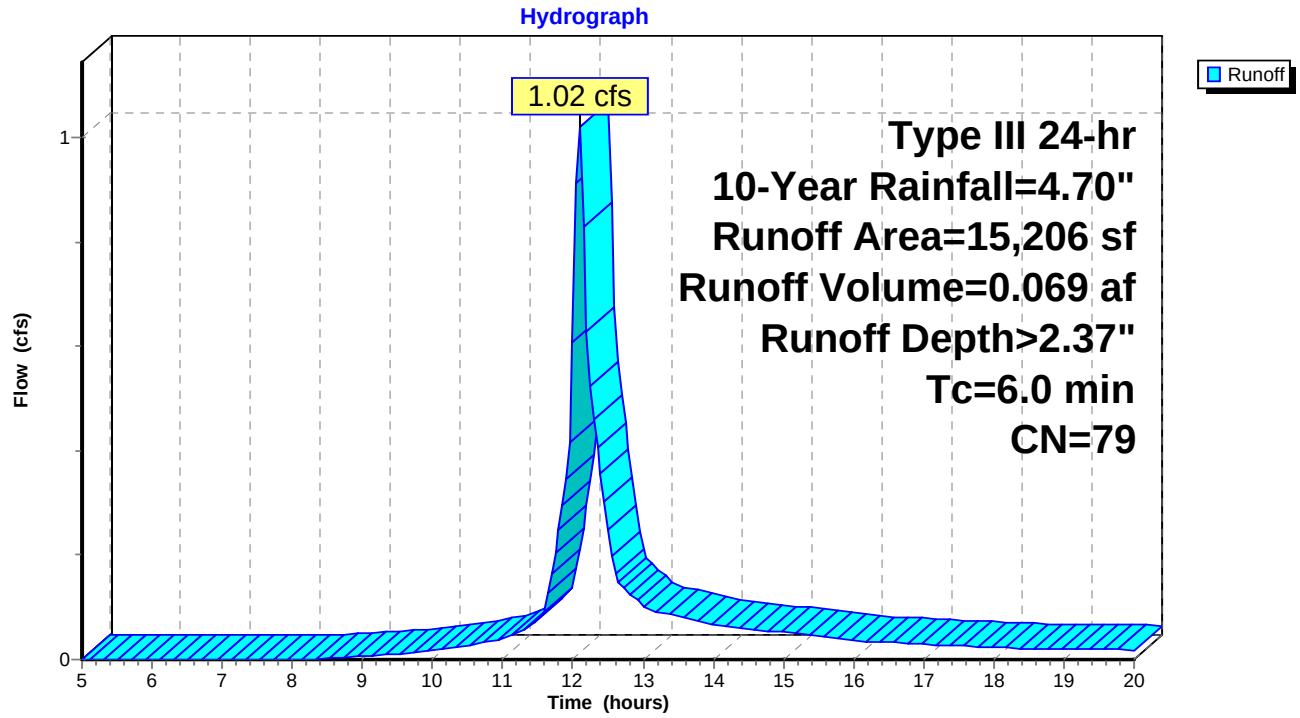
Runoff = 1.02 cfs @ 12.09 hrs, Volume= 0.069 af, Depth> 2.37"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Year Rainfall=4.70"

Area (sf)	CN	Description
3,331	98	Paved roads w/curbs & sewers, HSG C
11,875	74	>75% Grass cover, Good, HSG C
15,206	79	Weighted Average
11,875		78.09% Pervious Area
3,331		21.91% Impervious Area

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

Subcatchment 1S: DA 1



Summary for Subcatchment 1S: DA 1

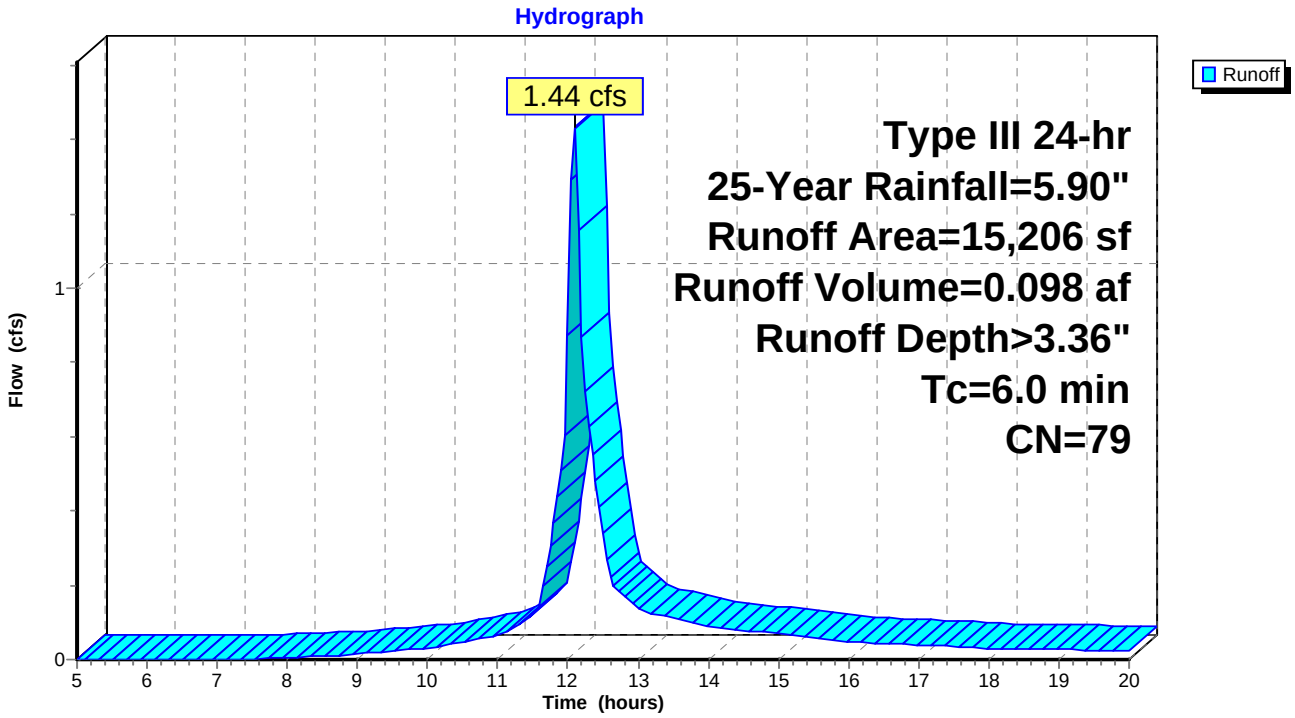
Runoff = 1.44 cfs @ 12.09 hrs, Volume= 0.098 af, Depth> 3.36"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-Year Rainfall=5.90"

Area (sf)	CN	Description
3,331	98	Paved roads w/curbs & sewers, HSG C
11,875	74	>75% Grass cover, Good, HSG C
15,206	79	Weighted Average
11,875		78.09% Pervious Area
3,331		21.91% Impervious Area

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

Subcatchment 1S: DA 1



Summary for Subcatchment 1S: DA 1

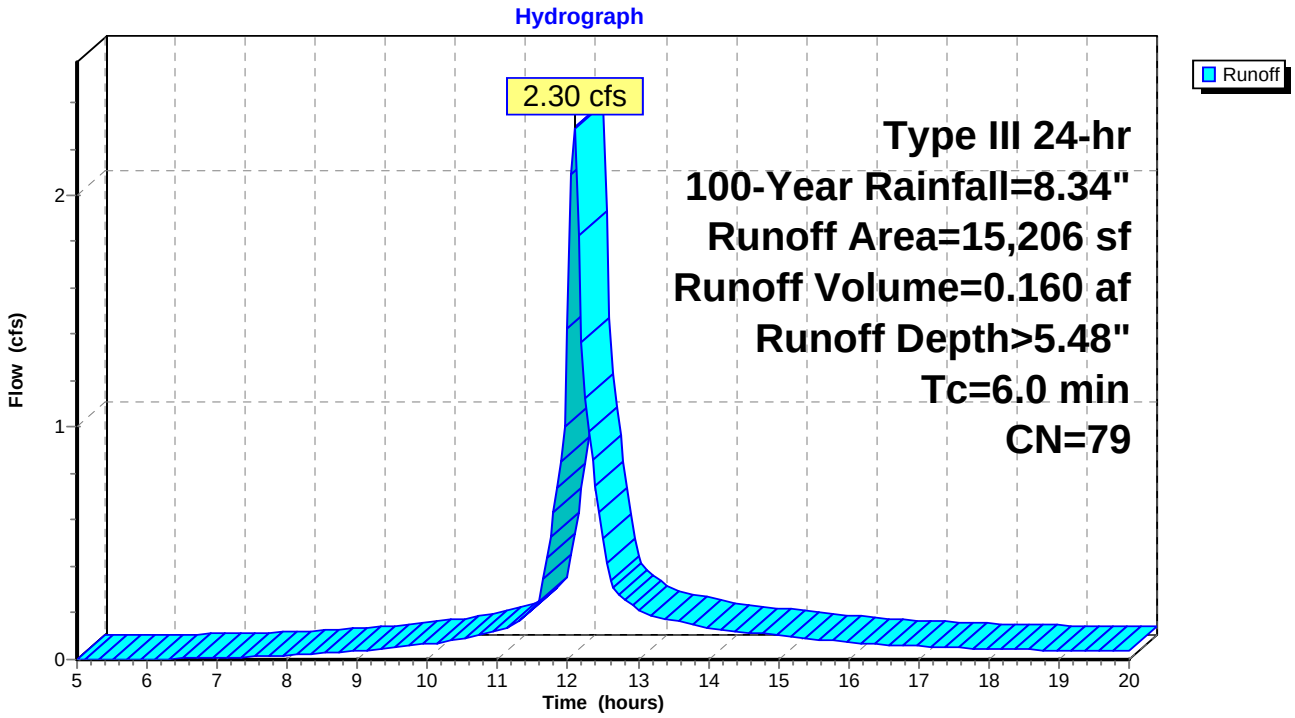
Runoff = 2.30 cfs @ 12.09 hrs, Volume= 0.160 af, Depth> 5.48"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-Year Rainfall=8.34"

Area (sf)	CN	Description
3,331	98	Paved roads w/curbs & sewers, HSG C
11,875	74	>75% Grass cover, Good, HSG C
15,206	79	Weighted Average
11,875		78.09% Pervious Area
3,331		21.91% Impervious Area

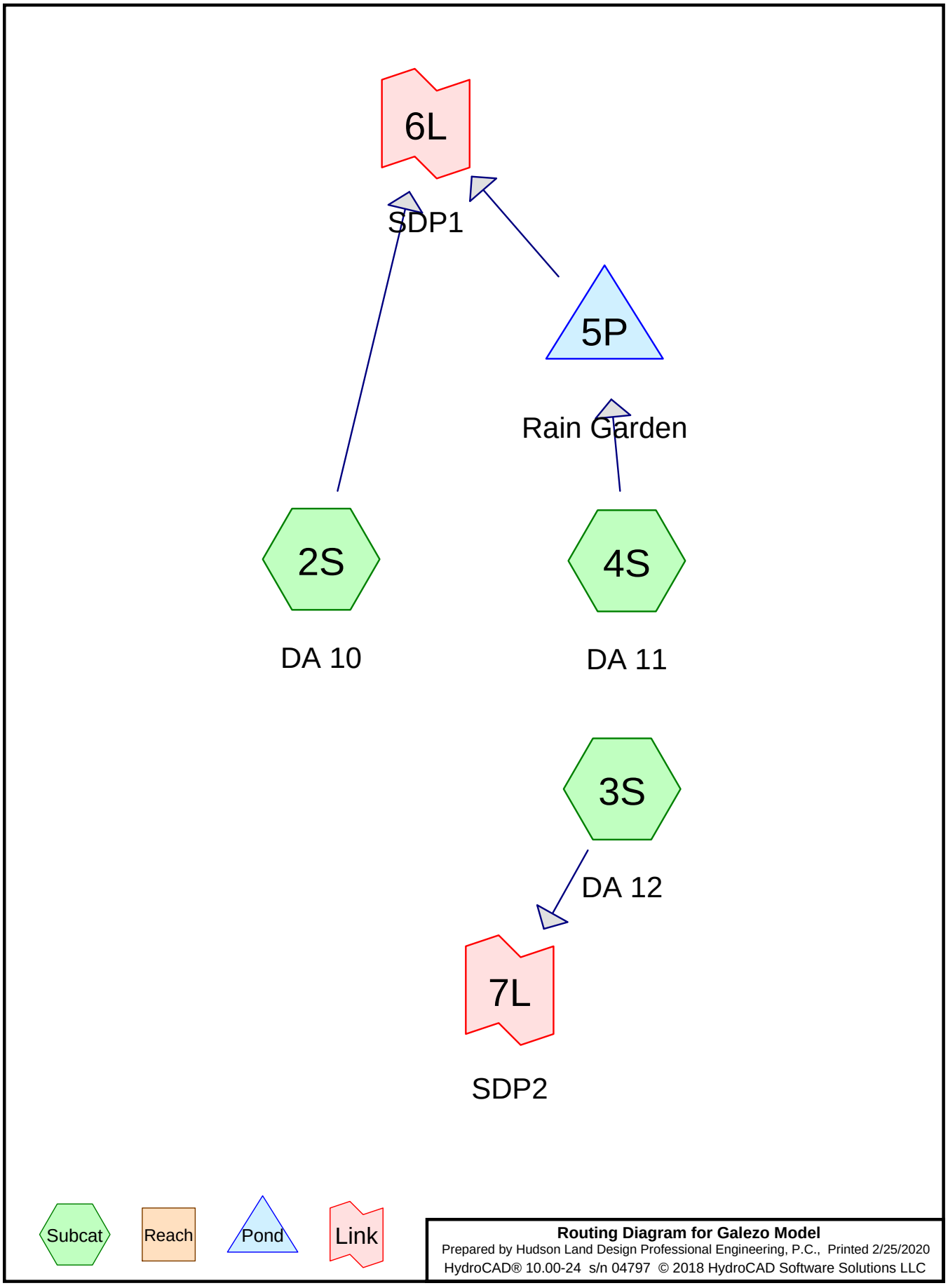
Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, Minimum**

