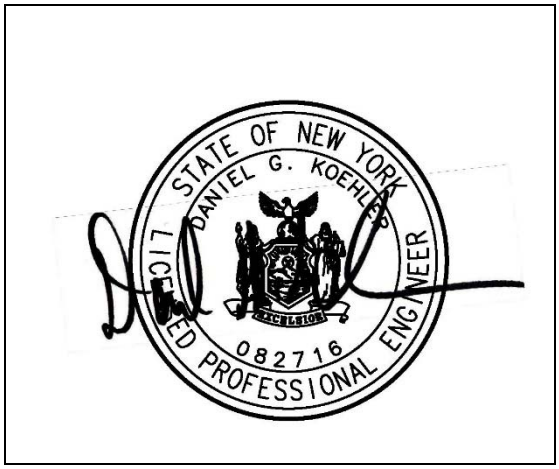
Drainage Report:
for
160 Rombout Avenue Subdivision

Prepared for:

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

February 25, 2020
Revised March 31, 2020



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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 (+/- 0.33 acres) and 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 approximately 7,790 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 brown sandy loam. 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 92.4. The 36" test was conducted approximately 1' below the bottom of the stormwater area, elevation 90.6. 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, which 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. Two design points for the main project area were selected, and are 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 24,421 sqft in total, and includes the existing single-family residence and shed, parking areas on Parcel 853796 and landscaped areas, and also includes runoff from the adjacent property to the east. In the drainage analysis model, the existing pre-development area is delineated as subcatchment 1. Drainage generally flows via sheet flow to the stormwater design point located on the northern property line. The surveyor recently generated additional topographic elevation shots that shows that the runoff generally ponds on the subject parcel and at approximately elevation 92.6, spills in a northerly direction behind the houses along S. Brett Street toward Beacon Street. The low point in the existing depression is at the northeast corner of the subject parcel with an elevation of 92.36. The following graphic provides a view of the general topography of the site and parcels to the north (note that the project surveyor used an assumed datum that does not match the vertical datum used in the graphic).

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. The existing depressed area was modelled as a pond with a weir outlet to provide for peak rates of flow off-site. A theoretical area for elevation 92.7 was estimated in order for the program to be able to calculate a peak elevation and to allow for the outflow via weir flow In addition, an infiltration rate of 30 inches per hour was applied, where the topsoil layer likely does not permit (i.e., the topsoil layer likely results in slower infiltration rates).

4.3 Existing Runoff Volumes and Rates

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

TABLE III - EXISTING RUNOFF VOLUMES AND RATES

Runoff Volumes (acre-feet) / Rates (cfs)

Designation	Area (sqft)	1-Year	10-Year	25-Year	100-Year
SDP 1	24,421	0.000 / 0.00[1]	0.005 / 0.58	0.015 / 1.21	0.047 / 2.51

1. Ponding to elevation 92.49' – no outflow, assumed to be eventually infiltrated

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 approximately 7,790 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, including those associated with the property to the east. The post development watershed was divided into two stormwater subcatchments; Subcatchment 10 and Subcatchment 20.

Subcatchment 10 consists of the existed single-family residence, driveway, and yard, the proposed driveway and yard for lot 2, and the existing developed parcel to the east of the property. 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, which is being enhanced to provide an infiltration basin.

Subcatchment 20 consists of the proposed single-family residence, the rooftop runoff that is captured by piping and conveyed to the existing catch basin on Rombout Avenue, designated as SDP2.

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 Volumes and Rates

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

TABLE IV
PROPOSED RUNOFF VOLUMES AND RATES

Runoff Volumes (acre-feet) / Rates (cfs)

Designation	Area (sqft)	1-Year	10-Year	25-Year	100-Year
SDP1	23,273	0.000 / 0.00[1]	0.000 / 0.00[2]	0.000 / 0.00[3]	0.028 / 2.29
SDP2	1,148	0.005 / 0.07	0.009 / 0.12	0.011 / 0.15	0.016 / 0.22

1. Ponding to elevation 91.12' – no outflow, all infiltrated
2. Ponding to elevation 92.29' – no outflow, all infiltrated
3. Ponding to elevation 92.59' – no outflow, all infiltrated

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 (ac-ft)		10 – Year (ac-ft)		25 – Year (ac-ft)		100 – Year (ac-ft)	
	Pre	Post	Pre	Post	Pre	Post	Pre	Post
1	0.000	0.000	0.005	0.000	0.015	0.000	0.047	0.016

SDP	1 – Year (cfs)		10 – Year (cfs)		25 – Year (cfs)		100 – Year (cfs)	
	Pre	Post	Pre	Post	Pre	Post	Pre	Post
1	0.00	0.00	0.58	0.00	1.21	0.00	2.51	2.29

The runoff rates at the SDP1 decrease from pre-development to post-development conditions with the infiltration facility in place. In addition, the volume of runoff to SDP1 is also being reduced in all storm events analyzed. 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

LEGEND:

SOIL BOUNDARY

DRAINAGE BOUNDARY

SUBCATCHMENT ID — 1

DESIGN POINT — SDP1

PRE–DRAINAGE
DA 1 = 24,421 SQFT
IMPERVIOUS = 4,736 SQFT
GRASS C = 19,685 SQFT

TIME OF CONCENTRATION, Tc:
1. DIRECT ENTRY = 6 MINUTES

DRAWN BY: CMB				CHECKED BY: DGK			
REVISIONS:				REVISIONS:			
NO.	DATE	DESCRIPTION	BY	NO.	DATE	DESCRIPTION	BY
1	03/31/20	PER PLANNING BOARD COMMENTS	DGK				

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STATE OF NEW YORK — DANIEL G. KOBYLARZ — 082716 — LICENSED PROFESSIONAL ENGINEER

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PRE–DEVELOPMENT DRAINAGE MAP

160 ROMBOUT AVENUE SUBDIVISION

160 ROMBOUT AVENUE
CITY OF BEACON
DUTCHESS COUNTY, NEW YORK
TAX ID: 5954–35–853796

JOB #:	2019:050
DATE:	02/25/2020
SCALE:	AS NOTED
TITLE:	DM–1
SHEET:	1 OF 2

DRAWN BY: CMB				CHECKED BY: DGK			
REVISIONS:				REVISIONS:			
NO.	DATE	DESCRIPTION	BY	NO.	DATE	DESCRIPTION	BY
1	03/31/20	PER PLANNING BOARD COMMENTS	DGK				

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PRE-DEVELOPMENT DRAINAGE MAP

160 ROMBOUT AVENUE SUBDIVISION

160 ROMBOUT AVENUE
CITY OF BEACON
DUTCHESS COUNTY, NEW YORK
TAX ID: 5954-35-853796

JOB #: 2019:050
DATE: 02/25/2020
SCALE: AS NOTED
TITLE: DM-2
SHEET: 2 OF 2

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)					

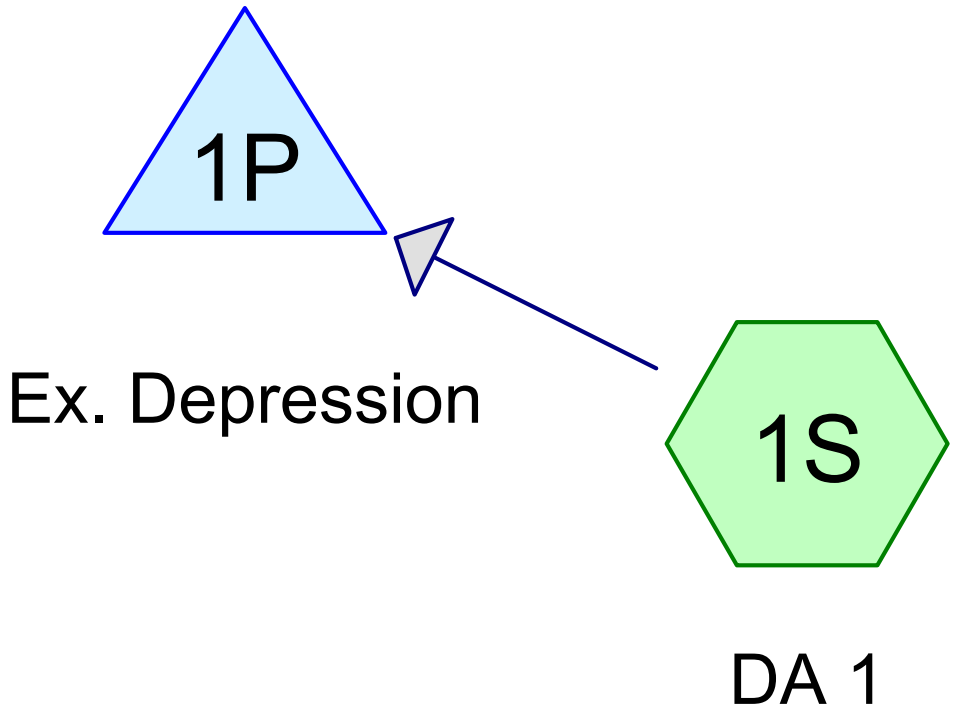
I, Daniel G. Koehler, P.E., the undersigned, certify that these infiltration tests were done by myself or under my direction according to the standard procedure as outlined in the NYS Stormwater Management Design Manual. The data and results presented are true and correct.

Dated: 2/21/2020 Signature: _____

License No. (P.E.) _____

APPENDIX C

PRE-DEVELOPMENT HYDROLOGY CALCULATIONS



Subcat Reach Pond Link

Routing Diagram for Galezo Model 2020-0331

Prepared by Hudson Land Design Professional Engineering, P.C., Printed 3/31/2020

Summary for Subcatchment 1S: DA 1

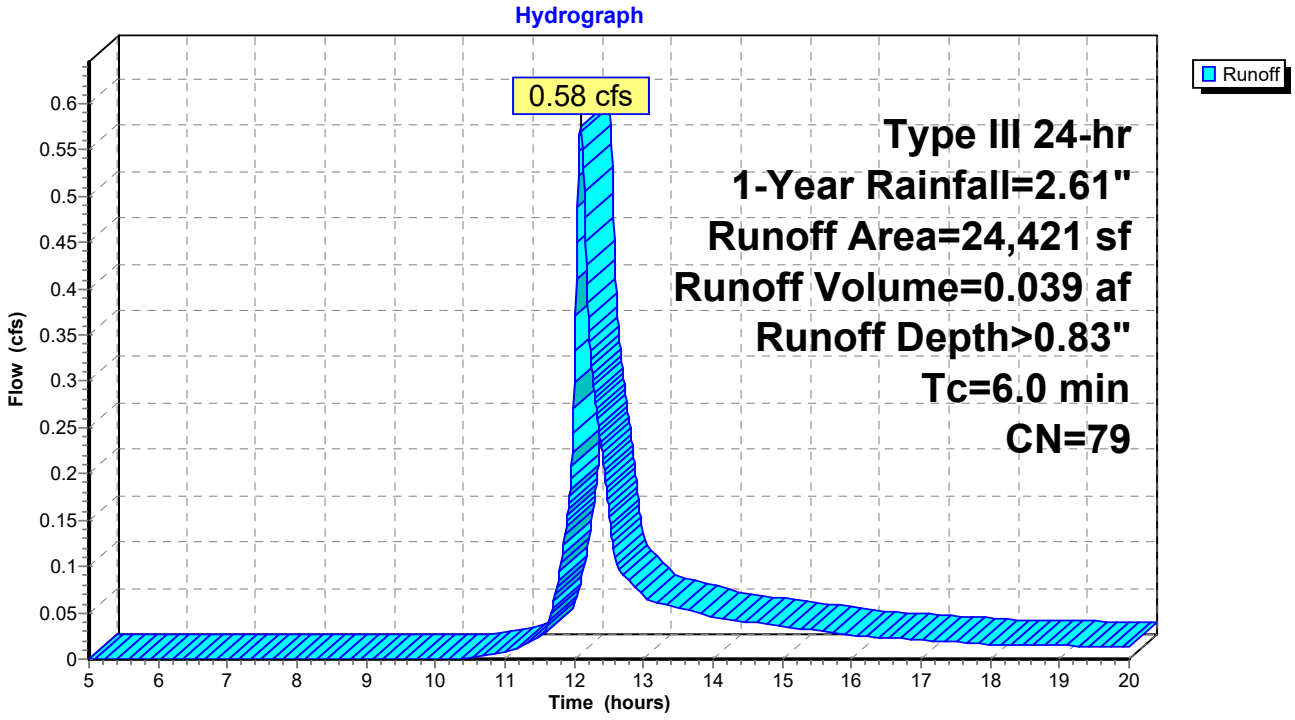
Runoff = 0.58 cfs @ 12.09 hrs, Volume= 0.039 af, Depth> 0.83"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.01 hrs
Type III 24-hr 1-Year Rainfall=2.61"

