



PRIMARY PLAT DRAINAGE CALCULATIONS

BSTP DEVELOPMENT SUBDIVISION

2490 N. Morton Street

Franklin, Indiana

Prepared by:

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Prepared on: May 30, 2018

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1. PROJECT DESCRIPTION

Kimley-Horn and Associates, Inc. serves as the engineering consultant for Bluestone Single Tenant Properties, LLC. Bluestone intends to develop the 6.42-acre parcel located at 2940 N Morton Street in the City of Franklin, Indiana. The primary plat serves to combine two existing lots at this location and splitting into 3 lots for commercial development. Lots 1 and 2 will be developed with 2 commercial buildings of approximately 7,500 square feet and 22,500 square feet with associated parking lots, utilities and detention. Detention will be provided for all three parcels with an allocation for the future development of Lot 3.

This report evaluates the pre and post development runoff characteristics of the development and addresses the stormwater requirements of the City of Franklin. The analysis of the proposed stormwater detention basin was completed with the assistance of HydroCAD Version 9.10.

1.1. Pre Development Conditions

The existing site is currently developed with 3 commercial buildings, totaling 238,337 square feet in site. The existing buildings will be demolished as part of this development. The site receives a small amount of offsite flow from the N Morton Street right of way to the east and Commerce Road right of way to the south. The site ultimately discharges to North Morton Street and to the northwest and southwest to the adjacent properties. The existing Drainage Area Map is located in **Exhibit 3** of this report.

Per the FEMA Map Panel 18081C0139D, dated August 2, 2007, the site is located in Zone X, or area of minimal flood hazard. See **Exhibit 1** for the FEMA map.

Per the Natural Resources Conservation Service, the majority of the site consists of Brookston silty clay and Crosby silt loam. Its hydrologic soil group is D. The NRCS soils map can be seen in **Exhibit 2**.

1.2. Post Development Conditions

The proposed site is approximately 6.42 acres which is proposed to be developed into 3 commercial properties. At this time, it is proposed for 1 – 7,500-square foot building and 1-22,500 square foot building to be constructed during the initial phase. A detention pond will be provided to meet the City's drainage standards for all 3 lots, assuming a percent impervious of the lot to be constructed at a later date. The stormwater runoff for the site will be conveyed through on site storm sewer system which will discharge into the pond for the overall development. The pond will then discharge into the existing drainage ditch located along the eastern property line at North Morton Street. Additional onsite area will sheet flow offsite to the north, west and east. The proposed drainage area map is included in **Exhibit 3** of this report.

2. DETENTION POND DESIGN SUMMARY

2.1. City of Franklin Detention Requirements

Per Section 6.19 of the City of Franklin Subdivision Control Ordinance, to achieve water quality standards, the release rate from the site shall be sized to restrict the peak discharge rate of the 10-year post development storm to the peak 2-year pre-development release rate. The pond shall also be sized to restrict the peak 100-year post development rate to the peak 10-year pre-development rate. For the proposed site, it has been assumed that the total site will be no greater than 85% impervious and an outlet control structure will be used to meet the detention requirements.

2.2. Rate Attenuation Summary

The maximum allowable release rates for the 2-year, 10-year, and 100-year storm were calculated per the City of Franklin Subdivision Ordinance using HydroCAD Version 9.10. The entire site in pre-development and post-development was looked at as a composite discharge. Therefore, Tables 1 and 2, provide the total release rates for the site. Detailed calculations have been provided in **Exhibits 4 and 5** and a summary of the maximum allowable and post development release rates is provided below.

Table 1: Pre-Development Release Rates (cfs) (Drainage Area 1)						
	<i>Storm Duration</i>					
<i>Return Period</i>	<i>1 hour</i>	<i>2 hour</i>	<i>3 hour</i>	<i>6 hour</i>	<i>12 hour</i>	<i>24 hours</i>
2-year Storm	2.82	4.13	4.89	6.30	7.88	9.67
10-year Storm	5.46	7.52	8.71	10.88	13.28	15.90

Per City of Franklin code, the peak 10-year post development release rate shall meet the peak 2-year pre-development release rate, or 9.67 cfs. Per City of Franklin code, the peak 100-year post development release rate shall meet the peak 10-year pre-development release rate, or 15.90 cfs. An outlet control structure at the downstream side of the pond will release the following flows:

Table 2: Post Development Release Rates (cfs)						
	<i>Storm Duration</i>					
<i>Return Period</i>	<i>1 hour</i>	<i>2 hour</i>	<i>3 hour</i>	<i>6 hour</i>	<i>12 hour</i>	<i>24 hours</i>
10-year Storm	4.91	5.98	6.53	7.45	8.45	9.42
100-year Storm	7.49	8.93	8.64	10.89	13.20	15.62

Based on the above table, the peak 10-year release rate for the entire site is less than the peak 2-year pre-development release rate and the peak 100-year release rate for the entire site is less than the peak 10-year pre-development release rate. Therefore, the proposed stormwater pond and associated outlet control structure achieves the rate attenuation requirements set forth in the City of Franklin Subdivision Ordinance.

2.3. Water Quality Requirements

In addition to water quantity, the site must also account for water quality onsite. The ponds shall be designed to detain, for over 24 hours after the peak runoff from a 24-hour storm, at least 20% of the runoff from either 1.25-inch rainfall depth storm or 0.5-inch direct runoff, whichever is greater. The minimum water quality orifice shall be two (2) inches in diameter. The pond will also be designed to include an emergency spillway that will convey 1.25 the peak discharge resulting from the 100-year post-development design storm.

2.4. Water Quality Calculations Summary

Water quality has been provided in accordance with City of Franklin requirements to provide the necessary volume. Wet detention will provide the following:

1.25" Rainfall Event Volume =

$$V = 0.512 \text{ ac-ft (refer to HydroCAD Calculations)}$$

0.5" Direct Runoff Volume =

$$V = 6.42\text{-ac} * (0.5"/12) = 0.268 \text{ ac-ft.}$$

Required volume needed (20% of greater): **WQ_v = 20% * 0.512 = 0.102 ac-ft**

Wet detention will be 0.5' feet with a bottom of pond elevation of 758.60 with the outlet control structure orifice located at 759.10. This provides 0.104 ac-ft of storage, meeting the City requirements. This water quality volume is provided for all three lots, with assumed 85% impervious area.

The emergency spillway will be designed with separate calculations provided at the secondary plat and construction plan submittal.

3. STORM SEWER DESIGN SUMMARY

3.1. Storm Sewer Design

The storm sewer design will be designed to accommodate the 10-year storm event using the Rational Method. Please note that the separate storm sewer calculations will be submitted for the overall development with the secondary plat and construction plan submittal.



Exhibit 1 – FEMA Map Panel



National Flood Hazard Layer FIRMMette



39°31'11.89"N



0 250 500 1,000 1,500 2,000 Feet 1:6,000 39°30'44.13"N 86°47'55"W

Legend

SEE FIS REPORT FOR DETAILED LEGEND AND INDEX MAP FOR FIRM PANEL LAYOUT

SPECIAL FLOOD HAZARD AREAS		Without Base Flood Elevation (BFE) Zone A, V, A99
		With BFE or Depth
		Regulatory Floodway Zone AE, AO, AH, VE, AR
OTHER AREAS OF FLOOD HAZARD		0.2% Annual Chance Flood Hazard, Areas of 1% annual chance flood with average depth less than one foot or with drainage areas of less than one square mile Zone X
		Future Conditions 1% Annual Chance Flood Hazard Zone X
		Area with Reduced Flood Risk due to Levee. See Notes. Zone X
		Area with Flood Risk due to Levee Zone D
OTHER AREAS		NO SCREEN Area of Minimal Flood Hazard Zone X
		Effective LOMRs
		Area of Undetermined Flood Hazard Zone D
GENERAL STRUCTURES		Channel, Culvert, or Storm Sewer
		Levee, Dike, or Floodwall
OTHER FEATURES		20.2 Cross Sections with 1% Annual Chance
		17.5 Water Surface Elevation
		Coastal Transect
		Base Flood Elevation Line (BFE)
		Limit of Study
		Jurisdiction Boundary
		Coastal Transect Baseline
MAP PANELS		Digital Data Available
		No Digital Data Available
		Unmapped



This map complies with FEMA's standards for the use of digital flood maps if it is not void as described below. The base map shown complies with FEMA's base map accuracy standards

The flood hazard information is derived directly from the authoritative NFHL web services provided by FEMA. This map was exported on 5/25/2018 at 1:37:25 PM and does not reflect changes or amendments subsequent to this date and time. The NFHL and effective information may change or become superseded by new data over time.

This map image is void if the one or more of the following map elements do not appear: base map imagery, flood zone labels, legend, scale bar, map creation date, community identifiers, FIRM panel number, and FIRM effective date. Map images for unmapped and unmodernized areas cannot be used for regulatory purposes.



Exhibit 2 – Web Soil Survey



Hydrologic Soil Group—Johnson County, Indiana



Soil Map may not be valid at this scale.

Map Scale: 1:1,450 if printed on A landscape (11" x 8.5") sheet.

0 20 40 80 120 Meters

0 50 100 200 300 Feet

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 16N WGS84



**Natural Resources
Conservation Service**









Web Soil Survey
National Cooperative Soil Survey

5/24/2018
Page 1 of 4

MAP LEGEND**Area of Interest (AOI)**
 Area of Interest (AOI)
Soils**Soil Rating Polygons**





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


Soil Rating Lines






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


Soil Rating Points

-  A
-  A/D
-  B
-  B/D

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

Water Features
 Streams and Canals
Transportation

-  Rails
-  Interstate Highways
-  US Routes
-  Major Roads
-  Local Roads

Background
 Aerial Photography
MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:15,800.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Johnson County, Indiana
Survey Area Data: Version 25, Oct 2, 2017

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

Date(s) aerial images were photographed: Sep 24, 2014—Mar 20, 2017

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Hydrologic Soil Group

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
Br	Brookston silty clay loam, 0 to 2 percent slopes	B/D	5.6	67.4%
CrA	Crosby silt loam, fine-loamy subsoil, 0 to 2 percent slopes	C/D	2.7	32.6%
Totals for Area of Interest			8.3	100.0%

Description

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

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

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

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

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

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

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

Rating Options

Aggregation Method: Dominant Condition

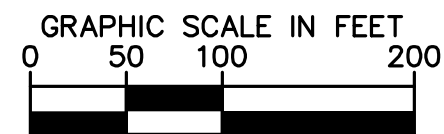
Component Percent Cutoff: None Specified



Tie-break Rule: Higher



Exhibit 3 – Drainage Area Maps





LEGEND	
DRAINAGE AREA	 
TOTAL DRAINAGE AREA:	6.82 AC

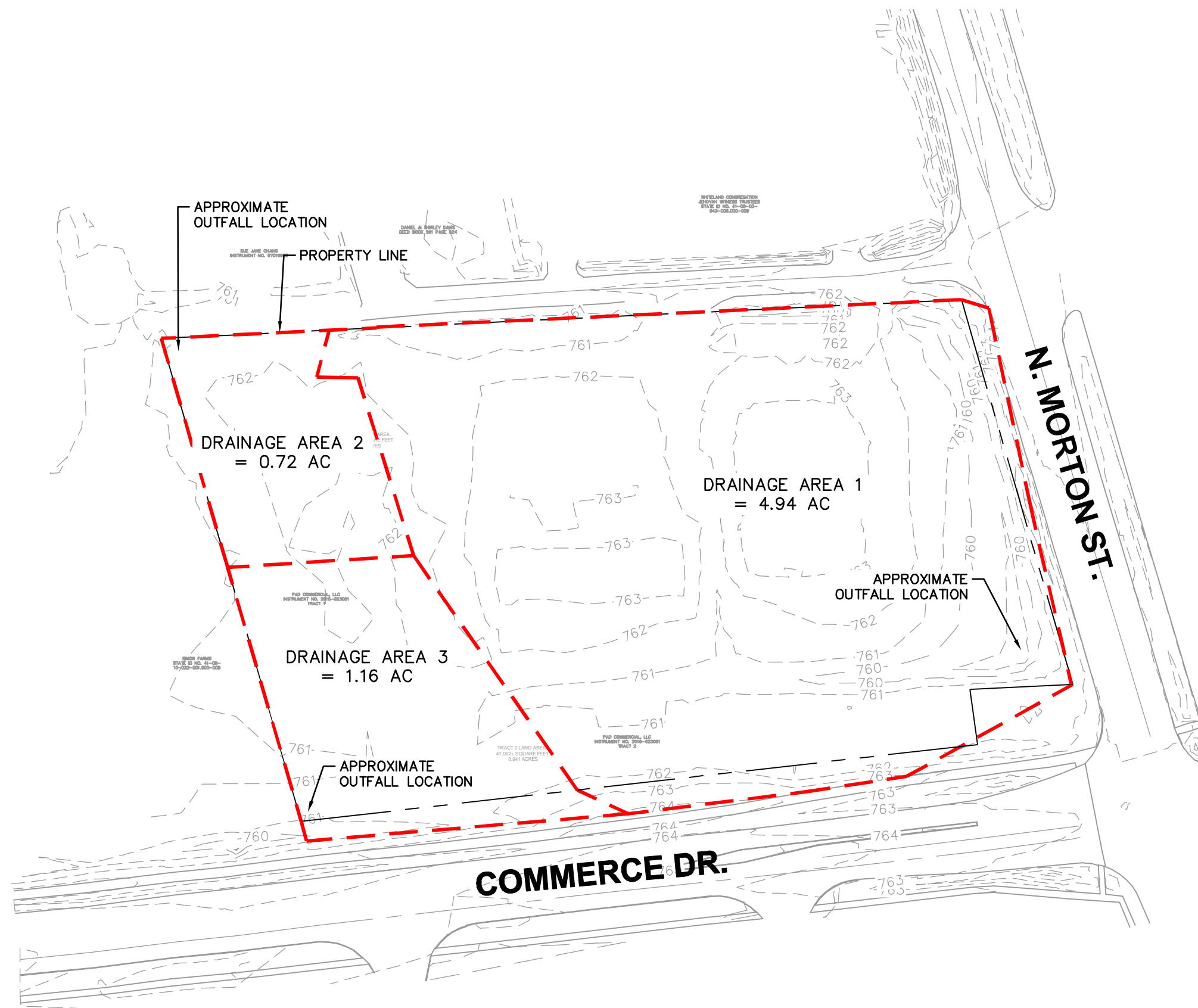




Exhibit 4 – Pre Development HydroCAD Model



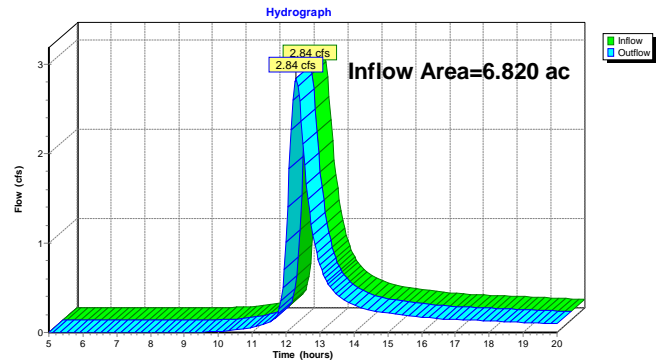
Summary for Reach 3R: Total Existing

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

Inflow Area = 6.820 ac, 37.39% Impervious, Inflow Depth > 0.50" for 2-year, 1-hour event
 Inflow = 2.84 cfs @ 12.29 hrs, Volume= 0.284 af
 Outflow = 2.84 cfs @ 12.29 hrs, Volume= 0.284 af, Atten= 0%, Lag= 0.0 min