Subcatchment 1S: DA 1



APPENDIX D

POST-DEVELOPMENT HYDROLOGY CALCULATIONS



Routing Diagram for Galezo Model

Prepared by Hudson Land Design Professional Engineering, P.C., Printed 2/25/2020

HydroCAD® 10.00-24 s/n 04797 © 2018 HydroCAD Software Solutions LLC

Summary for Subcatchment 2S: DA 10

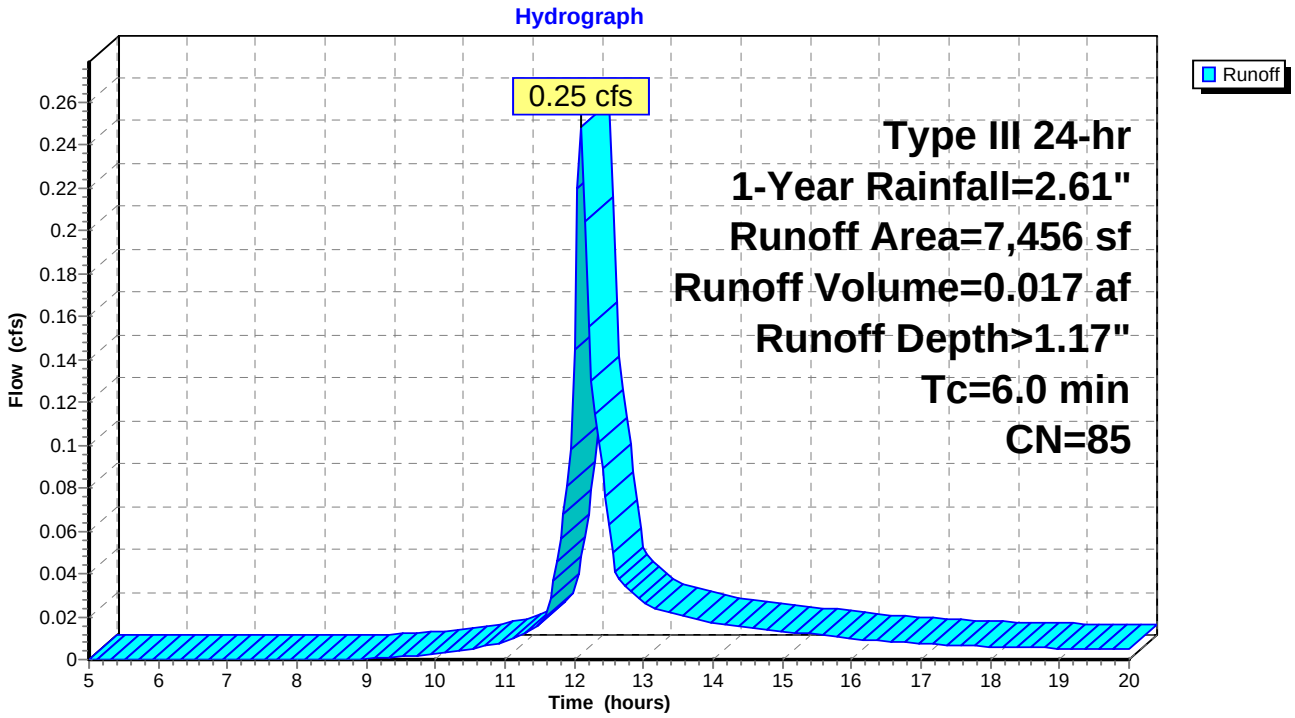
Runoff = 0.25 cfs @ 12.09 hrs, Volume= 0.017 af, Depth> 1.17"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 1-Year Rainfall=2.61"

Area (sf)	CN	Description
3,331	98	Paved parking, HSG C
4,125	74	>75% Grass cover, Good, HSG C
7,456	85	Weighted Average
4,125		55.32% Pervious Area
3,331		44.68% Impervious Area

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

Subcatchment 2S: DA 10



Summary for Subcatchment 3S: DA 12

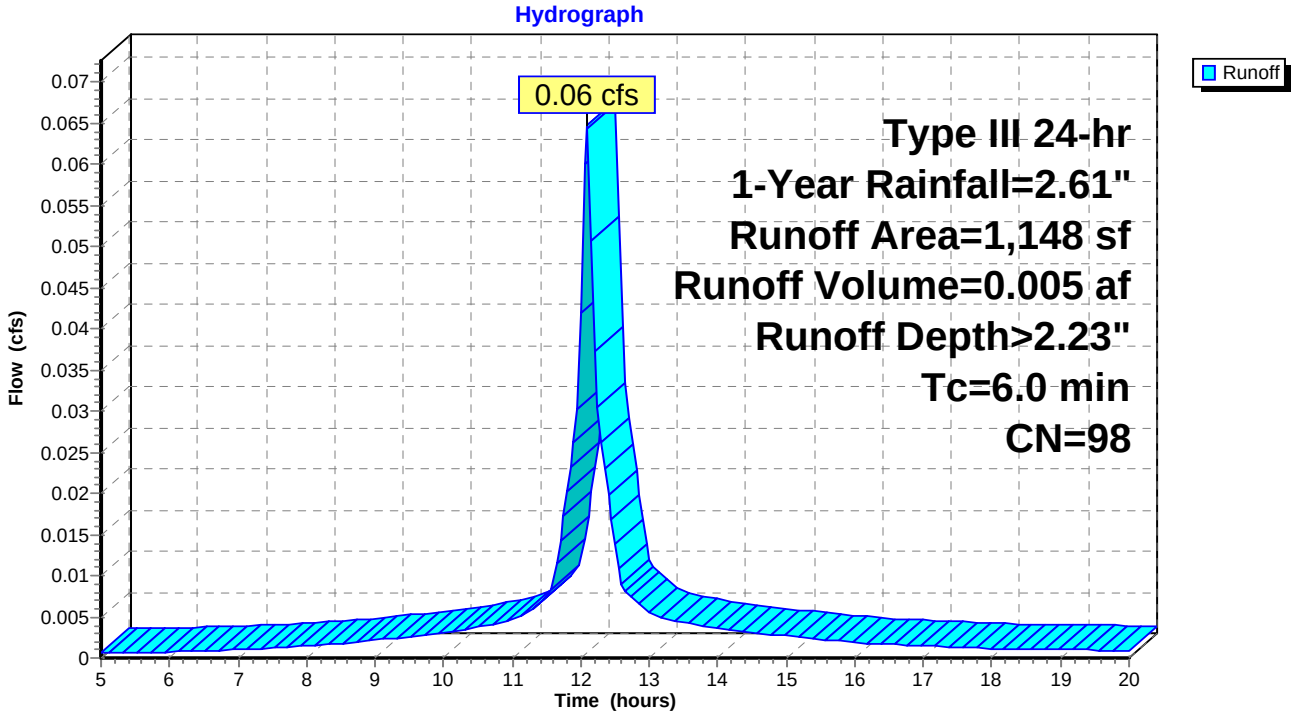
Runoff = 0.06 cfs @ 12.09 hrs, Volume= 0.005 af, Depth> 2.23"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 1-Year Rainfall=2.61"

Area (sf)	CN	Description
1,148	98	Paved parking, HSG C
1,148		100.00% Impervious Area

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

Subcatchment 3S: DA 12



Summary for Subcatchment 4S: DA 11

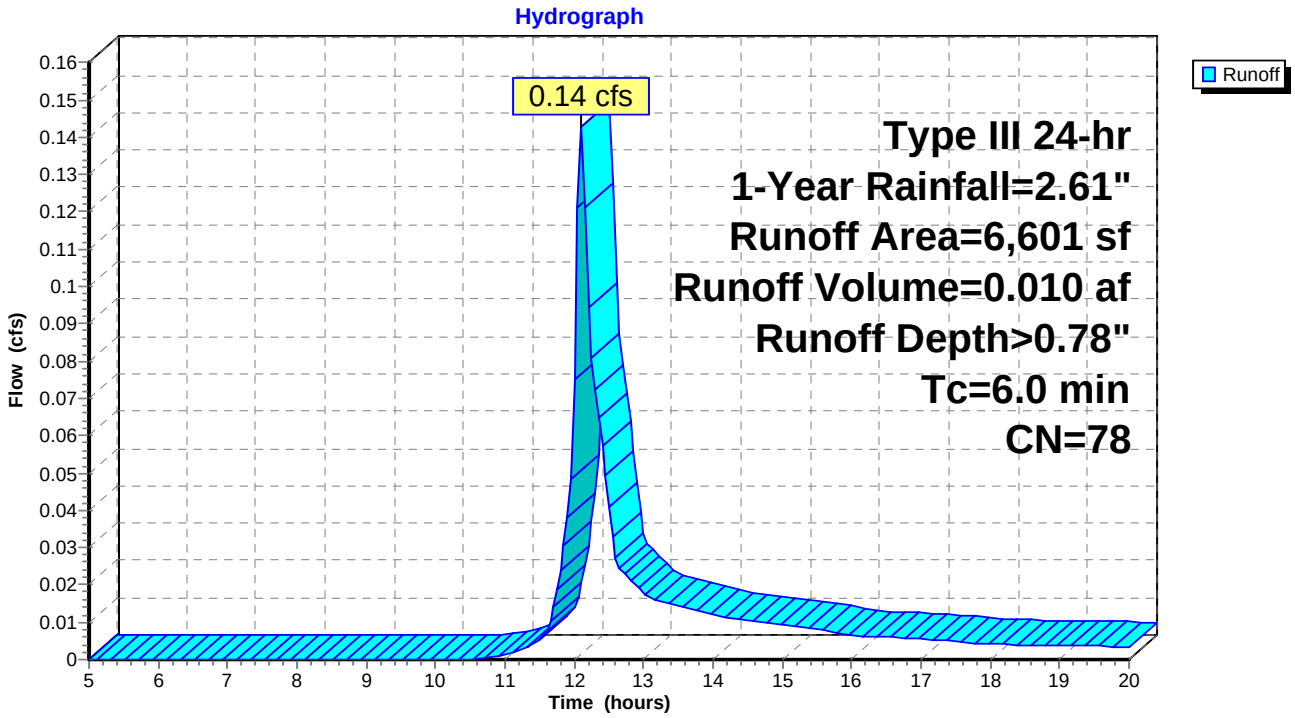
Runoff = 0.14 cfs @ 12.10 hrs, Volume= 0.010 af, Depth> 0.78"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 1-Year Rainfall=2.61"

Area (sf)	CN	Description
1,194	98	Paved parking, HSG C
5,407	74	>75% Grass cover, Good, HSG C
6,601	78	Weighted Average
5,407		81.91% Pervious Area
1,194		18.09% Impervious Area

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

Subcatchment 4S: DA 11



Summary for Pond 5P: Rain Garden

Inflow Area = 0.152 ac, 18.09% Impervious, Inflow Depth > 0.78" for 1-Year event
Inflow = 0.14 cfs @ 12.10 hrs, Volume= 0.010 af
Outflow = 0.14 cfs @ 12.11 hrs, Volume= 0.010 af, Atten= 1%, Lag= 0.7 min
Discarded = 0.14 cfs @ 12.11 hrs, Volume= 0.010 af

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 91.51' @ 12.11 hrs Surf.Area= 425 sf Storage= 6 cf

Plug-Flow detention time= 0.7 min calculated for 0.010 af (100% of inflow)
Center-of-Mass det. time= 0.6 min (818.2 - 817.6)

