Drainage Report:
for
Fairview Subdivision

Prepared for:

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&
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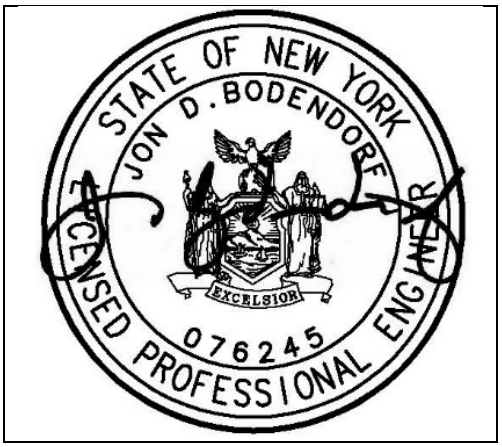
February 27, 2018



HUDSON
LAND DESIGN

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TABLE OF CONTENTS

APPENDICES

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

1.0 INTRODUCTION

The Fairview Subdivision project is located at 446 Washington Avenue in the City of Beacon, Dutchess County, New York. The project consists of two parcels, Tax IDs: 6055-82-656107 (±0.11 ac) and 6055-82-645105 (±0.72 ac). Parcel 656107 contains an existing single-family residence, while Parcel 645105 is undeveloped. The project proposes to re-align the lot lines on Parcel 656107 to bring it closer to lot conformance, then subdivide Parcel 645105 into two single family lots with a common driveway and associated parking. Both parcels are in the R1-10 zoning district.

2.0 METHODOLOGY AND REGULATORY COMPLIANCE

The proposed development of Parcel 645105 will result in 6,183 sqft of additional impervious area and 27,834 sqft of disturbance, and therefore is not subject to the requirements of NYSDEC GP-0-15-002 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, 5.89 and 8.31 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
BeC	Bernardston Silt loam, 8-15% slopes	>24”	>60”	C/D	Moderate
BeD	Bernardston Silt loam, 8-15% slopes	>24”	>60”	C/D	Severe

Source: websoilsurvey.sc.egov.usda.gov

Soil testing in the proposed stormwater sump on the western side of the project area was conducted on February 20, 2018 (Deep Test Pits) and February 22, 2018 (Infiltration Tests). Two test pits were excavated to a total depth of 5 feet and were primarily comprised of a brown silty-clay loam. Test Pit 1 had 8" of topsoil over 18" of the brown silty-loam. At 24" of depth the soil strata changed to an orange silty-clay loam. No bedrock, groundwater or mottling was observed. Test Pit 2 had 8" of topsoil over 52" of brown silty loam. Bedrock was observed at the bottom of the test pit, 60" in depth. No groundwater or mottling was observed in Test Pit 2.

Two infiltration tests were conducted in the stormwater sump area. Both infiltration tests were run three times at a depth of 24". Existing grade in the stormwater sump area is at elevation 66. The 24" tests are at the bottom of the stormwater sump, elevation 64. Infiltration Test 1 stabilized at 2.75 inches per hour while Infiltration Test 2 stabilized at 0.5 inches per hour.

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	Western Property Line

4.2 Existing Watershed Area

The pre-developed watershed is 36,007 sqft in total, and includes the existing single-family residence and shed, gravel parking areas on Parcel 645105 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 and shallow concentrated flow to the stormwater design point located on the western property line.

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	36,007	1.01	2.67	3.66	5.69

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 27,834 sqft of disturbance due to the construction of the two proposed single-family residences and common driveway. The post-developed watershed area is 36,007 sqft in total, and includes the existing & proposed residences, common driveway, some grass & landscaped areas. The post development watershed was delineated into two stormwater subcatchments; Subcatchment 10 and Subcatchment 11.

Subcatchment 10 consists of the proposed single-family residences, the common driveway and grassed areas and half of the pitched roof on the existing residence. The subcatchment contains soils in hydrologic soil group D. Drainage generally flows via sheet flow and shallow concentrated flow to the stormwater design point located on the western property line.

Subcatchment 11 consists of the other half of the existing residence's pitched roof, a small portion of the common driveway and grassed areas. The subcatchment contains soils in hydrologic soil group D. Drainage generally flows via sheet flow and shallow concentrated flow to the stormwater design point located on the western property line.

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. 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
SDP 1	36,007	0.42	2.66	3.64	5.64

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	1.01	0.42	2.67	2.66	3.66	3.64	5.69	5.64

The runoff rates at the SDP decrease from pre-development to post-development conditions with the infiltration facility in place.

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

INFILTRATION TEST DATA

Project: Fairview Subdivision City of: Beacon Date: 02/22/2018

By: Daniel G. Koehler, P.E.

Test Hole #	Test Hole Bottom Elevation	Soil Type	Soaked	TEST RUNS					
				*	1	2	3	4	5
IT1	64	Brown Silty-Clay Loam	Yes	Finish	10:35	11:37	12:40		
				Start	09:35	10:37	11:40		
				Depth (in)	3.0	3.0	2.75		
IT2	64	Brown Silty-Clay Loam	Yes	Finish	10:12	11:13	12:14		
				Start	9:12	10:13	11:14		
				Depth (in)	0.5	0.5	0.5		
				Finish					
				Start					
				Depth (in)					
				Finish					
				Start					
				Depth (in)					
				Finish					
				Start					
				Depth (in)					
				Finish					
				Start					
				Depth (in)					

I, Daniel G. Koehler, 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: 02/22/2018 Signature: _____

STATE OF NEW YORK
DANIEL G. KOEHLER
092716
LICENSED PROFESSIONAL ENGINEER

License No. (P.E.) _____

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

City of Beacon

Date: 02/20/2017

Name of property: Fairview Subdivision City of Beacon

TAX GRID #

6	1	5	5	-	8	2	-	6	4	5	1	0	5

Owner of property: Lori Joseph Builders, INC Engineer: Hudson Land Design

Person directing test: Daniel G. Koehler, P.E. City Rep: N/A

HOLE #	LOT #	TOTAL DEPTH	ROCK DEPTH	WATER DEPTH	MOTTLING DEPTH	SOIL DESCRIPTION
1	1	60”	None Observed	None Observed	None Observed	Brown Silty-Clay Loam; Orange Silty-Clay Loam
2	1	60”	60”	None Observed	None Observed	Brown Silty-Clay Loam

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

Deep tests conducted on a mild day, following a couple days of rainy conditions. Tests were dug by Lori Joseph Builder’s and witnessed by Daniel G. Koehler, PE.

Hydrologic Soil Group—Dutchess County, New York
(Fairview Subdivision)

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 14, Oct 8, 2017

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
BeC	Bernardston silt loam, 8 to 15 percent slopes	C/D	1.0	95.3%
BeD	Bernardston silt loam, 15 to 25 percent slopes	C/D	0.0	2.2%
GfC	Galway-Farmington complex, rolling, rocky	C	0.0	2.4%
Totals for Area of Interest			**1.1**	**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 Condition

Component Percent Cutoff: None Specified

Tie-break Rule: Higher

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	73.944 degrees West
Latitude	41.512 degrees North
Elevation	0 feet
Date/Time	Tue, 20 Feb 2018 12:10:14 -0500

Extreme Precipitation Estimates

	5min	10min	15min	30min	60min	120min		1hr	2hr	3hr	6hr	12hr	24hr	48hr		1day	2day	4day	7day	10day	
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	**1yr**	2.31	2.85	3.29	3.96	4.59	**1yr**
2yr	0.39	0.59	0.74	0.98	1.23	1.53	**2yr**	1.06	1.43	1.75	2.14	2.61	3.16	3.57	**2yr**	2.80	3.43	3.93	4.64	5.29	**2yr**
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	**5yr**	3.51	4.35	5.00	5.79	6.54	**5yr**
10yr	0.51	0.80	1.02	1.38	1.79	2.27	**10yr**	1.55	2.07	2.62	3.21	3.90	4.70	5.41	**10yr**	4.16	5.20	6.00	6.84	7.68	**10yr**
25yr	0.60	0.95	1.21	1.67	2.23	2.85	**25yr**	1.92	2.55	3.30	4.06	4.92	5.89	6.86	**25yr**	5.22	6.59	7.65	8.53	9.51	**25yr**
50yr	0.68	1.09	1.39	1.95	2.63	3.39	**50yr**	2.27	3.00	3.93	4.84	5.85	7.00	8.21	**50yr**	6.19	7.89	9.19	10.09	11.19	**50yr**
100yr	0.77	1.25	1.61	2.28	3.11	4.03	**100yr**	2.68	3.52	4.68	5.77	6.97	8.31	9.83	**100yr**	7.36	9.45	11.05	11.94	13.17	**100yr**
200yr	0.88	1.43	1.86	2.66	3.68	4.80	**200yr**	3.17	4.14	5.59	6.88	8.31	9.88	11.78	**200yr**	8.74	11.33	13.29	14.14	15.51	**200yr**
500yr	1.06	1.74	2.26	3.29	4.61	6.04	**500yr**	3.98	5.14	7.05	8.69	10.48	12.43	14.98	**500yr**	11.00	14.40	16.98	17.68	19.26	**500yr**

Lower Confidence Limits

	5min	10min	15min	30min	60min	120min		1hr	2hr	3hr	6hr	12hr	24hr	48hr		1day	2day	4day	7day	10day	
1yr	0.28	0.43	0.53	0.71	0.88	1.09	**1yr**	0.76	1.06	1.25	1.60	2.01	2.07	2.35	**1yr**	1.83	2.26	2.48	3.19	4.17	**1yr**
2yr	0.37	0.58	0.71	0.96	1.19	1.41	**2yr**	1.02	1.38	1.61	2.05	2.58	3.07	3.45	**2yr**	2.72	3.32	3.78	4.48	5.14	**2yr**
5yr	0.42	0.65	0.81	1.11	1.41	1.65	**5yr**	1.22	1.62	1.88	2.41	3.00	3.65	4.17	**5yr**	3.23	4.01	4.56	5.28	6.07	**5yr**
10yr	0.47	0.72	0.90	1.25	1.62	1.85	**10yr**	1.40	1.81	2.11	2.71	3.37	4.13	4.82	**10yr**	3.65	4.64	5.25	5.97	6.88	**10yr**
25yr	0.54	0.83	1.03	1.47	1.93	2.13	**25yr**	1.67	2.09	2.45	3.04	3.93	4.83	5.84	**25yr**	4.27	5.62	6.30	7.00	8.13	**25yr**
50yr	0.61	0.92	1.15	1.65	2.23	2.38	**50yr**	1.92	2.33	2.77	3.40	4.42	5.46	6.78	**50yr**	4.83	6.52	7.23	7.88	9.24	**50yr**
100yr	0.69	1.04	1.30	1.88	2.57	2.67	**100yr**	2.22	2.61	3.13	3.79	4.99	6.13	7.87	**100yr**	5.42	7.57	8.31	8.86	10.49	**100yr**
200yr	0.78	1.17	1.48	2.15	3.00	2.99	**200yr**	2.59	2.92	3.54	4.25	5.64	6.82	9.16	**200yr**	6.03	8.81	9.54	9.94	11.93	**200yr**
500yr	0.93	1.38	1.78	2.59	3.68	3.48	**500yr**	3.17	3.41	4.18	4.94	6.65	7.86	11.22	**500yr**	6.96	10.79	11.47	11.54	14.15	**500yr**

