

EAST VILLAGE MASTER PLAN DRAINAGE REPORT



PROJECT SITE:
690 STATE STREET
FRANKLIN, JOHNSON COUNTY, INDIANA

PREPARED ON BEHALF OF:
Indiana Masonic Homes
690 State Street
Franklin, IN 46131
317.736.6141

PREPARED BY:
V3 Companies
619 North Pennsylvania Street
Indianapolis, IN 46204
317.423.0690

Original Submittal: January 24, 2019

TABLE OF CONTENTS

<u>Stormwater Drainage Technical Report</u>	<u>Page</u>
1.0 INTRODUCTION	1
2.0 EXISTING CONDITIONS	1
3.0 DEVELOPED CONDITIONS.....	2
4.0 PROPOSED STORMWATER MANAGEMENT DESIGN	2
5.0 EMERGENCY OVERFLOW CALCULATIONS	3

FIGURES

Figure 1 – Site Location Map

Figure 2 – Soils Map

Figure 3 – FEMA FIRM Map

Figure 4 – Pre-Developed Watershed Map

Figure 5 – Post-Developed Watershed Map

APPENDICES

Appendix A – Hydrologic Soil Group Report

Appendix B – Calculated Watershed Parameters

Appendix C – Pre-Developed HydroCAD Results

Appendix D – Post-Developed HydroCAD Results

Appendix E – Emergency Overflow Calculations

1.0 INTRODUCTION

Indiana Masonic Homes (IMH) is proposing to extend the Skilled Nursing and Rehabilitation Center (SNRC) development to an adjacent property east of the SNRC site located at the intersection of Freemason Parkway and State Street in Franklin, Indiana (**SITE**) as shown in **Figure 1**. At this stage, IMH is preparing the site for future development by demolishing the existing building and associated infrastructure, which has been replaced by the new SNRC facility, to create a blank slate for the future development. This report describes the stormwater management design for the fully developed East Village to be included as part of the City of Franklin's Technical Review Committee submittal.

This report is intended to accompany the construction documents prepared by V3 COMPANIES and dated 01-22-2018.

2.0 EXISTING CONDITIONS

The SITE is located west of the intersection of Freemason Parkway and State Street. The SITE is bordered to the northeast/east by businesses, to the south by a wastewater treatment facility, and to the northwest/west by other IMH facilities. The East Village development encompasses approximately 11.97 acres. Planned demolition on the site is approximately 7 acres. See **Figure 3** for the extents of the floodway/floodplain on the site.

The SITE's existing watershed is approximately 10.05 acres. Generally, the existing watershed leaves the site through existing stormwater infrastructure (18" diameter pipe) located at the south end and ultimately crossing Freemason Parkway. Detailed survey does not exist for this pipe; therefore, it is unknown where the pipe (and the runoff from the site) ultimately discharges. Part of the existing site, the southwest corner, was master planned to drain to existing infrastructure from the SNRC project and ultimately to an existing master-planned detention pond. This system and modification to the master-planned pond's watershed was approved by the City of Franklin as part of the SNRC project. Refer to **Figure 4** for an exhibit showing pre-developed watersheds. **Table 2.1** summarizes the pre-developed flows from the SITE.

The current uses for the SITE include rehab facilities to be replaced by SNRC, Kresge chapel and assisted living apartments. Please note, the Kresge chapel will remain and be modified to become a standalone structure. The current hydrologic soil group for this site is C. See **Appendix A** for the Hydrologic Soil Group report generated from NRCS Web Soil Survey.

Table 2.1: Pre-Developed Peak Flow Rates				
East Village Watershed	10.05 Ac	10-Yr, 24-Hr	3.27	cfs
		100-Yr, 24-Hr	5.51	cfs

3.0 DEVELOPED CONDITIONS

INDIANA MASONIC HOMES is proposing demolition of its existing facilities and infrastructure to clear the SITE for future use. To prepare for future increase in impervious material in the SITE's watershed and to balance the earthwork on the SITE, a detention pond will be placed where the existing building will be demolished. The size of the pond is dictated mostly by balancing earthwork rather than detention storage needs. The proposed conditions of the SITE have been assumed to be 85% impervious surface, although no plans exist today for the future development. The post-developed watershed includes part of the SNRC site; therefore, the proposed watershed is larger in area than the existing watershed. Refer to **Figure 5** for an exhibit of the post-developed watershed map.

4.0 PROPOSED STORMWATER MANAGEMENT SYSTEM DESIGN

The stormwater management system for the SITE will treat water quantity per the City of Franklin Stormwater Management Ordinance. Goals for water quantity design are based on Section 3.b.1.i and are driven by release rates developed by the City of Franklin. The proposed stormwater management system is not a BMP and will not treat runoff for stormwater quality. It will be the responsibility of the future development projects to treat runoff to meet the City of Franklin's water quality standards.

When determining allowable release rates for the post-developed conditions, the City of Franklin has adopted a standard discharge ratio based on developed area. See **Table 4.1** below for allowable release rates for the site.

V3 proposes to utilize existing stormwater infrastructure as an outlet point from the pond described above. A 30"x30" box structure (Structure 702) will be utilized as an outlet control structure to the current pipe that serves as the outlet for the site as described in the existing conditions. The existing 18" pipe exiting the south side of the site has the capacity to serve as the outlet for the pond.

Water Quantity Treatment

Table 4.1 shows the Post-Developed Allowable Release Rates for the developed site. **Table 4.2** shows the Post-Developed Peak Discharge Results for the site.

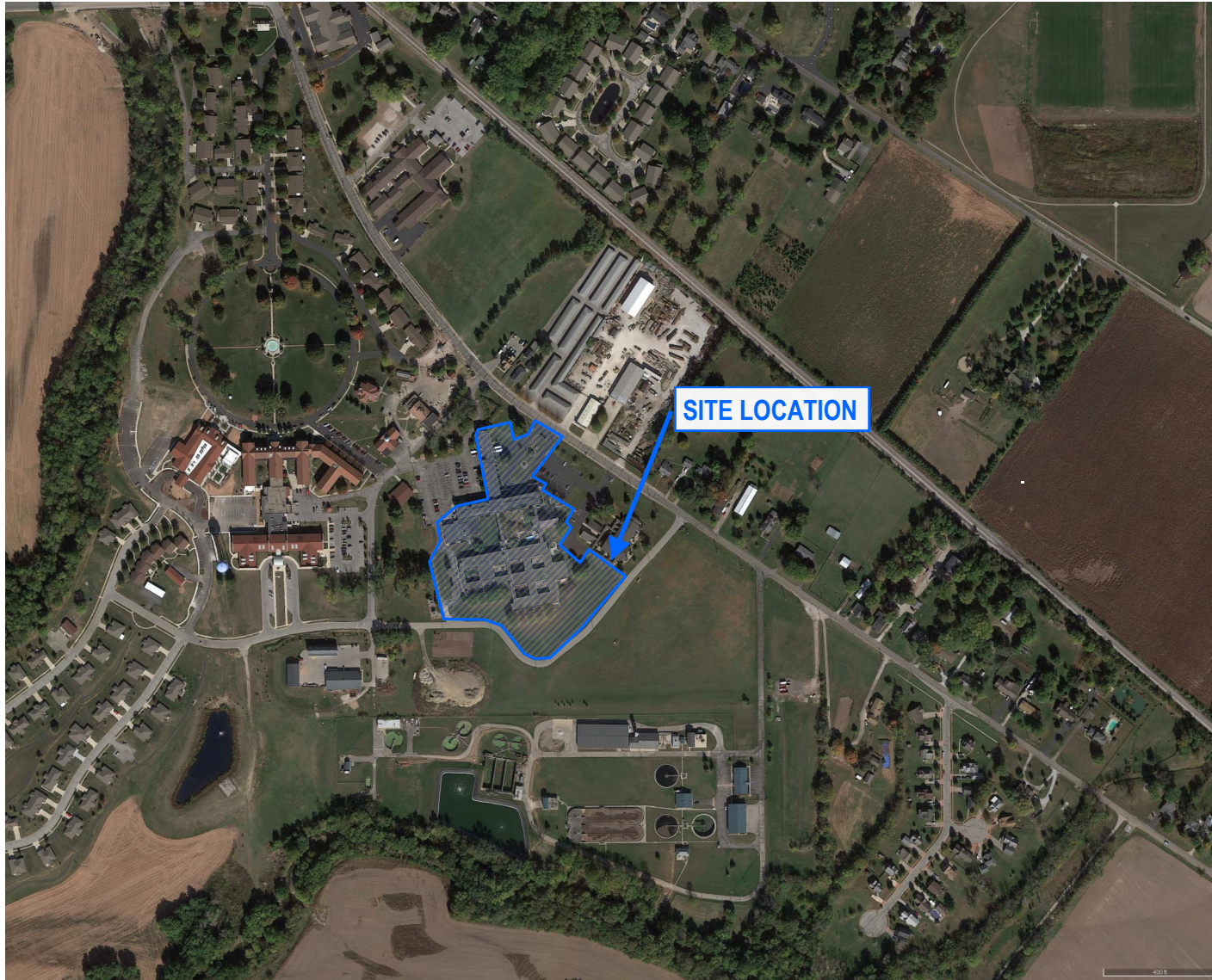
Table 4.1: Allowable Release Rates					
Structure 702 Outlet	10-Yr, 24-Hr	11.97 acres	11.97 acres x 0.1 cfs / acre	1.20	cfs
	100-Yr, 24-Hr	11.97 acres	11.97 acres x 0.3 cfs / acre	3.59	cfs

Table 4.2: Peak Discharge Results

Structure 702 Outlet	10-Year, 24-Hour SCS Type II	1.05 cfs
	100-Year, 24-Hour SCS Type II	2.88 cfs

5.0 EMERGENCY OVERFLOW CALCULATIONS

The emergency overflow weir has been sized to accommodate 125% of the Q100 inflow assuming the pond outlet is plugged. Utilizing the weir equation ($Q = C_d L H^{3/2}$) and design parameters of 6 inches for H, 3.3 for C_d , and 3.6 cfs for Q, the minimum weir width must be 3.09 feet or greater.



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FIGURE 1 SITE LOCATION MAP

East Village Master Plan
Franklin, Indiana

Prepared for:
Indiana Masonic Homes

Project No.
01.1151.B.1

Date:
23 January 2019



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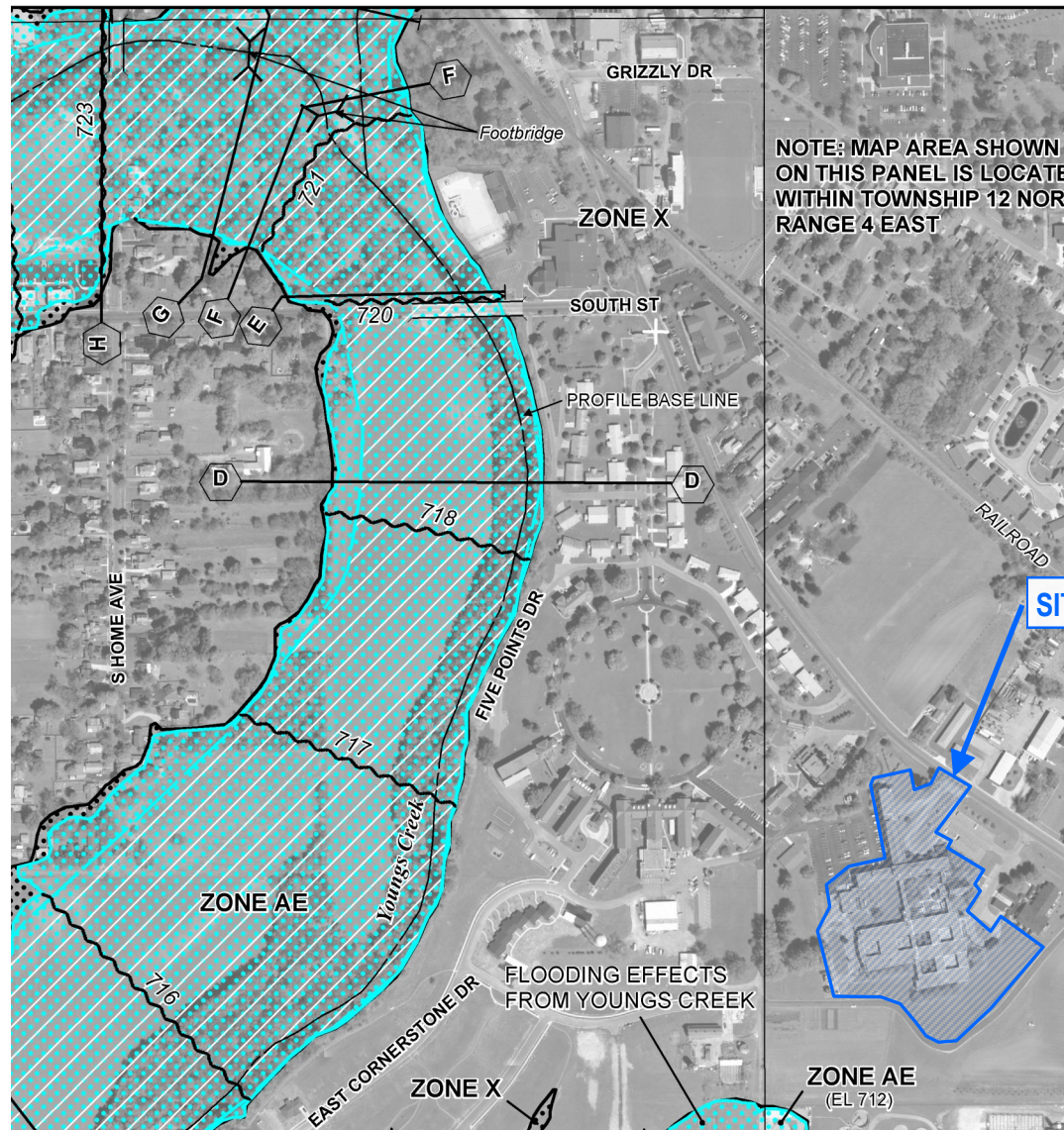
FIGURE 2 SOILS MAP

East Village Master Plan
Franklin, Indiana

Prepared for:
Indiana Masonic Homes

Project No.
01.1151.B.1

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FIGURE 3 FEMA FIRM MAP

East Village Master Plan
Franklin, Indiana

Prepared for:
Indiana Masonic Homes

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23 January 2019

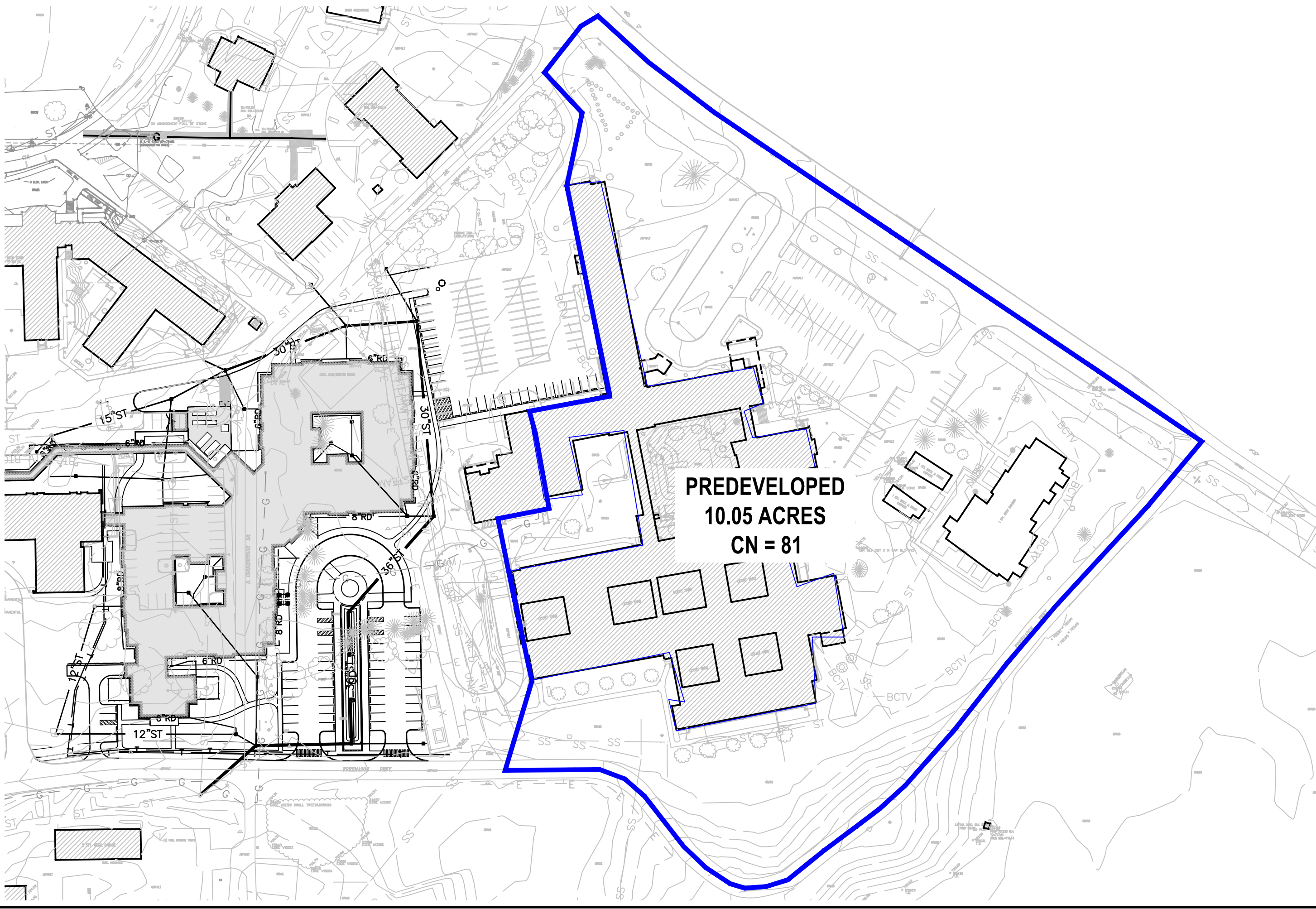


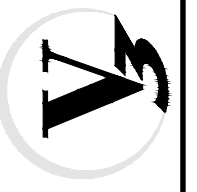
FIGURE 4

SKETCH NO.:

DATE: 1/23/2019

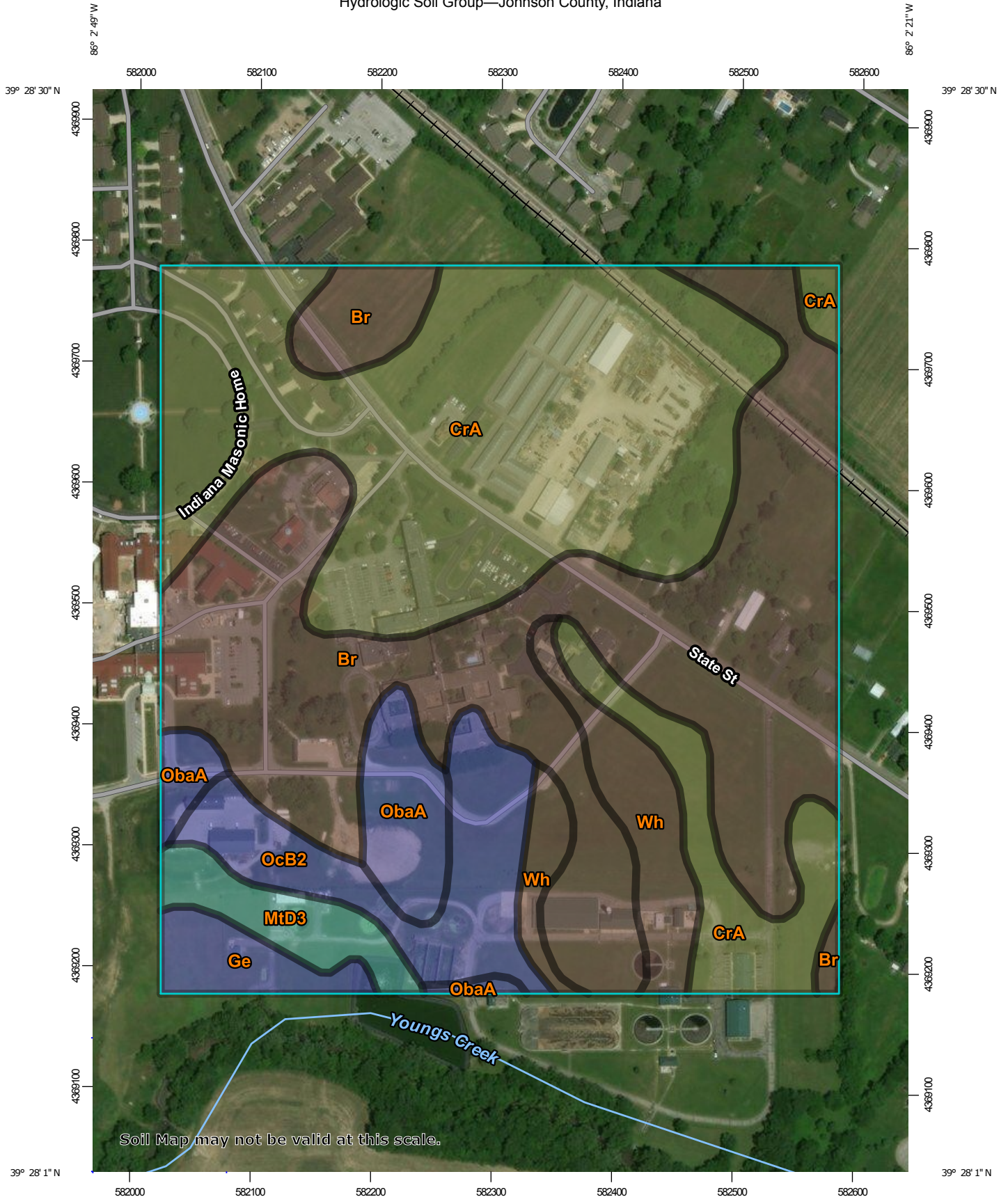
EAST VILLAGE MASTER PLAN
PREDEVELOPED WATERSHED

619 N Pennsylvania Street
Indianapolis, IN 46204
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www.v3co.com

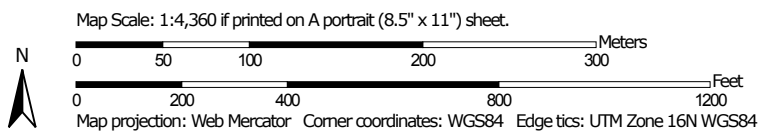


APPENDIX A

Hydrologic Soil Group—Johnson County, Indiana



Soil Map may not be valid at this scale.