Area (sf)	CN	Description
4,736	98	Paved roads w/curbs & sewers, HSG C
19,685	74	>75% Grass cover, Good, HSG C
24,421	79	Weighted Average
19,685		80.61% Pervious Area
4,736		19.39% 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 Pond 1P: Ex. Depression

Inflow Area = 0.561 ac, 19.39% Impervious, Inflow Depth > 0.83" for 1-Year event
Inflow = 0.58 cfs @ 12.09 hrs, Volume= 0.039 af
Outflow = 0.52 cfs @ 12.13 hrs, Volume= 0.039 af, Atten= 9%, Lag= 2.3 min
Discarded = 0.52 cfs @ 12.13 hrs, Volume= 0.039 af
Primary = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.01 hrs
Peak Elev= 92.49' @ 12.13 hrs Surf.Area= 753 sf Storage= 49 cf

Plug-Flow detention time= 0.5 min calculated for 0.039 af (100% of inflow)
Center-of-Mass det. time= 0.5 min (815.2 - 814.7)

Volume	Invert	Avail.Storage	Storage Description
#1	92.36'	331 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc)

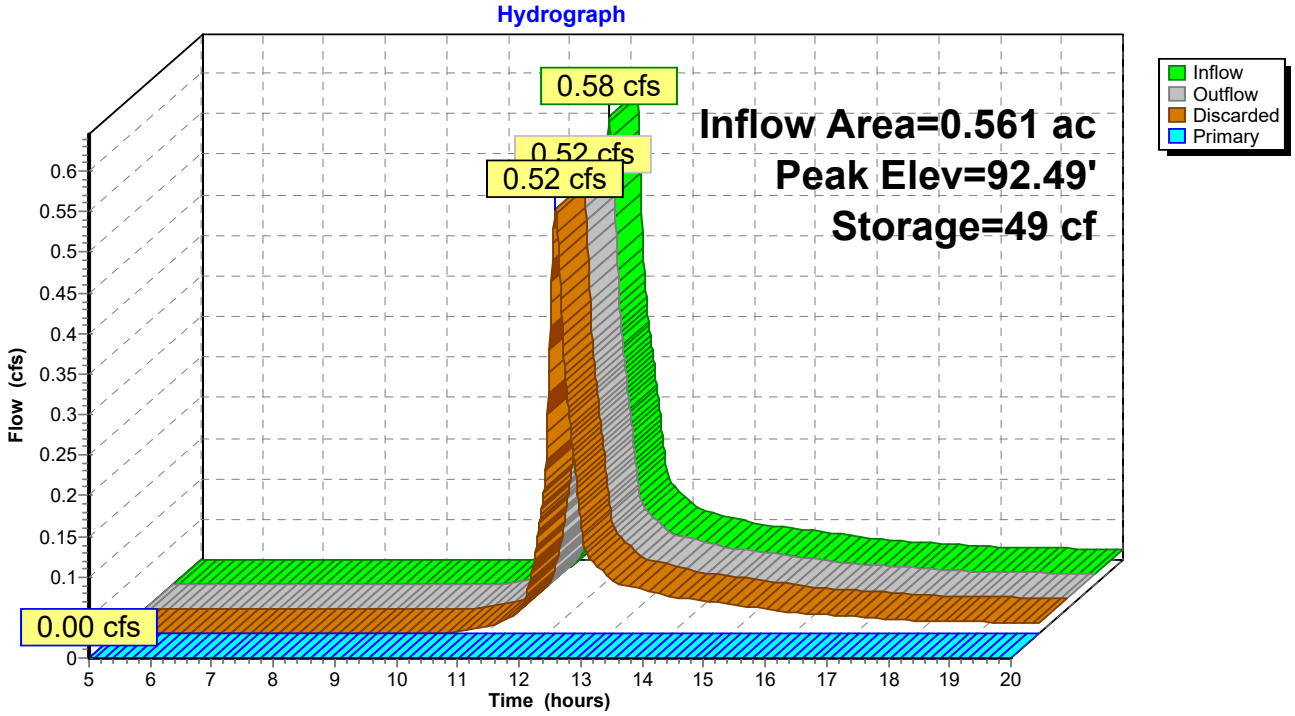
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
92.36	0	0	0
92.70	1,949	331	331

Device	Routing	Invert	Outlet Devices
#1	Primary	92.60'	**40.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s)
#2	Discarded	92.36'	**30.000 in/hr Exfiltration over Surface area**

Discarded OutFlow Max=0.52 cfs @ 12.13 hrs HW=92.49' (Free Discharge)
↑**2=Exfiltration** (Exfiltration Controls 0.52 cfs)

Primary OutFlow Max=0.00 cfs @ 5.00 hrs HW=92.36' (Free Discharge)
↑**1=Sharp-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond 1P: Ex. Depression



Summary for Subcatchment 1S: DA 1

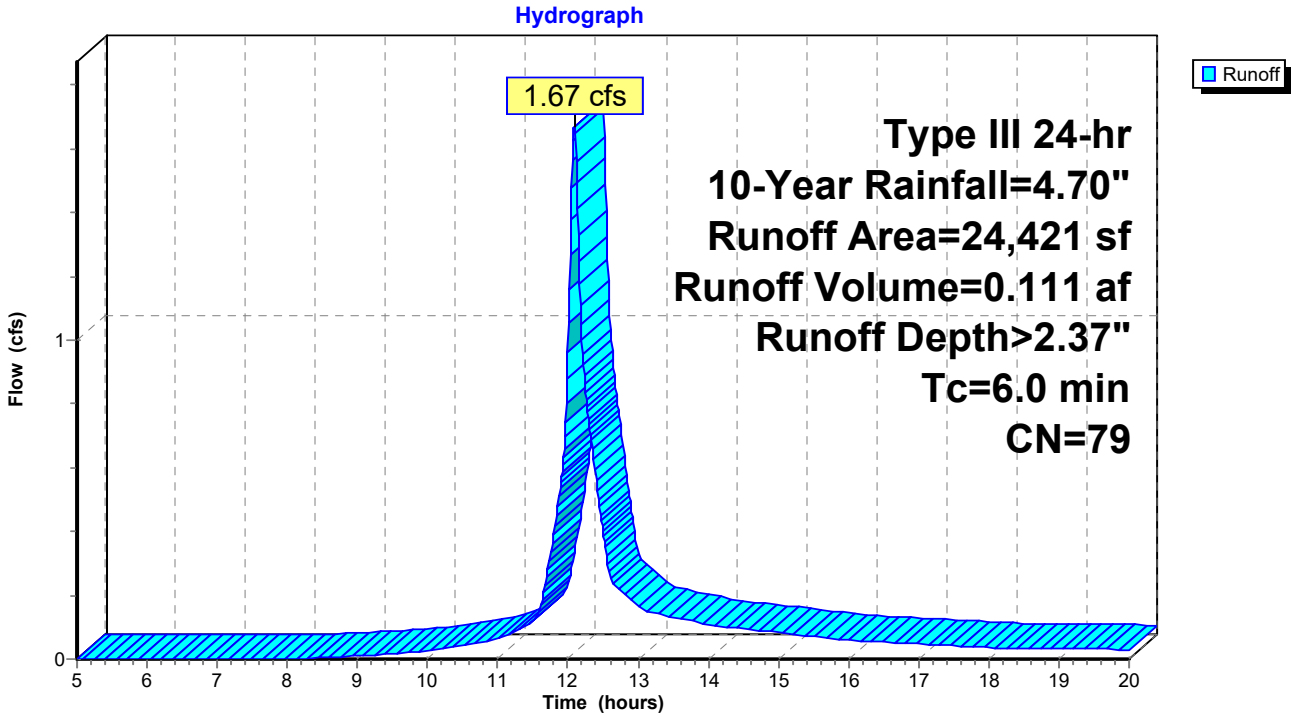
Runoff = 1.67 cfs @ 12.09 hrs, Volume= 0.111 af, Depth> 2.37"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-Year Rainfall=4.70"

Area (sf)	CN	Description
4,736	98	Paved roads w/curbs & sewers, HSG C
19,685	74	>75% Grass cover, Good, HSG C
24,421	79	Weighted Average
19,685		80.61% Pervious Area
4,736		19.39% 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 Pond 1P: Ex. Depression

Inflow Area = 0.561 ac, 19.39% Impervious, Inflow Depth > 2.37" for 10-Year event
Inflow = 1.67 cfs @ 12.09 hrs, Volume= 0.111 af
Outflow = 1.65 cfs @ 12.10 hrs, Volume= 0.111 af, Atten= 2%, Lag= 0.9 min
Discarded = 1.06 cfs @ 12.10 hrs, Volume= 0.106 af
Primary = 0.58 cfs @ 12.10 hrs, Volume= 0.005 af

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.01 hrs
Peak Elev= 92.63' @ 12.10 hrs Surf.Area= 1,531 sf Storage= 204 cf

Plug-Flow detention time= 1.2 min calculated for 0.111 af (100% of inflow)
Center-of-Mass det. time= 1.2 min (792.4 - 791.2)

Volume	Invert	Avail.Storage	Storage Description
#1	92.36'	331 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc)

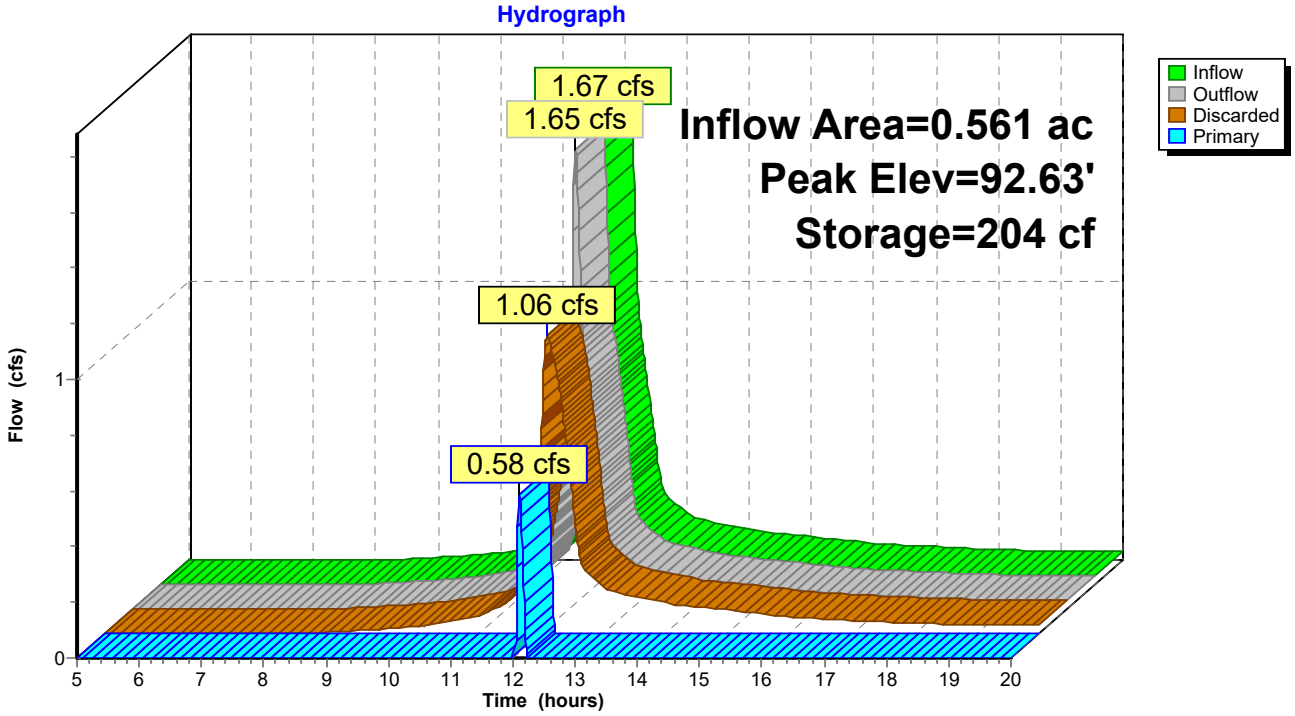
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
92.36	0	0	0
92.70	1,949	331	331

Device	Routing	Invert	Outlet Devices
#1	Primary	92.60'	**40.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s)
#2	Discarded	92.36'	**30.000 in/hr Exfiltration over Surface area**

Discarded OutFlow Max=1.06 cfs @ 12.10 hrs HW=92.63' (Free Discharge)
↑**2=Exfiltration** (Exfiltration Controls 1.06 cfs)

Primary OutFlow Max=0.58 cfs @ 12.10 hrs HW=92.63' (Free Discharge)
↑**1=Sharp-Crested Rectangular Weir** (Weir Controls 0.58 cfs @ 0.54 fps)