Upper Confidence Limits

	5min	10min	15min	30min	60min	120min		1hr	2hr	3hr	6hr	12hr	24hr	48hr		1day	2day	4day	7day	10day	
1yr	0.36	0.56	0.68	0.91	1.12	1.36	**1yr**	0.97	1.33	1.53	1.96	2.42	2.82	3.19	**1yr**	2.50	3.06	3.54	4.23	4.91	**1yr**
2yr	0.40	0.62	0.76	1.04	1.28	1.54	**2yr**	1.10	1.50	1.74	2.25	2.80	3.33	3.70	**2yr**	2.95	3.56	4.09	4.83	5.48	**2yr**
5yr	0.49	0.76	0.94	1.29	1.64	1.95	**5yr**	1.42	1.91	2.25	2.89	3.66	4.26	4.89	**5yr**	3.77	4.70	5.42	6.30	7.02	**5yr**
10yr	0.58	0.89	1.10	1.54	1.99	2.36	**10yr**	1.72	2.31	2.74	3.53	4.49	5.19	6.03	**10yr**	4.59	5.79	6.73	7.71	8.49	**10yr**
25yr	0.72	1.10	1.37	1.95	2.56	3.04	**25yr**	2.21	2.97	3.56	4.74	5.89	6.76	7.95	**25yr**	5.99	7.64	8.98	10.10	10.96	**25yr**
50yr	0.85	1.29	1.61	2.31	3.12	3.69	**50yr**	2.69	3.61	4.35	5.84	7.21	8.27	9.80	**50yr**	7.32	9.42	11.18	12.39	13.28	**50yr**
100yr	1.01	1.52	1.91	2.75	3.77	4.48	**100yr**	3.26	4.38	5.30	7.21	8.85	10.12	12.06	**100yr**	8.95	11.60	13.93	15.23	16.12	**100yr**
200yr	1.19	1.79	2.26	3.28	4.57	5.44	**200yr**	3.94	5.32	6.48	8.89	10.85	12.40	14.88	**200yr**	10.97	14.30	17.37	18.74	19.58	**200yr**
500yr	1.49	2.22	2.85	4.14	5.89	7.03	**500yr**	5.08	6.87	8.42	11.75	14.21	16.26	19.59	**500yr**	14.39	18.84	23.29	24.69	25.28	**500yr**

Powered by ACIS
Northeast Regional Climate Center

U.S. Fish and Wildlife Service
National Wetlands Inventory

446 Washington Avenue

December 12, 2017

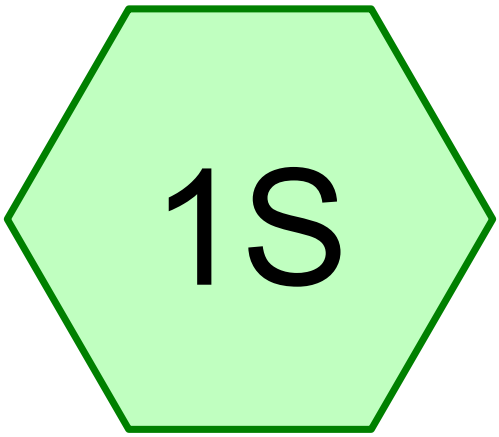
Wetlands

- Estuarine and Marine Deepwater
- Estuarine and Marine Wetland
- Freshwater Emergent Wetland
- Freshwater Forested/Shrub Wetland
- Freshwater Pond
- Lake
- Other
- Riverine

This map is for general reference only. The US Fish and Wildlife Service is not responsible for the accuracy or currentness of the base data shown on this map. All wetlands related data should be used in accordance with the layer metadata found on the Wetlands Mapper web site.

APPENDIX C

PRE-DEVELOPMENT HYDROLOGY CALCULATIONS



SUBCATCHMENT 1

Subcat Reach Pond Link

Routing Diagram for PRE
Prepared by Hudson Land Design, P.C. , Printed 2/27/2018

Area Listing (all nodes)

Area (acres)	CN	Description (subcatchment-numbers)
0.151	80	>75% Grass cover, Good, HSG D (1S)
0.120	96	Gravel surface, HSG D (1S)
0.035	98	Paved parking, HSG D (1S)
0.521	79	Woods/grass comb., Good, HSG D (1S)

Soil Listing (all nodes)

Area (acres)	Soil Group	Subcatchment Numbers
0.000	HSG A	
0.000	HSG B	
0.000	HSG C	
0.827	HSG D	1S
0.000	Other	

Ground Covers (all nodes)

HSG-A (acres)	HSG-B (acres)	HSG-C (acres)	HSG-D (acres)	Other (acres)	Total (acres)	Ground Cover	Subcatchment Numbers
0.000	0.000	0.000	0.151	0.000	0.151	>75% Grass cover, Good	1S
0.000	0.000	0.000	0.120	0.000	0.120	Gravel surface	1S
0.000	0.000	0.000	0.035	0.000	0.035	Paved parking	1S
0.000	0.000	0.000	0.521	0.000	0.521	Woods/grass comb., Good	1S

Summary for Subcatchment 1S: SUBCATCHMENT 1

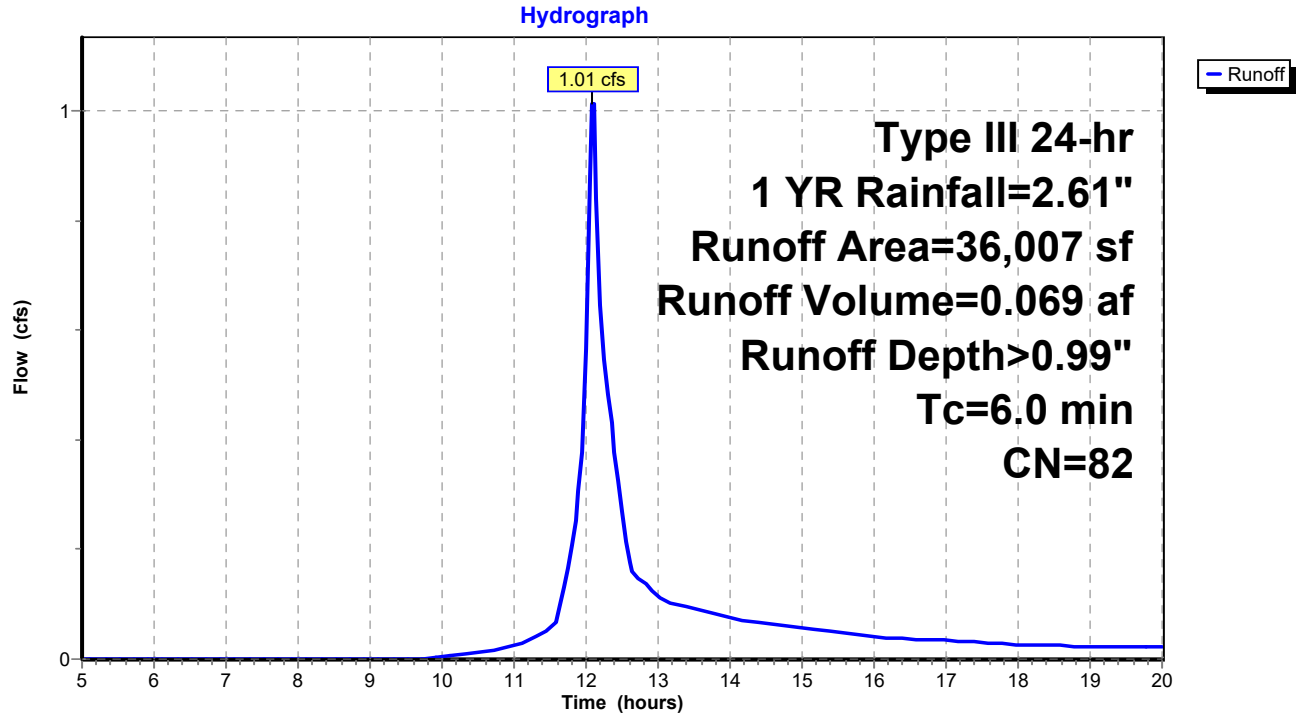
Runoff = 1.01 cfs @ 12.10 hrs, Volume= 0.069 af, Depth> 0.99"

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 YR Rainfall=2.61"

Area (sf)	CN	Description
1,544	98	Paved parking, HSG D
6,560	80	>75% Grass cover, Good, HSG D
5,230	96	Gravel surface, HSG D
22,673	79	Woods/grass comb., Good, HSG D
36,007	82	Weighted Average
34,463		95.71% Pervious Area
1,544		4.29% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, S1**

Subcatchment 1S: SUBCATCHMENT 1



Summary for Subcatchment 1S: SUBCATCHMENT 1

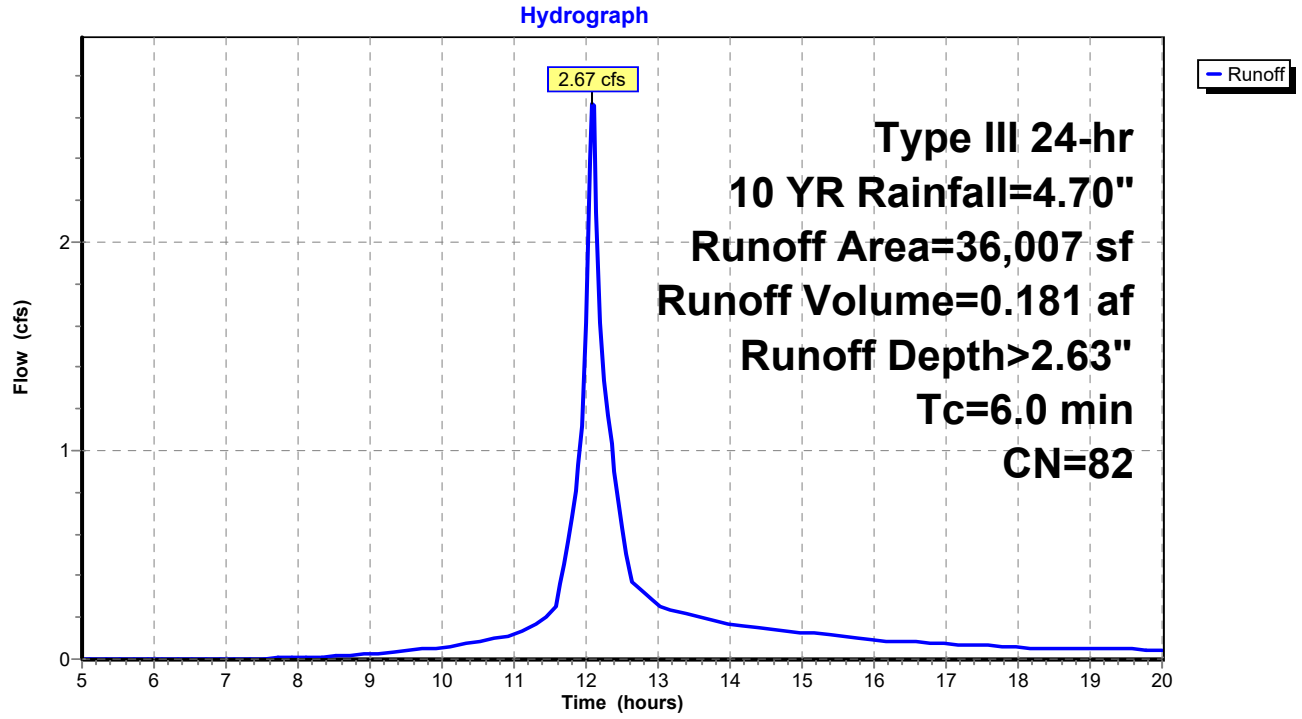
Runoff = 2.67 cfs @ 12.09 hrs, Volume= 0.181 af, Depth> 2.63"

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 YR Rainfall=4.70"

Area (sf)	CN	Description
1,544	98	Paved parking, HSG D
6,560	80	>75% Grass cover, Good, HSG D
5,230	96	Gravel surface, HSG D
22,673	79	Woods/grass comb., Good, HSG D
36,007	82	Weighted Average
34,463		95.71% Pervious Area
1,544		4.29% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, S1**