Natural Resources
Conservation Service

Web Soil Survey
National Cooperative Soil Survey

1/22/2019
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 26, Sep 7, 2018

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	32.7	38.8%
CrA	Crosby silt loam, fine-loamy subsoil, 0 to 2 percent slopes	C/D	32.7	38.8%
Ge	Genesee loam	B	1.9	2.3%
MtD3	Miami clay loam, 12 to 18 percent slopes, severely eroded	C	2.5	3.0%
ObaA	Ockley loam, 0 to 2 percent slopes	B	3.7	4.4%
OcB2	Ockley loam, 2 to 6 percent slopes, eroded	B	6.1	7.3%
Wh	Whitaker silt loam, 0 to 2 percent slopes	B/D	4.5	5.3%
Totals for Area of Interest			84.1	100.0%

Description

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

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

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

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

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

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

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

Rating Options

Aggregation Method: Dominant Condition

Component Percent Cutoff: None Specified

Tie-break Rule: Higher

APPENDIX B

Time of Concentration Worksheet Based on TR-55	PROJECT: Indiana Masonic Home - East Village JOB #: 01.1151.A.1
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Time of Concentration Worksheet Based on TR-55	PROJECT: Indiana Masonic Home - East Village JOB #: 01.1151.A.1
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Time of Concentration Worksheet Based on TR-55	PROJECT: Indiana Masonic Home - East Village JOB #: 01.1151.A.1
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Typical values for Manning's n			
Overland Flow		Channel Flow	
short grass	0.150	grass	0.025
dense grass	0.240	concrete	0.015
pavement	0.011	rip-rap	0.035

minimum T_c = 5 minutes

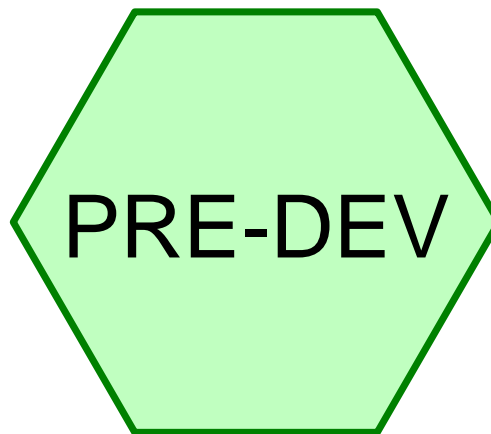
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File: P:\1 Indiana\BDMD\01.1151.B.1 Indiana Masonic Home East Village\Calcs&Data\LD\Storm\East Village MP Calculations_Final_1-22-2019.xlsx]C & CN
Project: Indiana Masonic Home - East Village
Design: DAM
Date: 1/23/2019
Revision:

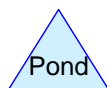
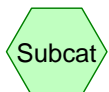
WEIGHTED "CN" AND "C" CALCULATIONS

BASIN	East Village MP Post-Developed					
	A. Total Area:	521,303 s.f.	=	11.97 acres		
	B. Breakdown				CN	CN*A
	Impervious	443,108 s.f.			98	43424540
	Pervious	78,195 s.f.			74	5786463
		Imp. Percentage:	0.85			
	C. Subtotal					49211003
	D. Weighted C					94
BASIN	East Village MP Pre-Developed					
	A. Total Area:	437,655 s.f.	=	10.05 acres		
	B. Breakdown				CN	CN*A
	Impervious	233,689 s.f.			98	22901522
	Pervious	203,966 s.f.			61	12441926
		Imp. Percentage:	0.53			
	C. Subtotal					35343448
	D. Weighted C					81

APPENDIX C



Pre-Developed Watershed



Routing Diagram for East Village MP Calculation_Final_1-22-2019

Prepared by V3 Companies Ltd., Printed 1/23/2019

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East Village MP Calculation_Final_1-22-2019

Prepared by V3 Companies Ltd.

Printed 1/23/2019

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Page 2

Area Listing (selected nodes)

Area (acres)	CN	Description (subcatchment-numbers)
10.047	81	From Spreadsheet (PRE-DEV)
10.047	81	TOTAL AREA

East Village MP Calculation_Final_1-22-2019

Prepared by V3 Companies Ltd.

Printed 1/23/2019

HydroCAD® 10.00-20 s/n 04552 © 2017 HydroCAD Software Solutions LLC

Page 3

Soil Listing (selected nodes)

Area (acres)	Soil Group	Subcatchment Numbers
0.000	HSG A	
0.000	HSG B	
0.000	HSG C	
0.000	HSG D	
10.047	Other	PRE-DEV
10.047		TOTAL AREA

Summary for Subcatchment PRE-DEV: Pre-Developed Watershed

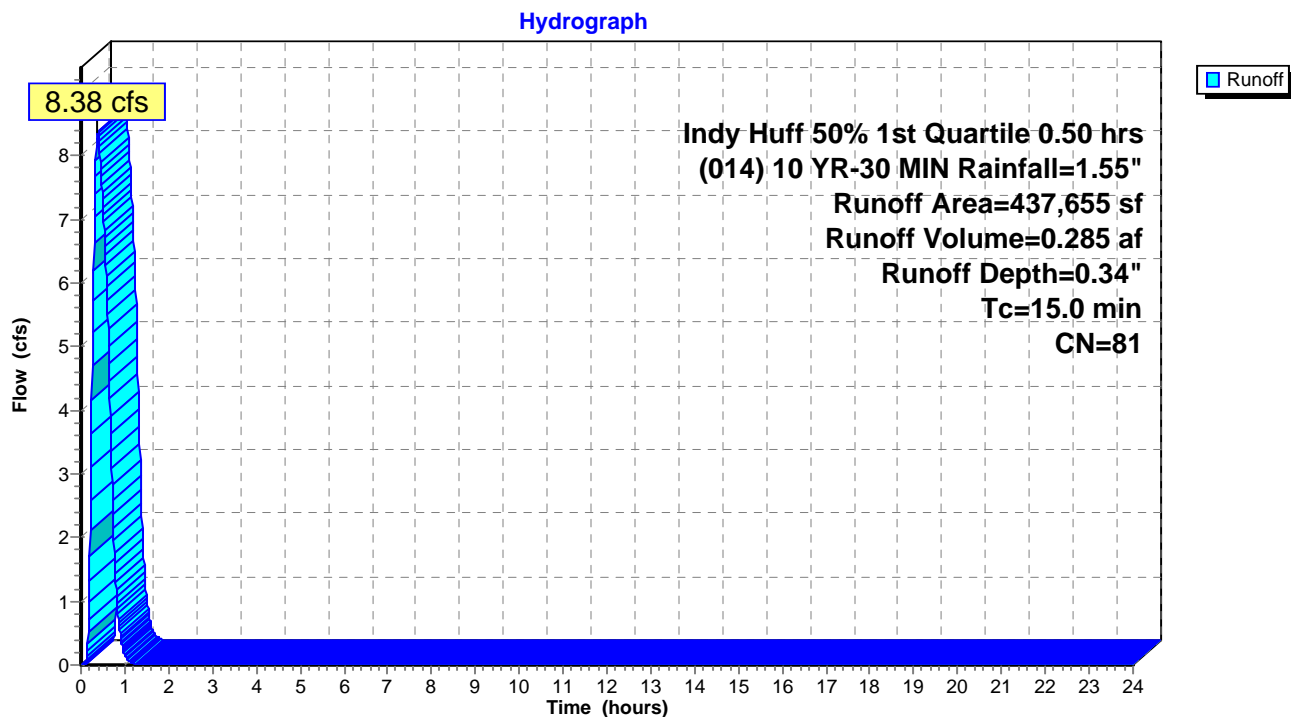
Runoff = 8.38 cfs @ 0.38 hrs, Volume= 0.285 af, Depth= 0.34"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
 Indy Huff 50% 1st Quartile 0.50 hrs (014) 10 YR-30 MIN Rainfall=1.55"

Area (sf)	CN	Description
* 437,655	81	From Spreadsheet
437,655		100.00% Pervious Area

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

Subcatchment PRE-DEV: Pre-Developed Watershed



Summary for Subcatchment PRE-DEV: Pre-Developed Watershed

Runoff = 9.28 cfs @ 0.49 hrs, Volume= 0.485 af, Depth= 0.58"

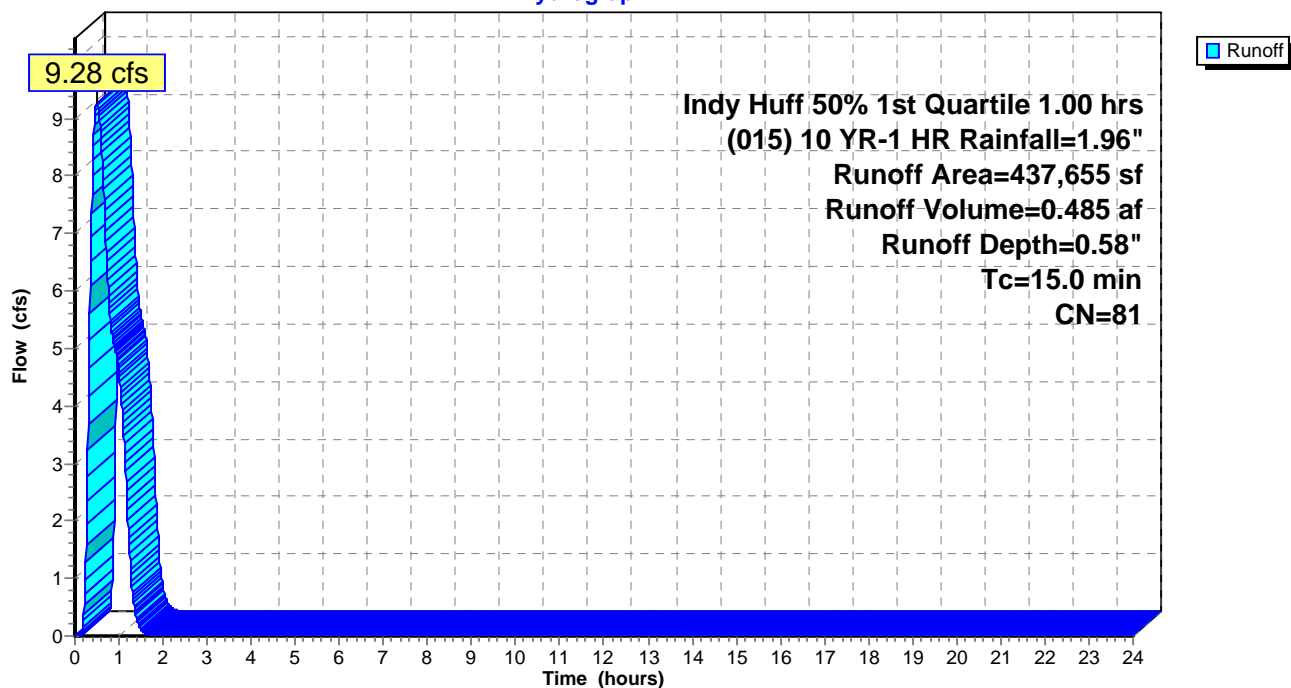
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
 Indy Huff 50% 1st Quartile 1.00 hrs (015) 10 YR-1 HR Rainfall=1.96"

Area (sf)	CN	Description
* 437,655	81	From Spreadsheet
437,655		100.00% Pervious Area

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

Subcatchment PRE-DEV: Pre-Developed Watershed

Hydrograph



Summary for Subcatchment PRE-DEV: Pre-Developed Watershed

Runoff = 8.40 cfs @ 0.69 hrs, Volume= 0.730 af, Depth= 0.87"

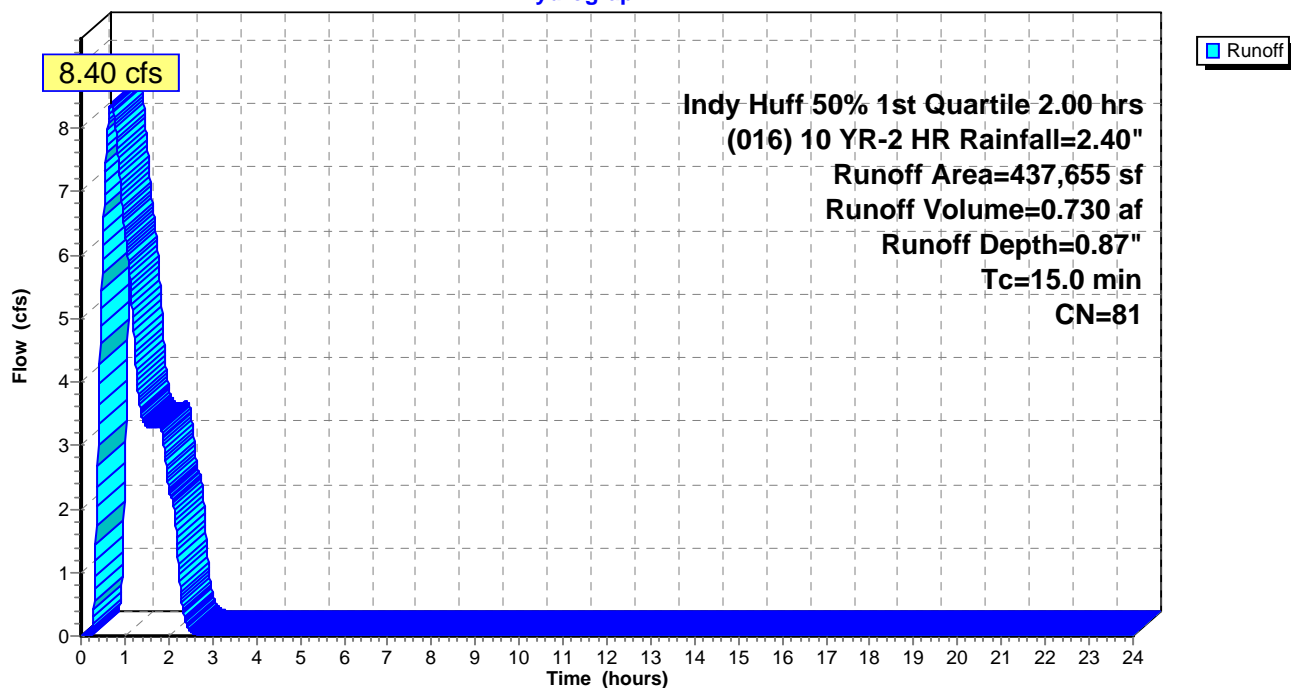
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
 Indy Huff 50% 1st Quartile 2.00 hrs (016) 10 YR-2 HR Rainfall=2.40"

Area (sf)	CN	Description
* 437,655	81	From Spreadsheet
437,655		100.00% Pervious Area

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

Subcatchment PRE-DEV: Pre-Developed Watershed

Hydrograph



Summary for Subcatchment PRE-DEV: Pre-Developed Watershed

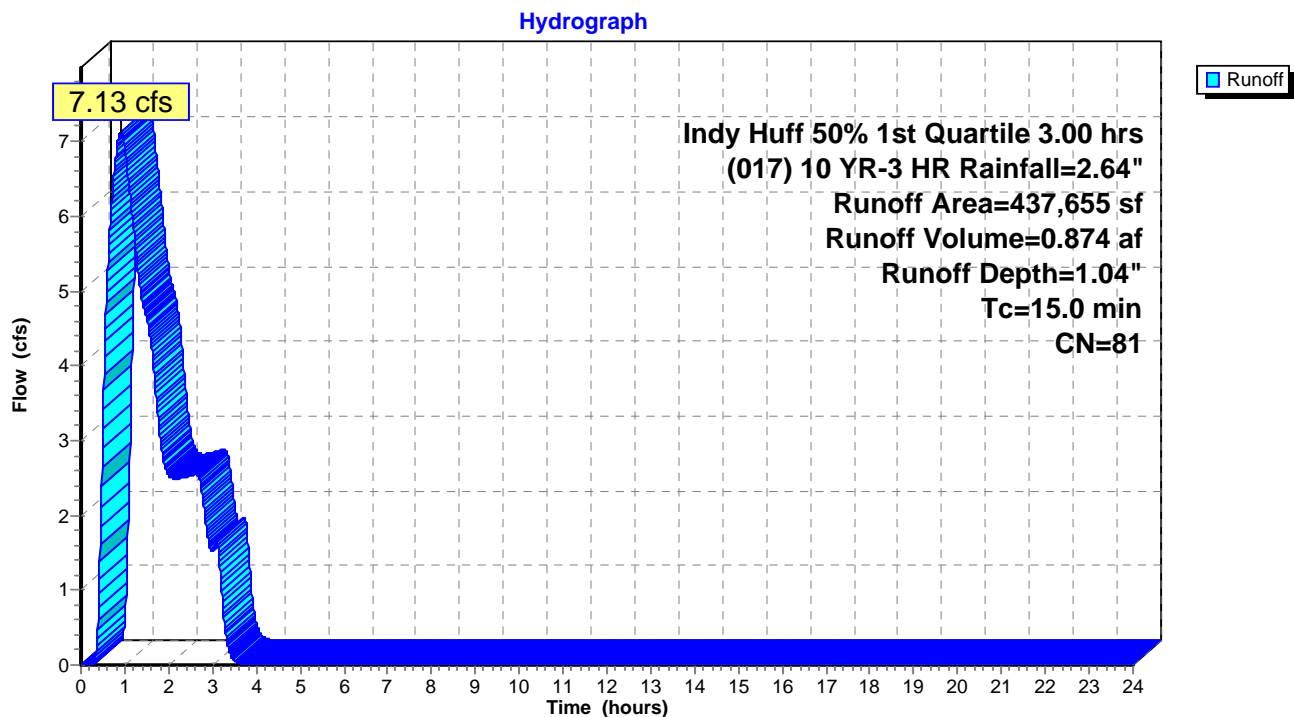
Runoff = 7.13 cfs @ 0.91 hrs, Volume= 0.874 af, Depth= 1.04"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
 Indy Huff 50% 1st Quartile 3.00 hrs (017) 10 YR-3 HR Rainfall=2.64"

Area (sf)	CN	Description
* 437,655	81	From Spreadsheet
437,655		100.00% Pervious Area

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

Subcatchment PRE-DEV: Pre-Developed Watershed



Summary for Subcatchment PRE-DEV: Pre-Developed Watershed

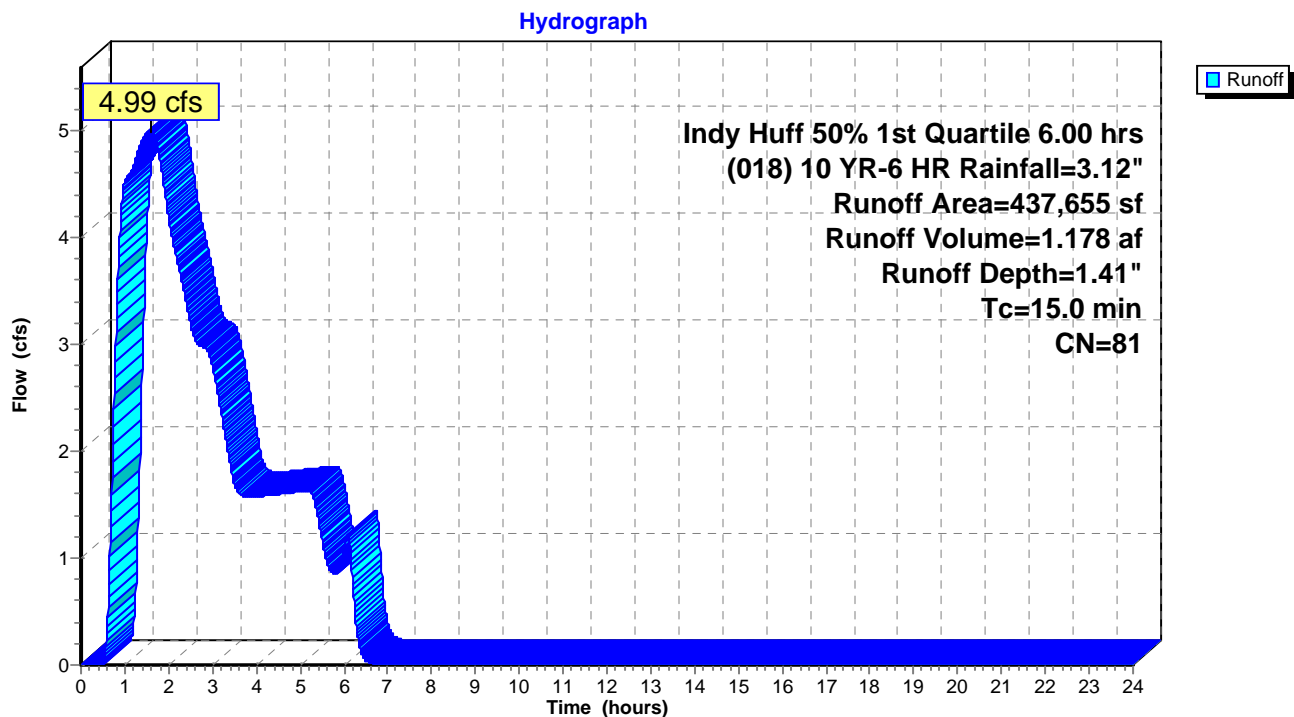
Runoff = 4.99 cfs @ 1.58 hrs, Volume= 1.178 af, Depth= 1.41"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
 Indy Huff 50% 1st Quartile 6.00 hrs (018) 10 YR-6 HR Rainfall=3.12"

Area (sf)	CN	Description
* 437,655	81	From Spreadsheet
437,655		100.00% Pervious Area

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

Subcatchment PRE-DEV: Pre-Developed Watershed



Summary for Subcatchment PRE-DEV: Pre-Developed Watershed

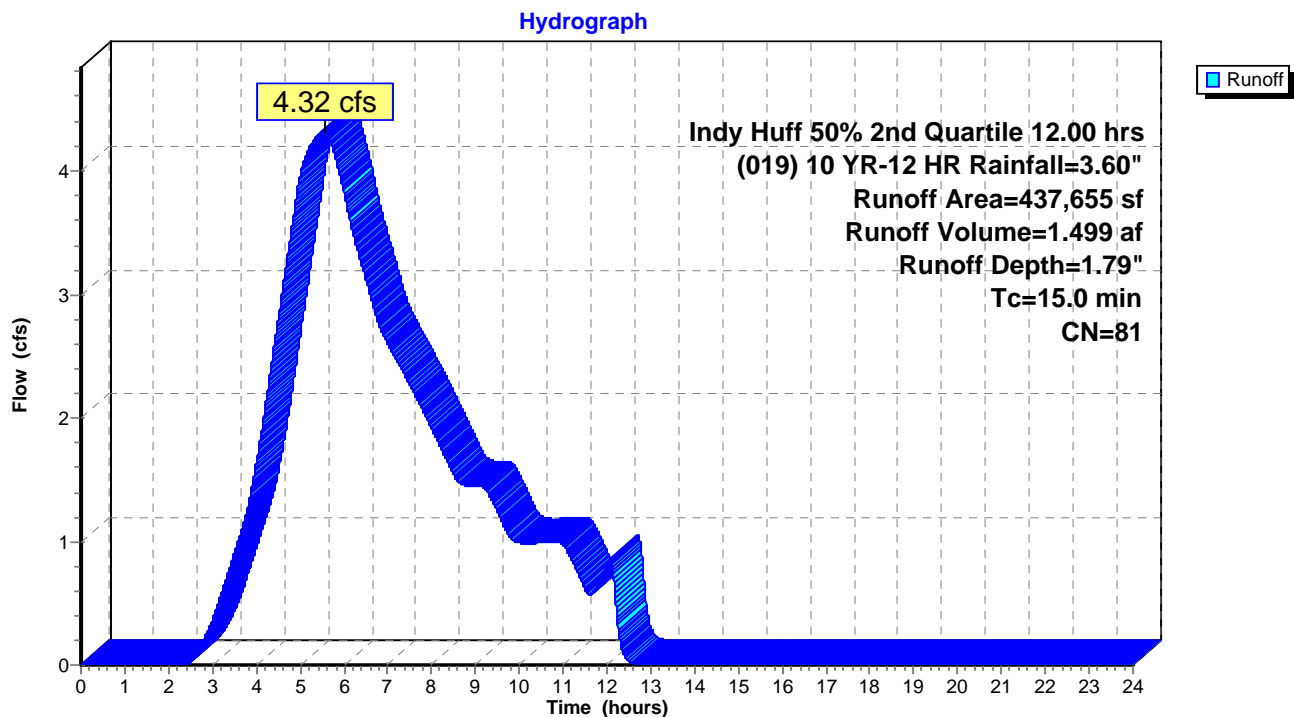
Runoff = 4.32 cfs @ 5.55 hrs, Volume= 1.499 af, Depth= 1.79"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
 Indy Huff 50% 2nd Quartile 12.00 hrs (019) 10 YR-12 HR Rainfall=3.60"

Area (sf)	CN	Description
* 437,655	81	From Spreadsheet
437,655		100.00% Pervious Area

