DRAINAGE ANALYSIS REPORT

EMBLEM HYANNIS

Proposed Multifamily Residences

Located at:

35 Scudder Avenue
Hyannis, Massachusetts

Prepared for:

Quarterra

(Formerly Lennar Multifamily Communities)
99 SUMMER STREET, SUITE 701
BOSTON, MA 02110

Prepared by:

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October 11, 2022

Drainage Analysis Report

EMBLEM Hyannis
35 Scudder Ave., Hyannis, MA

October 11, 2022

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Project Overview & Site Description

Quarterra (the Proponent), formerly Lennar Multifamily Communities, proposes to redevelop an existing golf course and construct a new multi-family residential community at 35 Scudder Avenue in the village of Hyannis (see Figure 1) in the Town of Barnstable, Massachusetts, known as "Emblem Hyannis." The Redevelopment is located within walking distance of the west end of downtown Hyannis – an area that has a shortage of year-round housing options for many of Cape Cod's residents. The Redevelopment will provide a diversity of rental housing (from studio to 3-bedroom units), which is vitally needed in the area. The proposed Redevelopment will include the construction of approximately 312 new rental homes located in thirteen (13) three-story multifamily residential buildings (with 24 homes each), together with approximately 493 parking spaces, a recreational clubhouse containing a fitness center, a pool and other amenities, open green space, and improvements that are accessory to such multifamily use.

The Redevelopment site is located within the "RB" Residential Zoning District and will be serviced by municipal water and sewer utilities. No portion of the proposed Redevelopment work is located with a Zone II of public water supply well. The Redevelopment site comprises a portion of the existing 53.8-acre property, which currently includes the Resort and Conference Center at Hyannis (the "Conference Center") at 35 Scudder Avenue, and the Twin Brooks Golf Course. The existing lot will be divided to create two separate lots. One lot, comprised of approximately 14.2 acres, will include the Conference Center and is not part of the Redevelopment Site. The second lot (approximately 39.6 acres) will contain the new redevelopment project.

The Redevelopment Site is bordered by the existing Conference Center and Scudder Avenue to the north, Stewart's Creek to the east, and Joshua's Brook to the west. The main access to the new community will be via a new driveway from Scudder Avenue in the northwest corner of the Redevelopment Site. This new entrance drive will result in less pavement and impervious cover than currently exists. A secondary emergency access drive is located on the northeast side of the Site (See the Civil/Site Plans by Pesce Engineering, as revised dated Sept. 23, 2022).

The topography of the Site is relatively flat (from clearing activities to build the golf course), with some small hills, ranging in surface elevation from approximately 35 feet in elevation above mean sea level (MSL) at the high point near the center, to approximately to 5 feet along the southeastern side near Stewart's Creek. See Figure 2, showing the USGS topographic map (excerpt of the Hyannis Quad.), for the project location.

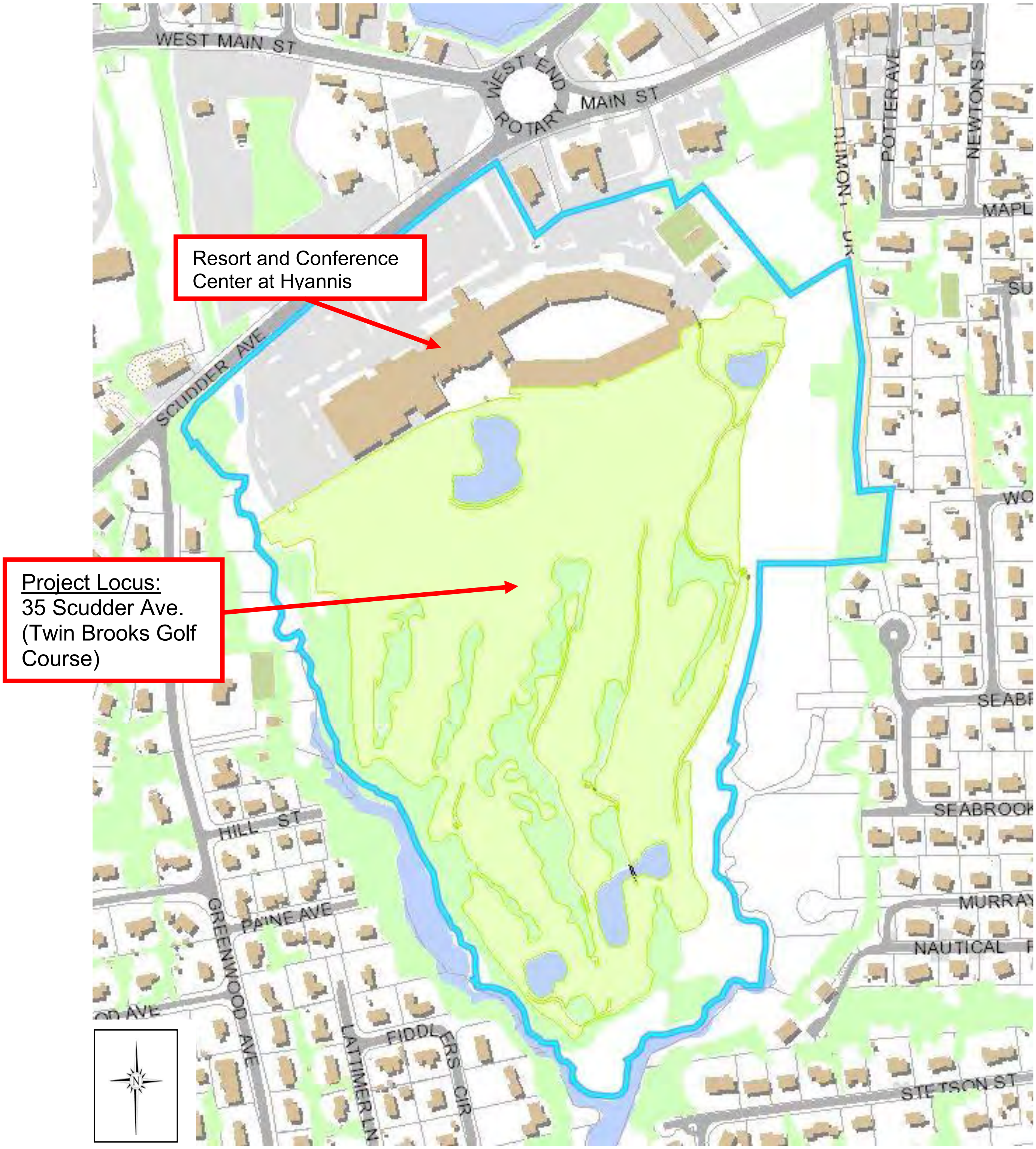

Figure 1. Project Locus – Barnstable GIS - Assessor's Map #289, Parcel #110

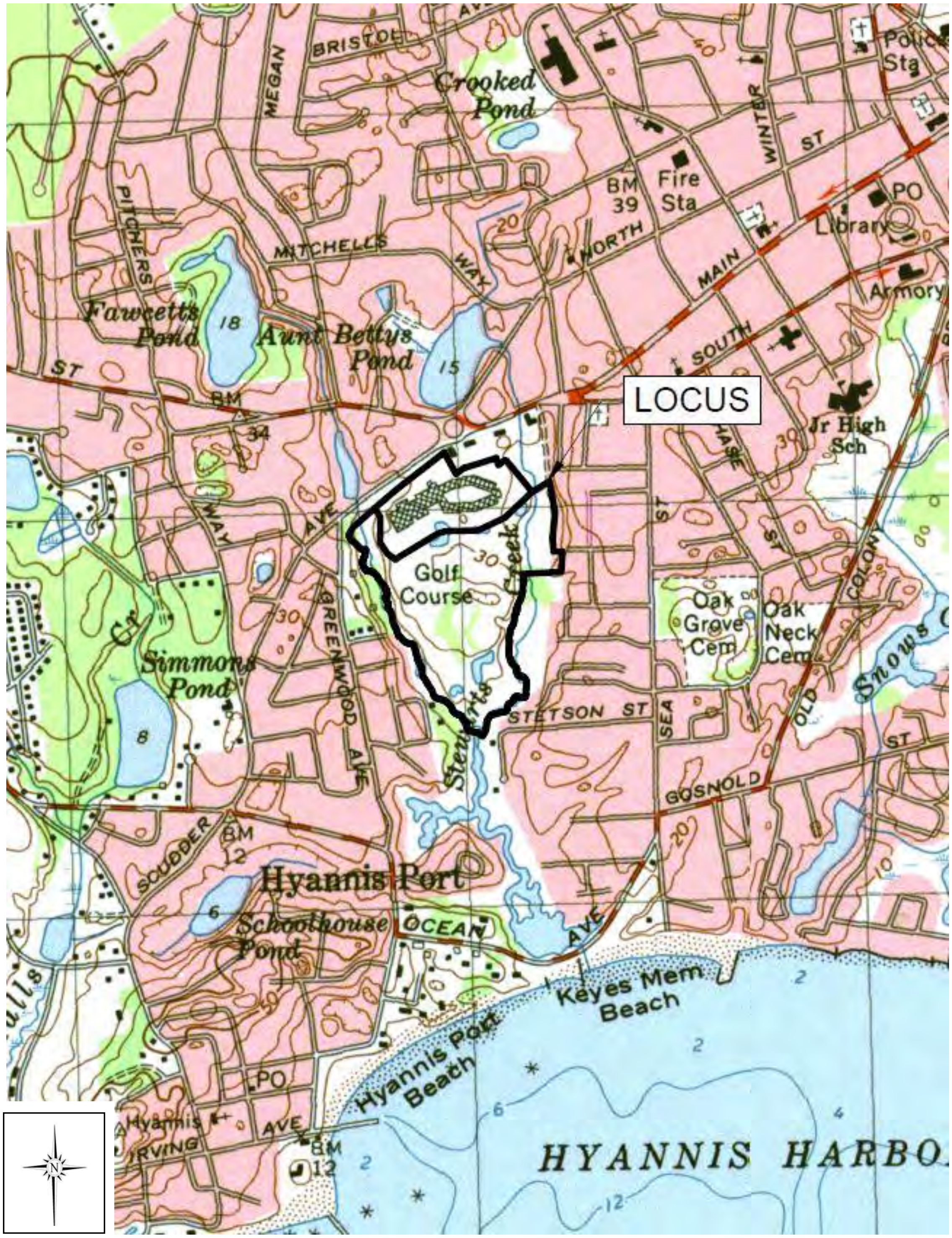

Figure 2. USGS Topographic Map (excerpt of the Hyannis Quadrangle Map)

The proposed Redevelopment Site consists of an 18-hole golf course facility with intermittent and bordering scrub oak and scrub pine tree forest, together with multiple managed turf areas (tees, fairways, and fairway roughs). Waterways and waterbodies on the Site include Joshua's Brook and Stewart's Creek which are perennial streams and 4 ponds, some of which were artificially constructed as part of the golf course). Wetland areas include vegetated wetlands bordering on the streams, coastal flood plain, and coastal bank, which predominate the perimeter areas of the gold course.

General Soils Information

Figure 3. USDA/NRCS Soil Map

Soil Map—Barnstable County, Massachusetts | 35 Scudder Ave., Hyannis, MA

Map Unit Legend

Soils in new development area

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
54A	Freetown and Swansea mucks, coastal lowland, 0 to 1 percent slopes	2.2	2.6%
55A	Freetown coarse sand, 0 to 3 percent slopes, sanded surface	5.9	6.9%
66A	Ipswich - Pawcatuck - Matunuck complex, 0 to 2 percent slopes, very frequently flooded	8.2	9.7%
252A	Carver coarse sand, 0 to 3 percent slopes	2.7	3.2%
252B	Carver coarse sand, 3 to 8 percent slopes	52.6	61.8%
252D	Carver coarse sand, 15 to 35 percent slopes	7.3	8.6%
602	Urban land	4.3	5.0%
607	Water, saline	1.9	2.3%
Totals for Area of Interest		**85.1**	**100.0%**

Figure 3 - Soil Map Unit Legend

Existing soil classifications and hydrologic soil groups for the site were obtained from the USDA Soil Conservation Service, Soil Survey of Barnstable County, Mass., 1993. Figure 3 above shows the soils that are mapped for this site. Additional soils information was also obtained from the Geotechnical Report prepared by LGCI, dated September 24, 2020 (see Appendix A).

The site soils are comprised primarily of Carver coarse sand (252B) for the upland areas, and as either Freetown coarse sand or Freetown and Swansea mucks for wetland areas along both stream corridors (see Figure 3). An excerpt from the Barnstable County Soil survey provides the following soil description for Carver Coarse Sand

> ***Carver Coarse Sand (3-8% slopes)***
>
> *This very deep, gently sloping, excessively drained soil is in broad areas and on the tops of knobs on outwash plains. It makes up approximately 10.3 percent (26,175 acres) of the survey area. It is mapped mainly in the Carver general soil map unit. Areas are irregular in shape and range from 5 to 1,000 acres in size.*
>
> *Permeability is very rapid in the subsoil and substratum of the Carver soil. Available water capacity is very low. Depth to the seasonal high water table is more than 6 feet.*
>
> *Most areas are used as woodland. Many areas have been developed for homesites, and a few areas are used as cropland.*

From the soil test pits performed in August 2020 for the geotechnical investigation, the parent soils (C Horizon) for the redevelopment area were clean medium to coarse sands and some gravel (see pages 4-7 & Appendix B test pit logs of the LGCI geotechnical report). Pesce Engineering observed the majority of these test pits, and found no soil mottling evident, and no groundwater was encountered.

Consulting the Barnstable Groundwater Contour Map (Barnstable GIS – 1992), the estimated elevation of the groundwater table is 5-8 feet above mean sea level (moving south to north on the site). Looking at the Existing Conditions Plan (Sheet 2 of 17 of the civil plans), the elevation of the pond on the northeast corner of the site is approximately 9.0 ft., and the pond in the southeast corner is approximately 3.5 ft. Following the USGS Cape Cod Method for estimating seasonal high groundwater elevation, the water level adjustment is 3.3 ft. (Index Well – MIW 29, Zone B, for Aug 2020 when the test pits were witnessed). Therefore, the Estimated Seasonal High Groundwater Elevation (ESHGWE) for this site ranges from 6.8 ft. – 12.3 ft from south to north on the site in the areas for the proposed Infiltration Basins 1 & 2 respectively. The bottom elevations for these 2 infiltration basins are designed as 10.5 ft. (Inf. Basin 1 - south) and 15.50 ft. (Inf. Basin 2 - north). This provides a separation from the bottom of the infiltration basins to the ESHGWE of 3.7 ft. & 3.2 ft. for Infiltration Basins 1 & 2 respectively.

NOTE: Additional soil test pit excavations will be conducted in the actual infiltration basin locations to confirm the soil and groundwater conditions at these sites prior to construction start. This was not performed at this time in order to not interfere with existing golf operations.

Finally, the medium to coarse sand and gravel soils exhibit a hydrological soil group classification of “A” (HSG A), which was used in the follow-on calculations.

Stormwater Management Analysis

Existing Conditions

The site consists of the existing Twin Brooks Golf Course, and has no formal or structural stormwater management system. Stormwater runoff currently flows uncontrolled from the higher topography along the north and center of the parcel (elevation 28’-32’), to the lower elevations in the southeast and southwest to the perennial streams (elevation 5’ – 16’) along the golf course perimeter.

Existing Conditions Drainage Analysis

The existing conditions were modeled using HydroCAD® software, which combines USDA Soil Conservation Service hydrology and hydraulic techniques (commonly known as SCS TR-55 and TR-20) to generate hydrographs. The *Existing Conditions Drainage Area Plan* and the Existing Conditions HydroCAD calculations are provided in the Appendix B of this report. The existing conditions stormwater runoff was evaluated for the 2, 10, 25 & 100-year, Type III, 24-hour storm events.

Proposed Conditions - Methodology & Design Approach

Our design approach is to provide the required DEP compliant stormwater management system for the new impervious surfaces, by collecting and treating the accumulated runoff from the parking areas and providing proper infiltration. The drainage analysis broke down the site area into 3 design points as follows:

1. Design Point 1 – the main entrance area on the north
2. Design Point 2 – the development area draining to the south and west to Infiltration Basin 1 and Joshua’s Brook
3. Design Point 3 – the development area draining to the south and east to Infiltration Basin 2 and Stewart’s Creek

For Design Point 1, the proposed new entrance represents a reduction of impervious paved surfaces of approximately 19,126 sf, as compared to the existing condition. The proposed stormwater management system will consist of deep-sump catch basins (with outlet hoods), flowing to a Contech® CDS Water Quality Unit (WQU - hydrodynamic separator), which allows for the removal of most of the total suspended solids (TSS) in the stormwater.

For Design Points 2 & 3 the proposed stormwater management system will consist of deep-sump catch basins (with outlet hoods), or a Bioretention area (with deep sump outlet structure), connected to piping to discharge to an infiltration basin, constructed with a sediment forebay. All the proposed stormwater management system is sized for the 100-yr storm, and will adequately allow for the treatment of the first ½ - inch of runoff, or the 'first flush" from a storm event.

Additionally, in light of the reality of the changing climate conditions, the design storm events were based on the current NOAA Atlas 14, Volume 10, Version 3, Point Precipitation Frequency Estimates for Hyannis, MA (see Appendix C). These design storm events are as follows:

Design Storm Events

Storm Event	2-Yr. Storm	10-Yr. Storm	25-Yr. Storm	100-Yr. Storm
24-hr. Precipitation (in.)	3.39	4.94	5.91	7.41

Proposed Conditions Drainage Analysis

The proposed conditions were also modeled using HydroCAD®, and again, stormwater runoff was evaluated for the 2, 10, 25 & 100-year, Type III, 24-hour storm events. This stormwater model was used to size the 2 main infiltration basins and roof drain infiltration systems as well. The proposed conditions drainage areas are shown on the *Proposed Drainage Areas Plan* in Appendix D, together with the associated proposed conditions calculations.

The proposed stormwater management system **provides no increase** of the stormwater peak rate of runoff or peak volume from the site, as compared to the existing conditions, for all storm events. The following tables shows the comparison of the pre & post development peak flowrates and volumes.

Table 1 Pre & Post Development Peak Flow Rates

	Peak Flow Rates (cfs)							
	2-year		**10-year**		**25-year**		**100-year**	
	Pre	Post	Pre	Post	Pre	Post	Pre	Post
DP-1 (Ex. Stormwater Area)	2.94	0.73	6.90	2.43	9.69	3.72	14.26	5.92
DP-2 (Joshua's Brook)	0.00	0.00	0.08	0.04	0.29	0.19	1.95	1.16
DP-3 (Stewart's Creek)	0.00	0.00	0.08	0.06	0.32	0.29	1.63	1.36

Table 2 Pre & Post Development Peak Volumes

	Peak Volume (acre-ft.)							
	2-year		**10-year**		**25-year**		**100-year**	
	Pre	Post	Pre	Post	Pre	Post	Pre	Post
DP-1 (Ex. Stormwater Area)	0.264	0.072	0.569	0.183	0.785	0.268	1.145	0.413
DP-2 (Joshua's Brook)	0.000	0.000	0.050	0.028	0.155	0.084	0.446	0.225
DP-3 (Stewart's Creek)	0.000	0.000	0.047	0.036	0.129	0.098	0.476	0.293

As a final factor of safety in the infiltration basin design, even though site soils observed were medium to coarse sand and highly permeable, a Rawls rate of exfiltration (see Vol. 3, Ch. 1, Pg. 22 of the MA Stormwater Management Handbook) was decreased from 8.27 in./hr. to 2.41 in./hr. We believe that this conservative design also enhances the ability of the infiltration systems to perform well for all storm events over time.

For treatment of total suspended solids (TSS), Appendix E shows the TSS removal calculations for the proposed conditions for all 3 design points. These calculations show a minimum TSS removal of ≥ 90% for this project.

Stormwater Operation & Maintenance (O&M) Plans
Appendix F contains both a Construction Period Pollution Prevention Plan and a Stormwater O&M Plan, along with manufacturer's information for the proper maintenance of the Contech® CDS WQU. Proper routine inspection and maintenance recommendations are included in this manufacturer's guide/manuals.

In summary, the results of this stormwater analysis indicate that the sizing of the proposed infiltration systems is adequate for all design storm events. The proposed peak rates of runoff are less than the existing peak rates of runoff, and do not create any off-site flooding impacts. Additionally, the proposed design will provide excellent TSS removal, and infiltration & recharge of runoff.

DEP STORMWATER MANAGEMENT STANDARDS COMPLIANCE

Since the proposed activity represents a redevelopment project, according to the MA Stormwater Handbook, Volume 2, Chapter 3, Standard 7:

> ***"Standard 7: A redevelopment project is required to meet the following Stormwater Management Standards only to the maximum extent practicable: Standard 2, Standard 3, and the pretreatment and structural stormwater best management practice requirements of Standards 4, 5, and 6. Existing stormwater discharges shall comply with Standard 1 only to the maximum extent practicable. A redevelopment project shall also comply with all other requirements of the Stormwater Management Standards and improve existing conditions."***

Per the above reference, the following information is provided to demonstrate compliance with these regulations, and good engineering practice (please find the completed DEP Checklist for Stormwater Report in Appendix H).

Standard 1: *No New Untreated Discharges*

There are no new untreated discharges.

Standard 2: *Peak Rate Attenuation*
Post-development peak discharges (uncontrolled) do not exceed pre-development rates (uncontrolled) for the 2, 10, 25 & 100-year storms.

***Standard 3**: Recharge*

Infiltration BMP's have been designed using the "static" method to infiltrate the Required Recharge Volume. Based on soil test pits performed, the soils are medium – coarse sand, and represent a hydrologic soil group classification of "A," and accordingly a 0.60-inch Target Depth Factor (F) is used

Recharge Volume Required

Rv = F x Imp

Rv = Recharge Volume required (cubic feet – cf)
F = Target Depth Factor = 0.60 inch
Imp = Impervious area = 8.85 acres (area of paved & concrete surfaces & roofs)

Rv = (F/12) x Impervious area

Rv = (0.60/12) x (8.85 ac x 43,560 sf/acre)

Rv = 19,275.3 cf

The Required Recharge Volume = *19,275.3 cf*, and from the HydroCAD calculations, the volume provided from the 2 infiltration basins alone are as follows (Note: additional infiltration volume is provided in the roof drain infiltration systems):

- Infiltration Basin 1 Available Storage = 61,135 cf
- Infiltration Basin 2 Available Storage = 37,352 cf

Total 98,487 cf

So, more than a total of 98,487 cf of recharge volume is provided, which exceeds the 19,275.3 cf required**: OK**√

Calculations for Drawdown in 72 hours (T) – For Infiltration Basins 1 & 2

$$T = Rv / (K \times A_{bottom})$$

T (drawdown hrs.)
Rv (storage volume cf)
K (saturated hydraulic conductivity) = 8.27 in./hr. *(Rawls Rate - A soils)*
A_{bottom} (bottom area of inf. basin sf)

Infiltration Basin 1
T (drawdown) = 61,135 cf/(8.27/12) X 8,346 sf')

T (Inf. Basin 1) = 10.63 hrs < 72 hours: OK√

Infiltration Basin 2
T (drawdown) = 37,352 cf/(8.27/12) X 7,983 sf')

T (Inf. Basin 2) = 6.79 hrs < 72 hours: OK√

Standard 4: *Required Water Quality Volume (V_{WQ})*

V_{WQ} = (D_{WQ}/12 inches/foot) * (A_{IMP} * 43,560 square feet/acre)

V_{WQ} = *Required Water Quality Volume* (in cubic feet)
D_{WQ} = Water Quality Depth (0.5" or 1.0")
A_{IMP} = Impervious Area treated (in acres)

For D_{WQ}: Hydrologic Group A Soils - Use 1.0" of runoff (for exfiltration to soils with infiltration rate greater than 2.4 in/hr.)

For Infiltration Basin 1

V_{WQ} = 1.0"/12 X (3.12 ac x 43,560 sf/ac)

V_{WQ} required = 11,325.6 cf

Water Quality volume provided in the sediment forebay & basin = 61,135 cf therefore OK√

For Infiltration Basin 2

V_{WQ} = 1.0"/12 X (2.52 ac x 43,560 sf/ac)

V_{WQ} required = 9,147.6 cf

Water Quality volume provided in the sediment forebay & basin = 37,352 cf therefore OK√

For the main entrance area (Design Point 1)

For the new main entrance area, this project will use a proprietary stormwater treatment system via the use of Contech® CDS water quality treatment unit (Model 1515-3). We have followed the DEP guidance for calculations to check the sizing of these units based on the following reference, which is included in Appendix G:

Massachusetts Department of Environmental Protection Wetlands Program Standard Method to Convert Required Water Quality Volume to a Discharge Rate for Sizing Flow Based Manufactured Proprietary Stormwater Treatment Practices (Sept 10, 2013)

Because the site does not drain to, or is located near a critical area, the water quality volume (WQV) used for this calculation is = ½ -inch. This method follows the following equation:

$Q_{0.5}$ = (qu)(A)(WQV)

Where:

$Q_{0.5}$ = flow rate associated with first ½ -inch of runoff

qu = the unit peak discharge, in csm/in.

A = impervious surface drainage area (in square miles)

WQV = water quality volume in watershed inches (½ -inch in this case)

The **qu** is derived from the time of concentration (Tc) and consulting Figure 2 of the referenced DEP guidance. The Impervious Area is found for each subcatchment area. The following table shows the calculations for **$Q_{0.5}$:**

Location with a WQU	Time of Concentration (Tc)	qu (unit peak discharge)	Impervious Area (ac)	$Q_{0.5}$ (cfs)
Entrance (DP 1)	5 min = .083 hrs	773	0.46	**0.28**

From the Contech Product Flow Rates (see below page), the <u>Contech CDS 1515-3 can handle a treatment flowrate of 1.0 cfs, which exceeds the required $Q_{0.5}$ calculated above.</u>

Product Flow Rates

CASCADE

Model	Treatment Rate (cfs)	Sediment Capacity[1] (CF)
CS-4	2.00	19
CS-5	3.50	29
CS-6	5.60	42
CS-8	12.00	75
CS-10	18.00	118

CDS

Model	Treatment Rate[2] (cfs)	Sediment Capacity[1] (CF)
1515-3	1.00	14
2015-4	1.40	25
2015-5	1.40	39
2015-6	1.40	57
2020-5	2.20	39
2020-6	2.20	57
2025-5	3.20	39
2025-6	3.20	57
3020-6	3.90	57
3025-6	5.00	57
3030-6	5.70	57
3035-6	6.50	57
4030-8	7.50	151
4040-8	9.50	151

VORTECHS

Model	Treatment Rate (cfs)	Sediment Capacity[3] (CF)
1000	1.60	16
2000	2.80	32
3000	4.50	49
4000	6.00	65
5000	8.50	86
7000	11.00	108
9000	14.00	130
11000	17.5	151
16000	25	192

STORMCEPTOR STC

Model	Treatment Rate (cfs)	Sediment Capacity[1] (CF)
STC 450i	0.40	46
STC 900	0.89	89
STC 2400	1.58	205
STC 4800	2.47	543
STC 7200	3.56	839
STC 11000	4.94	1086
STC 16000	7.12	1677

Water Quality Unit Selected for Main Entrance (DP-1) Model 1515-3

1 Additional sediment storage capacity available – Check with your local representative for information.
2 Treatment Capacity is based on laboratory testing using OK-110 (average D50 particle size of approximately 100 microns) and a 2400 micron screen.
3 Maintenance recommended when sediment depth has accumulated to within 12-18 inches of the dry weather water surface elevation.

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Sediment Forebay Sizing

Following the guidance contained in the DEP Stormwater Management Handbook, page 15, Vol. 2, Ch. 2, for the sizing of sediment forebays:

Volume Required = 0.1”/ impervious acre

For Infiltration Basin 1

Vol. req’d. = 0.1”/12 x 3.12 ac x 43,450 sf/ac

Vol. req’d. = 1,132.6 cf

Volume provided: Sediment Forebay Volume = 1,165 cf
Bioretention Area 1 Volume = 448 cf
Total 1,613 cf

The volume provided of 1,612 cf > than the 1,132.6 cf required**: OK**√

For Infiltration Basin 2

Vol. req’d. = 0.1”/12 x 2.52 ac x 43,450 sf/ac

Vol. req’d. = 914.8 cf

Volume provided: Sediment Forebay Volume = 895 cf
Bioretention Area 2 Volume = 1,433 cf
Bioretention Area 3 Volume = 695 cf
Total 3,023 cf

The volume provided of 3,023 cf > than the 914.8 cf required**: OK**√

Groundwater Mounding Analysis

Since the elevation of the bottom of the 2 Infiltration basins is less than 4 ft. from the estimated elevation of the seasonal high groundwater, we have performed the following groundwater mounding analysis using a spreadsheet solving the Hantush (1967) equation for ground-water mounding beneath an infiltration basin, and was made available to the general public by the USGS for those wishing to replicate values documented in the USGS Scientific Investigations Report 2010-5102:

Infiltration Basin 1 (see next page):

Infiltration Basin 1

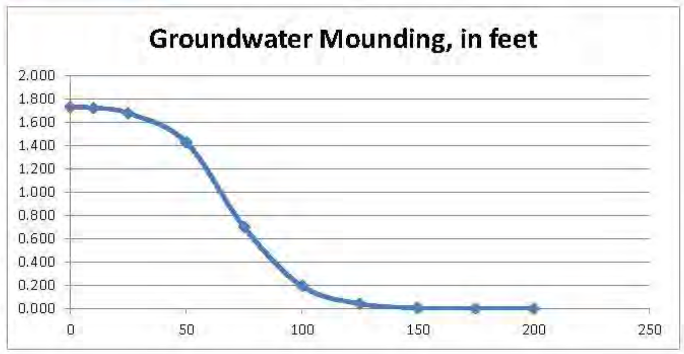
Input Values

Value	Parameter	Description
16.5400	*R*	Recharge (infiltration) rate (feet/day)
0.300	Sy	Specific yield, Sy (dimensionless, between 0 and 1)
55.00	K	Horizontal hydraulic conductivity, Kh (feet/day)*
70.000	x	1/2 length of basin (x direction, in feet)
32.000	y	1/2 width of basin (y direction, in feet)
0.041	t	duration of infiltration period (days)
100.000	hi(0)	initial thickness of saturated zone (feet)
101.730	h(max)	maximum thickness of saturated zone (beneath center of basin at end of infiltration period)
1.730	Δh(max)	maximum groundwater mounding (beneath center of basin at end of infiltration period)

Max. GW Mounding = 1.73 ft.

Ground-water Mounding, in feet	Distance from center of basin in x direction, in feet
1.730	0
1.724	10
1.678	25
1.429	50
0.701	75
0.199	100
0.043	125
0.009	150
0.002	175
0.001	200

Re-Calculate Now



Infiltration Basin 2

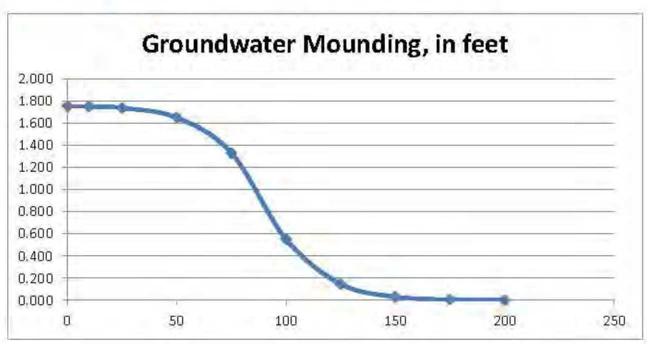
Input Values

Value	Parameter	Description
16.5400	*R*	Recharge (infiltration) rate (feet/day)
0.300	Sy	Specific yield, Sy (dimensionless, between 0 and 1)
55.00	K	Horizontal hydraulic conductivity, Kh (feet/day)*
90.000	x	1/2 length of basin (x direction, in feet)
32.000	y	1/2 width of basin (y direction, in feet)
0.041	t	duration of infiltration period (days)
100.000	hi(0)	initial thickness of saturated zone (feet)
101.754	h(max)	maximum thickness of saturated zone (beneath center of basin at end of infiltration period)
1.754	Δh(max)	maximum groundwater mounding (beneath center of basin at end of infiltration period)

Max. GW Mounding = 1.75 ft.

Ground-water Mounding, in feet	Distance from center of basin in x direction, in feet
1.754	0
1.752	10
1.709	25
1.663	50
1.333	75
0.552	100
0.147	125
0.031	150
0.005	175
0.001	200

Re-Calculate Now



Disclaimer

So, the estimated groundwater mounding from the 2 detention basins is only 1.75 ft. or less, and this mounding drops to approximately 0.147 ft. (1.8"), or less, as you approach 125 ft. away from each basin. This represents a minimal and localized mounding that will not affect the performance of the stormwater management system.

Standard 5: *Land Uses With Higher Potential Pollutant Loads (LUHPPLs)*
Not applicable - this project does not involve a land use with higher potential pollutant loads in stormwater:

Standard 6: *Critical Areas (*Zone II of a public water supply)

Not Applicable - This site is not located within a critical area or a Zone II.

Standard 7: *Redevelopments and Other Projects Subject to the Standards only to the maximum extent practicable.*

This project provides a robust stormwater management system and is sized for the 100-yr. storm, and complies with the DEP Stormwater Management Policy. There are no new discharges that cause or contribute to erosion of wetlands and waters of the Commonwealth.

Standard 8: *Construction Period Pollution Prevention and Erosion and Sedimentation Control.*

See attached Construction Period Pollution Prevention and Erosion and Sedimentation Control Plan in Appendix F.

Standard 9: *Operation and Maintenance Plan*

See attached Stormwater Management System O & M Plan in Appendix F

Standard 10: *Prohibition of Illicit Discharges*

This project does not involve any potential illicit discharges. As required, the Illicit Discharge Compliance Statement will be signed by the applicant and submitted prior to the start of construction.

REFERENCES

HydroCAD® Stormwater Analysis Software, HydroCAD Software Solutions, 2009.

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U.S. Soil Conservation Service, 1986. *Urban Hydrology for Small Watersheds (Technical Releases 55 & 20)*

APPENDIX A

Geotechnical Report by
LGCI, dated September 24, 2020

September 24, 2020

Mr. Dan Lee
Division President, Boston
LMC
99 Summer Street, Suite 701
Boston, MA 02110
Phone: (561) 596-5818
Mobile: (857) 343-8240
E-mail: dan.lee@livelmc.com

Re: **Geotechnical Report**
Proposed Residential Development
Hyannis, Massachusetts
LGCI Project No. 2026-Rev. 2

Dear Mr. Lee:

Lahlaf Geotechnical Consulting, Inc. (LGCI) has completed a geotechnical study for the proposed residential development in Hyannis, Massachusetts. We are submitting this report electronically, please notify us if you need a hard copy.

The soil samples from our explorations are currently stored at LGCI for further analysis, if requested. Unless notified otherwise, we will dispose of the soil samples after three months.

Thank you for choosing LGCI as your geotechnical engineer.

Very truly yours,

Lahlaf Geotechnical Consulting, Inc.

Abdelmadjid M. Lahlaf, Ph.D., P.E.
Principal Engineer

Lahlaf Geotechnical Consulting, Inc.

GEOTECHNICAL REPORT
PROPOSED RESIDENTIAL DEVELOPMENT
HYANNIS, MASSACHUSETTS
LGCI Project No. 2026-Rev. 2
September 1, 2020
Revised September 24, 2020

Prepared for:

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GEOTECHNICAL REPORT
PROPOSED RESIDENTIAL DEVELOPMENT
HYANNIS, MASSACHUSETTS
LGCI Project No. 2026-Rev. 2
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Prepared for:

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1. PROJECT INFORMATION

1.1 Project Authorization

This geotechnical report presents the results of the subsurface explorations and a geotechnical evaluation performed by Lahlaf Geotechnical Consulting, Inc. (LGCI) for the proposed residential development in Hyannis, Massachusetts. We performed our services in general accordance with the scope described in our proposal No. 20054 dated July 20, 2020, and in accordance with the terms and conditions of the Consultant Due Diligence Agreement dated July 21, 2020 signed by Mr. Dan Lee of LMC on the same date.

1.2 Purpose and Scope of Services

The purpose of our geotechnical services was to perform subsurface explorations at the site and to provide foundation design and construction recommendations. LGCI performed the following services:

- Coordinated the location of our explorations with Pesce Engineering & Associates, Inc. (PEA), the project Civil Engineer.

- Provided a field engineer to walk the site with PEA to adjust the exploration locations staked by the project surveyor, and notified Dig Safe Systems Inc. (Dig Safe) and the Town of Hyannis for utility clearance.

- Engaged an excavation subcontractor to excavate ten (10) test pits at the site.

- Engaged a drilling subcontractor to advance one (1) deep boring at the site.

- Provided an LGCI geotechnical engineer to observe the test pits and boring, describe the soil samples and prepare field logs.

- Submitted two (2) soil samples for laboratory testing.

- Prepared this geotechnical report containing the results of our subsurface explorations and our recommendations for foundation design and construction.

LGCI did not perform environmental services for this project. LGCI did not perform an assessment to evaluate for the presence or absence of hazardous or toxic materials above or below the ground surface at or around the site. Any statement about the color, odor, or the presence of suspicious materials included in our boring log or report were made by LGCI for information only and to support our geotechnical services. No environmental recommendations and/or opinions are included in this report.

Our scope does not include attending meetings, reviewing specifications and drawings, or performing field services. LGCI would be pleased to perform these services when needed. Recommendations for stormwater management, erosion control, pavement design, slope stability analyses, site specific liquefaction analysis, and detailed cost or quantity estimates are not included in our scope of work.

1.3 Site Description

LGCI's understanding of the site is based on our observations at the site, and on the following drawing:

- "Concept Site Plan at 35 Scudder Avenue in Hyannis, Massachusetts (Barnstable County)," (Concept Site Plan) prepared by PEA, dated July 13, 2020, and provided to LGCI by PEA via e-mail on July 17, 2020.

The site of the proposed development is located at 35 Scudder Avenue in Hyannis, Massachusetts as shown in Figure 1. The site is currently used as a Golf Course (Twin Brooks Golf Course). The site has frontage on Scudder Avenue, and is bordered by Scudder Avenue and an existing resource and conference center building on the northern side, by two brooks on the eastern and western sides, and by wet areas and private residential properties on the southern side.

An existing grading plan of the site was not available at the time of this report. However, based on our field observation, the grades at the site are slightly variable, typical with a golf course.

1.4 Project Description

Our understanding of the proposed construction is based on our discussions with PEA and on the Concept Site Plan.

We understand that the proposed construction will consist of thirteen apartment buildings and a club house. We understand that the size layout and locations of the proposed buildings are preliminary. The proposed construction will include driveways and parking lots. Access to the proposed development will be from a driveway connecting to Scudder Avenue on the western side of the resource and conference center.

Based on information provided to us by PEA, the proposed construction is outside of the buffer zones of nearby brooks and wetlands.

The proposed finished floor elevations and exterior grades have not been established at this time. We understand that the proposed buildings will be designed to require minor cuts and fill and will not have basements.

1.5 Elevation Datum

The ground surface elevations at our test pit and boring locations were provided to us by PEA via e-mail on August 13, 2013. We understand that the elevations are referenced to the National American Vertical Datum of 1988 (NAVD 88) and are in feet.

2. SITE AND SUBSURFACE CONDITIONS

2.1 Surficial Geology

LGCI reviewed a Surficial Geological Map titled: "Surficial Materials Map of the Hyannis Quadrangle, Massachusetts," prepared by Stone, B.D., Stone, J.R., and DiGiacomo-Cohen, M.L., for U.S. Geological Survey, Open File Report 2006-1260-F, 2018.

The Surficial Geological Map indicates that the natural soils in the general vicinity of the site consist of coarse deposits and swamp deposits.

The coarse deposits include gravel deposits, sand and gravel deposits, and sand deposits. The gravel deposits are composed of at least 50 percent gravel-size clasts, cobbles, and boulders. The sand and gravel deposits generally range from 25 to 50 percent gravel particles and from 50 to 75 percent sand particles. The sand deposits are composed mainly of very coarse to fine sand. Coarser layers may contain up to 25 percent gravel, and finer layers may contain fine sand, silt, and clay.

The swamp deposits are shown around the eastern, southern, and western sides along the streams. The swamp deposits are described as organic muck and peat and contain little sand, silt, and clay. The swamp deposits generally overly glacial deposits or bedrock and sometime glacial till. The swamp deposits are described to be at least 3 feet thick but are generally less than 10 feet thick.

The Surficial Geological Map of the site is shown in Figure 2.

2.2 Previous Explorations by Others

PEA provided us with the logs of eight (8) soil borings and sketch showing the profiles for nine (9) test pits performed by Briggs Engineering and Testing at the site in 2016. The previous borings and test pits generally indicated the presence of 1 to 4.5 feet of organic soil overlying natural sand. In one (1) test pit, excavated outside the limits of the site, the organic soil extended to a depth of about 6.5 feet beneath the ground surface.

The logs and locations of the previous explorations are included in Appendix A.

2.3 LGCI's Test Pits and Boring

2.3.1 General

LGCI coordinated our exploration locations with PEA who arranged to have the test pit and boring locations staked in the field by the project surveyor. LGCI visited the site to adjust the staked locations to be outside of the green areas. LGCI notified Dig Safe and the Town of Hyannis for utility clearance prior to starting our explorations at the site.

Unless notified otherwise, we will dispose of the soil samples obtained during our explorations after three months.

2.3.2 LGCI Explorations

2.3.2.1 Test Pits

LGCI engaged Northern Drill Service, Inc. (NDS) of Northborough, Massachusetts to excavate ten (10) test pits at the site (TP-1 to TP-6, TP-8, TP-9, TP-B-2, and TP-B-3) on August 18, 2020. The test pits were excavated using a John Deere 310 SL backhoe, and extended to depths ranging between 8 and 12 feet beneath the ground surface. Test pit TP-7 was not excavated due to access issues. Test pits TP-B-2 and TP-B-3 were substituted for borings B-2 and B-3, respectively as these locations were easier to access with a backhoe.

An LGCI engineer observed and logged the test pits in the field.

Upon completion, the test pit excavations were backfilled with the excavated material which was placed in about 18-inch lifts and tamped with the excavator bucket.

2.3.2.2 Soil Boring

LGCI engaged NDS to advance one (1) boring (B-4) at the site on August 17, 2020. The boring was advanced with a Mobile B-48 track rig using drive and wash techniques using a 4-inch casing. Boring B-4 extended to a depth of 60 feet beneath the ground surface. Upon completion, the borehole was backfilled with the soil cuttings. Our scope was to advance four (4) borings to depths of 20 feet each; however, because of heavy rain before the start of our explorations, the ground was soft, and only one (1) boring was performed.

NDS performed Standard Penetration Tests (SPT) during drilling and obtained split spoon samples in the boring with an automatic hammer at typical depth intervals of 2 feet or 5 feet as noted on the boring log in general accordance with ASTM D-1586.

An LGCI engineer observed and logged the boring in the field.

2.3.3 Test Pit and Boring Logs and Locations

The test pit and boring locations are shown in Figure 3. Appendix B contains LGCI's test pits logs. Appendix C contains LGCI's boring log. Tables 1 and 2 include summaries of LGCI's test pits and boring, respectively.

2.4 Subsurface Conditions

The subsurface description in this report is based on a limited number of test pits and one (1) boring and is intended to highlight the major soil strata encountered during our test pits and boring. The subsurface conditions are known only at the actual test pit and boring locations. Variations may occur and should be expected between test pit and boring locations. The test pit and boring logs represent conditions that we observed at the time of our test pits and boring, and were edited, as appropriate, based on the results of the laboratory test data and inspection of the soil samples in the laboratory. The strata boundaries shown in our test pit and boring logs are based on our interpretations and the actual transitions may be gradual. Graphic soil symbols are for illustration only.

The soil strata encountered in the test pits and boring were as follows, starting at the ground surface.

<u>Topsoil</u> – A layer of topsoil was encountered at the ground surface in all explorations and extended to depths ranging between 0.5 and 1.7 feet beneath the ground surface.

<u>Subsoil</u> – A layer of subsoil was encountered in boring B-4 and in test pit TP-1, and extended to depths of 3 and 4.5 feet beneath the ground surface, respectively. The samples in the subsoil were described as silty sand or poorly graded sand. The fines content ranged in the subsoil up to 30 percent. The subsoil contained between 10 and 25 percent fine to coarse gravel. The subsoil contained traces of organic soil and roots.

<u>Fill</u> – Fill was encountered beneath the topsoil or subsoil in all explorations except in test pit TP-1 and boring B-4, and extended to depths ranging 3.5 and 4.5 feet beneath the ground surface. The samples in the fill were mostly described as poorly graded sand or well graded sand. In one (1) test pit, the fill was described as silty sand. The fines content ranged in the fill up to15 percent and the gravel content ranged between 10 and 40 percent. The fill contained traces of organic soil and roots. The fill may be deeper at locations not explored by LGCI.

<u>Sand</u> – A layer of sand was encountered beneath the topsoil or subsoil in all test pits and in the boring, and extended to the test pit and boring termination depths. The samples in this layer were described as poorly graded sand with up to 10 percent fines and up to 15 percent gravel.

The standard penetration tests SPT N-values in this layer ranged between 9 and 27 blows per foot (bpf) with most values higher than 11 bpf, indicating mostly medium dense sand.

2.5 Groundwater

Groundwater was not encountered in the test pits, and was encountered at a depth of 14 feet during drilling and 19.9 feet beneath the ground surface at the end of drilling in boring B-4 as shown in Table 2 and in the boring log.

The groundwater information reported herein is based on observations made during or shortly after the completion of drilling and excavation, and may not represent the actual groundwater conditions, as additional time may be required for the groundwater levels to stabilize.

The groundwater information presented in this report only represents the conditions encountered at the time and location of the explorations. Seasonal fluctuation should be anticipated.

2.6 Laboratory Test Data

LGCI submitted two (2) soil samples collected from the test pits for grain-size analysis. The results of the grain-size analysis are provided in the test data sheets included in Appendix D and are summarized in the table below.

Grain-Size Analysis Test Results

Test Pit No.	Sample No.	Stratum	Sample depth (ft.)	Percent Gravel	Percent Sand	Percent Fines
TP-1	Grab	Subsoil	0.8 – 4.5	14.5	60.3	25.2
TP-9	Grab	Fill	1.4 – 4.5	28.0	60.3	11.7

3. EVALUATION AND RECOMMENDATIONS

3.1 General

Based on our understanding of the proposed residential development, our observation of the explorations, and the results of our laboratory testing, there are a few issues that we would like to highlight for consideration and discussion.

3.1.1 Surficial Topsoil and Subsoil

The surficial topsoil and subsoil are not suitable to support the proposed buildings and should be entirely removed from under the proposed building footprints. The removal should extend over an area extending beyond the zone of influence of the footings and at a minimum 2 feet outside the proposed building footprint, whichever is greater. The zone of influence is defined as the zone beneath a line starting at the bottom outer edge of the footings and extending outward and downward at a slope of 1H:1V.

In paved areas, we recommend entirely removing the surficial topsoil from within the proposed paved areas. We recommend removing the subsoil to the top of the natural sand, to the top of the existing fill, or to a minimum depth of 18 inches beneath the bottom of the proposed pavement, whichever occurs first. Where the subsoil extends to depths greater than 18 inches beneath the bottom of the proposed pavement, the subsoil deeper than 18 inches beneath the bottom of the proposed pavement may remain in place provided that it is improved in accordance with the recommendations in Section 4.1. The removal should extend 5 feet outside the limits of improvement areas.

3.1.2 Existing Fill

The existing fill is not suitable to support the proposed buildings and should be entirely removed from within the proposed building footprints. We anticipate that the removal will extend to depths of about 4.5 feet beneath the ground surface. The removal should extend over an area extending beyond the zone of influence of the footings and at a minimum 2 feet outside the proposed building footprint, whichever is greater. The zone of influence is defined as the zone beneath a line starting at the bottom outer edge of the footings and extending outward and downward at a slope of 1H:1V. The fill may be deeper at locations not explored by LGCI, especially near the brooks. We recommend engaging LGCI to perform additional explorations at the site to further delineate the limits and thickness of the existing fill.

The existing fill may remain in place within the proposed parking lots and driveways after it is improved in accordance with the recommendation in Section 4.1.

3.1.3 Shallow Foundations and Slab-on-grade

After the surficial topsoil, subsoil, and existing fill are entirely removed from within the proposed building footprint, the proposed building may be supported on shallow footings bearing in the natural sand. Due to the susceptibility of the natural sand to disturbance, we recommend placing footings on minimum of 6 inches of Structural Fill. The proposed slab may be designed as a slab-on-grade supported on Structural Fill placed directly on top of the natural sand.
Our recommendation for footing design and slab-on-grade are presented in Section 3.2 and 3.3, respectively.

3.1.4 Reuse of Onsite Materials

The subsoil is too silty and may not be used as backfill under roadways and buildings. It may be used in landscaped areas; however, the contractor is cautioned that when wet, the subsoil will become very soft and difficult to handle. The natural sand is generally poorly graded and while it may be used as Ordinary Fill (see Section 4.3), it will require to be wetted and will require significant effort to achieve the required relative compaction. Additional recommendations for fill materials and reuse, including amendment/improvement, of onsite materials are presented in Sections 4.3 and 4.4.

3.2 Foundation Recommendations

3.2.1 Footing Design

- For footings supported on a minimum of 6 inches of Structural Fill placed directly over the natural sand after removing the surficial topsoil, the subsoil, and the existing fill, we recommend a net allowable bearing pressure of 4 kips per square foot (ksf).

- Footing subgrades should be prepared in accordance with the recommendations in Section 4.1.

- All foundations should be designed in accordance with *The Commonwealth of Massachusetts State Building Code 780 CMR, ninth Edition* (MSBC 9th Edition).

- Exterior footings and footings in unheated areas should be placed at a minimum depth of 4 feet below the final exterior grade to provide adequate frost protection. Interior footings in heated areas may be designed and constructed at a minimum depth of 2 feet below finished floor grades.

- Wall footings should be designed and constructed with continuous, longitudinal steel reinforcement for greater bending strength to span across small areas of loose or soft soils that may go undetected during construction.

- A representative of LGCI should be engaged to observe that the subgrade has been prepared in accordance with our recommendations.

3.2.2 Settlement Estimate

For footings designed using the net allowable bearing pressure recommended above, we anticipate that the settlement will be about 1 inch and that the differential settlement of the footings will be 3/4 inch or less, over 25 feet. Total and differential settlements of these magnitudes are usually considered tolerable for the anticipated construction. As the design progresses and the settlement estimates are refined, the tolerance of the proposed structure to the predicted total and differential settlements should be assessed by the structural engineer.

3.3 Concrete Slab Considerations

- Floor slabs can be constructed as slabs-on-grade bearing on a minimum of 12 inches of Structural Fill placed directly on top of the natural sand. The subgrade of the slabs should be prepared as described in Section 4.1.

- To reduce the potential for dampness in the proposed floor slabs, the project architect may consider placing a vapor barrier beneath the floor slabs. The vapor barrier should be protected from puncture during construction of the slabs.

- For the design of the floor slabs bearing on the materials described above, we recommend using a modulus of subgrade reaction, k_{s1}, of 80 tons per cubic foot (tcf). Please note that the values of k_{s1} are for a 1 x 1 square foot area. These values should be adjusted for larger areas using the following expression:

$$Modulus\ of\ Subgrade\ \mathrm{Re}action\,(k_s) = k_{s1} * \left(\frac{B+1}{2B}\right)^2$$

where:

k_s = Coefficient of vertical subgrade reaction for loaded area,
k_{s1} = Coefficient of vertical subgrade reaction for 1 x 1 square foot area, and
B = Width of area loaded, in feet.

Please note that cracking of slabs-on-grade can occur as a result of heaving or compression of the underlying soil, but also as a result of concrete curing stresses. To reduce the potential for cracking, the precautions listed below should be closely followed for construction of all slabs-on-grade:

- Construction joints should be provided between the floor slab and the walls and columns in accordance with the American Concrete Institute (ACI) requirements, or other applicable code.

- Backfill in interior utility trenches should be properly compacted.

- In order for the movement of exterior slabs not to be transmitted to new foundations or superstructures, exterior slabs such as approach slabs and sidewalks, should be isolated from the superstructure.

3.4 Under-slab Drains

Based on the current groundwater levels observed in the explorations, we anticipate that under-slab drainage systems will not be required under the proposed buildings.

3.5 Seismic Design

In accordance with Section 1613 of MSBC 9th Edition and International Building Code (2015 IBC) and based on the boring data, the seismic criteria for the site are as follows:

- Site Class: D
- Spectral Response Acceleration at short period (Ss): 0.152g
- Spectral Response Acceleration at 1 sec. (S_1): 0.055g
- Site Coefficient Fa (Table 1613.5.3(1)): 1.6
- Site Coefficient Fv (Table 1613.5.3(2): 2.4
- Adjusted spectral response S_{MS}: 0.242 g
- Adjusted spectral responses S_{M1}: 0.132 g

Based on the boring information, we believe the site soils are not susceptible to liquefaction.

3.6 Lateral Pressures for Wall Design

3.6.1 Lateral Earth Pressures

Lateral earth pressures recommended for design of below grade building walls, if any, or site retaining walls are provided below.

Coefficient of Active Earth Pressure, K_A:	0.33
Coefficient of At-Rest Earth Pressure, K_o:	0.50
Coefficient of Passive Earth Pressure, K_p:	3.0
Total Unit Weight γ:	125 pcf

Note: The values in the table are based on a friction angle for the backfill of 30 degrees and neglecting friction between the backfill and the wall. The design active and passive coefficients are based on horizontal surfaces (non-sloping backfill) on both the active and passive sides, and a vertical wall face.

- Exterior walls of below ground spaces, and retaining walls braced at the top to restrain movement/rotation, should be designed using the "at-rest" pressure coefficient.

- We recommend placing free-draining material within the 3 feet immediately behind retaining walls. We recommend providing weep holes in site walls to promote drainage where possible, or a pipe should be placed at the base of the wall to collect the groundwater. Groundwater collected by the wall drains should be discharged in a lower area if gravity flow is possible.

- Passive earth pressures should only be used at the toe of the wall where special measures or provisions are taken to prevent disturbance or future removal of the soil on the passive side of the wall, or in areas where the wall design includes a key. In any case, the passive pressures should be neglected in the top 2 feet.

- Where a permanent vertical uniform load will be applied on the active side immediately adjacent to the wall, a horizontal surcharge load equal to half of the uniform vertical load should be applied over the height of the wall. At a minimum, a temporary construction surcharge of 100 psf should be applied uniformly over the height of the wall.

- We recommend using an ultimate friction factor of 0.45 between the natural sand and the bottom of the wall. Below grade walls should be designed for minimum factors of safety of 1.5 for sliding and 2.0 for overturning.

3.6.2 Seismic Pressures

In accordance with MSBC 9th Edition, Section 1610, a lateral earthquake force equal to $0.100*(S_s)*(F_a)*\gamma*H^2$ should be included in the design of walls (for horizontal backfill), where S_s is the maximum considered earthquake spectral response acceleration (defined in Section 3.5), F_a is the site coefficient (defined in Section 3.5), γ is the total unit weight of the soil backfill, and H is the height of the wall.

The earthquake force should be distributed as an inverted triangle over the height of the wall. In accordance with MSBC 9th Edition, Section 1610.2, a load factor of 1.43 shall be applied to the earthquake force for wall strength design.

Temporary surcharges should not be included when designing for earthquake loads. Surcharge loads applied for extended periods of time shall be included in the total static lateral soil pressure and their earthquake lateral force shall be computed and added to the force determined above.

3.6.3 Perimeter Drains

- We recommend that free-draining material be placed within 3 feet of the below grade spaces, if any. To reduce the potential for dampness in below-ground spaces, perimeter walls of the proposed below-ground spaces, if any, should be damp-proofed.

- We recommend that drains be provided behind the exterior of walls of below-ground spaces, and behind site retaining walls, if any. The drains should consist of 6-inch perforated PVC pipes installed with the slots facing down. Perimeter drains should be installed at the bottom of the wall in 18 inches of crushed stone wrapped in a geotextile fabric for separation and filtration. Site retaining walls may be designed with weep holes discharging near the bottom of the face of the walls.
- Groundwater collected by the wall drains could be discharged in a lower area if gravity flow is possible. Alternatively, it should be discharged into the street drains. A permit would be required for discharge into street drains.

3.7 Pavement Considerations

3.7.1 General

The subsurface conditions encountered at the site are generally suitable to support the proposed driveways, parking lots, and sidewalks after preparation of the subgrade as described in Section 4.1.

- We recommend entirely removing the topsoil from within the footprint of the proposed driveways and parking lots.

- The subsoil should be removed in accordance with the recommendations in Sections 3.1.1 and 4.1.

- The existing fill should be improved in accordance with the recommendations in Section 4.1.

- Cobbles and boulders should be removed to at least 18 inches below the bottom of the pavement.

3.7.2 Sidewalks

Sidewalks should be placed on a minimum of 12 inches of Structural Fill with less than 5 percent fines. To reduce the potential for heave caused by surface water penetrating under the sidewalk, the joints between the sidewalk concrete sections should be sealed with a waterproof compound. The sidewalks should be sloped away from the building or other vertical surfaces to promote flow of water. To the extent possible, roof leaders should not discharge onto sidewalk surfaces.

3.7.3 Pavement Sections

A typical, minimum, standard-duty pavement section that could be used for parking areas is as follows:

1.5" Asphalt "Top Course"
2.0" Asphalt "Base Course"
8" Processed Gravel for Sub-Base (MassDOT M1.03.1)

A typical, minimum, heavy-duty pavement section that could be used for areas of heavy truck traffic is as follows:

2.0" Asphalt "Top Course"
2.5" Asphalt "Base Course"
12" Processed Gravel for Sub-Base (MassDOT M1.03.1)

The pavement sections shown above represent minimum thicknesses representative of typical local construction practices for similar use. Periodic maintenance should be anticipated.

Pavement material types and construction procedures should conform to specifications of the “Standard Specifications for Highways and Bridges,” prepared by the Commonwealth of Massachusetts Department of Public Works and dated 1988 (with the latest Supplemental Specifications).

Areas to receive relatively highly concentrated, sustained loads such as dumpsters, loading areas, and storage bins are typically installed over a rigid pavement section to distribute concentrated loads and reduce the possibility of high stress concentrations on the subgrade. Typical rigid pavement sections consist of 6 inches of concrete placed over a minimum of 12 inches of subbase material.

3.8 Underground Utilities

Boulders at the bottom of utility trenches should be removed to at least 12 inches below the pipe invert and the resulting excavation should be backfilled with suitable backfill. Utilities should be placed on suitable bedding material in accordance with the manufacturer’s recommendations. “Cushion” material should be placed, by hand, above the utility pipe in maximum 6-inch lifts. The lift should be compacted by hand to avoid damage to the utility. Where the bedding/cushion material consists of crushed stone, it should be wrapped in a geotextile fabric.

Compaction of fill in utility trenches should be in accordance with our recommendations in Section 4.3. To reduce the potential for damage to utilities, placement and compaction of fill immediately above the utilities should be performed in accordance with the manufacturer’s recommendations.

4. CONSTRUCTION CONSIDERATIONS

4.1 Subgrade Preparation

- The surficial topsoil, subsoil, existing fill, and other deleterious matter should be entirely removed from within the proposed building footprint before the start of foundation work.

- Tree stumps, root balls, and roots larger than ½ inch in diameter should be removed and the cavities filled with suitable material and compacted per Section 4.3 of this report.

- Topsoil, root balls, and other deleterious material should be entirely removed from within the proposed paved areas.

- Cobbles and boulders should be removed at least 6 inches from beneath footings, and 24 inches beneath the bottom of proposed slabs and paved areas. The resulting excavations should be backfilled with compacted Structural Fill under the building and with Ordinary Fill under the subbase of paved areas.

- Due to the high susceptibility of the natural soil for disturbance under foot and vehicular traffic, we recommend placing a minimum of 6 inches of Structural Fill at the bottom of the excavation or 4 inches of lean concrete to serve as a working mat.

- The base of the footing excavations in granular soil should be compacted with a dynamic vibratory compactor weighing at least 200 pounds and imparting a minimum of 4 kips of force to the subgrade before placing the required 6 inches of Structural Fill.

- The subgrade of the slabs should be compacted using a vibratory roller compactor imparting a minimum of 40 kips of force to the subgrade before placing Structural Fill.

- Where soft zones are revealed during the preparation of the subgrade, the soft materials or buried organic soil should be removed and replaced with Structural Fill within the building footprint and with Ordinary Fill beneath the subbase of paved areas.

- To reduce the potential of increasing lateral pressures on the retaining walls, fill placed within 3 feet of the walls, if any, should be compacted using a small plate compactor imparting a maximum dynamic effort of 4 kips. The fill within 3 feet of the walls should be placed in maximum 8-inch loose lifts.

- After the surficial topsoil is entirely removed and after the subsoil is removed from within the proposed paved areas in accordance with the recommendations in Section 3.1.1, the existing subsoil deeper than 18 inches beneath the bottom of the proposed pavement and/or the existing fill should be improved by compacting the exposed surface with at least six (6) passes of a vibratory roller compactor imparting a dynamic effort of at least 40 kips. Where soft zones of soil are observed, the soft soil should be removed, and the grade should be restored using Ordinary Fill to the bottom of the proposed subbase layer.

- Fill placed within the footprint of the proposed building should meet the gradation and compaction requirements of Structural Fill shown in Section 4.3.

- Fill placed under the subbase of paved areas, should meet the gradation and compaction requirements of Ordinary Fill shown in Section 4.3.

- Fill placed in the top 12 inches beneath sidewalks and exterior slabs should consist of Structural Fill with less than 5 percent fines.

- When crushed stone is required in the drawings or it is used for the convenience of the contractor, it should be wrapped in a geotextile fabric for separation. The geotextile fabric should not be used under retaining walls as it promotes a plane of sliding.

- An LGCI geotechnical representative should observe the removal of the existing fill and the subgrades of footings and slabs prior to fill and concrete placement to verify that the exposed bearing materials are suitable for the design soil bearing pressure. If soft or loose pockets are encountered in the footing excavations, the soft or loose materials should be removed, and the bottom of the footing should be placed at a lower elevation on firm soil, or the resulting excavation should be backfilled with Structural Fill or crushed stone wrapped in geotextile for separation. The LGCI representative should also observe the improvement of the existing subsoil and/or fill within the proposed paved areas.

4.2 Subgrade Protection

The site soils are frost susceptible. If construction takes place during freezing weather, special measures should be taken to prevent the subgrade from freezing. Such measures should include the use of heat blankets or excavating the final six inches of soil just before pouring concrete. Footings should be backfilled as soon as possible after footing construction. Soil used as backfill should be free of frozen material, as should the ground on which it is placed. Filling operations should be halted during freezing weather.

Materials with high fines contents are typically difficult to handle when wet as they are sensitive to moisture content variations. Subgrade support capacities may deteriorate when such soils become wet and/or disturbed. The contractor should keep exposed subgrades properly drained and free of ponded water. Subgrades should be protected from machine and foot traffic to reduce disturbance.

4.3 Fill Materials

Structural Fill and Ordinary Fill should consist of inert, hard, durable sand and gravel, free from organic matter, clay, surface coatings and deleterious materials, and should conform to the gradation requirements shown below.

4.3.1 Structural Fill

The Structural Fill should have a plasticity index of less than 6 and should meet the gradation requirements shown below. Structural Fill should be compacted in maximum 9-inch loose lifts to at least 95 percent of the Modified Proctor maximum dry density (ASTM D1557), with moisture contents within ±2 percentage points of optimum moisture content.

Sieve Size Percent	Passing by Weight
3 inches	100
1 ½ inch	80-100
½ inch	50-100
No. 4	30-85
No. 20	15-60
No. 60	5-35
No. 200*	0-10

* 0 – 5 Under sidewalks, unheated slabs, exterior stairs, ramps, and pads

4.3.2 Ordinary Fill

Ordinary Fill should have a plasticity index of less than 6 and should meet the gradation requirements shown below. Ordinary Fill should be compacted in maximum 9-inch loose lifts to at least 95 percent of the Modified Proctor maximum dry density (ASTM D1557) under paved areas and sidewalks, and 92 percent of the Modified Proctor maximum dry density in landscaped areas, with moisture contents within ±2 percentage points of optimum moisture content.

Sieve Size Percent	Passing by Weight
6 inches	100
1 inch	50-100
No. 4	20-100
No. 20	10-70
No. 60	5-45
No. 200	0-20

4.4 Reuse of Onsite Materials

The subsoil is silty and cannot be used as Ordinary or Structural Fill. The subsoil can be used in landscaped areas that do not support structures, pavements, sidewalks, or ramps. Based on our field observations and the results of the grain-size analyses, we anticipate some of the natural soil may be used as Ordinary Fill.

The natural soil and subsoil free of organic matter may be amended/improved by blending with crushed stone to produce Ordinary and Structural Fill.

Suitable imported material and amended/improved materials should be stockpiled separately from unimproved onsite soils. Should reusable materials be encountered during excavation, they should be excavated and stockpiled separately for compliance testing.

Soils with 20 percent or greater fines content are generally very sensitive to moisture content variations and are susceptible to frost. Such soils are very difficult to compact at moisture contents that are much higher or much lower than the optimum moisture content determined from the laboratory compaction test. Therefore, strict moisture control should be implemented during compaction of onsite soils with fines contents of 20 percent or greater. The contractor should be prepared to remove and replace such soils if pumping occurs.

All materials to be used as fill, including blended materials, should first be tested for compliance with the applicable gradation specifications.

4.5 Groundwater Control Procedures

Based on the groundwater levels encountered in our explorations, we do not anticipate that groundwater control procedures will be needed during the excavations to remove the topsoil and subsoil, and the existing fill, and in utility trenches.

We anticipate that filtered sump pumps installed in a series of sump pits located at least three feet below the bottom of the proposed excavations may be sufficient to handle surface runoff that may enter the excavations during wet weather. Please note that the natural soil was fairly permeable. Accordingly, the site contractor should be prepared to use multiple sump pumps during wet weather.

The contractor should be permitted to employ whatever commonly accepted means and practices are necessary to maintain the groundwater level below the bottom of the excavations, and to maintain a dry excavation during wet weather. Groundwater levels should be maintained at a minimum of 1-foot below the bottom of excavations during construction. Placement of reinforcing steel or concrete in standing water should not be permitted.

To reduce the potential for sinkholes developing over sump pump pits after the sump pumps are removed, the crushed stone placed in the sump pump pits should be wrapped in a geotextile fabric. Alternatively, the crushed stone should be entirely removed after the sump pump is no longer in use and the sump pump pit should be restored with suitable backfill.

4.6 Temporary Excavations

All excavations to receive human traffic should be constructed in accordance with the OSHA guidelines.

The site soils should generally be considered Type "C" and should have a maximum allowable slope of 1.5 Horizontal to 1 Vertical (1.5H:1V) for excavations less than 20 feet deep. Deeper excavations, if needed, should have shoring designed by a professional engineer.

The contractor is solely responsible for designing and constructing stable, temporary excavations and should shore, slope, or bench the sides of the excavations as required to maintain stability of the excavation sides and bottom and to protect existing structures.

5. RECOMMENDATIONS FOR FUTURE WORK

We recommend engaging LGCI to perform the following services:

- Perform additional explorations at the site once the size and locations of the proposed buildings are established.

- Reviewing the geotechnical aspect of the Earth Moving specifications and the foundation drawings and provide written comments.

- Reviewing the geotechnical aspects of contractor submittals and requests for information (RFIs).

- Providing a field representative during construction to observe the subgrades for footings, floor slabs, and paved areas, and submit daily field reports documenting our observations and field recommendations.

6. REPORT LIMITATIONS

Our analysis and recommendations are based on project information provided to us at the time of this report. If changes to the type, size, and location of the proposed structures or to the site grading are made, the recommendations contained in this report shall not be considered valid unless the changes are reviewed, and the conclusions and recommendations modified in writing by LGCI. LGCI cannot accept responsibility for designs based on our recommendations unless we are engaged to review the final plans and specifications to determine whether any changes in the project affect the validity of our recommendations and whether our recommendations have been properly implemented in the design.

It is not part of our scope to perform a more detailed site history; therefore, we have not explored for or researched the locations of buried utilities or other structures in the area of the proposed construction. Our scope did not include environmental services or services related to moisture, mold, or other biological contaminants in or around the site.

The recommendations in this report are based in part on the data obtained from the subsurface explorations. The nature and extent of variations between explorations may not become evident until construction. If variations from anticipated conditions are encountered, it may be necessary to revise the recommendations in this report. We cannot accept responsibility for designs based on recommendations in this report unless we are engaged to 1) make site visits during construction to check that the subsurface conditions exposed during construction are in general conformance with our design assumptions and 2) ascertain that, in general, the work is being performed in compliance with the contract documents.

Our report has been prepared in accordance with generally accepted engineering practices and in accordance with the terms and conditions set forth in our agreement. No other warranty, expressed or implied, is made. This report has been prepared for the exclusive use of LMC for the specific application to the proposed residential development in Hyannis, Massachusetts as conceived at this time.

7. REFERENCES

In addition to the references included in the text of the report, we used the following references:

The Commonwealth of Massachusetts (2015), "The Massachusetts State Building Code, Ninth Edition," comprised of the International Building Code (IBC-2015) and 780 CMR: Massachusetts Amendments to IBC-2015.

The Department of Labor, Occupational Safety and Health Administration (1989), "Occupational Safety and Health Standards - Excavations; Final Rule," 20 CFR Part 1926, Subpart P.

USGS Hyannis, MA topographic map from http://mapserver.mytopo.com.

Table 1 - Summary of LGCI Test Pits
Proposed Residential Development
Hyannis, Massachusetts
LGCI Project No. 2026

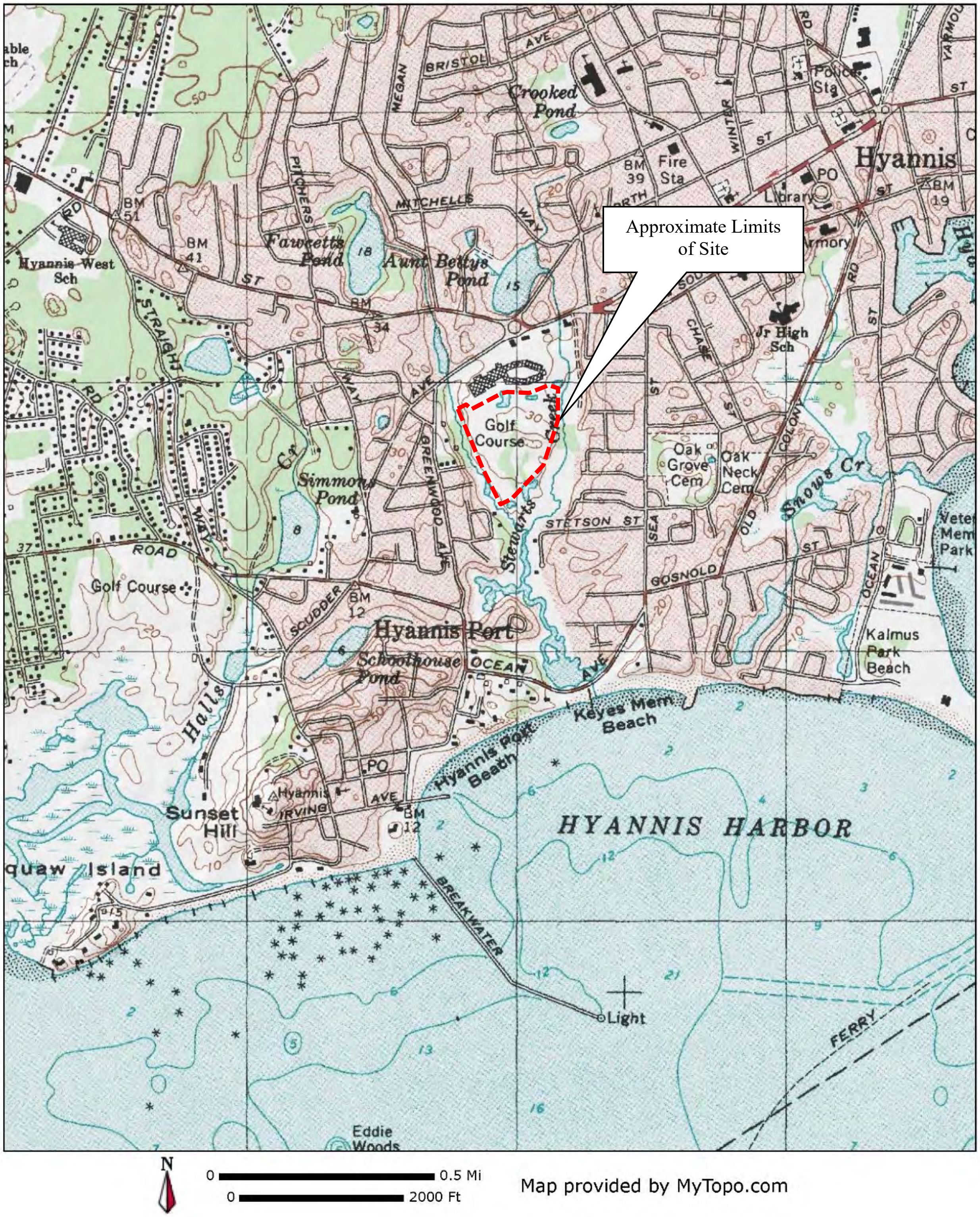
Test Pit No.	Ground Surface Elevation (ft.)[1]	Groundwater[2] Depth / El. (ft.)	Bottom of Topsoil Depth / El. (ft.)	Bottom of Subsoil Depth / El. (ft.)	Bottom of Fill Depth / El. (ft.)	Bottom of Test Pit Depth / El. (ft.)
TP-1	30.7	- / **-**	0.8 / **29.9**	4.5 / **26.2**	- / **-**	10.0 [3]/ **20.7**
TP-2	26.6	- / **-**	0.5 / **26.1**	- / **-**	4.5 / **22.1**	12.0 [3]/ **14.6**
TP-3	20.9	- / **-**	1.2 / **19.7**	- / **-**	3.5 / **17.4**	12.0 [3]/ **8.9**
TP-4	20.2	- / **-**	1.0 / **19.2**	- / **-**	3.5 / **16.7**	11.0 [3]/ **9.2**
TP-5	18.1	- / **-**	1.0 / **17.1**	- / **-**	3.5 / **14.6**	10.0 [3]/ **8.1**
TP-6	22.6	- / **-**	1.0 / **21.6**	- / **-**	4.5 / **18.1**	10.0 [3]/ **12.6**
TP-7[4]	Not performed					
TP-8	21.1	- / **-**	1.0 / **20.1**	- / **-**	3.5 / **17.6**	8.0 [3]/ **13.1**
TP-9	31.3	- / **-**	1.5 / **29.8**	- / **-**	4.5 / **26.8**	8.0 [3]/ **23.3**
TP-B-2[4]	25.2	- / **-**	1.4 / **23.8**	- / **-**	3.5 / **21.7**	12.0 [3]/ **13.2**
TP-B-3[4]	19.0	- / **-**	0.8 / **18.2**	- / **-**	4.0 / **15.0**	10.0 [3]/ **9.0**

1. The ground surface elevations were provided to LGCI by Pesce Engineering & Associates, Inc. via e-mail on 8/13/2020. The ground surface elevation at test pit TP-1 was adjusted by estimating the difference in elevations between the actual (as excavated) and original locations, and is therefore approximate.
2. "-" means groundwater or layer was not encountered.
3. Test pit terminated in the sand layer.
4. Test Pit TP-7 was not performed due to access issues. Test pits TP-B-2 and TP-B-3 were substituted for borings B-2 and B-3, respectively.

Table 2 - Summary of LGCI Borings
Proposed Residential Development
Hyannis, MA
LGCI Project No. 2026

Boring No.	Ground Surface Elevation (ft.)[1]	Groundwater[2] Depth / El. (ft.)	Bottom of Topsoil Depth / El. (ft.)	Bottom of Subsoil Depth / El. (ft.)	Bottom of Fill[2] Depth / El. (ft.)	Bottom of Boring Depth / El. (ft.)
B-4[4]	32.2	- / **-**	0.7 / **31.5**	3.0 / **29.2**	- / **-**	60.0 [3]/ **-27.8**

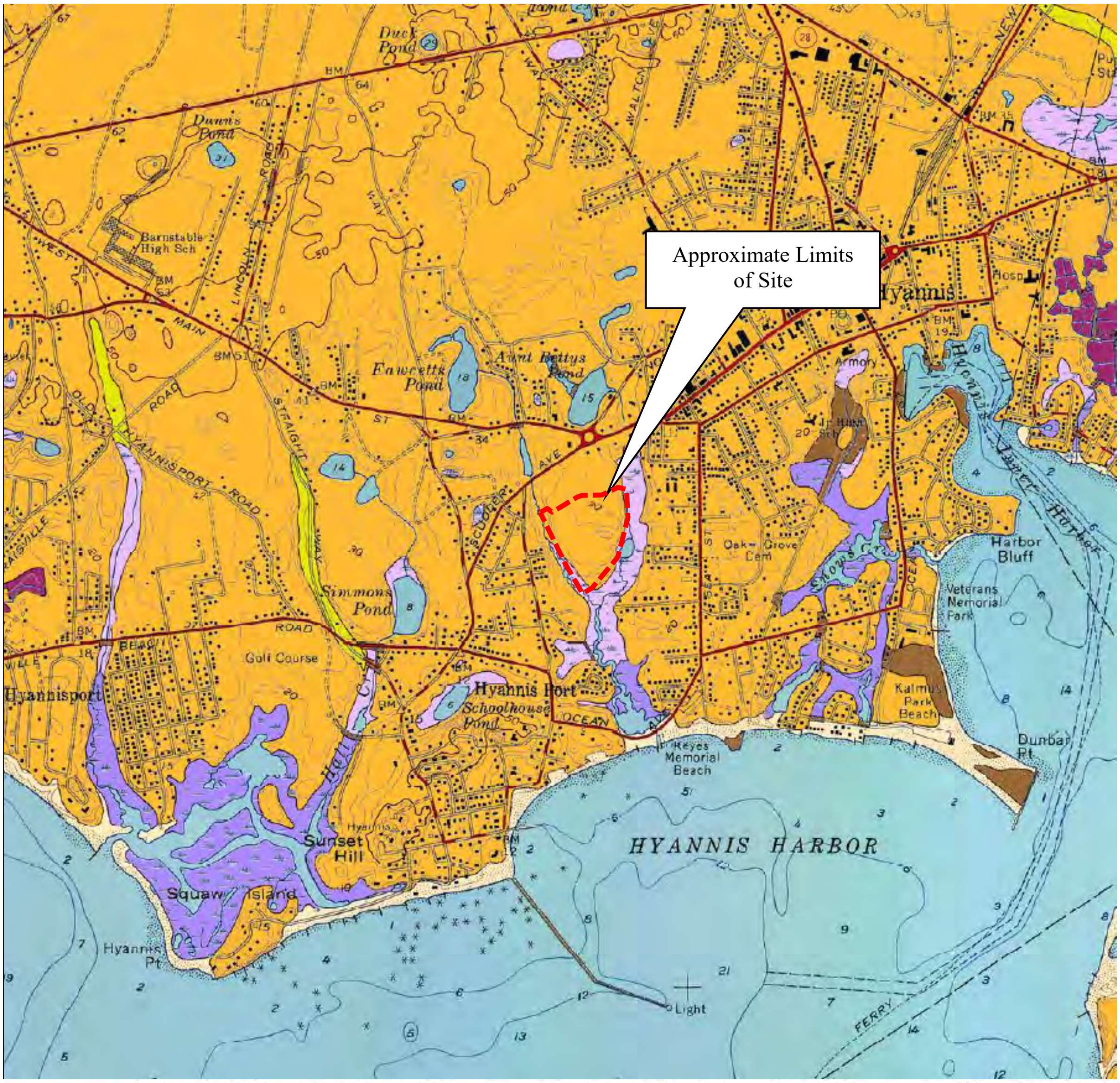
1. The ground surface elevation was provided to LGCI by Pesce Engineering & Associates, Inc. via e-mail on 8/13/2020, and was adjusted by estimating the difference in elevations between the actual (as drilled) and the original locations, and is therefore approximate.
2. "-" means layer was not encountered.
3. Boring terminated in the sand layer.
4. Boring B-1 was not performed due to access issues. Borings B-2 and B-3 were substituted by test pits TP-B-2, and TP-B-3, respectively.



Contour Intervals: 10 feet

Note: Figure based on USGS topographic map of Hyannis, MA obtained from www.mytopo.com/maps

Client: LMC	Project: Proposed Residential Development	Figure 1 – Site Location Map	
LGCI Lahlaf Geotechnical Consulting, Inc.	Project Location: Hyannis, MA	LGCI Project No.: 2026	Date: Sept. 2020



Coarse deposits consist of *gravel deposits*, *sand and gravel deposits*, and *sand deposits*, not differentiated in this report. *Gravel deposits* are composed of at least 50 percent gravel-size clasts; cobbles and boulders predominate; minor amounts of sand occur within gravel beds, and sand comprises a few separate layers. Gravel layers generally are poorly sorted, and bedding commonly is distorted and faulted due to postdepositional collapse related to melting of ice. *Sand and gravel deposits* occur as mixtures of gravel and sand within individual layers and as layers of sand alternating with layers of gravel. Sand and gravel layers generally range between 25 and 50 percent gravel particles and between 50 and 75 percent sand particles. Layers are well sorted to poorly sorted; bedding may be distorted and faulted due to postdepositional collapse. *Sand deposits* are composed mainly of very coarse to fine sand, commonly in well-sorted layers. Coarser layers may contain up to 25 percent gravel particles, generally granules and pebbles; finer layers may contain some very fine sand, silt, and clay

N

Swamp deposits—Organic muck and peat that contain minor amounts of sand, silt, and clay, are stratified and poorly sorted, and occur in swamps and freshwater marshes, in kettle depressions, or in poorly drained areas. Unit is shown only where deposits are estimated to be at least 3 ft thick; most deposits are less than 10 ft thick. Swamp deposits overlie glacial deposits or bedrock. They locally overlie glacial till even where they occur within thin glacial meltwater deposits

Note: Figure based on map titled: "Surficial Materials Map of the Hyannis Quadrangle, Massachusetts," compiled by Byron D. Stone, and Mary L. DiGiacomo-Cohen, for U.S. Geological Survey, Scientific Investigations Map 3402, Quadrangle 176 - Hyannis.

Client: LMC	Project: Proposed Residential Development	Figure 2 – Surficial Geologic Map	
LGCI Lahlaf Geotechnical Consulting, Inc.	Project Location: Hyannis, MA	LGCI Project No.: 2026	Date: Sept. 2020

Legend

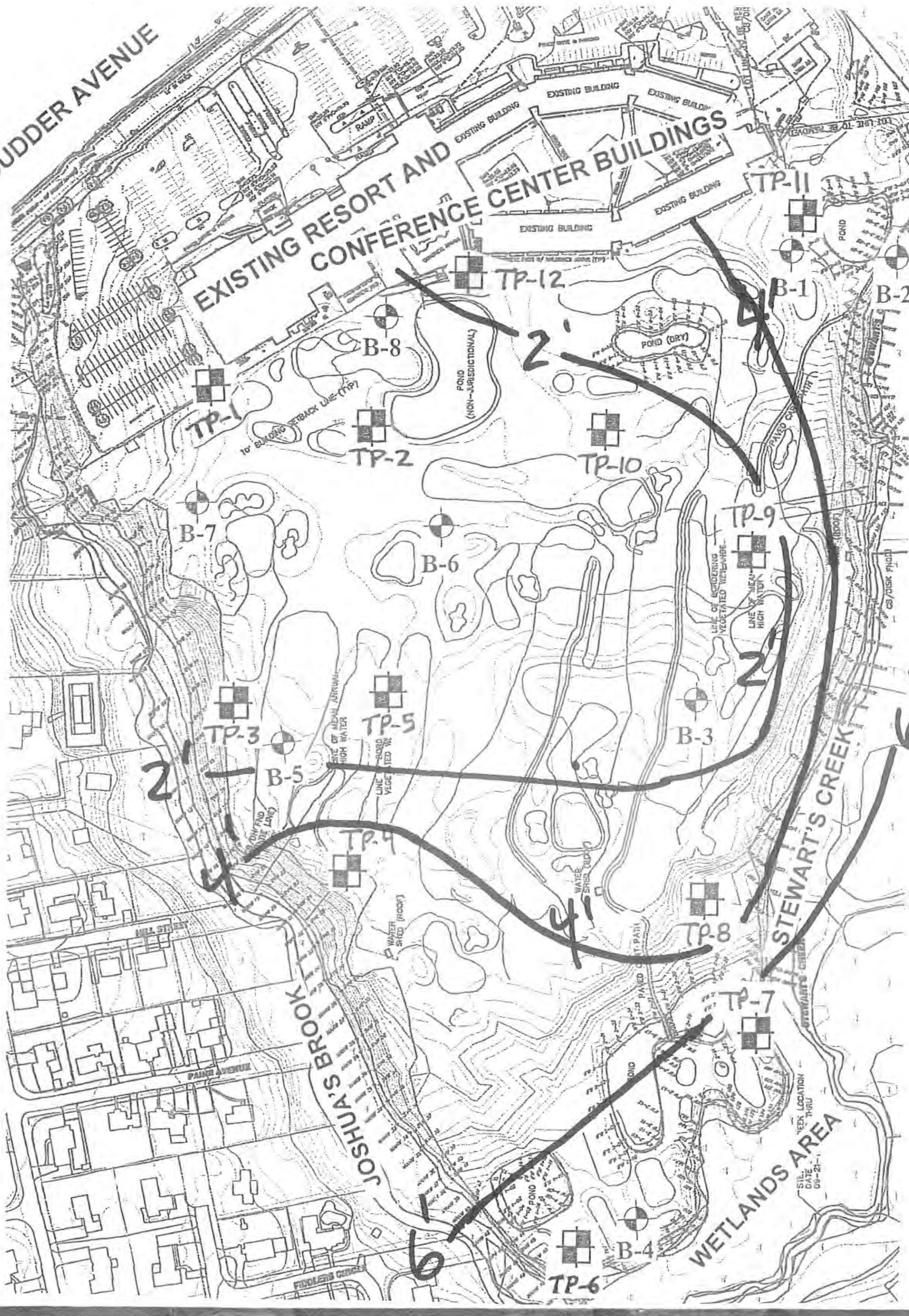
Approximate location of boring advanced by Northern Drill Service, Inc. (NDS) of Northborough, MA on August 17, 2020, and observed by Lahlaf Geotechnical Consulting, Inc. (LGCI).

Approximate location of test pits excavated by NDS on August 18, 2020, and observed by LGCI.

Note
Figure based on drawing titled: "Concept Site Plan at 35 Scudder Avenue in Hyannis, Massachusetts (Barnstable County)," prepared by Pesce Engineering & Associates, Inc. (PEA), dated July 20, 2020, and provided to LGCI by PEA via e-mail on September 1, 2020.

Client: LMC	Project: Proposed Residential Development	Figure 3 – Test Pit and Boring Location Plan	
LGCI Lahlaf Geotechnical Consulting, Inc.	Project Location: Sandwich, MA	LGCI Project No.: 2026	Date: Sept. 2020

APPENDIX A - Logs of Previous Explorations by Others

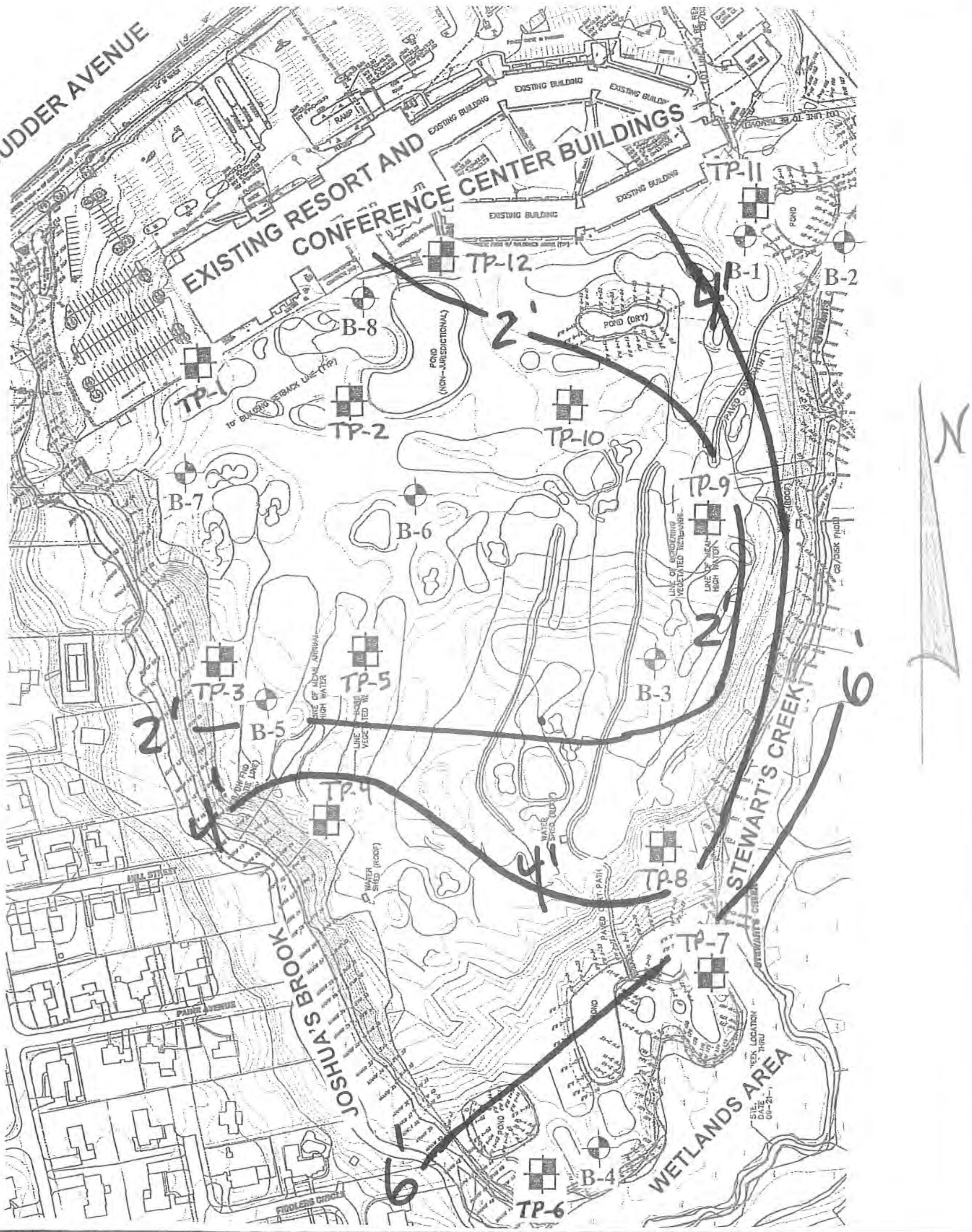


B-7	Test pit number and Approx. location.	
TP-2	Test boring no. and Approx. location	
— 4' —	Depth Contour from Ground Surface to Undisturbed Inorganic Subgrade	

Briggs Engineering & Testing
A Division of PK Associates, Inc.

LOCATION PLAN
PROPOSED SITE REDEVELOPMENT
25 SCUDDER AVE., HYANNIS, MA

Scale: N.T.S.	*Drawn:* DWG	FIG. 1
DEC 9, 2016	*Check:* DWG	



BRIGGS

Briggs Engineering & Testing
A Division of PK Associates, Inc.

Symbol	Description
B-7	Test pit number and Approx. location.
TP-2	Test boring no. and Approx. location
4'	Depth Contour from Ground Surface to Undisturbed Inorganic Subgrade

LOCATION PLAN
PROPOSED SITE REDEVELOPMENT
25 SCUDDER AVE., HYANNIS, MA

Scale: N.T.S.	*Drawn:* DWG	FIG. 1
DEC 9, 2016	*Check:* DWG	

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9,.))*,X	9HZ'6#3&	N7UUSR		!DGW
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9' 5* 9* $5C

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9,.))*,X	9HZ'6#3&	N7UUSR	!DGW	9' 5 — 9* $5C
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9*$5C %5	Ā'($)* 8#H	9*$5CĀ6	V*0H .0	R*6H .0	=)#4&2O	Ā5'5' PC'01 * %5	Ā'($)*Ā 9*&6,.$5.#0
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BG							

; ,#/0 +ĀĀ/,%6*Ā5# /&*+ 5C*0

V,#$#,5#0&Ā&*+	P#C*&.<*ĀR#0&.&50 6- =)#4&25	P#C*&.#0)*&&ĀĀ0&.5- =)#4&25	Ā'($)*Ā' -$*
",' 6* GĀ#ĀGa; T.5)* !GĀ#Ā@6; Ā#(* @Ā#ĀBEa; 70+ BEĀ#ĀEGa	G@] *,- ĀĀ#%5 L !E Ā5%%; B D Ā#%5 !J BG] Ā5%%; E K U Ā5%% B!^ N' ,+	G!G T##&*; !G BG U 9*0&*; BGEG 9* 0&*; EG^] 9* 0&*	_V c Y.F*+Ā/.&#0; _" c ĀC*)3-Ā' /3 *; ?S c ? $*0ĀS0+ĀR#+; ` c BGGVĀC'((*,

Ā !"#$** !HĀĀ C*Ā&5' 5%6' 5#0Ā0*&Ā*$,*&' 05ĀC*Ā$$,#F.(' 5'Ā8#/ 0+' ,-Ā8*540Ā8#.)Ā5 $*&ĀĀ C*Ā5' 0&5#0Ā(' -Ā8*Ā(,' +/')H @ĀĀ ' 5',Ā*<*)Ā*' +.01&Ā4*,*Ā(' +*Ā0ĀC*Ā+,.)ĀC#)*Ā+/ ,.01Ā#,Ā5ĀC*Ā6#($)*5#0Ā#%Ā+,.))01HĀĀ C*Ā4' 5',Ā*<*)Ā(' -Ā65' 5'ĀĀ<*,Ā5(*H

%"&' () #$ 8? " SXĀ7))Ā&#.)Ā*&6,.$5#0&Ā*Ā ('+*Ā.0ĀC*Ā%)+Ā8-ĀC*Ā9,.)).01ĀY#,*(' 0HĀ8#Ā)'3#,'5 #,-Ā0')-&*&Ā 4*,* $*,%#,(*+Ā%,ĀC.&ĀV,$#&*H

=TĀTTĀJ @D@ĀQ : Ā:ĀI 788 ĀH VZĀ S? T?: ĀH 9" Ā@22J

; *#)#1.6ĀĀS',5 CĀSF$)#,'5.#0:ĀQ6H	PTGS8" X Ā=,.11&ĀS01.0**,. 01 VR? ZSP" X BEĀ6/++*,Ā7 <*0/* T? P7" Q 8X N-'00.&:ĀJ7	=? RQ3; ĀWX = D V7;S ! ?Y !
MĀC*,4 ##+Ā9,.<* "S TĀEKĀBDĀDBD 8#,%#>:ĀJ7 ĀG@EJ Y7bĀEGKĀBKDĀDE@		

Y.)*ĀWX	!J@D@		P7 ĀQ3;	Ā7UVTSR	P? RSĀ=7RRST	Ā/,%6*ĀS)*<'5.#0X	
9' 5ĀĀ5, 5*+X	!@2K2J	"[VS	NĀ7	ĀĀ		Ā55.#0X	
9' 5ĀP#($)*5 *+X	!@2K2J	ĀQ\S	BĀ2DO	@O		; ,#/0 +4'5*, Ā*<*)Ā' +.01&	
9,.))*,X	9HZ'6#3&	N7UUSR		!DGW		9' 5	9* $5C
Ā.5ĀR*$HX	9H *.&&*,	Y7TT		BGO		9' 5	9* $5C

9*$5C %5	Ā'($)* 8#H	9*$5CĀ6	V*0H .0	R*6H .0	=)#4&2O	Ā5'5' PC'01 * %5	Ā'($)*Ā 9*&6,.$5.#0
	Ā !	GG @G !HG	@D	!J	B B E E	!HG	Ā !Ā" #$Ā#%&'($)*ĀĀ+,-Ā)##&*Ā+', >Ā3,#4 0Ā ? VĀ? QTĀ0+ Ā0*Ā6#Ā(*+./(Ā7 89: Ā.5)*ĀĀ.)5Ā5' 6*Ā? ,1' 0.6& =#5#(Ā#%&'($)*ĀĀ+,-Ā(*+./(Ā+*0&*Ā3,#4 0ĀĀ0*Ā6#Ā6#' ,&*Ā1,'< *))-ĀĀ7 89 :).5)*Ā, ' <*)Ā5'6*Ā Ā.)5
E	Ā @	EG MG	@D	!J	@@@@		Ā @Ā *5Ā##&*Ā', >Ā3,#4 0Ā6#Ā3)'6>Ā0*Ā6#Ā6#' ,&*Ā&.)5ĀĀ7 89 :Ā.5)*ĀĀ.)5Ā5'6* ? ,1'0 .6&
!G	Ā B	!GG !!HE	!K	D	E B! KG	!@HE	Ā BĀĀ.(.)',Ā5#ĀĀ @ 7/1* ,Ā* %&')Ā'5Ā@EI =#5#(Ā#%ĀF$)#,'5.#0Ā5Ā@EI
!E							
@G							
@E							
BG							

=TĀTTĀJ @D@ĀQ : Ā:ĀI 788 QĀH VZĀ S? T?: QH 9" Ā@22J

; ,#/0 +ĀĀ/,%6*Ā 5# ____ /&*+ ____ 5C*0 ____

V,#$#,5#0&Ā&*+	P#C*&.<*ĀR#0&.&50 6- =)#4&25	P#C*&.#0)*&&Ā9#0&.5- =)#4&25	Ā'($)*Ā' -$*
",' 6* GĀ5#ĀGa T.5)* !GĀ5#Ā@6 Ā#(* @Ā5#ĀBEa 70+ BEĀ5#ĀEGa	G@] *,- ĀĀ#%5 L !E Ā5%% B D Ā#%5 !J BG] Ā5%% E K U Ā5%% B!^ N' ,+	G!G T##&* !G BG U 9*0&* BGEG 9* 0&* EG^] 9* 0&*	_V c Y.F*+Ā/.&#0 _" c ĀC*)3-Ā'/3 * ?S c ? $*0Ā50+ĀR#+ ` c BGGWĀC'((*,

Ā !"#$	!HĀĀC*Ā5' 5%6' 5#0Ā0*&Ā* $,*&*05ĀC*Ā$$,#F.(' 5'Ā3#/ 0+' ,-Ā3*54* * 0Ā&#.)Ā5 $*&ĀĀC*Ā5' 0&5#0Ā(' -Ā3*Ā1,' +/')H @ĀĀ ' 5',Ā*<*)Ā*' +.01&Ā4*,*Ā(' +*Ā0ĀC*Ā+,.))ĀC#)*Ā+/ ,.01Ā#,Ā5ĀC*Ā6#($)*5#0Ā#%Ā+,.))01HĀĀC*Ā4' 5',Ā*<*)Ā(' -Ā)65' 5Ā#<*,Ā5(*H
%"&' () #$	8? " SXĀ7))Ā#.)Ā*&6,.$5#0&Ā*Ā ('+*Ā.0Ā5C*Ā%)+Ā3-ĀC*Ā9,.)).01ĀY#,*(' 0HĀ3#Ā)'3#,'5 #,-Ā0')-&*&Ā 4*,* $*,%#,(*+Ā%,ĀC.&ĀV,$#&*H

; *#)#1.6ĀĀS',5 CĀSF$)#,'5.#0:ĀQ06H

MĀĀC*,4##+Ā9,.<*
"S TĀEKĀBDĀDBD

8#,%#)>:ĀU7ĀG@EJ
Y7bĀEGKĀBKDĀDE@

PTQS8" X Ā=,.11&ĀS01.0**,. 01
VR? ZSP" X BEĀĀ6/++*,Ā7<*0/*
T? P7" Q 8X N-'00.&:ĀU7

=? RQ8; ĀWX
= E
V7;S
! ?Y !

Y.)*ĀWX	!J@D@		P7 ĀQ8;	Ā7UVTSR	P? RSĀ=7RRST	Ā/,%6*Ā S)*<'5.#0X
9' 5ĀĀ5, 5+X	!@22J	"[VS	NĀ7	ĀĀ		Ā55.#0X
9' 5ĀP#($)*5 *+X	!@22J	ĀQ\S	BĀ2DO	@O		; ,#/0 +4'5*, Ā*<*)Ā' +.01&
9,.))*,X	9HZ'6#3&	N7UUSR		!DGW		9' 5 9* $5C
Ā.5ĀR*$HX	9H *.&&*,	Y7TT		BGO		9' 5 9* $5C

9*$5C %5	Ā'($)* 8#H	9*$5CĀ6	V*0H .0	R*6H .0	=)#4&2O	Ā5'5' PC'01 * %5	Ā'($)*Ā 9*&6,.$5.#0
	Ā !	GHG @GH !HD	@D	@D	J ML !!	!HB	Ā !Ā" #$Ā#%Ā&'($)*ĀU*+./(Ā+*0&*Ā3)'6>Ā" ? VĀ? QTĀ0+Ā%0*Ā6#Ā6#' ,&* Ā7 89: Ā.5)*ĀĀ.)5Ā5' 6*Ā? ,1' 0.6 =#5#(Ā#%Ā&'$)*Ā Ā9', >Ā3,#4 0Ā,'<*))-Ā%0*Ā6#Ā6#',&*ĀĀ7 89 :Ā.5)*Ā, '<*)Ā.5)* Ā.)5
E	Ā @	EHG MHB	@D	@D	D J K K		Ā @ĀU*+./(Ā+*0&*Ā).1GĀ3,#4 0Ā%0*Ā6#Ā(*+./(ĀĀ7 89 :Ā5'6*Ā Ā.)5ĀĀ5'5 .%+
!G	Ā B	!GHG !@GH	@D	@D	E K L L		Ā BĀĀ.(.)',Ā5#ĀĀ D
!E	Ā D	!E HG !MHB	@D	@D	E E E !G		Ā DĀĀ.(.)',Ā5#ĀĀ D
@G	Ā E	@GHG @@GH	@D	@D	J K !@ @G		Ā EĀĀ.(.)',Ā5#ĀĀ D
@E	Ā J	@EHG @MHB	@D	@D	!G ! J !K ! @G	@MG	Ā JĀĀ.(.)',Ā5#ĀĀ D:ĀF6*$5Ā+*0&* =#5#(Ā#%ĀF$)#,'5.#0Ā5Ā@MGH
BG							

; ,#/0 +ĀĀ/,%6*Ā5# /&*+ 5C*0

V,#$#,5#0&Ā&*+	P#C*&.<*ĀR#0&.&50 6- =)#4&2%	P#C*&.#0)*&&ĀR0&.5- =)#4&2%	Ā'($)*Ā' -$*
",' 6* GĀ#ĀGa T.5)* !GĀ#Ā@G Ā#(* @GĀ#ĀBE 70+ BEĀ#ĀEG	G@] *,- ĀĀ#% L !E Ā5%% B D Ā#% !J BG] Ā5%% E K U Ā5%% B!^ N' ,+	G!G T##&* !G BG U 9*0&* BGEG 9* 0&* EG] 9* 0&*	_V c Y.F*+Ā/.&#0 _" c ĀC*)3-Ā"/3 * ?S c ? $*0ĀS0+ĀR#+ ` c BGGVĀC'((*,

**Ā !"#$** !HĀĀC*Ā5' 5%6' 5#0Ā0*&Ā*$,*&*05ĀC*Ā$$,#F.(' 5'Ā3#/ 0+' ,-Ā3*54 **0Ā#.)Ā5$*&ĀĀC*Ā5' 0&5#0Ā(' -Ā3*Ā,' +/')H @ĀĀ' 5',Ā*<*)Ā*' +.01&Ā4*,*Ā(' +*Ā0ĀC*Ā+,.)ĀC#)*Ā+/ ,.01Ā#,Ā5ĀC*Ā6#($)*5#0Ā#%Ā+,.)).01HĀĀC*Ā4' 5',Ā*<*)Ā(' -Ā%65' 5Ā#<*,Ā5(*H

%"&' ()#$ 8? " SXĀĀ7))Ā&#.)Ā*&6,.$5#0&Ā*Ā('+*Ā.0ĀC*Ā%)+Ā3-ĀC*Ā9,.)).01ĀY#,*(' 0HĀ8#Ā)'3#,'5 #,-Ā0')-&*&Ā4*,* $*,%#,(*+Ā#%ĀC.&ĀV,$#&*H

; *#)#1.6ĀĀS',5 CĀSF$)#,'5.#0:ĀQ6H

MĀĀC*,4 ##+Ā9,.<*
"S TĀEKĀBDĀDBD

8#,%#)>:ĀU7ĀG@EJ
Y7bĀEGKĀBKDĀDE@

PTGS8" X Ā=,.11&ĀS01.0**,. 01
VR? ZSP" X BEĀ6/++*,Ā7<*0/*
T? P7" Q 8X N-'00.&:ĀU7

=? RQ8; ĀWX
= J
V7;S
! ?Y !

Y.)*ĀWX !J@D@
9' 5ĀĀ5, 5+X !@22J
9' 5ĀP#($)*5 *+X !@22J
9,.))*,X 9HZ'6#3&
Ä.5ĀR*$HX 9H *.&&*,

	P7 ÄQ8;	Ä7 UVTSR	P? RSĀ7 RRST
"[VS	NÄ7	ÄÄ	
ÄQ\S	BĀ2DO	@O	
N7UUSR		!DGW	
Y7TT		BGO	

Ä/,%6*Ā S)*<'5.#0X
Ä55.#0X
; ,#/0 +4'5*,Ā)*<*)Ā*' +.01&
9' 5 9* $5C
9' 5 9* $5C

9*$5C %5	Ä'($)* 8#H	9*$5CĀ5	V*0H .0	R*6H .0	=)#4&2O	Ä5'5' PC'01 * %5	Ä'($)*Ā 9*&6,.$5.#0
	Ä !	GH @GH GHI	@D	@G	B E M K	GH @GH	Ä !Ā" #$Ā#%Ā'($)*ĀU*+./(Ā+*0&*Ā3)'6>Ā' ? VÄ? QTĀ0+Ā%0*Ā6#Ā6#' ,&* Ä7 89: Ā.5)*ĀÄ.)5Ā5' 6*Ā? ,1' 0.6 =#5#(Ā#%Ā'($)*ĀĀ+' ,>Ā3,#4 0Ā%0*Ā6#Ā6#' ,&*Ā,'<*))-ĀÄ7 89 :ĀYQT:Ā.5)* ; ,' <*):Ā5'6*Ā Ä.)5
E	Ä @	EHG MHI	@D	!D	B D B D		Ä @ĀĀ##&*Ā.1CĀ3,#4 0Ā%0*Ā6#Ā6#', &*ĀĀ7 89 :Ā5'6*Ā ; ,' <*):Ā5'6*Ā Ä.)5
!G	Ä B	!GHG !@GHI	@D	!K	@B E K		Ä BĀĀ.(.)',Ā5#ĀĀ @ĀĀ5'5.%+
!E	Ä D	!EHG !MHI	@D	!G	E K K L		Ä DĀU*+./(Ā+*0&*Ā.1G5Ā3,#4 0Ā%0*Ā6#Ā(*+./(ĀĀ7 89 :Ā5'6*Ā Ä.)5ĀĀ5'5.%+
@G	Ä E	@GHG @@GHI	@D	!K	B B @@		Ä EĀĀ.(.)',Ā5#ĀĀ D 4*5Ā3*)#4 Ā@!I
@E	Ä J	@EHG @MHI	@D	!D	D M M J		Ä JĀĀ *5Ā(*+./(Ā+*0&*Ā.1CĀ3,#4 0Ā%0*Ā6#Ā6#', &*ĀĀ7 89 :Ā5'6*Ā Ä.)5 Ä MĀĀ'($)*Ā55'($5+ĀĀ3Ā#%Ā3)#40 .0
BG						BGHG	=#5#(Ā#%ĀF$)#,'5.#0Ā5ĀBGHI

; ,#/0 +ĀĀ/,%6*Ā 5# /&*+ 5C*0

V,#$#,5#0&Ā&*+	P#C*&.<*ĀR#0&.&50 6- =)#4&2%	P#C*&.#0)*&&ĀĀ0&.5- =)#4&2%	Ä'($)*Ā' -$*
",' 6* GĀ#ĀGa T.5)* !GĀ#Ā@6 Ä#(* @Ā#ĀBEa 70+ BEĀ#ĀEGa	G@] *,- ĀĀ#%5 L !E Ä5%% B D Ä#%5 !J BG] Ä5%% E K U Ä5%% B!^ N' ,+	G!G T##&* !G BG U 9*0&* BGEG 9* 0&* EG^] 9* 0&*	_V c Y.F*+Ā/.&#0 _" c ÄC*)3-Ā' /3 * ?S c ? $*0ĀS0+ĀR#+ ` c BGGWĀC'((*,

Ä !"#$** !HĀĀ C*Ā5' 5%6' 5#0Ā0*&Ā*$,*&*05ĀC*Ā $$,#F.(' 5'Ā3#/ 0+' ,-Ā3*5 40Ā#.)Ā5 $*&#ĀĀ C*Ā5' 0&5#0Ā' -Ā3*Ā,' +/')H @ĀĀ ' 5',Ā)*<*)Ā*' +.01&Ā4*,*Ā' +*Ā0ĀC*Ā+,.)C#)*Ā+/ ,.01Ā#,Ā5ĀC*Ā6#($)*5#0Ā#%Ā+,.)).01HĀĀ C*Ā4' 5',Ā)*<*)Ā' -Ā65' 5'Ā#<*,Ā5(*H

%"&' () #$ 8? " SXĀĀ7))Ā&#.)Ā*&6,.$5#0&Ā*Ā ('+*Ā.0ĀC*Ā%)+Ā3-ĀC*Ā9,.)).01ĀY#,*(' 0HĀĀ8#Ā)'3#,'5 #,-Ā0')-&*&Ā 4*,* $*,%#,(*+Ā#%,Ā5C.&ĀV,$#&*H

=TĀTTĀU @D@ĀQ : Ä:ĀN 788 QĀH VZĀ S? T?: QĀH 9" ĀĀ@22J

; *#)#1.6ĀĀS',5 CĀSF$)#,'5.#0:ĀQ06H

MĀĀC*,4 ##+Ā9 ,.<*
"S TĀEKĀBDĀDBD

8#,%#)>:ĀU7ĀG@EJ
Y7bĀEGKĀBKDĀDE@

PTG8" X Ā=,.11&ĀS01.0**,. 01

VR? ZSP" X BEĀ6/++*,Ā7<*0/*

T? P7" Q8X N-'00.&:ĀU7

=? RQ3; ĀWX

= M

V7;S

! ?Y !

Y.)*ĀWX	!J@D@		P7 ĀQ3;	Ā7UVTSR	P? RSĀ=7RRST	Ā/,%6*ĀS)*<'5.#0X
9' 5ĀĀ5, 5+X	!@22J	"[VS	NĀ7	ĀĀ		Ā55.#0X
9' 5ĀP#($)*5 *+X	!@22J	ĀQ\S	BĀ2DO	@O		; ,#/0 +4'5*,Ā*<*)Ā' +.01&
9,.))*,X	9HZ'6#3&	N7UUSR		!DGW		9' 5 / 9* $5C
Ā.5ĀR*$HX	9H *.&&*,	Y7TT		BGO		9' 5 / 9* $5C

9*$5C %5	8#H	9*$5CĀ5	V*0H .0	R*6H .0	=)#4&2O	Ā5'5' PC'01 * %5	Ā'($)*Ā 9*&6,.$5.#0
	Ā !	GH @G GK	@D	!G	E E MK	GM @G	Ā !Ā" #$Ā#%Ā'($)*ĀU*+./(Ā+*0&*Ā)'6>Ā" ? VĀ? QTĀ0+Ā%0*ĀĀ7 89: Ā.5)* Ā.)5Ā'6*Ā ? ,1'0 .6 =#55#(Ā#%Ā'($)*ĀĀ=,#4 0Ā,'<*))-Ā%0*Ā6#Ā6#',&*ĀĀ7 89: ĀYQTĀ.5)*Ā ,' <*):).5)*Ā.)5
E	Ā @	EH MH	@D	!D	MJ !G ! !		Ā @ĀU*+./(Ā+*0&*Ā).1G5Ā3,#4 0Ā%0*Ā6#Ā(*+./(ĀĀ7 89 :Ā5'6*Ā Ā.)5
!G	Ā B	!GH !@GH	@D	!J	E E K !!		Ā BĀĀ.(.)',Ā5#ĀĀ @ĀĀ5'5 .%+
!E	Ā D	!EH !MH	@D	!K	J MMK		Ā DĀU*+./(Ā+*0&*Ā).1G5Ā3,#4 0Ā%0*Ā6#Ā6#' ,&*ĀĀ7 89: Ā5'6*Ā ; ,' <*):Ā5'6*Ā Ā.)5 Ā5'5 .%+
@G	Ā E	@GH @GH	@D	!G	B D E E		Ā EĀĀ.(.)',Ā5#ĀĀ D:ĀF6*$5Ā4 *5
@E	Ā J	@EH @MH	@D	K	D J L M		Ā JĀĀ.(.)',Ā5#ĀĀ D:ĀF6*$5Ā4 *5 Ā MĀ55'($5'+Ā&'($)*ĀBĀ3)#40 .0
BG						BGH	=#55#(Ā#%ĀF$)#,'5.#0Ā5ĀBGHI

; ,#/0 +ĀĀ/,%6*Ā5# /&*+ 5C*0

V,#$#,5#0&Ā&*+	P#C*&.<*ĀR#0&.&5 0 6- =)#4&25	P#C*&.#0)*&&ĀĀ0&.5- =)#4&25	Ā'($)*Ā' -$*
",' 6* GĀ#ĀGa T.5)* !GĀ#Ā@6 Ā#(* @Ā#ĀBEa 70+ BEĀ#ĀEGa	G@] *,- ĀĀ#% B D Ā#% E K U Ā5% L !E Ā5%% !J BG] Ā5% B!^ N' ,+	G!G T##&* !G BG U 9*0&* BGEG 9* 0&* EG] 9* 0&*	_V c Y.F*+Ā/.&#0 _" c ĀC*)3-Ā'/3 * ?S c ?$*0ĀS0+ĀR#+ ` c BGGWĀC'((*,

Ā !"#$!HĀĀC*Ā5' 5%' 5#0Ā0*&Ā* $,*&*05ĀC*Ā$$,#F.(' 5'Ā3#/0+' ,-Ā3*54**0Ā#.Ā5$*&HĀĀC*Ā5' 0&5#0Ā(' -Ā3*Ā,' +/')H @ĀĀ ' 5',Ā*<*)Ā' +.01&Ā4 *,*Ā(' +*Ā0ĀC*Ā+,.))C#)*Ā+/ ,.01Ā#,Ā5ĀC*Ā6#($)*5#0Ā#%Ā,.).01HĀĀC*Ā4 ' 5',Ā*<*)Ā(' -Ā65' ' 5'Ā#<*,Ā5(*H

%"&' () #$ 8? " SXĀĀ7))Ā&#.)Ā*&6,.$5#0&Ā*Ā ('+*Ā.0ĀC*Ā%)+Ā3-ĀC*Ā9,.)).01ĀY#,*(' 0HĀĀ8#Ā)'3#,'5 #,-Ā0')-&*&Ā 4*,* $*,%#,(*+Ā%,ĀC.&Ā5,$#&*H

=TĀTTĀU @D@ĀQ : Ā:ĀN 788 ĀH VZĀ S? T? : QH 9" Ā@22J

; *#)#1.6ĀĀS',5 CĀSF$)#,'5.#0:ĀQ06H

MĀĀC*,4##+Ā9,.<*
"S TĀEKĀBDĀDBD

8#,%#)>:ĀU7ĀG@EJ
Y7bĀEGKĀBKDĀDE@

PTGS8" X Ā+,.11&ĀS01.0**,. 01
VR? ZSP" X BEĀĀ6/++*,Ā7<*0/*
T? P7" Q8X N-'00.&:ĀU7

=? RQ8; ĀWX
= K
V7;S
! ?Y !

Y.)*ĀWX !J@D@
9' 5ĀĀ5, 5+X !@22J
9' 5ĀP#($)*5 *+X !@22J
9,.))*,X 9HZ'6#3&
Ä.5ĀR*$HX 9H *.&&*,

	P7ÄQ8;	Ä7UVTSR	P? RSĀ7RRST
"[VS	NÄ7	ÄÄ	
ÄQ\S	BĀ2DO	@O	
N7UUSR		!DGW	
Y7TT		BGO	

Ā/,%6*ĀS)*<'5.#0X
Ä55.#0X
; ,#/0 +4'5*,Ā*<*)Ā' +.01&
9' 5 9* $5C
9' 5 9* $5C

9*$5C %5	8#H	9*$5CĀ5	V*0H .0	R*6H .0	=)#4&2O	Ä5'5' PC'01 * %5	Ä'($)*Ā 9*&6,.$5.#0
	Ä !	GH @GH GH !HE	@D	!K	B @E E	GH !HE	Ä !Ā" #$Ā#%Ā&'($)*ĀT##&*Ā+' ,>Ā3,#4 0Ā ? VÄ? QTĀ0+Ā%0*Ā6#Ā(*+./(ĀÄ7 89 :).5)*ĀÄ.)5Ā5'6*Ā ? ,1'0 .6 U.++)*Ā@ĀĀ9' ,>Ā3,#4 0Ā%0*Ā6#Ā6#' ,&*Ā1,'< *))-ĀÄ7 89 :ĀYQT:Ā.5)*Ā ,'< *): 5'6*Ā Ä.)5 =#5#(Ā#%Ā&'($)*ĀĀ9 *0 &*Ā.1CĀ3,#4 0Ā%0*Ā6#Ā6#' ,&*ĀĀ7 89: Ā5'6*Ā; ,' <*): 5'6*Ā Ä.)5
E	Ä @	EHG MH	@D	!@	!G ! J !J @G		Ä @ĀĀ.(.)',Ā5#Ā3#5#(Ā#%ĀĀ !: ĀF6*$5Ā.5)*Ā ,'< *)
!G	Ä B	!GHG !@GH	@D	!@	B E J K		Ä BĀU*+./(Ā+*0&*Ā).1G5Ā3,#4 0Ā%0*Ā6#Ā6#' ,&*ĀĀ7 89: Ā5'6*Ā Ä.)5ĀĀ5' 5%+
!E	Ä D	!E HG !MH	@D	!K	E ML !!		Ä DĀĀ.(.)',Ā5#ĀĀ B
@G	Ä E	@HG @GH	@D	!J	D J E E		Ä EĀĀ.(.)',Ā5#ĀĀ B
@E	Ä J	@HG @MH	@D	!D	E MJ M		Ä JĀĀ.(.)',Ā5#ĀĀ B Ä MĀĀ5'($5'+Ā3Ā3)#40 .0
BG						BGHG	=#5#(Ā#%ĀF$)#,'5.#0Ā5ĀBGHI

=TĀTTĀU @DĀ@Q: Ä:ĀI 788 ĀH VZĀ S? T? : QH 9" Ā@22J

; ,#/0 +ĀĀ/,%6*Ā5# /&*+ 5C*0

V,#$#,5#0&Ā&*+		P#C*&.<*ĀR#0&.&5'0 6- =)#4&25				P#C*&.#0)*&&Ā0&.5- =)#4&25		Ä'($)*Ā' -$*
",' 6*	GĀ5#ĀGa	G@	] *,- ĀĀ#%5	L !E	Ä5%%	G!G	T##&*	_V c Y.F*+Ā/.&5#0
T.5)*	!GĀ5#Ā@6	B D	Ä#%5	!J BG	] Ä5%%	!G BG	U 9*0&*	_" c ÄC*)3-Ā'/3 *
Ä#(*	@Ā5#ĀBEa	E K	U Ä5%%	B!^	N' ,+	BGEG	9* 0&*	?S c ? $*0ĀS0+ĀR#+
70+	BEĀ5#ĀEGa					EG^	] 9* 0&*	` c BGGWĀC'((*,

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TEST PIT LOGS
35 SCUDDR AVENUE, HYANNIS, MA

TEST PITS EXCAVATED NOVEMBER 8, 2016
TEST PITS LOGGED BY DAVE GEISSER, BRIGGS E & T

TP-1

Grass and Topsoil - f/c Sand, trace Gravel, some Silt, trace organic, dark brown black to dark brown

0.3 ft

Subsoil – f/c Sand, little Gravel, some Silt Light orange brown

1.7 ft

Sand – f/c little Gravel, trace Silt, stratified light brown

4 ft

Bottom of Excavation (BOE)

TP-2

Grass and Topsoil - f/c Sand, trace Gravel, some Silt, trace organic, dark brown

1.0 ft

Silty Sand Fill – f/c Sand trace Gravel, little Silt light brown

2.7 ft

Sand – f/c little Gravel, trace Silt, stratified light brown

5 ft

BOE

TP-3

Grass and Topsoil - f/c Sand, some Silt, trace organic, dark brown

0.7 ft

Subsoil – f/c Sand trace Gravel, some silt

1.3 ft

Silty Sand – f/c, little Silt, stratified light brown to brown

5 ft

Sand – f/c trace Silt, light brown

8 ft

Note: some means 20 to 35%, little means 10 to 20%, trace means less than 10%

TEST PIT LOGS
35 SCUDDR AVENUE, HYANNIS, MA

TEST PITS EXCAVATED NOVEMBER 8, 2016
TEST PITS LOGGED BY DAVE GEISSER, BRIGGS E & T

Grass and Topsoil - f/c Sand, trace Gravel, some Silt, trace organic, dark brown

TP-4

0.3 ft

Subsoil and Topsoil Fill - – f/c Sand, little Subsoil – f/c Sand Organic, dark brown

3.3 ft

Subsoil – f/c Sand, some Silt, yellow brown

4.3 ft

Silty Sand – f/c, little Silt, stratified light brown

7.5 ft

Bottom of Excavation (BOE)

TP-5

0.3 ft

Silty Sand Filll- f/c, trace Gravel, little Silt, trace organic dark brown

0.7 ft

Topsoil – f/c Sand, little Silt, trace organic dark brown

1.0 ft

Subsoil – f/c Sand, some Silt, yellow brown

1.5 ft

Silty Sand – f/c, some Silt, stratified light brown

4 ft

Gravelly Sand – f/c little, Gravel, trace Silt, brown

6.5

BOE

TP-6

0.3 ft

1.3 ft

Stump Fill with organic silty sands Little f/c Sand, some Organic, black

4.5 ft

Sand – f/c, trace (-) organic trace silt, black

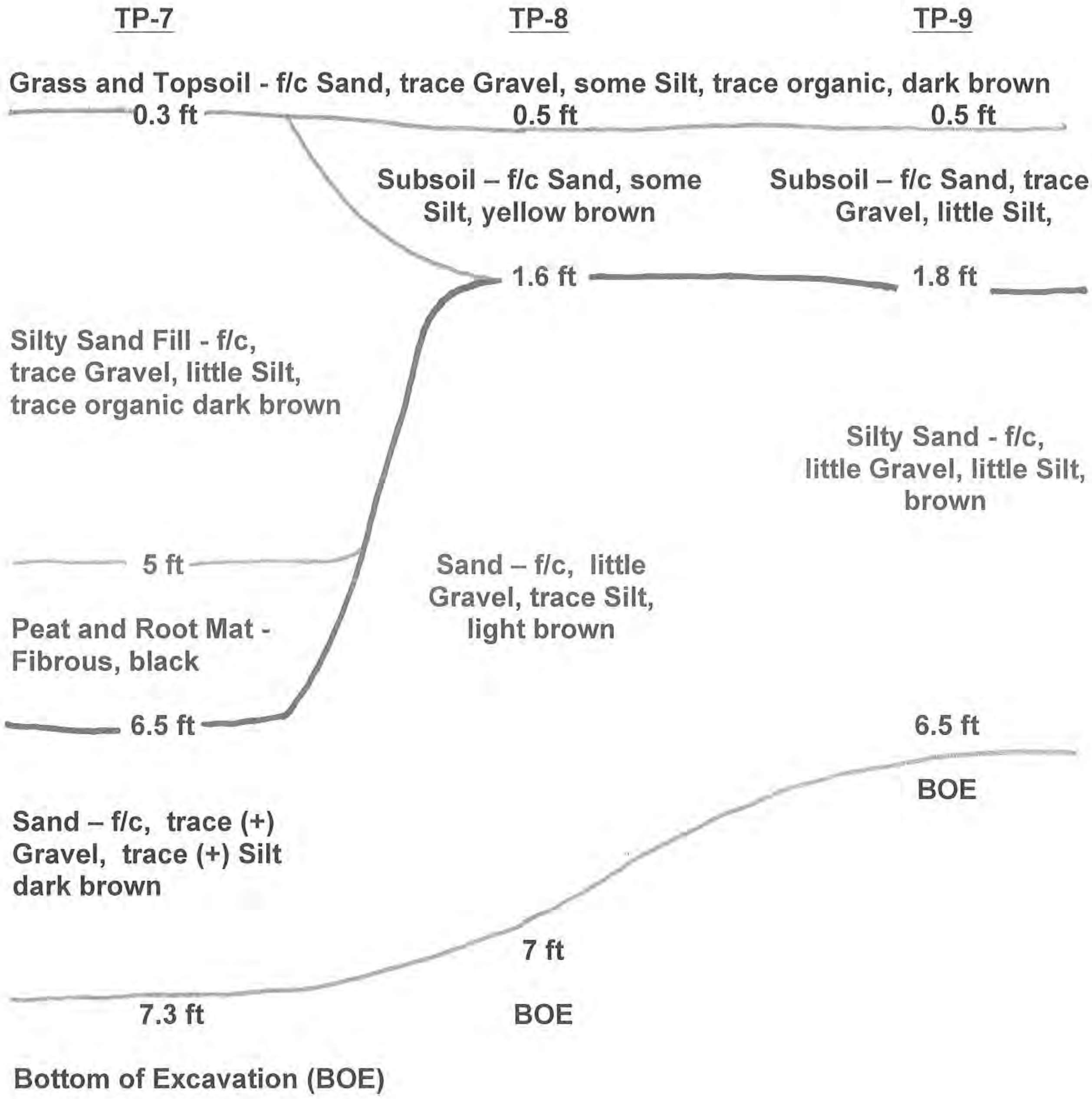
7 ft

BOE

Note: some means 20 to 35%, little means 10 to 20%, trace means less than 10%

TEST PIT LOGS
35 SCUDDR AVENUE, HYANNIS, MA

TEST PITS EXCAVATED NOVEMBER 8, 2016
TEST PITS LOGGED BY DAVE GEISSER, BRIGGS E & T



Note: some means 20 to 35%, little means 10 to 20%, trace means less than 10%

APPENDIX B - Test Pit Logs

LGCI
Lahlaf Geotechnical Consulting, Inc.
100 Chelamsford Road, Suite 2
Billerica, MA 01862
Telephone: (978) 330-5912
Fax: (978) 330-5056

TEST PIT LOG

TP-1

CLIENT: LMC
PROJECT NAME: Proposed Residential Development
LGCI PROJECT NUMBER: 2026
PROJECT LOCATION: Hyannis, MA

DATE STARTED: 8/18/20 **DATE COMPLETED:** 8/18/20
TEST PIT LOCATION: Near Northeastern corner of site
COORDINATES: NA
SURFACE EL.: 30.7 ft. (see note 1) **TOTAL DEPTH:** 10 ft.
GROUNDWATER LEVELS:
DURING EXCAVATION: -
AT END OF EXCAVATION: -

EXCAVATION SUBCONTRACTOR: Northern Drill Service, Inc.
EXCAVATION FOREMAN: Dave Edilberti
EXCAVATOR TYPE/MODEL: John Deere 310 SL
WEATHER: 80s, sunny/light rain
TEST PIT DIMENSIONS: 3' x 6'
LOGGED BY: AR **CHECKED BY:**

Depth (ft)	El. (ft)	Excavation Effort	Remark	Strata	Depth El.(ft.)	Material Description
	30.0	E		Topsoil	0.8	0 ft. - 0.8 ft.: Topsoil
2.5	27.5	E		Subsoil	29.9 / 4.5	0.8 ft. - 4.5 ft.: Silty SAND (SM), fine to medium sand, trace coarse, 25-30% fines, 10-15% fine to coarse subrounded gravel, light brown
5.0	25.0	E		Sand	26.2	4.5 ft. - 7 ft.: Poorly Graded SAND with Silt and Gravel (SP-SM), medium to coarse, 5-10% fines, ~15% fine to coarse subrounded to subangular gravel, brown, moist (natural)
7.5	22.5	E				7 ft. - 10 ft.: Poorly Graded SAND (SP), medium to coarse, trace fine, 0-5% fines, light brown, moist (natural)
10.0					10.0	Bottom of test pit at 10.0 feet. Backfilled with excavated material in 1-2' lifts and compacted with excavator bucket.

GENERAL COMMENTS: **E = Easy, M - Moderate, D = Difficult, V = Very Difficult**

1. The ground surface elevations was provided to LGCI by Pesce Engineering & Associates, Inc. via e-mail on 8/13/2020. The ground surface elevation at test pit TP-1 was adjusted by estimating the elevation difference between the actual, as excavated, and the original location and is therefore approximate.

LGCI — Lahlaf Geotechnical Consulting, Inc.
100 Chelamsford Road, Suite 2
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Telephone: (978) 330-5912
Fax: (978) 330-5056

TEST PIT LOG

TP-2

CLIENT: LMC
PROJECT NAME: Proposed Residential Development
LGCI PROJECT NUMBER: 2026
PROJECT LOCATION: Hyannis, MA

DATE STARTED: 8/18/20 **DATE COMPLETED:** 8/18/20
TEST PIT LOCATION: Eastern side of site
COORDINATES: NA
SURFACE EL.: 26.6 ft. (see note 1) **TOTAL DEPTH:** 12 ft.
GROUNDWATER LEVELS:
DURING EXCAVATION: -
AT END OF EXCAVATION: -

EXCAVATION SUBCONTRACTOR: Northern Drill Service, Inc.
EXCAVATION FOREMAN: Dave Edilberti
EXCAVATOR TYPE/MODEL: John Deere 310 SL
WEATHER: 80s, sunny/light rain
TEST PIT DIMENSIONS: 3.5' x 7'
LOGGED BY: AR **CHECKED BY:**

Depth (ft)	El. (ft)	Excavation Effort	Remark	Strata	Depth / El. (ft.)	Material Description
0 – 0.5	26.6 – 26.1	E		Topsoil	0.5 / 26.1	0 ft. - 0.5 ft.: Topsoil
0.5 – 4.5	26.1 – 22.1	E		Fill	4.5 / 22.1	0.5 ft. - 4.5 ft.: Silty SAND (SM), fine, trace medium to coarse, ~15% fines, 10-15% fine to coarse subrounded to angular gravel, trace of organic soil, trace of roots, brown, moist (fill)
4.5 – 12.0	22.1 – 14.6	E		Sand	12.0	4.5 ft. - 12 ft.: Poorly Graded SAND (SP), medium to coarse, trace fine, 0-5% fines, 5-10% fine to coarse subrounded gravel, light brown, moist (natural)
						Bottom of test pit at 12.0 feet. Backfilled with excavated material in 1-2' lifts and compacted with excavator bucket.

Depth scale: 2.5, 5.0, 7.5, 10.0. Elevation scale: 25.0, 22.5, 20.0, 17.5, 15.0.

GENERAL COMMENTS: **E = Easy, M - Moderate, D = Difficult, V = Very Difficult**

1. The ground surface elevations was provided to LGCI by Pesce Engineering & Associates, Inc. via e-mail on 8/13/2020.

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100 Chelamsford Road, Suite 2
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Telephone: (978) 330-5912
Fax: (978) 330-5056

TEST PIT LOG

TP-3

CLIENT: LMC
PROJECT NAME: Proposed Residential Development
LGCI PROJECT NUMBER: 2026
PROJECT LOCATION: Hyannis, MA

DATE STARTED: 8/18/20 **DATE COMPLETED:** 8/18/20
TEST PIT LOCATION: Eastern side of site
COORDINATES: NA
SURFACE EL.: 20.9 ft. (see note 1) **TOTAL DEPTH:** 12 ft.
GROUNDWATER LEVELS:
DURING EXCAVATION: -
AT END OF EXCAVATION: -

EXCAVATION SUBCONTRACTOR: Northern Drill Service, Inc.
EXCAVATION FOREMAN: Dave Edilberti
EXCAVATOR TYPE/MODEL: John Deere 310 SL
WEATHER: 80s, sunny/light rain
TEST PIT DIMENSIONS: 3' x 8'
LOGGED BY: AR **CHECKED BY:**

Depth (ft)	El. (ft)	Excavation Effort	Remark	Strata	Depth / El.(ft.)	Material Description
0 - 1.2	20.0	E		Topsoil	1.2 / 19.7	0 ft. - 1.2 ft.: Topsoil
1.2 - 3.5 (2.5)	17.5	E		Fill	3.5 / 17.4	1.2 ft. - 3.5 ft.: Well Graded SAND with Silt and Gravel (SW-SM), fine to coarse, ~10% fines, 20-25% fine to coarse subrounded to angular gravel, trace of organic soil, trace of roots, brown, moist (fill)
3.5 - 12 (5.0, 7.5, 10.0)	15.0, 12.5, 10.0	E		Sand	12.0	3.5 ft. - 12 ft.: Poorly Graded SAND (SP), medium to coarse, 0-5% fines, 5-10% fine subrounded gravel, light brown, moist (natural)
						Bottom of test pit at 12.0 feet. Backfilled with excavated material in 1-2' lifts and compacted with excavator bucket.

GENERAL COMMENTS: **E = Easy, M - Moderate, D = Difficult, V = Very Difficult**

1. The ground surface elevations was provided to LGCI by Pesce Engineering & Associates, Inc. via e-mail on 8/13/2020.

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100 Chelamsford Road, Suite 2
Billerica, MA 01862
Telephone: (978) 330-5912
Fax: (978) 330-5056

TEST PIT LOG

TP-4

CLIENT: LMC
PROJECT NAME: Proposed Residential Development
LGCI PROJECT NUMBER: 2026
PROJECT LOCATION: Hyannis, MA

DATE STARTED: 8/18/20 **DATE COMPLETED:** 8/18/20
TEST PIT LOCATION: Southern side of site
COORDINATES: NA
SURFACE EL.: 20.2 ft. (see note 1) **TOTAL DEPTH:** 11 ft.
GROUNDWATER LEVELS:
∇ **DURING EXCAVATION:** -
▼ **AT END OF EXCAVATION:** -

EXCAVATION SUBCONTRACTOR: Northern Drill Service, Inc.
EXCAVATION FOREMAN: Dave Edilberti
EXCAVATOR TYPE/MODEL: John Deere 310 SL
WEATHER: 80s, sunny/light rain
TEST PIT DIMENSIONS: 3' x 9'
LOGGED BY: AR **CHECKED BY:**

Depth (ft)	El. (ft)	Excavation Effort	Remark	Strata	Depth / El.(ft.)	Material Description
0	20.0	E		Topsoil	1.0 / 19.2	0 ft. - 1 ft.: Topsoil
2.5	17.5	E		Fill	3.5 / 16.7	1 ft. - 3.5 ft.: Poorly Graded SAND with Silt and Gravel (SP-SM), fine to medium, trace coarse, 10-15% fines, 25-30% fine to corase rounded to angular gravel, trace of organic soil, trace of roots, brown, moist (subsoil or fill)
5.0 / 7.5 / 10.0	15.0 / 12.5 / 10.0	E		Sand	11.0	3.5 ft. - 11 ft.: Poorly Graded SAND (SP), medium to coarse, trace fine, 0-5% fines, 0-5% fine subrounded gravel, light brown, moist (natural)
						Bottom of test pit at 11.0 feet. Backfilled with excavated material in 1-2' lifts and compacted with excavator bucket.

GENERAL COMMENTS: **E = Easy, M - Moderate, D = Difficult, V = Very Difficult**

1. The ground surface elevations was provided to LGCI by Pesce Engineering & Associates, Inc. via e-mail on 8/13/2020.

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Fax: (978) 330-5056

TEST PIT LOG

TP-5

CLIENT: LMC
PROJECT NAME: Proposed Residential Development
LGCI PROJECT NUMBER: 2026
PROJECT LOCATION: Hyannis, MA

DATE STARTED: 8/18/20 **DATE COMPLETED:** 8/18/20
TEST PIT LOCATION: Southern side of site
COORDINATES: NA
SURFACE EL.: 18.1 ft. (see note 1) **TOTAL DEPTH:** 10 ft.
GROUNDWATER LEVELS:
DURING EXCAVATION: -
AT END OF EXCAVATION: -

EXCAVATION SUBCONTRACTOR: Northern Drill Service, Inc.
EXCAVATION FOREMAN: Dave Edilberti
EXCAVATOR TYPE/MODEL: John Deere 310 SL
WEATHER: 80s, sunny/light rain
TEST PIT DIMENSIONS: 3' x 8'
LOGGED BY: AR **CHECKED BY:**

Depth (ft)	El. (ft)	Excavation Effort	Remark	Strata	Depth El.(ft.)	Material Description
0–1.0	17.5	E		Topsoil	1.0 / 17.1	0 ft. - 1 ft.: Topsoil
2.5	15.0	E		Fill	3.5 / 14.6	1 ft. - 3.5 ft.: Well Graded SAND with Gravel (SW), fine to coarse, 5-10% fines, 35-40% fine to coarse subrounded to angular gravel, trace of organic soil trace of roots, brown, moist (fill)
5.0, 7.5, 10.0	12.5, 10.0	E		Sand	10.0	3.5 ft. - 10 ft.: Poorly Graded SAND (SP), fine to coarse, 0-5% fines, light brown, moist (natural)
						Bottom of test pit at 10.0 feet. Backfilled with excavated material in 1-2' lifts and compacted with excavator bucket.

GENERAL COMMENTS: **E = Easy, M - Moderate, D = Difficult, V = Very Difficult**

1. The ground surface elevations was provided to LGCI by Pesce Engineering & Associates, Inc. via e-mail on 8/13/2020.

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TEST PIT LOG

TP-6

CLIENT: LMC
PROJECT NAME: Proposed Residential Development
LGCI PROJECT NUMBER: 2026
PROJECT LOCATION: Hyannis, MA

DATE STARTED: 8/18/20 **DATE COMPLETED:** 8/18/20
TEST PIT LOCATION: Western side of site
COORDINATES: NA
SURFACE EL.: 22.6 ft. (see note 1) **TOTAL DEPTH:** 10 ft.
GROUNDWATER LEVELS:
DURING EXCAVATION: -
AT END OF EXCAVATION: -

EXCAVATION SUBCONTRACTOR: Northern Drill Service, Inc.
EXCAVATION FOREMAN: Dave Edilberti
EXCAVATOR TYPE/MODEL: John Deere 310 SL
WEATHER: 80s, sunny/light rain
TEST PIT DIMENSIONS: 3' x 9'
LOGGED BY: AR **CHECKED BY:**

Depth (ft)	El. (ft)	Excavation Effort	Remark	Strata	Depth / El.(ft.)	Material Description
0 – 1.0	22.6 – 21.6	E		Topsoil	1.0 / 21.6	0 ft. - 1 ft.: Topsoil
1.0 – 4.5 (2.5)	21.6 – 18.1 (20.0)	E		Fill	4.5 / 18.1	1 ft. - 4.5 ft.: Poorly Graded SAND with Gravel (SP), fine to medium, trace coarse, 0-5% fines, 15-20% fine to coarse subrounded gravel, trace of organic soil, trace of roots, brown, moist (fill)
4.5 – 10.0 (5.0, 7.5, 10.0)	18.1 – 12.6 (17.5, 15.0)	E		Sand	10.0	4.5 ft. - 10 ft.: Poorly Graded SAND (SP), medium to coarse, trace fine, 0-5% fines, 5-10% fine to coarse subrounded gravel, light brown, moist (natural)
						Bottom of test pit at 10.0 feet. Backfilled with excavated material in 1-2' lifts and compacted with excavator bucket.