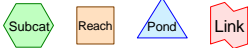
Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Reach 3R: Total Existing



3R

Total Existing



Routing Diagram for 2018-0530 Pre Development Calculations
 Prepared by Kimley-Horn and Associates, Printed 5/31/2018
 HydroCAD® 10.00-15 s/n 08910 © 2015 HydroCAD Software Solutions LLC

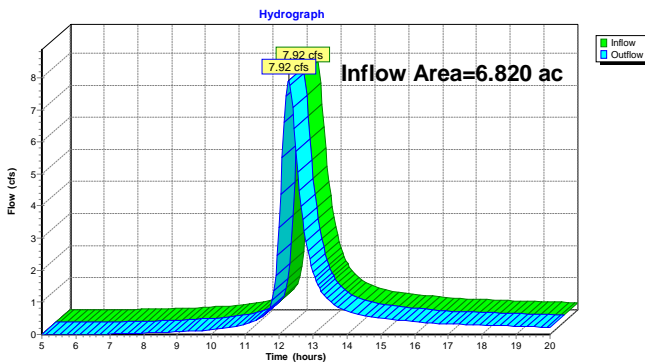
Summary for Reach 3R: Total Existing

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

Inflow Area = 6.820 ac, 37.39% Impervious, Inflow Depth > 1.39" for 2-year, 12-hour event
 Inflow = 7.92 cfs @ 12.28 hrs, Volume= 0.788 af
 Outflow = 7.92 cfs @ 12.28 hrs, Volume= 0.788 af, Atten= 0%, Lag= 0.0 min

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

Reach 3R: Total Existing



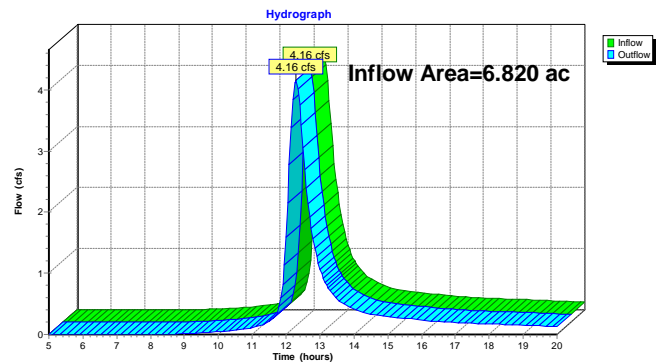
Summary for Reach 3R: Total Existing

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

Inflow Area = 6.820 ac, 37.39% Impervious, Inflow Depth > 0.72" for 2-year, 2-hour event
 Inflow = 4.16 cfs @ 12.29 hrs, Volume= 0.412 af
 Outflow = 4.16 cfs @ 12.29 hrs, Volume= 0.412 af, Atten= 0%, Lag= 0.0 min

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

Reach 3R: Total Existing

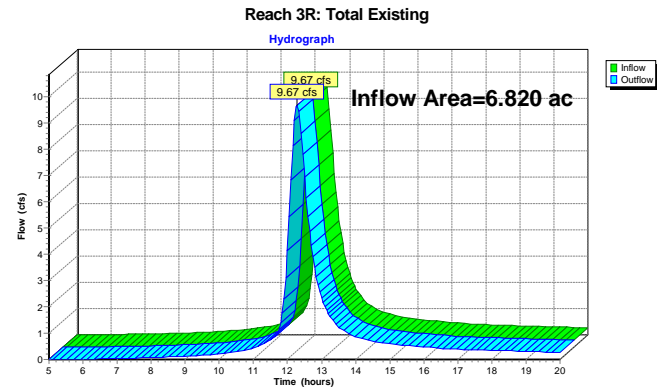


Summary for Reach 3R: Total Existing

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

Inflow Area = 6.820 ac, 37.39% Impervious, Inflow Depth > 1.70" for 2-year, 24-hour event
Inflow = 9.67 cfs @ 12.28 hrs, Volume= 0.967 af
Outflow = 9.67 cfs @ 12.28 hrs, Volume= 0.967 af, Atten= 0%, Lag= 0.0 min

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

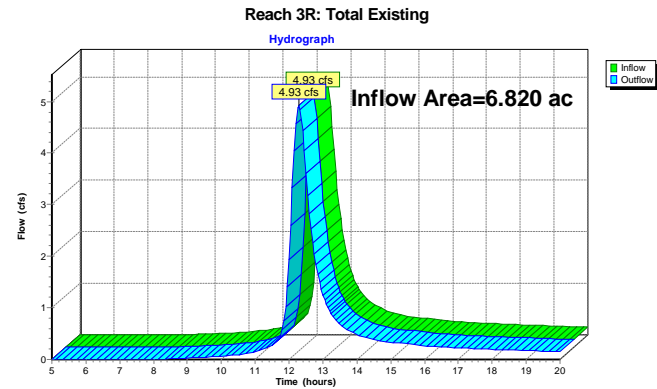


Summary for Reach 3R: Total Existing

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

Inflow Area = 6.820 ac, 37.39% Impervious, Inflow Depth > 0.86" for 2-year, 3-hour event
Inflow = 4.93 cfs @ 12.28 hrs, Volume= 0.488 af
Outflow = 4.93 cfs @ 12.28 hrs, Volume= 0.488 af, Atten= 0%, Lag= 0.0 min

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

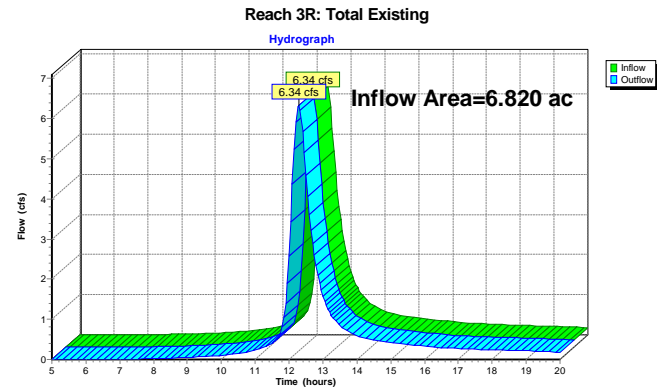


Summary for Reach 3R: Total Existing

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

Inflow Area = 6.820 ac, 37.39% Impervious, Inflow Depth > 1.11" for 2-year, 6-hour event
Inflow = 6.34 cfs @ 12.28 hrs, Volume= 0.628 af
Outflow = 6.34 cfs @ 12.28 hrs, Volume= 0.628 af, Atten= 0%, Lag= 0.0 min

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

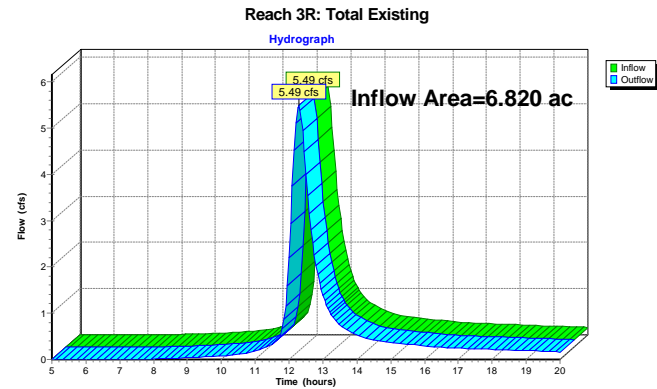


Summary for Reach 3R: Total Existing

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

Inflow Area = 6.820 ac, 37.39% Impervious, Inflow Depth > 0.96" for 10-year, 1-hour event
Inflow = 5.49 cfs @ 12.28 hrs, Volume= 0.544 af
Outflow = 5.49 cfs @ 12.28 hrs, Volume= 0.544 af, Atten= 0%, Lag= 0.0 min

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

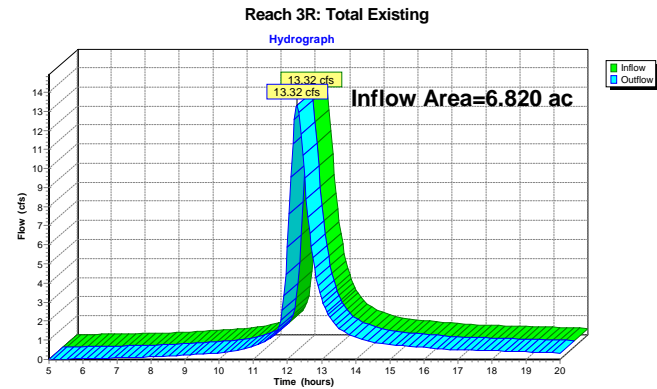


Summary for Reach 3R: Total Existing

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

Inflow Area = 6.820 ac, 37.39% Impervious, Inflow Depth > 2.37" for 10-year, 12-hour event
Inflow = 13.32 cfs @ 12.27 hrs, Volume= 1.347 af
Outflow = 13.32 cfs @ 12.27 hrs, Volume= 1.347 af, Atten= 0%, Lag= 0.0 min

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

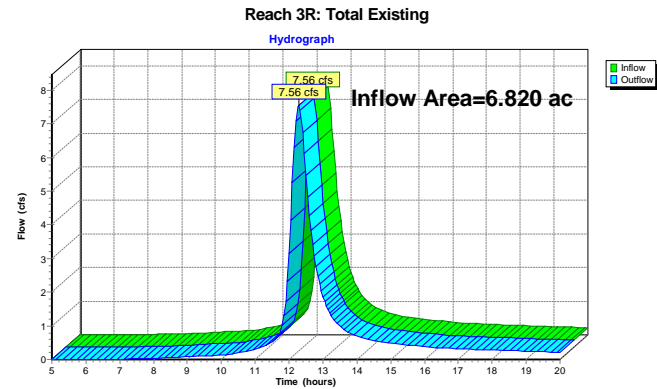


Summary for Reach 3R: Total Existing

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

Inflow Area = 6.820 ac, 37.39% Impervious, Inflow Depth > 1.32" for 10-year, 2-hour event
Inflow = 7.56 cfs @ 12.28 hrs, Volume= 0.751 af
Outflow = 7.56 cfs @ 12.28 hrs, Volume= 0.751 af, Atten= 0%, Lag= 0.0 min

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

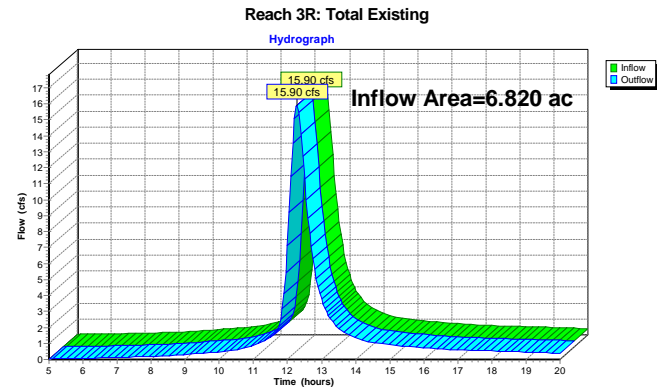


Summary for Reach 3R: Total Existing

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

Inflow Area = 6.820 ac, 37.39% Impervious, Inflow Depth > 2.85" for 10-year, 24-hour event
Inflow = 15.90 cfs @ 12.27 hrs, Volume= 1.621 af
Outflow = 15.90 cfs @ 12.27 hrs, Volume= 1.621 af, Atten= 0%, Lag= 0.0 min

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

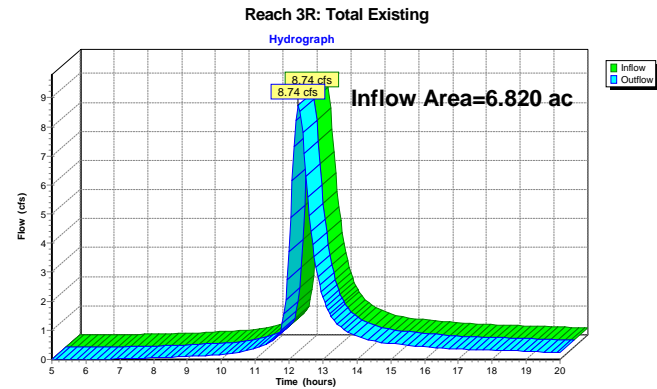


Summary for Reach 3R: Total Existing

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

Inflow Area = 6.820 ac, 37.39% Impervious, Inflow Depth > 1.54" for 10-year, 3-hour event
Inflow = 8.74 cfs @ 12.28 hrs, Volume= 0.873 af
Outflow = 8.74 cfs @ 12.28 hrs, Volume= 0.873 af, Atten= 0%, Lag= 0.0 min

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

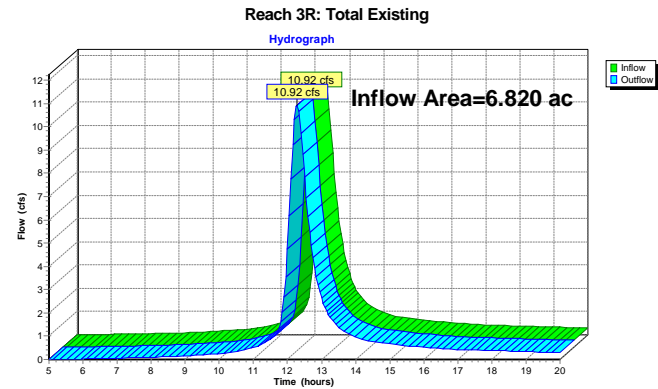


Summary for Reach 3R: Total Existing

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

Inflow Area = 6.820 ac, 37.39% Impervious, Inflow Depth > 1.93" for 10-year, 6-hour event
Inflow = 10.92 cfs @ 12.28 hrs, Volume= 1.097 af
Outflow = 10.92 cfs @ 12.28 hrs, Volume= 1.097 af, Atten= 0%, Lag= 0.0 min

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

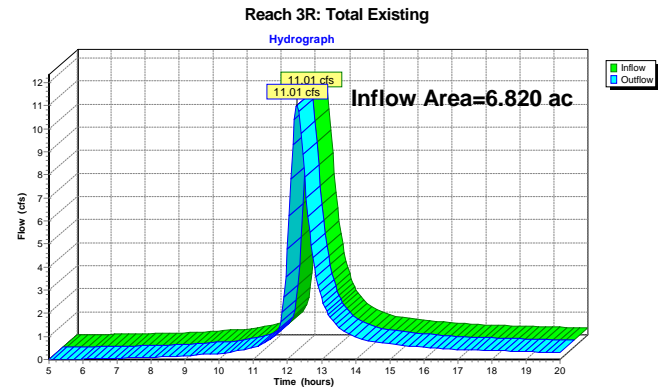


Summary for Reach 3R: Total Existing

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

Inflow Area = 6.820 ac, 37.39% Impervious, Inflow Depth > 1.95" for 100-year, 1-hour event
Inflow = 11.01 cfs @ 12.28 hrs, Volume= 1.107 af
Outflow = 11.01 cfs @ 12.28 hrs, Volume= 1.107 af, Atten= 0%, Lag= 0.0 min