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

Subcatchment PRE-DEV: Pre-Developed Watershed



Summary for Subcatchment PRE-DEV: Pre-Developed Watershed

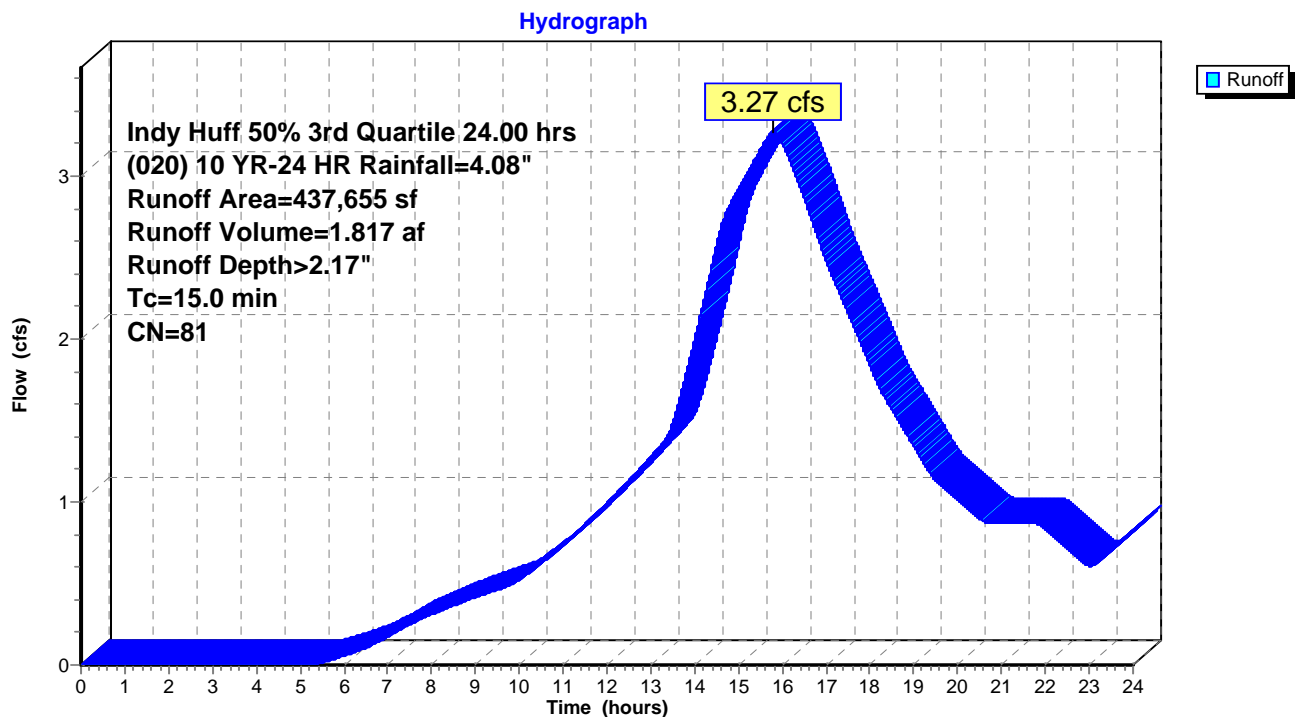
Runoff = 3.27 cfs @ 15.78 hrs, Volume= 1.817 af, Depth> 2.17"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
 Indy Huff 50% 3rd Quartile 24.00 hrs (020) 10 YR-24 HR Rainfall=4.08"

Area (sf)	CN	Description
* 437,655	81	From Spreadsheet
437,655		100.00% Pervious Area

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

Subcatchment PRE-DEV: Pre-Developed Watershed



Summary for Subcatchment PRE-DEV: Pre-Developed Watershed

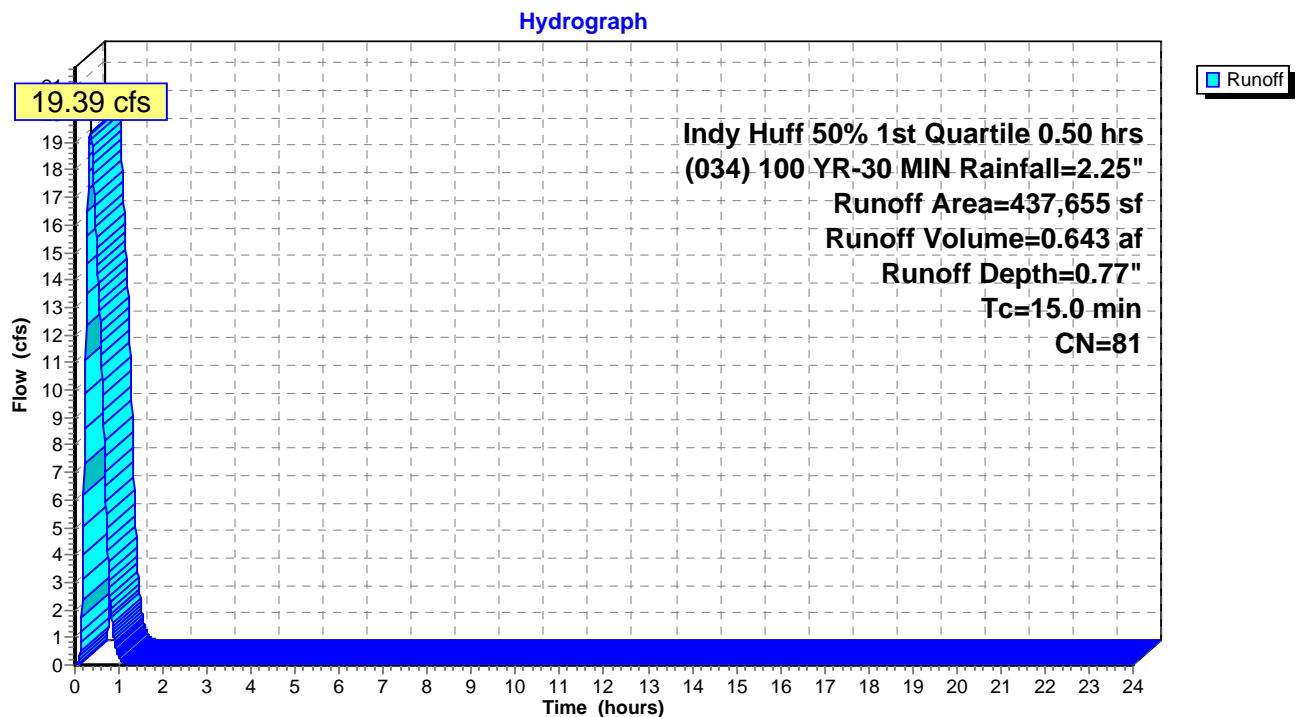
Runoff = 19.39 cfs @ 0.35 hrs, Volume= 0.643 af, Depth= 0.77"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
 Indy Huff 50% 1st Quartile 0.50 hrs (034) 100 YR-30 MIN Rainfall=2.25"

Area (sf)	CN	Description
* 437,655	81	From Spreadsheet
437,655		100.00% Pervious Area

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

Subcatchment PRE-DEV: Pre-Developed Watershed



Summary for Subcatchment PRE-DEV: Pre-Developed Watershed

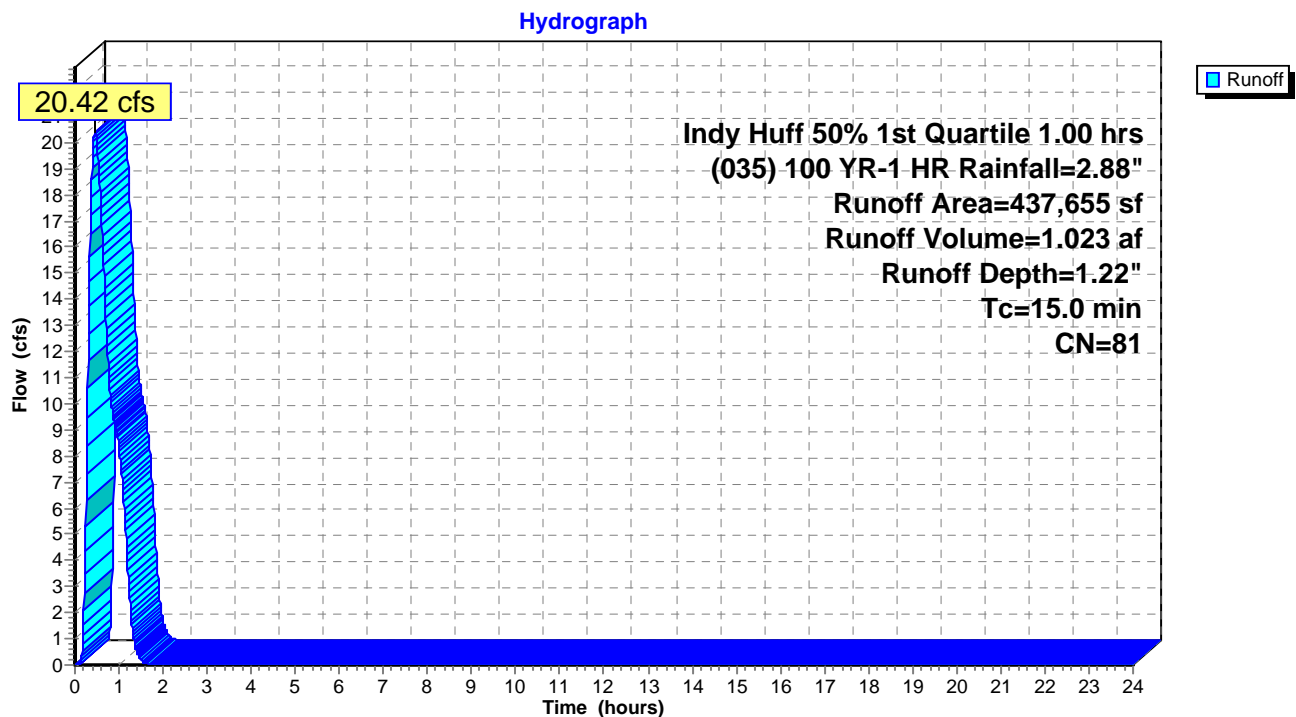
Runoff = 20.42 cfs @ 0.45 hrs, Volume= 1.023 af, Depth= 1.22"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
 Indy Huff 50% 1st Quartile 1.00 hrs (035) 100 YR-1 HR Rainfall=2.88"

Area (sf)	CN	Description
* 437,655	81	From Spreadsheet
437,655		100.00% Pervious Area

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

Subcatchment PRE-DEV: Pre-Developed Watershed



Summary for Subcatchment PRE-DEV: Pre-Developed Watershed

Runoff = 17.16 cfs @ 0.65 hrs, Volume= 1.431 af, Depth= 1.71"

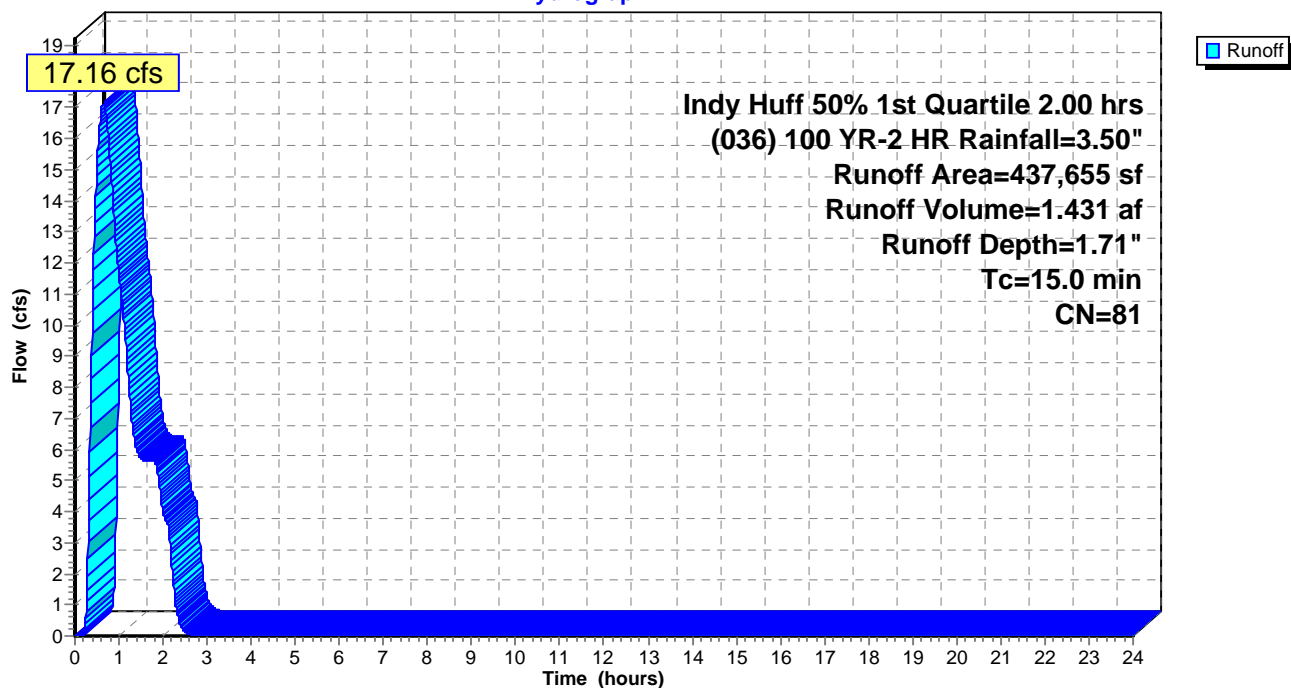
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
 Indy Huff 50% 1st Quartile 2.00 hrs (036) 100 YR-2 HR Rainfall=3.50"

Area (sf)	CN	Description
* 437,655	81	From Spreadsheet
437,655		100.00% Pervious Area

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

Subcatchment PRE-DEV: Pre-Developed Watershed

Hydrograph



Summary for Subcatchment PRE-DEV: Pre-Developed Watershed

Runoff = 14.14 cfs @ 0.85 hrs, Volume= 1.685 af, Depth= 2.01"

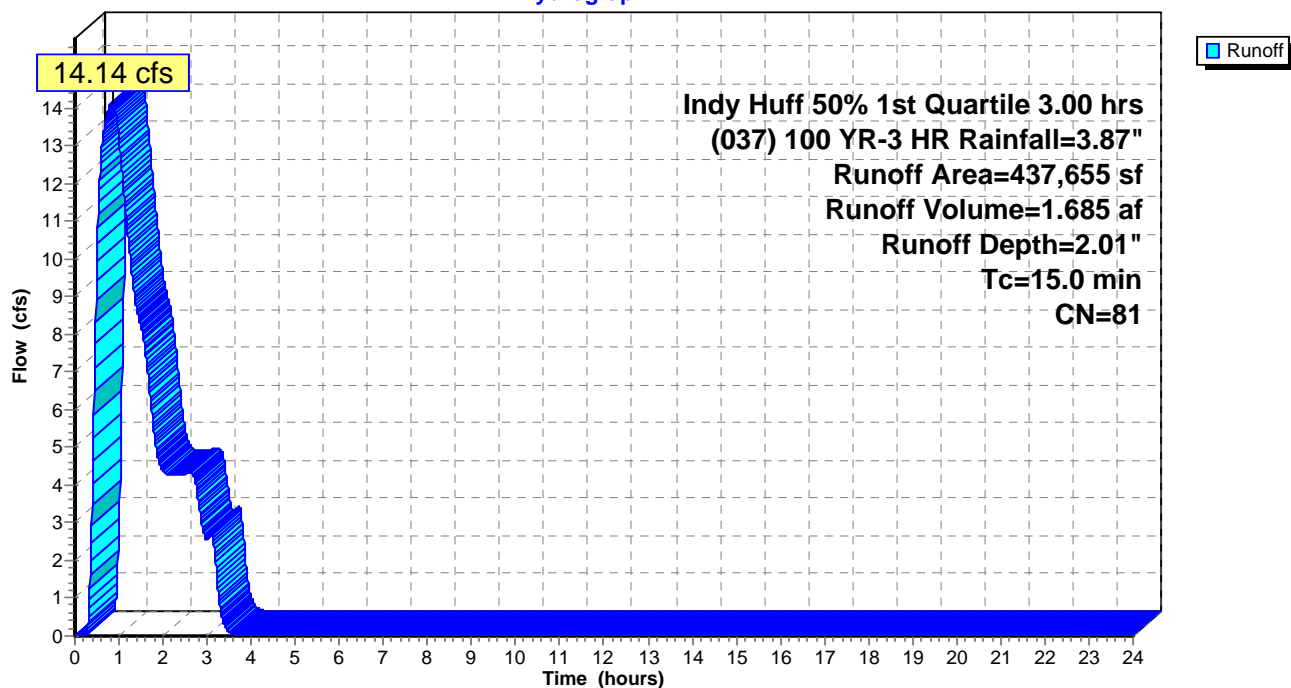
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
 Indy Huff 50% 1st Quartile 3.00 hrs (037) 100 YR-3 HR Rainfall=3.87"

Area (sf)	CN	Description
* 437,655	81	From Spreadsheet
437,655		100.00% Pervious Area

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

Subcatchment PRE-DEV: Pre-Developed Watershed

Hydrograph



Summary for Subcatchment PRE-DEV: Pre-Developed Watershed

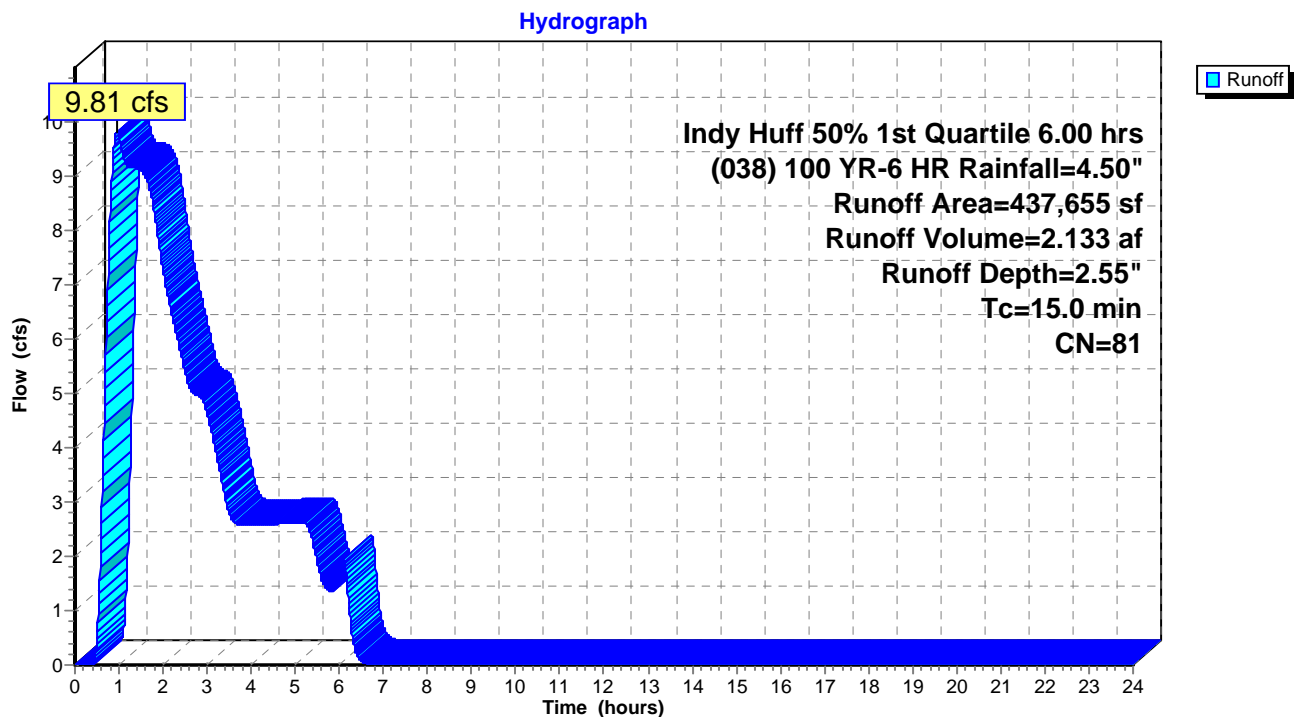
Runoff = 9.81 cfs @ 0.95 hrs, Volume= 2.133 af, Depth= 2.55"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
 Indy Huff 50% 1st Quartile 6.00 hrs (038) 100 YR-6 HR Rainfall=4.50"

Area (sf)	CN	Description
* 437,655	81	From Spreadsheet
437,655		100.00% Pervious Area

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

Subcatchment PRE-DEV: Pre-Developed Watershed



Summary for Subcatchment PRE-DEV: Pre-Developed Watershed

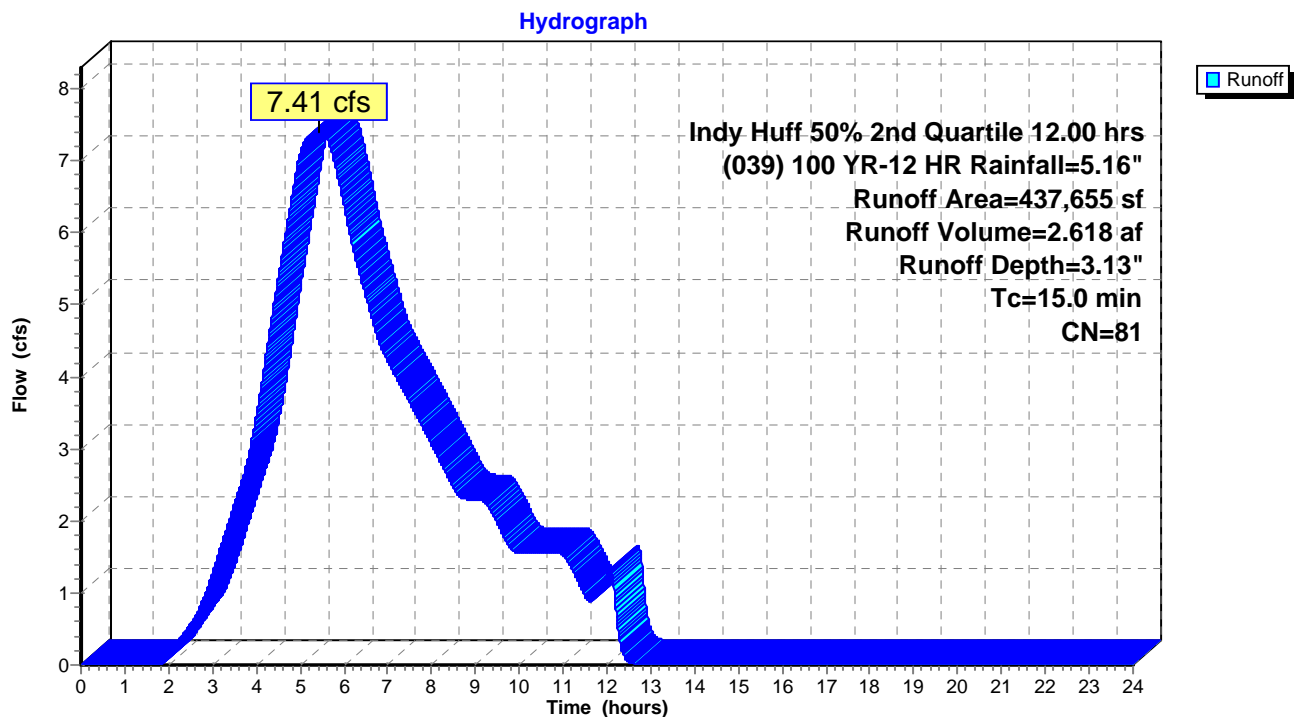
Runoff = 7.41 cfs @ 5.45 hrs, Volume= 2.618 af, Depth= 3.13"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
 Indy Huff 50% 2nd Quartile 12.00 hrs (039) 100 YR-12 HR Rainfall=5.16"

Area (sf)	CN	Description
* 437,655	81	From Spreadsheet
437,655		100.00% Pervious Area

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

Subcatchment PRE-DEV: Pre-Developed Watershed



Summary for Subcatchment PRE-DEV: Pre-Developed Watershed

Runoff = 5.51 cfs @ 15.78 hrs, Volume= 3.226 af, Depth> 3.85"

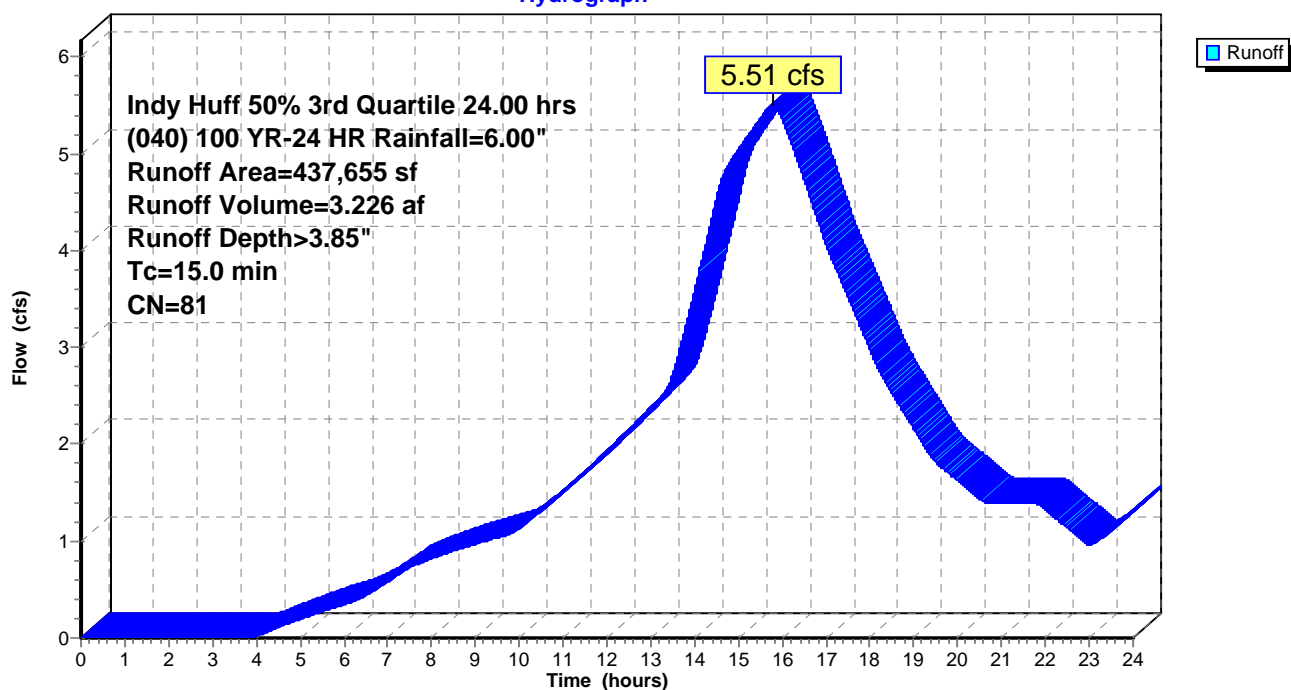
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
 Indy Huff 50% 3rd Quartile 24.00 hrs (040) 100 YR-24 HR Rainfall=6.00"

Area (sf)	CN	Description
* 437,655	81	From Spreadsheet
437,655		100.00% Pervious Area

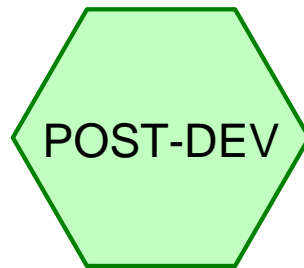
Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
15.0					Direct Entry,

Subcatchment PRE-DEV: Pre-Developed Watershed

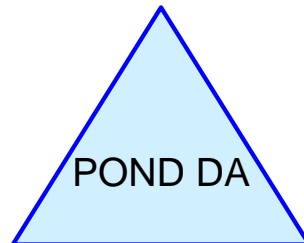
Hydrograph



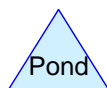
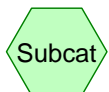
APPENDIX D



Post-Developed
Watershed



POND DA



Routing Diagram for East Village MP Calculation_Final_1-22-2019

Prepared by V3 Companies Ltd., Printed 1/24/2019

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East Village MP Calculation_Final_1-22-2019

Prepared by V3 Companies Ltd.