GENERAL COMMENTS: **E = Easy, M - Moderate, D = Difficult, V = Very Difficult**

1. The ground surface elevations was provided to LGCI by Pesce Engineering & Associates, Inc. via e-mail on 8/13/2020.

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TEST PIT LOG

TP-8

CLIENT: LMC
PROJECT NAME: Proposed Residential Development
LGCI PROJECT NUMBER: 2026
PROJECT LOCATION: Hyannis, MA

DATE STARTED: 8/18/20 **DATE COMPLETED:** 8/18/20
TEST PIT LOCATION: Near center of site
COORDINATES: NA
SURFACE EL.: 21.1 ft. (see note 1) **TOTAL DEPTH:** 8 ft.
GROUNDWATER LEVELS:
▽ **DURING EXCAVATION:** -
▼ **AT END OF EXCAVATION:** -

EXCAVATION SUBCONTRACTOR: Northern Drill Service, Inc.
EXCAVATION FOREMAN: Dave Edilberti
EXCAVATOR TYPE/MODEL: John Deere 310 SL
WEATHER: 80s, sunny/light rain
TEST PIT DIMENSIONS: 3' x 8'
LOGGED BY: AR **CHECKED BY:**

Depth (ft)	El. (ft)	Excavation Effort	Remark	Strata	Depth / El.(ft.)	Material Description
		E		Topsoil	1.0 / 20.1	0 ft. - 1 ft.: Topsoil
2.5	20.0 / 17.5	E		Fill	3.5 / 17.6	1 ft. - 3.5 ft.: Poorly Graded SAND (SP), fine to coarse, 5-10% fines, 10-15% fine to coarse subrouneded to angular gravel, trace of organic soil, trace of roots, brown, moist (fill)
5.0 / 7.5	15.0	E		Sand	8.0	3.5 ft. - 8 ft.: Poorly Graded SAND (SP), medium to coarse, trace fine, 0-5% fines, 0-5% fine subrounded gravel, light brown, moist (natural)
						Bottom of test pit at 8.0 feet. Backfilled with excavated material in 1-2' lifts and compacted with excavator bucket.

GENERAL COMMENTS: **E = Easy, M - Moderate, D = Difficult, V = Very Difficult**

1. The ground surface elevations was provided to LGCI by Pesce Engineering & Associates, Inc. via e-mail on 8/13/2020.

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TEST PIT LOG

TP-9

CLIENT: LMC
PROJECT NAME: Proposed Residential Development
LGCI PROJECT NUMBER: 2026
PROJECT LOCATION: Hyannis, MA

DATE STARTED: 8/18/20 **DATE COMPLETED:** 8/18/20
TEST PIT LOCATION: Near center of site
COORDINATES: NA
SURFACE EL.: 31.3 ft. (see note 1) **TOTAL DEPTH:** 8 ft.
GROUNDWATER LEVELS:
DURING EXCAVATION: -
AT END OF EXCAVATION: -

EXCAVATION SUBCONTRACTOR: Northern Drill Service, Inc.
EXCAVATION FOREMAN: Dave Edilberti
EXCAVATOR TYPE/MODEL: John Deere 310 SL
WEATHER: 80s, sunny/light rain
TEST PIT DIMENSIONS: 3' x 8'
LOGGED BY: AR **CHECKED BY:**

Depth (ft)	El. (ft)	Excavation Effort	Remark	Strata	Depth / El.(ft.)	Material Description
	30.0	E		Topsoil	1.5 / 29.8	0 ft. - 1.5 ft.: Topsoil
2.5	27.5	E		Fill	4.0 / 27.3	1.5 ft. - 4 ft.: Poorly Graded SAND with Silt and Gravel (SP-SM), mostly medium, 10-15% fines, 25-30% fine subrounded gravel, light brown
5.0, 7.5	25.0	E		Sand	8.0	4 ft. - 8 ft.: Poorly Graded SAND (SP), medium to coarse, trace fine, 0-5% fines, 0-5% fine subrounded gravel, light brown, moist (natural)
						Bottom of test pit at 8.0 feet. Backfilled with excavated material in 1-2' lifts and compacted with excavator bucket.

GENERAL COMMENTS: **E = Easy, M - Moderate, D = Difficult, V = Very Difficult**

1. The ground surface elevations was provided to LGCI by Pesce Engineering & Associates, Inc. via e-mail on 8/13/2020.

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TEST PIT LOG

TP-B-2

CLIENT: LMC
PROJECT NAME: Proposed Residential Development
LGCI PROJECT NUMBER: 2026
PROJECT LOCATION: Hyannis, MA

DATE STARTED: 8/18/20 **DATE COMPLETED:** 8/18/20
TEST PIT LOCATION: Near center of site
COORDINATES: NA
SURFACE EL.: 25.2 ft. (see note 1) **TOTAL DEPTH:** 10 ft.
GROUNDWATER LEVELS:
DURING EXCAVATION: -
AT END OF EXCAVATION: -

EXCAVATION SUBCONTRACTOR: Northern Drill Service, Inc.
EXCAVATION FOREMAN: Dave Edilberti
EXCAVATOR TYPE/MODEL: John Deere 310 SL
WEATHER: 80s, sunny/light rain
TEST PIT DIMENSIONS: 3' x 8'
LOGGED BY: AR **CHECKED BY:**

Depth (ft)	El. (ft)	Excavation Effort	Remark	Strata	Depth El.(ft.)	Material Description
0 – 1.4	25.0	E		Topsoil	1.4 / 23.8	0 ft. - 1.4 ft.: Topsoil
1.4 – 3.5 (2.5)	22.5	E		Fill	3.5 / 21.7	1.4 ft. - 3.5 ft.: Poorly Graded SAND (SP), fine to medium, trace coarse, 5-10% fines, 10-15% fine to coarse subrounded to angular gravel, trace of organic soil, trace of roots, brown, moist (fill)
3.5 – 10.0 (5.0, 7.5, 10.0)	20.0, 17.5	E		Sand	10.0	3.5 ft. - 10 ft.: Poorly Graded SAND (SP), medium to coarse, trace fine, 0-5% fines, 5-10% fine to coarse subrounded gravel, light brown, moist (natural)

Bottom of test pit at 10.0 feet. Backfilled with excavated material in 1-2' lifts and compacted with excavator bucket.

GENERAL COMMENTS: **E = Easy, M - Moderate, D = Difficult, V = Very Difficult**

1. The ground surface elevations was provided to LGCI by Pesce Engineering & Associates, Inc. via e-mail on 8/13/2020.

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Telephone: (978) 330-5912
Fax: (978) 330-5056

TEST PIT LOG

TP-B-3

CLIENT: LMC
PROJECT NAME: Proposed Residential Development
LGCI PROJECT NUMBER: 2026
PROJECT LOCATION: Hyannis, MA

DATE STARTED: 8/18/20 **DATE COMPLETED:** 8/18/20
TEST PIT LOCATION: Near Northeastern corner of site
COORDINATES: NA
SURFACE EL.: 19 ft. (see note 1) **TOTAL DEPTH:** 10 ft.
GROUNDWATER LEVELS:
DURING EXCAVATION: -
AT END OF EXCAVATION: -

EXCAVATION SUBCONTRACTOR: Northern Drill Service, Inc.
EXCAVATION FOREMAN: Dave Edilberti
EXCAVATOR TYPE/MODEL: John Deere 310 SL
WEATHER: 80s, sunny/light rain
TEST PIT DIMENSIONS: 3' x 8'
LOGGED BY: AR **CHECKED BY:**

Depth (ft)	El. (ft)	Excavation Effort	Remark	Strata	Depth / El.(ft.)	Material Description
0	19.0	E		Topsoil	0.8 / 18.2	0 ft. - 0.8 ft.: Topsoil
2.5	17.5	E		Fill	4.0 / 15.0	0.8 ft. - 4 ft.: Well Graded SAND with Gravel (SW), fine to coarse, 0-5% fines, ~15% fine to coarse subrounded to angular gravel, trace of organic soil, trace of roots, brown, moist (fill)
5.0, 7.5	15.0, 12.5, 10.0	E		Sand	10.0	4 ft. - 10 ft.: Poorly Graded SAND (SP), medium to coarse, 0-5% fines, 0-5% fine subrounded gravel, light brown, moist
10.0						Bottom of test pit at 10.0 feet. Backfilled with excavated material in 1-2' lifts and compacted with excavator bucket.

GENERAL COMMENTS: **E = Easy, M - Moderate, D = Difficult, V = Very Difficult**

1. The ground surface elevations was provided to LGCI by Pesce Engineering & Associates, Inc. via e-mail on 8/13/2020.

APPENDIX C – Boring Log

LGCI
Lahlaf Geotechnical Consulting, Inc.

BORING LOG

B-4

CLIENT: LMC
PROJECT NAME: Proposed Residential Development
LGCI PROJECT NUMBER: 2026
PROJECT LOCATION: Hyannis, MA

DATE STARTED: 8/17/20 **DATE COMPLETED:** 8/17/20
BORING LOCATION: Eastern side of Site
COORDINATES: NA
SURFACE El.: 32.2 ft. (see note 1) **TOTAL DEPTH:** 60 ft.
WEATHER: 70s, sunny
GROUNDWATER LEVELS:
DURING DRILLING: 14.0 ft. / El. 18.2 ft.
AT END OF DRILLING: 19.9 ft. / El. 12.3 ft.
OTHER: -

DRILLING SUBCONTRACTOR: Northern Drill Service, Inc.
DRILLING FOREMAN: John Beirholm
DRILLING METHOD: Drive and wash with 4-inch casing
DRILL RIG TYPE/MODEL: Track Mounted ATV B-48
HAMMER TYPE: Automatic
HAMMER WEIGHT: 140 lb. **HAMMER DROP:** 30 in.
SPLIT SPOON DIA.: 1.375 in. I.D., 2 in. O.D.
CORE BARREL SIZE: NA
LOGGED BY: AR **CHECKED BY:** SD

Depth (ft.)	El. (ft.)	Sample Interval (ft.)	Sample Number	Blow Counts (N Value)	Pen./Rec. (in.)	Remark	Strata	Depth El.(ft.)	Material Description
		0–2	S1	3-6-7-10 (13)	24/16		Topsoil	0.7 / 31.5	S1 - Top 8": Topsoil Bottom 8": Silty SAND with Gravel (SM), fine to medium, trace coarse, 15-20% fines, 20-25% fine to coarse subrounded to angular gravel, trace of organic soil, trace of roots, light brown, moist (subsoil)
	30.0	2–4	S2	8-11-10-13 (21)	24/18		Subsoil	3.0 / 29.2	S2 - Top 12": Poorly Graded SAND with Gravel (SP), fine to medium, trace coarse, 5-10% fines, ~15% fine to coarse subrounded to angular gravel, light brown, moist Bottom 6": Poorly Graded SAND with Gravel (SP), fine to coarse, 0-5% fines, ~15% fine to coarse subrounded to subangular gravel, light brown, moist (natural sand)
5		4–6	S3	4-7-11-13 (18)	24/6		Sand		S3 - Similar to bottom of S2, medium to coarse, trace fine
	25.0	6–8	S4	15-14-13-13 (27)	24/8				S4 - Poorly Graded SAND with Silt and Gravel (SP-SM), fine to coarse, ~10% fines, ~15% fine to coarse subrounded to angular gravel, light brown, moist
		8–10	S5	6-5-6-6 (11)	24/8				S5 - Poorly Graded SAND (SP), medium to coarse, 0-5% fines, 5-10% fine subrounded to angular gravel, light brown, wet
10		10–12	S6	6-6-8-9 (14)	24/14				S6 - Similar to S5 (moist soil in tip of split spoon)
	20.0	12							
15		14–16	S7	4-5-5-7 (10)	24/6			∇	S7 - Poorly Graded SAND (SP), fine to coarse, 0-5% fines, trace of fine subrounded gravel, light brown, wet
	15.0	16							
20		19–21	S8	4-6-9-8 (15)	24/4			▼	S8 - Poorly Graded SAND (SP), fine to medium, 0-5% fines, trace of fine subrounded to angular gravel, light brown, wet
	10.0	21							
25		24		4-4-5-4					S9 - No recovery, drove 3" split spoon to collect sample Poorly Graded SAND (SP), fine to coarse, 0-5% fines, 5-10% fine subrounded

GENERAL NOTES:

1. The ground surface elevations was provided to LGCI by Pesce Engineering & Associates, Inc. via e-mail on 8/13/2020. The ground surface elevation at boring B-4 was adjusted by estimating the elevation difference between the actual, as drilled, and the original location and is therefore approximate.

CLIENT: LMC
PROJECT NAME: Proposed Residential Development
LGCI PROJECT NUMBER: 2026
PROJECT LOCATION: Hyannis, MA

Depth (ft.)	El. (ft.)	Sample Interval (ft.)	Sample Number	Blow Counts (N Value)	Pen./Rec. (in.)	Remark	Strata	Depth El.(ft.)	Material Description
		24–26	S9	(9)	24/0			29.2	to angular gravel, light brown, wet
	5.0								
30		29–31	S10	5-6-6-7 (12)	24/0				S10 - No recovery
	0.0								
35		34–36	S11	6-5-4-4 (9)	24/0				S11 - No recovery, drove 3" split spoon to collect sample Poorly Graded SAND (SP), medium to coarse, 0-5% fines, 5-10% fine subrounded to angular gravel, light brown, wet
	-5.0								
40		39–40.5	S12	28-70-78	18/5				S12 - Poorly Graded SAND (SP), fine, 0-5% fines, gray, wet
	-10.0						Sand		
45		44–46	S13	5-6-6-7 (12)	24/0				S13 - No recovery
	-15.0								
50		49–51	S14	6-6-5-6 (11)	24/4				S14 - Poorly Graded SAND (SP), medium to coarse, 0-5% fines, 0-5% fine subrounded gravel, gray, wet
	-20.0								
55		54–56	S15	6-11-11-14 (22)	24/6				S15 - Poorly Graded SAND (SP), fine to coarse, 0-5% fines, 5-10% fine subrounded to subangular gravel, light brown, wet
	-25.0								
60						1		60.0	REMARK 1: Advanced roller bit to 60'. Therefore, no sample could be taken

BORING LOG

Lahlaf Geotechnical Consulting, Inc.

CLIENT: LMC **PROJECT NAME:** Proposed Residential Development

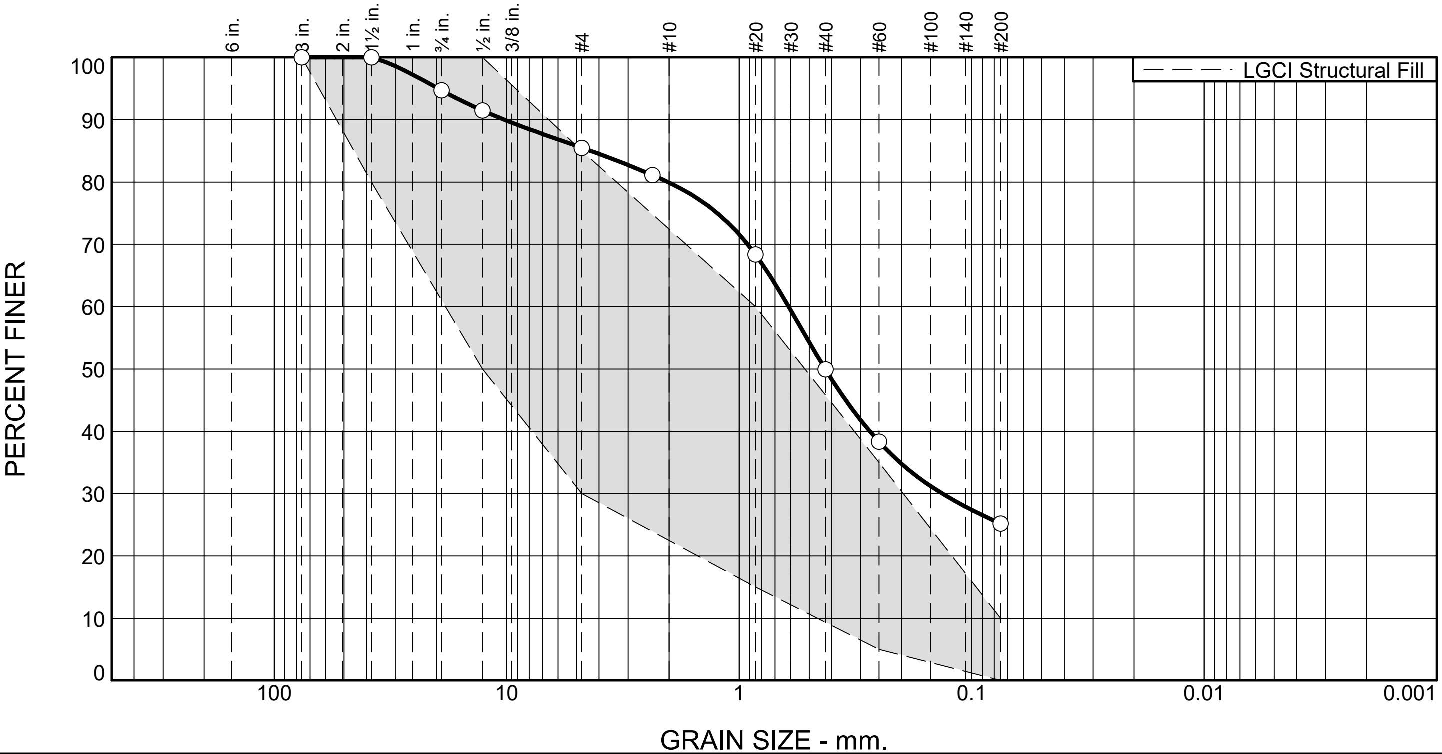
LGCI PROJECT NUMBER: 2026 **PROJECT LOCATION:** Hyannis, MA

Depth (ft.)	El. (ft.)	Sample Interval (ft.)	Sample Number	Blow Counts (N Value)	Pen./Rec. (in.)	Remark	Strata	Depth El.(ft.)	Material Description
									from 60-62'.
									Bottom of borehole at 60.0 feet. Backfilled borehole with drill cuttings.

Depth scale: 65, 70, 75, 80, 85, 90, 95
El. scale: -30.0, -35.0, -40.0, -45.0, -50.0, -55.0, -60.0

APPENDIX D - Laboratory Test Results

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	5.3	9.2	5.6	30.0	24.7	25.2	

TEST RESULTS

Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
3"	100.0	100.0	
1.5"	100.0	80.0 - 100.0	
0.75"	94.7		
0.5"	91.5	50.0 - 100.0	
#4	85.5	30.0 - 85.0	X
#8	81.1		
#20	68.4	15.0 - 60.0	X
#40	49.9		
#60	38.3	5.0 - 35.0	X
#200	25.2	0.0 - 10.0	X

* LGCI Structural Fill

Material Description

ASTM (D 2488) Classification: Silty SAND (SM), fine to medium sand, trace coarse, 25-30% fines, 10-15% fine to coarse subrounded gravel, light brown

Atterberg Limits (ASTM D 4318)

PL= **LL=** **PI=**

Classification

USCS (D 2487)= **AASHTO (M 145)=**

Coefficients

D_{90}= 10.1932 D_{85}= 4.3509 D_{60}= 0.6124
D_{50}= 0.4263 D_{30}= 0.1335 D_{15}=
D_{10}= C_u= C_c=

Remarks

Subsoil sample

Date Received: 8/18/2020 **Date Tested:** 8/21/2020

Tested By: OIL

Checked By: AML

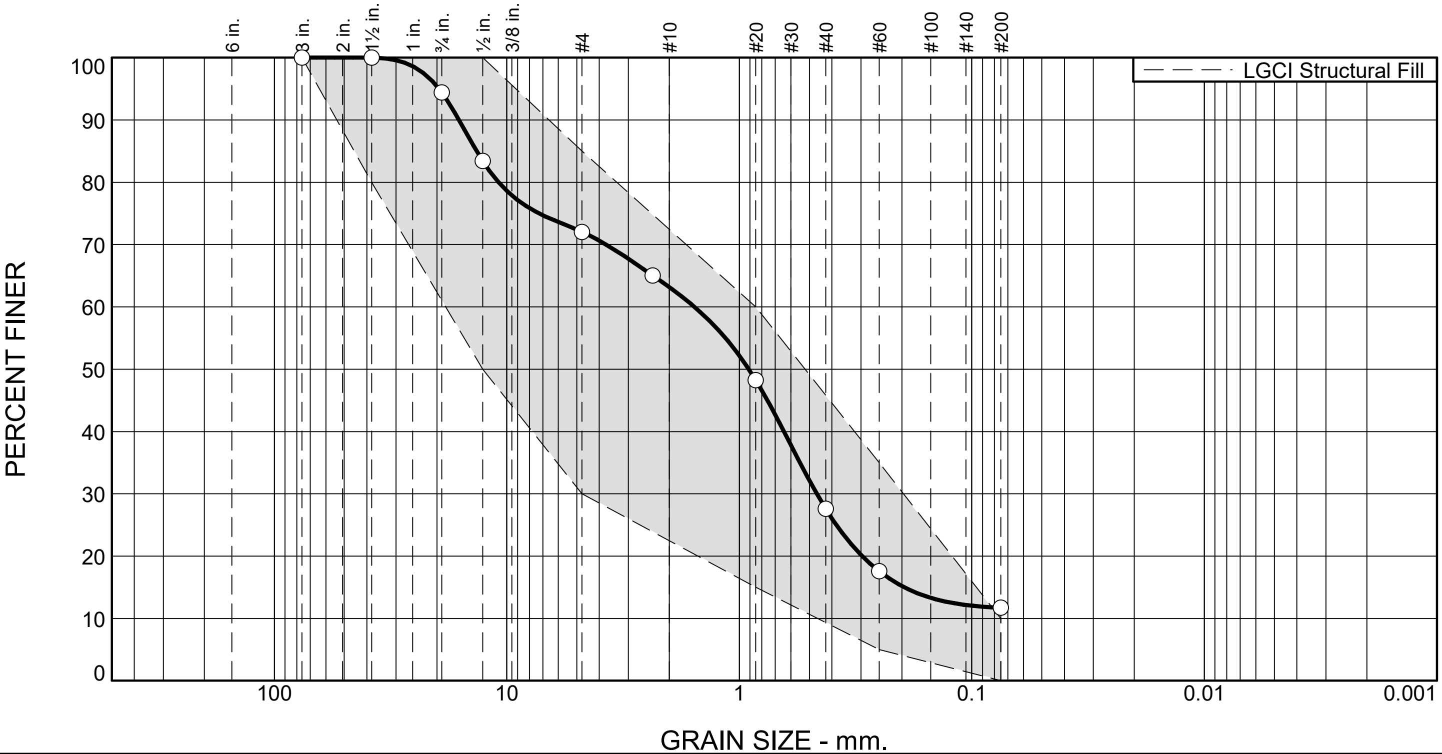
Location: Test Pit TP-1
Depth: 0.8' - 4.5'

Date Sampled: 8/18/2020

LGCI
Lahlaf Geotechnical Consulting, Inc.

Client: LMC
Project: Proposed Residential Development, Hyannis, MA
Project No: 2026 **Figure**

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	5.6	22.4	8.8	35.6	15.9	11.7	

TEST RESULTS			
Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
3"	100.0	100.0	
1.5"	100.0	80.0 - 100.0	
0.75"	94.4		
0.5"	83.4	50.0 - 100.0	
#4	72.0	30.0 - 85.0	
#8	65.1		
#20	48.3	15.0 - 60.0	
#40	27.6		
#60	17.6	5.0 - 35.0	
#200	11.7	0.0 - 10.0	X

* LGCI Structural Fill

Material Description

ASTM (D 2488) Classification: Poorly Graded SAND with Silt and Gravel (SP-SM), mostly medium, 10-15% fines, 25-30% fine subrounded gravel, light brown

Atterberg Limits (ASTM D 4318)

PL= **LL=** **PI=**

Classification

USCS (D 2487)= **AASHTO (M 145)=**

Coefficients

D_{90}= 16.0720 D_{85}= 13.4906 D_{60}= 1.5586
D_{50}= 0.9100 D_{30}= 0.4644 D_{15}= 0.1951
D_{10}= C_u= C_c=

Remarks

Subsoil Fill sample

Date Received: 8/18/2020 **Date Tested:** 8/21/2020

Tested By: OIL

Checked By: AML

Location: Test Pit TP-9
Depth: 1.5' - 4.5'

Date Sampled: 8/18/2020

LGCI
Lahlaf Geotechnical Consulting, Inc.

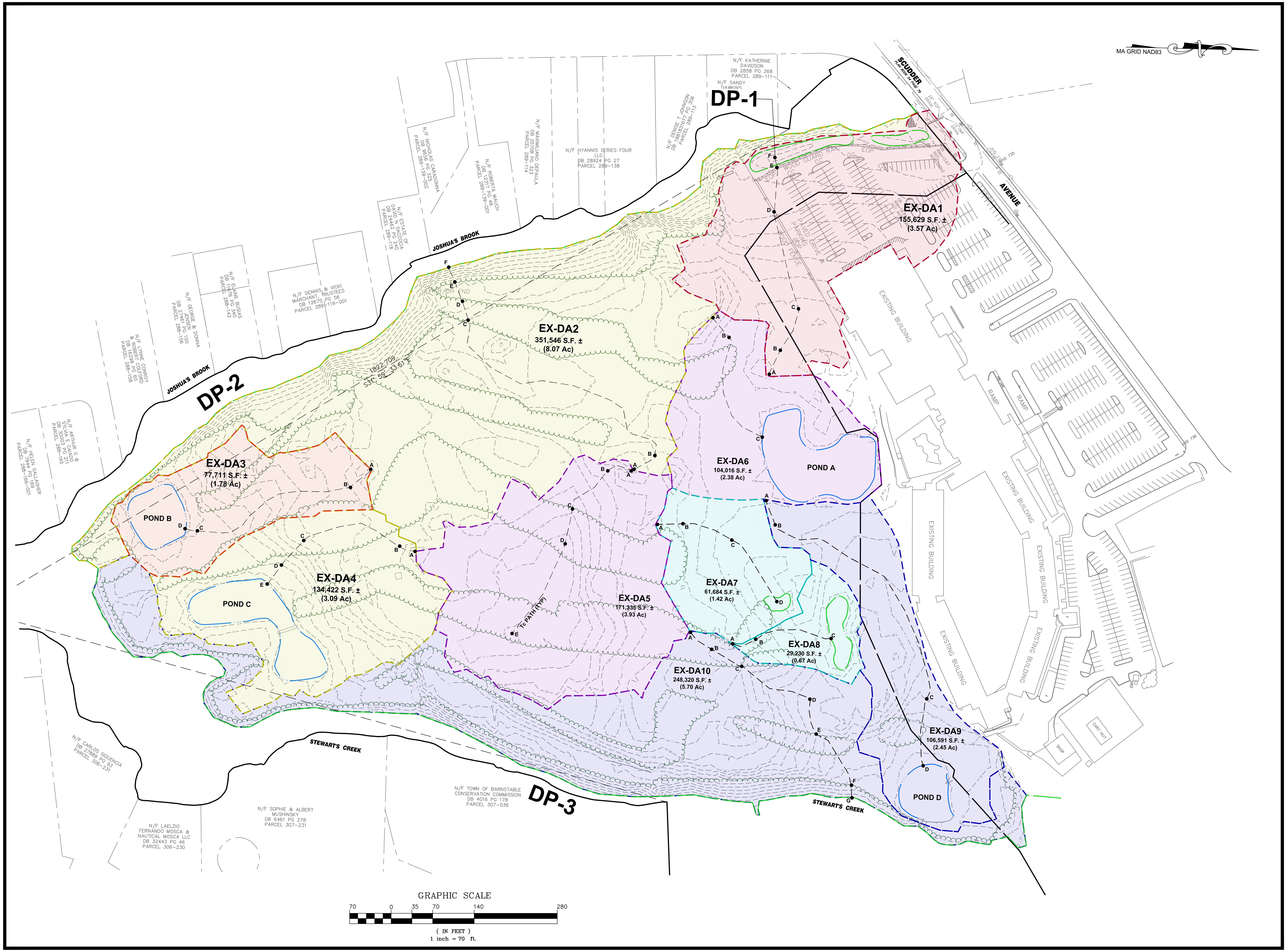
Client: LMC
Project: Proposed Residential Development, Hyannis, MA
Project No: 2026 **Figure**

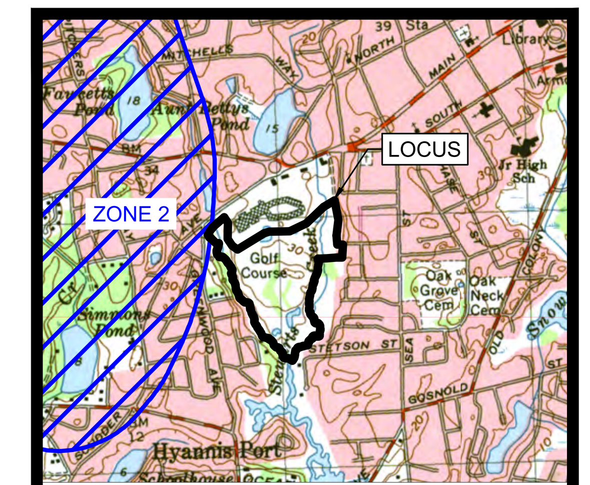
APPENDIX B

EXISTING DRAINAGE AREAS PLAN

&

HydroCAD® CALCULATIONS
For the
EXISTING CONDITIONS





LOCUS MAP
SCALE 1" = 2000'

COMMONWEALTH OF MASSACHUSETTS
EDWARD L. PESCE
CIVIL
NO. 32001
REGISTERED PROFESSIONAL ENGINEER

Edward L. Pesce 23 SEP 2022

EDWARD L. PESCE, P.E. DATE

THE PROPOSED EMBLEM AT HYANNIS RESIDENCES

AT

35 SCUDDER AVENUE

IN

HYANNIS, MASSACHUSETTS

(BARNSTABLE COUNTY)

EXISTING DRAINAGE AREAS PLAN

REVISIONS:

No.	DATE	DESC.
1	9/23/22	Updated Site Layout

PREPARED FOR:
QUARTERRA
99 SUMMER STREET, SUITE 701
BOSTON, MA 02110

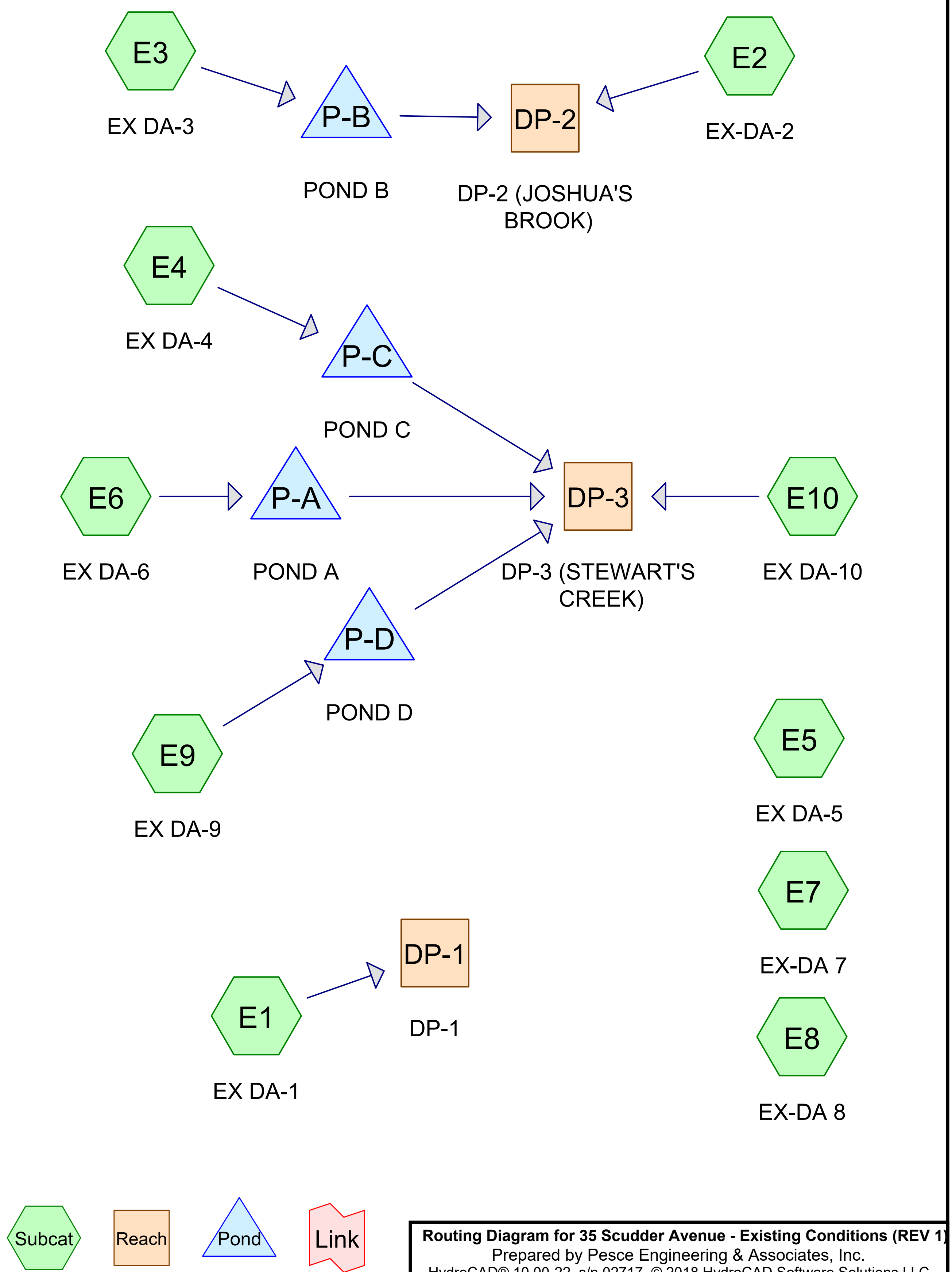
Quarterra

ENGINEERING BY:
PESCE ENGINEERING & ASSOCIATES, INC.
Edward L. Pesce, P.E., LEED® AP
43 Porter Lane
West Dennis, MA 02670
epesce@comcast.net Cell: 508-333-7630

LAND SURVEYING BY:
BAXTER NYE ENGINEERING & SURVEYING
78 NORTH STREET, 3RD FLOOR
HYANNIS, MA 02601

DATE:	JULY 1, 2021
FIELD:	BNE
CALC./DESIGN:	ELP
DRAWN:	BJW
CHECK:	ELP
JOB NO:	5061

SHEET 1 OF 1



Routing Diagram for 35 Scudder Avenue - Existing Conditions (REV 1)
Prepared by Pesce Engineering & Associates, Inc.
HydroCAD® 10.00-22 s/n 02717 © 2018 HydroCAD Software Solutions LLC

Area Listing (selected nodes)

Area (acres)	CN	Description (subcatchment-numbers)
21.019	39	>75% Grass cover, Good, HSG A (E1, E10, E2, E3, E4, E5, E6, E7, E8, E9)
1.653	98	Paved parking, HSG A (E1)
0.130	98	Water Surface, HSG A (E7, E8)
1.667	98	Wetland; Water Surface (E1, E3, E4, E6, E9)
8.243	30	Woods, Good, HSG A (E1, E10, E2, E3, E4, E5, E6, E9)
0.357	30	Woods, Good, HSG A & Sand Area (E7, E8)
33.069	**43**	**TOTAL AREA**

Soil Listing (selected nodes)

Area (acres)	Soil Group	Subcatchment Numbers
31.402	HSG A	E1, E10, E2, E3, E4, E5, E6, E7, E8, E9
0.000	HSG B	
0.000	HSG C	
0.000	HSG D	
1.667	Other	E1, E3, E4, E6, E9
33.069		**TOTAL AREA**

Ground Covers (selected nodes)

HSG-A (acres)	HSG-B (acres)	HSG-C (acres)	HSG-D (acres)	Other (acres)	Total (acres)	Ground Cover	Subcatchment Numbers
21.019	0.000	0.000	0.000	0.000	21.019	>75% Grass cover, Good	E1, E10, E2, E3, E4, E5, E6, E7, E8, E9
1.653	0.000	0.000	0.000	0.000	1.653	Paved parking	E1
0.130	0.000	0.000	0.000	0.000	0.130	Water Surface	E7, E8
0.000	0.000	0.000	0.000	1.667	1.667	Wetland; Water Surface	E1, E3, E4, E6, E9
8.600	0.000	0.000	0.000	0.000	8.600	Woods, Good	E1, E10, E2, E3, E4, E5, E6, E7, E8, E9
31.402	**0.000**	**0.000**	**0.000**	**1.667**	**33.069**	**TOTAL AREA**	

Pipe Listing (selected nodes)

Line#	Node Number	In-Invert (feet)	Out-Invert (feet)	Length (feet)	Slope (ft/ft)	n	Diam/Width (inches)	Height (inches)	Inside-Fill (inches)
1	P-D	9.08	8.16	18.5	0.0497	0.013	12.0	0.0	0.0

Time span=0.00-24.00 hrs, dt=0.01 hrs, 2401 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment E1: EX DA-1	Runoff Area=155,629 sf 50.78% Impervious Runoff Depth>0.89" Flow Length=435' Tc=9.6 min CN=69 Runoff=2.94 cfs 0.264 af
Subcatchment E10: EX DA-10	Runoff Area=248,320 sf 0.00% Impervious Runoff Depth=0.00" Flow Length=490' Tc=16.5 min CN=36 Runoff=0.00 cfs 0.000 af
Subcatchment E2: EX-DA-2	Runoff Area=351,546 sf 0.00% Impervious Runoff Depth=0.00" Flow Length=682' Tc=14.4 min CN=35 Runoff=0.00 cfs 0.000 af
Subcatchment E3: EX DA-3	Runoff Area=77,711 sf 13.22% Impervious Runoff Depth>0.08" Flow Length=400' Tc=7.0 min CN=46 Runoff=0.02 cfs 0.013 af
Subcatchment E4: EX DA-4	Runoff Area=134,422 sf 15.48% Impervious Runoff Depth>0.08" Flow Length=341' Tc=7.8 min CN=46 Runoff=0.04 cfs 0.022 af
Subcatchment E5: EX DA-5	Runoff Area=171,335 sf 0.00% Impervious Runoff Depth=0.00" Flow Length=433' Tc=11.9 min CN=36 Runoff=0.00 cfs 0.000 af
Subcatchment E6: EX DA-6	Runoff Area=104,016 sf 24.53% Impervious Runoff Depth>0.25" Flow Length=283' Tc=25.5 min CN=53 Runoff=0.18 cfs 0.049 af
Subcatchment E7: EX-DA 7	Runoff Area=61,684 sf 1.97% Impervious Runoff Depth>0.00" Flow Length=300' Tc=5.9 min CN=38 Runoff=0.00 cfs 0.000 af
Subcatchment E8: EX-DA 8	Runoff Area=29,230 sf 15.19% Impervious Runoff Depth>0.10" Flow Length=200' Tc=8.5 min CN=47 Runoff=0.01 cfs 0.006 af
Subcatchment E9: EX DA-9	Runoff Area=106,591 sf 8.42% Impervious Runoff Depth>0.05" Flow Length=675' Tc=15.0 min CN=44 Runoff=0.02 cfs 0.011 af
Reach DP-1: DP-1	Inflow=2.94 cfs 0.264 af Outflow=2.94 cfs 0.264 af
Reach DP-2: DP-2 (JOSHUA'S BROOK)	Inflow=0.00 cfs 0.000 af Outflow=0.00 cfs 0.000 af
Reach DP-3: DP-3 (STEWART'S CREEK)	Inflow=0.00 cfs 0.000 af Outflow=0.00 cfs 0.000 af
Pond P-A: POND A	Peak Elev=24.55' Storage=2,131 cf Inflow=0.18 cfs 0.049 af Outflow=0.00 cfs 0.000 af
Pond P-B: POND B	Peak Elev=2.75' Storage=547 cf Inflow=0.02 cfs 0.013 af Outflow=0.00 cfs 0.000 af
Pond P-C: POND C	Peak Elev=3.65' Storage=946 cf Inflow=0.04 cfs 0.022 af Outflow=0.00 cfs 0.000 af

Pond P-D: POND D Peak Elev=8.06' Storage=459 cf Inflow=0.02 cfs 0.011 af
Outflow=0.00 cfs 0.000 af

Total Runoff Area = 33.069 ac Runoff Volume = 0.364 af Average Runoff Depth = 0.13"
89.57% Pervious = 29.619 ac 10.43% Impervious = 3.450 ac

Summary for Subcatchment E1: EX DA-1

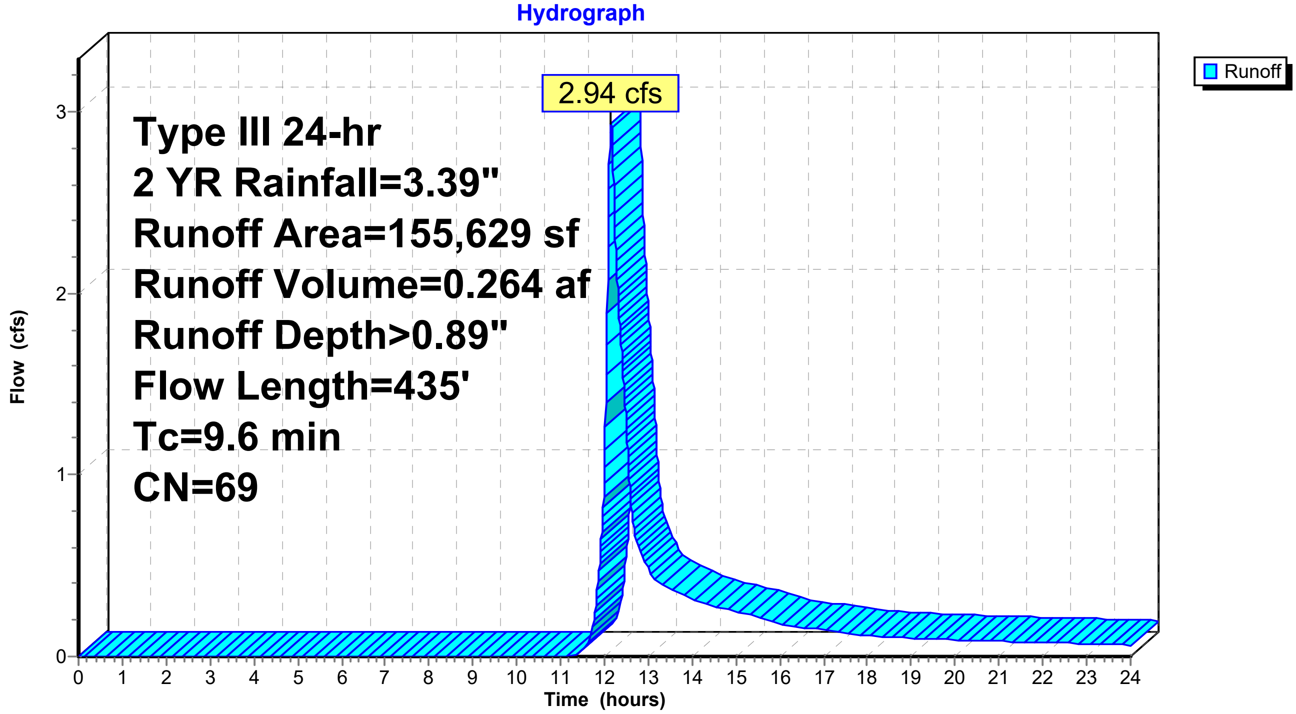
Runoff = 2.94 cfs @ 12.15 hrs, Volume= 0.264 af, Depth> 0.89"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 2 YR Rainfall=3.39"

	Area (sf)	CN	Description
	70,869	39	>75% Grass cover, Good, HSG A
	5,725	30	Woods, Good, HSG A
*	7,041	98	Wetland; Water Surface
	71,994	98	Paved parking, HSG A
	155,629	69	Weighted Average
	76,594		49.22% Pervious Area
	79,035		50.78% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.8	50	0.0270	0.17		**Sheet Flow, A-B** Grass: Short n= 0.150 P2= 3.40"
2.4	90	0.0077	0.61		**Shallow Concentrated Flow, B-C** Short Grass Pasture Kv= 7.0 fps
1.9	192	0.0550	1.64		**Shallow Concentrated Flow, C-D** Short Grass Pasture Kv= 7.0 fps
0.4	83	0.0260	3.27		**Shallow Concentrated Flow, D-E** Paved Kv= 20.3 fps
0.1	20	0.2000	3.13		**Shallow Concentrated Flow, E-F** Short Grass Pasture Kv= 7.0 fps
9.6	435	Total			

Subcatchment E1: EX DA-1



Summary for Subcatchment E10: EX DA-10

[45] Hint: Runoff=Zero

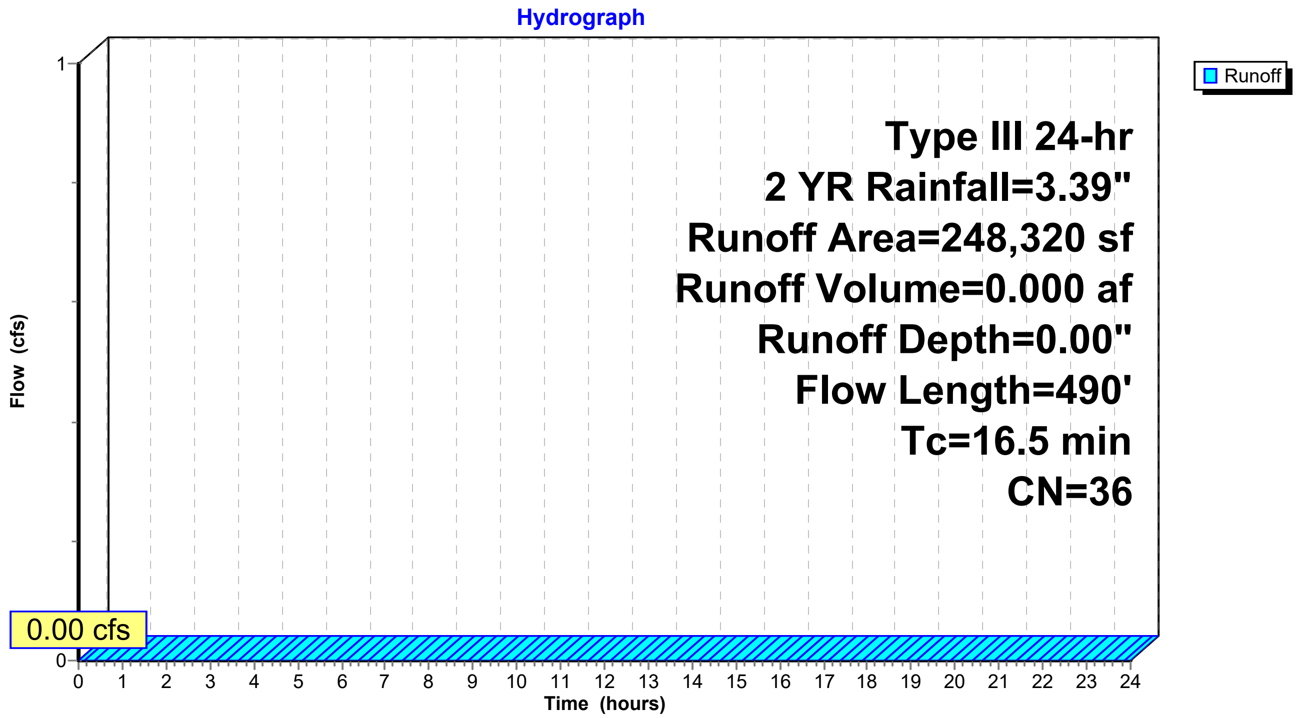
Runoff = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Depth= 0.00"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 2 YR Rainfall=3.39"

	Area (sf)	CN	Description
	166,992	39	>75% Grass cover, Good, HSG A
	81,328	30	Woods, Good, HSG A
*	0	98	Wetland; Water Surface
	0	98	Paved parking, HSG A
	248,320	36	Weighted Average
	248,320		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.1	50	0.0400	0.09		**Sheet Flow, A-B** Woods: Light underbrush n= 0.400 P2= 3.40"
3.1	70	0.0057	0.38		**Shallow Concentrated Flow, B-C** Woodland Kv= 5.0 fps
1.5	150	0.0580	1.69		**Shallow Concentrated Flow, C-D** Short Grass Pasture Kv= 7.0 fps
1.6	70	0.0110	0.73		**Shallow Concentrated Flow, D-E** Short Grass Pasture Kv= 7.0 fps
1.1	125	0.0680	1.83		**Shallow Concentrated Flow, E-F** Short Grass Pasture Kv= 7.0 fps
0.1	25	0.3000	3.83		**Shallow Concentrated Flow, F-G** Short Grass Pasture Kv= 7.0 fps
16.5	490	Total			

Subcatchment E10: EX DA-10



Summary for Subcatchment E2: EX-DA-2

[45] Hint: Runoff=Zero

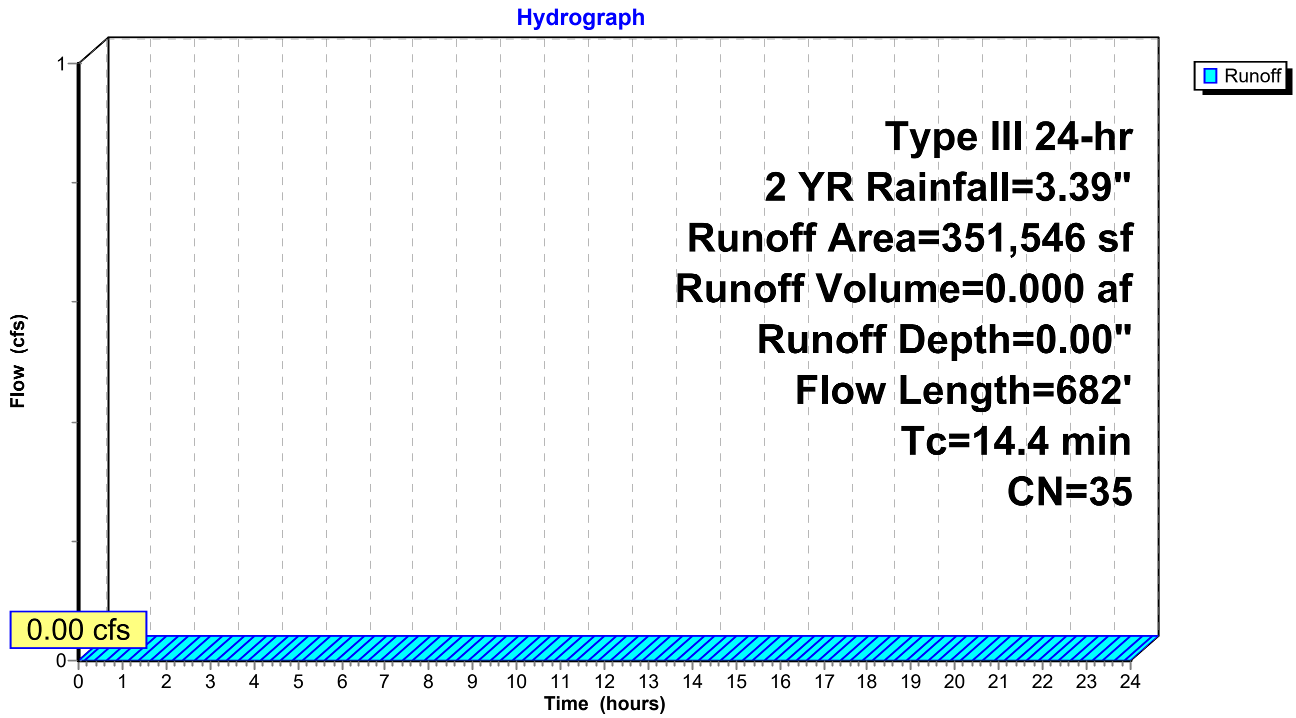
Runoff = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Depth= 0.00"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 2 YR Rainfall=3.39"

	Area (sf)	CN	Description
	195,277	39	>75% Grass cover, Good, HSG A
	156,269	30	Woods, Good, HSG A
*	0	98	Wetland; Water Surface
	0	98	Paved parking, HSG A
	351,546	35	Weighted Average
	351,546		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.1	50	0.0800	0.27		**Sheet Flow, A-B** Grass: Short n= 0.150 P2= 3.40"
10.1	520	0.0150	0.86		**Shallow Concentrated Flow, B-C** Short Grass Pasture Kv= 7.0 fps
0.5	40	0.0825	1.44		**Shallow Concentrated Flow, C-D** Woodland Kv= 5.0 fps
0.5	40	0.0425	1.44		**Shallow Concentrated Flow, D-E** Short Grass Pasture Kv= 7.0 fps
0.2	32	0.3900	3.12		**Shallow Concentrated Flow, E-F** Woodland Kv= 5.0 fps
14.4	682	Total			

Subcatchment E2: EX-DA-2



Summary for Subcatchment E3: EX DA-3

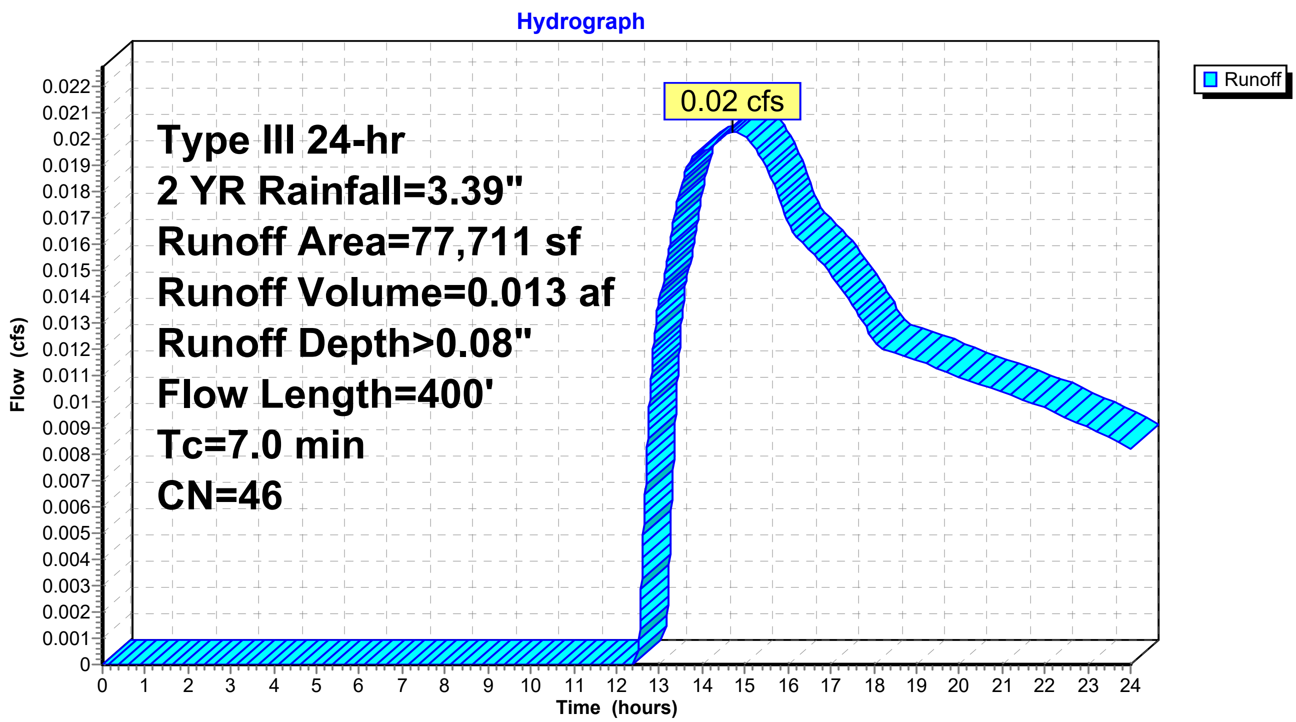
Runoff = 0.02 cfs @ 14.71 hrs, Volume= 0.013 af, Depth> 0.08"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 2 YR Rainfall=3.39"

	Area (sf)	CN	Description
	60,103	39	>75% Grass cover, Good, HSG A
	7,335	30	Woods, Good, HSG A
*	10,273	98	Wetland; Water Surface
	0	98	Paved parking, HSG A
	77,711	46	Weighted Average
	67,438		86.78% Pervious Area
	10,273		13.22% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.1	50	0.0800	0.27		**Sheet Flow, A-B** Grass: Short n= 0.150 P2= 3.40"
3.7	320	0.0430	1.45		**Shallow Concentrated Flow, B-C** Short Grass Pasture Kv= 7.0 fps
0.2	30	0.1000	2.21		**Shallow Concentrated Flow, C-D** Short Grass Pasture Kv= 7.0 fps
7.0	400	Total			

Subcatchment E3: EX DA-3



Summary for Subcatchment E4: EX DA-4

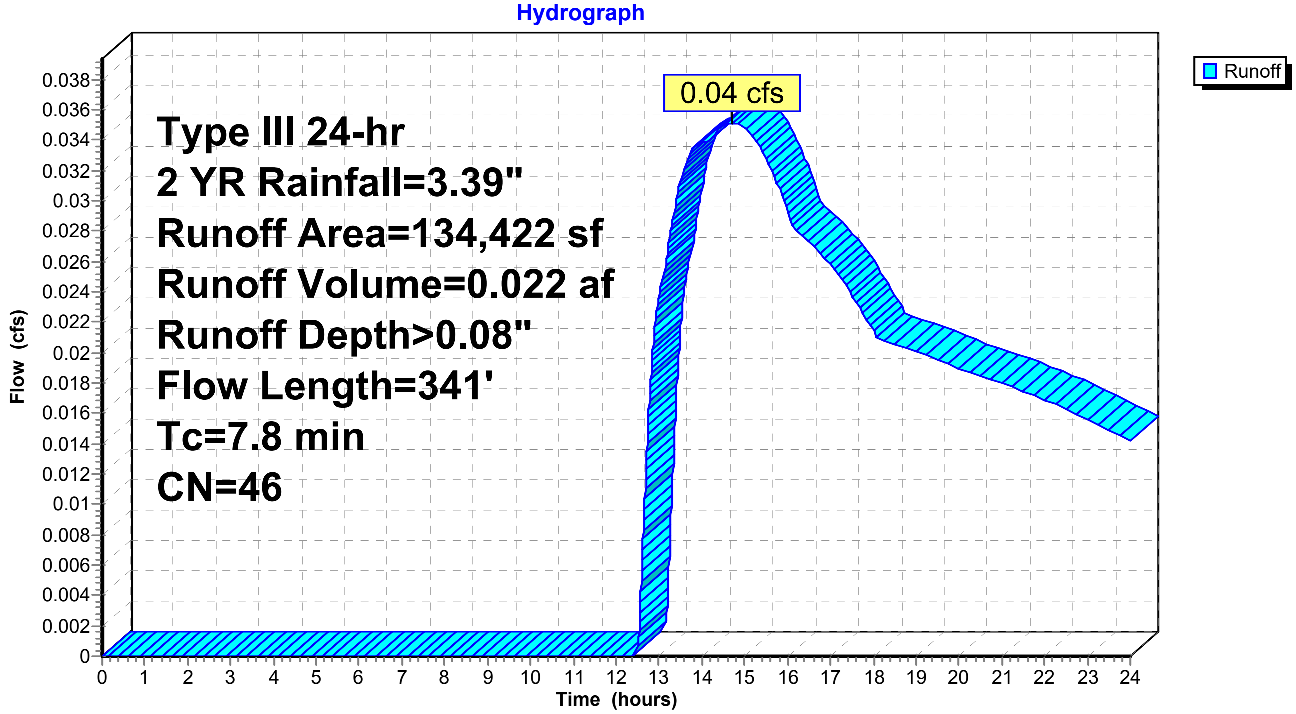
Runoff = 0.04 cfs @ 14.69 hrs, Volume= 0.022 af, Depth> 0.08"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 2 YR Rainfall=3.39"

	Area (sf)	CN	Description
	77,263	39	>75% Grass cover, Good, HSG A
	36,347	30	Woods, Good, HSG A
*	20,812	98	Wetland; Water Surface
	0	98	Paved parking, HSG A
	134,422	46	Weighted Average
	113,610		84.52% Pervious Area
	20,812		15.48% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.9	35	0.1300	0.30		**Sheet Flow, A-B** Grass: Short n= 0.150 P2= 3.40"
5.2	200	0.0165	0.64		**Shallow Concentrated Flow, B-C** Woodland Kv= 5.0 fps
0.4	63	0.1550	2.76		**Shallow Concentrated Flow, C-D** Short Grass Pasture Kv= 7.0 fps
0.3	43	0.1160	2.38		**Shallow Concentrated Flow, D-E** Short Grass Pasture Kv= 7.0 fps
7.8	341	Total			

Subcatchment E4: EX DA-4



Summary for Subcatchment E5: EX DA-5

[45] Hint: Runoff=Zero

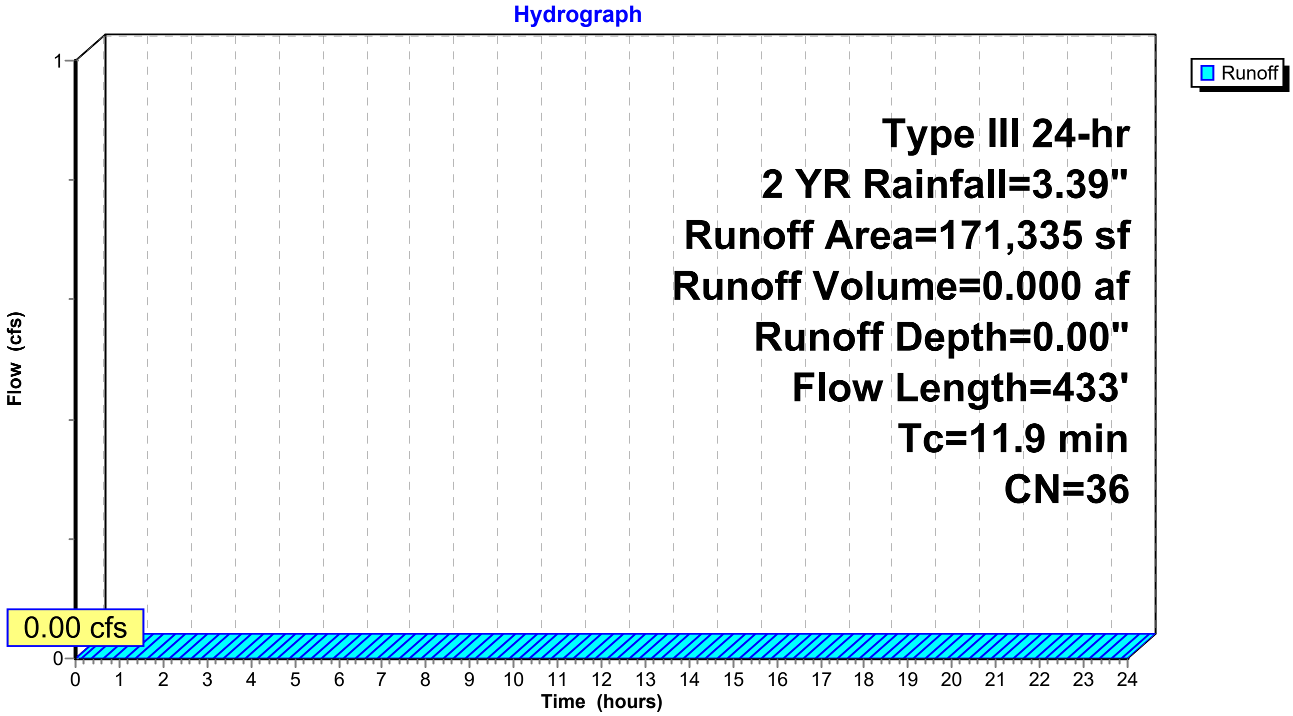
Runoff = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Depth= 0.00"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 2 YR Rainfall=3.39"

	Area (sf)	CN	Description
	109,518	39	>75% Grass cover, Good, HSG A
	61,817	30	Woods, Good, HSG A
*	0	98	Wetland; Water Surface
	0	98	Paved parking, HSG A
	171,335	36	Weighted Average
	171,335		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.9	50	0.1000	0.29		**Sheet Flow, A-B** Grass: Short n= 0.150 P2= 3.40"
1.0	105	0.0620	1.74		**Shallow Concentrated Flow, B-C** Short Grass Pasture Kv= 7.0 fps
1.2	75	0.0460	1.07		**Shallow Concentrated Flow, C-D** Woodland Kv= 5.0 fps
6.8	203	0.0050	0.49		**Shallow Concentrated Flow, D-E** Short Grass Pasture Kv= 7.0 fps
11.9	433	Total			

Subcatchment E5: EX DA-5



Summary for Subcatchment E6: EX DA-6

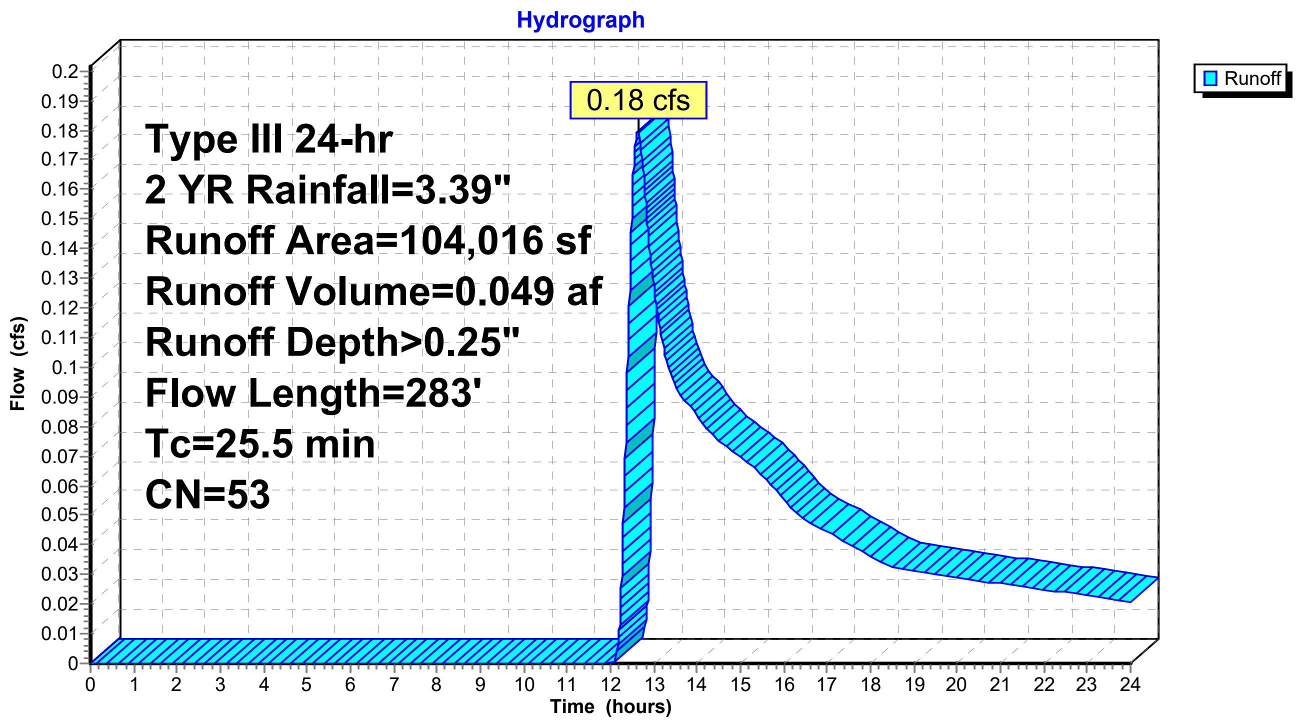
Runoff = 0.18 cfs @ 12.64 hrs, Volume= 0.049 af, Depth> 0.25"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 2 YR Rainfall=3.39"

	Area (sf)	CN	Description
	71,752	39	>75% Grass cover, Good, HSG A
	6,746	30	Woods, Good, HSG A
*	25,518	98	Wetland; Water Surface
	0	98	Paved parking, HSG A
	104,016	53	Weighted Average
	78,498		75.47% Pervious Area
	25,518		24.53% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.9	50	0.1000	0.29		**Sheet Flow, A-B** Grass: Short n= 0.150 P2= 3.40"
22.6	233	0.0006	0.17		**Shallow Concentrated Flow, B-C** Short Grass Pasture Kv= 7.0 fps
25.5	283	Total			

Subcatchment E6: EX DA-6



Summary for Subcatchment E7: EX-DA 7

[73] Warning: Peak may fall outside time span

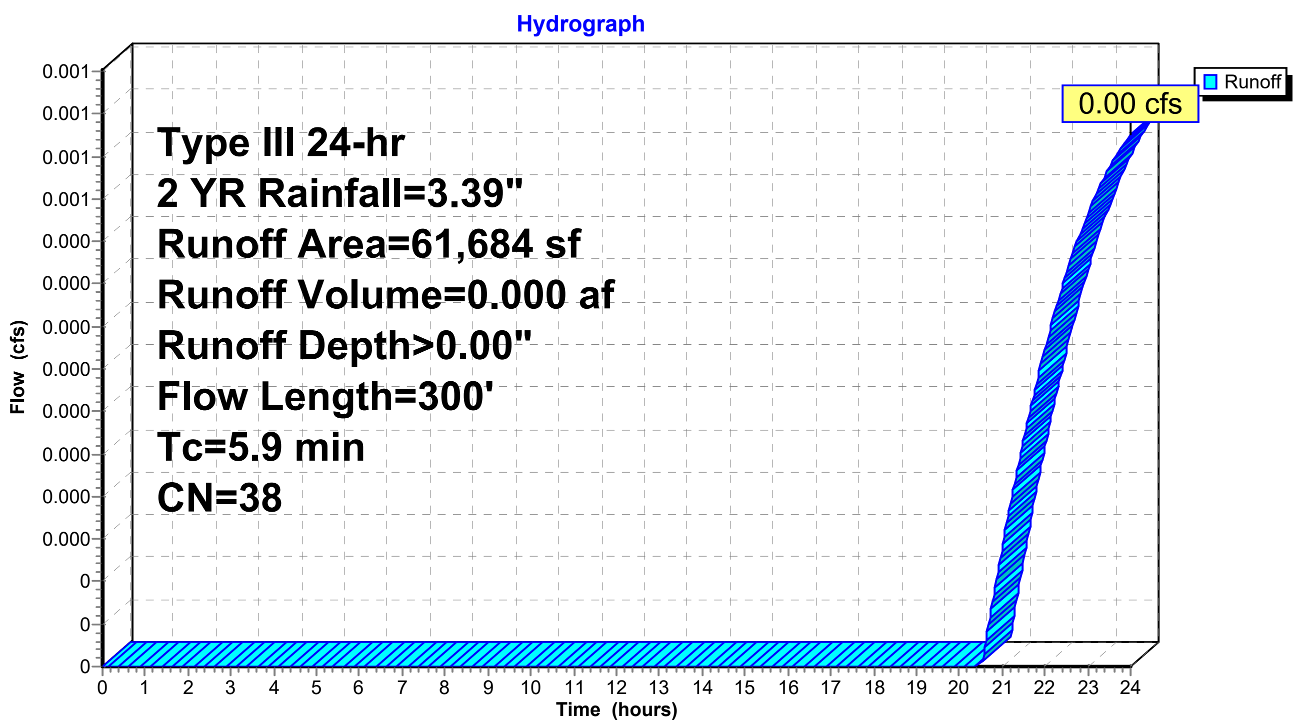
Runoff = 0.00 cfs @ 24.00 hrs, Volume= 0.000 af, Depth> 0.00"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 2 YR Rainfall=3.39"

	Area (sf)	CN	Description
	47,876	39	>75% Grass cover, Good, HSG A
*	12,590	30	Woods, Good, HSG A & Sand Area
	1,218	98	Water Surface, HSG A
	61,684	38	Weighted Average
	60,466		98.03% Pervious Area
	1,218		1.97% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.8	50	0.0280	0.17		**Sheet Flow, A-B** Grass: Short n= 0.150 P2= 3.40"
0.5	100	0.0460	3.45		**Shallow Concentrated Flow, B-C** Unpaved Kv= 16.1 fps
0.6	150	0.0750	4.41		**Shallow Concentrated Flow, C-D** Unpaved Kv= 16.1 fps
5.9	300	Total			

Subcatchment E7: EX-DA 7



Summary for Subcatchment E8: EX-DA 8

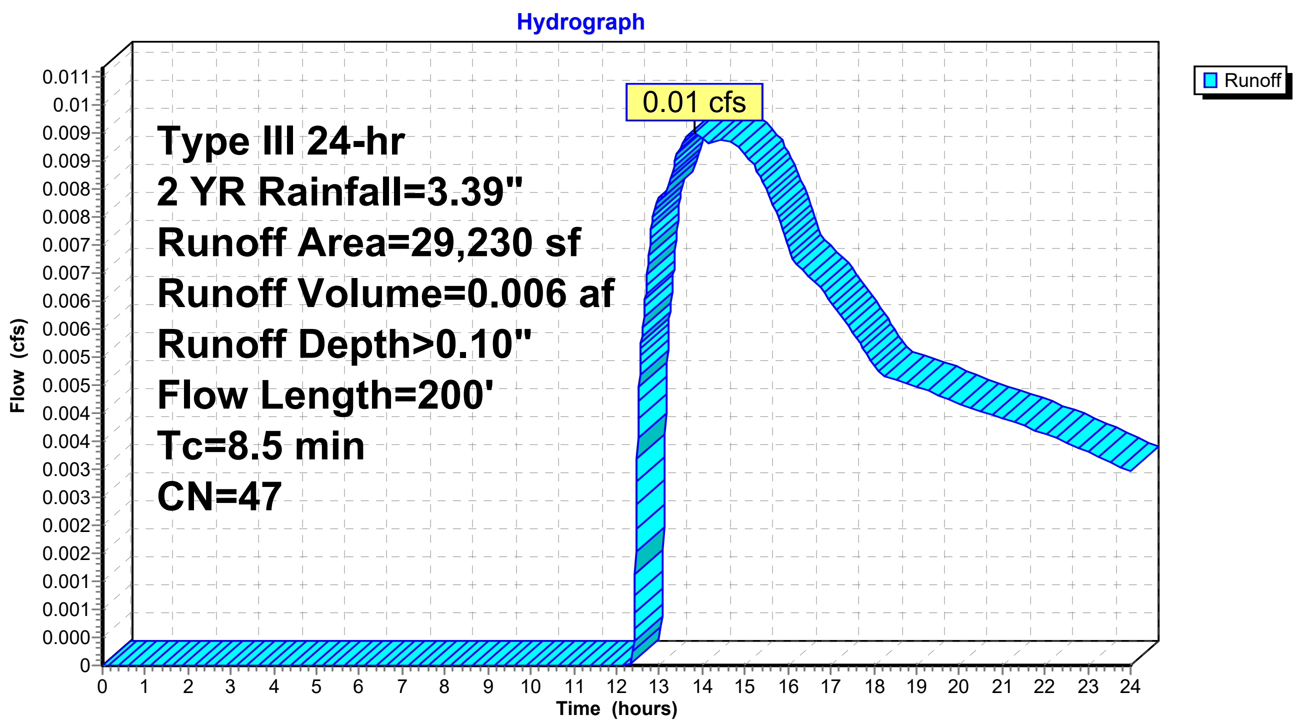
Runoff = 0.01 cfs @ 13.80 hrs, Volume= 0.006 af, Depth> 0.10"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 2 YR Rainfall=3.39"

	Area (sf)	CN	Description
	21,837	39	>75% Grass cover, Good, HSG A
*	2,953	30	Woods, Good, HSG A & Sand Area
	4,440	98	Water Surface, HSG A
	29,230	47	Weighted Average
	24,790		84.81% Pervious Area
	4,440		15.19% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.9	50	0.0800	0.12		**Sheet Flow, A-B** Woods: Light underbrush n= 0.400 P2= 3.40"
1.6	150	0.0530	1.61		**Shallow Concentrated Flow, B-C** Short Grass Pasture Kv= 7.0 fps
8.5	200	Total			

Subcatchment E8: EX-DA 8



Summary for Subcatchment E9: EX DA-9

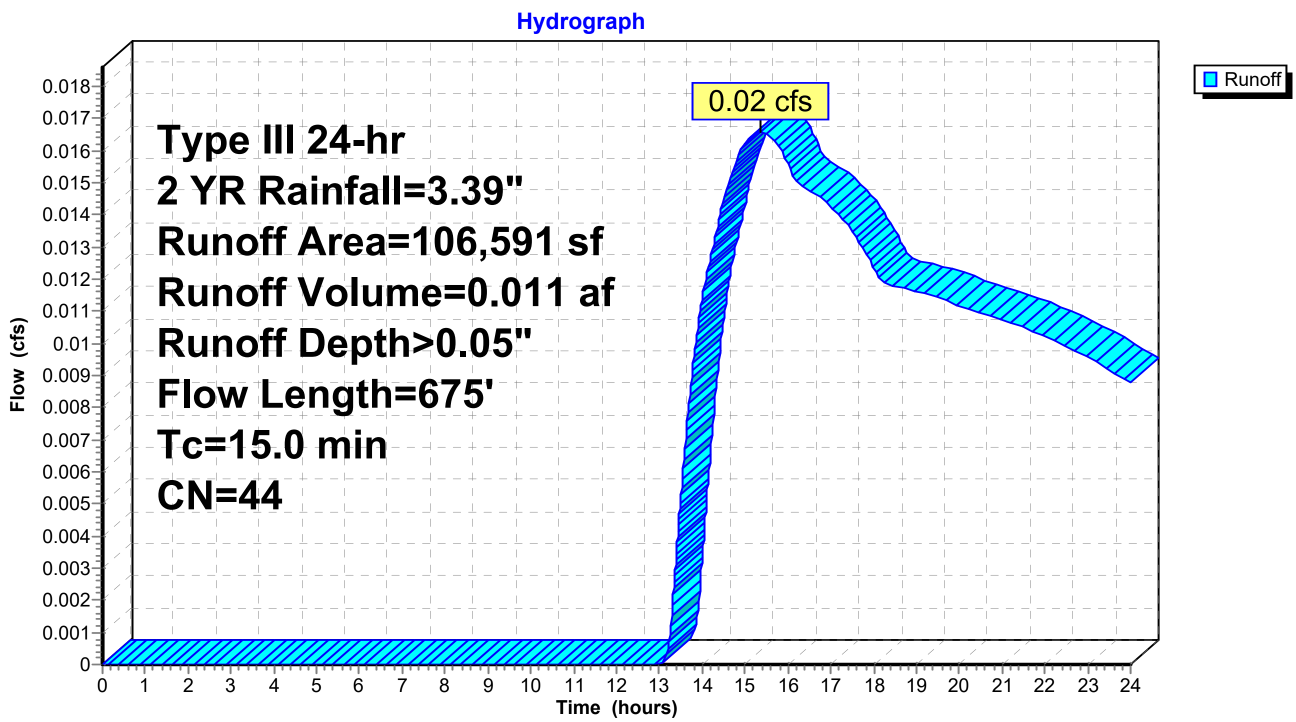
Runoff = 0.02 cfs @ 15.35 hrs, Volume= 0.011 af, Depth> 0.05"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 2 YR Rainfall=3.39"

	Area (sf)	CN	Description
	94,116	39	>75% Grass cover, Good, HSG A
	3,500	30	Woods, Good, HSG A
*	8,975	98	Wetland; Water Surface
	0	98	Paved parking, HSG A
	106,591	44	Weighted Average
	97,616		91.58% Pervious Area
	8,975		8.42% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.9	50	0.0260	0.17		**Sheet Flow, A-B** Grass: Short n= 0.150 P2= 3.40"
8.8	495	0.0180	0.94		**Shallow Concentrated Flow, B-C** Short Grass Pasture Kv= 7.0 fps
1.3	130	0.0540	1.63		**Shallow Concentrated Flow, C-D** Short Grass Pasture Kv= 7.0 fps
15.0	675	Total			

Subcatchment E9: EX DA-9

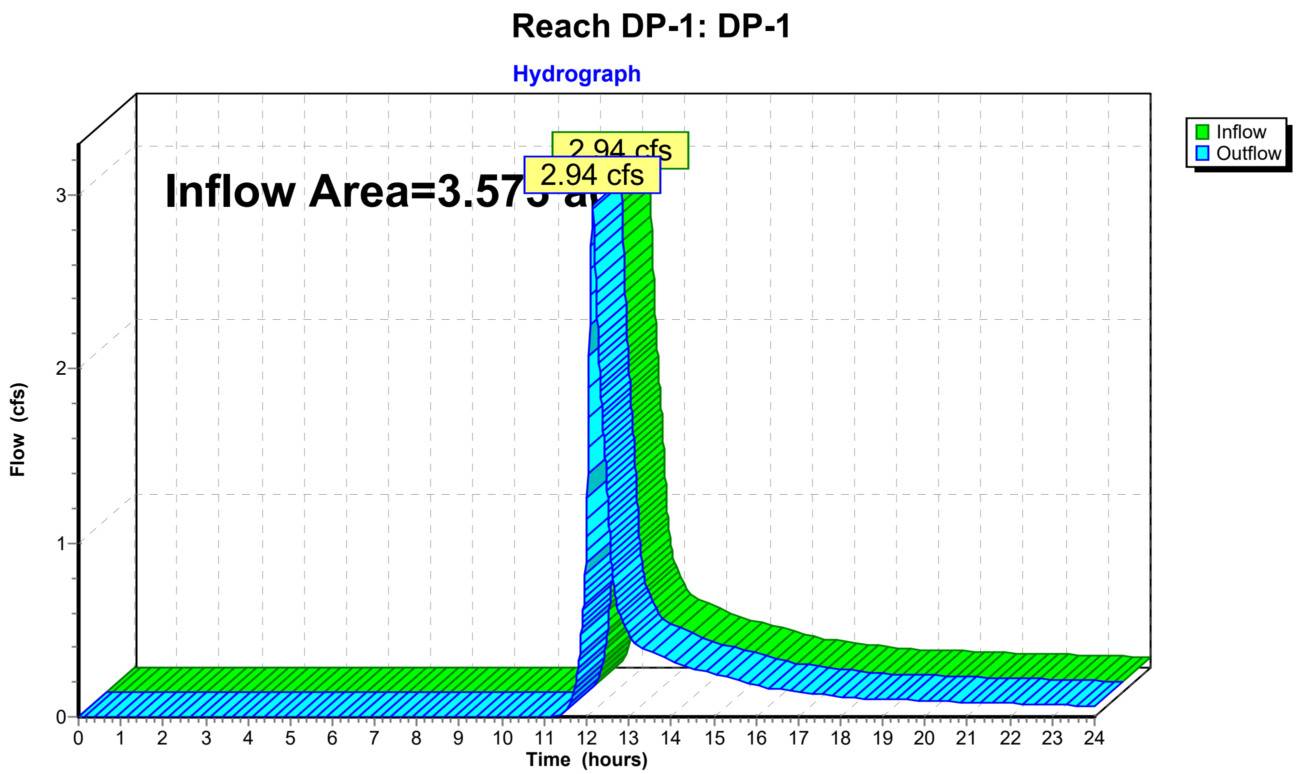


Summary for Reach DP-1: DP-1

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 3.573 ac, 50.78% Impervious, Inflow Depth > 0.89" for 2 YR event
Inflow = 2.94 cfs @ 12.15 hrs, Volume= 0.264 af
Outflow = 2.94 cfs @ 12.15 hrs, Volume= 0.264 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs



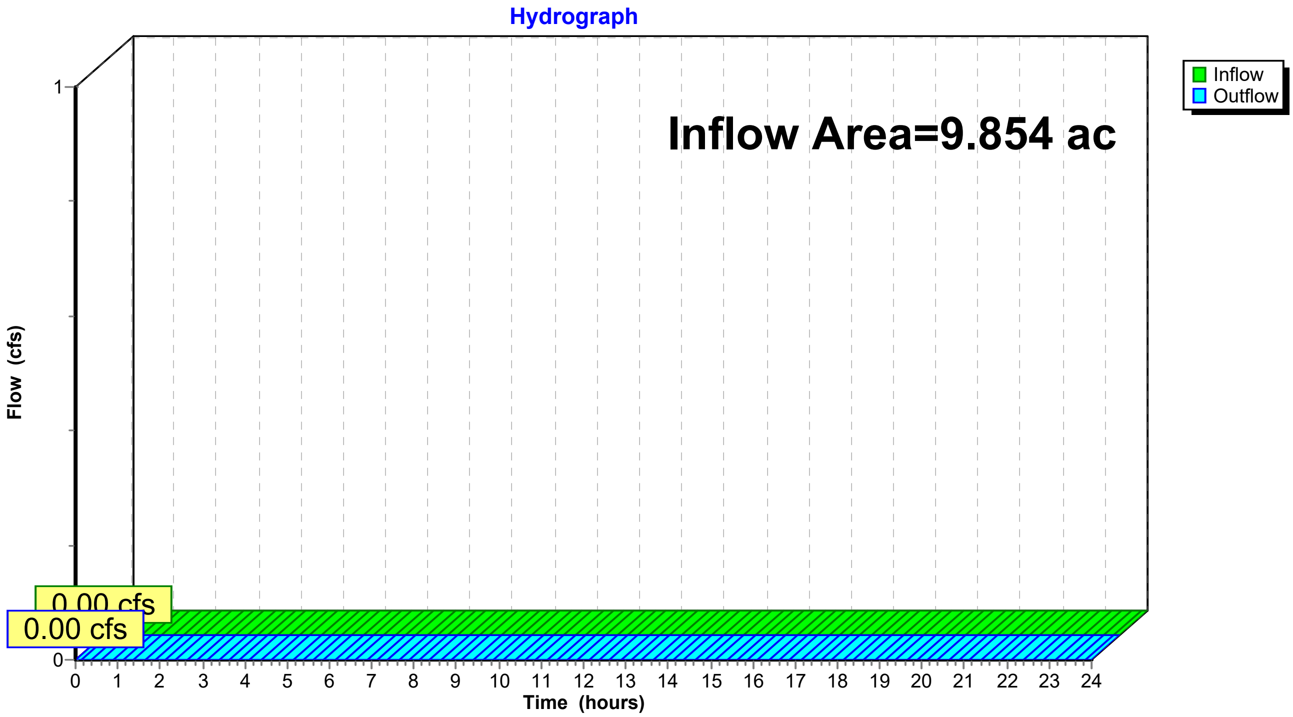
Summary for Reach DP-2: DP-2 (JOSHUA'S BROOK)

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 9.854 ac, 2.39% Impervious, Inflow Depth = 0.00" for 2 YR event
Inflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs

Reach DP-2: DP-2 (JOSHUA'S BROOK)



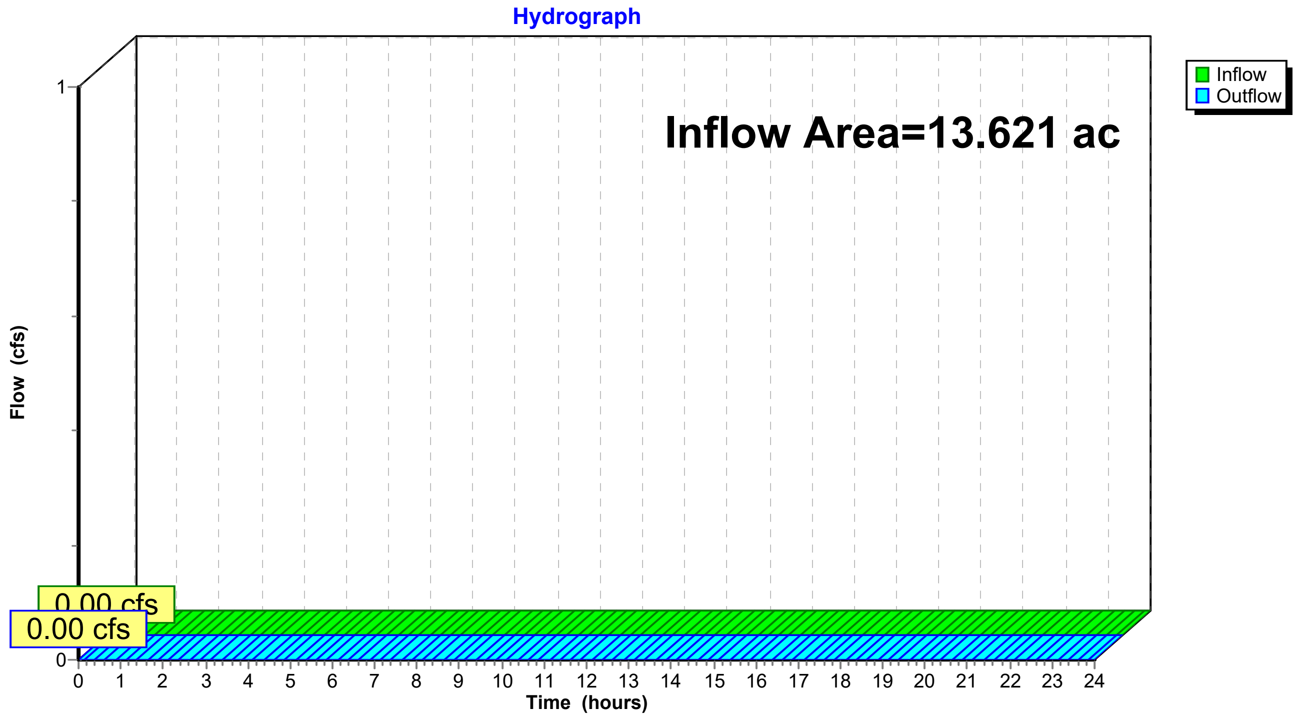
Summary for Reach DP-3: DP-3 (STEWART'S CREEK)

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 13.621 ac, 9.32% Impervious, Inflow Depth = 0.00" for 2 YR event
Inflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs

Reach DP-3: DP-3 (STEWART'S CREEK)



Summary for Pond P-A: POND A

Inflow Area = 2.388 ac, 24.53% Impervious, Inflow Depth > 0.25" for 2 YR event
Inflow = 0.18 cfs @ 12.64 hrs, Volume= 0.049 af
Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Atten= 100%, Lag= 0.0 min
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Peak Elev= 24.55' @ 24.00 hrs Surf.Area= 20,828 sf Storage= 2,131 cf

Plug-Flow detention time= (not calculated: initial storage exceeds outflow)
Center-of-Mass det. time= (not calculated: no outflow)

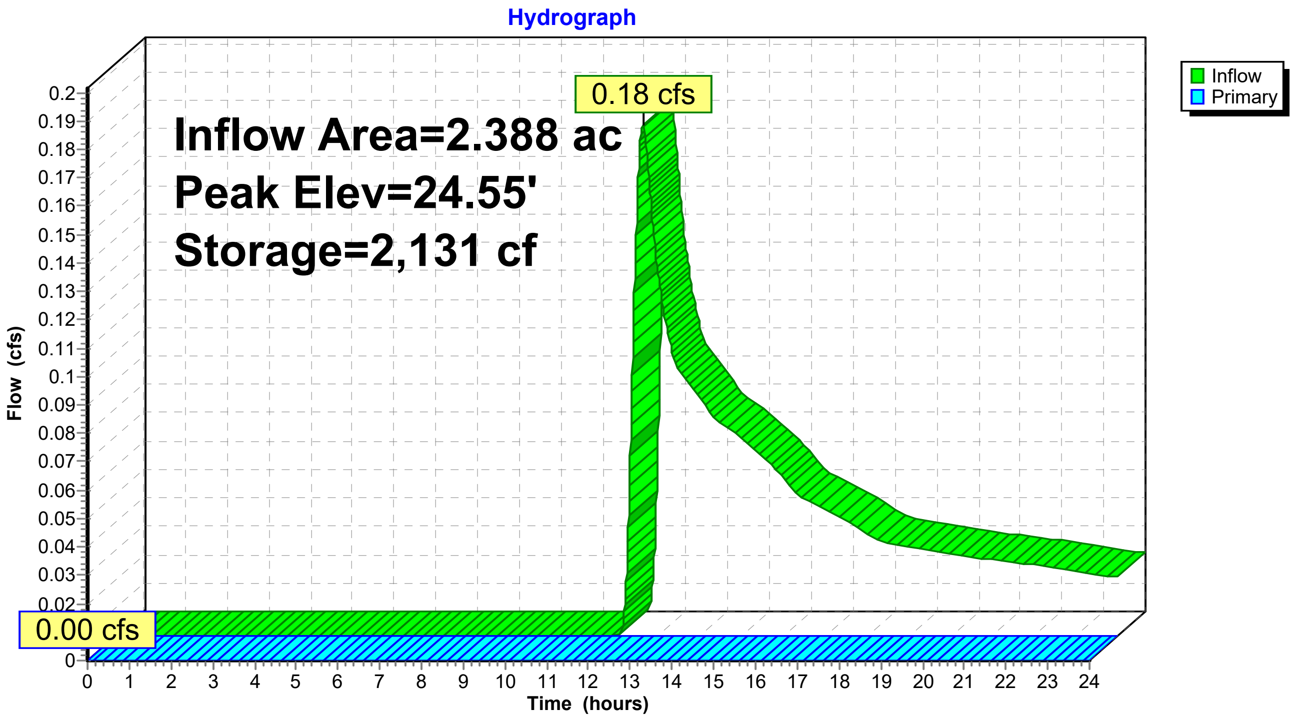
Volume	Invert	Avail.Storage	Storage Description
#1	24.45'	37,030 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
24.45	20,405	0	0
25.70	25,518	28,702	28,702
26.00	30,000	8,328	37,030

Device	Routing	Invert	Outlet Devices
#1	Primary	25.10'	**45.0 deg x 30.0' long x 0.50' rise Sharp-Crested Vee/Trap Weir** Cv= 2.56 (C= 3.20)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=24.45' (Free Discharge)
└─**1=Sharp-Crested Vee/Trap Weir** (Controls 0.00 cfs)

Pond P-A: POND A



Summary for Pond P-B: POND B

Inflow Area = 1.784 ac, 13.22% Impervious, Inflow Depth > 0.08" for 2 YR event
Inflow = 0.02 cfs @ 14.71 hrs, Volume= 0.013 af
Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Atten= 100%, Lag= 0.0 min
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Peak Elev= 2.75' @ 24.00 hrs Surf.Area= 10,415 sf Storage= 547 cf

Plug-Flow detention time= (not calculated: initial storage exceeds outflow)
Center-of-Mass det. time= (not calculated: no outflow)

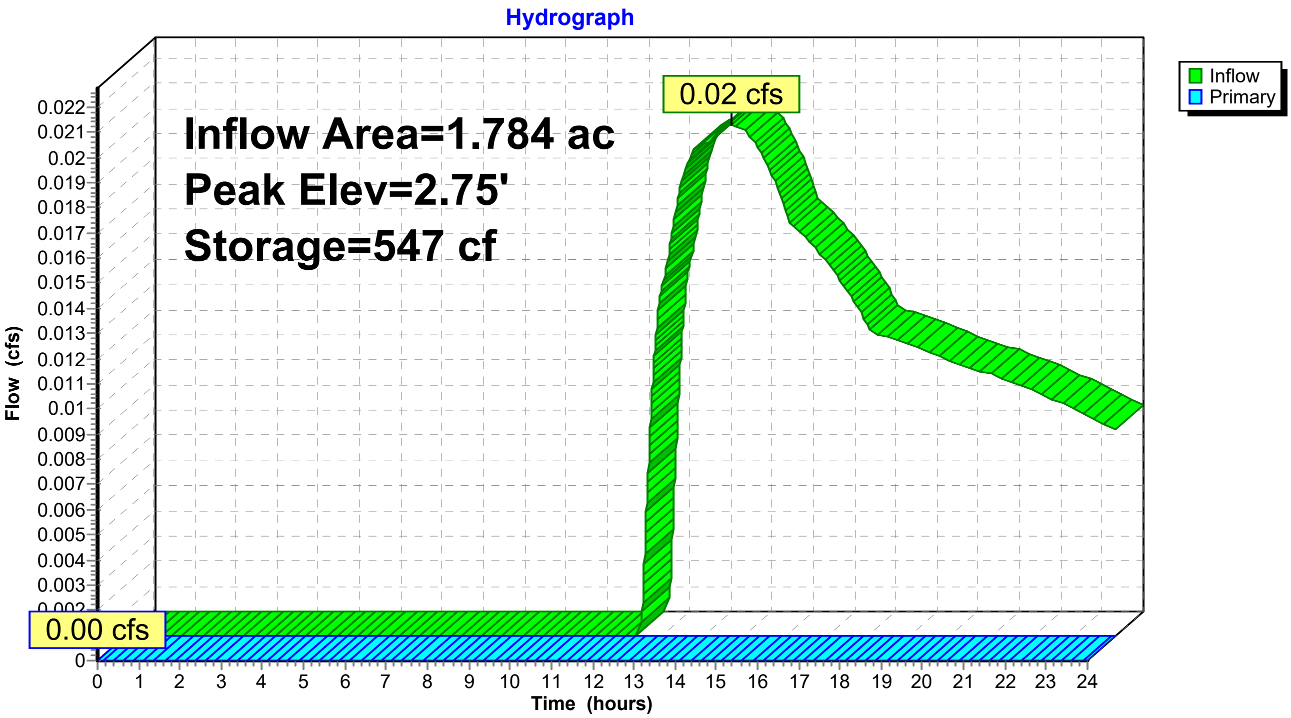
Volume	Invert	Avail.Storage	Storage Description
#1	2.70'	15,021 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
2.70	10,273	0	0
3.00	11,080	3,203	3,203
3.40	11,370	4,490	7,693
4.00	13,058	7,328	15,021

Device	Routing	Invert	Outlet Devices
#1	Primary	3.44'	**45.0 deg x 15.0' long x 0.50' rise Sharp-Crested Vee/Trap Weir** Cv= 2.56 (C= 3.20)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=2.70' (Free Discharge)
1=Sharp-Crested Vee/Trap Weir (Controls 0.00 cfs)

Pond P-B: POND B



Summary for Pond P-C: POND C

Inflow Area = 3.086 ac, 15.48% Impervious, Inflow Depth > 0.08" for 2 YR event
Inflow = 0.04 cfs @ 14.69 hrs, Volume= 0.022 af
Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Atten= 100%, Lag= 0.0 min
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Peak Elev= 3.65' @ 24.00 hrs Surf.Area= 21,115 sf Storage= 946 cf

Plug-Flow detention time= (not calculated: initial storage exceeds outflow)
Center-of-Mass det. time= (not calculated: no outflow)

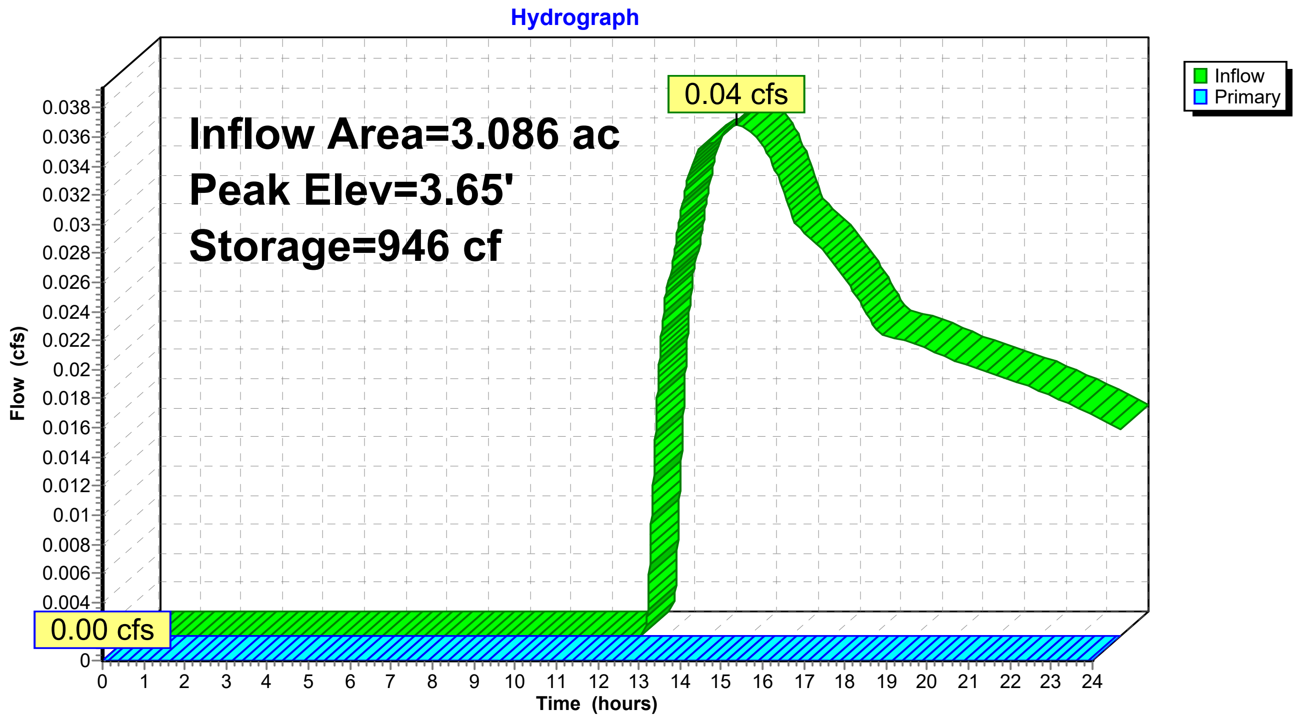
Volume	Invert	Avail.Storage	Storage Description
#1	3.60'	35,172 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
3.60	20,812	0	0
4.00	23,497	8,862	8,862
5.00	29,124	26,311	35,172

Device	Routing	Invert	Outlet Devices
#1	Primary	4.29'	**45.0 deg x 15.0' long x 0.50' rise Sharp-Crested Vee/Trap Weir** Cv= 2.56 (C= 3.20)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=3.60' (Free Discharge)
1=Sharp-Crested Vee/Trap Weir (Controls 0.00 cfs)

Pond P-C: POND C



Summary for Pond P-D: POND D

Inflow Area = 2.447 ac, 8.42% Impervious, Inflow Depth > 0.05" for 2 YR event
Inflow = 0.02 cfs @ 15.35 hrs, Volume= 0.011 af
Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Atten= 100%, Lag= 0.0 min
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Peak Elev= 8.06' @ 24.00 hrs Surf.Area= 7,669 sf Storage= 459 cf

Plug-Flow detention time= (not calculated: initial storage exceeds outflow)
Center-of-Mass det. time= (not calculated: no outflow)

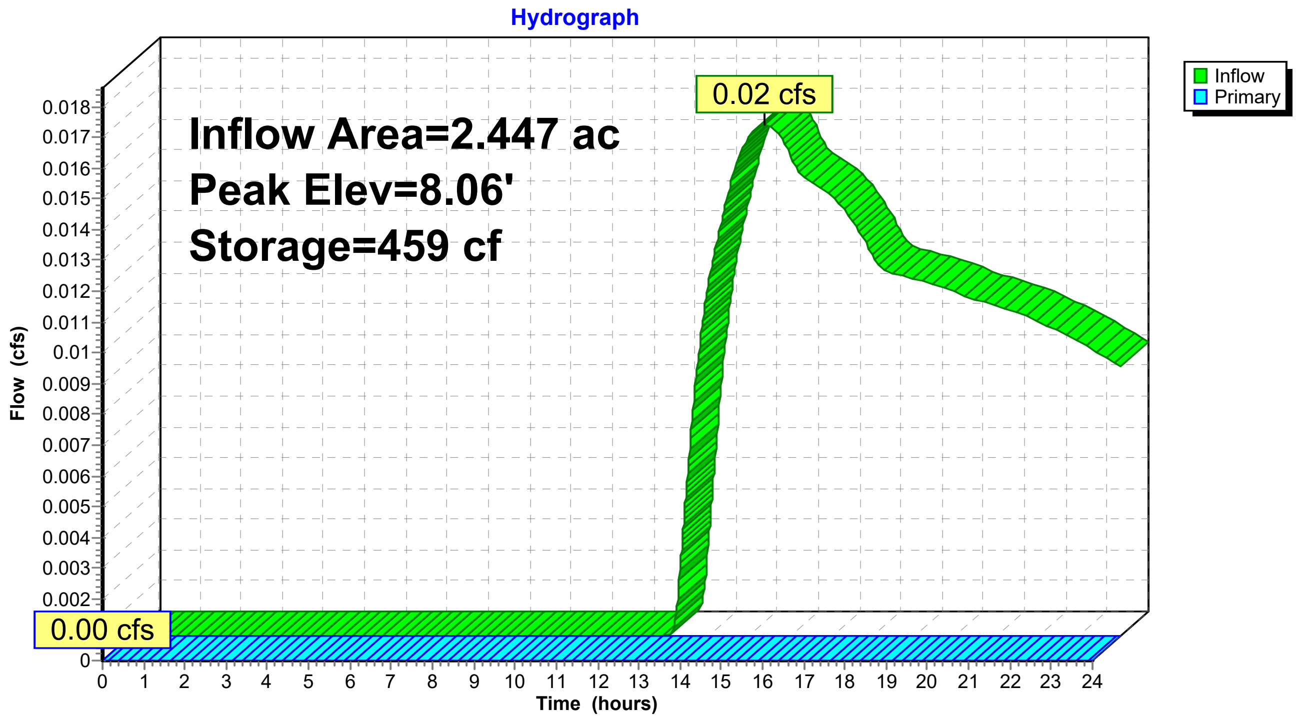
Volume	Invert	Avail.Storage	Storage Description
#1	8.00'	18,853 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
8.00	7,585	0	0
9.00	8,975	8,280	8,280
10.00	12,170	10,573	18,853

Device	Routing	Invert	Outlet Devices
#1	Primary	9.80'	**45.0 deg x 15.0' long x 0.50' rise Sharp-Crested Vee/Trap Weir** Cv= 2.56 (C= 3.20)
#2	Primary	9.08'	**12.0" Round Culvert** L= 18.5' CMP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 9.08' / 8.16' S= 0.0497 '/' Cc= 0.900 n= 0.013 Clay tile, Flow Area= 0.79 sf

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=8.00' (Free Discharge)
1=Sharp-Crested Vee/Trap Weir (Controls 0.00 cfs)
2=Culvert (Controls 0.00 cfs)

Pond P-D: POND D



Time span=0.00-24.00 hrs, dt=0.01 hrs, 2401 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment E1: EX DA-1 Runoff Area=155,629 sf 50.78% Impervious Runoff Depth>1.91"
Flow Length=435' Tc=9.6 min CN=69 Runoff=6.90 cfs 0.569 af

Subcatchment E10: EX DA-10 Runoff Area=248,320 sf 0.00% Impervious Runoff Depth>0.10"
Flow Length=490' Tc=16.5 min CN=36 Runoff=0.08 cfs 0.047 af

Subcatchment E2: EX-DA-2 Runoff Area=351,546 sf 0.00% Impervious Runoff Depth>0.07"
Flow Length=682' Tc=14.4 min CN=35 Runoff=0.08 cfs 0.050 af

Subcatchment E3: EX DA-3 Runoff Area=77,711 sf 13.22% Impervious Runoff Depth>0.47"
Flow Length=400' Tc=7.0 min CN=46 Runoff=0.39 cfs 0.069 af

Subcatchment E4: EX DA-4 Runoff Area=134,422 sf 15.48% Impervious Runoff Depth>0.47"
Flow Length=341' Tc=7.8 min CN=46 Runoff=0.67 cfs 0.120 af

Subcatchment E5: EX DA-5 Runoff Area=171,335 sf 0.00% Impervious Runoff Depth>0.10"
Flow Length=433' Tc=11.9 min CN=36 Runoff=0.05 cfs 0.032 af

Subcatchment E6: EX DA-6 Runoff Area=104,016 sf 24.53% Impervious Runoff Depth>0.83"
Flow Length=283' Tc=25.5 min CN=53 Runoff=1.06 cfs 0.164 af

Subcatchment E7: EX-DA 7 Runoff Area=61,684 sf 1.97% Impervious Runoff Depth>0.16"
Flow Length=300' Tc=5.9 min CN=38 Runoff=0.03 cfs 0.018 af

Subcatchment E8: EX-DA 8 Runoff Area=29,230 sf 15.19% Impervious Runoff Depth>0.51"
Flow Length=200' Tc=8.5 min CN=47 Runoff=0.17 cfs 0.029 af

Subcatchment E9: EX DA-9 Runoff Area=106,591 sf 8.42% Impervious Runoff Depth>0.38"
Flow Length=675' Tc=15.0 min CN=44 Runoff=0.34 cfs 0.077 af

Reach DP-1: DP-1 Inflow=6.90 cfs 0.569 af
Outflow=6.90 cfs 0.569 af

Reach DP-2: DP-2 (JOSHUA'S BROOK) Inflow=0.08 cfs 0.050 af
Outflow=0.08 cfs 0.050 af

Reach DP-3: DP-3 (STEWART'S CREEK) Inflow=0.08 cfs 0.047 af
Outflow=0.08 cfs 0.047 af

Pond P-A: POND A Peak Elev=24.79' Storage=7,154 cf Inflow=1.06 cfs 0.164 af
Outflow=0.00 cfs 0.000 af

Pond P-B: POND B Peak Elev=2.98' Storage=3,027 cf Inflow=0.39 cfs 0.069 af
Outflow=0.00 cfs 0.000 af

Pond P-C: POND C Peak Elev=3.84' Storage=5,233 cf Inflow=0.67 cfs 0.120 af
Outflow=0.00 cfs 0.000 af

Pond P-D: POND D Peak Elev=8.42' Storage=3,342 cf Inflow=0.34 cfs 0.077 af
Outflow=0.00 cfs 0.000 af

Total Runoff Area = 33.069 ac Runoff Volume = 1.176 af Average Runoff Depth = 0.43"
89.57% Pervious = 29.619 ac 10.43% Impervious = 3.450 ac

Summary for Subcatchment E1: EX DA-1

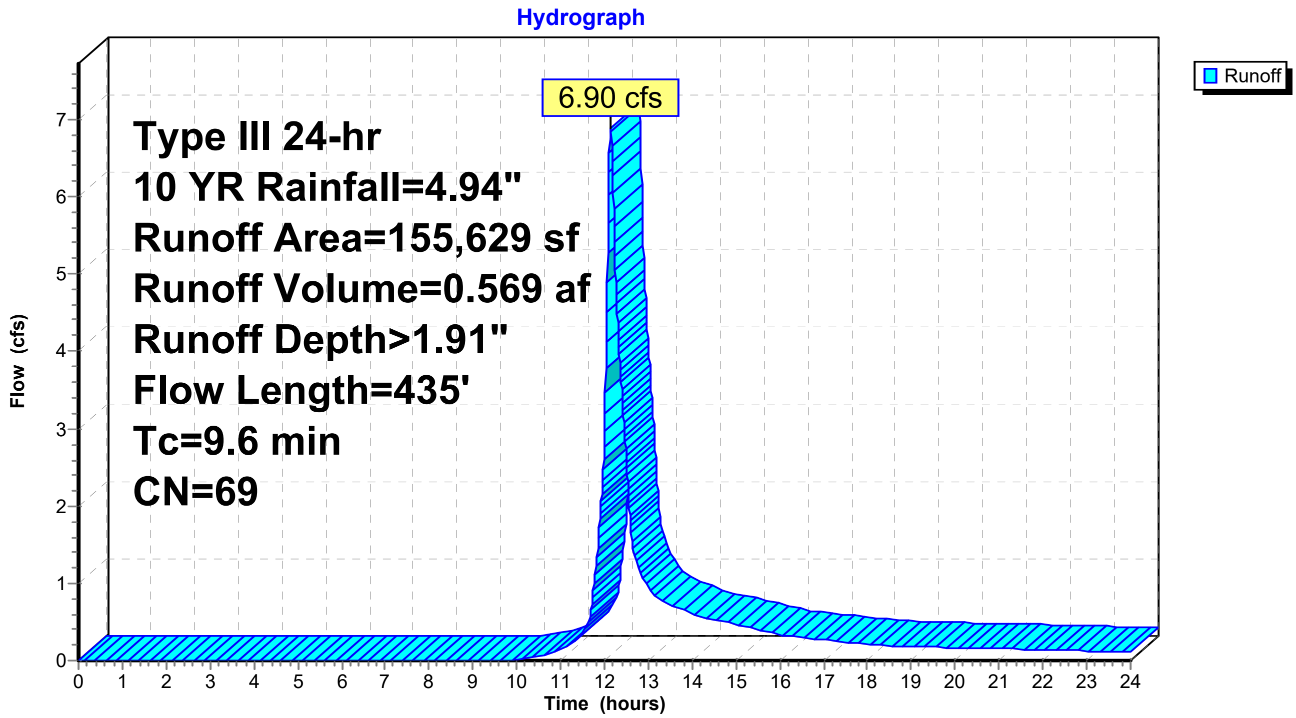
Runoff = 6.90 cfs @ 12.14 hrs, Volume= 0.569 af, Depth> 1.91"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 10 YR Rainfall=4.94"

	Area (sf)	CN	Description
	70,869	39	>75% Grass cover, Good, HSG A
	5,725	30	Woods, Good, HSG A
*	7,041	98	Wetland; Water Surface
	71,994	98	Paved parking, HSG A
	155,629	69	Weighted Average
	76,594		49.22% Pervious Area
	79,035		50.78% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.8	50	0.0270	0.17		**Sheet Flow, A-B** Grass: Short n= 0.150 P2= 3.40"
2.4	90	0.0077	0.61		**Shallow Concentrated Flow, B-C** Short Grass Pasture Kv= 7.0 fps
1.9	192	0.0550	1.64		**Shallow Concentrated Flow, C-D** Short Grass Pasture Kv= 7.0 fps
0.4	83	0.0260	3.27		**Shallow Concentrated Flow, D-E** Paved Kv= 20.3 fps
0.1	20	0.2000	3.13		**Shallow Concentrated Flow, E-F** Short Grass Pasture Kv= 7.0 fps
9.6	435	Total			

Subcatchment E1: EX DA-1



Summary for Subcatchment E10: EX DA-10

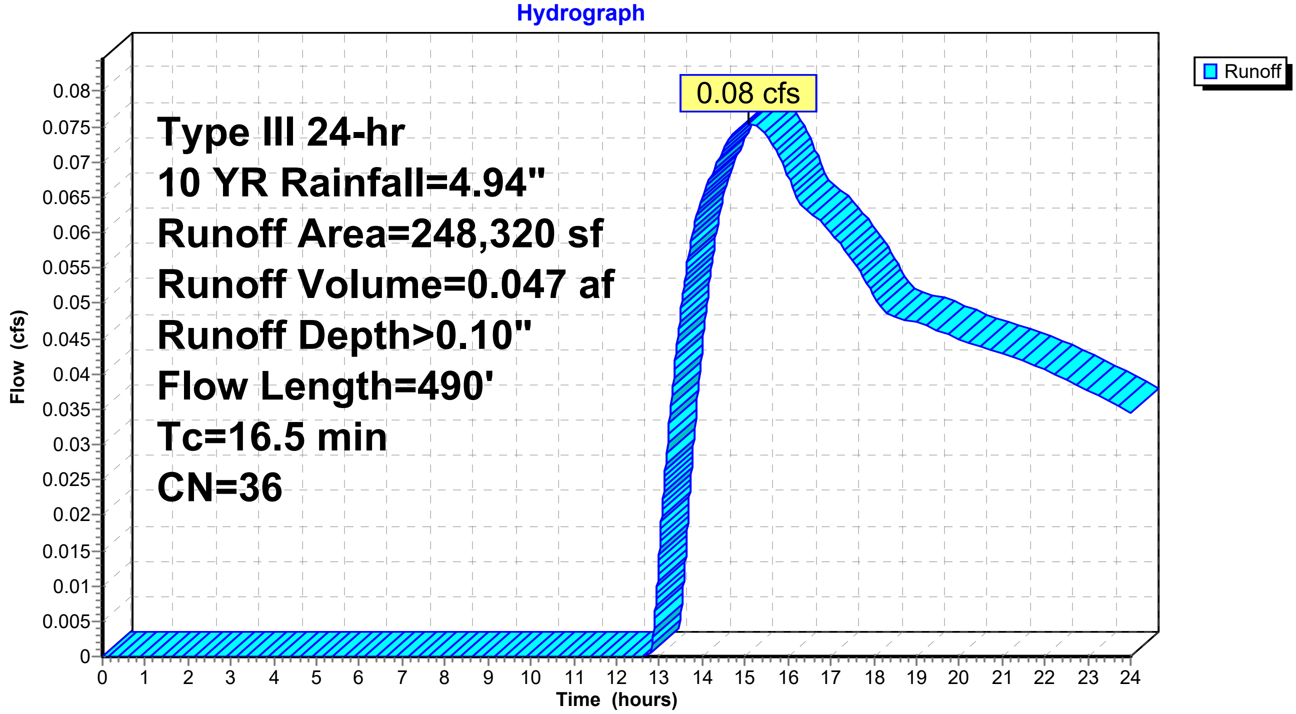
Runoff = 0.08 cfs @ 15.09 hrs, Volume= 0.047 af, Depth> 0.10"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 10 YR Rainfall=4.94"

	Area (sf)	CN	Description
	166,992	39	>75% Grass cover, Good, HSG A
	81,328	30	Woods, Good, HSG A
*	0	98	Wetland; Water Surface
	0	98	Paved parking, HSG A
	248,320	36	Weighted Average
	248,320		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.1	50	0.0400	0.09		**Sheet Flow, A-B** Woods: Light underbrush n= 0.400 P2= 3.40"
3.1	70	0.0057	0.38		**Shallow Concentrated Flow, B-C** Woodland Kv= 5.0 fps
1.5	150	0.0580	1.69		**Shallow Concentrated Flow, C-D** Short Grass Pasture Kv= 7.0 fps
1.6	70	0.0110	0.73		**Shallow Concentrated Flow, D-E** Short Grass Pasture Kv= 7.0 fps
1.1	125	0.0680	1.83		**Shallow Concentrated Flow, E-F** Short Grass Pasture Kv= 7.0 fps
0.1	25	0.3000	3.83		**Shallow Concentrated Flow, F-G** Short Grass Pasture Kv= 7.0 fps
16.5	490	Total			

Subcatchment E10: EX DA-10



Summary for Subcatchment E2: EX-DA-2

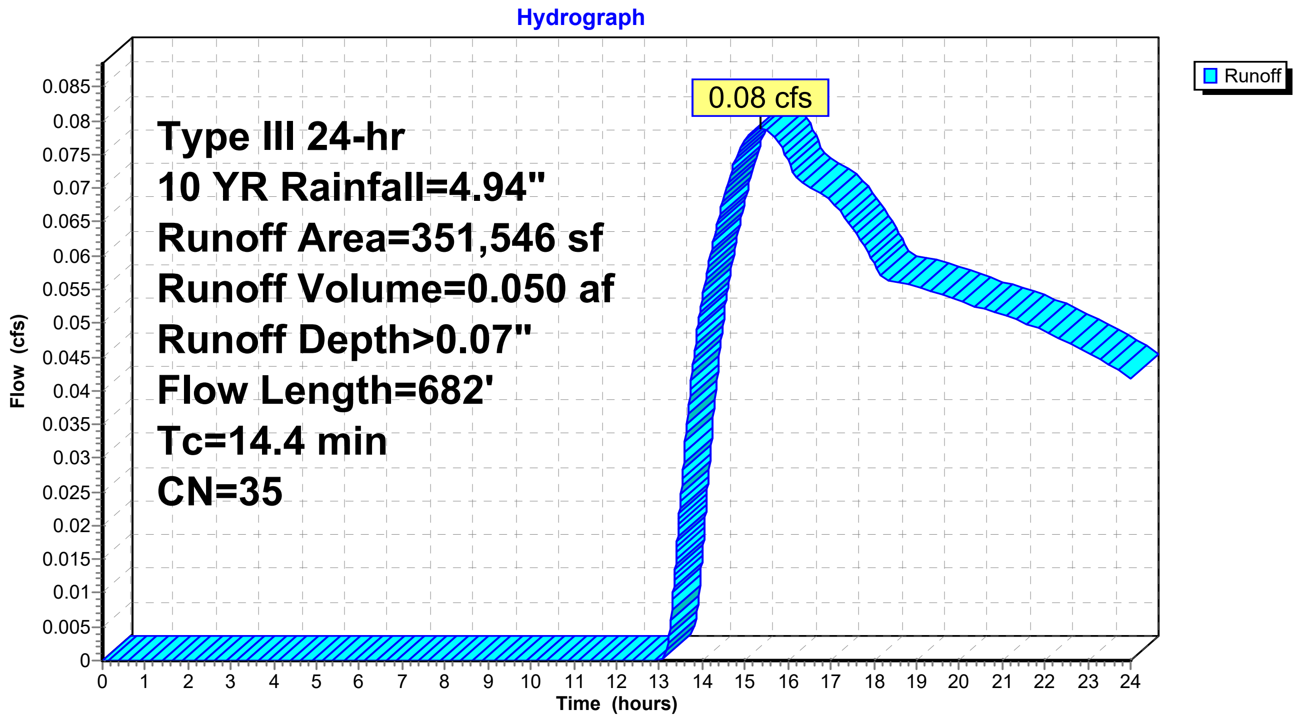
Runoff = 0.08 cfs @ 15.38 hrs, Volume= 0.050 af, Depth> 0.07"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 10 YR Rainfall=4.94"

	Area (sf)	CN	Description
	195,277	39	>75% Grass cover, Good, HSG A
	156,269	30	Woods, Good, HSG A
*	0	98	Wetland; Water Surface
	0	98	Paved parking, HSG A
	351,546	35	Weighted Average
	351,546		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.1	50	0.0800	0.27		**Sheet Flow, A-B** Grass: Short n= 0.150 P2= 3.40"
10.1	520	0.0150	0.86		**Shallow Concentrated Flow, B-C** Short Grass Pasture Kv= 7.0 fps
0.5	40	0.0825	1.44		**Shallow Concentrated Flow, C-D** Woodland Kv= 5.0 fps
0.5	40	0.0425	1.44		**Shallow Concentrated Flow, D-E** Short Grass Pasture Kv= 7.0 fps
0.2	32	0.3900	3.12		**Shallow Concentrated Flow, E-F** Woodland Kv= 5.0 fps
14.4	682	Total			

Subcatchment E2: EX-DA-2



Summary for Subcatchment E3: EX DA-3

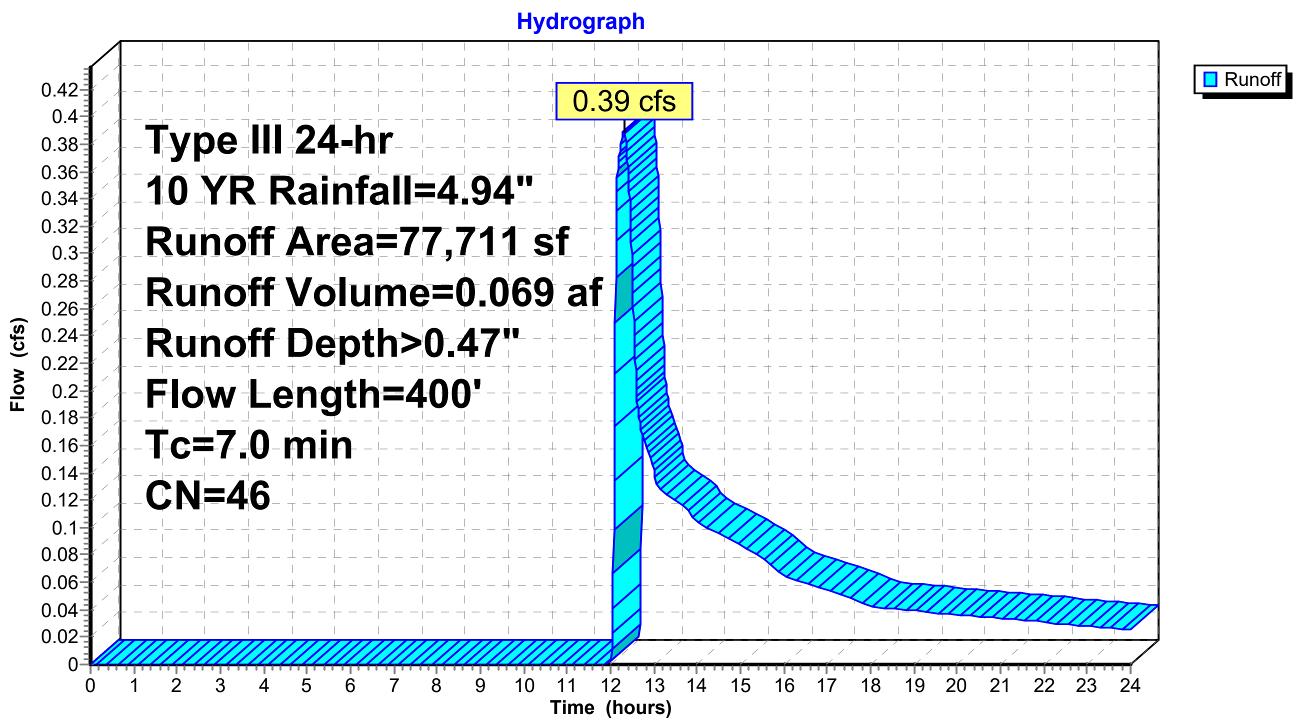
Runoff = 0.39 cfs @ 12.30 hrs, Volume= 0.069 af, Depth> 0.47"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 10 YR Rainfall=4.94"

	Area (sf)	CN	Description
	60,103	39	>75% Grass cover, Good, HSG A
	7,335	30	Woods, Good, HSG A
*	10,273	98	Wetland; Water Surface
	0	98	Paved parking, HSG A
	77,711	46	Weighted Average
	67,438		86.78% Pervious Area
	10,273		13.22% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.1	50	0.0800	0.27		**Sheet Flow, A-B** Grass: Short n= 0.150 P2= 3.40"
3.7	320	0.0430	1.45		**Shallow Concentrated Flow, B-C** Short Grass Pasture Kv= 7.0 fps
0.2	30	0.1000	2.21		**Shallow Concentrated Flow, C-D** Short Grass Pasture Kv= 7.0 fps
7.0	400	Total			

Subcatchment E3: EX DA-3



Summary for Subcatchment E4: EX DA-4

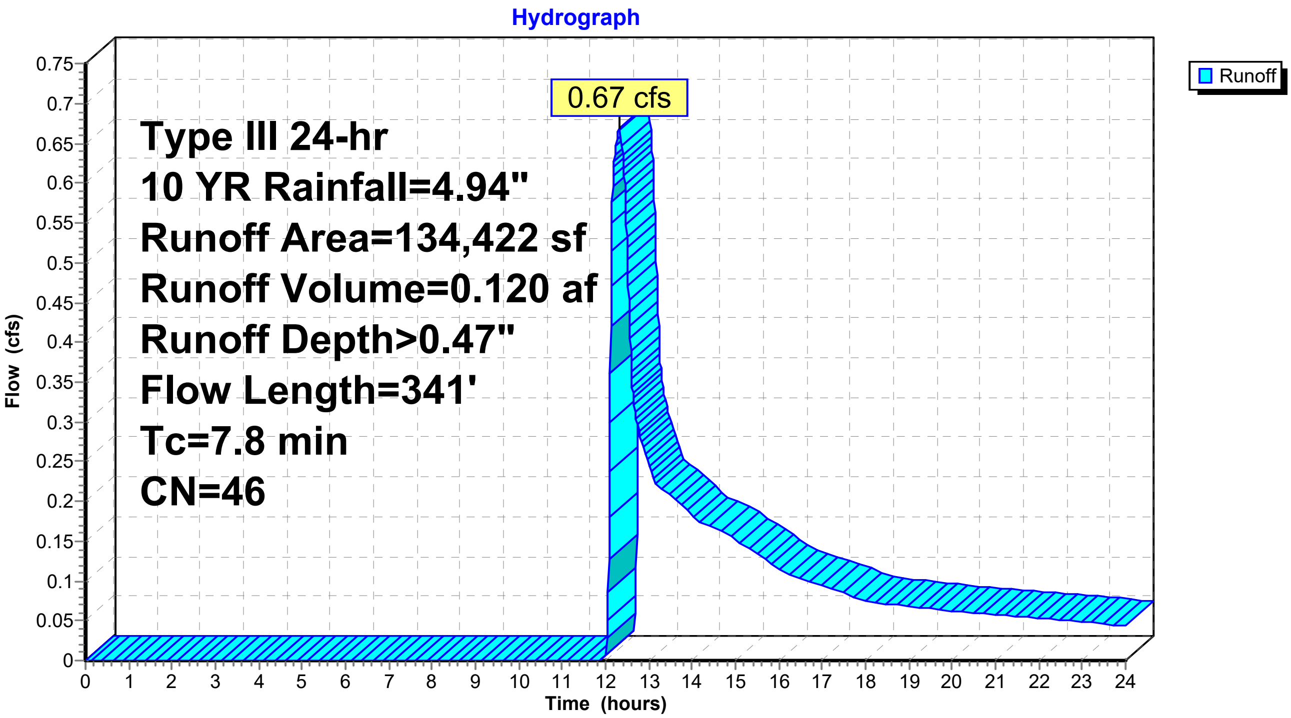
Runoff = 0.67 cfs @ 12.31 hrs, Volume= 0.120 af, Depth> 0.47"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 10 YR Rainfall=4.94"

	Area (sf)	CN	Description
	77,263	39	>75% Grass cover, Good, HSG A
	36,347	30	Woods, Good, HSG A
*	20,812	98	Wetland; Water Surface
	0	98	Paved parking, HSG A
	134,422	46	Weighted Average
	113,610		84.52% Pervious Area
	20,812		15.48% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.9	35	0.1300	0.30		**Sheet Flow, A-B** Grass: Short n= 0.150 P2= 3.40"
5.2	200	0.0165	0.64		**Shallow Concentrated Flow, B-C** Woodland Kv= 5.0 fps
0.4	63	0.1550	2.76		**Shallow Concentrated Flow, C-D** Short Grass Pasture Kv= 7.0 fps
0.3	43	0.1160	2.38		**Shallow Concentrated Flow, D-E** Short Grass Pasture Kv= 7.0 fps
7.8	341	Total			

Subcatchment E4: EX DA-4



Summary for Subcatchment E5: EX DA-5

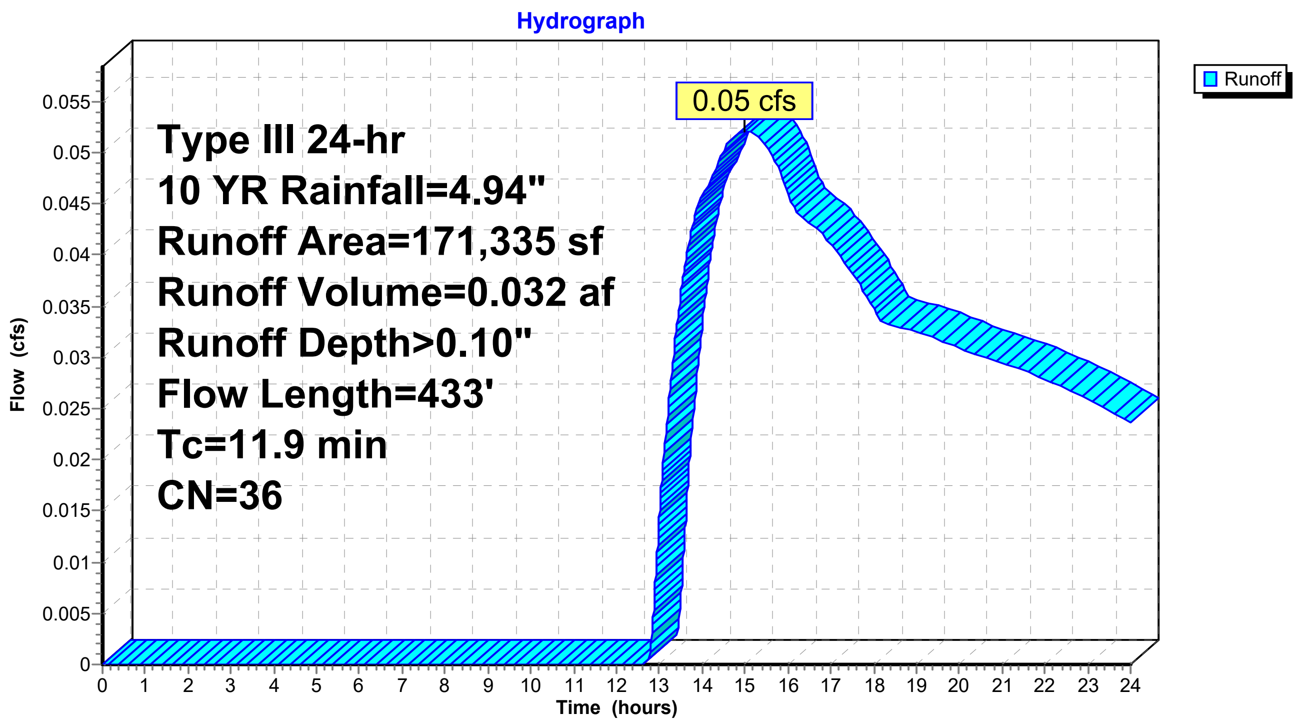
Runoff = 0.05 cfs @ 15.01 hrs, Volume= 0.032 af, Depth> 0.10"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 10 YR Rainfall=4.94"

	Area (sf)	CN	Description
	109,518	39	>75% Grass cover, Good, HSG A
	61,817	30	Woods, Good, HSG A
*	0	98	Wetland; Water Surface
	0	98	Paved parking, HSG A
	171,335	36	Weighted Average
	171,335		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.9	50	0.1000	0.29		**Sheet Flow, A-B** Grass: Short n= 0.150 P2= 3.40"
1.0	105	0.0620	1.74		**Shallow Concentrated Flow, B-C** Short Grass Pasture Kv= 7.0 fps
1.2	75	0.0460	1.07		**Shallow Concentrated Flow, C-D** Woodland Kv= 5.0 fps
6.8	203	0.0050	0.49		**Shallow Concentrated Flow, D-E** Short Grass Pasture Kv= 7.0 fps
11.9	433	Total			

Subcatchment E5: EX DA-5



Summary for Subcatchment E6: EX DA-6

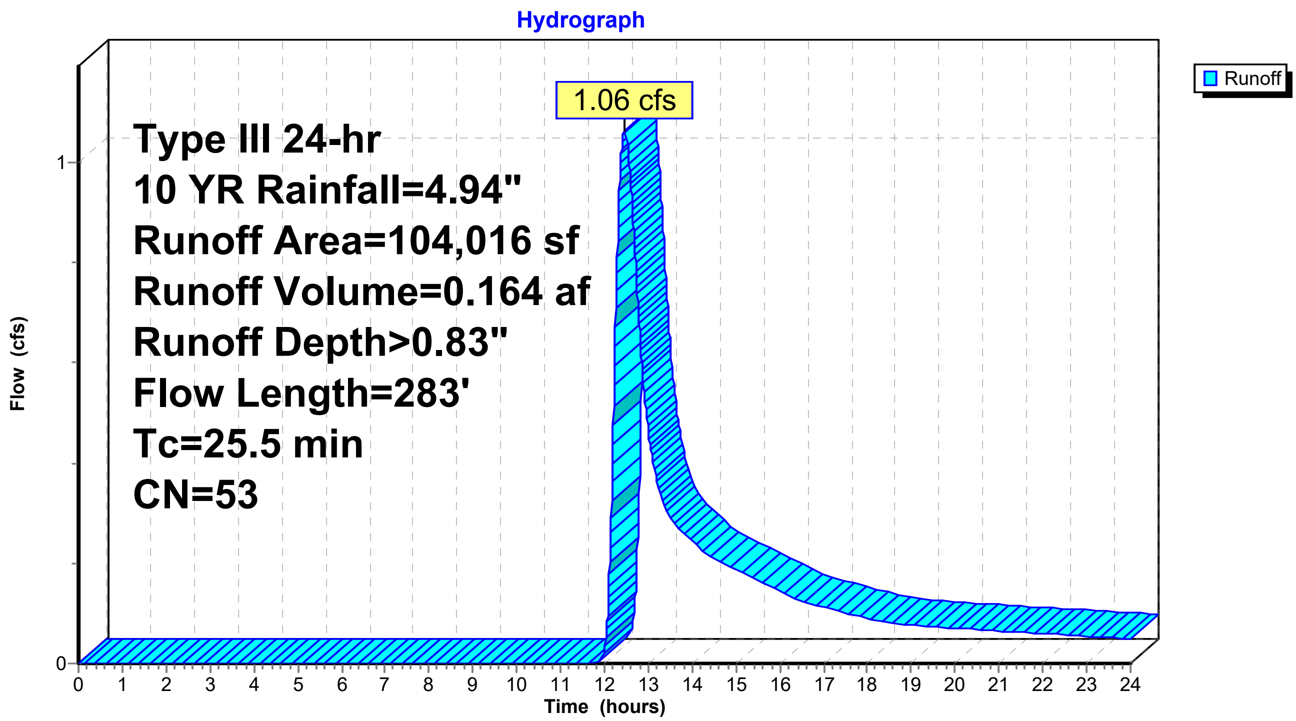
Runoff = 1.06 cfs @ 12.45 hrs, Volume= 0.164 af, Depth> 0.83"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 10 YR Rainfall=4.94"

	Area (sf)	CN	Description
	71,752	39	>75% Grass cover, Good, HSG A
	6,746	30	Woods, Good, HSG A
*	25,518	98	Wetland; Water Surface
	0	98	Paved parking, HSG A
	104,016	53	Weighted Average
	78,498		75.47% Pervious Area
	25,518		24.53% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.9	50	0.1000	0.29		**Sheet Flow, A-B** Grass: Short n= 0.150 P2= 3.40"
22.6	233	0.0006	0.17		**Shallow Concentrated Flow, B-C** Short Grass Pasture Kv= 7.0 fps
25.5	283	Total			

Subcatchment E6: EX DA-6



Summary for Subcatchment E7: EX-DA 7

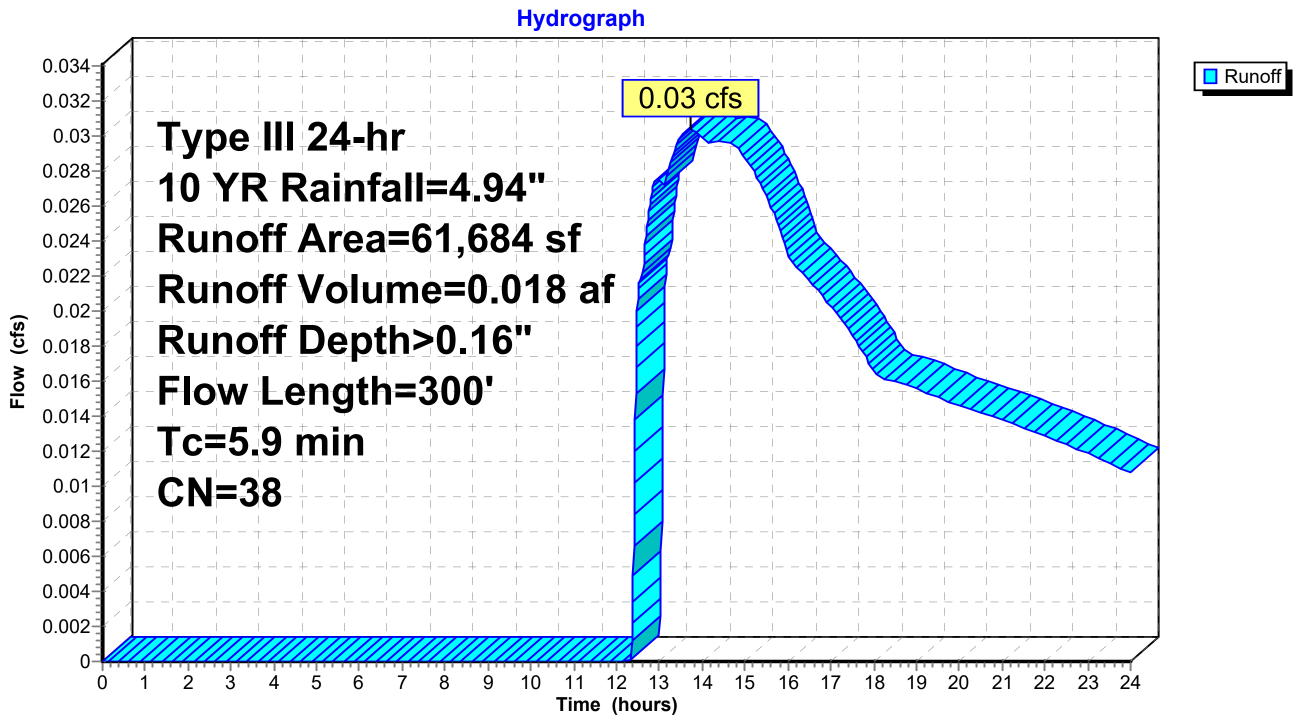
Runoff = 0.03 cfs @ 13.72 hrs, Volume= 0.018 af, Depth> 0.16"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 10 YR Rainfall=4.94"

	Area (sf)	CN	Description
	47,876	39	>75% Grass cover, Good, HSG A
*	12,590	30	Woods, Good, HSG A & Sand Area
	1,218	98	Water Surface, HSG A
	61,684	38	Weighted Average
	60,466		98.03% Pervious Area
	1,218		1.97% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.8	50	0.0280	0.17		**Sheet Flow, A-B** Grass: Short n= 0.150 P2= 3.40"
0.5	100	0.0460	3.45		**Shallow Concentrated Flow, B-C** Unpaved Kv= 16.1 fps
0.6	150	0.0750	4.41		**Shallow Concentrated Flow, C-D** Unpaved Kv= 16.1 fps
5.9	300	Total			