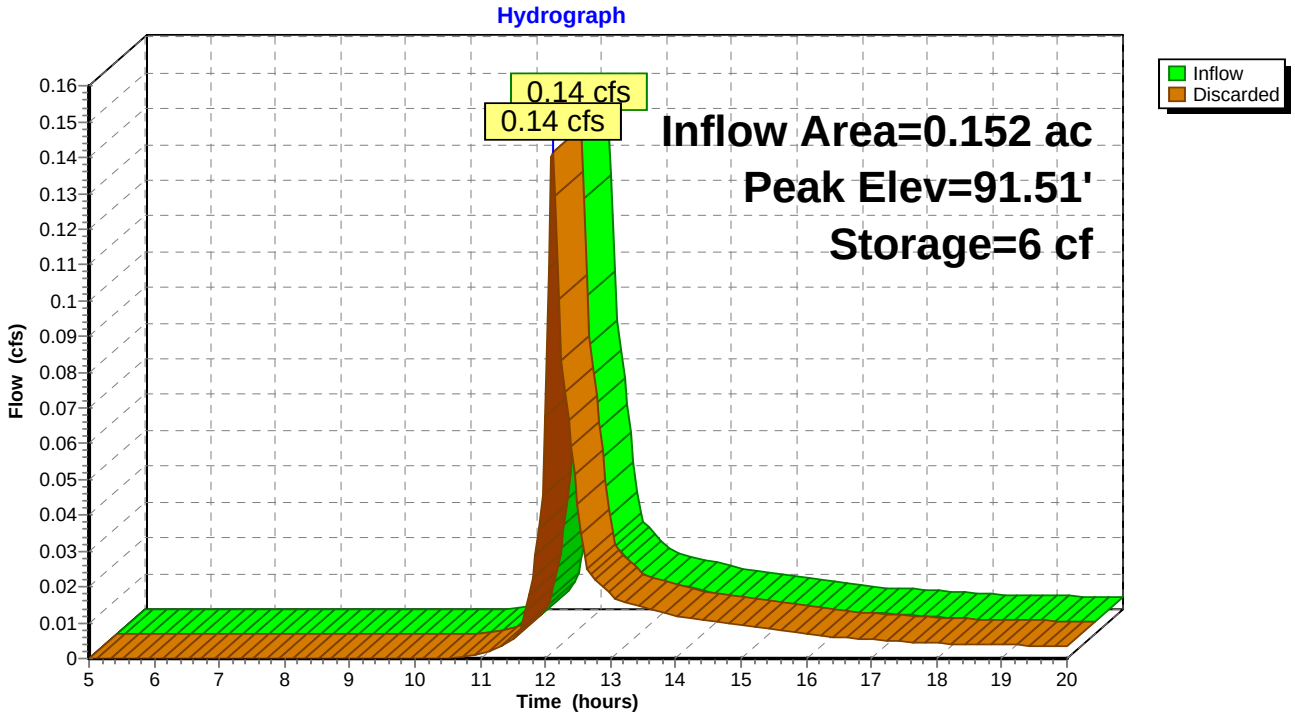
Volume	Invert	Avail.Storage	Storage Description
#1	91.50'	1,271 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
91.50	419	0	0
92.50	815	617	617
93.00	1,801	654	1,271

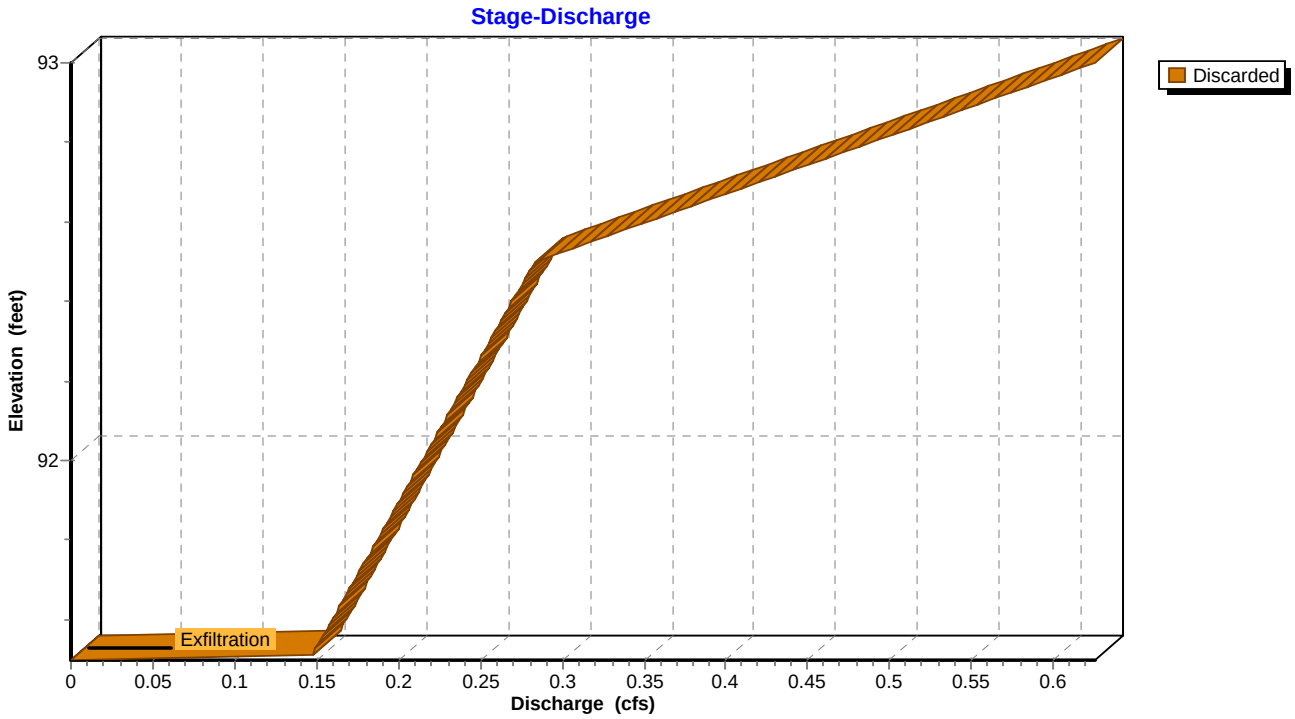
Device	Routing	Invert	Outlet Devices
#1	Discarded	91.50'	**15.000 in/hr Exfiltration over Surface area**

Discarded OutFlow Max=0.15 cfs @ 12.11 hrs HW=91.51' (Free Discharge)
↑**1=Exfiltration** (Exfiltration Controls 0.15 cfs)

Pond 5P: Rain Garden



Pond 5P: Rain Garden

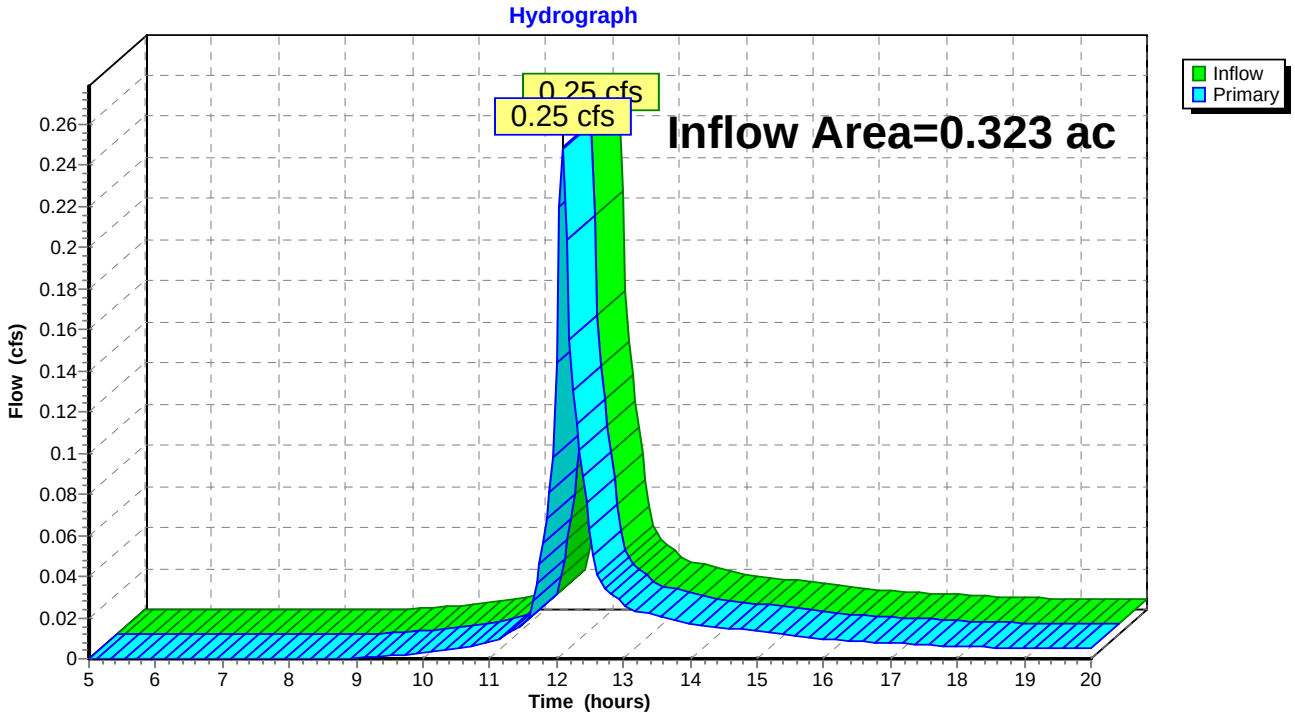


Summary for Link 6L: SDP1

Inflow Area = 0.323 ac, 32.19% Impervious, Inflow Depth > 0.62" for 1-Year event
Inflow = 0.25 cfs @ 12.09 hrs, Volume= 0.017 af
Primary = 0.25 cfs @ 12.09 hrs, Volume= 0.017 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Link 6L: SDP1

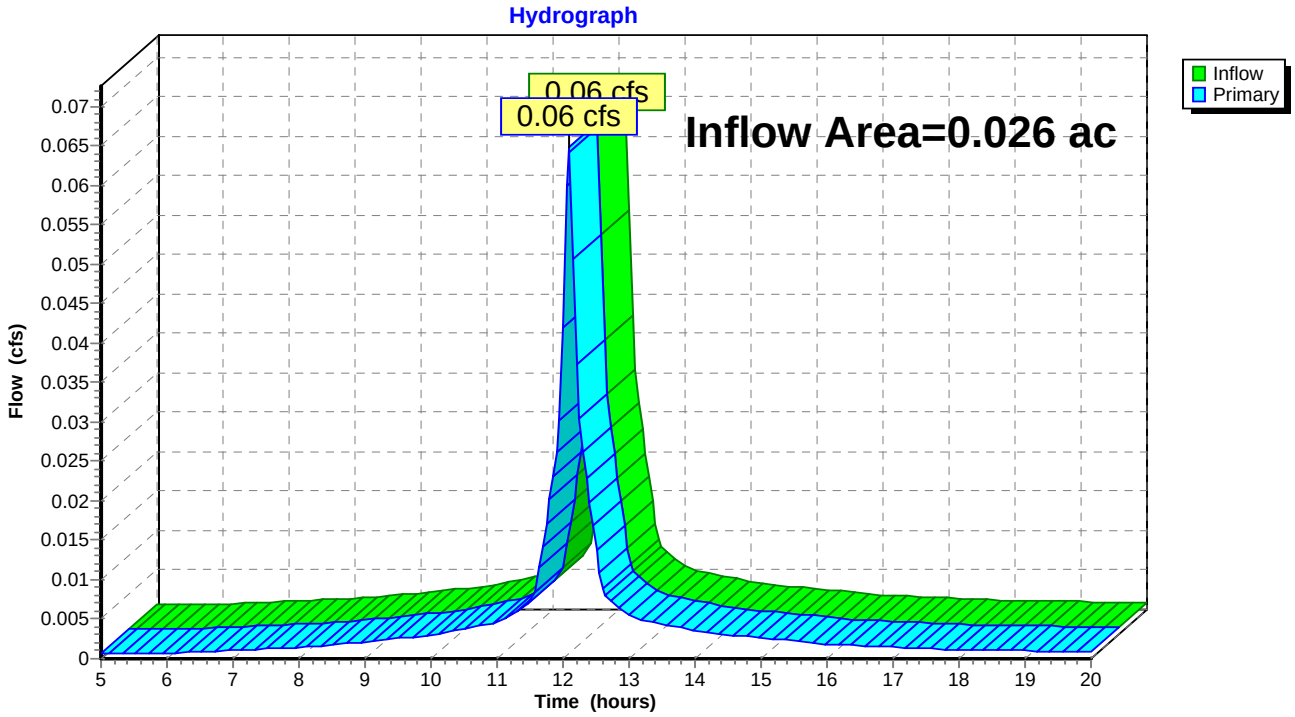


Summary for Link 7L: SDP2

Inflow Area = 0.026 ac,100.00% Impervious, Inflow Depth > 2.23" for 1-Year event
Inflow = 0.06 cfs @ 12.09 hrs, Volume= 0.005 af
Primary = 0.06 cfs @ 12.09 hrs, Volume= 0.005 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Link 7L: SDP2



Summary for Subcatchment 2S: DA 10

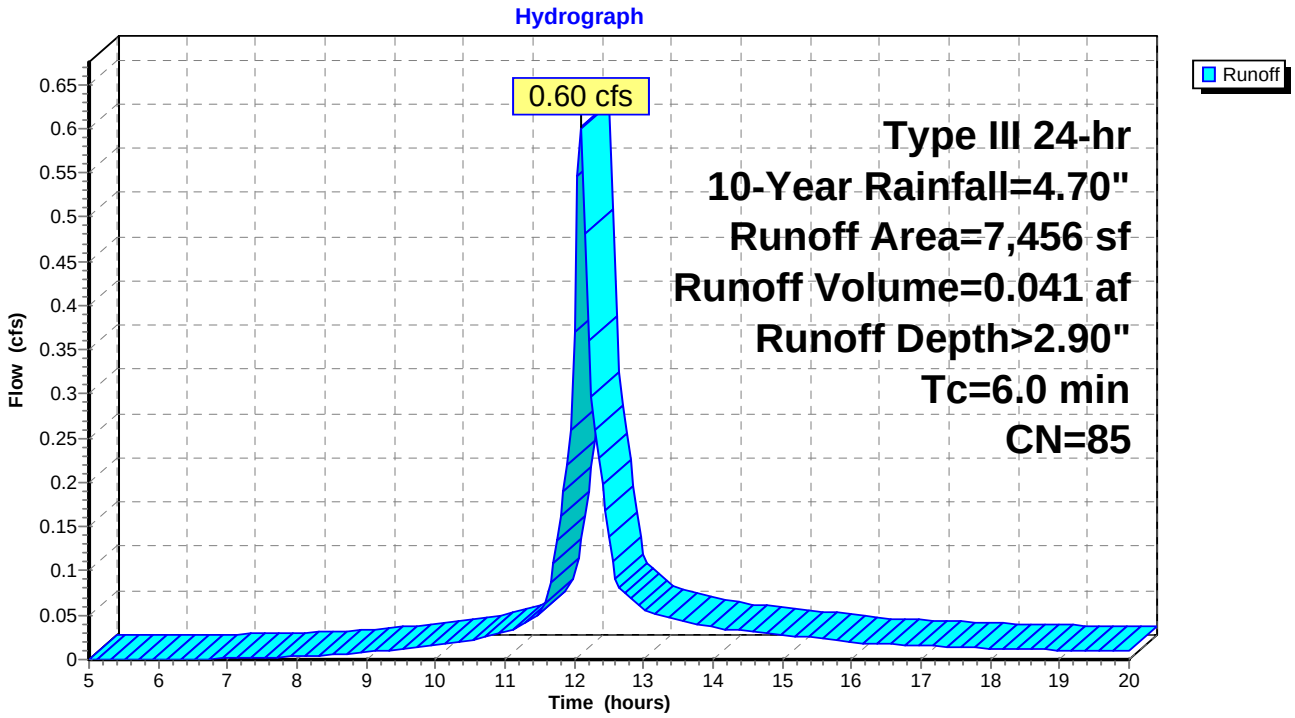
Runoff = 0.60 cfs @ 12.09 hrs, Volume= 0.041 af, Depth> 2.90"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Year Rainfall=4.70"