Printed 1/24/2019

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Page 2

Area Listing (selected nodes)

Area (acres)	CN	Description (subcatchment-numbers)
11.967	94	From Spreadsheet (POST-DEV)
11.967	94	TOTAL AREA

East Village MP Calculation_Final_1-22-2019

Prepared by V3 Companies Ltd.

Printed 1/24/2019

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Page 3

Soil Listing (selected nodes)

Area (acres)	Soil Group	Subcatchment Numbers
0.000	HSG A	
0.000	HSG B	
0.000	HSG C	
0.000	HSG D	
11.967	Other	POST-DEV
11.967		TOTAL AREA

Summary for Subcatchment POST-DEV: Post-Developed Watershed

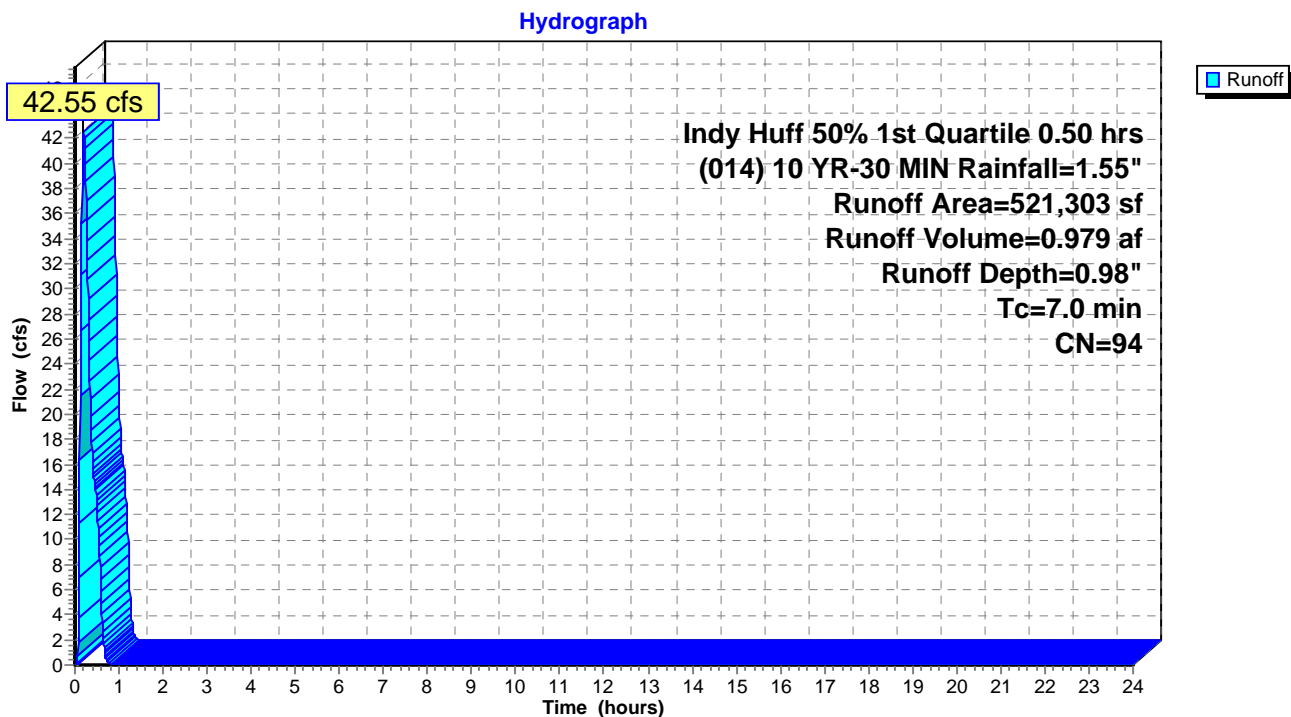
Runoff = 42.55 cfs @ 0.20 hrs, Volume= 0.979 af, Depth= 0.98"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
 Indy Huff 50% 1st Quartile 0.50 hrs (014) 10 YR-30 MIN Rainfall=1.55"

Area (sf)	CN	Description
* 521,303	94	From Spreadsheet
521,303		100.00% Pervious Area

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

Subcatchment POST-DEV: Post-Developed Watershed



Summary for Pond POND DA: POND DA

Inflow Area = 11.967 ac, 0.00% Impervious, Inflow Depth = 0.98" for (014) 10 YR-30 MIN event
 Inflow = 42.55 cfs @ 0.20 hrs, Volume= 0.979 af
 Outflow = 0.57 cfs @ 0.70 hrs, Volume= 0.631 af, Atten= 99%, Lag= 30.5 min
 Primary = 0.57 cfs @ 0.70 hrs, Volume= 0.631 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs / 3
 Peak Elev= 720.11' @ 0.70 hrs Surf.Area= 69,892 sf Storage= 41,747 cf
 Flood Elev= 722.50' Surf.Area= 80,761 sf Storage= 221,825 cf

Plug-Flow detention time= 547.4 min calculated for 0.631 af (64% of inflow)
 Center-of-Mass det. time= 542.4 min (560.0 - 17.6)

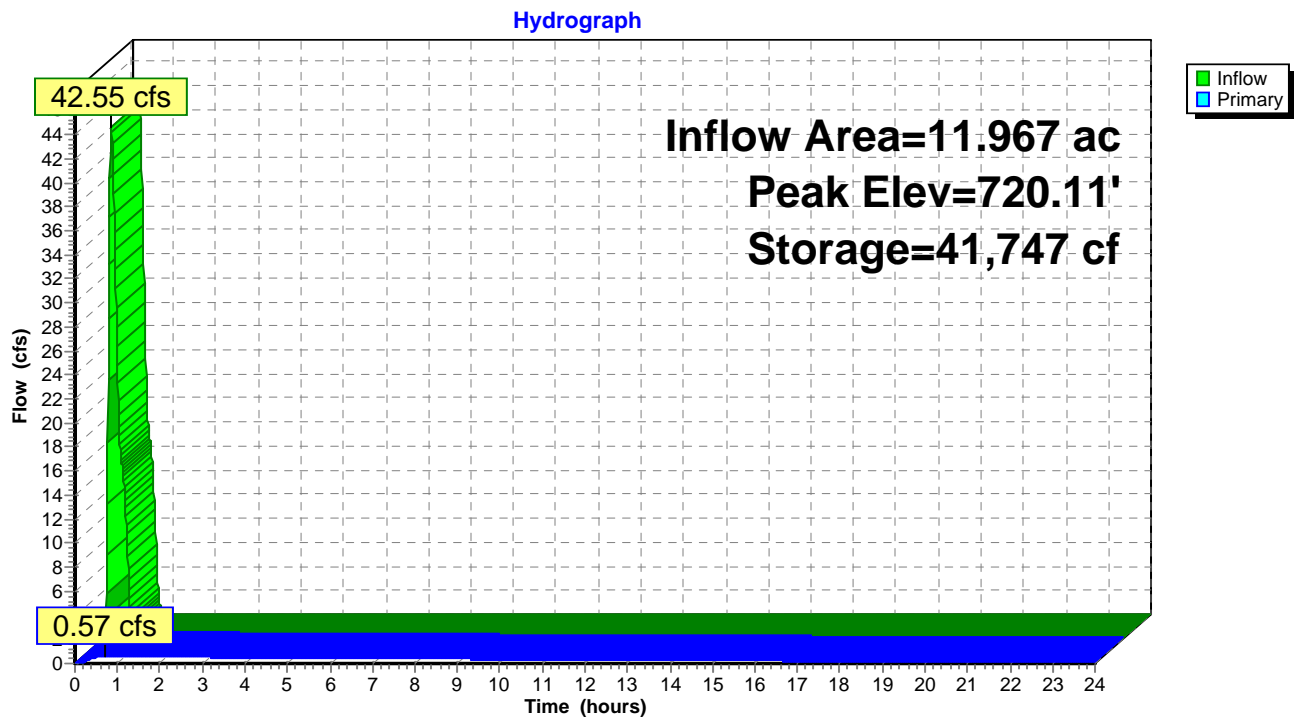
Volume	Invert	Avail.Storage	Storage Description
#1	719.50'	6,480,802 cf	Custom Stage Data (Prismatic) Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
719.50	67,122	0	0
722.50	80,761	221,825	221,825
800.00	80,761	6,258,978	6,480,802

Device	Routing	Invert	Outlet Devices
#1	Primary	710.76'	18.0" Round Outlet Pipe L= 100.0' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 710.76' / 709.56' S= 0.0120 ' /' Cc= 0.900 n= 0.013, Flow Area= 1.77 sf
#2	Device 1	719.50'	6.0" Vert. 10YR Outlet C= 0.600
#3	Device 1	721.50'	30.0" x 30.0" Horiz. Orifice/Grate C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=0.57 cfs @ 0.70 hrs HW=720.11' (Free Discharge)
 1=Outlet Pipe (Passes 0.57 cfs of 23.38 cfs potential flow)
 2=10YR Outlet (Orifice Controls 0.57 cfs @ 2.89 fps)
 3=Orifice/Grate (Controls 0.00 cfs)

Pond POND DA: POND DA



Summary for Subcatchment POST-DEV: Post-Developed Watershed

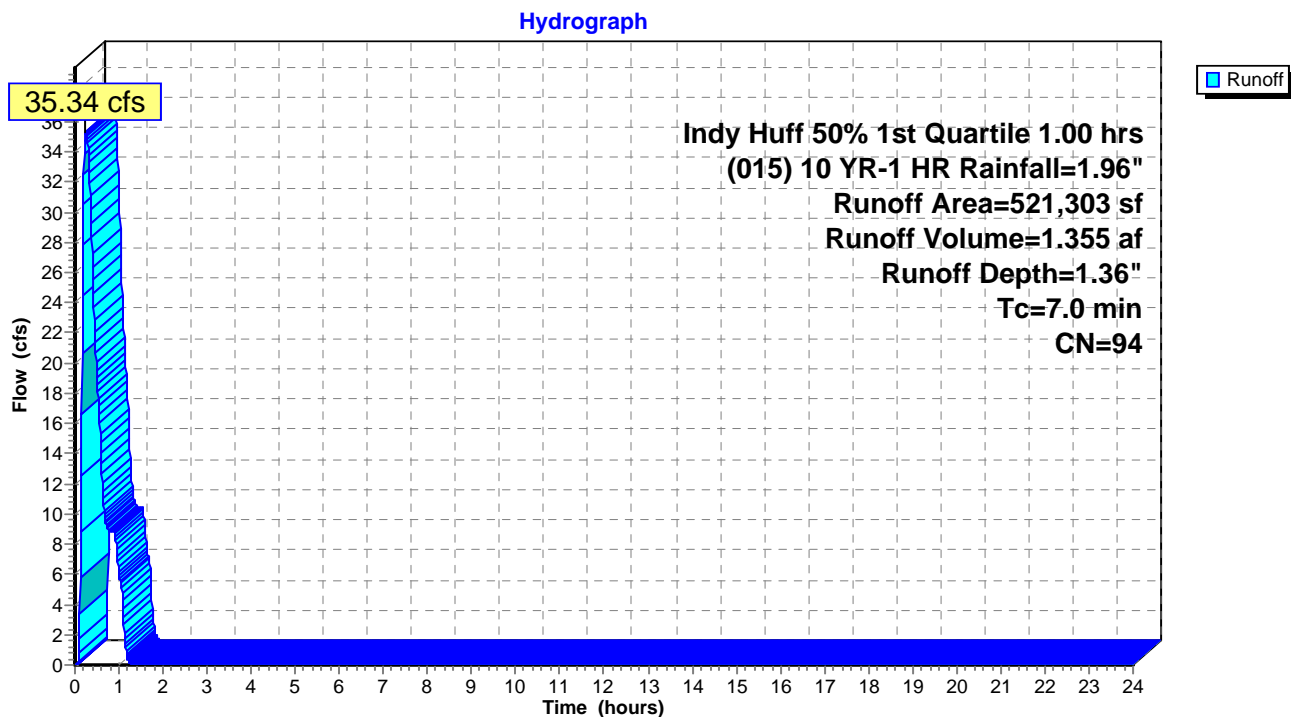
Runoff = 35.34 cfs @ 0.24 hrs, Volume= 1.355 af, Depth= 1.36"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
 Indy Huff 50% 1st Quartile 1.00 hrs (015) 10 YR-1 HR Rainfall=1.96"

Area (sf)	CN	Description
* 521,303	94	From Spreadsheet
521,303		100.00% Pervious Area

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

Subcatchment POST-DEV: Post-Developed Watershed



Summary for Pond POND DA: POND DA

Inflow Area = 11.967 ac, 0.00% Impervious, Inflow Depth = 1.36" for (015) 10 YR-1 HR event
 Inflow = 35.34 cfs @ 0.24 hrs, Volume= 1.355 af
 Outflow = 0.72 cfs @ 1.17 hrs, Volume= 0.906 af, Atten= 98%, Lag= 55.7 min
 Primary = 0.72 cfs @ 1.17 hrs, Volume= 0.906 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs / 3
 Peak Elev= 720.33' @ 1.17 hrs Surf.Area= 70,880 sf Storage= 57,030 cf
 Flood Elev= 722.50' Surf.Area= 80,761 sf Storage= 221,825 cf

Plug-Flow detention time= 578.4 min calculated for 0.906 af (67% of inflow)
 Center-of-Mass det. time= 569.4 min (597.4 - 28.0)

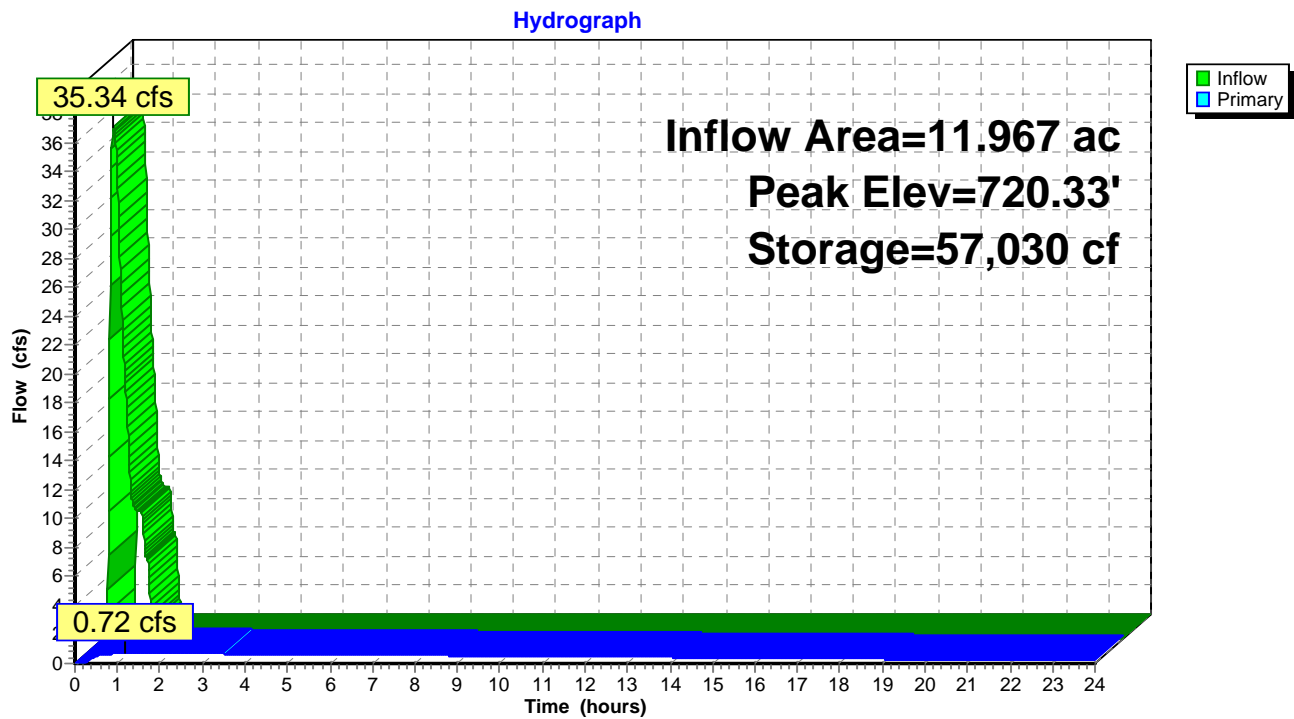
Volume	Invert	Avail.Storage	Storage Description
#1	719.50'	6,480,802 cf	Custom Stage Data (Prismatic) Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
719.50	67,122	0	0
722.50	80,761	221,825	221,825
800.00	80,761	6,258,978	6,480,802

Device	Routing	Invert	Outlet Devices
#1	Primary	710.76'	18.0" Round Outlet Pipe L= 100.0' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 710.76' / 709.56' S= 0.0120 ' /' Cc= 0.900 n= 0.013, Flow Area= 1.77 sf
#2	Device 1	719.50'	6.0" Vert. 10YR Outlet C= 0.600
#3	Device 1	721.50'	30.0" x 30.0" Horiz. Orifice/Grate C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=0.72 cfs @ 1.17 hrs HW=720.33' (Free Discharge)
 1=Outlet Pipe (Passes 0.72 cfs of 23.66 cfs potential flow)
 2=10YR Outlet (Orifice Controls 0.72 cfs @ 3.66 fps)
 3=Orifice/Grate (Controls 0.00 cfs)

Pond POND DA: POND DA



Summary for Subcatchment POST-DEV: Post-Developed Watershed

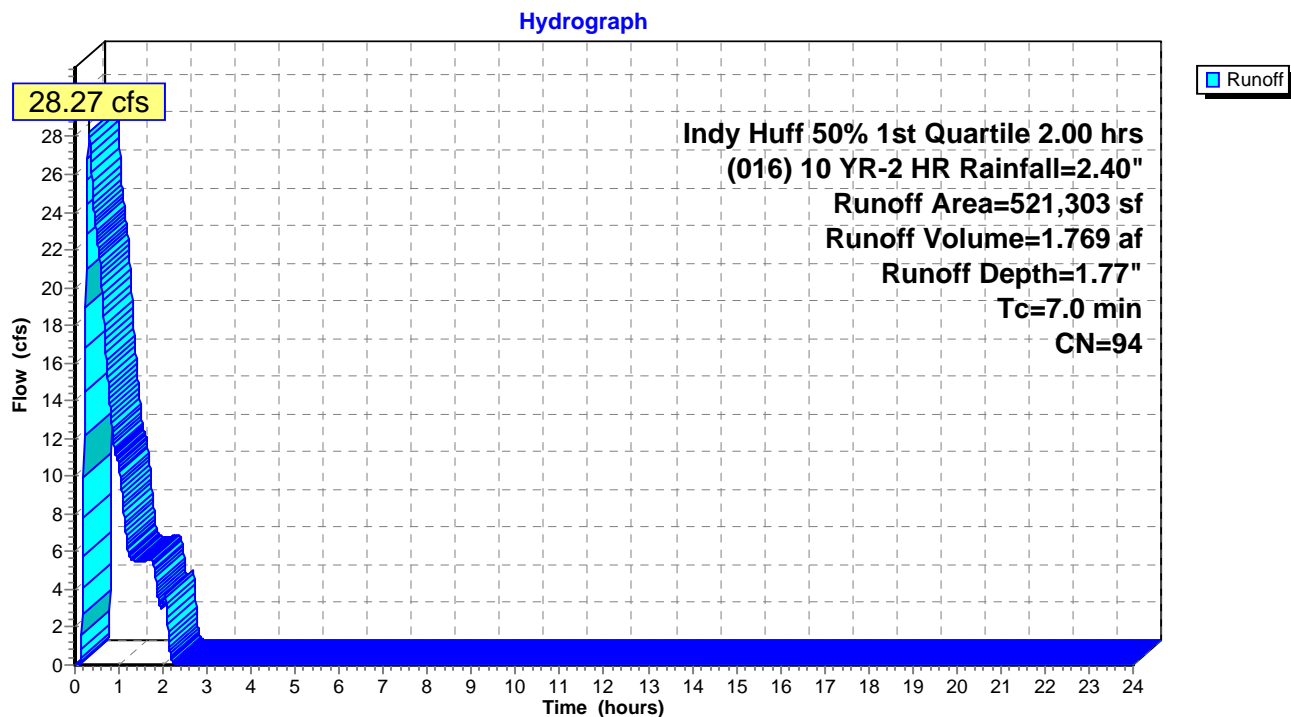
Runoff = 28.27 cfs @ 0.32 hrs, Volume= 1.769 af, Depth= 1.77"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
 Indy Huff 50% 1st Quartile 2.00 hrs (016) 10 YR-2 HR Rainfall=2.40"

Area (sf)	CN	Description
* 521,303	94	From Spreadsheet
521,303		100.00% Pervious Area