Subcatchment E7: EX-DA 7



Summary for Subcatchment E8: EX-DA 8

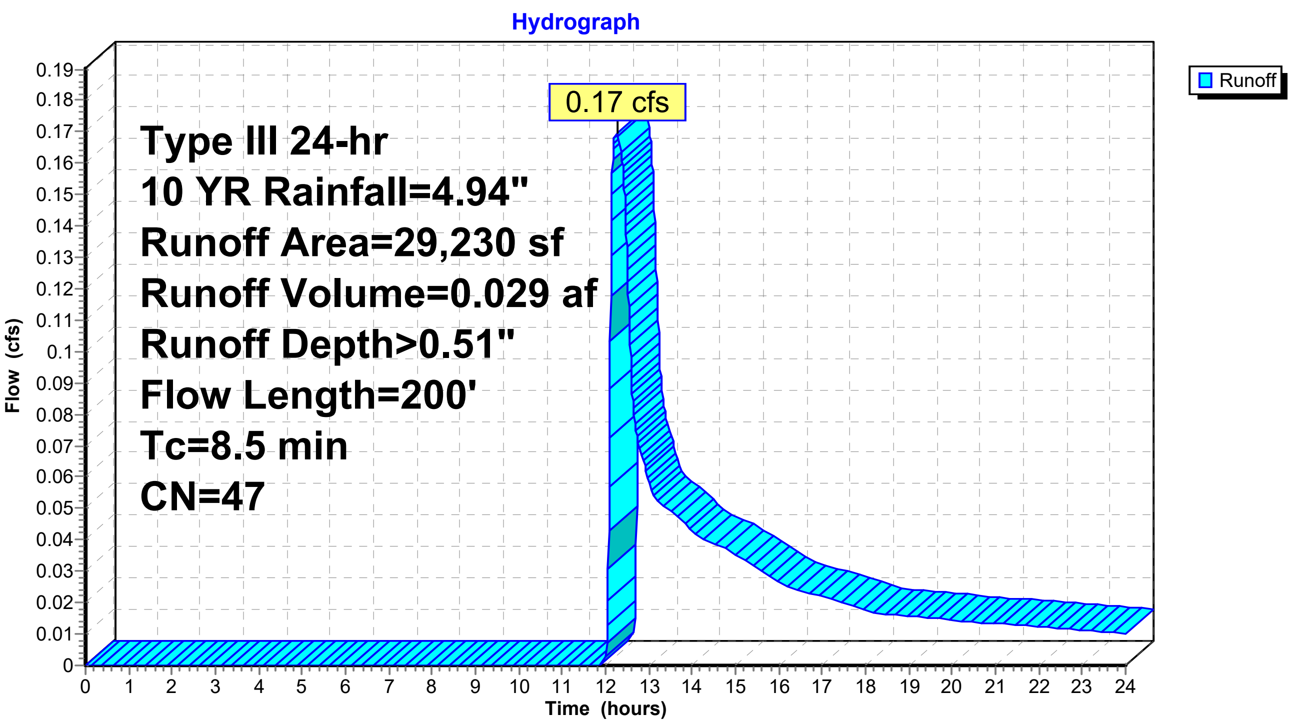
Runoff = 0.17 cfs @ 12.29 hrs, Volume= 0.029 af, Depth> 0.51"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 10 YR Rainfall=4.94"

	Area (sf)	CN	Description
	21,837	39	>75% Grass cover, Good, HSG A
*	2,953	30	Woods, Good, HSG A & Sand Area
	4,440	98	Water Surface, HSG A
	29,230	47	Weighted Average
	24,790		84.81% Pervious Area
	4,440		15.19% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.9	50	0.0800	0.12		**Sheet Flow, A-B** Woods: Light underbrush n= 0.400 P2= 3.40"
1.6	150	0.0530	1.61		**Shallow Concentrated Flow, B-C** Short Grass Pasture Kv= 7.0 fps
8.5	200	Total			

Subcatchment E8: EX-DA 8



Summary for Subcatchment E9: EX DA-9

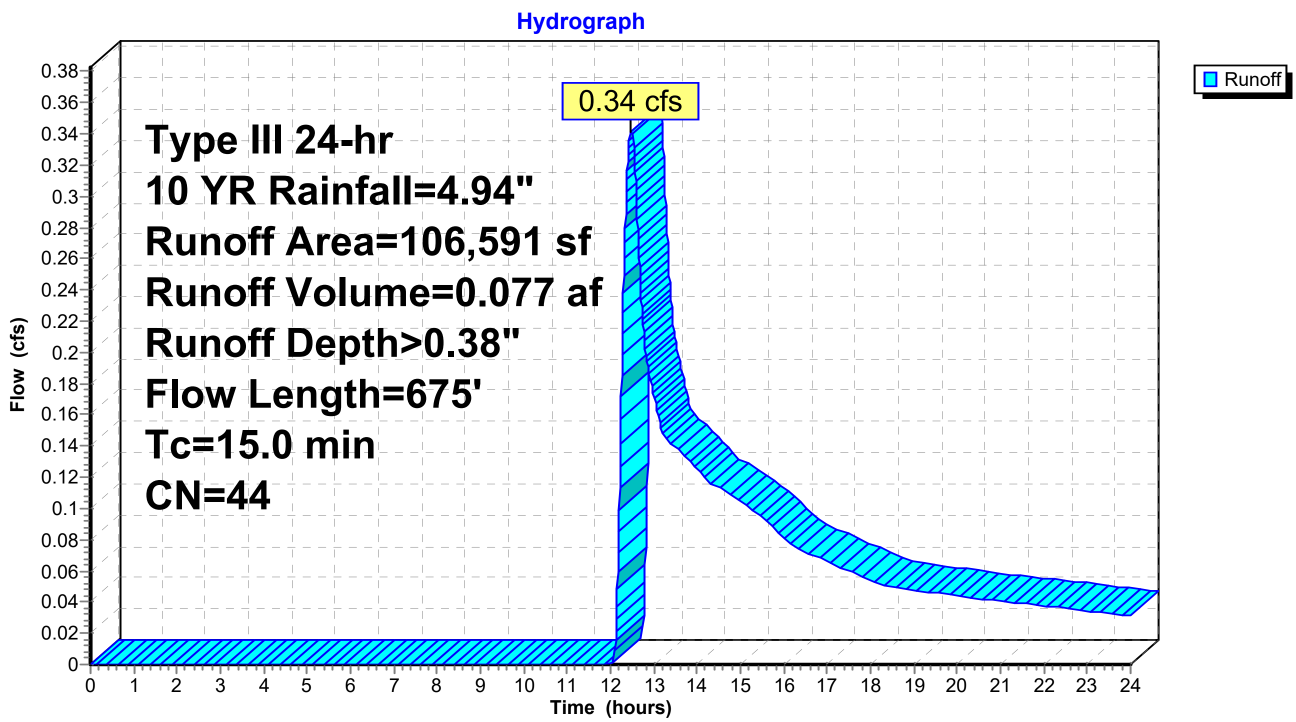
Runoff = 0.34 cfs @ 12.48 hrs, Volume= 0.077 af, Depth> 0.38"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 10 YR Rainfall=4.94"

	Area (sf)	CN	Description
	94,116	39	>75% Grass cover, Good, HSG A
	3,500	30	Woods, Good, HSG A
*	8,975	98	Wetland; Water Surface
	0	98	Paved parking, HSG A
	106,591	44	Weighted Average
	97,616		91.58% Pervious Area
	8,975		8.42% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.9	50	0.0260	0.17		**Sheet Flow, A-B** Grass: Short n= 0.150 P2= 3.40"
8.8	495	0.0180	0.94		**Shallow Concentrated Flow, B-C** Short Grass Pasture Kv= 7.0 fps
1.3	130	0.0540	1.63		**Shallow Concentrated Flow, C-D** Short Grass Pasture Kv= 7.0 fps
15.0	675	Total			

Subcatchment E9: EX DA-9

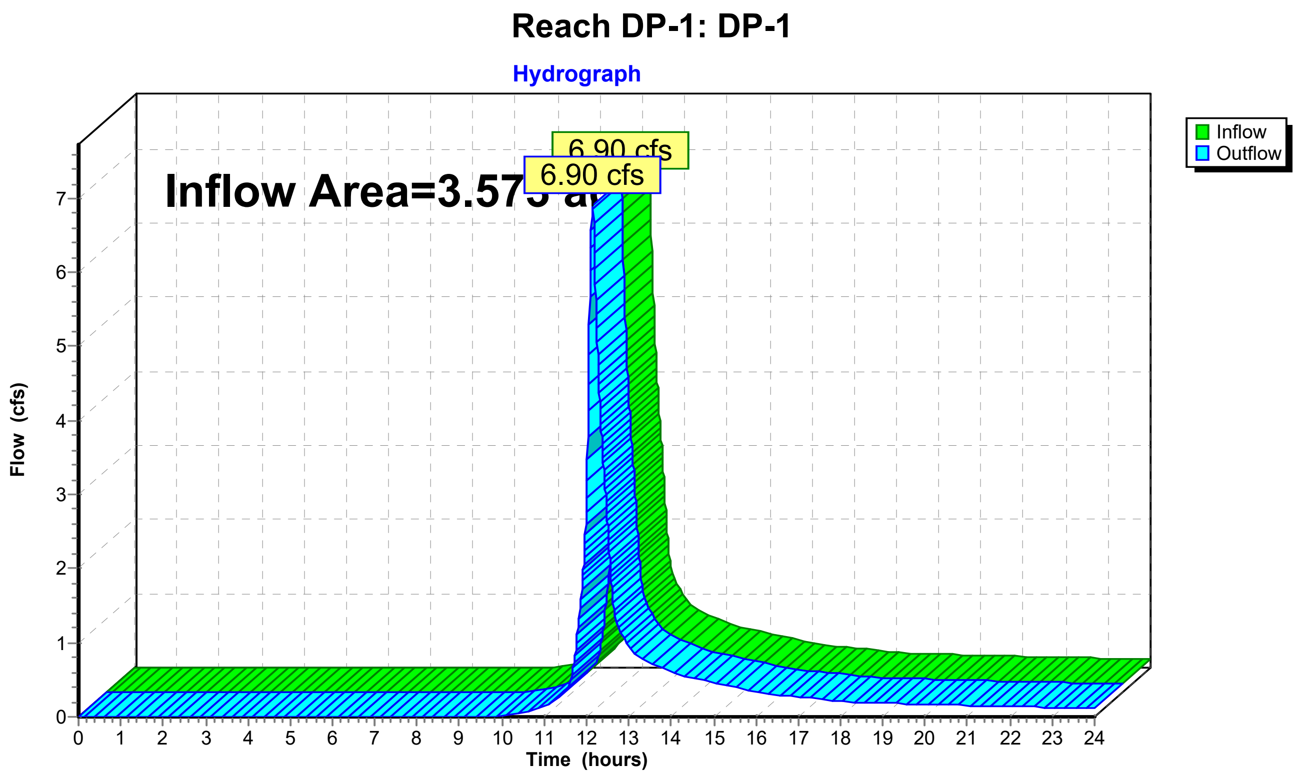


Summary for Reach DP-1: DP-1

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 3.573 ac, 50.78% Impervious, Inflow Depth > 1.91" for 10 YR event
Inflow = 6.90 cfs @ 12.14 hrs, Volume= 0.569 af
Outflow = 6.90 cfs @ 12.14 hrs, Volume= 0.569 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs



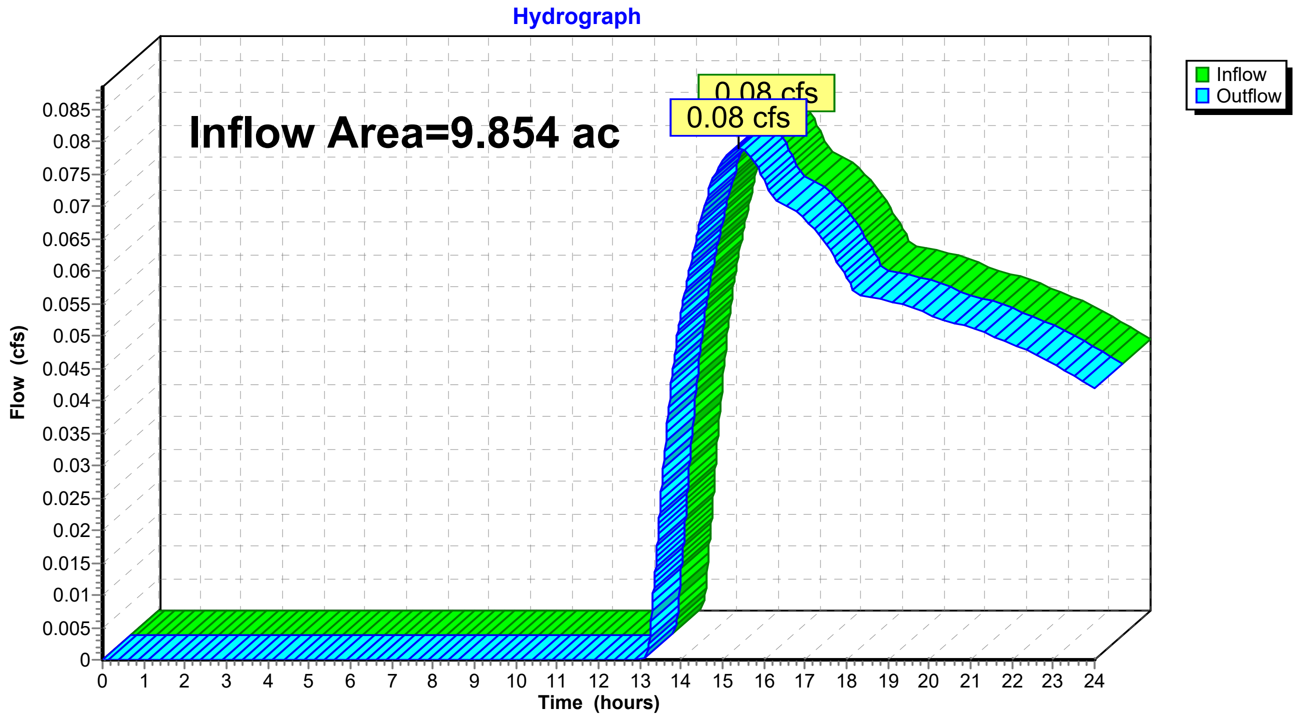
Summary for Reach DP-2: DP-2 (JOSHUA'S BROOK)

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area =	9.854 ac,	2.39% Impervious,	Inflow Depth > 0.06"	for 10 YR event
Inflow =	0.08 cfs @	15.38 hrs, Volume=	0.050 af	
Outflow =	0.08 cfs @	15.38 hrs, Volume=	0.050 af, Atten= 0%, Lag= 0.0 min	

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs

Reach DP-2: DP-2 (JOSHUA'S BROOK)



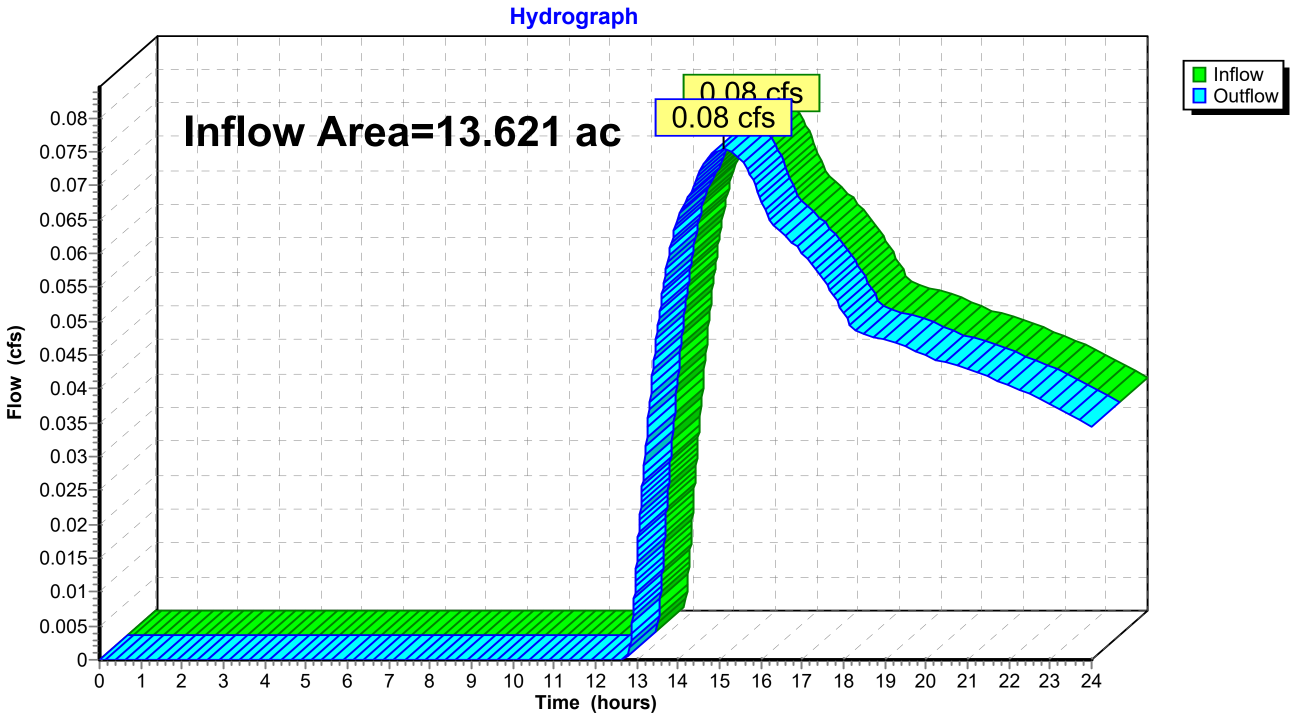
Summary for Reach DP-3: DP-3 (STEWART'S CREEK)

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 13.621 ac, 9.32% Impervious, Inflow Depth > 0.04" for 10 YR event
Inflow = 0.08 cfs @ 15.09 hrs, Volume= 0.047 af
Outflow = 0.08 cfs @ 15.09 hrs, Volume= 0.047 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs

Reach DP-3: DP-3 (STEWART'S CREEK)



Summary for Pond P-A: POND A

Inflow Area = 2.388 ac, 24.53% Impervious, Inflow Depth > 0.83" for 10 YR event
Inflow = 1.06 cfs @ 12.45 hrs, Volume= 0.164 af
Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Atten= 100%, Lag= 0.0 min
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Peak Elev= 24.79' @ 24.00 hrs Surf.Area= 21,792 sf Storage= 7,154 cf

Plug-Flow detention time= (not calculated: initial storage exceeds outflow)
Center-of-Mass det. time= (not calculated: no outflow)

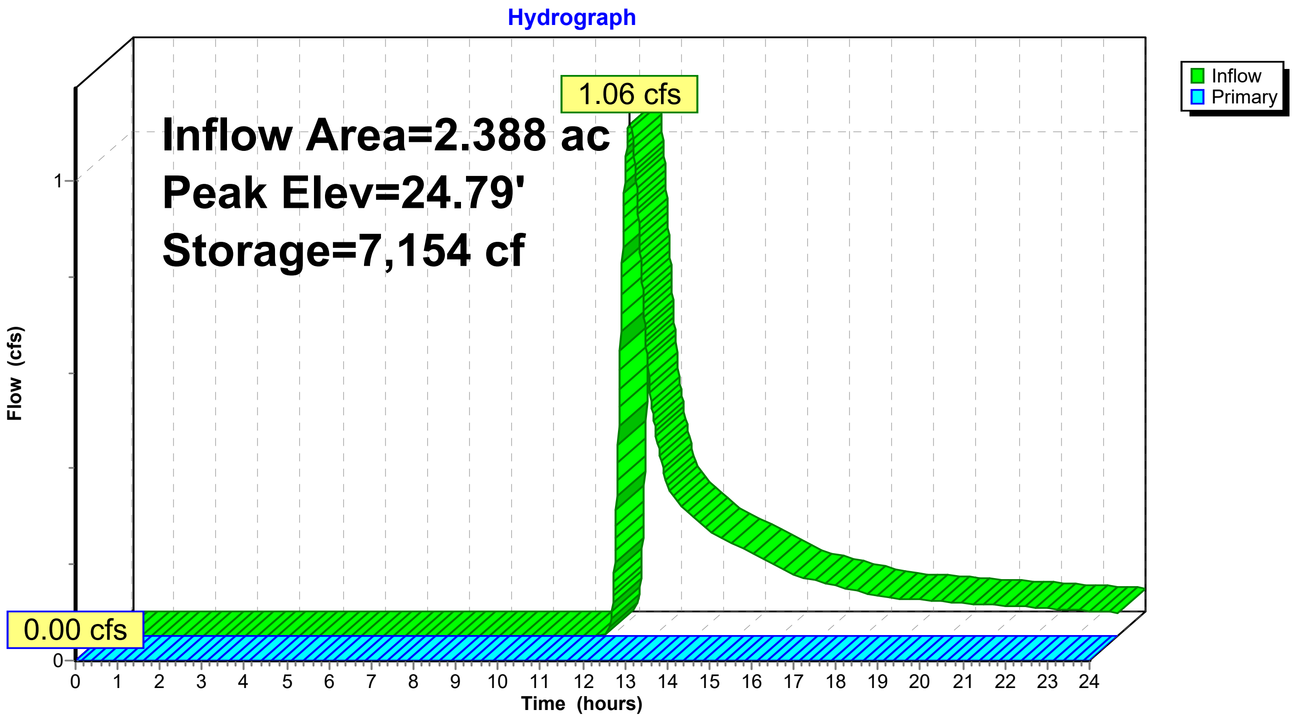
Volume	Invert	Avail.Storage	Storage Description
#1	24.45'	37,030 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
24.45	20,405	0	0
25.70	25,518	28,702	28,702
26.00	30,000	8,328	37,030

Device	Routing	Invert	Outlet Devices
#1	Primary	25.10'	**45.0 deg x 30.0' long x 0.50' rise Sharp-Crested Vee/Trap Weir** Cv= 2.56 (C= 3.20)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=24.45' (Free Discharge)
└─**1=Sharp-Crested Vee/Trap Weir** (Controls 0.00 cfs)

Pond P-A: POND A



Summary for Pond P-B: POND B

Inflow Area = 1.784 ac, 13.22% Impervious, Inflow Depth > 0.47" for 10 YR event
Inflow = 0.39 cfs @ 12.30 hrs, Volume= 0.069 af
Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Atten= 100%, Lag= 0.0 min
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Peak Elev= 2.98' @ 24.00 hrs Surf.Area= 11,037 sf Storage= 3,027 cf

Plug-Flow detention time= (not calculated: initial storage exceeds outflow)
Center-of-Mass det. time= (not calculated: no outflow)

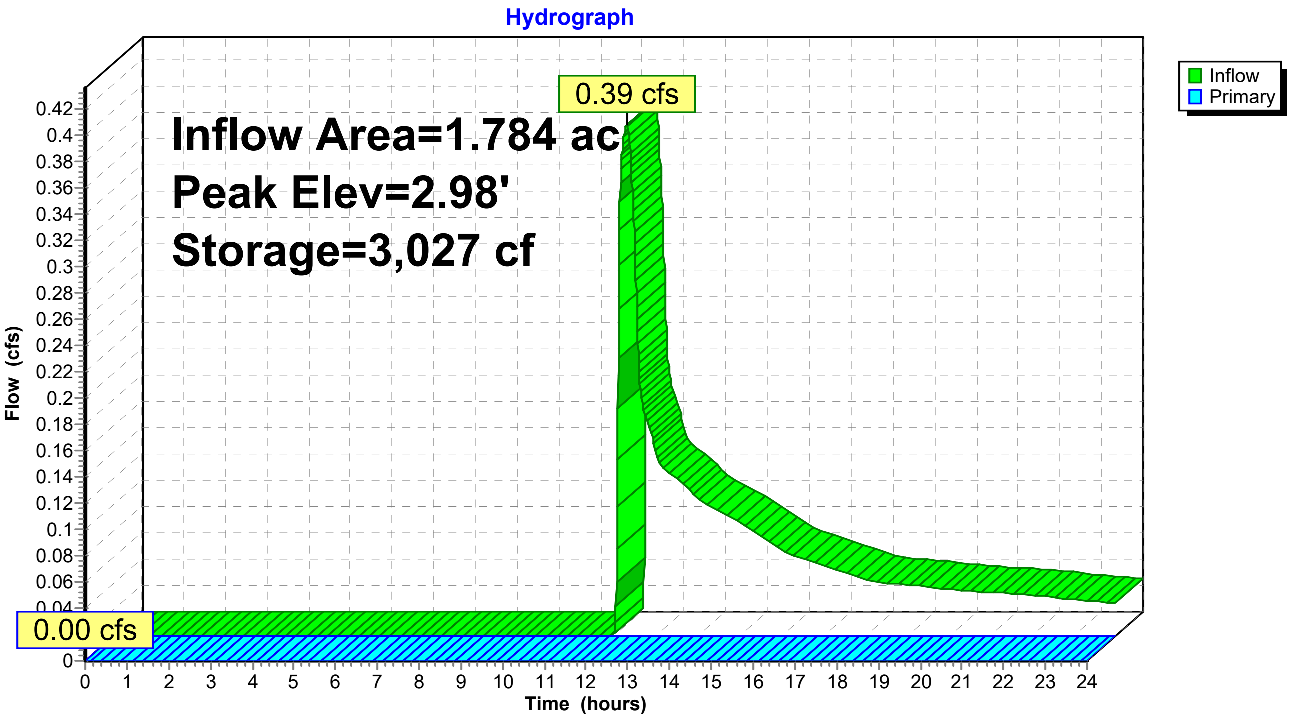
Volume	Invert	Avail.Storage	Storage Description
#1	2.70'	15,021 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
2.70	10,273	0	0
3.00	11,080	3,203	3,203
3.40	11,370	4,490	7,693
4.00	13,058	7,328	15,021

Device	Routing	Invert	Outlet Devices
#1	Primary	3.44'	**45.0 deg x 15.0' long x 0.50' rise Sharp-Crested Vee/Trap Weir** Cv= 2.56 (C= 3.20)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=2.70' (Free Discharge)
└─**1=Sharp-Crested Vee/Trap Weir** (Controls 0.00 cfs)

Pond P-B: POND B



Summary for Pond P-C: POND C

Inflow Area = 3.086 ac, 15.48% Impervious, Inflow Depth > 0.47" for 10 YR event
Inflow = 0.67 cfs @ 12.31 hrs, Volume= 0.120 af
Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Atten= 100%, Lag= 0.0 min
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Peak Elev= 3.84' @ 24.00 hrs Surf.Area= 22,436 sf Storage= 5,233 cf

Plug-Flow detention time= (not calculated: initial storage exceeds outflow)
Center-of-Mass det. time= (not calculated: no outflow)

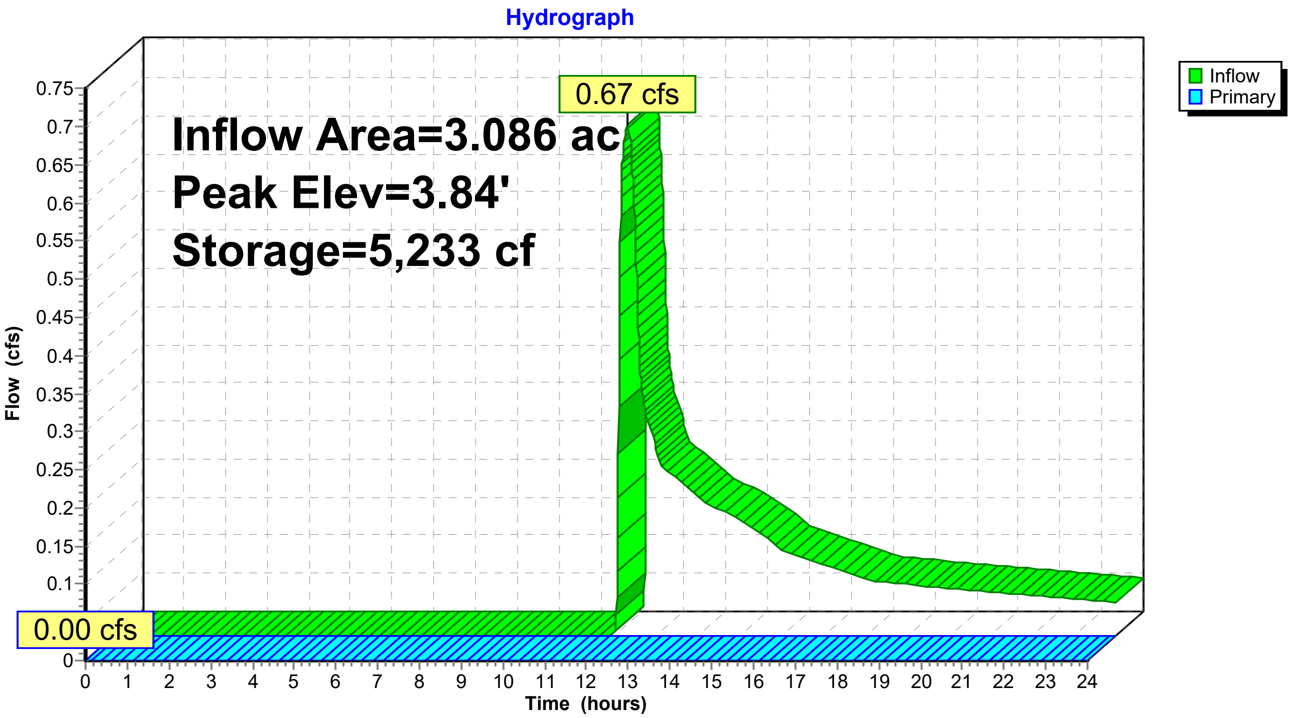
Volume	Invert	Avail.Storage	Storage Description
#1	3.60'	35,172 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
3.60	20,812	0	0
4.00	23,497	8,862	8,862
5.00	29,124	26,311	35,172

Device	Routing	Invert	Outlet Devices
#1	Primary	4.29'	**45.0 deg x 15.0' long x 0.50' rise Sharp-Crested Vee/Trap Weir** Cv= 2.56 (C= 3.20)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=3.60' (Free Discharge)
└─**1=Sharp-Crested Vee/Trap Weir** (Controls 0.00 cfs)

Pond P-C: POND C



Summary for Pond P-D: POND D

Inflow Area = 2.447 ac, 8.42% Impervious, Inflow Depth > 0.38" for 10 YR event
Inflow = 0.34 cfs @ 12.48 hrs, Volume= 0.077 af
Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Atten= 100%, Lag= 0.0 min
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Peak Elev= 8.42' @ 24.00 hrs Surf.Area= 8,175 sf Storage= 3,342 cf

Plug-Flow detention time= (not calculated: initial storage exceeds outflow)
Center-of-Mass det. time= (not calculated: no outflow)

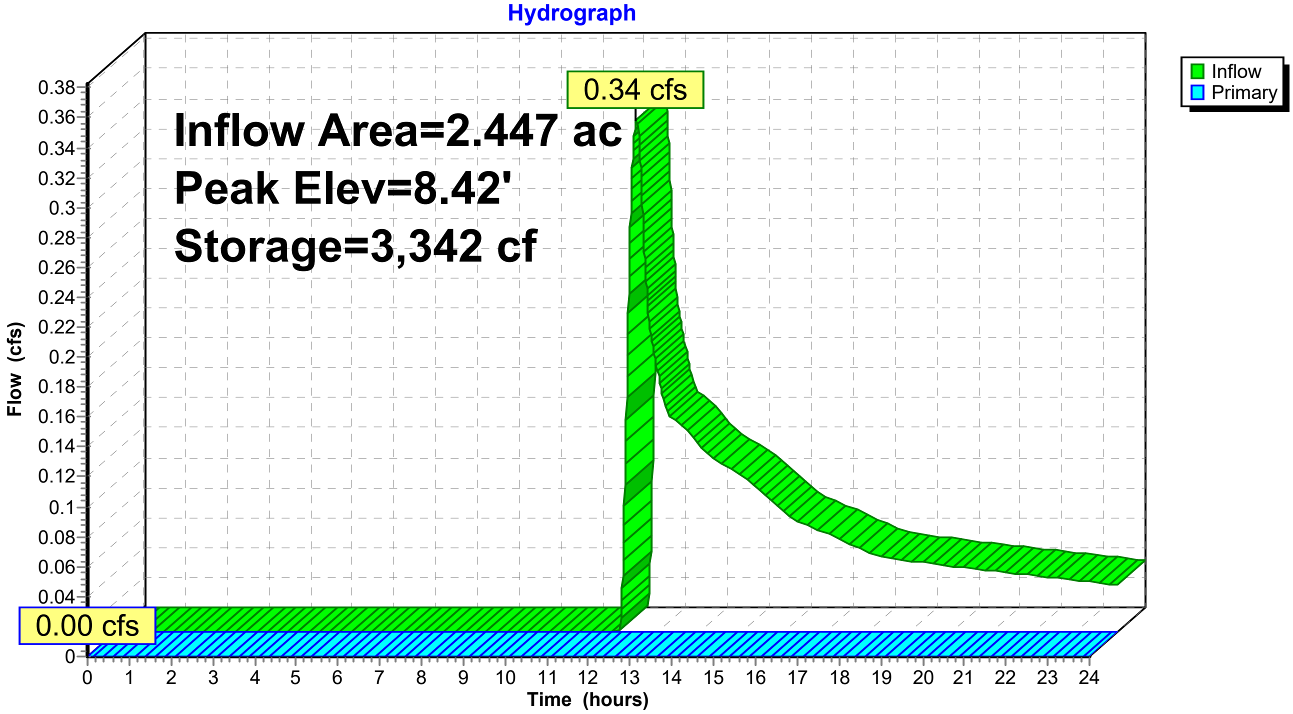
Volume	Invert	Avail.Storage	Storage Description
#1	8.00'	18,853 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
8.00	7,585	0	0
9.00	8,975	8,280	8,280
10.00	12,170	10,573	18,853

Device	Routing	Invert	Outlet Devices
#1	Primary	9.80'	**45.0 deg x 15.0' long x 0.50' rise Sharp-Crested Vee/Trap Weir** Cv= 2.56 (C= 3.20)
#2	Primary	9.08'	**12.0" Round Culvert** L= 18.5' CMP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 9.08' / 8.16' S= 0.0497 '/' Cc= 0.900 n= 0.013 Clay tile, Flow Area= 0.79 sf

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=8.00' (Free Discharge)
1=Sharp-Crested Vee/Trap Weir (Controls 0.00 cfs)
2=Culvert (Controls 0.00 cfs)

Pond P-D: POND D



Time span=0.00-24.00 hrs, dt=0.01 hrs, 2401 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment E1: EX DA-1 Runoff Area=155,629 sf 50.78% Impervious Runoff Depth>2.64"
Flow Length=435' Tc=9.6 min CN=69 Runoff=9.69 cfs 0.785 af

Subcatchment E10: EX DA-10 Runoff Area=248,320 sf 0.00% Impervious Runoff Depth>0.27"
Flow Length=490' Tc=16.5 min CN=36 Runoff=0.32 cfs 0.129 af

Subcatchment E2: EX-DA-2 Runoff Area=351,546 sf 0.00% Impervious Runoff Depth>0.23"
Flow Length=682' Tc=14.4 min CN=35 Runoff=0.29 cfs 0.155 af

Subcatchment E3: EX DA-3 Runoff Area=77,711 sf 13.22% Impervious Runoff Depth>0.83"
Flow Length=400' Tc=7.0 min CN=46 Runoff=1.05 cfs 0.123 af

Subcatchment E4: EX DA-4 Runoff Area=134,422 sf 15.48% Impervious Runoff Depth>0.83"
Flow Length=341' Tc=7.8 min CN=46 Runoff=1.76 cfs 0.213 af

Subcatchment E5: EX DA-5 Runoff Area=171,335 sf 0.00% Impervious Runoff Depth>0.27"
Flow Length=433' Tc=11.9 min CN=36 Runoff=0.24 cfs 0.090 af

Subcatchment E6: EX DA-6 Runoff Area=104,016 sf 24.53% Impervious Runoff Depth>1.30"
Flow Length=283' Tc=25.5 min CN=53 Runoff=1.90 cfs 0.260 af

Subcatchment E7: EX-DA 7 Runoff Area=61,684 sf 1.97% Impervious Runoff Depth>0.37"
Flow Length=300' Tc=5.9 min CN=38 Runoff=0.18 cfs 0.043 af

Subcatchment E8: EX-DA 8 Runoff Area=29,230 sf 15.19% Impervious Runoff Depth>0.89"
Flow Length=200' Tc=8.5 min CN=47 Runoff=0.43 cfs 0.050 af

Subcatchment E9: EX DA-9 Runoff Area=106,591 sf 8.42% Impervious Runoff Depth>0.70"
Flow Length=675' Tc=15.0 min CN=44 Runoff=0.86 cfs 0.143 af

Reach DP-1: DP-1 Inflow=9.69 cfs 0.785 af
Outflow=9.69 cfs 0.785 af

Reach DP-2: DP-2 (JOSHUA'S BROOK) Inflow=0.29 cfs 0.155 af
Outflow=0.29 cfs 0.155 af

Reach DP-3: DP-3 (STEWART'S CREEK) Inflow=0.32 cfs 0.129 af
Outflow=0.32 cfs 0.129 af

Pond P-A: POND A Peak Elev=24.98' Storage=11,310 cf Inflow=1.90 cfs 0.260 af
Outflow=0.00 cfs 0.000 af

Pond P-B: POND B Peak Elev=3.19' Storage=5,356 cf Inflow=1.05 cfs 0.123 af
Outflow=0.00 cfs 0.000 af

Pond P-C: POND C Peak Elev=4.02' Storage=9,261 cf Inflow=1.76 cfs 0.213 af
Outflow=0.00 cfs 0.000 af

Pond P-D: POND D Peak Elev=8.76' Storage=6,209 cf Inflow=0.86 cfs 0.143 af
Outflow=0.00 cfs 0.000 af

Total Runoff Area = 33.069 ac Runoff Volume = 1.990 af Average Runoff Depth = 0.72"
89.57% Pervious = 29.619 ac 10.43% Impervious = 3.450 ac

Summary for Subcatchment E1: EX DA-1

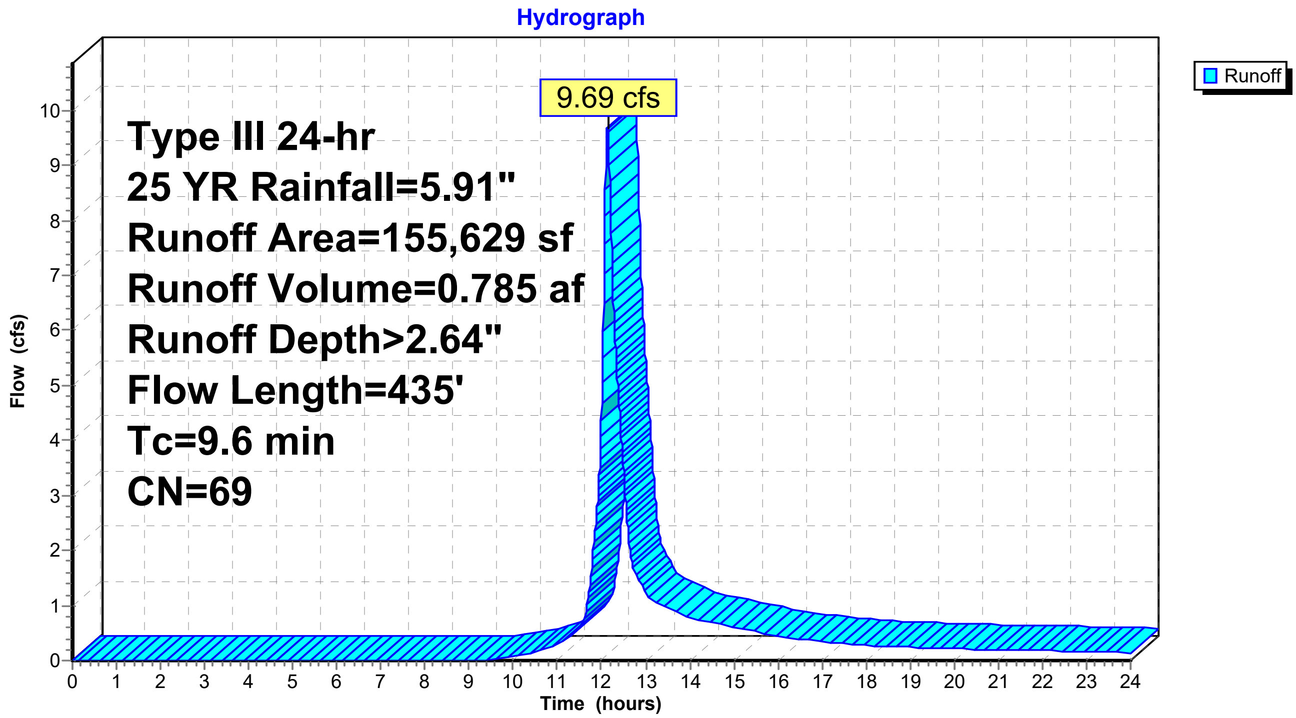
Runoff = 9.69 cfs @ 12.14 hrs, Volume= 0.785 af, Depth> 2.64"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 25 YR Rainfall=5.91"

	Area (sf)	CN	Description
	70,869	39	>75% Grass cover, Good, HSG A
	5,725	30	Woods, Good, HSG A
*	7,041	98	Wetland; Water Surface
	71,994	98	Paved parking, HSG A
	155,629	69	Weighted Average
	76,594		49.22% Pervious Area
	79,035		50.78% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.8	50	0.0270	0.17		**Sheet Flow, A-B** Grass: Short n= 0.150 P2= 3.40"
2.4	90	0.0077	0.61		**Shallow Concentrated Flow, B-C** Short Grass Pasture Kv= 7.0 fps
1.9	192	0.0550	1.64		**Shallow Concentrated Flow, C-D** Short Grass Pasture Kv= 7.0 fps
0.4	83	0.0260	3.27		**Shallow Concentrated Flow, D-E** Paved Kv= 20.3 fps
0.1	20	0.2000	3.13		**Shallow Concentrated Flow, E-F** Short Grass Pasture Kv= 7.0 fps
9.6	435	Total			

Subcatchment E1: EX DA-1



Summary for Subcatchment E10: EX DA-10

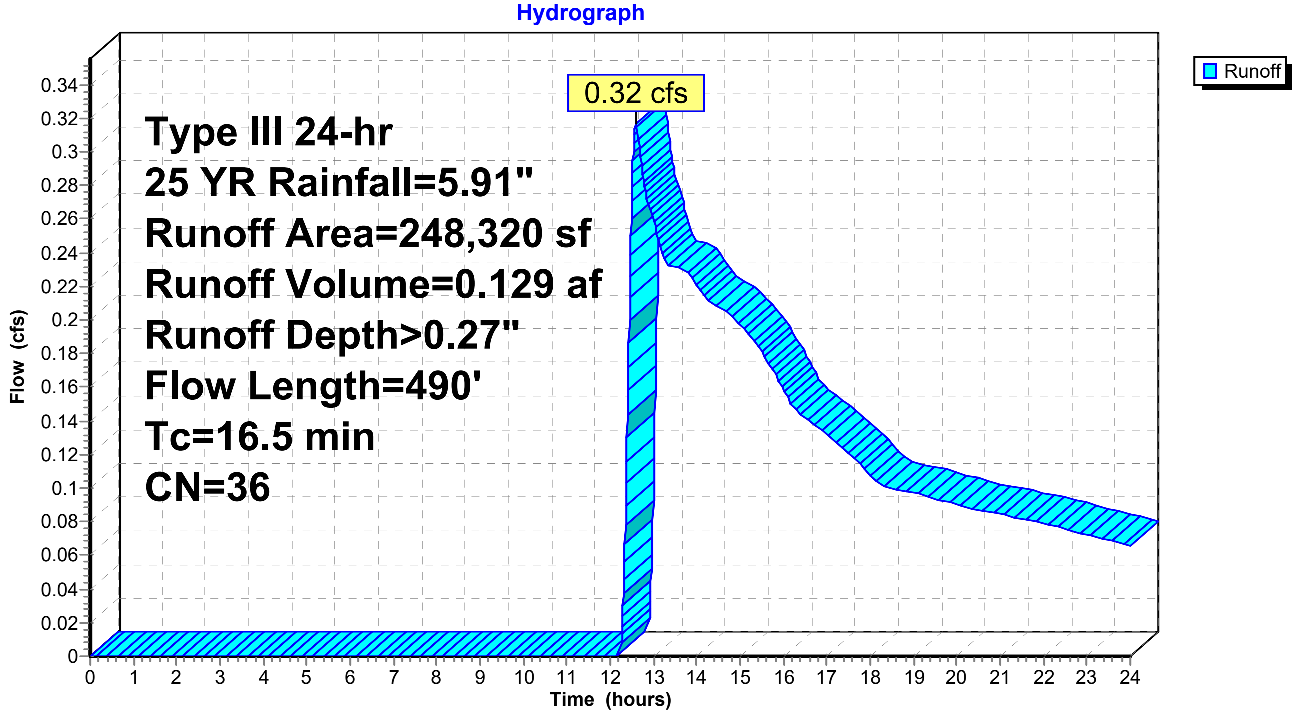
Runoff = 0.32 cfs @ 12.60 hrs, Volume= 0.129 af, Depth> 0.27"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 25 YR Rainfall=5.91"

	Area (sf)	CN	Description
	166,992	39	>75% Grass cover, Good, HSG A
	81,328	30	Woods, Good, HSG A
*	0	98	Wetland; Water Surface
	0	98	Paved parking, HSG A
	248,320	36	Weighted Average
	248,320		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.1	50	0.0400	0.09		**Sheet Flow, A-B** Woods: Light underbrush n= 0.400 P2= 3.40"
3.1	70	0.0057	0.38		**Shallow Concentrated Flow, B-C** Woodland Kv= 5.0 fps
1.5	150	0.0580	1.69		**Shallow Concentrated Flow, C-D** Short Grass Pasture Kv= 7.0 fps
1.6	70	0.0110	0.73		**Shallow Concentrated Flow, D-E** Short Grass Pasture Kv= 7.0 fps
1.1	125	0.0680	1.83		**Shallow Concentrated Flow, E-F** Short Grass Pasture Kv= 7.0 fps
0.1	25	0.3000	3.83		**Shallow Concentrated Flow, F-G** Short Grass Pasture Kv= 7.0 fps
16.5	490	Total			

Subcatchment E10: EX DA-10



Summary for Subcatchment E2: EX-DA-2

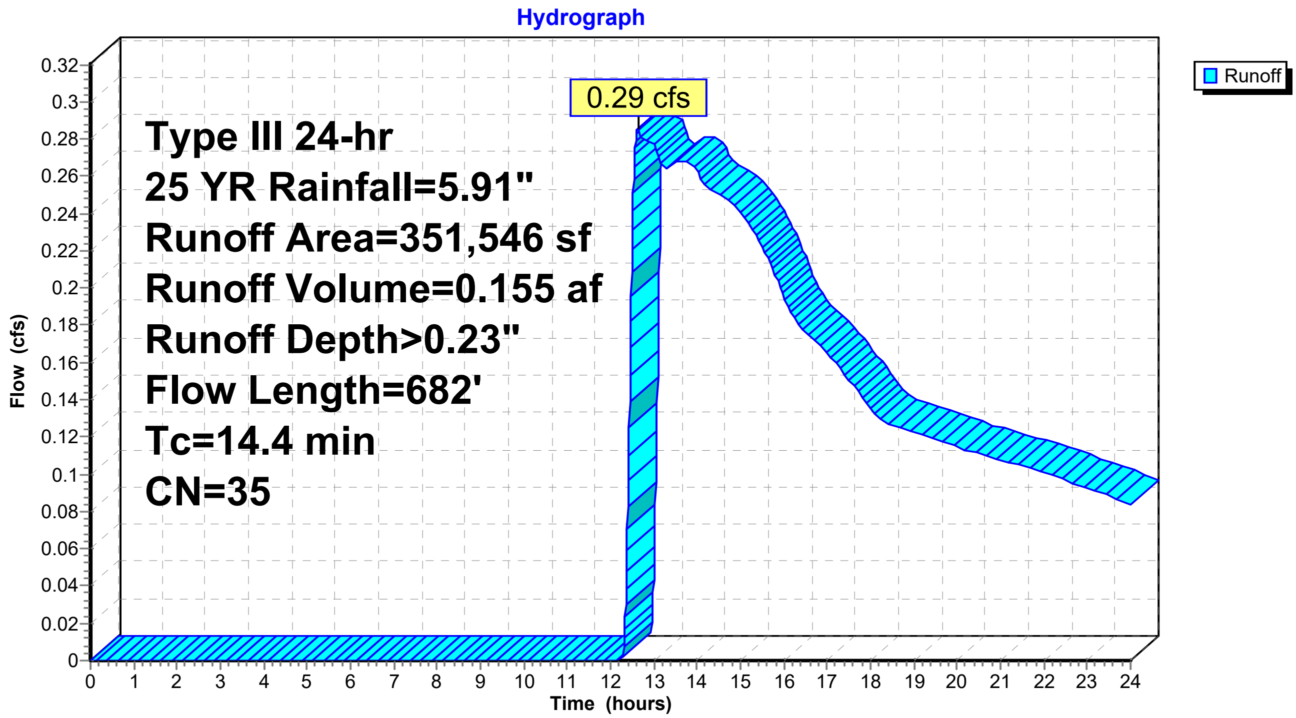
Runoff = 0.29 cfs @ 12.62 hrs, Volume= 0.155 af, Depth> 0.23"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 25 YR Rainfall=5.91"

	Area (sf)	CN	Description
	195,277	39	>75% Grass cover, Good, HSG A
	156,269	30	Woods, Good, HSG A
*	0	98	Wetland; Water Surface
	0	98	Paved parking, HSG A
	351,546	35	Weighted Average
	351,546		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.1	50	0.0800	0.27		**Sheet Flow, A-B** Grass: Short n= 0.150 P2= 3.40"
10.1	520	0.0150	0.86		**Shallow Concentrated Flow, B-C** Short Grass Pasture Kv= 7.0 fps
0.5	40	0.0825	1.44		**Shallow Concentrated Flow, C-D** Woodland Kv= 5.0 fps
0.5	40	0.0425	1.44		**Shallow Concentrated Flow, D-E** Short Grass Pasture Kv= 7.0 fps
0.2	32	0.3900	3.12		**Shallow Concentrated Flow, E-F** Woodland Kv= 5.0 fps
14.4	682	Total			

Subcatchment E2: EX-DA-2



Summary for Subcatchment E3: EX DA-3

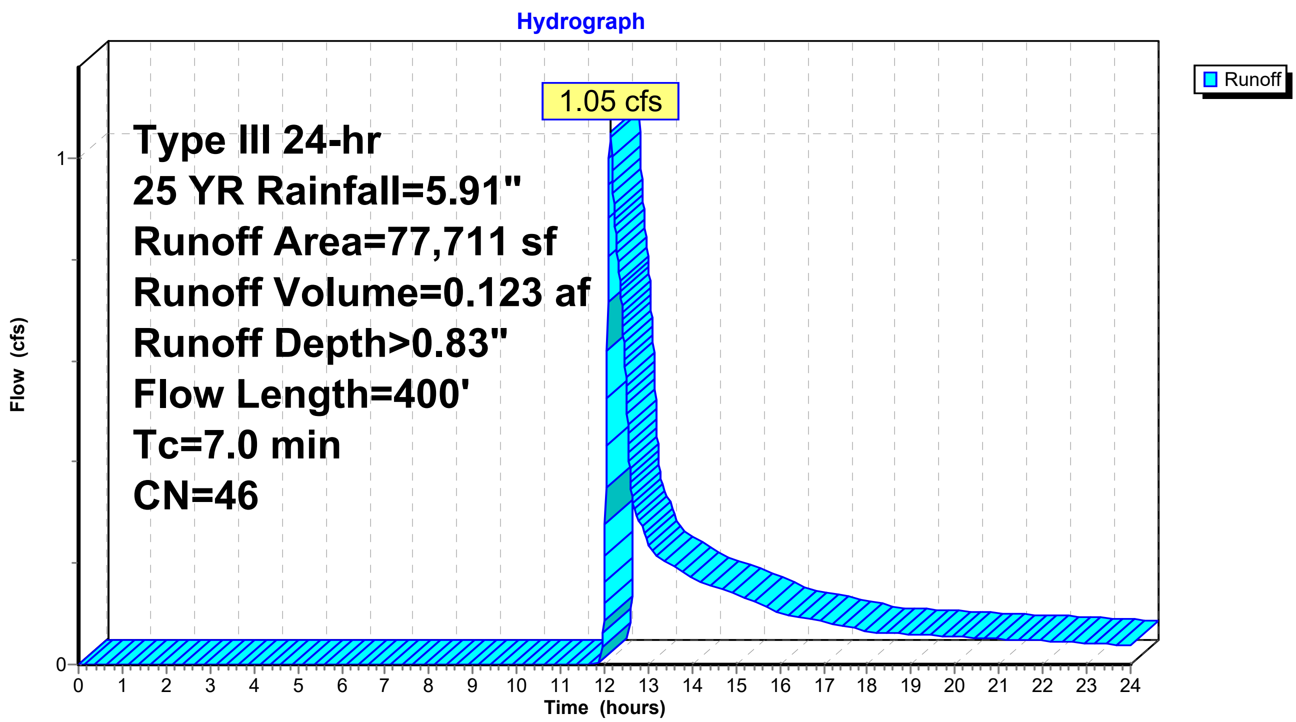
Runoff = 1.05 cfs @ 12.14 hrs, Volume= 0.123 af, Depth> 0.83"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 25 YR Rainfall=5.91"

	Area (sf)	CN	Description
	60,103	39	>75% Grass cover, Good, HSG A
	7,335	30	Woods, Good, HSG A
*	10,273	98	Wetland; Water Surface
	0	98	Paved parking, HSG A
	77,711	46	Weighted Average
	67,438		86.78% Pervious Area
	10,273		13.22% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.1	50	0.0800	0.27		**Sheet Flow, A-B** Grass: Short n= 0.150 P2= 3.40"
3.7	320	0.0430	1.45		**Shallow Concentrated Flow, B-C** Short Grass Pasture Kv= 7.0 fps
0.2	30	0.1000	2.21		**Shallow Concentrated Flow, C-D** Short Grass Pasture Kv= 7.0 fps
7.0	400	Total			

Subcatchment E3: EX DA-3



Summary for Subcatchment E4: EX DA-4

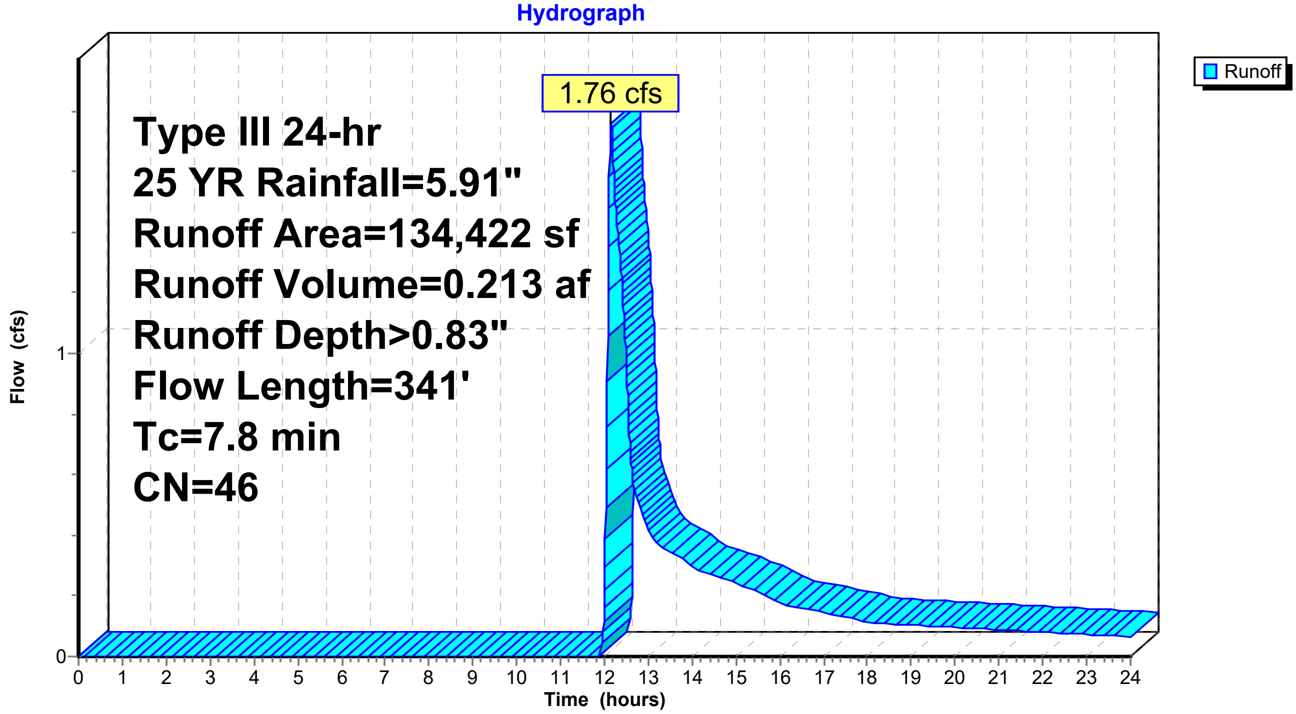
Runoff = 1.76 cfs @ 12.15 hrs, Volume= 0.213 af, Depth> 0.83"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 25 YR Rainfall=5.91"

	Area (sf)	CN	Description
	77,263	39	>75% Grass cover, Good, HSG A
	36,347	30	Woods, Good, HSG A
*	20,812	98	Wetland; Water Surface
	0	98	Paved parking, HSG A
	134,422	46	Weighted Average
	113,610		84.52% Pervious Area
	20,812		15.48% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.9	35	0.1300	0.30		**Sheet Flow, A-B** Grass: Short n= 0.150 P2= 3.40"
5.2	200	0.0165	0.64		**Shallow Concentrated Flow, B-C** Woodland Kv= 5.0 fps
0.4	63	0.1550	2.76		**Shallow Concentrated Flow, C-D** Short Grass Pasture Kv= 7.0 fps
0.3	43	0.1160	2.38		**Shallow Concentrated Flow, D-E** Short Grass Pasture Kv= 7.0 fps
7.8	341	Total			

Subcatchment E4: EX DA-4



Summary for Subcatchment E5: EX DA-5

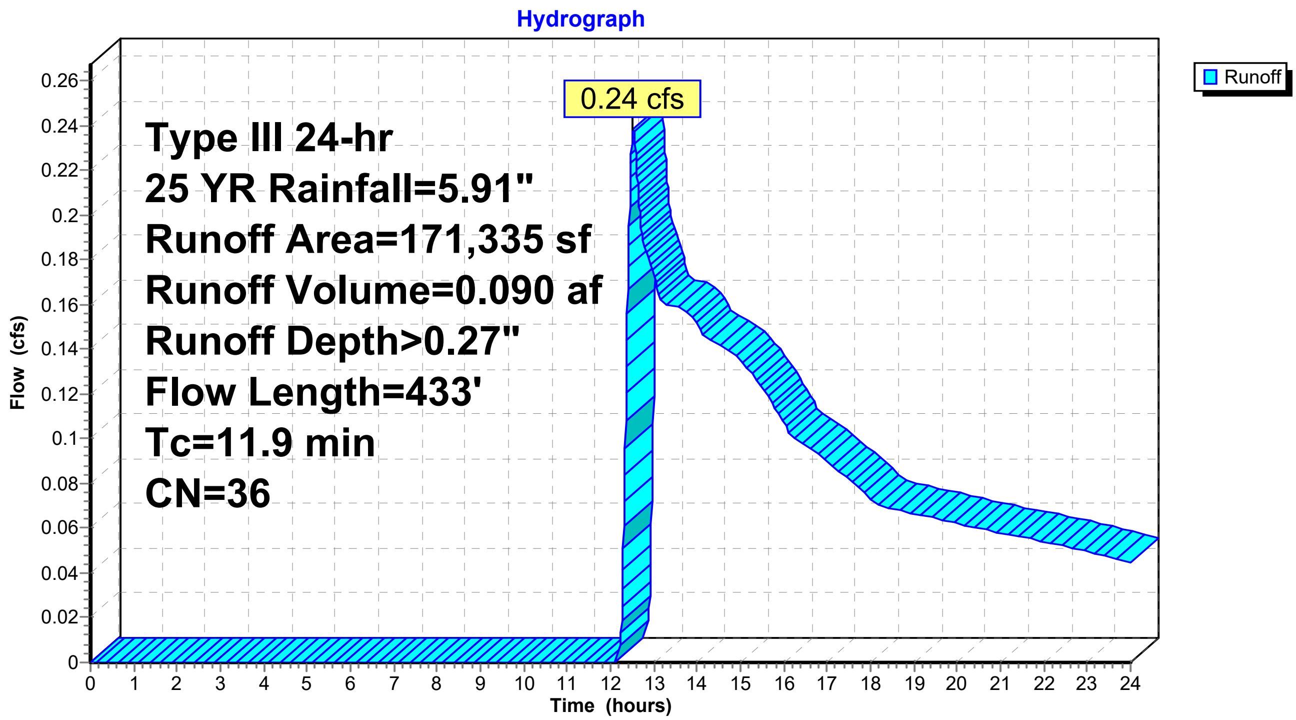
Runoff = 0.24 cfs @ 12.53 hrs, Volume= 0.090 af, Depth> 0.27"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 25 YR Rainfall=5.91"

	Area (sf)	CN	Description
	109,518	39	>75% Grass cover, Good, HSG A
	61,817	30	Woods, Good, HSG A
*	0	98	Wetland; Water Surface
	0	98	Paved parking, HSG A
	171,335	36	Weighted Average
	171,335		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.9	50	0.1000	0.29		**Sheet Flow, A-B** Grass: Short n= 0.150 P2= 3.40"
1.0	105	0.0620	1.74		**Shallow Concentrated Flow, B-C** Short Grass Pasture Kv= 7.0 fps
1.2	75	0.0460	1.07		**Shallow Concentrated Flow, C-D** Woodland Kv= 5.0 fps
6.8	203	0.0050	0.49		**Shallow Concentrated Flow, D-E** Short Grass Pasture Kv= 7.0 fps
11.9	433	Total			

Subcatchment E5: EX DA-5



Summary for Subcatchment E6: EX DA-6

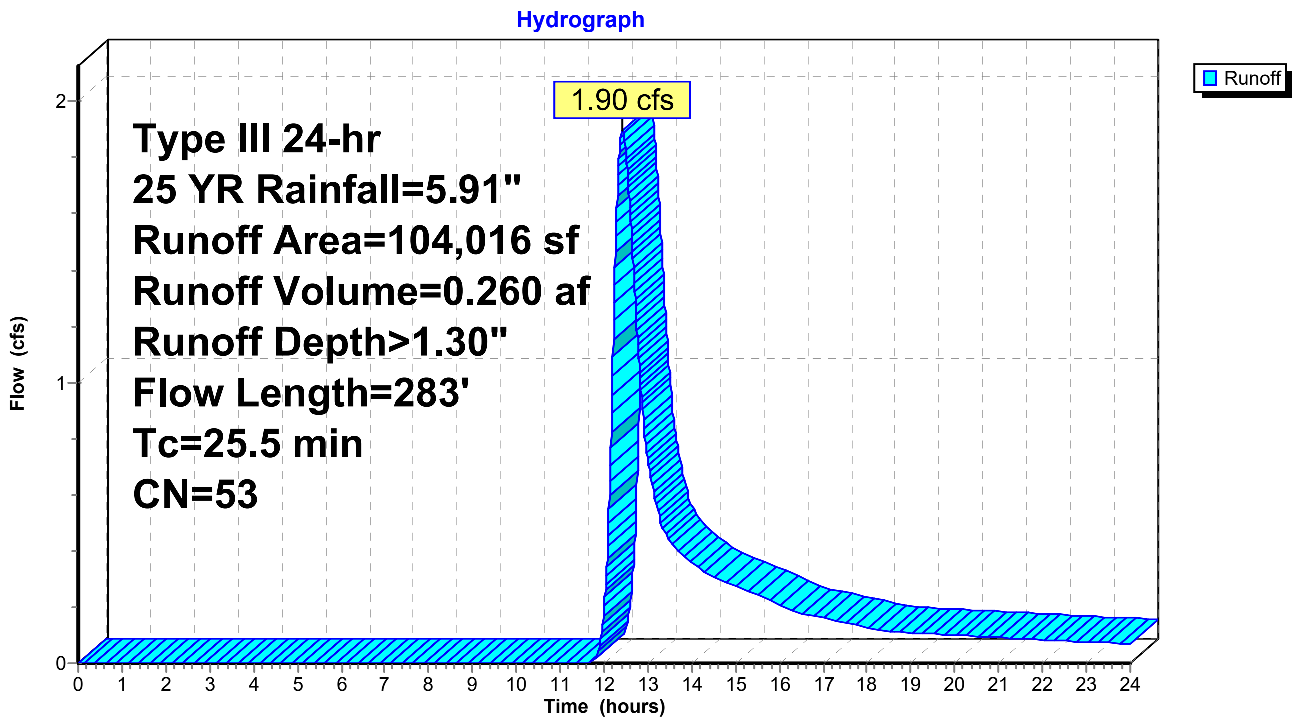
Runoff = 1.90 cfs @ 12.42 hrs, Volume= 0.260 af, Depth> 1.30"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 25 YR Rainfall=5.91"

	Area (sf)	CN	Description
	71,752	39	>75% Grass cover, Good, HSG A
	6,746	30	Woods, Good, HSG A
*	25,518	98	Wetland; Water Surface
	0	98	Paved parking, HSG A
	104,016	53	Weighted Average
	78,498		75.47% Pervious Area
	25,518		24.53% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.9	50	0.1000	0.29		**Sheet Flow, A-B** Grass: Short n= 0.150 P2= 3.40"
22.6	233	0.0006	0.17		**Shallow Concentrated Flow, B-C** Short Grass Pasture Kv= 7.0 fps
25.5	283	Total			

Subcatchment E6: EX DA-6



Summary for Subcatchment E7: EX-DA 7

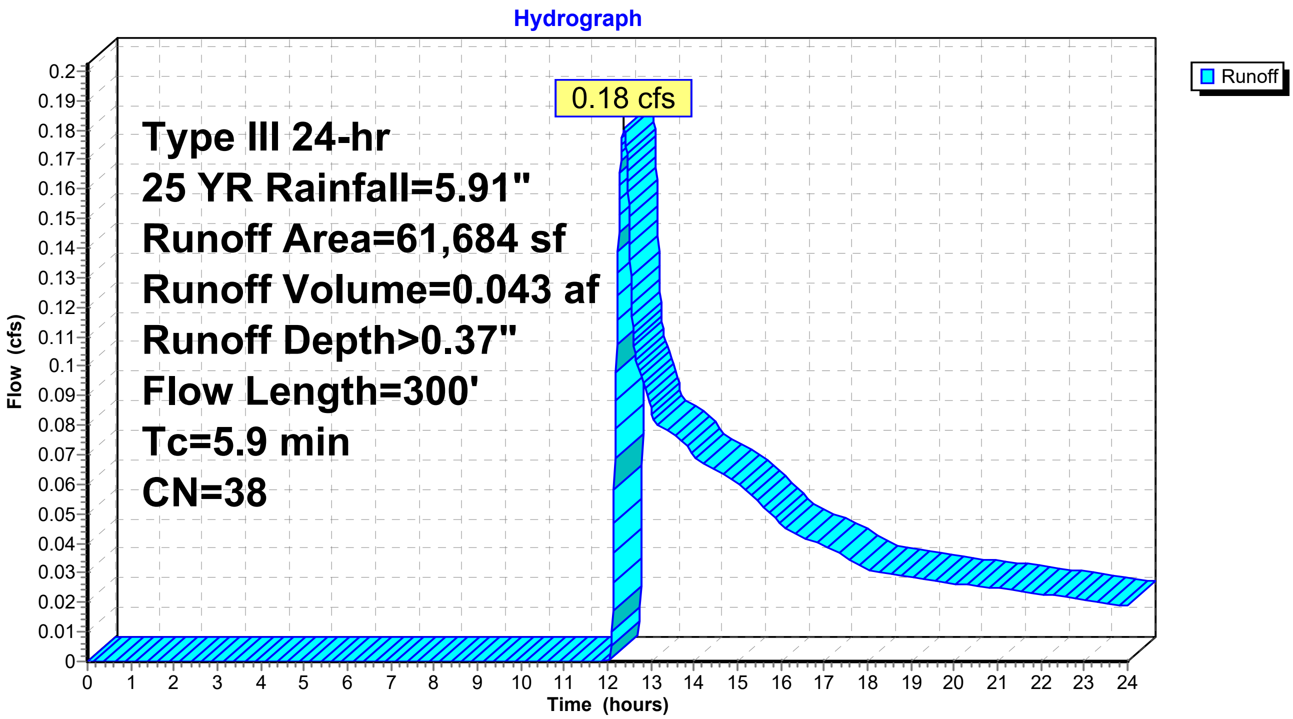
Runoff = 0.18 cfs @ 12.38 hrs, Volume= 0.043 af, Depth> 0.37"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 25 YR Rainfall=5.91"

	Area (sf)	CN	Description
	47,876	39	>75% Grass cover, Good, HSG A
*	12,590	30	Woods, Good, HSG A & Sand Area
	1,218	98	Water Surface, HSG A
	61,684	38	Weighted Average
	60,466		98.03% Pervious Area
	1,218		1.97% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.8	50	0.0280	0.17		**Sheet Flow, A-B** Grass: Short n= 0.150 P2= 3.40"
0.5	100	0.0460	3.45		**Shallow Concentrated Flow, B-C** Unpaved Kv= 16.1 fps
0.6	150	0.0750	4.41		**Shallow Concentrated Flow, C-D** Unpaved Kv= 16.1 fps
5.9	300	Total			

Subcatchment E7: EX-DA 7



Summary for Subcatchment E8: EX-DA 8

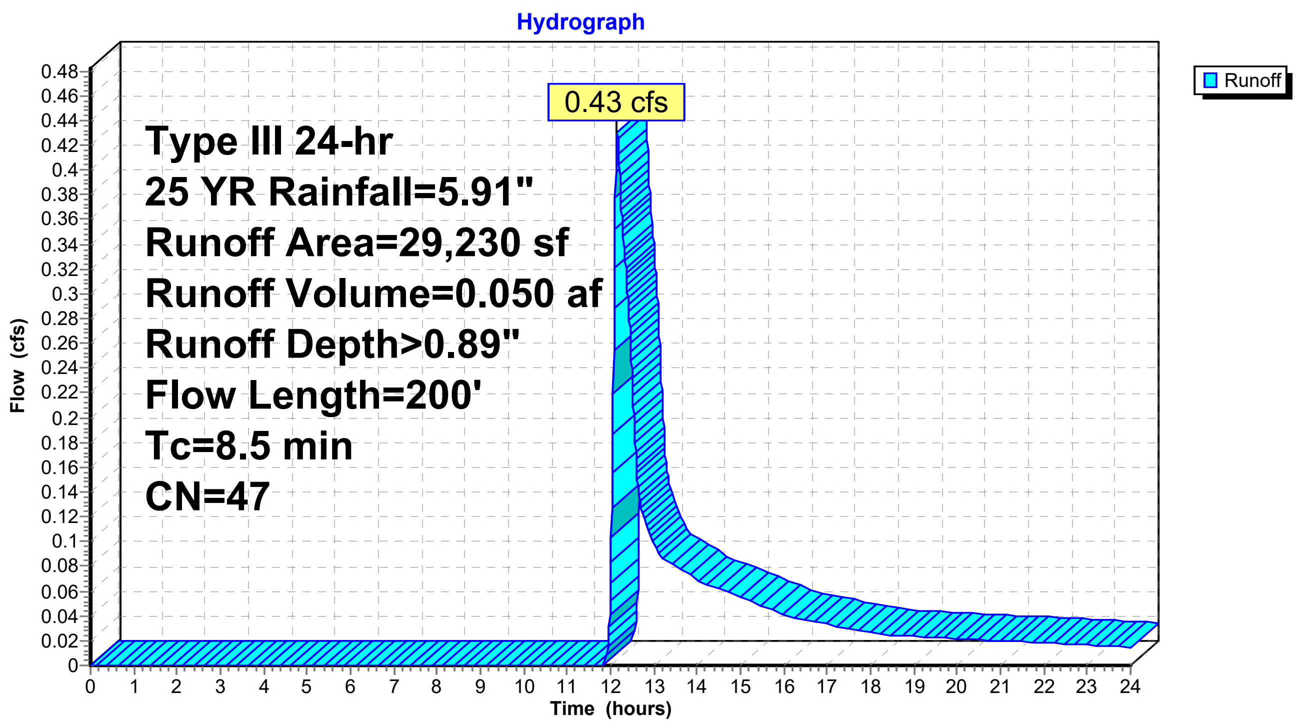
Runoff = 0.43 cfs @ 12.16 hrs, Volume= 0.050 af, Depth> 0.89"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 25 YR Rainfall=5.91"

	Area (sf)	CN	Description
	21,837	39	>75% Grass cover, Good, HSG A
*	2,953	30	Woods, Good, HSG A & Sand Area
	4,440	98	Water Surface, HSG A
	29,230	47	Weighted Average
	24,790		84.81% Pervious Area
	4,440		15.19% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.9	50	0.0800	0.12		**Sheet Flow, A-B** Woods: Light underbrush n= 0.400 P2= 3.40"
1.6	150	0.0530	1.61		**Shallow Concentrated Flow, B-C** Short Grass Pasture Kv= 7.0 fps
8.5	200	Total			

Subcatchment E8: EX-DA 8



Summary for Subcatchment E9: EX DA-9

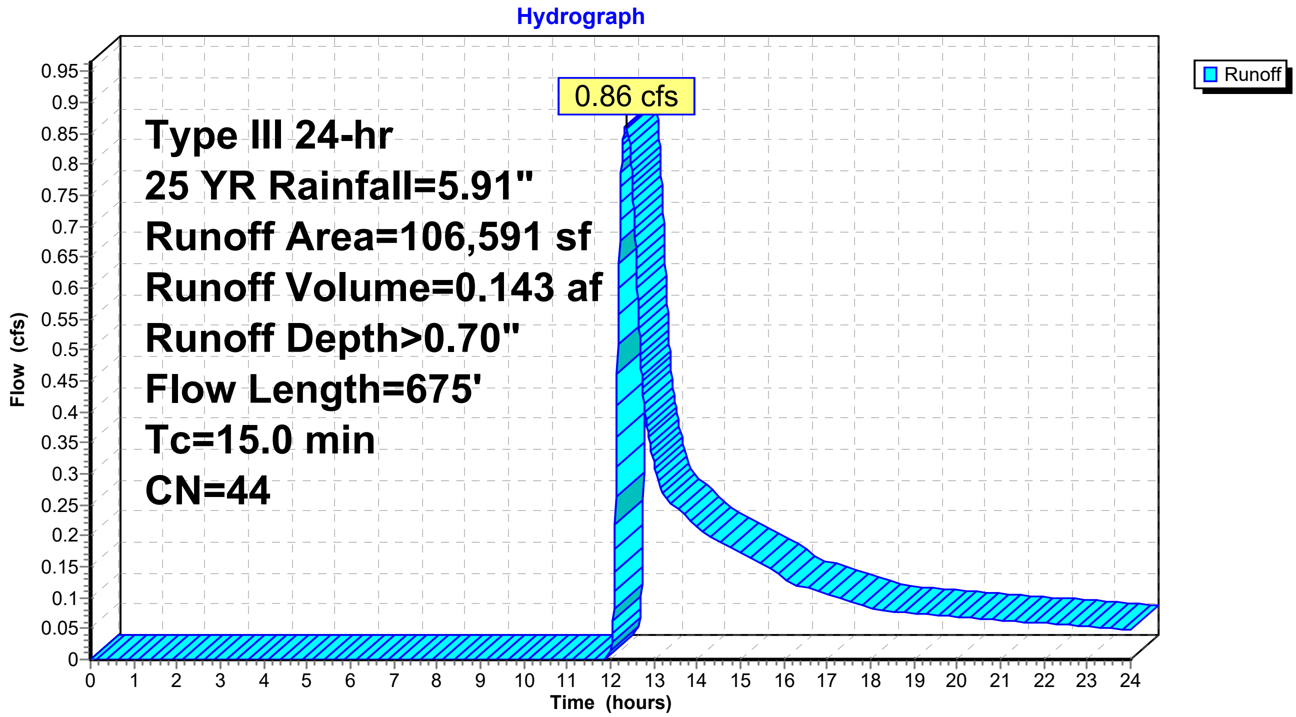
Runoff = 0.86 cfs @ 12.35 hrs, Volume= 0.143 af, Depth> 0.70"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 25 YR Rainfall=5.91"

	Area (sf)	CN	Description
	94,116	39	>75% Grass cover, Good, HSG A
	3,500	30	Woods, Good, HSG A
*	8,975	98	Wetland; Water Surface
	0	98	Paved parking, HSG A
	106,591	44	Weighted Average
	97,616		91.58% Pervious Area
	8,975		8.42% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.9	50	0.0260	0.17		**Sheet Flow, A-B** Grass: Short n= 0.150 P2= 3.40"
8.8	495	0.0180	0.94		**Shallow Concentrated Flow, B-C** Short Grass Pasture Kv= 7.0 fps
1.3	130	0.0540	1.63		**Shallow Concentrated Flow, C-D** Short Grass Pasture Kv= 7.0 fps
15.0	675	Total			

Subcatchment E9: EX DA-9

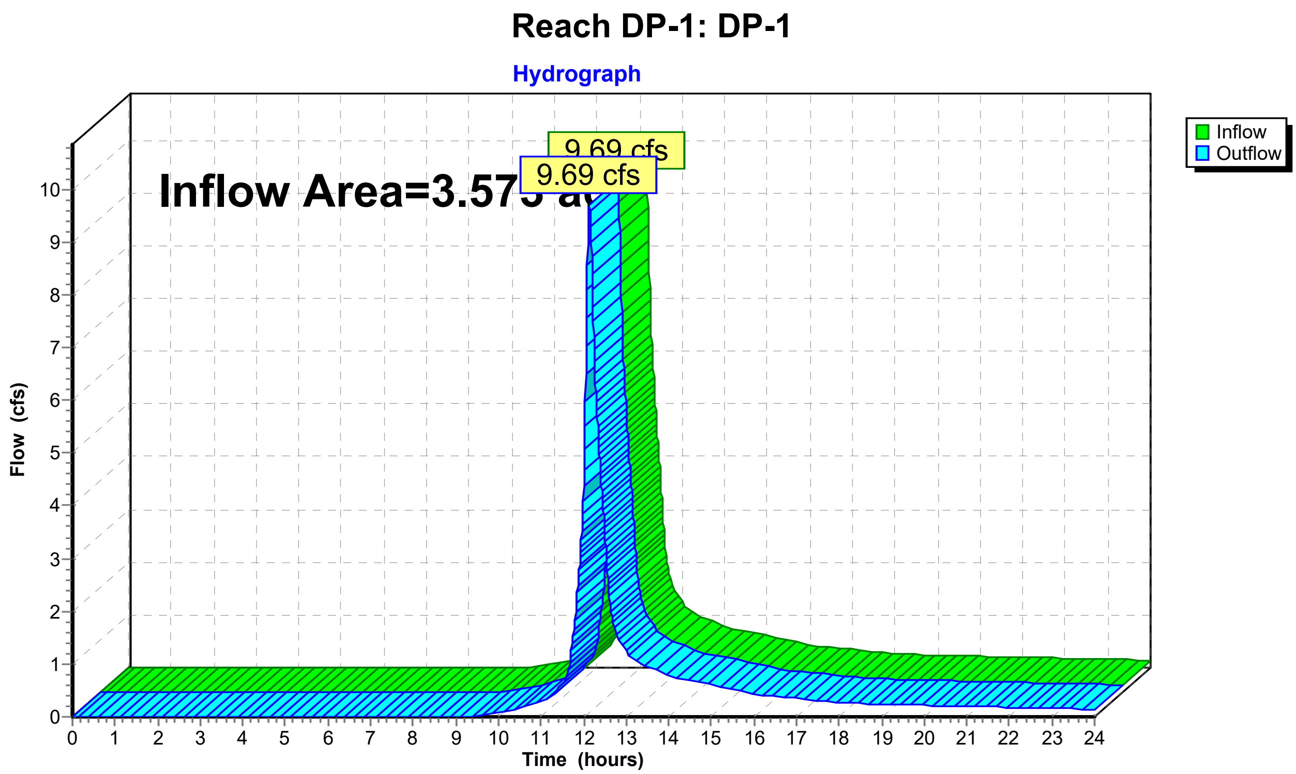


Summary for Reach DP-1: DP-1

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 3.573 ac, 50.78% Impervious, Inflow Depth > 2.64" for 25 YR event
Inflow = 9.69 cfs @ 12.14 hrs, Volume= 0.785 af
Outflow = 9.69 cfs @ 12.14 hrs, Volume= 0.785 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs



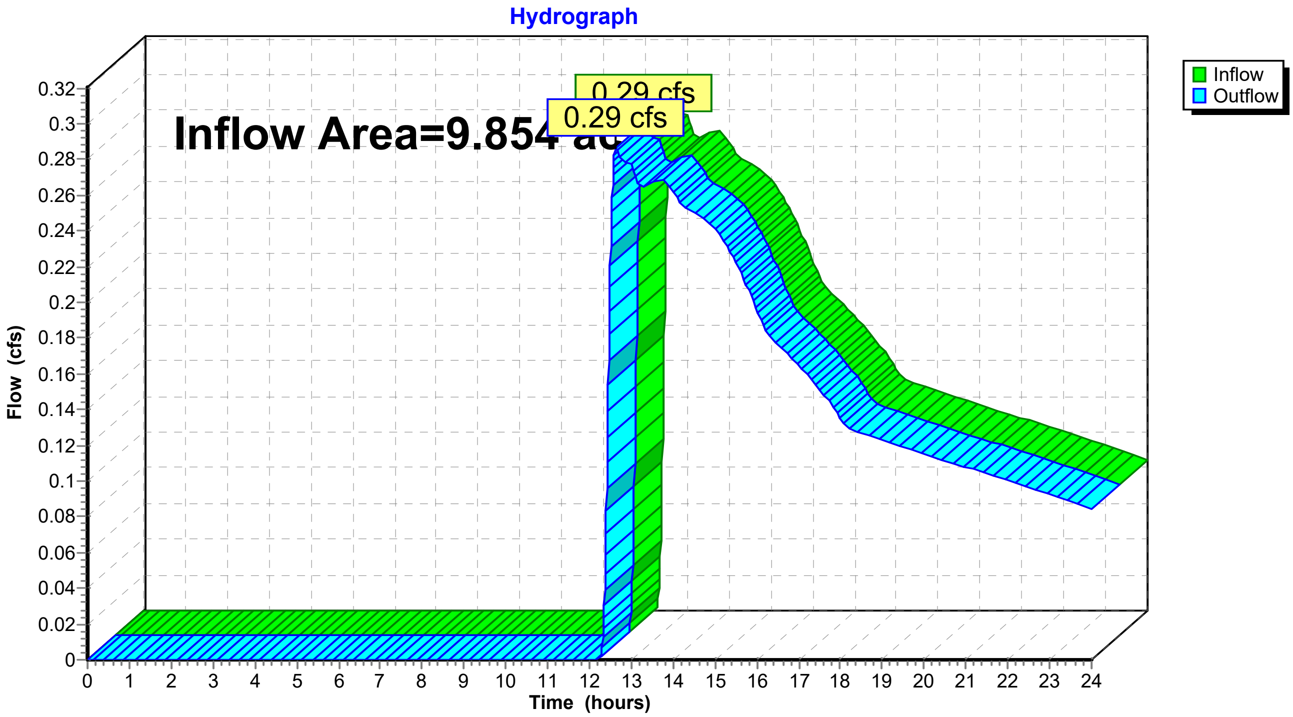
Summary for Reach DP-2: DP-2 (JOSHUA'S BROOK)

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 9.854 ac, 2.39% Impervious, Inflow Depth > 0.19" for 25 YR event
Inflow = 0.29 cfs @ 12.62 hrs, Volume= 0.155 af
Outflow = 0.29 cfs @ 12.62 hrs, Volume= 0.155 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs

Reach DP-2: DP-2 (JOSHUA'S BROOK)



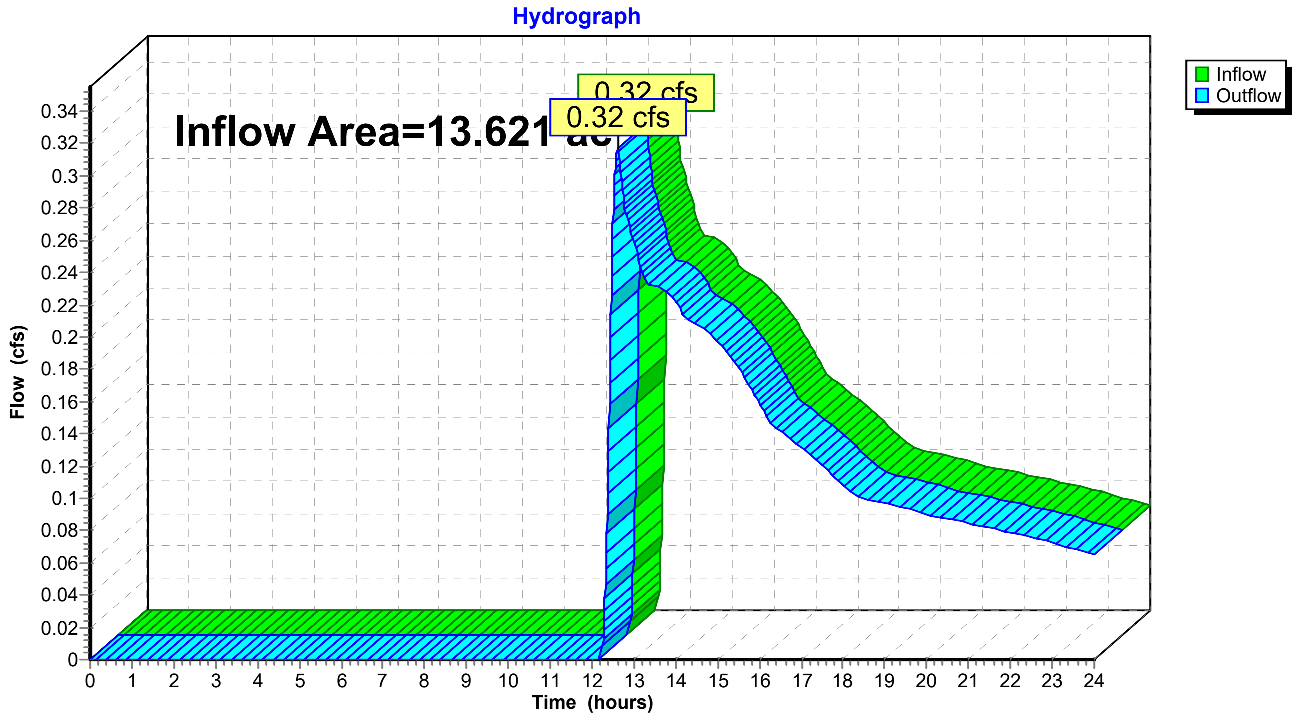
Summary for Reach DP-3: DP-3 (STEWART'S CREEK)

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area =	13.621 ac,	9.32% Impervious,	Inflow Depth > 0.11"	for 25 YR event	
Inflow =	0.32 cfs @	12.60 hrs,	Volume=	0.129 af	
Outflow =	0.32 cfs @	12.60 hrs,	Volume=	0.129 af,	Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs

Reach DP-3: DP-3 (STEWART'S CREEK)



Summary for Pond P-A: POND A

Inflow Area = 2.388 ac, 24.53% Impervious, Inflow Depth > 1.30" for 25 YR event
Inflow = 1.90 cfs @ 12.42 hrs, Volume= 0.260 af
Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Atten= 100%, Lag= 0.0 min
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Peak Elev= 24.98' @ 24.00 hrs Surf.Area= 22,559 sf Storage= 11,310 cf

Plug-Flow detention time= (not calculated: initial storage exceeds outflow)
Center-of-Mass det. time= (not calculated: no outflow)

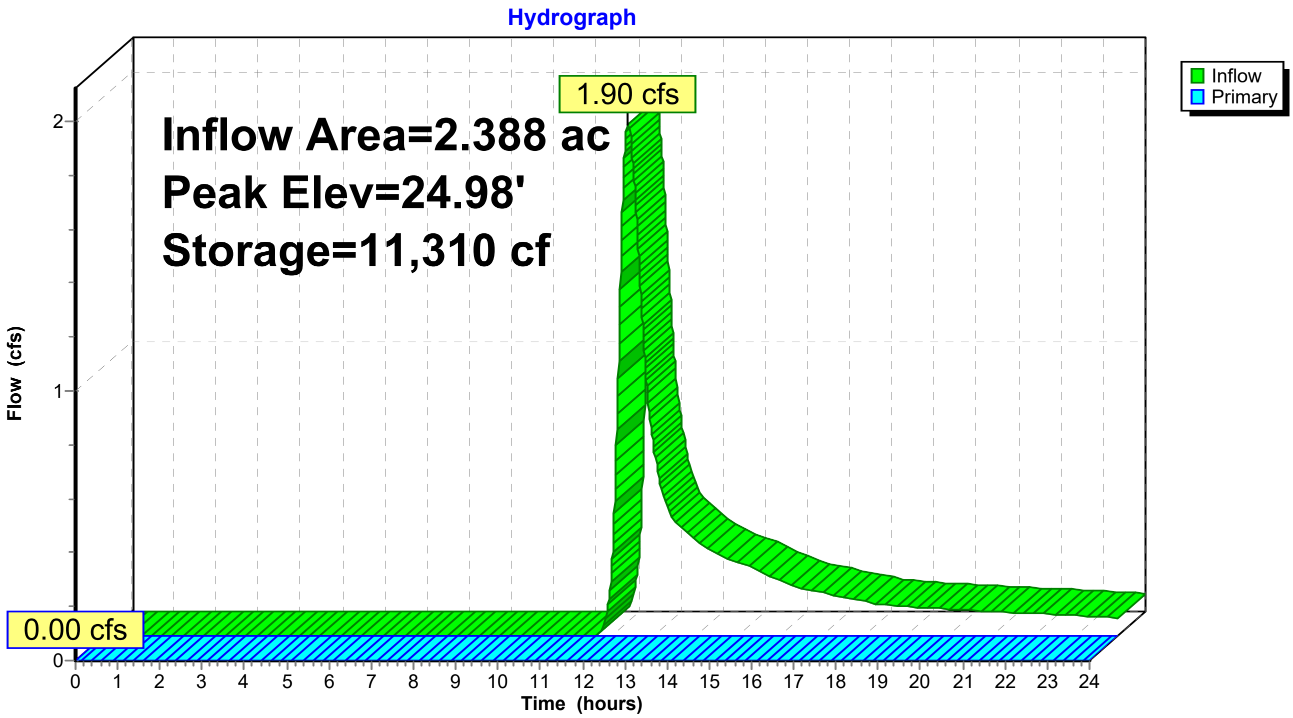
Volume	Invert	Avail.Storage	Storage Description
#1	24.45'	37,030 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
24.45	20,405	0	0
25.70	25,518	28,702	28,702
26.00	30,000	8,328	37,030

Device	Routing	Invert	Outlet Devices
#1	Primary	25.10'	**45.0 deg x 30.0' long x 0.50' rise Sharp-Crested Vee/Trap Weir** Cv= 2.56 (C= 3.20)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=24.45' (Free Discharge)
└─**1=Sharp-Crested Vee/Trap Weir** (Controls 0.00 cfs)

Pond P-A: POND A



Summary for Pond P-B: POND B

Inflow Area = 1.784 ac, 13.22% Impervious, Inflow Depth > 0.83" for 25 YR event
Inflow = 1.05 cfs @ 12.14 hrs, Volume= 0.123 af
Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Atten= 100%, Lag= 0.0 min
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Peak Elev= 3.19' @ 24.00 hrs Surf.Area= 11,220 sf Storage= 5,356 cf

Plug-Flow detention time= (not calculated: initial storage exceeds outflow)
Center-of-Mass det. time= (not calculated: no outflow)

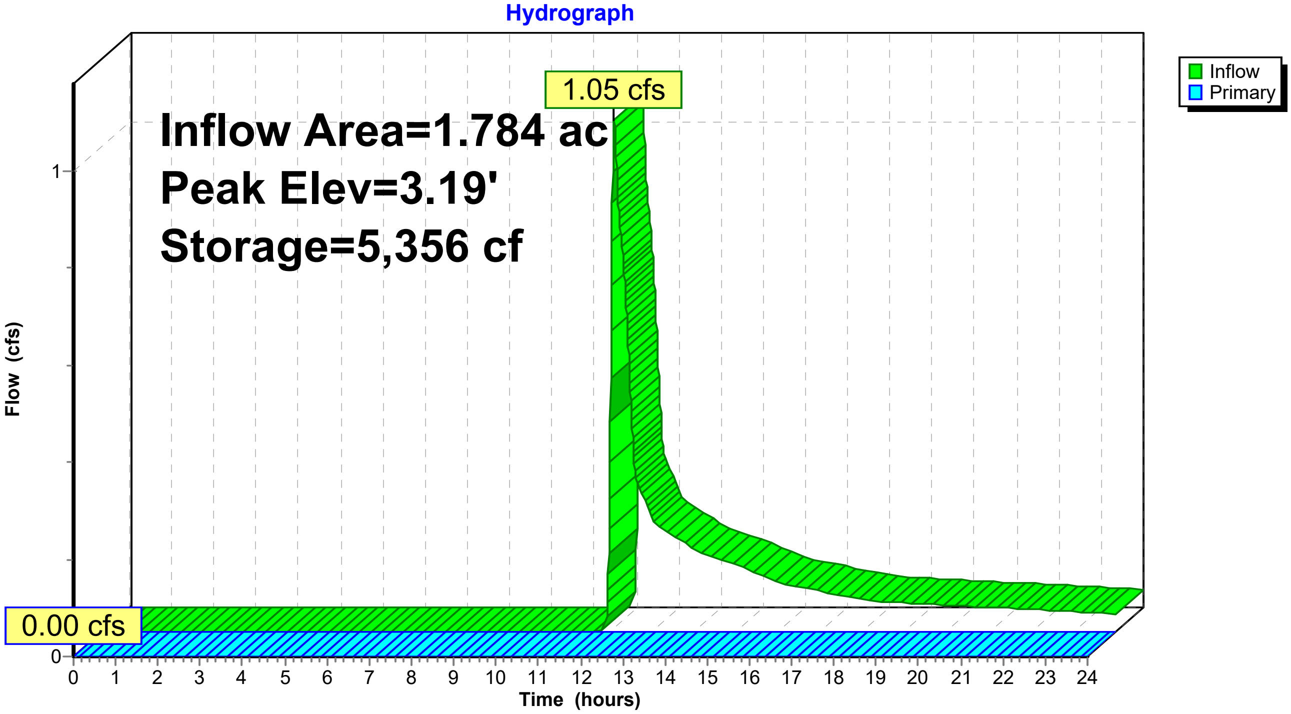
Volume	Invert	Avail.Storage	Storage Description
#1	2.70'	15,021 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
2.70	10,273	0	0
3.00	11,080	3,203	3,203
3.40	11,370	4,490	7,693
4.00	13,058	7,328	15,021

Device	Routing	Invert	Outlet Devices
#1	Primary	3.44'	**45.0 deg x 15.0' long x 0.50' rise Sharp-Crested Vee/Trap Weir** Cv= 2.56 (C= 3.20)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=2.70' (Free Discharge)
└─**1=Sharp-Crested Vee/Trap Weir** (Controls 0.00 cfs)

Pond P-B: POND B



Summary for Pond P-C: POND C

Inflow Area = 3.086 ac, 15.48% Impervious, Inflow Depth > 0.83" for 25 YR event
Inflow = 1.76 cfs @ 12.15 hrs, Volume= 0.213 af
Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Atten= 100%, Lag= 0.0 min
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Peak Elev= 4.02' @ 24.00 hrs Surf.Area= 23,592 sf Storage= 9,261 cf

Plug-Flow detention time= (not calculated: initial storage exceeds outflow)
Center-of-Mass det. time= (not calculated: no outflow)

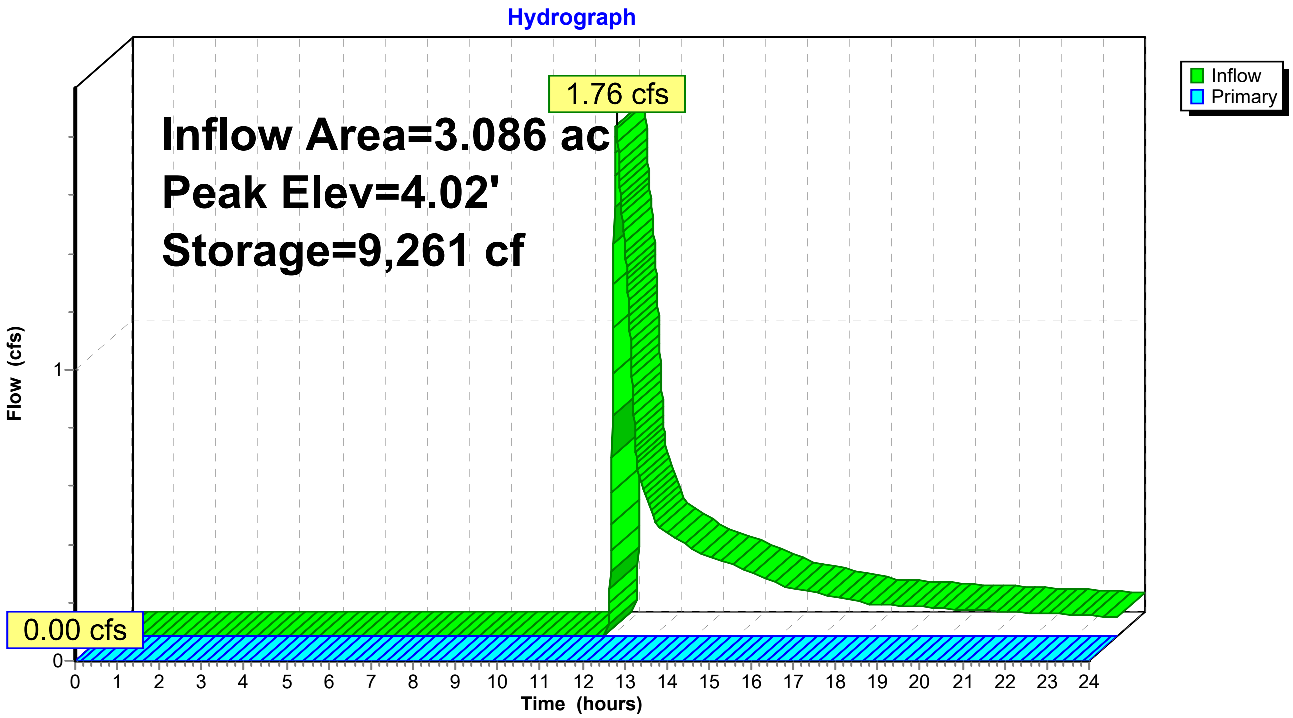
Volume	Invert	Avail.Storage	Storage Description
#1	3.60'	35,172 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
3.60	20,812	0	0
4.00	23,497	8,862	8,862
5.00	29,124	26,311	35,172

Device	Routing	Invert	Outlet Devices
#1	Primary	4.29'	**45.0 deg x 15.0' long x 0.50' rise Sharp-Crested Vee/Trap Weir** Cv= 2.56 (C= 3.20)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=3.60' (Free Discharge)
└─**1=Sharp-Crested Vee/Trap Weir** (Controls 0.00 cfs)

Pond P-C: POND C



Summary for Pond P-D: POND D

Inflow Area = 2.447 ac, 8.42% Impervious, Inflow Depth > 0.70" for 25 YR event
Inflow = 0.86 cfs @ 12.35 hrs, Volume= 0.143 af
Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Atten= 100%, Lag= 0.0 min
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Peak Elev= 8.76' @ 24.00 hrs Surf.Area= 8,648 sf Storage= 6,209 cf

Plug-Flow detention time= (not calculated: initial storage exceeds outflow)
Center-of-Mass det. time= (not calculated: no outflow)

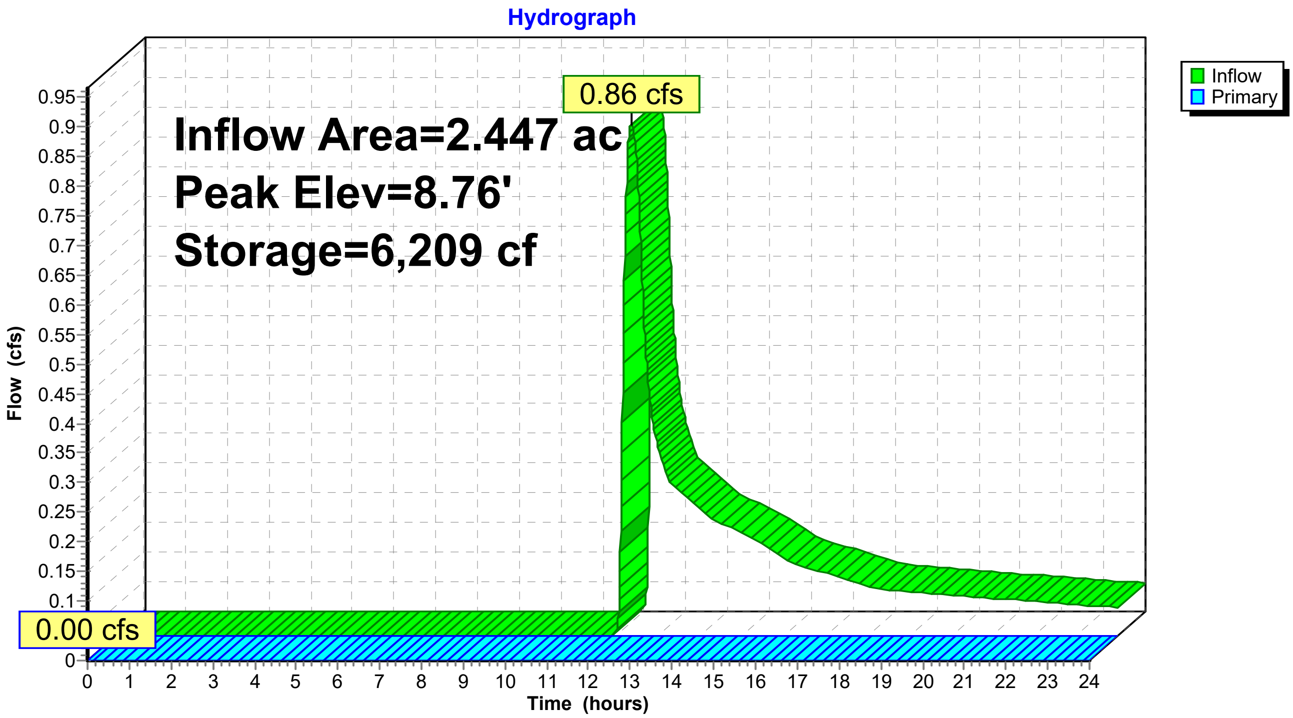
Volume	Invert	Avail.Storage	Storage Description
#1	8.00'	18,853 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
8.00	7,585	0	0
9.00	8,975	8,280	8,280
10.00	12,170	10,573	18,853

Device	Routing	Invert	Outlet Devices
#1	Primary	9.80'	**45.0 deg x 15.0' long x 0.50' rise Sharp-Crested Vee/Trap Weir** Cv= 2.56 (C= 3.20)
#2	Primary	9.08'	**12.0" Round Culvert** L= 18.5' CMP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 9.08' / 8.16' S= 0.0497 '/' Cc= 0.900 n= 0.013 Clay tile, Flow Area= 0.79 sf

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=8.00' (Free Discharge)
├─**1=Sharp-Crested Vee/Trap Weir** (Controls 0.00 cfs)
└─**2=Culvert** (Controls 0.00 cfs)

Pond P-D: POND D



Time span=0.00-24.00 hrs, dt=0.01 hrs, 2401 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment E1: EX DA-1 Runoff Area=155,629 sf 50.78% Impervious Runoff Depth>3.85"
Flow Length=435' Tc=9.6 min CN=69 Runoff=14.26 cfs 1.145 af

Subcatchment E10: EX DA-10 Runoff Area=248,320 sf 0.00% Impervious Runoff Depth>0.68"
Flow Length=490' Tc=16.5 min CN=36 Runoff=1.63 cfs 0.324 af

Subcatchment E2: EX-DA-2 Runoff Area=351,546 sf 0.00% Impervious Runoff Depth>0.61"
Flow Length=682' Tc=14.4 min CN=35 Runoff=1.95 cfs 0.410 af

Subcatchment E3: EX DA-3 Runoff Area=77,711 sf 13.22% Impervious Runoff Depth>1.52"
Flow Length=400' Tc=7.0 min CN=46 Runoff=2.51 cfs 0.226 af

Subcatchment E4: EX DA-4 Runoff Area=134,422 sf 15.48% Impervious Runoff Depth>1.52"
Flow Length=341' Tc=7.8 min CN=46 Runoff=4.22 cfs 0.391 af

Subcatchment E5: EX DA-5 Runoff Area=171,335 sf 0.00% Impervious Runoff Depth>0.68"
Flow Length=433' Tc=11.9 min CN=36 Runoff=1.19 cfs 0.224 af

Subcatchment E6: EX DA-6 Runoff Area=104,016 sf 24.53% Impervious Runoff Depth>2.17"
Flow Length=283' Tc=25.5 min CN=53 Runoff=3.45 cfs 0.433 af

Subcatchment E7: EX-DA 7 Runoff Area=61,684 sf 1.97% Impervious Runoff Depth>0.84"
Flow Length=300' Tc=5.9 min CN=38 Runoff=0.70 cfs 0.099 af

Subcatchment E8: EX-DA 8 Runoff Area=29,230 sf 15.19% Impervious Runoff Depth>1.61"
Flow Length=200' Tc=8.5 min CN=47 Runoff=0.97 cfs 0.090 af

Subcatchment E9: EX DA-9 Runoff Area=106,591 sf 8.42% Impervious Runoff Depth>1.34"
Flow Length=675' Tc=15.0 min CN=44 Runoff=2.21 cfs 0.273 af

Reach DP-1: DP-1 Inflow=14.26 cfs 1.145 af
Outflow=14.26 cfs 1.145 af

Reach DP-2: DP-2 (JOSHUA'S BROOK) Inflow=1.95 cfs 0.446 af
Outflow=1.95 cfs 0.446 af

Reach DP-3: DP-3 (STEWART'S CREEK) Inflow=1.63 cfs 0.476 af
Outflow=1.63 cfs 0.476 af

Pond P-A: POND A Peak Elev=25.12' Storage=14,540 cf Inflow=3.45 cfs 0.433 af
Outflow=0.23 cfs 0.104 af

Pond P-B: POND B Peak Elev=3.46' Storage=8,323 cf Inflow=2.51 cfs 0.226 af
Outflow=0.09 cfs 0.036 af

Pond P-C: POND C Peak Elev=4.31' Storage=16,319 cf Inflow=4.22 cfs 0.391 af
Outflow=0.11 cfs 0.017 af

Pond P-D: POND D Peak Elev=9.24' Storage=10,487 cf Inflow=2.21 cfs 0.273 af
Outflow=0.08 cfs 0.032 af

Total Runoff Area = 33.069 ac Runoff Volume = 3.614 af Average Runoff Depth = 1.31"
89.57% Pervious = 29.619 ac 10.43% Impervious = 3.450 ac

Summary for Subcatchment E1: EX DA-1

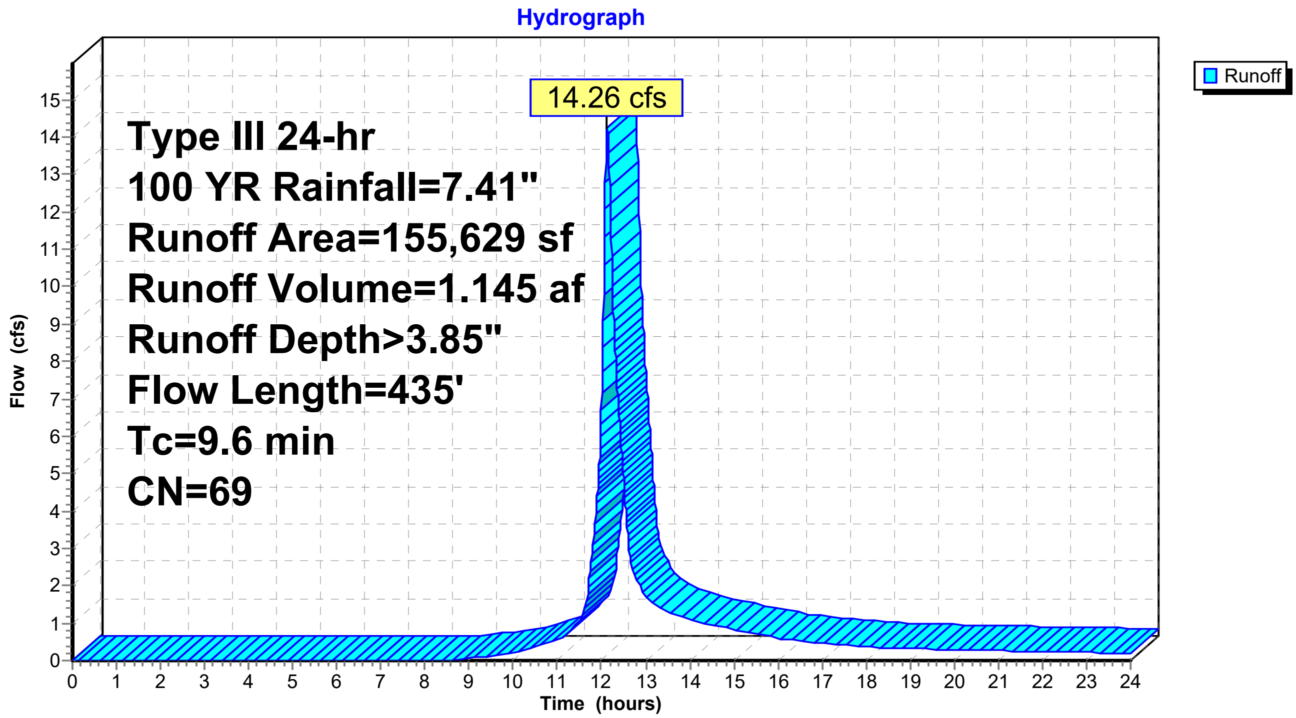
Runoff = 14.26 cfs @ 12.14 hrs, Volume= 1.145 af, Depth> 3.85"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 100 YR Rainfall=7.41"

	Area (sf)	CN	Description
	70,869	39	>75% Grass cover, Good, HSG A
	5,725	30	Woods, Good, HSG A
*	7,041	98	Wetland; Water Surface
	71,994	98	Paved parking, HSG A
	155,629	69	Weighted Average
	76,594		49.22% Pervious Area
	79,035		50.78% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.8	50	0.0270	0.17		**Sheet Flow, A-B** Grass: Short n= 0.150 P2= 3.40"
2.4	90	0.0077	0.61		**Shallow Concentrated Flow, B-C** Short Grass Pasture Kv= 7.0 fps
1.9	192	0.0550	1.64		**Shallow Concentrated Flow, C-D** Short Grass Pasture Kv= 7.0 fps
0.4	83	0.0260	3.27		**Shallow Concentrated Flow, D-E** Paved Kv= 20.3 fps
0.1	20	0.2000	3.13		**Shallow Concentrated Flow, E-F** Short Grass Pasture Kv= 7.0 fps
9.6	435	Total			

Subcatchment E1: EX DA-1



Summary for Subcatchment E10: EX DA-10

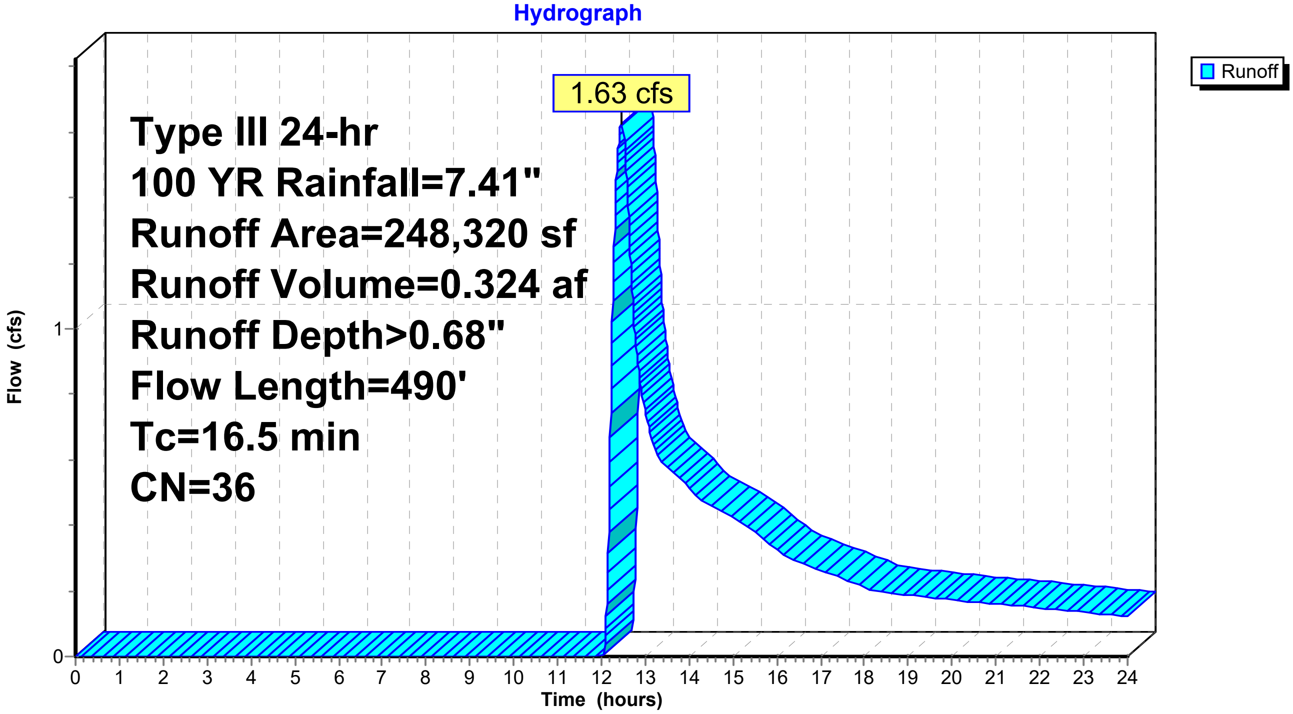
Runoff = 1.63 cfs @ 12.45 hrs, Volume= 0.324 af, Depth> 0.68"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 100 YR Rainfall=7.41"

	Area (sf)	CN	Description
	166,992	39	>75% Grass cover, Good, HSG A
	81,328	30	Woods, Good, HSG A
*	0	98	Wetland; Water Surface
	0	98	Paved parking, HSG A
	248,320	36	Weighted Average
	248,320		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.1	50	0.0400	0.09		**Sheet Flow, A-B** Woods: Light underbrush n= 0.400 P2= 3.40"
3.1	70	0.0057	0.38		**Shallow Concentrated Flow, B-C** Woodland Kv= 5.0 fps
1.5	150	0.0580	1.69		**Shallow Concentrated Flow, C-D** Short Grass Pasture Kv= 7.0 fps
1.6	70	0.0110	0.73		**Shallow Concentrated Flow, D-E** Short Grass Pasture Kv= 7.0 fps
1.1	125	0.0680	1.83		**Shallow Concentrated Flow, E-F** Short Grass Pasture Kv= 7.0 fps
0.1	25	0.3000	3.83		**Shallow Concentrated Flow, F-G** Short Grass Pasture Kv= 7.0 fps
16.5	490	Total			

Subcatchment E10: EX DA-10



Summary for Subcatchment E2: EX-DA-2

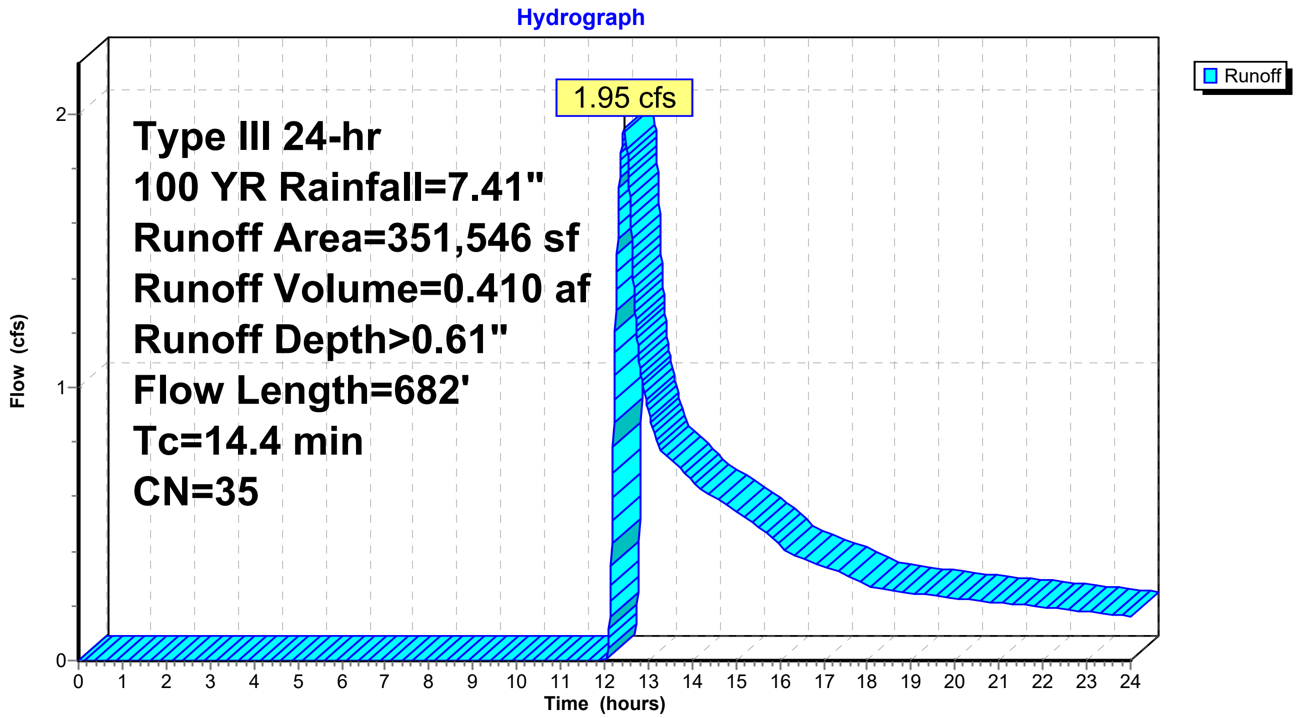
Runoff = 1.95 cfs @ 12.46 hrs, Volume= 0.410 af, Depth> 0.61"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 100 YR Rainfall=7.41"

	Area (sf)	CN	Description
	195,277	39	>75% Grass cover, Good, HSG A
	156,269	30	Woods, Good, HSG A
*	0	98	Wetland; Water Surface
	0	98	Paved parking, HSG A
	351,546	35	Weighted Average
	351,546		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.1	50	0.0800	0.27		**Sheet Flow, A-B** Grass: Short n= 0.150 P2= 3.40"
10.1	520	0.0150	0.86		**Shallow Concentrated Flow, B-C** Short Grass Pasture Kv= 7.0 fps
0.5	40	0.0825	1.44		**Shallow Concentrated Flow, C-D** Woodland Kv= 5.0 fps
0.5	40	0.0425	1.44		**Shallow Concentrated Flow, D-E** Short Grass Pasture Kv= 7.0 fps
0.2	32	0.3900	3.12		**Shallow Concentrated Flow, E-F** Woodland Kv= 5.0 fps
14.4	682	Total			

Subcatchment E2: EX-DA-2



Summary for Subcatchment E3: EX DA-3

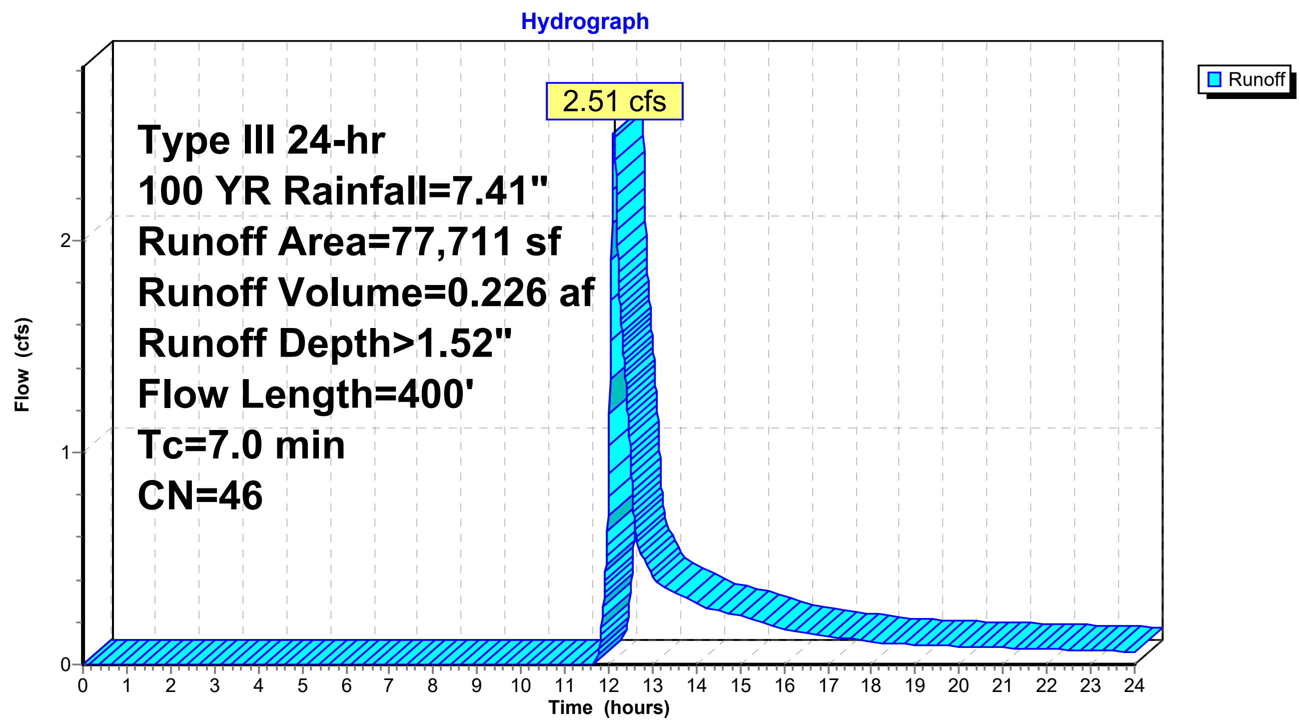
Runoff = 2.51 cfs @ 12.12 hrs, Volume= 0.226 af, Depth> 1.52"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 100 YR Rainfall=7.41"

	Area (sf)	CN	Description
	60,103	39	>75% Grass cover, Good, HSG A
	7,335	30	Woods, Good, HSG A
*	10,273	98	Wetland; Water Surface
	0	98	Paved parking, HSG A
	77,711	46	Weighted Average
	67,438		86.78% Pervious Area
	10,273		13.22% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.1	50	0.0800	0.27		**Sheet Flow, A-B** Grass: Short n= 0.150 P2= 3.40"
3.7	320	0.0430	1.45		**Shallow Concentrated Flow, B-C** Short Grass Pasture Kv= 7.0 fps
0.2	30	0.1000	2.21		**Shallow Concentrated Flow, C-D** Short Grass Pasture Kv= 7.0 fps
7.0	400	Total			

Subcatchment E3: EX DA-3



Summary for Subcatchment E4: EX DA-4

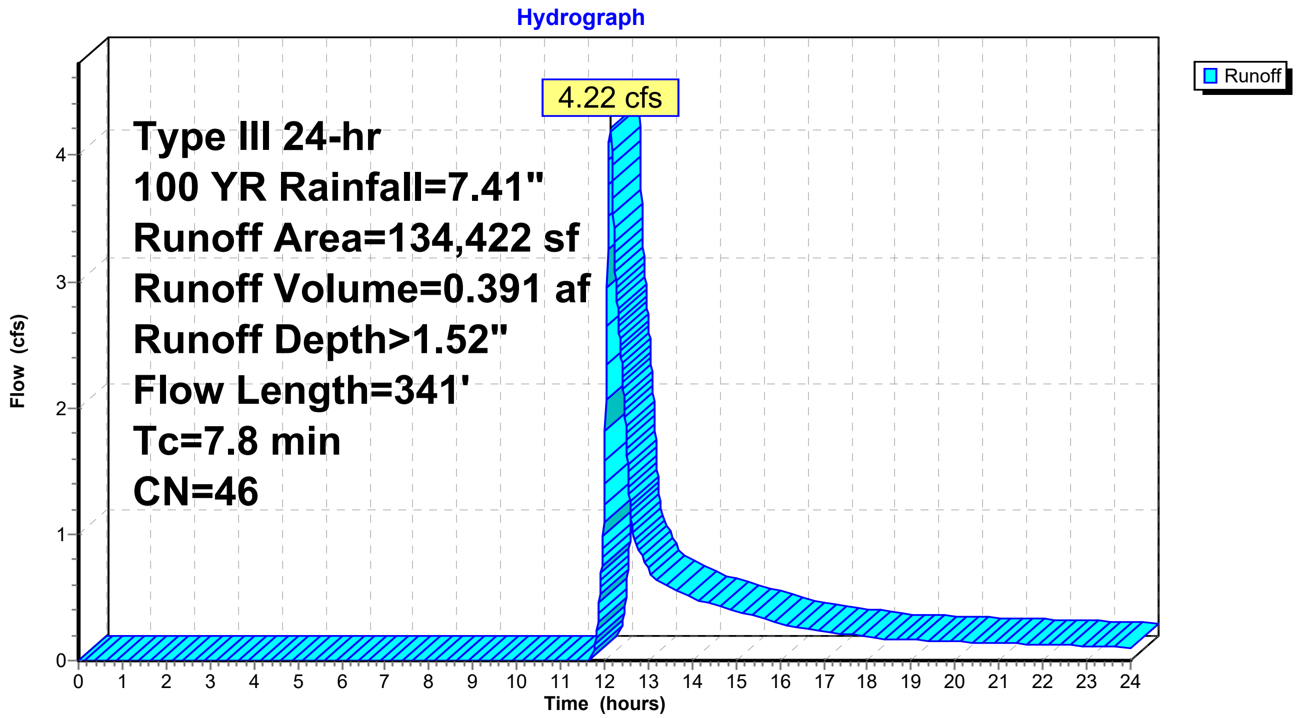
Runoff = 4.22 cfs @ 12.13 hrs, Volume= 0.391 af, Depth> 1.52"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 100 YR Rainfall=7.41"

	Area (sf)	CN	Description
	77,263	39	>75% Grass cover, Good, HSG A
	36,347	30	Woods, Good, HSG A
*	20,812	98	Wetland; Water Surface
	0	98	Paved parking, HSG A
	134,422	46	Weighted Average
	113,610		84.52% Pervious Area
	20,812		15.48% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.9	35	0.1300	0.30		**Sheet Flow, A-B** Grass: Short n= 0.150 P2= 3.40"
5.2	200	0.0165	0.64		**Shallow Concentrated Flow, B-C** Woodland Kv= 5.0 fps
0.4	63	0.1550	2.76		**Shallow Concentrated Flow, C-D** Short Grass Pasture Kv= 7.0 fps
0.3	43	0.1160	2.38		**Shallow Concentrated Flow, D-E** Short Grass Pasture Kv= 7.0 fps
7.8	341	Total			

Subcatchment E4: EX DA-4



Summary for Subcatchment E5: EX DA-5

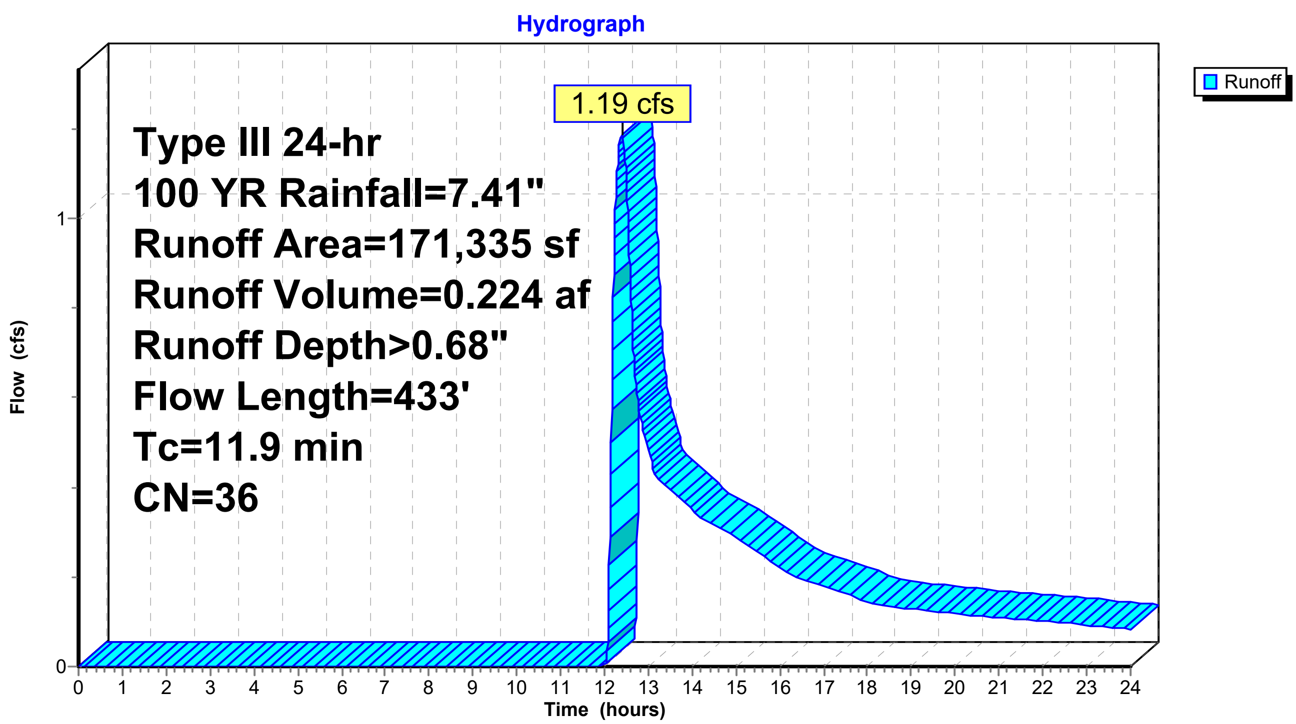
Runoff = 1.19 cfs @ 12.39 hrs, Volume= 0.224 af, Depth> 0.68"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 100 YR Rainfall=7.41"

	Area (sf)	CN	Description
	109,518	39	>75% Grass cover, Good, HSG A
	61,817	30	Woods, Good, HSG A
*	0	98	Wetland; Water Surface
	0	98	Paved parking, HSG A
	171,335	36	Weighted Average
	171,335		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.9	50	0.1000	0.29		**Sheet Flow, A-B** Grass: Short n= 0.150 P2= 3.40"
1.0	105	0.0620	1.74		**Shallow Concentrated Flow, B-C** Short Grass Pasture Kv= 7.0 fps
1.2	75	0.0460	1.07		**Shallow Concentrated Flow, C-D** Woodland Kv= 5.0 fps
6.8	203	0.0050	0.49		**Shallow Concentrated Flow, D-E** Short Grass Pasture Kv= 7.0 fps
11.9	433	Total			

Subcatchment E5: EX DA-5



Summary for Subcatchment E6: EX DA-6

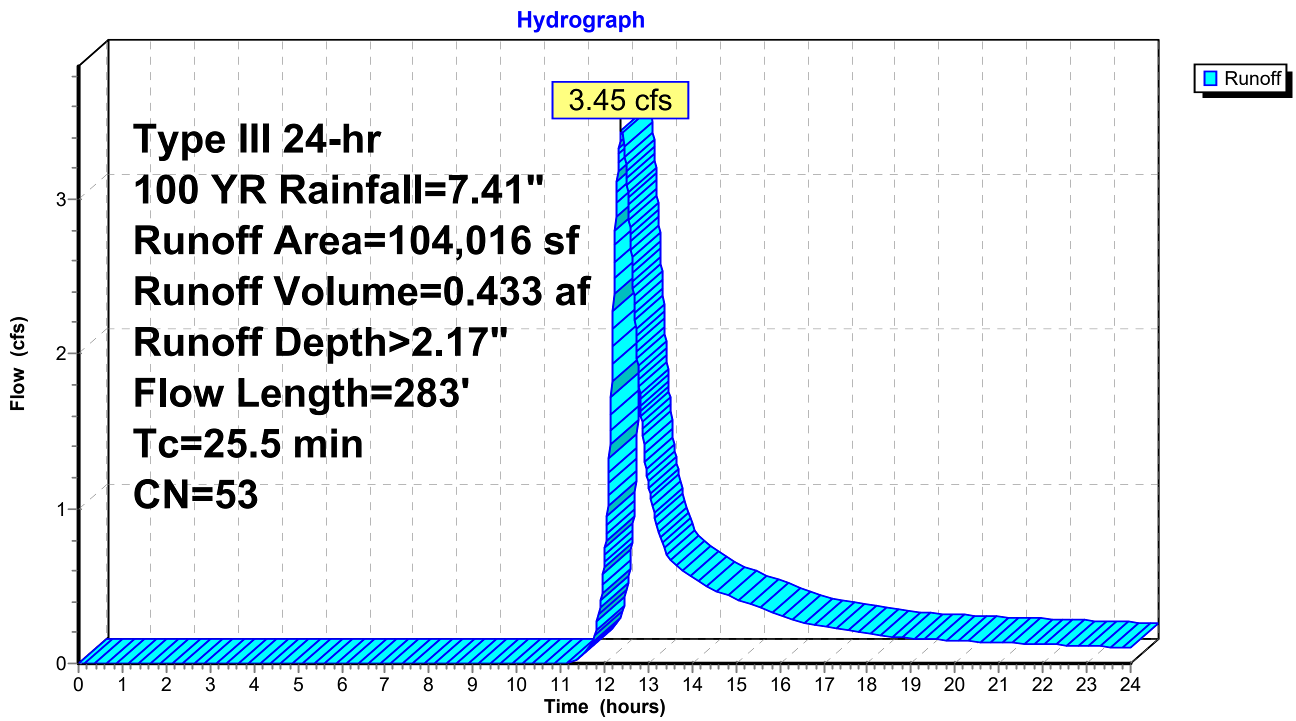
Runoff = 3.45 cfs @ 12.39 hrs, Volume= 0.433 af, Depth> 2.17"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 100 YR Rainfall=7.41"

	Area (sf)	CN	Description
	71,752	39	>75% Grass cover, Good, HSG A
	6,746	30	Woods, Good, HSG A
*	25,518	98	Wetland; Water Surface
	0	98	Paved parking, HSG A
	104,016	53	Weighted Average
	78,498		75.47% Pervious Area
	25,518		24.53% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.9	50	0.1000	0.29		**Sheet Flow, A-B** Grass: Short n= 0.150 P2= 3.40"
22.6	233	0.0006	0.17		**Shallow Concentrated Flow, B-C** Short Grass Pasture Kv= 7.0 fps
25.5	283	Total			

Subcatchment E6: EX DA-6



Summary for Subcatchment E7: EX-DA 7

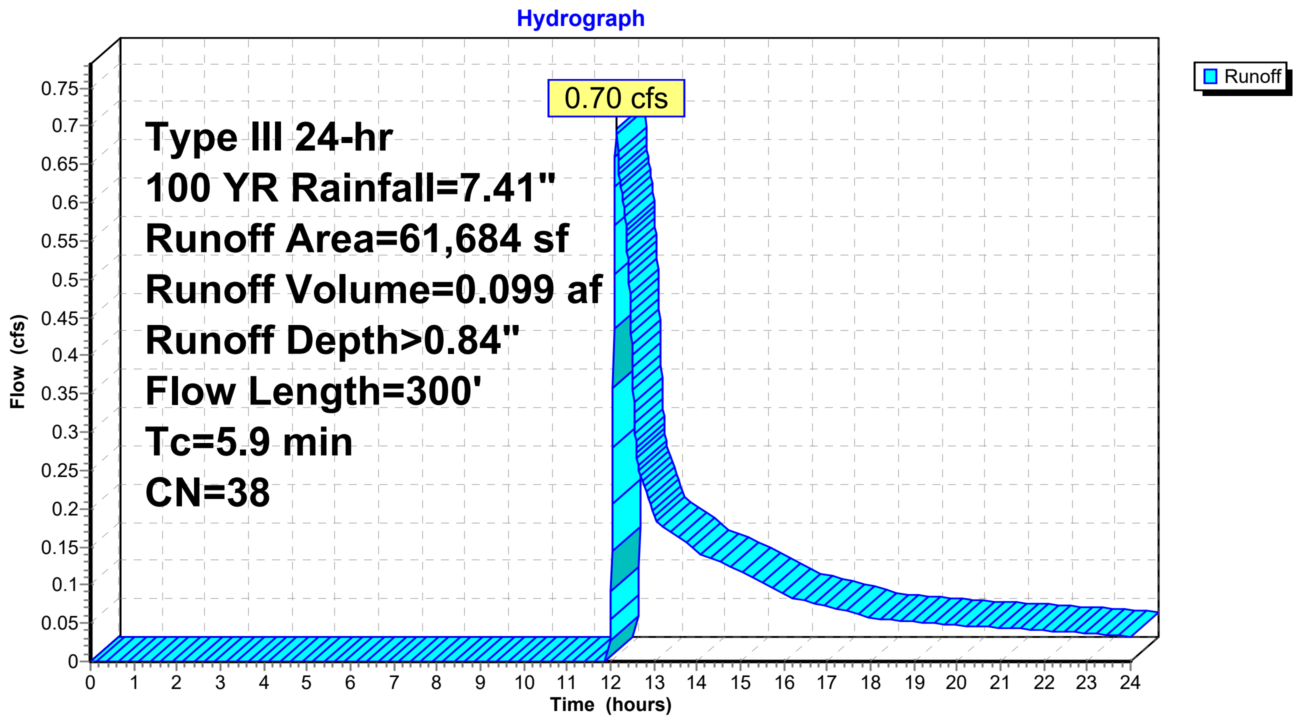
Runoff = 0.70 cfs @ 12.14 hrs, Volume= 0.099 af, Depth> 0.84"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 100 YR Rainfall=7.41"

	Area (sf)	CN	Description
	47,876	39	>75% Grass cover, Good, HSG A
*	12,590	30	Woods, Good, HSG A & Sand Area
	1,218	98	Water Surface, HSG A
	61,684	38	Weighted Average
	60,466		98.03% Pervious Area
	1,218		1.97% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.8	50	0.0280	0.17		**Sheet Flow, A-B** Grass: Short n= 0.150 P2= 3.40"
0.5	100	0.0460	3.45		**Shallow Concentrated Flow, B-C** Unpaved Kv= 16.1 fps
0.6	150	0.0750	4.41		**Shallow Concentrated Flow, C-D** Unpaved Kv= 16.1 fps
5.9	300	Total			