Area (sf)	CN	Description
3,331	98	Paved parking, HSG C
4,125	74	>75% Grass cover, Good, HSG C
7,456	85	Weighted Average
4,125		55.32% Pervious Area
3,331		44.68% Impervious Area

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

Subcatchment 2S: DA 10



Summary for Subcatchment 3S: DA 12

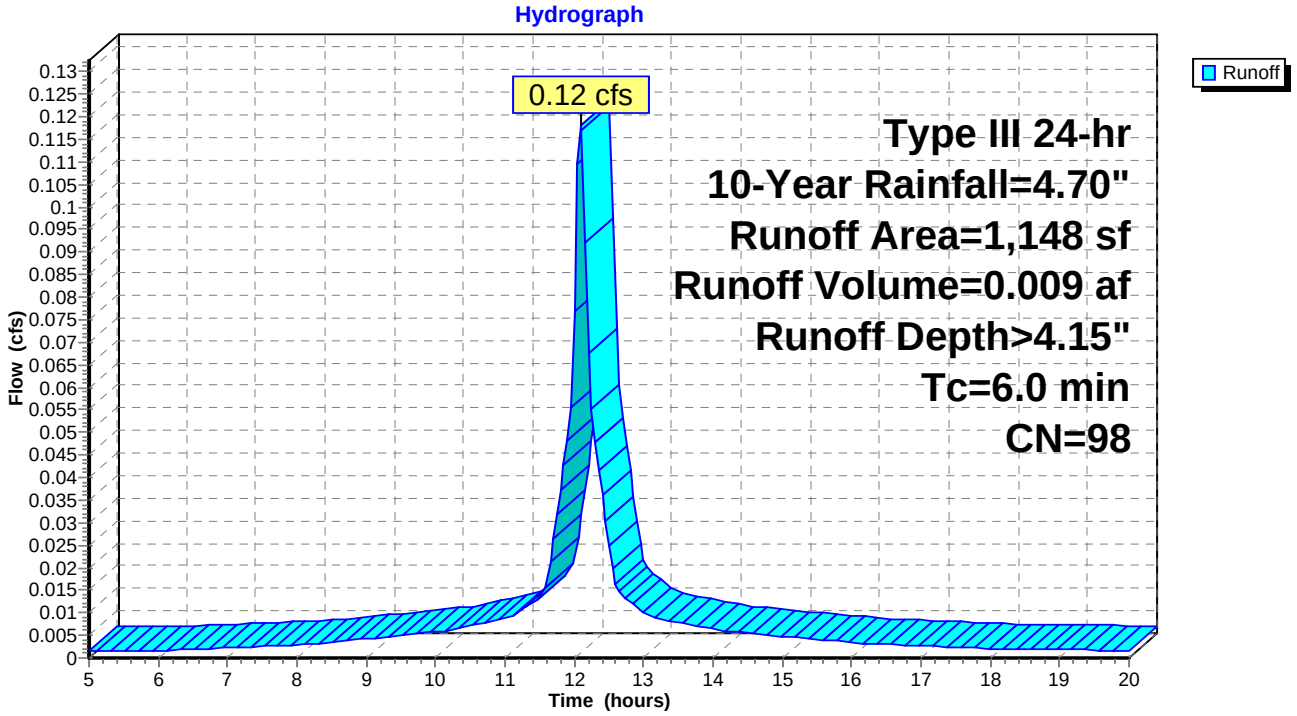
Runoff = 0.12 cfs @ 12.09 hrs, Volume= 0.009 af, Depth> 4.15"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Year Rainfall=4.70"

Area (sf)	CN	Description
1,148	98	Paved parking, HSG C
1,148		100.00% Impervious Area

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

Subcatchment 3S: DA 12



Summary for Subcatchment 4S: DA 11

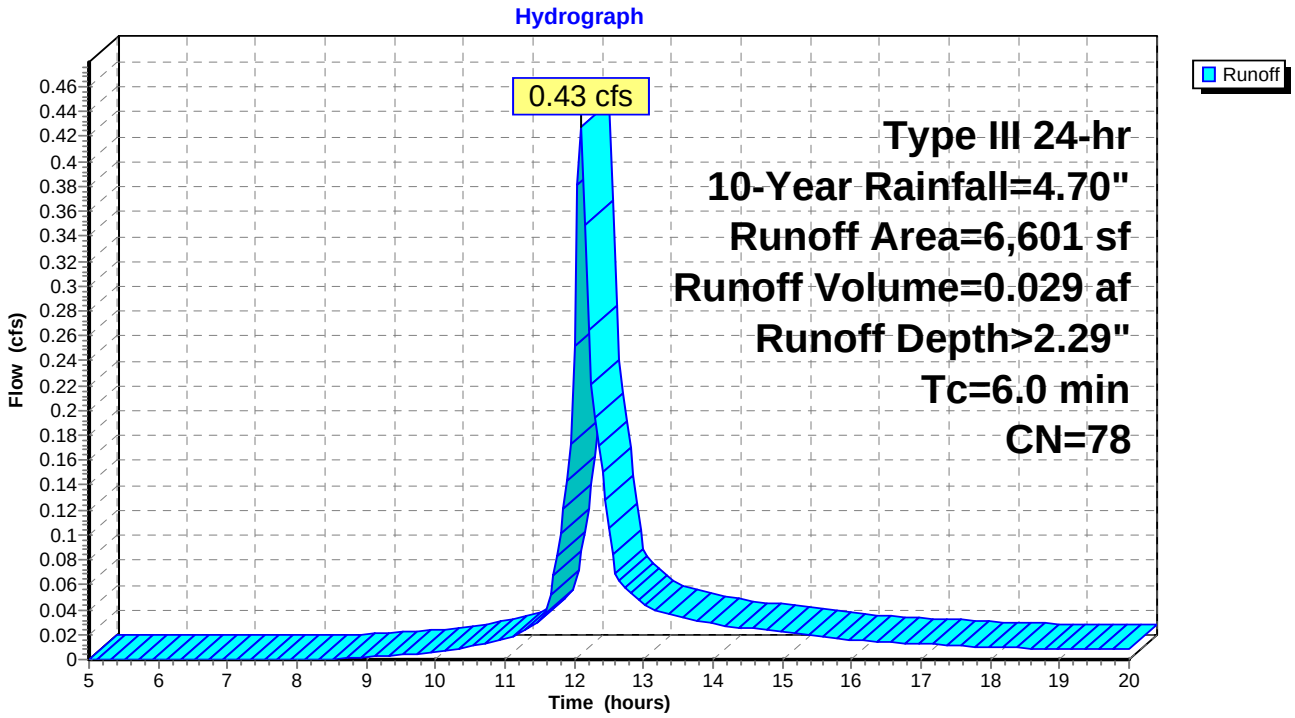
Runoff = 0.43 cfs @ 12.09 hrs, Volume= 0.029 af, Depth> 2.29"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Year Rainfall=4.70"

Area (sf)	CN	Description
1,194	98	Paved parking, HSG C
5,407	74	>75% Grass cover, Good, HSG C
6,601	78	Weighted Average
5,407		81.91% Pervious Area
1,194		18.09% Impervious Area

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

Subcatchment 4S: DA 11



Summary for Pond 5P: Rain Garden

Inflow Area = 0.152 ac, 18.09% Impervious, Inflow Depth > 2.29" for 10-Year event
Inflow = 0.43 cfs @ 12.09 hrs, Volume= 0.029 af
Outflow = 0.19 cfs @ 12.31 hrs, Volume= 0.029 af, Atten= 55%, Lag= 12.8 min
Discarded = 0.19 cfs @ 12.31 hrs, Volume= 0.029 af

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 91.84' @ 12.31 hrs Surf.Area= 552 sf Storage= 163 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 4.6 min (798.2 - 793.6)

Volume	Invert	Avail.Storage	Storage Description
#1	91.50'	1,271 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc)

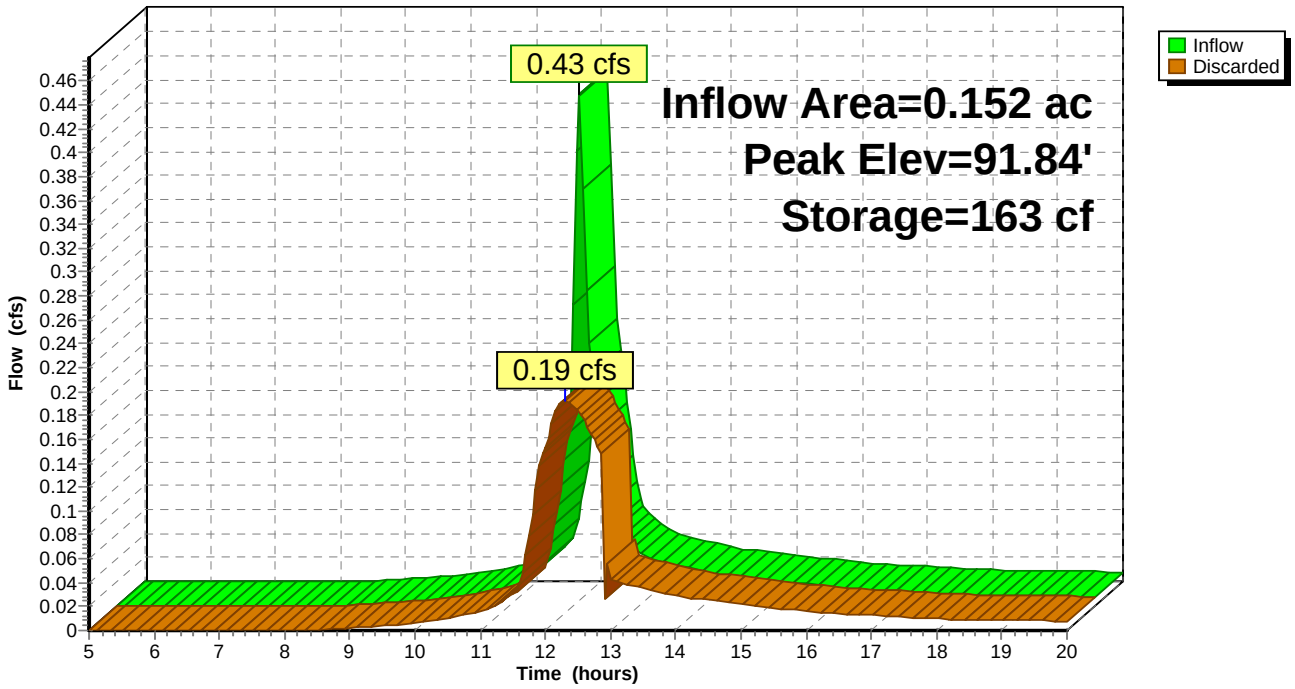
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
91.50	419	0	0
92.50	815	617	617
93.00	1,801	654	1,271

Device	Routing	Invert	Outlet Devices
#1	Discarded	91.50'	**15.000 in/hr Exfiltration over Surface area**

Discarded OutFlow Max=0.19 cfs @ 12.31 hrs HW=91.84' (Free Discharge)
↑**1=Exfiltration** (Exfiltration Controls 0.19 cfs)