Subcatchment 1S: SUBCATCHMENT 1



Summary for Subcatchment 1S: SUBCATCHMENT 1

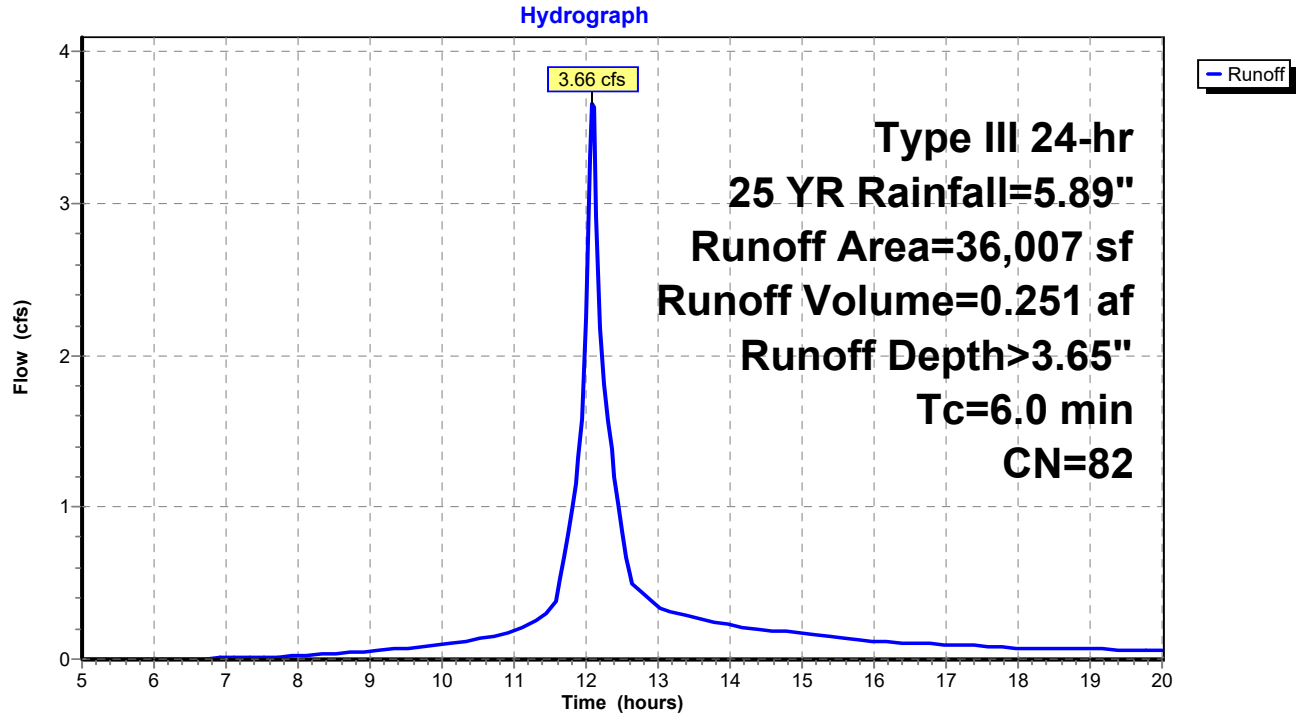
Runoff = 3.66 cfs @ 12.09 hrs, Volume= 0.251 af, Depth> 3.65"

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 YR Rainfall=5.89"

Area (sf)	CN	Description
1,544	98	Paved parking, HSG D
6,560	80	>75% Grass cover, Good, HSG D
5,230	96	Gravel surface, HSG D
22,673	79	Woods/grass comb., Good, HSG D
36,007	82	Weighted Average
34,463		95.71% Pervious Area
1,544		4.29% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, S1**

Subcatchment 1S: SUBCATCHMENT 1



Summary for Subcatchment 1S: SUBCATCHMENT 1

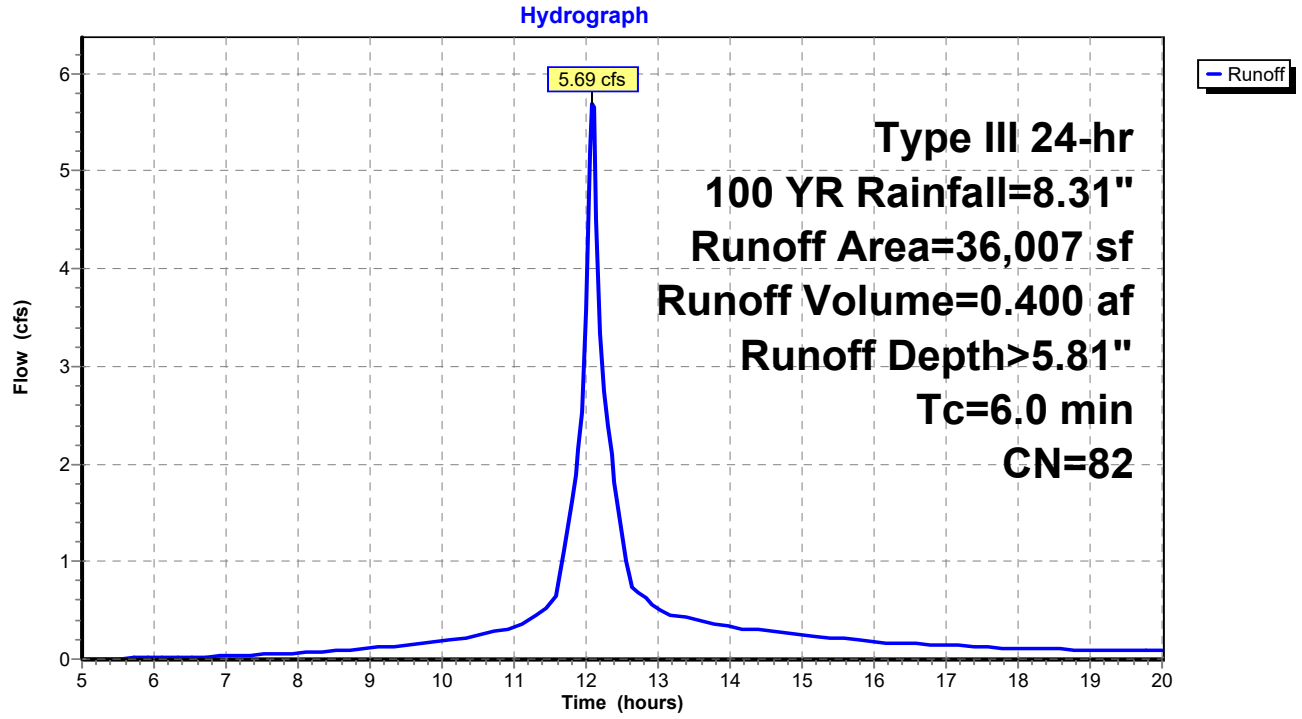
Runoff = 5.69 cfs @ 12.09 hrs, Volume= 0.400 af, Depth> 5.81"

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 YR Rainfall=8.31"

Area (sf)	CN	Description
1,544	98	Paved parking, HSG D
6,560	80	>75% Grass cover, Good, HSG D
5,230	96	Gravel surface, HSG D
22,673	79	Woods/grass comb., Good, HSG D
36,007	82	Weighted Average
34,463		95.71% Pervious Area
1,544		4.29% Impervious Area

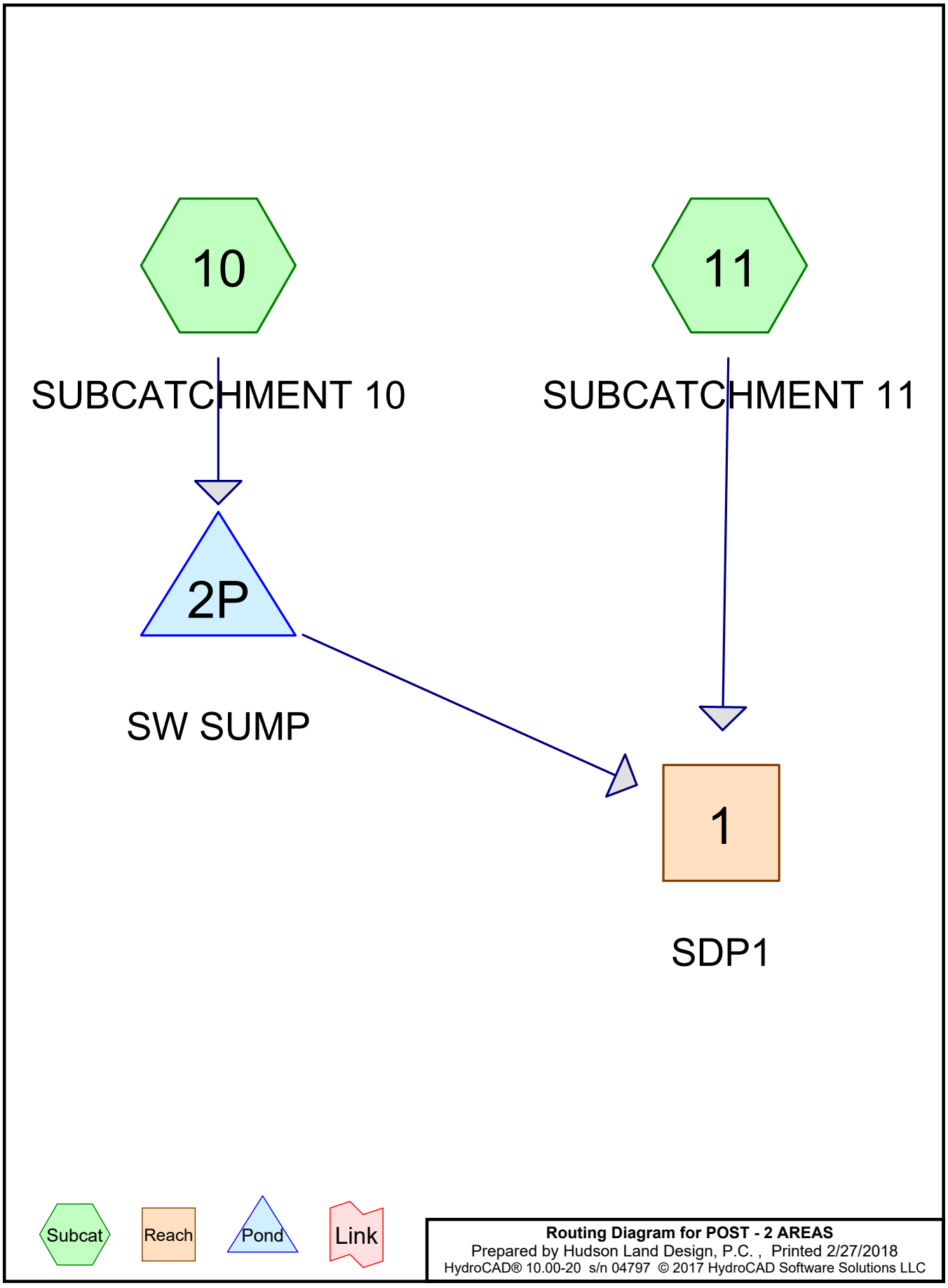
Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, S1**

Subcatchment 1S: SUBCATCHMENT 1



APPENDIX D

POST-DEVELOPMENT HYDROLOGY CALCULATIONS



Routing Diagram for POST - 2 AREAS
Prepared by Hudson Land Design, P.C. , Printed 2/27/2018

Area Listing (all nodes)

Area (acres)	CN	Description (subcatchment-numbers)
0.649	80	>75% Grass cover, Good, HSG D (10, 11)
0.177	98	Paved parking, HSG D (10, 11)