Pond 1P: Ex. Depression



Summary for Subcatchment 1S: DA 1

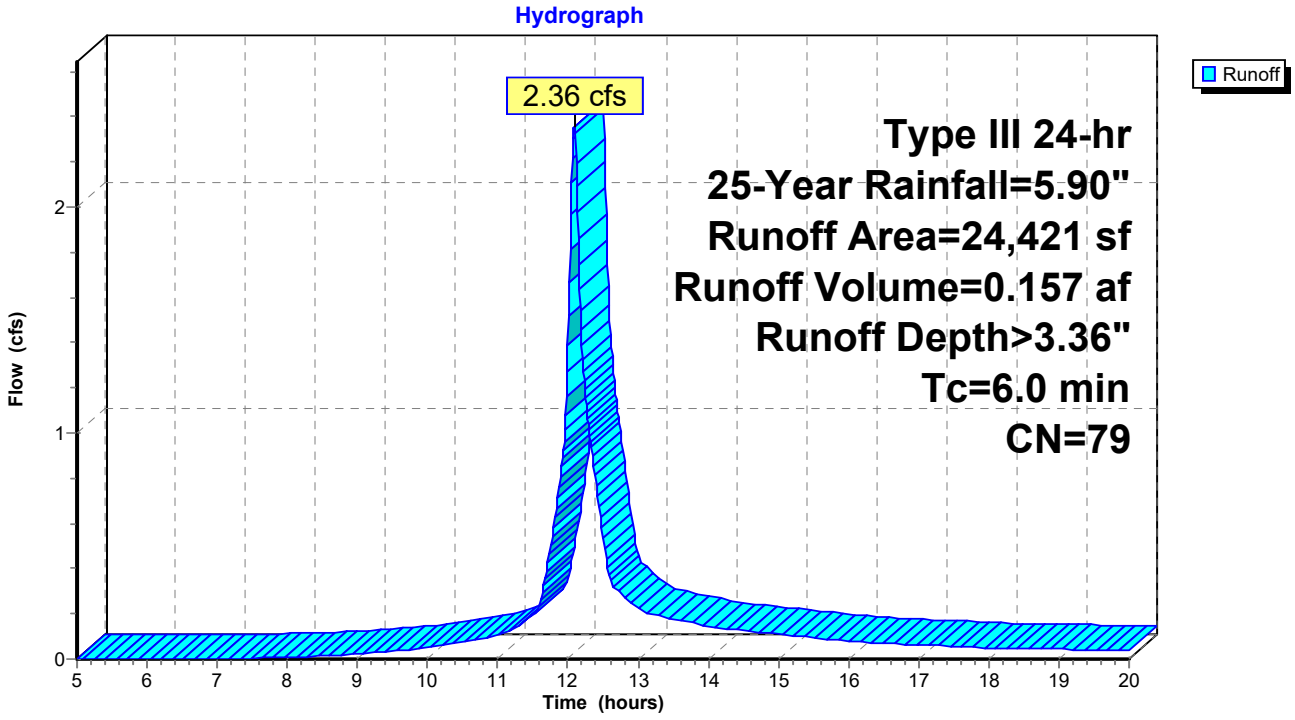
Runoff = 2.36 cfs @ 12.09 hrs, Volume= 0.157 af, Depth> 3.36"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.01 hrs
Type III 24-hr 25-Year Rainfall=5.90"

Area (sf)	CN	Description
4,736	98	Paved roads w/curbs & sewers, HSG C
19,685	74	>75% Grass cover, Good, HSG C
24,421	79	Weighted Average
19,685		80.61% Pervious Area
4,736		19.39% 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 Pond 1P: Ex. Depression

Inflow Area = 0.561 ac, 19.39% Impervious, Inflow Depth > 3.36" for 25-Year event
Inflow = 2.36 cfs @ 12.09 hrs, Volume= 0.157 af
Outflow = 2.34 cfs @ 12.10 hrs, Volume= 0.157 af, Atten= 1%, Lag= 0.6 min
Discarded = 1.13 cfs @ 12.10 hrs, Volume= 0.142 af
Primary = 1.21 cfs @ 12.10 hrs, Volume= 0.015 af

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.01 hrs
Peak Elev= 92.64' @ 12.10 hrs Surf.Area= 1,628 sf Storage= 231 cf

Plug-Flow detention time= 1.2 min calculated for 0.157 af (100% of inflow)
Center-of-Mass det. time= 1.2 min (784.4 - 783.2)

Volume	Invert	Avail.Storage	Storage Description
#1	92.36'	331 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc)

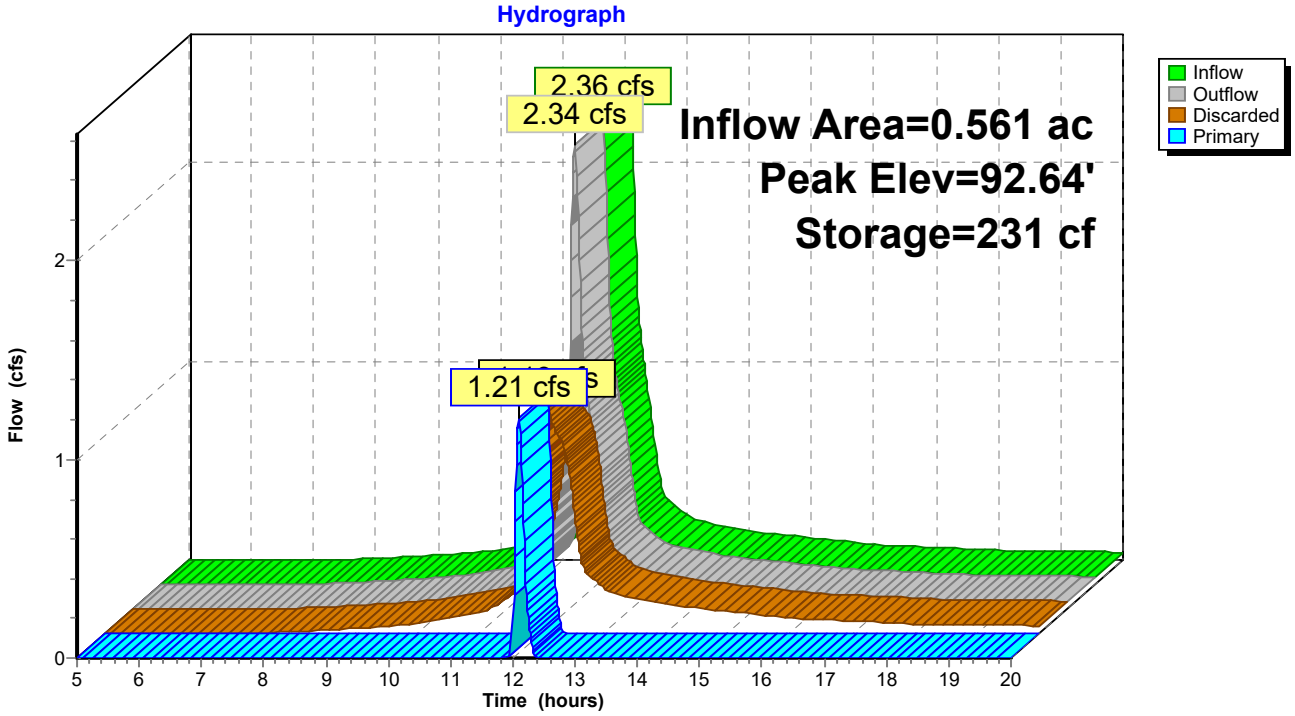
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
92.36	0	0	0
92.70	1,949	331	331

Device	Routing	Invert	Outlet Devices
#1	Primary	92.60'	**40.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s)
#2	Discarded	92.36'	**30.000 in/hr Exfiltration over Surface area**

Discarded OutFlow Max=1.13 cfs @ 12.10 hrs HW=92.64' (Free Discharge)
↑**2=Exfiltration** (Exfiltration Controls 1.13 cfs)

Primary OutFlow Max=1.20 cfs @ 12.10 hrs HW=92.64' (Free Discharge)
↑**1=Sharp-Crested Rectangular Weir** (Weir Controls 1.20 cfs @ 0.69 fps)

Pond 1P: Ex. Depression



Summary for Subcatchment 1S: DA 1

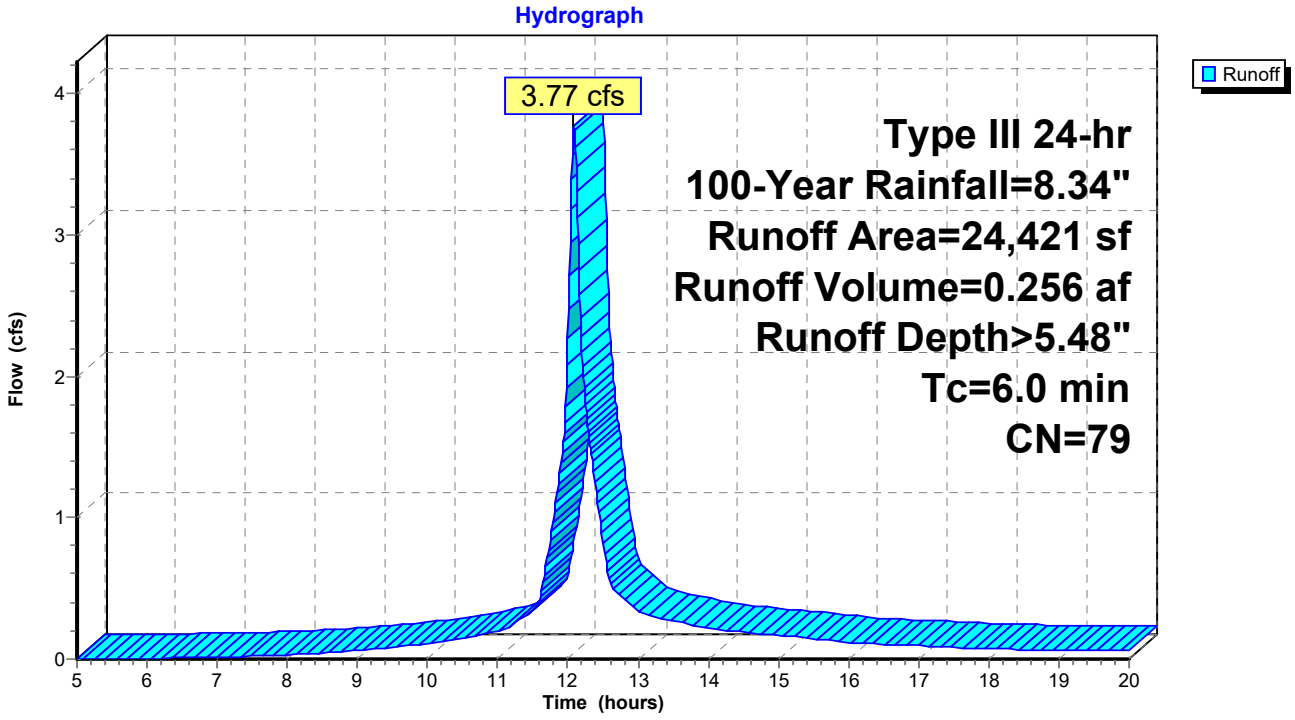
Runoff = 3.77 cfs @ 12.09 hrs, Volume= 0.256 af, Depth> 5.48"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-Year Rainfall=8.34"

Area (sf)	CN	Description
4,736	98	Paved roads w/curbs & sewers, HSG C
19,685	74	>75% Grass cover, Good, HSG C
24,421	79	Weighted Average
19,685		80.61% Pervious Area
4,736		19.39% 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 Pond 1P: Ex. Depression

Inflow Area = 0.561 ac, 19.39% Impervious, Inflow Depth > 5.48" for 100-Year event
Inflow = 3.77 cfs @ 12.09 hrs, Volume= 0.256 af
Outflow = 3.75 cfs @ 12.10 hrs, Volume= 0.256 af, Atten= 1%, Lag= 0.5 min
Discarded = 1.24 cfs @ 12.10 hrs, Volume= 0.209 af
Primary = 2.51 cfs @ 12.10 hrs, Volume= 0.047 af

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.01 hrs
Peak Elev= 92.67' @ 12.10 hrs Surf.Area= 1,787 sf Storage= 278 cf

Plug-Flow detention time= 1.2 min calculated for 0.256 af (100% of inflow)
Center-of-Mass det. time= 1.2 min (772.8 - 771.6)

Volume	Invert	Avail.Storage	Storage Description
#1	92.36'	331 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc)