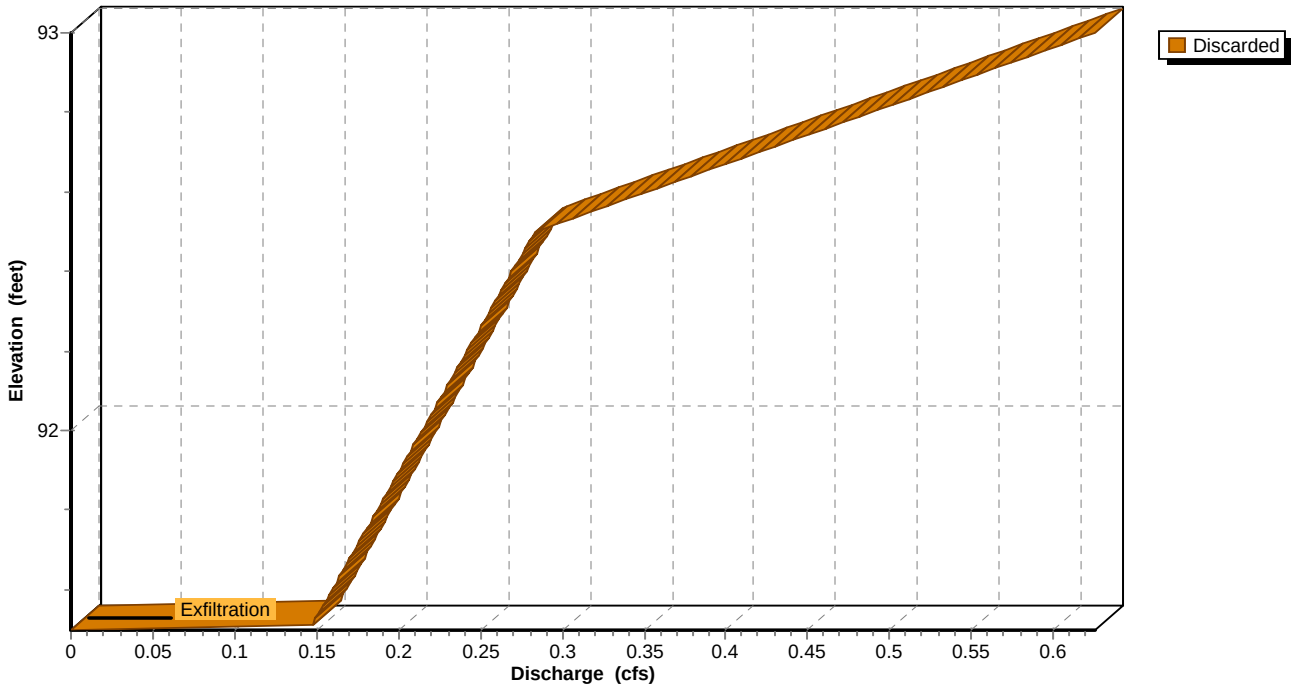
Pond 5P: Rain Garden

Hydrograph



Pond 5P: Rain Garden

Stage-Discharge

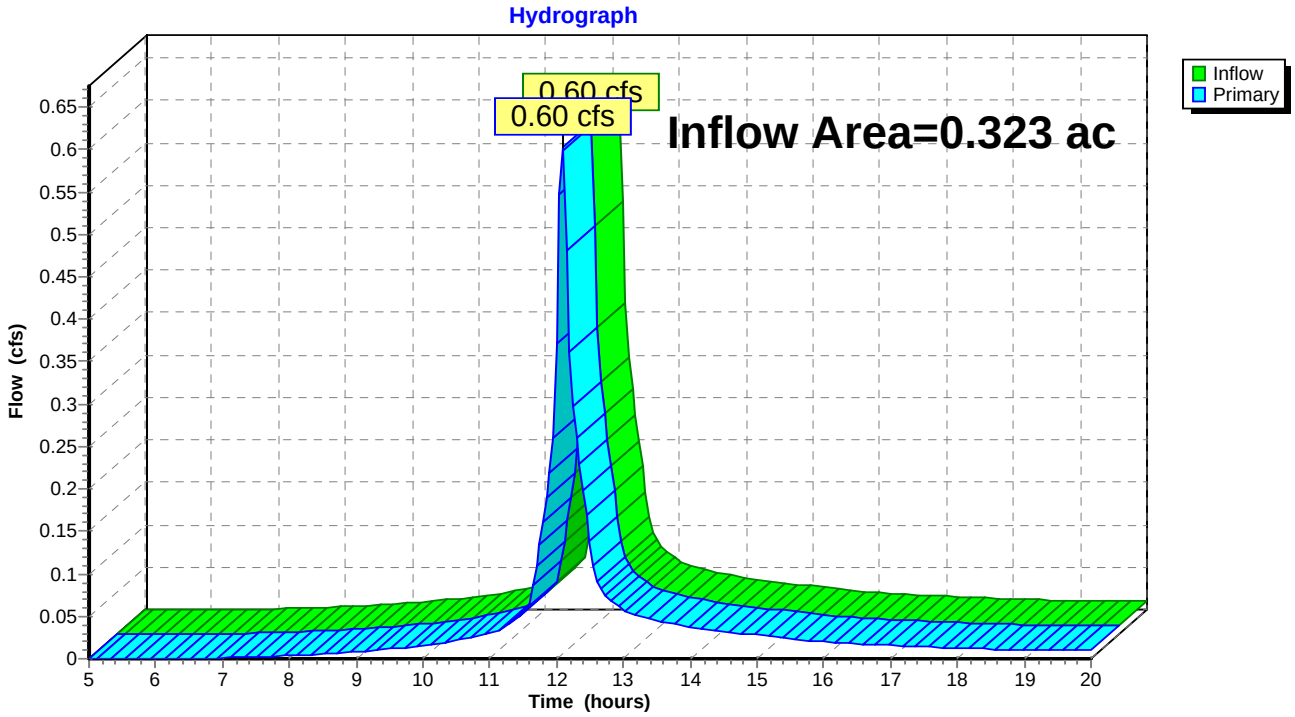


Summary for Link 6L: SDP1

Inflow Area = 0.323 ac, 32.19% Impervious, Inflow Depth > 1.54" for 10-Year event
Inflow = 0.60 cfs @ 12.09 hrs, Volume= 0.041 af
Primary = 0.60 cfs @ 12.09 hrs, Volume= 0.041 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Link 6L: SDP1

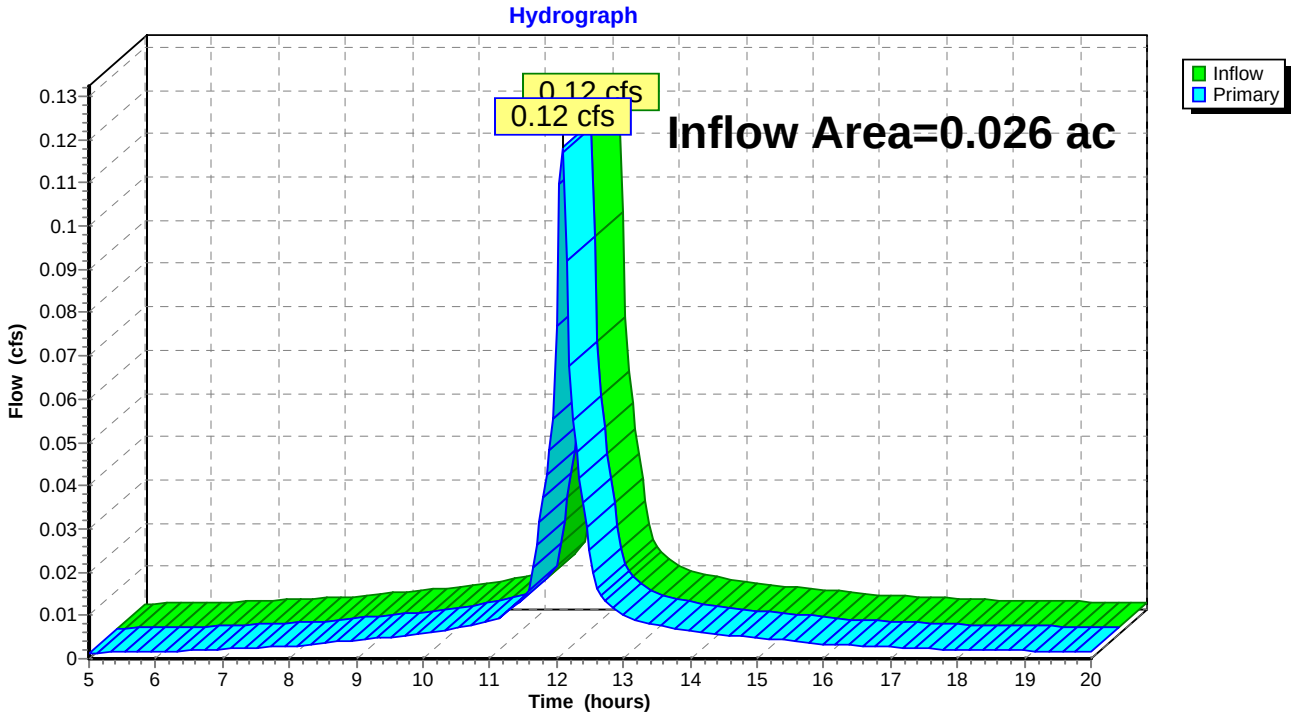


Summary for Link 7L: SDP2

Inflow Area = 0.026 ac,100.00% Impervious, Inflow Depth > 4.15" for 10-Year event
Inflow = 0.12 cfs @ 12.09 hrs, Volume= 0.009 af
Primary = 0.12 cfs @ 12.09 hrs, Volume= 0.009 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Link 7L: SDP2



Summary for Subcatchment 2S: DA 10

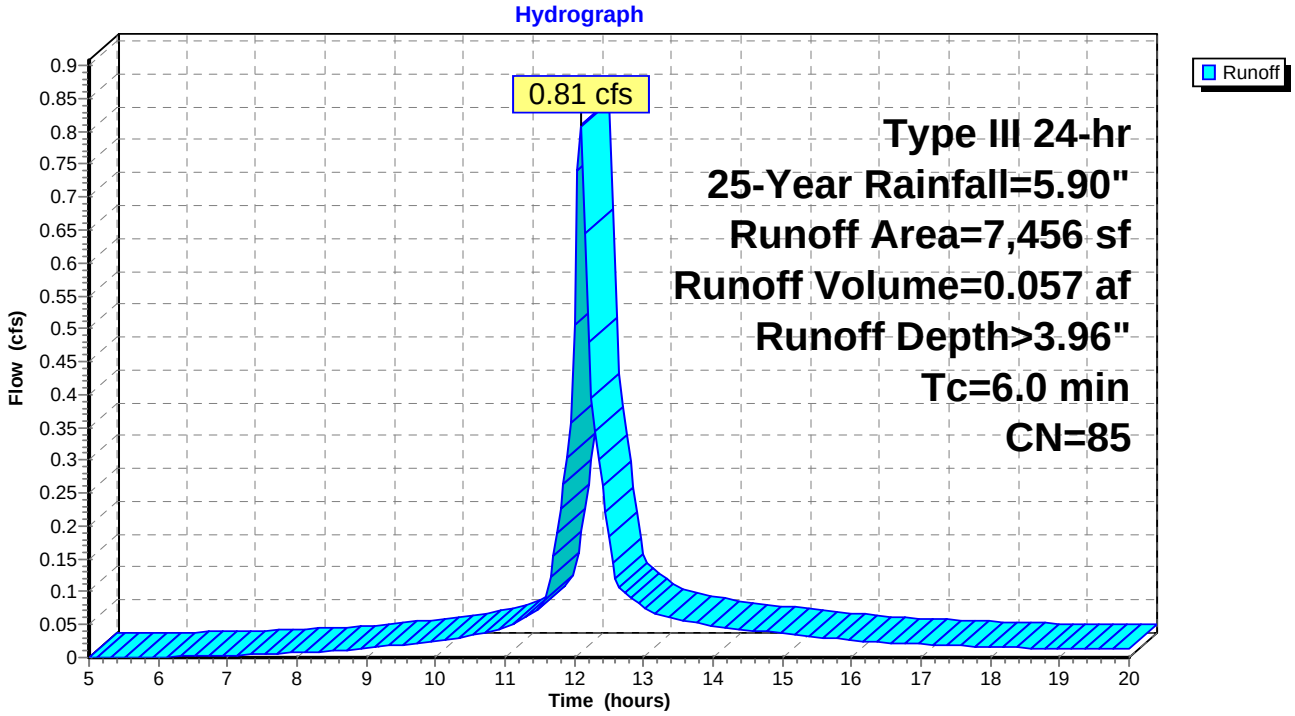
Runoff = 0.81 cfs @ 12.09 hrs, Volume= 0.057 af, Depth> 3.96"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-Year Rainfall=5.90"

Area (sf)	CN	Description
3,331	98	Paved parking, HSG C
4,125	74	>75% Grass cover, Good, HSG C
7,456	85	Weighted Average
4,125		55.32% Pervious Area
3,331		44.68% Impervious Area