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

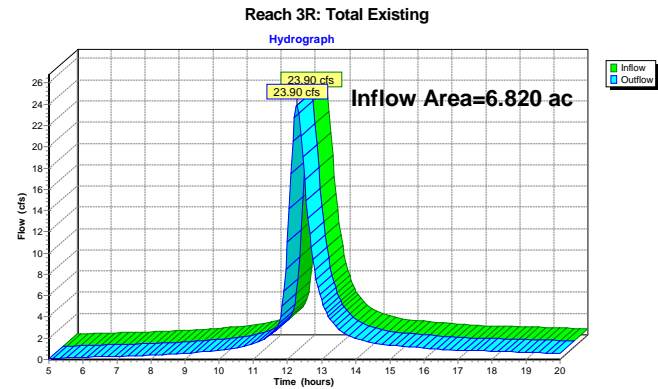


Summary for Reach 3R: Total Existing

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

Inflow Area = 6.820 ac, 37.39% Impervious, Inflow Depth > 4.37" for 100-year, 12-hour event
Inflow = 23.90 cfs @ 12.27 hrs, Volume= 2.484 af
Outflow = 23.90 cfs @ 12.27 hrs, Volume= 2.484 af, Atten= 0%, Lag= 0.0 min

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

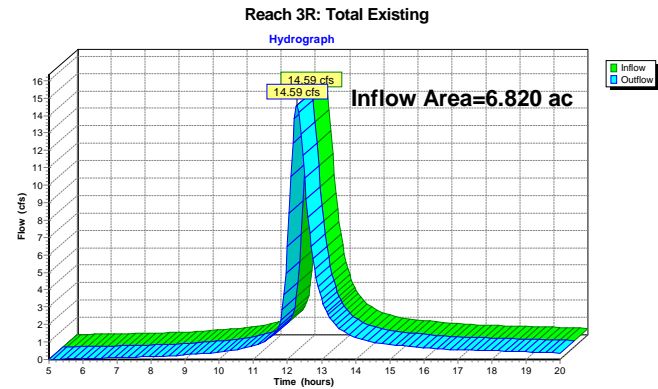


Summary for Reach 3R: Total Existing

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

Inflow Area = 6.820 ac, 37.39% Impervious, Inflow Depth > 2.61" for 100-year, 2-hour event
Inflow = 14.59 cfs @ 12.27 hrs, Volume= 1.481 af
Outflow = 14.59 cfs @ 12.27 hrs, Volume= 1.481 af, Atten= 0%, Lag= 0.0 min

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

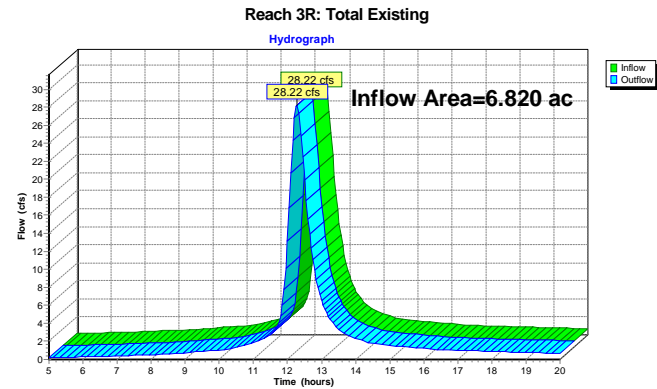


Summary for Reach 3R: Total Existing

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

Inflow Area = 6.820 ac, 37.39% Impervious, Inflow Depth > 5.20" for 100-year, 24-hour event
Inflow = 28.22 cfs @ 12.27 hrs, Volume= 2.957 af
Outflow = 28.22 cfs @ 12.27 hrs, Volume= 2.957 af, Atten= 0%, Lag= 0.0 min

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

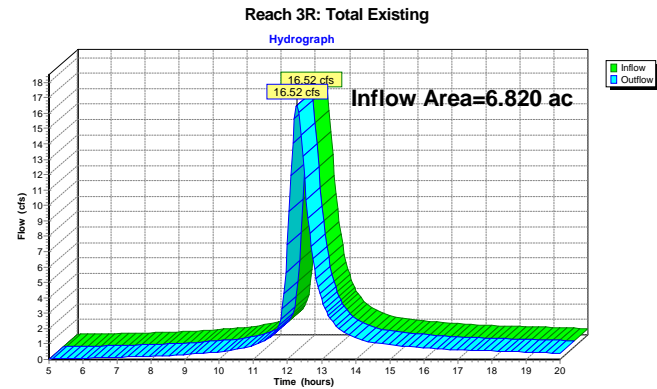


Summary for Reach 3R: Total Existing

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

Inflow Area = 6.820 ac, 37.39% Impervious, Inflow Depth > 2.97" for 100-year, 3-hour event
Inflow = 16.52 cfs @ 12.27 hrs, Volume= 1.686 af
Outflow = 16.52 cfs @ 12.27 hrs, Volume= 1.686 af, Atten= 0%, Lag= 0.0 min

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



Summary for Reach 3R: Total Existing

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

Inflow Area = 6.820 ac, 37.39% Impervious, Inflow Depth > 3.63" for 100-year, 6-hour event
Inflow = 20.05 cfs @ 12.27 hrs, Volume= 2.066 af
Outflow = 20.05 cfs @ 12.27 hrs, Volume= 2.066 af, Atten= 0%, Lag= 0.0 min

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

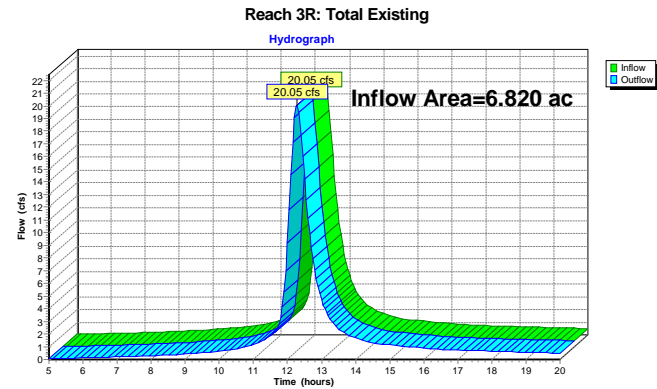




Exhibit 5 – Post Development HydroCAD Model



2018-0530 Post Development Calculations

Prepared by Kimley-Horn and Associates

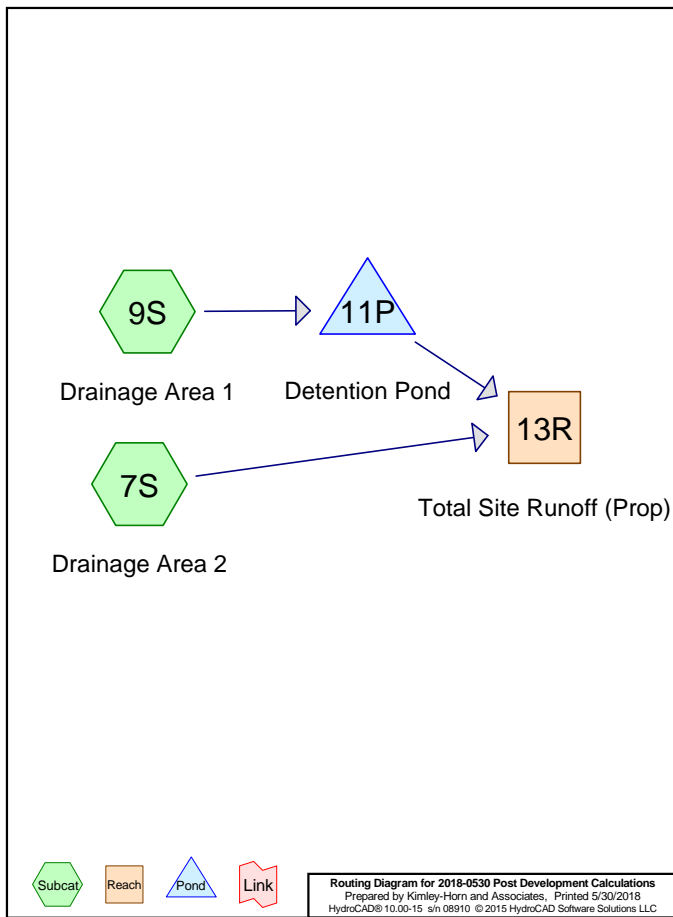
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Area Listing (selected nodes)

Area (acres)	CN	Description (subcatchment-numbers)
1.554	84	50-75% Grass cover, Fair, HSG D (7S, 9S)
5.270	98	Paved parking, HSG D (9S)
6.824	95	TOTAL AREA

**2018-0530 Post Development Calculations**

Prepared by Kimley-Horn and Associates

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Soil Listing (selected nodes)

Area (acres)	Soil Group	Subcatchment Numbers
0.000	HSG A	
0.000	HSG B	
0.000	HSG C	
6.824	HSG D	7S, 9S
0.000	Other	
6.824		TOTAL AREA

2018-0530 Post Development Calculations

Prepared by Kimley-Horn and Associates

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Type II 24-hr 1.25" Storm Rainfall=1.25"

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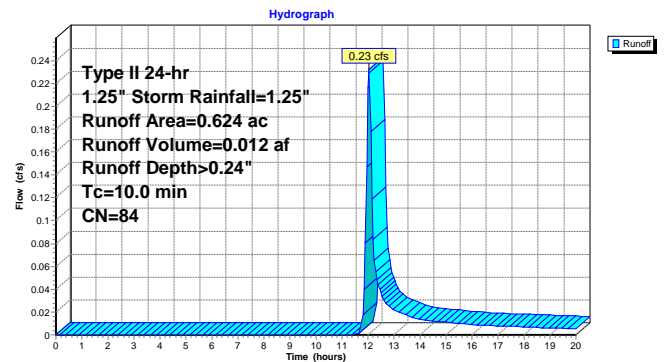
Summary for Subcatchment 7S: Drainage Area 2

Runoff = 0.23 cfs @ 12.04 hrs, Volume= 0.012 af, Depth> 0.24"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-20.00 hrs, dt= 0.05 hrs
Type II 24-hr 1.25" Storm Rainfall=1.25"

Area (ac)	CN	Description
0.624	84	50-75% Grass cover, Fair, HSG D
0.624		100.00% Pervious Area

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

Subcatchment 7S: Drainage Area 2

Summary for Subcatchment 9S: Drainage Area 1

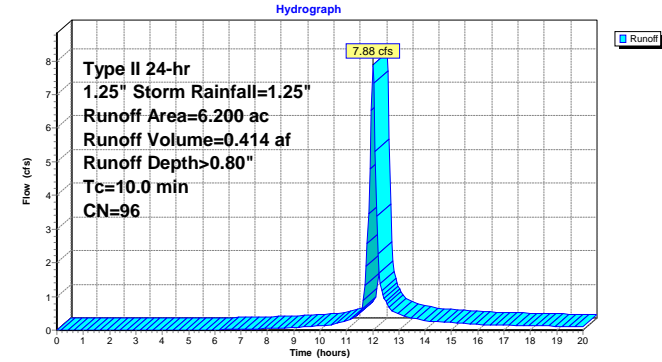
Runoff = 7.88 cfs @ 12.01 hrs, Volume= 0.414 af, Depth> 0.80"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-20.00 hrs, dt= 0.05 hrs
 Type II 24-hr 1.25" Storm Rainfall=1.25"

Area (ac)	CN	Description
5.270	98	Paved parking, HSG D
0.930	84	50-75% Grass cover, Fair, HSG D
6.200	96	Weighted Average
0.930		15.00% Pervious Area
5.270		85.00% Impervious Area

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

Subcatchment 9S: Drainage Area 1



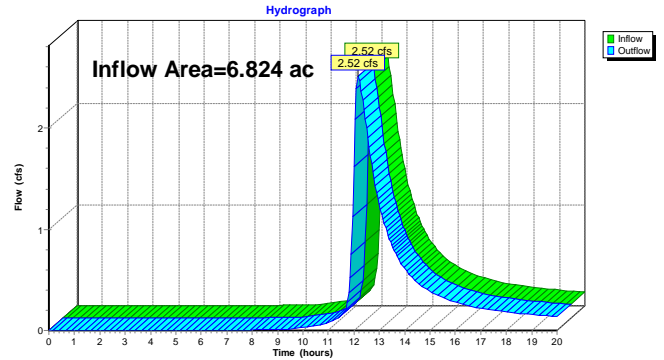
Summary for Reach 13R: Total Site Runoff (Prop)

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

Inflow Area = 6.824 ac, 77.23% Impervious, Inflow Depth > 0.69" for 1.25" Storm event
 Inflow = 2.52 cfs @ 12.17 hrs, Volume= 0.391 af
 Outflow = 2.52 cfs @ 12.17 hrs, Volume= 0.391 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-20.00 hrs, dt= 0.05 hrs

Reach 13R: Total Site Runoff (Prop)



Summary for Pond 11P: Detention Pond

Inflow Area = 6.200 ac, 85.00% Impervious, Inflow Depth > 0.80" for 1.25" Storm event
 Inflow = 7.88 cfs @ 12.01 hrs, Volume= 0.414 af
 Outflow = 2.42 cfs @ 12.20 hrs, Volume= 0.379 af, Atten= 69%, Lag= 11.3 min
 Primary = 2.42 cfs @ 12.20 hrs, Volume= 0.379 af

Routing by Stor-Ind method, Time Span= 0.00-20.00 hrs, dt= 0.05 hrs
 Peak Elev= 759.89' @ 12.20 hrs Surf.Area= 10,827 sf Storage= 7,999 cf

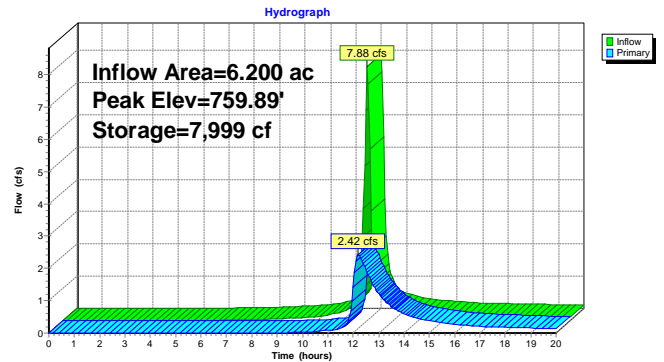
Plug-Flow detention time= 90.8 min calculated for 0.378 af (91% of inflow)
 Center-of-Mass det. time= 60.9 min (829.7 - 768.8)

Volume	Invert	Avail.Storage	Storage Description
#1	759.10'	71,910 cf	Custom Stage Data (Prismatic) Listed below (Recalc)
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
759.10	9,347	0	0
760.10	11,214	10,281	10,281
761.10	13,207	12,211	22,491
762.10	15,327	14,267	36,758
763.10	17,551	16,439	53,197
764.10	19,875	18,713	71,910

Device	Routing	Invert	Outlet Devices
#1	Primary	759.10'	14.5" Vert. Orifice/Grate C= 0.600
#2	Primary	761.75'	12.0" Vert. Orifice/Grate C= 0.600

Primary OutFlow Max=2.42 cfs @ 12.20 hrs HW=759.89' (Free Discharge)
 1=Orifice/Grate (Orifice Controls 2.42 cfs @ 3.03 fps)
 2=Orifice/Grate (Controls 0.00 cfs)