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

Subcatchment POST-DEV: Post-Developed Watershed



Summary for Pond POND DA: POND DA

Inflow Area = 11.967 ac, 0.00% Impervious, Inflow Depth = 1.77" for (016) 10 YR-2 HR event
 Inflow = 28.27 cfs @ 0.32 hrs, Volume= 1.769 af
 Outflow = 0.84 cfs @ 2.15 hrs, Volume= 1.175 af, Atten= 97%, Lag= 109.3 min
 Primary = 0.84 cfs @ 2.15 hrs, Volume= 1.175 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs / 3
 Peak Elev= 720.54' @ 2.15 hrs Surf.Area= 71,867 sf Storage= 72,533 cf
 Flood Elev= 722.50' Surf.Area= 80,761 sf Storage= 221,825 cf

Plug-Flow detention time= 609.3 min calculated for 1.175 af (66% of inflow)
 Center-of-Mass det. time= 591.3 min (639.7 - 48.4)

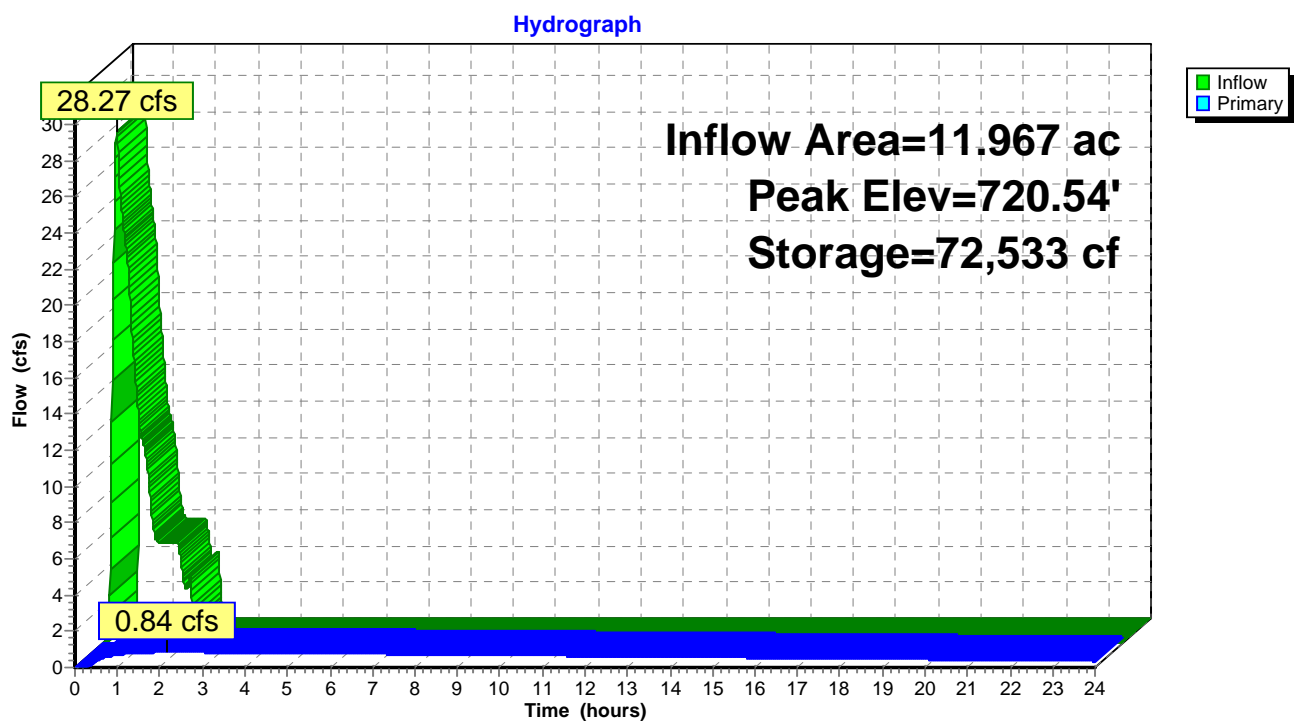
Volume	Invert	Avail.Storage	Storage Description
#1	719.50'	6,480,802 cf	Custom Stage Data (Prismatic) Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
719.50	67,122	0	0
722.50	80,761	221,825	221,825
800.00	80,761	6,258,978	6,480,802

Device	Routing	Invert	Outlet Devices
#1	Primary	710.76'	18.0" Round Outlet Pipe L= 100.0' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 710.76' / 709.56' S= 0.0120 ' /' Cc= 0.900 n= 0.013, Flow Area= 1.77 sf
#2	Device 1	719.50'	6.0" Vert. 10YR Outlet C= 0.600
#3	Device 1	721.50'	30.0" x 30.0" Horiz. Orifice/Grate C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=0.84 cfs @ 2.15 hrs HW=720.54' (Free Discharge)
 1=Outlet Pipe (Passes 0.84 cfs of 23.94 cfs potential flow)
 2=10YR Outlet (Orifice Controls 0.84 cfs @ 4.29 fps)
 3=Orifice/Grate (Controls 0.00 cfs)

Pond POND DA: POND DA



Summary for Subcatchment POST-DEV: Post-Developed Watershed

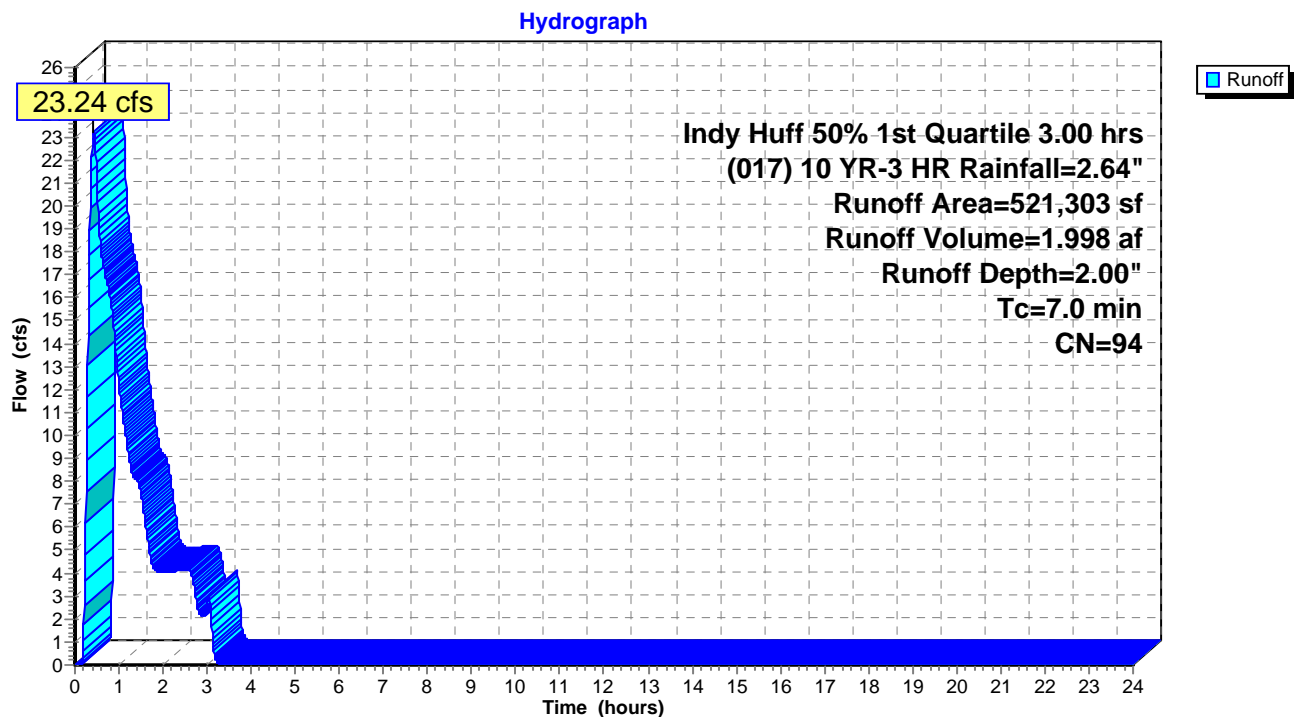
Runoff = 23.24 cfs @ 0.42 hrs, Volume= 1.998 af, Depth= 2.00"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
 Indy Huff 50% 1st Quartile 3.00 hrs (017) 10 YR-3 HR Rainfall=2.64"

Area (sf)	CN	Description
* 521,303	94	From Spreadsheet
521,303		100.00% Pervious Area

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

Subcatchment POST-DEV: Post-Developed Watershed



Summary for Pond POND DA: POND DA

Inflow Area = 11.967 ac, 0.00% Impervious, Inflow Depth = 2.00" for (017) 10 YR-3 HR event
 Inflow = 23.24 cfs @ 0.42 hrs, Volume= 1.998 af
 Outflow = 0.89 cfs @ 3.13 hrs, Volume= 1.300 af, Atten= 96%, Lag= 162.4 min
 Primary = 0.89 cfs @ 3.13 hrs, Volume= 1.300 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs / 3
 Peak Elev= 720.64' @ 3.13 hrs Surf.Area= 72,327 sf Storage= 79,824 cf
 Flood Elev= 722.50' Surf.Area= 80,761 sf Storage= 221,825 cf

Plug-Flow detention time= 620.5 min calculated for 1.300 af (65% of inflow)
 Center-of-Mass det. time= 592.9 min (661.5 - 68.6)

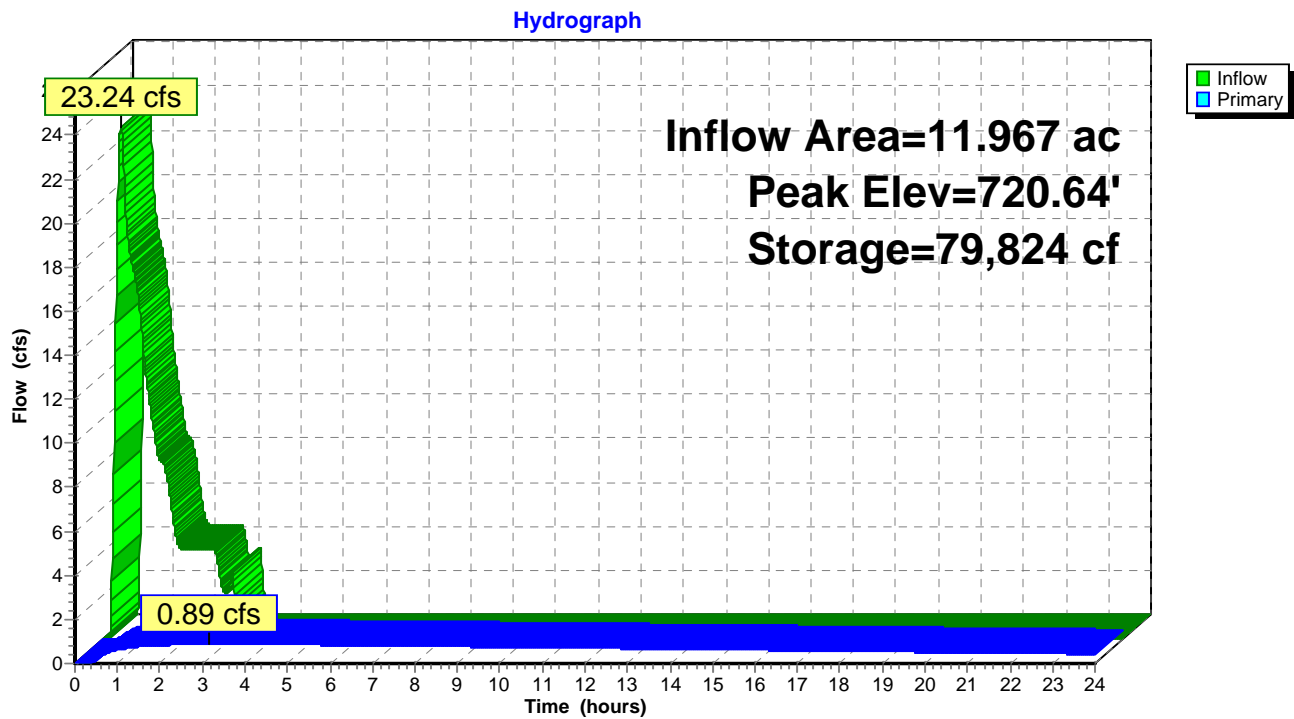
Volume	Invert	Avail.Storage	Storage Description
#1	719.50'	6,480,802 cf	Custom Stage Data (Prismatic) Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
719.50	67,122	0	0
722.50	80,761	221,825	221,825
800.00	80,761	6,258,978	6,480,802

Device	Routing	Invert	Outlet Devices
#1	Primary	710.76'	18.0" Round Outlet Pipe L= 100.0' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 710.76' / 709.56' S= 0.0120 ' /' Cc= 0.900 n= 0.013, Flow Area= 1.77 sf
#2	Device 1	719.50'	6.0" Vert. 10YR Outlet C= 0.600
#3	Device 1	721.50'	30.0" x 30.0" Horiz. Orifice/Grate C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=0.89 cfs @ 3.13 hrs HW=720.64' (Free Discharge)
 1=Outlet Pipe (Passes 0.89 cfs of 24.06 cfs potential flow)
 2=10YR Outlet (Orifice Controls 0.89 cfs @ 4.55 fps)
 3=Orifice/Grate (Controls 0.00 cfs)

Pond POND DA: POND DA



Summary for Subcatchment POST-DEV: Post-Developed Watershed

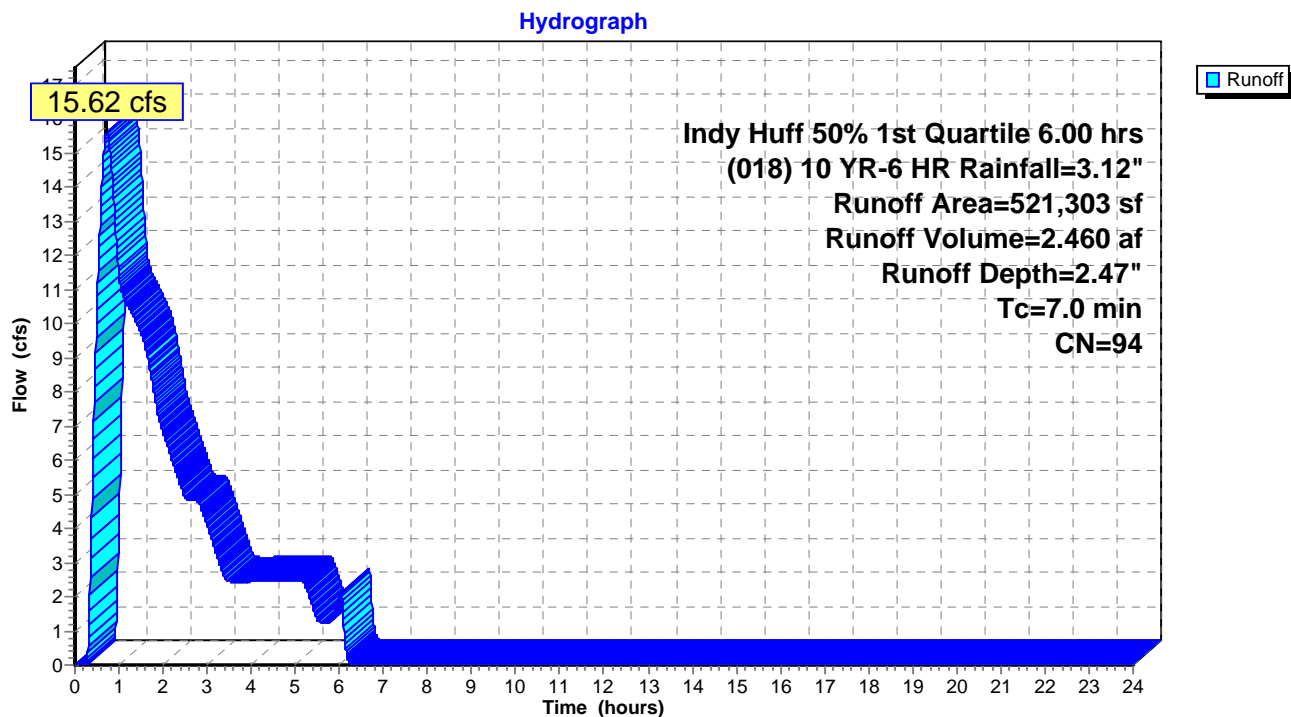
Runoff = 15.62 cfs @ 0.72 hrs, Volume= 2.460 af, Depth= 2.47"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
 Indy Huff 50% 1st Quartile 6.00 hrs (018) 10 YR-6 HR Rainfall=3.12"

Area (sf)	CN	Description
* 521,303	94	From Spreadsheet
521,303		100.00% Pervious Area

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

Subcatchment POST-DEV: Post-Developed Watershed



Summary for Pond POND DA: POND DA

Inflow Area = 11.967 ac, 0.00% Impervious, Inflow Depth = 2.47" for (018) 10 YR-6 HR event
 Inflow = 15.62 cfs @ 0.72 hrs, Volume= 2.460 af
 Outflow = 0.97 cfs @ 6.11 hrs, Volume= 1.501 af, Atten= 94%, Lag= 323.5 min
 Primary = 0.97 cfs @ 6.11 hrs, Volume= 1.501 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs / 3
 Peak Elev= 720.80' @ 6.11 hrs Surf.Area= 73,037 sf Storage= 91,182 cf
 Flood Elev= 722.50' Surf.Area= 80,761 sf Storage= 221,825 cf

Plug-Flow detention time= 633.7 min calculated for 1.501 af (61% of inflow)
 Center-of-Mass det. time= 575.0 min (703.4 - 128.4)

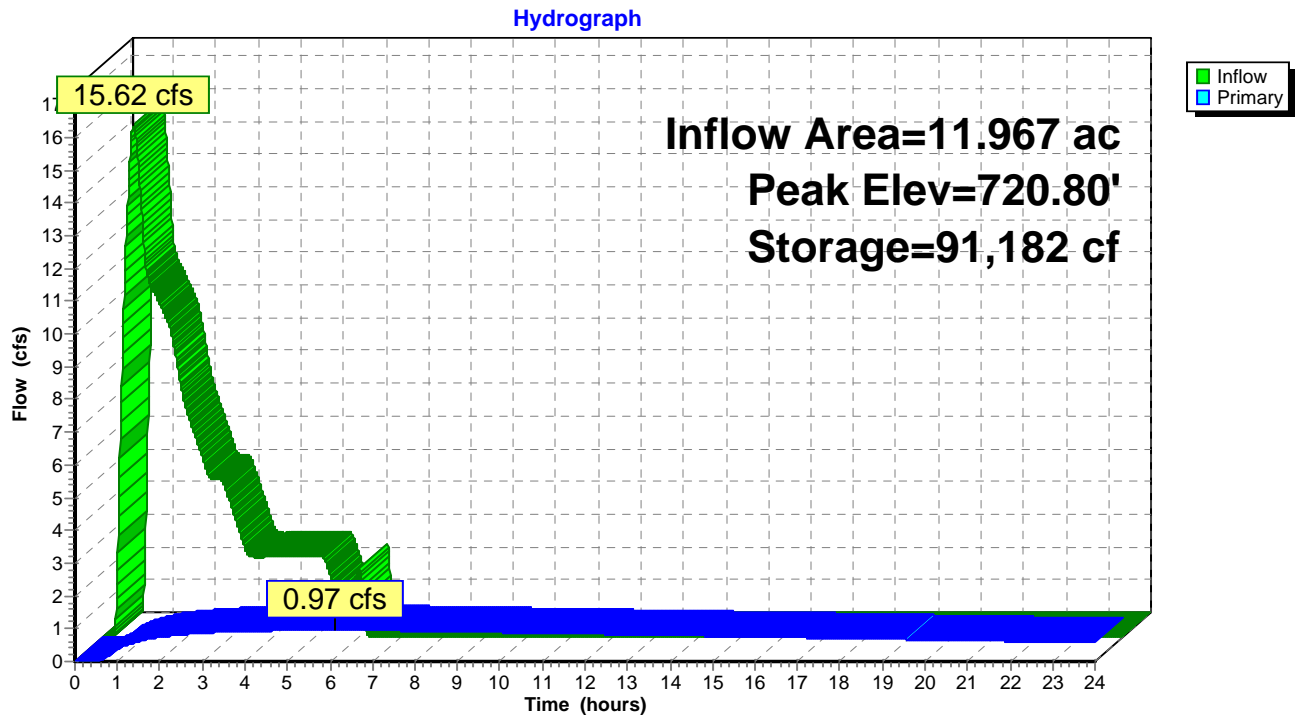
Volume	Invert	Avail.Storage	Storage Description
#1	719.50'	6,480,802 cf	Custom Stage Data (Prismatic) Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
719.50	67,122	0	0
722.50	80,761	221,825	221,825
800.00	80,761	6,258,978	6,480,802

Device	Routing	Invert	Outlet Devices
#1	Primary	710.76'	18.0" Round Outlet Pipe L= 100.0' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 710.76' / 709.56' S= 0.0120 ' /' Cc= 0.900 n= 0.013, Flow Area= 1.77 sf
#2	Device 1	719.50'	6.0" Vert. 10YR Outlet C= 0.600
#3	Device 1	721.50'	30.0" x 30.0" Horiz. Orifice/Grate C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=0.97 cfs @ 6.11 hrs HW=720.80' (Free Discharge)
 1=Outlet Pipe (Passes 0.97 cfs of 24.26 cfs potential flow)
 2=10YR Outlet (Orifice Controls 0.97 cfs @ 4.94 fps)
 3=Orifice/Grate (Controls 0.00 cfs)

Pond POND DA: POND DA



Summary for Subcatchment POST-DEV: Post-Developed Watershed

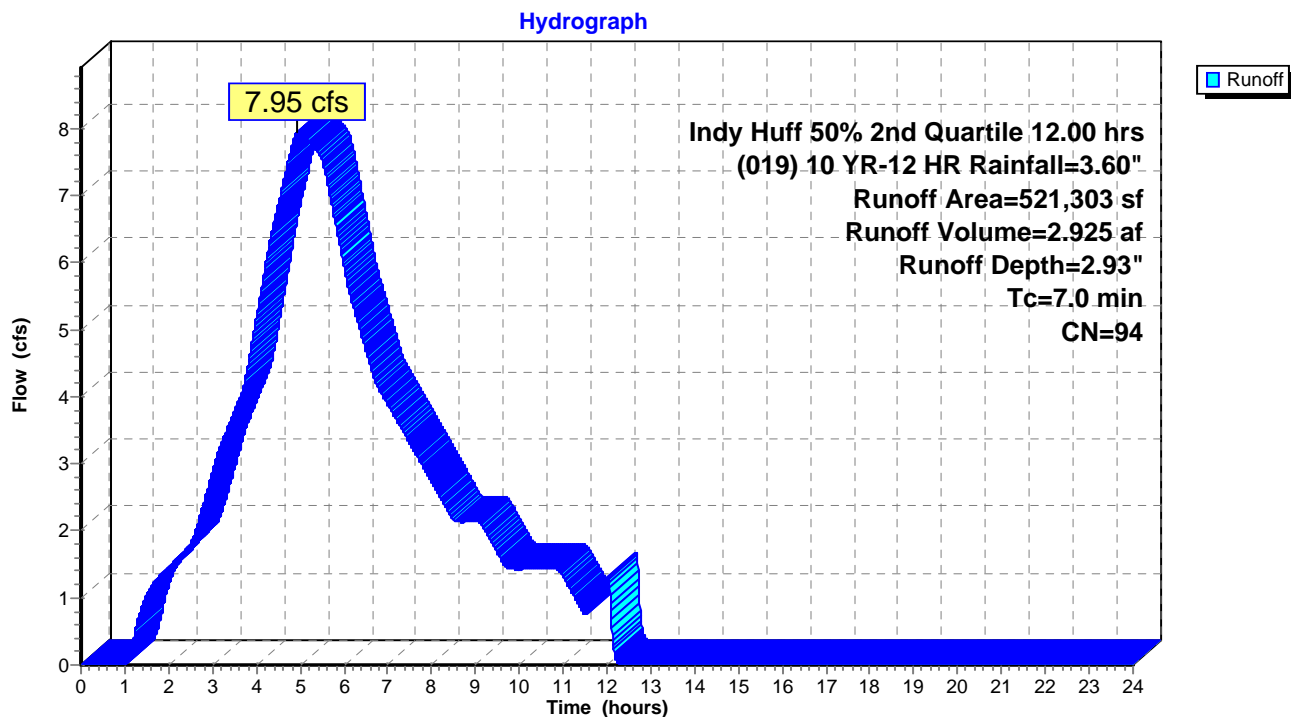
Runoff = 7.95 cfs @ 4.94 hrs, Volume= 2.925 af, Depth= 2.93"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
 Indy Huff 50% 2nd Quartile 12.00 hrs (019) 10 YR-12 HR Rainfall=3.60"