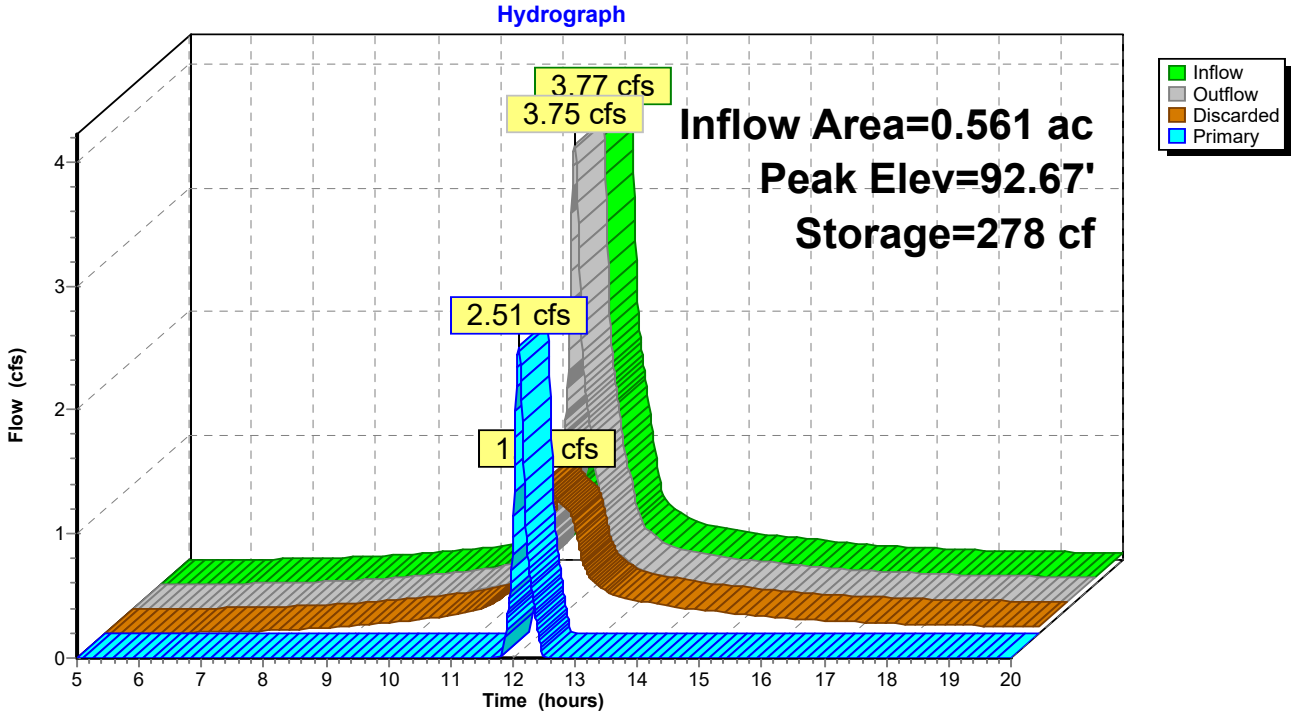
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
92.36	0	0	0
92.70	1,949	331	331

Device	Routing	Invert	Outlet Devices
#1	Primary	92.60'	**40.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s)
#2	Discarded	92.36'	**30.000 in/hr Exfiltration over Surface area**

Discarded OutFlow Max=1.24 cfs @ 12.10 hrs HW=92.67' (Free Discharge)
↑**2=Exfiltration** (Exfiltration Controls 1.24 cfs)

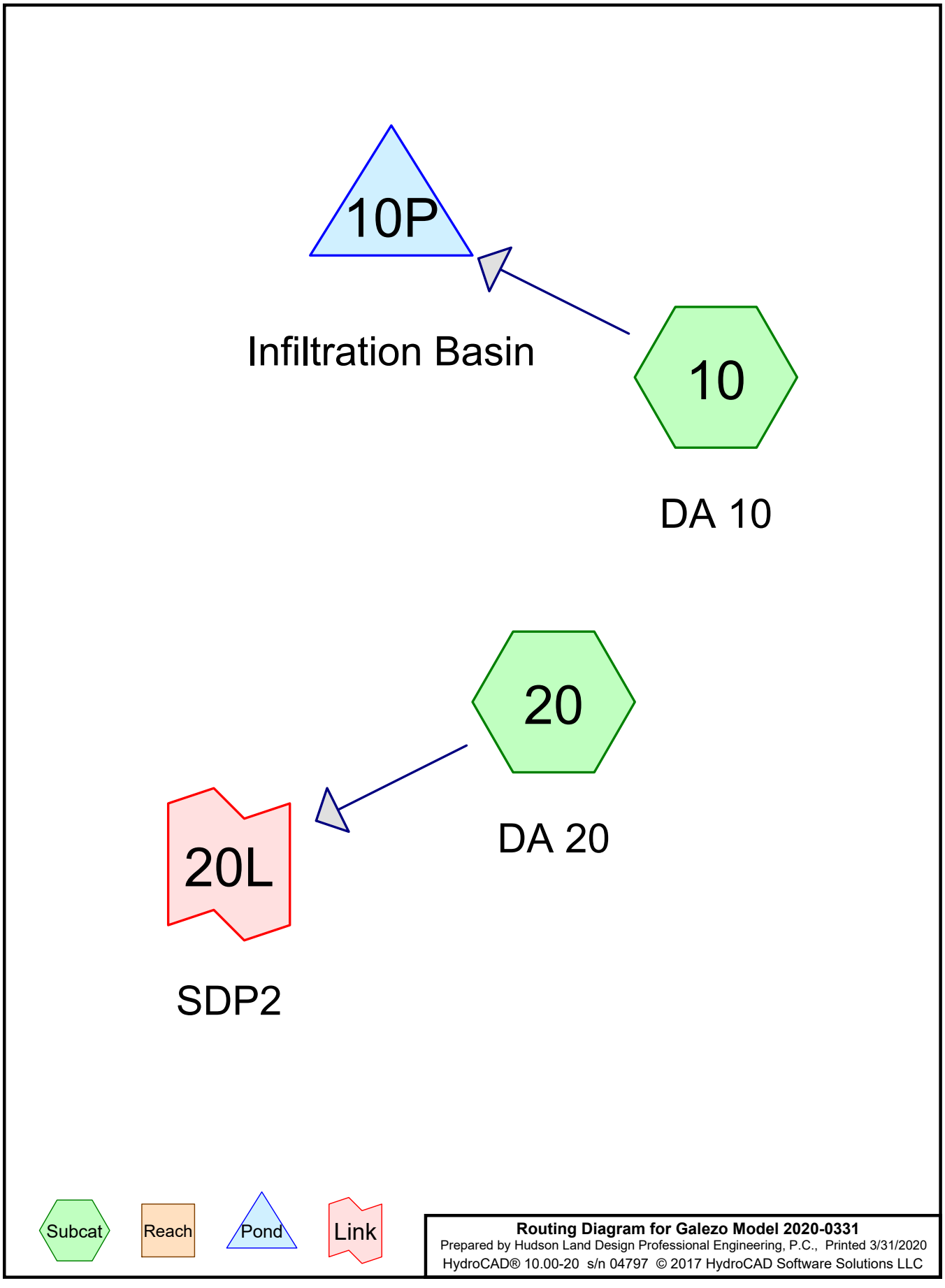
Primary OutFlow Max=2.50 cfs @ 12.10 hrs HW=92.67' (Free Discharge)
↑**1=Sharp-Crested Rectangular Weir** (Weir Controls 2.50 cfs @ 0.87 fps)

Pond 1P: Ex. Depression



APPENDIX D

POST-DEVELOPMENT HYDROLOGY CALCULATIONS



Routing Diagram for Galezo Model 2020-0331

Prepared by Hudson Land Design Professional Engineering, P.C., Printed 3/31/2020

Summary for Subcatchment 10: DA 10

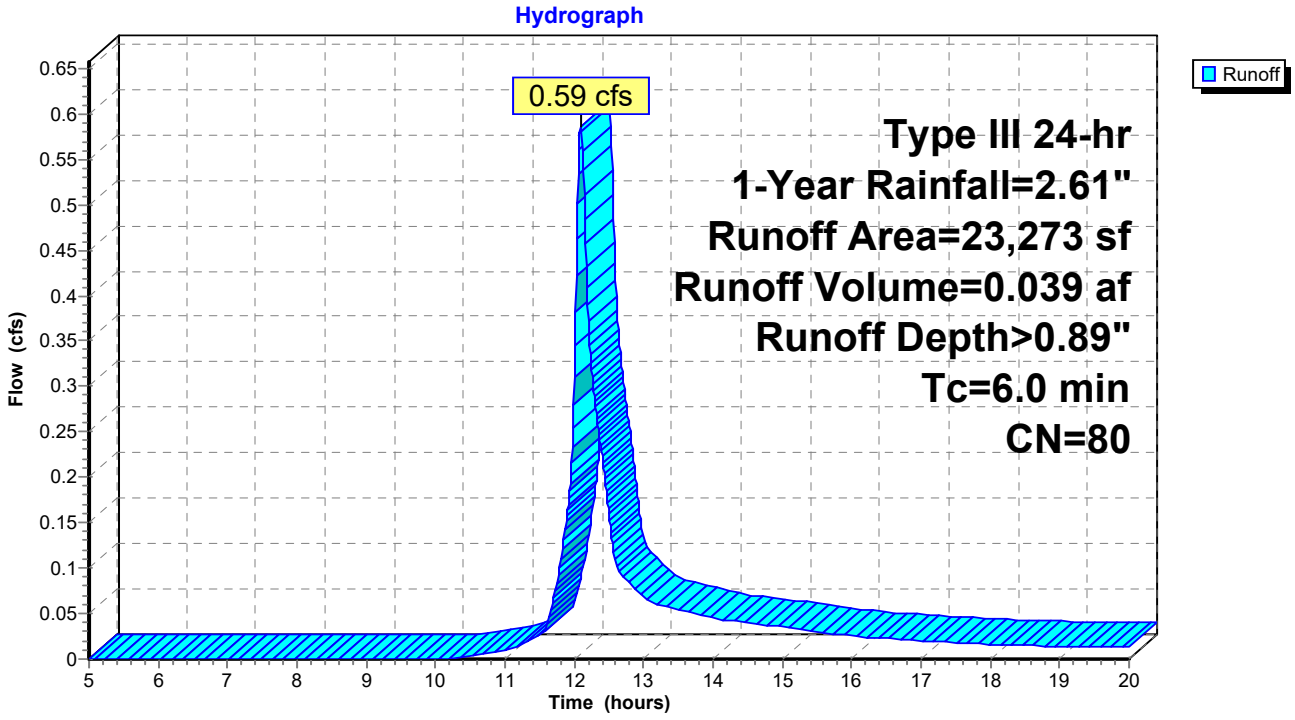
Runoff = 0.59 cfs @ 12.09 hrs, Volume= 0.039 af, Depth> 0.89"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.01 hrs
Type III 24-hr 1-Year Rainfall=2.61"

Area (sf)	CN	Description
6,124	98	Paved parking, HSG C
17,149	74	>75% Grass cover, Good, HSG C
23,273	80	Weighted Average
17,149		73.69% Pervious Area
6,124		26.31% Impervious Area

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

Subcatchment 10: DA 10



Summary for Pond 10P: Infiltration Basin

Inflow Area = 0.534 ac, 26.31% Impervious, Inflow Depth > 0.89" for 1-Year event
Inflow = 0.59 cfs @ 12.09 hrs, Volume= 0.039 af
Outflow = 0.31 cfs @ 12.26 hrs, Volume= 0.039 af, Atten= 47%, Lag= 10.1 min
Discarded = 0.31 cfs @ 12.26 hrs, Volume= 0.039 af
Primary = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.01 hrs
Peak Elev= 91.12' @ 12.26 hrs Surf.Area= 445 sf Storage= 184 cf

Plug-Flow detention time= 3.4 min calculated for 0.039 af (100% of inflow)
Center-of-Mass det. time= 3.3 min (815.3 - 812.0)

Volume	Invert	Avail.Storage	Storage Description
#1	90.60'	1,525 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc)