Soil Listing (all nodes)

Area (acres)	Soil Group	Subcatchment Numbers
0.000	HSG A	
0.000	HSG B	
0.000	HSG C	
0.827	HSG D	10, 11
0.000	Other	

Ground Covers (all nodes)

HSG-A (acres)	HSG-B (acres)	HSG-C (acres)	HSG-D (acres)	Other (acres)	Total (acres)	Ground Cover	Subcatchment Numbers
0.000	0.000	0.000	0.649	0.000	0.649	>75% Grass cover, Good	10, 11
0.000	0.000	0.000	0.177	0.000	0.177	Paved parking	10, 11

Summary for Subcatchment 10: SUBCATCHMENT 10

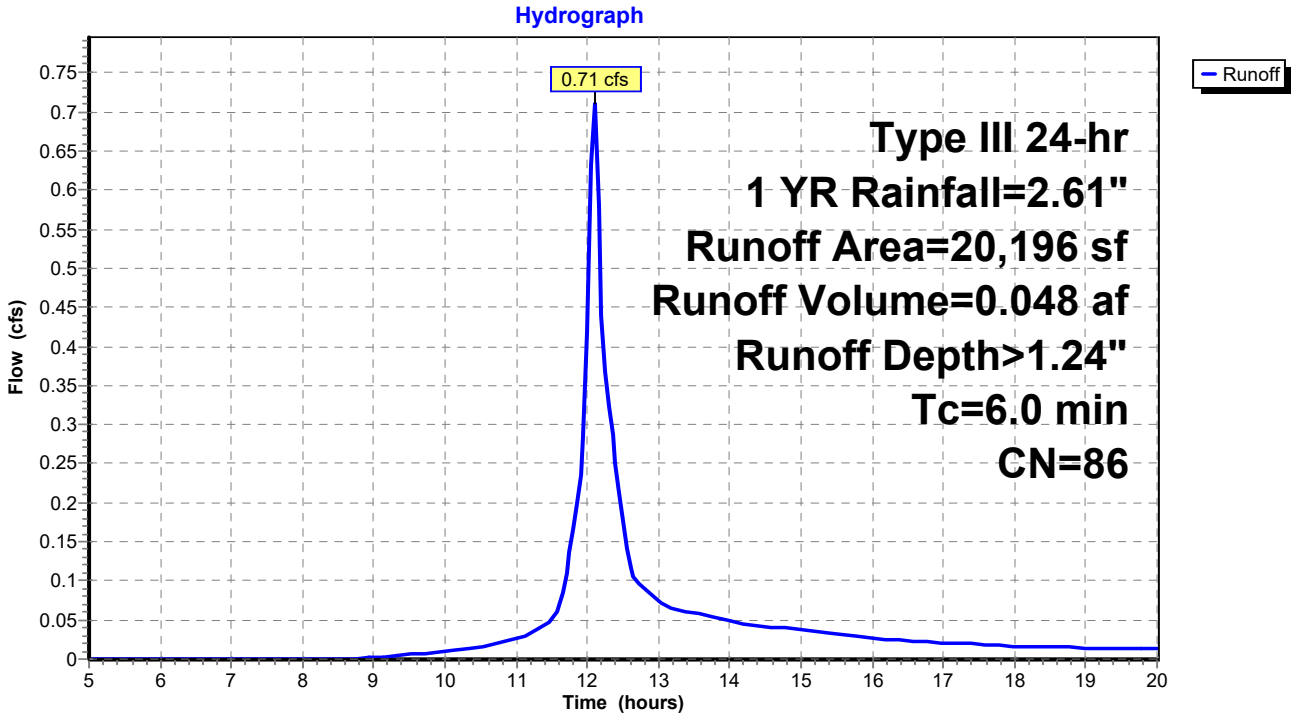
Runoff = 0.71 cfs @ 12.09 hrs, Volume= 0.048 af, Depth> 1.24"

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 1 YR Rainfall=2.61"

Area (sf)	CN	Description
6,829	98	Paved parking, HSG D
13,367	80	>75% Grass cover, Good, HSG D
20,196	86	Weighted Average
13,367		66.19% Pervious Area
6,829		33.81% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, S1**

Subcatchment 10: SUBCATCHMENT 10



Summary for Subcatchment 11: SUBCATCHMENT 11

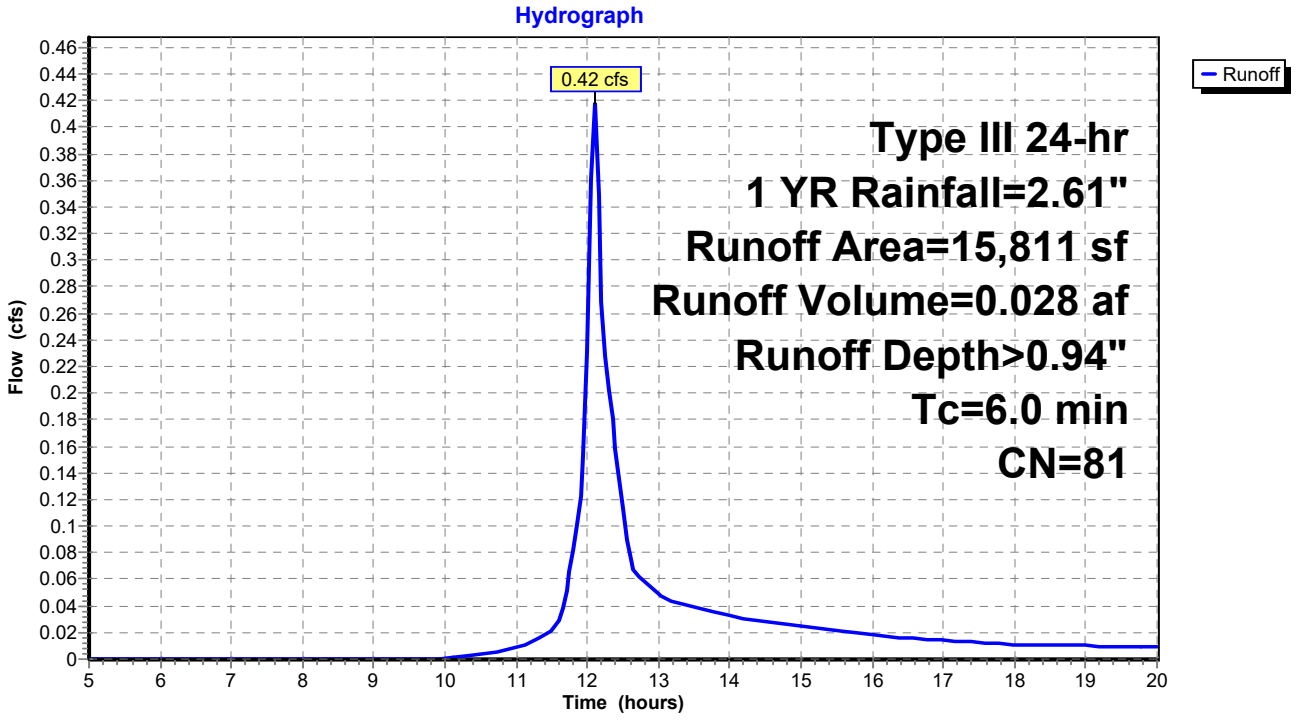
Runoff = 0.42 cfs @ 12.10 hrs, Volume= 0.028 af, Depth> 0.94"

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 YR Rainfall=2.61"

Area (sf)	CN	Description
898	98	Paved parking, HSG D
14,913	80	>75% Grass cover, Good, HSG D
15,811	81	Weighted Average
14,913		94.32% Pervious Area
898		5.68% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, S1**

Subcatchment 11: SUBCATCHMENT 11

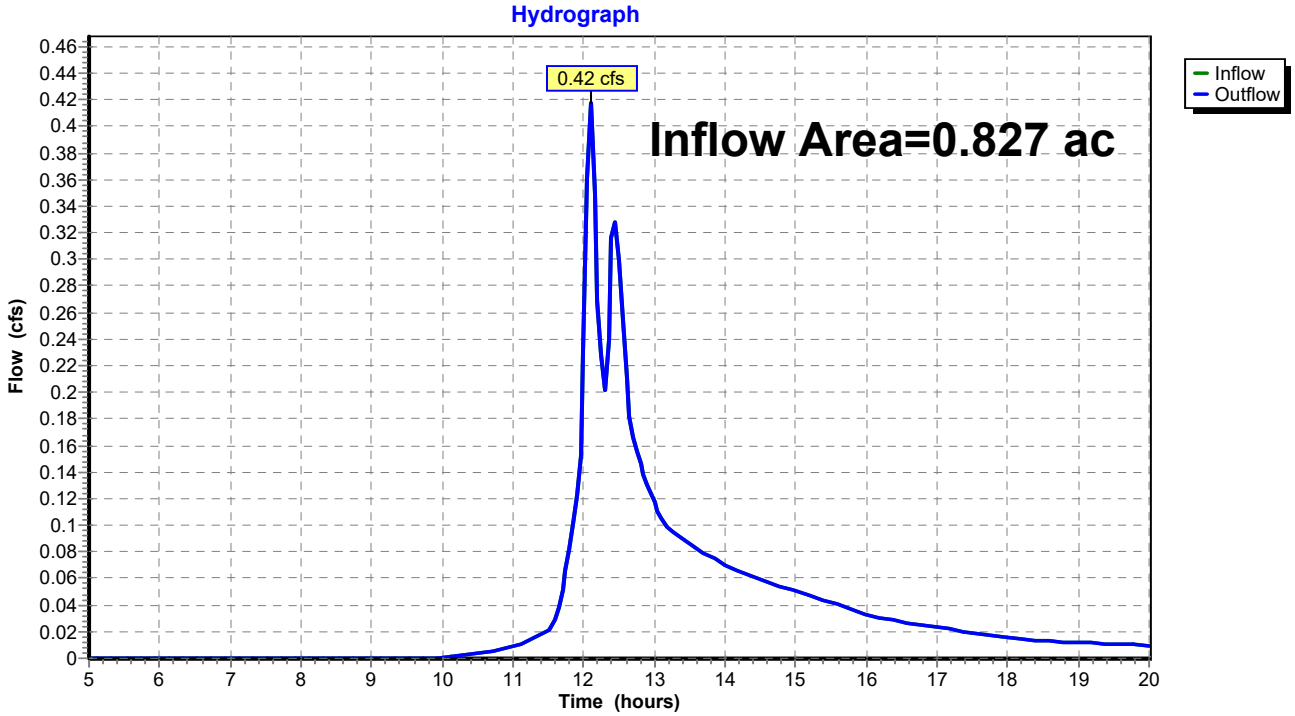


Summary for Reach 1: SDP1

Inflow Area = 0.827 ac, 21.46% Impervious, Inflow Depth > 0.65" for 1 YR event
Inflow = 0.42 cfs @ 12.10 hrs, Volume= 0.045 af
Outflow = 0.42 cfs @ 12.10 hrs, Volume= 0.045 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Reach 1: SDP1



Summary for Pond 2P: SW SUMP

Inflow Area = 0.464 ac, 33.81% Impervious, Inflow Depth > 1.24" for 1 YR event
Inflow = 0.71 cfs @ 12.09 hrs, Volume= 0.048 af
Outflow = 0.21 cfs @ 12.47 hrs, Volume= 0.026 af, Atten= 71%, Lag= 22.5 min
Discarded = 0.01 cfs @ 12.47 hrs, Volume= 0.009 af
Primary = 0.19 cfs @ 12.47 hrs, Volume= 0.017 af

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 65.56' @ 12.47 hrs Surf.Area= 1,128 sf Storage= 1,019 cf