Subcatchment E7: EX-DA 7



Summary for Subcatchment E8: EX-DA 8

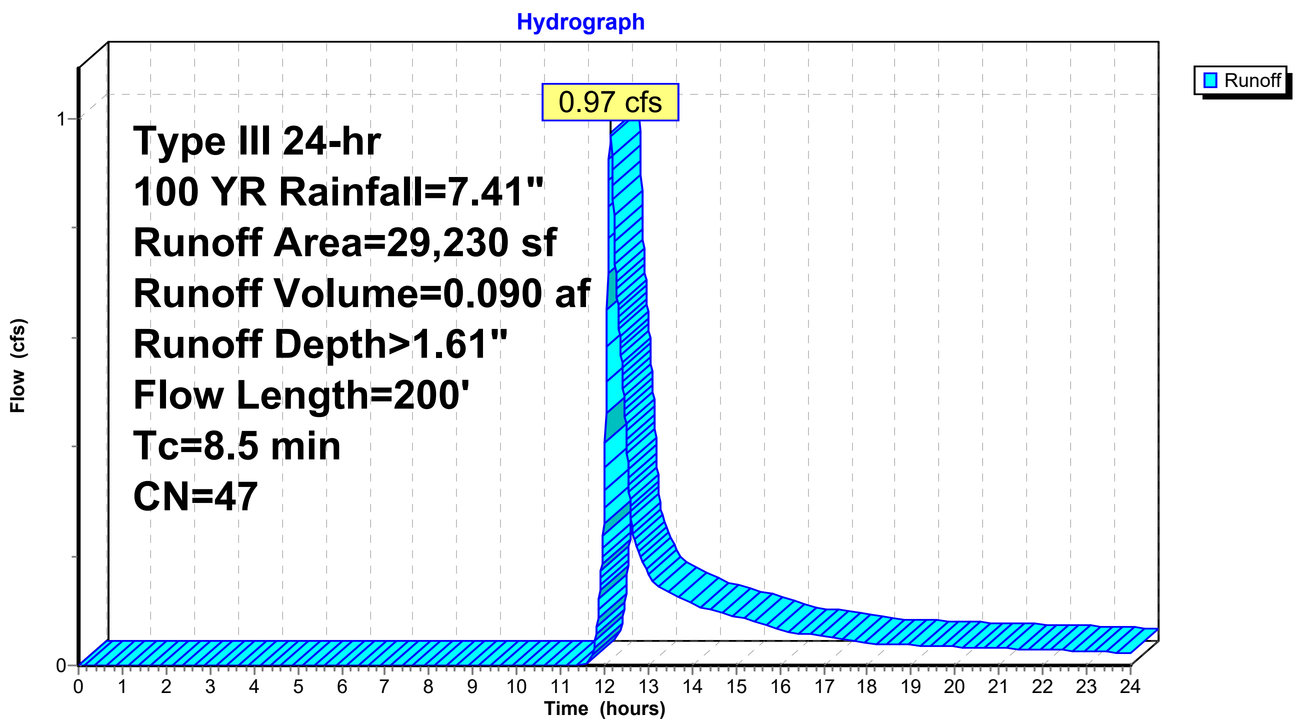
Runoff = 0.97 cfs @ 12.14 hrs, Volume= 0.090 af, Depth> 1.61"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 100 YR Rainfall=7.41"

	Area (sf)	CN	Description
	21,837	39	>75% Grass cover, Good, HSG A
*	2,953	30	Woods, Good, HSG A & Sand Area
	4,440	98	Water Surface, HSG A
	29,230	47	Weighted Average
	24,790		84.81% Pervious Area
	4,440		15.19% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.9	50	0.0800	0.12		**Sheet Flow, A-B** Woods: Light underbrush n= 0.400 P2= 3.40"
1.6	150	0.0530	1.61		**Shallow Concentrated Flow, B-C** Short Grass Pasture Kv= 7.0 fps
8.5	200	Total			

Subcatchment E8: EX-DA 8



Summary for Subcatchment E9: EX DA-9

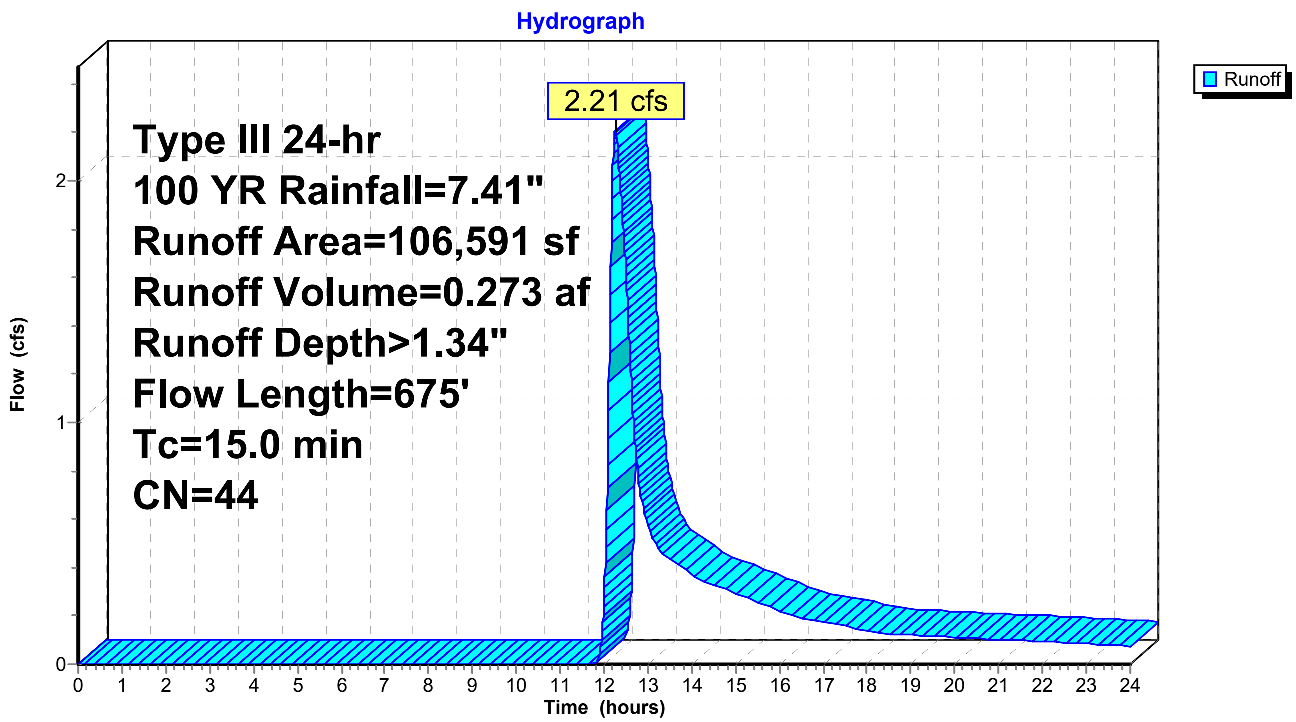
Runoff = 2.21 cfs @ 12.25 hrs, Volume= 0.273 af, Depth> 1.34"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 100 YR Rainfall=7.41"

	Area (sf)	CN	Description
	94,116	39	>75% Grass cover, Good, HSG A
	3,500	30	Woods, Good, HSG A
*	8,975	98	Wetland; Water Surface
	0	98	Paved parking, HSG A
	106,591	44	Weighted Average
	97,616		91.58% Pervious Area
	8,975		8.42% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.9	50	0.0260	0.17		**Sheet Flow, A-B** Grass: Short n= 0.150 P2= 3.40"
8.8	495	0.0180	0.94		**Shallow Concentrated Flow, B-C** Short Grass Pasture Kv= 7.0 fps
1.3	130	0.0540	1.63		**Shallow Concentrated Flow, C-D** Short Grass Pasture Kv= 7.0 fps
15.0	675	Total			

Subcatchment E9: EX DA-9

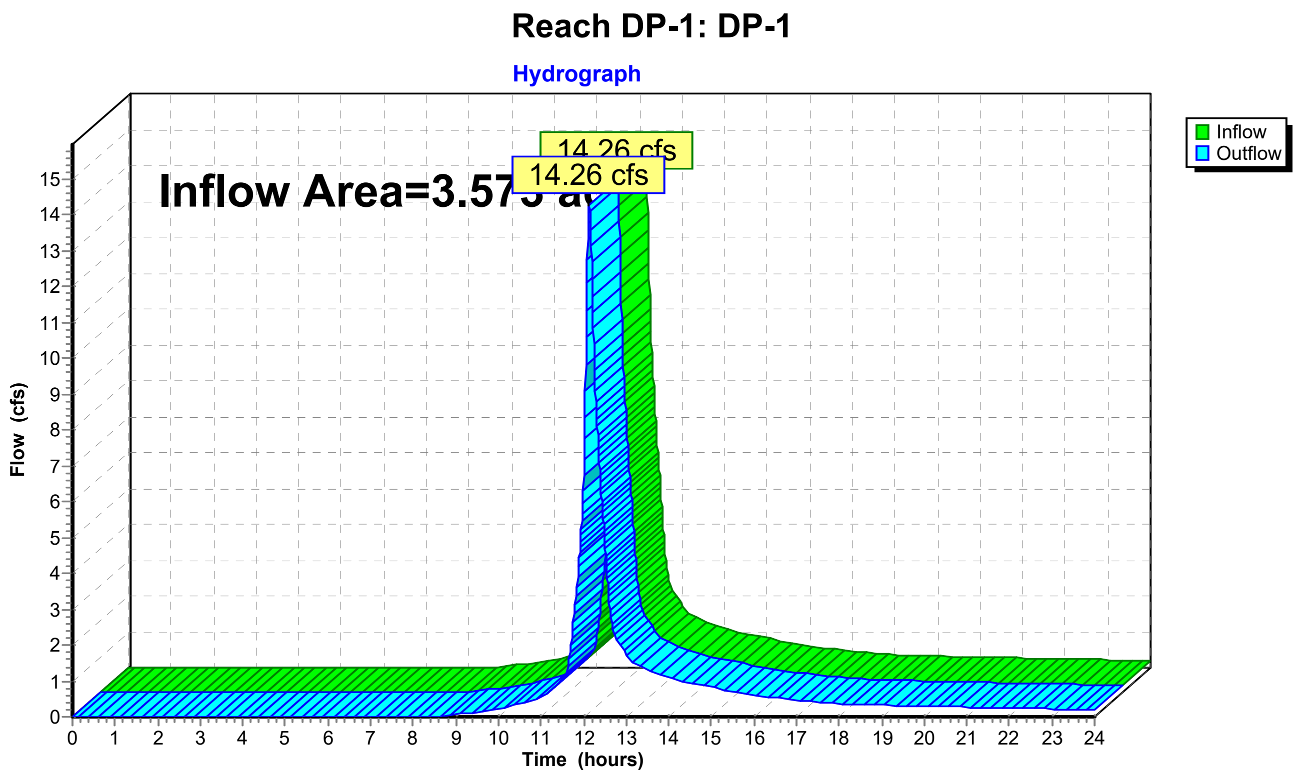


Summary for Reach DP-1: DP-1

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 3.573 ac, 50.78% Impervious, Inflow Depth > 3.85" for 100 YR event
Inflow = 14.26 cfs @ 12.14 hrs, Volume= 1.145 af
Outflow = 14.26 cfs @ 12.14 hrs, Volume= 1.145 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs



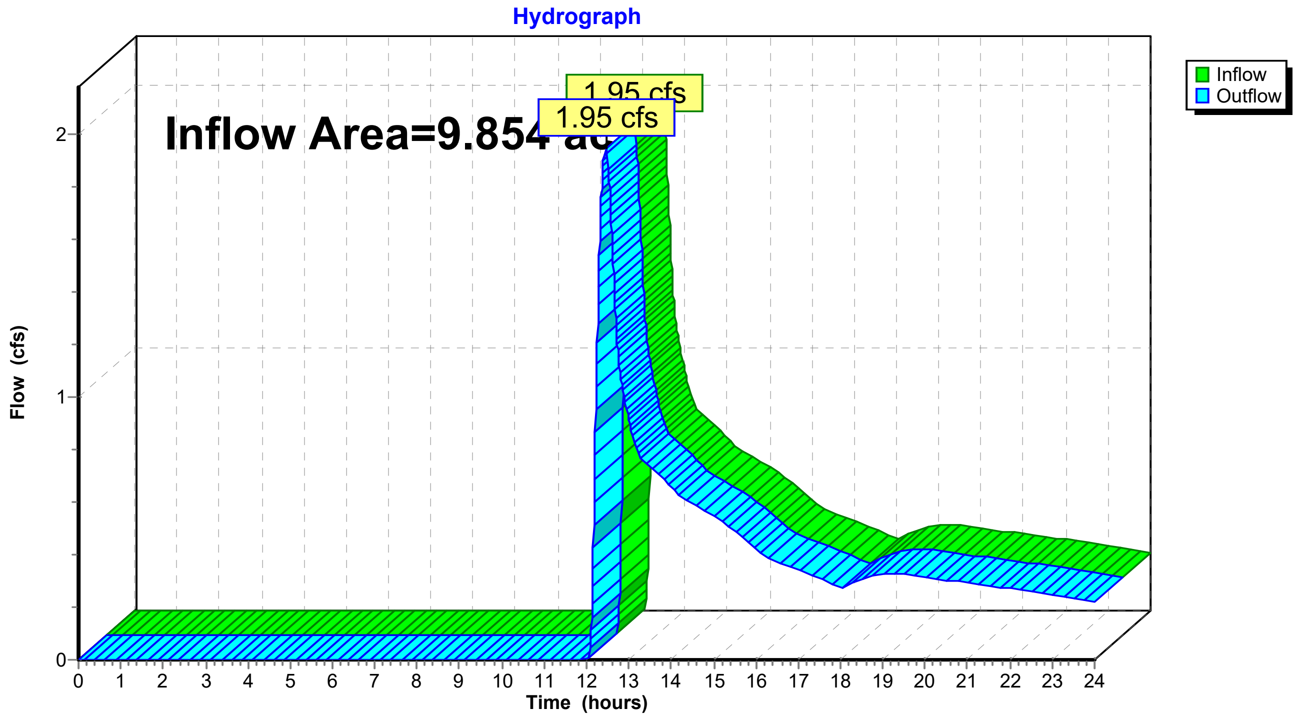
Summary for Reach DP-2: DP-2 (JOSHUA'S BROOK)

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 9.854 ac, 2.39% Impervious, Inflow Depth > 0.54" for 100 YR event
Inflow = 1.95 cfs @ 12.46 hrs, Volume= 0.446 af
Outflow = 1.95 cfs @ 12.46 hrs, Volume= 0.446 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs

Reach DP-2: DP-2 (JOSHUA'S BROOK)



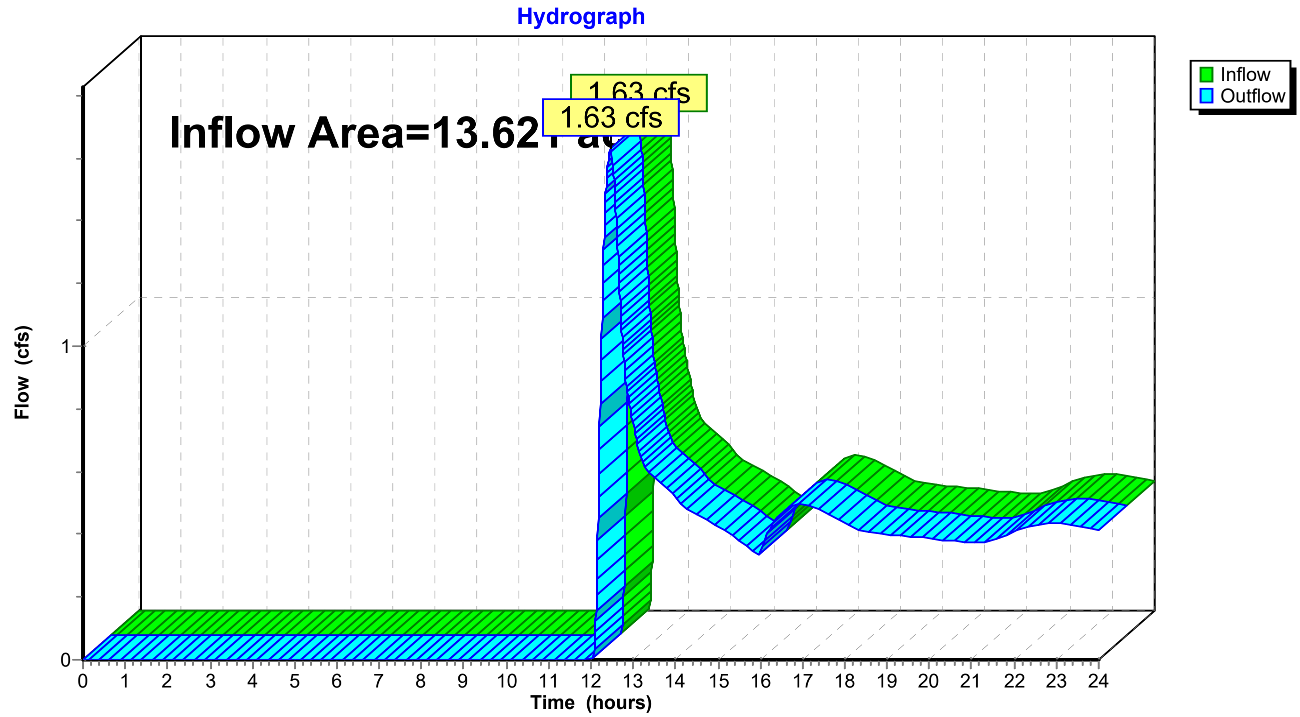
Summary for Reach DP-3: DP-3 (STEWART'S CREEK)

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 13.621 ac, 9.32% Impervious, Inflow Depth > 0.42" for 100 YR event
Inflow = 1.63 cfs @ 12.45 hrs, Volume= 0.476 af
Outflow = 1.63 cfs @ 12.45 hrs, Volume= 0.476 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs

Reach DP-3: DP-3 (STEWART'S CREEK)



Summary for Pond P-A: POND A

Inflow Area = 2.388 ac, 24.53% Impervious, Inflow Depth > 2.17" for 100 YR event
Inflow = 3.45 cfs @ 12.39 hrs, Volume= 0.433 af
Outflow = 0.23 cfs @ 17.11 hrs, Volume= 0.104 af, Atten= 93%, Lag= 283.6 min
Primary = 0.23 cfs @ 17.11 hrs, Volume= 0.104 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Peak Elev= 25.12' @ 17.11 hrs Surf.Area= 23,137 sf Storage= 14,540 cf

Plug-Flow detention time= 440.9 min calculated for 0.104 af (24% of inflow)
Center-of-Mass det. time= 294.2 min (1,175.8 - 881.7)

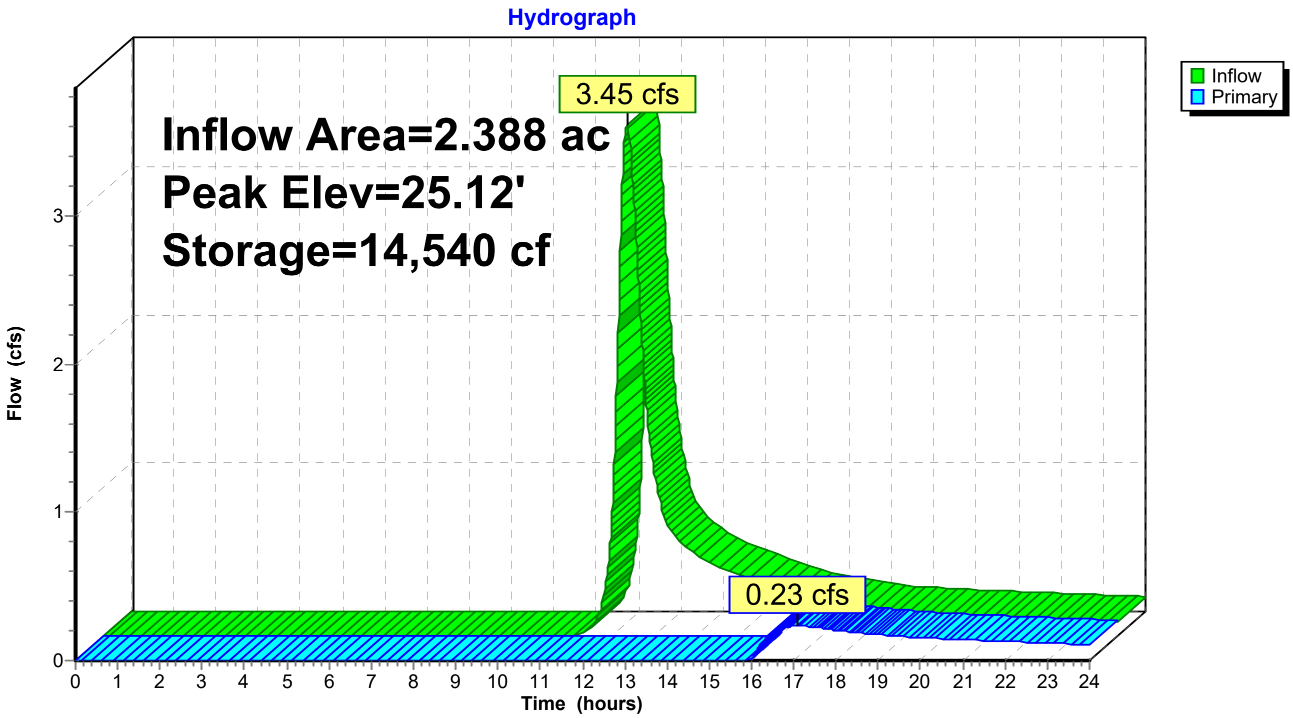
Volume	Invert	Avail.Storage	Storage Description
#1	24.45'	37,030 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
24.45	20,405	0	0
25.70	25,518	28,702	28,702
26.00	30,000	8,328	37,030

Device	Routing	Invert	Outlet Devices
#1	Primary	25.10'	**45.0 deg x 30.0' long x 0.50' rise Sharp-Crested Vee/Trap Weir** Cv= 2.56 (C= 3.20)

Primary OutFlow Max=0.23 cfs @ 17.11 hrs HW=25.12' (Free Discharge)
└─**1=Sharp-Crested Vee/Trap Weir** (Weir Controls 0.23 cfs @ 0.43 fps)

Pond P-A: POND A



Summary for Pond P-B: POND B

Inflow Area = 1.784 ac, 13.22% Impervious, Inflow Depth > 1.52" for 100 YR event
Inflow = 2.51 cfs @ 12.12 hrs, Volume= 0.226 af
Outflow = 0.09 cfs @ 19.59 hrs, Volume= 0.036 af, Atten= 96%, Lag= 448.1 min
Primary = 0.09 cfs @ 19.59 hrs, Volume= 0.036 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Peak Elev= 3.46' @ 19.59 hrs Surf.Area= 11,525 sf Storage= 8,323 cf

Plug-Flow detention time= 539.9 min calculated for 0.036 af (16% of inflow)
Center-of-Mass det. time= 374.6 min (1,263.9 - 889.3)

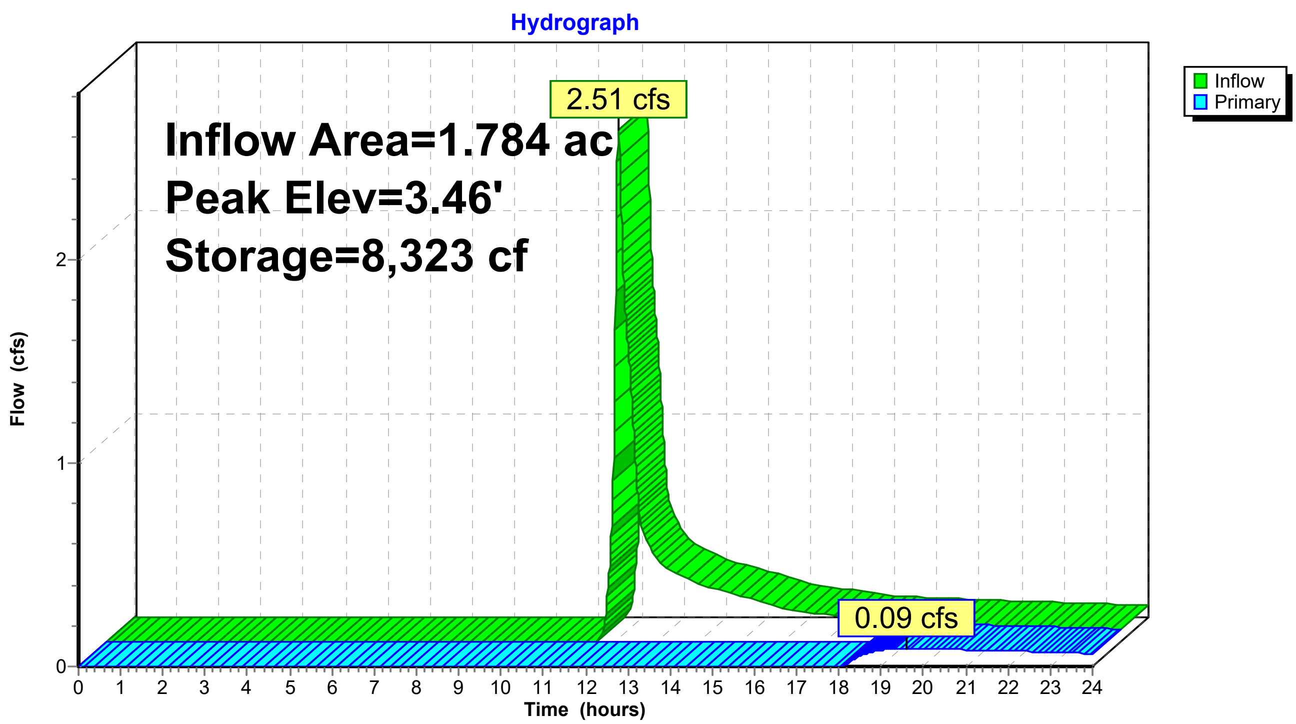
Volume	Invert	Avail.Storage	Storage Description
#1	2.70'	15,021 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
2.70	10,273	0	0
3.00	11,080	3,203	3,203
3.40	11,370	4,490	7,693
4.00	13,058	7,328	15,021

Device	Routing	Invert	Outlet Devices
#1	Primary	3.44'	**45.0 deg x 15.0' long x 0.50' rise Sharp-Crested Vee/Trap Weir** Cv= 2.56 (C= 3.20)

Primary OutFlow Max=0.09 cfs @ 19.59 hrs HW=3.46' (Free Discharge)
└─**1=Sharp-Crested Vee/Trap Weir** (Weir Controls 0.09 cfs @ 0.39 fps)

Pond P-B: POND B



Summary for Pond P-C: POND C

Inflow Area = 3.086 ac, 15.48% Impervious, Inflow Depth > 1.52" for 100 YR event
Inflow = 4.22 cfs @ 12.13 hrs, Volume= 0.391 af
Outflow = 0.11 cfs @ 23.71 hrs, Volume= 0.017 af, Atten= 98%, Lag= 694.5 min
Primary = 0.11 cfs @ 23.71 hrs, Volume= 0.017 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Peak Elev= 4.31' @ 23.71 hrs Surf.Area= 25,220 sf Storage= 16,319 cf

Plug-Flow detention time= 661.4 min calculated for 0.017 af (4% of inflow)
Center-of-Mass det. time= 489.1 min (1,379.0 - 889.9)

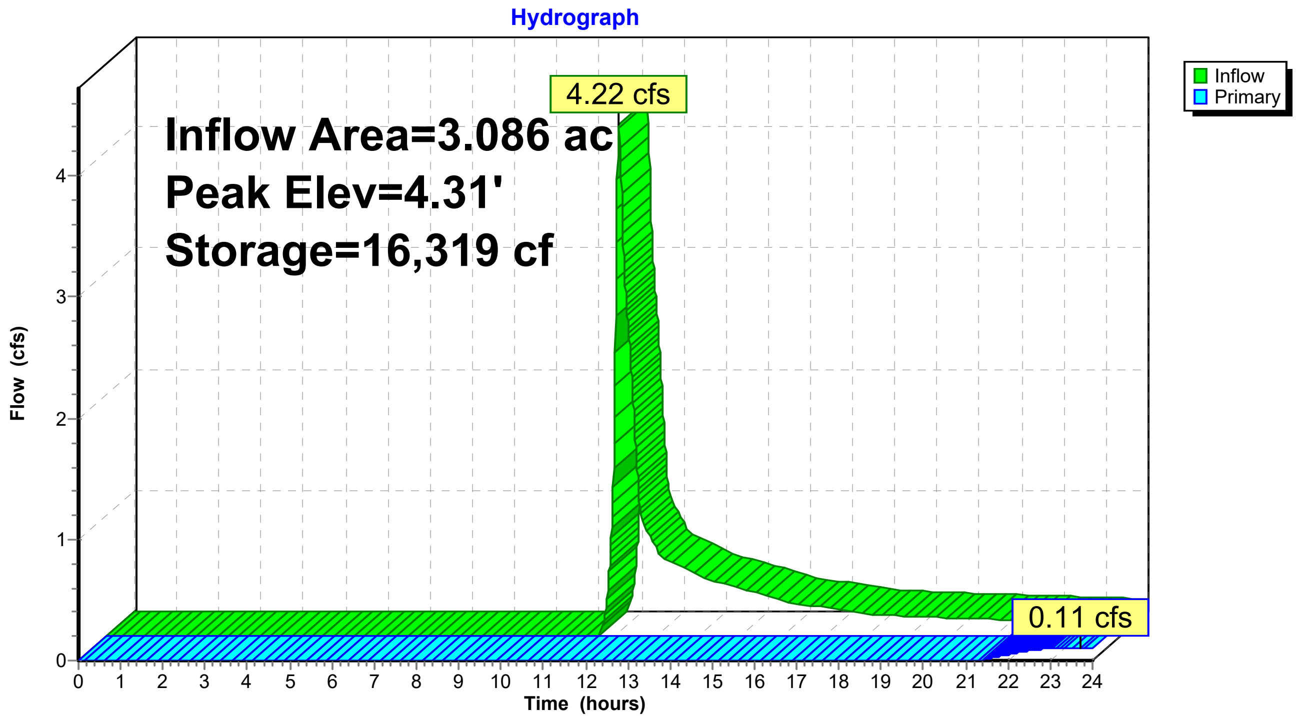
Volume	Invert	Avail.Storage	Storage Description
#1	3.60'	35,172 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
3.60	20,812	0	0
4.00	23,497	8,862	8,862
5.00	29,124	26,311	35,172

Device	Routing	Invert	Outlet Devices
#1	Primary	4.29'	**45.0 deg x 15.0' long x 0.50' rise Sharp-Crested Vee/Trap Weir** Cv= 2.56 (C= 3.20)

Primary OutFlow Max=0.10 cfs @ 23.71 hrs HW=4.31' (Free Discharge)
└─**1=Sharp-Crested Vee/Trap Weir** (Weir Controls 0.10 cfs @ 0.41 fps)

Pond P-C: POND C



Summary for Pond P-D: POND D

Inflow Area = 2.447 ac, 8.42% Impervious, Inflow Depth > 1.34" for 100 YR event
Inflow = 2.21 cfs @ 12.25 hrs, Volume= 0.273 af
Outflow = 0.08 cfs @ 23.22 hrs, Volume= 0.032 af, Atten= 96%, Lag= 658.0 min
Primary = 0.08 cfs @ 23.22 hrs, Volume= 0.032 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Peak Elev= 9.24' @ 23.22 hrs Surf.Area= 9,729 sf Storage= 10,487 cf

Plug-Flow detention time= 557.5 min calculated for 0.032 af (12% of inflow)
Center-of-Mass det. time= 384.5 min (1,287.5 - 903.0)

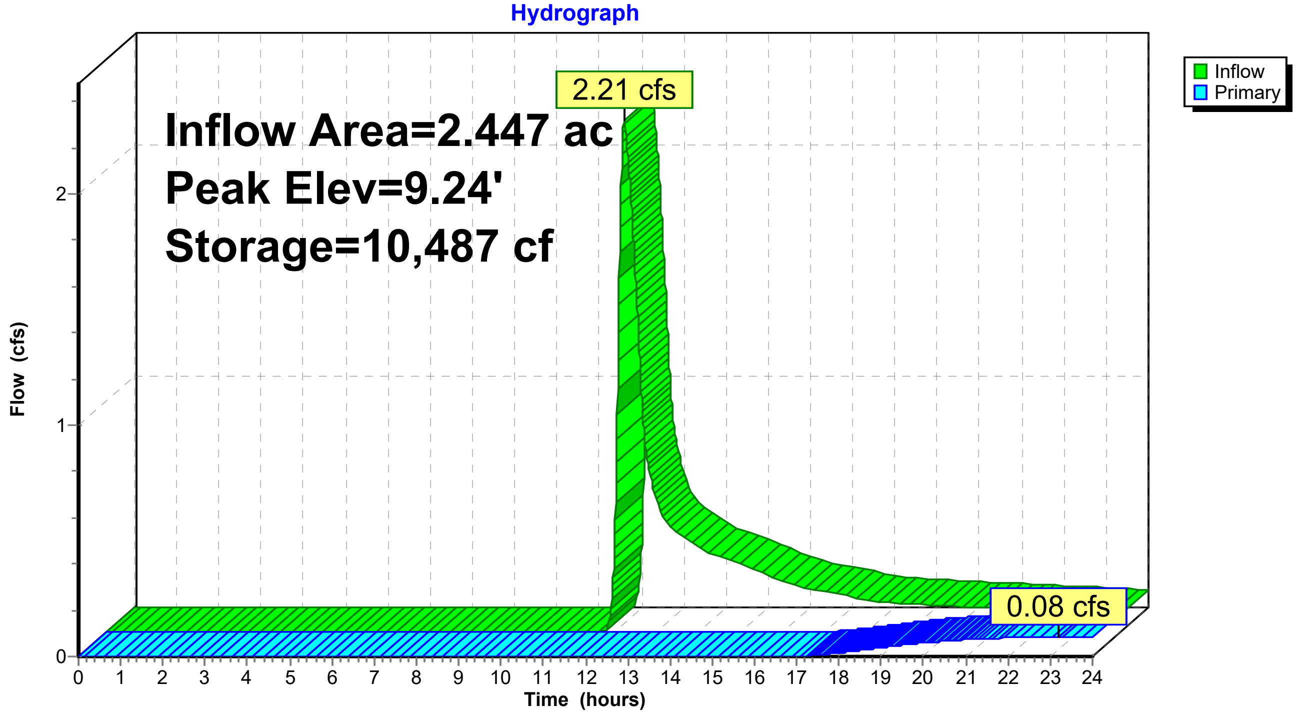
Volume	Invert	Avail.Storage	Storage Description
#1	8.00'	18,853 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
8.00	7,585	0	0
9.00	8,975	8,280	8,280
10.00	12,170	10,573	18,853

Device	Routing	Invert	Outlet Devices
#1	Primary	9.80'	**45.0 deg x 15.0' long x 0.50' rise Sharp-Crested Vee/Trap Weir** Cv= 2.56 (C= 3.20)
#2	Primary	9.08'	**12.0" Round Culvert** L= 18.5' CMP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 9.08' / 8.16' S= 0.0497 '/' Cc= 0.900 n= 0.013 Clay tile, Flow Area= 0.79 sf

Primary OutFlow Max=0.08 cfs @ 23.22 hrs HW=9.24' (Free Discharge)
1=Sharp-Crested Vee/Trap Weir (Controls 0.00 cfs)
2=Culvert (Inlet Controls 0.08 cfs @ 1.06 fps)

Pond P-D: POND D



APPENDIX C

NOAA Atlas, Volume 10, Version 3, Point Precipitation Frequency Estimates for Hyannis, MA

NOAA Atlas 14, Volume 10, Version 3
Location name: Hyannis, Massachusetts, USA*
Latitude: 41.6497°, Longitude: -70.2894°
Elevation: 34.22 ft**
* source: ESRI Maps
** source: USGS

POINT PRECIPITATION FREQUENCY ESTIMATES

Sanja Perica, Sandra Pavlovic, Michael St. Laurent, Carl Trypaluk, Dale Unruh, Orlan Wilhite

NOAA, National Weather Service, Silver Spring, Maryland

PF_tabular | PF_graphical | Maps_&_aerials

PF tabular

PDS-based point precipitation frequency estimates with 90% confidence intervals (in inches)[1]

Duration	Average recurrence interval (years)									
	1	2	5	10	25	50	100	200	500	1000
5-min	0.266 (0.218-0.322)	0.336 (0.275-0.409)	0.451 (0.367-0.550)	0.547 (0.443-0.672)	0.679 (0.529-0.878)	0.777 (0.591-1.03)	0.882 (0.649-1.22)	1.01 (0.687-1.41)	1.20 (0.780-1.74)	1.36 (0.862-2.02)
10-min	0.376 (0.309-0.457)	0.476 (0.390-0.579)	0.640 (0.522-0.779)	0.775 (0.627-0.950)	0.962 (0.749-1.24)	1.10 (0.837-1.46)	1.25 (0.919-1.73)	1.43 (0.974-2.00)	1.70 (1.11-2.46)	1.93 (1.22-2.85)
15-min	0.443 (0.363-0.537)	0.560 (0.459-0.681)	0.752 (0.613-0.917)	0.912 (0.739-1.12)	1.13 (0.882-1.46)	1.30 (0.986-1.72)	1.47 (1.08-2.03)	1.68 (1.15-2.35)	2.00 (1.30-2.90)	2.27 (1.44-3.36)
30-min	0.658 (0.540-0.799)	0.828 (0.679-1.01)	1.11 (0.902-1.35)	1.34 (1.08-1.64)	1.66 (1.29-2.14)	1.89 (1.44-2.50)	2.15 (1.58-2.97)	2.45 (1.67-3.43)	2.92 (1.90-4.23)	3.31 (2.10-4.90)
60-min	0.874 (0.717-1.06)	1.10 (0.898-1.33)	1.46 (1.19-1.78)	1.76 (1.43-2.16)	2.18 (1.70-2.82)	2.49 (1.89-3.29)	2.82 (2.08-3.90)	3.22 (2.20-4.51)	3.83 (2.49-5.56)	4.35 (2.76-6.44)
2-hr	1.23 (1.01-1.48)	1.53 (1.26-1.84)	2.01 (1.65-2.44)	2.41 (1.97-2.94)	2.97 (2.33-3.80)	3.38 (2.59-4.43)	3.82 (2.84-5.24)	4.36 (3.01-6.04)	5.18 (3.41-7.43)	5.89 (3.77-8.60)
3-hr	1.47 (1.22-1.77)	1.81 (1.50-2.18)	2.37 (1.95-2.86)	2.83 (2.32-3.44)	3.47 (2.74-4.42)	3.95 (3.04-5.14)	4.46 (3.33-6.06)	5.07 (3.52-6.97)	6.01 (3.98-8.54)	6.81 (4.38-9.87)
6-hr	1.93 (1.61-2.30)	2.34 (1.95-2.80)	3.02 (2.50-3.62)	3.58 (2.95-4.31)	4.35 (3.45-5.48)	4.93 (3.82-6.34)	5.54 (4.16-7.42)	6.27 (4.39-8.51)	7.35 (4.92-10.3)	8.26 (5.38-11.8)
12-hr	2.42 (2.03-2.86)	2.89 (2.42-3.43)	3.66 (3.06-4.36)	4.30 (3.57-5.15)	5.19 (4.14-6.46)	5.85 (4.56-7.43)	6.55 (4.93-8.61)	7.34 (5.19-9.83)	8.48 (5.74-11.7)	9.42 (6.20-13.3)
24-hr	2.87 (2.43-3.38)	3.39 (2.86-4.00)	4.24 (3.57-5.01)	4.94 (4.13-5.87)	5.91 (4.75-7.28)	6.65 (5.22-8.34)	7.41 (5.60-9.58)	8.23 (5.89-10.9)	9.39 (6.43-12.8)	10.3 (6.87-14.3)
2-day	3.27 (2.78-3.82)	3.82 (3.25-4.47)	4.72 (4.00-5.54)	5.47 (4.60-6.45)	6.50 (5.26-7.92)	7.29 (5.76-9.03)	8.09 (6.16-10.3)	8.94 (6.46-11.7)	10.1 (7.00-13.6)	11.0 (7.43-15.1)
3-day	3.54 (3.03-4.12)	4.10 (3.50-4.78)	5.02 (4.27-5.86)	5.78 (4.88-6.78)	6.82 (5.55-8.27)	7.62 (6.05-9.39)	8.44 (6.46-10.7)	9.30 (6.77-12.1)	10.5 (7.31-14.0)	11.4 (7.74-15.5)
4-day	3.78 (3.24-4.38)	4.34 (3.72-5.04)	5.26 (4.49-6.13)	6.03 (5.11-7.05)	7.08 (5.78-8.55)	7.88 (6.28-9.67)	8.70 (6.69-11.0)	9.58 (7.00-12.4)	10.8 (7.56-14.3)	11.8 (8.01-15.9)
7-day	4.41 (3.80-5.09)	4.98 (4.29-5.75)	5.91 (5.07-6.85)	6.69 (5.70-7.77)	7.75 (6.37-9.29)	8.56 (6.87-10.4)	9.39 (7.28-11.7)	10.3 (7.58-13.1)	11.5 (8.12-15.1)	12.4 (8.56-16.6)
10-day	5.00 (4.33-5.75)	5.59 (4.83-6.44)	6.56 (5.64-7.57)	7.36 (6.29-8.52)	8.46 (6.98-10.1)	9.30 (7.50-11.3)	10.2 (7.90-12.6)	11.1 (8.19-14.0)	12.3 (8.73-16.0)	13.2 (9.15-17.5)
20-day	6.81 (5.93-7.78)	7.50 (6.52-8.57)	8.62 (7.47-9.87)	9.55 (8.23-11.0)	10.8 (9.01-12.8)	11.8 (9.60-14.1)	12.8 (10.0-15.6)	13.8 (10.3-17.3)	15.0 (10.8-19.3)	15.9 (11.1-20.8)
30-day	8.38 (7.32-9.52)	9.15 (7.99-10.4)	10.4 (9.07-11.9)	11.5 (9.93-13.1)	12.9 (10.8-15.1)	14.1 (11.5-16.7)	15.2 (11.9-18.3)	16.2 (12.2-20.1)	17.4 (12.6-22.2)	18.3 (12.9-23.7)
45-day	10.4 (9.13-11.8)	11.3 (9.90-12.8)	12.7 (11.1-14.5)	13.9 (12.1-15.9)	15.6 (13.1-18.1)	16.9 (13.8-19.9)	18.2 (14.3-21.7)	19.3 (14.6-23.8)	20.6 (15.0-26.0)	21.4 (15.2-27.5)
60-day	12.1 (10.7-13.7)	13.1 (11.5-14.8)	14.7 (12.9-16.7)	16.1 (14.0-18.2)	17.9 (15.0-20.7)	19.3 (15.9-22.6)	20.7 (16.3-24.6)	21.9 (16.7-26.8)	23.2 (17.1-29.2)	24.1 (17.2-30.8)

[1] Precipitation frequency (PF) estimates in this table are based on frequency analysis of partial duration series (PDS).

Numbers in parenthesis are PF estimates at lower and upper bounds of the 90% confidence interval. The probability that precipitation frequency estimates (for a given duration and average recurrence interval) will be greater than the upper bound (or less than the lower bound) is 5%. Estimates at upper bounds are not checked against probable maximum precipitation (PMP) estimates and may be higher than currently valid PMP values.

Please refer to NOAA Atlas 14 document for more information.

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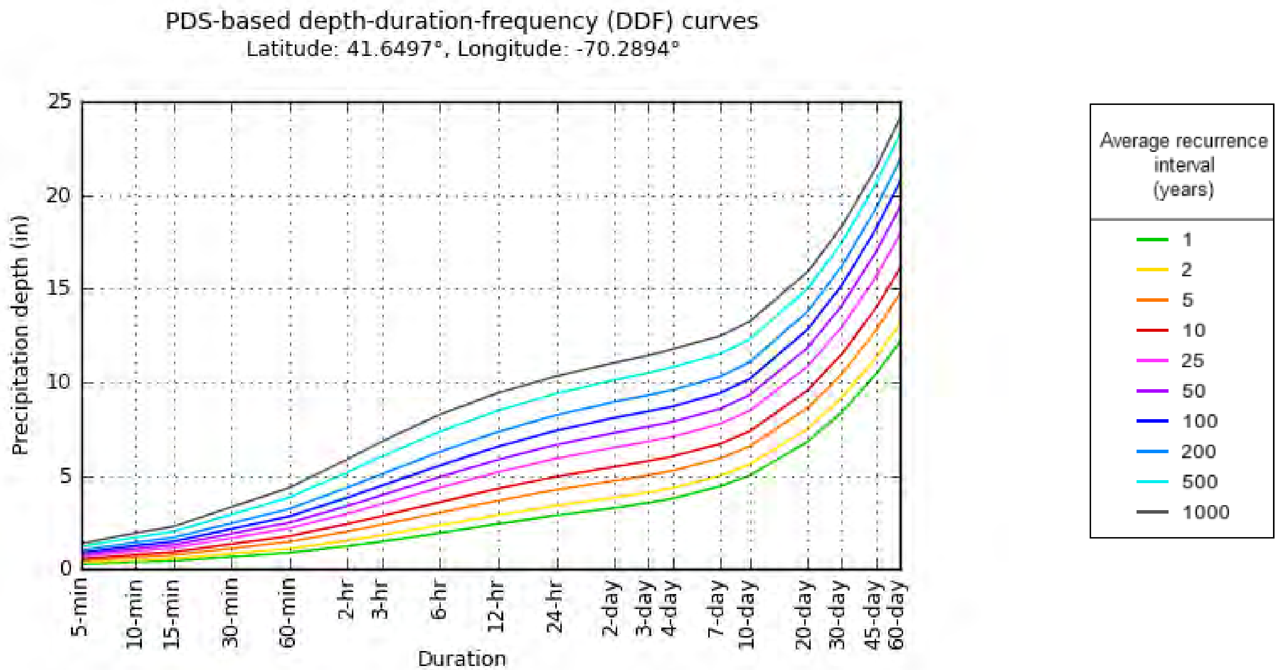
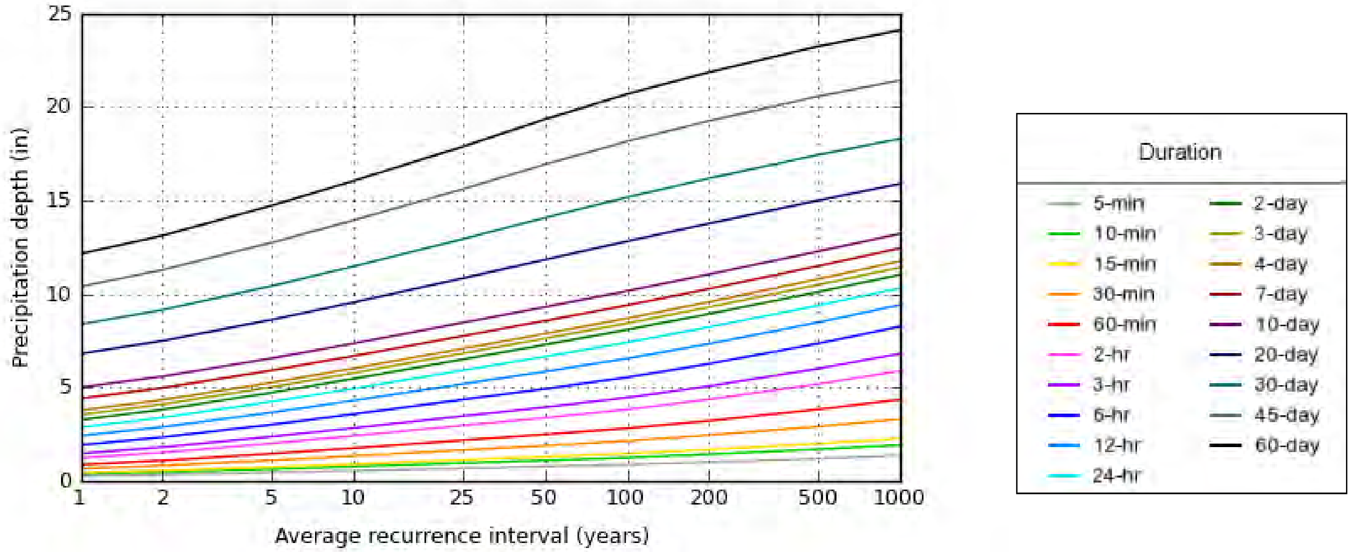
PF graphical





NOAA Atlas 14, Volume 10, Version 3

Created (GMT): Thu Apr 22 22:10:09 2021

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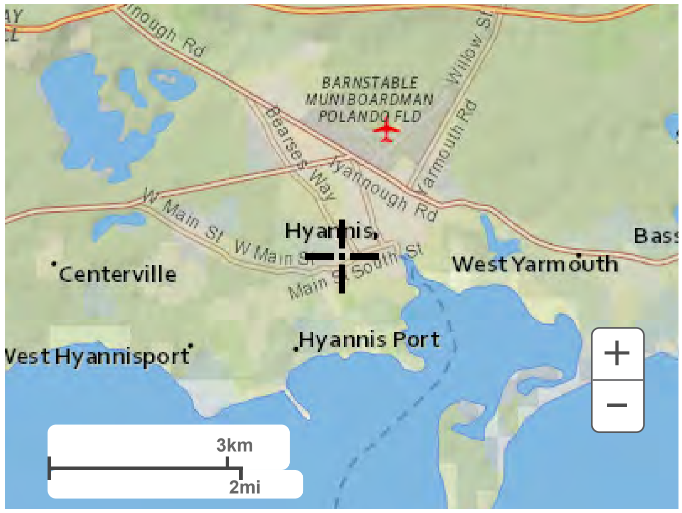
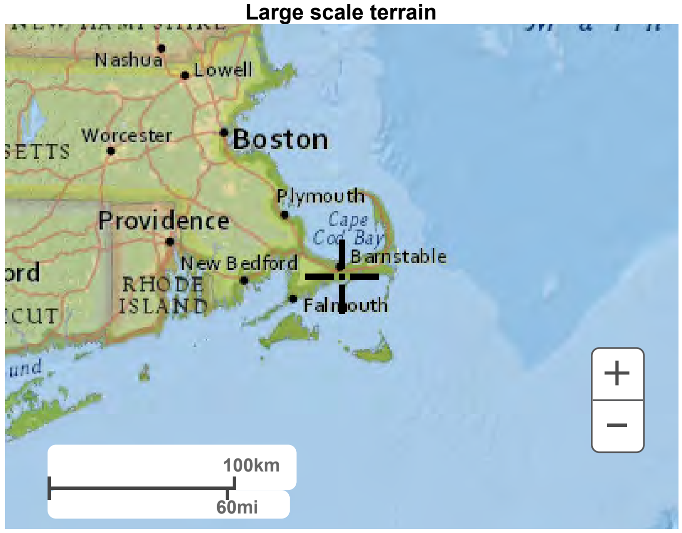
Maps & aerials

Small scale terrain



Large scale terrain



Large scale map

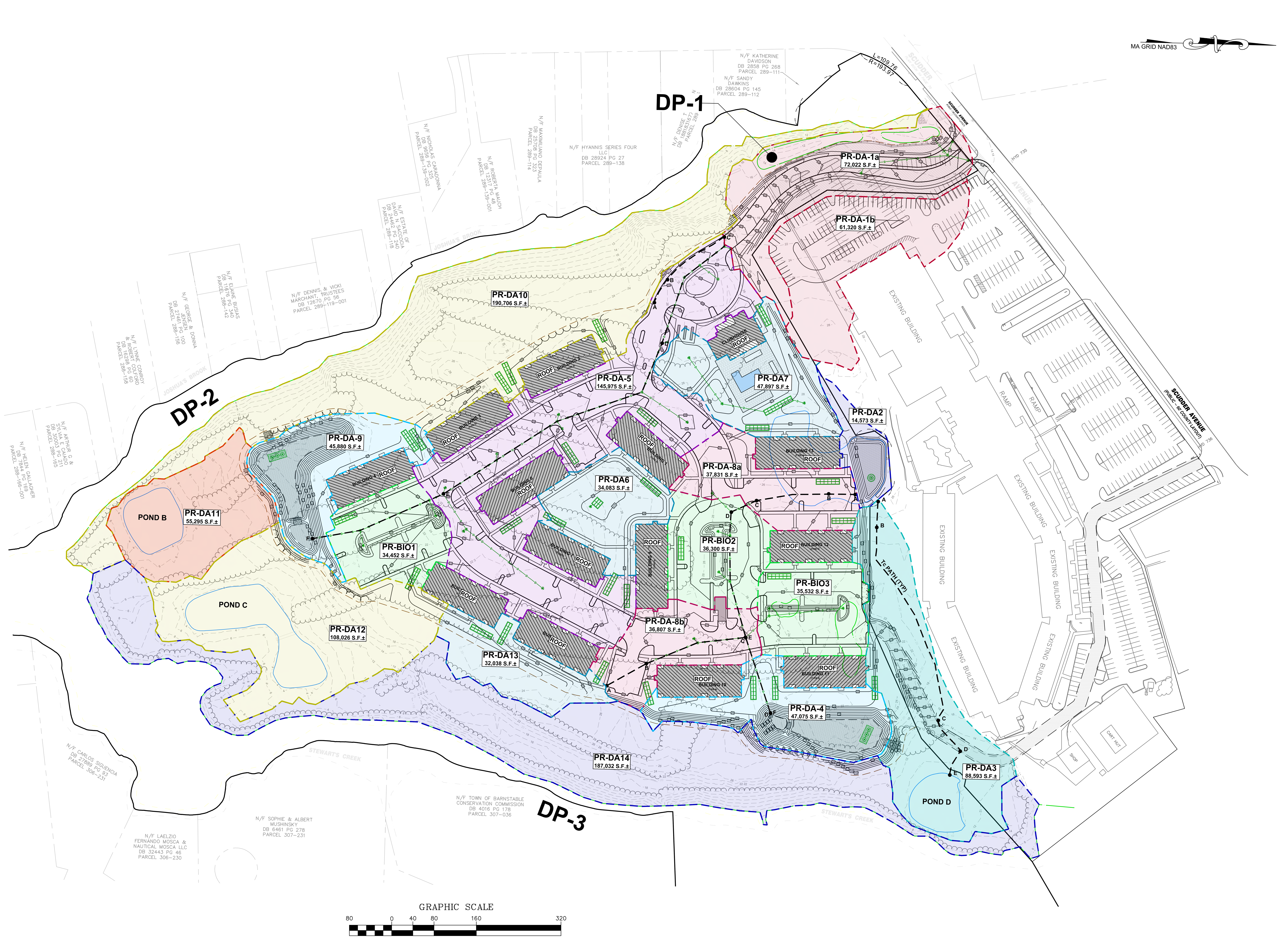
Large scale aerial

APPENDIX D

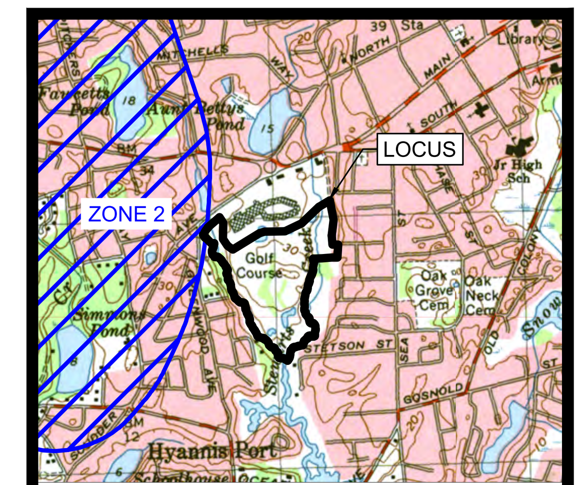
PROPOSED DRAINAGE AREAS PLAN

&

HydroCAD® CALCULATIONS
For the
PROPOSED CONDITIONS



NOTE: Tc PATHS NOT SHOWN ON PLAN ARE ASSUMED TO HAVE A TIME OF CONCENTRATION OF FIVE (5) MINUTES.



LOCUS MAP
SCALE 1" = 2000'

COMMONWEALTH OF MASSACHUSETTS
EDWARD L. PESCE
CIVIL
NO. 32001
REGISTERED PROFESSIONAL ENGINEER

Edward L. Pesce 23 SEP 2022

EDWARD L. PESCE, P.E. DATE

THE PROPOSED EMBLEM AT HYANNIS RESIDENCES

AT
35 SCUDDER AVENUE
IN
HYANNIS, MASSACHUSETTS
(BARNSTABLE COUNTY)

PROPOSED DRAINAGE AREAS PLAN

REVISIONS:

No.	DATE	DESC.
1	9/23/22	Updated Site Layout

PREPARED FOR:
QUARTERRA
99 SUMMER STREET, SUITE 701
BOSTON, MA 02110

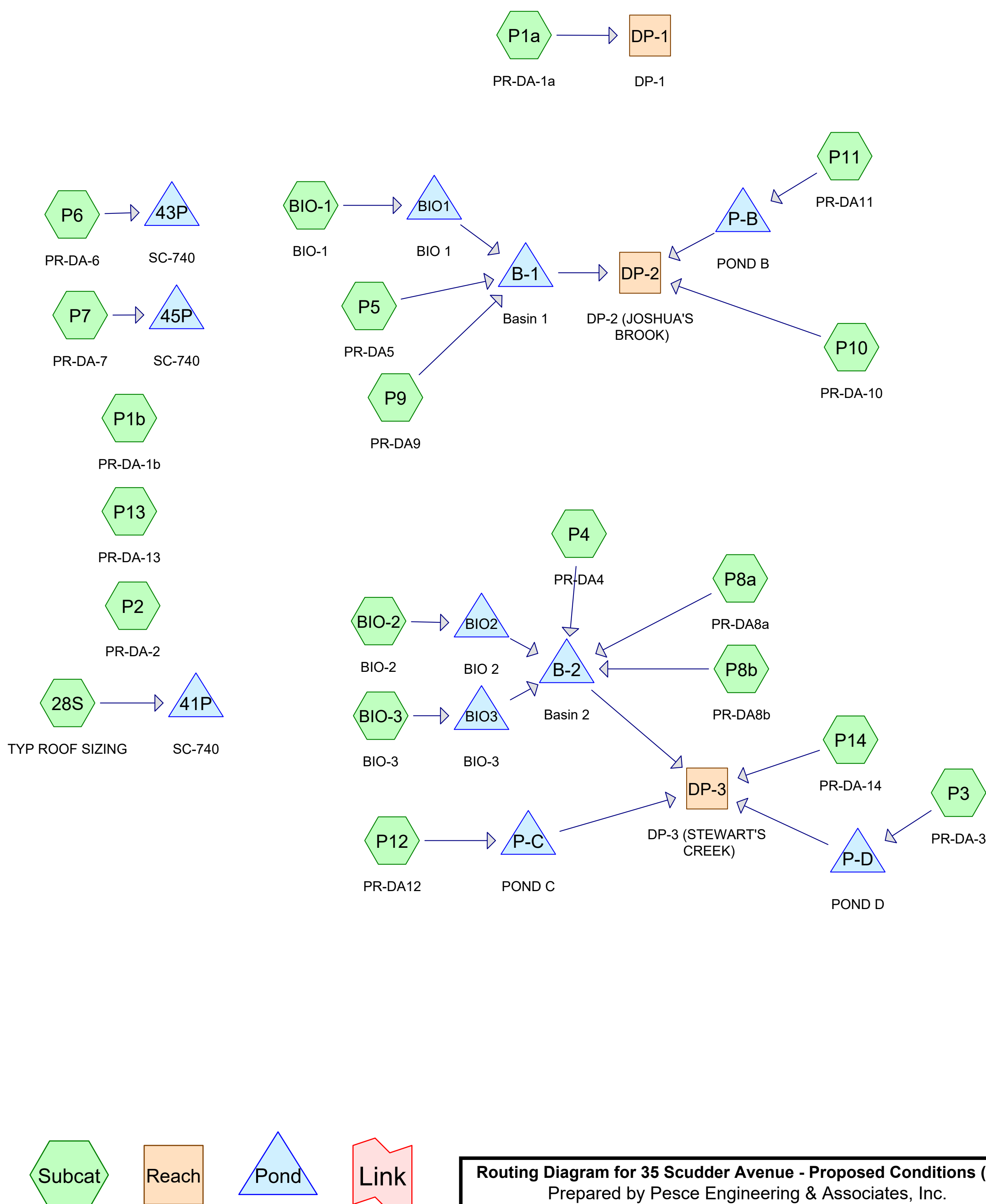
Quarterra

ENGINEERING BY:
PESCE ENGINEERING & ASSOCIATES, INC.
Edward L. Pesce, P.E., LEED AP
43 Porter Lane
West Dennis, MA 02670
epesce@comcast.net Cell:508-333-7630

LAND SURVEYING BY:
BAXTER NYE ENGINEERING & SURVEYING
78 NORTH STREET, 3RD FLOOR
HYANNIS, MA 02601

DATE:	SEPTEMBER 23, 2022
FIELD:	CB/RB
CALC./DESIGN:	ELP
DRAWN:	BJW
CHECK:	ELP
JOB NO:	5061

SHEET 1 OF 1



Routing Diagram for 35 Scudder Avenue - Proposed Conditions (REV 1)
Prepared by Pesce Engineering & Associates, Inc.
HydroCAD® 10.00-22 s/n 02717 © 2018 HydroCAD Software Solutions LLC

Area Listing (selected nodes)

Area (acres)	CN	Description (subcatchment-numbers)
17.268	39	>75% Grass cover, Good, HSG A (BIO-1, BIO-2, BIO-3, P10, P11, P12, P13, P14, P1a, P1b, P2, P3, P4, P5, P6, P7, P8a, P8b, P9)
0.165	76	Gravel roads, HSG A (P3)
5.600	98	Paved parking, HSG A (BIO-1, BIO-2, BIO-3, P1a, P5, P8a, P8b)
0.149	98	Roofs, HSG A (28S, BIO-2, BIO-3, P8a, P8b)
0.417	98	Stormwater Basin; Water Surface, HSG A (P4, P9)
1.323	98	Unconnected Impervious, HSG A (P13, P1b, P2, P6, P7)
0.020	98	Unconnected impervious, HSG A (P4, P9)
0.031	98	Unconnected roofs, HSG A (P5)
1.081	98	Water Surface, 0% imp, HSG A (P11, P12, P1a, P3)
1.873	30	Woods, Good, HSG A (P11, P12, P13, P14)
2.294	32	Woods/grass comb., Good, HSG A (P10)
30.221	**55**	**TOTAL AREA**

Soil Listing (selected nodes)

Area (acres)	Soil Group	Subcatchment Numbers
30.221	HSG A	28S, BIO-1, BIO-2, BIO-3, P10, P11, P12, P13, P14, P1a, P1b, P2, P3, P4, P5, P6, P7, P8a, P8b, P9
0.000	HSG B	
0.000	HSG C	
0.000	HSG D	
0.000	Other	
30.221		**TOTAL AREA**

Ground Covers (selected nodes)

HSG-A (acres)	HSG-B (acres)	HSG-C (acres)	HSG-D (acres)	Other (acres)	Total (acres)	Ground Cover	Subcatchment Numbers
17.268	0.000	0.000	0.000	0.000	17.268	>75% Grass cover, Good	BIO-1, BIO-2, BIO-3, P10, P11, P12, P13, P14, P1a, P1b, P2, P3,

Ground Covers (selected nodes) (continued)

HSG-A (acres)	HSG-B (acres)	HSG-C (acres)	HSG-D (acres)	Other (acres)	Total (acres)	Ground Cover	Subcatchment Numbers
0.165	0.000	0.000	0.000	0.000	0.165	Gravel roads	P3
5.600	0.000	0.000	0.000	0.000	5.600	Paved parking	BIO-1, BIO-2, BIO-3, P1a, P5, P8a, P8b
0.149	0.000	0.000	0.000	0.000	0.149	Roofs	28S, BIO-2, BIO-3, P8a, P8

Ground Covers (selected nodes) (continued)

HSG-A (acres)	HSG-B (acres)	HSG-C (acres)	HSG-D (acres)	Other (acres)	Total (acres)	Ground Cover	Subcatchment Numbers
0.417	0.000	0.000	0.000	0.000	0.417	Stormwater Basin; Water Surface	P4, P9
1.323	0.000	0.000	0.000	0.000	1.323	Unconnected Impervious	P13, P1b, P2, P6, P7
0.020	0.000	0.000	0.000	0.000	0.020	Unconnected impervious	P4, P9
0.031	0.000	0.000	0.000	0.000	0.031	Unconnected roofs	P5
1.081	0.000	0.000	0.000	0.000	1.081	Water Surface, 0% imp	P11, P12, P1a, P3

Ground Covers (selected nodes) (continued)

HSG-A (acres)	HSG-B (acres)	HSG-C (acres)	HSG-D (acres)	Other (acres)	Total (acres)	Ground Cover	Subcatchment Numbers
1.873	0.000	0.000	0.000	0.000	1.873	Woods, Good	P11, P12, P13, P14
2.294	0.000	0.000	0.000	0.000	2.294	Woods/grass comb., Good	P10
30.221	**0.000**	**0.000**	**0.000**	**0.000**	**30.221**	**TOTAL AREA**	

Pipe Listing (selected nodes)

Line#	Node Number	In-Invert (feet)	Out-Invert (feet)	Length (feet)	Slope (ft/ft)	n	Diam/Width (inches)	Height (inches)	Inside-Fill (inches)
1	P5	0.00	0.00	243.0	0.0050	0.013	12.0	0.0	0.0
2	P5	0.00	0.00	525.0	0.0050	0.013	15.0	0.0	0.0
3	P5	0.00	0.00	260.0	0.0050	0.013	18.0	0.0	0.0
4	P8a	0.00	0.00	48.0	0.0050	0.013	12.0	0.0	0.0
5	P8a	0.00	0.00	241.0	0.0050	0.013	15.0	0.0	0.0
6	P8a	0.00	0.00	150.0	0.0060	0.013	18.0	0.0	0.0
7	P8b	0.00	0.00	196.0	0.0100	0.013	12.0	0.0	0.0
8	P8b	0.00	0.00	150.0	0.0060	0.013	18.0	0.0	0.0
9	P-D	9.08	8.16	18.5	0.0497	0.013	12.0	0.0	0.0

Time span=0.00-24.00 hrs, dt=0.01 hrs, 2401 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 28S: TYP ROOF SIZING Runoff Area=5,000 sf 100.00% Impervious Runoff Depth>3.15"
Tc=5.0 min CN=98 Runoff=0.39 cfs 0.030 af

Subcatchment BIO-1: BIO-1 Runoff Area=34,452 sf 76.51% Impervious Runoff Depth>1.84"
Tc=5.0 min CN=84 Runoff=1.77 cfs 0.121 af

Subcatchment BIO-2: BIO-2 Runoff Area=36,300 sf 68.24% Impervious Runoff Depth>1.48"
Tc=5.0 min CN=79 Runoff=1.48 cfs 0.103 af

Subcatchment BIO-3: BIO-3 Runoff Area=35,532 sf 75.18% Impervious Runoff Depth>1.76"
Tc=5.0 min CN=83 Runoff=1.75 cfs 0.120 af

Subcatchment P10: PR-DA-10 Runoff Area=190,706 sf 0.00% Impervious Runoff Depth=0.00"
Tc=5.0 min CN=35 Runoff=0.00 cfs 0.000 af

Subcatchment P11: PR-DA11 Runoff Area=55,295 sf 0.00% Impervious Runoff Depth>0.15"
Tc=5.0 min CN=49 Runoff=0.04 cfs 0.015 af

Subcatchment P12: PR-DA12 Runoff Area=108,026 sf 0.00% Impervious Runoff Depth>0.15"
Tc=5.0 min CN=49 Runoff=0.08 cfs 0.030 af

Subcatchment P13: PR-DA-13 Runoff Area=32,038 sf 3.96% Impervious Runoff Depth>0.01"
Tc=5.0 min UI Adjusted CN=40 Runoff=0.00 cfs 0.001 af

Subcatchment P14: PR-DA-14 Runoff Area=187,032 sf 0.00% Impervious Runoff Depth=0.00"
Tc=5.0 min CN=36 Runoff=0.00 cfs 0.000 af

Subcatchment P1a: PR-DA-1a Runoff Area=72,022 sf 28.03% Impervious Runoff Depth>0.52"
Tc=5.0 min CN=61 Runoff=0.73 cfs 0.072 af

Subcatchment P1b: PR-DA-1b Runoff Area=61,320 sf 64.77% Impervious Runoff Depth>1.35"
Tc=5.0 min CN=77 Runoff=2.26 cfs 0.158 af

Subcatchment P2: PR-DA-2 Runoff Area=14,573 sf 0.97% Impervious Runoff Depth>0.00"
Tc=5.0 min UI Adjusted CN=39 Runoff=0.00 cfs 0.000 af

Subcatchment P3: PR-DA-3 Runoff Area=88,593 sf 0.00% Impervious Runoff Depth>0.12"
Flow Length=574' Tc=26.1 min CN=48 Runoff=0.04 cfs 0.021 af

Subcatchment P4: PR-DA4 Runoff Area=47,075 sf 19.25% Impervious Runoff Depth>0.17"
Tc=5.0 min CN=50 Runoff=0.05 cfs 0.015 af

Subcatchment P5: PR-DA5 Runoff Area=145,975 sf 68.19% Impervious Runoff Depth>1.48"
Flow Length=1,208' Tc=6.7 min CN=79 Runoff=5.62 cfs 0.413 af

Subcatchment P6: PR-DA-6 Runoff Area=34,083 sf 11.09% Impervious Runoff Depth>0.03"
Tc=5.0 min UI Adjusted CN=42 Runoff=0.00 cfs 0.002 af

Subcatchment P7: PR-DA-7 Runoff Area=47,897 sf 26.54% Impervious Runoff Depth>0.10"
Tc=5.0 min UI Adjusted CN=47 Runoff=0.02 cfs 0.009 af

Subcatchment P8a: PR-DA8a Runoff Area=37,831 sf 61.05% Impervious Runoff Depth>1.22"
Flow Length=626' Tc=5.0 min CN=75 Runoff=1.25 cfs 0.089 af

Subcatchment P8b: PR-DA8b Runoff Area=36,807 sf 71.01% Impervious Runoff Depth>1.62"
Flow Length=432' Tc=5.0 min CN=81 Runoff=1.66 cfs 0.114 af

Subcatchment P9: PR-DA9 Runoff Area=45,880 sf 21.77% Impervious Runoff Depth>0.22"
Tc=5.0 min CN=52 Runoff=0.08 cfs 0.019 af

Reach DP-1: DP-1 Inflow=0.73 cfs 0.072 af
Outflow=0.73 cfs 0.072 af

Reach DP-2: DP-2 (JOSHUA'S BROOK) Inflow=0.00 cfs 0.000 af
Outflow=0.00 cfs 0.000 af

Reach DP-3: DP-3 (STEWART'S CREEK) Inflow=0.00 cfs 0.000 af
Outflow=0.00 cfs 0.000 af

Pond 41P: SC-740 Peak Elev=37.40' Storage=253 cf Inflow=0.39 cfs 0.030 af
Outflow=0.09 cfs 0.030 af

Pond 43P: SC-740 Peak Elev=19.50' Storage=0 cf Inflow=0.00 cfs 0.002 af
Outflow=0.00 cfs 0.002 af

Pond 45P: SC-740 Peak Elev=19.51' Storage=2 cf Inflow=0.02 cfs 0.009 af
Outflow=0.02 cfs 0.009 af

Pond B-1: Basin 1 Peak Elev=11.54' Storage=9,795 cf Inflow=7.28 cfs 0.504 af
Discarded=0.60 cfs 0.502 af Primary=0.00 cfs 0.000 af Outflow=0.60 cfs 0.502 af

Pond B-2: Basin 2 Peak Elev=16.12' Storage=5,210 cf Inflow=4.41 cfs 0.288 af
Discarded=0.49 cfs 0.287 af Primary=0.00 cfs 0.000 af Outflow=0.49 cfs 0.287 af

Pond BIO1: BIO 1 Peak Elev=19.69' Storage=448 cf Inflow=1.77 cfs 0.121 af
Discarded=0.06 cfs 0.048 af Primary=1.66 cfs 0.072 af Outflow=1.71 cfs 0.120 af

Pond BIO2: BIO 2 Peak Elev=22.82' Storage=1,433 cf Inflow=1.48 cfs 0.103 af
Discarded=0.12 cfs 0.089 af Primary=0.38 cfs 0.014 af Outflow=0.50 cfs 0.103 af

Pond BIO3: BIO-3 Peak Elev=23.68' Storage=695 cf Inflow=1.75 cfs 0.120 af
Discarded=0.08 cfs 0.063 af Primary=1.56 cfs 0.057 af Outflow=1.64 cfs 0.120 af

Pond P-B: POND B Peak Elev=2.76' Storage=671 cf Inflow=0.04 cfs 0.015 af
Outflow=0.00 cfs 0.000 af

Pond P-C: POND C Peak Elev=3.66' Storage=1,311 cf Inflow=0.08 cfs 0.030 af
Outflow=0.00 cfs 0.000 af

Pond P-D: POND D Peak Elev=8.12' Storage=899 cf Inflow=0.04 cfs 0.021 af
Outflow=0.00 cfs 0.000 af

Total Runoff Area = 30.221 ac Runoff Volume = 1.333 af Average Runoff Depth = 0.53"
75.05% Pervious = 22.680 ac 24.95% Impervious = 7.541 ac

Summary for Subcatchment 28S: TYP ROOF SIZING

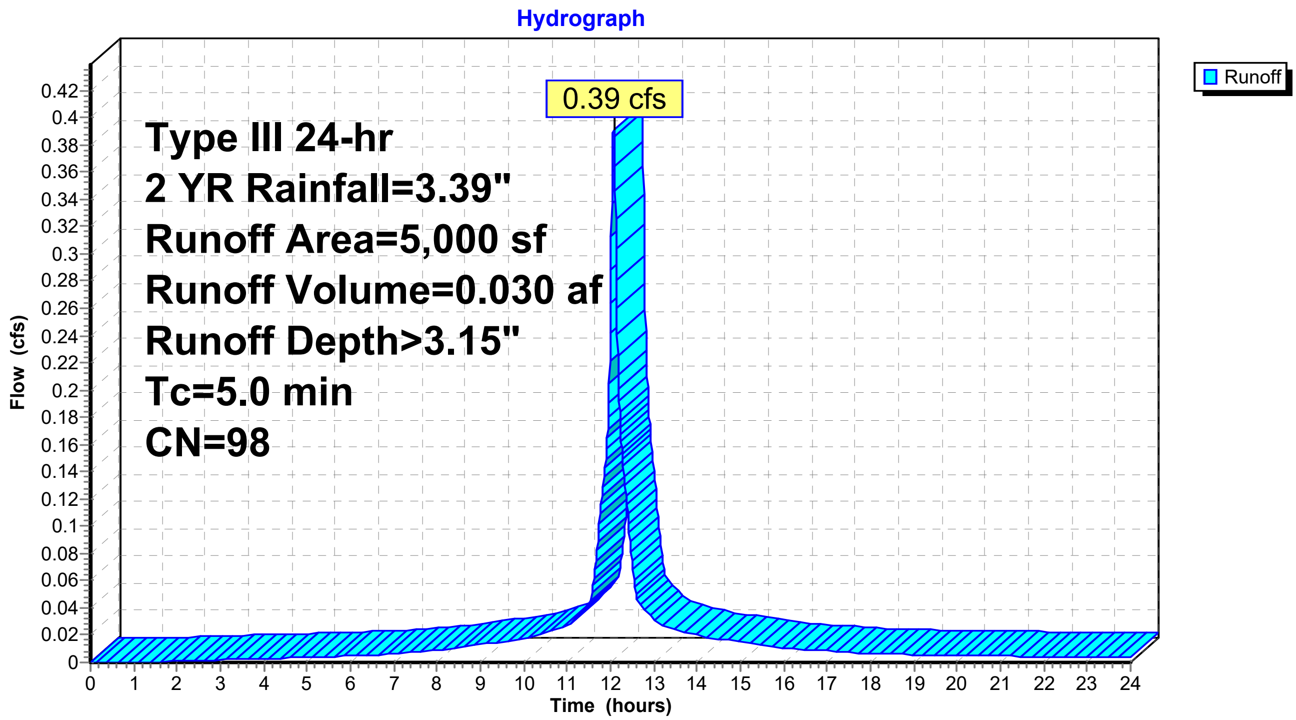
Runoff = 0.39 cfs @ 12.07 hrs, Volume= 0.030 af, Depth> 3.15"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 2 YR Rainfall=3.39"

Area (sf)	CN	Description
5,000	98	Roofs, HSG A
5,000		100.00% Impervious Area

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

Subcatchment 28S: TYP ROOF SIZING



Summary for Subcatchment BIO-1: BIO-1

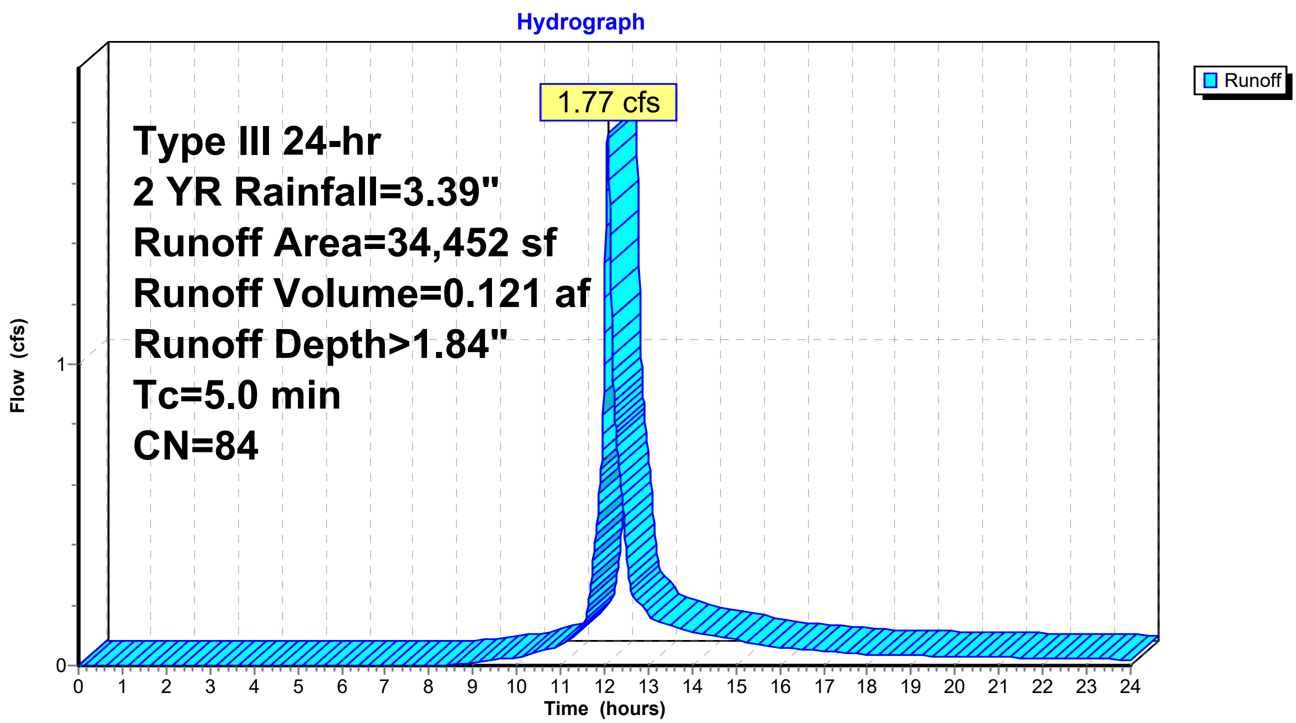
Runoff = 1.77 cfs @ 12.08 hrs, Volume= 0.121 af, Depth> 1.84"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 2 YR Rainfall=3.39"

Area (sf)	CN	Description
8,092	39	>75% Grass cover, Good, HSG A
26,360	98	Paved parking, HSG A
34,452	84	Weighted Average
8,092		23.49% Pervious Area
26,360		76.51% Impervious Area

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

Subcatchment BIO-1: BIO-1



Summary for Subcatchment BIO-2: BIO-2

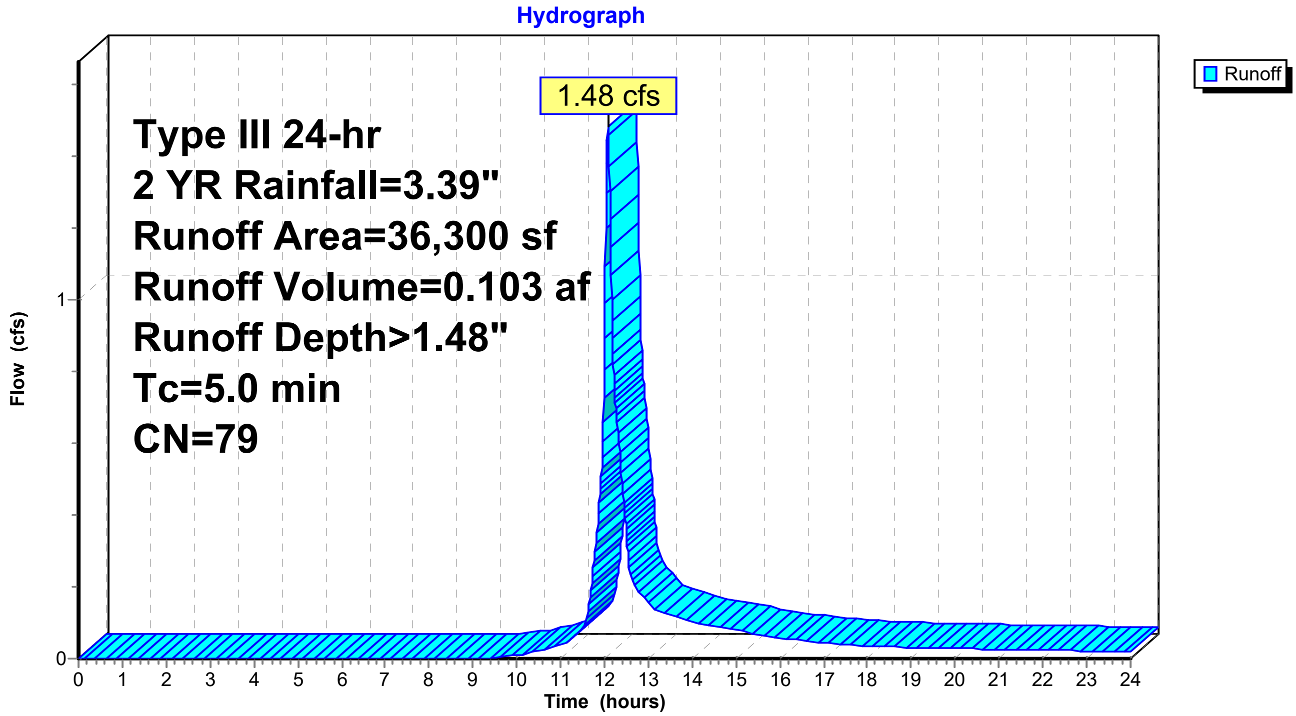
Runoff = 1.48 cfs @ 12.08 hrs, Volume= 0.103 af, Depth> 1.48"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 2 YR Rainfall=3.39"

Area (sf)	CN	Description
11,530	39	>75% Grass cover, Good, HSG A
24,660	98	Paved parking, HSG A
110	98	Roofs, HSG A
36,300	79	Weighted Average
11,530		31.76% Pervious Area
24,770		68.24% Impervious Area

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

Subcatchment BIO-2: BIO-2



Summary for Subcatchment BIO-3: BIO-3

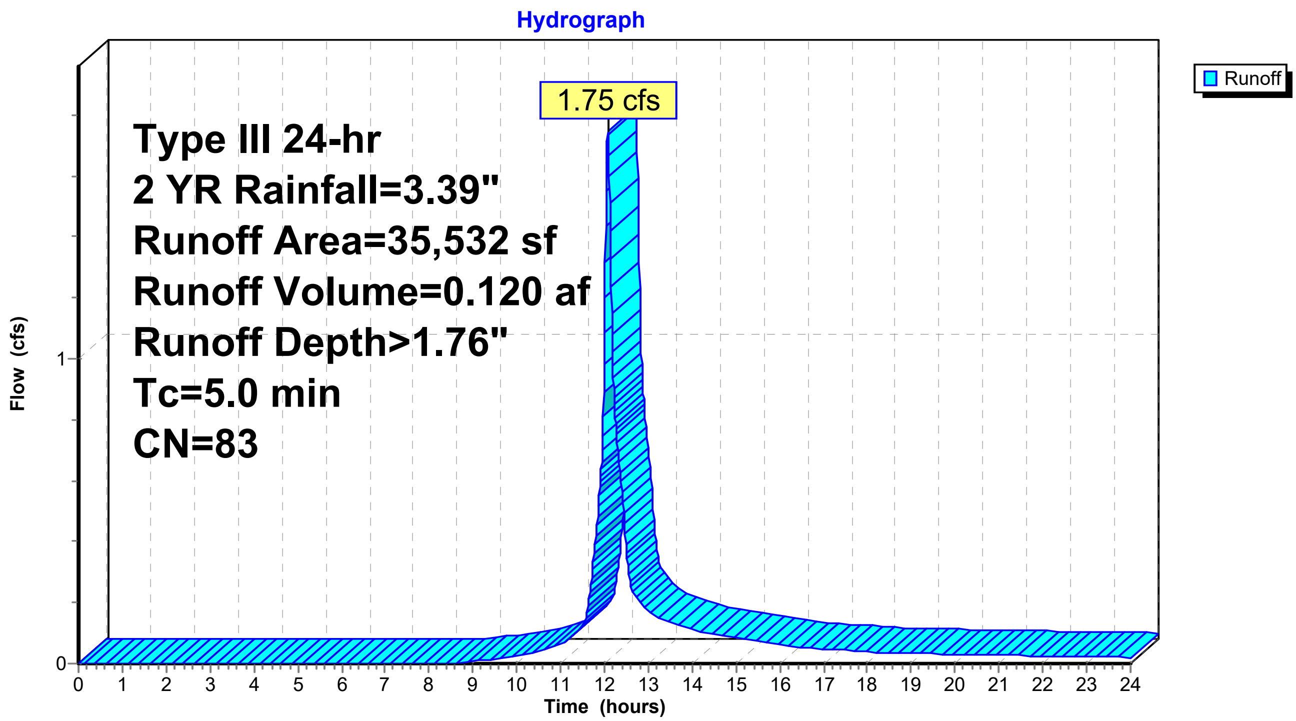
Runoff = 1.75 cfs @ 12.08 hrs, Volume= 0.120 af, Depth> 1.76"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 2 YR Rainfall=3.39"

Area (sf)	CN	Description
8,819	39	>75% Grass cover, Good, HSG A
26,493	98	Paved parking, HSG A
220	98	Roofs, HSG A
35,532	83	Weighted Average
8,819		24.82% Pervious Area
26,713		75.18% Impervious Area

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

Subcatchment BIO-3: BIO-3



Summary for Subcatchment P10: PR-DA-10

[45] Hint: Runoff=Zero

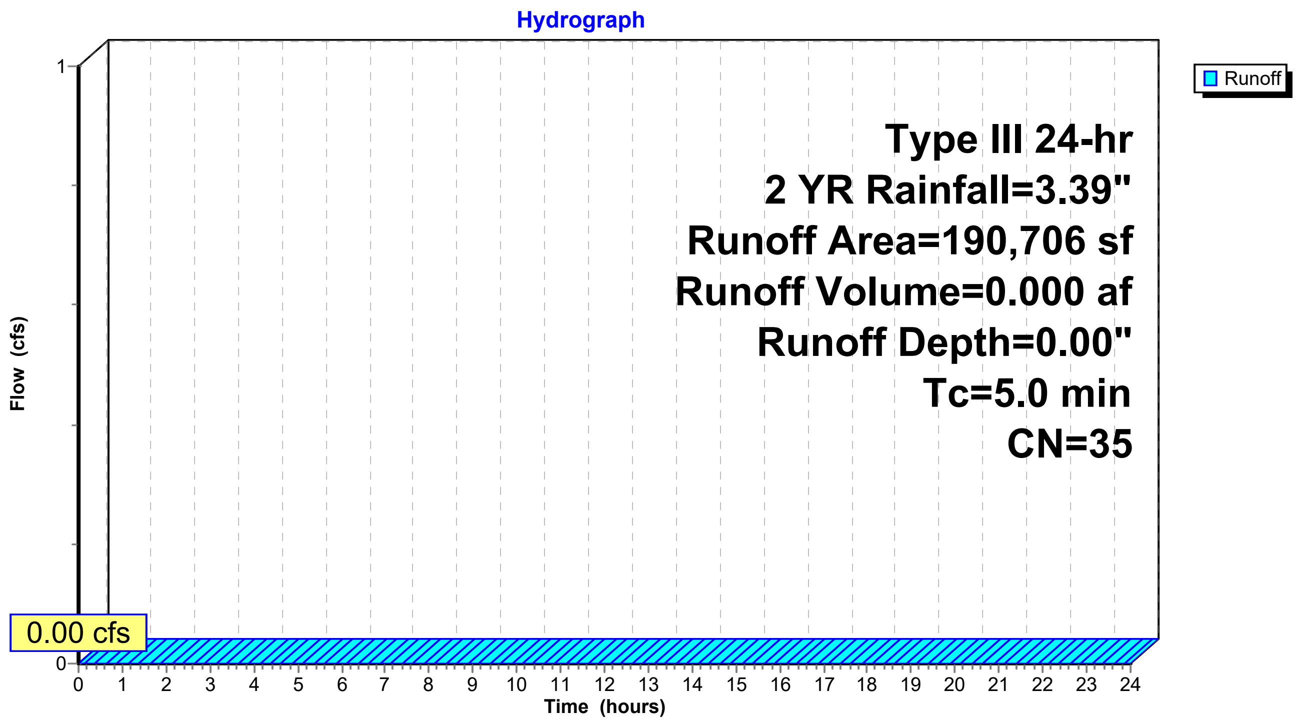
Runoff = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Depth= 0.00"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 2 YR Rainfall=3.39"

Area (sf)	CN	Description
90,801	39	>75% Grass cover, Good, HSG A
99,905	32	Woods/grass comb., Good, HSG A
190,706	35	Weighted Average
190,706		100.00% Pervious Area

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

Subcatchment P10: PR-DA-10



Summary for Subcatchment P11: PR-DA11

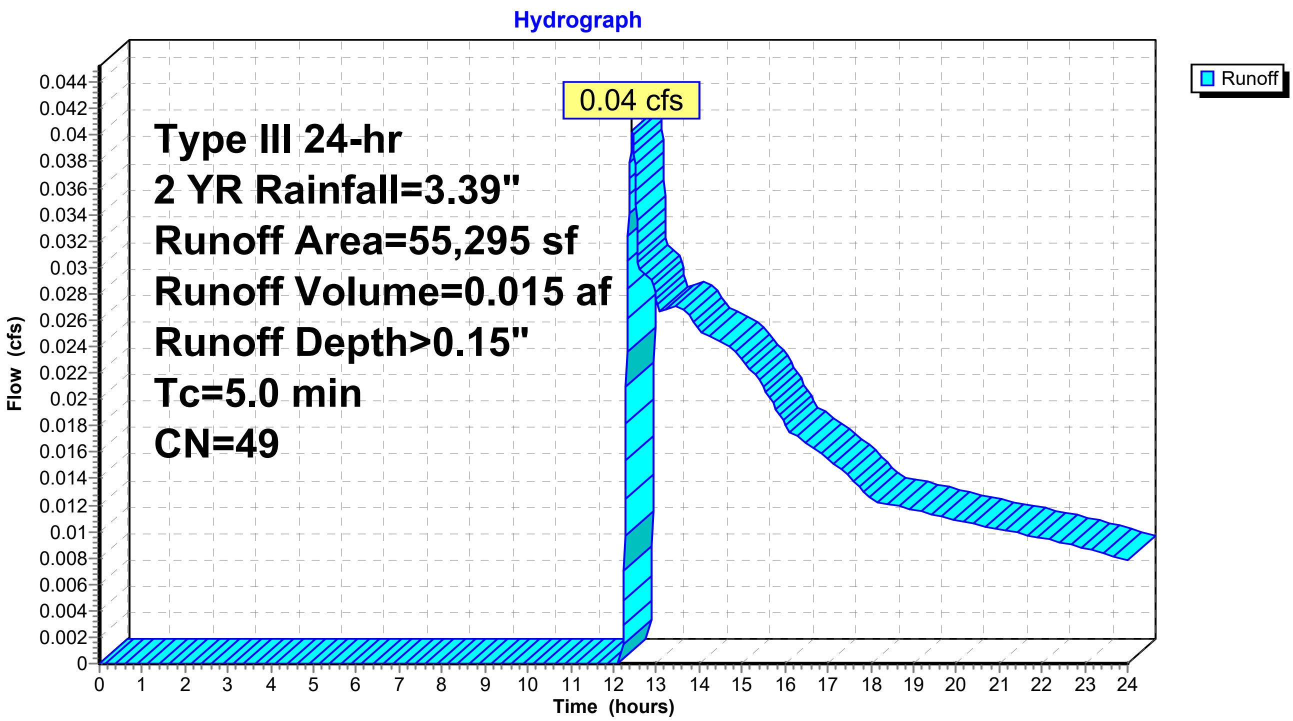
Runoff = 0.04 cfs @ 12.44 hrs, Volume= 0.015 af, Depth> 0.15"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 2 YR Rainfall=3.39"

Area (sf)	CN	Description
39,962	39	>75% Grass cover, Good, HSG A
5,060	30	Woods, Good, HSG A
10,273	98	Water Surface, 0% imp, HSG A
0	98	Paved parking, HSG A
55,295	49	Weighted Average
55,295		100.00% Pervious Area

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

Subcatchment P11: PR-DA11



Summary for Subcatchment P12: PR-DA12

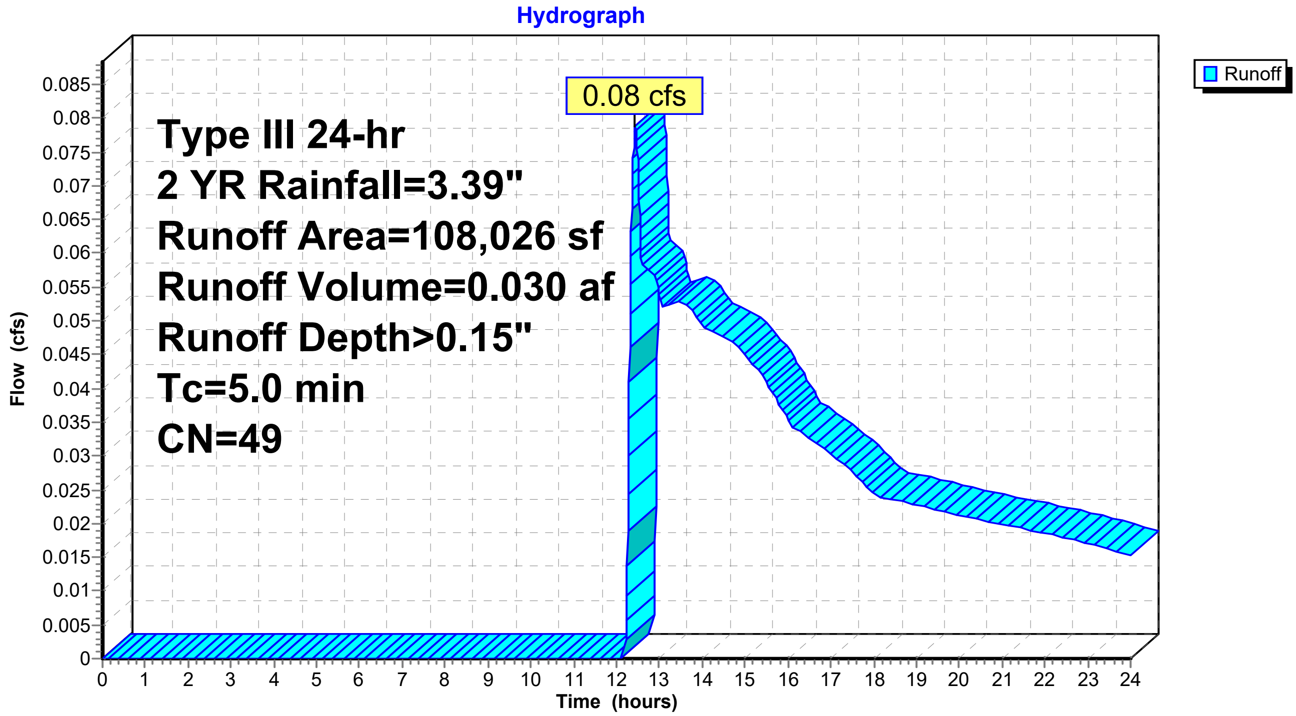
Runoff = 0.08 cfs @ 12.44 hrs, Volume= 0.030 af, Depth> 0.15"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 2 YR Rainfall=3.39"

Area (sf)	CN	Description
74,064	39	>75% Grass cover, Good, HSG A
13,150	30	Woods, Good, HSG A
20,812	98	Water Surface, 0% imp, HSG A
0	98	Paved parking, HSG A
108,026	49	Weighted Average
108,026		100.00% Pervious Area

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

Subcatchment P12: PR-DA12



Summary for Subcatchment P13: PR-DA-13

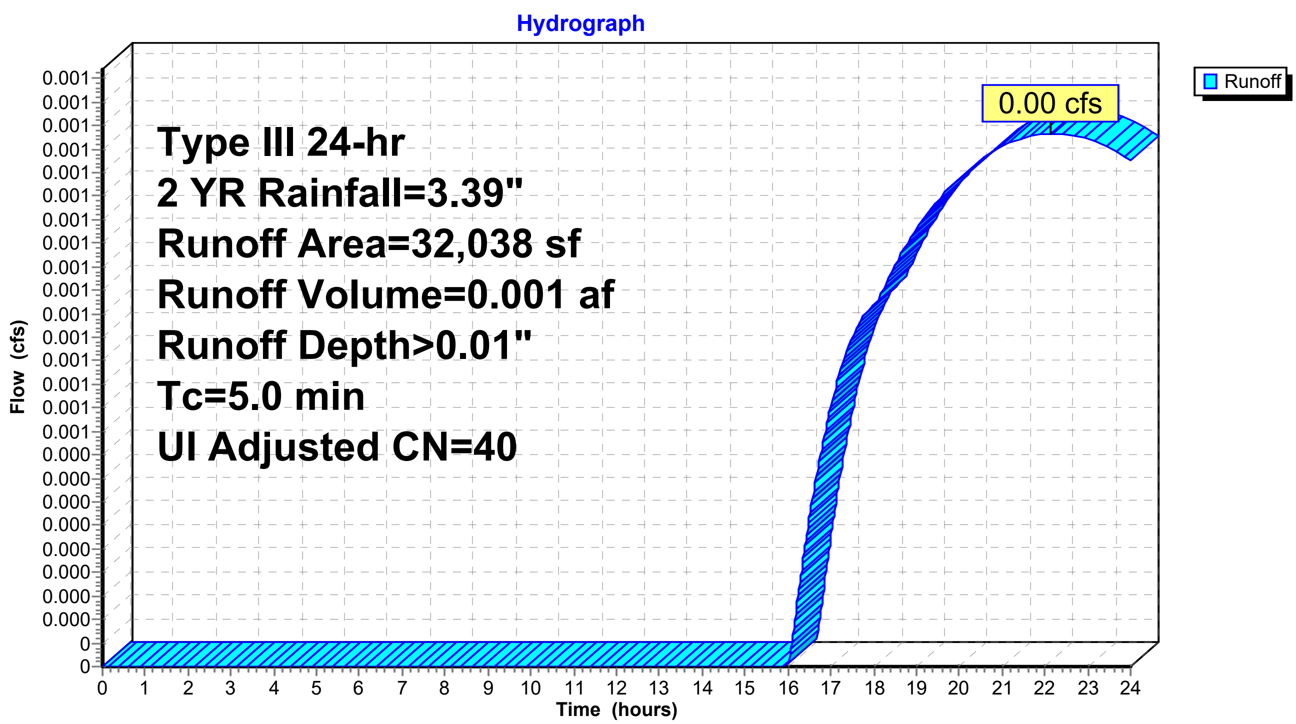
Runoff = 0.00 cfs @ 22.15 hrs, Volume= 0.001 af, Depth> 0.01"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 2 YR Rainfall=3.39"

	Area (sf)	CN	Adj	Description
	30,218	39		>75% Grass cover, Good, HSG A
*	1,270	98		Unconnected Impervious, HSG A
	550	30		Woods, Good, HSG A
	32,038	41	40	Weighted Average, UI Adjusted
	30,768			96.04% Pervious Area
	1,270			3.96% Impervious Area
	1,270			100.00% Unconnected

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

Subcatchment P13: PR-DA-13



Summary for Subcatchment P14: PR-DA-14

[45] Hint: Runoff=Zero

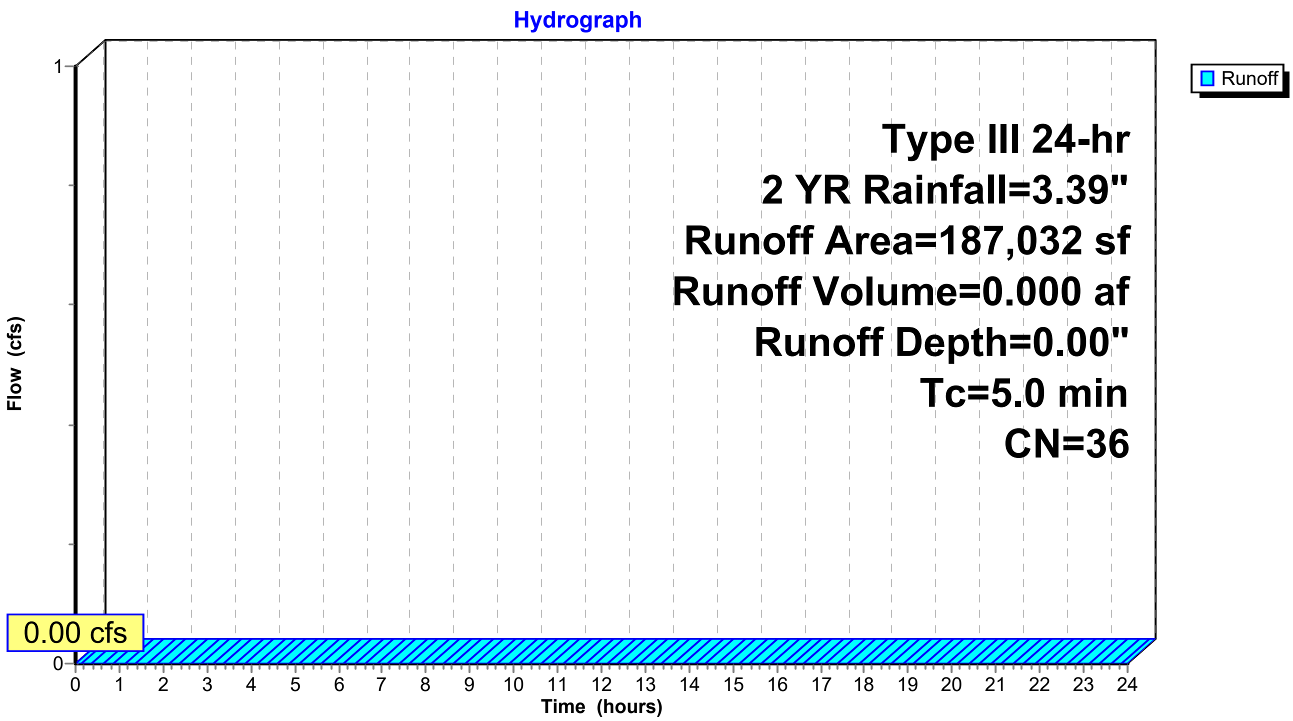
Runoff = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Depth= 0.00"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 2 YR Rainfall=3.39"

Area (sf)	CN	Description
124,219	39	>75% Grass cover, Good, HSG A
62,813	30	Woods, Good, HSG A
187,032	36	Weighted Average
187,032		100.00% Pervious Area

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

Subcatchment P14: PR-DA-14



Summary for Subcatchment P1a: PR-DA-1a

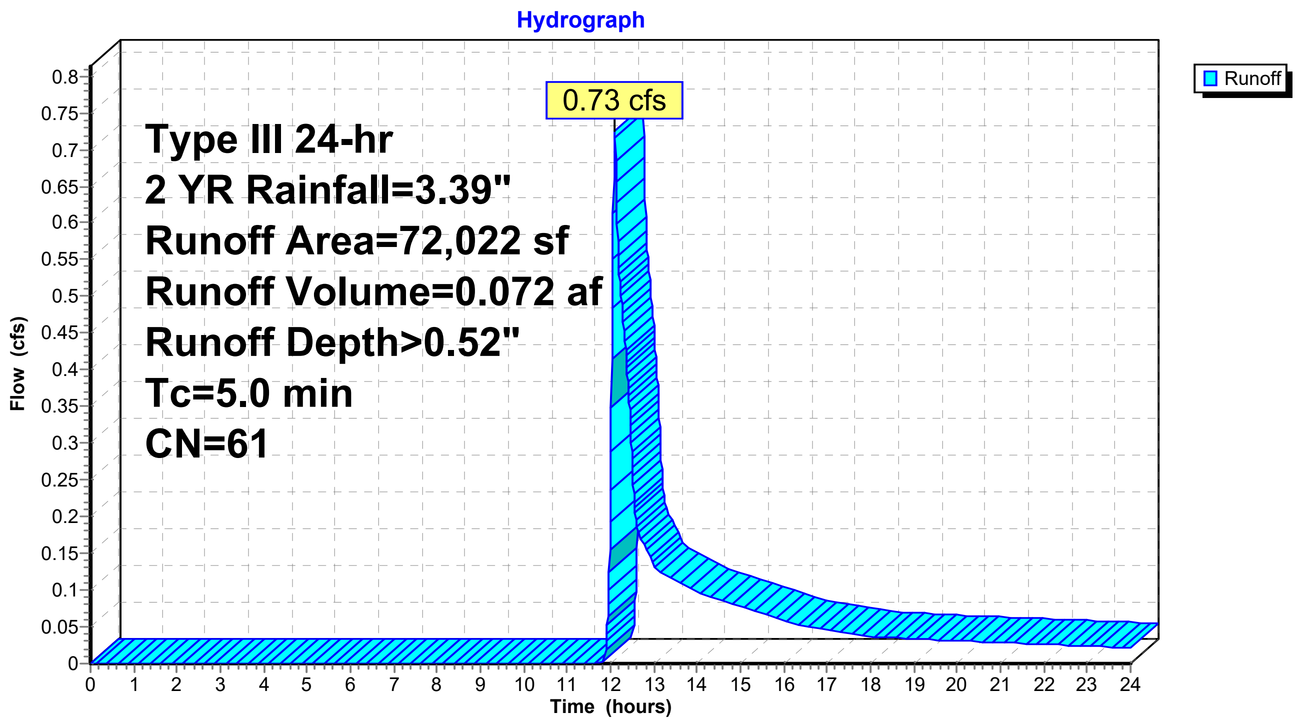
Runoff = 0.73 cfs @ 12.10 hrs, Volume= 0.072 af, Depth> 0.52"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 2 YR Rainfall=3.39"

Area (sf)	CN	Description
44,791	39	>75% Grass cover, Good, HSG A
20,190	98	Paved parking, HSG A
7,041	98	Water Surface, 0% imp, HSG A
72,022	61	Weighted Average
51,832		71.97% Pervious Area
20,190		28.03% Impervious Area

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

Subcatchment P1a: PR-DA-1a



Summary for Subcatchment P1b: PR-DA-1b

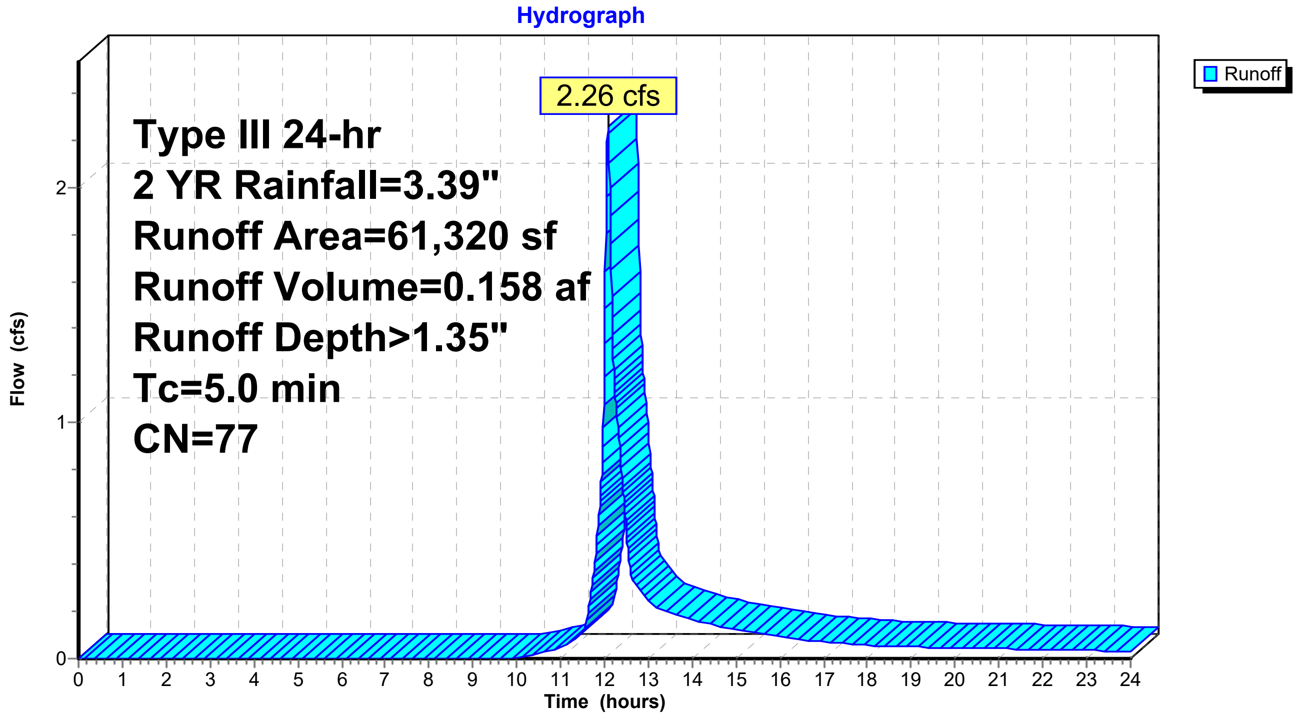
Runoff = 2.26 cfs @ 12.08 hrs, Volume= 0.158 af, Depth> 1.35"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 2 YR Rainfall=3.39"

	Area (sf)	CN	Description
	21,600	39	>75% Grass cover, Good, HSG A
*	39,720	98	Unconnected Impervious, HSG A
	61,320	77	Weighted Average
	21,600		35.23% Pervious Area
	39,720		64.77% Impervious Area
	39,720		100.00% Unconnected

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

Subcatchment P1b: PR-DA-1b



Summary for Subcatchment P2: PR-DA-2

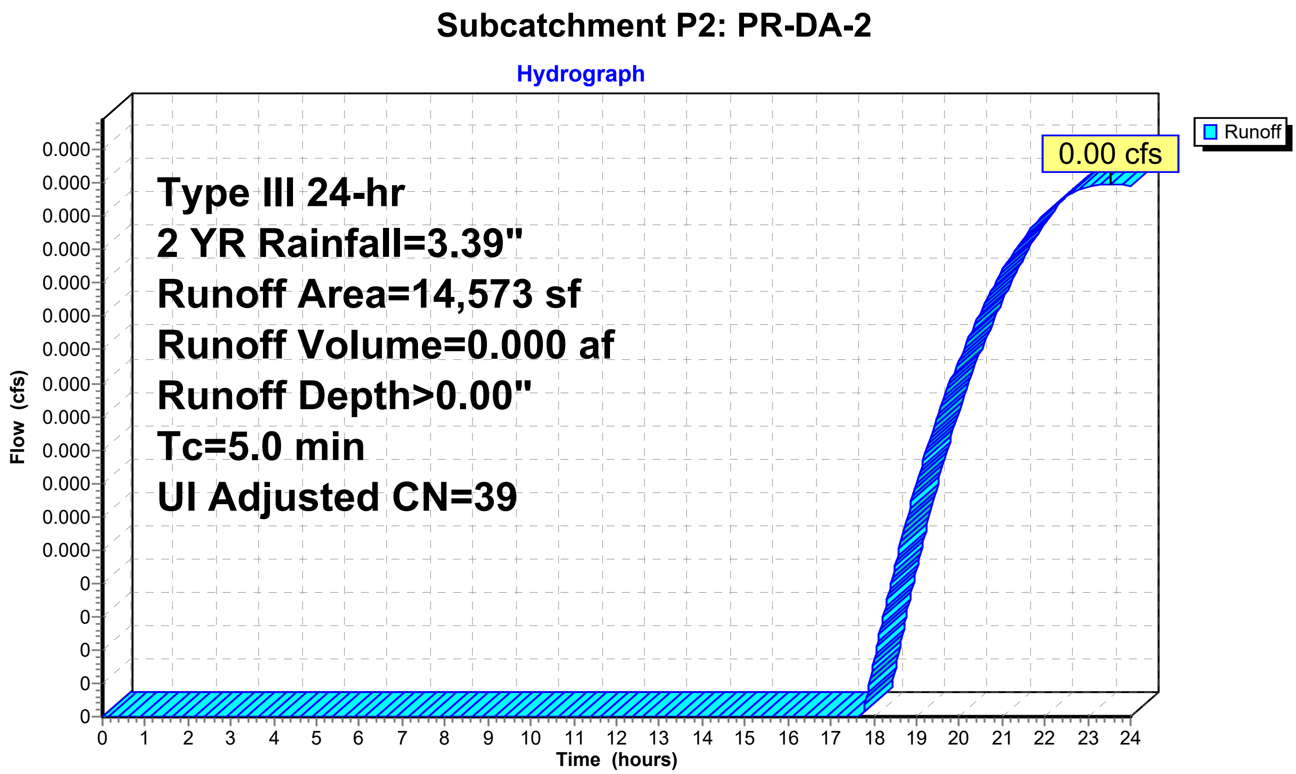
[73] Warning: Peak may fall outside time span

Runoff = 0.00 cfs @ 23.55 hrs, Volume= 0.000 af, Depth> 0.00"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 2 YR Rainfall=3.39"

	Area (sf)	CN	Adj	Description
	14,431	39		>75% Grass cover, Good, HSG A
*	142	98		Unconnected Impervious, HSG A
	14,573	40	39	Weighted Average, UI Adjusted
	14,431			99.03% Pervious Area
	142			0.97% Impervious Area
	142			100.00% Unconnected

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



Summary for Subcatchment P3: PR-DA-3

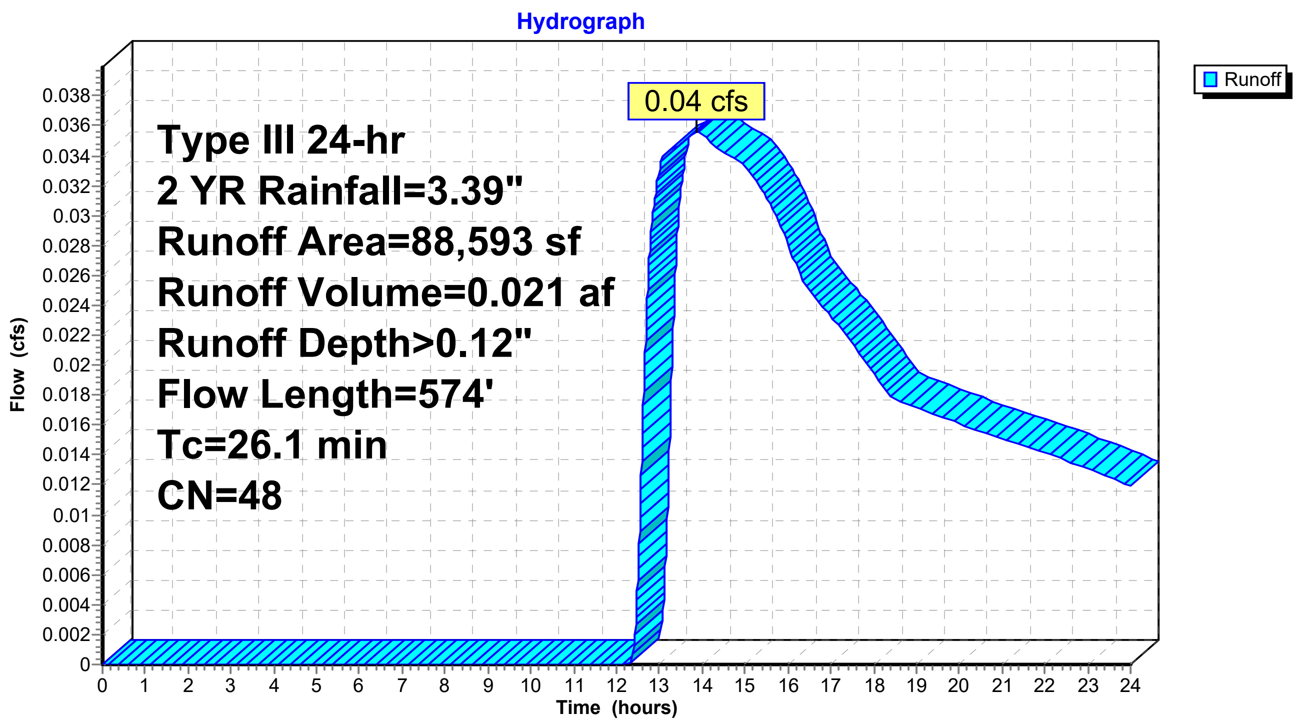
Runoff = 0.04 cfs @ 13.89 hrs, Volume= 0.021 af, Depth> 0.12"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 2 YR Rainfall=3.39"

Area (sf)	CN	Description
72,419	39	>75% Grass cover, Good, HSG A
7,200	76	Gravel roads, HSG A
8,974	98	Water Surface, 0% imp, HSG A
88,593	48	Weighted Average
88,593		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.2	50	0.0380	0.20		**Sheet Flow, A-B** Grass: Short n= 0.150 P2= 3.40"
20.8	400	0.0021	0.32		**Shallow Concentrated Flow, B-C** Short Grass Pasture Kv= 7.0 fps
0.5	74	0.0270	2.65		**Shallow Concentrated Flow, C-D** Unpaved Kv= 16.1 fps
0.6	50	0.0400	1.40		**Shallow Concentrated Flow, D-E** Short Grass Pasture Kv= 7.0 fps
26.1	574	Total			

Subcatchment P3: PR-DA-3



Summary for Subcatchment P4: PR-DA4

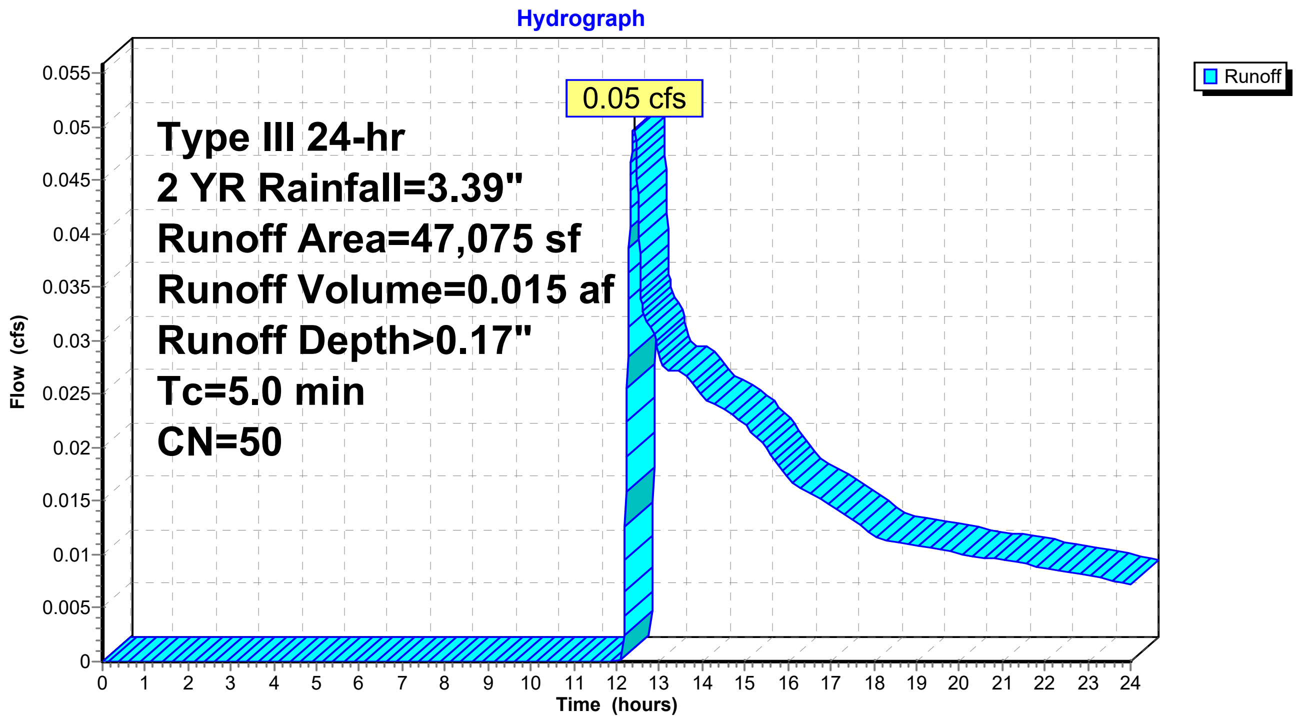
Runoff = 0.05 cfs @ 12.41 hrs, Volume= 0.015 af, Depth> 0.17"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 2 YR Rainfall=3.39"

	Area (sf)	CN	Description
	38,011	39	>75% Grass cover, Good, HSG A
*	500	98	Unconnected impervious, HSG A
	8,564	98	Stormwater Basin; Water Surface, HSG A
	47,075	50	Weighted Average
	38,011		80.75% Pervious Area
	9,064		19.25% Impervious Area
	500		5.52% Unconnected

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

Subcatchment P4: PR-DA4



Summary for Subcatchment P5: PR-DA5

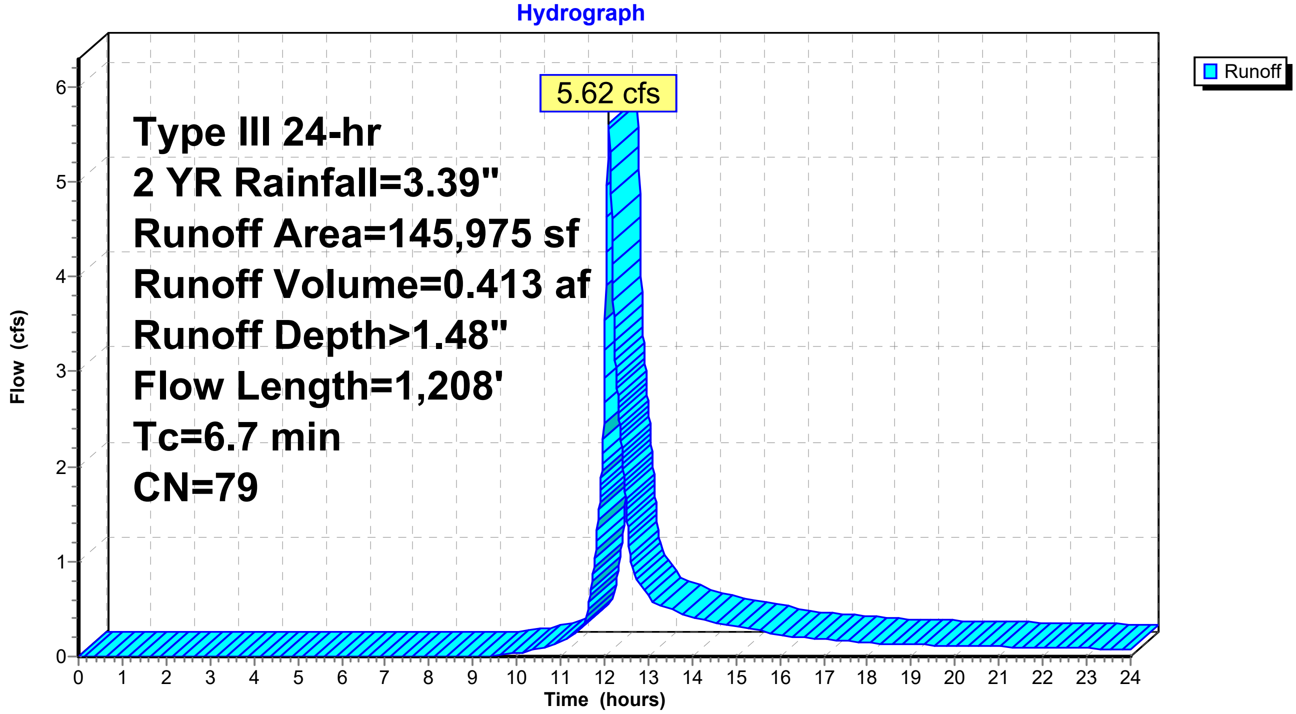
Runoff = 5.62 cfs @ 12.10 hrs, Volume= 0.413 af, Depth> 1.48"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 2 YR Rainfall=3.39"

Area (sf)	CN	Description
46,436	39	>75% Grass cover, Good, HSG A
98,201	98	Paved parking, HSG A
1,338	98	Unconnected roofs, HSG A
145,975	79	Weighted Average
46,436		31.81% Pervious Area
99,539		68.19% Impervious Area
1,338		1.34% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.9	50	0.0100	0.94		**Sheet Flow, A-B** Smooth surfaces n= 0.011 P2= 3.40"
1.1	130	0.0100	2.03		**Shallow Concentrated Flow, B-C** Paved Kv= 20.3 fps
1.3	243	0.0050	3.21	2.52	**Pipe Channel, C-D** 12.0" Round Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.013 Corrugated PE, smooth interior
2.4	525	0.0050	3.72	4.57	**Pipe Channel, D-E** 15.0" Round Area= 1.2 sf Perim= 3.9' r= 0.31' n= 0.013 Corrugated PE, smooth interior
1.0	260	0.0050	4.20	7.43	**Pipe Channel, E-F** 18.0" Round Area= 1.8 sf Perim= 4.7' r= 0.38' n= 0.013 Corrugated PE, smooth interior
6.7	1,208	Total			

Subcatchment P5: PR-DA5



Summary for Subcatchment P6: PR-DA-6

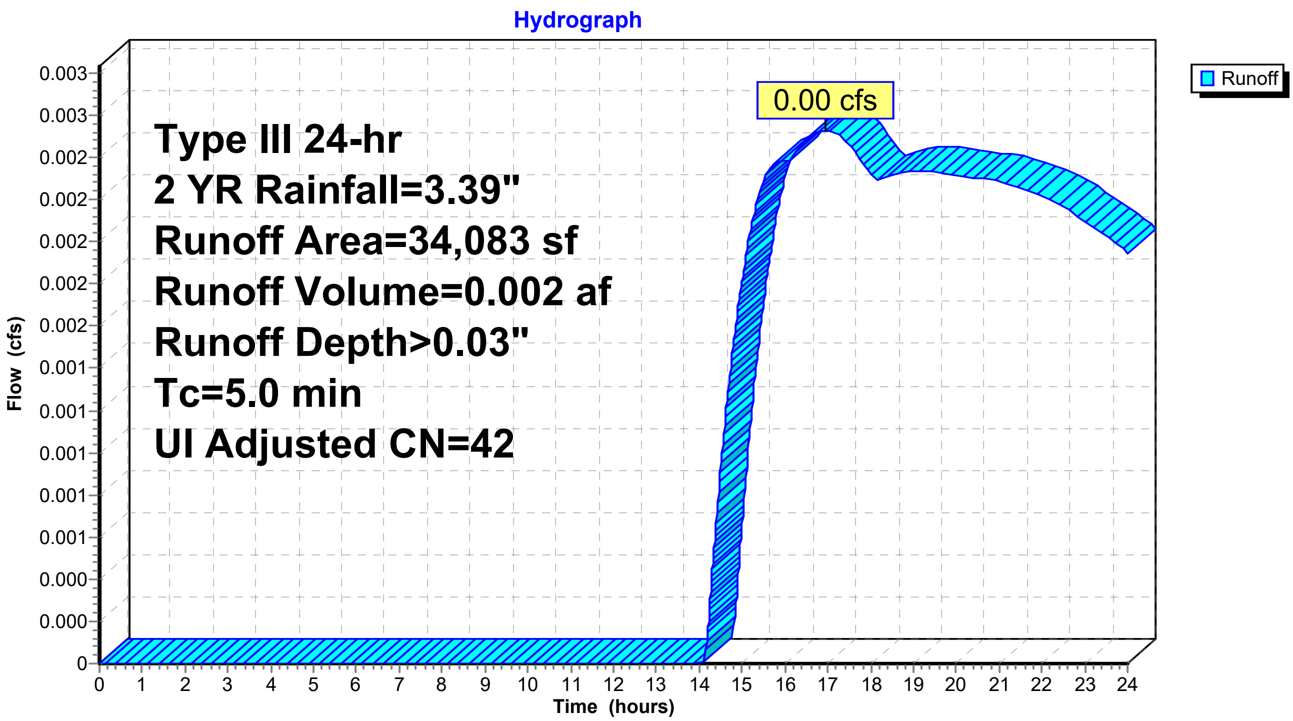
Runoff = 0.00 cfs @ 16.94 hrs, Volume= 0.002 af, Depth> 0.03"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 2 YR Rainfall=3.39"

	Area (sf)	CN	Adj	Description
	30,303	39		>75% Grass cover, Good, HSG A
*	3,780	98		Unconnected Impervious, HSG A
	34,083	46	42	Weighted Average, UI Adjusted
	30,303			88.91% Pervious Area
	3,780			11.09% Impervious Area
	3,780			100.00% Unconnected

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

Subcatchment P6: PR-DA-6



Summary for Subcatchment P7: PR-DA-7

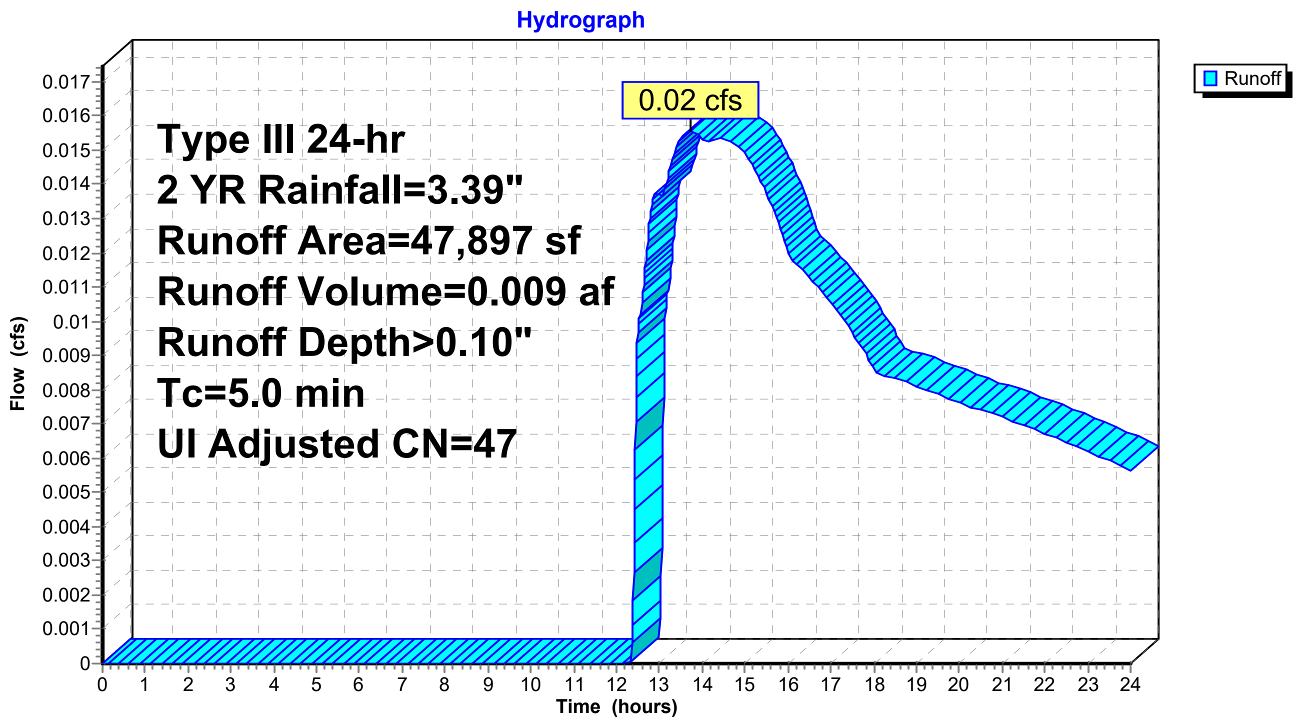
Runoff = 0.02 cfs @ 13.75 hrs, Volume= 0.009 af, Depth> 0.10"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 2 YR Rainfall=3.39"

	Area (sf)	CN	Adj	Description
	35,185	39		>75% Grass cover, Good, HSG A
*	12,712	98		Unconnected Impervious, HSG A
	47,897	55	47	Weighted Average, UI Adjusted
	35,185			73.46% Pervious Area
	12,712			26.54% Impervious Area
	12,712			100.00% Unconnected

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

Subcatchment P7: PR-DA-7



Summary for Subcatchment P8a: PR-DA8a

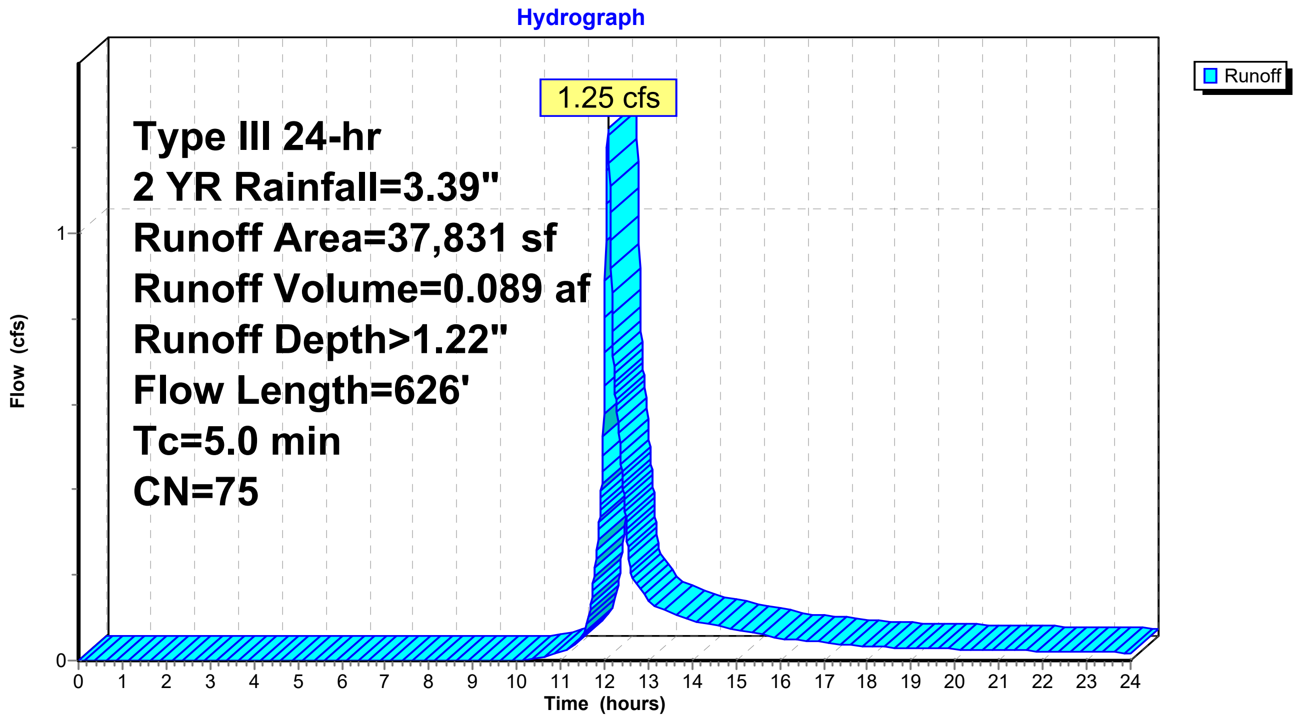
Runoff = 1.25 cfs @ 12.08 hrs, Volume= 0.089 af, Depth> 1.22"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 2 YR Rainfall=3.39"

Area (sf)	CN	Description
14,737	39	>75% Grass cover, Good, HSG A
22,874	98	Paved parking, HSG A
220	98	Roofs, HSG A
37,831	75	Weighted Average
14,737		38.95% Pervious Area
23,094		61.05% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.9	50	0.0100	0.94		**Sheet Flow, A-B** Smooth surfaces n= 0.011 P2= 3.40"
1.1	137	0.0100	2.03		**Shallow Concentrated Flow, B-C** Paved Kv= 20.3 fps
0.2	48	0.0050	3.21	2.52	**Pipe Channel, C-D** 12.0" Round Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.013 Corrugated PE, smooth interior
1.1	241	0.0050	3.72	4.57	**Pipe Channel, D-E** 15.0" Round Area= 1.2 sf Perim= 3.9' r= 0.31' n= 0.013 Corrugated PE, smooth interior
0.5	150	0.0060	4.60	8.14	**Pipe Channel, E-F** 18.0" Round Area= 1.8 sf Perim= 4.7' r= 0.38' n= 0.013 Corrugated PE, smooth interior
1.2					**Direct Entry, Added Tc**
5.0	626	Total			

Subcatchment P8a: PR-DA8a



Summary for Subcatchment P8b: PR-DA8b

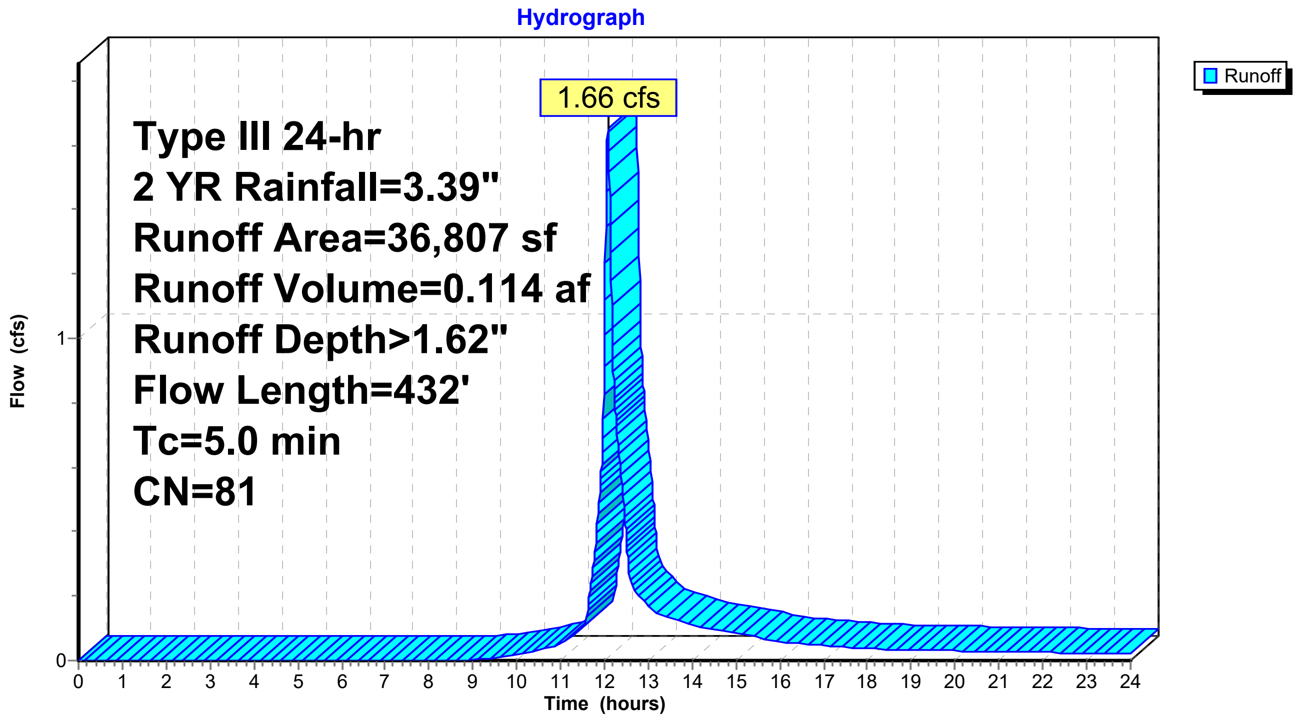
Runoff = 1.66 cfs @ 12.08 hrs, Volume= 0.114 af, Depth> 1.62"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 2 YR Rainfall=3.39"