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

Subcatchment 2S: DA 10



Summary for Subcatchment 3S: DA 12

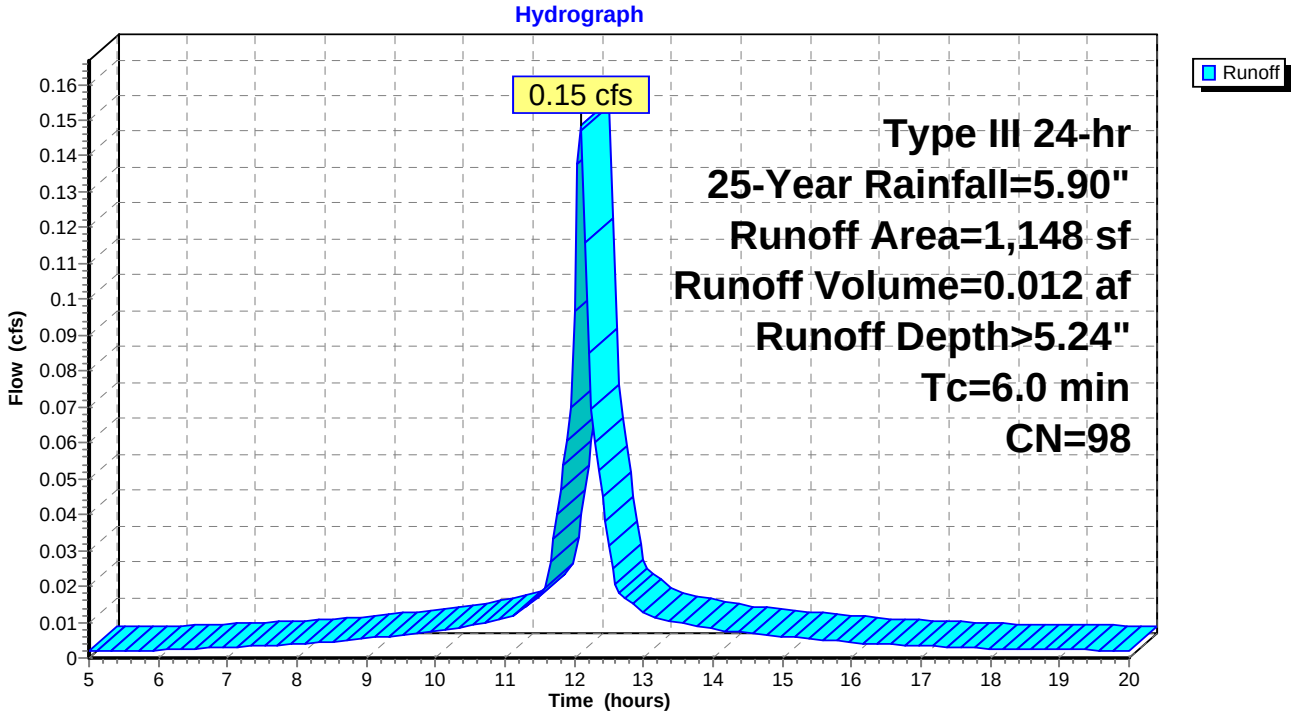
Runoff = 0.15 cfs @ 12.09 hrs, Volume= 0.012 af, Depth> 5.24"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-Year Rainfall=5.90"

Area (sf)	CN	Description
1,148	98	Paved parking, HSG C
1,148		100.00% Impervious Area

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

Subcatchment 3S: DA 12



Summary for Subcatchment 4S: DA 11

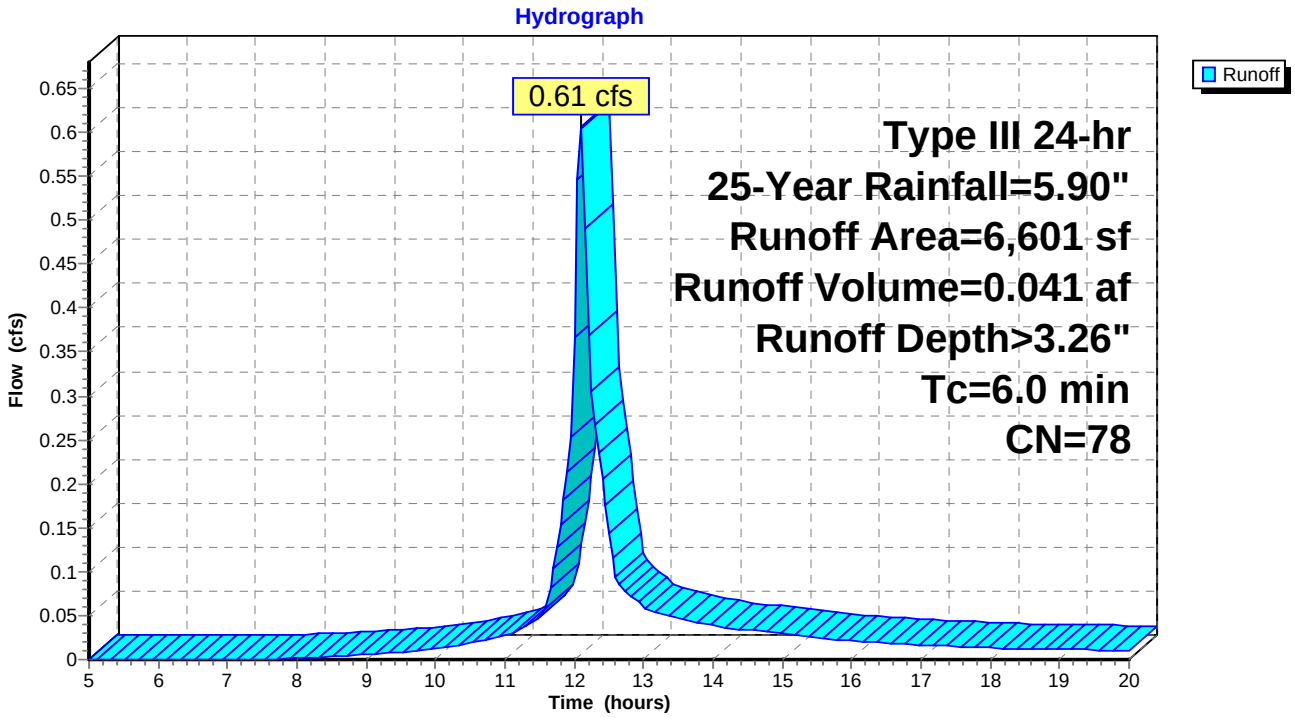
Runoff = 0.61 cfs @ 12.09 hrs, Volume= 0.041 af, Depth> 3.26"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-Year Rainfall=5.90"

Area (sf)	CN	Description
1,194	98	Paved parking, HSG C
5,407	74	>75% Grass cover, Good, HSG C
6,601	78	Weighted Average
5,407		81.91% Pervious Area
1,194		18.09% Impervious Area

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

Subcatchment 4S: DA 11



Summary for Pond 5P: Rain Garden

Inflow Area = 0.152 ac, 18.09% Impervious, Inflow Depth > 3.26" for 25-Year event
Inflow = 0.61 cfs @ 12.09 hrs, Volume= 0.041 af
Outflow = 0.23 cfs @ 12.37 hrs, Volume= 0.041 af, Atten= 63%, Lag= 16.4 min
Discarded = 0.23 cfs @ 12.37 hrs, Volume= 0.041 af

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 92.09' @ 12.37 hrs Surf.Area= 654 sf Storage= 318 cf

Plug-Flow detention time= 8.4 min calculated for 0.041 af (100% of inflow)
Center-of-Mass det. time= 8.3 min (793.7 - 785.4)

Volume	Invert	Avail.Storage	Storage Description
#1	91.50'	1,271 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc)

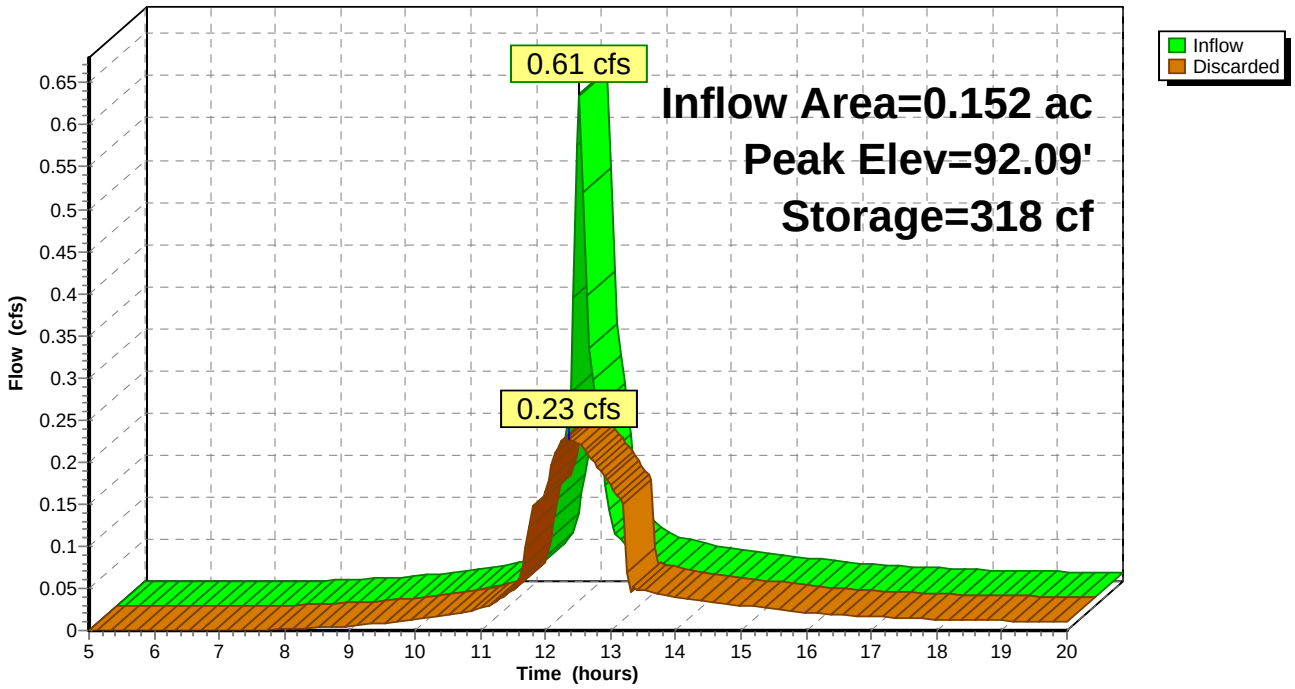
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
91.50	419	0	0
92.50	815	617	617
93.00	1,801	654	1,271

Device	Routing	Invert	Outlet Devices
#1	Discarded	91.50'	**15.000 in/hr Exfiltration over Surface area**

Discarded OutFlow Max=0.23 cfs @ 12.37 hrs HW=92.09' (Free Discharge)
↑**1=Exfiltration** (Exfiltration Controls 0.23 cfs)