Plug-Flow detention time= 154.0 min calculated for 0.026 af (54% of inflow)
Center-of-Mass det. time= 74.2 min (869.3 - 795.0)

Volume	Invert	Avail.Storage	Storage Description
#1	64.00'	1,582 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
64.00	203	0	0
65.00	776	490	490
66.00	1,408	1,092	1,582

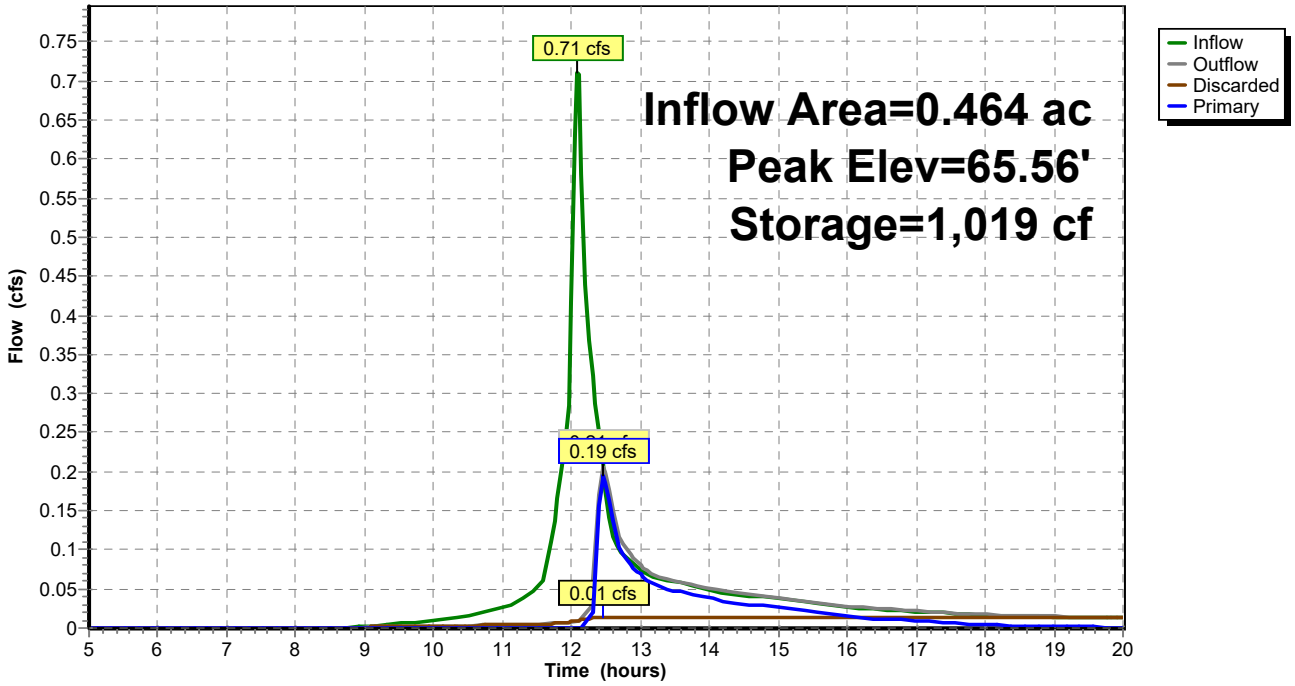
Device	Routing	Invert	Outlet Devices
#1	Primary	65.50'	**6.0' long x 4.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 5.00 5.50 Coef. (English) 2.38 2.54 2.69 2.68 2.67 2.67 2.65 2.66 2.66 2.68 2.72 2.73 2.76 2.79 2.88 3.07 3.32
#2	Discarded	64.00'	**0.500 in/hr Exfiltration over Surface area**

Discarded OutFlow Max=0.01 cfs @ 12.47 hrs HW=65.56' (Free Discharge)
↑—**2=Exfiltration** (Exfiltration Controls 0.01 cfs)

Primary OutFlow Max=0.19 cfs @ 12.47 hrs HW=65.56' (Free Discharge)
↑—**1=Broad-Crested Rectangular Weir** (Weir Controls 0.19 cfs @ 0.56 fps)

Pond 2P: SW SUMP

Hydrograph



Summary for Subcatchment 10: SUBCATCHMENT 10

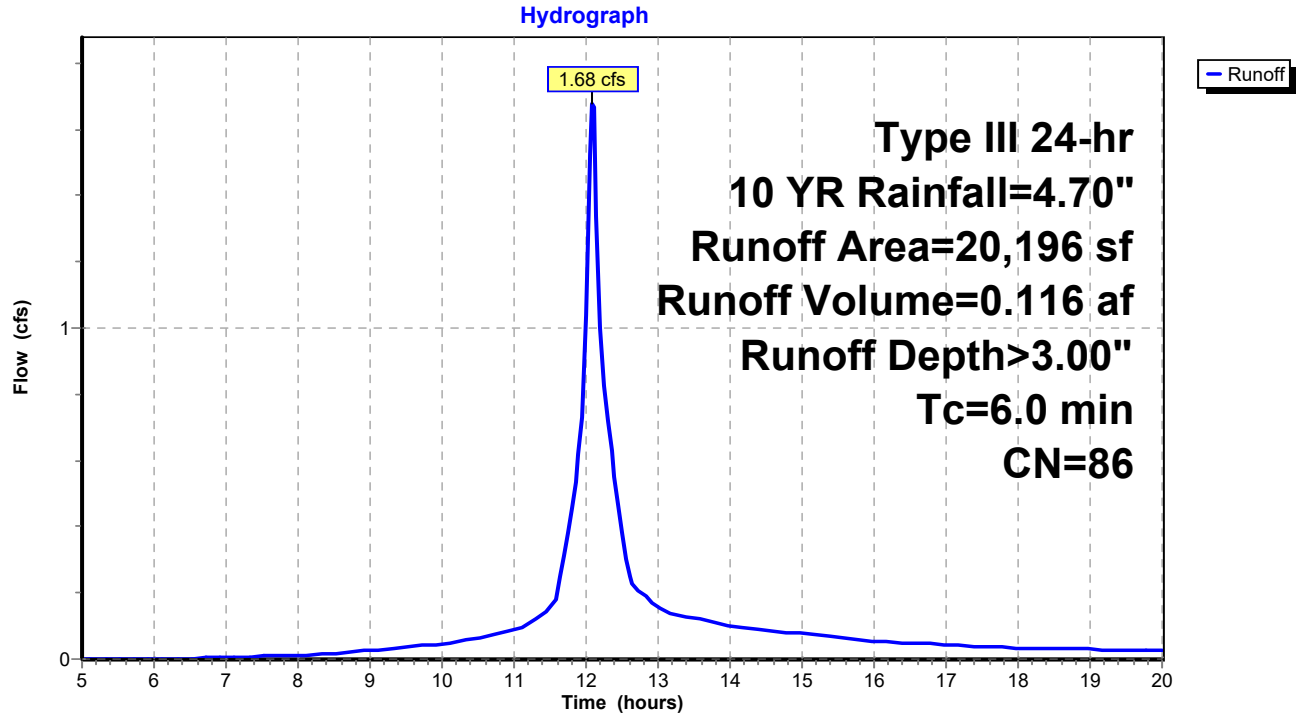
Runoff = 1.68 cfs @ 12.09 hrs, Volume= 0.116 af, Depth> 3.00"

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 YR Rainfall=4.70"

Area (sf)	CN	Description
6,829	98	Paved parking, HSG D
13,367	80	>75% Grass cover, Good, HSG D
20,196	86	Weighted Average
13,367		66.19% Pervious Area
6,829		33.81% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, S1**

Subcatchment 10: SUBCATCHMENT 10



Summary for Subcatchment 11: SUBCATCHMENT 11

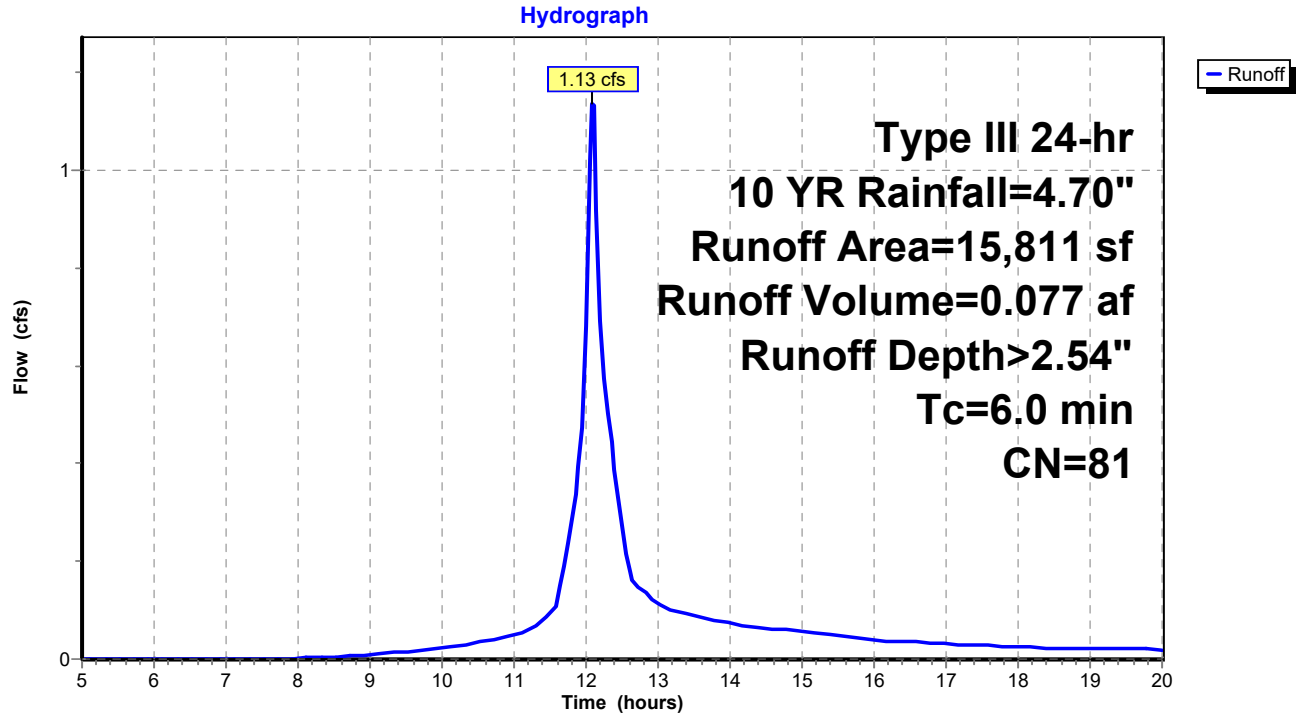
Runoff = 1.13 cfs @ 12.09 hrs, Volume= 0.077 af, Depth> 2.54"

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 YR Rainfall=4.70"

Area (sf)	CN	Description
898	98	Paved parking, HSG D
14,913	80	>75% Grass cover, Good, HSG D
15,811	81	Weighted Average
14,913		94.32% Pervious Area
898		5.68% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, S1**