Area (sf)	CN	Description
10,671	39	>75% Grass cover, Good, HSG A
25,176	98	Paved parking, HSG A
960	98	Roofs, HSG A
36,807	81	Weighted Average
10,671		28.99% Pervious Area
26,136		71.01% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.4	86	0.0100	1.04		**Sheet Flow, A-B**
					Smooth surfaces n= 0.011 P2= 3.40"
0.7	196	0.0100	4.54	3.56	**Pipe Channel, B-C**
					12.0" Round Area= 0.8 sf Perim= 3.1' r= 0.25'
					n= 0.013 Corrugated PE, smooth interior
0.5	150	0.0060	4.60	8.14	**Pipe Channel, C-D**
					18.0" Round Area= 1.8 sf Perim= 4.7' r= 0.38'
					n= 0.013 Corrugated PE, smooth interior
2.4					**Direct Entry, Added Tc**
5.0	432	Total			

Subcatchment P8b: PR-DA8b



Summary for Subcatchment P9: PR-DA9

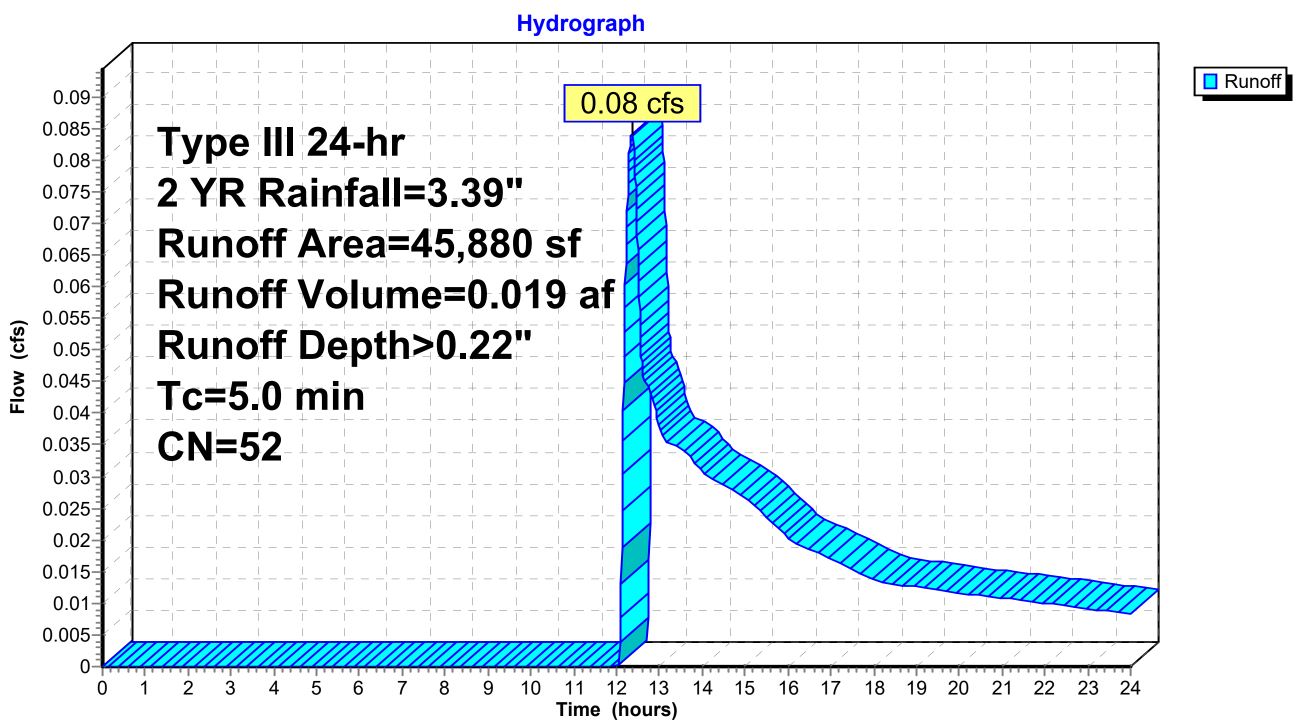
Runoff = 0.08 cfs @ 12.35 hrs, Volume= 0.019 af, Depth> 0.22"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 2 YR Rainfall=3.39"

	Area (sf)	CN	Description
	35,890	39	>75% Grass cover, Good, HSG A
*	380	98	Unconnected impervious, HSG A
	9,610	98	Stormwater Basin; Water Surface, HSG A
	45,880	52	Weighted Average
	35,890		78.23% Pervious Area
	9,990		21.77% Impervious Area
	380		3.80% Unconnected

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

Subcatchment P9: PR-DA9



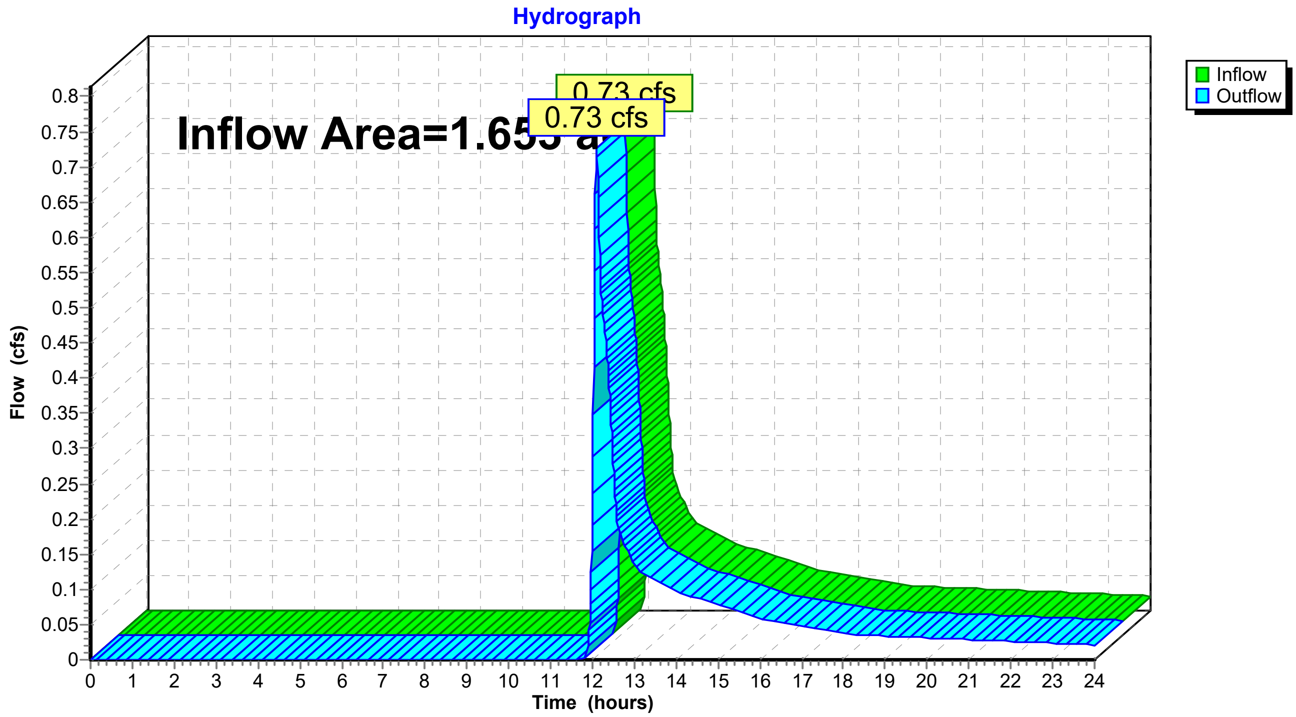
Summary for Reach DP-1: DP-1

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 1.653 ac, 28.03% Impervious, Inflow Depth > 0.52" for 2 YR event
Inflow = 0.73 cfs @ 12.10 hrs, Volume= 0.072 af
Outflow = 0.73 cfs @ 12.10 hrs, Volume= 0.072 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs

Reach DP-1: DP-1



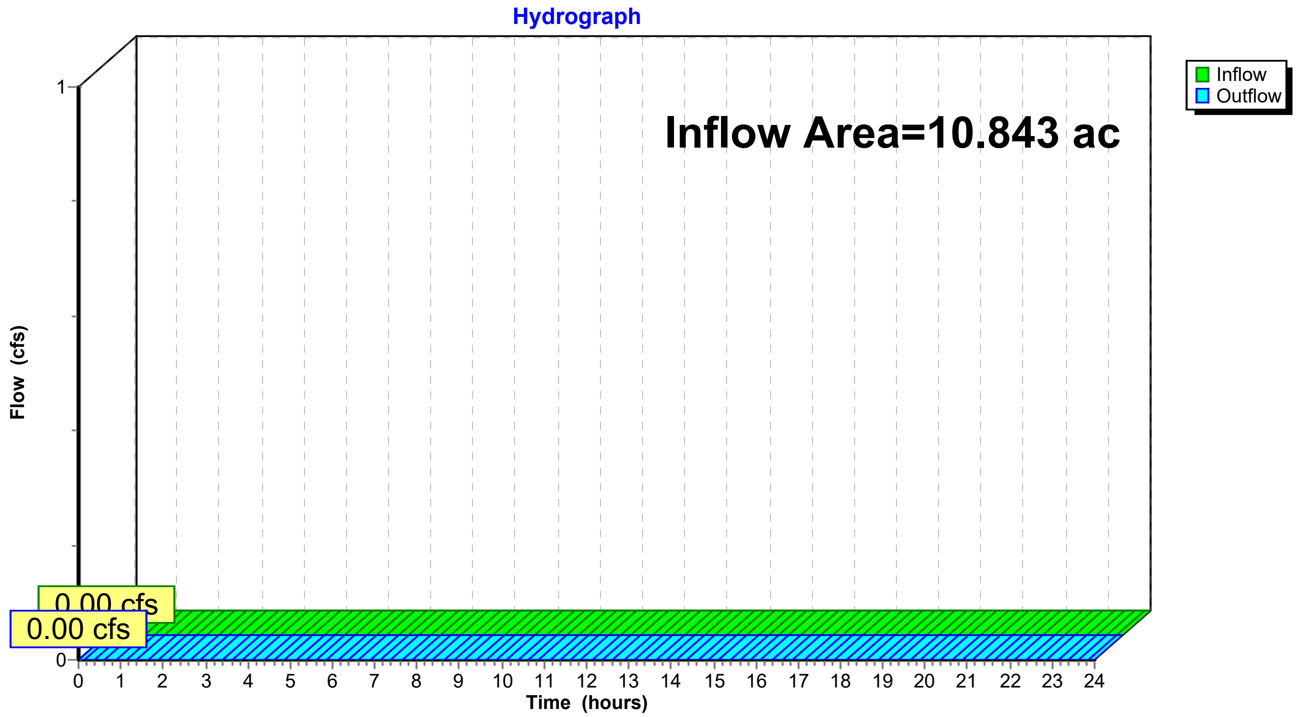
Summary for Reach DP-2: DP-2 (JOSHUA'S BROOK)

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 10.843 ac, 28.77% Impervious, Inflow Depth = 0.00" for 2 YR event
Inflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs

Reach DP-2: DP-2 (JOSHUA'S BROOK)



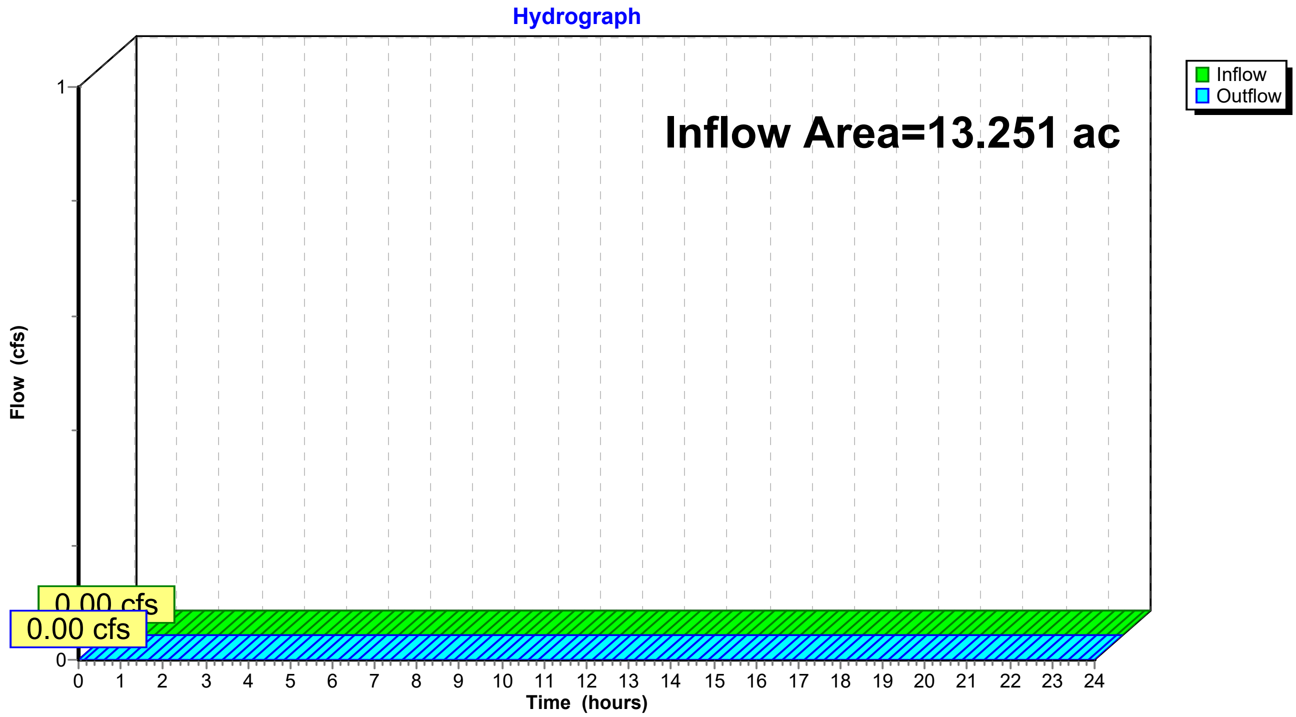
Summary for Reach DP-3: DP-3 (STEWART'S CREEK)

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 13.251 ac, 19.02% Impervious, Inflow Depth = 0.00" for 2 YR event
Inflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs

Reach DP-3: DP-3 (STEWART'S CREEK)



Summary for Pond 41P: SC-740

Inflow Area = 0.115 ac,100.00% Impervious, Inflow Depth > 3.15" for 2 YR event
Inflow = 0.39 cfs @ 12.07 hrs, Volume= 0.030 af
Outflow = 0.09 cfs @ 11.75 hrs, Volume= 0.030 af, Atten= 76%, Lag= 0.0 min
Discarded = 0.09 cfs @ 11.75 hrs, Volume= 0.030 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Peak Elev= 37.40' @ 12.44 hrs Surf.Area= 492 sf Storage= 253 cf

Plug-Flow detention time= 12.7 min calculated for 0.030 af (100% of inflow)
Center-of-Mass det. time= 12.6 min (766.4 - 753.8)

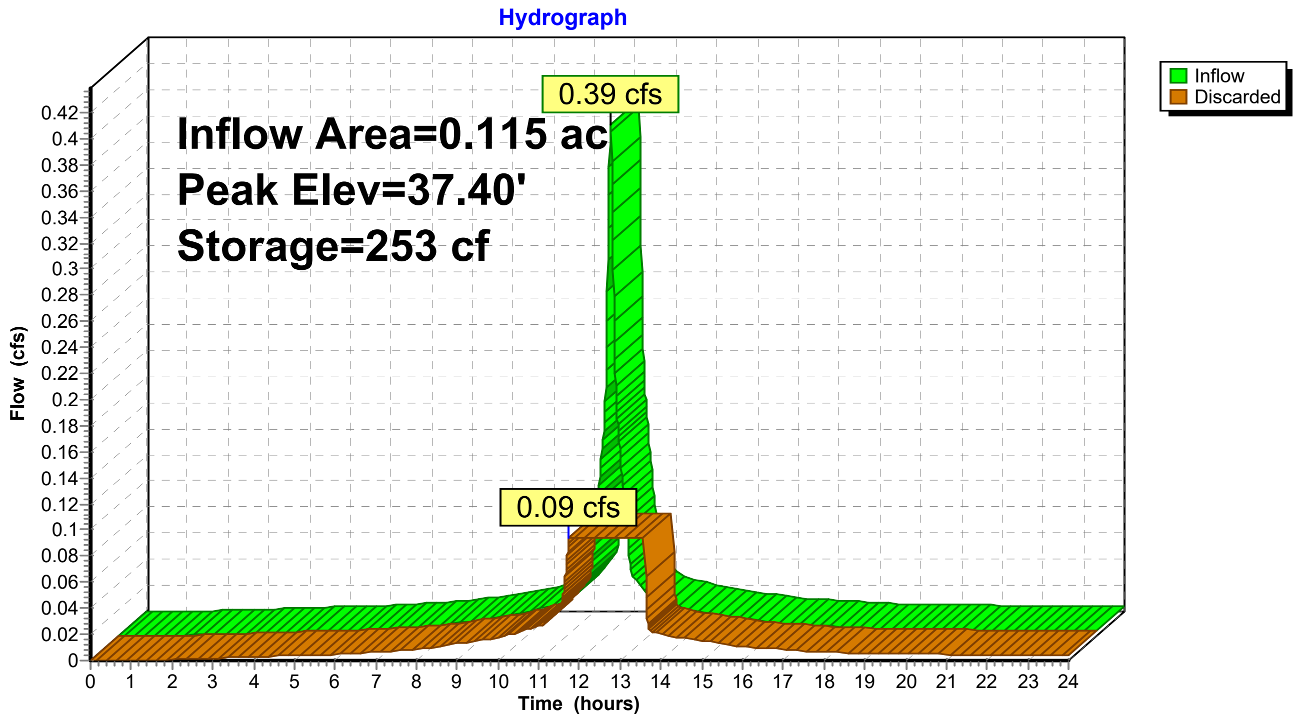
Volume	Invert	Avail.Storage	Storage Description
#1	36.50'	468 cf	**Stone (Prismatic)** Listed below (Recalc) 1,722 cf Overall - 551 cf Embedded = 1,171 cf x 40.0% Voids
#2	37.00'	551 cf	**ADS_StormTech SC-740 +Cap** x 12 Inside #1 Effective Size= 44.6"W x 30.0"H => 6.45 sf x 7.12'L = 45.9 cf Overall Size= 51.0"W x 30.0"H x 7.56'L with 0.44' Overlap 2 Rows of 6 Chambers
		1,020 cf	Total Available Storage

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
36.50	492	0	0
40.00	492	1,722	1,722

Device	Routing	Invert	Outlet Devices
#1	Discarded	36.50'	**8.270 in/hr Exfiltration over Surface area**

Discarded OutFlow Max=0.09 cfs @ 11.75 hrs HW=36.54' (Free Discharge)
└─**1=Exfiltration** (Exfiltration Controls 0.09 cfs)

Pond 41P: SC-740



Summary for Pond 43P: SC-740

Inflow Area = 0.782 ac, 11.09% Impervious, Inflow Depth > 0.03" for 2 YR event
Inflow = 0.00 cfs @ 16.94 hrs, Volume= 0.002 af
Outflow = 0.00 cfs @ 16.96 hrs, Volume= 0.002 af, Atten= 0%, Lag= 1.2 min
Discarded = 0.00 cfs @ 16.96 hrs, Volume= 0.002 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Peak Elev= 19.50' @ 16.96 hrs Surf.Area= 256 sf Storage= 0 cf

Plug-Flow detention time= 2.1 min calculated for 0.002 af (100% of inflow)
Center-of-Mass det. time= 1.2 min (1,153.7 - 1,152.5)

Volume	Invert	Avail.Storage	Storage Description
#1	19.50'	248 cf	**Stone (Prismatic)** Listed below (Recalc) 896 cf Overall - 276 cf Embedded = 620 cf x 40.0% Voids
#2	20.00'	276 cf	**ADS_StormTech SC-740 +Cap** x 6 Inside #1 Effective Size= 44.6"W x 30.0"H => 6.45 sf x 7.12'L = 45.9 cf Overall Size= 51.0"W x 30.0"H x 7.56'L with 0.44' Overlap 2 Rows of 3 Chambers
#3	24.50'	3,830 cf	**Surface Ponding (Prismatic)** Listed below (Recalc)
		4,353 cf	Total Available Storage

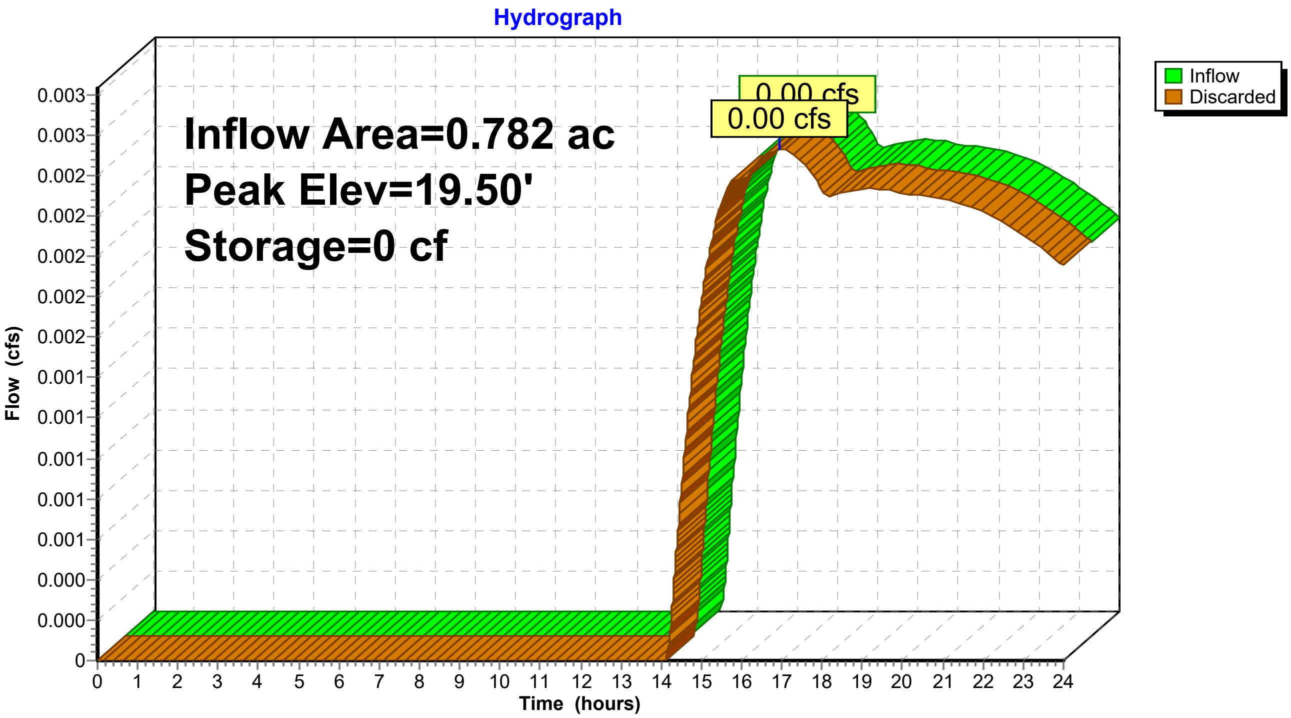
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
19.50	256	0	0
23.00	256	896	896

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
24.50	4	0	0
25.00	3,057	765	765
25.50	9,200	3,064	3,830

Device	Routing	Invert	Outlet Devices
#1	Discarded	19.50'	**8.270 in/hr Exfiltration over Surface area**

Discarded OutFlow Max=0.05 cfs @ 16.96 hrs HW=19.50' (Free Discharge)
└─**1=Exfiltration** (Exfiltration Controls 0.05 cfs)

Pond 43P: SC-740



Summary for Pond 45P: SC-740

Inflow Area = 1.100 ac, 26.54% Impervious, Inflow Depth > 0.10" for 2 YR event
Inflow = 0.02 cfs @ 13.75 hrs, Volume= 0.009 af
Outflow = 0.02 cfs @ 13.78 hrs, Volume= 0.009 af, Atten= 0%, Lag= 2.2 min
Discarded = 0.02 cfs @ 13.78 hrs, Volume= 0.009 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Peak Elev= 19.51' @ 13.78 hrs Surf.Area= 650 sf Storage= 2 cf

Plug-Flow detention time= 2.5 min calculated for 0.009 af (100% of inflow)
Center-of-Mass det. time= 1.7 min (1,033.3 - 1,031.6)

Volume	Invert	Avail.Storage	Storage Description
#1	19.50'	616 cf	**Stone (Prismatic)** Listed below (Recalc) 2,275 cf Overall - 735 cf Embedded = 1,540 cf x 40.0% Voids
#2	20.00'	735 cf	**ADS_StormTech SC-740 +Cap** x 16 Inside #1 Effective Size= 44.6"W x 30.0"H => 6.45 sf x 7.12'L = 45.9 cf Overall Size= 51.0"W x 30.0"H x 7.56'L with 0.44' Overlap 2 Rows of 8 Chambers
#3	25.50'	4,609 cf	**Surface Ponding (Prismatic)** Listed below (Recalc)
		5,960 cf	Total Available Storage

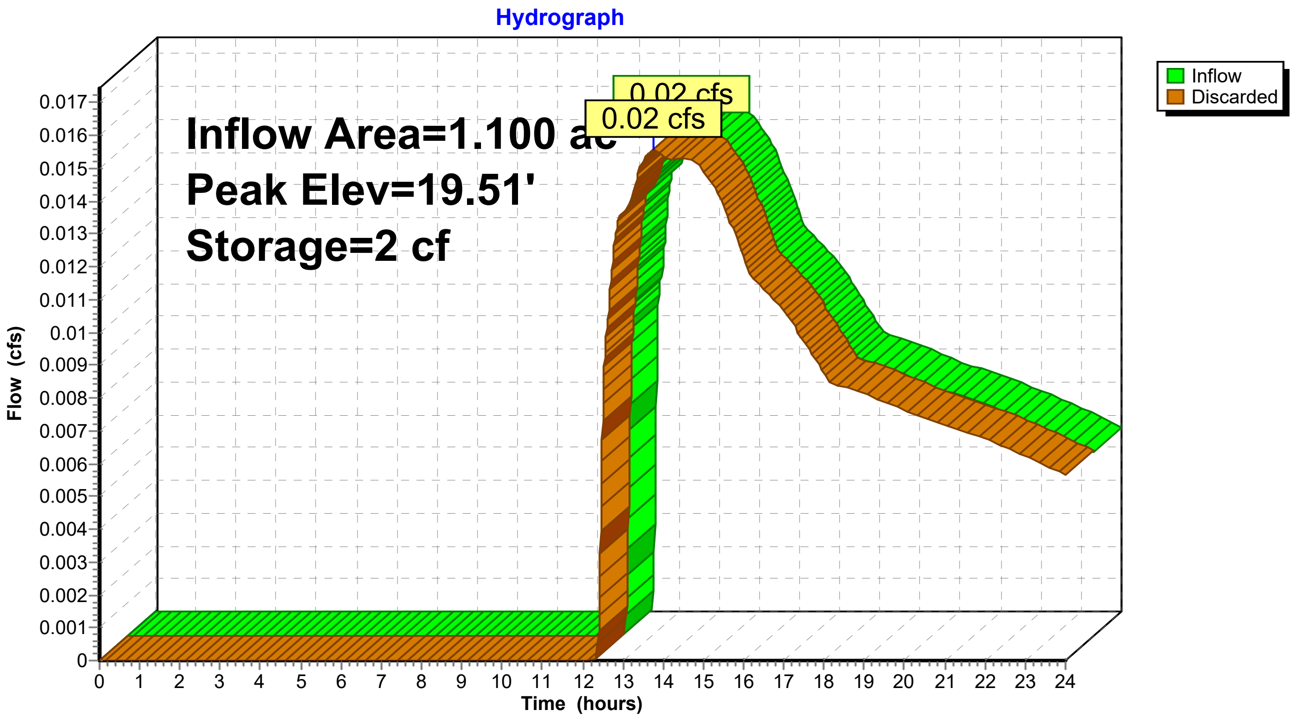
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
19.50	650	0	0
23.00	650	2,275	2,275

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
25.50	4	0	0
26.00	2,742	687	687
26.80	7,065	3,923	4,609

Device	Routing	Invert	Outlet Devices
#1	Discarded	19.50'	**8.270 in/hr Exfiltration over Surface area**

Discarded OutFlow Max=0.12 cfs @ 13.78 hrs HW=19.51' (Free Discharge)
└─**1=Exfiltration** (Exfiltration Controls 0.12 cfs)

Pond 45P: SC-740



Summary for Pond B-1: Basin 1

Inflow Area = 5.195 ac, 60.05% Impervious, Inflow Depth > 1.16" for 2 YR event
Inflow = 7.28 cfs @ 12.10 hrs, Volume= 0.504 af
Outflow = 0.60 cfs @ 13.61 hrs, Volume= 0.502 af, Atten= 92%, Lag= 90.8 min
Discarded = 0.60 cfs @ 13.61 hrs, Volume= 0.502 af
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Peak Elev= 11.54' @ 13.61 hrs Surf.Area= 10,743 sf Storage= 9,795 cf

Plug-Flow detention time= 171.4 min calculated for 0.502 af (100% of inflow)
Center-of-Mass det. time= 169.5 min (1,004.9 - 835.4)

Volume	Invert	Avail.Storage	Storage Description
#1	10.50'	61,135 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

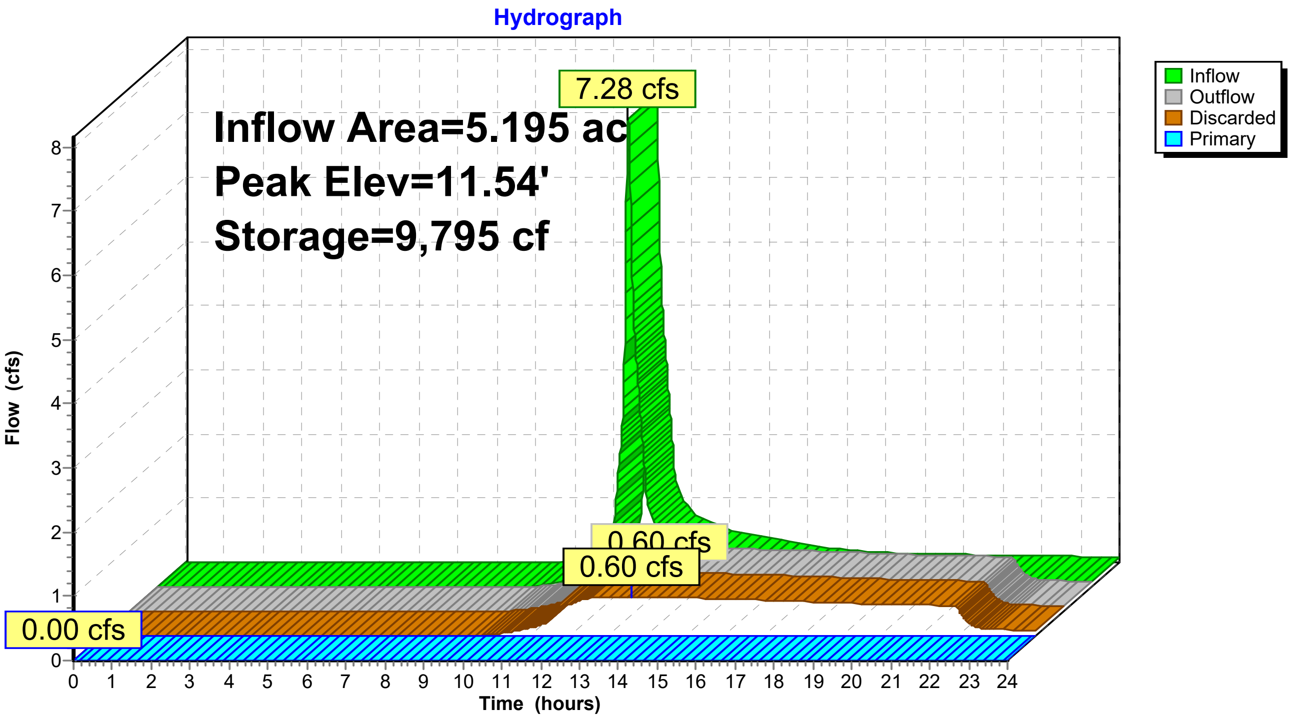
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
10.50	8,346	0	0
11.00	9,153	4,375	4,375
12.00	12,072	10,613	14,987
13.00	14,291	13,182	28,169
14.00	16,502	15,397	43,565
15.00	18,637	17,570	61,135

Device	Routing	Invert	Outlet Devices
#1	Discarded	10.50'	**2.410 in/hr Exfiltration over Surface area**
#2	Primary	15.00'	**45.0 deg x 15.0' long Sharp-Crested Vee/Trap Weir** Cv= 2.56 (C= 3.20)

Discarded OutFlow Max=0.60 cfs @ 13.61 hrs HW=11.54' (Free Discharge)
└─**1=Exfiltration** (Exfiltration Controls 0.60 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=10.50' (Free Discharge)
└─**2=Sharp-Crested Vee/Trap Weir** (Controls 0.00 cfs)

Pond B-1: Basin 1



Summary for Pond B-2: Basin 2

Inflow Area = 4.443 ac, 56.72% Impervious, Inflow Depth > 0.78" for 2 YR event
Inflow = 4.41 cfs @ 12.09 hrs, Volume= 0.288 af
Outflow = 0.49 cfs @ 13.03 hrs, Volume= 0.287 af, Atten= 89%, Lag= 56.5 min
Discarded = 0.49 cfs @ 13.03 hrs, Volume= 0.287 af
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Peak Elev= 16.12' @ 13.03 hrs Surf.Area= 8,742 sf Storage= 5,210 cf

Plug-Flow detention time= 97.5 min calculated for 0.287 af (100% of inflow)
Center-of-Mass det. time= 95.9 min (924.8 - 828.9)

Volume	Invert	Avail.Storage	Storage Description
#1	15.50'	37,352 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc)

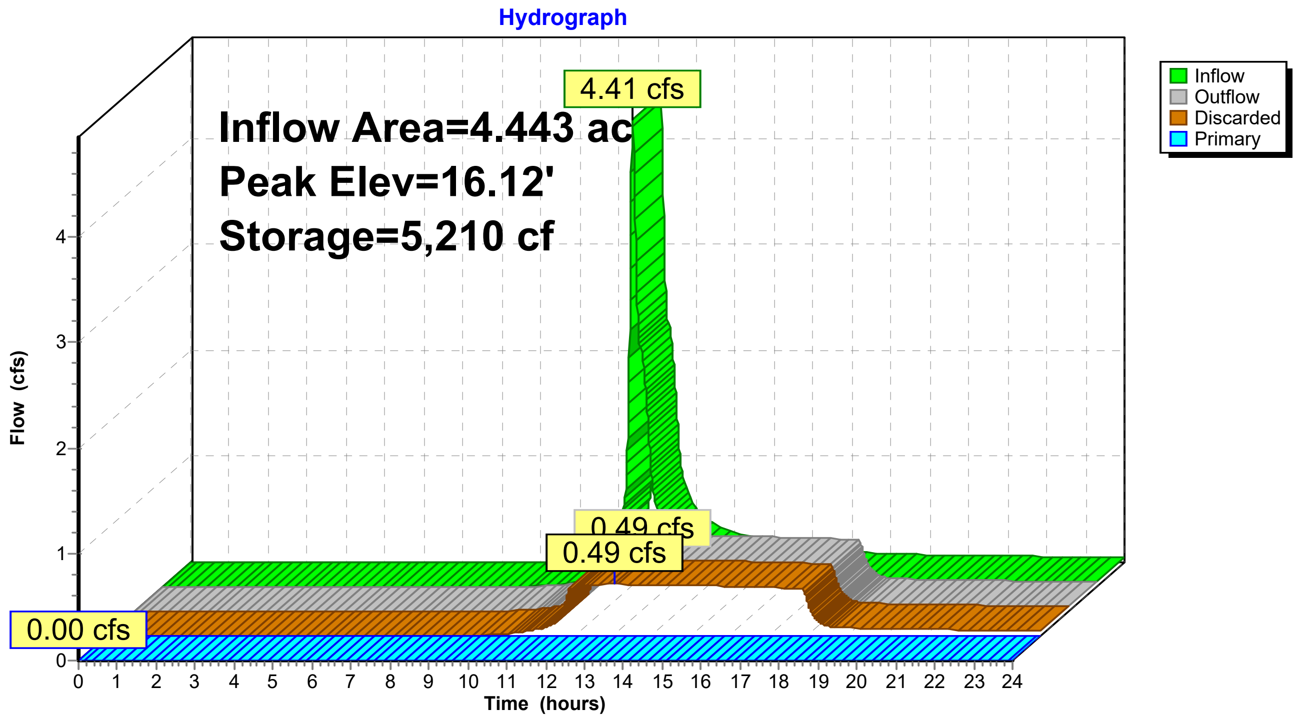
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
15.50	7,983	0	0
16.00	8,588	4,143	4,143
17.00	9,841	9,215	13,357
18.00	12,169	11,005	24,362
19.00	13,810	12,990	37,352

Device	Routing	Invert	Outlet Devices
#1	Discarded	15.50'	**2.410 in/hr Exfiltration over Surface area**
#2	Primary	19.50'	**45.0 deg x 15.0' long Sharp-Crested Vee/Trap Weir** Cv= 2.56 (C= 3.20)

Discarded OutFlow Max=0.49 cfs @ 13.03 hrs HW=16.12' (Free Discharge)
└─**1=Exfiltration** (Exfiltration Controls 0.49 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=15.50' (Free Discharge)
└─**2=Sharp-Crested Vee/Trap Weir** (Controls 0.00 cfs)

Pond B-2: Basin 2



Summary for Pond BIO1: BIO 1

Inflow Area = 0.791 ac, 76.51% Impervious, Inflow Depth > 1.84" for 2 YR event
Inflow = 1.77 cfs @ 12.08 hrs, Volume= 0.121 af
Outflow = 1.71 cfs @ 12.10 hrs, Volume= 0.120 af, Atten= 3%, Lag= 1.2 min
Discarded = 0.06 cfs @ 12.10 hrs, Volume= 0.048 af
Primary = 1.66 cfs @ 12.10 hrs, Volume= 0.072 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Peak Elev= 19.69' @ 12.10 hrs Surf.Area= 999 sf Storage= 448 cf

Plug-Flow detention time= 35.1 min calculated for 0.120 af (99% of inflow)
Center-of-Mass det. time= 26.8 min (852.2 - 825.4)

Volume	Invert	Avail.Storage	Storage Description
#1	19.00'	7,359 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc)

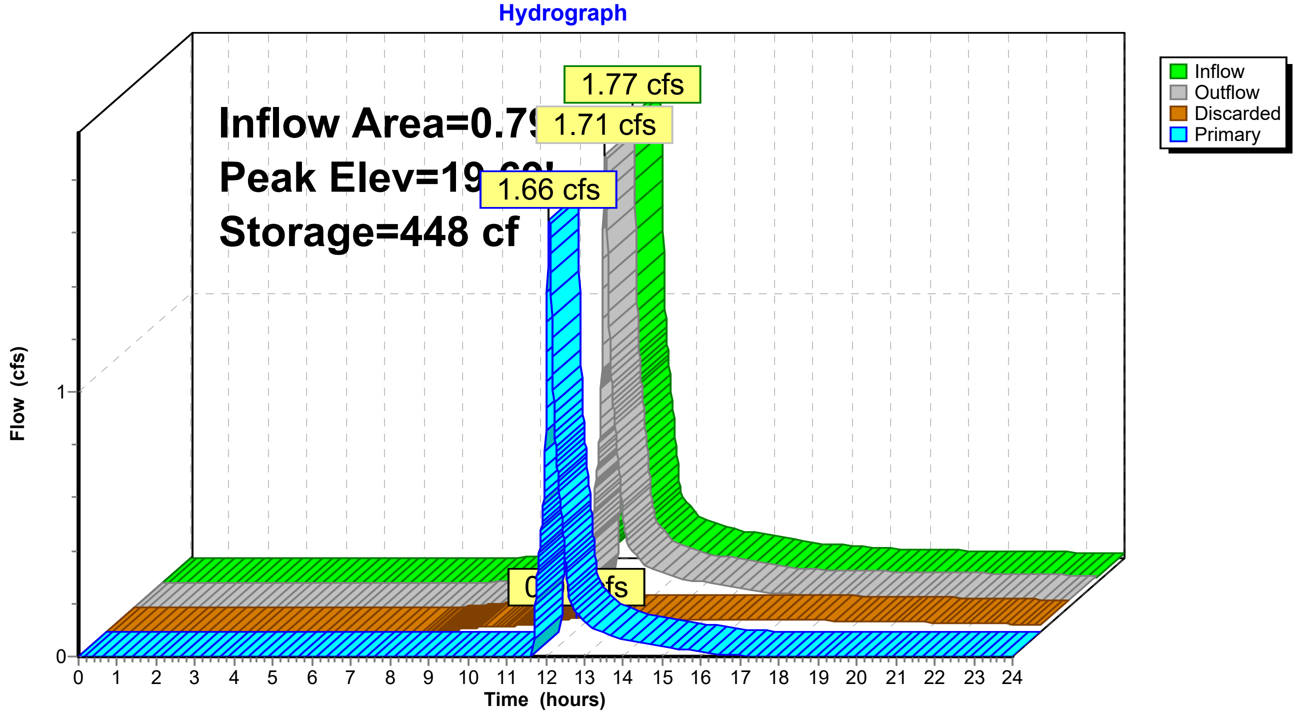
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
19.00	307	0	0
20.00	1,315	811	811
20.40	2,200	703	1,514
21.00	17,283	5,845	7,359

Device	Routing	Invert	Outlet Devices
#1	Discarded	19.00'	**2.410 in/hr Exfiltration over Surface area**
#2	Primary	19.50'	**12.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#3	Primary	19.50'	**12.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Discarded OutFlow Max=0.06 cfs @ 12.10 hrs HW=19.69' (Free Discharge)
└─**1=Exfiltration** (Exfiltration Controls 0.06 cfs)

Primary OutFlow Max=1.65 cfs @ 12.10 hrs HW=19.69' (Free Discharge)
├─**2=Orifice/Grate** (Weir Controls 0.83 cfs @ 1.41 fps)
└─**3=Orifice/Grate** (Weir Controls 0.83 cfs @ 1.41 fps)

Pond BIO1: BIO 1



Summary for Pond BIO2: BIO 2

Inflow Area = 0.833 ac, 68.24% Impervious, Inflow Depth > 1.48" for 2 YR event
Inflow = 1.48 cfs @ 12.08 hrs, Volume= 0.103 af
Outflow = 0.50 cfs @ 12.40 hrs, Volume= 0.103 af, Atten= 66%, Lag= 19.1 min
Discarded = 0.12 cfs @ 12.40 hrs, Volume= 0.089 af
Primary = 0.38 cfs @ 12.40 hrs, Volume= 0.014 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Peak Elev= 22.82' @ 12.40 hrs Surf.Area= 2,084 sf Storage= 1,433 cf

Plug-Flow detention time= 103.6 min calculated for 0.103 af (100% of inflow)
Center-of-Mass det. time= 102.7 min (944.1 - 841.4)

Volume	Invert	Avail.Storage	Storage Description
#1	22.00'	4,509 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc)

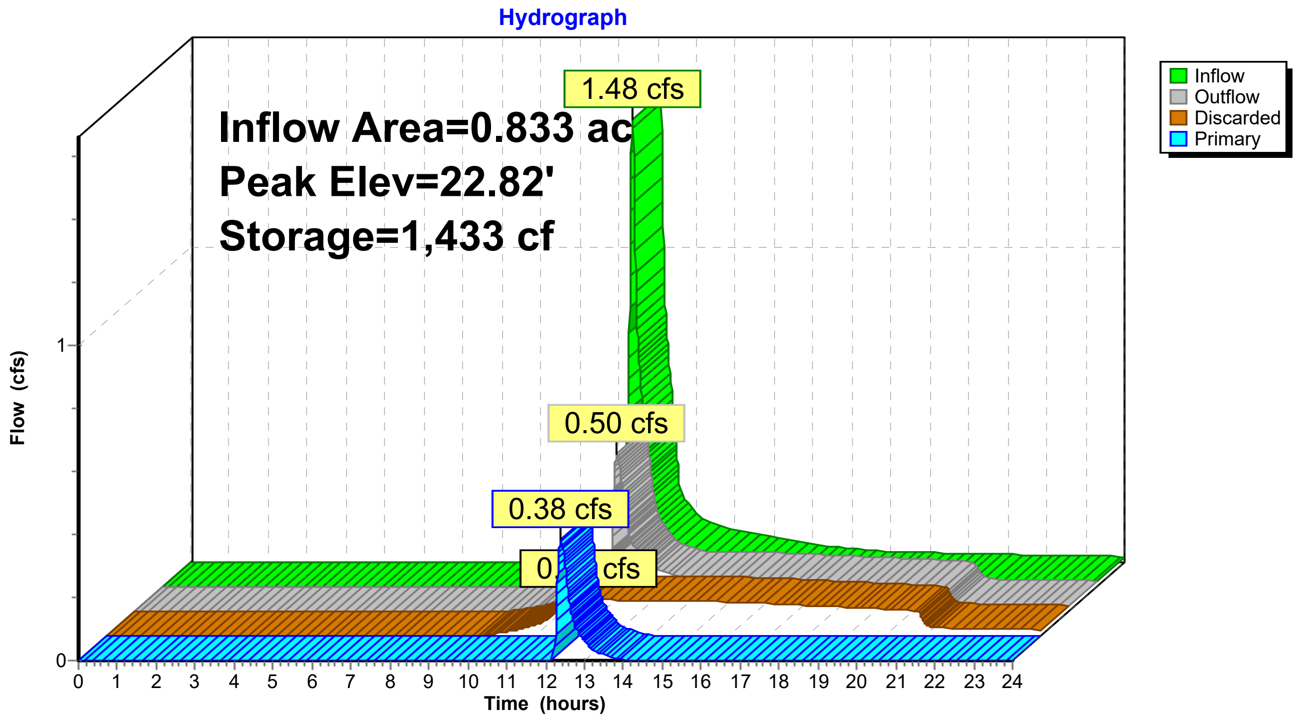
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
22.00	1,410	0	0
23.00	2,232	1,821	1,821
24.00	3,143	2,688	4,509

Device	Routing	Invert	Outlet Devices
#1	Discarded	22.00'	**2.410 in/hr Exfiltration over Surface area**
#2	Primary	22.75'	**12.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#3	Primary	22.75'	**12.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Discarded OutFlow Max=0.12 cfs @ 12.40 hrs HW=22.82' (Free Discharge)
└─**1=Exfiltration** (Exfiltration Controls 0.12 cfs)

Primary OutFlow Max=0.38 cfs @ 12.40 hrs HW=22.82' (Free Discharge)
├─**2=Orifice/Grate** (Weir Controls 0.19 cfs @ 0.87 fps)
└─**3=Orifice/Grate** (Weir Controls 0.19 cfs @ 0.87 fps)

Pond BIO2: BIO 2



Summary for Pond BIO3: BIO-3

Inflow Area = 0.816 ac, 75.18% Impervious, Inflow Depth > 1.76" for 2 YR event
Inflow = 1.75 cfs @ 12.08 hrs, Volume= 0.120 af
Outflow = 1.64 cfs @ 12.10 hrs, Volume= 0.120 af, Atten= 6%, Lag= 1.7 min
Discarded = 0.08 cfs @ 12.10 hrs, Volume= 0.063 af
Primary = 1.56 cfs @ 12.10 hrs, Volume= 0.057 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Peak Elev= 23.68' @ 12.10 hrs Surf.Area= 1,397 sf Storage= 695 cf

Plug-Flow detention time= 43.8 min calculated for 0.120 af (100% of inflow)
Center-of-Mass det. time= 43.2 min (871.9 - 828.7)

Volume	Invert	Avail.Storage	Storage Description
#1	23.00'	2,268 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

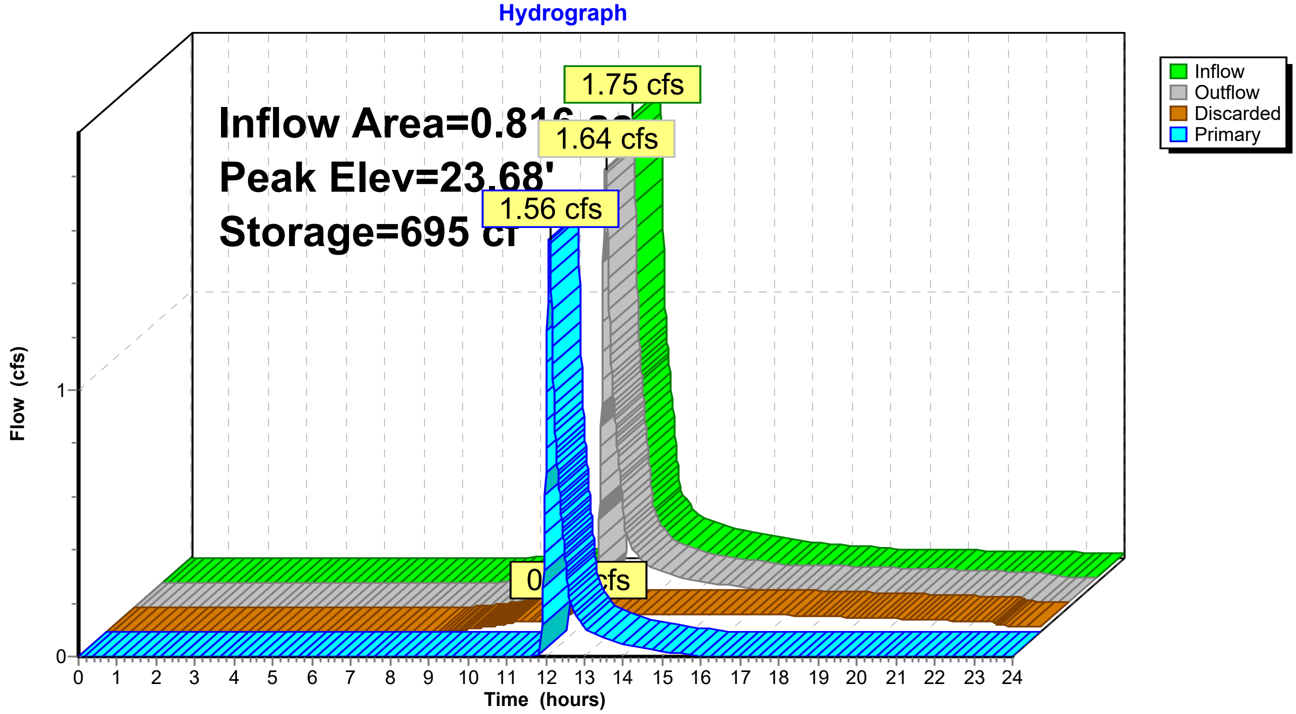
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
23.00	648	0	0
24.00	1,750	1,199	1,199
24.50	2,527	1,069	2,268

Device	Routing	Invert	Outlet Devices
#1	Discarded	23.00'	**2.410 in/hr Exfiltration over Surface area**
#2	Primary	23.50'	**12.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#3	Primary	23.50'	**12.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Discarded OutFlow Max=0.08 cfs @ 12.10 hrs HW=23.68' (Free Discharge)
└─**1=Exfiltration** (Exfiltration Controls 0.08 cfs)

Primary OutFlow Max=1.56 cfs @ 12.10 hrs HW=23.68' (Free Discharge)
├─**2=Orifice/Grate** (Weir Controls 0.78 cfs @ 1.38 fps)
└─**3=Orifice/Grate** (Weir Controls 0.78 cfs @ 1.38 fps)

Pond BIO3: BIO-3



Summary for Pond P-B: POND B

Inflow Area = 1.269 ac, 0.00% Impervious, Inflow Depth > 0.15" for 2 YR event
Inflow = 0.04 cfs @ 12.44 hrs, Volume= 0.015 af
Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Atten= 100%, Lag= 0.0 min
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Peak Elev= 2.76' @ 24.00 hrs Surf.Area= 10,447 sf Storage= 671 cf

Plug-Flow detention time= (not calculated: initial storage exceeds outflow)
Center-of-Mass det. time= (not calculated: no outflow)

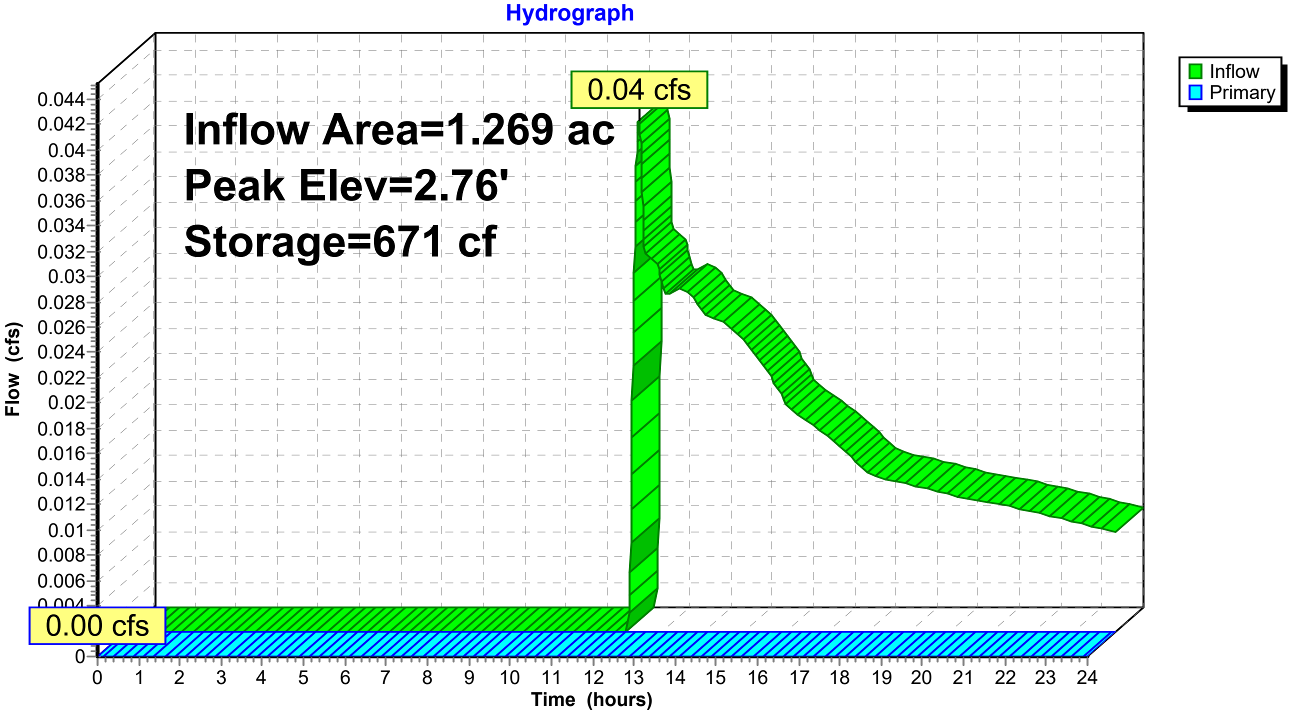
Volume	Invert	Avail.Storage	Storage Description
#1	2.70'	15,021 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
2.70	10,273	0	0
3.00	11,080	3,203	3,203
3.40	11,370	4,490	7,693
4.00	13,058	7,328	15,021

Device	Routing	Invert	Outlet Devices
#1	Primary	3.44'	**45.0 deg x 15.0' long x 0.50' rise Sharp-Crested Vee/Trap Weir** Cv= 2.56 (C= 3.20)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=2.70' (Free Discharge)
└─**1=Sharp-Crested Vee/Trap Weir** (Controls 0.00 cfs)

Pond P-B: POND B



Summary for Pond P-C: POND C

Inflow Area = 2.480 ac, 0.00% Impervious, Inflow Depth > 0.15" for 2 YR event
Inflow = 0.08 cfs @ 12.44 hrs, Volume= 0.030 af
Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Atten= 100%, Lag= 0.0 min
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Peak Elev= 3.66' @ 24.00 hrs Surf.Area= 21,231 sf Storage= 1,311 cf

Plug-Flow detention time= (not calculated: initial storage exceeds outflow)
Center-of-Mass det. time= (not calculated: no outflow)

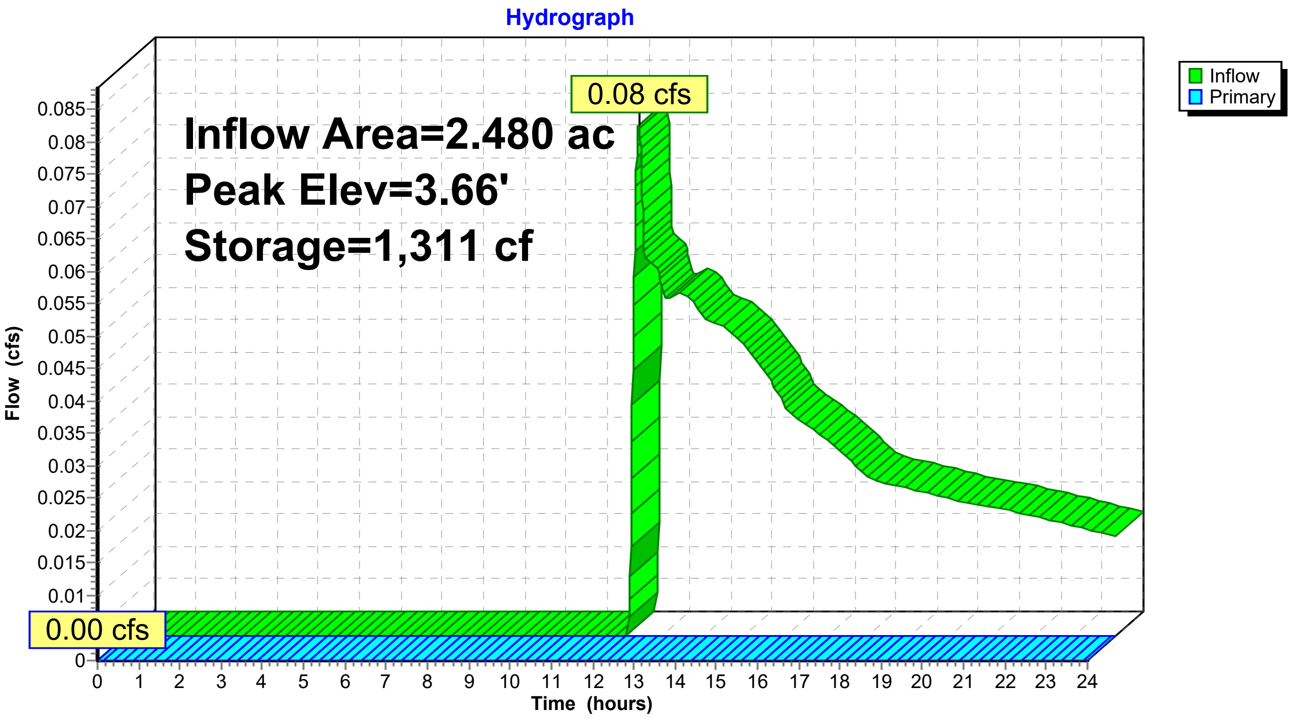
Volume	Invert	Avail.Storage	Storage Description
#1	3.60'	35,172 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
3.60	20,812	0	0
4.00	23,497	8,862	8,862
5.00	29,124	26,311	35,172

Device	Routing	Invert	Outlet Devices
#1	Primary	4.29'	**45.0 deg x 15.0' long x 0.50' rise Sharp-Crested Vee/Trap Weir** Cv= 2.56 (C= 3.20)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=3.60' (Free Discharge)
└─**1=Sharp-Crested Vee/Trap Weir** (Controls 0.00 cfs)

Pond P-C: POND C



Summary for Pond P-D: POND D

Inflow Area = 2.034 ac, 0.00% Impervious, Inflow Depth > 0.12" for 2 YR event
Inflow = 0.04 cfs @ 13.89 hrs, Volume= 0.021 af
Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Atten= 100%, Lag= 0.0 min
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Peak Elev= 8.12' @ 24.00 hrs Surf.Area= 7,748 sf Storage= 899 cf

Plug-Flow detention time= (not calculated: initial storage exceeds outflow)
Center-of-Mass det. time= (not calculated: no outflow)

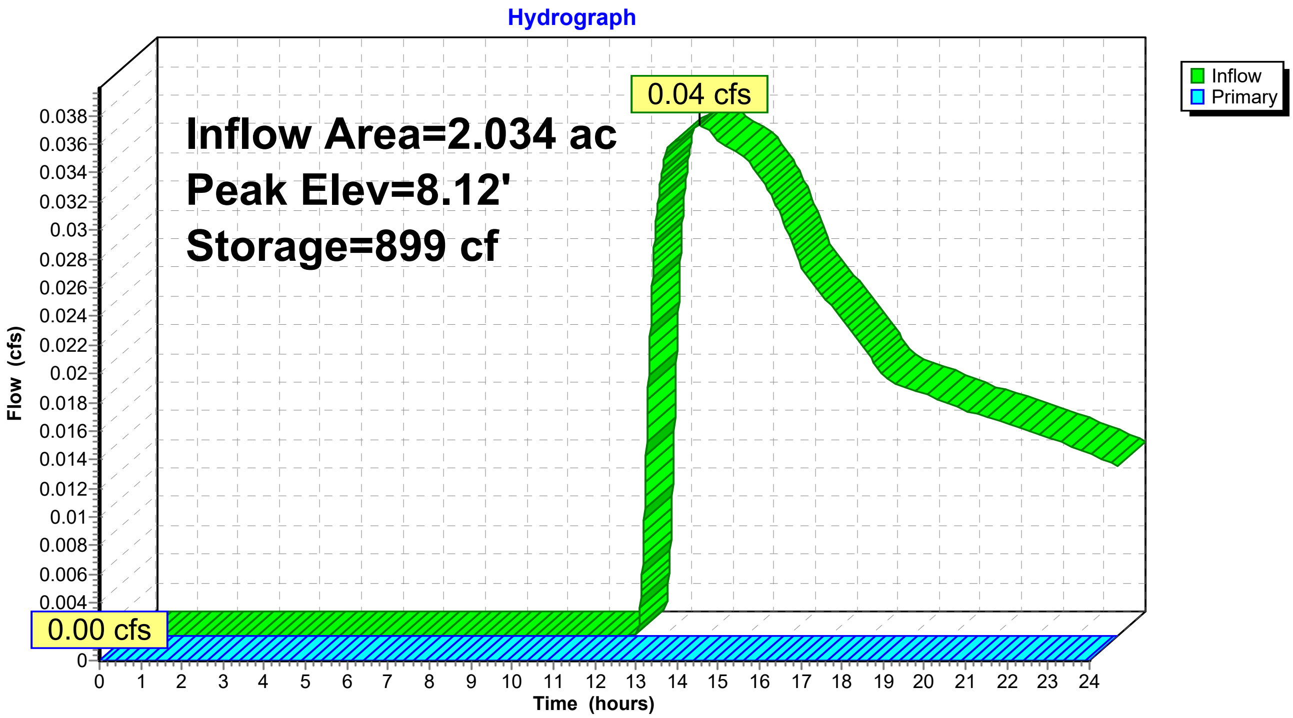
Volume	Invert	Avail.Storage	Storage Description
#1	8.00'	18,853 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
8.00	7,585	0	0
9.00	8,975	8,280	8,280
10.00	12,170	10,573	18,853

Device	Routing	Invert	Outlet Devices
#1	Primary	9.80'	**45.0 deg x 15.0' long x 0.50' rise Sharp-Crested Vee/Trap Weir** Cv= 2.56 (C= 3.20)
#2	Primary	9.08'	**12.0" Round Culvert** L= 18.5' CMP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 9.08' / 8.16' S= 0.0497 '/' Cc= 0.900 n= 0.013 Clay tile, Flow Area= 0.79 sf

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=8.00' (Free Discharge)
1=Sharp-Crested Vee/Trap Weir (Controls 0.00 cfs)
2=Culvert (Controls 0.00 cfs)

Pond P-D: POND D



Time span=0.00-24.00 hrs, dt=0.01 hrs, 2401 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 28S: TYP ROOF SIZING Runoff Area=5,000 sf 100.00% Impervious Runoff Depth>4.70"
Tc=5.0 min CN=98 Runoff=0.57 cfs 0.045 af

Subcatchment BIO-1: BIO-1 Runoff Area=34,452 sf 76.51% Impervious Runoff Depth>3.21"
Tc=5.0 min CN=84 Runoff=3.07 cfs 0.212 af

Subcatchment BIO-2: BIO-2 Runoff Area=36,300 sf 68.24% Impervious Runoff Depth>2.75"
Tc=5.0 min CN=79 Runoff=2.79 cfs 0.191 af

Subcatchment BIO-3: BIO-3 Runoff Area=35,532 sf 75.18% Impervious Runoff Depth>3.12"
Tc=5.0 min CN=83 Runoff=3.08 cfs 0.212 af

Subcatchment P10: PR-DA-10 Runoff Area=190,706 sf 0.00% Impervious Runoff Depth>0.08"
Tc=5.0 min CN=35 Runoff=0.04 cfs 0.028 af

Subcatchment P11: PR-DA11 Runoff Area=55,295 sf 0.00% Impervious Runoff Depth>0.61"
Tc=5.0 min CN=49 Runoff=0.54 cfs 0.065 af

Subcatchment P12: PR-DA12 Runoff Area=108,026 sf 0.00% Impervious Runoff Depth>0.61"
Tc=5.0 min CN=49 Runoff=1.05 cfs 0.127 af

Subcatchment P13: PR-DA-13 Runoff Area=32,038 sf 3.96% Impervious Runoff Depth>0.22"
Tc=5.0 min UI Adjusted CN=40 Runoff=0.04 cfs 0.014 af

Subcatchment P14: PR-DA-14 Runoff Area=187,032 sf 0.00% Impervious Runoff Depth>0.10"
Tc=5.0 min CN=36 Runoff=0.06 cfs 0.036 af

Subcatchment P1a: PR-DA-1a Runoff Area=72,022 sf 28.03% Impervious Runoff Depth>1.33"
Tc=5.0 min CN=61 Runoff=2.43 cfs 0.183 af

Subcatchment P1b: PR-DA-1b Runoff Area=61,320 sf 64.77% Impervious Runoff Depth>2.57"
Tc=5.0 min CN=77 Runoff=4.40 cfs 0.302 af

Subcatchment P2: PR-DA-2 Runoff Area=14,573 sf 0.97% Impervious Runoff Depth>0.19"
Tc=5.0 min UI Adjusted CN=39 Runoff=0.01 cfs 0.005 af

Subcatchment P3: PR-DA-3 Runoff Area=88,593 sf 0.00% Impervious Runoff Depth>0.56"
Flow Length=574' Tc=26.1 min CN=48 Runoff=0.48 cfs 0.095 af

Subcatchment P4: PR-DA4 Runoff Area=47,075 sf 19.25% Impervious Runoff Depth>0.67"
Tc=5.0 min CN=50 Runoff=0.54 cfs 0.060 af

Subcatchment P5: PR-DA5 Runoff Area=145,975 sf 68.19% Impervious Runoff Depth>2.75"
Flow Length=1,208' Tc=6.7 min CN=79 Runoff=10.55 cfs 0.767 af

Subcatchment P6: PR-DA-6 Runoff Area=34,083 sf 11.09% Impervious Runoff Depth>0.30"
Tc=5.0 min UI Adjusted CN=42 Runoff=0.08 cfs 0.019 af

Subcatchment P7: PR-DA-7 Runoff Area=47,897 sf 26.54% Impervious Runoff Depth>0.52"
Tc=5.0 min UI Adjusted CN=47 Runoff=0.31 cfs 0.047 af

Subcatchment P8a: PR-DA8a Runoff Area=37,831 sf 61.05% Impervious Runoff Depth>2.40"
Flow Length=626' Tc=5.0 min CN=75 Runoff=2.53 cfs 0.174 af

Subcatchment P8b: PR-DA8b Runoff Area=36,807 sf 71.01% Impervious Runoff Depth>2.93"
Flow Length=432' Tc=5.0 min CN=81 Runoff=3.01 cfs 0.206 af

Subcatchment P9: PR-DA9 Runoff Area=45,880 sf 21.77% Impervious Runoff Depth>0.78"
Tc=5.0 min CN=52 Runoff=0.69 cfs 0.068 af

Reach DP-1: DP-1 Inflow=2.43 cfs 0.183 af
Outflow=2.43 cfs 0.183 af

Reach DP-2: DP-2 (JOSHUA'S BROOK) Inflow=0.04 cfs 0.028 af
Outflow=0.04 cfs 0.028 af

Reach DP-3: DP-3 (STEWART'S CREEK) Inflow=0.06 cfs 0.036 af
Outflow=0.06 cfs 0.036 af

Pond 41P: SC-740 Peak Elev=38.06' Storage=496 cf Inflow=0.57 cfs 0.045 af
Outflow=0.09 cfs 0.045 af

Pond 43P: SC-740 Peak Elev=19.78' Storage=29 cf Inflow=0.08 cfs 0.019 af
Outflow=0.05 cfs 0.019 af

Pond 45P: SC-740 Peak Elev=20.20' Storage=235 cf Inflow=0.31 cfs 0.047 af
Outflow=0.12 cfs 0.047 af

Pond B-1: Basin 1 Peak Elev=12.61' Storage=22,799 cf Inflow=14.16 cfs 0.984 af
Discarded=0.75 cfs 0.763 af Primary=0.00 cfs 0.000 af Outflow=0.75 cfs 0.763 af

Pond B-2: Basin 2 Peak Elev=17.19' Storage=15,288 cf Inflow=10.56 cfs 0.645 af
Discarded=0.57 cfs 0.570 af Primary=0.00 cfs 0.000 af Outflow=0.57 cfs 0.570 af

Pond BIO1: BIO 1 Peak Elev=19.77' Storage=538 cf Inflow=3.07 cfs 0.212 af
Discarded=0.06 cfs 0.058 af Primary=2.92 cfs 0.149 af Outflow=2.98 cfs 0.207 af

Pond BIO2: BIO 2 Peak Elev=22.97' Storage=1,754 cf Inflow=2.79 cfs 0.191 af
Discarded=0.12 cfs 0.116 af Primary=2.12 cfs 0.074 af Outflow=2.24 cfs 0.191 af

Pond BIO3: BIO-3 Peak Elev=23.77' Storage=822 cf Inflow=3.08 cfs 0.212 af
Discarded=0.08 cfs 0.078 af Primary=2.84 cfs 0.130 af Outflow=2.93 cfs 0.209 af

Pond P-B: POND B Peak Elev=2.97' Storage=2,832 cf Inflow=0.54 cfs 0.065 af
Outflow=0.00 cfs 0.000 af

Pond P-C: POND C Peak Elev=3.86' Storage=5,533 cf Inflow=1.05 cfs 0.127 af
Outflow=0.00 cfs 0.000 af

Pond P-D: POND D Peak Elev=8.52' Storage=4,126 cf Inflow=0.48 cfs 0.095 af
Outflow=0.00 cfs 0.000 af

Total Runoff Area = 30.221 ac Runoff Volume = 2.855 af Average Runoff Depth = 1.13"
75.05% Pervious = 22.680 ac 24.95% Impervious = 7.541 ac

Summary for Subcatchment 28S: TYP ROOF SIZING

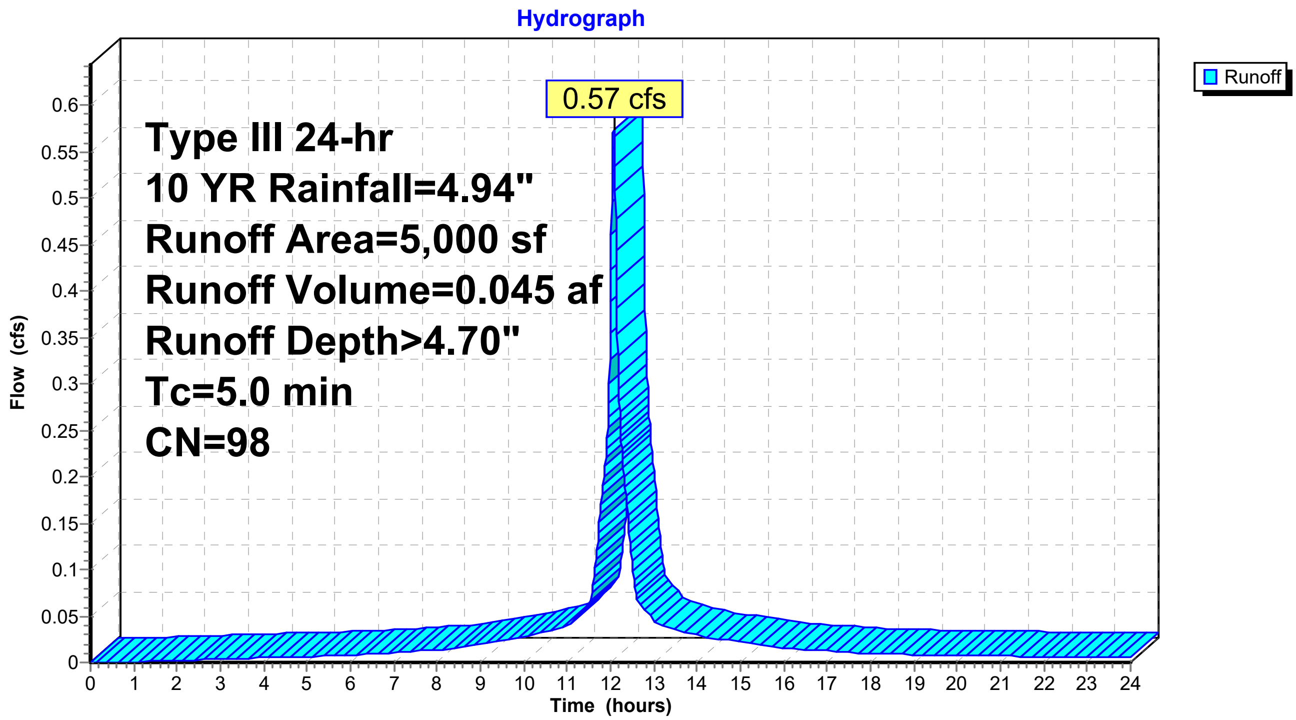
Runoff = 0.57 cfs @ 12.07 hrs, Volume= 0.045 af, Depth> 4.70"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 10 YR Rainfall=4.94"

Area (sf)	CN	Description
5,000	98	Roofs, HSG A
5,000		100.00% Impervious Area

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

Subcatchment 28S: TYP ROOF SIZING



Summary for Subcatchment BIO-1: BIO-1

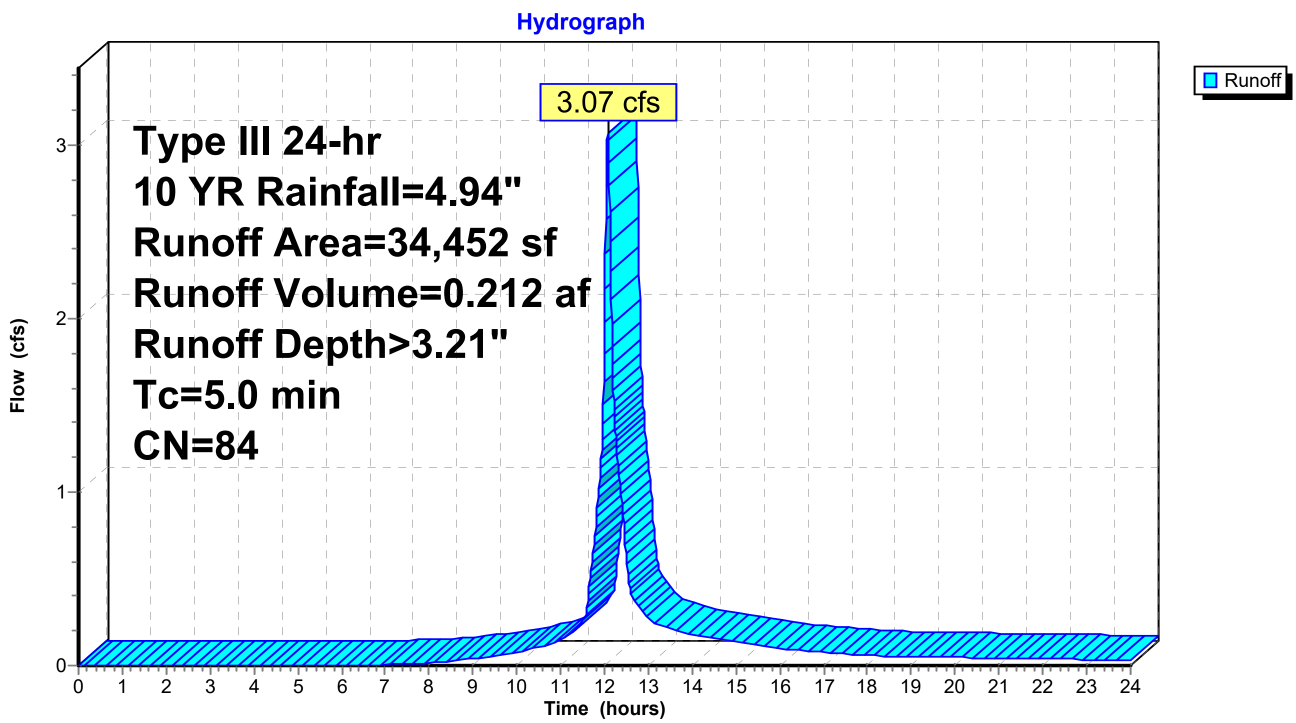
Runoff = 3.07 cfs @ 12.07 hrs, Volume= 0.212 af, Depth> 3.21"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 10 YR Rainfall=4.94"

Area (sf)	CN	Description
8,092	39	>75% Grass cover, Good, HSG A
26,360	98	Paved parking, HSG A
34,452	84	Weighted Average
8,092		23.49% Pervious Area
26,360		76.51% Impervious Area

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

Subcatchment BIO-1: BIO-1



Summary for Subcatchment BIO-2: BIO-2

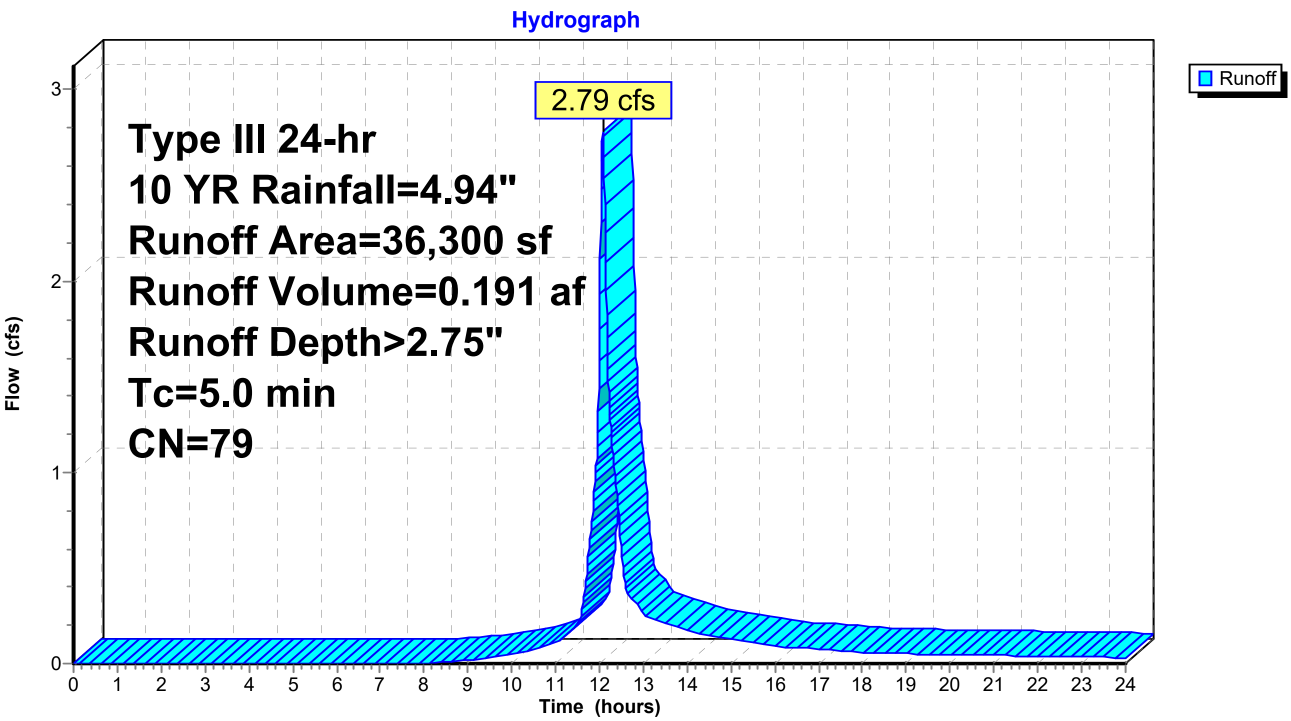
Runoff = 2.79 cfs @ 12.07 hrs, Volume= 0.191 af, Depth> 2.75"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 10 YR Rainfall=4.94"

Area (sf)	CN	Description
11,530	39	>75% Grass cover, Good, HSG A
24,660	98	Paved parking, HSG A
110	98	Roofs, HSG A
36,300	79	Weighted Average
11,530		31.76% Pervious Area
24,770		68.24% Impervious Area

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

Subcatchment BIO-2: BIO-2



Summary for Subcatchment BIO-3: BIO-3

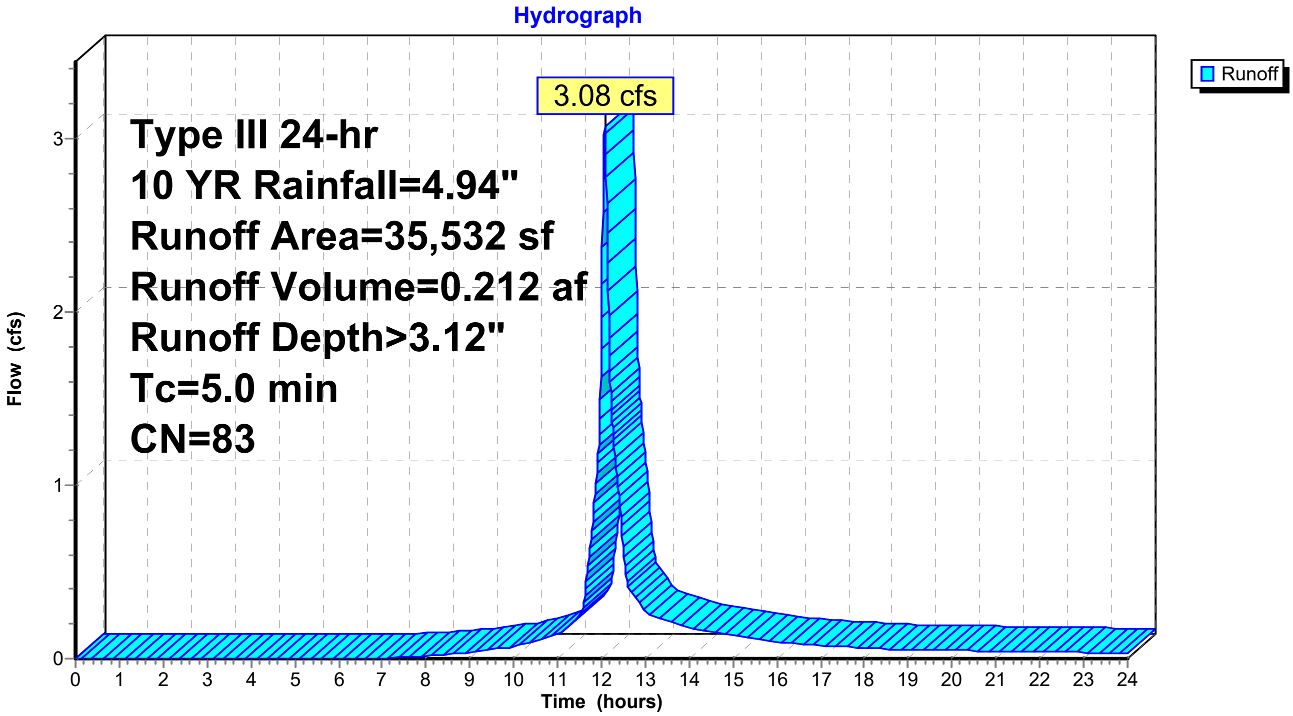
Runoff = 3.08 cfs @ 12.07 hrs, Volume= 0.212 af, Depth> 3.12"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 10 YR Rainfall=4.94"

Area (sf)	CN	Description
8,819	39	>75% Grass cover, Good, HSG A
26,493	98	Paved parking, HSG A
220	98	Roofs, HSG A
35,532	83	Weighted Average
8,819		24.82% Pervious Area
26,713		75.18% Impervious Area

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

Subcatchment BIO-3: BIO-3



Summary for Subcatchment P10: PR-DA-10

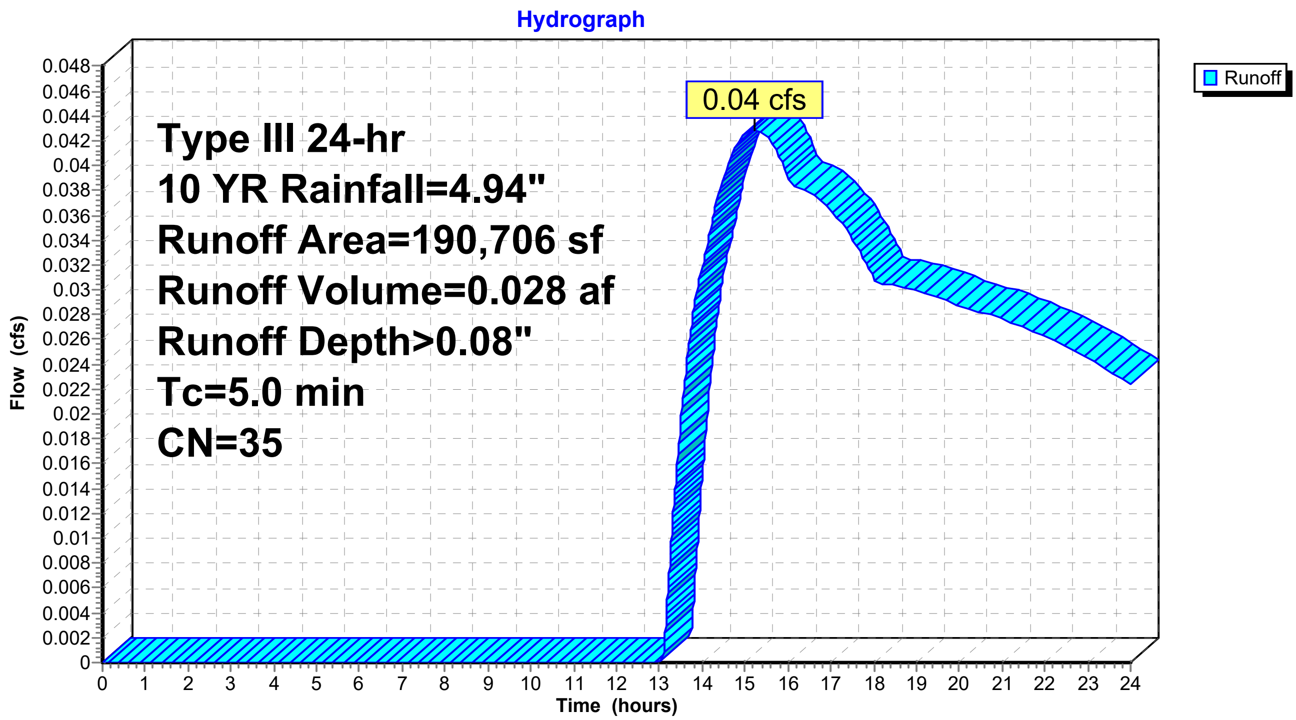
Runoff = 0.04 cfs @ 15.23 hrs, Volume= 0.028 af, Depth> 0.08"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 10 YR Rainfall=4.94"

Area (sf)	CN	Description
90,801	39	>75% Grass cover, Good, HSG A
99,905	32	Woods/grass comb., Good, HSG A
190,706	35	Weighted Average
190,706		100.00% Pervious Area

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

Subcatchment P10: PR-DA-10



Summary for Subcatchment P11: PR-DA11

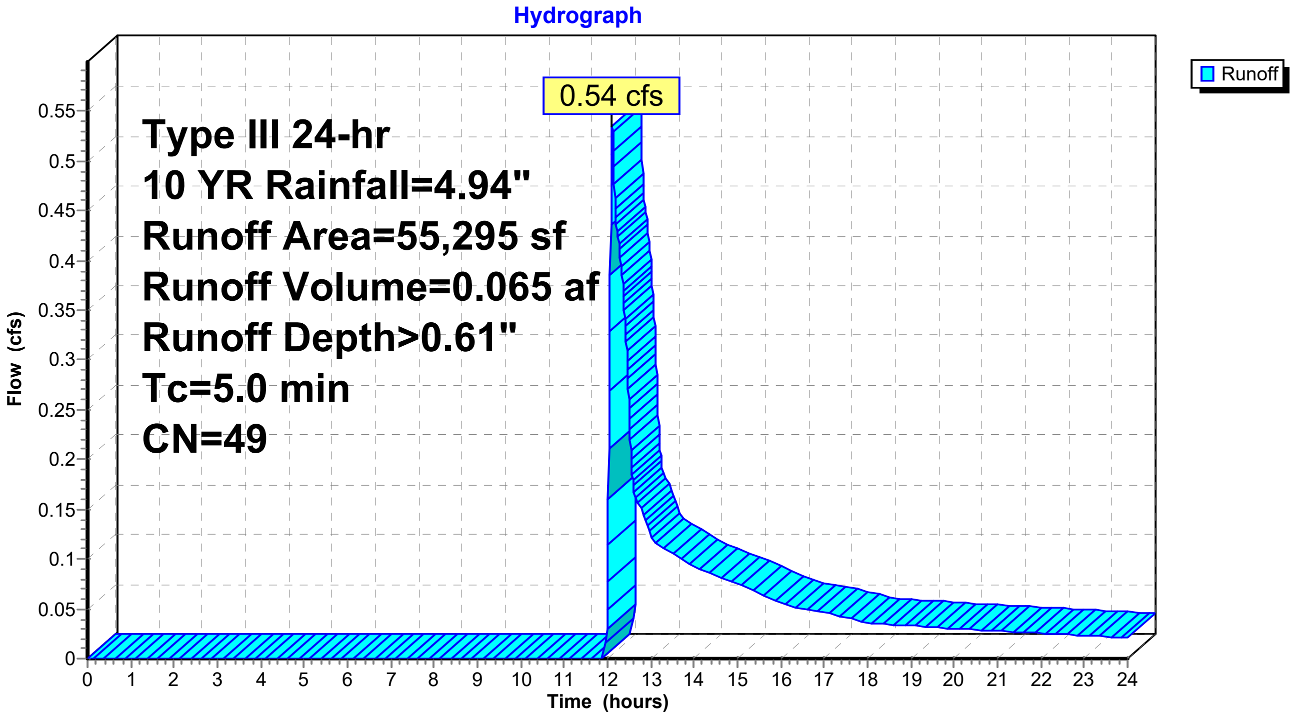
Runoff = 0.54 cfs @ 12.11 hrs, Volume= 0.065 af, Depth> 0.61"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 10 YR Rainfall=4.94"

Area (sf)	CN	Description
39,962	39	>75% Grass cover, Good, HSG A
5,060	30	Woods, Good, HSG A
10,273	98	Water Surface, 0% imp, HSG A
0	98	Paved parking, HSG A
55,295	49	Weighted Average
55,295		100.00% Pervious Area

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

Subcatchment P11: PR-DA11



Summary for Subcatchment P12: PR-DA12

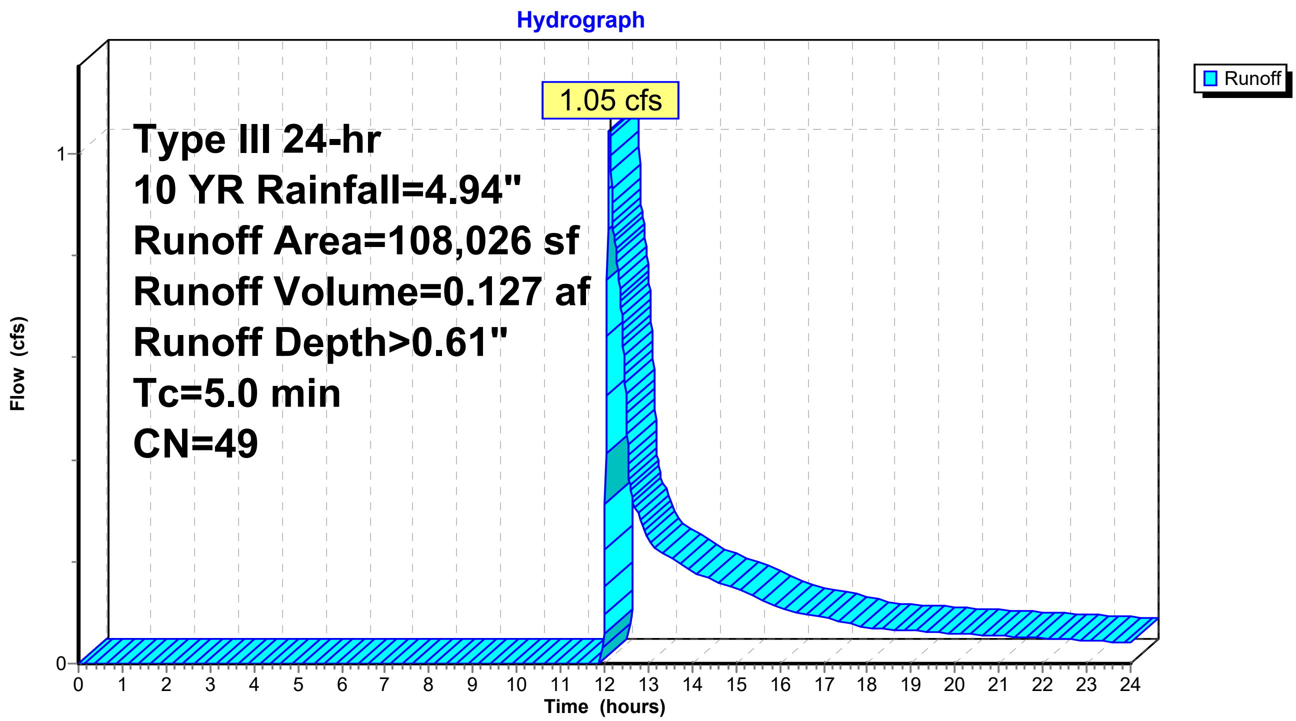
Runoff = 1.05 cfs @ 12.11 hrs, Volume= 0.127 af, Depth> 0.61"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 10 YR Rainfall=4.94"

Area (sf)	CN	Description
74,064	39	>75% Grass cover, Good, HSG A
13,150	30	Woods, Good, HSG A
20,812	98	Water Surface, 0% imp, HSG A
0	98	Paved parking, HSG A
108,026	49	Weighted Average
108,026		100.00% Pervious Area

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

Subcatchment P12: PR-DA12



Summary for Subcatchment P13: PR-DA-13

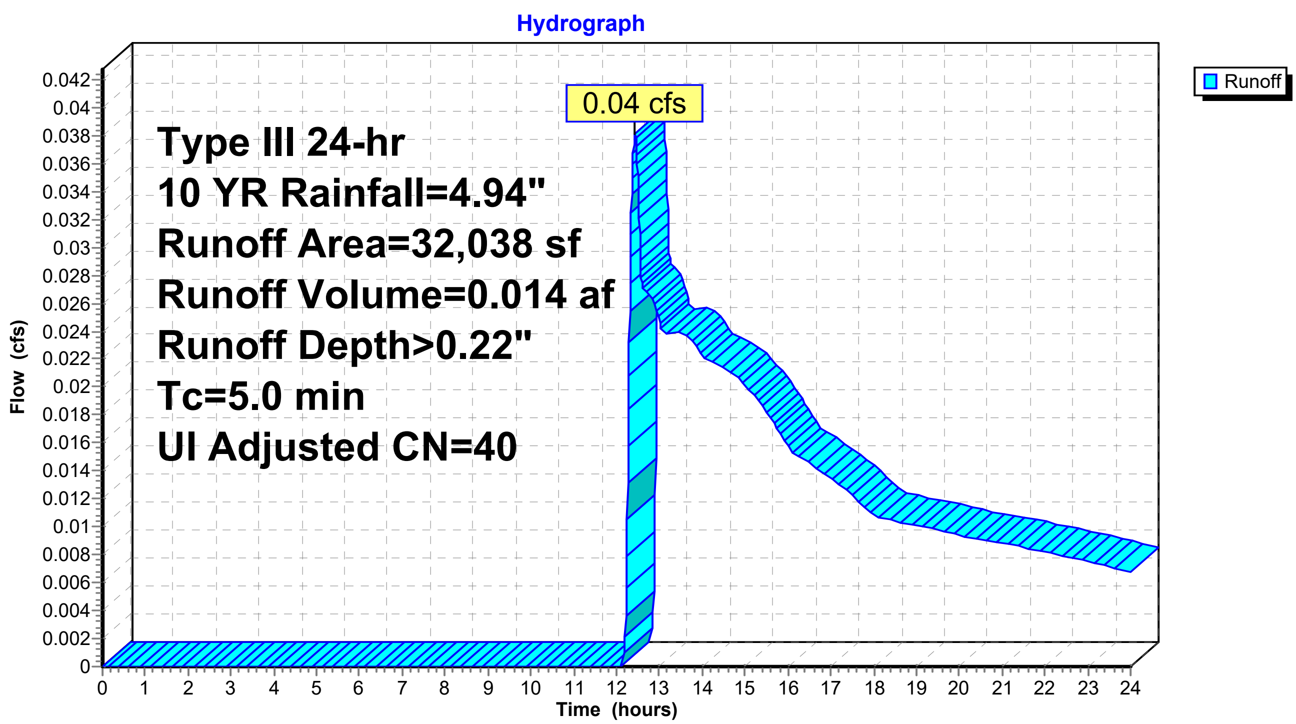
Runoff = 0.04 cfs @ 12.43 hrs, Volume= 0.014 af, Depth> 0.22"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 10 YR Rainfall=4.94"

	Area (sf)	CN	Adj	Description
	30,218	39		>75% Grass cover, Good, HSG A
*	1,270	98		Unconnected Impervious, HSG A
	550	30		Woods, Good, HSG A
	32,038	41	40	Weighted Average, UI Adjusted
	30,768			96.04% Pervious Area
	1,270			3.96% Impervious Area
	1,270			100.00% Unconnected

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

Subcatchment P13: PR-DA-13



Summary for Subcatchment P14: PR-DA-14

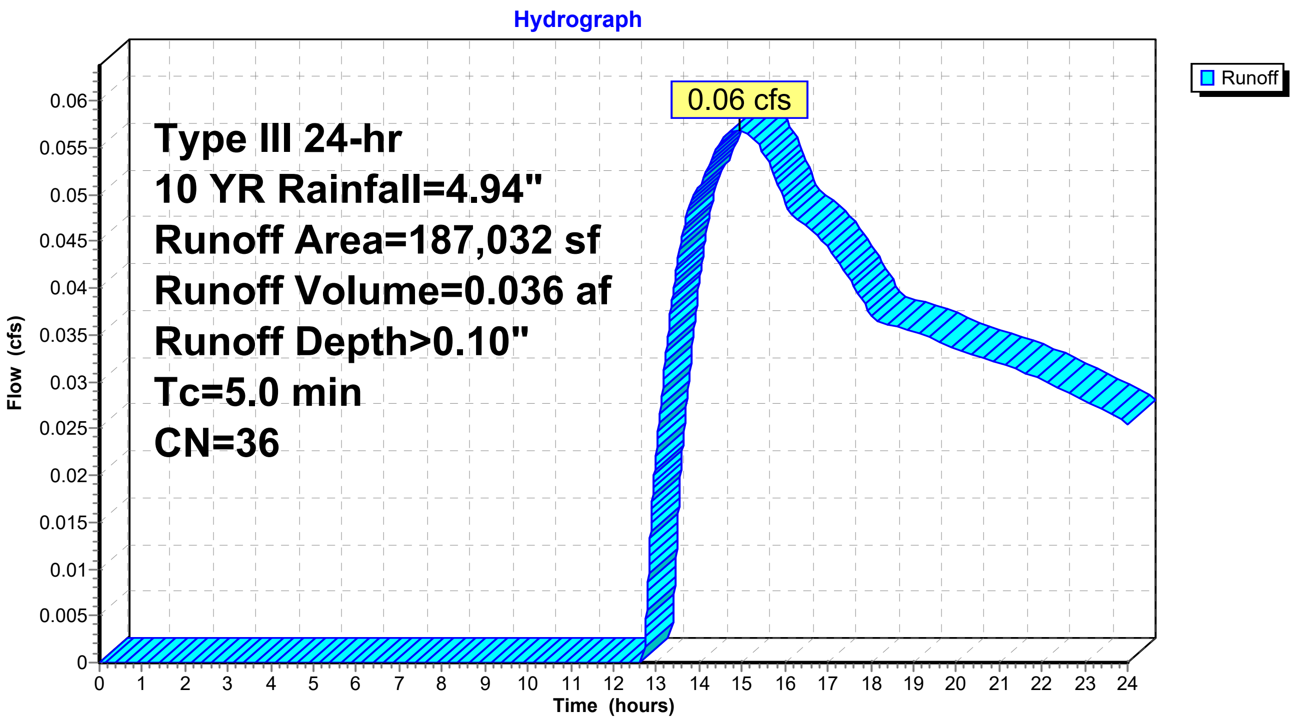
Runoff = 0.06 cfs @ 14.93 hrs, Volume= 0.036 af, Depth> 0.10"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 10 YR Rainfall=4.94"

Area (sf)	CN	Description
124,219	39	>75% Grass cover, Good, HSG A
62,813	30	Woods, Good, HSG A
187,032	36	Weighted Average
187,032		100.00% Pervious Area

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

Subcatchment P14: PR-DA-14



Summary for Subcatchment P1a: PR-DA-1a

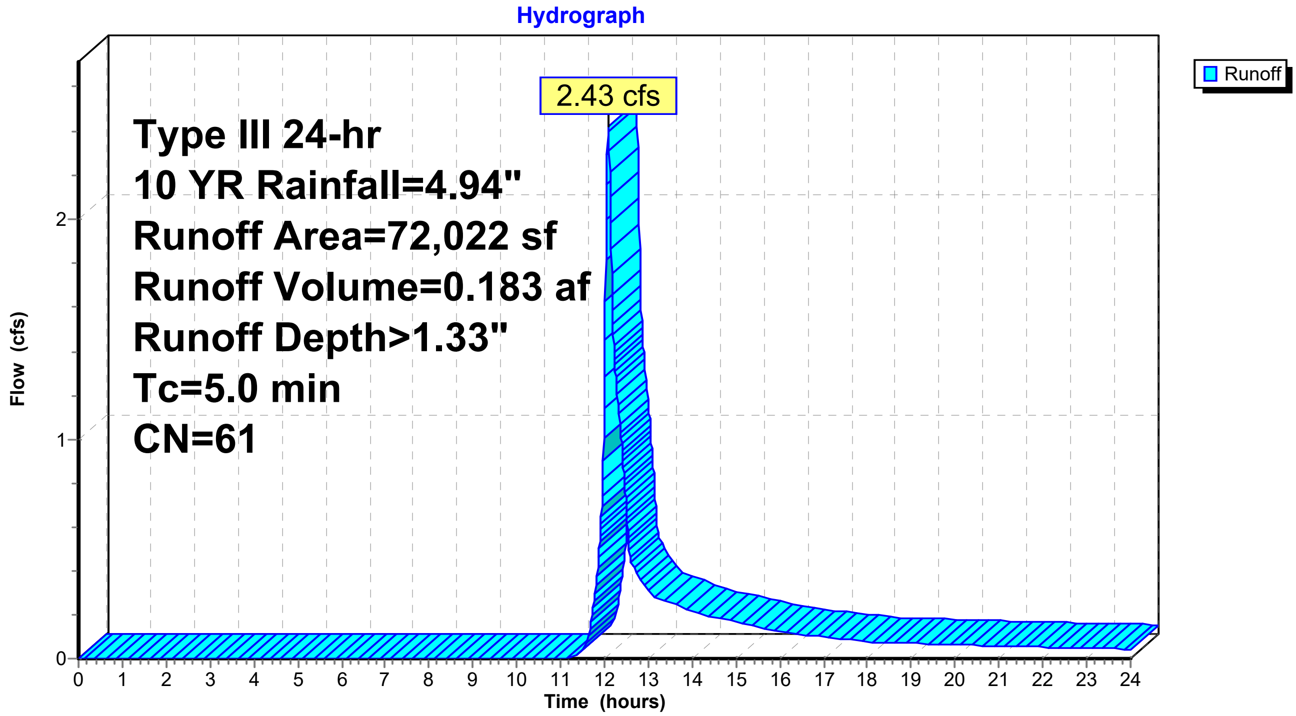
Runoff = 2.43 cfs @ 12.08 hrs, Volume= 0.183 af, Depth> 1.33"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 10 YR Rainfall=4.94"

Area (sf)	CN	Description
44,791	39	>75% Grass cover, Good, HSG A
20,190	98	Paved parking, HSG A
7,041	98	Water Surface, 0% imp, HSG A
72,022	61	Weighted Average
51,832		71.97% Pervious Area
20,190		28.03% Impervious Area

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

Subcatchment P1a: PR-DA-1a



Summary for Subcatchment P1b: PR-DA-1b

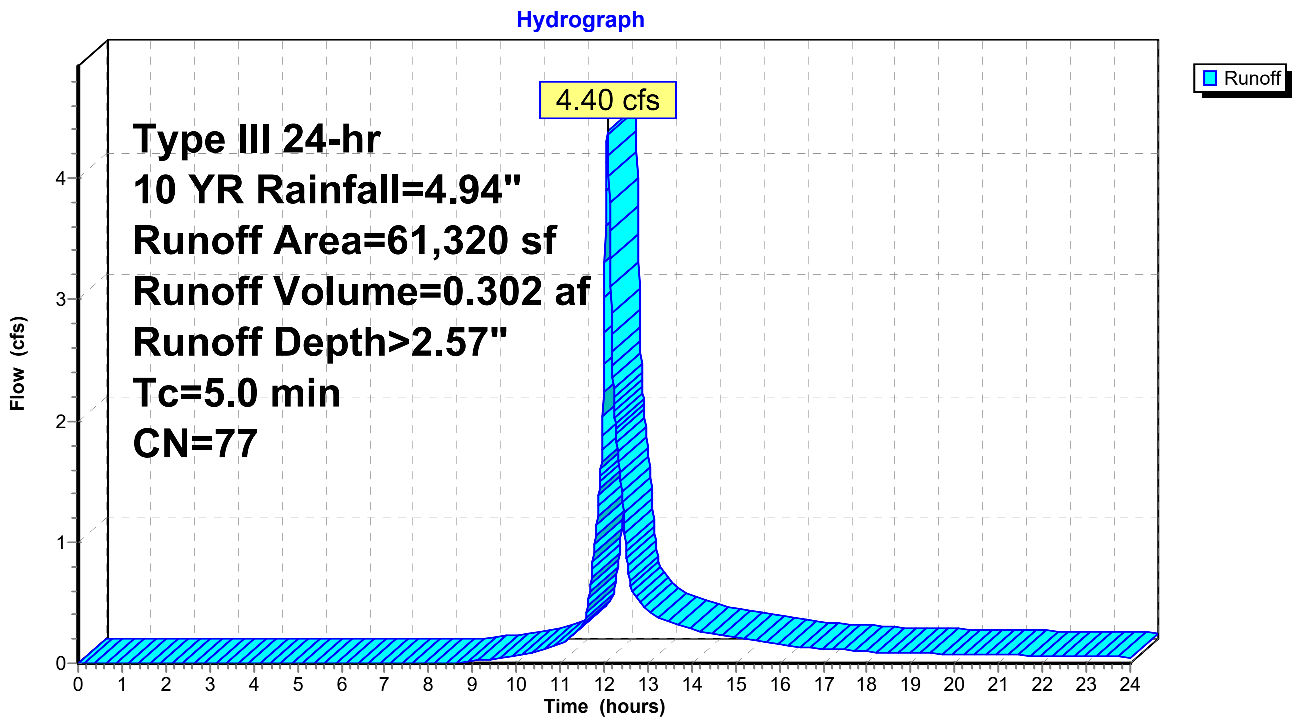
Runoff = 4.40 cfs @ 12.08 hrs, Volume= 0.302 af, Depth> 2.57"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 10 YR Rainfall=4.94"

	Area (sf)	CN	Description
	21,600	39	>75% Grass cover, Good, HSG A
*	39,720	98	Unconnected Impervious, HSG A
	61,320	77	Weighted Average
	21,600		35.23% Pervious Area
	39,720		64.77% Impervious Area
	39,720		100.00% Unconnected

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

Subcatchment P1b: PR-DA-1b



Summary for Subcatchment P2: PR-DA-2

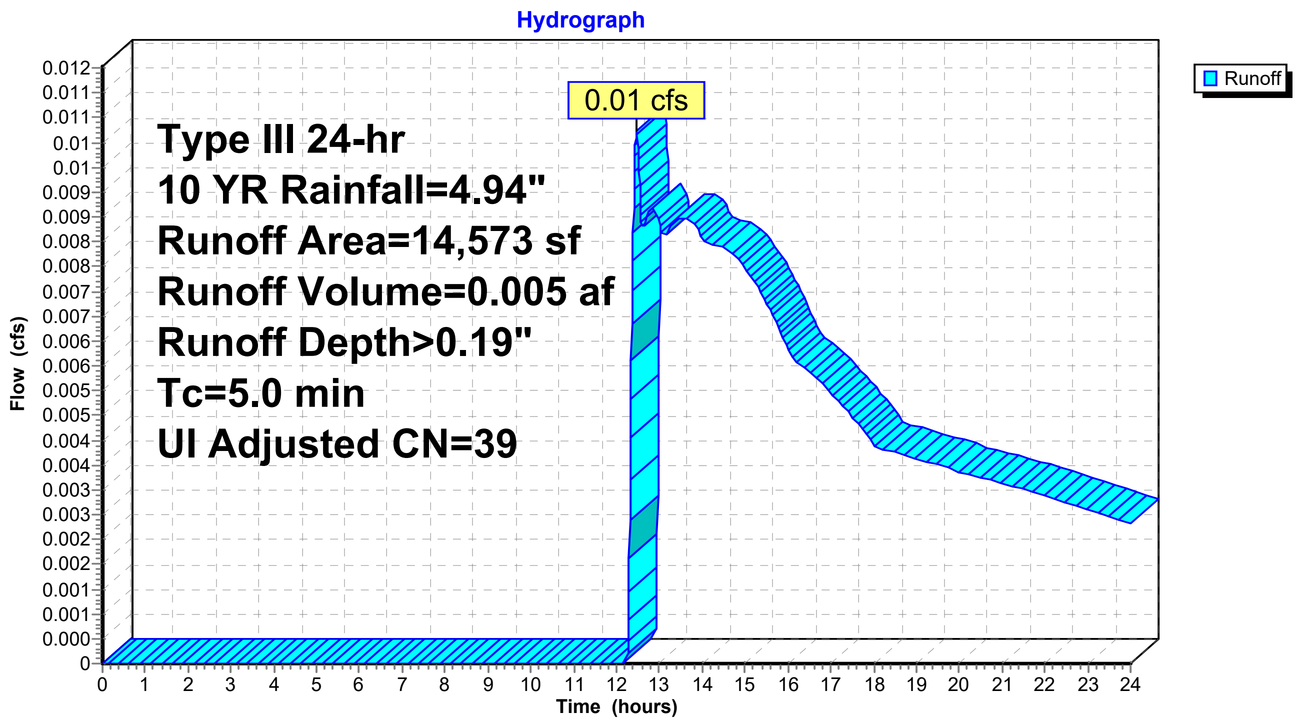
Runoff = 0.01 cfs @ 12.47 hrs, Volume= 0.005 af, Depth> 0.19"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 10 YR Rainfall=4.94"

	Area (sf)	CN	Adj	Description
	14,431	39		>75% Grass cover, Good, HSG A
*	142	98		Unconnected Impervious, HSG A
	14,573	40	39	Weighted Average, UI Adjusted
	14,431			99.03% Pervious Area
	142			0.97% Impervious Area
	142			100.00% Unconnected

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

Subcatchment P2: PR-DA-2



Summary for Subcatchment P3: PR-DA-3

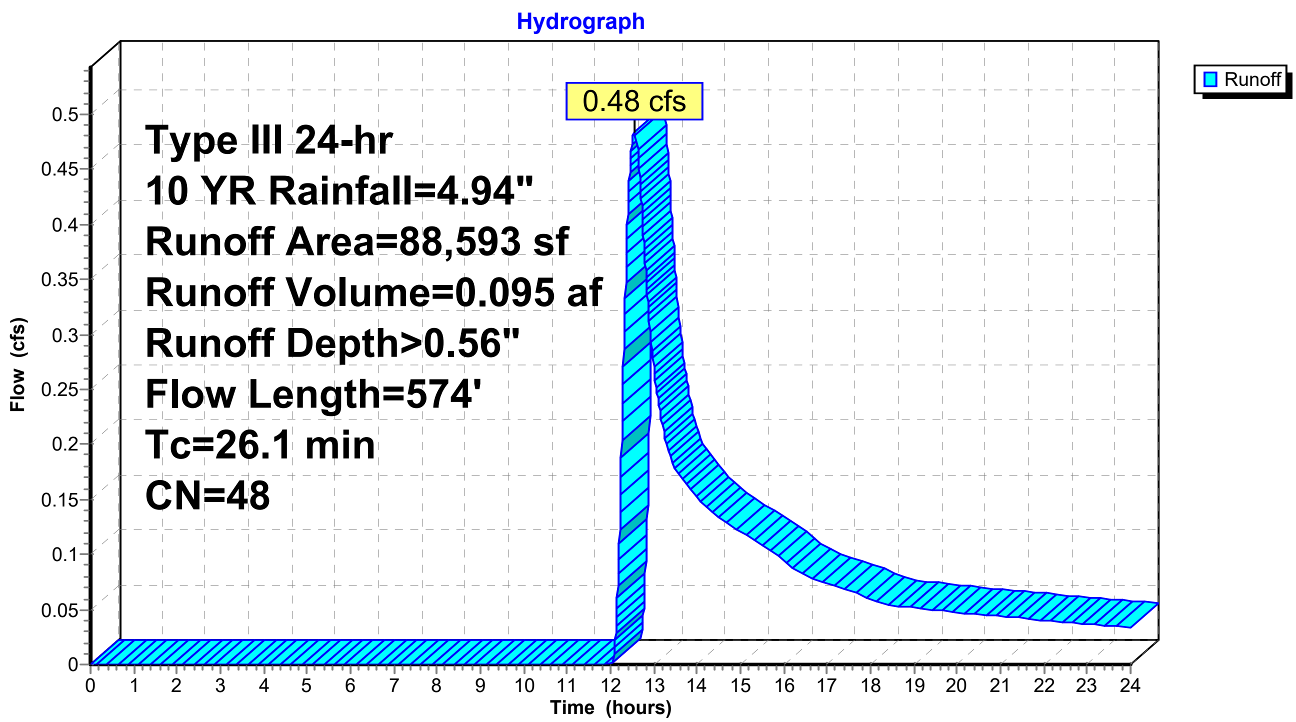
Runoff = 0.48 cfs @ 12.55 hrs, Volume= 0.095 af, Depth> 0.56"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 10 YR Rainfall=4.94"

Area (sf)	CN	Description
72,419	39	>75% Grass cover, Good, HSG A
7,200	76	Gravel roads, HSG A
8,974	98	Water Surface, 0% imp, HSG A
88,593	48	Weighted Average
88,593		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.2	50	0.0380	0.20		**Sheet Flow, A-B** Grass: Short n= 0.150 P2= 3.40"
20.8	400	0.0021	0.32		**Shallow Concentrated Flow, B-C** Short Grass Pasture Kv= 7.0 fps
0.5	74	0.0270	2.65		**Shallow Concentrated Flow, C-D** Unpaved Kv= 16.1 fps
0.6	50	0.0400	1.40		**Shallow Concentrated Flow, D-E** Short Grass Pasture Kv= 7.0 fps
26.1	574	Total			

Subcatchment P3: PR-DA-3



Summary for Subcatchment P4: PR-DA4

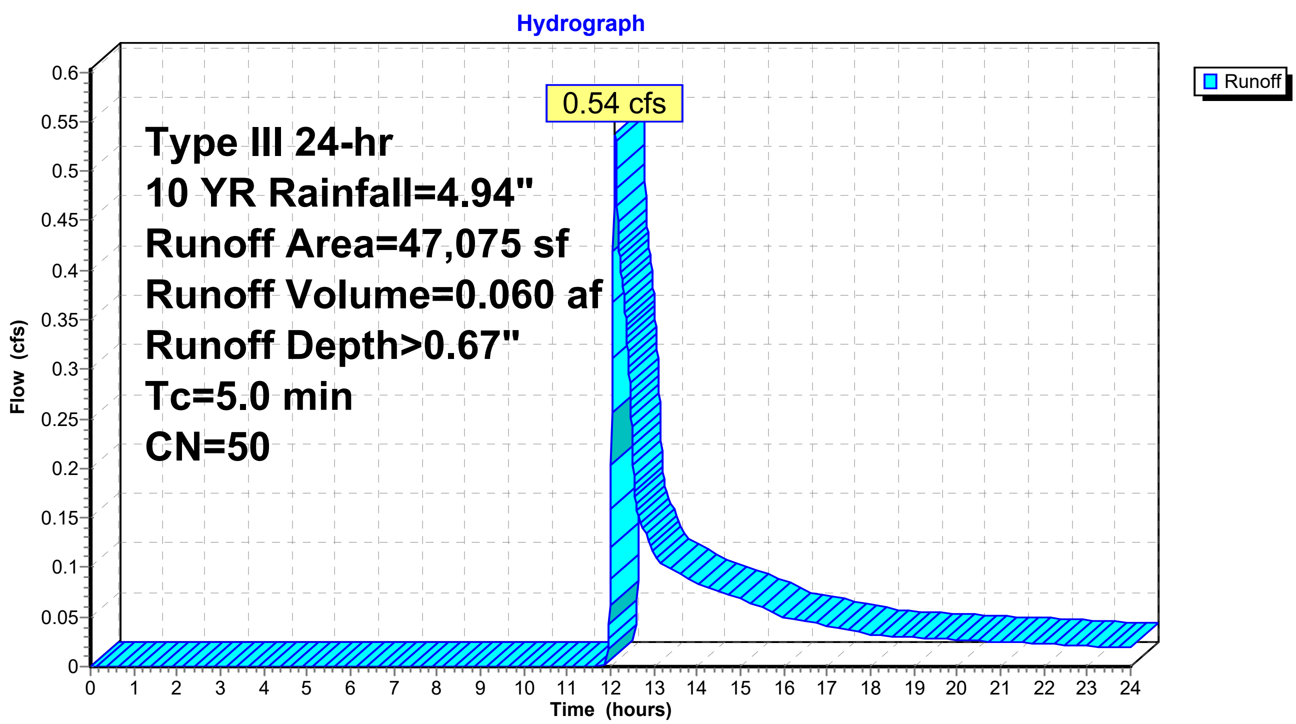
Runoff = 0.54 cfs @ 12.11 hrs, Volume= 0.060 af, Depth> 0.67"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 10 YR Rainfall=4.94"

	Area (sf)	CN	Description
	38,011	39	>75% Grass cover, Good, HSG A
*	500	98	Unconnected impervious, HSG A
	8,564	98	Stormwater Basin; Water Surface, HSG A
	47,075	50	Weighted Average
	38,011		80.75% Pervious Area
	9,064		19.25% Impervious Area
	500		5.52% Unconnected

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

Subcatchment P4: PR-DA4



Summary for Subcatchment P5: PR-DA5

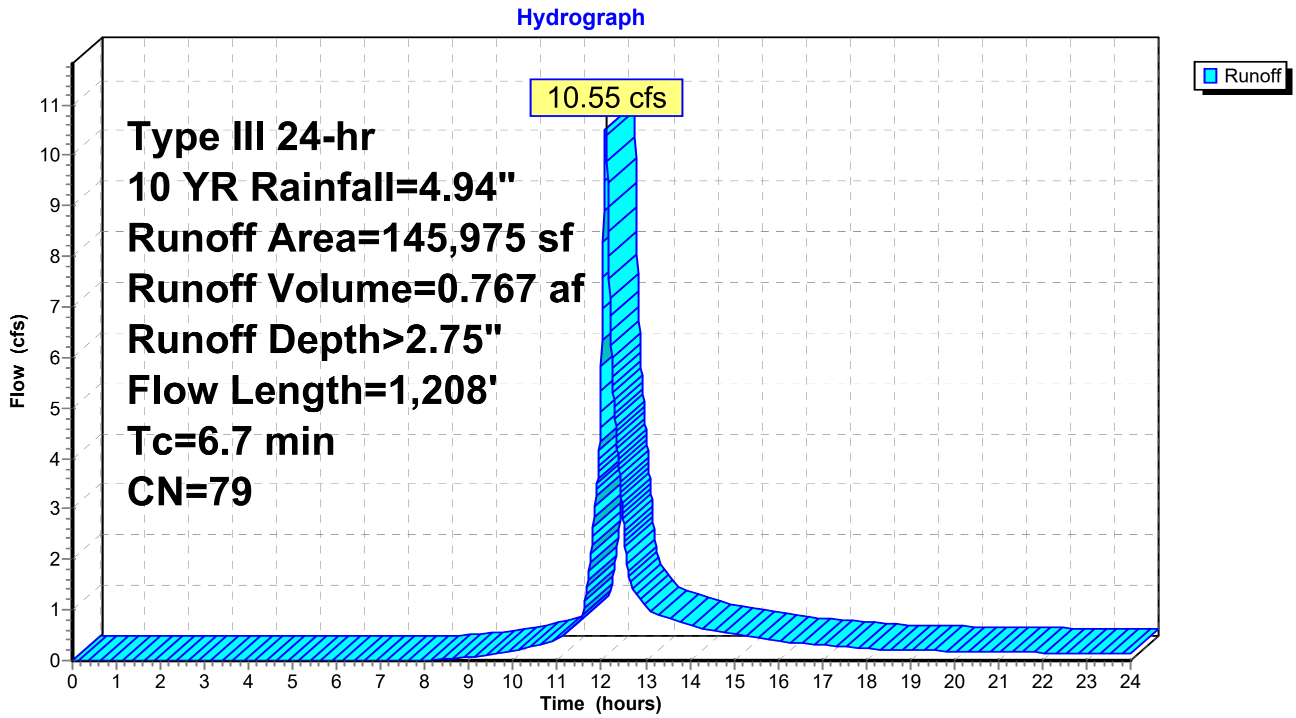
Runoff = 10.55 cfs @ 12.10 hrs, Volume= 0.767 af, Depth> 2.75"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 10 YR Rainfall=4.94"

Area (sf)	CN	Description
46,436	39	>75% Grass cover, Good, HSG A
98,201	98	Paved parking, HSG A
1,338	98	Unconnected roofs, HSG A
145,975	79	Weighted Average
46,436		31.81% Pervious Area
99,539		68.19% Impervious Area
1,338		1.34% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.9	50	0.0100	0.94		**Sheet Flow, A-B** Smooth surfaces n= 0.011 P2= 3.40"
1.1	130	0.0100	2.03		**Shallow Concentrated Flow, B-C** Paved Kv= 20.3 fps
1.3	243	0.0050	3.21	2.52	**Pipe Channel, C-D** 12.0" Round Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.013 Corrugated PE, smooth interior
2.4	525	0.0050	3.72	4.57	**Pipe Channel, D-E** 15.0" Round Area= 1.2 sf Perim= 3.9' r= 0.31' n= 0.013 Corrugated PE, smooth interior
1.0	260	0.0050	4.20	7.43	**Pipe Channel, E-F** 18.0" Round Area= 1.8 sf Perim= 4.7' r= 0.38' n= 0.013 Corrugated PE, smooth interior
6.7	1,208	Total			

Subcatchment P5: PR-DA5



Summary for Subcatchment P6: PR-DA-6

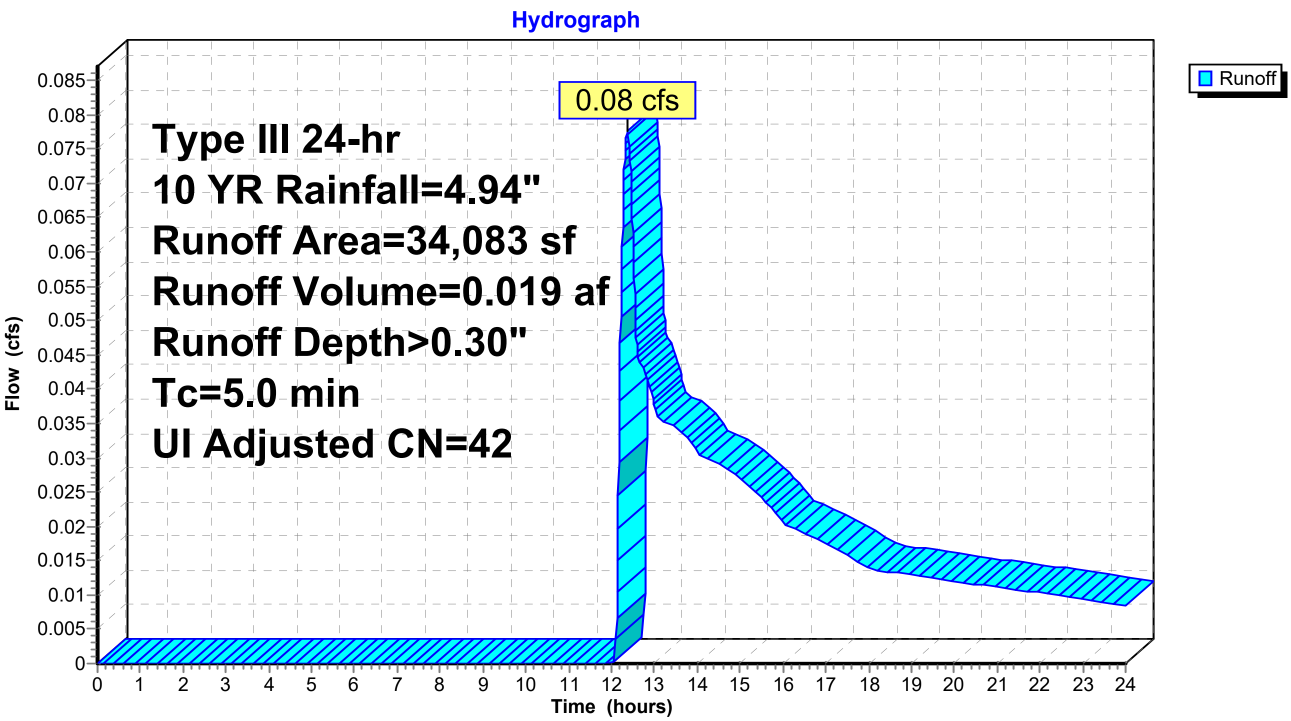
Runoff = 0.08 cfs @ 12.37 hrs, Volume= 0.019 af, Depth> 0.30"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 10 YR Rainfall=4.94"

	Area (sf)	CN	Adj	Description
	30,303	39		>75% Grass cover, Good, HSG A
*	3,780	98		Unconnected Impervious, HSG A
	34,083	46	42	Weighted Average, UI Adjusted
	30,303			88.91% Pervious Area
	3,780			11.09% Impervious Area
	3,780			100.00% Unconnected

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

Subcatchment P6: PR-DA-6



Summary for Subcatchment P7: PR-DA-7

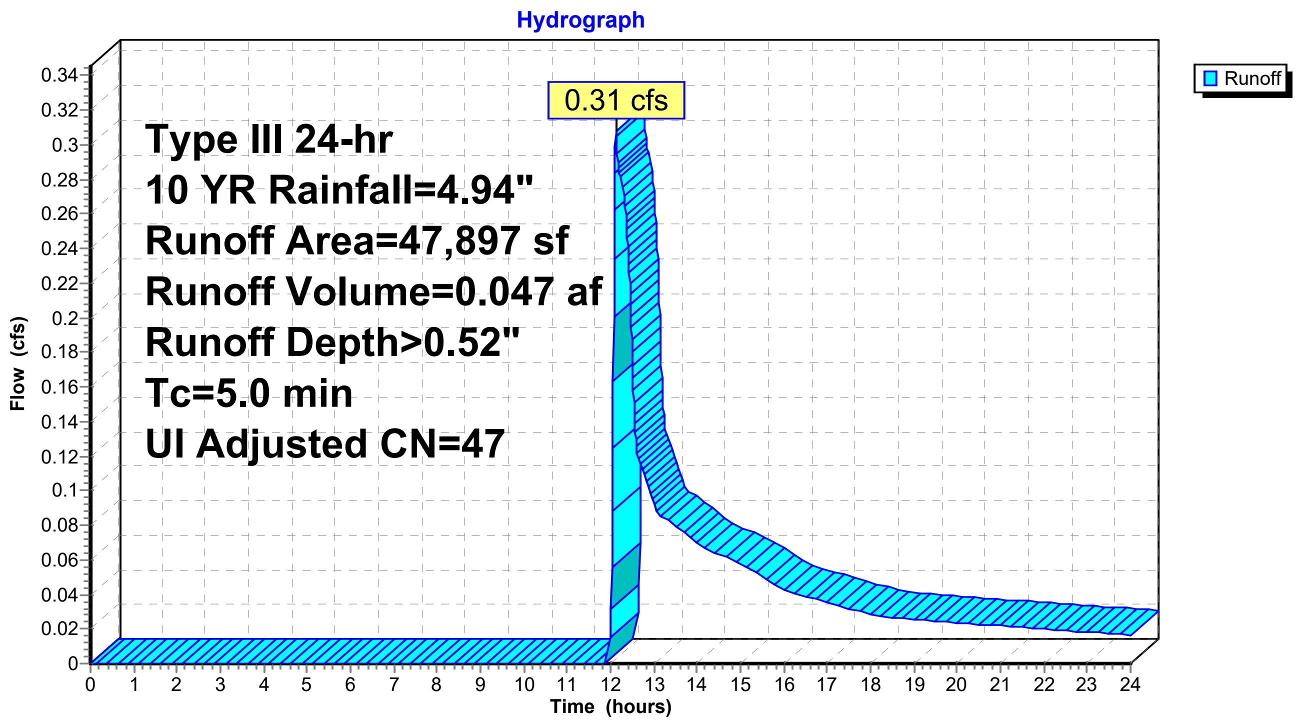
Runoff = 0.31 cfs @ 12.13 hrs, Volume= 0.047 af, Depth> 0.52"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 10 YR Rainfall=4.94"

	Area (sf)	CN	Adj	Description
	35,185	39		>75% Grass cover, Good, HSG A
*	12,712	98		Unconnected Impervious, HSG A
	47,897	55	47	Weighted Average, UI Adjusted
	35,185			73.46% Pervious Area
	12,712			26.54% Impervious Area
	12,712			100.00% Unconnected

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

Subcatchment P7: PR-DA-7



Summary for Subcatchment P8a: PR-DA8a

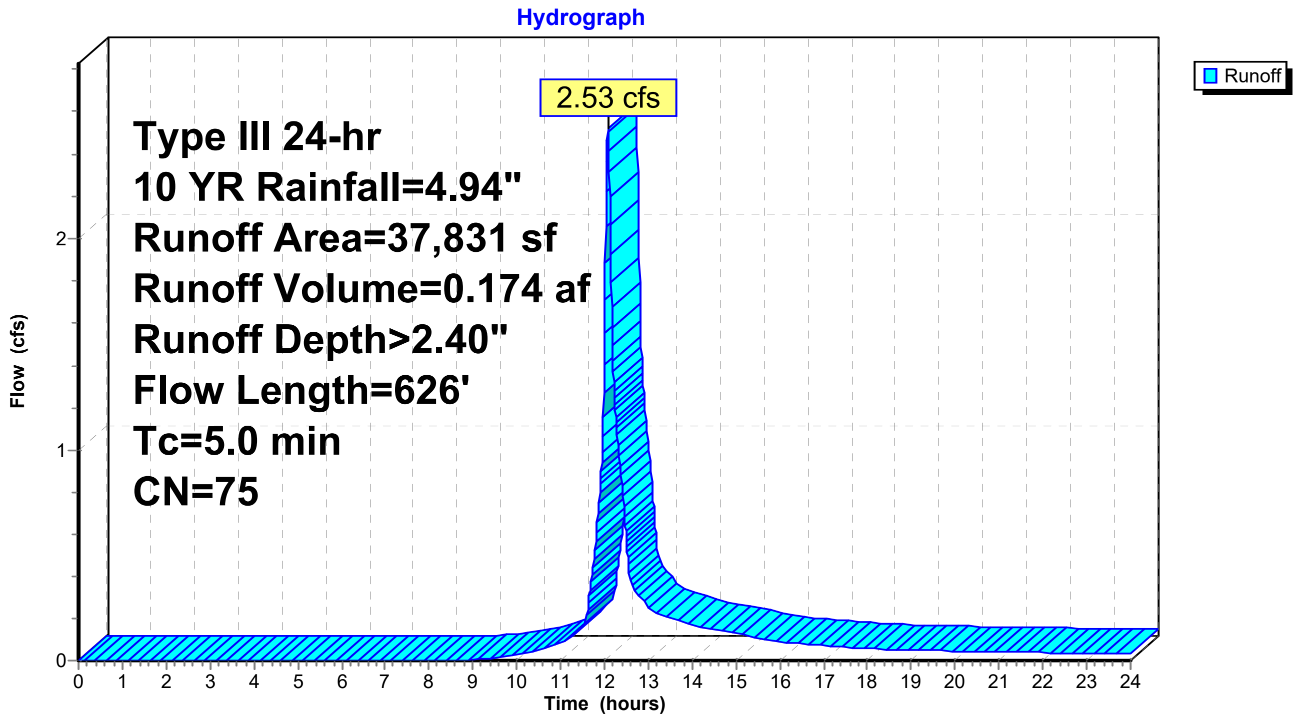
Runoff = 2.53 cfs @ 12.08 hrs, Volume= 0.174 af, Depth> 2.40"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 10 YR Rainfall=4.94"

Area (sf)	CN	Description
14,737	39	>75% Grass cover, Good, HSG A
22,874	98	Paved parking, HSG A
220	98	Roofs, HSG A
37,831	75	Weighted Average
14,737		38.95% Pervious Area
23,094		61.05% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.9	50	0.0100	0.94		**Sheet Flow, A-B** Smooth surfaces n= 0.011 P2= 3.40"
1.1	137	0.0100	2.03		**Shallow Concentrated Flow, B-C** Paved Kv= 20.3 fps
0.2	48	0.0050	3.21	2.52	**Pipe Channel, C-D** 12.0" Round Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.013 Corrugated PE, smooth interior
1.1	241	0.0050	3.72	4.57	**Pipe Channel, D-E** 15.0" Round Area= 1.2 sf Perim= 3.9' r= 0.31' n= 0.013 Corrugated PE, smooth interior
0.5	150	0.0060	4.60	8.14	**Pipe Channel, E-F** 18.0" Round Area= 1.8 sf Perim= 4.7' r= 0.38' n= 0.013 Corrugated PE, smooth interior
1.2					**Direct Entry, Added Tc**
5.0	626	Total			

Subcatchment P8a: PR-DA8a



Summary for Subcatchment P8b: PR-DA8b

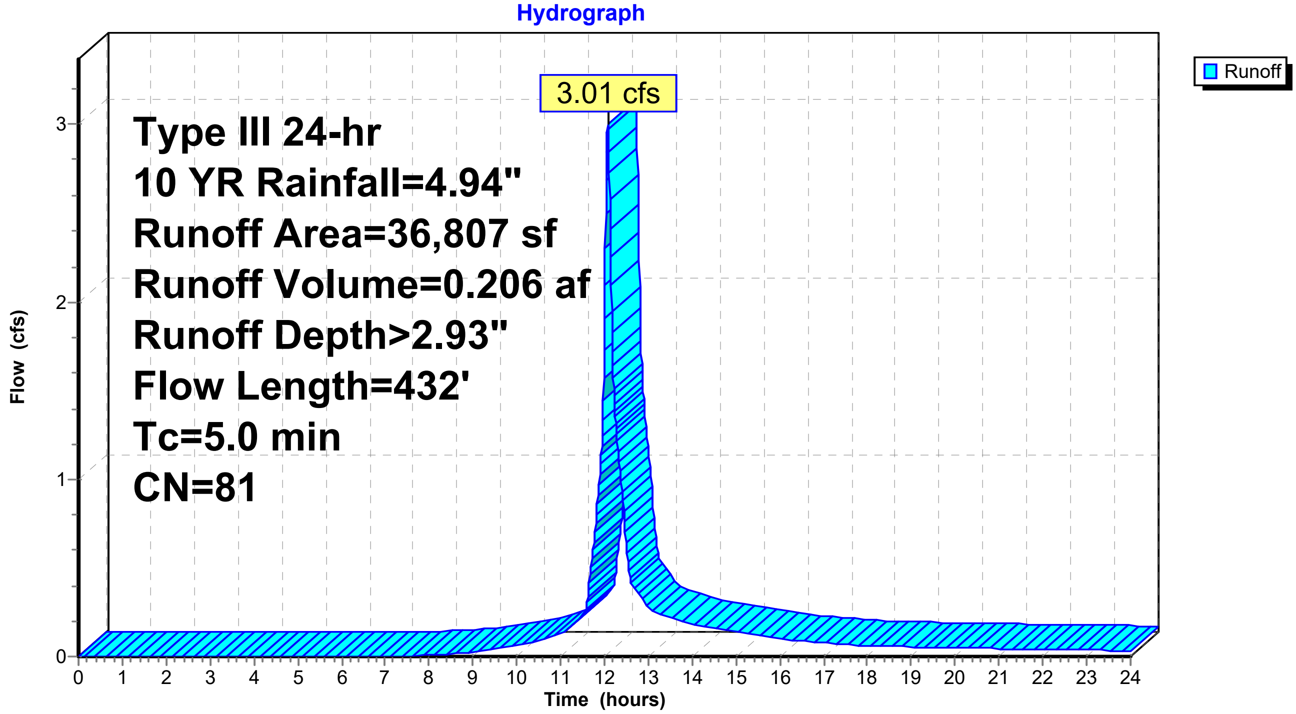
Runoff = 3.01 cfs @ 12.07 hrs, Volume= 0.206 af, Depth> 2.93"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 10 YR Rainfall=4.94"

Area (sf)	CN	Description
10,671	39	>75% Grass cover, Good, HSG A
25,176	98	Paved parking, HSG A
960	98	Roofs, HSG A
36,807	81	Weighted Average
10,671		28.99% Pervious Area
26,136		71.01% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.4	86	0.0100	1.04		**Sheet Flow, A-B** Smooth surfaces n= 0.011 P2= 3.40"
0.7	196	0.0100	4.54	3.56	**Pipe Channel, B-C** 12.0" Round Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.013 Corrugated PE, smooth interior
0.5	150	0.0060	4.60	8.14	**Pipe Channel, C-D** 18.0" Round Area= 1.8 sf Perim= 4.7' r= 0.38' n= 0.013 Corrugated PE, smooth interior
2.4					**Direct Entry, Added Tc**
5.0	432	Total			