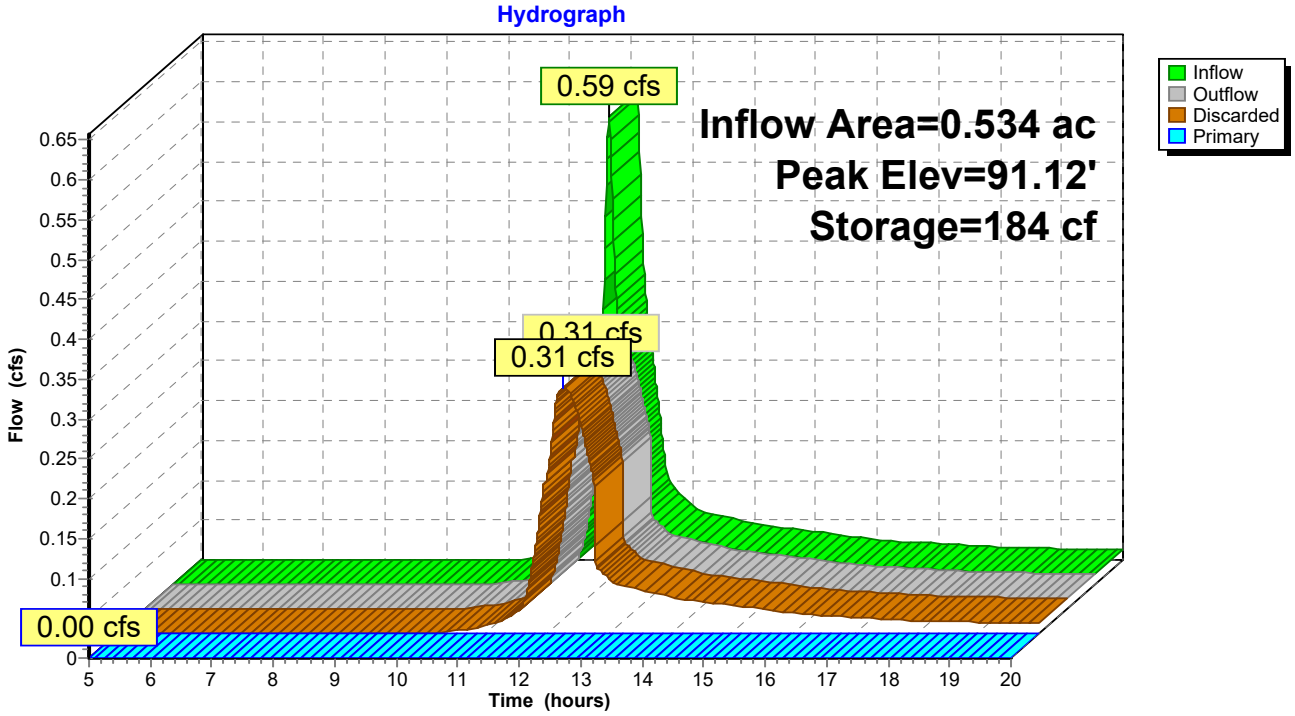
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
90.60	264	0	0
91.00	400	133	133
91.50	584	246	379
92.00	794	345	723
92.40	971	353	1,076
92.70	2,019	448	1,525

Device	Routing	Invert	Outlet Devices
#1	Primary	92.60'	**40.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s)
#2	Discarded	90.60'	**30.000 in/hr Exfiltration over Surface area**

Discarded OutFlow Max=0.31 cfs @ 12.26 hrs HW=91.12' (Free Discharge)
↑—**2=Exfiltration** (Exfiltration Controls 0.31 cfs)

Primary OutFlow Max=0.00 cfs @ 5.00 hrs HW=90.60' (Free Discharge)
↑—**1=Sharp-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond 10P: Infiltration Basin



Summary for Subcatchment 20: DA 20

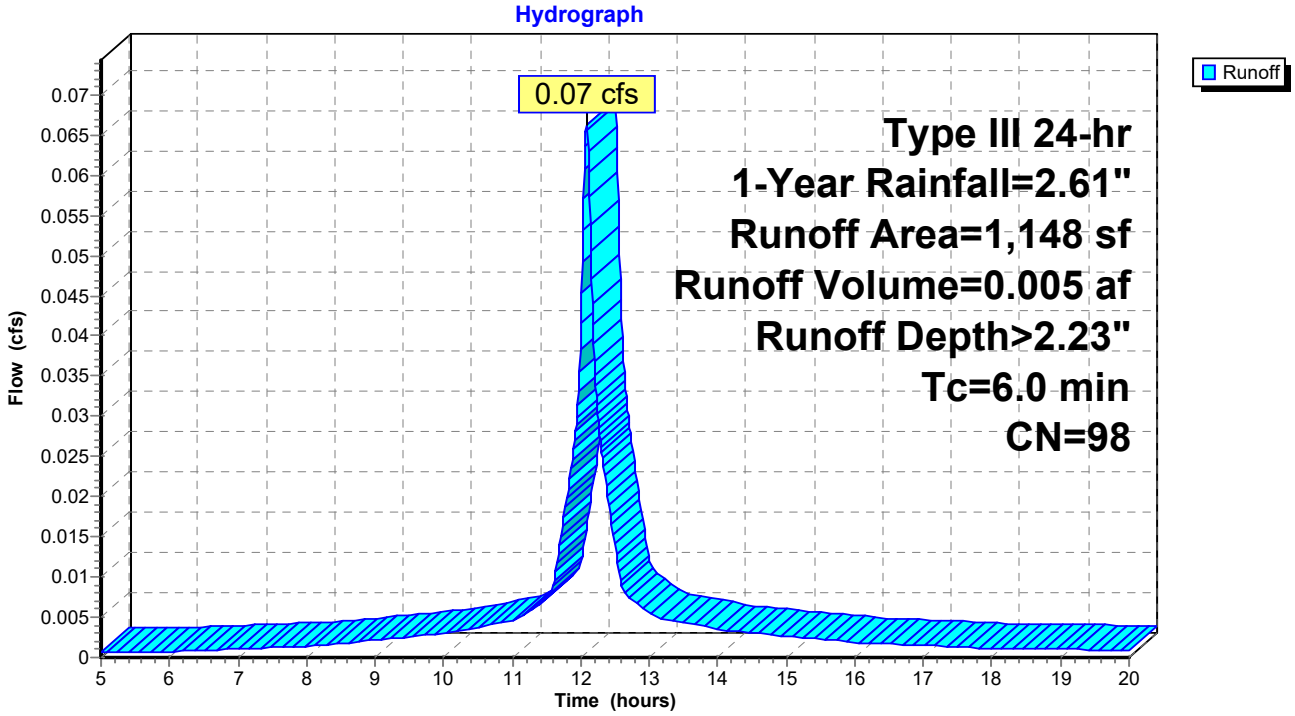
Runoff = 0.07 cfs @ 12.08 hrs, Volume= 0.005 af, Depth> 2.23"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.01 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 20: DA 20

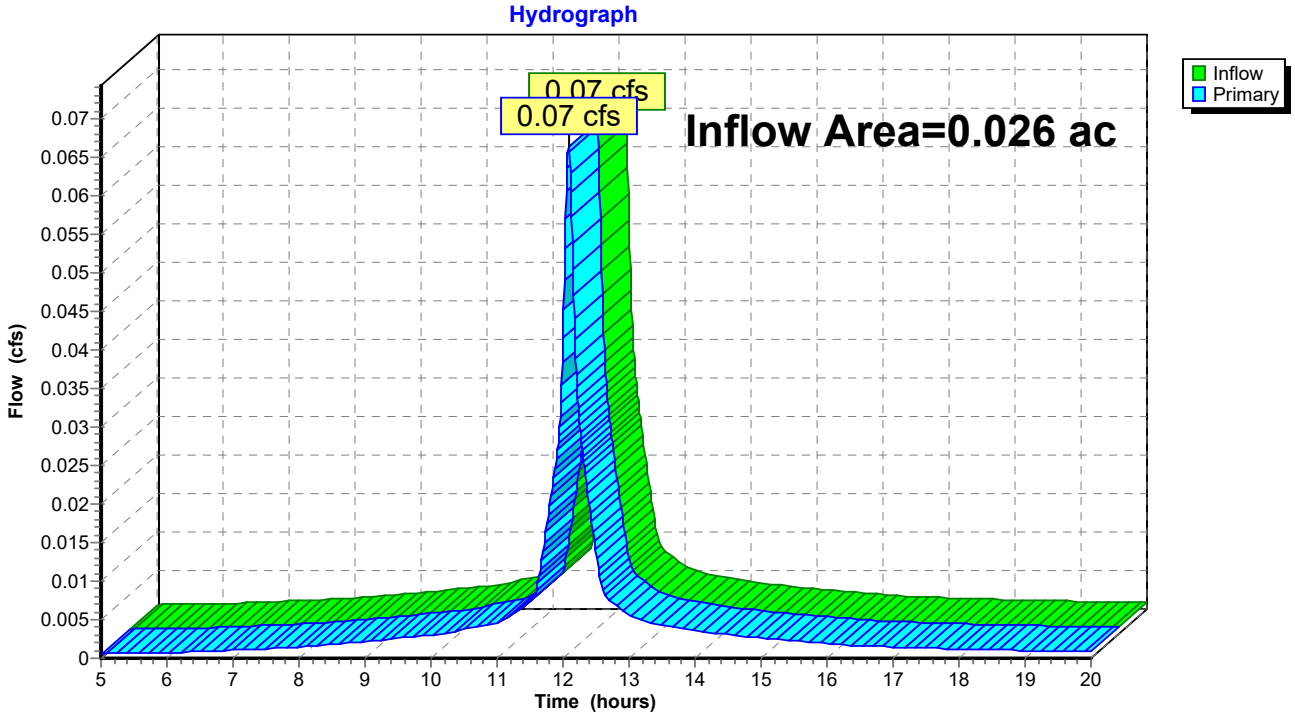


Summary for Link 20L: SDP2

Inflow Area = 0.026 ac,100.00% Impervious, Inflow Depth > 2.23" for 1-Year event
Inflow = 0.07 cfs @ 12.08 hrs, Volume= 0.005 af
Primary = 0.07 cfs @ 12.08 hrs, Volume= 0.005 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 5.00-20.00 hrs, dt= 0.01 hrs

Link 20L: SDP2



Summary for Subcatchment 10: DA 10

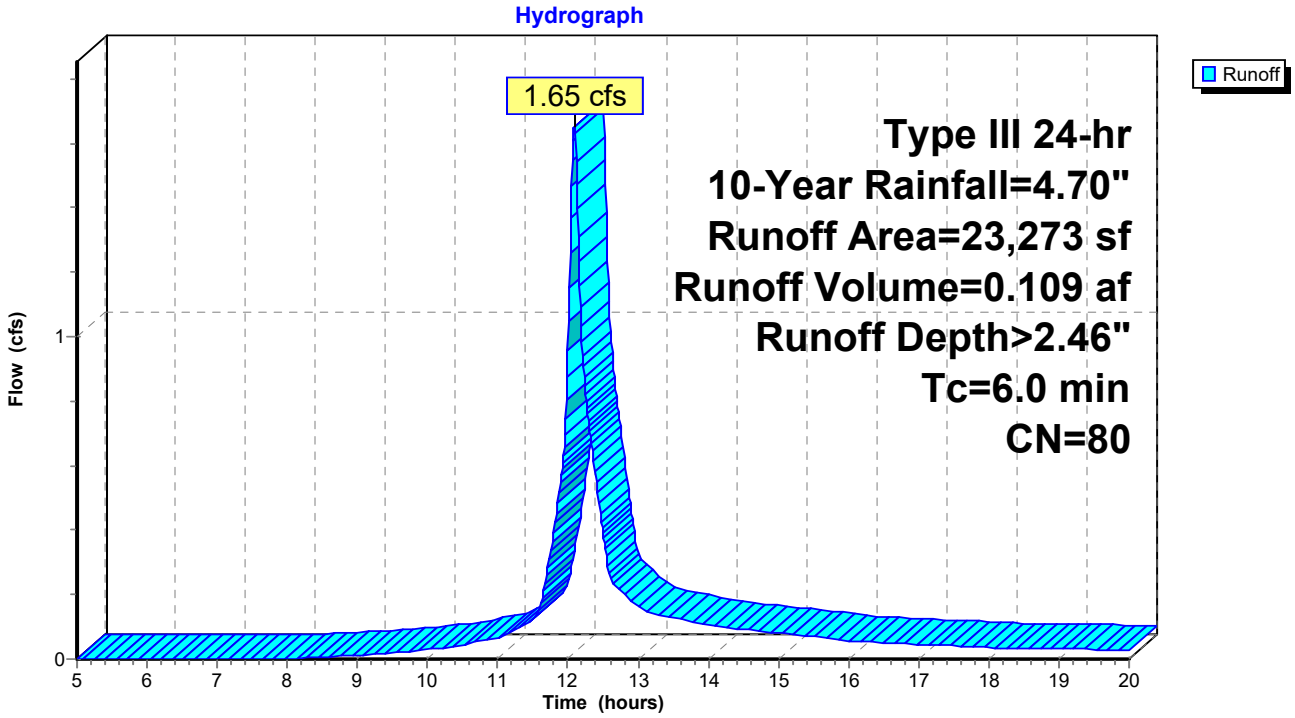
Runoff = 1.65 cfs @ 12.09 hrs, Volume= 0.109 af, Depth> 2.46"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-Year Rainfall=4.70"