Subcatchment 11: SUBCATCHMENT 11

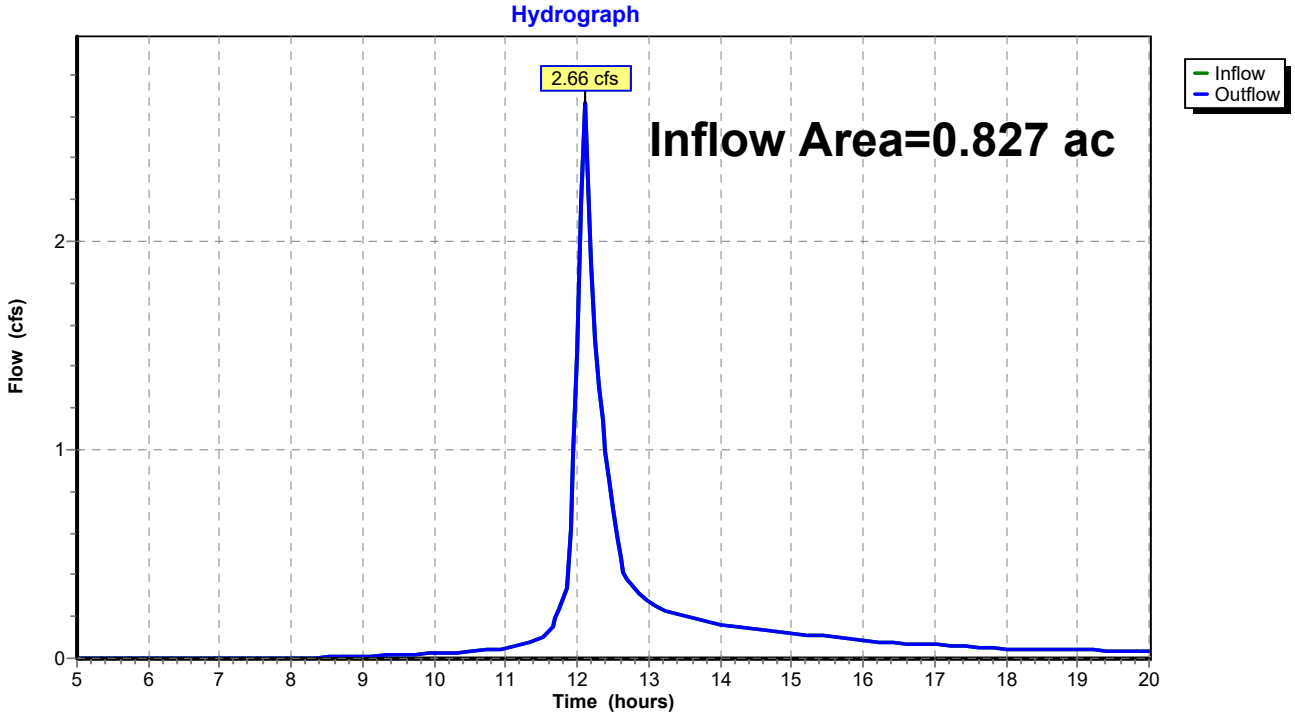


Summary for Reach 1: SDP1

Inflow Area = 0.827 ac, 21.46% Impervious, Inflow Depth > 2.32" for 10 YR event
Inflow = 2.66 cfs @ 12.11 hrs, Volume= 0.160 af
Outflow = 2.66 cfs @ 12.11 hrs, Volume= 0.160 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Reach 1: SDP1



Summary for Pond 2P: SW SUMP

Inflow Area = 0.464 ac, 33.81% Impervious, Inflow Depth > 3.00" for 10 YR event
Inflow = 1.68 cfs @ 12.09 hrs, Volume= 0.116 af
Outflow = 1.57 cfs @ 12.12 hrs, Volume= 0.094 af, Atten= 6%, Lag= 1.9 min
Discarded = 0.01 cfs @ 12.12 hrs, Volume= 0.011 af
Primary = 1.55 cfs @ 12.12 hrs, Volume= 0.083 af

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 65.73' @ 12.12 hrs Surf.Area= 1,235 sf Storage= 1,220 cf

Plug-Flow detention time= 84.1 min calculated for 0.094 af (81% of inflow)
Center-of-Mass det. time= 32.4 min (806.9 - 774.5)

Volume	Invert	Avail.Storage	Storage Description
#1	64.00'	1,582 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc)

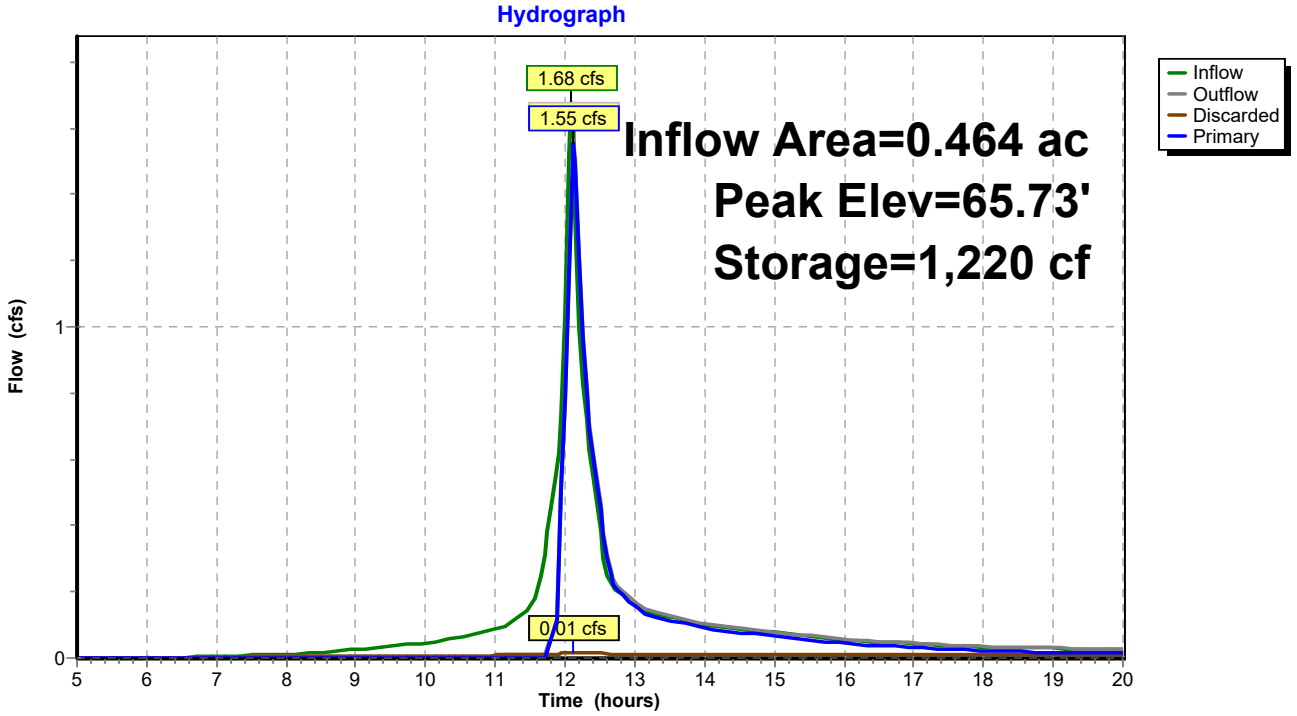
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
64.00	203	0	0
65.00	776	490	490
66.00	1,408	1,092	1,582

Device	Routing	Invert	Outlet Devices
#1	Primary	65.50'	**6.0' long x 4.0' 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) 2.38 2.54 2.69 2.68 2.67 2.67 2.65 2.66 2.66 2.68 2.72 2.73 2.76 2.79 2.88 3.07 3.32
#2	Discarded	64.00'	**0.500 in/hr Exfiltration over Surface area**

Discarded OutFlow Max=0.01 cfs @ 12.12 hrs HW=65.72' (Free Discharge)
↑—**2=Exfiltration** (Exfiltration Controls 0.01 cfs)

Primary OutFlow Max=1.51 cfs @ 12.12 hrs HW=65.72' (Free Discharge)
↑—**1=Broad-Crested Rectangular Weir** (Weir Controls 1.51 cfs @ 1.13 fps)

Pond 2P: SW SUMP



Summary for Subcatchment 10: SUBCATCHMENT 10

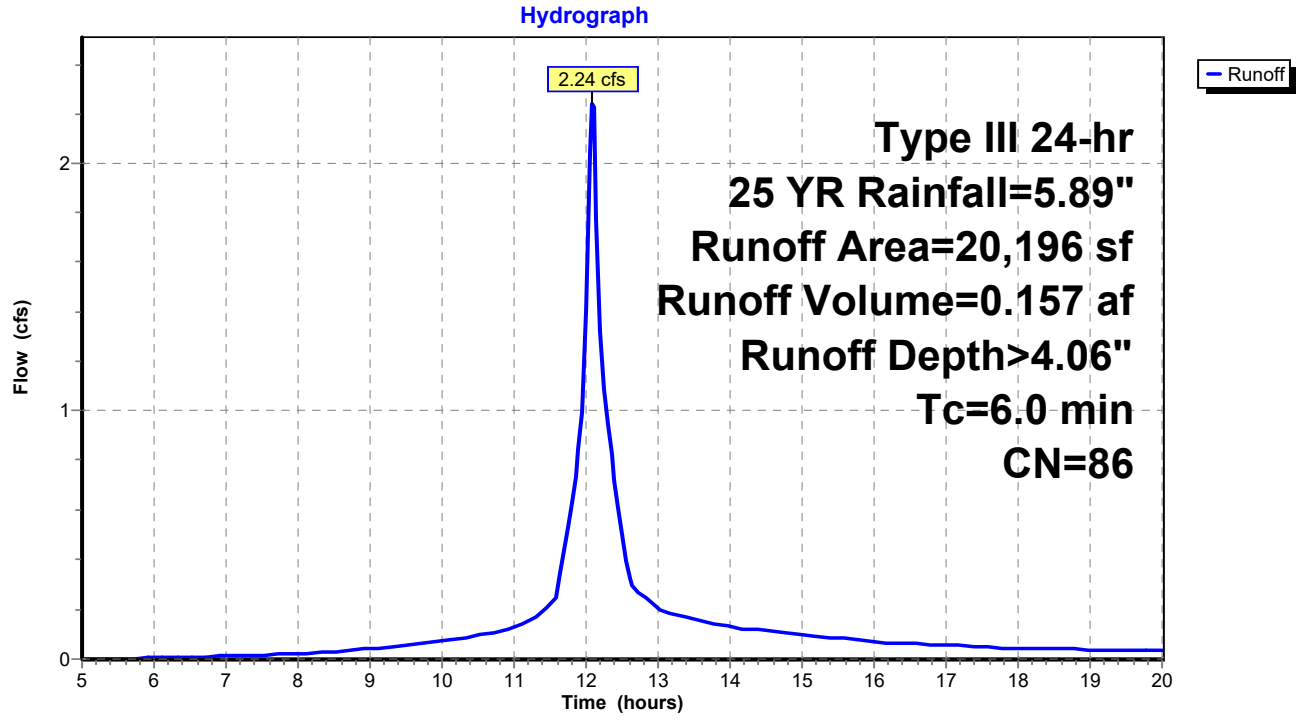
Runoff = 2.24 cfs @ 12.09 hrs, Volume= 0.157 af, Depth> 4.06"

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 YR Rainfall=5.89"

Area (sf)	CN	Description
6,829	98	Paved parking, HSG D
13,367	80	>75% Grass cover, Good, HSG D
20,196	86	Weighted Average
13,367		66.19% Pervious Area
6,829		33.81% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, S1**