Subcatchment P8b: PR-DA8b



Summary for Subcatchment P9: PR-DA9

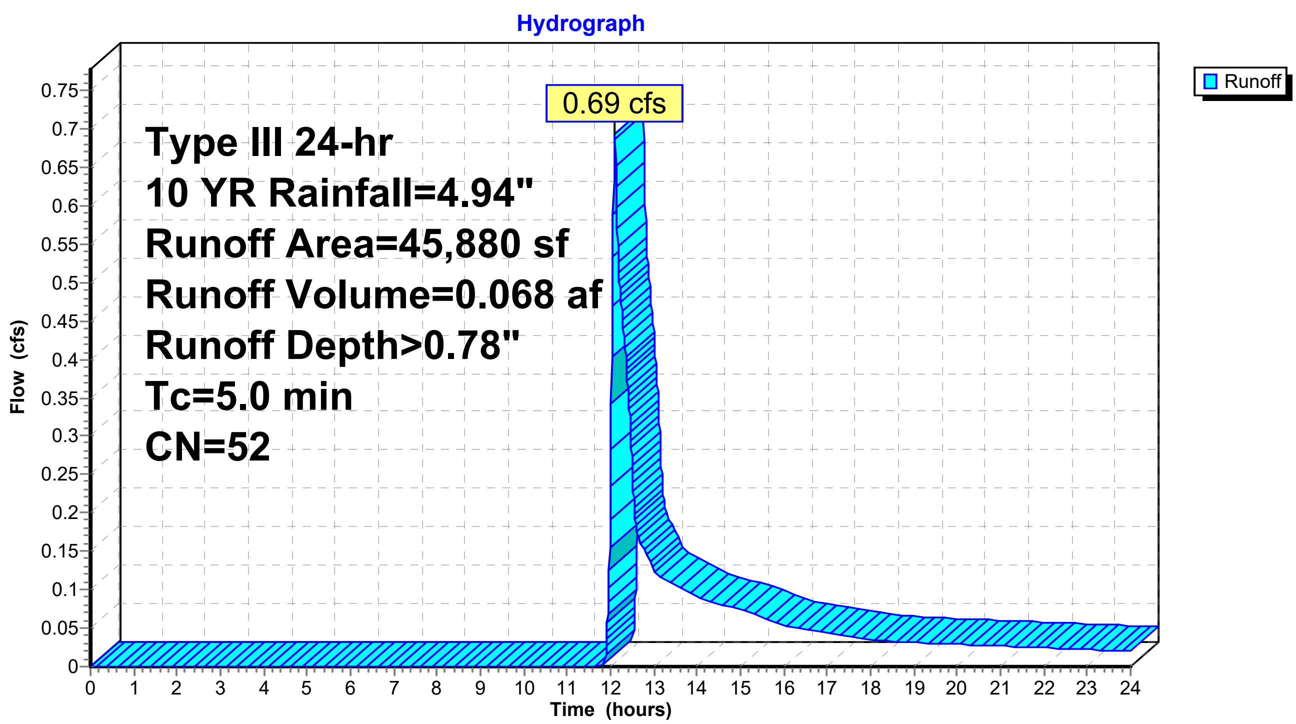
Runoff = 0.69 cfs @ 12.10 hrs, Volume= 0.068 af, Depth> 0.78"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 10 YR Rainfall=4.94"

	Area (sf)	CN	Description
	35,890	39	>75% Grass cover, Good, HSG A
*	380	98	Unconnected impervious, HSG A
	9,610	98	Stormwater Basin; Water Surface, HSG A
	45,880	52	Weighted Average
	35,890		78.23% Pervious Area
	9,990		21.77% Impervious Area
	380		3.80% Unconnected

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

Subcatchment P9: PR-DA9

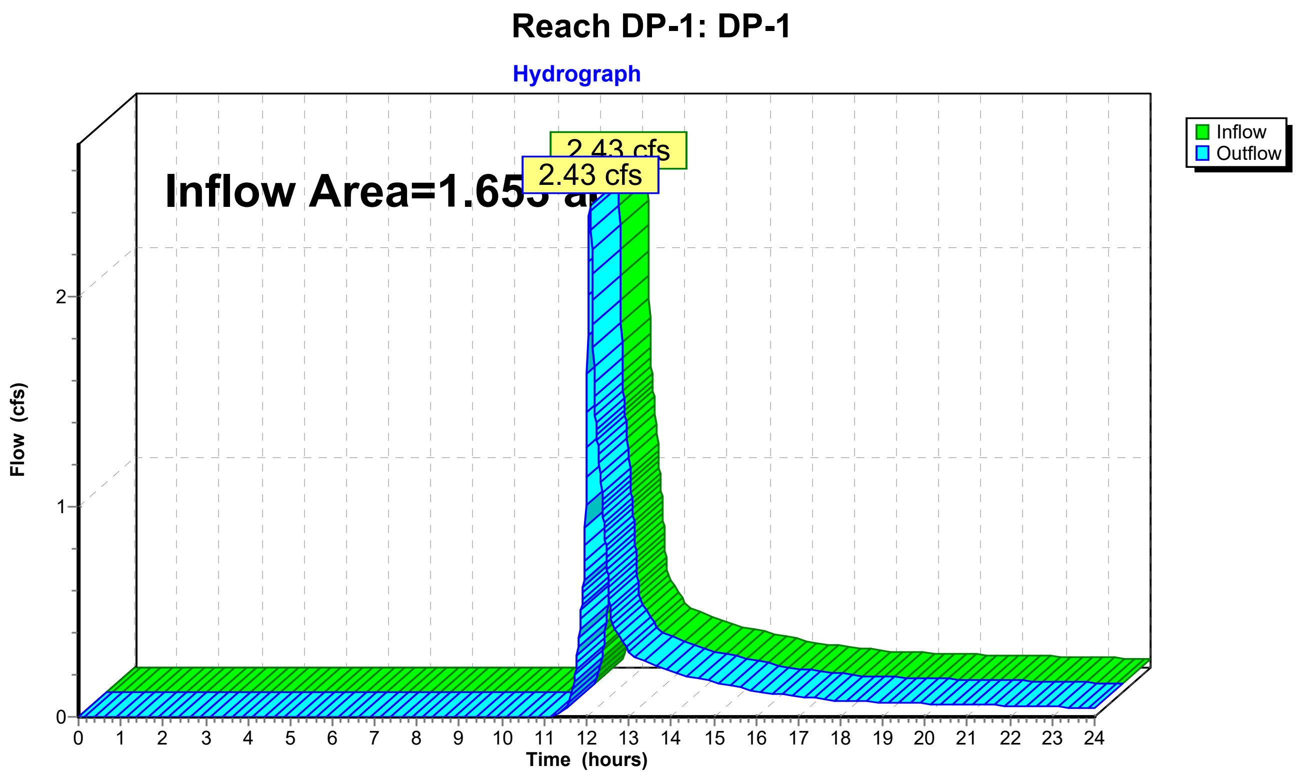


Summary for Reach DP-1: DP-1

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area =	1.653 ac, 28.03% Impervious, Inflow Depth > 1.33"	for 10 YR event	
Inflow =	2.43 cfs @ 12.08 hrs, Volume=	0.183 af	
Outflow =	2.43 cfs @ 12.08 hrs, Volume=	0.183 af,	Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs



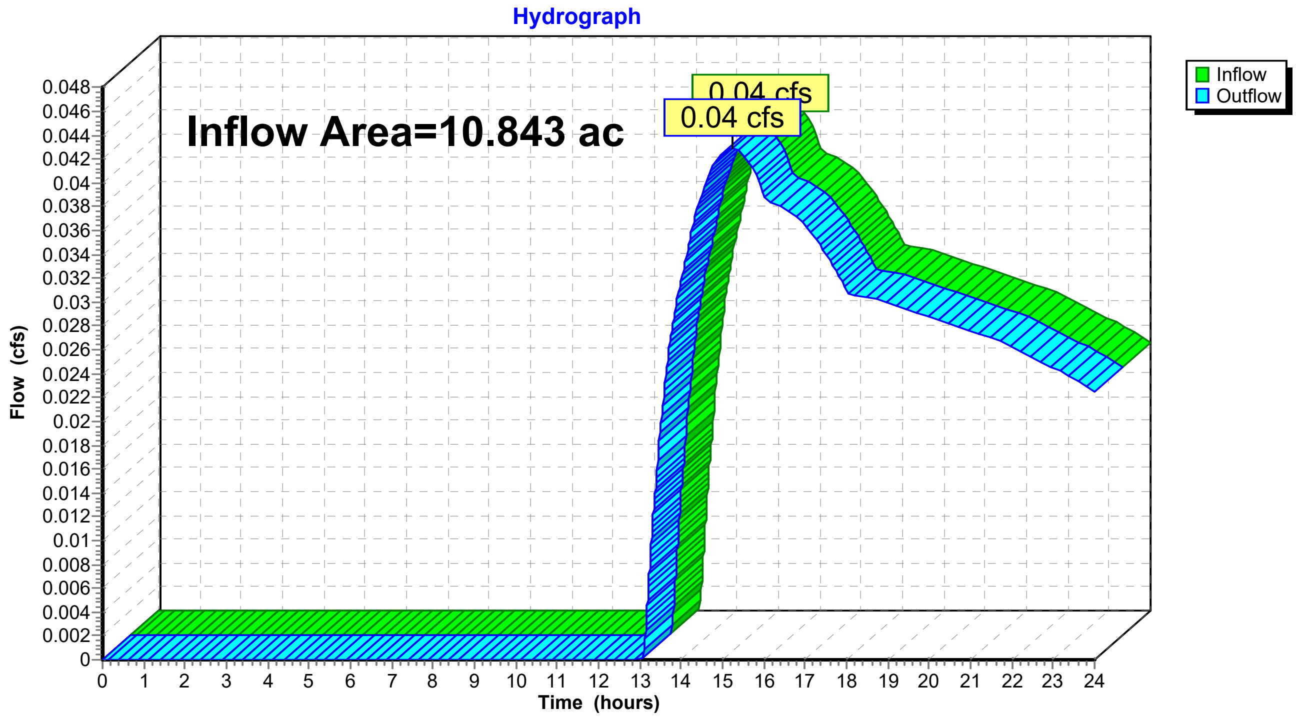
Summary for Reach DP-2: DP-2 (JOSHUA'S BROOK)

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area =	10.843 ac,	28.77% Impervious,	Inflow Depth > 0.03"	for 10 YR event	
Inflow =	0.04 cfs @	15.23 hrs,	Volume=	0.028 af	
Outflow =	0.04 cfs @	15.23 hrs,	Volume=	0.028 af,	Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs

Reach DP-2: DP-2 (JOSHUA'S BROOK)



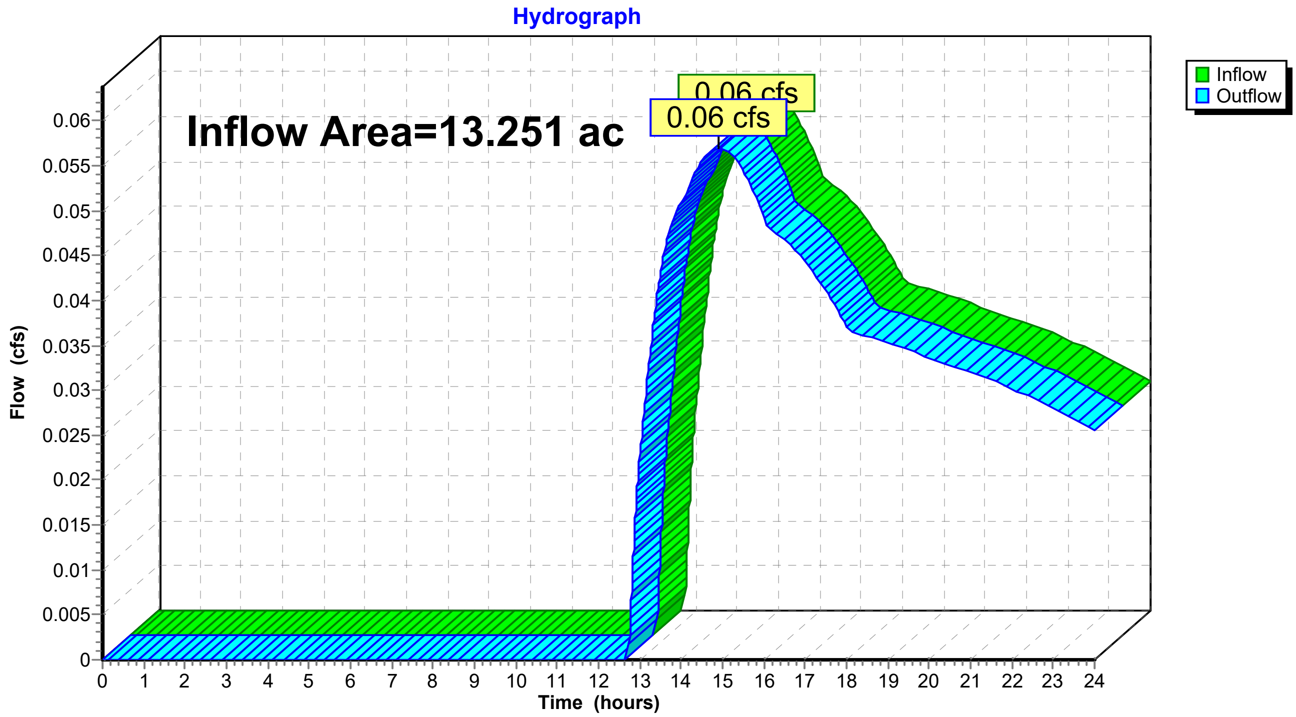
Summary for Reach DP-3: DP-3 (STEWART'S CREEK)

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 13.251 ac, 19.02% Impervious, Inflow Depth > 0.03" for 10 YR event
Inflow = 0.06 cfs @ 14.93 hrs, Volume= 0.036 af
Outflow = 0.06 cfs @ 14.93 hrs, Volume= 0.036 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs

Reach DP-3: DP-3 (STEWART'S CREEK)



Summary for Pond 41P: SC-740

Inflow Area = 0.115 ac,100.00% Impervious, Inflow Depth > 4.70" for 10 YR event
Inflow = 0.57 cfs @ 12.07 hrs, Volume= 0.045 af
Outflow = 0.09 cfs @ 11.65 hrs, Volume= 0.045 af, Atten= 84%, Lag= 0.0 min
Discarded = 0.09 cfs @ 11.65 hrs, Volume= 0.045 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Peak Elev= 38.06' @ 12.52 hrs Surf.Area= 492 sf Storage= 496 cf

Plug-Flow detention time= 27.9 min calculated for 0.045 af (100% of inflow)
Center-of-Mass det. time= 27.8 min (774.6 - 746.8)

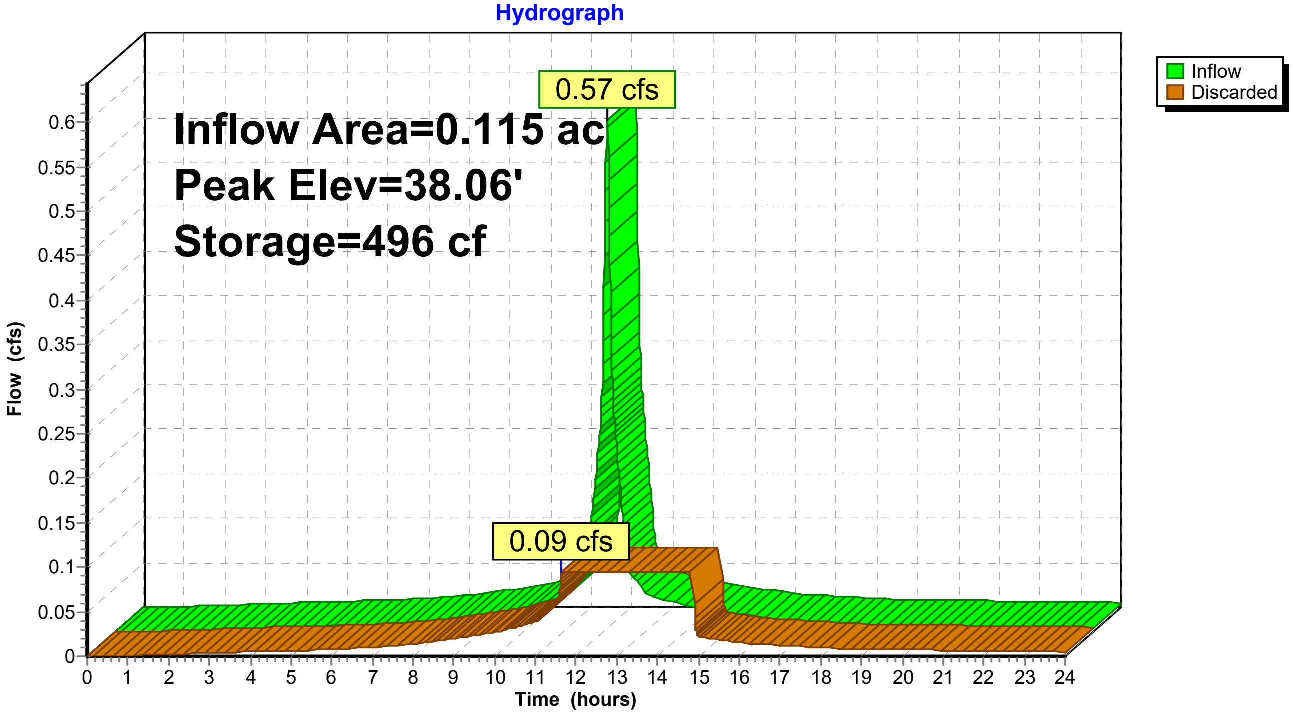
Volume	Invert	Avail.Storage	Storage Description
#1	36.50'	468 cf	**Stone (Prismatic)** Listed below (Recalc) 1,722 cf Overall - 551 cf Embedded = 1,171 cf x 40.0% Voids
#2	37.00'	551 cf	**ADS_StormTech SC-740 +Cap** x 12 Inside #1 Effective Size= 44.6"W x 30.0"H => 6.45 sf x 7.12'L = 45.9 cf Overall Size= 51.0"W x 30.0"H x 7.56'L with 0.44' Overlap 2 Rows of 6 Chambers
		1,020 cf	Total Available Storage

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
36.50	492	0	0
40.00	492	1,722	1,722

Device	Routing	Invert	Outlet Devices
#1	Discarded	36.50'	**8.270 in/hr Exfiltration over Surface area**

Discarded OutFlow Max=0.09 cfs @ 11.65 hrs HW=36.54' (Free Discharge)
└─**1=Exfiltration** (Exfiltration Controls 0.09 cfs)

Pond 41P: SC-740



Summary for Pond 43P: SC-740

Inflow Area = 0.782 ac, 11.09% Impervious, Inflow Depth > 0.30" for 10 YR event
Inflow = 0.08 cfs @ 12.37 hrs, Volume= 0.019 af
Outflow = 0.05 cfs @ 12.26 hrs, Volume= 0.019 af, Atten= 37%, Lag= 0.0 min
Discarded = 0.05 cfs @ 12.26 hrs, Volume= 0.019 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Peak Elev= 19.78' @ 12.57 hrs Surf.Area= 256 sf Storage= 29 cf

Plug-Flow detention time= 3.1 min calculated for 0.019 af (100% of inflow)
Center-of-Mass det. time= 2.5 min (976.6 - 974.1)

Volume	Invert	Avail.Storage	Storage Description
#1	19.50'	248 cf	**Stone (Prismatic)** Listed below (Recalc) 896 cf Overall - 276 cf Embedded = 620 cf x 40.0% Voids
#2	20.00'	276 cf	**ADS_StormTech SC-740 +Cap** x 6 Inside #1 Effective Size= 44.6"W x 30.0"H => 6.45 sf x 7.12'L = 45.9 cf Overall Size= 51.0"W x 30.0"H x 7.56'L with 0.44' Overlap 2 Rows of 3 Chambers
#3	24.50'	3,830 cf	**Surface Ponding (Prismatic)** Listed below (Recalc)
		4,353 cf	Total Available Storage

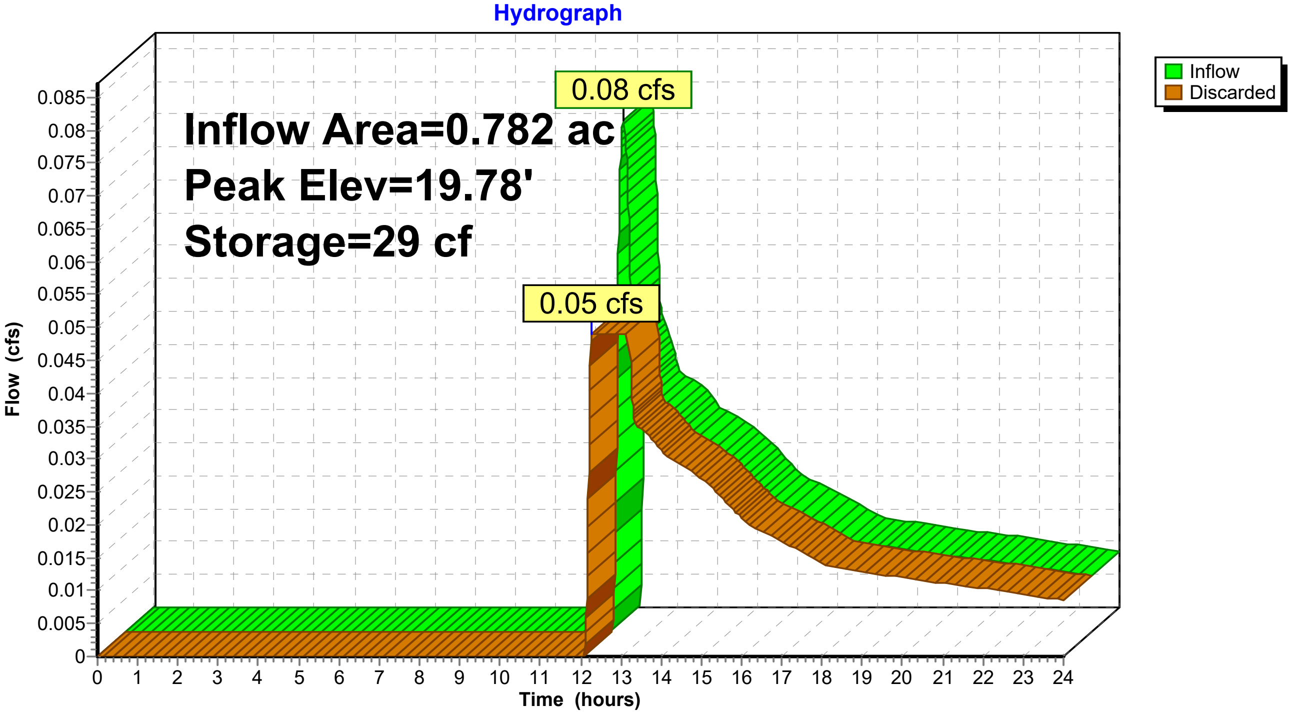
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
19.50	256	0	0
23.00	256	896	896

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
24.50	4	0	0
25.00	3,057	765	765
25.50	9,200	3,064	3,830

Device	Routing	Invert	Outlet Devices
#1	Discarded	19.50'	**8.270 in/hr Exfiltration over Surface area**

Discarded OutFlow Max=0.05 cfs @ 12.26 hrs HW=19.56' (Free Discharge)
└─**1=Exfiltration** (Exfiltration Controls 0.05 cfs)

Pond 43P: SC-740



Summary for Pond 45P: SC-740

Inflow Area = 1.100 ac, 26.54% Impervious, Inflow Depth > 0.52" for 10 YR event
Inflow = 0.31 cfs @ 12.13 hrs, Volume= 0.047 af
Outflow = 0.12 cfs @ 12.09 hrs, Volume= 0.047 af, Atten= 60%, Lag= 0.0 min
Discarded = 0.12 cfs @ 12.09 hrs, Volume= 0.047 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Peak Elev= 20.20' @ 12.60 hrs Surf.Area= 650 sf Storage= 235 cf

Plug-Flow detention time= 10.5 min calculated for 0.047 af (100% of inflow)
Center-of-Mass det. time= 9.9 min (942.1 - 932.3)

Volume	Invert	Avail.Storage	Storage Description
#1	19.50'	616 cf	**Stone (Prismatic)** Listed below (Recalc) 2,275 cf Overall - 735 cf Embedded = 1,540 cf x 40.0% Voids
#2	20.00'	735 cf	**ADS_StormTech SC-740 +Cap** x 16 Inside #1 Effective Size= 44.6"W x 30.0"H => 6.45 sf x 7.12'L = 45.9 cf Overall Size= 51.0"W x 30.0"H x 7.56'L with 0.44' Overlap 2 Rows of 8 Chambers
#3	25.50'	4,609 cf	**Surface Ponding (Prismatic)** Listed below (Recalc)
		5,960 cf	Total Available Storage

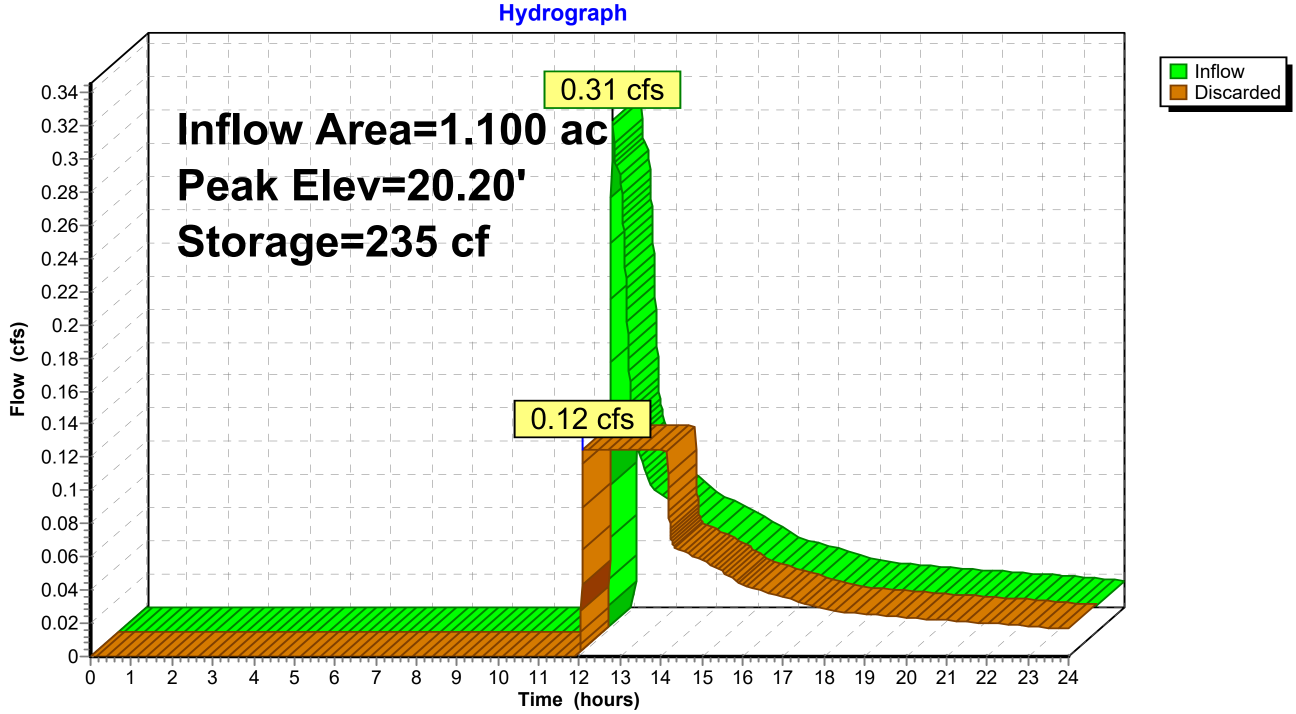
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
19.50	650	0	0
23.00	650	2,275	2,275

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
25.50	4	0	0
26.00	2,742	687	687
26.80	7,065	3,923	4,609

Device	Routing	Invert	Outlet Devices
#1	Discarded	19.50'	**8.270 in/hr Exfiltration over Surface area**

Discarded OutFlow Max=0.12 cfs @ 12.09 hrs HW=19.59' (Free Discharge)
└─**1=Exfiltration** (Exfiltration Controls 0.12 cfs)

Pond 45P: SC-740



Summary for Pond B-1: Basin 1

Inflow Area = 5.195 ac, 60.05% Impervious, Inflow Depth > 2.27" for 10 YR event
Inflow = 14.16 cfs @ 12.10 hrs, Volume= 0.984 af
Outflow = 0.75 cfs @ 14.74 hrs, Volume= 0.763 af, Atten= 95%, Lag= 158.4 min
Discarded = 0.75 cfs @ 14.74 hrs, Volume= 0.763 af
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Peak Elev= 12.61' @ 14.74 hrs Surf.Area= 13,431 sf Storage= 22,799 cf

Plug-Flow detention time= 288.9 min calculated for 0.763 af (78% of inflow)
Center-of-Mass det. time= 210.2 min (1,031.3 - 821.1)

Volume	Invert	Avail.Storage	Storage Description
#1	10.50'	61,135 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

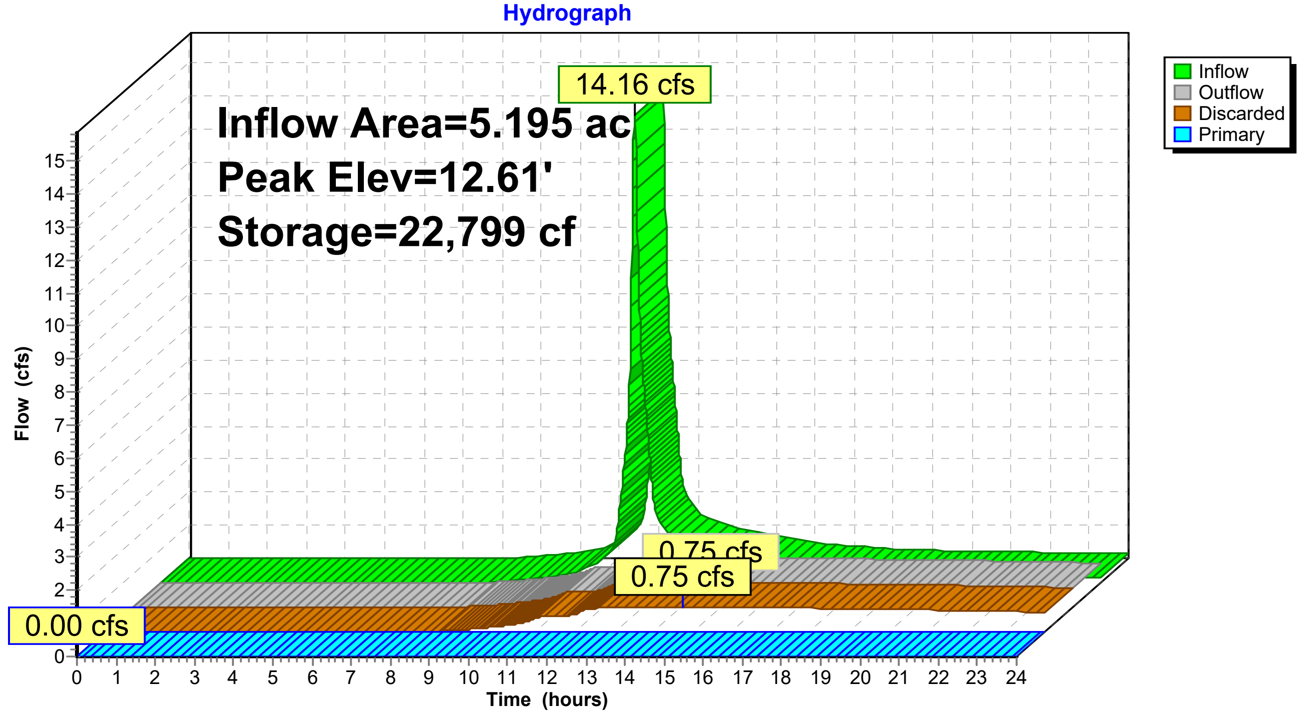
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
10.50	8,346	0	0
11.00	9,153	4,375	4,375
12.00	12,072	10,613	14,987
13.00	14,291	13,182	28,169
14.00	16,502	15,397	43,565
15.00	18,637	17,570	61,135

Device	Routing	Invert	Outlet Devices
#1	Discarded	10.50'	**2.410 in/hr Exfiltration over Surface area**
#2	Primary	15.00'	**45.0 deg x 15.0' long Sharp-Crested Vee/Trap Weir** Cv= 2.56 (C= 3.20)

Discarded OutFlow Max=0.75 cfs @ 14.74 hrs HW=12.61' (Free Discharge)
└─**1=Exfiltration** (Exfiltration Controls 0.75 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=10.50' (Free Discharge)
└─**2=Sharp-Crested Vee/Trap Weir** (Controls 0.00 cfs)

Pond B-1: Basin 1



Summary for Pond B-2: Basin 2

Inflow Area = 4.443 ac, 56.72% Impervious, Inflow Depth > 1.74" for 10 YR event
Inflow = 10.56 cfs @ 12.10 hrs, Volume= 0.645 af
Outflow = 0.57 cfs @ 14.13 hrs, Volume= 0.570 af, Atten= 95%, Lag= 121.7 min
Discarded = 0.57 cfs @ 14.13 hrs, Volume= 0.570 af
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Peak Elev= 17.19' @ 14.13 hrs Surf.Area= 10,288 sf Storage= 15,288 cf

Plug-Flow detention time= 277.0 min calculated for 0.569 af (88% of inflow)
Center-of-Mass det. time= 227.4 min (1,039.2 - 811.8)

Volume	Invert	Avail.Storage	Storage Description
#1	15.50'	37,352 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc)

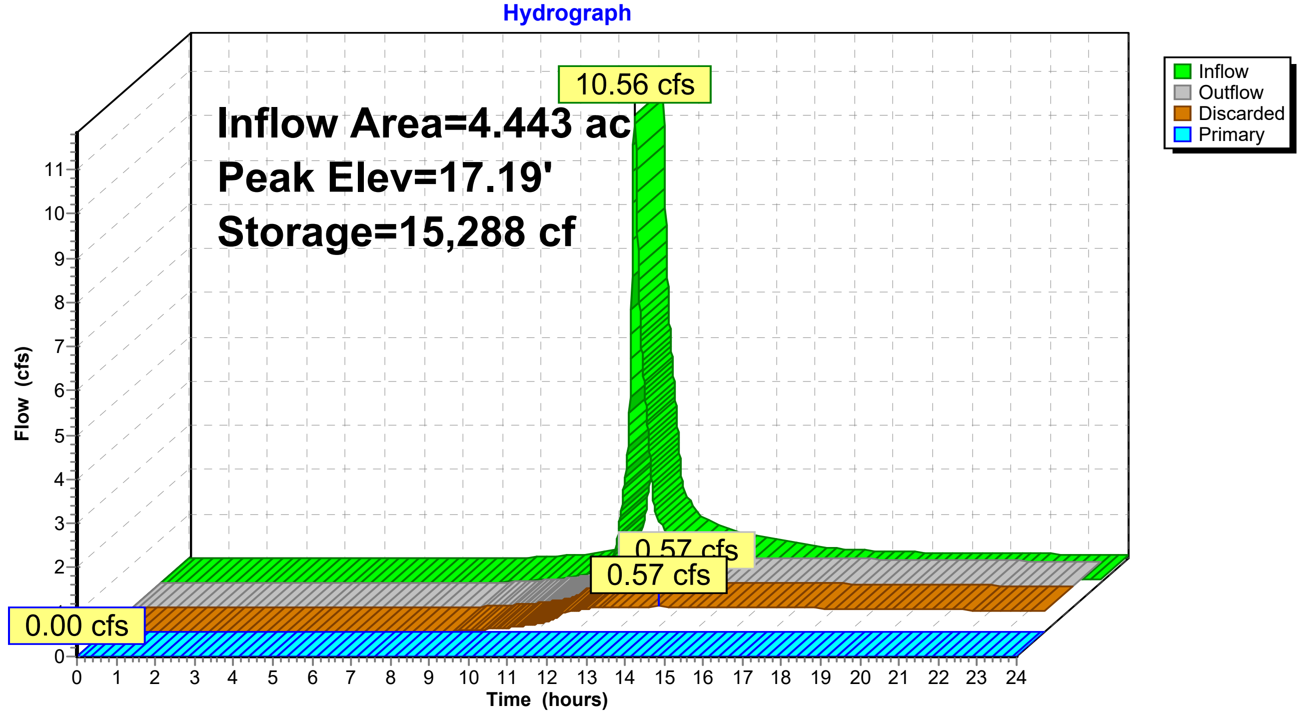
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
15.50	7,983	0	0
16.00	8,588	4,143	4,143
17.00	9,841	9,215	13,357
18.00	12,169	11,005	24,362
19.00	13,810	12,990	37,352

Device	Routing	Invert	Outlet Devices
#1	Discarded	15.50'	**2.410 in/hr Exfiltration over Surface area**
#2	Primary	19.50'	**45.0 deg x 15.0' long Sharp-Crested Vee/Trap Weir** Cv= 2.56 (C= 3.20)

Discarded OutFlow Max=0.57 cfs @ 14.13 hrs HW=17.19' (Free Discharge)
↑—**1=Exfiltration** (Exfiltration Controls 0.57 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=15.50' (Free Discharge)
↑—**2=Sharp-Crested Vee/Trap Weir** (Controls 0.00 cfs)

Pond B-2: Basin 2



Summary for Pond BIO1: BIO 1

Inflow Area = 0.791 ac, 76.51% Impervious, Inflow Depth > 3.21" for 10 YR event
Inflow = 3.07 cfs @ 12.07 hrs, Volume= 0.212 af
Outflow = 2.98 cfs @ 12.09 hrs, Volume= 0.207 af, Atten= 3%, Lag= 1.1 min
Discarded = 0.06 cfs @ 12.09 hrs, Volume= 0.058 af
Primary = 2.92 cfs @ 12.09 hrs, Volume= 0.149 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Peak Elev= 19.77' @ 12.09 hrs Surf.Area= 1,086 sf Storage= 538 cf

Plug-Flow detention time= 26.2 min calculated for 0.207 af (98% of inflow)
Center-of-Mass det. time= 12.8 min (822.3 - 809.5)

Volume	Invert	Avail.Storage	Storage Description
#1	19.00'	7,359 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc)

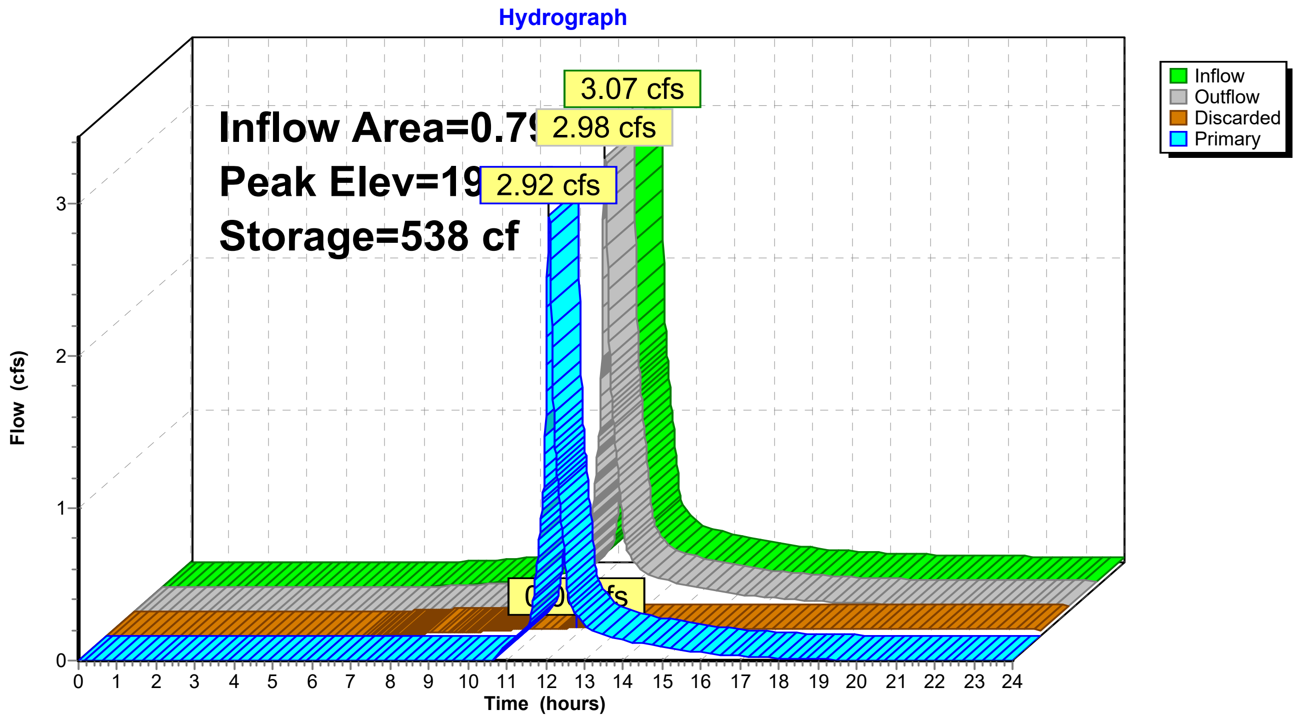
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
19.00	307	0	0
20.00	1,315	811	811
20.40	2,200	703	1,514
21.00	17,283	5,845	7,359

Device	Routing	Invert	Outlet Devices
#1	Discarded	19.00'	**2.410 in/hr Exfiltration over Surface area**
#2	Primary	19.50'	**12.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#3	Primary	19.50'	**12.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Discarded OutFlow Max=0.06 cfs @ 12.09 hrs HW=19.77' (Free Discharge)
└─**1=Exfiltration** (Exfiltration Controls 0.06 cfs)

Primary OutFlow Max=2.92 cfs @ 12.09 hrs HW=19.77' (Free Discharge)
├─**2=Orifice/Grate** (Weir Controls 1.46 cfs @ 1.71 fps)
└─**3=Orifice/Grate** (Weir Controls 1.46 cfs @ 1.71 fps)

Pond BIO1: BIO 1



Summary for Pond BIO2: BIO 2

Inflow Area = 0.833 ac, 68.24% Impervious, Inflow Depth > 2.75" for 10 YR event
Inflow = 2.79 cfs @ 12.07 hrs, Volume= 0.191 af
Outflow = 2.24 cfs @ 12.13 hrs, Volume= 0.191 af, Atten= 20%, Lag= 3.4 min
Discarded = 0.12 cfs @ 12.13 hrs, Volume= 0.116 af
Primary = 2.12 cfs @ 12.13 hrs, Volume= 0.074 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Peak Elev= 22.97' @ 12.13 hrs Surf.Area= 2,207 sf Storage= 1,754 cf

Plug-Flow detention time= 79.3 min calculated for 0.190 af (100% of inflow)
Center-of-Mass det. time= 78.4 min (901.9 - 823.5)

Volume	Invert	Avail.Storage	Storage Description
#1	22.00'	4,509 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

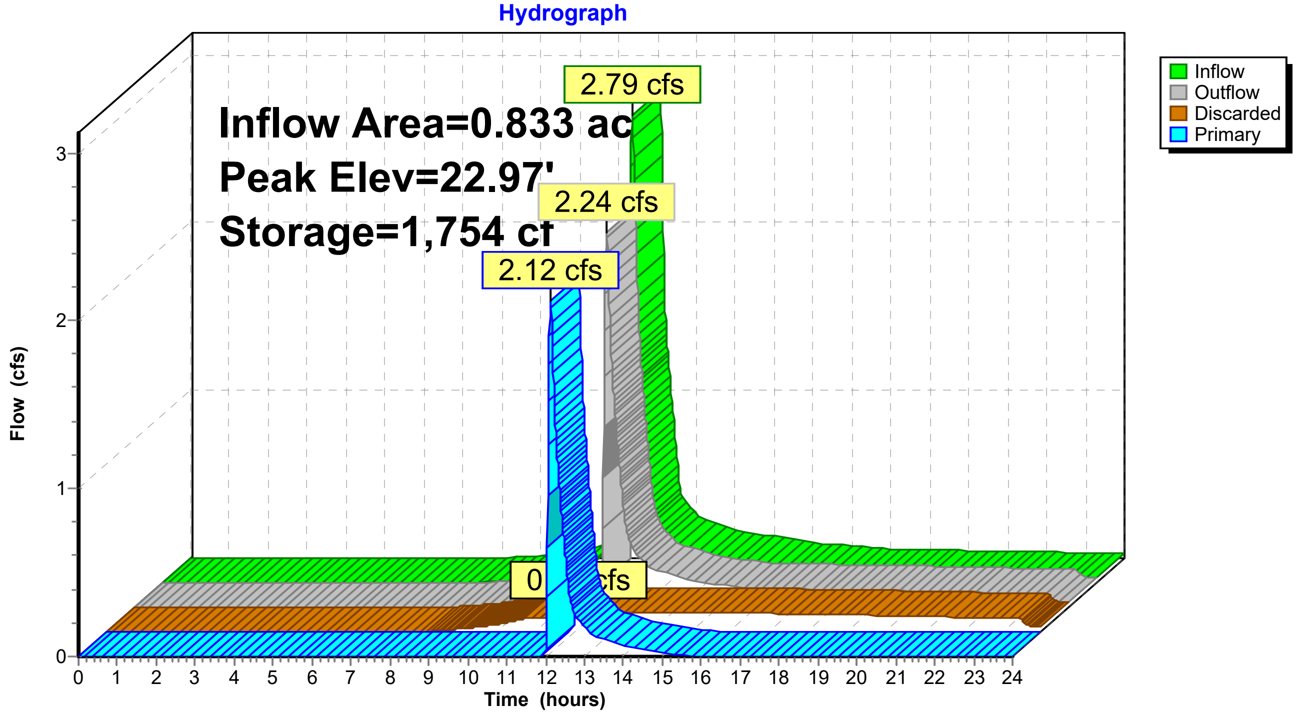
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
22.00	1,410	0	0
23.00	2,232	1,821	1,821
24.00	3,143	2,688	4,509

Device	Routing	Invert	Outlet Devices
#1	Discarded	22.00'	**2.410 in/hr Exfiltration over Surface area**
#2	Primary	22.75'	**12.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#3	Primary	22.75'	**12.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Discarded OutFlow Max=0.12 cfs @ 12.13 hrs HW=22.97' (Free Discharge)
└─**1=Exfiltration** (Exfiltration Controls 0.12 cfs)

Primary OutFlow Max=2.11 cfs @ 12.13 hrs HW=22.97' (Free Discharge)
├─**2=Orifice/Grate** (Weir Controls 1.06 cfs @ 1.53 fps)
└─**3=Orifice/Grate** (Weir Controls 1.06 cfs @ 1.53 fps)

Pond BIO2: BIO 2



Summary for Pond BIO3: BIO-3

Inflow Area = 0.816 ac, 75.18% Impervious, Inflow Depth > 3.12" for 10 YR event
Inflow = 3.08 cfs @ 12.07 hrs, Volume= 0.212 af
Outflow = 2.93 cfs @ 12.10 hrs, Volume= 0.209 af, Atten= 5%, Lag= 1.5 min
Discarded = 0.08 cfs @ 12.10 hrs, Volume= 0.078 af
Primary = 2.84 cfs @ 12.10 hrs, Volume= 0.130 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Peak Elev= 23.77' @ 12.10 hrs Surf.Area= 1,494 sf Storage= 822 cf

Plug-Flow detention time= 36.1 min calculated for 0.208 af (98% of inflow)
Center-of-Mass det. time= 26.7 min (839.2 - 812.5)

Volume	Invert	Avail.Storage	Storage Description
#1	23.00'	2,268 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

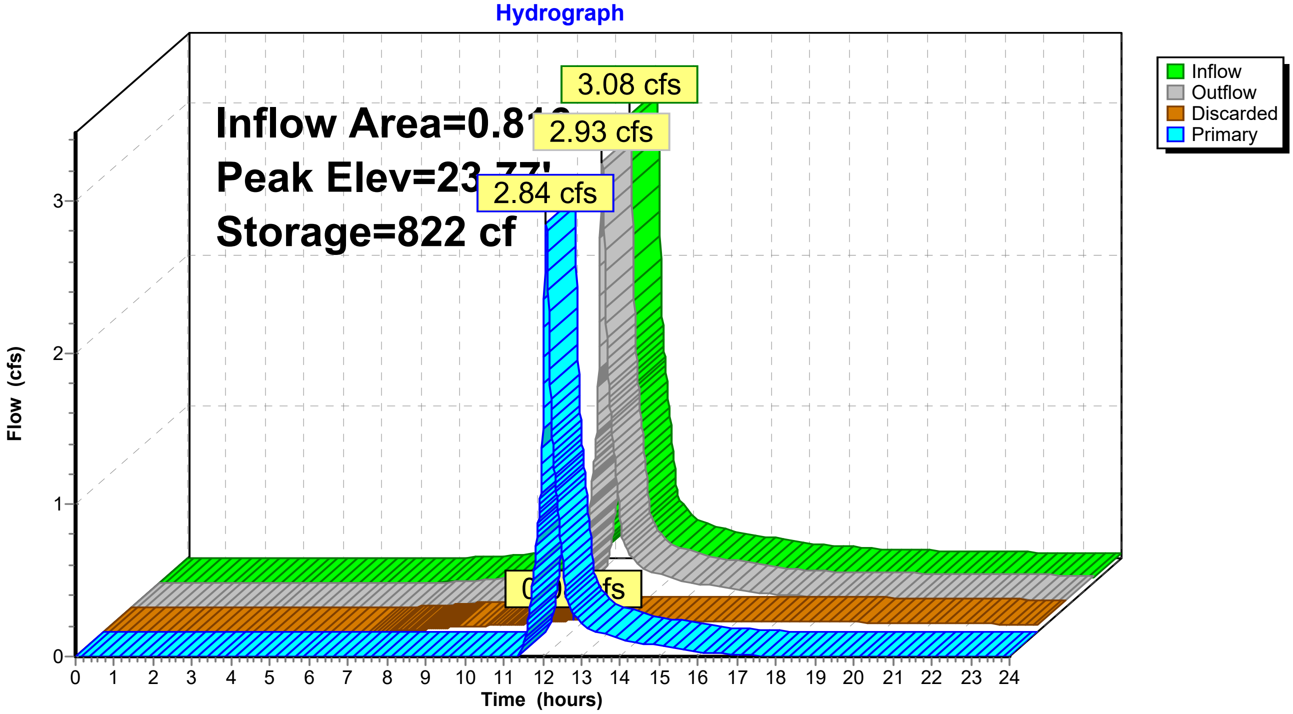
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
23.00	648	0	0
24.00	1,750	1,199	1,199
24.50	2,527	1,069	2,268

Device	Routing	Invert	Outlet Devices
#1	Discarded	23.00'	**2.410 in/hr Exfiltration over Surface area**
#2	Primary	23.50'	**12.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#3	Primary	23.50'	**12.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Discarded OutFlow Max=0.08 cfs @ 12.10 hrs HW=23.77' (Free Discharge)
└─**1=Exfiltration** (Exfiltration Controls 0.08 cfs)

Primary OutFlow Max=2.84 cfs @ 12.10 hrs HW=23.77' (Free Discharge)
├─**2=Orifice/Grate** (Weir Controls 1.42 cfs @ 1.69 fps)
└─**3=Orifice/Grate** (Weir Controls 1.42 cfs @ 1.69 fps)

Pond BIO3: BIO-3



Summary for Pond P-B: POND B

Inflow Area = 1.269 ac, 0.00% Impervious, Inflow Depth > 0.61" for 10 YR event
Inflow = 0.54 cfs @ 12.11 hrs, Volume= 0.065 af
Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Atten= 100%, Lag= 0.0 min
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Peak Elev= 2.97' @ 24.00 hrs Surf.Area= 10,990 sf Storage= 2,832 cf

Plug-Flow detention time= (not calculated: initial storage exceeds outflow)
Center-of-Mass det. time= (not calculated: no outflow)

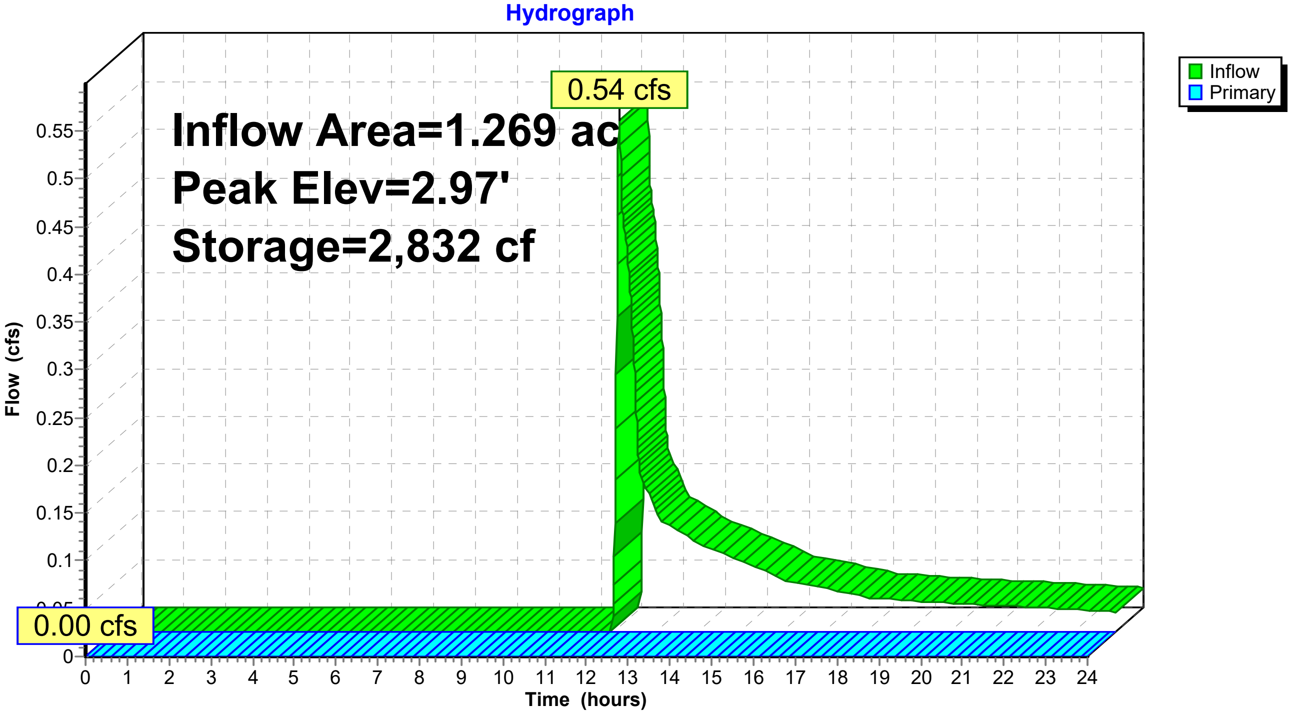
Volume	Invert	Avail.Storage	Storage Description
#1	2.70'	15,021 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
2.70	10,273	0	0
3.00	11,080	3,203	3,203
3.40	11,370	4,490	7,693
4.00	13,058	7,328	15,021

Device	Routing	Invert	Outlet Devices
#1	Primary	3.44'	**45.0 deg x 15.0' long x 0.50' rise Sharp-Crested Vee/Trap Weir** Cv= 2.56 (C= 3.20)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=2.70' (Free Discharge)
└─**1=Sharp-Crested Vee/Trap Weir** (Controls 0.00 cfs)

Pond P-B: POND B



Summary for Pond P-C: POND C

Inflow Area = 2.480 ac, 0.00% Impervious, Inflow Depth > 0.61" for 10 YR event
Inflow = 1.05 cfs @ 12.11 hrs, Volume= 0.127 af
Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Atten= 100%, Lag= 0.0 min
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Peak Elev= 3.86' @ 24.00 hrs Surf.Area= 22,526 sf Storage= 5,533 cf

Plug-Flow detention time= (not calculated: initial storage exceeds outflow)
Center-of-Mass det. time= (not calculated: no outflow)

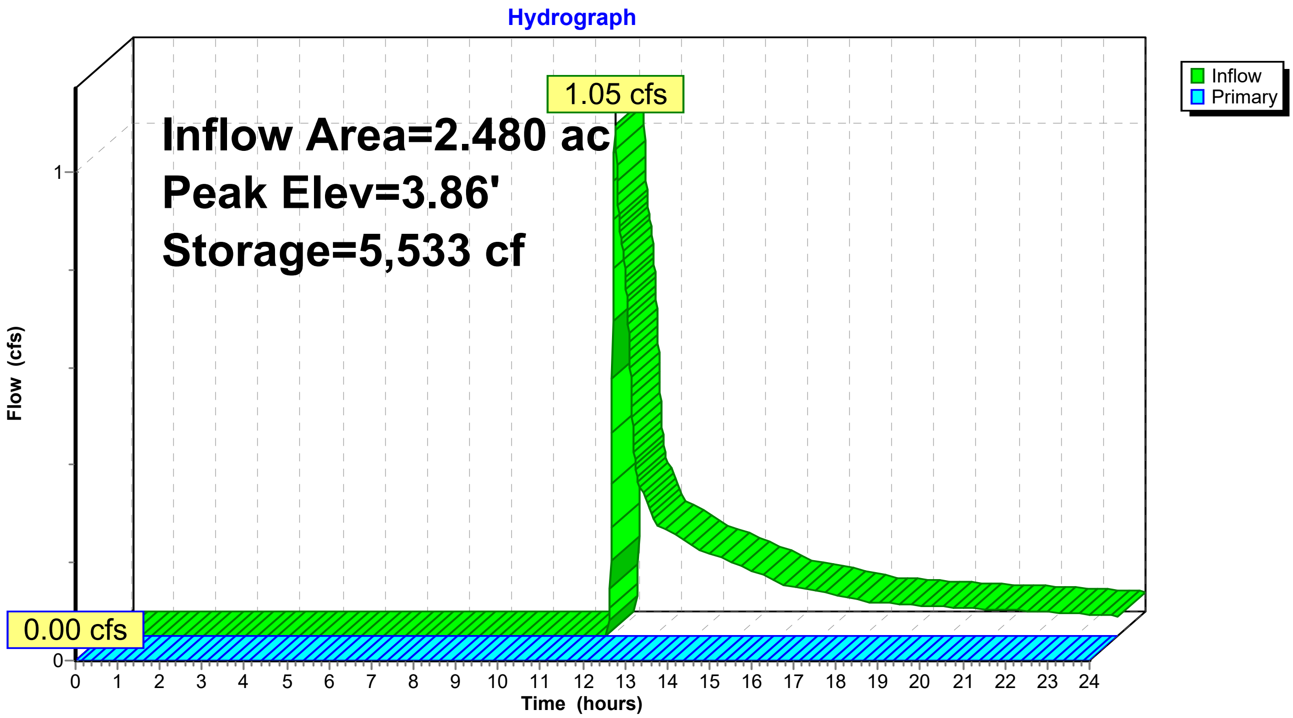
Volume	Invert	Avail.Storage	Storage Description
#1	3.60'	35,172 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
3.60	20,812	0	0
4.00	23,497	8,862	8,862
5.00	29,124	26,311	35,172

Device	Routing	Invert	Outlet Devices
#1	Primary	4.29'	**45.0 deg x 15.0' long x 0.50' rise Sharp-Crested Vee/Trap Weir** Cv= 2.56 (C= 3.20)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=3.60' (Free Discharge)
└─**1=Sharp-Crested Vee/Trap Weir** (Controls 0.00 cfs)

Pond P-C: POND C



Summary for Pond P-D: POND D

Inflow Area = 2.034 ac, 0.00% Impervious, Inflow Depth > 0.56" for 10 YR event
Inflow = 0.48 cfs @ 12.55 hrs, Volume= 0.095 af
Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Atten= 100%, Lag= 0.0 min
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Peak Elev= 8.52' @ 24.00 hrs Surf.Area= 8,307 sf Storage= 4,126 cf

Plug-Flow detention time= (not calculated: initial storage exceeds outflow)
Center-of-Mass det. time= (not calculated: no outflow)

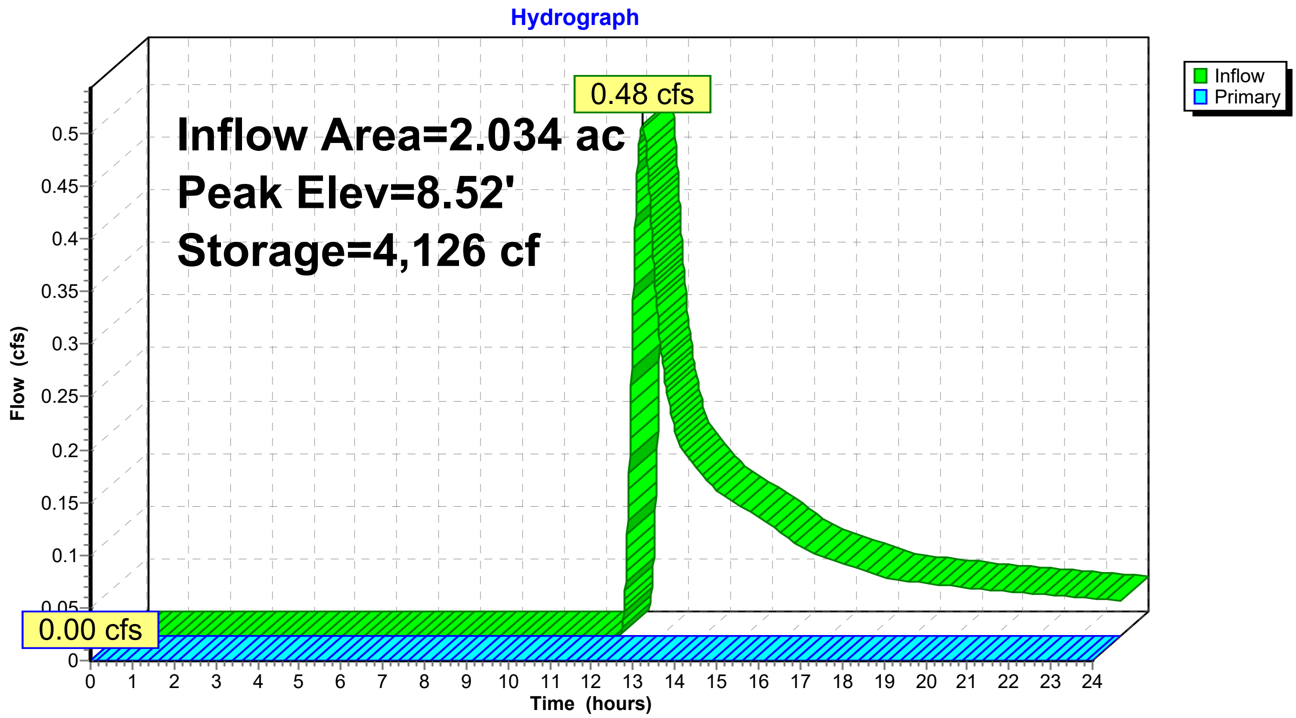
Volume	Invert	Avail.Storage	Storage Description
#1	8.00'	18,853 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
8.00	7,585	0	0
9.00	8,975	8,280	8,280
10.00	12,170	10,573	18,853

Device	Routing	Invert	Outlet Devices
#1	Primary	9.80'	**45.0 deg x 15.0' long x 0.50' rise Sharp-Crested Vee/Trap Weir** Cv= 2.56 (C= 3.20)
#2	Primary	9.08'	**12.0" Round Culvert** L= 18.5' CMP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 9.08' / 8.16' S= 0.0497 '/' Cc= 0.900 n= 0.013 Clay tile, Flow Area= 0.79 sf

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=8.00' (Free Discharge)
├─**1=Sharp-Crested Vee/Trap Weir** (Controls 0.00 cfs)
└─**2=Culvert** (Controls 0.00 cfs)

Pond P-D: POND D



Time span=0.00-24.00 hrs, dt=0.01 hrs, 2401 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 28S: TYP ROOF SIZING Runoff Area=5,000 sf 100.00% Impervious Runoff Depth>5.67"
Tc=5.0 min CN=98 Runoff=0.69 cfs 0.054 af

Subcatchment BIO-1: BIO-1 Runoff Area=34,452 sf 76.51% Impervious Runoff Depth>4.11"
Tc=5.0 min CN=84 Runoff=3.90 cfs 0.271 af

Subcatchment BIO-2: BIO-2 Runoff Area=36,300 sf 68.24% Impervious Runoff Depth>3.60"
Tc=5.0 min CN=79 Runoff=3.64 cfs 0.250 af

Subcatchment BIO-3: BIO-3 Runoff Area=35,532 sf 75.18% Impervious Runoff Depth>4.00"
Tc=5.0 min CN=83 Runoff=3.93 cfs 0.272 af

Subcatchment P10: PR-DA-10 Runoff Area=190,706 sf 0.00% Impervious Runoff Depth>0.23"
Tc=5.0 min CN=35 Runoff=0.19 cfs 0.084 af

Subcatchment P11: PR-DA11 Runoff Area=55,295 sf 0.00% Impervious Runoff Depth>1.03"
Tc=5.0 min CN=49 Runoff=1.19 cfs 0.109 af

Subcatchment P12: PR-DA12 Runoff Area=108,026 sf 0.00% Impervious Runoff Depth>1.03"
Tc=5.0 min CN=49 Runoff=2.32 cfs 0.212 af

Subcatchment P13: PR-DA-13 Runoff Area=32,038 sf 3.96% Impervious Runoff Depth>0.47"
Tc=5.0 min UI Adjusted CN=40 Runoff=0.15 cfs 0.029 af

Subcatchment P14: PR-DA-14 Runoff Area=187,032 sf 0.00% Impervious Runoff Depth>0.27"
Tc=5.0 min CN=36 Runoff=0.29 cfs 0.098 af

Subcatchment P1a: PR-DA-1a Runoff Area=72,022 sf 28.03% Impervious Runoff Depth>1.94"
Tc=5.0 min CN=61 Runoff=3.72 cfs 0.268 af

Subcatchment P1b: PR-DA-1b Runoff Area=61,320 sf 64.77% Impervious Runoff Depth>3.40"
Tc=5.0 min CN=77 Runoff=5.82 cfs 0.399 af

Subcatchment P2: PR-DA-2 Runoff Area=14,573 sf 0.97% Impervious Runoff Depth>0.42"
Tc=5.0 min UI Adjusted CN=39 Runoff=0.05 cfs 0.012 af

Subcatchment P3: PR-DA-3 Runoff Area=88,593 sf 0.00% Impervious Runoff Depth>0.95"
Flow Length=574' Tc=26.1 min CN=48 Runoff=1.02 cfs 0.161 af

Subcatchment P4: PR-DA4 Runoff Area=47,075 sf 19.25% Impervious Runoff Depth>1.10"
Tc=5.0 min CN=50 Runoff=1.12 cfs 0.099 af

Subcatchment P5: PR-DA5 Runoff Area=145,975 sf 68.19% Impervious Runoff Depth>3.59"
Flow Length=1,208' Tc=6.7 min CN=79 Runoff=13.77 cfs 1.004 af

Subcatchment P6: PR-DA-6 Runoff Area=34,083 sf 11.09% Impervious Runoff Depth>0.58"
Tc=5.0 min UI Adjusted CN=42 Runoff=0.23 cfs 0.038 af

Subcatchment P7: PR-DA-7 Runoff Area=47,897 sf 26.54% Impervious Runoff Depth>0.89"
Tc=5.0 min UI Adjusted CN=47 Runoff=0.81 cfs 0.082 af

Subcatchment P8a: PR-DA8a Runoff Area=37,831 sf 61.05% Impervious Runoff Depth>3.20"
Flow Length=626' Tc=5.0 min CN=75 Runoff=3.38 cfs 0.232 af

Subcatchment P8b: PR-DA8b Runoff Area=36,807 sf 71.01% Impervious Runoff Depth>3.80"
Flow Length=432' Tc=5.0 min CN=81 Runoff=3.88 cfs 0.267 af

Subcatchment P9: PR-DA9 Runoff Area=45,880 sf 21.77% Impervious Runoff Depth>1.24"
Tc=5.0 min CN=52 Runoff=1.32 cfs 0.109 af

Reach DP-1: DP-1 Inflow=3.72 cfs 0.268 af
Outflow=3.72 cfs 0.268 af

Reach DP-2: DP-2 (JOSHUA'S BROOK) Inflow=0.19 cfs 0.084 af
Outflow=0.19 cfs 0.084 af

Reach DP-3: DP-3 (STEWART'S CREEK) Inflow=0.29 cfs 0.098 af
Outflow=0.29 cfs 0.098 af

Pond 41P: SC-740 Peak Elev=38.53' Storage=656 cf Inflow=0.69 cfs 0.054 af
Outflow=0.09 cfs 0.054 af

Pond 43P: SC-740 Peak Elev=21.86' Storage=389 cf Inflow=0.23 cfs 0.038 af
Outflow=0.05 cfs 0.038 af

Pond 45P: SC-740 Peak Elev=21.66' Storage=926 cf Inflow=0.81 cfs 0.082 af
Outflow=0.12 cfs 0.082 af

Pond B-1: Basin 1 Peak Elev=13.30' Storage=32,617 cf Inflow=18.81 cfs 1.316 af
Discarded=0.83 cfs 0.880 af Primary=0.00 cfs 0.000 af Outflow=0.83 cfs 0.880 af

Pond B-2: Basin 2 Peak Elev=17.87' Storage=22,768 cf Inflow=14.95 cfs 0.899 af
Discarded=0.66 cfs 0.663 af Primary=0.00 cfs 0.000 af Outflow=0.66 cfs 0.663 af

Pond BIO1: BIO 1 Peak Elev=19.82' Storage=591 cf Inflow=3.90 cfs 0.271 af
Discarded=0.06 cfs 0.061 af Primary=3.73 cfs 0.204 af Outflow=3.79 cfs 0.265 af

Pond BIO2: BIO 2 Peak Elev=23.04' Storage=1,904 cf Inflow=3.64 cfs 0.250 af
Discarded=0.13 cfs 0.126 af Primary=3.16 cfs 0.120 af Outflow=3.28 cfs 0.246 af

Pond BIO3: BIO-3 Peak Elev=23.82' Storage=897 cf Inflow=3.93 cfs 0.272 af
Discarded=0.09 cfs 0.085 af Primary=3.66 cfs 0.182 af Outflow=3.75 cfs 0.266 af

Pond P-B: POND B Peak Elev=3.14' Storage=4,735 cf Inflow=1.19 cfs 0.109 af
Outflow=0.00 cfs 0.000 af

Pond P-C: POND C Peak Elev=4.02' Storage=9,251 cf Inflow=2.32 cfs 0.212 af
Outflow=0.00 cfs 0.000 af

Pond P-D: POND D Peak Elev=8.86' Storage=7,028 cf Inflow=1.02 cfs 0.161 af
Outflow=0.00 cfs 0.000 af

Total Runoff Area = 30.221 ac Runoff Volume = 4.050 af Average Runoff Depth = 1.61"
75.05% Pervious = 22.680 ac 24.95% Impervious = 7.541 ac

Summary for Subcatchment 28S: TYP ROOF SIZING

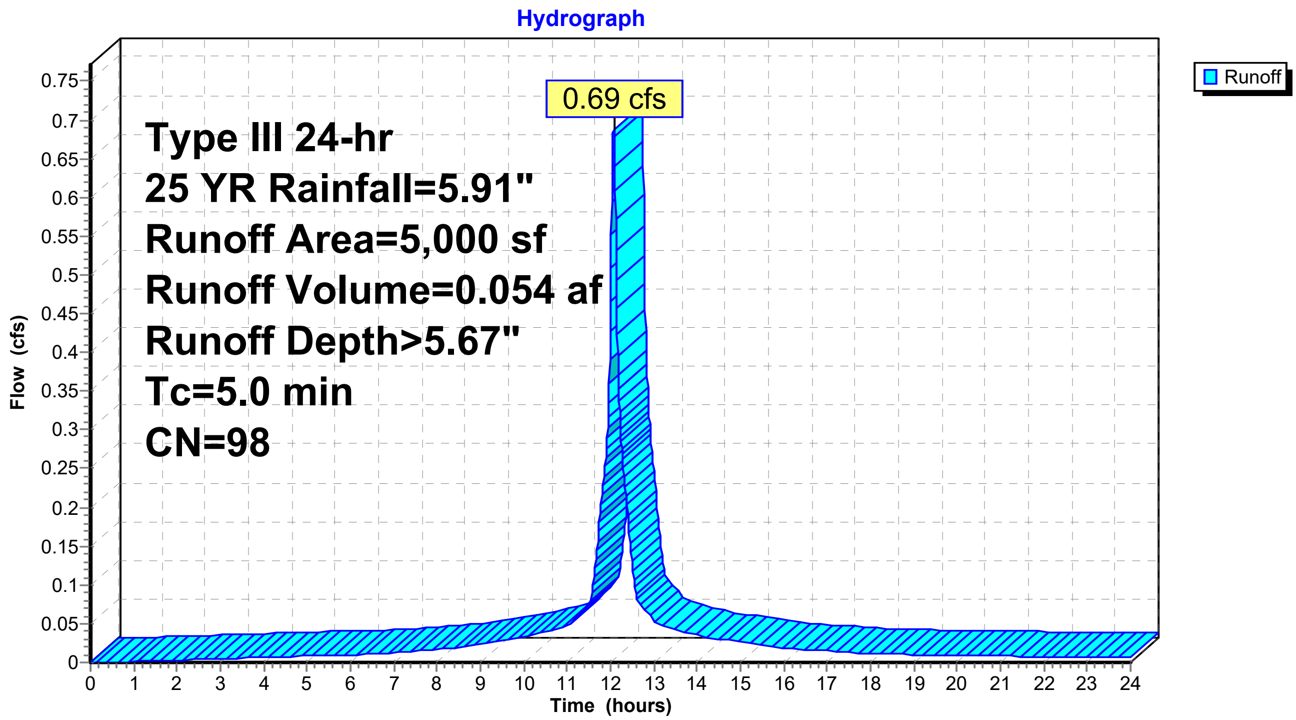
Runoff = 0.69 cfs @ 12.07 hrs, Volume= 0.054 af, Depth> 5.67"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 25 YR Rainfall=5.91"

Area (sf)	CN	Description
5,000	98	Roofs, HSG A
5,000		100.00% Impervious Area

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

Subcatchment 28S: TYP ROOF SIZING



Summary for Subcatchment BIO-1: BIO-1

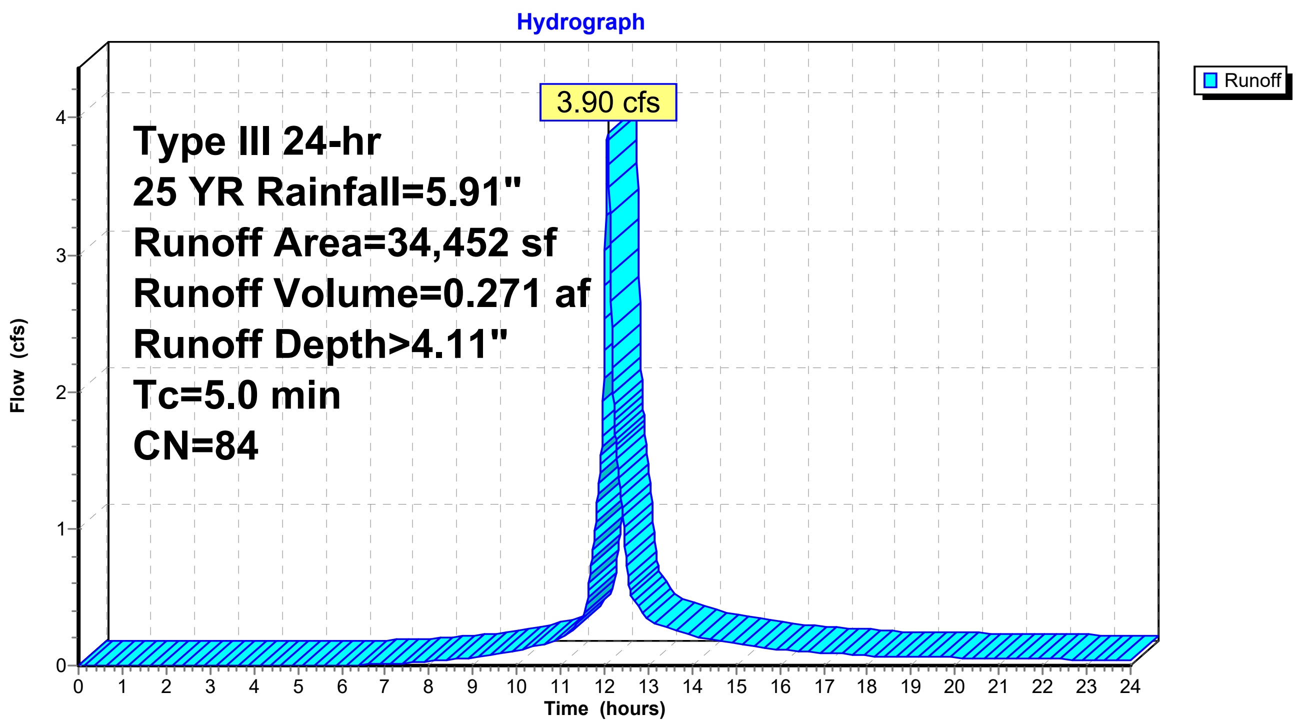
Runoff = 3.90 cfs @ 12.07 hrs, Volume= 0.271 af, Depth> 4.11"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 25 YR Rainfall=5.91"

Area (sf)	CN	Description
8,092	39	>75% Grass cover, Good, HSG A
26,360	98	Paved parking, HSG A
34,452	84	Weighted Average
8,092		23.49% Pervious Area
26,360		76.51% Impervious Area

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

Subcatchment BIO-1: BIO-1



Summary for Subcatchment BIO-2: BIO-2

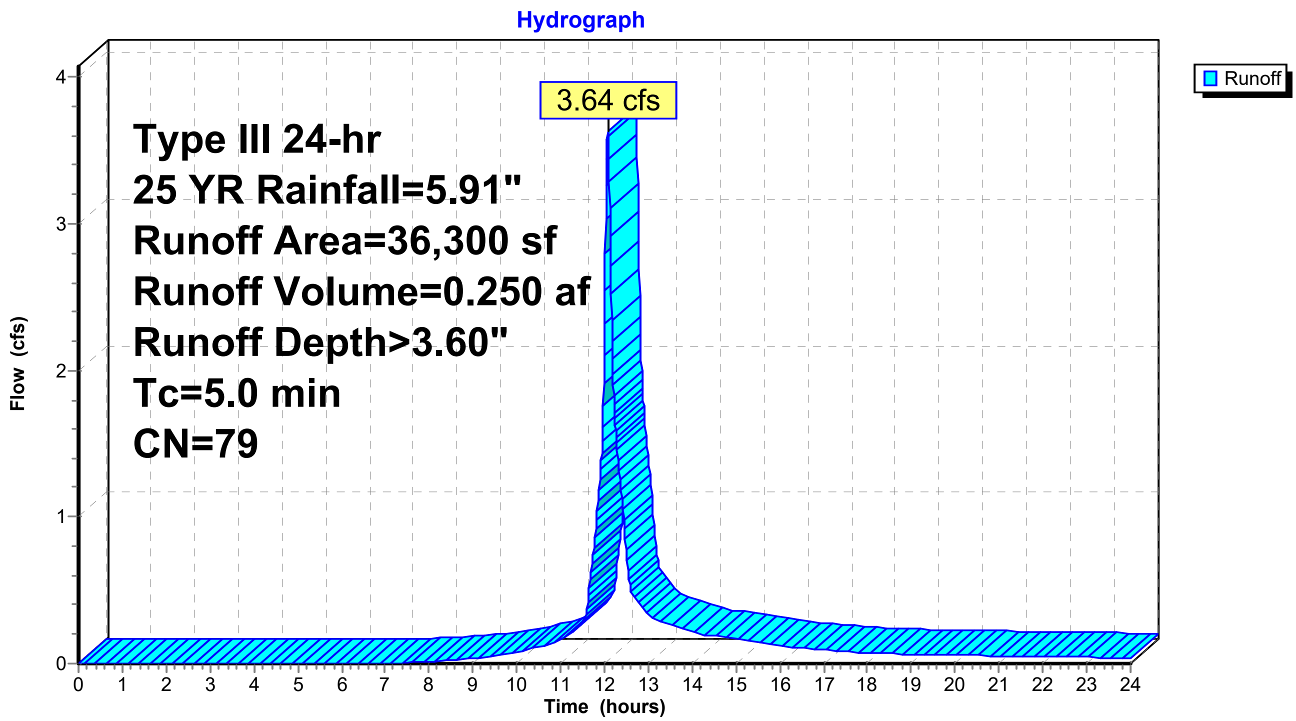
Runoff = 3.64 cfs @ 12.07 hrs, Volume= 0.250 af, Depth> 3.60"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 25 YR Rainfall=5.91"

Area (sf)	CN	Description
11,530	39	>75% Grass cover, Good, HSG A
24,660	98	Paved parking, HSG A
110	98	Roofs, HSG A
36,300	79	Weighted Average
11,530		31.76% Pervious Area
24,770		68.24% Impervious Area

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

Subcatchment BIO-2: BIO-2



Summary for Subcatchment BIO-3: BIO-3

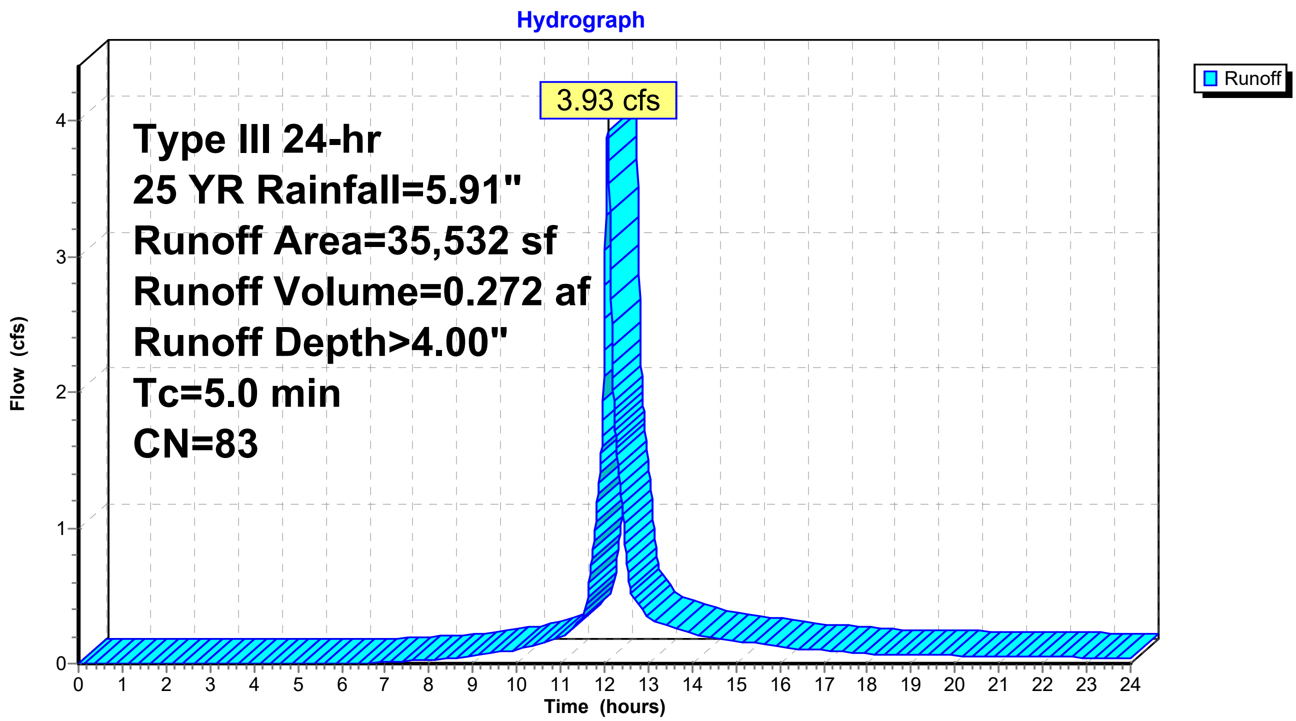
Runoff = 3.93 cfs @ 12.07 hrs, Volume= 0.272 af, Depth> 4.00"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 25 YR Rainfall=5.91"

Area (sf)	CN	Description
8,819	39	>75% Grass cover, Good, HSG A
26,493	98	Paved parking, HSG A
220	98	Roofs, HSG A
35,532	83	Weighted Average
8,819		24.82% Pervious Area
26,713		75.18% Impervious Area

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

Subcatchment BIO-3: BIO-3



Summary for Subcatchment P10: PR-DA-10

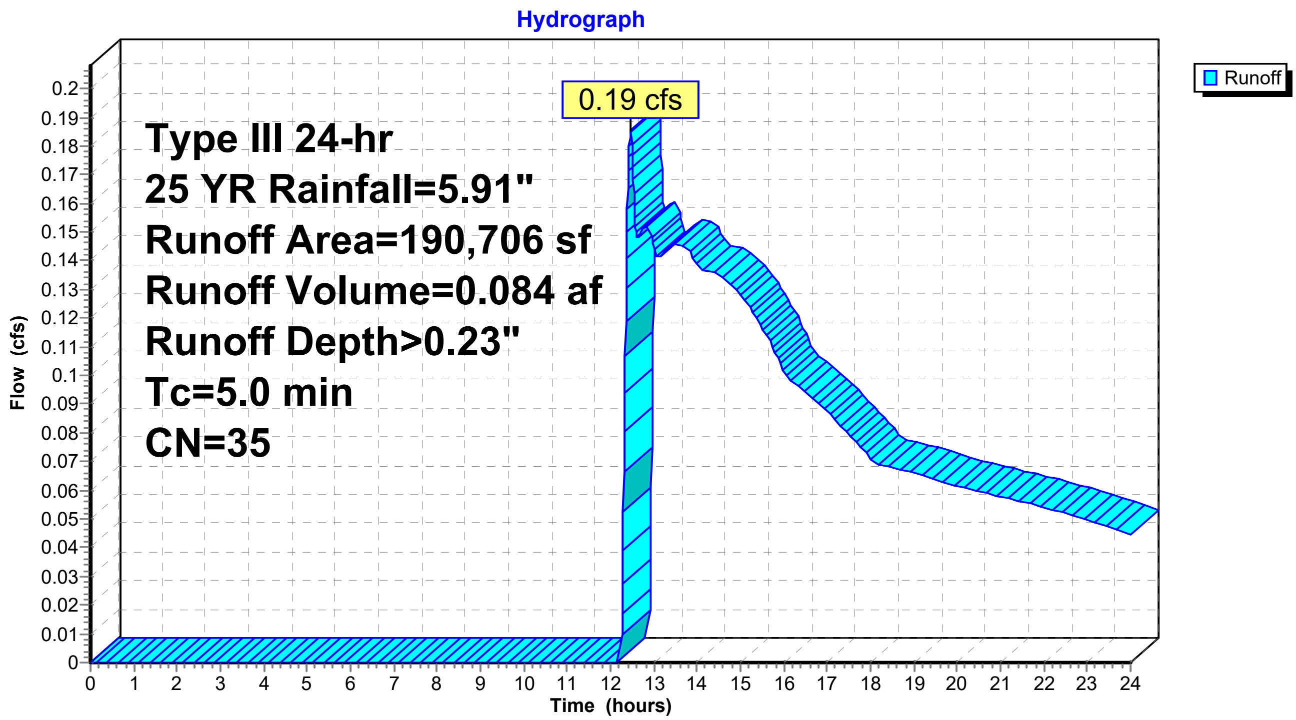
Runoff = 0.19 cfs @ 12.46 hrs, Volume= 0.084 af, Depth> 0.23"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 25 YR Rainfall=5.91"

Area (sf)	CN	Description
90,801	39	>75% Grass cover, Good, HSG A
99,905	32	Woods/grass comb., Good, HSG A
190,706	35	Weighted Average
190,706		100.00% Pervious Area

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

Subcatchment P10: PR-DA-10



Summary for Subcatchment P11: PR-DA11

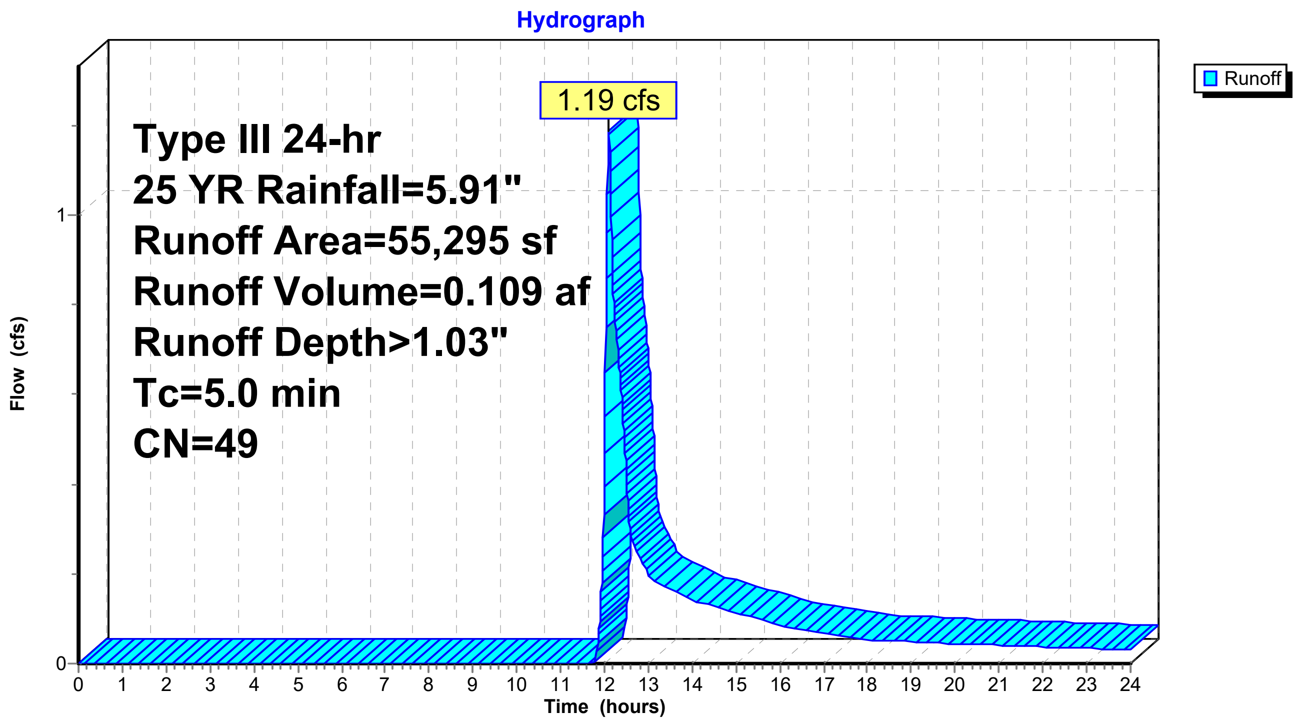
Runoff = 1.19 cfs @ 12.10 hrs, Volume= 0.109 af, Depth> 1.03"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 25 YR Rainfall=5.91"

Area (sf)	CN	Description
39,962	39	>75% Grass cover, Good, HSG A
5,060	30	Woods, Good, HSG A
10,273	98	Water Surface, 0% imp, HSG A
0	98	Paved parking, HSG A
55,295	49	Weighted Average
55,295		100.00% Pervious Area

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

Subcatchment P11: PR-DA11



Summary for Subcatchment P12: PR-DA12

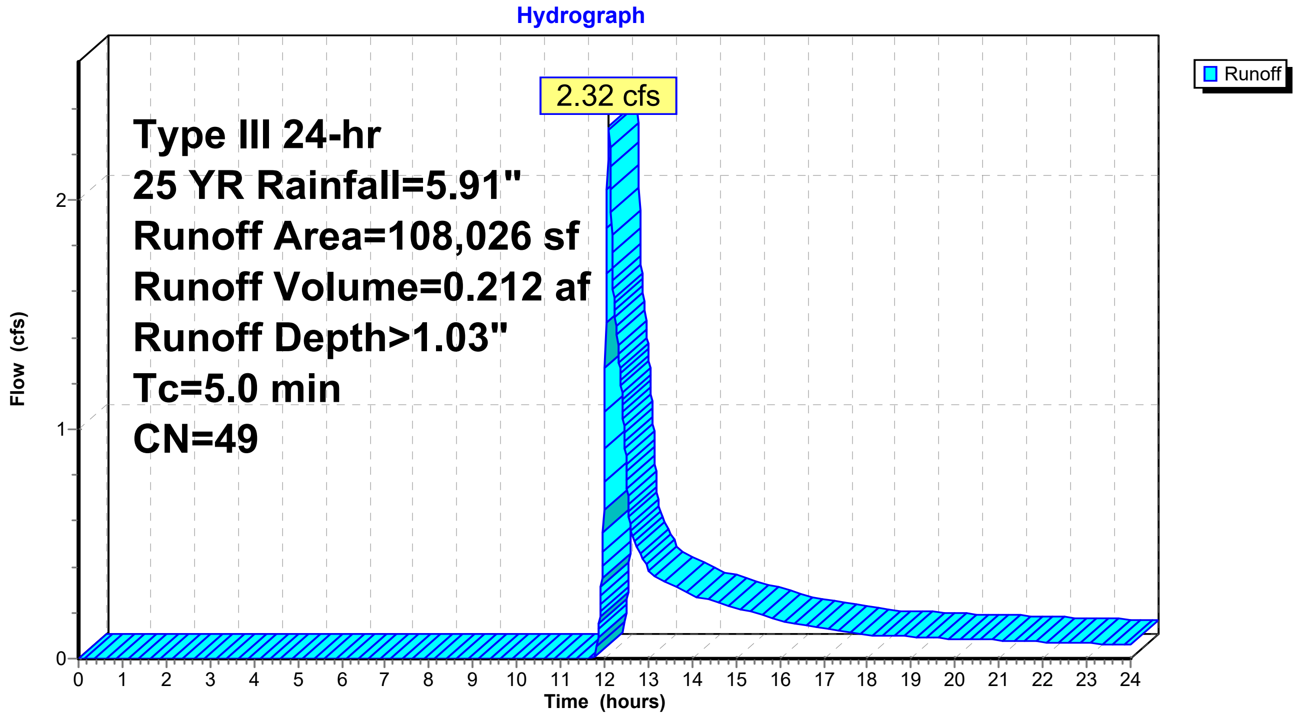
Runoff = 2.32 cfs @ 12.10 hrs, Volume= 0.212 af, Depth> 1.03"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 25 YR Rainfall=5.91"

Area (sf)	CN	Description
74,064	39	>75% Grass cover, Good, HSG A
13,150	30	Woods, Good, HSG A
20,812	98	Water Surface, 0% imp, HSG A
0	98	Paved parking, HSG A
108,026	49	Weighted Average
108,026		100.00% Pervious Area

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

Subcatchment P12: PR-DA12



Summary for Subcatchment P13: PR-DA-13

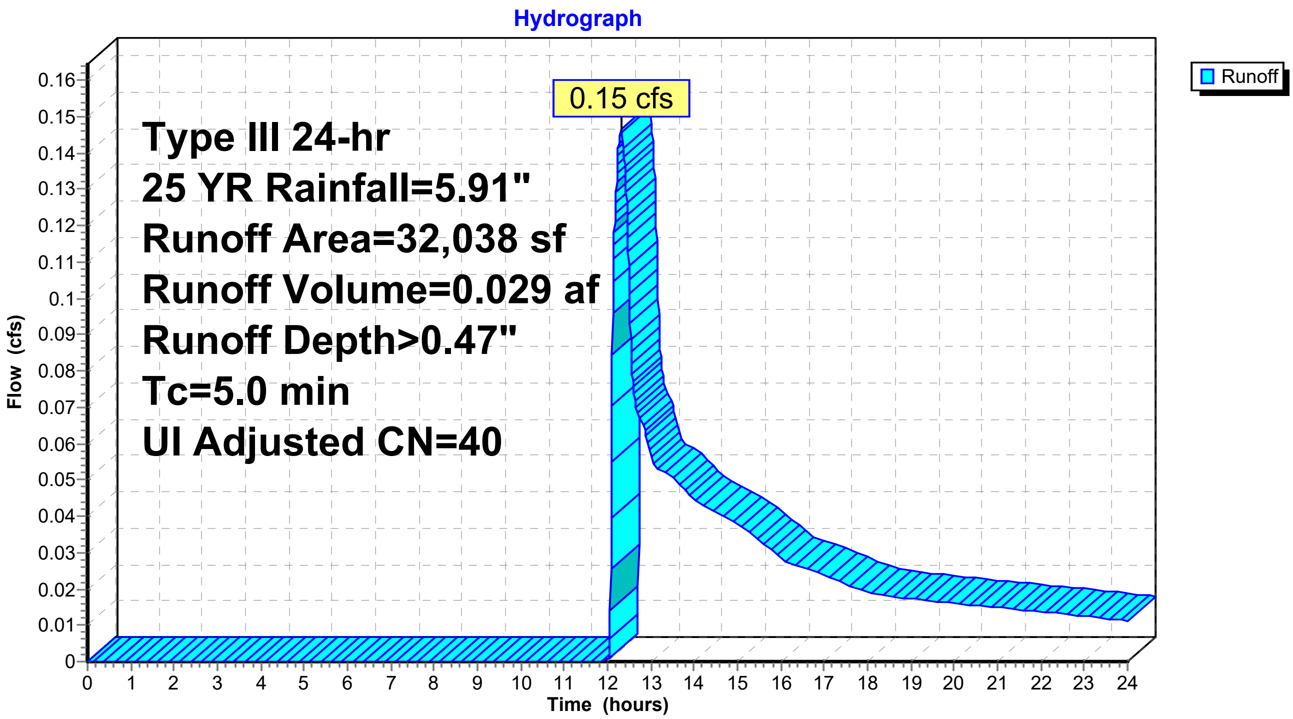
Runoff = 0.15 cfs @ 12.31 hrs, Volume= 0.029 af, Depth> 0.47"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 25 YR Rainfall=5.91"

	Area (sf)	CN	Adj	Description
	30,218	39		>75% Grass cover, Good, HSG A
*	1,270	98		Unconnected Impervious, HSG A
	550	30		Woods, Good, HSG A
	32,038	41	40	Weighted Average, UI Adjusted
	30,768			96.04% Pervious Area
	1,270			3.96% Impervious Area
	1,270			100.00% Unconnected

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

Subcatchment P13: PR-DA-13



Summary for Subcatchment P14: PR-DA-14

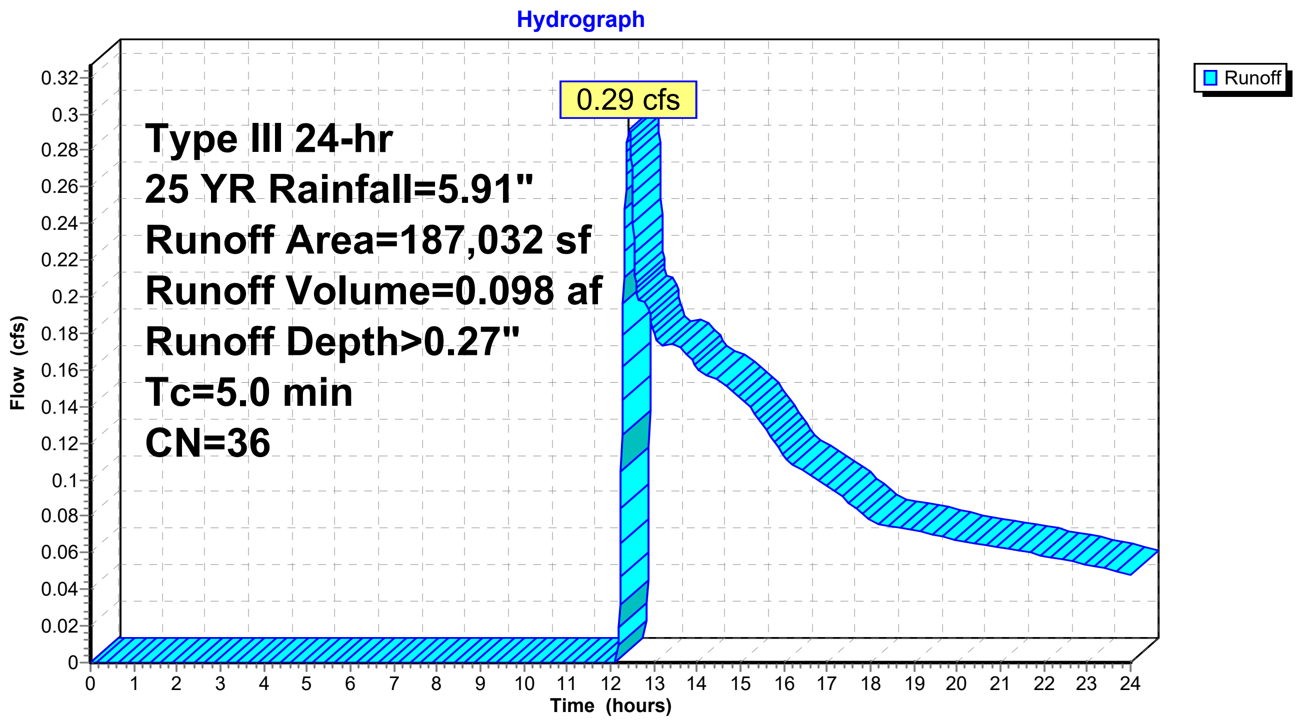
Runoff = 0.29 cfs @ 12.43 hrs, Volume= 0.098 af, Depth> 0.27"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 25 YR Rainfall=5.91"

Area (sf)	CN	Description
124,219	39	>75% Grass cover, Good, HSG A
62,813	30	Woods, Good, HSG A
187,032	36	Weighted Average
187,032		100.00% Pervious Area

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

Subcatchment P14: PR-DA-14



Summary for Subcatchment P1a: PR-DA-1a

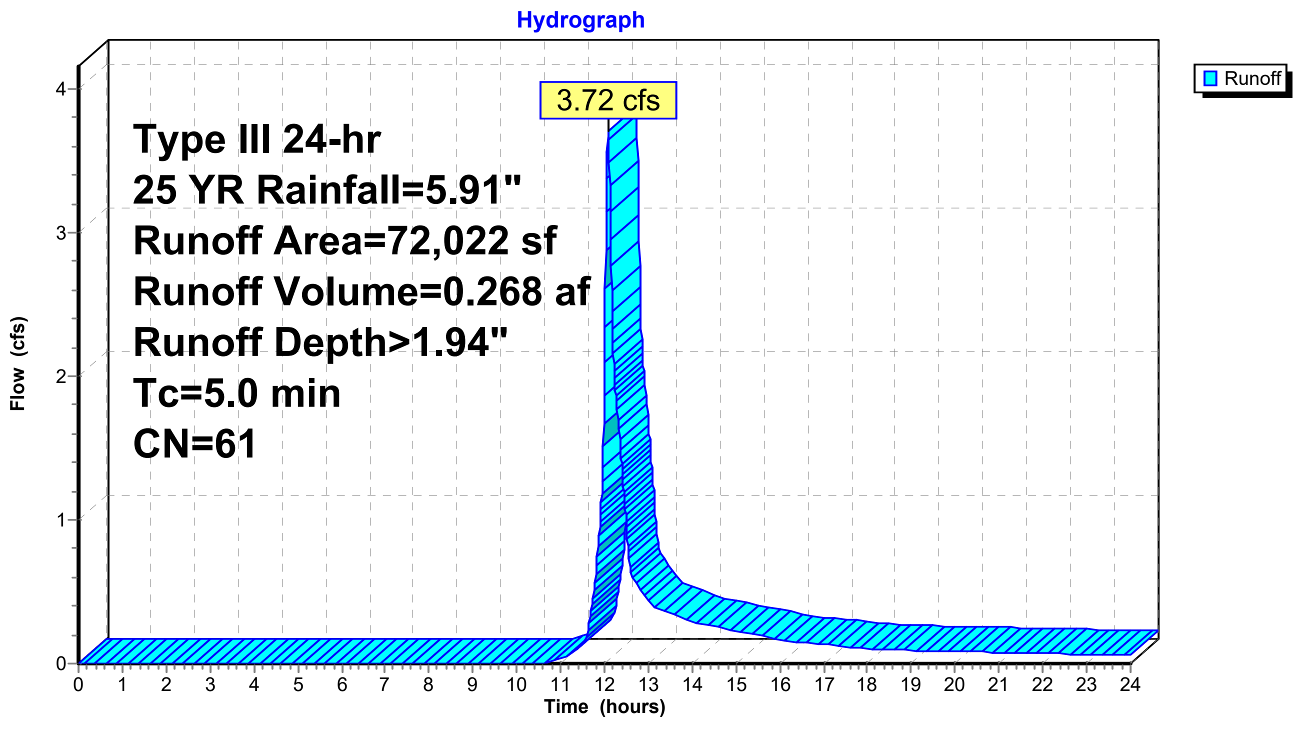
Runoff = 3.72 cfs @ 12.08 hrs, Volume= 0.268 af, Depth> 1.94"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 25 YR Rainfall=5.91"

Area (sf)	CN	Description
44,791	39	>75% Grass cover, Good, HSG A
20,190	98	Paved parking, HSG A
7,041	98	Water Surface, 0% imp, HSG A
72,022	61	Weighted Average
51,832		71.97% Pervious Area
20,190		28.03% Impervious Area

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

Subcatchment P1a: PR-DA-1a



Summary for Subcatchment P1b: PR-DA-1b

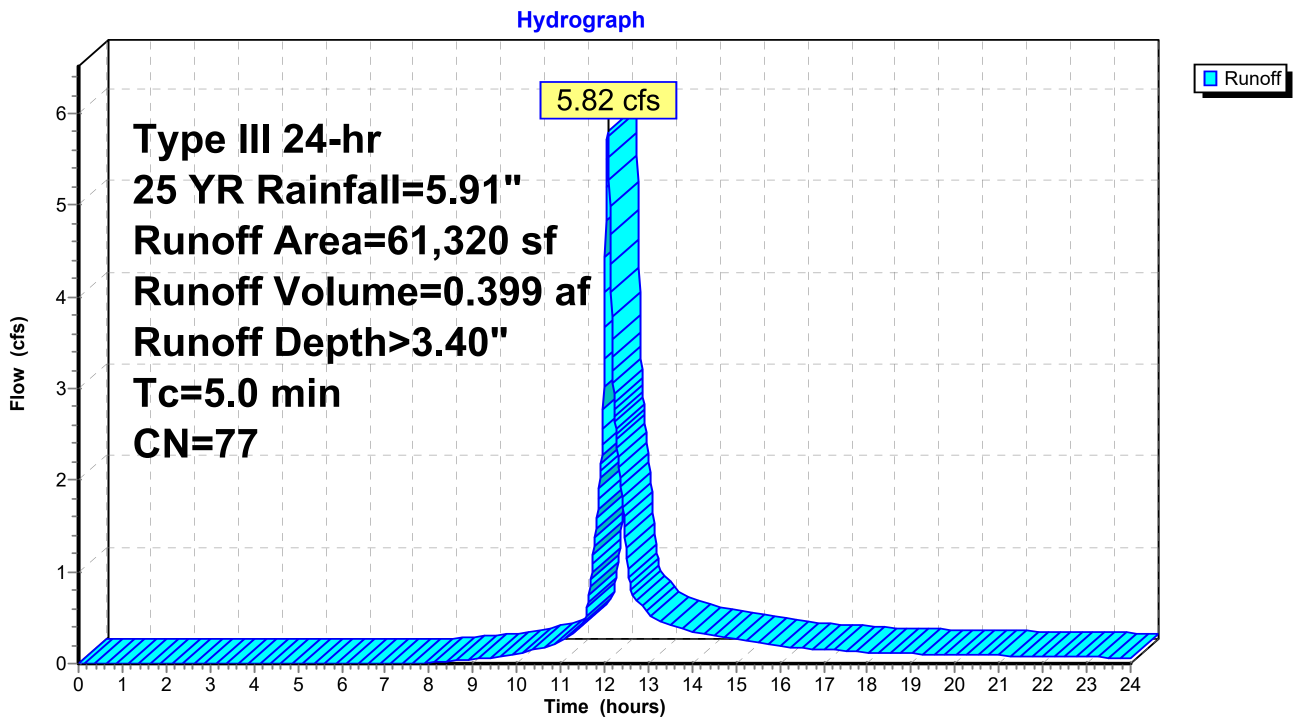
Runoff = 5.82 cfs @ 12.07 hrs, Volume= 0.399 af, Depth> 3.40"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 25 YR Rainfall=5.91"

	Area (sf)	CN	Description
	21,600	39	>75% Grass cover, Good, HSG A
*	39,720	98	Unconnected Impervious, HSG A
	61,320	77	Weighted Average
	21,600		35.23% Pervious Area
	39,720		64.77% Impervious Area
	39,720		100.00% Unconnected

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

Subcatchment P1b: PR-DA-1b



Summary for Subcatchment P2: PR-DA-2

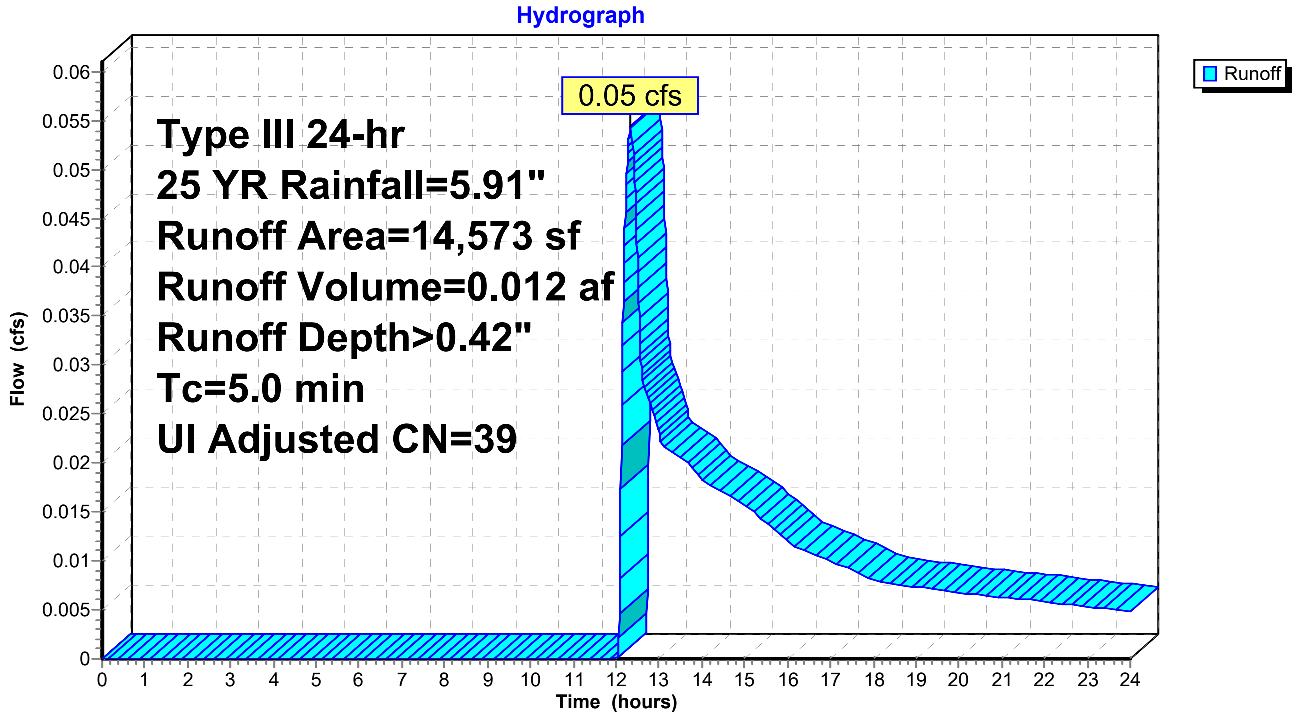
Runoff = 0.05 cfs @ 12.34 hrs, Volume= 0.012 af, Depth> 0.42"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 25 YR Rainfall=5.91"

	Area (sf)	CN	Adj	Description
	14,431	39		>75% Grass cover, Good, HSG A
*	142	98		Unconnected Impervious, HSG A
	14,573	40	39	Weighted Average, UI Adjusted
	14,431			99.03% Pervious Area
	142			0.97% Impervious Area
	142			100.00% Unconnected

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

Subcatchment P2: PR-DA-2



Summary for Subcatchment P3: PR-DA-3

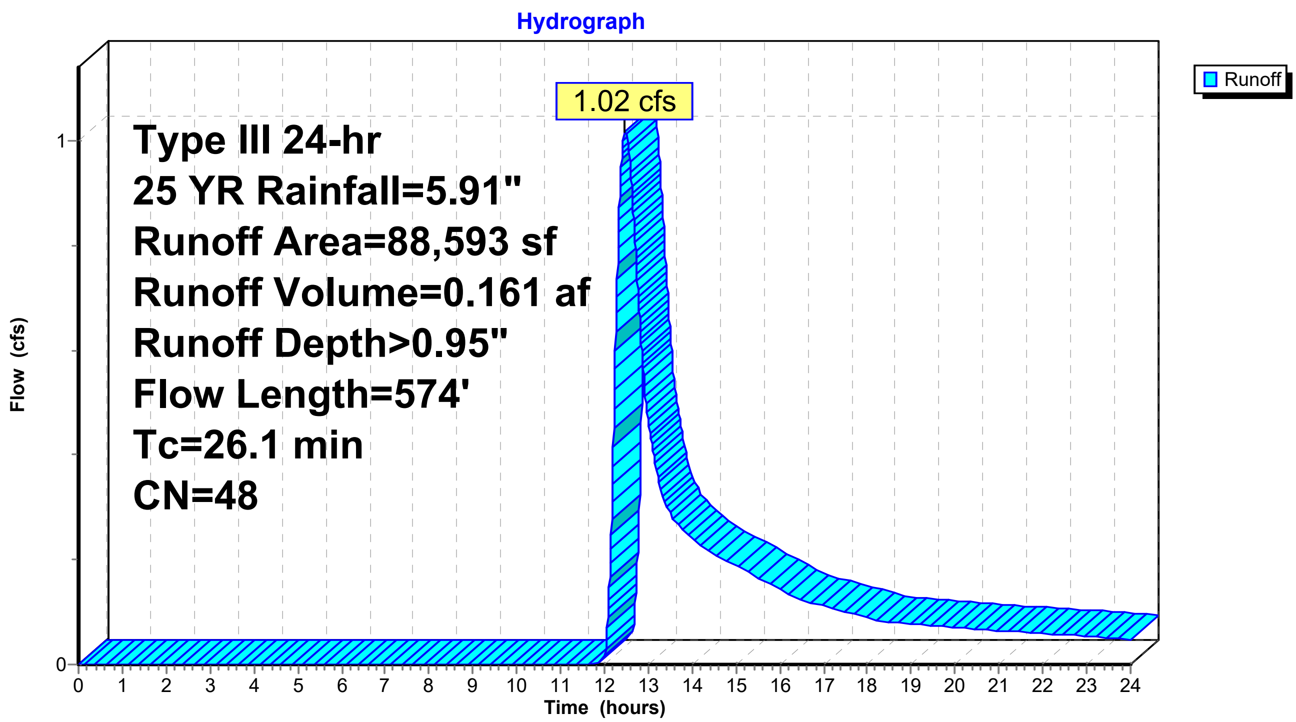
Runoff = 1.02 cfs @ 12.47 hrs, Volume= 0.161 af, Depth> 0.95"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 25 YR Rainfall=5.91"

Area (sf)	CN	Description
72,419	39	>75% Grass cover, Good, HSG A
7,200	76	Gravel roads, HSG A
8,974	98	Water Surface, 0% imp, HSG A
88,593	48	Weighted Average
88,593		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.2	50	0.0380	0.20		**Sheet Flow, A-B** Grass: Short n= 0.150 P2= 3.40"
20.8	400	0.0021	0.32		**Shallow Concentrated Flow, B-C** Short Grass Pasture Kv= 7.0 fps
0.5	74	0.0270	2.65		**Shallow Concentrated Flow, C-D** Unpaved Kv= 16.1 fps
0.6	50	0.0400	1.40		**Shallow Concentrated Flow, D-E** Short Grass Pasture Kv= 7.0 fps
26.1	574	Total			

Subcatchment P3: PR-DA-3



Summary for Subcatchment P4: PR-DA4

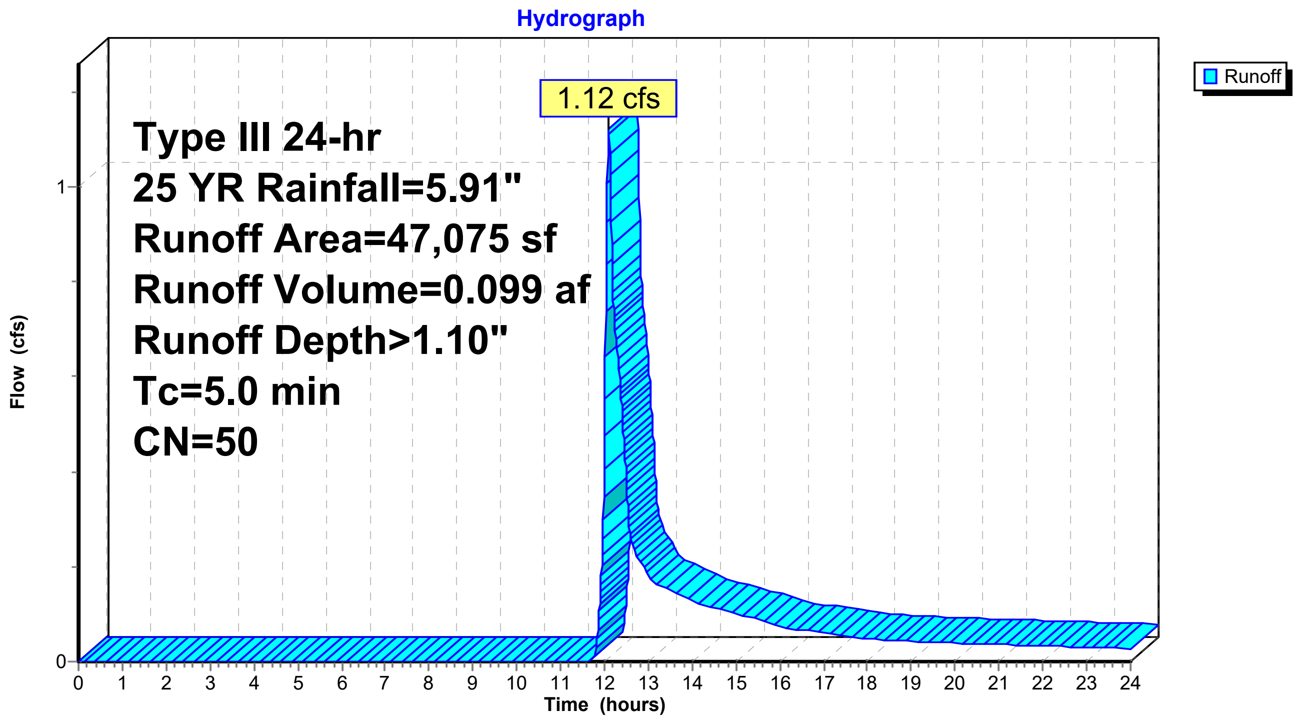
Runoff = 1.12 cfs @ 12.09 hrs, Volume= 0.099 af, Depth> 1.10"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 25 YR Rainfall=5.91"

	Area (sf)	CN	Description
	38,011	39	>75% Grass cover, Good, HSG A
*	500	98	Unconnected impervious, HSG A
	8,564	98	Stormwater Basin; Water Surface, HSG A
	47,075	50	Weighted Average
	38,011		80.75% Pervious Area
	9,064		19.25% Impervious Area
	500		5.52% Unconnected

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

Subcatchment P4: PR-DA4



Summary for Subcatchment P5: PR-DA5

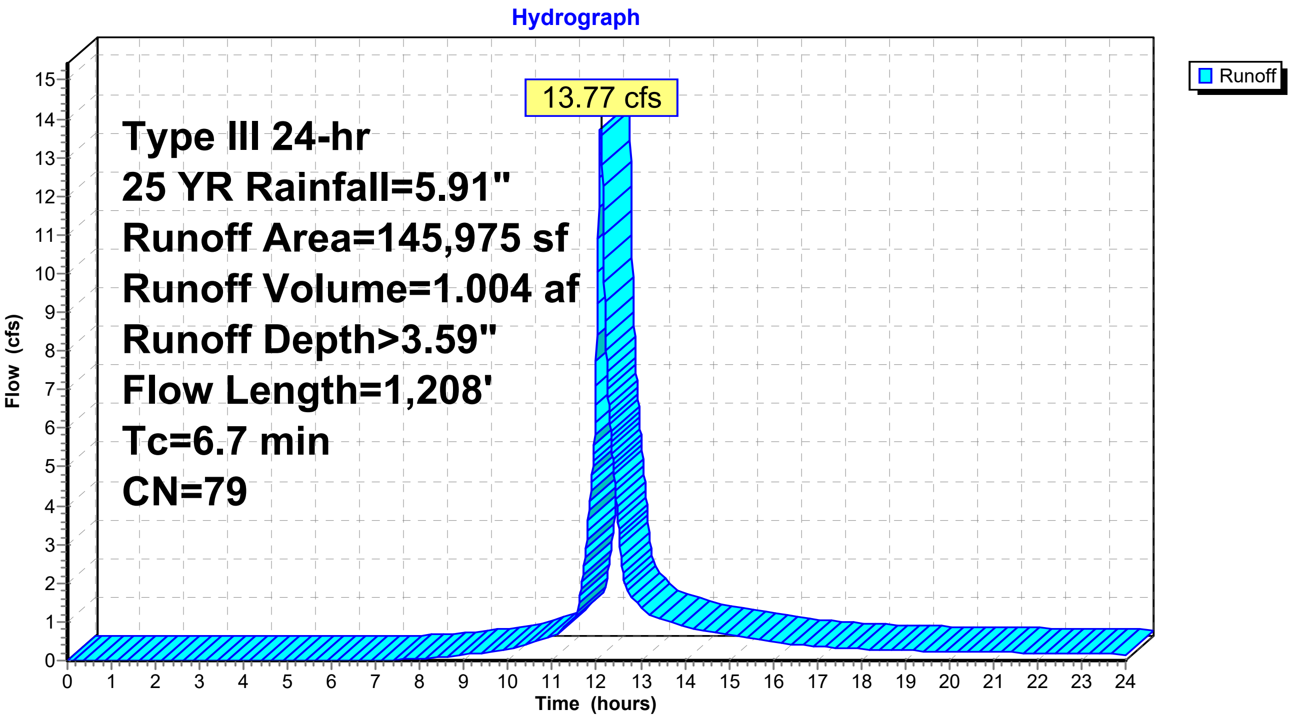
Runoff = 13.77 cfs @ 12.10 hrs, Volume= 1.004 af, Depth> 3.59"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 25 YR Rainfall=5.91"

Area (sf)	CN	Description
46,436	39	>75% Grass cover, Good, HSG A
98,201	98	Paved parking, HSG A
1,338	98	Unconnected roofs, HSG A
145,975	79	Weighted Average
46,436		31.81% Pervious Area
99,539		68.19% Impervious Area
1,338		1.34% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.9	50	0.0100	0.94		**Sheet Flow, A-B** Smooth surfaces n= 0.011 P2= 3.40"
1.1	130	0.0100	2.03		**Shallow Concentrated Flow, B-C** Paved Kv= 20.3 fps
1.3	243	0.0050	3.21	2.52	**Pipe Channel, C-D** 12.0" Round Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.013 Corrugated PE, smooth interior
2.4	525	0.0050	3.72	4.57	**Pipe Channel, D-E** 15.0" Round Area= 1.2 sf Perim= 3.9' r= 0.31' n= 0.013 Corrugated PE, smooth interior
1.0	260	0.0050	4.20	7.43	**Pipe Channel, E-F** 18.0" Round Area= 1.8 sf Perim= 4.7' r= 0.38' n= 0.013 Corrugated PE, smooth interior
6.7	1,208	Total			

Subcatchment P5: PR-DA5



Summary for Subcatchment P6: PR-DA-6

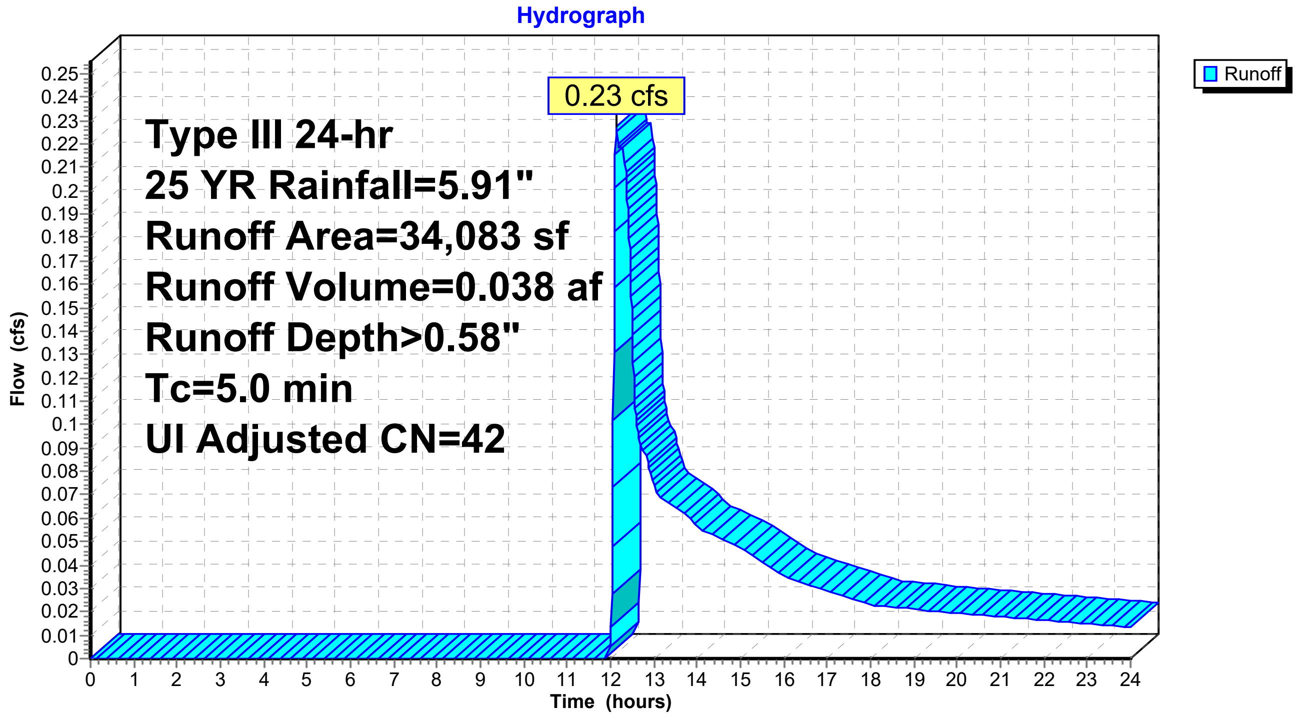
Runoff = 0.23 cfs @ 12.14 hrs, Volume= 0.038 af, Depth> 0.58"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 25 YR Rainfall=5.91"

	Area (sf)	CN	Adj	Description
	30,303	39		>75% Grass cover, Good, HSG A
*	3,780	98		Unconnected Impervious, HSG A
	34,083	46	42	Weighted Average, UI Adjusted
	30,303			88.91% Pervious Area
	3,780			11.09% Impervious Area
	3,780			100.00% Unconnected

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

Subcatchment P6: PR-DA-6



Summary for Subcatchment P7: PR-DA-7

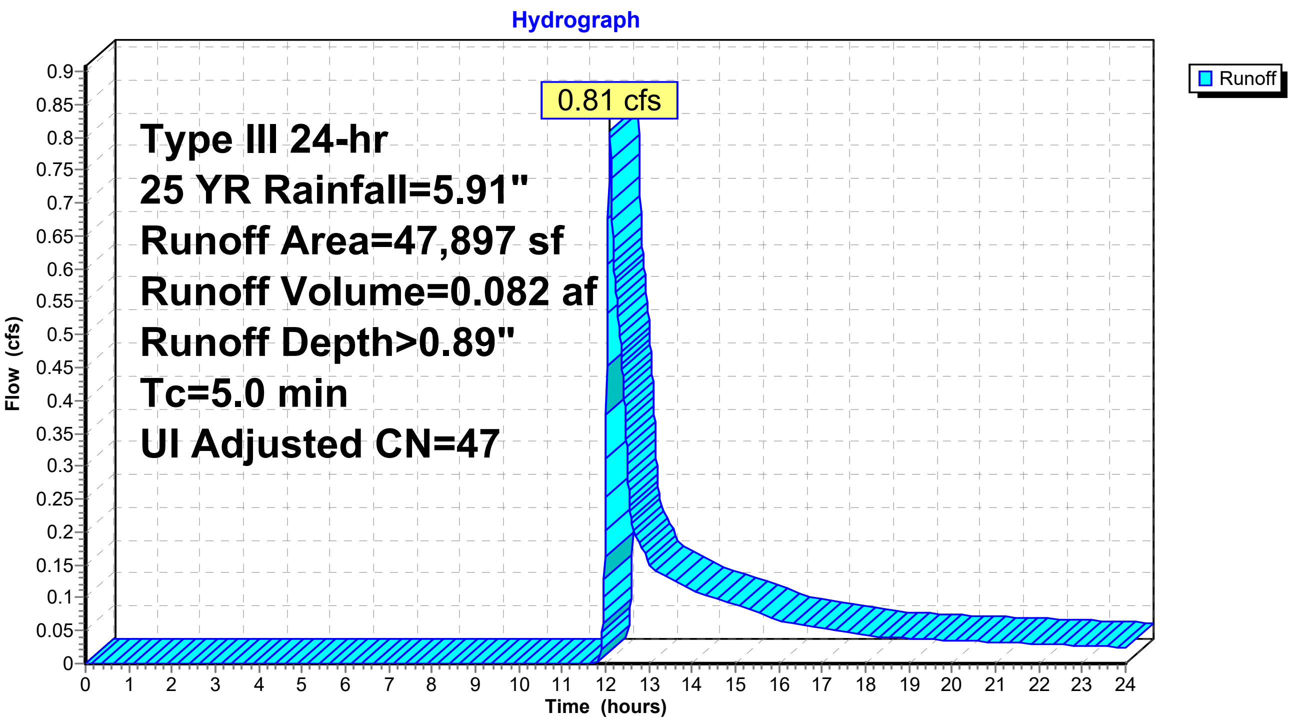
Runoff = 0.81 cfs @ 12.10 hrs, Volume= 0.082 af, Depth> 0.89"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 25 YR Rainfall=5.91"

	Area (sf)	CN	Adj	Description
	35,185	39		>75% Grass cover, Good, HSG A
*	12,712	98		Unconnected Impervious, HSG A
	47,897	55	47	Weighted Average, UI Adjusted
	35,185			73.46% Pervious Area
	12,712			26.54% Impervious Area
	12,712			100.00% Unconnected

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

Subcatchment P7: PR-DA-7



Summary for Subcatchment P8a: PR-DA8a

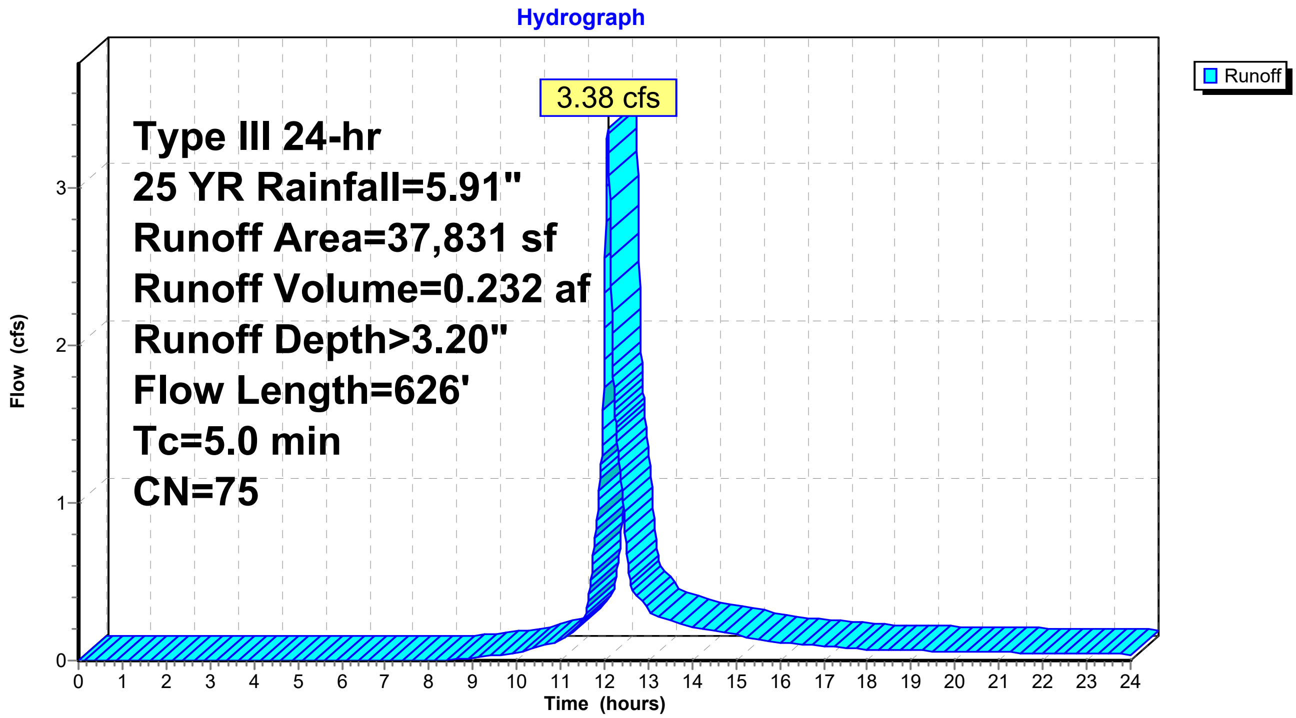
Runoff = 3.38 cfs @ 12.08 hrs, Volume= 0.232 af, Depth> 3.20"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 25 YR Rainfall=5.91"

Area (sf)	CN	Description
14,737	39	>75% Grass cover, Good, HSG A
22,874	98	Paved parking, HSG A
220	98	Roofs, HSG A
37,831	75	Weighted Average
14,737		38.95% Pervious Area
23,094		61.05% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.9	50	0.0100	0.94		**Sheet Flow, A-B** Smooth surfaces n= 0.011 P2= 3.40"
1.1	137	0.0100	2.03		**Shallow Concentrated Flow, B-C** Paved Kv= 20.3 fps
0.2	48	0.0050	3.21	2.52	**Pipe Channel, C-D** 12.0" Round Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.013 Corrugated PE, smooth interior
1.1	241	0.0050	3.72	4.57	**Pipe Channel, D-E** 15.0" Round Area= 1.2 sf Perim= 3.9' r= 0.31' n= 0.013 Corrugated PE, smooth interior
0.5	150	0.0060	4.60	8.14	**Pipe Channel, E-F** 18.0" Round Area= 1.8 sf Perim= 4.7' r= 0.38' n= 0.013 Corrugated PE, smooth interior
1.2					**Direct Entry, Added Tc**
5.0	626	Total			

Subcatchment P8a: PR-DA8a



Summary for Subcatchment P8b: PR-DA8b

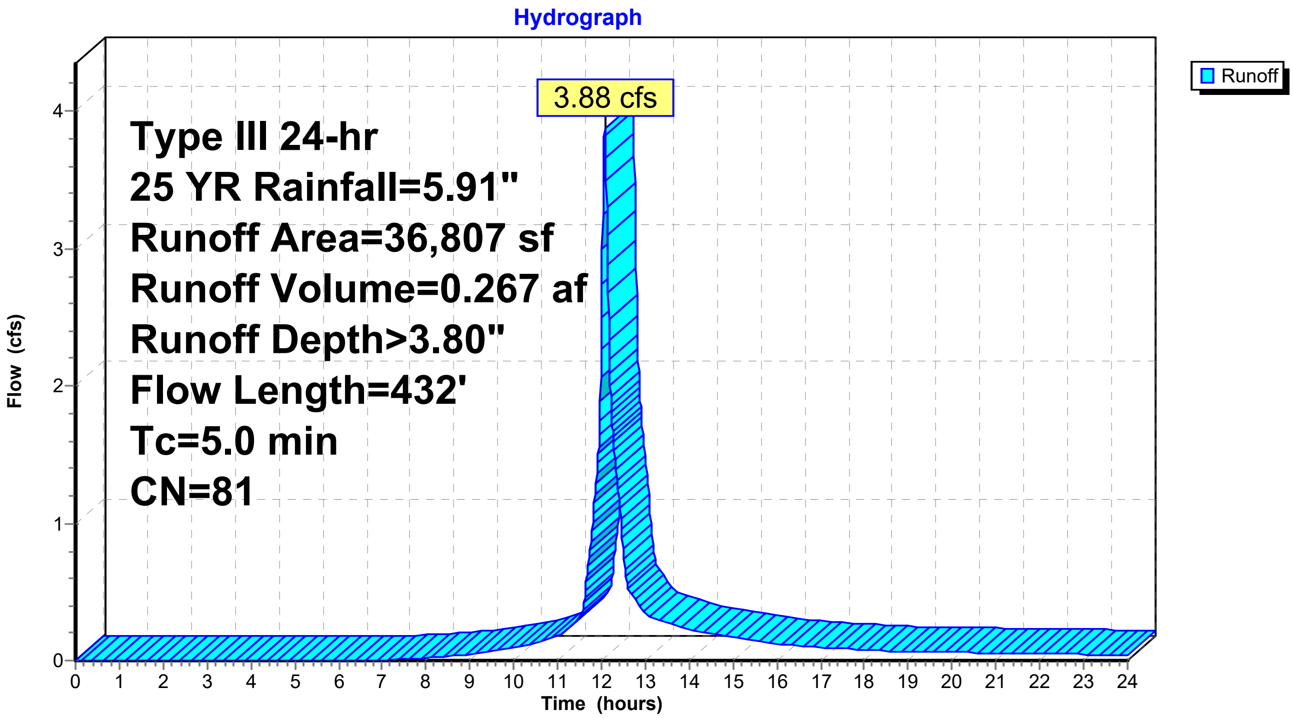
Runoff = 3.88 cfs @ 12.07 hrs, Volume= 0.267 af, Depth> 3.80"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 25 YR Rainfall=5.91"

Area (sf)	CN	Description
10,671	39	>75% Grass cover, Good, HSG A
25,176	98	Paved parking, HSG A
960	98	Roofs, HSG A
36,807	81	Weighted Average
10,671		28.99% Pervious Area
26,136		71.01% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.4	86	0.0100	1.04		**Sheet Flow, A-B** Smooth surfaces n= 0.011 P2= 3.40"
0.7	196	0.0100	4.54	3.56	**Pipe Channel, B-C** 12.0" Round Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.013 Corrugated PE, smooth interior
0.5	150	0.0060	4.60	8.14	**Pipe Channel, C-D** 18.0" Round Area= 1.8 sf Perim= 4.7' r= 0.38' n= 0.013 Corrugated PE, smooth interior
2.4					**Direct Entry, Added Tc**
5.0	432	Total			

Subcatchment P8b: PR-DA8b



Summary for Subcatchment P9: PR-DA9

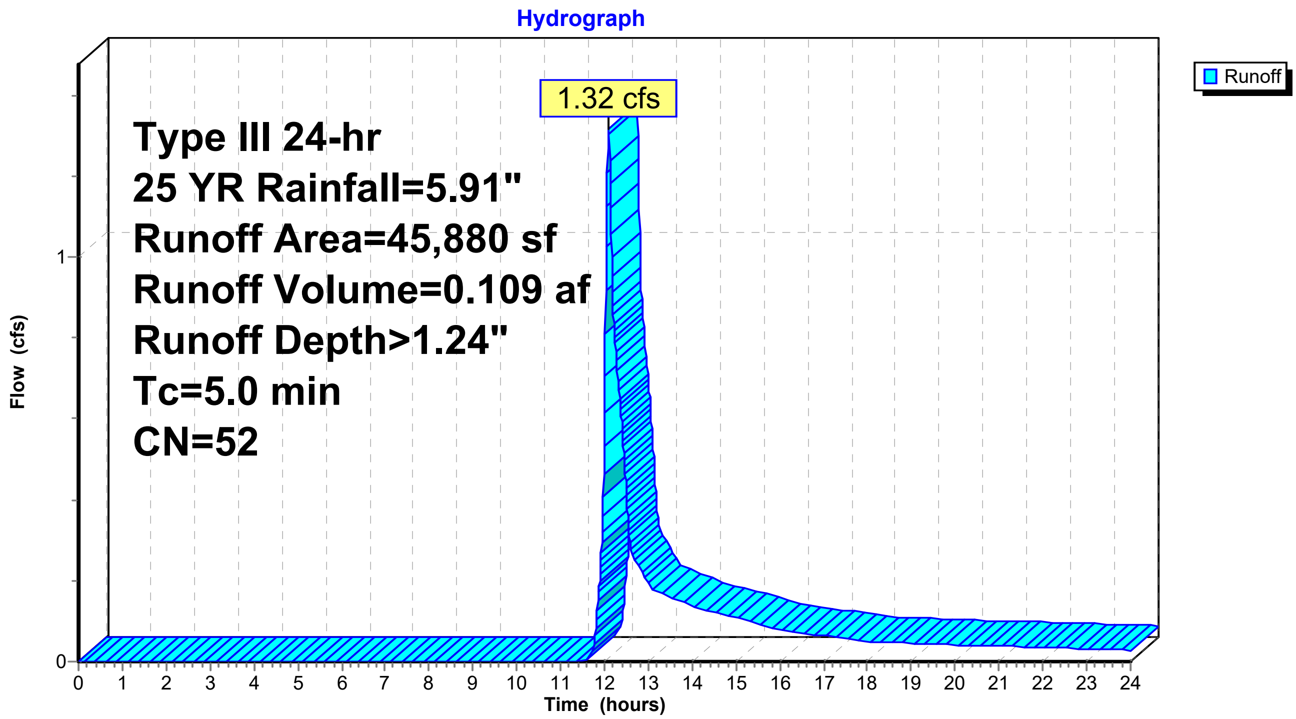
Runoff = 1.32 cfs @ 12.09 hrs, Volume= 0.109 af, Depth> 1.24"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 25 YR Rainfall=5.91"