Area (sf)	CN	Description
* 521,303	94	From Spreadsheet
521,303		100.00% Pervious Area

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

Subcatchment POST-DEV: Post-Developed Watershed



Summary for Pond POND DA: POND DA

Inflow Area = 11.967 ac, 0.00% Impervious, Inflow Depth = 2.93" for (019) 10 YR-12 HR event
 Inflow = 7.95 cfs @ 4.94 hrs, Volume= 2.925 af
 Outflow = 1.03 cfs @ 11.24 hrs, Volume= 1.492 af, Atten= 87%, Lag= 378.0 min
 Primary = 1.03 cfs @ 11.24 hrs, Volume= 1.492 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs / 3
 Peak Elev= 720.93' @ 11.24 hrs Surf.Area= 73,640 sf Storage= 100,906 cf
 Flood Elev= 722.50' Surf.Area= 80,761 sf Storage= 221,825 cf

Plug-Flow detention time= 585.4 min calculated for 1.491 af (51% of inflow)
 Center-of-Mass det. time= 479.0 min (834.9 - 355.8)

Volume	Invert	Avail.Storage	Storage Description
#1	719.50'	6,480,802 cf	Custom Stage Data (Prismatic) Listed below (Recalc)

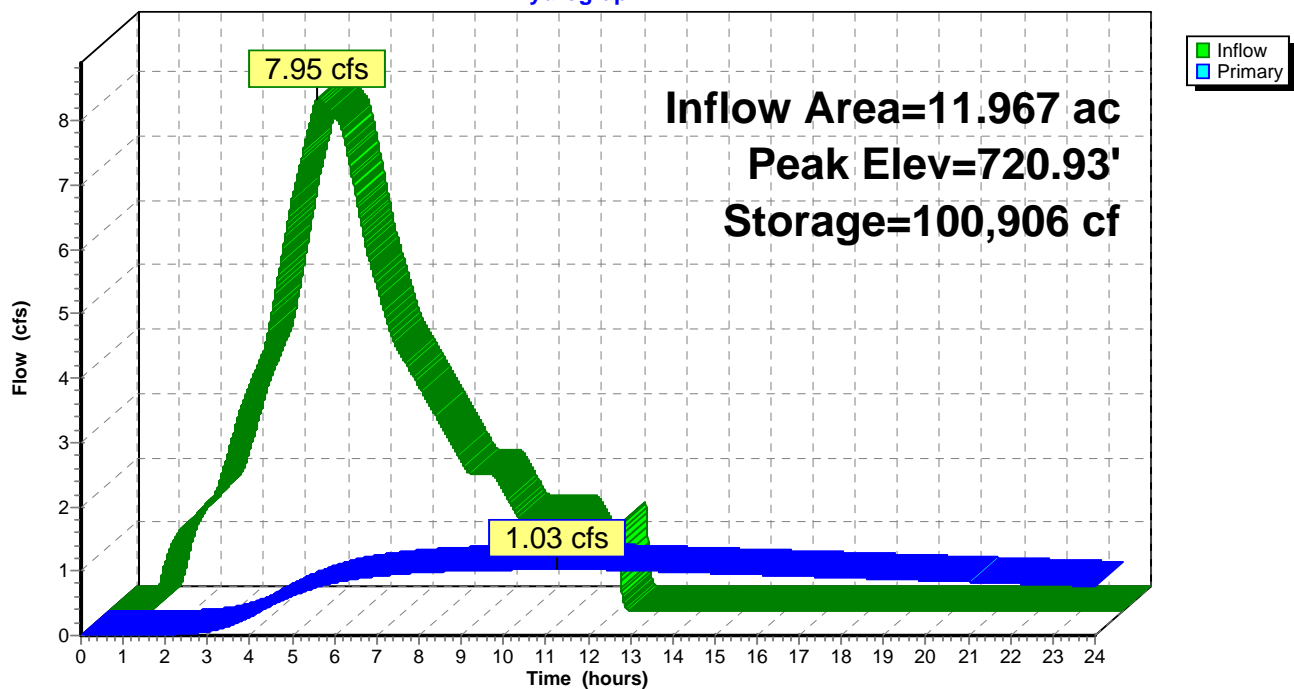
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
719.50	67,122	0	0
722.50	80,761	221,825	221,825
800.00	80,761	6,258,978	6,480,802

Device	Routing	Invert	Outlet Devices
#1	Primary	710.76'	18.0" Round Outlet Pipe L= 100.0' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 710.76' / 709.56' S= 0.0120 ' /' Cc= 0.900 n= 0.013, Flow Area= 1.77 sf
#2	Device 1	719.50'	6.0" Vert. 10YR Outlet C= 0.600
#3	Device 1	721.50'	30.0" x 30.0" Horiz. Orifice/Grate C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=1.03 cfs @ 11.24 hrs HW=720.93' (Free Discharge)
 1=Outlet Pipe (Passes 1.03 cfs of 24.42 cfs potential flow)
 2=10YR Outlet (Orifice Controls 1.03 cfs @ 5.24 fps)
 3=Orifice/Grate (Controls 0.00 cfs)

Pond POND DA: POND DA

Hydrograph



Summary for Subcatchment POST-DEV: Post-Developed Watershed

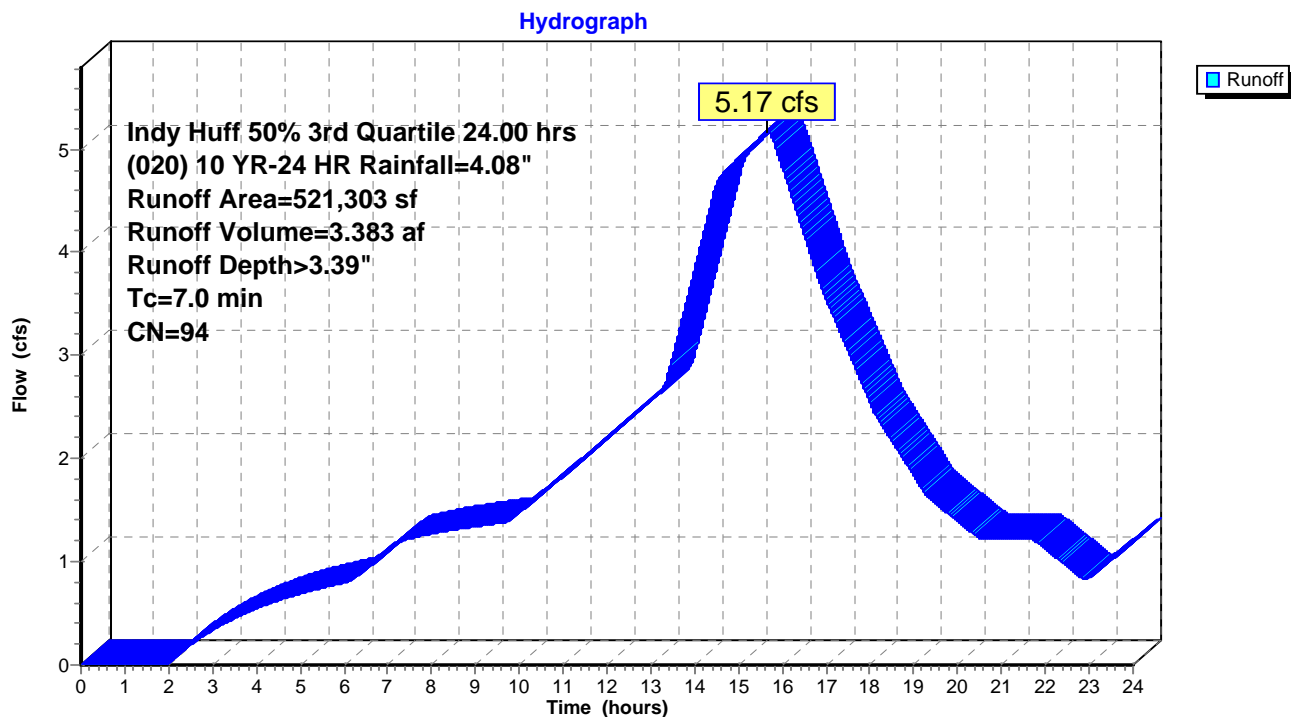
Runoff = 5.17 cfs @ 15.67 hrs, Volume= 3.383 af, Depth> 3.39"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
 Indy Huff 50% 3rd Quartile 24.00 hrs (020) 10 YR-24 HR Rainfall=4.08"

Area (sf)	CN	Description
* 521,303	94	From Spreadsheet
521,303		100.00% Pervious Area

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

Subcatchment POST-DEV: Post-Developed Watershed



Summary for Pond POND DA: POND DA

Inflow Area = 11.967 ac, 0.00% Impervious, Inflow Depth > 3.39" for (020) 10 YR-24 HR event
 Inflow = 5.17 cfs @ 15.67 hrs, Volume= 3.383 af
 Outflow = 1.05 cfs @ 22.22 hrs, Volume= 0.998 af, Atten= 80%, Lag= 393.3 min
 Primary = 1.05 cfs @ 22.22 hrs, Volume= 0.998 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs / 3
 Peak Elev= 720.98' @ 22.22 hrs Surf.Area= 73,853 sf Storage= 104,365 cf
 Flood Elev= 722.50' Surf.Area= 80,761 sf Storage= 221,825 cf

Plug-Flow detention time= 524.7 min calculated for 0.998 af (29% of inflow)
 Center-of-Mass det. time= 191.8 min (1,062.8 - 871.0)

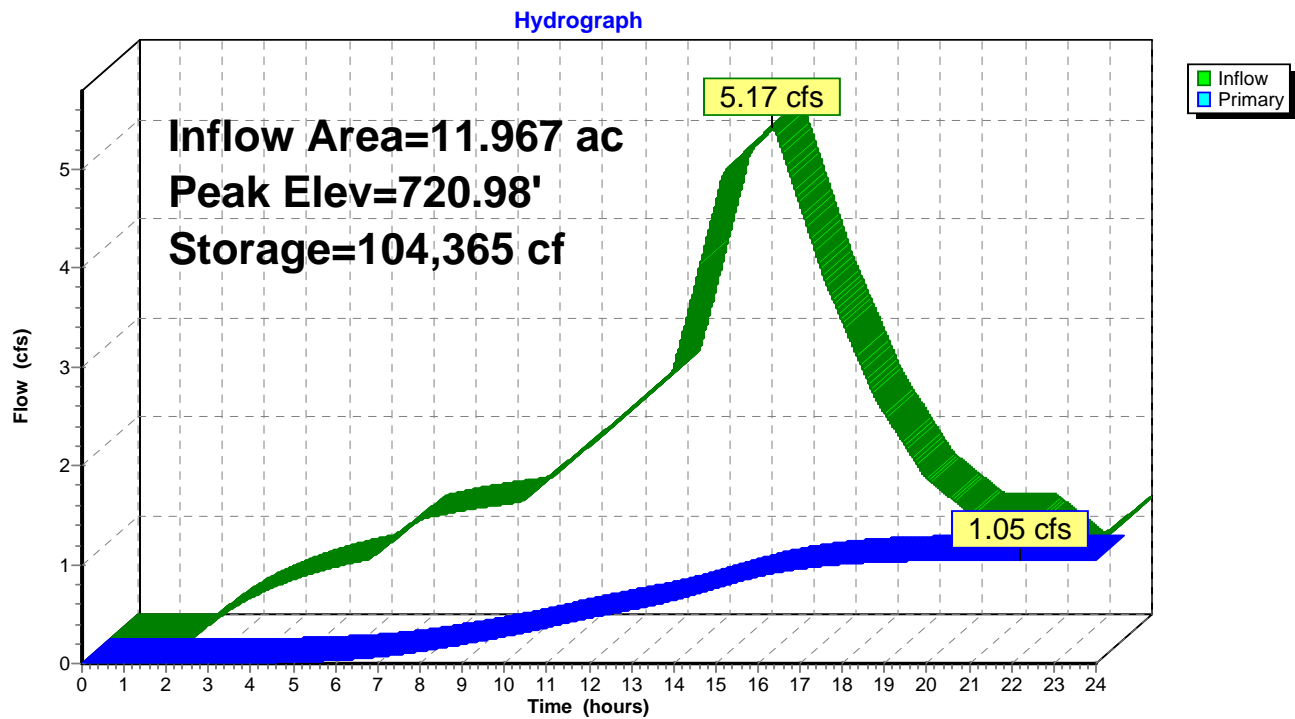
Volume	Invert	Avail.Storage	Storage Description
#1	719.50'	6,480,802 cf	Custom Stage Data (Prismatic) Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
719.50	67,122	0	0
722.50	80,761	221,825	221,825
800.00	80,761	6,258,978	6,480,802

Device	Routing	Invert	Outlet Devices
#1	Primary	710.76'	18.0" Round Outlet Pipe L= 100.0' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 710.76' / 709.56' S= 0.0120 ' / ' Cc= 0.900 n= 0.013, Flow Area= 1.77 sf
#2	Device 1	719.50'	6.0" Vert. 10YR Outlet C= 0.600
#3	Device 1	721.50'	30.0" x 30.0" Horiz. Orifice/Grate C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=1.05 cfs @ 22.22 hrs HW=720.98' (Free Discharge)
 1=Outlet Pipe (Passes 1.05 cfs of 24.48 cfs potential flow)
 2=10YR Outlet (Orifice Controls 1.05 cfs @ 5.34 fps)
 3=Orifice/Grate (Controls 0.00 cfs)

Pond POND DA: POND DA



Summary for Subcatchment POST-DEV: Post-Developed Watershed

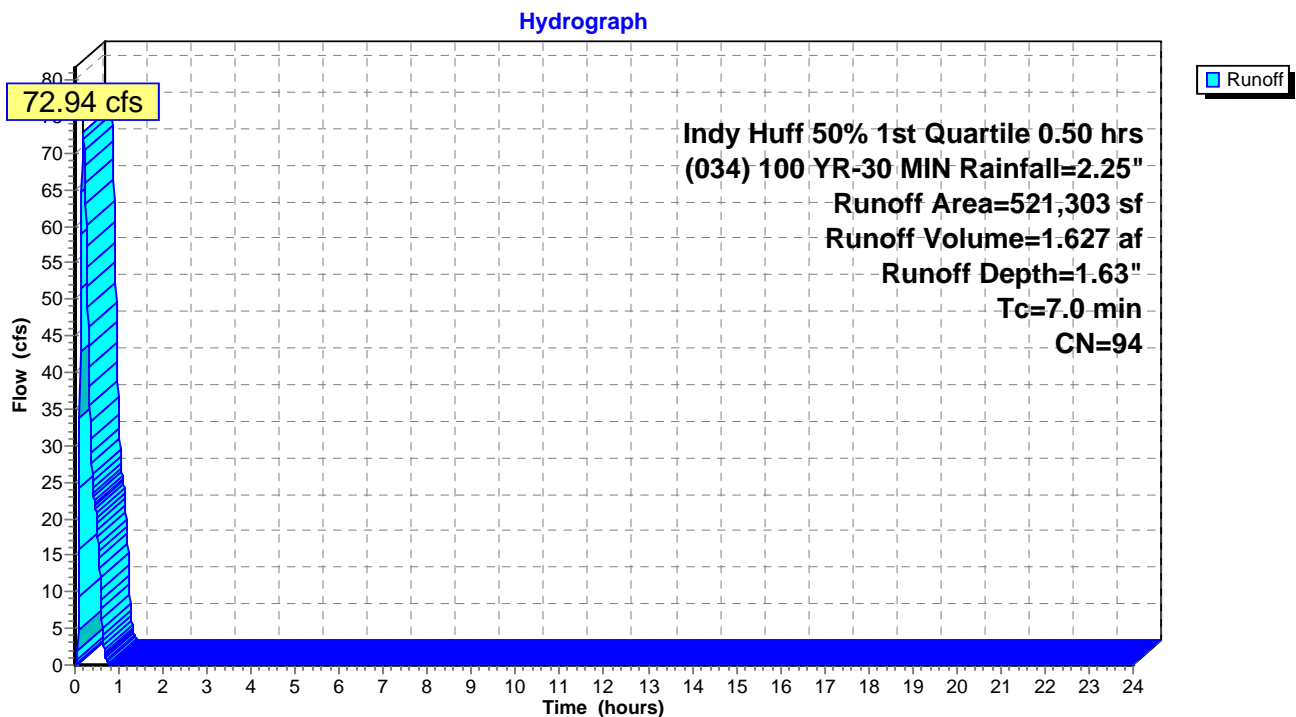
Runoff = 72.94 cfs @ 0.18 hrs, Volume= 1.627 af, Depth= 1.63"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
 Indy Huff 50% 1st Quartile 0.50 hrs (034) 100 YR-30 MIN Rainfall=2.25"

Area (sf)	CN	Description
* 521,303	94	From Spreadsheet
521,303		100.00% Pervious Area

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

Subcatchment POST-DEV: Post-Developed Watershed



Summary for Pond POND DA: POND DA

Inflow Area = 11.967 ac, 0.00% Impervious, Inflow Depth = 1.63" for (034) 100 YR-30 MIN event
 Inflow = 72.94 cfs @ 0.18 hrs, Volume= 1.627 af
 Outflow = 0.82 cfs @ 0.71 hrs, Volume= 1.096 af, Atten= 99%, Lag= 31.2 min
 Primary = 0.82 cfs @ 0.71 hrs, Volume= 1.096 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs / 3
 Peak Elev= 720.50' @ 0.71 hrs Surf.Area= 71,672 sf Storage= 69,452 cf
 Flood Elev= 722.50' Surf.Area= 80,761 sf Storage= 221,825 cf

Plug-Flow detention time= 599.2 min calculated for 1.096 af (67% of inflow)
 Center-of-Mass det. time= 594.5 min (611.5 - 17.1)

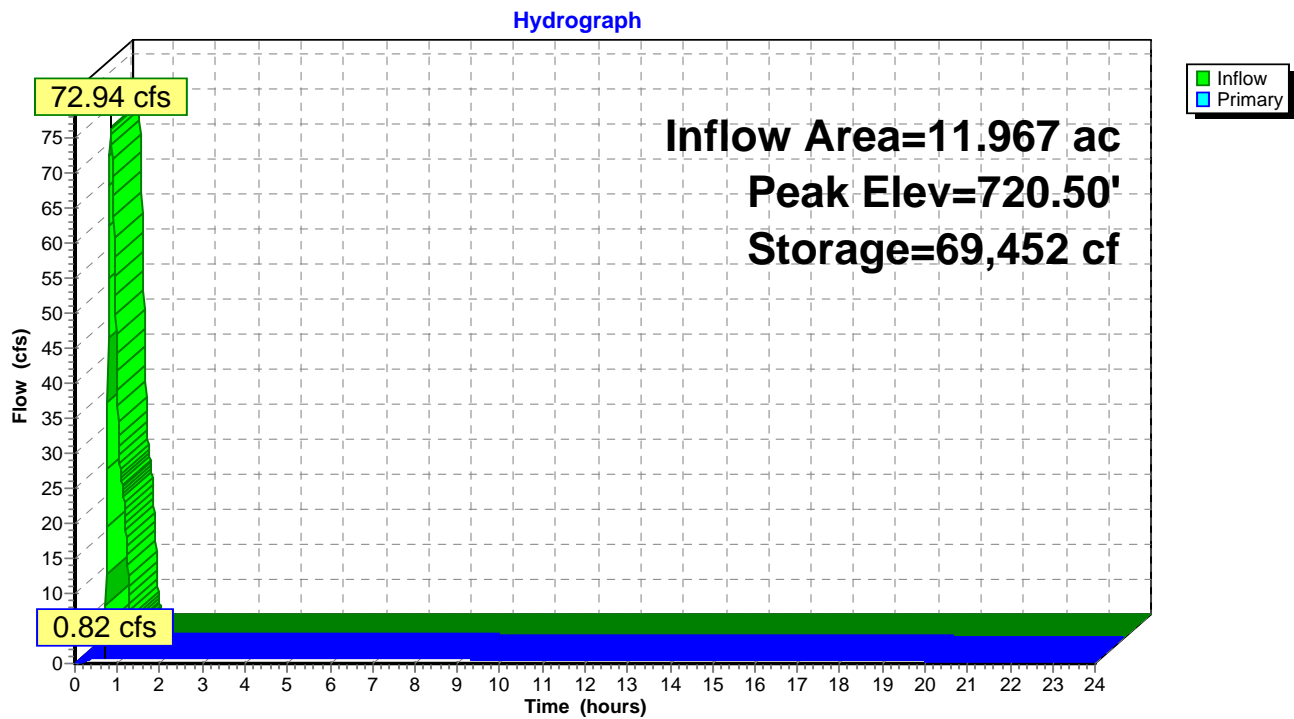
Volume	Invert	Avail.Storage	Storage Description
#1	719.50'	6,480,802 cf	Custom Stage Data (Prismatic) Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
719.50	67,122	0	0
722.50	80,761	221,825	221,825
800.00	80,761	6,258,978	6,480,802

Device	Routing	Invert	Outlet Devices
#1	Primary	710.76'	18.0" Round Outlet Pipe L= 100.0' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 710.76' / 709.56' S= 0.0120 ' S= 0.0120 ' Cc= 0.900 n= 0.013, Flow Area= 1.77 sf
#2	Device 1	719.50'	6.0" Vert. 10YR Outlet C= 0.600
#3	Device 1	721.50'	30.0" x 30.0" Horiz. Orifice/Grate C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=0.82 cfs @ 0.71 hrs HW=720.50' (Free Discharge)
 1=Outlet Pipe (Passes 0.82 cfs of 23.88 cfs potential flow)
 2=10YR Outlet (Orifice Controls 0.82 cfs @ 4.17 fps)
 3=Orifice/Grate (Controls 0.00 cfs)

Pond POND DA: POND DA



Summary for Subcatchment POST-DEV: Post-Developed Watershed

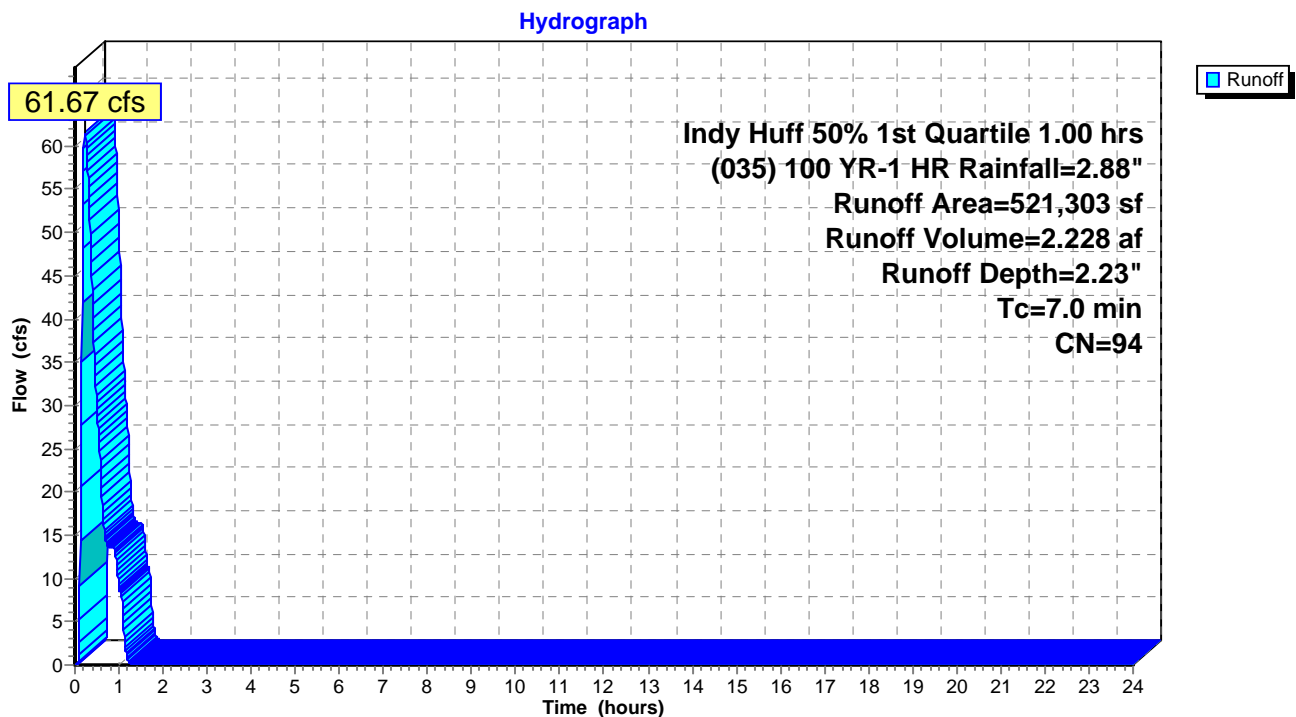
Runoff = 61.67 cfs @ 0.22 hrs, Volume= 2.228 af, Depth= 2.23"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
 Indy Huff 50% 1st Quartile 1.00 hrs (035) 100 YR-1 HR Rainfall=2.88"