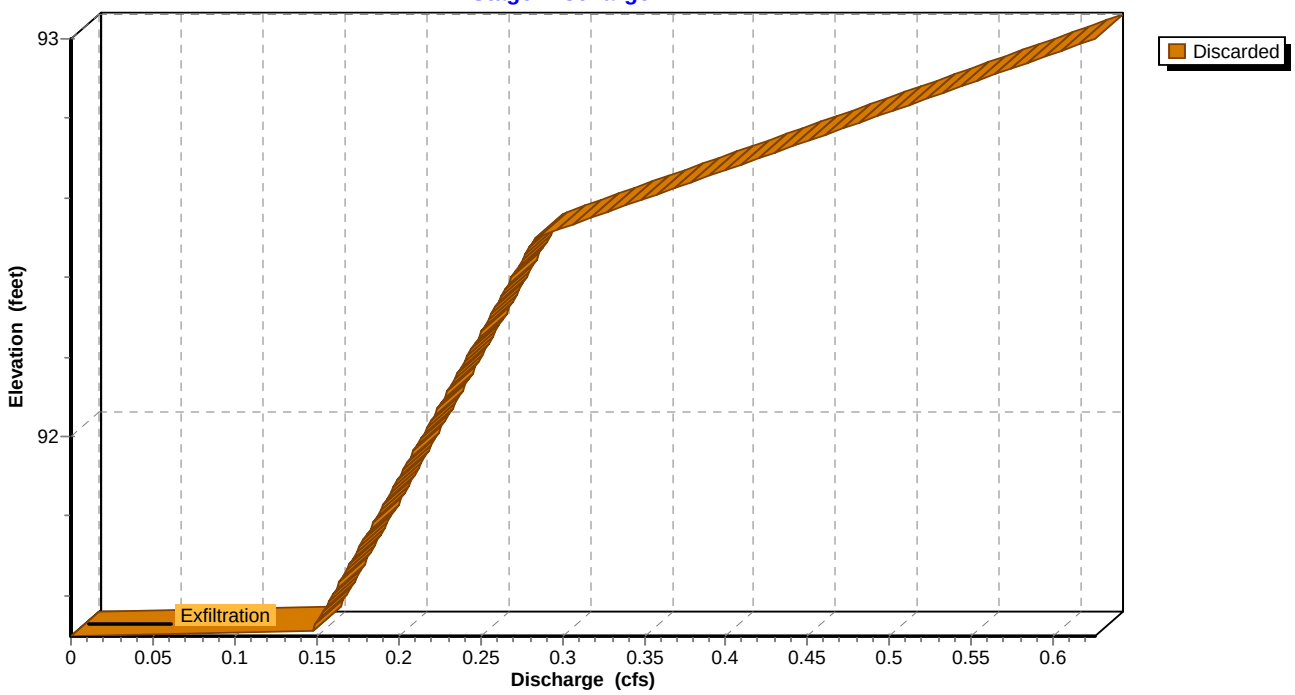
Pond 5P: Rain Garden

Hydrograph



Pond 5P: Rain Garden

Stage-Discharge

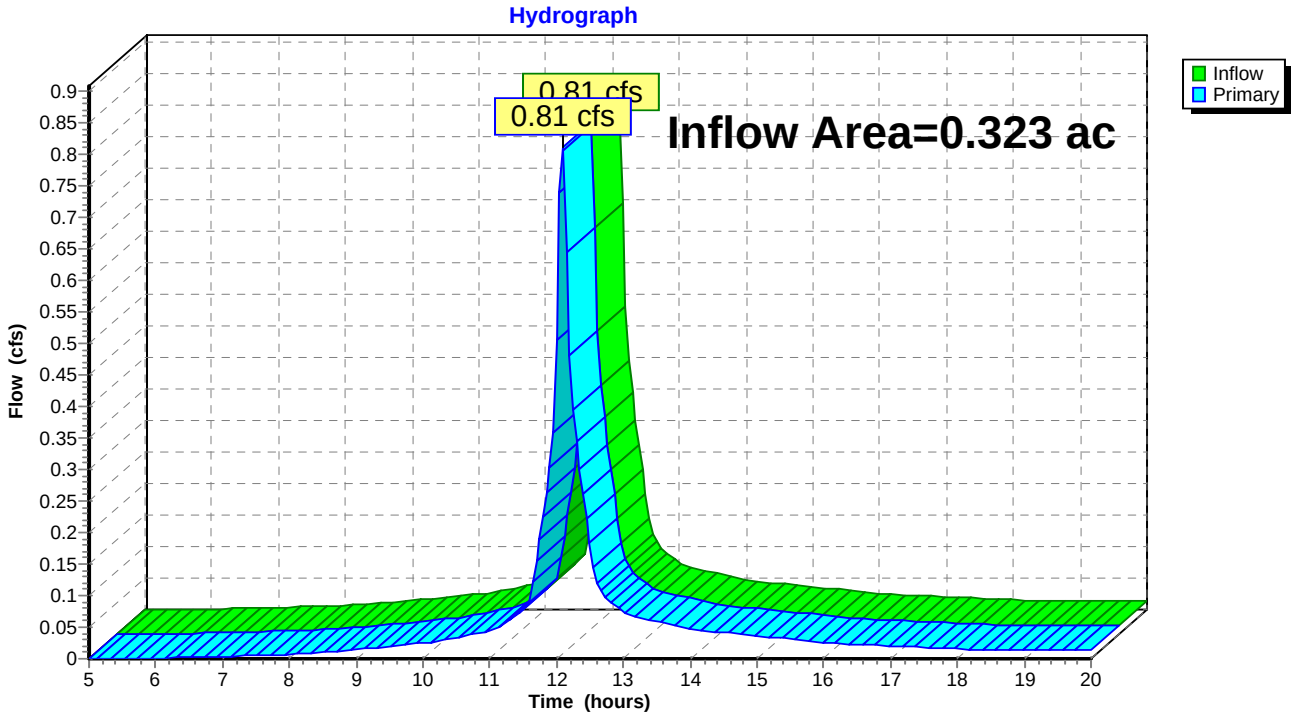


Summary for Link 6L: SDP1

Inflow Area = 0.323 ac, 32.19% Impervious, Inflow Depth > 2.10" for 25-Year event
Inflow = 0.81 cfs @ 12.09 hrs, Volume= 0.057 af
Primary = 0.81 cfs @ 12.09 hrs, Volume= 0.057 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Link 6L: SDP1

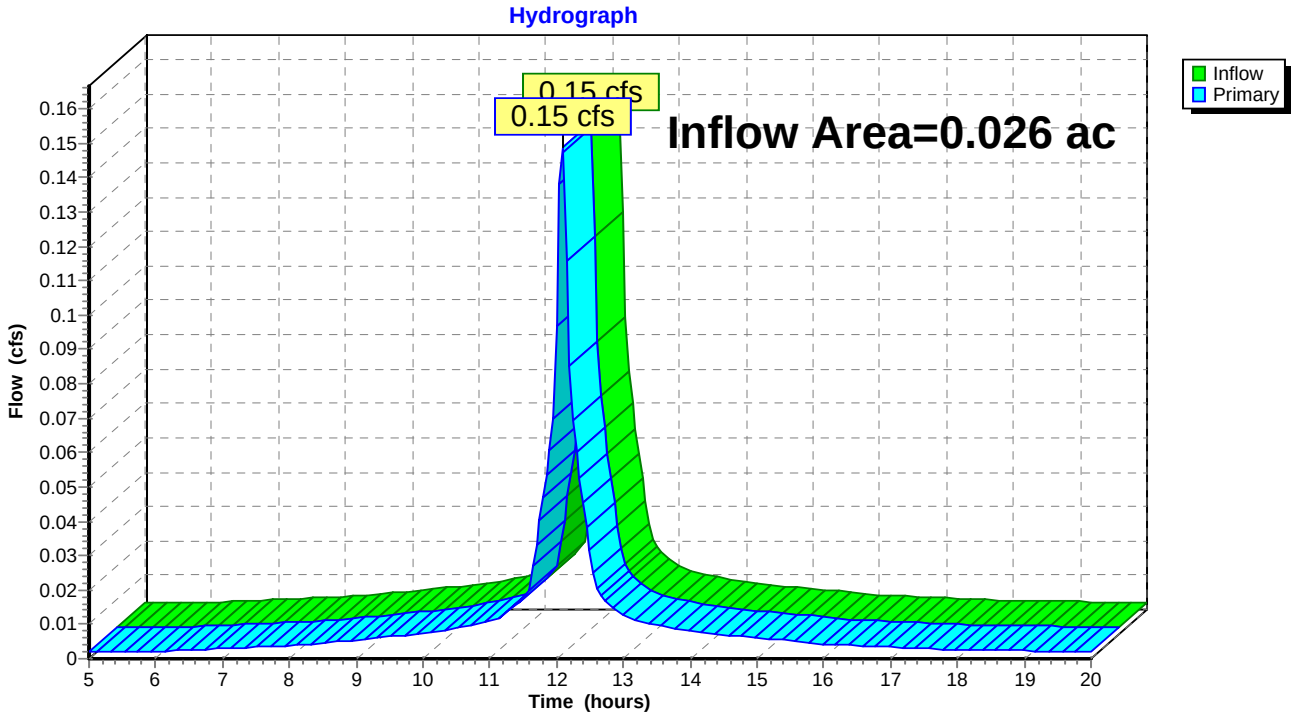


Summary for Link 7L: SDP2

Inflow Area = 0.026 ac,100.00% Impervious, Inflow Depth > 5.24" for 25-Year event
Inflow = 0.15 cfs @ 12.09 hrs, Volume= 0.012 af
Primary = 0.15 cfs @ 12.09 hrs, Volume= 0.012 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Link 7L: SDP2



Summary for Subcatchment 2S: DA 10

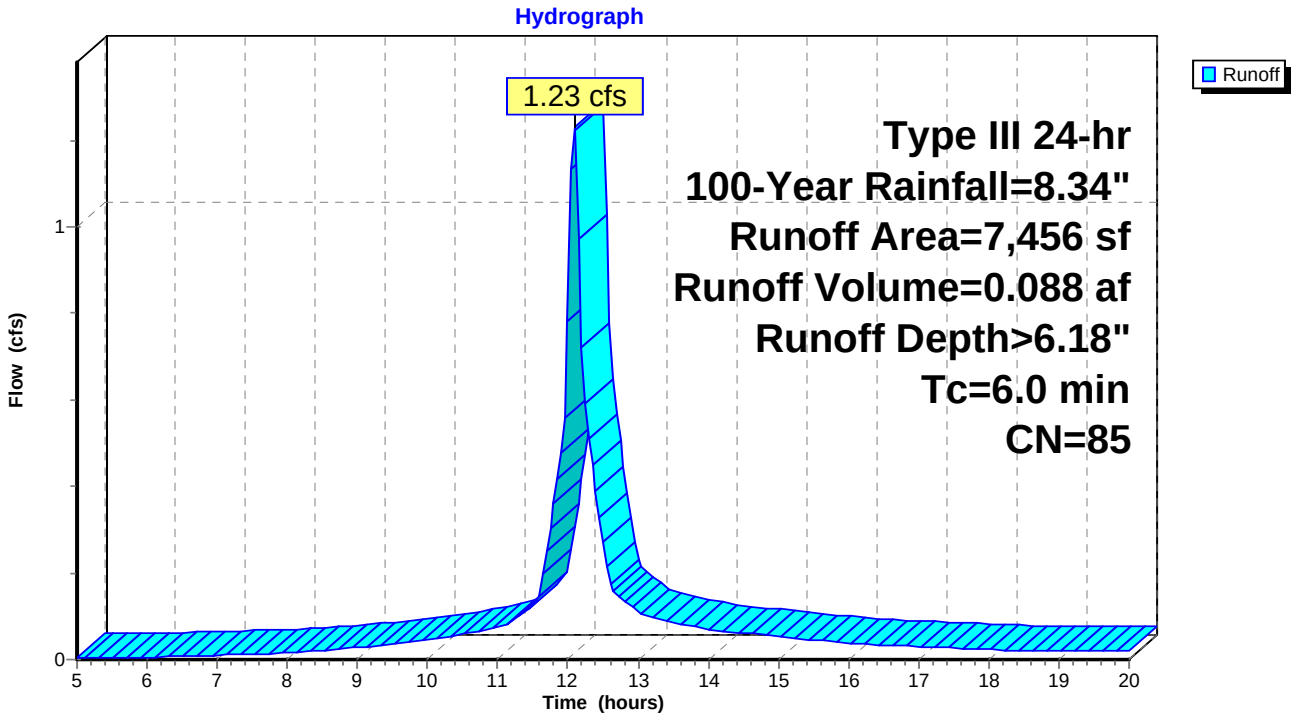
Runoff = 1.23 cfs @ 12.09 hrs, Volume= 0.088 af, Depth> 6.18"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-Year Rainfall=8.34"

Area (sf)	CN	Description
3,331	98	Paved parking, HSG C
4,125	74	>75% Grass cover, Good, HSG C
7,456	85	Weighted Average
4,125		55.32% Pervious Area
3,331		44.68% Impervious Area

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

Subcatchment 2S: DA 10



Summary for Subcatchment 3S: DA 12

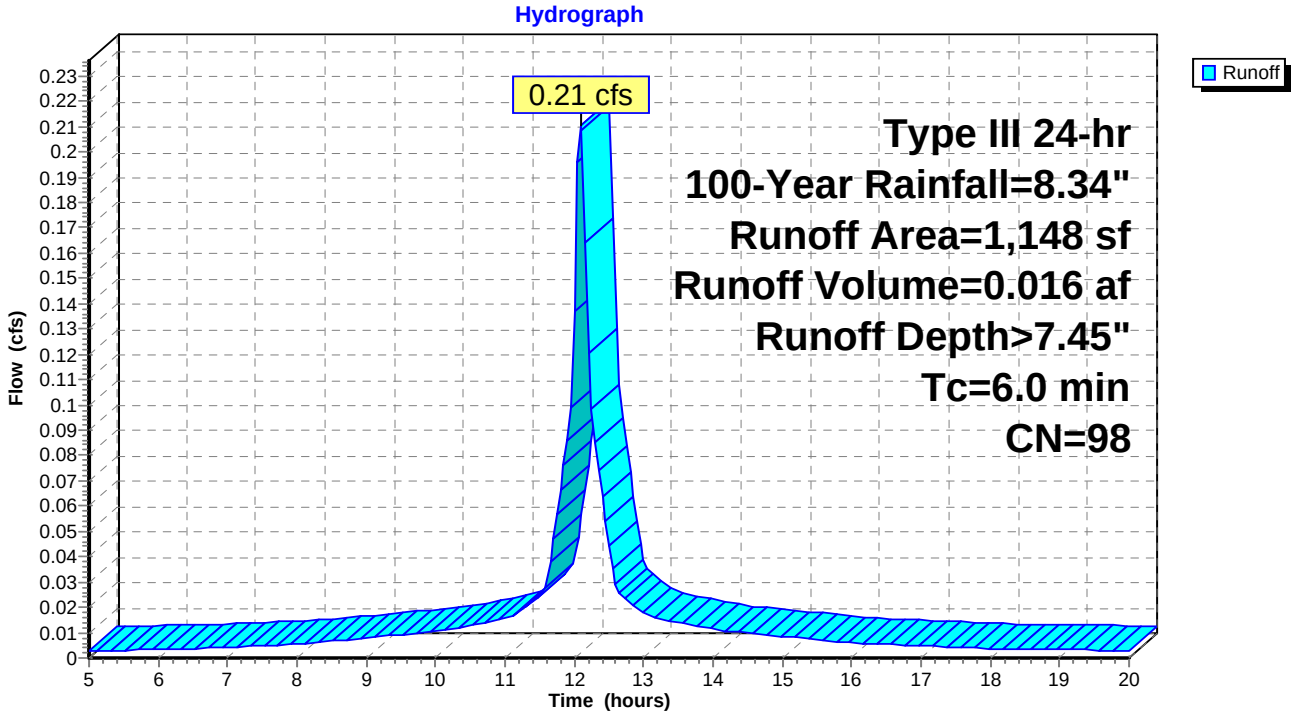
Runoff = 0.21 cfs @ 12.09 hrs, Volume= 0.016 af, Depth> 7.45"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-Year Rainfall=8.34"

Area (sf)	CN	Description
1,148	98	Paved parking, HSG C
1,148		100.00% Impervious Area