	Area (sf)	CN	Description
	35,890	39	>75% Grass cover, Good, HSG A
*	380	98	Unconnected impervious, HSG A
	9,610	98	Stormwater Basin; Water Surface, HSG A
	45,880	52	Weighted Average
	35,890		78.23% Pervious Area
	9,990		21.77% Impervious Area
	380		3.80% Unconnected

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

Subcatchment P9: PR-DA9

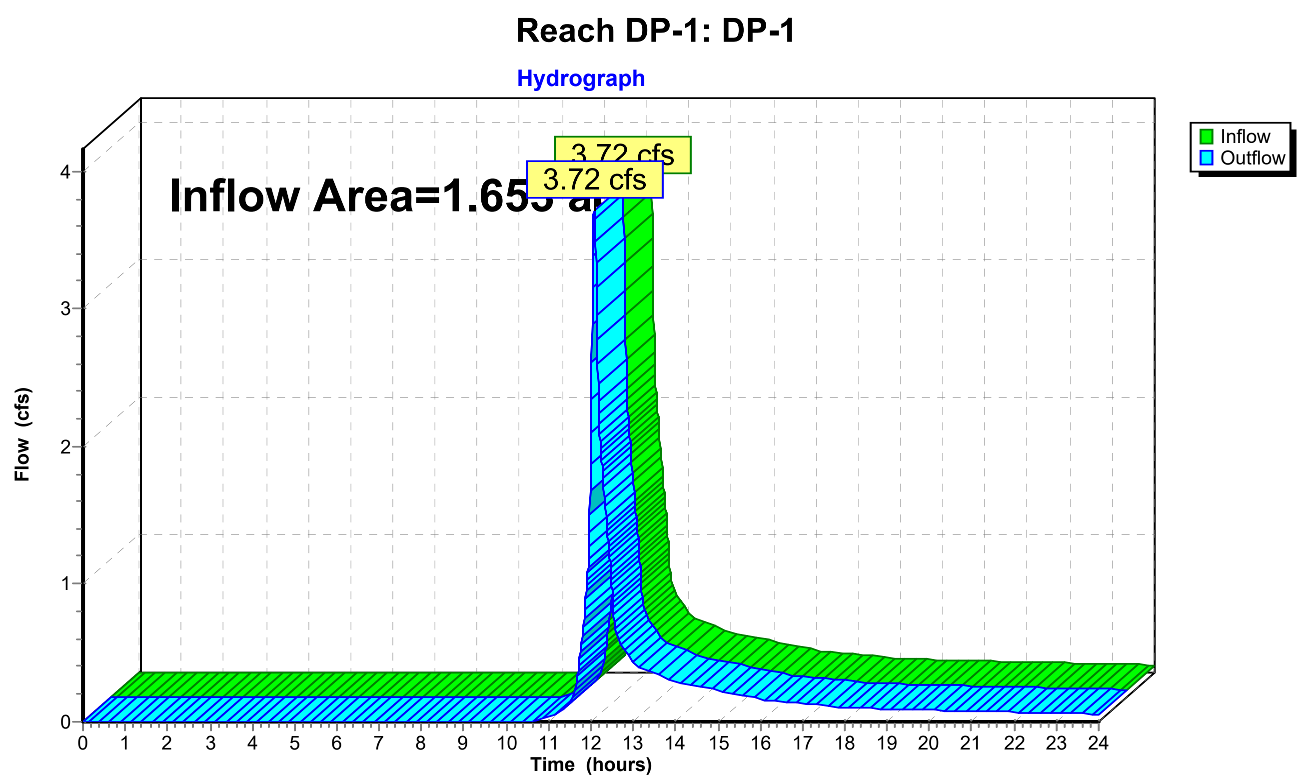


Summary for Reach DP-1: DP-1

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area =	1.653 ac, 28.03% Impervious, Inflow Depth > 1.94"	for 25 YR event	
Inflow =	3.72 cfs @ 12.08 hrs, Volume=	0.268 af	
Outflow =	3.72 cfs @ 12.08 hrs, Volume=	0.268 af, Atten= 0%, Lag= 0.0 min	

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs



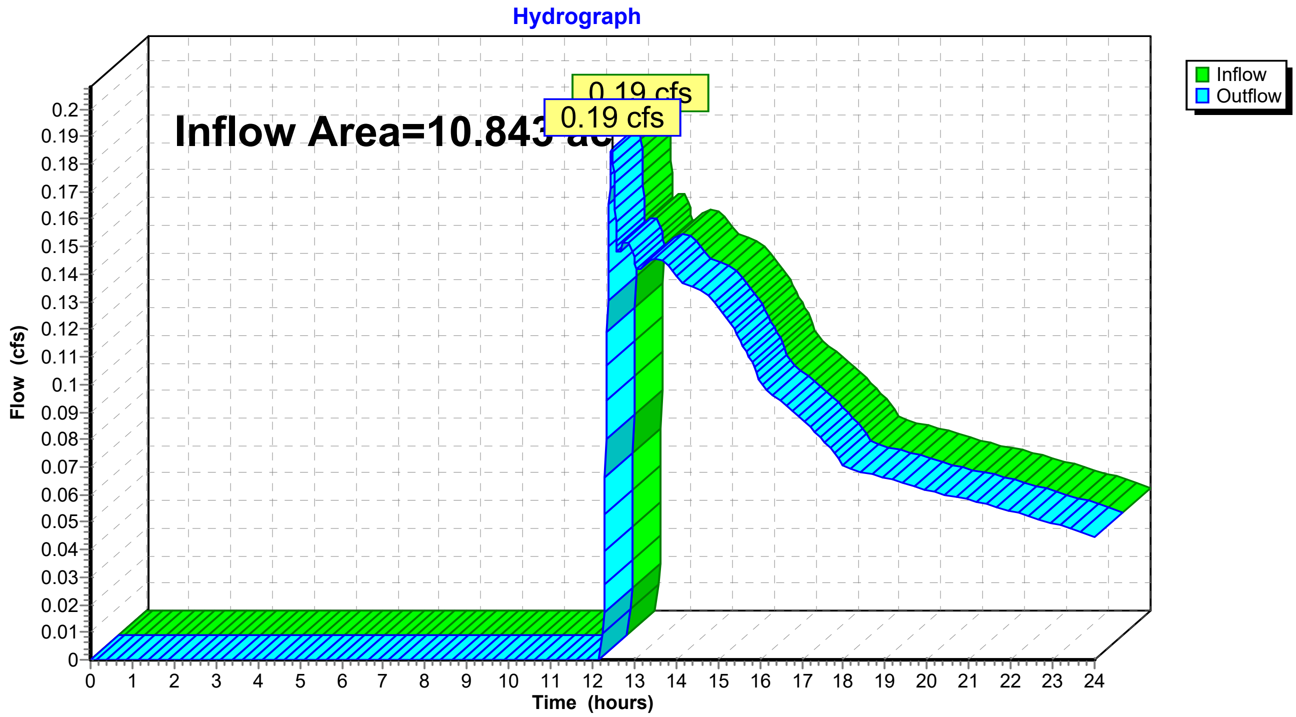
Summary for Reach DP-2: DP-2 (JOSHUA'S BROOK)

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 10.843 ac, 28.77% Impervious, Inflow Depth > 0.09" for 25 YR event
Inflow = 0.19 cfs @ 12.46 hrs, Volume= 0.084 af
Outflow = 0.19 cfs @ 12.46 hrs, Volume= 0.084 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs

Reach DP-2: DP-2 (JOSHUA'S BROOK)



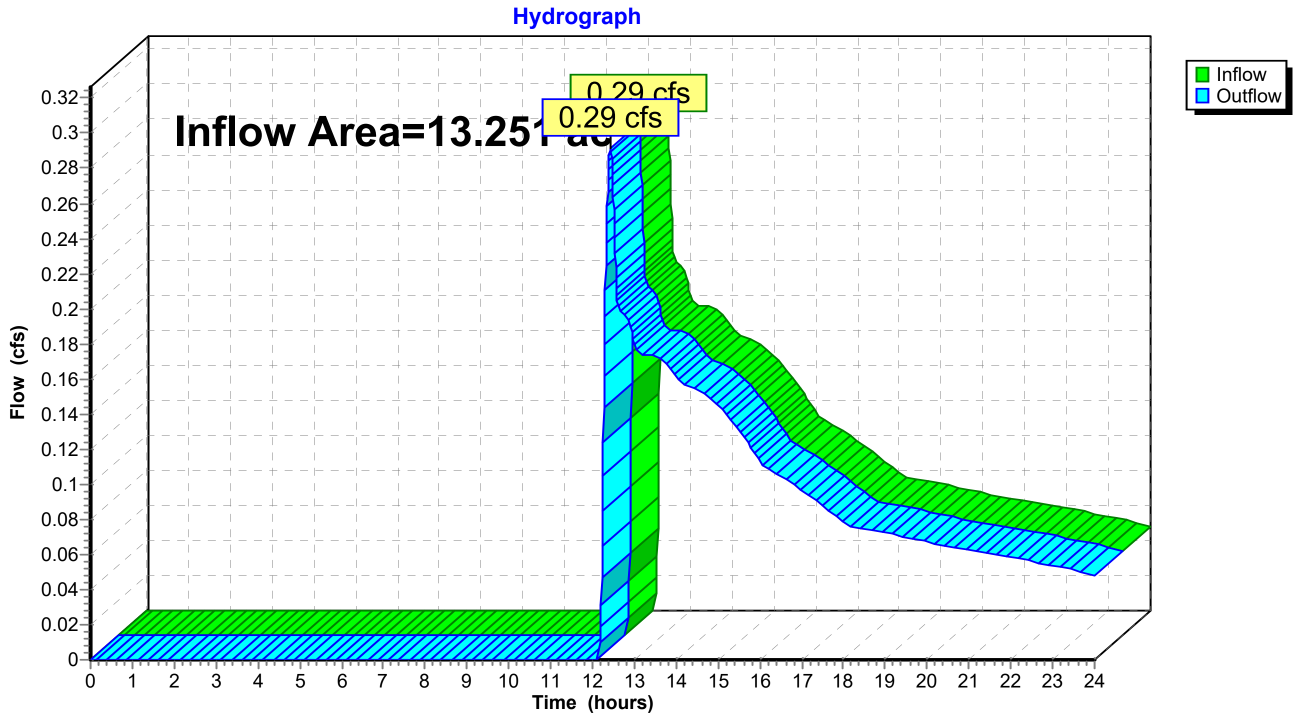
Summary for Reach DP-3: DP-3 (STEWART'S CREEK)

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 13.251 ac, 19.02% Impervious, Inflow Depth > 0.09" for 25 YR event
Inflow = 0.29 cfs @ 12.43 hrs, Volume= 0.098 af
Outflow = 0.29 cfs @ 12.43 hrs, Volume= 0.098 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs

Reach DP-3: DP-3 (STEWART'S CREEK)



Summary for Pond 41P: SC-740

Inflow Area = 0.115 ac,100.00% Impervious, Inflow Depth > 5.67" for 25 YR event
Inflow = 0.69 cfs @ 12.07 hrs, Volume= 0.054 af
Outflow = 0.09 cfs @ 11.62 hrs, Volume= 0.054 af, Atten= 86%, Lag= 0.0 min
Discarded = 0.09 cfs @ 11.62 hrs, Volume= 0.054 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Peak Elev= 38.53' @ 12.56 hrs Surf.Area= 492 sf Storage= 656 cf

Plug-Flow detention time= 39.5 min calculated for 0.054 af (100% of inflow)
Center-of-Mass det. time= 39.3 min (783.3 - 744.0)

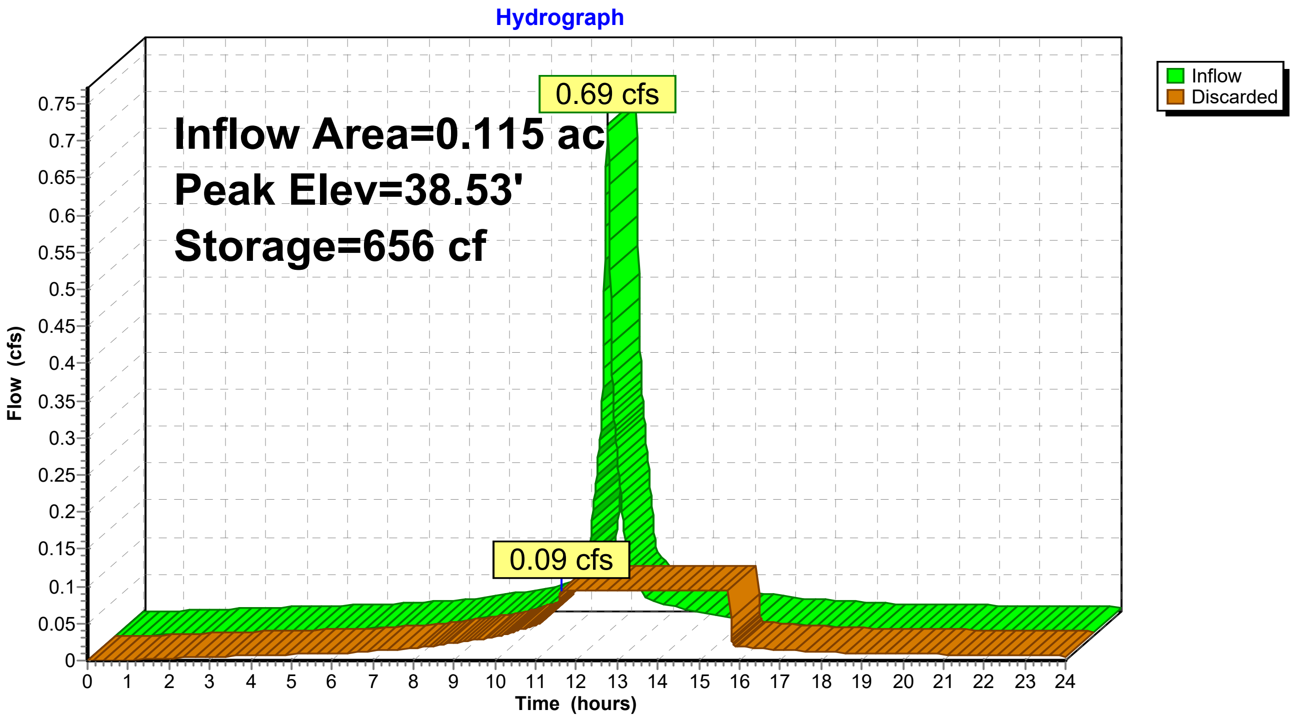
Volume	Invert	Avail.Storage	Storage Description
#1	36.50'	468 cf	**Stone (Prismatic)** Listed below (Recalc) 1,722 cf Overall - 551 cf Embedded = 1,171 cf x 40.0% Voids
#2	37.00'	551 cf	**ADS_StormTech SC-740 +Cap** x 12 Inside #1 Effective Size= 44.6"W x 30.0"H => 6.45 sf x 7.12'L = 45.9 cf Overall Size= 51.0"W x 30.0"H x 7.56'L with 0.44' Overlap 2 Rows of 6 Chambers
		1,020 cf	Total Available Storage

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
36.50	492	0	0
40.00	492	1,722	1,722

Device	Routing	Invert	Outlet Devices
#1	Discarded	36.50'	**8.270 in/hr Exfiltration over Surface area**

Discarded OutFlow Max=0.09 cfs @ 11.62 hrs HW=36.54' (Free Discharge)
└─**1=Exfiltration** (Exfiltration Controls 0.09 cfs)

Pond 41P: SC-740



Summary for Pond 43P: SC-740

Inflow Area = 0.782 ac, 11.09% Impervious, Inflow Depth > 0.58" for 25 YR event
Inflow = 0.23 cfs @ 12.14 hrs, Volume= 0.038 af
Outflow = 0.05 cfs @ 12.07 hrs, Volume= 0.038 af, Atten= 78%, Lag= 0.0 min
Discarded = 0.05 cfs @ 12.07 hrs, Volume= 0.038 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Peak Elev= 21.86' @ 14.79 hrs Surf.Area= 256 sf Storage= 389 cf

Plug-Flow detention time= 78.3 min calculated for 0.038 af (100% of inflow)
Center-of-Mass det. time= 77.8 min (1,013.9 - 936.2)

Volume	Invert	Avail.Storage	Storage Description
#1	19.50'	248 cf	**Stone (Prismatic)** Listed below (Recalc) 896 cf Overall - 276 cf Embedded = 620 cf x 40.0% Voids
#2	20.00'	276 cf	**ADS_StormTech SC-740 +Cap** x 6 Inside #1 Effective Size= 44.6"W x 30.0"H => 6.45 sf x 7.12'L = 45.9 cf Overall Size= 51.0"W x 30.0"H x 7.56'L with 0.44' Overlap 2 Rows of 3 Chambers
#3	24.50'	3,830 cf	**Surface Ponding (Prismatic)** Listed below (Recalc)
		4,353 cf	Total Available Storage

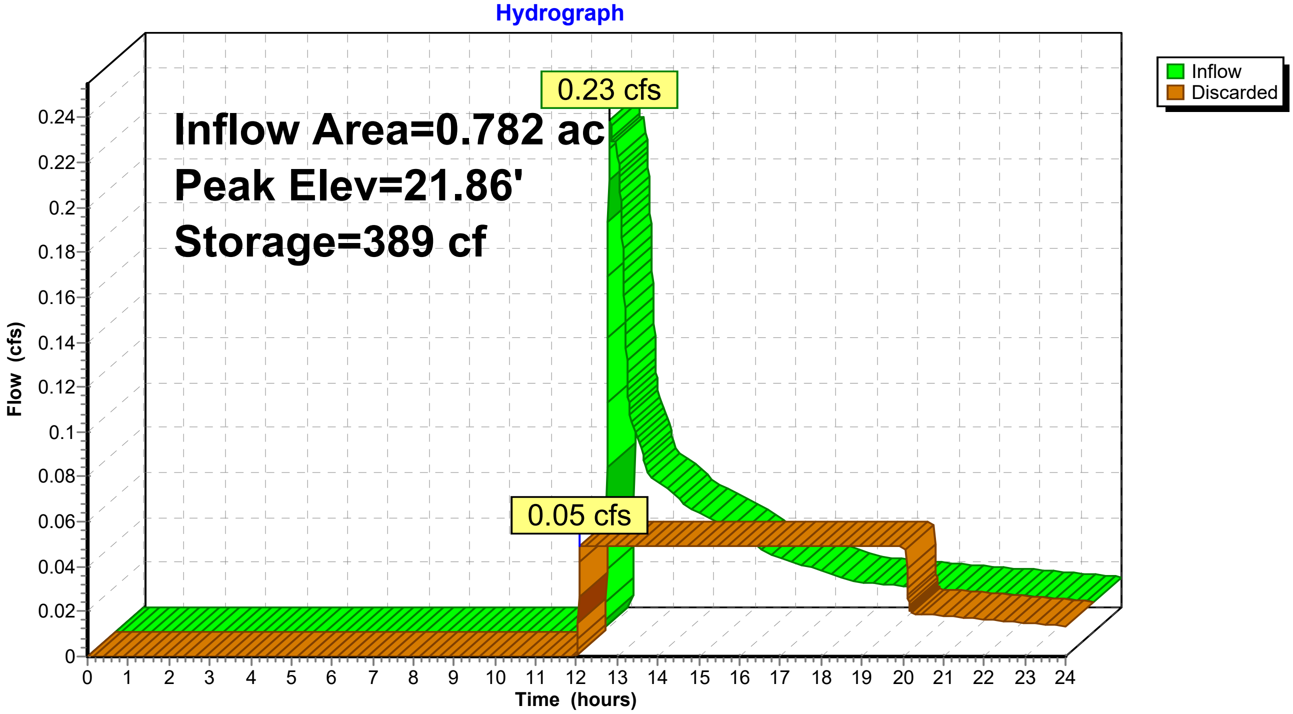
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
19.50	256	0	0
23.00	256	896	896

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
24.50	4	0	0
25.00	3,057	765	765
25.50	9,200	3,064	3,830

Device	Routing	Invert	Outlet Devices
#1	Discarded	19.50'	**8.270 in/hr Exfiltration over Surface area**

Discarded OutFlow Max=0.05 cfs @ 12.07 hrs HW=19.58' (Free Discharge)
└─**1=Exfiltration** (Exfiltration Controls 0.05 cfs)

Pond 43P: SC-740



Summary for Pond 45P: SC-740

Inflow Area = 1.100 ac, 26.54% Impervious, Inflow Depth > 0.89" for 25 YR event
Inflow = 0.81 cfs @ 12.10 hrs, Volume= 0.082 af
Outflow = 0.12 cfs @ 12.00 hrs, Volume= 0.082 af, Atten= 85%, Lag= 0.0 min
Discarded = 0.12 cfs @ 12.00 hrs, Volume= 0.082 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Peak Elev= 21.66' @ 13.65 hrs Surf.Area= 650 sf Storage= 926 cf

Plug-Flow detention time= 69.1 min calculated for 0.082 af (100% of inflow)
Center-of-Mass det. time= 68.6 min (975.7 - 907.2)

Volume	Invert	Avail.Storage	Storage Description
#1	19.50'	616 cf	**Stone (Prismatic)** Listed below (Recalc) 2,275 cf Overall - 735 cf Embedded = 1,540 cf x 40.0% Voids
#2	20.00'	735 cf	**ADS_StormTech SC-740 +Cap** x 16 Inside #1 Effective Size= 44.6"W x 30.0"H => 6.45 sf x 7.12'L = 45.9 cf Overall Size= 51.0"W x 30.0"H x 7.56'L with 0.44' Overlap 2 Rows of 8 Chambers
#3	25.50'	4,609 cf	**Surface Ponding (Prismatic)** Listed below (Recalc)
		5,960 cf	Total Available Storage

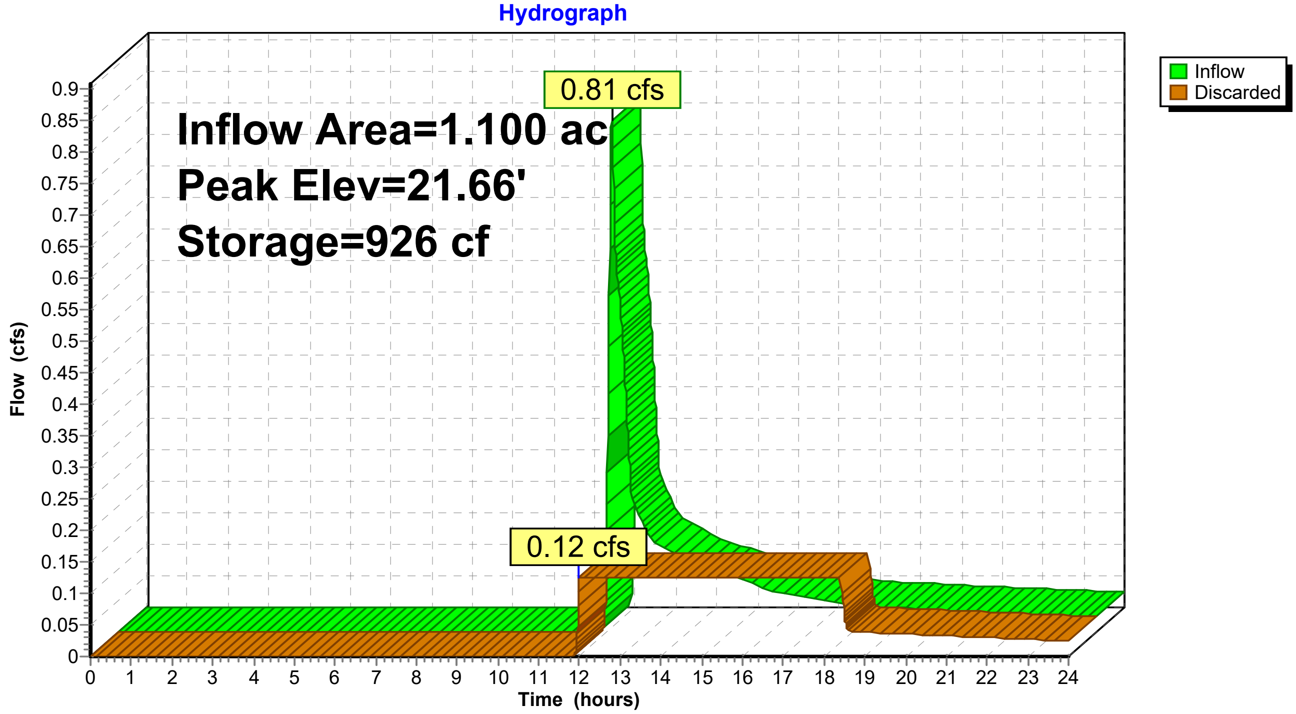
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
19.50	650	0	0
23.00	650	2,275	2,275

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
25.50	4	0	0
26.00	2,742	687	687
26.80	7,065	3,923	4,609

Device	Routing	Invert	Outlet Devices
#1	Discarded	19.50'	**8.270 in/hr Exfiltration over Surface area**

Discarded OutFlow Max=0.12 cfs @ 12.00 hrs HW=19.58' (Free Discharge)
1=Exfiltration (Exfiltration Controls 0.12 cfs)

Pond 45P: SC-740



Summary for Pond B-1: Basin 1

Inflow Area = 5.195 ac, 60.05% Impervious, Inflow Depth > 3.04" for 25 YR event
Inflow = 18.81 cfs @ 12.10 hrs, Volume= 1.316 af
Outflow = 0.83 cfs @ 15.22 hrs, Volume= 0.880 af, Atten= 96%, Lag= 187.6 min
Discarded = 0.83 cfs @ 15.22 hrs, Volume= 0.880 af
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Peak Elev= 13.30' @ 15.22 hrs Surf.Area= 14,963 sf Storage= 32,617 cf

Plug-Flow detention time= 305.3 min calculated for 0.880 af (67% of inflow)
Center-of-Mass det. time= 211.0 min (1,026.3 - 815.3)

Volume	Invert	Avail.Storage	Storage Description
#1	10.50'	61,135 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

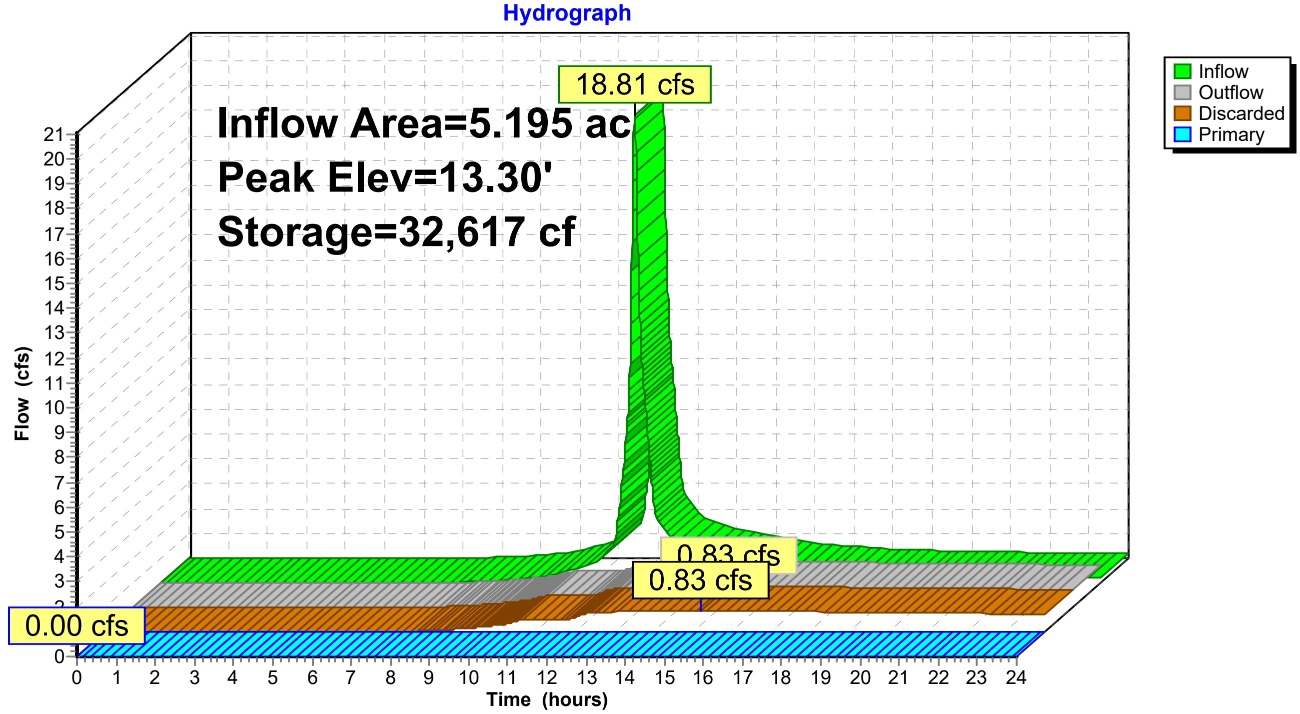
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
10.50	8,346	0	0
11.00	9,153	4,375	4,375
12.00	12,072	10,613	14,987
13.00	14,291	13,182	28,169
14.00	16,502	15,397	43,565
15.00	18,637	17,570	61,135

Device	Routing	Invert	Outlet Devices
#1	Discarded	10.50'	**2.410 in/hr Exfiltration over Surface area**
#2	Primary	15.00'	**45.0 deg x 15.0' long Sharp-Crested Vee/Trap Weir** Cv= 2.56 (C= 3.20)

Discarded OutFlow Max=0.83 cfs @ 15.22 hrs HW=13.30' (Free Discharge)
└─**1=Exfiltration** (Exfiltration Controls 0.83 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=10.50' (Free Discharge)
└─**2=Sharp-Crested Vee/Trap Weir** (Controls 0.00 cfs)

Pond B-1: Basin 1



Summary for Pond B-2: Basin 2

Inflow Area = 4.443 ac, 56.72% Impervious, Inflow Depth > 2.43" for 25 YR event
Inflow = 14.95 cfs @ 12.09 hrs, Volume= 0.899 af
Outflow = 0.66 cfs @ 14.69 hrs, Volume= 0.663 af, Atten= 96%, Lag= 155.9 min
Discarded = 0.66 cfs @ 14.69 hrs, Volume= 0.663 af
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Peak Elev= 17.87' @ 14.69 hrs Surf.Area= 11,860 sf Storage= 22,768 cf

Plug-Flow detention time= 298.5 min calculated for 0.663 af (74% of inflow)
Center-of-Mass det. time= 223.2 min (1,029.4 - 806.1)

Volume	Invert	Avail.Storage	Storage Description
#1	15.50'	37,352 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

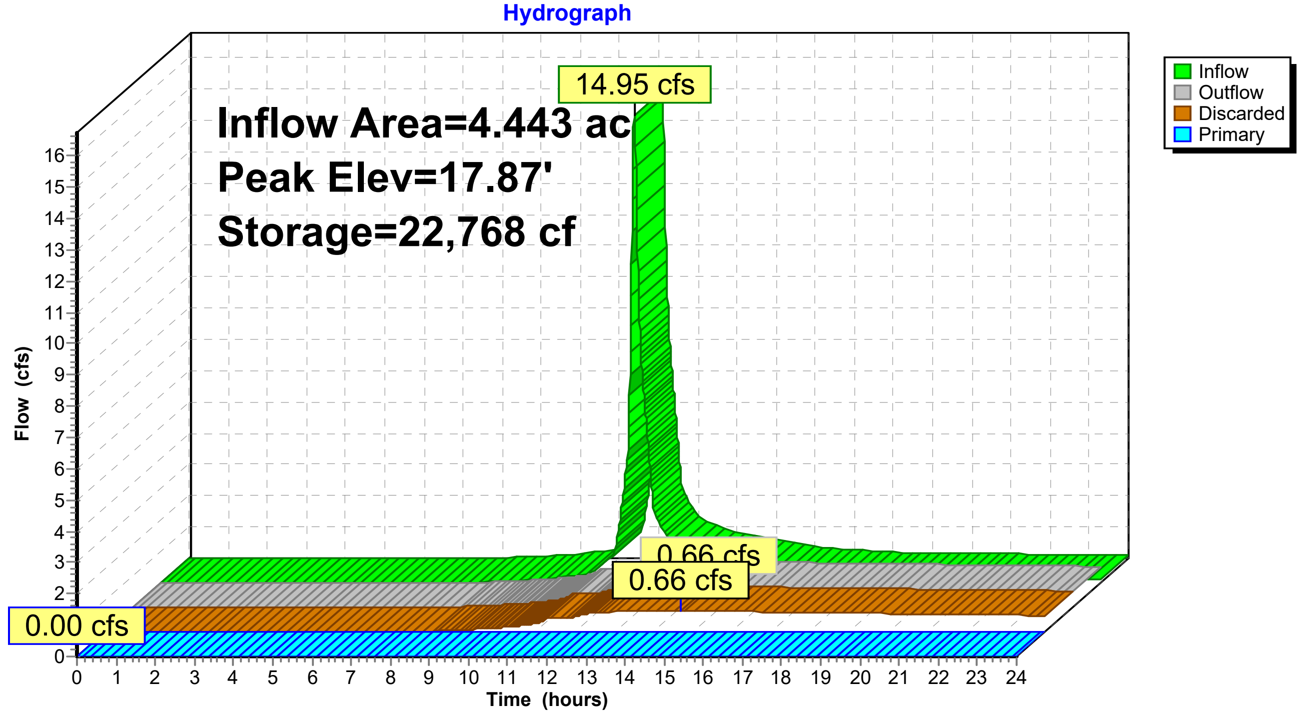
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
15.50	7,983	0	0
16.00	8,588	4,143	4,143
17.00	9,841	9,215	13,357
18.00	12,169	11,005	24,362
19.00	13,810	12,990	37,352

Device	Routing	Invert	Outlet Devices
#1	Discarded	15.50'	**2.410 in/hr Exfiltration over Surface area**
#2	Primary	19.50'	**45.0 deg x 15.0' long Sharp-Crested Vee/Trap Weir** Cv= 2.56 (C= 3.20)

Discarded OutFlow Max=0.66 cfs @ 14.69 hrs HW=17.87' (Free Discharge)
↑—**1=Exfiltration** (Exfiltration Controls 0.66 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=15.50' (Free Discharge)
↑—**2=Sharp-Crested Vee/Trap Weir** (Controls 0.00 cfs)

Pond B-2: Basin 2



Summary for Pond BIO1: BIO 1

Inflow Area = 0.791 ac, 76.51% Impervious, Inflow Depth > 4.11" for 25 YR event
Inflow = 3.90 cfs @ 12.07 hrs, Volume= 0.271 af
Outflow = 3.79 cfs @ 12.09 hrs, Volume= 0.265 af, Atten= 3%, Lag= 1.1 min
Discarded = 0.06 cfs @ 12.09 hrs, Volume= 0.061 af
Primary = 3.73 cfs @ 12.09 hrs, Volume= 0.204 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Peak Elev= 19.82' @ 12.09 hrs Surf.Area= 1,134 sf Storage= 591 cf

Plug-Flow detention time= 22.1 min calculated for 0.265 af (98% of inflow)
Center-of-Mass det. time= 8.8 min (811.4 - 802.6)

Volume	Invert	Avail.Storage	Storage Description
#1	19.00'	7,359 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

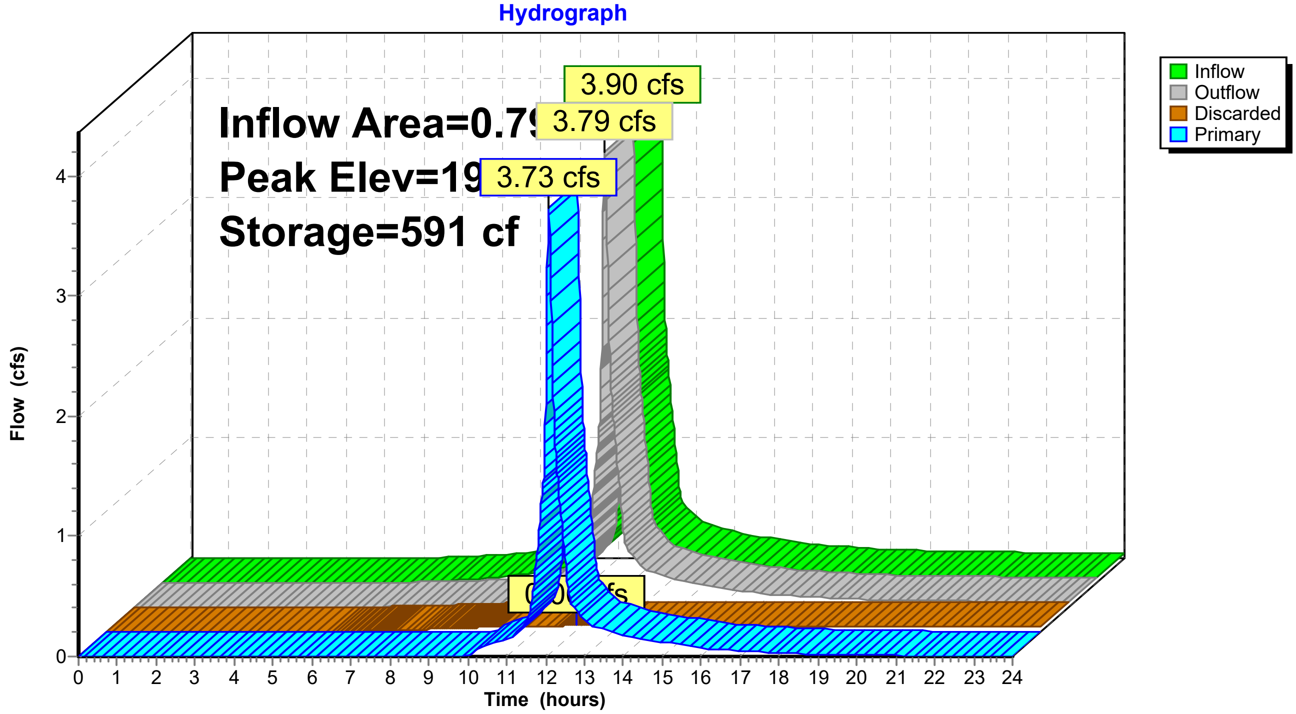
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
19.00	307	0	0
20.00	1,315	811	811
20.40	2,200	703	1,514
21.00	17,283	5,845	7,359

Device	Routing	Invert	Outlet Devices
#1	Discarded	19.00'	**2.410 in/hr Exfiltration over Surface area**
#2	Primary	19.50'	**12.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#3	Primary	19.50'	**12.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Discarded OutFlow Max=0.06 cfs @ 12.09 hrs HW=19.82' (Free Discharge)
└**1=Exfiltration** (Exfiltration Controls 0.06 cfs)

Primary OutFlow Max=3.73 cfs @ 12.09 hrs HW=19.82' (Free Discharge)
├**2=Orifice/Grate** (Weir Controls 1.86 cfs @ 1.85 fps)
└**3=Orifice/Grate** (Weir Controls 1.86 cfs @ 1.85 fps)

Pond BIO1: BIO 1



Summary for Pond BIO2: BIO 2

Inflow Area = 0.833 ac, 68.24% Impervious, Inflow Depth > 3.60" for 25 YR event
Inflow = 3.64 cfs @ 12.07 hrs, Volume= 0.250 af
Outflow = 3.28 cfs @ 12.11 hrs, Volume= 0.246 af, Atten= 10%, Lag= 2.2 min
Discarded = 0.13 cfs @ 12.11 hrs, Volume= 0.126 af
Primary = 3.16 cfs @ 12.11 hrs, Volume= 0.120 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Peak Elev= 23.04' @ 12.11 hrs Surf.Area= 2,266 sf Storage= 1,904 cf

Plug-Flow detention time= 71.1 min calculated for 0.245 af (98% of inflow)
Center-of-Mass det. time= 61.0 min (876.8 - 815.8)

Volume	Invert	Avail.Storage	Storage Description
#1	22.00'	4,509 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

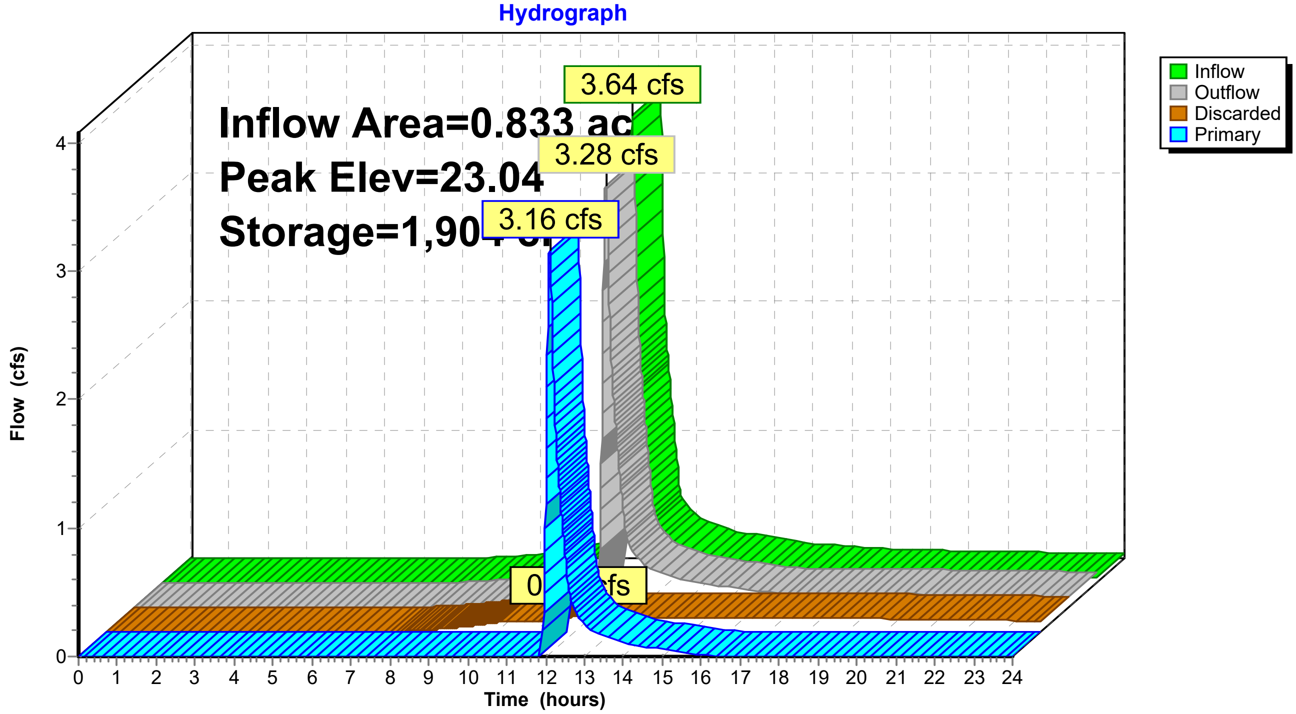
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
22.00	1,410	0	0
23.00	2,232	1,821	1,821
24.00	3,143	2,688	4,509

Device	Routing	Invert	Outlet Devices
#1	Discarded	22.00'	**2.410 in/hr Exfiltration over Surface area**
#2	Primary	22.75'	**12.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#3	Primary	22.75'	**12.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Discarded OutFlow Max=0.13 cfs @ 12.11 hrs HW=23.04' (Free Discharge)
└─**1=Exfiltration** (Exfiltration Controls 0.13 cfs)

Primary OutFlow Max=3.15 cfs @ 12.11 hrs HW=23.04' (Free Discharge)
├─**2=Orifice/Grate** (Weir Controls 1.58 cfs @ 1.75 fps)
└─**3=Orifice/Grate** (Weir Controls 1.58 cfs @ 1.75 fps)

Pond BIO2: BIO 2



Summary for Pond BIO3: BIO-3

Inflow Area = 0.816 ac, 75.18% Impervious, Inflow Depth > 4.00" for 25 YR event
Inflow = 3.93 cfs @ 12.07 hrs, Volume= 0.272 af
Outflow = 3.75 cfs @ 12.10 hrs, Volume= 0.266 af, Atten= 5%, Lag= 1.4 min
Discarded = 0.09 cfs @ 12.10 hrs, Volume= 0.085 af
Primary = 3.66 cfs @ 12.10 hrs, Volume= 0.182 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Peak Elev= 23.82' @ 12.10 hrs Surf.Area= 1,548 sf Storage= 897 cf

Plug-Flow detention time= 32.1 min calculated for 0.266 af (98% of inflow)
Center-of-Mass det. time= 19.1 min (824.5 - 805.4)

Volume	Invert	Avail.Storage	Storage Description
#1	23.00'	2,268 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

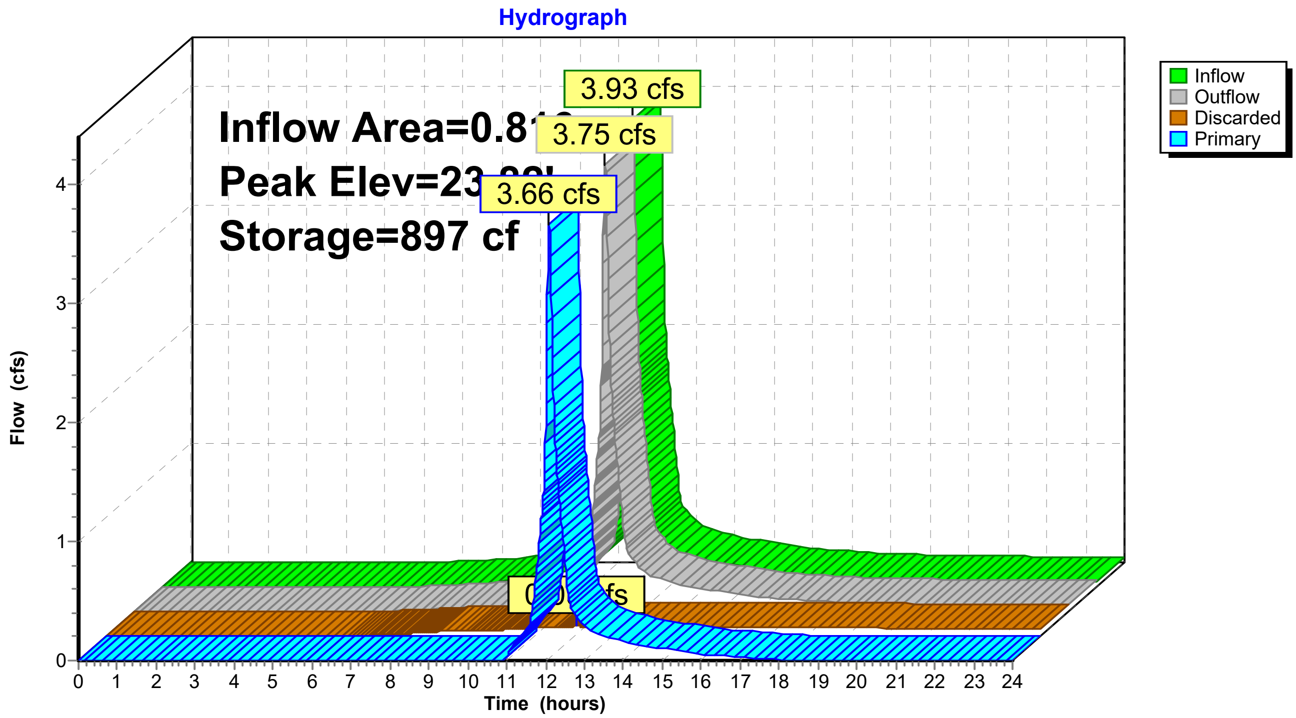
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
23.00	648	0	0
24.00	1,750	1,199	1,199
24.50	2,527	1,069	2,268

Device	Routing	Invert	Outlet Devices
#1	Discarded	23.00'	**2.410 in/hr Exfiltration over Surface area**
#2	Primary	23.50'	**12.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#3	Primary	23.50'	**12.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Discarded OutFlow Max=0.09 cfs @ 12.10 hrs HW=23.82' (Free Discharge)
└─**1=Exfiltration** (Exfiltration Controls 0.09 cfs)

Primary OutFlow Max=3.66 cfs @ 12.10 hrs HW=23.82' (Free Discharge)
├─**2=Orifice/Grate** (Weir Controls 1.83 cfs @ 1.84 fps)
└─**3=Orifice/Grate** (Weir Controls 1.83 cfs @ 1.84 fps)

Pond BIO3: BIO-3



Summary for Pond P-B: POND B

Inflow Area = 1.269 ac, 0.00% Impervious, Inflow Depth > 1.03" for 25 YR event
Inflow = 1.19 cfs @ 12.10 hrs, Volume= 0.109 af
Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Atten= 100%, Lag= 0.0 min
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Peak Elev= 3.14' @ 24.00 hrs Surf.Area= 11,180 sf Storage= 4,735 cf

Plug-Flow detention time= (not calculated: initial storage exceeds outflow)
Center-of-Mass det. time= (not calculated: no outflow)

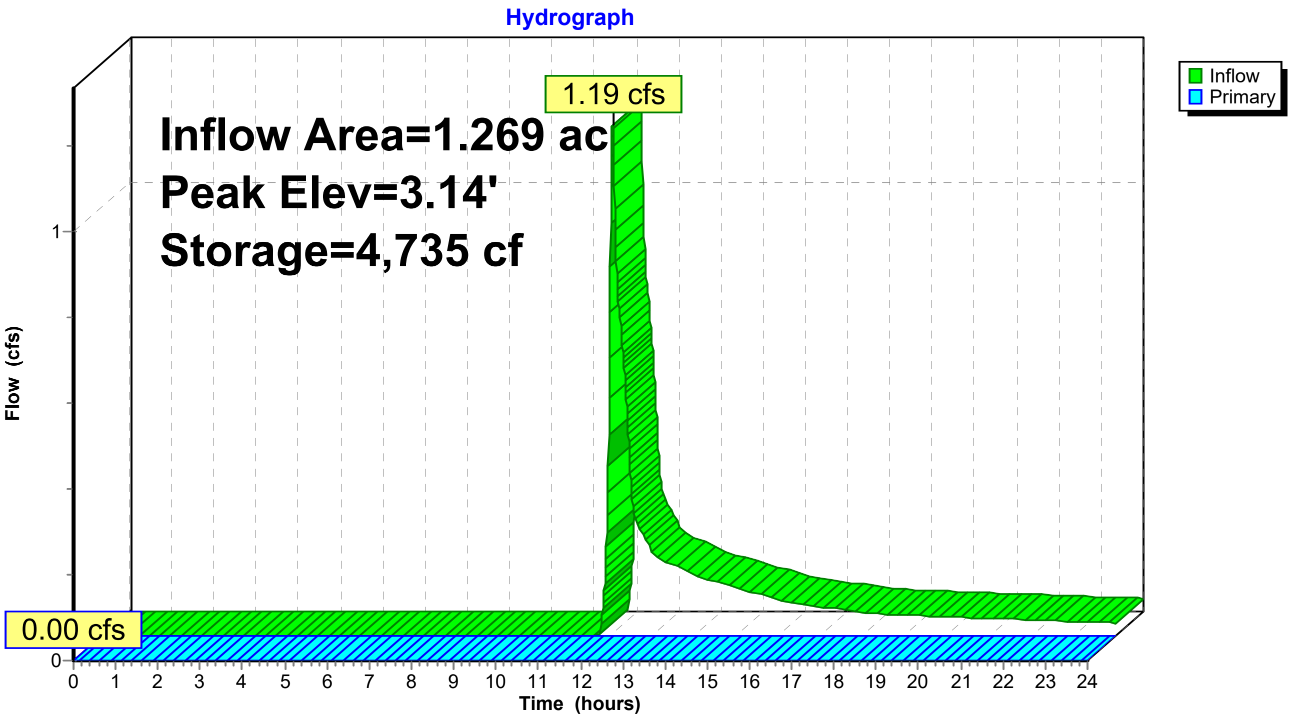
Volume	Invert	Avail.Storage	Storage Description
#1	2.70'	15,021 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
2.70	10,273	0	0
3.00	11,080	3,203	3,203
3.40	11,370	4,490	7,693
4.00	13,058	7,328	15,021

Device	Routing	Invert	Outlet Devices
#1	Primary	3.44'	**45.0 deg x 15.0' long x 0.50' rise Sharp-Crested Vee/Trap Weir** Cv= 2.56 (C= 3.20)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=2.70' (Free Discharge)
└─**1=Sharp-Crested Vee/Trap Weir** (Controls 0.00 cfs)

Pond P-B: POND B



Summary for Pond P-C: POND C

Inflow Area = 2.480 ac, 0.00% Impervious, Inflow Depth > 1.03" for 25 YR event
Inflow = 2.32 cfs @ 12.10 hrs, Volume= 0.212 af
Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Atten= 100%, Lag= 0.0 min
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Peak Elev= 4.02' @ 24.00 hrs Surf.Area= 23,590 sf Storage= 9,251 cf

Plug-Flow detention time= (not calculated: initial storage exceeds outflow)
Center-of-Mass det. time= (not calculated: no outflow)

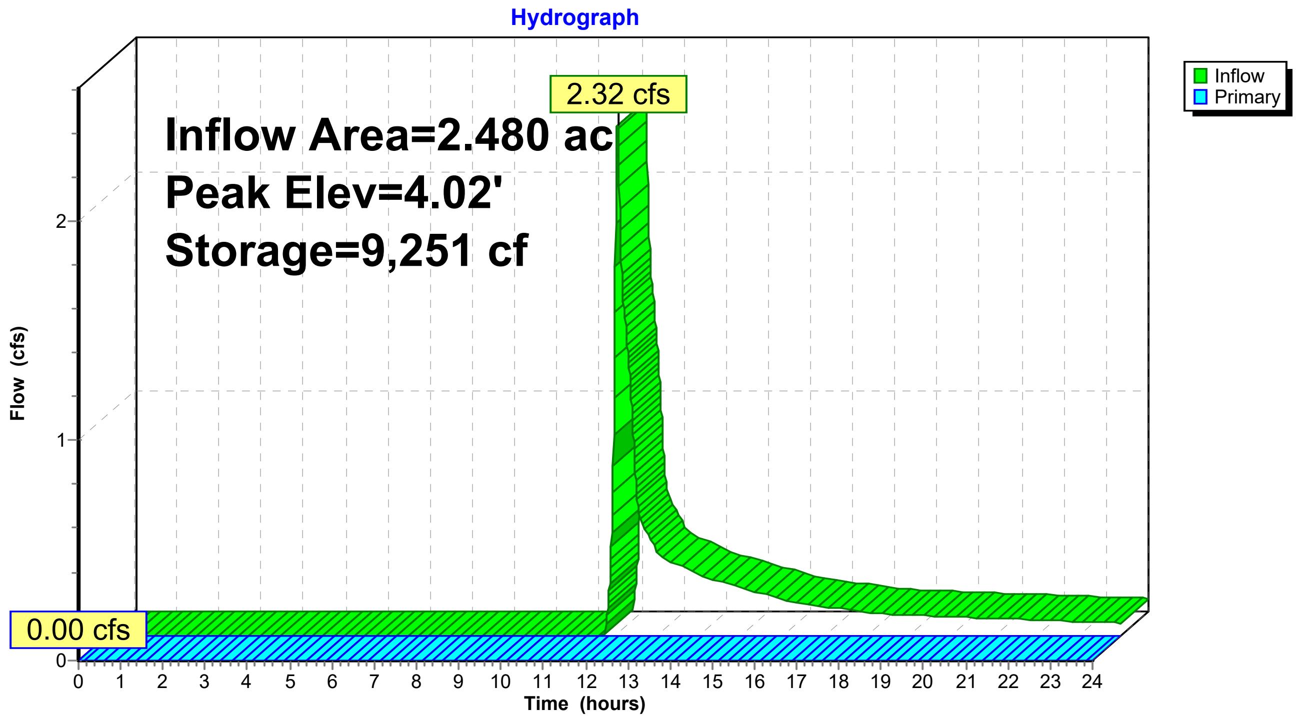
Volume	Invert	Avail.Storage	Storage Description
#1	3.60'	35,172 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
3.60	20,812	0	0
4.00	23,497	8,862	8,862
5.00	29,124	26,311	35,172

Device	Routing	Invert	Outlet Devices
#1	Primary	4.29'	**45.0 deg x 15.0' long x 0.50' rise Sharp-Crested Vee/Trap Weir** Cv= 2.56 (C= 3.20)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=3.60' (Free Discharge)
└─**1=Sharp-Crested Vee/Trap Weir** (Controls 0.00 cfs)

Pond P-C: POND C



Summary for Pond P-D: POND D

Inflow Area = 2.034 ac, 0.00% Impervious, Inflow Depth > 0.95" for 25 YR event
Inflow = 1.02 cfs @ 12.47 hrs, Volume= 0.161 af
Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Atten= 100%, Lag= 0.0 min
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Peak Elev= 8.86' @ 24.00 hrs Surf.Area= 8,779 sf Storage= 7,028 cf

Plug-Flow detention time= (not calculated: initial storage exceeds outflow)
Center-of-Mass det. time= (not calculated: no outflow)

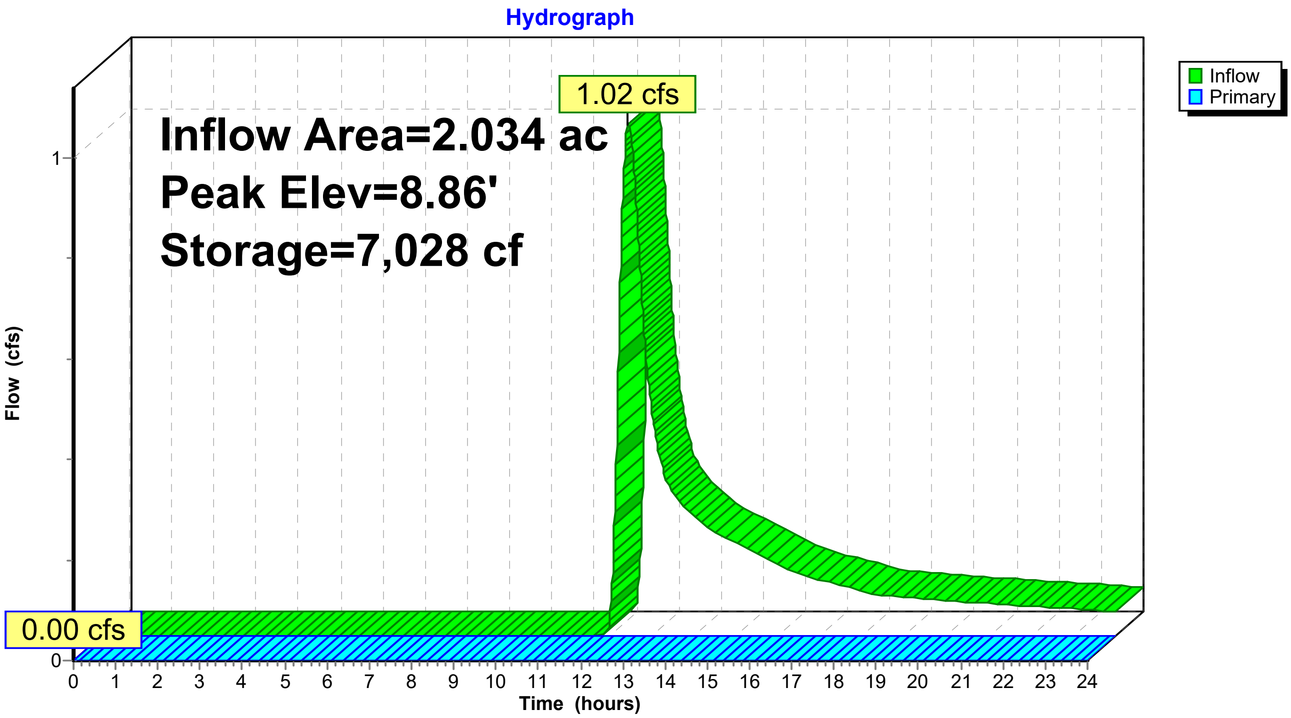
Volume	Invert	Avail.Storage	Storage Description
#1	8.00'	18,853 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
8.00	7,585	0	0
9.00	8,975	8,280	8,280
10.00	12,170	10,573	18,853

Device	Routing	Invert	Outlet Devices
#1	Primary	9.80'	**45.0 deg x 15.0' long x 0.50' rise Sharp-Crested Vee/Trap Weir** Cv= 2.56 (C= 3.20)
#2	Primary	9.08'	**12.0" Round Culvert** L= 18.5' CMP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 9.08' / 8.16' S= 0.0497 '/' Cc= 0.900 n= 0.013 Clay tile, Flow Area= 0.79 sf

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=8.00' (Free Discharge)
├─**1=Sharp-Crested Vee/Trap Weir** (Controls 0.00 cfs)
└─**2=Culvert** (Controls 0.00 cfs)

Pond P-D: POND D



Time span=0.00-24.00 hrs, dt=0.01 hrs, 2401 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 28S: TYP ROOF SIZING Runoff Area=5,000 sf 100.00% Impervious Runoff Depth>7.17"
Tc=5.0 min CN=98 Runoff=0.86 cfs 0.069 af

Subcatchment BIO-1: BIO-1 Runoff Area=34,452 sf 76.51% Impervious Runoff Depth>5.53"
Tc=5.0 min CN=84 Runoff=5.17 cfs 0.364 af

Subcatchment BIO-2: BIO-2 Runoff Area=36,300 sf 68.24% Impervious Runoff Depth>4.96"
Tc=5.0 min CN=79 Runoff=4.98 cfs 0.344 af

Subcatchment BIO-3: BIO-3 Runoff Area=35,532 sf 75.18% Impervious Runoff Depth>5.41"
Tc=5.0 min CN=83 Runoff=5.25 cfs 0.368 af

Subcatchment P10: PR-DA-10 Runoff Area=190,706 sf 0.00% Impervious Runoff Depth>0.61"
Tc=5.0 min CN=35 Runoff=1.16 cfs 0.223 af

Subcatchment P11: PR-DA11 Runoff Area=55,295 sf 0.00% Impervious Runoff Depth>1.80"
Tc=5.0 min CN=49 Runoff=2.44 cfs 0.191 af

Subcatchment P12: PR-DA12 Runoff Area=108,026 sf 0.00% Impervious Runoff Depth>1.80"
Tc=5.0 min CN=49 Runoff=4.77 cfs 0.372 af

Subcatchment P13: PR-DA-13 Runoff Area=32,038 sf 3.96% Impervious Runoff Depth>1.00"
Tc=5.0 min UI Adjusted CN=40 Runoff=0.55 cfs 0.061 af

Subcatchment P14: PR-DA-14 Runoff Area=187,032 sf 0.00% Impervious Runoff Depth>0.69"
Tc=5.0 min CN=36 Runoff=1.36 cfs 0.245 af

Subcatchment P1a: PR-DA-1a Runoff Area=72,022 sf 28.03% Impervious Runoff Depth>3.00"
Tc=5.0 min CN=61 Runoff=5.92 cfs 0.413 af

Subcatchment P1b: PR-DA-1b Runoff Area=61,320 sf 64.77% Impervious Runoff Depth>4.73"
Tc=5.0 min CN=77 Runoff=8.06 cfs 0.555 af

Subcatchment P2: PR-DA-2 Runoff Area=14,573 sf 0.97% Impervious Runoff Depth>0.92"
Tc=5.0 min UI Adjusted CN=39 Runoff=0.21 cfs 0.026 af

Subcatchment P3: PR-DA-3 Runoff Area=88,593 sf 0.00% Impervious Runoff Depth>1.70"
Flow Length=574' Tc=26.1 min CN=48 Runoff=2.11 cfs 0.287 af

Subcatchment P4: PR-DA4 Runoff Area=47,075 sf 19.25% Impervious Runoff Depth>1.90"
Tc=5.0 min CN=50 Runoff=2.23 cfs 0.171 af

Subcatchment P5: PR-DA5 Runoff Area=145,975 sf 68.19% Impervious Runoff Depth>4.96"
Flow Length=1,208' Tc=6.7 min CN=79 Runoff=18.84 cfs 1.384 af

Subcatchment P6: PR-DA-6 Runoff Area=34,083 sf 11.09% Impervious Runoff Depth>1.17"
Tc=5.0 min UI Adjusted CN=42 Runoff=0.78 cfs 0.076 af

Subcatchment P7: PR-DA-7 Runoff Area=47,897 sf 26.54% Impervious Runoff Depth>1.61"
Tc=5.0 min UI Adjusted CN=47 Runoff=1.82 cfs 0.148 af

Subcatchment P8a: PR-DA8a Runoff Area=37,831 sf 61.05% Impervious Runoff Depth>4.51"
Flow Length=626' Tc=5.0 min CN=75 Runoff=4.75 cfs 0.326 af

Subcatchment P8b: PR-DA8b Runoff Area=36,807 sf 71.01% Impervious Runoff Depth>5.18"
Flow Length=432' Tc=5.0 min CN=81 Runoff=5.25 cfs 0.365 af

Subcatchment P9: PR-DA9 Runoff Area=45,880 sf 21.77% Impervious Runoff Depth>2.09"
Tc=5.0 min CN=52 Runoff=2.46 cfs 0.183 af

Reach DP-1: DP-1 Inflow=5.92 cfs 0.413 af
Outflow=5.92 cfs 0.413 af

Reach DP-2: DP-2 (JOSHUA'S BROOK) Inflow=1.16 cfs 0.225 af
Outflow=1.16 cfs 0.225 af

Reach DP-3: DP-3 (STEWART'S CREEK) Inflow=1.36 cfs 0.293 af
Outflow=1.36 cfs 0.293 af

Pond 41P: SC-740 Peak Elev=39.46' Storage=913 cf Inflow=0.86 cfs 0.069 af
Outflow=0.09 cfs 0.069 af

Pond 43P: SC-740 Peak Elev=24.72' Storage=675 cf Inflow=0.78 cfs 0.076 af
Outflow=0.31 cfs 0.074 af

Pond 45P: SC-740 Peak Elev=25.86' Storage=1,708 cf Inflow=1.82 cfs 0.148 af
Outflow=0.50 cfs 0.148 af

Pond B-1: Basin 1 Peak Elev=14.35' Storage=49,437 cf Inflow=26.09 cfs 1.860 af
Discarded=0.96 cfs 1.046 af Primary=0.00 cfs 0.000 af Outflow=0.96 cfs 1.046 af

Pond B-2: Basin 2 Peak Elev=18.90' Storage=36,038 cf Inflow=21.16 cfs 1.325 af
Discarded=0.76 cfs 0.809 af Primary=0.00 cfs 0.000 af Outflow=0.76 cfs 0.809 af

Pond BIO1: BIO 1 Peak Elev=19.90' Storage=690 cf Inflow=5.17 cfs 0.364 af
Discarded=0.07 cfs 0.065 af Primary=4.81 cfs 0.292 af Outflow=4.88 cfs 0.358 af

Pond BIO2: BIO 2 Peak Elev=23.11' Storage=2,075 cf Inflow=4.98 cfs 0.344 af
Discarded=0.13 cfs 0.137 af Primary=4.45 cfs 0.196 af Outflow=4.58 cfs 0.333 af

Pond BIO3: BIO-3 Peak Elev=23.90' Storage=1,025 cf Inflow=5.25 cfs 0.368 af
Discarded=0.09 cfs 0.092 af Primary=4.77 cfs 0.267 af Outflow=4.86 cfs 0.359 af

Pond P-B: POND B Peak Elev=3.45' Storage=8,230 cf Inflow=2.44 cfs 0.191 af
Outflow=0.04 cfs 0.002 af

Pond P-C: POND C Peak Elev=4.30' Storage=16,139 cf Inflow=4.77 cfs 0.372 af
Outflow=0.04 cfs 0.002 af

Pond P-D: POND D Peak Elev=9.25' Storage=10,577 cf Inflow=2.11 cfs 0.287 af
Outflow=0.09 cfs 0.046 af

Total Runoff Area = 30.221 ac Runoff Volume = 6.172 af Average Runoff Depth = 2.45"
75.05% Pervious = 22.680 ac 24.95% Impervious = 7.541 ac

Summary for Subcatchment 28S: TYP ROOF SIZING

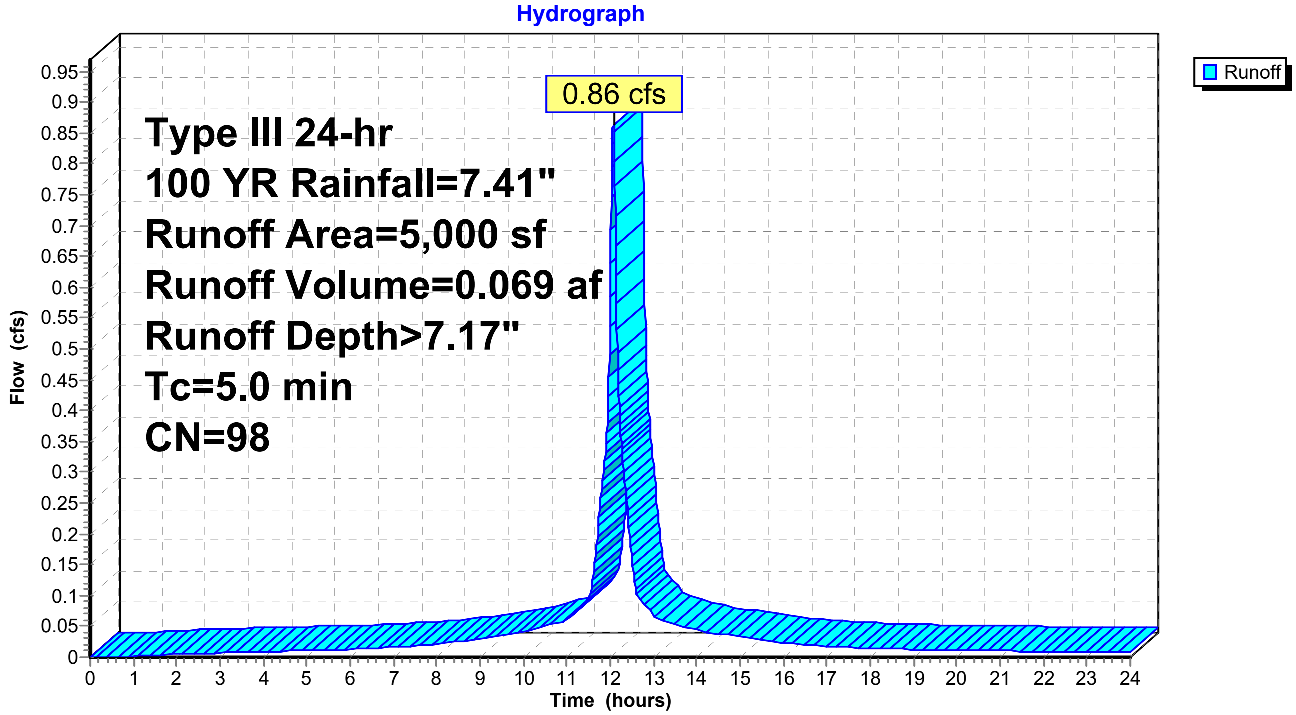
Runoff = 0.86 cfs @ 12.07 hrs, Volume= 0.069 af, Depth> 7.17"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 100 YR Rainfall=7.41"

Area (sf)	CN	Description
5,000	98	Roofs, HSG A
5,000		100.00% Impervious Area

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

Subcatchment 28S: TYP ROOF SIZING



Summary for Subcatchment BIO-1: BIO-1

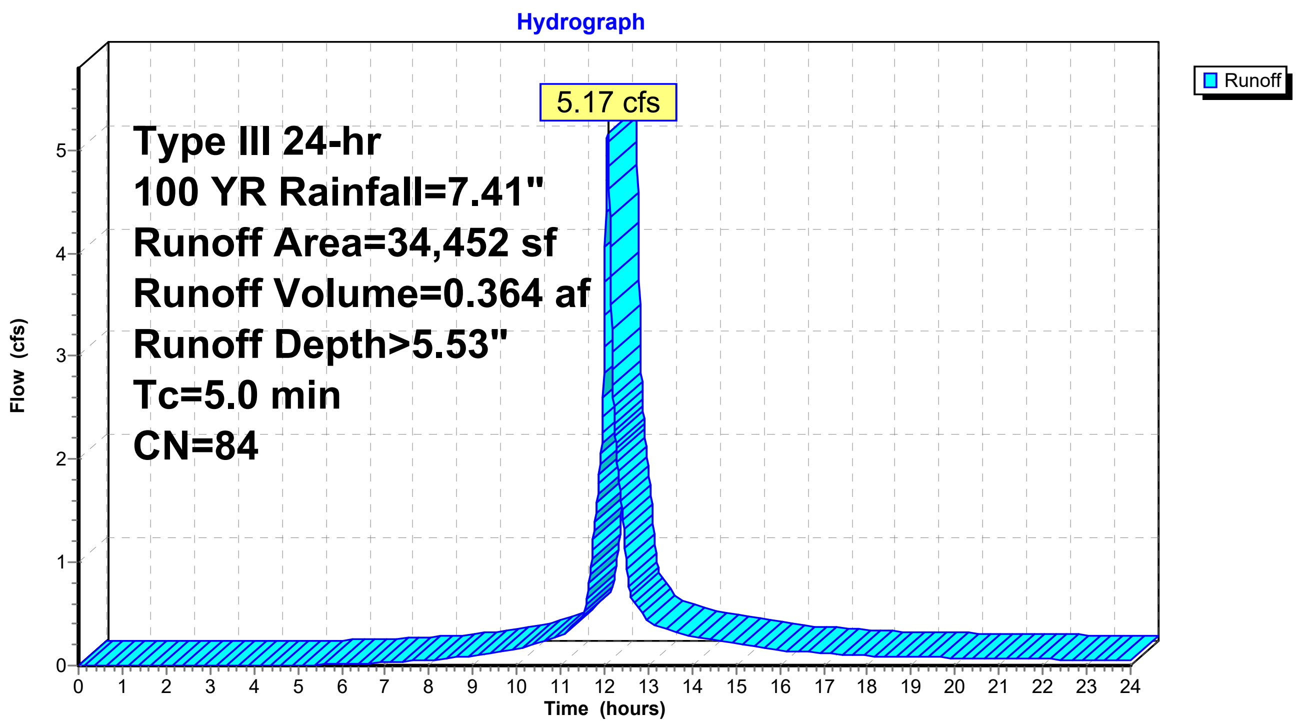
Runoff = 5.17 cfs @ 12.07 hrs, Volume= 0.364 af, Depth> 5.53"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 100 YR Rainfall=7.41"

Area (sf)	CN	Description
8,092	39	>75% Grass cover, Good, HSG A
26,360	98	Paved parking, HSG A
34,452	84	Weighted Average
8,092		23.49% Pervious Area
26,360		76.51% Impervious Area

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

Subcatchment BIO-1: BIO-1



Summary for Subcatchment BIO-2: BIO-2

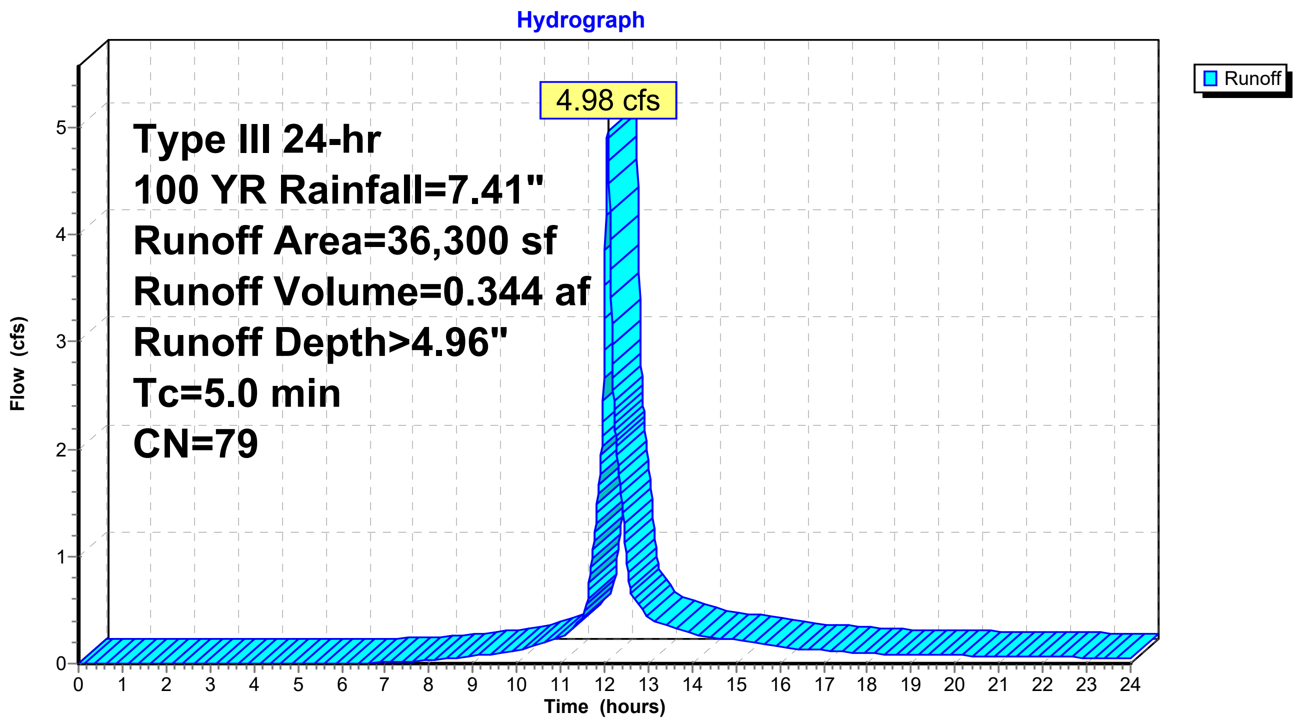
Runoff = 4.98 cfs @ 12.07 hrs, Volume= 0.344 af, Depth> 4.96"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 100 YR Rainfall=7.41"

Area (sf)	CN	Description
11,530	39	>75% Grass cover, Good, HSG A
24,660	98	Paved parking, HSG A
110	98	Roofs, HSG A
36,300	79	Weighted Average
11,530		31.76% Pervious Area
24,770		68.24% Impervious Area

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

Subcatchment BIO-2: BIO-2



Summary for Subcatchment BIO-3: BIO-3

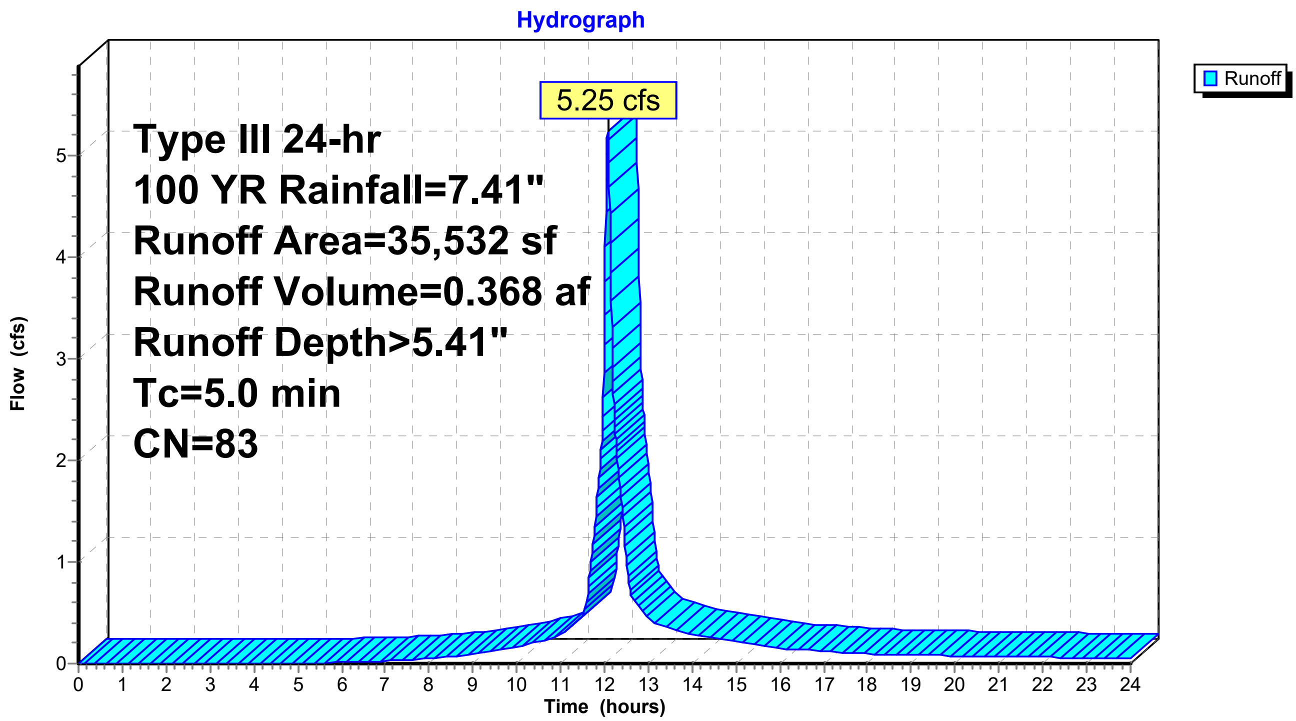
Runoff = 5.25 cfs @ 12.07 hrs, Volume= 0.368 af, Depth> 5.41"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 100 YR Rainfall=7.41"

Area (sf)	CN	Description
8,819	39	>75% Grass cover, Good, HSG A
26,493	98	Paved parking, HSG A
220	98	Roofs, HSG A
35,532	83	Weighted Average
8,819		24.82% Pervious Area
26,713		75.18% Impervious Area

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

Subcatchment BIO-3: BIO-3



Summary for Subcatchment P10: PR-DA-10

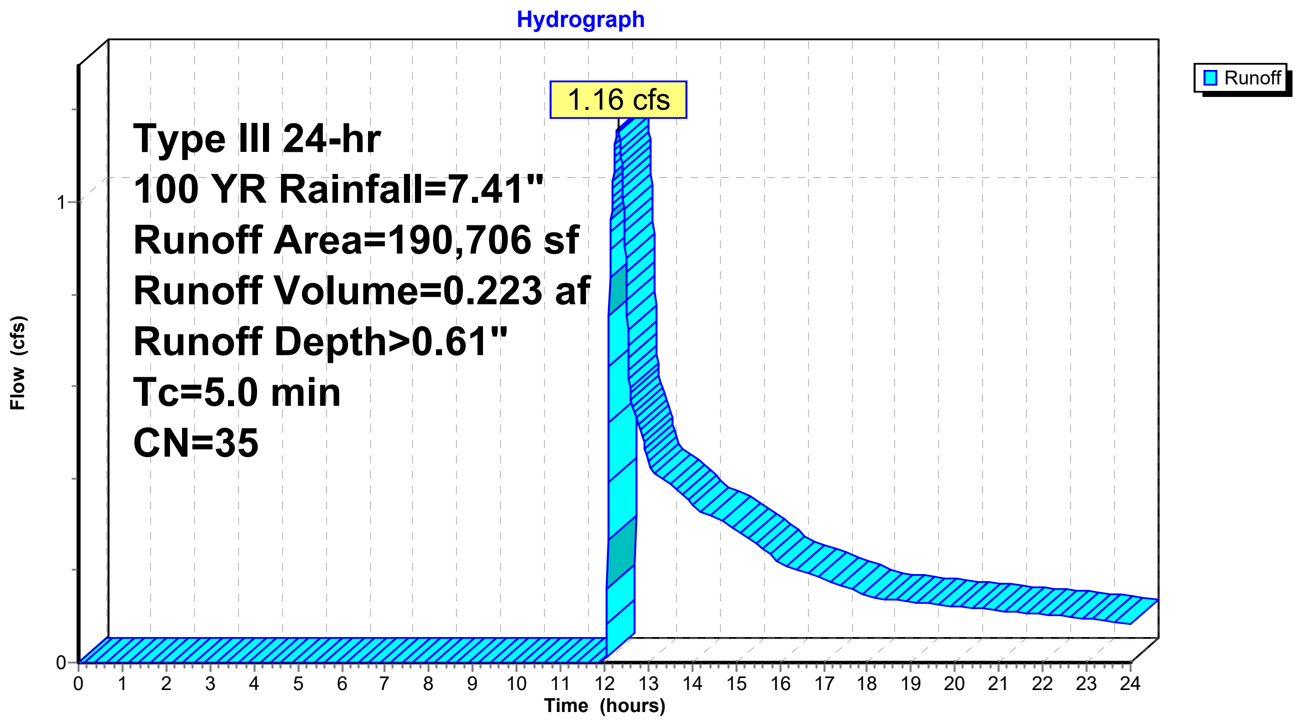
Runoff = 1.16 cfs @ 12.30 hrs, Volume= 0.223 af, Depth> 0.61"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 100 YR Rainfall=7.41"

Area (sf)	CN	Description
90,801	39	>75% Grass cover, Good, HSG A
99,905	32	Woods/grass comb., Good, HSG A
190,706	35	Weighted Average
190,706		100.00% Pervious Area

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

Subcatchment P10: PR-DA-10



Summary for Subcatchment P11: PR-DA11

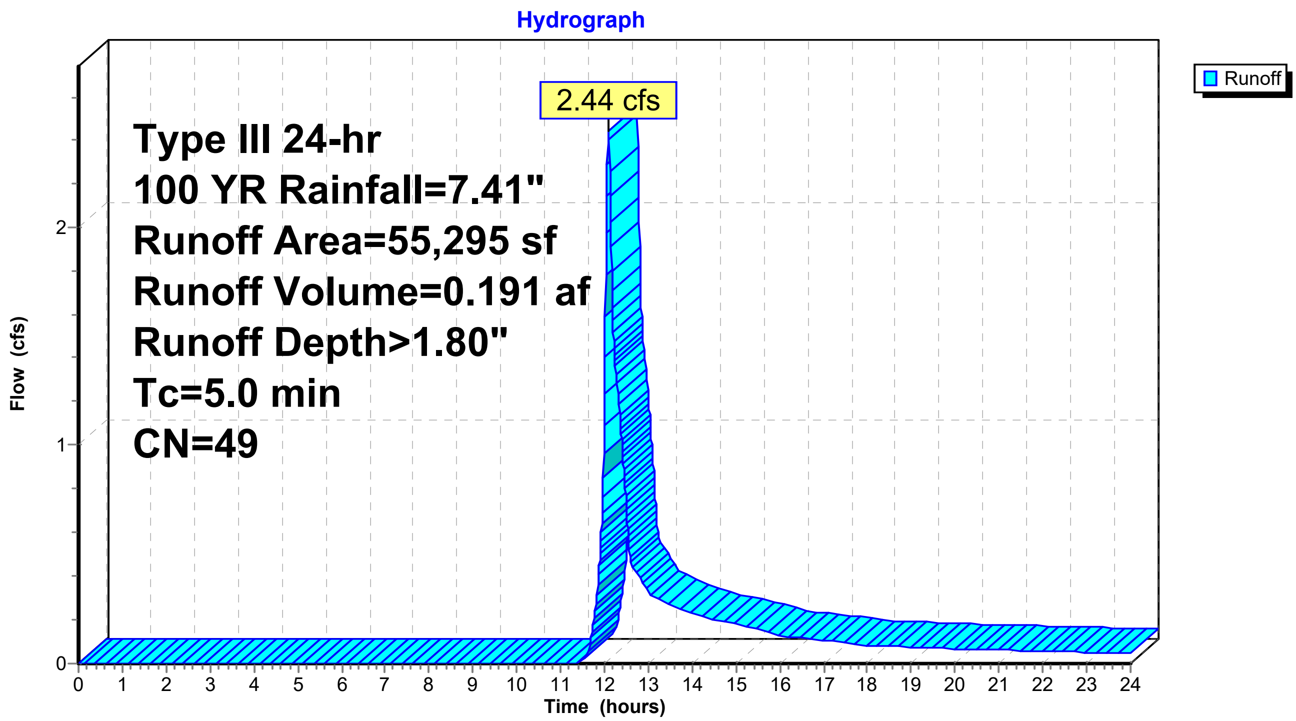
Runoff = 2.44 cfs @ 12.09 hrs, Volume= 0.191 af, Depth> 1.80"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 100 YR Rainfall=7.41"

Area (sf)	CN	Description
39,962	39	>75% Grass cover, Good, HSG A
5,060	30	Woods, Good, HSG A
10,273	98	Water Surface, 0% imp, HSG A
0	98	Paved parking, HSG A
55,295	49	Weighted Average
55,295		100.00% Pervious Area

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

Subcatchment P11: PR-DA11



Summary for Subcatchment P12: PR-DA12

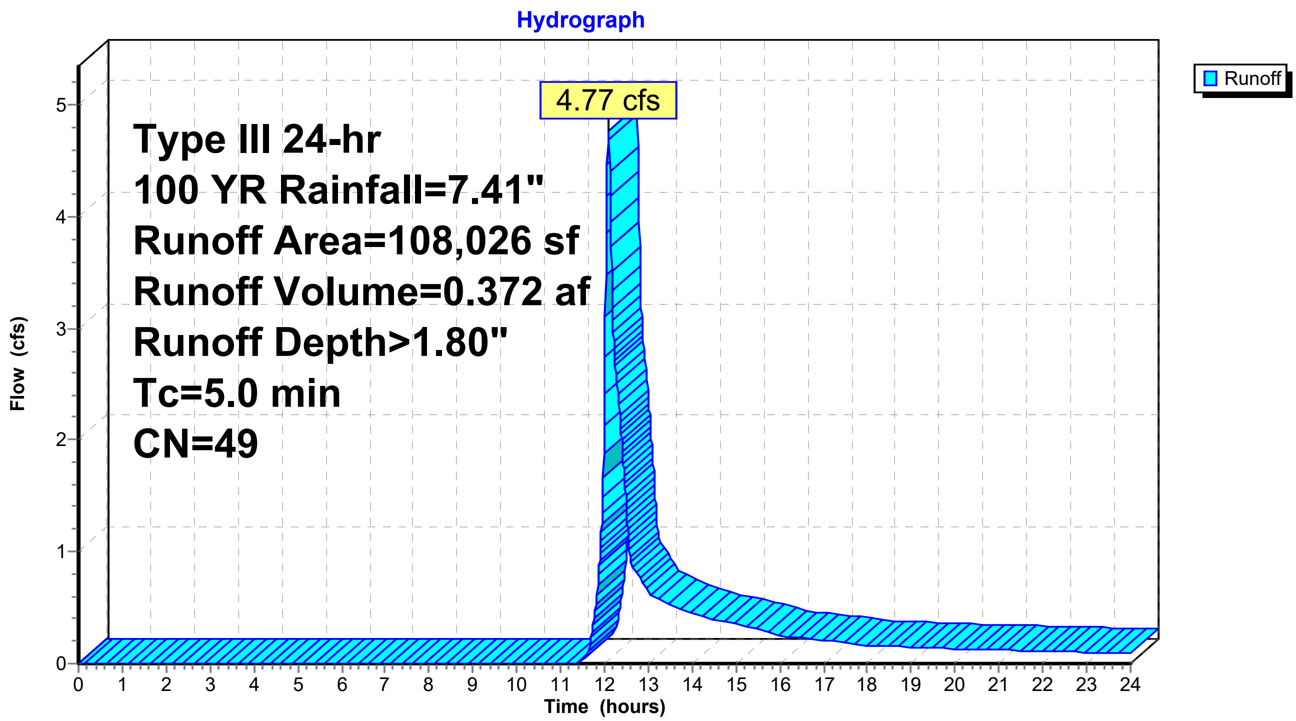
Runoff = 4.77 cfs @ 12.09 hrs, Volume= 0.372 af, Depth> 1.80"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 100 YR Rainfall=7.41"

Area (sf)	CN	Description
74,064	39	>75% Grass cover, Good, HSG A
13,150	30	Woods, Good, HSG A
20,812	98	Water Surface, 0% imp, HSG A
0	98	Paved parking, HSG A
108,026	49	Weighted Average
108,026		100.00% Pervious Area

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

Subcatchment P12: PR-DA12



Summary for Subcatchment P13: PR-DA-13

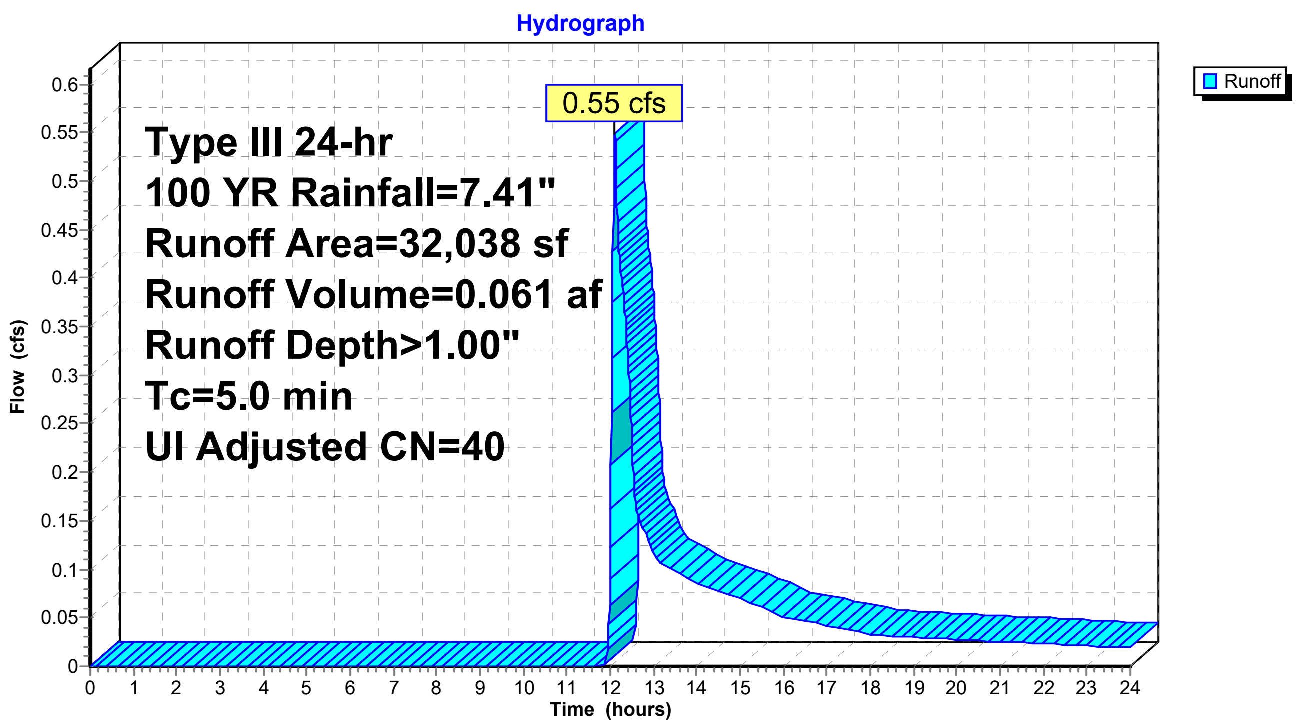
Runoff = 0.55 cfs @ 12.11 hrs, Volume= 0.061 af, Depth> 1.00"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 100 YR Rainfall=7.41"

	Area (sf)	CN	Adj	Description
	30,218	39		>75% Grass cover, Good, HSG A
*	1,270	98		Unconnected Impervious, HSG A
	550	30		Woods, Good, HSG A
	32,038	41	40	Weighted Average, UI Adjusted
	30,768			96.04% Pervious Area
	1,270			3.96% Impervious Area
	1,270			100.00% Unconnected

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

Subcatchment P13: PR-DA-13



Summary for Subcatchment P14: PR-DA-14

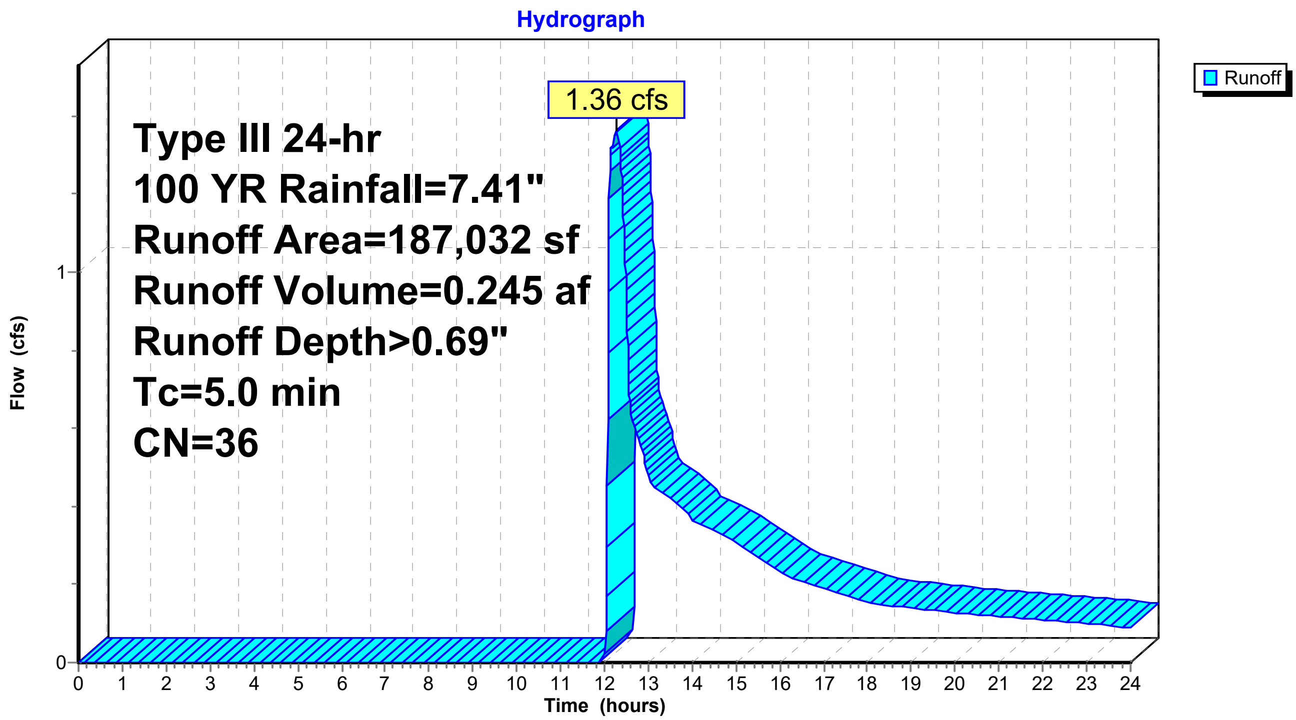
Runoff = 1.36 cfs @ 12.28 hrs, Volume= 0.245 af, Depth> 0.69"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 100 YR Rainfall=7.41"

Area (sf)	CN	Description
124,219	39	>75% Grass cover, Good, HSG A
62,813	30	Woods, Good, HSG A
187,032	36	Weighted Average
187,032		100.00% Pervious Area

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

Subcatchment P14: PR-DA-14



Summary for Subcatchment P1a: PR-DA-1a

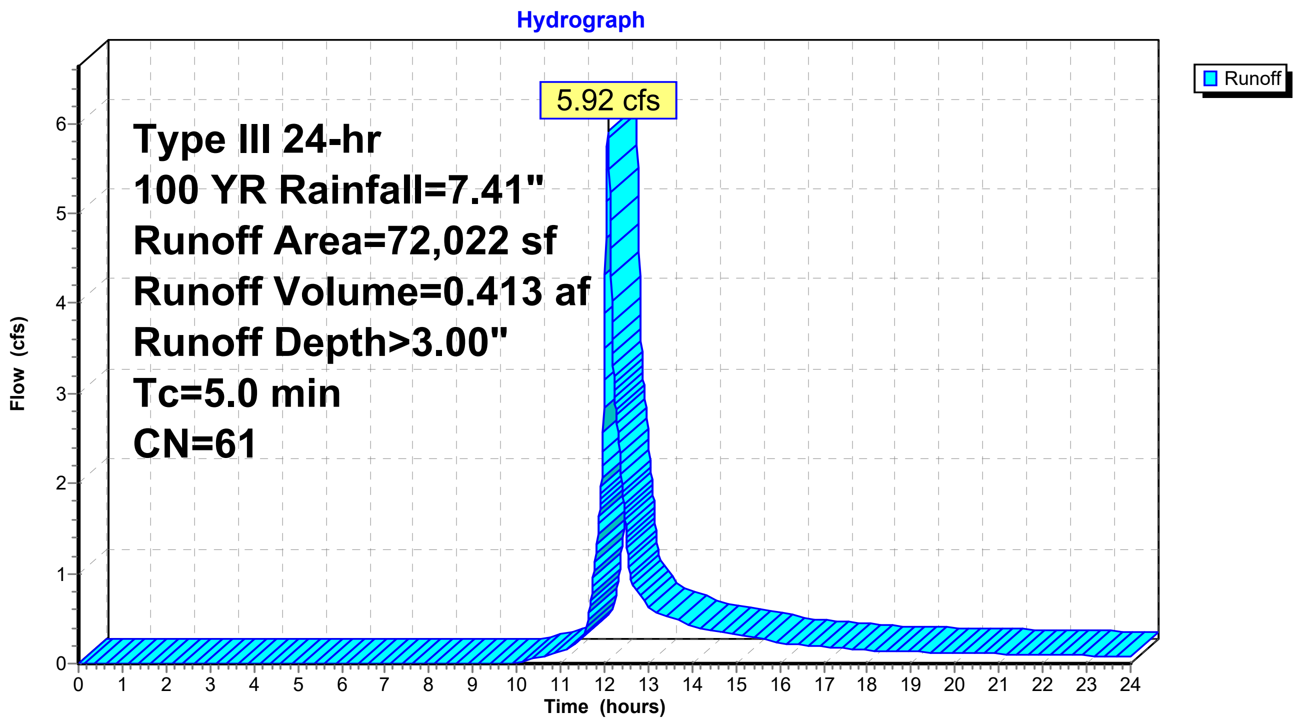
Runoff = 5.92 cfs @ 12.08 hrs, Volume= 0.413 af, Depth> 3.00"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 100 YR Rainfall=7.41"

Area (sf)	CN	Description
44,791	39	>75% Grass cover, Good, HSG A
20,190	98	Paved parking, HSG A
7,041	98	Water Surface, 0% imp, HSG A
72,022	61	Weighted Average
51,832		71.97% Pervious Area
20,190		28.03% Impervious Area

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

Subcatchment P1a: PR-DA-1a



Summary for Subcatchment P1b: PR-DA-1b

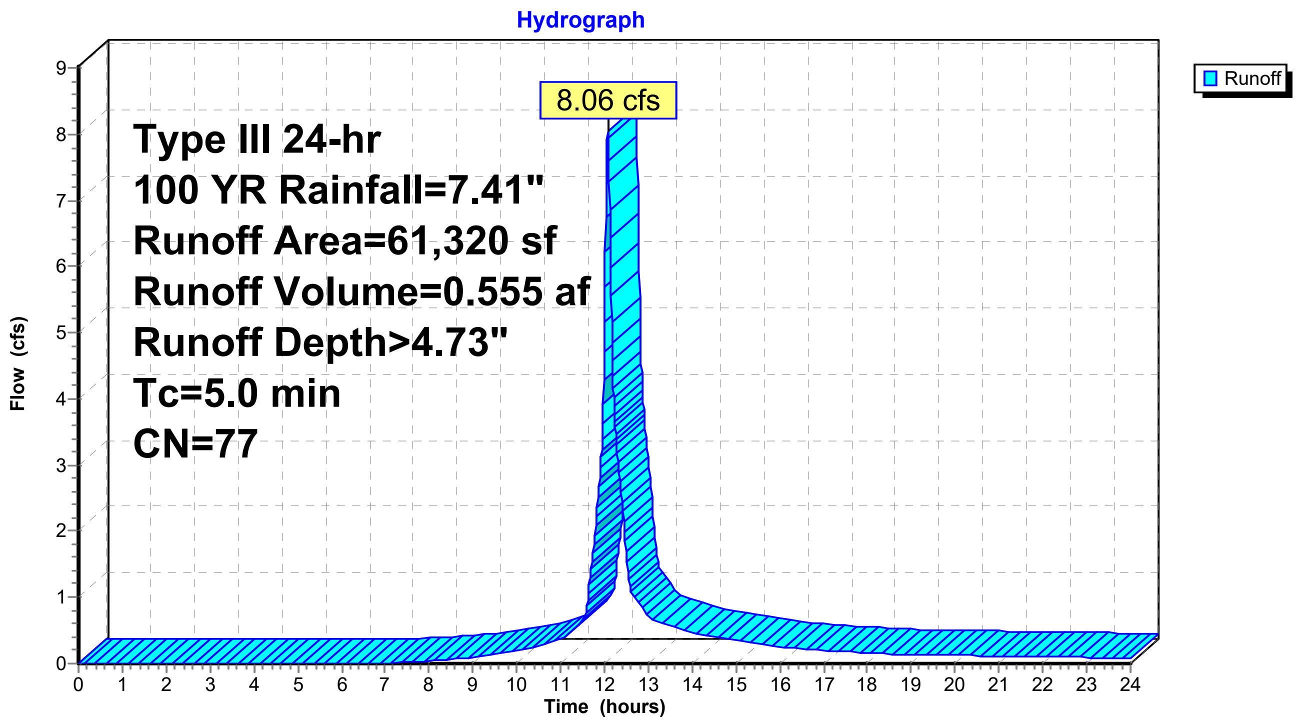
Runoff = 8.06 cfs @ 12.07 hrs, Volume= 0.555 af, Depth> 4.73"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 100 YR Rainfall=7.41"

	Area (sf)	CN	Description
	21,600	39	>75% Grass cover, Good, HSG A
*	39,720	98	Unconnected Impervious, HSG A
	61,320	77	Weighted Average
	21,600		35.23% Pervious Area
	39,720		64.77% Impervious Area
	39,720		100.00% Unconnected

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

Subcatchment P1b: PR-DA-1b



Summary for Subcatchment P2: PR-DA-2

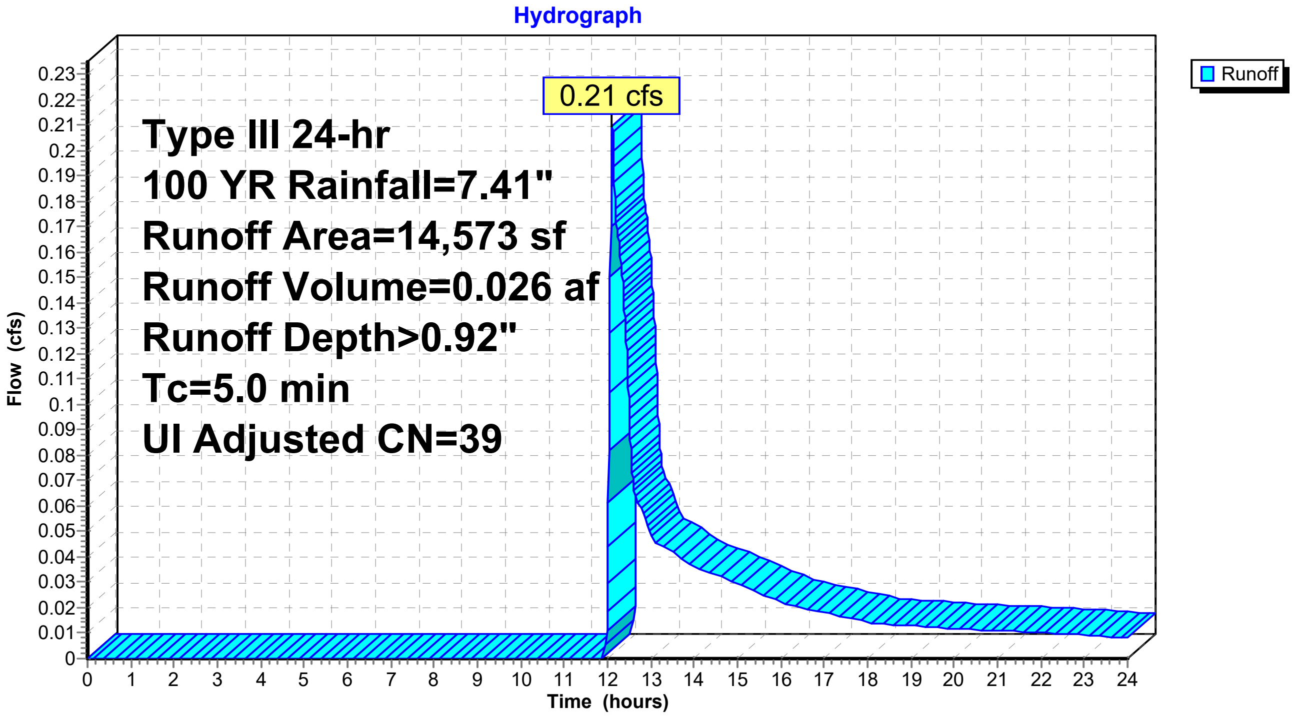
Runoff = 0.21 cfs @ 12.11 hrs, Volume= 0.026 af, Depth> 0.92"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 100 YR Rainfall=7.41"

	Area (sf)	CN	Adj	Description
	14,431	39		>75% Grass cover, Good, HSG A
*	142	98		Unconnected Impervious, HSG A
	14,573	40	39	Weighted Average, UI Adjusted
	14,431			99.03% Pervious Area
	142			0.97% Impervious Area
	142			100.00% Unconnected

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

Subcatchment P2: PR-DA-2



Summary for Subcatchment P3: PR-DA-3

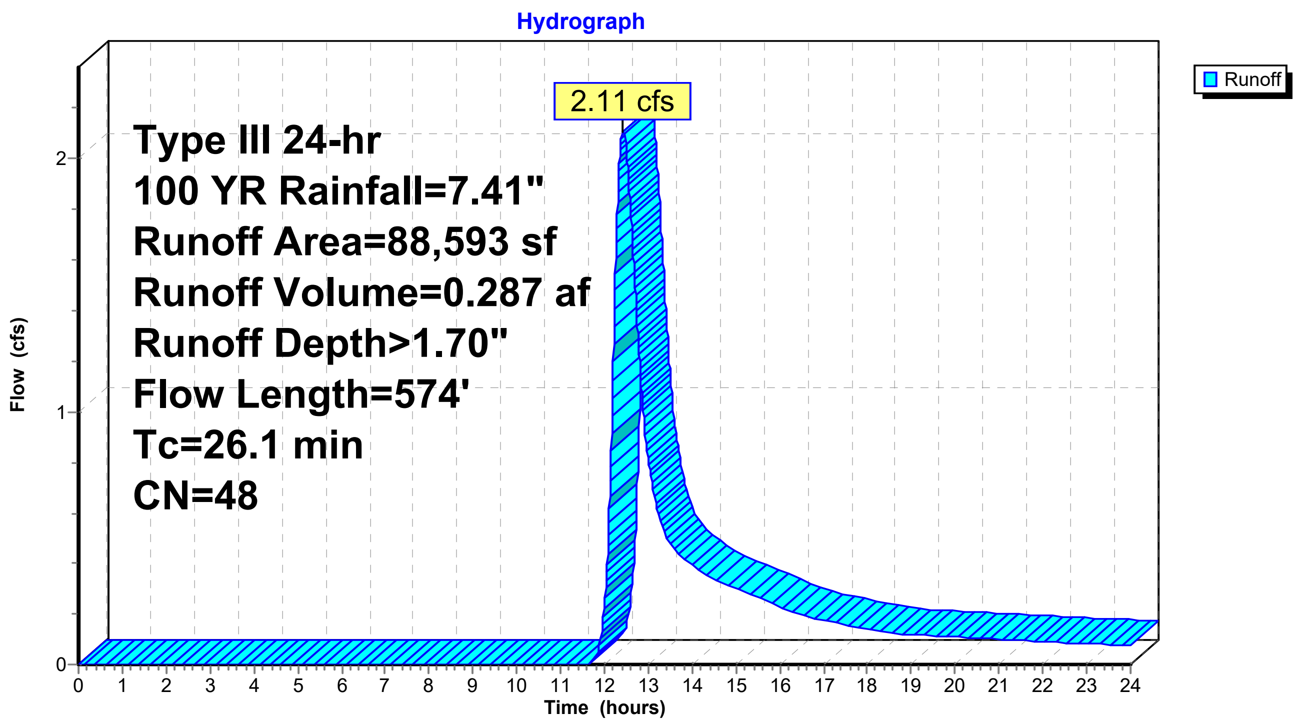
Runoff = 2.11 cfs @ 12.43 hrs, Volume= 0.287 af, Depth> 1.70"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 100 YR Rainfall=7.41"

Area (sf)	CN	Description
72,419	39	>75% Grass cover, Good, HSG A
7,200	76	Gravel roads, HSG A
8,974	98	Water Surface, 0% imp, HSG A
88,593	48	Weighted Average
88,593		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.2	50	0.0380	0.20		**Sheet Flow, A-B**
					Grass: Short n= 0.150 P2= 3.40"
20.8	400	0.0021	0.32		**Shallow Concentrated Flow, B-C**
					Short Grass Pasture Kv= 7.0 fps
0.5	74	0.0270	2.65		**Shallow Concentrated Flow, C-D**
					Unpaved Kv= 16.1 fps
0.6	50	0.0400	1.40		**Shallow Concentrated Flow, D-E**
					Short Grass Pasture Kv= 7.0 fps
26.1	574	Total			

Subcatchment P3: PR-DA-3



Summary for Subcatchment P4: PR-DA4

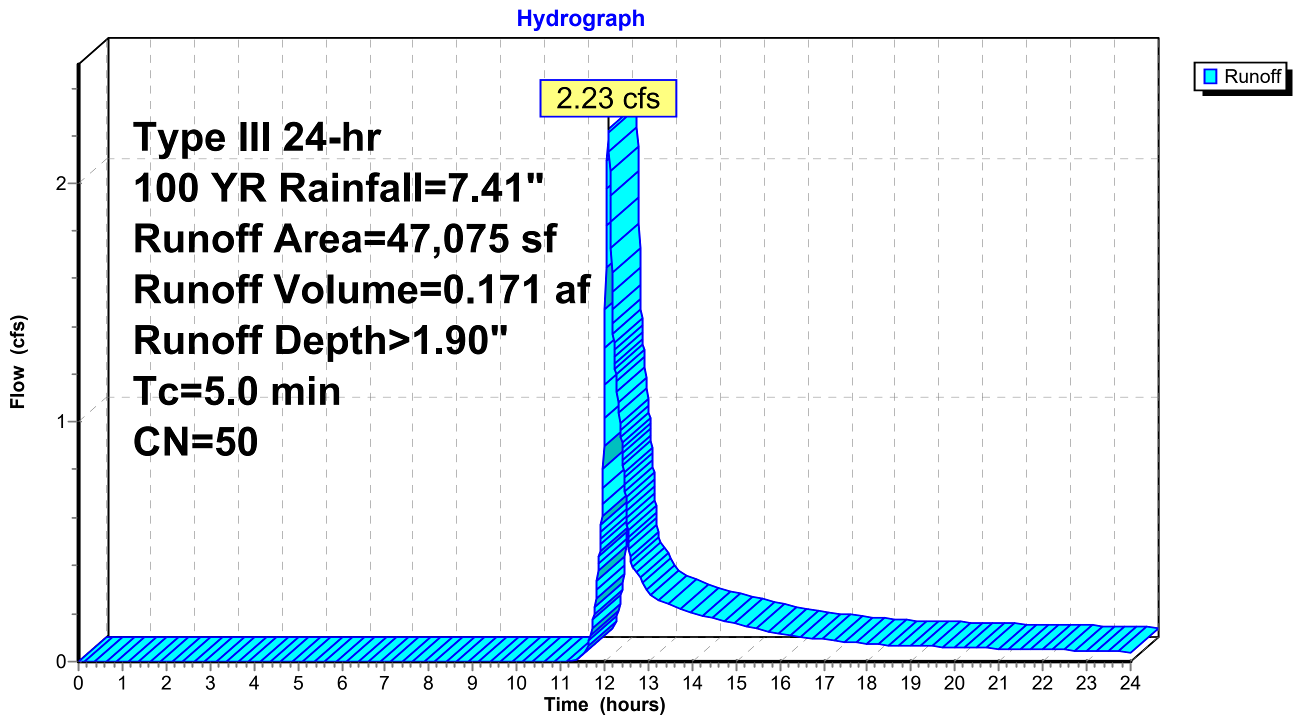
Runoff = 2.23 cfs @ 12.09 hrs, Volume= 0.171 af, Depth> 1.90"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 100 YR Rainfall=7.41"

	Area (sf)	CN	Description
	38,011	39	>75% Grass cover, Good, HSG A
*	500	98	Unconnected impervious, HSG A
	8,564	98	Stormwater Basin; Water Surface, HSG A
	47,075	50	Weighted Average
	38,011		80.75% Pervious Area
	9,064		19.25% Impervious Area
	500		5.52% Unconnected

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

Subcatchment P4: PR-DA4



Summary for Subcatchment P5: PR-DA5

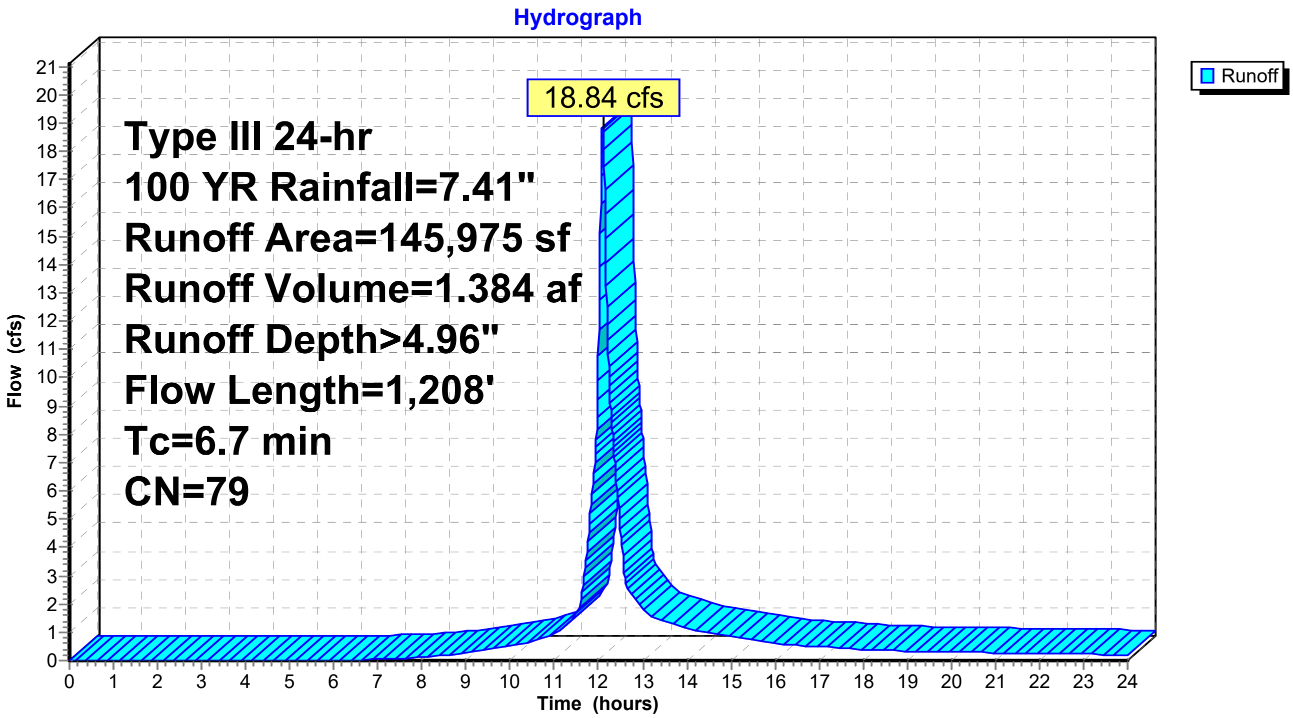
Runoff = 18.84 cfs @ 12.10 hrs, Volume= 1.384 af, Depth> 4.96"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 100 YR Rainfall=7.41"

Area (sf)	CN	Description
46,436	39	>75% Grass cover, Good, HSG A
98,201	98	Paved parking, HSG A
1,338	98	Unconnected roofs, HSG A
145,975	79	Weighted Average
46,436		31.81% Pervious Area
99,539		68.19% Impervious Area
1,338		1.34% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.9	50	0.0100	0.94		**Sheet Flow, A-B** Smooth surfaces n= 0.011 P2= 3.40"
1.1	130	0.0100	2.03		**Shallow Concentrated Flow, B-C** Paved Kv= 20.3 fps
1.3	243	0.0050	3.21	2.52	**Pipe Channel, C-D** 12.0" Round Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.013 Corrugated PE, smooth interior
2.4	525	0.0050	3.72	4.57	**Pipe Channel, D-E** 15.0" Round Area= 1.2 sf Perim= 3.9' r= 0.31' n= 0.013 Corrugated PE, smooth interior
1.0	260	0.0050	4.20	7.43	**Pipe Channel, E-F** 18.0" Round Area= 1.8 sf Perim= 4.7' r= 0.38' n= 0.013 Corrugated PE, smooth interior
6.7	1,208	Total			

Subcatchment P5: PR-DA5



Summary for Subcatchment P6: PR-DA-6

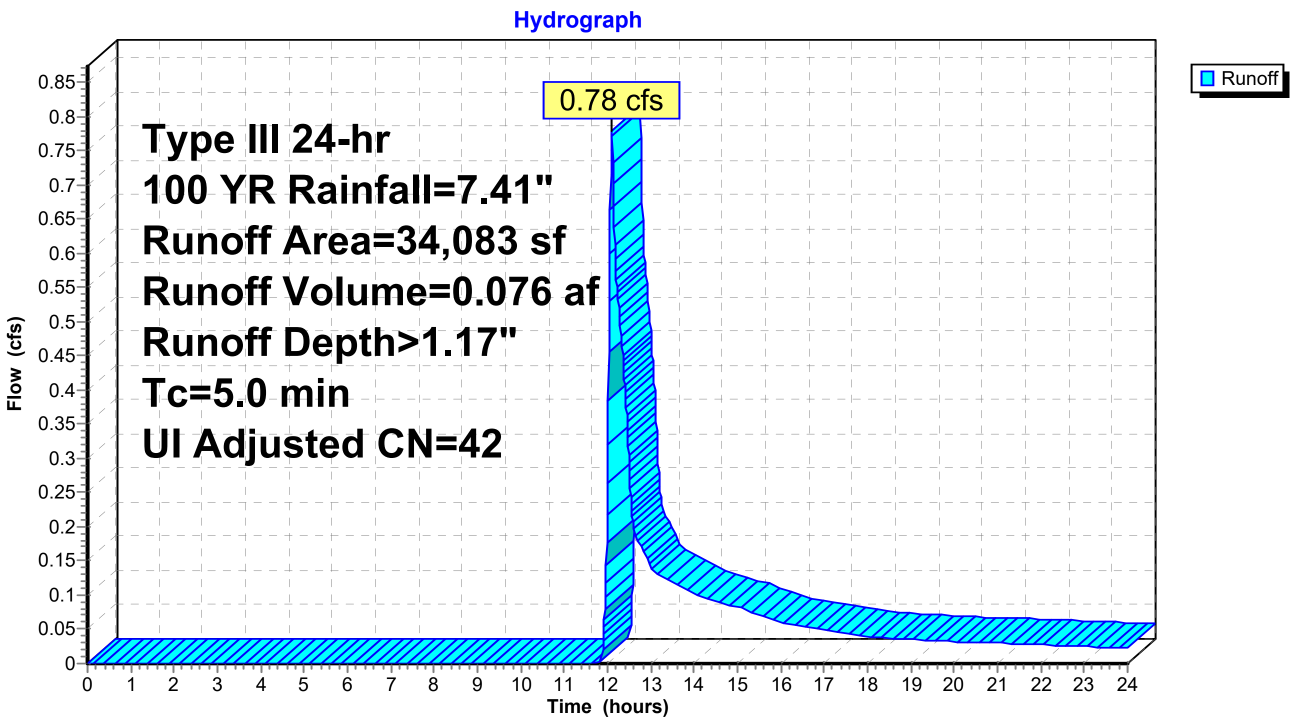
Runoff = 0.78 cfs @ 12.10 hrs, Volume= 0.076 af, Depth> 1.17"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 100 YR Rainfall=7.41"

	Area (sf)	CN	Adj	Description
	30,303	39		>75% Grass cover, Good, HSG A
*	3,780	98		Unconnected Impervious, HSG A
	34,083	46	42	Weighted Average, UI Adjusted
	30,303			88.91% Pervious Area
	3,780			11.09% Impervious Area
	3,780			100.00% Unconnected

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

Subcatchment P6: PR-DA-6



Summary for Subcatchment P7: PR-DA-7

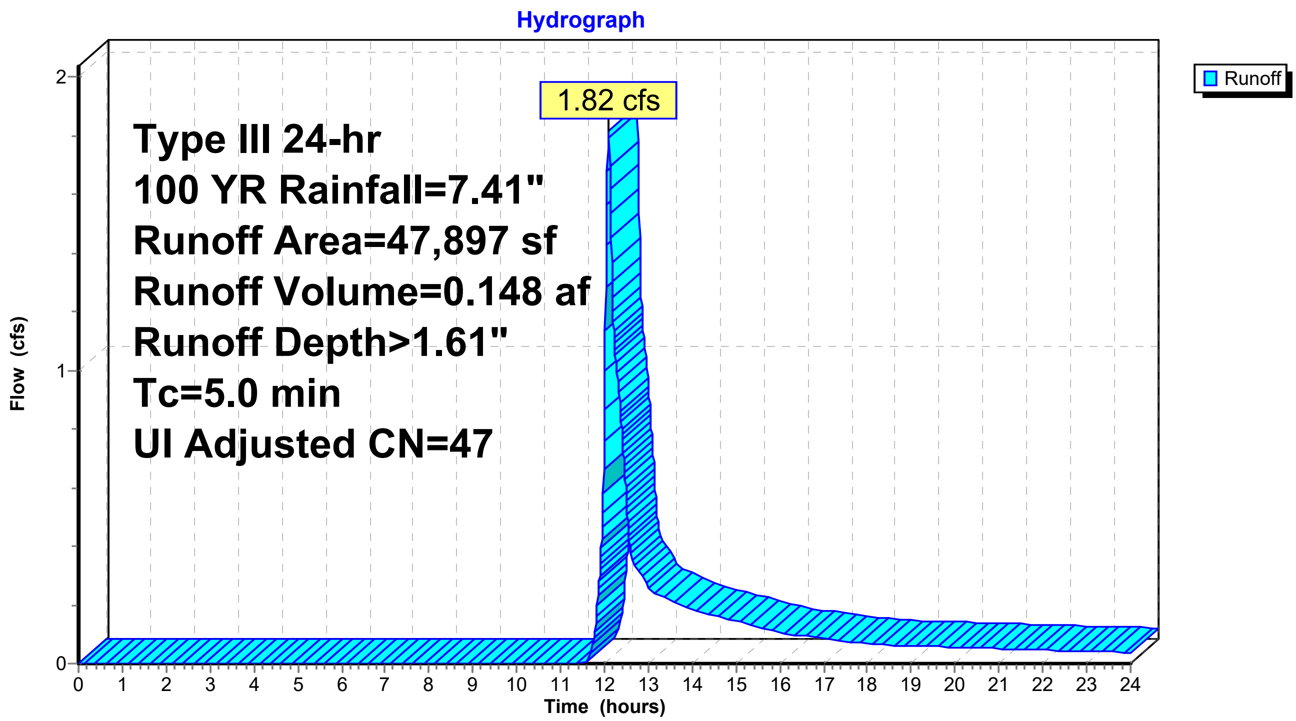
Runoff = 1.82 cfs @ 12.09 hrs, Volume= 0.148 af, Depth> 1.61"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 100 YR Rainfall=7.41"

	Area (sf)	CN	Adj	Description
	35,185	39		>75% Grass cover, Good, HSG A
*	12,712	98		Unconnected Impervious, HSG A
	47,897	55	47	Weighted Average, UI Adjusted
	35,185			73.46% Pervious Area
	12,712			26.54% Impervious Area
	12,712			100.00% Unconnected

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

Subcatchment P7: PR-DA-7



Summary for Subcatchment P8a: PR-DA8a

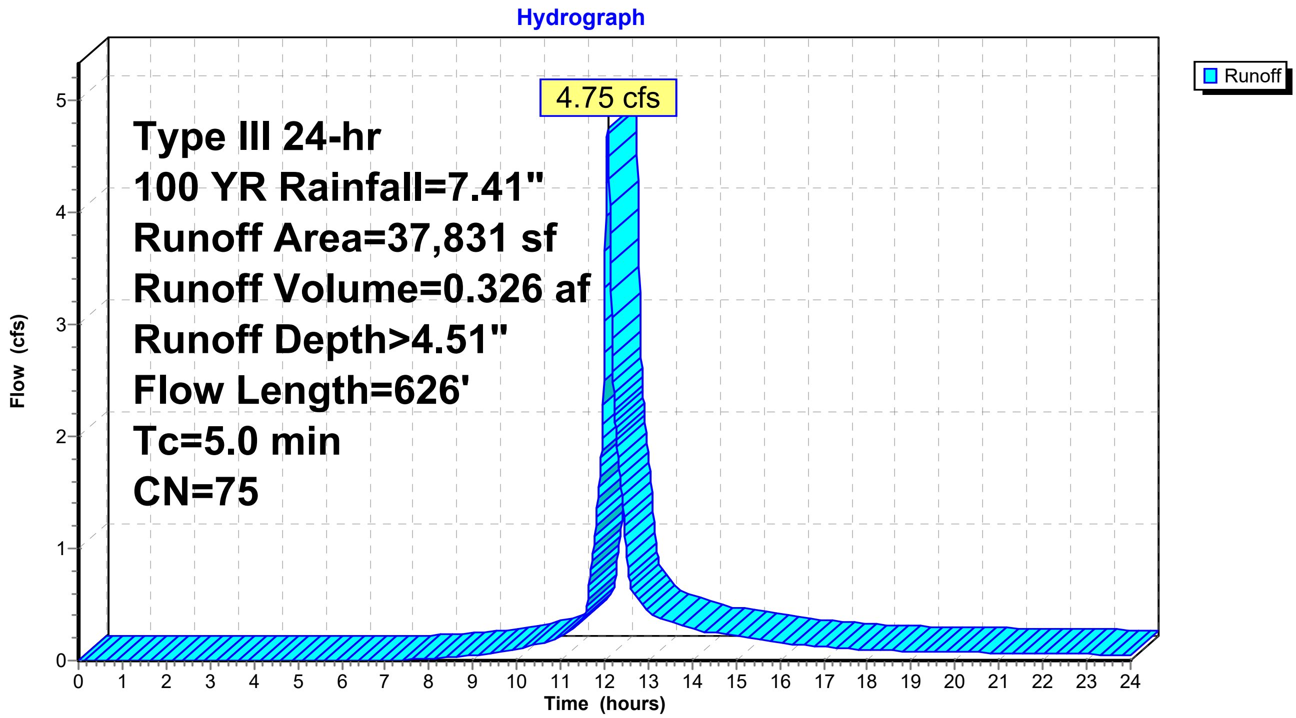
Runoff = 4.75 cfs @ 12.07 hrs, Volume= 0.326 af, Depth> 4.51"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 100 YR Rainfall=7.41"

Area (sf)	CN	Description
14,737	39	>75% Grass cover, Good, HSG A
22,874	98	Paved parking, HSG A
220	98	Roofs, HSG A
37,831	75	Weighted Average
14,737		38.95% Pervious Area
23,094		61.05% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.9	50	0.0100	0.94		**Sheet Flow, A-B** Smooth surfaces n= 0.011 P2= 3.40"
1.1	137	0.0100	2.03		**Shallow Concentrated Flow, B-C** Paved Kv= 20.3 fps
0.2	48	0.0050	3.21	2.52	**Pipe Channel, C-D** 12.0" Round Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.013 Corrugated PE, smooth interior
1.1	241	0.0050	3.72	4.57	**Pipe Channel, D-E** 15.0" Round Area= 1.2 sf Perim= 3.9' r= 0.31' n= 0.013 Corrugated PE, smooth interior
0.5	150	0.0060	4.60	8.14	**Pipe Channel, E-F** 18.0" Round Area= 1.8 sf Perim= 4.7' r= 0.38' n= 0.013 Corrugated PE, smooth interior
1.2					**Direct Entry, Added Tc**
5.0	626	Total			

Subcatchment P8a: PR-DA8a



Summary for Subcatchment P8b: PR-DA8b

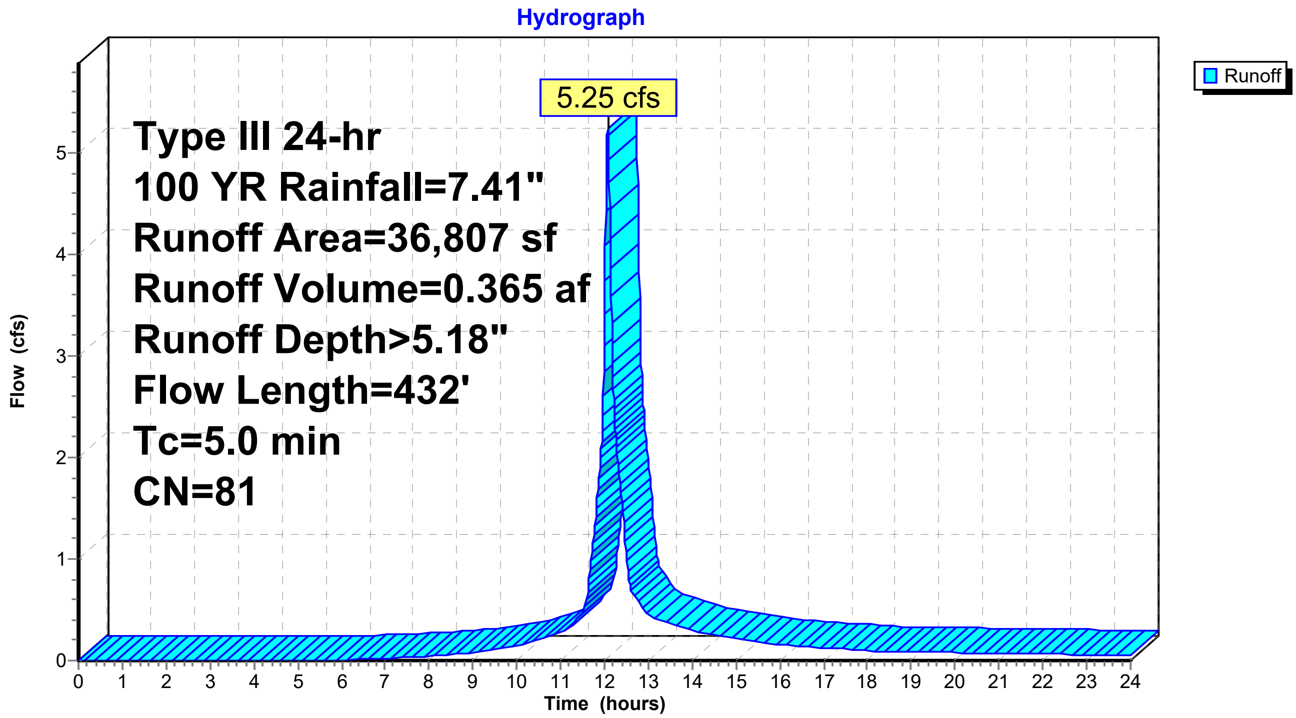
Runoff = 5.25 cfs @ 12.07 hrs, Volume= 0.365 af, Depth> 5.18"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 100 YR Rainfall=7.41"

Area (sf)	CN	Description
10,671	39	>75% Grass cover, Good, HSG A
25,176	98	Paved parking, HSG A
960	98	Roofs, HSG A
36,807	81	Weighted Average
10,671		28.99% Pervious Area
26,136		71.01% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.4	86	0.0100	1.04		**Sheet Flow, A-B** Smooth surfaces n= 0.011 P2= 3.40"
0.7	196	0.0100	4.54	3.56	**Pipe Channel, B-C** 12.0" Round Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.013 Corrugated PE, smooth interior
0.5	150	0.0060	4.60	8.14	**Pipe Channel, C-D** 18.0" Round Area= 1.8 sf Perim= 4.7' r= 0.38' n= 0.013 Corrugated PE, smooth interior
2.4					**Direct Entry, Added Tc**
5.0	432	Total			

Subcatchment P8b: PR-DA8b



Summary for Subcatchment P9: PR-DA9

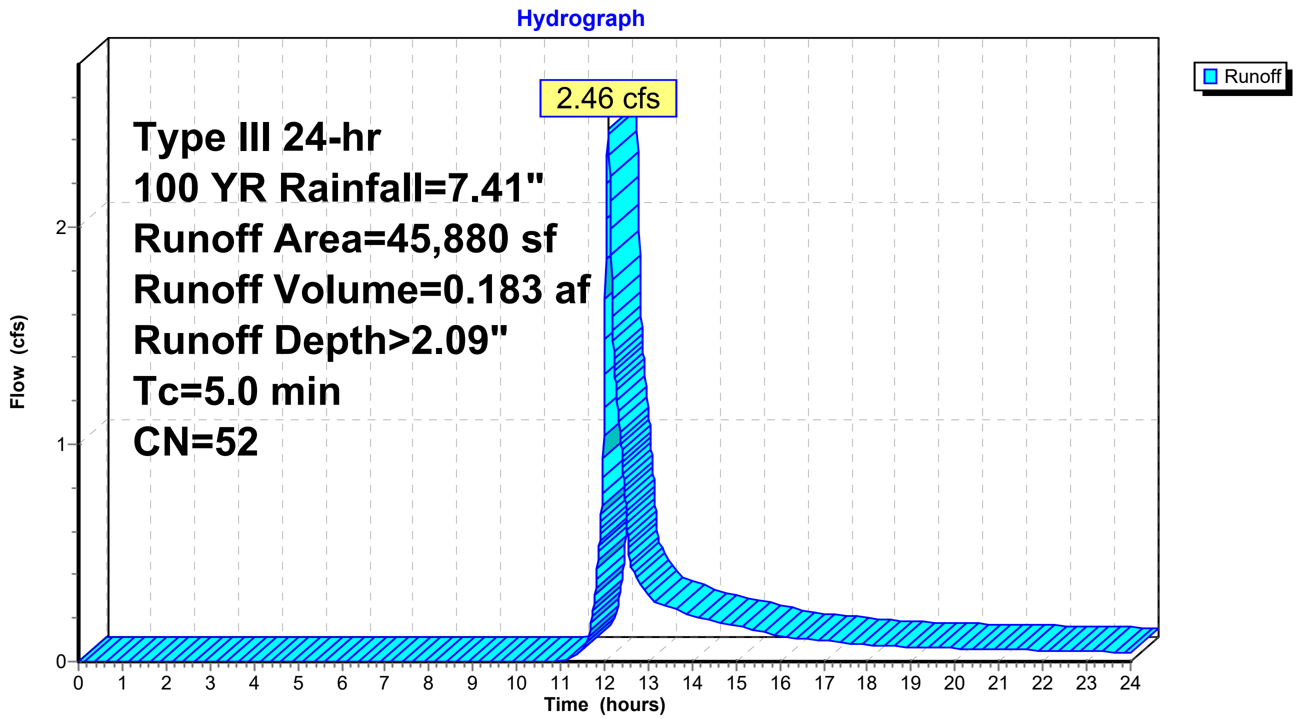
Runoff = 2.46 cfs @ 12.08 hrs, Volume= 0.183 af, Depth> 2.09"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 100 YR Rainfall=7.41"

	Area (sf)	CN	Description
	35,890	39	>75% Grass cover, Good, HSG A
*	380	98	Unconnected impervious, HSG A
	9,610	98	Stormwater Basin; Water Surface, HSG A
	45,880	52	Weighted Average
	35,890		78.23% Pervious Area
	9,990		21.77% Impervious Area
	380		3.80% Unconnected