Area (sf)	CN	Description
6,124	98	Paved parking, HSG C
17,149	74	>75% Grass cover, Good, HSG C
23,273	80	Weighted Average
17,149		73.69% Pervious Area
6,124		26.31% Impervious Area

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

Subcatchment 10: DA 10



Summary for Pond 10P: Infiltration Basin

Inflow Area = 0.534 ac, 26.31% Impervious, Inflow Depth > 2.46" for 10-Year event
Inflow = 1.65 cfs @ 12.09 hrs, Volume= 0.109 af
Outflow = 0.64 cfs @ 12.35 hrs, Volume= 0.109 af, Atten= 61%, Lag= 15.6 min
Discarded = 0.64 cfs @ 12.35 hrs, Volume= 0.109 af
Primary = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.01 hrs
Peak Elev= 92.29' @ 12.35 hrs Surf.Area= 921 sf Storage= 969 cf

Plug-Flow detention time= 11.1 min calculated for 0.109 af (100% of inflow)
Center-of-Mass det. time= 11.0 min (800.0 - 789.0)

Volume	Invert	Avail.Storage	Storage Description
#1	90.60'	1,525 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc)

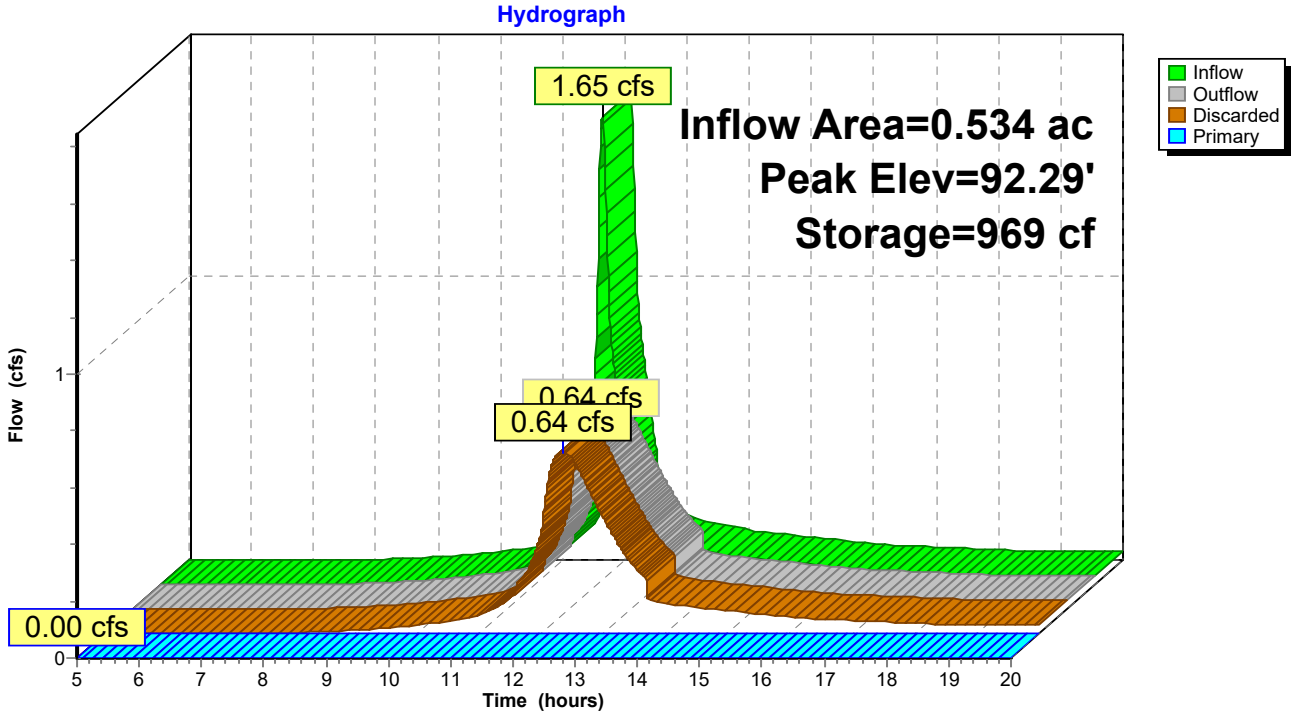
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
90.60	264	0	0
91.00	400	133	133
91.50	584	246	379
92.00	794	345	723
92.40	971	353	1,076
92.70	2,019	448	1,525

Device	Routing	Invert	Outlet Devices
#1	Primary	92.60'	**40.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s)
#2	Discarded	90.60'	**30.000 in/hr Exfiltration over Surface area**

Discarded OutFlow Max=0.64 cfs @ 12.35 hrs HW=92.29' (Free Discharge)
↑—**2=Exfiltration** (Exfiltration Controls 0.64 cfs)

Primary OutFlow Max=0.00 cfs @ 5.00 hrs HW=90.60' (Free Discharge)
↑—**1=Sharp-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond 10P: Infiltration Basin



Summary for Subcatchment 20: DA 20

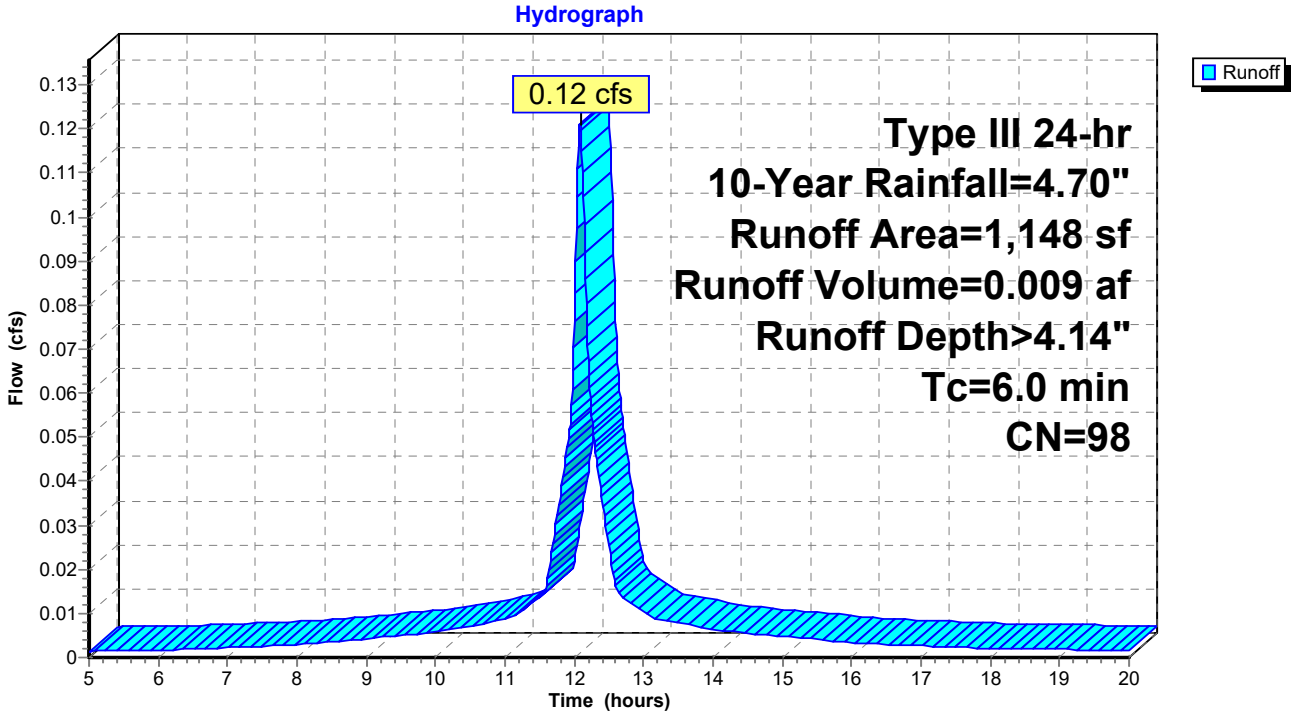
Runoff = 0.12 cfs @ 12.08 hrs, Volume= 0.009 af, Depth> 4.14"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.01 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 20: DA 20

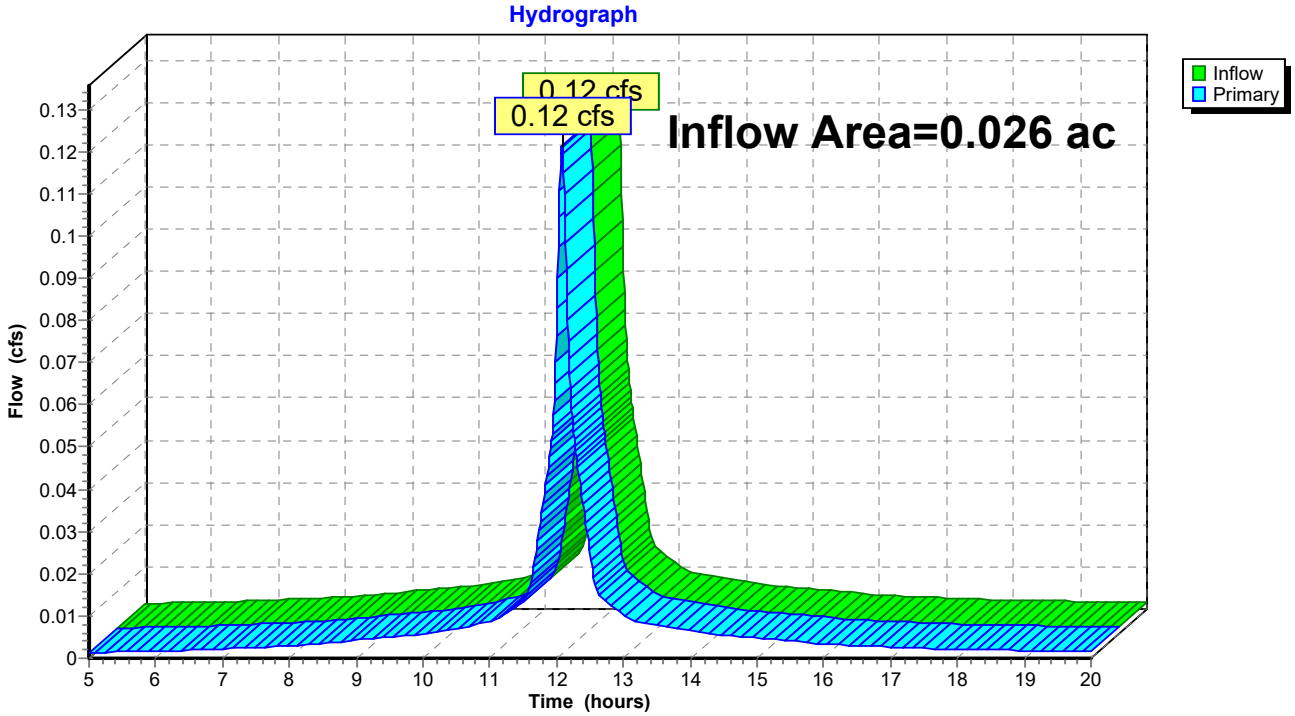


Summary for Link 20L: SDP2

Inflow Area = 0.026 ac,100.00% Impervious, Inflow Depth > 4.14" for 10-Year event
Inflow = 0.12 cfs @ 12.08 hrs, Volume= 0.009 af
Primary = 0.12 cfs @ 12.08 hrs, Volume= 0.009 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 5.00-20.00 hrs, dt= 0.01 hrs