Pond 11P: Detention Pond



Summary for Subcatchment 7S: Drainage Area 2

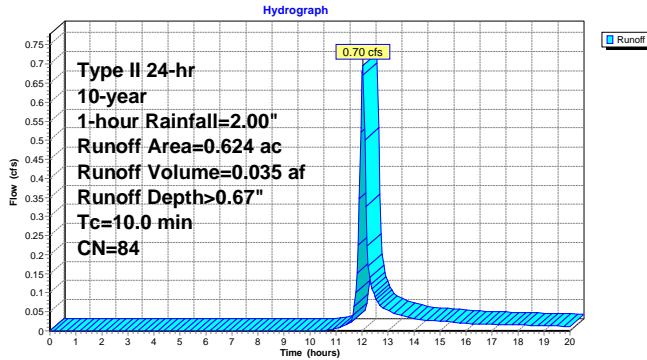
Runoff = 0.70 cfs @ 12.02 hrs, Volume= 0.035 af, Depth> 0.67"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-20.00 hrs, dt= 0.05 hrs
 Type II 24-hr 10-year, 1-hour Rainfall=2.00"

Area (ac)	CN	Description
0.624	84	50-75% Grass cover, Fair, HSG D
0.624		100.00% Pervious Area

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

Subcatchment 7S: Drainage Area 2



Summary for Subcatchment 9S: Drainage Area 1

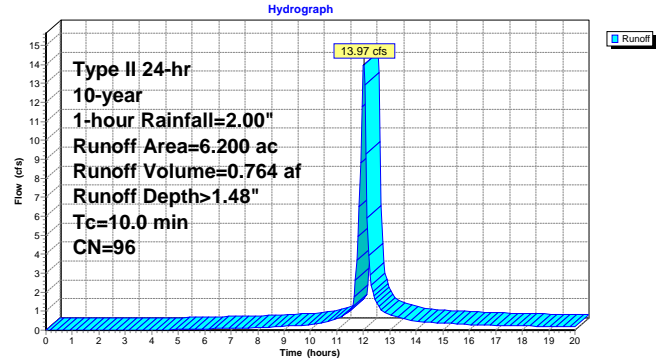
Runoff = 13.97 cfs @ 12.01 hrs, Volume= 0.764 af, Depth> 1.48"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-20.00 hrs, dt= 0.05 hrs
 Type II 24-hr 10-year, 1-hour Rainfall=2.00"

Area (ac)	CN	Description
5.270	98	Paved parking, HSG D
0.930	84	50-75% Grass cover, Fair, HSG D
6.200	96	Weighted Average
0.930		15.00% Pervious Area
5.270		85.00% Impervious Area

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

Subcatchment 9S: Drainage Area 1



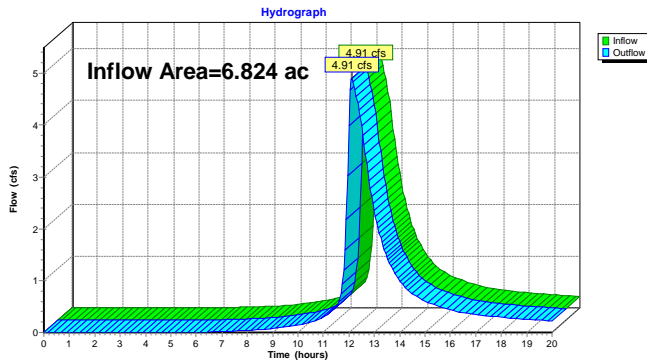
Summary for Reach 13R: Total Site Runoff (Prop)

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

Inflow Area = 6.824 ac, 77.23% Impervious, Inflow Depth > 1.33" for 10-year, 1-hour event
 Inflow = 4.91 cfs @ 12.12 hrs, Volume= 0.754 af
 Outflow = 4.91 cfs @ 12.12 hrs, Volume= 0.754 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-20.00 hrs, dt= 0.05 hrs

Reach 13R: Total Site Runoff (Prop)



Summary for Pond 11P: Detention Pond

Inflow Area = 6.200 ac, 85.00% Impervious, Inflow Depth > 1.48" for 10-year, 1-hour event
 Inflow = 13.97 cfs @ 12.01 hrs, Volume= 0.764 af
 Outflow = 4.57 cfs @ 12.19 hrs, Volume= 0.718 af, Atten= 67%, Lag= 10.7 min
 Primary = 4.57 cfs @ 12.19 hrs, Volume= 0.718 af

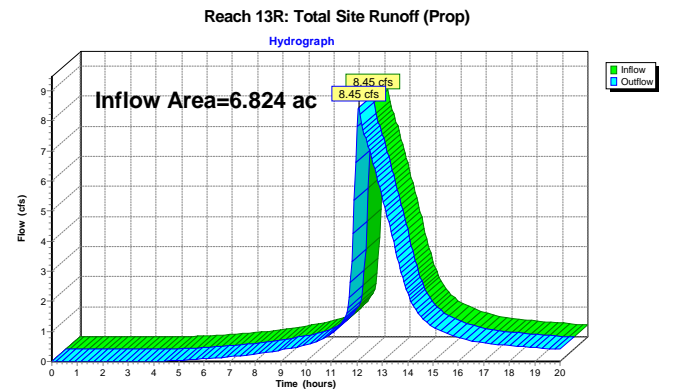
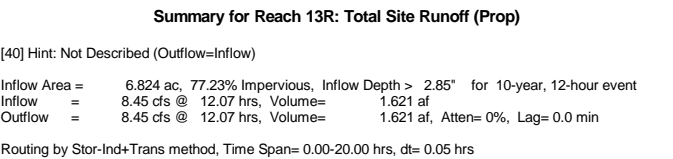
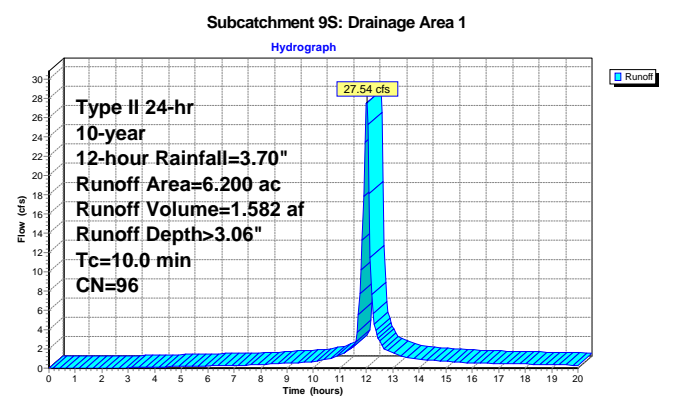
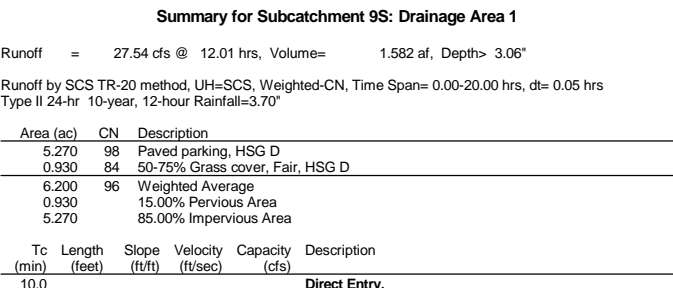
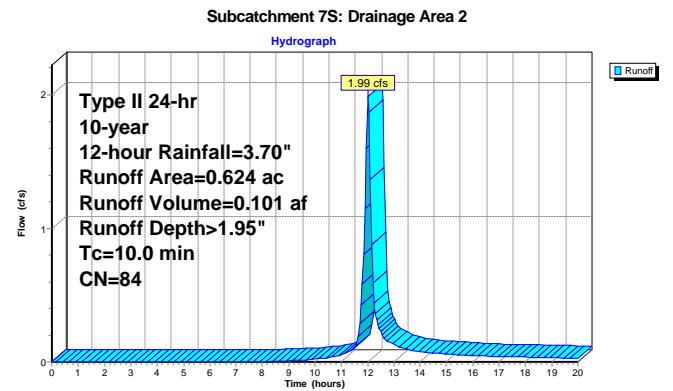
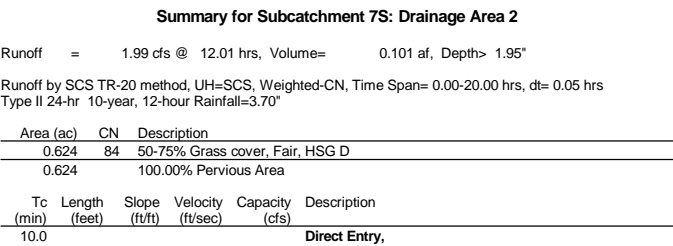
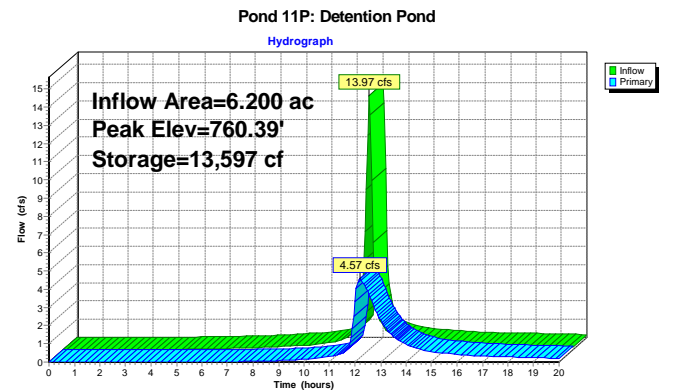
Routing by Stor-Ind method, Time Span= 0.00-20.00 hrs, dt= 0.05 hrs
 Peak Elev= 760.39' @ 12.19 hrs Surf.Area= 11,789 sf Storage= 13,597 cf

Plug-Flow detention time= 76.0 min calculated for 0.717 af (94% of inflow)
 Center-of-Mass det. time= 53.7 min (808.0 - 754.4)

Volume	Invert	Avail.Storage	Storage Description
#1	759.10'	71,910 cf	Custom Stage Data (Prismatic) Listed below (Recalc)
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
759.10	9,347	0	0
760.10	11,214	10,281	10,281
761.10	13,207	12,211	22,491
762.10	15,327	14,267	36,758
763.10	17,551	16,439	53,197
764.10	19,875	18,713	71,910

Device	Routing	Invert	Outlet Devices
#1	Primary	759.10'	14.5" Vert. Orifice/Grate C= 0.600
#2	Primary	761.75'	12.0" Vert. Orifice/Grate C= 0.600

Primary OutFlow Max=4.56 cfs @ 12.19 hrs HW=760.39' (Free Discharge)
 1=Orifice/Grate (Orifice Controls 4.56 cfs @ 3.98 fps)
 2=Orifice/Grate (Controls 0.00 cfs)



Summary for Pond 11P: Detention Pond

Inflow Area = 6,200 ac, 85.00% Impervious, Inflow Depth > 3.06" for 10-year, 12-hour event
 Inflow = 27.54 cfs @ 12.01 hrs, Volume= 1,582 af
 Outflow = 7.26 cfs @ 12.21 hrs, Volume= 1,520 af, Atten= 74%, Lag= 12.4 min
 Primary = 7.26 cfs @ 12.21 hrs, Volume= 1,520 af

Routing by Stor-Ind method, Time Span= 0.00-20.00 hrs, dt= 0.05 hrs
 Peak Elev= 761.43' @ 12.21 hrs Surf.Area= 13,915 sf Storage= 27,023 cf

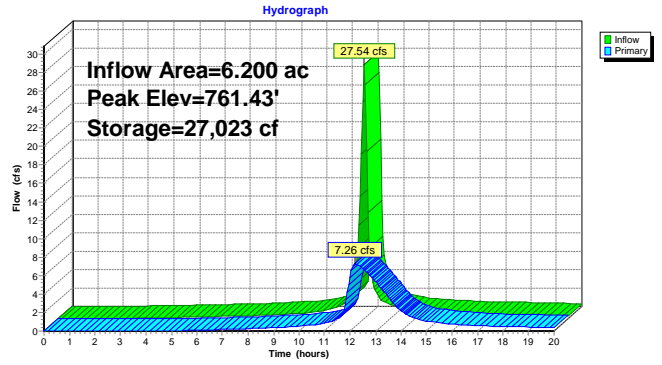
Plug-Flow detention time= 68.3 min calculated for 1,520 af (96% of inflow)
 Center-of-Mass det. time= 52.2 min (789.5 - 737.4)

Volume	Invert	Avail.Storage	Storage Description
#1	759.10'	71,910 cf	Custom Stage Data (Prismatic) Listed below (Recalc)
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
759.10	9,347	0	0
760.10	11,214	10,281	10,281
761.10	13,207	12,211	22,491
762.10	15,327	14,267	36,758
763.10	17,551	16,439	53,197
764.10	19,875	18,713	71,910

Device	Routing	Invert	Outlet Devices
#1	Primary	759.10'	14.5" Vert. Orifice/Grate C= 0.600
#2	Primary	761.75'	12.0" Vert. Orifice/Grate C= 0.600

Primary OutFlow Max=7.25 cfs @ 12.21 hrs HW=761.43' (Free Discharge)
 1=Orifice/Grate (Orifice Controls 7.25 cfs @ 6.33 fps)
 2=Orifice/Grate (Controls 0.00 cfs)

Pond 11P: Detention Pond



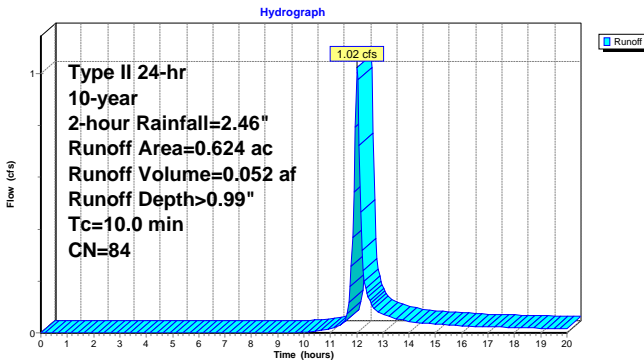
Summary for Subcatchment 7S: Drainage Area 2

Runoff = 1.02 cfs @ 12.02 hrs, Volume= 0.052 af, Depth> 0.99"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-20.00 hrs, dt= 0.05 hrs
 Type II 24-hr 10-year, 2-hour Rainfall=2.46"

Area (ac)	CN	Description			
0.624	84	50-75% Grass cover, Fair, HSG D			
0.624		100.00% Pervious Area			
Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.0					Direct Entry,

Subcatchment 7S: Drainage Area 2



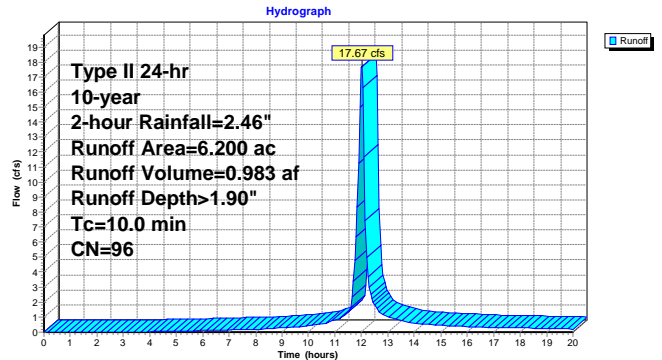
Summary for Subcatchment 9S: Drainage Area 1

Runoff = 17.67 cfs @ 12.01 hrs, Volume= 0.983 af, Depth> 1.90"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-20.00 hrs, dt= 0.05 hrs
 Type II 24-hr 10-year, 2-hour Rainfall=2.46"

Area (ac)	CN	Description
5.270	98	Paved parking, HSG D
0.930	84	50-75% Grass cover, Fair, HSG D
6.200	96	Weighted Average
0.930		15.00% Pervious Area
5.270		85.00% Impervious Area