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

Subcatchment P9: PR-DA9

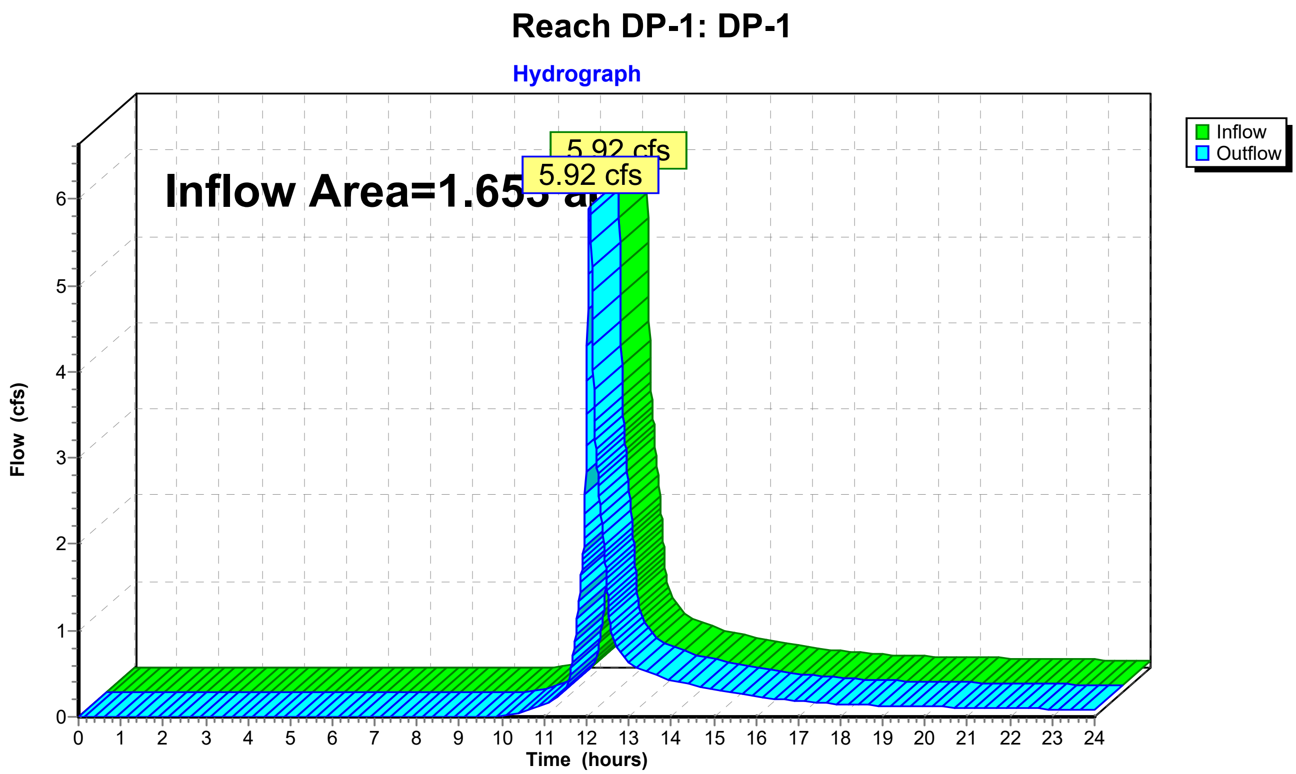


Summary for Reach DP-1: DP-1

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 1.653 ac, 28.03% Impervious, Inflow Depth > 3.00" for 100 YR event
Inflow = 5.92 cfs @ 12.08 hrs, Volume= 0.413 af
Outflow = 5.92 cfs @ 12.08 hrs, Volume= 0.413 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs



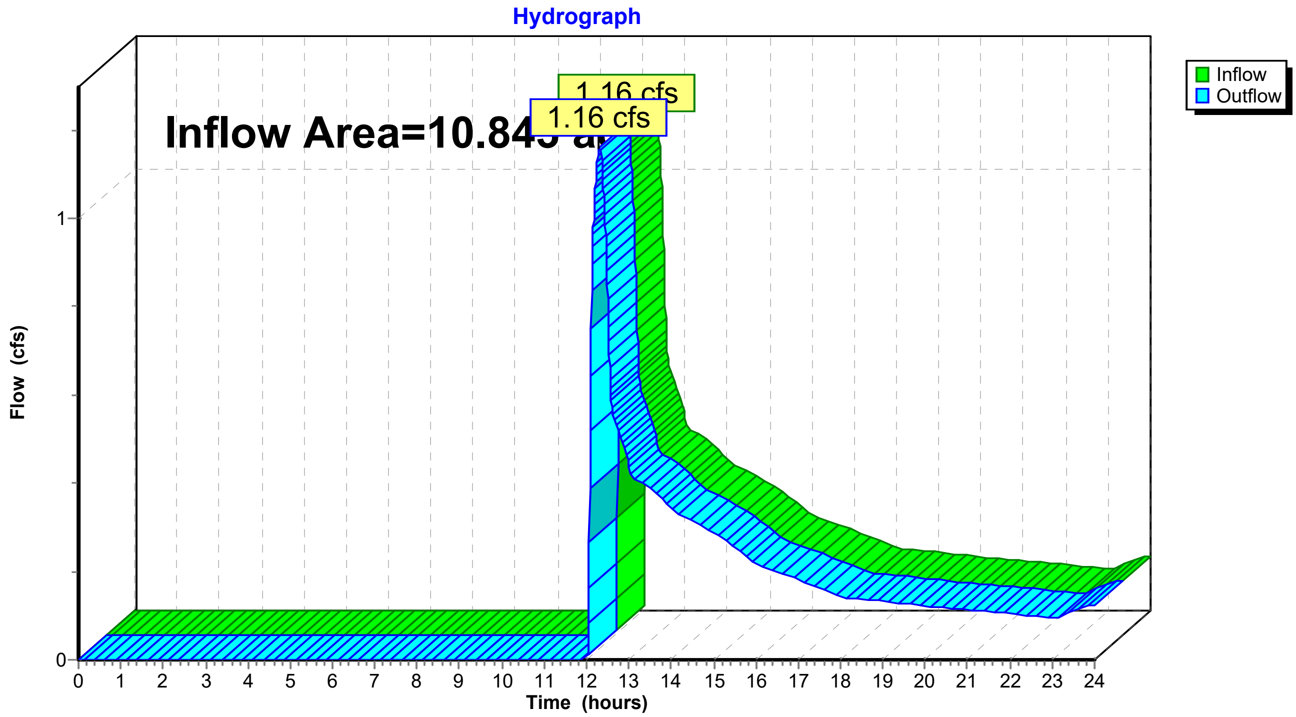
Summary for Reach DP-2: DP-2 (JOSHUA'S BROOK)

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 10.843 ac, 28.77% Impervious, Inflow Depth > 0.25" for 100 YR event
Inflow = 1.16 cfs @ 12.30 hrs, Volume= 0.225 af
Outflow = 1.16 cfs @ 12.30 hrs, Volume= 0.225 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs

Reach DP-2: DP-2 (JOSHUA'S BROOK)

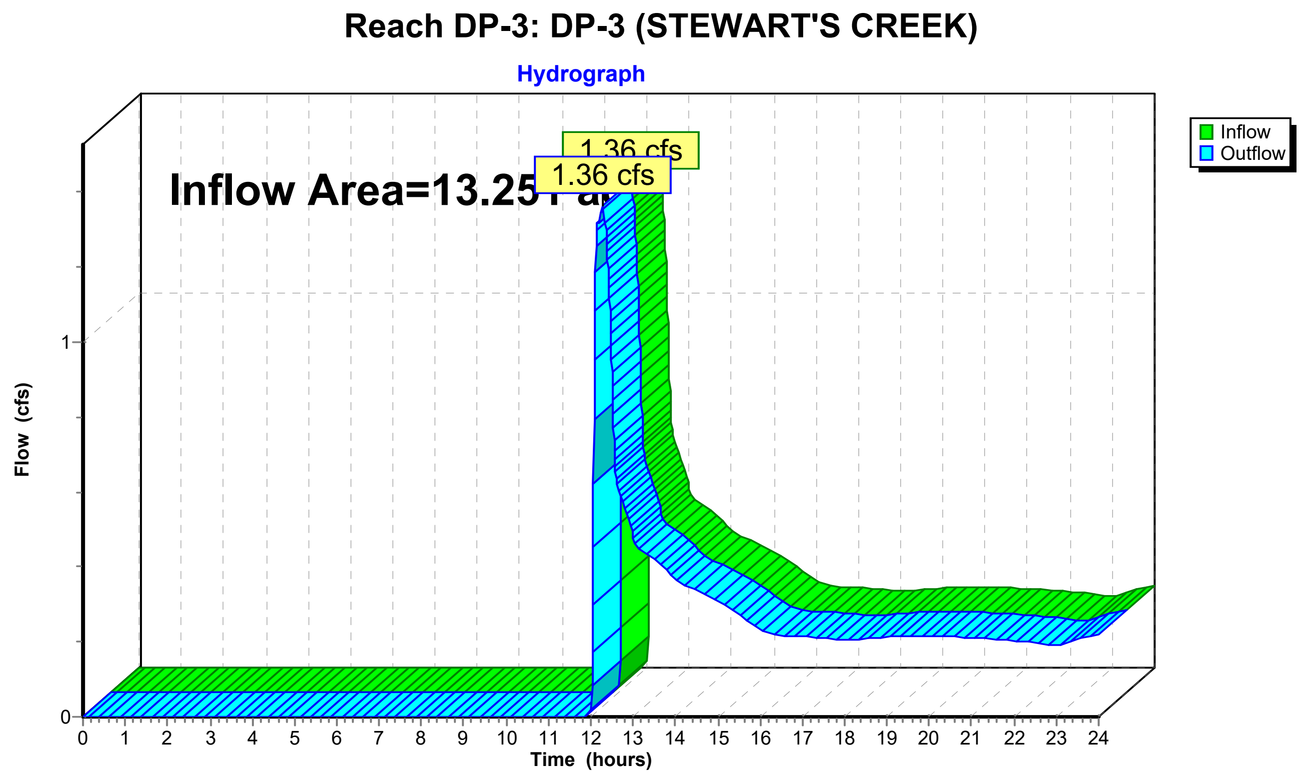


Summary for Reach DP-3: DP-3 (STEWART'S CREEK)

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 13.251 ac, 19.02% Impervious, Inflow Depth > 0.27" for 100 YR event
Inflow = 1.36 cfs @ 12.28 hrs, Volume= 0.293 af
Outflow = 1.36 cfs @ 12.28 hrs, Volume= 0.293 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs



Summary for Pond 41P: SC-740

Inflow Area = 0.115 ac,100.00% Impervious, Inflow Depth > 7.17" for 100 YR event
Inflow = 0.86 cfs @ 12.07 hrs, Volume= 0.069 af
Outflow = 0.09 cfs @ 11.51 hrs, Volume= 0.069 af, Atten= 89%, Lag= 0.0 min
Discarded = 0.09 cfs @ 11.51 hrs, Volume= 0.069 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Peak Elev= 39.46' @ 12.68 hrs Surf.Area= 492 sf Storage= 913 cf

Plug-Flow detention time= 59.8 min calculated for 0.069 af (100% of inflow)
Center-of-Mass det. time= 59.6 min (800.5 - 740.8)

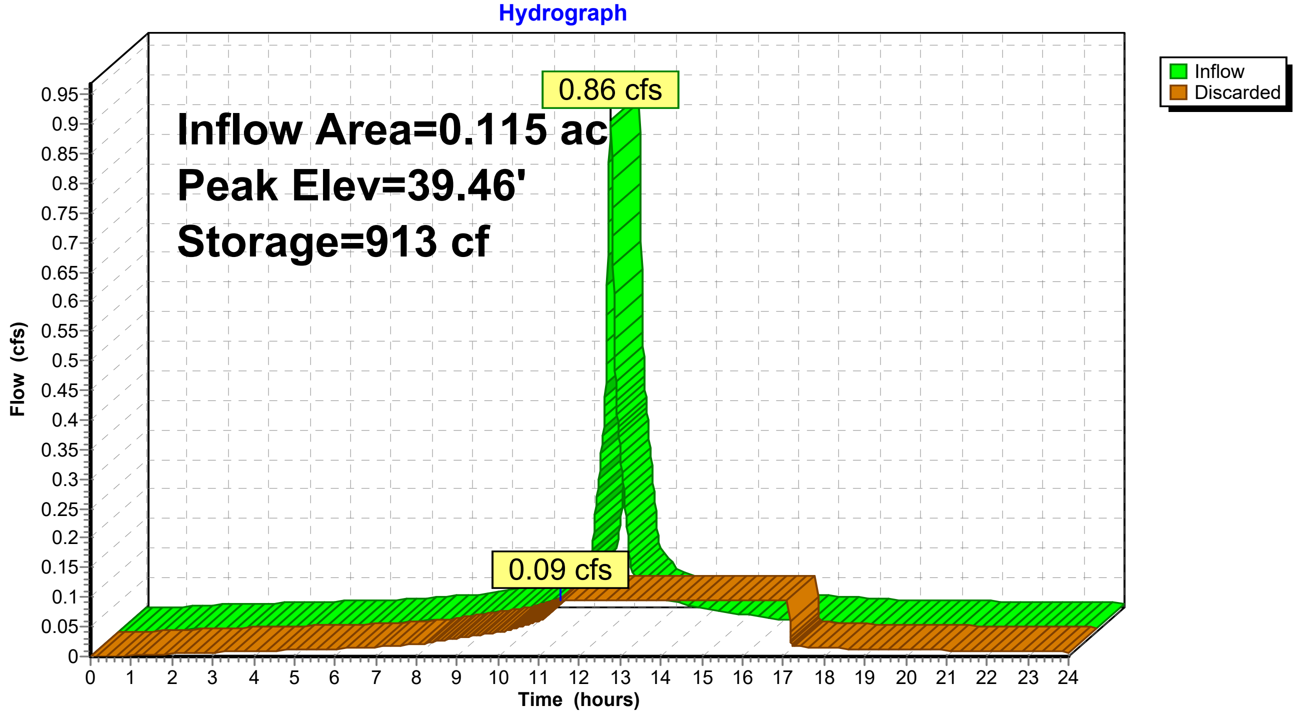
Volume	Invert	Avail.Storage	Storage Description
#1	36.50'	468 cf	**Stone (Prismatic)** Listed below (Recalc) 1,722 cf Overall - 551 cf Embedded = 1,171 cf x 40.0% Voids
#2	37.00'	551 cf	**ADS_StormTech SC-740 +Cap** x 12 Inside #1 Effective Size= 44.6"W x 30.0"H => 6.45 sf x 7.12'L = 45.9 cf Overall Size= 51.0"W x 30.0"H x 7.56'L with 0.44' Overlap 2 Rows of 6 Chambers
		1,020 cf	Total Available Storage

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
36.50	492	0	0
40.00	492	1,722	1,722

Device	Routing	Invert	Outlet Devices
#1	Discarded	36.50'	**8.270 in/hr Exfiltration over Surface area**

Discarded OutFlow Max=0.09 cfs @ 11.51 hrs HW=36.54' (Free Discharge)
└─**1=Exfiltration** (Exfiltration Controls 0.09 cfs)

Pond 41P: SC-740



Summary for Pond 43P: SC-740

Inflow Area = 0.782 ac, 11.09% Impervious, Inflow Depth > 1.17" for 100 YR event
Inflow = 0.78 cfs @ 12.10 hrs, Volume= 0.076 af
Outflow = 0.31 cfs @ 12.49 hrs, Volume= 0.074 af, Atten= 60%, Lag= 23.2 min
Discarded = 0.31 cfs @ 12.49 hrs, Volume= 0.074 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Peak Elev= 24.72' @ 12.49 hrs Surf.Area= 1,613 sf Storage= 675 cf

Plug-Flow detention time= 94.8 min calculated for 0.074 af (97% of inflow)
Center-of-Mass det. time= 80.2 min (984.6 - 904.4)

Volume	Invert	Avail.Storage	Storage Description
#1	19.50'	248 cf	**Stone (Prismatic)** Listed below (Recalc) 896 cf Overall - 276 cf Embedded = 620 cf x 40.0% Voids
#2	20.00'	276 cf	**ADS_StormTech SC-740 +Cap** x 6 Inside #1 Effective Size= 44.6"W x 30.0"H => 6.45 sf x 7.12'L = 45.9 cf Overall Size= 51.0"W x 30.0"H x 7.56'L with 0.44' Overlap 2 Rows of 3 Chambers
#3	24.50'	3,830 cf	**Surface Ponding (Prismatic)** Listed below (Recalc)
		4,353 cf	Total Available Storage

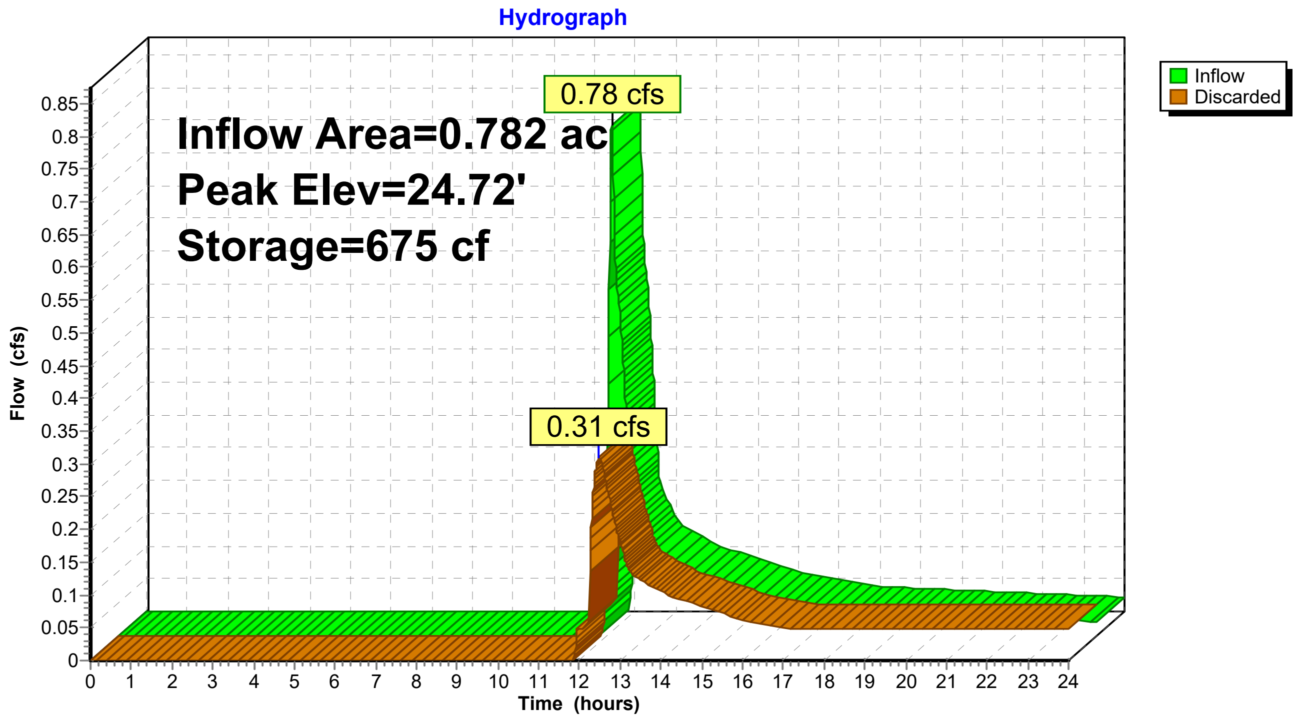
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
19.50	256	0	0
23.00	256	896	896

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
24.50	4	0	0
25.00	3,057	765	765
25.50	9,200	3,064	3,830

Device	Routing	Invert	Outlet Devices
#1	Discarded	19.50'	**8.270 in/hr Exfiltration over Surface area**

Discarded OutFlow Max=0.31 cfs @ 12.49 hrs HW=24.72' (Free Discharge)
└**1=Exfiltration** (Exfiltration Controls 0.31 cfs)

Pond 43P: SC-740



Summary for Pond 45P: SC-740

Inflow Area = 1.100 ac, 26.54% Impervious, Inflow Depth > 1.61" for 100 YR event
Inflow = 1.82 cfs @ 12.09 hrs, Volume= 0.148 af
Outflow = 0.50 cfs @ 12.52 hrs, Volume= 0.148 af, Atten= 72%, Lag= 25.9 min
Discarded = 0.50 cfs @ 12.52 hrs, Volume= 0.148 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Peak Elev= 25.86' @ 12.52 hrs Surf.Area= 2,627 sf Storage= 1,708 cf

Plug-Flow detention time= 96.1 min calculated for 0.148 af (100% of inflow)
Center-of-Mass det. time= 95.5 min (979.8 - 884.3)

Volume	Invert	Avail.Storage	Storage Description
#1	19.50'	616 cf	**Stone (Prismatic)** Listed below (Recalc) 2,275 cf Overall - 735 cf Embedded = 1,540 cf x 40.0% Voids
#2	20.00'	735 cf	**ADS_StormTech SC-740 +Cap** x 16 Inside #1 Effective Size= 44.6"W x 30.0"H => 6.45 sf x 7.12'L = 45.9 cf Overall Size= 51.0"W x 30.0"H x 7.56'L with 0.44' Overlap 2 Rows of 8 Chambers
#3	25.50'	4,609 cf	**Surface Ponding (Prismatic)** Listed below (Recalc)
		5,960 cf	Total Available Storage

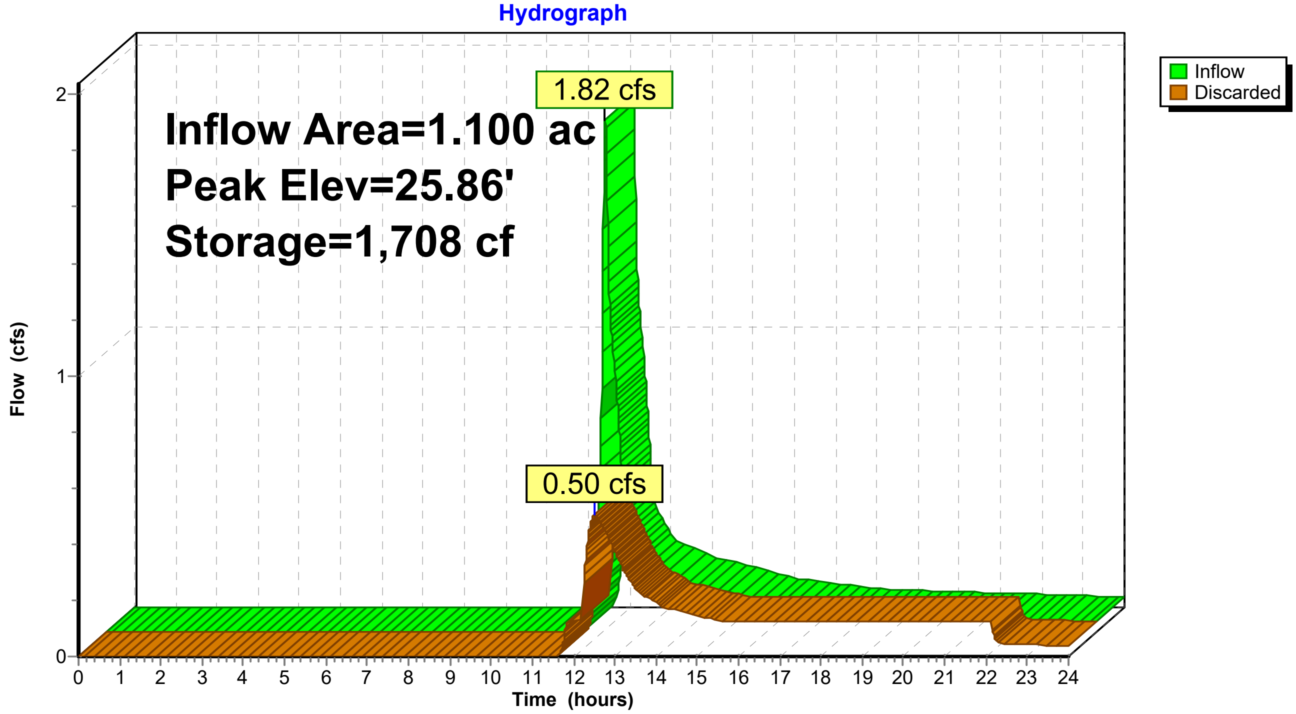
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
19.50	650	0	0
23.00	650	2,275	2,275

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
25.50	4	0	0
26.00	2,742	687	687
26.80	7,065	3,923	4,609

Device	Routing	Invert	Outlet Devices
#1	Discarded	19.50'	**8.270 in/hr Exfiltration over Surface area**

Discarded OutFlow Max=0.50 cfs @ 12.52 hrs HW=25.86' (Free Discharge)
└─**1=Exfiltration** (Exfiltration Controls 0.50 cfs)

Pond 45P: SC-740



Summary for Pond B-1: Basin 1

Inflow Area = 5.195 ac, 60.05% Impervious, Inflow Depth > 4.30" for 100 YR event
Inflow = 26.09 cfs @ 12.09 hrs, Volume= 1.860 af
Outflow = 0.96 cfs @ 15.67 hrs, Volume= 1.046 af, Atten= 96%, Lag= 214.7 min
Discarded = 0.96 cfs @ 15.67 hrs, Volume= 1.046 af
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Peak Elev= 14.35' @ 15.67 hrs Surf.Area= 17,245 sf Storage= 49,437 cf

Plug-Flow detention time= 314.1 min calculated for 1.046 af (56% of inflow)
Center-of-Mass det. time= 210.4 min (1,018.9 - 808.6)

Volume	Invert	Avail.Storage	Storage Description
#1	10.50'	61,135 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

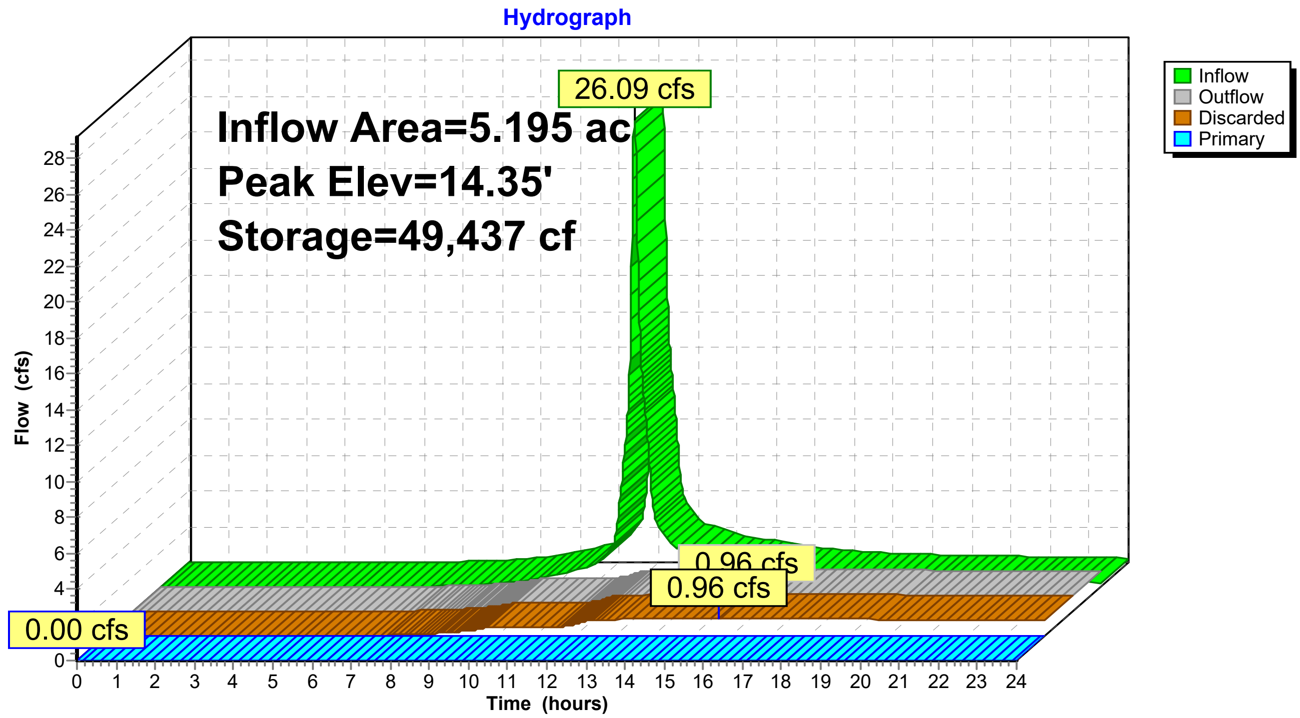
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
10.50	8,346	0	0
11.00	9,153	4,375	4,375
12.00	12,072	10,613	14,987
13.00	14,291	13,182	28,169
14.00	16,502	15,397	43,565
15.00	18,637	17,570	61,135

Device	Routing	Invert	Outlet Devices
#1	Discarded	10.50'	**2.410 in/hr Exfiltration over Surface area**
#2	Primary	15.00'	**45.0 deg x 15.0' long Sharp-Crested Vee/Trap Weir** Cv= 2.56 (C= 3.20)

Discarded OutFlow Max=0.96 cfs @ 15.67 hrs HW=14.35' (Free Discharge)
└─**1=Exfiltration** (Exfiltration Controls 0.96 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=10.50' (Free Discharge)
└─**2=Sharp-Crested Vee/Trap Weir** (Controls 0.00 cfs)

Pond B-1: Basin 1



Summary for Pond B-2: Basin 2

Inflow Area = 4.443 ac, 56.72% Impervious, Inflow Depth > 3.58" for 100 YR event
Inflow = 21.16 cfs @ 12.08 hrs, Volume= 1.325 af
Outflow = 0.76 cfs @ 15.32 hrs, Volume= 0.809 af, Atten= 96%, Lag= 194.4 min
Discarded = 0.76 cfs @ 15.32 hrs, Volume= 0.809 af
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Peak Elev= 18.90' @ 15.32 hrs Surf.Area= 13,653 sf Storage= 36,038 cf

Plug-Flow detention time= 311.5 min calculated for 0.809 af (61% of inflow)
Center-of-Mass det. time= 225.2 min (1,025.6 - 800.4)

Volume	Invert	Avail.Storage	Storage Description
#1	15.50'	37,352 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc)

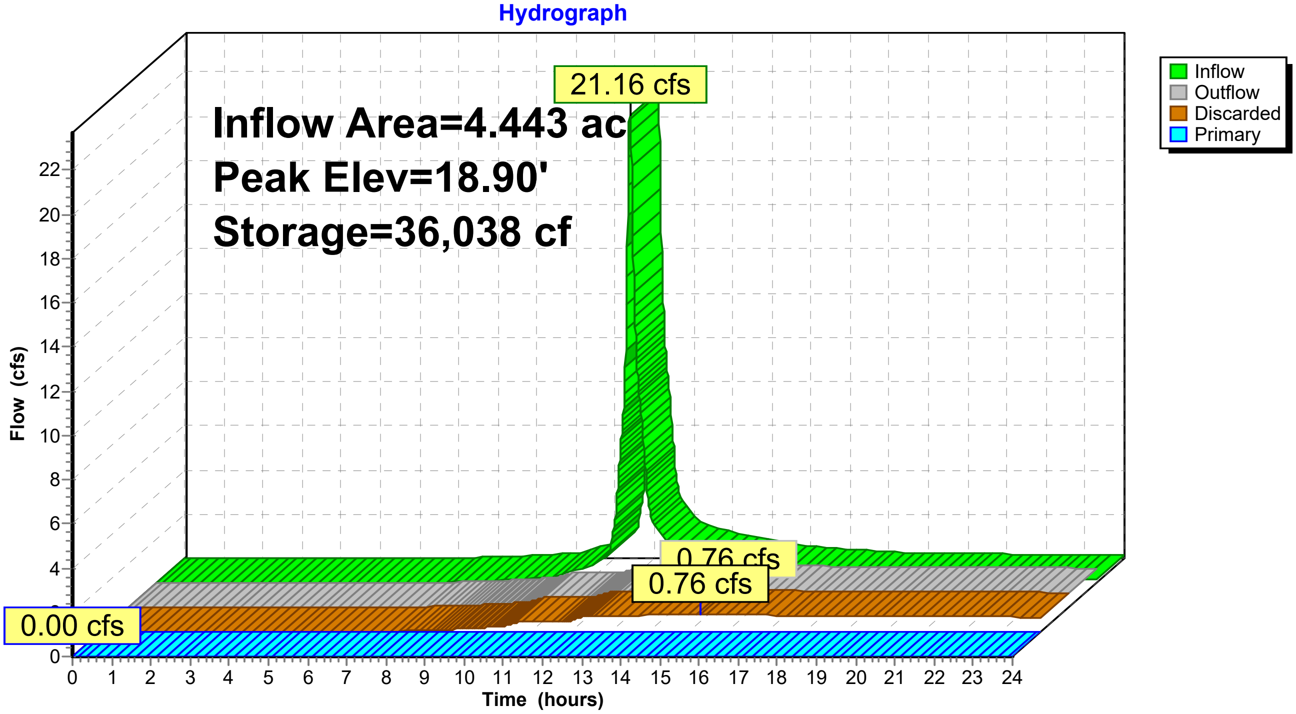
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
15.50	7,983	0	0
16.00	8,588	4,143	4,143
17.00	9,841	9,215	13,357
18.00	12,169	11,005	24,362
19.00	13,810	12,990	37,352

Device	Routing	Invert	Outlet Devices
#1	Discarded	15.50'	**2.410 in/hr Exfiltration over Surface area**
#2	Primary	19.50'	**45.0 deg x 15.0' long Sharp-Crested Vee/Trap Weir** Cv= 2.56 (C= 3.20)

Discarded OutFlow Max=0.76 cfs @ 15.32 hrs HW=18.90' (Free Discharge)
↑—**1=Exfiltration** (Exfiltration Controls 0.76 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=15.50' (Free Discharge)
↑—**2=Sharp-Crested Vee/Trap Weir** (Controls 0.00 cfs)

Pond B-2: Basin 2



Summary for Pond BIO1: BIO 1

Inflow Area = 0.791 ac, 76.51% Impervious, Inflow Depth > 5.53" for 100 YR event
Inflow = 5.17 cfs @ 12.07 hrs, Volume= 0.364 af
Outflow = 4.88 cfs @ 12.10 hrs, Volume= 0.358 af, Atten= 6%, Lag= 1.6 min
Discarded = 0.07 cfs @ 12.10 hrs, Volume= 0.065 af
Primary = 4.81 cfs @ 12.10 hrs, Volume= 0.292 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Peak Elev= 19.90' @ 12.10 hrs Surf.Area= 1,219 sf Storage= 690 cf

Plug-Flow detention time= 17.9 min calculated for 0.358 af (98% of inflow)
Center-of-Mass det. time= 7.1 min (801.4 - 794.3)

Volume	Invert	Avail.Storage	Storage Description
#1	19.00'	7,359 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc)

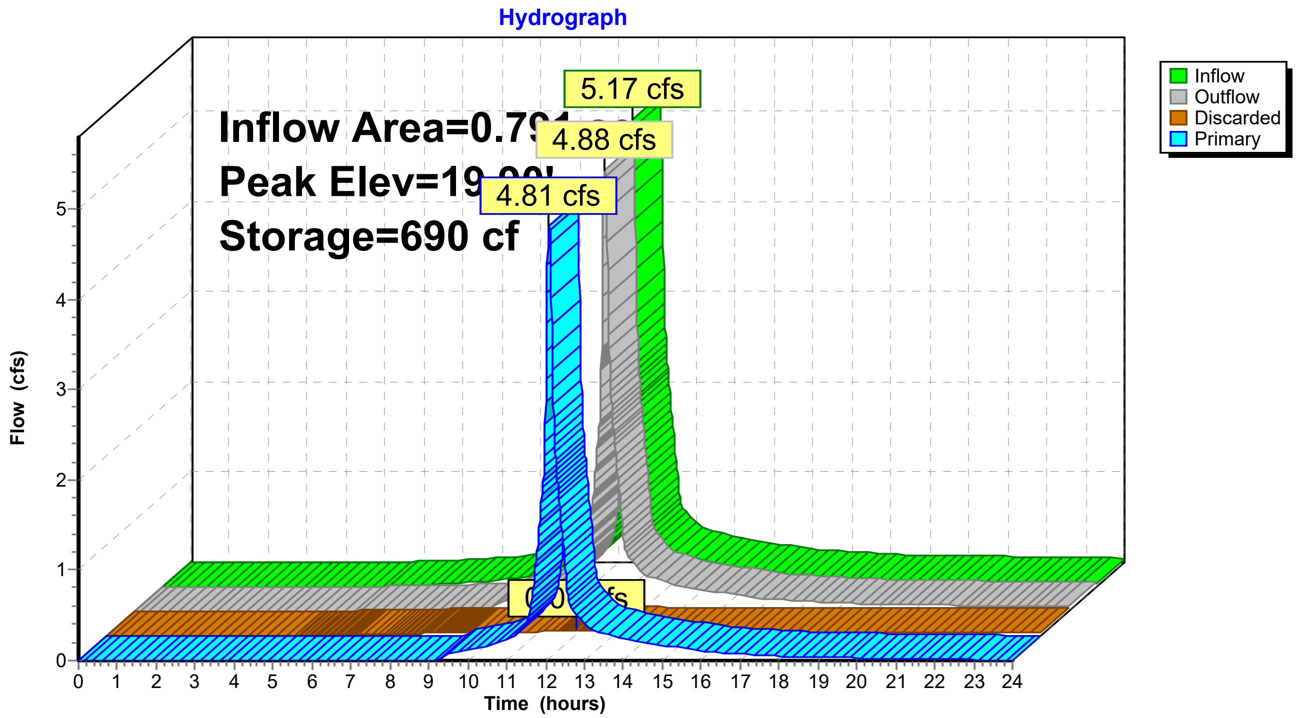
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
19.00	307	0	0
20.00	1,315	811	811
20.40	2,200	703	1,514
21.00	17,283	5,845	7,359

Device	Routing	Invert	Outlet Devices
#1	Discarded	19.00'	**2.410 in/hr Exfiltration over Surface area**
#2	Primary	19.50'	**12.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#3	Primary	19.50'	**12.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Discarded OutFlow Max=0.07 cfs @ 12.10 hrs HW=19.90' (Free Discharge)
└─**1=Exfiltration** (Exfiltration Controls 0.07 cfs)

Primary OutFlow Max=4.81 cfs @ 12.10 hrs HW=19.90' (Free Discharge)
├─**2=Orifice/Grate** (Orifice Controls 2.40 cfs @ 3.06 fps)
└─**3=Orifice/Grate** (Orifice Controls 2.40 cfs @ 3.06 fps)

Pond BIO1: BIO 1



Summary for Pond BIO2: BIO 2

Inflow Area = 0.833 ac, 68.24% Impervious, Inflow Depth > 4.96" for 100 YR event
Inflow = 4.98 cfs @ 12.07 hrs, Volume= 0.344 af
Outflow = 4.58 cfs @ 12.11 hrs, Volume= 0.333 af, Atten= 8%, Lag= 1.9 min
Discarded = 0.13 cfs @ 12.11 hrs, Volume= 0.137 af
Primary = 4.45 cfs @ 12.11 hrs, Volume= 0.196 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Peak Elev= 23.11' @ 12.11 hrs Surf.Area= 2,333 sf Storage= 2,075 cf

Plug-Flow detention time= 60.1 min calculated for 0.333 af (97% of inflow)
Center-of-Mass det. time= 40.7 min (847.4 - 806.7)

Volume	Invert	Avail.Storage	Storage Description
#1	22.00'	4,509 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

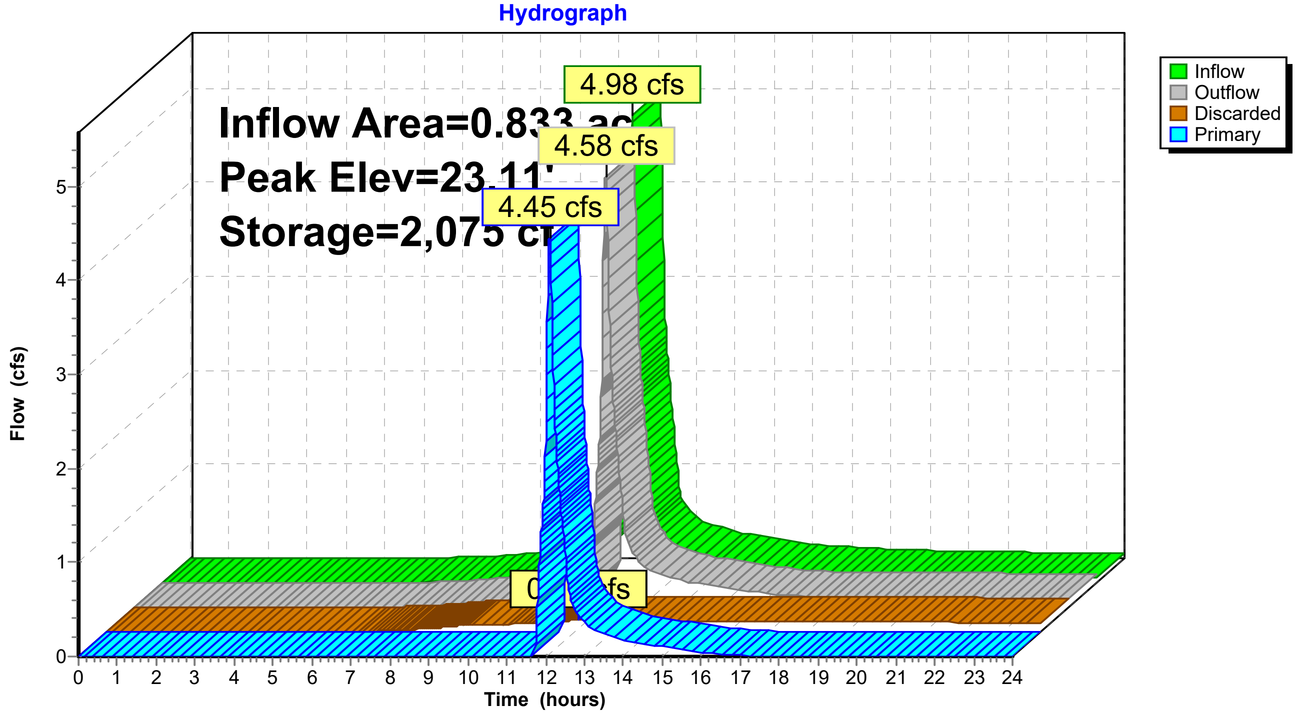
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
22.00	1,410	0	0
23.00	2,232	1,821	1,821
24.00	3,143	2,688	4,509

Device	Routing	Invert	Outlet Devices
#1	Discarded	22.00'	**2.410 in/hr Exfiltration over Surface area**
#2	Primary	22.75'	**12.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#3	Primary	22.75'	**12.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Discarded OutFlow Max=0.13 cfs @ 12.11 hrs HW=23.11' (Free Discharge)
└─**1=Exfiltration** (Exfiltration Controls 0.13 cfs)

Primary OutFlow Max=4.46 cfs @ 12.11 hrs HW=23.11' (Free Discharge)
├─**2=Orifice/Grate** (Weir Controls 2.23 cfs @ 1.96 fps)
└─**3=Orifice/Grate** (Weir Controls 2.23 cfs @ 1.96 fps)

Pond BIO2: BIO 2



Summary for Pond BIO3: BIO-3

Inflow Area = 0.816 ac, 75.18% Impervious, Inflow Depth > 5.41" for 100 YR event
Inflow = 5.25 cfs @ 12.07 hrs, Volume= 0.368 af
Outflow = 4.86 cfs @ 12.10 hrs, Volume= 0.359 af, Atten= 7%, Lag= 1.8 min
Discarded = 0.09 cfs @ 12.10 hrs, Volume= 0.092 af
Primary = 4.77 cfs @ 12.10 hrs, Volume= 0.267 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Peak Elev= 23.90' @ 12.10 hrs Surf.Area= 1,637 sf Storage= 1,025 cf

Plug-Flow detention time= 26.6 min calculated for 0.359 af (98% of inflow)
Center-of-Mass det. time= 12.0 min (808.9 - 796.9)

Volume	Invert	Avail.Storage	Storage Description
#1	23.00'	2,268 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

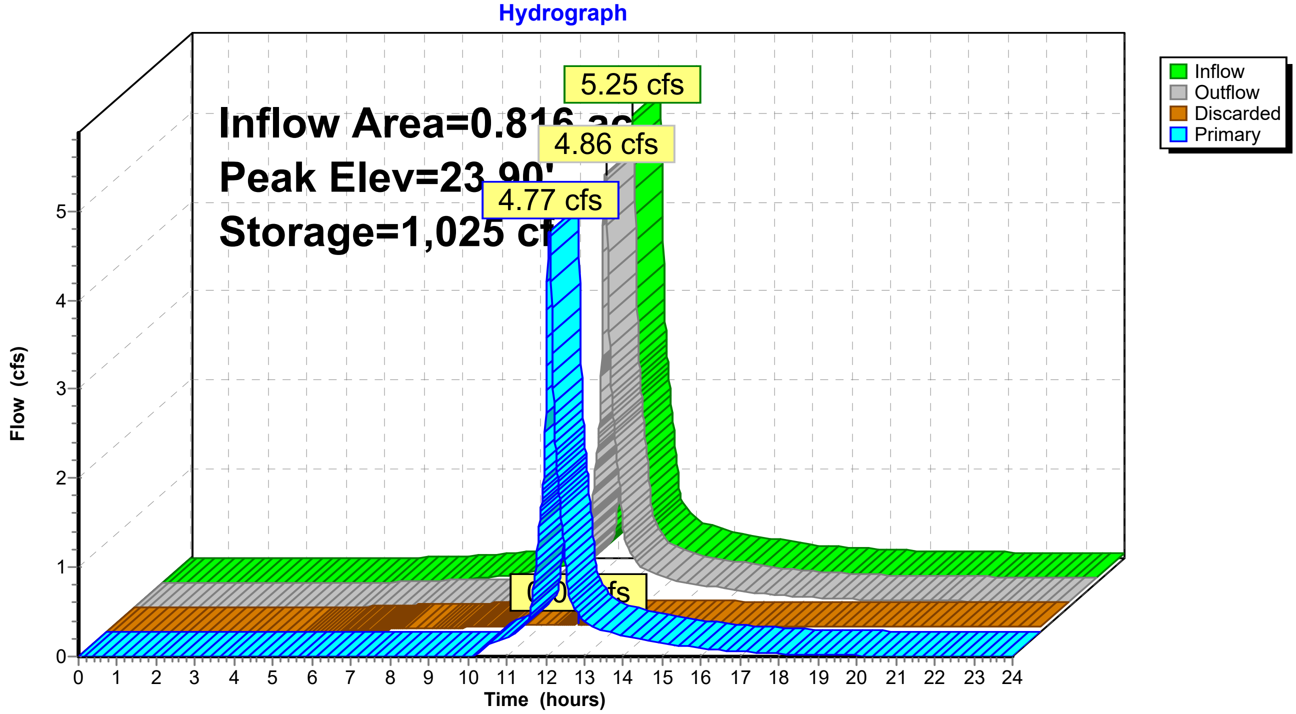
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
23.00	648	0	0
24.00	1,750	1,199	1,199
24.50	2,527	1,069	2,268

Device	Routing	Invert	Outlet Devices
#1	Discarded	23.00'	**2.410 in/hr Exfiltration over Surface area**
#2	Primary	23.50'	**12.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#3	Primary	23.50'	**12.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Discarded OutFlow Max=0.09 cfs @ 12.10 hrs HW=23.90' (Free Discharge)
└─**1=Exfiltration** (Exfiltration Controls 0.09 cfs)

Primary OutFlow Max=4.76 cfs @ 12.10 hrs HW=23.90' (Free Discharge)
├─**2=Orifice/Grate** (Orifice Controls 2.38 cfs @ 3.03 fps)
└─**3=Orifice/Grate** (Orifice Controls 2.38 cfs @ 3.03 fps)

Pond BIO3: BIO-3



Summary for Pond P-B: POND B

Inflow Area = 1.269 ac, 0.00% Impervious, Inflow Depth > 1.80" for 100 YR event
Inflow = 2.44 cfs @ 12.09 hrs, Volume= 0.191 af
Outflow = 0.04 cfs @ 24.00 hrs, Volume= 0.002 af, Atten= 98%, Lag= 714.8 min
Primary = 0.04 cfs @ 24.00 hrs, Volume= 0.002 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Peak Elev= 3.45' @ 24.00 hrs Surf.Area= 11,502 sf Storage= 8,230 cf

Plug-Flow detention time= 720.9 min calculated for 0.002 af (1% of inflow)
Center-of-Mass det. time= 544.0 min (1,421.7 - 877.7)

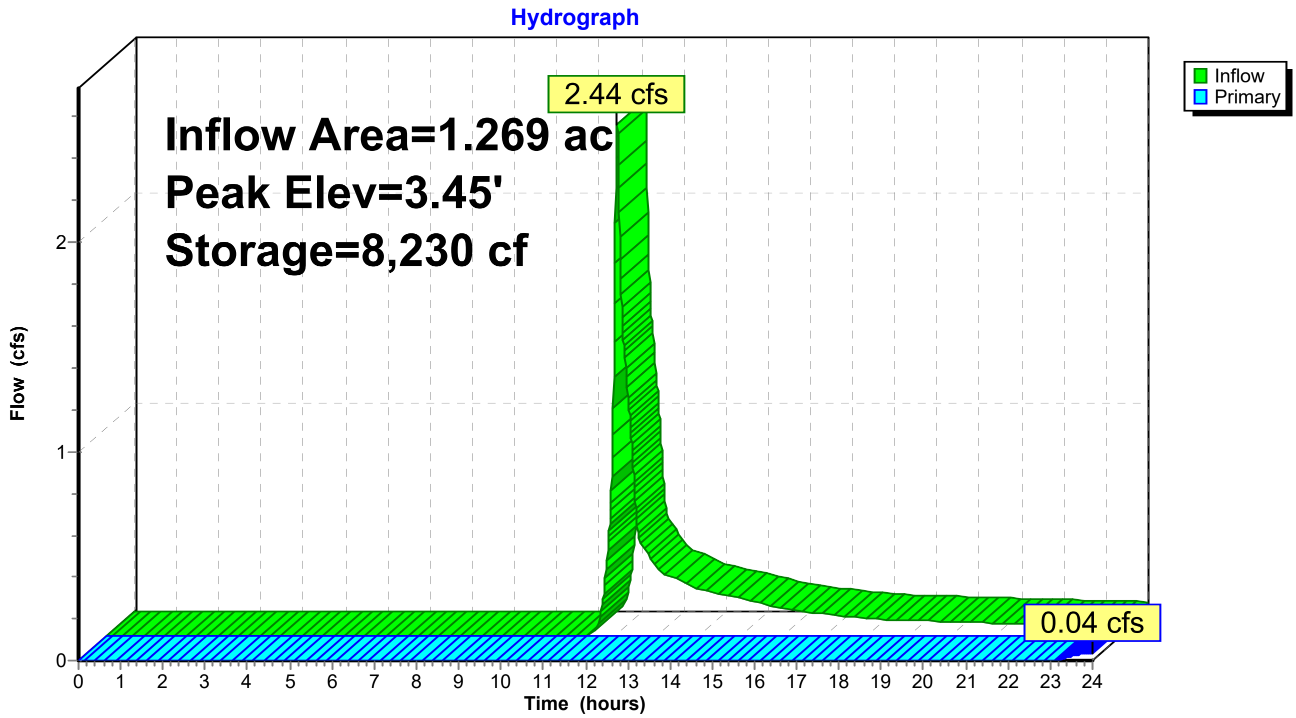
Volume	Invert	Avail.Storage	Storage Description
#1	2.70'	15,021 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
2.70	10,273	0	0
3.00	11,080	3,203	3,203
3.40	11,370	4,490	7,693
4.00	13,058	7,328	15,021

Device	Routing	Invert	Outlet Devices
#1	Primary	3.44'	**45.0 deg x 15.0' long x 0.50' rise Sharp-Crested Vee/Trap Weir** Cv= 2.56 (C= 3.20)

Primary OutFlow Max=0.03 cfs @ 24.00 hrs HW=3.45' (Free Discharge)
↑**1=Sharp-Crested Vee/Trap Weir** (Weir Controls 0.03 cfs @ 0.27 fps)

Pond P-B: POND B



Summary for Pond P-C: POND C

Inflow Area = 2.480 ac, 0.00% Impervious, Inflow Depth > 1.80" for 100 YR event
Inflow = 4.77 cfs @ 12.09 hrs, Volume= 0.372 af
Outflow = 0.04 cfs @ 24.00 hrs, Volume= 0.002 af, Atten= 99%, Lag= 714.8 min
Primary = 0.04 cfs @ 24.00 hrs, Volume= 0.002 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Peak Elev= 4.30' @ 24.00 hrs Surf.Area= 25,179 sf Storage= 16,139 cf

Plug-Flow detention time= 723.2 min calculated for 0.002 af (0% of inflow)
Center-of-Mass det. time= 543.6 min (1,421.2 - 877.7)

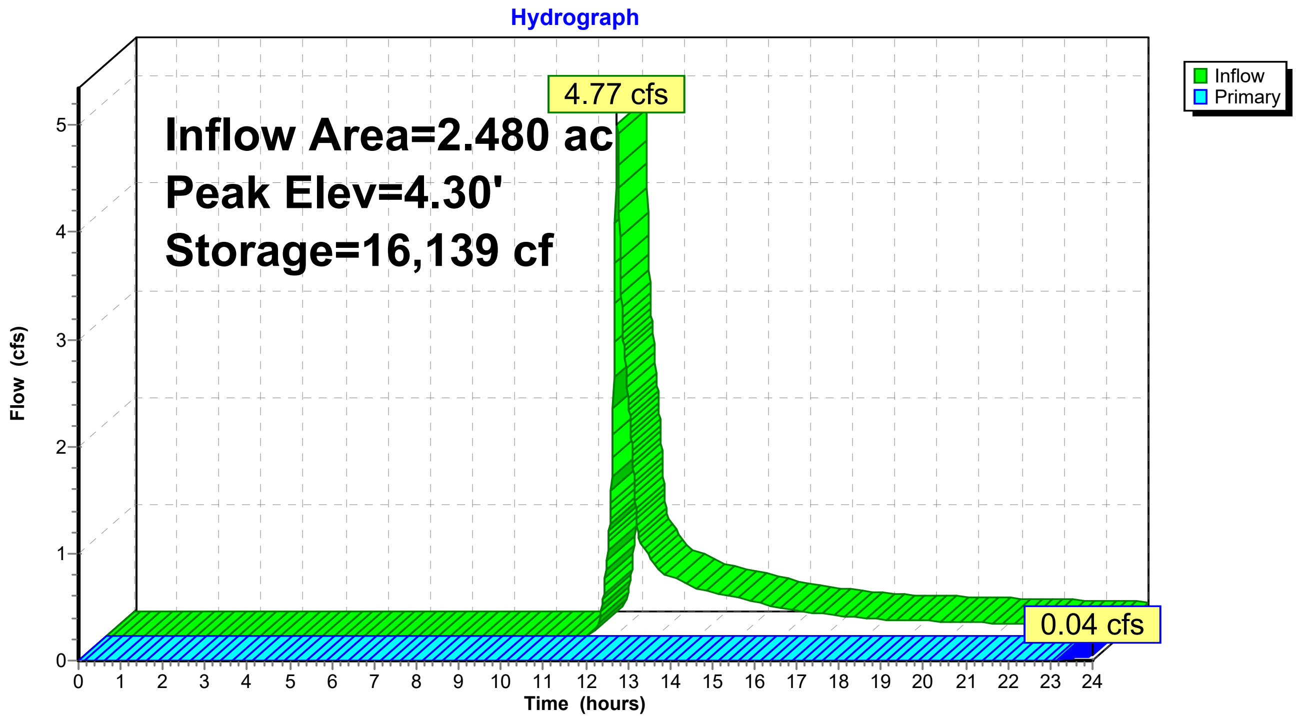
Volume	Invert	Avail.Storage	Storage Description
#1	3.60'	35,172 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
3.60	20,812	0	0
4.00	23,497	8,862	8,862
5.00	29,124	26,311	35,172

Device	Routing	Invert	Outlet Devices
#1	Primary	4.29'	**45.0 deg x 15.0' long x 0.50' rise Sharp-Crested Vee/Trap Weir** Cv= 2.56 (C= 3.20)

Primary OutFlow Max=0.04 cfs @ 24.00 hrs HW=4.30' (Free Discharge)
└─**1=Sharp-Crested Vee/Trap Weir** (Weir Controls 0.04 cfs @ 0.30 fps)

Pond P-C: POND C



Summary for Pond P-D: POND D

Inflow Area = 2.034 ac, 0.00% Impervious, Inflow Depth > 1.70" for 100 YR event
Inflow = 2.11 cfs @ 12.43 hrs, Volume= 0.287 af
Outflow = 0.09 cfs @ 21.78 hrs, Volume= 0.046 af, Atten= 96%, Lag= 561.0 min
Primary = 0.09 cfs @ 21.78 hrs, Volume= 0.046 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Peak Elev= 9.25' @ 21.78 hrs Surf.Area= 9,759 sf Storage= 10,577 cf

Plug-Flow detention time= 515.1 min calculated for 0.046 af (16% of inflow)
Center-of-Mass det. time= 354.3 min (1,251.0 - 896.7)

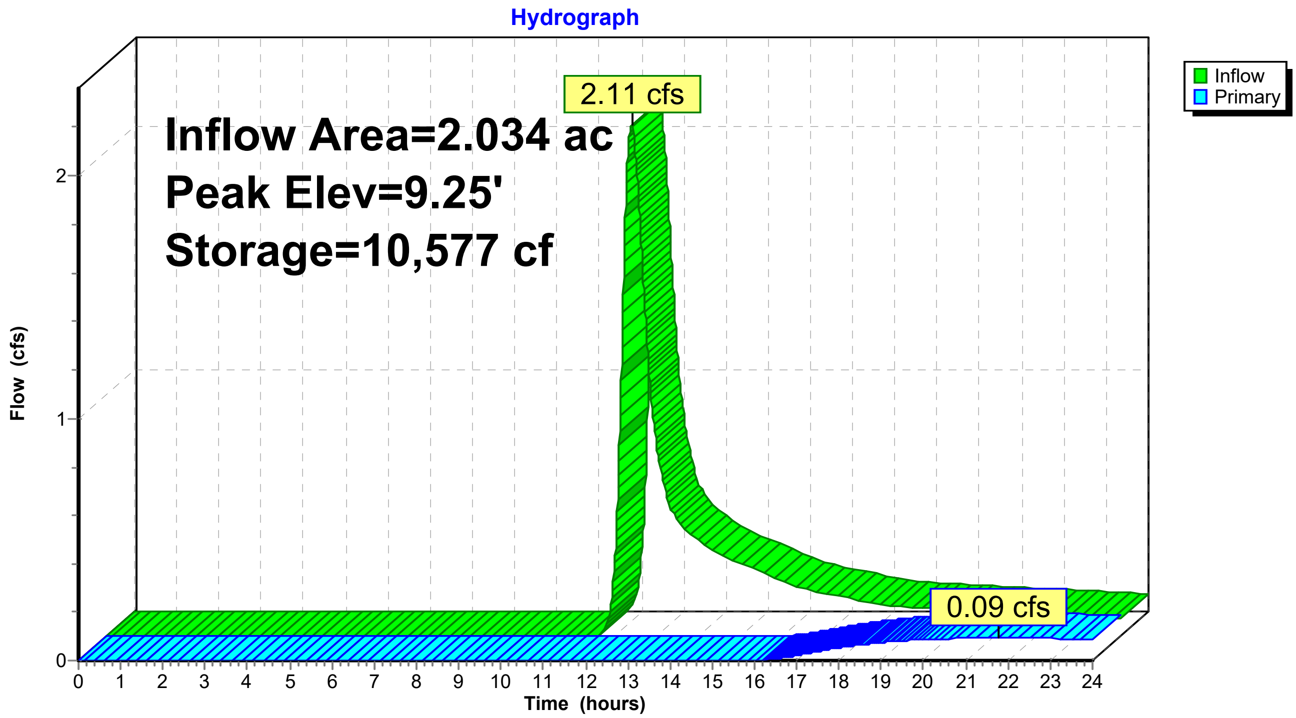
Volume	Invert	Avail.Storage	Storage Description
#1	8.00'	18,853 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
8.00	7,585	0	0
9.00	8,975	8,280	8,280
10.00	12,170	10,573	18,853

Device	Routing	Invert	Outlet Devices
#1	Primary	9.80'	**45.0 deg x 15.0' long x 0.50' rise Sharp-Crested Vee/Trap Weir** Cv= 2.56 (C= 3.20)
#2	Primary	9.08'	**12.0" Round Culvert** L= 18.5' CMP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 9.08' / 8.16' S= 0.0497 '/' Cc= 0.900 n= 0.013 Clay tile, Flow Area= 0.79 sf

Primary OutFlow Max=0.09 cfs @ 21.78 hrs HW=9.25' (Free Discharge)
↑—**1=Sharp-Crested Vee/Trap Weir** (Controls 0.00 cfs)
└—**2=Culvert** (Inlet Controls 0.09 cfs @ 1.09 fps)

Pond P-D: POND D



APPENDIX E

TSS REMOVAL WORKSHEET CALCULATIONS

PESCE ENGINEERING & ASSOCIATES, INC.
34 Porter Lane
West Dennis, MA 02670

BMP System: **Front Entrance System (Design Point # 1)**
Project: **Emblem Hyannis**
Prepared By: ELP
Date: 6/15/2022

TSS Removal
Calculation Worksheet

A	B	C*	D	E
BMP	TSS Removal Rate	Starting TSS Load*	Amount Removed (BxC)	Remaining Load (C-D)
Street Sweeping	10%	1.00	0.10	0.90
Deep Sump Catch Basin	25%	0.90	0.23	0.67
Contech® CDS Water Quality Unit	25%	0.67	0.17	0.50
Infiltration Basin	80%	0.50	0.40	0.10

Total TSS Removal = 90%

*Note: Column C Equals remaining load from previous BMP (Column E), which enters the following BMP

PESCE ENGINEERING & ASSOCIATES, INC.
34 Porter Lane
West Dennis, MA 02670

BMP System: **Infiltration Basin Systems (Infiltration Basins 1 & 2 with Sediment Forebay)**
Project: **Emblem Hyannis**
Prepared By: ELP
Date: 6/15/2022

TSS Removal Calculation Worksheet

A	B	C*	D	E
BMP	TSS Removal Rate	Starting TSS Load*	Amount Removed (BxC)	Remaining Load (C-D)
Street Sweeping	10%	1.00	0.10	0.90
Deep Sump Catch Basin	25%	0.90	0.23	0.67
Sediment Forebay	25%	0.67	0.17	0.50
Infiltration Basin	80%	0.50	0.40	0.10
		Total TSS Removal =	90%	

*Note: Column C Equals remaining load from previous BMP (Column E), which enters the following BMP

APPENDIX F

CONSTRUCTION PERIOD POLLUTION PREVENTION and EROSION AND SEDIMENTATION CONTROL PLAN

and

STORMWATER MANAGEMENT SYSTEM OPERATIONS & MAINTENANCE PLAN

Including

Contech® CDS Maintenance Guide

CONSTRUCTION PERIOD POLLUTION PREVENTION and EROSION AND SEDIMENTATION CONTROL PLAN

Proposed EMBLEM Hyannis Development

35 Scudder Ave., Hyannis, MA

PREPARED FOR (Operator & Responsible Party):
Quarterra
99 Summer Street, Suite 701
Boston, MA 02110

The construction period should take approximately 18-30 months after receipt of a Building Permit.

CONSTRUCTION PERIOD POLLUTION CONTROL MEASURES

Appropriate erosion control and construction methods shall be employed to prevent sediment erosion & dust during construction. A permit will be sought through the EPA for a Stormwater NPDES permit, and a Stormwater pollution Prevention Plan will be prepared, prior to construction start.

EROSION CONTROL AND INPSECTION SCHEDULE

Staked hay bales and silt fence shall be located at all down gradient areas of construction activity as shown on the site plans (see Sheet 13 of 17, Erosion Control Plan of the site plan set). Erosion controls shall be inspected weekly and after significant rainfalls (1- inch or greater) and replaced where necessary. Double rows of hay bales may be required in isolated areas where site conditions require this additional protection.

Additional silt fencing may also be required, as directed by the Engineer. All finished slopes and graded areas are to be stabilized with landscaping. Temporary measures such as mulching of slopes during non-planting seasons will be required.

A temporary construction entrance will be installed consisting of a 20’ x 50’ x 6-inch deep (min.) rip-rap crushed stone tracking pad, in order to minimize the tracking of soils/sediment to any off-site areas (see the Erosion Control Plan (sheet 13 of 17) for locations).

Shoulders and seeded side slopes shall be protected with mulch, hay, jute matting, or other acceptable method until all slopes are permanently stabilized.

STORMWATER MANAGEMENT CONTROLS

The proposed catch basins on the site, together with the existing catch basins on Scudder Avenue will be fitted with a new "Silt Sack" as shown on the above-mentioned Erosion Control Plan to protect the existing and new drainage systems from sediment accumulation during construction. They shall be serviced/emptied monthly, or as needed to allow proper function. The contractor shall conduct periodic (weekly) street sweeping as needed.

VEGETATION PLANNING

Proposed vegetation consists of various plantings and loam & seed over the landscaped areas. Appropriate erosion controls (jute matting, etc.) will be required to maintain slopes or provide erosion control of seeded areas, as required by the contractor.

CONSTRUCTION SEQUENCING PLAN

Construction sequencing for this project shall be as follows:

1. Install erosion control barriers; rip-rap construction entrance (tracking pad); Silt Sacks in catch basins
2. Conduct limited demolition operations in the limit of work
3. Excavate for the proposed foundations and parking garages
4. Conduct new concrete foundation and building construction.
5. Install new utilities infrastructure
6. Excavate existing parking to sub base level and construct new parking area surface per plan
7. Loam and seed disturbed areas; plant trees/shrubs
8. Remove erosion control after vegetation has established.

INSPECTION SCHEDULE

All work shall be inspected by the design Engineer prior to backfilling. Erosion control measures to be inspected prior to any earthwork. The contractor shall be responsible for adhering to this plan and applicable Town of Barnstable regulations or permit conditions. The Town Engineer/DPW or Water District Inspector shall inspect/approve each new water & sewer utility connection as required.

GENERAL (Stockpile areas)

Stockpile areas for subsoil shall be located in an area away from the drainage and wetland areas with erosion controls to prevent soils from entering the drainage systems. This erosion control will include as a minimum, the perimeter of stockpile areas staked with silt fence and/or hay bales, as required or directed by the Engineer.

STORMWATER MANAGEMENT SYSTEM OPERATION AND MAINTENANCE PLAN

Proposed EMBLEM Hyannis Development

35 Scudder Ave., Hyannis, MA

PREPARED FOR (Operator & Responsible Party):
Quarterra
99 Summer Street, Suite 701
Boston, MA 02110

The following is the Stormwater Management Operations and Maintenance Plan with a maintenance inspection report for this project:

Facility Description:
The Stormwater Management System components for the paved areas consist of the following:

- Deep sump catch basin (drives & parking areas)
- One (1) Contech® CDS treatment structure (shown as a WQU on the plans for the front entrance system)
- Infiltration Basis #1 and #2 with sediment forebays, and 3 Bioretention areas that precede the infiltration basins.

Routine Maintenance:
The routine maintenance program shall begin only after the following:

- New building construction and slope stabilization is complete;
- All disturbed areas are adequately vegetated and stabilized;
- All catch basins, and the oil/water separator have been pumped and completely cleaned;
- The system has been completely inspected by the design Engineer and found to be functioning as designed (no clogging of the leaching system has occurred during construction)

Routine maintenance shall consist of the following:

1. Street Sweeping shall be conducted 2 times per year, and as a minimum, shall occur after the spring thaw to avoid excessive accumulation of sediment into the drainage system

2. The deep sump catch basin shall be inspected and pumped & cleaned annually, or when the sediment collected in the sump reaches 2 ft. in depth, whichever comes first;

3. The infiltration/leaching systems shall be inspected annually;

4. The Contech® CDS treatment structure shall be inspected and pumped in accordance with the attached manufacturer's O & M Manual. All waste removed will be disposed of in accordance with State and Federal laws.

5. The bioretention areas, infiltration basins & sediment forebays shall be inspected annually, and excess debris, trash or sediment removed.

NOTE; See the attached manufacturer's recommended O&M information from for the Contech® CDS structure..

Construction Certification
The Engineer of Record (Pesce Engineering) shall inspect stormwater system and shall certify in writing to the Owner/Operator staff that it has been constructed in accordance with the approved plans (as shown on the record plans).

Owner/Operator's O & M Responsibilities
To assure that the requirements of this Stormwater Operation and Maintenance Plan (O&M Plan) are met in all seasons and for the life of the project, the following are the responsibilities of the Operator (operator of record):

1) The operator of record is responsible for the Stormwater System as outlined in the O&M Plan including inspection, maintenance and repairs.

2) The operator of record (and or tenants) will authorize funds for inspection, maintenance and emergency repairs as needed. Funding will be released for any and all repairs of stormwater systems identified in the O&M Plan within 30 calendar days of an inspection by a certified engineer that reveals any defect.

3) The operator of record will keep records of stormwater inspections, maintenance and repairs, and such records will be made available within 21 business days upon written request.

4) The requirements of the O&M Plan, including those for on-going inspection, maintenance and repairs as outlined in this plan applies to all successors and assigns as long as the proposed project is in operation.

Owner/Operator's Endorsement

Signature: ________________________________ Date: ____________

Quarterra
99 Summer Street, Suite 701, Boston, MA 02110

Stormwater Management System Inspection Report

Address: EMBLEM Hyannis, Scudder Ave., Hyannis, MA

Inspector: ______________________________ **Date:** ___________

	Description	Yes	No*	N/A
1	Are all erosion control devices in place and functioning in accordance with the erosion and control plan? (NOTE: Applies to Construction Period only)			
2	Are Catch Basins functioning properly (not more than 24 inches of sediment present, and not exhibiting excess oil or floatable debris)?			
3.	Is there evidence that Street Sweeping been performed on a routine basis (twice per year minimum)?			
4	Is the ConTech CDS® Separator functioning properly (Not showing excessive sediment or floatable oil/debris?			
5	Inspection of the Infiltration Basins & Sediment Forebay, or Bioretention Areas: Is there any evidence of debris, erosion or sediment build-up?			
6	Other (explain below)			

*If any answer is "No", describe needed corrections(s) below. Indicate the location of needed corrections(s), along with the date corrections are estimated to be made.

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Inspector's Signature: ____

CONTECH®
ENGINEERED SOLUTIONS

CDS® Inspection and Maintenance Guide

CDS TECHNOLOGIES

Maintenance

The CDS system should be inspected at regular intervals and maintained when necessary to ensure optimum performance. The rate at which the system collects pollutants will depend more heavily on site activities than the size of the unit. For example, unstable soils or heavy winter sanding will cause the grit chamber to fill more quickly but regular sweeping of paved surfaces will slow accumulation.

Inspection

Inspection is the key to effective maintenance and is easily performed. Pollutant transport and deposition may vary from year to year and regular inspections will help ensure that the system is cleaned out at the appropriate time. At a minimum, inspections should be performed twice per year (e.g. spring and fall) however more frequent inspections may be necessary in climates where winter sanding operations may lead to rapid accumulations, or in equipment washdown areas. Installations should also be inspected more frequently where excessive amounts of trash are expected.

The visual inspection should ascertain that the system components are in working order and that there are no blockages or obstructions in the inlet and separation screen. The inspection should also quantify the accumulation of hydrocarbons, trash, and sediment in the system. Measuring pollutant accumulation can be done with a calibrated dipstick, tape measure or other measuring instrument. If absorbent material is used for enhanced removal of hydrocarbons, the level of discoloration of the sorbent material should also be identified during inspection. It is useful and often required as part of an operating permit to keep a record of each inspection. A simple form for doing so is provided.

Access to the CDS unit is typically achieved through two manhole access covers. One opening allows for inspection and cleanout of the separation chamber (cylinder and screen) and isolated sump. The other allows for inspection and cleanout of sediment captured and retained outside the screen. For deep units, a single manhole access point would allows both sump cleanout and access outside the screen.

The CDS system should be cleaned when the level of sediment has reached 75% of capacity in the isolated sump or when an appreciable level of hydrocarbons and trash has accumulated. If absorbent material is used, it should be replaced when significant discoloration has occurred. Performance will not be impacted until 100% of the sump capacity is exceeded however it is recommended that the system be cleaned prior to that for easier removal of sediment. The level of sediment is easily determined by measuring from finished grade down to the top of the sediment pile. To avoid underestimating the level of sediment in the chamber, the measuring device must be lowered to the top of the sediment pile carefully. Particles at the top of the pile typically offer less resistance to the end of the rod than consolidated particles toward the bottom of the pile. Once this measurement is recorded, it should be compared to the as-built drawing for the unit to determine weather the height of the sediment pile off the bottom of the sump floor exceeds 75% of the total height of isolated sump.

Cleaning

Cleaning of a CDS systems should be done during dry weather conditions when no flow is entering the system. The use of a vacuum truck is generally the most effective and convenient method of removing pollutants from the system. Simply remove the manhole covers and insert the vacuum hose into the sump. The system should be completely drained down and the sump fully evacuated of sediment. The area outside the screen should also be cleaned out if pollutant build-up exists in this area.

In installations where the risk of petroleum spills is small, liquid contaminants may not accumulate as quickly as sediment. However, the system should be cleaned out immediately in the event of an oil or gasoline spill should be cleaned out immediately. Motor oil and other hydrocarbons that accumulate on a more routine basis should be removed when an appreciable layer has been captured. To remove these pollutants, it may be preferable to use absorbent pads since they are usually less expensive to dispose than the oil/water emulsion that may be created by vacuuming the oily layer. Trash and debris can be netted out to separate it from the other pollutants. The screen should be power washed to ensure it is free of trash and debris.

Manhole covers should be securely seated following cleaning activities to prevent leakage of runoff into the system from above and also to ensure that proper safety precautions have been followed. Confined space entry procedures need to be followed if physical access is required. Disposal of all material removed from the CDS system should be done in accordance with local regulations. In many jurisdictions, disposal of the sediments may be handled in the same manner as the disposal of sediments removed from catch basins or deep sump manholes.

CDS Model	Diameter		Distance from Water Surface to Top of Sediment Pile		Sediment Storage Capacity	
	ft	m	ft	m	y^3	m^3
CDS1515	3	0.9	3.0	0.9	0.5	0.4
CDS2015	4	1.2	3.0	0.9	0.9	0.7
CDS2015	5	1.3	3.0	0.9	1.3	1.0
CDS2020	5	1.3	3.5	1.1	1.3	1.0
CDS2025	5	1.3	4.0	1.2	1.3	1.0
CDS3020	6	1.8	4.0	1.2	2.1	1.6
CDS3025	6	1.8	4.0	1.2	2.1	1.6
CDS3030	6	1.8	4.6	1.4	2.1	1.6
CDS3035	6	1.8	5.0	1.5	2.1	1.6
CDS4030	8	2.4	4.6	1.4	5.6	4.3
CDS4040	8	2.4	5.7	1.7	5.6	4.3
CDS4045	8	2.4	6.2	1.9	5.6	4.3
CDS5640	10	3.0	6.3	1.9	8.7	6.7
CDS5653	10	3.0	7.7	2.3	8.7	6.7
CDS5668	10	3.0	9.3	2.8	8.7	6.7
CDS5678	10	3.0	10.3	3.1	8.7	6.7

Table 1: CDS Maintenance Indicators and Sediment Storage Capacities

Support

- Drawings and specifications are available at www.contechstormwater.com.
- Site-specific design support is available from our engineers.

Contech Engineered Solutions LLC provides site solutions for the civil engineering industry. Contech's portfolio includes bridges, drainage, sanitary sewer, stormwater, earth stabilization and wastewater treament products. For information, visit www.ContechES.com or call 800.338.1122

The product(s) described may be protected by one or more of the following US patents: 5,322,629; 5,624,576; 5,707,527; 5,759,415; 5,788,848; 5,985,157; 6,027,639; 6,350,374; 6,406,218; 6,641,720; 6,511,595; 6,649,048; 6,991,114; 6,998,038; 7,186,058; 7,296,692; 7,297,266; 7,517,450 related foreign patents or other patents pending.

CDS Inspection & Maintenance Log

CDS Model: ______________________ Location: ______________________

Date	Water depth to sediment[1]	Floatable Layer Thickness[2]	Describe Maintenance Performed	Maintenance Personnel	Comments

1. The water depth to sediment is determined by taking two measurements with a stadia rod: one measurement from the manhole opening to the top of the sediment pile and the other from the manhole opening to the water surface. If the difference between these measurements is less than the values listed in table 1 the system should be cleaned out. **Note: to avoid underestimating the volume of sediment in the chamber, the measuring device must be carefully lowered to the top of the sediment pile.**

2. For optimum performance, the system should be cleaned out when the floating hydrocarbon layer accumulates to an appreciable thickness. In the event of an oil spill, the system should be cleaned immediately.

<u>APPENDIX G</u>

MA DEP STANDARD METHOD TO CONVERT WATER QUALITY VOLUME TO A DISCHARGE RATE FOR SIZING FLOW BASED MANUFACTURED PROPRIETARY STORMWATER TREATMENT
(SEPTEMBER 10, 2013)

Massachusetts Department of Environmental Protection Wetlands Program

Standard Method to Convert Required Water Quality Volume to a Discharge Rate for Sizing Flow Based Manufactured Proprietary Stormwater Treatment Practices

Effective October 15, 2013, computations following the standardized method must be submitted with a Wetlands Notice of Intent (NOI) when a proprietary manufactured stormwater treatment device sized using a flow rate is proposed in connection with work proposed in a wetland resource area or associated buffer zone. The computational method will primarily affect the sizing of the proprietary manufactured stormwater treatment separators, and not other types of stormwater treatment practices that are volume based (such as extended detention basins) or proprietary stormwater treatment filters sized using the Water Quality Volume (WQV).

Stormwater Standard No. 4 requires structural stormwater management practices to be sized to capture the required WQV in accordance with the Massachusetts Stormwater Handbook (310 CMR 10.05(6)(k)(4) and 314 CMR 9.06(6)(a)(4)) . Stormwater Standard No. 4 requires that the full WQV be captured and treated to remove 80% of the Total Suspended Solid (TSS) load.

Since manufactured proprietary stormwater separators are sized using discharge rates and not volume, MassDEP is requiring the standardized method described below be used to convert the required WQV to a discharge rate (Q). No other methods are allowed to convert the WQV to the Q rate. This will ensure that flow rate based manufactured proprietary stormwater treatment practices are sized consistently from manufacturer to manufacturer. This section contains the following: caveats for method use, method description, examples of how to use the method, and documentation describing how the method was derived. This method will be incorporated into the Massachusetts Stormwater Handbook.

The following caveats apply to use of the method:

- Device sized using the Q rate must only be used as pretreatment practice.
- Device sized using this method shall be designed to be "offline", unless approved otherwise through written reciprocity granted by MassDEP to a final certification pursuant to the Technology Acceptance Reciprocity Partnership (TARP). This means the device must be sized at a minimum to fully treat the Q rate without any overflow, by-pass, surcharge of runoff, or scouring of sediments or oils previously trapped or entrained in the device.
- The computations described below must be provided in the Stormwater Report accompanying Wetlands Notice of Intent or application for 401 Water Quality Certification.
- MassDEP reserves ability to revise this method in the future as may be needed to reflect documented increases to precipitation intensity (Douglas 2011), updates to design intensity storms currently being considered by the National Weather Service or Northeast Climate Center (NECC)[1] to Technical Paper 40 (upon which this methodology is based), NRCS revisions to the WinTR55/TR20 methods,[2] or changes to the National Pollution Discharge Elimination System (NPDES) permits issued by EPA for Massachusetts.

[1] On web, see precipitation intensities at http://precip.net

[2] On web, See MA-NRCS description at: http://www.nrcs.usda.gov/Internet/FSE_DOCUMENTS/nrcs144p2_013763.pdf

METHOD

1. Determine if the WQV is the first ½-inch or 1-inch of runoff. If WQV is the first ½ -inch, go to STEP 2. If WQV is the first 1-inch of runoff, go to STEP 7.

FOR FIRST ½ INCH RUNOFF WQV

2. Use Curve Number (CN) 98 to represent the runoff potential for impervious surfaces (see Method Derivation section below for explanation regarding how CN 98 was obtained).

   Only use impervious surfaces for these computations. Runoff from pervious surfaces should not be included in the WQV computations for the Q rate. The WQV required by the Massachusetts Wetlands Protection (310 CMR 10.05(6)(k)(4)) and 401 Water Quality Certification (314 CMR 9.06(6)(a)(4)) regulations for Stormwater Standard No. 4 is based only on impervious surfaces.

3. Compute the time of concentration (tc) using the methods described in TR-55 1986, Chapter 3.

4. Refer to Figure 1, Ia/P Curve = 0.058

5. Determine unit peak discharge using Figure 1 or 2. Figure 2 is in tabular form so is preferred. Using the tc determined in STEP 3, read the unit peak discharge (qu) from Figure 1 or Table in Figure 2. qu is expressed in the following units: cfs/mi^2/watershed inches (csm/in).

6. Compute Q rate using the following equation:

$$Q_{0.5} = (qu)(A)(WQV)$$

   Where:

   $Q_{0.5}$ = flow rate associated with first ½ -inch of runoff

   qu = the unit peak discharge, in csm/in.

   A = impervious surface drainage area (in square miles)

   WQV = water quality volume in watershed inches (½ -inch in this case)

See Example 1, page 8 applying use of the method to convert first ½ -inch WQV to minimum $Q_{0.5}$ rate.

Figure 1: For First ½-inch Runoff, Ia/P Curve = 0.058, Relationship Between Unit Peak Discharge and Time of Concentration for NRCS Type III Storm Distribution.

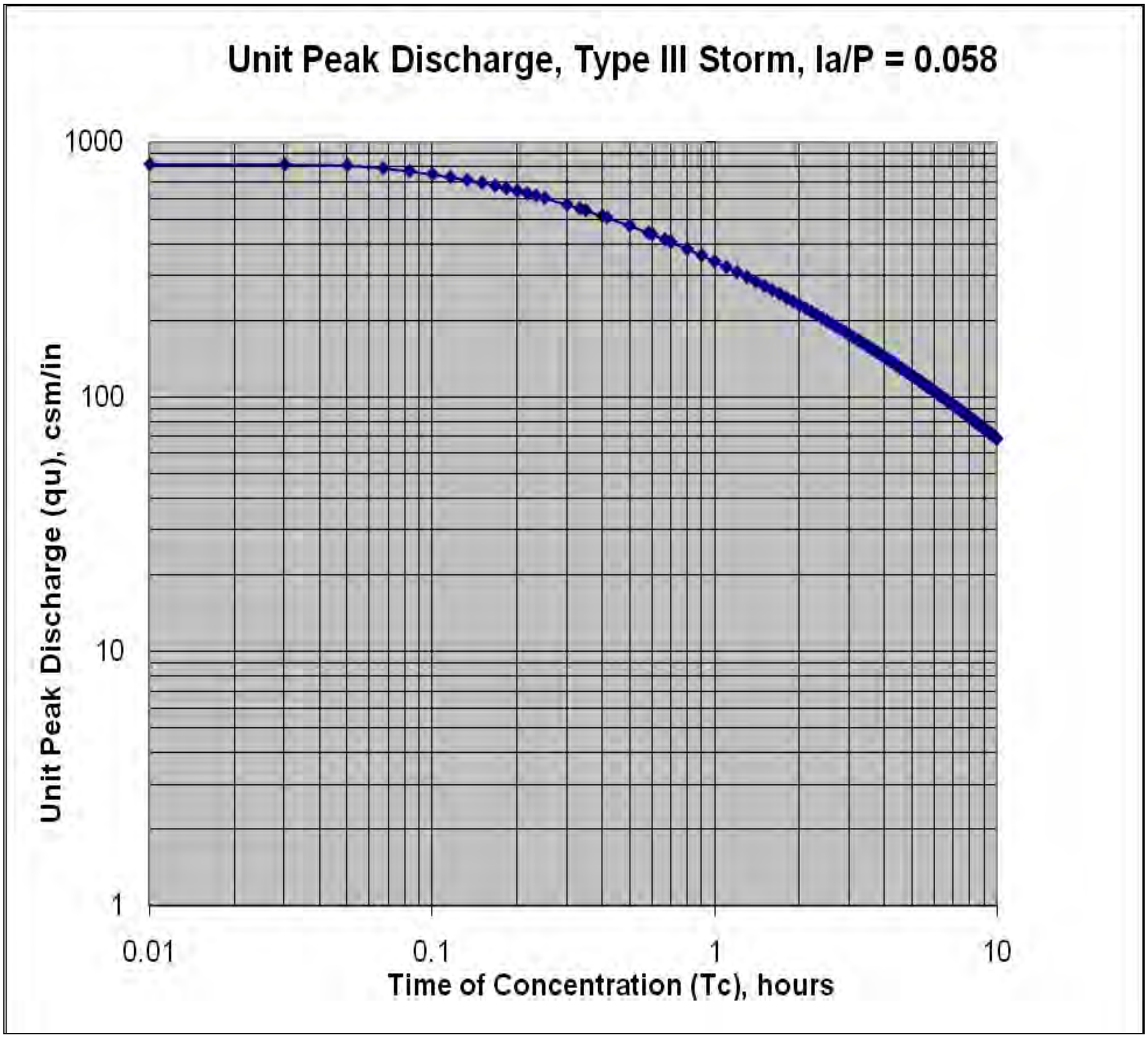

Figure 2: For First ½-inch of Runoff, Table of qu values for Ia/P Curve = 0.0.058, listed by tc, for Type III Storm Distribution

Tc (Hours)	qu (csm/in)
0.01	821
0.03	821
0.05	813
0.067	794
0.083	773
0.1	752
0.116	733
0.133	713
0.15	694
0.167	677
0.183	662
0.2	646
0.217	632
0.233	619
0.25	606
0.3	572
0.333	552
0.35	542
0.4	516
0.416	508
0.5	472
0.583	443
0.6	437
0.667	417
0.7	408
0.8	383
0.9	361
1	342
1.1	325
1.2	311
1.3	297
1.4	285
1.5	274
1.6	264
1.7	254

Tc (Hours)	qu (csm/in)
1.8	246
1.9	238
2	230
2.1	223
2.2	217
2.3	211
2.4	205
2.5	200
2.6	194
2.7	190
2.8	185
2.9	181
3	176
3.1	173
3.2	169
3.3	165
3.4	162
3.5	158
3.6	155
3.7	152
3.8	149
3.9	147
4	144
4.1	141
4.2	139
4.3	136
4.4	134
4.5	132
4.6	130
4.7	128
4.8	126
4.9	124
5	122
5.1	120
5.2	118

Tc (Hours)	qu (csm/in)
5.3	116
5.4	115
5.5	113
5.6	112
5.7	110
5.8	109
5.9	107
6	106
6.1	104
6.2	103
6.3	102
6.4	100
6.5	99
6.6	98
6.7	97
6.8	96
6.9	94
7	93
7.1	92
7.2	91
7.3	90
7.4	89
7.5	88
7.6	87
7.7	86
7.8	85
7.9	84
8	84
8.1	83
8.2	82
8.3	81
8.4	80
8.5	79
8.6	79
8.7	78

Tc (Hours)	qu (csm/in)
8.8	77
8.9	76
9	76
9.1	75
9.2	74
9.3	74
9.4	73
9.5	72
9.6	72
9.7	71
9.8	70
9.9	70
10	69

FOR FIRST 1-INCH RUNOFF WQV

7. Use Curve Number (CN) 98 to represent the runoff potential for impervious surfaces (see Method Derivation section below for explanation regarding how CN 98 was obtained).

   Only use impervious surfaces for these computations. Runoff from pervious surfaces should not be included in the WQV computations for peak WQF. The WQV required by the Massachusetts Wetlands Protection (310 CMR 10.05(6)(k)(4)) and 401 Water Quality Certification (314 CMR 9.06(6)(a)(4)) regulations for Stormwater Standard No. 4 is based only on impervious surfaces.

8. Compute the time of concentration (tc) using the methods described in TR-55 1986, Chapter 3.

9. Refer to Ia/P Curve = 0.034 (Figure 3)

10. Determine unit peak discharge using Figure 3 or 4. Figure 4 is in tabular form so is preferred. Using the tc determined in STEP 8, read the unit peak discharge (qu) from Figure 2 or from Table in Figure 4. qu is expressed in the following units: cfs/mi²/watershed inches (csm/in).

11. Compute the water quality flow (WQF) using the following equation:

$$Q_1 = (qu)(A)(WQV)$$

Where:

Q_1 = peak flow rate associated with first 1-inch of runoff

qu = the unit peak discharge, in csm/in.

A = impervious surface drainage area (in square miles)

WQV = water quality volume in watershed inches (1.0-inches in this case)

See Example 2, page 8 applying use of the method to convert first 1-inch WQV to minimum Q_1 rate.

Figure 3: For First 1-inch Runoff, Ia/P Curve = 0.034, Relationship Between Unit Peak Discharge and Time of Concentration for NRCS Type III Storm Distribution

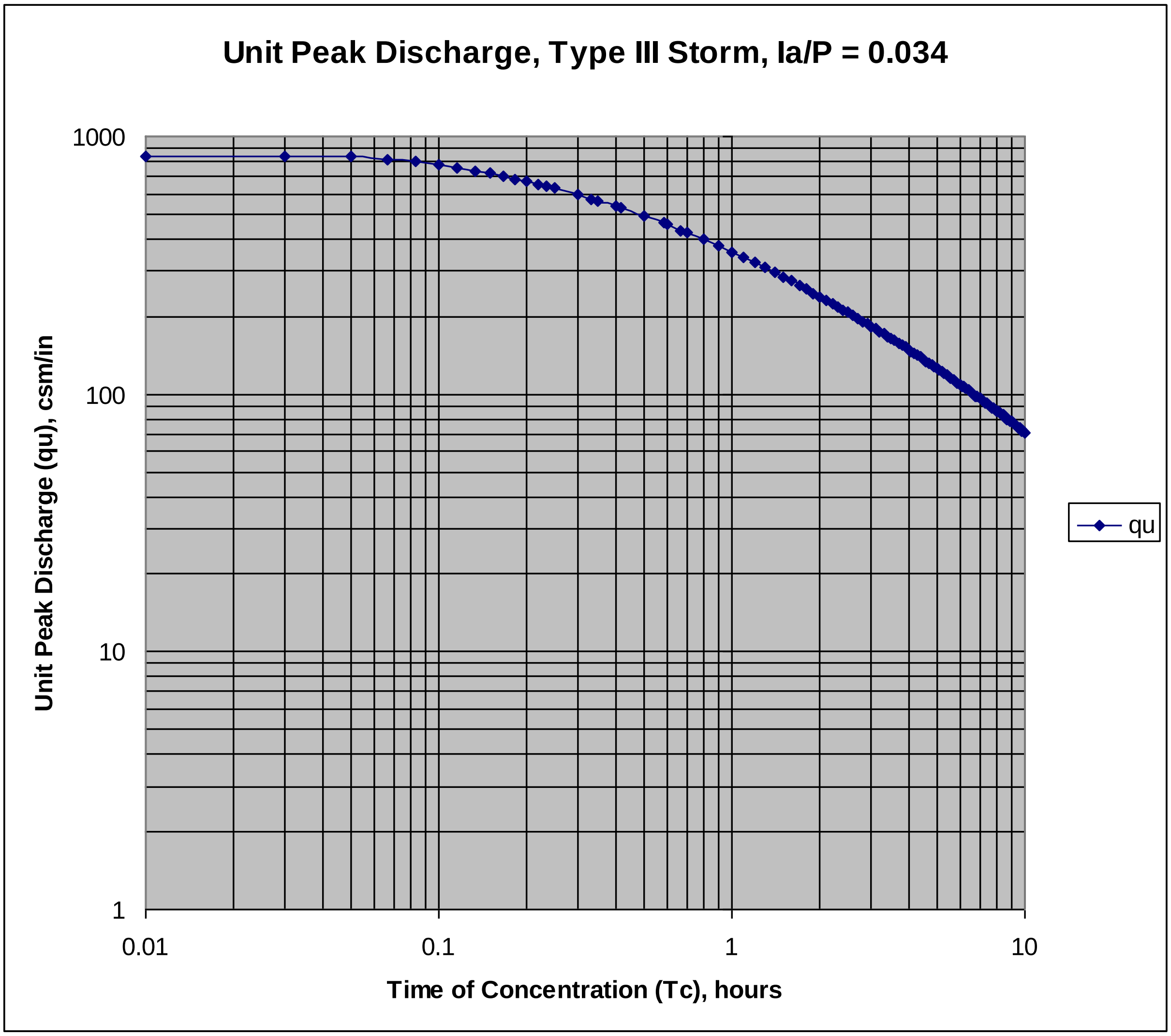

Figure 4: for First 1-inch Runoff, Table of qu values for Ia/P Curve = 0.034, listed by tc, for Type III Storm Distribution

Tc (Hours)	qu (csm/in)
0.01	835
0.03	835
0.05	831
0.067	814
0.083	795
0.1	774
0.116	755
0.133	736
0.15	717
0.167	700
0.183	685
0.2	669
0.217	654
0.233	641
0.25	628
0.3	593
0.333	572
0.35	563
0.4	536
0.416	528
0.5	491
0.583	460
0.6	454
0.667	433
0.7	424
0.8	398
0.9	376
1	356
1.1	339
1.2	323
1.3	309
1.4	296
1.5	285
1.6	274
1.7	264
1.8	255
1.9	247
2	239
2.1	232
2.2	225
2.3	219
2.4	213
2.5	207
2.6	202
2.7	197
2.8	192
2.9	187
3	183
3.1	179
3.2	175
3.3	171
3.4	168
3.5	164
3.6	161
3.7	158
3.8	155
3.9	152
4	149
4.1	146
4.2	144
4.3	141
4.4	139
4.5	137
4.6	134
4.7	132
4.8	130
4.9	128
5	126
5.1	124
5.2	122
5.3	120
5.4	119
5.5	117
5.6	115
5.7	114
5.8	112
5.9	111
6	109
6.1	108
6.2	106
6.3	105
6.4	104
6.5	102
6.6	101
6.7	100
6.8	99
6.9	98
7	96
7.1	95
7.2	94
7.3	93
7.4	92
7.5	91
7.6	90
7.7	89
7.8	88
7.9	87
8	86
8.1	85
8.2	84
8.3	84
8.4	83
8.5	82
8.6	81
8.7	80
8.8	79
8.9	79
9	78
9.1	77
9.2	76
9.3	76
9.4	75
9.5	74
9.6	74
9.7	73
9.8	72
9.9	72
10	71

Examples

Example 1: 2.28-acre asphalt parking lot (impervious surface), with time of concentration equal to 0.25 hours. The proposed parking lot drains to a wetland resource area, which is not a critical area, nor is the site located "near" a critical area. A proprietary separator is proposed to pretreat runoff to be directed to an Extended Detention Basin.

Because site does not drain to or located near a critical area, WQV = ½ -inch

1-acre = 0.0015625 mi^2

Step 1: Use CN = 98 to represent the 2.28-acre impervious surface.

Step 2: Determine tc

tc = 0.25 hours (given).

Step 3: Determine qu using Figure 2

With tc = 0.25 hours, qu is determined to be 606 csm/inch using Table in Figure 2.

Step 4 (Final Step): Determine $Q_{0.5}$

$Q_{0.5}$ = (qu)(A)(WQV)

$Q_{0.5}$ = (606 csm/in)(2.28-acre)(0.0015625 mi^2/acre)(½ -inch)

$Q_{0.5} \approx$ 1.1 CFS

Example 2: One-acre site composed entirely of impervious surfaces, with time of concentration equal to 6 minutes. The proposed impervious surfaces are to be drained to a stream located in Zone II of a public drinking water supply. A proprietary separator is proposed to pretreat runoff to be directed to an Infiltration Basin.

Because site drains to a critical area, WQV = 1-inch

1-acre = 0.0015625 mi^2

Step 1: Use CN = 98 to represent the 1-acre impervious surface.

Step 2: Determine tc

tc = 6 minutes (given).

Convert minutes to hours

tc = (6 minutes) /(60 minutes/hr) = 0.1 hours

Step 3: Determine qu using Table in Figure 4

Using the tc column, read down to find tc = 0.1 hours. Read to the right of tc = 0.1 hours to find the qu value which is 774 csm/inch.

Alternatively, you may use Figure 3 (Ia/P curve = 0.034). Find tc = 0.1 hours, read up to the Ia/P curve, then follow intersecting line to the left to interpolate the qu value. You'll note that using Figure 4 is quicker in so far as no interpolation is required. In cases where the tc is not listed in Figure 4, you may need to use Figure 3. In such instances, Figure 4 may still assist you in bracketing the qu values to interpolate.

Step 4 (Final Step): Determine Q_1

$$Q_1 = (qu)(A)(WQV)$$

$$Q_1 = (774 \text{ csm/in})(1\text{-acre})(0.0015625 \text{ mi}^2\text{/acre})(1\text{-inch})$$

$$Q_1 \approx 1.2 \text{ CFS}$$

If the conversion factor to convert acres to square miles is not included, the result will not be correct. As different units are used in the computations, double check your units to ensure the result is correct.

Method Derivation

The Stormwater Advisory Committee convened to assist MassDEP with the 2008 stormwater revisions to the Wetlands and 401 Water Quality Certification regulations. The Advisory Committee tabled a method proposed at that time and asked its Proprietary BMP subcommittee to study the issue further. Subsequently, the Proprietary BMP subcommittee met from 2008 to 2011, examining multiple methods. Among the methods reviewed included the Rational Method used by New Jersey DEP, Ahlfeld et al 2004, Winkler et al 2001, Claytor and Scheuler 1996, Imbrium PCSWMM, and Bryant. The Ahlfeld and Winkler methods were funded by MassDEP through 319 funds and developed using Massachusetts precipitation data. The Claytor method is based on SCS TR-55 graphical methods. The PCSWMM method is a proprietary version of the EPA SWMM method, based on Mannings equation. The Bryant method was based on precipitation data compiled in the Ahlfeld and Winkler methods.

To assist in selecting a method, Rees and Schoen 2009 conducted third party review of the different approaches. Rees and Schoen found that the various methods produced different peak rate flows.

Differences were also found between peak flow rates in coastal and inland areas. With some methods, the precipitation intensity associated with the ½-inch water quality volume produced a greater flow rate than the 1-inch water quality volume. The study concluded that the Claytor and Schueler 1996 method was the most complete in attempting to transform the Water Quality Volume to a flow rate.

Subsequent to the study, flow rate results from the Claytor and Schueler method were adapted for use in Massachusetts using both the first ½ - inch and 1-inch Water Quality Volumes. Flow rates were found to bypass a portion of the Water Quality Volume for the both the first ½ -inch and 1-inch of runoff depending on drainage area and treatment device size. As bypassed runoff is not treated, the Proprietary BMP Subcommittee agreed on meeting held in March 2011 that practices sized using the flow conversion method must be restricted to pretreatment only and directed to stormwater treatment practices. The Proprietary BMP Subcommittee subsequently recommended the Claytor and Schueler 1996 method be used, as adapted for use in Massachusetts, to the Stormwater Advisory Committee in May 2011.

The Claytor and Schueler 1996 approach in part utilizes the U.S. Natural Resource and Conservation Service Technical Release 55 (TR-55) Graphical Peak Discharge Method (NRCS / SCS 1986), adapted for small storm hydrology (Pitt 1999). It was adapted for use in Massachusetts by determining the precipitation values that generate the first ½ -inch and 1-inch of runoff, using the NRCS / SCS 1986 equations as described below.

1. The Massachusetts Stormwater Standard No. 4 sets the required WQV equal to 0.5-inch or 1.0- inch, depending if the discharge is to or near a critical area, Land Use with Higher Potential Pollutant Load (LUHPPL), or soil with rapid infiltration rate.

2. The Claytor and Scheuler 1996 method requires a Curve Number (CN) be determined to represent the ability of a surface to effectively convey runoff. CN 98 was derived for impervious surfaces using small storm hydrology using the following equation (NRCS / SCS 1986). The precipitation depth associated with the first 1.0-inch of runoff is 1.2 watershed inches based on Figure 4 (NRCS 1986 Table 2-1) and Figure 5 (NRCS 1986 Figure 2-1). The precipitation depth associated with the first ½ -inch of runoff is 0.7 watershed inches.

½-inch WQV Derivation:

Solve for P_t

$$CN = \frac{1000}{10 + 5P_t + 10Q_{WQV} - 10(Q_{WQV}{}^2 + 1.25Q_{WQV}P_t)^{0.5}}$$

Where:

- CN = Runoff Curve Number = 98 for runoff impervious surfaces

P_t = Precipitation depth

Q_{WQV} = Runoff depth related to Water Quality Volume = 0.5 watershed inches

This equation produces the result **P_t = 0.7** inches, when CN = 98 and Q_{WQV} = 0.5 inches.

1-inch WQV Derivation

$$CN = \frac{1000}{10 + 5P_t + 10Q_{WQV} - 10(Q_{WQV}{}^2 + 1.25Q_{WQV}P_t)^{0.5}}$$

Where:

CN = Runoff Curve Number = 98 for runoff from impervious surfaces

P_t = Precipitation depth

Q_{WQV} = Runoff depth related to Water Quality Volume = 1.0 watershed inches

This equation produces the result **P_t = 1.2** inches, when CN = 98 and Q_{WQV} = 1.0 inches

3. Potential maximum retention (S) in inches was derived using the following equation (NRCS 1986):

½-inch WQV Derivation / 1-inch WQV Derivation (result same for both):

S = (1000/CN) – 10

This equation produces the result S = 0.204 when the CN = 98

4. The initial abstraction (Ia) was derived using the following equation (NRCS 1986):

½-inch WQV Derivation / 1-inch WQV Derivation (result same for both):

Ia = 0.2S

This equation produces the result Ia = 0.041, when S = 0.204

Also See Figure 6 (NRCS 1986, Table 4-1), where Ia = 0.041, for CN = 98

5. The Ia/P Ratio was derived using the following equation (NRCS 1986):

½-inch WQV Derivation

Solve for Ia/P Ratio using the following equation (NRCS 1986):

Ia/P Ratio = Ia/ P_t

Where:

Ia = 0.041 (for CN = 98)

P_t = 0.7 watershed inches

Ia/P Ratio = 0.041/ 0.7 = 0.058

1-inch WQV Derivation

$$Ia/P \text{ Ratio} = Ia/ P_t$$

Where:

$Ia = 0.041$ (for CN = 98)

$P_t = 1.2$ watershed inches

$$Ia/P \text{ Ratio} = 0.041/ 1.2 = 0.034$$

6. For the first ½ -inch runoff, Ia/P curve for 0.058 ratio (Figure 1) and corresponding table (Figure 2) were generated using coefficients C_0, C_1 and C_2 derived from regression of coefficients published in Appendix F in NRCS / SCS TR-55 1986.
7. For the first 1-inch runoff, Ia/P curve for 0.034 ratio (Figure 3) and corresponding table (Figure 4) were generated using coefficients C_0, C_1 and C_2 derived from regression of coefficients published in Appendix F in NRCS / SCS TR-55 1986.

Figures Used for Method Derivation

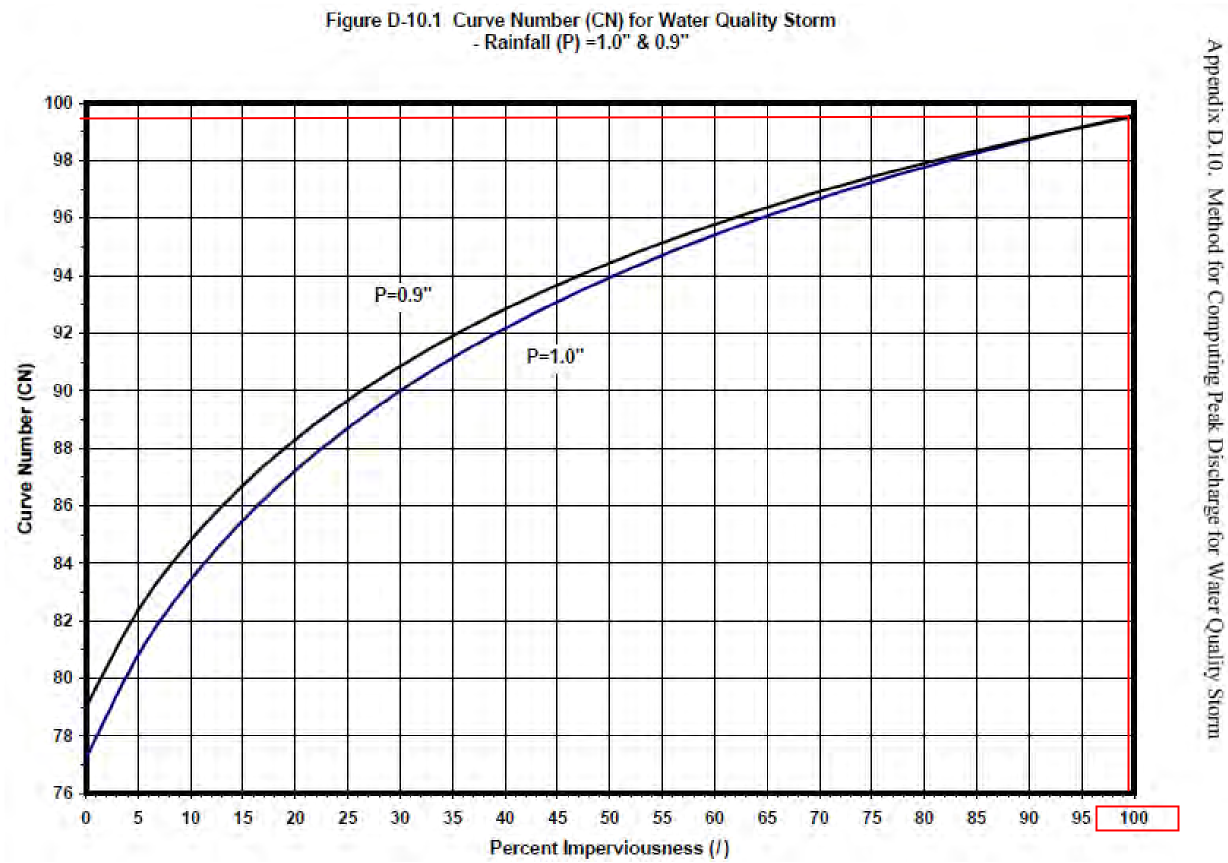

Figure 5: Graph Depicting CN to Percent Impervious Relationship by Precipitation Depth (MD 2000, Figure D-10.1). Note at 100% imperviousness, precipitation depths coincide, making corresponding Runoff CN greater than 98.

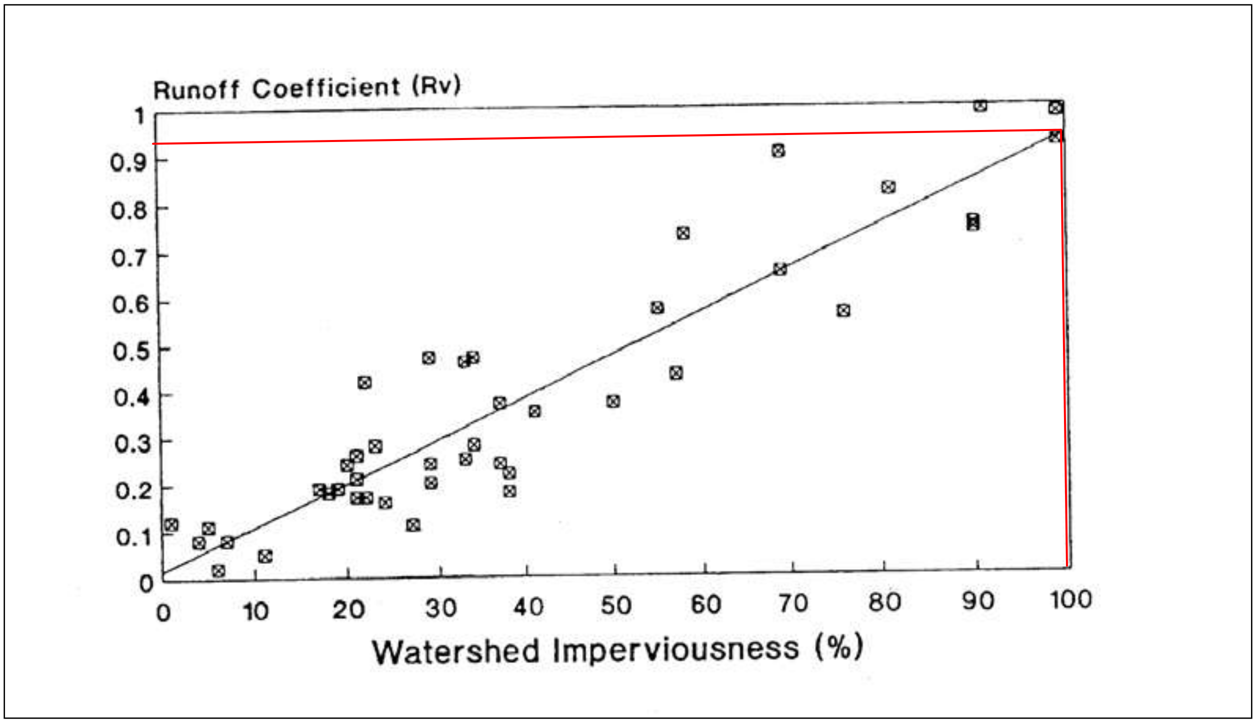

Figure 6: Relationship Between Impervious Cover & Runoff Coefficient (Vermont 2002, from Schueler, 1987). Note at 100% imperviousness, Rv is between 0.9 and 1, meaning that most of the precipitation effectively becomes runoff.

Table 2-1 Runoff depth for selected CN's and rainfall amounts [1]

Rainfall	Runoff depth for curve number of—												
	40	45	50	55	60	65	70	75	80	85	90	95	98
	inches												
1.0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.03	0.08	0.17	0.32	0.56	0.79
1.2	.00	.00	.00	.00	.00	.00	.03	.07	.15	.27	.46	.74	.99
1.4	.00	.00	.00	.00	.00	.02	.06	.13	.24	.39	.61	.92	1.18
1.6	.00	.00	.00	.00	.01	.05	.11	.20	.34	.52	.76	1.11	1.38
1.8	.00	.00	.00	.00	.03	.09	.17	.29	.44	.65	.93	1.29	1.58
2.0	.00	.00	.00	.02	.06	.14	.24	.38	.56	.80	1.09	1.48	1.77
2.5	.00	.00	.02	.08	.17	.30	.46	.65	.89	1.18	1.53	1.96	2.27
3.0	.00	.02	.09	.19	.33	.51	.71	.96	1.25	1.59	1.98	2.45	2.77
3.5	.02	.08	.20	.35	.53	.75	1.01	1.30	1.64	2.02	2.45	2.94	3.27
4.0	.06	.18	.33	.53	.76	1.03	1.33	1.67	2.04	2.46	2.92	3.43	3.77
4.5	.14	.30	.50	.74	1.02	1.33	1.67	2.05	2.46	2.91	3.40	3.92	4.26
5.0	.24	.44	.69	.98	1.30	1.65	2.04	2.45	2.89	3.37	3.88	4.42	4.76
6.0	.50	.80	1.14	1.52	1.92	2.35	2.81	3.28	3.78	4.30	4.85	5.41	5.76
7.0	.84	1.24	1.68	2.12	2.60	3.10	3.62	4.15	4.69	5.25	5.82	6.41	6.76
8.0	1.25	1.74	2.25	2.78	3.33	3.89	4.46	5.04	5.63	6.21	6.81	7.40	7.76
9.0	1.71	2.29	2.88	3.49	4.10	4.72	5.33	5.95	6.57	7.18	7.79	8.40	8.76
10.0	2.23	2.89	3.56	4.23	4.90	5.56	6.22	6.88	7.52	8.16	8.78	9.40	9.76
11.0	2.78	3.52	4.26	5.00	5.72	6.43	7.13	7.81	8.48	9.13	9.77	10.39	10.76
12.0	3.38	4.19	5.00	5.79	6.56	7.32	8.05	8.76	9.45	10.11	10.76	11.39	11.76
13.0	4.00	4.89	5.76	6.61	7.42	8.21	8.98	9.71	10.42	11.10	11.76	12.39	12.76
14.0	4.65	5.62	6.55	7.44	8.30	9.12	9.91	10.67	11.39	12.08	12.75	13.39	13.76
15.0	5.33	6.36	7.35	8.29	9.19	10.04	10.85	11.63	12.37	13.07	13.74	14.39	14.76

Figure 7: Table Depicting Relationship Between Precipitation (P) and Direct Runoff (Q) by Curve Number (NRCS 1986, Table 2-1). 1.2 inches of precipitation effectively becomes 0.99-inch of runoff.

Figure 2-1 Solution of runoff equation.

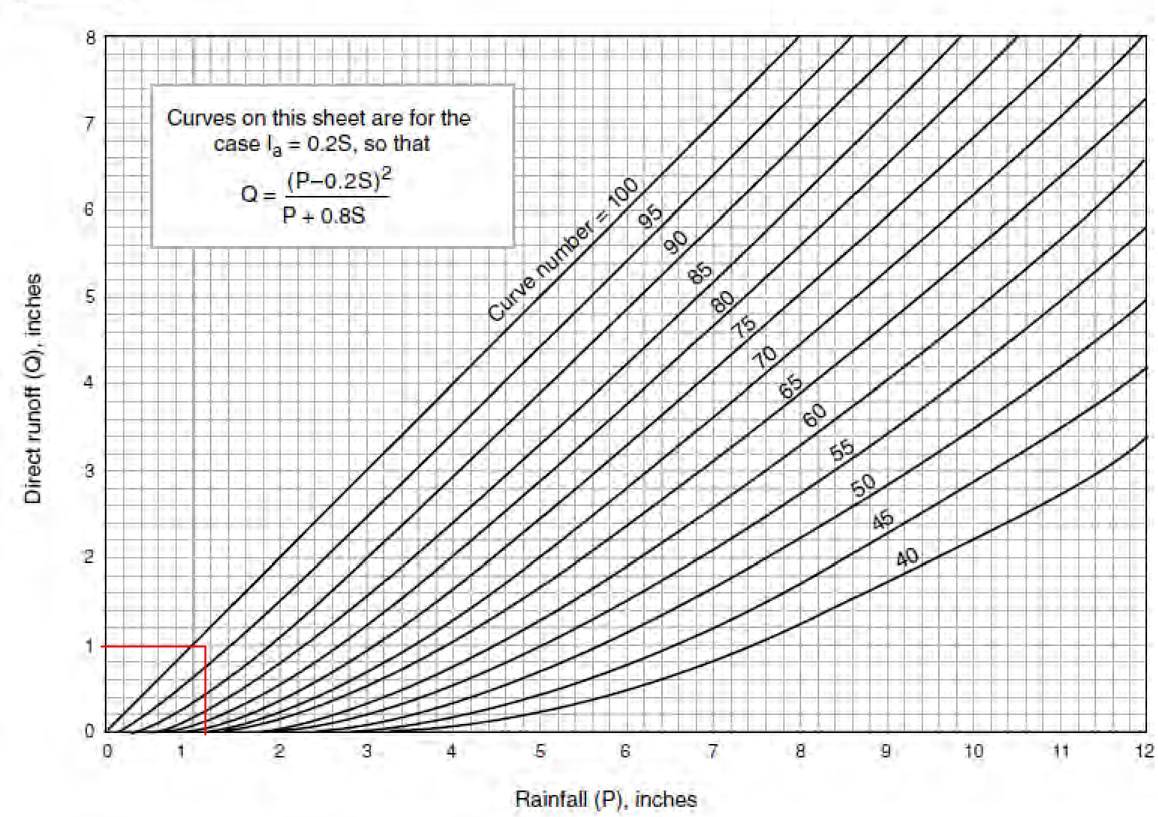

Figure 8: Graph Depicting Relationship Between Precipitation (P) and Direct Runoff (Q) by Curve Number (NRCS 1986, Figure 2-1). This indicates that for a CN 98 (representing impervious surfaces), 1.2 inches of precipitation effectively equals 1-inch of direct runoff.

Table 4-1 I_a values for runoff curve numbers

Curve number	I_a (in)	Curve number	I_a (in)
40	3.000	70	0.857
41	2.878	71	0.817
42	2.762	72	0.778
43	2.651	73	0.740
44	2.545	74	0.703
45	2.444	75	0.667
46	2.348	76	0.632
47	2.255	77	0.597
48	2.167	78	0.564
49	2.082	79	0.532
50	2.000	80	0.500
51	1.922	81	0.469
52	1.846	82	0.439
53	1.774	83	0.410
54	1.704	84	0.381
55	1.636	85	0.353
56	1.571	86	0.326
57	1.509	87	0.299
58	1.448	88	0.273
59	1.390	89	0.247
60	1.333	90	0.222
61	1.279	91	0.198
62	1.226	92	0.174
63	1.175	93	0.151
64	1.125	94	0.128
65	1.077	95	0.105
66	1.030	96	0.083
67	0.985	97	0.062
68	0.941	98	0.041
69	0.899		

Figure 9: Table Listing Ia by CN (NRCS 1986, Table 4-1). This indicates Initial Abstraction (Ia) for CN 98 = 0.041

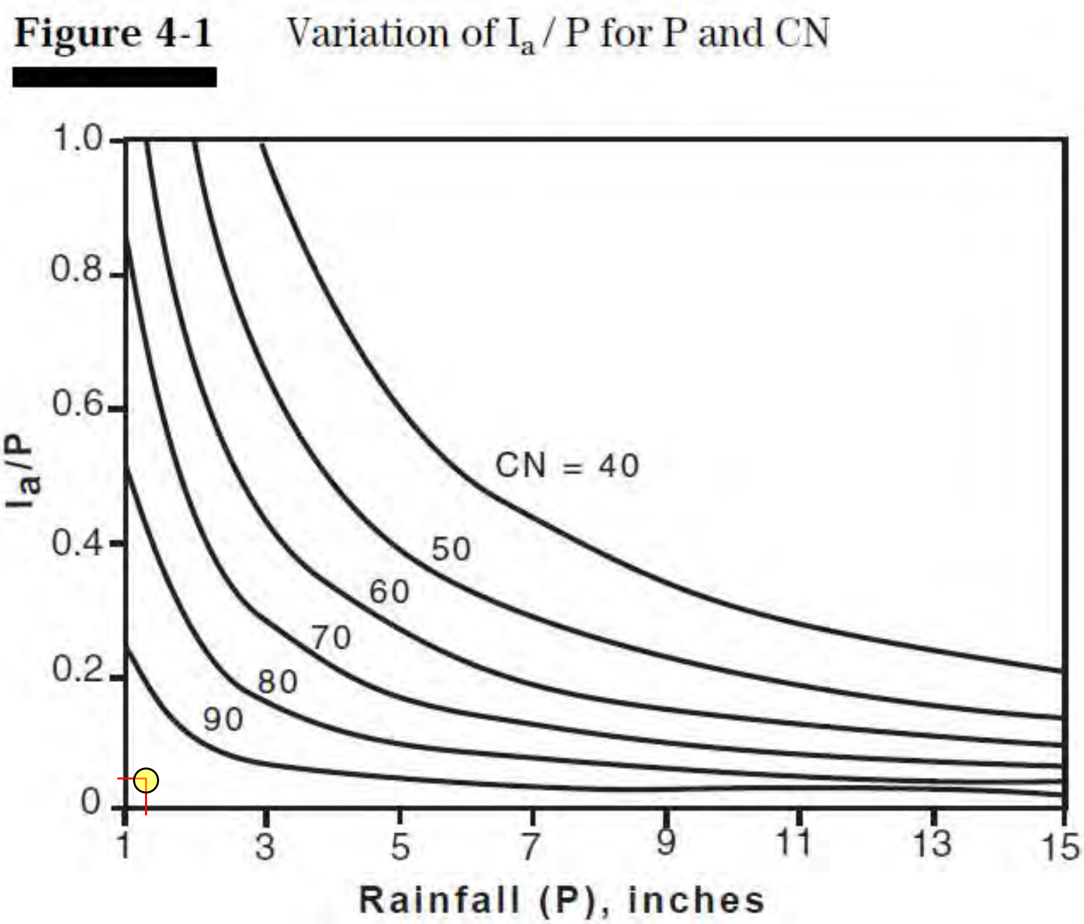

Figure 10: Graph Depicting Ia/P to Precipitation Relationship by CN (NRCS 1986, Figure 4-1). Ia/P ratio of 0.034 corresponding to 1.2 inches of precipitation added. Ia/P ratio determined for CN 98, using Ia = 0.041, P = 1.2

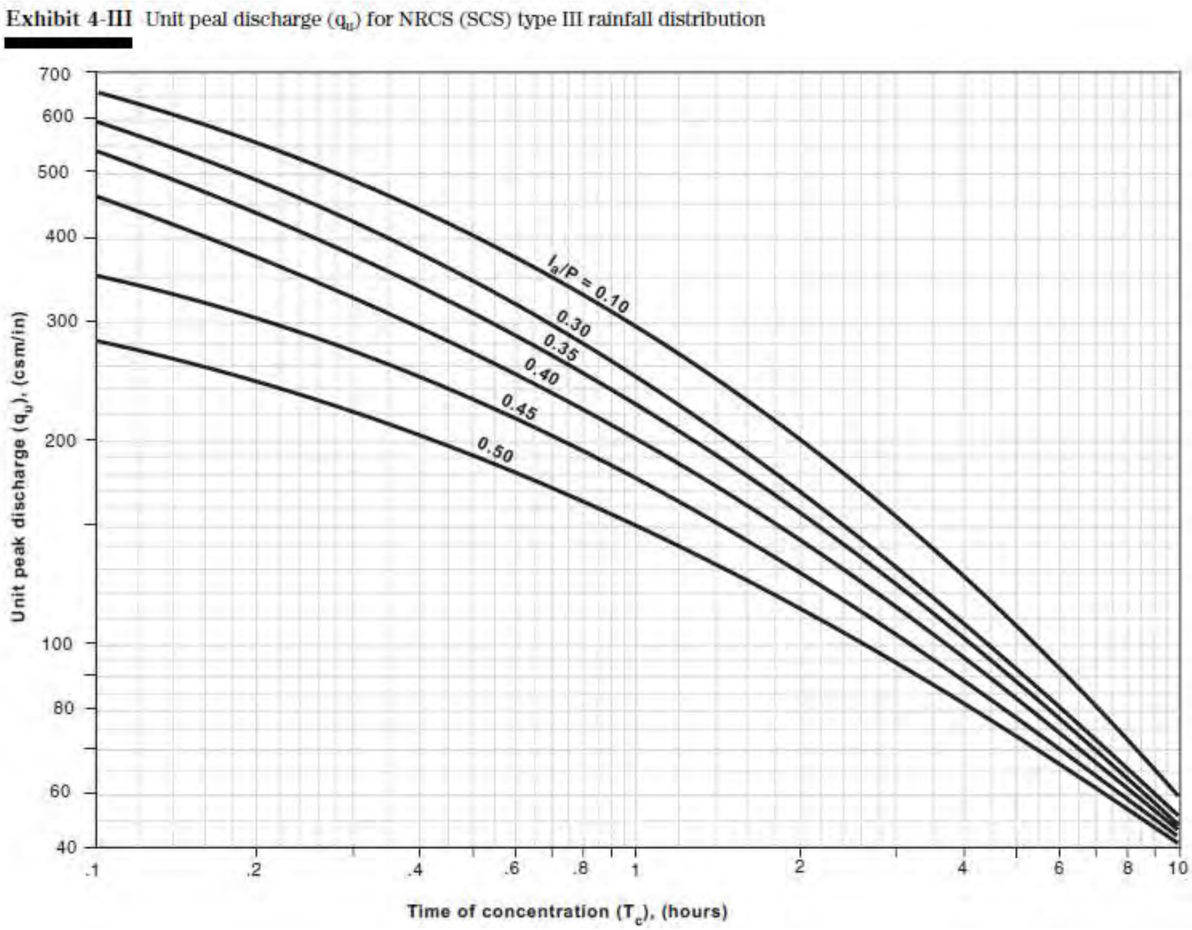

Figure 11: Relationship Between Time of Concentration and Unit Peak Discharge for Ia/P Ratios from 0.10 to 0.50 for NRCS Type III Storm Distribution (NRCS 1986, Exhibit 4-III). NRCS / SCS 1986 specifies Type III storm distribution (tropical influenced storms) for Massachusetts. See Figure 3 and 4 for Ia/P Ratio = 0.034

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APPENDIX H

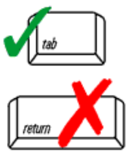
DEP CHECKLIST FOR STORMWATER REPORT

Massachusetts Department of Environmental Protection
Bureau of Resource Protection - Wetlands Program

Checklist for Stormwater Report

A. Introduction

Important: When filling out forms on the computer, use only the tab key to move your cursor - do not use the return key.



A Stormwater Report must be submitted with the Notice of Intent permit application to document compliance with the Stormwater Management Standards. The following checklist is NOT a substitute for the Stormwater Report (which should provide more substantive and detailed information) but is offered here as a tool to help the applicant organize their Stormwater Management documentation for their Report and for the reviewer to assess this information in a consistent format. As noted in the Checklist, the Stormwater Report must contain the engineering computations and supporting information set forth in Volume 3 of the Massachusetts Stormwater Handbook. The Stormwater Report must be prepared and certified by a Registered Professional Engineer (RPE) licensed in the Commonwealth.

The Stormwater Report must include:

- The Stormwater Checklist completed and stamped by a Registered Professional Engineer (see page 2) that certifies that the Stormwater Report contains all required submittals.[1] This Checklist is to be used as the cover for the completed Stormwater Report.
- Applicant/Project Name
- Project Address
- Name of Firm and Registered Professional Engineer that prepared the Report
- Long-Term Pollution Prevention Plan required by Standards 4-6
- Construction Period Pollution Prevention and Erosion and Sedimentation Control Plan required by Standard 8[2]
- Operation and Maintenance Plan required by Standard 9

In addition to all plans and supporting information, the Stormwater Report must include a brief narrative describing stormwater management practices, including environmentally sensitive site design and LID techniques, along with a diagram depicting runoff through the proposed BMP treatment train. Plans are required to show existing and proposed conditions, identify all wetland resource areas, NRCS soil types, critical areas, Land Uses with Higher Potential Pollutant Loads (LUHPPL), and any areas on the site where infiltration rate is greater than 2.4 inches per hour. The Plans shall identify the drainage areas for both existing and proposed conditions at a scale that enables verification of supporting calculations.

As noted in the Checklist, the Stormwater Management Report shall document compliance with each of the Stormwater Management Standards as provided in the Massachusetts Stormwater Handbook. The soils evaluation and calculations shall be done using the methodologies set forth in Volume 3 of the Massachusetts Stormwater Handbook.

To ensure that the Stormwater Report is complete, applicants are required to fill in the Stormwater Report Checklist by checking the box to indicate that the specified information has been included in the Stormwater Report. If any of the information specified in the checklist has not been submitted, the applicant must provide an explanation. The completed Stormwater Report Checklist and Certification must be submitted with the Stormwater Report.

---

[1] The Stormwater Report may also include the Illicit Discharge Compliance Statement required by Standard 10. If not included in the Stormwater Report, the Illicit Discharge Compliance Statement must be submitted prior to the discharge of stormwater runoff to the post-construction best management practices.

[2] For some complex projects, it may not be possible to include the Construction Period Erosion and Sedimentation Control Plan in the Stormwater Report. In that event, the issuing authority has the discretion to issue an Order of Conditions that approves the project and includes a condition requiring the proponent to submit the Construction Period Erosion and Sedimentation Control Plan before commencing any land disturbance activity on the site.

Checklist for Stormwater Report

B. Stormwater Checklist and Certification

The following checklist is intended to serve as a guide for applicants as to the elements that ordinarily need to be addressed in a complete Stormwater Report. The checklist is also intended to provide conservation commissions and other reviewing authorities with a summary of the components necessary for a comprehensive Stormwater Report that addresses the ten Stormwater Standards.

Note: Because stormwater requirements vary from project to project, it is possible that a complete Stormwater Report may not include information on some of the subjects specified in the Checklist. If it is determined that a specific item does not apply to the project under review, please note that the item is not applicable (N.A.) and provide the reasons for that determination.

A complete checklist must include the Certification set forth below signed by the Registered Professional Engineer who prepared the Stormwater Report.

Registered Professional Engineer's Certification

I have reviewed the Stormwater Report, including the soil evaluation, computations, Long-term Pollution Prevention Plan, the Construction Period Erosion and Sedimentation Control Plan (if included), the Long-term Post-Construction Operation and Maintenance Plan, the Illicit Discharge Compliance Statement (if included) and the plans showing the stormwater management system, and have determined that they have been prepared in accordance with the requirements of the Stormwater Management Standards as further elaborated by the Massachusetts Stormwater Handbook. I have also determined that the information presented in the Stormwater Checklist is accurate and that the information presented in the Stormwater Report accurately reflects conditions at the site as of the date of this permit application.

Registered Professional Engineer Block and Signature

COMMONWEALTH OF MASSACHUSETTS
EDWARD L. PESCE
CIVIL
NO. 32001
REGISTERED PROFESSIONAL ENGINEER

October 11, 2022

Signature and Date

Checklist

Project Type: Is the application for new development, redevelopment, or a mix of new and redevelopment?

☐ New development

☒ Redevelopment

☐ Mix of New Development and Redevelopment

Checklist for Stormwater Report

Checklist (continued)

LID Measures: Stormwater Standards require LID measures to be considered. Document what environmentally sensitive design and LID Techniques were considered during the planning and design of the project:

- ☐ No disturbance to any Wetland Resource Areas
- ☒ Site Design Practices (e.g. clustered development, reduced frontage setbacks)
- ☐ Reduced Impervious Area (Redevelopment Only)
- ☐ Minimizing disturbance to existing trees and shrubs
- ☐ LID Site Design Credit Requested:
  - ☐ Credit 1
  - ☐ Credit 2
  - ☐ Credit 3
- ☐ Use of “country drainage” versus curb and gutter conveyance and pipe
- ☒ Bioretention Cells (includes Rain Gardens)
- ☐ Constructed Stormwater Wetlands (includes Gravel Wetlands designs)
- ☐ Treebox Filter
- ☐ Water Quality Swale
- ☐ Grass Channel
- ☐ Green Roof
- ☐ Other (describe): ____________________

Standard 1: No New Untreated Discharges

- ☒ No new untreated discharges
- ☒ Outlets have been designed so there is no erosion or scour to wetlands and waters of the Commonwealth
- ☒ Supporting calculations specified in Volume 3 of the Massachusetts Stormwater Handbook included.

Checklist for Stormwater Report

Checklist (continued)

Standard 2: Peak Rate Attenuation

☐ Standard 2 waiver requested because the project is located in land subject to coastal storm flowage and stormwater discharge is to a wetland subject to coastal flooding.

☒ Evaluation provided to determine whether off-site flooding increases during the 100-year 24-hour storm.

☐ Calculations provided to show that post-development peak discharge rates do not exceed pre-development rates for the 2-year and 10-year 24-hour storms. If evaluation shows that off-site flooding increases during the 100-year 24-hour storm, calculations are also provided to show that post-development peak discharge rates do not exceed pre-development rates for the 100-year 24-hour storm.

Standard 3: Recharge

☒ Soil Analysis provided.

☒ Required Recharge Volume calculation provided.

☐ Required Recharge volume reduced through use of the LID site Design Credits.

☒ Sizing the infiltration, BMPs is based on the following method: Check the method used.

☒ Static ☐ Simple Dynamic ☐ Dynamic Field[1]

☒ Runoff from all impervious areas at the site discharging to the infiltration BMP.

☐ Runoff from all impervious areas at the site is *not* discharging to the infiltration BMP and calculations are provided showing that the drainage area contributing runoff to the infiltration BMPs is sufficient to generate the required recharge volume.

☒ Recharge BMPs have been sized to infiltrate the Required Recharge Volume.

☐ Recharge BMPs have been sized to infiltrate the Required Recharge Volume *only* to the maximum extent practicable for the following reason:

- ☐ Site is comprised solely of C and D soils and/or bedrock at the land surface
- ☐ M.G.L. c. 21E sites pursuant to 310 CMR 40.0000
- ☐ Solid Waste Landfill pursuant to 310 CMR 19.000
- ☒ Project is otherwise subject to Stormwater Management Standards only to the maximum extent practicable.

☒ Calculations showing that the infiltration BMPs will drain in 72 hours are provided.

☐ Property includes a M.G.L. c. 21E site or a solid waste landfill and a mounding analysis is included.

[1] 80% TSS removal is required prior to discharge to infiltration BMP if Dynamic Field method is used.

Checklist (continued)

Standard 3: Recharge (continued)

☒ The infiltration BMP is used to attenuate peak flows during storms greater than or equal to the 10-year 24-hour storm and separation to seasonal high groundwater is less than 4 feet and a mounding analysis is provided.

☒ Documentation is provided showing that infiltration BMPs do not adversely impact nearby wetland resource areas.

Standard 4: Water Quality

The Long-Term Pollution Prevention Plan typically includes the following:
- Good housekeeping practices;
- Provisions for storing materials and waste products inside or under cover;
- Vehicle washing controls;
- Requirements for routine inspections and maintenance of stormwater BMPs;
- Spill prevention and response plans;
- Provisions for maintenance of lawns, gardens, and other landscaped areas;
- Requirements for storage and use of fertilizers, herbicides, and pesticides;
- Pet waste management provisions;
- Provisions for operation and management of septic systems;
- Provisions for solid waste management;
- Snow disposal and plowing plans relative to Wetland Resource Areas;
- Winter Road Salt and/or Sand Use and Storage restrictions;
- Street sweeping schedules;
- Provisions for prevention of illicit discharges to the stormwater management system;
- Documentation that Stormwater BMPs are designed to provide for shutdown and containment in the event of a spill or discharges to or near critical areas or from LUHPPL;
- Training for staff or personnel involved with implementing Long-Term Pollution Prevention Plan;
- List of Emergency contacts for implementing Long-Term Pollution Prevention Plan.

☒ A Long-Term Pollution Prevention Plan is attached to Stormwater Report and is included as an attachment to the Wetlands Notice of Intent.

☐ Treatment BMPs subject to the 44% TSS removal pretreatment requirement and the one inch rule for calculating the water quality volume are included, and discharge:

- ☐ is within the Zone II or Interim Wellhead Protection Area
- ☐ is near or to other critical areas
- ☐ is within soils with a rapid infiltration rate (greater than 2.4 inches per hour)
- ☐ involves runoff from land uses with higher potential pollutant loads.

☐ The Required Water Quality Volume is reduced through use of the LID site Design Credits.

☒ Calculations documenting that the treatment train meets the 80% TSS removal requirement and, if applicable, the 44% TSS removal pretreatment requirement, are provided.

Checklist (continued)

Standard 4: Water Quality (continued)

☐ The BMP is sized (and calculations provided) based on:

- ☒ The ½" or 1" Water Quality Volume or
- ☐ The equivalent flow rate associated with the Water Quality Volume and documentation is provided showing that the BMP treats the required water quality volume.

☒ The applicant proposes to use proprietary BMPs, and documentation supporting use of proprietary BMP and proposed TSS removal rate is provided. This documentation may be in the form of the propriety BMP checklist found in Volume 2, Chapter 4 of the Massachusetts Stormwater Handbook and submitting copies of the TARP Report, STEP Report, and/or other third party studies verifying performance of the proprietary BMPs.

☐ A TMDL exists that indicates a need to reduce pollutants other than TSS and documentation showing that the BMPs selected are consistent with the TMDL is provided.

Standard 5: Land Uses With Higher Potential Pollutant Loads (LUHPPLs)

☐ The NPDES Multi-Sector General Permit covers the land use and the Stormwater Pollution Prevention Plan (SWPPP) has been included with the Stormwater Report.

☐ The NPDES Multi-Sector General Permit covers the land use and the SWPPP will be submitted ***prior to*** the discharge of stormwater to the post-construction stormwater BMPs.

☐ The NPDES Multi-Sector General Permit does ***not*** cover the land use.

☐ LUHPPLs are located at the site and industry specific source control and pollution prevention measures have been proposed to reduce or eliminate the exposure of LUHPPLs to rain, snow, snow melt and runoff, and been included in the long term Pollution Prevention Plan.

☐ All exposure has been eliminated.

☐ All exposure has ***not*** been eliminated and all BMPs selected are on MassDEP LUHPPL list.

☐ The LUHPPL has the potential to generate runoff with moderate to higher concentrations of oil and grease (e.g. all parking lots with >1000 vehicle trips per day) and the treatment train includes an oil grit separator, a filtering bioretention area, a sand filter or equivalent.

Standard 6: Critical Areas

☐ The discharge is near or to a critical area and the treatment train includes only BMPs that MassDEP has approved for stormwater discharges to or near that particular class of critical area.

☐ Critical areas and BMPs are identified in the Stormwater Report.

Checklist (continued)

Standard 7: Redevelopments and Other Projects Subject to the Standards only to the maximum extent practicable

☒ The project is subject to the Stormwater Management Standards only to the maximum Extent Practicable as a:

- ☐ Limited Project
- ☐ Small Residential Projects: 5-9 single family houses or 5-9 units in a multi-family development provided there is no discharge that may potentially affect a critical area.
- ☐ Small Residential Projects: 2-4 single family houses or 2-4 units in a multi-family development with a discharge to a critical area
- ☐ Marina and/or boatyard provided the hull painting, service and maintenance areas are protected from exposure to rain, snow, snow melt and runoff
- ☐ Bike Path and/or Foot Path
- ☒ Redevelopment Project
- ☐ Redevelopment portion of mix of new and redevelopment.

☐ Certain standards are not fully met (Standard No. 1, 8, 9, and 10 must always be fully met) and an explanation of why these standards are not met is contained in the Stormwater Report.

☐ The project involves redevelopment and a description of all measures that have been taken to improve existing conditions is provided in the Stormwater Report. The redevelopment checklist found in Volume 2 Chapter 3 of the Massachusetts Stormwater Handbook may be used to document that the proposed stormwater management system (a) complies with Standards 2, 3 and the pretreatment and structural BMP requirements of Standards 4-6 to the maximum extent practicable and (b) improves existing conditions.

Standard 8: Construction Period Pollution Prevention and Erosion and Sedimentation Control

A Construction Period Pollution Prevention and Erosion and Sedimentation Control Plan must include the following information:

- Narrative;
- Construction Period Operation and Maintenance Plan;
- Names of Persons or Entity Responsible for Plan Compliance;
- Construction Period Pollution Prevention Measures;
- Erosion and Sedimentation Control Plan Drawings;
- Detail drawings and specifications for erosion control BMPs, including sizing calculations;
- Vegetation Planning;
- Site Development Plan;
- Construction Sequencing Plan;
- Sequencing of Erosion and Sedimentation Controls;
- Operation and Maintenance of Erosion and Sedimentation Controls;
- Inspection Schedule;
- Maintenance Schedule;
- Inspection and Maintenance Log Form.

☒ A Construction Period Pollution Prevention and Erosion and Sedimentation Control Plan containing the information set forth above has been included in the Stormwater Report.

Checklist (continued)

Standard 8: Construction Period Pollution Prevention and Erosion and Sedimentation Control (continued)

☐ The project is highly complex and information is included in the Stormwater Report that explains why it is not possible to submit the Construction Period Pollution Prevention and Erosion and Sedimentation Control Plan with the application. A Construction Period Pollution Prevention and Erosion and Sedimentation Control has ***not*** been included in the Stormwater Report but will be submitted ***before*** land disturbance begins.

☐ The project is ***not*** covered by a NPDES Construction General Permit.

☐ The project is covered by a NPDES Construction General Permit and a copy of the SWPPP is in the Stormwater Report.

☐ The project is covered by a NPDES Construction General Permit but no SWPPP been submitted. The SWPPP will be submitted BEFORE land disturbance begins.

Standard 9: Operation and Maintenance Plan

☒ The Post Construction Operation and Maintenance Plan is included in the Stormwater Report and includes the following information:

- ☒ Name of the stormwater management system owners;
- ☒ Party responsible for operation and maintenance;
- ☒ Schedule for implementation of routine and non-routine maintenance tasks;
- ☒ Plan showing the location of all stormwater BMPs maintenance access areas;
- ☐ Description and delineation of public safety features;
- ☐ Estimated operation and maintenance budget; and
- ☒ Operation and Maintenance Log Form.

☐ The responsible party is ***not*** the owner of the parcel where the BMP is located and the Stormwater Report includes the following submissions:

- ☐ A copy of the legal instrument (deed, homeowner's association, utility trust or other legal entity) that establishes the terms of and legal responsibility for the operation and maintenance of the project site stormwater BMPs;
- ☐ A plan and easement deed that allows site access for the legal entity to operate and maintain BMP functions.

Standard 10: Prohibition of Illicit Discharges

☐ The Long-Term Pollution Prevention Plan includes measures to prevent illicit discharges;

☐ An Illicit Discharge Compliance Statement is attached;

☒ NO Illicit Discharge Compliance Statement is attached but will be submitted ***prior to*** the discharge of any stormwater to post-construction BMPs.