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

Subcatchment 3S: DA 12



Summary for Subcatchment 4S: DA 11

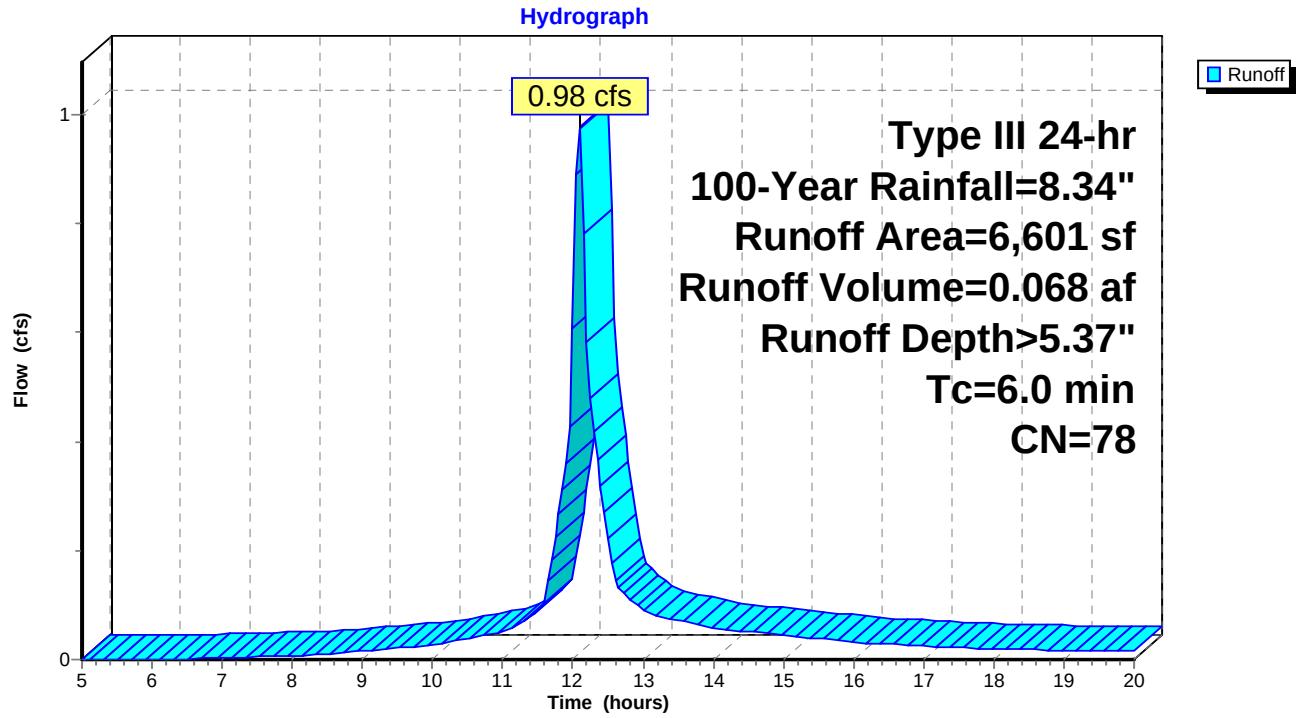
Runoff = 0.98 cfs @ 12.09 hrs, Volume= 0.068 af, Depth> 5.37"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-Year Rainfall=8.34"

Area (sf)	CN	Description
1,194	98	Paved parking, HSG C
5,407	74	>75% Grass cover, Good, HSG C
6,601	78	Weighted Average
5,407		81.91% Pervious Area
1,194		18.09% Impervious Area

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

Subcatchment 4S: DA 11



Summary for Pond 5P: Rain Garden

Inflow Area = 0.152 ac, 18.09% Impervious, Inflow Depth > 5.37" for 100-Year event
Inflow = 0.98 cfs @ 12.09 hrs, Volume= 0.068 af
Outflow = 0.33 cfs @ 12.39 hrs, Volume= 0.068 af, Atten= 66%, Lag= 17.9 min
Discarded = 0.33 cfs @ 12.39 hrs, Volume= 0.068 af

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 92.57' @ 12.39 hrs Surf.Area= 954 sf Storage= 679 cf

Plug-Flow detention time= 15.3 min calculated for 0.068 af (100% of inflow)
Center-of-Mass det. time= 15.1 min (788.8 - 773.7)

Volume	Invert	Avail.Storage	Storage Description
#1	91.50'	1,271 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc)

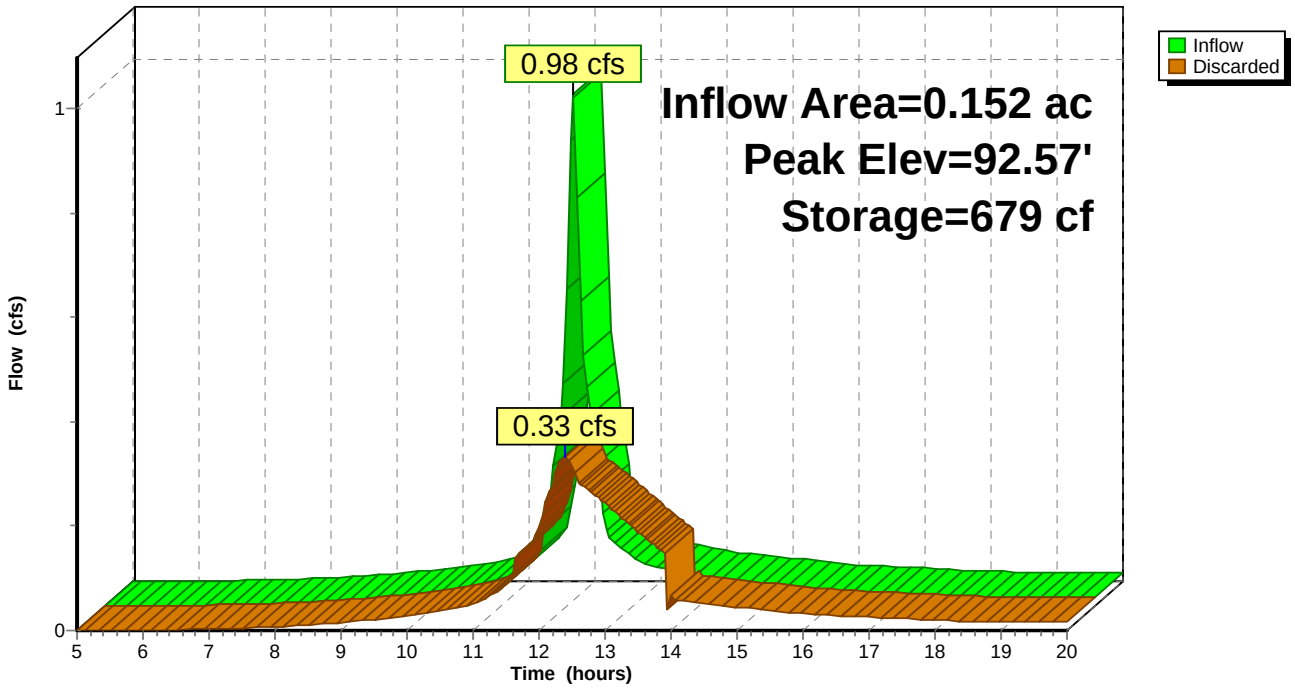
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
91.50	419	0	0
92.50	815	617	617
93.00	1,801	654	1,271

Device	Routing	Invert	Outlet Devices
#1	Discarded	91.50'	**15.000 in/hr Exfiltration over Surface area**

Discarded OutFlow Max=0.33 cfs @ 12.39 hrs HW=92.57' (Free Discharge)
↑**1=Exfiltration** (Exfiltration Controls 0.33 cfs)

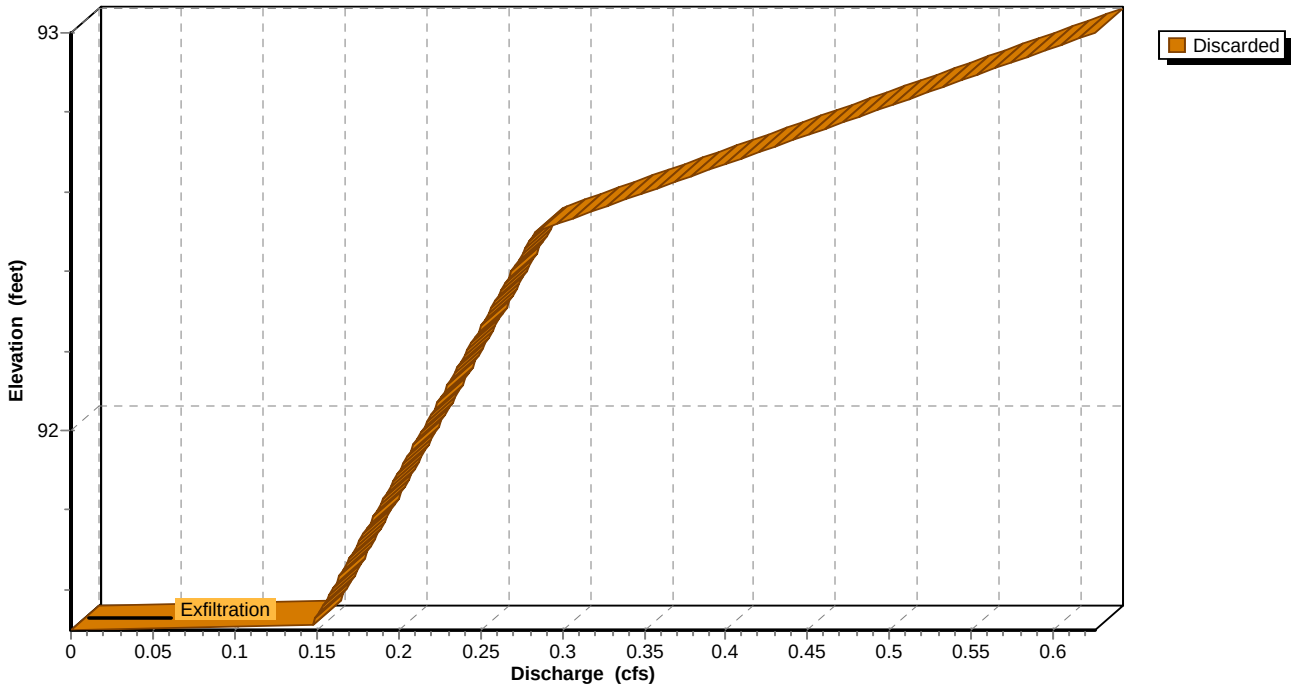
Pond 5P: Rain Garden

Hydrograph



Pond 5P: Rain Garden

Stage-Discharge

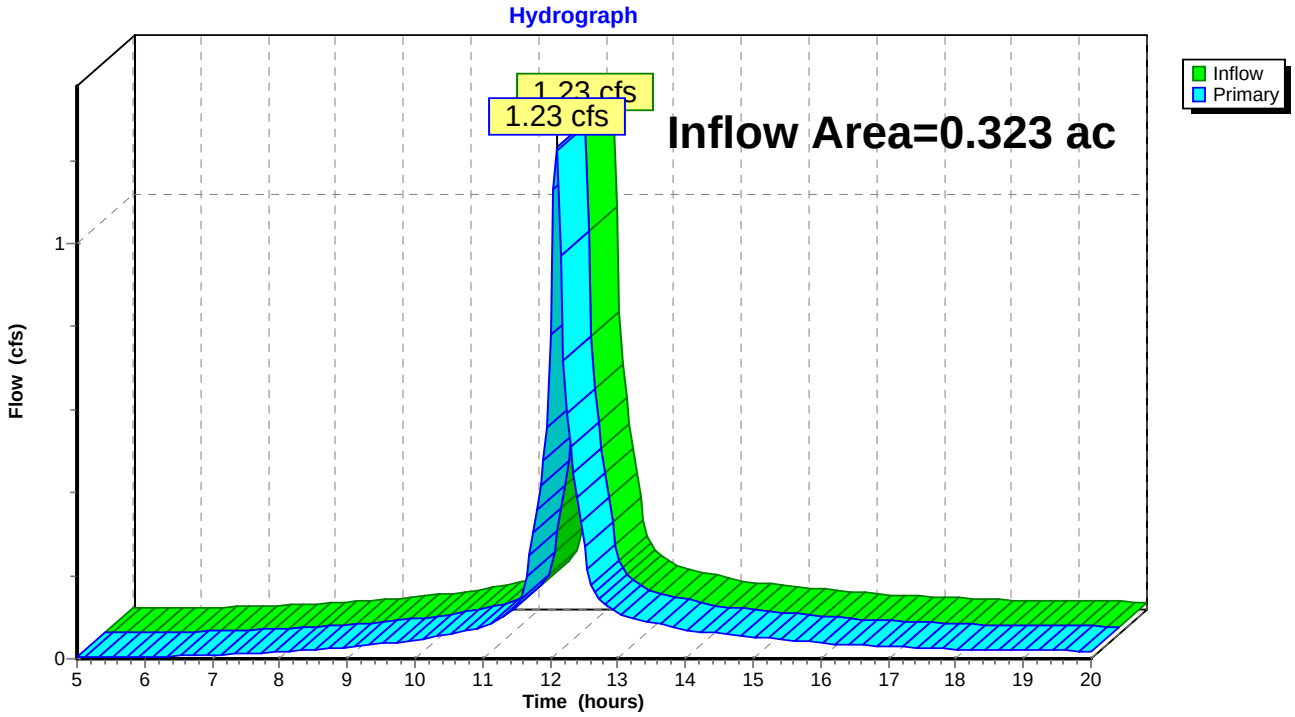


Summary for Link 6L: SDP1

Inflow Area = 0.323 ac, 32.19% Impervious, Inflow Depth > 3.28" for 100-Year event
Inflow = 1.23 cfs @ 12.09 hrs, Volume= 0.088 af
Primary = 1.23 cfs @ 12.09 hrs, Volume= 0.088 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Link 6L: SDP1



Summary for Link 7L: SDP2

Inflow Area = 0.026 ac,100.00% Impervious, Inflow Depth > 7.45" for 100-Year event
Inflow = 0.21 cfs @ 12.09 hrs, Volume= 0.016 af
Primary = 0.21 cfs @ 12.09 hrs, Volume= 0.016 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Link 7L: SDP2