Subcatchment 10: SUBCATCHMENT 10



Summary for Subcatchment 11: SUBCATCHMENT 11

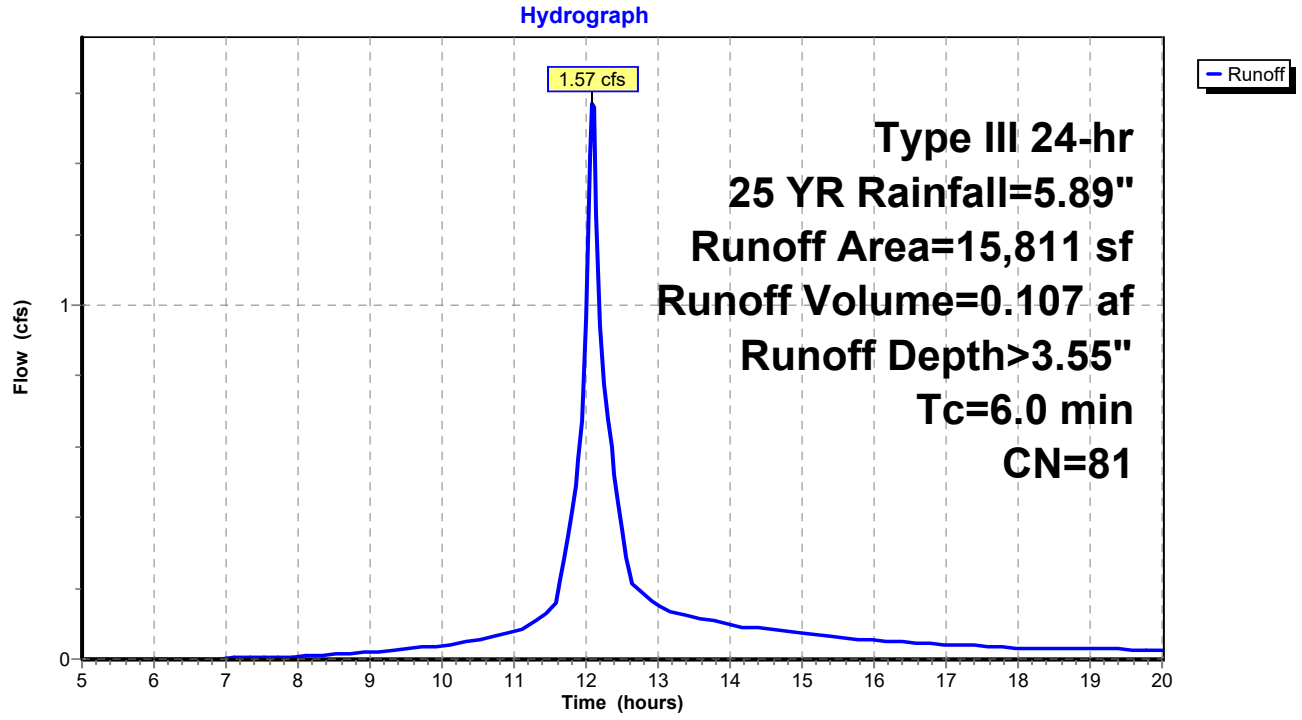
Runoff = 1.57 cfs @ 12.09 hrs, Volume= 0.107 af, Depth> 3.55"

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 YR Rainfall=5.89"

Area (sf)	CN	Description
898	98	Paved parking, HSG D
14,913	80	>75% Grass cover, Good, HSG D
15,811	81	Weighted Average
14,913		94.32% Pervious Area
898		5.68% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, S1**

Subcatchment 11: SUBCATCHMENT 11

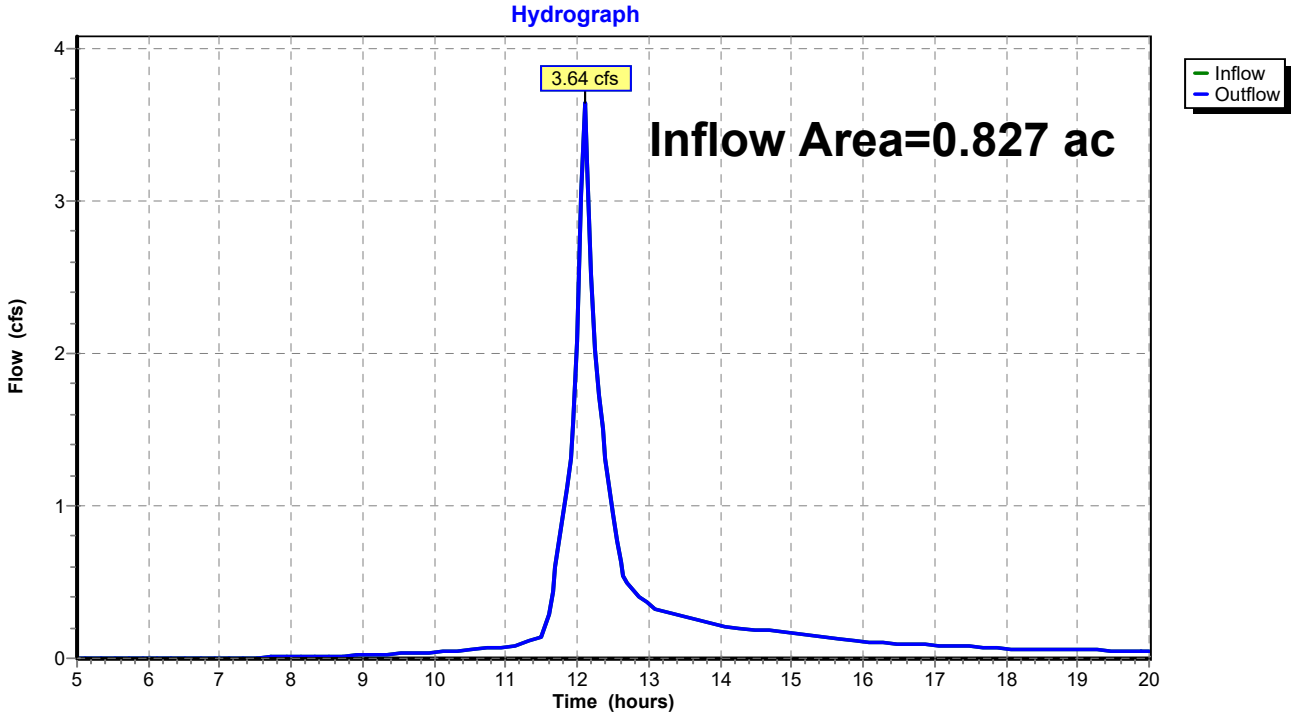


Summary for Reach 1: SDP1

Inflow Area = 0.827 ac, 21.46% Impervious, Inflow Depth > 3.34" for 25 YR event
Inflow = 3.64 cfs @ 12.11 hrs, Volume= 0.230 af
Outflow = 3.64 cfs @ 12.11 hrs, Volume= 0.230 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Reach 1: SDP1



Summary for Pond 2P: SW SUMP

Inflow Area = 0.464 ac, 33.81% Impervious, Inflow Depth > 4.06" for 25 YR event
Inflow = 2.24 cfs @ 12.09 hrs, Volume= 0.157 af
Outflow = 2.12 cfs @ 12.12 hrs, Volume= 0.135 af, Atten= 5%, Lag= 1.7 min
Discarded = 0.01 cfs @ 12.12 hrs, Volume= 0.012 af
Primary = 2.10 cfs @ 12.12 hrs, Volume= 0.123 af

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 65.77' @ 12.12 hrs Surf.Area= 1,266 sf Storage= 1,280 cf

Plug-Flow detention time= 70.8 min calculated for 0.134 af (86% of inflow)
Center-of-Mass det. time= 29.0 min (796.3 - 767.2)

Volume	Invert	Avail.Storage	Storage Description
#1	64.00'	1,582 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc)

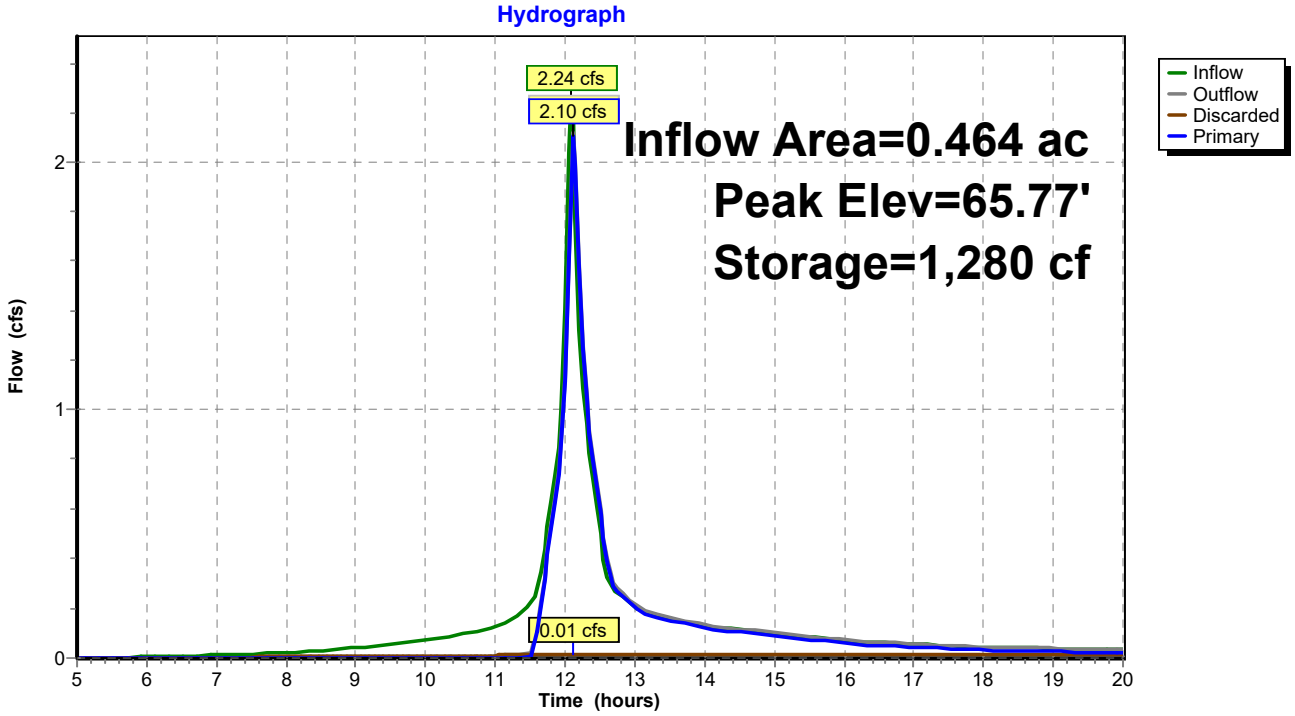
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
64.00	203	0	0
65.00	776	490	490
66.00	1,408	1,092	1,582

Device	Routing	Invert	Outlet Devices
#1	Primary	65.50'	**6.0' long x 4.0' 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) 2.38 2.54 2.69 2.68 2.67 2.67 2.65 2.66 2.66 2.68 2.72 2.73 2.76 2.79 2.88 3.07 3.32
#2	Discarded	64.00'	**0.500 in/hr Exfiltration over Surface area**

Discarded OutFlow Max=0.01 cfs @ 12.12 hrs HW=65.77' (Free Discharge)
↑—**2=Exfiltration** (Exfiltration Controls 0.01 cfs)

Primary OutFlow Max=2.04 cfs @ 12.12 hrs HW=65.77' (Free Discharge)
↑—**1=Broad-Crested Rectangular Weir** (Weir Controls 2.04 cfs @ 1.26 fps)