Link 20L: SDP2



Summary for Subcatchment 10: DA 10

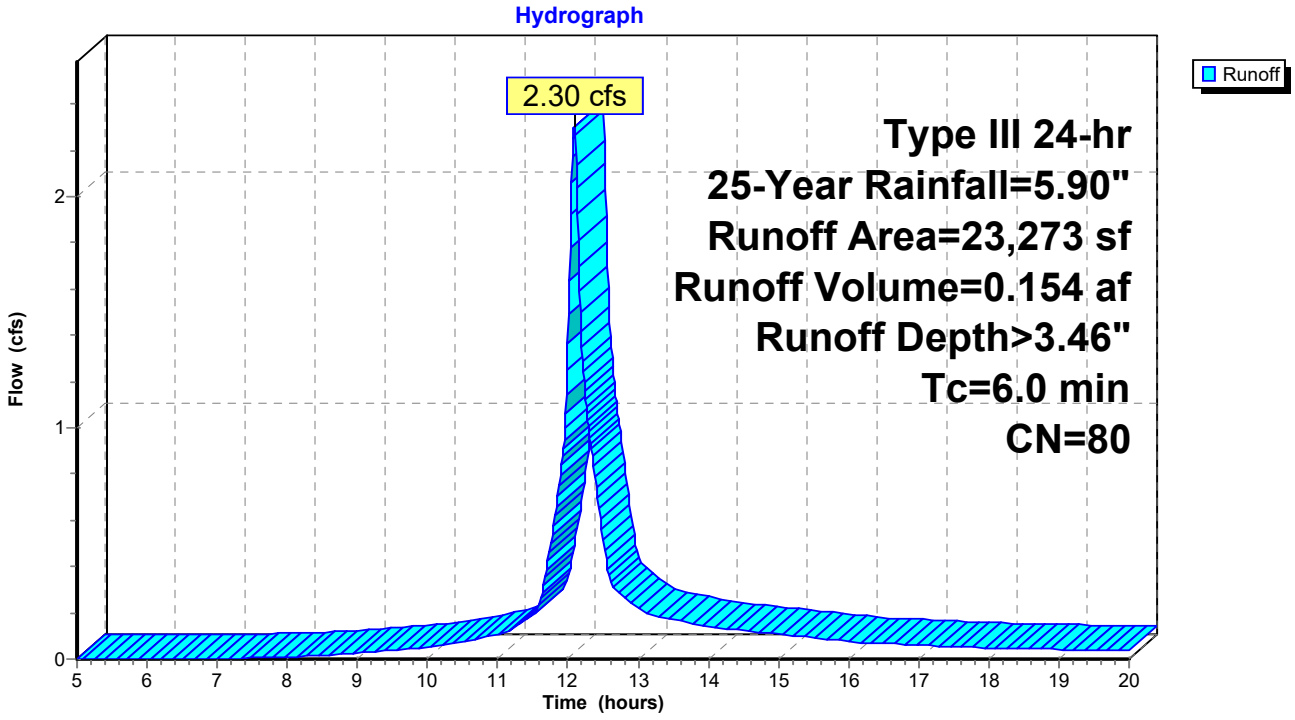
Runoff = 2.30 cfs @ 12.09 hrs, Volume= 0.154 af, Depth> 3.46"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.01 hrs
Type III 24-hr 25-Year Rainfall=5.90"

Area (sf)	CN	Description
6,124	98	Paved parking, HSG C
17,149	74	>75% Grass cover, Good, HSG C
23,273	80	Weighted Average
17,149		73.69% Pervious Area
6,124		26.31% Impervious Area

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

Subcatchment 10: DA 10



Summary for Pond 10P: Infiltration Basin

Inflow Area = 0.534 ac, 26.31% Impervious, Inflow Depth > 3.46" for 25-Year event
Inflow = 2.30 cfs @ 12.09 hrs, Volume= 0.154 af
Outflow = 1.15 cfs @ 12.24 hrs, Volume= 0.154 af, Atten= 50%, Lag= 9.3 min
Discarded = 1.15 cfs @ 12.24 hrs, Volume= 0.154 af
Primary = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.01 hrs
Peak Elev= 92.59' @ 12.24 hrs Surf.Area= 1,651 sf Storage= 1,331 cf

Plug-Flow detention time= 11.9 min calculated for 0.154 af (100% of inflow)
Center-of-Mass det. time= 11.8 min (792.9 - 781.1)

Volume	Invert	Avail.Storage	Storage Description
#1	90.60'	1,525 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc)

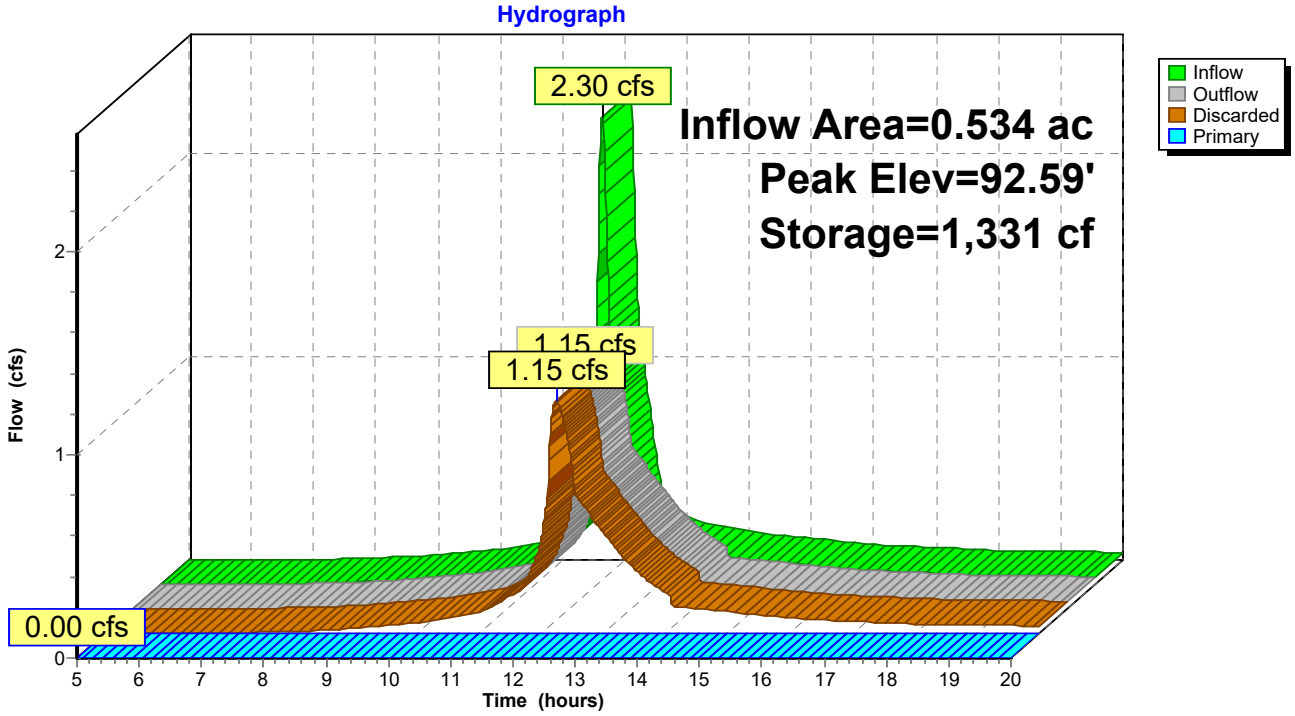
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
90.60	264	0	0
91.00	400	133	133
91.50	584	246	379
92.00	794	345	723
92.40	971	353	1,076
92.70	2,019	448	1,525

Device	Routing	Invert	Outlet Devices
#1	Primary	92.60'	**40.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s)
#2	Discarded	90.60'	**30.000 in/hr Exfiltration over Surface area**

Discarded OutFlow Max=1.15 cfs @ 12.24 hrs HW=92.59' (Free Discharge)
↑—**2=Exfiltration** (Exfiltration Controls 1.15 cfs)

Primary OutFlow Max=0.00 cfs @ 5.00 hrs HW=90.60' (Free Discharge)
↑—**1=Sharp-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond 10P: Infiltration Basin



Summary for Subcatchment 20: DA 20

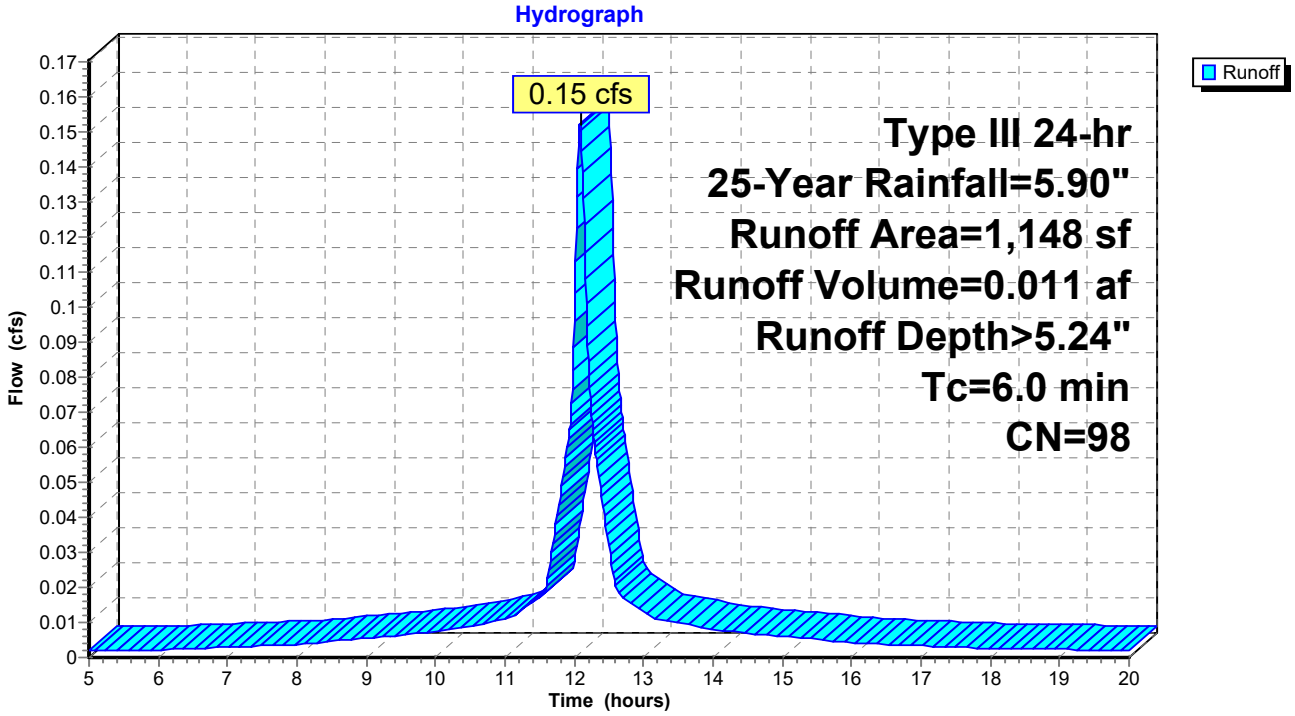
Runoff = 0.15 cfs @ 12.08 hrs, Volume= 0.011 af, Depth> 5.24"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.01 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 20: DA 20

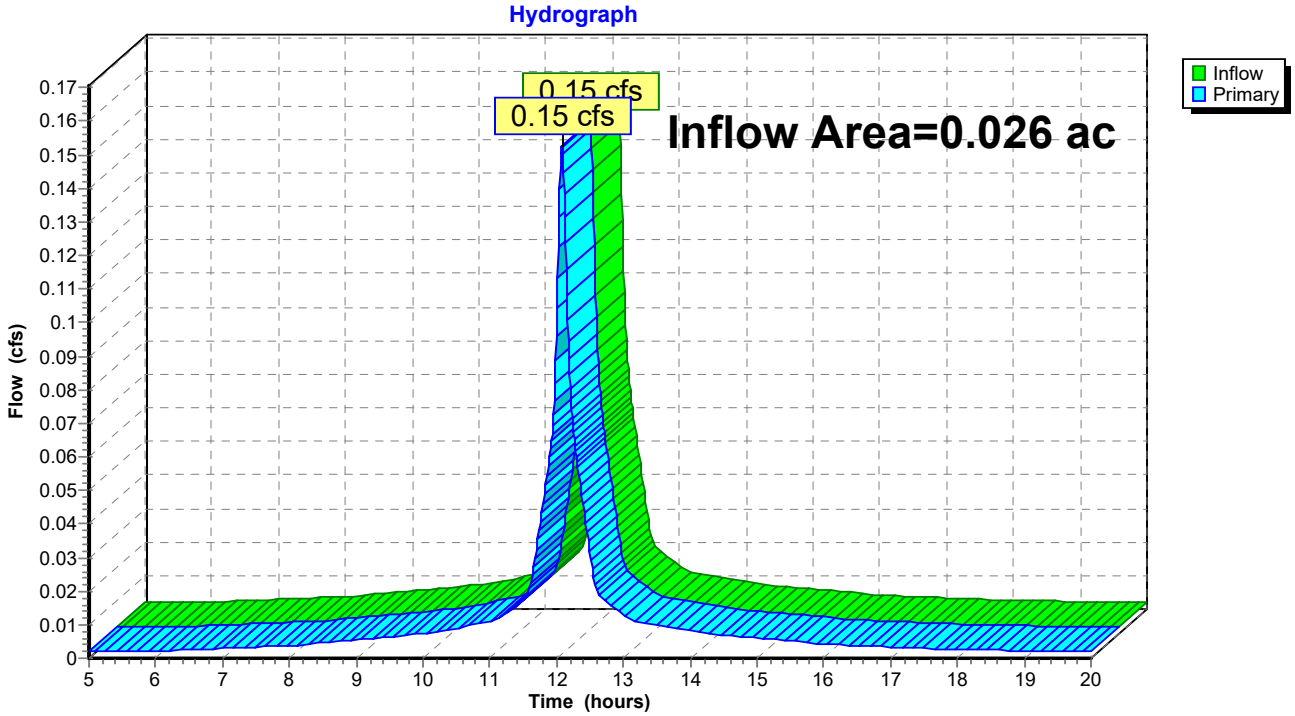


Summary for Link 20L: SDP2

Inflow Area = 0.026 ac,100.00% Impervious, Inflow Depth > 5.24" for 25-Year event
Inflow = 0.15 cfs @ 12.08 hrs, Volume= 0.011 af
Primary = 0.15 cfs @ 12.08 hrs, Volume= 0.011 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 5.00-20.00 hrs, dt= 0.01 hrs