Area (sf)	CN	Description
* 521,303	94	From Spreadsheet
521,303		100.00% Pervious Area

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

Subcatchment POST-DEV: Post-Developed Watershed



Summary for Pond POND DA: POND DA

Inflow Area = 11.967 ac, 0.00% Impervious, Inflow Depth = 2.23" for (035) 100 YR-1 HR event
 Inflow = 61.67 cfs @ 0.22 hrs, Volume= 2.228 af
 Outflow = 0.99 cfs @ 1.18 hrs, Volume= 1.446 af, Atten= 98%, Lag= 57.1 min
 Primary = 0.99 cfs @ 1.18 hrs, Volume= 1.446 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs / 3
 Peak Elev= 720.84' @ 1.18 hrs Surf.Area= 73,218 sf Storage= 94,087 cf
 Flood Elev= 722.50' Surf.Area= 80,761 sf Storage= 221,825 cf

Plug-Flow detention time= 629.1 min calculated for 1.446 af (65% of inflow)
 Center-of-Mass det. time= 619.8 min (646.8 - 27.0)

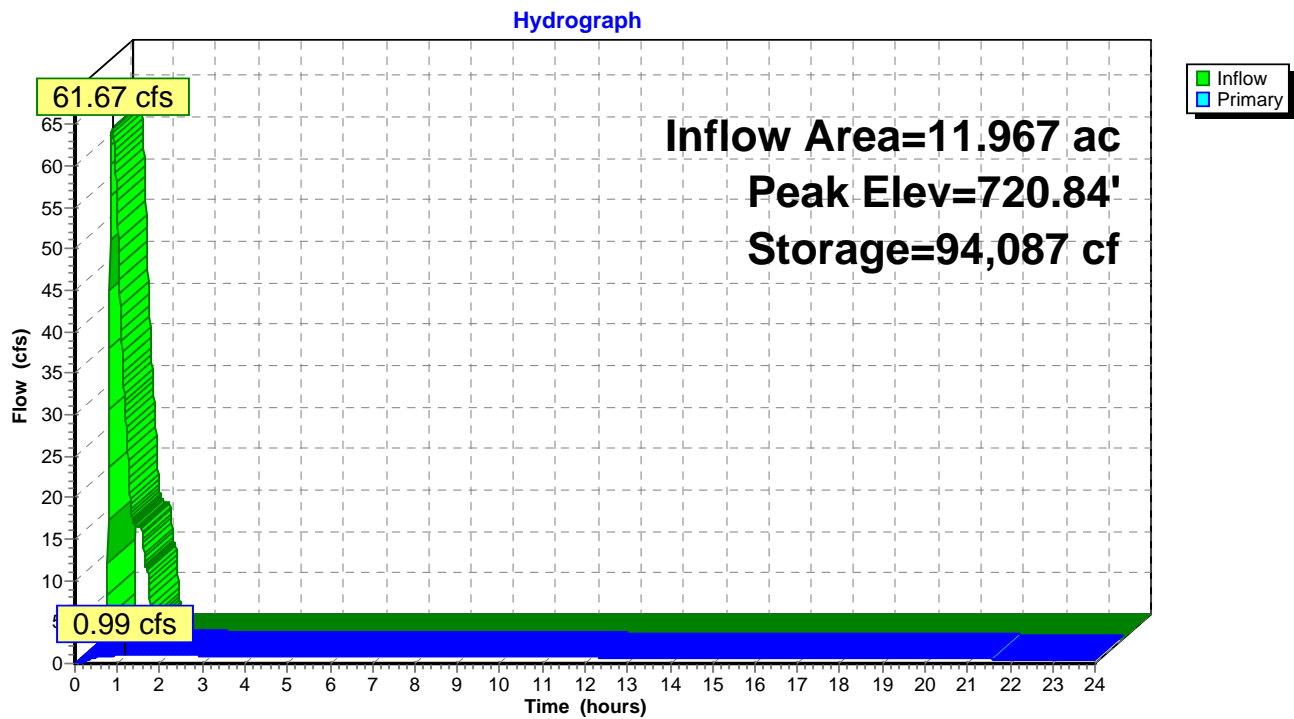
Volume	Invert	Avail.Storage	Storage Description
#1	719.50'	6,480,802 cf	Custom Stage Data (Prismatic) Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
719.50	67,122	0	0
722.50	80,761	221,825	221,825
800.00	80,761	6,258,978	6,480,802

Device	Routing	Invert	Outlet Devices
#1	Primary	710.76'	18.0" Round Outlet Pipe L= 100.0' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 710.76' / 709.56' S= 0.0120 ' /' Cc= 0.900 n= 0.013, Flow Area= 1.77 sf
#2	Device 1	719.50'	6.0" Vert. 10YR Outlet C= 0.600
#3	Device 1	721.50'	30.0" x 30.0" Horiz. Orifice/Grate C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=0.99 cfs @ 1.18 hrs HW=720.84' (Free Discharge)
 1=Outlet Pipe (Passes 0.99 cfs of 24.31 cfs potential flow)
 2=10YR Outlet (Orifice Controls 0.99 cfs @ 5.03 fps)
 3=Orifice/Grate (Controls 0.00 cfs)

Pond POND DA: POND DA



Summary for Subcatchment POST-DEV: Post-Developed Watershed

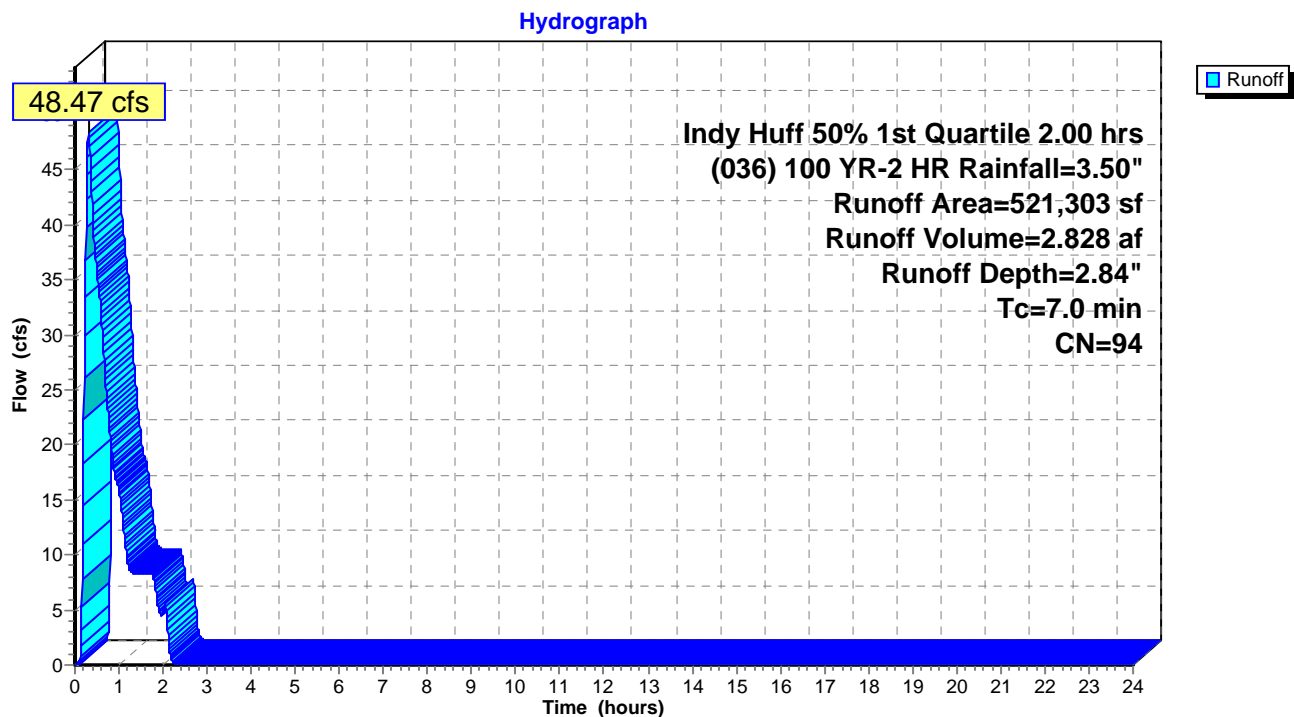
Runoff = 48.47 cfs @ 0.31 hrs, Volume= 2.828 af, Depth= 2.84"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
 Indy Huff 50% 1st Quartile 2.00 hrs (036) 100 YR-2 HR Rainfall=3.50"

Area (sf)	CN	Description
* 521,303	94	From Spreadsheet
521,303		100.00% Pervious Area

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

Subcatchment POST-DEV: Post-Developed Watershed



Summary for Pond POND DA: POND DA

Inflow Area = 11.967 ac, 0.00% Impervious, Inflow Depth = 2.84" for (036) 100 YR-2 HR event
 Inflow = 48.47 cfs @ 0.31 hrs, Volume= 2.828 af
 Outflow = 1.12 cfs @ 2.15 hrs, Volume= 1.728 af, Atten= 98%, Lag= 110.3 min
 Primary = 1.12 cfs @ 2.15 hrs, Volume= 1.728 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs / 3
 Peak Elev= 721.15' @ 2.15 hrs Surf.Area= 74,616 sf Storage= 116,821 cf
 Flood Elev= 722.50' Surf.Area= 80,761 sf Storage= 221,825 cf

Plug-Flow detention time= 644.3 min calculated for 1.728 af (61% of inflow)
 Center-of-Mass det. time= 624.6 min (671.2 - 46.7)

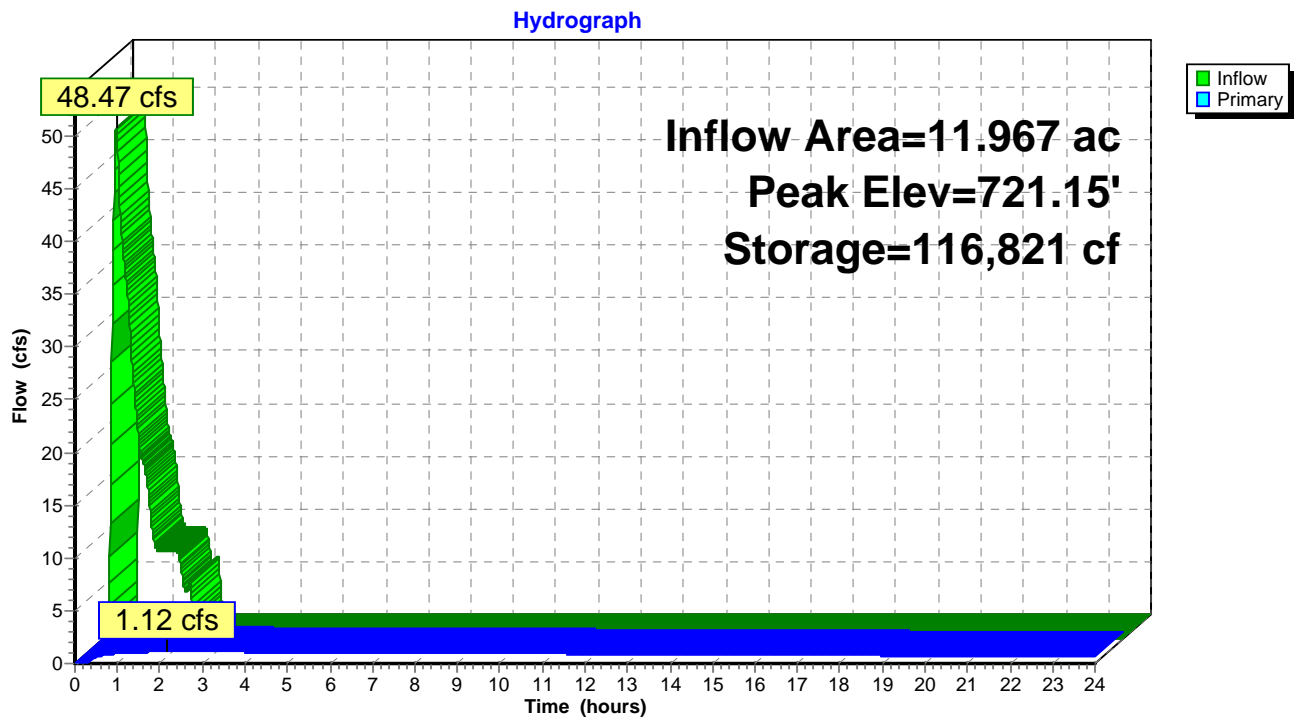
Volume	Invert	Avail.Storage	Storage Description
#1	719.50'	6,480,802 cf	Custom Stage Data (Prismatic) Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
719.50	67,122	0	0
722.50	80,761	221,825	221,825
800.00	80,761	6,258,978	6,480,802

Device	Routing	Invert	Outlet Devices
#1	Primary	710.76'	18.0" Round Outlet Pipe L= 100.0' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 710.76' / 709.56' S= 0.0120 ' /' Cc= 0.900 n= 0.013, Flow Area= 1.77 sf
#2	Device 1	719.50'	6.0" Vert. 10YR Outlet C= 0.600
#3	Device 1	721.50'	30.0" x 30.0" Horiz. Orifice/Grate C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=1.12 cfs @ 2.15 hrs HW=721.15' (Free Discharge)
 1=Outlet Pipe (Passes 1.12 cfs of 24.69 cfs potential flow)
 2=10YR Outlet (Orifice Controls 1.12 cfs @ 5.69 fps)
 3=Orifice/Grate (Controls 0.00 cfs)

Pond POND DA: POND DA



Summary for Subcatchment POST-DEV: Post-Developed Watershed

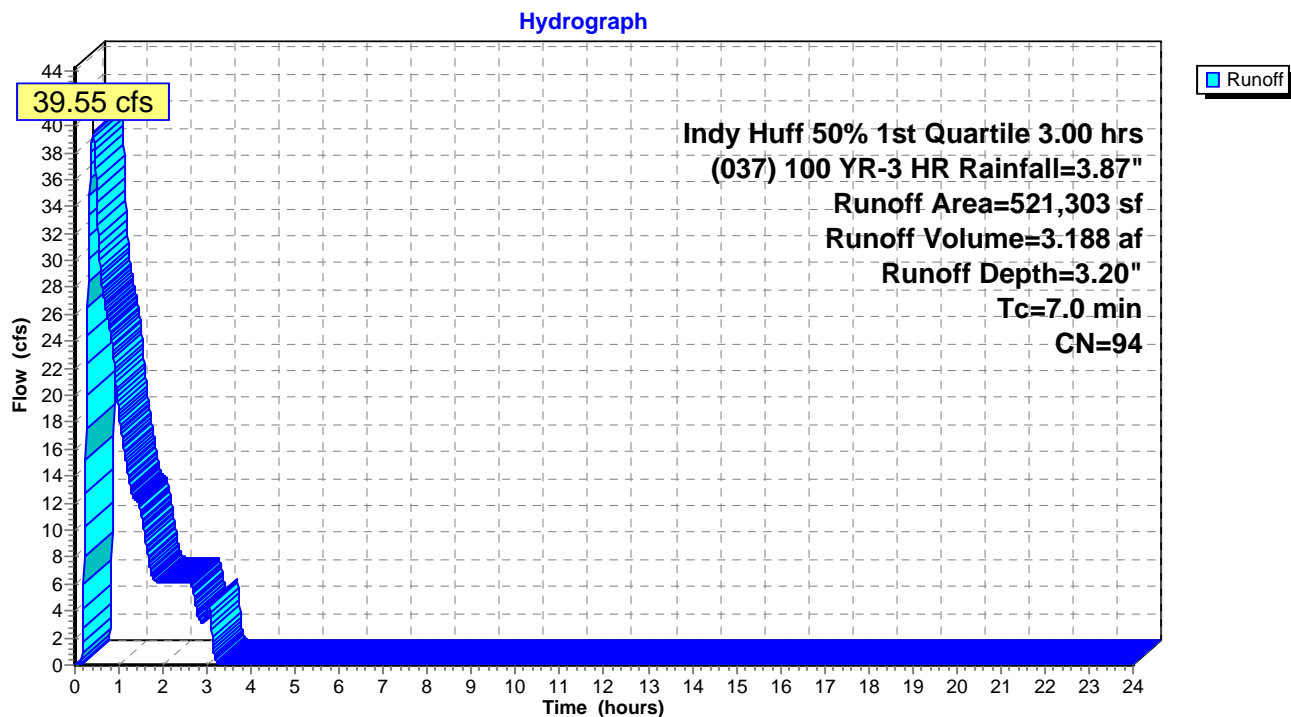
Runoff = 39.55 cfs @ 0.41 hrs, Volume= 3.188 af, Depth= 3.20"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
 Indy Huff 50% 1st Quartile 3.00 hrs (037) 100 YR-3 HR Rainfall=3.87"

Area (sf)	CN	Description
* 521,303	94	From Spreadsheet
521,303		100.00% Pervious Area

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

Subcatchment POST-DEV: Post-Developed Watershed



Summary for Pond POND DA: POND DA

Inflow Area = 11.967 ac, 0.00% Impervious, Inflow Depth = 3.20" for (037) 100 YR-3 HR event
 Inflow = 39.55 cfs @ 0.41 hrs, Volume= 3.188 af
 Outflow = 1.18 cfs @ 3.14 hrs, Volume= 1.870 af, Atten= 97%, Lag= 163.7 min
 Primary = 1.18 cfs @ 3.14 hrs, Volume= 1.870 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs / 3
 Peak Elev= 721.31' @ 3.14 hrs Surf.Area= 75,349 sf Storage= 128,903 cf
 Flood Elev= 722.50' Surf.Area= 80,761 sf Storage= 221,825 cf

Plug-Flow detention time= 650.3 min calculated for 1.870 af (59% of inflow)
 Center-of-Mass det. time= 619.8 min (685.9 - 66.1)

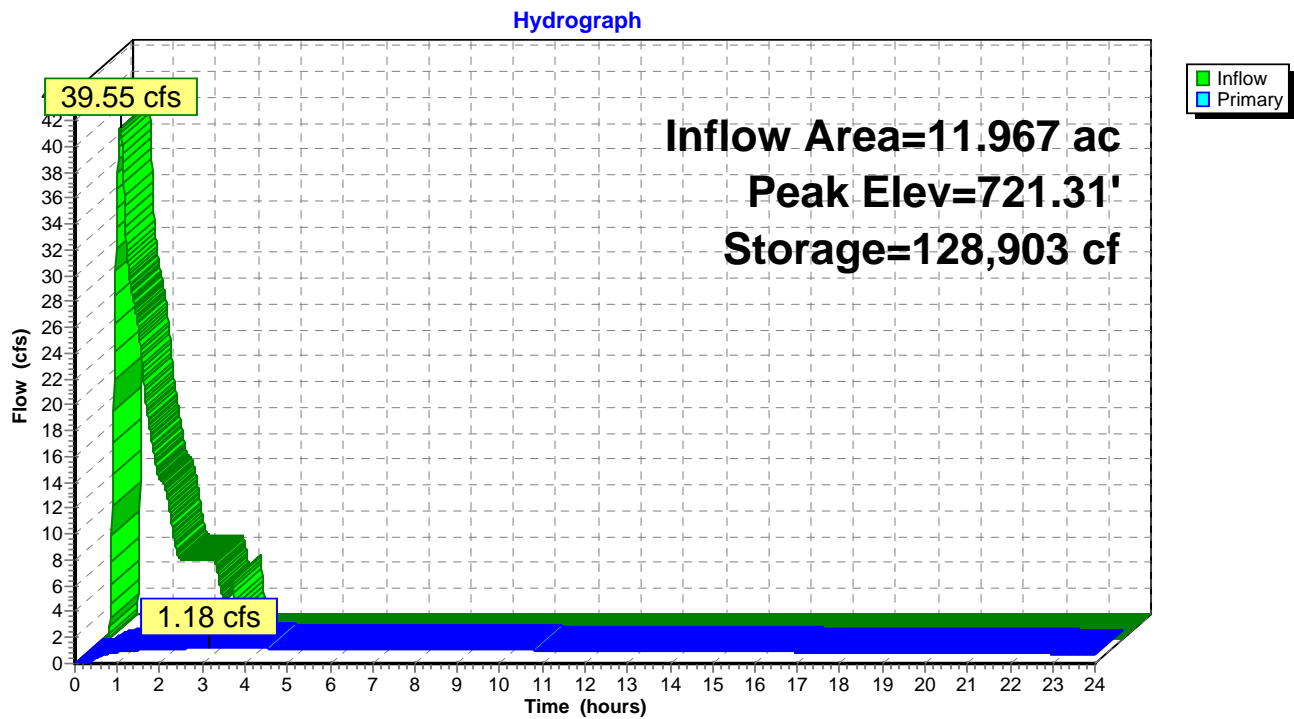
Volume	Invert	Avail.Storage	Storage Description
#1	719.50'	6,480,802 cf	Custom Stage Data (Prismatic) Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
719.50	67,122	0	0
722.50	80,761	221,825	221,825
800.00	80,761	6,258,978	6,480,802

Device	Routing	Invert	Outlet Devices
#1	Primary	710.76'	18.0" Round Outlet Pipe L= 100.0' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 710.76' / 709.56' S= 0.0120 ' /' Cc= 0.900 n= 0.013, Flow Area= 1.77 sf
#2	Device 1	719.50'	6.0" Vert. 10YR Outlet C= 0.600
#3	Device 1	721.50'	30.0" x 30.0" Horiz. Orifice/Grate C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=1.18 cfs @ 3.14 hrs HW=721.31' (Free Discharge)
 1=Outlet Pipe (Passes 1.18 cfs of 24.88 cfs potential flow)
 2=10YR Outlet (Orifice Controls 1.18 cfs @ 6.01 fps)
 3=Orifice/Grate (Controls 0.00 cfs)