Subcatchment 9S: Drainage Area 1

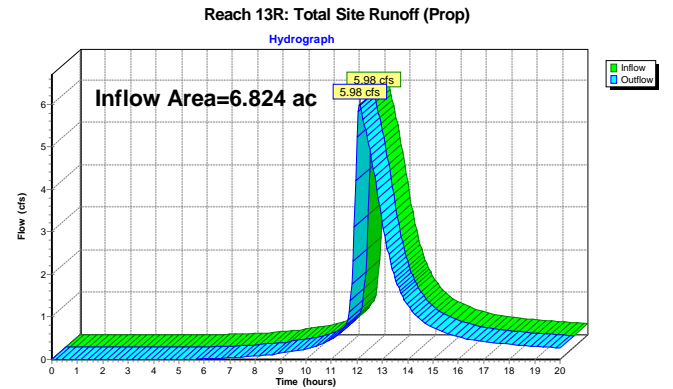


Summary for Reach 13R: Total Site Runoff (Prop)

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

Inflow Area = 6.824 ac, 77.23% Impervious, Inflow Depth > 1.73" for 10-year, 2-hour event
Inflow = 5.98 cfs @ 12.11 hrs, Volume= 0.984 af
Outflow = 5.98 cfs @ 12.11 hrs, Volume= 0.984 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-20.00 hrs, dt= 0.05 hrs



Summary for Pond 11P: Detention Pond

Inflow Area = 6.200 ac, 85.00% Impervious, Inflow Depth > 1.90" for 10-year, 2-hour event
Inflow = 17.67 cfs @ 12.01 hrs, Volume= 0.983 af
Outflow = 5.46 cfs @ 12.19 hrs, Volume= 0.933 af, Atten= 69%, Lag= 11.2 min
Primary = 5.46 cfs @ 12.19 hrs, Volume= 0.933 af

Routing by Stor-Ind method, Time Span= 0.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 760.68' @ 12.19 hrs Surf.Area= 12,373 sf Storage= 17,139 cf

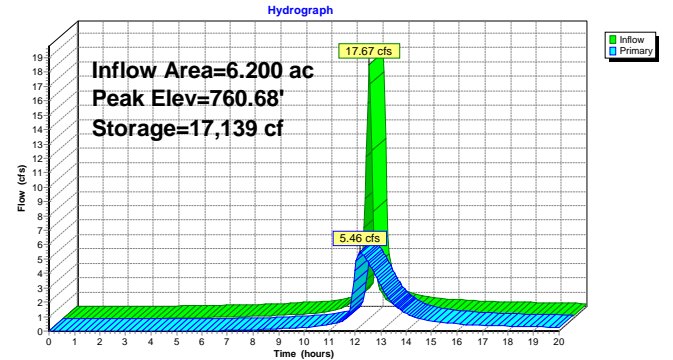
Plug-Flow detention time= 72.4 min calculated for 0.933 af (95% of inflow)
Center-of-Mass det. time= 52.3 min (800.7 - 748.4)

Volume	Invert	Avail.Storage	Storage Description
#1	759.10'	71,910 cf	Custom Stage Data (Prismatic) Listed below (Recalc)
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
759.10	9,347	0	0
760.10	11,214	10,281	10,281
761.10	13,207	12,211	22,491
762.10	15,327	14,267	36,758
763.10	17,551	16,439	53,197
764.10	19,875	18,713	71,910

Device	Routing	Invert	Outlet Devices
#1	Primary	759.10'	14.5" Vert. Orifice/Grate C= 0.600
#2	Primary	761.75'	12.0" Vert. Orifice/Grate C= 0.600

Primary OutFlow Max=5.45 cfs @ 12.19 hrs HW=760.68' (Free Discharge)
1=Orifice/Grate (Orifice Controls 5.45 cfs @ 4.76 fps)
2=Orifice/Grate (Controls 0.00 cfs)

Pond 11P: Detention Pond



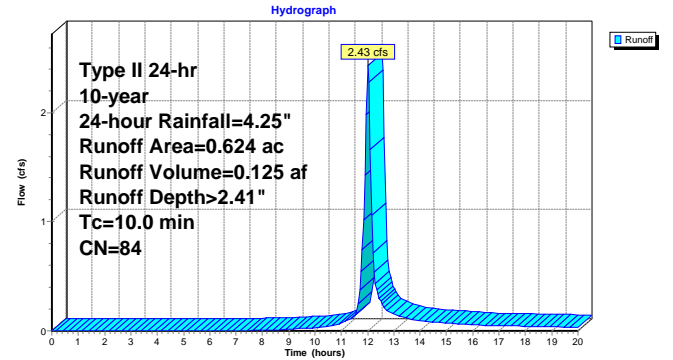
Summary for Subcatchment 7S: Drainage Area 2

Runoff = 2.43 cfs @ 12.01 hrs, Volume= 0.125 af, Depth> 2.41"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-20.00 hrs, dt= 0.05 hrs
Type II 24-hr 10-year, 24-hour Rainfall=4.25"

Area (ac)	CN	Description			
0.624	84	50-75% Grass cover, Fair, HSG D			
0.624		100.00% Pervious Area			
Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.0					Direct Entry,

Subcatchment 7S: Drainage Area 2



Summary for Subcatchment 9S: Drainage Area 1

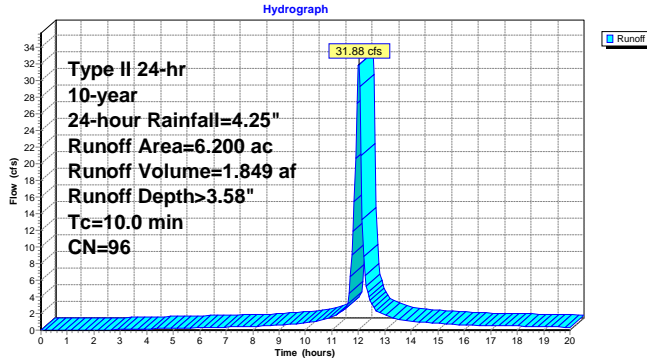
Runoff = 31.88 cfs @ 12.01 hrs, Volume= 1.849 af, Depth> 3.58"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-20.00 hrs, dt= 0.05 hrs
 Type II 24-hr 10-year, 24-hour Rainfall=4.25"

Area (ac)	CN	Description
5.270	98	Paved parking, HSG D
0.930	84	50-75% Grass cover, Fair, HSG D
6.200	96	Weighted Average
0.930		15.00% Pervious Area
5.270		85.00% Impervious Area

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

Subcatchment 9S: Drainage Area 1



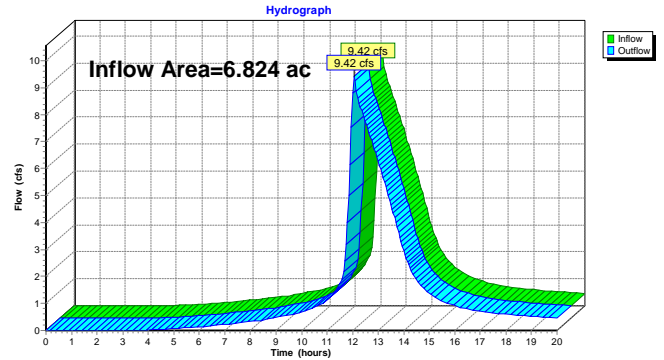
Summary for Reach 13R: Total Site Runoff (Prop)

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

Inflow Area = 6.824 ac, 77.23% Impervious, Inflow Depth > 3.35" for 10-year, 24-hour event
 Inflow = 9.42 cfs @ 12.07 hrs, Volume= 1.907 af
 Outflow = 9.42 cfs @ 12.07 hrs, Volume= 1.907 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-20.00 hrs, dt= 0.05 hrs

Reach 13R: Total Site Runoff (Prop)



Summary for Pond 11P: Detention Pond

Inflow Area = 6.200 ac, 85.00% Impervious, Inflow Depth > 3.58" for 10-year, 24-hour event
 Inflow = 31.88 cfs @ 12.01 hrs, Volume= 1.849 af
 Outflow = 7.90 cfs @ 12.22 hrs, Volume= 1.782 af, Atten= 75%, Lag= 12.9 min
 Primary = 7.90 cfs @ 12.22 hrs, Volume= 1.782 af

Routing by Stor-Ind method, Time Span= 0.00-20.00 hrs, dt= 0.05 hrs
 Peak Elev= 761.75' @ 12.22 hrs Surf.Area= 14,587 sf Storage= 31,540 cf

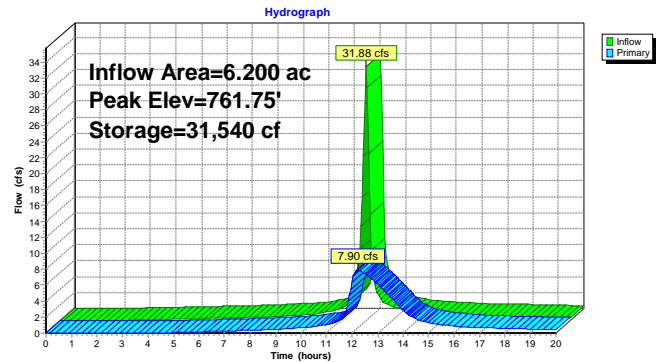
Plug-Flow detention time= 67.9 min calculated for 1.782 af (96% of inflow)
 Center-of-Mass det. time= 52.9 min (786.8 - 733.9)

Volume	Invert	Avail.Storage	Storage Description
#1	759.10'	71,910 cf	Custom Stage Data (Prismatic) Listed below (Recalc)
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
759.10	9,347	0	0
760.10	11,214	10,281	10,281
761.10	13,207	12,211	22,491
762.10	15,327	14,267	36,758
763.10	17,551	16,439	53,197
764.10	19,875	18,713	71,910

Device	Routing	Invert	Outlet Devices
#1	Primary	759.10'	14.5" Vert. Orifice/Grate C= 0.600
#2	Primary	761.75'	12.0" Vert. Orifice/Grate C= 0.600

Primary OutFlow Max=7.89 cfs @ 12.22 hrs HW=761.75' (Free Discharge)
 1=Orifice/Grate (Orifice Controls 7.89 cfs @ 6.88 fps)
 2=Orifice/Grate (Controls 0.00 cfs)

Pond 11P: Detention Pond



Summary for Subcatchment 7S: Drainage Area 2

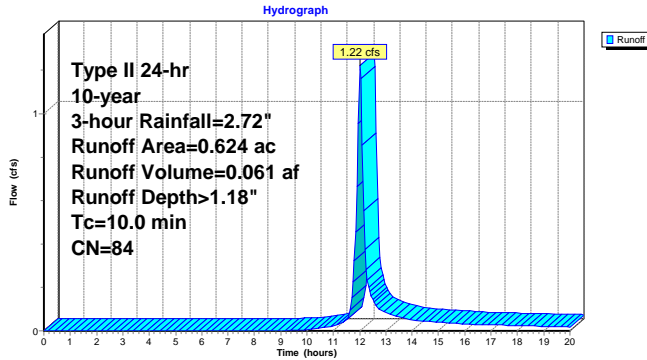
Runoff = 1.22 cfs @ 12.02 hrs, Volume= 0.061 af, Depth> 1.18"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-20.00 hrs, dt= 0.05 hrs
 Type II 24-hr 10-year, 3-hour Rainfall=2.72"

Area (ac)	CN	Description
0.624	84	50-75% Grass cover, Fair, HSG D
0.624		100.00% Pervious Area

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

Subcatchment 7S: Drainage Area 2



Summary for Subcatchment 9S: Drainage Area 1

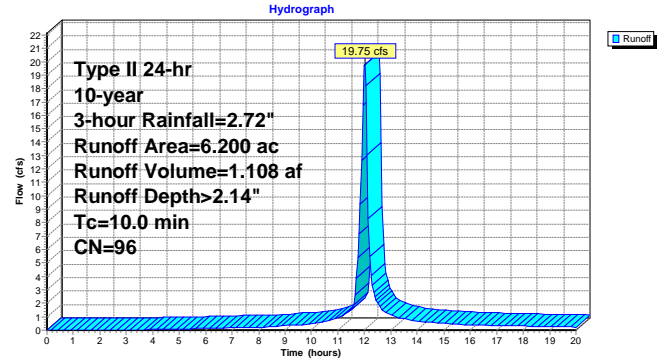
Runoff = 19.75 cfs @ 12.01 hrs, Volume= 1.108 af, Depth> 2.14"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-20.00 hrs, dt= 0.05 hrs
 Type II 24-hr 10-year, 3-hour Rainfall=2.72"

Area (ac)	CN	Description
5.270	98	Paved parking, HSG D
0.930	84	50-75% Grass cover, Fair, HSG D
6.200	96	Weighted Average
0.930		15.00% Pervious Area
5.270		85.00% Impervious Area

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

Subcatchment 9S: Drainage Area 1



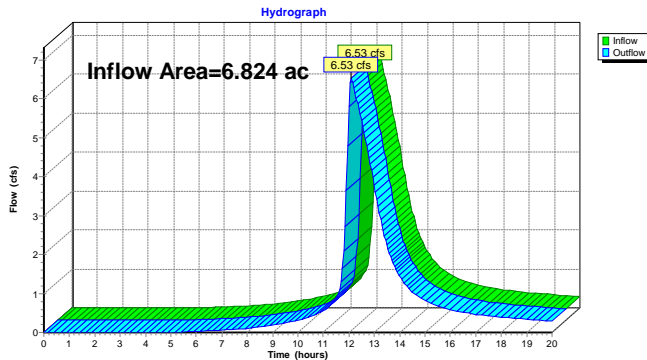
Summary for Reach 13R: Total Site Runoff (Prop)

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

Inflow Area = 6.824 ac, 77.23% Impervious, Inflow Depth > 1.96" for 10-year, 3-hour event
 Inflow = 6.53 cfs @ 12.10 hrs, Volume= 1.116 af
 Outflow = 6.53 cfs @ 12.10 hrs, Volume= 1.116 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-20.00 hrs, dt= 0.05 hrs

Reach 13R: Total Site Runoff (Prop)



Summary for Pond 11P: Detention Pond

Inflow Area = 6.200 ac, 85.00% Impervious, Inflow Depth > 2.14" for 10-year, 3-hour event
 Inflow = 19.75 cfs @ 12.01 hrs, Volume= 1.108 af
 Outflow = 5.89 cfs @ 12.20 hrs, Volume= 1.055 af, Atten= 70%, Lag= 11.5 min
 Primary = 5.89 cfs @ 12.20 hrs, Volume= 1.055 af