Link 20L: SDP2



Summary for Subcatchment 10: DA 10

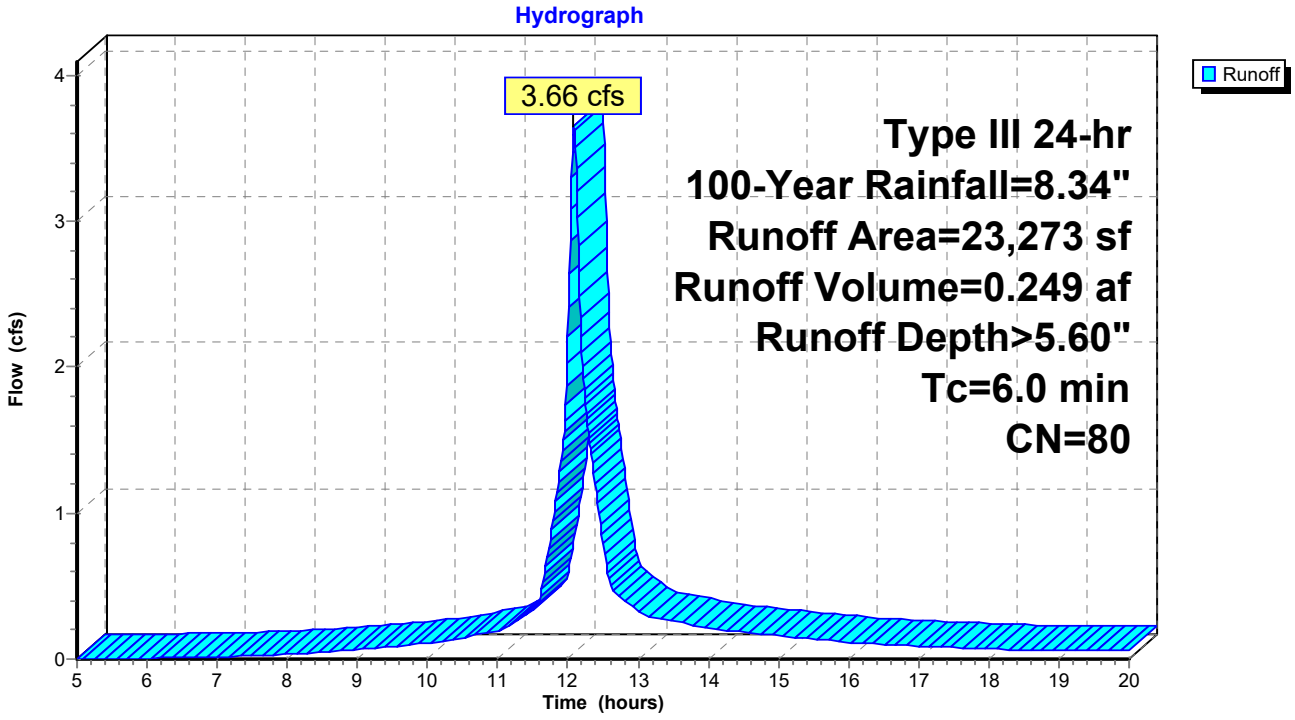
Runoff = 3.66 cfs @ 12.09 hrs, Volume= 0.249 af, Depth> 5.60"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-Year Rainfall=8.34"

Area (sf)	CN	Description
6,124	98	Paved parking, HSG C
17,149	74	>75% Grass cover, Good, HSG C
23,273	80	Weighted Average
17,149		73.69% Pervious Area
6,124		26.31% Impervious Area

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

Subcatchment 10: DA 10



Summary for Pond 10P: Infiltration Basin

Inflow Area = 0.534 ac, 26.31% Impervious, Inflow Depth > 5.60" for 100-Year event
Inflow = 3.66 cfs @ 12.09 hrs, Volume= 0.249 af
Outflow = 3.61 cfs @ 12.10 hrs, Volume= 0.249 af, Atten= 1%, Lag= 0.8 min
Discarded = 1.32 cfs @ 12.10 hrs, Volume= 0.221 af
Primary = 2.29 cfs @ 12.10 hrs, Volume= 0.028 af

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.01 hrs
Peak Elev= 92.67' @ 12.10 hrs Surf.Area= 1,904 sf Storage= 1,460 cf

Plug-Flow detention time= 10.7 min calculated for 0.249 af (100% of inflow)
Center-of-Mass det. time= 10.7 min (780.3 - 769.6)

Volume	Invert	Avail.Storage	Storage Description
#1	90.60'	1,525 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc)

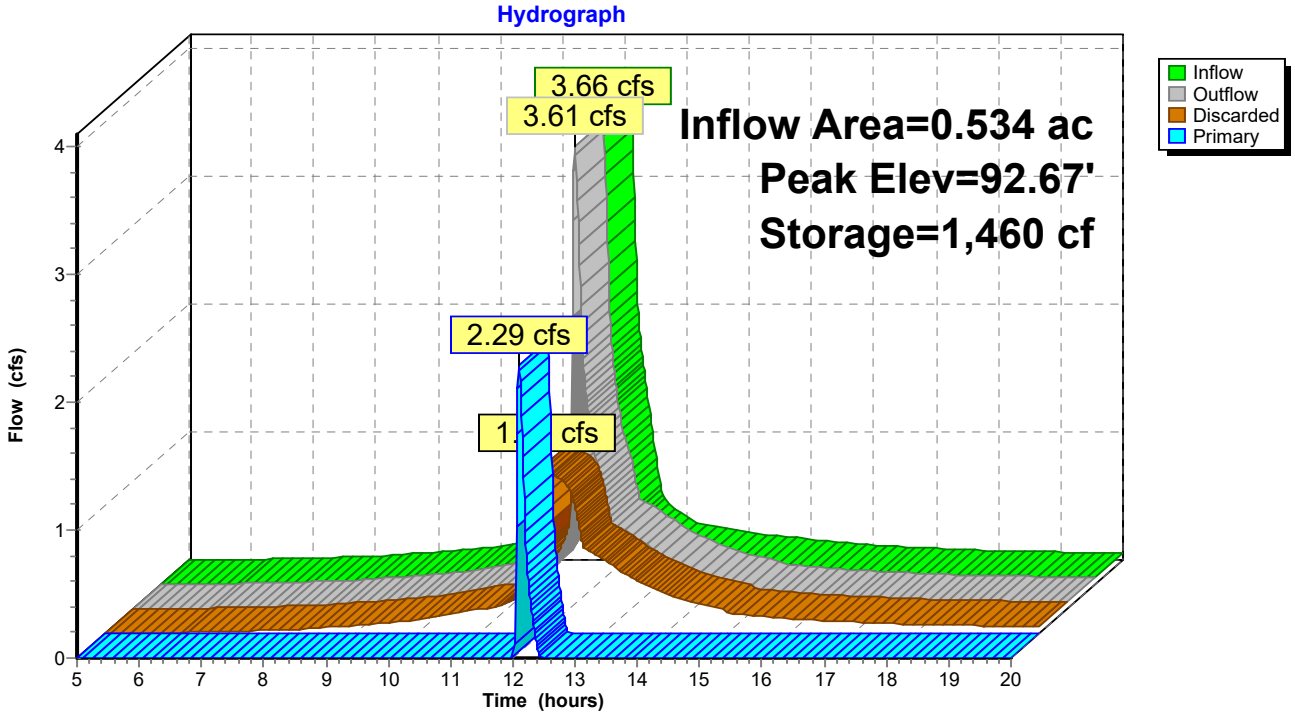
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
90.60	264	0	0
91.00	400	133	133
91.50	584	246	379
92.00	794	345	723
92.40	971	353	1,076
92.70	2,019	448	1,525

Device	Routing	Invert	Outlet Devices
#1	Primary	92.60'	**40.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s)
#2	Discarded	90.60'	**30.000 in/hr Exfiltration over Surface area**

Discarded OutFlow Max=1.32 cfs @ 12.10 hrs HW=92.67' (Free Discharge)
↑**2=Exfiltration** (Exfiltration Controls 1.32 cfs)

Primary OutFlow Max=2.27 cfs @ 12.10 hrs HW=92.67' (Free Discharge)
↑**1=Sharp-Crested Rectangular Weir** (Weir Controls 2.27 cfs @ 0.85 fps)

Pond 10P: Infiltration Basin



Summary for Subcatchment 20: DA 20

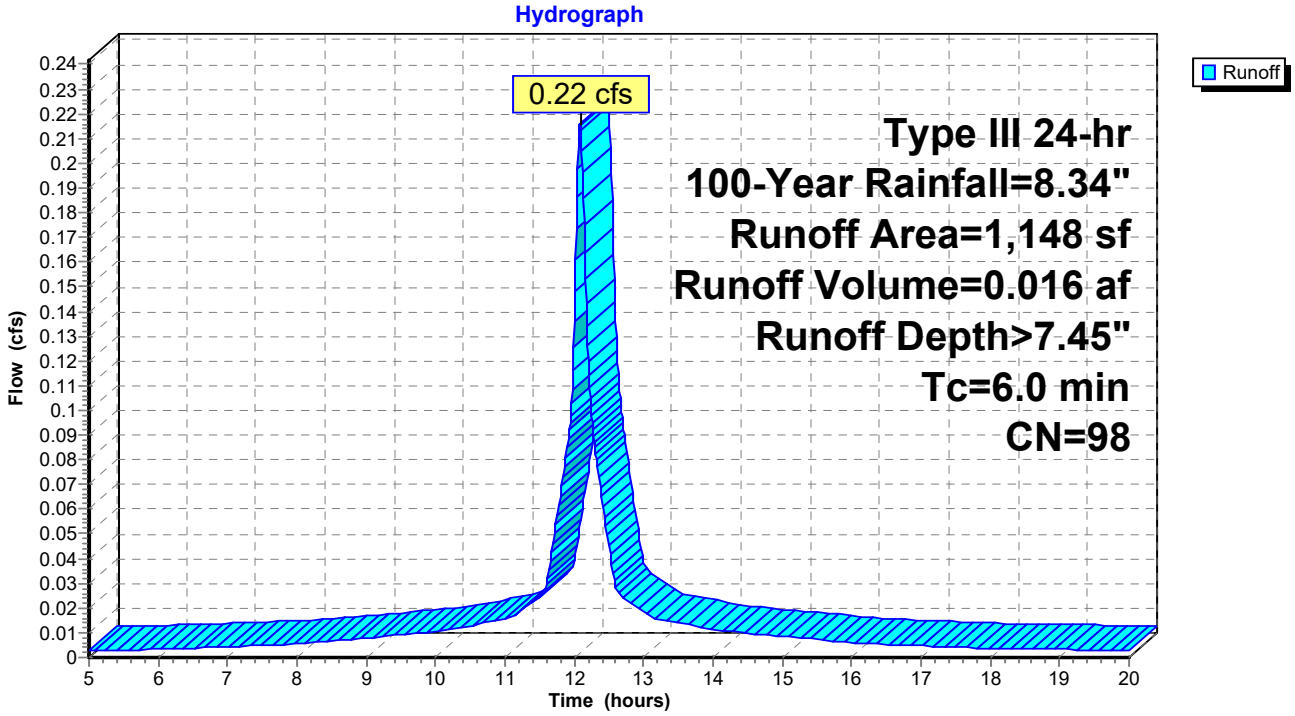
Runoff = 0.22 cfs @ 12.08 hrs, Volume= 0.016 af, Depth> 7.45"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.01 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 20: DA 20



Summary for Link 20L: SDP2

Inflow Area = 0.026 ac,100.00% Impervious, Inflow Depth > 7.45" for 100-Year event
Inflow = 0.22 cfs @ 12.08 hrs, Volume= 0.016 af
Primary = 0.22 cfs @ 12.08 hrs, Volume= 0.016 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 5.00-20.00 hrs, dt= 0.01 hrs

Link 20L: SDP2