Pond POND DA: POND DA



Summary for Subcatchment POST-DEV: Post-Developed Watershed

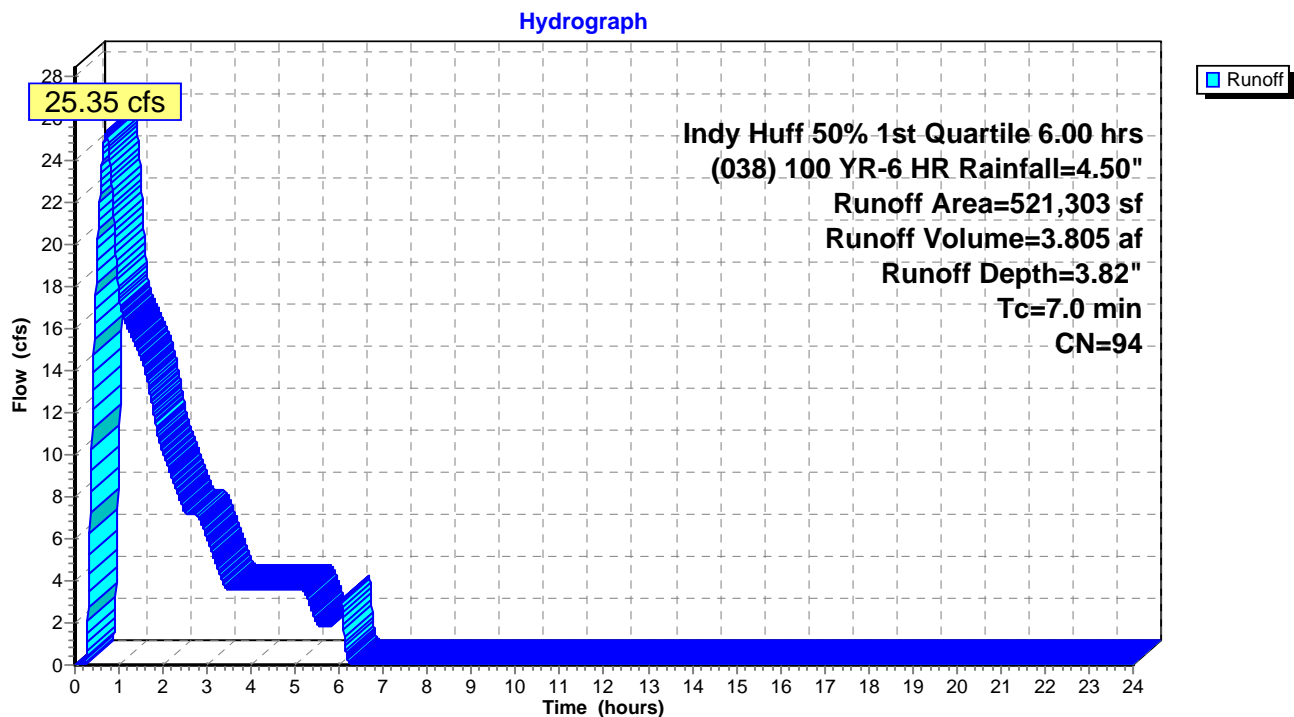
Runoff = 25.35 cfs @ 0.70 hrs, Volume= 3.805 af, Depth= 3.82"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
 Indy Huff 50% 1st Quartile 6.00 hrs (038) 100 YR-6 HR Rainfall=4.50"

Area (sf)	CN	Description
* 521,303	94	From Spreadsheet
521,303		100.00% Pervious Area

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

Subcatchment POST-DEV: Post-Developed Watershed



Summary for Pond POND DA: POND DA

Inflow Area = 11.967 ac, 0.00% Impervious, Inflow Depth = 3.82" for (038) 100 YR-6 HR event
 Inflow = 25.35 cfs @ 0.70 hrs, Volume= 3.805 af
 Outflow = 1.31 cfs @ 6.11 hrs, Volume= 2.060 af, Atten= 95%, Lag= 324.8 min
 Primary = 1.31 cfs @ 6.11 hrs, Volume= 2.060 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs / 3
 Peak Elev= 721.51' @ 6.11 hrs Surf.Area= 76,276 sf Storage= 144,365 cf
 Flood Elev= 722.50' Surf.Area= 80,761 sf Storage= 221,825 cf

Plug-Flow detention time= 657.1 min calculated for 2.059 af (54% of inflow)
 Center-of-Mass det. time= 592.7 min (716.8 - 124.1)

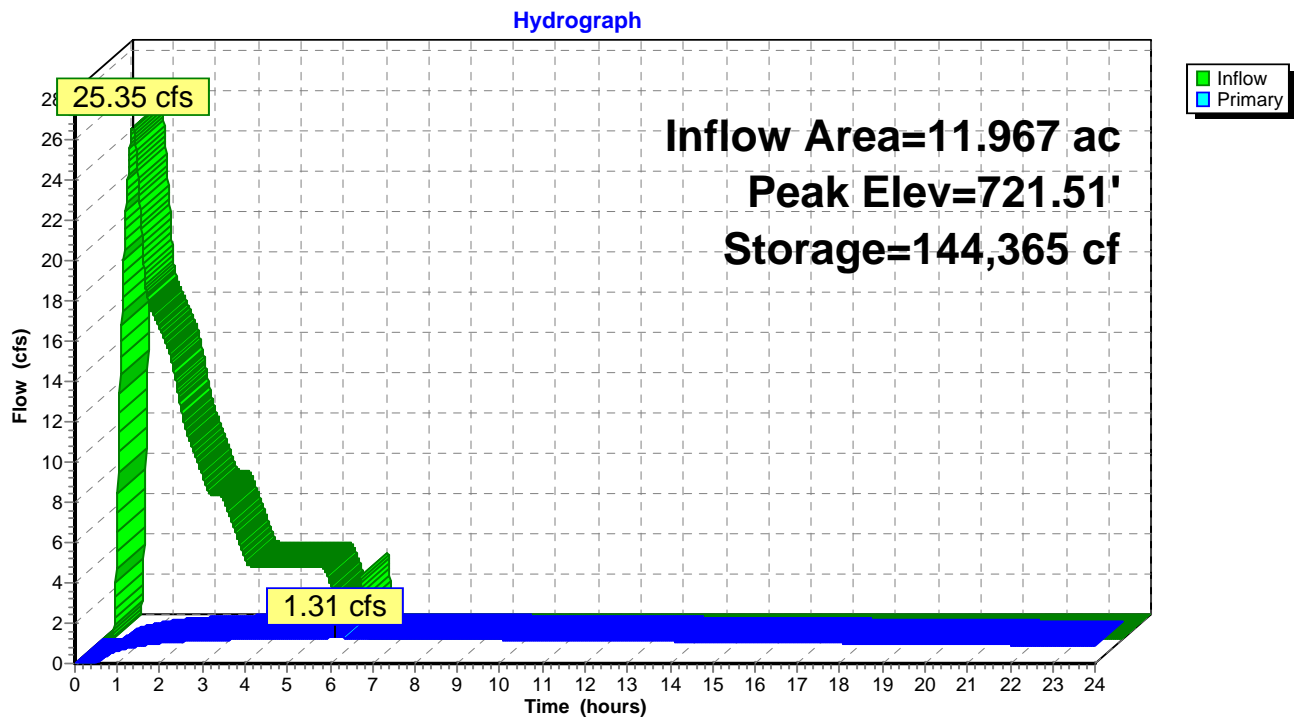
Volume	Invert	Avail.Storage	Storage Description
#1	719.50'	6,480,802 cf	Custom Stage Data (Prismatic) Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
719.50	67,122	0	0
722.50	80,761	221,825	221,825
800.00	80,761	6,258,978	6,480,802

Device	Routing	Invert	Outlet Devices
#1	Primary	710.76'	18.0" Round Outlet Pipe L= 100.0' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 710.76' / 709.56' S= 0.0120 ' /' Cc= 0.900 n= 0.013, Flow Area= 1.77 sf
#2	Device 1	719.50'	6.0" Vert. 10YR Outlet C= 0.600
#3	Device 1	721.50'	30.0" x 30.0" Horiz. Orifice/Grate C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=1.31 cfs @ 6.11 hrs HW=721.51' (Free Discharge)
 1=Outlet Pipe (Passes 1.31 cfs of 25.13 cfs potential flow)
 2=10YR Outlet (Orifice Controls 1.26 cfs @ 6.39 fps)
 3=Orifice/Grate (Weir Controls 0.05 cfs @ 0.38 fps)

Pond POND DA: POND DA



Summary for Subcatchment POST-DEV: Post-Developed Watershed

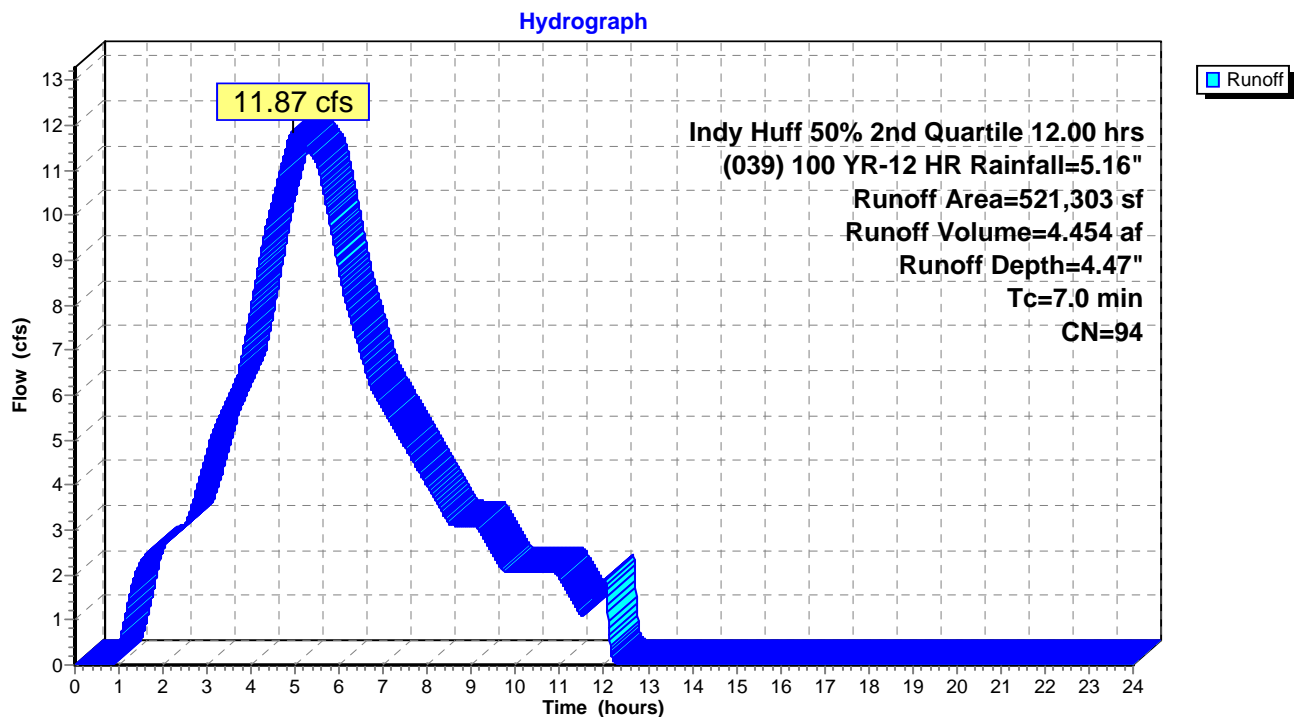
Runoff = 11.87 cfs @ 4.94 hrs, Volume= 4.454 af, Depth= 4.47"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
 Indy Huff 50% 2nd Quartile 12.00 hrs (039) 100 YR-12 HR Rainfall=5.16"

Area (sf)	CN	Description
* 521,303	94	From Spreadsheet
521,303		100.00% Pervious Area

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

Subcatchment POST-DEV: Post-Developed Watershed



Summary for Pond POND DA: POND DA

Inflow Area = 11.967 ac, 0.00% Impervious, Inflow Depth = 4.47" for (039) 100 YR-12 HR event
 Inflow = 11.87 cfs @ 4.94 hrs, Volume= 4.454 af
 Outflow = 2.25 cfs @ 9.60 hrs, Volume= 2.189 af, Atten= 81%, Lag= 279.6 min
 Primary = 2.25 cfs @ 9.60 hrs, Volume= 2.189 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs / 3
 Peak Elev= 721.60' @ 9.60 hrs Surf.Area= 76,650 sf Storage= 150,652 cf
 Flood Elev= 722.50' Surf.Area= 80,761 sf Storage= 221,825 cf

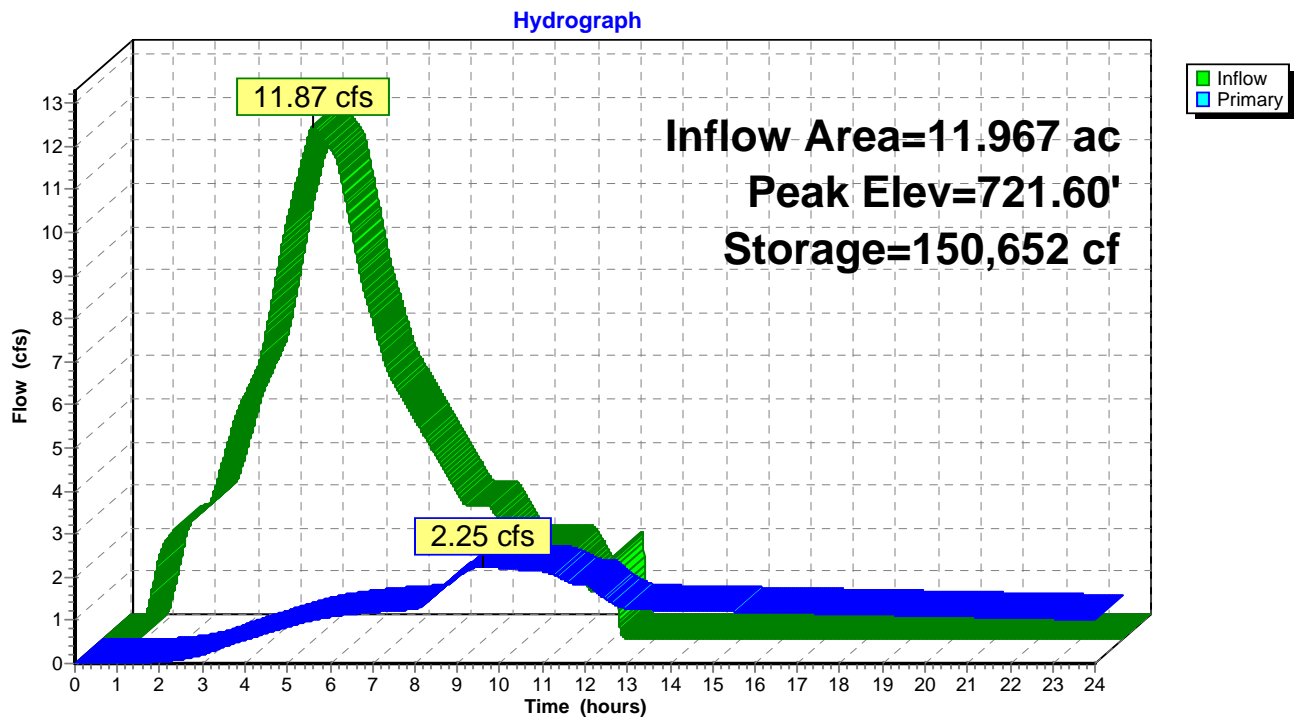
Plug-Flow detention time= 566.6 min calculated for 2.189 af (49% of inflow)
 Center-of-Mass det. time= 454.8 min (802.7 - 347.9)

Volume	Invert	Avail.Storage	Storage Description
#1	719.50'	6,480,802 cf	Custom Stage Data (Prismatic) Listed below (Recalc)
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
719.50	67,122	0	0
722.50	80,761	221,825	221,825
800.00	80,761	6,258,978	6,480,802

Device	Routing	Invert	Outlet Devices
#1	Primary	710.76'	18.0" Round Outlet Pipe L= 100.0' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 710.76' / 709.56' S= 0.0120 '/' Cc= 0.900 n= 0.013, Flow Area= 1.77 sf
#2	Device 1	719.50'	6.0" Vert. 10YR Outlet C= 0.600
#3	Device 1	721.50'	30.0" x 30.0" Horiz. Orifice/Grate C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=2.25 cfs @ 9.60 hrs HW=721.60' (Free Discharge)
 1=Outlet Pipe (Passes 2.25 cfs of 25.23 cfs potential flow)
 2=10YR Outlet (Orifice Controls 1.28 cfs @ 6.54 fps)
 3=Orifice/Grate (Weir Controls 0.97 cfs @ 1.01 fps)

Pond POND DA: POND DA



Summary for Subcatchment POST-DEV: Post-Developed Watershed

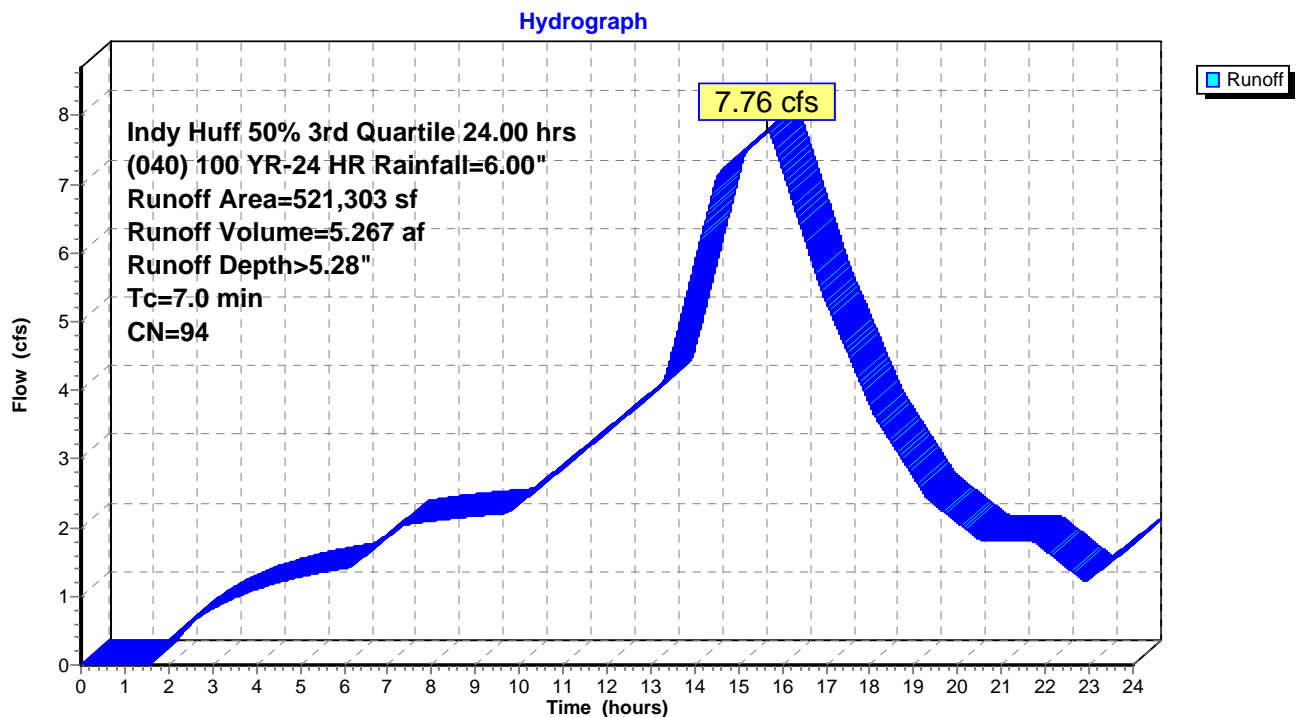
Runoff = 7.76 cfs @ 15.67 hrs, Volume= 5.267 af, Depth> 5.28"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
 Indy Huff 50% 3rd Quartile 24.00 hrs (040) 100 YR-24 HR Rainfall=6.00"

Area (sf)	CN	Description
* 521,303	94	From Spreadsheet
521,303		100.00% Pervious Area

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

Subcatchment POST-DEV: Post-Developed Watershed



Summary for Pond POND DA: POND DA

Inflow Area = 11.967 ac, 0.00% Impervious, Inflow Depth > 5.28" for (040) 100 YR-24 HR event
 Inflow = 7.76 cfs @ 15.67 hrs, Volume= 5.267 af
 Outflow = 2.88 cfs @ 18.85 hrs, Volume= 1.888 af, Atten= 63%, Lag= 191.2 min
 Primary = 2.88 cfs @ 18.85 hrs, Volume= 1.888 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs / 3
 Peak Elev= 721.63' @ 18.85 hrs Surf.Area= 76,818 sf Storage= 153,491 cf
 Flood Elev= 722.50' Surf.Area= 80,761 sf Storage= 221,825 cf

Plug-Flow detention time= 523.1 min calculated for 1.888 af (36% of inflow)
 Center-of-Mass det. time= 218.0 min (1,070.4 - 852.4)

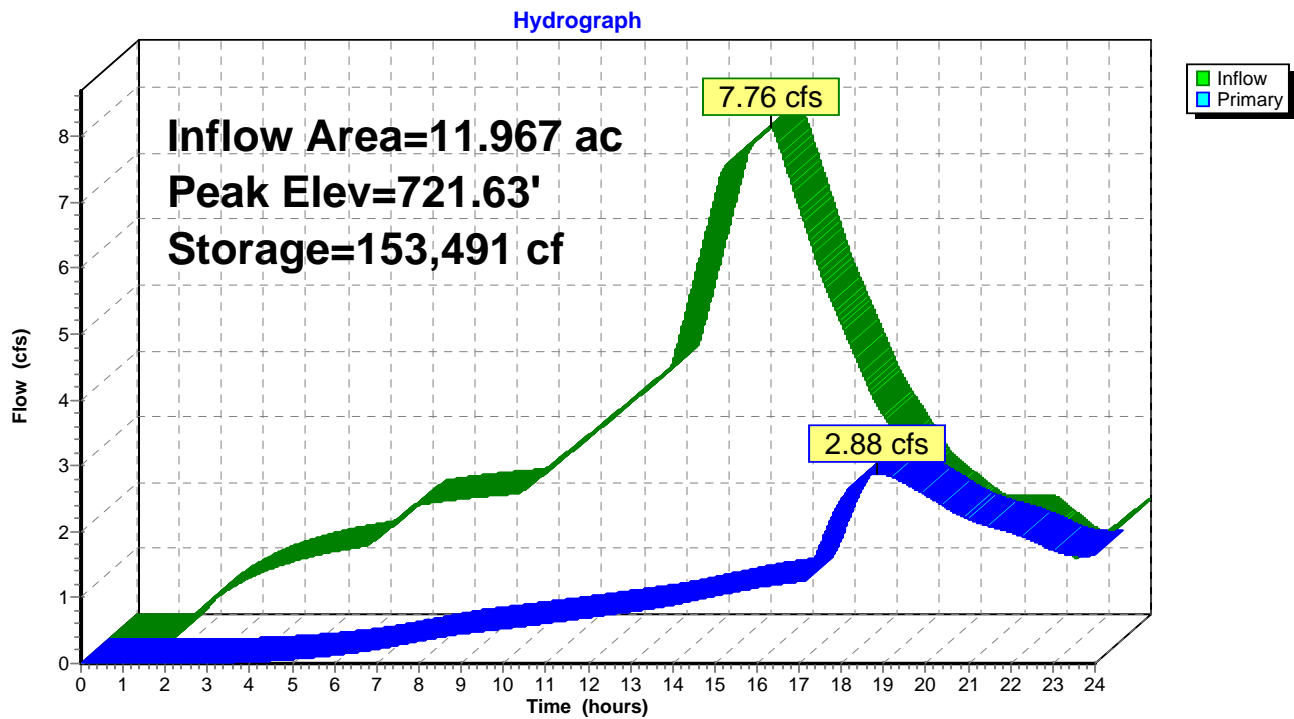
Volume	Invert	Avail.Storage	Storage Description
#1	719.50'	6,480,802 cf	Custom Stage Data (Prismatic) Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
719.50	67,122	0	0
722.50	80,761	221,825	221,825
800.00	80,761	6,258,978	6,480,802

Device	Routing	Invert	Outlet Devices
#1	Primary	710.76'	18.0" Round Outlet Pipe L= 100.0' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 710.76' / 709.56' S= 0.0120 ' / ' Cc= 0.900 n= 0.013, Flow Area= 1.77 sf
#2	Device 1	719.50'	6.0" Vert. 10YR Outlet C= 0.600
#3	Device 1	721.50'	30.0" x 30.0" Horiz. Orifice/Grate C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=2.88 cfs @ 18.85 hrs HW=721.63' (Free Discharge)
 1=Outlet Pipe (Passes 2.88 cfs of 25.27 cfs potential flow)
 2=10YR Outlet (Orifice Controls 1.30 cfs @ 6.61 fps)
 3=Orifice/Grate (Weir Controls 1.58 cfs @ 1.19 fps)

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APPENDIX E

Emergency Overflow Calculations

BMP 1

Q100	2.88 cfs	$Q = Cd * L * H^{3/2}$
125% Q100	3.6	
Cd	3.3	
H	0.5	
Length	3.09	