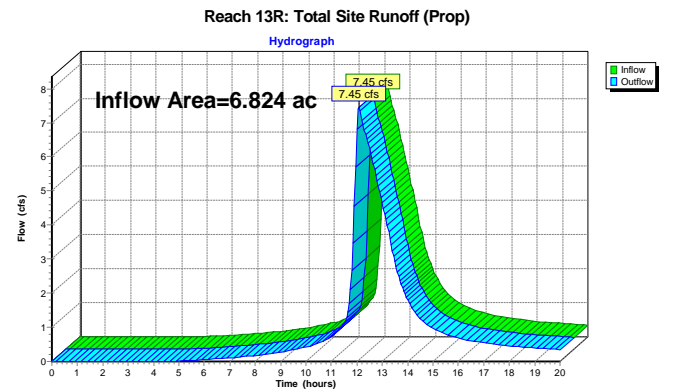
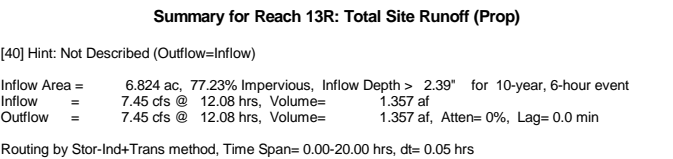
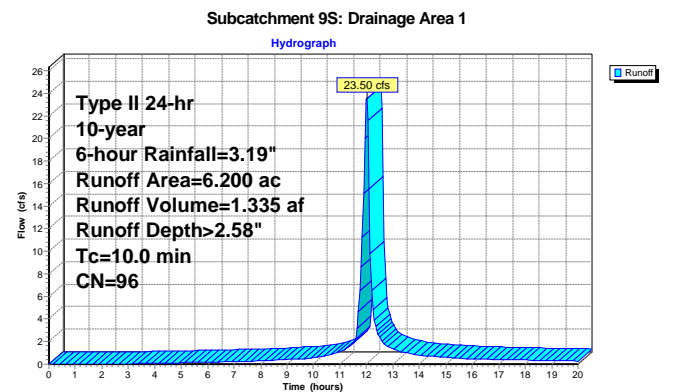
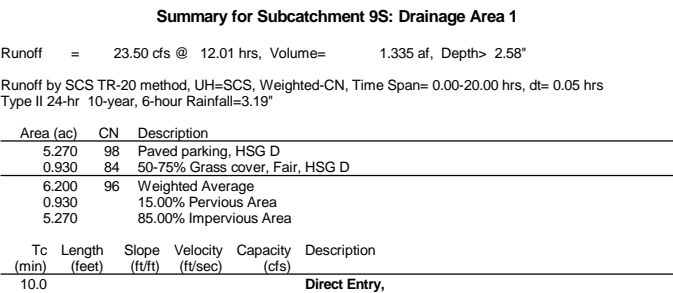
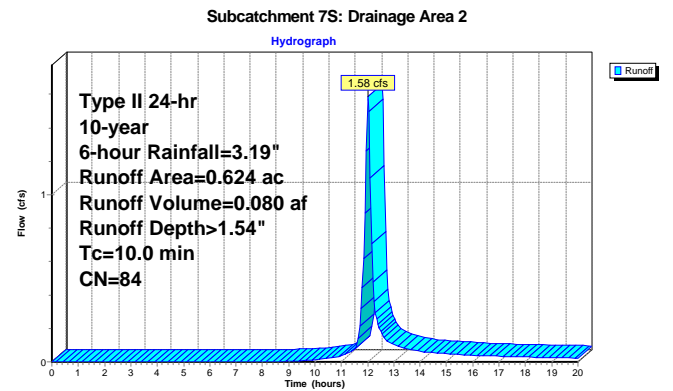
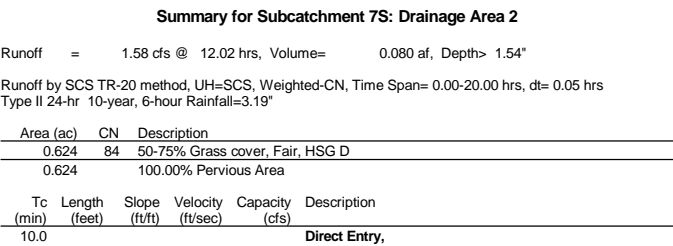
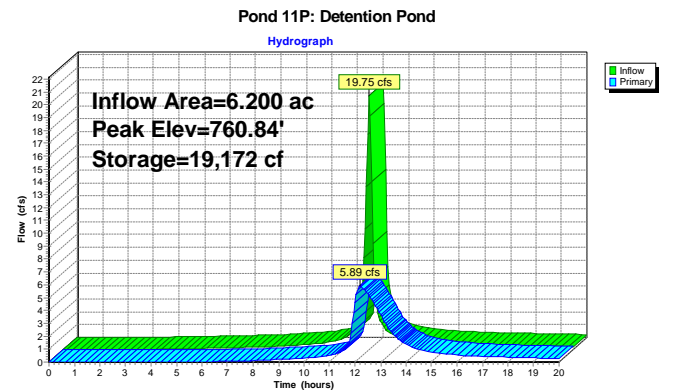
Routing by Stor-Ind method, Time Span= 0.00-20.00 hrs, dt= 0.05 hrs
 Peak Elev= 760.84' @ 12.20 hrs Surf.Area= 12,696 sf Storage= 19,172 cf

Plug-Flow detention time= 71.0 min calculated for 1.055 af (95% of inflow)
 Center-of-Mass det. time= 52.0 min (797.5 - 745.5)

Volume	Invert	Avail. Storage	Storage Description
#1	759.10'	71,910 cf	Custom Stage Data (Prismatic) Listed below (Recalc)
Elevation (feet)	Surf. Area (sq-ft)	Inc. Store (cubic-feet)	Cum. Store (cubic-feet)
759.10	9,347	0	0
760.10	11,214	10,281	10,281
761.10	13,207	12,211	22,491
762.10	15,327	14,267	36,758
763.10	17,551	16,439	53,197
764.10	19,875	18,713	71,910

Device	Routing	Invert	Outlet Devices
#1	Primary	759.10'	14.5" Vert. Orifice/Grate C= 0.600
#2	Primary	761.75'	12.0" Vert. Orifice/Grate C= 0.600

Primary OutFlow Max=5.89 cfs @ 12.20 hrs HW=760.84' (Free Discharge)
 1=Orifice/Grate (Orifice Controls 5.89 cfs @ 5.14 fps)
 2=Orifice/Grate (Controls 0.00 cfs)



Summary for Pond 11P: Detention Pond

Inflow Area = 6,200 ac, 85.00% Impervious, Inflow Depth > 2.58" for 10-year, 6-hour event
 Inflow = 23.50 cfs @ 12.01 hrs, Volume= 1.335 af
 Outflow = 6.60 cfs @ 12.21 hrs, Volume= 1.277 af, Atten= 72%, Lag= 12.0 min
 Primary = 6.60 cfs @ 12.21 hrs, Volume= 1.277 af

Routing by Stor-Ind method, Time Span= 0.00-20.00 hrs, dt= 0.05 hrs
 Peak Elev= 761.13' @ 12.21 hrs Surf.Area= 13,273 sf Storage= 22,904 cf

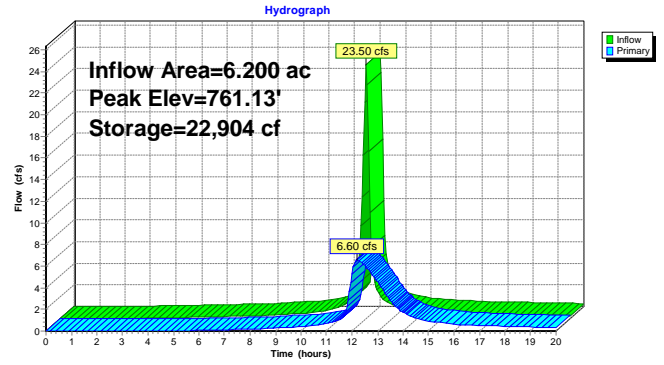
Plug-Flow detention time= 69.2 min calculated for 1.274 af (95% of inflow)
 Center-of-Mass det. time= 51.9 min (793.1 - 741.2)

Volume	Invert	Avail.Storage	Storage Description
#1	759.10'	71,910 cf	Custom Stage Data (Prismatic) Listed below (Recalc)
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
759.10	9,347	0	0
760.10	11,214	10,281	10,281
761.10	13,207	12,211	22,491
762.10	15,327	14,267	36,758
763.10	17,551	16,439	53,197
764.10	19,875	18,713	71,910

Device	Routing	Invert	Outlet Devices
#1	Primary	759.10'	14.5" Vert. Orifice/Grate C= 0.600
#2	Primary	761.75'	12.0" Vert. Orifice/Grate C= 0.600

Primary OutFlow Max=6.59 cfs @ 12.21 hrs HW=761.13' (Free Discharge)
 1=Orifice/Grate (Orifice Controls 6.59 cfs @ 5.75 fps)
 2=Orifice/Grate (Controls 0.00 cfs)

Pond 11P: Detention Pond



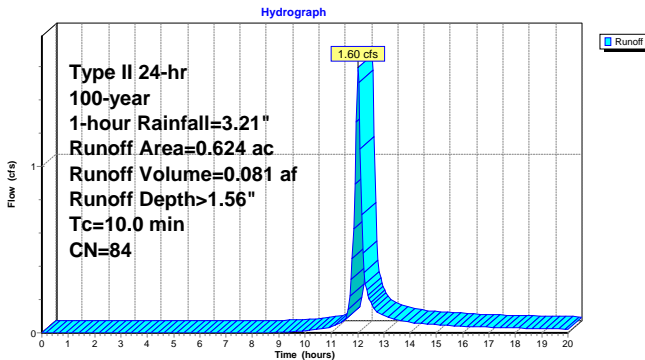
Summary for Subcatchment 7S: Drainage Area 2

Runoff = 1.60 cfs @ 12.02 hrs, Volume= 0.081 af, Depth> 1.56"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-20.00 hrs, dt= 0.05 hrs
 Type II 24-hr 100-year, 1-hour Rainfall=3.21"

Area (ac)	CN	Description			
0.624	84	50-75% Grass cover, Fair, HSG D			
0.624		100.00% Pervious Area			
Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.0					Direct Entry,

Subcatchment 7S: Drainage Area 2



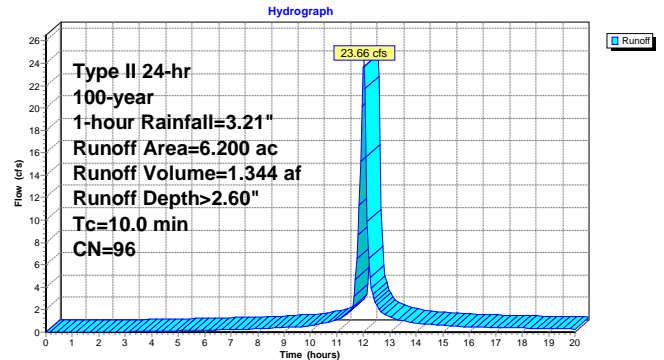
Summary for Subcatchment 9S: Drainage Area 1

Runoff = 23.66 cfs @ 12.01 hrs, Volume= 1.344 af, Depth> 2.60"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-20.00 hrs, dt= 0.05 hrs
 Type II 24-hr 100-year, 1-hour Rainfall=3.21"

Area (ac)	CN	Description
5.270	98	Paved parking, HSG D
0.930	84	50-75% Grass cover, Fair, HSG D
6.200	96	Weighted Average
0.930		15.00% Pervious Area
5.270		85.00% Impervious Area

Subcatchment 9S: Drainage Area 1

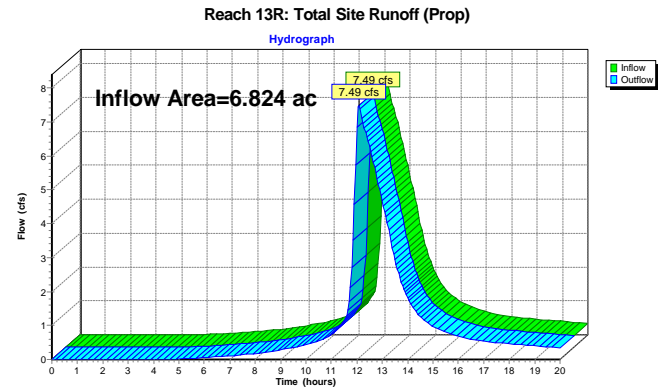


Summary for Reach 13R: Total Site Runoff (Prop)

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

Inflow Area = 6.824 ac, 77.23% Impervious, Inflow Depth > 2.41" for 100-year, 1-hour event
Inflow = 7.49 cfs @ 12.08 hrs, Volume= 1.368 af
Outflow = 7.49 cfs @ 12.08 hrs, Volume= 1.368 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-20.00 hrs, dt= 0.05 hrs



Summary for Pond 11P: Detention Pond

Inflow Area = 6.200 ac, 85.00% Impervious, Inflow Depth > 2.60" for 100-year, 1-hour event
Inflow = 23.66 cfs @ 12.01 hrs, Volume= 1.344 af
Outflow = 6.62 cfs @ 12.21 hrs, Volume= 1.287 af, Atten= 72%, Lag= 12.0 min
Primary = 6.62 cfs @ 12.21 hrs, Volume= 1.287 af

Routing by Stor-Ind method, Time Span= 0.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 761.14' @ 12.21 hrs Surf.Area= 13,299 sf Storage= 23,064 cf

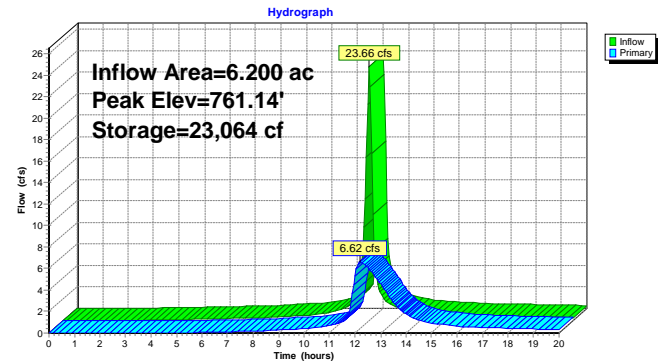
Plug-Flow detention time= 69.3 min calculated for 1.287 af (96% of inflow)
Center-of-Mass det. time= 51.9 min (792.9 - 741.1)

Volume	Invert	Avail.Storage	Storage Description
#1	759.10'	71,910 cf	Custom Stage Data (Prismatic) Listed below (Recalc)
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
759.10	9,347	0	0
760.10	11,214	10,281	10,281
761.10	13,207	12,211	22,491
762.10	15,327	14,267	36,758
763.10	17,551	16,439	53,197
764.10	19,875	18,713	71,910

Device	Routing	Invert	Outlet Devices
#1	Primary	759.10'	14.5" Vert. Orifice/Grate C= 0.600
#2	Primary	761.75'	12.0" Vert. Orifice/Grate C= 0.600

Primary OutFlow Max=6.62 cfs @ 12.21 hrs HW=761.14' (Free Discharge)
1=Orifice/Grate (Orifice Controls 6.62 cfs @ 5.77 fps)
2=Orifice/Grate (Controls 0.00 cfs)

Pond 11P: Detention Pond



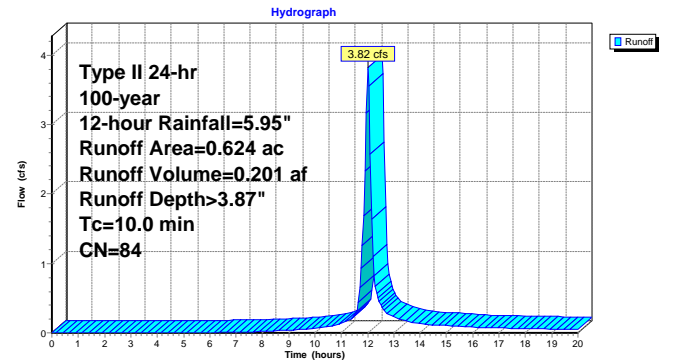
Summary for Subcatchment 7S: Drainage Area 2

Runoff = 3.82 cfs @ 12.01 hrs, Volume= 0.201 af, Depth> 3.87"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-20.00 hrs, dt= 0.05 hrs
Type II 24-hr 100-year, 12-hour Rainfall=5.95"