Pond 2P: SW SUMP



Summary for Subcatchment 10: SUBCATCHMENT 10

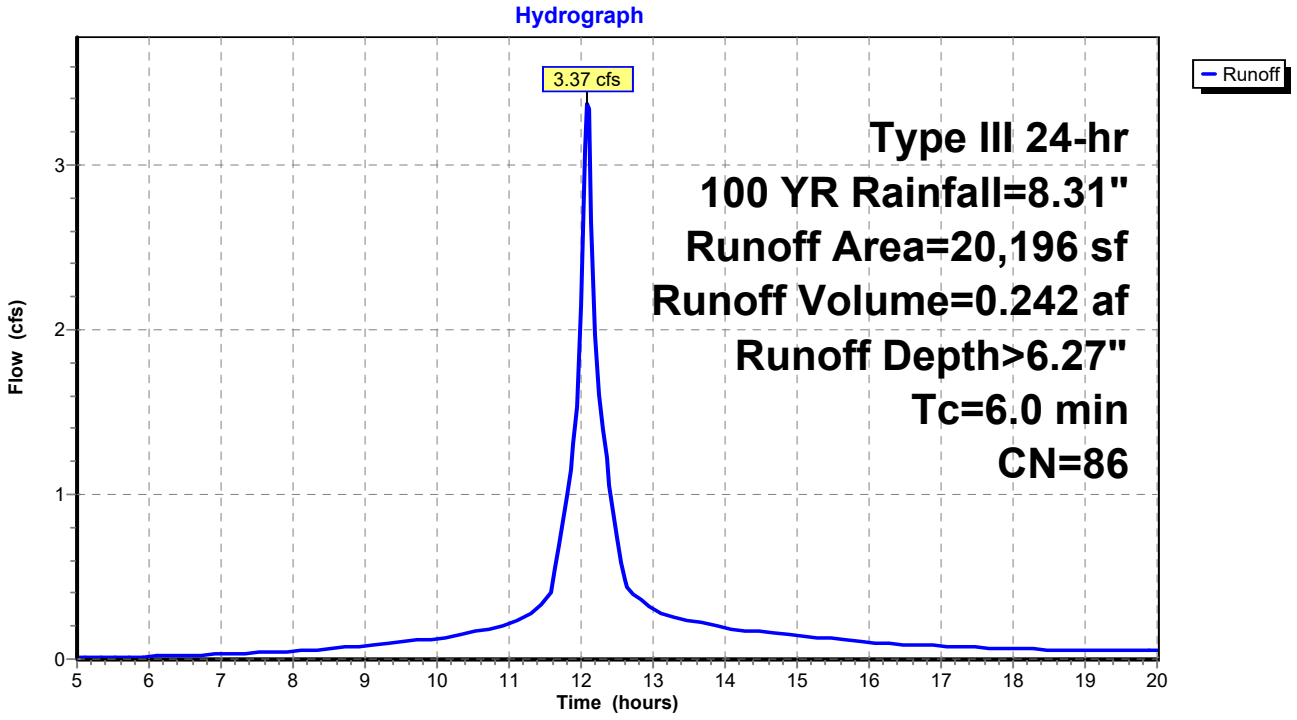
Runoff = 3.37 cfs @ 12.09 hrs, Volume= 0.242 af, Depth> 6.27"

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 YR Rainfall=8.31"

Area (sf)	CN	Description
6,829	98	Paved parking, HSG D
13,367	80	>75% Grass cover, Good, HSG D
20,196	86	Weighted Average
13,367		66.19% Pervious Area
6,829		33.81% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, S1**

Subcatchment 10: SUBCATCHMENT 10



Summary for Subcatchment 11: SUBCATCHMENT 11

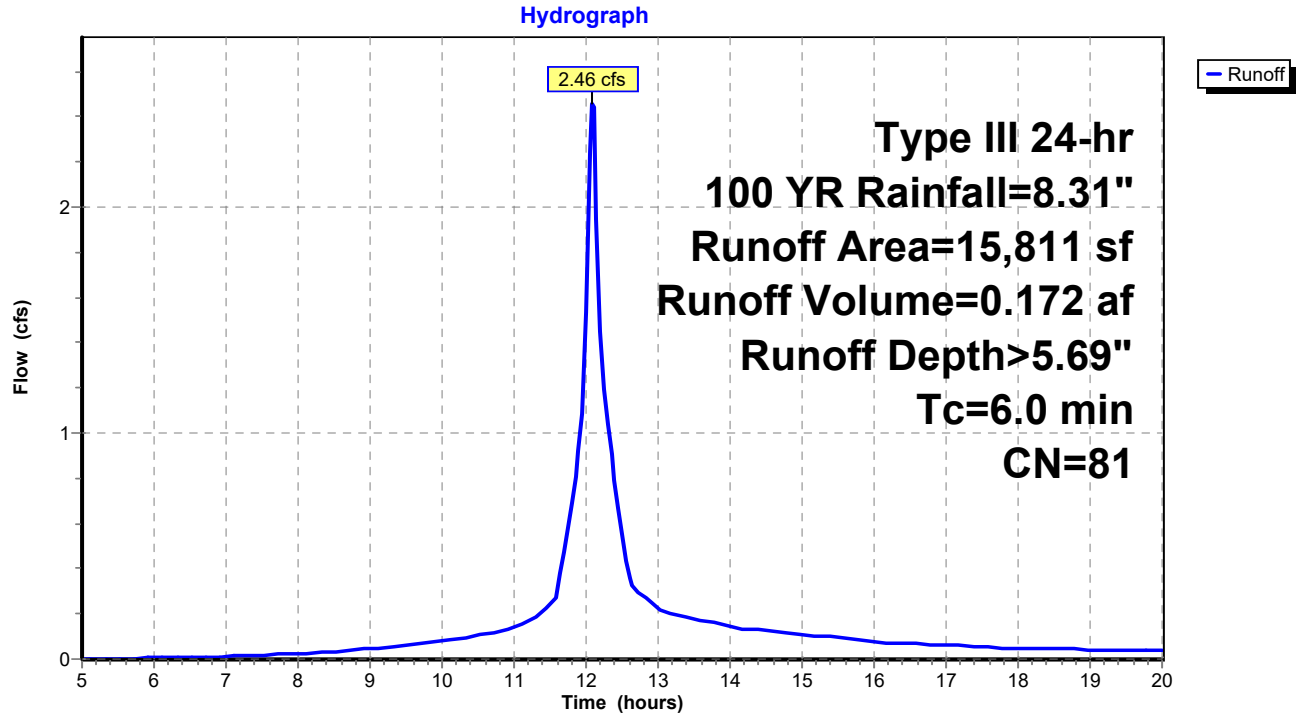
Runoff = 2.46 cfs @ 12.09 hrs, Volume= 0.172 af, Depth> 5.69"

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 YR Rainfall=8.31"

Area (sf)	CN	Description
898	98	Paved parking, HSG D
14,913	80	>75% Grass cover, Good, HSG D
15,811	81	Weighted Average
14,913		94.32% Pervious Area
898		5.68% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, S1**

Subcatchment 11: SUBCATCHMENT 11

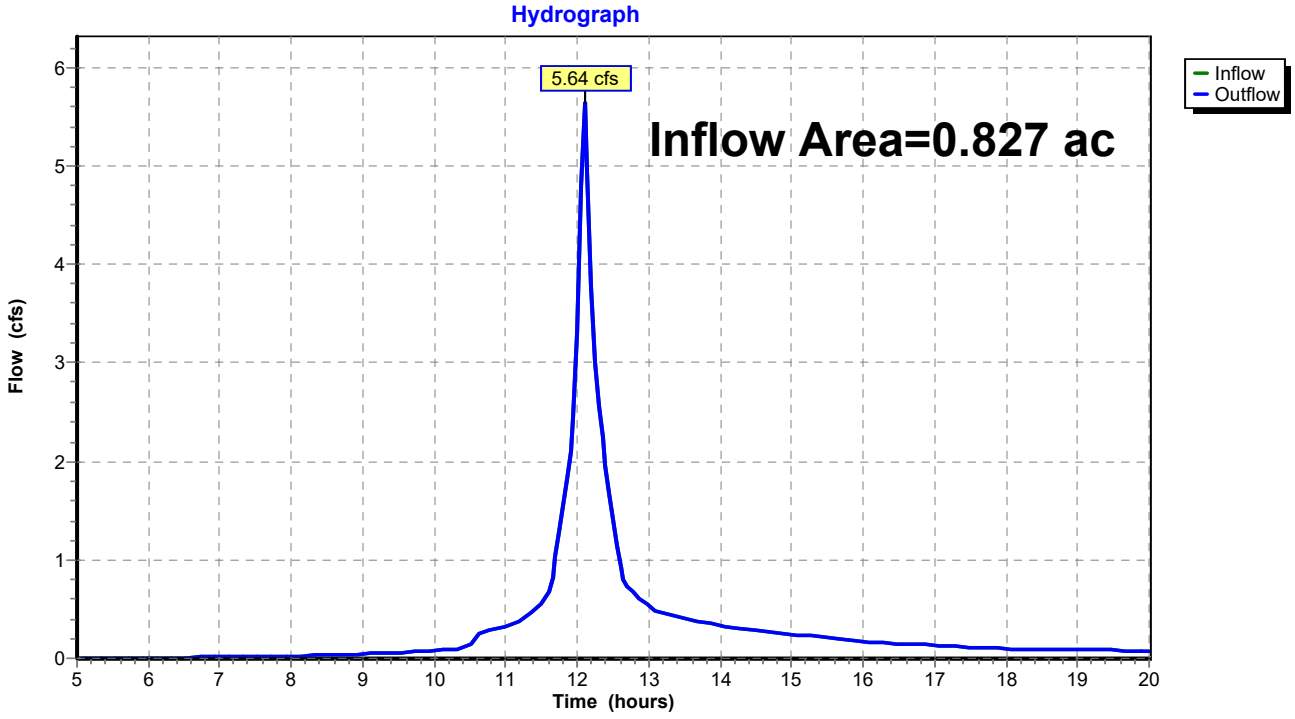


Summary for Reach 1: SDP1

Inflow Area = 0.827 ac, 21.46% Impervious, Inflow Depth > 5.50" for 100 YR event
Inflow = 5.64 cfs @ 12.10 hrs, Volume= 0.379 af
Outflow = 5.64 cfs @ 12.10 hrs, Volume= 0.379 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Reach 1: SDP1



Summary for Pond 2P: SW SUMP

Inflow Area = 0.464 ac, 33.81% Impervious, Inflow Depth > 6.27" for 100 YR event
Inflow = 3.37 cfs @ 12.09 hrs, Volume= 0.242 af
Outflow = 3.23 cfs @ 12.11 hrs, Volume= 0.220 af, Atten= 4%, Lag= 1.5 min
Discarded = 0.02 cfs @ 12.11 hrs, Volume= 0.013 af
Primary = 3.22 cfs @ 12.11 hrs, Volume= 0.207 af

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 65.86' @ 12.11 hrs Surf.Area= 1,318 sf Storage= 1,388 cf

Plug-Flow detention time= 56.8 min calculated for 0.220 af (91% of inflow)
Center-of-Mass det. time= 25.3 min (782.8 - 757.5)

Volume	Invert	Avail.Storage	Storage Description
#1	64.00'	1,582 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
64.00	203	0	0
65.00	776	490	490
66.00	1,408	1,092	1,582

Device	Routing	Invert	Outlet Devices
#1	Primary	65.50'	**6.0' long x 4.0' 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) 2.38 2.54 2.69 2.68 2.67 2.67 2.65 2.66 2.66 2.68 2.72 2.73 2.76 2.79 2.88 3.07 3.32
#2	Discarded	64.00'	**0.500 in/hr Exfiltration over Surface area**

Discarded OutFlow Max=0.02 cfs @ 12.11 hrs HW=65.85' (Free Discharge)
↑—**2=Exfiltration** (Exfiltration Controls 0.02 cfs)

Primary OutFlow Max=3.14 cfs @ 12.11 hrs HW=65.85' (Free Discharge)
↑—**1=Broad-Crested Rectangular Weir** (Weir Controls 3.14 cfs @ 1.48 fps)

Pond 2P: SW SUMP