Area (ac)	CN	Description			
0.624	84	50-75% Grass cover, Fair, HSG D			
0.624		100.00% Pervious Area			
Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.0					Direct Entry,

Subcatchment 7S: Drainage Area 2



Summary for Subcatchment 9S: Drainage Area 1

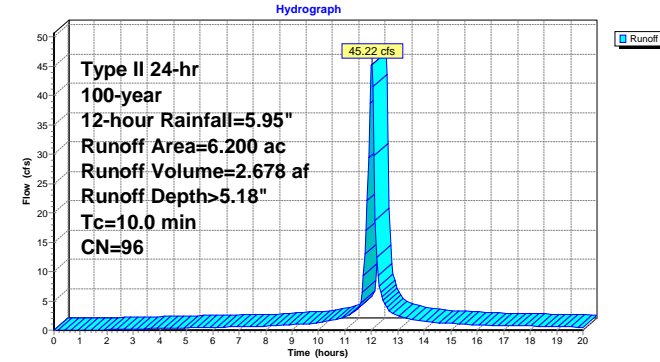
Runoff = 45.22 cfs @ 12.01 hrs, Volume= 2.678 af, Depth> 5.18"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-20.00 hrs, dt= 0.05 hrs
 Type II 24-hr 100-year, 12-hour Rainfall=5.95"

Area (ac)	CN	Description
5.270	98	Paved parking, HSG D
0.930	84	50-75% Grass cover, Fair, HSG D
6.200	96	Weighted Average
0.930		15.00% Pervious Area
5.270		85.00% Impervious Area

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

Subcatchment 9S: Drainage Area 1



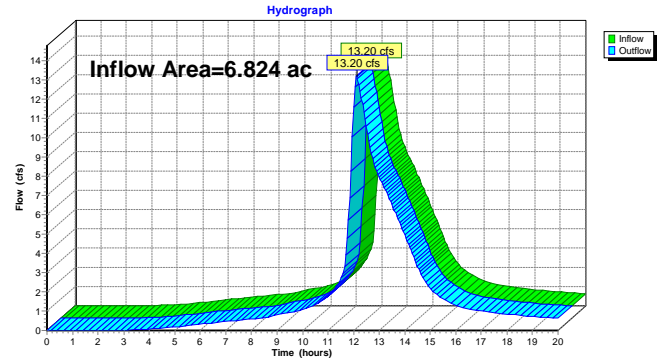
Summary for Reach 13R: Total Site Runoff (Prop)

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

Inflow Area = 6.824 ac, 77.23% Impervious, Inflow Depth > 4.92" for 100-year, 12-hour event
 Inflow = 13.20 cfs @ 12.11 hrs, Volume= 2.800 af
 Outflow = 13.20 cfs @ 12.11 hrs, Volume= 2.800 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-20.00 hrs, dt= 0.05 hrs

Reach 13R: Total Site Runoff (Prop)



Summary for Pond 11P: Detention Pond

Inflow Area = 6.200 ac, 85.00% Impervious, Inflow Depth > 5.18" for 100-year, 12-hour event
 Inflow = 45.22 cfs @ 12.01 hrs, Volume= 2.678 af
 Outflow = 11.65 cfs @ 12.22 hrs, Volume= 2.599 af, Atten= 74%, Lag= 12.6 min
 Primary = 11.65 cfs @ 12.22 hrs, Volume= 2.599 af

Routing by Stor-Ind method, Time Span= 0.00-20.00 hrs, dt= 0.05 hrs
 Peak Elev= 762.60' @ 12.22 hrs Surf.Area= 16,449 sf Storage= 44,775 cf

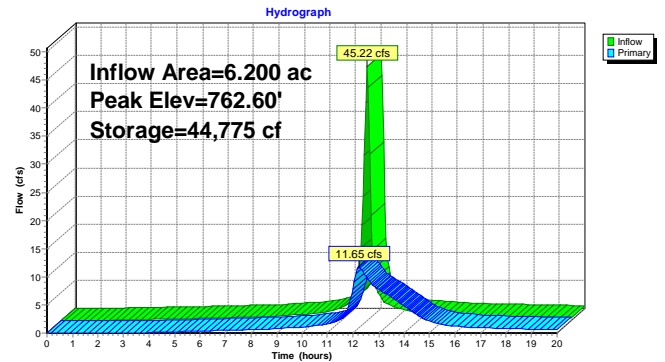
Plug-Flow detention time= 66.2 min calculated for 2.599 af (97% of inflow)
 Center-of-Mass det. time= 53.4 min (779.7 - 726.3)

Volume	Invert	Avail.Storage	Storage Description
#1	759.10'	71,910 cf	Custom Stage Data (Prismatic) Listed below (Recalc)
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
759.10	9,347	0	0
760.10	11,214	10,281	10,281
761.10	13,207	12,211	22,491
762.10	15,327	14,267	36,758
763.10	17,551	16,439	53,197
764.10	19,875	18,713	71,910

Device	Routing	Invert	Outlet Devices
#1	Primary	759.10'	14.5" Vert. Orifice/Grate C= 0.600
#2	Primary	761.75'	12.0" Vert. Orifice/Grate C= 0.600

Primary OutFlow Max=11.62 cfs @ 12.22 hrs HW=762.60' (Free Discharge)
 1=Orifice/Grate (Orifice Controls 9.39 cfs @ 8.19 fps)
 2=Orifice/Grate (Orifice Controls 2.23 cfs @ 3.14 fps)

Pond 11P: Detention Pond



Summary for Subcatchment 7S: Drainage Area 2

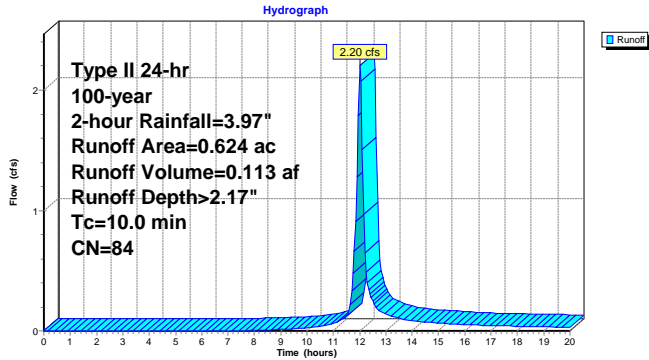
Runoff = 2.20 cfs @ 12.01 hrs, Volume= 0.113 af, Depth> 2.17"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-20.00 hrs, dt= 0.05 hrs
 Type II 24-hr 100-year, 2-hour Rainfall=3.97"

Area (ac)	CN	Description
0.624	84	50-75% Grass cover, Fair, HSG D
0.624		100.00% Pervious Area

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

Subcatchment 7S: Drainage Area 2



Summary for Subcatchment 9S: Drainage Area 1

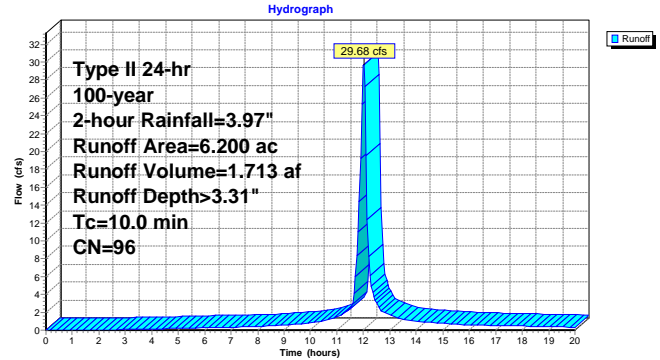
Runoff = 29.68 cfs @ 12.01 hrs, Volume= 1.713 af, Depth> 3.31"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-20.00 hrs, dt= 0.05 hrs
 Type II 24-hr 100-year, 2-hour Rainfall=3.97"

Area (ac)	CN	Description
5.270	98	Paved parking, HSG D
0.930	84	50-75% Grass cover, Fair, HSG D
6.200	96	Weighted Average
0.930		15.00% Pervious Area
5.270		85.00% Impervious Area

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

Subcatchment 9S: Drainage Area 1



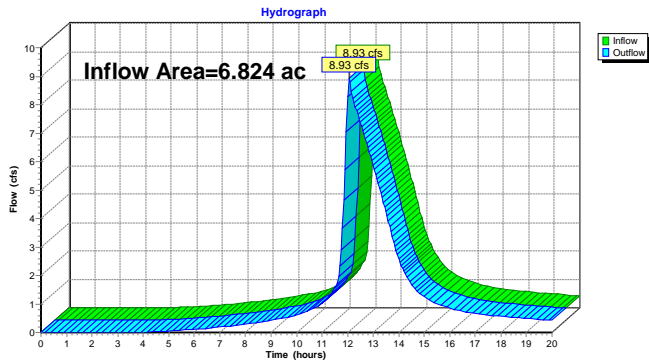
Summary for Reach 13R: Total Site Runoff (Prop)

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

Inflow Area = 6.824 ac, 77.23% Impervious, Inflow Depth > 3.10" for 100-year, 2-hour event
 Inflow = 8.93 cfs @ 12.07 hrs, Volume= 1.761 af
 Outflow = 8.93 cfs @ 12.07 hrs, Volume= 1.761 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-20.00 hrs, dt= 0.05 hrs

Reach 13R: Total Site Runoff (Prop)



Summary for Pond 11P: Detention Pond

Inflow Area = 6.200 ac, 85.00% Impervious, Inflow Depth > 3.31" for 100-year, 2-hour event
 Inflow = 29.68 cfs @ 12.01 hrs, Volume= 1.713 af
 Outflow = 7.58 cfs @ 12.22 hrs, Volume= 1.648 af, Atten= 74%, Lag= 12.7 min
 Primary = 7.58 cfs @ 12.22 hrs, Volume= 1.648 af

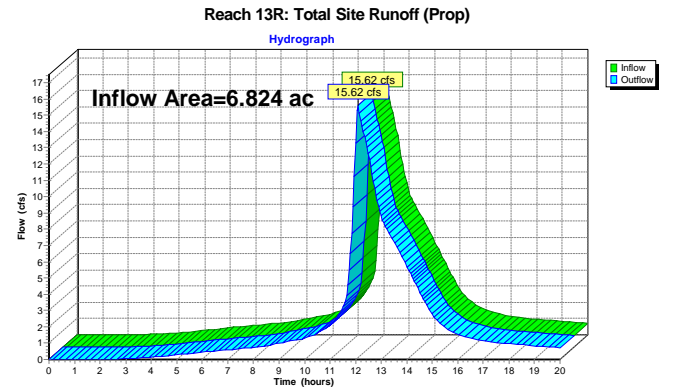
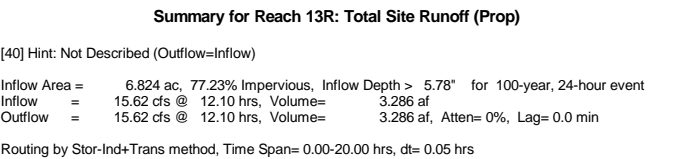
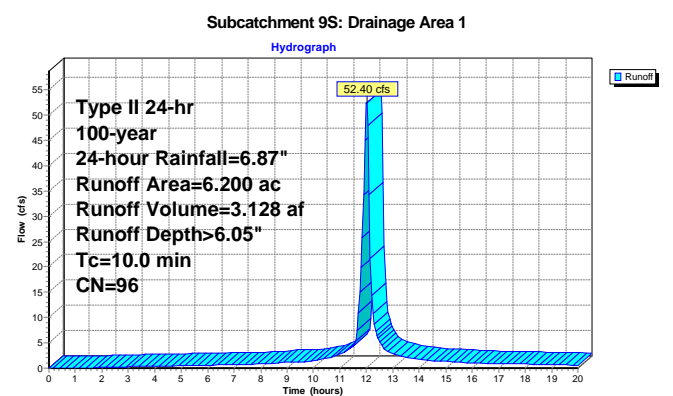
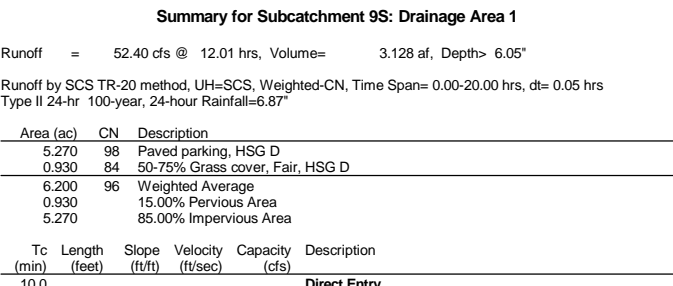
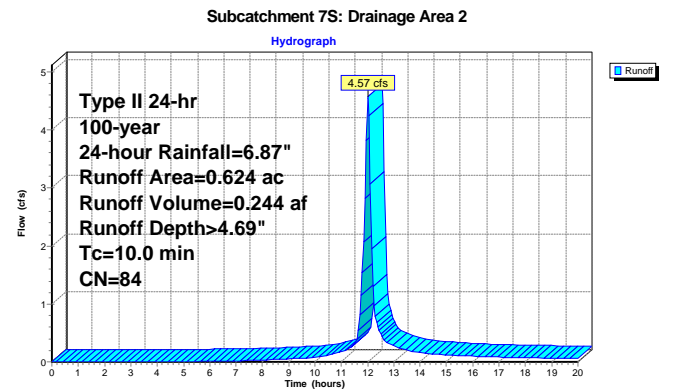
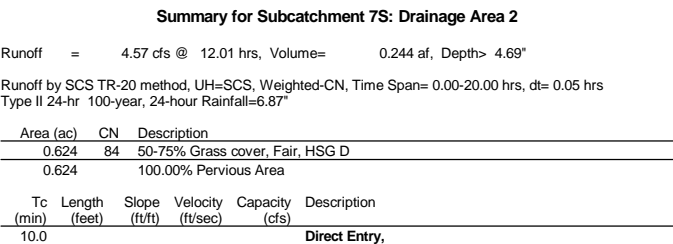
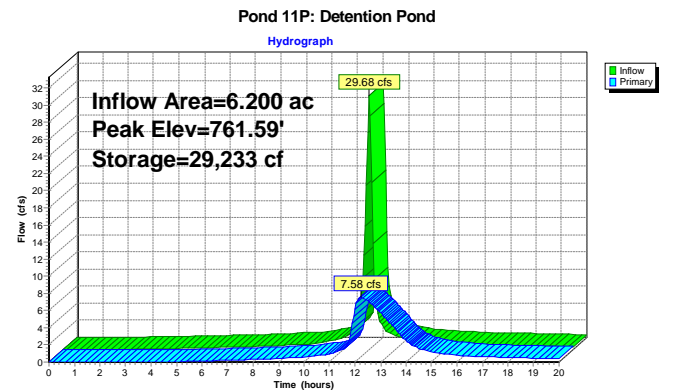
Routing by Stor-Ind method, Time Span= 0.00-20.00 hrs, dt= 0.05 hrs
 Peak Elev= 761.59' @ 12.22 hrs Surf.Area= 14,248 sf Storage= 29,233 cf

Plug-Flow detention time= 67.9 min calculated for 1.644 af (96% of inflow)
 Center-of-Mass det. time= 52.5 min (788.1 - 735.6)

Volume	Invert	Avail. Storage	Storage Description
#1	759.10'	71,910 cf	Custom Stage Data (Prismatic) Listed below (Recalc)
Elevation (feet)	Surf. Area (sq-ft)	Inc. Store (cubic-feet)	Cum. Store (cubic-feet)
759.10	9,347	0	0
760.10	11,214	10,281	10,281
761.10	13,207	12,211	22,491
762.10	15,327	14,267	36,758
763.10	17,551	16,439	53,197
764.10	19,875	18,713	71,910

Device	Routing	Invert	Outlet Devices
#1	Primary	759.10'	14.5" Vert. Orifice/Grate C= 0.600
#2	Primary	761.75'	12.0" Vert. Orifice/Grate C= 0.600

Primary OutFlow Max=7.58 cfs @ 12.22 hrs HW=761.59' (Free Discharge)
 1=Orifice/Grate (Orifice Controls 7.58 cfs @ 6.61 fps)
 2=Orifice/Grate (Controls 0.00 cfs)



Summary for Pond 11P: Detention Pond

Inflow Area = 6,200 ac, 85.00% Impervious, Inflow Depth > 6.05" for 100-year, 24-hour event
 Inflow = 52.40 cfs @ 12.01 hrs, Volume= 3.128 af
 Outflow = 13.38 cfs @ 12.22 hrs, Volume= 3.042 af, Atten= 74%, Lag= 12.7 min
 Primary = 13.38 cfs @ 12.22 hrs, Volume= 3.042 af

Routing by Stor-Ind method, Time Span= 0.00-20.00 hrs, dt= 0.05 hrs
 Peak Elev= 763.02' @ 12.22 hrs Surf.Area= 17,375 sf Storage= 51,816 cf

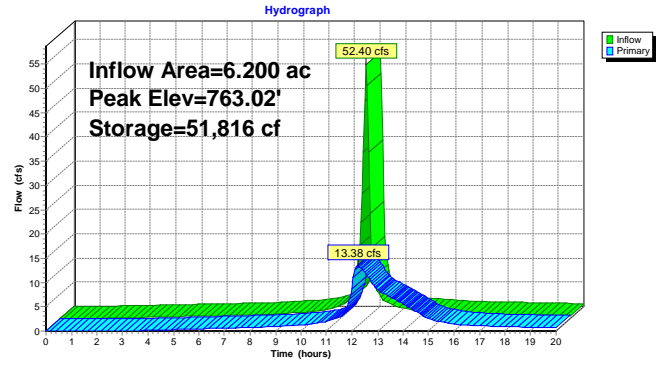
Plug-Flow detention time= 65.1 min calculated for 3.035 af (97% of inflow)
 Center-of-Mass det. time= 53.2 min (776.5 - 723.3)

Volume	Invert	Avail.Storage	Storage Description
#1	759.10'	71,910 cf	Custom Stage Data (Prismatic) Listed below (Recalc)
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
759.10	9,347	0	0
760.10	11,214	10,281	10,281
761.10	13,207	12,211	22,491
762.10	15,327	14,267	36,758
763.10	17,551	16,439	53,197
764.10	19,875	18,713	71,910

Device	Routing	Invert	Outlet Devices
#1	Primary	759.10'	14.5" Vert. Orifice/Grate C= 0.600
#2	Primary	761.75'	12.0" Vert. Orifice/Grate C= 0.600

Primary OutFlow Max=13.35 cfs @ 12.22 hrs HW=763.01' (Free Discharge)
 1=Orifice/Grate (Orifice Controls 10.05 cfs @ 8.76 fps)
 2=Orifice/Grate (Orifice Controls 3.31 cfs @ 4.21 fps)

Pond 11P: Detention Pond



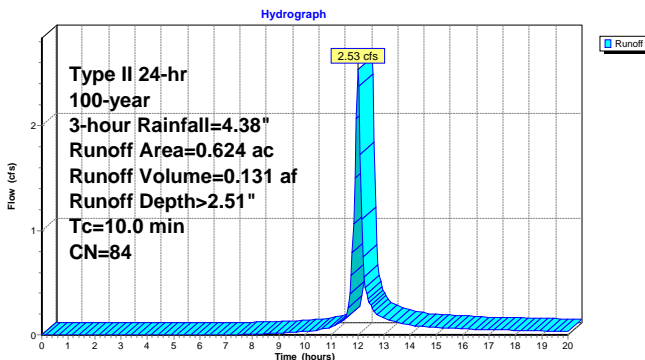
Summary for Subcatchment 7S: Drainage Area 2

Runoff = 2.53 cfs @ 12.01 hrs, Volume= 0.131 af, Depth> 2.51"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-20.00 hrs, dt= 0.05 hrs
 Type II 24-hr 100-year, 3-hour Rainfall=4.38"

Area (ac)	CN	Description			
0.624	84	50-75% Grass cover, Fair, HSG D			
0.624		100.00% Pervious Area			
Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.0					Direct Entry,

Subcatchment 7S: Drainage Area 2



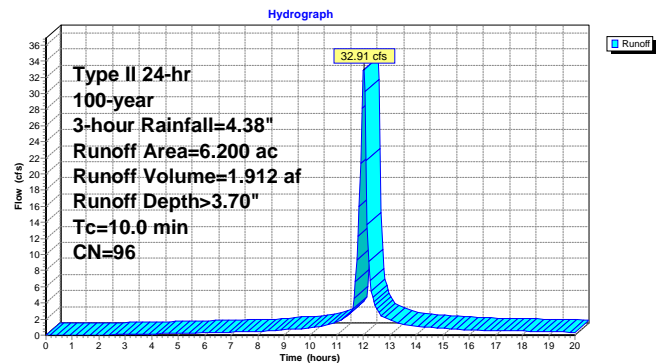
Summary for Subcatchment 9S: Drainage Area 1

Runoff = 32.91 cfs @ 12.01 hrs, Volume= 1.912 af, Depth> 3.70"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-20.00 hrs, dt= 0.05 hrs
 Type II 24-hr 100-year, 3-hour Rainfall=4.38"

Area (ac)	CN	Description
5.270	98	Paved parking, HSG D
0.930	84	50-75% Grass cover, Fair, HSG D
6.200	96	Weighted Average
0.930		15.00% Pervious Area
5.270		85.00% Impervious Area

Subcatchment 9S: Drainage Area 1



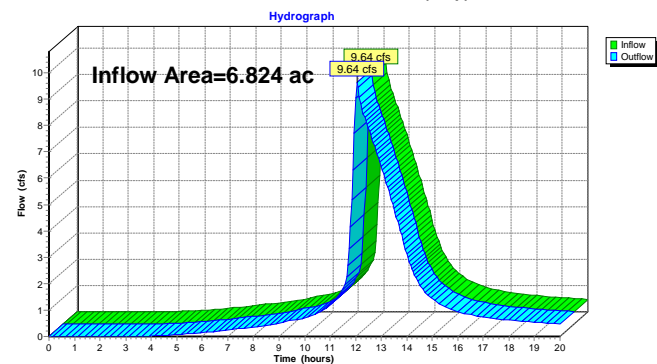
Summary for Reach 13R: Total Site Runoff (Prop)

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

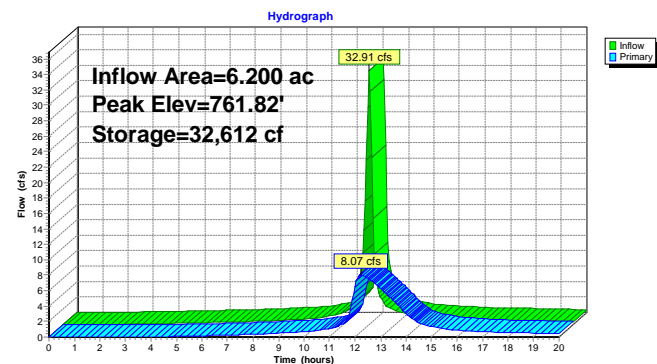
Inflow Area = 6.824 ac, 77.23% Impervious, Inflow Depth > 3.47" for 100-year, 3-hour event
Inflow = 9.64 cfs @ 12.06 hrs, Volume= 1.975 af
Outflow = 9.64 cfs @ 12.06 hrs, Volume= 1.975 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-20.00 hrs, dt= 0.05 hrs

Reach 13R: Total Site Runoff (Prop)



Pond 11P: Detention Pond



Summary for Pond 11P: Detention Pond

Inflow Area = 6.200 ac, 85.00% Impervious, Inflow Depth > 3.70" for 100-year, 3-hour event
Inflow = 32.91 cfs @ 12.01 hrs, Volume= 1.912 af
Outflow = 8.07 cfs @ 12.22 hrs, Volume= 1.845 af, Atten= 75%, Lag= 12.9 min
Primary = 8.07 cfs @ 12.22 hrs, Volume= 1.845 af

Routing by Stor-Ind method, Time Span= 0.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 761.82' @ 12.22 hrs Surf.Area= 14,742 sf Storage= 32,612 cf

Plug-Flow detention time= 67.7 min calculated for 1.840 af (96% of inflow)
Center-of-Mass det. time= 53.0 min (786.2 - 733.2)

Volume	Invert	Avail.Storage	Storage Description
#1	759.10'	71,910 cf	Custom Stage Data (Prismatic) Listed below (Recalc)
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
759.10	9,347	0	0
760.10	11,214	10,281	10,281
761.10	13,207	12,211	22,491
762.10	15,327	14,267	36,758
763.10	17,551	16,439	53,197
764.10	19,875	18,713	71,910

Device	Routing	Invert	Outlet Devices
#1	Primary	759.10'	14.5" Vert. Orifice/Grate C= 0.600
#2	Primary	761.75'	12.0" Vert. Orifice/Grate C= 0.600

Primary OutFlow Max=8.05 cfs @ 12.22 hrs HW=761.82' (Free Discharge)
1=Orifice/Grate (Orifice Controls 8.03 cfs @ 7.00 fps)
2=Orifice/Grate (Orifice Controls 0.02 cfs @ 0.89 fps)

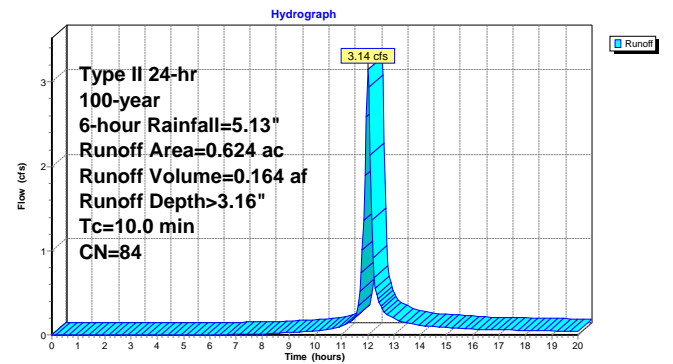
Summary for Subcatchment 7S: Drainage Area 2

Runoff = 3.14 cfs @ 12.01 hrs, Volume= 0.164 af, Depth> 3.16"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-20.00 hrs, dt= 0.05 hrs
Type II 24-hr 100-year, 6-hour Rainfall=5.13"

Area (ac)	CN	Description			
0.624	84	50-75% Grass cover, Fair, HSG D			
0.624		100.00% Pervious Area			
Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.0					Direct Entry,

Subcatchment 7S: Drainage Area 2



Summary for Subcatchment 9S: Drainage Area 1

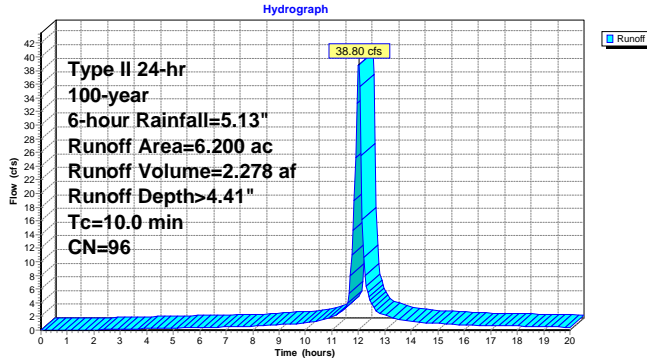
Runoff = 38.80 cfs @ 12.01 hrs, Volume= 2.278 af, Depth> 4.41"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-20.00 hrs, dt= 0.05 hrs
 Type II 24-hr 100-year, 6-hour Rainfall=5.13"

Area (ac)	CN	Description
5.270	98	Paved parking, HSG D
0.930	84	50-75% Grass cover, Fair, HSG D
6.200	96	Weighted Average
0.930		15.00% Pervious Area
5.270		85.00% Impervious Area

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

Subcatchment 9S: Drainage Area 1



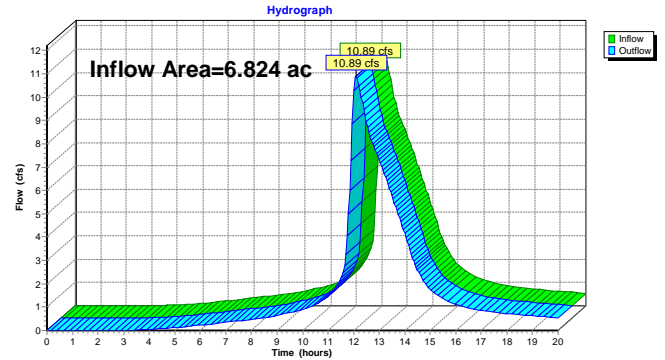
Summary for Reach 13R: Total Site Runoff (Prop)

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

Inflow Area = 6.824 ac, 77.23% Impervious, Inflow Depth > 4.16" for 100-year, 6-hour event
 Inflow = 10.89 cfs @ 12.08 hrs, Volume= 2.368 af
 Outflow = 10.89 cfs @ 12.08 hrs, Volume= 2.368 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-20.00 hrs, dt= 0.05 hrs

Reach 13R: Total Site Runoff (Prop)



Summary for Pond 11P: Detention Pond

Inflow Area = 6.200 ac, 85.00% Impervious, Inflow Depth > 4.41" for 100-year, 6-hour event
 Inflow = 38.80 cfs @ 12.01 hrs, Volume= 2.278 af
 Outflow = 9.59 cfs @ 12.22 hrs, Volume= 2.204 af, Atten= 75%, Lag= 12.9 min
 Primary = 9.59 cfs @ 12.22 hrs, Volume= 2.204 af

Routing by Stor-Ind method, Time Span= 0.00-20.00 hrs, dt= 0.05 hrs
 Peak Elev= 762.22' @ 12.22 hrs Surf.Area= 15,589 sf Storage= 38,582 cf

Plug-Flow detention time= 67.2 min calculated for 2.199 af (97% of inflow)
 Center-of-Mass det. time= 53.6 min (783.1 - 729.5)

Volume	Invert	Avail.Storage	Storage Description
#1	759.10'	71,910 cf	Custom Stage Data (Prismatic) Listed below (Recalc)
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
759.10	9,347	0	0
760.10	11,214	10,281	10,281
761.10	13,207	12,211	22,491
762.10	15,327	14,267	36,758
763.10	17,551	16,439	53,197
764.10	19,875	18,713	71,910

Device	Routing	Invert	Outlet Devices
#1	Primary	759.10'	14.5" Vert. Orifice/Grate C= 0.600
#2	Primary	761.75'	12.0" Vert. Orifice/Grate C= 0.600

Primary OutFlow Max=9.57 cfs @ 12.22 hrs HW=762.21' (Free Discharge)
 1=Orifice/Grate (Orifice Controls 8.74 cfs @ 7.63 fps)
 2=Orifice/Grate (Orifice Controls 0.82 cfs @ 2.31 fps)

Pond 11P: Detention Pond

